

Operating Instruction
for
Humidity/Temperature- Measuring
Instrument

Model: AFH-G



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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.

The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.

Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:

The standard delivery includes:

- Humidity/Temperature- Measuring Instrument model: AFH-G

4. Regulation Use

Any use of the Humidity/Temperature- Measuring Instrument, model: AFH-G, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

5. Operating Principles

The type AFH-G measuring instrument serves to measure relative humidity indoors and in air ducts. Auxiliary temperature measurement is available as an option.

The moisture sensing element in the sensor comprises several strips of plastic fabric each with 90 fibres of 3 µm diameter. These plastic fibres undergo a special process to acquire hygroscopic properties, this means that they absorb and release moisture. The molecular structure of the fibres changes when they absorb water, giving rise to a measurable change in length. The length of the plastic fibres is thus a measure of the relative humidity.

The swelling effect, acting primarily in the longitudinal direction, is sensed by an electronic pick-off system and transferred to an integrated signal pre-processing system. The output signal of the passive sensors is 100...138.5 Ω, and 4- 20 mA for the active sensors.

The special treatment of the measuring element ensures that its hygroscopic properties remain stable, that is sensitivity is maintained until destroyed by external influence. Regeneration found in conventional instruments is not required here, but is also not damaging. The measuring element is protected by a perforated tube and is open to the housing.

Measuring instruments with an integrated temperature sensor provide temperature measurement. The temperatures are also converted to the standardized signals 100 -138.5 Ω, and 4-20 mA.

5.1. Design of the sensor

The expanding action (predominantly lengthways) of the fibres is picked up by means of an electronic sensing system and converted by integrated signal pre-processing into standardised signals 0..20 mA or 4..20mA or 100...138.5 Ω.

The fan-shaped measuring element, which faces outward from the housing, is protected by a perforated sensor tube. The sensors are designed for pressureless systems.

For simultaneous measurement of temperature a temperature sensors (mainly Pt 100) is available. Temperature readings are converted likewise into standardised signals 0..20 mA or 100..138.5 Ω.

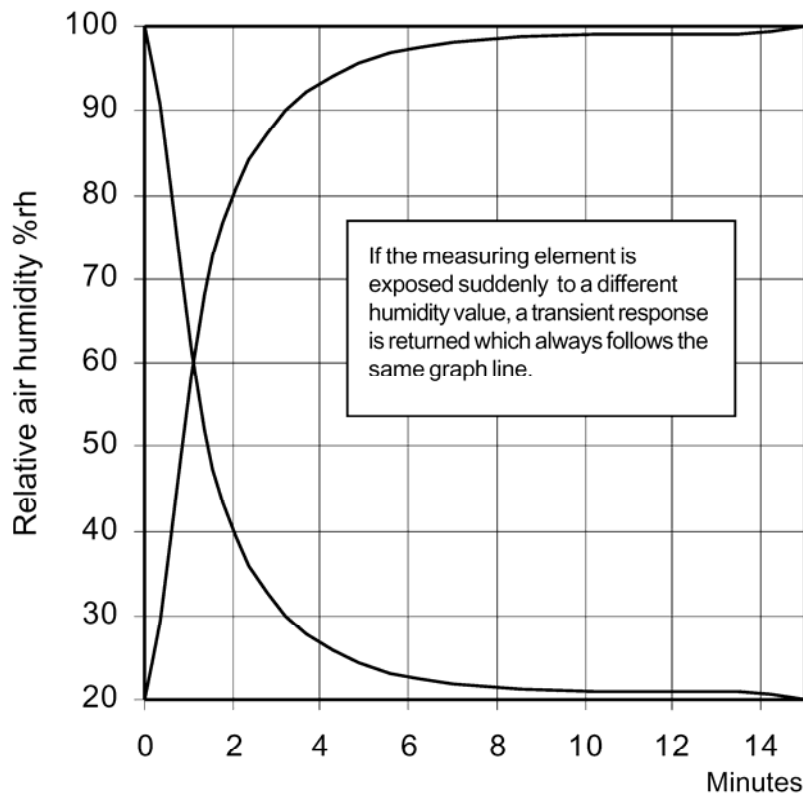
5.2. Ageing

In order to maintain their long-term stability, it is important that the measuring elements undergo a special ageing process, details of which cannot be given here.

5.3. Reaction of the sensor

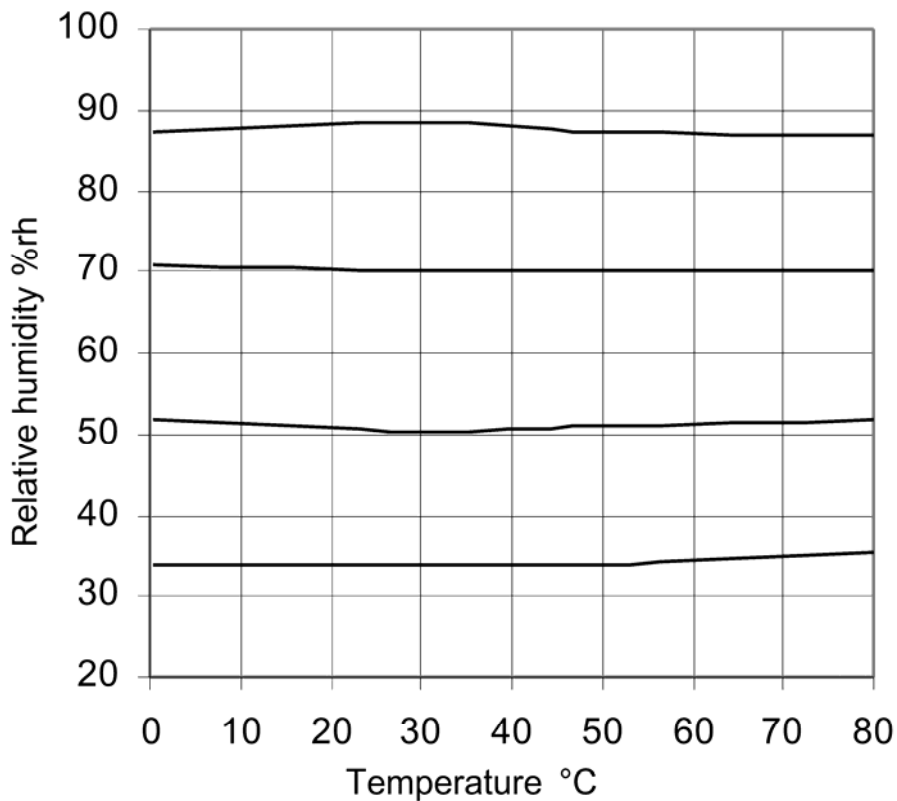
Due to the law of diffusion, there is a time delay before the fibres are saturated during water absorption. This is a decisive factor when determining the reaction time. Thus, for one individual fibre with a diameter of 3 μm , a short saturation time (several seconds) can be measured. Empirical investigations show that bundled or woven fibres, as are used here in the Kobold sensor, give rise to a longer period prior to saturation. This is because the individual fibres impede each other during water absorption and/or water loss, and the ensuing humidity does not register until later. Measurements have shown that, at a wind speed of 2m / sec. the half-life period is 1.2 min. This represents an effective period of approx. 30 - 40 min.

Half-life period



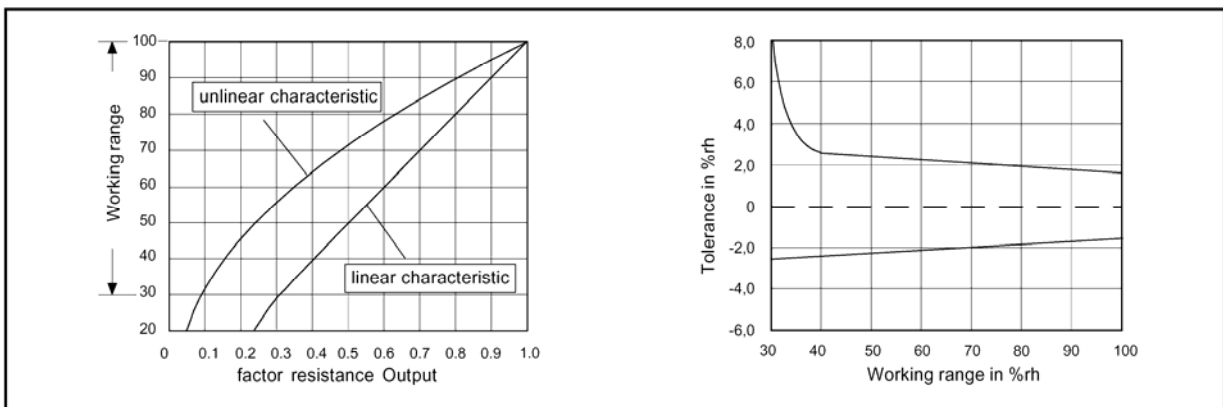
Transient response of the measuring element between 20 and 100% rh.

Thermal behaviour



80 °C is given as the maximum temperature value. Higher temperatures can only be tolerated for a short period of time. The eventual result is a change in the molecular structure which causes a constant error. The maximum temperature of 80 °C only applies, however, if no harmful substances (acids, solvents etc.) are present in the medium.

5.4. Humidity and tolerance diagram



6. Mechanical Connection



Unavoidable sources of interference should be kept at a good distance from the control systems.



Data and signalling lines should not be used in parallel with control, networking and power lines.

For data and signalling lines, shielded cable should be used, and the shielding must be applied to the earth terminal. Ensure that earth circuits and fault currents do not arise as a result of a second earth connection.

For equipment with a network connection, it is recommended that a separate network circuit be used.

During the switch process, electrical power consumers such as switch contactors, magnetic valves etc. produce induction voltages that can cause interference. In the trade there is an abundance of protective and suppressor component parts that are most effective when applied directly to the source of the trouble. A suitable suppressor has the added advantage that components such as relays, microswitches etc. have a longer service life.

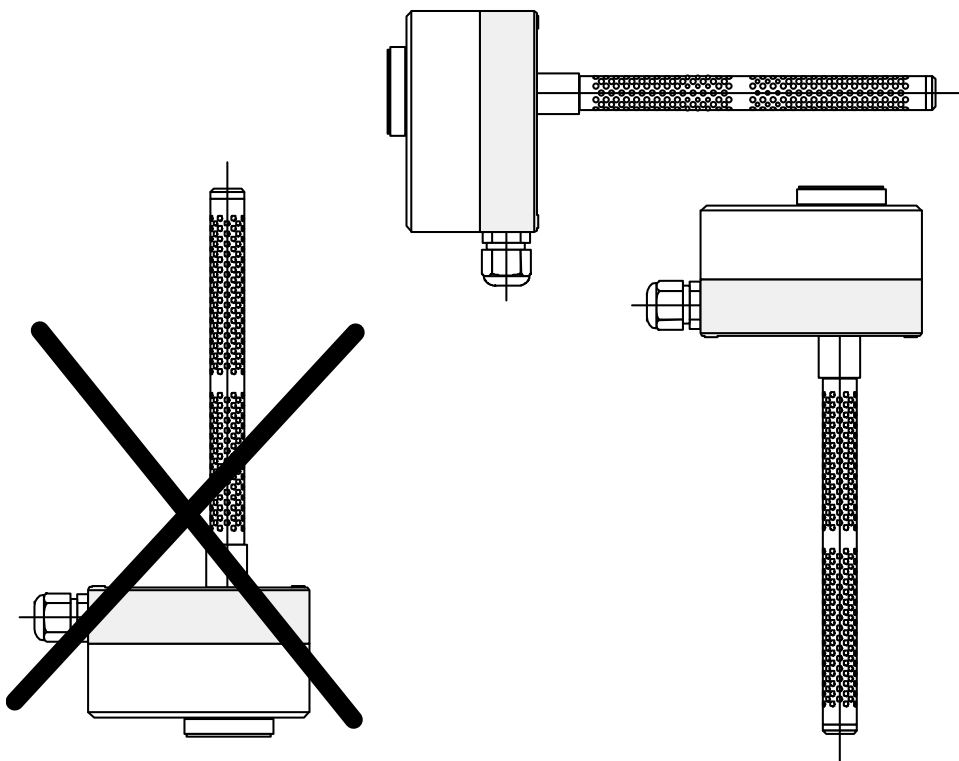
Further difficulties during installation can arise if signalling lines are joined together with common lines. It is essential to check whether this is permissible. Interference is particularly likely when installing using equipment of different makes. Here, too, the trade offers isolating amplifiers that overcome the problem.

AFH-G

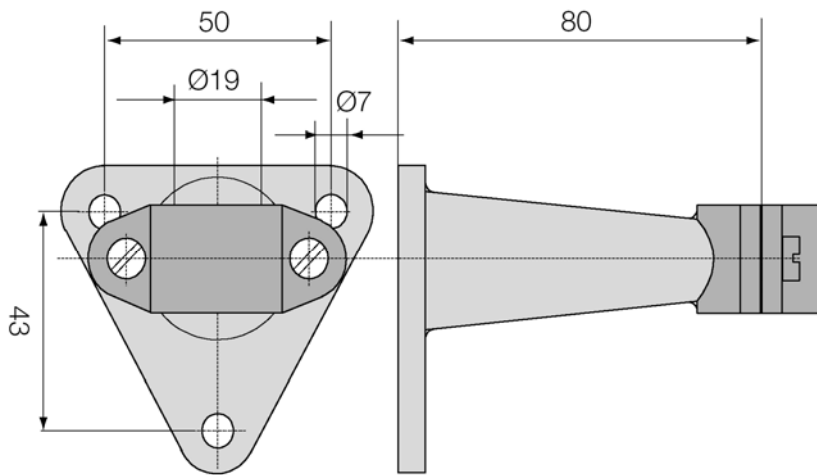
Installation:

The installation position should be chosen so as to prevent condensed water from entering the housing. The preferred installation position is "sensor vertically pointing downwards" or "sensor horizontal".

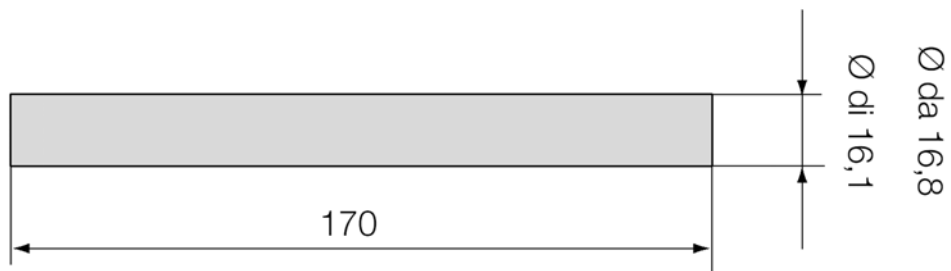
A grommet in the probe prevents penetration of water in the installation positions described above.



Wall mounting: AFM



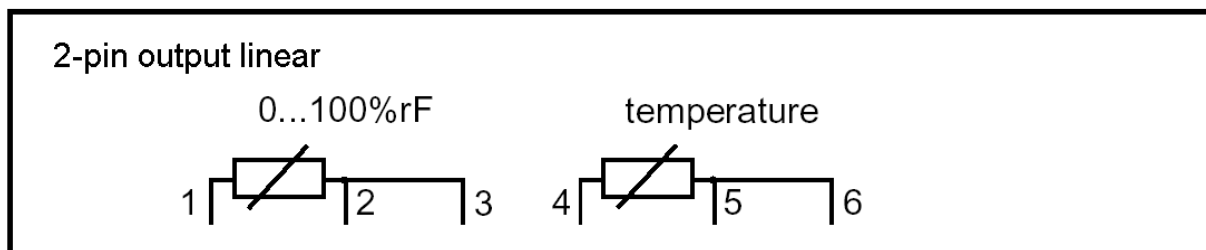
Gauze protection: AFG



7. Electrical Connection

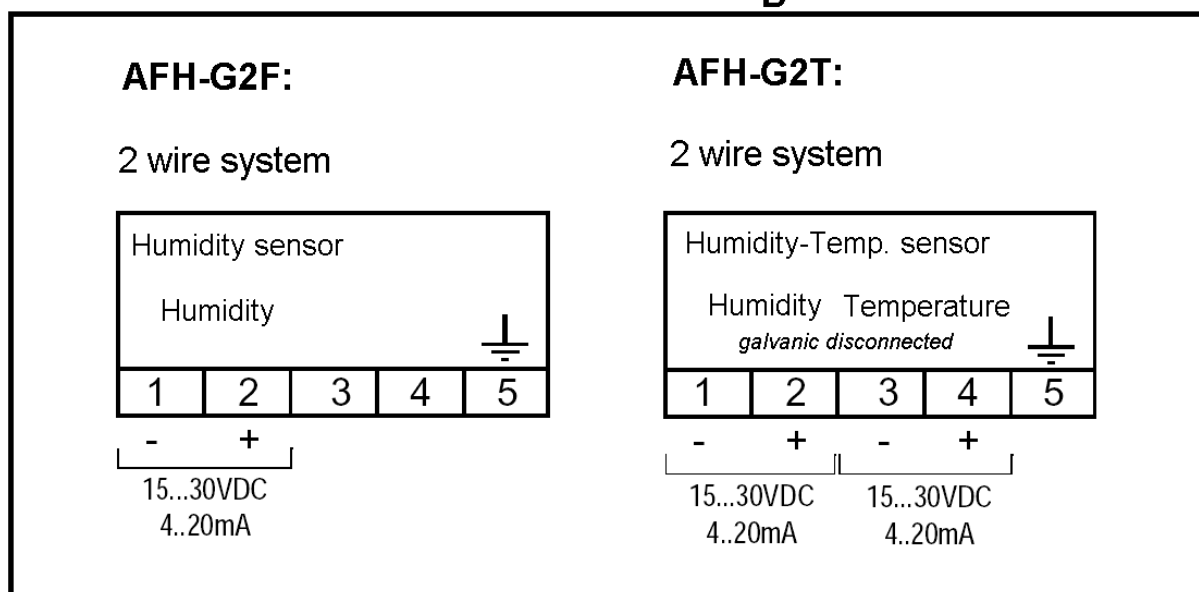
7.1. Passive sensors

Connection diagramm for passive sensors with resistance output



7.2. Active sensors

Connection diagramm for active sensors $U_B = 15...30V$ DC



8. Maintenance and Instruction for Use

The measuring element is maintenance free when the surrounding air is clean. Agents that are corrosive and contain solvents, depending upon the type and concentration of the agent, can result in faulty measurements and cause the measuring element to break down. Direct sunlight should be avoided. Substances deposited on the sensor are damaging as they eventually form a water-repellent film (this applies to all humidity sensors with hygroscopic measuring elements). Such substances are resin aerosols, lacquer aerosols, smoke deposits etc. The water-resistant property of the Kobold sensors allows for cleaning using water. Solvents cannot be used for this purpose. A light-duty detergent is recommended. Any detergent residue should, however, always be thoroughly washed out. A special process ensures that Kobold sensors have good long-term stability. Regeneration is not necessary, but is also not harmful.

The temperature coefficient as well as the self-heating may vary according to the location and the application (especially with sensors where electronic and measuring systems are integrated in one housing).



The guarantee is no longer valid if the interior of the measuring element has been accessed.

9. Calibration

Kobold sensors are adjusted correctly at a room temperature of 23 °C and 50 % rH at a mean air pressure corresponding to 430 m NN. If, however, a further adjustment is necessary, the following procedure should be adhered to:

- Ensure that the ambient humidity as well as the ambient temperature is constant.
- If possible, use a psychrometer for testing, (do not use testing equipment with capacitive sensors).
- Leave the equipment to be tested for *a minimum of 1 hour under constant test conditions*.
- All sensors are equipped with an adjustment facility. In most cases this involves an adjuster screw fixed with screw securing lacquer. When the lacquer is removed the screw can be adjusted. After calibration, the adjuster screw should again be secured.

Important: The air's capacity to absorb water is influenced among other factors by the temperature. This is a physical law (identified in the hx diagram of Mollier). The higher the air temperature is the larger the amount of steam that can be absorbed up to saturation point (100 % rH). If a sensor is calibrated under varying air temperature conditions, the result is an irregular, inhomogeneous measuring medium which automatically gives calibration errors. The table below shows the influence of the air temperature on air humidity. If, for example, calibration occurs at an air temperature of 20 °C and 50 % rh and a varying temperature range of only +/-1 °K, this results in a variation in humidity of the measuring medium (air) of +/-3.2 % rH.

	10 °C	20 °C	30 °C	50 °C
10% rH	+/- 0,7% rH	+/- 0,6% rH	+/- 0,6 rH	+/- 0,5% rH
50% rH	+/- 3,5% rH	+/- 3,2% rH	+/- 3,0 rH	+/- 2,6% rH
90% rH	+/- 6,3% rH	+/- 5,7% rH	+/- 5,4 rH	+/- 4,6% rH

Physical influence of air temperature on air humidity

10. Technical Information

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

11. Order Codes

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

12. Dimensions

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

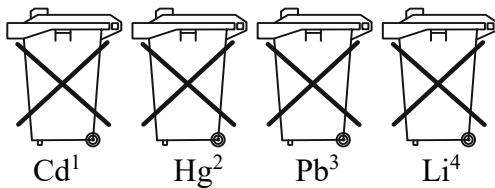
13. Disposal

Note!

- Avoid environmental damage caused by media-contaminated parts
- Dispose of the device and packaging in an environmentally friendly manner
- Comply with applicable national and international disposal regulations and environmental regulations.

Batteries

Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:



1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

Electrical and electronic equipment



14. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

Humidity/Temperature - Measuring Instrument Model: AFH-G

to which this declaration relates is in conformity with the following EU directives stated below:

2011/65/EU RoHS
2015/863/EU Delegated Directive (RoHS III)

According to article 2.2 of the EMC directive 2014/30/EU this directive does not apply to **AFH-G1F** and **AFH-G1T** due to the inherent nature of their physical characters.

Additional for model **AFH-G2F** und **AFH-G2T**:

2014/30/EU Electromagnetic Compability

Also, the following standards are fulfilled:

EN 60730-1:2012 Automatic electrical controls for household and similar use - Part 1: General requirements

EN 60730-2-13:2008 Automatic electrical controls for household and similar use - Part 2-13: Particular requirements for humidity sensing controls

Additional for model **AFH-G1T**:

EN 60730-2-9:2011 Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls

Additional for model **AFH-G2F**:

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 61326-2-3:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

Additional for model **AFH-G2T**:

EN 60730-2-9:2011 Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 61326-2-3:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

Hofheim, 14 August 2023



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