

EY-AS 525: Modular automation station, modu525

How energy efficiency is improved

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

Features

- Part of the SAUTER EY-modulo 5 system family
- Modular automation station (AS)
- Regulation, control, monitoring and optimisation of operational systems, e.g. in HVAC engineering
- 26 inputs/outputs
- BACnet/IP communication (EN ISO 16484-5)
- BACnet profile B-BC
- Integrated web server
- Programming/parameterisation via PC using CASE Suite (based on IEC 61131-3)
- Control libraries
- Time and calendar function
- Predictive control based on meteorological forecast data
- Data recording
- Alive signal output pulsed



EY-AS525F005U



Technical data

Power supply¹⁾

Power supply	24 V AC/DC, 50/60 Hz
Power consumption	11 VA / 4 W
Dissipated power	≤ 5 W
Peak inrush current	40 A, 5 ms, or depending on the power supply

Parameters

Battery (buffer: RTC/SRAM)	CR2032, insertable
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Inputs/outputs

Digital inputs	8 (alarm/status)
Digital outputs	6 (relays, 30 V AC, 2 A)
Universal inputs	8 (Ni1000/Pt1000, U/I/R, DI)
Analogue outputs	4 (0...10 V)
Watchdog output pulsed	1 (5 Hz)

Function

BACnet data point objects	512 (incl. HW)
BACnet client links	200 (Peer-to-Peer)
Control	32 (Loop)
Active COV subscription	1500
Structured view	128 (Structured View)
BBMD in BDT	32
FD in FDT	32

Dynamic objects

Time programmes	64 (Schedule)
Calendar	16 (Calendar)
Historical data	100 (Trend Log) up to 30000 entries
Alarms	16 (Notification Class)
Chart	32 (Log View), only via moduWeb
Command object	16

Architecture

Processor	32-bit, 400 MHz
Flash	16 MB
Embedded web server	moduWeb
Application data	Via CASE Engine
SDRAM (synchronous dynamic RAM)	32 MB

¹⁾ Values without tolerances are mean values



SRAM (static RAM)	1 MB
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Interfaces and communication

Ethernet network	1 × RJ-45 connector
10/100 BASE-T(X)	10/100 Mbit/s
Communication protocols	BACnet/IP (DIX)

Ambient conditions

Operating temperature	32...113 °F
Storage and transport temperature	-13...158 °F
Admissible ambient humidity ²⁾	10...85% rh, no condensation

Construction

Fitting	On DIN rail
Dimensions W x H x D	6.3 × 6.7 × 4.53 inch
Weight	28.22 oz
Version	Open type Class 2 (NEC) device

Standards and directives

Type of protection ³⁾	IP20 (EN 60529)
Protection class	III (IEC 60730-1)
Environment class	3K3 (IEC 60721)
Software class	A (IEC 60730-1, Appendix H)
BACnet profile	B-BC (ISO 16484-5)
Approval ⁴⁾	FCC, UL

Accessories

Replacement relay

Type	Description
0929360005	PCB relays (2 × pluggable electronic PCB with 3 relays, including connection terminals)

Manuals

Type	Description
7010050001	Operating manual for moduWeb, German
7010050002	Operating manual for moduWeb, French
7010050003	Operating manual for moduWeb, English

Description of operation

The modu525 automation stations (AS) is used to regulate, control, monitor and optimise operational installations. It is based entirely on BACnet/IP communication. A web server (moduWeb) is integrated into the AS for comprehensive operation, direct visualisation of the data points, notification and forwarding of alarms and creation of time profiles (scheduler).



Note

All information related to the operation of the web server is contained in the document "modu525 web operation" (manual 7010050001). More detailed information on BACnet functionality of the AS can be found in the PICS documentation.

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.

Engineering notes

Fitting and power supply

The modu525 AS must be fitted using a DIN rail (EN 60715) in a cabinet. You must ensure that it is not installed in the immediate vicinity of power contactors, frequency converters or other EMC interference sources. We generally recommend fitting the AS in a separated DDC cabinet field. During installation, there must also be an external, primary isolating facility. Connection may only be performed

²⁾ For indoor use only

³⁾ Only on front with terminal cover, blanking piece for LOI and transparent cover

⁴⁾ Conform to FCC 47, Part 15, Class B. UL approval according UL916, File E501075.

when the system is disconnected from the electrical supply. The ground terminals are connected internally to the earth connection (PELV electrical circuits). All plant devices are connected using screw terminals. When connecting the supply/feed, the protective earth must also be connected to the correct terminal.

Communication wiring is to be carried out professionally and must obey the provisions of the standards EN 50174-1, -2 and -3. Communication and plant device wiring must be separated from live wires.

Special standards such as IEC/EN 61508, IEC/EN 61511, IEC/EN 61131-1 and -2 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.

For the conductor cross-section, the following applies: min. AWG 18, max. AWG 13 copper wire in accordance with standards and national installation requirements.

The return line of the Ni/Pt1000 sensors must be separated from the other inputs and outputs, i.e. separate GND terminals \perp must be used.

For more information, see fitting instructions MV P100017836.

Installation shall be according to NEC NFPA75.

Inputs/outputs

As a basic unit, the AS has 26 inputs and outputs with the following functionalities:

Universal inputs

Number of inputs	8 (UI)
Type of inputs (software coding)	Ni1000 (DIN 43760) Pt1000 (EN 60751) Voltage measurement (U) Current measurement (I), channels u12 and u13 only! Potentiometer input (Pot) Resistance (R) Digital input (DI)
Protection against external voltage	
Ni/Pt/U/R/Pot/DI	$\pm 30 \text{ V} / 24 \text{ V AC}$ (without destruction)
I (channels u12, u13)	$+12 \text{ V} / -0.3 \text{ V}$ (without destruction)
Refresh rate	
Channels u12, u16	100 ms
Channels u13, u14, u15, u17, u18, u19	500 ms
For temperature measurement (independent of channel)	$\leq 3 \text{ s}$
Resolution	14 bits
Measuring ranges	
Voltage (U)	0 (2)...10 V, 0 (0.2)...1 V
Current (I)	0 (4)...20 mA
Potentiometer (Pot)	0...1 (100%) with 3-wire connection (1...100 k Ω)
Reference	U _{ref} 1.23 V (terminal no. 37, 38) load max. 10 mA
Resistance (R)	200...2500 Ω
Temperature	
Ni1000	-58...+302 °F
Pt1000	-58...+302 °F
Digital input	Potential-free contacts with ground connection Opto-coupler, transistor (open collector) approx. I _{out} = 1.2 mA
Pulse counter	$\leq 3 \text{ Hz}$

Temperature measurement (Ni/Pt)

The Ni/Pt1000 sensors are connected using two wires between one of the input terminals for universal inputs (channel u12...u19) and a ground terminal. The inputs require no calibration and can be used directly. Line resistance of 2 Ω is pre-compensated as standard. With the correct line resistance of 2 Ω (cable size AWG 18), the power cable (wire) may be no more than 280 ft. Larger line resistance

ces can be compensated by the software. The measurement current is pulsed to ensure that the sensor is not heated (I_{meas} approx. 0.3 mA).

Voltage measurement (U)

The voltage to be measured is connected between an input terminal for universal inputs (channel u12...u19) and a ground terminal. The signal must be potential-free. The measuring ranges with or without offset 0 (0.2)...1 V or 0 (2)...10 V are selected through the software.

The internal resistance r_i of the input (load) is 9 M Ω .

Current measurement (I)

The current can only be measured at two inputs. The current to be measured is connected at one of the two input terminals for universal inputs (channel u12, u13) and a ground terminal. The current signal must be potential-free. The measuring ranges with or without offset 0 (4)...20 mA are selected via the software. The maximum input current must be limited to 50 mA. The internal resistance R_i is < 50 Ω .

Potentiometer measurement (Pot)

The potentiometer is connected between an input terminal for universal inputs (channel u12...u19), a ground terminal and a terminal with reference voltage (U_{ref}). The principle of a voltage divider applies for this measurement. The reference voltage outputs are not short circuit-proof. To avoid overloading them, the overall resistance of all connected potentiometers may not drop below 123 Ω (max. 10 mA load). For a stable, interference-free measurement, a potentiometer value of ≤ 10 k Ω is recommended.

Digital inputs

Digital inputs (DI with UI)

The AS also records binary information with the universal inputs. The information (alarm/status) is connected between an input terminal and the ground (channel u12...u19). The station applies a voltage of approx. 13 V to the input terminal. In the case of an open contact, this corresponds to INACTIVE/bit=0. In the case of a closed contact, this is changed to ACTIVE/bit=1 (principle of normally-open contacts). Virtually 0 V is applied here, with a current of approx. 1.3 mA.

Every input can be defined individually as an alarm or a status by setting software parameters.

The digital inputs can be displayed with a local indicating unit (e.g. modu630 accessory).

Digital inputs (DI fixed)

Number of inputs	8 (DI fixed)
Type of inputs	Potential-free contacts with ground connection Opto-coupler Transistor (open collector)
Pulse counter	≤ 50 Hz
Protection against external voltage	± 30 V/24 V AC (without destruction)
Maximum output current	Approx. 1.2 mA with respect to ground
Refresh rate	100 ms

The binary information is connected between one of the input terminals (d4...d11) and the ground. The station applies a voltage of approx. 13 V to the input terminal. In the case of an open contact, this corresponds to INACTIVE/bit=0. In the case of a closed contact, this is changed to ACTIVE/bit=1 (principle of normally-open contacts). Virtually 0 V is applied here, with a current of approx. 1.3 mA. Every input can be defined individually as an alarm or a status by setting software parameters. The digital inputs can be displayed with a local indicating unit (e.g. modu630 accessory).

Pulse counters (CI with DI)

At the digital inputs, meter inputs of potential-free contacts, opto-couplers or transistors with an open collector can be connected. The maximum pulse frequency may be 50 Hz. To ensure that switching contacts are recorded correctly, a debounce time of 5 ms is used. Pulses can be captured on the falling or rising edge, or on both edges. The minimum pulse duration should be four times the debounce time.

Overview of pulse detection

Firmware module	BI	PC
Digital input	3 Hz	50 Hz
Universal input	3 Hz	3 Hz

Digital outputs

Number of outputs	6 (DO)
Type of outputs	Relays, normally-open contacts (0-I)
Load on outputs	30 V AC, 2 A at each contact
Processing cycle time	≤ 500 ms
Switching frequency	10 ⁶ cycles

The actuator to be switched is connected directly to the relay terminals (R20...R25).

The outputs can be defined for single- or multi-layered functions. Real feedback is only possible via digital inputs (BACnet COMMAND FAILURE).

The relay outputs can each be supplied with a voltage of a maximum of 30 V AC and loaded with 2 A.

The plant devices are connected via screw terminals; this may only take place when the system is disconnected from the electrical supply.

Special protective measures allow the relay outputs to be safely separated from each other.

The outputs of the relay contacts adopt the defined status "0" (open) when:

- the power supply/communication on the I/O bus is interrupted,
- or, when the AS power supply fails

The relays are installed into 2 pluggable PCBs with connection terminals, allowing them to be easily replaced.

Analogue outputs

Number of outputs	4 (AO)
Type of outputs	4 × 0(2)...10 V
Load	≤ 2 mA
Refresh rate	100 ms
Resolution	13 bits

The output voltage is generated at one of the output terminals (a0...a3) and a ground terminal. The outputs are designed as push-pull outputs with active sink capability. Every output can be subjected to a load of 2 mA.

The outputs are protected against static discharges, but not against external voltages!

Watchdog

The watchdog signal that monitors the internal process of the AS can be taken from terminal 01. If the processor and program sequence are working correctly, the watchdog output is timed at approx. 5 Hz. It is an open collector design with a ground connection; the following should be noted: Activation of an external actuator, max. 15 V = load of 10 mA.

As a practical application, the signal can be connected directly to a digital input (CI) of a second AS and monitored using software.

Technical specifications of the inputs and outputs

Universal input	Measuring range	Resolution	Precision	
			a	b
Ni/Pt1000	−58...+302 °F	< 0.09 °F	±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%
I (0/4...20 mA)	0.5...22 mA	< 0.02 mA	±1%	±2%
R	200...2500 Ω	< 0.1 Ω	±0.2%	±1%
Pot (> 1 kΩ)	2...100%	< 0.5%	±1%	±1%

 $a \times \text{measuring span} + b \times \text{measured value}$

Analogue output	Range of adjustment	Resolution	Accuracy
AO (0/2...10 V)	0.01...10.2 V	< 2 mV	< 1% of the end value

Binary input (0-I)	Universal input (UI)	Digital input (DI)
Switching threshold inactive "0"	> 3 V	> 4 V
Switching threshold active "1"	< 1.5 V	< 2.5 V
Switching hysteresis	> 0.4 V	> 0.3 V
Pulse counter	≤ 3 Hz	≤ 50 Hz

Watchdog
Open collector output
15 V _{DC} , ≤ 10 mA
Pulse frequency 5 Hz

Commissioning

The switch (designated "ON/OFF") for switching the AS on and off is located on the top left of the AS. This is not a mains power isolating facility! The switch only isolates the secondary circuit of the switched-mode power supply, which supplies the base station, the I/O modules and the operating units.

LED indicators

When the AS is switched on (ON switch), 4 LEDs are used to display the different operating statuses. The following table shows the functions of individual LEDs.

System LED

LED name	State	Description
RUN/FAULT	Continuous green light	AS in operation
	Flashing green	Identification via CASE Sun
	Flashing red	AS in configuration, restart/download active
	Alternating green – red – off	Lamp test active (indicator type priority)
	Flashing red	Internal error
I/O bus ⁵⁾ (No designation)	Continuous green light	I/O operation OK
	Pulsating green	No user program (CASE Engine)
	Flashing red or continuously lit	I/O bus not ready for operation
	Alternating green – red – off	Lamp test active (indicator type priority)
LNK	Continuous yellow light, continuous red light	AS in startup mode
	Continuous green light	Network connection present
	Off	Network connection interrupted
	Pulsating yellow	Ethernet (data transmission active)

Programming and parameterisation

The complete user program (Engine Plan) and the different parameterisations (BACnet objects, images for moduWeb, etc.) are created using CASE Suite. Up to 512 BACnet data points incl. hardware inputs and outputs can be used.

Every AS must be configured for communication in an Ethernet network. All settings such as IP address, subnet mask, gateway and instance number (DOI) are parameterised via CASE Suite. Automatic configuration via DHCP servers is also possible.

To identify the AS visually in a network, the CASE Sun commissioning tool can set the run/fault LED to flashing mode.

The AS contains a fast operating program. This reads in all inputs, processes the parameterised function modules, updates the outputs and handles the necessary communication with other stations or the management level (PC).

The user program can be loaded from any point in the IP network using CASE Suite. Flashing red LED indicators show that there is an active download. The data is written to a flash memory and is retained even in the event of a power failure.

The inputs and outputs can be parameterised with the user program and used freely for control and regulation tasks.

⁵⁾ The I/O bus LED is located on the top right between two housing ribs

Initialisation

An initialisation of the AS can be carried out before the download with CASE Suite.

Firmware/update

The AS is delivered with a current version of the firmware. If a newer version of the firmware becomes available before installation and commissioning, the AS can be updated directly via the network using CASE Suite. Flashing red LED indicators show that there is an active update.

The firmware version in the AS can be read out using the modu840 local operating device or via PC/CASE Suite.

Before an AS is commissioned, you must check the firmware version and carry out an update if necessary.

Internal clock

A Real Time Clock (RTC) is integrated in the AS for time programmes. Date, time and time zone are set in the AS when the user data is loaded.

The time, date and time zone can be set manually via the integrated web server (moduWeb) or using the BACnet browser.

The BACnet services "DM-TS-B" and "DM-UTC-B" are used to synchronise the time and date automatically if the correct BACnet time server data is specified (e.g. SAUTER Vision Center). The AS can also be used as a BACnet time server (DM-ATS-A service).

The summer time setting (daylight saving) is activated in the network properties (CASE Engine) of the AS by default and includes all the automation stations integrated into the same network. If there is a deviation with regard to the European summer time regulation, the switchover date can be adapted to local conditions.

Time programmes, calendar

The BACnet functionality can be used to create up to 64 time programme objects (scheduler) and up to 16 calendar objects (calendar) in the AS.

Display, operation and adjustment of the time or calendar objects can be carried out with the modu840 local operating device or the moduWeb web server.

Data recording

The BACnet functionality can be used to create up to 100 Trend Log objects (data points). A log can be defined either periodically (time interval) or grid threshold-based (COV).

The integrated moduWeb web server can be used to log data points periodically at a time interval of one minute and independently of trend objects.

Battery, data buffering

A pluggable lithium button-cell battery ensures that the RTC for time programmes (scheduler/calendar) and data such as counters, adaptive control algorithms and historical data (Trend Log) are retained in the memory (SRAM), even if there is a power failure. The battery buffering is activated immediately after a power failure. After approx. one week without power supply, the AS switches to what is known as storage mode. This is to ensure the longest possible serviceable life for the battery in devices not being operated. In the process, data buffering by the battery is switched off and the Real Time Clock is discontinued. Historical data, meter readings and adaptive control algorithms are no longer buffered either. Therefore, after the power supply reactivates the device, it is necessary to re-set the date and time. The battery voltage is not monitored by the AS.



Note

After approximately one week without a power supply, the AS goes into what is known as storage mode, i.e. data buffering by the battery is switched off and data may be lost! The battery voltage is not monitored by the AS.

Technical data

Type (standard)	CR2032 lithium button cell
Nominal voltage	3 V
Capacity	210 mAh
Dimensions	0.79 in × 0.13 in

If the battery needs to be changed during the operating time, this may only be performed by trained specialist personnel.

The user data from CASE Engine and changed user data (e.g. changed by the BACnet client) are

stored permanently in the flash memory and do not require battery buffering.

We recommend, however, that user data (CASE Engine) and the changed user data be backed up (e.g. with BACnet DM BR); this decreases the risk of data loss.

Behaviour in case of mains failure

There are different types of power failure:

Micro-interruptions

Grid interruptions shorter than 1 ms are bridged without any switch-offs or other consequences. The system continues to run in normal mode.

Normal interruptions

Grid interruptions longer than 1 ms mean that the AS is switched off correctly. When the mains voltage returns, the system is switched back on according to priority. The behaviour when switching on and off is defined by the AS itself; the following applies to BACnet objects and functions:

- Every restart can be announced with a restart notification (DM-R-A service).
- The "Notification Class Recipient List" remains and the clients still automatically receive the event and alarm information without logging in again.
- The COV subscriptions on other stations are logged in again automatically.
- Connections between automation stations (AS-AS) are updated again (re-subscription). When the power returns, the AS will check the consistency of the data and will automatically restart communication.

Switch

The "ON/OFF" switch (μ P power, stand-by) is used only to isolate the secondary circuit of the switched-mode power supply, which supplies the AS and the I/O modules with operating units internally. When the AS is switched off, all applications are stopped correctly and the CPU function is switched off; static RAM and the Real Time Clock (RTC) for date and time continue to be operated from the primary circuit. This ensures that, when the unit is connected to the mains voltage, the battery is not used for data buffering.

Meteorological forecast data

The AS can obtain weather forecast data (temperature (min, max), hours of sunshine, global radiation, amount of precipitation, rel. humidity, wind speed and direction) for energy-efficient and proactive regulation via a constant internet connection, directly and without additional components.

Channel and terminal assignment

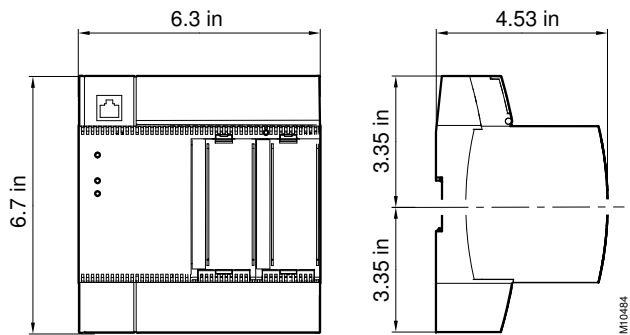
Description modu525	Channel	Schematic	Terminals	
			Signal	GND
Watchdog output (OC pulsing)	–	WD	1	–
Analogue output (0...10 V)	0	a0	2	3
	1	a1	4	5
	2	a2	6	7
	3	a3	8	–
Digital input Pulse counter (CI)	4	d4	9	–
	5	d5	10	11
	6	d6	12	13
	7	d7	14	15
	8	d8	16	17
	9	d9	18	–
	10	d10	19	–
	11	d11	20	–
Universal input (Ni/Pt1000/U/I/R/Pot/DI) Current signal only on channels 12, 13 or terminals 22, 24	12	u12	22	21
	13	u13	24	23
	14	u14	26	25
	15	u15	28	27
	16	u16	30	29
	17	u17	32	31
	18	u18	34	33
	19	u19	36	35

Description modu525	Channel	Schematic	Terminals	
			Signal	GND
Reference voltage 1.23 V	–	–	37	–
	–	–	38	–
	–	–	In	Out
Digital output (relay 0-I)	20	R20	39	40
	21	R21	41	42
	22	R22	43	44
	23	R23	45	46
	24	R24	47	48
	25	R25	49	50

Disposal

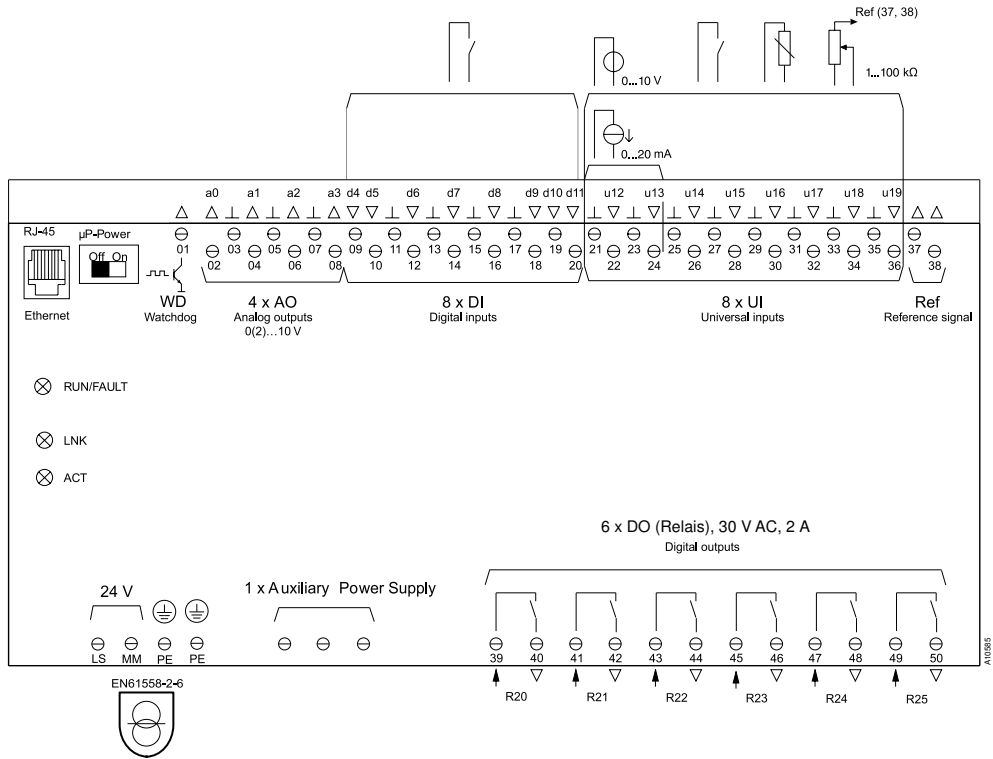
When disposing of the product, observe the currently applicable local laws.
More information on materials can be found in the Declaration on materials and the environment for this product.

Dimension drawing



Connection diagram

EY-AS525F005U





Note

Only Class 2 (NEC) wiring and power supply are admissible.

Terminals MM, PE (earth) and ground have the same potential.