

Process Control

detect and identify

Concentration Meters

Micro-Polar Brix™
Micro-Polar Brix ++
LB 565

Hardware Manual



User's Guide

ID No. 39531BA2

Rev. No. 04E 10.10.2008

Soft. Version: ≥ 1.21

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

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
- installation
- 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.

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Table of Contents

	Page
Chapter 1. Safety Summary	7
1.1 Symbol and Pictograms	7
1.2 Use and Function	8
1.3 General Safety Instructions	10
Chapter 2. General Information	13
2.1 Intended Use	13
2.2 Definitions	14
Chapter 3. System Description	15
3.1 Principle of Measurement	15
3.2 Calculation of Measured Values	16
3.3 Temperature Compensation	16
3.4 Mechanical Components	18
3.4.1 Evaluation Units	19
3.4.2 Flow Cell	22
3.4.3 Container Probe	23
3.4.4 High-Frequency Cable	27
3.5 Pipeline Measurement Configuration	29
3.6 Container Measurement Configuration	30
Chapter 4. Getting Started	31
4.1 Transport to the Installation Site	31
4.2 Installation	31
4.2.1 Flow Cell Installation	31
4.2.2 Container Probe Installation	33
4.2.3 Installing the Evaluation Unit	35
4.3 Connecting the Evaluation Unit	36
4.3.1 Connecting the HF Cable	36
4.3.2 Pin Configuration of the Connector Strip	39
4.3.3 Digital Outputs, Relays	43
Chapter 5. Service Instructions	45
5.1 General Information	45
5.2 Wearing Parts	45
5.3 Instrument Cleaning	45
5.4 Battery	46
5.5 Fuse Replacement	46
Chapter 6. Technical Data	47
6.1 Evaluation Unit	47
6.2 Technical Data Sensors	50
6.3 Technical Data HF-Cable	52
6.4 Format of Serial Data Output RS 232 and RS 485	53

Chapter 7. Certificates	55
7.1 EC Declaration of Conformity	55
7.2 Frequency Approval	57
Chapter 8. Technical Drawings	61
8.1 Dimensional Drawing of Evaluation Unit Housing	61
8.1.1 Evaluation Unit from Micro-Polar Brix	61
8.1.2 Evaluation Unit from Micro-Polar Brix++	62
8.2 Electrical Wiring Diagram	63
8.3 Dimensional Drawings Flow Cells	64
8.3.1 Type LB 3543-11 MP, Nominal Width 50 mm, Options	64
8.3.2 Type LB 3543-11 MP, Nominal Width 50 mm, Adapter	65
8.3.3 Type LB 3543-31 MP, Nominal Width 50 mm	66
8.3.4 Type LB 3547-11 MP, Nominal Width 65 mm, Options	67
8.3.5 Type LB 3545-11 MP, Nominal Width 80 mm	68
8.3.6 Type LB 3544-11 MP, Nominal Width 100 mm, Options	69
8.3.7 Type LB 3544-21 MP, Nominal Width 100 mm	70
8.3.8 Type LB 3548-11 MP, Nominal Width 150 mm	71
8.4 Dimensional Drawings Container Probes	72
8.4.1 Type LB 5650-01	72
8.4.2 Type LB 5650-02	73
8.4.3 Type LB 5650-03	74
8.4.4 Type LB 5650-04	75
8.4.5 Type LB 5650-05	76
8.4.6 Type LB 5650-09	77
8.4.7 Installation Situation in Pipelines	78
8.5 Dimensional Drawings Container Flush Probes	79
8.5.1 Type LB 5651-01	79
8.5.2 Type LB 5651-02	80
8.5.3 Type LB 5651-03	81
8.5.4 Type LB 5651-04	82
8.5.5 Type LB 5651-05	83
8.5.6 Installation Situation in Pipelines	84
8.6 Installation Sheets for LB 5650 (Container Probe)	85
8.7 Installation Sheets for LB 5651 (Container Flush Probe)	87

Chapter 1. Safety Summary

1.1 Symbol and Pictograms

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



Danger!

Possible danger for 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 licenses

The Micro-Polar Brix and Micro-Polar Brix ++ comply with part 15 of the FCC Rules¹, and with RSS-210 of Industry Canada. These devices fulfill the requirements regarding immunity to interference and emitted interference and are licensed for operation.

FCC license certificate

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.

Trade Name: BERTHOLD TECHNOLOGIES
Model Name: Micro-Polar (Brix)++
FCC ID: R9ZFCC01X12
IC: 4777A-IC01X12



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.

"IC²": 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.

¹ FCC ... Federal Communications Commission

² IC ... Industry Canada

CE 0682

The Micro-Polar Brix and Micro-Polar Brix ++ comply with the R&TTE regulations 1999/5/EG and fulfil herein all requirements for this type of high-frequency device. The devices contain 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*.



The LB 565 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 activity and are, therefore, not at all hazardous to human beings or the environment. Also, the product is not affected at all by the microwaves.



The LB 565 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 approval and will be prosecuted.

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



NOTICE:

Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC authorization to operate this equipment.

1.3 General Safety Instructions



The systems have been manufactured in accordance with state-of-the-art technology and in compliance with acknowledged safety rules ensuring the highest level of occupational safety.

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



The measuring systems have to be protected against direct sun rays and rain during outdoor applications e. g. by a suitable protective cover.



Never change the installation and 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.



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

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

Only authorized persons who have been trained, have the proper qualification and have received the necessary instructions may work with the systems! Installations and modifications on the systems which may affect the operational safety are not permitted!



Ambient conditions:

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



Electrical shock hazard:

Disconnect power to rule out any contact with live parts during installation and when servicing.

Turn off power supply before opening the instrument. NEVER work on open and live instruments.



Attention! Possible danger, damage to property! Concerns the system type LB 565-12 Micro-Polar Brix ++ (ID no. 51832-02):

When connecting the 24 V DC auxiliary power, the + and – Poles should be connected correctly. There is no reverse voltage protection!



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



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



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

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. The following sensor and evaluation unit versions are available:

1. The container probes have been designed for installation into pipelines with a nominal width of ≥ 200 mm and in containers, for example, crystallizers. The probe is installed such that both measuring rods (transmitter and receiver) are immersed into the product being measured.
2. The flow cell is a tubular probe, with microwave transmitter and receiver being firmly welded onto the outside of the pipe. The inside of the pipe is Teflon-coated. The flow cell is installed into the existing pipeline system inline or into a bypass.

The evaluation unit is available in two versions: The Standard Model Micro-Polar Brix and the high dynamic version Micro-Polar Brix ++. The evaluation unit Micro-Polar Brix ++ can only be used when sufficiently large microwave attenuation (min. 40 dB) is present. The Micro-Polar Brix should be used for lower microwave attenuation.

During operation, the concentration measuring devices Micro-Polar Brix and Micro-Polar Brix ++ send out electromagnetic radiation in the frequency range between 2.4 GHz and 2.5 GHz (range restrictions depending on local regulations in your country). The microwaves which emerge are not dangerous to human beings and the environment (power emission < 10 mW). The microwaves are emitted from the microwave window; the product is not changed by the microwaves.

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



- 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 nearly constant.
- The total attenuation of microwave signals must be at least 40 dB for the Micro-Polar Brix ++. For details, see Chapter 3.4.1 the evaluation units

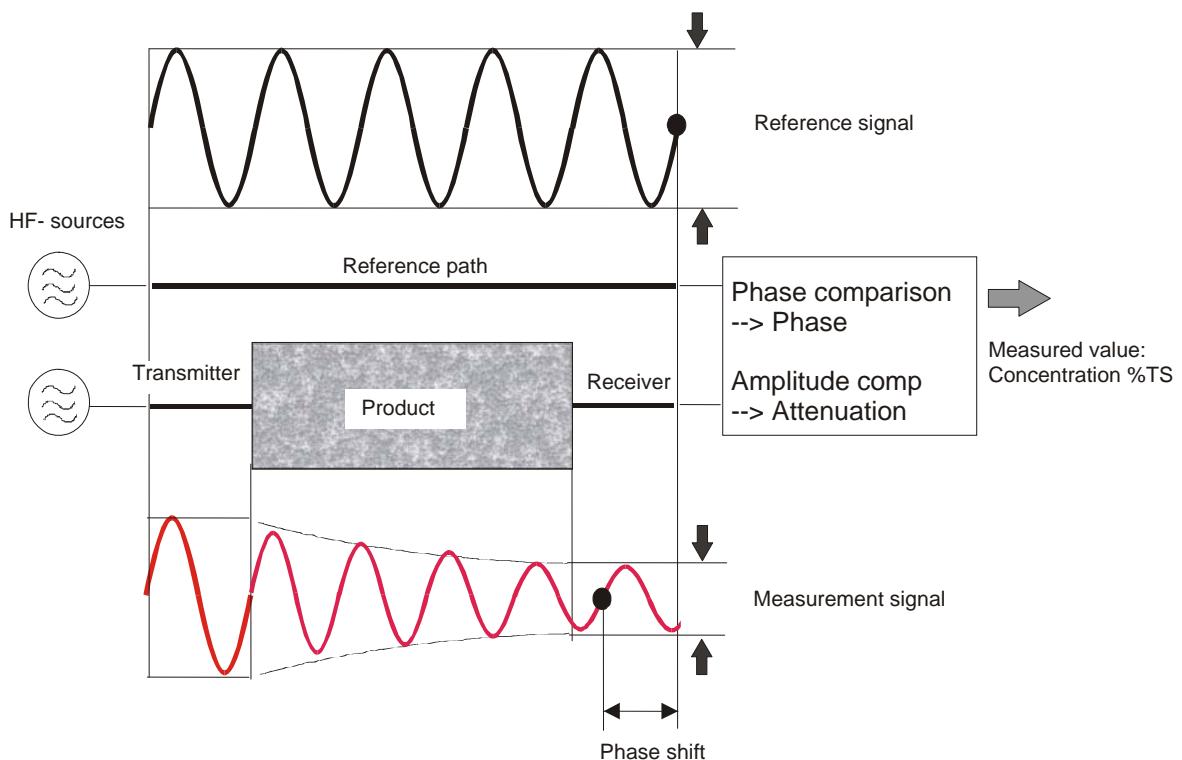
2.2 Definitions

Attenuation	Weakening of microwave signals, microwave measurement effect.
Container flush probe	Container probe with flushing device.
EVU	Evaluation unit
Factory setting	All parameters have been set to standard values by the manufacturer. In most cases this simplifies calibration of the device significantly. Despite factory setting, calibration always has to be performed.
Flow cell	Tubular probe for simple integration into the existing pipeline system.
HF cable	H igh- f requency cable.
Microwaves	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	Temperature c ompensation.

Chapter 3. System Description

3.1 Principle of Measurement

The microwaves that spread between the rods pass through the product being measured; their propagation speed is slowed down (= phase shift) and their intensity is damped (= attenuation). Figure 3-1 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 3-1:
Schematic diagram:
Change of microwave
by product*

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

The concentration to be detected in the product is therefore dependent in good approximation linear on phase shift and attenuation. For this reason we can measure the concentration or the Brix content of the product using a linear calibration (see chapter 3.2 Calculation of Measured Values).

3.2 Calculation of Measured Values

The microwave measuring phase and attenuation are calibrated after an automatic plausibility analysis.

During calibration, the phase and/or the attenuation or a concentration value (or density value) are assigned by sampling. The calibration is full automatic and the sample taking is supported by the evaluation unit.

Which of the parameters, either phase, attenuation or both are used for the calibration depends on the size and interference of the measuring effect. For example, the attenuation is significantly more sensitive to electrolytic conductivity (salt content).

In many cases, the mere phase measurement is recommended and is calculated in good approximation by a linear calibration as follows:

$$\text{Con} = A \cdot \varphi + C$$

Con	concentration
A, C	coefficients of respective calibration function
φ	phase

The LB 565 allows you to calibrate, display and output two concentrations Con1 and Con2. 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) is necessary if the product temperature varies. In general, we recommend connecting a temperature compensation, i.e. a temperature signal (0/4...20 mA or Pt 100) to the evaluation unit and, if necessary, to enable the compensation in the evaluation unit. The evaluation unit is designed such that the required TC's can be calculated automatically. The variation in temperature where temperature compensation becomes absolutely essential is dependent on the product and on the water content. In first approximation, $\pm 2^\circ\text{C}$ should be set as fluctuation limit.



TC has to be carried out whenever you are working with cooling crystallizers.

The TC corrects the phase and attenuation before the measured value calculation (calibration), in most applications according to the following formulae (linear compensation, additive).

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

$$D_{\text{comp}} = D_{\text{meas}} + C_D \cdot \Delta\theta$$

Where

φ_{meas} = measured phase

φ_{comp} = compensated phase

D_{meas} = measured attenuation

D_{comp} = compensated attenuation

C_{φ} = temperature coefficient

C_D = temperature coefficient

$\Delta\theta$ = measured temperature (T_{meas}) – reference temp. (T_{Ref})

Depending on the selected function (additive, multiplicative, linear, quadratic), 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 Pt 100 or via current input. This has to be defined on the Calibration menu. The Pt 100 temperature range is between -50°C and $+200^{\circ}\text{C}$.

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

3.4 Mechanical Components

The measurement system consists of an evaluation unit, a probe and a set of special high frequency cables (in short HF-cable). The evaluation unit is available in two versions: the standard model Micro-Polar Brix LB 565 and the high dynamic version Micro-Polar Brix ++ LB 565, see Figure 3-2 and 3-3.



Figure 3-2:
Evaluation unit
Micro-Polar Brix
LB 565



Figure 3-3:
Evaluation unit
Micro-Polar Brix ++
LB 565

The probes are available in different versions, as pipeline and container probe with and without flushing device (see Figure 3-4, 3-5 and 3-6).



*Figure 3-4:
Container probe LB 5650*



*Figure 3-5:
Container probe with
flushing device LB 5651*



*Figure 3-6:
Flow cell LB 3543 MP
nominal width 50 mm*

3.4.1 Evaluation Units

The evaluation units consist of evaluation analyser with microwave unit. The microwaves are generated, received and analyzed by 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.

Differences between Micro-Polar Brix ++ und Micro-Polar Brix

The Micro-Polar Brix ++ evaluation unit, has an additional HF amplifier module in comparison to the standard model, whereby the wall housing is larger (dimensions see chapter 6.2 Technical Data

Micro-Polar Brix ++

evaluation unit). Otherwise, the evaluation units only differ in their applications.

Higher product attenuations are allowed for the high dynamic version of Micro-Polar Brix ++. Therefore larger measuring paths can be irradiated, for example measuring cells of larger nominal width can be used. The application of both evaluation units is predetermined by the product attenuation. Up to an attenuation of 50 dB, Micro-Polar Brix is used and beyond, Micro-Polar Brix ++. The Micro-Polar Brix ++ generally requires an attenuation of 40 dB. If this is lower, the software indicates an error message (only on software version 1.22).

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

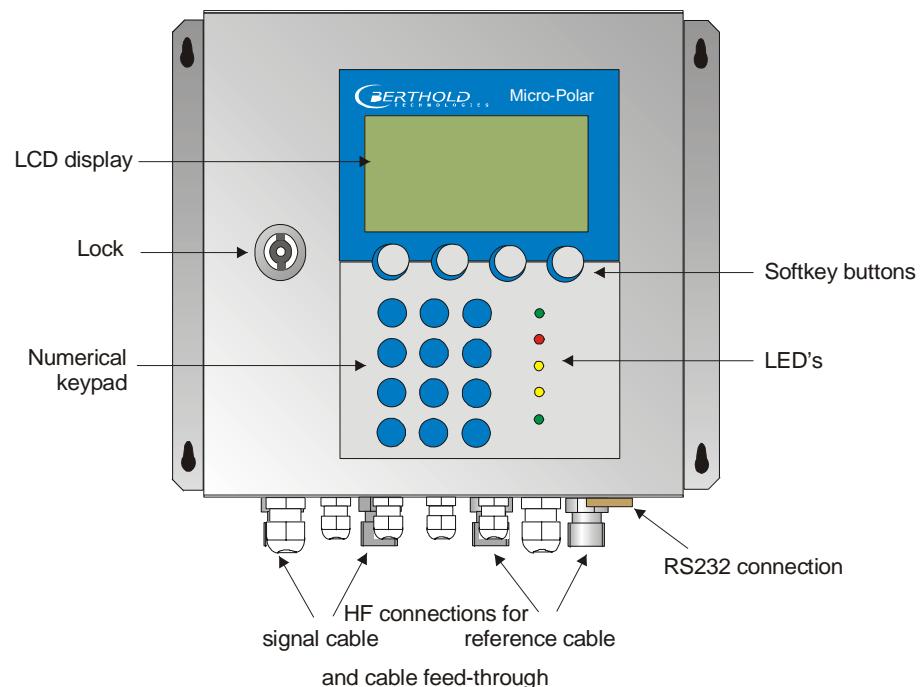


Figure 3-7:
Front view of
evaluation unit

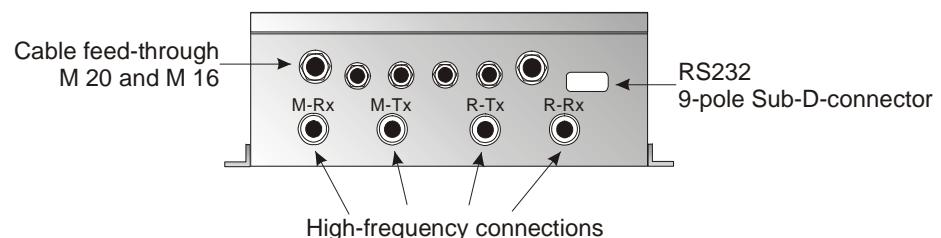


Figure 3-8:
Evaluation unit -
bottom view

LED's on the Front Panel

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

- Run
- Error
- Signal 1
- Signal 2
- Comm

*Figure 3-9:
LED's on the front panel
of the evaluation unit*

LED	Function
Run	Instrument in measurement mode Display is flashing when concentration average value is put on hold, e.g. if an error has occurred, if the measurement has been paused or stopped
Error	Error Goes out after reset or if fault has been repaired
Signal 1	Display depending on the selected function of relay 1, possible functions: error, no product, limit value min., limit value max., measurement stopped
Signal 2	Display depending on the selected function of relay 2, possible functions: error, no product, limit value min., limit value max., measurement stopped.
Comm	Communication active, e.g. via RS 232 / HART®

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 fuses. 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 Flow Cell

The flow cells are available with nominal widths from 50 to 150 mm (see Figure 3-10) and different flanges. For technical data please refer to chapter 6.2.

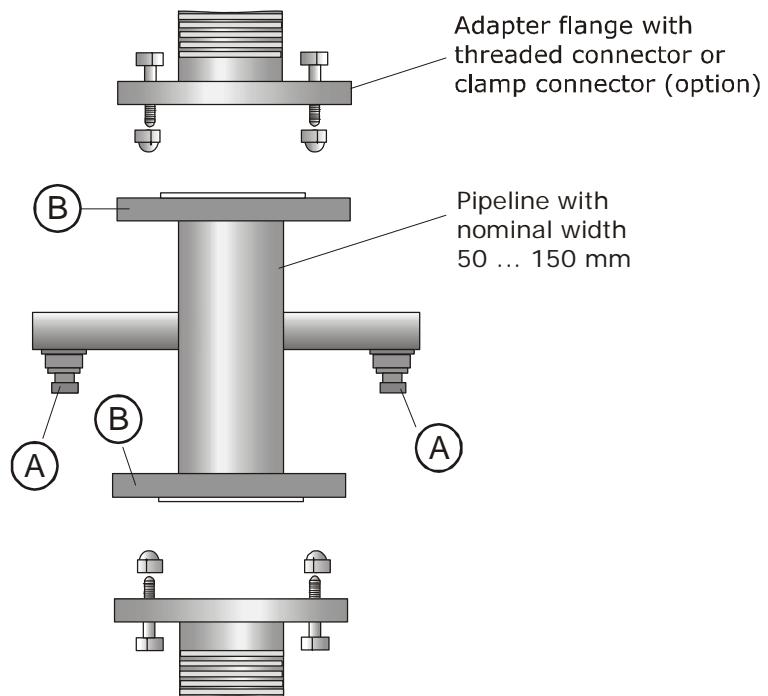


Figure 3-10:
Flow cell

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

The flow cell consists of a sturdy stainless steel body. The microwave transmitter and receiver are firmly welded to the outside of the pipe. The entire product pipe is PTFE-coated and fulfills the special requirements for use in foodstuffs.

There are not objects extending into the pipe (such as measuring sensors). The flow cell can be installed in the pipeline via flange, threaded connector or clamp connector. Adapter flanges are available as accessories.

The flow cell has two HF connections to feed in and output microwave signals. Input and output can be allocated as needed (M-Tx, M-Rx). The microwave signals transmit the product over the entire pipeline cross-section.

3.4.3 Container Probe

Two different container probe versions are available – either with or without flushing device (see Figure 3-11). For technical data please refer to chapter 6.2 Technical Data.

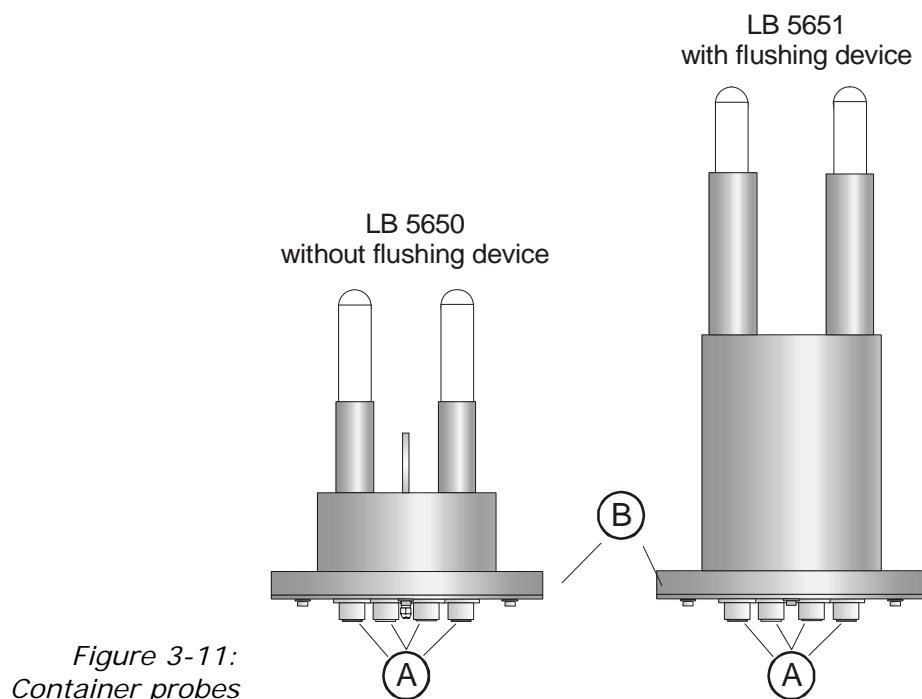


Figure 3-11:
Container probes

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

Container Probe Type LB 5650 and Type LB 5651

The container probe has been specially designed for concentration measurements in containers. Both measuring rods are immersed into the product. Microwaves are emitted from one end of the rod and received by the other end of the rod; they are emitted only towards 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 foodstuffs.

Two different probe types are available:

- The standard type is the container probe without flushing device
- The container flush probe is employed in processes where incrustations are likely to occur, for example, due to increased depositions. The flushing device prevents any deposition on the microwave exit windows. Long travel times are supported by continuous crystal processes (i.e. VKT).

The flow direction of the product being measured should be vertical, as shown in Figure 3-11. This ensures that the product between the measuring rods is representative, provided it is mixed thoroughly.

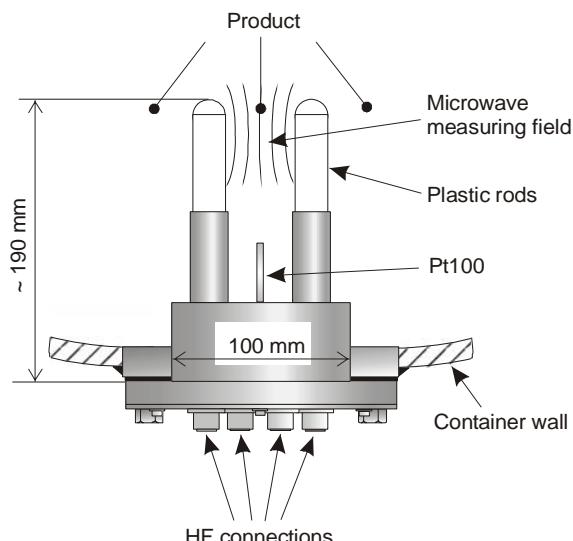


Figure 3-12:
Container probe
LB 5650

Pt 100

Only the container probe LB 5650 is provided with a Pt 100 and is connected to the evaluation unit via 4-wire cable. The wiring diagram for the Pt 100 is described in chapter 4.3.2 Pin Configuration of the Connector Strip. To reduce the danger of incrustation in the immediate vicinity of the measuring rods, the container flush probe is not provided with a Pt 100.



Warning, possible property damages

Do not open the cover screws on the front of the container probes, see Figure 3-13.

Probe flange
e.g. Container Probe DN65 / PN6

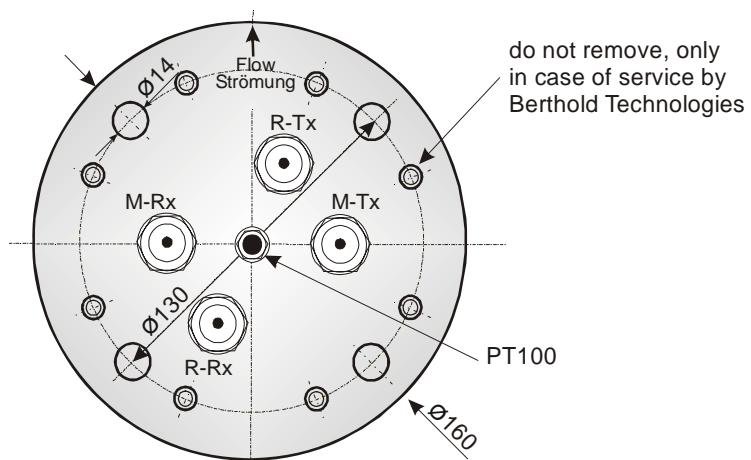


Figure 3-13:
The front of the container probe LB 5650

Container Probe Type LB 5651 with Flushing Device

The probe LB 5651 with flushing device has been designed for processes where depositions, for example, due to incrustations are likely to occur on the probe.

The container flush probe has two flushing channels which keep the plastic rod 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 3-14 shows the probe design.

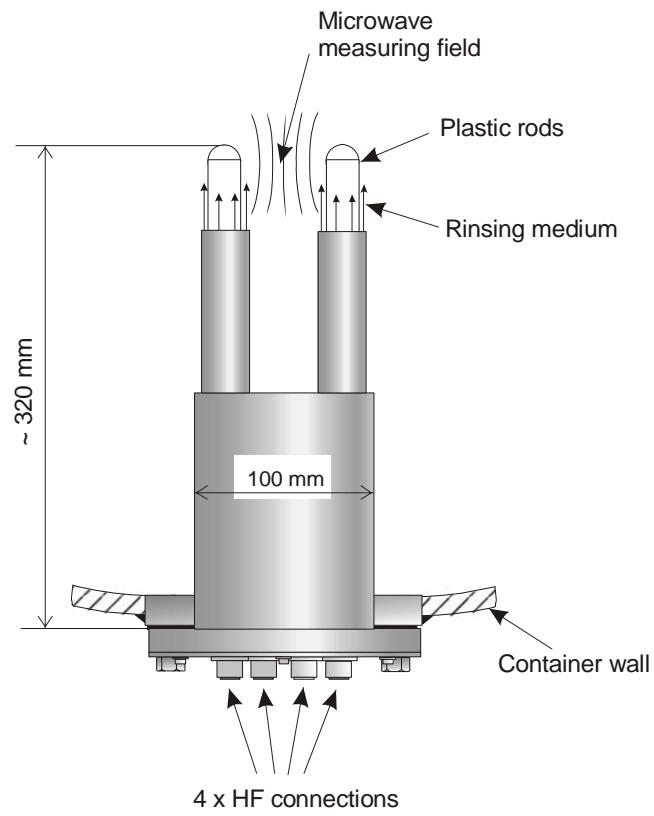


Figure 3-14:
Flushing probe
LB 5651

The flushing slit width is the same for both probe rods and shown in Figure 3-15.

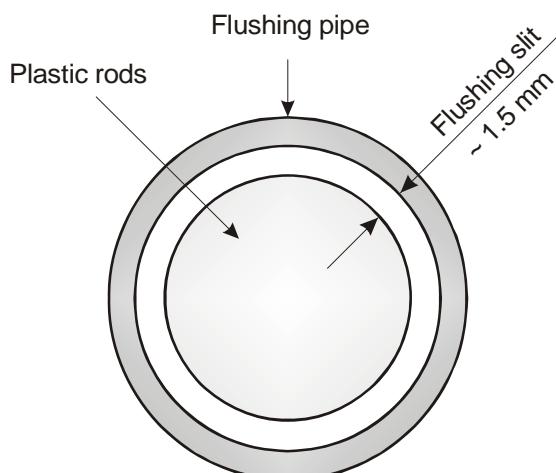


Figure 3-15:
Rod head
with flushing pipe

3.4.4 High-Frequency Cable

High-frequency cables (HF cable) are used to transmit microwaves between probe and evaluation electronics.

HF cables change their conductivity (for microwaves) relative to the temperature. Therefore, variations in the ambient temperature would create measurement errors. This error is compensated for by enabling the cable compensation. 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. Therefore, we recommend installing both cable types together in a corrugated tube; this also simplifies installation.

Special HF-cables are available for each sensor type. **For the container probe** (with and without flushing device) the HF-cable quad is used (see Figure 3-16). It consists of four single HF-cables of equal length, whose ends are terminated by one HF-connector (N-type). Available cable lengths: 2, 4, 6 and 10 m.

Two cable versions are available for the **flow cell**.

Version 1: A HF cable quad as described above, where the reference cable is sort-circuited by means of the N-connector at the side of the probe (see Figure 3-17). Available cable lengths: 2, 4, 6 and 10 m.

Version 2: The flow cell is connected using two separate HF-cables (solid sheath cable) of equal length (signal cable). Another separate cable, with the length corresponding to the sum of both signal cables, makes up the reference cable (not shown). Available lengths of the solid sheath cable: signal cable: 1.5 and 2.0 m; reference cable: 3.0 and 4.0 m.



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

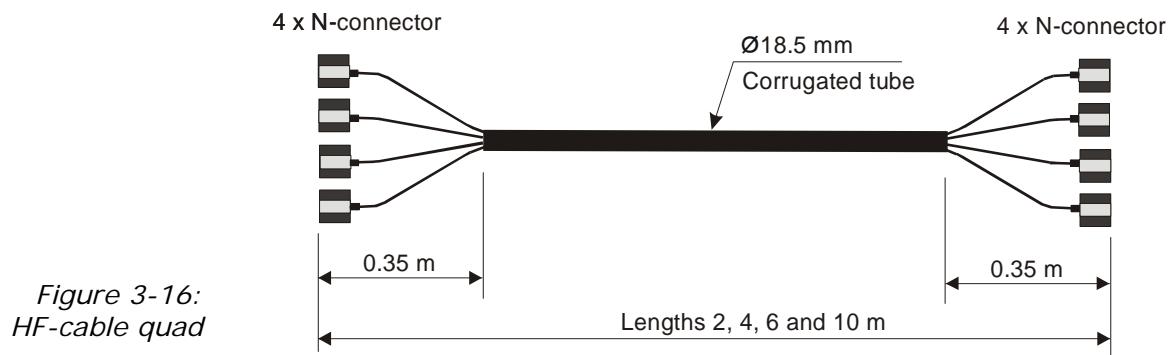


Figure 3-16:
HF-cable quad

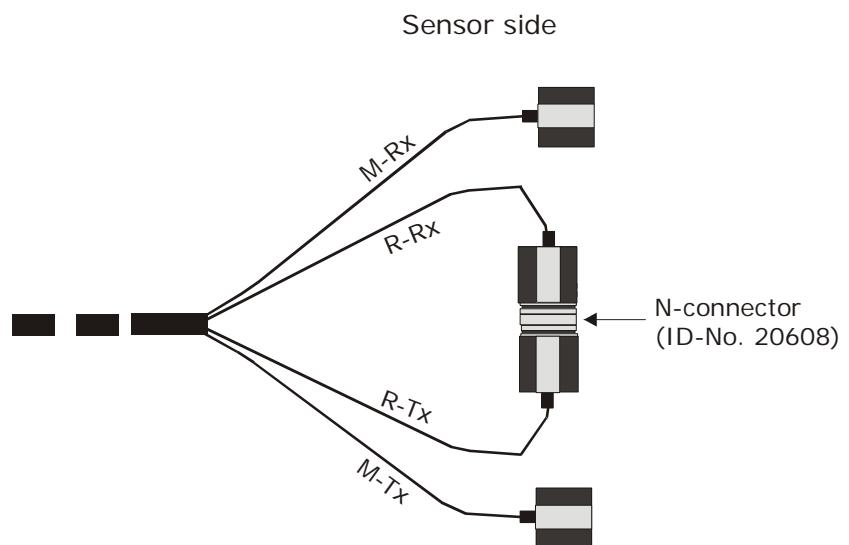


Figure 3-17:
HF-cable quad, at the
side of the probe

Figure 3-17: The ends of the reference cable R-Rx and R-Tx are short-circuited with an N-connector.

For further technical data see chapter 6.3 Technical Data HF-Cable.

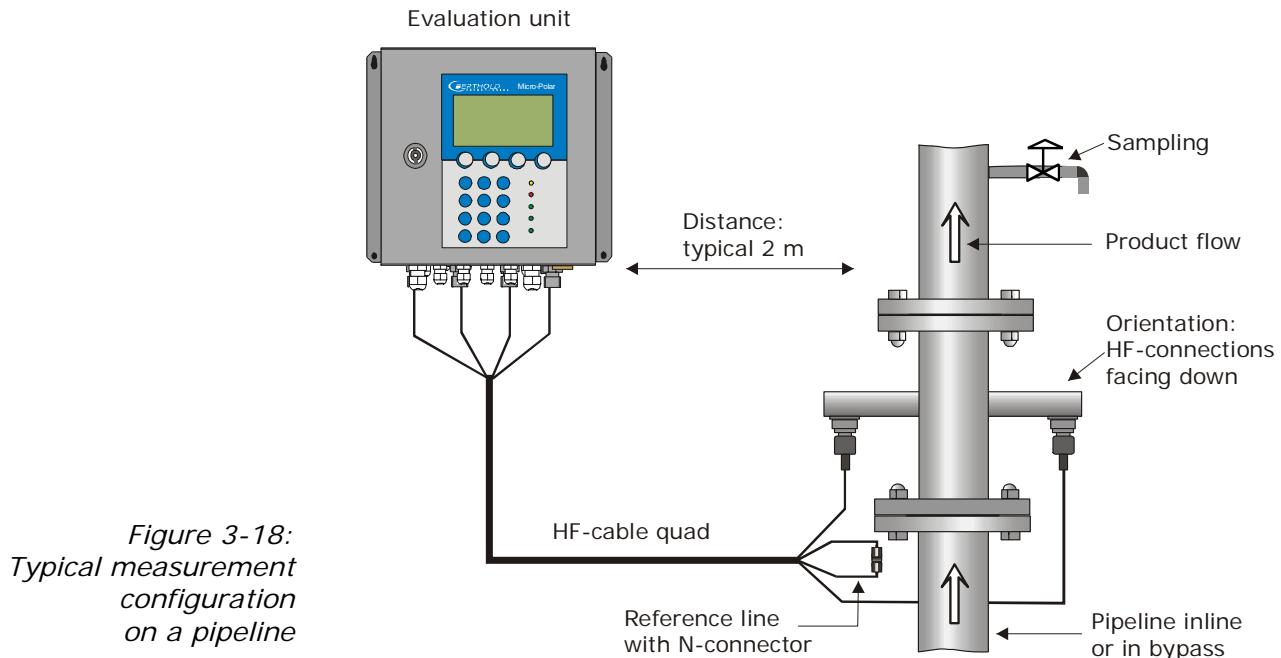
3.5 Pipeline Measurement Configuration

The evaluation unit is installed in the immediate vicinity of the container probe to keep the HF-cable between evaluation unit and probe fairly short. The shorter the cable connection, the better the stability of the measurement. The standard length is 2 m and the maximum length of the HF-cables is 10 m.

The flow cell is installed into the existing pipeline system inline or into a bypass. The orientation of the flow cell may either be vertical or horizontal. To rule out sedimentary depositions, vertical installation in a riser is preferred (see Figure 3-18).

The flow cell should be installed fairly close to the sampling location to ensure representative sampling for calibration.

For possibly required product temperature compensation, a representative temperature signal (current signal or Pt 100) has to be connected to the evaluation unit.

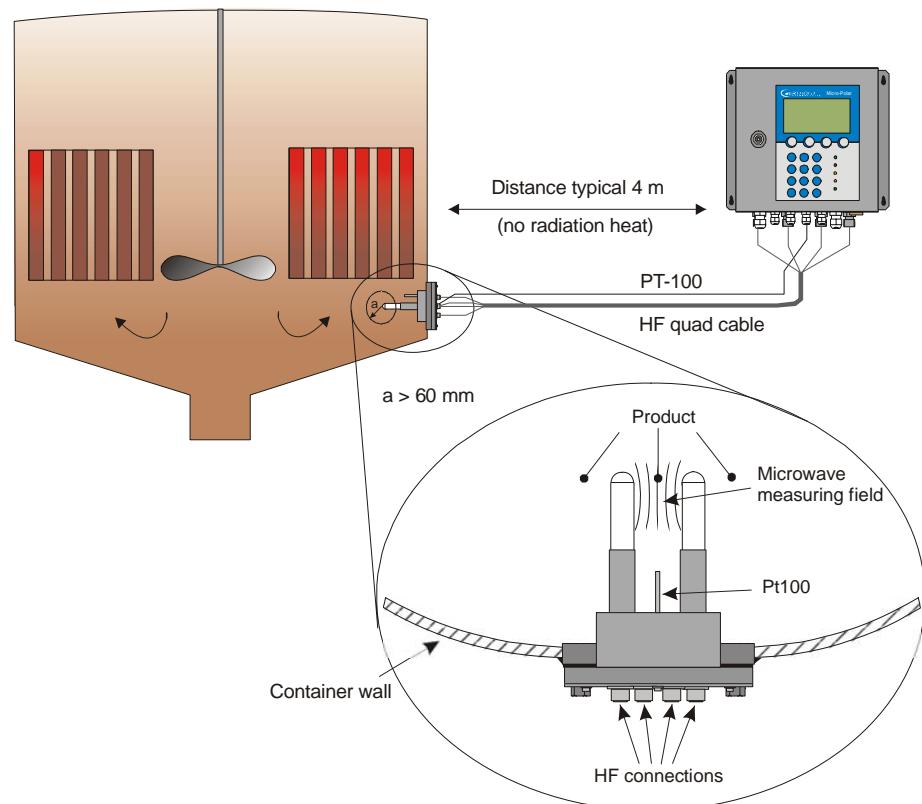


3.6 Container Measurement Configuration

The evaluation unit is installed in the immediate vicinity of the container probe to keep the HF-cable between evaluation unit and probe fairly short. The shorter the cable connection, the better the stability of the measurement. The standard length is 2 or 4 m and the maximum length of the HF-cables is 10 m.

The evaluation unit should be installed fairly close to the sampling location to ensure representative sampling for calibration. A representative temperature signal (current signal or Pt 100) should be connected to the evaluation unit for possibly required product temperature compensation.

Our example below shows the measurement configuration on a discontinuous evaporation crystallizer. The probe is fixed to the container wall such that both measuring rods are immersed into the product.



*Figure 3-19:
Typical system
configuration on a
evaporation
crystallizer*

Chapter 4. Getting Started

4.1 Transport to the Installation Site



Risk of damage!

System parts may get damaged during transportation!

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

Especially the plastic rods of the container 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 Flow Cell Installation

For installation of the flow cell please keep in mind:

- The flow cell is installed into the pipeline system. Keep in mind that material sampling should be possible for calibration directly behind the flow cell.
- The flow cell should be installed in a vertical riser, if possible. It has to be ensured that no material depositions occur on the pipe walls and no bubbles are present in the product. For horizontal installation, please observe the correct orientation of the HF-connections (see Figure 4-2).
- There should be a straight pipe section of at least 200 mm and equal nominal width before and after the flow cell to ensure a fairly homogeneous flow profile and to rule out possibly occurring microwave reflections in the pipeline.

- No gas bubbles should be present in the product. If gas bubbles cannot be ruled out, a pressure of at least 4 bar is required in the pipeline to minimize the influence of gas bubbles. Please observe the max. permissible working pressure (see chapter 6.2 Technical Data Sensors)
- The high-frequency cable should preferably be connected to the flow cell from below to prevent inflowing water from getting to the connecting sockets.
- Measuring and reference cable should follow the same path as much as possible to make sure both cables are exposed to the same temperature and do not get in touch with warm pipelines. We recommend installing the HF-cable through a common cable protection. If you are working with the HF-cables quad and quad 2-port, this function is taken over by the corrugated tube.

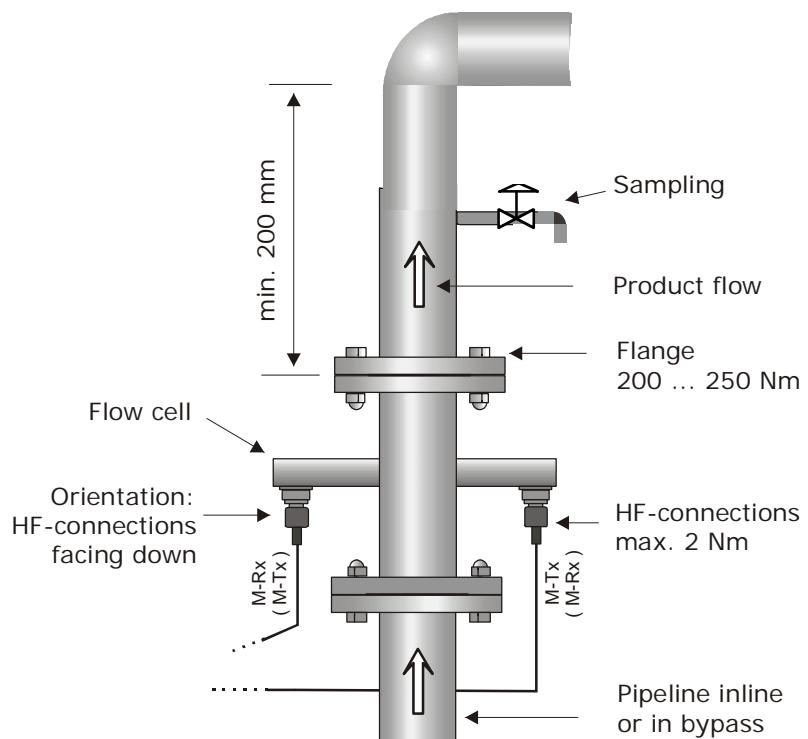
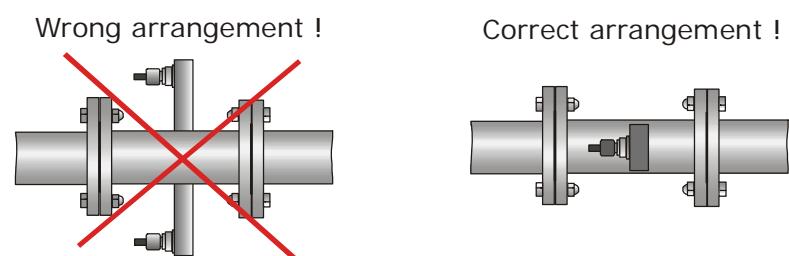


Figure 4-1:
Installation in a
vertical riser

Figure 4-2:
Horizontal installation:
orientation of
HF-connections



4.2.2 Container Probe Installation

For installation, please keep in mind:

- Select the installation site such that good mixing and a homogeneous product are ensured and no bubbles are present in the probe. 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. That means the fork (both measuring rods) has to be installed at an angle of 90° to the material flow.
- The distance between the measuring rod tips and any metalized walls (heating elements, stirrer, container wall) should be at least **60 mm**.
- The following **installation hole sizes in the fitting flange** are required for installation of the probe:

Flange	Minimum installation hole size Ø (mm)
DN 65 / PN 6	100 ± 0.2
others	102 ± 0.5

- For further installation dimensions please refer to chapter 8 (see installation sheets).
- Use the respective flat gasket (standard accessory) to compensate for minor surface tolerances in the fitting flange.

Installation on Process Containers

Figure 3-19 shows the position of the container probe on the container. This position is also valid for the container flush probe.

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

Installation in Pipelines

The container probes can be installed in pipelines with a nominal width ≥ 200 mm using an adapter flange. Please observe the position and orientation of the container probe (see the technical drawings in chapters 8.4.7 and 8.5.6 Installation Situation in Pipelines).

Connection of the flushing pipes

The container probe with flushing device consists of two flushing devices with a 3/8 inch inner thread (DIN ISO 228-1). The flushing connections are subsequently sealed to this thread. A sealing to the probe cover is not permitted, for example with silicone.

Flush Parameters (only for container flush probe)

The degree of deposition or incrustation is essential for the flush parameters, i.e. flush frequency and duration. The flush parameters have to be adapted to the product and the process.

The following independent flushing parameters for products and processes have to be observed:

Flush solution	water, condensation
Temperature of flush solution	Maximum 120 °C
Pressure	≥ 3 bar, max. 8 bar
Fittings	2 x 3/8 inch female screw thread (DIN ISO 228-1)
Supply pipe	≥ 1/2 inch

Independent flushing parameters product and process, **typical starting rates**:

Interval	every 2 hours
Duration	12 seconds
Temperature of flush solution	average product temperature, mostly 65 ±5°C

For measurements on the C-product the flushing intervals can be considerably reduced, e.g. every 6 hours for 30 seconds.

The following is generally valid: the flushing devices can be flushed simultaneously or in shifts. The flushing parameters are valid for every flushing device.



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

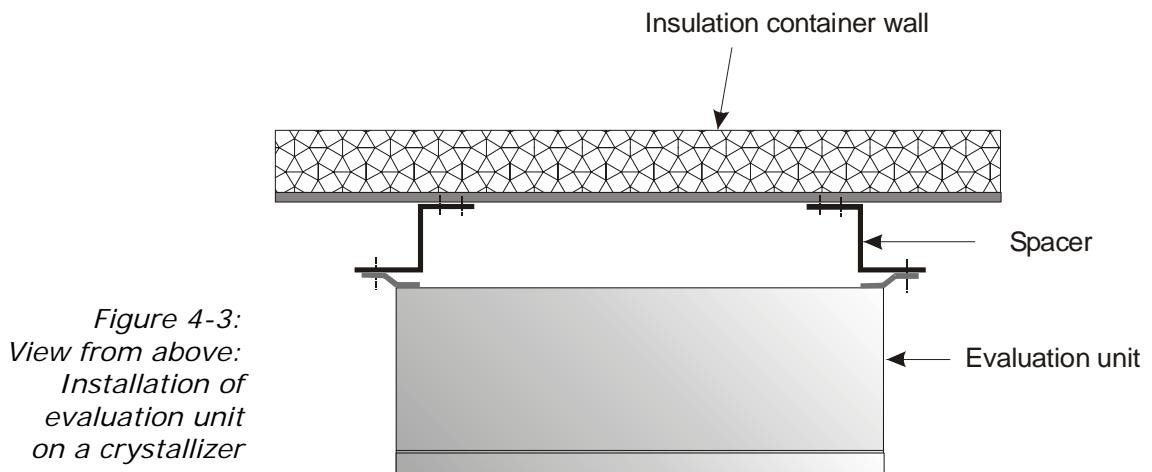
Amount of water

The amount of water per flushing connector is approx. 0.8 l/sec at a flushing pressure of 5 bars.

4.2.3 Installing the Evaluation Unit

For installation of the evaluation unit, please keep in mind:

- Install the evaluation unit in the vicinity of the microwave probe, keeping in mind the length of the HF cable. HF cables are available in a length of 2, 4, 6 and 10 m; the standard cable length are 2 or 4 m.
- Protect the instrument against vibrations.
- For instrument installation you should foresee a cutoff device to allow easy and quick disconnection of the device from the power supply.
- When installing the evaluation unit on a crystallizer, use a distance rail to minimize thermal radiation and heat conduction. See Figure 4-3.
- When the evaluation unit is set-up outdoors, it has to be protected from direct sunshine and rain for example by means of an adequately large protective roof.



4.3 Connecting the Evaluation Unit

4.3.1 Connecting the HF Cable

You need the following HF quad cable to connect the sensor to the evaluation unit.

For the flow cell

Version1: 1 HF-cable quad with N-connector

Version 2: 2 x solid sheath cable (as signal cable, same length)
1 x solid sheath cable (as reference cable)

For the container probes

1 x HF-cable quad

Prerequisite for a proper measurement is the correct installation of cables! Please keep in mind:



Make sure the cables do 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.

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

Connecting the Flow Cell

Version 1

The HF-cable quad and the HF-connections on the evaluation unit are labeled. Connect the flow cell to the evaluation unit as shown in Figure 4-4 and make sure that you only connect cables with equal labeling. The two connections on the flow cell are not labeled, the allocation of the cable connectors M-Tx and M-Rx is arbitrary. The cable plugs R-Tx and R-Mx are connector to the N-connector (short-circuited).

Version 2

Connect the flow cell to the evaluation unit as shown in Figure 4-5 and make sure that the reference cable (ring line) is connected to R-Tx and R-Mx.

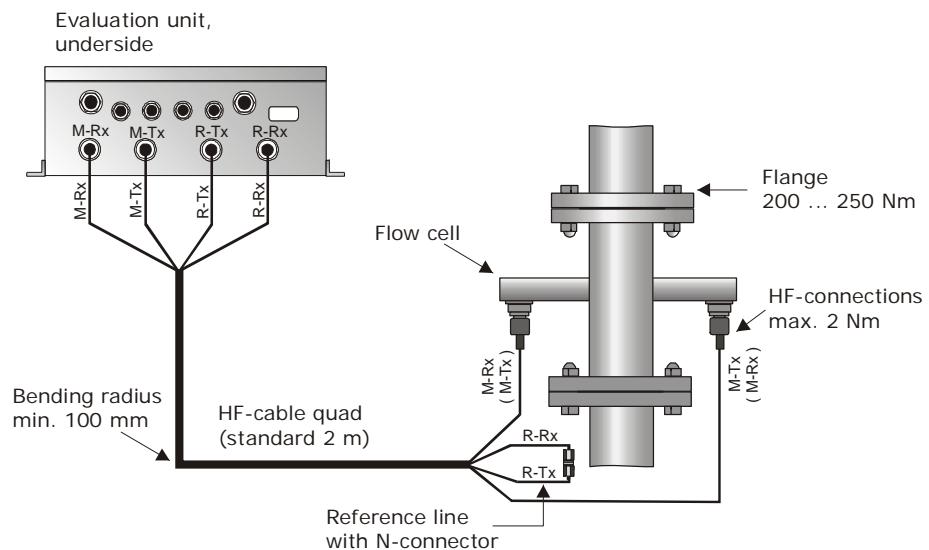


Figure 4-4:
Connection of flow cell
version 1

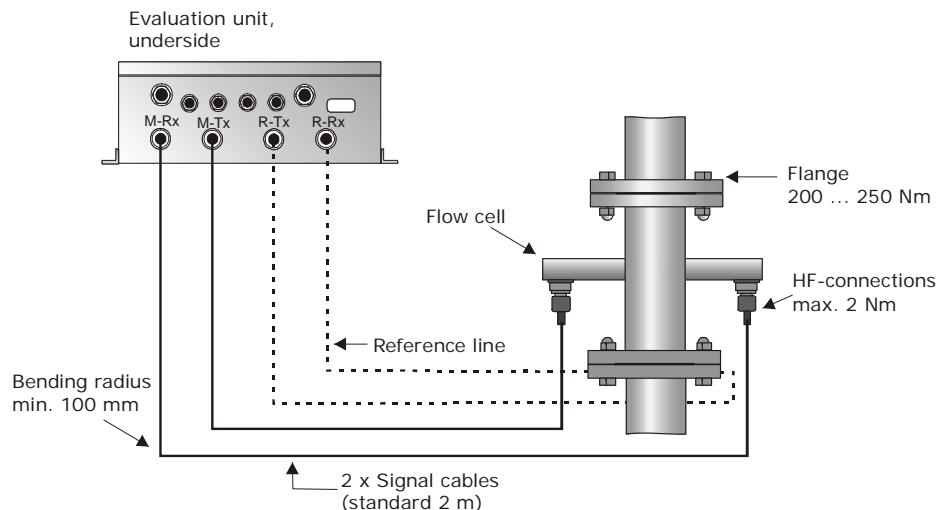
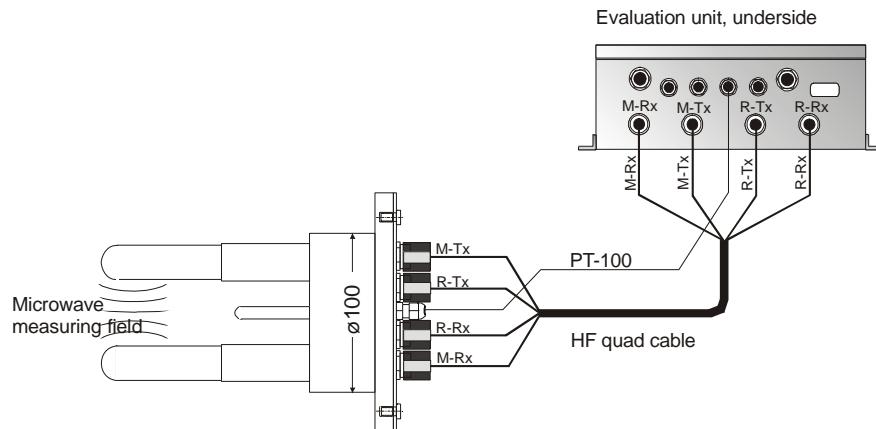


Figure 4-5:
Connection of flow cell
version 2

Connecting the Container Probes

The HF cables and the HF connections on the evaluation unit and on the probe are labeled. Connect the flow cell to the evaluation unit as shown in Figure 4-6, and make sure that you only connect cables with equal labeling.



*Figure 4-6:
Connection of the
container probe to
the evaluation unit*



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.

4.3.2 Pin Configuration of the Connector Strip



Electrical shock hazard:

Disconnect power to rule out any contact with live parts during installation and when servicing.

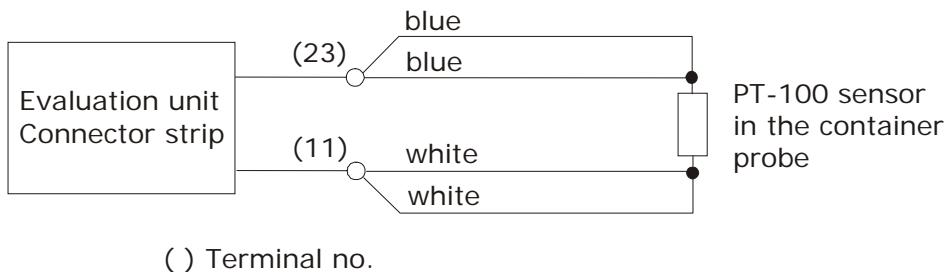
Turn off power supply before opening the instrument. NEVER work on open and live instruments.

Temperature Signal Connection

A Pt 100 or a temperature current signal has to be connected to current input 1 or 2 if 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 container probe into operation, connect the 4-wire cable of the Pt 100 to the connector strip of the evaluation unit as follows:

Figure 4-7:
Pt 100 connection
container probe



Other Connections

- Connect all desired input and output signals to the terminal strip as shown below. Use the M feed-through to maintain 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 5-1).
- Close the instrument housing and turn on the power supply.



Attention! Possible danger, damage to property! Concerns the system type LB 565-12 Micro-Polar Brix ++ (ID no. 51832-02):

When connecting the 24 V DC auxiliary power, the + and – Poles should be connected correctly. There is no reverse voltage protection!

The line cross-section for the power supply must be at least 1.0 mm².

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

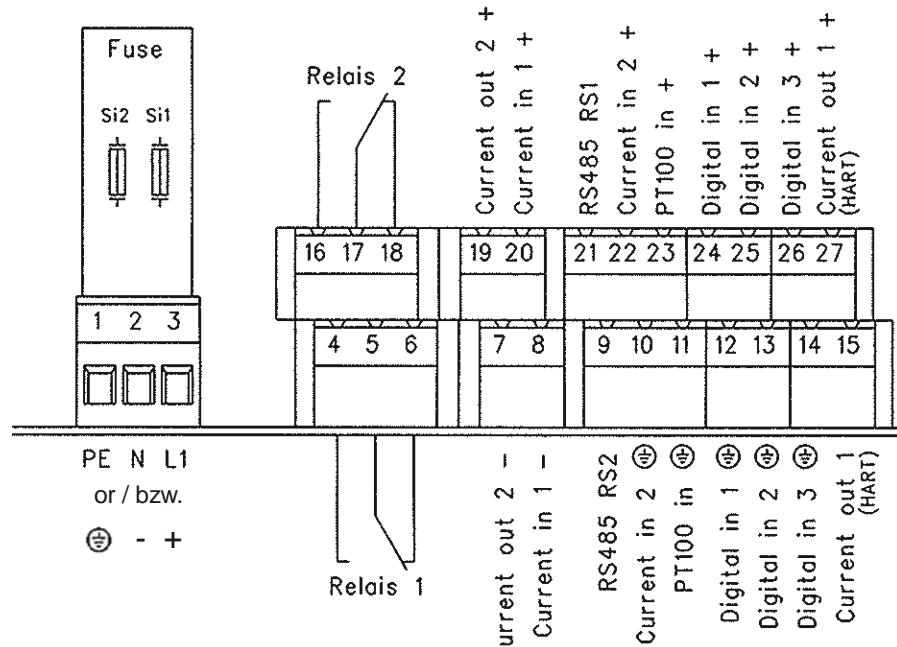


Figure 4-8:
LB 565 wiring diagram

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

For Micro-Polar Brix, depending on instrument version, see type label on the outer wall of the housing.

- 1.) 90 V - 265 V AC, 45 - 65 Hz
- 2.) 24 V DC: 18 ... 36 V

24 V AC: -20%, +5%, 40 ... 440 Hz

For Micro-Polar Brix ++, depending on instrument version, see type label on the outer wall of the housing.

- 1.) 90 V - 265 V AC, 45 - 65 Hz
- 2.) 24 V DC: 18 ... 36 V, no reverse voltage protection

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

Input as 0/4 - 20 mA signal. e.g. for temperature compensation or reference signal recording.

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

Input as 0/4 - 20 mA signal. e.g. 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 Pt 100 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 Pt 100 signal

Pt 100 (terminals 23+ and 11-)

Connection for temperature measurement.

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

Configuration options:

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

Digital input 2: DI 2 (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 (SPDT), insulated, configuration option:

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

Relay 2: (terminals 16, 17 and 18)

Changeover contacts (SPDT), insulated, configuration option:

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

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

Serial data interface for output of live data (all measuring data for every sweep, measuring cycle) the setup protocol and data log.

Data format: 38400 baud, 8 data bits, 1 stop bit, no parity, no handshake.

RS232 interface (on instrument bottom)

9-pole SubD-connector. Serial data interface for output of live data (all measuring data for every sweep, measuring cycle) the setup protocol and data log.

Data format: 38400 baud (Data transfer rate), 8 data bits, 1 stop bit, no parity, no handshake.

4.3.3 Digital Outputs, Relays

The status of the measurement is output via two relays:

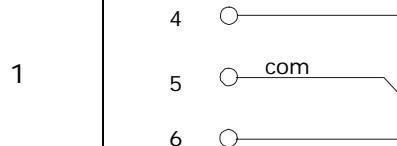
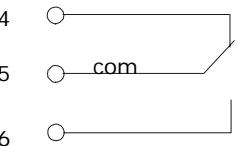
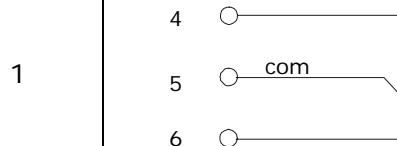
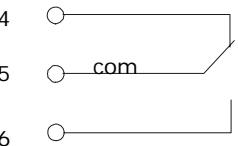
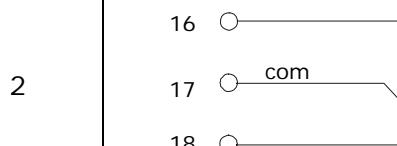
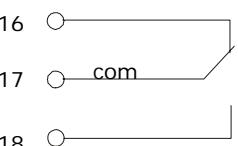
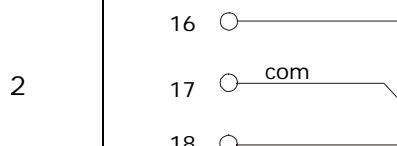
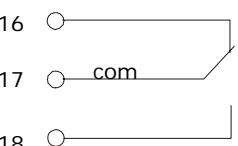
- Error
- Alarm (alarm min. and max.)
- No product

Under menu item Plausibility, you may enter a min. attenuation for pause detection (e.g. for process pause, no product present); if this value is not reached, „no product“ is signaled via a relay and the current output drops to 0 or 4 mA.

A typical application is pause detection between the discontinuous evaporation crystal processes.

- 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, currentless 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.

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 Wearing Parts

The evaluation unit consists of no wearing parts and components that need special attention.

The plastic rods of the container probes and the PTFE lining of the measuring cell can eventually experience abrasion depending on the material being measured. A lower to middle abrasion influences inconsiderably the measurement or is compensated by calibration. Therefore, you should check the wearing parts approximately every 2 years.

The plastic rods of the container probe and the lining of the measuring cell can be exchanged if abrasion is heavy. During excessive wear, the plastic rods of the container probe and the lining of the Flow cells can be exchanged. These container probes and the Flow cells have to be sent back to the company. An on-site exchange is not possible.

5.3 Instrument Cleaning

Clean all system components using a moistened cloth. Do not use any 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 Technical Data Sensors).

5.4 Battery

If the measuring system LB 565 is without power supply (power failure or disconnected from mains), the system clock is supplied with power by 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 type: 3 Volt Lithium cell (round cell battery), type CR2032.

5.5 Fuse Replacement

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

Use only fuses with correct rating:

For Micro-Polar Brix:

Instrument version with 90 ... 265 V AC: 2.0 A slow-blow

Instrument version with 24 V AC/DC: 2.0 A slow-blow

For Micro-Polar Brix ++:

Instrument version with 90 ... 265 V AC: 2.0 A slow-blow

Instrument version with 24 V DC: 6.3 A slow-blow



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

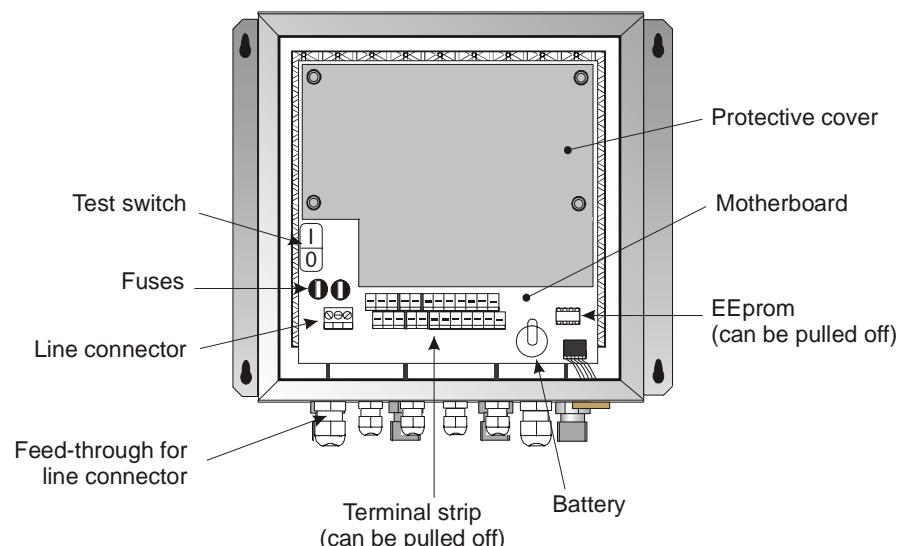


Figure 5-1:
Look inside the
instrument Micro-Polar

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	Micro-Polar Brix: < 0.1 mW (< -10 dBm) Micro-Polar Brix ++: < 10 mW (< 10 dBm) All coaxial line power
Applications	Concentration measurement in containers and pipes

6.1 Evaluation Unit

Evaluation Unit	
Housing	Wall housing made of stainless steel, material 1.4571 (~316+Ti), see dimensional drawing in chapter 8. Micro-Polar Brix: HxWxD: 300 x 323 x 140 mm Micro-Polar Brix ++: HxWxD: 400 x 338 x 170 mm
Protection type	IP 65
Weight	Micro-Polar Brix: approx. 6.5 kg Micro-Polar Brix ++: approx. 8.0 kg
Operating temperature	-20 ... +60°C (253 ... 333 K), no condensation
Storage temperature	-20 ... +80°C (253 ... 353 K), no condensation
Achievable accuracy	≤ 0.2 weight % (standard deviation) depending on product and sensor
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 four softkeys (software-assigned buttons)
Power supply	For Micro-Polar Brix depending on instrument version: 1.) 90 ... 265 V AC, 45 ... 65 Hz or 2.) 24 V DC: 18 ... 36 V 24 V AC: +5%, -20%, 40 ... 440 Hz For Micro-Polar Brix ++ depending on instrument version: 1.) 90 ... 265 V AC, 45 ... 65 Hz or 2.) 24 V DC: 18 ... 36 V, no reverse voltage protection

Power consumption	Micro-Polar Brix: max. 30 VA (AC/DC), depending on configuration Micro-Polar Brix ++: max. (48/60) VA (AC/DC), depending on configuration
Fuses	For Micro-Polar Brix: 2 x 2.0 A / slow-blow For Micro-Polar Brix ++: 2 x 2.0 A / slow-blow for 90 ... 265 V AC or 2 x 6.3 A / slow-blow for 24 V DC
Battery type	3 V Lithium button cell, type CR2032
Measured value	e.g. concentration, dry content
Communication	Prepared for HART®
Inputs and Outputs	
Cable cross-section	min. 1.0 mm ² (mains supply)
Cable feed-through	2 x M20x1.5 for cable 5...14 mm (depending on application) 4 x M16x1.5 for cable 5 ...8 mm (depending on application)
Sensor connection	Inputs and outputs for signal and reference channel, 50 Ω N-socket
HF-cable	Cable lengths: 2, 4, 6 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 ... +200°C (223 ... 473 K); measurement tolerance: < 0.4°C

Digital input	<p>3 x digital inputs (DI1..3), for floating connectors</p> <p><u>Configuration options:</u></p> <p>DI1: none, measurement start/stop DI2: none, measurement hold, product selection DI3: none, sampling, product selection</p> <p><u>Function description:</u></p> <ol style="list-style-type: none"> 1. Measurement (Start/Stop) <u>open</u>: measurement stopped <u>closed</u>: measurement started or measurement running 2. Hold measurement <u>open</u>: measurement running <u>closed</u>: measurement stopped, i.e. average values and current output are held 3. Product selection <u>open</u>: product 1 (P1) <u>closed</u>: P2; with two DI's: <u>DI2 open & DI3 open</u>: P1, <u>DI2 closed & DI3 open</u>: P2, <u>DI2 open & DI3 closed</u>: P3, <u>DI2 closed & DI3 closed</u>: P4 4. Start sampling <u>open</u>: no actions <u>closed</u>: single measurement starts
Relay outputs	<p>2 x relays (SPDT), insulated</p> <p><u>Configuration options:</u></p> <ul style="list-style-type: none"> - Collective failure message - Stop measurement - Limit value (alarm min. and max.) - No product <p><u>Load capacity:</u></p> <p>AC: max. 400VA DC: max. 90W AC / DC: max. 250V, max. 2A, non-inductive $\geq 150V$: voltage must be grounded</p> <p><u>Restrictions for 24 V AC/DC (DC: 18 ..36 V; AC: 24 V +5 %, -20 %) mains supply, if the ground conductor is not connected to terminal 1 (PE):</u></p> <p>AC: max. 50 V DC: max. 70 V</p>
Serial interfaces	<p>RS 232 on the underside of the instrument, RS 485 through terminal block</p> <p>Data type: 38400 baud, no handshake, 8 data bits, 1 stop bit</p>

6.2 Technical Data Sensors

Flow cells	
Application	Microwave flow cell with various nominal widths and flanges for measurement on pipelines
Material	Stainless steel, PTFE lining
Process coupling	Flange according to DIN EN 1092 Type 05 and ASA Optional with threaded or clamp connector
Process pressure	Up to 20 bar (relative), depending on nominal width and flange type, see table below
Temperature range	Product temperature: +10 ... +130°C (283 ... 403 K) Ambient temperature: -20 ... +60°C (253 ... 333 K) Storage temperature: +10 ... +80°C (283 ... 353 K)
Connections	2 x HF connections: N-socket, 50 Ω for HF-cable with max. 10 m length
Versions	Nominal pipe widths from 50 ... 150 mm
Dimensions	See dimensional drawings in chapter 8

Overview flow cells

Designation	ID-No.	Nominal width [mm]	Flange	Pressure [bar]
LB 3543-11 MP	43617	50	DN 50 / PN 16	16
LB 3547-11 MP	43619	65	DN 65 / PN 40	20
LB 3545-11 MP	43620	80	DN 80 / PN 16	16
LB 3544-11 MP	43621	100	DN 100 / PN 6	6
LB 3544-21 MP	53231	100	DN 100 / PN 16	16
LB 3548-11 MP	43622	150	DN 150 / PN 16	16
LB 3543-31 MP	43623	50	ASA 2" / 150 PSI	16
LB 3547-31 MP	43624	65	ASA 2.5" / 300 PSI	20
LB 3545-31 MP	43625	80	ASA 3" / 150 PSI	16
LB 3544-31 MP	43626	100	ASA 4" / 150 PSI	16
LB 3548-31 MP	43627	150	ASA 6" / 150 PSI	16

Container probes	
Application	Container probes with and without flushing device for concentration measurement in process containers and pipelines with nominal width ≥ 200 mm.
Material	Plastic rod, stainless steel 1.4301 PT100 connection cable: Silicon / Teflon
Process coupling	Flange according to DIN EN 1092 Type 05 DN65 / PN6, DN 80, 100, 150 / PN16; ASA flange 2.5", 3" / 150 PSI (others on request)
Process pressure	Up to 16 bar (relative), depending on model
Temperature range	Product temperature: +10 ... +120°C (283 ... 393 K) Ambient temperature: -20 ... +60°C (253 ... 333 K) Storage temperature: +10 ... +80°C (283 ... 353 K)
Connections	4 x HF connections: N-socket, 50 Ω for HF-cable with max. 10 m length
Dimensions	See dimensional drawings in chapter 8
Accessory sealing washer	
Material	Klingsersil C-4400
Thickness	3 mm

Overview container probes and sealing washers

Designation	ID-No.	Flange	Pressure [bar]	ID-No. sealing washer
LB 5650-01	41975-01	DN 65 / PN 6	6	32175
LB 5650-02	41975-02	DN 80 / PN 16	16	33717
LB 5650-03	41975-03	DN 100 / PN 16	16	46661
LB 5650-04	41975-04	DN 150 / PN 16	16	46664
LB 5650-05	41975-05	ASA 2.5" / 150 PSI	16	46665
LB 5650-09	41975-09	ASA 3" / 150 PSI	16	
LB 5651-01	41976-01	DN 65 / PN 6	6	32175
LB 5651-02	41976-02	DN 80 / PN 16	16	33717
LB 5651-03	41976-03	DN 100 / PN 16	16	46661
LB 5651-04	41976-04	DN 150 / PN 16	16	46664
LB 5651-05	41976-05	ASA 2.5" / 150 PSI	16	46665

6.3 Technical Data HF-Cable

HF-Cable Quad	
Material	Corrugated tube: Polyamide (PA6) Cable sheath: Polyethylene (PE)
Protection type	IP 66
Temperature	Operating temperature: -30 ... +70°C (243 ... 343 K) Installation temperature: -20 ... +70°C (253... 343 K)

Solid sheath cable	
Material	Cable sheath: Polyethylene (PE)
Protection type	IP 66
Temperature	Operating temperature: -40 ... +70°C (233 ... 343 K) Installation temperature: -20 ... +70°C (253... 343 K)

6.4 Format of Serial Data Output RS 232 and RS 485

Header

Date·Time→Flags→Status→Product→Att→Phi→R2→Tint→IN1→IN2→Pt 100→C→Cm→C2→C2m¶

Following lines

01.01.2005·00:00:00→0000→0→1→0.43→5.30→0.07→0.0→0.0→0.0→0.0→75.36→75.00→0.00→0.00¶

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Column no.	Description	Format
1	Date and time	DD.MM.YY·HH:MM:SS
2	Flags (for test purposes)	4 digits, HEX
3	Status: Information on quality of last measurement	0 : measurement OK < 0 : error
4	Product number	X (1 to 4)
5	Attenuation [dB]	X.XX
6	Phase [°/GHz]	X.XX
7	Statistical spread of phase regression	X.XX
8	Instrument temperature [temperature unit]	X.X
9	Current input 1 [unit of current input]	X.X
10	Current input 2 [unit of current input]	X.X
11	Pt 100 temperature [temperature unit]	X.X
		[...] by selection of unit g/cm ³
12	Concentration 1 live	X.XX [X.XXXX]
13	Concentration 1 averaged	X.XX [X.XXXX]
14	Concentration 2 live	X.XX [X.XXXX]
15	Concentration 2 averaged	X.XX [X.XXXX]

Special characters

"→" Tabulation

"¶" Carriage return + Line feed

"." Blank character

Chapter 7. Certificates

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 construction 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 products:

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

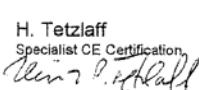
EN 61000-4-11:1994 + A1:2001

This declaration is issued by the manufacturer:

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

by


 Dr. J. Brügmann
 Development Manager
 Process Control


 H. Tetzlaff
 Specialist CE Certification

Bad Wildbad, 05.04.2004

Registergericht / Court of Registration
 Persönlich haftende Gesellschafterin / Fully liable Associates
 Registergericht / Court of Registration
 Geschäftsführung / Management
 Beiratsvorsitzender / Chairman of the Board
 USt-IdNr. / VAT Reg.No
 Deutsche Steuernummer / German Tax No

Calw HRA 991
 BERTHOLD TECHNOLOGIES Verwaltungs-GmbH
 Calw HRB 1520
 Hans J. Oberhofer (Vors./CEO), Dr. Wilfried Reuter
 Dr. Fritz Berthold
 DE813050511
 49038/08038

Dresdner Bank 75105 Pforzheim Konto/account no.6 511 120 (BLZ 656 800 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



BERTHOLD TECHNOLOGIES GmbH & Co.KG

Calmbacher Str. 22
75323 Bad Wildbad, GermanyPhone +49 7081 177-0
Fax +49 7081 177-100
info@Berthold.com
www.Berthold.com

EC-Declaration of Conformity

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

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

Description: **Concentration-Measuring Systems
Micro-Polar Brix ++**

Type: **LB 565-XX**

EC-Regulation and Reviews		considered Norms	
EMC	2004/108/EG	EN 55011	1998 +A1:1999 +A2:2002
Low Voltage Directive	73/23/EWG	EN 61326-1	2006-05
R&TTE	1999/5/EC	EN 61000-4-2	1995 +A1:1998 +A2:2001
		EN 61000-4-3	2006-12
		EN 61000-4-4	2004
		EN 61000-4-5	1995 +A1:2001
		EN 61000-4-6	1996 +A1:2001
		EN 61000-4-11	1994-08 +A1:2001-02
		Namur NE21	2004
	93/68/EWG	EN 61010 Part 1	2002-08
		ETSI EN 300 440-1	2007-08
		ETSI EN 300 440-2	2007-08

This declaration is issued by the manufacturer

BERTHOLD TECHNOLOGIES GmbH & Co. KG
Calmbacher Str. 22
75323 Bad Wildbad, Germany

updated by



Dr. Wilfried Reuter
Technical Director
Bad Wildbad, 06.06.2008

Registergericht / Court of Registration
Persönlich haftende Gesellschafterin / Fully liable Associates
Registergericht / Court of Registration
Geschäftsführung / Management
Beiratsvorsitzender / Chairman of the Board
USt-Id-Nr. / VAT Reg. No.
Deutsche Steuernummer / German Tax No.
WEE-Reg. No.

Stuttgart HRA 330991
BERTHOLD TECHNOLOGIES Verwaltungs-GmbH
Stuttgart HRB 331520
Hans J. Oberhofer, Dr. Wilfried Reuter
Dr. Fritz Berthold
DE813050511
49038/08038
DE99468690

Dresdner Bank 75105 Pforzheim Konto/Account No. 6 511 120 (BLZ 666 800 13) /SWIFT-BIC DRES DEFF 666 IBAN: DE05 6668 0013 0651 1120 00
Sparkasse PF-CW 75323 Bad Wildbad Konto/Account No. 80 450 03 (BLZ 666 500 85) /SWIFT-BIC PZHSD66 IBAN: DE37 6665 0085 0008 0450 03

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



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:

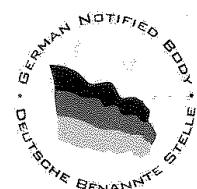
Specification	Test report no. & date	Name of test laboratory	Notes
EN 55011:1998+A1:1999 (class A)	2003-731-1182-REN dated Sept. 9, 2003	ELMAC GmbH	conform
EN 61000-6-2:2001			
EN 300 440-1 V1.3.1 (2001-09)	2-3389-01-01/03 dated May 14, 2004	CETECOM ICT	conform
EN 300 440-2 V1.1.1 (2001-09)			

Statement **This equipment fulfils the requirements or parts thereof in the above mentioned 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



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

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



Conformity Assessment Body
Certification Body at Industry Canada

CERTIFICATE OF CONFORMITY

Certificate Holder:	Berthold Technologies GmbH & Co KG Calmbacher Str. 22 D-75323 Bad Wildbad Germany
Model Identification:	LB 565, LB 566, LB465 and LB 466
Equipment Category:	Concentration Measuring System
Standards and Specifications:	RSS210 Issue 6
Equipment Category:	Field Disturbance Sensor
OATS Facility:	Cetecom ICT Services GmbH Untertuerkheimer Str. 6-10 66117 Saarbruecken Germany
OATS Facility ID:	3463
IC Certification Number:	4777A-IC01X01
Frequency Range:	2441 MHz
Emission Designator:	15M0P0N
RF Output Rating:	80.8 mV/m @ 3m
Antenna Information:	Horn Antenna LB X60X-XX Flow Cell Sensor LB X54X-XX MP Tank Sensor LB X65X-XX
Cetecom Registration No:	5-5110/05

Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the radio standards specifications and procedures issued by Industry Canada.

This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the radio standards specifications and procedures issued by the Department.

The Bureau will record the details of all certifications in the Department's Radio List (REL). Certified equipment shall not be distributed, leased, sold, offered for sale in Canada before the details of this certification have been added to the REL. URL: <<http://strategis.ic.gc.ca/sitt/reltel/search/newRadioSearch.do?language=eng>>

2005-09-29

Date:

Joachim Seewald

Signature:



Recognized by

IC

CB ID: DE0001

DAR
 Deutscher
 Akkreditierungs
 Rat

TTI-P-G 166/98-30

TCB

**GRANT OF EQUIPMENT
AUTHORIZATION**
Certification
Issued Under the Authority of the
Federal Communications Commission
By:

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6-10
D-66117 Saarbruecken,
Germany

Date of Grant: 09/23/2005

Application Dated: 09/23/2005

Berthold Technologies
Calmbacher Str. 22 75323 Bad Wildbad Germany
Bad Wildbad, 75323
Germany

Attention: Wilfried Reuter, Dr.

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE,
and is VALID ONLY for the equipment identified hereon for use under the
Commission's Rules and Regulations listed below.

FCC IDENTIFIER: R9ZFCC01X01

Name of Grantee: Berthold Technologies

Equipment Class: Part 15 Field Disturbance Sensor

Notes: Moisture Measuring System

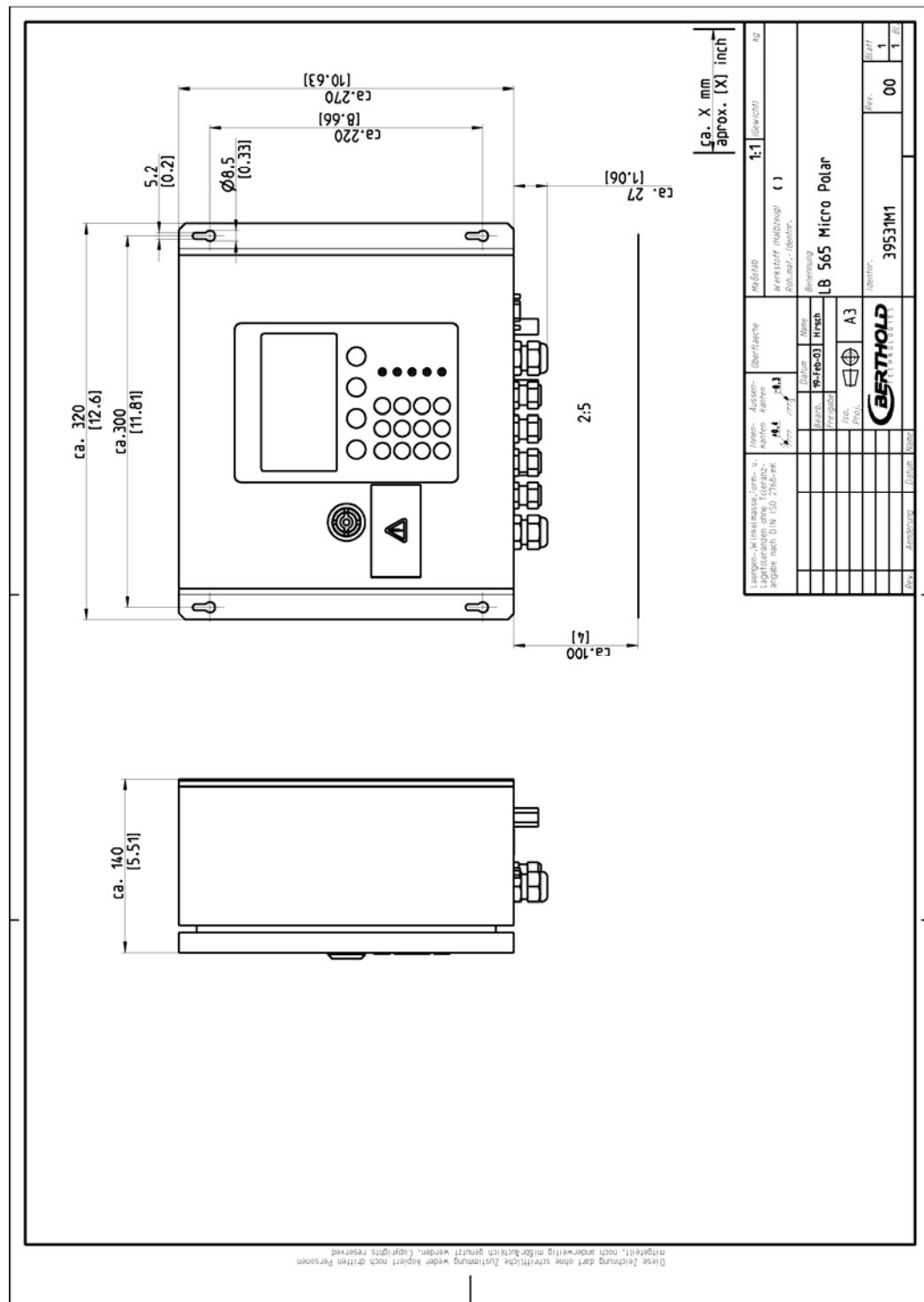
Grant Notes	FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designator
	15.245	2441.0 - 2441.0			



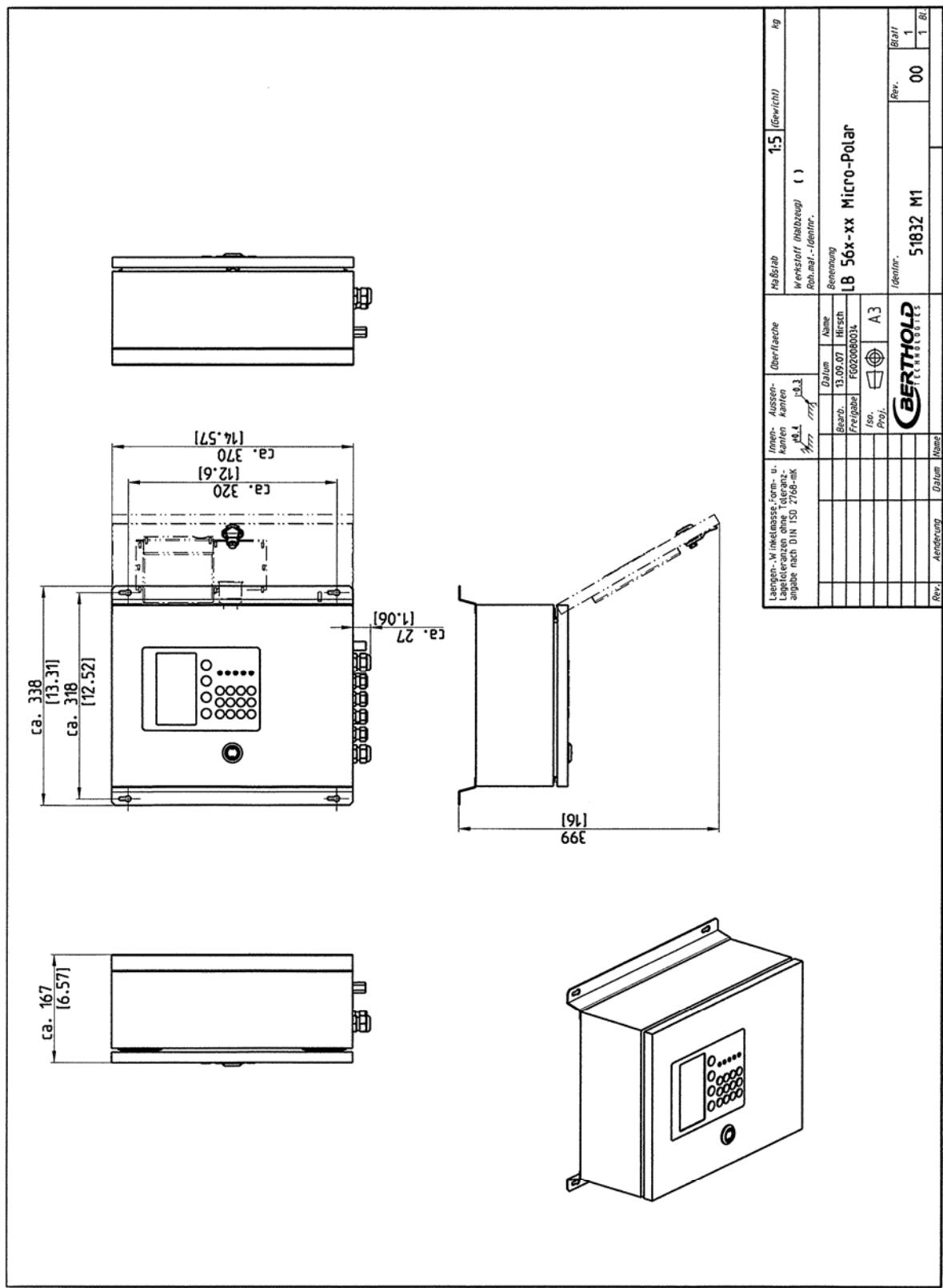
Chapter 8. Technical Drawings

8.1 Dimensional Drawing of Evaluation Unit Housing

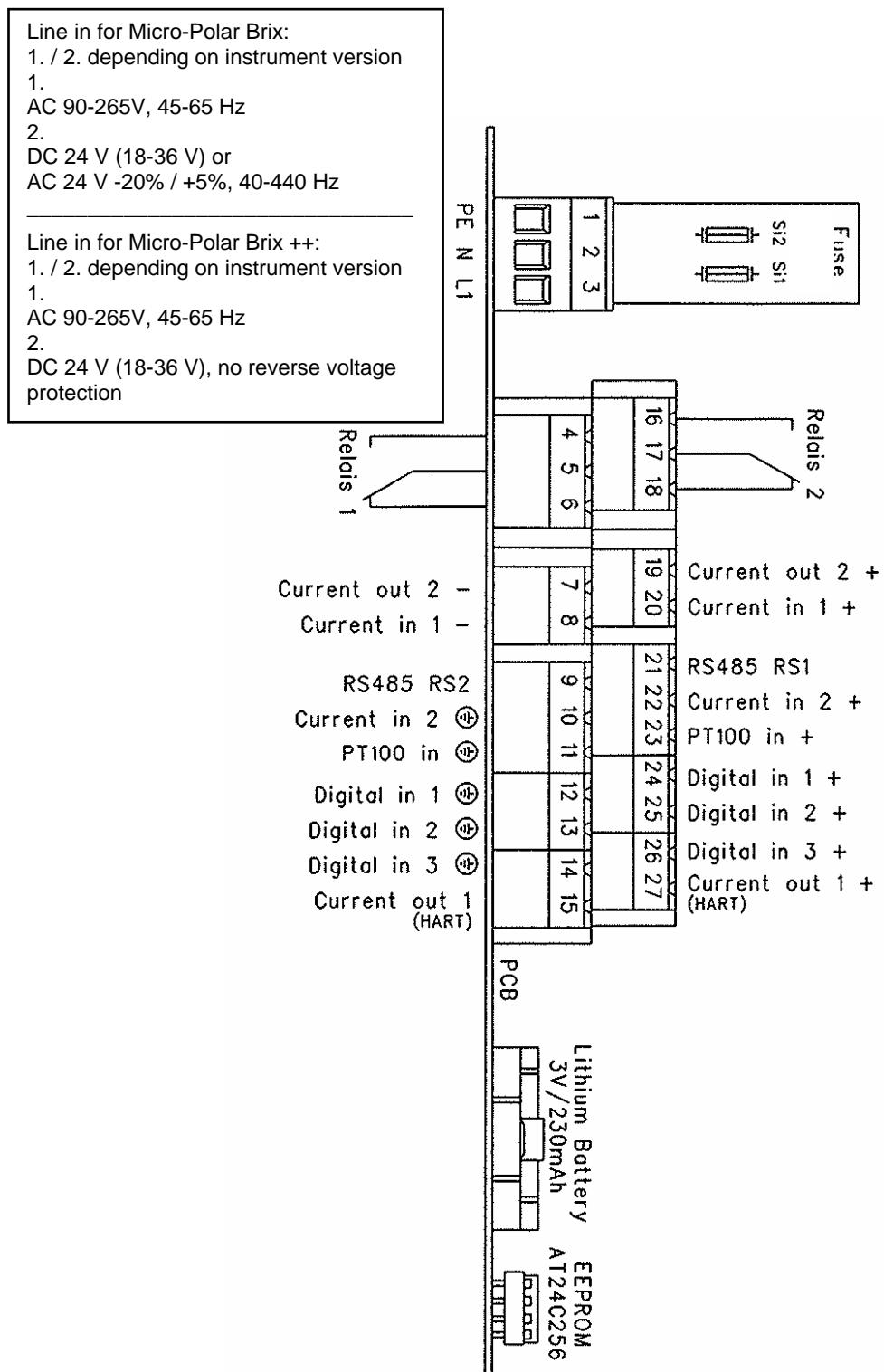
8.1.1 Evaluation Unit from Micro-Polar Brix



8.1.2 Evaluation Unit from Micro-Polar Brix++

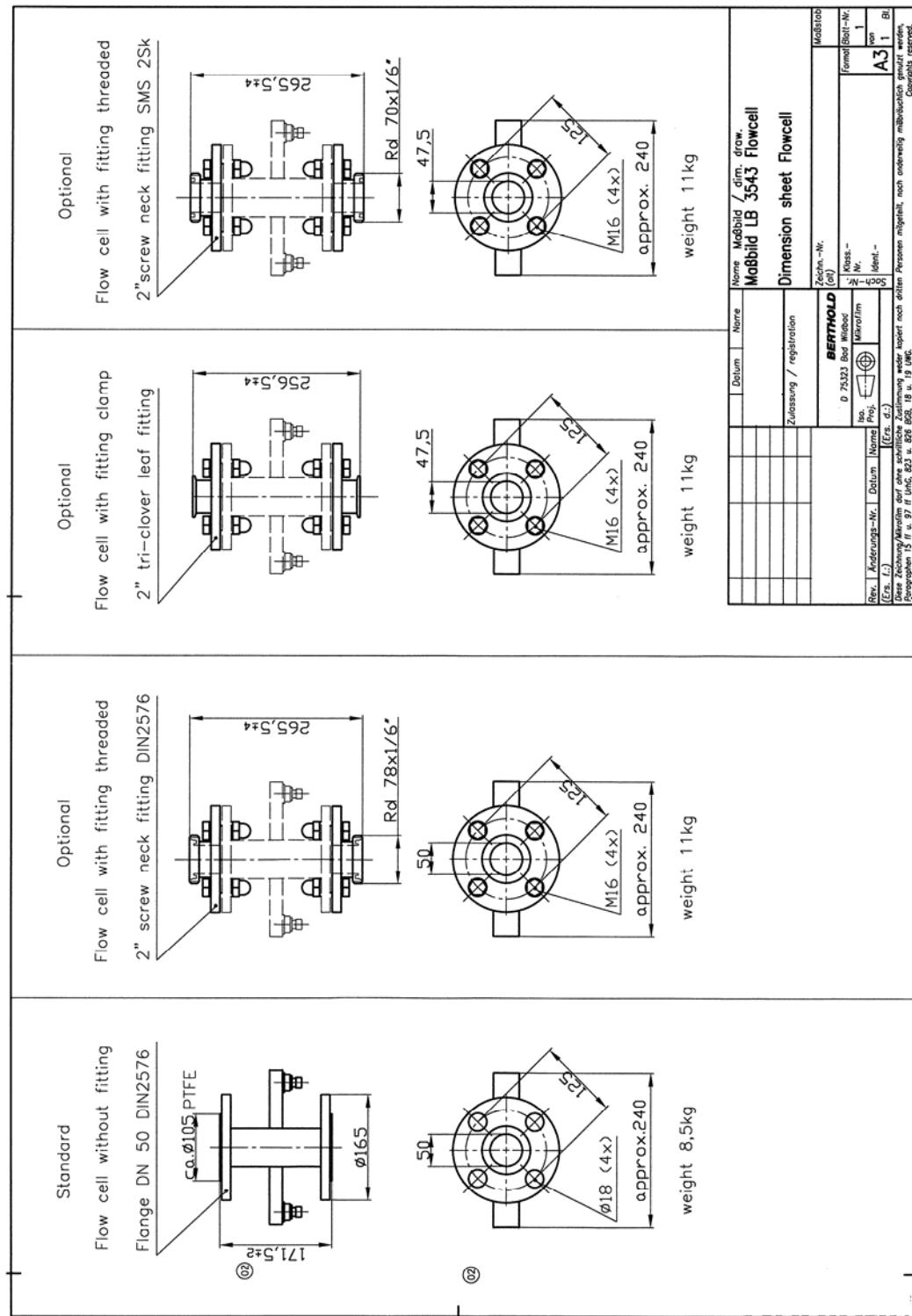


8.2 Electrical Wiring Diagram

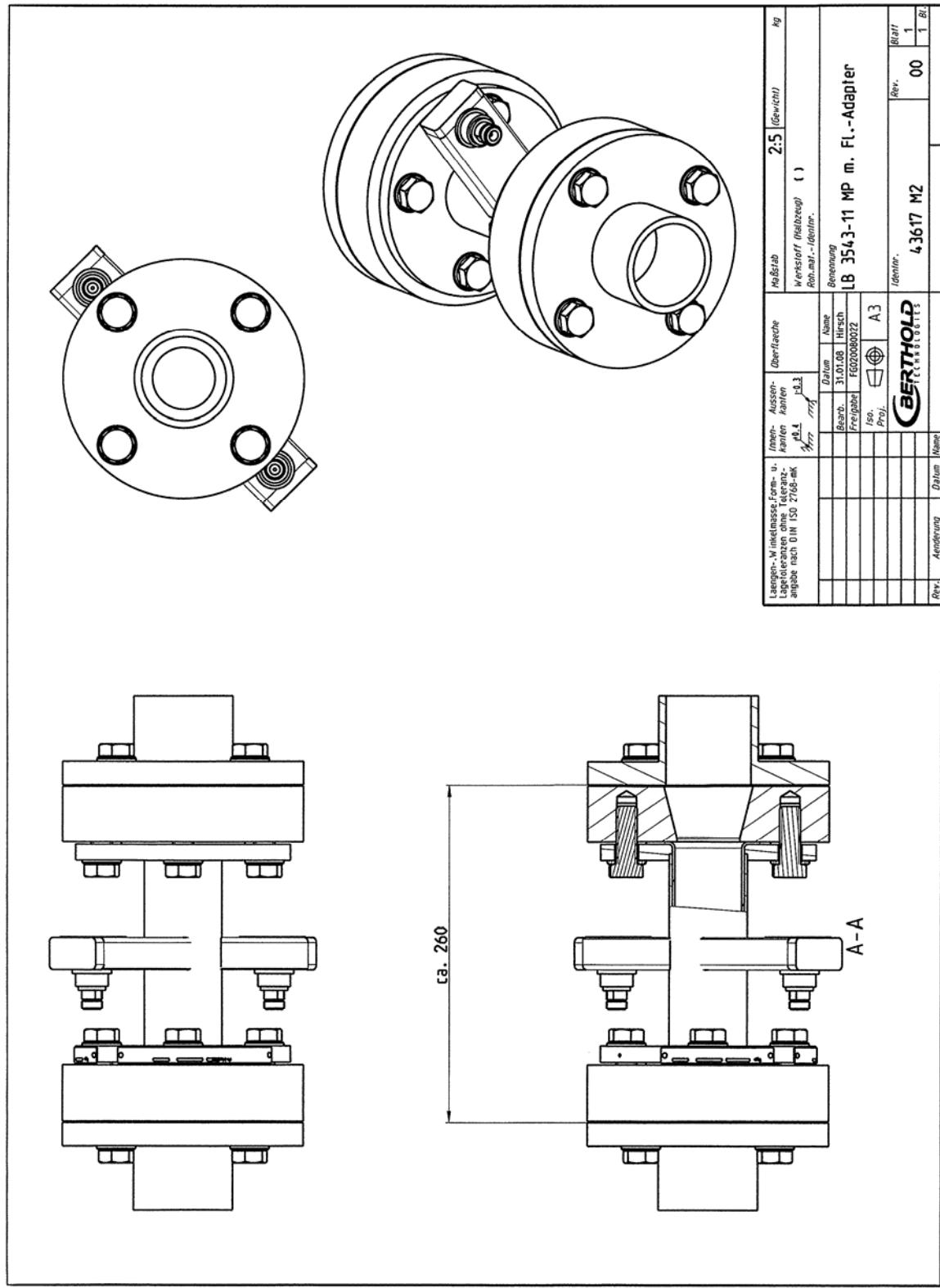


8.3 Dimensional Drawings Flow Cells

8.3.1 Type LB 3543-11 MP, Nominal Width 50 mm, Options

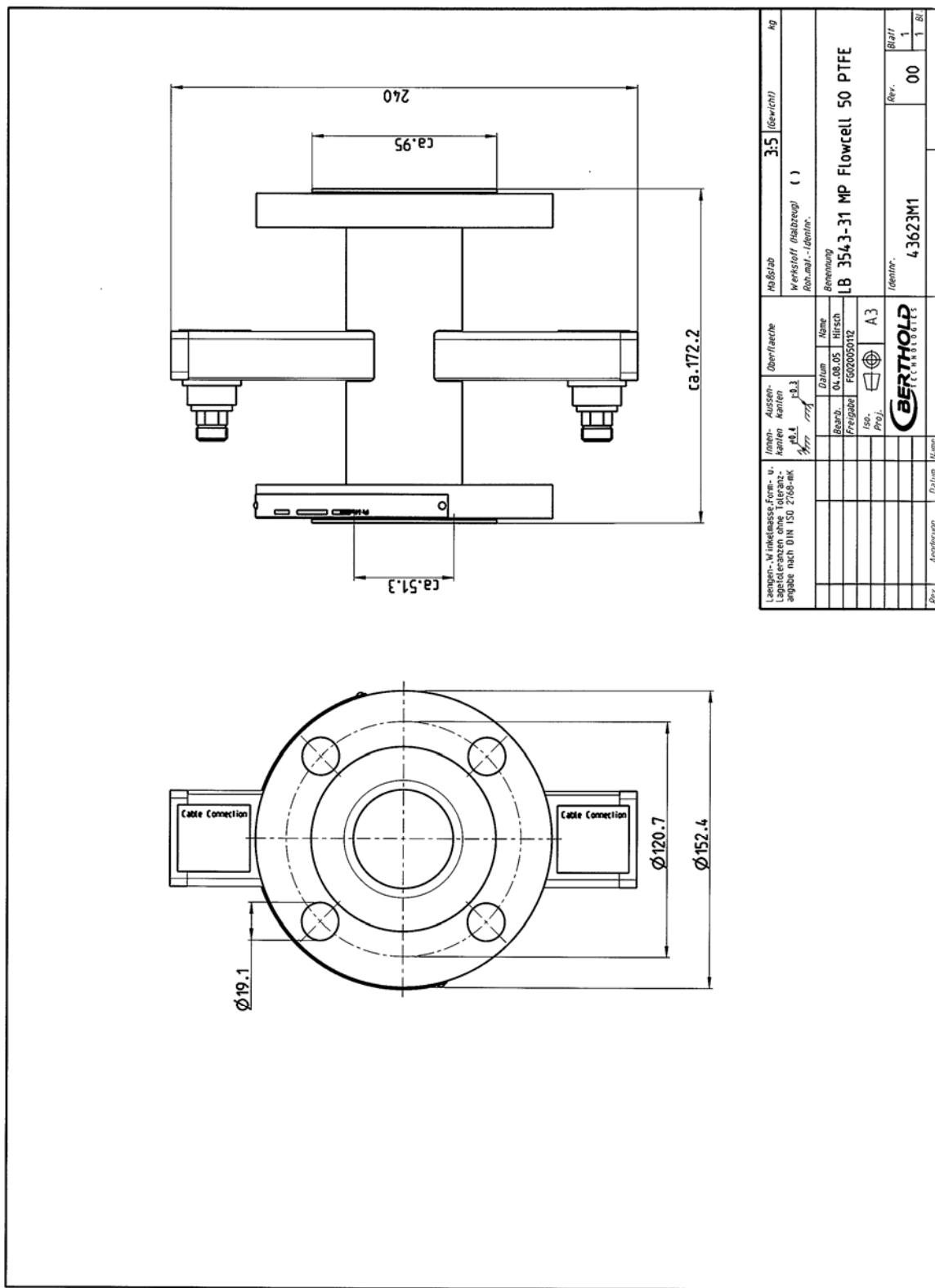


8.3.2 Type LB 3543-11 MP, Nominal Width 50 mm, Adapter



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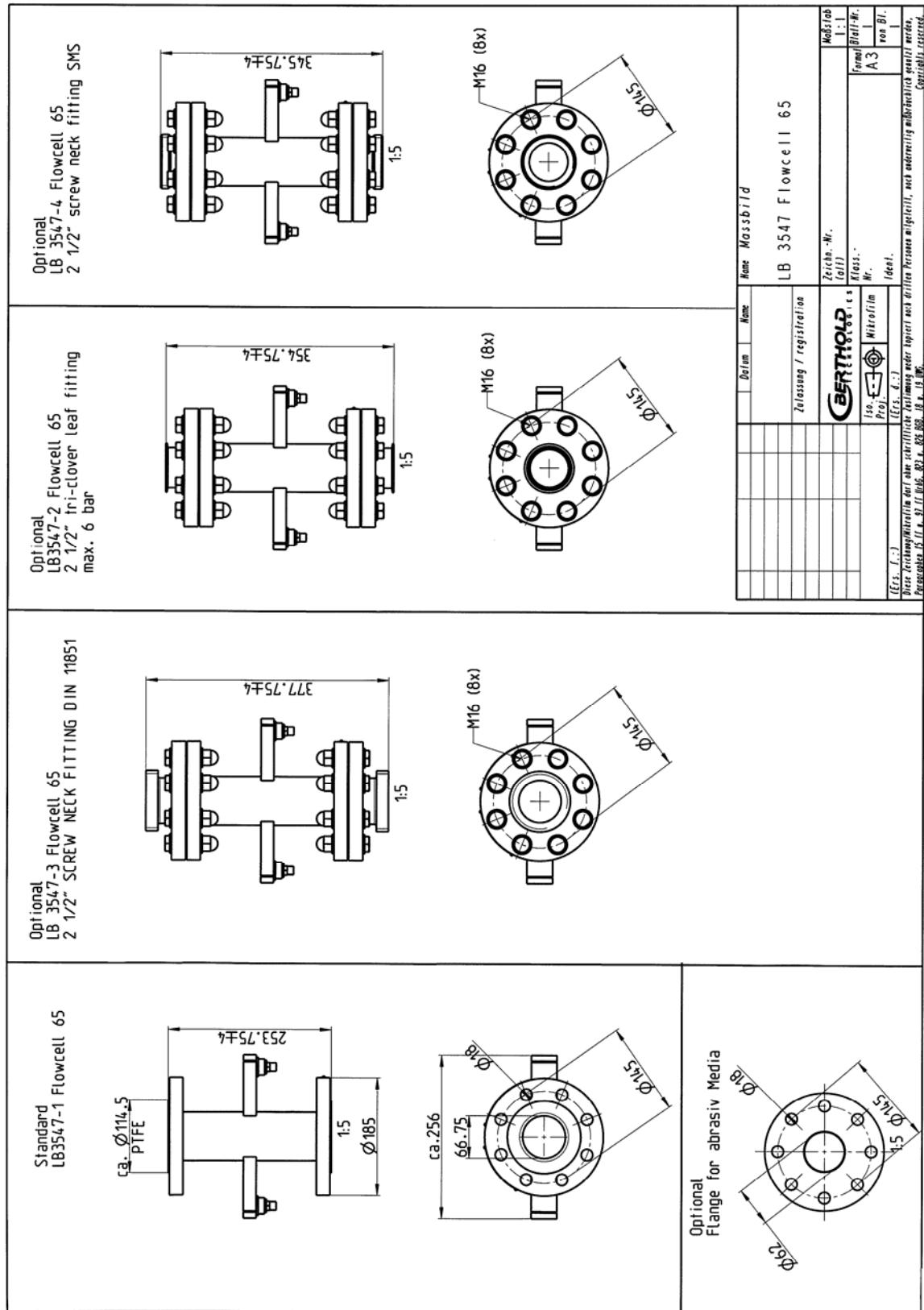
8.3.3 Type LB 3543-31 MP, Nominal Width 50 mm



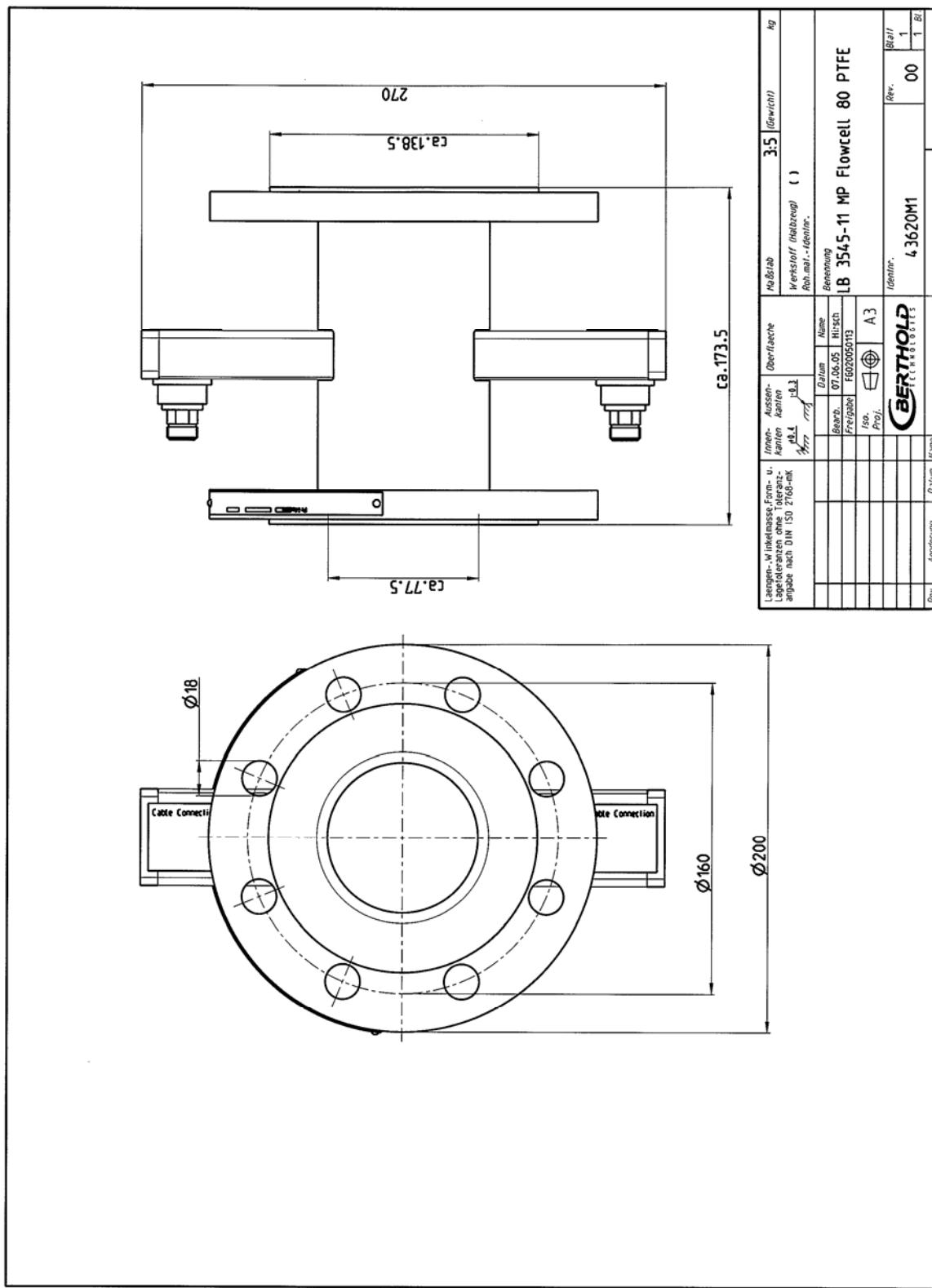
Diese Zeitschriftung darf ohne Schriftliche Zustimmung weder kopiert noch dritten Personen mitgeteilt, noch anderweitig für die Schriftliche genutzt werden. Copyright © 2006

Original

8.3.4 Type LB 3547-11 MP, Nominal Width 65 mm, Options

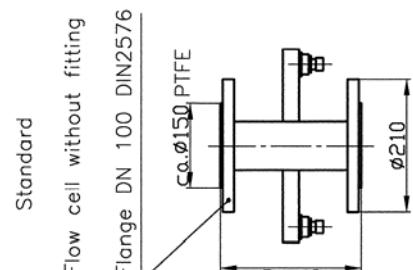
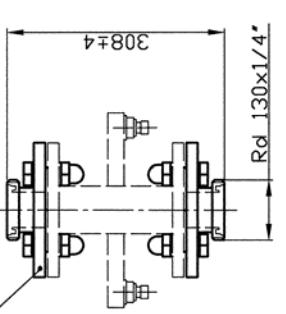
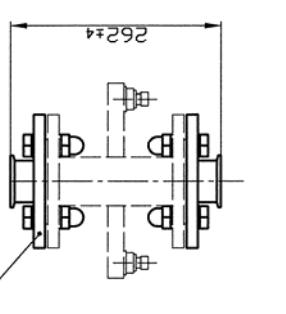
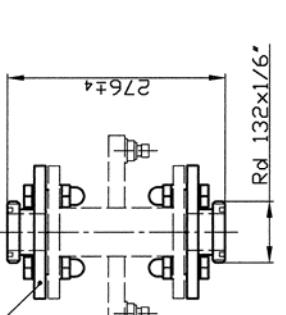
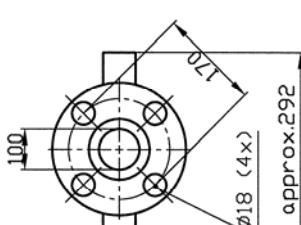
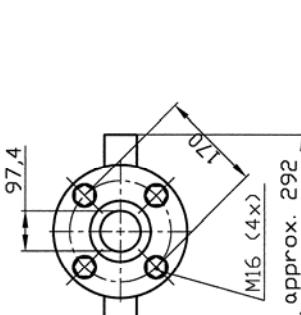
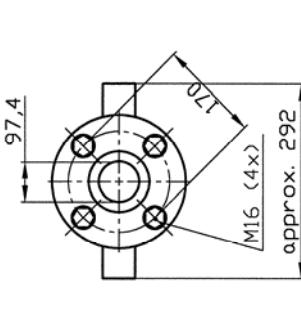
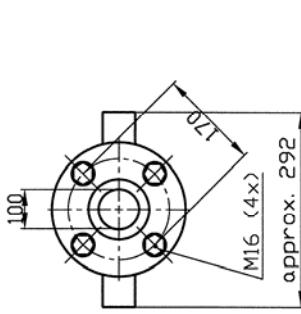


8.3.5 Type LB 3545-11 MP, Nominal Width 80 mm

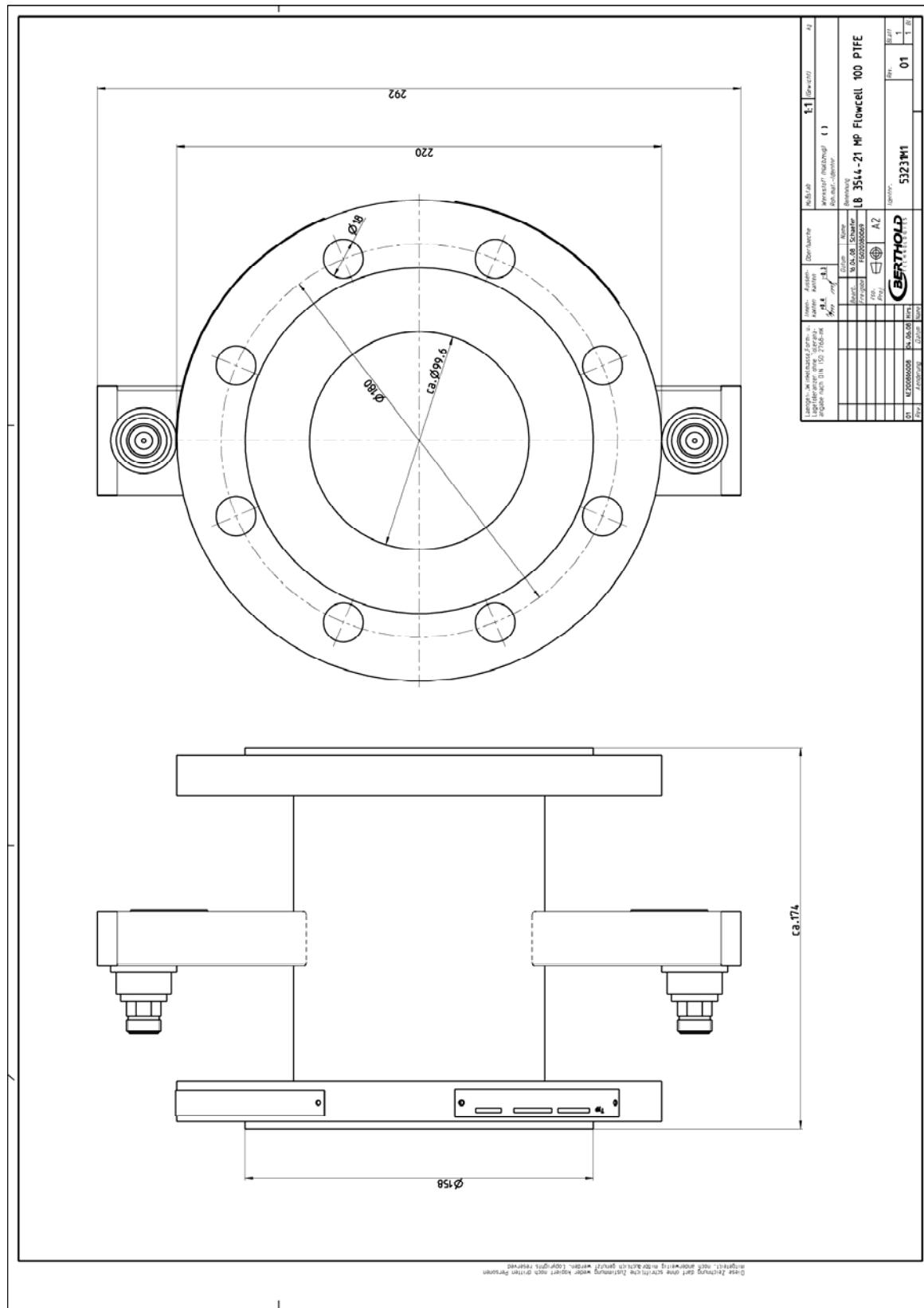


Original

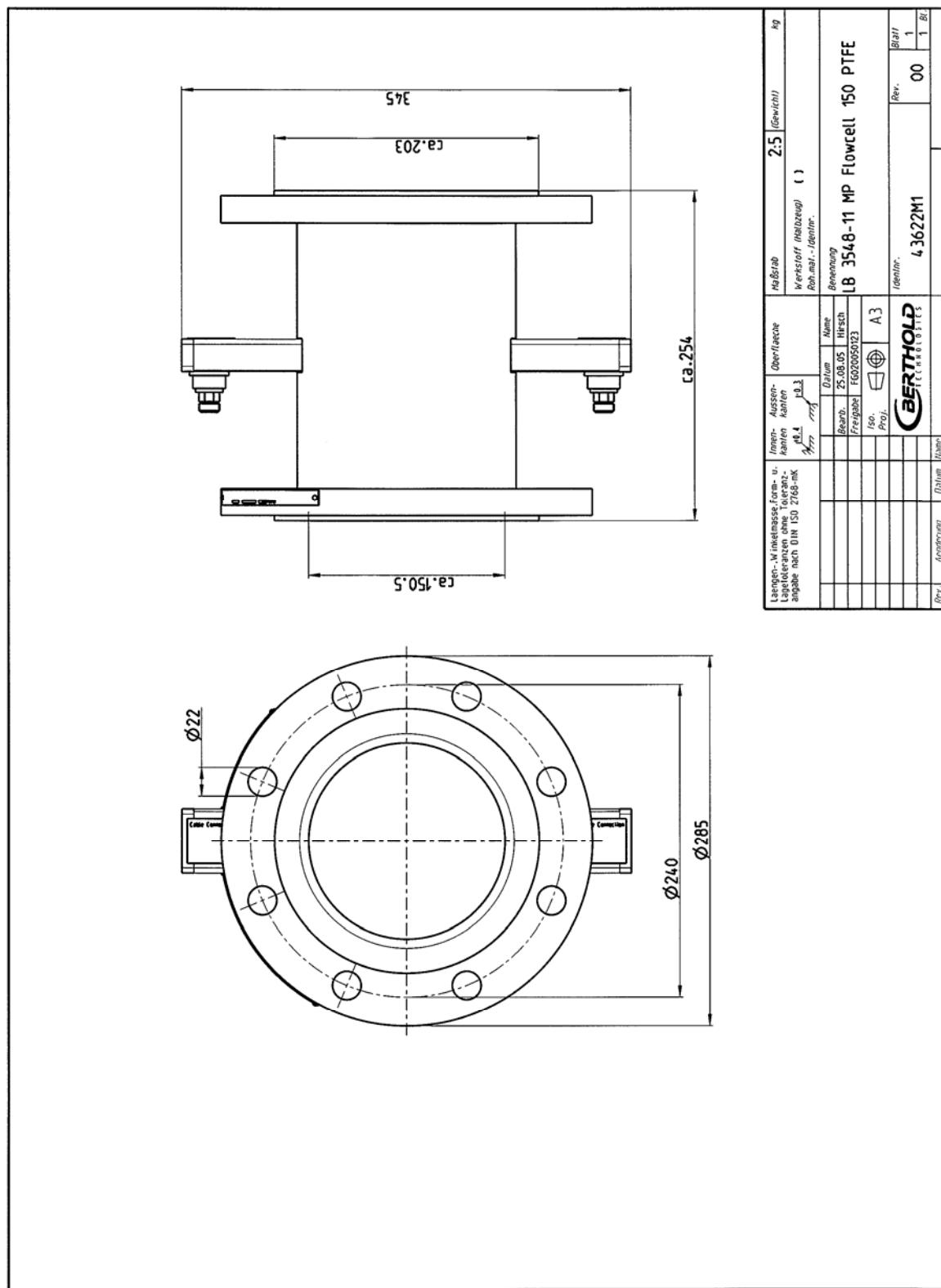
8.3.6 Type LB 3544-11 MP, Nominal Width 100 mm, Options

 <p>Standard Flow cell without fitting Flange DN 100 DIN2576 Φ150 PTFE</p>	 <p>Optional Flow cell with fitting threaded 4" screw neck fitting DIN2576</p>	 <p>Optional Flow cell with fitting clamp 4" tri-clover leaf fitting</p>	 <p>Optional Flow cell with fitting threaded 4" screw neck fitting SMS 25K</p>	 <p>weight 9,5kg</p>																																				
				 <p>weight 19kg</p>																																				
				 <p>weight 19kg</p>																																				
				 <p>weight 19kg</p>																																				
<table border="1"> <tr> <td colspan="2">Zield.-Nr. (al)</td> <td colspan="2">Name MaBild / dim. draw.</td> <td colspan="2">Name Bestell</td> </tr> <tr> <td colspan="2">BERTHOLD</td> <td colspan="2">MaBild LB 3544 Flowcell 100</td> <td colspan="2">Format Blatt-Nr.</td> </tr> <tr> <td colspan="2">Zulassung / registration</td> <td colspan="2">Dimension draw Flowcell 100</td> <td colspan="2">1</td> </tr> <tr> <td>Ref. Änderungs-Nr. (Ers. d.)</td> <td>Datum (Ers. d.)</td> <td>Norm. Proj.</td> <td>Norm. Proz.</td> <td>Ident.-Nr.</td> <td>Bl.</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>505</td> <td>A3</td> </tr> <tr> <td colspan="6">Diese Zeichnung/Makrofilm darf ohne schriftliche Zustimmung weder kopiert noch dritten Personen mitgeteilt, noch anderweitig missbraucht werden. Copyrights 15. II u. 97, II UrhG, 823 u. 826 866, 18 u. 19 UMC.</td> </tr> </table>					Zield.-Nr. (al)		Name MaBild / dim. draw.		Name Bestell		BERTHOLD		MaBild LB 3544 Flowcell 100		Format Blatt-Nr.		Zulassung / registration		Dimension draw Flowcell 100		1		Ref. Änderungs-Nr. (Ers. d.)	Datum (Ers. d.)	Norm. Proj.	Norm. Proz.	Ident.-Nr.	Bl.					505	A3	Diese Zeichnung/Makrofilm darf ohne schriftliche Zustimmung weder kopiert noch dritten Personen mitgeteilt, noch anderweitig missbraucht werden. Copyrights 15. II u. 97, II UrhG, 823 u. 826 866, 18 u. 19 UMC.					
Zield.-Nr. (al)		Name MaBild / dim. draw.		Name Bestell																																				
BERTHOLD		MaBild LB 3544 Flowcell 100		Format Blatt-Nr.																																				
Zulassung / registration		Dimension draw Flowcell 100		1																																				
Ref. Änderungs-Nr. (Ers. d.)	Datum (Ers. d.)	Norm. Proj.	Norm. Proz.	Ident.-Nr.	Bl.																																			
				505	A3																																			
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8.3.7 Type LB 3544-21 MP, Nominal Width 100 mm



8.3.8 Type LB 3548-11 MP, Nominal Width 150 mm

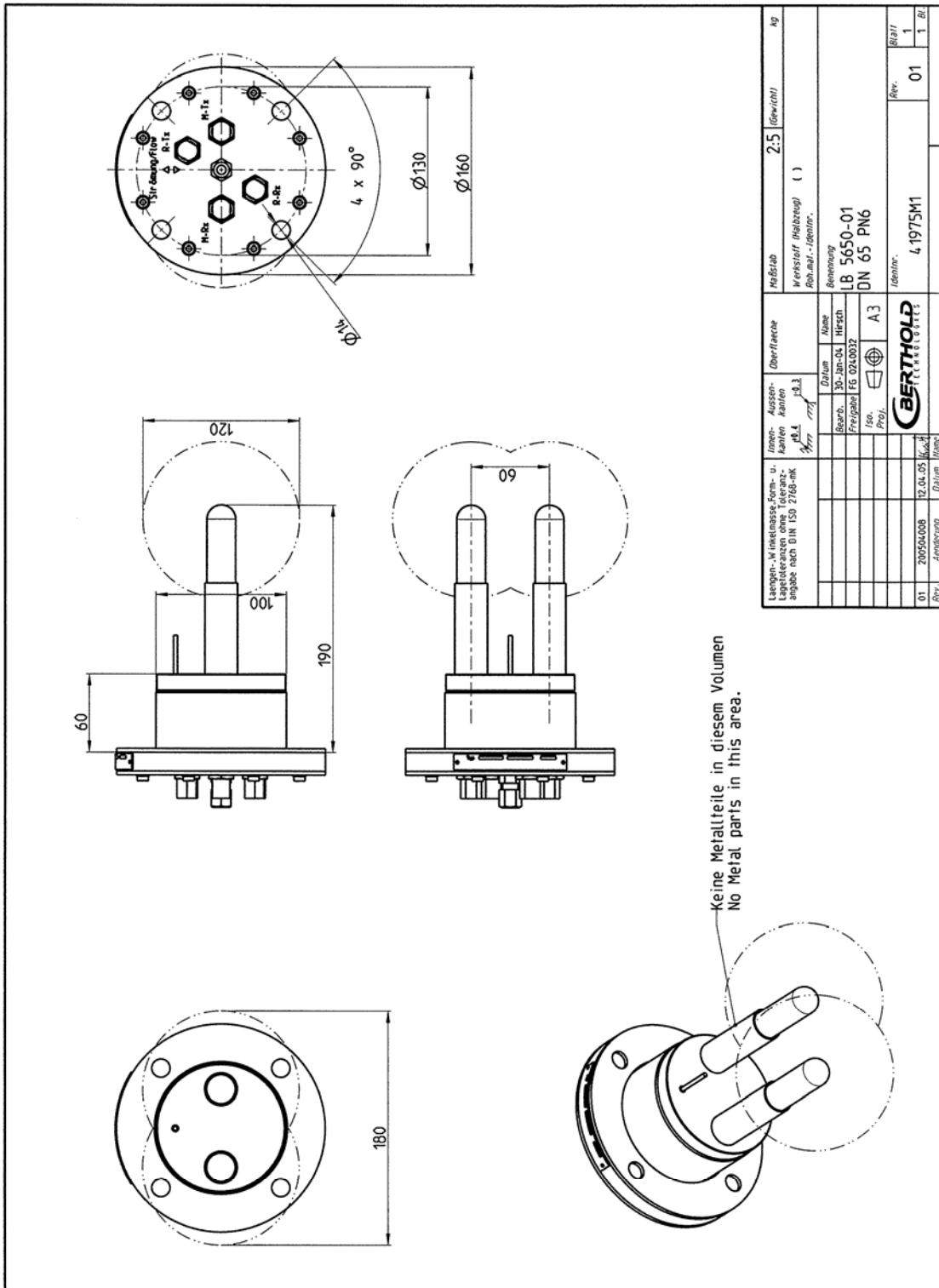


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Original

8.4 Dimensional Drawings Container Probes

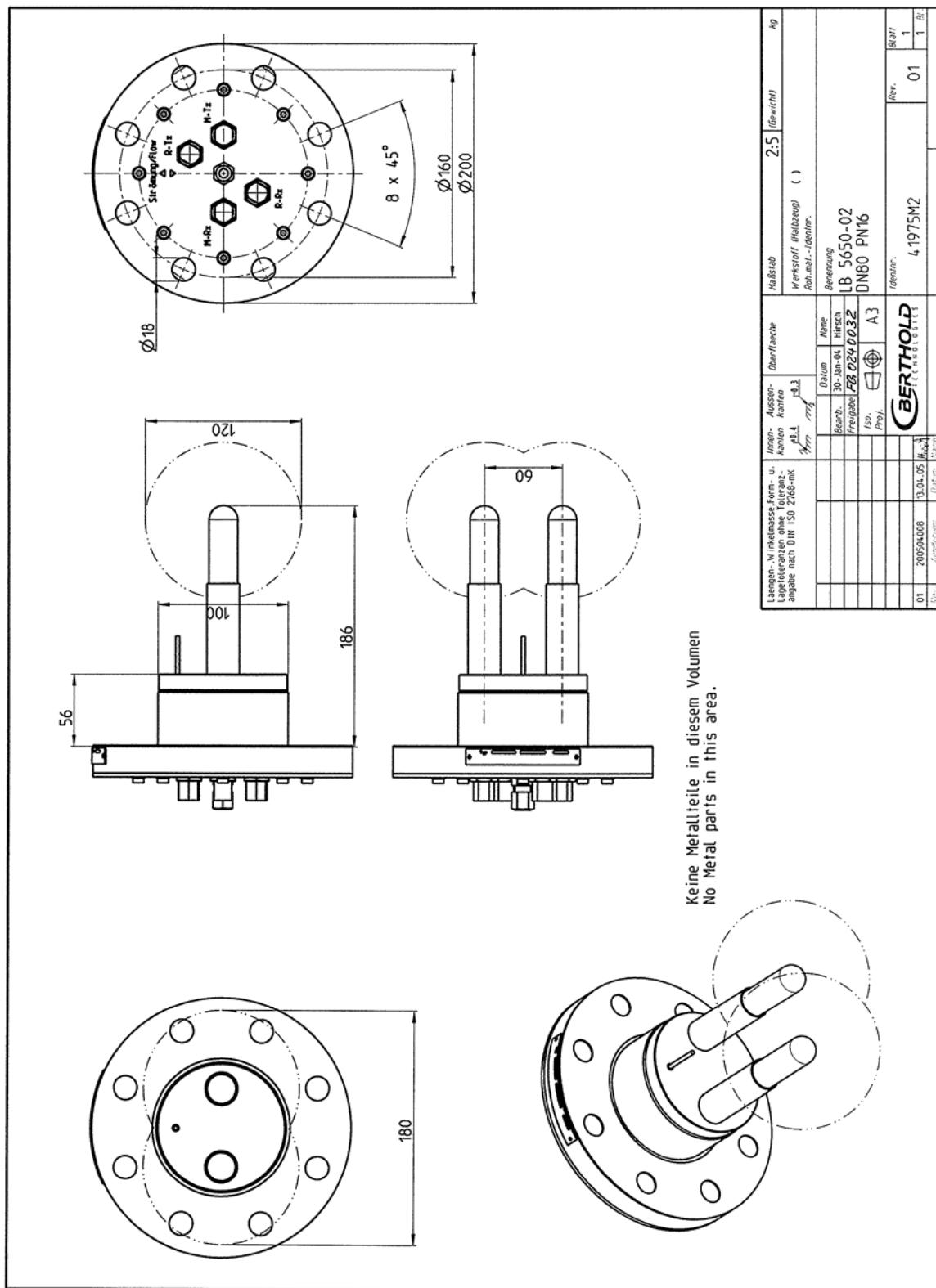
8.4.1 Type LB 5650-01



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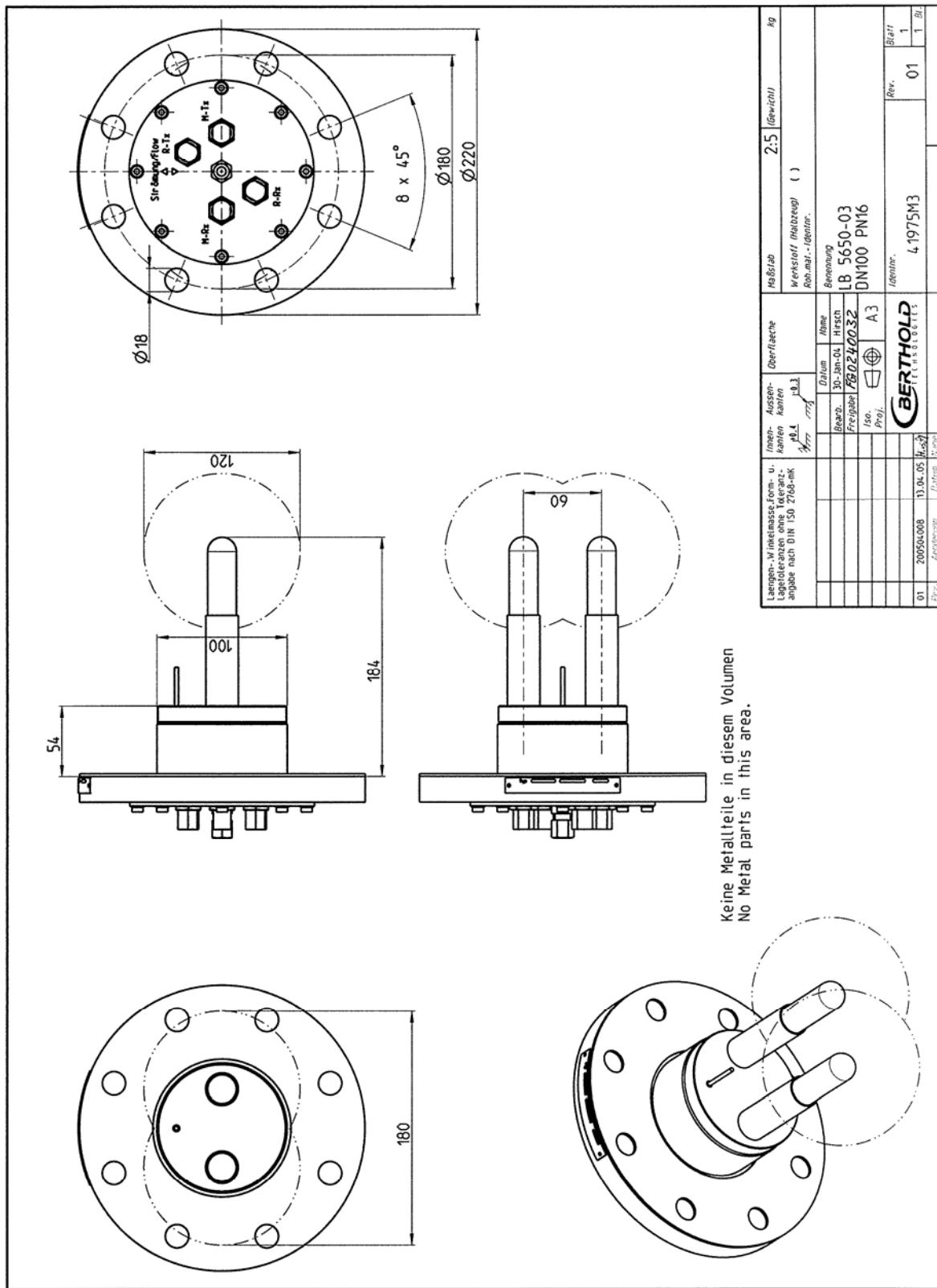
8.4.2 Type LB 5650-02



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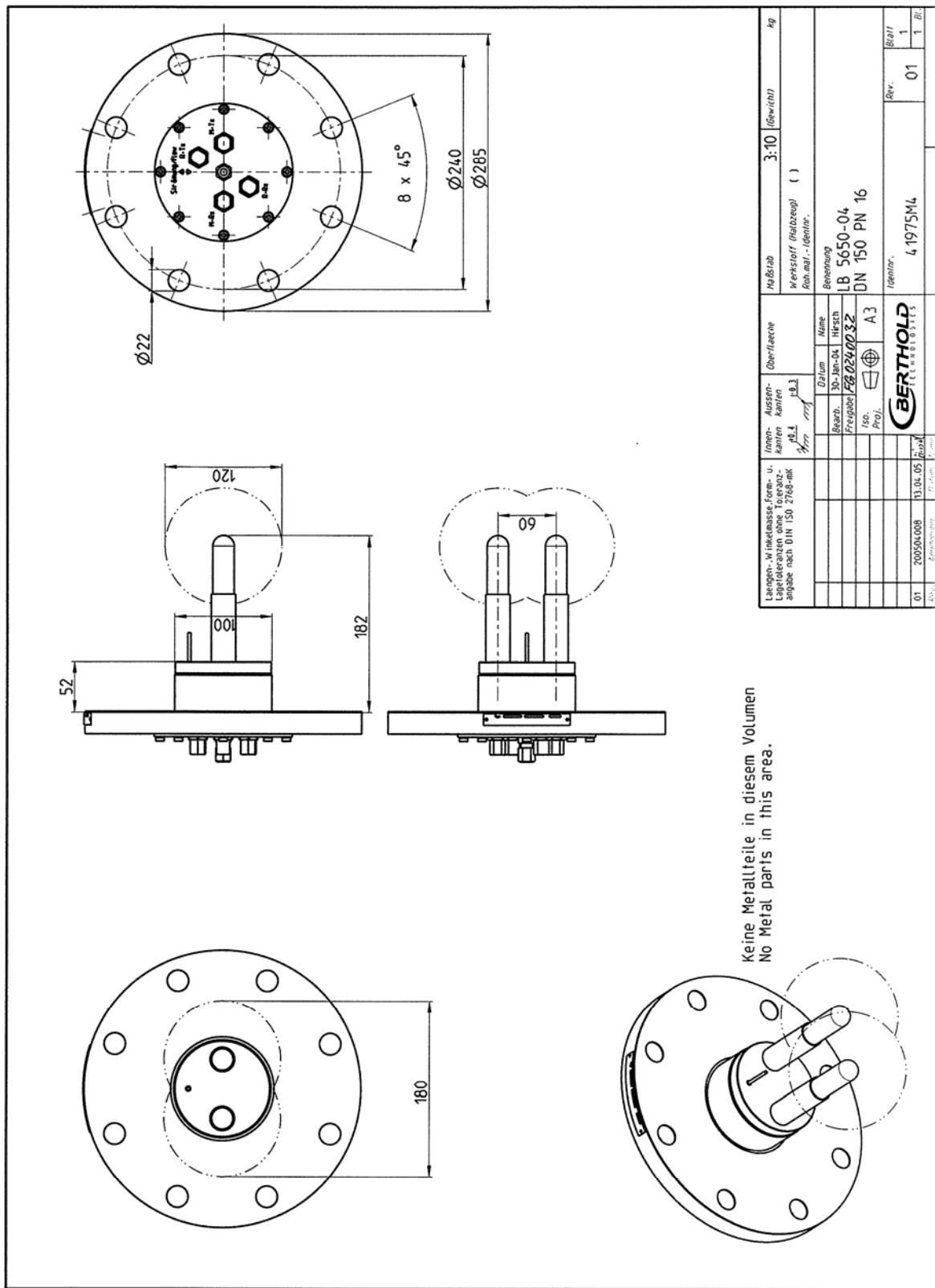
Original

8.4.3 Type LB 5650-03



Micro-Polar Brix (++) LB 565

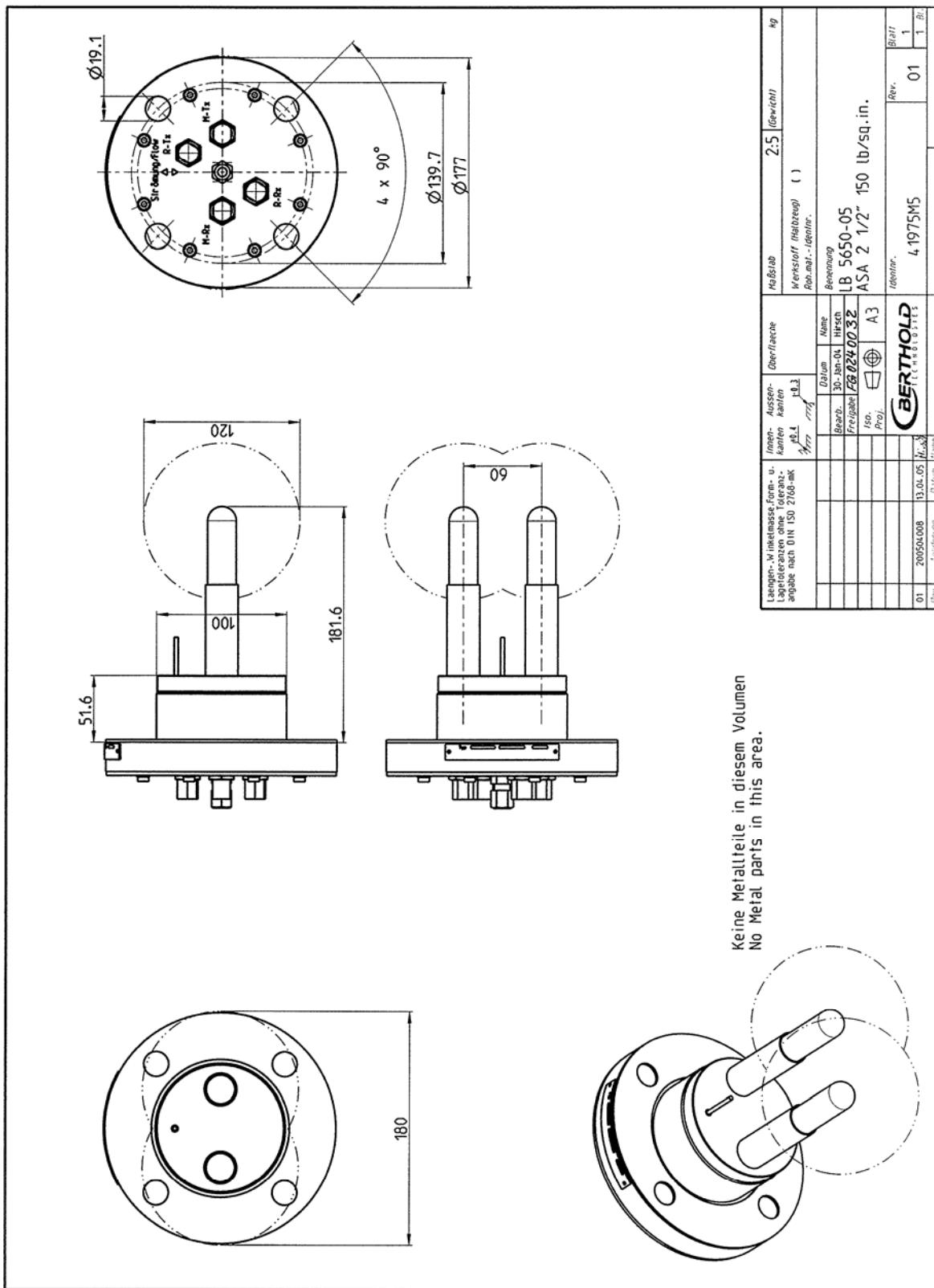
8.4.4 Type LB 5650-04



Keine Metallteile in diesem Volumen
No Metal parts in this area.

Original

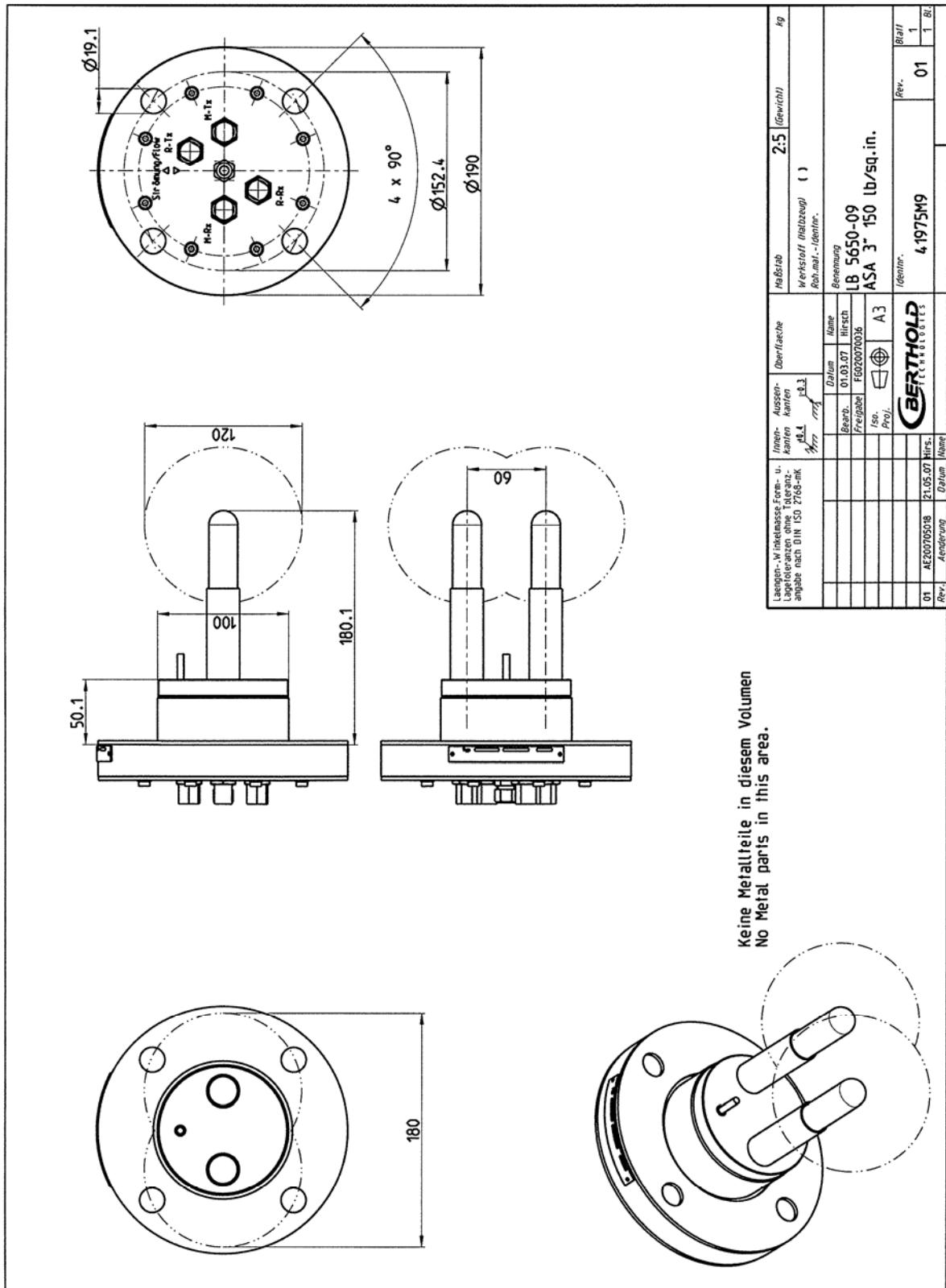
8.4.5 Type LB 5650-05



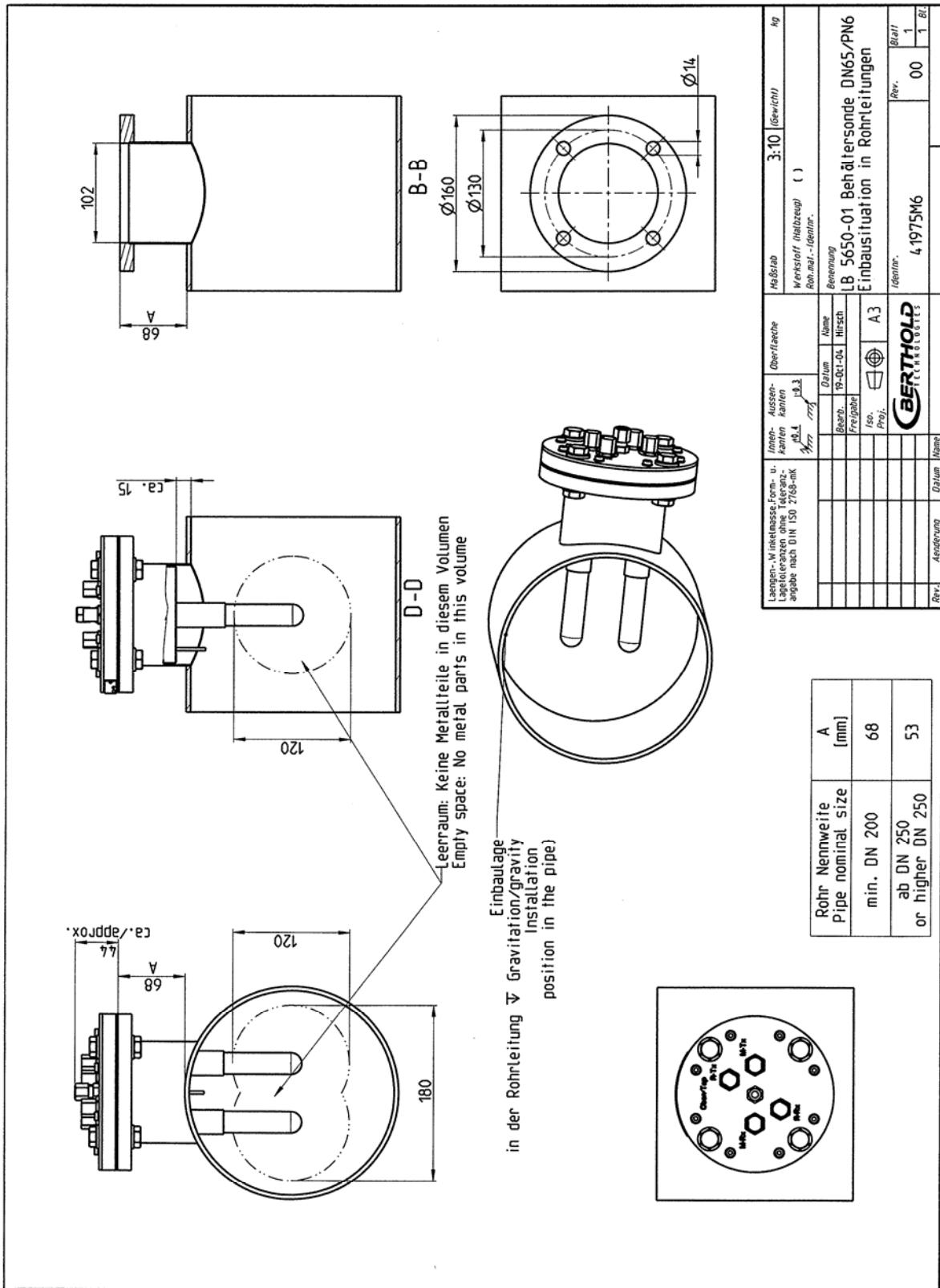
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Original

8.4.6 Type LB 5650-09



8.4.7 Installation Situation in Pipelines

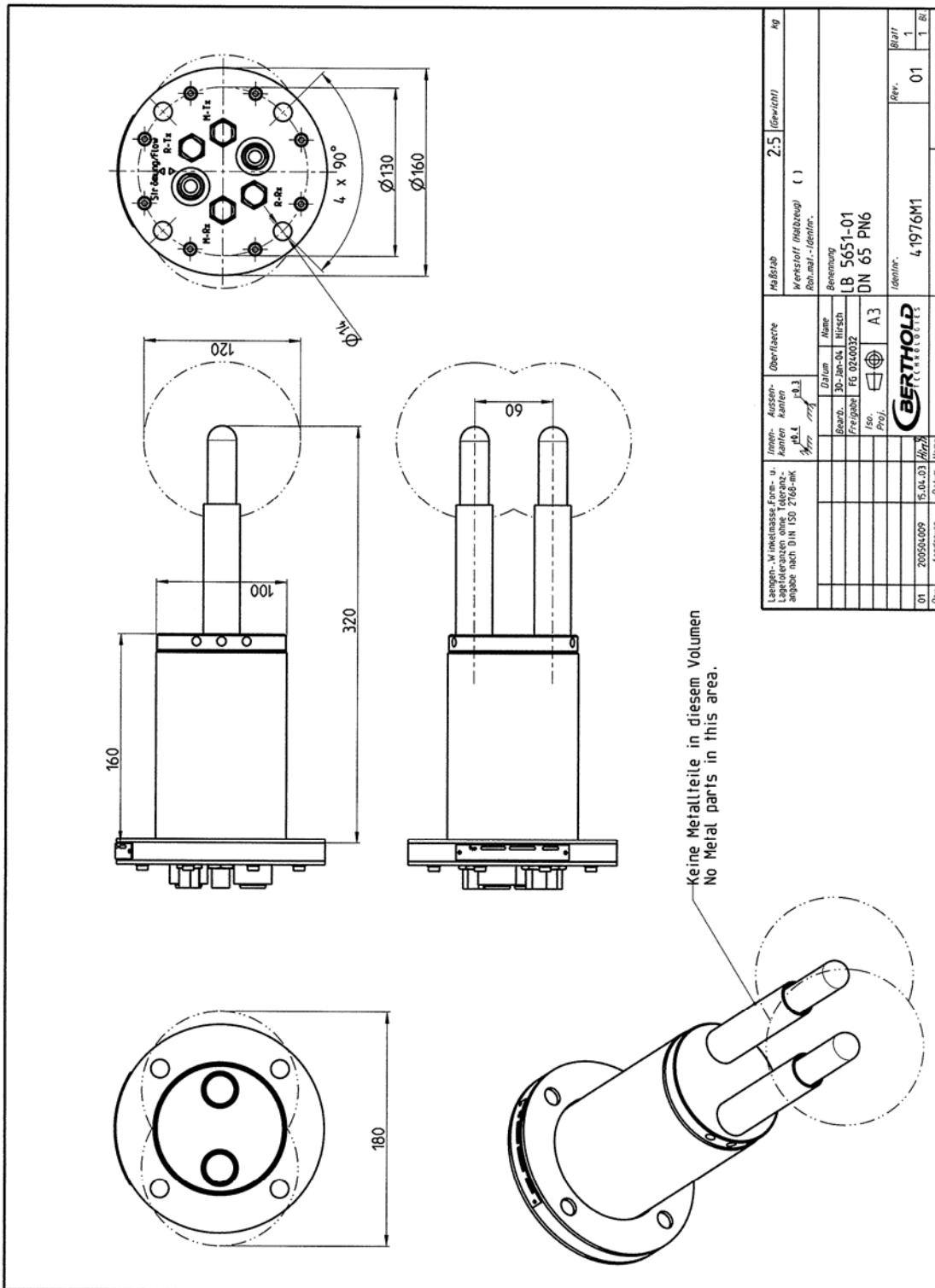


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Original

8.5 Dimensional Drawings Container Flush Probes

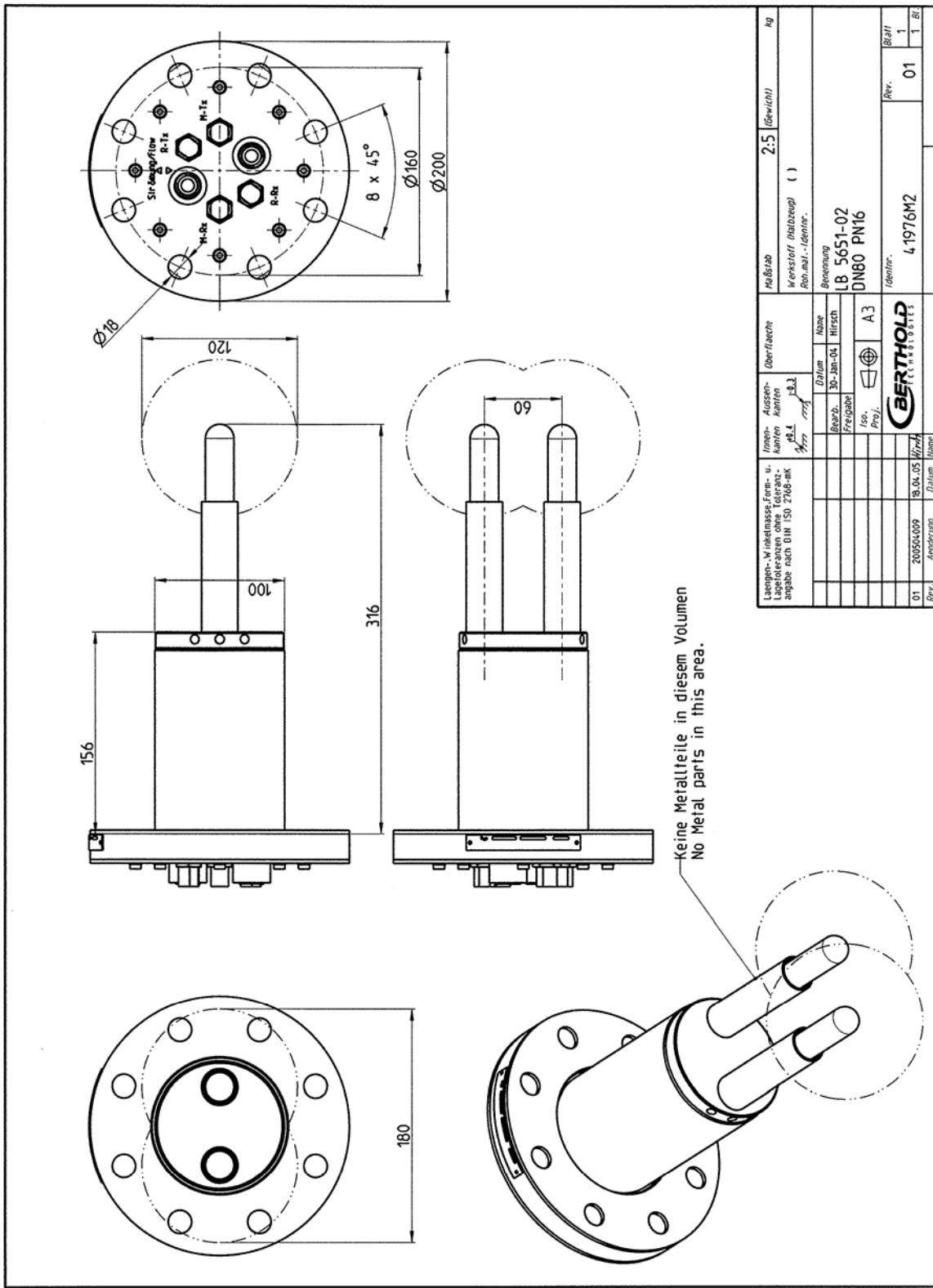
8.5.1 Type LB 5651-01



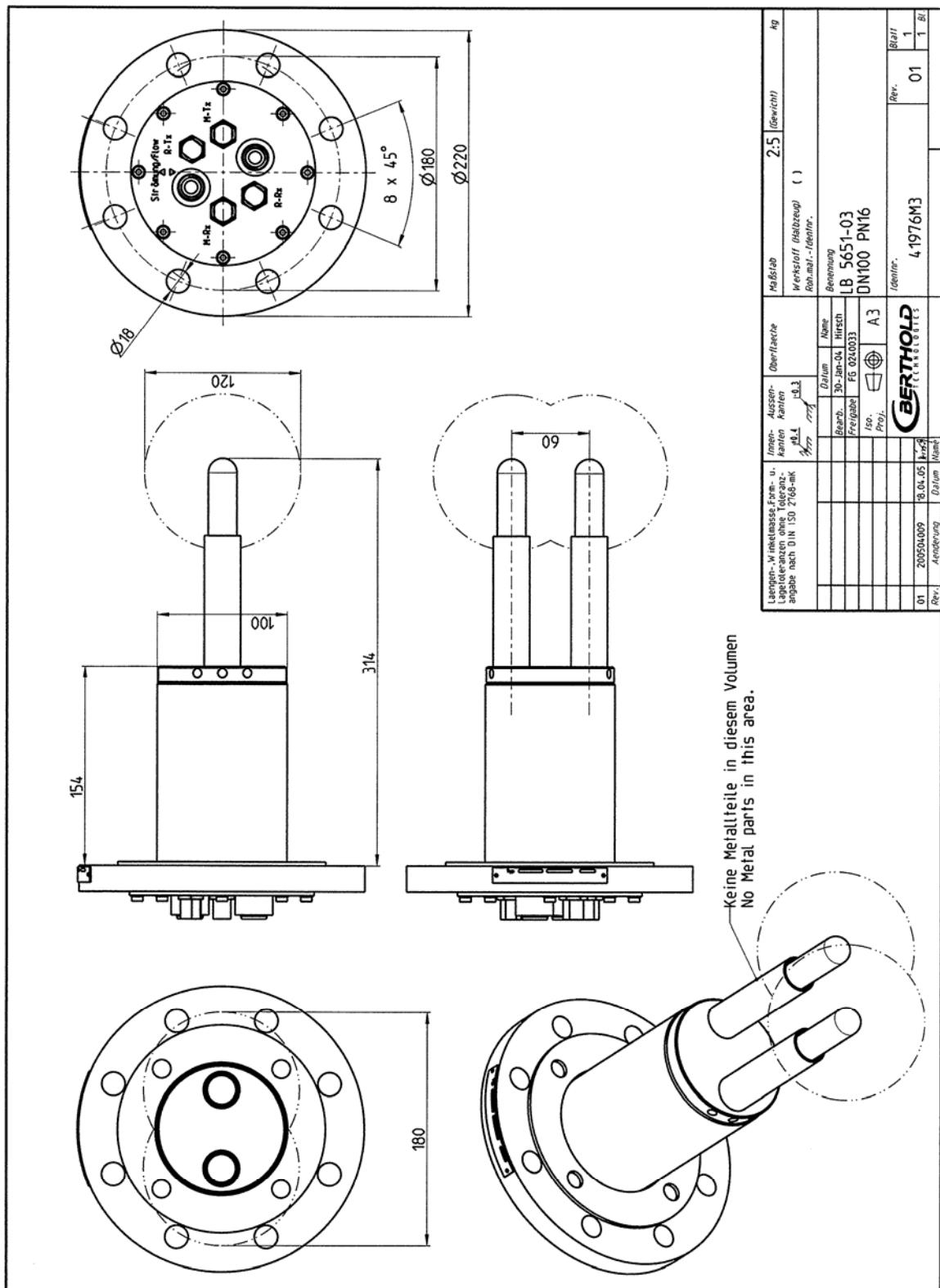
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Original

8.5.2 Type LB 5651-02



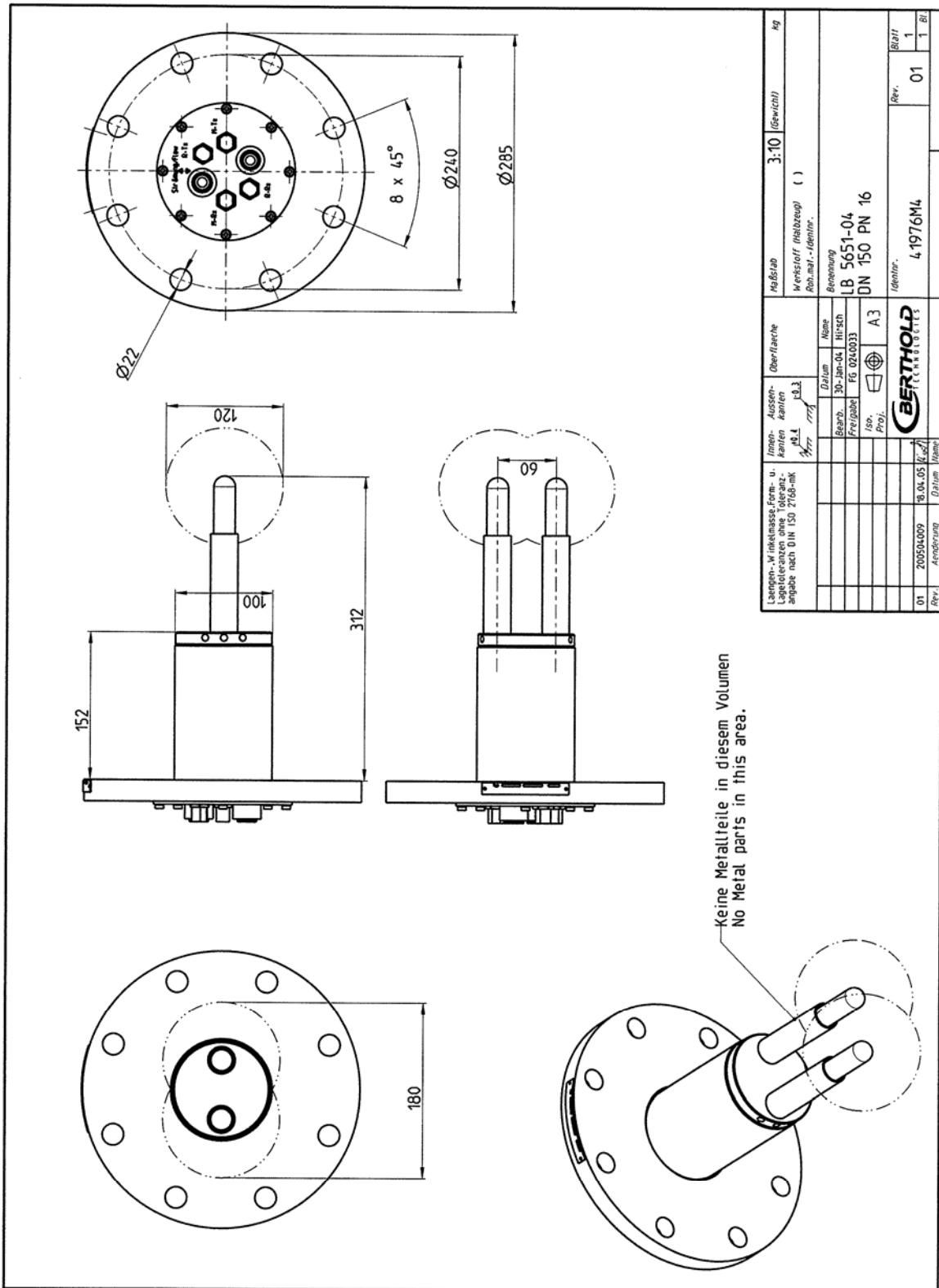
8.5.3 Type LB 5651-03



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Original

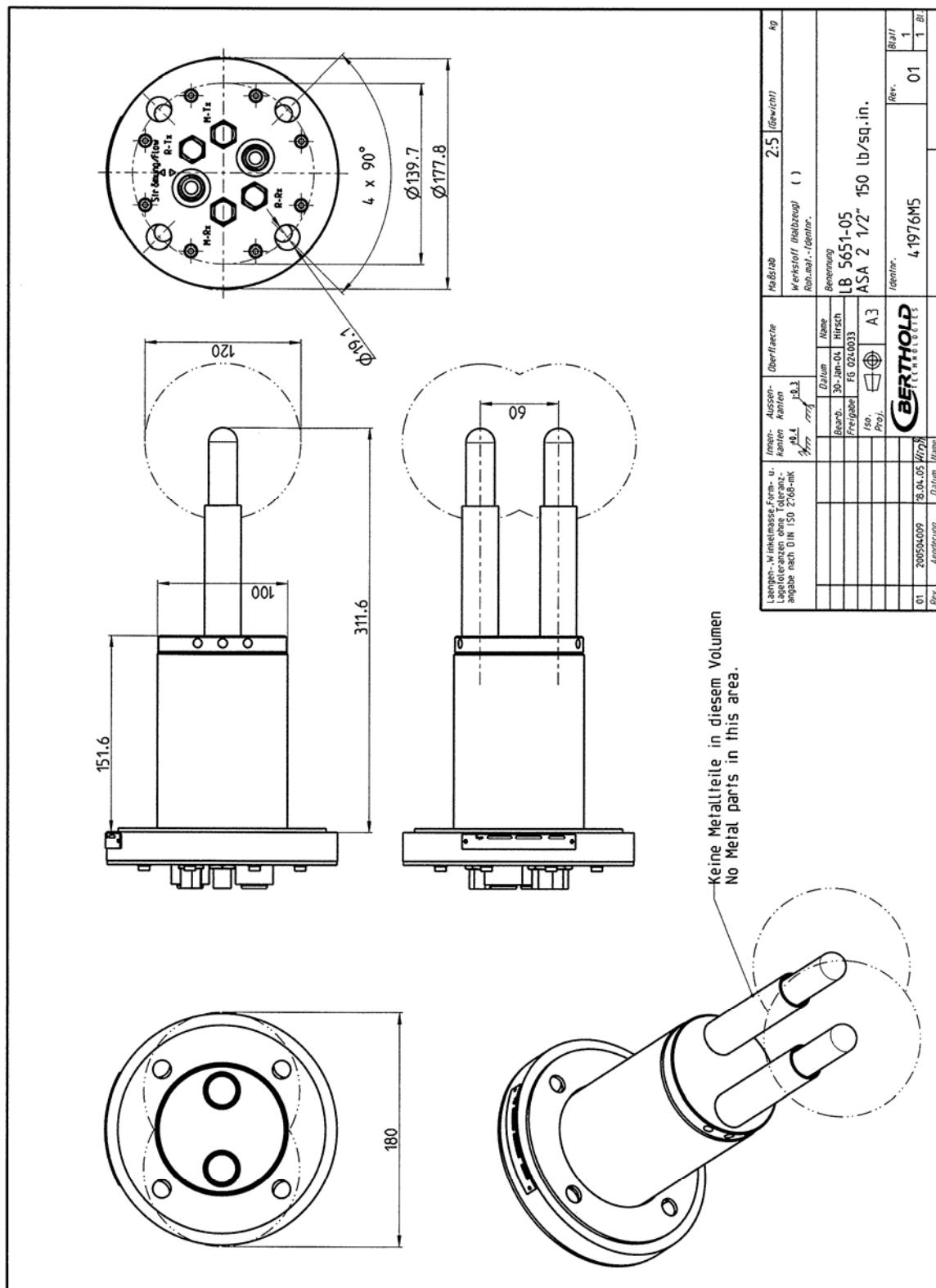
8.5.4 Type LB 5651-04



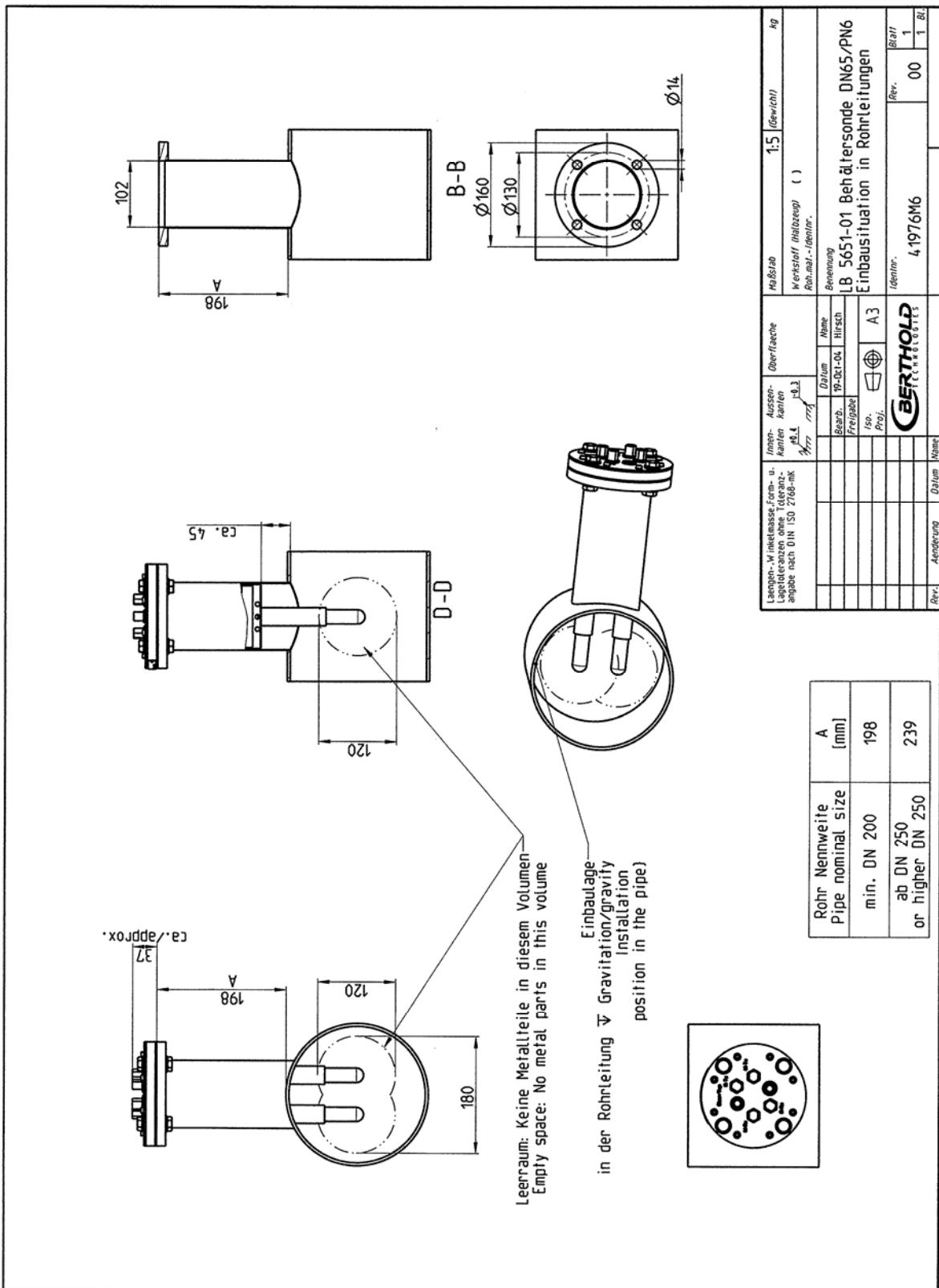
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Original

8.5.5 Type LB 5651-05

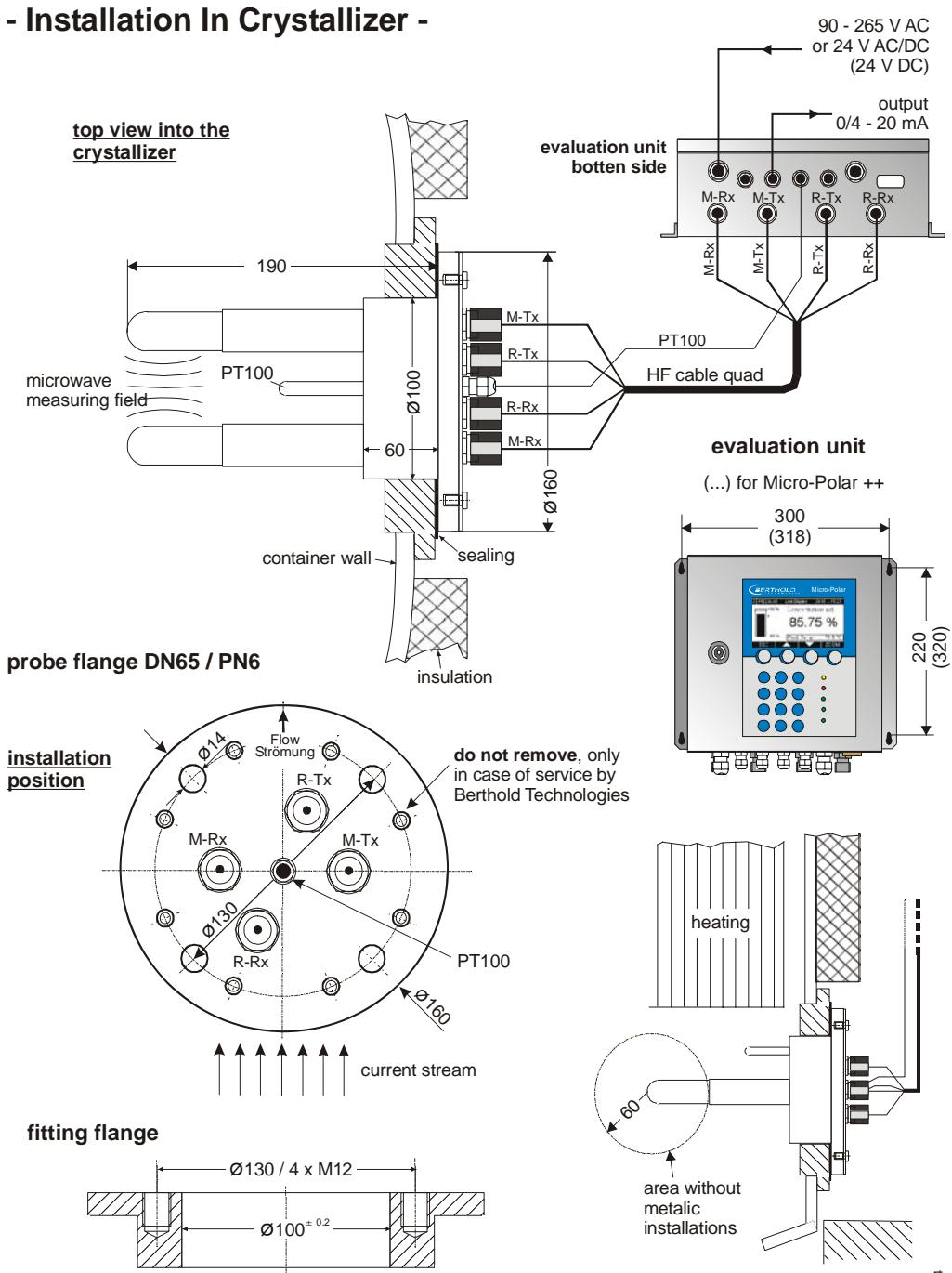


8.5.6 Installation Situation in Pipelines



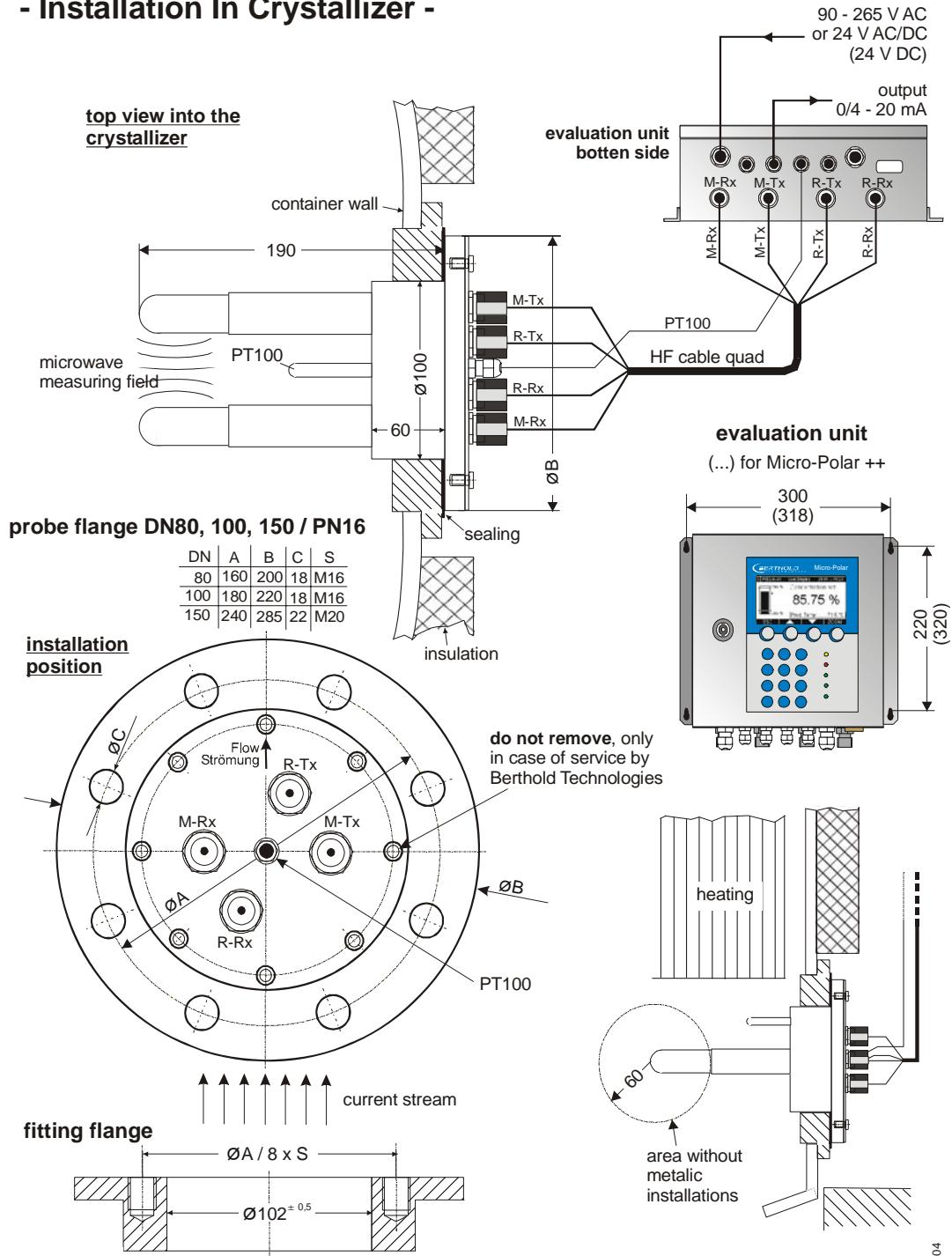
8.6 Installation Sheets for LB 5650 (Container Probe)

Micro-Polar with Container Probe - Installation In Crystallizer -



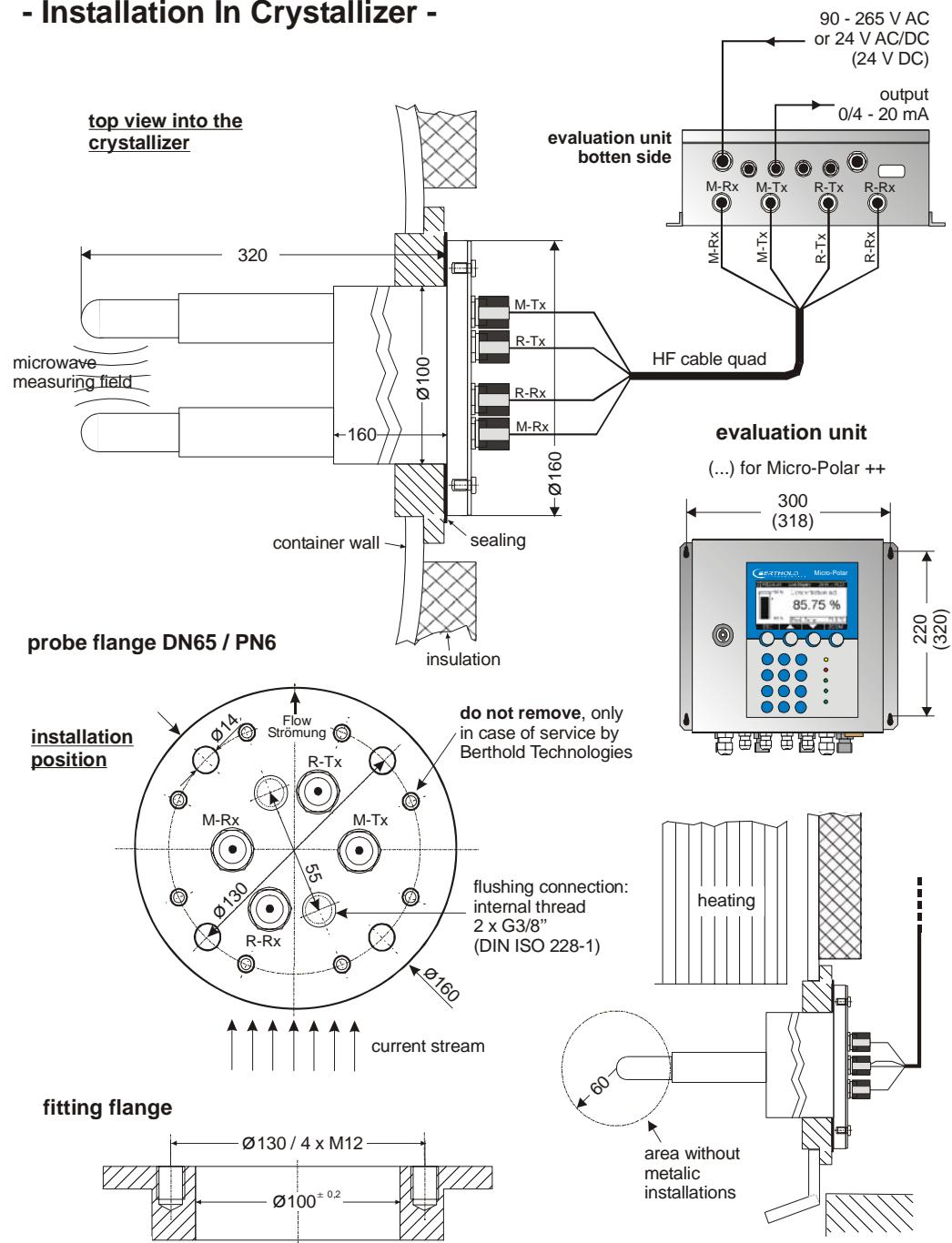
Micro-Polar with Container Probe

- Installation In Crystallizer -



8.7 Installation Sheets for LB 5651 (Container Flush Probe)

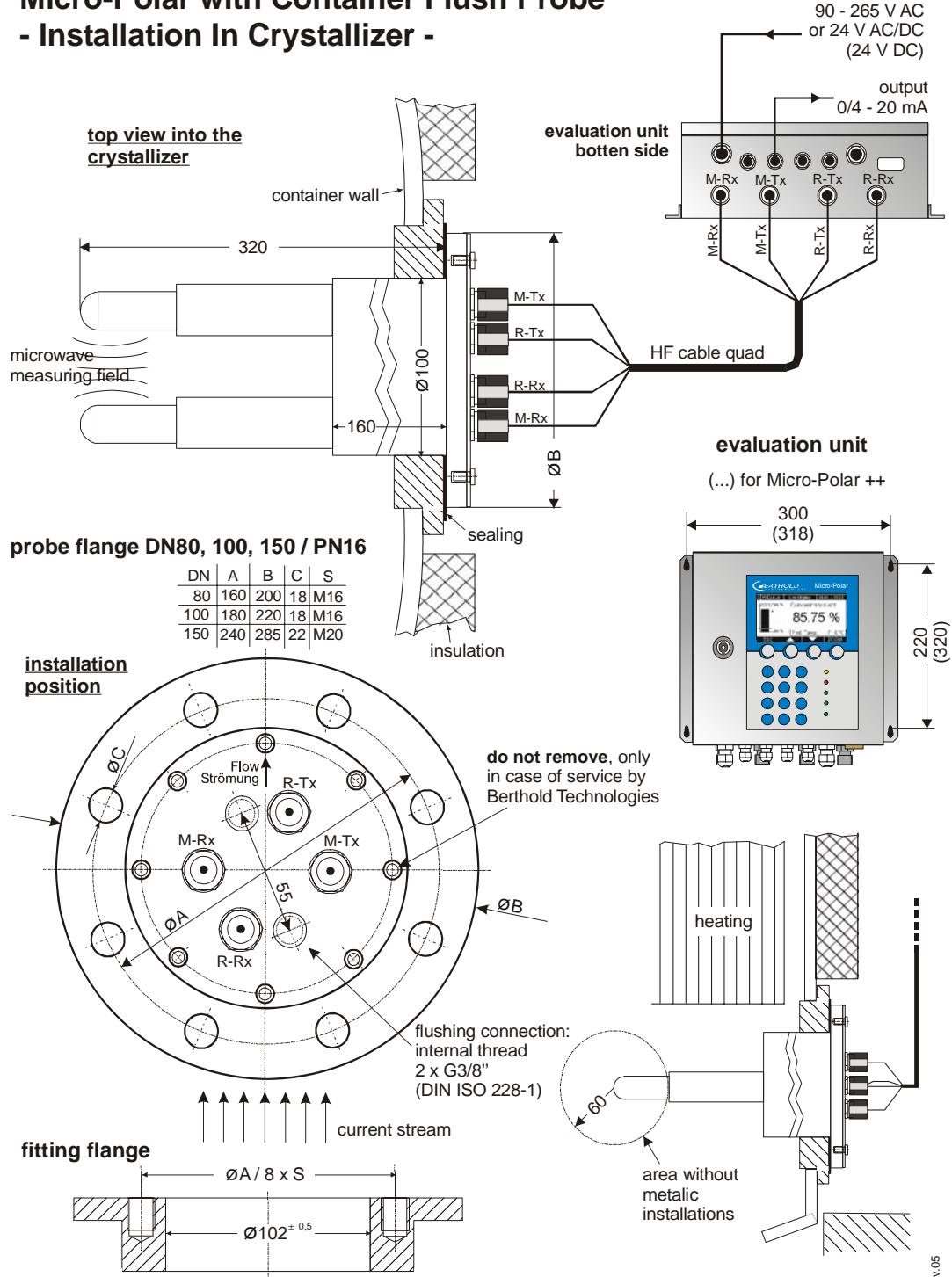
Micro-Polar with Container Flush Probe - Installation In Crystallizer -



Id.-No. 4197612 Rev05

Micro-Polar with Container Flush Probe

- Installation In Crystallizer -



Id.-No. 41976T1 Rev.05



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Index

A

accuracy · 45
adapter flange · 31

B

Battery · 44
bending radius · 25

C

Calculation of Measured Values · 14
CE symbol · 8
Certificates · 53
clamp connector · 20
Components · 16
Connecting the Container Probes · 36
Connecting the Flow Cell · 35
container flush probe · 23
Container Probe · 21
Container Probe Installation · 31

D

Data format RS232 · 51
Data transfer rate · 40
Digital Outputs · 41
Dimensional Drawings Container Flush Probes · 77
Dimensional Drawings Container Probes · 70
Dimensional Drawings Flow Cells · 62
distance rail · 33

E

EC Declaration of Conformity · 53
Electrical Wiring Diagram · 61
Evaluation Unit Housing · 59
Evaluation Units · 17

F

Factory setting · 12
fitting flange · 31
Flow Cell · 20
Flow Cell Installation · 29
Flush Parameters · 32
foodstuffs · 21

Frequency Approval · 8, 55
Fuse Replacement · 44

G

gas bubbles · 11, 30

H

High-Frequency Cable · 25

I

Installation in Pipelines · 31
Installation Sheets · 83
Installation Situation in Pipelines · 76, 82
Instrument Cleaning · 43

L

LED's · 19

M

Measurement Configuration · 27, 28
Microwaves · 12

O

Overview container probes · 49
Overview flow cells · 48

P

Principle of Measurement · 13
Pt 100 connection · 37

R

Reference temperature · 15
Relays · 41
riser · 29
RS232 interface · 40

S

safety instructions · 7

salt content · 11
sealing washers · 49
Softkeys · 12
solid sheath cable · 25
symbols · 7

T

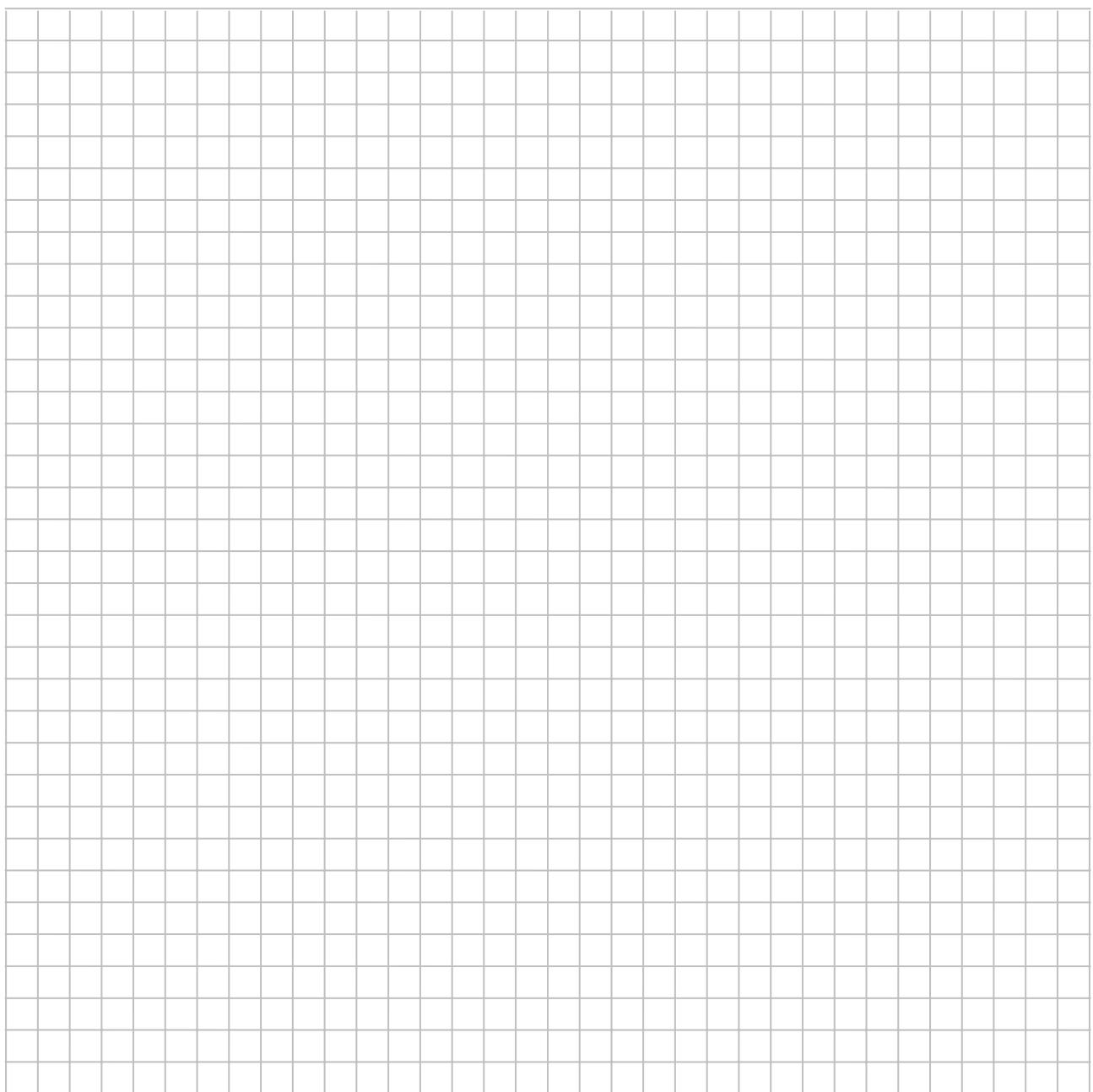
Technical Data · 45
Technical Data HF-Cable · 50

Technical Data Sensors · 48
Technical Drawings · 59
Temperature Compensation · 14
threaded connector · 20
Transmission power · 45
Transport · 29

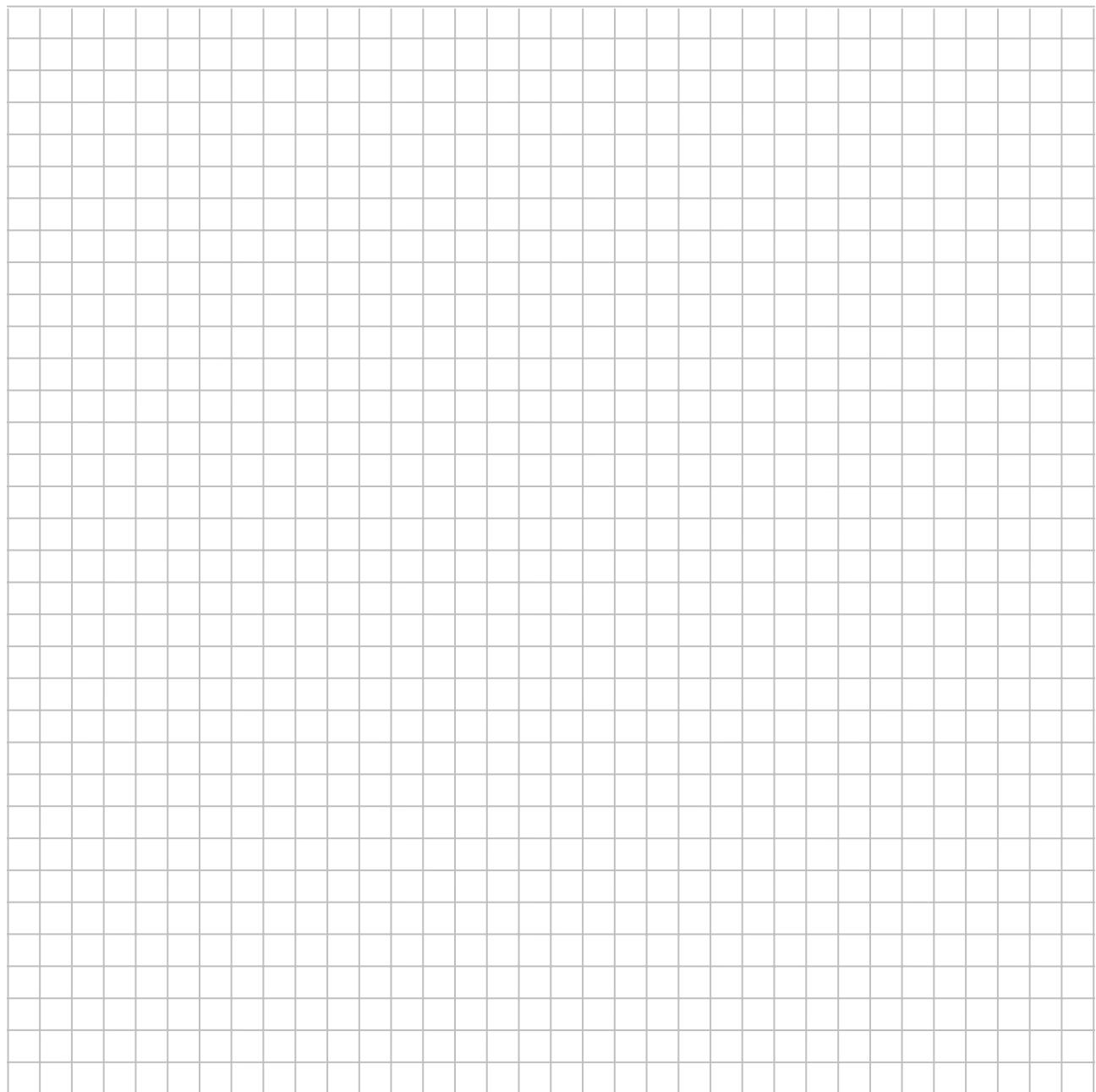
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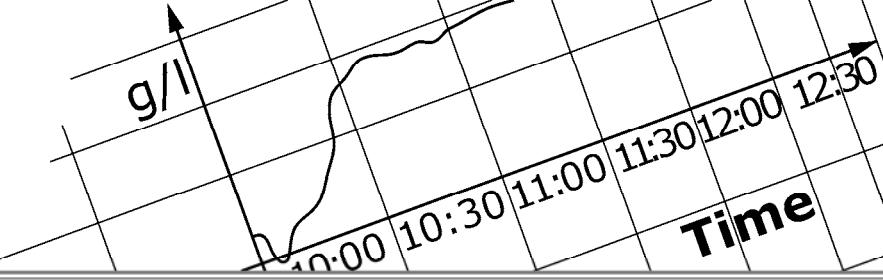
Wearing Parts · 43

Notes



Notes





Process Control

detect and identify

Concentration Meters

**Micro-Polar Brix™
Micro-Polar Brix ++
LB 565**

Software Manual



User's Guide

ID No. 39531BA2

Rev. No.: 03 01.08.2008

Soft. Version: \geq 1.21

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
- installation
- 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 changes without prior notice.

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Table of Contents

	Page
Chapter 1. Communication with Micro-Polar Brix	9
1.1 Brief Instructions	10
1.2 System Configuration	10
1.3 System Calibration	10
Chapter 2. Software Functions	11
2.1 Information on Menu Structure	11
2.2 Menu Structure	12
2.2.1 Start Menu	14
2.2.2 Diagnostic	14
2.2.3 Setup	16
2.2.4 Access Level	17
2.2.5 Language	17
2.2.6 Configuration	18
2.2.7 General Data	19
2.2.8 Measurement	19
2.2.9 Plausibility	20
2.2.10 Phase Measurement	21
2.2.11 Pause Detection	22
2.2.12 Calibration	24
2.2.13 System Adjust	24
2.2.14 Calibrate Concentration	25
2.2.15 Sample No.	26
2.2.16 Sample Data (expanded)	27
2.2.17 Advanced Settings	27
2.2.18 Calibr. manual	28
2.2.19 Input / Output	28
2.2.20 Current output	29
2.2.21 Current Output 1	29
2.2.22 Current Output 2	29
2.2.23 Current input	30
2.2.24 Current In 1	30
2.2.25 Current In 2	30
2.2.26 Pt 100	30
2.2.27 Digital Output	31
2.2.28 Digital Input	31
2.2.29 Service	32
2.3 Trend Display	34
Chapter 3. Configuration	35
3.1 Configuration Setup	35
3.1.1 General Data	35
3.1.2 Measurement	36
3.1.3 Plausibility	36
3.1.4 Microwave	36
3.1.5 Marker	37
3.1.6 Units	37
3.2 Start Calibration Coefficients	39
Chapter 4. Calibration	41
4.1 System Calibration	41
4.2 Start-up of Micro-Polar Brix ++	43
4.3 Start Calibration	44

4.3.1 First Process Run	44
4.3.2 Sampling	46
4.3.3 Entering the Lab Values	47
4.3.4 Automatic Calibration	49
4.3.5 Automatic Calibration with Temperature Compensation	50
4.4 Manual Calibration	52
4.4.1 Manual Calibration with one Concentration	52
4.4.2 Calibration with Two Concentrations	55
4.4.3 Calibration with Split Value	59
4.4.4 Calibration with Temperature Compensation	61
4.5 Adjusting the Calibration	64
4.6 Output of the start-up protocol	66
Chapter 5. Password	67
5.1 Forgot password	68
Chapter 6. Inputs / Outputs	69
6.1 Current Outputs	69
6.1.1 Current Output Setup	70
6.1.2 Test and Adjustment	71
6.1.3 Error Current	73
6.1.4 Current Output 2	74
6.2 Current Inputs	75
6.2.1 Enabling the Current Input	75
6.2.2 Range Setting and Adjustment	76
6.3 Pt 100	78
6.3.1 Pt 100 Enabling	78
6.3.2 Pt 100 Calibration	79
6.4 Digital Output	80
6.4.1 Digital Output Assignment	80
6.5 Digital Input	81
6.5.1 External Product Selection	82
Chapter 7. Factory Settings	83
Chapter 8. Error Lists	85
8.1 Error Lists	85
8.1.1 Hardware Error	85
8.1.2 Input Error	85
8.1.3 Measurement Error and Error Prompts	86
Chapter 9. Calibration Data Sheet	87
9.1 Configuration	87
9.1.1 General Data	87
9.1.2 Measurement	87
9.1.3 Plausibility	87
9.1.4 Microwave	87
9.2 Product	87
9.3 Inputs/Outputs	88
9.3.1 Current Output	88
9.3.2 Current Input	88
9.3.3 Pt 100 Input	88
9.3.4 Digital Output	88
9.3.5 Digital Input	89
9.4 Calibration Data	89
9.4.1 Calibration Coefficients	89

9.4.2 Typical Calibration Coefficients	89
9.5 Start-up protocol printout	90
9.5.1 Examples of a start-up protocol	93
9.6 Sample Table	98

Safety Summary

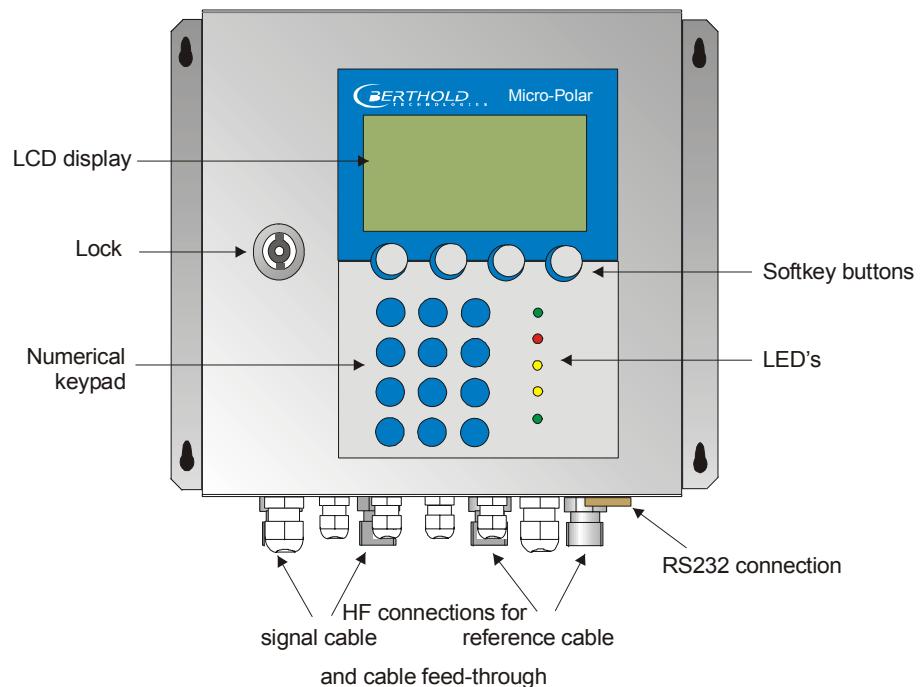
GENERAL WARNINGS

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

The communication with Micro-Polar Brix and with Micro-Polar Brix ++ is carried out 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

Provided that Micro-Polar Brix / Micro-Polar Brix ++ is installed correctly, after power on of the device the main menu appears automatically. To get correct measurement values, the instrument has to be configured and calibrated before running the first measurement. Go to the Profi mode.

We recommend that you use these brief instructions only if you have already performed a process measurement with the same product and you are familiar with the Phi/att ratio.

1.2 System Configuration

- Select | Setup | Configuration | General Data
- Enter the general data (date, time, tag)
- ☐< Push the Home button to return to the Configuration menu and select | Measurement |
- Enter the system parameters (measurement mode, start mode, averaging, units, ...)
- ☐< Push the Home button to return to the Configuration menu
- Select | Plausibility |
- Enter: 1. Process limits; 2. Phase measurement: Sigma max. = 100, Phi/att ratio = known value, Auto set = OFF; 3. Disable pause detection
- ☐< Push the Home button to return to the Configuration menu
- Select | Microwave |
- Enter the cable length (reference cable length, signal cable length)
- ☐< Push the Home button to return to the Setup menu
- Select | Input/Output |
- Enter the values for current output, current input, Pt100, digital out-/input
- ☐< Push the Home button to return to the Setup menu.

1.3 System Calibration

- Power on the instrument at least 45 minutes prior to system calibration.
- On the main menu, select | Setup | Calibration | System Adjust | Adjust |
- Start the adjustment only if you are sure that the transducer is sufficiently covered by the product. The typical standard coefficients for your application have been set up by the manufacturer. A sample has to be taken during system calibration. The lab value of the sample is needed for calculation of the offset. Calculation: Analysis value – Display = Offset.
- Upon completion of the system calibration, 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 **ESC** to get to the main display and enter the offset value via | Setup | Calibration | Calibrate Conc | Adjust | 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.

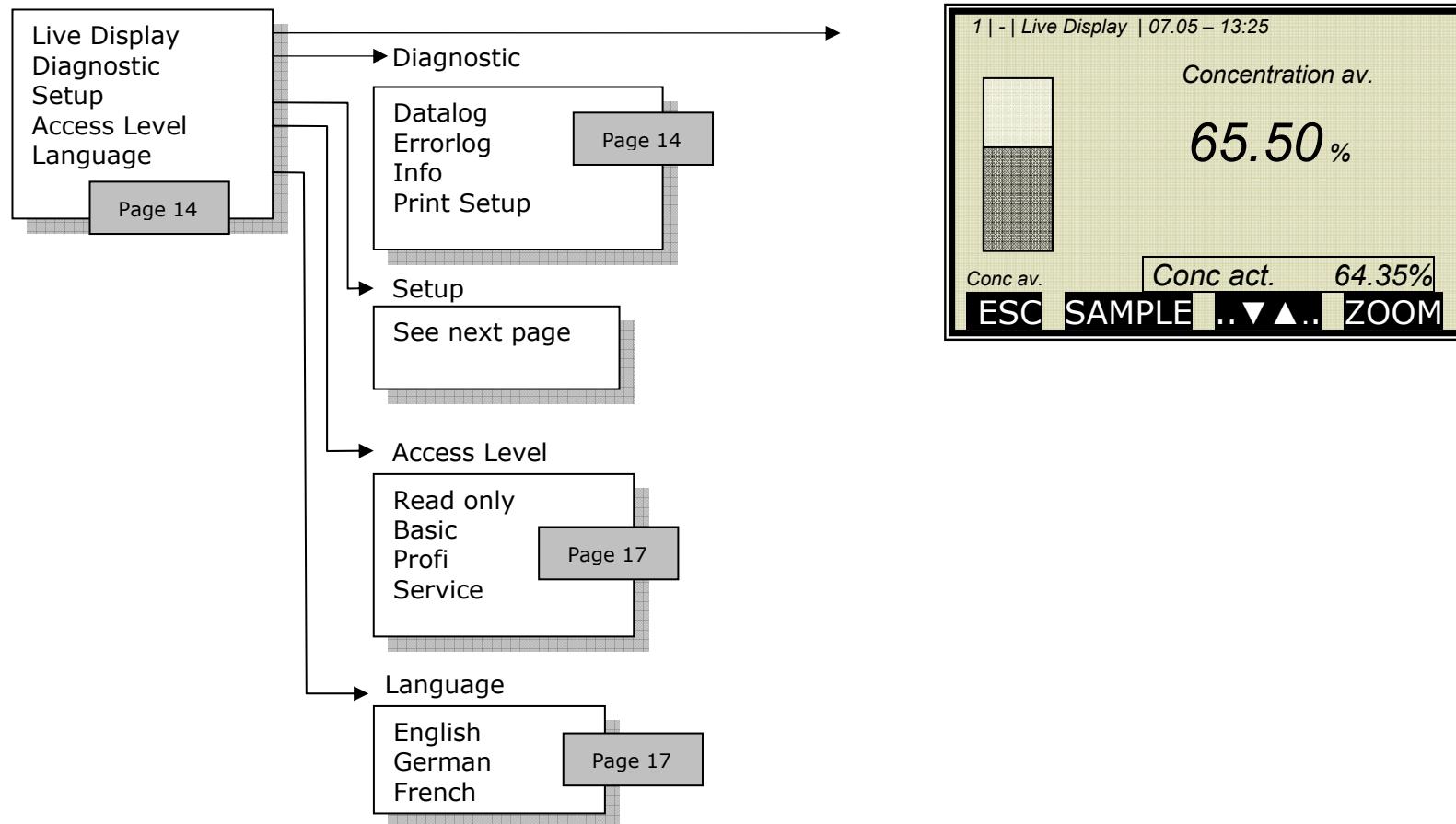
Chapter 2. Software Functions

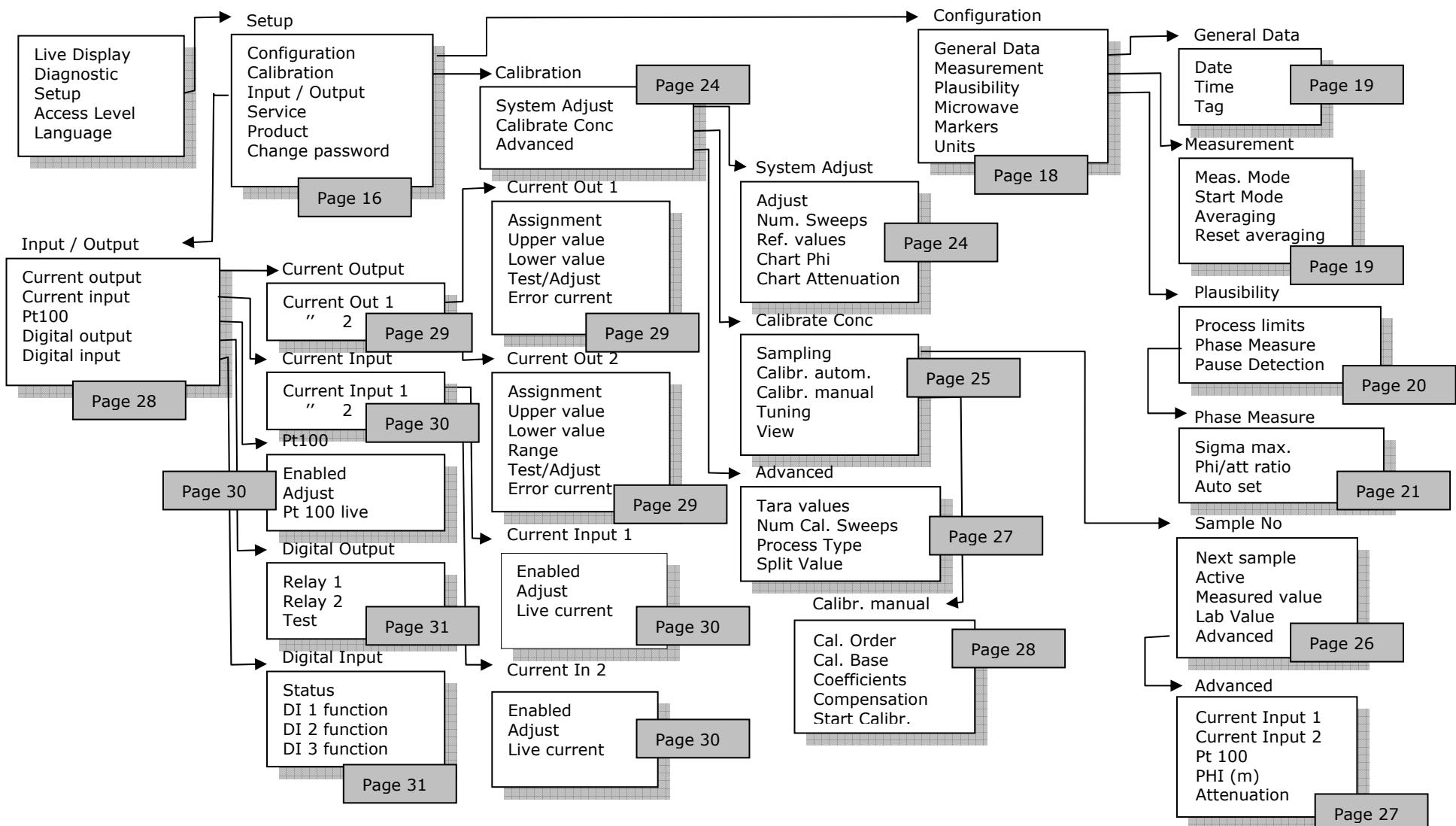
2.1 Information on Menu Structure

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.

Depending on the access level, some menu items are hidden. You have to enter an editable password to change from the level „**Read only**“ to „**Basic**“ or to „**Profi**“ . The „**Service level**“ is not accessible due to licensing regulations.

2.2 Menu Structure





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 enabled.

LANGUAGE:

Select the dialog language.

2.2.2 Diagnostic



Datalog:

The data log records the data corresponding to the content of the serial data output RS 232 and RS 485 (see hardware manual, *chapter 6.4*).

All data per measurement values (sweep) are averaged over the measuring time (see below) and stored. This time interval results from the selected logging period. The content of the log file can be accessed via the Live Display graphically, see chapter 2.3 Trend Display. Output as a text-file is also possible by using RS 232 and RS 485, or the Memory Tool instead (optional accessory).

- Log type Disable
 single
 continuous
 stop at error
- Log time logging period
 15 minutes to 3 days
- Restart Log Clears the datalog and starts with the
 above setting
- Averaging time Obtained from log time
- Print log Printout of table, output via RS 232
 and RS 485, format see hardware
 manual, *chapter 6.4*

Change datalog settings:

If you change the logtype from any to „single“ the datalog will be cleared and you start again with the current setting.

If you change all other logtypes and log times, the datalog will not be cleared and you continue with the new settings.

Stopped measurement:

If the measurement is stopped for a time during the data log, then the measurement pause is interpreted as log time during the data logging “single”. For all other log types, the measuring pause is added to the log time.

Error log:

- Shows the logged error. The last 20 error messages will be stored with date and time.

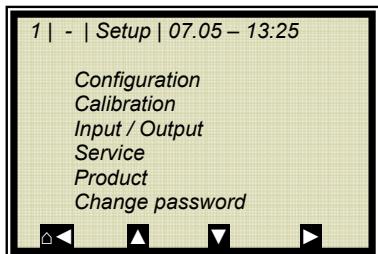
Info:

- Tag : ...
- Device type : LB566
- Supplier : Berthold Technologies
- Manufacturer : Berthold Technologies
- Device no. : ...
- Production no. : ...-...
- Software ver. : V...
- SW release date: ...

Print Setup:

Printout of the start-up protocol via RS 232 and RS 485. Format, content and example see chapter 9.5 Start-up protocol printout.

2.2.3 Setup



Configuration:

Setup of

- General data
- Measurement-specific data
- Plausibility data
- Microwave data
- Marker
- Units

Calibration:

- System adjut
- Concentration calibration
- Advanced setup

Input / Output:

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

Service:

In the Profi mode the SERVICE menu is displayed and can be edited. The following settings are possible:

- Factory settings
- General reset
- Memory Tool (operation of Memory Tool, optional accessory)
- Data printout (via RS 232 and RS 485, data contents can be selected)
- HART® interface

Product:

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

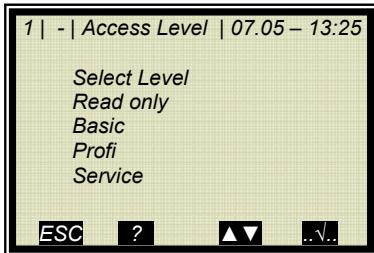
When you call the products 2 to 4 for the first time, all settings and contents (e.g. system calibration, sampling table, datalog and calibration) of the current product will be copied to the new product.

Change password:

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

See for more information also chapter 5 Password.

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.
- At the basic level some menu items are disabled, respectively masked, e.g. manual calibration.

Profi:

- As described above. Should be used only if you are sufficiently familiar with the measuring system.
- Changing between basic and profi is possible without using a password.

Service:

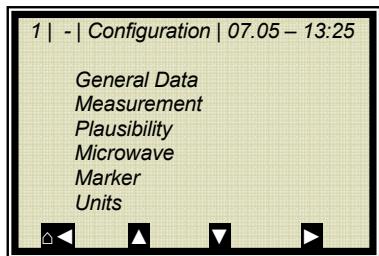
- This level is reserved to the service personnel.

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)

Plausibility:

- The process limits define the valid range, the current concentration has to be within this range.
- The phase measurement is subject to a plausibility analysis, which can be set here.
- Enable and define the pause detection

For more information please see *chapter 2.2.9 Plausibility*

Microwave:

Cable (enter the reference and signal cable length). E.g. for 2 meters of HF-cable quad, 4 meters for both length has to be entered.

Marker:

You can enter a name (max. 5 characters) and values for a marker. The graphic occurs in the live display and relates to the bar diagram. In order to deactivate the marker, choose a marker value outside of the bar diagram limits or the current output limits.

Units:

According the configuration, for the concentration, current input and temperature there are different dimensions selectable.

Selectable for concentration are: none, specific, %, %DS, °Bx, g/L and g/cm³

2.2.7 General Data

**Date:**

- Enter the current date

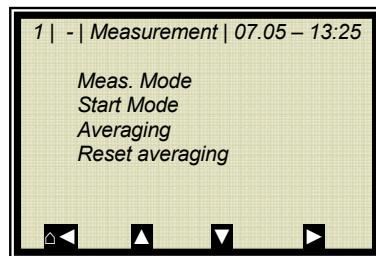
Time:

- Enter the current time

Tag:

- Enter the tag name. The tag (max. 8 characters) is displayed in the header on the display.

2.2.8 Measurement

**Meas. Mode:**

Selection continuous or batch. In batch-mode a mean value is generated from start to stop. In continuous mode a moving average is generated, respective to the mean-rate preset.

Start Mode:

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

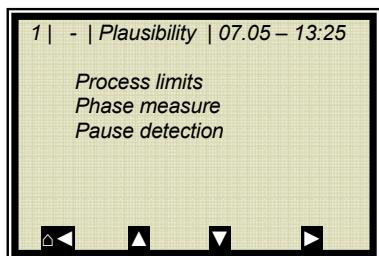
Averaging:

Enter the number of single measurement values over which a moving average is to be calculated. Typical: 20 sweeps. Relates only to the measuring mode continuous.

Reset Averaging:

Reset averaging (yes/no). Relates to batch or continuous.

2.2.9 Plausibility



Process Limits:

A minimum and maximum concentration has to be set. Only concentrations within the range are permitted. If the concentration exceeds the range, the concentration average is put on hold and an error message is displayed.

Phase Measure:

The phase is subject to a plausibility analysis. For more information please see *chapter 2.2.10 Phase Measurement*.

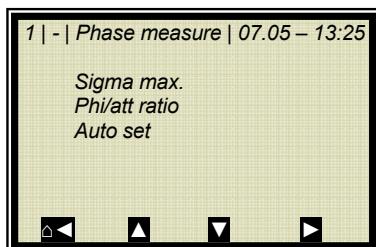
Pause Detection:

Can be enabled or disabled. Switching variable is the attenuation, if the entered min. attenuation is not reached, the evaluation unit switches to the pause mode:

- Current output drops to the lower current output limit (0/4 mA)
- Message on display
- RUN LED is flashing

Details regarding pause function see *chapter 2.2.11 Pause Detection*.

2.2.10 Phase Measurement



Sigma max.

Here you set the maximum sigma of the regression Phase vs. Frequency.

During normal measurement operation, sigma lies between 0 and 100.

Phi/att ratio

The correlation between Phase and Attenuation is another plausibility criterion. It has to be measured when taking the instrument into operation. The automatic ratio measurement is quite helpful (see Auto set).

Auto set

The automatic ratio measurement Phi/att can be turned on and off.

Turn it on during start-up. During measurement, please keep in mind:

- Cover the entire concentration range, if possible
- Do not stop the measurement
- Do not change the concentration erratically (max. 1 %).

Stopping the recording:

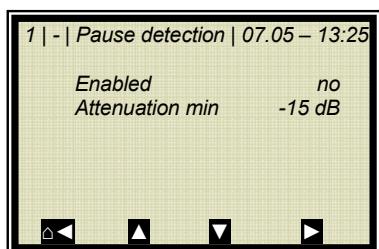
The measurement can be stopped by switching off record. The recording is frozen and only restarts when the system switched on again.

Start new recording:

Condition: Recording is switched off. Stop and start the measurement before you start a new recording. The results of old recordings are deleted by doing so.

! After the measurement, the automatic measurement has to be disabled again! The ratio value is automatically stored and enabled on the PHI/ATT RATIO menu.

2.2.11 Pause Detection



Enabled

Here the pause function is activated and deactivated. Consider the measuring conditions for using the pause detection; see below.

Attenuation min

Input of the minimum attenuation, when falling below that value measurement goes into pause mode.

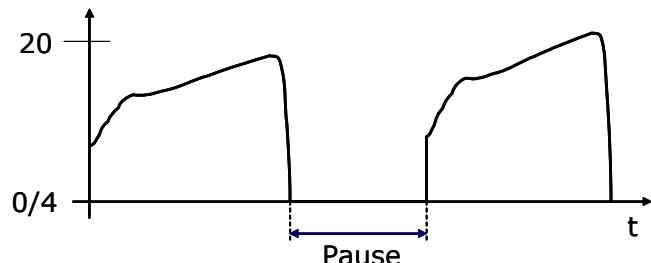
Conditions and description:

The pause detection function is a software feature for pause detection between two sequential discontinuous crystallization processes. This is interesting because during the cleaning phase, the sensor indicates the lower current output value (0/4 mA). Only after restart of a crystallization process, does the sensor show the current dry substance content (Brix content) after product entry.

Condition: pure phase calibration first order. This corresponds to the default adjustment of the automatical calibration.

For example: typical signal behavior of two crystallization processes.

Current output [mA]



Necessary Software Installations

Enter under menu SETUP | CONFIGURATION | PLAUSIBILITY | the following values:

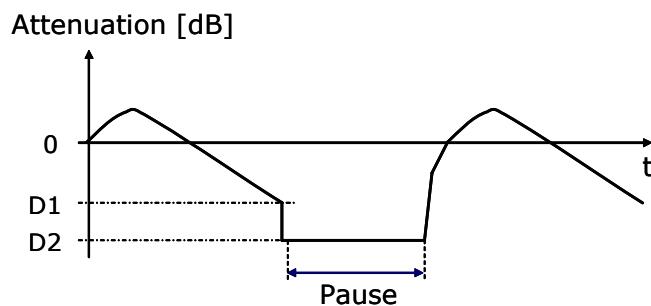
- Under PROCESS LIMITS:
Min. Conc. and Max. Conc.
Entry of process limits: $\pm 5\%$ DS to the real process limits. Example: real process limits 70 to 90 %DS, therefore 65 to 95 %DS is entered.
- Under PAUSE DETECTION:
The pause detection can be activated here.
Switching variable is the attenuation; if the entered minimum attenuation is fallen short of, then the evaluation unit pauses.

Adjust these settings if applicable according to the conditions of „Quitting the pause mode” (see below).

Determination of the min. attenuation as a switching variable:

For this, the attenuation process must be observed up to the end of a crystallization process including cleaning phase. In addition, you can take the data log (see chapter 2.2.2 diagnosis) for assistance.

For example, typical attenuation process:



D1 = smallest attenuation value in the product

D2 = Attenuation value for an empty vessel

D (min) = Switching variable = average attenuation between D1 and D2

Typical values (Sugar beet):

D1: -15 to -10 dB

D2: -25 to -20 dB

D (min): -20 to -15 dB

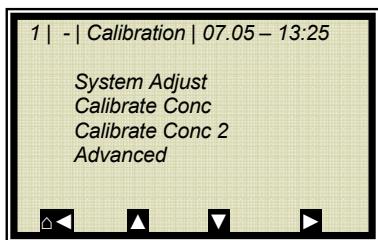
Quitting the pause mode (change to measuring mode):

Two conditions have to be met before changing the mode:

1. The attenuation has to be higher than the attenuation threshold.
2. The recent concentration (Conc act.) has to be in the following range:
 - Conc act. > min. process limit
 - Conc act. < min. process limit - A1 · Faktor · 146

A1:	Calibration coefficient of the phase
Factor:	From tuning (Default =1; see chapter 2.2.13 Calibr. Concentration).
Process limit:	See menu PLAUSIBILITY

2.2.12 Calibration



System Adjust:

The system calibration is started on this page.

Calibrate Conc:

Opens the calibration menu of concentration 1

Calibrate Conc2:

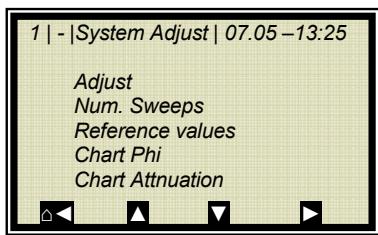
Opens the calibration menu of concentration 2

Advanced:

Here you set the Tara values, number of sweeps at sampling, process type and split value.

Details see chapter 2.2.17 Advanced.

2.2.13 System Adjust



Adjust:

System calibration is started.

Num. Sweeps:

Here you define the number of sweeps for the system calibration (arithmetic mean value).

Ref. values:

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

Chart Phi:

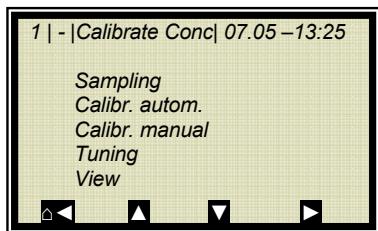
Shows the characteristic curve of Phase versus Frequency based on the regression.

Chart Attenuation:

Shows the characteristic curve of Attenuation versus Frequency based on the regression.

By means of a system calibration, the data log is not deleted (see chapter 2.2.2 Diagnosis).

2.2.14 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. Moreover, compensation can be enabled if the following prerequisites have been fulfilled:

1. The respective analog input has been enabled (Pt100 or current input 1 / 2).
2. Sampling has been carried out using the previously set up compensation input.
3. The reference value has been entered on the menu COMPENSATION. The reference value is either the current product temperature at system adjustment or the average product temperature.

There are at least three samples needed for temperature compensation, otherwise the calibration error "Keeping old coefficients" appears at the evaluation unit.

Basis of automatic calibration (fixed setting):

- Linear phase calibration
- Compensation: additive and linear

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.

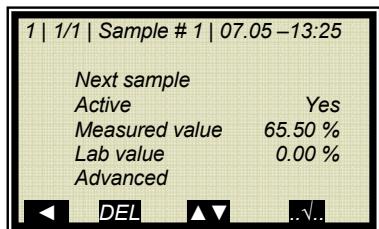
Calculation is carried out according to the following formula:

$$\text{Corrected display} = \text{display} \cdot \text{factor} + \text{offset}$$

View:

Presentation of calibration curve, display of correlation and coefficients.

2.2.15 Sample No.



The header includes the following information (starting from the left):

- Product-No.
- Current table position / Total number of entries
- Sample no. of current table position
- Date and time of sampling

Up to 20 sample entries are possible. The sample can be assigned to the lab value either via the sample no. or via date/time. The sample no. is assigned on a continuous basis. If a sample is deleted, the sample no. will not be assigned a second time. Up to 999 sample numbers are available. Only if all numbers have been assigned, you may assign a number for the second time; you will be alerted accordingly on the display.

Next sample:

Continues with the next sample.

Active:

Here you can choose if this sample should be taken into account for calibration.

Measured value:

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

Lab value:

Entry position for the laboratory value.

Advanced:

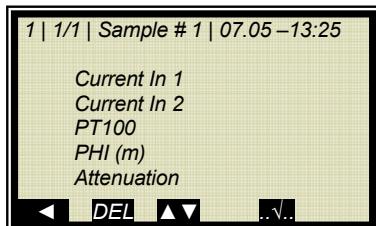
Switches to the next data page.

DEL:

The displayed sample value can be deleted by pushing briefly the corresponding soft key.

Pushing longer, all sample values are deleted at once.

2.2.16 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.

Attenuation:

Not editable display of the measured attenuation.

2.2.17 Advanced Settings


Tara Values:

Input option of Tara values for phase and attenuation. The Tara values are attributed to the phase or the attenuation before calibration.

The calculation is the following:

$$\begin{aligned} \text{Phase} &= \text{Phase}_{\text{meas}} - \text{Phase Tara} \\ \text{Attenuation} &= \text{Attenuation}_{\text{meas}} - \text{AttenuationTara} \end{aligned}$$

This function is not needed for the determination of dry substance, brix or density in sugar solution.

Number of Calibration Sweeps:

Freely adjustable number of sweeps over which a calibration point (in the course of automatic sample measurement) will be averaged.

Process Type:

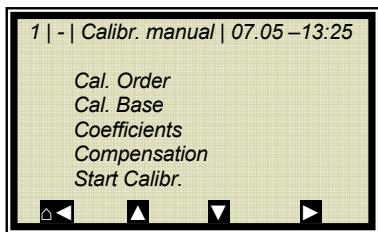
Select the operation mode:

- 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.

2.2.18 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.

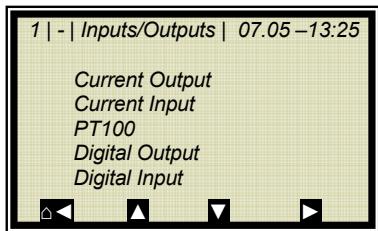
Compensation:

If at least one analog input is active, you may assign the compensation and set the compensation parameters.

Start Calibr.:

Starts the calibration using the parameters you have set earlier.

2.2.19 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.

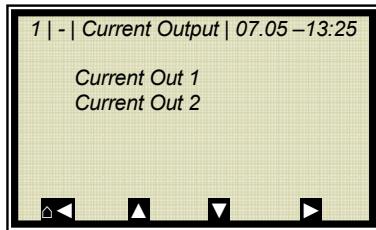
Digital Output:

Allocation of relays 1 and 2 and test function.

Digital Input:

Status control and assignment of the digital inputs.

2.2.20 Current output



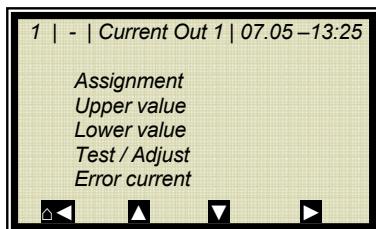
Current Out 1:

Select the setup display for output 1.

Current Out 2:

Select the setup display for output 2.

2.2.21 Current Output 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.

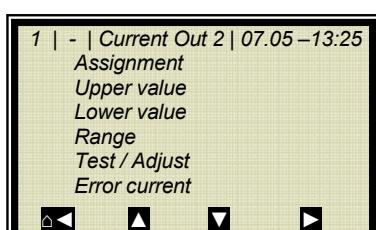
! (*In case of test function, the measurement should be stopped.*)

Error current:

Status of current output in case of error

- 22 mA
- 3.5 mA
- Hold
- Value

2.2.22 Current Output 2



All functions same as current output 1

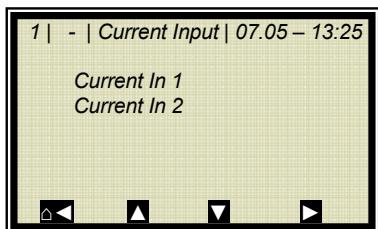
! Current output 2 can be set from 0 – 20mA to 4 – 20mA.

Range:

Change of the current output

- 0 – 20mA
- 4 – 20 mA

2.2.23 Current input



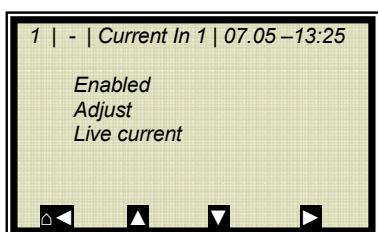
Current Input 1:

When selected, change to activation and calibration menu.

Current In 2:

As described above.

2.2.24 Current In 1



Enabled:

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

Adjust:

Follow the instructions on the display.

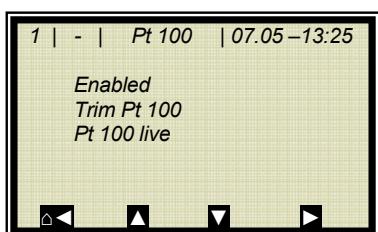
Live current:

Display of the live current signal.

2.2.25 Current In 2

Set and enabled same as input 1.

2.2.26 Pt 100



Enabled:

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

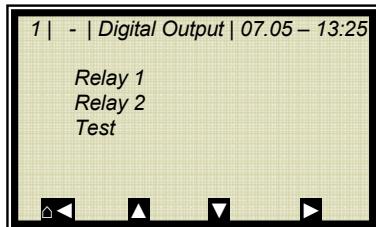
Trim Pt 100:

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.

2.2.27 Digital Output



Relay 1:

Relay 1 can be assigned to different functions:

- None
- Error
- Halt
- No product
- Alarm min.
- Alarm max.

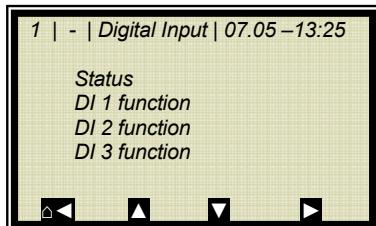
Relay 2:

Same assignments possible as above.

Test:

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

2.2.28 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:

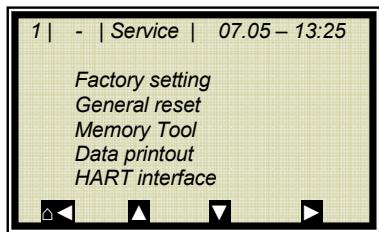
- None
- Hold (averaging is stopped)
- Product (external product selection)

DI 3 Function:

Assignments for DI 3

- None
- Sample (external control of sampling)
- Product (external product selection)

2.2.29 Service



Factory Settings and general reset:

See table on next page.

Memory Tool:

Communication with the external memory unit (Memory Tool, optional accessory). Data transfer takes place via the 9-pole SubD-connector on the bottom of the instrument.

- Backup settings: all operation parameters for all products are stored in the Memory Tool.
- Upload settings: all operation parameters are loaded into the evaluation unit by the Memory Tool. With that, all parameters are deleted from the evaluation unit.
- Backup data log: the data log is stored on the Memory Tool.
- Backup setup: the start-up protocol is stored on the Memory Tool.

! Important: The concentration average value is put on hold during communication with the Memory Tool.

Data Printout:

All measurement values for every single measurement (sweep) are sent by the serial interfaces RS 232 and RS 485 (also referred to as raw data).

The output can be adjusted as follows:

- None (disabled)
- Row (data transfer, see Hardware Manual chapter 6.4)
- Table (microwave data for each frequency point)
- Row and table (one data row and one table are output for each sweep)

Default represents "Line".

HART® interface (only prepare):

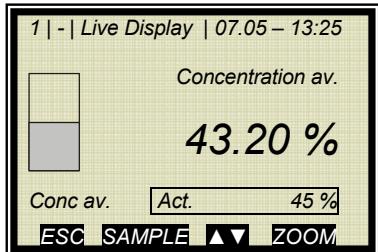
Settings for communication with HART®

- Polling address
- Write protection
- HART® version

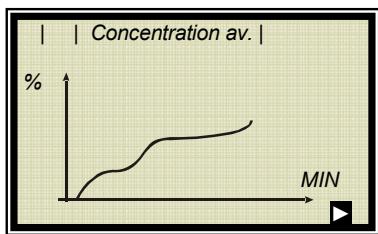
	Factory settings	General Reset
Language selection	Unchanged	Unchanged
Access level	Unchanged	Default: Basis
Measurement	Has been stopped	Has been stopped
Password	Unchanged	Default: PASS1
Product selection	Unchanged	All products deleted
Error log	Not deleted	Deleted
Data log	Not deleted, Setting default	Deleted, setting default
System calibration	Not deleted	Deleted
Cable length	Unchanged	Default
Sample table	Not deleted	Deleted
Measuring table description	Default	Default
All parameter under menu: Measurement Plausibility Marker Unit	Default	Default
Calibration coefficients	Default	Default
All calibration under the analog and digital in and outputs.	Default	Default
Adjustment of analog in and outputs	Unchanged	Deleted
Remark:	Only is effective on current product	Is effective for all products (P1 to P4)
-		

*Default: default values, see chapter 9. under „Factory settings“

2.3 Trend Display



Push the **ZOOM** button to enlarge the measurement value which is surrounded by a frame.



By pushing the **ZOOM** button for a longer time, the enlarged measurement value will be displayed as trend over the entire display.

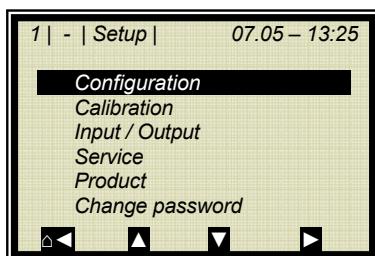
The trend display corresponds to the contents of the datalog. Datalog has to be enabled for the trend display.

! During the trend set up (few seconds), the measuring value or the power output is frozen.

Chapter 3. Configuration

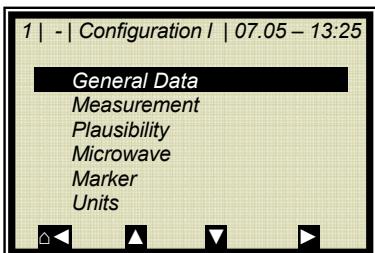
Before carrying out any calibration work, you should check the configuration setup of the measuring system and change it, if necessary.

3.1 Configuration Setup

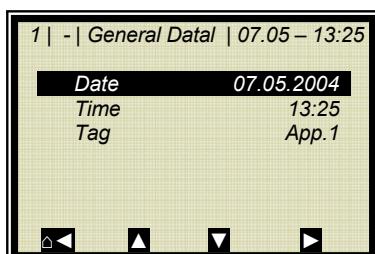


➤ CONFIGURATION

3.1.1 General Data



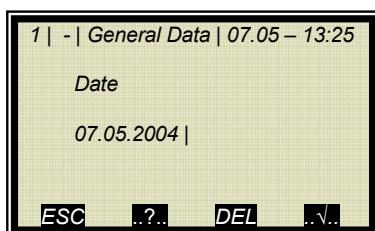
➤ GENERAL DATA



Example:

Select the respective entry, edit and store it.

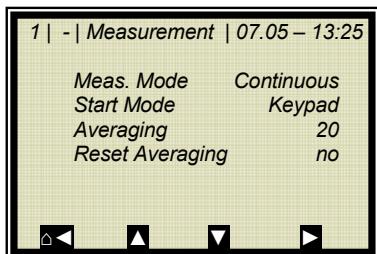
➤ DATE



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

! The colon for the time input (e.g. 13:25) is invoked by pushing the button [.].

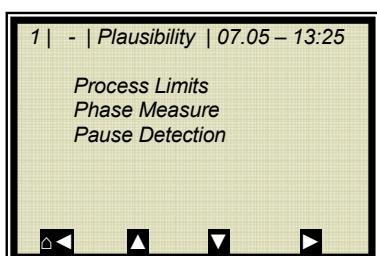
3.1.2 Measurement



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.

3.1.3 Plausibility

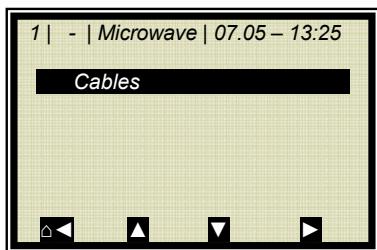


To rule out any unnecessary disturbances during calibration, the **process limits** should be set, as far as possible, below or above the measuring range.

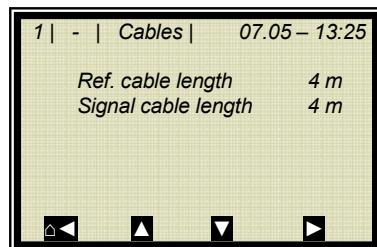
You should keep the factory-set default values for the **phase measurement** and disable **Pause detection**. If a default value has to be changed, you have to check all entries that are relevant for calibration and, if necessary, renew them.

Upon completion of the calibration work, you can enable *Pause detection* again.

3.1.4 Microwave



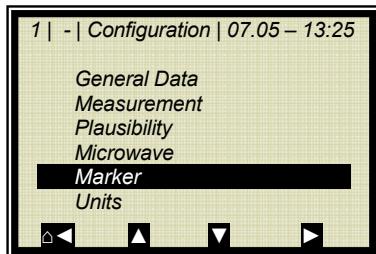
➤ CABLES



If the factory-set cable lengths do 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.

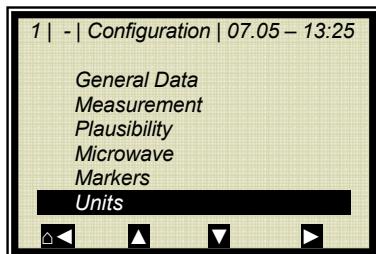
3.1.5 Marker



You can set a marker comprising max. 5 characters which identify the value set on in the live display.

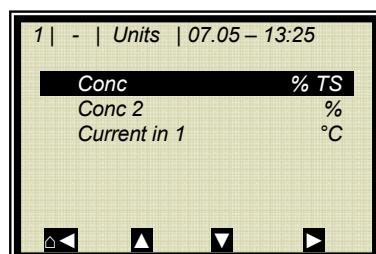
➤ MARKER

3.1.6 Units



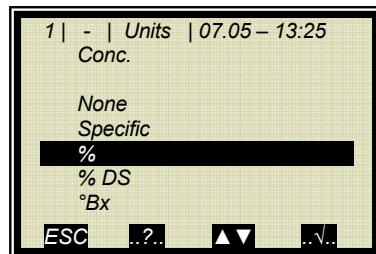
Set the units as desired.

➤ UNITS



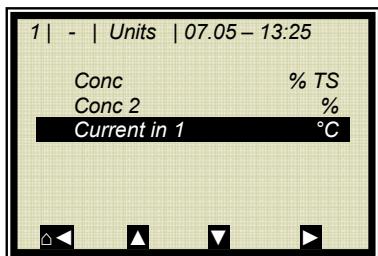
➤ CONC

The units of the concentrations (conc 1 and 2) and those of the enabled analog inputs can be selected.

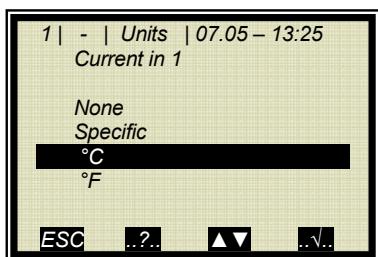


➤ %

Different units can be set for both concentrations.



➤ CURRENT INPUT 1

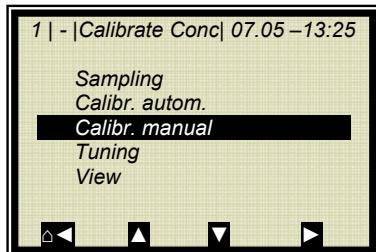


➤ °C

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

3.2 Start Calibration Coefficients

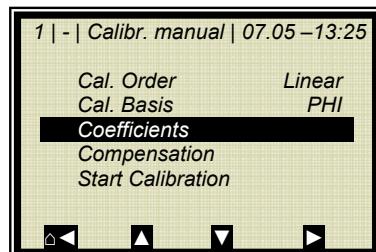
Prerequisite: You are in the Profi mode



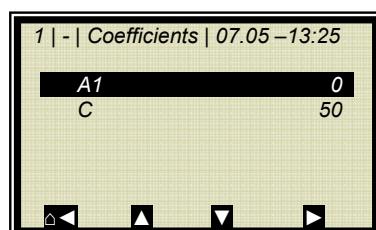
If the display depicted to the left is not visible, do the following on the live display:

ESC | SETUP | CALIBRATION | CALIBRATE CONC |

➤ CALIBR. MANUAL



➤ COEFFICIENTS



Check the coefficients A1 and C and correct them, if necessary, as follows:

C = average measuring range value (concentration value)

A1 = 0

Note: With these calibration coefficients the concentration average value and thus the current output is put on hold during start-up.

Chapter 4. Calibration

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

It has to be ensured that the flow cell is completely filled with product or the container probe is completely surrounded by product.

Prerequisite: Chapter

3.1 Configuration Setup

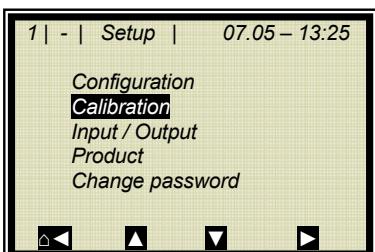
has been completed.

4.1 System Calibration

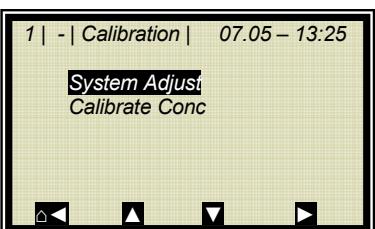


If you turn on the measuring system, the following display appears:

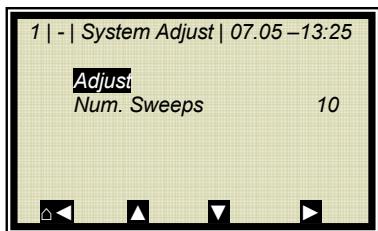
➤ SETUP



➤ CALIBRATION

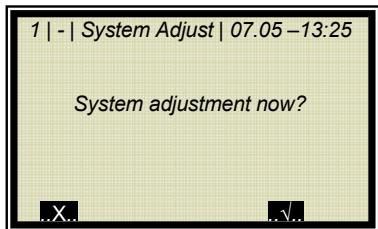


➤ SYSTEM ADJUST

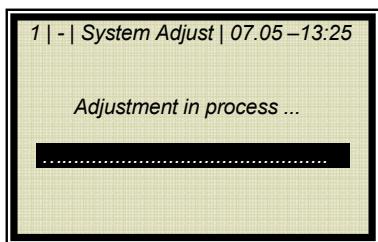


The manufacturer has set the number of measurement cycles (sweeps) to 10.

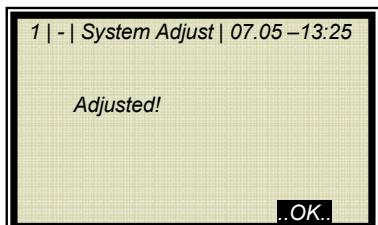
➤ ADJUST



Confirm



System adjustment is in process.



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

4.2 Start-up of Micro-Polar Brix ++

System adjustment and calibration are carried out in just the same way for Micro-Polar ++, as they are for the standard system Micro-Polar Brix. However it has to be paid attention to the fact, that the ++system needs a minimum attenuation of 40 dB above the complete concentration range and while system adjustment. When falling below, the measurement is not precise anymore and error prompts may occur.

The complete attenuation is generated the following way:

$$dB_{\text{total}} = dB_{\text{adjust}} + dB_{\text{live}} + 0.4 \times \text{measuring cable length}$$

This applies for:

dB_{total} : total attenuation

dB_{adjust} : attenuation while system adjustment

dB_{live} : actual attenuation while measuring

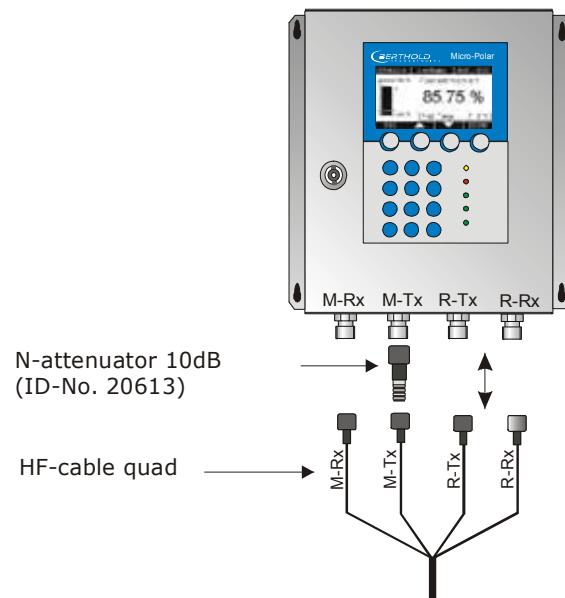
measuring cable length: e.g. 4 meters of HF-cable quad results into 8 meters measuring cable length (counting both ways, forward and backwards).

From software version 1.22 on, the evaluation unit is controlling the total attenuation automatically and shows an error prompt when falling below (Error no. 55).

Remedy when falling below minimum attenuation:

If the necessary attenuation is not reached, it is possible to install a 10 dB attenuator in the transmitter branch (see Figure 4-1). However when falling below significantly, the standard system Micro-Polar Brix should be used instead.

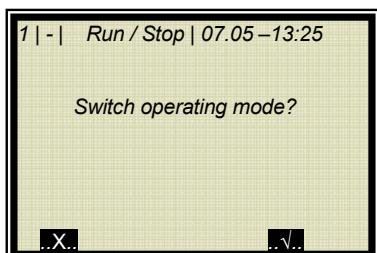
Figure. 4-1:
Installation the
10 dB attenuator



4.3 Start Calibration



Push **RUN** to start the measuring system.



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

4.3.1 First Process Run

Prerequisite: You are in the Profi mode
 Chapters **3.1 Configuration Setup**
3.2 Start Calibration Coefficients
4.1 System Calibration

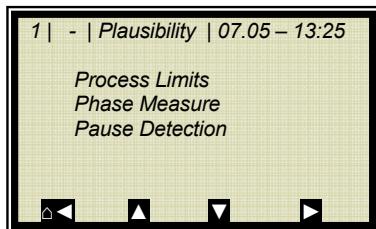
have been completed.

The first process run is used to determine the ratio of Phase and Attenuation (Phi/att), a parameter from the plausibility analysis for correct determination of the phase.

If you know the ratio already from other measurements, you may enter it directly on the PLausibility menu (see *chapter 2.2.10 Phase Measurement*); in this case, process recording is not necessary.

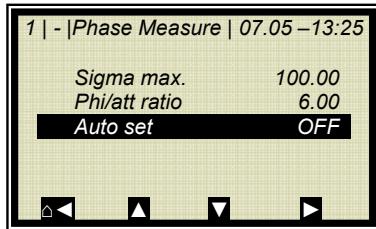
! The measurement takes place automatically; you only have to start and stop it again. During measurement, please keep in mind:

- Do not stop the measurement
- Do not change the concentration erratically (max. 1%).
- Cover the entire measuring range, if possible

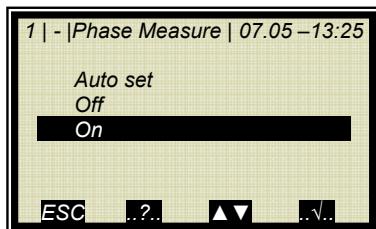


From the main menu, you get in the Advanced mode to the display to the left by selecting | SETUP | CALIBRATION | CALIBRATE CONC.

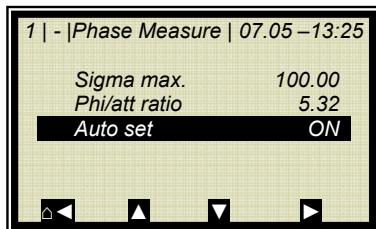
➤ PHASE MEASURE



➤ AUTO SET



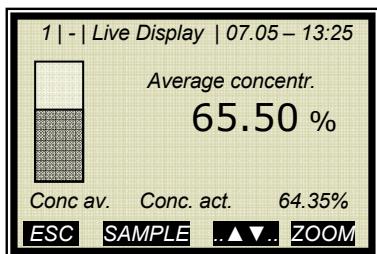
➤ ON



While the process recording is running, carry out sampling (see the following chapter).

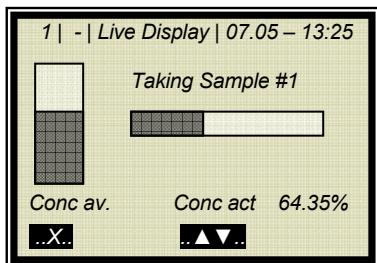
Do not forget to enable the process recording again as described above!

4.3.2 Sampling



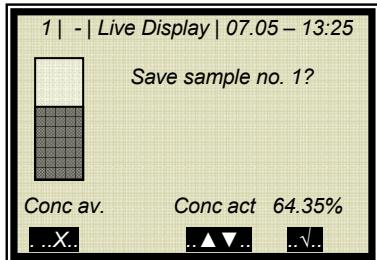
Push **RUN** and the display to the left will appear.

Note: Push the SAMPLE 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 sampling process any time.



If the sampling process has been completed without any problem, push the **..V..** button to save the sample in the table and the measurement continues.

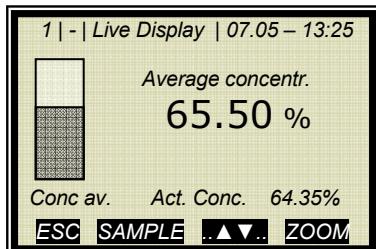
You have to repeat the process described above for each further sample.

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

The assumed concentration of the samples should be distributed within the complete measuring range. If there is an additional temperature compensation, the temperature of the samples should be also distributed within the complete temperature range.

The minimum number of required samples is derived according to the preset calibration. In case there is not a sufficient number of samples, an error message will appear after attempted calibration.

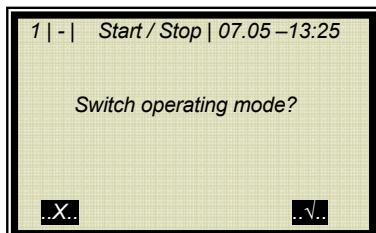
4.3.3 Entering the Lab Values



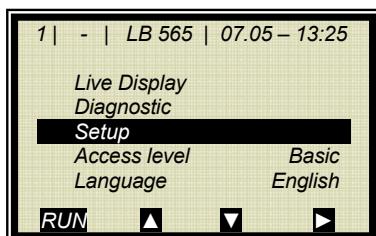
Push the **ESC** button to go to the main menu. A measurement can be stopped only on the main menu.



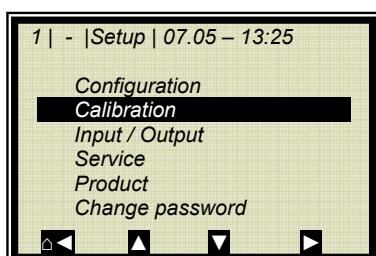
Push **STOP** to stop the measuring system.



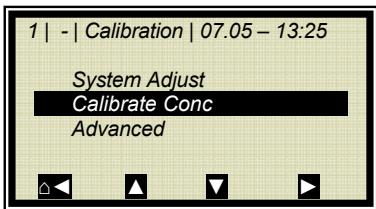
Push **..√..** to confirm the prompt and the measurement switches to the **STOP** mode.



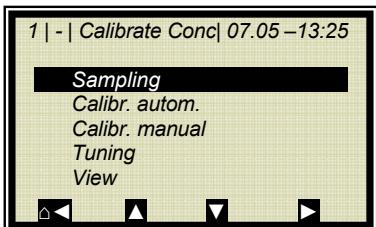
➤ **SETUP**



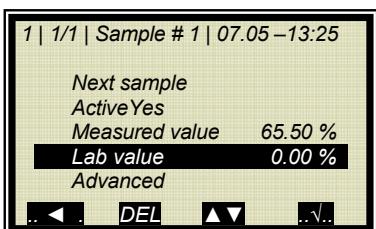
➤ **CALIBRATION**



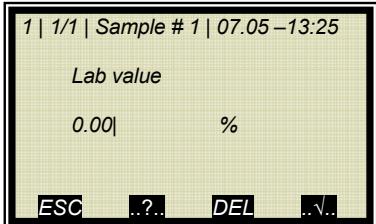
➤ CALIBRATE CONC



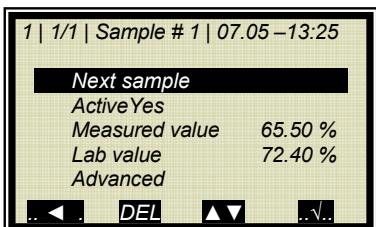
➤ SAMPLING



➤ LAB VALUE



Delete default value with **DEL**, enter new value and confirm with **.V..**.

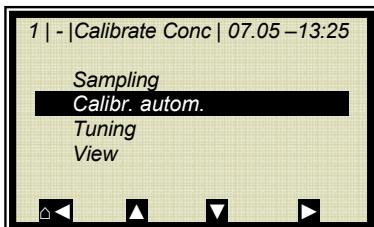


➤ NEXT SAMPLE

and repeat the step described above with the next sample.

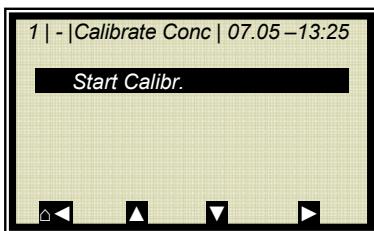
After you have entered the last sample by pushing the **◀** button you get back to the Calibration menu. (Short push – one page, longer push of the button – you get back to the Calibration menu immediately.)

4.3.4 Automatic Calibration

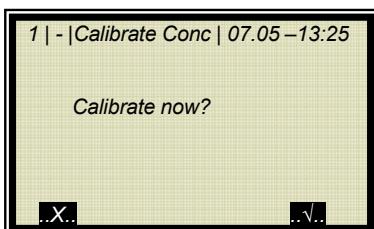


Phase calibration including the enabled compensation is carried out during automatic calibration.

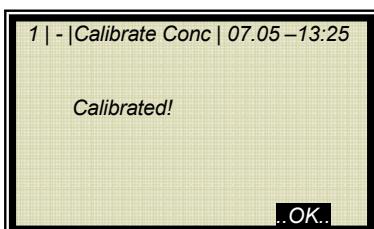
➤ CALIBR. AUTOM.



➤ START CALIBR.

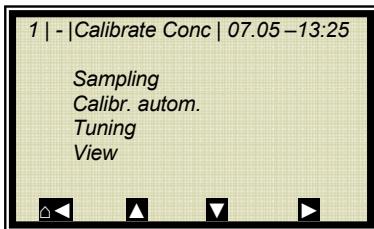


Push the ..√.. button to start the calibration.



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

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



Push the ..△◀.. button four times to return to the main menu.

4.3.5 Automatic 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.

Usually, automatic calibration is sufficient and can be performed in the Basic mode.

The chapters

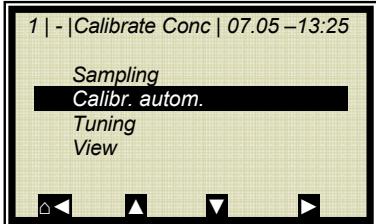
4.1 System Calibration

4.2.2 Sampling and

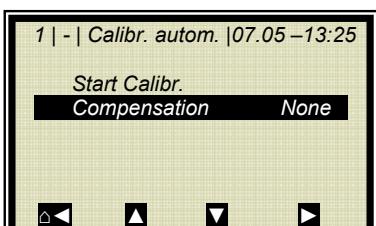
4.2.3 Entering of Lab Values

are prerequisites for automatic calibration.

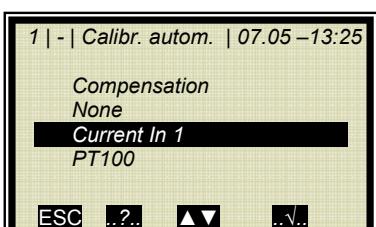
Starting from the main display, you get to the display depicted to the left by selecting | SETUP | CALIBRATION | CALIBRATE CONC. |



➤ CALIBR. AUTOMATIC

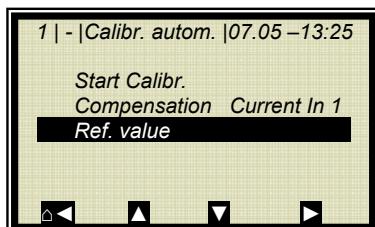


➤ COMPENSATION



All active inputs are displayed here for compensation selection.

➤ CURRENT IN 1

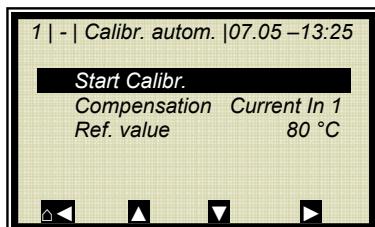


➤ REFERENCE VALUE

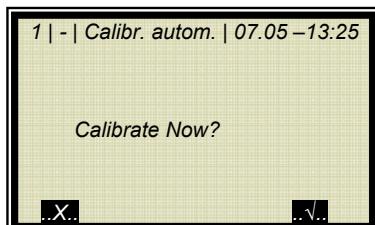
After selection of the compensation input, REFERENCE VALUE is displayed on the menu. The input of a reference value (e.g. the reference temperature) is required.



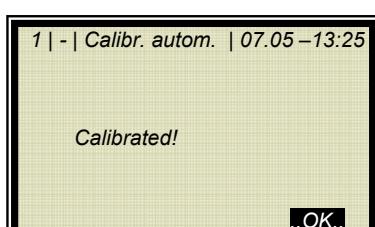
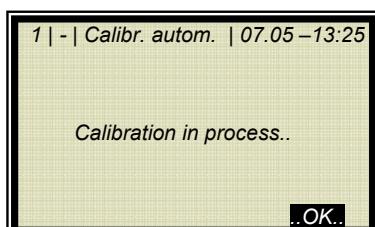
As reference value either the temperature of the product during calibration or the averaged operating temperature entered and confirmed.



➤ START CALIBRATION



Start calibration.



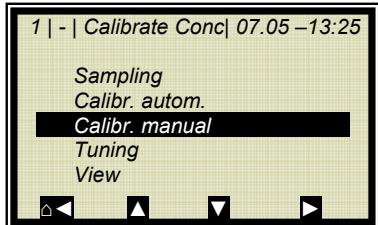
Push **..OK..** to confirm the Calibration. The calibration is finished. Push the Home button **△◀** four times to return to the main menu and to start a measurement.

4.4 Manual Calibration

Manual calibration is possible only on the Profi level.
Prerequisite for manual calibration are the chapters

- 4.1 System Calibration
- 4.2 Start Calibration
- 4.2.2 Sampling and
- 4.2.3 Entering the Lab Values

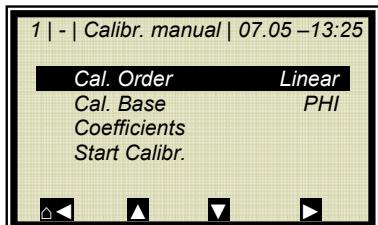
4.4.1 Manual Calibration with one Concentration



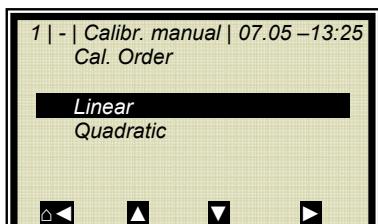
If the display depicted to the left is not visible, do the following on the live display:

ESC | SETUP | CALIBRATION | CALIBRATE CONC |

- CALIBR. MANUAL

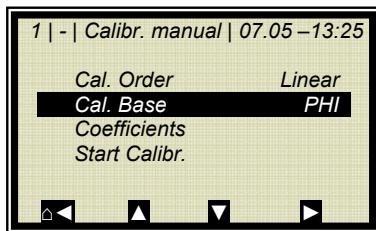


- CAL ORDER

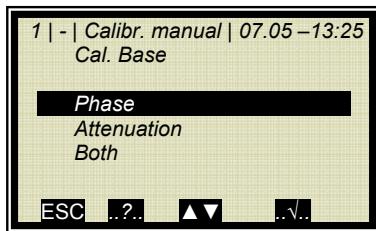


- LINEAR

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

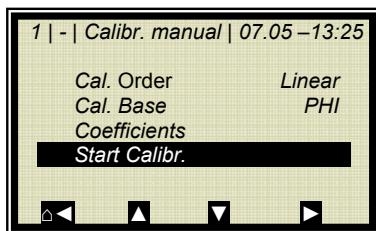


➤ CAL. BASE

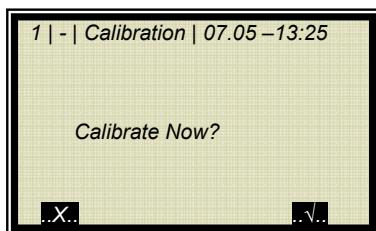


➤ PHASE (Phase measurement)

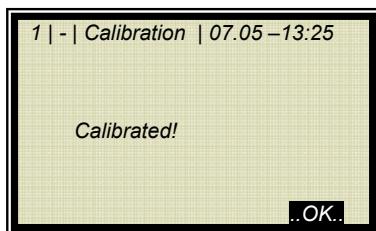
The calibration base is selected depending on the number of samples and their raw data. Initial calibration should be as simple as possible, since calibration can be optimized any time.



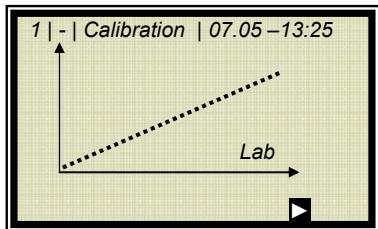
➤ START CALIBRATION



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

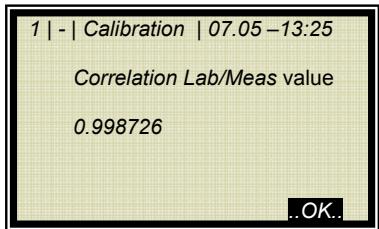


..OK.. takes over the calibration and changes to the next display.



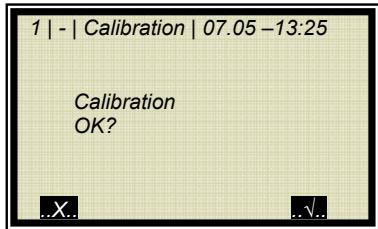
The curve to the left shows the characteristic curve lab vs. measured value.

➤ ...►...



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

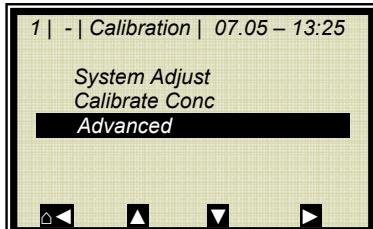
➤ ..OK..



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.

4.4.2 Calibration with Two Concentrations

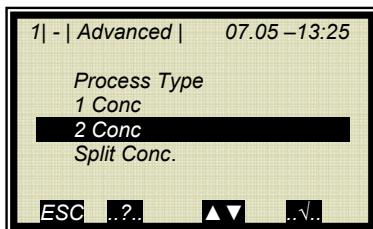
Calibration for two concentrations starts by changing the process type as described below.
 Prerequisite for calibration are the chapters
4.1 System Calibration and
4.2.2 Sampling



➤ ADVANCED

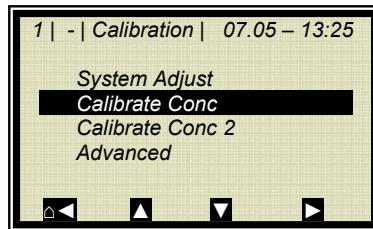


➤ PROCESS TYPE

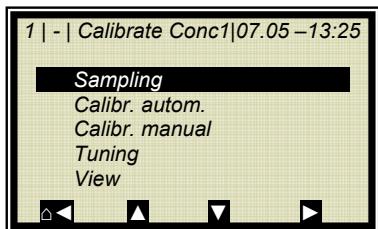


➤ 2 CONC

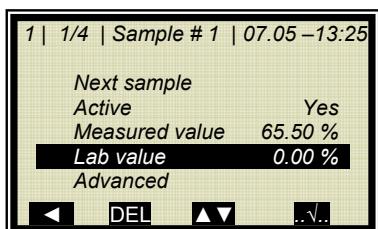
Push the **.. \checkmark ..** button to accept the selected process type and push the **.. \triangleleft ..** button once to go to the display depicted below.



➤ CALIBRATE CONC 1

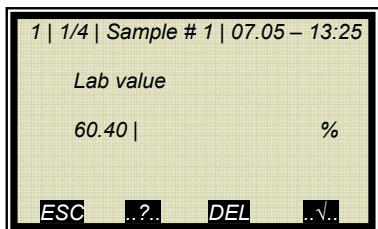


➤ SAMPLING

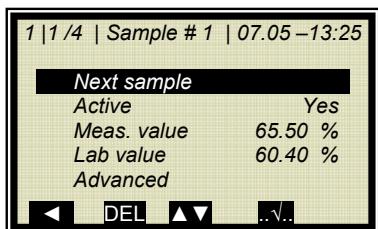


There is only one sample table for both calibrations.
The lab values have to be entered for all samples used for calibration of concentration 1. All other samples have to be disabled (Active.... Yes/No).

➤ LAB VALUE

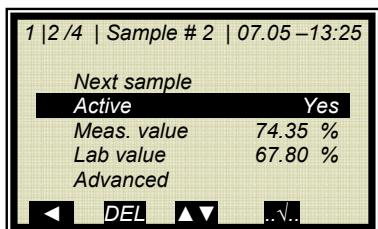


Delete default value with **DEL**, enter new value and confirm with **.V...**.



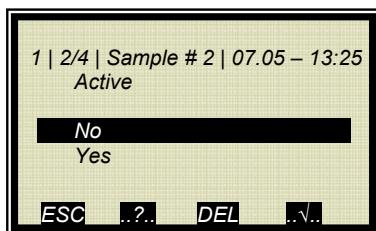
➤ NEXT SAMPLE

Continue with next sample

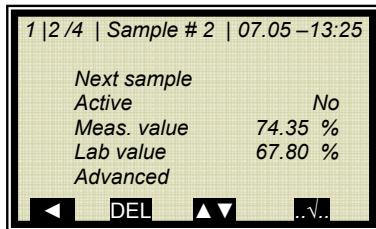


➤ ACTIVE

Disable sample

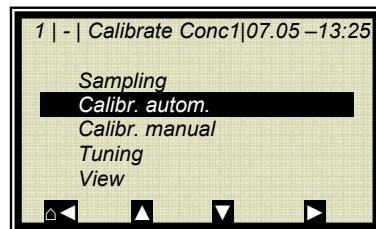


➤ NO

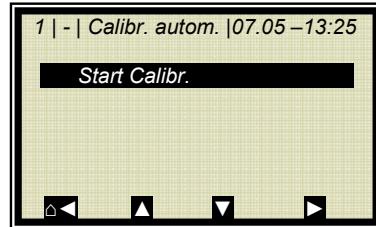


Make sure that all samples have been processed and only those samples are active which are relevant for this calibration.

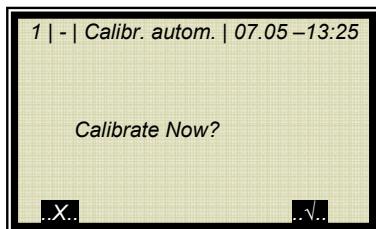
Push **◀** ESC to get to the Calibration page



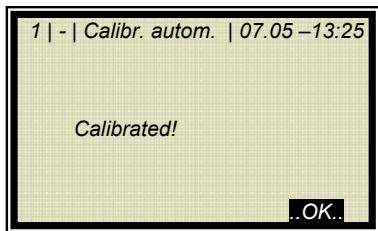
Automatic as well as manual calibration is possible in this calibration mode. For non-professional users we recommend the automatic mode.



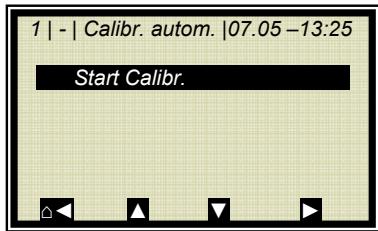
➤ START CALIBRATION



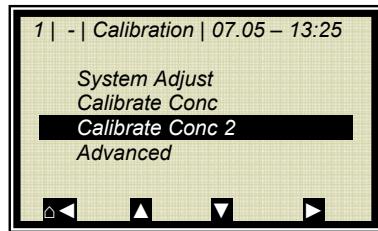
Push **...√...** to start the calibration, push **...X...** to go back one page without calibration.



..OK.. takes over the calibration and changes to the next display.

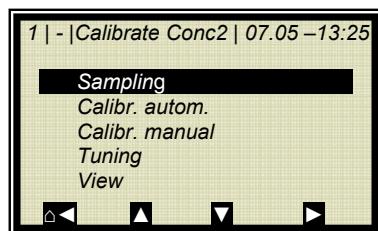


Push **◀** twice to return two pages.



➤ CALIBRATE CONC 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.

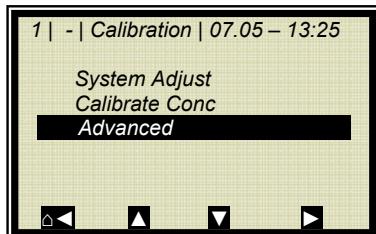


➤ SAMPLING

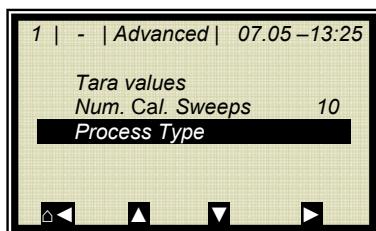
4.4.3 Calibration with Split Value

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

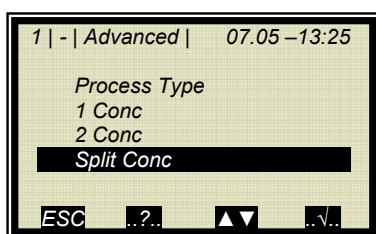
Conc 1 for the lower and conc 2 for the upper measuring range can be output only together via current output.



➤ ADVANCED



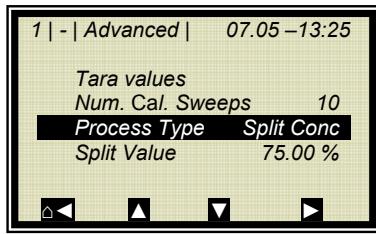
➤ PROCESS TYPE



➤ SPLIT CONC

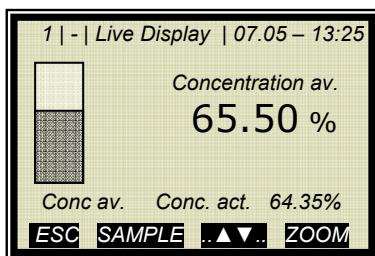
Push the **...√..** button to accept the selected process type and push the **..**△**..** button once to go to the display depicted below.

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



The samples should be chosen that way that the last sample of the lowest concentration is as close as possible to the first sample of the highest concentration.

It is the ideal case, when the last sample of the initial concentration coincides with the first sample of the final concentration.



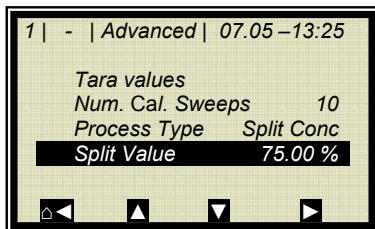
The sample measurement is carried out continuously over the entire measuring range with the display depicted to the left. See chapter 4.2.2 Sampling

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.

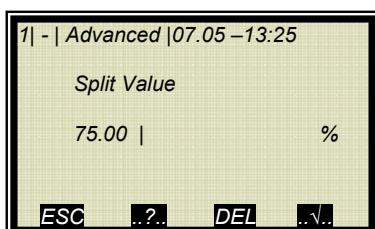
The correlation of the samples is carried out automatically, for instance after setting the splitting value or after entering the laboratory value (e.g. after re-sampling). The correlation complies with both, the splitting value and the laboratory value.

! By entering a splitting value, this automatic correlation reactivates samples that had been deactivated before! In such cases the deactivated samples should be deleted or deactivated again after entering the splitting value.

The required splitting value has to comply with the intersection of the two calibration characteristic lines. After calibration it is adjusted automatically (only to a certain extend).

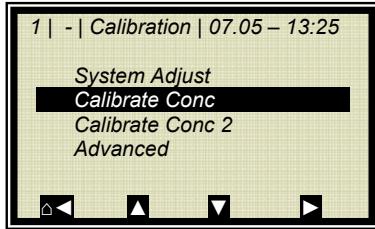


➤ SPLIT VALUE

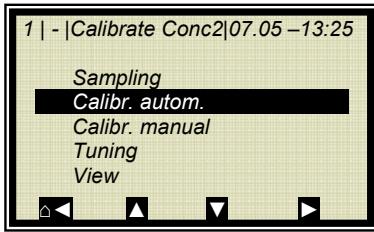


Enter the split value and confirm with ..✓..

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



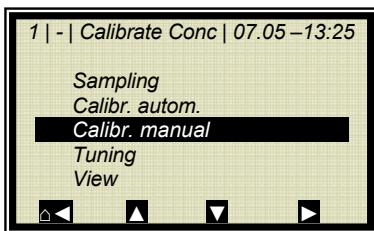
➤ CALIBRATE CONC



➤ CALIBR. AUTOM.

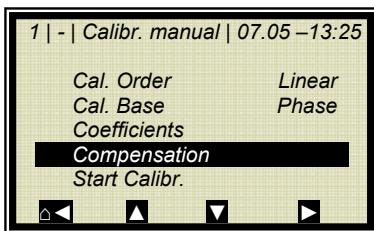
The lower concentration is now calibrated. Then select CONC 2 and repeat the calibration process.
Back to the main menu and start the measurement.

4.4.4 Calibration with Temperature Compensation

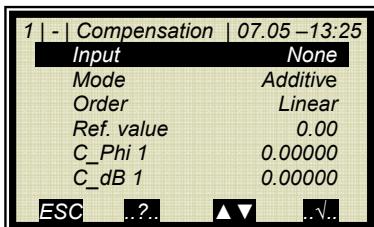


Starting from the main menu, you get to the display to the left by selecting | SETUP | CALIBRATION | CALIBRATE CONC | in the Profi mode.

➤ CALIBR. MANUAL

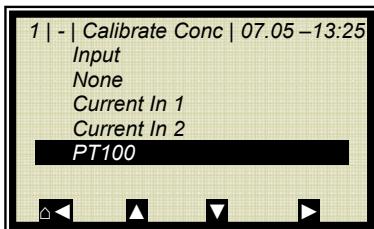


➤ COMPENSATION



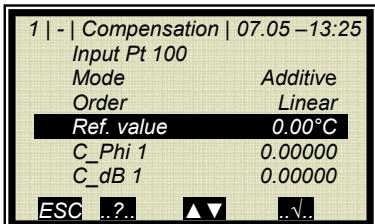
➤ INPUT

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

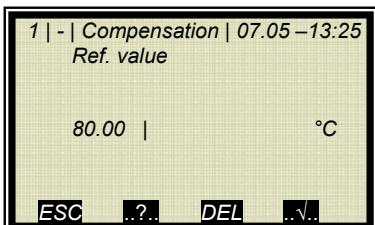


➤ Pt 100

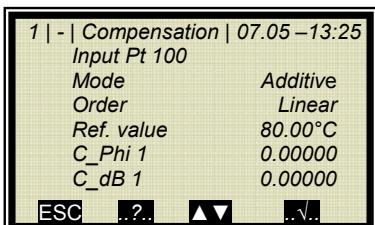
You can select additive or multiplicative **mode** and set the **order** to linear or quadratic. If you select **automatic** calibration mode, the above modes will be calculated automatically. This is recommended for non-professional users.



➤ REF VALUE



As reference value either the temperature of the product during calibration or the averaged operating temperature entered and confirmed.



The coefficients C_Phi 1 and C_dB 1 are automatically calculated during calibration.

➤ ESC

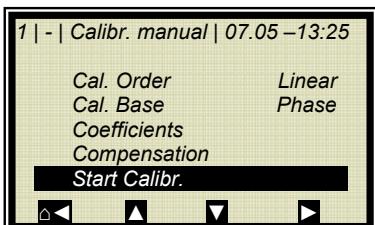
If you have completed the entries described above and have carried out the steps described in chapters

4.1 System Calibration

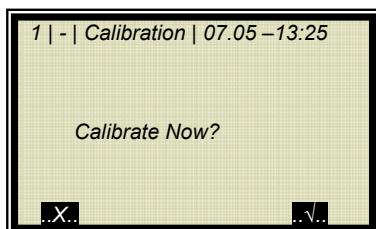
4.2.2 Sampling and

4.2.3 Entering the Lab Values

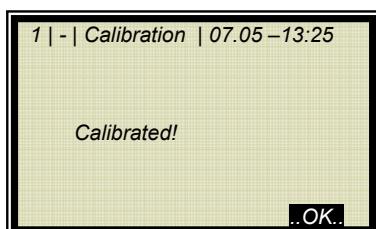
you may proceed with the calibration as described below.



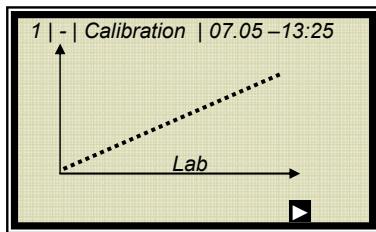
➤ START CALIBR.



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

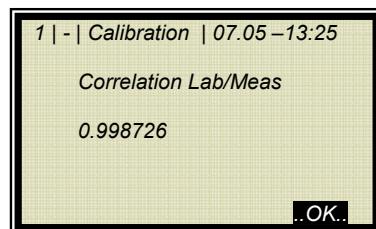


..OK.. takes over the calibration and changes to the next display.



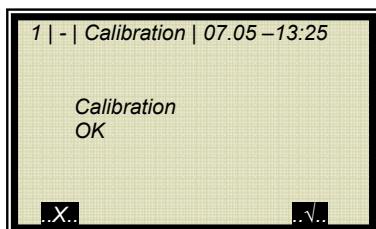
The curve to the left shows the characteristic curve lab vs. measured value.

➤ **..►..**



The correlation indicates the average deviation of the characteristic curve from the sample series.

➤ **..OK..**



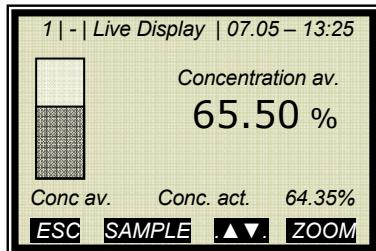
As soon as you confirm this prompt, the calibration display appears again; from there you get back to the main menu by pushing **△◀** four times and you can start the measurement again.

4.5 Adjusting the Calibration

A correction factor and an offset factor may be entered later to obtain subsequent adjustment of the calibration (fine calibration).

Below please find an example for an offset adjustment.

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



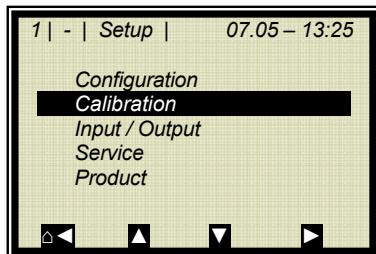
The display reading is now compared with the analysis value of the lab sample. The difference has to be entered as offset with the correct algebraic sign.

Calculation: Analysis value – display = offset

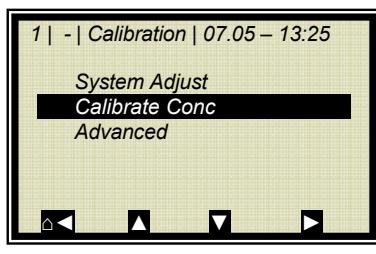
Push **ESC** to return to the main display.



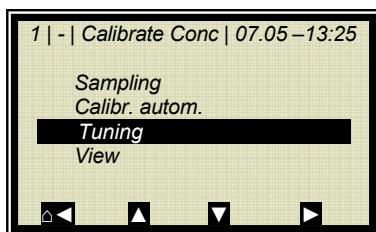
➤ **SETUP**



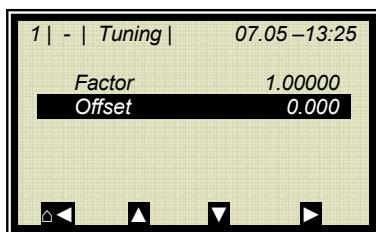
➤ **CALIBRATION**



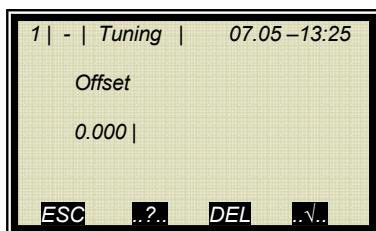
➤ **CALIBRATE CONC**



➤ TUNING



➤ OFFSET



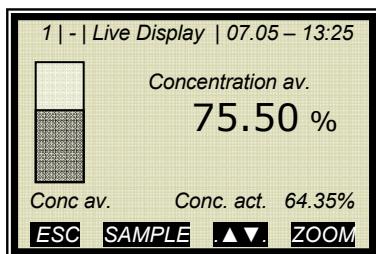
Enter the calculated offset value, confirm with **...√...** button and push the Home button four times to return to the main menu.



Select with

➤ LIVE DISPLAY

to get back to the display.



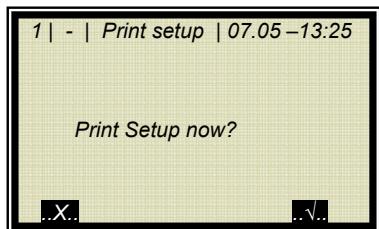
The reading value should now correspond to the actual value.

4.6 Output of the start-up protocol



Starting from the main menu, you get to the display to the left by selecting | DIAGNOSTIC | in the Profi mode.

➤ PRINT SETUP



Push **...√...** to start the print out by RS 232 and RS 485, push **...X...** to go back one page without sending.

The start-up protocol includes all adjustable parameters, calibration data, data of the system adjust and entries of the sample table.

Further information for instance about the format or an example of such a protocol can be found in chapter 9.5.

Chapter 5. Password

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

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 to service personnel.

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

The password can be changed in the profi mode at: menu | SETUP | CHANGE PASSWORD.

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



Note: Depending on the access level, some menu items are hidden.

5.1 Forgot password

The device is in the “read only” mode and the user forgot the password. In order to carry out a “reset” of the user level, use the following way:

Switch off the device.

Switch it on again, the moment when all 5 LEDs light up while booting the 0 (zero-key) has to be pushed constantly for 8 seconds!

The device boots in basic mode now. Henceforward it can be carried out a manual “general reset” or define a new password respectively.

! Caution: check your process before switching off the device. For example the power output drop to 0 mA.

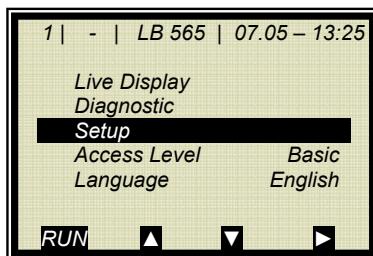
Chapter 6. Inputs / Outputs

The measuring system includes two separate floating current outputs.

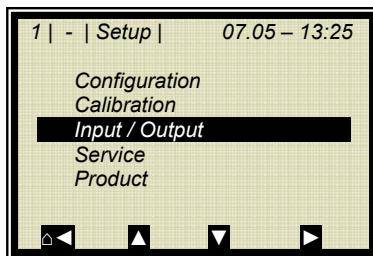
6.1 Current Outputs

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

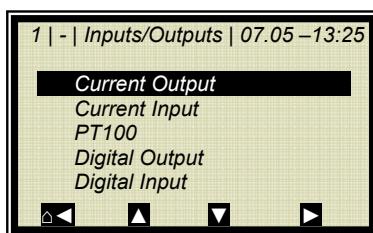
You get to the setup display as follows.



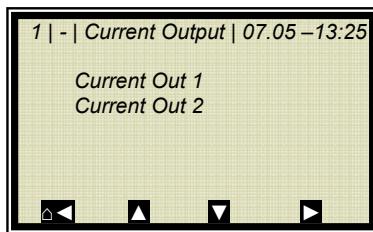
➤ SETUP



➤ INPUTS / OUTPUTS

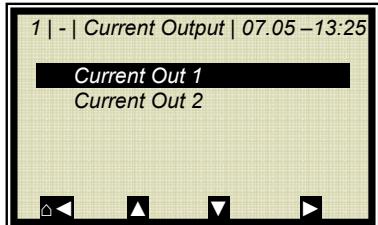


➤ CURRENT OUTPUT

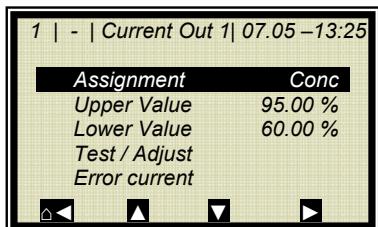


Now you can select the respective current output and assign it to the concentration after calibration.

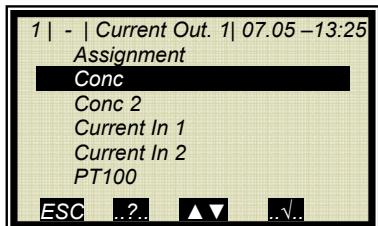
6.1.1 Current Output Setup



➤ CURRENT OUT 1



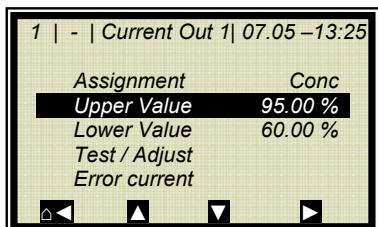
➤ ASSIGNMENT



➤ CONC

Select and confirm with **...v...**

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



➤ UPPER VALUE

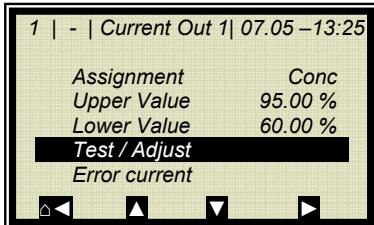


Delete the old value with **DEL**. Enter the new limit value and confirm with **...v...**.

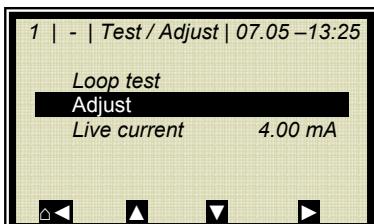
Set the lower value also as described above.

6.1.2 Test and Adjustment

Prerequisite: You are in the Profi mode

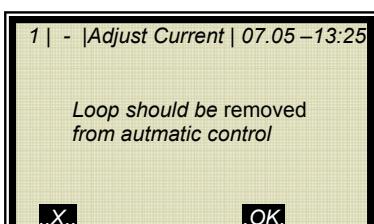


➤ TEST / ADJUST

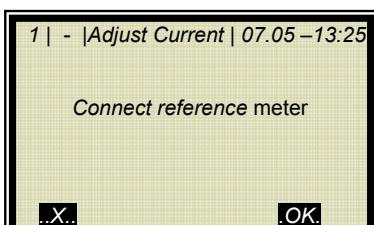


➤ ADJUST

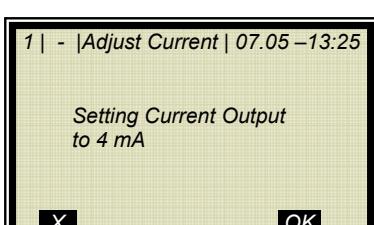
! **Warning:** Current output 1 can only be set from 4 to 20 mA, since it is foreseen for a HART communicator.



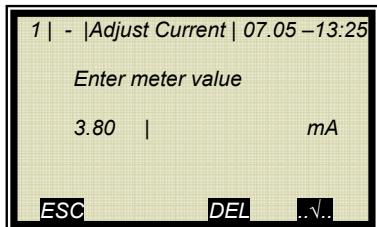
Push **..OK..** to confirm that the process is not affected by the measurement.



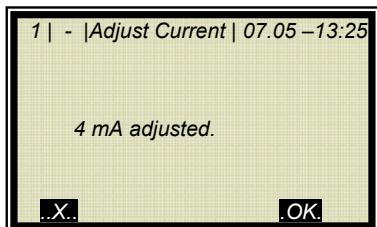
Push **..OK..** to confirm that the measuring system is connected.



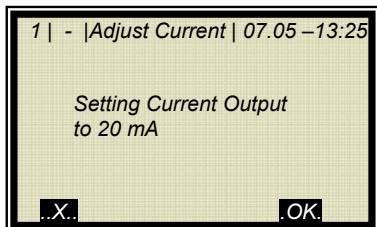
Push **..OK..** to confirm.



Read off display of measuring system and enter value.



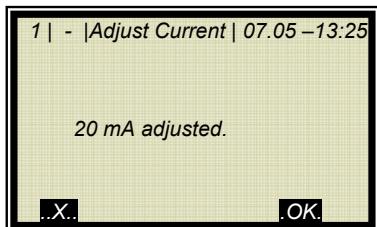
4 mA value adjusted.



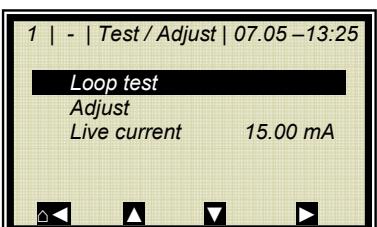
Push ..OK.. to confirm.



Read off display of measuring system and enter value.



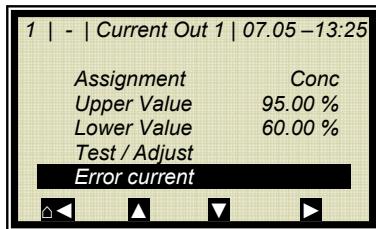
Adjustment finished.



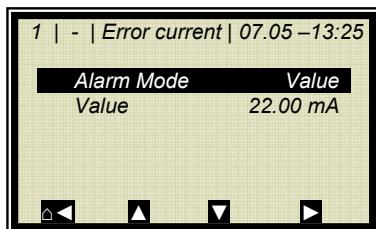
To check the current loop and possibly connected remote displays, you can set a current between 4 and 20 mA via the test function. If you quit the test function, the system automatically switches back to the live current.

6.1.3 Error Current

Different signal effects can be assigned to the output current.

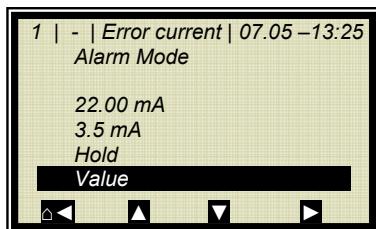


➤ ERROR CURRENT



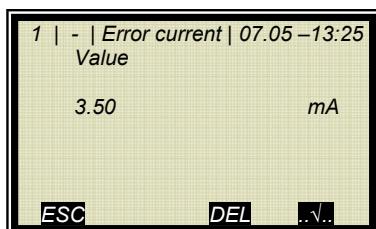
➤ ALARM MODE

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



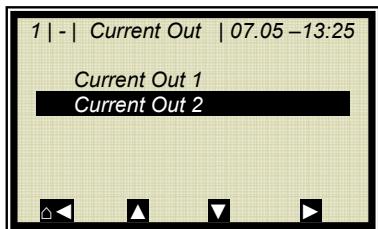
➤ VALUE

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



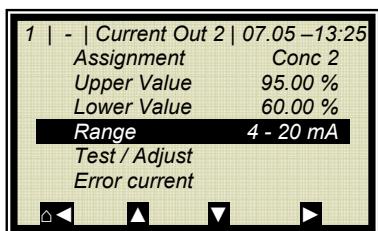
Enter value and confirm with **..\r..**.

6.1.4 Current Output 2

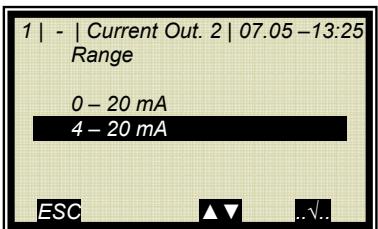


➤ CURRENT OUT 2

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.



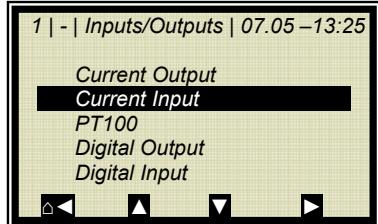
➤ RANGE



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

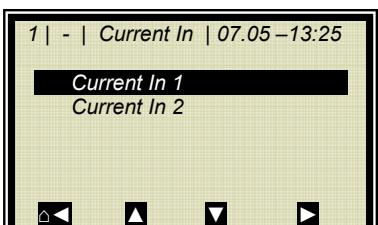
6.2 Current Inputs

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

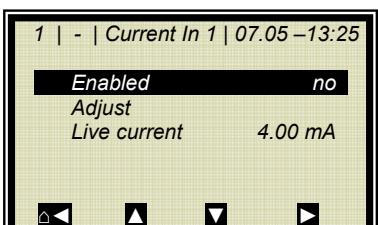


➤ CURRENT INPUT

6.2.1 Enabling the Current Input

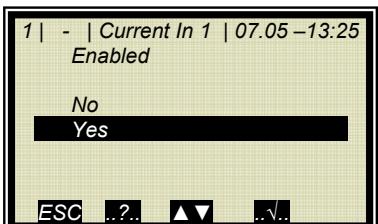


➤ CURRENT IN 1



➤ ENABLED

The menu ADJUST is only displayed at the profi mode.

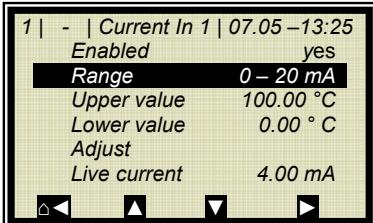


➤ ENABLING

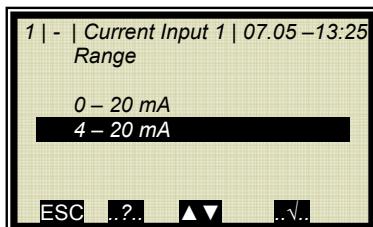
If a measurement is running, enabling an adjusted current input which is not used may cause an error.

6.2.2 Range Setting and Adjustment

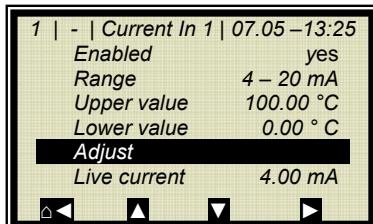
Prerequisite: You are in the Profi mode



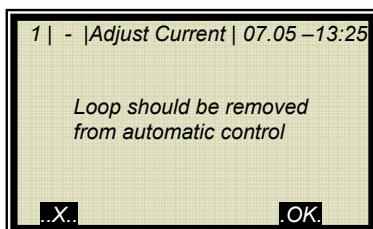
➤ RANGE SETTING



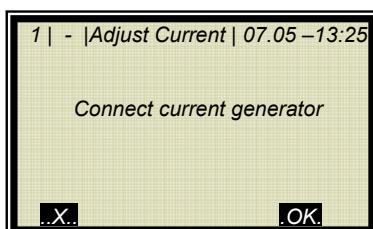
➤ 4 – 20 mA



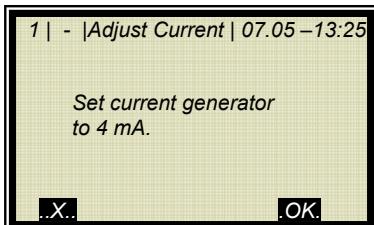
➤ ADJUST



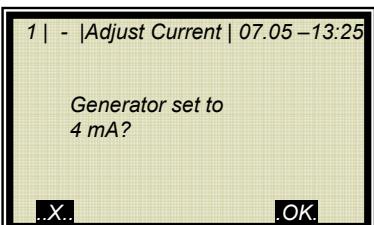
Push **...OK..** to confirm that the process is not affected by the measurement.



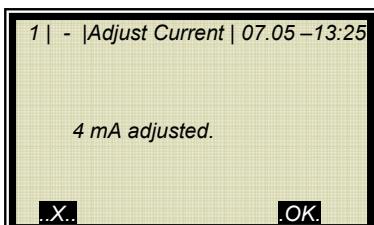
Push **...OK..** to confirm that the current generator is connected.



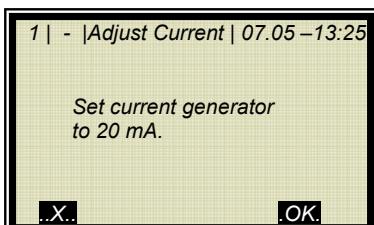
➤ Set current generator to 4 mA.



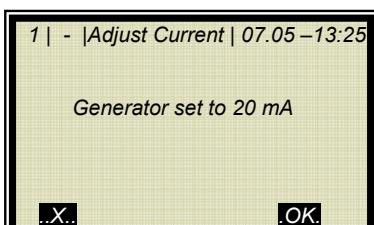
Push the **..OK..** button to confirm.



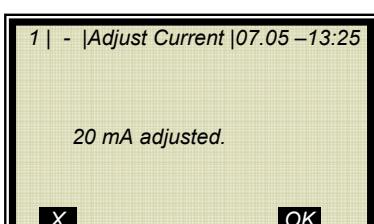
Push **..OK..** to confirm adjustment of the lower value.



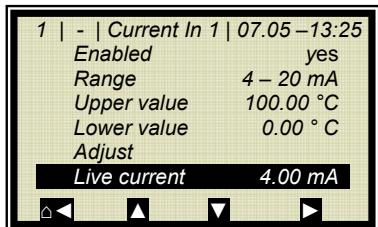
➤ Set current generator to 20 mA.



Push the **..OK..** button to confirm.



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

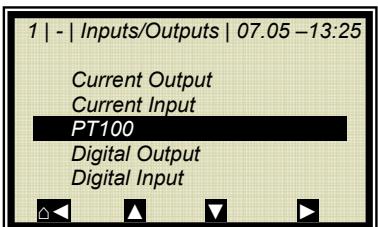


Adjustment finished. The live current is displayed.

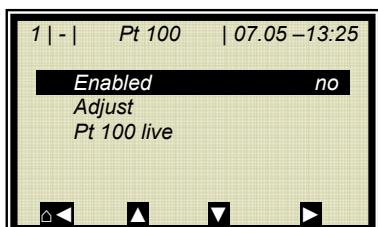
If necessary, carry out range setting and calibration of current input 2 as described above.

6.3 Pt 100

6.3.1 Pt 100 Enabling

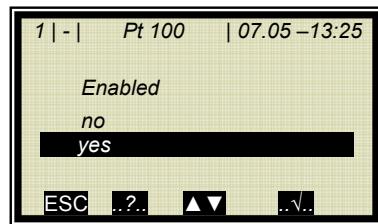


➤ Pt 100



➤ ENABLED

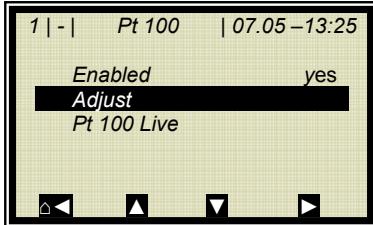
The menu ADJUST is only displayed at the profi mode.



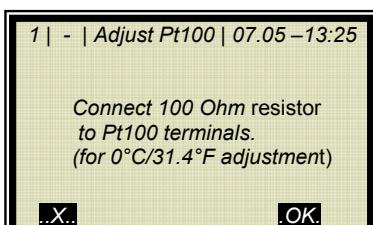
Select „yes“ and push ..√.. to confirm.

6.3.2 Pt 100 Calibration

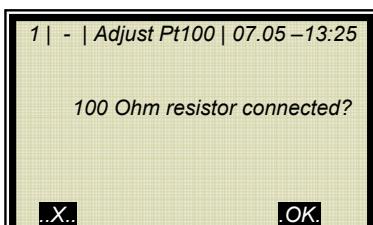
Prerequisite: You are in the Profi mode



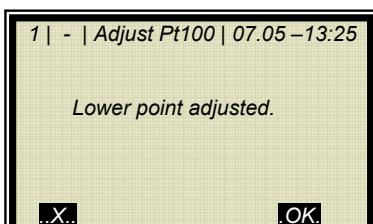
➤ ADJUST



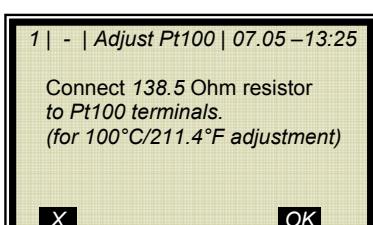
Connect 100 Ohm resistor to Pt100 terminals [11] [23].



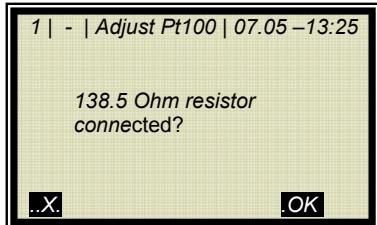
Confirm once more with ..OK..



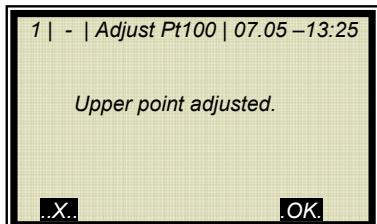
Adjustment of lower point finished.



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



Confirm safety prompt.



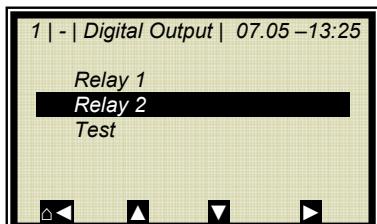
Calibration is finished.

6.4 Digital Output

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

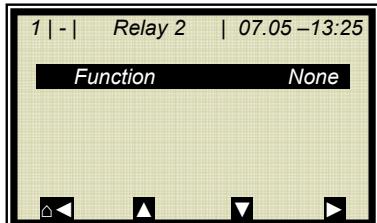
Relay 1 is associated with LED signal 1 and relay 2 with signal 2.

6.4.1 Digital Output Assignment

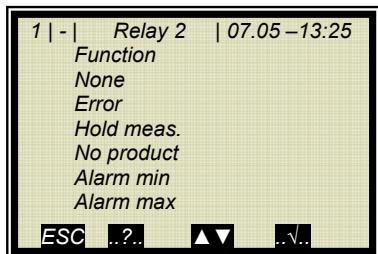


From the main menu you get to the display depicted to the left via | Setup | Input/Output | Digital Output

➤ 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	If Hold function is enabled, relay and LED will be set.
No product	If <i>Pause detection</i> 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/Stop		12/24
DI 2	None	Hold	Product	13/25
DI 3	None	Sample	Product	14/26

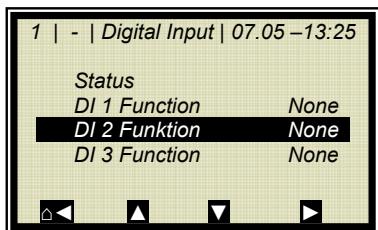
For external start function, the start function has to be set to **external** in the **Measurement** menu window.

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

Sample: sampling is started by closing the contact.

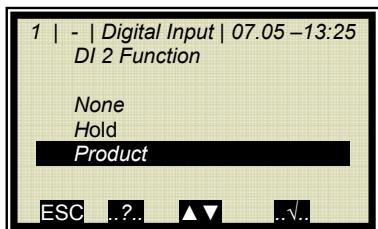
Product: by closing the contact it changes into another product (product 1 to 4). Details see chapter 6.5.1.

6.5.1 External Product Selection

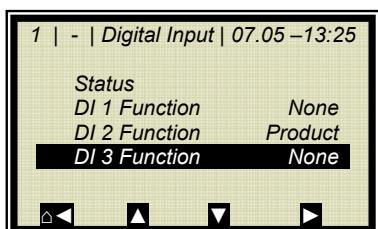


From the main menu you get to the window display depicted to the left via | SETUP | INPUT/OUTPUT | DIGITAL INPUT.

➤ DI 2 FUNCTION



➤ PRODUCT



To change all 4 products, 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!

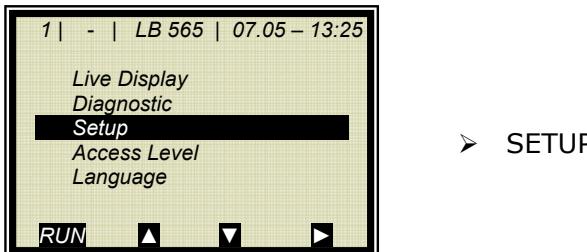
If you select a product for the first time (product 2 to 4) all adjustments and contents of the resent product are copied into the new one, including:

- Configuration data
- System calibration
- Calibration data (including sampling table)
- Input/Output definitions

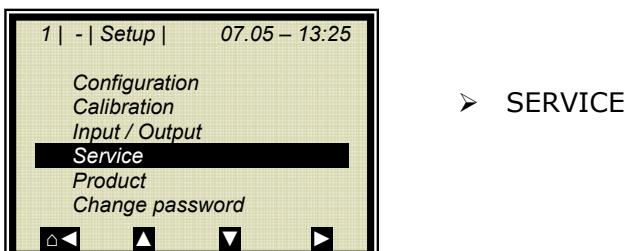
Chapter 7. Factory Settings

This function allows you to reset the measuring system to its original status (see chapter 9. „Factory Settings“).

Prerequisite: You are in the Profi mode.



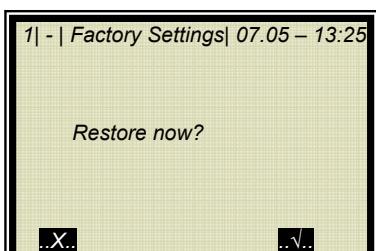
➤ SETUP



➤ 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

The status of the device is signalized by LED's. After the error has been remedied, the LEDs are reset to the normal status.

8.1.1 Hardware Error

Code	Error	Possible cause
14	Battery voltage	<i>The battery will be exhausted soon, please replace it immediately. See Hardware Manual, chapter 5.4 Battery.</i>
20	HF temperature out of range	<i>Check the operating temperature of the evaluation unit, permissible range: -20 to +60 °C</i>
21	Attention: Ambient temperature too high!	<i>Check the operating temperature of the evaluation unit, permissible range: -20 to +60 °C</i>
39	RF hardware failure	<i>Malfunctioning cable connection between motherboard and HF-unit. Check plug on the motherboard.</i> <i>Caution! The evaluation unit has to be cut off the power supply first!</i>
<i>For all other error message, please contact the Berthold Technologies Service</i>		

8.1.2 Input Error

Error	Probable Cause
Value too large	<i>Input value too large</i>
Value too small	<i>Input value too small</i>
Table is empty	<i>Sampling has been selected without previous sample measurement</i>
Chart data faulty	<i>The measuring system has determined faulty chart data during calibration.</i>
No chart data available	<i>The calculated chart data have been deleted or calibration has not been completed.</i>
Sampling full	<i>You have tried to measure more than 20 samples.</i>

8.1.3 Measurement Error and Error Prompts

Code	Error	Possible cause
50	<i>Sigma of phase is too large</i>	<i>The measured phase exceeds the permissible limit value.</i>
52	<i>Attenuation too high</i>	<i>The measured attenuation exceeds the permissible max. value.</i>
53	<i>No product</i>	<i>The evaluation unit is in pause mode ("no product" is signaled).</i>
54	<i>No system calibration done</i>	<i>No system calibration has yet been carried out.</i>
55	<i>Insertion attenuation is not reached</i>	<i>Details see chapter 4.2</i>
60	<i>Current input 1 out of range</i>	<i>The enabled current input has not yet been calibrated or is not occupied.</i>
61	<i>Current input 2 out of range</i>	<i>The enabled current input has not yet been calibrated or is not occupied.</i>
62	<i>Pt 100 temperature out of range</i>	<i>The enabled Pt 100 input has not yet been calibrated or is not occupied.</i>
70	<i>Concentration out of range</i>	<i>The concentration calculated on the basis of the raw data is outside the valid measuring range.</i>
71	<i>Concentration 2 out of range</i>	<i>The concentration calculated on the basis of the raw data is outside the valid measuring range.</i>
80	<i>Current output 1 out of range</i>	<i>The concentration calculated on the basis of the current is outside the current range.</i>
81	<i>Current output 2 out of range</i>	<i>The concentration calculated on the basis of the current lies outside the current range.</i>
<i>For all other error message, please contact the Berthold Technologies Service.</i>		

After the measurement error is remedied, the measurement returns into the status before error. There is no confirmation necessary.

Chapter 9. Calibration Data Sheet

9.1 Configuration

9.1.1 General Data

General Data	Factory setting	Setup
Date	actual	
Time	actual	
Tag	-	

9.1.2 Measurement

Measurement	Factory setting	Setup
Meas. mode	continuous	
Start mode	keyboard	
Averaging	20	
Reset averaging	no	

9.1.3 Plausibility

Plausibility	Factory setting	Setup
Process limits	50.0 – 100.0	
Phase measurement		
Sigma	100.00	
Phi/att ratio	6.0	
Auto set	OFF	
Pause detection	no -15.0 dB	

9.1.4 Microwave

Microwave	Factory setting	Setup
Cable		
Ref. cable length	4.00 m	
Signal cable length	4.00 m	

9.2 Product

Product	Factory setting	Setup
Product	1	

9.3 Inputs/Outputs

9.3.1 Current Output

<i>Current out 1</i>	<i>Factory setting</i>	<i>Setup</i>
<i>Assignment</i>	<i>Conc.</i>	
<i>Upper value</i>	<i>95.00</i>	
<i>Lower value</i>	<i>60.00</i>	
<i>Test/Adjust</i>	<i>O.K.</i>	
<i>Error current</i>	<i>Hold</i>	

<i>Current out. 2</i>	<i>Factory setting</i>	<i>Setup</i>
<i>Assignment</i>	<i>Keine</i>	
<i>Upper value</i>	<i>95.00</i>	
<i>Lower value</i>	<i>60.00</i>	
<i>Range</i>	<i>4 – 20 mA</i>	
<i>Test/Adjust</i>	<i>O.K.</i>	
<i>Error current</i>	<i>Hold</i>	

9.3.2 Current Input

<i>Current in 1</i>	<i>Factory setting</i>	<i>Setup</i>
<i>Enabled</i>	<i>no</i>	
<i>Range</i>	<i>4 – 20 mA</i>	
<i>Upper value</i>	<i>100.00</i>	
<i>Lower value</i>	<i>0.00</i>	
<i>Adjust</i>	<i>O.K.</i>	

<i>Current in2</i>	<i>Factory setting</i>	<i>Setup</i>
<i>Enabled</i>	<i>no</i>	
<i>Range</i>	<i>4 – 20 mA</i>	
<i>Upper value</i>	<i>100.00</i>	
<i>Lower value</i>	<i>0.00</i>	
<i>Adjust</i>	<i>O.K.</i>	

9.3.3 Pt 100 Input

<i>Pt 100</i>	<i>Factory setting</i>	<i>Setup</i>
<i>Enabled</i>	<i>no</i>	
<i>Pt 100 Adjust</i>	<i>O.K.</i>	

9.3.4 Digital Output

<i>Digital output</i>	<i>Factory setting</i>	<i>Setup</i>
<i>Relay 1</i>	<i>Error</i>	
<i>Relay 2</i>	<i>Hold</i>	

9.3.5 Digital Input

Digital input	Factory setting	Setup
<i>DI 1 function</i>	<i>none</i>	
<i>DI 2 function</i>	<i>none</i>	
<i>DI 3 function</i>	<i>none</i>	

9.4 Calibration Data

9.4.1 Calibration Coefficients

Calibration	Factory setting	Setup
<i>Calibration order</i>	<i>linear</i>	
<i>Calibration basic</i>	<i>Phase</i>	
<i>Coefficients</i>		
<i>A1</i>	<i>-0.19</i>	
<i>A2</i>	<i>0.0</i>	
<i>B1</i>	<i>0.0</i>	
<i>B2</i>	<i>0.0</i>	
<i>C</i>	<i>75.00</i>	
<i>Compensation</i>	<i>none</i>	
<i>Mode</i>	<i>additive</i>	
<i>Order</i>	<i>linear</i>	
<i>Ref. temp.</i>	<i>0.00</i>	
<i>TC_Phi 1</i>	<i>0.00000</i>	
<i>TC_Phi 2</i>	<i>0.00000</i>	
<i>TC_Attn 1</i>	<i>0.00000</i>	
<i>TC_Attn 2</i>	<i>0.00000</i>	

9.4.2 Typical Calibration Coefficients

C: Concentration value at system calibration

For applications with the container probe

A1: -0.19 for determination of the concentration or dry matter substance (Brix-content).

9.5 Start-up protocol printout

Output is possible by using RS 232 and RS 485. The output is started under menu | DIAGNOSTIC | PRINT SETUP |.

The serial interfaces RS 232 and RS 485 have the following accesses:

Data transfer rate 38400 Bd, 8 data bits, no parity, 1 stop bit.

The protocol will be saved via a terminal program into a TXT-file. To display it e.g. via Excel® the following data format has to be regarded:

Separators: tabulator
 Decimal-separator: .
 1000-separator: ,

The following **code-list** is for the interpretation of the start-up protocol; see an example of a protocol in chapter 9.5.1.

Parameter	Code-No.	Information
Log type	0 1 2 3	Log type: Disabled Single Continuous Stop on error
Log time	0 1 2 3 4 5	Log time: 15 Minutes 1 Hour 4 Hours 8 Hours 1 Day 3 Days
Measuring mode	0 1	Meas. mode: Continuous Batch
Start mode	0 1	Start mode (Start/Stop): Keypad Extern
Compensation input	0 1 2 3	Compensation input: None Current In 1 Current In 2 PT100

Parameter	Code-Nr.	Information
Calibration mode	0 1	Cal. order: Lineare regression Quadratic regression
Calibration variable	0 1 2	Cal. base: Phase Attenuation Both (Phase and Attenuation)
Compensation mode	0 1	Compensation mode: Additive Multiplicative
Compensation fit	0 1	Compensation order: Lineare regression Quadratic regression
Measure configuration	0 1 2	Process type: 1 Concentration 2 Concentrationen Split Concentration
AO Assign Code	0 1 2 3 4 5	Assignment of current output: None Concentration Concentration 2 Current In 1 Current In 2 PT100
AO Alarm select code	0 1 2 3	Error current for current output: 22 mA 3.5 mA Hold Value
Range selection	0 1	Current output range: 0 ... 20 mA 4 ... 20 mA
AI Range selection	0 1	Current input range: 0 ... 20 mA 4 ... 20 mA
AI Enabled[2]		State current in 2, enabled yes/No
DO Function	0 1 2 3 4 5	Relay function: None Error Hold meas. No product Alarm min Alarm max
DO Assignment	0 1 2 3 4	Relay: the min/max alarm is assigned to ...: Concentration Concentration 2 Current In 1 Current In 2 PT100

Parameter	Code-Nr.	Information
DI Function selection	0 1 2 3 4	Function of digital inputs: None Start/Stop Hold Sample Product
Printout mode	0 1 2 3	Form of data printout: Disabled Line Table Line + Table
Access level	0 1 2 3	Access level: Read only Basic Profi Service
Language	0 1 2	Language: English German French

9.5.1 Examples of a start-up protocol

Menu:	Start of Setup:	Examples of a start-up protocol	Interpretation:
Product	Entry	Product1 Product2 Prod.3 Prod.4	(* Only relevant for service)
Datalog	Log type : Log time : Number of errors : NTC temperature : max. NTC temperature : 9V power supply :	1 2 2 45.3 °C 46.7 °C 8.94 V	See code-list See code-list Number of entries into errorlog * * *
Info	Tag : Berthold LB number : Unique device ID number : Serial number : Final assembly number : Software version : Software release date : Actual date : Actual time :	- LB 566 2685 4.295E+09 000-000 1.21 12.09.2007 17.03.2008 00:24	Record date Record time
Measurement	Measuring mode : Start mode : Filter damping value : Filter damping value[2] : Filter damping value[3] : Reset average :	0 0 20 20 20 FALSE	See code-list See code-list Number of average values * *
Plausibility	Lower limit : Upper limit : Max. phase sigma : Correlation Phi/Att : Auto-set mode : Pause detection : Minimum attenuation :	0 100 100 6 FALSE FALSE -15.0 dB	Min. Concentration Max. Concentration Sigma max. Phi/Att ratio Auto set: ON/OFF
Microwave	Ref. cable length : Meas. cable length : Wave band selection : Start frequency : Internal Attenuation :	4.00 m 4.00 m 1 2 0	*
Marker	Marker name : Marker value : Marker name[2] : Marker value[2] :	Mark1 50 Mark2 50	For Concentration For Concentration For Concentration 2 For Concentration 2
System adjust	Nbr of sweeps for reference:	10	

Calibrate concentration	Compensation input : 0 Compensation reference : 0 Calibration mode : 0 Calibration variable : 0 Phase coefficients : -0.19 Phase coefficients[2] : 0 Attenuation coefficients : 0 Attenuation coefficients[2] : 0 Constant coefficient : 50 Compensation mode : 0 Compensation fit : 0 Compensation reference : 0 Phase coeff. for comp. : 0 Phase coeff. for comp.[2] : 0 Attenuation coeff. for comp : 0 Attenuation coeff. for comp[2] : 0 Adjust factor : 1 Adjust offset : 0	See code-list See code-list See code-list See code-list A1 A2 B1 B2 C See code-list See code-list C_Ph1 C_Ph2 C_dB1 C_dB2
Calibrate concentration 2	Compensation input : 0 Compensation reference : 0 Calibration mode : 0 Calibration variable : 0 Phase coefficients : -0.19 Phase coefficients[2] : 0 Attenuation coefficients : 0 Attenuation coefficients[2] : 0 Constant coefficient : 50 Compensation mode : 0 Compensation fit : 0 Compensation reference : 0 Phase coeff. for comp. : 0 Phase coeff. for comp.[2] : 0 Attenuation coeff. for comp : 0 Attenuation coeff. for comp[2] : 0 Adjust factor : 1 Adjust offset : 0	See code-list See code-list See code-list A1 A2 B1 B2 C See code-list See code-list C_Ph1 C_Ph2 C_dB1 C_dB2
Advanced	Tara Phase (°/GHz) : 0.00 °/GHz Tara Attenuation (dB) : 0.00 dB Measure configuration : 0 Range split value : 75	Process type: see code-list Split value

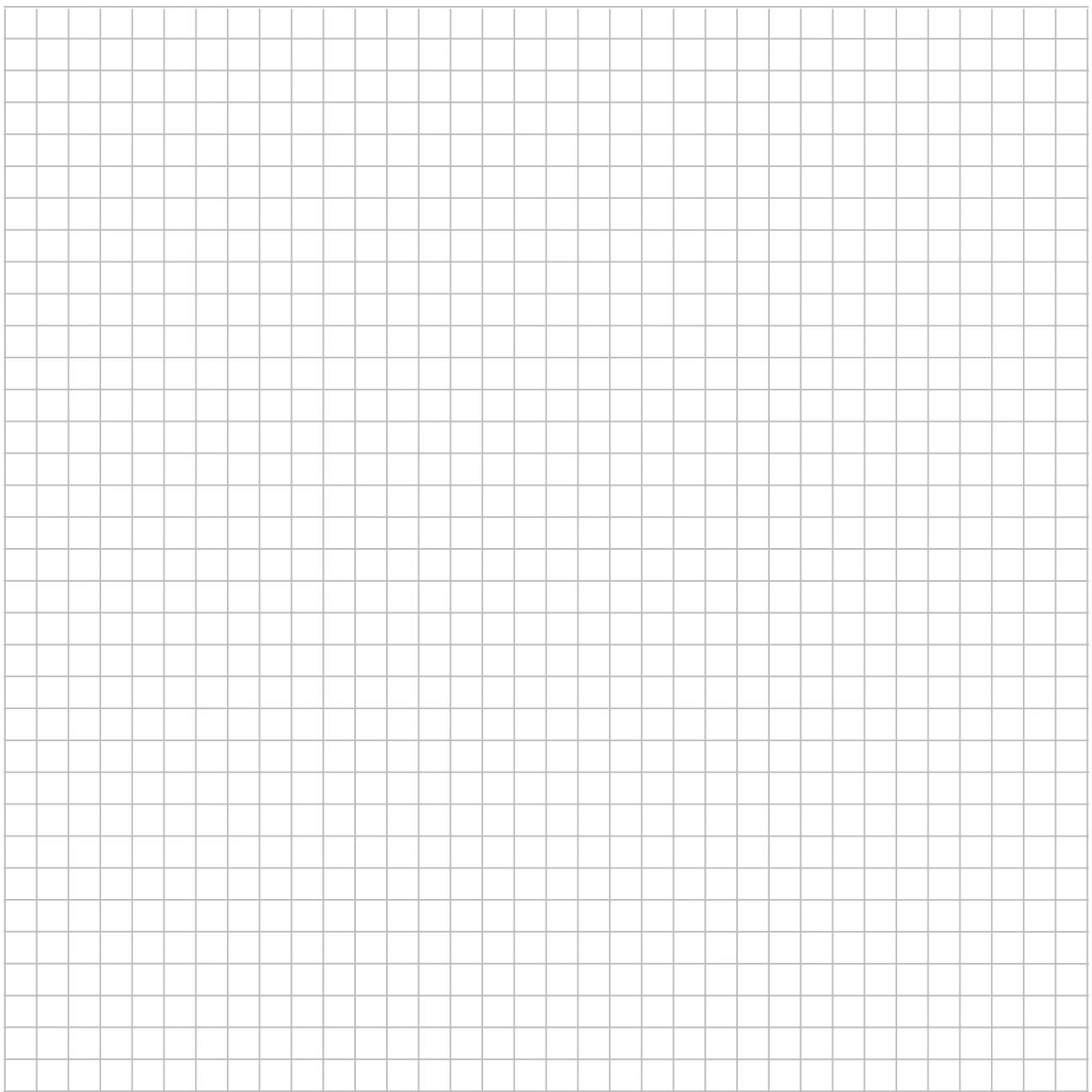
Current out 1	AO Assign code : 1 AO Upper range value : 100.00% AO Lower range value : 0.00% AO Current value : 4.00 mA AO Alarm select code : 2 AO Error current value : 22.00 mA	Assignment: see code-list Upper value Lower value Live current Error current: see code-list Error current value
Current out 2	AO Assign code[2] : 0 AO Upper range value[2] : 100 AO Lower range value[2] : 0 Range selection[2] : 1 AO Current value[2] : 4.00 mA AO Alarm select code[2] : 2 AO Error current value[2] : 22.00 mA	Assignment: see code-list Upper value Lower value Range Live current Error current: see code-list Error current value
Current in 1	AI Enabled : FALSE AI Range selection : 1 AI Upper range value : 100 AI Lower range value : 0 AI Current : 0.00 mA	Range: see code-list Upper value Lower value Live current
Current in 2	AI Enabled[2] : FALSE AI Range selection[2] : 1 AI Upper range value[2] : 100 AI Lower range value[2] : 0 AI Current[2] : 0.02 mA	Range: see code-list Upper value Lower value Live current
PT100 input	AI Enabled[3] : TRUE Pt100 value : 2.8 °C	Live value
Relay 1	DO Function : 1 DO Assignment : 0 DO Threshold : 0.00% DO Hysteresis : 5.00%	Function: see code-list Assignment: see code-list * *
Relay 2	DO Function[2] : 2 DO Assignment[2] : 0 DO Threshold[2] : 0.00% DO Hysteresis[2] : 5.00%	Function: see code-list Assignment: see code-list * *
Digital input	DI Function selection : 0 DI Function selection[2] : 0 DI Function selection[3] : 0	Function digital input 1 Function digital input 2 Function digital input 3
	Printout mode : 1 Access level : 2 Language : 1 End of Setup	

	<p>Start of Sample Data:</p> <p>Sample Table</p> <p>Product 1: Sample Data for Concentration 1:</p> <table border="0" data-bbox="234 1235 1442 1347"> <thead> <tr> <th data-bbox="234 1235 396 1257">Sample:</th> <th data-bbox="523 1235 603 1257">Active:</th> <th data-bbox="650 1235 761 1257">Kon.(%):</th> <th data-bbox="777 1235 856 1257">Lab.(%):</th> <th data-bbox="872 1235 952 1257">AIN1(°C):</th> <th data-bbox="968 1235 1047 1257">AIN2(°C):</th> <th data-bbox="1063 1235 1142 1257">Temp.(°C):</th> <th data-bbox="1158 1235 1237 1257">Phi.(°/GHz):</th> <th data-bbox="1253 1235 1333 1257">Att.(dB):</th> </tr> </thead> <tbody> <tr> <td data-bbox="234 1268 396 1291">1 16.03 - 20:53</td> <td data-bbox="523 1268 603 1291">TRUE</td> <td data-bbox="650 1268 761 1291">50.0193</td> <td data-bbox="777 1268 793 1291">0</td> <td data-bbox="872 1268 888 1291">0</td> <td data-bbox="968 1268 983 1291">0</td> <td data-bbox="1063 1268 1110 1291">2.83</td> <td data-bbox="1158 1268 1206 1291">-0.1</td> <td data-bbox="1253 1268 1301 1291">-0.16</td> </tr> <tr> <td data-bbox="234 1291 396 1313">2 17.03 - 00:22</td> <td data-bbox="523 1291 603 1313">TRUE</td> <td data-bbox="650 1291 761 1313">50.1061</td> <td data-bbox="777 1291 793 1313">0</td> <td data-bbox="872 1291 888 1313">0</td> <td data-bbox="968 1291 983 1313">0</td> <td data-bbox="1063 1291 1110 1313">2.71</td> <td data-bbox="1158 1291 1206 1313">-0.56</td> <td data-bbox="1253 1291 1301 1313">0.18</td> </tr> </tbody> </table> <p>Correlation factor between lab and meas values: 1</p> <p>End of Sample Data</p>	Sample:	Active:	Kon.(%):	Lab.(%):	AIN1(°C):	AIN2(°C):	Temp.(°C):	Phi.(°/GHz):	Att.(dB):	1 16.03 - 20:53	TRUE	50.0193	0	0	0	2.83	-0.1	-0.16	2 17.03 - 00:22	TRUE	50.1061	0	0	0	2.71	-0.56	0.18
Sample:	Active:	Kon.(%):	Lab.(%):	AIN1(°C):	AIN2(°C):	Temp.(°C):	Phi.(°/GHz):	Att.(dB):																				
1 16.03 - 20:53	TRUE	50.0193	0	0	0	2.83	-0.1	-0.16																				
2 17.03 - 00:22	TRUE	50.1061	0	0	0	2.71	-0.56	0.18																				
	Do not use following data!																											

9.6 Sample Table

No.	Active	Measured value	Lab value	Current In 1	Current In 2	Pt 100	Phi (m)	Attenuation	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Notes



Notes

