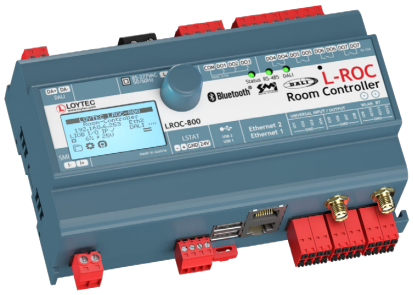
# L-ROC Room Controller

# LROC-800

Datasheet #89094605





The LROC-800 Room Controller extends LOYTEC's L-ROC system with a rich blend of wired, wireless, and electrical interfaces. It is designed for advanced single-room automation applications and scales up to 3 rooms or room segments. Its core feature is a Bluetooth Mesh (SIG) interface for integrating Bluetooth Mesh sensors, luminaires, and other actuators. The device targets the need for cabling reduction in both, new buildings and retrofit scenarios. The LROC-800 Room Controller also seamlessly integrates with native BACnet/IP networks and LonMark Systems at the controller level. Together with the L-STUDIO software, flexible room solutions can be created and adapted to changing requirements during the project with little effort. Integral parts of the L-ROC system are a web-based room operation via an LWEB-802/803 dashboard and the automatic generation of graphics for the L-VIS / L-PAD Touch Panel for local operation.

Our room controllers provide all common interfaces and a large number of physical I/Os for room automation projects. KNX devices are integrated via the KNXnet/IP interface. DALI lamps and DALI sensors are connected to the DALI interface with an integrated DALI power supply. Up to 16 SMI sunblind motors connect to the SMI interface. L-STAT room operator panels can be connected to the LSTAT port. The port can also be used for BACnet MS/TP devices or generic Modbus RTU/ASCII devices. Dual Ethernet ports allow daisy chaining of L-ROC controllers in a ring topology and provide BACnet/IP, LON/IP, Modbus/IP, KNXnet/IP and OPC communication. The LROC-800 has a built-in WLAN interface. 3 TRIACS (0.5A), 4 Relays (10A) and 12 universal inputs outputs (IO) connect various physical inputs and outputs. Our room automation library provides pre-built function modules for all lighting, heating, cooling, ventilation, and sunblinds. Built-in TLS encryption ensures secure operation of the room automation system.

**Flexible Room Concept for Room Automation**

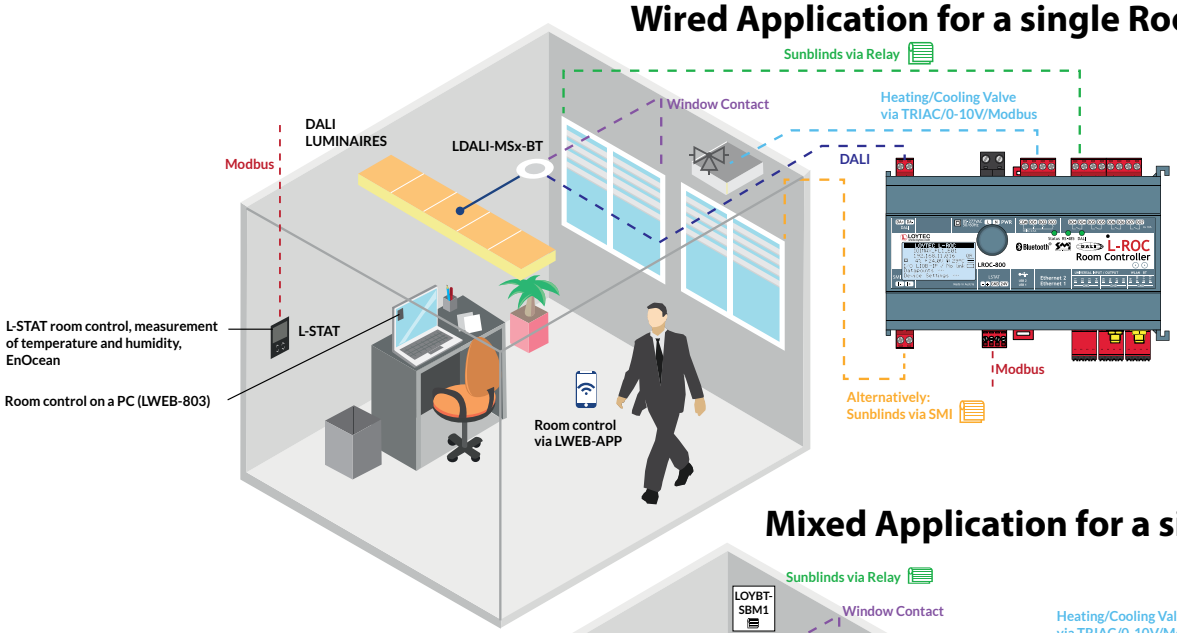
A room segment is the smallest individually controllable entity in the L-ROC System. The L-ROC Library provides a set of functions for every room segment including:

- Lighting control with constant light controller
- Sunblind control with angle adjustment and year shade progression
- Temperature control for heating, cooling, and ventilation
- Occupancy detection
- Window monitoring and window contact

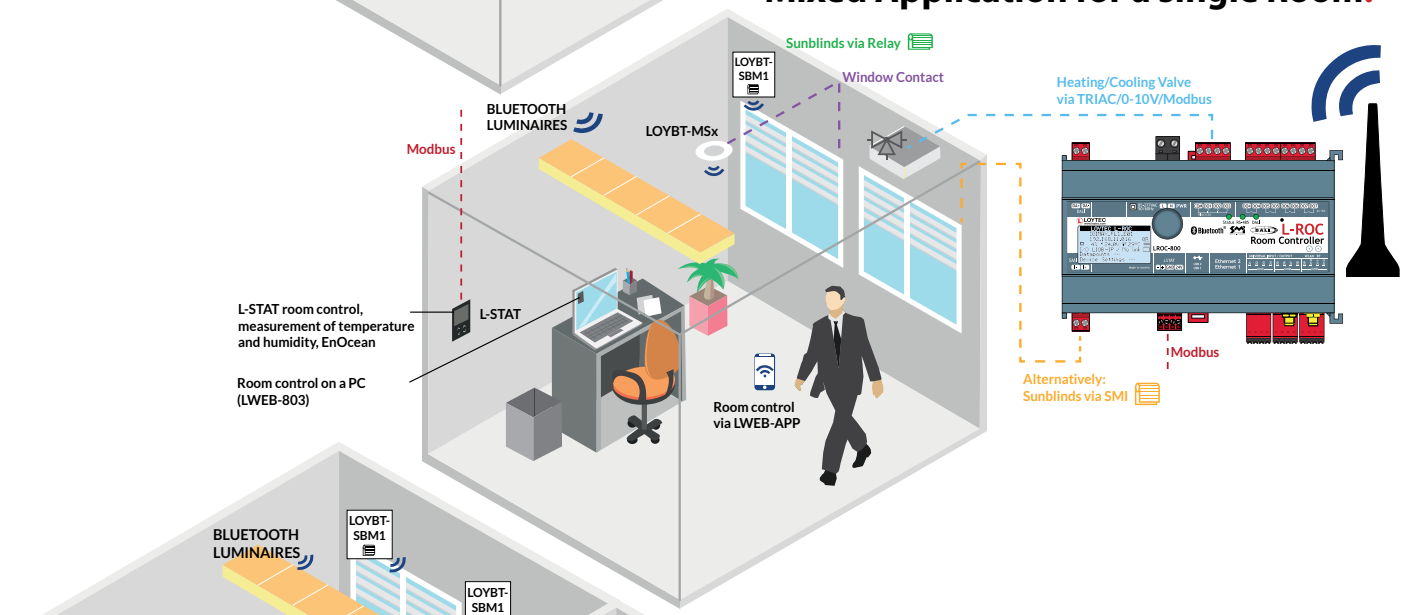
## L-ROC Room Controller

# LROC-800

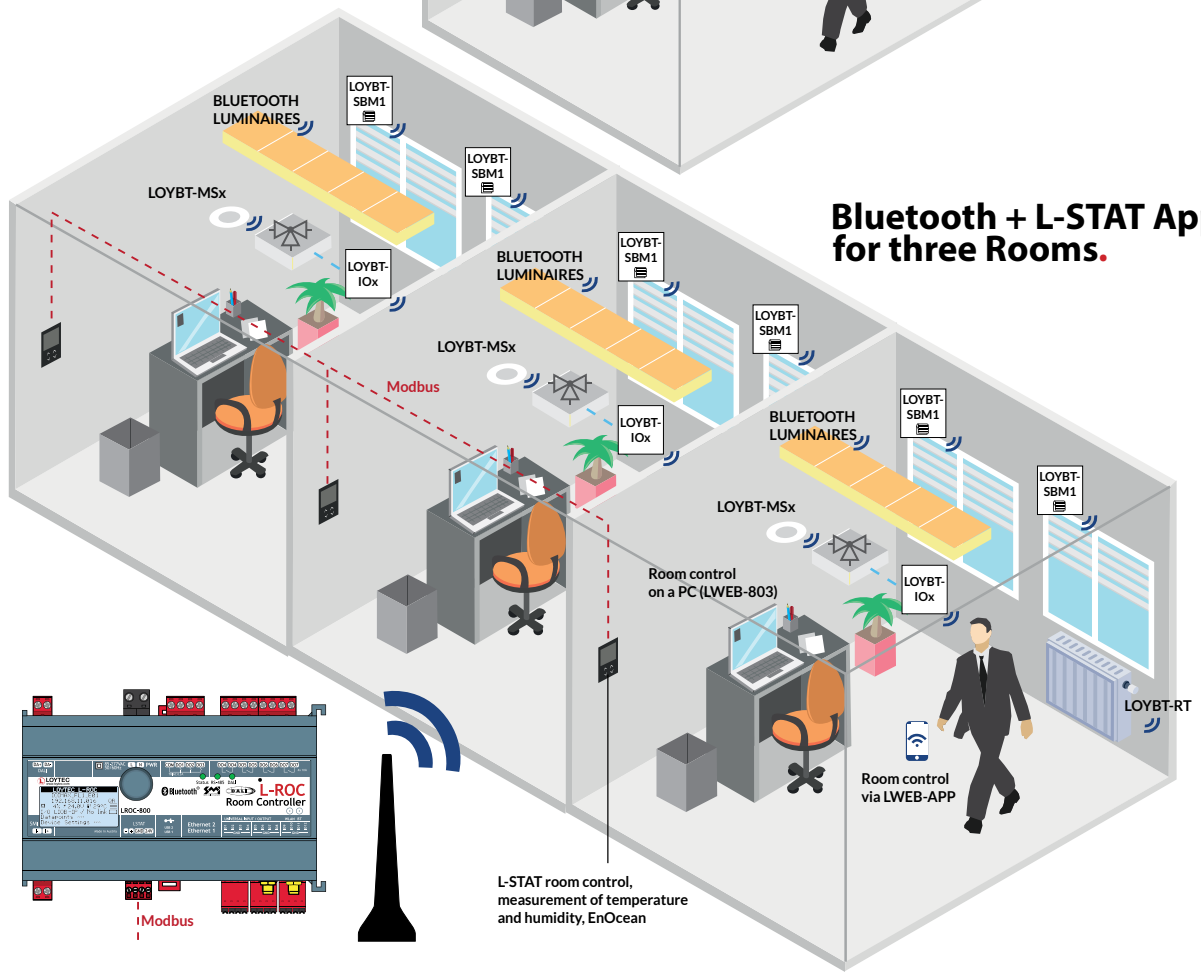
## Wired Application for a single Room.




## Mixed Application for a single Room.




## Bluetooth + L-STAT Application for three Rooms.

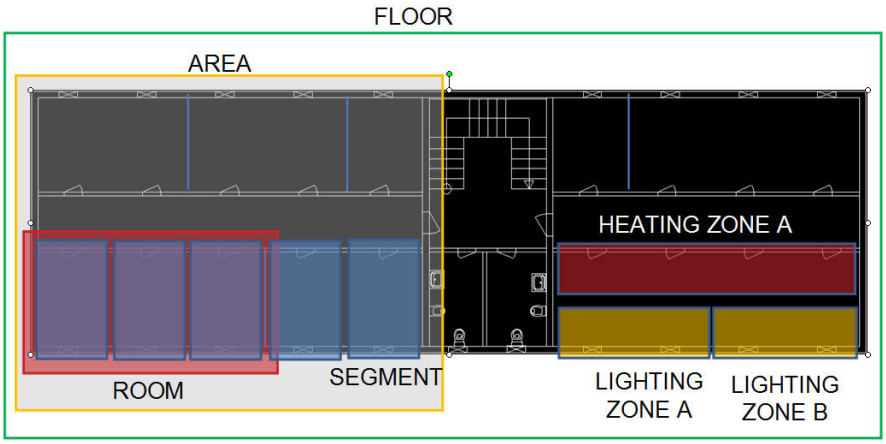


# LROC-800

The LROC-800 Room Controller can control 3 room segments. Based on the various room segment types, larger buildings can be modeled in a hierarchical manner. Areas are built with an area manager by combining multiple room controllers. A floor manager manages multiple areas in one floor. Depending on the architecture, the building can be split up into areas and floors as needed.

Area/Floor Managers are responsible for handling functions needed for corridor, staircase, and bathroom lighting, or even ventilation. Floor managers facilitate the data communication between the floors and handle floor relevant functions e.g. processing meter data.

Rooms can be created in any size by moving, installing, or removing partition walls. The resulting logical connections between the L-ROC Room Controllers will be built automatically. All graphical user interfaces and network connections are automatically generated and adapted respectively.

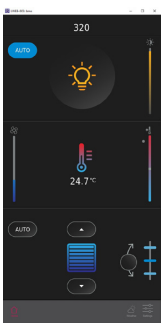



**AST™ for every Room Segment**

L-ROC provides a set of functions for Alarming, Scheduling, and Trending (AST™) for every room segment. Each room segment can be operated entirely independently. The AST™ functions are fully available to higher-level systems through BACnet/IP and web services (L-WEB System). Distributed schedulers can be efficiently managed and changed with LWEB-900.

**Room Communication through redundant or separated IP Network**

L-ROC Room Controllers are interconnected via a 100Base-T Ethernet or a WIFI network. Each L-ROC device is equipped with two Ethernet ports. It can either be configured to use the internal switch to interconnect the two ports or every port is configured to work in a separate IP network.



When the Ethernet ports are configured for two separate IP networks, one port can be connected for instance to a WAN (Wide Area Network) with enabled network security (HTTPS) while the second port can be configured to be connected to an insecure network (LAN) where the standard building automation protocols like BACnet/IP, LON/IP, or Modbus TCP are present. These devices also feature firewall functionality of course to isolate particular protocols or services between the ports. The built-in VPN function provides for simple VPN setup and secure access to remote sites. The LTE-800 interface enables wireless access to remote sites through a mobile carrier.

Using the internal switch, a daisy chained line topology of up to 20 devices can be built, which reduces costs for network installation. The IP switch also allows the setup of a redundant Ethernet installation (ring topology), which increases reliability. The redundant Ethernet topology is enabled by the Rapid Spanning Tree Protocol (RSTP), which is supported by most managed switches.

# LROC-800




### Integrated L-WEB Room Operation

L-ROC controllers provide graphical user interfaces for room operation directly via an IP connection to the user, without the need for an additional web server. Graphic projects are distributed among the L-ROC Room Controllers and can be accessed by LWEB-802/803 from any PC workstation, smartphone (by LWEB-APP), or tablet PC running Android or iOS.

### Integration of the L-STAT Room Operator Panel

L-STAT room operator panels can be integrated via RS-485 interface. In addition to the attractive, modern design and intuitive operation, L-STAT provides a range of features to individually increase the room comfort.

Internal sensors measure temperature, humidity, dew point, occupancy, and the $CO_2$ content of the air. There is also the possibility to control room functions via an IR remote control. Standard pushbuttons and external temperature sensors can be integrated through additional inputs.

### Connection to Higher-Level Systems

Higher-level systems can seamlessly integrate L-ROC Room Controllers via BACnet/IP, LonMark IP-852, or web services (OPC).

All these protocols are simultaneously available. It is possible to integrate the L-ROC Room Controller in a BACnet Operator Workstation and at the same time L-ROC will communicate with other CEA-709 devices on the IP-852 channel. Moreover, a higher-level SCADA or ERP System (Facility Management) gets information directly from the L-ROC Room Controller by using web services based on OPC XML-DA or OPC UA.

### Full LWEB-900 Support

The L-WEB System uses web services to communicate with the L-ROC System. All device and operating parameters of every single L-ROC Room Controller are automatically synchronized with the LWEB-900 SQL database. Controllers can be replaced from the database with a backup without user interaction.


### L-STUDIO

L-STUDIO is the world's first IEC 61499 based room automation system. Any room function can be realized with L-STUDIO in a distributed system of L-ROC devices. We call this new approach in automation "Cloud Control". In a cloud of L-ROC devices, all automation functions are mapped automatically to physical hardware. The object-oriented design method allows the efficient reuse of previously implemented functions. In the graphical development environment of L-STUDIO, areas are created from room segment with just a few mouse clicks. The areas are interconnected to floors and multiple floors form a building. The entire building application is automatically distributed to the L-ROC Controllers installed in the building.

New functions can be added to the room segment objects after initial configuration. These new functions can be applied individually or to all room segment objects very easily. Comprehensive debugging and watch functions allow for complete building troubleshooting. An extensive library of functions is provided for heating, ventilation, cooling, lighting, sunblind control, and security. With the integrated L-VIS/L-WEB Configurator, graphical pages for L-VIS Touch Panels and L-WEB applications can be customized.

### Year Shade Progression

Especially in dense city areas, buildings can cast shadows on each other. In case a façade element is shaded by another building, sunblinds can be deactivated for better daylight harvesting. The high-performance L-ROC controllers allow to calculate a 3D model in dxf-Format of the building and its close-by neighbors. The model can be constructed using common 3D CAD software or can be derived from a Building Information Model. In case the scenery changes due to new

constructions, only the new buildings have to be inserted in the model. The calculation can be done for each window individually or per shadowing zone.


**IoT Integration**

The IoT function (Node.js or Node-RED) allows connecting the system to almost any cloud service, either for uploading historical data to analytics services, telemetry using MQTT, delivering alarm messages to alarm processing services or operating parts of the control system over a cloud service (e.g., scheduling based on Web calendars or booking systems). Processing Internet information such as weather data in forecast-based control is also possible. Finally, the JavaScript kernel also allows implementing serial protocols to non-standard equipment in primary plant control.

## Features

- Flexible built-in management for room segments
- Room controller for up to 3 room segments
- Networking via redundant IP network
- Programmable with L-STUDIO (IEC 61499)
- 128x64 graphic display with backlight for device configuration and maintenance
- Extension with physical inputs and outputs using up to two L-IOB I/O Modules (LIOB-45x/55x/56x)
- Local display of device and data point information
- Manual operation using the jog dial or VNC Client
- Integrated AST™ functions (Alarming, Scheduling, and Trending) for each room segment
- Node.js/Node-RED support for easy IoT integration (e.g. Google calendar, MQTT, Alexa & friends, multimedia equipment,…)
- Event-driven e-mail notification
- Math objects to execute mathematical operations on data points
- Stores customized graphical pages
- Visualization of customized graphical pages through LWEB-900 (Building Management), LWEB-803 (Monitoring and Control), LWEB-802 (Web Browser), or LWEB-APP
- Support of the L-STAT Room Operator Panel
- Built-in OPC XML-DA and OPC UA server
- Access to network statistics via SNMP
- Compliant with ANSI/ASHRAE 135-2012 and ISO 16484-5:2012 standard
- Supports BACnet/IP, BACnet/SC and BACnet MS/TP
- BACnet Client Function (Write Property, Read Property, COV Subscription)
- BACnet Client Configuration with configuration tool (scan and EDE import)
- B-BC (BACnet Building Controller) functionality, BTL certified
- Integrated BACnet/IP to BACnet/SC and BACnet MS/ TP Router including BBMD as well as Slave-Proxy functionality
- Compliant with CEA-709, CEA-852, and ISO/IEC 14908 Standard (LonMark System)
- CEA-709 integration via LonMark IP-852 (Ethernet/IP) channel
- Support of dynamically created or static NVs
- Support of user-defined NVs (UNVTs) and Configuration Properties (SCPTs, UCPTs)
- Connection to KNXnet/IP
- Gateway functions including Smart Auto-Connect™
- Modbus TCP and Modbus RTU/ASCII (Master or Slave)
- Integrated web server for device configuration and monitoring data points
- DALI integration of up to 64 DALI lamps
- Integrated DALI power supply, 16 V DC, 116 mA guaranteed supply current, 125 mA max. supply current
- Test and assignment of DALI devices via the web interface
- Replacement of DALI devices without additional software tools via the graphic display and jog dial
- Supports up to 16 DALI sensors
- Supports up to 64 DALI pushbuttons
- Supports the control of standard loads in the power grid via LDALI-RM5/RM6/RM8 Relay Modules
- Supports DALI-2 devices (drivers and input devices)
- DALI-2 certified, compliant with IEC 62386-101 and IEC 62386-103
- Support DALI color control (DT8 tunable white & full color control)
- Supports lamp burn-in mode
- Integrated DALI Protocol Analyzer
- Integrated WLAN interface
- Connection to EnOcean wireless devices via LENO-80x Interface or L-STAT EnOcean antenna
- Supports MP-Bus through LMPBUS-804 Interface
- Supports SMI (Standard Motor Interface)
- Supports LTE through LTE-800 Interface
- Supports RS-232 through LRS232-802 Interface
- Stores user-defined project documentation
- Configurable Bluetooth beacons and services: indoor navigation, asset tracking (requires LIC-ASSET license) and access to LWEB-900 room control solution

## L-ROC Room Controller

# LROC-800

| General Specifications | |
|---|---|
| Dimensions (mm) | 159 x 100 x 75 (L x W x H), 9 DU, DIM036 |
| Installation | DIN rail mounting following DIN 43880, top hat rail EN 50022 |
| Power supply | 85 V - 277 V AC |
| Operating conditions | 0 °C to +40 °C, 10 – 90 % RH, noncondensing, degree of protection: IP30, IP20 (terminals) |
| Storage conditions | -20 °C to +70 °C |
| **Specifications** | |
| Type | **LROC-800** |
| Power consumption | max. 19 W |
| Interfaces | 2 x Ethernet (100Base-T):<br>Web services (OPC XML-DA, OPC UA), LonMark IP-852, BACnet/IP*, BACnet/SC*, LIOB-IP, KNXnet/IP, Modbus TCP (Master or Slave), HTTP, FTP, SSH, HTTPS, Firewall, VNC, SNMP |
| | 2 x USB-A:<br>MP-Bus (needs LMPBUS-804), SMI (needs LSMI-804),<br>LTE (needs LTE-800), RS-232 (needs LRS232-802), EnOcean (needs LENO-80x) |
| | 1 x RS-485 (ANSI TIA/EIA-485):<br>BACnet MS/TP*<br>or<br>Modbus RTU/ASCII (Master or Slave)<br>1 x DALI with integrated DALI bus power supply 16 V DC,<br>116 mA guaranteed supply current,[1]<br>125 mA max. supply current<br>1 x SMI (Standard Motor Interface Master)<br>1 x Bluetooth<br>1 x WLAN (IEEE 802.11b/g/n) |
| | ** Router between BACnet/IP and BACnet MS/TP* |
| BACnet/IP Router | 1 |
| Bluetooth RF characteristics | Maximum output power: +4 dBm<br>Frequency range: 2.402 - 2.480 GHz |
| WLAN RF characteristics | Maximum output power: +20 dBm;<br>Frequency range: 2.412 - 2.472 GHz |
| Program cycle time | Event-triggered |
| Programming, tools | L-STUDIO (IEC 61499 based) |
| Universal I/O (IO) | 12 (U, R) [2] |
| Digital Output (DO) | 3 TRIACS (0.5 A), 4 Relays (10 A) |
| I/O Specification | Please refer to the "General Input and Output Specification of LOYTEC devices" at the end of the L-IOB section for more details. |
| L-STAT Room Operator Panels | 3 |

[1] With high DALI traffic (e.g. during DALI-scan) increased current consumption may occur depending on the devices connected. Therefore, according to IEC62386-101 it is recommended to take an additional current of at least 20% for dynamic processes into account in system design.

[2] U: 0-10V input or 0-10V output, R: resistance measurement

# LROC-800

| Resource limits | | | |
|---|---|---|---|
| Total number of data points | 15 000 | LonMark Calendars | 1 (25 calendar patterns) |
| OPC data points | 5 000 | LonMark Schedulers | 100 |
| Number of L-WEB clients | 32 (simultaneously) | LonMark Alarm Servers | 1 |
| Max. number of Rooms/Segments | 3 | DALI devices | 64 |
| Alarm logs | 10 | DALI groups | 16 |
| Math objects | 100 | DALI sensors | 16 |
| E-mail templates | 100 | DALI pushbuttons (LDALI-BM2) | 64 pushbutton coupler |
| Trend logs (BACnet or generic) | 512 (13 000 000 entries, ≈ 200 MB) | EnOcean data points | 1 000 |
| Total trended data points | 2 000 | EnOcean devices via LENO-80x | 32 |
| BACnet objects | 1 000 (analog, binary, multi-state) | EnOcean devices commissioning limit | 32 |
| BACnet client mappings | 2 500 | Modbus data points | 2 000 |
| BACnet calendar objects | 25 | KNXnet/IP data points | 500 |
| BACnet scheduler objects | 100 (64 data points per object) | MP-Bus devices (per channel) | 8 (16 MPL) |
| BACnet notification classes | 32 | MP-Bus devices via LMPBUS-804 | 4 x 8 (16 MPL) |
| Bluetooth datapoints | 3 000 | MP-Bus devices (maximum) | 64 |
| Bluetooth functional objects* | 100 | SMI devices | 16 |
| CEA-709 network variables (NVs) | 1 000 | SMI devices (per channel) | 16 |
| CEA-709 Alias NVs | 2 000 | LIOB I/O Modules | 2 |
| CEA-709 External NVs (polling) | 2 000 | LIOB Terminals (non-local) | 80 |
| CEA-709 address table entries | 1 000 (non-ECS mode: 15) | | |

*A Bluetooth functional object is a typical sensor or actuator function within a Bluetooth device, like a multi-sensor, a luminaire or an I/O terminal

| Order number | Product description |
|---|---|
| LROC-800 | Bluetooth Mesh Room Controller for room segment, aisle, floor, building, or campus management |
| LIC-ASSET | Add-on Software License to activate asset tracking |
| L-STUDIO | Development and integration platform for programmable LOYTEC controllers |
| L-LIB-LROC | L-ROC Room Automation Library |
| LDALI-BM2 | Quadruple DALI pushbutton coupler |
| LDALI-RM5 | DALI Relay Module 10 A, Analog Interface 1 – 10 V |
| LDALI-RM6 | DALI Relay Module 10 A, Analog Interface 1 – 10 V, “spud-mount” |
| LDALI-RM8 | DALI Relay Module, 8-channel |
| LDALI-PD1 | DALI Phase-Cut Dimmer Module |
| LDALI-PWM4 | PWM module, DALI, 4 x 3 A LED outputs, 24 V DC ext. |
| LDALI-PWM4-TC | PWM module tunable white, DALI, 4 x 3 A LED outputs, 24 V DC ext. |
| LDALI-PWM4-RGBW | PWM module RGBW, DALI, 4 x 3 A LED outputs, 24 V DC ext. |
| LDALI-MS2-BT | DALI multi-sensor (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth), up to 12 m mounting height, total diameter 104 mm, white |
| LDALI-MS2-BT-B | DALI multi-sensor (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth), up to 12 m mounting height, total diameter 104 mm, black |
| LDALI-MS3-BT | DALI multi-sensor (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth), up to 12 m mounting height, total diameter 68 mm, white |
| LDALI-MS3-BT-B | DALI multi-sensor (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth), up to 12 m mounting height, total diameter 68 mm, black |
| LDALI-MS4-BT | DALI multi-sensor (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth, flat lens), up to 5 m mounting height, total diameter 68 mm, white |
| LOYBT-IO1 | LOYBT I/O Module: 12 x Universal I/O (U, I, R), 6 DO (4 x Relay; 2 x TRIAC) |
| LOYBT-RT1 | Wireless Radiator Thermostat |
| LOYBT-SBM1 | Bluetooth SIG Mesh qualified Sunblind Module, 2 x 6A/240 V AC |
| LOYBT-TEMP2 | Bluetooth Mesh temperature and vibration sensor (5 pieces per package) |
| LOYUNO-L | UNOlite Indoor Air Quality Sensor |

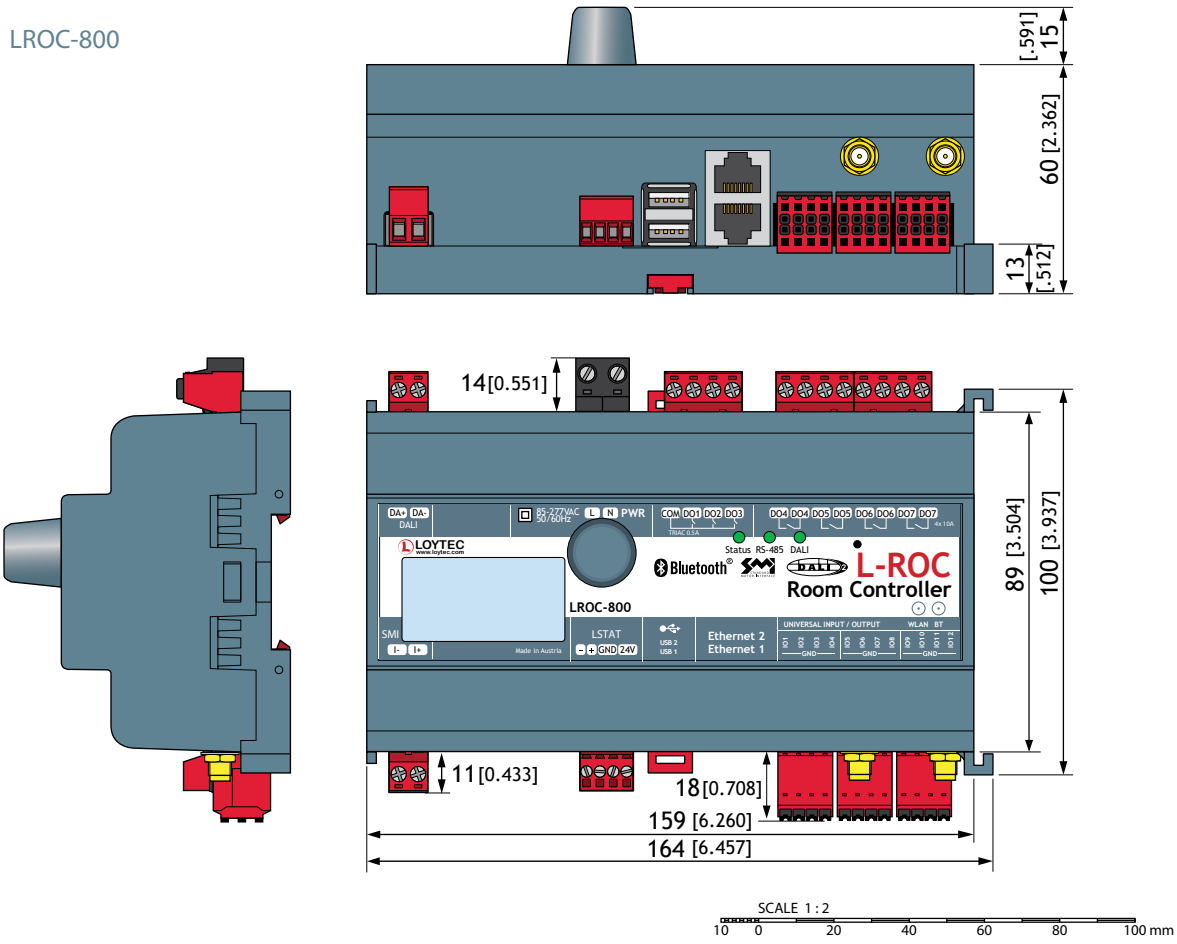
## L-ROC Room Controller

# LROC-800

| Order number | Product description |
|---|---|
| LOYBT-MS2 | Multi-sensor with Bluetooth SIG qualified stack (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth Mesh), up to 12 m mounting height, total diameter 104 mm, white |
| LOYBT-MS2-B | Multi-sensor with Bluetooth SIG qualified stack (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth Mesh), up to 12 m mounting height, total diameter 104 mm, black |
| LOYBT-MS3 | Multi-sensor with Bluetooth SIG qualified stack (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth Mesh), up to 12 m mounting height, total diameter 68 mm, white |
| LOYBT-MS3-B | Multi-sensor with Bluetooth SIG qualified stack (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth Mesh), up to 12 m mounting height, total diameter 68 mm, black |
| LOYBT-MS4 | Multi-sensor with Bluetooth SIG qualified stack (presence detection, lux sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth Mesh, flat lens), up to 5m mounting height,total diameter 68 mm, white |
| LIOB-450 | LIOB-IP852 I/O Module: 8 UI, 2 DI, 2 AO, 8 DO (4 x Relay 6 A, 4 x Triac 0.5 A) |
| LIOB-451 | LIOB-IP852 I/O Module: 8 UI, 12 DI |
| LIOB-452 | LIOB-IP852 I/O Module: 6 UI, 6 AO, 8 DO (8 x Relay 6 A) |
| LIOB-453 | LIOB-IP852 I/O Module: 6 UI, 6 AO, 5 DO (4 x Relay 16 A, 1 x Relay 6 A) |
| LIOB-454 | LIOB-IP852 I/O Module: 7 UI, 4 AO, 7 DO (5 x Relay 6 A, 2 x Triac 0.5 A), 1 Pressure Sensor |
| LIOB-550 | LIOB-BIP I/O Module: 8 UI, 2 DI, 2 AO, 8 DO (4 x Relay 6 A, 4 x Triac 0.5 A) |
| LIOB-551 | LIOB-BIP I/O Module: 8 UI, 12 DI |
| LIOB-552 | LIOB-BIP I/O Module: 6 UI, 6 AO, 8 DO (8 x Relay 6 A) |
| LIOB-553 | LIOB-BIP I/O Module: 6 UI, 6 AO, 5 DO (4 x Relay 16 A, 1 x Relay 6 A) |
| LIOB-554 | LIOB-BIP I/O Module: 7 UI, 4 AO, 7 DO (5 x Relay 6 A, 2 x Triac 0.5 A), 1 Pressure Sensor |
| LIOB-560 | LIOB-BIP I/O Module: 20 Universal I/O (IO) |
| LIOB-562 | LIOB-BIP I/O Module: 40 Universal I/O, (12 optionally with 4-20 mA current output) |
| LSTAT-800-G3-Lx | Room Operator Panel, black front, white enclosure, Modbus, temperature, rel. humidity, ext. switch/NTC, IR receiver, Buttons (Lx) |
| LSTAT-801-G3-Lx | Room Operator Panel, front black, white enclosure, Modbus, temperature, rel. humidity, ext. switch/NTC, occupancy, IR receiver, Buttons (Lx) |
| LSTAT-802-G3-Lx | Room Operator Panel, front black, white enclosure, Modbus, temperature, rel. humidity, ext. switch/NTC, occupancy, IR receiver, CO2, Buttons (Lx) |
| LSTAT-800-G3-L20x | Room Operator Panel, white front, white enclosure, Modbus, temperature, rel. humidity, ext. switch/NTC, IR receiver, Buttons (Lx) |
| LSTAT-801-G3-L20x | Room Operator Panel, white front, white enclosure, Modbus, temperature, rel. humidity, ext. switch/NTC, occupancy, IR receiver, Buttons (Lx) |
| LSTAT-802-G3-L20x | Room Operator Panel, white front, white enclosure, Modbus, temperature, rel. humidity, ext. switch/NTC, occupancy, IR receiver, CO2, Buttons (Lx) |
| LSTAT-810-G3-L0 | Remote EnOcean Antenna, Europe, white |
| LSTAT-820-G3-L0 | Remote EnOcean Antenna, USA/CA, white |
| LSTAT-830-G3-L0 | Remote EnOcean Antenna, Japan, white |
| LSTAT-80x-CUSTOM | One-time customization cost for L-STAT custom design |
| L-TEMP2 | External temperature sensor (NTC10K) for use with L-IOB Universal Inputs |
| LMPBUS-804 | MP-Bus interface for 16 devices per channel, up to 4 channels |
| LSMI-804 | Standard Motor Interface for 64 motors, 4 SMI channels via USB |
| LTE-800 | LTE Interface |
| LRS232-802 | USB to 2 x RS-232 Interface |
| LENO-800 | EnOcean Interface 868 MHz Europe |
| LENO-801 | EnOcean Interface 902 MHz USA/Canada |
| LENO-802 | EnOcean Interface 928 MHz Japan |
| LOY-SPE2 | Dual Single-Pair-Ethernet Converter |

# Dimensions of the devices in mm and [inch]

**DIM036** LROC-800

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