

HygroClip M22 Series

2-wire loop powered
humidity temperature transmitters

INSTRUCTION MANUAL



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PLEASE, READ THIS FIRST

- Check the product for any physical damage that may have occurred during shipment. We carefully pack and routinely insure all shipments. If any damage has occurred, it is your responsibility to file a claim with the carrier, **prior to returning the damaged product**. Please note that our warranty does not cover damage during shipment.
- Prior to installation, get fully familiarized with the operating limits of the product and with the installation instructions provided in this manual.
- Do not remove the sensor protection (dust filter) from the probe. Both sensors (humidity and temperature) can be mechanically damaged by careless removal of the protection.
- Identification labels (model number, output ranges, etc.): identification labels are located (a) on the shipping box and (b) inside the electronics module, under the printed circuit board (pop out the board to read the label).

Every instrument is carefully calibrated before shipment and should not require any further adjustment before installation. If you have any question or problem, please call our service department at 631/427-3898 and press 5 (or ask for extension 21).

Overview

The HygroClip M22 series are 2-wire, loop powered transmitters used to measure humidity and temperature in manufacturing areas, clean rooms, research laboratories and other industrial applications. Linearized output signals (DC current) are provided for transmission over a length of cable to a remote display, recorder, controller or data processing unit. The M22 series uses the HygroClip S plug-in probe. This probe has two analog outputs that are used by the M22 to read the probe data. The HygroClip S also features a digital input / output which is used during calibration. Digital signal processing within the HygroClip S maintains accurate measurements over the entire operating range.

Main Features:

- relative humidity and temperature measurement
- fully interchangeable ROTRONIC HygroClip S digital plug-in probe
- software-based probe calibration
- two linearized analog 4-20 mA outputs signals (loop powered)
- test connector for communication with the HygroPalm 3 indicator ¹⁾

1) allows the HygroPalm 3 to read and / or calibrate the transmitter

The M22 series features a unique installation method that is both convenient and problem free. Each M22 series transmitter includes a base plate and a plug-in electronics module. During installation, the base plate is mounted first and wired without the electronics module. This is done at the same time as general electrical work. During that time, the electronics module and probe can safely be stored away.

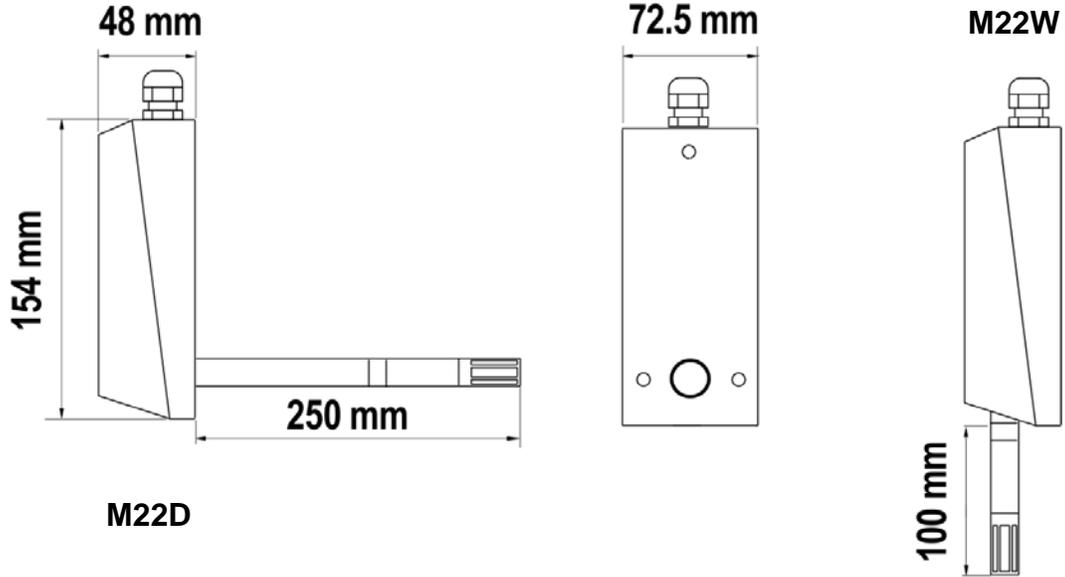
The M22 series was designed for simple field maintenance and to minimize any downtime:

- Operation of the M22 transmitter can be easily verified in the field by connecting a HygroPalm 3 indicator to the M22 service connector. This is done without interrupting the output signals.
- Calibration is entirely digital, without any potentiometer. In addition, the HygroClip S digital probe is 100% interchangeable: calibration data, sensor characteristics, serial number, etc. are retained within a non-volatile memory. Should the probe require maintenance, it can be replaced in seconds without any loss of accuracy and without requiring a recalibration of the M22 transmitter. ROTRONIC offers easy-to-use software and accessories for in-house calibration of the HygroClip S. If you do not wish to calibrate, or if the HygroClip S has to be replaced, use our unique exchange program. This plan is supported by the ROTRONIC worldwide distribution network. The replacement probe is either a brand new HygroClip S or a reconditioned probe with a brand new humidity sensor and dust filter.
- Should the electronic module develop a problem, it can easily be removed from the base plate and replaced with another module without having to do any wiring work.

The M22 series is available in the following configurations:

| Model | Measurement | Circuit Type | Installation |
|-------------|-------------------|---------------------|--|
| M22W | %RH + Temperature | 2-Wire Loop Powered | Wall mount (surface) or remote probe ^{*)} |
| M22D | %RH + Temperature | 2-Wire Loop Powered | Duct mount (through Wall) |

*) remote probe requires an extension cable (see accessories)



Operation

Power supply

Transmitters of the M22 series require a supply voltage of 10...35 VDC (depending on the load connected to the output)

The minimum supply voltage can be determined as follows: $V_{\min} = 10 \text{ V} + 0.02 \times \text{Load (ohm)}$. For the maximum load of 250Ω , the minimum supply voltage is $10 + 0.02 \times 250 = 15 \text{ VDC}$.

The maximum current consumption is 40 mA.

HygroClip S digital probe



HygroClip S

operating range -40 to 85°C (-40 to 185°F)
wire mesh filter ¹⁾
length: 100mm (3.9"), d: 15mm (0.6")

1) Special environments may require using a foam filter (consult ROTRONIC).

M22W



The HygroClip S measures relative humidity with a ROTRONIC HYGROMER™ C94 capacitive humidity sensor. This well proven sensor offers exceptional durability and stability in all kinds of environments. Temperature is measured with a precision RTD Pt100 sensor.

The ROTRONIC HygroClip S digital probe is highly accurate and is calibrated entirely by means of software (no adjustment potentiometers). Because calibration and other data are stored in the probe non-volatile memory, the probe is fully interchangeable. When the probe requires calibration or has to be repaired, it can be replaced with another probe in a few seconds.

With the M22W (wall mount model), the probe can be separated from the transmitter with extension cable MOK-xx-DAT05: (xx = 2 or 5 meters / 6.5 or 16.4 ft). The maximum separation is 5 meter.

Temperature operating range and limits

The M22 series can operate within -40 to 60°C (-40 to 140°F) at the electronics.

The temperature operating range of the HygroClip S probe is -40...85°C (-40...185°F).

Operating the transmitter and/or its probe outside of the temperature limits can result in permanent damage.

Humidity limits

As far as possible, avoid sudden condensation at the sensors. When measuring at high humidity, condensation may occur on the humidity sensor due to a sudden difference in temperature with the environment. This does not damage the sensor. However, this will produce an overflow reading (an output signal of more than 100 %RH) for as long as condensation is present on the humidity sensor.

Temperature compensation of the humidity sensor

Practically every make of relative humidity sensor requires a compensation for the effect of temperature on the humidity output signal in order to measure accurately over a wide range of temperature conditions. In the specific case of an instrument using a capacitive sensor, compensation is required because the dielectric characteristics of both the water molecule and the hygroscopic polymer used in the sensor vary with temperature.

The HygroClip S probe uses the temperature data from the Pt100 RTD to provide automatic compensation for the effect of temperature on the humidity sensor. The temperature compensation uses normal room temperature as a reference. Because of this, calibration of the HygroClip S is done at normal room temperature rather than at the temperature of operation at the sensor.

Output range

The range of the relative humidity output is 0 to 100%RH. The temperature output depends on the range specified when ordering - see identification labels (a) on shipping box and (b) inside electronics module under the printed circuit board.

Output signals

The M22 series provides two 4-20 mA output signals. These signals are linear and are consistent with the requirements of most data/signal processing instrumentation (panel meter, controller, computer card, etc.).

The M22 behaves as a variable source of current and adjusts the current flowing through the terminals as a function of relative humidity and temperature. The output signal may be read with any current sensing device having a maximum impedance of 250 ohms. When several devices are connected in series with the transmitter, the resulting impedance should not exceed 250 ohms, wiring included.

If so desired, the loop of one of the signal can be left open without affecting operation of the other output (humidity or temperature only).

Installation

Do not unnecessarily remove the dust filter from the HygroClip probe. The sensors can easily be damaged when not protected.

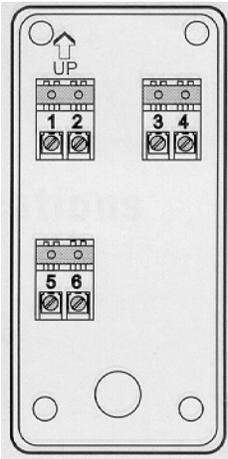
General recommendations

Relative humidity is extremely dependent on temperature. Proper measurement of relative humidity requires that the probe and its sensors be at exactly the temperature of the environment to be measured. Because of this, the location where you choose to install the probe can have a significant effect on the performance of the instrument. The following guidelines should guarantee good instrument performance:

- a) **Select a representative location:** install the probe where humidity, temperature and pressure conditions are representative of the environment to be measured.
- b) **Provide good air movement at the probe:** air velocity of at least 200 ft/ minute (1 meter/second) facilitates adaptation of the probe to changing temperature.
- c) **Avoid the following:** (1) Close proximity of the probe to a heating element, a cooling coil, a cold or hot wall, direct exposure to sun rays, etc. (2) Close proximity of the probe to a steam injector, humidifier, direct exposure to precipitation, etc. (3) Unstable pressure conditions resulting from excessive air turbulence.
- d) **Immerse as much of the probe as possible in the environment to be measured.**
- e) **Prevent the accumulation of condensation water at the level of the sensor leads.** Install the probe so that the probe tip is looking downward. If this is not possible, install the probe horizontally.

Installation and wiring of the base plate

The base plate should be installed first, using screws with an approximate diameter of 5/32".

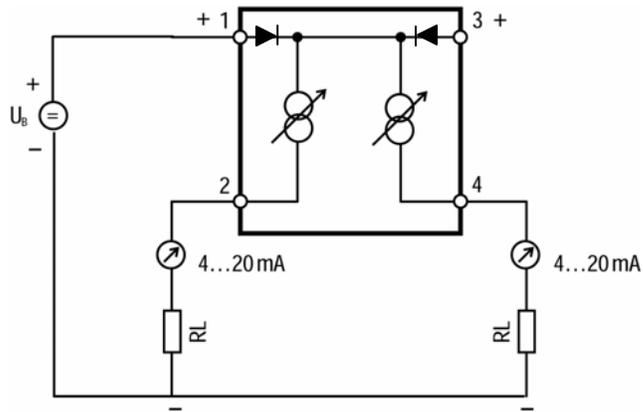
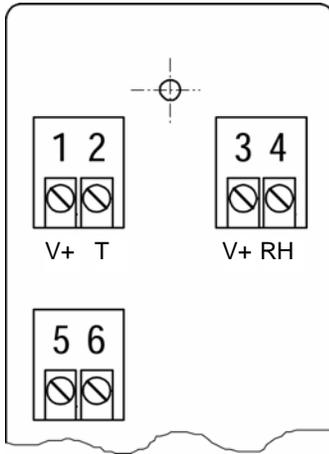


Installation Note (through wall installation and remote probes)

You may want to provide an orifice at a distance of about 3" from the probe of the transmitter for future use by a reference probe and HygroPalm indicator.

The base plate of the standard M22 series transmitter is supplied with one sealing cable grip. This cable grip provides effective sealing only with cables having the proper outside diameter. Preferably, use a cable with an outside diameter of 0.236 to 0.275 inch (6 to 7 mm) and with 18 AWG wires. Avoid running the cables connecting the unit in the same conduit as 110 VAC power cables. Depending on the installation, you may have to use a cable with twisted pairs or a shielded cable to avoid electromagnetic interference.

In order to determine the maximum length of cable that can be used to connect the transmitter to other devices, the first step is to find out what is the resistance per unit of length of the cable that you plan on using. The maximum permissible cable length, connecting the unit to other devices, is determined by the total resistance resulting from the addition of the cable resistance and that of the devices connected in series with the unit. This resistance should not exceed 250 ohms.



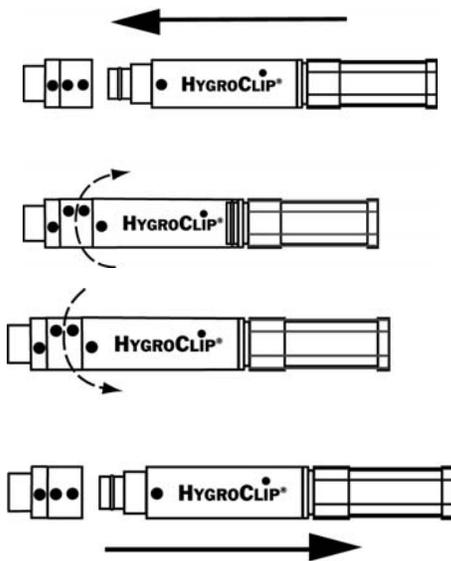
| Base Plate Terminals | Description |
|----------------------|--------------------------|
| 1 and 3 | 10...35 VDC (+) |
| 2 | temperature output |
| 4 | relative humidity output |
| 5 and 6 | not used |

Note: it is not necessary to connect both terminals 1 and 3 to the plus side of the power supply. The transmitter will operate normally with just one of these terminals connected.

Measuring humidity or temperature only: the humidity and temperature circuits of the M22 are independent one from the other. Any output can be operated without closing the loop for the other output.

We generally recommend grounding the (-) side of the power supply, especially if the electronics will be subjected to a low humidity environment (35 %RH or less).

Installation and removal of the HygroClip S probe



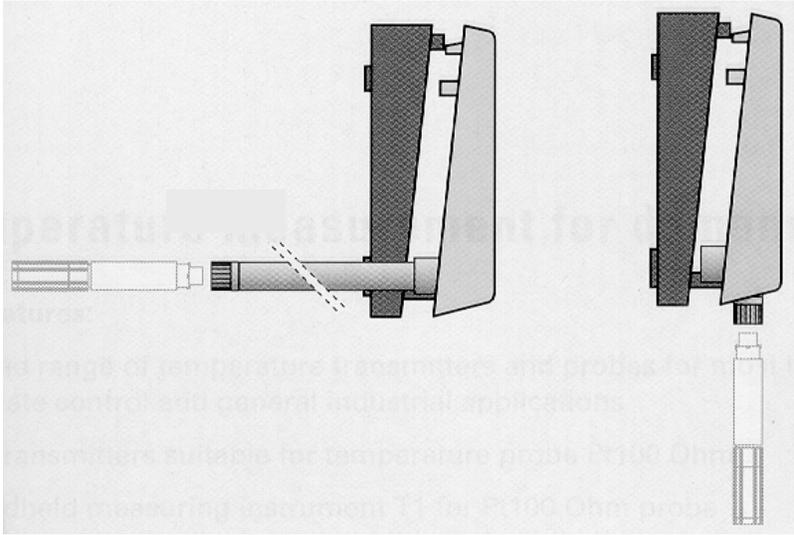
Both the HygroClip S and the base of the connector on the transmitter are marked with a dot. The locking ring is marked with 2 dots.

The probe can be inserted straight into the connector (or removed from the connector) when all dots are aligned. If necessary, rotate the locking ring to align the 2 dots of the ring with the dot at the base of the connector.

WARNING: do not rotate the HygroClip as this may damage the connector.

After inserting the probe, turn the locking ring clockwise to secure the

Installation of the electronics module



Once the base plate has been installed and wired, the electronics module can be inserted and secured with the screws provided. The transmitter is ready to operate.

Maintenance

Cleaning or replacing the dust filter of the HygroClip S

The dust filter should be cleaned from time to time, depending on the conditions of measurement. Cleaning should be done without removing the filter from the probe. Clean the filter with a fine brush. If this is not sufficient, the filter should be replaced. To do this, unscrew the filter from the probe.

Before putting on a new dust filter, check the alignment of both sensors with the probe. The wires that connect the sensors to the probe are very thin and bend easily. If this happens, correct the alignment by holding the sensor very gently with a pair of small flat nosed pliers.

Periodic calibration check of the probe

Long term stability of the ROTRONIC Hygromer humidity sensor is typically better than 1 %RH per year. For maximum accuracy, calibration of the probe should be verified every 6 to 12 months. Applications where the probe is exposed to significant pollution may require more frequent verifications.

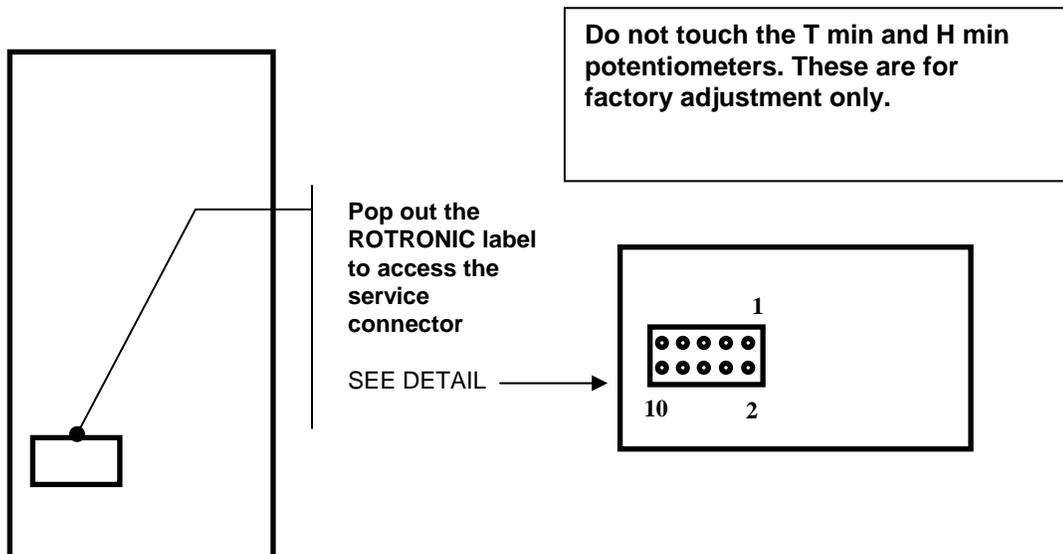
Both the Pt 100 RTD temperature sensor and associated electronics are very stable and should not require any calibration after the initial factory adjustment.

For routine calibration checks, the probe should be verified at one or two values of humidity. For more details, see **service connector**, **accessories - service cable** and **appendix 2 – calibration**

Note: the electronics module of the M22 transmitter should not require any field calibration and it can be easily validated by using a probe simulator (see **accessories**). The electronics module cannot be serviced in the field and should be returned to the factory if there is any problem.

Service connector

Transmitters of the M22 series feature a keyed 10-pin service connector. This service connector can be used to connect M22 transmitter to probe input 2 of the HygroPalm 3 indicator with a service cable. For details, see **accessories - service cable** below.



| Service Connector Pin # | Wire Color | Signal |
|-------------------------|------------|---------------------------------------|
| 1 | | Temperature Lo ¹⁾ |
| 2 | | Temperature Hi ¹⁾ |
| 3 | | Humidity Lo ¹⁾ |
| 4 | | Humidity Hi ¹⁾ |
| 5 | | Ground |
| 6 | | V+ (power to service cable) |
| 7 | | Not Used |
| 8 | | Not Used |
| 9 | | Not Used |
| 10 | | Digital signal from HygroClip S (DIO) |

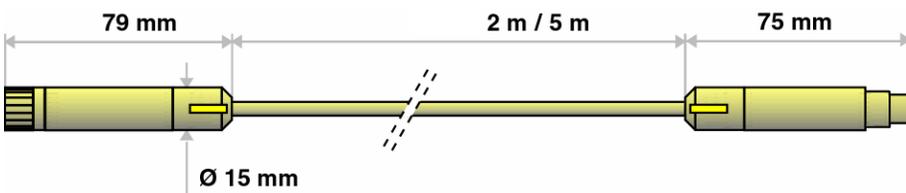
1) Pins 1 and 2, as well as pins 3 and 4, are connected to each side of a precision 49.9 ohm resistor (0.1%) which is in series with the output current. With a signal of 4 .. 20 mA current output the voltage measured across pins 1 and 2 (or pins 3 and 4) is within the range of 200 ... 998 mV. The signals can be measured with a DVM.

The components used in the circuits of the M22 transmitter are very stable and should not exhibit any noticeable long-term drift. The transmitter can be verified with a probe simulator (see accessories below). Transmitters that have drifted should be returned to the factory for repair or replacement.

Accessories

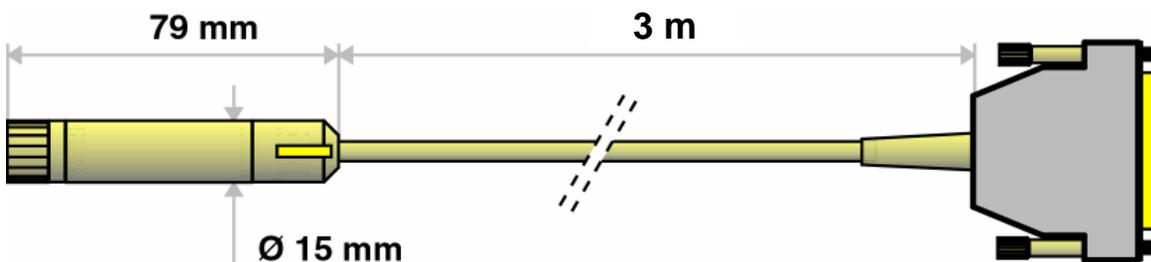
Extension cable for the HygroClip S (used with model M22W)

MOK-xx-DAT05: (xx = 2 or 5 meters)



Calibration cable for the HygroClip S

The MOK-03-WIN cable is used to calibrate the HygroClip S probe independently from the M22 transmitter. The MOK-03-WIN cable connects the HygroClip S probe to the COM port of a PC. This cable is shipped together with the Rotronic HW3 software which is used to read and calibrate the probe from the PC.



The requirements for using HW3 are as follows:

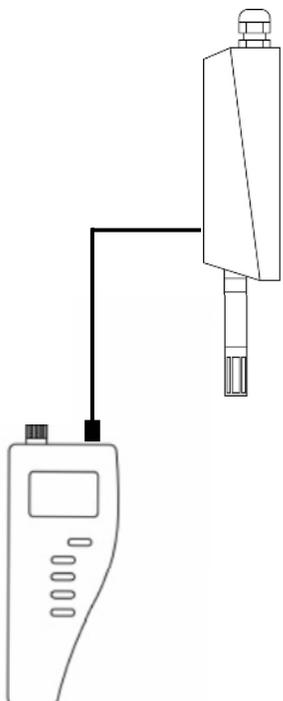
| | |
|-------------------|--|
| PC | Pentium 233MHz or better |
| Windows® | 95/98, Me, XP or NT or 2000® |
| Memory | 64MB |
| Disk Space | 20MB free |
| Drives | CD ROM drive required |
| Monitor | VGA or Super VGA |
| Resolution | 1024 x 768 or higher (set to small fonts) High Color 16Bit (256 Color minimum) |
| COM Port | RS232 (COM 1-4) |
| Software | HW3 (includes - MSIE 4.0 Browser - Adobe® Acrobat Reader) MS Internet Explorer: for best viewing, set fonts to smallest |

For more details see separate instruction manual provided with the HW3 software.

Service cable



Service cable ACRLXB5 is normally used to connect the service connector of the M22 to probe input 2 of the HygroPalm 3 portable indicator. The 5-pin connector of this cable is also compatible with probe input 1 of the HygroPalm.



The ACRLXB5 service cable allows to do any of the following:

- a) Display locally the signals of the transmitter with the HygroPalm 3.

This can be used to validate the entire measuring loop: probe, transmitter, wiring and central processing unit. If so desired, the HygroClip probe can be replaced with a probe simulator that generates known fixed humidity and temperature values.

Note: the HygroPalm should be configured to read temperature in the same unit as the transmitter. Changing the temperature unit can be done directly on the HygroPalm.

- b) Single/multi-point adjustment against a reference environment with the HygroPalm 3.

A known reference environment is required for a multi-point adjustment and it is not necessary to connect any probe to the HygroPalm. For detailed instructions, see separate HygroPalm manual manual – HygroPalm Function Menu – Adjust M.PT or Adjust 1PT.

- c) 1-point adjustment against a reference probe with the HygroPalm 3.

For a 1-point adjustment against a reference probe, connect the ACRLXB5 service cable to probe input 1 of the HygroPalm 3 (the 5-pin connector of the cable is also compatible with this input). Use an adapter cable such as the MOK-02-B5 to connect the reference probe to probe input 2 of the HygroPalm 3. **Note that these connections are the opposite of what is shown on the drawing to the left.** For detailed instructions, see separate HygroPalm manual – HygroPalm Function Menu – Adjust REF

Note: both probe inputs of the HygroPalm should be configured for a digital HygroClip probe (standard factory configuration).

Probe simulators

For validation purposes, a probe simulator can be plugged in place of the HygroClip S probe to generate fixed humidity and temperature values.

In principle, any combination of humidity and temperature can be ordered. The following are some of the most common combinations:

HygroClip S35/25: 35%RH and 25°C (77°F).

HygroClip S50/25: 50%RH and 25°C (77°F).

HygroClip S80/25: 80%RH and 25°C (77°F).

Like the HygroClip S probe, the probe simulators provide both digital and analog output signals. Prior to shipment, the digital signal is verified with the validated HW3 software. The analog outputs are verified with a traceable voltmeter.

Specifications

| | |
|------------------------------------|--|
| Probe (plug-in) | HygroClip S |
| Operating limits at probe | 0...100%RH and -40...85°C (-40...185°F) |
| Operating limits at transmitter | 0...99%RH non condensing -40...60°C (-40...140°F) |
| Standard humidity output range | 0..100 %RH |
| Standard temperature output ranges | 0..100°F or 0..100°C |
| Output signals (linear) | 4-20 mA (max. load 250Ω) |
| Accuracy at 68..77°F (20..25°C) | ± 1.5%RH ± 0.5°F (±0.3°C) |
| Repeatability | ± 0.3%RH and better than ±0.2°F (±0.1°C) |
| Humidity sensor stability | better than 1%RH over a year |
| Response time (without filter) | 10 seconds (%RH and temperature) |
| Supply voltage | 10..35VDC; 10V + 0.02 x Load |
| Electrical connections | power / outputs probe input |
| Sensor protection | cable grip and terminals connector |
| Housing material | Wire Mesh Filter |
| Housing dimensions (w/o probe) | ABS |
| Weight | 154 x 72.5 x 48 mm (6.06 x 2.86 x 1.89") |
| Protection grade | 0.7 lbs (300 g) IP 65 / NEMA 4 |

Appendix 1: Practical Advice for Measuring Humidity

The most common source of error when measuring relative humidity is a difference between the temperature of the probe and the temperature of the environment. At a humidity condition of 50 %RH, a temperature difference of 1°C (1.8 °F) typically results in an error of 3 %RH on relative humidity.

When the probe is mounted through a wall, avoid temperature errors by inserting as much of the probe as possible in the environment to be measured. Whenever there is a large temperature difference across the wall, you may have to insert not only the probe itself but also some of the probe cable (cables do conduct temperature).

In extreme situations, condensation may occur on the sensors when the probe is colder than the environment. As long as the humidity / temperature limits of the humidity sensor are not exceeded, condensation does not alter the calibration of the sensor. However, the sensor has to dry out before it can provide a valid measurement.

Non-moving air is an excellent insulator. When there is no air movement, surprising differences in temperature and humidity can be observed over short distances. Air movement at the probe generally results in measurements that are both faster and more accurate.

Appendix 2: Calibration

The following choices are available to calibrate the probe used with the M22 transmitter:

a) Calibration of the probe connected to the M22 transmitter:

This requires a HygroPalm 3 indicator and service cable ACRLXB5 (see accessories – service cable). Connect cable ACRLXB5 to probe input 2 of the HygroPalm 3 and select probe 2 on the HygroPalm prior to calibrating.

Press the MENU key of the HygroPalm to access the function menu and use the UP and DOWN keys to navigate the function menu. Selections are confirmed by pressing the ENTER key. Select one of the calibration functions: ADJUST M-PT or ADJUST 1-PT. Detailed calibration instructions are provided separately in the HygroPalm manual.

Note that the M22 transmitter must be powered up during calibration.

b) Calibration of the probe removed from the M22 transmitter:

This requires a PC with the optional HW3 software and the **MOKX-03-WIN** calibration cable (separate instructions are provided with the HW3 software).

Appendix 3: Accessories for the M22 Series

| Order Code | Description |
|------------------|--|
| HW3 | HW3 software (CD ROM) |
| HygroPalm 3 | HygroPalm 3, field calibrator |
| ACRLXB5 | Cable: service connector M22 to HygroPalm 3 (probe input 2) |
| MOK-xx-DAT05 | Probe extension cable for M22W (xx = 2 or 5 meter) |
| MOKX-03-WIN | Calibration cable HygroClip probe with DAT05 connector to PC. Terminated with a 25-pin SUB D connector. Converter 25-pin to 9-pin is supplied. Cable length 3 meter (9.8 ft). 9VDC adapter included |
| HygroClip Sxx/yy | HygroClip S probe simulator where xx = relative humidity in %RH and yy = temperature in °C (fixed values) |
| EAx-SCS | humidity std, SCS certified, pack of 5 where xx = 00 (0 %RH) = 05 (5 %RH) = 10 (10 %RH) = 11 (11 %RH) = 20 (20 %RH) = 35 (35 %RH) = 50 (50 %RH) = 65 (65 %RH) = 75 (75 %RH) = 80 (80 %RH) = 95 (95 %RH) |
| ER-15 | calibration device for HygroClip S probe |