

USER'S GUIDE



Vaisala HUMICAP[®] Humidity and Temperature Module HMM212



PUBLISHED BY

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CHAPTER 1 **GENERAL INFORMATION**

Safety

Throughout the manual important instructions regarding the safety considerations are focused as follows.

WARNING	Warning denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury to or death of personnel.
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CAUTION	Caution denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.
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NOTE	Note highlights important information. It calls attention to an essential procedure, practice, condition or the like.
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Warranty

Vaisala issues a guarantee for the material and workmanship of this product under normal operating conditions for one (1) year from the date of delivery. Exceptional operating conditions, damage due to careless handling and misapplication will void the guarantee.

CHAPTER 2 **PRODUCT DESCRIPTION**

The HMM212 modules are designed especially for relative humidity measurements in environmental chamber applications with high temperature and humidity levels.

The HMM212 module is a microprocessor-based instrument with temperature compensation in RH measurements. The module includes separate 4...20 mA loop powered RH and T channels. The humidity probe length is an order-specified option. Furthermore, the customer can also order the module with:

- a suitable cable length (0.65 m, 1.50 m or 3.0 m)
- a temperature loop current scaled for that particular application (0...100°C, -20...+120°C, -20...+180°C, -40...+180°C or -70...+180°C).

The HMM212 modules are connected to process control systems with screw terminals. These versatile modules incorporate the HUMICAP[®]180 humidity sensor, which uses an operating principle based on changes in the capacitance of a thin polymer film as it absorbs water molecules. The HMM212 modules measure temperature with the reliable Pt 1000 sensor.

CHAPTER 3 TO BE NOTED WHEN MEASURING HUMIDITY

In the measurement of relative humidity and especially in calibration, it is essential the temperature equilibrium to be reached. Even a slight difference in the temperature between the measured object and the sensor causes an error. For example, at +20 °C (+ 68 °F) and 50%RH, a temperature difference of ± 1 °C between the measured object and the sensor causes an error of ± 3 %RH. If relative humidity is 90 %RH, the error is about ± 5.4 %RH.

The error is at its greatest when the temperature of the sensor differs from that of the surroundings and the humidity is high. A few degrees' difference in temperature may cause water to condense on sensor surface. Efficient ventilation accelerates the evaporation of the condensed water whereas in an unventilated space, it may take hours. The HUMICAP[®]180 sensor returns to its normal functioning as soon as water has evaporated. Contaminated water condensing on the sensor may shorten its life span and change the calibration.

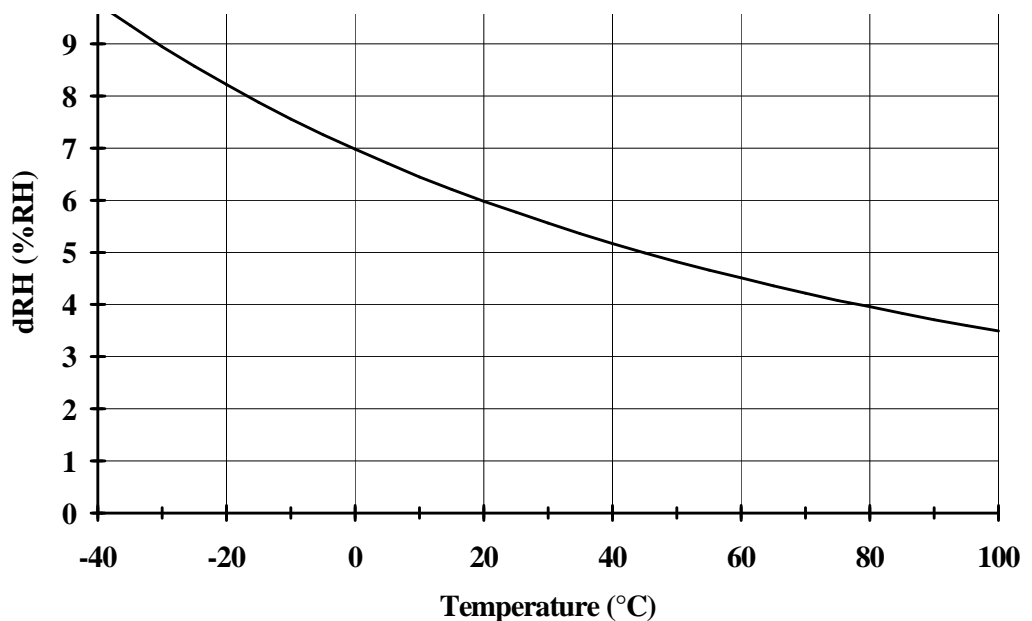


FIGURE 3-1 Measurement error at 100%RH when the temperature difference between the ambient air and the sensor is 1°C

CHAPTER 4 INSTALLATION

Selecting the place of installation

Select a place that gives a true picture of the environment or process and is as clean as possible. Air should flow freely around the sensor.

Install the sensor head to a sufficient distance from the duct or chamber walls. Make sure to insert enough cable to the same space with the probe in order to prevent heat conduction.

Dimensions

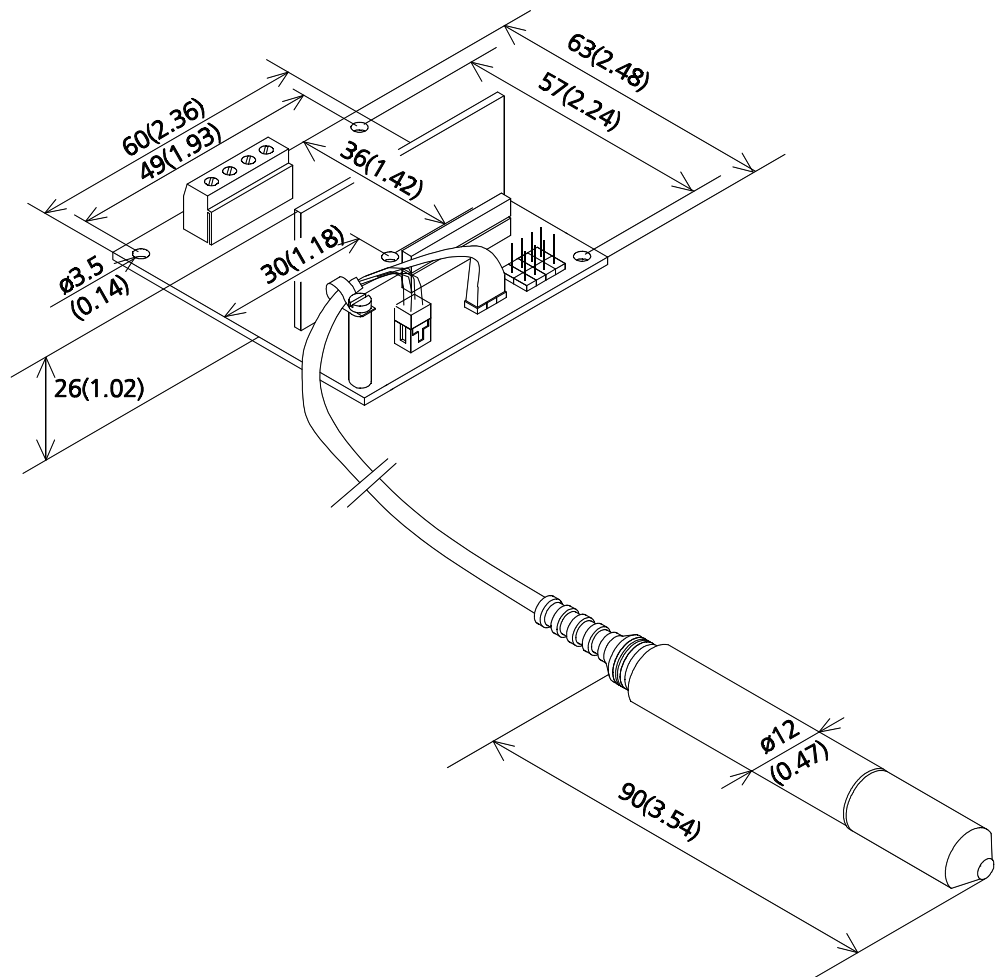


FIGURE 4-1 Dimensions in mm (inches)

Electrical connections

Connect wires according to **FIGURE 4-2**.

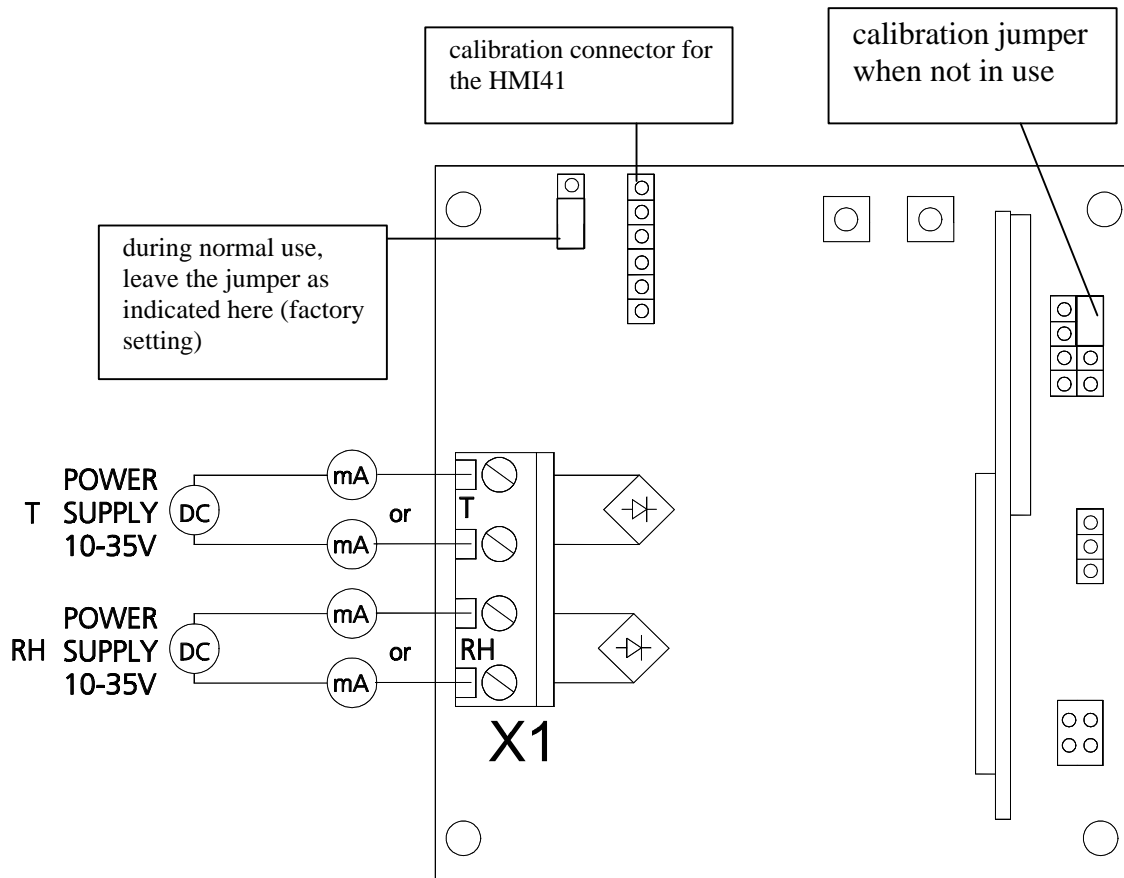


FIGURE 4-2 Electrical connections of HMM212 module

CHAPTER 5 CALIBRATION

We recommend a re-calibration of the HMM212 module after six months' use. After the first re-calibration, the calibration interval should be approximately 12 months. However, please note that these intervals depend on the operating conditions and the required accuracy. When calibrating humidity instruments, it is important that the probe, the reference instrument and the calibrator are in thermal equilibrium. Therefore, always allow enough time for stabilization before starting the actual calibration.

- **CALIBRATION IN THE CHAMBER:** leave the calibrator (e.g. the HMK15) in the chamber overnight with the chamber door open.
- **CALIBRATION OF A HUMIDITY AND TEMPERATURE MODULE:** allow at least one hour for the stabilization of the calibrator (e.g. HMI41 with a reference probe).

One-point humidity calibration

With the HMI41 indicator and calibration cable

You can calibrate the HMM212 module with the HMI41 indicator and an appropriate calibration cable (19164ZZ). Connect the cable to the test connector of the HMM212 module and insert the jumper as indicated in **FIGURE 5-1**; see detailed instructions in the calibration cable manual. See also the HMI41 indicator manual.

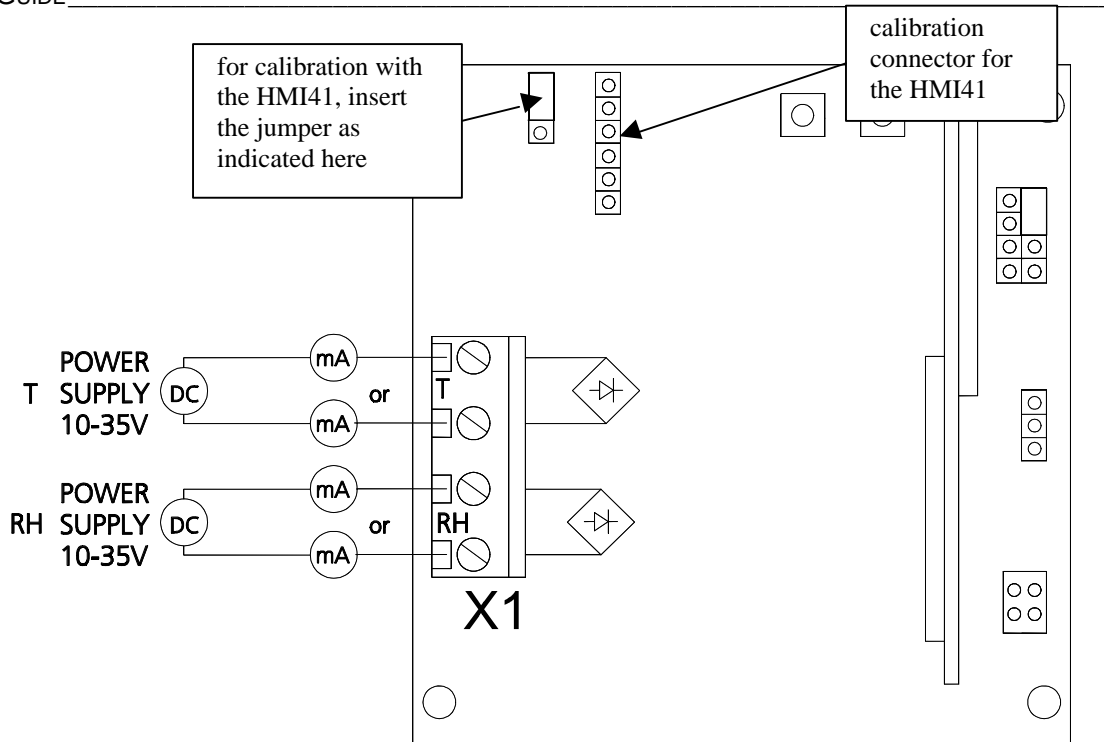


FIGURE 5-1 Calibration connector for the HMI41

NOTE The serial communication parameters are:
1200 bauds, no parity, 8 data bits, 1 stop bit

NOTE When the connection is being established, the message 'CON ERROR' blinks on the HMI41 display for a couple of times after which measurement readings appear. This is quite normal and requires no action; however, if the message is not replaced by measurement readings, it is an indication of an operation error.

NOTE Do not interrupt the calibration procedure. In case of an interruption or a power failure, the normal mode is restored by completing the calibration or resetting the module. Reset the module by switching off the supply power of temperature channel.

NOTE During the calibration with HMI41, please note that temperature loop current is not within the scaling.

With pushbuttons and a jumper

You can also perform the calibration with pushbuttons and a jumper on the component board (see **FIGURE 5-2**). In addition, you need a digital multimeter (DMM). There are two push buttons (UP and DOWN) and four pairs of pins (RH offset, RH gain, T offset and T gain), which are connected with the calibration jumper. We recommend using the RH offset pins if the RH is below 65%RH and the gain pins if the RH is $\geq 65\%RH$.

For example, to perform a one-point humidity calibration using saturated NaCl salt solution at 75.5%RH as a reference, do as follows:

- Insert the probe into a NaCl salt chamber and let stabilize.
- Connect a DMM to the RH current loop and wait until the reading stabilizes.
- Connect a jumper to the RH gain pins and adjust the DMM reading with buttons UP and DOWN until the loop current corresponds to 75.5%RH.
- Disconnect the jumper.

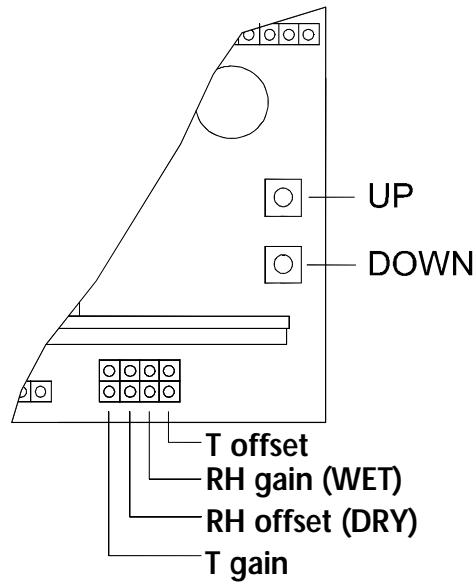
Two-point humidity calibration

You can also perform a two-point calibration with saturated salt calibrators (e.g. HMK15 or HMK13B), or you can send the instrument to Vaisala or a Vaisala representative for re-calibration. **FIGURE 5-3** illustrates the difference between offset and gain calibrations.

Two-point humidity calibration procedure

- Leave the calibrator and the probe for at least 1 hour in the same space so that their temperatures have time to equalize. NOTE: see Chapter 4 for more accurate stabilization times.
- Insert the probe into the measurement hole of the LiCl salt chamber in the humidity calibrator.
- Wait for 20 - 40 minutes.
- Check the temperature and read the closest corresponding RH value in the calibration table (**TABLE 5-1**)
- Connect the jumper to the RH offset pins (see **FIGURE 5-2**) and adjust the output signal with push buttons to the value given in the calibration table (**TABLE 5-1**).
- Insert the probe into the measurement hole of the NaCl chamber.
- Wait for 20 - 40 minutes.

- Check that the reading corresponds within the desired accuracy to the reading given in the calibration table. If not, connect the jumper to the RH gain pins and adjust the reading with push buttons.
- Check again the reading at the first point and repeat the procedure if necessary.



With the jumper connected to the RH gain pins, each pressing of the UP or DOWN button changes the value approximately 0.05%RH at 75%RH. With the jumper connected to the RH offset pins, each pressing changes the value approximately 0.05%RH.

With the jumper connected to the T offset pins, each pressing of the UP or DOWN button changes the value 0.05°C or 0.05 °F in all temperatures. With the jumper connected to the T gain pins, each pressing changes the value 0.05°C or 0.05°F in the temperature currently prevailing in the process.

FIGURE 5-2 Calibration pins and pushbuttons

Calibration table

TABLE 5-1 Greenspan's calibration table with output values according to the chosen scale

Temperature	°C	15	20	25	30	35
	°F	59	68	77	86	95
LiCl	%RH	*)	11.3	11.3	11.3	11.3
4...20 mA	mA		5.81	5.81	5.81	5.81
0...20 mA	mA		2.26	2.26	2.26	2.26
0...1 V	V		0.113	0.113	0.113	0.113
0...5 V	V		0.565	0.565	0.565	0.565
0...10 V	V		1.13	1.13	1.13	1.13

NaCl	%RH	75.6	75.5	75.3	75.1	74.9
4...20 mA	mA	16.10	16.08	16.05	16.02	15.98
0...20 mA	mA	15.12	15.10	15.06	15.02	14.98
0...1 V	V	0.756	0.755	0.753	0.751	0.749
0...5 V	V	3.780	3.775	3.765	3.755	3.745
0...10 V	V	7.56	7.55	7.53	7.51	7.49

*) If the LiCl solution is used or stored in temperatures below +18 °C (+64 °F), the equilibrium humidity of the salt solution may change permanently

Temperature calibration

NOTE

The temperature channel of the HMM212 is very stable and the modules have been calibrated at the factory. Unless there is a strong reason to believe that the adjustments have changed, DO NOT perform a temperature calibration. This is a very demanding procedure and requires both expertise and extremely accurate references. Furthermore, it is important to allow enough time for the stabilization during calibration. If for some reason, it is necessary to perform the temperature calibration, follow attentively the instructions given below.

Temperature calibration of an RH and T module

- Allow enough time for the instruments to stabilize to the same - temperature.
- Connect a DMM to the temperature current loop.
- Connect a jumper to the T offset or the T gain pins. Adjust the reading with UP and DOWN switches (see **FIGURE 5-2**). Note that during gain adjustment, the offset point does not change:

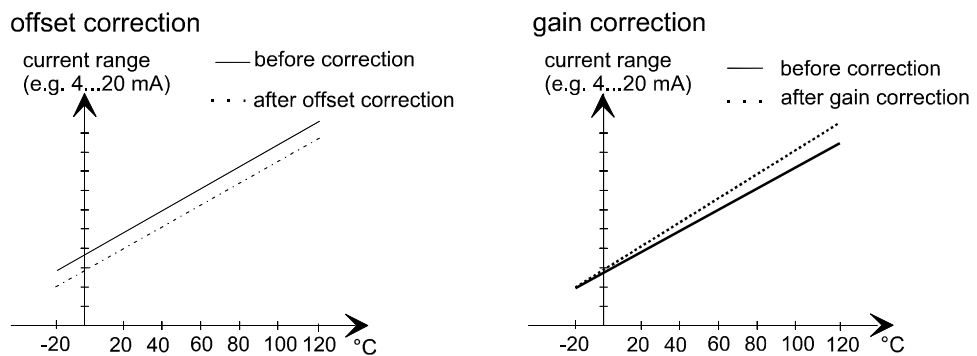


FIGURE 5-3 Offset and gain calibration examples

NOTE

After having performed the calibration, disconnect the jumper.

CHAPTER 6 MAINTENANCE

Replacing the HUMICAP[®]180 sensor and the filter

Remove the damaged sensor and insert a new one. Handle the sensor by the plastic socket. **DO NOT TOUCH THE SENSOR ELEMENT.** Recalibrate the transmitter.

Replace a dirty filter to ensure a maximum lifetime and a fast response for the sensor

CHAPTER 7 TECHNICAL DATA

Relative humidity

Measurement range	0...100%RH
Accuracy against salt solutions (ASTM E104-85)	±2%RH (0...90%RH) ±3%RH (90...100%RH)
Achievable accuracy when calibrated against high quality humidity standards	±2 %RH (0...100 %RH)
Response time (90%) at +20°C in still air (with sintered filter)	15 s
Typical temperature dependence of electronics	0.02%RH/°C
Sensor	HUMICAP®H180

Temperature

Measurement range	-70...+180 °C
Typical accuracy of electronics at +20°C (+68 °F)	±0.1 °C
Typical temperature dependence of electronics	0.0025°C/°C
Sensor	Pt 1000 RTD 1/3 Class B IEC 751

Analog outputs

Two analog outputs	4...20 mA Ch1: RH Ch2: T
Typical accuracy	±0.1 %FS
Resolution	Ch1: 0.025 %RH Ch2: 0.01 %FS
Typical temperature dependence	0.005 %FS/°C

General

Operating temperature range	
probe	-70...+180°C
electronics	-5...+55°C
Storage temperature range (electronics)	-40...+70°C
Sensor protection: standard	stainless steel sintered filter
Connections	screw terminals for 0.5...1.5 mm ² wires

Power supply

Operating voltage	10...35 VDC
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Electromagnetic compatibility

The emission and immunity tests have been performed according to standards EN50081-1 and EN50082-1.

Emissions

Test	Setup according to
RF field emission	CISPR 22 Class B (EN55022)

Immunity

Test	Setup according to
Electrostatic discharge	IEC 1000-4-2 (EN 61000-4-2)
Fast transient burst	IEC 1000-4-4 (EN 61000-4-4)
RF field immunity	IEC 1000-4-3 (EN 61000-4-3)
* GSM-field immunity (*additional test)	ENV 50204:1995
Conducted RF immunity	IEC 1000-4-6 (EN 61000-4-6)
NOTE: cable length at least 8 meters	



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