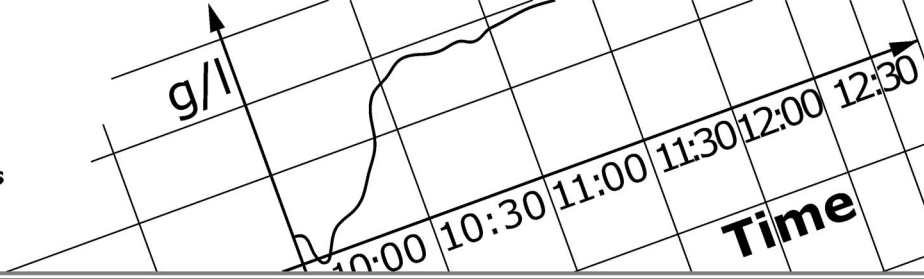
BERTHOLD TECHNOLOGIES



Process Control

detect and identify

Concentration Meter Micro-Polar Brix LB 565

Hardware Manual

User's Guide

ID No. 39531 BA2
Rev. No.: 00 01/11/04
Soft. Version: 1.00

The units supplied should not be repaired by anyone other than Berthold Service engineers or technicians authorized by Berthold.

In case of operation trouble, please address our central service department.

The complete user's guide consists of two manuals, the hardware description and the software description.

The **hardware manual** comprises:

- mechanical components
- assembly
- electrical installation
- technical data
- electrical and mechanical drawings

The **software manual** comprises:

- operation of the evaluation unit
- parameter description
- basic setting
- calibration
- error messages

The present manual is the hardware description.

Subject to change without prior notice.

Table of Contents

Chapter 1. **Safety Summary**

1.1 Symbol and Pictograms

The following symbols identify safety instructions in this user's guide:

Danger!

Possible danger of life and health hazard

Caution!

Possible hazard
Minor personal injuries

Warning!

Possible hazard
Property damages

Note!

Tips for application and useful information

The safety instructions are supplemented by explanatory pictograms, for example:

1.2 Use and Function

Frequency-Approvals

The Micro-Polar fulfils the regulations of FCC[1], Part 15 and the regulations of the Canadian Industry according to RSS-210. This measuring system complies with interference immunity and radiated interference and is permissible for operation.

FCC-Approval Sign

Trade Name: Berthold Technologies
Model No: LB 565
FCC ID: R9ZFCC01X01
IC: 4777A-IC01X01

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industrie Canada. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

"IC[2]:" before the equipment certification number signifies that the Industry Canada technical specifications were met. It does not guarantee that the certified product will operate to the user's satisfaction.

CE 0682

The Micro-Polar Brix complies with the R&TTE regulations 1999/5/EG and fulfils herein all requirements for such high frequency systems. The Micro-Polar Brix contains the identification of conformity according to CE symbol of No. 0682 of the certification office. The certificate can be found in chapter *7.2 Frequency approval*.

[1] FCC … Federal Communications Commission
[2] IC ... Industry Canada

Note!

The Micro-Polar *Brix* is a system for concentration measurement using microwave technology. The microwave probe is immersed into the product being measured. The emitted microwaves have a very low power (< 0.1 mW) and are, therefore, not at all hazardous to human beings or the environment. Also, the product is not altered at all.

Danger!

The Micro-Polar *Brix* has been manufactured in compliance with the safety requirements for microwave devices. If special legal provisions exist regarding the use of microwaves, it will be the responsibility of the user to adhere to them.

Any change in frequency or any other manipulation on the microwave device will result in a loss of the frequency license and will be prosecuted.

The microwave modules do not include any replaceable components and must not be opened.

1.3 General Safety Instructions

Note!

The Micro-Polar *Brix* has been manufactured in accordance with the best available technology and in compliance with acknowledged safety rules to ensure the highest level of occupational safety.

The instrument housing is protected according to protection type IP 65 and is suitable for outdoor application. The instrument has been tested by the manufacturer and is delivered in a condition that allows safe and reliable operation.

Caution!

The safety instructions and warnings in this user's guide have to be observed without fail to ensure safe operation of the instrument!

The system may only be used in technically good order and only according to regulations!

Only authorized persons may work with the system who have been assigned to do this and who have the proper qualification and have received the necessary instructions!

Installations and modifications on the system which could affect the operational safety are not permitted!

Warning!

Ambient conditions:

All system components require non-corrosive ambient conditions during transport, storage and starting up.

Danger!

Electrical shock hazard:

Disconnect power to ensure that contact with live part is avoided during installation and when servicing.

Disconnect power before opening the instrument. Work on open and live instruments is prohibited.

Warning!

Spare fuses must match the rating specified by the device manufacturer. Short-circuiting or manipulation is not permitted.

Warning!

The LB 565 and all ancillary units have to be connected to mains via grounded connection.

Caution!

If liquid gets inside the instrument, cut off the power supply. The instrument has to be checked and cleaned by an authorized service center.

Warning!

Never change the installation and the parameter settings without full knowledge of these operating instructions, as well as full knowledge of the behavior of the connected controller and the possible influence on the operating process to be controlled.

Chapter 2. **General Information**

2.1 Intended Use

The measuring system LB 565 can be used to determine the concentration of nearly all materials which can be dissolved or suspended in water using microwave technology. Pan probes with and without rinsing device are available.

The pan probes have been designed for installation in pipelines with a nominal width of ≥ 200 mm and in containers, for example, evaporation crystallizers. The probe is installed so that both measuring rods (sender and receiver) are immersed into the product being measured.

During operation, the concentration meter Micro-Polar *Brix* sends out electromagnetic radiation in a frequency range between 2.4 GHz and 2.5 GHz (range restrictions depend on local regulations in your Country). The microwaves emerge only between both measuring rods of the probe, and are not dangerous to human beings and the environment (power emission < 0.1 mW). The microwaves are emitted targeted from the microwave window; the product is not altered by the microwaves.

To ensure proper function of the meter, please pay attention to the following:

Note!

- The material being measured must not be electrically conductive, i.e. the ohmic resistance is infinite.
- The product must not contain any gas bubbles, or gas bubbles have to be compressed with adequate pressure when carrying out measurements in pipelines.
- The ion concentration, e.g. salt content, has to be near constant.

2.2 Definitions

Attenuation	Weakening of the microwave signals, microwaves measurement effect.
Batch pan probe	Pan probe without rinsing device. Application e.g. in evaporation crystallization process.
Continuous pan probe	Pan probe with rinsing device. Application e.g. in continuous evaporation crystallization process.
Factory setting	All parameters have been set by the manufacturer using standard values. In most cases this simplifies calibration of the instrument significantly. Despite factory setting, calibration **always** has to be performed.
HF cable	**H**igh-**f**requency cable.
Microwaves	Term for electromagnetic waves in a certain frequency range.
Phase	Phase or phase shift. Microwave measurement effect.
Quad cable	Combination of four HF cables of equal length in a corrugated tube.
Softkeys	Buttons associated with the software.
TC	**T**emperature **c**ompensation.

Chapter 3. **System Description**

3.1 Principle of Measurement

The microwaves that spread between the rods transmit the product being measured; their propagation speed is slowed down (= phase shift) and their intensity is damped (= attenuation). Figure 1 illustrates the principle of measurement: The propagation speed of microwaves passing through the product being measured is slowed down (phase shift) and their intensity (attenuation) is reduced, relative to a reference signal.

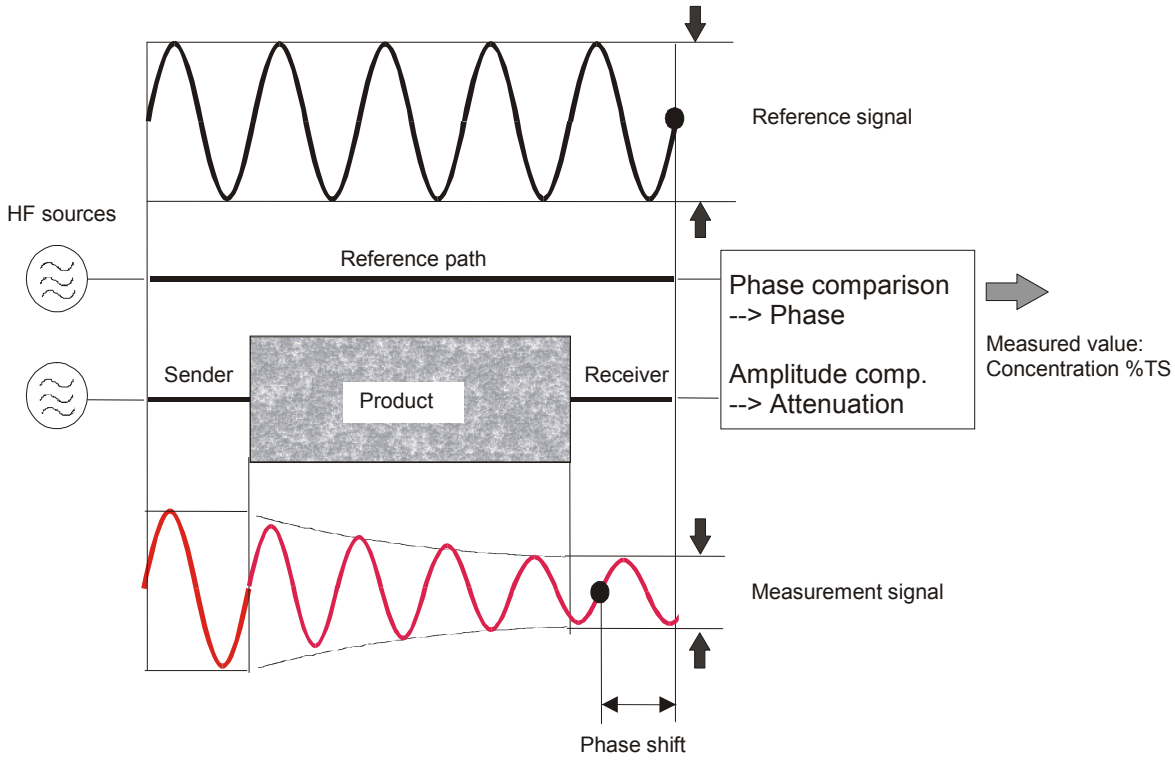


Figure 1: Schematic diagram: Change of microwave by product

Prerequisite is that the product being measured shows some dielectric properties. In sugar strike, it is the water which presents a very distinct dielectric fluid. The water or dry mass concentration can therefore be determined by measuring the phase shift and/or attenuation.

The concentration to be detected in the product depends in good approximation linear on phase shift and attenuation. For this reason we can measure the concentration or the dry mass content of the sugar solution using a linear calibration (see *chapter 3.2 Calculation of Measured Values*).

3.2 Calculation of Measured Values

The microwave parameters phase and attenuation are calibrated according to the plausibility analysis.

Linear calibration:

$$K = A \cdot \varphi + B \cdot D + C$$

Quadratic calibration:

$$K = A_1 \cdot \varphi + \left(A_2 \cdot |\varphi|^2\right) \cdot \arg(\varphi) + B_1 \cdot D + \left(B_2 \cdot |D|^2\right) \cdot \arg(D) + C$$

K	Concentration
A, B, C	Coefficients of respective calibration function
φ	Phase
D	Attenuation
$\|\varphi\|$, $\|D\|$	Rate of phase, attenuation
$\arg(\varphi)$, $\arg(D)$	algebraic sign of phase, attenuation

The formula is simplified accordingly for a pure phase or attenuation measurement.

In case of varying measurement parameters (product density, temperature, etc.), the microwave phase shift method yields a much better accuracy compared to the microwave attenuation method. The phase measurement is significantly less affected by material parameters such as temperature or salt contents (electrolytic conductivity), bubbles and grain size than an attenuation measurement.

Note!

In most cases we recommend using a pure phase measurement to determine the concentration of sugar strike. It is calculated in good approximation through linear calibration:

$$K = A \cdot \varphi + C$$

Micro-Polar *Brix* allows you to calibrate, display and output two concentrations K1 and K2. You have to enter the calibration coefficients separately for concentration 1 and 2. For more information please refer to the Software Manual.

3.3 Temperature Compensation

Temperature compensation (TC) has to be carried out if varying operating states are likely to occur, for example vapour pressure and product temperature. TC has to be carried out whenever you are working with cooling crystallizers. The following formulas are used for temperature compensation.

Linear compensation

Additive:

$$\varphi_{comp} = \varphi_{meas} + TC_{\varphi} \cdot \Delta\theta$$

$$D_{comp} = D_{meas} + TC_{D} \cdot \Delta\theta$$

Multiplicative:

$$\varphi_{comp} = \varphi_{meas}\ (1 + TC_{\varphi} \cdot \Delta\theta)$$

$$D_{comp} = D_{meas}\ (1 + TC_{D} \cdot \Delta\theta)$$

Quadratic compensation

Additive:

$$\varphi_{comp} = \varphi_{meas} + TC_{\varphi 1} \cdot \Delta\theta + \left(TC_{\varphi 2} \cdot |\Delta\theta|^2 \right) \cdot \arg(\Delta\theta)$$

$$D_{comp} = D_{meas} + TC_{D1} \cdot \Delta\theta + \left(TC_{D2} \cdot |\Delta\theta|^2 \right) \cdot \arg(\Delta\theta)$$

Multiplicative:

$$\varphi_{comp} = \varphi_{meas}\ (1 + TC_{\varphi 1} \cdot \Delta\theta + \left(TC_{\varphi 2} \cdot |\Delta\theta|^2 \right) \cdot \arg(\Delta\theta))$$

$$D_{comp} = D_{meas}\ (1 + TC_{D1} \cdot \Delta\theta + \left(TC_{D2} \cdot |\Delta\theta|^2 \right) \cdot \arg(\Delta\theta))$$

Where

φ_{meas} = measured phase [°]
φ_{comp} = compensated phase [°]
D_{meas} = measured attenuation [dB]
D_{meas} = compensated attenuation [dB]
$TC_{\varphi x}$ = temperature coefficient [° / °C]
TC_{Dx} = temperature coefficient [dB/ °C]

$\Delta\theta$ = measured temperature (T_{meas}) – reference temp. (T_{Ref})
$|\Delta\theta|$ = difference temperature
$\arg(\Delta\theta)$ = algebraic sign of difference temperature

Depending on the selected function (additive, multiplicative, quadratic, cubic), the required temperature coefficients appear on the Calibration menu. Temperature coefficients that are not used are set to zero.

If you select two-range calibration (split concentration), separate TC's have to be entered for both concentration ranges. The coefficients are entered in the course of calibration.

TC can be carried out via Pt100 or via current input. This has to be defined on the Calibration menu. The Pt100 temperature range is between –50 °C and +200 °C.

How to work with the temperature compensation is described in detail in the Software Manual.

Note!

In the most cases, linear multiplicative temperature compensation in good approximation is the correct mode of calculation, e.g. for cooling crystallizers.

3.4 Mechanical Components

The measuring system comprises an evaluation unit (see Figure 2), **one** probe and one set of special high-frequency (HF) cables. The probes are available in different versions, as pan probe with and without rinsing device (see Figure 3 and Figure 4).

Figure 2: Evaluation unit Micro-Polar Brix LB 565

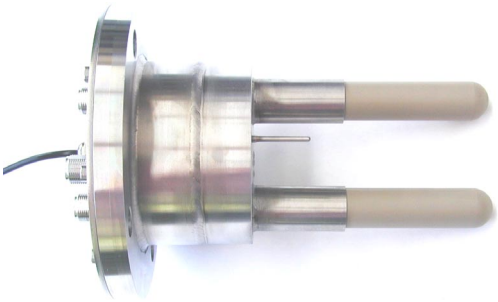


Figure 3: Batch pan probe LB 5650

Figure 4: Continuous pan probe LB 5651

3.4.1 The Evaluation Unit

The evaluation unit comprises the evaluation computer with microwave unit. The microwaves are generated, received and analyzed in the microwave unit. Signal processing and communication take place in the evaluation computer. For simple operation, the measuring system includes a display, 4 softkeys and an alphanumeric keypad. Different functions are assigned to the softkeys on the display.

An RS232 interface is included on the underside of the instrument.

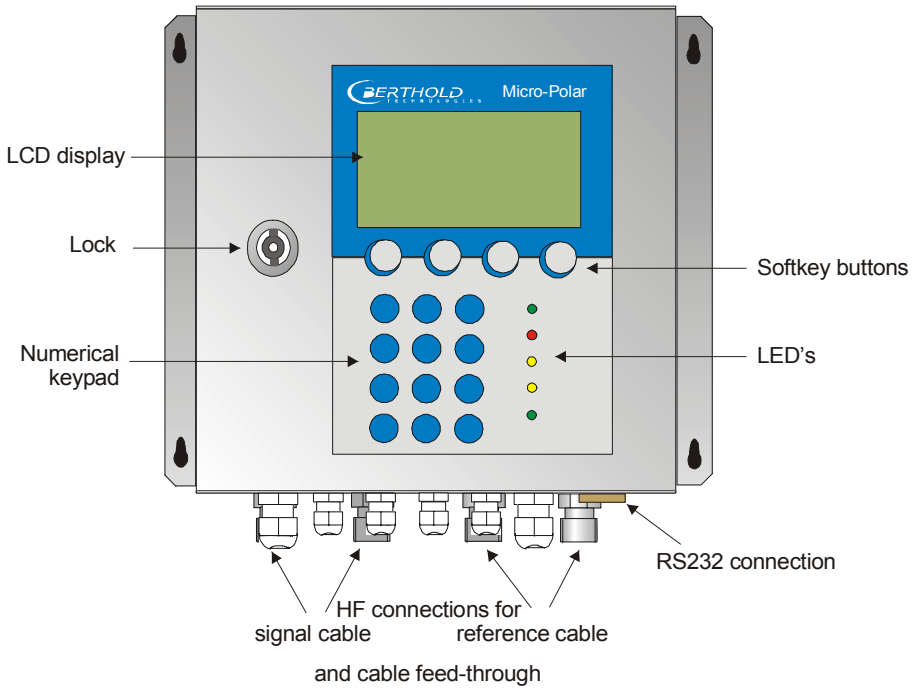


Figure 5: Front view of evaluation unit

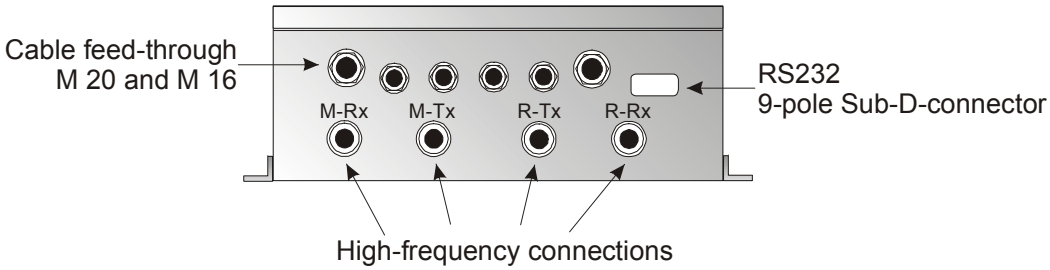


Figure 6: Evaluation unit - Bottom view

LED's on the Front Panel

Five LED's on the instrument front panel indicate the instrument status.

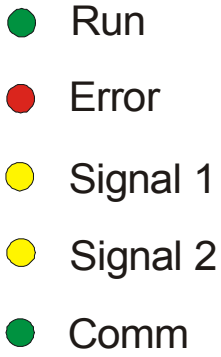


Figure 7: LED's on the front panel

LED	Function
Run	Instrument in measurement mode A flashing LED indicates an error
Error	Error Cancelled after reset or if error has been eliminated
Signal 1	Display depending on the selected function of relay 1, possible functions: error, no product, alarm min., alarm max., measurement stopped
Signal 2	Display depending on the selected function of relay 2, possible functions: error, no product, alarm min., alarm max., measurement stopped.
Comm	Communication active, e.g. via RS 232 or RS 485

Terminal Block

The electrical connections of the LB 565 are located on a connector strip in the wall housing. The terminal block is accessible from the front after you have opened the cover. There, you also find the power cut-off switch and the fuse. The high-frequency connections are located on the outside of the housing. All other elements, especially the live elements (on the motherboard) are provided with a protection cap.

3.4.2 The Microwave Probes

The pan probe is available in two different versions: with and without rinsing device (see Figure 8). For technical data please refer to *chapter 8. Technical Data*.

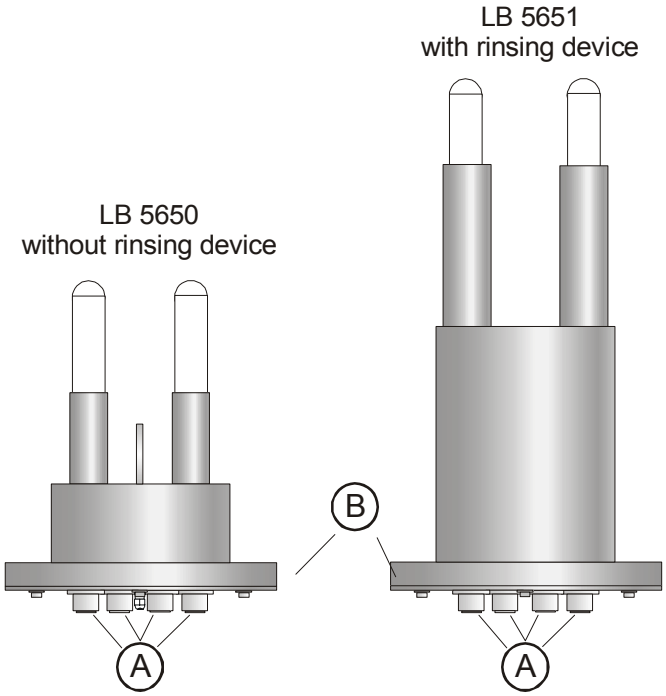


Figure 8: Pan probe

A: High-frequency connections
B: Process connection, flanges of different sizes

Pan Probe Type LB 5650 and Type LB 5651

The pan probe has been specially designed for concentration measurements in containers. Both measuring rods are immersed into the product. The microwaves are emitted from one end of the rod and received at the other end of the rod; they are emitted only in the direction of the opposite end of the rod. This direction characteristic of the probe minimizes the interfering influence of metal parts in the vicinity of the probe and allows installation if only little space is available. For example, the concentration of sugar strike can be measured continuously to find the suitable inoculation time.

The plastic rods meet the special requirements for application in food.
Two different probe types are available:

- the "batch pan probe" is used for discontinuous crystallization processes

- the "continuous pan probe" with rinsing device is used for continuous crystallization processes; this type of probe prevents crystallization on the microwave exit windows and therefore provides exact measurement results.

The flow direction of the product being measured should be vertical, as shown in Figure 9. This ensures a representative product between the measuring rods, provided it is mixed thoroughly.

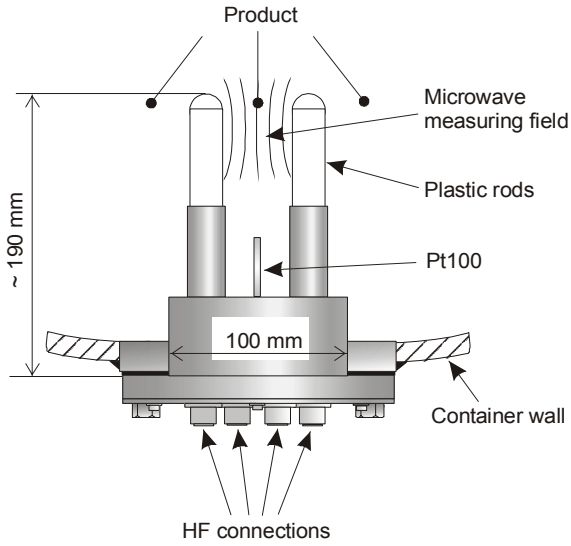


Figure 9:
Batch pan probe LB 5650

PT-100

Only the batch pan probe is provided with a PT-100 and is connected to the evaluation unit via a 4-wire cable. The wiring diagram for the PT-100 is described in chapter 4.3.2 Pin Configuration of the Connector Strip. Usually, no temperature compensation is required for measurements with the continuous pan probe; therefore, the continuous pan probe is not equipped with a PT 100.

Pan Probe Type LB 5651 with Rinsing Device

The probe LB 5651 with rinsing device has been designed for measurements in continuous crystallization processes. The continuous pan probe can be used, for example, for sugar manufacturing, in the afterproduct, raw sugar and white sugar.

The continuous pan probe has two rinsing channels which keep the plastic rods free from incrustations; this ensures that the microwaves come into direct contact with the product being measured. All parts coming into contact with the product meet the specific requirements for application in foodstuffs. Figure 10 shows the design of the probe.

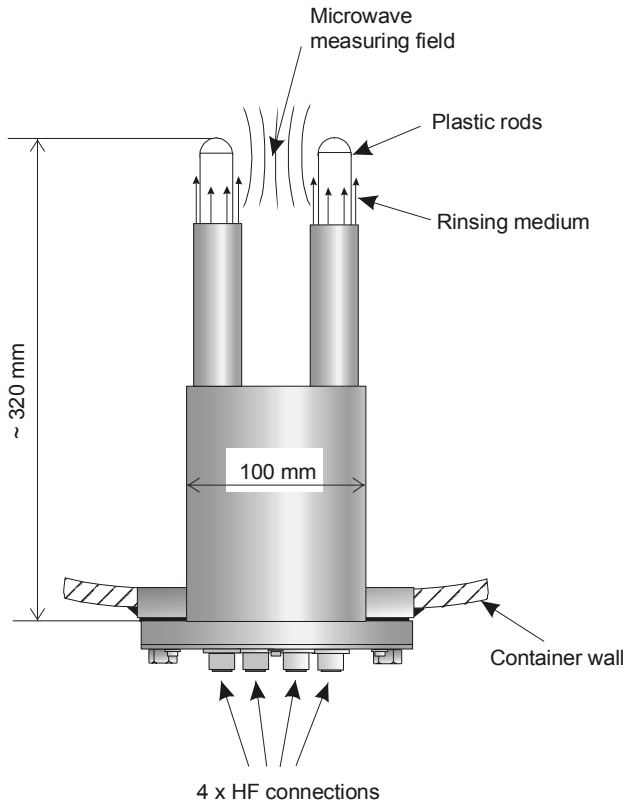


Figure 10: Continuous pan probe LB 5651

3.4.3 High-frequency Cable

High-frequency cables (HF cable) are used to transmit microwaves between probe and evaluation electronics. The measuring system includes a HF quad cable, see Figure 11. The quad cable comprises four individual HF cables of equal length whose ends are terminated by an HF connector (N-type).

However, these high-quality special cables are rugged and temperature-resistant only to a certain degree.

Warning!

Never bend HF cables! The bending radius should not be less than 100 mm. After installation, fix cables with cable binders.

HF cables change the conductivity (of microwaves) depending on the temperature. Therefore, they would create measurement errors if the ambient temperature varies. This error is compensated for by enabling the cable compensation. The influences of the ambient temperature on the signal cable are compensated for by means of the reference cable. The reference cable has the same length as the signal cable; during operation, it should be exposed to the same ambient temperature. We, therefore, recommend installing both cable types together in a corrugated tube; this also simplifies installation.

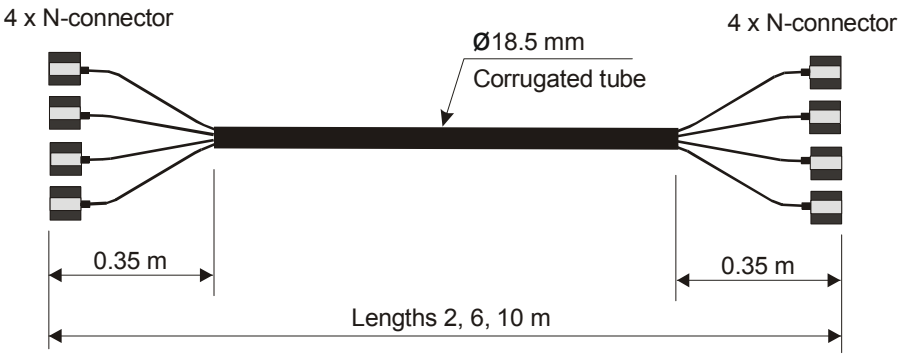


Figure 11: Quad cable

3.5 Measurement Configuration

The evaluation unit is connected to the microwave probe via HF quad cable. Cable lengths of up to 10 m allow you to place the evaluation unit in a sufficient distance to the evaporation apparatus to rule out any influence by the radiation heat.

The pan probe is connected using a HF quad cable, with two individual cables making up the signal and the reference channel.

Our example below (Figure 12) shows the measurement configuration on a discontinuous evaporation crystallizer.

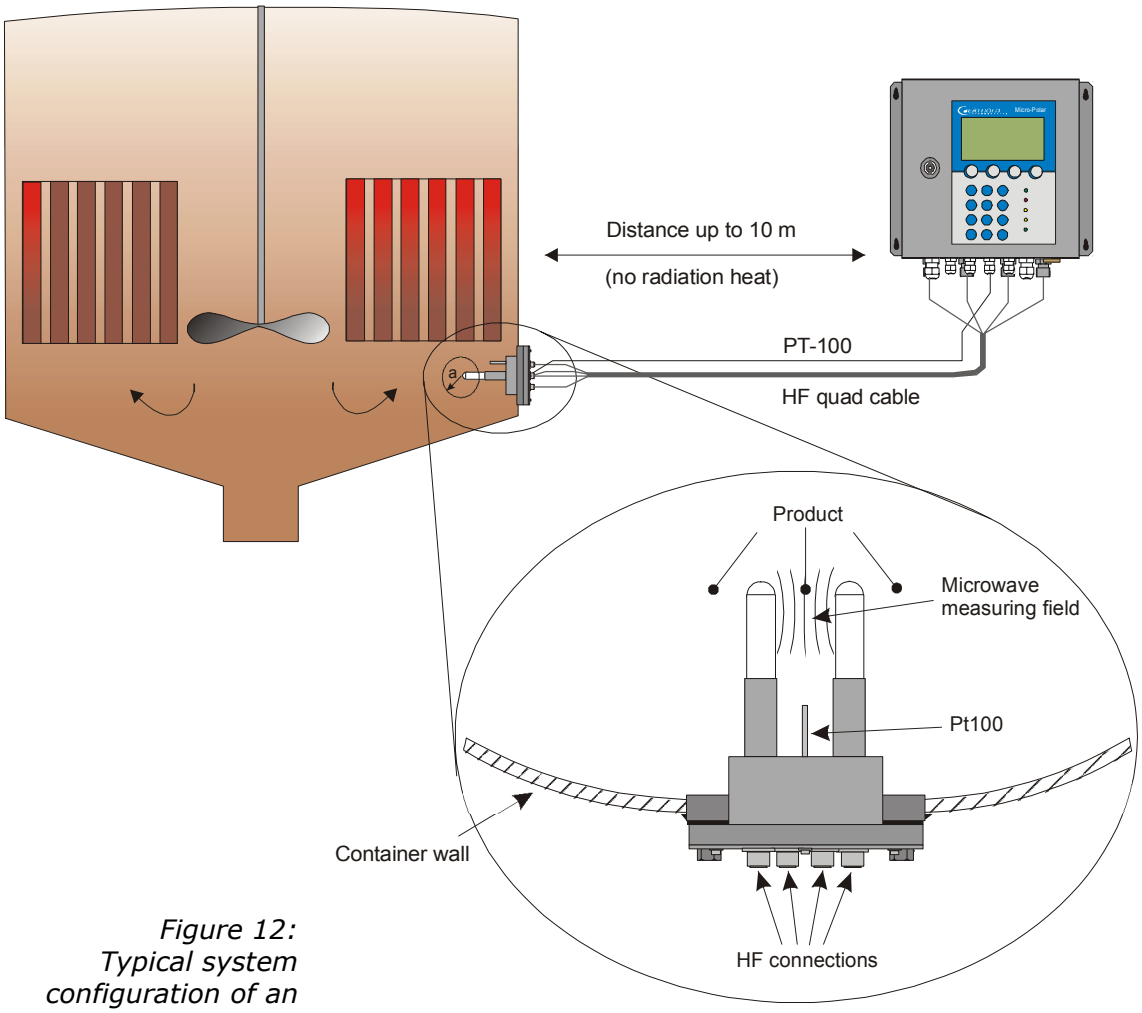


Figure 12: Typical system configuration of an evaporation crystallizer

Chapter 4. **Getting Started**

4.1 Transport to the Installation Site

Warning!

Risk of damage!

System parts may get damaged during transportation!

Transport probe and the evaluation unit in their original packaging. Protect parts against shocks.

Especially the plastic rods of the pan probes have to be protected against mechanical impact!

After unpacking, make sure all parts listed on the packing list have been delivered and show no sign of damage; if necessary, clean these parts.

If you detect any damage, please notify the forwarder and the manufacturer immediately.

4.2 Installation

4.2.1 Pan Probe Installation

Figure 12 shows the position of the batch pan probe on the container. This position is equally valid for the continuous pan probe.

The installation sheet in *chapter 8* includes all information required for installation.

For installation, please keep in mind:

- Select the installation site such that good mixing and a homogeneous product is ensured and the formation of bubbles on the probe is prevented. A tap should be provided in the direct vicinity to allow representative sampling.

- The probe has to be flange-mounted on the container such that the product being measured flows between both measuring rods. In other words, the fork (both measuring rods) has to be arranged vertically to the material flow (e.g. sugar strike).
- The distance between the measuring rod tips and any metallized walls (heating element, stirrer, container wall) should be at least **a = 60 mm**.
- For installation of the probe you need **a hole diameter in the connection flange of at least ∅ 102 mm**.
- For further installation dimensions please refer to chapter 8 (see installation sheets).

Rinse Parameters (only with continuous pan probe)

The sugar quality or purity is essential for the rinse parameters, i.e. rinse frequency and duration. The rinse parameters may change with the purity of the solution and have to be adapted, in individual cases, to the product and the crystallization process.

The following typical rinse parameters are used:

Rinse parameters

Frequency	Every 2 hours
Duration	12 seconds
Rinse solution	Water, condensate
Temperature of rinse solution	Average product temperature, typically 65 ±5°C
Pressure	≥ 3 bar, max. 8 bar
Connections	2 x 3/8 inch (female screw thread)
Supply pipe	≥ 1/2 inch

The rinse connections can be rinsed at the same time or one after the other. The above rinse parameters have to be observed for each connection.

Note!

The required rinse duration has to take into account a possible inertness of the system, e.g. valve openings. The rinse supply pipes have to be insulated well against heat, in order to prevent an initially colder rinse solution.

4.2.2 Setting up the Evaluation Unit

For installation of the evaluation unit please keep in mind:

- Position the evaluation unit depending on the length of the HF cable in the vicinity of the microwave probe. The HF cable is available in a length of 2, 6 and 10 m; the standard cable length is 2 m.
- The instrument has to be protected against vibrations.
- For instrument installation you should foresee a cutoff device to allow you to disconnect the meter easily and quickly from the power supply.
- When installing the evaluation unit on an evaporation crystallizer, you should use a distance rail to minimize the thermal radiation and conduction. See Figure 13

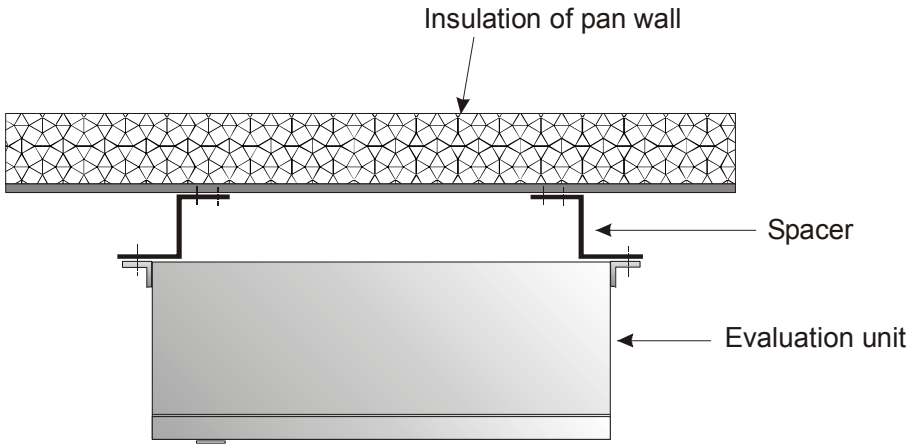


Figure 13: Top view: Installation of evaluation unit on the evaporation crystallizer

4.3 Connecting the Evaluation Unit

4.3.1 Connecting the HF Cable

You need a HF quad cable to connect the pan probe to the evaluation unit.

Note!

Correct cable installation:

Make sure the cable does not get into contact with hot pipes over the entire length (corrugated tube and single cable section after splitting), e.g. direct contact with the device wall (not insulated). This alone guarantees that all single cables are subject to the same ambient conditions and that the compensation of the cable drift works properly.

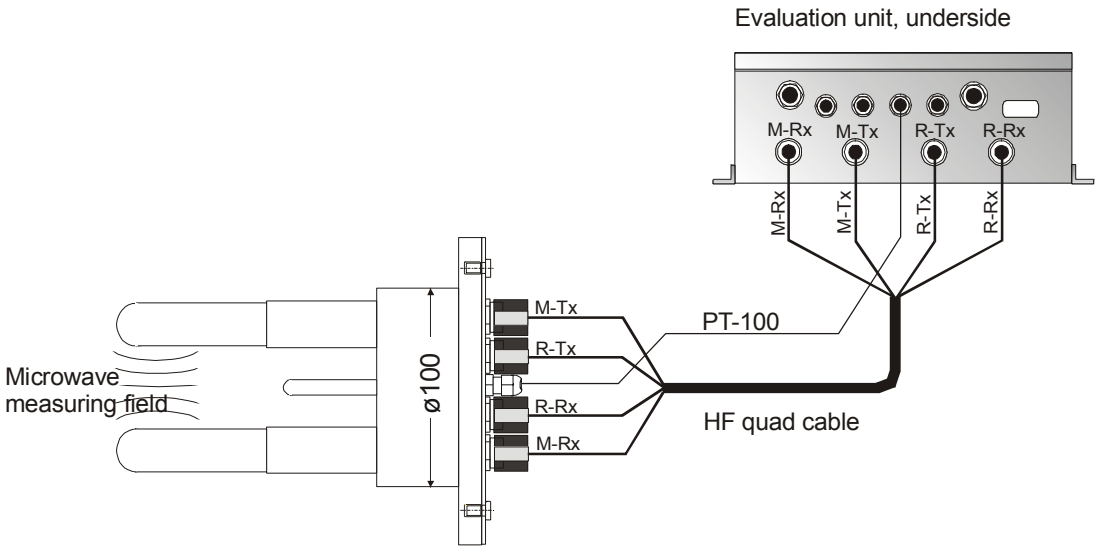


Figure 14: Connection of the discontinuous probe on the evaluation unit

The HF cables and the HF connections on the evaluation unit and on the probe are labeled. Connect the probe to the evaluation unit as shown in Figure 14.

Note!

When tightening the 21 mm screw nut, make sure that the connector is not twisted on the cable. If the connector is twisted relative to the cable, the shielding may get damaged and this could result in mismatching and bad sealing.

Hand tighten all screwed connections of the HF cable (2 Nm = 0.2 kg/m)! Before tightening, carefully screw on the cable by hand. Caution! Threaded joint jams easily.

Occasionally you should check if the screwed connection is still properly tightened. If the installation is exposed to vibrations, the screwed connection may come loose and this may result in inaccurate measurements or corrosion of the connections.

As long as the cables are not connected, the coaxial sockets have to be covered immediately with plastic caps and the cable connectors have to be protected by suitable provisions against moisture and dirt.

Note!

Never bend HF cables! The bending radius should not be less than 100 mm. After installation, fix cables with cable binders or other suitable means, so that the cable cannot slip any more!

4.3.2 Pin Configuration of the Connector Strip

Danger!

Electrical hazards:

Turn off power supply to ensure that contact with voltage-carrying parts is avoided during installation and when servicing.

Turn off power supply before opening the instrument. Work on open and live instruments is prohibited.

Temperature Signal Connection

A PT100 or a temperature current signal has to be connected to current input 1 or 2 if significant temperature fluctuations occur in the product and if a temperature dependence of the phase or attenuation measurement is likely to occur. The temperature sensor has to measure the material temperature in the vicinity of the microwave probe.

When taking the batch pan probe into operation, connect the 4-wire cable of the PT-100 to the connector strip of the evaluation unit as follows:

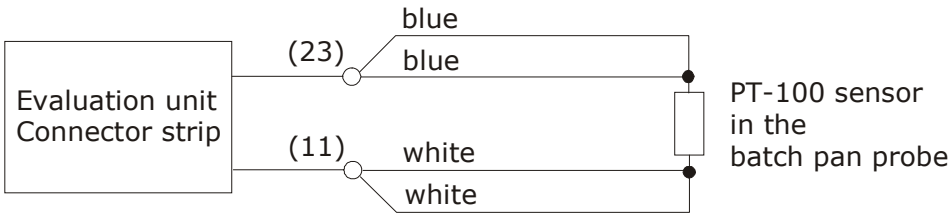


Figure 15: PT-100 Connection batch pan probe

( ) Terminal no.

Other Connections

- Connect all desired input and output signals to the terminal strip as shown on the following pages. Use the M feed-through to keep the degree of protection.
- Check if the voltage indicated on the type plate matches your local supply voltage.
- Connect the line cable to the terminals 3(L1), 2(N) and 1(PE).
- Check if the test switch (mains interruption) is in position „on" (see Figure 17).
- Close the instrument housing and turn on the power supply.

The line cross-section for power supply must be at least 1.0 mm^2.

On the connector strip of the evaluation unit you find the following connections:

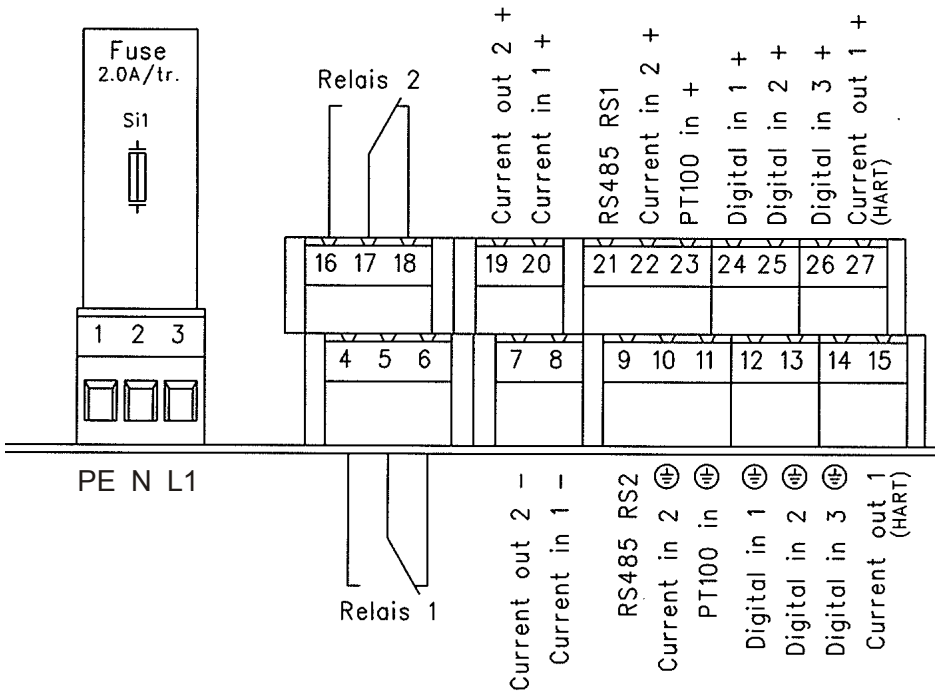


Figure 16: Wiring diagram LB 565

Power supply: Terminals 3 (L1), 2 (N) and 1 (PE)

90 V - 260 V AC, 45 - 65 Hz or
24 V AC/DC, DC: 18 V … 36 V ; AC: 24 V +5%, -20%; 45…65 Hz
Depending on the type of system, see type plate on the outer wall of the housing.

Current input no. 1 (terminals 20+ and 8-), insulated

Input as 0/4 - 20 mA signal. For example, for temperature compensation or reference signal recording.

Current input no. 2 (terminals 22+ and 10-), not insulated

Input as 0/4 - 20 mA signal. For example, for temperature compensation or reference signal recording.

Current output no. 1 (terminals 27+ and 15-), insulated

Output as 4 - 20 mA signal. Output options: concentrations (1 / 2), current inputs signals (1 / 2) and PT100 signal

Current output no. 2 (terminals 19+ and 7-), insulated

Output as 0/4 - 20 mA signal. Output options: concentrations 1 and 2, current input signals 1 and 2 and PT100 signal

PT100 (terminals 23+ and 11-)

Connection for temperature measurement.

Digital input 1: DI1 (terminals 24+ and 12-)

Configuration options:

- no function
- measurement: start (closed) and stop (open)

Digital input 2: DI2 (terminals 25+ and 13-)

Configuration options:

- no function
- average value: hold (closed) and continue averaging (open)
- product selection: product 1 (open) and product 2 (closed)

Digital input 3: DI3 (terminals 26+ and 14-)

Configuration options:

- no function
- start sampling, open: no action, closed: unique measurement starts
- product selection

Relay 1: (terminals 4, 5 and 6)

Changeover contacts, insulated, configuration option:

- no function
- error message
- measurement stopped
- limit value min. and max.
- no product

Relay 2: (terminals 16, 17 and 18)

Changeover contacts, insulated, configuration option:

- no function
- error message
- measurement stopped
- limit value min. and max.
- no product

RS485 interface (terminals 21 (RS1) and 9 (RS2))

Transfer rate 38400 baud, 8 data bits, 1 stop bit, no parity, no handshake. Bidirectional, serial data interface for communication and protocol output

RS232 interface (on instrument underside)

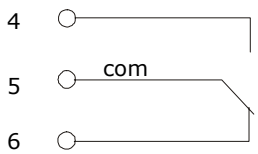
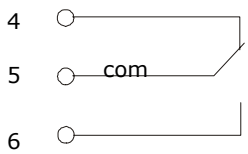
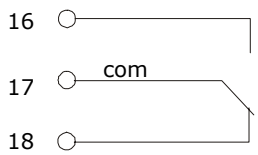
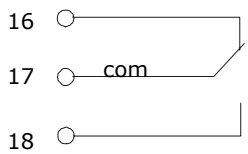
9-pole D-connectors. Data transfer rate 38400 baud, 8 data bits, 1 stop bit, no parity, no handshake. Bidirectional, serial data interface for communication and protocol output.

4.3.3 Digital Outputs, Relays

The status of the measurement is output via two relays:

- Error
- Alarm (alarm min. and max.)
- No product
  Under menu item Plausibility, you may enter a min. attenuation for pause detection (e.g. for discontinuous evaporation crystallizer); if this value is not reached, „no product" is signalled via a relay and the current output drops to 0 or 4 mA.
- Measurement stopped

The respective switching status is also signaled via LED's on the front panel (LED's: signal 1 and 2).

Relay no.	Error, alarm, no product, measurement stopped, current-free status	Normal
1		
2		

The relays with changeover contacts can either be operated as make contact, terminals 4 & 5 (open at error, alarm ...) or as break contact, terminals 5 & 6 (closed at error, alarm ...).

Chapter 5. **Service Instructions**

5.1 General Information

The evaluation unit has no wearing parts or components requiring any special maintenance.

A malfunction of the measuring system is not always due to a defect in the instrument. Often the error is caused by incorrect operation, wrong installation, or irregularities in the product being measured.

If a malfunction occurs, anyway, the measuring system helps you to identify and eliminate errors by displaying error messages on the LCD, indicating operator errors and defects of the electronics. Moreover, the modular design of the measuring system simplifies the replacement of individual module components.

Usually, faulty modules of the evaluation unit cannot be repaired but have to be replaced. The microwave module is fixed with screws to a shielding cover and must not be opened.

5.2 Instrument Cleaning

Clean all system components using only a moistened cloth without chemical cleaning agent. Parts coming into contact with the product (during regular operation) can be cleaned with hot water, taking into account the temperature limits (see *chapter 6.2*).

5.3 Batteries

If the measuring system LB 565 is without power supply (power failure or disconnected from mains), the system clock is supplied with power via the Lithium battery on the CPU. The instrument works correctly even with empty battery, only measured data which are output via one of the serial interfaces may become useless as a result of the faulty date and time information.

The service life of the battery, even under continuous load, is at least 8 years. To replace the battery, you have to disconnect the instrument from mains. Battery data see *chapter 8.2 Electrical Wiring Diagram*.

Battery type: 3 Volt Lithium cell (button cell), type CR2032.

5.4 Fuse Replacement

The mains fuse of the LB 565 is located in the wall housing. Replace the fuse only if the instrument is disconnected from mains. Be sure that the new fuse matches the rating specified.

Use only fuse with correct rating:
Instrument version with 90 V ... 260 V AC: 2.0 A slow-blow
Instrument version with 24 V AC/DC: 2.0 A slow-blow

Warning!

Spare fuses must match the rating specified by the device manufacturer. Short-circuiting or manipulation is not permitted.

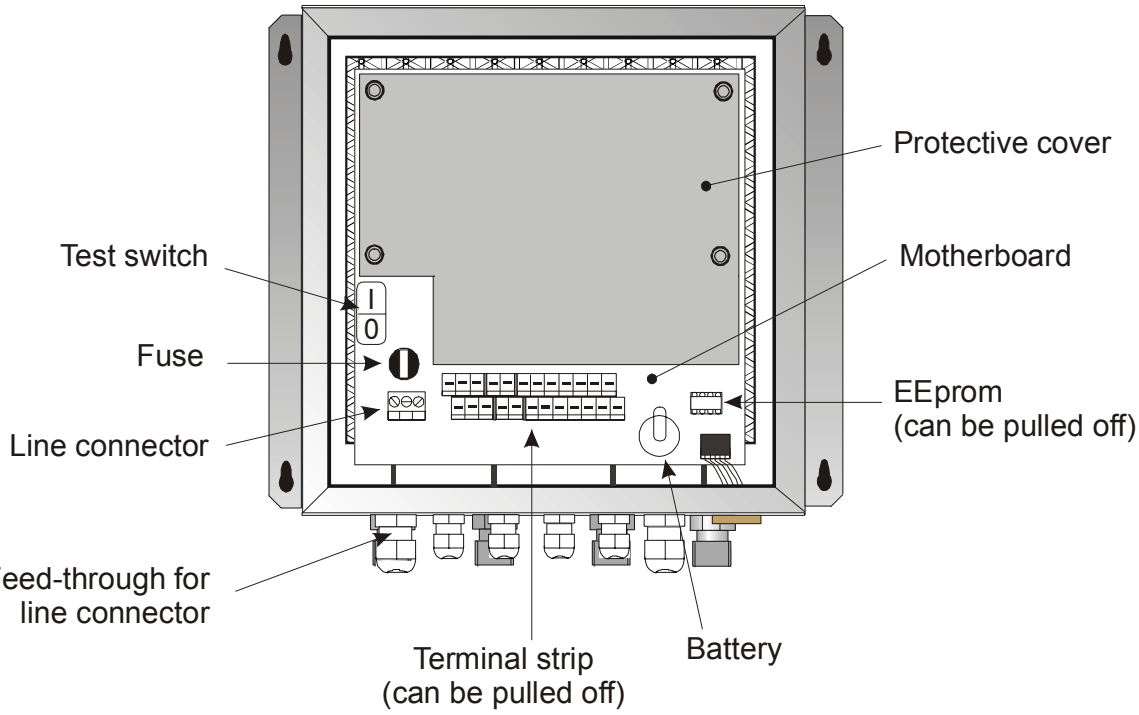


Figure 17: View with open wall housing

Chapter 6. **Technical Data**

General Specifications	
Method	Microwave transmission measurement
Working frequency	2.4 – 2.5 GHz (ISM band), depending on local regulations
Transmission power	< 0.1 mW (< - 10 dBm), coaxial line power
Applications	Concentration measurement in sugar solutions in containers and pipes

6.1 Evaluation Unit

Evaluation Unit	
Housing	Wall housing made of stainless steel, material 1.4571 (~316+Ti), HxWxD: 300 x 323 x 140 mm, see dimensional drawing in chapter 8
Protection type	IP 65
Weight	approx. 6.5 kg
Operating temperature	0 °C ... + 60 °C (273 K ...333 K), no condensation
Storage temperature	- 20 °C ... + 80 °C (253 K ... 353 K), no condensation
Display	Dot matrix LC display, 114 mm x 64 mm, 240 x 128 pixels, with back-lighting, automatic contrast setting
Keyboard	Freely accessible foil keypad, light-stable and weatherproof: alphanumeric keyboard and 4 softkeys (software-assigned buttons)
Power supply	Depending on instrument version: **1.** 90 V - 260 V AC, 45 Hz – 65 Hz **2.** 24 V AC/DC; DC: 18 V – 36 V; AC: 24 V +5%, -20%, 45 Hz – 65Hz
Power consumption	max. 30 VA (AC/DC), depending on configuration

Fuses	2.0 A / slow-blow
Battery type	3 V Lithium button cell, type CR2032
Measured value	Concentration, dry mass content, Brix
Communication module	Preparation for HART®
Inputs and Outputs	
Cable cross-section	min. 1.0 mm² (mains supply)
Cable feed-through	2 x M20x1.5 for cable 5...14mm (depending on application), 4 x M16x1.5 for cable 5 ...8 mm (depending on application)
Probe connection	Inputs and outputs for signal and reference channel, 50 Ω N-socket
Probes	Cable lengths: 2 m, 6 m and 10 m; 50 Ω ; both sides with 4 N connectors
Current input	2 x current input 0/4 ...20 mA, ohmic resistance 50 Ω, 1x insulated, 1x instrument ground e.g. for temperature compensation
Current output	Current output 1: 4...20 mA, ohmic resistance max. 800 Ω , insulated current output 2: 0/4...20 mA, ohmic resistance max. 800 Ω , insulated e.g. for measured value or temperature output
PT-100 connection	Measuring range: - 50 °C ... + 200 °C (223 K ... 473 K); measurement tolerance: < 0,4 °C
Digital input	3 x digital inputs (DI1..3), for floating contacts, TTL-level connected to instrument ground Configuration options: DI1: none, measurement start/stop DI2: none, measurement hold, product DI3: none, sample measurement, product Function description: 1. Measurement (Start/Stop), open: measurement stopped, closed: measurement started or measurement running 2. Hold measurement, open: measurement running, closed: measurement stopped, i.e. average values and current output are held

	3. Product selection, open: product 1 (P1), closed: P2; **with two DI's:** DI2 open & DI3 open: P1, DI2 closed & DI3 open: P2, DI2 open & DI3 closed: P3, DI2 closed &DI3 closed: P4 4. Start sample measurement, open: no actions, closed: single measurement starts
Relay outputs	2 x relay (SPDT), insulated Configuration options: - collective error message - measurement hold - threshold (min. and max.) - no product Loading capacity: AC: max. 400VA DC: max. 90W AC / DC: max. 250V or max. 2A, not inductive ≥ 150V: voltage must be grounded Restrictions for 24 V AC/DC (DC: 18 V...36 V; AC: 24 V +5 %, -20 %) mains supply, if the ground conductor is not connected to terminal 1 (PE): AC: max. 50 V DC: max. 70 V
Serial interface (bidirectional)	RS 232 on the underside of the instrument, 38400 baud, no handshake, data format 8 data bits, 1 stop bit RS 485 via terminal block, 38400 baud, no handshake, data format 8 data bits, 1 stop bit

6.2 Probes

Pan Probes	
Application	Pan probes with and without rinsing device for concentration measurement in process containers and in pipelines with nominal width ≥ 200 mm.
Material	Plastic rod, stainless steel 1.4301
Process coupling	Flange according to DIN 2527 DN65 / PN6, DN 80, 100, 150 / PN16; ANSI Flange 2.5" / 150 PSI (others on request)
Process pressure	0 ... + 3 bar (relative)
Temperature range	Product temperature: + 10 °C ...+100 °C, short-term up to + 120 °C; storage temperature: + 10 °C to + 80 °C
Connections	4 x HF cable: 50 Ω , N-connectors on both sides (max. 10 m HF cable)
Dimensions	See dimensional drawings in chapter 8

Chapter 7. **Certificate**

7.1 EC-Declaration of Conformity

BERTHOLD TECHNOLOGIES GmbH & Co.KG

Calmbacher Str. 22
75323 Bad Wildbad, Germany

Phone +49 7081 177-0
Fax +49 7081 177-100
info@BertholdTech.com
www.BertholdTech.com

EC – Declaration of Conformity

We herewith confirm that the constraction of the following indicated products / systems / units is brought into circulation to comply with the relevant EC regulations.

This declaration is declared void should alterations or unintended use take place without our authorisation.

Title: **Concentration-Measuring System Micro-Polar Brix**

Type: **LB 565-XX**

Relevant EC regulations:

89/336/EWG (electromagnetic compatibility)
reviewed: 91/263/EWG, 92/31/EWG, 93/68/EWG, 93/97/EWG

73/23/EWG (low voltage guidelines)
reviewed: 93/68/EWG

The following norms were considered for the assessment of the pruducts:

EN 55011:1998 + A1:1999 + A2:2002
EN 61010-1:2002-08
EN 61006-6-2:2001
EN 61000-4-2:1995 + A1:1998 + A2:2001
EN 61000-4-3:2002 + A1:2002
EN 61000-4-4:1995 + A1:2001 + A2:2001
EN 61000-4-5:1995 + A1:2001
EN 61000-4-6:1996 + A1:2001
EN 61000-4-11:1994 + A1:2001

This declaration is issued by the manufacturer:

BERTHOLD TECHNOLOGIES GmbH & Co. KG
P.O. Box 100163
D-75312 Bad Wildbad / Gerrmany

by

Dr. J. Briggmann
Development Manager
Process Control

H. Tetzlaff
Specialist CE Certification

Bad Wildbad, 05.04.2004

Registergericht / Court of Registration: Calw HRA 991
Persönlich haftende Gesellschafterin / Fully liable Associates: BERTHOLD TECHNOLOGIES Verwaltungs-GmbH
Registergericht / Court of Registration: Calw HRB 1520
Geschäftsführung / Management: Hans J. Oberhofer (Vors./CEO), Dr. Wilfried Reuter
Beiratsvorsitzender / Chairman of the Board: Dr. Fritz Berthold
USt.-IdNr. / VAT Reg.No: DE813050511
Deutsche Steuernummer / German Tax No: 49038/08038

Dresdner Bank 75105 Pforzheim Konto/account no.6 511 120 (BLZ 666 800 13)/ SWIFT-BIC DRES DE FF 666 IBAN: DE05 6668 0013 0651 1120 00
Sparkasse PF-CW 75323 Bad Wildbad Konto/account no.80 450 05 (BLZ 606 510 70)/ SWIFT-BIC PZHSDE66 IBAN: DE76 6065 1070 0008 0450 05

7.2 Frequency approval

CETECOM ICT Services GmbH

EC Identification number 0682

authorized by the German Government

to act as Notified Body in accordance with the R&TTE Directive 1999/5/EC of 09. March 1999.

CERTIFICATE
EXPERT OPINION

Registration-No.: **E814059R-EO**

Certificate Holder: **Berthold Technologies GmbH & Co KG**
Calmbacher Strasse 22

D-75323 Bad Wildbad

Product Designation: **LB 465–xx, LB 466–xx, LB 565–xx, LB 566–xx**

Product Description: **Short Range Devices**

Product Manufacturer: **Berthold Technologies GmbH & Co KG**
Calmbacher Strasse 22

D-75323 Bad Wildbad

Essential requirements	Specifications / Standards	Submitted documents	Result
EMC (R&TTE, Article 3.1b)	EN 55011:1998+A1:1999 (class A) EN 61000-6-2:2001	Test Report	conform
Radio spectrum (R&TTE, Article 3.2)	EN 300 440-1 V1.3.1 (2001-09) EN 300 440-2 V1.1.1 (2001-09)	Test Report	conform

Marking: **The product shall be signed with CE and our notified body number as shown right hand.**

CE 0682

The scope of this evaluation relates to the submitted documents only.
The certificate is only valid in conjunction with the following number of annexes.

Number of annexes: 1

Saarbrücken, 24.06.2004
Place, Date of Issue

Signed by Ernst Hussinger
Notified Body

GERMAN NOTIFIED BODY · DEUTSCHE BENANNTE STELLE ·

CETECOM ICT Services GmbH, Untertürkheimer Straße 6-10, D-66117 Saarbrücken, Germany
http://www.cetecom.de

CETECOM ICT Services GmbH

CERTIFICATE OF CONFORMITY

Registration-No.: **E814059R-CC** Number of annexes: ---

Certificate Holder: **Berthold Technologies GmbH & Co KG**
Calmbacher Strasse 22

D-75323 Bad Wildbad

Product Designation: **LB 465–xx, LB 466–xx, LB 565–xx, LB 566–xx**

Product Description: **Short Range Devices**
(humidity sensor)

Product Manufacturer: **Berthold Technologies GmbH & Co KG**
Calmbacher Strasse 22

D-75323 Bad Wildbad

Specifications and test reports:

Specification	Test report no. & date	Name of test laboratory	Notes
EN 55011:1998+A1:1999 (class A) EN 61000-6-2:2001	2003-731-1182-REN dated Sept. 9, 2003	ELMAC GmbH	conform
EN 300 440-1 V1.3.1 (2001-09) EN 300 440-2 V1.1.1 (2001-09)	2-3389-01-01/03 dated May 14, 2004	CETECOM ICT	conform

Statement **This equipment fulfils the requirements or parts thereof in the above mentionend specifications.**

CETECOM ICT Services is authorized to act as Notified Body in accordance with the R&TTE Directive 1999/5/EC of 09. March 1999

Saarbrücken, 24.06.2004
Place, Date of Issue

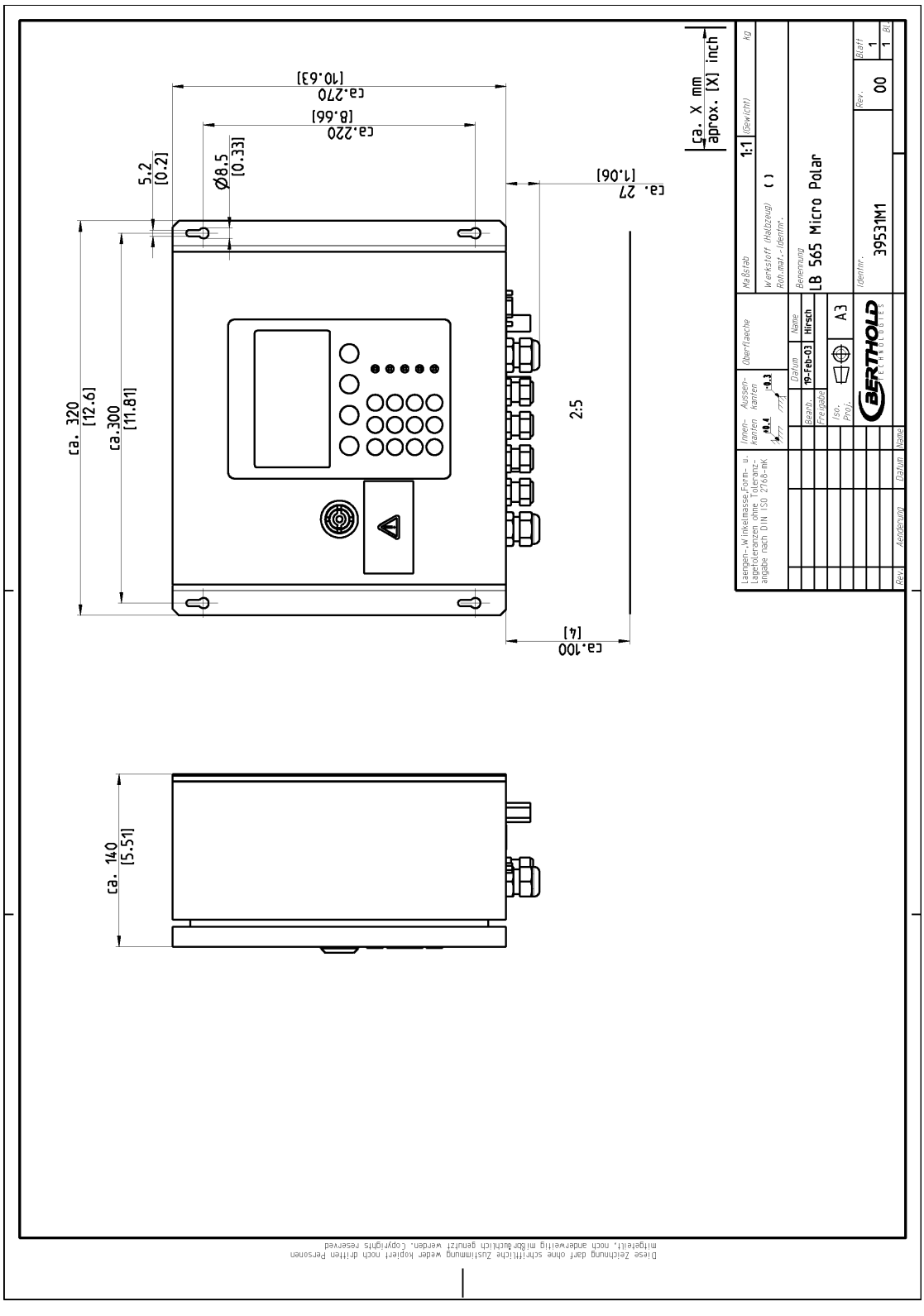
Signed by Ernst Hussinger
Notified Body

GERMAN NOTIFIED BODY · DEUTSCHE BENANNTE STELLE ·

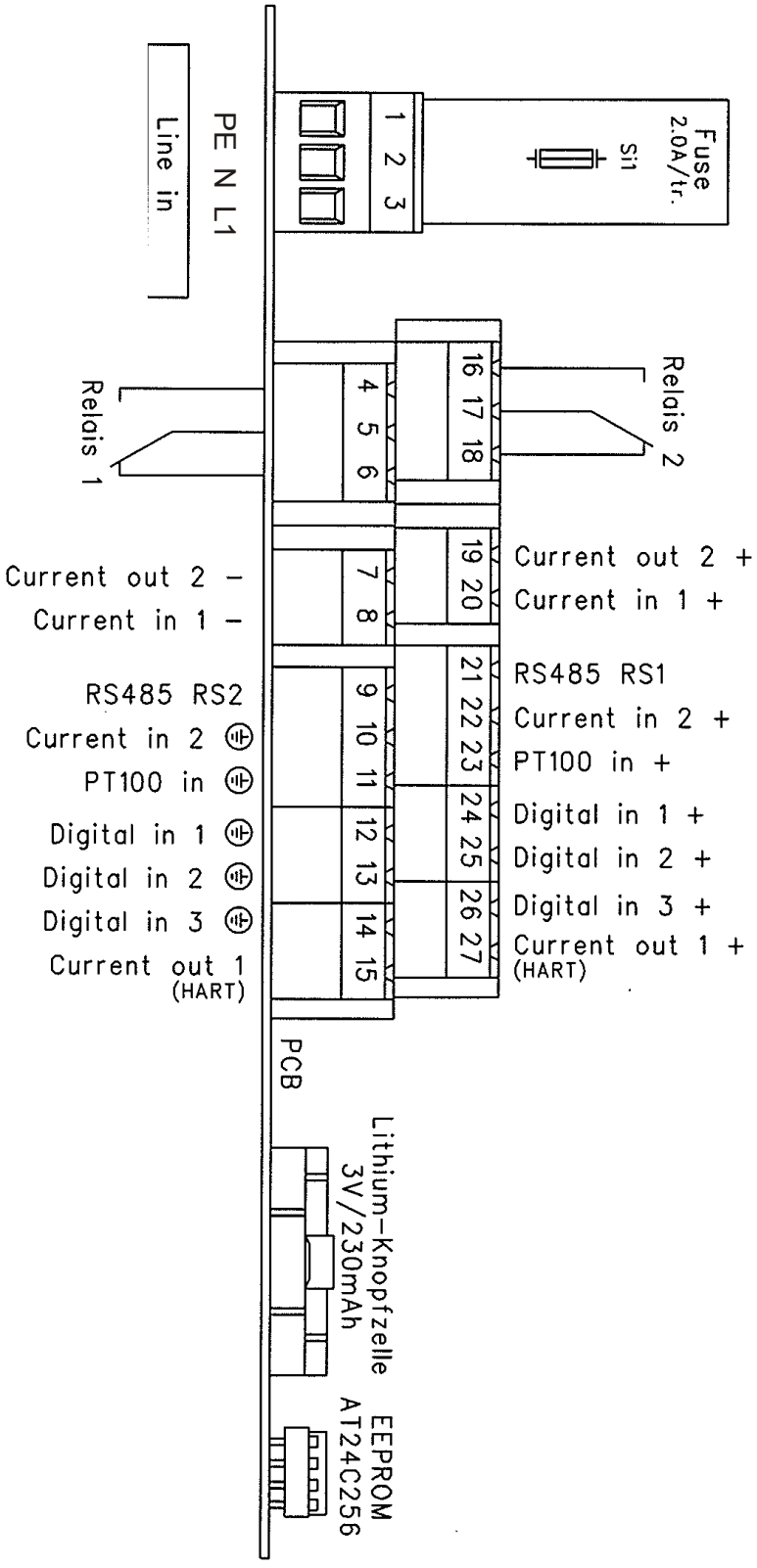
CETECOM ICT Services GmbH, Untertürkheimer Straße 6-10, D-66117 Saarbrücken, Germany

Chapter 8. **Engineering drawings**

8.1 Dimensional drawing for housing

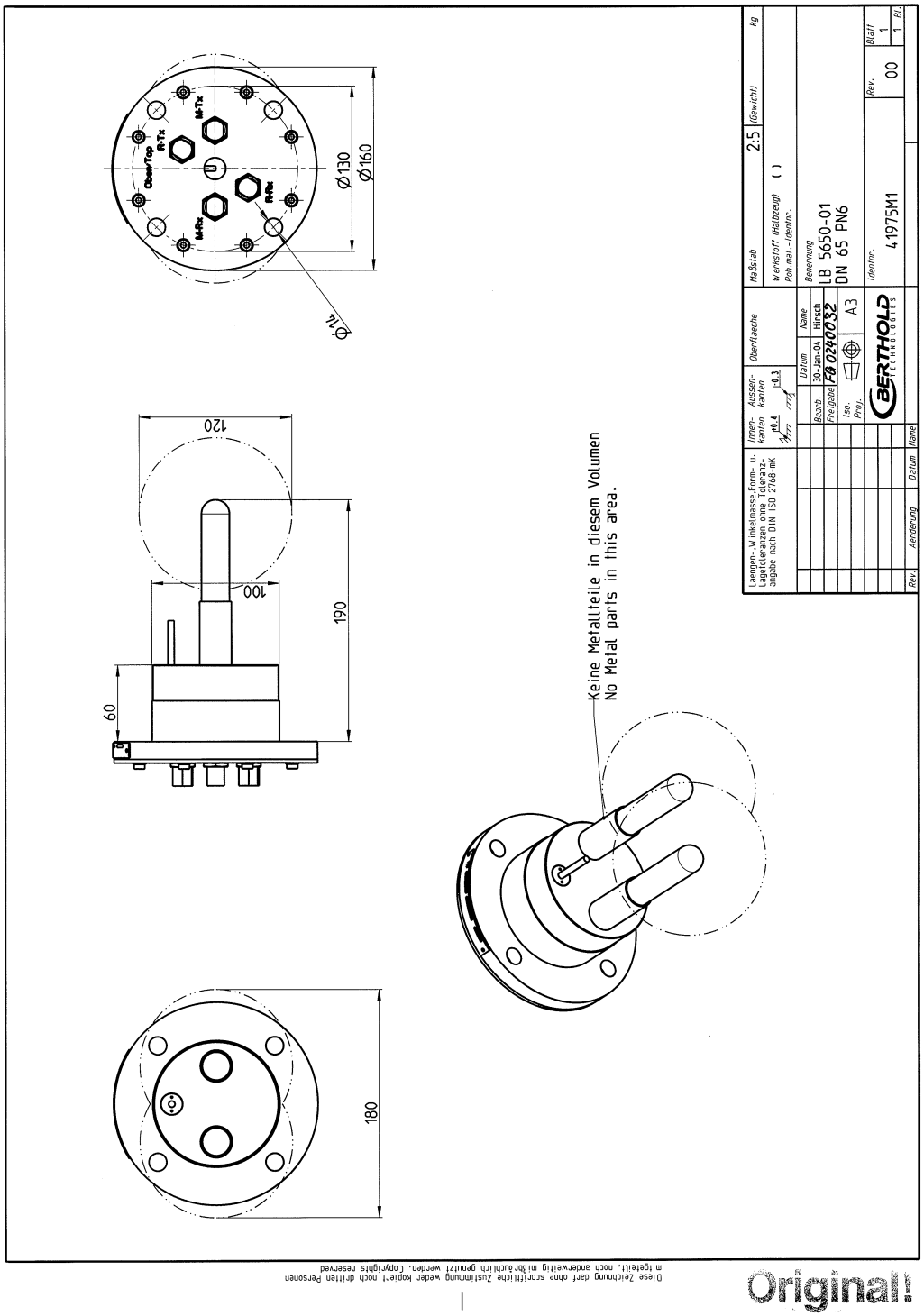


8.2 Electrical Wiring Diagram

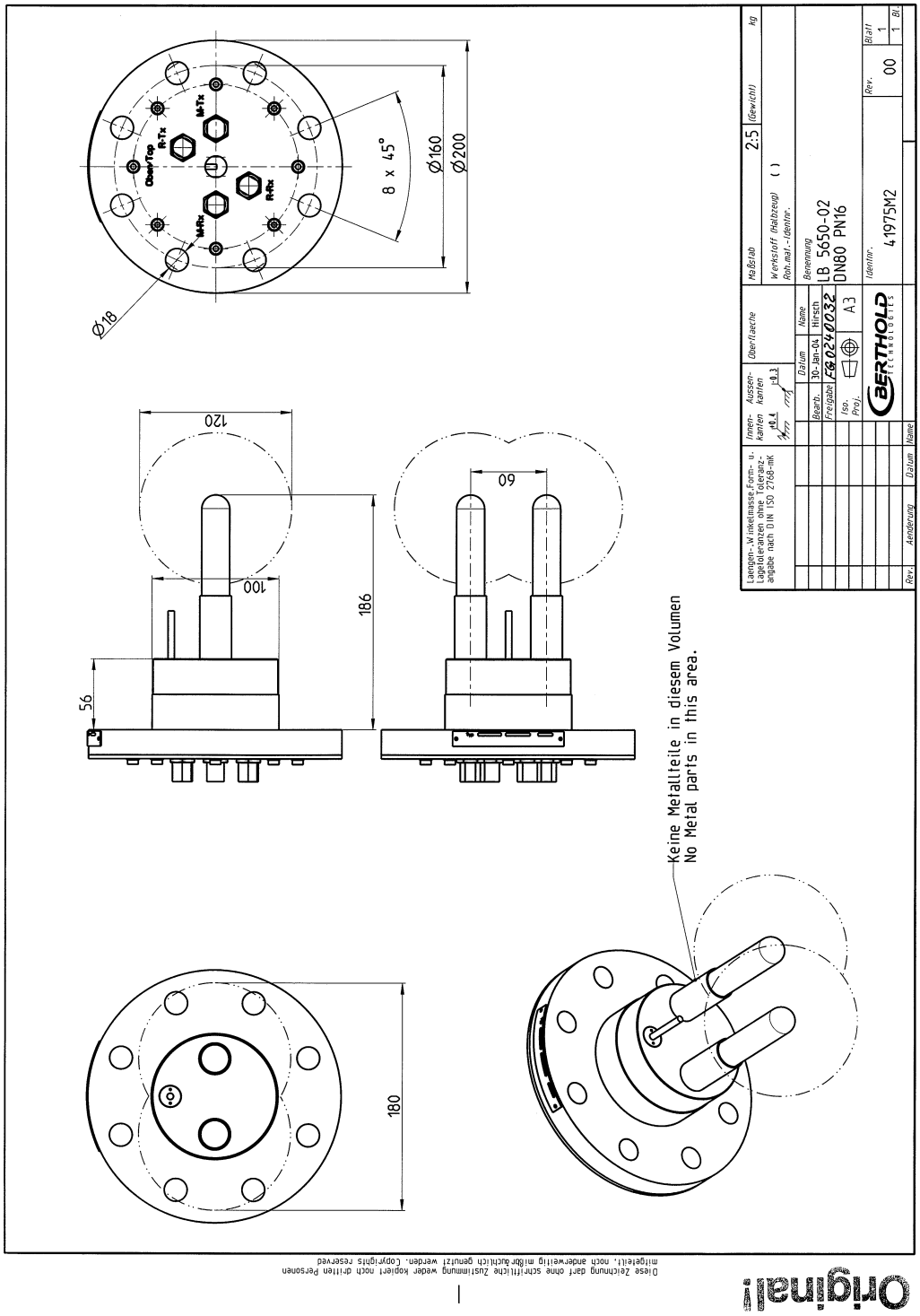


8.3 Dimensional drawings for batch pan probes

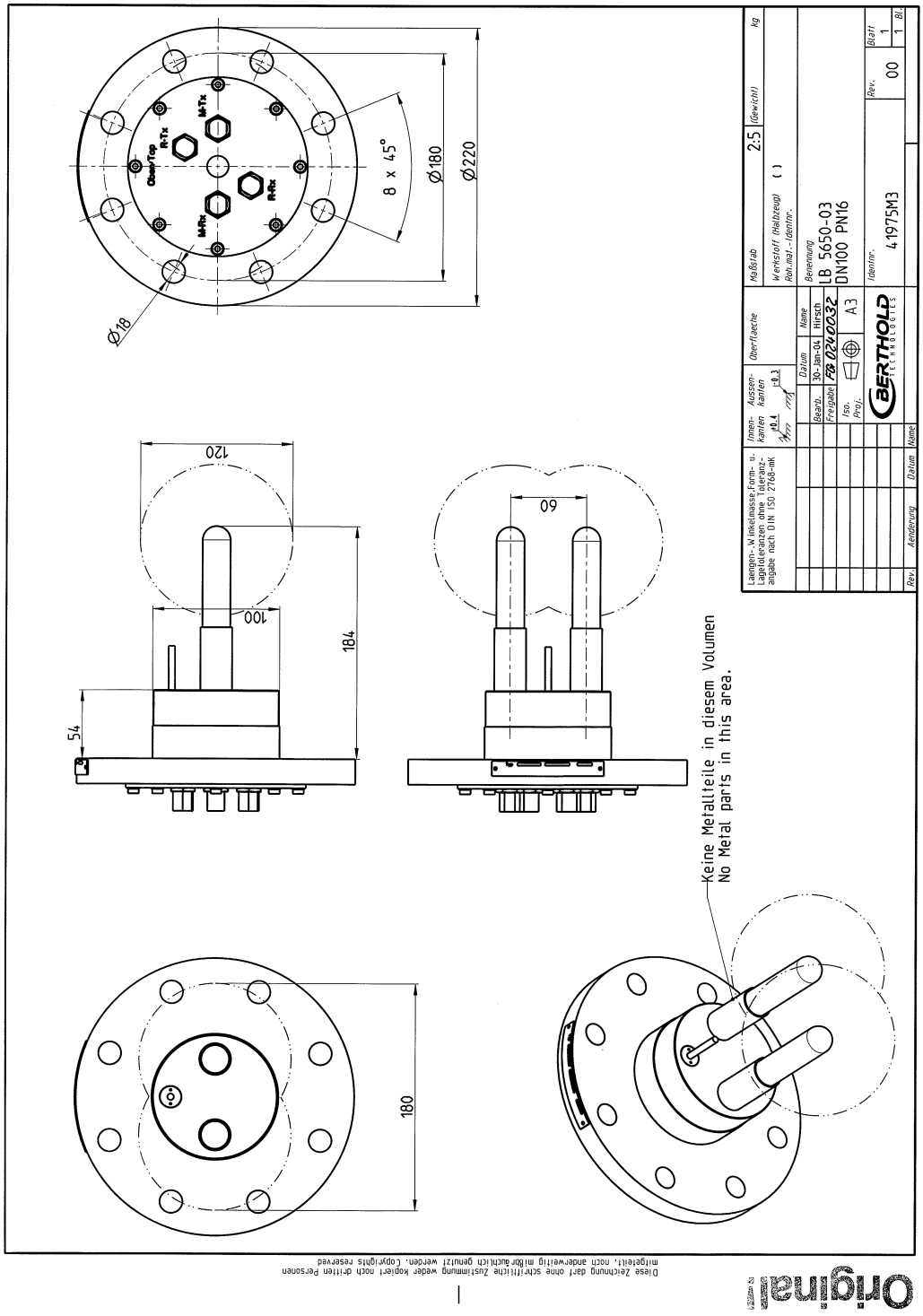
8.3.1 Type LB 5650-01



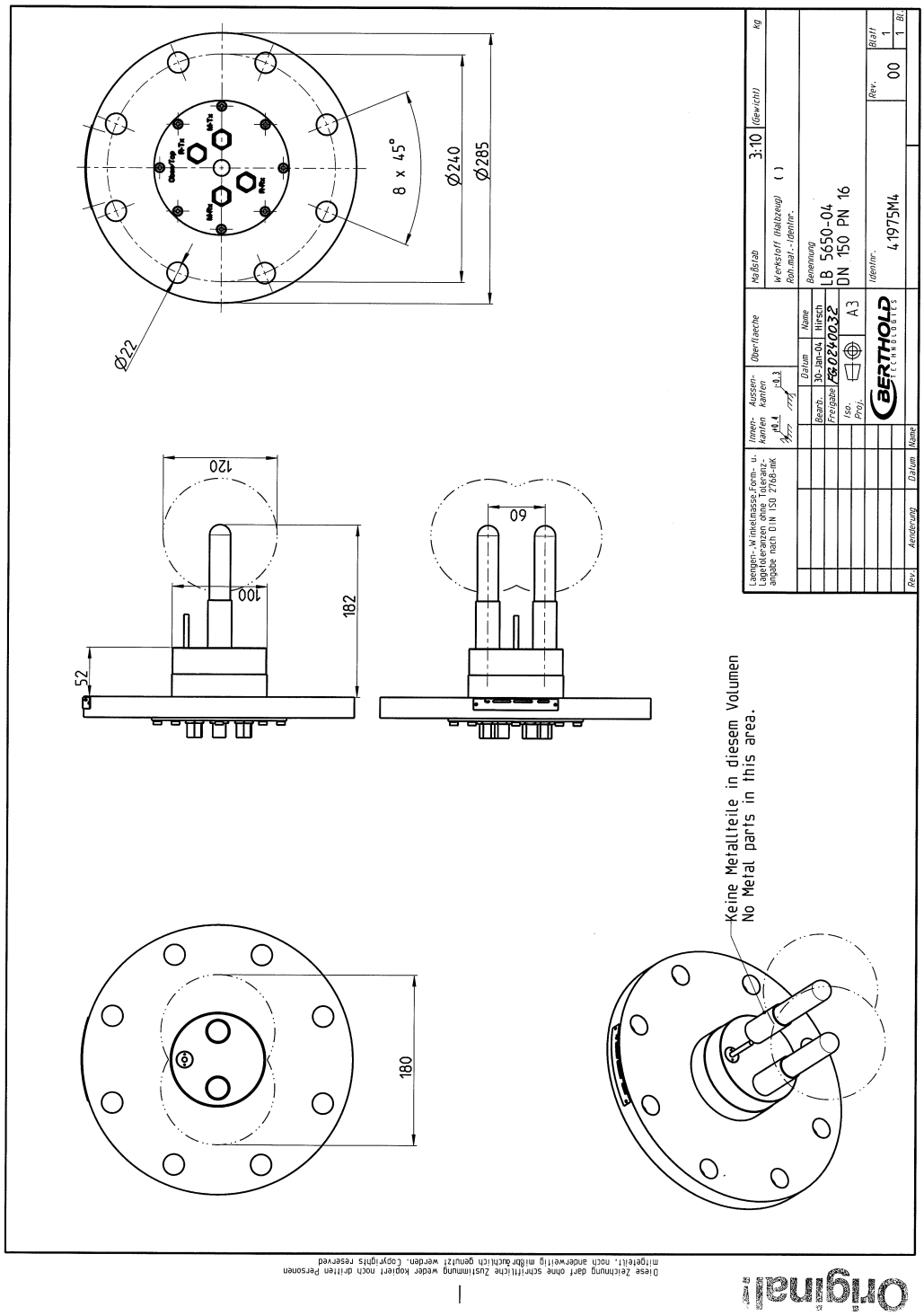
8.3.2 Type LB 5650-02



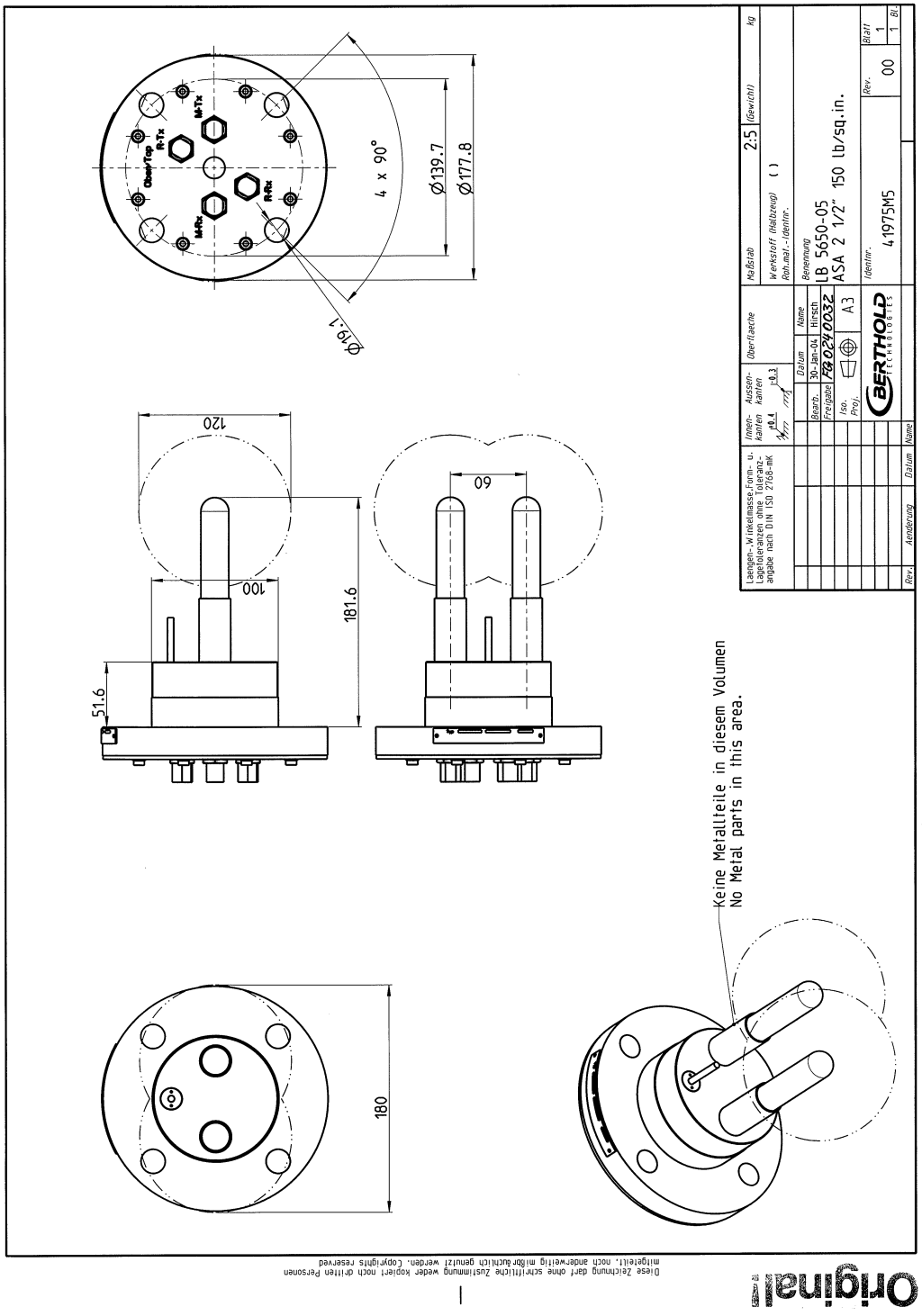
8.3.3 Type LB 5650-03



8.3.4 Type LB 5650-04

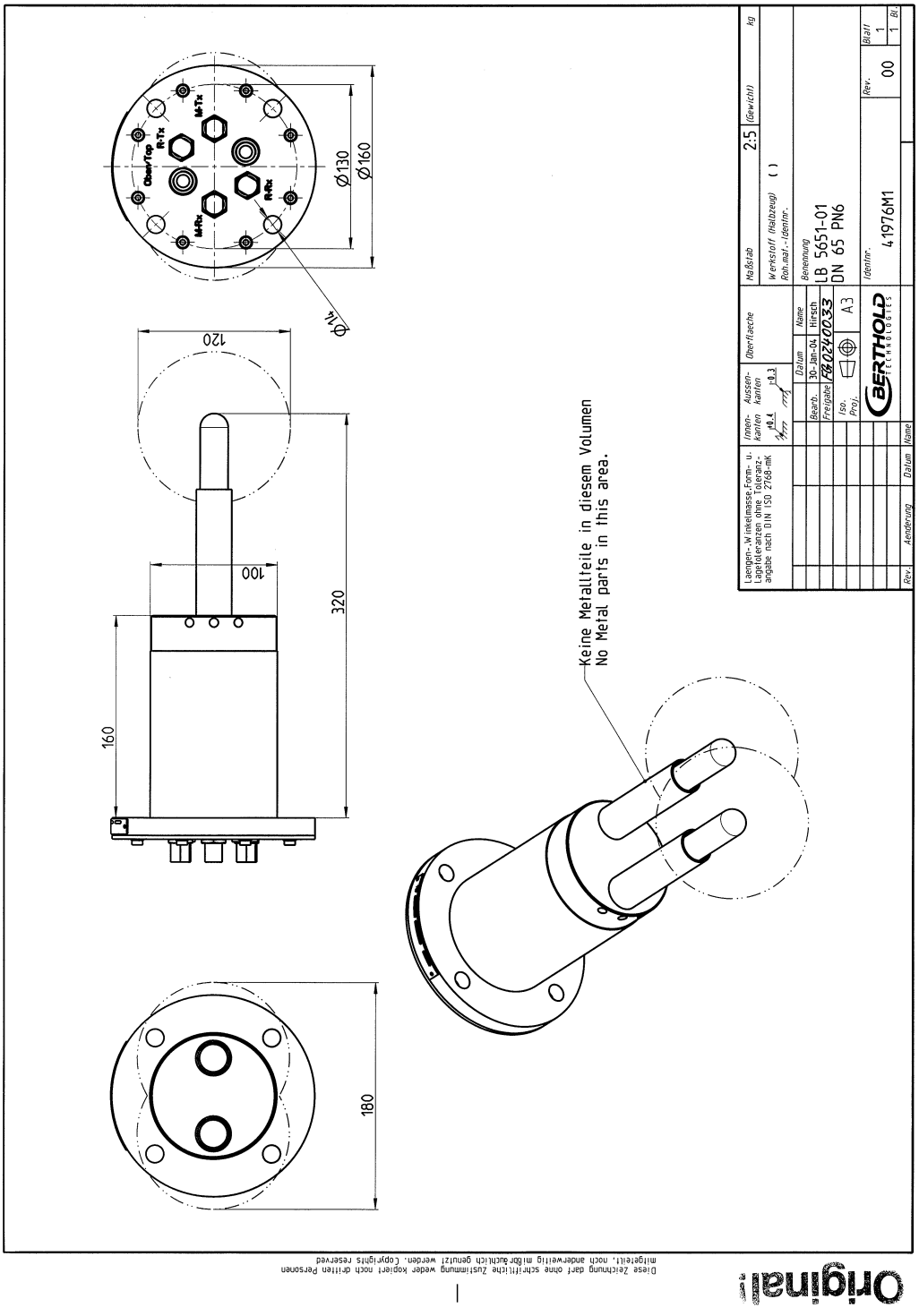


8.3.5 Type LB 5650-05

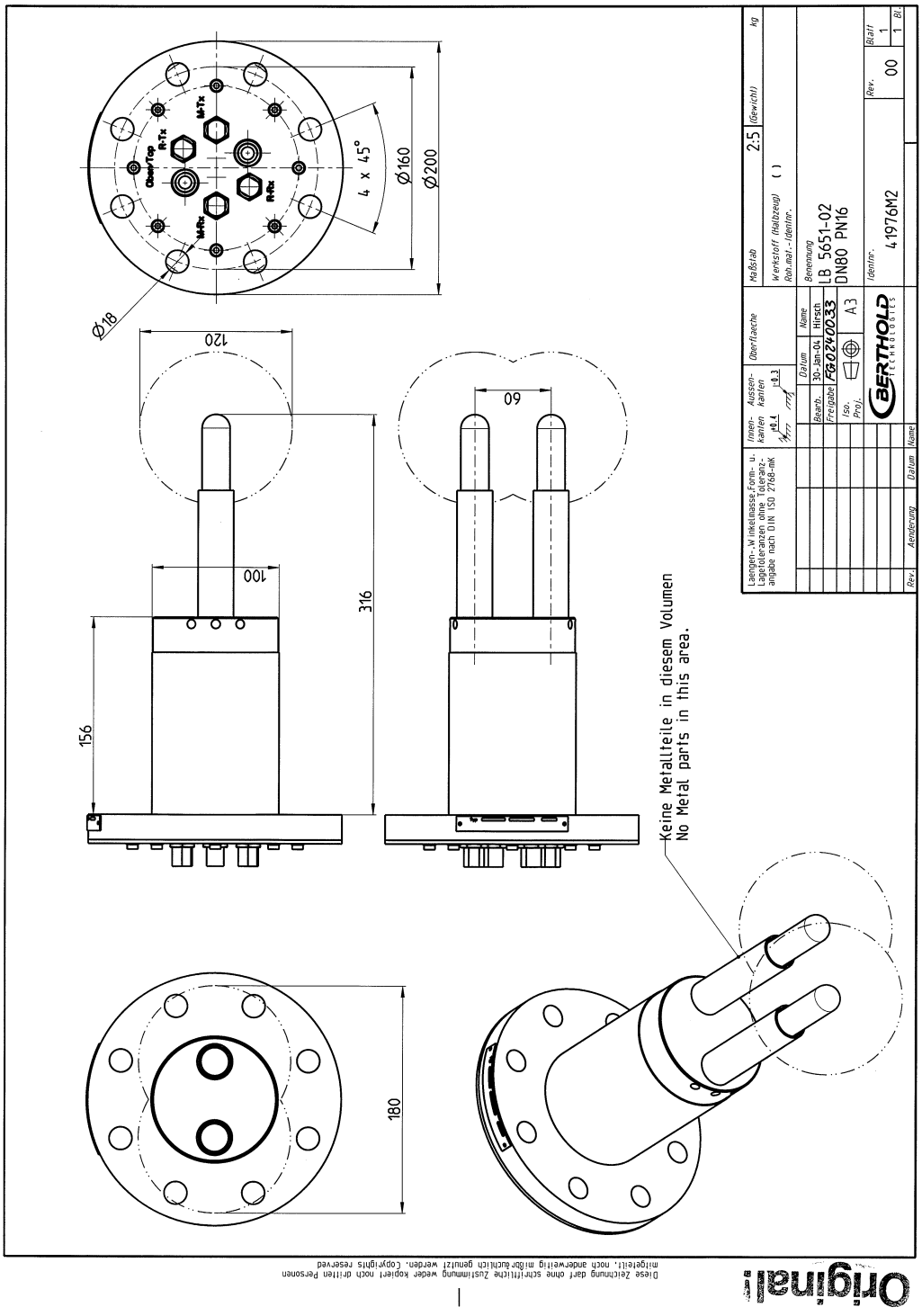


8.4 Dimensional drawings for continuous pan probes

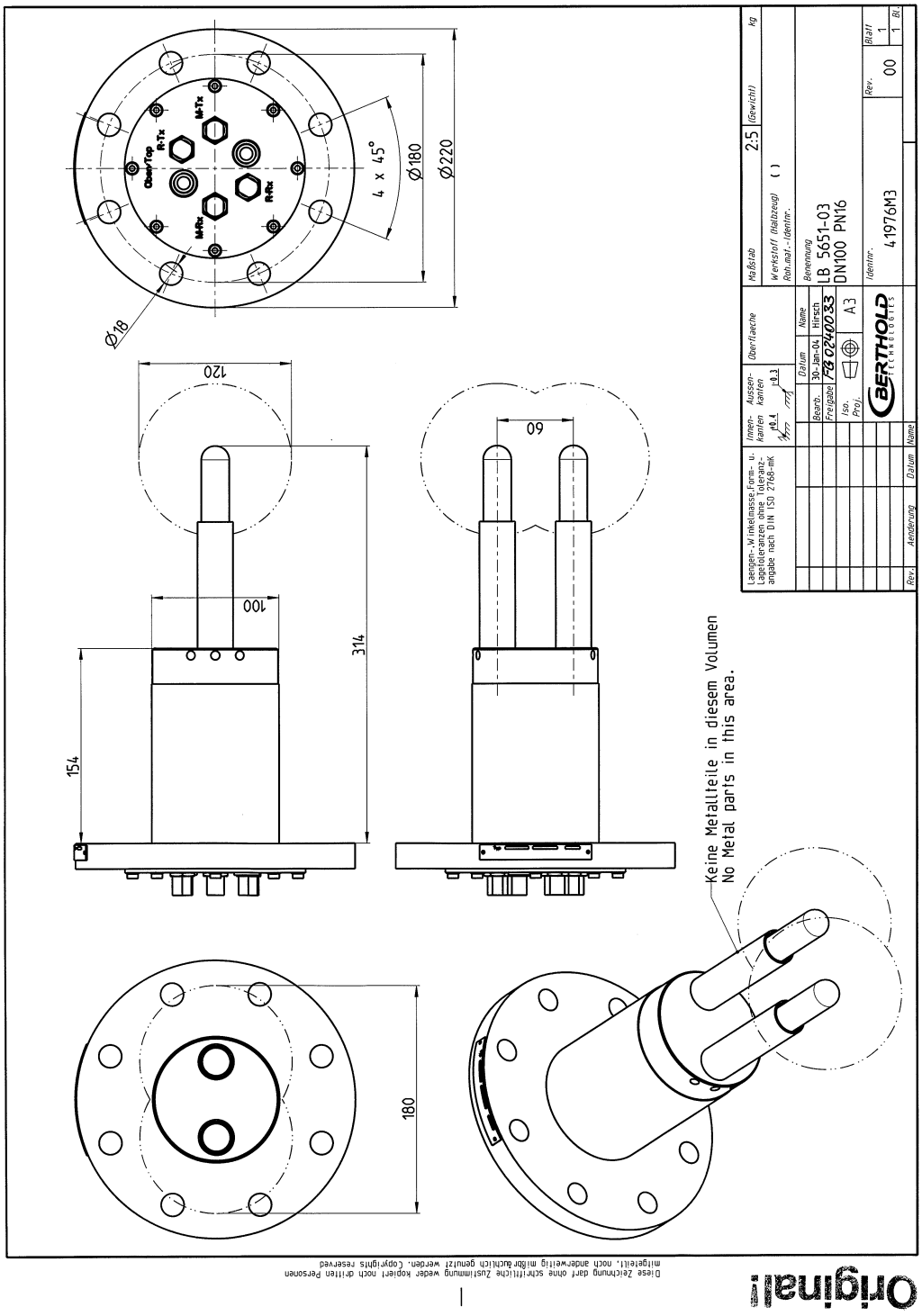
8.4.1 Type LB 5651-01



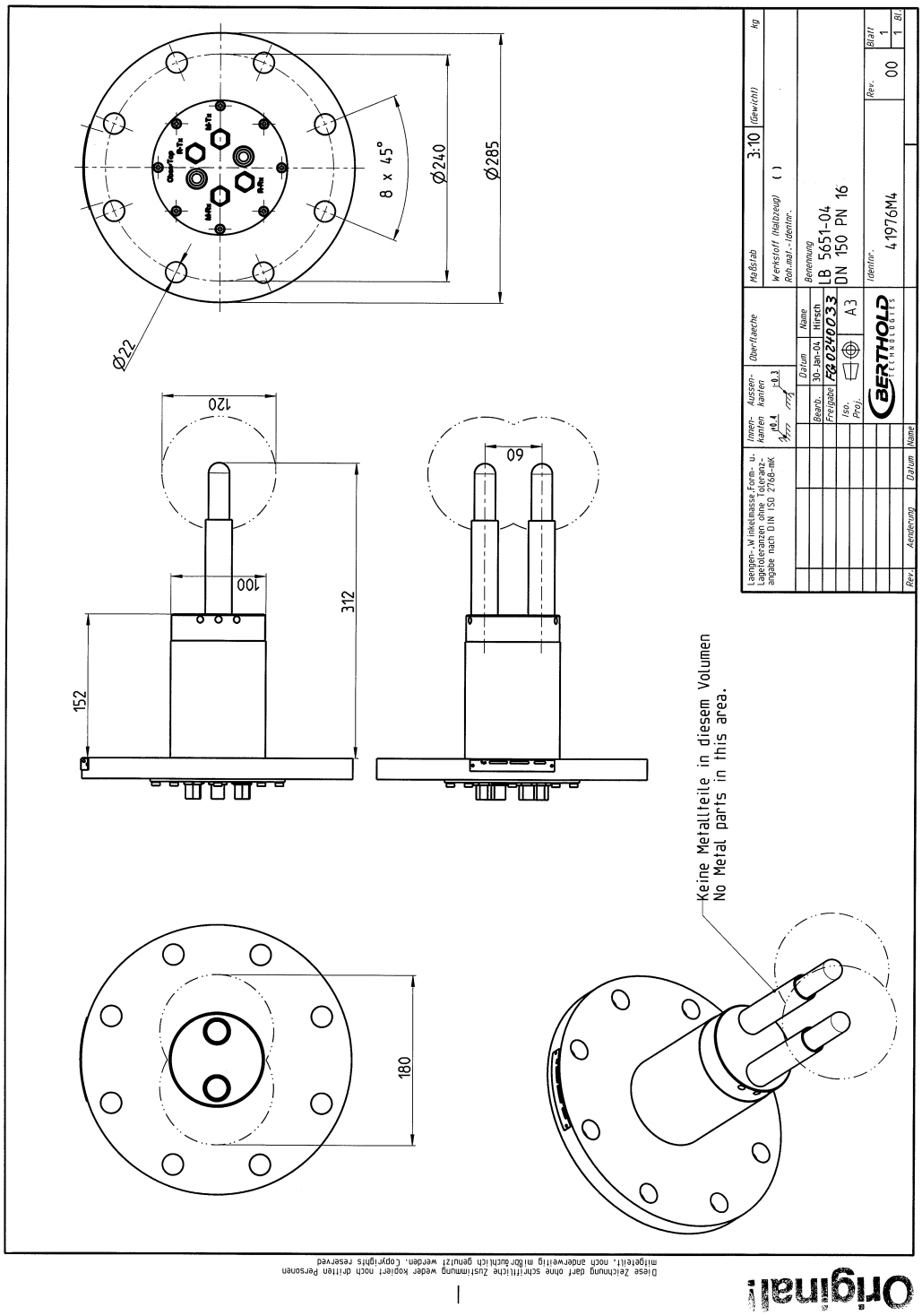
8.4.2 Type LB 5651-02



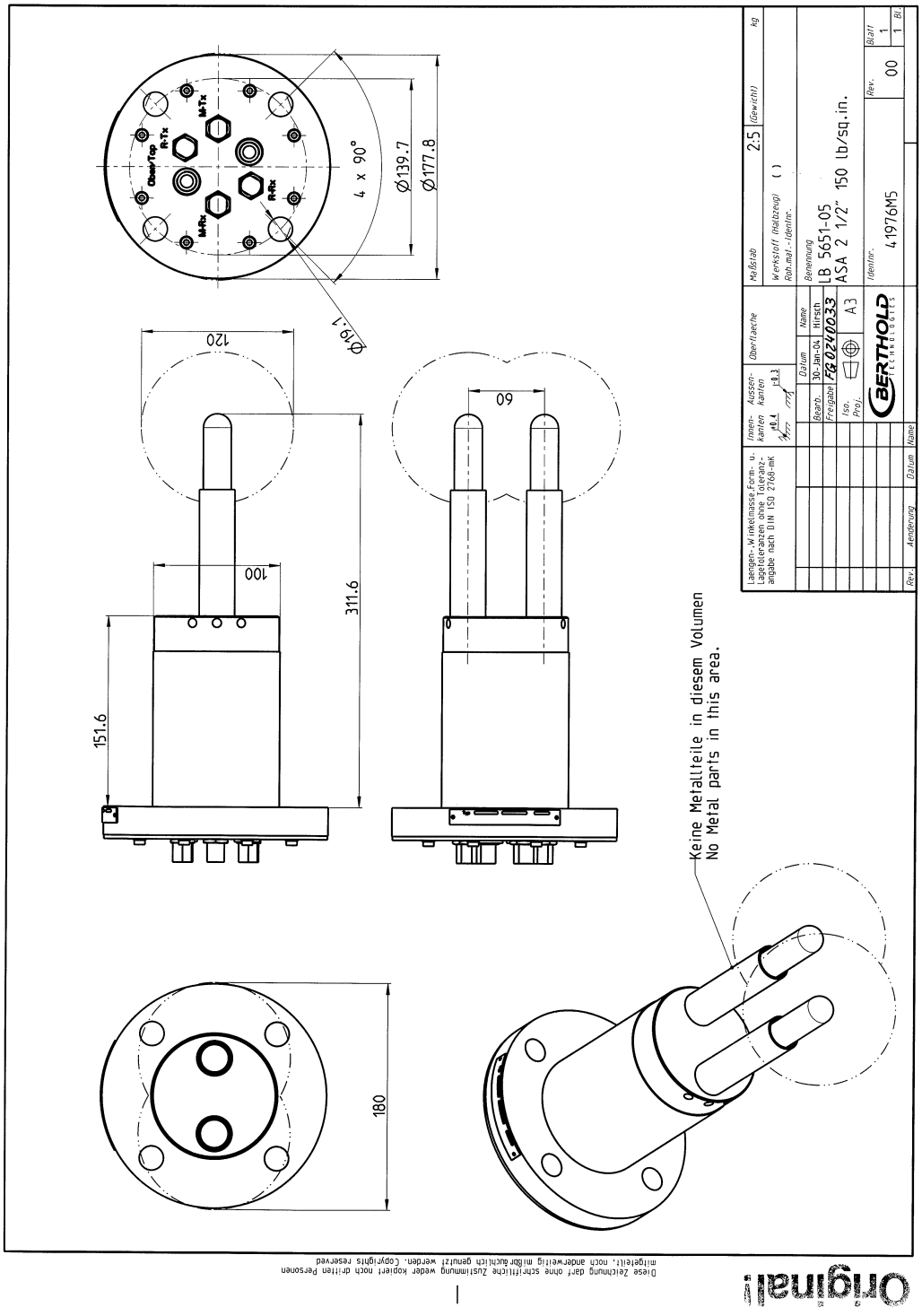
8.4.3 Type LB 5651-03



8.4.4 Type LB 5651-04

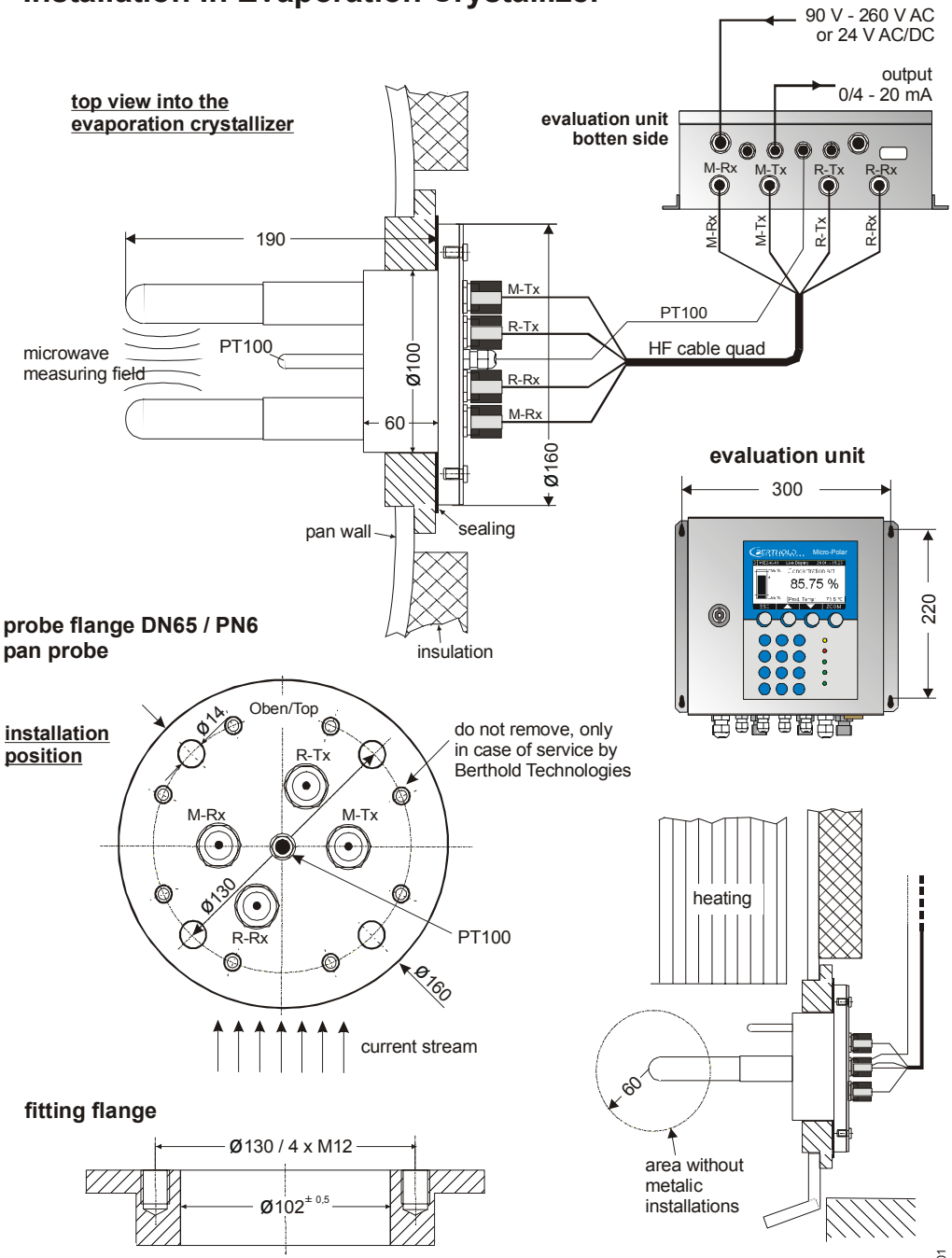


8.4.5 Type LB 5651-05



8.5 Installation sheets for LB 5650 (Batch pan probes)

Micro-Polar *Brix* With Pan Probe
- Installation In Evaporation Crystallizer -



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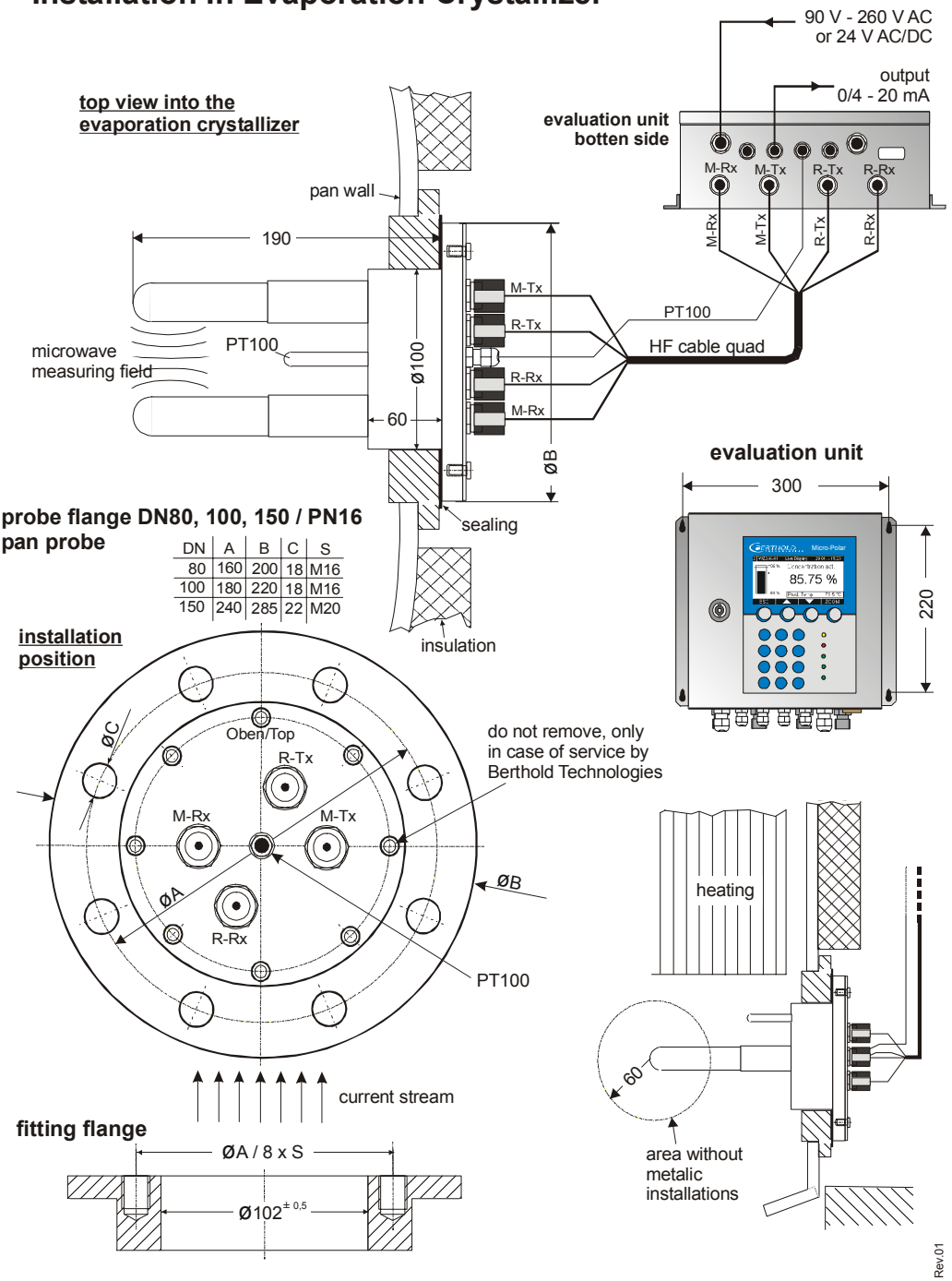
Id.-No. 41975TI2 Rev.01

Micro-Polar *Brix* With Pan Probe
- Installation In Evaporation Crystallizer -



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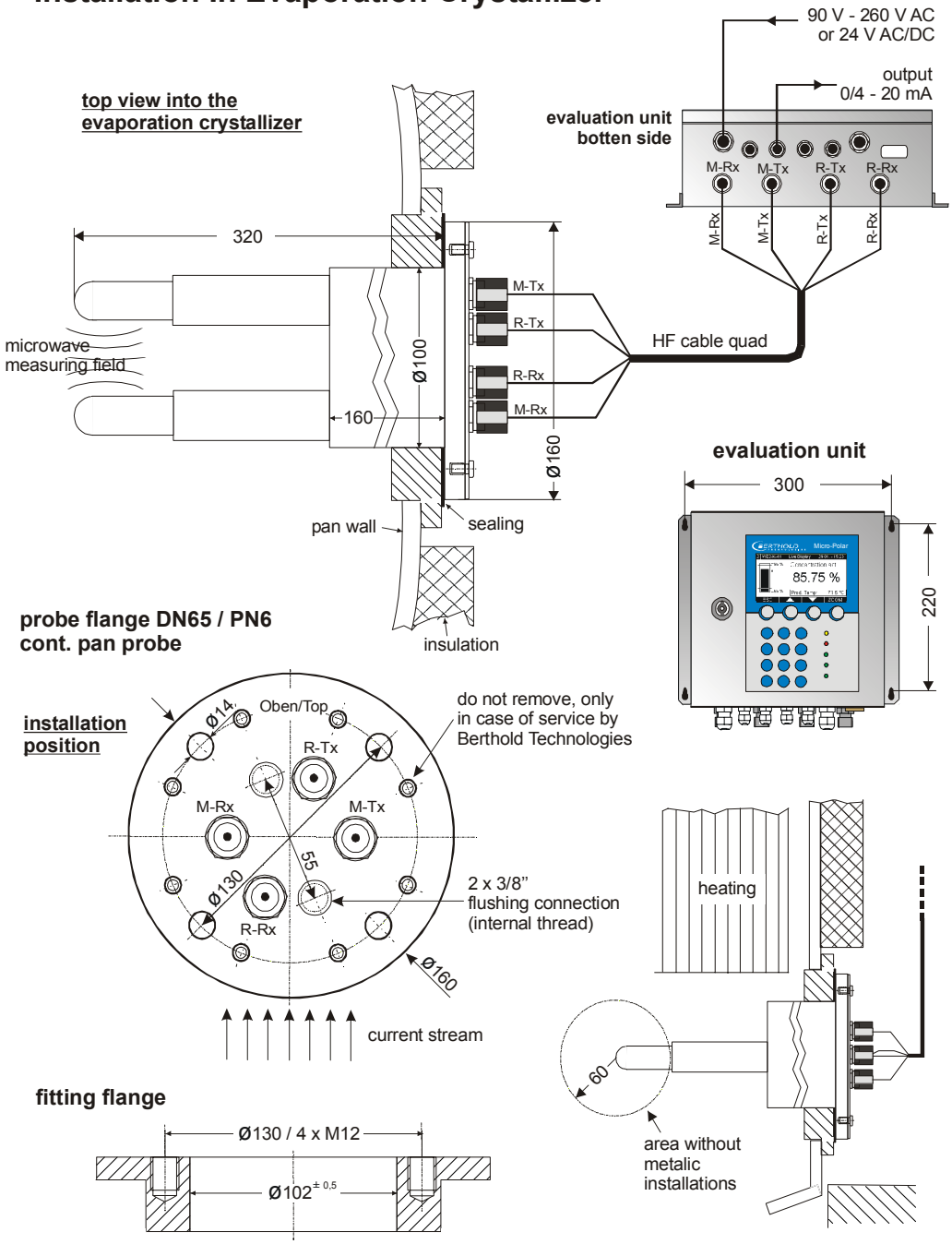
Id.-No. 41975T121 Rev.01

8.6 Installation sheets for LB 5651 (Continuous pan probes)

Micro-Polar *Brix* With Continuous Pan Probe
- Installation In Evaporation Crystallizer -



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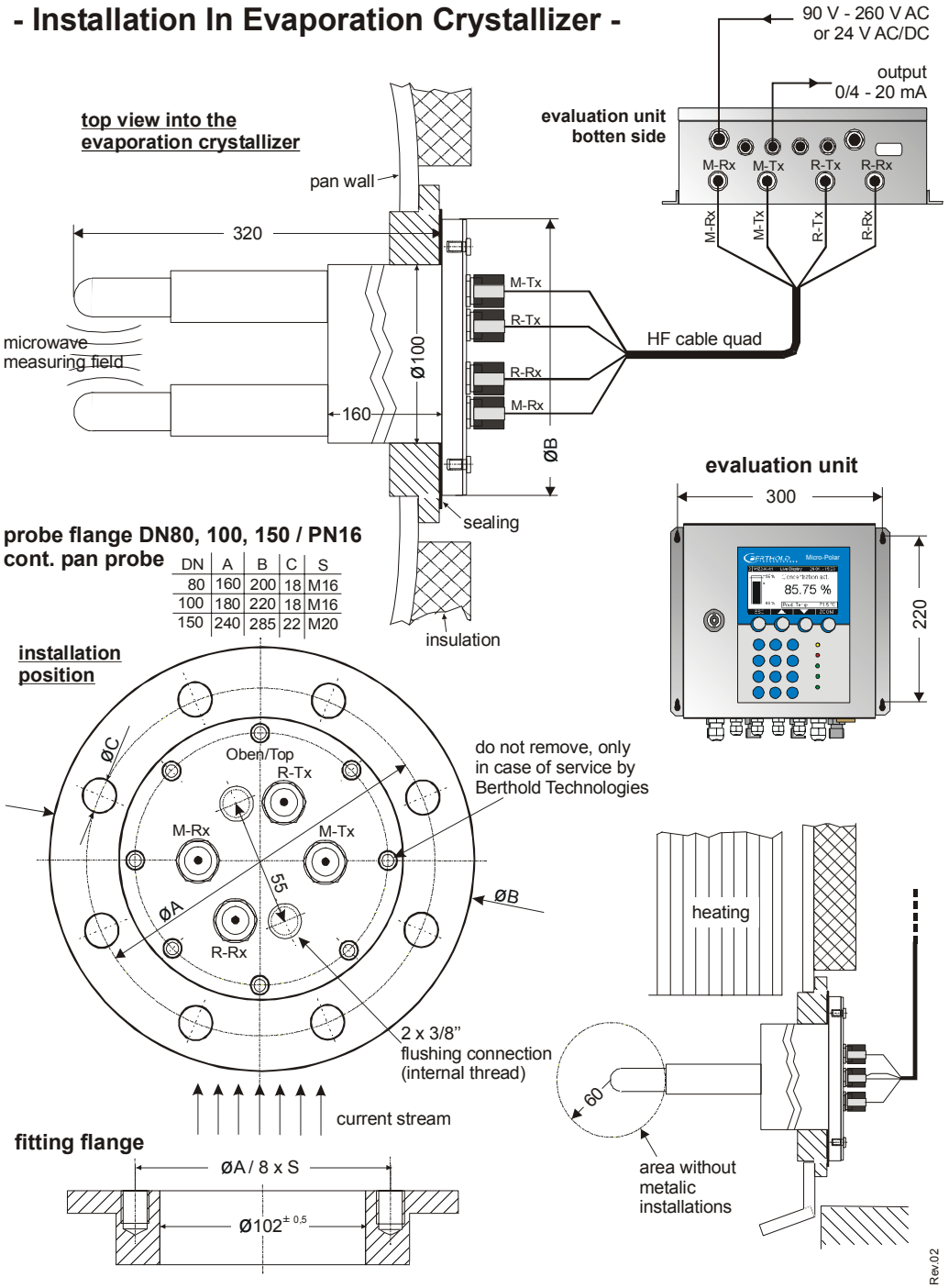
Id.-No. 41976T12 Rev.02

Micro-Polar *Brix* With Continuous Pan Probe
- Installation In Evaporation Crystallizer -



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Id.-No. 41976T121 Rev.02

Notes

Notes

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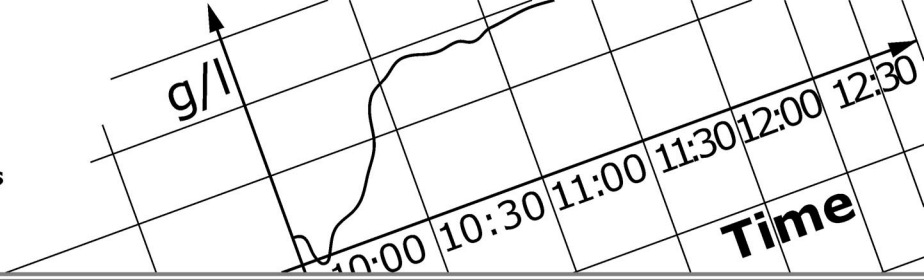


detect and identify

Process Control

Concentration Meter Micro-Polar Brix LB 565

Software Manual

User's Guide

ID No. 39531BA2
Rev. No.: 00 01/07/04
Soft. Version 1.00

The units supplied should not be repaired by anyone other than Berthold Service engineers or technicians authorized by Berthold.

In case of operation trouble, please address to our central service department.

The complete user's guide consists of two manuals, the hardware description and the software description.

The **hardware manual** comprises:

- mechanical components
- assembly
- electrical installation
- radiation protection guidelines
- technical data
- electrical and mechanical drawings

The **software manual** comprises:

- operation of the evaluation unit
- parameter description
- basic setting
- calibration
- error messages

The present manual is the software description.

Subject to change without prior notice.

Table of Contents

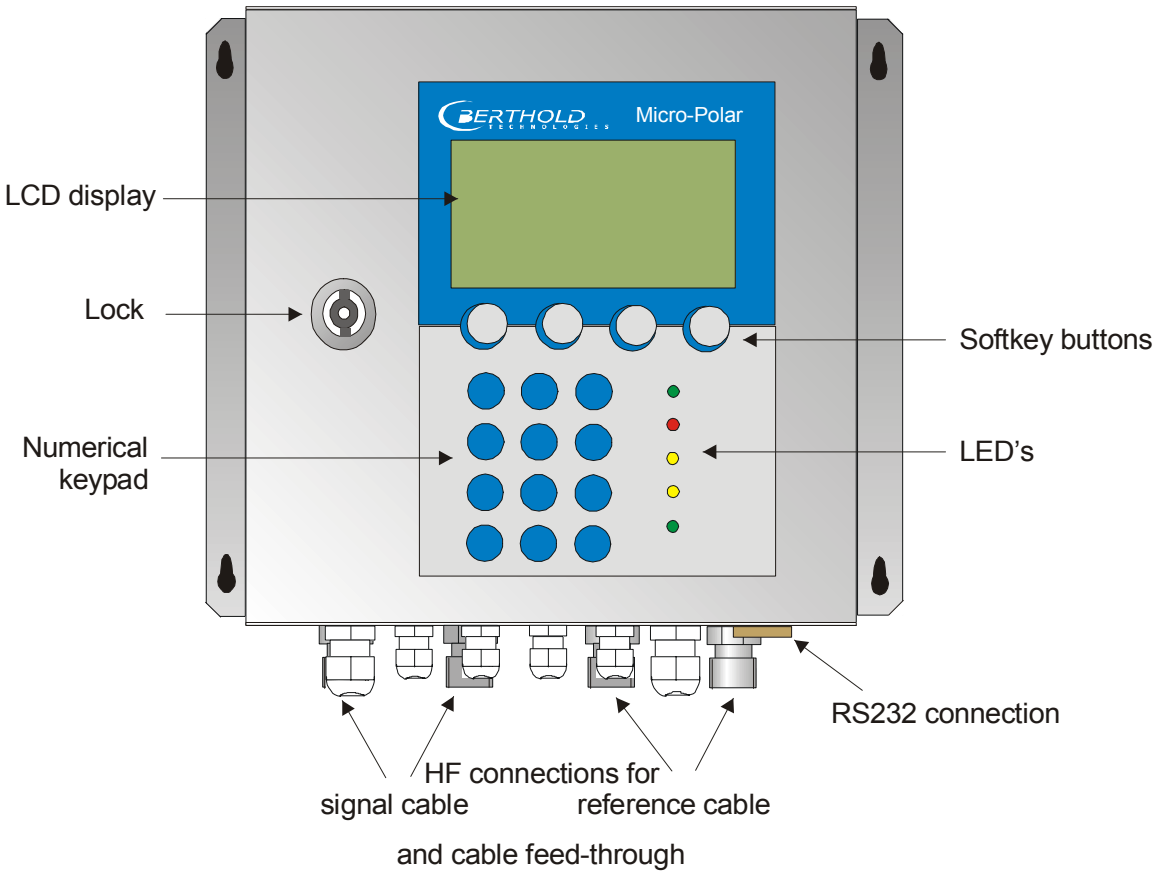
Page

Safety Summary

GENERAL WARNINGS
Parameter settings Never change the parameter settings without a full knowledge of these operating instructions, as well as a full knowledge of the behavior of the connected controller and the possible influence on the operating process to be controlled.

Chapter 1. **Communication with Micro-Polar Brix**

Communication with the Micro-Polar Brix takes place via 4 softkey buttons. The function of the individual buttons changes relative to the position in the menu. Values and texts are entered via an alphanumeric keyboard. The instrument status is indicated by 5 LED's.



1.1 Brief Instructions

The main menu is displayed automatically after power on, provided the Micro-Polar Brix has been connected properly.
To get correct measurement values, the instrument has to be configured and calibrated before running the first measurement.

1.2 System Configuration

- Select | Setup | Configuration | General Data
- Enter the general data (date, time, tag)
- □< Push Home button to return to the Configuration menu and select | Measurement |
- Enter the system parameters (measurement mode, start mode, averaging, units, ...)
- □< Push Home button to return to the Configuration menu
- Select | Plausibility |
- Enter the limit values (limits conc. 1, variance of phase measurement, pause detection)
- □< Push Home button to return to the Configuration menu
- Select | Microwave |
- Enter the cable length (reference cable length, signal cable length)
- □< Push Home button to return to the Setup menu
- Select | Input/Output |
- Enter the values for current output, current input, Pt100, digital out-/input
- □< Push Home button to return to the Setup menu.

1.3 System Calibration

- You have to power on the instrument at least 30 minutes prior to system calibration.
- On the main menu, select | Setup |Calibration | System Adjust | Adjust |
- Start the adjustment only if it is sure that the transducer is sufficiently covered by the product. The typical standard coefficients have been set up by the manufacturer for your application. A sample has to be taken during system adjustment. The lab value of the sample is needed for calculation of the offset. Calculation: analysis value – reading = offset. The offset can only be entered in the **Profi mode**.
- Upon completion of the system adjustment, push the □< Home button three times to return to the main menu.
- Push the „**RUN**" softkey to start the measurement. The live display appears.
- Push the „**ESC**" button to return to the main menu and select | Setup | Calibration | Calibrate Conc. | Tuning | Offset |
- Enter offset value.
- Push the □< Home button 4 times to return to the main menu.
- Select | Live display |
- If the product has not changed, the reading value corresponds to the laboratory value.

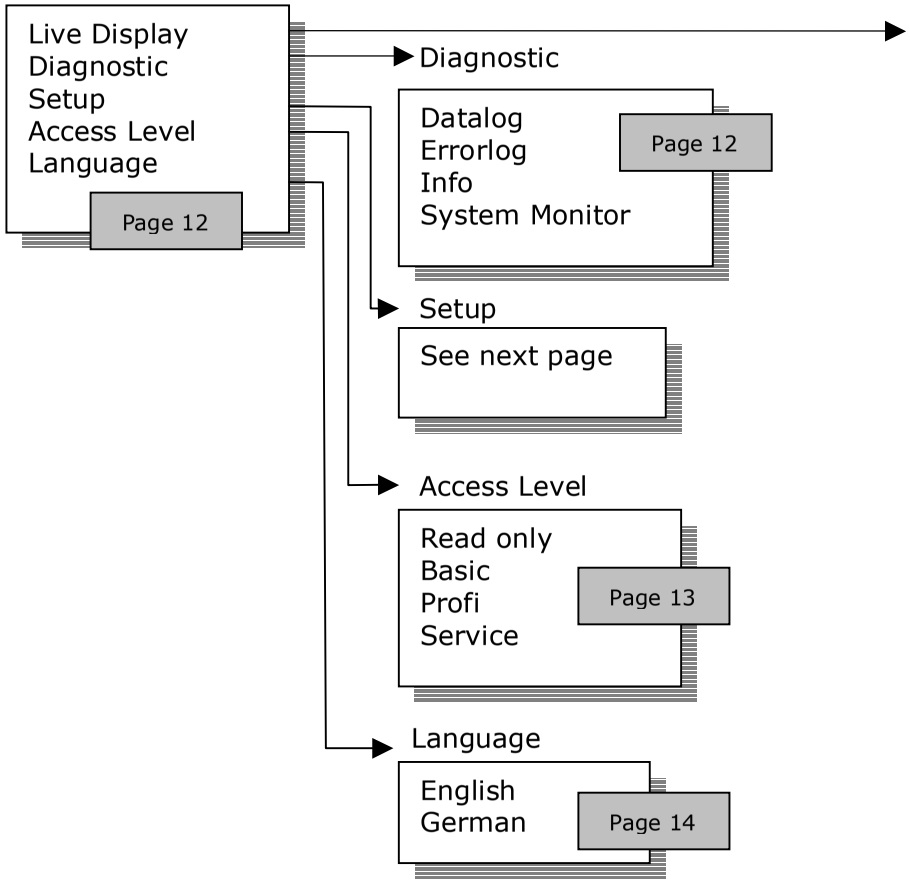
Chapter 2. **Software Functions**

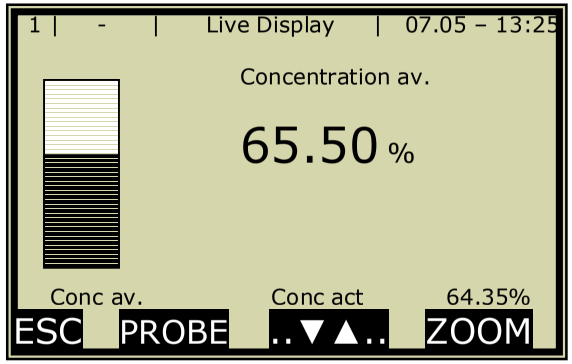
2.1 Information on Menu Structure

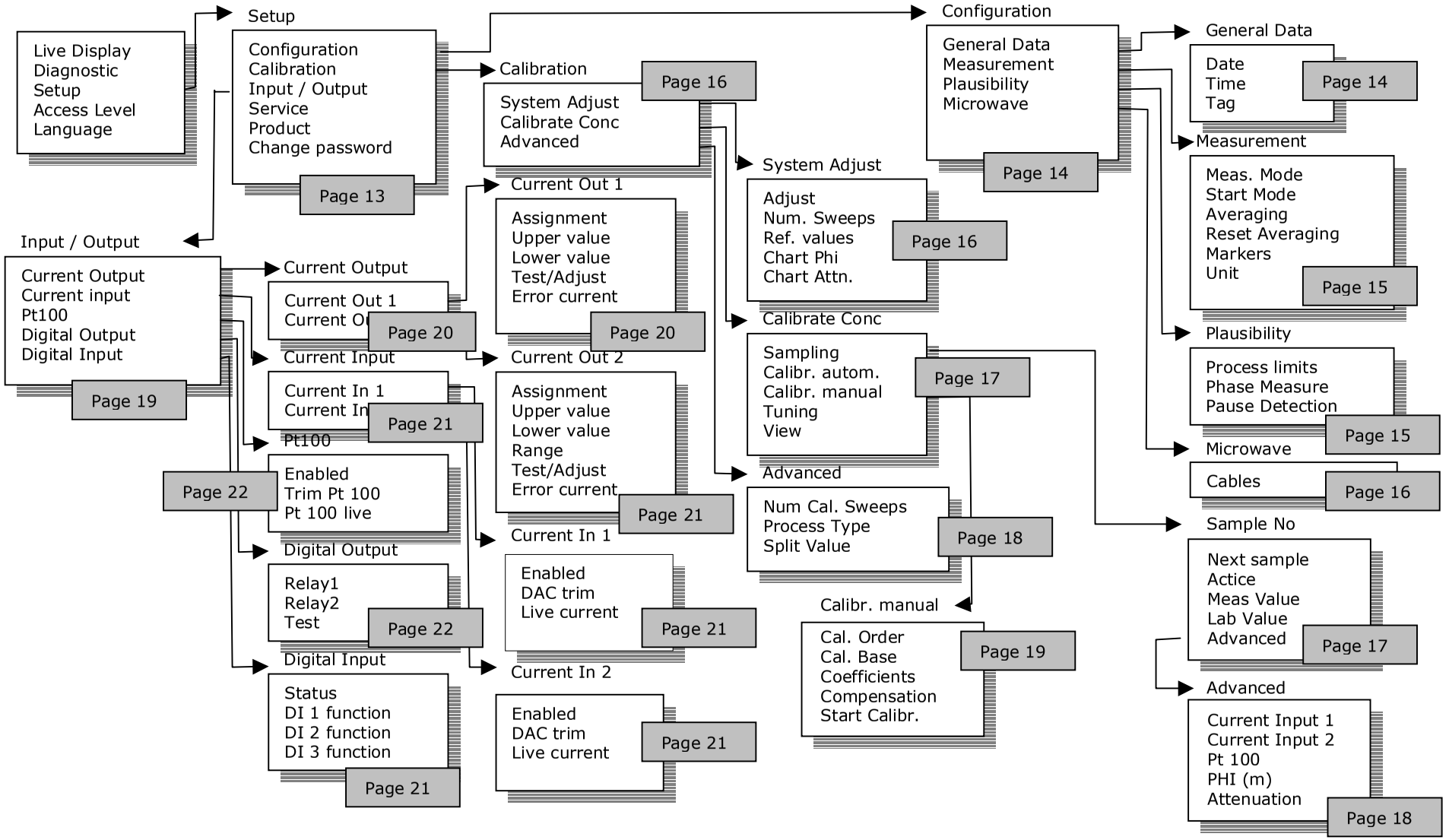
The menu structure on the following pages provides an overview of all functions of the Micro-Polar Brix. Using the **page numbers** indicated you can look up the function of the depicted window.

The menu scope is reduced, depending on the access level. You have to enter an editable password to change from the level „**Read only**" to „**Basic**" or to „**Profi**". For „**Service**" the password is fixed.

2.2 Menu Structure






Live Display
Diagnostic
Setup
Access Level
Language
Setup
Configuration
Calibration
Input / Output
Service
Product
Change password
Page 13
Calibration
Page 16
System Adjust
Calibrate Conc
Advanced
Configuration
General Data
Measurement
Plausibility
Microwave
Page 14
General Data
Date
Time
Tag
Page 14
Measurement
Meas. Mode
Start Mode
Averaging
Reset Averaging
Markers
Unit
Page 15
System Adjust
Adjust
Num. Sweeps
Ref. values
Chart Phi
Chart Attn.
Page 16
Input / Output
Current Output
Current input
Pt100
Digital Output
Digital Input
Page 19
Current Output
Current Out 1
Current Out
Page 20
Current Out 1
Assignment
Upper value
Lower value
Test/Adjust
Error current
Page 20
Calibrate Conc
Sampling
Calibr. autom.
Calibr. manual
Tuning
View
Page 17
Plausibility
Process limits
Phase Measure
Pause Detection
Page 15
Current Input
Current In 1
Current In
Page 21
Current Out 2
Assignment
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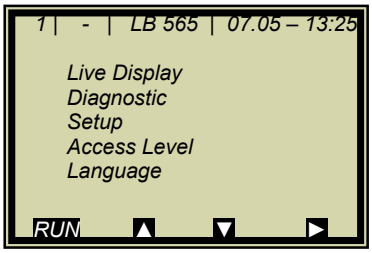
Range
Test/Adjust
Error current
Page 21
Microwave
Cables
Page 16
Pt100
Enabled
Trim Pt 100
Pt 100 live
Page 22
Advanced
Num Cal. Sweeps
Process Type
Split Value
Page 18
Sample No
Next sample
Actice
Meas Value
Lab Value
Advanced
Page 17
Current In 1
Enabled
DAC trim
Live current
Page 21
Digital Output
Relay1
Relay2
Test
Page 22
Calibr. manual
Cal. Order
Cal. Base
Coefficients
Compensation
Start Calibr.
Page 19
Digital Input
Status
DI 1 function
DI 2 function
DI 3 function
Page 21
Current In 2
Enabled
DAC trim
Live current
Page 21
Advanced
Current Input 1
Current Input 2
Pt 100
PHI (m)
Attenuation
Page 18

2.2.1 Start Menu



LIVE DISPLAY:
Shows the live display.

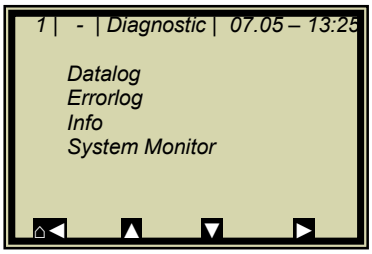
DIAGNOSTIC:
This menu item contains the submenu items data logger, error log and further instrument information.

SETUP:
All necessary inputs for operation of the measuring system can be entered here.

ACCESS LEVEL:
Areas protected by passwords can be cleared.

LANGUAGE:
Select the dialog language.

2.2.2 Diagnostic



Datalog:

- Log type — enable/disable
- Log time — logging period
- — 15 minutes to 3 days
- Averaging time — Input in seconds
- Print log — Printout of tables

Error log:

- Shows the logged error

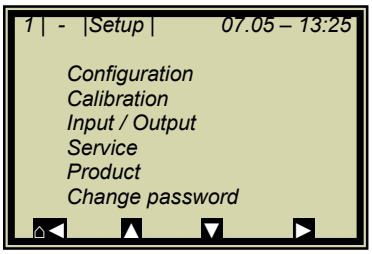
Info:

- Device type : LB565
- Supplier : Berthold
- Manufacturer : Berthold
- Device no. : 4294967295
- Serial no. : 4294967295
- Tag : Input possible
- Date : 05.04.2004
- Production no. : 0
- Software ver. : V1.00
- Hardware ver. : P01

System Monitor:

- Internal temperature : 40.79°C
- Max int. temperature : 42.27°C
- HF voltage : 9.72 V

2.2.3 Setup



Configuration:

- Setup of
- General data
- Measurement-specific data
- Plausibility data
- Microwave data

Calibration:

- System calibration
- Concentration calibration
- Advanced setup

Input / Output:

- Current outputs
- Current inputs
- Pt 100
- Digital outputs
- Digital inputs

Service:

- Factory setting (default values)

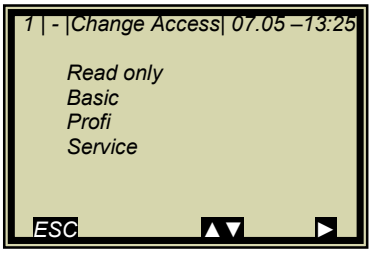
Product:

- Product selection (1 – 4); if you select another product, the product-specific data will be loaded; outputs, inputs and calibration

Change password:

- The password for the access levels Basic / Advanced can be changed here.

2.2.4 Access Level



Read only:

- This mode can be selected on all levels without password.

Basic:

- No password required on higher levels. Password has to be entered for „Read only".
- Password can be changed.

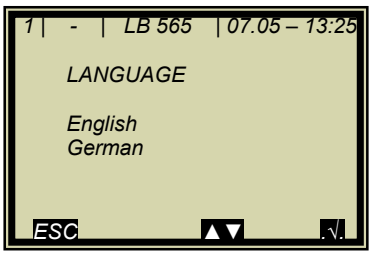
Profi:

- As described above. Should be used only if you have sufficient knowledge of the measuring system.

Service:

- This level is reserved to the service personnel and cannot be changed.

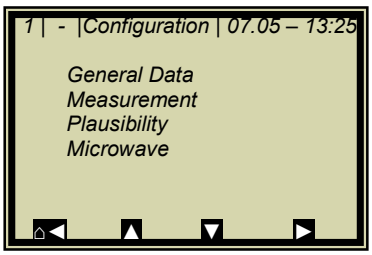
2.2.5 Language



Language:

- Select the dialog language

2.2.6 Configuration



General Data:

- Enter date, time and tag

Measurement:

- Measurement mode (batch/continuous)
- Start mode (keyboard/external)
- Averaging (number of measured values used for averaging)
- Reset average value (yes/no)
- Marker (enter: value, name and correlation)
- Units for concentration and temperature

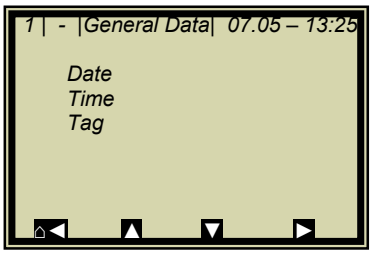
Plausibility:

- Variance
- Ratio phase/dB

Microwave:

- Cable (enter the reference and signal cable length)

2.2.7 General



Date:

- Enter the current date

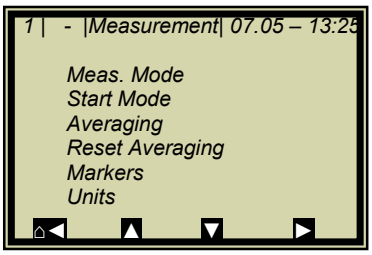
Time:

- Enter the current time

Tag:

- Enter the name of the tag.

2.2.8 Measurement



Meas. Mode:

- Continuous or batch (in the batch mode, an average value is calculated between start and stop; continuous means averaging depending on the defined number of averaging cycles)

Start Mode:

- The measurement device can be started or stopped via external terminals (digital input) or via keyboard.

Averaging:

- Enter the number of single measurement values over which a moving average is to be calculated.

Reset Averaging:

- Reset averaging (yes/no)

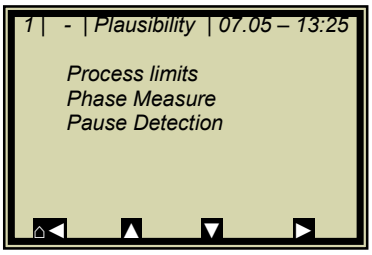
Markers:

- Depending on the configuration, up to two markers can be entered by name and by value.

Units:

- Depending on the configuration, different units can be selected for concentrations and temperature.

2.2.9 Plausibility



Process Limits:

- A minimum and maximum concentration can be set where averaging stops and a message is displayed.

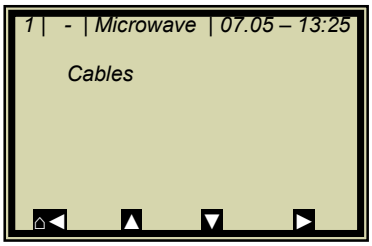
Phase Measure:

- Here you set the maximum variance of the regression Phase vs. Frequency.
- The correlation between Phase and Attenuation is another plausibility criterion.

Pause Detection:

- Can be enabled or disabled and utilizes the measured attenuation as switching variable; the current output, e.g. with empty container, will be set to min. display.

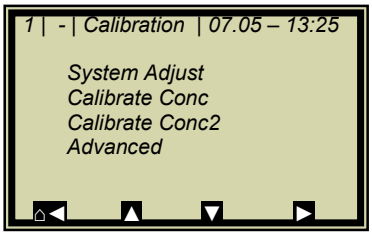
2.2.10 Microwave



Cables:

- Enter the reference and signal cable length.

2.2.11 Calibration



System Adjust:

- The system calibration is started on this page.

Calibrate Conc:

- Opens the calibration menu of concentration 1.

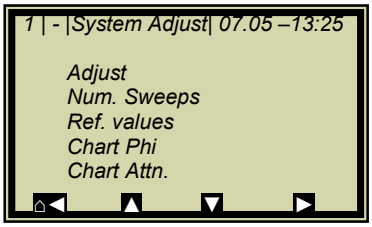
Calibrate Conc2:

- Opens the calibration menu of concentration 2.

Advanced:

- Here you set are the number of sweeps, the process type and the split value.

2.2.12 System Adjust



Adjust:

- System calibration is started.

Num. Sweeps:

- Here the number of measurement cycles is set.

Ref. values:

- Upon completion of the reference measurement, the reference values for phase, attenuation, slope and variance can be output.

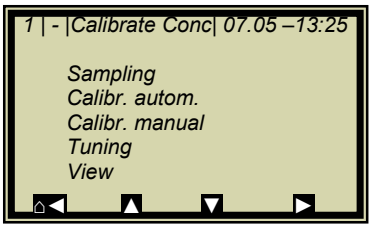
Chart Phi:

- Shows the characteristic curve of Phase versus Frequency of the regression.

Chart Atten.:

- Shows the characteristic curve of Attenuation versus Frequency of the regression.

2.2.13 Calibrate Concentration



Sampling:

- Shows all measured samples.

Calibr. autom.:

- Calibration can be started after measurement of two samples and input of the respective laboratory values.

Calibr. manual:

- Here you can choose the calibration order [linear/quadratic], the basis [phase/attenuation or both] and compensation [temperature].

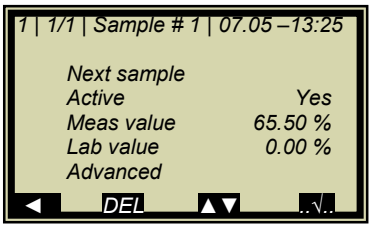
Tuning:

- Subsequent correction of the reading is possible by entering a factor and an offset.

View:

- Presentation of calibration curve, display of correlation and coefficients.

2.2.14 Sample No.



Sample number, date and time of the sample measurement are displayed in the header.

Next sample:

- Continues with the next sample.

Active:

- Here you can choose if this sample should be taken into account in the calibration.

Measured value:

- Display of the measured values, calculated with the actual coefficient.

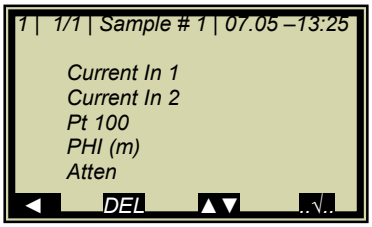
Lab value:

- Entry position for the laboratory value.

Advanced:

- Switches to the next data page.

2.2.15 Sample Data (expanded)



Current In 1:

- Editable display of the first compensation input.

Current In 2:

- Editable display of the second compensation input.

Pt 100:

- Editable display of the Pt 100 input.

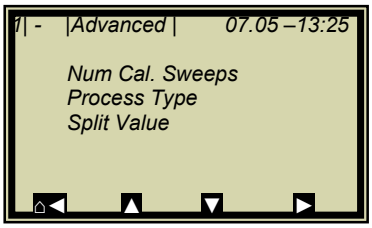
PHI (m):

- Not editable display of the measured phase.

Atten:

- Not editable display of the measured attenuation.

2.2.16 Advanced Settings



Number of Calibration Sweeps:

- Freely selectable number of individual measurements [Sweeps] used for determination of a calibration point.

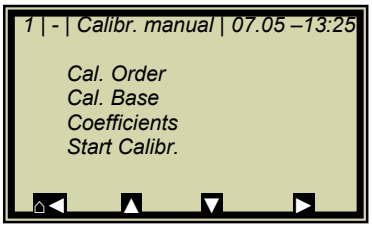
Process Type:

- Select the operation mode:
  - one concentration [1 measuring range]
  - two concentrations [2 measuring ranges]
  - split concentration [1 measuring range with switching point (split value) for coefficient switchover].

Split Value:

- Setting of the switching point on a value basis.

2.2.17 Calibr. manual



Cal. Order:

- Here you define the calibration order [linear/quadratic]

Cal. Base:

- The following parameters can be set:
  - Phase
  - Attenuation
  - Phase and attenuation

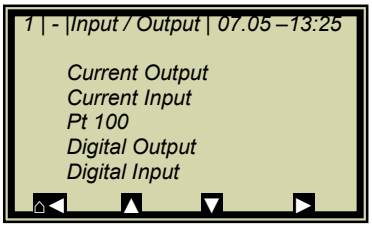
Coefficients:

- Here you can edit all coefficients for phase and attenuation.

Start Calibr.:

- Starts the calibration using the parameters you have set earlier.

2.2.18 Input / Output



Current Output:

- Both outputs can be adjusted, assigned and set up on the selected level.

Current Input:

- Activation level of current input, calibration and display of the live current signal.

Pt 100:

- Here you can enable and adjust a connected Pt 100. Display of the actual temperature signal.

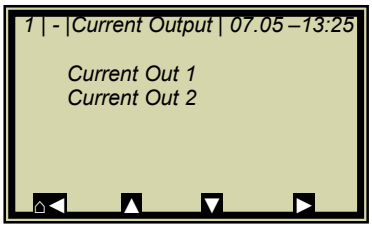
Digital Output:

- Allocation of relays 1 and 2 and test function.

Digital Input:

- Status control and assignment of the digital inputs.

2.2.19 Current Output



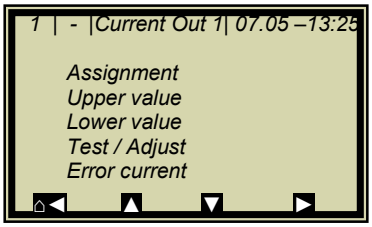
Current Out 1:

- Select the setup display for output 1.

Current Out 2:

- Select the setup display for output 2.

2.2.20 Current Out 1



Assignment:

- The current output can be assigned to a concentration or one of the activated inputs.

Upper value:

- Display value assigned to the 20mA value.

Lower value:

- Display value assigned to the 4mA value.

! (*Current output 1 only 4 – 20mA possible*)

Test/Adjust:

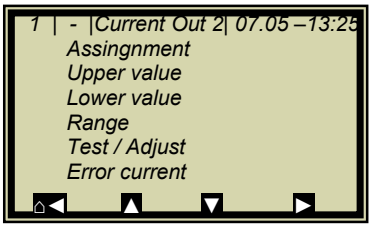
- Current test, calibration and display of live current.

! (*In case of test function, the measurement should be stopped.)*

Error current:

- Status of current output in case of error
  - 22 mA
  - 3.5 mA
  - Hold
  - Value

2.2.21 Current Out 2



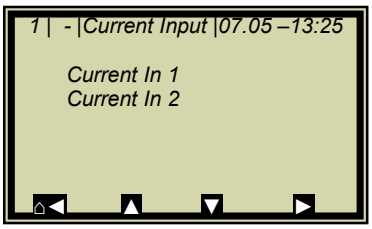
All functions same as current output 1

! Current output 2 can be set from 0 – 20mA to 4 – 20mA.

Range:

- Change of the current output
  - 0 – 20mA
  - 4 – 20mA

2.2.22 Current Input



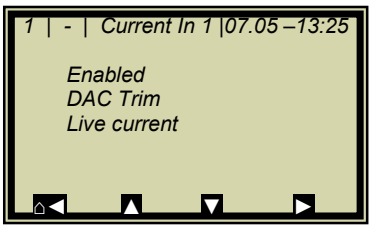
Current In 1:

- When selected, change to activation and calibration menu.

Current In 2:

- As described above.

2.2.23 Current In 1



Enabled:

- If you select yes/no, the current input is enabled or disabled.

DAC Trim:

- Follow the instructions on the display.

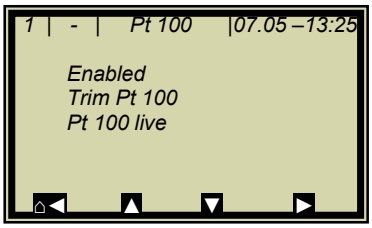
Live current:

- Display of the live current signal.

2.2.24 Current In 2

Set and enabled same as input 1.

2.2.25 Pt 100



Enabled:

- If a Pt 100 is connected, the input has to be enabled first.

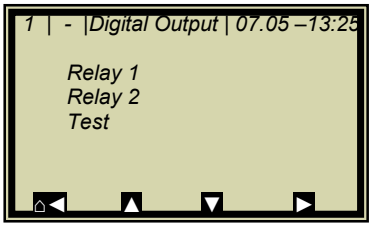
Trim Pt 100:

- You need a 100 Ohm and a 138.5 Ohm resistance. Follow the instructions on the display.

Pt 100 live:

- Display of the live temperature.

2.2.26 Digital Output



Relay 1:

- Relay 1 can be assigned to different functions:
  - None
  - Error
  - Halt
  - No product
  - Alarm min
  - Alarm max

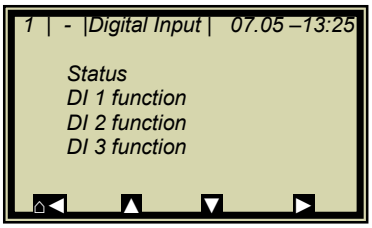
Relay 2:

- Same assignments possible as above.

Test:

- The switching status of the relays can be set here and checked at the respective terminals.

2.2.27 Digital Input



Status:

- Shows the status of the input circuit
  - open/closed

DI 1 Function:

- The following functions can be assigned to DI 1:
  - None
  - Start (external start)

DI 2 Function:

- The following functions can be assigned to DI 2:
  - None
  - Hold (averaging is stopped)
  - Product (external product selection)

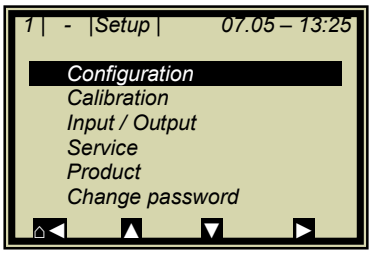
DI 3 Function:

- Assignments for DI 3
  - None
  - Sample (external control of sampling)
  - Product (external product selection)

Chapter 3. **Configuration**

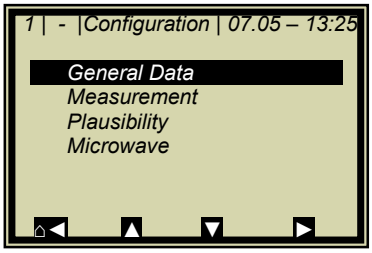
Before carrying out any calibration work, you should check the configuration setup of the measuring system and, if necessary, correct it.

3.1 Configuration Setup

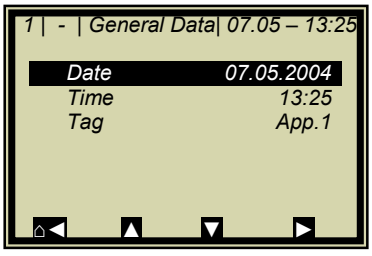


➢ CONFIGURATION

3.1.1 General Data

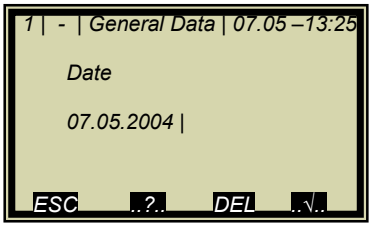


➢ GENERAL DATA



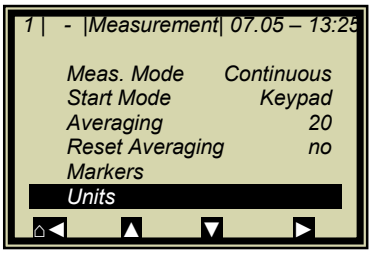
Example:
Select the respective entry, edit and store it.

➢ DATE



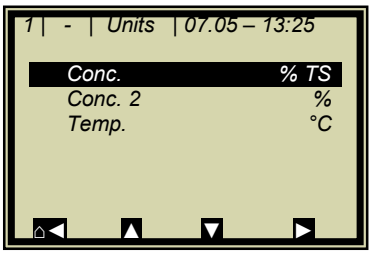
Push DEL to delete the entry and then enter the new date. Push ..√.. to confirm and store the changed date.

3.1.2 Measurement



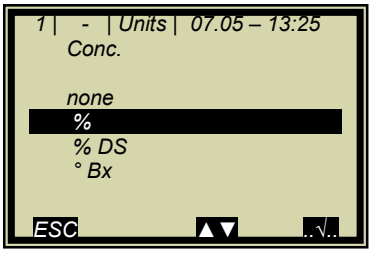
You have to check the settings on this display and adapt them to the measurement conditions.
For example, you have to adapt the measurement mode, the start mode and the averaging to the actual operating conditions. With continuous measurements, the averaged values do not have to be reset. You can set a marker comprising max. 5 characters which identify the value set on in the live display.
Set the units as desired.

- UNITS



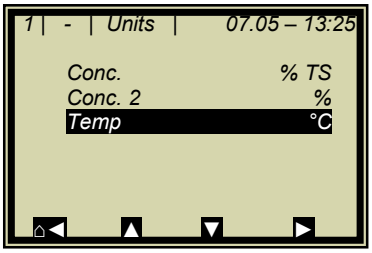
- CONC.

You can select three different units or no unit (none).

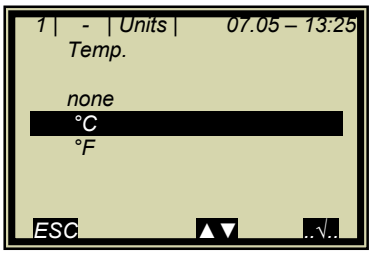


- %

Different units can be set for both concentrations.



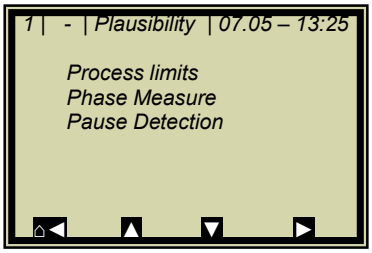
- TEMP



➢ °C

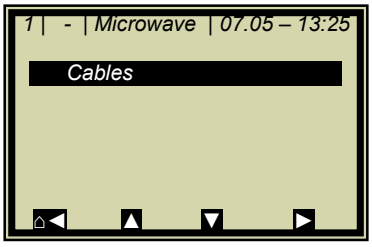
The temperature input can be set to °C, °F or none.

3.1.3 Plausibility

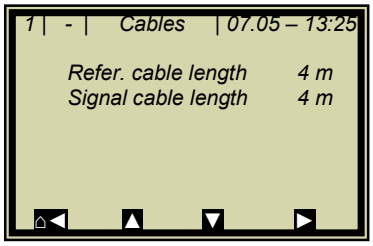


To rule out any unnecessary disturbances during calibration, the process limits should be set, as far as possible, below or above the measuring range.
You should keep the factory-set default values for the phase measurement and disable *Pause detection*. If a default value has to be changed, you have to check all entries that are relevant for the calibration and, if necessary, renew them.
Upon completion of the calibration work, you can enable *Pause detection* again.

3.1.4 Microwave



➢ CABLES



If the factory-set cable lengths does not match the actual geometry conditions, you have to correct the values.

Example: For a 2 m long HF quad cable, enter 4 m for the reference and signal cable length. The input value corresponds to twice the quad cable length.

Chapter 4. **Calibration**

Prerequisite: The measuring system has been connected properly and the normal operating temperature has been reached (approx. 30 to 45 min.).

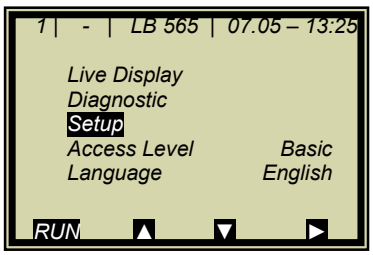
If the instrument is still in the delivery status, you may start calibration with section

4.1 System Calibration.

If the manufacture's default settings have been lost, you have to start with section

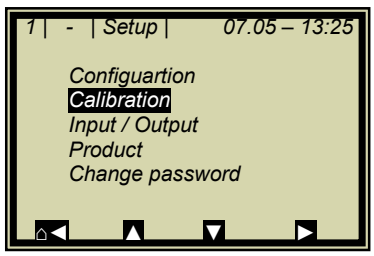
7.1 Factory Settings.

4.1 System Calibration

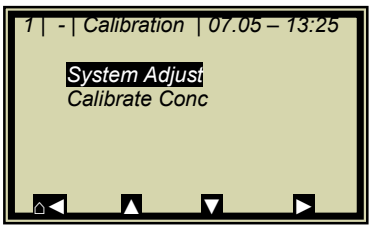


If you turn on the measuring system, the following display appears:

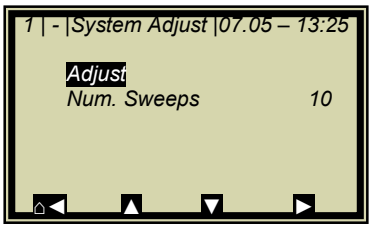
- SETUP



CALIBRATION

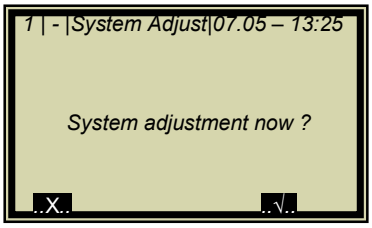


- SYSTEM ADJUST



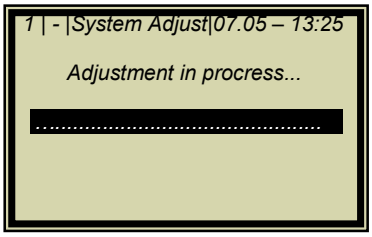
The manufacturer has set the number of measurement cycles (sweeps) to 10.

- ADJUST

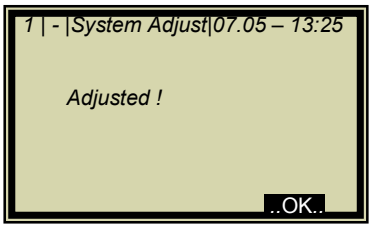


Confirm

During system calibration, a sample should be taken and analyzed. This analysis value is needed to calculate the offset value.



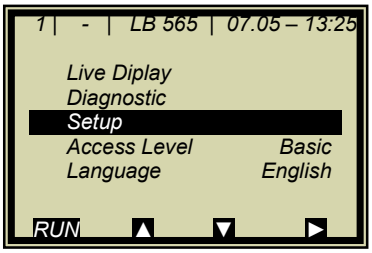
System adjustment is in process.



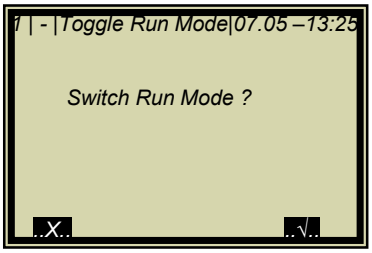
Push **OK** to confirm and push ⌂◀ three times to return to the main menu.

Fine tuning (calibration) is required to optimize the reading.

4.2 Start Calibration



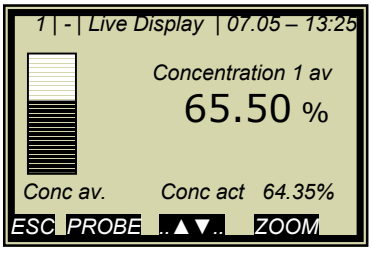
The standard coefficients required for your application have already been set up by the manufacturer.
Push *RUN* to start the measuring system.



Push ..√.. to confirm this prompt and the instrument switches to the run mode.

4.2.1 Tuning

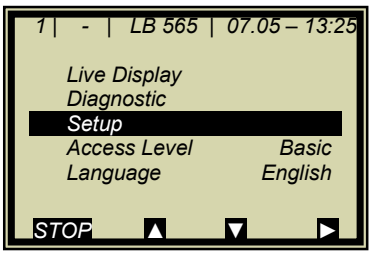
The display to the left appears if you push *RUN*.



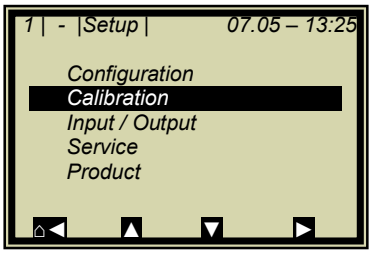
The live display is now compared with the analysis value of the system calibration sample. The difference has to be entered with the correct sign character as offset
.

Calculation: Analysis value – display = offset

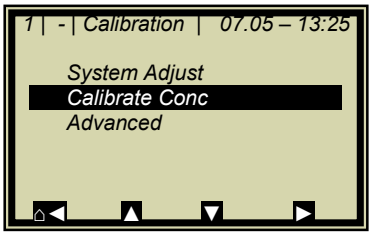
Push *ESC* to return to the main menu.



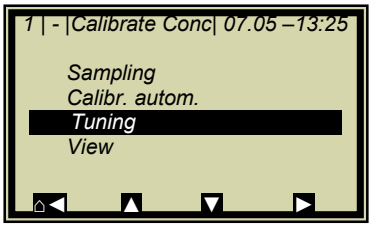
➢ SETUP



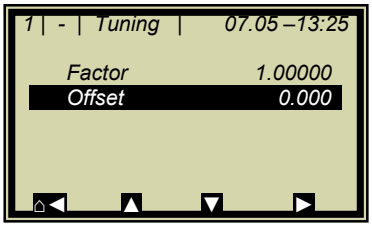
➢ CALIBRATION



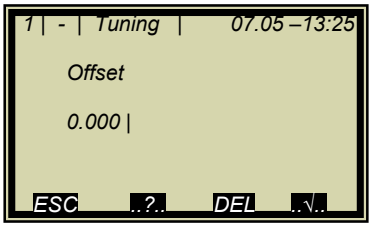
➢ CALIBRATE CONC



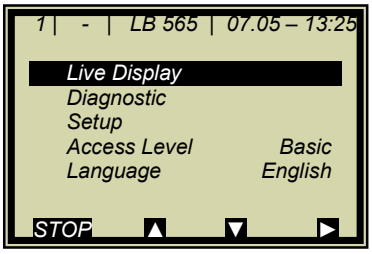
➢ TUNING



➢ OFFSET



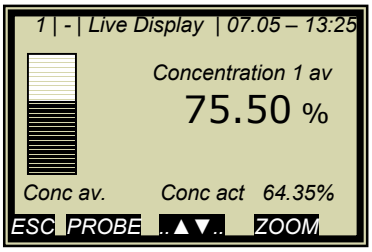
Enter the calculated offset value, confirm with ..√.. and push the Home button four times to return to the main menu.



Select

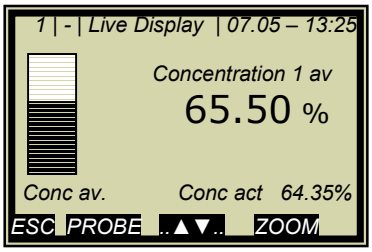
- LIVE DISPLAY

to return to the display.



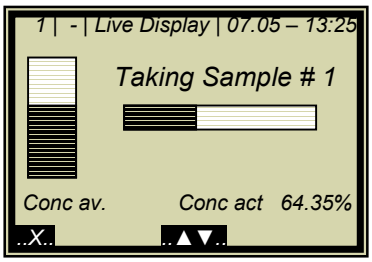
The display value should now correspond to the actual value.

4.2.2 Sampling



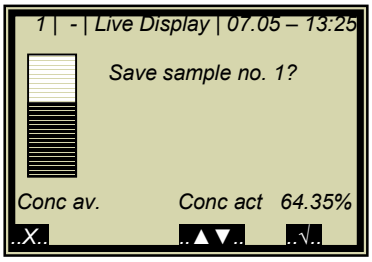
The display to the left appears if you push *RUN*.

Note: Push the *PROBE* button to start measurement of the raw data. At the same time, the laboratory sample has to be taken and marked. The analysis may be performed later, provided the product is not changed by this.



Sampling is in process.....

Push the ..X.. button to stop the sample taking any time.

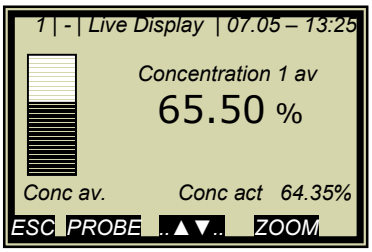


If the sample taking took place without any problem, push the ..√.. button to store the sample in the table and the measurement continues.

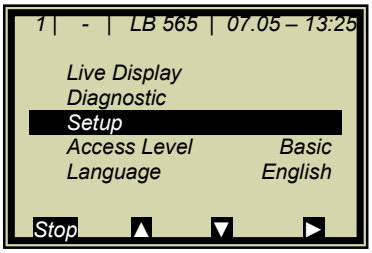
You have to repeat the process described above for each further sample.

The second sample taking should be started only when the display shows a significant difference to the first sample taking.

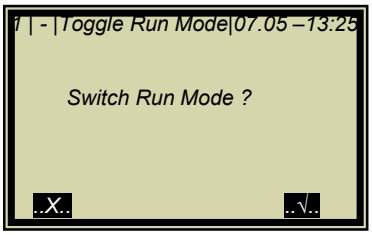
4.2.3 Entering the Laboratory Values



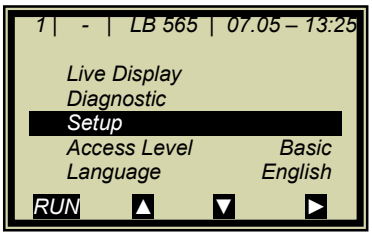
Push the ESC button to go to the main menu. A measurement can be stopped only on the main menu.



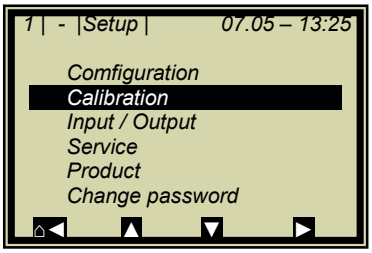
Push *STOP* to stop the measuring system.



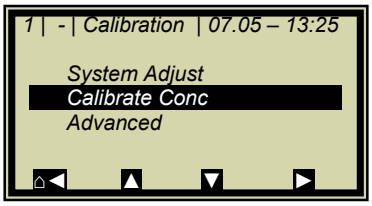
Push ..√.. to confirm the prompt and the measurement switches to the *STOP* mode.



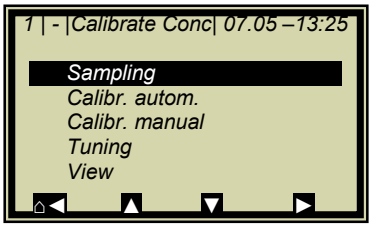
- SETUP



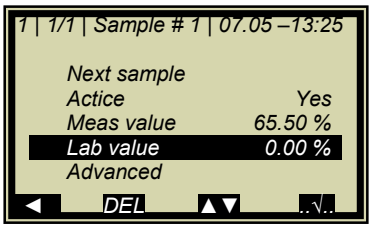
- CALIBRATION



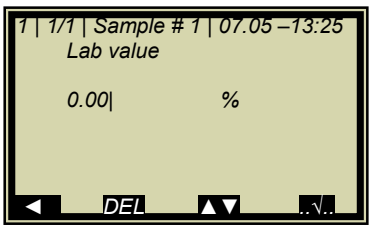
➢ CALIBRATE CONC



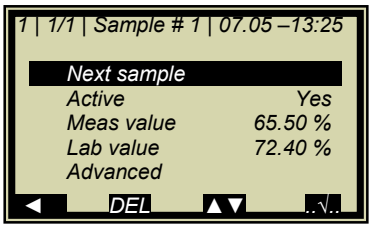
➢ SAMPLING



➢ LAB VALUE



Push DEL to delete default value, enter new value and push ..√.. to confirm.

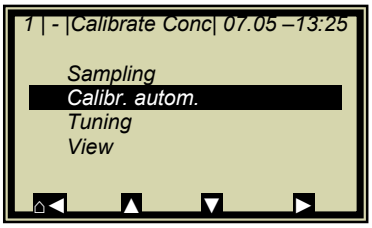


➢ NEXT SAMPLE

and repeat the step described above with the next sample.

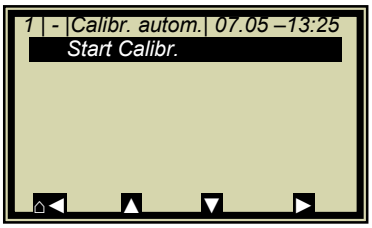
After you have entered the last sample, push the ◄ button to return to the calibration menu. (short push – one page, longer push of the button – you get back to the Calibration menu immediately)

4.2.4 Automatic Calibration

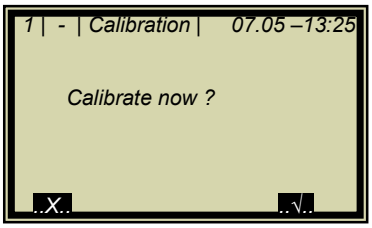


Phase calibration including the enabled compensation is carried out during automatic calibration.

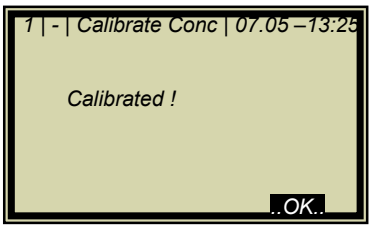
- CALIBR. AUTOM.



- START CALIBR.

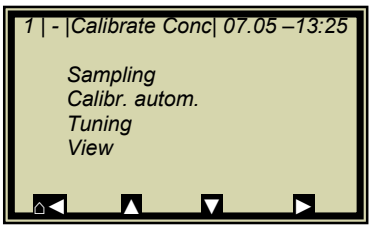


Push the ..√.. button to start the calibration.



Push the ..OK.. button to confirm calibration.

When calculating the new coefficient set, the factor and offset will be reset (factor 1.00000 and offset 0.000).



Push the ..⌂◄.. button four times to return to the main menu.

4.3 Manual Calibration

Manual calibration is possible only on the **Advanced** level.

Prerequisites for manual calibration are chapters

4.1 System Calibration

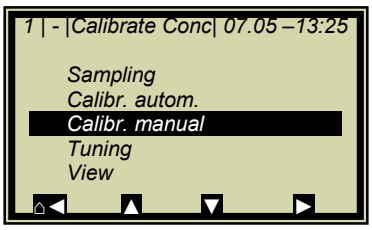
4.2 Start Calibration

4.2.1 Tuning

4.2.2 Sampling and

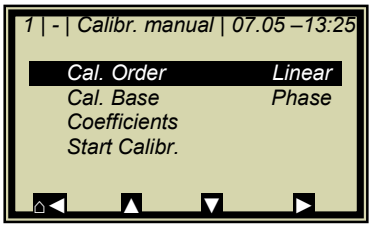
4.2.3 Entering the Laboratory Values

4.3.1 Manual Calibration with One Concentration

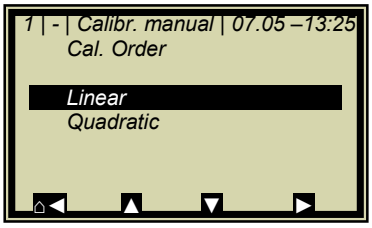


If the display depicted to the left is not visible, do the following on the live display:
ESC|SETUP|CALIBRATION|CALIBRATE CONC|

- CALIBR. MANUAL

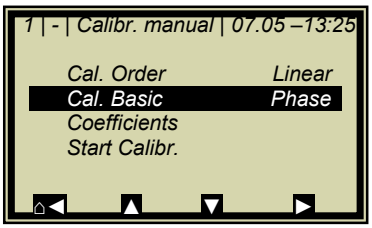


- CAL. ORDER

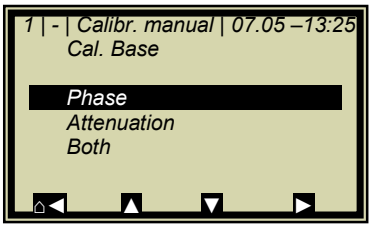


- LINEAR

Quadratic calibration is possible only for a calibration with three and more samples.

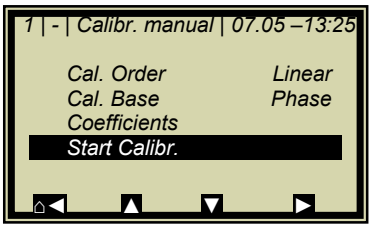


- CAL. BASE

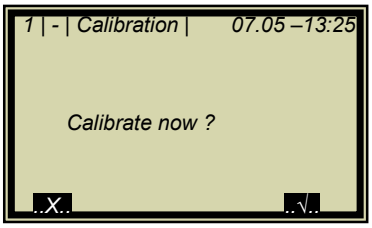


- PHI (phase measurement)

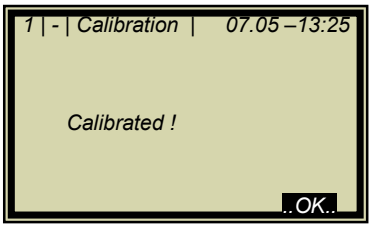
The calibration base is selected depending on the number of samples and their raw data. Initial calibration should be as simple as possible, since calibration can be optimized any time.



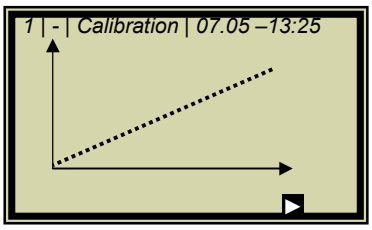
- START CALIBRATION



Push the ..√.. button to start the calibration, push ..X.. to go back one page without calibration.

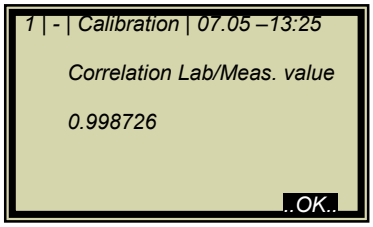


..OK.. accepts the calibration and changes to the next display.



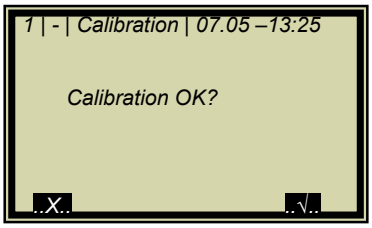
The curve to the left shows the characteristic curve lab / measured value.

➢ ..►..



The correlation shows the average deviation of the curve from the sample series.

➢ ..OK..



As soon as you confirm this prompt, the calibration display appears again; from there you get back to the main menu by pushing .⌂◄. four times and you can start the measurement again.

4.3.2 Calibration with Two Concentrations

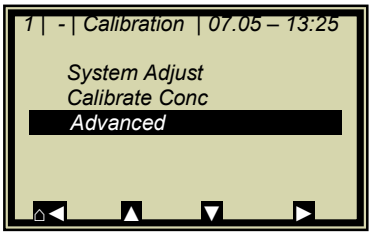
Calibration for two concentrations starts with changing the process type as described below.

Prerequisites for manual calibration are chapters

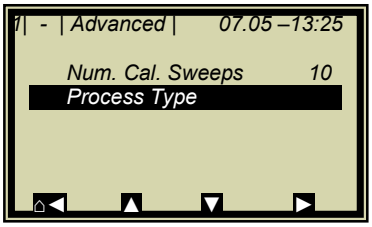
4.1 System Calibration

4.2.1 Tuning and

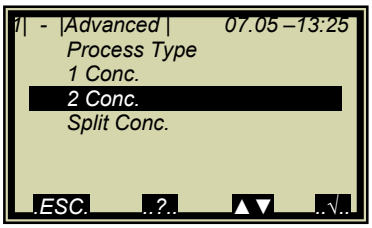
4.2.2 Sampling



➢ ADVANCED

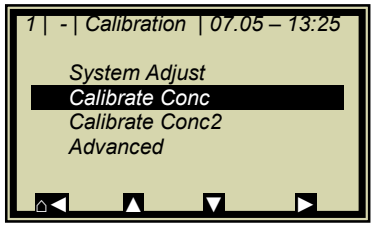


➢ PROCESS TYPE

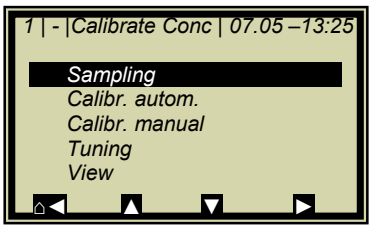


➢ 2 CONC

Push the **..√..** button to accept the selected process type and push the **.⌂◄.** button once to get to the following display.



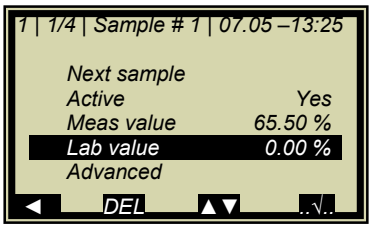
➢ CALIBRATE CONCENTRATION 1



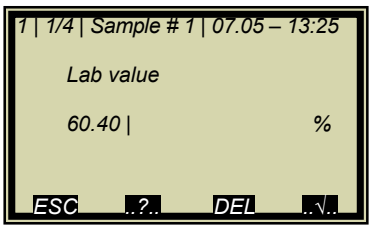
➢ SAMPLING

There is only one sample table for both calibrations.

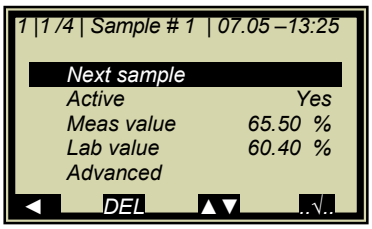
The lab values have to be entered for all samples used for calibration of concentration 1. All other samples have to be disabled (active.... yes/no).



➢ LAB VALUE

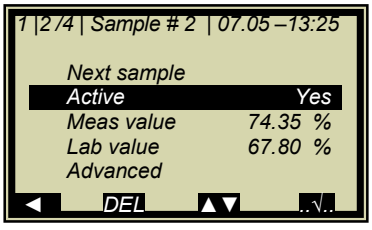


Delete default value with DEL, enter new value and confirm with ..√..



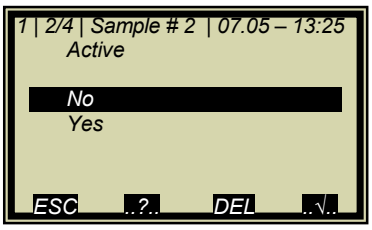
➢ NEXT SAMPLE

with next sample.

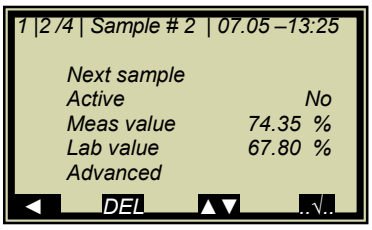


➢ ACTIVE

Disable sample.

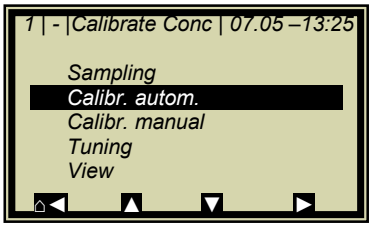


➢ NO

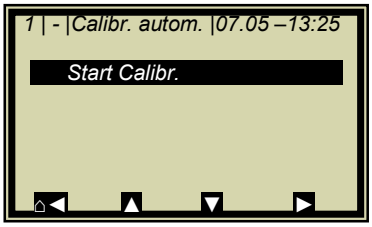


Make sure that all samples have been processed and only those samples are active which are relevant for this calibration.

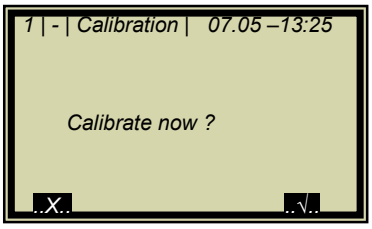
Push ◀ to return to the calibration page.



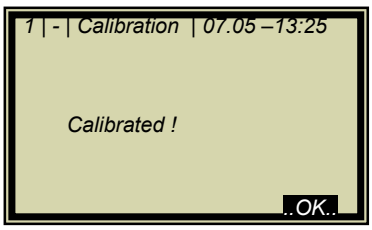
Automatic as well as manual calibration is possible in this calibration mode. For non-professional users we recommend the automatic mode.



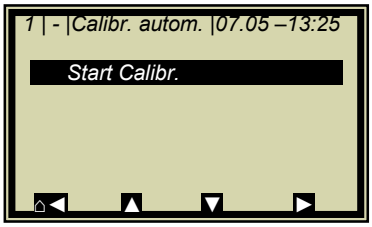
➢ START CALIBRATION



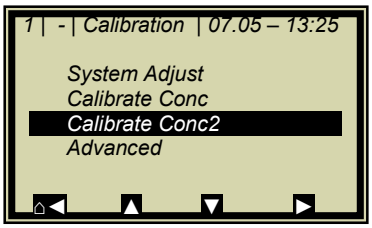
Push the ..√.. button to start the calibration; push ..X.. to return one page without calibration.



Push ..OK.. to accept the calibration and to change to the next display.

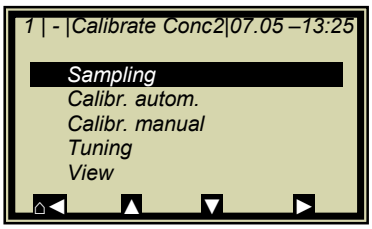


Push .⌂◀. twice to return two pages.



- CALIBRATE CONCENTRATION 2

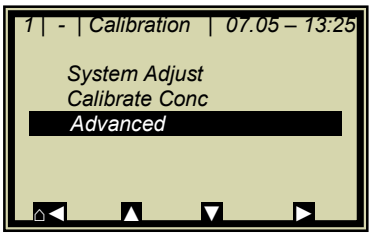
Repeat the steps as described above for concentration 2; all samples have to be enabled again in the sample table. Now you have to disable all samples which are not used for concentration 2.



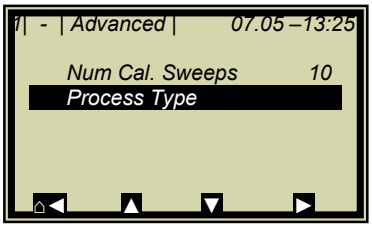
- SAMPLING

4.3.3 Calibration with Split Value

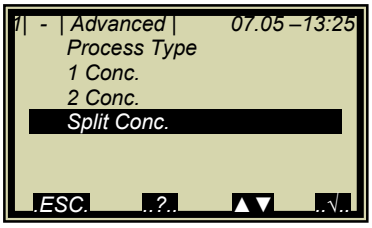
With this type of calibration, two characteristic curves (concentrations) are combined in one measuring range; their point of intersection defines the split value.



- ADVANCED

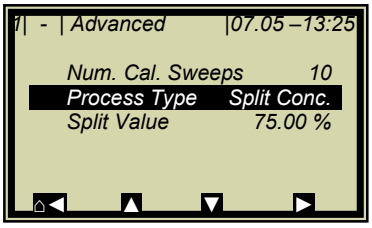


- PROCESS TYPE



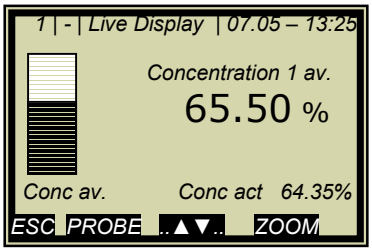
- SPLIT CONC

Push the **..√..** button to accept the selected process type and push the **.⌂◄.** button once to go to the display depicted below.



The displayed split value has been set by the manufacturer, but has to be adapted to the respective application.

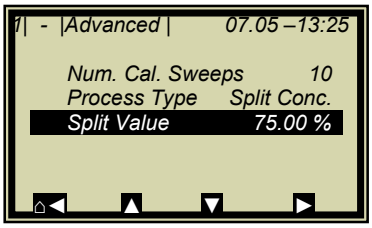
The sample measurement should be selected such that the last sample of the lower concentration is fairly close to the first sample measurement of the upper concentration. Ideally, the last sample of the initial concentration is the first sample of the final concentration.



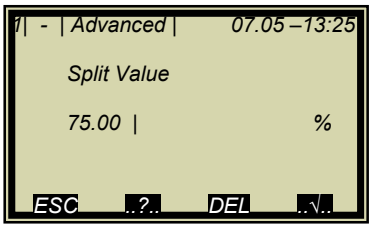
The sample measurement is carried out continuously over the entire measuring range with the display depicted to the left. See chapter **4.2.2 Sampling**.

After completion of sampling, the individual samples will be enabled or disabled during input of the laboratory values, relative to the set split values. All samples smaller or equal to the split value will be assigned to the lower concentration range and all samples above to the upper concentration range.

The split value to be set must correspond to the point of intersection of both calibration curves.

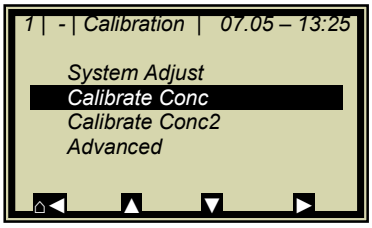


- SPLIT VALUE

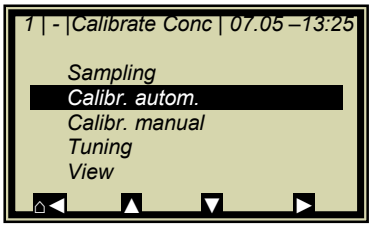


Enter the split value and confirm with ..√..

Push the Home button .⌂◀. to return to the calibration page.



- CALIBRATE CONC

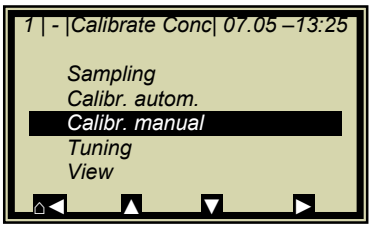


- CALIBR. AUTOM.

The lower concentration is now calibrated. Then select CONC2 and repeat the calibration process.
Back to the main menu and start the measurement.

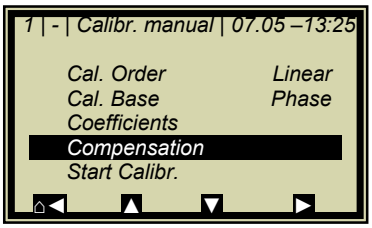
4.3.4 Calibration with Temperature Compensation

Before running a sample measurement you have to enable the desired compensation input and check the calibration. If **all** inputs are enabled, the measured values of all inputs will be stored automatically in the sample table.

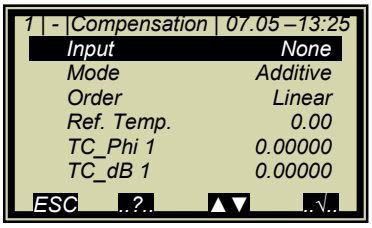


From the main menu, you get in the Advanced mode to the display to the left via | SETUP | CALIBRATION | CALIBRATE CONC. |

- CALIBR. MANUAL

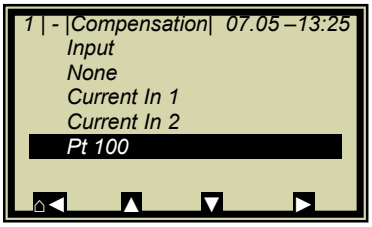


- COMPENSATION



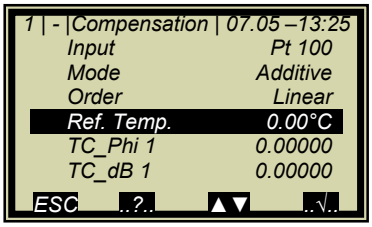
- INPUT

If all inputs have been enabled during sample measurement, you have the option to select a compensation from the list, since all input values have been stored in the sample table.

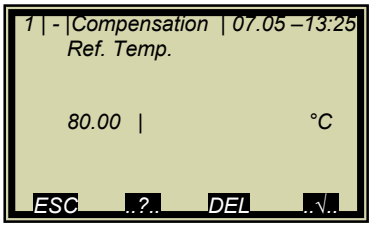


- Pt 100

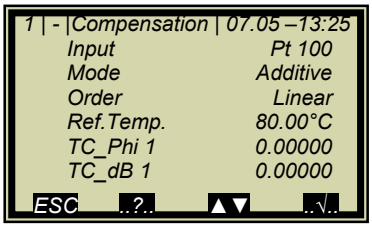
You can select additive or multiplicative **mode** and set the **order** to linear or quadratic. If you select **automatic** calibration mode, the above modes will be calculated automatically. This is recommended for non-professional users.



➢ REF TEMP



Enter the average operating temperature and confirm.



The coefficients TC_Phi 1 and TC_dB 1 are automatically calculated during calibration.

If you have completed the entries described above and have carried out the steps described in chapters

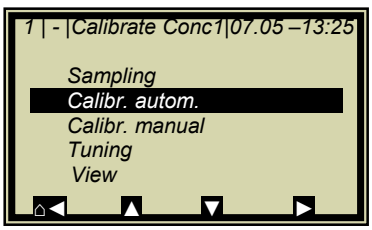
4.1 System calibration

4.2.1 Tuning

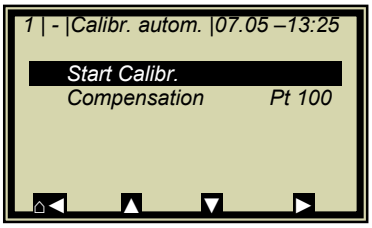
4.2.2 Sampling and

4.2.3 Entering the Lab Values

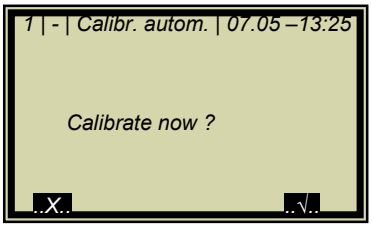
you may proceed with the calibration as described below.



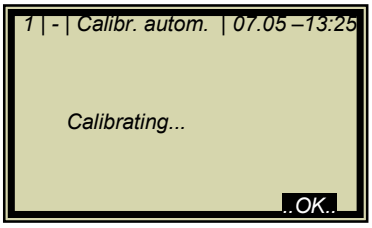
➢ CALIBR. AUTOM.

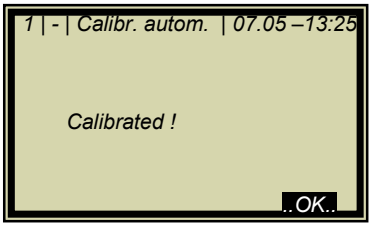


➢ START CALIBR.



Start calibration process.





Push .O.K. to confirm the calibration. Calibration is finished. Push the Home button .⌂◄. four times to return to the main menu and to start a measurement.

Chapter 5. **Password**

The measuring system can be protected by passwords against unauthorized access.

5.1 Password

The following access levels are available.

Read only
The measuring system cannot be started and stopped. You can only switch from the live display to Diagnostic and to Access Level.

Basic
On the Basic level you can make essential entries, and stop and start the system.

Profi
The Profi mode allows additional entries in the process type menu, calibration menu and opens the Service menu.

Service
The Service level is reserved for technical service.

You have to enter a password to change from the access level „Read only" to „Basic" or „Profi".
At the time of delivery, this password is

PASS1

Changing from Profi to Basic or vice versa is possible without password. You can change the password on the Profi or Basic level.

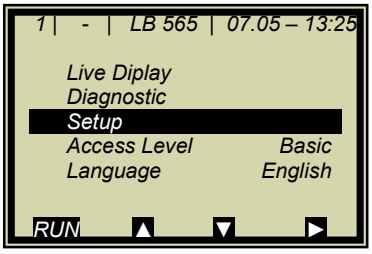
Chapter 6. **Inputs / Outputs**

The measuring system includes two separate floating current outputs.

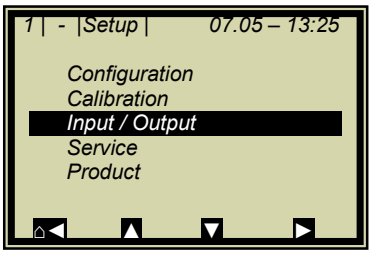
6.1 Current Outputs

Current outputs 1 and 2 can be assigned to the concentrations for calibration with two concentrations.

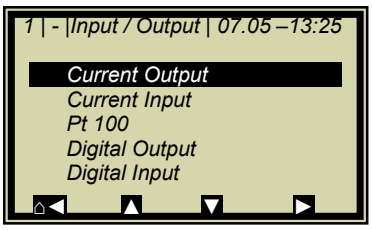
You get to the setup display as follows.



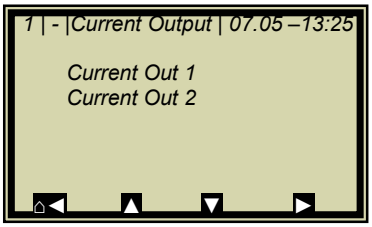
- SETUP



- INPUT/OUTPUT

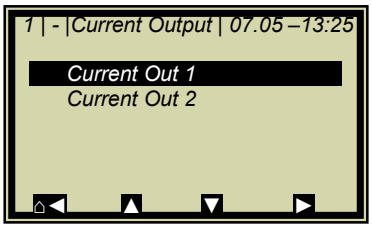


- CURRENT OUTPUT

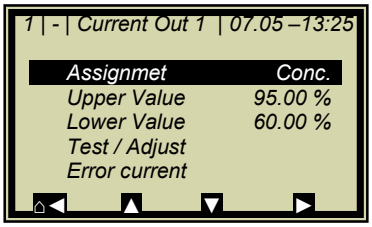


Now you can select the respective current output and assign it to the concentration after calibration.

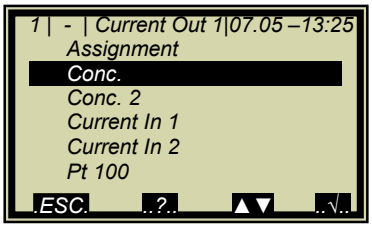
6.1.1 Current Output Setup



➢ CURRENT_OUT 1



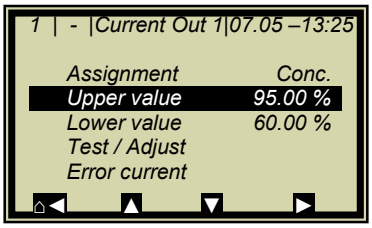
➢ ASSIGNMENT



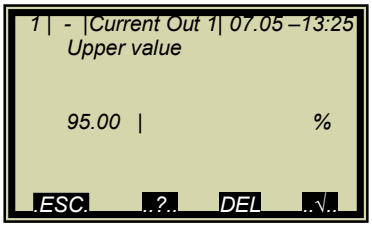
➢ CONC

Select and confirm with **..√..**.

In case of two concentrations and outputs enabled, the assignment can be chosen as needed.



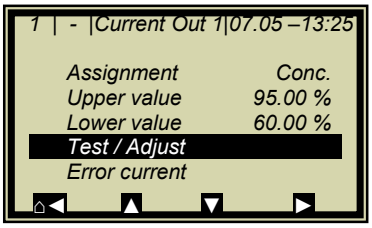
➢ UPPER VALUE



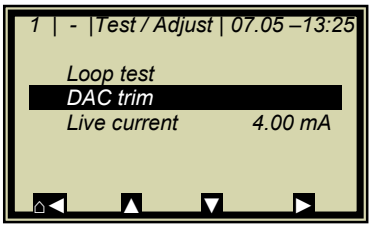
Delete the old value with **DEL**. Enter the new limit value and confirm with **..√..**.

Set the lower value also as described above.

6.1.2 Test and Adjustment

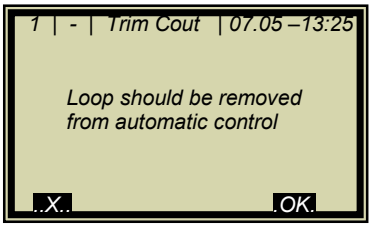


➢ TEST / ADJUST

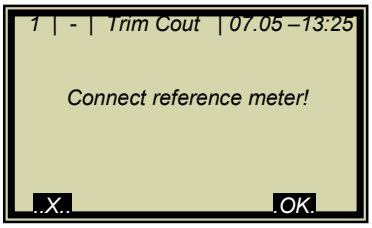


➢ DAC TRIM

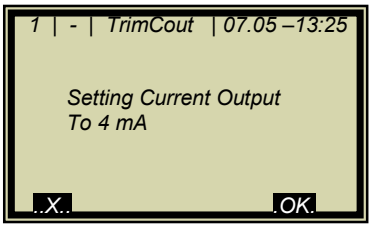
! **CAUTION:** Current output 1 can only be set between 4 and 20 mA, since it is foreseen for a Hart® communicator.



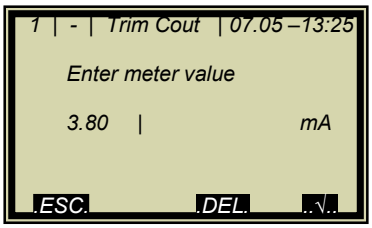
Push .OK. to confirm that the process is not affected by the measurement.



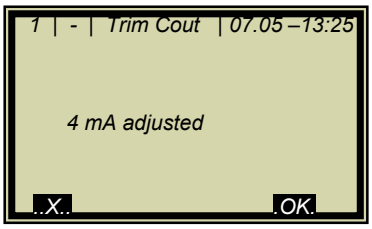
Push .OK. to confirm that the measuring system is connected.



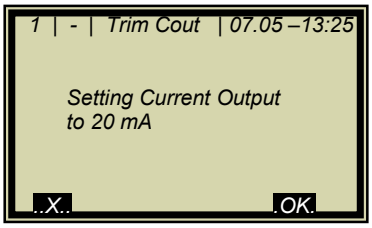
Push .OK. to confirm.



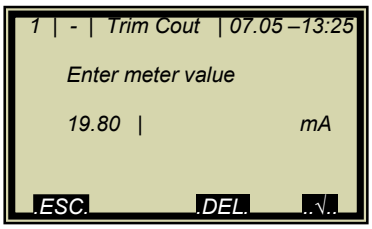
Read off display of measuring system and enter value.



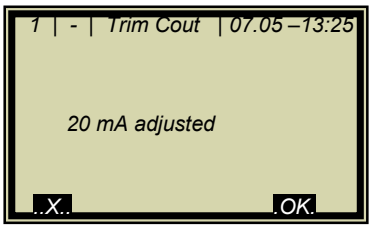
4 mA value adjusted.



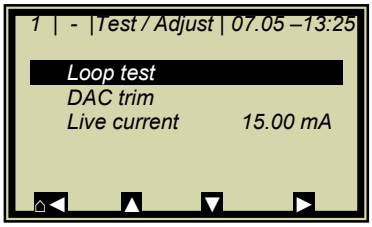
Push the OK. button to confirm.



Read off display of measuring system and enter value.



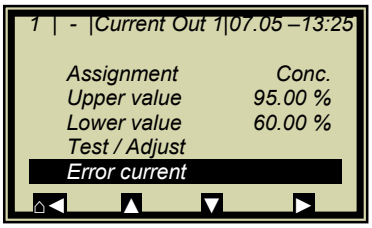
Adjustment finished.



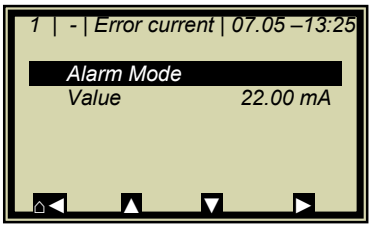
To check the current loop and possibly connected remote displays, you can set a current between 4 and 20 mA via the test function. If you quit the test function, the system automatically switches back to the live current.

6.1.3 Error Current

Different signal effects can be assigned to the output current.

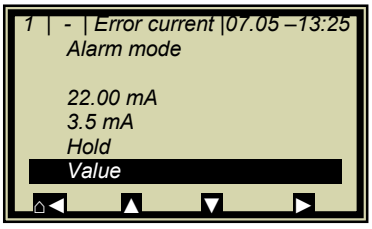


➢ ERROR CURRENT



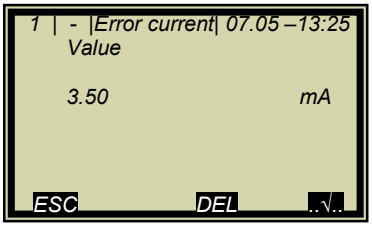
➢ ALARM MODE

Fixed values, Hold or freely adjustable values between 0 and 24 mA can be assigned.



➢ VALUE

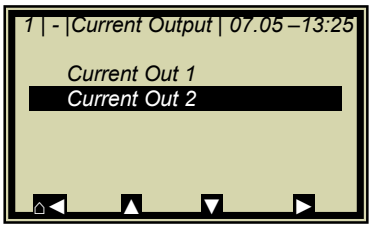
With this setting, you can default any current value for the error case.



! **CAUTION**: The current output 1 can only be set between 3.5 mA and 24 mA. [HART®]

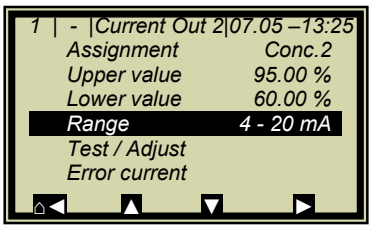
Enter value and confirm with ..√..

6.1.4 Current Output 2

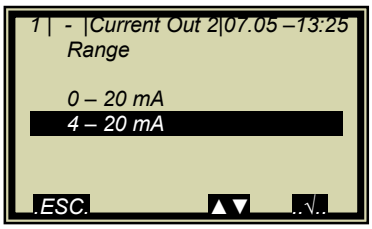


- CURRENT OUT 2

All settings for current output 2 have to be made in the same manner as for output 1, with the exception of the range setting.



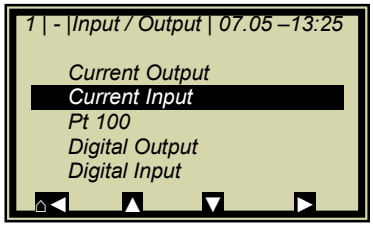
- RANGE



After selection of the required range, carry out all setting and calibration steps as described in **chapter 6.1.2**.

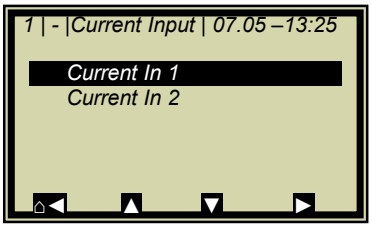
6.2 Current Inputs

If the window below is not displayed, you can invoke it on the main menu via **|**SETUP **|**INPUT/OUTPUT **|**

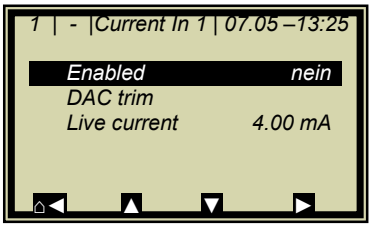


- CURRENT INPUT

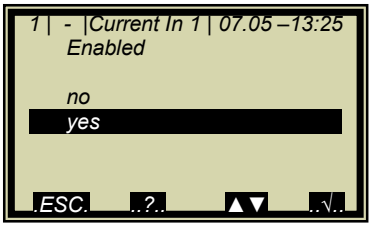
6.2.1 Enabling the Current Input



- CURRENT IN 1



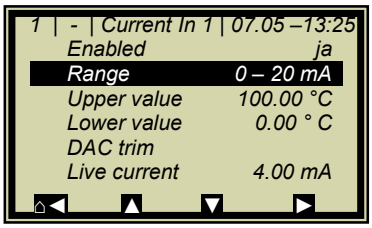
- ENABLED



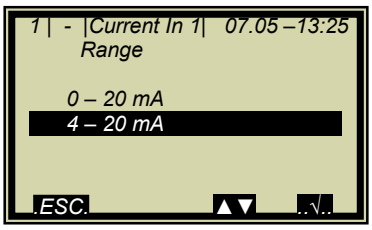
- ENABLING

If a measurement is running, enabling an adjusted current input which is not used may cause an error.

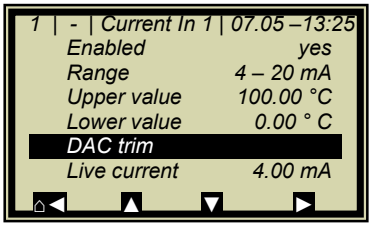
6.2.2 Range Setting and Adjustment



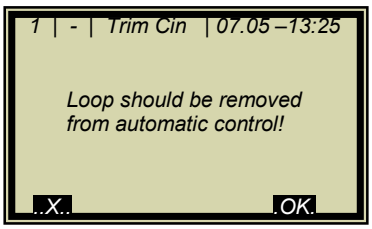
- RANGE SETTING



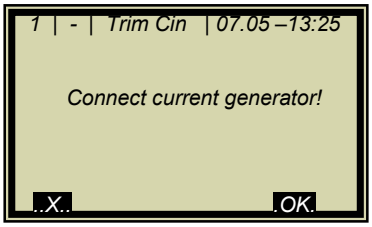
- 4 – 20 mA



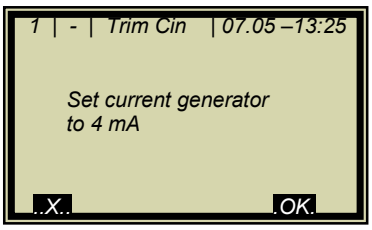
- DAC trim



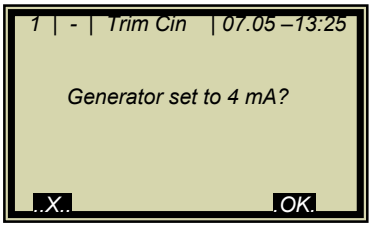
Push .OK. to confirm that the process is not affected by the measurement.



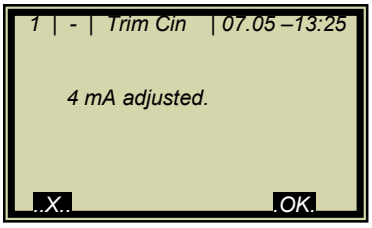
Push .OK. to confirm that the current generator is connected.



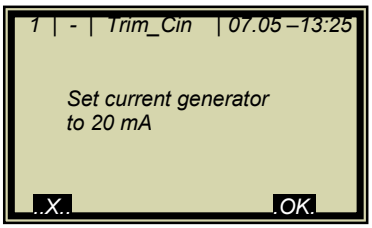
- Set current generator to 4 mA.



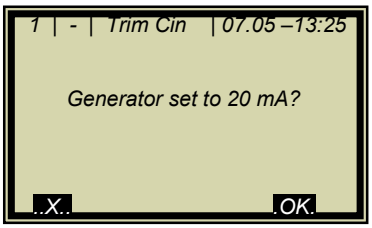
Push the .OK. button to confirm.



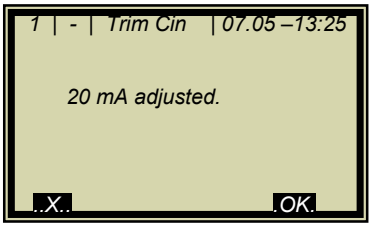
Push .OK. to confirm adjustment of the lower value.



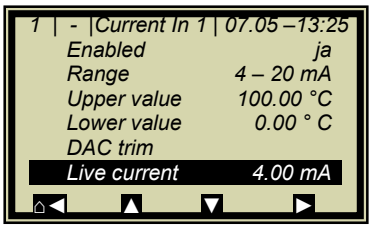
- Set current generator to 20 mA.



Push the .OK. button to confirm.



Push .OK. to confirm adjustment of the lower value.



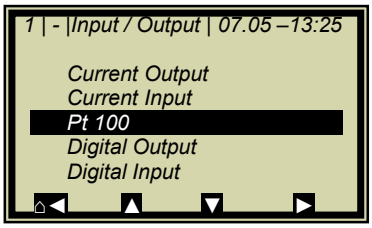
Adjustment finished. The live current is displayed.

If necessary, carry out range setting and calibration of current input 2 as described above.

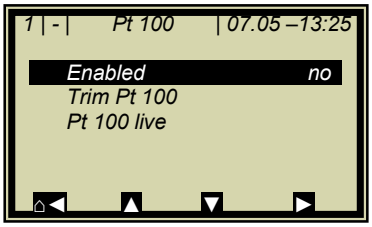
6.3 Pt 100

Before enabling, you have to stop the measuring system, as the change in configuration may lead to errors.

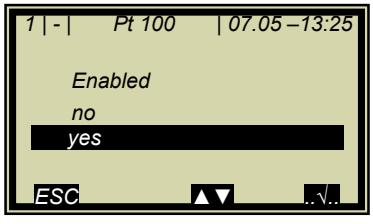
6.3.1 Pt 100 Enabling



- PT 100

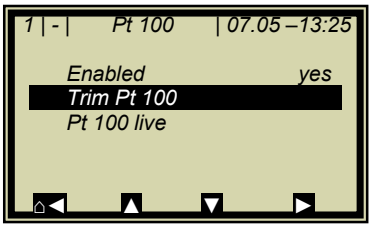


- ENABLED

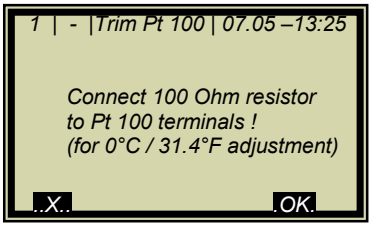


Select „yes“ and confirm with ..√...

6.3.2 Pt 100 Calibration

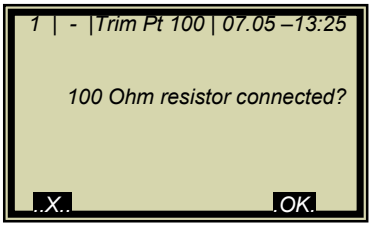


- TRIM Pt 100

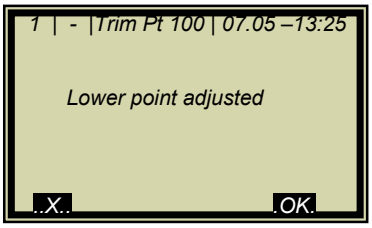


- ..OK..

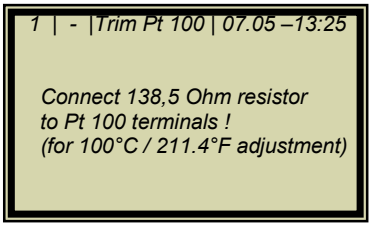
Connect 100 Ohm resistor to the Pt100 terminals [11] [23].



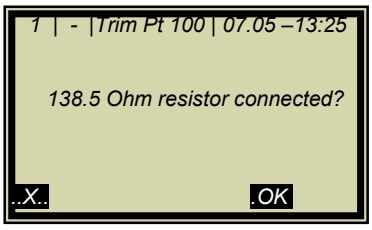
Confirm once more with ..O.K..



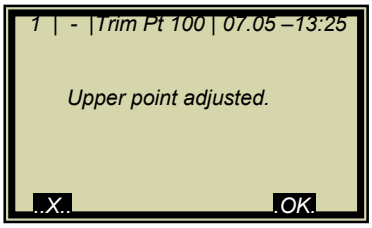
Adjustment of lower point finished.



After connection of the resistor, confirm with ..OK..



Confirm prompt.



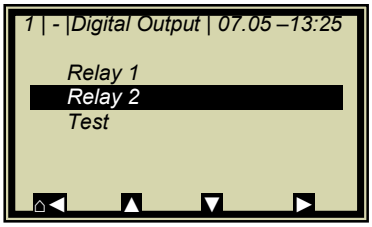
Calibration is finished.

6.4 Digital Output

The measuring system includes two changeover relay outputs which can be assigned to the respective application.

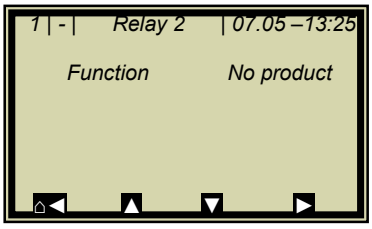
Relay 1 is associated with LED signal 1 and relay 2 with signal 2.

6.4.1 Digital Output Assignment

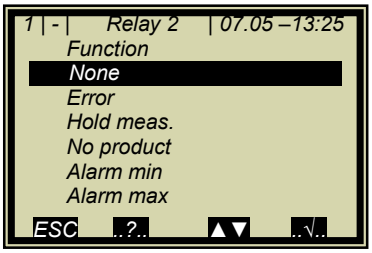


From the main menu you get to the display depicted to the left via | Setup | Input/Output | Digital Output

- RELAY 2



Select the display with the arrow keys.



Push ▲▼ and then ..√.. to assign a function to the relay.

Function	Description
None	Relay and LED function disabled
Error	In case of error, relay and LED will be set.
Hold meas.	If Hold function is enabled, relay and LED will be set.
No product	If *Pause detection* is enabled, this will be signaled via relay and LED.
Alarm min.	The relay switches if the value falls below the limit value to be set.
Alarm max.	The relay switches if the value exceeds the limit value to be set.

6.5 Digital Input

Different functions can be assigned to the digital inputs. See table below:

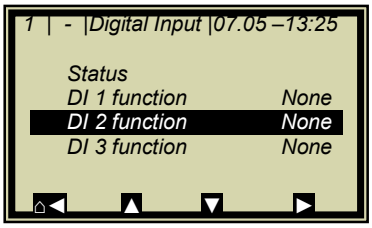
	Function1	Function2	Function3	Terminals
DI 1	None	Start		12/24
DI 2	None	Hold	Product	13/25
DI 3	None	Sample	Product	14/26

For external start function, the start function has to be set to ***external*** in the ***Measurement*** menu window.

Hold means that averaging is stopped, but the measurement continues to run.

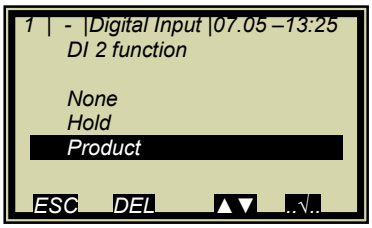
Sample means that sampling is started by closing the contact.

6.5.1 External Product Switchover



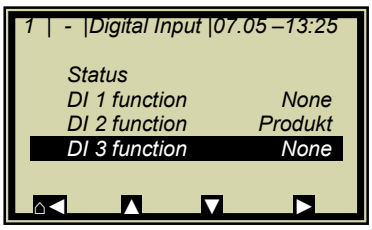
From the main menu you get to the window display depicted to the left via |SETUP |INPUT/OUTPUT |DIGITAL IINPUT.

- DI 2 FUNCTION



- PRODUCT

DI 3 also has to be set to product. Please take the terminal assignment from the table below.

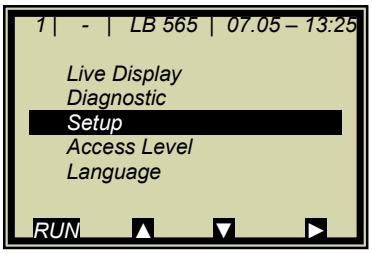


Terminals	DI 2 13 / 25	DI 3 14 / 26
Product 1	Open	Open
Product 2	Closed	Open
Product 3	Open	Closed
Product 4	Closed	Closed

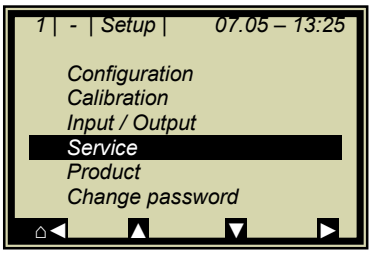
CAUTION!
If you change to another product, the product-specific data will be loaded automatically, including:
Configurations data
System calibration
Calibration data
Input/Output definitions

Chapter 7. **Factory Settings**

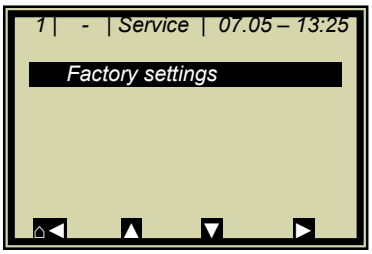
This function allows you to reset the measuring system to its original status.



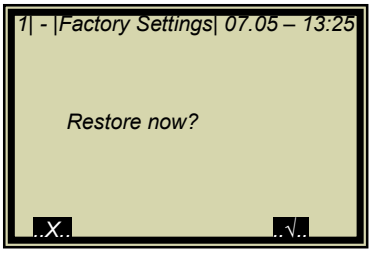
➢ SETUP



➢ SERVICE



➢ FACTORY SETTINGS



If you confirm this prompt, all parameters and configuration settings will be reset to their original status, with the exception of the sampling table and the reference measurement.

Chapter 8. **Error Lists**

8.1 Error Lists

All errors will be signaled by a red LED and a flashing RUN LED. Error displayed on the LCD have to be confirmed. After the error has been remedied, the LED's are reset to the normal status.

8.1.1 Hardware Error

Battery voltage
Program memory faulty
Data memory faulty
I/O Communication trouble

8.1.2 Input Error

Error	***Cause***
Value too high	*Input value is too high*
Value too low	*Input value is too low*
Table is empty	*Sampling has been selected without previous sample measurement*
Chart data faulty	*The measuring system has determined faulty chart data during calibration.*
No chart data available	*The calculates chart data have been deleted or calibration has not been completed.*
Sampling full	*You have tried to measure more then 10 samples.*

8.1.3 Measurement Error

Error	*Possible cause*
Variance of phase is too large	*The measured phase exceeds the permissible limit value.*
Attenuation too high	*The measured attenuation exceeds the permissible maximum value.*
Current input 1 out of range	*The enabled current input has not yet been calibrated or is not occupied.*
Current input 2 out of range	*The enabled current input has not yet been calibrated or is not occupied.*
Pt 100 temperature out of range	*The enabled Pt 100 input has not yet been calibrated or is not occupied.*
Concentration out of range	*The concentration calculated on the basis of the raw data lies outside the valid measuring range.*
Concentration 2 out of range	*The concentration calculated on the basis of the raw data lies outside the valid measuring range.*

All remedied measurement errors have to be confirmed with O.K. so that the measuring system can return to the live display.

Chapter 9. **Calibration Data Sheet**

9.1 Configuration

9.1.1 General

General	***Default***	***Setting***
Date	*01.06.04*	
Time	*13:00*	
Tag	-	

9.1.2 Measurement

Measurement	***Default***	***Setting***
Meas. mode	*continuous*	
Start mode	*keyboard*	
Averaging	*20*	
Reset averaging	*no*	
Marker	*Mark1*	
Units	*%*	

9.1.3 Plausibility

Plausibility	***Default***	***Setting***
Process limits	*60.0 – 100.0*	
Phase measure-ment *Variance* *Ratio Phi/dB*	 *100.00* *6.0*	
Pause detection	*yes* *-15.0 dB*	

9.1.4 Microwave

Microwave	***Default***	***Setting***
Cable *Ref. cable length* *Signal cable length*	 *4.00 m* *4.00 m*	

9.2 Product

Product	*Default*	*Setting*
Product	*1*	

9.3 Input / Output

9.3.1 Current Output

Current_out 1	*Default*	*Setup*
Assignment	*Conc.*	
Upper value	*95.00*	
Lower value	*60.00*	
Test/Calibration	*O.K.*	
Error current	*Hold*	

Current_out 2	*Default*	*Setting*
Assignment	*conc. 2*	
Upper value	*95.00*	
Lower value	*60.00*	
Range	*4 – 20 mA*	
Test/Calibration	*O.K.*	
Error current	*Hold*	

9.3.2 Current Input

Current_in 1	*Default*	*Setting*
Enabled	*no*	
Range	*4 – 20 mA*	
Upper value	*100.00*	
Lower value	*0.00*	
Calibration	*O.K.*	
Live current	*17.05 mA*	

Current_in 2	*Default*	*Setting*
Enabled	*No*	
Range	*4 – 20 mA*	
Upper value	*100.00*	
Lower value	*0.00*	
Calibration	*O.K.*	
Live current	*17.05 mA*	

9.3.3 Pt 100 Input

Pt 100	*Default*	*Setting*
Enabled	*no*	
Pt 100 Calibration	*O.K.*	
Pt 100 Live	*99.99 °C*	

9.3.4 Digital Output

Digital output	*Default*	*Setting*
Relay 1	*Error*	
Relay 2	*No Product*	

9.3.5 Digital Input

Digital input	*Default*	*Setting*
DI 1 function	*none*	
DI 2 function	*none*	
DI 3 function	*none*	

9.4 Calibration Data

9.4.1 Calibration Coefficients

Calibration	*Default*	*Setting*
Calibration order	*linear*	
Calibration Basic	*phase*	
Coefficients *A1* *A2* *B1* *B2* *C*	 *-0.19* *0.0* *0.0* *0.0* *75.00*	
Compensation *Mode* *Order* *Ref. temp.* *TC_Phi 1* *TC_Phi 2* *TC_Attn 1* *TC_Attn 2*	*none* *additive* *linear* *0.00* *0.00000* *0.00000* *0.00000* *0.00000*	

9.4.2 Sampling Table

No.	*Active*	*Meas. value*	*Lab value*	*Current_in 1*	*Current_in 2*	*Pt 100*	*Phi (m)*	*Attenuation*
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Notes

Notes