

GE

Sensing & Inspection Technologies



VeriDri™
Moisture Transmitter

User's Manual



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Introduction

The GE Sensing & Inspection Technologies VeriDri™ is a low-cost, loop-powered transmitter that provides accurate dew/frost point measurements covering an overall range of -110° to 40°C (-166° to 104°F). It can also be provided to cover a number of moisture ranges from 0 to 10,000 PPMv.

The VeriDri is supplied with one 4 to 20 mA analog output that is factory-configured for a specified range.

The VeriDri is easy to install, operate and maintain. This manual contains the following sections:

- Sample System Guidelines
- Inserting the Transmitter in the Sample System/Process
- Making Wiring Connections
- Operating the Transmitter
- Cleaning the Transmitter Probe
- Specifications

Sample System Guidelines

You can install the VeriDri transmitter into a sample system or directly into the process. GE recommends that the unit be installed in a sample system to protect the probe from coming into contact with damaging elements in the process.

Before constructing a sample system, you should consult a GE Applications Engineer and adhere to the guidelines below. See Figure 1 on the next page for an example of a sample system.

- Consult *Specifications* on page 13 for dimensions and other requirements.
- Sample systems should be kept very simple.
- The transmitter should be installed so it is perpendicular to the sample inlet.
- The sample system should contain as few components as possible and all or most of those components should be located downstream of the measurement location.
- If possible, you should use stainless steel material for all wetted parts.
- Sample system components should not be made of any material that will affect measurement. Most common filters and pressure regulators are not suitable for sample systems because they have wetted parts that may absorb or release components (such as moisture) into the sample system. They may also allow ambient contamination to enter the sample system.

Sample System Guidelines (cont.)

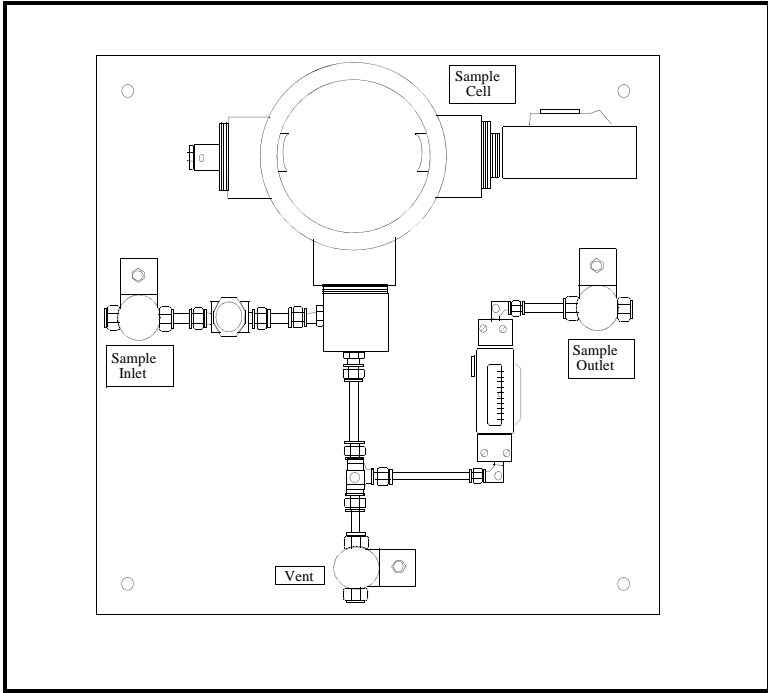


Figure 1: Example of a Sample System

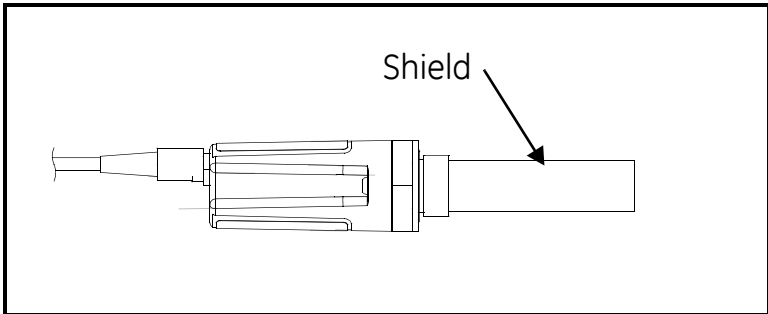
Inserting the Transmitter in the Sample System/Process

!CAUTION!

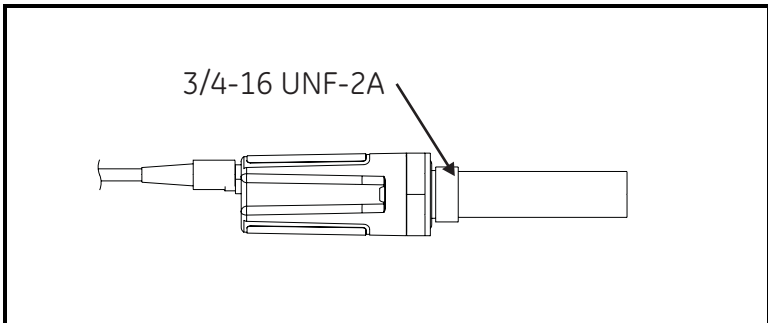
If you are mounting the VeriDri directly into the process line, you must consult the factory for proper installation instructions and precautions before beginning the following procedure.

Use the steps below to install the VeriDri:

1. Make sure the sintered or sheet stainless-steel shield is in place. The shield protects the aluminum oxide sensor from damaging elements in the process.



2. The probe is mounted into the process via the 3/4-16 straight male thread located on the probe. Thread the probe end of the transmitter into the process/sample system fitting. Make sure not to cross thread it.

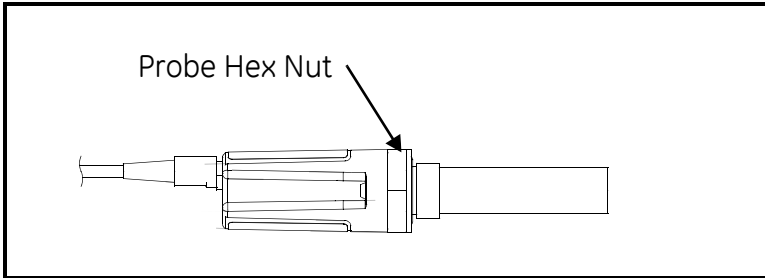


Inserting the Transmitter in the Sample System/Process (cont.)

3. Using a 1-1/8 in. wrench, tighten the probe securely into the process using the probe hex nut.

!CAUTION!

Do not apply force to the transmitter module to tighten the unit into its fitting.



Making Wiring Connections

You must wire the transmitter using the factory-supplied cable which is available in a variety of lengths.

Note: *If you need to lengthen cables, refer to Table 1 below to splice an extension onto the existing cable. Connect positive to positive and negative to negative.*

Use the following steps to wire the transmitter to your system.

1. Push the female connector end on the transmitter cable into the mating male connector on the transmitter module. Make sure the pins are properly aligned. Once inserted, secure the connectors together by sliding the metal sleeve on the cable over the connectors and turning it clockwise until it is tight.
2. Using the flying leads at the other end of the transmitter cable, connect the transmitter to your power supply and data acquisition system (DAS) as shown in Figure 2 on the next page. Refer to Table 1 below for a description of the leads in the factory-supplied cable.

Table 1: Cable Lead Descriptions

Lead Color*	Connection Description
Blue	(+) 7 to 28 VDC
Brown	(-) 7 to 28 VDC
Connect the shield to ground if desired.	

**The blue and brown leads also produce a current output equivalent to 4 to 20 mA.*

3. Trim any unused leads back to the outer cable jacket in order to remove the bare tinned wire and prevent accidental short circuits.

The VeriDri is now ready for operation.

Making Wiring Connections (cont.)

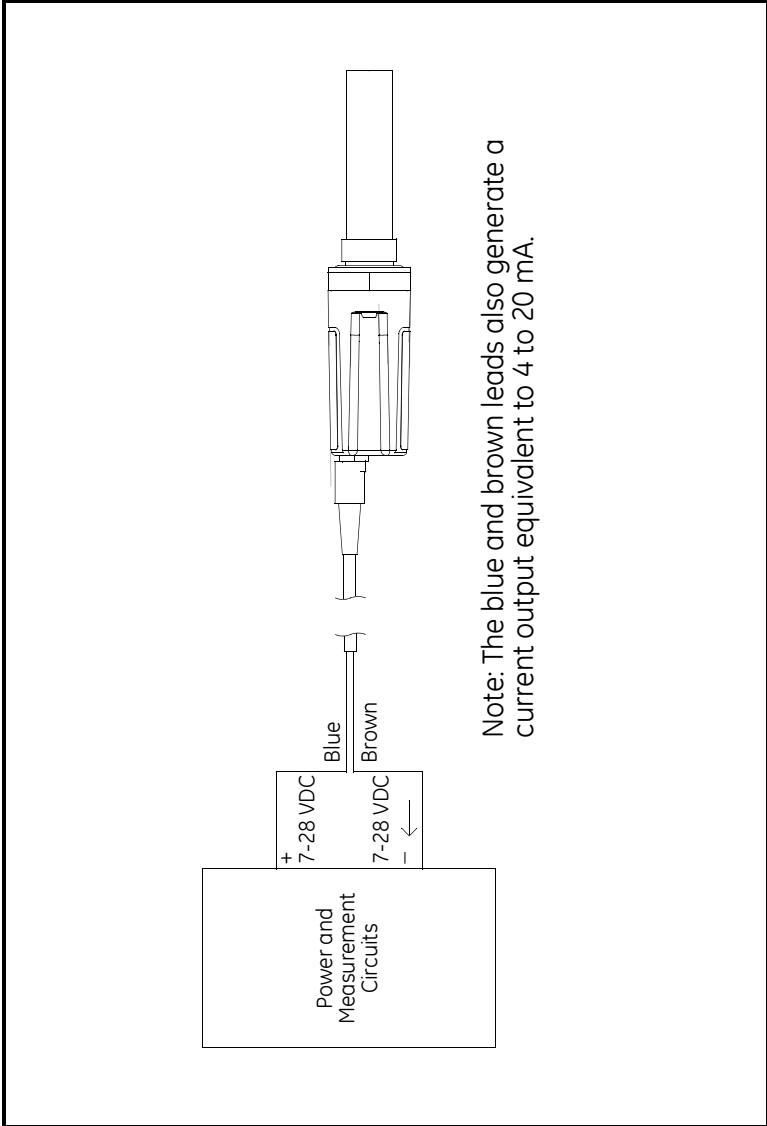


Figure 2: Wiring Connections

Operating the Transmitter

After proper installation, the VeriDri Transmitter is very easy to use; simply power the unit up and you are ready to begin taking measurements. Since the VeriDri stores moisture calibration data in non-volatile FLASH memory, you do not have to enter data manually or worry about losing data during a power loss.

Probes may need to be cleaned occasionally depending on the application. Consult a GE Applications Engineer for required cleaning intervals.

If a problem should arise with the probe, see *Error Handling* below for how the transmitter reacts to error conditions.

!CAUTION!

Any attempt to open the module or remove the sensor probe will void the warranty.

Powering Up

After the VeriDri is wired as described in the previous section, you may apply power to the unit. The transmitter takes approximately 20 seconds to initialize and begin normal operation. The unit will meet specified accuracy in 3 minutes.

Error Handling

In the event of an error condition, the analog output reading is forced to the following values:

- ≥ 22 mA to indicate a shorted probe
- ≤ 3.5 mA to indicate an open probe

Cleaning the Transmitter Probe

!CAUTION!

Be sure to perform the probe cleaning procedure in a well ventilated area. Observe all necessary safety precautions when handling cleaning solvents

To clean the moisture probe, you will need the following:

- Three glass (**NOT** metal) containers containing the following solvents:
 - 2 containers of approximately 300 ml of reagent-grade hexane or toluene each.
 - 1 container of approximately 300 ml of distilled (**NOT** deionized) water.

IMPORTANT: *Make sure the containers are deep enough to submerge the probe. Do not place the transmitter module into the solvents. You should only insert the sensor portion of the transmitter into the solvents.*

- Rubber or latex gloves.
- Oven set at $50^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($122^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) for drying probe.
- 1-1/8 in. wrench

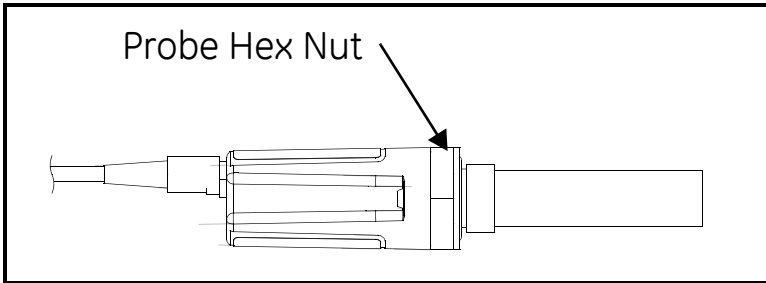
Use the sections that follow to properly clean the probe.

Removing the Transmitter

Use the following steps to remove the transmitter from the installation site:

Note: *Once the probe is cleaned, it must dry in the oven for 24 hours.*

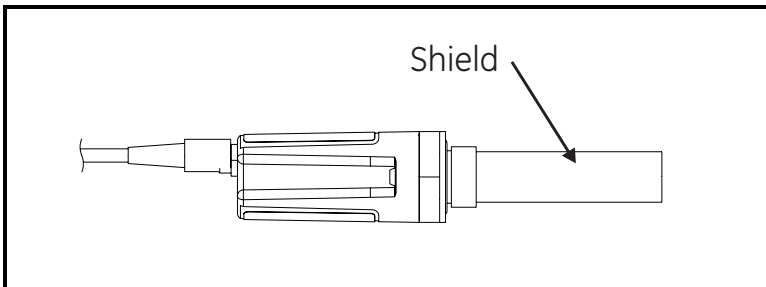
1. Using a 1-1/8 in. wrench, unthread the transmitter from the fitting on the sample system/process using the probe hex nut as shown below.



2. Record the dew point of the ambient air.
3. Disconnect the cable from the module.
4. Unscrew the stainless-steel shield from the probe mount and carefully remove it without touching the sensor.

!CAUTION!

Any attempt to open the module or remove the probe from the module will void the warranty.



Soaking the Sensor and Shield

!CAUTION!

Do not place the transmitter module into the solvents.

You should only insert the sensor portion of the transmitter into the solvents. Also, do not allow the sensor to come into contact with the surfaces of the cleaning containers or any other hard surface.

1. Wearing gloves, place the sensor in the first container of hexane or toluene and allow it to soak for 10 minutes.
2. Remove the sensor from the hexane or toluene and soak it in the container of distilled water for 10 minutes.
3. Remove the sensor from the distilled water and soak it in the second (clean) container of hexane or toluene for 10 minutes.
4. Remove the sensor from the hexane or toluene and set it aside until the shield has completed the cleaning cycle.
5. Repeat steps 1 to 3, above, to clean the shield. To ensure the removal of any contaminants that may have become embedded in the porous walls of the shield, swirl the shield in the solvents during the soaking procedure.
6. Remove the shield from the hexane or toluene.
7. Carefully replace the shield over the exposed sensor without touching it.
8. Place the sensor with the shield in an oven set at $50^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($122^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) for 24 hours.

Evaluating the Probe

1. Re-connect the cable to the transmitter module and measure the dew point. Make sure you measure the same ambient air as measured in step 2 on page 10.
2. Compare the two ambient air readings. If the new ambient air reading is within $\pm 2^{\circ}\text{C}$ ($\pm 3.6^{\circ}\text{F}$) of the first reading, the cleaned probe is properly calibrated and may be reinstalled. If it is not, proceed to step 3 below.
3. If the probe is still not reading the ambient air accurately, repeat the cleaning procedure using soaking times that are 5 times the previous cleaning sequence, until two consecutive ambient air readings are identical.

If the above cleaning procedure does not result in accurate readings, contact the factory for assistance.

Specifications

Moisture Ranges

- -110° to 20°C
- -110° to -50°C
- -90°C to 10°C
- -80°C to -30°C
- -80° to 20°C
- -30° to 20°C
- -130° to 70°F
- -130° to -40°F
- -40° to 70°F
- -50° to 50°F
- -100° to 0°F
- 0 to 10 PPM_v
- 0 to 100 PPM_v
- 0 to 1000 PPM_v
- 0 to 10,000 PPM_v

Note: *PPM_v ranges based on constant pressure, provided at time of order placement.*

Operating Temperature

-40° to 60°C (-40° to 140°F)

Storage Temperature

70°C (158°F) maximum. The probe should be stored with the plastic cover and desiccant packet threaded onto the probe. Store in a cool, dry environment.

Warm-up Time

Meets specified accuracy in 3 minutes

Calibrated Accuracy @ 77°F (25°C)

- $\pm 3.6^{\circ}\text{F}$ ($\pm 2^{\circ}\text{C}$) from -85°F to 50°F (-65°C to 10°C) dew/frost point
- $\pm 5.4^{\circ}\text{F}$ ($\pm 3^{\circ}\text{C}$) from -112°F to -86°F (-80°C to -66°C) dew/frost point

Repeatability

- $\pm 0.9^{\circ}\text{F}$ ($\pm 0.5^{\circ}\text{C}$) from -85°F to 50°F (-65°C to 10°C) dew/frost point
- $\pm 1.8^{\circ}\text{F}$ ($\pm 1.0^{\circ}\text{C}$) from -112°F to -86°F (-80°C to -66°C) dew/frost point

Response Time

Less than 5 seconds for 63% of a step change in moisture content in either wet-up or dry-down cycle

Electronics

Power

- Supply voltage: 7 to 28 VDC (loop-powered, customer supplied)
- Output: 4 to 20 mA
- Output Resolution: 0.01 mA
- Max. Loop R = $50\ \Omega \times (\text{PSV} - 7)$,
where PSV = Power Supply Voltage

Example: Given a 24 VDC Power Supply,

$$\begin{aligned}\text{Max. Loop R} &= 50\ \Omega \times (24 - 7) \\ &= 850\ \Omega\end{aligned}$$

- Cable: 2 m (6 ft.) standard (consult factory for custom lengths)

Mechanical

Sample Connection

- 3/4 in. (16 mm) 16 straight male thread with O-ring
- G 1/2 in with optional adapter

Operating Pressure

5 μ Hg to 5,000 psig (345 bar)

Enclosure

Type 4X/IP67

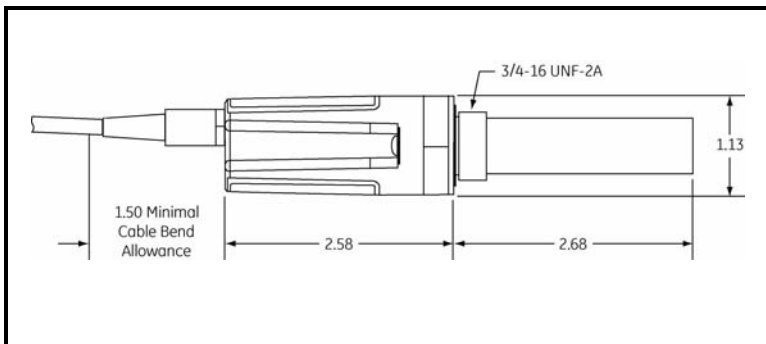
European Compliance

Complies with the following:

- EMC Directive 2004/108/EC and PED 97/23/EC for DN<25
- EN 61326:1998
Class A, Annex A, Continuous Unmonitored Operation
(For EN 61000-4-3 transmitter meets performance criteria A and in a number of frequencies, criteria B per EN 61326)

Dimensions

- Overall: 6.76 \times 1.13 in. (17.17 \times 2.87 cm)
- Electronics with cable: 4.08 \times 1.13 in. diameter
(10.36 \times 2.87 cm)
- Weight: 5 oz (140 grams)



Moisture Sensor

Sensor Type

Thin-film aluminum oxide moisture sensor probe

Calibration

Each sensor is individually computer-calibrated against known moisture concentrations, traceable to NIST

Calibration Interval

Sensor recalibration at GE Sensing is recommended every six to 12 months depending on application

Calibration Data

Factory-calibrated, stored in FLASH

Flow Rate

- *Gases*: Static to 10,000-cm/s linear velocity at a pressure of 1 atm.
- *Liquids*: Static to 10-cm/s linear velocity at density of 1 g/cc

Warranty

Each instrument manufactured by GE Sensing, Inc. is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Sensing, Inc. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Sensing, Inc. determines that the equipment was defective, the warranty period is:

- one year from delivery for electronic or mechanical failures
- one year from delivery for sensor shelf life

If GE Sensing, Inc. determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Sensing, Inc., the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Sensing, Inc. instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Sensing, Inc., giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Sensing, Inc. will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Sensing, Inc. instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Sensing, Inc. will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GE Sensing, Inc. determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

We,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

declare under our sole responsibility that the

VeriDri™ Moisture Transmitter

to which this declaration relates, is in conformity with the following standards:

- EN 61326:1998, Class A, Annex A, Continuous Unmonitored Operation
(For EN 61000-4-3, the above units meet performance Criteria A, and in a limited number of frequencies, performance Criteria B per EN 61326.)
- EN 60529:1991+A1:2000
IP67

following the provisions of the 2004/108/EC EMC Directive.

The units listed above and any ancillary sample handling systems supplied with them do not bear CE marking for the Pressure Equipment Directive, as they are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

January 8, 2009

Date of Issue



Mr. Gary Kozinski

Certification & Standards, Lead Engineer



Nous,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

déclarons comme étant de notre seule responsabilité que le

Transmetteur d'humidité VeriDri™

sur lequel porte ce document, est conforme aux spécifications suivantes :

- EN 61326:1998, Classe A, Annexe A, Fonctionnement continu sans surveillance
(Pour EN 61000-4-3, les appareils ci-dessus sont conformes au critère A de performance
et, dans un nombre limité de fréquences, au critère B de performance, selon EN 61326.)
- EN 60529:1991+A1:2000
IP67

conformément aux dispositions de la directive 2004/108/EC (compatibilité
électromagnétique).

Les appareils indiqués plus haut et tous les accessoires d'échantillonnage fournis avec ne
portent pas la marque CE pour la directive concernant les équipements de pression, dans la
mesure où ils sont fournis conformément à l'article 3, section 3 (pratiques d'ingénierie sûres
et codes de bienfacture) de la directive concernant les équipements de pression 97/23/EC
pour DN<25.

8 janvier 2009

Date d'émission



Mr. Gary Kozinski

Certification et normes, ingénieur de fil



Wir,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

erklären unter alleiniger Eigenverantwortlichkeit, dass die Produkte

VeriDri™ Feuchtigkeitsmesswandler

auf das sich diese Deklaration bezieht, die folgenden Normen erfüllen:

- EN 61326:1998, Class A, Annex A, kontinuierlicher, überwachungsfreier Betrieb
(Für EN 61000-4-3 erfüllen die obigen Geräte die Leistungskriterien A und in bei einer begrenzten Anzahl von Frequenzen die Leistungskriterien B gemäß EN 61326.)
- EN 60529:1991+A1:2000
IP67

und dass sie die Anforderungen der EMC-Direktive 2004/108/EC einhalten.

Die oben aufgeführten Geräte und zugehörige, mitgelieferte Schallwandler (Messrohre werden in einer separaten Konformitätserklärung behandelt) tragen keine CE-Kennzeichnung gemäß der Druckgeräte-Richtlinie, da sie in Übereinstimmung mit Artikel 3, Absatz 3 (gute Ingenieurpraxis) der Druckgeräte-Richtlinie 97/23/EG für DN<25 geliefert werden.

8. Januar 2009
Außstellungsdatum



Hr. Gary Kozinski
Bescheinigung und Normen, Leitungingenieur





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