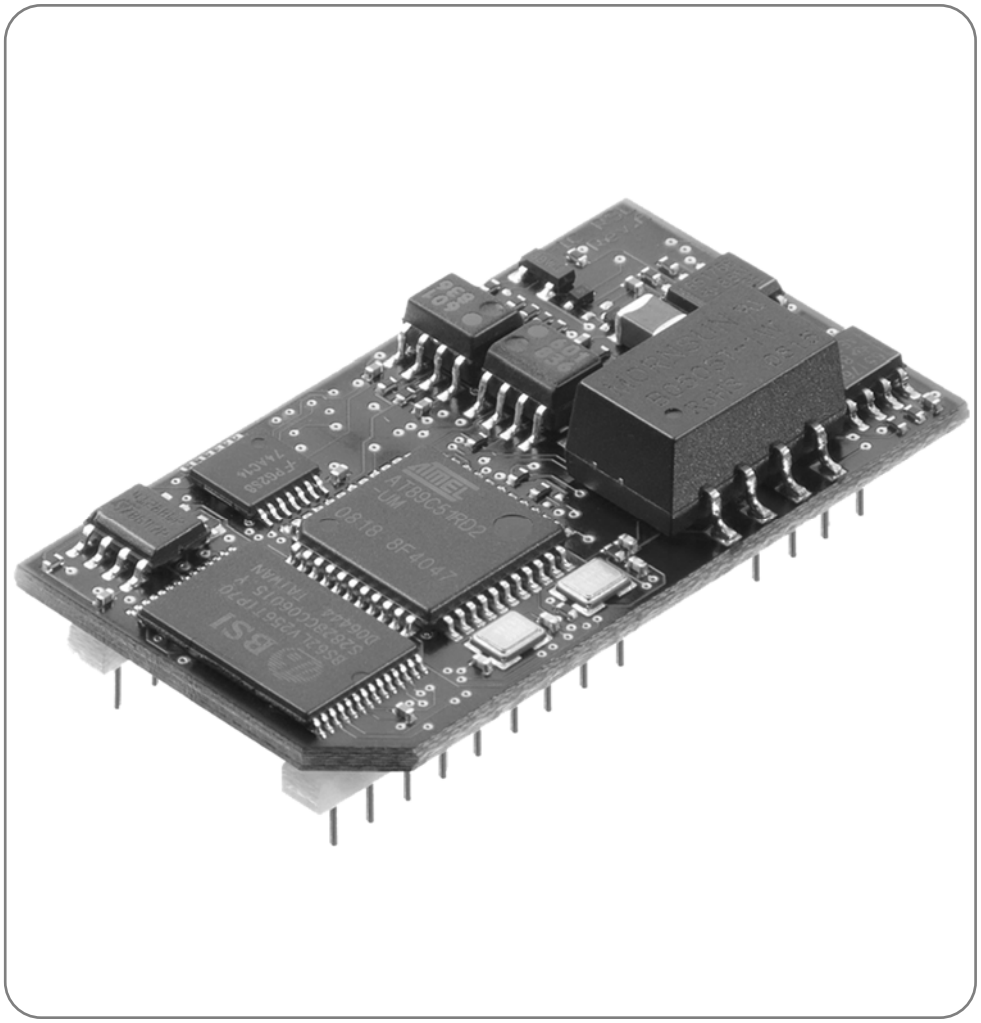
Operating Instructions

PS-AMS1x with Fieldbus-Interface Modbus RTU



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Änderungen vorbehalten!

Content

1. Description

The optional fieldbus module Modbus RTU allows operation of the PS-AMS1x actuator via Modbus network. This interface communicates to the actuator via the standard serial port. The actuator does then not use analogue set values. Feedback from a process sensor to the optionally available PSIC process controller integrated in the actuator is digitally transmitted as well. Command level allows on request to read out all parameters and diagnostics data.

Adjustment of parameters of the actuator is not possible via fieldbus.

Note: The actuator has a single communication port. This is used when the optional fieldbus module is installed. For parameterisation of the actuator with the communication software PSCS for PS-AMS or local control unit PSC.2, the position of a switch on the mainboard of the actuator PS-AMS1x has to be changed, see chapter 2.2. After that, communication with PC is possible via the communication cable. After parameterisation, the switch has to be placed to position “Fieldbus” again, to allow communication of the fieldbus module to the actuator.
-> See also Instruction Manual PSCS for PS-AMS

Note: „Digital Set Value” (in the communication software PSCS for PS-AMS under Operate - Configuration - Set Value & Feedback) must be activated to control the actuator via the fieldbus interface!

Note: During PC communication there may unreasonable data appear in the (fieldbus-based) process data objects.

2. Connecting the Fieldbus

Caution: When working at or on the actuator’s mainboard, proper earthing of the worker has to be ensured. As a makeshift it will help to firmly touch the actuator housing with bare hands before working on the actuator, to create an equalisation of potential.

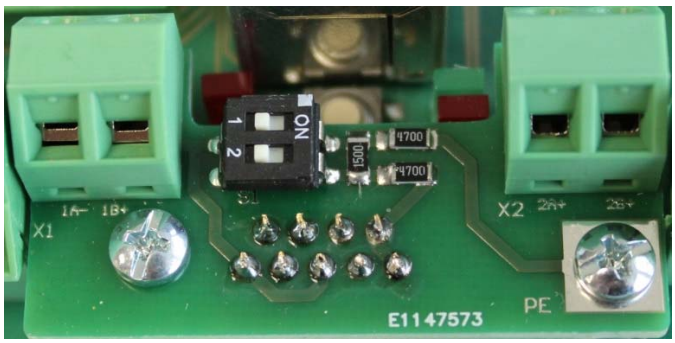
2.1 Wiring to terminal block

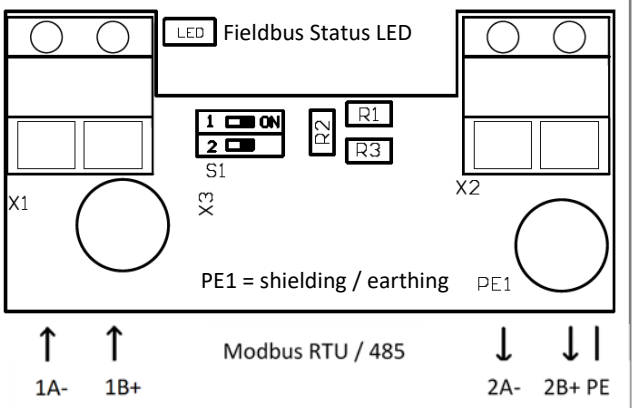
There are two specific metal cable glands for insertion of the fieldbus cables. These allow connection of the PE shielding as shown in Figure 1.

Figure 1: EMC cable gland with earthing cones

PE can also be connected to the PE screw on the connection adapter (see Figure 2).

The fieldbus / RS485 is connected on the connection board for channel 1 (X1) and channel 2 (X2).





Channel 1 (X1)	1A-	green	RS485 -
	1B+	red	RS485 +
Channel 2 (X2)	2A-	green	RS485 -
	2B+	red	RS485 +

Figure 2: Connection adapter

2.1.1. Termination

Termination of the bus is possible with the termination switches 1 and 2 (see Figure 3) between the terminal blocks. Both switches have to be put to the same position mandatorily.

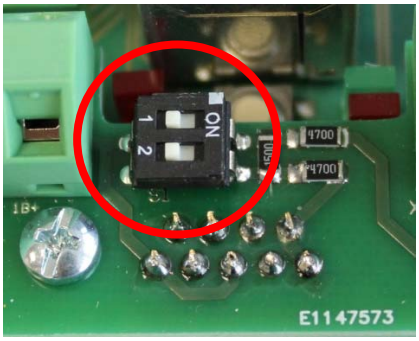


Figure 3: Termination switches

ON : Termination ON
OFF : Termination OFF

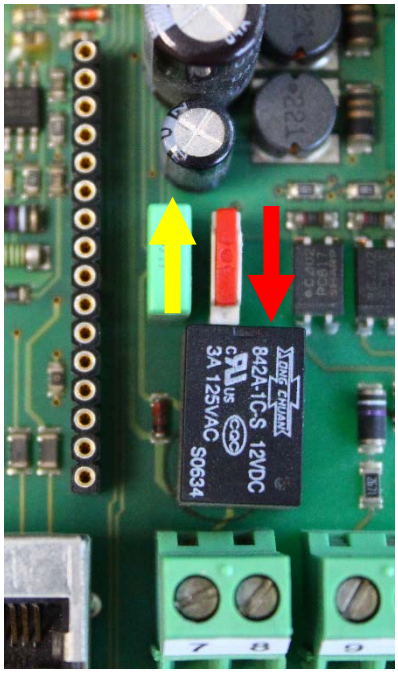
2.1.2. Fieldbus-Status-LED

There is one single red LED on the main board for signaling the status of the fieldbus, see Figure 4.

Figure 4: Fieldbus-Status-LED

LED Off: Switches off in case of successful commissioning and correct start of the fieldbus.
LED On: No connection to the fieldbus

2.2. Slide switch for selecting the communication interface



On the mainboard inside the actuator there is a slide switch for selecting the interface (see Figure 5).
For normal operation, i.e. if the actuator is controlled via the fieldbus, put the switch to lower position (red arrow).
For adjustment work, parameterisation, etc. with the communication software PSCS for PS-AMS the switch has to be put in upper position to allow PC-communication (yellow arrow).

Caution: After finishing adjustment work, make sure that the switch is in "fieldbus communication" position (red arrow). In "PC communication" position (yellow arrow) the interface does communicate to the bus, but not to the actuator's electronics!

yellow: PC-communication
red: fieldbus-communication

Figure 5: Slide switch for selecting the interface

3. Adjustment of fieldbus address & transmission rate

The actuator is supplied with adjustment Modbus Slave ID 0. At commissioning the user can modify the address and the transmission rate using the two turn-coding switches, see Figure 6Figure 6. After this modification, switch the actuator off for a short period and switch on again to adopt the change.

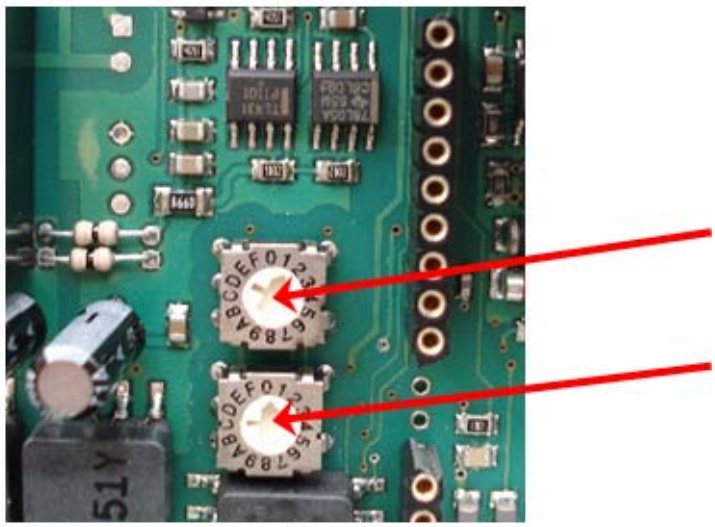


Figure 6: Turn coding switches for adjusting of Slave ID and baud rate

Modbus slave ID (0 to 31) and baud rate can be adjusted (see Standard settings / Figure 7). The standard parity of our actuators is 8-N-1. Other formats are available on request. Please pay attention to the sticker with interface parameters fixed under the main cover of your actuator.

Code swith	S302 High Bit				S301 Low Bit			
	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
00 - FF	7	6	5	4	3	2	1	0
Modbus Slave ID				Slave ID [0-31]				
Baud rate	0	0	0	1200 Baud				
	0	0	1	2400 Baud				
	0	1	0	4800 Baud				
	0	1	1	9600 Baud				
	1	0	0	19200 Baud				
	1	0	1	38400 Baud				
	1	1	0	57600 Baud				
	1	1	1	115200 Baud				

Figure 7: Standard settings for Modbus slave ID and baud rate

4. Process data object

See table „ Process data objects Modbus RTU” in the annex.

4.1. Process data object „Bus-Output“

The Actuator (as Slave) is controlled by the Fieldbus Master according to the process data objects "Bus Output" using the Modbus address.

4.1.1. 0x0001 - Set Value High-Byte

Bit 7 (MSB) defines the input to be in percent (MSB = 0) or in tenth of percent (MSB = 1).

4.1.2. 0x0001 - Set Value Low-Byte

Input has to be made as per MSB of High-Byte.

4.1.3. 0x0002 - Process Sensor High-Byte

Bit 7 (MSB) defines the input to be in percent (MSB = 0) or in tenth of percent (MSB = 1).

Caution: In case if your actuator is additionally equipped with optional PSIC (process controller) and an analogue process sensor will be used, then 0x0002 have to be set to „0xFF“!

4.1.4. 0x0002 Process Sensor Low-Byte

Input has to be made as per MSB of High-Byte.

Caution: In case if your actuator is additionally equipped with optional PSIC (process controller) and an analogue process sensor will be used, then 0x0002 have to be set to „0xFF“!

4.1.5. 0x0003 - Command

Use the command byte to read / write data from / to the memory of the actuator.

0x00 = no action

0x20 = send data for RAM
0x21 = read data from RAM

0x1D = send data for E²PROM
0x1E = read data from E²PROM

Caution: To ensure that a command is sent to the correct address with the correct data, follow this procedure when writing to the process data object:

1. Write 0x00 to command 0x0003
2. Write address (0x0004), Data (0x0005) High-Byte and Data Low-Byte
3. Write the actual command, e.g. 0x1E
4. As result the command will be sent to the actuator for one time. To send another command, the command byte 0x00 has to be sent again.

Note: At reading of data, these will be available at Data (0x0105) High-Byte and Data Low-Byte of the process data object “Bus Input” after 250 msec.

4.1.6. 0x0004 - Address

Address for memory access.

4.1.7. 0x0005 - Data-High

High-Byte of data to be written.

4.1.8. 0x0005 - Data-Low

Low-Byte of data to be written.

4.2. Process data object „Bus-Input“

The process data object “Bus Input” shows the details of the feedback of the actuator (as slave).

4.2.1. 0x0101 - Actual Value High-Byte

Feedback is scaled in line with the set value, as adjusted under 4.1.1.

4.2.2. 0x0101 - Actual Value Low-Byte

Feedback is scaled in line with the set value, as adjusted under 4.1.1.

4.2.3. 0x0102 - Working Condition / Error Code of the Actuator

The below table lists the messages that can appear during operation.

Error No. [dec]	Description of Status
Working condition	
0	Normal operation
1	Actuator doing auto-commissioning
2	Actuator not commissioned to the valve
14	Actuator not in AUTO mode (in conjunction with local control unit PSC.2)
Peripheral errors	
3	Set value error
4	Torque error
5	Fail Safe-action is started
6	Set value error of the process sensor
12	Position passed over
13	Position nor reached
11	Under voltage at supply
Errors in actuator	
7	Mechanical / positioning error
8	Critical / maximum temperature reached
9	Electronics error / CRC
10	Limit of wear reached
Communication error	
32	No communication to actuator possible

Note: Error No. 32 may be displayed twice during commissioning of the actuator to the valve: when either of the end positions is reached and the measured values are stored inside the actuator. During normal operation, this error signals a malfunction if it is displayed longer than 10 s

4.2.4. 0x0104 - Address

Address of data to be read.

4.2.5. 0x0105 - Data-High

High-Byte of data to be read.

4.2.6. 0x0105 - Data-Low

Low-Byte of data to be read.

5. Technical Data

Communication protocol	Modbus RTU 485	Interface configuration
Fieldbus baud rate	1200/2400/4800/9600/19200/38400/ 57600/115200	8-N-1
Process data object „Bus Input“	4 byte	
Process data object „Bus Output“	5 byte	

6. Parameter Storage Addresses

RAM-Parameter					
Address	Data high	Data low	Range	Unit	Description
000	x	x	0...1000	% / ‰	present digital set value
001	x	x	0...1023	digit	present set value
002	x	x	0...1023	digit	present feedback
005	x	x	0...1000	% / ‰	present digital feedback
Diagnosis data					
185	x	x	0...65536	EV x 50	Number of motor starts
186	x	x	0...65536	EV	Number of motor starts at excess temperature
187	x	x	0...65536	h x 2	Operation time of actuator
188	x	x	0...65536	min x 6	Operation time of motor
189	x	x	0...65536	min	Operation time of motor at excess temperature

Note: The current layout does not allow writing parameters to the actuator via the fieldbus.

Process Image OUTPUT

Modbus Address	Set Value								Set Value							
	unit [‰ / %]	High-Byte							Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0001																

	Feedback from Process Sensor								Feedback from Process Sensor							
	unit [‰ / %]	High-Byte							Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0002																

	High-Byte not used								Command							
									Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0003																

	High-Byte not used								Address							
									Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0004																

	Data								Data							
	High-Byte								Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0005																

Process Image INPUT

Modbus Address	Actual Value								Actual Value							
	High-Byte								Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0101																

	High-Byte not used								Operating Condition/Error Codes							
									Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0102																

	High-Byte not used								Address							
									Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0104																

	Data								Data							
	High-Byte								Low-Byte							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0105																

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