HL-RC

Wireless Data Logger

Instruction Manual

Contents

Scope

This manual is valid for the HL-RC series of wireless data loggers and for the device types LOG-HC2-RC and LOG-PT1000.

Firmware version of the devices:

- HL-RC: v1.0 (all types)
- LOG-HC2-RC: v4.1
- LOG-PT1000-RC: v4.2
- LOG-HC2-RC-US: v3.0
- LOG-PT1000-RC-US: v3.4

1 Overview

The ROTRONIC wireless data loggers measure humidity/temperature or temperature with the highest precision, save the measured values in the logger and transmit these values to the ROTRONIC HW4 software. The data loggers offer the highest data integrity and flexibility in use.
The loggers communicate with the HW4 software via a LAN interface or a USB dongle on the frequencies 433.92 MHz (Europe) or 915 MHz (USA).

Main features of the wireless data loggers:

- Interchangeable HygroClip 2 probes
- Radio frequencies: 433.92 MHz (Europe) or 915 MHz (USA)
- Highest possible measuring accuracy: ±0.8 %RH and ±0.1 °C
- Outstanding repeatability of the measurement results
- Battery life up to 6 years
- Large storage capacity of up to 300,000 measured values
- Transmission distance of up to 100 metres in the open

The wireless data loggers and corresponding LAN interfaces and USB dongles currently come in two different versions:

- with integrated battery power monitor
- without integrated battery power monitor

It is only possible to distinguish between the two versions externally by way of the ID number of the device type on the label. As shown in Figure 1, the labels contain the following information: article number, serial number (HEX & DEC format) and access code.

Figure 1: Wireless data logger label

Note:
The devices with and without battery power monitor are not compatible with each other. The LAN interfaces and USB dongles without battery power monitor do not recognise the devices with battery power monitor and vice versa.

1.1 Devices with Battery Power Monitor (HL Types)

Order Code	Description	
HL-RC-B	Wireless data logger for relative humidity (%RH) and temperature (°C)	
HL-RC-T	Wireless data logger for temperature (°C)	
HL-RC-T030	Wireless data logger for temperature (°C) with remote sensor (30 cm)	
HL-RC-T100	Wireless data logger for temperature (°C) with remote sensor (100 cm)	 (symbol picture)
HL-DS-EXT	Wireless interface USB to 433.92 MHz (Europe) or 915 MHz (USA)	

HL-LAN-INTERFACE	Wireless interface Ethernet to 433.92 MHz (Europe)	

1.2 Devices without Battery Power Monitor (LOG Types)

Type	Description	
LOG-HC2	Wireless data logger for relative humidity (%RH) and temperature (°C) with HC2	
LOG-PT1000	Wireless data logger for relative humidity (°C)	
LOG-PT1000-ET030	Wireless data logger for temperature (°C) with remote Pt1000 sensor (30 cm)	
LOG-PT1000-ERT100-RC	Wireless data logger for temperature (°C) with remote Pt1000 sensor (100 cm)	 (symbol picture)
LOG-PT1000-ERT100-RCT	Wireless data logger for temperature (°C) with remote Pt1000 sensor (100 cm) Measuring range: -90…120°C	 (symbol picture)

LAN-INTERFACE	Wireless interface Ethernet to 433.92 MHz (Europe) / 915 MHz (USA)	
LOG-DS-EXT	Wireless interface USB to 433.92 MHz (Europe) / 915 MHz (USA)	

1.3 Overview Wireless Systems

1.3.1 *LAN Network*

1.3.2 *USB Network*

2 Dimensions

The following drawings show the external dimensions of the various wireless data logger types in mm.

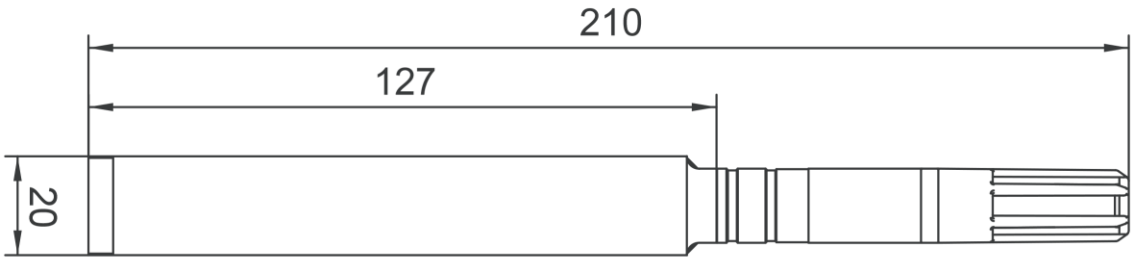

Figure 2: Wireless humidity and temperature data logger with HC2

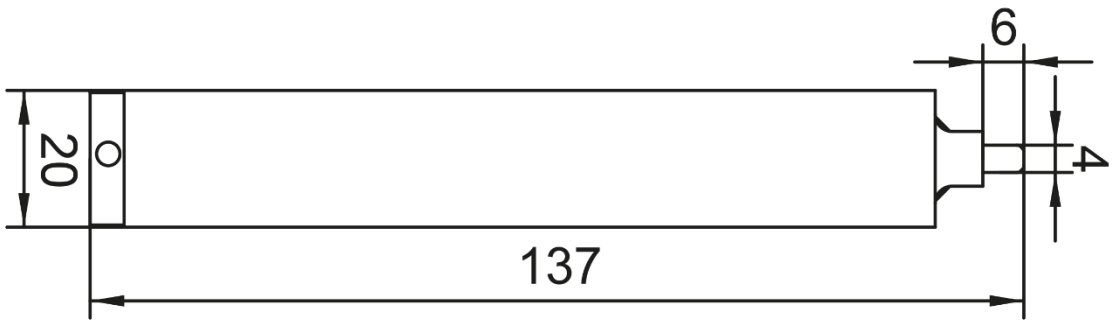

Figure 3: Wireless temperature data logger with integrated Pt1000 sensor

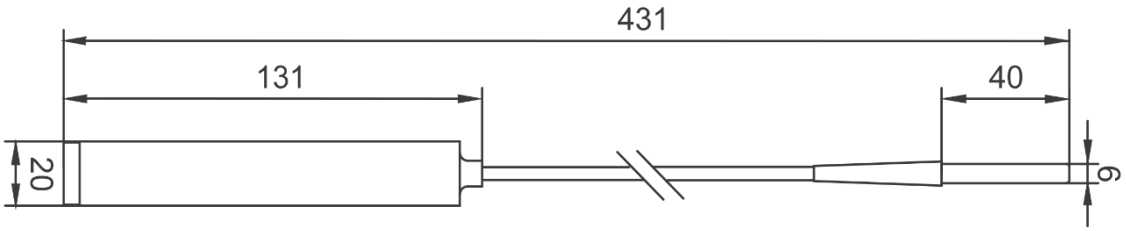

Figure 4: Wireless temperature data logger with remote sensor

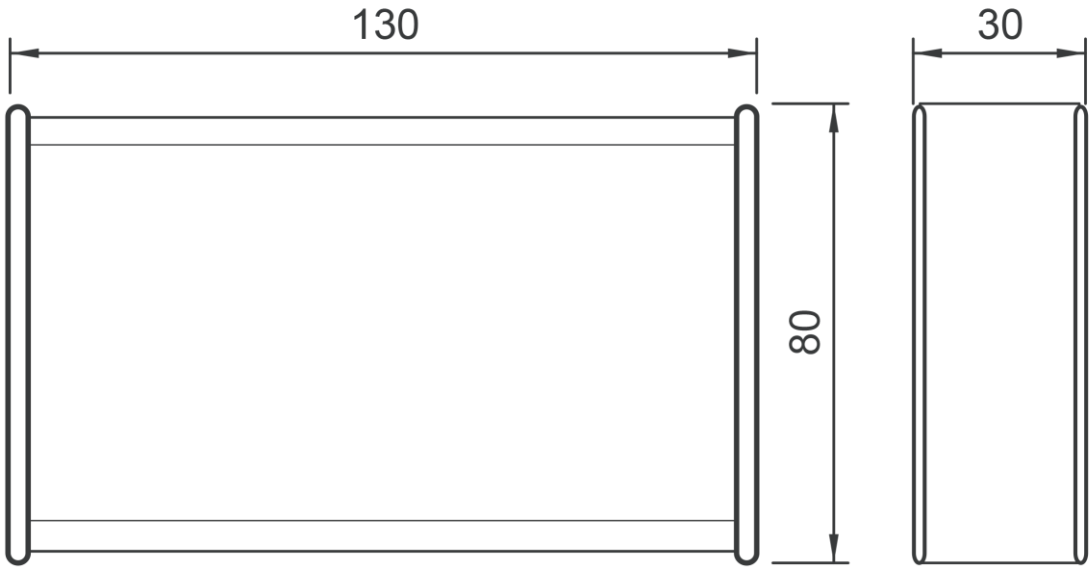

Figure 5: LAN interface

3 General Description

The ROTRONIC wireless data loggers comprise the following function groups: sensor, memory, wireless interface and battery for independent operation. Depending on the device, the sensor consists of a HygroClip2 for humidity and temperature or an integrated or remote Pt1000 sensor for temperature. The values measured by the sensors are stored in the internal memory. With the HW4 software, the measured values can either be read out directly from the logger and sent to the software (online mode) or they are stored in the data logger and then read out from the logger as a complete data file with the HW4 software (offline mode).

The software functions are described in the following manuals:

- E-M-HW4v3-F2-021: HW4 manual for operation of the wireless data loggers
- E-M-HW4v3-Main: Main HW4 manual with general information

3.1 Power Supply

The power supply for the data loggers comes from an integrated AA battery (mignon cell). The USB dongle is supplied with power directly via the PC's USB port and the LAN interface by a wide-range AC adapter (100 ... 250 VAC).

3.2 Battery Life

The life of the batteries integrated in the wireless data loggers depends on the measurement interval, reading frequency and current consumption of the logger sensors. The table below serves as a guide.

Type	**Interval**		**Current Consumption**	**Lifetime**
	Measurements / hour	Every **x** min.		
LOG-HC2 HL-RC-B	1	60	0.022 mA	6.2 years
	6	10	0.057 mA	2.4 years
	12	5	0.099 mA	1.4 years
	60	1	0.435 mA	0.3 years
LOG-PT1000 HL-RC-T	1	60	0.0155 mA	8.8 years
	6	10	0.015 mA	7.6 years
	12	5	0.021 mA	6.5 years
	60	1	0.045 mA	3.0 years

Note:

At a measurement interval of six measurements per hour or less, the logger's memory is also full when the battery reaches the end of its life.

3.3 Wireless Interface

The devices work on the frequencies 433.92 MHz (Europe) or 915 MHz (USA). One interface device (LAN interface / USB dongle) can manage up to 100 loggers. The range of the wireless connection extends up to 100 m. The range for devices with remote temperature sensor or a 30 cm E3-F2A extension cord between a LOG-HC2-RC / HL-RC-B wireless logger and HC2-S combination probe can be up to 300 m.

3.3.1 *Online Mode*

In online mode the measured values are sent to the HW4 without delay. Depending on the settings in the HW4, the data are then given a timestamp and stored on the PC. It is immaterial if the wireless logger also saves the data or not. Data lost due to a disruption in the transmission path are not refreshed automatically when the wireless connection is restored. To complete lost data, the user must initiate downloading from the logger. This is conditional upon the logger itself having saved the data. Recording of the data in the device can be enabled with the HW4 software.

3.3.2 *Offline Mode*

If the logger saves the measurements in its internal memory without a permanent connection to the HW4 software, we speak of offline mode. In this mode the device is configured and recording of the data started. The device then records the data without a direct wireless connection to the HW4 software being necessary. The user can then download the data from the logger to the PC as required. The data are saved directly on the PC as a LOG file by the HW4 software.

3.3.3 *Alternative Antennas*

The standard antenna screwed on to the SMA jack of the USB dongle (or LAN interface) can be swapped for a model with higher gain. In this way it is possible to enlarge the range of the wireless connection in adverse environmental conditions (buildings, walls etc.).

ROTRONIC offers a ground plane antenna for 433.92 MHz as an alternative.

Order Code	Description
LOG-AN-GP433	Ground plane antenna, cable length 2.5 m. The antenna radiates equally in all directions on the horizontal plane. There is no irradiation vertically upwards.

- Including 2.5 m coaxial cable RG58U MIL-C17 (50 Ω)
- SMA connector
- Dimensions: 190 x 460 mm (width / height)

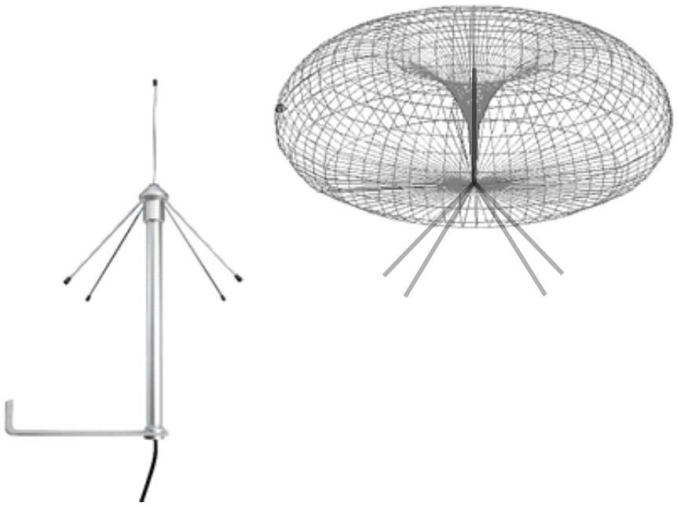

Figure 6: Ground plane antenna with mounting bracket (left) and radiation diagram (right)

3.4 Interfaces

The LAN interface and USB dongle serve as interfaces between the LAN and USB ports and the wireless transmission path. Both devices can manage up to 100 wireless data loggers.

3.4.1 *USB Dongle*

The USB dongle is plugged directly into a USB port on the PC or connected via a USB extension cord. The dongle is primarily suitable for mobile applications.

Figure 7: USB dongle for 433.92 MHz (Europe) or 915 MHz (USA); can manage up to 100 terminal devices

3.4.2 *LAN Interface*

The LAN interface is ideal for fixed installations. It is supplied with power directly from the local power grid via an external AC adapter. The HW4 software and LAN interface communicate via the Ethernet port.
If more than one LAN interface has been installed, the wireless loggers are connected automatically to the interface with the most stable connection to the logger.

Figure 8: LAN interface for 433.92 MHz (Europe) or 915 MHz (USA); can manage up to 100 terminal devices

Note:

To use LAN interfaces, port 6767 must be enabled on the PC.

3.5 HW4 Software Compatibility

The following wireless loggers and interface devices can be used as from **HW4 version v3.2.0**.

- LOG-HC2-RC(-US)
- LOG-PT1000-RC(-US)
- LOG-PT1000-ET030-RC
- LOG-PT1000-30-RC-US
- LOG-DS-EXT(-US)
- LAN-INTERFACE

The following wireless loggers and interface devices with battery monitoring can be used as from **HW4 version v3.6.0**.

- HL-RC-B(-US)
- HL-RC-T(-US)
- HL-RC-T030(-US)
- HL-DS-EXT(-US)

The following interface devices with battery monitoring can be used as from **HW4 version v3.8.0**.

- HL-LAN-INTERFACE

4 Mechanical Installation

LOG-HC2-RC / HL-RC-B: The probe in the HC2 series is plugged into the socket of the wireless data logger and fastened by tightening the union nut by hand.

LOG-PT1000 / HL-RC-T: These loggers are ready for use on delivery.

Install the wireless data logger according to the following recommendations.

4.1 Choice of Location

To attain an optimum transmission and reception range, the location for the wireless data loggers is to be selected indoors in the dry by the following criteria:

- Position of the wireless data logger (vertical installation of the wireless data logger usually results in the best irradiation)
- Not blocked by metallic objects (water pipes, steel cabinets etc.)
- Ideally there should be a "line of sight" between the antenna and the device that is to be addressed
- Avoid sunlight, moisture and temperature changes
- Minimum distance to receiving antenna 1 metre

5 Electrical Installation

5.1 Installation of LAN Interface

Notes on Use

A configured Ethernet infrastructure with a transmission rate of 100 Mbit/s is needed to use the LAN interface. Together with the HW4 software, the device enables communication with suitable wireless devices. A PC with HW4 or a normal web browser (e.g. Firefox, Internet Explorer) integrated in the same Ethernet infrastructure is needed to configure the Ethernet parameters of the LAN interface. The LAN interface and the AC adapter supplied are only suitable for indoor use.

Important: The HW4 needs a static IP address for the LAN interface.

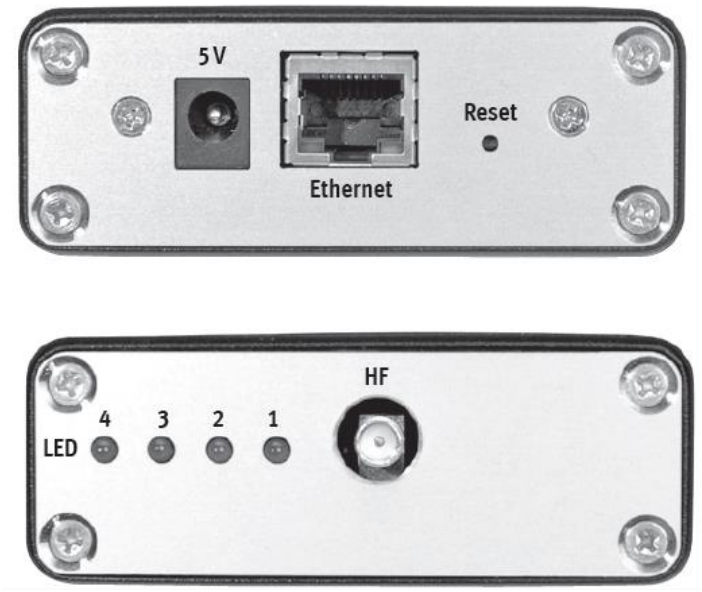

Figure 9: Front and back sides of the LAN interface with connections for the antenna (HF), Ethernet and power supply (5V) as well as status LEDs (1 … 4) and Reset button

5.1.1 *Connections and LEDs*

- 5V AC adapter connection
- Ethernet RJ45 network connection
- Reset Push button to reset the network configuration to delivery state
- HF Antenna connection
- LED1 Power
- LED2 Sending wireless data (flashes)
- LED3 Processing received wireless data (flashes)
- LED4 Status, flashes at variable intervals (see below)

5.1.2 *Delivery State*

The LAN interface is configured with the following network settings on delivery:

- IP 192.168.1.120
- Network mask 255.255.255.0
- Gateway 192.168.1.1
- DNS 192.168.1.1
- Network name rotroniclan
- DHCP On

When the device has been connected to the mains for the first time, LED1 lights up and the LAN interface runs through the following start phase, the status of which is shown by LED4.

- 25ms: Querying network configuration per DHCP.
- 100ms: DHCP query failed, no user-defined settings. The network interface was configured automatically with the values on delivery.
- 1s: The network configuration was downloaded successfully from the DHCP server.
- 2s: User-defined network configuration (DHCP use disabled).

The network configuration should then be adapted and personalised via the web interface or the HW4 software (see **E-M-HW4v3-F2-021**).
Note: We recommend allocation of a fixed IP address to the LAN interface.

Ports Used

The following ports must be open on the firewall when running the LAN interface in a company network:

- TCP 6767 (communication with HW4 and LAN interface)
- TCP 3384 (search for LAN interface)
- UDP 67, 68, 69, 9 (firmware update LAN interface)

5.2 Installation of USB Dongle

Connect the device to a PC using the USB port. The driver is then installed via the HW4 software. When the device has been connected to the PC for the first time, the green LED lights up permanently and the red LED periodically. When communicating with wireless devices, the red LED lights up when receiving data and the green LED when sending data.

Note:

Use of a USB extension cord can improve the wireless range notably.

5.3 Installation of Wireless Data Logger

The wireless data loggers require no electrical installation. They can be connected directly to the HW4 software. Connection of the wireless data logger to the HW4 software is described in the manual **E-M-HW4v3-F2-021**.

5.3.1 *Access Protection*

The data loggers are equipped with access protection. A four-digit access code must be entered into the software to disable or enable a logger. This code is to be found on the label of the wireless data logger. As shown in Figure 10, the access code is printed on the bottom half of the label. The procedure to disable the wireless data logger via the HW4 software is described in the manual **E-M-HW4v3-F2-021**.

Figure 10: Label with access code (4414) to disable/enable the logger

Note on LOG-HC2-RC-US / HL-RC-B-US

The temperature in HygroClip (HC2) must be set on °C (default).

6 Operation

It must be ensured for operation that all device settings have been made correctly. They are set with the HW4 software and are to be found in the manual **E-M-HW4v3-F2-021**.

6.1 Main Device Settings

The main settings are:

- Time/date
- Device name
- Alarm limits
- Logging interval
- Start/stop logging

The HW4 software from ROTRONIC (as from version 3.5) offers a configuration tool that guides the user through the main settings automatically.

6.2 Read Out Measurements

It is advisable to read out the measurements regularly during operation. Data transfer via the wireless interface takes some time and should therefore be carried out regularly. It is not necessary to stop recording in the data logger to read out the data. The two processes can run simultaneously.

7 Maintenance

The data loggers are largely maintenance-free. The battery needs to be replaced dependent on the measurement interval and the current consumption of the sensor. It is also advisable to calibrate the devices regularly.

Do not use hard or sharp objects or aggressive cleaning agents to clean the devices.

7.1 Battery Replacement

A lithium battery (type AA, 3.6 V) is used as the power source. The battery can be ordered from ROTRONIC.

Order Code	Description
LOG-BATTERY	Replacement battery: Lithium-(Li-SOCl2) 2400 mAh, 3.6V

The housing cover with seal ring can be unscrewed with a screwdriver in an anti-clockwise direction (see Figure 11).

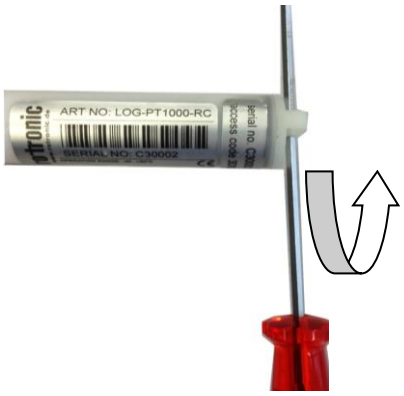

Figure 11: Unscrew cover with screwdriver

The battery is soldered to the electronics and can be removed after opening the cover (see Figure 12).

Figure 12: Removed battery

The battery must be unsoldered with a soldering iron (see Figure 13). The connections of the new battery must be shortened to around 5 mm and then bent by 90° (see Figure 14).

Figure 13: Unsoldering the battery

Figure 14: Shortening and bending the connections

Note:

Pay attention to the correct polarity of the batteries. Incorrect battery polarity can damage the electronics.

In the last step the new battery must be soldered on to the electronics again and the cover screwed on.

Figure 15: Soldering the solder connections and subsequently screwing on the cover

NOTE: The seal ring and thread must not be dirty or damaged. Check and grease the seal ring before screwing on the cover (silicone grease or O-ring grease).

After changing the battery, set the system time of the logger correctly again in the logger's Device Manager with the HW4 software.

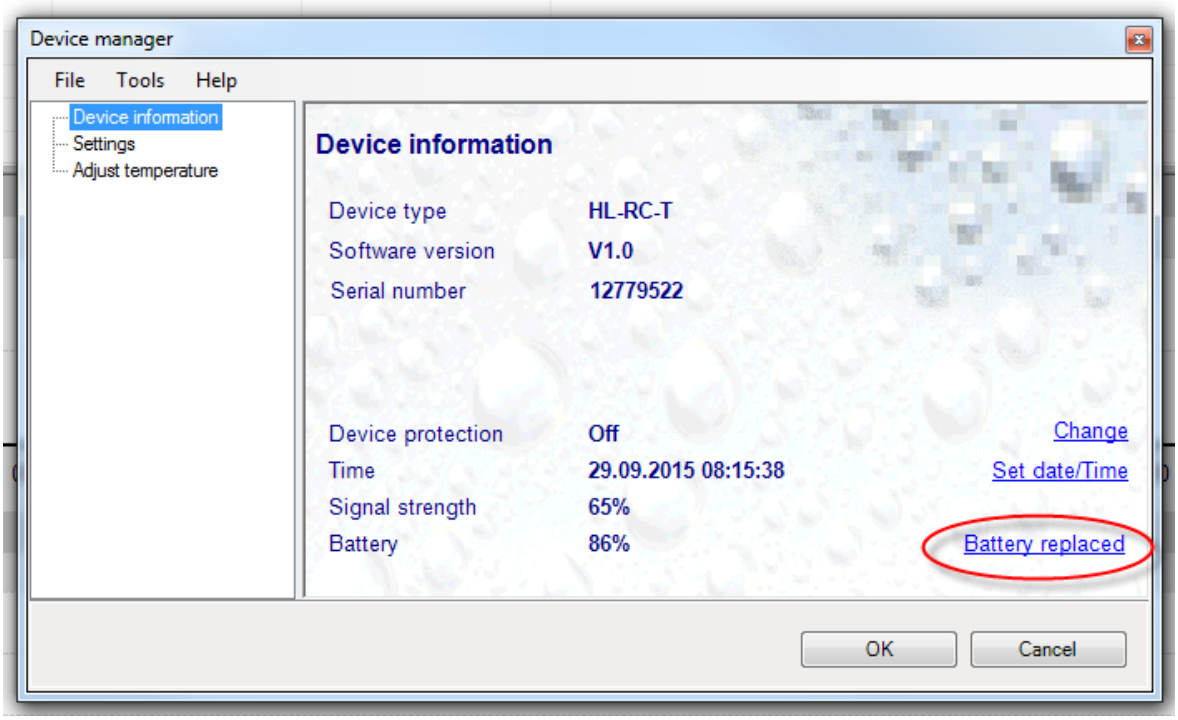

Figure 16: Setting the time after a battery change

7.2 Calibration and Adjustment Procedure

7.2.1 *Adjust HC2 Probe*

Both the Pt1000-RTD temperature sensor used in the probe and the corresponding electronics are very stable and do not normally need to be calibrated after initial factory calibration.

The long-term stability of the HYGROMER humidity sensor from ROTRONIC is normally better than 1 %RH per year. For maximum accuracy, it is advisable to check the calibration of the probe every 6-12 months. Applications in which the probe is exposed to considerable contamination could require more frequent checks.

The HC2 probe cannot be adjusted directly via the data logger. The probe must be connected to the PC via the service cable AC 3001 for adjustment. You can find instructions for the adjustment process in the manual.

8 Firmware Update

The firmware can be updated with the HW4 software. Firmware updates are available for downloading from the ROTRONIC website. To update the firmware, the data logger must be connected to the HW4 via the LAN interface or USB dongle. The connection to the computer must remain intact throughout the update process and there must be a stable power supply for the complete duration of the process.

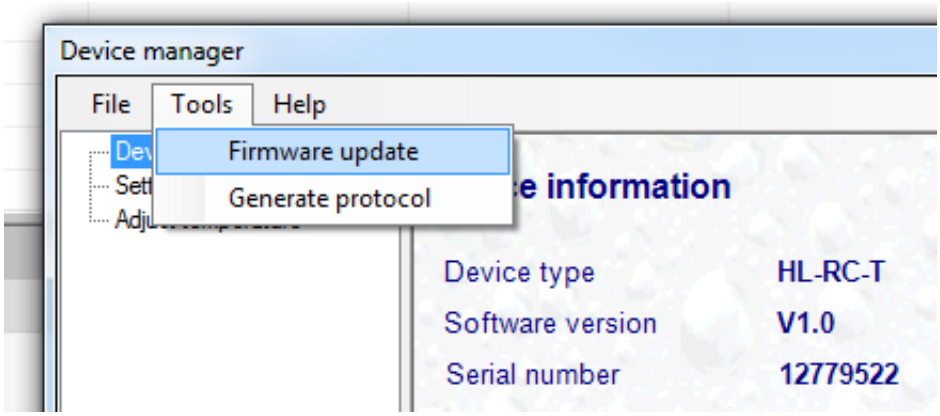

Figure 17: Firmware update in device manager menu bar.

9 Technical Data

General	
Device type	Wireless data logger 433.92 MHz (Europe) / 915 MHz (USA)

Power Supply and Connections	
Supply voltage	Lithium (Li-SOCl2) battery 2400 mAh, 3.6V
Polarity protection	None, battery must be fitted correctly

Humidity and Temperature Measurement	
With HC2	See document **E-M-HC2 Probes** > Specifications
With Pt1000	Accuracy: ±0.1 K at 0 °C Measurement range: -40…85 °C

Calculated Parameters	
Psychrometric parameters	Dew point (Dp) / Frost point (Fp) can be calculated via HC2

Measurement Interval	
Measurement interval	1 min. to 12 h

Digital Interface	
Interface type	Ethernet 100 Mbit, via LAN interface
	USB, via USB dongle

General Specifications	
Memory size	175,000 measured values (%RH&°C) 300,000 measured values (°C)
Wireless range	Wireless logger with HC2: up to 100 m in the open Wireless logger with Pt1000 sensor: up to 300 m in the open
Number of devices per LAN interface / USB dongle	100
Accuracy real time clock RTC	±2 s/day @ 25 °C ±4 s/day @ 0…50°C
Transmission power	<10 mW (LAN interface / USB dongle) <5 mW (wireless data loggers)
Housing material	Wireless logger: POM, PUR (cable for external Pt1000 sensor) LAN interface: aluminium
Housing protection grade	Wireless logger: IP65 (with HC2) IP69 (with Pt1000 sensor) LAN interface: IP20 USB dongle: IP20
Dimensions	Wireless data logger: 140 mm x Ø 20 mm LAN interface: 30 x 130 x 80 mm USB dongle: 15 x 77 x 20 mm
Weight	Wireless logger: 60 g / 85 g with external sensor LAN interface: 300 g USB dongle: 30 g

Conformity with Standards	
CE / EMC immunity	EMC Directive 99/5/EC: EN 61000-6-1: 2007 EN 61000-6-3: 2007 + A1: 2011 EN 12830
Solder type	Lead-free (RoHS directive)
FDA / GAMP directives	CFR21 Part 11 and GAMP5

Environmental Limits	
Storage and transit	Wireless logger: -40...85 °C / 0...100 %RH LAN interface: -20…85 °C / 0…90 %RH, non-condensing USB dongle: -20…85 °C / 0…90 %RH
Operation	-40...85 °C / 0...100 %RH

10 Accessories

Order Code	Description	
AC1319	Fastening element, 15 mm for HygroClip	
LOG-BATTERY	Replacement battery: Lithium-(Li-SOCl2) 2400 mAh, 3.6V	
LOG-AN-GP433	Ground plane antenna, cable length 2.5 m	

11 Additional Documents

Document Name	Contents
E-M-HC2 Probes	HC2 manual
E-M-HW4v3-Main	HW4 software, main manual
E-M-HW4v3-F2-021	HW4 software, manual for wireless data loggers
E-M-Calibration best practice	Instructions for calibration of humidity measuring devices

12 Document Versions

Version	Date	Remark
E-M-HL-RC-V1_00	September 2015	Release document
E-M-HL-RC-V1_01	November 2015	Correction of memory space
E-M-HL-RC-V1_02	March 2016	Additional types included in chapter 1.1 / 1.2
E-M-HL-RC-V1_03	March 2017	Update HL-LAN-INTERFACE