8 channel analog input module E7125-8AS

USER MANUAL

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Specifications

Power supply	24 VDC
Power consumption	< 6 VA
Number of inputs	8 x 4-20 mA
Communication interface	RS-485
Baud Rate	Up to 57600 bit/s
Communication protocol	Modbus RTU
Protection class	IP20
Dimensions	H60 × W70 × L90
Mounting	DIN rail
Terminals	Pluggable 3 way screw terminals
Operating conditions	-10...+55 °C, < 80 %RH without condensation Safe indoor areas
CE marking	EN 61000-6-3:2007, EN 61326-1:2013 (EMC, Emissions) EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61326-2-1:2013 (EMC, Immunity)

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Product Description

E7125-8AS eight-channel analog input module which measures and converts 4-20 mA analog signals from transmitters to digital data. The device can be used in a variety of automation systems at fieldbus level together with PLCs, HMIs or SCADA systems.

The module operates in the RS485 network using Modbus RTU protocol.

The device is a Slave unit, so the Fieldbus network must include a Master unit, e.g. a PC with a running SCADA system, controller or regulator.

The product complies with the 2004/108/EC and 2014/30/EU Directives on electromagnetic compatibility

Safety requirements

Always adhere to the safety provisions applicable in the country of use.

The voltage on terminal contacts of the device is life-threatening. Only trained personnel can operate the module.

Operating conditions

The device should be used in explosion-safe (non ATEX -rated) indoor areas, without aggressive gases in the atmosphere. Allowed conditions are:

– Temperature in the range of -10...+55 °C
– Relative humidity in the range of 0...80% RH
– Non-condensing;
– Atmospheric pressure in the range of 84...106,7 kPa.

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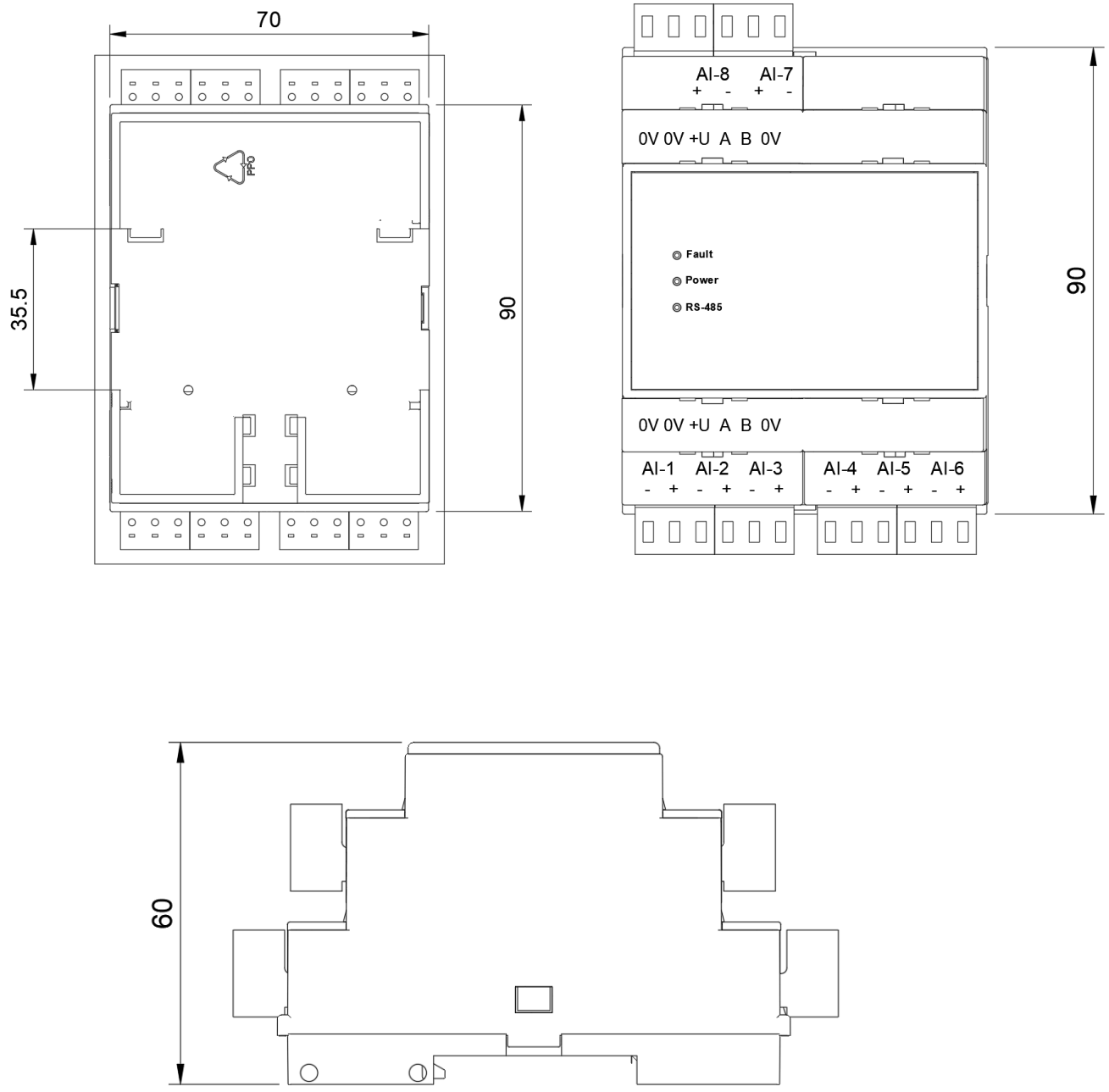
Device dimensions

The device is mounted to the 35 mm DIN-rail and should be installed in the cabinet providing protection from moisture, dust and unauthorised access.



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Installation and connections

To connect the device proceed as follows:

Collect the cables for connection of the device to the transmitters, power source and RS485 interface cable.

- Connect the device to the power source
- Connect 4-20 mA sensors to the device inputs
- Connect the device to RS485 interface
- Apply power to the device

Power the device through the supply line, which is not connected to the heavy-duty equipment.

Installation of the power switch in the outer circuit is recommended.

Independent DC supply unit mounted in the same electrical cabinet must be used to power the device.

To connect external devices via the RS-485 interface use a two-wire circuit.

Overall length of all connections via the RS-485 interface should not exceed 1200 m.

Switch off power for both units while connecting.

Use twisted pair cable, respect polarities.

The A cable is connected to A output of the device, cable B — to B output.

As power and the RS-485 terminals are doubled you can connect input from one side and continue the power and RS-485 cabling from another side.

Use cables with copper stranded wires with cross-section not exceeding 0,75 mm^2 to ensure the reliability of electrical connections.

Strip and dip cable ends beforehand.

Stripped end of the cable should not protrude over the terminal block.

We recommend using screened cables and line interference filters to protect circuits from external inducted interferences.

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General functionality

The E7125-8AS analog input module is an extension module with 8 analog inputs for the following standard signals:

- 4-20 mA
- 0-20 mA

The module performs the following functions:

- Connection of peripherals with analog outputs
- Conversion of analog signals to digital values
- Sensor-based status diagnostics
- Generation of appropriate error signals or alarm signals

Signal processing

Inputs are sampled cyclically with 1 Hz interval.

Device incorporates internal sampling functionality where all inputs are sampled 16 times before the actual signal is accepted as a measured value within 1 Hz interval.

The measured values are converted into digital values, analysed and processed in accordance with the set parameters of the device.

The results are saved in data registers.

Signal change rate limitation

Signal change rate limitation allows reducing impulse noise efficiently.

This limitation can be adjusted using **change rate** parameters so that the noise suppression does not affect a measuring signal.

The module calculates the difference between two last measured values of the parameter and compares it to the limit deviation set by the user.

If the difference exceeds the limit, the last measured value is considered as unreliable and its processing handled with the **change rate** parameter by only applying change rate value to measurement. This allows more stable measurements but at the same time the device will react more slowly to rapid changes of measurements.

Integrating time filter

Signal filtering with an integrating time filter allows reducing noise efficiently over time.

This limitation can be adjusted using **Filter time** parameters so that the signal is averaged over set time so that harmonics can be filtered out and signal shall be more stable in time.

The higher the value, the higher the noise resistance but at the same time the device reacts more slowly to the changes of measured parameters.

Linear scaling over measurement range

To scale the linear signal the measurement limits must be set. Parameters **Lower limit** and **Upper limit** parameters are set in the module to represent actual measured value over the measurement range.

By default all channels are configured with 0 - 1000 scaling which represents 0 - 100.0% of the configured range.

This allows convenient usage of the module to implement recalculation of measured value in PC / SCADA system instead of having to reconfigure the input **Lower limit and Upper Limit** parameters each time a different device with different measurement range is connected to the input.

Input status

When Modbus master is polling inputs, the module controls the status of the connected sensors, the correctness of communication and the measurement. The detected errors are transmitted with the response as an error code. If there is a measurement error, the last correctly saved value is transmitted.

Error	**Comment**	**Code**
OK	Measured value is valid	0x0000
Value error	Measured value is invalid	0xF000
Not ready	Device has not measured yet	0xF006
Off	Input is OFF	0xF007
Too High	Range exceeded	0xF00A
Too low	Below measuring range	0xF00B
Wire break	Measurement is zero	0xF00D
Cal error	Calibration incorrect	0xF00F

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Polling of measurement values

Device outputs measured values in following formats:

- Integer (16 bits)
- Floating-point (32 bits)

The integer measurement output is calculated by multiplying the measured value with a **decimal point** parameter. The parameter is a 10^{dP} which can be set within the range of 0…3. This means that if the **decimal point** parameter is set as 1 then the measurement value shall be multiplied by 10 after linearising according to the measurement range and the result shall be outputted to the integer value register.

Users are required to check which way the channels are required to be configured if integer measurement outputs are used to make sure that the configuration applies with the expected result and that the measurement does fit into the 16 bit signed integer range.

The floating point measurement output is transmitted in 32 bit data where the most significant byte is stored in the first register (big-endian) and the last significant byte is stored in the second register (little-endian). Users can read the floating point data by reading 2 registers at the same time and then using UNION for an example to manage the data into a float32 variable.

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Default Modbus RTU parameters

Parameter	Permitted values	Default
Modbus ID	1…247	16
Supported baud rates	1200, 2400, 4800, 9600, 19200, 38400, 57600	9600
Data bits	8	8
Parity	none / odd / even	none
Stop bits	1, 2	1
Protocol	Modbus RTU	
Implemented functions	03 - Read multiple registers 06 - Write a single register	

Delivery set

- 8 channel analog input module E7125-8AS
- 10 x 3 way screw terminals
- All necessary software can be requested from your distributor

Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of the original sale. During this warranty period, the Manufacturer will, at its option, either repair or replace a product that proves to be defective.

This warranty is void if the product has been operated in conditions outside ranges specified by the Manufacturer or damaged by customer error or negligence or if there has been an unauthorised modification.

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Annex 1 Modbus RTU Registers

Parameter	Unit	Value	Type	Address
Sensor type 1	-	0 - OFF 1 - 4...20 mA 2 - 0...20 mA	UINT16	0
Sensor type 2	-	0 - OFF 1 - 4...20 mA 2 - 0...20 mA	UINT16	1
...	-	0 - OFF 1 - 4...20 mA 2 - 0...20 mA	UINT16	...
Sensor type 8	-	0 - OFF 1 - 4...20 mA 2 - 0...20 mA	UINT16	7
Change rate 1	-	0...65535	UINT16	8
Change rate 2	-	0...65535	UINT16	9
...	-	0...65535	UINT16	...
Change rate 8	-	0...65535	UINT16	15
Filter time 1	seconds	0...10000	UINT16	24
Filter time 2	seconds	0...10000	UINT16	25
...	seconds	0...10000	UINT16	...
Filter time 8	seconds	0...10000	UINT16	31
Decimal point 1	-	0...3	UINT16	32
Decimal point 2	-	0...3	UINT16	33
...	-	0...3	UINT16	...
Decimal point 8	-	0...3	UINT16	39

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Baud rate	-	9600, 14400, 19200, 38400, 57600	UINT16	40
Parity	-	0 = None 1 = Odd 2 = Even	UINT16	41
Stop bits	-	1…2	UINT16	42
Device address	-	1…247	UINT16	43
Response delay	ms	1…255	UINT16	44
Measurement range lower limit channel 1 big-endian	-	FLOAT32		88…89
Measurement range lower limit channel 1 little-endian	-			
Measurement range lower limit channel 2 big-endian	-	FLOAT32		90…91
Measurement range lower limit channel 3 little-endian	-			
…	…	…	…	…
Measurement range lower limit channel 8 big-endian	-	FLOAT32		102…103
Measurement range lower limit channel 8 little-endian	-			

Measurement range upper limit channel 1 big-endian	-	FLOAT32		104…105
Measurement range upper limit channel 1 little-endian	-			
Measurement range upper limit channel 2 big-endian	-	FLOAT32		106…107
Measurement range upper limit channel 3 little-endian	-			
…	…	…	…	…
Measurement range upper limit channel 8 big-endian	-	FLOAT32		118…119
Measurement range upper limit channel 8 little-endian	-			
Measurement range lower limit channel 1	-	-32767…+32768	INT16	120
Measurement range lower limit channel 2	-	-32767…+32768	INT16	121
…	-	-32767…+32768	INT16	…
Measurement range lower limit channel 8	-	-32767…+32768	INT16	127

Measurement range upper limit channel 1	-	-32767...+32768	INT16	128
Measurement range upper limit channel 2	-	-32767...+32768	INT16	129
...	-	-32767...+32768	INT16	...
Measurement range upper limit channel 8	-	-32767...+32768	INT16	135
Measured value channel 1	-	-32767...+32768	INT16	256
Measured value channel 2	-	-32767...+32768	INT16	257
...	-	-32767...+32768	INT16	...
Measured value channel 8	-	-32767...+32768	INT16	263
Channel 1 status	-	0x0000 - Measurement correct 0xF000 - Measurement value error 0xF006 - Measurement not ready 0xF007 - Sensor switched off 0xF00A - Measurement value too high 0xF00B - Measurement value too low 0xF00D - Wire break 0xF00F - Calibration error		280
Channel 2 status	-			281
...	-			...
Channel 8 status	-			287
Measured value channel 1 big-endian	-	FLOAT32		288...289
Measured value channel 1 little-endian	-			

Measured value channel 2 big-endian	-	FLOAT32		290…291
Measured value channel 2 little-endian	-			
…	…	…	…	…
Measured value channel 8 big-endian	-	FLOAT32		302…303
Measured value channel 8 little-endian	-			
Restart	-	42330	UINT16	512

Manufacturer contacts

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