

HELTUN™

IMPOSSIBLY SMART



HIGH LOAD SWITCH HE-HLS01 USER MANUAL

for Hardware v.84 & Firmware v.1.5



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MANUAL REVISION HISTORY

October 2021

- **Firmware V1.5** - Added “**Parameter 66 – Retore Relay State**”
- **Firmware V1.5** – Changed the default values for overvoltage and voltage drop protections
- **Firmware V1.3** - Added “**Parameter 46 – Hold Mode Duration for External Input S1**”
- **Firmware V1.3** - Max supported Nodes for each Association Group increased to 5
- **Firmware V1.2** - Added “**Parameter 159 – Load On Notification**”
- **Firmware V1.2** - Added “**Parameter 160 – Load Off Notification**”

Detailed Changelog & OTA update files can be found at support.heltun.com

OVERVIEW

The HELTUN HE-HLS01 High Load Switch with Thermostat Functions brings incredible capabilities to any connected device: saving energy, wireless control of connected devices, and absolute comfort and convenience for your home. It fits easily behind outlets or switches in standard electrical junction boxes or in a circuit breaker panel connected to entire banks of lights or outlets making them 'Impossibly Smart' with over-the-Internet monitoring, control, and advanced programmability.

Full thermostat functions

The High Load Switch provides Internet-connected thermostat functions where a local display and controls are not needed such as roof or driveway de-icing systems. An included NTC temperature sensor can be installed on the wall, under floorboards, on the roof, or under decking allowing accurate monitoring of ambient or radiant floor/roof system temperatures.

Inputs & outputs

It can also be connecting to external switches or systems—such as a light switch or alarm system, etc.— through a pilot wire to allow direct or pre-programmed control of connected devices using eight different modes.

Know how much energy you use

Determine how much energy is used by major appliances, entertainment systems, computers, small appliances, or entire lighting systems by monitoring how much energy has passed through the HE-HLS01 during any particular day, week, or month.

Makes circuit breakers 'Impossibly Smart'

Since the High Load Switch can handle up to 16 Amp loads, it is a perfect addition to your circuit breaker panel for monitoring and controlling groups of devices from the Internet through a Z-Wave™ gateway.

Safety

The High Load Switch adds safety to your home by protecting against overloads, overheat, sparks conditions, and it can even be configured to turn off an outlet if a family member leaves a high load device turned on for a long period of time, possibly preventing a fire.

Enables scenarios triggered by time

The High Load Switch has an onboard Real Time Clock (RTC) that enables scenarios where connected devices can be triggered on a schedule.

Based on the latest Z-Wave platform

The HE-HLS01 integrates a Z-Wave Plus™ v2 700 platform module allowing it to be used with Z-Wave home automation systems. The HE-HLS01 supports Z-Wave 'S0' and 'S2' security protocols, SmartStart technology, and can be connected (associated) to other Z-Wave devices, such as relays, motor controllers, dimmers, etc.

TECHNICAL SPECIFICATIONS

- Dimensions: 50mm (H) x 50mm (W) x 26mm (D)
- Materials: Flame retardant plastic
- LED indicator for device status
- Operating temperature: 0°C to +50°C
- Power supply: 85-265VAC 50Hz/60Hz, 24-48VDC
- Power consumption: 1W
- Active elements: Electromagnetic Relay Switch
- Maximum resistive load: 16A, 4000W @ 250VAC
- HELTUN Advanced Zero-Cross relay switching technology
- Relay lifetime: 100.000 switches
- External floor temperature sensor
 - NTC 10kΩ
 - Measurement range: -20°C to +100°C
 - Accuracy: ±0.5°C
- Device control
 - Through Z-Wave network
 - Directly with pilot wire
- Real-time energy consumption meter
- IP class: IP21
- Z-Wave Plus V2 SDK: V7.11
- Z-Wave module: ZGM130S
- Can be mounted to flush electrical junction box:
 - round, square or rectangular type – min. depth 40

FUNCTIONS & FEATURES

The functions and features of HE-HLS01 could be different depending on how the device is included in Z-Wave network. Depending on the number of button presses (two or four) during the inclusion process HE-HLS01 could function as either “Binary Switch” or “Thermostat”. In case if the device is already included in Z-Wave network and there is a need to change the device type, it should be removed from network and re-included with the corresponding type.

COMMON FOR “BINARY SWITCH” AND “THERMOSTAT” DEVICE TYPES

- Options for Inclusion/Exclusion to/from Z-Wave network
 - Non-Secure
 - S0 Secure
 - S2 Unauthorized, S2 Authorized with Key
- Association control of devices in z-wave network
- 8 safety functions:
 - **Overheat** protection & notification
 - **Temperature Rise** protection & notification
 - **Over-current** protection & notification
 - **Over-load** protection & notification
 - **Over-voltage** protection & notification
 - **Voltage drop** protection & notification
 - **Spark & Surge** protection & notification
 - **Device Failure** notification
- External control input
- Periodic measurements from:
 - External temperature sensor
 - Energy consumption meter
- Can be used with different NTC-sensors (range: 1kΩ to 100kΩ)
- Calibration of External NTC Temperature Sensor
- Zero-cross relay switching
- NO/NC relay mode
- LED indicator blinking function (for easy identification among other Z-Wave devices)
- Real-time and cumulative energy usage to 0.1kW accuracy
- Factory reset function
- SmartStart technology for quick addition to Z-Wave networks
- Encrypted OTA (Over The Air) firmware update feature
- Z-Wave Frequency change

“BINARY SWITCH” DEVICE TYPE

- Auto On/Off function
 - Switch output Off if there is no consumption
 - Switch output On when the load is reconnected
- Time limit for high load
- Timer mode for relay control
- 10 scenarios for relay control

“THERMOSTAT” DEVICE TYPE

- 6 operational modes with individual temperature set points:
 - **Heat** – Most comfort mode
 - **Auto** – Time schedule mode
 - **Dry** – Fast floor drying mode
 - **Energy Saving** – Power efficient mode
 - **Away** – Vacation mode
 - **Off** – Thermostat Off (IDLE) mode
- 4-time schedules for 7 days of the week:
 - **Morning**
 - **Day**
 - **Evening**
 - **Night**
- Additional safety function:
 - Load Failure notification
- Can be used with different NTC-sensors (range: 1kΩ to 100kΩ)
- Temperature set intervals: 1.0°C to 110.0°C
- Temperature scale selection (Celsius or Fahrenheit)
- Temperature hysteresis selection range: 0.2°C to 10.0°C

INSTALLATION

The HELTUN HE-HLS01 High Load Switch must be installed by a licensed electrician in a manner that conforms to local regulations and building codes. Provide these instructions to the licensed electrician who is installing the HE-HLS01.

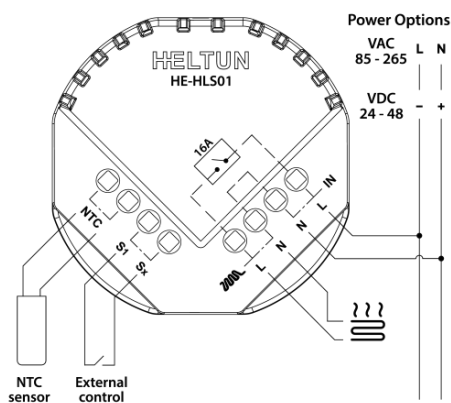
WARNING: ELECTRICAL POWER MUST BE SWITCHED OFF DURING INSTALLATION.



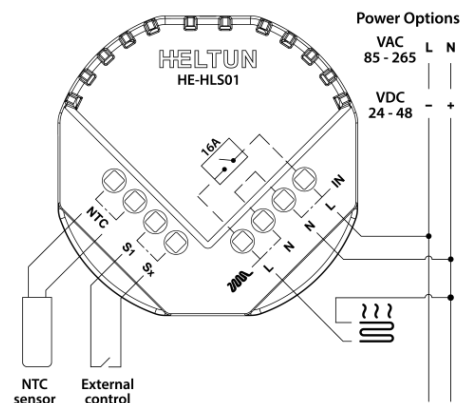
1. FIRST ENSURE THE POWER IS OFF at the main circuit breaker, and then test the wires with a probe or multimeter to verify.
2. Insert the power and load wires to the correct HE-HLS01 terminals by inserting a small Phillips-head screwdriver in the slot beneath each terminal and unscrew to open.

Follow connection diagrams 1 (or 2 or 3 or 4) and the instructions below:

- **Power wires:** for AC power (85-265VAC) connect Line & Neutral lead wires to L & N terminals labeled “IN”. For DC power (24-48VDC) connect “+” wire to terminal N and “-” wire to terminal L.
 - **Load wires:** connect Line & Neutral wires to L & N terminals labeled with “heating element” graphic
- ≡ **Note:** it is possible to connect Neutral wire from load directly to your neutral line (Connection diagrams 2 or 4).
- ≡ **Note:** HELTUN recommends installing cord terminals (electric wire ferrules) on the ends of wires before connecting them to the HE-HLS01 outputs (various colors terminals are included).
- ≡ **Note:** Zero-Cross technology is unavailable if the device is DC (24-48VDC) powered. Tighten wires using Phillips screwdriver in slot beneath each wire.

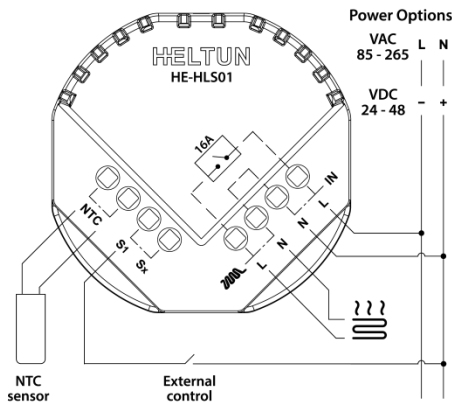


Connection diagram 1

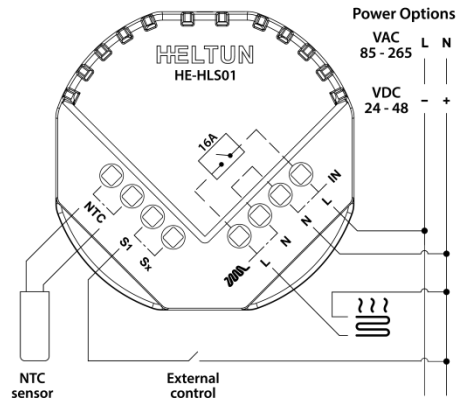


Connection diagram 2

3. If using the HE-HLS01 for radiant floor heating, connect the NTC temperature sensor wire to the terminals labeled “NTC.” A 10 kΩ NTC sensor is included inside the HE-HLS01 packaging, but any NTC sensor can be used.
 - ≡ **Note:** If an NTC sensor other than 10 kΩ is used, you must change the sensor resistance value in Parameter 10.
4. If you will be using an external device to select modes for the HE-HLS01 (such as a security system or wall switch), connect wires from the external device’s dry contacts to the two HE-HLS01 terminals labeled “S1” & “Sx”.
 - Two different connection methods for external control are possible:
 - Connect S1 to Sx through dry contact switch (Connection diagrams 1 or 2)
 - Connect S1 to electric network Line through dry contact switch (Connection diagrams 3 or 4)
 - ≡ **Note:** In case of using “Connection Diagram 3 or 4”, it is MANDATORY to connect S1 terminal to the same wire connected to terminal N on the device (labeled as “IN”) through dry contacts of an external device (like wall switch).



Connection diagram 3



Connection diagram 4

5. Switch On the main power at the circuit breaker. The HE-HLS01 will start up with the original default factory settings and the LED indicator will blink red slowly meaning the device is excluded from a Z-Wave network.

DISASSEMBLY

1. ENSURE POWER IS SWITCHED OFF at the main circuit breaker AND THE LED INDICATOR IS OFF.
2. Disconnect the wires by inserting a small Phillips-head screwdriver into the slot beneath each wire and unscrewing to release.

FACTORY RESET

To reset the HE-HLS01 to factory defaults, press and hold the service button for six seconds. If successful, the LED indicator will blink white for two seconds then the device will reboot. The factory reset will change all the Parameters to their original factory default values and will also Exclude the device from any Z-Wave network.

- ≡ **Note:** Please use this procedure only when the network primary controller is missing or otherwise inoperable.

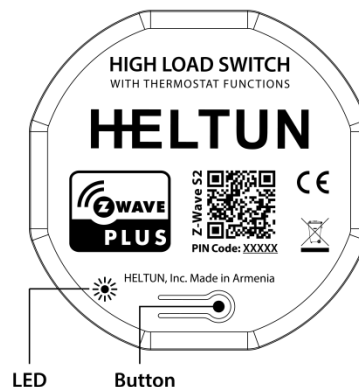
Z-WAVE NETWORK

The HE-HLS01 may be operated in any Z-Wave network with other Z-Wave-certified devices from other manufacturers. The HELTUN HE-HLS01 will act as a 'repeater' (i.e. 'range extender') for other devices regardless of manufacturer or brand to increase the reliability of the overall network.

Adding to Z-Wave network

To add the HE-HLS01 to an existing Z-Wave network (i.e. “inclusion”), do the following:

1. Ensure the HE-HLS01 is Powered On and the LED indicator blinks red slowly (i.e. it is excluded).
2. Start the Inclusion Mode from the gateway/controller.
3. To start the inclusion process on the HE-HLS01:
 - a) if you want to use the device as a “Binary Switch”, double-press the service button on the device (with no more than a one-second interval between presses).
 - b) if you want to use the device as a “Thermostat”, press four times the service button on the device (with no more than a one-second interval between presses).
4. The LED indicator will blink green quickly.
5. If the inclusion has been successful, the LED indicator will turn green for three seconds then continue slowly blinking green while the HE-HLS01 device type is “Binary Switch” and turn blue for three seconds then continue slowly blinking blue while the device type is “Thermostat”.
6. If the inclusion was not successful, the LED indicator will turn red for three seconds then continue slowly blinking red continuously while the HE-HLS01 is Powered On. In that case repeat the inclusion process (2-5) above



Removing from Z-Wave network

To remove the HE-HLS01 from a Z-Wave network (i.e. "Exclusion"), do the following:

1. Ensure the HE-HLS01 is Powered On and the LED indicator blinks green or blue slowly (i.e. it is included in a Z-Wave network).
2. Start the Exclusion Mode from the gateway/controller.
3. To start the exclusion process on the HE-HLS01, double-press the service button on the device (with no more than a one-second interval between presses).
4. The LED indicator will blink red quickly.
5. If the exclusion has been successful, LED indicator will turn red for three seconds then continue slowly blinking red continuously while the HE-HLS01 is Powered On.
6. If the exclusion was not successful, the LED indicator will turn green or blue for three seconds then continue slowly blinking green or blue continuously while the HE-HLS01 is Powered On. In that case repeat the exclusion process (2-5) above.

Note: If the HE-HLS01 has previously been part of a Z-Wave network and not Excluded since (the LED indicator blinks green or blue slowly), Inclusion is not possible without first performing an Exclusion or Factory Reset procedure.

Security

S0, S2 unauthorized, and S2 authorized Inclusion Modes are supported. If you use the S2 authorized Inclusion Mode, the security key should be used during the inclusion process. Security key is the first 5 digits of DSK (device DSK is printed on the rear of the device plus on the Security Card included in the packaging, see Figures 2 & 3).

- ≡ **Note:** Be sure to save this key. Without the key, it is impossible to perform an inclusion in S2 authorized mode.

SmartStart

SmartStart-enabled products can be added to a Z-Wave network by scanning the Z-Wave QR Code shown on the product (see Figures 1 & 3) with gateways/controllers that provide for SmartStart inclusion. In this case, no further action will be required and the SmartStart product will be added automatically within ten minutes of being turned on in the vicinity of a network.

To add the HE-HLS01 to the Z-Wave network using **SmartStart**:

1. Input the High Load Switch DSK to the controller's Node Provisioning List (or scan the QR code)
2. Power on the device.
3. Wait for the adding process to complete.
4. Successful adding will be confirmed by a message on the Z-Wave controller and the LED indicator on HE-HLS01 will turn green for three seconds then continue to slowly blink green continuously while the device is Powered On.

- ≡ **Note:** The device QR code and DSK are printed on the front and rear of the HE-HLS01 plus on the additional Security Card included in the packaging (see Figures 1, 2 & 3).

- ≡ **Note:** During SmartStart inclusion the device will be included to the gateway as a binary switch. If you want to use the device as a thermostat, use manual inclusion process.



Figure 1



Figure 2



Figure 3

Firmware OTA Update

To wirelessly update the HE-HLS01 firmware, follow these steps:

1. Check the device current firmware version in the gateway/controller.
2. Start the process from the Z-Wave gateway/controller.
3. Download the latest firmware that corresponds to the HE-HLS01 (see <http://support.heltun.com/>)
4. Set the main controller in Firmware OTA (“over-the-air”) Update Mode (see the gateway/controller manual).
5. As soon as the Firmware update begins, the LED indicator will sequentially blink red→green→blue (this will take a few minutes).
6. When the Firmware has updated, the LED will turn blue for two seconds and then the HE-HLS01 will reboot.
7. When the update has been completed, the HE-HLS01 will return to normal operation.
8. If desired, verify the update was successful by checking firmware version from the gateway/controller.

Z-WAVE PLUS V2 SPECIFICATIONS

Thermostat Generic Device Class: GENERIC_TYPE_THERMOSTAT
 Thermostat Specific Device Class: SPECIFIC_TYPE_THERMOSTAT_GENERAL_V2

Binary Switch Generic Device Class: GENERIC_TYPE_SWITCH_BINARY
 Binary Switch Specific Device Class: SPECIFIC_TYPE_NOT_USED

Supported Command Classes

Command Class	Version	Required Security Class	Binary Switch	Thermostat
Z-Wave Plus Info	V2	none	V	V
Association	V2	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Association Group Info	V3	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Multi Channel Association	V3	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Thermostat Operating State	V1	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	X	V
Thermostat Mode	V3	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	X	V
Thermostat Setpoint	V3	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	X	V
Switch Binary	V2	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	X
Sensor Multilevel	V11	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Meter	V5	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Clock	V1	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Transport Service	V2	none	V	V

Security 0	V1	none	V	V
Security 2	V1	none	V	V
Version	V3	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Manufacturer Specific	V2	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Device Reset Locally	V1	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Powerlevel	V1	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Supervision	V1	none	V	V
Indicator	V3	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Configuration	V4	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Application Status	V1	none	V	V
Firmware Update Meta Data	V5	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Basic	V2	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V
Notification	V8	highest granted (S2 Authenticated, S2 Unauthenticated or S0)	V	V

Meter Command Class:

Meter Type	Scale	Rate Type	Precision	Size
Electric [0x01]	Electric_kWh [0x00]	Import [0x01]	2	4
Electric [0x01]	Electric_W [0x02]	Import [0x01]	0	2
Electric [0x01]	Electric_V [0x04]	Import [0x01]	0	2

Notification Types:

Notification Type	Event/State	Binary Switch	Thermostat
Heat Alarm	Overheat detected	V	V
	Rapid temperature rise	V	V
System	System hardware failure (manufacturer proprietary failure code provided)	V	V
Power Management	AC mains disconnected	V	X
	AC mains re-connected	V	X
	Over-current detected	V	V
	Over-voltage detected	V	V
	Over-load detected	V	V
	Surge detected	V	V
	Voltage drop/drift	V	V
	Load error	X	V

ASSOCIATIONS

Association enables the HE-HLS01 to control other Z-Wave devices over the network. An Association Group may include up to five other devices from different brands and/or manufacturers. The HE-HLS01 has four association groups:

Group 1 – “Lifeline”: reports state of the device and used to communicate with the Z-Wave gateway. The group supports one Node.

≡ **Note:** It is not recommended to modify this group.

Group 2 – “Relay Basic Set”: is assigned to the HE-HLS01 relay state. It sends a Basic Set command with value 255 (On) when relay goes to On state and sends 0 (Off) when relay goes to Off state. The group supports five Nodes.

Group 3 – “S1 Basic Set”: is assigned to the HE-HLS01 external input state. It sends a Basic Set command with value 255 (On) when external input is shorted and sends 0 (Off) when input is open. The group supports five Nodes.

Group 4 – “Temperature Sensor”: is assigned to the HE-HLS01 external temperature sensor and sends the sensor value when it changes. The group supports five Nodes.

The device also can receive Basic Set command via associations. In the “Binary Switch” mode the device will change the relay state according to the value in Basic Set command. In the “Thermostat” mode the device will change the operating mode according to the Parameter 171 value from Thermostat parameters list.

SETTINGS (available through Z-Wave network)

All configuration parameters are accessed through Z-Wave
 COMMAND_CLASS_CONFIGURATION

DEVICE TYPE “BINARY SWITCH”

Parameters List & Factory Defaults

These parameters will take affect only in case if the device is included in the Binary Switch mode. For more information about the different inclusion modes see the section Z-Wave Network.

Number	Size	Description	Default Value	Available Values
1	1 byte	Frequency Region 0 = EU, 1 = US, 2 = ANZ 3 = HK, 4 = IN, 5 = IL 6 = RU, 7 = CN, 8 = JP 9 = KR	Read Only	0 ... 9
2	1 byte	Included Device Type 1 = Binary Switch 2 = Thermostat	Read Only	1, 2
3	4 bytes	Hardware and Software Versions	Read Only	XXYYZZ
4	4 bytes	Energy Consumption, kW	Read Only	Total consumption
5-6	Reserved by the manufacturer			
7	1 byte	Relay output NO or NC mode	0	0, 1
8-9	Reserved by the manufacturer			
10	1 byte	Floor Sensor Resistance, kΩ	10	1 ... 100
11-16	Reserved by the manufacturer			
17	1 byte	Temperature Sensor Calibration in °C, value X 10, e.g. 1.5°C=15	0	-100 ... 100 °C

18		Reserved by the manufacturer		
19	1 byte	Time correction by controller	1	0, 1
20		Reserved by the manufacturer		
21	1 byte	Week Day	1	1, 2, 3, 4, 5, 6, 7
22	2 bytes	Time: Hour and Minutes	0	0 ... 2359
23	1 byte	Load Auto On/Off	0	0, 1
24	1 byte	Auto Off Timeout	5	0 ... 120
25	1 byte	Auto ON Reconnect Timeout	0	0 ... 120
26	2 bytes	Time Limited Load	0	0, 100 ... 3500
27	2 bytes	High Load ON Time Limit	0	0 ... 1440
28-40		Reserved by the manufacturer		
41	1 byte	S1 Input Hold Control Mode	2	0, 1, 2, 3
42-45		Reserved by the manufacturer		
46	1 byte	Hold Mode Duration for External Input S1	500	200 ... 5000
47-50		Reserved by the manufacturer		
51	1 byte	S1 Input Click Control Mode	1	0, 1, 2, 3, 4, 5
52-65		Reserved by the manufacturer		
66	1 byte	Restore Relay State After Power Failure	0	0, 1
67-70		Reserved by the manufacturer		

71	2 bytes	Relay Timer Duration	0	0 ... 43200
72-110	Reserved by the manufacturer			
111	4 bytes	Relay control scenario 1	0	0, 1000000 ... 1912359
112	4 bytes	Relay control scenario 2	0	0, 1000000 ... 1912359
113	4 bytes	Relay control scenario 3	0	0, 1000000 ... 1912359
114	4 bytes	Relay control scenario 4	0	0, 1000000 ... 1912359
115	4 bytes	Relay control scenario 5	0	0, 1000000 ... 1912359
116	4 bytes	Relay control scenario 6	0	0, 1000000 ... 1912359
117	4 bytes	Relay control scenario 7	0	0, 1000000 ... 1912359
118	4 bytes	Relay control scenario 8	0	0, 1000000 ... 1912359
119	4 bytes	Relay control scenario 9	0	0, 1000000 ... 1912359
120	4 bytes	Relay control scenario 10	0	0, 1000000 ... 1912359
121-140	Reserved by the manufacturer			
141	1 byte	Consumption meter consecutive reporting interval, minutes	10	1 ... 120
142	1 byte	Consumption difference to send to controller, %	25	0, 1 ... 50
143	1 byte	Sensors consecutive reporting interval, minutes	10	1 ... 120
144	1 byte	Temperature difference to send to controller, value X 10	2	0, 1 ... 100 for °C
145-150	Reserved by the manufacturer			
151	1 byte	System Error Notification	1	0, 1

152	2 bytes	Temperature Rise Notification	50 for °C	0, 1 ... 120 for °C
153	2 bytes	Overheat Protection Level	60 for °C	0, 1 ... 120 for °C
154	1 byte	Overcurrent Notification	1	0, 1
155	2 bytes	Overload Protection Level	3500	0, 100 ... 4000
156	2 bytes	Overvoltage Protection Level	260	0, 120 ... 280
157	2 bytes	Voltage Drop Protection Level	90	0, 80 ... 240
158	1 byte	Spark Protection	1	0, 1
159	1 byte	Load On Notification	0	0, 1
160	1 byte	Load Off Notification	0	0, 1
161-200	Reserved by the manufacturer			

Z-Wave Frequency

Parameter 01 – Frequency Region

The HE-HLS01 has Z-Wave 700 series chip inside which allows to use the device in different Z-Wave frequencies. If there is a need to use the device in the frequency different from the factory default, change the value of this Parameter according to the frequency list below.

- ≡ **Note:** The factory default frequency differs depending on which region the device was intended for sale in. Check the factory default frequency on the device plate or on the packaging.
- ≡ **Note:** Do not change this Parameter value if there is no special need.
- ≡ **Note:** If change the value of this Parameter, the frequency change will be applied only after removing the device from Z-Wave network (the device will automatically reboot).
- ≡ **Note:** The change of this Parameter will result in inability to control the device, if the device was included to the controller/gateway which supports only one frequency.
- ≡ **Note:** Resetting the device to factory default settings will revert the frequency to the factory default value.
- ≡ **Note:** In most of countries it is not allowed to use the frequency different from the frequency intended for that country.

Frequency list for different regions:

0: EU (868.4 MHz, 869.85 MHz)	5: IL (916.0 MHz)
1: US (908.4 MHz, 916.0 MHz)	6: RU (869.0 MHz)
2: ANZ (919.8 MHz, 921.4 MHz)	7: CN (868.4 MHz)
3: HK (919.8 MHz)	8: JP (922.5 MHz, 923.9 MHz, 926.3 MHz)
4: IN (865.2 MHz)	9: KR (920.9 MHz, 921.7 MHz, 923.1 MHz)

The full list of Z-Wave global regions where Z-Wave works is available at Z-Wave Global Regions SiLabs page

Hardware & Software Versions

Parameter 03 – Hardware and Software Versions

This Parameter allows to check the hardware and firmware versions of the device. The Parameter returns value in the format XXYYZZ, where XX is Hardware Version, YY is Firmware Major Version and ZZ is Firmware Minor Version.

- ≡ **Note:** This Parameter is read-only.

Power and Energy Consumption

HE-HLS01 monitors Real-Time and Cumulative power Energy Consumption and Voltage using advanced micro-controller technology which assures maximum accuracy ($\pm 1\%$ for loads greater than 1000W). Real-Time Consumption, Cumulative Consumption, and network Voltage are periodically reported to the Z-Wave controller (according to the Parameters 141 and 142):

Parameter 04 – Energy Consumption

This Parameter allows you to check the Cumulative Energy Consumption of the connected load. Through the Z-Wave network this Parameter returns Total Cumulative Consumption value in kWh.

- ≡ **Note:** This Parameter is read-only.

Resetting Cumulative Consumption memory:

The HE-HLS01 allows to erase stored Consumption Data through Z-Wave network.

The HE-HLS01 enables you to erase stored Consumption Data through the Z-Wave network as follows:

1. Make sure the HE-HLS01 is powered.
2. If not already done so, include the device into Z-Wave Gateway network.
3. Reset memory consumption data using the Reset Command in COMMAND_CLASS_METER (see the Gateway owner's manual).

- ≡ **Note:** Turning the device main power off/on will not erase the consumption data as it is stored in nonvolatile memory.

Input & Outputs Configurations

Parameter 07 – Relay output mode (NO / NC)

This Parameter determines the type of load connected to the device relay output. The output type can be NO – normal open (no contact/voltage switch the load OFF) or NC - normal close (output is contacted / there is a voltage to switch the load OFF). Choose the value 0 if NO contact type is required or value 1 if NC type is required.

The factory default value is 0.

Parameter 10 – Floor Sensor Resistance

If the external floor NTC temperature sensor is used it is necessary to select the correct resistance value in Ohms (Ω) of the sensor. The selection range is 1 to 100 kiloOhms (k Ω). One 10k Ω NTC floor temperature sensor is included in the HE-HLS01 package with a 3-meter connection wire. The factory default value is 10k Ω .

Temperature Configurations

Parameter 17 – Temperature Sensor Calibration

This Parameter defines the offset value for floor temperature. If the external floor temperature sensor is not calibrated properly, then manual calibration can be made by adjusting the values up to $\pm 10.0^{\circ}\text{C}$. This value will be added or subtracted from the floor temperature sensor reading. Through the Z-Wave network the value of this Parameter should be x10, e.g. for 1.5°C set the value 15. The factory default value is 0.

Time Configurations

Parameter 19 – Time Correction by Main Controller

If this Parameter value = 1 and the HE-HLS01 is connected to a Z-Wave gateway, the HE-HLS01 time and day will be periodically polled and corrected from the gateway. To switch off auto-correction set the Parameter value to 0. The factory default value is 1.

Parameter 21 – Day of the Week Manual Adjustment

This Parameter allows manual adjustment of the day of the week in case the HE-HLS01 is not connected to any Z-Wave gateway or auto-correction is disabled (Parameter 19 value is 0). 1 = Monday, 2 = Tuesday, 3 = Wednesday, 4 = Thursday, 5 = Friday, 6 = Saturday, 7 = Sunday. The factory default value is 1.

Parameter 22 – Time Manual Adjustment

This Parameter allows manual adjustment of Time. The Parameter has the following format: HHMM, where HH is hours and MM is minutes. E.g. for 16:08 set the value 1608 and for 1:00 set the value 100.

Auto On/Off function

Parameter 23 – Auto On/Off

If this function is enabled the device will switch Off the relay output when there is no consumption and switch On the output again when the load is reconnected. It is possible to set the delay for Auto Off function (in the Parameter 24) and for Auto On function (in the Parameter 25). To enable Auto On/Off function, set this Parameter value to 1 and use the value 0 if there is a need to disable the function.

The factory default value is 0 (the function is disabled).

- ≡ **Note:** If the output is manually switched Off (from Gateway or External Input toggle) Auto ON function will be blocked until the output switches back to ON manually or the load reconnected.
- ≡ **Note:** The function works only if the device is AC powered.

Parameter 24 – Auto Off Timeout

If Auto On/Off function (the Parameter 23) is enabled, it is possible to delay the Auto Off function. The output will be switched Off when there is no consumption for the interval defined in this parameter in minutes. The value of this parameter can be set from 0 to 120 min. Set the parameter value to 0 if there is a need to switch Off the output immediately when consumption drops to 0W.

The factory default value is 5 min.

- ≡ **Note:** The function works only if the device is AC powered.

Parameter 25 – Auto On Reconnect Timeout

If Auto On/Off function (the Parameter 23) is enabled, it is possible to delay the Auto On function. When the load is reconnected the relay output will be switched On after the time defined in this parameter in minutes. The value of this parameter can be set from 0 to 120 min. Set the parameter value to 0 if there is a need to switch On the output immediately when the load is reconnected.

The factory default value is 0 min.

- ≡ **Note:** The function works only if the device is AC powered.

Parameter 26 – High Load Timeout Protection: Power Threshold

If the HLS01 is used to control an electric socket, you can configure the device so that it automatically switch Off the socket if the potentially dangerous high load is connected longer than allowable time (time to be set in the Parameter 27), for example, if you left the iron switched On for too long. Set in this parameter the threshold value in watts, reaching which the connected load will be considered high. The value of this parameter can be set from 100 to 3500 in watts. Use the value 0 if there is a need to disable this function.

The factory default value is 0 (the function is disabled).

- ≡ **Note:** If the connected load power is less than value of this parameter, the protection will not be activated.
- ≡ **Note:** If the Parameter 27 (time threshold) value is set to 0, the protection will not be activated.
- ≡ **Note:** The time counter is reset every time when the load consumption drops to zero for 15 minutes, or the load is reconnected while the relay is off.
- ≡ **Note:** We recommend activating the Load Switched Off notification (the Parameter 160) to be informed when the device automatically switch Off the socket.
- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 27 – High Load Timeout Protection: Time Threshold

If High Load Timeout Protection is activated (the Parameter 26 is set) use this parameter to set the threshold value in minutes. If the load is connected longer than this value, the device will automatically switch Off the socket. The value of this parameter is in minutes and can be set from 1 to 1440. Use the value 0 if there is a need to disable this function. The factory default value is 0 (the function is disabled).

- ≡ **Note:** If the value of this parameter is set 0, the protection will not be activated.
- ≡ **Note:** If the connected load power is less than value of the Parameter 26, the protection will not be activated.
- ≡ **Note:** The time counter is reset every time when the load consumption drops to zero. If the connected load may change its consumption, make sure that the time threshold will be reached before the load consumption drops.
- ≡ **Note:** We recommend activating the Load Switched Off notification (the Parameter 160) to be informed when the device automatically switch Off the socket.
- ≡ **Note:** The protection works only if the device is AC powered.

External Input Configuration

The HE-HLS01 can be connected to the dry output contacts of an external device (i.e. security system or wall switch) to control the Switch output state depending on the state of the external device.

Two different connection diagrams are possible for external input:

1. Connect S1 to Sx through dry contact switch
2. Connect S1 to electric network Line through dry contact switch

- ≡ **Note:** In case of connecting S1 to electric network Line, it is MANDATORY to connect S1 terminal to the same wire connected to terminal N on the device (labeled as "IN").

Parameter 41 – External Input: Hold Control Mode

0 – Hold function is disabled

1 – Operate like click (the Parameter 51)

2 – Momentary Switch: When the button on switch connected to external input is held, (key closed) the relay output state is ON, as soon as the button is released (key opened) the relay output state changes to OFF.

3 – Reversed Momentary Switch: When the button on switch connected to external input is held, the relay output state is OFF, as soon as the button is released the relay output state changes to ON.

The factory default value is 2.

Parameter 46 – Hold Mode Duration for External Input S1

This parameter specifies the time the device needs to recognize a hold mode when the button connected to an external input is held (key closed). The acceptable values are: 200 to 5000 milliseconds. The factory default value is 500 milliseconds.

Parameter 51 – External Input: Click Control Mode

0 – Click function disabled

1 – Toggle switch: relay inverts state (ON to OFF, OFF to ON).

2 – Relay switches to ON state only

3 – Relay switches to OFF state only

4 – Timer: On>Off Mode: Relay output switches to ON state (contacts are closed) then after a specified time switches back to OFF state (contacts are open). The time is specified in the Parameter 71.

5 – Timer: OFF>ON Mode: Relay output switches to OFF state (contacts are open) then after a specified time switches back to ON state (contacts are closed). The time is specified in Parameter 71.

The factory default value is 1.

Parameter 66 – Restore Relay State

This parameter determines if the last relay state should be restored after power failure or not. Use value 1 if there is a need to restore the last relay state, and value 0 for not restoring the last relay state. The relay state will always be off after power failure if value 0 is selected. The factory default value is 0

Parameter 71 – Relay Timer Mode Duration

These parameters specify the duration in seconds for the Timer mode (values 4 or 5 in the Parameter 51). Press the button on the switch connected to external input and the relay output goes to ON/OFF for the specified time then changes back to OFF/ON. The time value can be configured from 0 sec to 43200 sec (12 hours).

The factory default value is 0.

- ≡ **Note:** If the parameter value is set to “0” the relay output will operate as a short contact (duration is about 0.5 sec).

Scenarios

Parameters 111-120 – Relay Control by Scenario

In these parameters, the relay state changes depending on day and time. For these configurations, parameter values are encoded as 7-digit numbers (ABCDEFGF).

A: State. 0 = Disabled, 1 = Enabled

B: Day of week

0 = every day

1-7 = corresponding day (1 is Monday, 7 is Sunday)

8 = every weekday (Monday - Friday)

9 = every weekend (Saturday and Sunday)

C: Change state to

0 = Switch OFF

1 = Switch ON

DEFG: Time

DE represents Hour (from 0 to 23),

FG represents Minutes (from 0 to 59).

All other numbers are reserved and will not affect the operation. To disable this option simply set this parameter to 0.

The factory default value is 0.

Example: Parameter value 1210350 means A=1 (the scenario is enabled), B=2 (Tuesday), C=1 (switch the relay On), DEFG=0350 (time 03:50). In this case each Tuesday at 03:50 the

relay output will be switched On. To disable the scenario, change the first digit to 0. In this example it will be 0210350.

- ≡ **Note:** The relays still can be controlled manually using External Inputs or via controller/gateway.
- ≡ **Note:** The logic will implement the operation when the time crosses the value in the Parameter. Meaning, that if the logic switches On the relay and you manually switch it Off, the relay will switch On next time when the value crosses the set parameter.
- ≡ **Note:** Parameters 111-120 are representing independent scenarios.

Energy and Sensor Report Interval

Parameter 141 – Energy Consumption Meter Consecutive Report Interval

When the device is connected to the Z-Wave gateway (controller), it periodically sends to the gateway reports from its energy consumption sensor even if there is no change in the value. This Parameter defines the interval between consecutive reports of real time and cumulative energy consumption data to the gateway. The value can be adjusted from 1 min to 120 min. The factory default value is 10 min.

- ≡ **Note:** If the consumption changes, the device will send the report to the gateway regardless of this Parameter value (the report will be sent according to value in Parameter 142).
- ≡ **Note:** It is not recommended to reduce the value of this Parameter in order not to increase the traffic on your network. We recommend to reduce the value of this Parameter only in case of poor connection, when reports from the device does not always reach the gateway.

Parameter 142 – Energy Consumption Meter Report

This Parameter determines the change in the load power resulting in the consumption report being sent to the gateway. From 1% to 50% can be selected. Use the value 0 if there is a need to stop sending the reports. The factory default value is 25.

- ≡ **Note:** When the HE-HLS01 is turning ON, the consumption data will be sent to the gateway once, even if the value of this Parameter is 0.

Parameter 143 – Sensors Consecutive Report Interval

When the device is connected to the Z-Wave gateway (controller), it periodically sends to the gateway reports from its external NTC temperature sensor even if there are not changes in the values. This Parameter defines the interval between consecutive reports. The value can be adjusted from 1 min to 120 min. The factory default value is 10 min.

- ≡ **Note:** If the sensor readings change, the device will send the report to the gateway regardless of this Parameter value (the report will be sent according to values in Parameter 144).
- ≡ **Note:** It is not recommended to reduce the value of this Parameter in order not to increase the traffic on your network. We recommend to reduce the value of this Parameter only in case of poor connection, when reports from the device does not always reach the gateway.

Parameter 144 – External Temperature Sensor Report Threshold

This Parameter determines the change in temperature level resulting in temperature sensors report being sent to the gateway. The value of this Parameter should be x10 for °C, e.g. for 0.4°C use value 4. From 0.1°C (value 1) to 10°C (value 100) can be selected. Use the value 0 if there is a need to stop sending the reports. The factory default value is 2 (0.2°C).

- ≡ **Note:** When the thermostat is turning ON, the sensor data will be sent to the gateway once, even if the value of this Parameter is 0.
- ≡ **Note:** It is not recommended to decrease the value of this Parameter, in order not to increase the load on your Z-Wave network traffic.

Protections and Notifications

Parameter 151 – Device Failure Notifications

If the HLS01 does not work properly it sends “System Failure” notification to the gateway with the error code. Set the value 1 to enable “System Failure” notification or the value 0 to disable. The factory default value is 1 (the notification is enabled).

Errors code list (sent with the notification):

0 – No Error (no issue is detected)

1 – Relay Off Error (when unable to switch Off the relay output).

2 – Relay On Error (when unable to switch On the relay output).

3 – Relay On & Off Error (when unable to switch On and Off the relay output).

4 – NTC Error (when no NTC sensor is detected or when it is damaged).

5 – NTC and Relay Off Error (when no NTC sensor is detected or when it is damaged and unable to switch Off the relay output).

6 – NTC and Relay On Error (when no NTC sensor is detected or when it is damaged and unable to switch On the relay output).

7 – NTC and Relay On & Off Error (when no NTC sensor is detected or when it is damaged and unable to switch On and Off the relay output).

Parameter 152 – Temperature Rise Notification

Use this parameter if you want to know about temperature rise before it reaches the critical value, defined in the “Overheat Protection” parameter. The device will send “Rapid Temperature Rise” notification to the gateway if the temperature sensor reading reaches the value defined in this parameter. The value can be set from 1 to 120 in °C scale mode. To disable the notification, set the value of this parameter to 0.

The factory default value is 50 in °C scale.

- ≡ **Note:** We recommend setting the value of this Parameter lower than value of Parameter 153 (Overheat Protection).

Parameter 153 – Overheat Protection & Notification

You can define the maximum limit of temperature, reaching which the device will automatically switch Off the load and send “Overheat Detected” notification to the gateway. The value of this parameter can be set from 1 to 120 in °C scale mode. Use the value 0 if there is a need to disable this function.

The factory default value is 60 in °C scale.

Parameter 154 – Over-Current Protection & Notification

The maximum load for the device is 16A. If the connected load current exceeds 16A the device will automatically switch Off the output and send the “Over-Current Detected” notification to the gateway. To disable sending the notification, set the value of this Parameter to 0. The factory default value is 1 (the notification is enabled).

- ≡ **Note:** Even if you turn off the notification, the device will switch Off the load when the current reaches 16A.
- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 155 – Over-Load Protection & Notification

You can define the maximum power in Watt for connected load. The device will automatically switch off the output and send “Over-Load Detected” notification to the gateway if power consumed by the connected load exceeds this limit. The value of this parameter can be set from 100 to 4000 in watts. Use the value 0 if there is a need to disable this function. The factory default value is 3500W.

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 156 – Over-Voltage Protection & Notification

The device constantly monitors the voltage of your electricity network. You can define the maximum voltage of network exceeding which the device will automatically switch off the output and send “Over-Voltage Detected” notification to the gateway. The value of this parameter can be set from 120 to 280 in volts. Use the value 0 if there is a need to disable this function. The factory default value is 260V.

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 157 – Voltage Drop Protection & Notification

You can define the minimum voltage of your electricity network. If the voltage of the network drops determined level the device will automatically switch off the output and send “Voltage Drop Detected” notification to the gateway. The value of this parameter can be set from 80 to 240 in volts. Use the value 0 if there is a need to disable this function. The factory default value is 90V.

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 158 – Sparks Protection & Notification

If connected load fails it can create sparks that may cause a fire. The device constantly monitors the power consumption of connected load and can detect even a small surge in consumption and automatically switch off the output and send “Surge Detected” notification to the gateway. Set the value 1 to enable this function or the value 0 to disable. The factory default value is 1 (the protection is enabled).

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 159 – Load On Notification

Use this parameter if you want to get a “Power reconnected” notification every time the relay turns on. If you want to enable the notification set the parameter value to 1. The factory default value is 0 (Notification is disabled)

Parameter 160 – Load Off Notification

Use this parameter if you want to get a “AC mains disconnected” notification every time the relay turns off. If you want to enable the notification set the parameter value to 1. The factory default value is 0 (Notification is disabled)

DEVICE TYPE “THERMOSTAT”

OPERATION MODES

When the HE-HLS01 is included as Thermostat it has 6 Operating Modes:

1. Heat – Comfort Mode
2. Auto Change Over – Time Mode (schedule different Set Point per time and day)
3. Dry – Floor Fast Drying Mode
4. Energy saving – Power Efficient Mode
5. Away – Vacation Mode
6. Off – Thermostat IDLE Mode

Each operating mode has individual temperature Set Points. The HE-HLS01 will operate automatically depending on the current Set Point. You may control Set Points through your Z-Wave gateway software.

≡ **Note:** The minimum Set Point is 1.0°C and the maximum Set Point is 110.0°C.

Heat Mode

This mode is recommended for normal comfort. The factory default set point is 25.0°C.

Auto Changeover Mode - Temperature Schedule Mode

The Temperature Schedule Auto Mode can adjust home temperatures automatically to align with your personal habits, saving energy while you are away, and maintaining a comfortable temperature while you are active at home.

The HE-HLS01 can have different Schedules for Morning, Daytime, Evening and Night. For example, the “Morning” Schedule could be set to 25.0°C starting at 7:00. The “Day” Schedule could then be set to 11.0°C at 9:00 when everyone has gone to work or school, and so on. Here are recommended Scheduled Set Points for heating during the work week – you may wish to change these on weekends depending on your family’s schedule (see example below):

Schedule Mode	Set Time	Set Point Temperature
Morning	6:00 (6:00 AM)	24°C
Day	9:00 (9:00 AM)	20°C
Evening	18:00 (6:00 PM)	23°C
Night	23:00 (11:00 PM)	18°C

≡ **Note:** All four Schedules (Morning, Day, Evening, & Night) are the same for all seven days of the week.

- ≡ **Note:** Auto mode will only work properly if the correct current time and date have been set. The time can be automatically corrected from your Z-Wave gateway if the Parameter 19 value is set to 1. Or it can be set manually in Parameters 21 and 22.
- ≡ **Note:** In Auto mode, the temperature Set Point will be automatically changed depending on the Schedule. At any time, the Set Point can be adjusted but it will be effective only until the next Schedule.

Dry - Fast Floor Drying Mode

This mode is recommended for use if a high floor temperature is required for a limited period of time. For example, after washing the floor. By choosing DRY Mode, the HE-HLS01 will increase the temperature to the selected Set Point for the time specified in the “Dry Time” parameter (Parameter 25). A time range from 1 to 720 minutes (12 hours) can be set. As the Dry Time passes, the HE-HLS01 will automatically change to the Mode set in Parameter 26.

- ≡ **Note:** Factory defaults for Dry Time are: 30 minutes at 30.0°C.

Energy Saving Mode

This Mode can be used if lower temperature and energy consumption is desired. It can also be used at night or when the property is not occupied for prolonged period of time. The factory default Set Point is 20.0°C.

Away Mode

Use Vacation Mode when you are planning to be away from home for some period. The factory default temperature Set Point is 15.0°C.

- ≡ **Note:** The minimum set point for each mode is 1.0°C and the maximum set point is 110.0°C.

Parameters List & Factory Defaults

These parameters will take affect only in case if the device is included in the Thermostat mode. For more information about the different inclusion process see the section Z-Wave Network.

Number	Size	Description	Default Value	Available Values
1	1 byte	Frequency Region 0 = EU, 1 = US, 2 = ANZ 3 = HK, 4 = IN, 5 = IL 6 = RU, 7 = CN, 8 = JP 9 = KR	Read Only	0 ... 9
2	1 byte	Included Device Type 1 = Binary Switch 2 = Thermostat	Read Only	1, 2
3	4 bytes	Hardware and Software Versions	Read Only	XXYYZZ
4	4 bytes	Energy Consumption, kW	Read Only	Total consumption

5-6	Reserved by the manufacturer			
7	1 byte	Relay output NO or NC mode	0	0, 1
8	1 byte	S1 Input Mode	0	0, 1, 2, 3
9	1 byte	S1 Input Action	1	1, 2, 3, 4, 5
10	1 byte	Floor Sensor Resistance, kΩ	10	1 ... 100
11-16	Reserved by the manufacturer			
17	1 byte	Temperature Sensor Calibration in °C, value X 10, e.g. 1.5°C=15	0	-100 ... 100 °C
18	1 byte	Temperature Hysteresis, value X 10, e.g. 0.5°C=5	5	2 ... 100 in °C
19	1 byte	Time correction by the controller	1	0, 1
20	Reserved by the manufacturer			
21	1 byte	Week Day	1	1, 2, 3, 4, 5, 6, 7
22	2 bytes	Time: Hour and Minutes	0	0 ... 2359
23-24	Reserved by the manufacturer			
25	2 bytes	Dry Time	30	1 ... 720
26	1 byte	Dry Mode Switch	1	1, 2, 4, 5, 6
27-40	Reserved by the manufacturer			
41	2 bytes	Morning start time. Format: HHMM. e.g.08:00 should be sent as 0800	600	0000 ... 2359
42	2 bytes	Day start time. Format: HHMM.	900	0000 ... 2359
43	2 bytes	Evening start time. Format: HHMM.	1800	0000 ... 2359

44	2 bytes	Night start time. Format: HHMM.	2300	0000 ... 2359
45	2 bytes	Monday Morning temperature, valueX10	240 for °C	10 ... 1100 for °C
46	2 bytes	Monday Day temperature, valueX10	200 for °C	10 ... 1100 for °C
47	2 bytes	Monday Evening temperature, valueX10	230 for °C	10 ... 1100 for °C
48	2 bytes	Monday Night temperature, valueX10	180 for °C	10 ... 1100 for °C
49	2 bytes	Tuesday Morning temperature, valueX10	240 for °C	10 ... 1100 for °C
50	2 bytes	Tuesday Day temperature, valueX10	200 for °C	10 ... 1100 for °C
51	2 bytes	Tuesday Evening temperature, valueX10	230 for °C	10 ... 1100 for °C
52	2 bytes	Tuesday Night temperature, valueX10	180 for °C	10 ... 1100 for °C
53	2 bytes	Wednesday Morning temperature, valueX10	240 for °C	10 ... 1100 for °C
54	2 bytes	Wednesday Day temperature, valueX10	200 for °C	10 ... 1100 for °C
55	2 bytes	Wednesday Evening temperature, valueX10	230 for °C	10 ... 1100 for °C
56	2 bytes	Wednesday Night temperature, valueX10	180 for °C	10 ... 1100 for °C
57	2 bytes	Thursday Morning temperature, valueX10	240 for °C	10 ... 1100 for °C
58	2 bytes	Thursday Day temperature, valueX10	200 for °C	10 ... 1100 for °C
59	2 bytes	Thursday Evening temperature, valueX10	230 for °C	10 ... 1100 for °C
60	2 bytes	Thursday Night temperature, valueX10	180 for °C	10 ... 1100 for °C
61	2 bytes	Friday Morning temperature, valueX10	240 for °C	10 ... 1100 for °C
62	2 bytes	Friday Day temperature, valueX10	200 for °C	10 ... 1100 for °C

63	2 bytes	Friday Evening temperature, valueX10	230 for °C	10 ... 1100 for °C
64	2 bytes	Friday Night temperature, valueX10	180 for °C	10 ... 1100 for °C
65	2 bytes	Saturday Morning temperature, valueX10	240 for °C	10 ... 1100 for °C
66	2 bytes	Saturday Day temperature, valueX10	200 for °C	10 ... 1100 for °C
67	2 bytes	Saturday Evening temperature, valueX10	230 for °C	10 ... 1100 for °C
68	2 bytes	Saturday Night temperature, valueX10	180 for °C	10 ... 1100 for °C
69	2 bytes	Sunday Morning temperature, valueX10	240 for °C	10 ... 1100 for °C
70	2 bytes	Sunday Day temperature, valueX10	200 for °C	10 ... 1100 for °C
71	2 bytes	Sunday Evening temperature, valueX10	230 for °C	10 ... 1100 for °C
72	2 bytes	Sunday Night temperature, valueX10	180 for °C	10 ... 1100 for °C
73-140	Reserved by the manufacturer			
141	1 byte	Consumption meter consecutive reporting interval, minutes	10	1 ... 120
142	1 byte	Consumption difference to send to controller, %	25	0, 1 ... 50
143	1 byte	Sensors consecutive reporting interval, minutes	10	1 ... 120
144	1 byte	Temperature difference to send to controller, value X 10	2	0, 1 ... 100 in °C
145-150	Reserved by the manufacturer			
151	1 byte	System Error Notification	1	0, 1
152	2 bytes	Temperature Rise Notification	50 for °C	0, 1 ... 120 for °C
153	2 bytes	Overheat Protection Level	60 for °C	0, 1 ... 120 for °C

154	1 byte	Overcurrent Notification	1	0, 1
155	2 bytes	Overload Protection Level	3500	0, 100 4000
156	2 bytes	Overvoltage Protection Level	260	0, 120 ... 280
157	2 bytes	Voltage Drop Protection Level	90	0, 80 ... 240
158	1 byte	Spark Protection	1	0, 1
159	1 byte	Load Error Notification	0	0, 1
160-170	Reserved by the manufacturer			
171	1 byte	Basic Set Mode	0	1, 2, 3, 4, 5
172-200	Reserved by the manufacturer			

Z-Wave Frequency

Parameter 01 – Frequency Region

The HE-HLS01 has Z-Wave 700 series chip inside which allows to use the device in different Z-Wave frequencies. If there is a need to use the device in the frequency different from the factory default, change the value of this Parameter according to the frequency list below. Modification is possible only while the HE-HLS01 is not included to Z-Wave network.

- ≡ **Note:** The factory default frequency differs depending on which region the device was intended for sale in. Check the factory default frequency on the device plate or on the packaging.
- ≡ **Note:** Do not change this Parameter value if there is no special need.
- ≡ **Note:** If change the value of this Parameter, the frequency change will be applied only after removing the device from Z-Wave network (the device will automatically reboot).
- ≡ **Note:** The change of this Parameter will result in inability to control the device, if the device was included to the controller/gateway which supports only one frequency.
- ≡ **Note:** Resetting the device to factory default settings will revert the frequency to the factory default value.
- ≡ **Note:** In most of countries it is not allowed to use the frequency different from the frequency intended for that country.

Frequency list for different regions:

0: EU (868.4 MHz, 869.85 MHz)	5: IL (916.0 MHz)
1: US (908.4 MHz, 916.0 MHz)	6: RU (869.0 MHz)
2: ANZ (919.8 MHz, 921.4 MHz)	7: CN (868.4 MHz)
3: HK (919.8 MHz)	8: JP (922.5 MHz, 923.9 MHz, 926.3 MHz)
4: IN (865.2 MHz)	9: KR (920.9 MHz, 921.7 MHz, 923.1 MHz)

The full list of Z-Wave global regions where Z-Wave works is available at Z-Wave Global Regions SiLabs page

Hardware & Software Versions

Parameter 03 – Hardware and Software Versions

This Parameter allows to check the hardware and firmware versions of the device. The Parameter returns value in the format **XXYYZZ**, where **XX** is Hardware Version, **YY** is Firmware Major Version and **ZZ** is Firmware Minor Version.

- ≡ **Note:** This Parameter is read-only.

Power and Energy Consumption

HE-HLS01 monitors Real-Time and Cumulative power Energy Consumption and Voltage using advanced micro-controller technology which assures maximum accuracy ($\pm 1\%$ for loads greater than 1000W). Real-Time Consumption, Cumulative Consumption, and network Voltage are periodically reported to the Z-Wave controller (according to the Parameters 141 and 142):

Parameter 04 – Energy Consumption

This Parameter allows you to check the Cumulative and Real-Time Energy Consumption of the connected load. Through the Z-Wave network this Parameter returns Total Cumulative Consumption value in kW.

- ≡ **Note:** This Parameter is read-only.

Resetting Cumulative Consumption memory:

The HE-HLS01 allows to erase stored Consumption Data through Z-Wave network.

The HE-HLS01 enables you to erase stored Consumption Data through the Z-Wave network as follows:

1. Make sure the HE-HLS01 is powered.
2. If not already done so, include the device into Z-Wave Gateway network.
3. Reset memory consumption data using the Reset Command in `COMMAND_CLASS_METER` (see the Gateway owner's manual).

- ≡ **Note:** Turning the device main power off/on will not erase the consumption data as it is stored in nonvolatile memory.

Input & Outputs Configurations

Parameter 07 – Relay output mode (NO / NC)

This Parameter determines the type of load connected to the device relay output. The output type can be NO – normal open (no contact/voltage switch the load OFF) or NC - normal close (output is contacted / there is a voltage to switch the load OFF). Choose the value 0 if NO contact type is required or value 1 if NC type is required.

The factory default value is 0.

Parameter 08 – External Input Mode

0 – the input state changes will be ignored by the Thermostat logic.

1 – the external input will operate in “Toggle Switch” mode: if the external input is shorted (with Sx or Line) the Thermostat switches to the operating mode selected in the Parameter 09 and switches to OFF mode when the external input is open.

2 – the external input will operate in “Toggle Switch Reverse” mode: if the external input is shorted the Thermostat switches to OFF mode and switches to the operating mode selected in the Parameter 09 when the input is open.

3 – the external input will operate in “Push Button (Momentary Switch)” mode: each press of button (shorten of input) will consistently change the mode to the operating mode selected in the Parameter 09.

The factory default value is 0.

Parameter 09 – External Input Action

This Parameter allows selection of which Operating Mode the HE-HLS01 should revert to when the external input is shorted. 1 = Heat, 2 = Auto, 3 = Dry, 4 = Energy Saving, 5 = Away. The factory default value is 1.

Parameter 10 – Floor Sensor Resistance

If the external floor NTC temperature sensor is used it is necessary to select the correct resistance value in Ohms (Ω) of the sensor. The selection range is 1 to 100 kiloOhms (k Ω). One 10k Ω NTC floor temperature sensor is included in the HE-HLS01 package with a 3-meter connection wire. The factory default value is 10k Ω .

Temperature Configurations

Parameter 17 – Temperature Sensor Calibration

This Parameter defines the offset value for floor temperature. If the external floor temperature sensor is not calibrated properly, then manual calibration can be made by adjusting the values up to $\pm 10.0^{\circ}\text{C}$. This value will be added or subtracted from the floor temperature sensor reading. Through the Z-Wave network the value of this Parameter should be x10, e.g. for 1.5°C set the value 15. The factory default value is 0.

Parameter 18 – Temperature Hysteresis

This Parameter defines the hysteresis value for temperature control. The HE-HLS01 will stabilize the temperature with selected hysteresis. For example, if the SET POINT is set for 25°C and HYSTERESIS is set for 0.5°C the HE-HLS01 will change the state to IDLE when the temperature reaches 25.0°C , but it will change the state to HEATING if the temperature drops lower than 24.5°C . The hysteresis can be changed from 0.2°C to 10.0°C range in Celsius mode. Through the Z-Wave network the value of this Parameter should be x10 e.g. for 0.5°C set the value 5. The factory default value for $^{\circ}\text{C}$ is 5.

Time Configurations

Parameter 19 – Time Correction by Main Controller

If this Parameter value = 1 and the HE-HLS01 is connected to a Z-Wave gateway, the HE-HLS01 time and day will be periodically polled and corrected from the gateway. To switch off auto-correction set the Parameter value to 0. The factory default value is 1.

Parameter 21 – Day of the Week Manual Adjustment

This Parameter allows manual adjustment of the day of the week in case the HE-HLS01 is not connected to any Z-Wave gateway or auto-correction is disabled (Parameter 19 value is 0). 1 = Monday, 2 = Tuesday, 3 = Wednesday, 4 = Thursday, 5 = Friday, 6 = Saturday, 7 = Sunday. The factory default value is 1.

Parameter 22 – Time Manual Adjustment

This Parameter allows manual adjustment of Time. The Parameter has the following format: HHMM, where HH is hours and MM is minutes. E.g. for 16:08 set the value 1608 and for 1:00 set the value 100.

Parameter 25 – Dry Mode Timeout

By choosing Dry Mode, the device will increase the temperature to the selected Set Point and keep it for the time specified in this parameter. A time range of 1 to 720 minutes (12 hours) can be set. As the Dry Time passes, the Thermostat will automatically change to the Mode set in the Parameter 37.

The factory default value is 30 minutes.

Parameter 26 – Mode to Switch After Dry Mode Operation Complete

This Parameter indicates the mode that will be set after Dry Time: 1 = Heat, 2 = Auto, 4 = Energy Saving, 5 = Away, 6 = Off.

The factory default value is 1.

- ≡ **Note:** The value 3 (Dry mode) will be ignored for this parameter

Time Mode Schedule

Parameters 41-44 – Schedule Time

Use these Parameters to set the Morning, Day, Evening and Night times manually for the Temperature Schedule.

The value of these Parameters has format HHMM, e.g. for 08:00 use value 0800 (time without a colon). From 00:00 to 23:59 can be selected.

The factory default value for Morning (Parameter 41) is 0600.

The factory default value for Day (Parameter 42) is 0900.

The factory default value for Evening (Parameter 43) is 1800.

The factory default value for Night (Parameter 44) is 2300.

Parameters 45-72 – Schedule Temperature

Use these Parameters to set the temperature for each day Schedule manually (see the Parameters table on the page 18 of this manual). The value of this Parameter should be x10, e.g., for 22.5°C set value 225. From 1°C (value 10) to 110°C (value 1100) can be selected.

The factory default Morning temperature for all 7 days (Parameters 45, 49, 53, 57, 61, 65, 69) is 24.0°C (value 240).

The factory default Day temperature for all 7 days (Parameters 46, 50, 54, 58, 62, 66, 70) is 20.0°C (value 200).

The factory default Evening temperature for all 7 days (Parameters 47, 51, 55, 59, 63, 67, 71) is 23.0°C (value 230).

The factory default Nigh temperature for all 7 days (Parameters 48, 52, 56, 60, 64, 68, 72) is 18.0°C (value 180).

Energy and Sensor Report Interval

Parameter 141 – Energy Consumption Meter Consecutive Report Interval

When the device is connected to the Z-Wave gateway (controller), it periodically sends to the gateway reports from its energy consumption sensor even if there is no change in the value. This Parameter defines the interval between consecutive reports of real time and cumulative energy consumption data to the gateway. The value can be adjusted from 1 min to 120 min. The factory default value is 10 min.

- ≡ **Note:** If the consumption changes, the device will send the report to the gateway regardless of this Parameter value (the report will be sent according to value in Parameter 142).
- ≡ **Note:** It is not recommended to reduce the value of this Parameter in order not to increase the traffic on your network. We recommend to reduce the value of this Parameter only in case of poor connection, when reports from the device does not always reach the gateway.

Parameter 142 – Energy Consumption Meter Report

This Parameter determines the change in the load power resulting in the consumption report being sent to the gateway. From 1% to 50% can be selected. Use the value 0 if there is a need to stop sending the reports. The factory default value is 25.

- ≡ **Note:** When the HE-HLS01 is turning ON, the consumption data will be sent to the gateway once, even if the value of this Parameter is 0.

Parameter 143 – Sensors Consecutive Report Interval

When the device is connected to the Z-Wave gateway (controller), it periodically sends to the gateway reports from its external temperature sensor even if there are not changes in the values. This Parameter defines the interval between consecutive reports. The value can be adjusted from 1 min to 120 min. The factory default value is 10 min.

- ≡ **Note:** If the sensor readings change, the device will send the report to the gateway regardless of this Parameter value (the report will be sent according to values in Parameter 144).
- ≡ **Note:** It is not recommended to reduce the value of this Parameter in order not to increase the traffic on your network. We recommend to reduce the value of this Parameter only in case of poor connection, when reports from the device does not always reach the gateway.

Parameter 144 – External Temperature Sensor Report Threshold

This Parameter determines the change in temperature level resulting in temperature sensors report being sent to the gateway. The value of this Parameter should be x10 for °C, e.g. for 0.4°C use value 4. From 0.1°C (value 1) to 10°C (value 100) can be selected. Use the value 0 if there is a need to stop sending the reports. The factory default value is 2 (0.2°C).

- ≡ **Note:** When the thermostat is turning ON, the sensor data will be sent to the gateway once, even if the value of this Parameter is 0.
- ≡ **Note:** It is not recommended to decrease the value of this Parameter, in order not to increase the load on your Z-Wave network traffic.

Protections and Notifications

Parameter 151 – Device Failure Notifications

If the HLS01 does not work properly it sends “System Failure” notification to the gateway with the error code. Set the value 1 to enable “System Failure” notification or the value 0 to disable. The factory default value is 1 (the notification is enabled).

Errors code list (sent with the notification):

0 – No Error (no issue is detected)

1 – Relay Off Error (when unable to switch Off the relay output).

2 – Relay On Error (when unable to switch On the relay output).

3 – Relay On & Off Error (when unable to switch On and Off the relay output).

4 – NTC Error (when no NTC sensor is detected or when it is damaged).

5 – NTC and Relay Off Error (when no NTC sensor is detected or when it is damaged and unable to switch Off the relay output).

6 – NTC and Relay On Error (when no NTC sensor is detected or when it is damaged and unable to switch On the relay output).

7 – NTC and Relay On & Off Error (when no NTC sensor is detected or when it is damaged and unable to switch On and Off the relay output).

Parameter 152 – Temperature Rise Notification

Use this parameter if you want to know about temperature rise before it reaches the critical value, defined in the “Overheat Protection” parameter. The device will send “Rapid Temperature Rise” notification to the gateway if the temperature sensor reading reaches the value defined in this parameter. The value can be set from 1 to 120 in °C scale mode. To disable the notification, set the value of this parameter to 0.

The factory default value is 50 in °C scale.

- ≡ **Note:** We recommend setting the value of this Parameter lower than value of Parameter 153 (Overheat Protection).

Parameter 153 – Overheat Protection & Notification

You can define the maximum limit of temperature, reaching which the device will automatically go to “Off” mode, switch Off the load and send “Overheat Detected” notification to the gateway. The value of this parameter can be set from 1 to 120 in °C scale mode. Use the value 0 if there is a need to disable this function.

The factory default value is 60 in °C scale.

Parameter 154 – Over-Current Protection & Notification

The maximum load for the device is 16A. If the connected load current exceeds 16A the device will automatically go to “Off” mode, switch Off the output and send the “Over-Current Detected” notification to the gateway. To disable sending the notification, set the value of this Parameter to 0.

The factory default value is 1 (the notification is enabled).

- ≡ **Note:** Even if you turn off the notification, the device will switch Off the load when the current reaches 16A.
- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 155 – Over-Load Protection & Notification

You can define the maximum power in Watt for connected load. The device will automatically go to “Off” mode, switch off the output and send “Over-Load Detected” notification to the gateway if power consumed by the connected load exceeds this limit. The value of this parameter can be set from 100 to 4000 in watts. Use the value 0 if there is a need to disable this function.

The factory default value is 3500W.

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 156 – Over-Voltage Protection & Notification

The device constantly monitors the voltage of your electricity network. You can define the maximum voltage of network exceeding which the device will automatically go to “Off” mode, switch off the output and send “Over-Voltage Detected” notification to the gateway. The value of this parameter can be set from 120 to 280 in volts. Use the value 0 if there is a need to disable this function.

The factory default value is 260V.

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 157 – Voltage Drop Protection & Notification

You can define the minimum voltage of your electricity network. If the voltage of the network drops determined level the device will automatically go to “Off” mode, switch off the output and send “Voltage Drop Detected” notification to the gateway. The value of this parameter can be set from 80 to 240 in volts. Use the value 0 if there is a need to disable this function.

The factory default value is 90V.

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 158 – Sparks Protection & Notification

If connected load fails it can create sparks that may cause a fire. The device constantly monitors the power consumption of connected load and can detect even a small surge in consumption and automatically go to “Off” mode, switch off the output and send “Surge Detected” notification to the gateway. Set the value 1 to enable this function or the value 0 to disable.

The factory default value is 1 (the protection is enabled).

- ≡ **Note:** The protection works only if the device is AC powered.

Parameter 159 – Load Error Notification

The device can send the “Load Error” notification to the gateway when the relay is On but there is no power consumption (meaning possible problems with the heating system). Set the value 1 to enable “Load Error” notification or the value 0 to disable.

The factory default value is 1 (the notification is enabled).

- ≡ **Note:** The function works only if the device is AC powered.

Basic Set Command

Parameter 171 – Basic Set Action

This Parameter defines which Operating Mode the HE-HLS01 reverts to if the Basic Set command is received. If the Basic Set command value is 0 (OFF state) the HE-HLS01 will go to Manual mode and switch Off the heating element (IDLE mode). If the Basic Set command is value is 0xFF (ON state) the HE-HLS01 will change the Mode to the corresponding Parameter value as follows.

- 1: Heat Mode
- 2: Auto Mode
- 3: Dry Mode
- 4: Energy Saving Mode
- 5: Away Mode

The factory default value is 1.

LIMITED WARRANTY

HELTUN warrants this product to be free from defects in workmanship or materials, under normal use and service, for a period of one (1) year from the date of purchase by the consumer ("Warranty Period"). HELTUN will extend this Warranty Period to three (3) years from the date of consumer purchase for any consumer who registers his/her product with HELTUN at this website page: bonus.heltun.com. This Limited Warranty applies only to the first end-user of the product and is not transferable.

If during the Warranty Period the product is determined to be defective or malfunctions due to workmanship or materials, HELTUN, at HELTUN's option, shall either repair or replace the defective product. If the product is defective, (i) return it with dated proof of purchase to the place it was purchased; or (ii) contact HELTUN Customer Care by email at support@heltun.com. HELTUN Customer Care will make the determination whether the product should be returned or whether a replacement product will be sent to you.

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