

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7134-6HD01-0BA1

Voltage and Current Input Module. Source PDF pages: manual pp. 2-6,12-42. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

Analog Input Module AI 4xUI 2-wire ST (6ES7134-6HD01-0BA1); 06/2020, A5E03572832-AF

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Siemens June 2020 AF manual from an independent archive, not a latest-edition claim. All model-specific chapters and safety context retained; generic tool-guide pages omitted. Appendix 6GD references are not compatibility guidance.

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SIMATIC

ET 200SP

Analog Input Module AI 4xU/I 2-wire ST

(6ES7134-6HD01-0BA1)

Equipment Manual

Preface

Documentation guide

1

Product overview

2

Wiring up

3

Parameters/address space

4

Interrupts/diagnostics alarms

5

Technical specifications

6

Parameter data record

A

Representation of analog values

B

Legal information

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WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

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Preface

Purpose of the documentation

This manual supplements the system manual ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>).

Functions that generally relate to the system are described in this manual.

The information provided in this manual and in the system/function manuals supports you in commissioning the system.

Changes compared to previous version

Compared to the previous version, this manual contains the following change:

Wiring and block diagram has been modified.

Conventions

CPU: When the term "CPU" is used in the following, it applies to the CPUs of the S7-1500 automation system as well as to the CPUs/interface modules of the ET 200SP distributed I/O system.

STEP 7: In this documentation, "STEP 7" is used as a synonym for all versions of the configuration and programming software "STEP 7 (TIA Portal)".

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

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Table of contents

	Preface	3
1	Documentation guide	6
2	Product overview	11
2.1	Properties.....	11
3	Wiring up	14
3.1	Wiring and block diagram	14
4	Parameters/address space	16
4.1	Measuring types and ranges	16
4.2	Parameters	17
4.3	Explanation of the parameters.....	19
4.4	Address space	22
5	Interrupts/diagnostics alarms.....	23
5.1	Status and error display	23
5.2	Interrupts	25
5.3	Diagnostics alarms.....	25
6	Technical specifications	27
6.1	Technical specifications	27
A	Parameter data record	32
A.1	Dependencies when configuring with GSD file.....	32
A.2	Parameter assignment and structure of the parameter data record.....	33
A.3	Error in transferring the data record analog input.....	37
B	Representation of analog values	38
B.1	Representation of input ranges.....	39
B.2	Representation of analog values in voltage measuring ranges.....	40
B.3	Representation of analog values in the current measuring ranges	41

Product overview

2.1 Properties

Article number

6ES7134-6HD01-0BA1 (number in pack: 1 unit)

6ES7134-6HD01-2BA1 (number in pack: 10 units)

View of the module

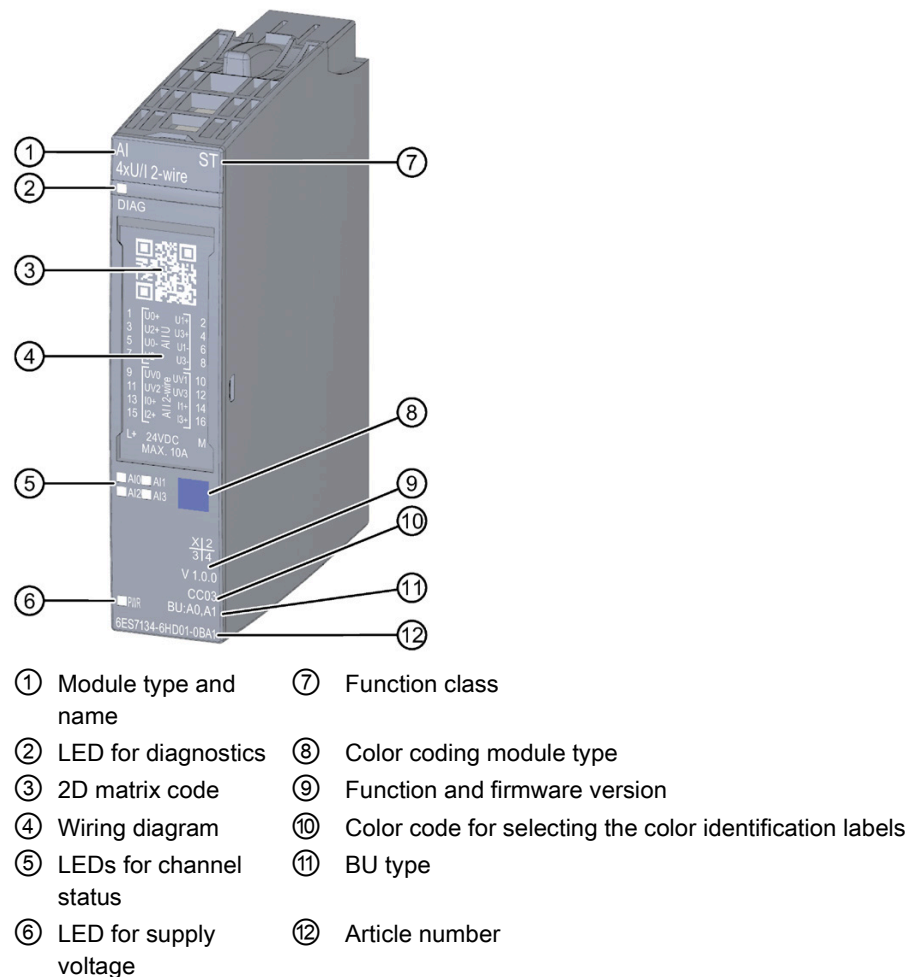


Figure 2-1 View of the module AI 4xU/I 2-wire ST

Properties

The module has the following technical properties:

- Analog input module with 4 inputs
- Measuring type voltage and current for 2-wire transducer (can be set for each channel)
- Input ranges for voltage measurement:
 - ± 10 V, resolution 16 bits including sign
 - ± 5 V, resolution 16 bits including sign
 - 1 to 5 V, resolution 15 bits
 - 0 to 10 V, resolution 15 bits
- Input ranges for current measurement:
 - 4 to 20 mA, resolution 15 bits
 - 0 to 20 mA, resolution 15 bits
- Electrically isolated from the supply voltage L+ (only for voltage measuring type)
- Permitted common mode voltage: $10 V_{SS}$
- Configurable diagnostics per module

The module supports the following functions:

Table 2- 1 Version dependencies of the functions

Function	HW version	FW version	STEP 7		GSD file	
			TIA Portal	V5.x	PROFINET IO	PROFIBUS DP
Firmware update	FS01	V2.0.0 or higher	V14 or higher with HSP 0239	V5.5 SP3 or higher with HSP 0227 V7.0 or higher	X	X
Identification data I&M0 to I&M3	FS01	V2.0.0 or higher	V14 or higher with HSP 0239	V5.5 SP3 or higher with HSP 0227 V7.0 or higher	X	X
Reconfiguration in RUN	FS01	V2.0.0 or higher	V14 or higher with HSP 0239	V5.5 SP3 or higher with HSP 0227 V7.0 or higher	X	X
PROFInergy	FS01	V2.0.0 or higher	V14 or higher with HSP 0239	V5.5 SP3 or higher with HSP 0227 V7.0 or higher	X	X
Value status	FS01	V2.0.0 or higher	V14 or higher with HSP 0239	V5.5 SP3 or higher with HSP 0227 V7.0 or higher	X	X

Accessories

The following accessories must be ordered separately:

- Labeling strips
- Color identification labels
- Reference identification label
- Shield connector

See also

You will find additional information on the accessories in the ET 200SP distributed I/O system (<https://support.industry.siemens.com/cs/ww/en/view/58649293>) system manual.

Wiring up

3.1 Wiring and block diagram

This section includes the block diagram of the AI 4xU/I 2-wire ST module with the terminal assignments.

You can find information on wiring the BaseUnit in the ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>) system manual.

Note

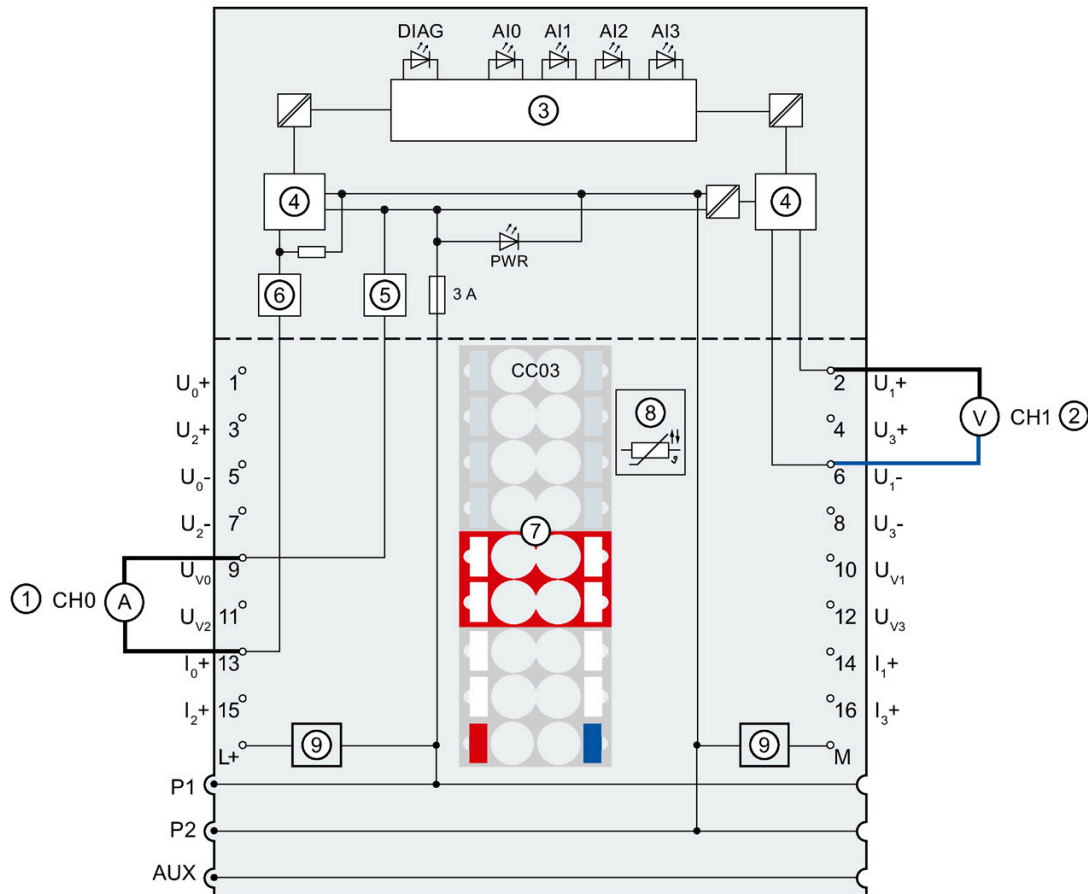
You can use and combine the different wiring options for all channels.

Note

The load group of the module must begin with a light BaseUnit. Keep this in mind also during the configuration.

Wiring: Voltage and current measurement 2-wire connection

The following figure shows the block diagram and an example of the terminal assignment of the analog input module AI 4xU/I 2-wire ST on the BaseUnit BU type A0/A1.



①	2-wire connection for current measurement (2-wire transducer)	U_n+	Voltage input positive, channel n
②	2-wire connection for voltage measurement	U_n-	Voltage input negative, channel n
③	Backplane bus interface	U_{vn}	Supply voltage, channel n
④	Analog-to-digital converter (ADC)	I_n+	Current input positive, channel n
⑤	Short-circuit protection	$L+$	24 V DC (infeed only with light BaseUnit)
⑥	Current limitation	M	Ground
⑦	Color-coded label with color code CC03 (optional)	$P1, P2, AUX$	Internal self-assembling voltage buses Connection to left (dark BaseUnit) Connection to left interrupted (light BaseUnit)
⑧	Temperature recording for BU type A1 only (function cannot be used for this module)	$DIAG$	Diagnostics LED (green, red)
⑨	Supply voltage filter circuit (only when light BaseUnit is present)	$AI0, AI1, AI2, AI3$	Channel status LED (green)
		PWR	Power LED (green)

Figure 3-1 Wiring and block diagram for voltage and current measurement

Parameters/address space

4.1 Measuring types and ranges

The analog input module AI 4×U/I 2-wire ST has the following measuring ranges:

Table 4- 1 Measuring ranges

Measuring type	Measuring range	Resolution
Voltage	$\pm 5\text{ V}$	16 bits including sign
	$\pm 10\text{ V}$	16 bits including sign
	1 to 5 V	15 bits
	0 to 10 V	15 bits
Current (2-wire transducer)	0 mA to 20 mA	15 bits
	4 to 20 mA	15 bits

You will find the tables of the measuring ranges as well as overflow, overrange, etc., in the section Representation of analog values (Page 38).

4.2 Parameters

Parameters of the AI 4xU/I 2-wire ST

Specify the module properties with the various parameters in the course of your STEP 7 configuration. The following table lists the configurable parameters. The effective range of the configurable parameters depends on the type of configuration. The following configurations are possible:

- Central operation with an ET 200SP CPU
- Distributed operation on PROFINET IO in an ET 200SP system
- Distributed operation on PROFIBUS DP in an ET 200SP system

When assigning parameters in the user program, use the "WRREC" instruction to transfer the parameters to the module using the data records; refer to the section Parameter assignment and structure of the parameter data record (Page 33).

The following parameter settings are possible:

Table 4- 2 Configurable parameters and their defaults (GSD file)

Parameter	Value range	Default	Configura- tion in RUN	Effective range with configuration software, e.g. STEP 7 (TIA Portal)	
				GSD file PROFINET IO	GSD file PROFIBUS DP
Diagnostics No supply voltage L+	• Disable • Enable	Disable	Yes	Module	Module
Diagnostics Short-circuit to ground	• Disable • Enable	Disable	Yes	Module	Module
Diagnostics Overflow	• Disable • Enable	Disable	Yes	Module	Module
Diagnostics Underflow	• Disable • Enable	Disable	Yes	Module	Module
Diagnostics Wire break	• Disable • Enable	Disable	Yes	Module	Module
Measuring type/range	• deactivated • Voltage +/- 5 V • Voltage +/- 10 V • Voltage 1..5 V • Voltage 0..10 V • Current (2-wire transducer) 0..20 mA • Current (2-wire transducer) 4..20 mA	Current (2-wire transducer) 4..20 mA	Yes	Channel	Channel

4.2 Parameters

Parameter	Value range	Default	Configura- tion in RUN	Effective range with configuration software, e.g. STEP 7 (TIA Portal)	
				GSD file PROFINET IO	GSD file PROFIBUS DP
Smoothing	- None - weak - medium - strong	None	Yes	Channel	Channel
Interference frequency suppression ²	60 Hz 50 Hz¹ 16.6 Hz	50 Hz	Yes	Channel	Module ³
Potential group	- Use potential group of the left module (module plugged into a dark BaseUnit) - Enable new potential group (module plugged into light BaseUnit)	Use potential group of the left module	No	Module	Module

¹ ...Interference frequency suppression: Noise at 400 Hz is automatically included in the filtering at 50 Hz.

² The settings in the "Interference frequency suppression" parameter have a direct effect on the conversion time of the channel. The analog value is therefore also affected by additionally set filtering via the "Smoothing" parameter.

² Due to the limited number of parameters of a maximum of 244 bytes per ET 200SP station with a PROFIBUS GSD configuration, the parameter assignment options are restricted. The parameter length of the I/O module is 5 bytes with PROFIBUS GSD configuration. If necessary, you can set this parameter by using the data record 128, see the appendix "Parameter data set".

Note
Unused channels

Disable unused channels in the parameter assignment to improve the cycle time of the module.

A disabled channel always returns the value 7FFF_H.

4.3 Explanation of the parameters

Diagnostics no supply voltage L+

Enabling of the diagnostics for no or insufficient supply voltage L+.

Diagnostics Short-circuit to ground

Enabling of the diagnostics in the event of a short-circuit of the encoder supply to ground or of an input to the encoder supply. Short-circuit is also detected in the range 1 to 5 V, when both input signals are short-circuited.

The short-circuit and underflow diagnostics can be activated simultaneously. If both diagnostics events occur simultaneously, however, the short-circuit diagnostics suppresses the underflow diagnostics. Short-circuit is output as the diagnostics event.

Diagnostics overflow

Enabling of the diagnostics when the measured value exceeds the overrange.

Diagnostics underflow

Enabling of the diagnostics when the measured value falls below the underrange.

Diagnostics Wire break

Enabling of the diagnostics if the module has no current flow or the current is too weak to be measured at the relevant input.

The wire break and underflow diagnostics can be activated simultaneously. If both diagnostics events occur simultaneously, the wire break diagnostics info is output.

Type/range of measurement

Refer to the section Measuring types and ranges (Page 16).

Smoothing

The individual measured values are smoothed by filtering. The smoothing can be set in 4 levels.

Smoothing time = number of module cycles (k) x cycle time of the module.

The following figure shows how many module cycles it takes for the smoothed analog value to approach 100%, depending on the configured smoothing. This applies to every signal change at the analog input.

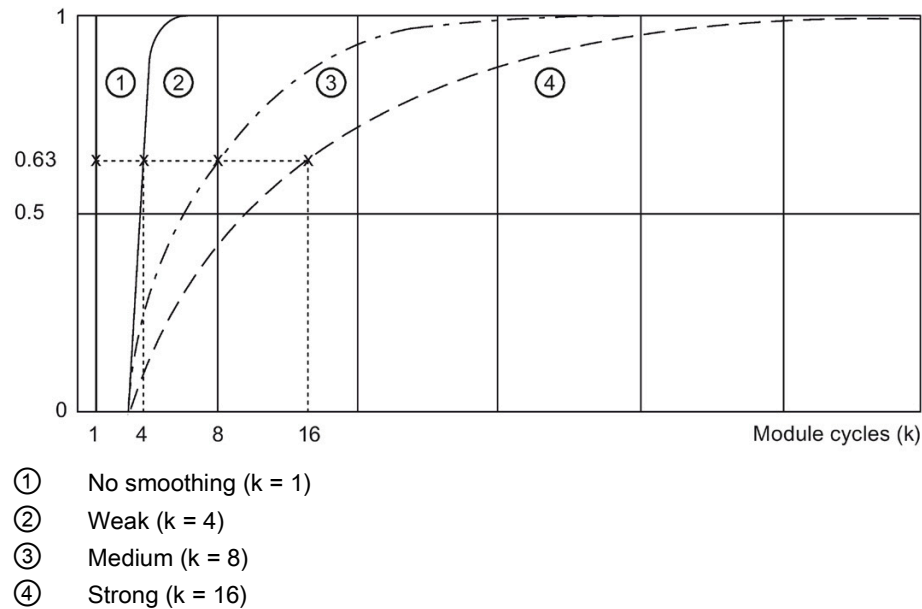


Figure 4-1 Smoothing with AI 4xU/I 2-wire ST

Interference frequency suppression

Suppresses the interference affecting analog input modules that is caused by the frequency of the AC voltage network used.

The frequency of the AC voltage network can negatively affect the measured value, in particular when measuring in the low voltage range and with thermocouples. With this parameter, the user specifies the supply frequency that is predominant in the plant.

Potential group

A potential group consists of a group of directly adjacent I/O modules within an ET 200SP station, which are supplied via a common supply voltage.

A potential group begins with a light-colored BaseUnit through which the required voltage is supplied for all modules of the potential group. The light-colored BaseUnit interrupts the three self-assembling voltage buses P1, P2 and AUX to the left neighbor.

All additional I/O modules of this potential group are plugged into dark-colored BaseUnits. You take the potential of the self-assembling voltage buses P1, P2 and AUX from the left neighbor.

A potential group ends with the dark-colored BaseUnit, which follows a light-colored BaseUnit or server module in the station configuration.

4.4 Address space

Configuration options

The following configurations are possible:

- Configuration 1: Without value status
- Configuration 2: With value status

Evaluating the value status

If you enable the value status for the analog module, an additional byte is occupied in the input address space. Bits 0 to 3 in this byte are assigned to a channel. They provide information about the validity of the analog value.

Bit = 1: No fault is present on the channel.

Bit = 0: Channel is disabled or there is a fault/error on the module.

If a fault/error occurs on a channel with this module, the value status for all channels is 0.

Address space

The following figure shows the assignment of the address space for the AI 4×U/I 2-wire ST with value status (Quality Information (QI)). The addresses for the value status are only available if the value status is enabled.

Assignment in the process image input (PII)

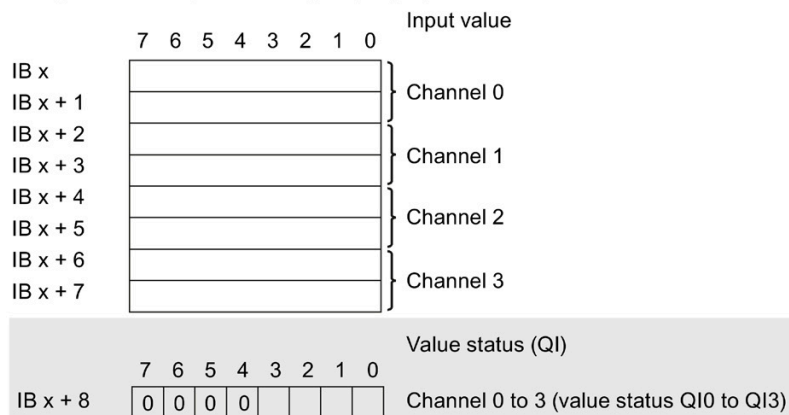


Figure 4-2 Address space of the AI 4×U/I 2-wire ST with value status

Interrupts/diagnostics alarms

5.1 Status and error display

LED display

The figure below shows the LED displays (status and error displays) of the AI 4xU/I 2-wire ST.

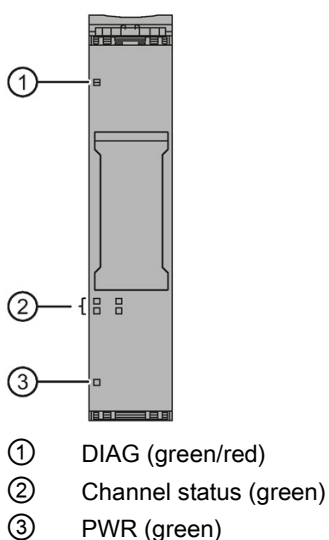


Figure 5-1 LED display

Meaning of the LED displays

The following tables show the meaning of the status and error displays. Measures for dealing with diagnostics alarms can be found in the section Diagnostics alarms (Page 25).

DIAG LED

Table 5- 1 DIAG LED fault/error display

DIAG LED	Meaning
 Off	Backplane bus supply of the ET 200SP not OK
 Flashes	Module parameters not assigned
 On	Module parameters assigned and no module diagnostics
 Flashes	Module parameters assigned and module diagnostics

Channel status LED

Table 5- 2 Status display of the channel status LED

Channel status LED	Meaning
 Off	Channel disabled
 On	Channel activated

PWR LED

Table 5- 3 Status display of the PWR LED

PWR LED	Meaning
 Off	No supply voltage L+
 On	Supply voltage L+ present

5.2 Interrupts

The analog input module AI 4xU/I 2-wire ST supports diagnostics interrupts.

Diagnostics interrupt

The module generates a diagnostics interrupt for the following events:

- Channel temporarily unavailable
- Short-circuit (current, voltage 1..5 V)
- Wire break (current 4 to 20 mA)
- Low limit violated
- High limit violated
- Error
- Parameter assignment error
- Supply voltage missing

5.3 Diagnostics alarms

A diagnostics alarm is generated and the DIAG-LED flashes on the module for each diagnostics event. You can read out the diagnostics alarms, for example, in the diagnostics buffer of the CPU. You can evaluate the error codes with the user program.

Table 5- 4 Diagnostics alarms, their meaning and how to deal with them

Diagnostics alarm	Error code	Meaning	Solution
Short-circuit (current)*	1 _H	Sensor supply to ground	Correct the module/encoder tuning
		Input to sensor supply	
Short-circuit (1 to 5 V) **	1 _H	Short-circuit of input signal	Correct the module/encoder tuning
		Open input	Connect input
Wire break (current) **	6 _H	Impedance of encoder circuit too high.	Use a different encoder type or modify the wiring, for example, using cables with a larger cross-section
		Wire break between the module and sensor	Connect the cable
		Channel not connected (open)	• Disable diagnostics • Connect the sensor contacts
High limit violated	7 _H	Value is above the overrange.	Correct the module/encoder tuning
Low limit violated	8 _H	Value is below the underrange.	Correct the module/encoder tuning
Error	9 _H	Internal module error occurred.	Replace module
Parameter assignment error	10 _H	• The module cannot evaluate parameters for the channel. • Incorrect parameter assignment.	Correct the parameter assignment

5.3 Diagnostics alarms

Diagnostics alarm	Error code	Meaning	Solution
Supply voltage missing	11 _H	No or insufficient supply voltage L+	• Check supply voltage L+ on the BaseUnit • Check BaseUnit type
Channel temporarily unavailable	1F _H	Firmware update in progress or update has been canceled. The module does not read any process values in this state.	• Wait for firmware update. • Restart the firmware update.

* Short-circuit of the encoder supply to ground and/or of the input signal to the encoder supply of a channel can have a temporary effect on other channels (duration < 0.5 s). This means the short-circuit diagnostics can also be reported for unaffected channels and/or the measured value can be affected temporarily.

** In case of activated smoothing the module calculates the measured values across several module cycles. The module only generates the short circuit or wire break diagnosis if the smoothed measured value is stable. After the short-circuit or wire break has been eliminated, the module supplies stable measured values again depending on the set smoothing level.

Technical specifications

6.1 Technical specifications

Technical specifications of the AI 4×U/I 2-wire ST

The following table shows the technical specifications as of 06/2020. You will find a data sheet including daily updated technical specifications on the Internet (<https://support.industry.siemens.com/cs/ww/en/pv/6ES7134-6HD01-0BA1/td?dl=en>).

Article number	6ES7134-6HD01-0BA1
General information	
HW functional status	From FS02
Firmware version	
• FW update possible	Yes
usable BaseUnits	BU type A0, A1
Color code for module-specific color identification plate	CC03
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	No
• Measuring range scalable	No
Engineering with	
• STEP 7 TIA Portal configurable/integrated as of version	V14 / -
• STEP 7 configurable/integrated as of version	V5.6 and higher
• PCS 7 configurable/integrated as of version	V8.1 SP1
• PROFIBUS as of GSD version/GSD revision	One GSD file each, Revision 3 and 5 and higher
• PROFINET as of GSD version/GSD revision	GSDML V2.3
Operating mode	
• Oversampling	No
• MSI	No
CiR – Configuration in RUN	
Reparameterization possible in RUN	Yes
Calibration possible in RUN	No

6.1 Technical specifications

Article number	6ES7134-6HD01-0BA1
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	37 mA; without sensor supply
24 V encoder supply	
• 24 V	Yes
• Short-circuit protection	Yes
• Output current, max.	20 mA; max. 50 mA per channel for a duration < 10 s
Power loss	
Power loss, typ.	0.85 W; Without encoder supply voltage
Address area	
Address space per module	
• Address space per module, max.	8 byte; + 1 byte for QI information
Hardware configuration	
Automatic encoding	
• Mechanical coding element	Yes
Selection of BaseUnit for connection variants	
• 2-wire connection	BU type A0, A1
Analog inputs	
Number of analog inputs	4; Differential inputs
permissible input voltage for voltage input (destruction limit), max.	30 V
permissible input current for current input (destruction limit), max.	50 mA
Cycle time (all channels), min.	Sum of the basic conversion times and additional processing times (depending on the parameterization of the active channels)
Input ranges (rated values), voltages	
• 0 to +10 V	Yes; 15 bit
– Input resistance (0 to 10 V)	120 kΩ
• 1 V to 5 V	Yes; 15 bit
– Input resistance (1 V to 5 V)	120 kΩ
• -10 V to +10 V	Yes; 16 bit incl. sign
– Input resistance (-10 V to +10 V)	120 kΩ
• -5 V to +5 V	Yes; 16 bit incl. sign
– Input resistance (-5 V to +5 V)	120 kΩ

Article number	6ES7134-6HD01-0BA1
Input ranges (rated values), currents	
0 to 20 mA - Input resistance (0 to 20 mA) 4 mA to 20 mA - Input resistance (4 mA to 20 mA)	Yes; 15 bit 100 Ω; + approx. 0.7 V diode forward voltage Yes; 15 bit 100 Ω; + approx. 0.7 V diode forward voltage
Cable length	
shielded, max.	1 000 m; 200 m for voltage measurement
Analog value generation for the inputs	
Measurement principle	integrating (Sigma-Delta)
Integration and conversion time/resolution per channel	
- Resolution with overrange (bit including sign), max. - Integration time, parameterizable - Interference voltage suppression for interference frequency f1 in Hz - Conversion time (per channel)	16 bit Yes 16.6 / 50 / 60 Hz 180 / 60 / 50 ms
Smoothing of measured values	
- Number of smoothing levels - parameterizable	4; None; 4/8/16 times Yes
Encoder	
Connection of signal encoders	
- for voltage measurement - for current measurement as 2-wire transducer - Burden of 2-wire transmitter, max. - for current measurement as 4-wire transducer	Yes Yes 650 Ω No
Errors/accuracies	
Linearity error (relative to input range), (+/-)	0.01 %
Temperature error (relative to input range), (+/-)	0.005 %/K
Crosstalk between the inputs, min.	50 dB
Repeat accuracy in steady state at 25 °C (relative to input range), (+/-)	0.05 %
Operational error limit in overall temperature range	
- Voltage, relative to input range, (+/-) - Current, relative to input range, (+/-)	0.5 % 0.5 %

6.1 Technical specifications

Article number	6ES7134-6HD01-0BA1
Basic error limit (operational limit at 25 °C)	
Voltage, relative to input range, (+/-)	0.3 %
Current, relative to input range, (+/-)	0.3 %
Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, f_1 = interference frequency	
Series mode interference (peak value of interference < rated value of input range), min.	70 dB
Common mode voltage, max.	10 V
Common mode interference, min.	90 dB
Interrupts/diagnostics/status information	
Diagnostics function	Yes
Alarms	
Diagnostic alarm	Yes
Limit value alarm	No
Diagnostic messages	
Monitoring the supply voltage	Yes
Wire-break	Yes; at 4 to 20 mA
Short-circuit	Yes; with 1 to 5 V or 2-wire mode: Short-circuit of the encoder supply to ground or of an input to the encoder supply
Group error	Yes
Overflow/underflow	Yes
Diagnostics indication LED	
Monitoring of the supply voltage (PWR-LED)	Yes; green LED
Channel status display	Yes; green LED
for channel diagnostics	No
for module diagnostics	Yes; green/red LED
Potential separation	
Potential separation channels	
between the channels	Yes; channel group-specific between 2-wire current input group and voltage input group
between the channels and backplane bus	Yes
between the channels and the power supply of the electronics	Yes; only for voltage inputs
Permissible potential difference	
between the inputs (UCM)	10 V DC

Article number	6ES7134-6HD01-0BA1
Isolation	
Isolation tested with	707 V DC (type test)
Standards, approvals, certificates	
Suitable for applications according to AMS 2750	Yes; Declaration of Conformity, see online support entry 109757262
Suitable for applications according to CQI-9	Yes
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-30 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	-30 °C
• vertical installation, max.	50 °C
Altitude during operation relating to sea level	
• Installation altitude above sea level, max.	5 000 m; Restrictions for installation altitudes > 2 000 m, see manual
Dimensions	
Width	15 mm
Height	73 mm
Depth	58 mm
Weights	
Weight, approx.	31 g

Dimension drawing

See manual ET 200SP BaseUnits
(<http://support.automation.siemens.com/WW/view/en/59753521>)

Parameter data record

A.1 Dependencies when configuring with GSD file

When configuring the module with a GSD file, remember that the settings of some parameters are dependent on each other.

Configuring with a PROFINET GSD file

The table lists the properties and their dependencies on the measuring type and measuring range for PROFINET.

Measuring type	Measuring range	Diagnostics				
		No supply voltage L+	Short-circuit to M	Overflow	Underflow	Wire break
deactivated		*	*	*	*	*
Voltage	±5 V	x	-	x	x	-
	±10 V	x	-	x	x	-
	1..5 V	x	x	x	x	-
	0..10 V	x	-	x	x	-
Current (2-wire transducer)	0..20 mA	x	x	x	x	-
	4..20 mA	x	x	x	x	x

x = Property is allowed, - = Property is **not allowed**, * = Property is not relevant

Configuring with a PROFIBUS GSD file

The table lists the properties and their dependencies on the measuring type and measuring range for PROFIBUS.

Measuring type	Measuring range	Diagnostics			
		No supply voltage L+	Short-circuit to M	Overflow/ Underflow	Wire break
deactivated		*	*	*	*
Voltage	±5 V	x	-	x	-
	±10 V	x	-	x	-
	1..5 V	x	x	x	-
	0..10 V	x	-	x	-
Current (2-wire transducer)	0..20 mA	x	x	x	-
	4..20 mA	x	x	x	x

x = Property is allowed, - = Property is **not allowed**, * = Property is not relevant

A.2 Parameter assignment and structure of the parameter data record

The data record of the module has an identical structure, regardless of whether you configure the module with PROFIBUS DP or PROFINET IO. With data record 128, you can reconfigure the module in your user program regardless of your programming. This means that you can use all the functions of the module even if you configured it via PROFIBUS-GSD.

Parameter assignment in the user program

You can reassign the parameters of the module in RUN. For example, the voltage or current values of selected channels can be changed in RUN without having an effect on the other channels.

Changing parameters in RUN

The "WRREC" instruction is used to transfer the parameters to the module using data record 128. The parameters set in STEP 7 are not changed in the CPU, which means that the parameters set in STEP 7 will be valid again after a restart.

Output parameter STATUS

If errors occur when transferring parameters with the "WRREC" instruction, the module continues operation with the previous parameter assignment. The STATUS output parameter contains a corresponding error code.

You will find a description of the "WRREC" instruction and the error codes in the STEP 7 online help.

Structure of data record 128

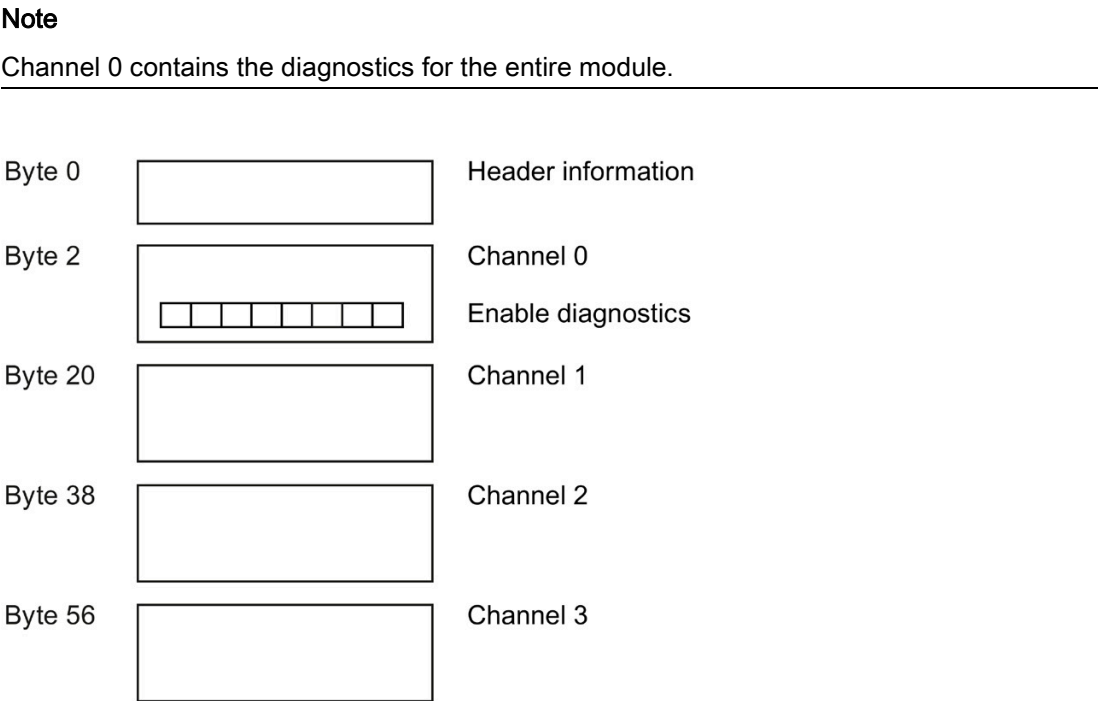


Figure A-1 Structure of data record 128

Header information

The figure below shows the structure of the header information.

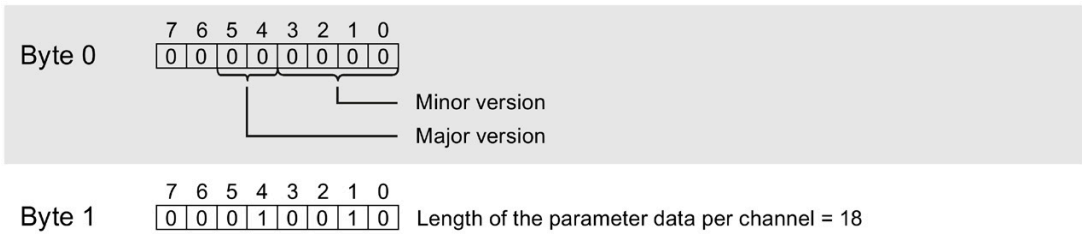
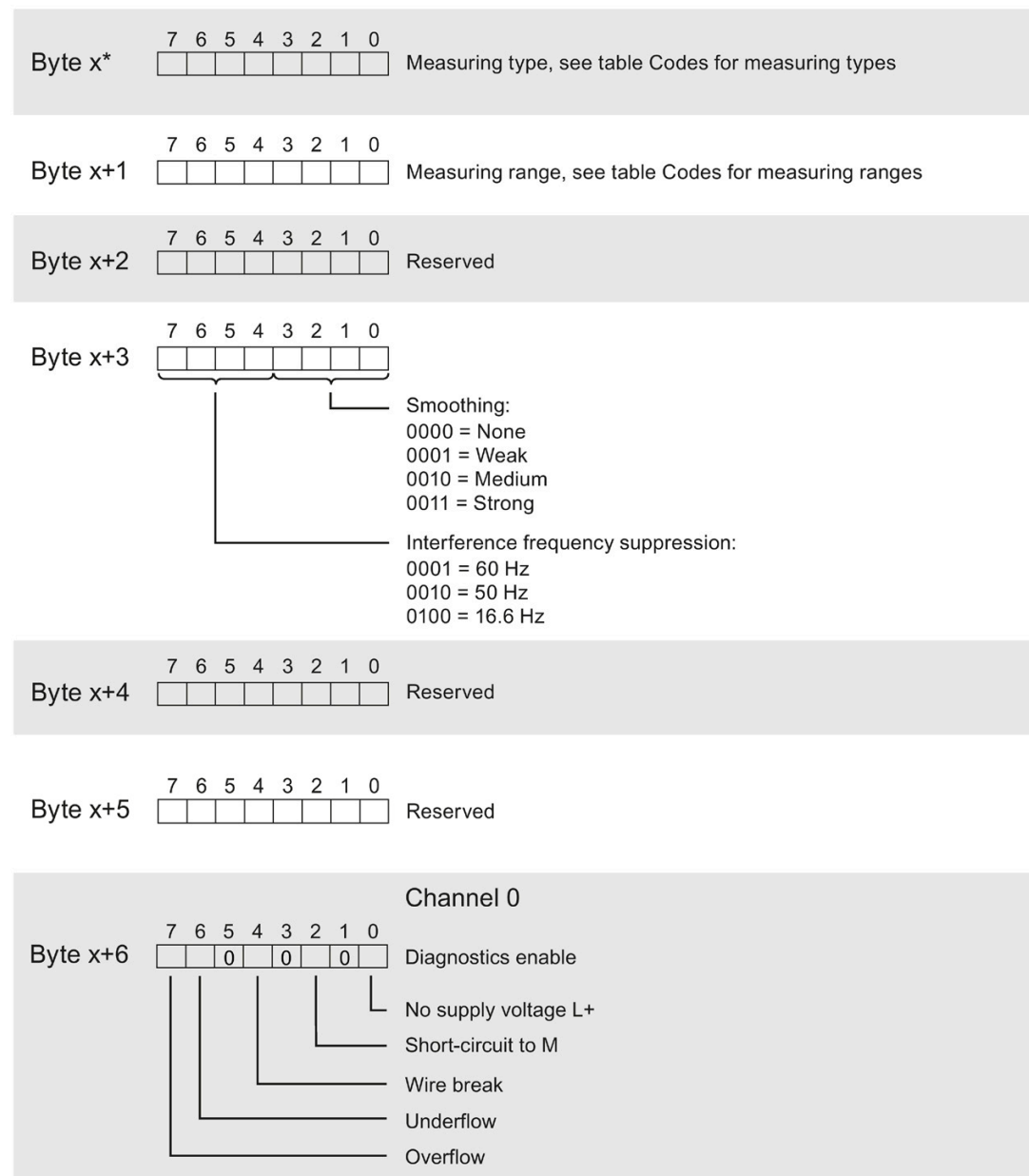


Figure A-2 Header information

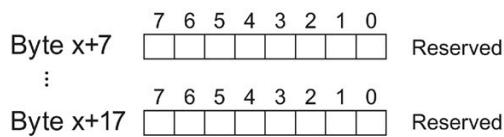
Parameter

The figure below shows the structure of the parameters for channels 0 to 3.

You enable a parameter by setting the corresponding bit to "1".



A.2 Parameter assignment and structure of the parameter data record



* $x = 2 + (\text{channel number} \times 18)$; channel number = 0 to 3

Figure A-3 Structure of byte x to x+17 for channels 0 to 3

Codes for the measuring type

The following table contains the codes for the measuring types of the analog input module. You must enter these codes at byte x (see previous figure).

Table A- 1 Codes for the measuring type

Measuring type	Coding
Deactivated	0000 0000
Voltage	0000 0001
Current, 2-wire transducer	0000 0011

Codes for the measuring range

The following table contains the codes for the measuring ranges of the analog input module. You enter these codes at byte x+1 (see previous figure).

Table A- 2 Codes for the measuring range

Measuring type	Coding
Voltage	
±5 V	0000 1000
±10 V	0000 1001
1 to 5 V	0000 1010
0 to 10 V	0000 1011
Current	
0 to 20 mA	0000 0010
4 to 20 mA	0000 0011

A.3 Error in transferring the data record analog input

Error transferring the data record

The module always checks all values of the data record to be sent. The module applies the values from the data record only when all values have been transmitted without errors.

The WRREC instruction for writing data records returns corresponding error codes when errors occur in the STATUS parameter, see also the description of the "STATUS" parameter in the STEP 7 online help).

The following table shows the module-specific error codes and their meaning for parameter data record 128.

Error code in STATUS parameter (hexadecimal)				Meaning	Solution
Byte 0	Byte 1	Byte 2	Byte 3		
DF	80	B0	xx	Number of the data record unknown.	Enter a valid number for the data record.
DF	80	B1	xx	Length of the data record incorrect.	Enter a valid value for the data record length.
DF	80	B2	xx	Slot invalid or cannot be accessed.	- Check the station to determine whether the module is plugged or pulled. - Check the assigned values for the parameters of the WRREC instruction.
DF	80	E0	xx	Wrong version or error in the header information.	Correct the version, length and number of parameter blocks.
DF	80	E1	01	Reserved bit set	Check the parameters of the module.
DF	80	E1	02	Invalid diagnostics enable bit set for operating mode.	Check the parameters of the module.
DF	80	E1	05	Invalid coding set for measuring range / measurement type.	Check the parameters of the module.
DF	80	E1	08	Invalid coding set for interference frequency suppression / integration time.	Check the parameters of the module.
DF	80	E1	09	Invalid coding for smoothing.	Check the parameters of the module.

Representation of analog values

This appendix shows the analog values for all measuring ranges that you can use with the analog module.

Measured value resolution

The resolution of the analog values differs depending on the analog module and its assigned parameters.

The table below shows the representation of binary analog values and of the associated decimal and hexadecimal units of the analog values.

Each analog value is written left aligned to the tags. The bits marked with "x" are set to "0".

Table B- 1 Resolution of the analog values

Resolution in bits including sign	Values		Analog value	
	Decimal	Hexadecimal	High byte	Low byte
14	4	4 _H	Sign 0 0 0 0 0 0 0	0 0 0 0 0 1 x x
15	2	2 _H	Sign 0 0 0 0 0 0 0	0 0 0 0 0 0 1 x
16	1	1 _H	Sign 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1

B.1 Representation of input ranges

In the following tables, you can find the digitized representation of the bipolar and unipolar input ranges. The resolution is 16 bits.

Table B- 2 Bipolar input ranges

Dec. value	Measured value in %	Data word																Range
		2 ¹⁵	2 ¹⁴	2 ¹³	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	
32767	>117.589	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Overflow
32511	117.589	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	Overrange
27649	100.004	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	
27648	100.000	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	Nominal range
1	0.003617	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
0	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-0.003617	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
-27648	-100.000	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	
-27649	-100.004	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	Underrange
-32512	-117.593	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
-32768	<-117.593	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Underflow

Table B- 3 Unipolar input ranges

Dec. value	Measured value in %	Data word																Range
		2 ¹⁵	2 ¹⁴	2 ¹³	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	
32767	>117.589	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Overflow
32511	117.589	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	Overrange
27649	100.004	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	
27648	100.000	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	Nominal range
1	0.003617	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
0	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-0.003617	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Underrange
-4864	-17.593	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	
-32768	<-17.593	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Underflow

B.2 Representation of analog values in voltage measuring ranges

The following tables list the decimal and hexadecimal values (codes) of the possible voltage measuring ranges.

Table B- 4 Voltage measuring range ± 10 V and ± 5 V

Values		Voltage measuring range		Range
Dec.	Hex.	± 10 V	± 5 V	
32767	7FFF	>11.759 V	>5.879 V	Overflow
32511	7EFF	11.759 V	5.879 V	Overrange
27649	6C01			
27648	6C00	10 V	5 V	Nominal range
20736	5100	7.5 V	3.75 V	
1	1	361.7 μ V	180.8 μ V	
0	0	0 V	0 V	
-1	FFFF			
-20736	AF00	-7.5 V	-3.75 V	
-27648	9400	-10 V	-5 V	
-27649	93FF			Underrange
-32512	8100	-11.759 V	-5.879 V	
-32768	8000	<-11.759 V	<-5.879 V	Underflow

Table B- 5 Voltage measuring range 1 to 5 V and 0 to 10 V

Values		Voltage measuring range		Range
Dec.	Hex.	1 to 5 V	0 to 10 V	
32767	7FFF	>5.704 V	>11.759 V	Overflow
32511	7EFF	5.704 V	11.759 V	Overrange
27649	6C01			
27648	6C00	5 V	10 V	Nominal range
20736	5100	4 V	7.5 V	
1	1	1 V + 144.7 μ V	0 V + 361.7 μ V	
0	0	1 V	0 V	
-1	FFFF			
-4864	ED00	0.296 V	-1.759 V *	Underrange **
-32768	8000	<0.296 V	<-1.759 V *	
				Underflow **

* negative values are only possible if the module (6ES7134-6GD01-0BA1) with FW version V2.0.0 and higher is configured.

** no underrange/underflow if the predecessor module (6ES7134-6GD00-0BA1) is configured.

B.3 Representation of analog values in the current measuring ranges

The following tables list the decimal and hexadecimal values (codes) of the possible current measuring ranges.

Table B- 6 Current measuring ranges 0 to 20 mA and 4 to 20 mA

Values		Current measuring range		Range
Dec.	Hex.	0 to 20 mA *	4 to 20 mA	
32767	7FFF	>23.52 mA	>22.81 mA	Overflow
32511	7EFF	23.52 mA	22.81 mA	Overrange
27649	6C01			
27648	6C00	20 mA	20 mA	Nominal range
20736	5100	15 mA	16 mA	
1	1	723.4 nA	4 mA + 578.7 nA	
0	0	0 mA	4 mA	
-1	FFFF			Underrange
-4864	ED00	-3.52 mA	1.185 mA	
-32768	8000	<-3.52 mA	<1.185 mA	Underflow

* For measuring type "2-wire transducer", negative values are not possible for the range "0 to 20 mA".
Therefore, no underrange or underflow exists here.