

**HygroLog NT  
Humidity Temperature Data Logger  
v1.2a**

**Instruction Manual**



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**About the version number:** this manual is valid for instruments with firmware version 1.2a (see MENU, Instrument or check using the ROTRONIC HW4 software, Device Manager). Changes in the last digit of the version number reflect minor changes in the internal software of the instrument that do not affect the manner in which the instrument should be operated.

## OVERVIEW

HygroLog NT is a series of data loggers primarily designed for use with the HygroClip digital humidity-temperature probes. The HygroLog NT operates together with the ROTRONIC HW4 software for Windows based PCs. The main functions of HW4 include configuring the HygroLog NT, programming the logging functions, downloading the recorded data, on-line data monitoring by the PC, automatic generation of graphs and data tables, networking and adjustment (calibration) of the HygroClip probes. Depending on the model and options, main features are as follows:

- Internal humidity-temperature probe designed to prevent unauthorized removal.
- Inputs for up to 6 additional external probes, including analog probes and 4-wire passive RTD probes.
- Monitoring of up to two external contacts (relay output, door, etc.).
- Large recording capacity with removable flash memory card. Up to 750,000 values can be recorded with the standard 16 MB card. Cards with a capacity of up to 1 GB are available.
- Display and keypad. This allows the HygroLog NT to operate as a stand-alone unit after initial configuration with the HW4 software.
- Compliance with FDA 21 CFR Part II and GAMP regulations regarding electronic records and electronic signatures.
- Compatible with Ethernet networks (TCP / IP protocol – LAN or WLAN).
- Dedicated RS-485 network of up to 64 HygroLog NT per communication port
- Simultaneous data recording and data display either locally or on a PC.

Internal power for both the HygroLog NT and probes is provided by a 9V battery (factory standard) or by a 9V rechargeable battery (user supplied).

The optional docking station is required (a) to power the HygroLog NT with an external AC adapter, (b) to configure the HygroLog NT and communicate with a PC, (c) to connect the HygroLog NT to a network and (d) to mount the HygroLog NT to a wall or to place the HygroLog NT on the optional desk-top stand.

The most basic model of docking station simply provides a means of mounting the HygroLog NT to a wall and of powering the HygroLog NT with an external AC adapter. All other models offer the same functionality as the basic model and also provide a communication port (RS232, USB or RJ45 / Ethernet) as well as additional inputs for probes and external contacts. Docking stations with an RS232 or USB port are used to connect the HygroLog NT directly to a PC. Docking stations with an RJ45 connector are used to connect the HygroLog NT to an Ethernet LAN. In both cases, the docking station features an RS485 port that can be used to connect up to 64 HygroLog NT in a multi-dropped arrangement (dedicated RS-485 network). This is useful when the PC does not have an Ethernet network interface card or when the number of available Ethernet ports is limited. Direct connection to an Ethernet LAN allows, in principle, an unlimited number of HygroLog NT to be put on a network monitored by the HW4 software. HW4 allows any combination of RS-232, USB, Ethernet and RS-485 connections.

The optional Bluetooth internal wireless transceiver can be used as an alternative to communicating via a docking station. This allows bi-directional communication with a PC over distances of up to 9m / 30ft. Communication with the PC is on a one to one basis (no networking).

Using either the optional Bluetooth transceiver or a network allows downloading data without removing the HygroLog NT from its location. A fail safe network is obtained by combining remote data monitoring and local data logging.

# HygroLog NT DATALOGGER

## ***Models***

### **Basic models without display and keypad**

HygroLog NT1: internal humidity-temperature probe, non-removable.

HygroLog NT2: internal HygroClip S probe, removable (plug-in)

HygroLog NT3: same as NT2 with 2 additional connectors suitable for a HygroClip digital probe.

### **Models with display and keypad**

HygroLog NT1-D: same probe as HygroLog NT1

HygroLog NT2-D: same probe as HygroLog NT2

HygroLog NT3-D: same probe / probe inputs as HygroLog NT3

### **Models with internal Bluetooth transceiver**

The following models are equipped with Bluetooth transceiver, display and keypad

HygroLog NT2-D-BT: same probe as HygroLog NT2

HygroLog NT3-D-BT: same probe / probe inputs as HygroLog NT3

Note: models NT2 and NT3 can be ordered without the internal probe.

## ***Power***

The HygroLog NT ships with a regular 9V battery which must be inserted first (see battery replacement).

To conserve battery power, models with the LC display and keypad are shipped with the Display Sleep function enabled (see Software Functions). When the keypad has not been used for some time, this function automatically turns off the display. The display can be temporarily activated by pressing on any key of the keypad.

When connected to a docking station, the HygroLog NT can be powered with an external AC adapter.

Note: most models of docking station require the use of an external AC adapter due to the current consumption of the docking station internal electronics. Use of an external AC adapter is strongly recommended together with Bluetooth models due to the current consumption of the internal Bluetooth transceiver.

After reconfiguring the HygroLog NT with the ROTRONIC HW4 software, a rechargeable battery (accumulator) can be used instead of a regular battery. Recharging the battery requires a docking station and an external AC adapter.

**WARNING: Trying to recharge a regular battery is potentially dangerous. Whenever a regular battery is being used, the logger should be configured with the internal battery charge function disabled.**

## Battery lifetime

The battery lifetime depends on the manner in which the HygroLog NT is being used. The HygroLog NT has a battery lifetime of one year when just one HygroClip probe is being used (standard 500 mAh alkaline battery), when no docking station with internal electronics is connected to the HygroLog NT and when the logger is configured / programmed as follows:

- Display Sleep function enabled (models with display)
- No docking station with internal electronics
- LED and beeper functions disabled
- Log interval set to 15 minutes

Additional examples of battery lifetime (LED turned off, Logging active): in the following table, LCD means that the LC display is permanently on (Display Sleep function disabled). No docking station with internal electronics is connected to the HygroLog NT.

Lifetime in days	Rechargeable Battery 120mAh	Rechargeable Battery 150mAh	Regular Battery 500mAh	Regular Battery 1000mAh
1 Probe / 5s Interval	1.8	2.3	7.8	15.6
1 Probe / 5s Interval / LCD	1.6	2.0	6.7	13.5
1 Probe / 1min Interval	20	25	84	168
1 Probe / 1min Interval / LCD	6	8	26	52
1 Probe / 15min Interval	84	105	350	700
1 Probe / 15min Interval / LCD	10	12	41	82

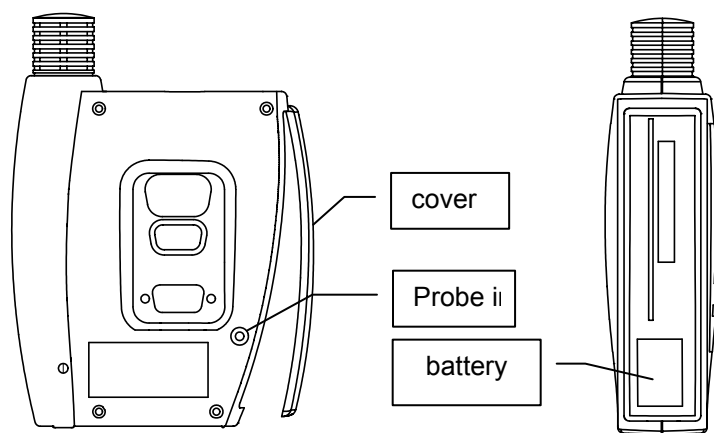
Note: the consumption of the display is negligible when the Display Sleep function is enabled. With the display always on, power consumption is at its highest when the display refresh rate is set with HW4 to the minimum of 5 sec.

Because of the requirement to keep track of the date and time, the HygroLog NT does not have a power on/off switch. Every minute, both the date and time are recorded to the internal EEPROM. Seconds are not recorded. In the event of a relatively brief interruption of power (such as when replacing the battery), time may fall behind in increments of one minute. Removing the battery for an extended period of time will cause the logger to completely lose track of the date and time.

## Battery replacement

To access the battery, remove the screw shown to the right and open the rubber cover.

The battery is located at the bottom of the instrument.



## Probes

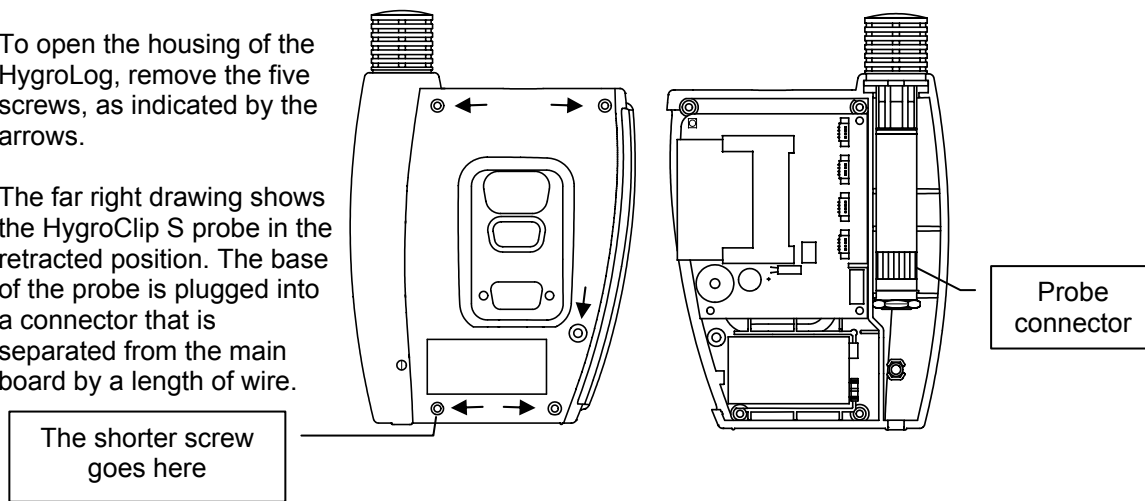
### Internal Probe (probe 1)

**HygroLog NT1:** this model is equipped with a non-removable internal probe, located under the slotted cap on the right hand side of the instrument.

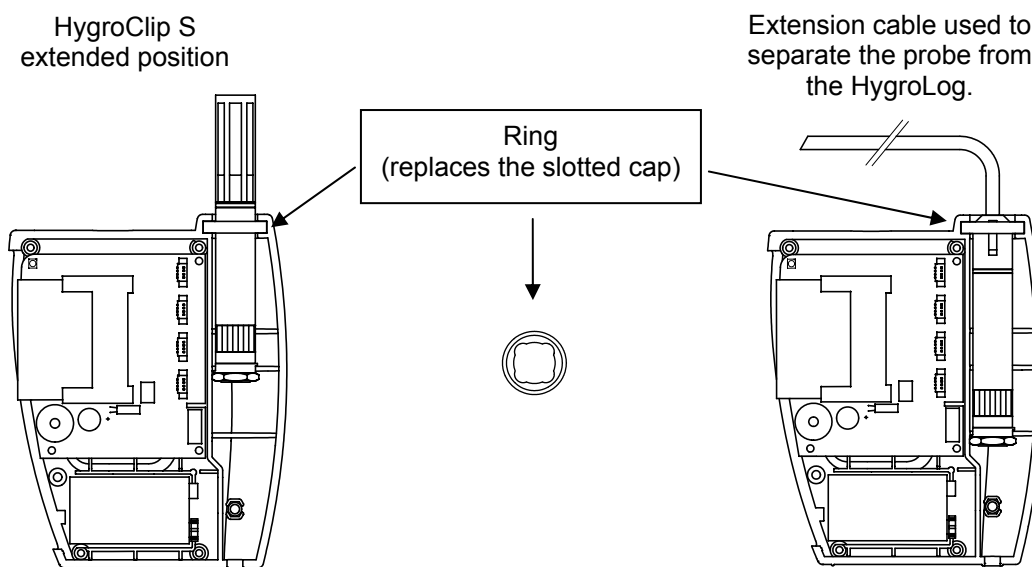
**HygroLog NT2 and NT3:** both models are supplied with a HygroClip S probe. This probe can be either retracted or extended and can also be separated from the logger with an extension cable. Open the housing of the HygroLog to change the position of the probe or to install a probe extension cable.

To open the housing of the HygroLog, remove the five screws, as indicated by the arrows.

The far right drawing shows the HygroClip S probe in the retracted position. The base of the probe is plugged into a connector that is separated from the main board by a length of wire.



To extend the probe, lift the HygroClip S probe from its position and remove the slotted cap from the HygroLog. To extend the probe, place on the probe the ring supplied with the HygroLog. Insert the ring into the slot in the instrument housing where the slotted cap was. Relocate the probe connector up by one or two ribs. Close the instrument housing. Proceed in a similar manner to install a probe extension cable.



Notes:

- 1) For maximum protection against vandalism, use the probe in the retracted position. For a faster response, use the probe in the extended position.
- 2) The extension cable allows to make full use of the operating temperature range of the HygroClip S or to use another model of HygroClip probe.

## External Probes (HygroLog NT3)

The HygroLog NT3 permits the use of additional ROTRONIC HygroClip digital humidity temperature probes. These probes permit to take full advantage of all the features and functions of the HygroLog NT.

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

The ROTRONIC HygroClip digital probes are available in different configurations so as to meet the requirements of each application:



L. 100mm (3.9")  
Dia. 15mm (0.6")

HygroClip S  
measurement in air  
max. 85°C (185°F) – wire mesh filter



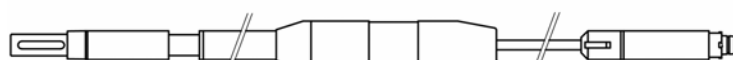
Tube L. 200mm (7.9")  
Dia. 5mm (0.2")  
Cable: 2m (6.5ft)

HygroClip SP05  
measurement in air ducts  
max. 85°C (185°F)



Dia. 5mm / 0.2"  
Cable: 2m (6.5 ft)

HygroClip SC05  
measurement in tight spaces  
max. 100°C (212°F)



Tube L. 250/400mm / (9.8/15.7")  
Dia. 15mm (0.6")  
Cable: 2m (6.5ft)

Logical inputs



Tube L. 280mm (11")  
Dia. 10mm (0.4")  
Cable: 2m (6.5ft)

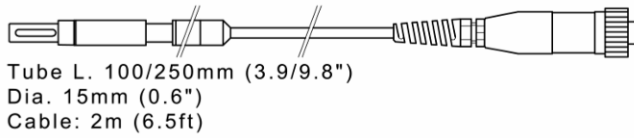
HygroClip HP28 insertion probe  
measurement of materials in bulk  
max. 85°C (185°F)  
sintered steel filter



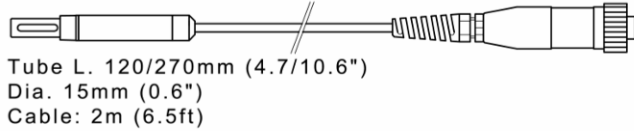
Blade L. 280mm (11")  
W. 18mm (0.7")  
T. 4mm (0.16")  
Cable: 2m (6.5ft)

HygroClip HS28 sword probe  
measurement of paper stacks/rolls  
max. 85°C (185°F)

Note: the above probes have a 5-pin DAT-05 connector. An extension cable such as the MOK-02-DAT05 can be used to connect any of the above probes to input 1 of the HygroLog NT2 / NT3 (this input is normally used for an internal HygroClip S probe). An adapter cable such as the MOK-02-B5 is required to connect any of the above probes to inputs 2 and 3 the HygroLog NT3 or to inputs 4 to 7 of the docking station (see Accessories).



HygroClip IC-1 (100mm) / IC-3 (250mm)  
 for through-wall installation  
 max. 200°C (392°F) - wire mesh filter



HygroClip IM-1 (120mm) / IM-3 (270mm)  
 for through-wall installation in high humidity  
 applications  
 max. 200°C (392°F) - wire mesh filter

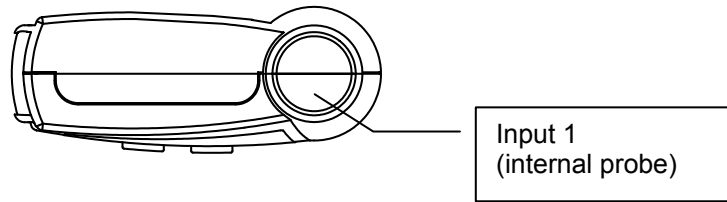


HygroClip IE-1 (G 1/2") / IE-3 (NPT 1/2")  
 for compressed air (max. 50 bar / 725 PSI)  
 max. 85°C (185°F) – sintered steel filter  
 to avoid errors, temperature should be the  
 same on both sides of the mounting wall

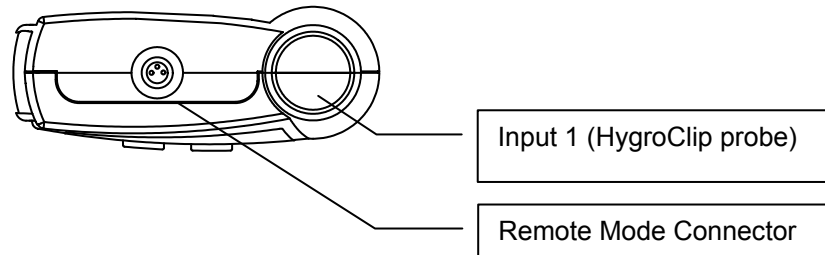
Note: the above probes have a 7-pin connector. An adapter cable such as the T7-03-B5 is required for connection to inputs 2 and 3 the HygroLog NT3 or to inputs 4 to 7 of the docking station (see Accessories). Extension cable model AC1616 may be used to allow up to 200 meter (656ft) probe separation (restrictions may apply - please consult factory).

### Connector identification

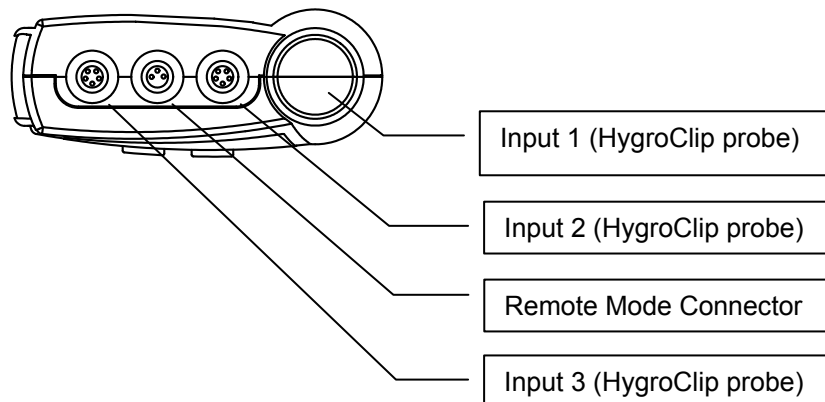
#### NT1



#### NT2



#### NT3



Note: an adapter cable is required to connect a probe to input 2 or 3 of the HygroLog NT3. Use cable MOK-02-B5 (or similar) for probes with a 5-pin DAT-05 connector. Use cable T7-03-B5 (or similar) for probes with a 7-pin T7 connector.

## Remote Mode connector (NT2 and NT3)

Both the HygroLog NT2 and NT3 have a remote mode connector. This allows using a HygroLog NT2-D or a HygroLog NT3-D (display and keypad) to read, configure or program a HygroLog NT2 or a HygroLog NT3 (without display and keypad).

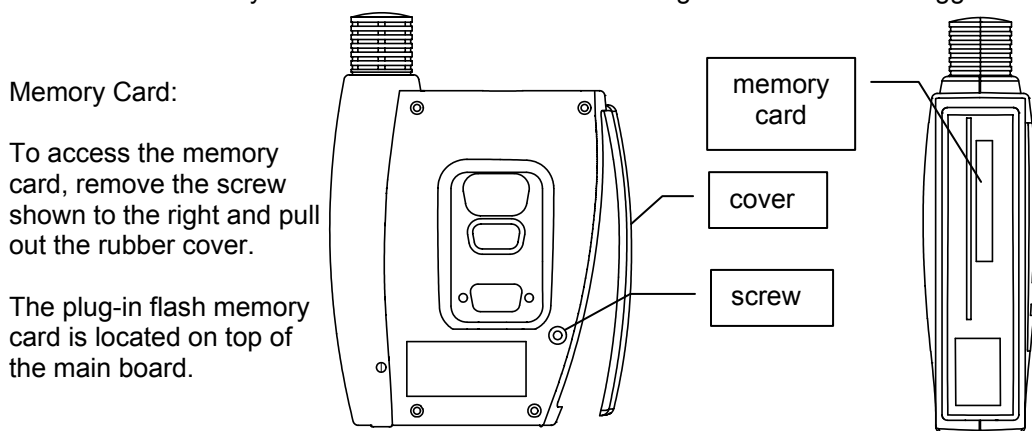
See Internal Function Menu, Remote Mode

## Memory

The HygroLog NT has a non-volatile 64 kb EEPROM internal memory that is used to save the logger configuration data, the logger events and to temporarily hold measurement data.

The main memory is a plug-in flash memory card. This holds a maximum of 498 measurement data files as well as one configuration and one logger-event file. As a standard, the HygroLog NT ships with a 16 MB card. This card allows the recording of up to 400,000 values in text file format (unprotected) or up to 750,000 values in binary file format (protected). Memory cards with a capacity of up to 1 GB can be purchased from third parties.

The measurement data can be saved either to a file with extension XLS or to a file with extension LOG. Files with XLS extension can be read with Notepad or imported into Microsoft Excel. Files with extension LOG are encoded in binary format so as to prevent data manipulation and can only be read with the ROTRONIC HW4 software. Both types of files can co-exist on the memory card. The memory card can be removed from the logger and transferred to a card reader, a PDA, etc. The flash memory card can also be read without being removed from the logger.



## PC interface

With the exception of models equipped with an internal Bluetooth transceiver, the HygroLog NT requires a docking station with the appropriate interface to be able to communicate with a PC (see Docking Station). The connector located on the back of the instrument is meant to be used with one of the available docking stations (UART interface). When installed on a PC, the ROTRONIC HW4 software is used to configure the HygroLog NT, to program its logging function, to download the recorded data and to adjust the probes connected to the logger against a reference environment.

Models with the Bluetooth option require a PC equipped with a Bluetooth transceiver and with the ROTRONIC HW4 software installed.

## **Internal Bluetooth transceiver**

The HygroLog NT2-D-BT and HygroLog NT3-D-BT are equipped with an internal Bluetooth transceiver. This transceiver can be enabled or disabled from the logger using the keypad. Due to the current consumption of the Bluetooth module, we recommend using a docking station to power the HygroLog NT whenever the Bluetooth transceiver is enabled.

The Bluetooth transceiver allows bi-directional wireless communication at distances of up to 9m / 30ft. The PC must be also equipped with a Bluetooth transceiver.

## ***LED***

The HygroLog NT is equipped with a green and red LED. The logger can be configured with HW4 to have the green side of the LED flash when logging is active. The red side of the LED can be made to flash when there is an alarm condition (see note below) and / or when the logger requires attention (low battery, flash memory card full, etc.)

In the transient alarm mode, the red LED flashes for only as long as the data from a probe corresponds to an alarm condition. In the durable alarm mode, the red LED stays on even after the alarm condition has disappeared. When the LED is set to provide a durable alarm, it can be reset from the keypad or with HW4.

## ***Internal beeper***

The HygroLog NT is equipped with an internal beeper and can be configured with HW4 to make a clicking sound when any key is being pressed. The beeper can also be configured to emit a 5-second non-repeating sound when there is an alarm condition and / or when the logger requires attention.

## DOCKING STATIONS

A docking station is required to do any of the following:

- Mount the HygroLog NT to a wall
- Place the HygroLog on the optional desk-top stand
- Use an external AC adapter to power the HygroLog NT
- Connect the HygroLog NT to a PC: RS232 or USB port, LAN or WLAN
- Connect up to 64 HygroLog NT together in a multi-dropped arrangement (RS-485)

Depending on the model, using a docking station also adds functionality to the HygroLog NT:

- Up to 4 additional probes, including analog probes and direct 4-wire RTDs
- Logical inputs (external contacts)
- Relay outputs

Note: docking station models with internal electronics substantially increase the current drawn from the battery and should be generally used with an external AC adapter.

### ***Models***

All models of docking station have the same physical dimensions and can be used either as a mechanical adapter to place the HygroLog NT on the optional desk-top stand or as a bracket to mount the HygroLog NT to a wall. Docking stations are available in the following configurations:

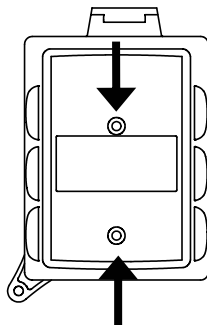
- DS-NT0: basic docking station without internal electronics. This model simply provides a means of mounting the HygroLog NT to a wall
- DS-NT1: basic docking station without internal electronics. This model simply provides a receptacle for an AC adapter used to power the HygroLog NT
- DS-NT2: receptacle for AC adapter, one serial port (RS232) and one RS485 port (multi-drop). This model has an internal electronic circuit.
- DS-NT3: receptacle for AC adapter, one USB port and one RS485 port (multi-drop). This model has an internal electronic circuit.
- DS-NT4: receptacle for AC adapter, one RJ45 connector (Ethernet), one RS485 port (multi-drop) and one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-NT4-WL: receptacle for AC adapter, WLAN transceiver, one RS485 port (multi-drop) and one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-U-1: receptacle for AC adapter, one serial (RS232) port, one RS485 port (multi-drop), four probe connectors (HygroClip or analog voltage probe), one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-U-2: receptacle for AC adapter, one USB port, one RS485 port (multi-drop), four probe connectors (HygroClip or analog voltage probe), one connector for up to two logical input signals. This model has an internal electronic circuit.

- DS-U-4: receptacle for AC adapter, one RJ45 connector (Ethernet), one RS485 port (multi-drop), four probe connectors (HygroClip or analog voltage probe), one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-U-4-4-20: same as DS-U-4 with the difference that analog probes with a 4-20 mA output signal can be used.
- DS-U-4-WL: receptacle for AC adapter, WLAN transceiver, one RS485 port (multi-drop), two probe connectors (HygroClip or analog voltage probe), one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-PT-2: receptacle for AC adapter, one USB port, one RS485 port (multi-drop networking), four connectors for RTD probe (direct 4-wire connection), one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-PT-4: receptacle for AC adapter, one RJ45 connector (Ethernet), one RS485 port (multi-drop networking), two connectors for RTD probe (direct 4-wire connection), one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-PT-4-WL: receptacle for AC adapter, WLAN transceiver, one RS485 port (multi-drop networking), two connectors for RTD probe (direct 4-wire connection), one connector for up to two logical input signals. This model has an internal electronic circuit.
- DS-R-1: receptacle for AC adapter, one USB port, one RS485 port (multi-drop networking), one connector for up to two logical input signals and two independent relay output connectors. This model has an internal electronic circuit.

## Installation

Installation is the same for all models of docking station.

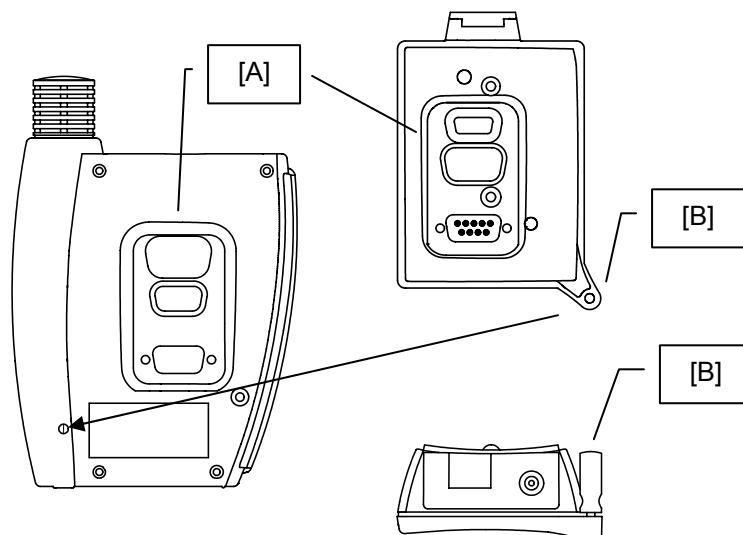
To mount the docking station to a wall, use the two holes shown on the right. The HygroLog NT can then be attached to the docking station as explained below.



To attach the HygroLog NT to the docking station:

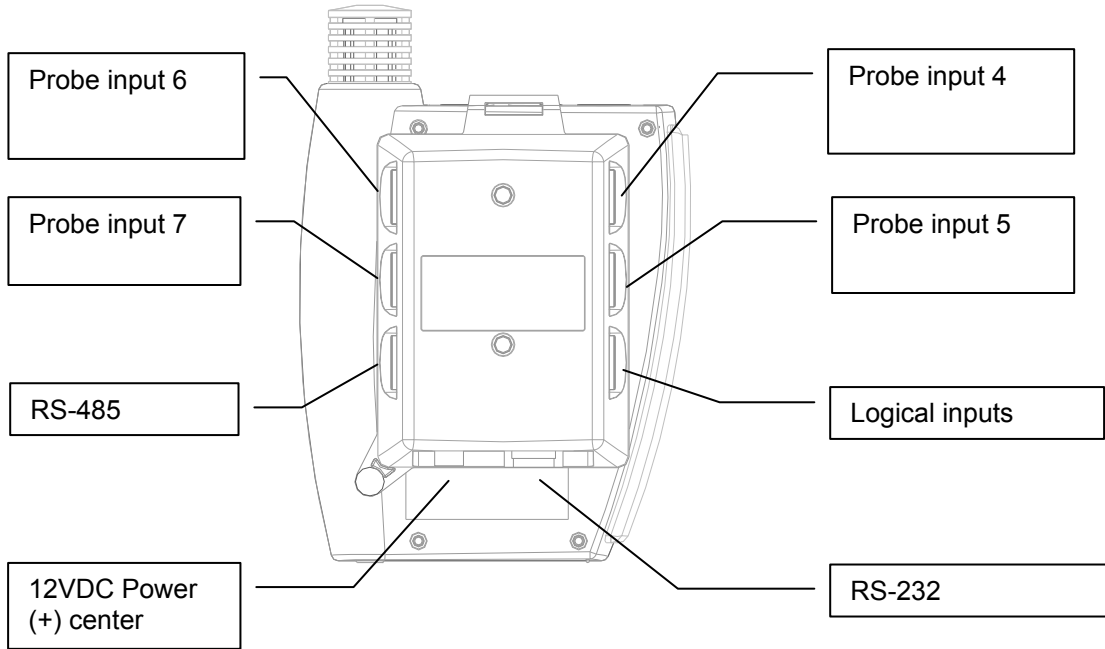
Place the HygroLog NT on the docking station so as to match the two areas [A]. Press lightly one against the other and secure the assembly with threaded pin [B].

When the docking station is mounted on a wall, a small padlock (not shown) may be put through pin [B] to prevent removal of the HygroLog NT from the docking station.

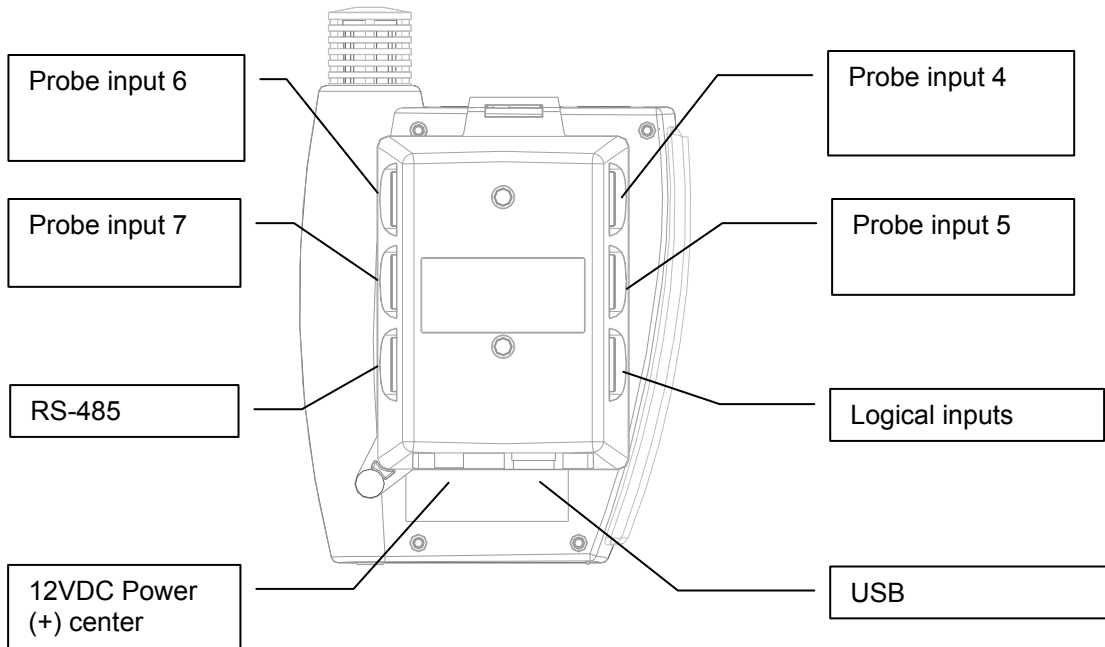


## Connector identification

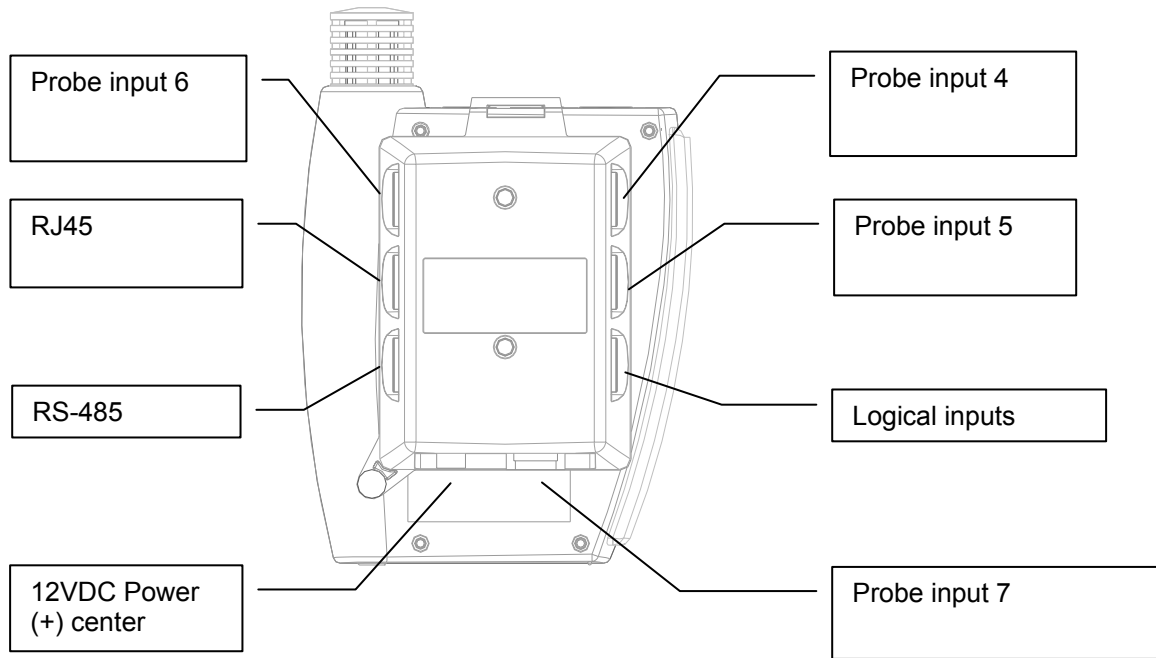
### DS-U1



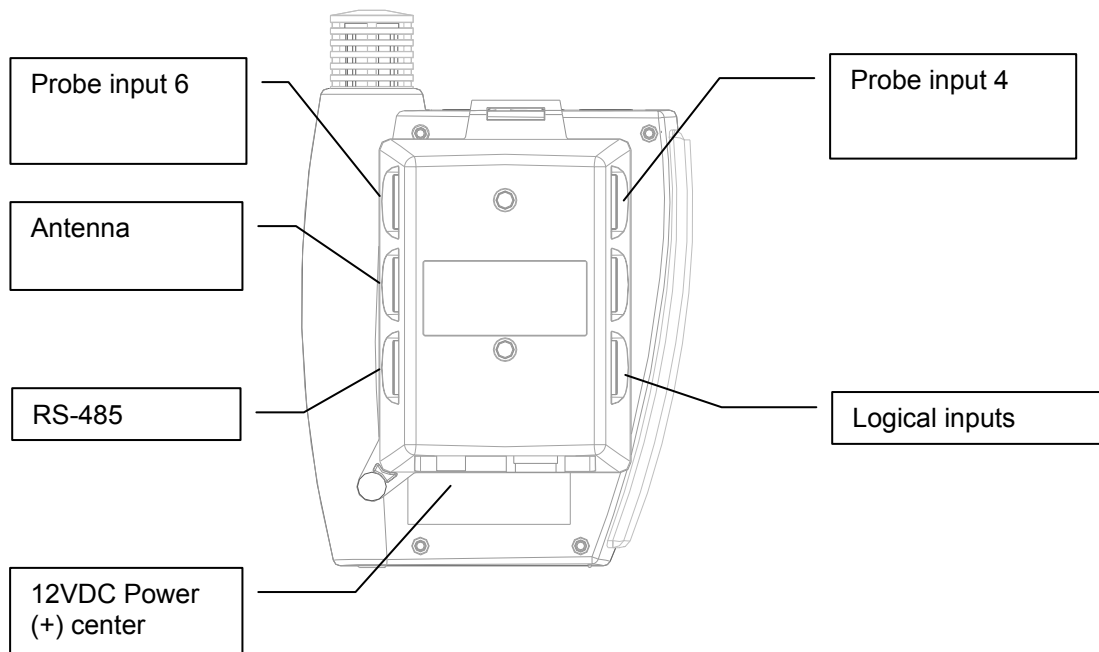
### DS-U2



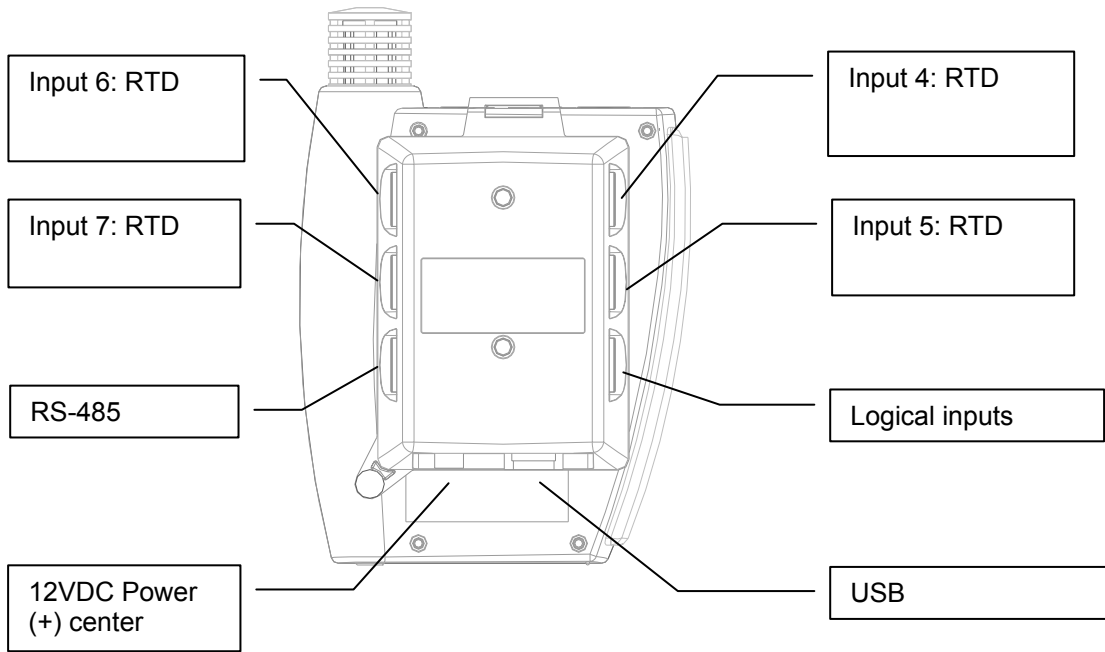
**DS-U-4 / DS-U-4-4-20**



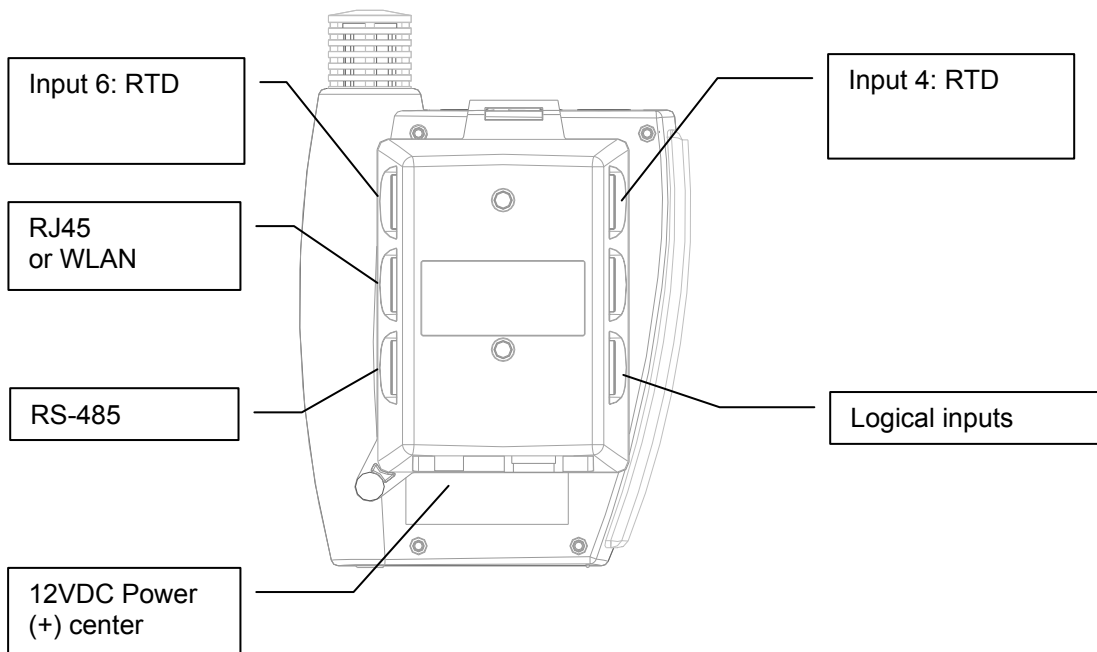
**DS-U-4-WL**



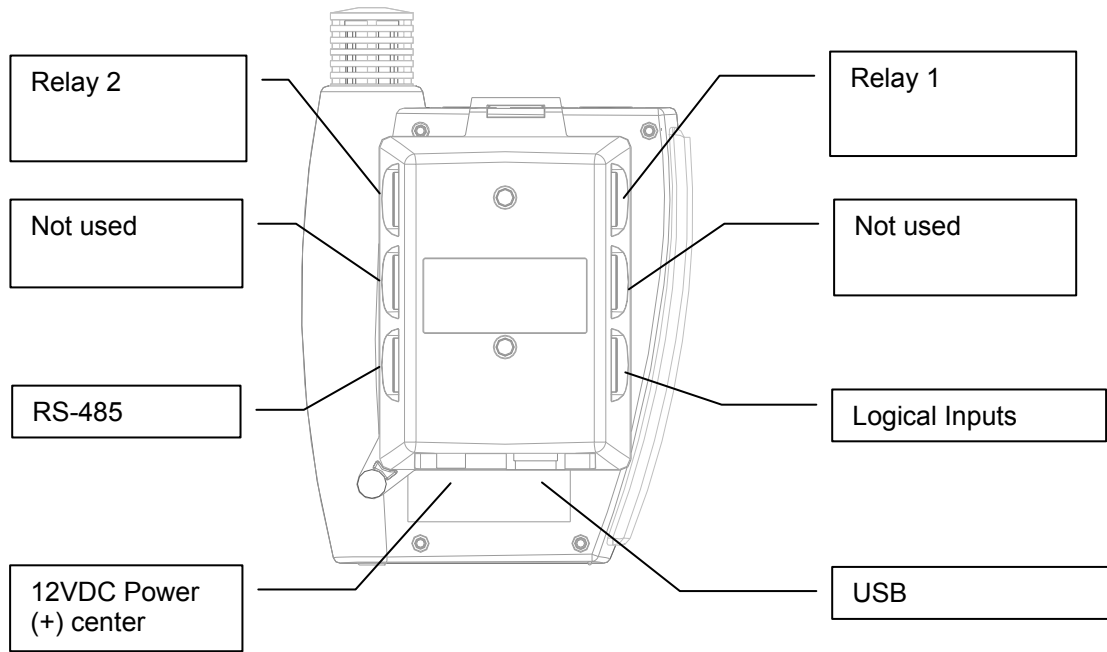
**DS-PT-2**



**DS-PT-4 / DS-PT-4-WL**



**DS-R-1**



The relay contacts are specified as follows:

Contact material	Silver alloy
Initial contact resistance	100 mΩ
Initial insulation resistance	Min. 1,000 MΩ at 500V DC
Nominal switching capacity 1)	2 A 250 VAC
Minimum switching power 1)	1,500 VA
Maximum switching voltage 1)	250 V AC
Maximum switching current 1)	2 A AC
Minimum switching capacity 1)	100 mA, 5 V DC
Expected life (min. operations)	Mechanical: $5 \times 10^6$ Electrical: N.O. $5 \times 10^4$ N.C. $3 \times 10^4$

1) Resistive

The DS-R-1 docking station is provided with two matching 4-pin connectors. The pins of these connectors are numbered on the connector solder side (see pin-out diagrams).

## **Probe inputs**

Depending on the model of docking station, the signals from up to 4 additional probes can be processed by the HygroLog NT. These probes can be either HygroClip digital probes or analog probes (including pressure probes). Any input used together with an analog or pressure probe should be configured with the ROTRONIC HW4 software.

## **HygroClip probes**

An adapter cable is required to connect a probe to inputs 4, 5, 7 and 7 of the docking station. Use cable MOK-02-B5 (or similar) for probes with a 5-pin DAT-05 connector. Use cable T7-03-B5 (or similar) for probes with a 7-pin T7 connector.

## **Analog and pressure probes**

An analog probe may be used to measure with the HygroLog NT a parameter other than humidity or temperature. For example, an analog pressure probe may be used to provide the value of barometric pressure required for the calculation of parameters such as the wet bulb temperature, mixing ratio or enthalpy.

The following requirements and restrictions apply to analog probes:

- ROTRONIC analog humidity-temperature probes with the standard temperature output signal of  $-0.5...2.0\text{ V} = -50...200^{\circ}\text{C}$ : because the HygroLog NT cannot read a negative voltage signal, temperature measurement is generally limited to values above freezing.
- Third-party analog probes: single channel probes (one signal), voltage output signal within the range of 0 to 2.5 VDC, supply voltage: 7.6...9 VDC (direct from the HygroLog NT battery) or 12 VDC when using an AC adapter, maximum current consumption: 10 mA.

Docking station model DS-U-4-4-20 accepts up to four 3-wire single channel analog probes with a 4-20 mA current output signal. The probes are powered by the docking station (supply voltage: 7.6...9 VDC (direct from HygroLog NT battery) or 12 VDC when using an AC adapter, maximum current draw: 10 mA / probe). It is also possible to use a 2-wire single channel probe but in that case only one probe can be connected to the docking station (use any of the two probe inputs). Connecting two 2-wire probes at the same time would create a current loop and result in erroneous measurements.

- Resolution is limited by the 10-bit A/D converter used for the analog inputs. This converter provides a theoretical maximum of 1024 counts for an input voltage span of 2.5 VDC. In theory, this gives a resolution of  $2.5 / 1024 = 0.00244\text{ V}$ . In practice, it is not possible to get 100% of the counts from an A/D converter and the actual resolution should be about 0.0027 V (typical). For example, if a probe with a temperature signal of  $0...1\text{ V} = 0...100^{\circ}\text{C}$  is being used, the signal resolution will be about  $100 \times 1 \times 0.0027 = 0.27^{\circ}\text{C}$

## **Direct 4-wire RTD probes**

Docking stations that accept direct 4-wire RTD probes allow measurement of temperature conditions within the range of  $-100$  to  $600^{\circ}\text{C}$ . Accuracy depends on the class of Pt100 RTD used for the probes. Presently, there is no provision for making an adjustment of the RTD inputs against a reference.

## **Logical signal inputs (on / off)**

Several models of docking station allow the HygroLog NT to process up to 2 logical inputs. Typically this is used to monitor a relay contact, a door contact, etc.

## Relay contacts

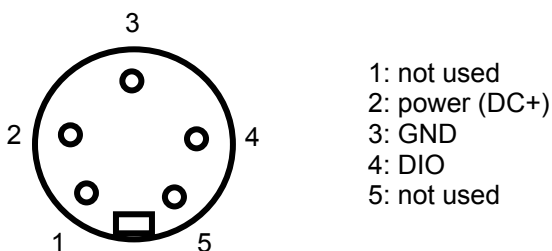
Docking station model DS-R-1 features two independent relays, each with 3 contacts: normally closed, normally open and common. When configuring the HygroLog NT and docking station with the HW4 software, a number of conditions can be defined that will cause the relay to be energized.

The relays of the DS-R-1 docking station can be used to provide a local indication of the following:

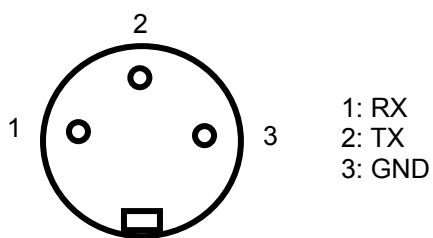
- Out of limit values for probe inputs 1 to 3 of the HygroLog NT
- Status of the two logical inputs of the DS-R-1 docking station
- Memory card error
- External power failure
- Low battery charge

## PIN-OUT DIAGRAMS

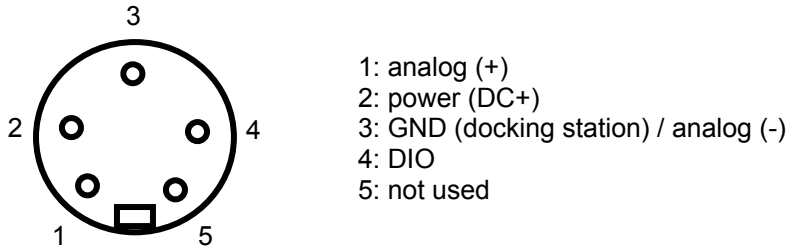
**Input 1, 2 and 3 (HygroLog NT2, NT3) - solder side of matching male connector**



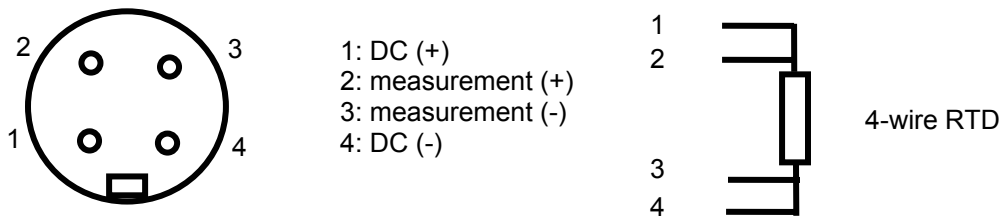
**Remote Mode (HygroLog NT2 / NT3) - solder side of matching male connector**



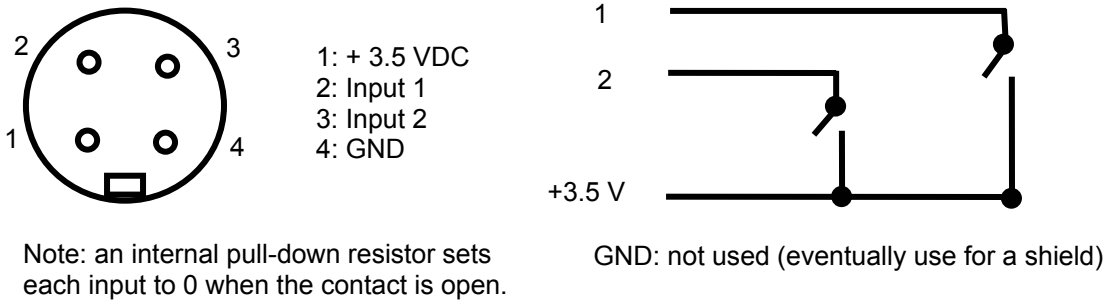
**Input 4, 5, 6 and 7 (docking stations with HygroClip or analog input - solder side of matching male connector)**



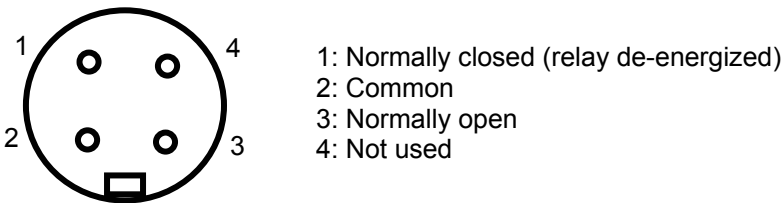
**Input 4, 5, 6 and 7 (docking stations with RTD input) - solder side of matching male connector**



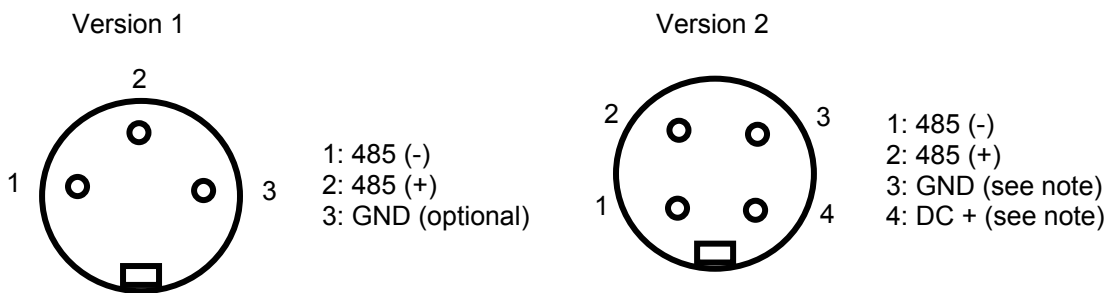
**Logical inputs (docking station) - solder side of matching male connector**



**Relay outputs (docking station) - solder side of matching male connector**

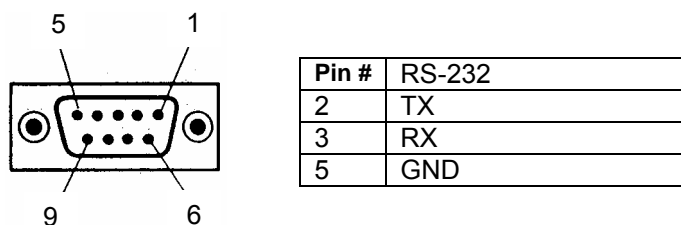


**RS-485 port (docking station) - solder side of matching male connector**



Note: use pins 3 and 4 to power multi-dropped instruments with a single external 12 VDC power supply with adequate mA rating. Pin 4 and the 12VDC power jack of the docking station are not connected.

**RS-232 port (docking station) - solder side of matching male connector**



**OPERATING LIMITS (electronics only)**

Models without display:

- -10...50°C with the factory supplied alkaline battery
- -30...70°C with a lithium battery or an external AC adapter

Models with display:

- -10...50°C with the factory supplied alkaline battery
- -10...60°C with a lithium battery or an external AC adapter

The HygroClip probes have generally wider operating limits (see individual probe specifications).

## SOFTWARE FUNCTIONS

### ***Calculated parameter***

Using the HW4 software, the HygroLog NT can be set to compute for each probe one of the following psychrometric parameters.

- Dew point (Dp)
- Frost point (Fp)
- Wet bulb temperature (Tw)
- Enthalpy (H)
- Vapor concentration (Dv)
- Specific humidity (Q)
- Mixing ratio by weight (R)
- Vapor concentration at saturation (Dvs)
- Vapor partial pressure (E)
- Vapor saturation pressure (Ew)

A different parameter can be associated with each individual probe:

Note: depending on whether dew point or frost point was selected, both the HygroLog NT and HW4 will display either the symbol Dp or the symbol Fp for values below freezing. The symbol Fp indicates that the value is a frost point as opposed to being a dew point. Regardless of the dew point / frost point selection, the symbol Dp is always displayed for values above freezing.

Some of the above parameters require barometric pressure as an input. If an analog pressure probe is connected to one of the HygroLog NT inputs, the logger can be set to use the measurement from this probe. When no pressure probe is being used, a fixed pressure value can be used. This value can be specified as part of the HygroLog NT settings.

### ***Trend indicators***

See also: Main operating modes and measurement interval

When the trend indicator function is enabled, a symbol appears on the left side of the LC display, on the line corresponding to each measured or calculated value. An up arrow denotes a rising value and a down arrow denotes a decreasing value. Both arrows denote a stable value.

The trend of a parameter is evaluated by comparing successive averages made of 6 values each. With the shortest possible measurement interval of 5 seconds, each average covers a time period of 30 seconds and the first indication of a trend is available after one minute. Subsequently, the trend is evaluated and updated every 30 seconds. With a longer measurement interval, each average is computed over a longer period of time (always using 6 values) and the trend is also updated over longer intervals of time.

For any measured or calculated parameter, the trend indicator shows a stable condition when the absolute value of the difference between two successive averages is  $< 0.02$ .

### ***Alarm function***

Using the HW4 software, both a high and a low alarm value can be associated with the humidity, temperature and calculated parameter of each probe input. A hysteresis value can also be entered for each parameter. This value is used for both the low and the high alarm conditions.

The HygroLog NT has a red LED which can be set with HW4 to flash whenever the value of any parameter corresponds to an alarm condition. The LED can be set to flash only as long as the alarm condition exists or it can be set to provide a durable alarm and, in this case, it will keep flashing until the alarm is reset.

The HygroLog NT can also be set with HW4 to beep for 5 seconds when there is an alarm condition. The HygroLog NT will beep only once, when the condition occurs.

Log files do not record the existence of an alarm condition. However, when the contents of a log file are viewed as a data table with the HW4 software, values that correspond to an alarm condition are printed over a red background, based on the alarm settings that HW4 downloaded from the logger.

## ***Data logging***

Data logging requires that a flash memory card be inserted inside the logger. Using HW4, log files can be set to one of the following formats:

- HW4 binary format [LOG]: files in this format are encoded and can be opened only with the ROTRONIC HW4 software. HW4 does not allow any manipulation / alteration of the data and requires a password to log in. Should the file be somehow modified, HW4 will give a warning that the file is not an original.
- Text file format [XLS]: in principle, files in this format can be opened with any text editor and / or imported into Microsoft Excel.

The log file format is a global setting of the flash memory card (changing this setting requires the HW4 software). At any given time, the card records data from all inputs in either one format or the other. Files of different formats can co-exist in the flash memory card. Binary files (protected) use substantially less memory space than text files (unprotected).

The logging function is independently activated for each individual input. The HygroLog NT creates a separate file for each input that is to be recorded. Multiple inputs cannot be recorded to the same file. The HygroLog NT automatically generates each file name. A file name consists of 8 digits followed by the extension LOG or XLS. The first 4 digits are the same as the last 4 digits of the logger serial number, the 5<sup>th</sup> digit is the same as the input number and the last 3 digits are a number between 000 and 999 used to differentiate log files created for the same input. The last number that was created is retained in the non-volatile EEPROM and is updated whenever a new file is created for the input. When the number reaches 999, the next update will reset it to 000.

All files are located in the root directory of the flash memory card, including the logger event file and the logger configuration file. Regardless of the memory card capacity, the root directory is limited to a maximum of 500 files. This means that the memory card can hold a maximum of 498 log files, and that a card with this amount of files is considered to be full, even if all the memory has not been used.

Using HW4, the following log settings can be defined individually for each input:

- Start date and time
- Stop date and time
- Log interval (minimum 5 seconds)
- Measured values and computed parameter, or any parameter combination
- User custom text (used for the log file header)
- User name, HW4-ID, HW4 Serial Number
- Automatic creation of a new file after 200,000 data points or at the end of each day, week or month

Note: unlimited logging (loop mode logging) is not possible. Logging stops automatically when the flash memory card is full. Prior to logging, the user may use HW4 to check the amount of free memory, and verify that there is enough room available.

If the flash memory card is removed when logging is active, the HygroLog NT will stop logging until a new card is inserted. Unless the stop date and time have been reached, logging will start again under the next available file name when a new card is inserted.

Warning: removing the memory card while logging is active may result in a corrupted log file and in loss of data.

Logging can be started immediately for any individual input from the keypad of the HygroLog NT. A deferred start can only be programmed with HW4. The green LED of the HygroLog NT can be set to flash when the instrument is recording data. To conserve battery power, you may want to do this only when an external power source is being used.

Logging can be immediately stopped for any individual input directly from the keypad. With HW4, logging can be stopped either immediately or at a future date and time for any individual input or for all inputs.

When logging is ended, the HygroLog NT returns to the measuring mode.

### ***Display-Sleep function***

This function can be enabled and configured only with the HW4 software.

Using the Display Sleep function can substantially extend the lifetime of the battery. When the Display Sleep function is active, the LC display of the HygroLog NT stays blank. The Display Sleep function is effective both in the measure and in the record mode.

The display of the HygroLog NT can be set to be always on. It can also be set to automatically go blank after 30 seconds, 1, 5, 10 or 20 minutes when no key is being pressed or when there is no communication with a PC. If the HygroClip NT was in the function menu at the time the display goes blank, it automatically exits the menu.

The HygroLog suspends the Display Sleep function whenever a key is pressed. The function is also suspended when external power is available or when the logger receives a communication request (for example from a PC <sup>1</sup>). When the display comes up again, it shows by default the measurements from the probe that was selected last.

<sup>1</sup> **When the HygroLog NT is connected by means of a docking station to a PC and HW4 is running, you should use an external AC adapter to power both the HygroLog NT and docking station.** HW4 uses a 5-second interval to interrogate all instruments connected to the PC and this could cause the battery life time to be sharply reduced.

## **COMPLIANCE with FDA 21CFR Part II and GAMP**

When used together with the ROTRONIC HW4 software – Professional Edition; the HygroLog NT complies with the FDA / GAMP requirements regarding electronic records and electronic signatures. HW4 is designed to keep track of logger configuration changes, programming changes and of any probe adjustment. HW4 also keeps track of user events (main operations performed by each user) and self-events (software problems). The records generated by HW4 are protected, have an electronic signature and can be cross referenced one with the other.

**IMPORTANT:** In order to comply with the FDA / GAMP requirements, be sure to configure both the HygroLog NT and HW4 as follows (use HW4 to this purpose):

- When using HW4 and the HygroLog NT for the first time, create at least one user with administrator rights and password (HW4 Users and Passwords). After creating one or more users, be sure to log as one of the users (HW4 - Users and Passwords - Change User). Doing this enables the HygroLog NT to maintain a record of any change made by any user.
- Enable HW4 to monitor electronic signatures and user events (HW4 - Global Settings - Events)
- Enable HW4 to monitor system events (HW4 - Global Settings - General)
- Enable protocols in HW4 (HW4 - Device Manager - Device Manager Settings)
- If the HygroLog NT has a display and keypad, disable the MENU key (HW4 - Device Manager - Keypad).

The HygroLog NT keeps track of the last 170 operations, events and configuration changes. This data is retained in the internal non volatile EEPROM memory of the HygroLog NT and is also automatically written to the flash memory card in a special event file (file extension .EVT). This protected file can be opened with HW4 and cross referenced with the other HW4 record files.

Examples of events monitored by the HygroLog NT:

- Log function programming
- Log function start
- Log function stop
- Log function disabled because there is no memory card in the logger
- Probe adjustment
- Removal and installation of the flash memory card
- Flash memory card is full
- Start-up (Boot)
- Watchdog timeout
- Logger configuration changes
- Alarm condition detected
- Beeper / Led
- Battery
- Change in the calculated parameter
- Measured values configuration
- Optional inputs
- RS-232 connection
- Network address change (RS-485)
- Language change
- Trend on / off
- User custom text
- Time and date change
- Insertion of the logger in the docking station
- Low Battery - beginning / end
- Accumulator charge - beginning / end
- Connection / removal of an external power adapter
- Use of protected commands
- Access to the flash memory card files
- File deletion from the flash memory card
- Transmission of SMS
- Activation of the Bluetooth transceiver
- Instrument power up / power down

## OPERATION

### ***Required accessories / equipment***

- Models without display/keypad and without Bluetooth transceiver:

The following accessories are required in order to be able to use the logger:

Any model of docking station (except model DS-NT1)  
Connecting cable docking station to PC  
PC with the ROTRONIC HW4 software installed

- Models with display/keypad and without Bluetooth transceiver:

In principle, these models can be used without any accessory. However, accessing all of the product functions and changing some important settings such as the date and time requires the same accessories as for the models without display.

Note: the HygroLog NT3-D can be used to read and to program the HygroLog NT3 (see Remote Mode). The two instruments must be connected together, using the "Remote" connector and the appropriate cable.

- Models with display/keypad and with Bluetooth transceiver:

PC with the ROTRONIC HW4 software installed  
Bluetooth transceiver connected to PC

### **HW4 Software Requirements**

Note: a full description of HW4 is available in a separate manual (HW4Instr.pdf). This document can be downloaded from our web site.

The following are the minimum values required to install and run HW4 on a computer. It is highly recommended to exceed these values.

- Processor: Pentium II, 450 MHz
- RAM: 128 MB
- Available hard disk space: 50 MB
- Monitor: SVGA, 1024 x 768, 256 colors
- Ports: one free serial (COM) port or one free USB port

Operating System compatibility:

- Windows 98, XP, NT4 with SP 6a or higher
- Windows 2000 with SP 2 or higher
- Windows Server 2003

HW4 was written for the Microsoft .NET framework and requires this framework to be installed on the computer.

The .NET framework offers significant improvements in the areas of networking and user security. When new software is being installed, the .NET framework also eliminates the potential problem of conflicting dynamic library files (DLL). According to Microsoft, the .NET framework will be used by all future Microsoft operating systems.

## ***Getting started***

Insert a 9V alkaline battery in the HygroLog NT as explained under Hardware Description - Power. **To conserve battery power, models with a display are shipped with the Display Sleep function enabled.** With this function enabled and when logging is not active, the logger just keeps track of the date and time and uses very little battery power. Press any key on the keypad to temporarily suspend the Display Sleep function. The HW4 software is required to either disable the Display Sleep function or to reconfigure this function. See Display Sleep function under Software Functions

## ***Display and keypad***

Depending on the model, the HygroLog NT is equipped with a display and a keypad.

### **Display**

The HygroLog NT uses a monochrome graphic LC display with a resolution of 128 x 88 pixels. The active area of the display measures 48 x 33 mm. The normal function of the display is to show the most recent measured values, one at a time. The display is also used to navigate the Function Menu of the HygroLog NT.

**IMPORTANT:** Using the HW4 software, the display can be set to automatically go blank after a specific time interval when there is no keypad activity and when there is no communication over the UART interface. This serves the purpose of conserving battery power. The display comes up again when any key is pressed or when a communication is initiated. See Software Functions, Display Sleep function.

### **Keypad**

The keypad of the HygroLog NT is comprised of the following keys:

- **MENU:** press this key to open the function menu, to go back one menu level or to exit the menu.

- **ENTER:** this key has two functions:

If the function menu is not open, press this key to switch the display between showing the measured values, date, time and probe number and showing the measured values and calculated parameter (if HW4 was used to associate a calculated parameter with the probe).

If the function menu is open, press this key to select a menu item and/or to confirm a value or setting.

- **UP:** the up-arrow key has two functions:

If the function menu is not open, the up-arrow key is used to switch the display between the different probe inputs.

If the function menu is open, the up-arrow key is used to navigate the function menu and/or to change the setting or value of a menu function.

- **DOWN:** the down-arrow key has a similar functionality as the up-arrow key:

**IMPORTANT:** the HW4 software can be used to disable either the MENU key or the entire keypad. If the keypad does not work, you should check the configuration of the HygroLog NT with

HW4. Disabling the MENU key prevents unauthorized changes to the configuration of the HygroLog NT and also prevents any probe adjustment. Compliance with FDA / GAMP requires the MENU key to be disabled.

## ***Display modes***

The display shows the measurement data for one input at a time. Values shown on the display are updated according a refresh interval that can be set with the HW4 software. Use the UP or the DOWN arrow key to switch between inputs. Two different modes are available to display the measurement data. Use the ENTER key to toggle between the two modes:

- **Display Mode 1:**

Measured value 1 (usually relative humidity)  
Measured value 2 (usually temperature)  
Date and time  
Probe / input description (as entered with HW4 when configuring the HygroLog NT)

Note: the bottom line of the display remains empty if no description was entered for the probe or input.

- **Display Mode 2:**

Measured value 1 (usually relative humidity)  
Measured value 2 (usually temperature)  
Calculated parameter (as selected with HW4 when configuring the HygroLog NT)

Note: in this mode, the last line of the display shows the symbols --.- when no calculated parameter was selected with HW4.

In both modes, a trend indicator appears to the left of each measured value when the trend function is enabled. See Software Functions, Trend Indicators.

## ***Operating modes and measurement interval***

The HygroLog NT has two main operating modes: measure and record.

- **Measure mode:** the HygroLog NT defaults to this mode when it is not recording any data. What happens in this mode depends on whether or not the HygroLog NT is communicating with a PC.

When there is no communication with a PC, the model without display is in a low power consumption mode and just keeps track of the date and time. The model with display behaves differently, depending on whether or not the Display Sleep function is enabled (see Software Functions). If the function is disabled (display always on), measurements take place at intervals of time corresponding to the display refresh interval that was specified with HW4 when configuring the data logger. When the display goes blank because the Display Sleep function is enabled, the model with display behaves in the same manner as the model without display.

- **Record mode:** the model without display measures data according to the log interval that was specified for each individual input. The shortest log interval is 5 seconds. The log interval and the measurement interval are the same. In the case of the model with display, the measurement interval is the shortest of the log interval and display refresh interval. If the Display Sleep function is active, the measurement interval is by default the same as the log interval.

## ***Settings and functions***

### **Settings and functions accessible both from the Keypad and HW4**

Note: access to the following functions from the keypad can be prevented by disabling the MENU key when configuring the HygroLog NT with the HW4 software.

The following settings can be entered / programmed from either the Keypad or with the HW4 software:

- Display mode: measured and calculated values or measured values, date, time and probe / input description
- Unit System (metric or English) - configuring some English units such as pressure requires HW4
- Trend indicators on / off
- Symbol used for humidity
- Contrast of the LC display
- Decimal resolution of the display
- Date
- Time
- Enable / disable optional Bluetooth transceiver
- Logging functions (set individually for each input, cannot be scheduled for a future date / time):
  - Start logging
  - Stop logging
  - Log Interval
- View recorded data (in table form only)
- Probe adjustment functions, one probe at a time (HygroClip probes only)

### **Settings and functions accessible only with HW4**

- User specific information (retained in the logger)
- Custom text associated with the logger (30-character description)
- Network address of the logger
- Language used in the logger menu
- Date and time format / separators
- Decimal symbol
- Pressure unit (English) and mixed unit systems
- Individual input settings:
  - Probe / input description (maximum 12 characters)
  - Parameter to be calculated for an individual input
  - Barometric pressure: fixed value or read from an input
  - Value to be used as fixed barometric pressure
  - Alarm settings for humidity, temperature and calculated parameter

- Display settings:
  - Display refresh rate
  - Turn display off after xx minutes
  - Alternate the display - automatically show all inputs one after the other
- Keypad disable functions:
  - Disable entire keypad
  - Disable only the MENU key
- Type of internal power source: standard battery or rechargeable battery
- Display Sleep function - enable / disable
- LED and Sound settings
- Cancel a latching alarm (LED on logger and/or de-energizing optional docking station relays)
- Programming of the optional inputs
- Log file format (global setting of the flash memory card)
- Logging functions (set individually for each input, can be scheduled for a future date / time):
  - Start date and time
  - Stop date and time
  - Log measured values and computed parameter, or any combination
  - Custom text (used for the log file header - up to 43 characters)
  - User name, HW4-ID, HW4-serial number (used for the log file header)
  - Automatic creation of a new file after 200,000 data points or at the end of each day, week or month
- Global programming of the log function of all inputs
- Data downloading (from the logger) and associated functions
- Simultaneous adjustment of several probes (HygroClip probes only)

## ***Internal Function menu***

### **Log data**

This menu item is used to immediately start or stop recording data from each individual input. Log operations that are set in the future and / or settings that apply globally to all probe inputs cannot be programmed from here. When data logging is not active, selecting this menu item displays the following:

- Probe: probe name (custom name specified by user)
  - To change the probe, use the up or down arrow key to highlight probe and press ENTER. Use the arrow keys to change the probe and press ENTER to confirm the selection.
- Interval: log interval in HH:mm:ss
- START LOGGING: record data immediately
- EXIT: exit the log data function

When data logging is either in progress or has been scheduled at a future time, the third menu item (START LOGGING) changes to:

- STOP LOGGING: stop recording data immediately

### **View Data**

This menu item is used to view on the LC display data from the most recent log file for the selected probe (older log files cannot be opened with this menu item).

- Probe: probe name (custom name specified by user)
  - To change the probe, use the up or down arrow key to highlight probe and press ENTER. Use the arrow keys to change the probe and press ENTER to confirm the selection.
- [OPEN]: select and press ENTER to review the data

- [EXIT]: select and press ENTER to exit this menu item

If there is no log file in the flash memory card for the selected probe, the message “Log file not found” appears. When there is at least one log file for the selected probe, data from the most recent file is presented in table form, showing 7 lines of data at a time. Each line corresponds to the log interval that was in effect when the data was recorded. The date and time corresponding to line 4 (this line is always highlighted) are displayed at the bottom of the display.

The first 7 data points of the log file are presented first. Press the UP arrow key to view the next 7 data points. Press the DOWN arrow key to view again the previous data points. Both the date and time change at the bottom of the display as the arrow keys are pressed until the beginning or end of the log file has been reached.

For a faster data review, press the ENTER key. The scrolling step is displayed at the top of the display and changes each time that the ENTER key is pressed. For example, with the scrolling step set to 7 and a log interval of 30 seconds, time moves in increments of 3 minutes and 30 seconds (7 x 30 seconds) each time that one of the arrow keys is being pressed.

Press the MENU key to exit the data table.

## **Adjust (except HygroLog NT1)**

This menu item can be used to adjust (calibrate) any ROTRONIC HygroClip digital probe that is connected to the HygroLog NT. The adjust function cannot be used with other types of probe.

IMPORTANT: see the instructions provided under “Adjusting a HygroClip probe” before using this function.

- Probe: probe name (custom name specified by user)  
To change the probe, use the up or down arrow key to highlight probe and press ENTER. Use the arrow keys to change the probe and press ENTER to confirm the selection.
- Adjust: parameter to be adjusted (humidity, humidity RHS or temperature)
- Mode: adjustment type (single- of multi-point)
- RefValue: reference value against which the probe will be adjusted
- ADJUST: adjust the probe
- EXIT: exit the adjust function

Note: next to the word “current”, the bottom of the display shows the value of the parameter to be adjusted at the time the parameter to be adjusted was selected. This value is not updated while the Adjust menu item is active (exit Adjust to update the value).

## **Settings**

This menu item allows both to review and to modify some of the settings of the HygroLog NT and to cancel (reset) a permanent alarm condition.

- Trend: turn trend indicators on or off.
- Units: use Metric or English unit system
- H.Symbol: select the symbol to be used for relative humidity RH, Aw, HR, rh, rF
- Contrast: contrast setting, 0% is the minimum and 100% is the maximum
- Decimals: decimal resolution of the display 1 or 2.
- Date
- Time
- Bl. tooth - enables / disables the optional Bluetooth transceiver
- Exit

To change a setting:

- Use the UP or DOWN key to highlight the setting to be changed. The entire line corresponding to the setting is highlighted.
- Press on the ENTER key to select the setting. Only the value of the setting is highlighted.
- Use the UP or DOWN key to review the available setting values
- When the desired value is displayed, press on the ENTER key
- The entire line corresponding to the setting is highlighted again.

To cancel a durable alarm:

- Use the UP or DOWN key to highlight the line that says [Cancel Alarm].
- Press on the ENTER key. The line text changes to [Alarm Cancelled]

## Instrument

This menu item provides information on the HygroLog NT. No changes can be made from within this menu item.

- Release: firmware release
- S/N: serial number
- Address (network address of the logger)
- Baud rate: serial transmission rate
- Battery: % remaining battery capacity (automatically reset to 100% after replacing the battery)
- Ext. Power: No (not connected), Yes (connected)
- Name: custom name specified by the user for the logger (max. 30 characters)

Press the ENTER key to exit this menu item

## Inputs

This menu item provides information on the inputs of the HygroLog NT and optional docking station. No changes can be made from within this menu item. Information is shown one input at a time. The input number appears on the top of the screen and can be changed with the up-arrow or with the down arrow key.

- Status: Connected / Not Detected - shows if a probe is connected or not
- Name: custom name specified by the user for the input (max. 12 characters)
- Release: firmware release of the probe (HygroClip probes only)
- S/N: serial number of the probe (HygroClip probes only)
- Logging: status of the logging function for the input being displayed
  - scheduled: data from the input is scheduled to be logged at a future time
  - active: data from the input is being logged
  - inactive: no input data is being logged or scheduled to be logged

## Docking Station

This menu item provides information on any docking station with internal electronics that is attached to the HygroLog NT. No changes can be made from within this menu item.

- Status: Connected / Not Detected
- Release: firmware release of the docking station
- S/N: serial number of the docking station

## **Remote Mode (HygroLog NT2 / NT3)**

A HygroLog NT2-D or NT3-D (with display and keypad) can be used to read the measurements and access the function menu of a HygroLog NT2 or NT3 (without display and keypad).

To use the Remote Mode, the two instruments must be connected with a special cable that plugs into the Remote Mode connector of each unit (see Accessories). The function is activated from the menu of the unit with the display and keypad. When the function is active, the unit with display and keypad displays the measurements and the function menu of the other unit. The remote mode is disabled when the (fictitious) MENU key of the unit without display and keypad has been blocked out during configuration with HW4 (FDA / GAMP requirement).

## ***Warnings and Useful tips***

### Do not attempt to charge a regular battery:

When using a regular battery, configure the logger with HW4 so as to disable the internal battery charge function of the logger. **Trying to recharge a regular battery is potentially dangerous.**

### Date and Time Format:

Prior to using your logger for the first time, be sure to verify the following configuration settings: date format (including separator), time format (including separator) and decimal separator. In order to be able to read log files on a PC, these settings must be identical to the settings of the PC operating system. If necessary, use HW4 to re-configure your logger.

### Conserving Battery Power:

When no external AC adapter is connected, use the HW4 software to set the display to automatically go blank after a specific time interval when there is no keypad activity or communication over the UART interface.

Set both the display refresh rate and the log interval to the highest values compatible with your application.

Avoid using a docking station with internal electronics without using an AC adapter.

Do not connect several probes to the HygroLog NT without using an AC adapter.

### Internal Probe (Input 1):

For a faster response, use the probe in the extended position.

### Compliance with FDA / GAMP:

Use the HW4 software to disable either the MENU key or the entire keypad. Disabling the MENU key prevents unauthorized changes to the configuration of the HygroLog NT and also prevents any probe adjustment.

## ADJUSTING A HYGROCLIP PROBE

### *Single Point*

Note: this function is not available with the HygroLog NT1

#### Definition

The Single-Point function permits to do a 1-point adjustment (temperature or humidity) of a ROTRONIC HygroClip digital probe against a known reference environment. This function is limited to a simple offset adjustment that is applied across the entire measuring range.

- For a temperature adjustment the reference value should be  $\geq -20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) and  $< 40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ )
- For a humidity adjustment, any reference value may be used.

Warning: a 1-point adjustment is no substitute for a full calibration (2 or more points). Doing a 1-point adjustment can improve accuracy over a narrow range of conditions but may also be detrimental to accuracy at other conditions.

#### Procedure

IMPORTANT: always adjust temperature first (if temperature needs to be adjusted)

Wait for the probe to be at equilibrium before using the ADJUST function.

Use the UP or DOWN key to highlight any menu item. Press on the ENTER key to select the menu item. Only the value of the item is highlighted. Use the UP or DOWN key to review the available choices or to change a numerical value. When the desired selection or value is displayed, press on the ENTER key. The entire line corresponding to the menu item is highlighted again.

Make the appropriate selections from the ADJUST menu:

- Probe: name of the probe to be adjusted (custom name specified by user)  
To change the probe, use the up or down arrow key to highlight probe and press ENTER. Use the arrow keys to change the probe and press ENTER to confirm the selection.

- Adjust: select here the parameter to be adjusted

Humidity: humidity adjustment against a stable environment of known value.

Humi RHS: humidity adjustment against a ROTRONIC certified standard 1)

Temperature: temperature adjustment against a stable environment of known value.

1) For adjusting humidity, ROTRONIC offers convenient, certified humidity standards to generate known humidity values (see separate probe calibration manual).

- Mode: select Single Point
- RefValue: Use the UP or DOWN key to change the numerical value of the reference to be used for the adjustment. For a faster change of the numerical value, keep the key pressed down. If using a ROTRONIC humidity standard (Humi RHS), use the mean value (at  $23^{\circ}\text{C}$ ) written on the certificate supplied with the standard.

Note: in the RHS mode, the software automatically compensates for the effect of temperature on the humidity standard. No additional correction is required.

- ADJUST: highlight this menu item and press on ENTER to do the adjustment
- EXIT: highlight this menu item and press on ENTER to exit the ADJUST function

The bottom of the display shows the word "Current" and the value read by the probe at the time the ENTER key was pressed

Note: you can exit the ADJUST function at any time (without adjusting the probe) by pressing the MENU key.

## ***Multi-Point***

Note: this function is not available with the HygroLog NT1

### **Definition**

The Multi-point function permits the full calibration of a ROTRONIC HygroClip digital probe against a known reference environment. This function is designed to permit calibration at 2 temperature values and at up to 4 relative humidity values.

### **Procedure**

IMPORTANT: always adjust temperature first (if temperature needs to be adjusted)

Wait for the probe to be at equilibrium before using the ADJUST function.

Use the UP or the DOWN key to highlight any menu item. Press on the ENTER key to select the menu item. Only the value of the item is highlighted. Use the UP or DOWN key to review the available choices or to change a numerical value. When the desired selection or value is displayed, press on the ENTER key. The entire line corresponding to the menu item is highlighted again.

Make the appropriate selections from the ADJUST menu:

- Probe: name of the probe to be adjusted (custom name specified by user). To select a different probe, use the up or down arrow key to highlight probe and press ENTER. Use the arrow keys to change the probe and press ENTER to confirm the selection.
- Adjust: select here the parameter to be adjusted

Humidity: humidity adjustment against a stable environment of known value.

Humi RHS: humidity adjustment against a ROTRONIC certified standard 1)

Temperature: temperature adjustment against a stable environment of known value.

1) For adjusting humidity, ROTRONIC offers convenient, certified humidity standards to generate known humidity values (see separate probe calibration manual).

- Mode: select MultiPoint
- RefValue: Use the UP or the DOWN key to change the numerical value of the reference to be used for the adjustment. For a faster change of the numerical value, keep the key pressed down.

If using a ROTRONIC humidity standard (Humi RHS), use the mean value (at 23°C) written on the certificate supplied with the standard.

Note: in the RHS mode, the software automatically compensates for the effect of temperature on the humidity standard. No additional correction is required.

When using the multi-point function, it is important to observe the following rules:

- a) When both temperature and humidity are to be adjusted, temperature should be adjusted first because it is an input value for the temperature compensation of the humidity sensor.
- b) Always adjust the probe first at the low value (T-low). The HygroLog NT assumes that any temperature below 40°C (104°F) is T-low and this is used to compute the offset. The gain is computed from the high temperature value (T-high), using 20°C as a fixed pivot point. Because of this, T-low should be as close as possible to 20°C (68°F) so as not to introduce an error. Any temperature  $\geq 40$  °C (104 °F) is automatically assumed to be T-high.
- c) When adjusting humidity (2, 3 or 4 points) with the ROTRONIC humidity standards, always follow the sequence 35 %RH, 80 %RH, 10 %RH or 5 %RH, 0 %RH. When using a reference other than the ROTRONIC humidity standards, adjust against reference humidity values that are within the following brackets. Be sure to observe the sequence since each adjustment point influences the next adjustment point:

>25 %RH...≤55 %RH	: used to compute the adjustment offset
>55 %RH	: used to compute the adjustment gain
>1 %RH...≤25 %RH	: sensor linearity adjustment
≤ 1 %RH	: sensor linearity adjustment

The HygroLog NT automatically recognizes these brackets. Any value between 25 and 55 %RH is automatically used to compute the offset. Any value higher than 55 %RH is used to compute the gain, based on a fixed pivot point of 35 %RH. Because of this, the first adjustment value should be as close as possible to 35 %RH so as not to introduce an error.

- ADJUST: highlight this menu item and press on ENTER to do the adjustment
- EXIT: highlight this menu item and press on ENTER to exit the ADJUST function

The bottom of the display shows the word “Current” and the value read by the probe at the time the ENTER key was pressed

Note: you can exit the ADJUST function at any time (without adjusting the probe) by pressing the MENU key.

## NETWORKING

Networking the HygroLog NT requires the use of a docking station (any model other than the DS-NT1). Depending on the model of docking station, the following is available to connect the HygroLog NT to a PC:

RS-232 (serial) port, USB port or LAN / WLAN (TCP/IP - RJ45 connector or wireless connection)

HW4 accepts a mix of TCP/IP, RS-232 and USB connections. All connections are detected automatically by HW4.

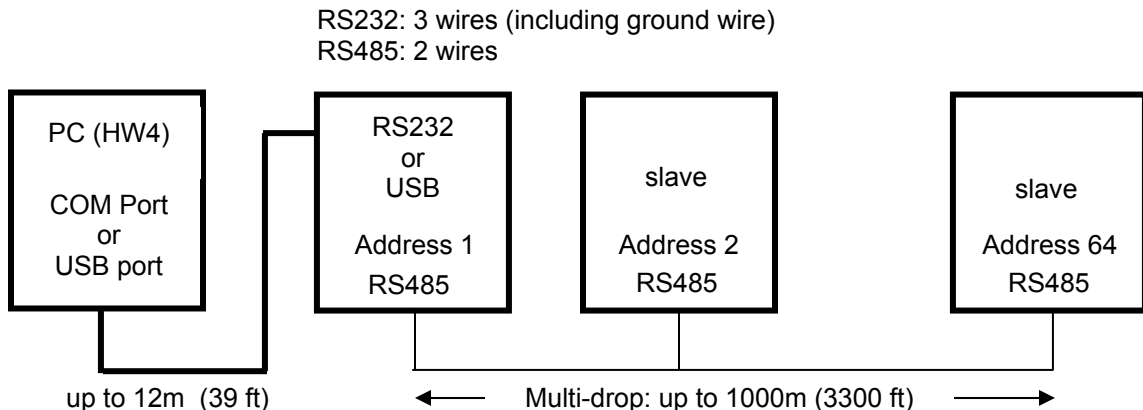
With the exception of model DS-NT1, all models of docking station also feature an RS-485 connector. When the number of available ports (serial, USB or TCP/IP) is limited, this can be used to connect together up to 64 HygroLog NT in a multi-dropped arrangement. In principle, an unlimited number of such networks can be monitored with the HW4 software, but each RS-485 multi-drop network is limited to 64 HygroLog NT and docking stations. Any HygroLog NT can be used either as a slave or a master, without special configuration. The master is automatically the device that is directly connected to the PC by means of a COM or USB port or the device that is directly connected to a TCP/IP port. The RS485 wiring can be done with a twisted pair (2-wire, telephone type) and wall mounted RJ45 receptacles. No shielded cable and no terminator should be required. Be sure to observe the polarity for each connection.

Automatic RS-485 Address Generation: the RS-485 address of the HygroLog NT is used to differentiate instruments that are connected within a multi-dropped RS-485 sub-network. This address is part of the HygroLog NT communications protocol. Instruments that are directly connected to the PC or to an Ethernet network can share the same RS-485 address. The factory default for the RS-485 is 00. HW4 automatically changes the RS-485 address from 00 to 01 for any HygroLog NT that is directly connected for the first time to the PC (master). As a result, all masters have the same RS-485 network address (01). In the situation where a multi-drop RS-485 network is also detected, HW4 automatically gives each slave in the multi-drop a unique network address ranging from 02 to 64. The same address range (02 to 64) is used again when there is more than one multi-drop RS485 network.

In the case where HW4 will not be used to monitor the devices on the RS-485 network, HW4 should be used to manually give each device a unique network address prior to connecting to the RS-485 multi-drop network. You may also want to use HW4 to give each HygroLog NT a descriptive name for easier identification.

### Docking station with RS232 or USB port

The number of docking stations with RS-232 or USB port that can be directly connected to a PC depends on the number of physical COM ports and USB ports available on the PC.

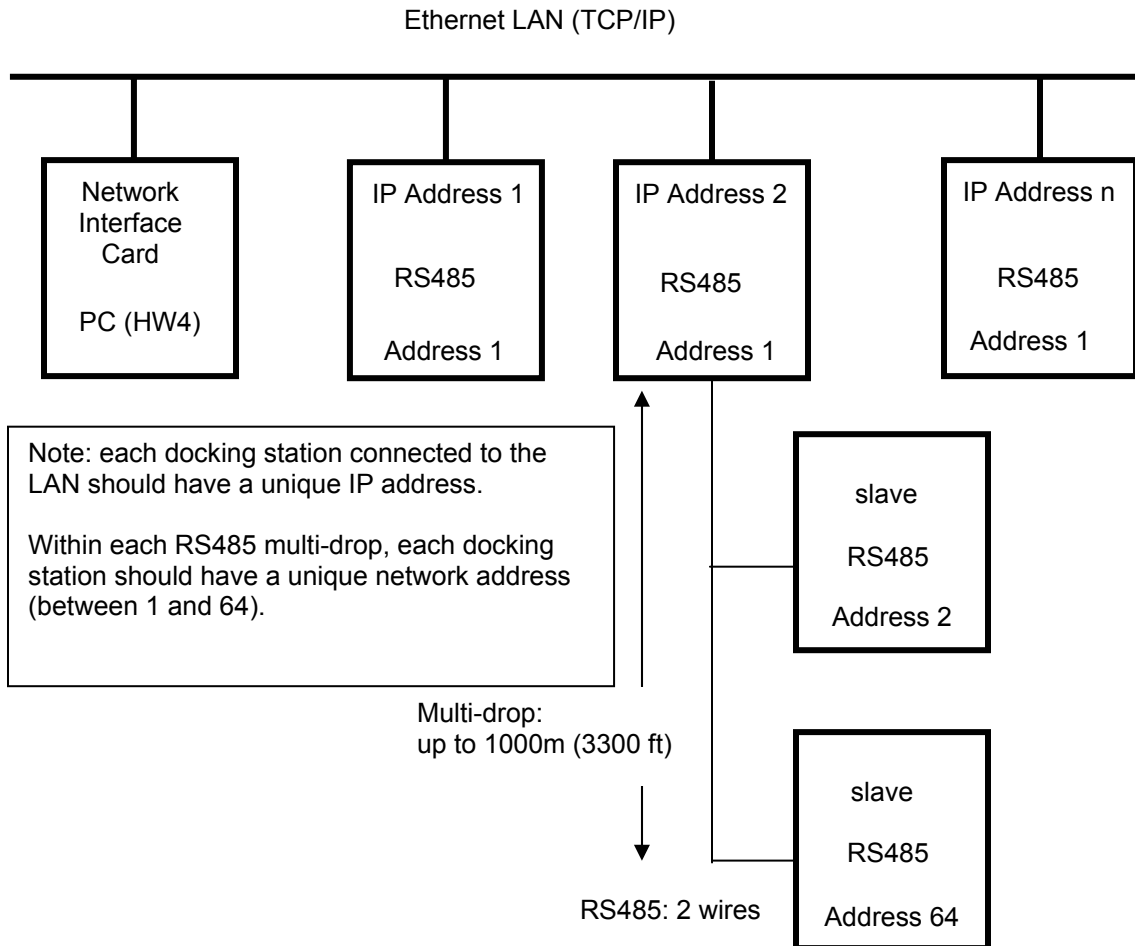


Using the RS485 connector, a maximum of 64 HygroLog NT with docking station can be connected directly or indirectly to each RS-232 or USB port (multi-dropped network). The RS232 connection between the first device and the PC requires 3 wires: RX, TX and GND <sup>1)</sup>. Without a signal booster, the maximum cable length is limited to 12 m (39 ft).

1) GND is internally connected to the power ground of the device

### Docking station with RJ45 connector or WLAN transceiver (TCP/IP)

In principle, using a LAN or WLAN (TCP/IP) allows an unlimited number of HygroLog NT to be connected either locally or by way of the Internet. Both cases are compatible with the HW4 software.



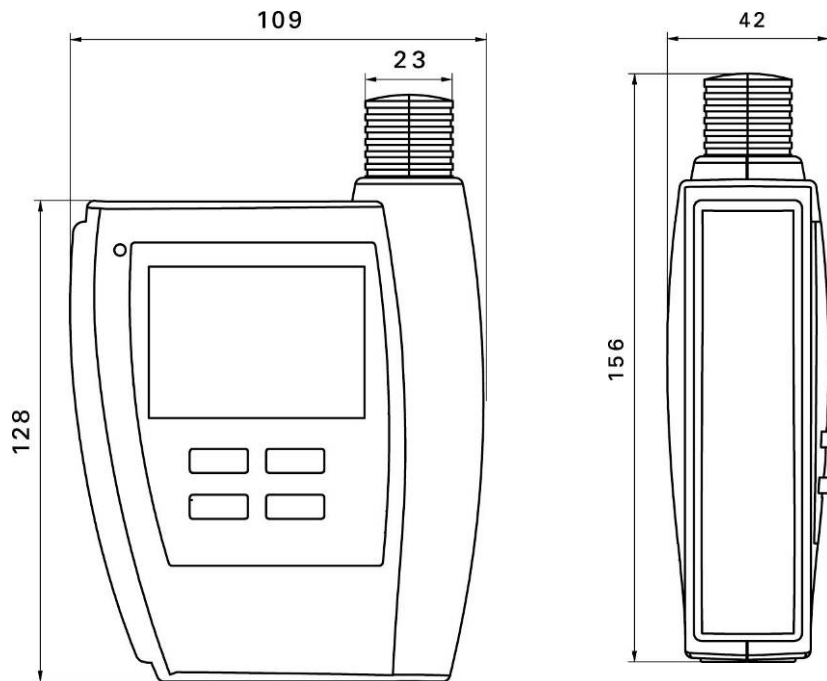
#### IMPORTANT:

If you change an instrument that was previously connected from being a master (direct connection the PC or direct TCP/IP connection) to being an RS-485 slave, be sure to change the RS address of the instrument to 00 before establishing the RS-485 connection (same address as a new instrument from the factory). Not doing so may prevent HW4 from detecting the instrument. After detecting the instrument, HW4 will automatically change the RS address to 02 or higher. In all other situations, do not use address 00 as this address number will eventually be changed by HW4.

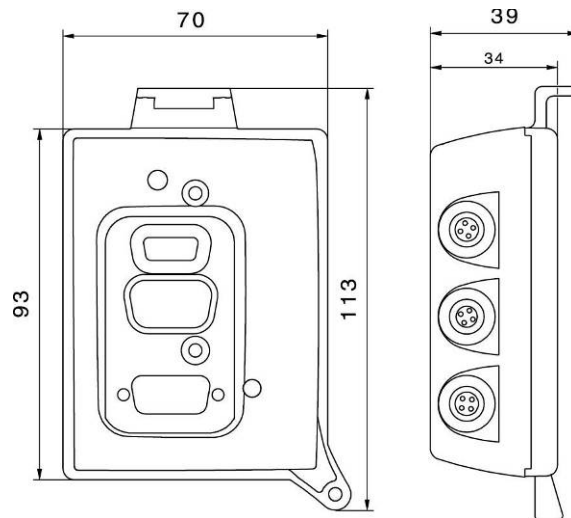
## SPECIFICATIONS

Model	HygroLog NT1	HygroLog NT2	HygroLog NT3
Internal Humidity / Temperature probe	Integral probe	Plug-in ROTRONIC HygroClip S	
Operating limits electronics			
Humidity	0...100 %RH		
Temperature	-30...70 °C (-22...158°F) / -10...60 °C (14...140°F) with display		
Operating limits battery			
Alkaline battery	-10...+50 °C (14...122°F)		
Lithium battery	-30...+70 °C (-22...158°F)		
Measuring range			
Internal probe	0...100 %RH, same temperature limits as logger		
External probes	See probe specifications HygroClip probes are available for temperatures within the range of -50...200°C / -58...392°F		
Accuracy at 23°C (internal probe)	±2 %RH ±0.4°C	±1.5 %RH ±0.2°C	
Interface			
Logger	UART	UART Bluetooth (option)	
Docking station	RS232 or USB , RS485		
Internal Power supply	9V battery ≥500 mAh		
External power supply	Via docking station (allows use of a rechargeable battery)		
Battery lifetime	> 1 year - w/o display, 1 probe, 15 min. log interval		
Display	Graphic LC display (option)		
Event logging	Practically unlimited number of events such as configuration changes, alarm, etc.		
Internal Menu	Simplified functions, viewing of logged data		
Internal probe adjustment	N/A	Direct from internal menu	
External probe adjustment	Direct from internal menu (HygroClip probes only)		
Probe inputs			
Logger	Internal probe only		Internal probe + 2 external HygroClip probes
Docking station	Up to 4 probes (HygroClip probes, analog probes or RTD probes (Pt100) and 2 digital signals (depends on model)		
Plug-in Memory Card	Compact flash memory card (16 MB standard - up to 1 GB)		
Internal memory	EEPROM		
Memory capacity (16 MB compact card)	400,000 data points in text file format 752,000 data points in encoded binary format (protected)		
Log interval	Programmable from 5 sec to 24 hours		
Log mode	Start / Stop, with programmable date and time		
Alarm function	Optical and acoustical - programmable		

Housing	ABS, protection grade IP65
Logger dimensions	
Logger	155 x 106 x 37 mm
Docking station	110 x 70 x 37 mm
Weight	
Logger	about 300 g
Docking station	about 175 g
NT desk stand	About 350 g
Conformance	FDA CFR 21 / 11 / GAMP4
Anti-theft protection	Use docking station



Docking Station



Dimensions in mm

## ACCESSORIES

Order Code	Description
HW4-E	HW4 Edition software (CD ROM), single user
HW4-P	HW4 Professional software (CD ROM) FDA/GAMP conformance, multi user
MOK-02-DAT05	Extension cable for HygroClip probes with DAT05 connector (use for input 1 of the HygroLog NT2 / NT3). Cable length 2 meter (6.5 ft)
MOK-02-B5 MOK-05-B5	Adapter cable for HygroClip probes with DAT05 connector (use for inputs 2 to 7). Cable length 2 meter (6.5 ft) or 5 meter (16.4 ft)
T7-03-B5	Adapter cable for HygroClip probes with T7 connector (use for inputs 2 to 7). Cable length 3 meter (9.8 ft)
AC1616	Probe extension cable with T7 connectors and signal amplifier, 2 to 200 meter (6 to 656 ft) – restrictions may apply, please consult factory
DS-NT0	Basic docking station – used as a bracket to mount the HygroLog NT to a wall
DS-NT1	Same as DS-NT0 – plus receptacle to plug-in an AC adapter to power the HygroLog NT
DS-NT2	Same as DS-NT1 plus one serial port (RS232) and one RS485 port
DS-NT3	Same as DS-NT1 plus one USB port and one RS485 port
DS-NT4	Same as DS-NT1 plus one RJ45 connector (Ethernet), one RS485 port and one connector for up to two logical input signals.
DS-NT4-WL	Same as DS-NT1 plus W-LAN transceiver, one RS485 port and one connector for up to two logical input signals.
DS-U-1	Same as DS-NT1 plus one serial port (RS232), one RS485 port, four probe connectors (HygroClip or analog voltage probe) and one connector for up to two logical input signals.
DS-U-2	Same as DS-NT1 plus one USB port, one RS485 port, four probe connectors (HygroClip or analog voltage probe) and one connector for up to two logical input signals.
DS-U-4	Same as DS-NT1 plus one RJ45 connector (Ethernet), one RS485 port, four probe connectors (HygroClip or analog voltage probe) and one connector for up to two logical input signals.
DS-U-4-4-20	Same as DS-NT1 plus one RJ45 connector (Ethernet), one RS485 port, four probe connectors (HygroClip or 4-20 mA analog current probe) and one connector for up to two logical input signals.
DS-U-4-WL	Same as DS-NT1 plus W-LAN transceiver, one RS485 port, two probe connectors (HygroClip or analog voltage probe) and one connector for up to two logical input signals.
DS-PT-2	Same as DS-NT1 plus one USB port, one RS485 port, four connectors for RTD probe (direct 4-wire connection) and one connector for up to two logical input signals.

Order Code	Description
DS-PT-4	Same as DS-NT1 plus one RJ45 connector (Ethernet), one RS485 port, two connectors for RTD probe (direct 4-wire connection) and one connector for up to two logical input signals
DS-PT-4-WL	Same as DS-NT1 plus W-LAN transceiver, one RS485 port, two connectors for RTD probe (direct 4-wire connection) and one connector for up to two logical input signals
DS-R-1	Same as DS-NT1 plus one USB port, one RS485 port, two relay output connectors and one connector for up to two logical input signals.
NT-Desk	Desktop stand for HygroLog NT with docking station
AC1211	AC adapter 12VDC / 200mA, includes adapter for US receptacles
11.01.6218	Data cable RS232 - docking station to PC (length 1.8 m / 5.9 ft)
2/11/8818	Data cable USB type A-B - docking station to PC (length 1.8 m / 5.9 ft)
AC1614-02	RS-485 cable with 3-pin connector and tinned ends. Suitable for connecting to a terminal box. Length 2 meter / 6.5 ft.
AC-NT-REM	Remote mode cable for HygroLog NT3
AC-NT-BT	Bluetooth transceiver, connects to USB port on PC
AC-NT16MB	Compact flash memory card 16 MB
AC-NT32MB	Compact flash memory card 32 MB
AC-NT64MB	Compact flash memory card 64 MB
15.08.6212	Flash card reader, incl. USB cable and driver

## COMMUNICATIONS PROTOCOL

For customers who for any reason cannot use the HW4 software a description of the HygroLog NT / docking station communications protocol is available in a separate document.

This document (Com\_NT.pdf) is available directly from ROTRONIC and can also be downloaded from our web site.