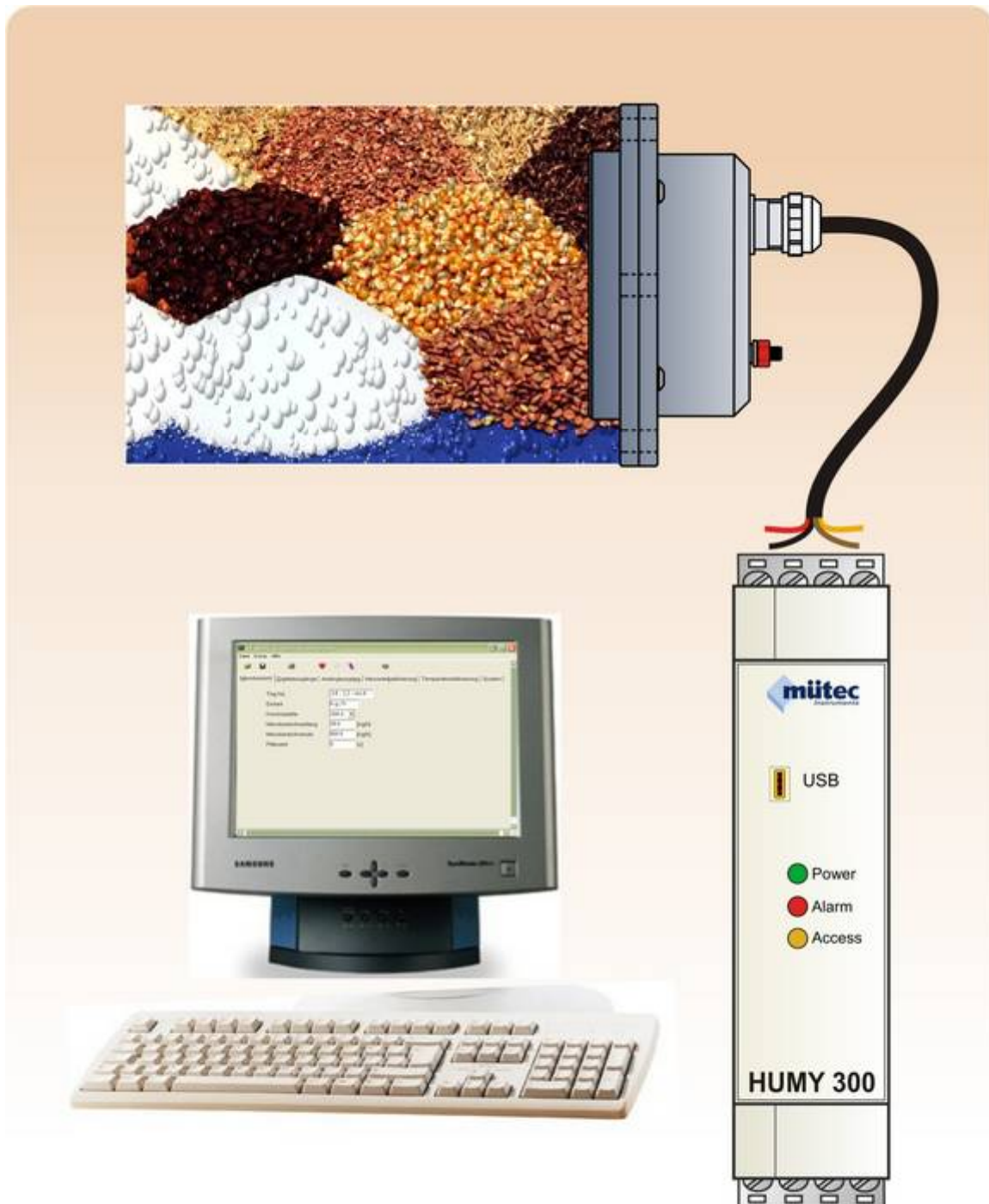


Operating Manual

HUMY 300

with USB- and RS485-Interface



Operating Manual

HUMY 300 with USB 2.0 port and RS485 interface for connection to PC and process control system.

No. BA 7.01
Date: 08/2010

Manufacturer:

Mütec Instruments GmbH
Bei den Kämpen 26
21220 Seevetal
Germany

Tel.: +49 (0) 4185 8083-0
Fax: +49 (0) 4185 808380

E-Mail: info@muetec.de
Internet: www.muetec.de

Licence, trademark and copyright notes

Modbus™ is a registered trademark of Modicon Inc.
Windows™ is a registered trademark of Microsoft Corp.
USB™ is a registered trademark of Implementers Forum Inc.

Copyright © Mütec Instruments GmbH 2010 All rights reserved

This document is copyright protected. It supports the user in making reliable and efficient use of the unit. Transmission and duplication of this document as well as utilization and disclosure of its content are prohibited unless expressly permitted. Any breach or infringement shall result in liability for damages. The software described in this document is licensed and may only be used and copied in accordance with the terms of the licence.
All rights reserved.

Disclaimer

We have checked the content of the printed document for compliance with the described hardware and software. Nevertheless, deviations cannot be excluded and consequently we cannot assume any guarantee for complete accordance. The data in this printed document are checked regularly. Corrections and additions are made in the following version in each case. We would be grateful for any suggestions for improvement.

Contents

	Classification of safety information	3
	General information	4
1.0	Description of the HUMY 300	5
2.0	Description of the sensor FMS 400	6
3.0	Technical data of HUMY 300	7
4.0	Technical data of HUMY-sensor FMS 400	10
5.0	Block diagram and terminal connections	11
6.0	Cable connection of HUMY-sensor	12
7.0	Installation instructions and examples	13

Classification of the safety instructions

This manual contains instructions that you have to observe for your personal safety as well as to avoid material damage. These instructions are highlighted using a triangular warning sign and shown as follows, depending on the degree of risk.



HAZARD

means that death or severe physical injury will occur if the appropriate precautionary measures are not taken.



WARNING

means that death or severe physical injury may occur if the appropriate precautionary measures are not taken.



CAUTION

with a triangular warning sign means that minor physical injury may occur if the appropriate precautionary measures are not taken.

CAUTION

without a triangular warning sign means that material damage may occur if the appropriate precautionary measures are not taken.



ATTENTION

means that an undesired result or state may ensue if the corresponding instruction is not followed.



NOTE

denotes important information about the product, handling of the product or the respective part of the documentation, is aimed at drawing special attention to the latter and should be complied with.

In addition to the instructions in this manual, the generally applicable safety and accident prevention regulations must be observed.

If the information contained in this document should not be sufficient in any specific case, you can obtain more detailed information from our telephone service.

Please read this manual carefully prior to installation and commissioning.

CE mark

This product meets the specifications according to the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC.

General instructions

This device left the plant in flawless condition in terms of its safety features. To preserve this condition and ensure safe operation of the device, the user has to observe the instructions and warning notes indicated in this operating manual.

NOTE

For the sake of clarity the manual does not contain complete detailed information on all product types and can therefore not take into account every conceivable case with respect to installation, operation and maintenance.

Should you wish further information or should special problems arise that are not treated in sufficient detail in the manual, you can obtain the necessary information by telephone.

Moreover, we point out that the content of the manual shall not constitute part of or amend a previous or existing contract, agreement or legal relationship. All obligations of Mütec Instruments GmbH shall result from the respective contract of purchase, which also contains the complete and solely valid warranty terms. These contractual warranty terms shall neither be extended nor limited by the information contained in the manual.

The content reflects the technical state of the art regarding printing. It is subject to technical modifications in the course of further development.

WARNING

Devices with the type of protection designated as “intrinsic safety” lose their conformity certification as soon as they have been operated in circuits that do not meet the values specified in the test certificate. Flawless and safe operation of this device requires proper transport, proper storage, installation and assembly as well as careful operation and maintenance. The device may only be used for the purposes specified in this operating manual.

DISCLAIMER

All modifications to the device fall within the responsibility of the user unless expressly specified otherwise in the operating manual.

Qualified PERSONNEL

are persons who are familiar with installation, assembly, repair and operation of the product and have the qualifications necessary for their work, such as:

- Training, instruction and/or authorization to operate and maintain equipment/systems in accordance with the standards of safety technology for electrical circuits, high pressures and corrosive as well as hazardous media.
- In the case of equipment with explosion protection: training, instruction and/or authorization to perform work on electrical circuits for potentially explosive equipment.
- Training or instruction in accordance with the standards of safety technology regarding care and use of appropriate safety equipment.

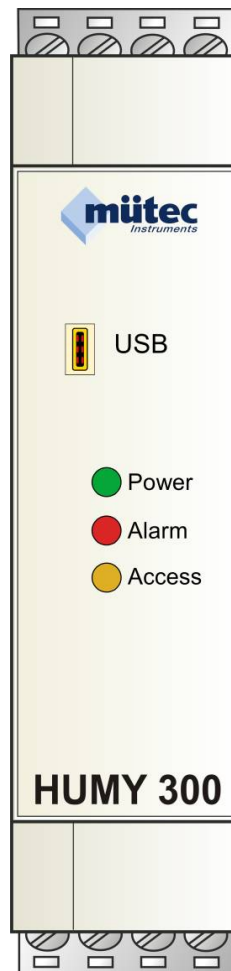
CAUTION

Potentially electrostatic components may be destroyed by voltage that is far below the limits of human perception. Such voltage occurs even when you touch a component or electrical connections of a component and are not electrostatically discharged. The damage that occurs to a component because of overvoltage usually cannot be detected immediately and does not become noticeable until after a longer operating period.



1.0 Description of HUMY 300

The moisture measuring system consists of the **HUMY 300** control and evaluation unit in a DIN rail enclosure and the **FMS 400** moisture sensor. The inline measuring system for process monitoring guarantees troublefree measurement of the internal product moisture of solids and emulsions. A PC-aided user interface with a clearly arranged display of the measured, alarm and MIN/MAX values, combined with easy editing and parameterization, enables uncomplicated and simple operation.



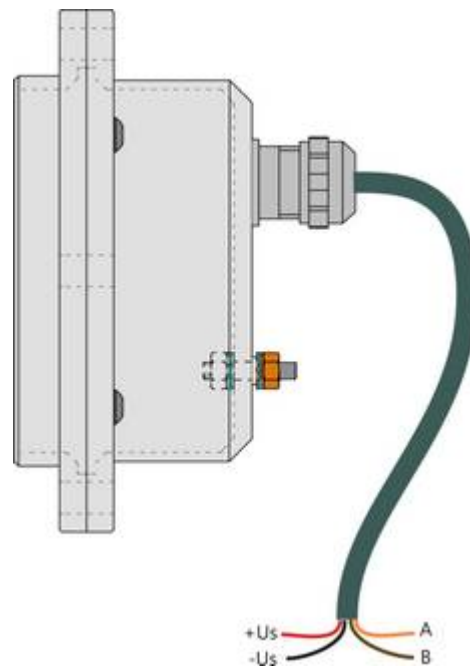
Pic. 1

Specification

- PC-Control with HUMY-Config-300
- PLS-Connection with MODBUS-RTU-Protocol
- 24 independent product settings
- Galvanic separated USB 2.0-Interface to the PC
- Galvanic separated RS485-Interface to the PLS
- Galvanic separated analog output for moisture
- Galvanic separated MAX-Alarm-Output
- Galvanic separated digital input for external control
- Galvanic separated HUMY-sensor-connection

2.0 Description of the sensor FMS 400

The HUMY sensor for capacitive moisture measurement is based on the open capacitor principle. The bulk material in front of the measuring window serves as the dielectric of the measuring capacitor. Data processing of the raw measured values with temperature compensation already takes place in the moisture sensor. Data exchange with the HUMY 300 takes place via the RS485 interface.



Pic. 2

The electronics installed behind the measuring window are encapsulated in a sturdy, hermetically sealed plastic case. Mounted in a solid cylindrical stainless steel housing, the sensor is extensively insensitive to external influences. Special internal casting protects the entire electronics against penetration of moisture and increases resistance to caustic solutions, acids and solvents. The power supply is provided via a fixed cable connection in the sensor and guarantees tightness to IP67 thanks to a high-quality PG cable gland. The thickness of the dielectric can vary between 20 and 100 mm and is determined by the type of bulk material. Electrical conductivity, pH value and surface structure hardly have any influence on the measurement, but do influence density. The measuring surface of the sensor is sensitive and has to be protected against mechanical impacts. In the case of special applications with high abrasion risk, the measuring surface can be reinforced by means of a built-in ceramic disk.

Features

- 20-bit measured value acquisition and measured value processing in the sensor
- Automatic temperature compensation according to stored table
- High degree of functional reliability combined with self-monitoring function
- Low power input (≤ 350 mW)
- Digital transmission of measured values immune to interference via RS485 interface
- 1000 m maximum cable length between sensor and HUMY 300
- Sturdy cylindrical stainless steel flange housing
- Little installation effort required for 4-core connecting line
- Easy, space-saving installation

3.0 Technical Data of HUMY 300

MOISTURE MEASURING

Measured value:	0-85% moisture or 15-100% dry substance (TR)
Indicator:	Percentage value with max. 3 decimal places
Accuracy:	max. 0.2 % (depending on the product)
Average value:	0-999 seconds
Filter value:	0-999.9 seconds
Temperature coefficient	
Maximal:	<0.05 %/K
Typical:	<0.03 %/K
Product memory:	max. 24 product characteristics

ANALOG OUTPUT AA-1 (moisture)

For the analog outputs, a filter of the 1st order (0.1 – 9.9)s can be parameterized.
Galvanic separation between the auxiliary energy and to all other inputs/outputs.

	Current	Voltage
Max. range:	0...22 or 22...0 mA	0...11 or 11...0 V
Standard range:	0/4-20 mA	0/2-10 V
Load:	max. 500 ohm	min. 50k ohm
Accuracy:	0.02 % of final value	0.02 % of final value
Load influence:	<0.005 %	0.5 % at R _L =100 kΩ
Rise time:	<150 ms	<150 ms

TRANSISTOR OUTPUT DA-1 (MAX-Alarm)

Galvanic separation between the auxiliary energy and to all other inputs/outputs.

Alarm number:	2 independently adjustable limit values
Setting:	%- value of moisture
Alarm delay:	free configurable from 0 ... 9.9 s
Switching hysteresis:	free configurable from 0 ... 99.9 %
Operating mode:	NO- or NC-principle
Output:	Open Collector
Switching power:	<1.4 W
Switching voltage:	<28 VDC
Switching current:	<50 mA

DIGITAL INPUTS DE-1, DE-2 (different functions)

Galvanic separation between the digital inputs, to the auxiliary energy and to all other inputs/outputs.

Direction of effect:	direct or invers
Control voltage:	min. 8 VDC, max. 36 VDC
Control current:	min. 2 mA, max. 14 mA

PLS-INTERFACE RS485

Galvanic separation of the RS485 to the auxiliary energy and to all other inputs/outputs.

Protocol:	MODBUS, RTU-Mode
RS485:	Half-duplex, termination with jumper
Baud rate/device address:	2,400-19,200 bps, 1...248

PC-INTERFACE USB

Galvanic separation to the auxiliary energy and to all other interfaces or all other in-/outputs !

Type: USB 2.0

HUMY-SENSOR-CONNECTION

Galvanic separation of the sensor to the auxiliary energy and all other in-/outputs!

Supply: 20 VDC, < 20 mA
 RS485: Half-duplex
 Baud rate/ device address: 19,200 bps, 1

AUXILIARY ENERGY

Supply: 24 VAC (50-60 Hz), +15%, -20%
 24 VDC, +/- 25 %
 Power consumption: max. 1.5 W

CONFORMITY

EMV-directive 2004/108/EG: EN 61000-6-2, EN 61000-6-4, EN 61326-1

GENERAL DATA

Galvanic separation

In-/Output/Supply: 300 Veff (rated insulation voltage, overvoltage II, Contamination level2, secure division according to EN 61010, EN 50178)

Electrical connection

TE-1 to TE-24: Screw-plug in connection /grey with 2.5 mm²
 TE-B1 to TE-B5: TBUS-connection with 2.5 mm²

Housing

Material: PBT
 Protection class: IP20
 Combustibility class: VO to UL
 Dimensions (BxLxH): 22.5 mm x 114.5 mm x 99.0 mm without clamps
 Weight: 250 g
 Form of construction: Terminal case for assembling mounting rail
 Mounting/Installation: random

Ambient conditions

Perm. temperature: -10 °C ... +60 °C
 Storage/ transport: -10 °C ... +70 °C
 Perm. humidity while operation: 10 % ... 95 % humidity without condensation

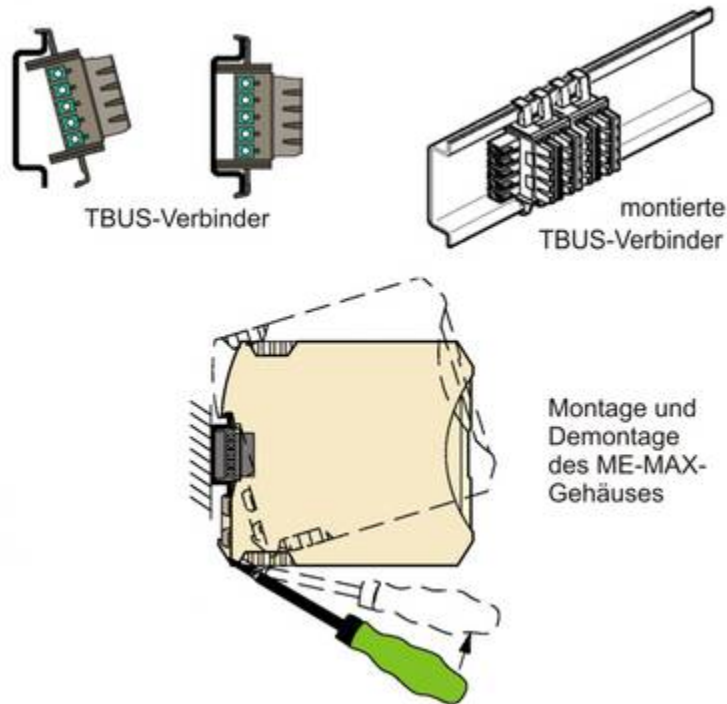
INSTALLATION

The ME MAX housing can be combined with a 5-pole TBUS connector / rail connector. The RS485 interface and the supply voltage can be conveniently wired through via the TBUS connector snapped onto the DIN rail. The TBUS connection is set up automatically in the mounting grid of the devices involved. Consequently elaborate preliminary project planning or follow-up work on the TBUS connection on site is passé.

Technical data: 5-pole connector in the mounting grid 3.81 mm
 8 A maximum contact load
 high contact quality thanks to gold plating
 installation on DIN rails NS 35/7.5 or NS 35/15

Important note: The device may only be snapped into place on or disconnected from the TBUS connector with the power off!

TBUS-CONNECTOR latching ---► HOUSING swirl ---► DEVICE mounted !



Pic. 3

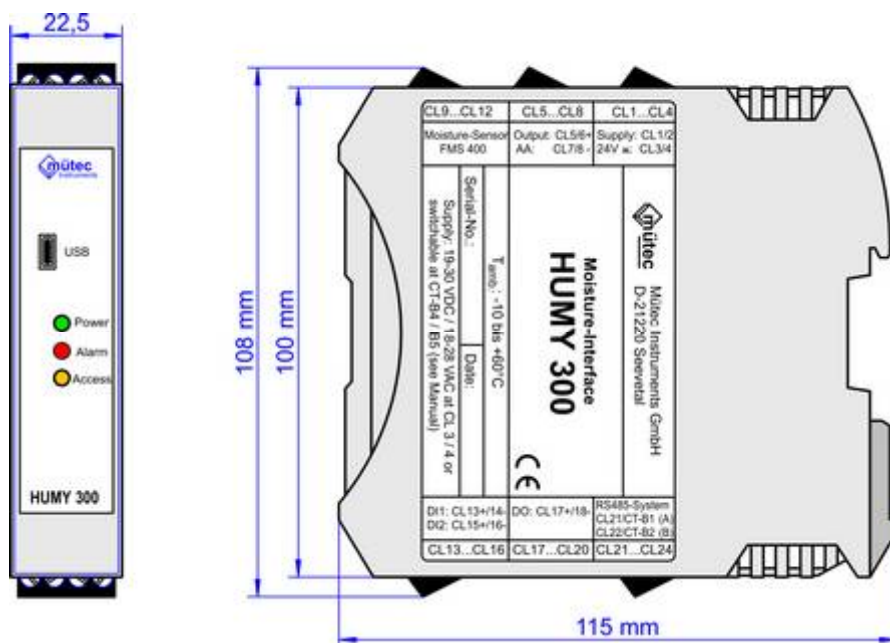


Abb. 4

4.0 Technical Data of HUMY- sensor FMS400

ELECTRICAL DATA

Supply:	20 VDC, 20 mA
RS485:	Half-duplex
Baud rate/device address:	19,200 bps, 1
Power consumption:	0.4 W

MECHANICAL DATA

Housing:	Special steel 1.4301
Protection class:	IP 67 according to EN 60529
Weight:	ca. 1,050 g
Response time:	ca. 1 sec
Connecting cable:	Shielded cable, 4-wire, min.: 0.5 mm ²
Wire length:	max. 1,000 m

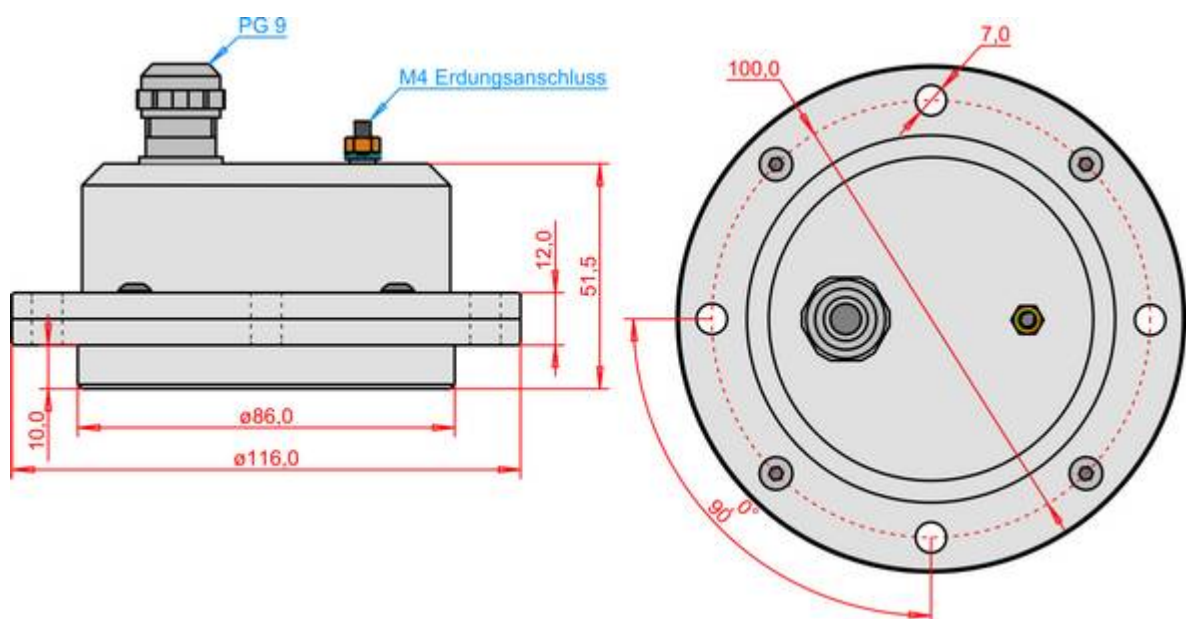
MATERIAL of the MEASURING AREA

FMS400K:	PTFE
FMS400C:	Ceramic
FMS400G:	Wear resistant rubber
Other versions on request	

LIMIT VALUES

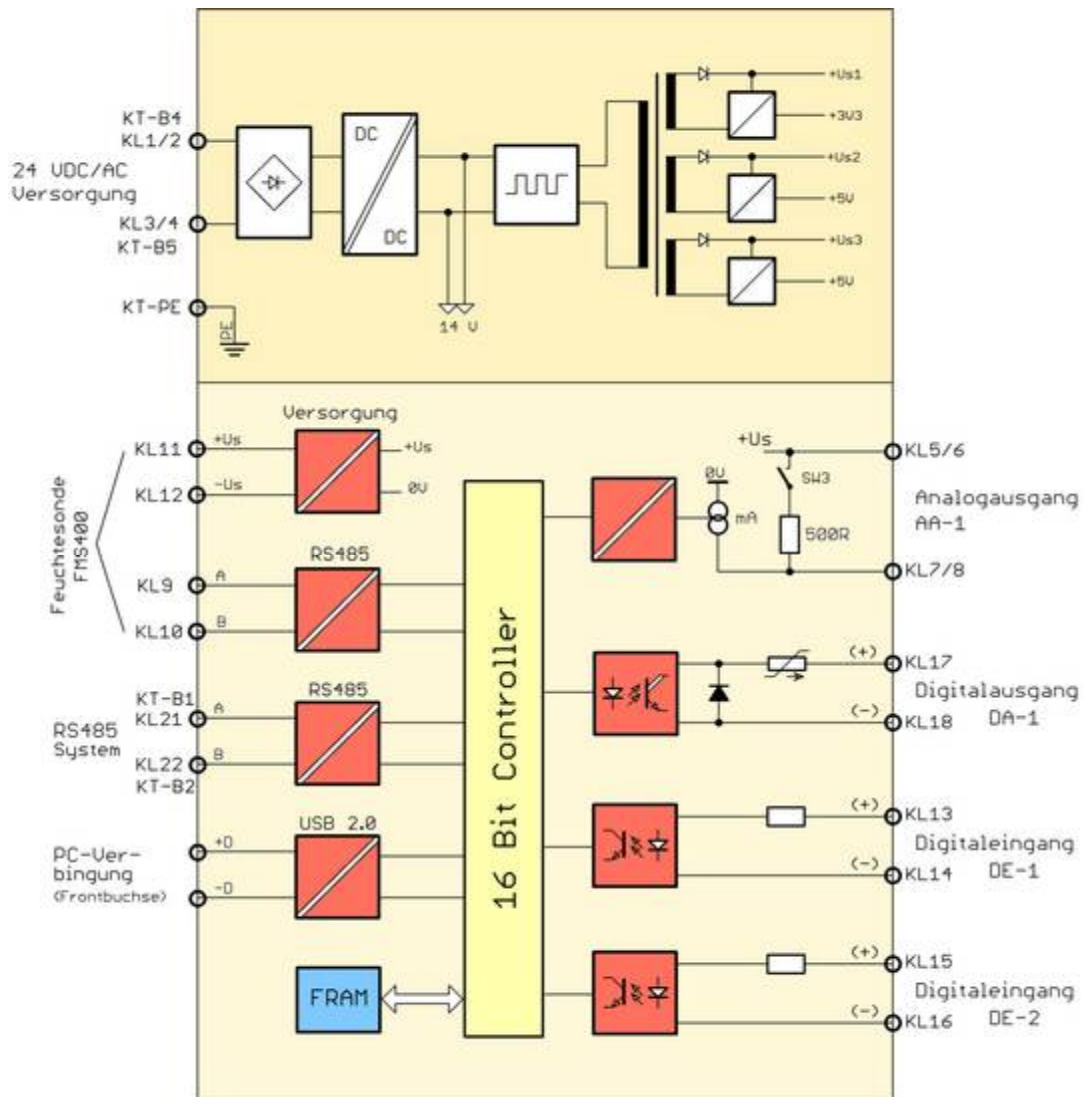
Pressure resistance:	max. 6 bar, short-term 10 bar
Working temperature:	0°C to +80°C in the sensor
Process temperature:	-10°C to +90 °C at the measuring area, with separation layer or cooling up to 140°C
Storage temperature:	-10 to 80°C

DIMENSIONS



Pic. 5

5.0 Block diagram and terminal connections



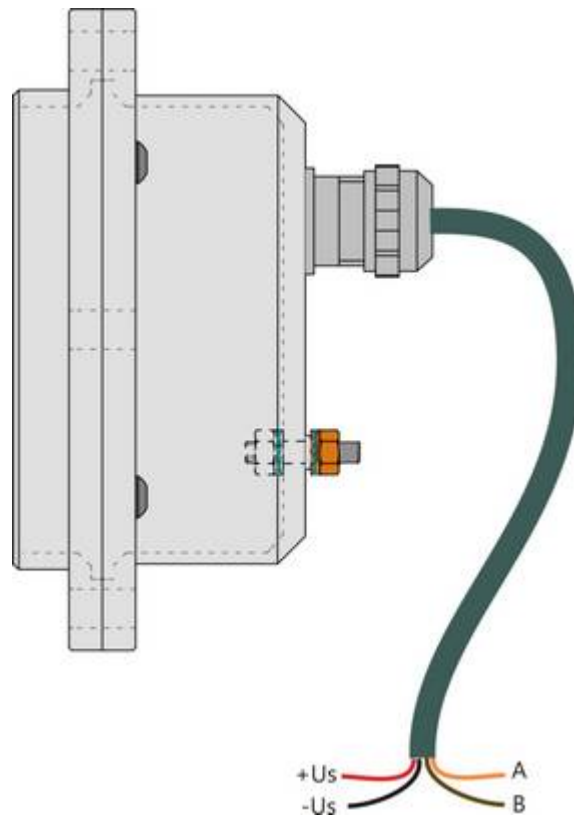
Pic. 6

Terminal 1+2	24 VAC/DC	Terminal 13	(+) digital input-1
Terminal 3+4	24 VAC/DC	Terminal 14	(-) digital input-1
Terminal 5+6	(+) analog output	Terminal 15	(+) digital input-2
Terminal 7+8	(-) analog output	Terminal 16	(-) digital input-2
Terminal 9	(A) RS485/probe	Terminal 17	(+) digital output
Terminal 10	(B) RS485/probe	Terminal 18	(-) digital output
Terminal 11	(+) Us/probe	Terminal 21	(A) RS485/system
Terminal 12	(-) Us/probe	Terminal 22	(B) RS485/system

TBUS-connector/mounting rail-connector:

contact KT-B1	(A) RS485/system	contact KT-B4	24 VAC/DC
contact KT-B2	(B) RS485/system	contact KT-B5	24 VAC/DC

6.0 Cable connection of HUMY-Sensor



Pic. 7



The cable shield is connected to the ground terminal in the sensor. If the cable shield is also grounded at the other end of the line and there is a significant potential difference between the two grounding points, the result is a considerable flow of compensating current via the cable shield with all related impacts.

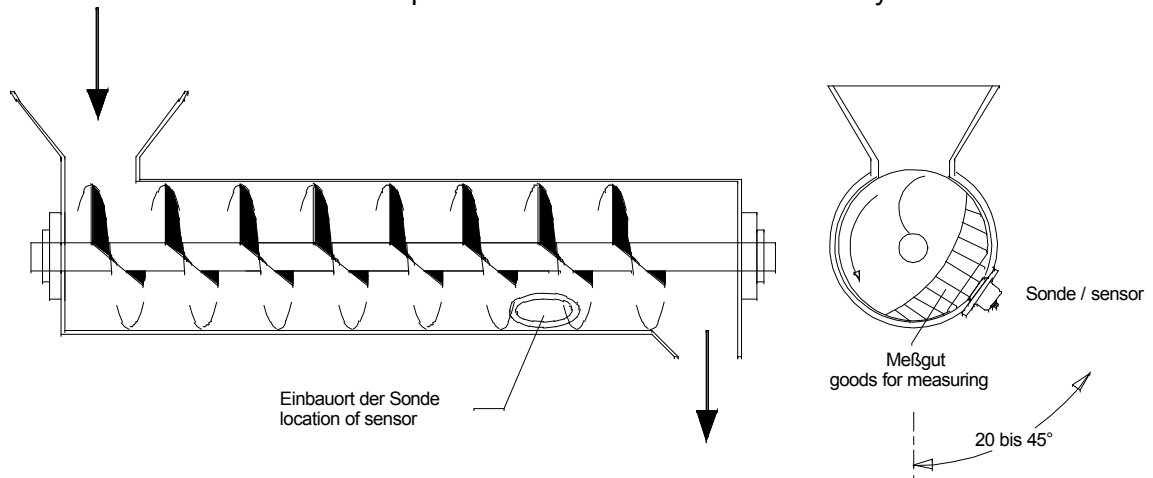
7.0 Installation instructions and examples

The HUMY 300 is designed for continuous moisture measurement in production flow. A prerequisite for correct moisture measurement in bulk materials is always to select the right place to install the moisture sensor. In connection with bulk material chutes or conveyor belts, you additionally have to ensure that the material to be measured is fed over the sensor at a constant layer height as far as possible.

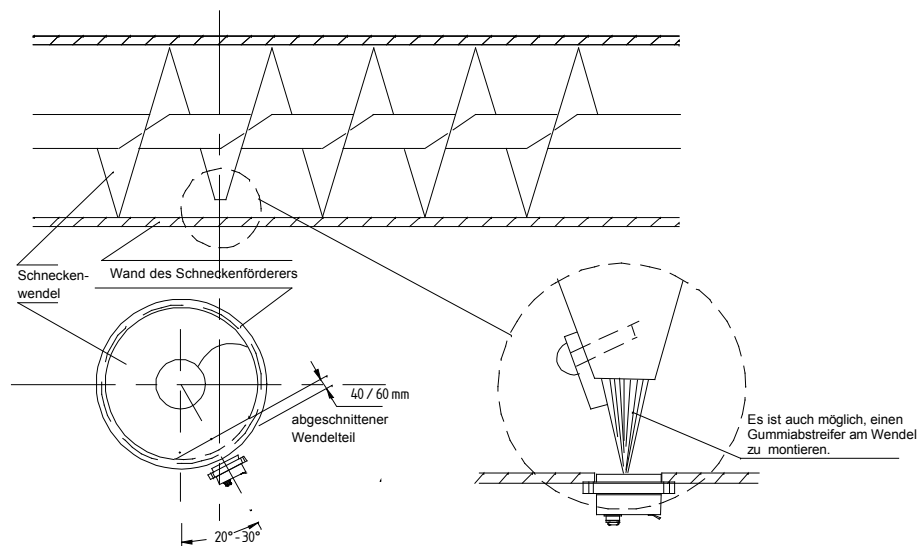
7.1 **Mounting in the screw conveyor**

Mounting the moisture sensor in the screw conveyor has proven to be particularly advantageous since the measured product is guided over the sensor at regular intervals with a constant thickness.

The moisture sensor has to be placed underneath the screw conveyor.



Pic. 8



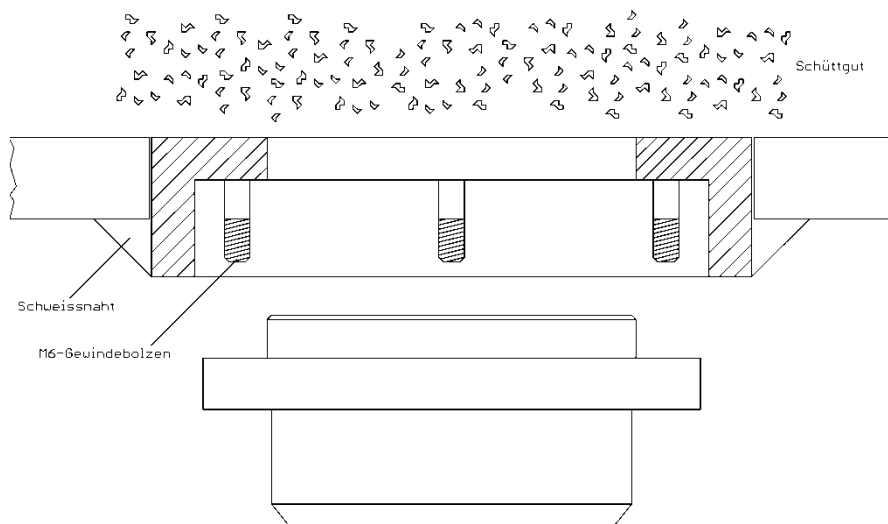
Pic. 9



In the case of hard bulk materials, the sensor surface is subject to a latent risk of material getting stuck between the screw conveyor and the HUMY sensor. This can be prevented here by cutting off the spiral. As a substitute for the cut-off spiral, you can install a rubber scraper that then performs the function of material transport.

7.2 Indirect installation

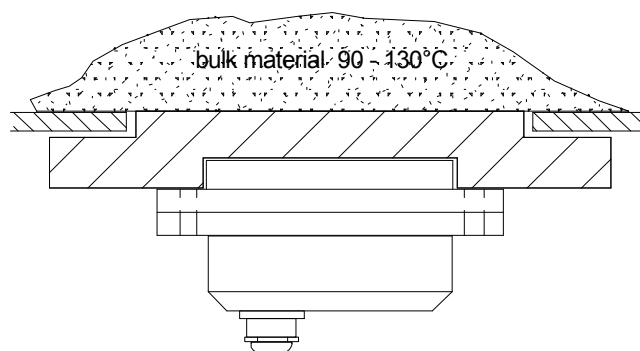
Indirect installation of the HUMY sensor is necessary if the wall thickness is 10 mm or more or the wall is curved. In such cases use of a welded flange is recommended.



Pic. 10

7.3 Mounting at a measurement window or separation layer

For most applications direct contact of the sensor surface with the product is desired. In some applications this might not be possible / suitable. Here, a neutral separator layer made out of Plexiglas, glass, or similar material can be fitted between sensor and product. A metallic separator layer is NOT permitted. Maximum thickness of the separator material is 30 mm.



Pic. 11

Use of a separating layer of 5 to 15 mm is recommended with chain conveyors or for measurements with media having a temperature of over 80°C up to max. 130°C. The permissible thickness depends on the material to be measured and the residual water content. The measuring surface of the moisture sensor must always have mechanical contact to the separating layer.