

## Data sheet

SM 031 - Analog input (031-1LB90)

## Technical data

Type	Order no.	031-1LB90
Seatures	Туре	SM 031 - Analog input
Note   -	Module ID	040F 1543
Features 2x AI 15 Bits 2x AI 17 Bits 2x AI 1	General information	
Current consumption/power loss  Current consumption from backplane bus 55 mA  Power loss 1 W  Technical data analog inputs  Number of inputs 2  Cable length, shielded 200 m  Rated load voltage DC 24 V  Current consumption from load voltage L+ (without load) 30 mA  Voltage inputs  Min. input resistance (voltage range) 10 MOhm  Input voltage ranges +80 mV +80 mV  Operational limit of voltage ranges with SFU ±0.5%  Basic error limit voltage ranges with SFU +0.05%  Basic error limit voltage (current range)  Operational limit of urrent ranges with SFU +0.05%  Basic error limit ourent ranges with SFU +0.05%  Basic error limit ourent ranges  Operational limit of urrent ranges with SFU +0.05%  Basic error limit voltage ranges with SFU +0.05%  Basic error limit voltage ranges with SFU +0.05%  Basic error limit outrent ranges  Operational limit of urrent ranges with SFU +0.05%  Basic error limit current ranges with SFU +0.05%  Basic error limit errent error e	Note	
Current consumption from backplane bus 55 mA Power loss 1 W  Technical data analog inputs  Number of inputs 2 Cable length, shielded 200 m Rated load voltage DC 24 V Current consumption from load voltage L+ (without load) 30 mA Voltage inputs - Min. input resistance (voltage range) 10 MChm Input voltage ranges -80 mV +80 mV Operational limit of voltage ranges ±0.3% Operational limit of voltage ranges ±0.25% Basic error limit voltage ranges with SFU ±0.1% Basic error limit voltage ranges with SFU ±0.05% Destruction limit voltage ranges with SFU ±0.05%  Destruction limit voltage ranges with SFU ±0.05%  Operational limit of current range) - Input current ranges - Operational limit of current ranges - Operational limit of current ranges - Operational limit of current ranges - Sacice aror limit current ranges - Radical error limit current ranges with SFU - Destruction limit current ranges with SFU - Destruction limit current ranges with SFU - Basic error limit current ranges with SFU - Destruction limit current inputs (voltage) - Destruction limit current inputs (voltage) - Destruction limit of resistor ranges with SFU - Destruction limit terestance inputs - Current ranges - Curr	Features	16 Bit Voltage -80 mV+80 mV TC type J, K, N, R, S, T, B, C, E, L
Power loss 1 W  Technical data analog inputs  Number of inputs 2 Cable length, shielded 200 m Rated load voltage DC 24 V  Current consumption from load voltage L+ (without load) 30 mA  Voltage inputs - Min. input resistance (voltage range) 10 MOhm Input voltage ranges -80 mV +80 mV  Operational limit of voltage ranges ±0.3%  Operational limit of voltage ranges ±0.25%  Basic error limit voltage ranges ±0.25%  Basic error limit voltage ranges with SFU ±0.05%  Destruction limit corrent ranges -  Operational limit of current ranges -  Input current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance ranges -  Operational limit of resistor ranges with SFU -  Basic error limit for resistor ranges with SFU -  Basic error limit for resistor ranges with SFU -  Basic error limit torrent inputs (voltage) -  Operational limit of resistor ranges with SFU -  Basic error limit terrent inputs (voltage) -  Operational limit of resistor ranges with SFU -  Basic error limit with SFU -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -  Basic error limit with SFU -  Basic error limit with SFU -  Basic error limit with SFU -  Basic erro	Current consumption/power loss	
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Number of inputs         2           Cable length, shielded         200 m           Rated load voltage         DC 24 V           Current consumption from load voltage L+ (without load)         30 mA           Voltage inputs         -           Min. input resistance (voltage range)         10 MOhm           Input voltage ranges         ±0.0 mV +80 mV           Operational limit of voltage ranges         ±0.3%           Operational limit of voltage ranges with SFU         ±0.1%           Basic error limit voltage ranges with SFU         ±0.05%           Basic error limit voltage ranges with SFU         ±0.05%           Destruction limit voltage         max. 20V           Current inputs         -           Max. input resistance (current range)         -           Operational limit of current ranges         -           Operational limit of current ranges with SFU         -           Basic error limit current ranges with SFU         -           Basic error limit current inputs (voltage)         -           Destruction limit current inputs (voltage)         -           Destruction limit current inputs (electrical current)         -           Resistance ranges         -           Operational limit of resistor ranges with SFU         -	Power loss	1 W
Cable length, shielded 200 m Rated load voltage DC 24 V Current consumption from load voltage L+ (without load) 30 mA  Voltage inputs	Technical data analog inputs	
Rated load voltage DC 24 V  Current consumption from load voltage L+ (without load) 30 mA  Voltage inputs -  Min. input resistance (voltage range) 10 MOhm  Input voltage ranges -80 mV +80 mV  Operational limit of voltage ranges ±0.3%  Operational limit of voltage ranges with SFU ±0.1%  Basic error limit voltage ranges with SFU ±0.05%  Destruction limit voltage ranges with SFU ±0.05%  Destruction limit voltage ranges with SFU ±0.05%  Max. input resistance (current range) -  Input current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges with SFU -  Basic error limit current inputs (voltage) -  Destruction limit current inputs (voltage) -  Operational limit of resistor ranges with SFU -  Basic error limit current ranges with SFU -  Basic error limit current ranges with SFU -  Basic error limit current ranges with SFU -  Basic error limit with SFU -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Number of inputs	2
Current consumption from load voltage L+ (without load)  Voltage inputs  - Min. input resistance (voltage range)  Input voltage ranges  -80 mV +80 mV  Operational limit of voltage ranges  ±0.3%  Operational limit of voltage ranges with SFU  Basic error limit voltage ranges with SFU  ±0.1%  Basic error limit voltage ranges with SFU  ±0.05%  Destruction limit voltage ranges with SFU  Max. input resistance (current range)  Input current ranges  - Operational limit of current ranges  - Operational limit of current ranges with SFU  Basic error limit current ranges  - Operational limit of current ranges  - Operational limit of current ranges  - Operational limit current ranges  - Redical error limit current inputs (voltage)  Destruction limit current inputs (voltage)  - Destruction limit current inputs (voltage)  - Coperational limit of resistor ranges  - Operational limit of resistor ranges with SFU  - Basic error limit  - Basic error limit with SFU  - Basic error limit tesistance inputs  - Resistance thermometer inputs	Cable length, shielded	200 m
Voltage inputs -  Min. input resistance (voltage range) 10 MOhm  Input voltage ranges -80 mV +80 mV  Operational limit of voltage ranges ±0.3%  Operational limit of voltage ranges with SFU ±0.1%  Basic error limit voltage ranges with SFU ±0.05%  Basic error limit voltage ranges with SFU ±0.05%  Destruction limit voltage manges with SFU ±0.05%  Destruction limit voltage manges with SFU ±0.05%  Max. input resistance (current range) -  Input current ranges -  Operational limit of current ranges +  Operational limit of current ranges -  Operational limit current ranges -  Pasic error limit current ranges -  Operational limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance inputs -  Resistance ranges -  Operational limit of resistor ranges with SFU -  Basic error limit  Basic error limit theresistor ranges with SFU -  Basic error limit ranges -  Operational limit of resistor ranges with SFU -  Basic error limit errent ranges -  Operational limit of resistor ranges with SFU -  Basic error limit errent ranges with SFU -  Basic error limit ersistance inputs -  Resistance thermometer inputs -	Rated load voltage	DC 24 V
Min. input resistance (voltage range)  Input voltage ranges  -80 mV +80 mV  Operational limit of voltage ranges  ±0.3%  Operational limit of voltage ranges  ±0.1%  Basic error limit voltage ranges with SFU  ±0.1%  Basic error limit voltage ranges with SFU  ±0.05%  Destruction limit voltage  max. 20V  Current inputs  -  Max. input resistance (current range)  Input current ranges  -  Operational limit of current ranges with SFU  -  Basic error limit current ranges with SFU  -  Basic error limit current ranges with SFU  Destruction limit current ranges with SFU  -  Resistance inputs  -  Operational limit of resistor ranges  -  Operational limit of resistor ranges with SFU  -  Basic error limit  -  Basic error limit myth SFU  -  Basic error limit this FU  -  Destruction limit resistance inputs  -  Resistance thermometer inputs  -  Resistance thermometer inputs  -  Resistance thermometer inputs  -  Resistance thermometer inputs	Current consumption from load voltage L+ (without load)	30 mA
Input voltage ranges -80 mV +80 mV Operational limit of voltage ranges ±0.3% Operational limit of voltage ranges with SFU ±0.1% Basic error limit voltage ranges with SFU ±0.05% Basic error limit voltage ranges with SFU ±0.05%  Destruction limit voltage may. 20V Current inputs - Max. input resistance (current range) - Input current ranges - Operational limit of current ranges with SFU - Basic error limit current ranges with SFU - Basic error limit current ranges with SFU - Destruction limit current inputs (voltage) - Destruction limit current inputs (electrical current) - Resistance inputs - Resistance ranges - Operational limit of resistor ranges with SFU - Basic error limit current inputs (electrical current) - Resistance inputs - Resistance inputs - Basic error limit of resistor ranges with SFU - Basic error limit theresistor ranges with SFU - Basic error limit of resistor ranges with SFU - Basic error limit of resistor ranges with SFU - Basic error limit in of resistor ranges with SFU - Basic error limit in of resistor ranges with SFU - Basic error limit with SFU - Basic error limit with SFU - Basic error limit resistance inputs -	Voltage inputs	
Operational limit of voltage ranges ±0.3%  Operational limit of voltage ranges with SFU ±0.1%  Basic error limit voltage ranges with SFU ±0.05%  Basic error limit voltage ranges with SFU ±0.05%  Destruction limit voltage ranges with SFU ±0.05%  Destruction limit voltage max. 20V  Current inputs	Min. input resistance (voltage range)	10 MOhm
Operational limit of voltage ranges with SFU ±0.1%  Basic error limit voltage ranges ±0.25%  Basic error limit voltage ranges with SFU ±0.05%  Destruction limit voltage may max. 20V  Current inputs -  Max. input resistance (current range) -  Input current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges with SFU -  Basic error limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance inputs -  Operational limit of resistor ranges with SFU -  Basic error limit current inputs (electrical current) -  Resistance inputs -  Operational limit of resistor ranges -  Operational limit of resistor ranges with SFU -  Basic error limit with SFU -  Basic error limit with SFU -  Destruction limit resistance inputs -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Input voltage ranges	-80 mV +80 mV
Basic error limit voltage ranges ±0.25%  Basic error limit voltage ranges with SFU ±0.05%  Destruction limit voltage max. 20V  Current inputs -  Max. input resistance (current range) -  Input current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance inputs -  Operational limit of resistor ranges with SFU -  Basic error limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance ranges -  Operational limit of resistor ranges with SFU -  Basic error limit with SFU -  Basic error limit with SFU -  Destruction limit erisistance inputs -  Operational limit of resistor ranges with SFU -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Operational limit of voltage ranges	±0.3%
Basic error limit voltage ranges with SFU ±0.05%  Destruction limit voltage max. 20V  Current inputs -  Max. input resistance (current range) -  Input current ranges -  Operational limit of current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance inputs -  Operational limit of resistor ranges -  Operational limit of resistor ranges with SFU -  Basic error limit surrent inputs (electrical current) -  Resistance inputs -  Operational limit of resistor ranges -  Operational limit of resistor ranges with SFU -  Basic error limit with SFU -  Destruction limit resistance inputs -  Operational limit of resistance inputs -  Operational limit of resistor ranges with SFU -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Operational limit of voltage ranges with SFU	±0.1%
Destruction limit voltage rax. 20V  Current inputs -  Max. input resistance (current range) -  Input current ranges -  Operational limit of current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges with SFU -  Basic error limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance inputs -  Resistance ranges -  Operational limit of resistor ranges with SFU -  Basic error limit tourent inputs (electrical current) -  Resistance ranges -  Operational limit of resistor ranges -  Operational limit of resistor ranges with SFU -  Basic error limit -  Basic error limit -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Basic error limit voltage ranges	±0.25%
Current inputs  Max. input resistance (current range)	Basic error limit voltage ranges with SFU	±0.05%
Max. input resistance (current range)  Input current ranges  Operational limit of current ranges  Operational limit of current ranges with SFU  Basic error limit current ranges with SFU  Catherina and the series of the series	Destruction limit voltage	max. 20V
Input current ranges Operational limit of current ranges Operational limit of current ranges with SFU Basic error limit current ranges with SFU	Current inputs	-
Operational limit of current ranges -  Operational limit of current ranges with SFU -  Basic error limit current ranges -  Radical error limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance inputs -  Resistance ranges -  Operational limit of resistor ranges with SFU -  Basic error limit  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Max. input resistance (current range)	-
Operational limit of current ranges with SFU  Basic error limit current ranges  Radical error limit current ranges with SFU  Destruction limit current inputs (voltage)  Destruction limit current inputs (electrical current)  Resistance inputs  Resistance ranges  Operational limit of resistor ranges  Operational limit of resistor ranges with SFU  Basic error limit  Basic error limit with SFU  Destruction limit resistance inputs  Resistance thermometer inputs  -  Resistance thermometer inputs	Input current ranges	-
Basic error limit current ranges - Radical error limit current ranges with SFU - Destruction limit current inputs (voltage) - Destruction limit current inputs (electrical current) - Resistance inputs - Resistance ranges - Operational limit of resistor ranges - Operational limit of resistor ranges with SFU - Basic error limit with SFU - Destruction limit resistance inputs - Resistance inputs - Resistance inputs - Construction limit resistance inputs - Resistance inputs - Resistance thermometer inputs - Resistance thermometer inputs - Construction limit resistance inputs - Construction limit resist	Operational limit of current ranges	-
Radical error limit current ranges with SFU -  Destruction limit current inputs (voltage) -  Destruction limit current inputs (electrical current) -  Resistance inputs -  Resistance ranges -  Operational limit of resistor ranges -  Operational limit of resistor ranges with SFU -  Basic error limit -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Operational limit of current ranges with SFU	-
Destruction limit current inputs (voltage)  Destruction limit current inputs (electrical current)  Resistance inputs  Resistance ranges  Operational limit of resistor ranges  Operational limit of resistor ranges with SFU  Basic error limit  Destruction limit resistance inputs  Resistance thermometer inputs	Basic error limit current ranges	-
Destruction limit current inputs (electrical current)  Resistance inputs  - Resistance ranges  - Operational limit of resistor ranges  Operational limit of resistor ranges with SFU  Basic error limit  - Destruction limit resistance inputs  - Resistance thermometer inputs  -	Radical error limit current ranges with SFU	-
Resistance inputs  Resistance ranges  Operational limit of resistor ranges  Operational limit of resistor ranges with SFU  Basic error limit  Basic error limit with SFU  Destruction limit resistance inputs  Resistance thermometer inputs  -	Destruction limit current inputs (voltage)	-
Resistance ranges - Operational limit of resistor ranges - Operational limit of resistor ranges with SFU - Basic error limit - Basic error limit with SFU - Destruction limit resistance inputs - Resistance thermometer inputs -	Destruction limit current inputs (electrical current)	-
Operational limit of resistor ranges - Operational limit of resistor ranges with SFU - Basic error limit - Basic error limit with SFU - Destruction limit resistance inputs - Resistance thermometer inputs -	Resistance inputs	-
Operational limit of resistor ranges with SFU -  Basic error limit -  Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Resistance ranges	-
Basic error limit - Basic error limit with SFU - Destruction limit resistance inputs - Resistance thermometer inputs -	Operational limit of resistor ranges	-
Basic error limit with SFU -  Destruction limit resistance inputs -  Resistance thermometer inputs -	Operational limit of resistor ranges with SFU	-
Destruction limit resistance inputs - Resistance thermometer inputs -	Basic error limit	-
Resistance thermometer inputs -	Basic error limit with SFU	-
	Destruction limit resistance inputs	-
Resistance thermometer ranges -	Resistance thermometer inputs	-
	Resistance thermometer ranges	-



Operational limit of resistance thermometer ranges	-
Operational limit of resistance thermometer ranges with SFU	-
Basic error limit thermoresistor ranges	-
Basic error limit thermoresistor ranges with SFU	•
Destruction limit resistance thermometer inputs	•
Thermocouple inputs	yes
Thermocouple ranges	type B type E type J type K type L type N type R type S type T
Operational limit of thermocouple ranges	Type E, L, T, J, K, N: ±2.5K / Type B, C, R, S: ±8.0K
Operational limit of thermocouple ranges with SFU	Type E, L, T, J, K, N: ±1.5K / Type B, C, R, S: ±4.0K
Basic error limit thermocouple ranges	Type E, L, T, J, K, N: ±2.0K / Type B, C, R, S: ±7.0K
Basic error limit thermocouple ranges with SFU	Type E, L, T, J, K, N: ±1.0K / Type B, C, R, S: ±3.0K
Destruction limit thermocouple inputs	max. 20V
Programmable temperature compensation	yes
External temperature compensation	yes
Internal temperature compensation	yes
Temperature error internal compensation	1 K
Technical unit of temperature measurement	°C, °F, K
Resolution in bit	16
Measurement principle	Sigma-Delta
Basic conversion time	84.2 ms (50 Hz) 70.5 ms (60 Hz) per channel
Noise suppression for frequency	>90dB at 50Hz (UCM<10V)
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes
Process alarm	no
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes
Diagnostics information read-out	possible
Module state	green LED
Module error display	red LED
Channel error display	red LED per channel
Isolation	
Between channels	
Between channels of groups to	-
Between channels and backplane bus	yes
Between channels and power supply	-
Max. potential difference between circuits	-
Max. potential difference between inputs (Ucm)	DC 75 V/ AC 50 V
Max. potential difference between Mana and Mintern (Uiso)	-
Max. potential difference between inputs and Mana (Ucm)	-
Max. potential difference between inputs and Mintern (Uiso)	DC 75 V/ AC 50 V
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Max, potential difference between Mintern and outputs	-
Max. potential difference between Mintern and outputs  Insulation tested with	- DC 500 V



Technical data encoder supply	
Number of outputs	-
Output voltage (typ)	-
Output voltage (rated value)	-
Short-circuit protection	-
Binding of potential	-
Datasizes	
Input bytes	4
Output bytes	0
Parameter bytes	10
Diagnostic bytes	20
Housing	
Material	PPE / PPE GF10
Mounting	Profile rail 35 mm
Mechanical data	
Dimensions (WxHxD)	12.9 mm x 109 mm x 76.5 mm
Net weight	58 g
Weight including accessories	58 g
Gross weight	72 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL certification	yes
KC certification	yes