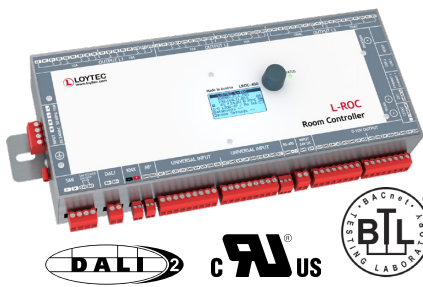


- ✓ BACnet
- ✓ CEA-709
- ✓ KNX
- ✓ Modbus
- ✓ M-Bus
- ✓ OPC



LROC-400, LROC-401, LROC-402

Datasheet #89036424



The L-ROC Room Controller provides the basis for a revolutionary room automation system based on IP, which 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 Touch Panel for local operation.

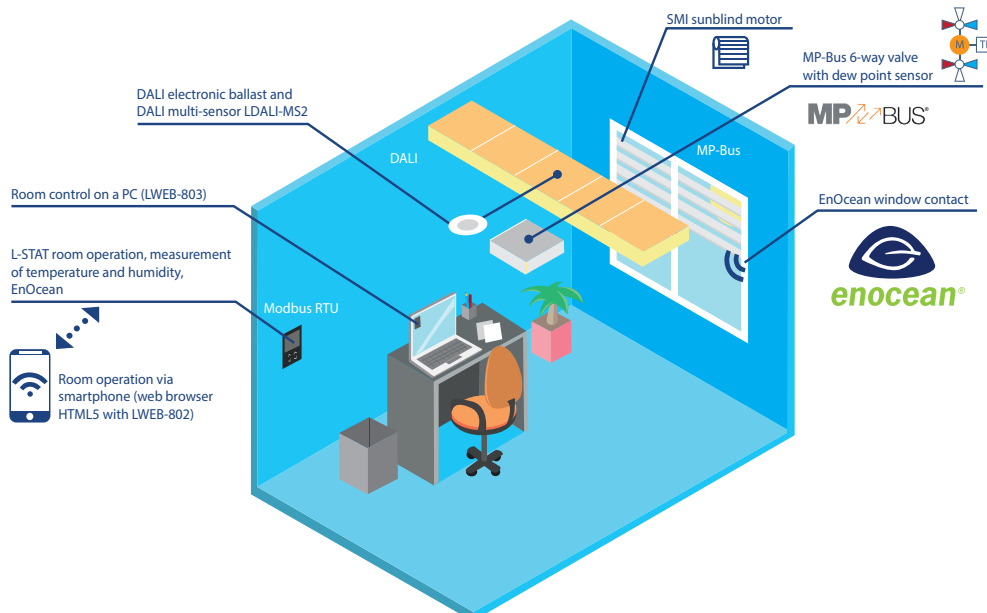
Our room controllers provide all common interfaces and a large number of physical I/Os for room automation projects. KNX devices are integrated via the built-in KNX TP1 or the KNXnet/IP interface. DALI lamps and DALI sensors are connected to the DALI interface with an integrated DALI power supply. Up to 16 SMI sunblind motors connect to the SMI interface. Belimo valves connect to the MP-Bus interface. BACnet MS/TP devices connect to the RS-485 interface, which can also be configured as a Modbus RTU/ASCII interface to connect Modbus devices like energy meters or ekey finger scanner for access control. L-STAT room operator panels connect to the dedicated L-STAT interface. The EXT interface can connect 16 more SMI sunblind motors through the LSMI-800 interface or M-Bus meters through the L-MBUS20 interface. EnOcean devices connect to the EnOcean interface through an external antenna. 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. Optionally the L-ROC can communicate via wireless LAN through the LWLAN-800 wireless adapter connected to the USB port. 24 relay outputs, 8 TRIAC outputs, 8 analog outputs, 10 universal inputs and 2 digital inputs connect various physical inputs and outputs. Our room automation library provides pre built function modules for all lighting, heating, cooling, ventilation, sunblinds and access control via finger scanners. Built-in TSL 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



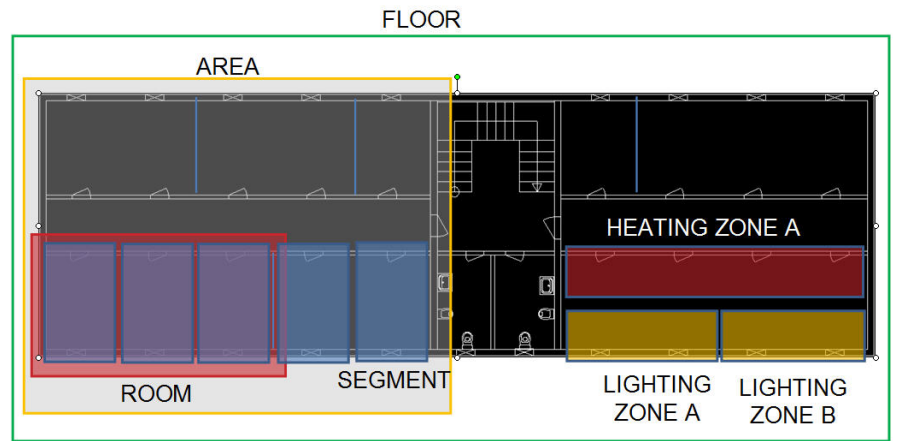
L-ROC Room Controller

LROC-400, LROC-401, LROC-402

Depending on the model an L-ROC Room Controller can control between 8 and 16 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

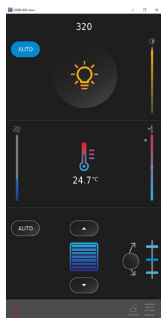
L-ROC provides a set of functions for Alarming, Scheduling, and Trending (AST™) for every room segment. Each room segment can be operated entirely independently. The AST™ functions are fully available to higher-level systems through BACnet/IP and web services (L-WEB System). Distributed schedulers can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

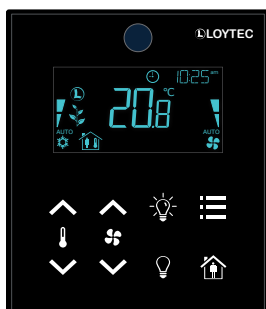
When the Ethernet ports are configured for two separate IP networks, one port can be connected for instance to a WAN (Wide Area Network) with enabled network security (HTTPS) while the second port can be configured to be connected to an insecure network (LAN) where the standard building automation protocols like BACnet/IP, LON/IP, or Modbus TCP are present. These devices also feature fire-wall 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.



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, smart phone, or tablet PC running Android or iOS.



Integration of the L-STAT Room Operator Panel

Depending on the model, 8 to 16 L-STAT room operator panels can be integrated via the L-STAT interface per L-ROC Room Controller. 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 CO₂ 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.

I/O Integration via Plug and Play

The L-ROC Room Controllers can automatically integrate additional physical I/Os by using L-IOB I/O Modules. Up to 2 L-IOB I/O Modules can be connected through LIOB-IP. All I/Os can be used by the L-ROC application and are also available via the web interface of L-ROC. All configurations of the L-IOB Modules are stored on the L-ROC and loaded on demand into the L-IOB I/O Modules. Exchanging I/O modules is done without any configuration effort requiring only a few quick configuration steps.

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) 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 8 or 16 room segments
- Networking via redundant IP network
- Programmable with L-STUDIO (IEC 61499)
- Extension with physical inputs and outputs using L-IOB I/O Modules (LIOB-45x or LIOB-55x)
- 128x64 graphic display with backlight for device configuration and maintenance
- 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 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), or LWEB-802 (Web Browser)
- 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 or 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 and KNX TP1
- M-Bus Master according to EN 13757-3, connection via optional M-Bus Converter (L-MBUS20 or L-MBUS80)
- 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 (depending on the model)
- Integrated DALI power supply, 16 V DC, 230 mA guaranteed supply current, 250 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 (only LROC-400, LROC-401)

LROC-400, LROC-401, LROC-402

- Support DALI color control (DT8 tunable white & full color control)
- Supports lamp burn-in mode
- Supports periodic testing of DALI emergency lights
- Integrated DALI Protocol Analyzer
- Connection to EnOcean wireless devices (built-in EnOcean interface with external antenna for Europe, 868 MHz) or via LENO-80x (LROC-402 only)
- Supports WLAN through LWLAN-800 Interface
- Integration of actuators via MP-Bus (expandable via LMPBUS-804)
- Supports SMI (Standard Motor Interface):
LROC-400, LROC-401: built-in (expandable via LSMI-80x)
LROC-402: needs LSMI-804
- 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 (only LROC-400, LROC-401)

General Specifications

Dimensions (mm)	340 x 144 x 70 (L x W x H), DIM047
Installation	mountable directly via two oblong holes (ø 7 mm, distance 315 mm) or system distribution box LBOX-ROCx, DIM048
Power supply	24 VDC ±10 % or 85 – 240 VAC, 50 – 60 Hz (do not connect 24 VDC if SMI or DALI are used)
Operating conditions	0 °C to 40 °C, 10 – 90 % RH, noncondensing, degree of protection: IP40, IP20 (terminals)

Specifications

Type	LROC-400	LROC-401	LROC-402
Power consumption	max 15 W	max 15 W	max 15 W
Interfaces	2 x Ethernet (100Base-T): 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 1 x L-STAT (Room Operator Panel) 1 x MP-Bus (actuator) 1 x KNX TP1 2 x USB-A: WLAN (needs LWLAN-800), MP-Bus (needs LMPBUS-804), SMI (needs LSMI-804), LTE (needs LTE-800) RS-232 (needs LRS232-802)	2 x USB-A: WLAN (needs LWLAN-800), MP-Bus (needs LMPBUS-804), SMI (needs LSMI-804), LTE (needs LTE-800) RS-232 (needs LRS232-802)	2 x USB-A: WLAN (needs LWLAN-800), MP-Bus (needs LMPBUS-804), EnOcean (needs LENO-80x), SMI (needs LSMI-804), LTE (needs LTE-800) RS-232 (needs LRS232-802)
	1 x RS-485 (ANSI TIA/EIA-485): BACnet MS/TP* or Modbus RTU/ASCII (Master or Slave) 1 x DALI with integrated DALI bus power supply 16 VDC, 230 mA guaranteed supply current,** 250 mA max. supply current 1 x SMI (Standard Motor Interface Master) 1 x EnOcean (Europe 868 MHz) with external antenna 1 x EXT: M-Bus, Master EN 13757-3 (needs LMBUS-20 or LMBUS-80) or SMI (needs LSMI-800)	1 x RS-485 (ANSI TIA/EIA-485): BACnet MS/TP* or Modbus RTU/ASCII (Master or Slave) 1 x DALI with integrated DALI bus power supply 16 VDC, 230 mA guaranteed supply current,** 250 mA max. supply current 1 x SMI (Standard Motor Interface Master) 1 x EnOcean (Europe 868 MHz) with external antenna 1 x EXT: M-Bus, Master EN 13757-3 (needs LMBUS-20 or LMBUS-80) or SMI (needs LSMI-800)	–

* Router between BACnet/IP and BACnet MS/TP

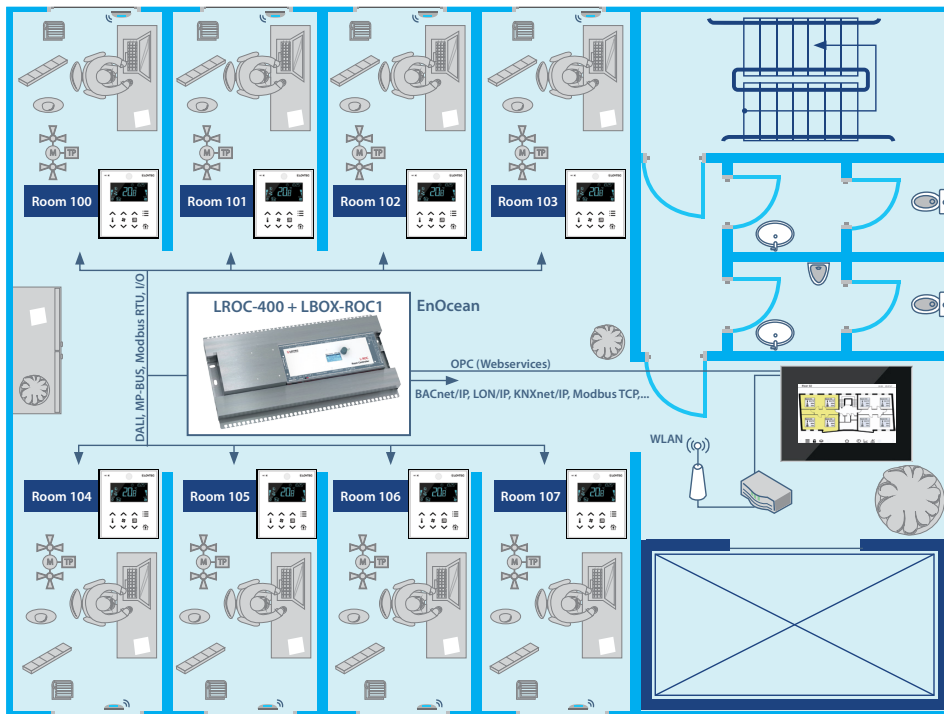
***With high DALI traffic (e.g. during DALI-scan) increased current consumption may occur depending on the devices connected. Therefore, according to IEC62386-101 it is recommended to take an additional current of at least 20% for dynamic processes into account in system design.

LROC-400, LROC-401, LROC-402

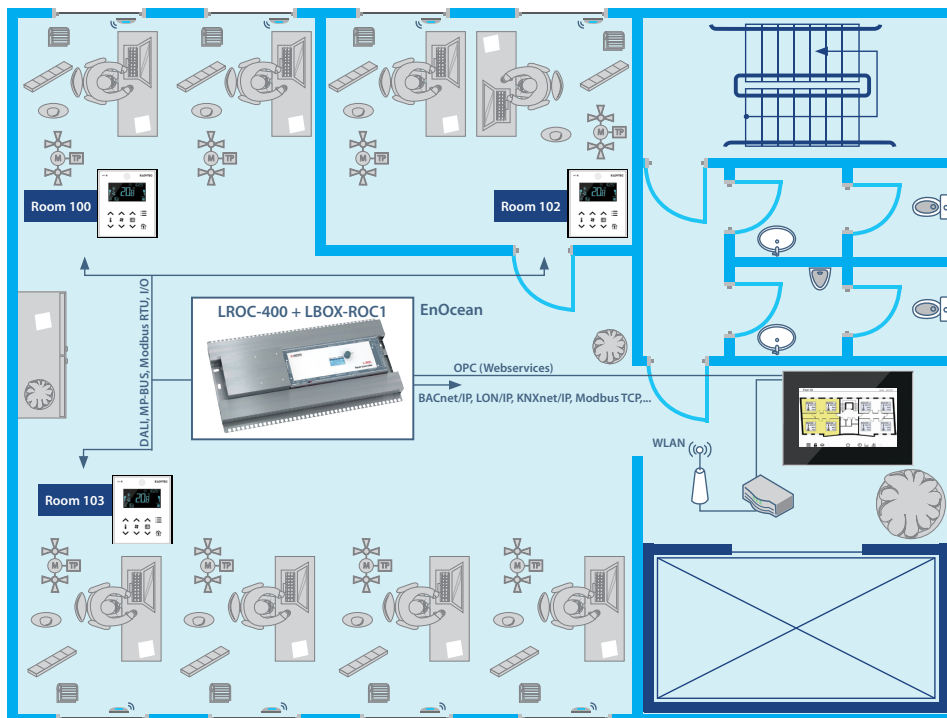
Specifications			
Type	LROC-400	LROC-401	LROC-402
Universal Input (UI)	10	0	10
Digital Input (DI)	2	0	2
Analog Output (AO)	8	0	8
Digital Output (DO)	32 (24 x Relay, 8 x Triac)	0	32 (24 x Relay, 8 x Triac)
Digital Output specification	Relay: 10 A Triac: 0.5 A @ 24–240 VAC	-	Relay: 10 A Triac: 0.5 A @ 24–240 VAC
Please refer to the “General Input and Output Specification of LOYTEC devices” at the end of the L-IOB section for more details.			
Frequency	868.3 MHz	868.3 MHz	-
RF Output Power	3 dBm	3 dBm	-
L-IOB I/O extension	2 L-IOB I/O Modules of Type LIOB-45x or LIOB-55x		
BACnet/IP Router	1		
Program cycle time	Event-triggered		
Programming, Tools	L-STUDIO (IEC 61499 based)		
Max. number of Rooms/Segments	8	16	8
SMI devices (via built-in interface)	1 x 16	1 x 16	-
SMI devices via LSMI-800	1 x 16	1 x 16	1 x 16
SMI devices via LSMI-804	4 x 16	4 x 16	4 x 16
SMI devices (maximum)	96	96	64
EnOcean devices (via built-in interface)	32	64	-
EnOcean devices via LENO-80x	-	-	32
EnOcean devices (maximum)	64	64	64
EnOcean devices commissioning limit	32	64	32
L-STAT Room Operator Panels	8	16	8
DALI devices	64	64	-
DALI groups	16	16	-
DALI sensors	16	16	-
DALI pushbuttons (LDALI-BM2)	64 pushbutton coupler	64 pushbutton coupler	-
MP-Bus devices (via built-in interface)	1 x 8 (16 MPL)	1 x 8 (16 MPL)	1 x 8 (16 MPL)
MP-Bus devices via LMPBUS-804	4 x 8 (16 MPL)	4 x 8 (16 MPL)	4 x 8 (16 MPL)
MP-Bus devices (maximum)	80	80	80

Resource limits			
Total number of data points	30 000	LonMark Alarm Servers	1
OPC data points	10 000	E-mail templates	100
BACnet objects	4 000 (analog, binary, multi-state)	Math objects	100
BACnet client mappings	5 000	Alarm logs	10
BACnet calendar objects	25	M-Bus data points	1 000
BACnet scheduler objects	100 (64 data points per object)	Modbus data points	2 000
BACnet notification classes	32	KNX TP1 data points	1 000
Trend logs (BACnet or generic)	512 (13 000 000 entries, ≈ 200 MB)	KNXnet/IP data points	1 000
Total trended data points	2 000	Connections (Local / Global)	2 000 / 250
CEA-709 network variables (NVs)	2 000	Number of L-WEB clients	32 (simultaneously)
CEA-709 Alias NVs	2 000	L-IOB I/O Modules (via LIOB-IP)	2
CEA-709 External NVs (polling)	1 000	EnOcean data points	10 per EnOcean device
CEA-709 address table entries	1 000 (non-ECS mode: 15)	SMI devices (per channel)	16
LonMark Calendars	1 (25 calendar patterns)	MP-Bus devices (per channel)	8 (16 MPL)
LonMark Scheduler	100		

LROC-400, LROC-401, LROC-402



Application example: Creating a new floor plan by simply changing room numbers (here: 8 single offices)



Application example for 8 segments (1 open plan office, 1 single office)

Order number	Product description
LROC-400	Room Controller for room segment, aisle, floor, building, or campus management
LROC-401	Room Controller for room segment, aisle, floor, building, or campus management
LROC-402	Room Controller for room segment, aisle, floor, building, or campus management
LBOX-ROC1	System Distribution Box for LROC-40x Room Controller, 519 x 280 x 71 (L x W x H in mm)
LBOX-ROC2	System Distribution Box for LROC-40x Room Controller, 60 W 24 VDC power supply

L-ROC Room Controller

LROC-400, LROC-401, LROC-402

Order number	Product description
LROC-SEG8	License to add 8 segments to L-ROC Controller
LIC-ASSET	Add-on Software License to activate asset tracking (for LDALI-ME20x-U, LDALI-3E10x-U, LDALI-PLCx, LROC-400, LROC-401, LIOB-AIR20, LIOB-591)
L-STUDIO	Development and integration platform for programmable LOYTEC controllers
L-LIB-LROC	L-ROC Room Automation Library
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, including 2 working samples
LDALI-MS2-BT	DALI multi-sensor (presence detection, illuminance sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth), up to 12 m mounting height
LDALI-MS4-BT	DALI multi-sensor (presence detection, illuminance sensor, IR receiver, temperature sensor, humidity sensor, 3 digital inputs, Bluetooth, flat lense), up to 5 m mounting height
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-PWM8	PWM module, DALI, 8 x 0.5 A LED outputs, 24 V DC ext.
LDALI-PWM8-TC	PWM module tunable white, DALI, 8 x 0.5 A LED outputs, 24 V DC ext.
LDALI-PWM8-RGBW	PWM module RGBW, DALI, 8 x 0.5 A LED outputs, 24 V DC ext.
L-TEMP2	External temperature sensor (NTC10K) for use with L-IOB Universal Inputs
L-MBUS20	M-Bus Level Converter, Interface for up to 20 M-Bus devices
L-MBUS80	M-Bus Level Converter, Interface for up to 80 M-Bus devices
LENO-800	EnOcean Interface 868 MHz Europe
LENO-801	EnOcean Interface 902 MHz USA/Canada
LENO-802	EnOcean Interface 928 MHz Japan
LWLAN-800	Wireless LAN Interface IEEE 802.11bgn
LMPBUS-804	MP-Bus interface for 16 devices per channel, up to 4 channels
LSMI-800	Standard Motor Interface for 16 motors via EXT port
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

