

# Schleibinger Geräte

## Building Materials Testing Systems

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### Schleibinger CDF/CIF - Freeze-Thaw Testing Equipment

### User manual

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October 11, 2021

Version 3.0



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## 1 Introduction

In this user manual the product „CDF/CIF - Freeze-Thaw Testing Equipment“ (hereafter CDF machine) is described.

This user manual contain information on the safe, trouble-free and economical use of the CDF machine.

These informations are intended for people who carry out tasks with or in connection with the CDF machine.

Keep this user manual or relevant parts of it ready to hand in the immediate vicinity of the CDF machine.

When handing over the machine to another person, the operator passes this user manual on to this person.

The other applicable documents are supplied with this user manual and can be found under „CDF Service Dokumente“.

## 2 Safety Information

### Read and follow the instructions.

This manual contain Warning and Caution statements. This information is important for safe and efficient installation and operation. The following signal words and symbols are used in this user manual:



Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



Indicates a dangerous situation which, if not obviated, may result in damage to property.



Hazardous voltage. Danger of electrical shock or burn.



Warning of the risk of crushing and injury to the hand.



Warning of the risk of crushing the hand.



Wear protective gloves when using equipment.

Wear safety glasses when using equipment.



Wash hands before breaks and immediately after handling the product.



When using do not eat, drink or smoke.

## 2.1 Important Safety Information



Make sure that the input voltage and frequency correspond to the device specification. This information is printed on the type label and can be found on the machine in the area of the connection cable.

Disconnect the power supply before servicing. To reduce the risk of fire, electric shock, or personal injury, installation work and electrical wiring must be done by a qualified electrician in accordance with all applicable regulations and standards, including fire-rated construction.

The CDF machine is operating with a refrigerant and requires a careful handling with it. Service and repair jobs at the cooling machine are allowed only for well trained and special educated persons. Please contact Schleibinger for further questions.

## 2.2 Protection Switches

The CDF machine is equipped with the following safety and security components, which are adjusted by manufacturer.

- electromagnetic lock for the lid. The lock is active, when the temperature is below 0°C or the testing machine is switched off.
- Over-temperature protection for the heating unit.
- Level indicator for the testing bath and the buffer.
- Safety switching device for limiting the high pressure of the compressor.
- Safety switching device for limiting the low pressure of the compressor
- safety switch to monitor for overshoot and undershoot of the compressor current
- safety switch to monitor for compressor over-temperature
- safety switch over-temperature bath, user adjustable.



**Changing the set-up of the security devices is prohibited! Any manipulation will lead to a total loss of the warranty!**

## 2.3 Personal Safety and First Aid



- In the event of defects that endanger safety, do not use the machine and inform responsible.
- Do not swallow the heat transfer fluid and antifreeze concentrate (glycol)!
- Avoid skin contact!
- Avoid eye contact!
- Do not use reactive substances.
- Do not eat, drink or smoke.

During hanging and removal of the sample containers:

- Wear protective gloves!
- Wear safety glasses!



- Avoid splashing when refilling.
- Avoid splashing when taking sample container.
- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- In case of contact with clothes and skin, take off immediately all contaminated clothing and wash the skin immediately with plenty of water for a minimum of 10 minutes.
- Absorb leaked liquid with absorbent material and dispose of according to the local regulations.
- In case of fire: use fire extinguisher. Do not use water in the full jet! Do not breath fumes!
- When closing the machine, do not put your hands under the cover. There is a risk of crushing
- When closing the machine, do not place your hands in the area of the safety switch. There is a risk of crushing and injury.

## 2.4 Safety Instructions for the Refrigerant

Work on the refrigerant-related parts of the testing equipment is only permitted for educated and trained technicians in accordance with all applicable regulations and standards.

The refrigerant R448a is classified in safety class A1 according to ISO/ASHRAE. It is not flammable and has no significant harmful effects on humans. R448a has a global warming potential of GWP = 1387.



**Do not change safety, protection and control devices!**



In case of fire, switch off the refrigeration system. Containers and system parts that are filled with refrigerant can burst violently. When extinguishing, cool the container and system parts with water spray.

### 3 Intended Use

The CDF machine is designed for the storage of mineral building materials at changing temperatures in a range of - 20 °C to + 20 °C and is intended for use in closed rooms. Use the system only for its intended purpose.

### 4 Reasonably Foreseeable Misuse or Foreseeable Incorrect Use

**Do not use** the machine for the following applications:

- Storage and cooling of products that are not mineral building materials.
- Storage of mineral materials that tend to form gas during storage.
- Storage of mineral materials that create a flammable atmosphere during storage.
- Applications that create a risk of explosion.
- Use in potentially explosive areas.
- Use outdoors or in damp and splash water areas.

### 5 Declaration of Conformity

The declaration of conformity is supplied with the user manual and can be found in the additional applicable documents under „CDF Service Dokumente“.

## 6 Description of the Appliance

The CDF/CIF-Freeze-Thaw testing equipment (CDF machine) is a high-quality testing device for carrying out freeze-thaw resistance tests on building materials. CDF machine is equipped with a microprocessor controller including internet interface. All relevant safety regulations for refrigeration and electrics have taken into account.

The CDF freeze-thaw testing device enables the implementation of the freeze-thaw resistance test according to RILEM Recommendation (Materials and Structures (1996) Vol. 29 (193), pp 523-528), according to RILEM CIF test and according to CEN/TS 12390-9. The advantage of these test methods lies in the very good reproducibility of the measurement results.

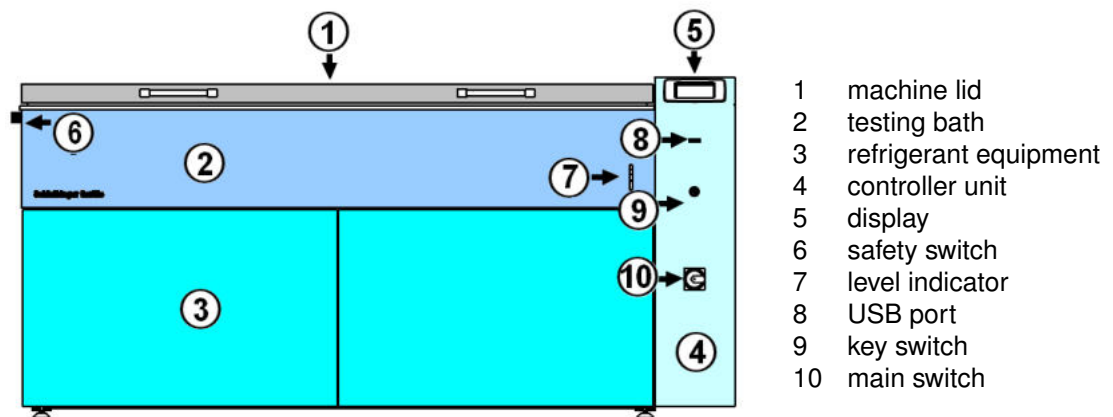
These test methods describe the periodic freezing of building materials through indirect contact with a heat transfer fluid. This arrangement enables an optimal temperature distribution, a fast temperature adjustment and a temperature gradient perpendicular to the tested surface. Due to the optimal thermal contact, the temperature can be maintained very accurately over the entire temperature curve.

The CDF machine is cooled by means of air cooling. Optionally, the machine can be equipped with a combined air-water cooling „**Additional Feature Air and Water Cooling for CDF equipment**“.

With a appropriate system upgrade, the cube test (VDZ cube method) in accordance with CEN/TS 12390-9 and the ASTM test in accordance with ASTM C666 procedure A can be carried out („**Additional Feature Cube Test and ASTM C666 Procedure A**“). In contrast to air conditioning cabinets, the freeze-thaw cycle can be run through in 12 hours instead of 24 hours due to an efficient heat transfer from the heat-transfer fluid to the sample. Hence, testing time and costs will be minimized.

The technology of the system is easily accessible from all sides due to removable panels. A thick, carefully executed pipe insulation and a cross ventilation of the device parts reliable prevent condensation. All components fits well due to the use of CNC punching and CNC bending presses. Robust surfaces result from powder coating of all sheet metal parts.

The CDF machine is supplied as a plug-in compact device in chest form. It consists of three main parts: testing bath, refrigerant equipment and controller unit (fig. 1).



**Figure 1:** Structure of the CDF machine.

### 6.1 Testing Bath with Machine Lid

The tub of the testing bath is thermally insulated and is made of high quality stainless steel. For the uniform temperature distribution in the testing bath, the cooling liquid is kept flowing. The sample containers are made of stainless steel and are placed in the cooling bath. The concrete samples are placed in the sample containers. The buffer with the heat transfer fluid is placed directly under the testing bath.

### 6.2 Refrigerant Equipment

The unit part, which contains the refrigerant equipment and the assemblies for circulation and temperature control, is located below the testing bath (fig. 1, (3)).

The temperature bath is circulated with a pump and thus enabling rapid temperature control. If the temperature bath is to be heated up, the heating is switched on. If the temperature bath is to be cooled, pre-cooled heat transfer fluid is taken from the storage bath and fed into the main circuit.

The temperature in the storage bath is always kept well below the target temperature of the testing bath so that a sufficient amount of cold is available.

### 6.3 Controller Unit



The controller unit contains the regulation and switches of the machine and is attached to the right of the machine (fig. 1, (4)). Disconnect the power supply before maintenance work. All installation and maintenance work on the electrics and electronics may only be carried out by qualified specialist in accordance with all applicable regulations and standards.

### 6.4 Display

The machine is operated via the operating and control unit (display) (fig. 1, (5)). Up to 7 different temperature profiles can be entered and selected on the screen. A test program can only be started and stopped on the display.

## 6.5 Safety Switch

Opening the lid of the cooling bath is only permitted, if the bath temperature is close to room temperature. The lid of the CDF machine is equipped with the safety switch (fig. 2). The lock is active, when the temperature is below 0 °C or the testing machine is switched off.

The lock is deactivated, when the power is on and the temperature inside is above 0 °C.



Do not place hands in the area of the safety switch when closing the lid. There is a risk of crushing and injury!



**Figure 2:** Lid lock on the left side of the machine: closed position (left) and open position (right).

## 6.6 Level Indicator

The level indicator shows the level of the heat transfer fluid in the storage bath (fig. 1, (7)). The level should be set in the area of the optimum and must not be below the minimum mark or above the maximum mark.

## 6.7 USB Port

USB port for the supplied USB stick is available below the display (fig. 1, (8)). Use the supplied USB stick only!

## 6.8 Key Switch

During the operation, the equipment can be protected against unauthorized users with a key switch (fig. 1, (9)). The display can be blocked so that the operation from the display is no longer possible.

To lock the machine, insert the key into the lock and turn it in the direction **0**. The key can then be withdrawn. To unlock, turn the key to the **I** position.

When the machine is locked with the key switch, it is possible to access the system via the network.

## 6.9 Main Switch

The main switch is located in the lower area of the controller unit (fig. 1, (10)).

### 6.10 Notices and Stickers

Notices and stickers are attached on the system. These must be renewed in the event of loss or illegibility.

Mandatory signs can be found on the lid of the CDF machine (fig. 3, 1):



Wear protective gloves.

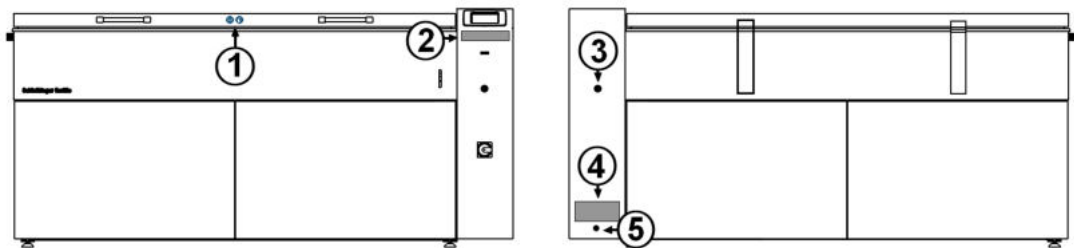
Wear safety glasses.

The CDF machine contains fluorinated greenhouse gases. The marking is mandatory as a result of the Kyoto protocol. The information on the refrigerant used can be found on the sticker under the screen (fig. 3, 2).

The type label is located on the back of the machine in the area of the connection cable (fig. 3, 4 und 5). The information on the type label can be found in the applicable documents „CDF Service Dokumente“.

### 6.11 Network Connection

The Network socket is located on the rear of the machine (fig. 3, 3).



**Figure 3:** Stickers and rear connections of the CDF machine:

- 1 mandatory signs
- 2 information on the refrigerant used
- 3 network socket
- 4 type label
- 5 power cable

**6.12 Important Information about the Machine****General**

dimension (w x d x h)	225 x 95 x 120 cm
weight without cooling liquid	approx. 560 kg
protection	IP20
temperature range	-20 °C ... +20 °C (-40 °C at evaporator)
temperate deviation	< ± 0,5 °C, except freezing point of the test fluid
temperature control	indirectly via heat transfer fluid
heat transfer fluid	approx. 50 % ethylene glycol approx. 50 % water adjusted to -45 °C
volume heat transfer fluid	approx. 100 liters

**Environmental conditions**

temperature range	+5 °C ... +28 °C
humidity	max. 65 %

**Testing bath**

inner dimensions (l x w x d)	170 x 51 x 20 cm
material	stainless steel 1.4301

**Power supply**

mains	400 V 3PH+N+PE, 50 Hz (optional 60 Hz)
power consumption	4.5 ... 8.5 kW
supply fuse	32 A

**Values for the safety switches****Refrigerator:**

overpressure switch:	25 bar
under-pressure switch:	-0.3 bar

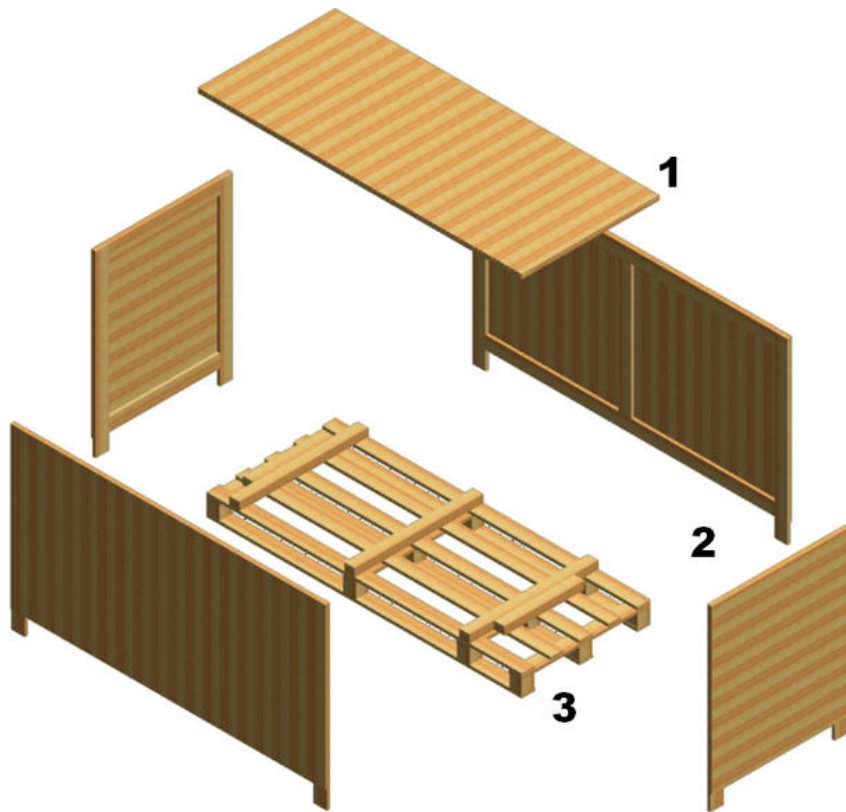
**Heater:**

over-temperature switch:	70 °C, max. 85 °C
over-temperature bath sensor:	30 °C

## 7 Delivery and Installation

### 7.1 Delivery and Packaging

- The testing equipment is delivered on a pallet in a wooden box.
- Check the packaging for damage before accepting the goods. Damages caused by transportation must be reported immediately.
- The wooden box is fastened with wood screws. First unscrew the lid (fig. 4, (1)) and then the side parts of the wooden box (fig. 4, (2)).
- The CDF machine stands on a pallet (fig. 4, (3)). It can be lifted off the pallet with a forklift. Pay attention to the maximum permissible load capacity of the forklift! The empty weight of the CDF machine is approx. 560 kg.
- If the equipment is to be lifted with the straps, fold them about the entire body of the machine. Never lift the machine by the lid or the controller unit!



**Figure 4:** Packaging of the CDF machine.

The packaging is designed to protect the equipment during moving and is made of wood. The box is heat-treated according to the regulations ISPM15/IPPC.

When the packaging is no longer needed, dispose of it according to local regulations.

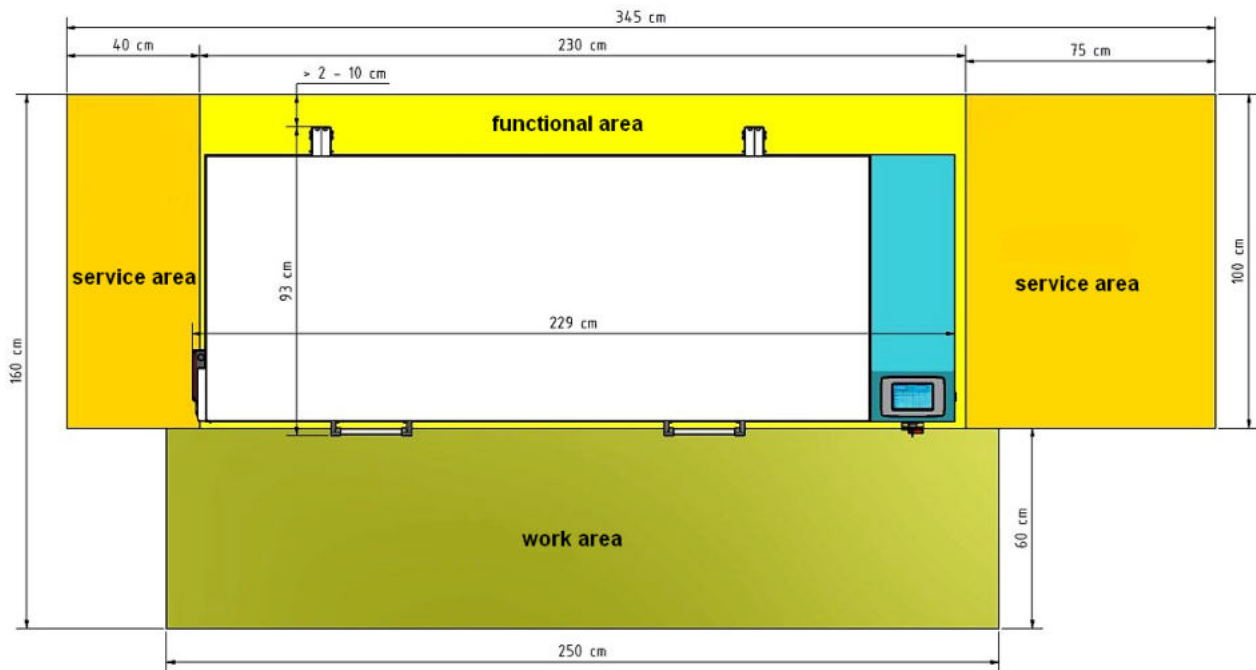
## 7.2 Spatial Requirements

The CDF machine is designed for operation in closed rooms. The environmental conditions should be at minimum +5 °C to maximum +28 °C and relative humidity of maximum 65 %. At higher humidity, more condensation may occur on some parts of the machines. For the temperatures above 28 °C additional water cooling system is required.

The CDF machine is engineered in accordance with DIN EN 378-1 class A. This means it is allowed to operate the CDF machine in a room where people are sleeping, disabled persons are working, or a lot of not instructed people are present. So there are no special requirements in the training of the people working with, or nearby the machine.

The floor should be designed for a load of at least 300 kg/m<sup>2</sup>. For a purely air-cooled system, the room size should be at least 200 m<sup>3</sup> and be well ventilated to dissipate the waste heat. For the set up of the CDF machine, please ensure free air circulation around the equipment.

The installation area required for the CDF machine is shown in fig. 5.



**Figure 5:** Required area for the installation of the CDF machine.

## 7.3 Transportation

For the transportation of the CDF machine, remove sample containers and the cooling liquid from the bath and the storage tank (buffer) when filled (see also chapter 10.5).

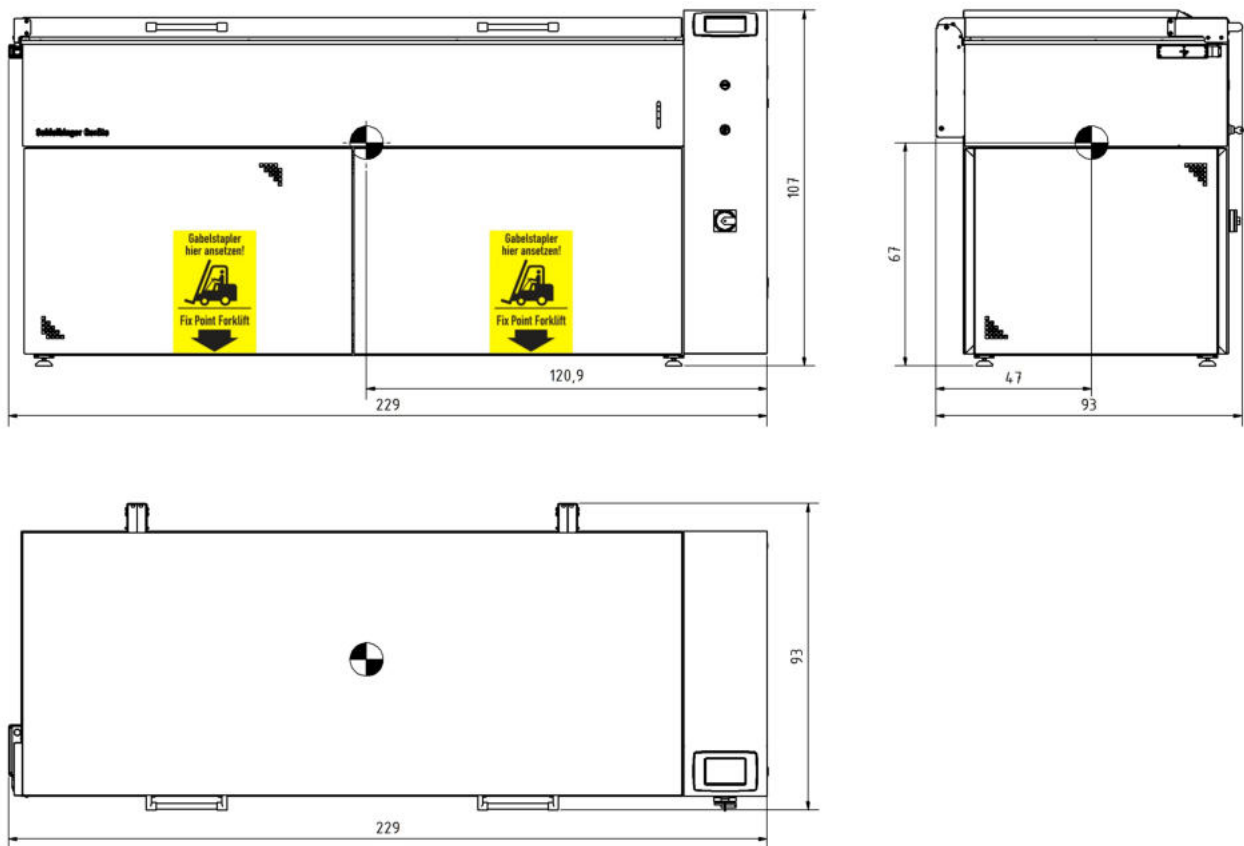


**Only attach the system to the frame of the chest and avoid exerting any force on the side (trim panels) of the chest or the controller unit.** The trim panels should be additionally secured or transported extra.

The dimensions and the balance point of the equipment as well as the points of support for the forklift are shown in the figure 6.

If no frost-proof transportation is to be expected, the residual water from the water-cooled systems must be drained from the plate heat exchanger

(evaporator) to prevent frost damage. Contact appropriately trained technician to perform this work.



**Figure 6:** Dimensions (in cm) and balance point of the CDF machine.

#### 7.4 Turn on the Equipment

Make sure incoming voltage and frequency are the same as the equipment rating. This information is printed on the type label and can be found on the CDF machine in the area of the power cable.

The CDF machine requires a 5-pin Euro power socket and 400 V three-phase power network with a rating of 3x32A CEE32A (3x25A characteristic B) and an appropriate circuit protection. Direction of rotation is right.

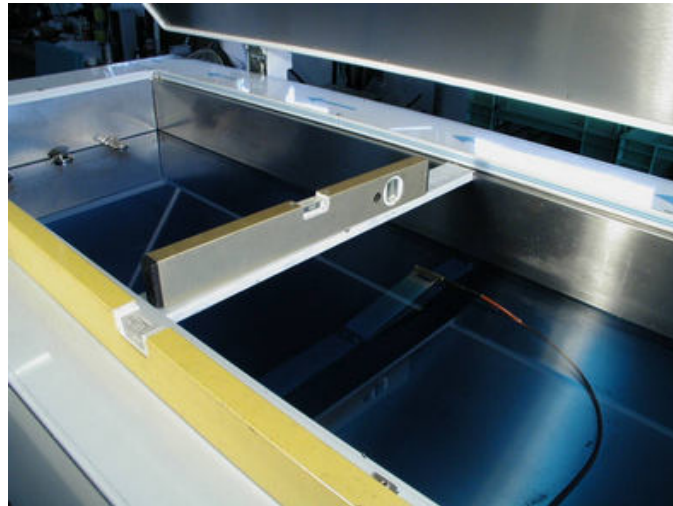
Connect the power supply by a red 3PH+N+PE plug and turn on the equipment. The display is on.

#### **NOTICE**

The main switch of the system should be switched on preferably 12 hours before starting testing. The compressor heater is then activated. The warming up prevents overpressure failure of the compressor after a long standstill.

## 7.5 Filling the Equipment

Set the CDF machine in level before filling the bath. Check this by a level at the testing bath (7). If necessary, the device can be levelled with four adjustable feet. It should be adjusted to  $\pm 1$  mm/m exactly.



**Figure 7:** Level check.

Insert the filter through the drainage openings in the testing bath (fig. 8, left).

Fill the heat transfer fluid (water-glycol mixture) into the testing bath. The filling quantity of the equipment in approx. 100 litres and depends on the number of sample containers in the testing bath. Hang up the required number of sample containers in the testing bath and fill up the heat transfer fluid to the optimum level (fig. 8, right).

Turn on the pump „PU 1“ for the testing bath and pump „PU 2“ for the buffer from the menu **Setup** → **System Menu** → **Manual** (see chapter 8.5.5). If need, turn the pumps on and off several times until the circuit remains stable. For pumping the heat transfer fluid from the buffer into the testing bath activate „Y-K1“ from the menu „manual“.

**NOTICE**

Never run the pumps for long time without fluid. Always make sure that the pumps are not sucking in air.



**Figure 8:** Inserting the filter (left) and optimum filling quantity of the heat transfer fluid of the machine (right).

### 7.6 Cooling Water Connection for the Combined Air-Water-Cooling (optional)

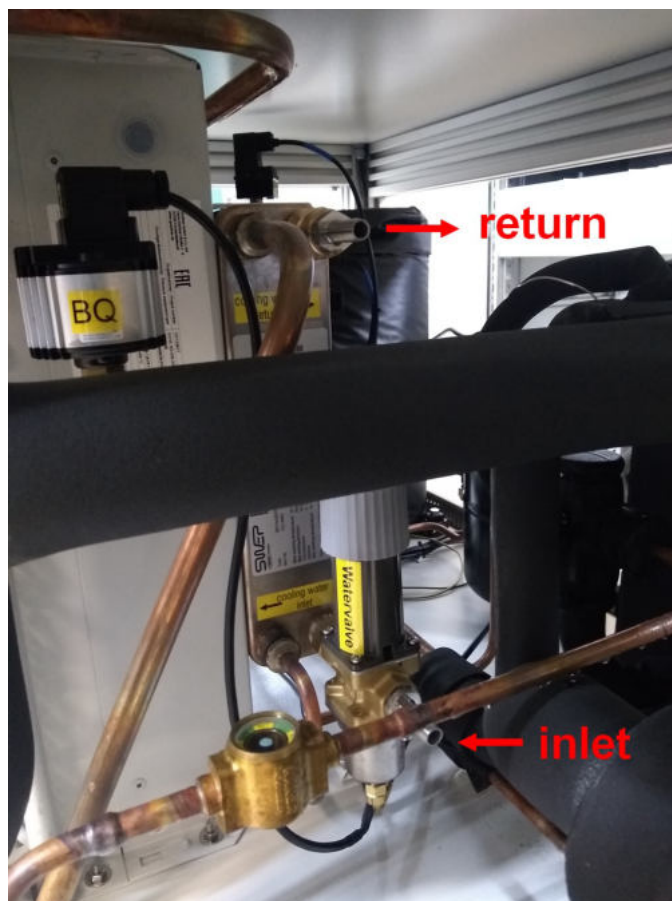
If the CDF machine is equipped for the combined air-water cooling, it can be supplied with cooling water via 1/2" hoses. When connecting, pay attention to the flow direction (fig. 9). The hoses can then be passed under the machine.

On-site installation of manometers in the water inlet and water outlet, a water meter and a water filter with a mesh size of 0.1 mm are recommended.

The water inlet pressure should be between 1 and 10 bar.

The regulation for the cooling of the CDF machine is set via pressure of the condenser. For the pressure of the condenser between 15 and 16 bar air cooling takes place. Higher temperatures due to the environment or inefficient ventilation and heat dissipation cause higher pressure of the condenser. If the pressure of the condenser rises to 16 bar and higher, the water cooling switches on additionally.

All changes to the settings must be carried out by a qualified technicians. Contact your customer service or Schleibinger for questions.



**Figure 9:** Water connectors for cooling water.

### 7.7 Cube Test and ASTM C666 Procedure A (optional)

The equipment may optionally be used for the cube testing method according to CEN/TS 12390-9 or for the testing method according to ASTM C666 procedure A. Both methods require a higher filling level of cooling liquid and a higher heat output. For the conversion, proceed as follows:

- Remove the filter and screw on additional sequence pieces including the sealing of the drain in the testing bath to reach a level of 100 mm. Put the filter back in.
- Place the majority of the sample containers in the testing bath and add heat transfer fluid until the optimum fluid level is reached.
- Check from the menu **Setup** → **System menu** → **Misc.** additional sensor **Ad. Sensor** is activated.
- Choose the suitable profile in set-up menu: profile for cube test method (VDZ12 or VDZ24) or profile ASTM 666 for test profile according to ASTM C666 procedure A.

This option is characterized by a higher heating output. The heating parameters can be changed using the controller parameters. Select from the display **Setup** → **System Menu** → **Controller** → **Bath** → **VDZkr**. The number means the temperature difference between the current temperature and the set temperature and should be between 1 and 5. For the input number of 5, the heating switches on when the difference between the current and set temperature reaches 5 °C. For carry out the freeze-thaw test according to ASTM C666 Procedure A or Cube Test according to CEN/TS 12390-9 usage of the temperature difference of 2 °C is recommended (fig. 10).

The CDF machine equipped with this option is factory set. No changes are required for heating operation.



**Figure 10:** Parameter setting for higher heating power.

## 8 Operation of the CDF Machine

This part of the user manual describes all the functions that can be set by the user from the display of the CDF controller. The controller itself is located in the controller unit at the top left.

An overview of the menu structure is shown in the fig 11 schematically.

Depending on the position within the menu, the following options are possible by selecting a menu item:

- selecting this menu item, which is marked accordingly,
- forwarding to the next menu or
- you will be asked to provide specification.

By selecting the menu item **Return** or **Back** you return to the previous menu.

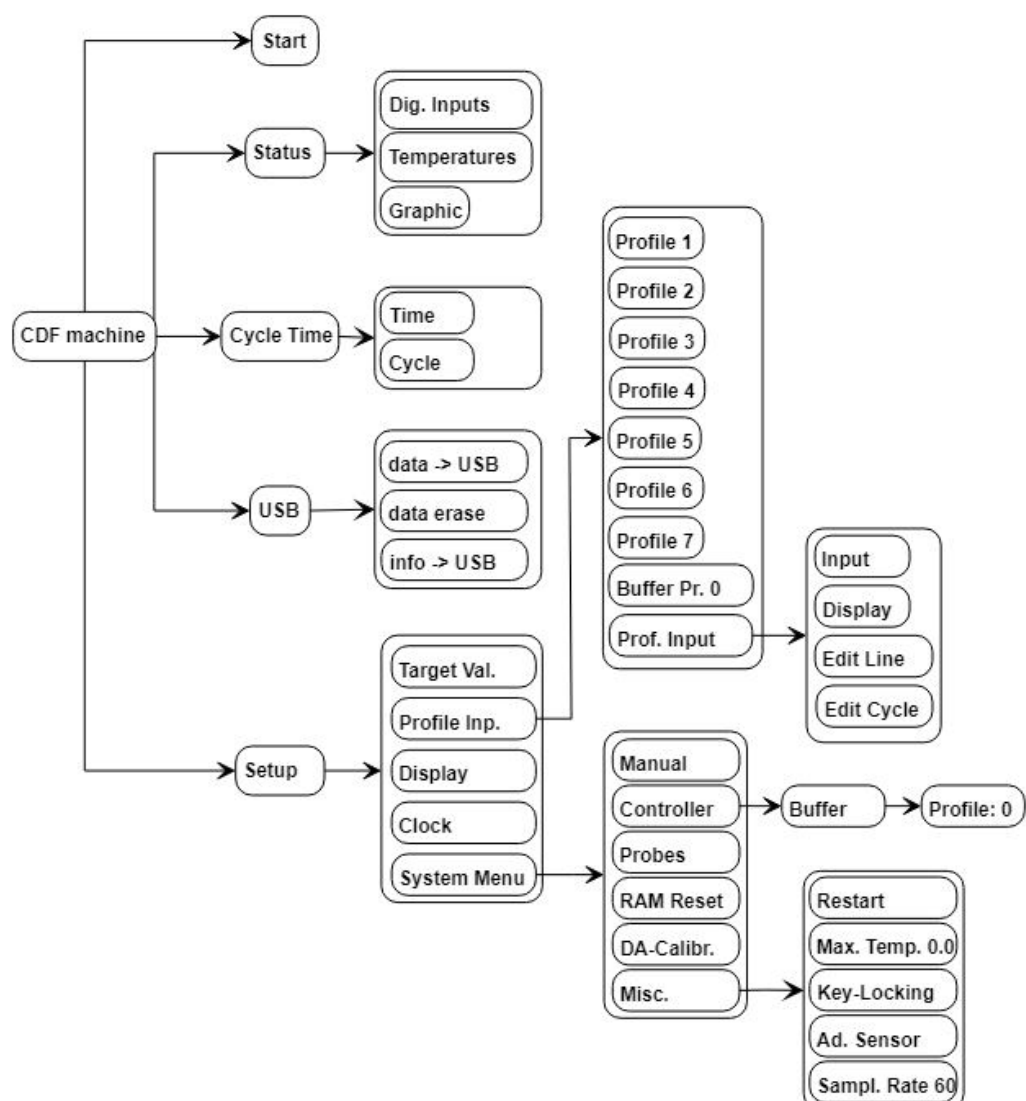


Figure 11: Menu structure of the CDF machine (excerpt).

## 8.1 Start and Stop

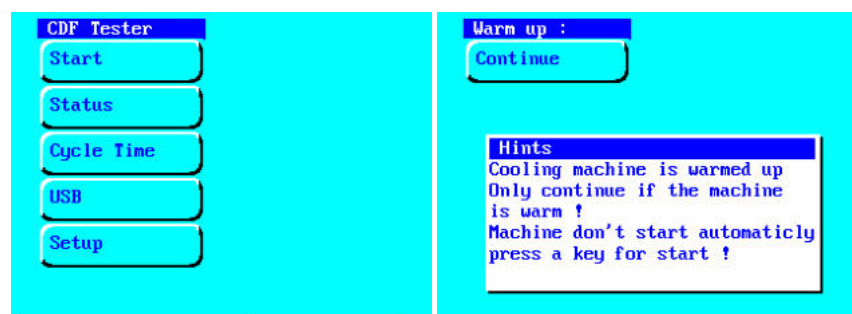
### NOTICE

The main switch of the system should be turned on preferably 12 hours before starting testing. The compressor heater is then activated. The warming up prevents overpressure failure of the compressor after a long standstill.

Turn the red main switch below the USB port to turn on the system. After starting up the main menu appears on the display (fig. 12, left). When choosing **Start** a hint appears on the display (fig. 12, right). If you are sure the device is already warm, you can skip the hint with **Continue**. The main menu appears on display again (fig. 12, left).

By selecting **Start**, the system starts at the specified cycle time. This time is retained even after turning off and can be changed in the menu **cycle time** (see chapter 8.3). For the CDF test 28 cycles of 12 hours each will be executed. The corresponding number of cycles will expire, if another profile is activated. At the end of the last cycle, the temperature is kept constant at +20 °C until the cycle time is reset and the profile is restarted. This means in case of a new test the cycle time has to be reset.

To stop the CDF controller when running, press anywhere on the display and select **stop**.



**Figure 12:** Main menu on display (left) and hints for warming up of the system (right).

## 8.2 Status

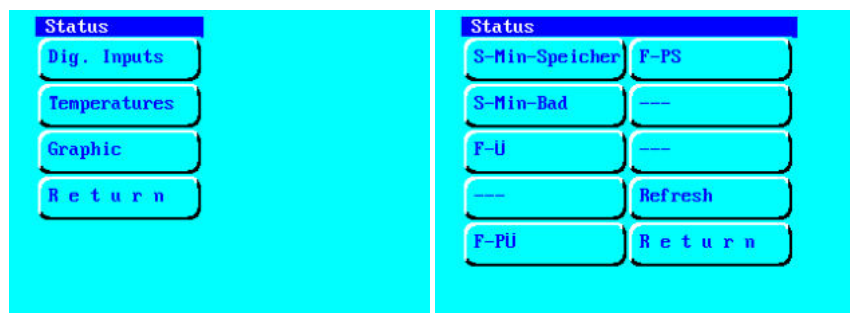
From the menu item **Status** the current readings of the CDF machine can be obtained (fig. 13, left).

**digital inputs:** The information about the status of the digital inputs can be shown from **Status** → **Dig. Inputs** (fig. 13, right).

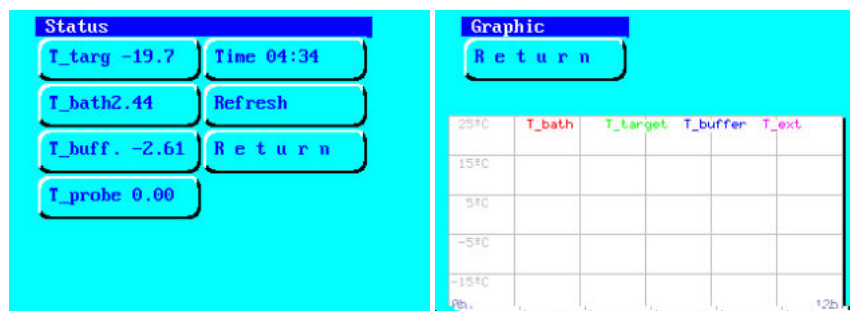
For refreshing the values select «Refresh».

**Temperatures:** The current temperature readings can be displayed from the sub-menu **Status** → **Temperatures** (fig. 14, left). For refreshing the values select «Refresh».

**Graphic:** The current graphic display can be shown from the sub-menu **Status** → **Graphic** (fig. 14, right)



**Figure 13:** Menu item «Status» (left) and the sub-menu «Dig. Inputs» (right).



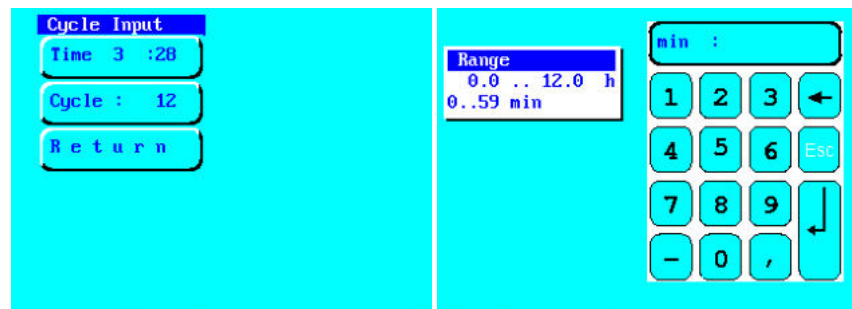
**Figure 14:** Current temperature readings from the sub-menu «Temperatures» (left) and current graphic display from the sub-menu «Graphic» (right).

### 8.3 Cycle Time

From the menu **Cycle time** the current cycle time and cycle number is shown as well the starting time of the cycle and the starting number of cycle can be entered (fig. 15).

The internal clock of the system remembers the cycle time of the last stop and continues at the same position at the next start. This is also the case in the event of a power failure or after a long stop of the device. The cycle time is indicated in hours (h) and minutes (min.).

With this function, the system can be started at any time during the selected temperature profile. For example in case of CDF test, when the system should start at 10 a.m. and the weathering should be determined at 1 to 3 p.m., the cycle time should be set to 7 h and 30 min. According to the temperature profile, 3 hours later the cycle time is 10 h 30 min and the real time is 1 p.m. The temperature in the testing room is in the range over +15 °C and the samples can be removed out of the bath for further processing. Please note, in this case the first 7 h and 30 min will be lost.



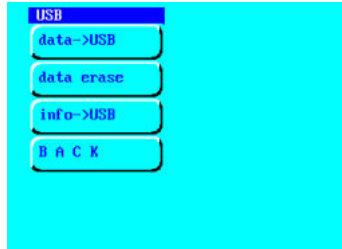
**Figure 15:** Menu item „Cycle time“ and the submenu «Time» (right).

From the menu **Cycle time** → **Cycle** the number of cycles can be entered. For reset of the system to the begin of the first cycle, enter 0 for hours and 0 for minutes and change the cycle number to 0 (or 1). The valid range is between 0 and the cycle number defined in the selected profile.

After completion of specified number of cycles, the temperature control will remain at +20 °C until the cycle number has been reset.

## 8.4 USB

The CDF machine is equipped with an USB port located under the display of the machine. To ensure error-free data transfer, use the supplied USB stick only. Select **USB** from the main menu (fig. 16).



From the sub-menu **data** → **USB** the temperature data can be copy from the internal storage to the USB stick. After saving the data on the internal storage can be deleted. Select **data erase** to delete the data from the CDF machine (PIN code 2603). In case of service the internal error memory can be read out and copy on USB stick. Select **info** → **USB** for copy the error file on USB stick.

**Figure 16:** Menu item „USB“.

### NOTICE

- use only the USB stick supplied with the CDF machine! The use of other sticks can possibly lead to malfunctions.
- Do not use violence! The USB stick must always be easy to insert.
- Do not clean the USB stick with some liquid or compressed air.
- Do not change the format of the USB stick!

### NOTICE

- The data available on USB stick will be overwritten, when copy the data again.
- Do not connect other USB devices such as printer or smart-phone! Not suitable for charging USB devices such as mobile phone.

The measurement data will be saved on USB stick as a txt file in the folder \daten:

\daten\data1.txt

Open the txt file for example with Excel. The measured data is shown in a table. The single tabs are separated by tab characters:

```
1279889704 44034.538241 17.41 17.44 -12.61 0.21
1279889760 44034.538889 17.26 17.29 -12.26 0.32
1279889815 44034.539525 17.10 17.12 -11.88 0.20
1279889871 44034.540174 16.95 16.96 -11.56 0.10
```

The first tab shows seconds since 01.01.1980. The second tab contains the Excel time. Format the second tab as date:time. The values of the temperature set ( $T_{\text{targ}}$ ) are shown in the third tab. The measured bath temperature ( $T_{\text{bath}}$ ) can be found in the fourth tab and the measured temperature of the buffer ( $T_{\text{buff}}$ ) in the fifth tab. The sixth tab contains the temperature difference between the temperature set and the temperature of the bath multiplied by a factor 10 ( $T_{\text{diff}} \cdot 10$ ). In case additional temperature sensors are installed ( $T_{\text{probe}}$ ), the data is shown in the following tabs.

seconds since 01.01.1980	Excel time.	$T_{\text{targ}}$	$T_{\text{bath}}$	$T_{\text{buff}}$	$T_{\text{diff}} \cdot 10$
1279889704	44034.538241	17.41	17.44	-12.61	0.21

## 8.5 Setup

The settings for the CDF machine are available from the submenu **setup** (fig. 17).

### NOTICE

**The set-up parameters are individually adjusted for each testing machine in order to get a proper work of the testing. Any changes can lead to improper work of the controller.**

**Do not change any settings in this menu if you have not dealt with the system in detail beforehand and you are clear about the inter-relationships!**

Improper handling can lead to defects in the system. Contact your supervisor or Schleibinger.



**Figure 17:** Menu item „Setup“.

### 8.5.1 Target Value

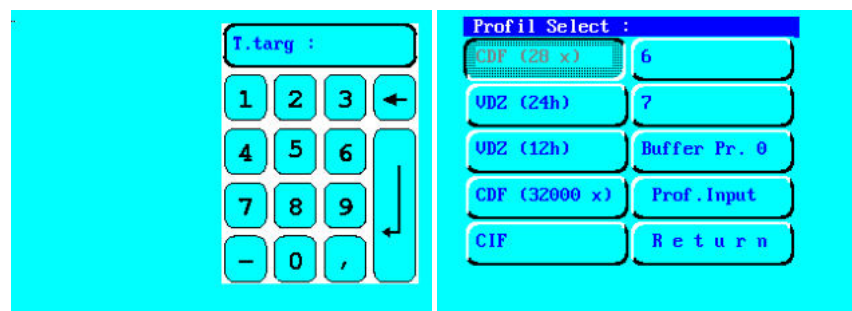
With this function the CDF machine works as a temperature control unit. The temperature can be adjusted from the sub-menu **Target. Val.** (fig. 18, left).

The CDF machine runs at set temperature until it stops.

### 8.5.2 Profile input

The temperature profile as well as the cycle number can be entered from the sub-menu item **Setup** → **Profile Inp.**. The temperature profile is freely programmable within the system specification. Up to 7 temperature profiles for the temperature bath can be stored for this testing device.

Some of the temperature profiles are factory-set and can be selected directly from the display. The current activated temperature profile is marked accordingly (fig. 18, right).



**Figure 18:** Submenu items „Target val.“ (left) and „Profile Inp.“ (right).

All temperature profiles can be changed by the user. Please note:

- The controller is optimized for the CDF testing and the temperature range of -20 °C to +20 °C. Every change of the settings may worsen the regulation of the controller. In worst case, this may lead to instability of the control.

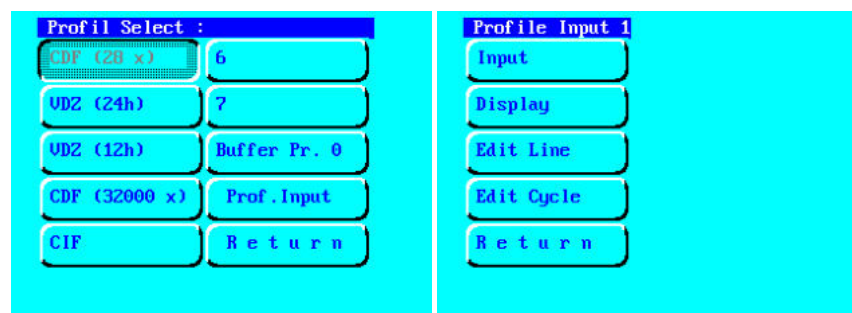
- The testing equipment has a refrigeration and temperature control system optimized for the CDF testing. Temperatures lower than -20 °C should not be used.
- The cooling liquid becomes viscous at lower temperatures. Depending on the glycol to water ratio it may freeze at lower temperatures. This can lead to the shut-down of the system.
- The pumps are designed for the temperature range of -20 °C to +40 °C.

**NOTICE**

Any changes of the temperature profile that lead to settings outside the technical specifications of the system is an improper use of the system with regard to guarantee and product liability. Liability is hereby rejected.

For changes of the temperature profile carefully check the technical possibilities of the equipment. For questions contact your supplier or Schleibinger Geräte.

For viewing or changing of the temperature profile select the profile by tapping. Than select the sub-menu **Prof. Input** (fig. 19).



**Figure 19:** Submenu items „Profile select“ (left) and „Profile Input“ (right).

From the sub-menu **Prof. Input** the following specifications are possible:

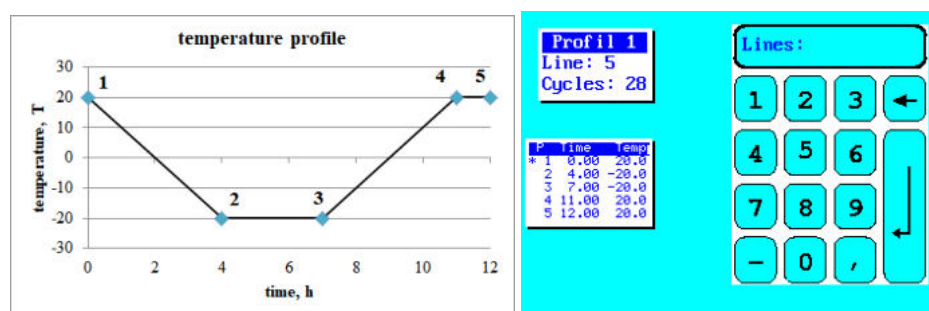
- For change of the selected temperature profile use **Input**
- For displaying of selected temperature profile choose **Display**
- For editing of temperature-time line select **Edit Line**. The input must be carried out separately for each line.
- For editing of the cycle number choose **Edit Cycle**
- Select **Return** to come back to the previous menu.

**NOTICE**

It is only possible to name a temperature profile from the computer via the network, but not from the display of the machine.

The temperature profile is defined by time, temperature and number of cycles. Accordingly, the CDF temperature profile is defined as follows:

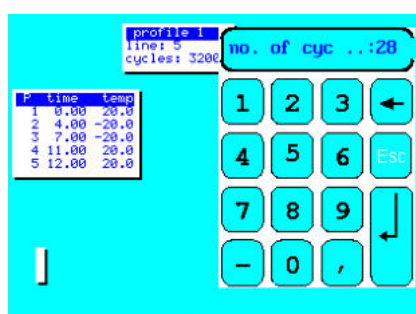
line	time	temperature
1	0	+20
2	4	-20
3	7	-20
4	11	+20
5	12	+20



**Figure 20:** Graphical representation of the temperature profile (left) and Profile input on the display of CDF machine (right).

To complete the testing profile the number of cycles (=number of repetitions) has to be entered. The number of cycles depends on the testing procedure for example CDF or CIF procedure with 28 cycles. For continuous working the equipment with the same temperature profile the number of cycles can be set to 32000 maximum. With a cycle length of 12 hours, the test duration would be in this case approx. 43 years.

For the changing the cycle number of the selected profile tap on **Prof. Input** → **Edit Cycle** (fig. 21).



**Figure 21:** Submenu item «Prof. Input» → «Edit Cycle».

For common applications of the CDF machine the temperature of the butter is adjusted according to the temperature difference between the target temperature and the bath temperature. For some special applications, it may be useful to assign the buffer its own temperature profile.

In order to have enough refrigeration capacity available at the freezing point, it is possible to define a storage profile in which the buffer holds the heat transfer fluid at the minimum temperature. The temperature

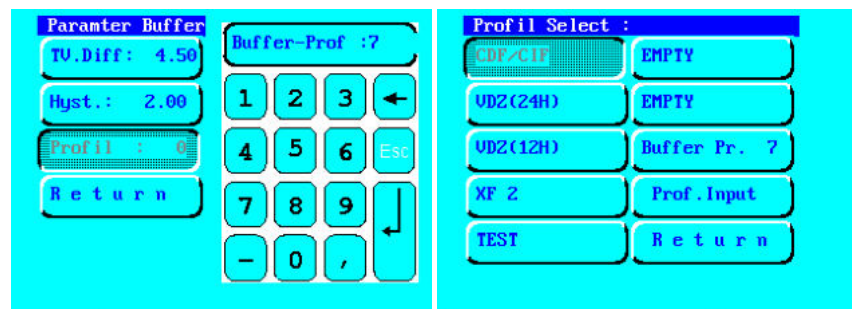
difference is no longer active in this case, so that the lead to the nominal temperature profile must be taken into account. An example of a possible temperature profile for the buffer is shown as following:

line	time, h	temperature, °C
1	0	+20
2	2	-22,5
3	7	-22,5
4	11	+20
5	12	+20

The buffer temperature profile is a special case and shows in the **Profile select** the number of the profile according to which the temperature in the buffer is adjusted. The profile for the buffer can be selected and define in the sub-menu **Profile Input** as well as the temperature profile for the bath using the profiles 1 to 7.

The assignment of the selected temperature profile to the buffer can be done from the menu **Setup** → **System Menu** → **Controller** → **Buffer** → **Profile** (fig. 22, left). Enter the number of the temperature profile, which should be assigned to a buffer. The valid values are 1 to 7. The selected number appears on the button **Setup** → **Profile Inp.** → **Buffer Pr.**. For the common application the number should be changed back to 0 which means the buffer temperature is adjusted according the temperature difference between the target temperature and the bath temperature.

The buffer profile can only be used in combination with the temperature profile of the bath. The bath profile can be selected as usual according to the testing profile (fig. 22, right).

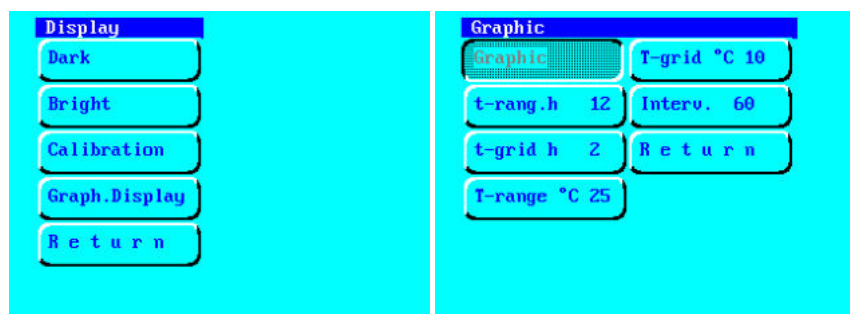


**Figure 22:** Profile assignment for the buffer (left) and display of the assigned profile in «Profile select» in combination with the bath temperature profile 1 (here CDF/CIF) (right).

## 8.5.3 Display

The set-up of the display can be done from the sub-menu **Display** (fig.23, left). The following settings are possible:

- set the display brighter or darker. The setting is automatic for the CDF machine from year of construction 2010.
- calibration of the touch screen. The setting is automatic for the CDF machine from year of construction 2010.
- set-up of the graphical display **Graph. Display** (fig. 23, right). By selecting the button **Graphic** it is possible to specify whether the graphic should be displayed on the display during the operation. The graphic set-up can be done individually. The current graphic display can be shown from **Status** → **Graphic**.



**Figure 23:** Sub-menu - Display (left) and "Graph. Display" (right).

## 8.5.4 Clock

The CDF machine differentiates between the cycle time and the real time. The cycle time can be adjusted from the sub-menu **Cycle Time** (see also chapter 8.3). The real time can be adjusted from the sub-menu **Setup** → **Clock**.

**NOTICE**

Do not change the time during the test procedure.

## 8.5.5 System Menu

The basic set-up of the controller can be done from the sub-menu **Setup** → **System Menu** (fig. 24, left).

**NOTICE**

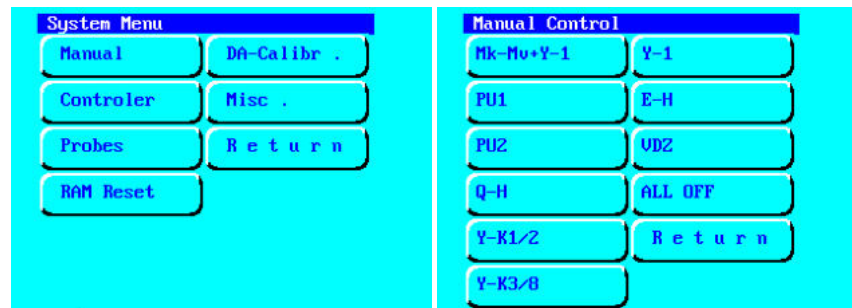
**The set-up parameters are individually adjusted for each testing machine in order to get a proper work of the testing. Any changes can lead to improper work of the controller.**

**Do not change any settings in this menu if you have not dealt with the system in detail beforehand and you are clear about the inter-relationships!**

Improper handling can lead to defects in the system. Contact your supervisor or Schleibinger.

## Manual

From this submenu **Manual** pumps, valves, radiator and heater can be switched on or off manually (fig. 24, right).



**Figure 24:** Menu item „Setup“ → „System Menu“ (left) and submenu „Manual“ (right).

submenu	description
Mk-Mv+Y-1	activates the compressor and condenser, opens the magnetic valve 1 of the refrigeration circuit at the same time
PU1	activates pump 1 of the bath
PU2	activates pump 2 of the buffer
Q-H	activates relay of the heating
Y-K1/2	activates magnetic valve for dosing of the heat transfer fluid from the buffer into the bath
Y-K3/8	additional magnetic valve, if available
E-H	activates the heating unit
VDZ	relay to increase heating capacity, if available
ALL OFF	deactivation of all functions at the same time
Return	return to the previous menu

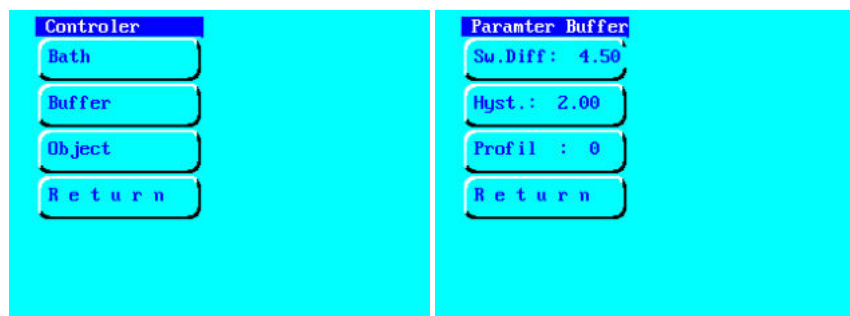
## Controller

From the sub-menu **Controller** the controller settings for the bath, buffer and objects can be adjusted (fig. 25, left).

The switching parameters for the temperature bath are stored in the submenu **Bath**. The designations are based on VDE 2189.

The buffer capacity of the CDF machine is approx. 50 litres, which is installed directly under the temperature bath. The temperature of the buffer is based on the target temperature of the bath (temperature profile). The temperature of the cooling liquid in the buffer is about 4 °C to 6 °C lower compared to the temperature in the bath above. The buffer parameters such as set-point and hysteresis are set in sub-menu **Buffer** (fig. 25, right).

A separate temperature profile can be assigned to the buffer from the menu **Controller** → **Buffer** → **Profil**. The valid input is in the range of 1 to 7 and relates to the temperature profiles of the temperature bath (see also chapter 8.5.2). The number of the selected profile will be displayed. The profile itself can be entered in the sub-menu **Setup** → **Profile Inp..**. Please note, the assignment makes the buffer parameter such as set-point and hysteresis ineffective.

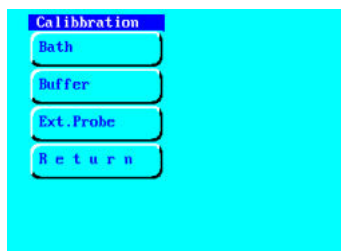


**Figure 25:** Control parameters of the controller (left) and setting parameters of the buffer (right).

The controller is implemented with a so called Luenberg observer. This parameters of the CDF machine are required and can be adjusted from the sub-menu **Object**.

### Probes

The temperature of the CDF machine is measured by PT100 sensors. The calibration values for the temperature sensors of the testing bath and the buffer will be secured in the sub-menu **Setup** → **System Menu** → **Probes** (fig. 26).



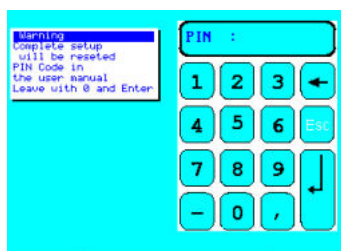
These parameters are set individually for each CDF machine. **Do not change the values!** If the original values are lost, they can be found on the calibration certificate in the control unit.

**Figure 26:** Sub-menu for the calibration parameters of the temperature sensors.

### RAM Reset

From the **RAM Reset** the factory setting can be restored, which guarantee at least emergency operation on all systems. All control and system parameters are reset to default values. The target temperature profile is reset to the first temperature profile (number 1). The time of the profile and the cycle counter are also reset to 0. All entered profiles and calibration data are lost.

A 4-digit code is requested to carry out the reset (fig. 27). Use the code 2603 to reset the CDF machine. After entering the code, the display jumps to the previous menu.



All the individual parameters of the CDF machine can be found in the controller unit. Make sure, the set parameters are correct!

**Figure 27:** Entering the code for RAM reset.

## DA-calibration

The settings for data acquisition with an alternative data acquisition system (for example recorder) can be made in the sub-menu **Da-Calibr..**

## Misc.

In the sub-menu **Setup** → **System Menu** → **Misc.** additional fundamental settings of the CDF machine can be done (fig. 28).



**Figure 28:** Sub-menu „Misc.“. with activated additional sensor (left) and input of sampling rate (right).

**NOTICE**

- **Restart:** If this sub-menu is activated, the CDF machine starts automatically after the power failure or after being switched off via the main switch, if the main voltage is applied again and the system was previously in operation. A restart is not recommended for a controlled test procedure. Only activate this function after consulting a qualified electrician.
- **Max.Temp.:** defines the maximum temperature at which the CDF machine stops with an error message. In addition, an over-temperature protection circuit from the heater is active. This setting can be reduced to 30 °C to protect the samples.
- **Key-Locking:** By activating this sub-menu it is no longer possible to operate the system via touch screen. To deactivate, restart the CDF machine and deactivate this menu item within 10 seconds. The screen can also be deactivated using the key switch (see also chapter 6.8).
- **Ad. Sensor:** If an additional sensor is available, it can be activated in this sub-menu for data acquisition. If activated the button is marked grey (fig. 28, left).
- **Sampl. Rate:** If the sampling rate is to be changed, this can be entered in seconds in this sub-menu (fig. 28, right). The sampling rate defines the time interval in seconds at which the data should be recorded. Sampling rates of less than 30 seconds are not useful and are not recommended.

## 9 Software Handling from Web Browser

The CDF testing equipment can largely be connected via its built-in network interface. The user interface on the PC is the web browser software.

Please note: **Start and stop of the CDF machine is only possible from the display on the device!!**

### 9.1 Configuration of the Network access

The network configuration can be done with the program Chiptool which can be found on USB stick delivered with the equipment.

**Ask your IT administrator for integration of the equipment into your Intranet.**

Example of Default Settings:

```
Device: CDF machine
Customer: Miximaxi AG
Serial Nr: 201312324
MAC-ID: 00:30:56:90:7D:C3
Hostname: CDF_202021370
[] Obtain an IP-Address automatically
[] Use the following IP-Adresse: IP adresse:.....
Subnet mask:.....
```

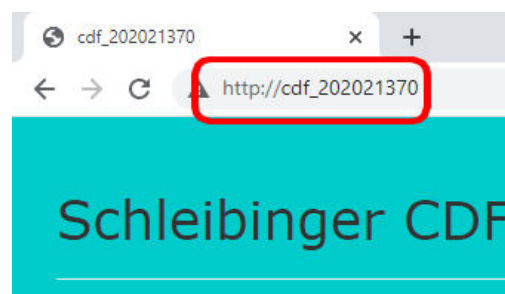
There are two options for the network configuration of the CDF machine and PC available:

- by receiving IP address automatically (default setting at time of delivery)
- by using a static IP address

#### 9.1.1 receive IP address automatically

Connection of the data logger into a local network with DHCP- and DNS-Server is the simplest and fastest method.

- Connect the device with the network via network cable and switch it on.
- Enter the host name into the address line of your web browser in a form "**http://...**" (Fig. 29.)



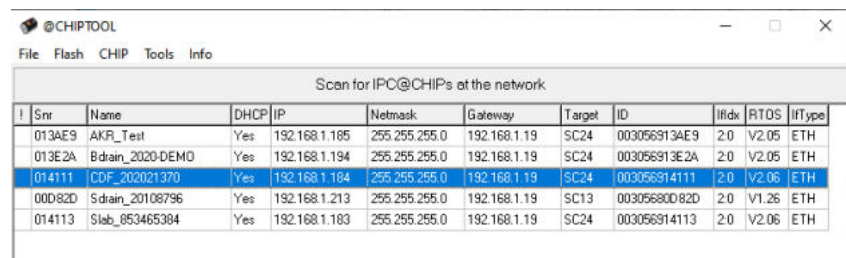
**Figure 29:** Accessing the device by a host name.

A DHCP-Server assigns a free IP address to the device. The access can be done via the default host name using the DNS.

Hint: DHCP server is scanning the network from time to time assigning a IP address and a symbolic name to all devices in the network. This procedure may take some time.

Alternatively, in the case the host name - DNS-server does not work or supported in your network the connection with the device can be done by using of the assigned IP address. The IP address can be found for example from the program Chiptool (Fig. 30).

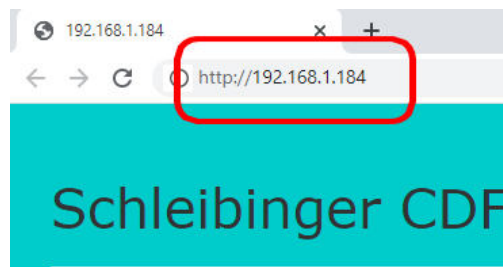
**Make sure the data logger always getting the same IP address from the DHCP server.** Enter the IP address assigned by the DHCP server into the address line of the browser instead of the host name (Fig. 31).



The screenshot shows the CHIPTOOL application window with a menu bar (File, Flash, CHIP, Tools, Info) and a title bar (@CHIPTOOL). The main area displays a table titled "Scan for IPC@CHIPs at the network". The table has columns: I, Snr, Name, DHCP, IP, Netmask, Gateway, Target, ID, Ifidx, RTOS, and IfType. The third row is highlighted in blue.

I	Snr	Name	DHCP	IP	Netmask	Gateway	Target	ID	Ifidx	RTOS	IfType
013AE9		AKR_Test	Yes	192.168.1.185	255.255.255.0	192.168.1.19	SC24	003056913AE9	2.0	V2.05	ETH
013E2A		Bdrain_2020-DEMO	Yes	192.168.1.194	255.255.255.0	192.168.1.19	SC24	003056913E2A	2.0	V2.05	ETH
014111		CDF_202021370	Yes	192.168.1.184	255.255.255.0	192.168.1.19	SC24	003056914111	2.0	V2.06	ETH
00D82D		Sdrain_20108796	Yes	192.168.1.213	255.255.255.0	192.168.1.19	SC13	00305680D82D	2.0	V1.26	ETH
014113		Slab_853465384	Yes	192.168.1.183	255.255.255.0	192.168.1.19	SC24	003056914113	2.0	V2.06	ETH

**Figure 30:** Readout the IP address of the device with the program chiptool.



**Figure 31:** Accessing the device with a fixed IP address.

### 9.1.2 use of static IP address

If no network available, the Schleibinger device can be connected directly to a computer or a notebook. For the direct connection use a static IP address. To set the static IP address proceed as follows:

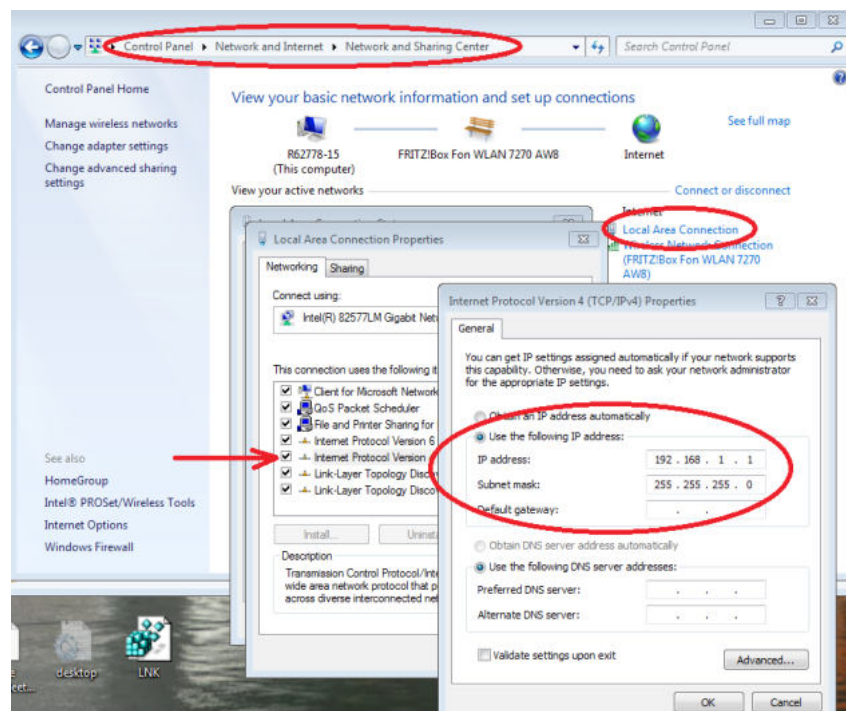
#### a) set static IP address on computer:

- Open Control Panel → Network and Internet → LAN-Connection → Properties (fig. 32).
- Set a static IP-address from the so called private area e.g. 192.168.1.1
- Set a network mask for a local network e.g. 255.255.255.0
- Gateway does not have to be set.

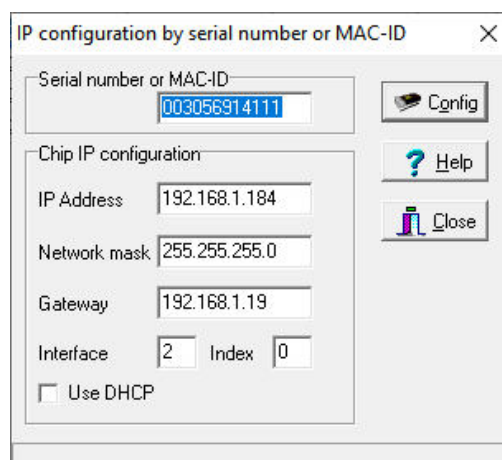
#### b) set static IP address on device:

- Connect the device and computer with a network cable.
- Start the program chiptool. The program is searching for the device and displays it in the program window if the configuration was correct.

- Right-click the entry in the chiptool window and select IP configuration.
- Deactivate Use DHCP.
- Enter a static IP address from the same private area as for the computer (fig. 33). The IP addresses of the device and the computer must be different e.g. 192.168.1.184
- The network mask of the device must be the same as for the computer e.g. 255.255.255.0
- To save select Config.



**Figure 32:** Configuration of PC for a direct connection with the device.



**Figure 33:** Configuration of the device with the program Chiptool.

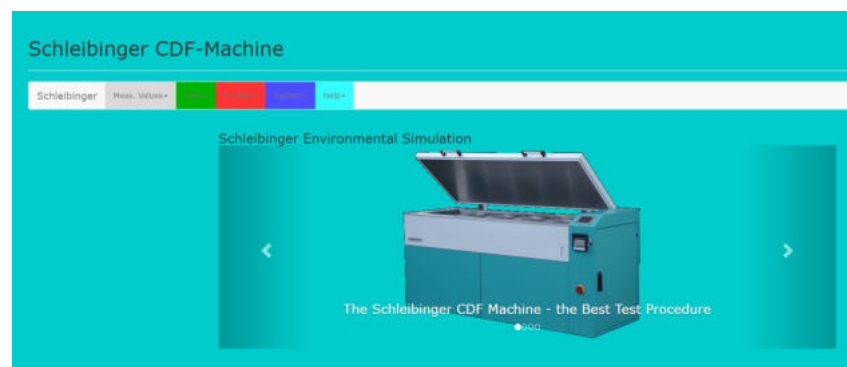
Enter the IP address of the CDF machine in the address field of the web browser. After successful connection, the start screen is displayed (fig. 34).

In the upper part of the window the menu bar is located showing different tabs:

- **Meas. values**
- **Data**
- **Profiles**
- **System**
- **Help**

Click on the tab to open the subdirectories. By selecting „Schleibinger“ you will be forwarded to the Schleibinger web page:

[www.schleibinger.com](http://www.schleibinger.com)

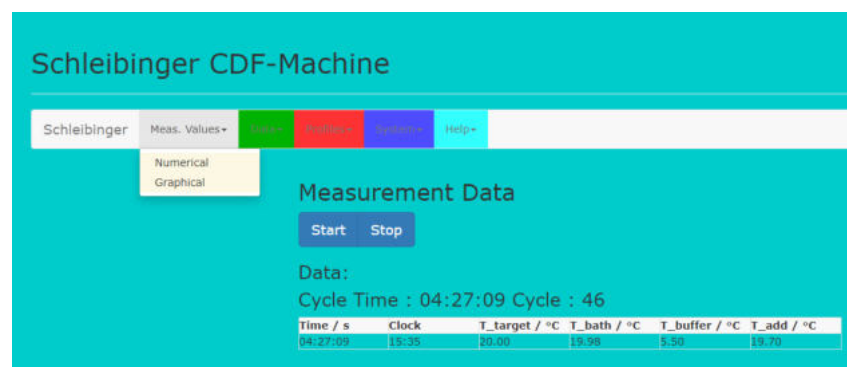


**Figure 34:** Start screen in web browser.

## 9.2 Measured Values

The temperature values can be displayed from the sub-menu «**Meas. Values**» in a numerical or graphical format.

For displaying the current measurement data select sub-menu «**Numerical**» and click on «**Start**» (fig. 35).



**Figure 35:** Displaying of current measurement data.

For graphical display of the measured temperature values select sub-menu «**Graphical**» (fig. 36).

The graphical display can be customized. Please note, the display of the data in the web browser may very depending on the browser.

**Selection of the channel:** The buttons above the graphic allow the selection of the channels to be displayed. The color of the measurement curves corresponds to the color of the respective channel. After the selection, update the graph by clicking the icon „double-arrow“.

**Selection of measuring range in the Y direction:** The graph is scaled automatically. By entering in the fields **Y-min** and **Y-max** the graph can be adjusted individually in the Y-axis.

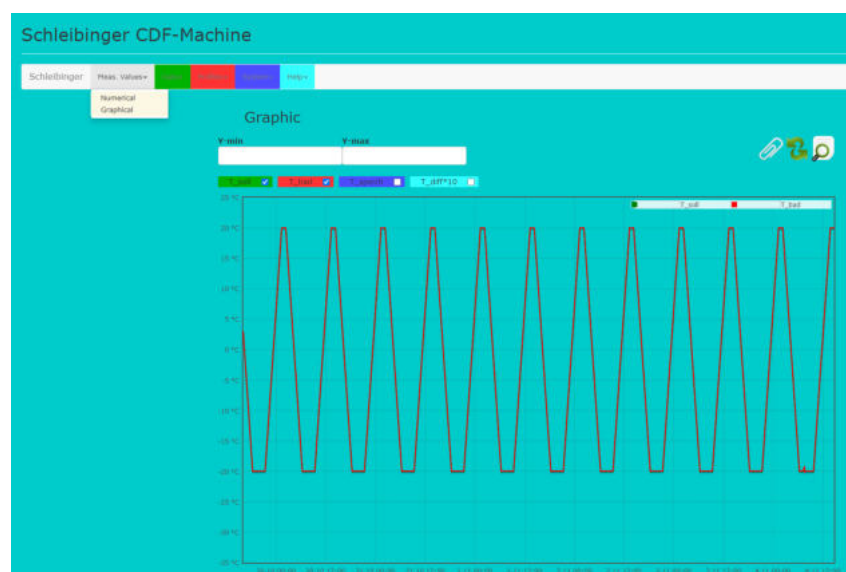
**Selection of the measuring range in the X direction:** A section on the X-axis (time axis) can be determined with the mouse. Press the left mouse button and mark the area of the graph to be displayed.

For zoom out use the symbol „magnifying glass“.

**Inserting text:** By selecting the „paper clip“ icon a text box opens in the graphic area. Comments or notes can be entered here. For closing the box select the cross on the box.

**Printing the graph:** Use the print function of the browser.

- **Firefox:** Select «current frame» from the print dialogue to print the graphic without menu items.
- **Internet Explorer 9 and others:** For the most browsers it is possible to open the print dialogue by pressing the right mouse button and thus print the graphic without menu items or to save the graph as a pdf file.

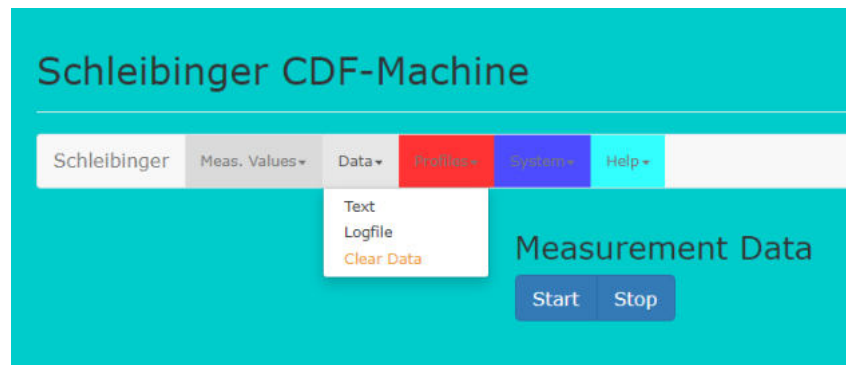


**Figure 36:** Graphical display of measured values.

### 9.3 Data

The main menu **Data** contains the following submenus (fig. 37):

- Text
- Logfile
- Clear Data



**Figure 37: Main menu - Data.**

### 9.3.1 Display of Temperature Data

All recorded measured values are displayed in tabular form after selection **Data** → **Text** → **Load** (fig. 38).

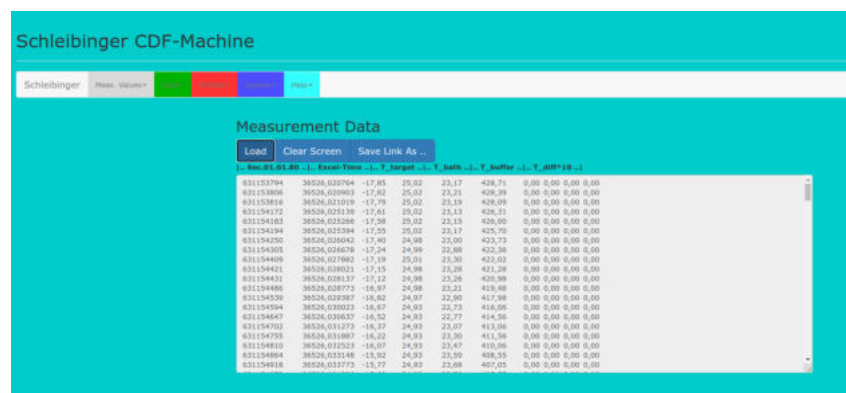
By selecting **Clear Screen** the data is hidden and not displayed.

The data can be copied directly into an Excel sheet, Word or similar. Save the data as txt file using „Strg-S“.

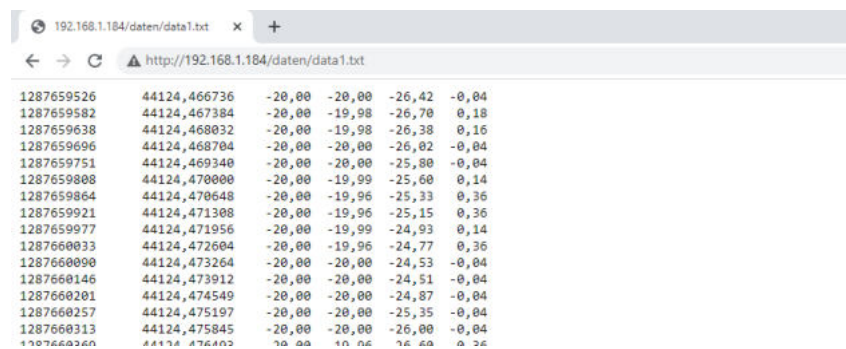
Alternatively, the data can be read in Excel. Select the tab **Save Link** as . . . A new window with the measured data opens (fig. 39). Copy the address:

for example: `http://192.168.1.184/DATEN/DATA1.TXT`

and import the link in Excel via Data → from the web.



**Figure 38:** Display of the measurement data in tabular form.



1287659526	44124,466736	-20,00	-20,00	-26,42	-0,04
1287659582	44124,467384	-20,00	-19,98	-26,70	0,18
1287659638	44124,468032	-20,00	-19,98	-26,38	0,16
1287659696	44124,468704	-20,00	-20,00	-26,02	-0,04
1287659751	44124,469340	-20,00	-20,00	-25,80	-0,04
1287659808	44124,470000	-20,00	-19,99	-25,60	0,14
1287659864	44124,470648	-20,00	-19,96	-25,33	0,36
1287659921	44124,471308	-20,00	-19,96	-25,15	0,36
1287659977	44124,471956	-20,00	-19,99	-24,93	0,14
1287660033	44124,472604	-20,00	-19,96	-24,77	0,36
1287660090	44124,473264	-20,00	-20,00	-24,53	-0,04
1287660146	44124,473912	-20,00	-20,00	-24,51	-0,04
1287660201	44124,474549	-20,00	-20,00	-24,87	-0,04
1287660257	44124,475197	-20,00	-20,00	-25,35	-0,04
1287660313	44124,475845	-20,00	-20,00	-26,00	-0,04

**Figure 39:** Measured values in tabular form for import.

The measured data is shown in a table. The single tabs are separated by tab characters:

```
1279889704 44034.538241 17.41 17.44 -12.61 0.21
1279889760 44034.538889 17.26 17.29 -12.26 0.32
1279889815 44034.539525 17.10 17.12 -11.88 0.20
1279889871 44034.540174 16.95 16.96 -11.56 0.10
```

The first tab shows seconds since 01.01.1980. The second tab contains the Excel time. The values of the temperature set (T<sub>targ</sub>) are shown in the third tab. The measured bath temperature (T<sub>bath</sub>) can be found in the fourth tab and the measured temperature of the buffer (T<sub>buff</sub>) in the fifth tab. The sixth tab contains the temperature difference between the temperature set and the temperature of the bath multiplied by a factor 10 (T<sub>diff</sub>\*10). In case additional temperature sensors are installed (T<sub>probe</sub>), the data is shown in the following tabs.

seconds since 01.01.1980	Excel time.	T <sub>targ</sub>	T <sub>bath</sub>	T <sub>buff</sub> .	T <sub>diff</sub> *10
1279889704	44034.538241	17.41	17.44	-12.61	0.21

Tapping on **Clear Screen** will hide the data.

The experienced user can also read the data with FTP (FileTransfer-Protocol). Log-in name is „ftp“, user name is „ftp“. The data is in the directory: B:/httpd/htdocs/daten . The usage of Explorer for this purpose is not recommended. Explorer does not behave like ftp. Programs like Wise-FTP or smartftp are recommended.

### 9.3.2 Logfile and Error Codes

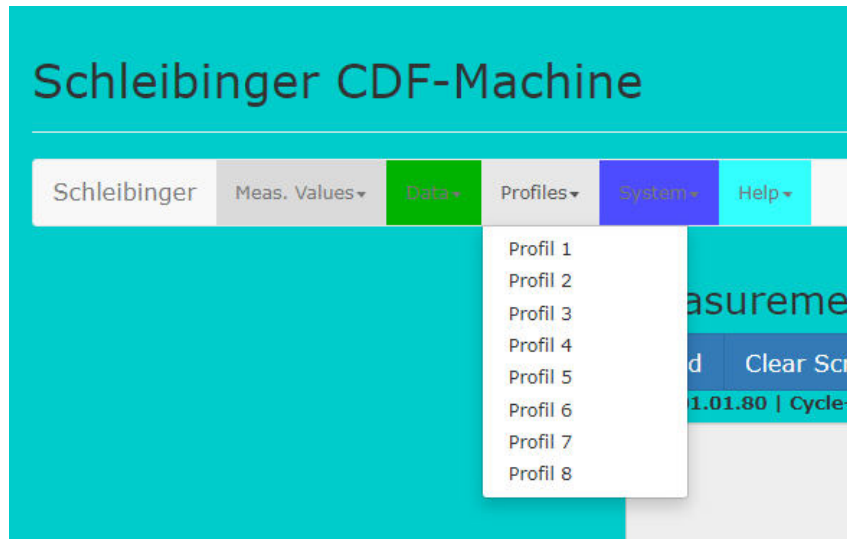
All important processes - which are start or stop of the system, error messages etc. - are monitored after choosing the tab **Data** → **Logfile**. By selecting „Load“ the data will be displayed. Save the data as txt file using „Strg-S“.

### 9.3.3 Delete data

The measured data can be deleted in the sub-menu **Clear Data**. Select this menu and confirm the deletion by tipping on **Erase**. All previous measured values will be deleted.

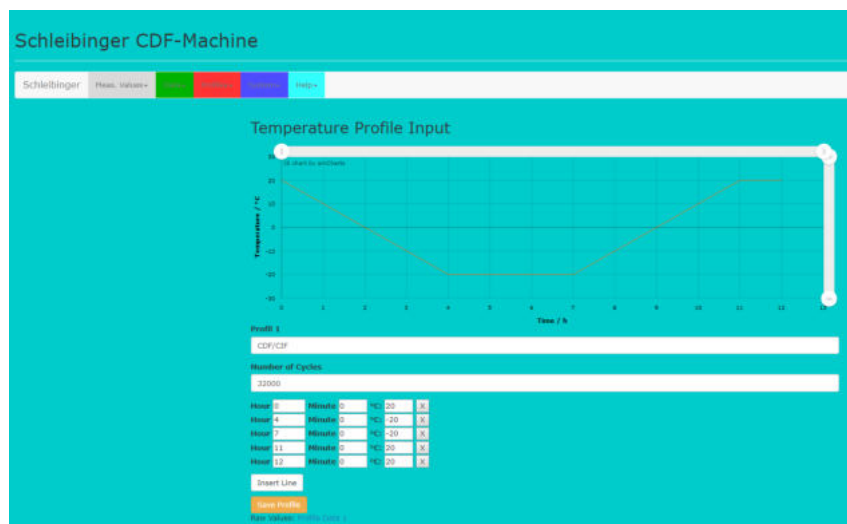
## 9.4 Profiles

The individual temperature profiles can be entered or changed on the CDF machine itself and via web browser. From the menu item **Profiles** 7 different temperature profiles can be entered (fig. 40). The last profile number 8 is inactive and can be used for practice.



**Figure 40:** Selection of the temperature profile from the web browser.

After selecting the profile, the profile details are displayed in the lower area of the window and the associated graph is displayed in the upper area (fig. 41).



**Figure 41:** Entering of the temperature profile.

**NOTICE**

**Any change in the temperature profile outside of the specification is an improper use of the equipment in terms of warranty and product liability. Any liability for this will be rejected.**

For changes of the temperature profile carefully check the technical possibilities of the equipment. For questions contact your supplier or Schleibinger Geräte.

All temperature profiles can be changed by the user. Please note:

- The profile name can be specified under the profile number. Use short and concise descriptions as they will be displayed later on CDF touch screen in the sub-menu of the profile selection.
- Enter the number of cycles. For continuous testing the maximum number of cycles **32000** can be entered. With the cycle length of 12 h, the running time of the testing profile would be about 43 years.
- Than the cycle is defined by entering the time in hours and minutes and the corresponding temperature. Please note:
  - The controller is optimized for the CDF testing and the temperature range of -20 °C to +20 °C. Every change of the settings may worsen the regulation of the controller. In worst case, this may lead to instability of the control.
  - The testing equipment has a refrigeration and temperature control system optimized for the CDF testing. Temperatures lower than -20 °C should not be used.
  - The cooling liquid becomes viscous at lower temperatures. Depending on the glycol to water ratio it may freeze at lower temperatures. This can lead to the shut-down of the system.
  - The pumps are designed for the temperature range of -20 °C to +40 °C.
- Additional lines can be added with «insert line». A line can be removed with the cross behind the selected line.
- The profile input can be checked directly in graphic window above the input mask. If the entry is correct, the profile must be saved. Save the profile with **Save Profile** when finished the input.

## 9.5 System and Help

The configuration data can be displayed after selecting **System**. To view, click on **Load**. To save the file proceed at the same way as for measured data (see chapter 9.3).

The user manual is stored in the sub-menu **Help**. Click on «Open PDF Help File» to view the manual or to download the manual as a PDF file.

## 10 Service Hints

### 10.1 Repair and Maintenance

Some maintenance work can be done by the user himself. A job list is showing in the table 1.

For further maintenance (see table 2), our customer service is at your disposal. The maintenance work have to be carried out by qualified persons only.

To ensure the reliability of the machine an annual maintenance is recommended. The technology and the temperature sensors are checked, which guarantees compliance with the test regulations. For questions feel free to contact your supplier or Schleibinger.

**Table 1:** Maintenance work that can be carried out independently by the user:

<b>maintenance job</b>	<b>every 3 months</b>	<b>ones a year</b>
Set the frost resistance of the heat transfer fluid. Use of a refractometer is recommended.	X	
Checking and adjusting of the filling quantity of the heat transfer fluid. To do this, stop the CDF machine, place the required amount of sample containers in the bath and check the fill level of the buffer.	X	
Clean the filter around the overflow in the testing bath.	X	
Clean the equipment on the outside. Clean the lamella of the heat exchanger. If necessary drain and clean the testing bath.		X

**Table 2:** Maintenance work by the customer service:

<b>maintenance job</b>	<b>once a year</b>
Check the temperature sensors	X
Calibration of the bath probe at -20°C, 0°C, 20°C	X
Leak test of the refrigeration system	X
Checking safety pressure switch	X
Checking compressor heating	X
Checking the insulation	X
Change of the heat transfer fluid	X if necessary
Checking of the magnetic valves and exchange if necessary	X
Checking of the controller	X
Battery exchange of the controller	X (if necessary, but latest after 3...4 years of working)

#### **NOTICE**

Depending on the type and amount of refrigerant used, an annual inspection of the CDF machine according to the European F-gas regulation EU 517-2014 is required

The information on the refrigerant and the amount of refrigerant used can be found in the applicable documents unter „CDF Service Dokumente“ and on the machine's type label.

## 10.2 Cleaning of the CDF Machine

Use clean water and a soft cloth to clean the surfaces of the machine.

### NOTICE

Do not use harsh cleaning agents!

Stubborn dirt such as cement stone have to be avoided.

## 10.3 Adjusting the Heat Transfer Fluid

A mixture of water and glycol is used as a heat transfer fluid. At a mixing ratio of 50% water and 50% glycol concentrate, this mixture is slightly hazardous to water and is classified in water hazard class 1 according to the European water protection standard.

During operation and by handling the samples, a part of the heat transfer fluid can be removed and additional water can be added to the bath, thereby changing the concentration of the water-glycol mixture. Regularly check the fill level and the antifreeze of the heat transfer fluid in the machine.

- Adjust the heat transfer fluid to a maximum of -40 °C and a minimum of -50 °C.
- The density of the water-glycol mixture should be between 1.072 g/cm<sup>3</sup> and 1.075 g/cm<sup>3</sup> at 20 °C.

For concentration, replace the amount of water-glycol mixture with glycol concentrate as shown in table 3.

**Table 3:** Adjustment of the heat transfer fluid

measured antifreeze, °C	density	amount of glycol/water	amount to be replaced in litres
-20	1.051	35/65	23
-25	1.058	40/60	18
-30	1.065	45/55	14
-35	1.070	53/47	9
-40	1.075	55/45	6

For quick and safe control the use of refractometer is recommended (fig. 42).

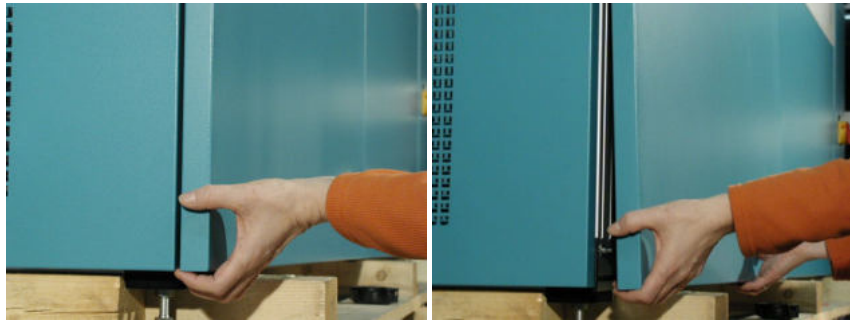


**Figure 42:** Refractometer (left) and antifreeze indicator at -36 °C (right).

## 10.4 Removing the Panels

The upper part of the CDF machine is accessible by removing the side panels. These are attached with spring straps. To remove the panel, grasp the panel from below and pull it outwards with a jerk (fig. 43).

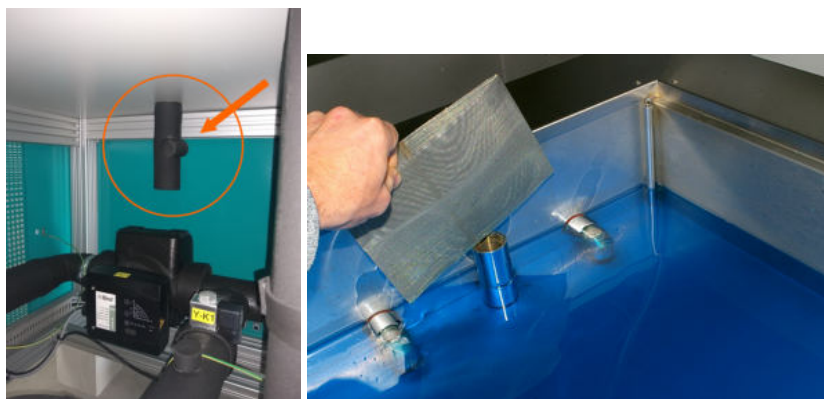
To attach the panel, insert the nipples into the openings in the spring tabs. Lock the panel by applying pressure all around the edges of the plate. Never apply pressure into the center of the panel.



**Figure 43:** Removing the panels of the CDF machine.

## 10.5 Emptying the Heat Transfer Fluid

- Remove the panel on the right of the CDF machine (see fig. 43).
- Remove the insulation plug under the drain cock under the bath on the right side and near the controller unit (fig. 44, left). The complete drain insulation does not have to be removed.
- Connect the suitable water hose (1/2") to the drain valve under the bath.
- Open the drain valve with the lever handle and let the cooling liquid drain into the appropriate containers.
- Remove the filter from the overflow pieces (fig. 44, right).
- Remove the overflow pieces including the sealing of the drain in the bath so the heat transfer fluid can run out of bath into the buffer.



**Figure 44:** Drain cock for emptying the cooling liquid under the buffer bath (left) and the filter with the overflow piece in the bath (right).

## 10.6 Battery Change

The main board of the controller includes a lithium battery. Battery type is RENATA CR1220 lithium. The durability of this battery is about 4 years. For change the battery proceed as follows:

- Before changing the battery, save all setting parameters, which have been changed. These parameters will not be saved permanently and have to be re-entered after the change of the battery.
- Switch off the CDF equipment and pull out the mains plug.
- Open the controller unit and remove the acrylic glass cover from the main board of the controller.
- Change the battery.
- Fix the acrylic glass cover.
- Plug in the power plug and switch on the CDF machine.
- Check the setting parameters from the System Menu and especially of probes. If these are displayed correctly, you can proceed with the tests.
- If the setting parameters deviate from the values before the change, perform a RAM reset: **Setup** → **System Menu** → **RAM reset**
- Controll the setting parameters and check the set-up of the temperature sensor PT100 from the sub-menu **Probes**.

## 10.7 Help in the Event of a Malfunction

In general, the cause of a fault and a suggested solution are shown on the display. The cause of a malfunction does not necessarily have to be on the device. Some errors can be corrected by the user himself.

problem	cause	help
the machine is switched off	power failure of phase L1	check power supply.
	power adapter defective	check the yellow LEDs on the controller board.
no input on touch screen	key switch off display off by software	switch on the key switch switch off and on the system. Select the menu <b>Setup</b> → <b>System Menu</b> → <b>Misc.</b> and deactivate <b>Key-Locking</b>
	switch S1 on PCB board points to the left	turn switch S1 to the right
display stays dark after switching on the machine	Power supply is off	check fuse F6
	fuse blown	check melting fuses on the PCB board.
	connection interrupted	check the D-Sub cable from the controller to the display. 4 yellow LEDs on the control must light.
the system does not heat up	triggered fuse	check the fuse

problem	cause	help
no circulation in the testing bath visible	Fuse of the pump 1	check the fuse F5.1
	air in the pump	switch the pump off and on several times (see also chapter ??).
«bath too hot»	valve Y-K damaged	change the coiln
	Tmax set to low	check Tmax from <b>System Menu</b> .
	temperature sensor for the bath is broken	change probe
	to less refrigerant	call for service
temperature deviation	the probe from the testing bath is not under the sample container	place the probe under the sample container
	filling level to low or to high	check and adjust the filling level
	setting parameters are wrong	check the set-up menu and adjust the settings
fuse F2 is missing, error no. 191	One phase of the power supply is missing	check in-house fuses and fuses in the controlling unit.
	Direction of rotation of the power supply is not correct.	change the power supply rotation by exchange of two phases from the supply line.
„low pressure“, error no. 223	freeze protection of the cooling liquid to low	check the density of the cooling liquid and adjust it to -40 °C minimum.
	pump 2 does not run	check the fuse F4
	valve Y-1 does not work	change coil, check the voltage (24V)
	temperature of the buffer to low	check the buffer probe
	leak in the refrigerant system	call for service
„high pressure“, error no. 239	immediate start after a longer standstill	switch on the main switch at least 12 hours before starting testing (see chapter 7.4).
	room temperature to high	lower the air temperature in the room
	no cooling water, water input and water output blocked, cooling water to warm	check the cooling water circulation at water output.
	dirty heat exchanger	clean the heat exchanger
„Door open“, error no. 253	door is open even the temperature is below 0 °C	close the door and restart the machine

## 11 Decommissioning and Disposal

### 11.1 Decommissioning

The decommissioning of the CDF machine contains the emptying and cleaning of the machine.

- Stop the test cycle and set the machine to room temperature.
- Open the Lid.
- Disconnect the machine from the power network.
- Remove and clean all accessories from the testing bath.
- Drain the heat transfer fluid (chapter 10.5).
- Clean the machine inside and outside (chapter 10.2).

### 11.2 Disposal of the Heat Transfer Fluid

The disposal of the heat transfer fluid must be carried out professionally and properly in accordance with the locally applicable regulations and laws.

- Avoid release to the environment.
- Do not empty into drains. Dispose the heat transfer fluid and its container in a safe way in accordance with the local regulations.
- Completely emptied or cleaned metal containers can be released for scrap utilization.
- Completely emptied or cleaned plastic containers can be returned for recycling.

### 11.3 Disposal of the Machine

The machine contains valuable materials and is to be collected separately from unsorted municipal waste. The machine must be disposed of professionally and properly in accordance with the locally applicable regulations and laws.



Work on the refrigerant-related parts of the testing equipment is only permitted for educated and trained technicians in accordance with all applicable regulations and standards. Do not damage the machine on the refrigeration circuit when transporting it.

Information about proper disposal can be obtained from the local authority or a waste disposal company.

Schleibinger will take back the system for an expense allowance. Contact Schleibinger for further questions.

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