micropelt
Eine Marke der EH4 GmbH

Wall Mount Thermostat with Temperature Set Point
MLRTS1iEU-07 (EN)
LoRaWAN CLASS A EU868MHz SF7BW125
User Manual and Device Specification

The Micropelt MLRTS product series is designed for use as a room thermostat. Installation of the MLRTS is simple and only takes a few minutes. Compared to conventional systems, the LoRaWAN MLRTS enables significant cost savings in labor and material costs for cabling, network infrastructure and building structure changes. LoRaWAN enables heating control over long distances, even within buildings.

For inquiries please contact us at:

Email: info@micropelt.com. Telephone +49 761 59026190

1 MLRTS1iEU-07 Title Page

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2 MLRTS1iEU-07 Revision History

REV. No.	Description of Revision	Beschreibung der Überarbeitung	Revised by	Date
REV1.2	First release MLRTS is an extended version of MLRTPS REV1.2	Erste Version MLRTS ist eine erweiterte Version von MLRTPS REV1.2	Bala	

3 MLRTS1iEU-07 Intended Use

The Micropelt MLRTS product series is designed for use as a room thermostat. Any other use is not permitted and may lead to malfunctions or damage. It is essential to observe the safety instructions in these operating instructions.

4 MLRTS1iEU-07 Safety

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or a lack of experience and knowledge, unless they have been given supervision or instruction concerning the use of the device by a person responsible for their safety.

- This product is not a toy. Children shall be advised to refrain from playing with it.
- If the device has been stored in a cold environment, make sure that it resumes close to room temperature before use. This is to prevent damage due to condensation.
- The room temperature sensor is designed for indoor use only. Do not allow the device to get wet. Its sensitive electronics can be affected.
- The unit is best cleaned with a dry or slightly damp cloth. Do not use aggressive cleaning agents or solvents.
- Refrain from exposing the unit to environmental stress such as high mechanical forces (do not step on it), strong vibrations, direct sunlight or extreme temperatures.
- The unit must not be disassembled or modified. There are no user-serviceable parts inside.
- Be aware that correct operation can be affected by strong electromagnetic fields. Typical sources of such are mobile phones, 2-way radios, RC transmitters, microwave ovens, electric motors.
- When operating the device in a workplace environment, be sure to observe the workplace regulations that may apply.

In case of questions, please contact:

Micropelt - a brand of EH4 GmbH. Email: info@micropelt.com**. Telephone +49 761 59026190**

5 MLRTS1iEU-07 General Description

This document defines the properties of Micropelt's indoor room temperature sensor with Set Point functionality.

Installing the Micropelt MLRTS system is simple. Use the provided screws and dowels to mount the back plate on the wall and mount the housing onto the back plate.

MLRTS is an 868MHz LoRaWAN CLASS-A wireless wallmount thermostat. LoRaWAN allows to control over long distances, even inside buildings. LoRaWAN end-devices of Class A allow for bidirectional communications whereby each end-device's uplink transmission is followed by two short downlink receive windows. The transmission slot scheduled by the end-device is based on its own communication needs with a small variation based on a random time basis (ALOHA-type of protocol). Class-A operation is the lowest power end-device system for applications that only require downlink communication from the server shortly after the end-device has sent an uplink transmission.

Each standard production MLRTS unit has a unique DEVEUI, JOINEUI (APPEUI) and a randomly generated APPKEY. Device credentials are secret and will only be submitted with the product delivery. Questions related to device credentials can be sent to devicecredentials@micropelt.com.

To operate the device, the unit must be paired with a compatible controller or gateway unit supporting its communication profile. After connecting the battery and mounted on the wall, the device attempts to connect to a gateway. If the connection to the gateway is successful, then it is ready for use.

Success of activation or deactivation is signaled by tone signals and LED.

The product is delivered with the Battery/Primary Cell disconnected to save energy. The installer has to connect the Primary Cell before mounting the device.

The room temperature sensor operates with a communication profile. Installation, activation and a successful join with the network server will immediately set the radio communication interval to every 10 seconds for an installation period of 5 minutes to provide rapid feedback.

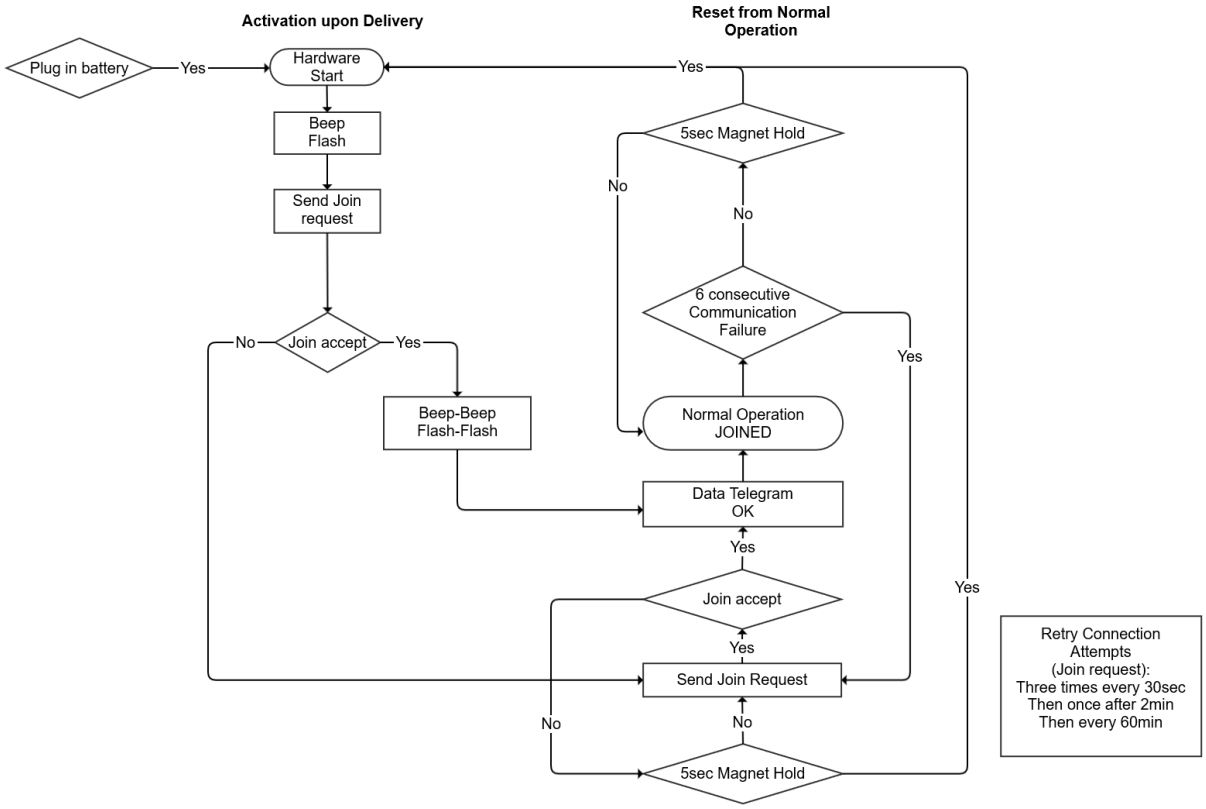
The MLRTS has a built-in temperature sensor to measure the ambient temperature of the room. The MLRTS also has a temperature set point functionality. The rotary dial is used to select the required Set Point Temperature.

Model	Description
 MLRTS1	Relative Set Point Temperature Settings (-4 °C to +5 °C and Freeze Protection 6°C)

6 MLRTS1iEU-07 Operating Instructions

6.1 User Interface Functionality

The unit has no user-accessible buttons to avoid manipulation of the device in public environments. Installers can use a pen-shaped magnet to perform tasks related to the installation.



6.2 Setting up a Gateway

In a web browser, navigate to the gateway IP address

1. Login to the gateway
2. LoRaWAN, Network Settings, Join Delay 5 seconds
3. LoRaWan, Network Settings, Max Datarate 5 – SF7BW125
   Click Submit
   Wait for Save and Apply to go red, and then click it
4. Firewall, Settings, Input Filter Rules
   Add ‘Allow Inbound’
5. Click Submit
6. Wait for Save and Apply to go red, and then click it

6.3 Pairing the Device with a Room Controller or Gateway

Devices will be accompanied with a spreadsheet containing the following information:

- Device EUI
- Join EUI
- Application Key

The Device EUI is unique to the device and allows identification and communication via LoRaWAN.

The Application Key is randomly generated to ensure secure communication.

To pair a device to a MultiTech gateway:

1. In a web browser, navigate to the gateway IP address
2. Login to the gateway
3. LoRaWAN, Key Management, click Add New
4. For each device, enter the following details, and then click OK:
   Dev EUI (available in the spreadsheet)
   App EUI (available in the spreadsheet)
   App Key (available in the spreadsheet)
   Class: A
   Device Profile: LW102-OTA-EU868
   Network Profile: DEFAULT-CLASS-A
5. Click Submit
6. Wait for Save and Apply to go red, and then click it

6.4 Unboxing and Assembly

The product consists of the following

- Base Plate
- Main Housing with Battery disconnected
- Screws and dowels

Use the provided screws and dowels to fix the base plate onto the wall

Connect the battery to the holder and mount the main housing onto the base plate

6.5 Attaching and Activating a unit

Before mounting the device onto the wall, be sure that the battery is connected (refer to the above section).

Once the battery is connected

1. The MLRTS will immediately activate and try to connect to the Gateway
2. The radio establishes a link to the gateway upon successful completion, a double-beep sounds
3. The unit is now active

6.6 Reset (from Normal Operation only)

The RESET function allows the user to restart the device. It is also useful to restore correct operation should a malfunction occur.

To RESET the device:

1. Hold the pen-shaped magnet to the Set Point “0” / Set Point Standard, until a beep sounds
2. The internal microcontroller will reset
3. The unit is now active

7 MLRTS1iEU-07 Communication Profile

FPort Number	Type of operation	Payload length	Description
0x00	MAC Commands	8 Bytes	RESERVED
0x01	Temperature Sensor Set Point Functionality	Uplink: 4 Bytes	• Measure Ambient Temperature • Use the dial for setting the Set Point Temperature
0x02	Report: • REV • Hardware Version • Firmware Version	Downlink: 0 Bytes Uplink: 6 Bytes	Request: • REV • Hardware Version • Firmware Version

7.1 MLRTS1iEU-07 FPORT 0x00 MAC Commands

DOWNLINK

BYTE	BIT RANGE	SIZE	OFFSET	ABBREVIATION	DETAILS
1	DB0.7…0.0	8	0	DevStatusReq	Requests the battery level of the device 0x06 = Device Status Request

Response is communicated in field “opts” (not in an FPORT 0x00 Uplink)

BYTE	BIT RANGE	SIZE	OFFSET	ABBREVIATION	DETAILS	
1	DB0.7…0.0	8	0		0x06	
2	DB1.7…1.0	8	8	DevStatusAns	**Battery Level**	
					Device Response	**Battery Level**
					0	The device is connected to an external power source
					1	2.00 V
					$1 \leq d \leq 254$	$2.0 + \frac{(d-1) * 1.7}{253} V$
					254	3.7 V
					255	The device was not able to measure the battery level
3	DB2.7…2.0	8	16	DevStatusAns	**Demodulation Margin** SNR in dB rounded to the nearest integer value for the last successfully received DevStatusReq command	

7.2 MLRTS1iEU-07 FPORT 0x01 UPLINK: Device to Controller / Network Server

BYTE	BIT RANGE	SIZE	OFFSET	ABBREVIATION	DETAILS
1	DB0.7… 0.0	8	0	ATV	Ambient Temperature Value 0x00 … 0xFF / 0 … 63.75°C , Res = 0.25
2	DB1.7… 1.5	3	8	RES	RESERVED
	DB1.4	1	11	ES	Energy Storage Low 1 = Battery is low
	DB1.3	1	12	RCE	Radio Communication Error 1 = Radio Loss
	DB1.2	1	13	RSS	Radio Signal Strength 1 = Weak Radio
	DB1.1	1	14	RES	RESERVED
	DB1.0	1	15	ATF	Ambient Temperature Failure 1 = Sensor Failure
3	DB2.7… 2.0	8	16	STV	Storage Voltage 0x00 … 0xFF / 0 … 5100mV Res = 20mV
4	DB3.7 ...3. 0	8	24	SPT	Set Point Temperature °C
					Relative Set Point Temperature (in Two's Complement)
					0xFF (Freeze protection 6°)

		0x0C (-4)
		0x0D (-3)
		0x0E (-2)
		0x0F (-1)
		0x00 (0)
		0x01 (+1)
		0x02 (+2)
		0x03 (+3)
		0x04 (+4)
		0x05 (+5)

7.3 MLRTS1iEU-07 FPORT 0x02 UPLINK: Version

DOWNLINK

BYTE	BIT RANGE	SIZE	OFFSET	ABBREVIATION	DETAILS

Requests a 0x02 Uplink containing the device version details

UPLINK

BYTE	BIT RANGE	SIZE	OFFSET	ABBREVIATION	DETAILS
1	DB0.7…0.4	4	0	REV	REV Minor value
	DB0.3…0.0	4	4		REV Major value
2	DB1.7…1.4	4	8	HW	Hardware Minor value
	DB1.3…0.0	4	12		Hardware Major value
3	DB2.7…2.0	8	16	FWy	Firmware Year value since 2000
4	DB3.7…3.4	4	24		RESERVED
	DB3.3…3.0	4	28	FWm	Firmware Month value (1 = January, 12 = December)
5	DB4.7…4.6	3	32		RESERVED
	DB4.5…4.0	5	35	FWd	Firmware Day value (1 = 1st day of the month)
6	DB57…5.0	8	40	FWi	Firmware Minor value

8 MLRTS1iEU-07 Operating Modes

	Installation cycle	Standard operation	Idle state	Radio failure
Comments		Ambient Temperature Measurement and Set Point Functionality	Phases between monitoring and communicating	Uplinks not received by the gateway
Trigger	When Battery is first connected (or) when the device is RESET using Push Button Join accept from Gateway	Internal timer	Internal timer	From activation: No Gateway connect From standard operation: 3 consecutive Gateway communication failures
Radio communication interval (RCI)	10 seconds for 5 minutes	5 minutes	OFF	Three times 30 seconds Then once 2 minutes Then 60 minutes
Dynamic change of communication interval	No	No	No	No
Sensors (Temperature)	Active, every 10 seconds	Active	OFF	Active
Monitoring of battery	Active, every 10 seconds	Active	OFF	Active

9 MLRTS1iEU-07 Power Consumption

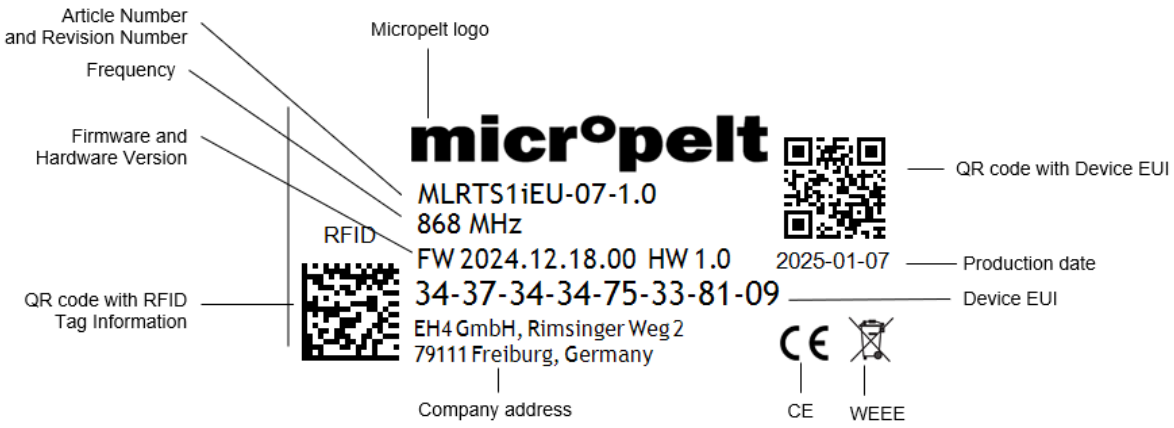
Function	Power consumption average current draw	Battery runtime @ 2600mAh
Sleep mode (No Sensor measurements)	2.3 µA	129.04 years
Radio communication every 5 min. **(Temperature Measurement every 5 minutes, Uplink only with fixed time interval of 5 minutes)**	11.8 µA	25.1 years

10 MLRTS1iEU-07 Performance Data

Parameter	**Value**
Ambient operating temperature range	0 to 40°C, max 70% rH
Transportation & storage temperature range	-20 to +65°C, max 70% rH
Dimensions (L x W x H mm)	85 x 85 x 25 (excl. setpoint device) 85 x 85 x 34 (incl. setpoint device)
Weight	110 g (excluding packing)
Operation at high altitude	Max N m / N ft above sea level
Radio Communication Interval during Installation Cycle	10 seconds for 5 minutes
Radio Communication Interval normal operation	5 Minuten
Radio Communication attempt Interval (after join fail or 6 consecutive communication fails)	3 * 10 seconds Then 2 minutes Then 60 minutes
Accuracy of internal ambient temperature sensor	±0.5°C
Energy storage	Primary Cell (Nominal 2600 mAh) 3,6 Volt
Color	RAL9003
CE Conformity Radio Radio EMC EMC EU Human Exposure Product safety	 EN300220-2V3.1.1 & EN300220-2V3.2.1 & EN300220-1V3.1.1 EN301489-1 V2.2.3 / -3 V2.1.1 EN55014-1 / -2 () ()
Radio specification	868.0 - 868.6 MHz, 14 dBm

11 MLRTS1iEU-07 CE Conformity

12 MLRTS1iEU-07 Labels



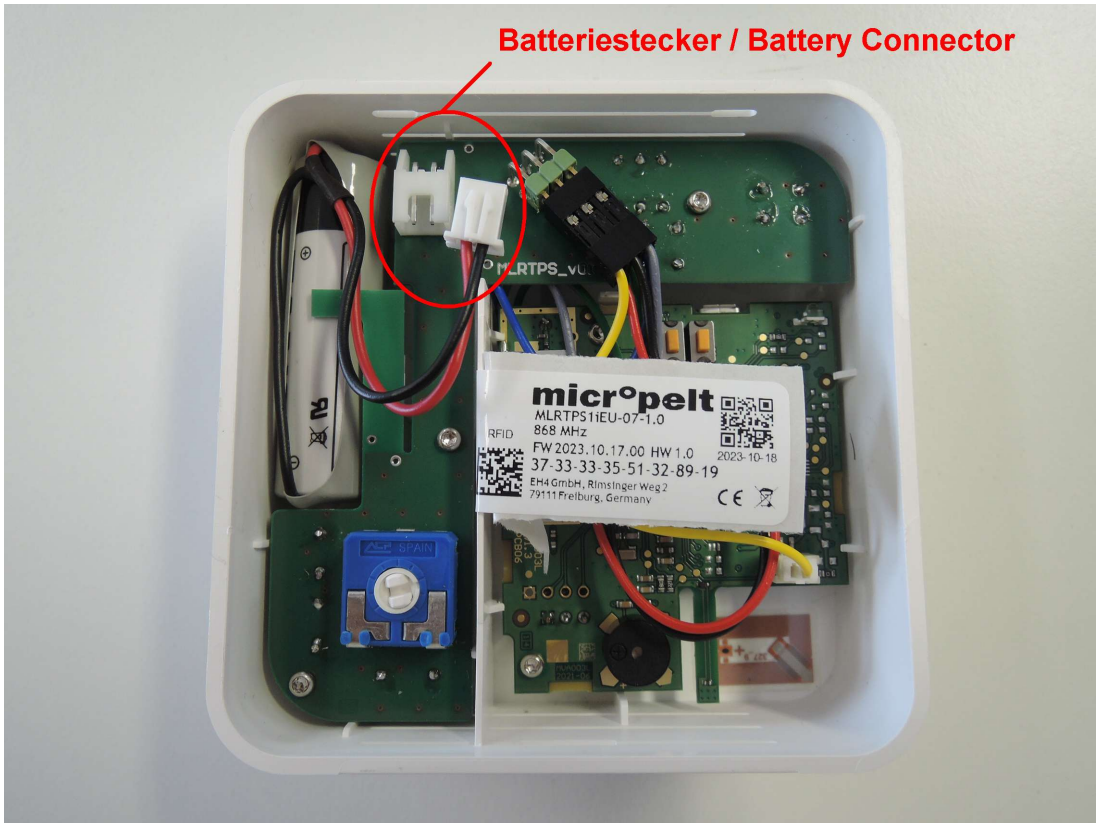
What	**Where**
Product type	On Label
REVn.n	On Label
Date of production	On Label
Hardware version	On Label
Firmware version	On Label
LoRaWAN frequency	On Label
Device EUI (16 digits)	On Label
Join EUI (16 digits)	In Spreadsheet
Application Key (32 digits)	In Spreadsheet (Secret)
Country of Origin	On Label
Address	On Label
Micropelt Logo	On Label

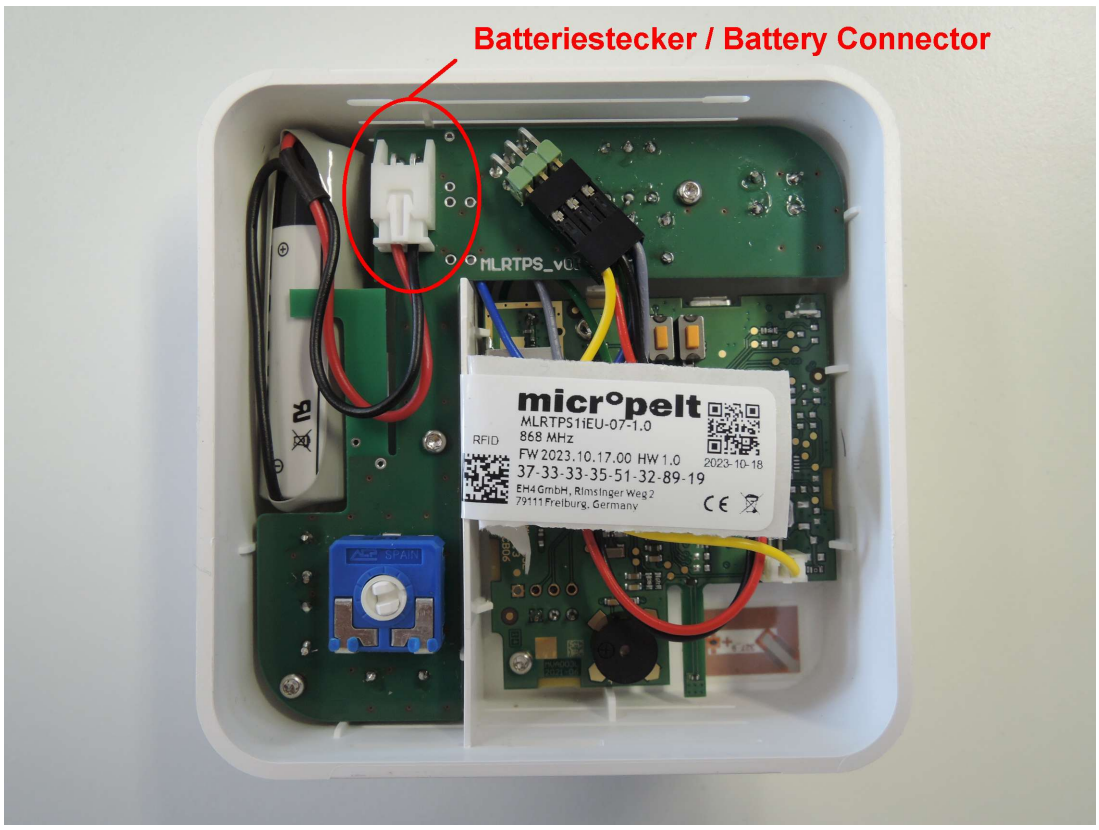
13 MLRTS1iEU-07 Accessories

13.1 MLR-KEY Magnetic switch

1 Pen-shaped magnet required for activating and deactivating the device

14 MLRTS1iEU-07 Battery Connection





15 MLRTS1iEU-07 Waste Disposal Instructions

Genereller Hinweis zur Entsorgung:

Die EH4 ist unter der WEEE REG Nummer DE90689057 registriert.

Die WEEE-Nummer ist eine Herstellernummer, die nach einer erfolgreichen Registrierung bei der stiftung ear an Erstinverkehrbringer von Elektro-/ Elektronikgeräten vergeben wird. (Elektro- und Elektronikgerätegesetz ElektroG)

Das ElektroG dient der Vermeidung von Abfällen von Elektro- und Elektronikgeräten“, um die zu beseitigende Abfallmenge zu reduzieren sowie den Eintrag von Schadstoffen aus Elektro- und Elektronikgeräten in Abfälle zu verringern.“

Für unsere B2B Geräte (siehe ElektroG: §19), die nicht bei einem kollektiven Rücknahmesystem abgegeben werden können, bieten wir - soweit vertraglich nicht anders vereinbart - die Möglichkeit zur Rückgabe an. Setzen Sie sich im Bedarfsfall direkt mit uns oder dem Anbieter in Verbindung, von der Sie die Geräte erworben haben.

Für in unseren Produkten verwendete Industriebatterien (siehe BattG: § 2 (5)) bieten wir die Möglichkeit zur Rückgabe an. Setzen Sie sich im Bedarfsfall direkt mit dem jeweiligen Anbieter in Verbindung, von dem Sie unsere Industriebatterien erworben haben.

Transport-Verpackungsmaterial sind recyclingfähig.

General information on disposal:

The EH4 is registered under the WEEE REG number DE90689057.

The WEEE number is a manufacturer number that is assigned to the first distributor of electrical/ electronic equipment after successful registration with the ear foundation. (Electrical and Electronic Equipment Act ElektroG)

The ElektroG serves to prevent waste from electrical and electronic equipment, in order to reduce the amount of waste to be disposed of and to reduce the entry of pollutants from electrical and electronic equipment into waste."

For our B2B devices (see ElektroG: §19) that cannot be returned to a collective return system, we offer the option of returning them - unless otherwise agreed in the contract. If necessary, contact us or the supplier from whom you purchased the devices directly.

We offer the option of returning industrial batteries used in our products (see BattG: § 2 (5)). If necessary, please contact the supplier from whom you purchased our industrial batteries directly.

Transport packaging materials are recyclable.

Bei allen Fragen zu Entsorgung erreichen Sie uns unter:
E-Mail recycling@micropelt.com
Telefon +49 761 590 26 190

If you have any questions about disposal, please contact us at:
E-Mail recycling@micropelt.com
Phone 49 761 590 26 190