EY-RC 504: Room automation station, ecos504 (UL/FCC)

EY-RC504F001U

How energy efficiency is improved

Powerful function modules in the ecos504 integrate the regulation of the room temperature, lighting and sunshading to create a comfortable room climate with minimum energy consumption

Features

- Part of the SAUTER EY-modulo 5 system family
- Modular room automation station for up to eight rooms or eight flexible room segments
- BACnet/IP communication (ISO 16484-5) as BACnet Building Controller (B-BC)
- The ecoUnit 3 (EY-RU 3**) room operating units enable individual adjustment of the room climate
- Optimises energy consumption thanks to presence function, window contact monitoring, demand-controlled ventilation, control of lighting and window blinds, and time-dependent setpoint specification
- Function libraries for climate, lighting and sunshading
- Expansion bus for remote ecoLink modules, ecoUnit room operating units
- Time programme and calendar function; data recording
- Engineering/programming using SAUTER CASE Suite (based on IEC 61131-3)
- Integration into the building management system via BACnet/IP with Ethernet interface

Technical data

Power supply		
	Power supply	24 V= ±10% 24 V~ +25%/-15%, 48...63 Hz
	Current consumption	Max. 0.33 A
	Max. peak inrush current	13 A (10 ms)
	Power consumption	4 W/8 VA; typ. 2.5 W
	Connection	Spring-type terminals 0.2...2.5 mm^2 (AWG 24...14) rigid/flexible Ampacity max. 5 A
Ambient conditions		
	Operating temperature	0...45 °C (32...113 °F)
	Storage and transport temperature	–25...70 °C (–13...158 °F)
	Admissible ambient humidity	10...85% rh, no condensation Indoor use only
Function		
BACnet	BACnet profile	B-BC (ISO 16484-5)
	BACnet data point objects	600 (incl. HW)
	Control	32 (Loop)
	Active COV subscription	1500
	BACnet client links	200 (Peer-to-Peer)
Dynamic objects	Time programmes	32 (Schedule)
	Alarms	16 (Notification Class)
	Historical data	256 (Trend Log) up to 60,000 entries
	Command object	16 (Command)
Services	Number of BBMDs in BDT	32
	Number of FDs in FDT	32
Architecture		
	Processor	32-bit, 600 MHz (ARM)
	SDRAM (synchronous dynamic RAM)	128 MB
	SRAM (static RAM)	64 kB
	Flash	128 MB
	Operating system	Embedded Linux
	Cycle time	100 ms
	Application data	Via CASE Engine

Interfaces and communication		
Ethernet network	Communication protocol	BACnet/IP
	Connection	2 × RJ-45 connector
	Type	10/100 BASE-TX switched
RS-485 A, RS-485 B	Communication protocol	2 × RS-485, SLC
	Use	ecoLink modules and ecoUnit 3 operating devices
	Participant	Max. 2 × 8 ecoLink modules Max. 2 × 4 ecoUnit 3
	Power supply	5 V ±5% < 200 mA (sum of both RS-485), protected against short circuit
	Connection	Pluggable spring-type terminals 2 × 4-pin 0.2...1.5 mm^2 (AWG 24...16) rigid/flexible
	Cable[1)]	4-wire, twisted, shielded
	Cable length[2)]	Max. 100 m (328 ft) [30 m (98 ft)] with ecoUnit, up to 500 m (1640 ft), bus termination necessary
Construction		
	Fitting	On DIN rail 35 × 7.5/15 EN 50022 Rail housing DIN 43880
	Dimensions W x H x D[3)]	105 × 90 × 58 mm (4.12 x 3.54 x 2.28 inch); Width: 6 HP
	Weight	220 g (7.76 oz)
	Type	Open device. Circuit class 2 (NEC)
Standards and directives		
	Type of protection	IP00 (IEC 60529), connections and terminals IP30 (IEC 60529), front in DIN cut-out IP30 (IEC 60529), with accessory terminal cover
	Environment class	3K3 (IEC 60721)
	Approval[4)]	FCC, UL

Overview of types

Type	Features
EY-RC504F001U	Room automation station, 8 room segments

Accessories

Type	Description
0940240001	ecos504 terminal cover (2 pcs)
EY-PS021F011	Power supply module 230 V~; 3 HP DIN rail mounting
EY-PS021F021	Power supply module 230 V~; 4 HP DIN rail mounting
EY-PS021F041	Power supply module 230 V~; 5 HP DIN rail mounting
EY-RU 3**	ecoUnit 3 room operating units (apart from EY-RU 38*)
EY-EM 51*	Remote ecoLink I/O modules
EY-EM 52*	Remote ecoLink I/O modules

FCC and UL approvals of the EY-RC504F001U are not valid for the accessories.

Power supply module accepts line voltage of 85...264 V~.

Description of operation

The ecos 5 system family comprises a range of devices for room automation for the BACnet/IP system bus. The ecos504 room automation station (AS) is a modular, freely programmable BACnet

1) *Example cable CAT-5, J-Y(ST)Y, RS-485 bus cable (e.g. Belden 9842).*
2) *With the cable length and the conductor cross-section, the supply voltage (+5 V) for the ecoUnit 3 must not fall below the minimum required voltage due to the voltage drop.*
3) *1 HP = One horizontal pitch with 17.5 mm (0.689 in).*
4) *Conform to FCC 47, Part 15, Class B. UL approval according UL 916, File E501075.*

Building Controller (B-BC) for the automation of up to eight rooms or flexible room segments with the functions room climate, lighting and sunshading.
The ecos504 as BACnet Building Controller (B-BC) can also be used as an individual AS for other functions in building automation (ventilation system unit, decentral data preparation for devices on a BACnet MS/TP line, central control of multiple VAV boxes etc.).
The powerful programming environment, SAUTER CASE Suite, and the available function libraries allow both standard tasks of room automation and complex projects with flexible room division, based on room segments, to be carried out efficiently. Room operating units of the ecoUnit series and remote ecoLink I/O modules are connected to the ecos504 via RS-485 interfaces.

Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the “Description of operation” section. Destined for the U.S market, according UL916 & FCC47.
All related product regulations must also be adhered to. Changing or converting the product is not admissible.

For further safety instructions, information and guidelines, see fitting instructions P100017835.

Engineering notes

The ecos504 is a modular device suitable for series installation (DIN 43880) on 35 mm DIN rails. The installation position can be chosen at will.

Fitting and installation

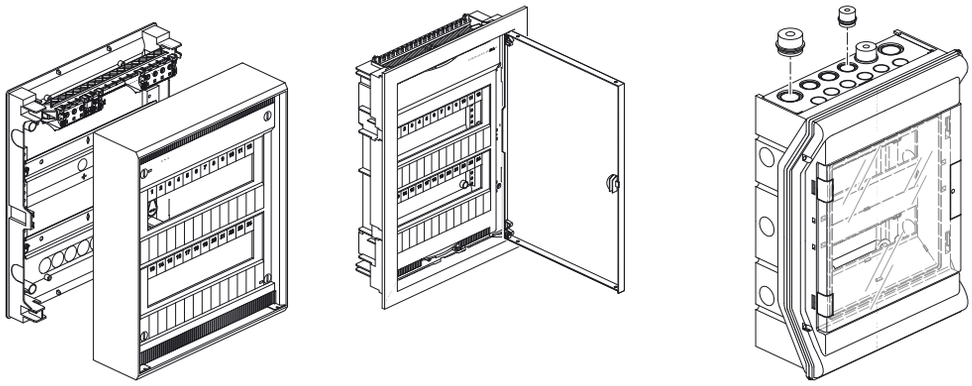
Note
When fitted in an installation box or cabinet, it must be ensured that there is sufficient ventilation to allow the permissible operating temperature to be maintained.

The following conditions must be met or observed during the installation:
- Connection may only be performed when the system is disconnected from the electrical supply.
- The unit must be protected against contact.
- There must be an external primary isolating facility.
- There must be a connection of the protective earth to the relevant terminal.
- The connection to terminal MM may not be interrupted by switching elements.

Special standards such as IEC 61508, IEC 61511, IEC 61131-1 and -2 and similar were not taken into account. Not suitable for any safety or limiting applications.
Local requirements regarding installation, usage, access, access rights, accident prevention, safety, dismantling and disposal must be taken into account. Furthermore, the installation standards EN 50178, 50310, 50110, 50274, 61140 and similar must be observed.
Use only shielded communication cables with twisted pair wires. Route the communication lines carefully. This means that the communication lines may not be placed alongside from products or lines which broadcast electromagnetic noises, such as frequency converters, inductive load switches, HF radiators and similar.
The completed installation must be in accordance with the NEC (NFPA 70) and with the local electrical safety and fire protection rules.
The communication wiring (Ethernet, RS-485) must be separated from current-carrying and live installations.

Installation in small distribution boxes

The ecos504 is suitable for fitting in standard small distribution boxes using DIN rail housing. The small distribution boxes are available in variants for surface mounting and flush mounting from various manufacturers of electrical installation equipment. This allows the ecos504 to be used simply and cheaply for all kinds of installation requirements, e.g.:
- Decentralised surface mounting for false ceilings or double floors
- Recessed mounting in small distribution boxes for hotel rooms or floor distributors together with automatic fuses, power supply modules, power contactors etc.
- Fitting with protection against dust and splashing (IP40...IP65) with suitable small distribution boxes and cable glands



Terminal cover

The terminal cover (0940240001) is intended for proper connection of the supply and control lines with a cable fastener in the case of wall mounting if no surrounding housing is required. When it is in place, the terminal cover, together with the ecos504, provides IP30 protection.

EY-RC 504

Power supply

The device is suitable for operation at 24 V~ or 24 V=. Operation with 24 V= power supply modules (EY-PS 021) is recommended, as these are optimally matched to the ecos504. DC operation causes the lowest power loss and heat development, which increases the service life and minimises the devices' power consumption.

The power supply connection is equipped with double terminals, allowing it to be looped through to other devices. The maximum ampacity of the connection terminals is to be maintained; to this end, an external fuse protection must be used in all cases. When a current-limiting power supply unit is used, such as EY-PS 021, fuse protection in the 24 V electrical circuit is not necessary. The fuse required for the primary electrical circuit on the power supply unit can be found in the manufacturer's instructions.

For the sizing of a DC power supply, the maximum current consumption of the ecos504 and all other devices attached to the 24 V supply is added up. The next-largest power supply module is selected; a reserve of at least 15% is to be taken into account.

The earth connector ⏚ on the ecos504 is the protective earth and must always be suitably connected to the earth for safety and EMC reasons.

Note

Some field devices (e.g. AXS continuous thermal actuator) and the remote ecoLink510, 511, 512* I/O modules require a 24 V~ AC power supply. The remote ecoLink514, 515 I/O modules can also be supplied with 24 V= (DC power supply). This is to be taken into consideration during engineering.

Note

The ecos504 needs to be connected to a power source class 2 circuits according to NEC (NFPA-75). Users in the U.S. must use a power supply with the required approvals.

For the operation of the ecos504 with 24 V~ a transformer of 42 VA can be used. The output voltage must always lie within the specified input voltage range of the ecos504, taking into account the full

tolerance range of the mains power supply. For the dimensioning of the transformer, a reserve of at least 15 VA is to be included in order to take into account the pulse-like current consumption of the connected devices.

Run/fault LED indicator

The operating status of the device is indicated by the RUN/FAULT LED.

RUN/FAULT	Indicator sequence	Description
Continuous green light	----------	Normal operation
Flashing green	• • • • • •	Identification via CASE Sun
Continuous yellow light	----------	In start-up mode
Flashing yellow	• • • • • •	The internal backup battery must be replaced
Continuous red light	----------	No CASE Engine Plan in ecos
Flashing red	• • • • • •	Program download or configuration active
Red flashing rapidly	••••••••••	Internal device error

Programming/configuration/initialisation

The ecos504 room automation station is freely programmable. The complete user program (CASE Engine Plan), and the parameterisation of the ecos (BACnet objects) and of the devices connected via the interfaces of the ecos504, are set up using CASE Suite. In this user program, the inputs and outputs are linked and the required control and regulation tasks are carried out.
The user program can be loaded from any point in the IP network with CASE Suite. Flashing red LED indicators show that there is an active download. The user program and the parameterisation are permanently saved in the ecos in a flash module and are retained even if there is a power failure.
Every AS must be configured for communication in an Ethernet network. All settings such as IP address, subnet mask, gateway and instance number (DOI), as well as additional properties such as host name and location, are parameterised via CASE Suite. The devices are delivered with DHCP mode (Zeroconf) as the factory setting.
In order to be able to identify the AS in a network visually, the CASE Sun commissioning tool can be used to put the run/fault LED in flashing mode.
An initialisation of the AS can be carried out before the download with CASE Suite.

Firmware

The AS is delivered with a current version of the firmware. At the time of commissioning, a newer firmware version may be available. Before commissioning an AS, you must therefore check the firmware version and, if necessary, perform an update with CASE Sun via the network.

RTC (Real Time Clock)

A Real Time Clock (RTC) is integrated into the ecos504 for the time programmes (schedulers/calendars). The date, time and time zone are set in the AS when loading the user parameters. The BACnet services “DM-TS-B” and “DM-UTC-B” are used to synchronise the time and date automatically if a BACnet time master is specified accordingly (e.g. SAUTER Vision Center, moduWeb Vision, modu525). The time, date and time zone can be set manually, for example using the BACnet browser.
The summer time setting (daylight saving) is activated in the network properties of the AS (CASE Engine) by default and includes all the AS integrated into the same network.
A lithium button-cell of the type CR2032 in the device ensures that in the event of a power failure the Real Time Clock is retained. The battery is designed for a serviceable life of approx. 10 years. High storage or transportation temperatures can significantly reduce the capacity of the battery. The user parameters from CASE Engine and the user data (e.g. modified by BACnet client) are permanently stored in the flash memory and are battery-independent.

Note
The battery is to be replaced by a qualified electrician only!

Data recording

The BACnet functionality can be used to create Trend Log objects (data points). The recording can be defined either periodically (time interval) or by means of a grid threshold (COV).

Note
Trend Log objects are not permanently saved. If the power supply is interrupted, the data of the objects is deleted. We recommend regular data back-up for the Trend Log objects by the building management system (e.g. SAUTER Vision Center).

Time programmes, calendar

The BACnet functionality allows BACnet time programmes (Scheduler) and calendar objects (Calendar) to be created in the ecos504. The time or calendar objects can be displayed, operated or adjusted with a BACnet client (e.g. SAUTER Vision Center).

Behaviour when the power supply fails

Power failures lead to an orderly shut-down of the ecos504 and, once the power supply is restored, to an automatic and orderly restart. The AS automatically restores the communication via BACnet and RS-485/SLC.
For BACnet objects, this means:

- The “Notification Class Recipient List” remains and the clients still automatically receive the event and alarm information without logging in again
- One’s own COV messages remain
- The COV subscriptions on other stations are logged in again automatically
- Connections between room automation stations (AS-AS) are updated again (re-subscription)

RS-485 A, RS-485 B interfaces

The RS-485 A and B interfaces are for connecting remote I/O modules from the ecoLink family as well as room operating units of the ecoUnit 3 series (EY-RU 31*/34*/35*/36*). This means that the I/O mix of the ecos can be optimally adapted to the project requirements.
The max. admissible bus length depends on the cable type used and the correct termination with terminating resistors. In general, a 4-wire shielded cable with twisted wire pairs must be used. Observe the correct polarity of all signals. The cable shield of the entire bus line must be connected continuously, and connected to protective earth as directly as possible at one location. The length of the line may not exceed 8 cm (3 inch) for optimum resistance to interference.

For Ethernet CAT 5 cables and J-Y(ST)Y cables, the possible bus length is up to 500 m (1640 ft). The bus length is reduced when EY-RU 3** room operating units are connected (see connection plans). In the case of RS-485 interfaces, the bus wiring must follow line topology. Star, tree or branch topologies are not recommended. The devices do not have internal terminating resistors. Therefore, a terminating resistor of 120 Ω (0.25 W) must be connected at the start and end of the bus line, parallel to the D +/D− data lines.

Room operating units EY-RU 31* and 34* with EY-SU 306 and EY-RU 35* with EY-SU 35* are supplied directly from the 5 V power supply of the RS-485 A or RS-485 B interfaces. The sum of all load currents of the connected devices of both interfaces may not exceed the max. permissible current of 200 mA. Furthermore, it must be ensured that there is a sufficient cable cross-section (= 0.5 mm^2(AWG 21)) to limit the voltage drop across the power cable to max. 1.2 V.
The EY-RU 35* with EY-SU 35* and the EY-RU 36* can only use the D+/D− data lines of SLC/RS-485. The devices must then be supplied by an external power supply (24 V=). It is recommended to connect them to the power supply of the controller so that the devices have a common reference (common ground).

RS-485 A, RS-485 B LED indicators

RS-485 A, RS-485 B	Indicator sequence	Description
Continuous green	----------	OK
Flashing green	• • • • • •	Network traffic
Continuous yellow	----------	Start-up phase, communication is being established
Continuous red	----------	5 V supply overloaded
Flashing red	• • • • • •	Communication error (e.g. ecoLink not connected)
Continuous OFF	----------	Interface not used, no communication

Integration of ecoLink modules via SAUTER CASE Suite

The ecoLink modules are engineered using CASE Engine. If the ecos AS is engineered as a group station with individual segment plans, the inputs and outputs of the ecoLink modules can be freely assigned to the individual functions in the segment plans. The user has maximum freedom. The eco-

Link modules are engineered and device addresses are issued to this end. Data points are then defined in CASE Engine and assigned to the relevant modules with their channel connections. This allows the inputs and outputs to be mapped directly to BACnet data points.
In contrast to this, in the case of identical room segments, both the function and the allocation of the inputs and outputs are identical for all room segments. The inputs and outputs are then correspondingly “mirrored”, i.e. repeated. In the case of engineering with identical room segments, this means that each complete ecoLink module is assigned to a certain room segment and cannot be divided among several. An additional description of the benefits and disadvantages or optimum working technique can be found in the engineering guideline for room automation.
Below you will find possible configurations of the ecos504 for engineering with 1, 2, 4 and 8 identical room segments, as well as the mirroring of the ecoLink device addresses. For engineering with individual room segments, mirroring is not required. The data points can then be freely assigned.

1 segment per ecos or individual station:

Interface	RS-485 A	RS-485 B
Segment	Seg 1	
ecoUnit address	1, 2, 3, 4	1, 2, 3, 4
ecoLink address	1, 2, 9, 10, 17, 18, 25, 26	1, 2, 9, 10, 17, 18, 25, 26

Mirroring type RS-485 A:

If mirroring type “RS-485 A” is selected, 2 or 4 room segments are possible. The RS-485 B bus can then only be used with individual segment plans.

Configuration	2 segments	
Interface	RS-485 A	
Segment	Seg 1	Seg 2
ecoUnit address	1, 3	2, 4
ecoLink address	1, 2, 9, 10	17, 18, 25, 26

Configuration	4 segments			
Interface	RS-485 A			
Segment	Seg 1	Seg 2	Seg 3	Seg 4
ecoUnit address	1	2	3	4
ecoLink address	1, 2	9, 10	17, 18	25, 26

Mirroring type RS-485 A / RS-485 B:

If mirroring type “RS-485 A / RS-485 B” is selected, 2, 4 or 8 room segments are possible.

Configuration	2 segments	
Interface	RS-485 A	RS-485 B
Segment	Seg 1	Seg 2
ecoUnit address	1, 2, 3, 4	1, 2, 3, 4
ecoLink address	1, 2, 9, 10, 17, 18, 25, 26	1, 2, 9, 10, 17, 18, 25, 26

Configuration	4 segments			
Interface	RS-485 A		RS-485 B	
Segment	Seg 1	Seg 2	Seg 3	Seg 4
ecoUnit address	1, 3	2, 4	1, 3	2, 4
ecoLink address	1, 2, 9, 10	17, 18, 25, 26	1, 2, 9, 10	17, 18, 25, 26

Configuration	8 segments							
Interface	RS-485 A				RS-485 B			
Segment	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8
ecoUnit address	1	2	3	4	1	2	3	4
ecoLink address	1, 2	9, 10	17, 18	25, 26	1, 2	9, 10	17, 18	25, 26

Start-up behaviour/monitoring function

The communication between ecos and the engineered ecoLink modules at the RS-485 buses is monitored. If the communication fails for more than the monitoring time of 10s, the affected ecoLink modules switch to the safety status. The data points in the ecos are marked with the status “unreliable”. All outputs of the affected ecoLink modules are switched to the defined value for the safety state (“relinquish default”).
Equally, engineered room operating units are monitored; the status of the devices is shown by means of corresponding “valid” outputs on the ROOM_UNIT block in CASE Engine.
Details on start-up behaviour and monitoring functions can be found in the documentation of the peripheral devices in question.

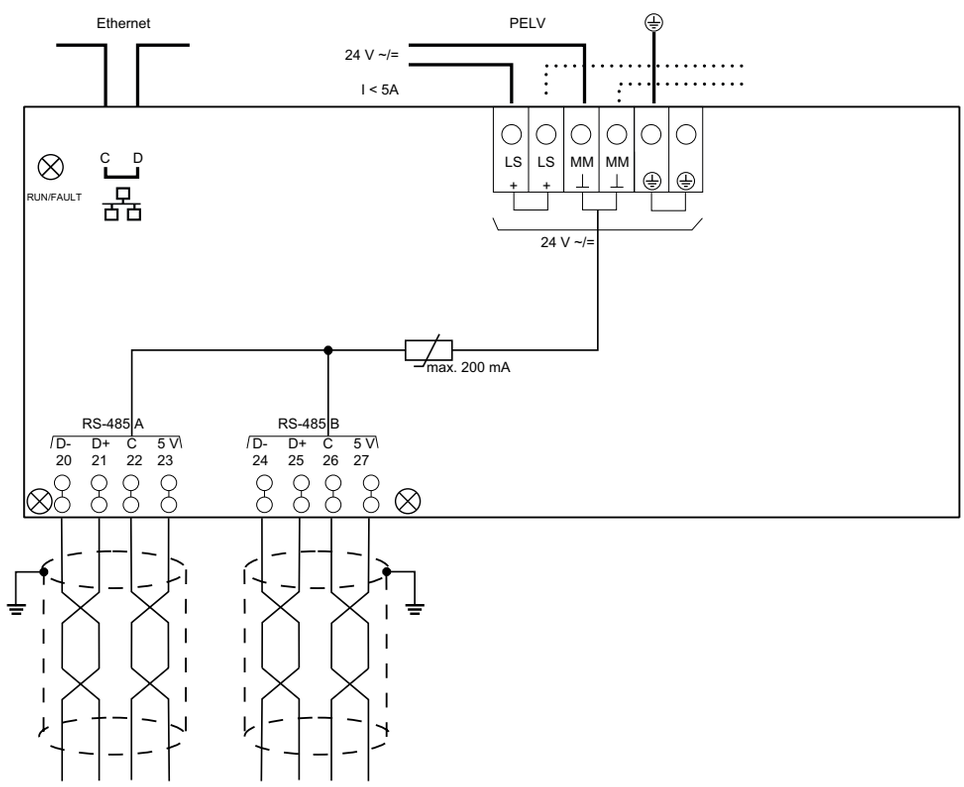
Additional information

Technical information	
Fitting instructions	P100017835
BACnet PICS ecos504/ecos505	D100275255
BACnet BTL Certification	No: BTL-30257 (V3.1.0b753) for EY-RC504F***
ecos 5 engineering guidelines	See SAUTER extranet

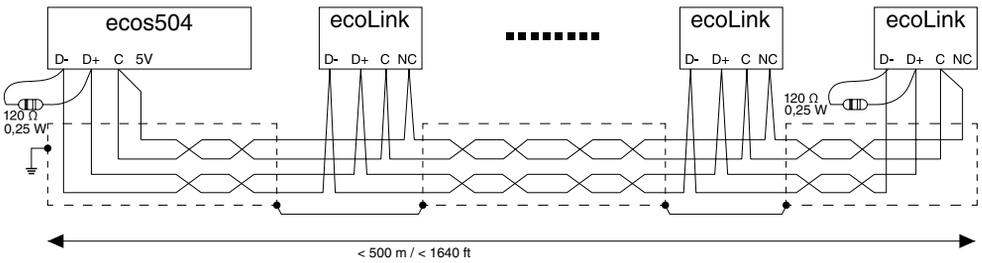
Disposal

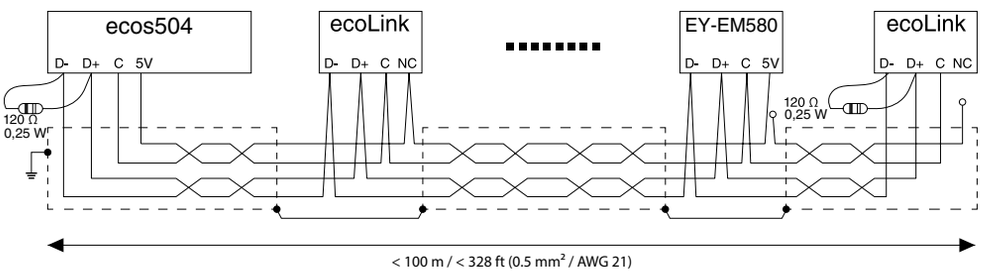
When disposing of the product, observe the currently applicable local laws.
More information on materials can be found in the Declaration on materials and the environment for this product.

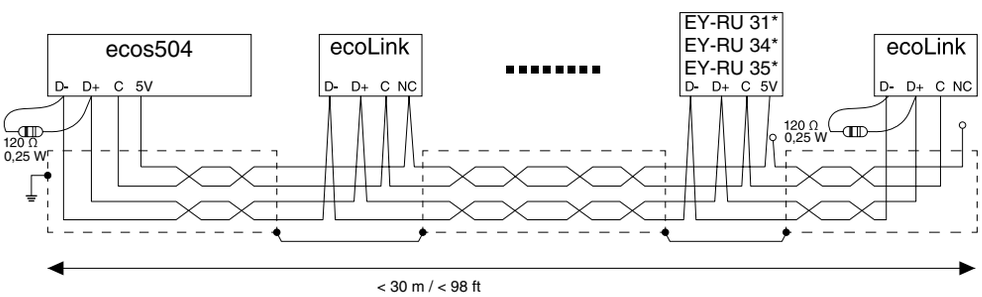
Connection diagram for EY-RC504F001U



Bus wiring

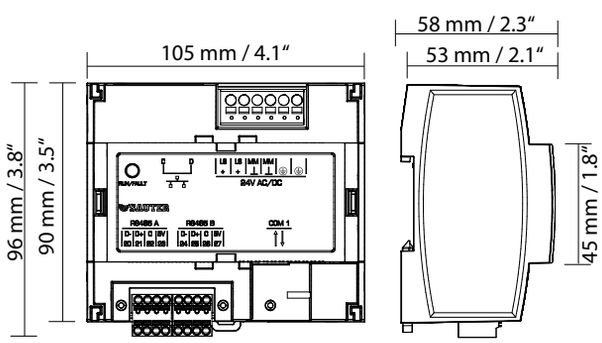






When EY-RU 31* and EY-RU 34* are used, the max. total bus length permitted is 30 m (98 ft). Cross-section of the cable must be ≥ 0.5 mm^2(AWG 21)
Further bus cabling options are to be found in the fitting instructions.

EY-RC 504 dimension drawing



Dimensions in [mm]/[inch]

Fr. Sauter AG
Im Surinam 55
CH-4016 Basel
Tel. +41 61 - 695 55 55
www.sauter-controls.com