Manual

CryoStar I
Article Nr. 7150

January 2016

Table of contents

1. Introduction

1.1. working with the manual

Field	Interactive fields on the touch screen are marked like the example on the left
fat	Special hints are marked fat.

2. Security precautions

a) For your protection

The device must not be used in hazardous environments; it is not gas-tight (danger from the formation of sparks, corrosion due to the entry of gases)

Always adhere to hazard warnings and safety tips when using reagents, chemicals and cleaning agents.

b) Measures to the working safety

The device should not be opened as live parts might be exposed. If in exceptional cases the device has to be opened, remove the mains plug from the socket before opening the device!

Under no circumstances should you expose the device to the following:

- Direct sunlight
- High humidity (above 80%)
- Strong electric or magnetic fields
- Strong vibrations
- Corrosive gases or liquids
- Temperatures below 5°C and above 40°C

3. Installation

3.1. Unpacking

After opening the carton, remove all accessory parts from the side areas of the carton. Afterwards, you can lift out the machine included the moulded foam parts. Remove these moulded parts from the machine. Please keep both the carton as well as these transport moulded parts in case the machine has to be transported.

3.2. Scope of delivery

The following parts are included in the scope of delivery:

CryoStar I
Mains cable
1 bottle of cooling bath liquid(500 ml)
1 bottle of calibration solution A(250 ml)
1 bottle of calibration solution B (250 ml)
1 cooling bath container
1 pack (50) of sample vials
1 stand for 27 sample vials
1 Phillips screwdriver
1 Allen key
1 copy of these Operating Instructions
Please check the delivery is complete.

3.3. Installation location

Select an even, level place in your laboratory for the machine. The machine should not be installed in the vicinity of ovens, water baths or other sources of heat or in a humid environment. The machine requires a very large amount of cooling air which is sucked in on the right-hand side of the machine and below the machine. Therefore, ensure that the air slots on the sides are always unobstructed and that there is no other equipment within approx. 20 cm (right and left), especially not heat-emitting equipment. Do not place any loose sheets of paper or similar near the machine. These could be sucked in with the air stream and obstruct the air access.

3.4. Filling with cooling bath liquid

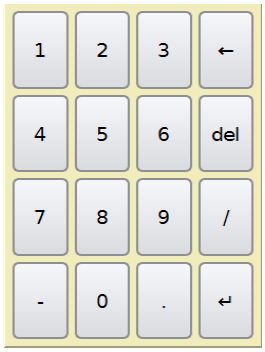
There is a holder for the cooling bath liquid container on the back.	
Fill up the cooling bath liquid container **bevor** turning on the machine for the first time up to the MAX marking. Insert the container into the holder and insert both tubes into the container. Make sure that the longer one is beyond the MIN marking in the container. Now turn on the device. It will automatically fill up the cooling system with coolingbathliquid.	
Please make sure, that there is enough cooling bath liquid in system, by pressing the ***pump*** button in ***Settings->System->pump*** . The liquid should be flowing visible into the sample tube opening. If not, activating the pumpe again until the liquid is filling the opening.	

4. Operation

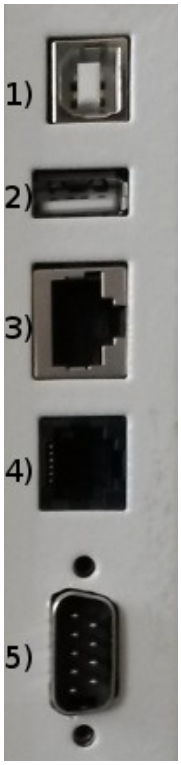
The device is equipped with a touch sensitive screen. There is no force necessary for using. Single fields can be activated by touch.

The display of chart can be changed after a measurement.

Touch: activation of a field or an action	
Drag in a chart with one finger	
Zoom in a chart with two fingers	

Up-count / down-count of numbers	▲ ▼
For entering numbers a virtual keypad. Enterings have to be accomplished always with ↵	

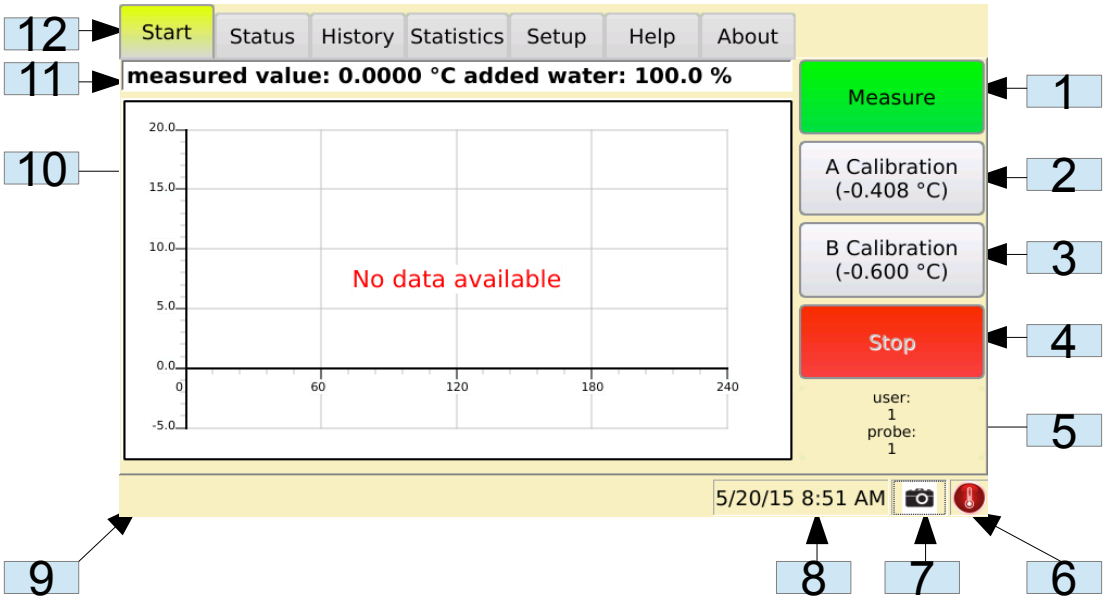
4.1. Connections

1) USB B port for connections with a PC The device is setup as an serial device.	
2) USB A port for USB-mass storage USB-Sticks formatted preferably with FAT file system can be connected. Usage of USB-hard-disks is not recommended.	
3) Ethernet-port	
4) serial port for extensions	
5) serial port for printer The baud rate is 9600 Baud/s with 8N1 setting.	
Main connection The device can be connected to an AC Power source with 84 to 264 volts	

4.2. Screen

a) Start

The Start screen shows all relevant informations for measurements or calibrations.

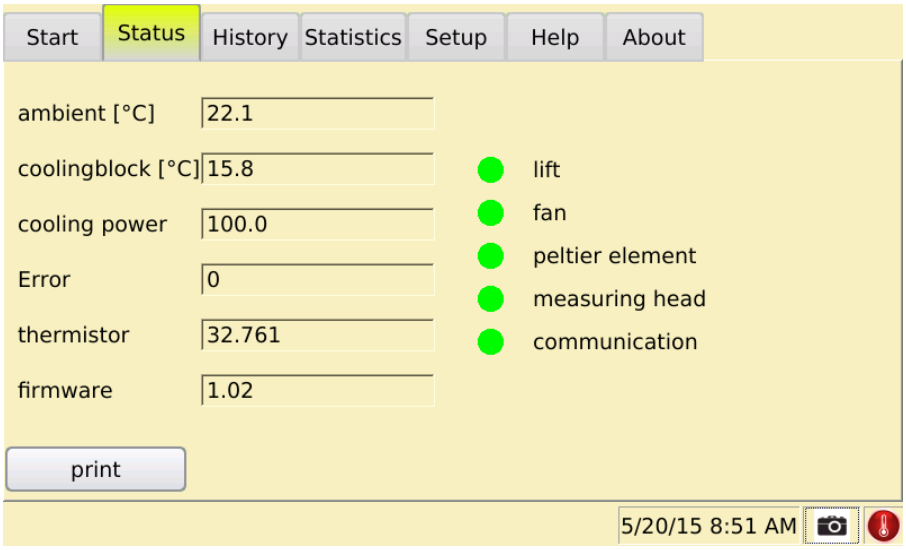


Measurements or calibration can started and stopped.

1. ***Measure***: start a new measurement, see 5.
2. ***A Calibration:*** start an A-calibration, see 6.2. b), the selected calibration solutions is shown
3. ***B Calibration***: start a B-calibration, see 6.2. c), the selected calibration solutions is shown
4. ***Stop*** :stops a running measurement or calibration
5. show the actual setup user and probe number. By touching both fields can be changed
6. temperature:changes from red to blue when the cooling system is ready
7. Screen shot: when an USB-stick is connected, the actual screen can be saved to the USB-stick
8. Time
9. Status-line for messaged
10. Chart for measured values
11. the actual measurement value, the unit and in Celsius mode the added water is shown
12. Pages can be activated by touching the tabs

b) Status

The Status screen shows actual parameters and possible problems of the device.

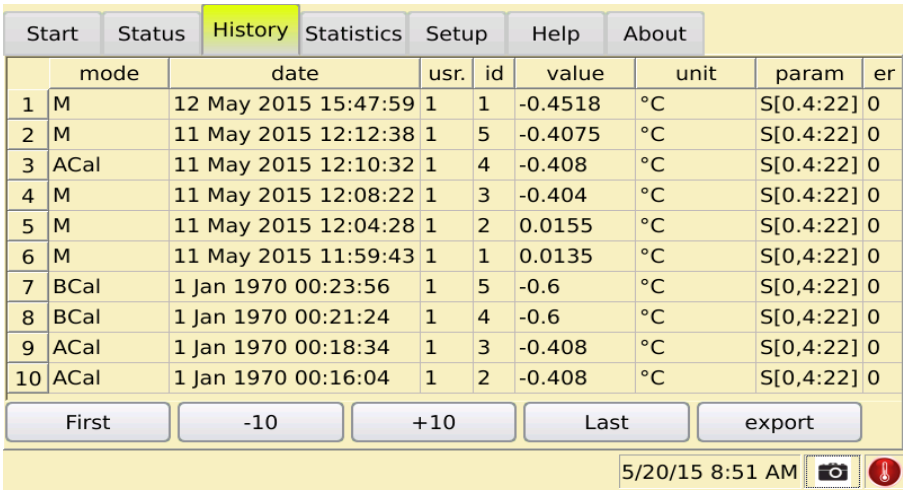


If there was an error while measuring, it is shown here. Error codes, error messages and possible solutions are available in 9..

The status-area on the right shows the state of several components. They all should be green. A red state means a serious technical problem has occurred and the service should be contacted.

c) History

The device has a built-in memory for saving of 500 measurement values. Measurements and calibration are saved.



	mode	date	usr.	id	value	unit	param	er
1	M	12 May 2015 15:47:59	1	1	-0.4518	°C	S[0.4:22]	0
2	M	11 May 2015 12:12:38	1	5	-0.4075	°C	S[0.4:22]	0
3	ACal	11 May 2015 12:10:32	1	4	-0.408	°C	S[0.4:22]	0
4	M	11 May 2015 12:08:22	1	3	-0.404	°C	S[0.4:22]	0
5	M	11 May 2015 12:04:28	1	2	0.0155	°C	S[0.4:22]	0
6	M	11 May 2015 11:59:43	1	1	0.0135	°C	S[0,4:22]	0
7	BCal	1 Jan 1970 00:23:56	1	5	-0.6	°C	S[0,4:22]	0
8	BCal	1 Jan 1970 00:21:24	1	4	-0.6	°C	S[0,4:22]	0
9	ACal	1 Jan 1970 00:18:34	1	3	-0.408	°C	S[0,4:22]	0
10	ACal	1 Jan 1970 00:16:04	1	2	-0.408	°C	S[0,4:22]	0

<table>
<tr><th>Column</th><th>Name</th><th>Description</th></tr>
<tr><td>1</td><td>Mode</td><td>kind of measurement. The following abbreviation are used<table><tr><td>M</td><td>Measure</td></tr><tr><td>Acal</td><td>A-Calibration</td></tr><tr><td>Bcal</td><td>B-Calibration</td></tr><tr><td>Pre</td><td>Pre-Calibration</td></tr></table></td></tr>
<tr><td>2</td><td>Date</td><td>The date of the measurement</td></tr>
<tr><td>3</td><td>User.</td><td>The set user</td></tr>
<tr><td>4</td><td>Id</td><td>The sequentially id of the measurement</td></tr>
<tr><td>5+6</td><td>Value/
Unit</td><td>The value and the unit of the measurement</td></tr>
<tr><td>7</td><td>Parameter</td><td>For the different plateau-criteria, see 12.1
for example:<table><tr><td>S[0.4:22]</td><td>Plateau Search, with criteria 0.4 mK and 22 seconds time</td></tr><tr><td>F[50]</td><td>Fix-time, with the criteria 50 seconds measurements after hit</td></tr><tr><td>M[0.4]</td><td>Maximum, with criteria 0.4 mK difference between maximum and measured value</td></tr></table></td></tr>
<tr><td>8</td><td>Error</td><td>for descriptions of error codes, see 9</td></tr>
</table>

For the last 100 measurements the charts are also available.

These can be shown by selecting a measurement in the history. A pop-up window will show the chart and the possibility to zoom into the values. The chart can be saved to the USB-stick as a png file.

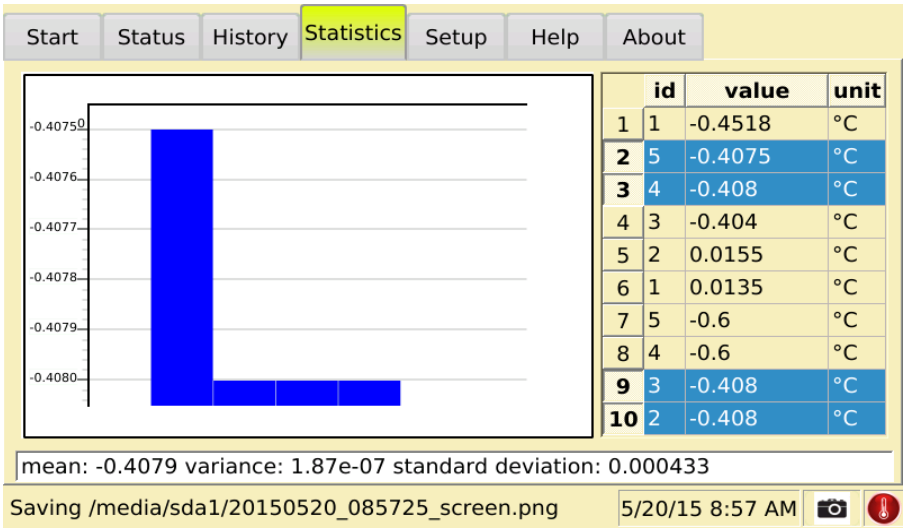
The shown measurements are always shown descending, a navigation is possible with the fields beyond the table.It is possible to export the whole history to stick as a text-file in csv format. One line means one measurement.

Example:

M	*21 Apr 2015 12:05:52*	*1*	*66*	*-0.6008*	*°C*	*S[0.4:22]*	*0*
M	*21 Apr 2015 12:03:28*	*1*	*65*	*-0.5997*	*°C*	*S[0.4:22]*	*0*
BCal	*21 Apr 2015 11:51:09*	*1*	*61*	*-0.6*	*°C*	*S[0.4:22]*	*0*
M	*21 Apr 2015 11:45:50*	*1*	*59*	*-0.4076*	*°C*	*S[0.4:22]*	*0*
ACal	*21 Apr 2015 11:43:10*	*1*	*58*	*-0.408*	*°C*	*S[0.4:22]*	*0*
ACal	*21 Apr 2015 11:40:39*	*1*	*57*	*-0.408*	*°C*	*S[0.4:22]*	*0*

d) Statistic

The Statistic screen is for fast comparison of the last 10 measurements. By selection single cells values can be compared and statistic value are calculated.

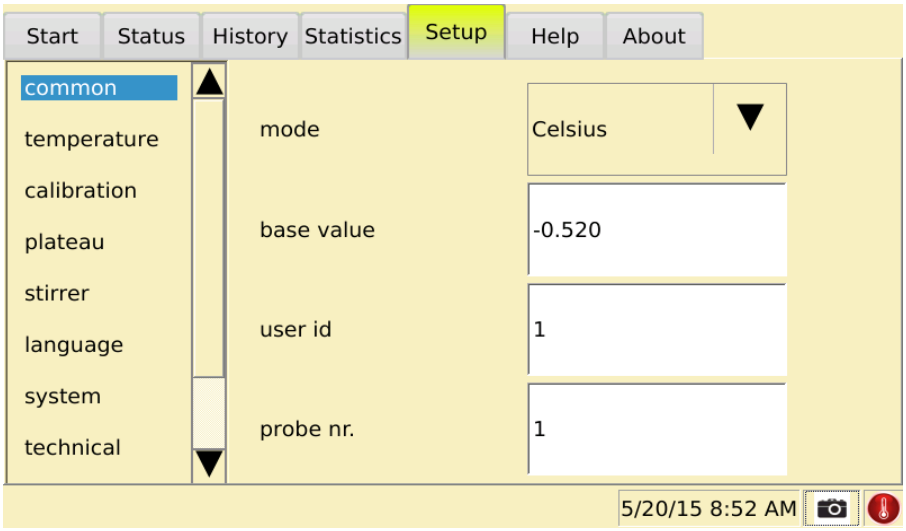


e) Setup

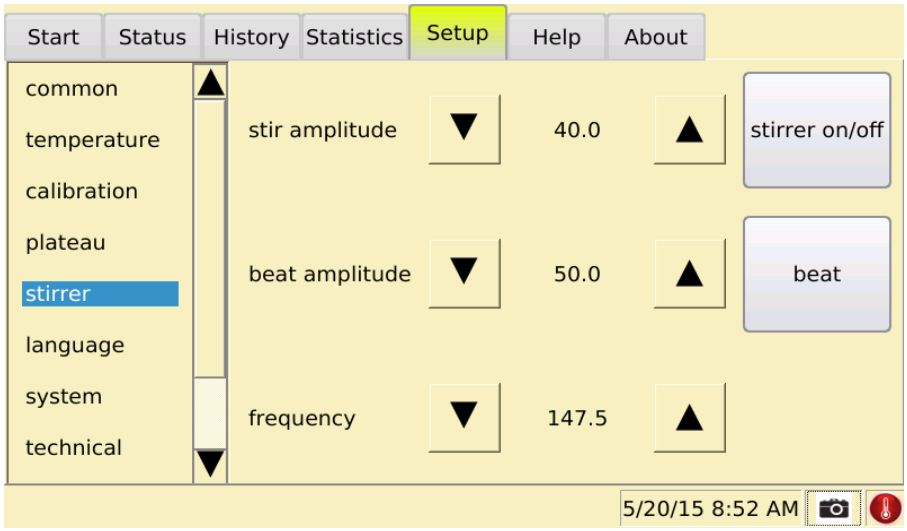
On the Setup screen are all parameters, the can be changed by the user. On the left is the navigation area, on the right the parameters.

Recommended settings

Designation	**Settings**
A-calibration value	0.000°C or -0.408°C
B-calibration value	-0.557°C or -0.600°C
Base value	-0.520°C (Limit EU)
beat temperature.	-2.00°C (-3.00°C Minimum)
coolingbath temperature	-6.50 °C
Mode	Celsius
Plateau	Plateau search: 0.4 m°C / 22s Fixed time: 50 s Maximum: 0.2m°C
Stirring device	see below



- **Common**: Mode can be changed to Celsius, Osmol, Hortvet or alcohol mode. The base value for added water in Celsius mode, the user and the id can be changed.
- **Temperature**: The temperature of the cooling bath and the beat temperature can be changed.
- **Calibration**: The used solutions for A- and B-calibration can be changed. And with ***Pre-Calibration*** a Pre-calibration can be started.
- **Plateau**: Plateau Search, Fixed time and Maximum are available. The parameters can be changed depending on the selected plateau mode, see 12.1
- **Stirrer**: The stirring and beat amplitude and the stirring frequency can be changed. To test the different settings, two different fields are available. By ***Stirrer On*** the agitator starts moving. The agitator should be set to approx. 2 mm movement width by changing ***stir amplitude*** . If the agitator is considered from the side, the oscillation distance can be seen well. The agitator movement should be checked regularly and readjusted if needed. **The agitator frequency should not be changed. It has already been adjusted at the factory.** In the case that the frequency has to be adjusted, it should be set to 4 Hz higher than the resonance frequency. The resonance frequency is determined, e.g. by starting at 150 Hz and constantly increasing the frequency afterwards. The resonance frequency is at the point where the agitator movement achieves a maximum. By ***beat- amplitude*** the amplitude when beating can be changed and with ***beat*** the amplitude can be checked. For this purpose, hold a sample vial filled with 2.5 ml of water on the measuring head so that agitator and thermistor dip in the water and activate the agitator by touching ***beat***. On the one hand, the agitator should strongly strike the glass wall of the sample vial so that the freezing process is well and quickly triggered: on the other hand it should not be too strong in order to prevent damaging the sample vial.



- **Language**: The language can be chosen from several languages.
- **System**: Date and time can be changed. The cooling bath pump can be tested, history database can be cleared and updates can be installed.
- **technical**: all technical parameters, that user normally do not need to change. If parameters need to be changed, please contact the service.
- At least the error log and information to used software.

f) Help

Error codes, error-messages and solution for solving problems are available on the ***Help*** screen.

g) About

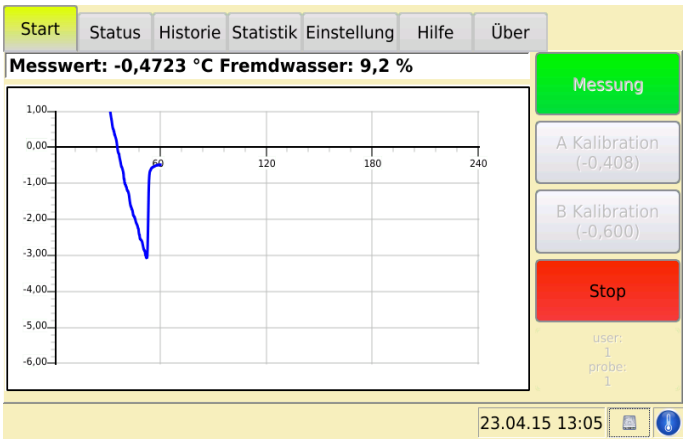
The actual software version and further information are shown.

5. Performing measurements

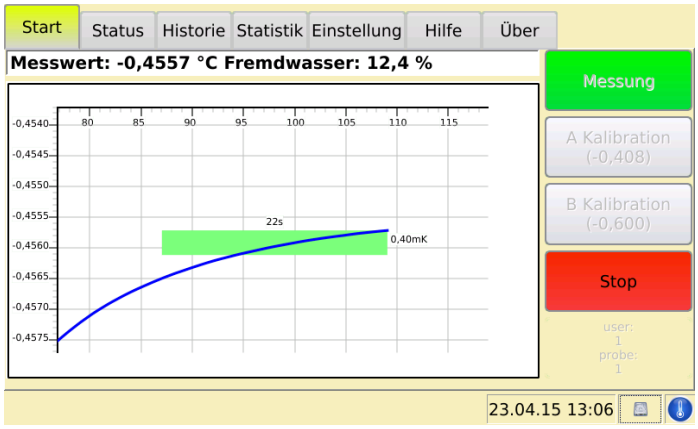
5.1. Insert sample vial

The milk sample to be measured is pipetted into a sample vial. The sample quantity must be between 2.0 ml and 2.5 ml, preferably 2.2 ml. The sample vial is placed at the measuring point.

5.2. Start measurement



By touching ***Measure*** a new measurement starts. The chart shows the actual temperature of the thermistor in degree Celsius. On the vertical axes are the temperature values. On the horizontal axes the time in seconds. The measurement can be stopped by touching ***Stop***.



After reaching the triggering temperature (beat temperature), e.g. -2.00°C, the machine changes over to plateau display. This means the temperature range is displayed strongly magnified. The area underneath the green line represents the specified plateau criterion. Thus it can be checked in a simple and retraceable way whether the specified plateau criterion is satisfied. If the plateau criteria are reached, the measurements stops and values are saved.

5.3. Saving measurements

If an USB-stick is connected while measuring, the measured values are saved for further processing on the stick.

The file is parted in two sections:

1. The parameters

user	*1*
probe	*1*
date	*4/20/15 9:32 AM*
mode	*measure*
value	*-0.575 °C [0.0 %]*
plateau	*S[0.4:22]*

2. The measured values:

0.4	*33.4049*
0.6	*33.0357*
0.8	*32.5181*
1.0	*31.7487*
aso.	

First column is time in seconds, second is temperature in °C.

Attention: You can still export the measurement in history mode, if no USB-stick was present while measuring. See 9c .

6. Calibration

In order to obtain precise measurements, it is necessary to calibrate the machine. This is due to the physical ambient conditions such as the air pressure. It is recommended to check the calibration at least once per day and recalibrate if needed. The calibration can be checked easily using a control standard. Funke-Gerber has such a control standard (-0.512°C) in its product range.

The machine is calibrated using two-point calibration, an A-calibration and a B-calibration. Funke-Gerber provides two different A-calibration standards (0.000°C and -0.408°C) and two different B standards (-0.557°C and -0.600°C). As the machine can be freely programmed, other calibration standards can also be used.

6.1. Preparing for calibration

Ensure that the machine is set to the correct calibration values. Otherwise, the calibration values must be changed accordingly. (see 4.2. e)). Three vials each are needed for the A and B calibration. Place the vials in

the vial stand; ensure that the sample vials are separated from each other in the vial stand so that mix-ups between A and B are ruled out. Pipette 3 sample vials each with 2,2 ml A-Standard and 3 vials each with 2.2 ml B-Standard.

Tip: In order to ensure that the vials are really clean, or that the calibration liquids in the vial correspond to 100% of their value, we recommend rinsing the vials with the respective calibration fluid in advance.

6.2. Perform calibration

a) Adjust the machine to the calibration standard

The machine can be adjusted to different calibration standards (see 4.2. e).

b) A-calibration

a) Pipetting
3 sample vials are each pipetted with 2.5 ml of the “A” calibration liquid.

b) Measurement with calibration liquid “A”
Put sample vial with calibration liquid “a” in the cooling bath opening. Start measurement (see 5.). This is only a preliminary measurement for flushing purposes.

c) A-calibration with calibration liquid “A”.
Place sample vial in the cooling bath opening. Select the “A-calibration” function by touching ***A-Calibration*** .

d) Remeasurement with calibration liquid “A”.
This is used for controlling whether the A-calibration has been carried out successfully. The measurement value should match the first measurement value in the context of repeatability (+ 0.0020°C).

c) B-calibration

a) Pipetting
3 sample vials are each pipetted with 2.5 ml of calibration liquid “B”.

b) Measurement with calibration liquid “B”.
Place sample vial with calibration liquid “B” in the cooling bath opening. Start measurement (see 5.). This is only a preliminary measurement for flushing purposes.

c) B-calibration with calibration liquid “B”.
Place sample vial in the cooling bath opening. Select the “A-calibration” function by touching ***B-Calibration*** .

d) Remeasurement with calibration liquid “B”.
This is used for controlling whether the B-calibration has been carried out successfully. The measurement value should match the first measurement value in the context of repeatability (+ 0.0020°C).

6.3. Pre-calibration

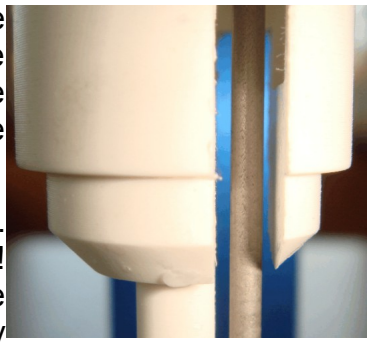
In normal usage pre-calibration is not necessary.
Using pre-calibration, the measuring technology is put into a defined condition. Such a pre-calibration is necessary in particular cases, e.g. for a thermistor change. Without pre-calibration, it would often not be possible to perform a normal calibration. A sample vial with calibration liquid “A” is needed for the pre-calibration. The pre-calibration can be started after the vial has been placed in the cooling bath opening. After pre-calibration a normal calibration has to follow.

7. Maintenance

7.1. Replacing the thermistor

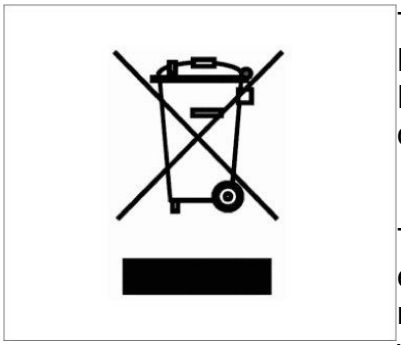
Proceed as follows to replace the thermistor:

- Remove the blue measuring head cover. Undo the Phillips screw on the rear side of the measuring head for this. The cover can be lifted off afterwards.
- There is a hole on each side of the bottom part of the measuring head. In both these holes, there is an Allen screw which fastens the thermistor.
- Both the screws can be slackened (slacken only, do not undo completely) using the small Allen key included in the scope of delivery. Pull the thermistor connector out of the connection socket. The thermistor can be removed afterwards. Rotating the thermistor slightly makes its removal easier. Now, you can start installing the new thermistor.
- The new thermistor is inserted into the bore provided with a slight rotary movement.
- **Important**: The slot in the thermistor case must be aligned exactly parallel to the oscillation movement of the agitator (see Fig.). The agitator must never touch the thermistor case at any point. The agitator must oscillate completely freely.



- Now tighten both the Allen screws (grub screws). Attention: do not screw too tight or even with force! Afterwards, plug the connector completely, i.e. until the plug engages, into the connection socket. Carefully lay the cable in the area of the rear coil so that it can never come into contact with the moving parts of the agitator.
- Replace the measuring head cover afterwards.

8. WEEE Notice



The WEEE (Waste Electrical and Electronic Equipment) Directive, which was adopted by European legislation on February 13, 2003, has led to a major reconsideration of the disposal of electrical and electronic equipment.

The purpose of this directive is primarily to avoid WEEE, i.e. electrical and electronic waste, and also to promote the reuse, recycling and other forms of continuing use of this type of waste in order to reduce waste quantities.

The WEEE logo on the product or its packaging indicates that this product must not be placed in your household waste. It is your responsibility to take any harmful waste from electrical and electronic equipment to designated collection points. By separately collecting and correctly recycling your electrical and electronic waste, you can contribute to environmental protection. The proper recycling of electrical and electronic equipment promotes the health of the general population and protects the environment. Further information on the disposal, re-use and collection of electrical and electronic waste can be obtained from the household refuse collection service, recycling centres, as well as from the seller and manufacturer of the device.

9. Error messages

9.1. Error codes

Error code	Description
1 :	error lift: end position not reached, please check
3 :	uncalibrated or defective thermistor
4 :	error on calibration: please check solution
5 :	frozen too early
6 :	plateau not found
7 :	not frozen
- :	cooling system not ready yet
- :	communication error

a) error lift: end position not reached, please check

When starting a measurement or calibration, the device tries to move the lift at first to the upper position and after that to the lower position and checks the movement. If the lift can't move freely or is blocked and can't reach the final positions, the device will show the lift error. This can be caused by defective final position switches or defective lift motor or broken cable to the switches or motor.

b) uncalibrated or defective thermistor:

The instrument tests the current thermistor value when starting a measurement or calibration. Its electrical resistance is known to be a function of the temperature. This electrical resistance is translated with an ADC (analogue digital converter) into a number which is then used by the instrument. If the thermistor has a short circuit or a disruption, its resistance is zero or infinite, both of which conditions are impossible for a properly functioning thermistor. In this case, the thermistor will not start the measurement. If the temperature which is given from the current thermistor value together with the calibration constant stored in the device is lower than +1°C (which is not possible with a thermistor which is located in a new, i.e. still warm sample), the device will also fail to start the measurement.

c) error on calibration: please check solution

see 9.2

d) frozen too early

The state of the sample is unstable when it is below its freezing point. It can therefore happen that the sample freezes due to an unintentional influence or on its own before the device triggers freezing. There are many possible reasons for this. If stirring is too strong or if the stirring rod is grinding against something, jolting can occur and trigger freezing. The longer cooling takes the more time the sample has to freeze on its own. Therefore the cooling should be carried out as quickly as possible. If the sample is contaminated, freezing may be triggered.

e) plateau not found

This error can only occur when the “Plateau Search Method“ in accordance IDF is used to determine the freezing point. With this method, the temperature value must be within the defined range for a certain time during the plateau. It can so happen that a certain milk sample does not fulfil this criterion. Then a second sample of this milk must be measured. If this error occurs frequently even though the device is otherwise functioning correctly, the error is either with the thermistor or the result of external disturbances.

f) not frozen

If the temperature set for supercooling (the “trigger temperature”) is reached, the device beats against the glass wall of the sample tube to trigger freezing. The temperature should then start to rise. A criterion for this is a rise in temperature of at least 0.1° C. This is always the case with water or calibration solutions if the stirring rod is set in such a way that it beats hard against the glass wall. This is not always the case with milk. Some milks freeze slowly. Should this error occur rarely with individual milk samples, the milk in question should be heated to approx. 40°C, cooled and measured again. However, if this error occurs often in a certain region, then it is better to lower the trigger temperature so that the samples are supercooled more aggressively, causing them to freeze easier. If this error occurs with calibration solutions, then the calibration of the device is incorrect or cooling bath liquid has leaked into the sample.

g) cooling system not ready yet

the device should reach a cooling bath temperature of at least -6°C in a reasonable amount of time. This time depends on the surrounding temperature, but should not be longer than 20 minutes. Temperature of the cooling bath can be checked with the internal thermometer and the value shown at the status page or with an external thermometer. If the device can't reach the selected value, the following needs to be checked:

- the cooling block temperature on the status page should show a value, not an error. When showing error, please check the cable between the cooling block sensor and the measuring board.
- the peltier element dot should be green. If not, please check the cable to the cooling block.
- the fan should be running and the fan status on the status page should be green

h) communication error

The connection to the measurement board is broken. This could caused by a defective cable or a defective measurement board. Both should be checked.

9.2. Detection of errors during use

Most of the errors made during use of freezing point determination equipment are miscalibrations. The calibration of a cryoscope is a necessary precondition for every use. It is necessary to use a thermistor for measuring the temperature of a sample for measuring technology reasons. Thermistors have a very large temperature effect which is necessary for resolutions of more than 1 m°K. Unfortunately, the fluctuation range of the resistance values of these components is so large for production technology reasons that the temperature zero point (0°C)in the cryoscope must usually be determined by a pre-calibration before the machine can be calibrated with a new thermistor. It must be assumed that the A-calibration cannot be performed successfully after a thermistor replacement. The reason for this is that the machine must first reach the specified beat temperature and then recognise an increase in the temperature after the beat (as an indication that the freezing has initiated). However, this is not guaranteed because the values of the new thermistor after calculation with the calibration constants of the old thermistor result in wrong temperatures. Therefore, a so-called pre-calibration is necessary where the machine does not pay attention to the temperatures but instead carries out a purely time-controlled measuring procedure. Afterwards, the calibration constants are adapted to the characteristics of the new thermistor so that both the A as well as the B calibration can be carried out successfully. Unfortunately, it is often the case that the sample vials filled with the calibration liquids are mixed up during the calibration.
Attention: Please do NOT mix up probe vials with calibration vials.

a) Mixing up the A-solution with the B-solution:

Initially the A-calibration is made without any anomalies. During the B-calibration, the machine reports the “not calibrated or defective thermistor” error and remains in an uncalibrated state. In every case, a new pre-calibration and then a correct calibration should be performed.

b) Mixing up A-calibration instead of B-calibration

Afterwards, the complete temperature scale of the machine is shifted. During remeasurement of the calibration solutions, transposed values and a transposed leading sign are obtained.

Example:
A-calibration with 0.000°C
A-calibration with -0.557°C (Operating error)
Remeasurement B-solution: results in 0.000°C
Remeasurement A-solution: results in + 0.557°C

c) Defective thermistor

This is the most frequently occurring error. There are two possible causes:

1. The thermistor is (has been) broken off: This can be recognised by the display constantly, without any change, showing a negative value.
2. The glass shell of the thermistor is showing hairline cracks and is leaky: This manifests itself with extremely unstable measuring behaviour. The repeatability is very bad, e.g. fluctuations from approx. 20 m°C to 100 m°C.

In both cases, the thermistor must be replaced.

d) Agitator error

a) The agitator is not oscillating freely:
The agitator must be able to move freely in the slot provided for it. It must never touch the thermistor at any point. This must be paid particular attention to during thermistor replacement.

b) The agitator amplitude is not large enough:
Cooling the sample is not performed evenly and clearly lasts longer than 90 seconds. With a correctly adjusted agitator, the cooling time is almost about 90 seconds. The agitator amplitude must be approx. 2 mm.

c) The agitator amplitude is too large:
Premature freezing of the sample happens often.
The agitator must be readjusted if needed.

10. Guarantee conditions

10.1. Guarantee period

The guarantee period is 24 months from the date of invoice.

10.2. Guarantee terms

Replacement parts will be exchanged at no cost during this period. Other costs for working time, transport etc. are not covered by the guarantee.

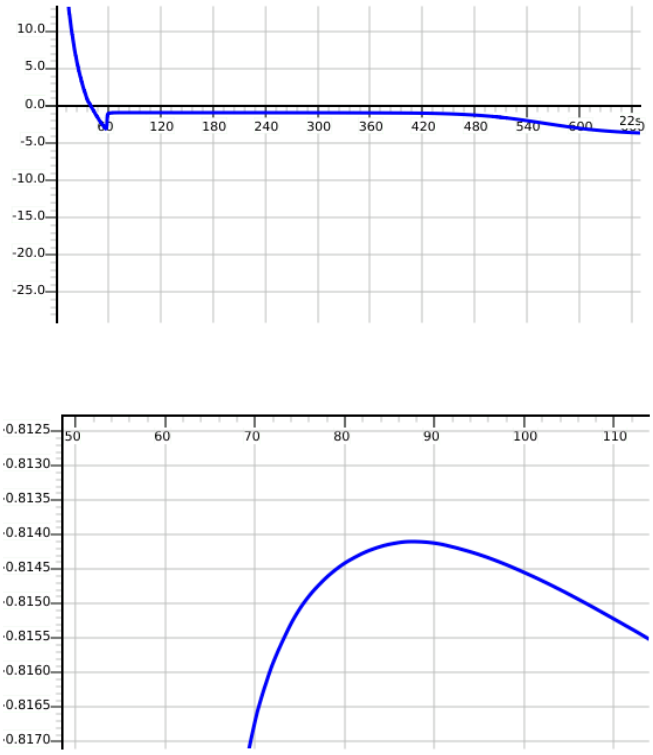
11. Specification

Measurement range	0,0000 °C bis -1,5000 °C	
Resolution	0,0001 °C (0,1 m°C)	
Repeatability	± 0,0020 °C (± 2.0 m°C)	
Calibration	2-point	
Sample volume	2,0 ml bis 2,5 ml	
Sample rate	up to 40/h	
Connectors	1 x USB-A, 1x USB-B, 1xEthernet, 2 x seriell	
Powersupply	85 to 264 VAC / 180W	
Dimension (BHT)/ Weight	340x330x290 mm³ 8,7 kg	
Display	TFT 7Zoll	
Ambient conditions	temperature	5...35°C
	Installation Category	II
	Relative humidity	5%...80% (not condensing)
	Pollution degree	2
	Altitude	Up to 2000 m above sea level

12. Appendix

12.1. Principle of the freezing point determination

The freezing point is the temperature at which the solid phase and the liquid phase of a substance or mixture of substances are present simultaneously and are in equilibrium. The best suitable method for determining the freezing point has proved to be cooling down the sample and then triggering the freezing. In doing so, use is made of the fact that a liquid can be cooled down to below its actual freezing point while being carefully agitated. This state is not stable. The freezing process can be triggered by vibrations, e.g. by beats on the wall of the sample vial. The freezing is also triggered by introducing a small ice crystal into the supercooled liquid. During freezing, the fusion heat is released and the temperature rises until the freezing point is reached. There, the fusion heat released by the freezing solid stays in equilibrium with the heat loss due to the surrounding cooling bath until the sample is completely frozen solid and the temperature then drops.



The graph on the left shows the principal temperature curve. However, if the curve in the area of the plateau is considered with higher resolution (second graph), it can clearly be seen that this plateau is not completely flat. Therefore a binding regulation (standard) is needed which specifies how the freezing point must be determined from the curve.

For this reason, it has been precisely specified in the national and international standards how the chronological progress of the measurement curve must be evaluated in order to determine the standardised freezing point. The currently applicable standard defines the plateau as follows: The temperature value must not increase by more than 0.5m°C within a period of at least 20 seconds. The freezing point determination equipment from Funke-Gerber can be freely adjusted in all the important parameters for the measurement. For this reason, the equipment complies with all national and international standards and possible corresponding changes to the standards. The equipment from Funke-Gerber provide the possibility of being able to select from various methods:

a) Fixed time

Here, there is a fixed waiting time (freely configurable from 20 to 200 seconds) after triggering the freezing. After this time, the measured value has set itself to a certain temperature which is then output as the freezing point value.

Advantage: relatively high sample throughput
Drawback: low repeatability for strongly fluctuating fat contents.

This method is only authorised for routine examinations.

b) Plateau search

With this method, it is set as a criterion that the temperature of the sample mist not change by more than a specified amount within a certain period. This can be imagined as a template with a window being placed over the cooling-down curve. The window width (20 to 23 seconds is usual) and the window height (0.2 m°C to 1 m°C is usual) are specified and the plateau is considered as found as soon as the temperature curve is within this window without touching the top or bottom edge.

Benefits: High repeatability.
Reference process
Drawbacks: Long measuring times
For some milk samples, no measurement value can be found because the plateau criterion is not satisfied.

c) Maximum search

In this method, the warmest point of the temperature curve is searched for. For this, the progress of the temperature curve must be followed until a clear reduction of the temperature can be seen. Therefore this method takes the longest time of all the methods. It is only used for scientific purposes.

13. CE

Funke-Dr.N.Gerber LabortechnikGmbH
Ringstr. 42
12105 Berlin

CE

EC declaration of conformity
according to EU Directive Machines 06/42/EC

We hereby declare that the machine specified below complies with the basic health and safety requirements of the EC Machines Directive in its design and construction and in the configuration put on the market by us. This declaration is invalid if the machine is modified without our agreement.

Machine description:		CryoStar I
Machine type:		Gefrierpunktbestimmungsgerät
Machine No.	7150-	

Applicable EU Directives:	EU Machines Directive 06/42/EG
	EG-EC Low Voltage Directive 2006/95/EG
	EG-Directive EMV 2004/108/EG

Berlin, the

Funke-Dr.N.Gerber Labortechnik GmbH

Dipl.-Ing. K. Schäfer