SAUTER
Für Lebensräume mit Zukunft.

ecos502: Room automation station

How energy efficiency is improved

High-performance function modules in the ecos allow energy-optimised room regulation with control of lighting and window blinds in order to ensure minimal energy consumption.

Areas of application

Room automation for temperature regulation, control of lighting and window blinds etc. Integration of non-SAUTER installations via BACnet/IP.

Features

- Part of the SAUTER EY-modulo 5 system family
- Communication: BACnet/IP (EN ISO 16484-5)
- Room automation station for 2 rooms or 2 functional axes
- Individual setting of room conditions using ecoUnit 3 (EY-RU3..) and ecoUnit 1 (EY-RU1..) room control units; any combination of the two types is permitted.
- Optimisation of energy consumption thanks to occupancy function, window contact monitoring, demand-led switching of the fan speed, control of lighting and window blinds, and time-dependent setpoint specification.
- Time and calendar function
- Integration into the building management system via Ethernet / BACnet/IP data interface
- Programming/parameterisation via PC with CASE Suite (based on IEC 61131-3)
- Control engineering libraries

Technical description

- Power supply 230 V~ ± 10% (transformer with 30 VA)
- Ethernet system bus, BACnet/IP protocol

Products

Type	Description
EY-RC502F001	Room automation station

Technical data

Electrical supply

Power supply	230 V~, ± 10%, 50...60 Hz
Power consumption	up to 24 VA (including 12 VA external)
Dissipated power	up to 7.6
Battery (buffer: RTC/SRAM)	Lithium button cell CR2032, plug-in

Interfaces, communication

Ethernet network	2x RJ-45 socket (switch)
10/100 BASE-T(X)	10/100 Mbit/s
Communication protocol	BACnet/IP
Operating devices	up to four operating units in total;
EY-RU3.. and/or	direct
EY-RU1..	via EY-EM580 (bidirectional)

Inputs/outputs

Universal inputs	8 (Ni1000, Pt1000, U (0-10V), DI)
Digital inputs	4
Analogue outputs	4 (0-10V)
TRIAC outputs	8 (24 V~)
Relay outputs	16 (250 V~)[1] terminals 1 to 24
Relay outputs	2 (24 V=) terminals 25 to 28

Architecture

Processor	32 Bit, 200 MHz
SDRAM (operational memory)	32 MB
SRAM (static memory)	128 kB
Flash	16 MB
Operating system	Linux
User data	via CASE Engine

Function

BACnet data point objects incl. HW	256
Dynamic objects	
Time programs	32 (Schedule)
Calendar	8 (Calendar)
Alerting	16 (Notification Class)

Function (continued)

Historical data	16 (Trend Log)
	up to 2,000 entries
Control	32 (Loop)
COV Notifications	500
Structured view	64 (Structured View)
BACnet client links	200 (peer to peer)
BBMD in BDT	32
FD in FDT	32

Permitted ambient conditions

Operating temperature	0…45 °C
Storage and transport temperature	-25…70 °C
Humidity	10…85% rh
	no condensation

Installation

Fitting	top-hat rail / wall mounting
Dimensions W x H x D (mm)	299 x 120 x 73
Weight (kg)	2.5

Standards, guidelines and directives

Type of protection	IP 00 (EN 60529) [2]
Protection class	I (EN 60730-1)
Environmental class	3K3 (IEC 60721)
CE conformity as per	
EMC Directive 2004/108/EC	EN 61000-6-1 to -6-4
Electrical safety	EN 60730-1
2006/95/EC	EN 60730-2-9
Software class A	EN 60730-1 annexe H

Additional information

Fitting instructions	MV P100002325
Material declaration	MD 94.110
Dimension drawing	K10479
Wiring diagram	A10577

1) Different phases can be routed to the switch contact blocks. The voltage between any phase and the neutral conductor must not exceed 250 V~.

2) Type of protection IP10 with terminal cover (accessory 090024002); Type of protection IP20 with wiring box (accessory 090024011)

Accessories

Type	Description
090024002	Terminal covers, 295 mm (2 pcs.)
090024011	Wiring box, 295 mm (2 pcs.)

Engineering notes

The I/O mix of the ecos502 is typically designed for two rooms or two functions, i.e. one device incorporates two room controllers. The program created during the programming sequence is equally valid for both rooms/functional axis. The possible number of axes is one or two.

Installation and power supply

The ecos502 is a compact device which is suitable for wall mounting or installation in rows (DIN 43880) on a 35 mm top-hat rail. The plant devices are connected via screw terminals, whereby the following conditions must be observed:

- Connection work must be carried out only when there is no voltage (i.e. the circuit is dead).
- The unit must be protected against physical contact.
- The maximum power that can be tapped on the LS terminals is 12 VA.
- The earthing terminals are internally connected to the earth connection (PE) (PELV power circuits).

Cross-section of conductors: min. 0.8 mm² (AWG 18), max. 2.5 mm² (AWG 13), compliant with standards and national installation regulations.

Two RJ-45 network connections with switch functionality are available for communication; they can be switched in series via the ecos502. The network topology structure must take Ethernet network standards into consideration.

Communication cabling must be carried out correctly and must meet the requirements of standards EN 50174-1, -2 and -3. The communication wiring must be kept at a distance to other current-carrying cabling.

No account has been taken of special standards such as IEC/EN 61508, IEC/EN 61511, IEC/EN 61131-1 and 2 or similar standards. Local regulations on installation, application, access, access authorisations, accident prevention, safety, dismantling and disposal must be observed. Compliance is also required with installation standards EN 50178, 50310, 50110, 50274, 61140 and similar.

For further information, consult the fitting instructions P100002325

Wiring box
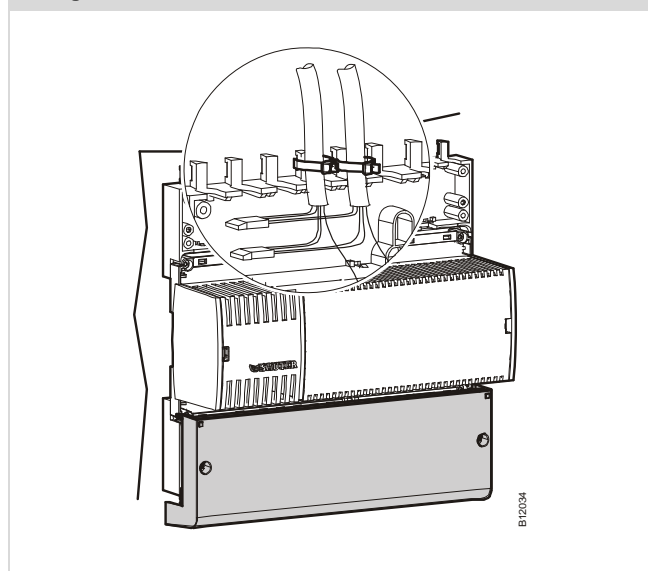
The wiring box is used to ensure correct connection of the supply and control lines with tension relief. With the cover in place, the box together with the ecos will guarantee protection type IP 20.

Inputs/outputs

As a basic unit the ecos502 has 42 inputs/outputs offering the following functions:

Universal inputs

Number of inputs:	8 (UI)
Type of inputs:	Ni1000 (DIN 43760)
(software coding)	Pt1000 (IEC 751)
	Voltage measurement (U)
	Current measurement (I) with ext. resistance)
	Resistance measurement
	Digital input (DI fixed)
Protection against extraneous voltage	
Ni/Pt/U/DI	± 30 V / 24 V~ (without destruction)
Scan rate	100 ms (digital values)
	500 ms (analogue inputs)
Resolution	14 bit
Measuring ranges	
Voltage (U)	0 (2)...10 V, 0 (0.2)...1 V
Current (I) (via ext. R)	0 (4)...20 mA
Resistance	200…250 Ω
Temperature	
Ni/Pt1000	-50...+150 °C
Digital input	Potential-free contacts, wired to earth
	Opto-coupler, transistor (open collector)
	I_{out}: ~1.2 mA for UI
	~1.8 mA for DI
Counter	max. 3 Hz (100 ms scan rate)

Temperature measurement (Ni/Pt)

The Ni/Pt1000 sensors are connected using the two-wire method between one of the input terminals for universal inputs (channel 26...33) and an earth terminal. Inputs do not require calibration and can be used directly. A corresponding line resistance of 2 Ω is pre-compensated as standard. With the corresponding line resistance of 2 Ω (cable cross-section: 1.5 mm²), the connection cable may be a maximum of 85 m in length. Greater line resistances can be compensated using the software. The measurement current is pulsed so that the sensor does not heat up (I_{Mess} ~0.3 mA).

Voltage measurement (U)

The voltage to be measured is connected between one of the input terminals for universal input (channel 26...33) and an earth terminal. The signal must be potential-free. The two measurement ranges with or without offset 0 (0.2)...1 V and 0 (2)...10 V are selected by means of the software. The input's internal resistance R_i (burden) is 9 MΩ.

Current measurement (I)

The current can be measured via an external resistance (e.g. 50 Ω). The voltage to be measured is connected between one of the two input terminals for universal input (channel 26...33) and an earth terminal. The current signal must be potential-free.

Resistance measurement

The ecos502 can measure an ohmic resistance of 200 to 2500 Ω. Measurement is taken with respect to earth. Higher resistance values can be scaled to approximately 2500 Ω by adding another fixed resistance to the circuit in parallel. It may be necessary to implement linearisation in the user program.

Digital inputs (DI with UI)

The ecos502 also uses the universal inputs to record binary information. This information (alarm/status) is connected between an input terminal (26...33) and an earth terminal. The station applies a voltage of approx. 13 V to the terminal. This usually corresponds to INACTIVE (bit=0) for an open contact. When a contact is closed it is ACTIVE (bit=1) and 0 V are applied, whereby the current flow equates to approx. ~1.2 mA.

Each input can be defined via software configuration as an alarm or status input.

Counter inputs for potential-free contacts, opto-couplers or transistors with an open collector can be connected to universal inputs. The maximum pulse frequency may reach 3 Hz.

Digital inputs (DI fixed)

Number of inputs	4 (DI fixed)
Type of inputs	Potential-free contacts, wired to earth
	Opto-coupler
	Transistor (open collector)
Counter	up to 3 Hz (100 ms scan rate)
Protection against extraneous voltage	
	± 30 V / 24 V~ (without destruction)
Maximum output current	
	~1.8 mA to earth
Scan rate	100 ms

Binary information is connected between one of the input terminals (channels 38...41) and earth. The station applies a voltage of approx. 13 V to the terminal. In normal cases (NORMAL) this corresponds to INACTIVE (bit=0) for an open contact. When a contact is closed it is ACTIVE (bit=1) and 0 V is applied, and the current is a maximum of 2 mA.

Each input can be defined via software configuration as an alarm or status input.

Counter outputs for potential-free contacts, opto-couplers or transistors with an open collector can be connected to the digital inputs. The maximum pulse frequency may reach 3 Hz.

Operating devices

Number of devices	Up to a total of 4 operating units EY-RU3.. and /or EY-RU1.

The operating devices are connected direct to the serial RS-485 interface with four-core twisted wire. The cable can be up to 100 metres in length. The communication protocol is SLC.

The EY-RU1.. EnOcean wireless operating units are connected to the ecos via an EY-EM580 bidirectional wireless receiver, which is also connected with four-core to the serial RS-485 interface. The cable may be up to 100 metres in length. The communication protocol is SLC.

A total of four operating devices can be connected for each ecos502. It is possible to combine wired (EY-RU3..) and wireless (EY-RU1..) room operating units.

Digital outputs (relays)

Number of outputs	18 (DO)
Type of outputs	Relays, normally-open contacts (0-I)
Load for outputs	s. technical specifications table
Switching frequency	10^6 cycles
Schaltspannung	24…250 V

The actuator to be switched is connected directly to the relay terminals (channel 0...17).

Outputs can be defined for single or multi-level functions. Real feedback signals can only be implemented via the digital inputs (BACnet COMMAND FAILURE).

Digital outputs (TRIAC)

Number of outputs	8 (DO)
Type of outputs	TRIAC, normally-open contacts (0-I)
Load for outputs	24 V~ / 0.5 A (resistive load)

The actuator to be switched (e.g. thermal actuator) is connected directly to the TRIAC terminals (channel 18...25). Die TRIAC are wired to GND.

TRIAC outputs can be defined for single or multi-level functions. Real feedback signals can only be implemented via the digital inputs (BACnet COMMAND FAILURE).

The voltage supply for thermal drives can be tapped from the LS terminals. The maximum tappable current should be referenced from the load calculations for ecos502.

Analogue outputs

Number of outputs	4 (AO)
Type of outputs	4x 0(2)...10 V
Load	$\leq$ 2 mA
Refresh	100 ms
Resolution	13 bit

The output voltage is measured between the relevant output terminal (channel 34...37) and an earth terminal. The outputs are designed as push-pull outputs with active sink capability. A load of 2 mA can be applied to each output. To ensure proper operation, output currents should not exceed 8 mA.

The analogue output of the ecos502 is protected against short circuits with respect to earth, but not against extraneous voltage. However, the permanent short-circuiting of **several** outputs leads to their being damaged by heat. There are still protected against static discharges.

Technical specifications of inputs and outputs

Universal input	Measuring range	Resolution	Accuracy	
			Measuring span	plus measurement value
Ni/Pt1000	-50…+150 °C	< 0.05 K	± 0.5%	0.5%
U (0/0.2...1 V)	0.02...1.1 V	< 0.1 mV	± 0.5%	0.5%
U (0/2...10 V)	0.15...10.2 V	< 1 mV	± 0.5%	0.5%
R	200…2500 Ω	< 0.5%	± 1%	1%

Relay outputs

Terminals	Continuous load (per contacts)	Start-up current	Switching voltage	Intended application
1-2, 10-11	10 A	80 A (20 ms)	24 V…250 V*	Electric heater
3-5, 12-14	1 A	80 A (20 ms)	24 V…250 V*	Lights
6-9, 15-18	1 A	30 A (20 ms)	24 V…250 V*	Fan (3-speed)
19-21, 22-24	1 A	30 A (20 ms)	24 V…250 V*	Window blinds, max. 100 VA motor rating, 5 Nm
25-28	1 A	30 A (20 ms)	24 V=	Polarity inverter, control of lighting and window blinds with 24 V= d.c. motor

* Mixture of 24 V and 250 V is not permitted; max. 26 A steady current per ecos

Triac outputs

Terminals	Continuous load (max.)			Intended application
59-66	0.5 A			Thermal drives A triac can switch up to 0.5 A. If the voltage supply for thermal drives is taken from the LS terminal then the sum of all currents switched simultaneously via the triacs can be up to 0.5 A.

Analogue output	Correcting range	Resolution	Accuracy
AO (0/2…10 V, ≤ 2 mA)	0.01…10.2 V	< 2 mV	1% of end value

Binary input (O-I)	Universal input (UI)	Digital input (DI fixed)	
Switching threshold, active	> 3 V	> 4 V	
Switching threshold, inactive	< 1.5 V	< 1.5 V	
Switching hysteresis	> 0.4 V	> 0.4 V	

Controlling continuous drives

A permanent load of up to 2 mA can be applied to an analogue output (10 V=). The resultant load is ≥ 5000 Ω.

### Sizing/rating the internal transformer

The transformer incorporated in the ecos502 provides power for the electronic system, the control current for internal relays and 24 V~ on the LS terminals for thermal drives.

Care should be taken not to overload the transformer when wiring the ecos502. The *ecos502 load calculation* table can be used to calculate loads.

Adding an external transformer

If the maximum permissible current of the internal transformer is exceeded, an external transformer can be used to remedy the problem. In this case, the external transformer is used to supply current to thermal drives. The maximum permanent load on the triac must not exceed. 0.5 A.

Circuit diagram: external transformer
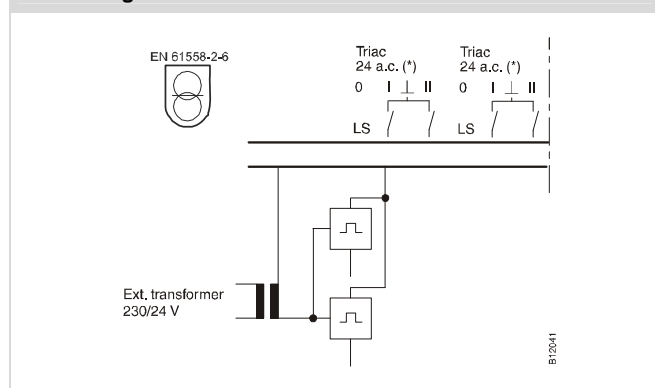
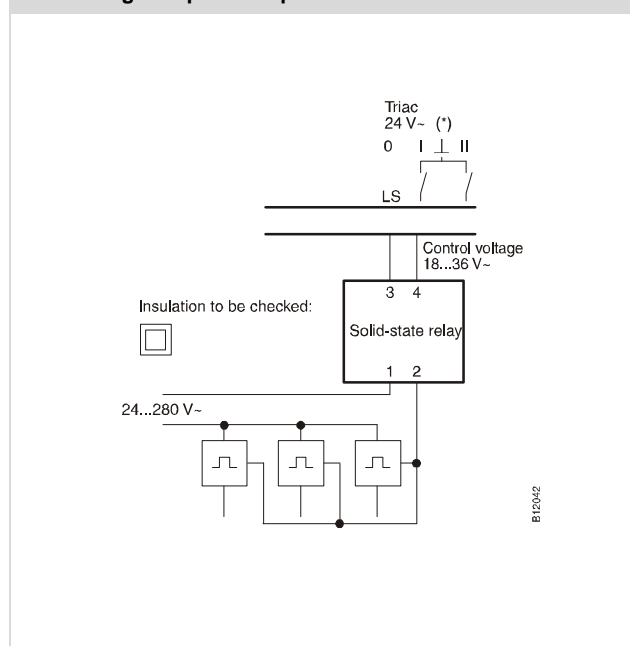### Parallel operation of more than 4 thermal actuators

A semiconductor relay can be interconnected if higher currents are required. The current supply to drives is also provided by an external transformer. The number of actuators is limited by the rating of the semiconductor relay.

Example:
24 to 280 V~,   8 A without heat sink at 230 V~, control voltage 18...36 V~.

Circuit diagram: parallel operation

ecos502 load calculation

The ecos502 is designed for two rooms/axes, each with the following application: electric heater, 3-stage fan, two lights, window blinds UP/DOWN, two thermal drives.
The internal transformer is rated for this application.

Care should be taken not to overload the transformer if the ecos502 is used with a different configuration.

The following table can be used to calculate the load of a configuration.

ecos502 load calculation

Terminal no.	Type	Start-up currents max.	Continuous load (A) max.	Application: Continuous load (A) Relay contacts	Current load (mA) Internal transformer	Application: Continuous load (A) Internal transformer
01	Relay	80 A (Inrush)	10		40	
02	IN					
03	Relay	80 A (Inrush)	1		40	
04	Relay	80 A (Inrush)	1		40	
05	IN					
06	IN					
07	Relay	30 A	1		20	
08	Relay				20	
09	Relay				20	
10	Relay	80 A (Inrush)	10		40	
11	IN					
12	Relay	80 A (Inrush)	1		40	
13	Relay	80 A (Inrush)	1		40	
14	IN					
15	IN					
16	Relay	30 A	1		20	
17	Relay				20	
18	Relay				20	
19	IN					
20	Relays	30 A	1		20	
21	Relay				20	
22	IN					
23	Relay	30 A	1		20	
24	Relay				20	
25	IN					
26	IN					
27	Relay	30 A	1		20	
28	Relay				20	
57	LS_out					
58	LS_out					
59	Triac 24 V~				125*	
60	Triac 24 V~				125*	
61	Triac 24 V~		12 VA (=0.5 A) simultaneous	---------	125*	
62	Triac 24 V~				125*	
63	Triac 24 V~				125*	
64	Triac 24 V~				125*	
65	Triac 24 V~				125*	
66	Triac 24 V~				125*	
			Total		**Total**	
				Permanent current max. 26 A		Permanent current max. 800 mA

*) e.g. AXT111F202, AXT211F112/F212

General functional description

The room automation station is based fully on BACnet / IP communication.

Note
Details on BACnet functionality can be referenced from the PICS documentation.

Ethernet system bus

The ecos stations have two Ethernet connections. These have the function of a SWITCH. Cabling must be compliant with the general regulations for Ethernet/IP networks.

Commissioning

This work must be undertaken while the equipment is dead (no voltage). Protective ESD precautions must be in place for all manipulations.

Programming and parameterisation

The complete user program (Engine Plan) and the various parameterisations (BACnet objects, images for moduWEB, etc.) are produced using CASE Suite. Up to 256 BACnet data points including input and output hardware can be used.

Every ecos502 must be configured for communicating in an Ethernet network. All settings such as IP address, subnet mask, gateway and instance number (DOI) are parameterised using

CASE Sun. Automatic configuration via DHCP server is also possible.

The Run/Fault LED can be set to flash mode using the CASE Sun commissioning tool to identify the room automation station within a network.

The user program can be loaded from any in the IP network using CASE Suite. An active download is signalled by means of flashing red LEDs. Data is written to a Flash memory and remains intact even in the event of a power failure. This provides very high protection against data loss.

Inputs and outputs can be parameterised via the user program and are free to for utilisation in control and activation tasks.

Initialisation

The room automation station can be initialised using CASE Suite prior to executing the download.

Firmware update

The room automation station is supplied together with a current version of the firmware. If a new firmware version becomes available during the time prior to installation and commissioning, it is possible to update the ecos502 directly using CASE Sun via the network. An active update is signalled by means of flashing red LEDs.

It is essential to check the firmware version prior to commissioning a room automation station and to execute an update where indicated.

Internal clock

A battery-buffered real-time clock (RTC) for the time programs is integrated in the ecos502. Date, time and time zone are set in the ecos when the user data is loaded.

It is possible to set the date, time and time zone via the BACnet browser, for example.

The BACnet services "DM-TS-B" and "DM-UTC-B" are synchronised automatically when provided with appropriate input from a BACnet time server (e.g. novaPro Open).

The automatic change-over from summertime to wintertime and vice versa (daylight saving) is activated by default in the AS network properties (CASE Engine) and applies to all the room automation stations located in the same network.

Time programs, calendar

BACnet functionality allows for up to 32 time programmes (scheduler) and 8 calendar objects (calendar) to be created in the ecos502.

Battery, data buffering

A plug-in lithium button cell battery ensures that the real-time clock for time programmes (Scheduler / Calendar) and data such as counters, e.g. adaptive control algorithms, are maintained in the memory (SRAM).

The battery enables a total back-up operation period of 150 weeks.

The ecos502 does not monitor the battery voltage.

Technical data

Type (standard)	CR2032 lithium button-cell
Nominal voltage	3 V
Capacity	210 mAh
Dimensions	20 mm x 3.2 mm

User data from CASE Engine and modified user data (e.g. modified via BACnet client) are stored permanently in the flash memory and do not require battery buffering.

However, it is recommended to safeguard user data (CASE Engine) and modified user data by means of a backup (e.g. BACnet DM-BR); this will increase safety against loss of data.

Changing the battery

If it becomes necessary to change the battery during the operating period, this must be done by trained specialist staff.

Behaviour in the event of a power failure

Power failures are differentiated as follows:

- Micro-interruptions

Micro-interruptions are generally described in terms of microseconds (0…999 μsec.). These interruptions are bridged without any deactivations or other consequences. The plant maintains normal operations.

- Normal interruptions

These interruptions are generally described in terms of seconds and minutes. Normal interruptions for the ecos502 mean controlled deactivation and controlled reactivation according to priority when the voltage supply is resumed. The ecos502 implements controlled deactivation and reactivation automatically.

For BACnet objects this means:

- The "Notification Class Recipient List" remains intact and the clients continue to receive event and alarm information automatically without having to log in again.
- Proprietary COV notifications remain intact
- The COV subscriptions to other stations are re-registered automatically.
- Connections between room automation stations (AS-AS) are updated (re-subscription).
- When mains power is restored, the room automation station checks the data consistency and re-launches communication automatically.

Extension options

Various components can be added as extensions to the ecos502 via an SLC interface.
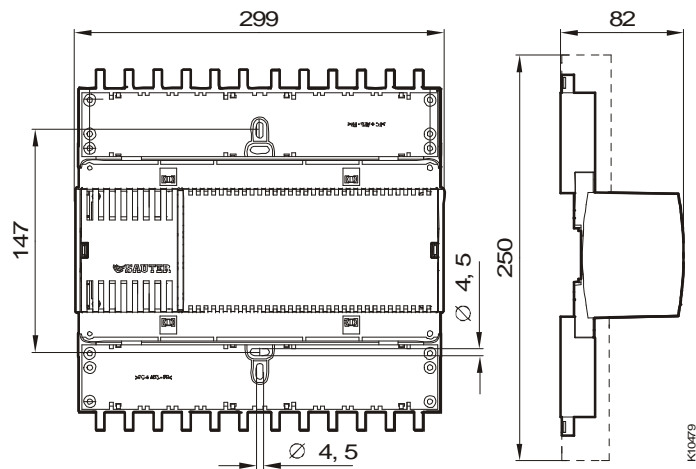
Channel and terminal occupancy – ecos502 for 1 room/axis

| Description	Channel	Signal	Common	Occupancy
		Terminals Room/Axis 1		**Field Devices (Application)**
	Channel	**Signal**	**Common**	**Occupancy**
Digital output (relay 0-I)	0	01	02	
	1	03	05	
	2	04		
	3	07	06	
	4	08		
	5	09		
	6	10	11	
	7	12	14	
	8	13		
	9	16	15	
	10	17		
	11	18		
	12	20	19	
	13	21		
	14	23	22	
	15	24		
	16	27	25, 26	
	17	28		
RS-485		29, 30, 31, 32		
			GND	
Analogue output (0…10 V)	34	38	37	
	35	39		
	36	40	42	
	37	41		
Universal input (Ni/Pt1000/U/DI)	26	43	47	
	27	44		
	28	45		
	29	46		
	30	48		
	31	49		
	32	50		
	33	51		
Digital input (DI fixed)	38	52	56	
	39	53		
	40	54		
	41	55		
Voltage output LS (24 V~)		57		
		58		
Digital output (TRIAC 0-I)	18	59		
	19	60		
	20	61		
	21	62		
	22	63		
	23	64		
	24	65		
	25	66		

Channel and terminal occupancy - ecos502 for 2 rooms/axes (1 device with 2 functionally identical ecos (2 virtual ecos))

Description	Channel	Terminals				Field Devices (Application)	Room/Axis	
		Room/Axis 1		Room/Axis 2				
		Signal	Common	Signal	Common	Occupancy	1	2
Digital output (relay 0-I)	0	01	02	10	11			
	1	03	05	12	14			
	2	04		13				
	3	07	06	16	15			
	4	08		17				
	5	09		18				
	12	20	19	23	22			
	13	21		24				
RS-485	---	29, 30, 31, 32						
			GND		GND			
Analogue output (0…10 V)	34	38	37	40	42			
	35	39		41				
Universal input (Ni/Pt1000/U/DI)	26	43	47	48	47			
	27	44		49				
	28	45		50				
	29	46		51				
Digital input (DI fixed)	38	52	56	54	56			
	39	53		55				
Voltage output LS (24 V~)	---	57, 58						
Digital output (TRIAC 0-I)	18	59		63				
	19	60		64				
	20	61		65				
	21	62		66				

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Dimension drawing

Wiring diagram
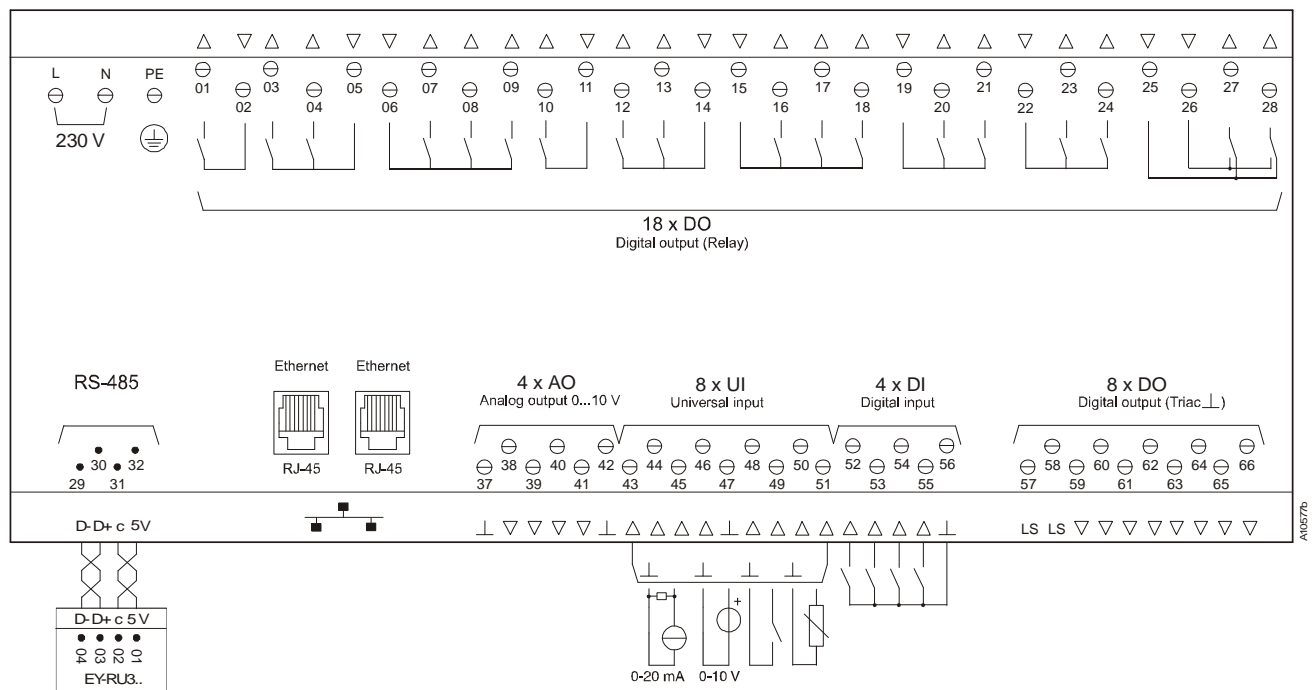
If it is mandatory to comply with the industrial standard (EN 61000-6-2), the connecting cables for the digital inputs (DI), analogue inputs and outputs (AI/AO), the counter inputs (CI) and the RS485 cable must not exceed 30 metres in length.

Application example

Room automation with temperature control via fan-coil unit, control for lighting, window blinds and windows
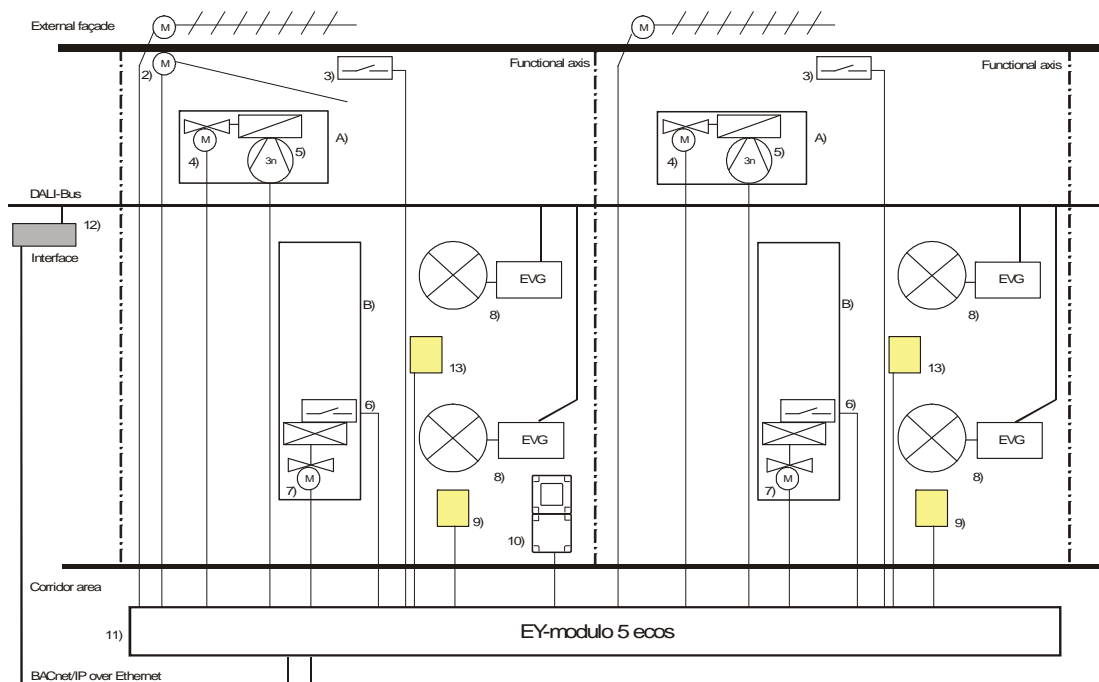
Pos.	Description	SAUTER code*	Documentation
1	Window blind actuator (up/down/shade)		
2	Window motor (open/close)		
3	Window contacts		
4	Actuator for unit valves (continuous)	AXS111F…	PDS 55.014
4	Unit valve	VUL/BUL	PDS 55.008/55.009
5	Fan control (3-speed)		
6	Dew-point monitor	EGH102F001	PDS 34.042
7	Actuator for unit valves (thermal)	AXT111F…	PDS 55.014
7	Unit valve	VUL/BUL	PDS 55.008/55.009
8	Lighting control via DALI signal converter (ballast)		
9	Motion detector		
10	LCD operating device, 4 switch functions	EY-RU346F001	PDS 94.040
10	Switching unit for operating device, 6 buttons	EY-SU306F001	PDS 94.035
11	EY-modulo 5 ecos	EY-RC502F001	PDS 94.110
12	BACnet/DALI gateway		
13	Light sensor		
A	Floor convector with fan		
B	Chilled-beam element		

*) any accessories that may be required are not included in the parts list

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