Calibration software

The calibration software is only available over the Internet. You will find the latest version of the calibration software under entry ID 12443337.

Following the installation of this software, you can specify user-specific calibration values for each channel and each input range. Further information can be found under ID 12436891 on the Customer Support FAQ page.

Circuit diagram for SM 431; AI 8 x RTD x 16 bit

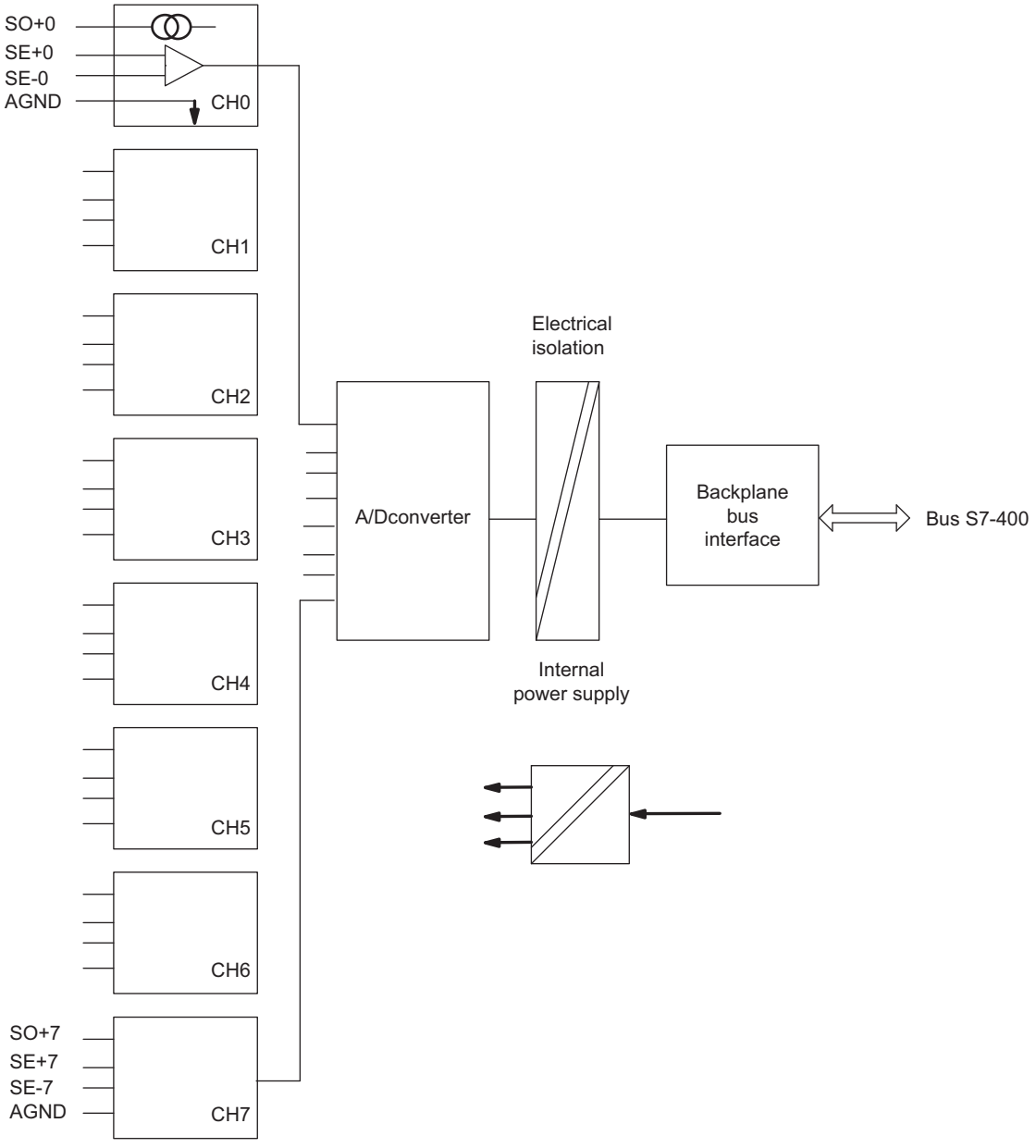


Figure 5-35 Circuit diagram for SM 431; AI 8 x RTD x 16 bit

Connection diagram for SM 431; AI 8 x RTD x 16 bit

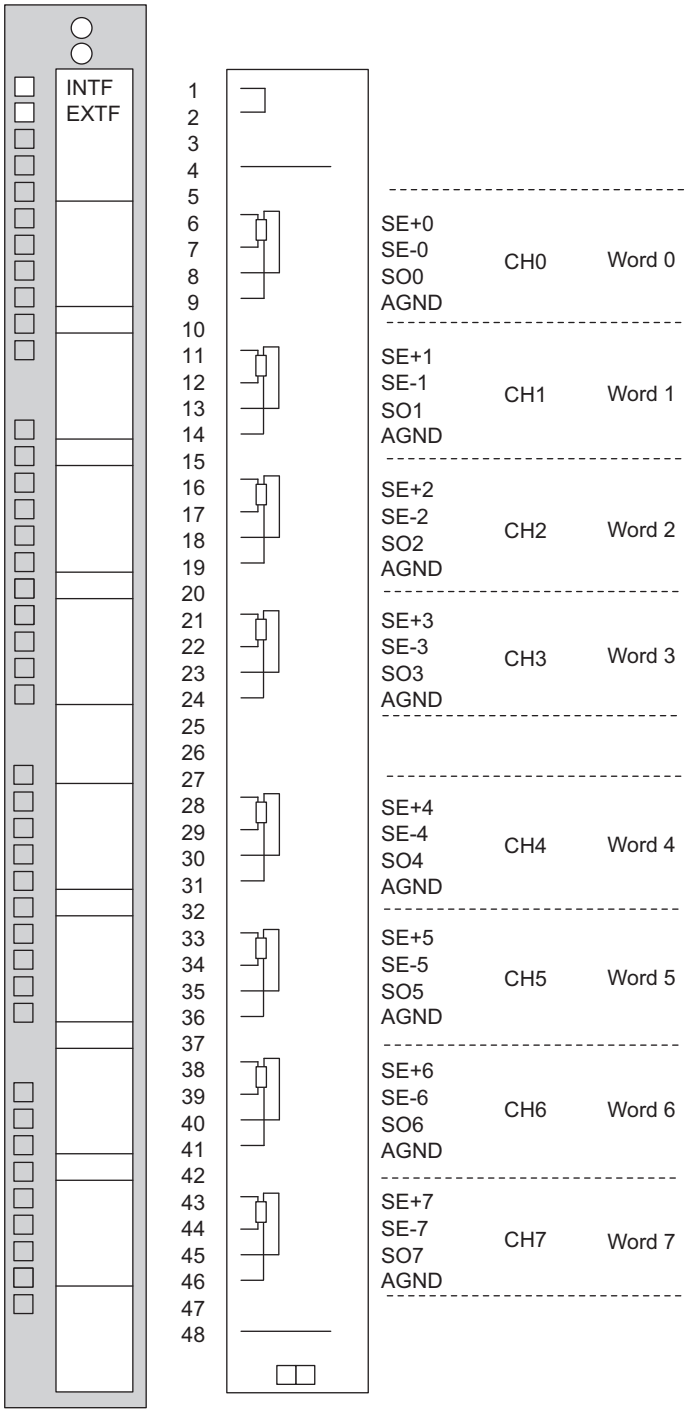


Figure 5-36 Connection diagram for SM 431; AI 8 x RTD x 16 bit

Technical specifications for SM 431; AI 8 x RTD x 16 bit

Dimensions and weight	
Dimensions W x H x D (in mm)	25 x 290 x 210
Weight	ca. 650 g
Module-specific data	
Number of inputs	8
Cable length • Shielded	 Maximum 200 m
Voltage, current and potential	
Constant current for resistance-based sensor	Typ. 1 mA
Electrical isolation	
• Between channels and backplane bus • Between channels	Yes No
Permissible potential difference	
Between M_{ANA} and M_{intern} (U_{ISO})	60 V DC/30 V AC (SELV)
Insulation tested at	1500 V DC
Current consumption	
• From backplane bus (5 V)	Maximum 650 mA
Module power loss	Typ. 3.3 W
Formation of analog values	
Measuring principle	Integrating
Integration time/conversion time/resolution	
• Configurable	Yes
• Basic conversion time (all channels enabled)	8 ms/23 ms/25 ms
Additional conversion time / repeat rate	
• Wire-break monitoring	110 ms/4 s
• 3-wire compensation	110 ms/390 s
• Internal self-calibration	
No interference frequency suppression 50/60 Hz	50 ms/110 s
• Resolution, including sign	210 ms/390 s 16 bits
• Interference voltage suppression for interference frequency f1 in Hz	None/50/60
Measured value smoothing	Parameters can be assigned in 4 stages
Basic response time of the module (all channels enabled)	8 ms/23 ms/25 ms
Noise suppression, error limits	
Noise suppression for f = n (fl ± 1%), (f1 = interf. freq.) n = 1, 2, ...	
• Common mode interference (Ucm < 120 V)	> 100 dB
• Series-mode interference (peak value of interference < rated value of input range)	> 50 dB

Crosstalk between the inputs	> 70 dB
Operational limit (throughout temperature range, relative to input range)	
• RTD input – Pt 100 – Pt 200 – Pt 500 – Pt 1000 – Ni 100 – Ni 1000	RTD-4L RTD-3L ±1.8 °C ± 3.4 °C ± 0.8 °C ± 1.7 °C ± 0.4 °C ± 0.7 °C ± 0.3 °C ± 0.4 °C ± 1.5 °C ± 2.1 °C ± 0.2 °C ± 0.3 °C
Basic error limit (operational limit at 25°C, relative to input range)	
• RTD input – Pt 100 – Pt 200 – Pt 500 – Pt 1000 – Ni 100 – Ni 1000	RTD-4L RTD-3L ± 0.5 °C ± 1.0 °C ± 0.3 °C ± 0.5 °C ± 0.3 °C ± 0.4 °C ± 0.2 °C ± 0.2 °C ± 0.3 °C ± 0.6 °C ± 0.2 °C ± 0.2 °C
Linearity error (relative to input range)	 Additional fault
• RTD input – Pt 100 – Pt 200 – Pt 500 – Pt 1000 – Ni 100 – Ni 1000	RTD-4L RTD-3L ± 0.2 °C ± 0.3 °C ± 0.2 °C ± 0.2 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.2 °C ± 0.1 °C ± 0.1 °C
Repeat accuracy (in settled state at 25°C, relative to input range)	 Additional fault
• RTD input – Pt 100 – Pt 200 – Pt 500 – Pt 1000 – Ni 100 – Ni 1000	RTD-4L RTD-3L ± 0.2 °C ± 0.3 °C ± 0.2 °C ± 0.2 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.2 °C ± 0.1 °C ± 0.1 °C
Status, interrupts, diagnostics	
Interrupts	
• Hardware interrupt	Configurable
• Hardware interrupt when limit value exceeded	Configurable
• Diagnostic interrupt	Configurable
Diagnostic functions	Configurable

• Group fault display – For internal fault – For external fault – Diagnostic information can be read out	 Red LED (INTF) Red LED (EXTF) Possible
Data for selecting a sensor	
Input range (rated values) / input resistance	
• Resistance thermometer	Pt 100/> 10M Pt 200/> 10M Pt 500/> 10M Pt 1000/> 10M Ni 100/> 10M Ni 1000/> 10M
Maximum input voltage for voltage input (destruction limit)	35 V continuous; 75 V for max. 1 s (duty factor 1:20)
Connection of encoder	
• For resistance measurement with 3-wire connection	Possible (max. permissible line resistance 10 Ohm)
• With 4-wire connection	Possible
Characteristic curve linearization	Configurable
For RTD resistance temperature detection	Pt100...1000, 0.00385 Alpha to DIN IEC 751 Ni 100...1000, 0.00618 Alpha to DIN 43760
[1] Measuring range	
• PT100, PT200	-200 °C to +850 °C
• PT 500	-200 °C to +800 °C
• PT 1000	-200 °C to +240 °C
• Ni 100	-60 °C to +250 °C
• Ni 1000	-60 °C to +130 °C
User data in engineering format	Degrees C/ Degrees F
[1] 7KF10 does not support all measuring ranges for S7.	

5.24.2 Commissioning the SM 431; AI 8 x RTD x 16 Bit

Setting the operating mode

You set the operating mode of the SM 431; AI 8 x RTD x 16 Bit in STEP 7.

Parameters

You will find a description of the general procedure for assigning parameters to analog modules in the respective sections.

The table below provides an overview of configurable parameters, including defaults.

Table 5-68 Parameters of the SM 431; AI 8 x RTD x 16 Bit

Parameters	Value range		Default[2]	Parameter type	Scope
Enable					
• Diagnostic interrupt[1] • Hardware interrupt[1]	Yes/no Yes/no		No No	Dynamic	Module
• Destination CPU for interrupt	1 to 4		-	Static	Module
Trigger for hardware interrupt[3]			-	Dynamic	Channel
• High limit • Low limit	32767 to - 32768 - 32768 to 32767				
Diagnostics					
• Wire break • Underflow • Overflow	Yes/no Yes/no Yes/no		No No No	Static	Channel
Measurement					
• Measuring method	Disabled		RTD-3L		
	RTD-4L	Thermal resistance (linear, 4-conductor connection)			
	RTD-3L	Thermal resistance (linear, 3-conductor connection)			
• Measuring range	Refer to the respective section for the measuring ranges of the input channels that you can set.		Pt 100 Standard		
• Temperature unit	Degrees Celsius; degrees Fahrenheit		Degrees Celsius	Static	Module

Parameters	Value range	Default[2]	Parameter type	Scope
• Temperature coefficient for temperature measurement with thermal resistance (RTD)	For platinum (Pt) 0.00385 Ω/Ω/ °C 0.003916 Ω/Ω/ °C 0.003902 Ω/Ω/ °C 0.003920 Ω/Ω/ °C For nickel (Ni) 0.00618 Ω/Ω/ °C 0.00672 Ω/Ω/ °C	0,00385	Static	Channel
• Noise suppression	60 Hz; 50 Hz; none	60 Hz		
Smoothing	None Weak Medium Strong	None	Static	Channel

[1] If you use the module in ER-1/ER-2, you must set this parameter to "No" because the interrupt lines are not available in ER-1/ER-2.

[2] Only in the CR (central rack) is it possible to start up the analog modules with the default settings.

[3] The limit values must be within the temperature range of the connected sensor.

Measured value smoothing

You will find information that is generally applicable to the smoothing of analog values in the respective section.

The following figure shows for the module the number of module cycles, in the case of a step response, after which the smoothed analog value is applied to almost 100%, depending on the smoothing setting. The figure applies to every change of signal at an analog input.

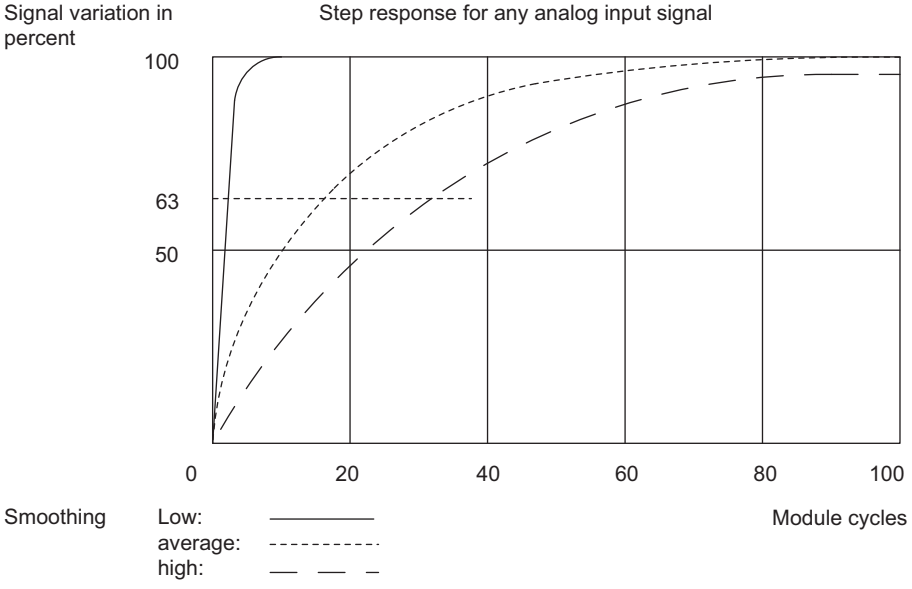


Figure 5-37 Step response of the SM 431; AI 8 x RTD x 16 Bit

Displaying parameter assignment errors

The SM 431; AI 8 x RTD x 16 Bit is capable of diagnostics. Below you will find an overview of the displays that are possible for modules with parameter assignment errors.

Table 5-69 Diagnostic information of the SM 431; AI 8 x RTD x 16 Bit

Incorrect parameter assignment	Possible display	Explanation
Of the module	• Module error • Internal error • Incorrect parameters • No module parameters	You will find explanations of the diagnostics information in the respective tables.
Affecting certain channels	• Module error • Internal error • Channel error • Incorrect parameters • Channel information available • Channel error vector • Channel parameter assignment error • User calibration does not correspond to the parameter assignment	

See also

Parameters of analog input modules (Page 201)

Conversion, cycle, settling and response time of analog modules (Page 196)

General information about diagnostic messages (Page 88)

5.24.3 Measuring methods and measuring ranges of the SM 431; AI 8 x RTD x 16 Bit

Measuring methods

You can set the temperature measurement as the measuring method for the input channels.

Unused channels

For unused channels, set the "measuring method" parameter to "deactivated". This reduces the module's cycle time.

Measuring ranges

Set the measuring ranges by means of the "Measuring range" parameter in STEP 7.

Table 5-70 Measuring ranges of the SM 431; AI 8 x RTD x 16 Bit

Selected measuring method	Measuring range	Description
RTD-3L: Thermal resistance (linear, 3-conductor connection) (temperature measurement)	Pt 100 Standard Pt 200 Standard Pt 500 Standard Pt 1000 Standard Ni 100 Standard Ni 1000 Standard	The digitized analog values are listed in the section "Analog Values of the Analog Input Channels" in the temperature range.
RTD-4L: Thermal resistance (linear, 4-conductor connection) (temperature measurement)		

Default

The default settings of the module in STEP 7 are "Thermal resistor (linear, 3-conductor connection)" for the measuring method and "Pt 100 Standard" for the measuring range. You can use this measuring method with this measuring range without configuring the SM 431; AI 8 x RTD x 16 Bit with STEP 7.

See also

Representation of analog values of analog input channels (Page 169)