USER MANUAL

Longo Bluetooth Products
LBT-1.DO1
Bluetooth Mesh Relay output module

Version 4

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User Manual

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STANDARDS AND PROVISIONS: Standards, recommendations, regulations and provisions of the country in which the devices will operate, must be considered while planning and setting up electrical devices. Work on 100 .. 240 V AC network is allowed for authorized personnel only.

DANGER WARNINGS: Devices or modules must be protected from moisture, dirt and damage during transport, storing and operation.

WARRANTY CONDITIONS: For all modules LBT-1 – if no modifications are performed upon and are correctly connected by authorized personnel – in consideration of maximum allowed connecting power, warranty of 24 months is valid from the date of sale to the end buyer, but not more than 36 months after delivery from Smarteh. In case of claims within warranty time, which are based on material malfunctions the producer offers free replacement. The method of return of malfunctioned module, together with description, can be arranged with our authorized representative. Warranty does not include damage due to transport or because of unconsidered corresponding regulations of the country, where the module is installed.

This device must be connected properly by the provided connection scheme in this manual. Misconnections may result in device damage, fire or personal injury.
Hazardous voltage in the device can cause electric shock and may result in personal injury or death.
NEVER SERVICE THIS PRODUCT YOURSELF!

This device must not be installed in the systems critical for life (e.g. medical devices, aircrafts, etc.).

If the device is used in a manner not specified by the manufacturer, the degree of protection provided by the equipment may be impaired.

Waste electrical and electronic equipment (WEEE) must be collected separately!

LBT-1 devices are developed considering the following standards:

- EMC: EN 303 446-1
- LVD: EN 60669-2-1

Smarteh d.o.o. operates a policy of continuous development. Therefore we reserve the right to make changes and improvements to any of the products described in this manual without any prior notice.

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Longo Bluetooth Products LBT-1.DO1

1. ABBREVIATIONS

LED	Light Emitted Diode
PLC	Programmable Logic Controller
PC	Personal Computer
OpCode	Message Option Code
LPN	Low Power Node

2. TERMINOLOGY

- **Mesh Network** A network topology where devices communicate with one another to create a reliable and scalable system, enabling devices to forward messages within the network.
- **Provisioning** The process of adding a new device to a mesh network by assigning it a unique unicast address and network keys, ensuring secure communication with other devices.
- **Mesh Proxy** A device that allows non-mesh devices to interact with a mesh network by forwarding messages between the mesh network and other devices that do not support mesh functionality.
- **Unicast Address** A unique identifier assigned to each device in the network, ensuring that messages are sent to a specific device rather than broadcasted to all devices.
- **Group Address** An address that represents a group of devices within the mesh network. Messages sent to a group address are received by all devices in that group.
- **Network Key** A shared key used by all devices in the mesh network to secure communication. It is essentialfor ensuring the confidentiality and integrity of data in the network.
- **Application Key** A key used for securing application-specific communication within the mesh network. Each device in the network can have one or more application keys assigned to it.
- **Composition Data** Data that describes the features, models, and capabilities of a device in the mesh network. This information is used to inform other devices in the network about the device's capabilities.
- **Subscription Address** A group address to which devices can subscribe in order to receive specific messages. This allows devices to act as receivers for broadcasted data within the mesh.
- **Friendship** A feature in BLE Mesh where one device stores data on behalf of a low-power device, allowing the low-power device to conserve energy by sleeping and receiving messages later.
- **Provisioned Device** A device that has been successfully added to the mesh network and has received its unique address, keys, and other configuration settings.
- **Provisioning Tool** The tool used to configure and provision devices into a mesh network, including device setup, network key management, and application key assignment.
- **Provisioning Success** A status indicating that a device has been successfully added to the network, with its keys and settings properly configured. Smarteh BLE Mesh Provisioning tool
- **Device Binding** The process of associating a device with an application key, publication address, or subscription address to enable specific communication within the mesh network.
- **Publication Address** An address used by devices to broadcast information to other devices in the network. It is typically a group address that all devices in the group can receive.
- **Opcode** A specific operation code used to define actions or commands within the mesh network, allowing devices to execute predefined functions.
- **Key Index** A reference number used to distinguish different keys used in the mesh network. It helps to identify the specific key used for security purposes during communication.
- **Security Credentials** A set of keys and authentication mechanisms used to secure communication between devices in the mesh network.
- **Key Refresh** A process of changing the network or application key periodically to enhance security by preventing unauthorized access to the mesh network.

- **Message Retransmit** A mechanism in the mesh network to retransmit messages to ensure reliability and prevent data loss, typically associated with network transmit settings like retransmit count.
- **Node**: Provisioned Device connected and talking to Bluetooth mesh network. The device can be simple node in the network or it can have one or more network features (LPN, Friend, Relay, Proxy).
- **Low-power node (LPN)** for nodes in the Bluetooth mesh network that are powered with battery and need to preserve power. They need friend node to receive massages when they are in low power mode.
- **Friend node** friend node in the Bluetooth mesh network receives and stores massages for LPN and delivers them when LPN asks for them
- **Relay node** relay nodes in the Bluetooth mesh network re-transmit massages of the same mesh network that are meant for other nodes so that massage can travel longer distances across mesh network.
- **Proxy node**: proxy node in the Bluetooth mesh network act as bridge between Bluetooth mesh network and normal Bluetooth network. It is used to connect to Bluetooth mesh network.

3. DESCRIPTION

LBT-1.DO1 Bluetooth Mesh relay output module is designed to be used as a relay digital output module with RMS current and voltage measuring possibility. The module can operate with a wide range of DC and AC voltages. It can be placed inside the 60mm diameter flush mounting box and so it can be used for switching On and Off the power supply voltage of standard electric wall sockets. It also can be placed inside the lights, inside various electrical equipment and devices to switch On and Off their power supply voltage. Additional switch input is provided to have the possibility of manually switching On and Off the module relay.

LBT-1.DO1 Bluetooth Mesh relay output module can also be connected close to the light in the traditional electrical wiring 115/230 VAC for lightning. Light connected to the LBT-1.DO1 relay can be switched on and off with existing light switches. The module can detect power supply input voltage drop when the switch is pressed. Wire bridge on the last switch before the LBT-1.DO1 relay module should be wired as shown in Figure 4. While LBT-1.DO1 is a Bluetooth Mesh module the relay output can be also switched On and Off by using Bluetooth Mesh communication. At the same time relay RMS current and voltage can be sent over the Bluetooth Mesh communication.

LBT-1.DO1 Bluetooth Mesh relay output module can only operate with Smarteh LBT-1.GWx Modbus RTU Bluetooth Mesh gateway connected to the same Bluetooth Mesh network. LBT-1.GWx Modbus RTU gateway is connected to the main control device as Smarteh LPC-3.GOT.012 7" PLC based Touch panel, any other PLC or any PC with Modbus RTU communication. Besides Smarteh Bluetooth Mesh devices, other standard Bluetooth Mesh devices can be integrated into above mentioned Bluetooth Mesh network. More than a hundred Bluetooth Mesh devices can be provisioned and can operate in a single Bluetooth Mesh network.

4. FEATURES

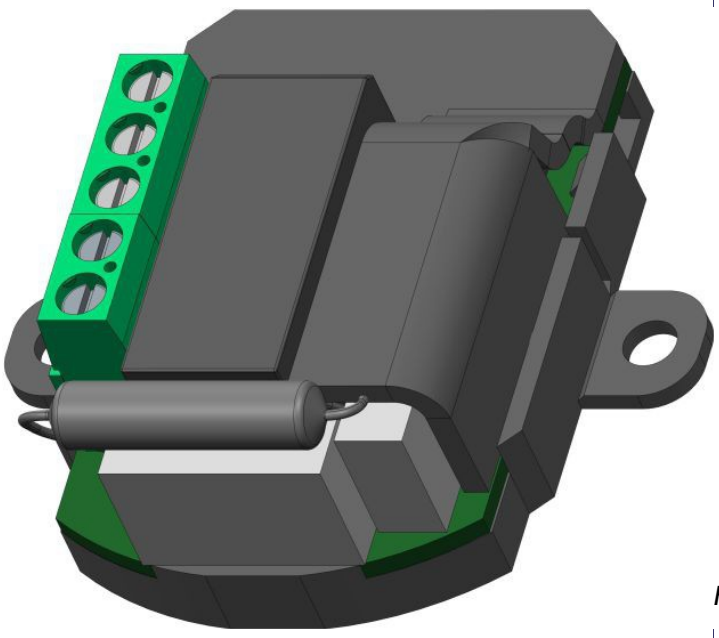


Figure 1: LBT-1.DO1

Table 1: Technical data
Communication standard: Bluetooth Mesh is a low power wireless mesh protocol and allows device to device communication and device to main control device communication.
Radio frequency: 2.4 GHz
Radio range for direct connection: < 30m, depending on application and building. By using Bluetooth Mesh topology, much bigger distances can be achieved.
Power supply: 11.5 .. 13.5 V DC or 90 .. 264 V AC, 50/60Hz
Ambient temperature: 0 .. 40 °C
Storage temperature: -20 .. 60 °C
Status indicators: red and green LED
Relay output with maximum resistive load current 4 A AC/DC
RMS current and voltage measurement, power consumption measurement
Power supply line switch digital input, operating with 90 .. 264 V AC power supply voltage
Switch digital input
Mounting in flush mounting box

5. OPERATION

LBT-1.DO1 Bluetooth Mesh window sensor can operate over Bluetooth mesh network with Smarteh LBT-1.GWx Modbus RTU Bluetooth Mesh gateway, while provisioned to the same Bluetooth Mesh network. LBT-1.DO1 acts as a **Relay and Friend node** in a Bluetooth mesh network.

Figure 2: LBT-1.DO1 device connection

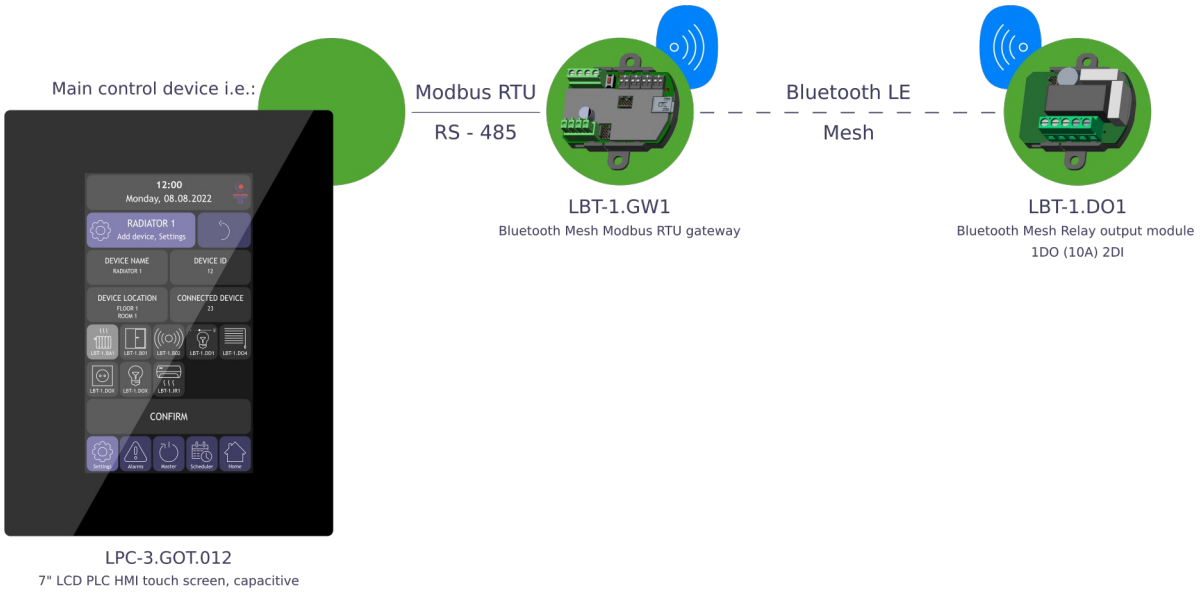
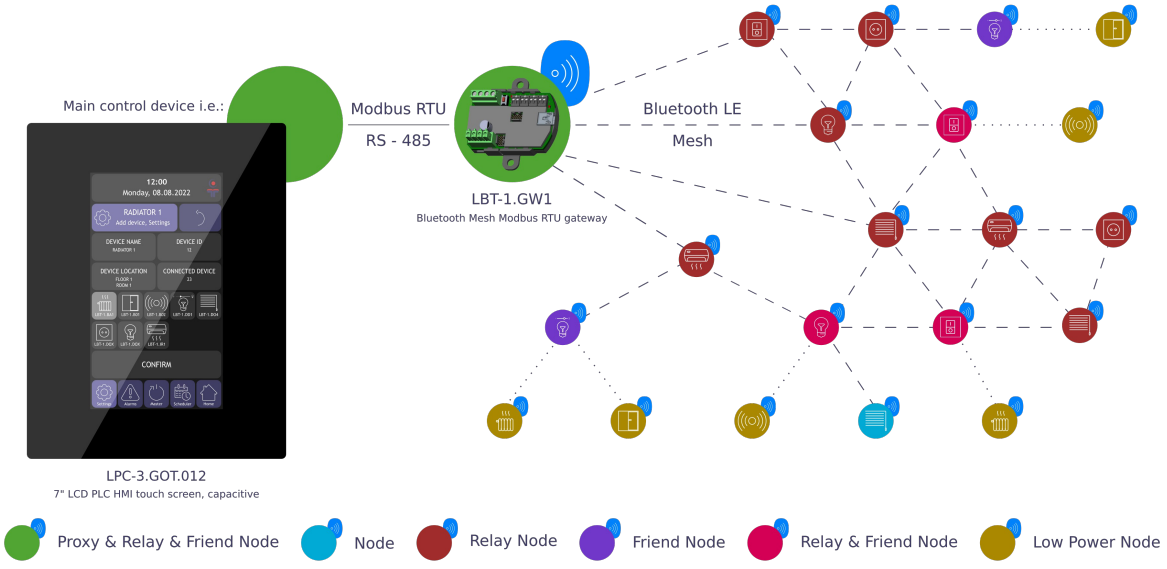


Figure 3: Bluetooth Mesh system topology



5.1. Other relay output module functions

- **Factory reset:** This function will delete all Bluetooth Mesh network parameters stored on LBT-1.DO1 relay output module and will restore to the conditions of the initial programming, ready for provisioning. See Table 5 for more information.

5.2. Operation parameters

LBT-1.DO1 Bluetooth Mesh Relay output module accepts a set of operation codes as specified in below tables 2 to 4.
LBT-1.DO1 Bluetooth Mesh relay output module is communicating with the main control device as Smarteh LPC-3.GOT.012 or similar via Smarteh LBT-1.GWx Modbus RTU Bluetooth Mesh gateway. All communication between the main control device is performed by using Modbus RTU communication. Individual Bluetooth Mesh node configuration data should be observed by using the network provisioning tool.

Table 2: 4xxxx, Holding registers, Modbus RTU to Bluetooth Mesh gateway

Reg.	Name	Description	Raw → Engineering data
10	Execute command	Execute command for Read and/or Write by toggling bit	Bit0 toggle → Write Bit1 toggle → Read
11	Destination address*	Destination node address. Can be a unicast, group or virtual address	0 .. 65535 → 0 .. 65535
12	Element index*	Sending node model element index	0 .. 65535 → 0 .. 65535
13	Vendor ID*	Vendor ID of the sending node model	0 .. 65535 → 0 .. 65535
14	Model ID*	Model ID of the sending node model	0 .. 65535 → 0 .. 65535
16	Virtual address index*	Index of the destination Label UUID	0 .. 65535 → 0 .. 65535
17	Application key index*	The application key index used	0 .. 65535 → 0 .. 65535
18	Option code**	Refer to the option code table	0 .. 63 → 0 .. 63
19	Payload byte length**	Refer to the option code table	1 .. 10 → 1 .. 10 bytes
20	Payload word[0]**	Refer to the option code table	0 .. 65535 → 0 .. 65535
21	Payload word[1]**	Refer to the option code table	0 .. 65535 → 0 .. 65535
22	Payload word[2]**	Refer to the option code table	0 .. 65535 → 0 .. 65535
23	Payload word[3]**	Refer to the option code table	0 .. 65535 → 0 .. 65535
24	Payload word[4]**	Refer to the option code table	0 .. 65535 → 0 .. 65535

* Observed from network provisioning tool

** User defined parameters, refer to the option code table

Table 3: 3xxxx, Input registers, Modbus RTU to Bluetooth Mesh gateway			
Reg.	**Name**	**Description**	**Raw → Engineering data**
10	Messages pending	Number of messages pending in receiving buffer	1 .. 10 → 1 .. 10
11	Destination address	Destination node address. Can be a unicast, group or virtual address	0 .. 65535 → 0 .. 65535
12	Element index	Sending node model element index	0 .. 65535 → 0 .. 65535
13	Vendor ID	Vendor ID of the sending node model	0 .. 65535 → 0 .. 65535
14	Model ID	Model ID of the sending node model	0 .. 65535 → 0 .. 65535
15	Source address	Unicast address of the node model which sent the message	0 .. 65535 → 0 .. 65535
16	Virtual address index	Index of the destination Label UUID	0 .. 65535 → 0 .. 65535
17	Application key index	The application key index used	0 .. 65535 → 0 .. 65535
18	Option code	Refer to the option code table	0 .. 63 → 0 .. 63
19	Payload length	Refer to the option code table	1 .. 10 → 1 .. 10 bytes
20	Payload word[0]	Refer to the option code table	0 .. 65535 → 0 .. 65535
21	Payload word[1]	Refer to the option code table	0 .. 65535 → 0 .. 65535
22	Payload word[2]	Refer to the option code table	0 .. 65535 → 0 .. 65535
23	Payload word[3]	Refer to the option code table	0 .. 65535 → 0 .. 65535
24	Payload word[4]	Refer to the option code table	0 .. 65535 → 0 .. 65535

Table 4: Relay output LBT-1.DO1 option codes			
Option code	**Name**	**Description**	**Raw → Engineering data**
1	FW version status	Firmware version status	0 .. 65535 → 0 .. 65535
2	Operation mode set	Node operation mode selection	0 → Not used 1 → Not used 2 → Not used 3 → Not used 4 → Reset 5 → Factory reset
9	Wake up interval command	Command to set the time interval in which the device wakes up and sends data about the current and voltage status	0 .. 65535 → 0 .. 65535 s
10	Wake up interval status	Status of the time interval in which the device wakes up and sends data about the current and voltage status	0 .. 65535 → 0 .. 65535 s
18	Voltage status	Input voltage RMS value	0 .. 65535 → 0 .. 6553.5 V
19	Current status	Load current RMS value	0 .. 65535 → 0 .. 65.535 A
40	Digital out command	Relay output command	0 → OFF 1 → ON
41	Digital out status	Relay output status	0 → OFF 1 → ON
53	PS line switch enable command	Command for enabling the power supply line switch input	0 → Disable 1 → Enable
54	PS line switch enable status	Enable status of the power supply line switch input	0 → Disabled 1 → Enabled
55	Switch SW enable command	Command for enabling the SW switch input	0 → Disable 1 → Enable
56	Switch SW enable status	Enable status of the SW switch input	0 → Disabled 1 → Enabled

6. INSTALLATION

6.1. Connection scheme

Figure 4: Example of connection scheme

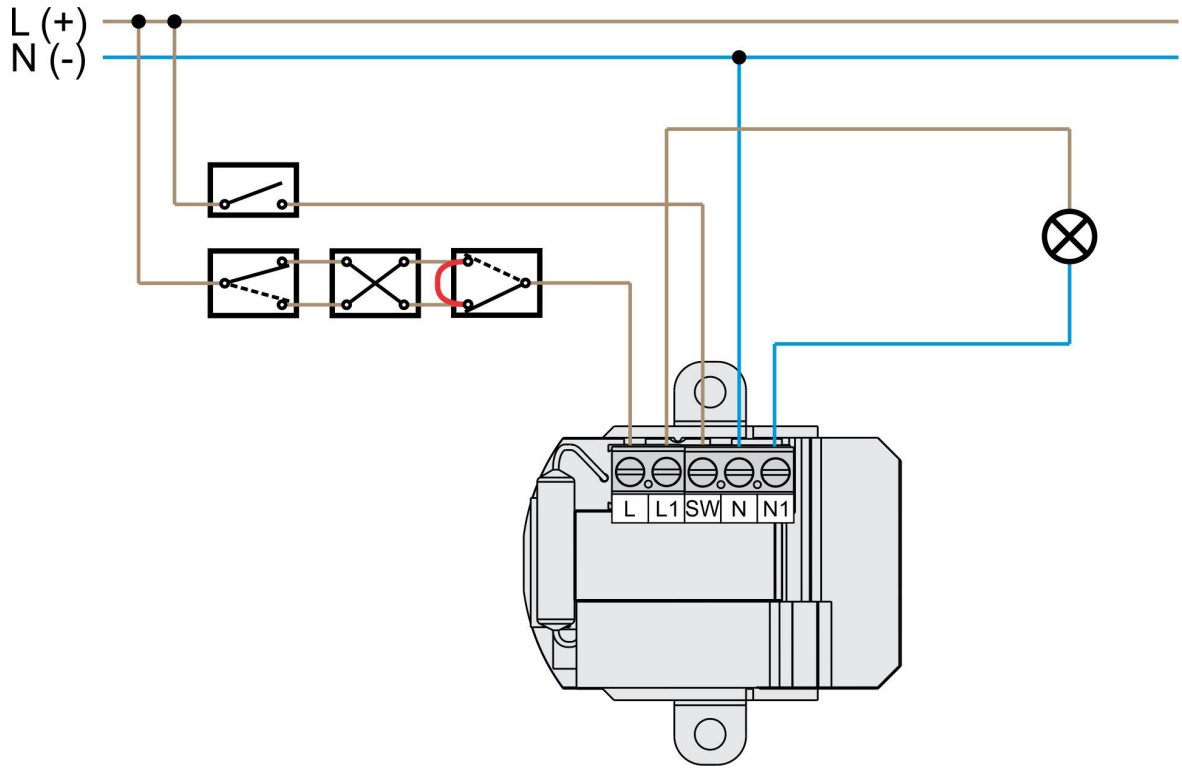


Figure 5: LBT-1.DO1 module

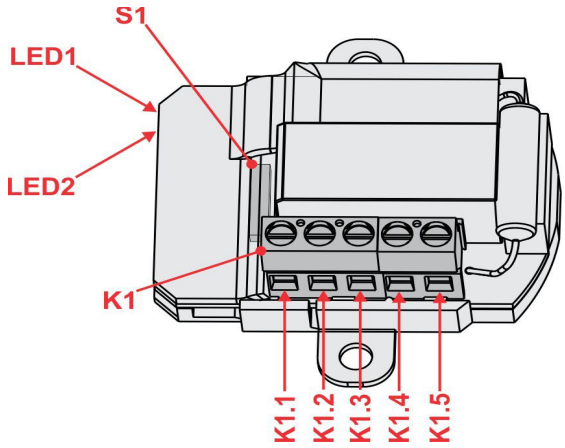
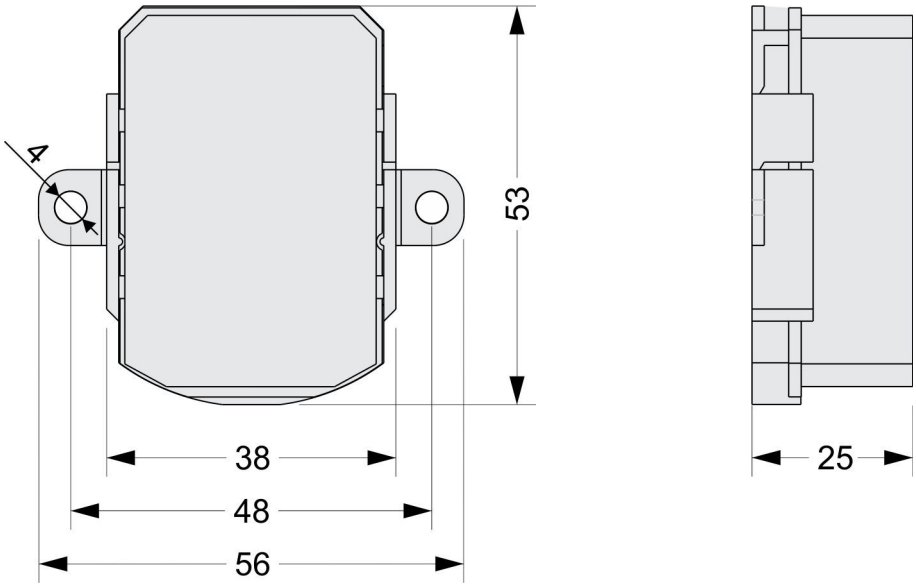


Table 5: Inputs, Outputs and LEDs

K1.1	N1	Load output: neutral or negative
K1.2	N	Power supply input: neutral or negative (-)
K1.3	SW	Switch input: line or positive (+) The same voltage as the power supply input (L) 90 .. 264 V AC or 11.5 .. 13.5 V DC
K1.4	L1	Load output: line or positive
K1.5	L	Power supply input: line or positive (+), 90 .. 264 V AC or 11.5 .. 13.5 V DC
LED1: red	Error	2x blink inside 5 s time period = network/friend lost 3x blink inside 5 s time period = unprovisioned node
LED2: green	Status	1x blink = normal operation. It's also feedback for S1 reed contact, when activated with magnet.
S1	Reed contact	Mode setting contact Inside 5 s time window, perform corresponding number of swipes in duration of not less than 200 ms with permanent magnet close to the window sensor S1 reed contact position. Following window sensor action or mode will be set: Number of swipes — Action 4 — Reset 5 — Factory reset A hardware reset is triggered if reed contact is continuously closed with a permanent magnet for more than 5 seconds.

6.2. Mounting instructions

Figure 6: Housing dimensions



Dimensions in millimeters.

Figure 7: Mounting in flush mounting box

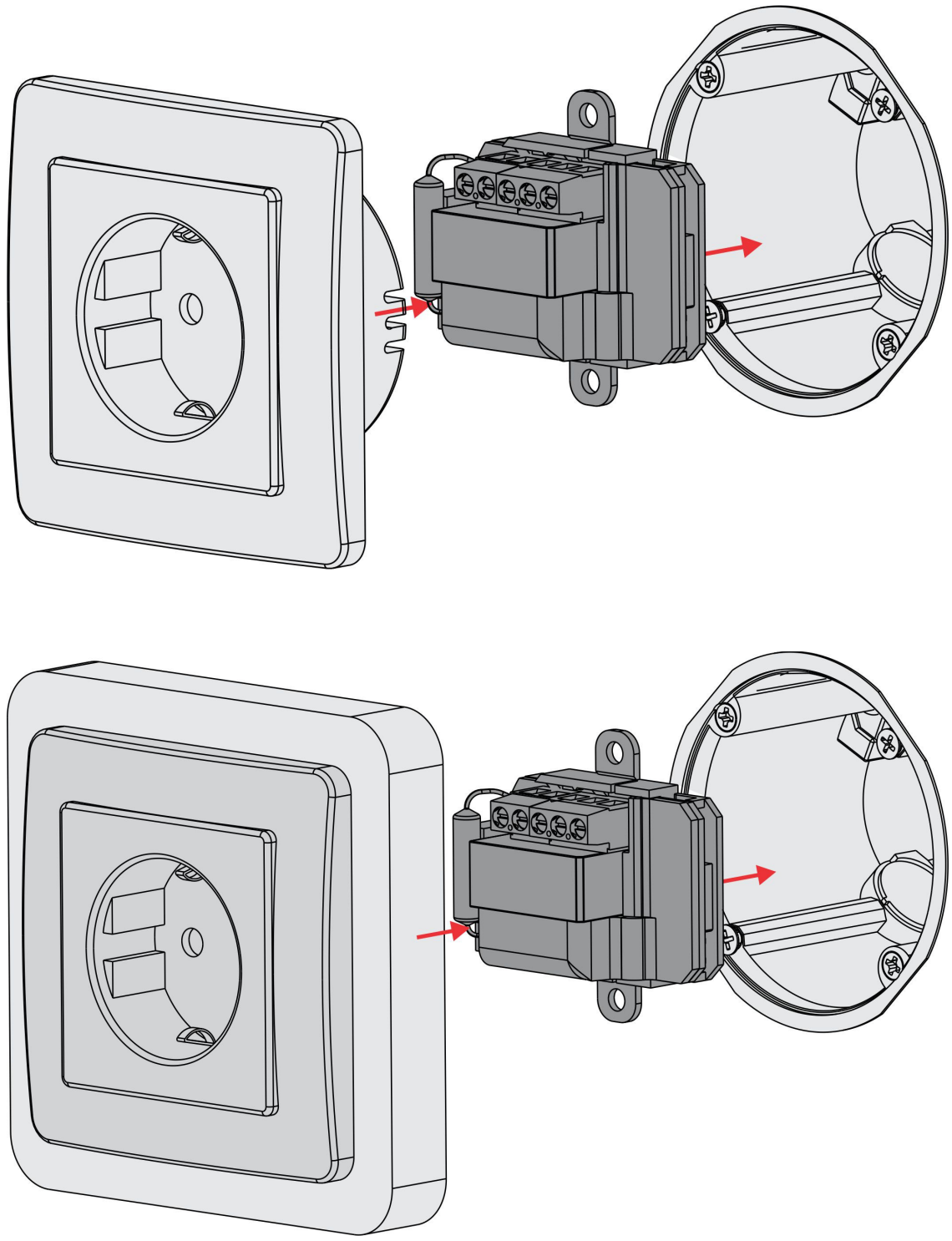
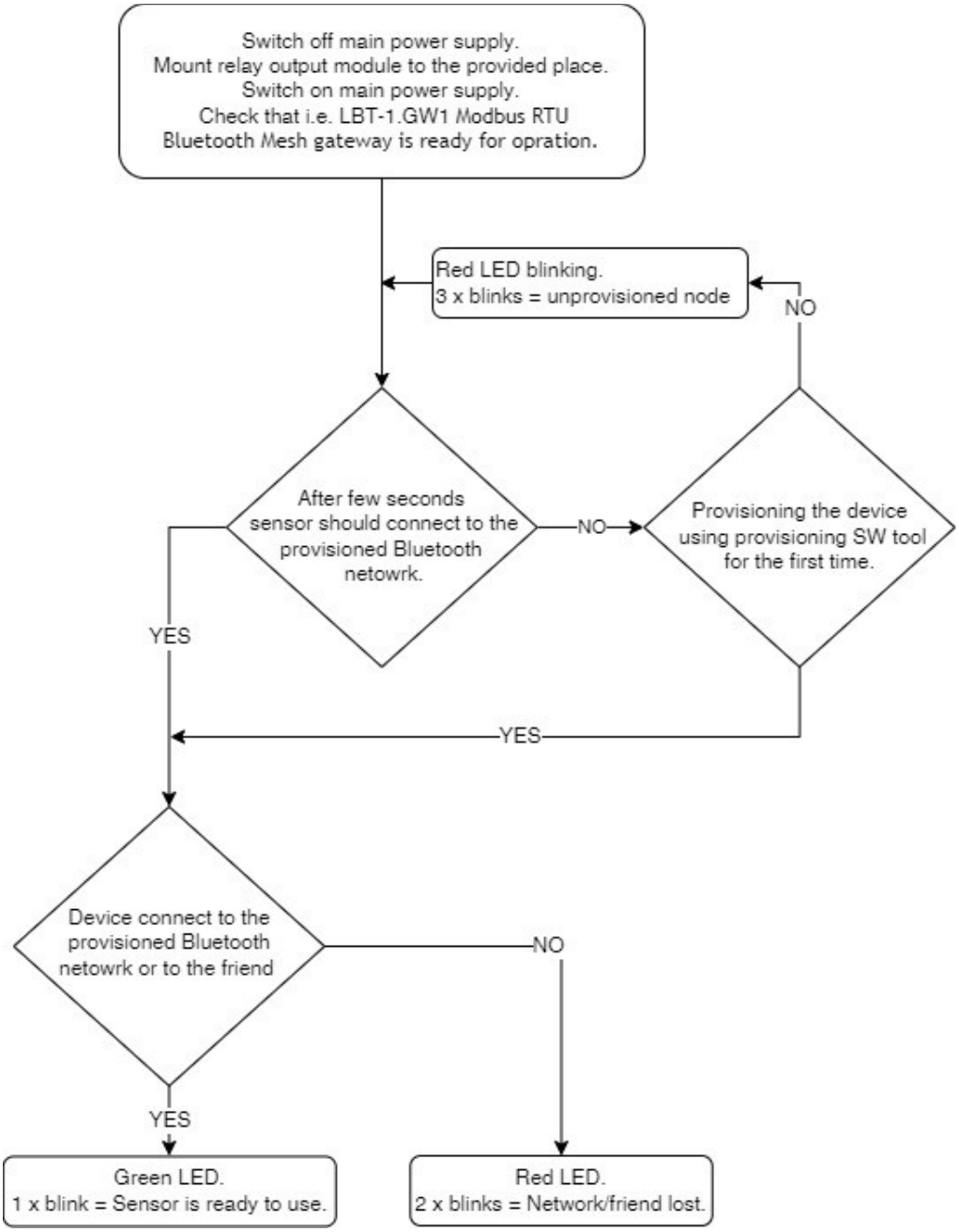


Figure 8: Installation flowchart



1. Switching Off the main power supply.
2. When you mount the module inside the flush mounting box first check, that the flush mounting box is depth enough.
   If needed please use an additional spacer between the flush mounting box and the socket or contact the producer for additional information.
3. Mount the module up to the provided place and wire the module according to the connection scheme in Figure 4. When you connect the module to the traditional electrical wiring for lighting please be sure, that you wired the bridge on the last switch before the LBT-1.DO5 module as shown in Figure 4.
4. Switching On the main power supply.
5. After a few seconds Green or Red LED starts to blink, please see the flowchart above for details.
6. If the module is not provisioned Red LED will blink 3x, the provisioning procedure has to be started. Contact the producer for more details*.
7. Once provisioning is finished, the module will continue with the normal mode of operation and this will be indicated as Green LED blinking once per 10 seconds.

Dismount in reverse order.

***NOTE:** Smarteh Bluetooth Mesh products are added and connected to a Bluetooth Mesh network by using standard provisioning and configuration mobile apps tool such as nRF Mesh or similar.

Please contact producer for more detail information.

7. SYSTEM OPERATION

LBT-1.DO1 Bluetooth Mesh relay output module can switch power to the output load based on power suplly voltage drop pulse, based on switch input voltage change or based on Bluetooth Mash command.

7.1. Interference warning

Common sources of unwanted interference are devices that generate high frequency signals. These are typically computers, audio and video systems, electronic transformers, power supplies and various ballasts. The distance of the LBT-1.DO1 relay output module to the above mentioned devices should be at least 0.5 m or greater.

WARNING:

- In order to protect plants, systems, machines and network against cyber threats it is necessary to implement and continuously maintain up to date security concepts.
- You are responsible for preventing unauthorized access to your plants, systems, machines and networks and they are allowed to be connected to the Internet only, when security measures like firewalls, network segmentation, etc. are in place.
- We strongly recommend the updates and usage of the latest version. Usage of the version that is no longer supported may increase the possibility of cyber threats.

8. TECHNICAL SPECIFICATIONS

Table 6: Technical specifications	
Power supply	11.5 .. 13.5 V DC 90 .. 264 V AC, 50/60 Hz
Fuse	4 A (T-slow), 250 V
Max. power consumption	1.5 W
Load voltage	Same as power supply voltage
Maximum load current * (resistive load)	4 A AC/DC
Connection type	Screw type connectors for stranded wire 0.75 to 2.5 mm2
RF communication interval	Minimum 0.5 s
Dimensions (L x W x H)	53 x 38 x 25 mm
Weight	50 g
Ambient temperature	0 .. 40°C
Ambient humidity	Max. 95 %, no condensation
Maximum altitude	2000 m
Mounting position	Any
Transport and storage temperature	-20 to 60 °C
Pollution degree	2
Over voltage category	II
Electrical equipment	Class II (double insulation)
Protection class	IP 10

* NOTE: Special care must be taken in case of usage inductive character loads, e.g. contactors, solenoids, or loads that draw high inrush currents, e.g. capacitive character load, incandescent lamps. Inductive character loads cause over-voltage spikes at output relay contacts when they are switched off. The use of appropriate suppression circuits is advised.

Loads that draw high inrush currents may cause the relay output to be temporarily overloaded with the current above its allowed limits, which may damage the output, even though that steady-state current is within the allowed limits. For that type of load, the use of an appropriate inrush current limiter is advised.

Inductive or capacitive loads influence the relay contacts by shortening their working life period or can even permanently melt contacts together. Consider using another type of digital output (e.g. triac).

9. MODULE LABELING

Figure 9: Label

Label (sample):

XXX-N.ZZZ.UUU
P/N: AAABBBCCDDDEEE
S/N: SSS-RR-YYXXXXXXXXX
D/C: WW/YY

Label description:

1. **XXX-N.ZZZ** - full product name,
   - **XXX-N** - product family,
   - **ZZZ.UUU** – product,
2. **P/N: AAABBBCCDDDEEE -** part number,
   - **AAA** - general code for product family,
   - **BBB** - short product name,
   - **CCDDD** - sequence code,
     - **CC** – the year of code opening,
     - **DDD** - derivation code,
   - **EEE** – version code (reserved for future HW and/or SW firmware upgrades),
3. **S/N: SSS-RR-YYXXXXXXXXX -** serial number,
   - **SSS** – short product name,
   - **RR** – user code (test procedure, e.g. Smarteh person xxx),
   - **YY** – year,
   - **XXXXXXXXX** – current stack number,
4. **D/C: WW/YY -** date code,
   - **WW** – week and,
   - **YY** – the year of production.

Optional:

- *MAC,*
- *Symbols,*
- *WAMP,*
- *Other.*

10. CHANGES

The following table describes all the changes to the document.

Date	V.	Description
21.02.25	4	Added terminology chapter, more descriptive image of mesh network and node functions description.
22.08.23	3	Table 6 update.
26.05.23	2	Reviewed text, fuse and relay specifications.
05.05.23	1	The initial version, issued as *LBT-1.DO1 relay output module User Manual*.

11. NOTES