EY-CM 721: Communication module with EIA-232 and EIA-485 interfaces, modu721

How energy efficiency is improved

SAUTER EY-modulo 5 technology: modular, fast and universal

Features

- Part of the SAUTER EY-modulo 5 system family
- Plug-in element for extending the modu524/525 automation station (AS)
- One or two COM modules per AS
- Connection to non-SAUTER systems (PLC, chillers, meters etc.)
- Connection for point-to-point protocols with EIA-232 interface
- Connection for field bus protocols based on EIA-485
- 2-wire EIA-485 (half-duplex)
- Galvanic isolation up to 300 V
- Jumper for EIA-485 bus voltage, bus termination and connection for galvanic isolation
- M-Bus and further integration of third-party products with the AS for integrated control and optimised regulation and the option to use BACnet/IP communication with the management level.
- Direct labelling on the front

EY-CM721F010

Technical data

Power supply

Power supply	From AS via I/O bus
Per AS at location 1 or 2	≤ 2 COM modules
Current consumption	≤ 150 mA
Dissipated power	≤ 1.2 W

Ambient conditions

Operating temperature	0…45 °C
Storage and transport temperature	–25…70 °C
Ambient humidity	10…85% rh, no condensation

Architecture

Protocol processor	FPGA
COM port	UART
Memory	Flash memory (user and protocol data)
Number of data points	≤ 200
Number of loads	31 unit loads (UL)

Interfaces, communication

COM port, EIA-232 (DTE)	D-Sub plug (9-pin, male)
COM port, EIA-485	6 screw terminals (2 × C, 2 × D+, 2 × D-)
Baud rate	0.3…38.4 kbit/s
Data bits	5, 6, 7, 8
Stop bits	1, 1.5, 2
Parity	None, even, odd
Connection, I/O bus	12-pin, integrated in base

Construction

Fitting	On DIN rail
Dimensions W x H x D	42 × 170 × 115 mm
Weight	0.8 kg

Standards, directives

Type of protection	IP20 (EN 60529)
Protection class	III (EN 60730-1)
Environment class	3K3 (IEC 60721)

	Software class	EN 60730-1 Appendix H
CE conformity according to	EMC Directive 2014/30/EU[1]	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4

Overview of types

Type	Protocol
EY-CM721F010	Communication module for Modbus/RTU (master, EIA-232 or EIA-485)
EY-CM721F020	Communication module for M-Bus (master, EIA-232 or EIA-485)

Accessories

Type	Description
7010037001	Manual for moduCom communication modules, German
7010037002	Manual for moduCom communication modules, French
7010037003	Manual for moduCom communication modules, English
0386301001	Connection cable COM DB9(f)-DB9(f), 3 m (null modem)

Description of operation

The moduCom communication module (abbreviated as: COM module) modu721 is used to extend the modu524 and modu525 automation stations. It is used to integrate third-party products on the automation level in operational systems such as HVAC engineering. Third-party products based on the field bus protocols for EIA-232 or EIA-485 such as Modbus/RTU, M-Bus can be integrated in the automation station. This allows for the option of BACnet/IP communication with the management level.

Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the "Description of operation" section.

All related product regulations must also be adhered to. Changing or converting the product is not admissible.

Engineering notes

General information for moduCom

The configuration of the COM modules, the system protocol parameters and user-specific data point parameters is carried out with the software tools of SAUTER CASE Suite. Information regarding the exact configuration and function are described in CASE Suite (online help) and the moduCom manual (7010037).

Reading and writing data points is generally supported by field bus devices. BACnet's present values are written into the data point values of the third-party system or are read from the data point values of the third-party system. The following functions apply to "mapping" from the point of view of the AS (BACnet object):

BACnet alien systems – mapping

AS (BACnet object)	Function	CM (FS data point)
BI (Present Value)	Reading	Bit data point
AI (Present Value)	Reading	Float data point Unsigned data point Signed data point
MI (Present Value)	Reading	Unsigned data point
BO (Present Value) BO (Feedback Value)	Writing (reading)	Bit data point (feedback)
AO (Present Value)	Writing	Float data point Unsigned data point Signed data point
MO (Present Value) MO (Feedback Value)	Writing (reading)	Unsigned data point (feedback)
PC (count)	Reading	Unsigned data point

Erroneous reading or writing can be supported with the BACnet property "Reliability". When unsigned/signed values are converted to or from analogue objects, the value may lose accuracy and resolution in some cases.

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[1] *EN 61000-6-1: EIA-232 cable max. 15 m in length; EIA-485: Shielded cable 2 × 2 twisted pair*

Listening function for commissioning, monitoring, analysis, etc.:

there is an AS TELNET interface (via special TELNET/TCP port) for data logging. This allows the listening data to be recorded in a legible text format (TELNET client, etc.).

More detailed information on the protocols and functions can be found in the function module description and the moduCom manual (7010037).

EY-CM721F010: modu721 Modbus/RTU (master) (EIA-232 or EIA-485 interface)

For the Modbus/RTU (master) protocol implementation, the following Modbus "function codes" (fc) are supported:

(R/W: Read/Write)

fc1:	Read Coils (R/W)	Reading 1-bit values (R/W)
fc2:	Read Discrete Inputs (R)	Reading 1-bit values (R)
fc3:	Read Holding Registers (R/W)	Reading 16-bit values (R/W)
fc4:	Read Input Registers (R)	Reading 16-bit values (R)
fc5:	Write Single Coil (R/W)	Writing 1-bit value
fc6:	Write Single Register (R/W)	Writing 16-bit value
fc15:	Write Multiple Coils (R/W)	Writing 1-bit values
fc16:	Write Multiple Registers (R/W)	Writing 16-bit values

Other supported functions:
• As master only
• Range of slave addresses 1...247
• Max. 200 objects/data points
• Multi-telegram addressable
• Telegram transmission only as RTU frame (Remote Terminal Unit frame)

Restrictions – the following functions are not supported:

Other function codes than those mentioned are not supported, and neither is telegram transmission with Modbus/ASCII. Exception codes are also not evaluated.

The following data types can be used for the master functionality:

1-bit coil, 1-bit discrete input, 16-bit holding register, 16-bit input register, "32-bit formats" with 2x16-bit registers ("double registers"), 1-bit of a 16-bit register. The data from the Modbus data model can be read and written. The protocol implementation for the Modbus master can interpret the data in various formats and link them to the BACnet data objects.

The following data types are supported by the Modbus master:
• 1-bit Boolean
• (8-bit signed/unsigned integer)
• (8-/16-/32-bit fields)
• 16-bit signed/unsigned integer
• 32-bit signed/unsigned integer
• 32-bit IEEE float

Special Modbus master functionality

With data point parameter "byte order", the 32-bit data formats can be interpreted in reverse 16-bit register order. This parameter can be defined individually for each data point.

Each individual bit of a 16-bit register can also be assigned to a binary data object (BACnet BI, BO) (data point parameter: "BitNo. on BitField").

Note

When several BOs are used on a register, only the most recently written bit affects the whole register.

The data point parameter "Function code" can be used to force single writing of coils with fc15 and execute single writing of registers with fc16.

JBUS addressing (from 0 to 65535) is supported for all data model ranges (x, 1x, 3x, 4x), meaning that Modbus addresses are used with an offset of -1.

EY-CM721F020: modu721 M-Bus (master) (EIA-232 or EIA-485 interface)

For M-Bus protocol implementation, the following M-Bus functions are supported (in accordance with EN 1434 or EN 13757 (partially)):

• As master only
• Range of primary addresses 1...250
• 32-bit IEEE float
• Max. number of M-Bus meters is defined by the level converter
• Max. 200 objects/data points
• Data point sequence is defined by the manufacturer's description ("M-Bus Records")
• "Response with fixed data structure and response with variable data structure"
• Transmission format low byte/high byte only (CI field = 0x72)
• Query of values from several memory pages
  (Multi-telegram counter with "M-Bus Pages")
• Initialisation telegram SND_NKE
• REQ_UD2 only
• Decoding of the data fields of the DIF and VIF frame part (data/value information field)
• Time- or command-controlled reading of meters (to protect the battery)
• Automatic detection of M-Bus units and adaptation to SI units

Restrictions – the following functions are not supported:

• Secondary addressing and network support
• Broadcast telegrams
• Manufacturer-specific frame parts (DIF 0x0F)
• Frame parts such as medium, DIFE (Data Inform. Field Extension)
• Frame parts VIFE (Value Information Field (Extension))

The following data types are used for the master functionality:

• 8-, 16-, 24-, 32-, 48-, 64-bit integer
• 32-bit IEEE float (real)
• 2-, 4-, 6-, 8-, 12-digit BCD

Counting values can be converted to the 32-bit IEEE real-float format for the present value of the BACnet object. Values larger than 16,777,215 exceed the resolution of 1 and may no longer be displayed correctly. The use of the pulse-converter object with the property count as an unsigned 32 value increases the maximum counting value (4,294,967,296).

Generally for modu721

COM module with the following 6 or 7 LED functions:

LED name I/O bus	Status[2]	Indicator	Description
No designation	Green continuous	🟢	moduCom operation ok ('running')
	Green flashing	🟢	No channel configuration
	Green flashing rapidly	🟢	Device being configured
	Red flashing	🔴	No protocol loaded in device
	Red flashing rapidly	🔴	No communication with the AS
Left Ethernet LED	Red flashing slowly	🔴	Internal error
	Green – red – off alternating	🟢 → 🔴 → ⚫	Lamp test active (display type has priority)
LED no.			
1	Green continuous	🟢	Voltage 1 present at moduCom
2			Not used
3			Not used
4			Not used

[2] *flashing: 100 ms / 10% duty cycle, flashing quickly: 100 ms / 50% d.c., flashing slowly: 500 ms / 50% d.c., alternating: every 1 second*

LED name I/O bus	Status[2]	Indicator	Description
5	Green flashing twice	…	Specific to protocol, in general Request (SEND)
	Red flashing or continuous	or	Specific to protocol, in general, erroneous request (Tg error)
6	Green flashing twice	…	Specific to protocol, in general Response (RECEIVE)
	Red flashing		Specific to protocol, in general, erroneous response (timeout, Tg error)

COM module with a 12-bank terminal block and the following terminal assignment:

Terminals	Direction	Designation	Description
7-12	-	NC	Not connected
5, 6	Common	C	EIA-485 common (ground GND2)[3]
3, 4	Output	D+	EIA-485 data line (+)
1, 2	Input	D-	EIA-485 data line (-)

COM module with following jumpers for bus termination and bus voltage (in accordance with EIA-485, half-duplex):

Jumper	Resistance	Designation	Description
Top	-	GND	Ground GND2 connected to GND1
Top, centre	511 Ω	Pulldown	Jumper pull-down (D- to GND2 (ground EIA-485) with 511 Ω)
Bottom, centre	511 Ω	Pull-up	Jumper pull-up (D+ to VPP2 (feed EIA-485) with 511 Ω)
Bottom	121 Ω	Termination	Jumper line termination (D+ to D- with 121 Ω)

The COM module has two interfaces: a serial interface in accordance with EIA-232 and an interface for field bus protocols in accordance with EIA-485 (half-duplex). The communication with the third-party system can be operated either with the EIA-232 or the EIA-485 interface.

The correct connection directly to third-party devices or to an additional bus coupler (EIA-485<>EIA-485/422) for a possible higher insulation protection against external voltage (galvanic or optical isolation) must be made in accordance with the standards of EIA-485.

For the EIA-485 half-duplex (2-wire) wiring there is a line termination resistor (121 Ω) as well as pull-up and pull-down resistors (511 Ω) on the COM module. These resistors can be switched on or off with jumpers. In the delivery state, all jumpers are set except for "GND". The station must be completely isolated from the power supply when the jumper positions are being changed. The COM module electronics must be separated from the baseplate and the jumpers inside the module can then be removed or replaced. The "common line" should also be used. The 3 wires for the bus (C, D +, D-) should have a maximum length when twisted of 1.2 km (depending on the Baud rate) (wiring recommendation: 2*2-core, twisted in pairs with shielding; one pair with shielding can go to common). There should not be any "spur lines" on the EIA-485 bus. The bus must be designed with linear topology. A maximum of up to 31 EIA-485 devices can be connected to the bus.

Diverse topologies can be taken into account and can be found in the documentation of the third-party device or the optional bus coupler:
• 2-wire EIA-485 bus topology connected to the modu721
• 4-wire (full-duplex) EIA-485 devices connected to the modu721 with 2-wire bus topology
• 4-wire (full-duplex) EIA-485 bus topology with additional bus coupler for modu721
• EIA-485 bus topology with more than 31 EIA-485 devices with additional bus amplifier
Notes on these topologies are documented in the moduCom manual (7010037).

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[2] *flashing: 100 ms / 10% duty cycle, flashing quickly: 100 ms / 50% d.c., flashing slowly: 500 ms / 50% d.c., alternating: every 1 second*

[3] *Can be galvanically isolated from the system ground GND1 with jumper GND*

COM module with 9-pin D-Sub plug and the following pin assignment (in accordance with DTE):

PIN	Direction	Designation	Description
1	Input	DCD	Data Channel Detect
2	**Input**	**RxD**	**Receive Data**
3	**Output**	**TxD**	**Transmit Data**
4	Output	DTR	Data Terminal Ready
5	**-**	**GND**	**Ground**
6	Input	DSR	Data Set Ready
7	Output	RTS	Ready to Send
8	Input	CTS	Clear to Send
9	Input	RI	Ring Indicator
SH	-	GND	Ground ("shield" cable screening)

The correct connection directly to the third-party device or to a bus coupler (EIA-232<>EIA-485/422) must be taken from the documentation of the third-party device or the bus coupler. Connecting the data pins (2/3) and pin 5 (ground) is usually sufficient.
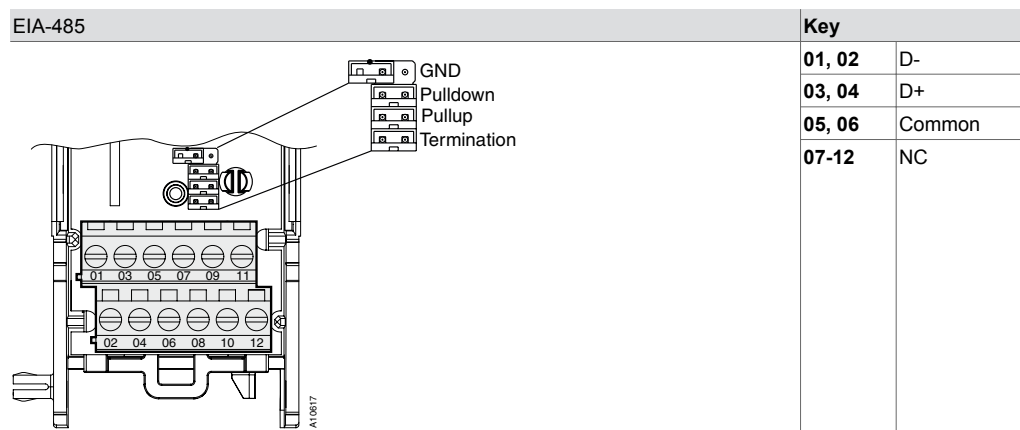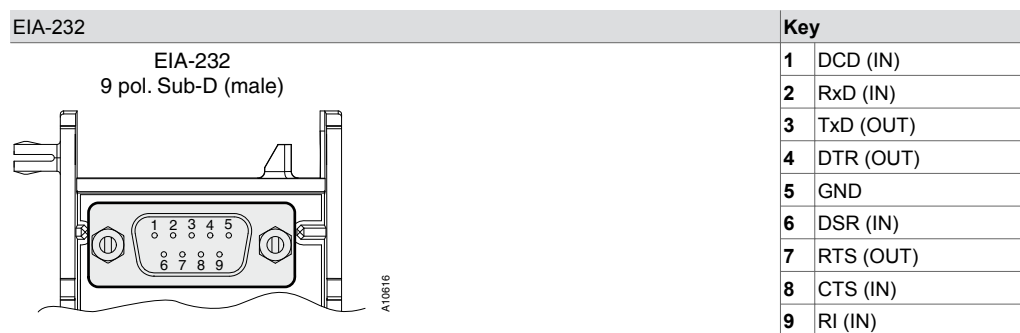
The maximum cable length of the EIA-232 line may not exceed 15 m. Burst interference greater than 1 kV may disrupt communication of the EIA-232 line. For greater distances, the EIA-485 interface should be used directly, or an additional EIA-485<>EIA-232 level converter.

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

EIA-232	Key	
EIA-232 9 pol. Sub-D (male)	**1**	DCD (IN)
	2	RxD (IN)
	3	TxD (OUT)
	4	DTR (OUT)
	5	GND
	6	DSR (IN)
	7	RTS (OUT)
	8	CTS (IN)
	9	RI (IN)

EIA-485	Key	
	01, 02	D-
	03, 04	D+
	05, 06	Common
	07-12	NC

Dimension drawing