HygroClip IW-Ex, ID-Ex, IC-Ex and IE-Ex

intrinsically safe humidity - temperature probes

Instruction Manual

20040602

Contents

Important Instructions:

This manual should have been supplied to you together with a copy of **equipment installation drawing 12.0724.0001**. Please contact ROTRONIC if this is not so.

This symbol indicates a safety instruction that must be strictly followed. Disregarding this instruction may result in serious damage and injury.

This symbol indicates an important operating instruction. Not following this instruction may cause a measurement error and / or a product malfunction.

1. Introduction

The HygroClip Ex series are intrinsically safe probes for the measurement of humidity and / or temperature in hazardous areas, where the classification Ex is required. These products meet the requirements of European Standard EN 50014:1197 + A1 + A2, EN 50020:1994 and EN 50284:1999 and carry the marks:

II 1 G EEx ia IIC T5 resp. II 2 G EEx ia IIC T6 / PTB 01 ATEX 2180

FM Approved: Class1, 2, 3, Division 1, Groups A,B,C,D,E,F,G
T6 in accordance with installation drawing 12.0724.0001
Ui= 28V, Ii=195mA, Pi=830 mW, Ci=11nF, Li=0

The HygroClip Ex series feature the following operating modes:

a) measurement of relative humidity and temperature combined: the output signal is a digital modulated 4…10 mA current, which combines the measurement data for both humidity and temperature. A transmitter of the HygroFlex series is required to process the probe signal.

b) measurement of relative humidity only: in this operating mode, the probe output signal is a linear 4…20 mA analog current corresponding to 0…100%RH. No additional transmitter is required.

c) measurement of temperature only: in this operating mode, the probe output signal is a linear 4…20 mA analog current corresponding to 0…100 °C. No additional transmitter is required.

To meet the requirements of different applications, the HygroClip EX probes are available in 4 mechanical configurations:

IW-EX : probe for surface mounting (room monitoring)
ID-EX : probe for through wall installation (electronics with integral probe)
IC-EX : probe for through wall installation (probe is separated from electronics by a length of cable)
IE-EX : probe for compressed air applications (probe is separated from electronics by a length of cable)

In hazardous areas always operate the probe with a type of Zener barrier that was approved for use together with the probe! Be sure to verify that the position of jumpers B1 to B4 matches the specific model of Zener barrier being used.

See wiring diagram 12.0724.0001 (attached)

Additional copies of this manual can be obtained either from ROTRONIC or its representatives.

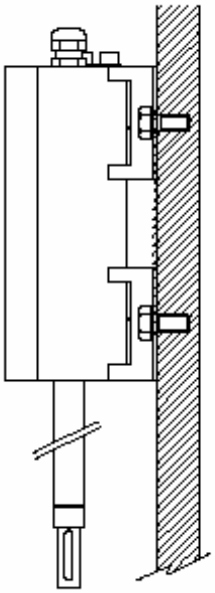
2. Installation

Installation should comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70). See ANSI/ISA RP12.06.01 for guidance on the installation of intrinsically safe apparatus and systems. Control room equipment connected to intrinsically safe associated apparatus should not use or generate more than 250 V rms or DC.

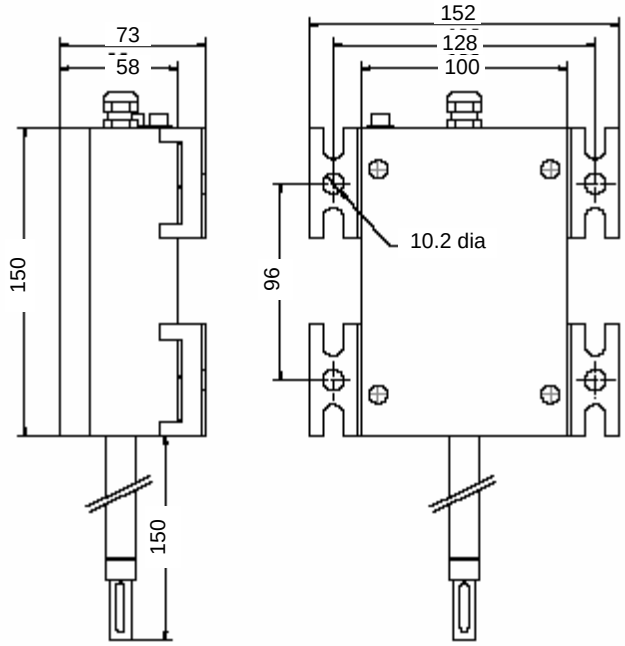
2.1 Mechanical Installation

The method of installation depends on the mechanical configuration of the probe:

IW-EX: surface mount configuration

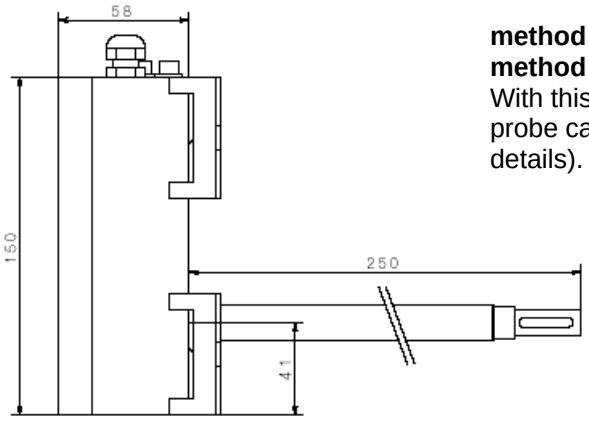


The enclosure is attached to the mounting surface with 4 screws (not included)



Dimensions in mm

ID-EX: through wall configuration



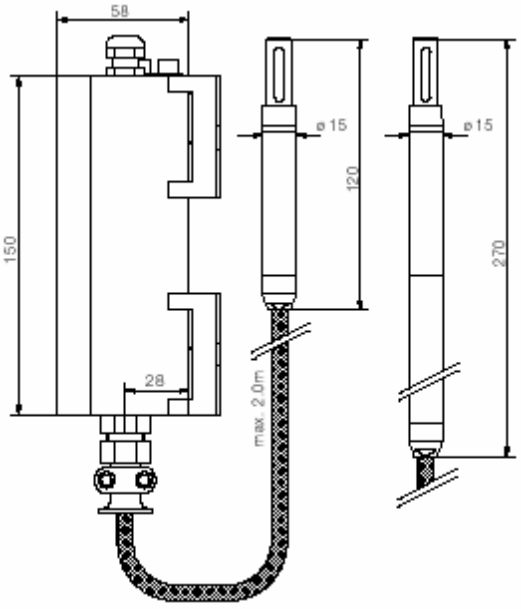
Use one of the following installation methods:

method A: same as surface mount configuration (use 4 screws).
method B: use probe holder part no. AC1301-MEX (not included). With this method, the opening for the probe is sealed and the probe can be easily removed / installed (see further down for details).

ID-EX: probe length 250 mm (probe tip to enclosure)
dia. 15 mm

Dimensions in mm

IC-EX: cable probe configuration



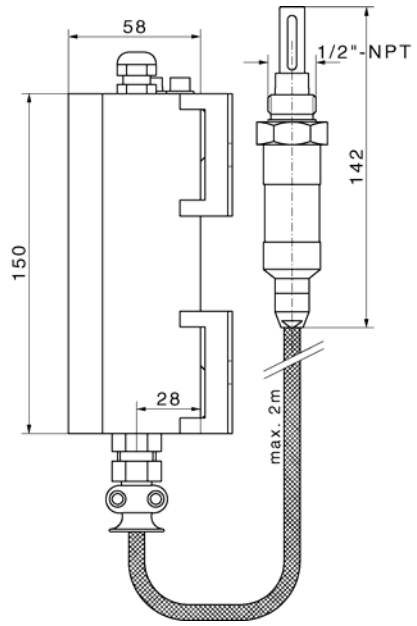
enclosure: same as surface mount configuration (4 screws).
cable probe: use probe holder part no. AC1301-MEX. This is a compression fitting with a flange.

Note: when using the short probe at elevated temperature, be sure to fully immerse the probe in the process to be measured. Partial immersion of the probe may result in errors of measurement due to heat transmission through the probe cable.

IC1-EX: probe length 120 mm, dia. 15 mm
IC2-EX: probe length 270 mm, dia. 15 mm

Dimensions in mm

IE3-EX: compressed air probe configuration

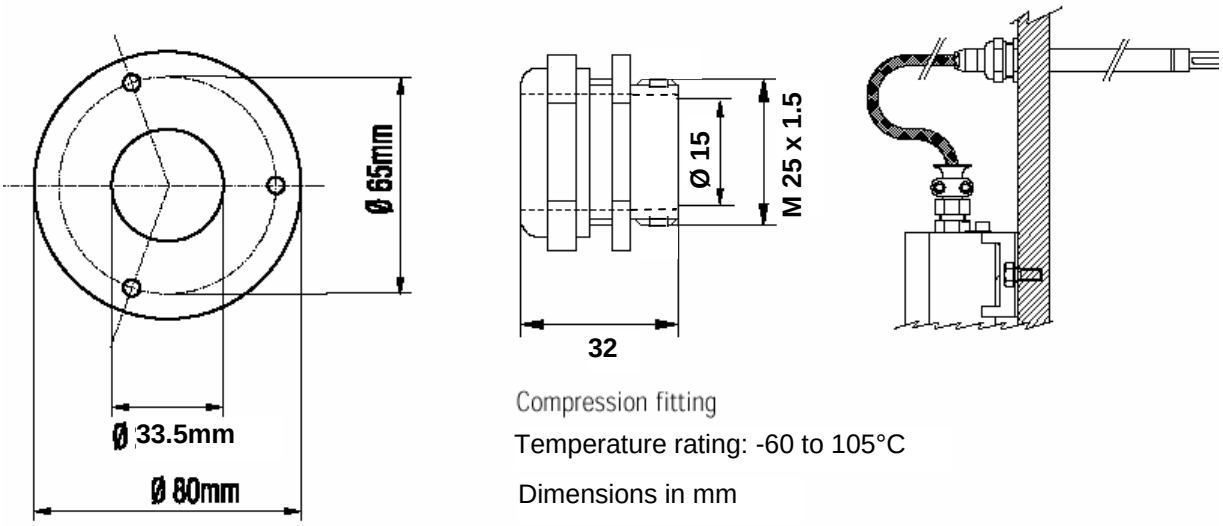


enclosure: same as surface mount configuration (4 screws).
probe: use matching female ½" NPT fitting (not supplied).

Note: use of this probe is limited to applications where the temperature on both sides of the mounting wall is practically identical. Any significant temperature difference will result in erroneous measurements due to heat transmission through the probe body and probe cable.

Dimensions in mm

AC1301-MEX compression fitting and flange (ID-EX and IC-EX)



Compression fitting

Temperature rating: -60 to 105°C

Dimensions in mm

Probe installation guidelines

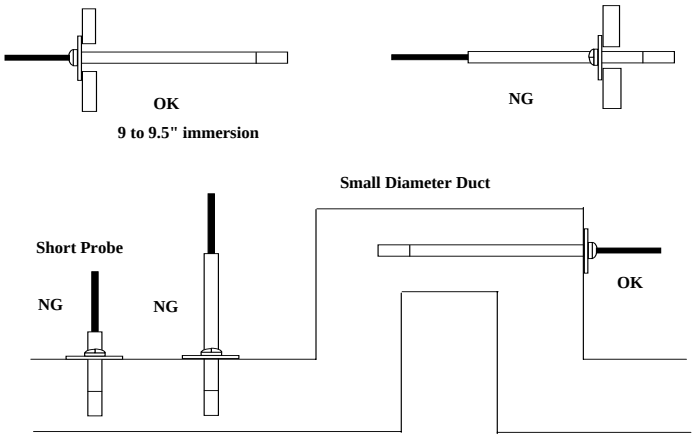
Do not remove the dust filter or slotted cap from the probe. Both sensors can easily be damaged when not protected.

For best results, please observe the following guidelines:

- Install the probe at a location where humidity, temperature and pressure conditions are representative of the environment or process to be measured. Avoid the following: (a) Close proximity of the probe to a heating element, a cooling coil, a cold or hot wall, direct exposure to sun rays, etc. (b) Close proximity of the probe to a steam injector, humidifier, direct exposure to precipitation, etc. (c) Unstable pressure conditions resulting from excessive air turbulence.

- If possible, choose a location that provides good air movement at the probe: air velocity of at least 1 meter/second (200 ft/ minute) facilitates adaptation of the probe to changing temperature.

- When installing the probe through a wall, immerse as much of the probe as possible in the environment to be measured.



Position the probe so as to prevent the accumulation of condensation water at the level of the sensor. Install the probe so that the probe tip is looking downward. When this is not possible, install the probe horizontally.

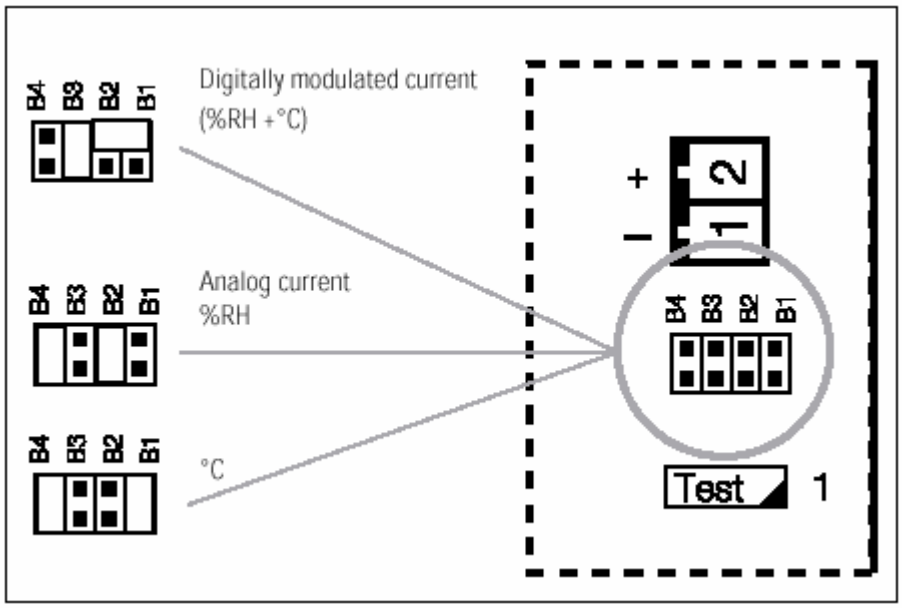
2.2 Operating modes and electrical installation

The HygroClip Ex is factory configured with jumpers for one of the following operating modes:

1. Combined measurement of relative humidity and temperature. This mode requires the use of a HygroFlex transmitter to process the probe digital current signal.

2. Measurement of relative humidity only. The probe behaves as a 2-wire transmitter with a 4-20mA analog signal

3. Measurement of temperature only (in °C). The probe behaves as a 2-wire transmitter with a 4-20mA analog signal



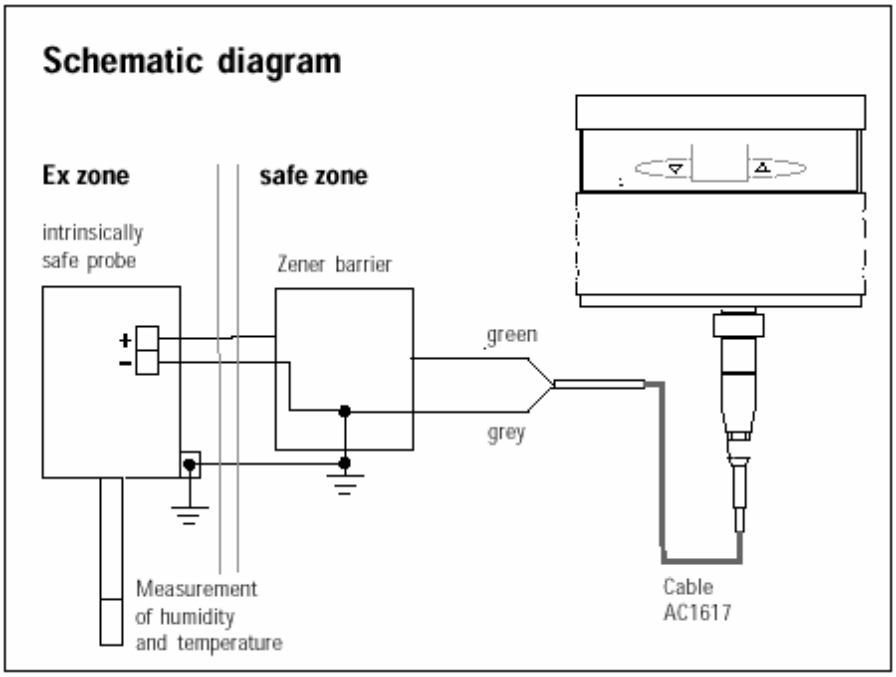
Do not change the factory configuration of the jumpers.

Be sure to verify that the specific model of Zener barrier being used matches the position of jumpers B1 to B4 (See wiring diagram 12.0724.0001)

2.2.1 Combined humidity and temperature measurement (default factory setting)

The digital probe signal is processed with a HygroFlex transmitter and special cable, via a Zener barrier.

- Max. cable length between probe and HygroFlex transmitter = 200m (656 ft)
- Cable for connecting the probe to the Zener barrier: type E-7018
- Cable for connecting the Zener barrier to the HygroFlex transmitter: type AC1617/ZBxxx
  where xxx is the length in meters (2 to 100m / 6 to 326 ft)
- Connections and type of Zener barrier according to wiring diagram 12.0724.0001

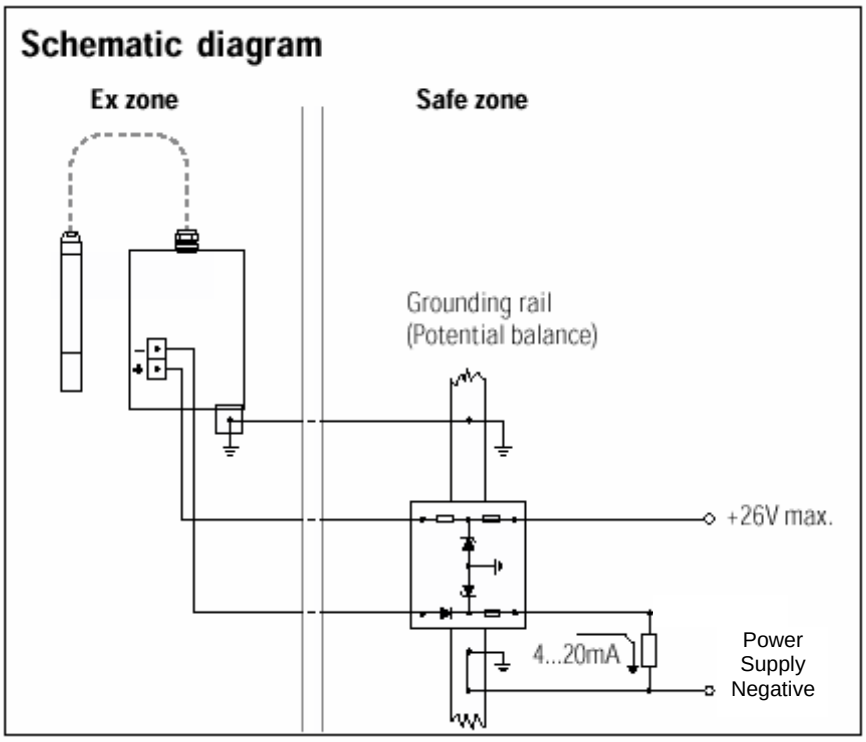


2.2.2 Humidity measurement only

The probe operates as a conventional analog transmitter with 4...20mA = 0...100%RH

Connection via Zener barrier:

- Max. cable length between probe and signal processing unit = 200m (656 ft)
- Cable for the connecting the probe to the Zener barrier: type ET-7018
- Connections and type of Zener barrier according to wiring diagram 12.0724.0001



2.2.3 Temperature measurement only

The probe operates as conventional analog transmitter with 4...20mA = 0...100°C

Connection via Zener barrier:

- Max. cable length between probe and signal processing unit = 200m (656 ft)
- Cable for the connecting the probe to the Zener barrier: type ET-7018
- Connections and type of Zener barrier according to wiring diagram 12.0724.0001

3. Start up

The ROTRONIC probes are adjusted and tested at the factory. No additional test should be required after installation.

4. Sensor protection / contaminants

Sensor contamination by dust and particles is avoided by using a dust filter with removable cartridge. The following filter cartridges are available:

- SP-G15: wire mesh cartridge – suitable for most applications (factory standard)
- SP-S15: sintered steel cartridge – applications with very high level of abrasives
- SP-F15: Teflon cartridge – applications with very fine dust or salt / salt water spray

Maximum air velocity at the probe with wire mesh filter: up to 20 m/s (about 3,940 ft / min), up to 40 m/s with Teflon or sintered steel.

Depending upon the level of contamination of the application, replace the filter cartridge periodically.

The humidity sensor is resistant to many chemicals as long as the concentration does not exceed normally accepted work place exposure limits. Consult ROTRONIC for higher concentrations or possible contact with liquids.

5. Maintenance and service

Defective probes should be returned to the factory for repair. The probes cannot be serviced in the field (a special test is required to ensure the probe intrinsic safety).

5.1 General

The following instructions and diagrams refer to the combined humidity and temperature operating mode. They are also applicable to the other two operating modes.

5.2 Service (test) connector

The 5-pin service connector is accessible after removing the cover from the probe housing. This connector is primarily used to calibrate / adjust the HygroClip Ex probe either with a HygroPalm indicator or with a PC.

Connecting the HygroClip Ex to a HygroPalm indicator or to a PC by means of the service connector has not been approved in hazardous areas. Remove the probe from the hazardous area prior to connecting any device or cable to the service connector.

5.3 Calibration / adjustment of the probe outside of the hazardous area

Calibration or adjustment of the HygroClip Ex probes should be performed only in an area known to be non-hazardous.

Accuracy of the probe should be checked from time to time. Under normal conditions of use, checking the probe every 1 to 2 years should be sufficient.

Definitions: Calibration = measurements are compared to a reference
Adjustment = measurements are adjusted against a reference

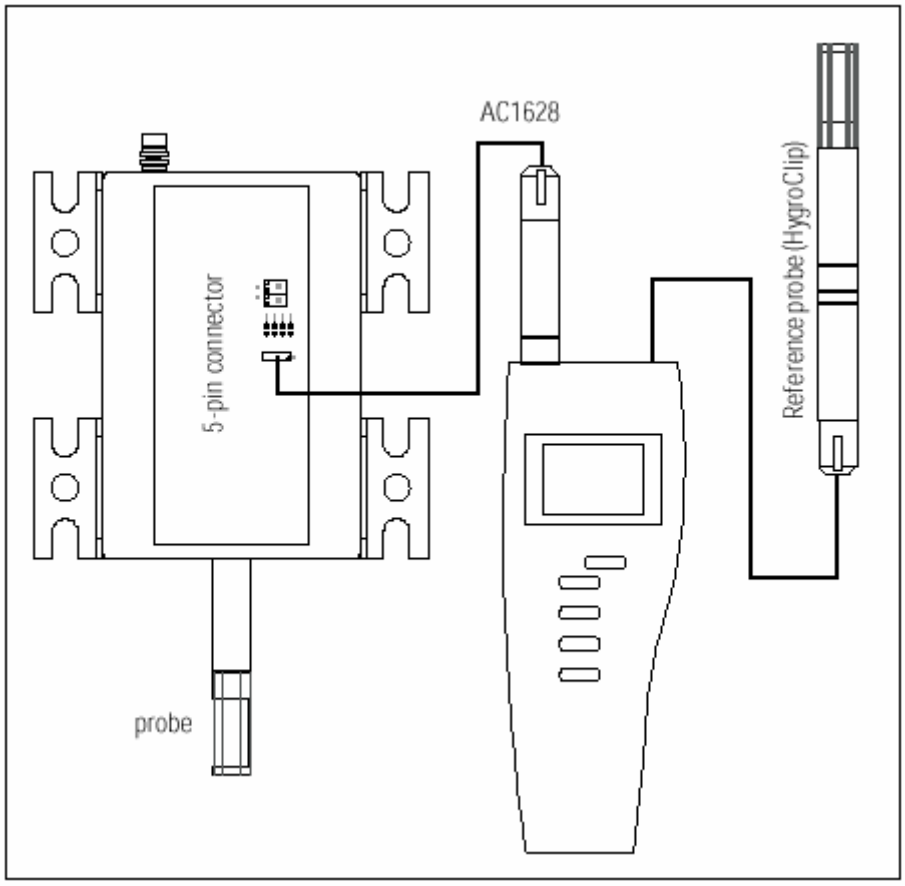
5.3.1. Checking humidity and temperature at one value against a reference probe

The following procedure can be used to do a 1-point adjustment of both temperature and humidity, using a reference probe connected to the HygroPalm portable indicator.

Material required:
- reference probe
- service cable (Art. no. AC1628)
- HygroPalm 2 or 3 portable indicator

Verify the reference probe beforehand and adjust as necessary. For instructions, see the manual of the HygroPalm indicator.

Connections:



During this procedure, temperature should be stable.

1. Loosen the screws and remove the cover of the probe enclosure.
2. Make sure that the probe is powered
3. Connect the service cable to the 5-pin service connector and to the HygroPalm indicator.
4. Place the reference probe next to the probe to be checked, as closely as possible to the sensors.
5. If possible, ventilate both probes. Wait for the HygroPalm display to stabilize.
6. Transfer the readings of the reference probe as per the HygroPalm instruction manual.
7. Disconnect the service cable and put the cover back on the probe enclosure

5.3.2. Probe calibration in a laboratory

The following procedures can be used for a full calibration / adjustment of the probe in a metrology lab.

a) Temperature calibration

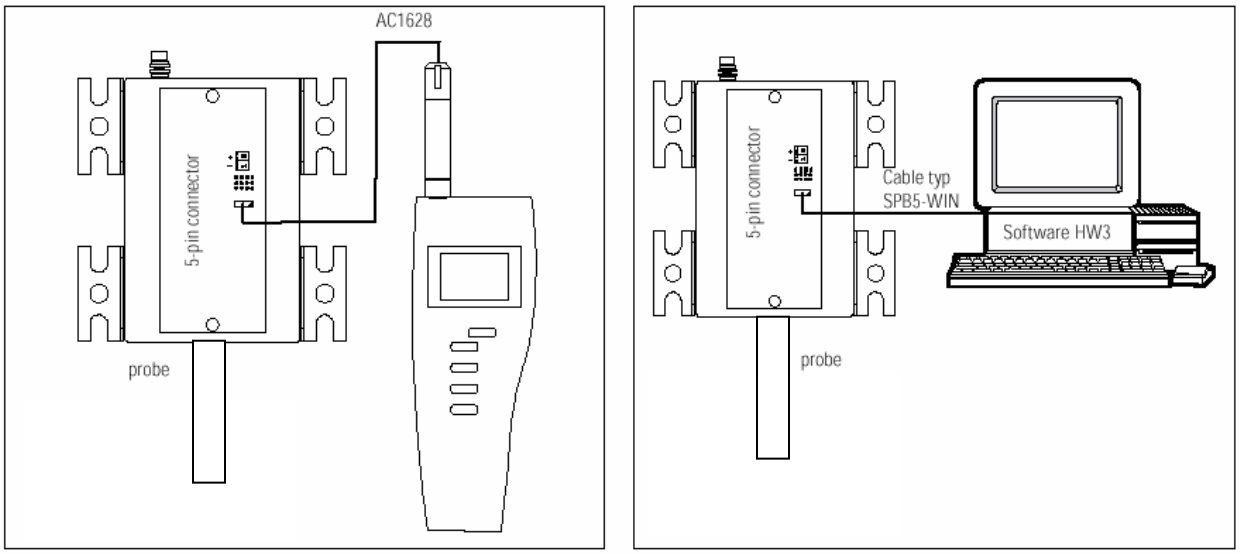
The Pt 100 RTD used on the ROTRONIC probes is very stable and the probe should not normally require a temperature adjustment.

When in doubt, you may want to check the probe and adjust it, if necessary. As a reference, use an accurate temperature probe or an accurate thermometer.

Material required:
- Reference probe or thermometer
- Service cable (type AC1628)
- HygroPalm2 or 3

As an alternative to using the HygroPalm indicator and service cable AC1628, you may connect the probe to the COM port of a PC with the ROTRONIC HW3 software installed. Connect the probe to the PC with cable part no. SPB5-WIN. Note that this cable should be powered with the AC adapter provided together with the cable.

Connections



During calibration, a uniform and stable temperature at both probes is essential. Ventilation of the probes is highly recommended

Calibration procedure:

1. Loosen the screws and remove the cover plate.
2. Power up the probe
3. Plug the service cable into the 5-pin service connector
4. Connect the service cable to the HygroPalm or to the PC.
5. Place the reference probe or thermometer next to the probe. Ventilation of both probes is highly recommended.
6. Wait for the display to become stable.
7. Adjustment according to the operating instructions of HygroPalm or HW3 software.
8. Remove the service cable and put back the cover plate on the probe.

Unless the temperature adjustment was minimal, always follow a temperature adjustment with a humidity calibration.

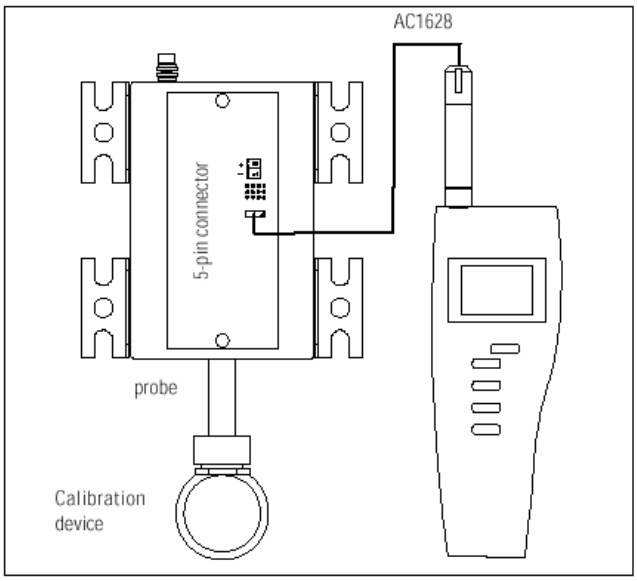
b) Humidity Calibration

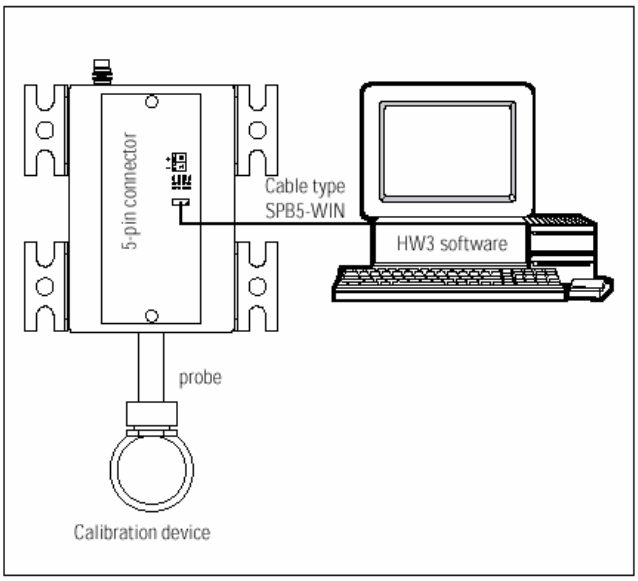
ROTRONIC provides easy-to-use, certified humidity standards for customer that do not have access to a humidity generator. To use these standards, you will need a calibration device that is suitable for your probe.

Material required:
- Calibration device (see below)
- ROTRONIC humidity standards: type EA35 (35 % RH), EA80 (80% RH), EA10 (10% RH), EA05 (5 %RH) or EA00 (0% RH)
- Service cable (part no. AC1628)
- HygroPalm 2 or 3 indicator

As an alternative to using the HygroPalm indicator and service cable AC1628, you may connect the probe to the COM port of a PC with the ROTRONIC HW3 software installed. Connect the probe to the PC with cable part no. SPB5-WIN. Note that this cable should be powered with the AC adapter provided together with the cable.

Connections





Calibration Device

The calibration device is a small airtight container that fits on the probe and seals around the humidity sensor. During calibration, a known reference humidity is produced inside the calibration device by means of a humidity standard (usually an aqueous salt solution).

The following calibration devices are available from ROTRONIC:

for the **IW-Ex probe**:

ERV-15: slips on the probe over the filter. Remove the filter cartridge prior to using the calibration device. Leave the slotted filter base in place to protect the sensors.

for the **ID-Ex and IC-Ex probes**:

ER-15: slips on the probe over the filter. Remove the filter cartridge prior to using the calibration device.

for the **IE3-Ex probe**:

EMG: screws on the ½" NPT thread of the probe. Remove the filter cartridge prior to using the calibration device. Leave the slotted filter base in place to protect the sensors.

ROTRONIC Certified Humidity Standards

The ROTRONIC certified standards are available in boxes of 5 glass ampoules of the same value, which can be stored indefinitely. Standards in the range of 5 to 95 %RH are non-saturated aqueous salt solutions that are precisely titrated at our factory for the right concentration. The 0 %RH humidity standard is made of small granules of a highly porous ceramic that have been dried at a high temperature. A Material Safety Data Sheet is available for each standard. Since most standards are a salt solution, parts which have come in contact with the liquid should be cleaned after each use.

Some of the ROTRONIC standards may cause irritations on sensitive skin. If contact with the skin or the eyes occurs, wash abundantly with water. Do not swallow or ingest the humidity standards!

Each box of standards comes with a certificate that provides statistical data on the manufacturing batch of the standard. Information on the effect of room temperature on each particular standard is provided on the cover of each box of standard.

The effect of room temperature on the ROTRONIC humidity standards is automatically compensated between 5 and 40°C by the HygroPalm or the HW3 software, when the option RHS is selected.

The value of the standards is not affected by altitude.

Observe the following rules during humidity calibration or adjustment:

- During humidity calibration, temperature stability is the single most important requirement. If possible, calibrate the probe at room temperature (18 to 25°C). Room temperature should be stable to ±0.25°C or better during the period of time required for each calibration point. Do not calibrate close to an air vent or a heater, in direct exposure to sun rays, etc. Place the probe and the calibration device on an insulating base (e.g. the cover of the humidity standard set) for optimum temperature stabilization.

- If using a humidity generator to calibrate the probe, make sure that the probe is as fully immersed in the generator as possible to minimize temperature effects.

- The ROTRONIC probes feature a digital compensation for the effect of temperature on the humidity sensor. Any temperature adjustment should be done prior to adjusting humidity.

- Start with the 35% RH calibration point and, if necessary, adjust with the HygroPalm or the PC. Follow with the second, third and fourth calibration values in the sequence of 80%, 10% and 0%RH. Adjust as necessary.

Calibration procedure:

1. Loosen the screws and remove the cover plate.
2. Power up the probe
3. Plug the service cable into the 5-pin service connector
4. Connect the service cable to the HygroPalm or to the PC.
5. Install the calibration device on the probe so that the receptacle (or solution holder) is under the probe. Check for a tight fit and remove the receptacle from the calibration device.
6. Place one fiber disc (each box of standards includes 5 discs) in the receptacle of the calibration device. The purpose of this disc is to prevent accidental spilling of the solution inside the calibration device or on the humidity sensor.
7. Tap the top of the ampoule so that all liquid drops to the bottom of the ampoule. Snap off top and empty contents on fiber disc. Since the ampoule is made of glass, exercise proper caution (gloves, safety glasses) when snapping off the top.
8. Put the receptacle back on the calibration device and make sure that the solution does not come in contact with the sensor: The solution inside the calibration device should never be on top of the sensors.
9. Allow at least 60 minutes to insure that the calibration device, the solution and the sensor are in a state of equilibrium. This is verified by monitoring the display.
10. Adjustment according to the operating instructions of HygroPalm or HW3 software.
11. After adjusting the probe, remove the receptacle from the calibration device. Throw away the wet disc (non reusable). Thoroughly wash and wipe dry the receptacle.
12. Repeat steps 6 through 11 for each calibration value
13. When finished, remove power from the probe, remove the service cable and put back the cover plate on the probe.

5.4 Filter maintenance

A contaminated or clogged filter can cause measurement errors and /or increase the probe response time. Dependent on the application, the dust filter cartridge should be replaced periodically.

To avoid damaging the sensors, remove the filter cartridge from the filter base and leave the slotted filter base on the probe as shown below.

6. Technical data

Humidity sensor	ROTRONIC-HYGROMER ® C-94
Temperature sensor	Pt 100 1 / 3 DIN
Operating limits at electronics	-20...+40°C
Survival limits at the sensors	0...100% RH HygroClip IW-Ex and IE3-Ex: -20...+40°C other probes: -50...+200°C electronics housing must remain at all times within the temperature limits of -20...+40°C
Accuracy at 23 °C ±2 °C	± 1.0 % RH (0...100 % RH) ± 0.2 °C
Repeatability	< 0.5 % RH < 0.1 °C
Long-term stability humidity	typical at normal conditions < 1 % RH /year
Time constant at 23 °C, 1 m/s air velocity) without protective filter	 Humidity < 15 s Temperature < 15 s
Adjustment values	Humidity 35 %, 80%, 10%, 0%RH Temperature T0, Tmax.
Output signal	4...20 mA (analog current signal) 4...10 mA (digital current signal)
Load	max. 800 Ohm at 26 VDC (max. load depends on supply voltage)
Supply volatage	10...28 VDC
Case material	high-grade steel
Indentification	**II 1 G EEx ia IIC T5 resp. II 2 G EEx ia IIC T6 / PTB 01 ATEX 2180** **FM Approved: Class1, 2, 3 Division 1, Groups A,B,C,D,E,F,G** **T6 in accordance with installation drawing 12.0724.0001** **Ui= 28V, Ii=195mA, Pi=830 mW, Ci=11nF, Li=0**

7. Accessories and spare parts

Order Code	Description
AC1617	Cable Zener barrier to HygroFlex transmitter. Specify length when ordering (from 2 to 100 m / 6 to 326 ft)
AC1301-MEX	Probe holder for ID-EX and IC-EX probes.
HW3	HW3 software (CD ROM)
SPB5-WIN	Cable service connector to PC COM port.
HygroPalm 3	HygroPalm 3, field calibrator
AC1628	Cable from service (test) connector to HygroPalm 2 or 3
EA00-SCS	0%RH humidity std, SCS cert., pack of 5
EA05-SCS	5%RH humidity std, SCS cert., pack of 5
EA10-SCS	10%RH humidity std, SCS cert., pack of 5
EA11-SCS	11%RH humidity std, SCS cert., pack of 5
EA20-SCS	20%RH humidity std, SCS cert., pack of 5
EA35-SCS	35%RH humidity std, SCS cert., pack of 5
EA50-SCS	50%RH humidity std, SCS cert., pack of 5
EA65-SCS	65%RH humidity std, SCS cert., pack of 5
EA75-SCS	75%RH humidity std, SCS cert., pack of 5
EA80-SCS	80%RH humidity std, SCS cert., pack of 5
EA95-SCS	95%RH humidity std, SCS cert., pack of 5
ERV-15	calibration device for the IW-Ex probe
ER-15	calibration device for the ID-Ex and IC-Ex probes
EMG	calibration device for the IE3-Ex probe
SP-G15	wire mesh filter cartridge (factory standard)
SP-F15	Teflon filter cartridge
SP-S15	sintered steel filter cartridge
ZB1	Zener barrier Peperl & Fuchs Z 722 – for digital current output
ZB1-420	Zener barrier Peperl & Fuchs Z 788.H – for analog current output)
ZB2	1 x ZB1 installed in housing (housing accepts up to 4 Zener barriers)
ZB2-420	1 x ZB1-420 installed in housing (housing accepts up to 4 Zener barriers)