

<b>IN-E-LogNT-V1.2_11</b> <small>Document code</small>	Rotronic AG Bassersdorf, Switzerland <small>Unit</small>
<b>HygroLog NT data logger version 1.2:          instruction manual</b> <small>Document title</small>	<p style="text-align: center;"><b>Instruction Manual</b></p> <small>Document Type</small> <p style="text-align: center;">Page 1 of 50</p>

# HygroLog NT Data Logger version 1.2

## Instruction Manual



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## Applicability:

This manual is valid for instruments with firmware version 1.2x (see MENU - Instrument or check using the ROTRONIC HW4 software, Device Manager). Examples: 1.2a, 1.2b. Changes in the last character 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.

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**Note:** complete access to all functions of the HygroLog NT requires a docking station with PC interface (RS-232, USB or Ethernet) and a PC with the ROTRONIC HW4 software installed. Instructions for using the HW4 software are not included in this manual. These instructions are shipped separately on the software CD ROM.

## 1. 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 (ERES).
- 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.

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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.

## 2. General description

### 2.1 HygroLog NT 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.

### 2.2 Power supply

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 off. 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.

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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.**

## 2.2.1 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.

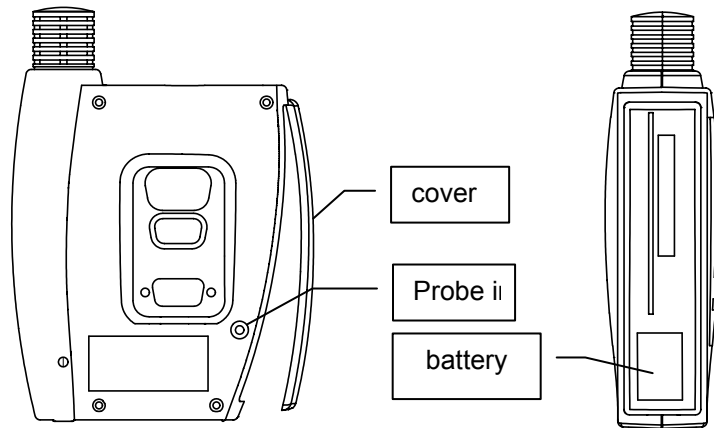
Because of the requirement to keep track of the date and time, the HygroLog NT does not have a power on/off switch. Every minute, both the date and time are recorded to the internal EEPROM. Seconds are not recorded. In the event of a relatively brief interruption of power (such as when replacing the 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.

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## 2.2.2 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.



## 2.3 Probes

### 2.3.1 Internal Probe (probe 1)

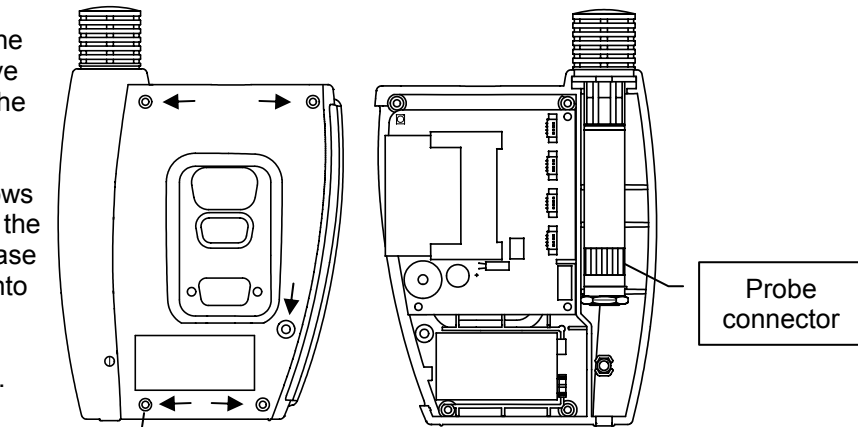
**HygroLog NT1:** this model is equipped with a non-removable internal probe, located under the slotted cap on the right hand side of the instrument.

**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.

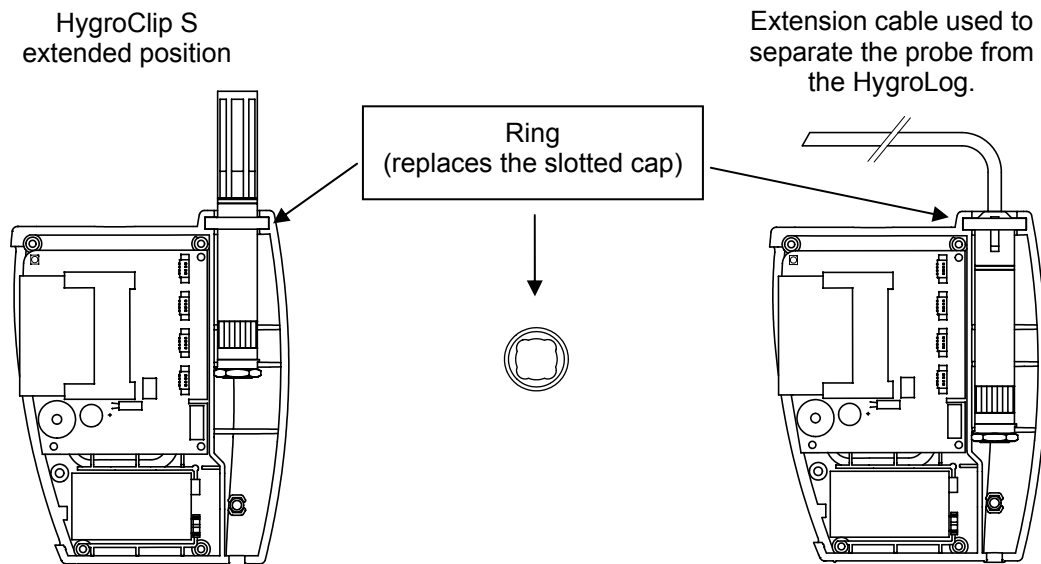
The shorter screw goes here



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.

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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.

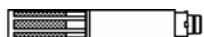
### 2.3.2 External Probes (HygroLog NT3)

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.

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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).



Tube L. 100/250mm (3.9/9.8")  
Dia. 15mm (0.6")  
Cable: 2m (6.5ft)

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



Tube L. 120/270mm (4.7/10.6")  
Dia. 15mm (0.6")  
Cable: 2m (6.5ft)

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



Cable: 2m (6.5ft)

**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

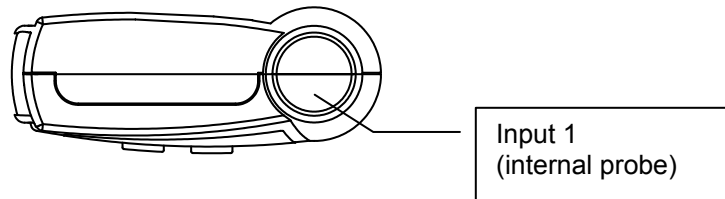


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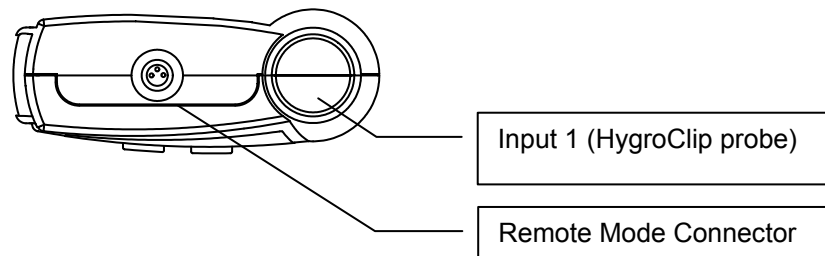
Note: the above probes have a 7-pin connector. An adapter cable such as the T7-03-B5 is required for connection to inputs 2 and 3 the HygroLog NT3 or to inputs 4 to 7 of the docking station (see Accessories). Extension cable model AC1616 may be used to allow up to 200 meter (656ft) probe separation (restrictions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

## 2.4 Connector identification

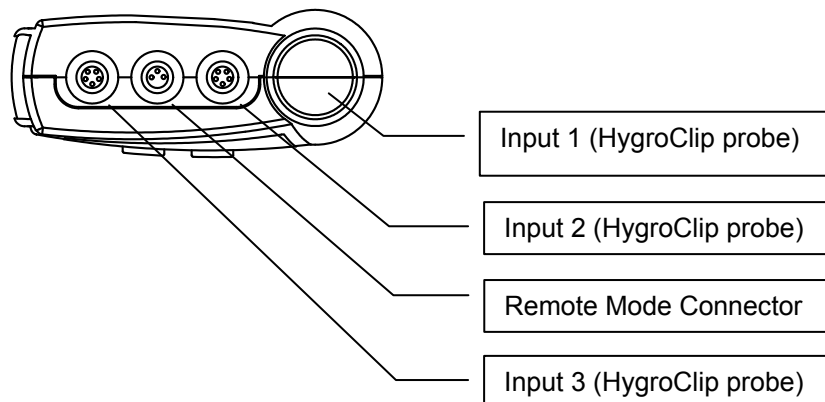
### NT1



### 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.

## 2.5 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

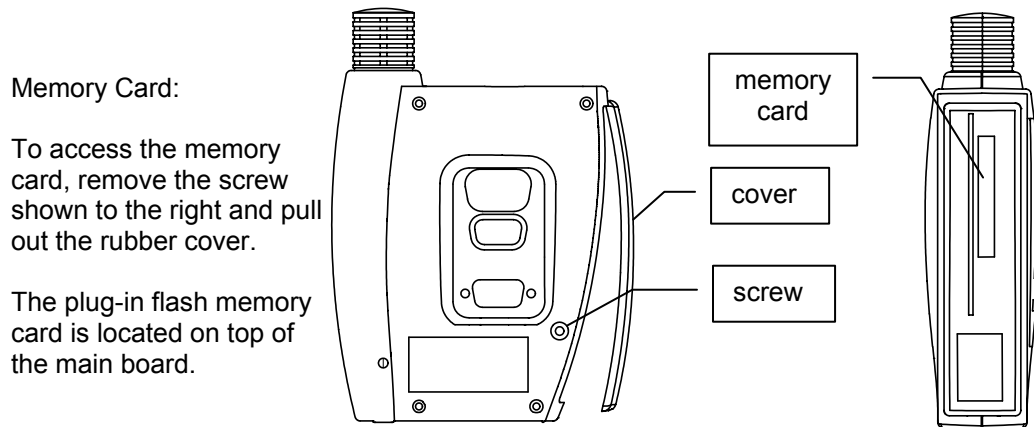
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## 2.6 Memory

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. 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. Regardless of its size, the flash memory card holds a maximum of 512 files and directories, including one logger-configuration and one logger-event file.

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.



## 2.7 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.

## 2.8 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.

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## 2.9 Models with 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 and the ROTRONIC HW4 software must be installed.

### 2.10 Docking stations

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 with the ROTRONIC HW4 software installed. The connector located on the back of the HygroLog NT 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.

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, Ethernet (TCP/IP) LAN or WLAN
- Connect up to 64 HygroLog NT or other devices together in a multi-dropped network (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 stations with internal electronics and PC interface should be generally used with an external AC adapter.

#### 2.10.1 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:

##### Docking stations without PC interface:

- 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 (similar to model DS-NT0). This model simply provides a receptacle for an AC adapter used to power the HygroLog NT

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**Docking stations with internal electronics and PC interface:**

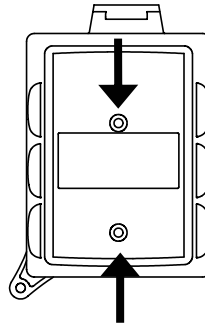
- DS-NT2: receptacle for AC adapter, one serial port (RS232) and one RS485 port (multi-drop).
- DS-NT3: receptacle for AC adapter, one USB port and one RS485 port (multi-drop).
- DS-NT4: receptacle for AC adapter, one RJ45 connector (Ethernet), one RS485 port (multi-drop) and one connector for up to two logical input signals.
- DS-NT4-WL: receptacle for AC adapter, WLAN transceiver, one RS485 port (multi-drop) and one connector for up to two logical input signals.
- DS-U1: receptacle for AC adapter, one serial (RS232) port, one RS485 port (multi-drop), four probe inputs (HygroClip or analog probe with voltage output signal), one connector for up to two logical input signals.
- DS-U2: receptacle for AC adapter, one USB port, one RS485 port (multi-drop), four probe inputs (HygroClip or analog probe with voltage output signal), one connector for up to two logical input signals.
- DS-U4: receptacle for AC adapter, one RJ45 connector (Ethernet), one RS485 port (multi-drop), four probe inputs (HygroClip or analog probe with voltage output signal), one connector for up to two logical input signals.
- DS-U4-4-20: same as DS-U4 but designed for analog probes with a 4-20 mA output signal. Each probe input uses an internal 150 Ohm resistor to convert 4...20 mA to 600...3000 mV (nominal).
- DS-U4-WL: receptacle for AC adapter, WLAN transceiver, one RS485 port (multi-drop), two probe inputs (HygroClip or analog probe with voltage output signal), one connector for up to two logical input signals.
- DS-PT2: 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.
- DS-PT4: 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.
- DS-PT4-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.
- DS-R1: 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.

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## 2.10.2 Installation

Installation is the same for all models of docking station.

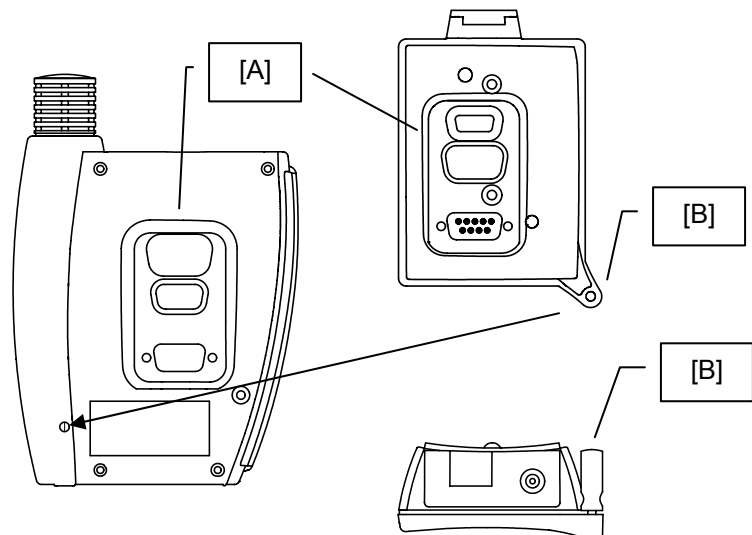
To mount the docking station to a wall, use the two holes shown on the right. The HygroLog NT can then be attached to the docking station as explained below.



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].

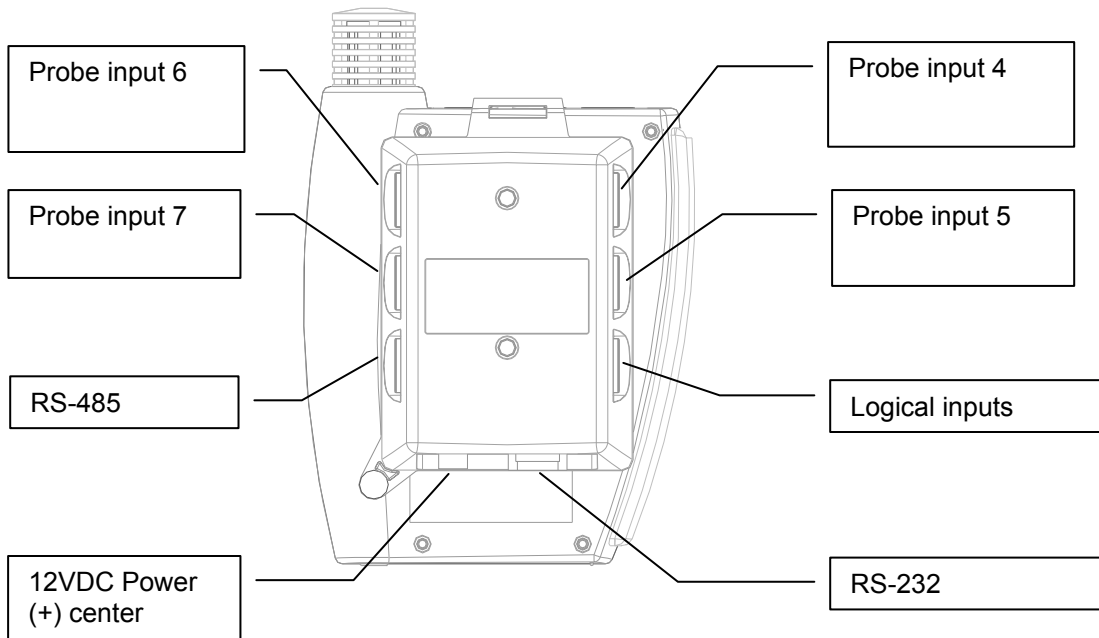
When the docking station is mounted on a wall, a small padlock (not shown) may be put through pin [B] to prevent removal of the HygroLog NT from the docking station.



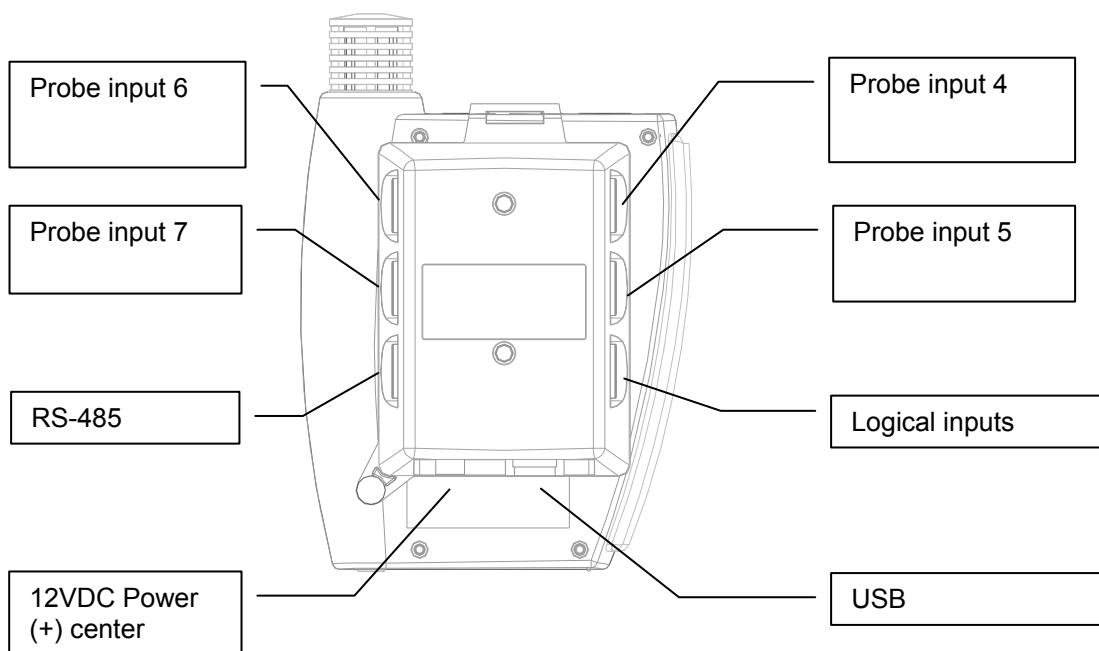
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### 2.10.3 Connector identification

#### DS-U1

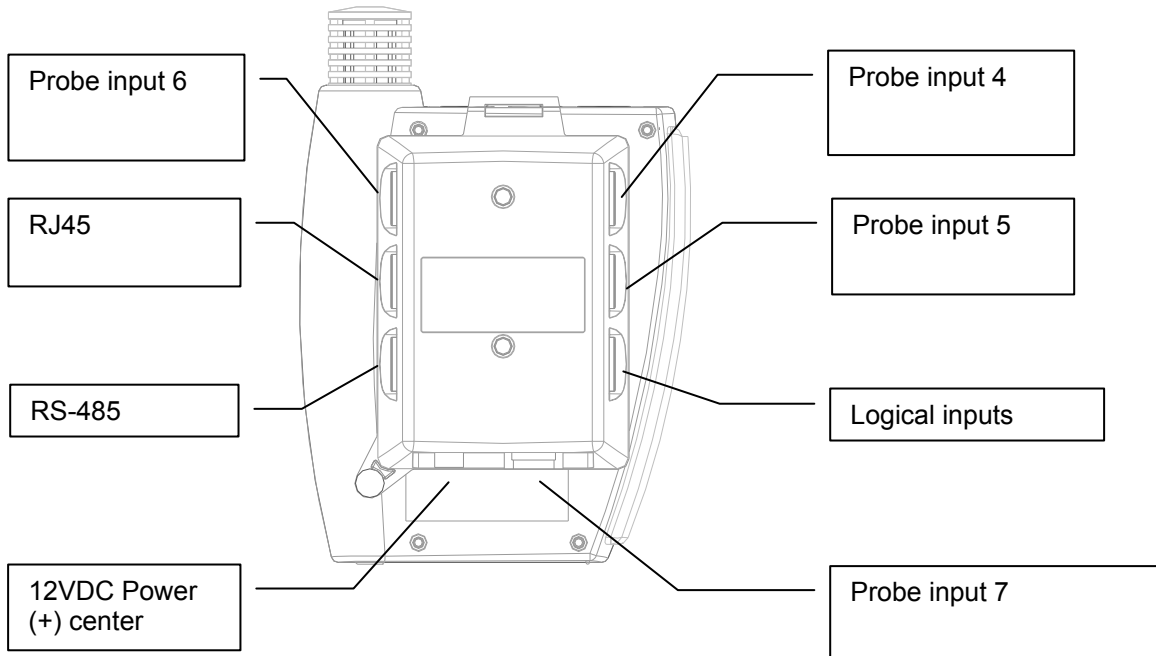


#### DS-U2

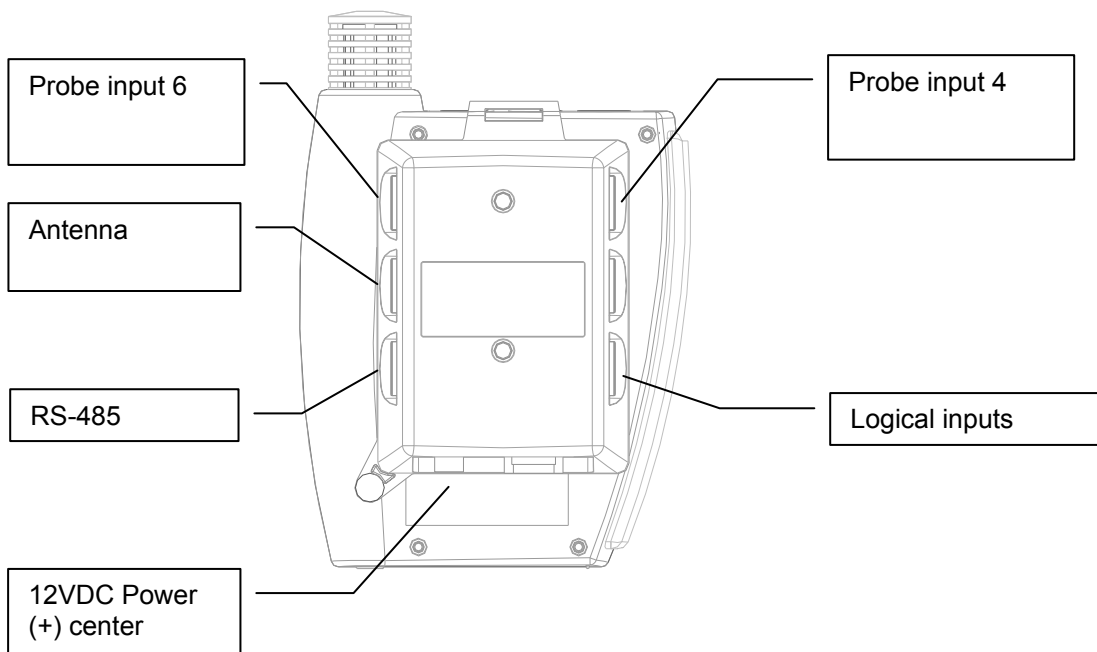


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**DS-U4 / DS-U4-4-20**

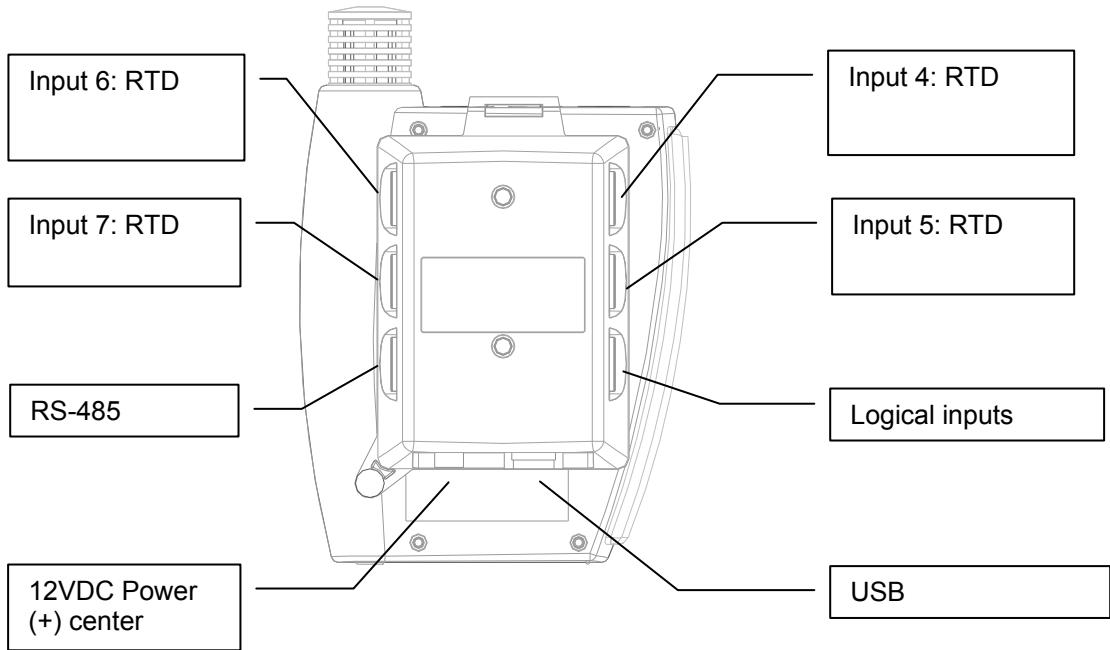


**DS-U-4-WL**

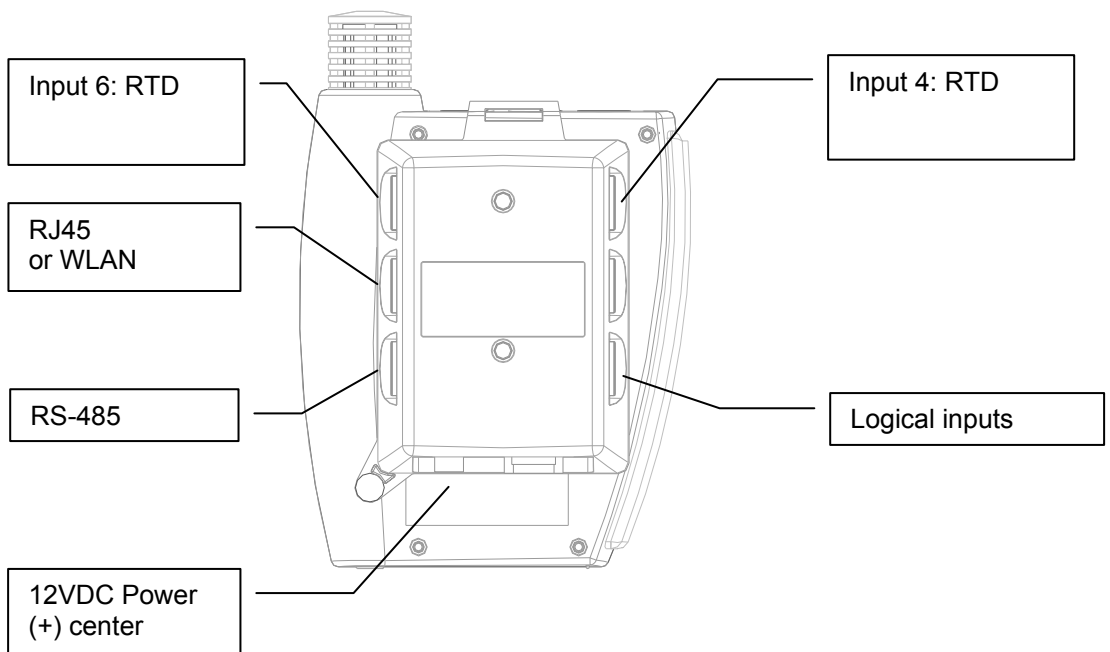


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**DS-PT-2**



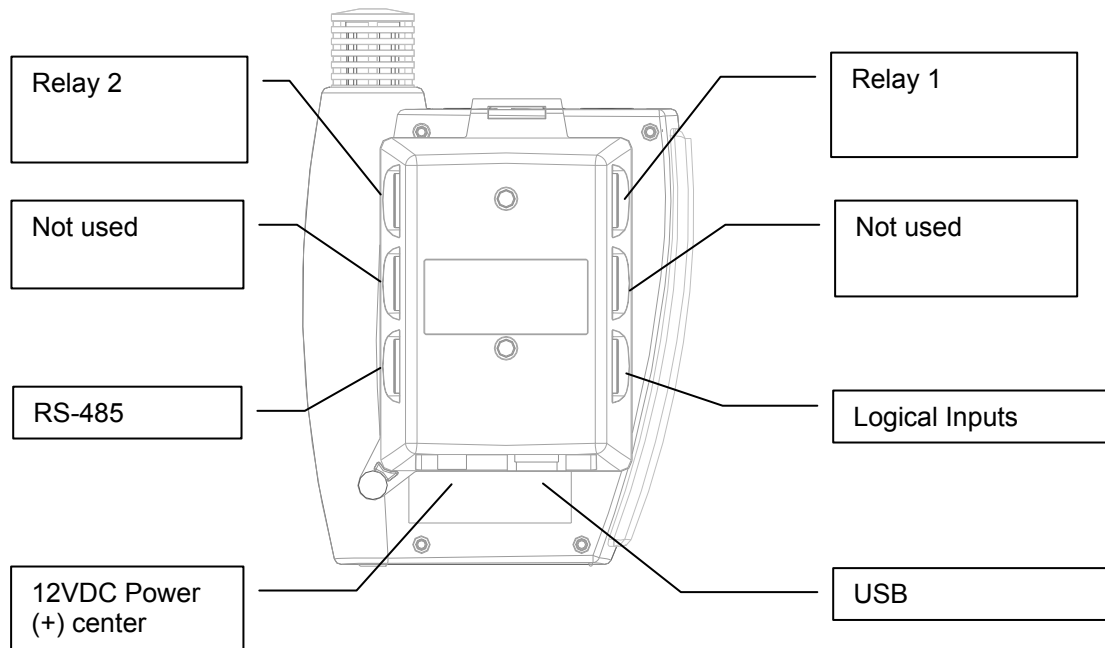
**DS-PT-4 / DS-PT-4-WL**





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### 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).

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## 2.10.4 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 probe should be configured with the ROTRONIC HW4 software. Detailed configuration instructions are provided in document **IN-E-DS-Aconf\_11** (available in pdf format).

### 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

The probe inputs of a docking station can be configured to accept an analog probe. Analog probes cannot be used with the probe inputs of the HygroLog NT and these inputs are designed for use with the HygroClip probes only. An analog probe can 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-U4-4-20 accepts up to four 3-wire single channel analog probes with a 4-20 mA current output signal. Each probe input uses an internal 150 Ohm resistor to convert 4...20 mA to 600...3000 mV (nominal). The HW4 software allows a 2-point adjustment of the mA to mV conversion to compensate for the tolerance on the 150 Ohm resistor (use Device Manager in HW4). 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  $100 \times 1 \times 0.0027 = 0.27^{\circ}\text{C}$

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### 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°C. Accuracy depends on the class of Pt100 RTD used for the probes. Adjustment of the RTD inputs against a reference temperature is limited to a 1-point adjustment (global offset).

### 2.10.5 Logical 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.

### 2.10.6 Relay contacts

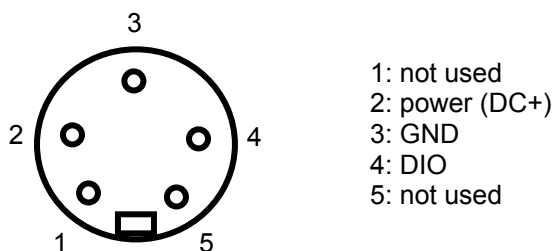
Docking station model DS-R-1 features two independent relays, each with 3 contacts: normally closed, normally open and common. When configuring the HygroLog NT and docking station with the HW4 software, a number of conditions can be defined that will cause the relay to be energized.

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

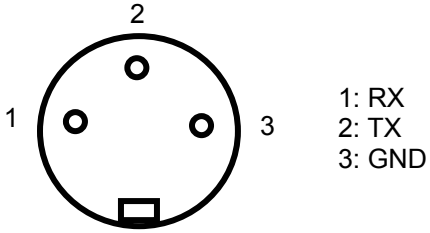
## 2.11 Pin-out diagrams

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

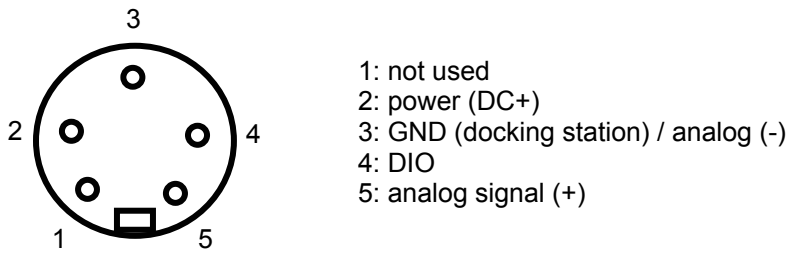


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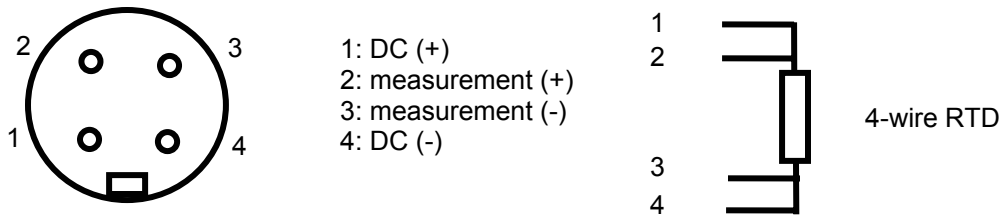
**Remote Mode (HygroLog NT2 / NT3) - solder side of matching male connector**



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

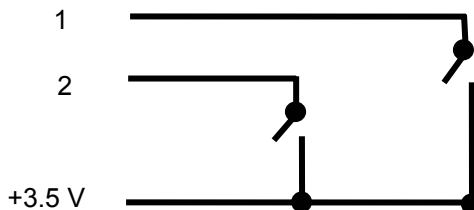
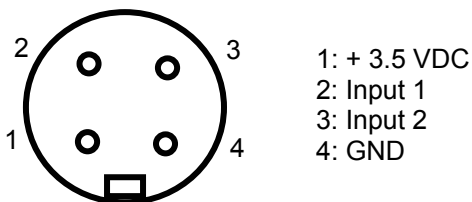


**Input 4, 5, 6 and 7 (docking stations with RTD input) - solder side of matching male connector**



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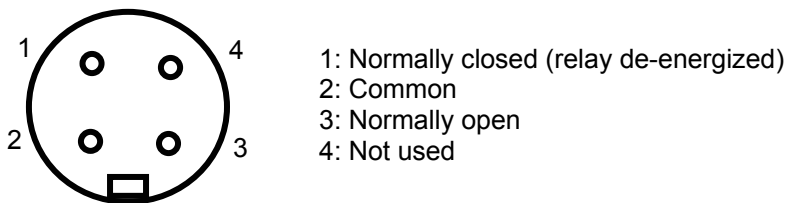
**Logical inputs (docking station) - solder side of matching male connector**



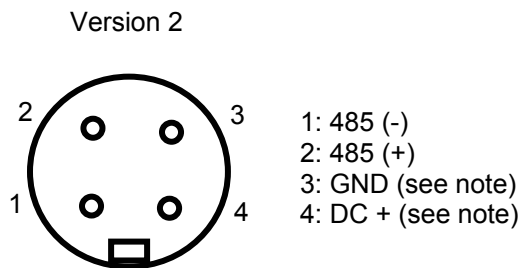
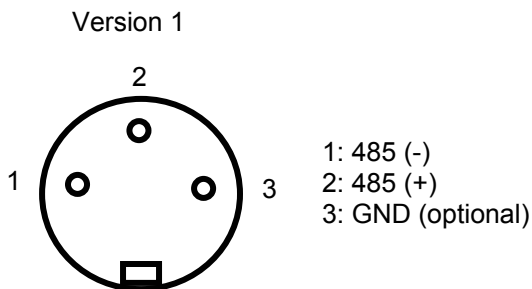
Note: an internal pull-down resistor sets each input to 0 when the contact is open.

GND: not used (eventually use for a shield)

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



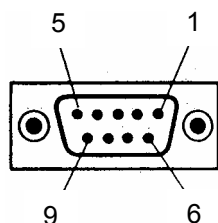
**RS-485 port (docking station) - solder side of matching male connector**



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.

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



Pin #	RS-232
2	TX
3	RX
5	GND

## 2.12 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).

## 2.13 Internal firmware functions

### 2.13.1 Calculated parameter

Using the HW4 software, the HygroLog NT can be set to compute for each HygroClip 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.

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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.

### 2.13.2 Data logging

Data logging requires that a flash memory card be inserted inside the logger. Using the HW4 software, 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.

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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 the HW4 software. 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.

### 2.13.3 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  $< 0.02$ .

### 2.13.4 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



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condition are printed over a red background, based on the alarm settings that HW4 downloaded from the logger.

### 2.13.5 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 can be set to use a polling interval as short as 5 seconds to interrogate all instruments connected to the PC and this could cause the battery life time to be sharply reduced.

### 2.13.6 Logger events tracking

The HygroLog NT maintains an internal event file with the extension EVT. No particular configuration is required to enable this feature.

Part of the procedure to ensure conformity to the FDA requirements is to disable the MENU key on the HygroLog NT keypad. The MENU key is the only one that can be used to make changes to the logger. Therefore, the events recorded by the HygroLog NT are normally the result of an interaction with the HW4 software. When the MENU key is not disabled, a limited number of events are recorded in the logger event file and no entries are made in the logger event file header. The two tables below provide a list of the events tracked by the HygroLog NT.

The logger event file is split between the internal memory of the logger (up to 170 events) and the flash memory card (practically unlimited number of events). HW4 offers the possibility of downloading, opening and printing the entire file contents. All past logger events are available to HW4 as long as the flash memory card is not removed from the logger. The serial number of the logger is used as the file name.

Example: 1111111111.EVT

The logger event file consists of a file header and a file body. The file header provides the following information:

- Most recent programming of the log function: programming date and time, user and HW4 product ID
- Most recent device configuration: date and time, user and HW4 product ID

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- Most recent adjustment to the PC date and time: date and time, user and HW4 product ID

An individual record with date and time is entered in the event file body for each event listed in the table below:

<b>Event File Text</b>	<b>Event (interaction with HW4)</b>
Power up	The battery was inserted or the instrument powered down and up after an internal problem
Watchdog overflow	Internal instrument error (normally should not occur)

<b>Event File Text</b>	<b>Event (interaction with HW4)</b>
Writing device configuration	New or existing configuration written to logger
Memory card removed	While recording data, the logger could not find the memory card. The data was written to the EEPROM and are not yet lost
Memory card full	No free memory space on the memory card
New memory card inserted	The memory card was replaced while data was being logged. The data will be split between two different memory cards. Possibly, some data has been lost.
Humidity adjusted	Humidity adjustment of the probe connected to input #
Temperature adjusted	Temperature adjustment of the probe connected to input #
Logging started	Start recording data from input #
Logging stopped manually	Data recording of input # ended before the programmed stop time
Logging ended automatically	Data recording of input # ended at the programmed stop time
Out-of-limits value detected	An out-of-limits value was newly detected on input #
Battery almost empty	Battery voltage dropped below 6.5V
Battery empty	The battery is empty and the logger has powered itself off (keeping power up could result in erroneous data or loss of data)
Beginning accumulator charge	Starting to charge the rechargeable battery
Accumulator charge ended	Rechargeable battery full
MFG command	<i>Reserved for the factory</i>
Lost data, memory card not ready	While recording data, the logger could not find the memory card. The data could not be written to the EEPROM, and was lost
HygroClip probe connected <sup>1</sup>	A HygroClip probe was connected to input #

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HygroClip probe disconnected <sup>1</sup>	A HygroClip probe was removed from input # or the input can no longer communicate with the probe
External power connected	The A/C adapter was connected and is being powered
External power removed or faulty	The A/C adapter was disconnected, or failed, or is not being powered
Device time changed / adjusted	Device date and time prior and after adjustment (up to firmware v1.1d only)
Prior device time	Device date and time prior to change (firmware v1.2a and up)
New device time	Device date and time after change (firmware v1.2a and up)
RS-485 address changed	The RS-485 address was changed
EEPROM erased	<i>Reserved for the factory</i>

<b>Event File Text</b>	<b>Event (interaction with HW4)</b>
Docking station disconnected <sup>2</sup>	The docking station was disconnected or there is no longer any communication with it
Docking station connected <sup>2</sup>	A docking station was connected and communication was established
Logger language file downloaded	A different internal language file was loaded or the same file was loaded again
Log function programmed	The log function has been programmed for input #
Event file deleted	<i>Reserved for the factory</i>

<sup>1</sup> connection / removal of analog probes is not recorded

<sup>2</sup> only when the docking station has internal electronics

<b>Event File Text</b>	<b>Event (triggered from the Keypad)</b>
Humidity adjusted	Humidity adjustment of the probe connected to input #
Temperature adjusted	Temperature adjustment of the probe connected to input #
Logging started	Start recording data from input #
Logging stopped manually	Data recording of input # ended before the programmed stop time
Prior device time	Device date and time prior to change (firmware v1.2a and up)
New device time	Device date and time after change (firmware v1.2a and up)
Log function programmed	The log function has been programmed for input #

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### 3. 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

### 4. ERES regulatory compliance

In order to comply with ERES regulatory requirements (Electronic Records and Electronic Signatures), the HygroLog NT should be used together with the ROTRONIC HW4 software – Professional Edition. 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 with an electronic authentication stamp, can be cross referenced and can be electronically signed.

**IMPORTANT:** In order to comply with ERES regulatory requirements, be sure to configure both the HygroLog NT and the HW4 software as follows:

- In HW4, create a user with full rights (administrator) and a password (see HW4 manual - Users and Passwords). After creating the first user, be sure to log in as this user (see HW4 manual - Users and Passwords - Change User). This enables both the HygroLog NT and the HW4 software to maintain a record of events and to associate these with a specific user. Create additional users with or without limited rights, as per your requirements.
- Enable HW4 to monitor electronic signatures and user events (see HW4 manual - Global Settings - Events)
- Enable HW4 to monitor system events (see HW4 manual - Global Settings - General)
- Enable protocols in HW4 (see HW4 manual - Device Manager - Device Manager Settings)

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If the HygroLog NT has a display and keypad, disable the MENU key (see HW4 manual - Device Manager - HygroLog NT - Keypad).

## 5. 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

## 6. Operation with the HW4 software

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 with the ROTRONIC HW4 software installed.

### 6.1 HW4 software requirements

Note: a full description of HW4 is available in a separate manual. 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:

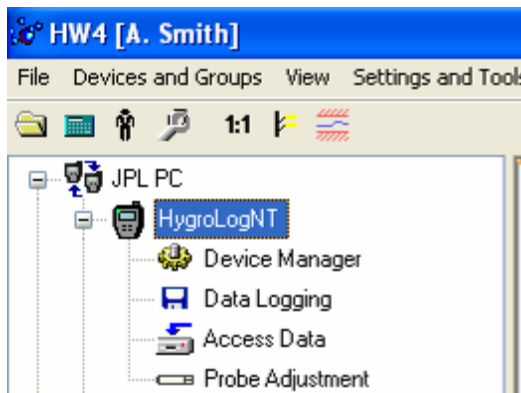
- Windows XP, NT4 with SP 6a or higher
- Windows 2000 with SP 2 or higher
- Windows Server 2003

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.

### 6.2 HW4 functions

After discovering the HygroLog NT with HW4, the functions available for the HygroLog NT are illustrated below:

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### Device Manager

Configuration of the HygroLog NT data logger and docking station

### Data Logging

Programming of the data logging function. Compared to the equivalent function available directly on models with a display and keypad, HW4 offers added functionality such as scheduled recording for each individual input at a future date / time.

### Access Data

Downloading to the PC of the files present on the logger and management of the files.

### Probe Adjustment

Essentially duplicates the probe adjustment function directly available on models with display and keypad.

**For a detailed description of these functions, please consult the on-line instruction manual available from the HW4 main menu bar. The HW4 instruction manual is also available on the HW4 installation CD and can be downloaded from our web site as a PDF file.**

## **6.3 Functionality and settings 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

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- 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)

## 7. Stand-alone operation

### 7.1 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

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Display Sleep function is active, the measurement interval is by default the same as the log interval.

## 7.2 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.**



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### 7.3 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.

### 7.4 Internal Function menu (models with display and keypad)

#### 7.4.1 Settings and functions accessible from the Keypad

**Note:** access to the following functions 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
- Cancel alarm (works only when the latching mode is enabled)

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- 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)

### 7.4.2 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

### 7.4.3 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.

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Press the MENU key to exit the data table.

### 7.4.4 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).

### 7.4.5 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
- Cancel Alarm (used to cancel an alarm when the latching mode is enabled)
- 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 an alarm when the latching mode is enabled:

- Use the UP or DOWN key to highlight the line that says [Cancel Alarm].

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- Press on the ENTER key.

### 7.4.6 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

### 7.4.7 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

### 7.4.8 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

### 7.4.9 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).

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## 8. Adjusting a HygroClip probe

### 8.1 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.

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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.

## 8.2 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

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- 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:

- 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.
- 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 ≥ 40 °C (104 °F) is automatically assumed to be T-high.
- 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.

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## 9. Warnings and useful tips

- **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.

- **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.
- **Internal Probe (Input 1):** for a faster response, use the probe in the extended position.
- **Compliance with ERES regulatory requirements:** 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.

## 10. Baud rate compatibility requirements

Depending on the model, devices from ROTRONIC use one of the following Baud rates as the factory default:

- 57600 bps: HygroLog NT data logger and docking stations
- 19200 bps: HygroPalm and HygroLab indicators, HygroFlex and M33 transmitters, HygroClip Alarm programmable alarm card, HygroClip DI interface, HygroStat MB Thermo-Hygrostat

### IMPORTANT:

- All devices connected to a RS-485 multi-drop network (master and slaves) must use the same Baud rate
- In the case of a docking station with an internal Ethernet (TCP/IP) module, the Baud rate of the Ethernet module must be the same as the Baud rate of the HygroLog NT used with the docking station.



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Devices and internal Ethernet modules with mismatched Baud rate will not communicate together.

- The Baud rate configuration of a ROTRONIC device can be changed with the **Device Manager** function (Digital Interface tab) available from within the HW4 software.
- The Baud rate of a Digi internal Ethernet module can be changed only from the module web interface. See separate document **IN-E-TCPIP-Conf\_11** (available in PDF format).

## 11. Ethernet local area network

ROTRONIC devices with an Ethernet (TCP/IP) interface presently use an internal module manufactured by Digi International (Digi Connect ME for a wired connection, Digi Connect WI-ME for a wireless connection). Both types of module feature a web interface that is used to configure the module.

**IMPORTANT:** The TCP/IP settings of any docking station with Ethernet interface should be configured to be compatible with the local area network. Detailed instructions are provided separately in document **IN-E-TCPIP-Conf\_11** (available in PDF format).

Docking station models with an Ethernet (TCP/IP) interface are shipped with a Device Configuration Certificate that provides information about the factory configuration settings of both the Ethernet module. See example below:

Setting	Value
DHCP or Static Address	Static
IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.0
TCP Port	2101
MAC Address	00:40:9D:28:2D:2A
Firmware Release (device)	1.4
User Name (web interface)	rotronic
Password (web interface)	wlan
Serial Port Configuration Profile	TCP Sockets
Basic Serial Settings	
Baud Rate	57600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

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## 12. RS-485 multi-drop network

Most models of docking station feature a RS-485 connector. When the number of available PC ports is limited, this connector can be used to connect together up to 64 devices 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 devices. A docking station with 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 or LAN by means of a RS-232 port, USB port or TCP/IP port.

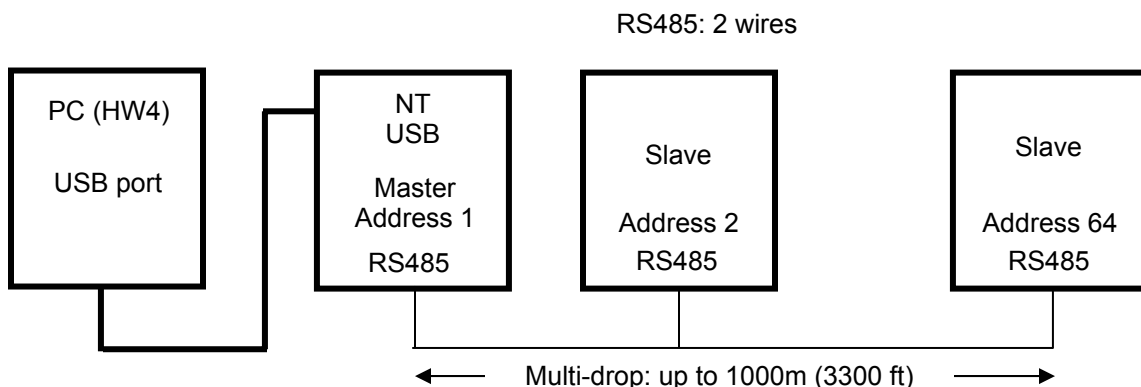
**RS-485 Address:** the RS-485 address is used to identify the individual devices that are connected to a RS-485 multi-drop and must be unique to each device. This address is part of the HygroLog NT communications protocol. The factory default for the RS-485 address is 00. In general, this address should not be changed manually (see note below). As far as HW4 is concerned, all masters can share the same RS-485 address. When the HW4 command "Search for RS-485 slaves" is being used, HW4 automatically changes from 00 to 01 the RS-485 address of any master that has slaves attached. As a result, all masters end up with the same RS-485 network address (01). In addition, HW4 automatically changes the RS-485 address of the slaves in each multi-drop from 00 (factory default) to a unique 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.

### Notes:

- We recommend using HW4 to give each HygroLog NT a unique name for easier identification.
- In the situation where an RS-485 network is to be monitored by software other than HW4, you will have to use HW4 to give each device a unique RS-485 address prior to connecting to the network.

### Example: HygroLog NT and docking station with USB port

The number of HygroLog NT and docking station with USB port that can be directly connected to a PC depends on the number of USB ports available on the PC.



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**IMPORTANT:**

- If you change an instrument from master to slave, be sure to change the RS address of the instrument to 00 before establishing the RS-485 connection. 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. Please note that HW4 may eventually change the address of any master with address 00.
- All devices within a multi-drop should use the same Baud rate. See Baud rate compatibility requirements.
- Docking stations with Ethernet (TCP/IP) interface: please note that the Baud rate of the HygroLog NT and the Baud rate of the docking station internal Ethernet module should be set to the same value

The RS485 wiring can be done with a twisted pair (2-wire, telephone type) and wall mounted RJ45 receptacles (see Electrical installation guidelines in this manual). Be sure to observe the polarity for each connection. Using 4-wire cable, offers the option of powering all devices in the multi-drop from a single DC voltage source.

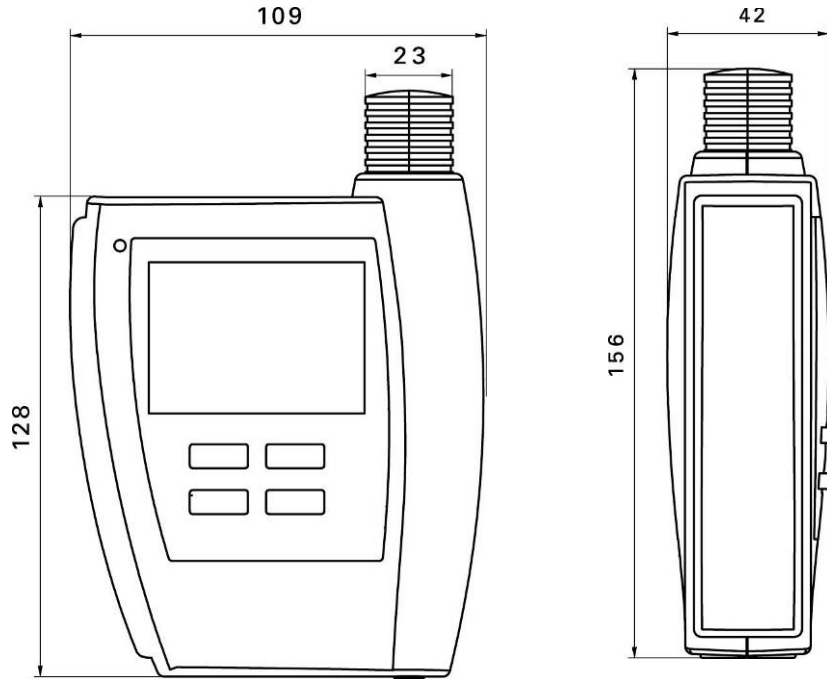
### 13. Specifications

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	RS-232 or USB or Ethernet (wired or wireless) / RS-485		
Serial interface (RS-232 / RS-485)	Baud rate : 19200 or 57600 Data bits : 8 Stop bits : 1 Parity : none		
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)		

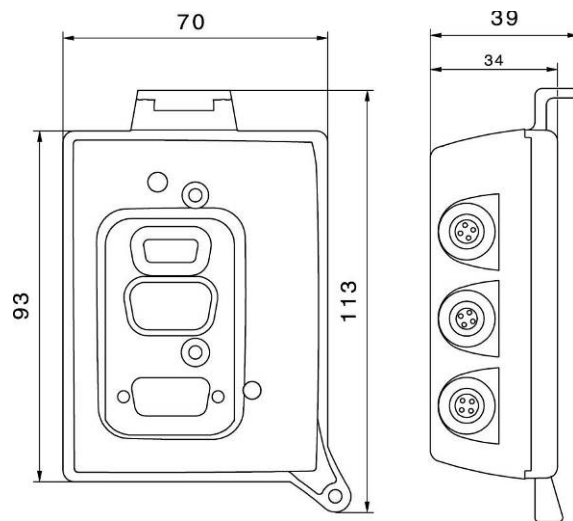
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Event logging	Practically unlimited number of events such as configuration changes, alarm, etc.	
Internal Menu	Simplified functions, viewing of logged data	
Internal probe adjustment	N/A	Direct from internal menu
External probe adjustment	Direct from 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	

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**Docking Station**



Dimensions in mm

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## 14. 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.

Order Code	Description
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.

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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.
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

Order Code	Description
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

## 15. 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.

Document **Com\_NT.pdf** is available directly from ROTRONIC and can also be downloaded from our web site.

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## 16. Electrical installation guidelines

### *Power supply wiring*

Heavy machinery and instrumentation should not share the same power supply wiring. If this cannot be avoided, noise filters and surge protectors should be used. Most UPS devices have those features already integrated.

### *General guidelines for signal cables*

The following guidelines are derived from European Standard EN 50170 for the transmission of signals by copper wires. When planning an installation, the rules provided by EN 50170 should be followed under consideration of local circumstances to determine the position of machines and equipment.

**All ROTRONIC HygroClip products are tested for Electromagnetic Compatibility according to following European standards:**

- **EN 61000-6-3 + EN 61000-6-1 (residential)**
- **EN 61000-6-4 + EN 61000-6-2 (industrial)**

Whenever the level of electromagnetic interference is expected to be high, both the instruments and signal cables should be placed as far away as possible from the source of interference.

In general, signal cables should be installed in bundles or channels / conduits, separate from other cables as indicated in the table below:

<ul style="list-style-type: none"> <li>• Bus signals such as RS485</li> <li>• Data signals for PCs, printers etc.</li> <li>• Shielded analog inputs</li> <li>• Unshielded direct current (&lt;= 60V)</li> <li>• Shielded process signals (&lt;= 25 V)</li> <li>• Unshielded alternating current (&lt;= 25V)</li> <li>• Coaxial cables for CRT monitors</li> </ul>	In common bundles or channels / conduits
<ul style="list-style-type: none"> <li>• Direct current from 60 V to 400 V (unshielded)</li> <li>• Alternating current from 25V to 400 V (unshielded)</li> </ul>	In separated bundles or channels / conduits, without minimum distance
<ul style="list-style-type: none"> <li>• Direct and alternating current &gt; 400 V (unshielded)</li> <li>• Telephone lines</li> <li>• Lines leading into EX-rated areas</li> </ul>	In separated bundles or channels /conduits, without minimum distance



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### ***Lightning protection***

Cabling in areas with a risk of lightning requires a lightning protection. For cabling underground in between buildings, we recommend the use of special fiber optic cables. If this is not possible, use copper cables that are suitable for underground installation.

Additional guidelines for RS-485 wiring (products with a serial interface)

### **RS-485 Cable**

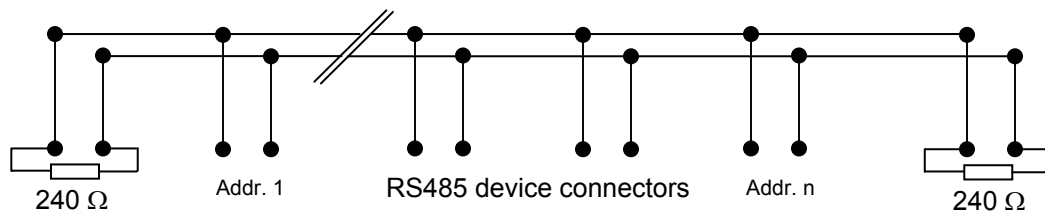
Using a symmetrical transmission method in combination with low capacity/ low attenuation twisted pair cables, allows extremely reliable long distance connections. The use of a high grade shielded cable avoids cross talk between the transmitted signals and also reduces the potential of external interference. For the RS-485 cable, we recommend using a cable Cat. 5e ANSI/TIA /EIA-568-A-5.

In general the RS-485 cable should be shielded and comply with the following specifications:

**Cable capacitance**     **<=300pF/m or 90 pF/ft**  
**Line impedance**        **100 Ω ±15 Ω**  
**Line resistance**        **140 Ω/km or 225 Ω/km**  
**Signal lines**             **Twisted pair**

In addition, we recommend terminating each end of the RS-485 cable with a 240 Ohm resistor.

### **RS485 Network**



Note: all instruments connected to the network should use the same baud rate

### ***Voltage potential issues***

The existence of a voltage-potential between instruments that are interconnected can be a source on concern in large installations, installations with different mains power supply and in inter-building networking.

As a first measure, the shield of a signal cable should be connected at both ends. In the case of a data cable, a low-resistance potential equalization cable may also have to be used. This cable should be run parallel and as near as possible to the data cable, preferably in the same conduit. The shield of the data cable should under no circumstances be used as equalization cable! The conductors of the potential equalization cable should ideally be stranded in order to be effective also in case of high-frequency interference.

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The following points should also be observed:

- Close the parasitic circuit
- Connect all devices to the potential equalizing cable as often as possible. Electrical conductors such as machine elements, metal tubes or supporting constructions should be integrated into the system.
- Protect the potential-equalization cable and connections against corrosion.
- Select the cross-section of the potential equalization cable according to the maximum equalization current.

If these different measures do not correct the problem, a galvanic separation according to ISO 9549 may have to be installed. You may also want to consider the use of fiber-optic cables.

## 17. Document releases

Doc. Release	Date	Notes
_10	Jan. 17, 2007	See Hardware and firmware changes
_11	May 3, 2007	Made minor editorial changes. Added section 16: Electrical installation guidelines

### Hardware and firmware changes covered in document release \_10:

Firmware Version	Date	PCB-No.
1.2a	Jun 1, 2005	66.0758.0412
1.2b	May 8, 2006	66.0758.0412
1.2c	Sep 21, 2006	66.0758.0412

- Firmware version 1.2b adds the item "Cancel Alarm" to the internal HygroLog Settings menu (accessible from the optional keypad). When the latching alarm mode is enabled, this item is used to cancel the alarm directly from the optional keypad.
- Firmware version 1.2c fixes a problem with the driver used for the logger UART interface which occasionally caused communication to freeze.