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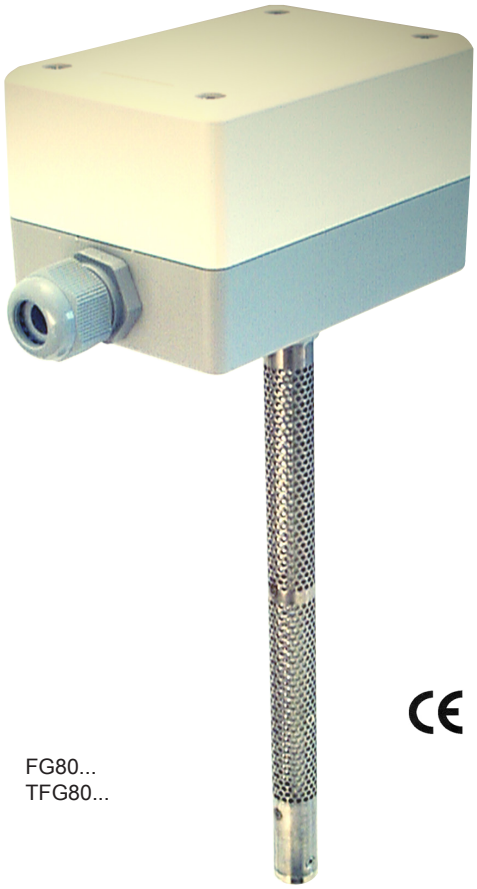
Humidity sensors - TFG80...

and combined

Humidity-temperature sensors - TFG80...

with Polyga® humidity measuring element for the measurement of relative air humidity and temperature
- for rooms and air channels.



FG80...
TFG80...

CE

Model overview

passive sensors

FG80H	**Humidity Sensor** with resistance output up to 10k ohms
TFG80H	**Humidity-temperature Sensor** with resistance output up to 10k ohms

active sensors

FG80J	**Humidity Sensor** 0(4)...20mA or 0...10V DC for U=15...30V DC
TFG80J	**Humidity-temperature Sensor** each 0(4)...20mA or 0...10V DC for U=15...30V DC
FG80AC	**Humidity Sensor** each 0(4)...20mA or 0...10V DC for U=24V AC
TFG80AC	**Humidity-temperature Sensor** each 0(4)...20mA or 0...10V DC for U=24V AC

Description of the sensor

The Polyga® humidity measuring element consists of several synthetic fabric bands each with 90 individual fibres with a diameter of 3 µm each. In their untreated state, the synthetic fibres are not hygroscopic - their hygroscopic properties are acquired by means of a special process which allows the synthetic fibres to absorb moisture. The molecular structure of the individual fibres is arranged lengthways. When water is absorbed, the molecular chains alter, the outward result being a change in length. A loss of water has a converse effect on the fibre. If the fibre is in equilibrium with the air humidity, there is neither absorption nor a loss of water. The length at this point serves as a gauge for the relative humidity.
If the measuring element is exposed to an air humidity of 100%rh, a film of water forms on the surface of the element (dew point). The physical effect is one as if the measuring element had been immersed in water. The measuring element is saturated. An ideal fixed point is thus attained for adjusting or controlling the sensors. The measuring element is waterresistant. Once administered to the Galltec measuring element, the hygroscopic properties remain stable, the sensitivity remaining until it becomes destroyed by extraneous influences. Regeneration as with fine-measuring elements is not necessary, but does not cause any harm.

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 preprocessing into standardised signals **0..20mA or 4..20mA or 0...10V**.
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. The unit should be installed in a location where condensation cannot enter into the housing. A preferred position would be ”sensor vertically down” or ”sensor horizontal”. In these positions, a cover plate with a 0.8 mm diameter hole will prevent water from entering.
The TFG80 range of sensors have built-in temperature sensors (mainly Pt100) for simultaneous measurement of temperature. Temperature readings are converted likewise into standardised signals **0..20mA or 4..20mA or 0..10V**.

Ageing

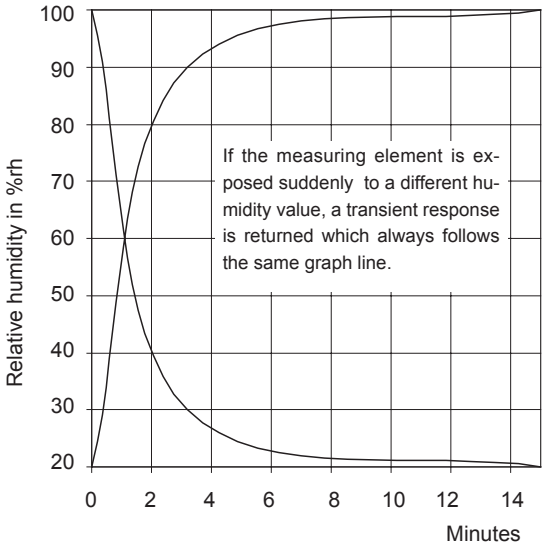
In order to maintain their long-term stability, it is important that the measuring elements undergo a special ageing process, details of which cannot be given here.

Reaction of the sensor

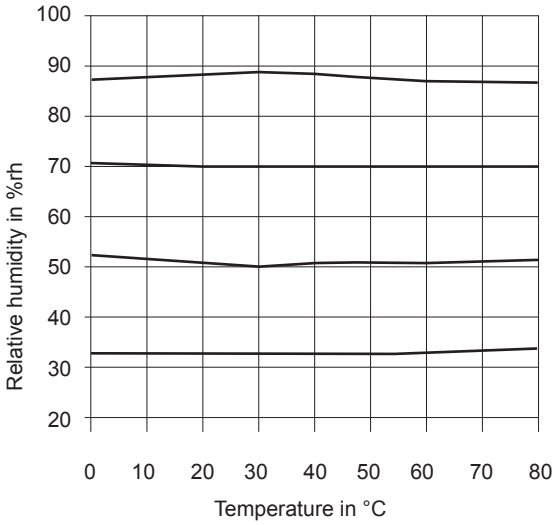
Due to the law of diffusion, there is a time delay before the fibres are saturated during water absorption. This is a decisive factor when determining the reaction time. Thus, for one individual fibre with a diameter of 3 µm, a short saturation time (several seconds) can be measured. Empirical investigations show that bundled or woven fibres, as are used here in the Galltec 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 mins. This represents an effective period of approx. 30 - 40 mins.

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.

Half-life period



Thermal behaviour



Technical data

Physical data

humidity measuring range ..... 0...100%rh
measuring accuracy
..... >40%rh ..... ±2.5%rh
.....<40%rh .. according to tolerance diagram
working range ..... 30...100%rh
temperature working range ..... -30...+80ºC
measuring accuracy ..... ±0.5ºC
measuring medium ..... air, pressureless, non-aggressive
permissible ambient temperature
at the housing ..... -20...60ºC
at the sensor ..... -40...+80ºC
medium temperature coefficient ..... -0.1%/K at 20ºC and 50%rh
adjustment ..... at average air pressure 430m NN
permissible air speed 8m/sec
with protective gauze (order no. 20.014) 15m/sec
half-life period at v=2m/sec.....1.2 min
sensor length ; sensor material ..... 220mm; high-grade steel
fixing ..... slots in housing base for channel mounting
(order no. 20.009) ..... console for wall mounting
mounting position ... sensor vertically downwards, or horizontal
connecting terminals ..... for conductor cross sections 0.5mm²
cable connection ..... by twist nipple M20x1,5
Directive about electromagnetic compatibility **2014/30/EU**
DIN EN 61326-1 ..... issue 07/13
DIN EN 61326-2-3 ..... issue 07/13

housing ..... ABS
protective system IP64
weight ..... ca 0.4 kg

Electrical data for passive sensors

Humidity Output 1 ..... 0...100 ohm linear 2-wire
..... 0...200 ohm linear 2-wire
..... 0...1000 ohm linear 2-wire
..... 100...138.5 ohm linear 2-wire
.....5..100..5 ohm unlinear 3-wire
further resistance ranges on request
permissible load of signal outputs
humidity output ..... 250 mW
temperature output (Pt100) ....
..... 1 mA at air speeds of 1 m/s

Temperature Output 2 (TFG80H) ..... Pt100 ref. DIN EN 60751
permissible load for air 1m/sec ..... 1 mA

Electrical data for active sensors

Humidity Output 1 ..... 0...20mA or 0...10V 4-wire system
... or 4...20mA .... 2-wire system (only with DC)
Temperature Output 2 ..... 0...20mA or 0..10V 4-wire system
.. or 4...20mA ..... 2-wire system (only with DC)
operating voltage ..... 15...30V DC or 24V AC ± 10 %
max. load for current output ..... 500 Ohm
min. load resistance for voltage output .....10k Ohm
internal consumption per range ..... 5 mA, DC version
internal consumption per range .....10 mA, AC version
temperature measuring range ..... see table
linearity distortion of the temperature output ..... <0.5%

Type Survey passive Sensors

Type	Order no.	Measuring range		Conductor-system	Outputs	
		Humidity	Temperature		Humidity	Temperature
FG80H	44010300	0 … 100 % rh	-	2-pin	0 … 1000 Ω linear	-
	44010400	0 … 100 % rh	-	2-pin	100 … 138,5 Ω lin.	-
	44010100	0 … 100 % rh	-	2-pin	0 … 100 Ω lin.	-
	44010200	0 … 100 % rh	-	2-pin	0 … 200 Ω linear	-
TFG80H	44700350	0 … 100 % rh	Pt100	2-pin	0 … 1000 Ω linear	Pt100
	44700450	0 … 100 % rh	Pt100	2-pin	100 … 138,5 Ω linear	Pt100
	44700150	0 … 100 % rh	Pt100	2-pin	0 … 100 Ω linear	Pt100
	44700250	0 … 100 % rh	Pt100	2-pin	0 … 200 Ω linear	Pt100
	44732666	0 … 100 % rh	NTC	2-pin	0 … 48 kΩ non-linear	NTC

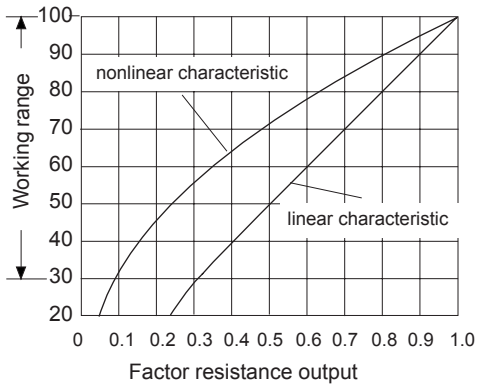
Further resistance ranges on request.

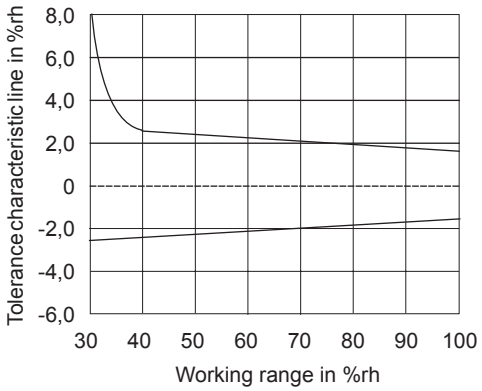
Type Survey active Sensors

Type	Order no.	Measuring range		Outputs		Conductor-system	Supply-voltage
		Humidity	Temperature	Humidity	Temperature		
FG80J FG80AC	44014700	0 … 100 % rh	-	0 … 10 V DC	-	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44014800	0 … 100 % rh	-	4 … 20 mA	-	2-wire	15 … 30 V DC
	44013000	0 … 100 % rh	-	0 … 20 mA	-	3/4-wire	15 … 30 V DC
	44014200	0 … 100 % rh	-	0 … 20 mA	-	3/4-wire	24 V AC
TFG80J TFG80AC	44514747	0 … 100 % rh	0 … 40°C	0 … 10 V DC	0 … 10 V DC	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44574747	0 … 100 % rh	-30 … 60°C	0 … 10 V DC	0 … 10 V DC	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44544747	0 … 100 % rh	0 … 100°C	0 … 10 V DC	0 … 10 V DC	3/4-wirer	15 … 30 V DC/ 24 V AC ±10 %
	44624747	0 … 100 % rh	-10 … 90°C	0 … 10 V DC	0 … 10 V DC	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44514848	0 … 100 % rh	0 … 40°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44574848	0 … 100 % rh	-30 … 60°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44544848	0 … 100 % rh	0 … 100°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44624848	0 … 100 % rh	-10 … 90°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44513030	0 … 100 % rh	0 … 40°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44573030	0 … 100 % rh	-30 … 60°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44543030	0 … 100 % rh	0 … 100°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44623030**	0 … 100 % rh	-10 … 90°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44514242	0 … 100 % rh	0 … 40°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
	44574242	0 … 100 % rh	-30 … 60°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
	44624242	0 … 100 % rh	-10 … 90°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
	44544242	0 … 100 % rh	0 … 100°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
FG80JPt100	44704750	0 … 100 % rh	Pt100	0 … 10 V DC	Pt100	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44703050	0 … 100 % rh	Pt100	0 … 20 mA	Pt100	3/4-wire	15 … 30 V DC
	44704850	0 … 100 % rh	Pt100	4 … 20 mA	Pt100	2-wire	15 … 30 V DC

** suitable for EDJ regulator

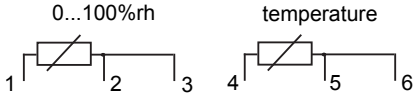
Humidity and tolerance diagram



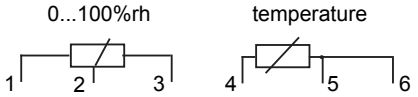


Connection diagram for passive sensors with resistance output

2-pin output linear



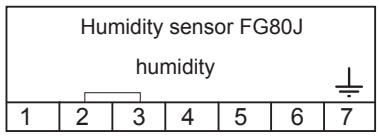
potentiometer output non-linear



Connection diagram for active sensor U =15...30V DC

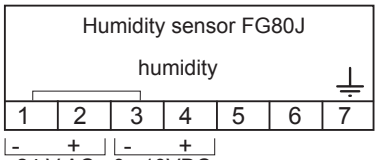
EMV information: use shielded signalling lines and earth the shielding!

4-wire system



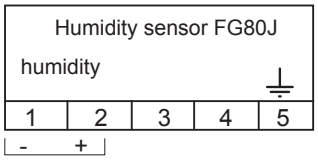
not galvanically disconnected

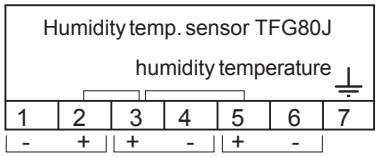
3/4-wire system



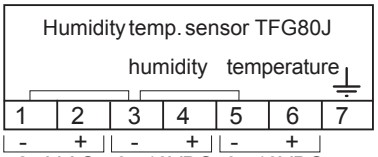
not galvanically disconnected

2-wire system

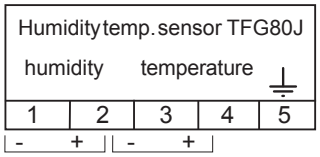




not galvanically disconnected

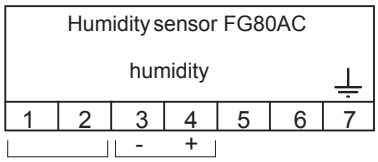


not galvanically disconnected



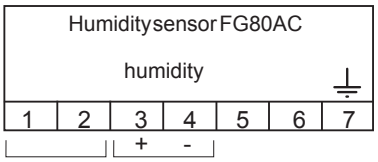
galvanically disconnected

Connection diagram for active sensors U_B=24V AC (± 10 %)

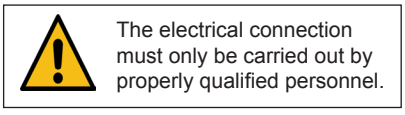


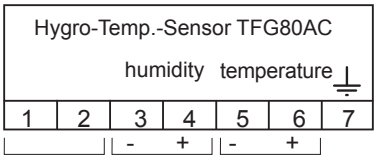
not galvanically disconnected

EMV information:
use shielded signalling lines
and earth the shielding!

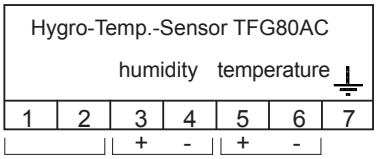


not galvanically disconnected





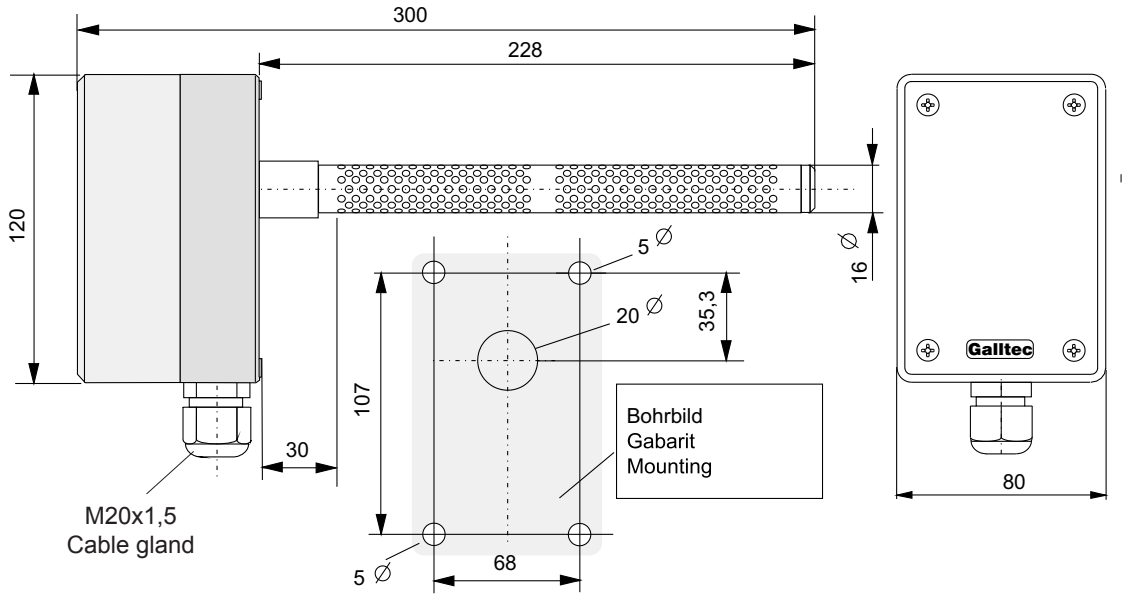
not galvanically disconnected



not galvanically disconnected

Information for voltage output and 3-wire connection: the internal consumption of the sensor of about 15...25 mA causes a voltage drop on the supply lines. If the measuring signal is taken from terminal 4 / terminal 6 to the connecting point at the power supply (three-wire circuit), then an additional measuring error is incurred, dependant upon the circuit length. A 4-wire connection is recommended.

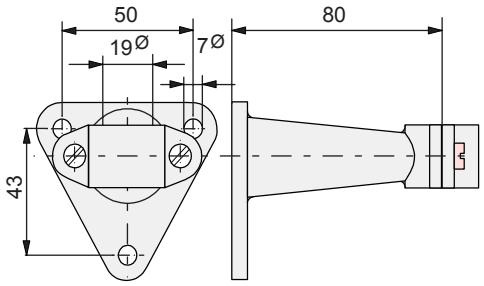
Dimensions diagram



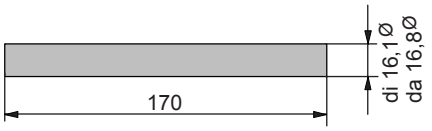
Accessories

Canvas blind for exterior assembly without solar cell Item No. 20.024
with solar cell Item No. 20.025

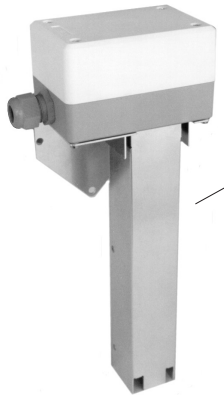
Console for wall mounting Item No. 20.009



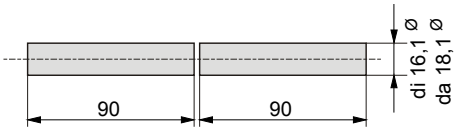
Gauze protector Item No. 20.014
recommended for air speeds between 8 and 15 m/s



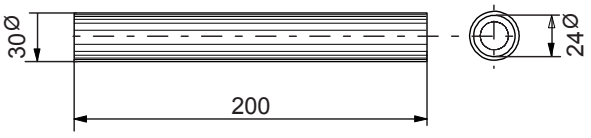
Ventilated sensor tube
for improved air flow
Item No. 20.022



PTFE filter, two-part, Item No. 23.063
recommended for extreme operating conditions



Protector tube for external mounting
without ventilating fan, Item No. 20.011



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, 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, unhomogenous 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 20ºC and 50%rh and a varying temperature range of only +/-1 ºK, 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

Calibration

Equipment with Galltec sensors is correctly set by the factory at a room temperature of 23°C and 50% rel. humidity, relative to the average air pressure of 430m NN.
If, however, subsequent adjustment should be necessary, the following procedure should be observed.

- Ensure that the ambient humidity and the ambient temperature are constant.
- If possible, use a psychrometer for checking (no checking equipment with capacitive sensors).
- Leave the equipment to be checked for at least *1 hour in a* **constant** *checking climate.*
- All Galltec sensors are equipped with an adjustment facility. In most cases this is an adjuster screw fixed with screw securing lacquer. After removing the lacquer, the adjuster screw can be moved in the area of ±2.0%rh. Never make a readjustment several times in the same direction; this could have a cumulative effect.
  After calibration, the adjuster screw should again be secured.

Maintenance - Instructions for use - Effect of pollutants

The measuring element is maintenance-free in pure ambient air. Depending on their type and concentration, aggressive media containing solvents can cause incorrect readings or cause the humidistat to fail. Direct sunlight should be avoided. Substances deposited on the measuring element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film. The water-resistant property of the Galltec measuring elements allows cleaning to be carried out in water. Solvents cannot be used for this purpose. A light-duty detergent is recommended, but any residue should always be washed out thoroughly. A special process ensures that Galltec sensors have good long-term stability. Regeneration is not necessary, but is also not harmful.
The temperature coefficient as well as the self-heating of the electronic may vary according to the location and the application (especially with sensors where electronic and measuring system are integrated in one housing).

NOTE
Contact with the inner parts of the humidistat nullifies the warranty.

Guide to installation

Interference is often to be encountered during installation. The correct installation procedure can prevent interference to a very large extent. However, some ground rules should be observed.
To avoid interference, suppression should be carried out in accordance with VDE 0875 and VDE 0874 (*VDE* - this is assumed to be the *Vorschriftenwerk Deutscher Elektrotechniker* - regulations governing German electrical engineers*).*
Fundamentally, interference must be removed at its source, where suppressor material is most effective. Interference can, however, also result from electromagnetic fields via signalling lines. The EMV law determines the corresponding protective measures. All Jumo equipment is designed in accordance with European standards EN 61326-1 and EN 61326-2-3. In addition, further protective measures must be observed.

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.