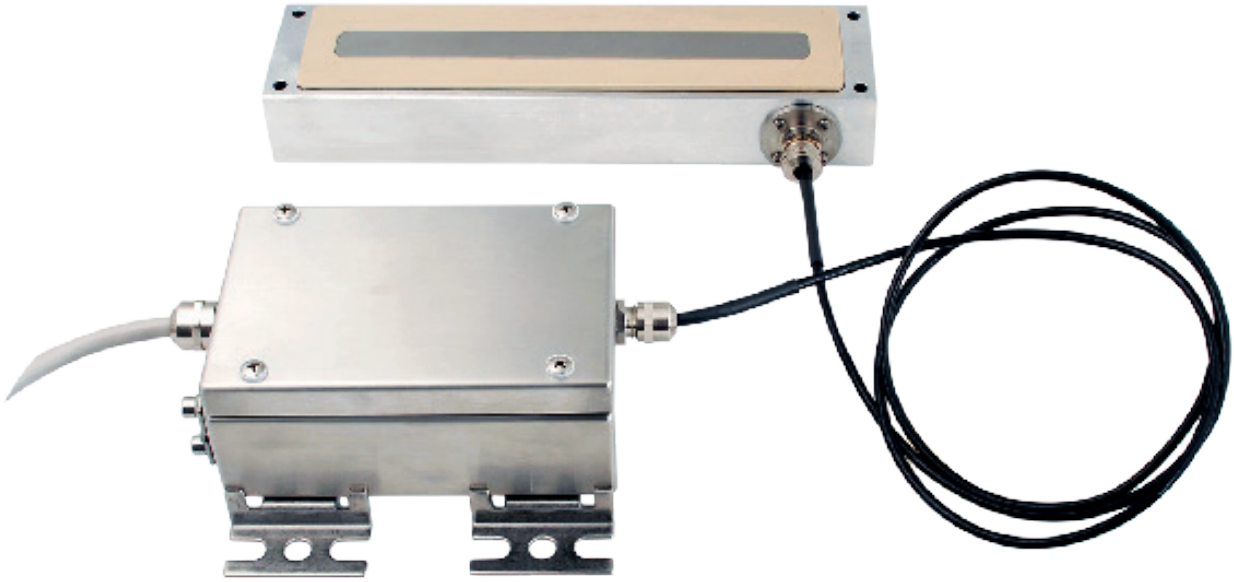
Manual

SONO-Ex GS1

ATEX Guideline 2014/34/EU | II 2 D Ex tb IIIC T75°C Db conformable EPS 20 ATEX 1 237 X

More information:
www.imko.de



Moisture Sensor Experts

IMKO

Thank you for purchasing this IMKO product

This manual is an original operating manual of the manufacturer.

The described instructions for use and commissioning are part of the products described and must be kept for future installation or use.

Important!

Please read these instructions carefully to accomplish optimum results with your moisture probe. Please contact your authorized dealer, distributor or service center for troubleshooting, questions or suggestions on your new moisture probe. You may contact IMKO directly, too after exploring your local contact.

We look forward to helping you!

For warranty claims, please contact your local dealer, distributor or service center. The warranty does not include any kind of willful damage to the device or its accessories or an operation outside of the product specification. Please refer to the information in this manual. If you have any questions, please contact IMKO service. Don’t open the device and please do not try to repair the device yourself- the guarantee expires when the device is opened or modified.

In the course of product improvements, we reserve the right to make technical and visual changes to the device.

Inhalt

1 Description

1.1 The patented TRIME® TDR measuring method

The TDR technology (Time Domain Reflectometry) is based on a radar-based dielectric measurement method in which the transit times of electromagnetic pulses for measuring the dielectric constant or the water content are determined.

The SONO-Ex GS1 humidity measuring system consists of a measuring unit and an external measuring probe.

The external measuring probe consists of an aluminum housing with a window made of PEEK.

The measuring unit is a stainless-steel housing with an integrated TRIME TDR transmitter. The high-frequency TDR pulse (1 GHz) generated in the TRIME transmitter runs along waveguides and builds up an electromagnetic field around these conductors and therefore in the material around the probe. With the patented measuring method, the transit time of this pulse is measured with a resolution of less than a picosecond ($1x10^{-12}$) in order to determine humidity and conductivity.

1.2 TRIME® compared to other measuring methods

In contrast to capacitive or microwave measuring methods, the TRIME® technology (**T**ime-**D**omain-**R**eflectometry with Intelligent Micromodule Elements) offers many advantages in humidity measurement.

The TRIME-TDR, for example, works in the optimal frequency range for moisture measurement between 600MHz and 1.2 GHz.

Another great advantage of this technology is that the measuring field, and thus the measuring properties, do not change due to unavoidable abrasive wear on the measuring probes, removing the requirement for regular recalibrations.

1.3 Possible uses of the SONO-Ex GS1 moisture probe

The SONO-Ex GS1 humidity probe is suitable for installation in containers, shafts or silos. Due to the relatively large probe dimensions, the SONO-Ex GS1 humidity probe, with a very large measuring field, is particularly suitable for heterogeneous bulk goods such as wood chips, pellets and other materials. Ideally, the probe is installed in screw conveyors to take advantage of the relatively constant density of the material in this mechanism. If the probe is installed in places where the material can move loosely, considerable density fluctuations can occur, which can lead to incorrect measurements. This aspect must be considered for every application.

2 Functionality

2.1 Measured value acquisition with preliminary check, averaging and filtering

SONO probes measure internally at very high cycle rates in the 10 kHz range, but output the measured value at the analog output with a cycle time of 280 milliseconds. In these 280 milliseconds, a probe-internal preliminary check of the humidity value takes place, i.e. only plausible and already physically checked and somewhat pre-averaged individual measured values are processed, which considerably increases the reliability for the acquisition of the measured values to a downstream control.

The probes can be configured to different measurement modes with external programming devices (SONO-VIEW, or laptop in connection with SM-USB module).

In the CS (Cyclic Successive) measuring mode, there is no further averaging and the cycle time here is 250 milliseconds. In the CA, CF, CH, CC or CK measuring mode, the currently measured individual values are not output immediately, but an average value is formed over an adjustable number of measurements in order to filter out short-term fluctuations in the material flowing past. The SONO-Ex GS1 humidity measuring system is delivered from the factory with standard parameters for the averaging time and a powerful filter function for common applications.

2.2 Material temperature measurement

A temperature sensor is built into the SONO-Ex GS1 probe, which records the housing temperature approx. 3mm below the surface of the probe head. If required, the temperature can be output at analog output 2. Since the probe electronics work with approx. 1.5W power, the probe housing heats up to a small extent; this effect must be taken into account when measuring the material temperature. When installed, the material temperature can be determined after an external calibration and compensation of the sensor's self-heating. With the help of the SONO-CONFIG app, the measured temperature value can be adjusted with an offset.

The TRIME measurement method is based on radar, making it possible not only to measure the humidity, but also to make a statement about the conductance or the mineral concentration. Here, the attenuation of the radar pulse is determined in the measured volume fraction of a material. This provides a radar-based conductance value (RbC - Radar-based-Conductivity) as a characteristic value in dS/m which is determined as a function of the mineral concentration and output as a non-standardized value. The conductivity measuring range of the SONO-Ex GS1 humidity measuring system is 0..12dS/m.

2.3 Temperature compensation when used in higher temperatures (with the SONO-CONFIG app)

SONO probes generally show a low temperature dependency. However, there are applications that require temperature compensation. SONO probes offer two options for temperature compensation:

2.3.1 Internal Temperature Compensation of the TRIME® Electronics

Using this temperature adjustment, a possible temperature drift of the SONO electronics can be compensated for. Since the SONO electronics generally have little temperature dependency, the standard parameter TempComp = 0.2 is preset in each SONO probe for "normal" ambient temperature ranges. This TempComp parameter can be set to values up to TempComp = 0.7 for use at high temperatures, depending on the SONO probe type up to 70°C. However, after changing the TempComp parameter > 0.2, it is advisable to carry out a basic calibration in air and water with the SONO probe.

The TempComp parameter can be set using the SONO-CONFIG software tool under "Calibrations" in the "Electronic-Temperature-Compensation" menu.

NOTE:

If the TempComp parameter is changed, the basic calibration of the probe changes, which is why a new basic calibration of the SONO probe would then be required.

2.3.2 Compensation of the temperature of the material to be measured

When used in higher temperature ranges, water and certain materials to be measured show a temperature dependency of the dielectric constant (DC).

The humidity is determined via the dielectric constant, i.e. the DC is the actual measurement parameter when measuring humidity with SONO probes. If materials to be measured, such as corn, show a very special temperature dependency of the DC (i.e. temperature dependency in only very specific humidity ranges), then it may be necessary to carry out a significantly more complex material temperature compensation, which, however, is associated with considerable laboratory work. For this, in addition to the moisture, the temperature of the measured material must be measured with the temperature sensor built into a SONO probe. The parameters t0 to t5 can be set in each of the 15 preprogrammed calibration curves Cal1 to Cal15. If you need this very complex material-specific temperature compensation, please contact the IMKO GmbH service.

2.4 The analog outputs for outputting measured values

The measured values are output as a current signal via the analog output. The SONO probe can be set to the two versions for 0..20mA or 4..20mA with the help of the SONO-CONFIG app. The SONO-CONFIG app can also be used to variably set the humidity dynamic range for the analog output, e.g. 0-10%, 0-20% or 0-30%.

Output 1: humidity in% (variably adjustable)

Output 2: Conductivity (EC-TRIME) 0..12dS/m or optionally temperature 0..70°C or optionally the standard deviation in the humidity measurement.

There is also the option of dividing analog output 2 into two areas in order to output both conductivity and temperature, in 4..11mA for the temperature and 12..20mA for the conductivity. Analog output 2 automatically switches between these two current windows every 5 seconds. The two analog outputs can be variably adjusted with the SONO-CONFIG app. A 500 Ohm resistor can be used for a 0-10V DC voltage output.

For the analog outputs 1 and 2 there are several setting options for the SONO probe:

Analog output: selection 0..20mA or 4..20mA

For special controls and applications, the current output can also be set inversely with 20..0mA and 20..4mA

Analog Output Channels: The two analogue outputs of the SONO probe can be set to one of four possible variations.

1. Moist, Temp	Analog output 1 for humidity, output 2 for material temperature
2. Moist, Conduct	Analog output 1 for humidity, output 2 for conductivity from 0..20dS/m or 50dS/m
3. Moist, Temp/ Conductivity	Analog output 1 for humidity, output 2 for material temperature and EC-TRIME conductivity with automatic current window change
4. Moist / MoistSTdDev	Analog output 1 for humidity, output 2 for the standard deviation in the humidity measurement (for use e.g. in fluidized bed dryers)

The moisture dynamic range and the material temperature output range at analog outputs 1 and 2 can be set variably.

The moisture range must not exceed 100%.

Moisture Range in %	**Temp. Range in °C:**
Maximum: z.B. 20 for sand (Set in %)	Maximum: 70°C
Minimum: 0	Minimum:-10°C
Conductivity Range:	0..20dS/m oder 0..50dS/m

SONO probes can measure the EC-TRIME pore water conductivity from 5dS/m to 50dS/m, depending on the type of probe and the humidity.

2.5 The serial interfaces RS485 and IMP bus

SONO probes have two serial interfaces, a standard RS485 interface and the IMKO IMP bus to read out individual parameters or measured values serially. An easy-to-implement data transfer protocol enables several probes to be connected to the bus. The SONO probe can be connected directly to the USB port of a PC via the serial interface, and the SM-USB is module available from IMKO in order to adjust individual measurement parameters or to carry out calibrations.

2.6 The IMP bus for practical sensor networking

If the probes are powered externally on site, a 2-wire line is sufficient for networking. When using a 4-wire line, SONO probes can also be supplied with voltage.

Standard RS485 interfaces may be susceptible to interference in industrial environments. They are not galvanically isolated, i.e. there is always the risk of ground loops or interference pulses, which can lead to considerable safety problems. Furthermore, a shielded and twisted cable must be used for the RS485, especially with longer cable lengths. Depending on the cabling plan (topology) with individual stub lines, a 100 Ohm terminating resistor must then be attached to "sensitive" points in the RS485 network. In practice, this means considerable expert effort and often insurmountable problems.

The robust IMP bus ensures safety. In addition to the standard RS485 interface, SONO probes also have the robust IMP bus, which is galvanically separated and ensures increased safety. This means that the serial signal line is galvanically separated from the operating voltage of the probes and a sensor network can thus be set up completely independently of individual ground potentials with different network phases. Furthermore, the IMP bus does not send its data packets as voltage pulses but rather as current pulses. This makes the IMP bus extremely robust, a function is ensured even with long cable lengths with existing and laid lines. A shielded cable is not required and stub lines in a wide variety of network topologies are not a problem**.**

2.7 Error output and error messages

The SONO probe is very fault-tolerant, enabling trouble-free operation. Error messages can be queried via the serial interface

3 Installation of the measuring probe

The installation conditions are heavily dependent on the conditions of the respective installation location. The optimal installation location must be determined individually. The following guidelines should be observed.

3.1 Installation instructions

- It must be checked whether the information on the nameplate of the device and in the documentation correspond to the permissible Ex application conditions on site:
  - Explosion group
  - Device category
  - Zone
  - Temperature class or the maximum surface temperature
- When installing on the floor and on uneven floors, the probe must be installed at the highest point in the floor. No water must collect on the probe head, otherwise the measurement could be falsified.
- Areas in which there is strong turbulence are not ideal for installation. There should be a continuous flow of material over the probe head.
- The stirring movement of mixer blades should take place without any gaps above the probe head.
- The probe should not be installed in the immediate vicinity of sources of electrical interference such as motors.
- No material must be allowed to deposit on the probe head, otherwise the measurement could be falsified.
- In the case of curved installation surfaces, the center of the probe head should be flush with the radius of the mixer wall without disturbing the radial material flow. The probe must not protrude at the risk of, for example, being caught by shovels or wipers.

Attention, risk of explosion!

Earthing/equipotential bonding is mandatory for areas at risk of explosion: To avoid dangerous charges / discharges in areas at risk of explosion, devices e.g. to ground the SONO-Ex GS1 or to include it in the equipotential bonding. The test of the ground leakage resistance (according to TRGS 727 Paragraph 8) must always be measured and recorded before commissioning and after changes to the system. The test is only to be carried out by qualified persons in accordance with TRBS 1203 and TRBS 1203 Part 1. The limit value of the leakage resistance must never exceed 1 MΩ.

Attention, special conditions of use according to EPS 20 ATEX 1 237 X!

The permitted ambient temperature range is -10°C to +70°C. The cable to the housing of the evaluation electronics must be laid permanently. The sensor housing must be installed so that it is protected from UV radiation.

Attention risk of breakage!

The probe head is made of special steel and wear-resistant ceramic to guarantee a long service life for the probe. Despite the stable and wear-resistant structure, the ceramic plate must not be hit because ceramic has a limited fracture resistance.

Risk of overvoltages!

During welding work on the system, all probes must be completely electrically disconnected. SONO probes require a stabilized supply voltage of 12V DC to a maximum of 24V DC. Unstabilized power supplies run the risk of overvoltages, which is why we strongly advise against using these power supplies.

Risk of malfunction!

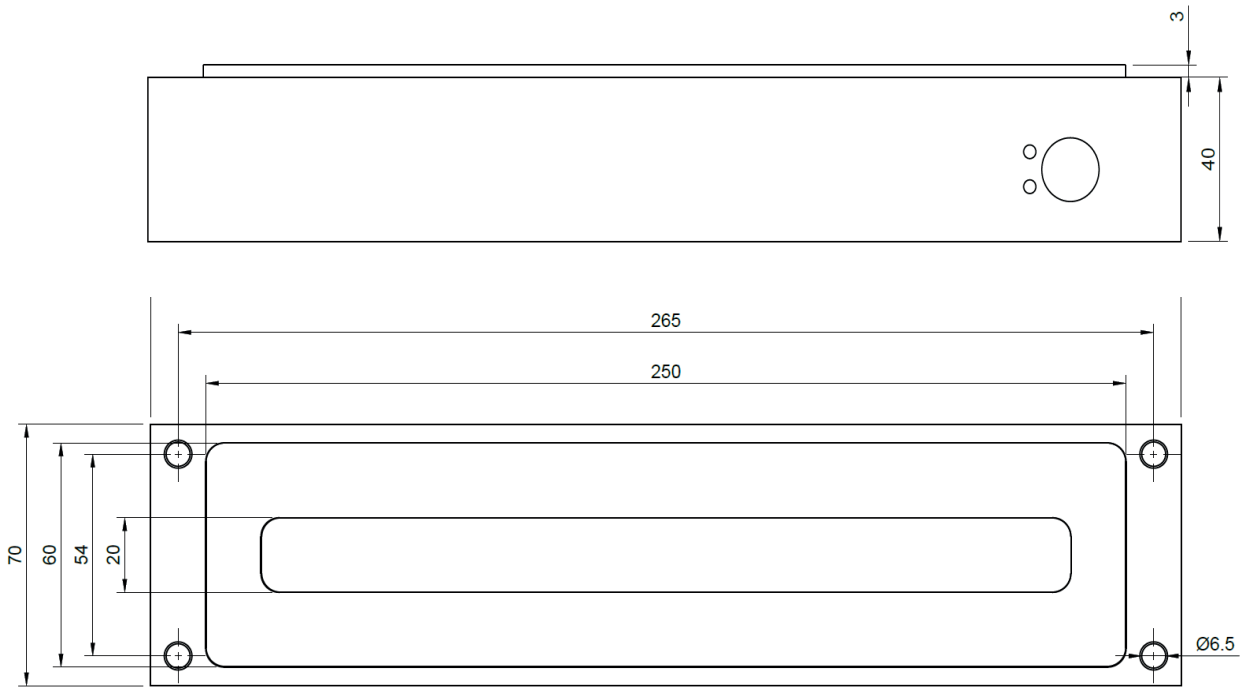
1. There are systems in which the mains voltages can have different ground potentials, which can lead to the analog signal 0 (4)..20mA not being correctly measured in a PLC. Here we recommend the use of a galvanically isolated power supply or an isolating coupler for the power supply of the SONO probes. These are available from IMKO on request.
2. Make sure that there are no other electromagnetic fields in the immediate vicinity of the probe head. E.g. no other humidity probes, in particular microwave probes, should be installed directly next to or opposite SONO probes.

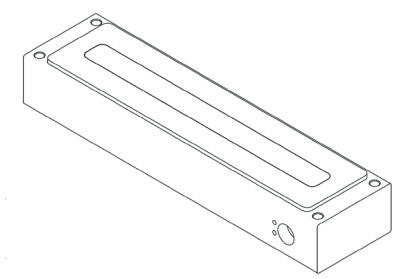
Damage caused by incorrect installation is not covered by the guarantee!

Wear on probe parts is not covered by the guarantee!

3.2 Installation dimensions

The SONO-Ex GS1 probe can be installed with four M8 screws on the floor or on the side wall of a mixer. It should be taken into account that smaller amounts of material can also be used for measurement when installing on the floor.



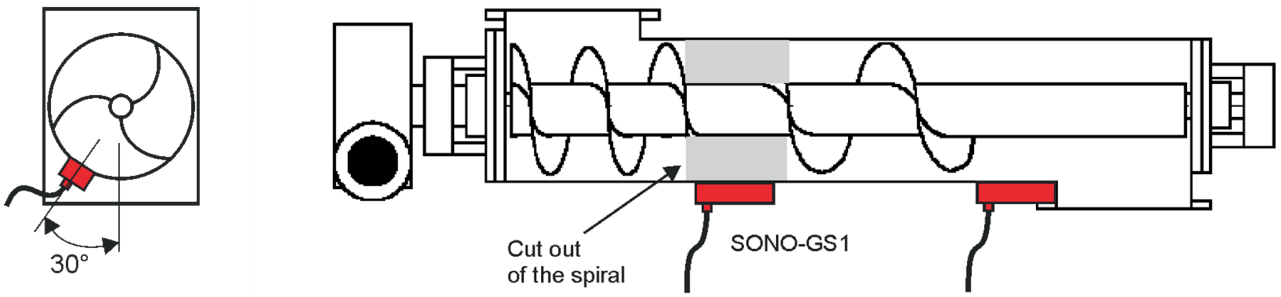


cut-out in the container wall:
250 x 60 mm with a radius of 7.5 mm

3.3 Examples of procedural integration

3.3.1 The procedural integration in a screw conveyor

The installation of the SONO-Ex GS1 in a screw conveyor ensures optimal conditions in terms of material flow and material density, as the measured medium is compacted by the screw.



The SONO-Ex GS1 probe can be installed along the conveyor screw. It is advisable to maintain an installation angle of 30°C, as shown in the sketch. The probe should be installed on the side where the material accumulates to ensure that there is enough material on the probe.

Optionally, the helix can be cut out so that a plug is formed in order to compress the material a little more. However, the SONO-Ex GS1 can also be installed at the end of the screw, where a backwater forms, in an area with a recessed screw spiral. If the SONO-Ex GS1 is installed without a helix recess, the probe must be set with the appropriate filter algorithms, as the metal of the helix falsifies the measured value. The parameters of operating mode C must be found on a case-by-case basis, depending on the screw speed, using a corresponding operating mode with filtering.

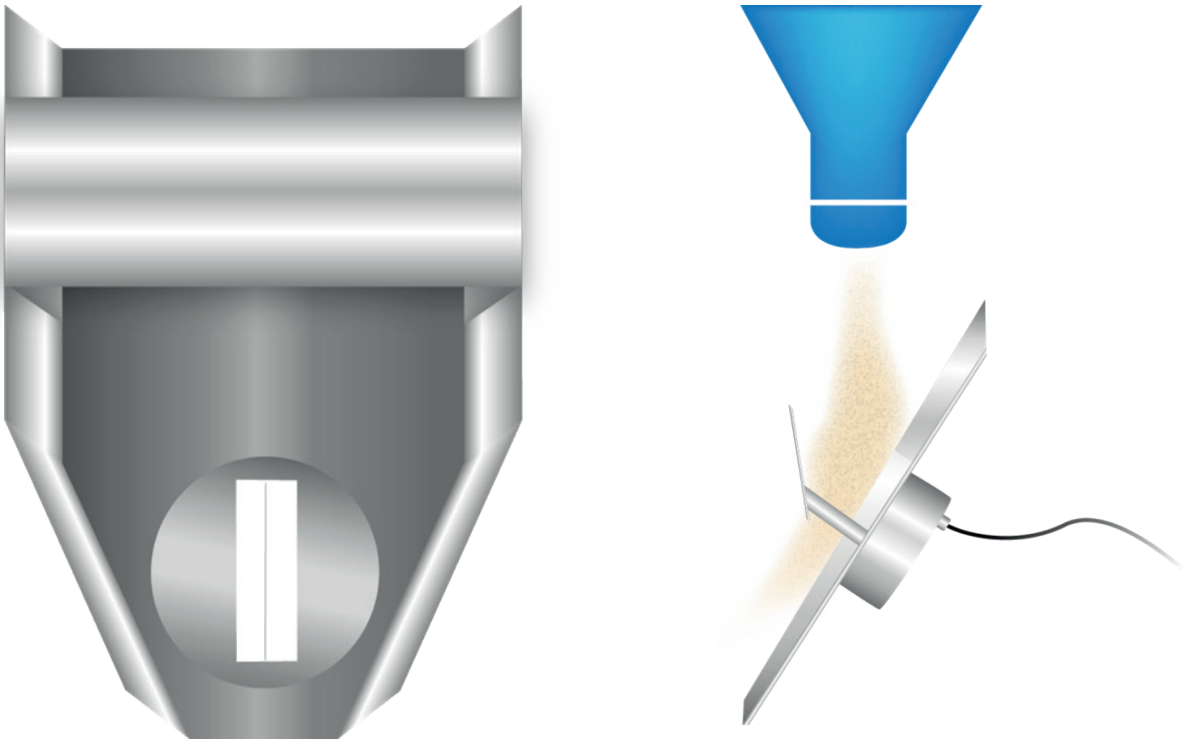
We recommend the two different operating modes CK for installation with interference from the helix, or operating mode CF for installation with a recessed helix.

3.3.2 Process integration in mixers

Even the best sensor technology can only deliver precise results if certain limits are adhered to during installation, the ambient conditions and the associated bulk density.

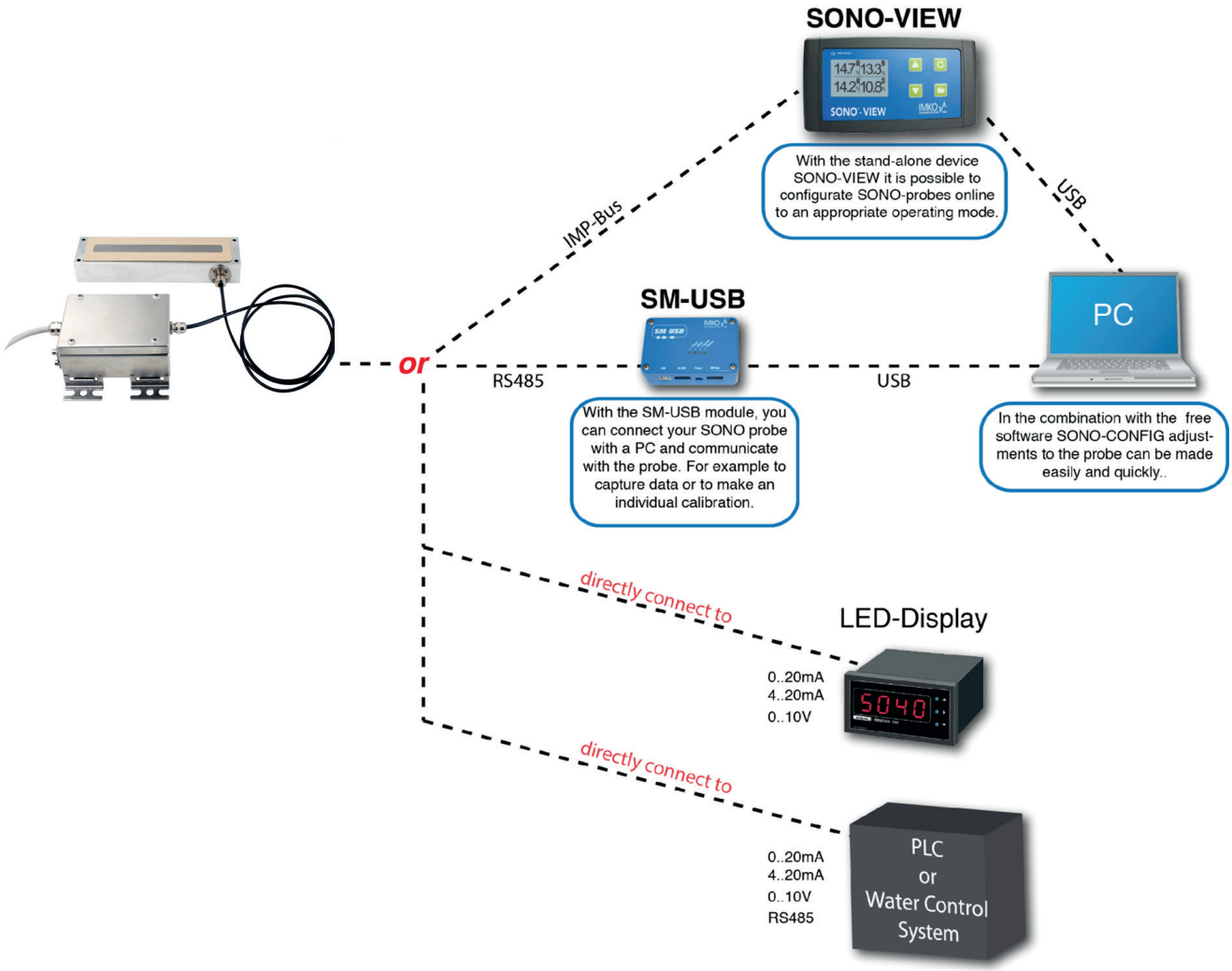
Too fast a material flow can lead to the material height above the probe surface being too low. A funnel gutter with baffles can concentrate and increase the height of the material above a probe head.

There are systems where the material flow is relatively low or too broad, so that it is not ensured that enough material can flow over the SONO-Ex probe. In such a case it may be necessary to "bundle" the material flow in such a way that the material is dammed as it flows over the probe. The following illustration shows an example of a possible device where the material is "bundled" on the side of the probe as well as above the probe.



In the case of inhomogeneous material flow, there is also the option of using the filter functions with upper and lower limit implemented in the SONO-Ex probe (a SONO-VARIO probe shown here as an example).

4 Electronic Integration



4.1 Pin assignment of the probe

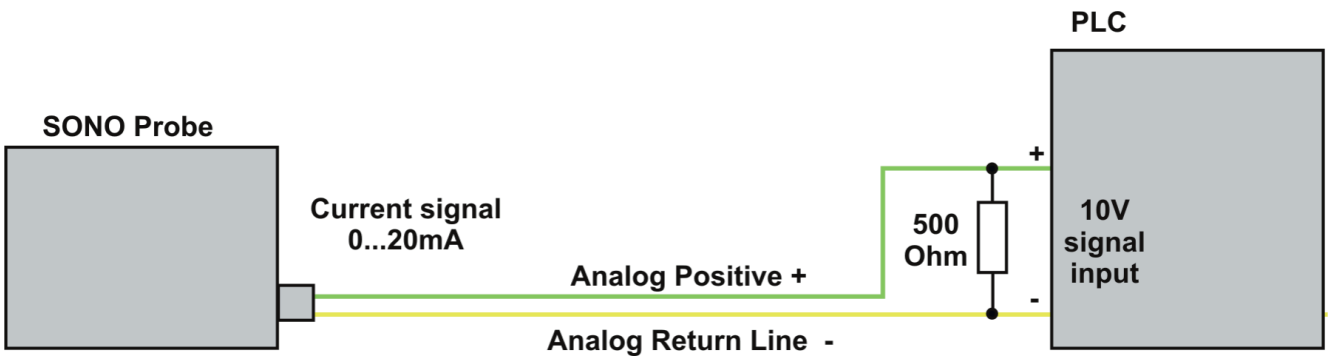
SONO-Ex GS1 is delivered with a 10-pole permanently installed cable.

Assignment of the 10-pin cable

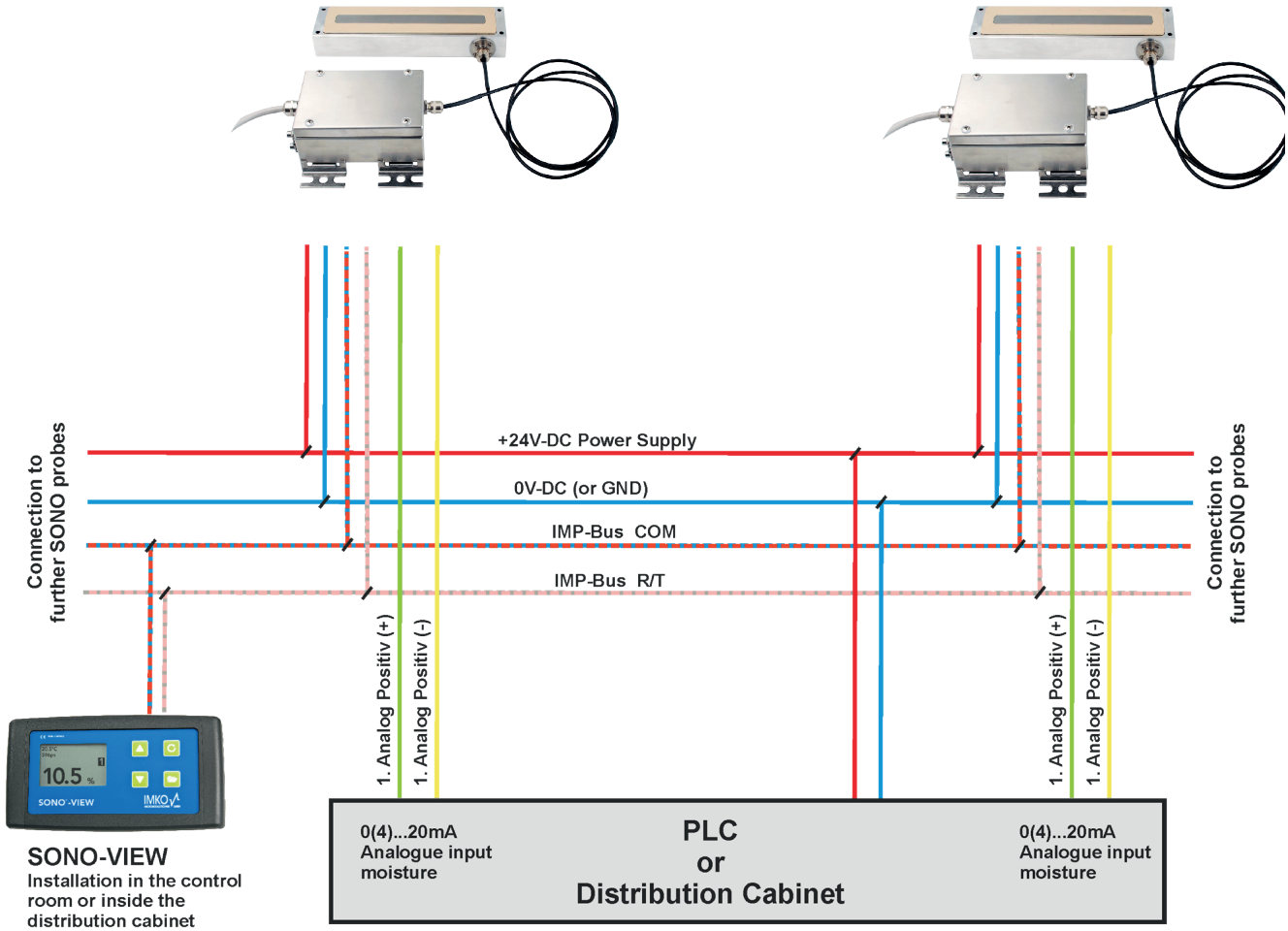
Plug-PIN	Sensor connections	Conductor color	Conductor color
A	+12V..24V DC Power supply	Red	Red
B	0V Power supply	Blue	Blue
D	1. Analog positive (+) humidity	Green	Green
E	1. Analog return line (-) humidity	Yellow	Yellow
F	RS485 A (must be activated)	White	White
G	RS485 B (must be activated)	Brown	Brown
C	IMP-Bus RT	Grey / Pink	Grey / Pink
J	IMP-Bus COM	Blue / Red	Blue / Red
K	2. Analog positive (+)	Pink	Pink
E	2. Analog return line (-)	Grey	Grey
H	Shielding (is grounded at the sensor. The system must be properly grounded!)	Transparent	Transparent

4.2 Analog output 0..10V with shunt resistor

There are controls which do not have a current input 0..20mA but a voltage input 0..10V. With the use of a 500 Ohm shunt resistor (included in the scope of delivery), a 0..10V voltage signal can be generated from a 0..20mA current signal. The 500 Ohm shunt resistor should be attached to the end of the line or to the control input. The following sketch shows the circuit principle.



4.3 Connection diagram to the PLC and use of SONO-VIEW



5 Settings, operating modes and calibration levels

5.1 Online-Konfiguration via SONO-VIEW

With the stand-alone display device SONO-VIEW, it is possible to set suitable configuration parameters directly during operation without being connected to a PC. SONO-VIEW adapts its LCD dynamically to the number of connected SONO-Ex GS1 (see SONO-VIEW manual).

5.2 Configuration using the SM-USB module

SONO-Ex GS1 can be connected to a PC via the external SM-USB module and the serial interface. With the SONO-CONFIG software, the SONO-Ex GS1 can be set to the appropriate operating mode with individual parameters. All set configuration parameters are saved in the SONO-Ex GS1 in a non-volatile manner.

6 Commissioning and handling

The installation conditions are heavily dependent on the conditions of the respective system. The optimal installation location must be determined individually. The following guidelines should be observed.

1. It must be checked whether the information on the nameplate of the device and in the documentation correspond to the permissible Ex operating conditions on site:
    a. Explosion group
    b. Device category
    c. Zone
    d. Temperature class or the maximum surface temperature

Attention, danger of overvoltages!

During welding work on the system, all probes must be completely electrically disconnected.

SONO probes require a stabilized supply voltage of 12V DC to max. 24V DC. Unstabilized power supplies run the risk of overvoltages, which is why we strongly advise against using these power supplies.

Caution, risk of malfunction

1. There are systems in which the mains voltages can have different ground potentials, which can lead to the analog signal 0 (4)..20mA not being correctly measured in a PLC. Here we recommend the use of a galvanically isolated power supply or an isolating coupler for the power supply of the SONO probes. Available from IMKO on request.
2. Make sure that there are no other electromagnetic fields in the immediate vicinity of the probe head. E.g. no other humidity probes, especially microwave probes, should be installed directly next to or opposite SONO probes.

7 Technische Daten

PROBE DESIGN

Housing: stainless steel V2A with highly wear-resistant ceramic window.

ASSEMBLY

Probe dimensions: 135 x 60 x 40 (length x width x height)

MEASURING RANGE HUMIDITY

The sensor measures from 0% to material saturation. With special calibrations, humidity measuring ranges of up to 100% are possible.

MEASURING RANGE CONDUCTIVITY

The probe delivers a radar-based conductance value (EC-TRIME- Radar-based-Conductivity) via the serial interface as a characteristic value of 0..10dS/m, depending on the probe design, which is determined as a function of the mineral concentration in the measured material.

MEASURING RANGE TEMPERATURE

Measuring range: 0°C..70°C

The temperature is measured on the probe housing below the wear head and can optionally be sent to analog output 2. Since the probe electronics work with approx. 1.5W power, the probe housing heats up a little. Precise measurement of the material temperature is therefore only possible to a limited extent. The material temperature can, however, be measured after an external calibration and compensation of the sensor's self-heating.

MEASURING FIELD EXPANSION

approx. 50 - 80 mm, depending on the type of probe, material and humidity.

POWER SUPPLY

+12V to +24V DC 3W

Caution: Unstable power packs must not be used, risk of overvoltage!

ENVIRONMENTAL CONDITIONS

-10°C to +70°C

EXPLOSION PROTECTION

Ⓔx II 2 D Ex tb IIIC T75°C Db

SPECIAL CONDITIONS

The permitted ambient temperature range is -10°C to +70°C

The line to the housing of the evaluation electronics must be laid permanently.

MEASUREMENT DATA PRE-PROCESSING

SONO-Ex GS1 can be set to different operating modes (measurement mode).

Mode CS (Cyclic Successive):

Without averaging for very short measuring processes in the seconds range (e.g. 5..20 seconds) with internally up to 100 measurements per second and a cycle time of 250 milliseconds at the analog output. The CS operating mode is also used to record raw values without averaging and filtering.

Mode CA (Cyclic Average Filter):

Standard averaging for relatively fast but continuous measurement processes, with filtering and an accuracy of up to 0.1%.

Mode CF (Cyclic Floating Average with filter):

Floating averaging for very slow and continuous measuring processes, with filtering and an accuracy of up to 0.1%. Suitable for applications e.g. in fluidized bed dryers, on the assembly line, etc.

Mode CK (Cyclic with Kalman filter):

For complex applications.

Mode CC (Cyclic Cumulated):

With automatic summation of the moisture quantity measurement in a batch process.

Mode CH (Cyclic Hold):

Similar to Mode CC but without adding up

SIGNAL OUTPUT

2x analog output 0 (4)..20mA

Output 1: humidity in % (0..20% variably adjustable)

Output 2: conductivity (EC-TRIME / RbC) or optionally temperature or standard deviation.

There is also the option of dividing analog output 2 into two areas, 4..11mA for the temperature and 12..20mA for the conductivity. Analog output 2 changes between these two current windows every 5 seconds. The two analog outputs can be variably adapted with the SONO-CONFIG software. A 500 Ohm resistor can be used for a 0-10Vdc voltage output.

CALIBRATION

The probe is delivered with 15 different calibrations. For special materials, variable calibrations with polynomials up to 5th degree are possible and can be entered into the probe with the SONO-CONFIG software. The zero point can be adjusted using the SONO-CONFIG software.

COMMUNICATION

A serial RS485 interface or the IMP bus enables networked operation of the probe, whereby a data bus protocol for connecting several SONO probes to the serial interface is implemented as standard. The probe can be connected to industrial buses such as Profibus, Ethernet, etc. via optional external modules (on request).

PROBE CONNECTION

The probe is connected via a 6-pole cable which is led out of the probe via a PG screw connection. The cable length is 5 meters.

8 Safety instructions

In this documentation, text passages that require special attention are highlighted accordingly.

Attention:

The warning triangle with the exclamation mark warns you of personal injury or property damage.

Intended Use

Sensors and measuring systems from IMKO GmbH may only be used for the purpose described within their technical boundaries. Improper use is not permitted. The function and operational safety of a sensor or measuring system can only be guaranteed if the generally applicable safety precautions, national regulations and the special safety instructions in these operating instructions are observed.

The humidity sensors and measuring systems from IMKO GmbH are used to measure humidity according to the measuring purpose and measuring range defined and specified in the technical data. Only compliance with the instructions described in the manual is considered intended use. The manual describes the connection, use and care of the IMKO sensors and IMKO measuring systems.

Read the manual before connecting and operating a sensor or measuring system.

The manual is part of the product and must be kept ready to hand near the sensor or measuring system.

Impairment of security

The sensor or the measuring system has been built and tested in accordance with the safety regulations for electronic measuring devices applicable in Germany and left the factory in a perfectly safe condition. If the sensor or the measuring system can no longer be operated safely, it must be put out of operation and secured with a label before further commissioning. In cases of doubt, the sensor or the measuring system must be sent to the manufacturer or his contractual partner for repair or maintenance.

Changes

For safety reasons, it is not permitted to make modifications or changes to the sensor or the measuring system without the consent of the manufacturer.

Opening the sensor or hand-held measuring device, adjustment and repair work as well as all maintenance work except the work described in the manual may only be carried out by a specialist authorized by us. The sensor or the measuring system must be disconnected from the power supply before installation or maintenance work.

The hand-held measuring device and the power supply unit must not be opened or repaired!

Hazard warnings

Danger from improper operation.

The sensor or the measuring system may only be operated by trained personnel. The operating personnel must have read and understood the instructions for use.

Attention:

The warning triangle with the exclamation mark warns you of personal injury or property damage.

Electricity hazard

The hand-held measuring device must not be immersed in water or other liquids. The sensor is insensitive to moisture contained in the products typically measured.

Only connect the hand-held measuring device to a properly installed socket with the supplied power supply cable, the voltage of which corresponds to the technical data. Use only the adapter that is suitable for your socket outlet.

Only operate the measuring device with the original accessories included in the scope of delivery. Contact the manufacturer if you need additional accessories or replacements.

Do not use the meter:

- if the measuring device, sensor, plug-in power supply unit or accessories are damaged,
- the sensor or the measuring system does not work as intended,
- the power cord or plug is damaged,
- the sensor or the measuring system has fallen.

Pull the plug-in power supply unit out of the socket:

- if you do not use the sensor or the measuring system for a longer period of time,
- before you clean, pack away or move the sensor or the measuring system,
- when you carry out work on the sensor or measuring device, e.g. connecting devices,
- if a malfunction obviously occurs during operation,
- during a thunderstorm.

Caution - property damage

Make sure that there is a sufficiently large distance from strong heat sources such as heating plates, heating pipes.

Disconnect the sensor or hand-held measuring device from other devices before moving or transporting it. Pull out the plug on the device.

Do not use any aggressive chemical cleaning agents, scouring agents, hard sponges or the like for cleaning. The operator must ensure that he is not statically charged. Should a display error occur due to static discharge, please restart the device.

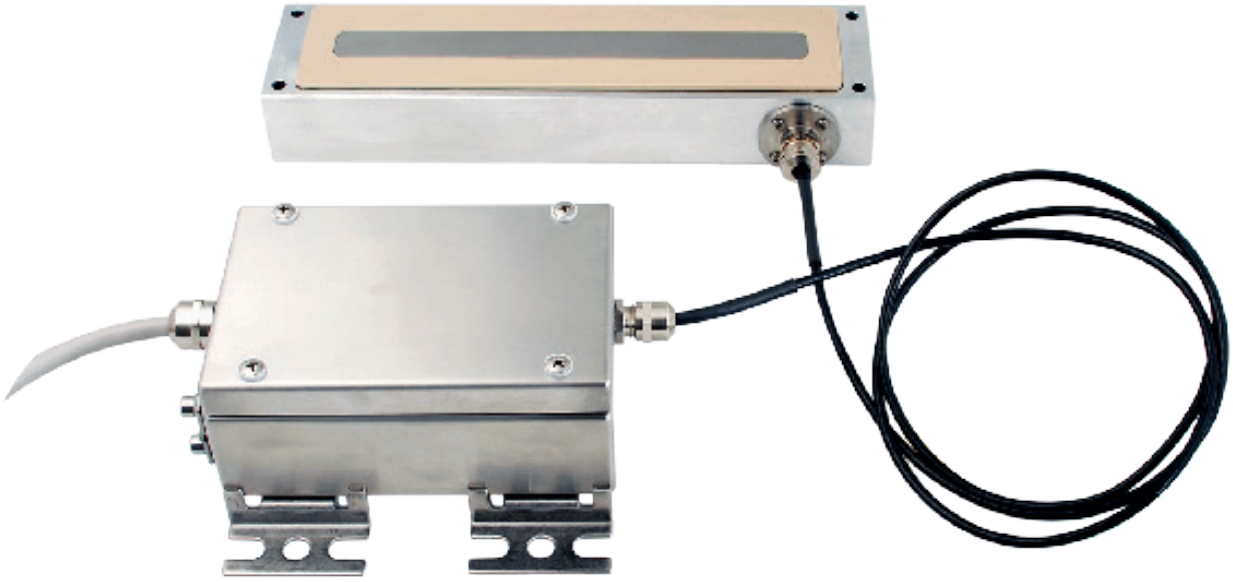
Attention

The device is not intended for use in residential areas and, in rare cases, may interfere with radio reception.

9 Certificate and approvals

CE-mark	The measuring system fulfills the legal requirements of the applicable EC directives. These are listed together with the applied standards in the corresponding EC Declaration of Conformity. IMKO Micromodultechnik GmbH confirms the successful testing of the device by affixing the CE mark.
RoHS	The measuring system complies with the substance restrictions of the directive on the restriction of the use of certain hazardous substances 2011/65/EU (RoHS2).
Radio Approval	Meets "Part 15" of the FCC regulations for an 'Unintentional Radiator'. All probes meet the requirements of a "Class A Digital Device".
Electromagnetic Compatibility	Electromagnetic compatibility according to all relevant requirements of the EN 61326 series. Details can be found in the declaration of conformity. Maximum measurement deviation during EMC tests: < 3.0% of the span When installing the probes in metal and concrete containers and when using a coaxial probe • Emitted interference according to EN 61326-x series, equipment of the class B • Interference immunity according to EN 61326-series requirements for industrial areas When installing without a shielding / metallic wall, e.g. in plastic and wooden silos, the measured value can be influenced by the effects of strong electromagnetic fields • Emitted interference according to EN – 61326 series, Equipment Class A • Interference immunity: the measured value can be influenced by the effects of strong electromagnetic fields.
Explosion Protection (ATEX)	Directive conformity with 2014/34/EU is confirmed by the EU type examination certificate EPS 20 ATEX 1 237 X

10 Product images



Transmitter in stainless steel housing with SONO-GS1 probe

11 Note

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