



UR20 Analog Input Modules

UR20-2AI-SG-24-DIAG

The UR20-2AI-SG-24-DIAG strain gauge module is an analog input module designed to connect force sensors working with strain gauges. Thus weights, torques or vibrations can be exactly measured. You can calibrate the module through its parameters. Using the web server, the module can be calibrated and password protected. The calibration setting will then be documented. The tare function can be triggered individually for each channel either via a digital input or via software.

- Several sensors can be connected in parallel to each of the two channels in 4-wire or 6-wire technique as long as their input impedance is within the permissible sensor load.
- The resolution is 24 bits per channel with a 0.01% accuracy of the full scale.
- A status LED is assigned to each channel.
- The module electronics supply the connected sensors with power from a potential that is galvanically isolated from the input current path (I_{IN}).
- The inputs are protected against voltage surges and overcurrent.
- Voltages that exceed $\pm 30V$ may cause the destruction of the module.
- The module provides single-channel diagnosis with channel-related error diagnostic and line break detection.



CAUTION: VOLTAGES THAT EXCEED $\pm 30V$ MAY CAUSE THE DESTRUCTION OF THE MODULE.

Technical Specifications - UR20-2AI-SG-24-DIAG	
Price	\$468.00
Drawing	PDF
Analog Inputs	
Number	2
Sensor connection	4-wire, 6-wire, parameterizable
Input value	Differentially, to evaluate a strain gauge full bridge
Conversion time	5 to 800 ms
Conversion rate	1.25 to 200 samples per second
Conversion method	Sigma-Delta
Operation mode	Continuous conversion
Bandwidth input filter	> 500 Hz (3 dB)
Resolution	24 Bit per channel
Data type output	32 Bit signed integer
Measurement range	± 150 mV
Supported sensor sensitivity	0.5–30 mV/V, parameterizable
Overload	> 5%
Output on overload	0x7FFFFFFF
Input impedance signal	> 100 M Ω
Input impedance sense	> 200 k Ω
Accuracy (customer calibration) ¹	$\pm 0.01\%$ FSR (100 ppm)
Accuracy (factory calibration) ¹	$\pm 0.05\%$ FSR (500 ppm)
Accuracy (-20 to +60 °C)	
Accuracy during interference	$\pm 1\%$ FSR
Temperature coefficient	< 5 ppm/K
Nonlinearity	< 50 ppm
Repeat accuracy (after 2h of operation)	< 20 ppm
Common mode rejection ratio (CMRR) at 2.5 VDC ± 1.5 V/50 Hz ¹	> 120 dB
Crosstalk attenuation	> 120 dB

1 - With conversion time ≥ 80 ms and sensor sensitivity > 2 mV/V

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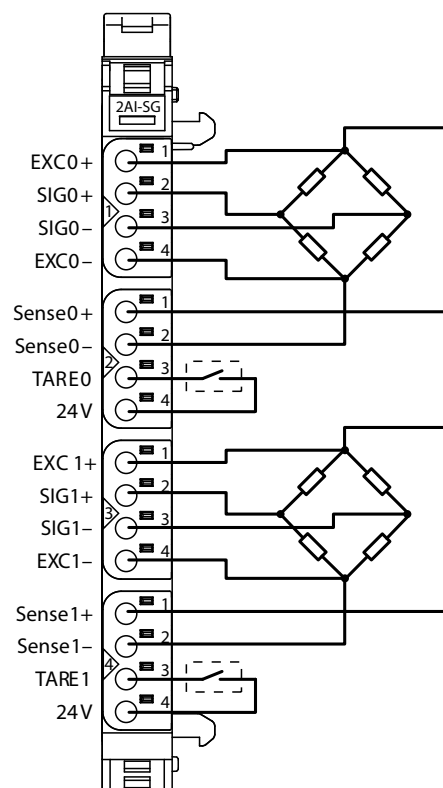
UR20 Analog Input Modules

Technical Specifications - UR20-2AI-SG-24-DIAG

(continued)

Insulation rated voltage between power path and bus	50 VDC
Insulation rated voltage between power path and signal	50 VDC
Sensor excitation voltage	5 VDC $\pm 0.2V$
Permissible sensor load	85–5000 Ω
Short-circuit-proof	Yes
Module diagnosis	Yes
Individual channel diagnosis	Yes, line break detection, short circuit detection, overload
Common potential between channels	EXC 0- and EXC 1-
Calibration interval	Max. 1 year
Calibration capability	Yes
Digital Inputs	
Number	2
Input type	Type 1 and Type 3 as per IEC 61131-2
Input filter	10 ms fixed
Input voltage low	< 5V
Input voltage high	> 11V
Permissible load of auxiliary voltage	< 10 mA
Supply	
Supply voltage for system, inputs and outputs	24 VDC +20% / -15%
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 35 mA (75 mA at nominal load)
Weight	
Weight (operational status)	90g

Terminal Connections



Terminal Assignments

Terminal	Assignment	Function/Connection
1.1	EXC 0+	AI0: Excitation +
1.2	SIG 0+	AI0: Signal +
1.3	SIG 0-	AI0: Signal -
1.4	EXC 0-	AI0: Excitation -
2.1	Sense 0+	AI0: Sense +
2.2	Sense 0-	AI0: Sense -
2.3	TARE 0	DI0: Digital input (tare)
2.4	24V	DI0: 24 VDC (for the digital input only)
3.1	EXC 1+	AI1: Excitation +
3.2	SIG 1+	AI1: Signal +
3.3	SIG 1-	AI1: Signal -
3.4	EXC 1-	AI1: Excitation -
4.1	Sense 1+	AI1: Sense +
4.2	Sense 1-	AI1: Sense -
4.3	TARE 1	DI1: Digital input (tare)
4.4	24V	DI1: 24 VDC (for the digital input only)



UR20 Analog Input Modules

UR20-2AI-UI-16

The UR20-2AI-UI-16 analog input module can measure up to 2 analog sensors with $\pm 10\text{V}$, $\pm 5\text{V}$, $0-10\text{V}$, $0-5\text{V}$, $2-10\text{V}$, $1-5\text{V}$, $0-20\text{ mA}$ or $4-20\text{ mA}$. The resolution is 16 bit per channel.

- Sensors can be connected to each connector in a 2-wire, 3-wire, or 3-wire connection + FE.
- The measurement range is defined using parameterization.
- A status LED is assigned to each channel.
- The module electronics supply the connected sensors with power from the input current path (I_{IN}).
- The inputs are protected against voltage surges and overcurrent.
- Voltages that exceed $\pm 30\text{ V}$ may cause the destruction of the module. As a protection against overcurrent, the module temporarily switches to voltage mode.

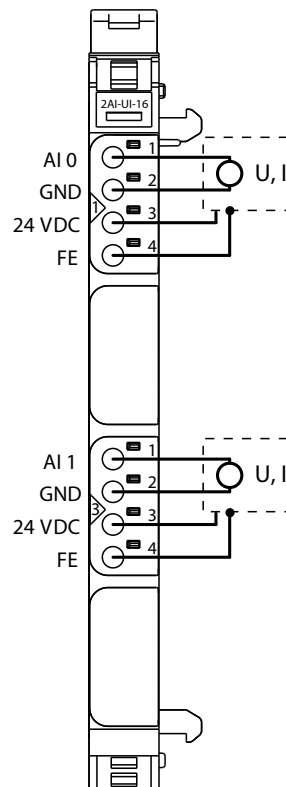


CAUTION: VOLTAGES THAT EXCEED $\pm 30\text{V}$ MAY CAUSE THE DESTRUCTION OF THE MODULE.

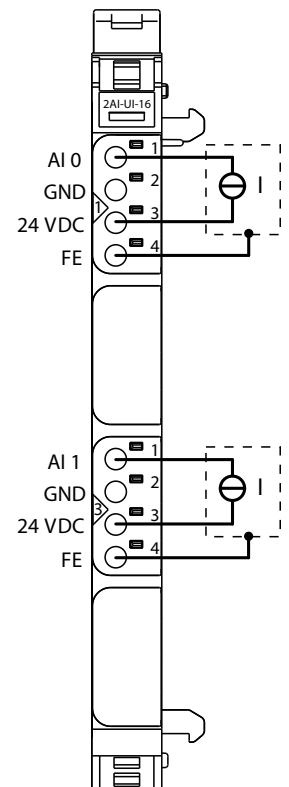


Technical Specifications - UR20-2AI-UI-16		
Price		\$220.00
Drawing		PDF
Inputs		
Number		2
Input values	Voltage	0–5V, $\pm 5\text{V}$, 0–10V, $\pm 10\text{V}$, 1–5V, 2–10V
	Current	0–20 mA, 4–20 mA
Resolution		16 bits
Accuracy		0.1% max. at 25 °C $\pm 50\text{ ppm/K}$ max. temperature coefficient Max. +10 mV/A: additional inaccuracy in the voltage mode due to sensor power supply current
Sensor supply		Max. 2A per plug, total max. 4A
Sensor connection		2-wire, 3-wire, 3-wire + FE
Conversion time		1 ms
Internal resistance		U: typ. 100 k Ω I: < 50 Ω
Reverse polarity protection		Yes
Short-circuit-proof		Yes
Response time of the protective circuit		< 50 ms
Module diagnosis		Yes
Individual channel diagnosis		No
Supply		
Supply voltage for system, inputs and outputs		24 VDC +20% / -15%
Current consumption from system current path I_{SYS}		8 mA
Current consumption from input current path I_{IN}		25 mA + sensor supply current
Weight		
Weight (operational status)		96g

Terminal Connections



3/4 sensor with signal wiring and sensor supply via module electronics



2-wire sensor loop powered by module electronics



UR20 Analog Input Modules

UR20-4AI-UI-16

The UR20-4AI-UI-16 analog input module can record up to 4 analog sensors with $\pm 10V$, $\pm 5V$, $0-10V$, $0-5V$, $2-10V$, $1-5V$, $0-20\text{ mA}$ or $4-20\text{ mA}$. The resolution is 16 bit per channel.

- Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE.
- The measurement range is defined using parameterization.
- A status LED is assigned to each channel.
- The module electronics supply the connected sensors with power from the input current path (I_{IN}).
- The inputs are protected against voltage surges and overcurrent.
- Voltages that exceed $\pm 30V$ may cause the destruction of the module. As a protection against overcurrent, the module temporarily switches to voltage mode.

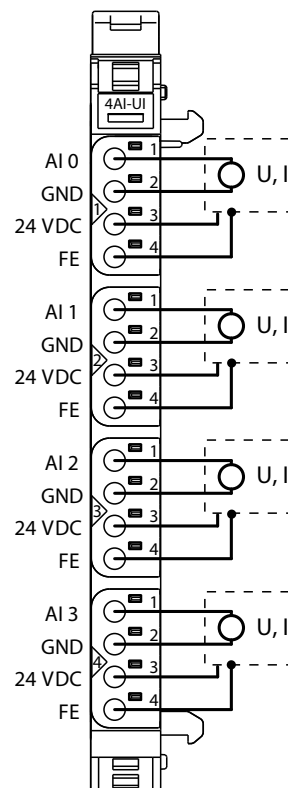


CAUTION: VOLTAGES THAT EXCEED $\pm 30V$ MAY CAUSE THE DESTRUCTION OF THE MODULE.

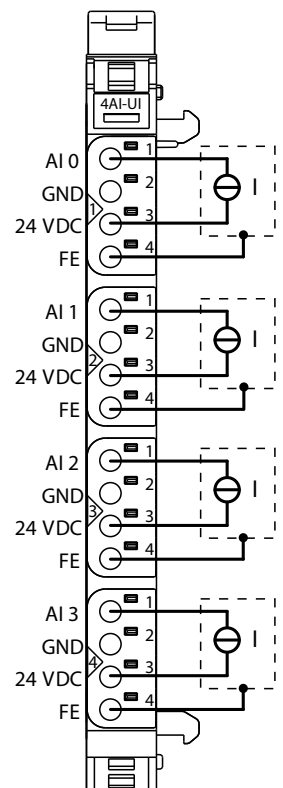


Technical Specifications - UR20-4AI-UI-16		
Price		\$306.00
Drawing		PDF
Inputs		
Number		4
Input values	Voltage	$0-5V$, $\pm 5V$, $0-10V$, $\pm 10V$, $1-5V$, $2-10V$
	Current	$0-20\text{ mA}$, $4-20\text{ mA}$
Resolution		16 bits
Accuracy		0.1% max. at $25\text{ }^{\circ}\text{C}$ $\pm 50\text{ ppm/K}$ max. temperature coefficient Max. $+10\text{ mV/A}$: additional inaccuracy in the voltage mode due to sensor power supply current
Sensor supply		Max. 2A per plug, total max. 8A
Sensor connection		2-wire, 3-wire, 3-wire + FE
Conversion time		1 ms
Internal resistance		U: typ. $100\text{ k}\Omega$ I: $\sim 42\Omega$
Reverse polarity protection		Yes
Short-circuit-proof		Yes
Response time of the protective circuit		$< 50\text{ ms}$
Module diagnosis		Yes
Individual channel diagnosis		No
Supply		
Supply voltage for system, inputs and outputs		$24\text{ VDC} + 20\% / -15\%$
Current consumption from system current path I_{SYS}		8 mA
Current consumption from input current path I_{IN}		$25\text{ mA} + \text{sensor supply current}$
Weight		
Weight (operational status)		96g

Terminal Connections



3/4 sensor with signal wiring and sensor supply via module electronics



2-wire sensor loop powered by module electronics

UR20 Analog Input Modules

UR20-4AI-RTD-DIAG

The analog input module UR20-4AI-RTD-DIAG can detect up to 4 analog resistance thermometers. The resolution is 16 bit per channel.

- A sensor can be connected to each connector in a 2-wire, 3-wire or 4-wire connection.
- Mixed operation using different sensors as well as different connection methods is possible.
- Sensor type and temperature range are set using parameterization.
- A status LED is assigned to each channel.
- The inputs are protected against voltage surges and overcurrent. Voltages that exceed $\pm 30V$ may cause the destruction of the module.
- The module provides individual channel diagnosis with channel related error messages.

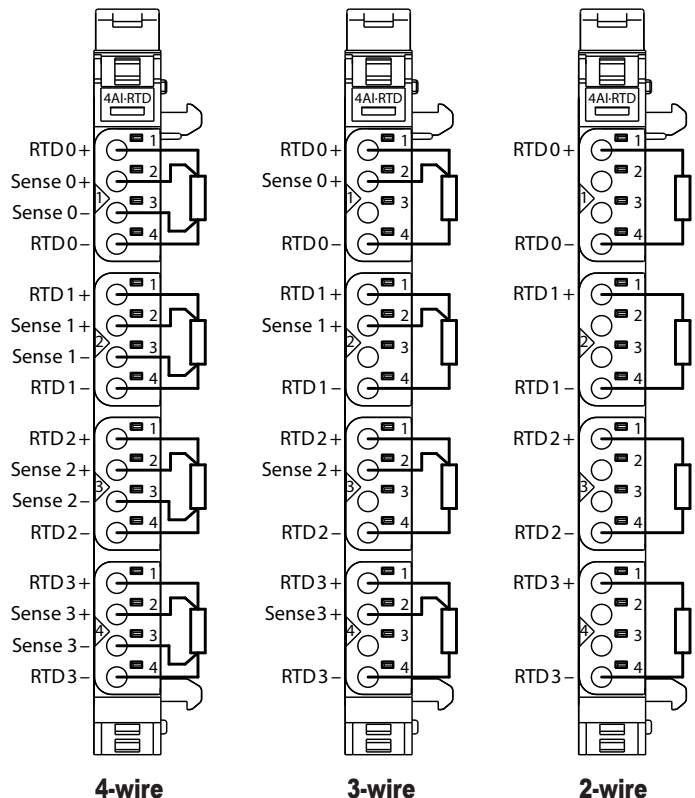


CAUTION: VOLTAGES THAT EXCEED $\pm 30V$ MAY CAUSE THE DESTRUCTION OF THE MODULE.



Technical Specifications - UR20-4AI-RTD-DIAG	
Price	\$386.00
Drawing	PDF
Inputs	
Number	4
Sensor types	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni 200, Ni500, Ni1000, Cu10, 40 Ω , 80 Ω , 150 Ω , 300 Ω , 500 Ω , 1 k Ω , 2 k Ω , 4 k Ω
Resolution	16 bits
Accuracy	Max. 0.2% FSR / 0.3% FSR for Ni sensors / 0.6% FSR for Cu10
Sensor connection	2-wire, 3-wire, 4-wire
Sensor current	Depending on the sensor type 0.75 mA (Pt100, Ni100, Ni120, Cu10, 40 Ω , 80 Ω , 150 Ω , 300 Ω) or 0.25 mA (Pt200, Pt500, Pt1000, Ni200, Ni500, Ni1000, 500 Ω , 1 k Ω , 2 k Ω , 4 k Ω)
Max. wire resistance / measurement range	2.5 Ω /40 Ω , 5 Ω /80 Ω , 10 Ω /150 Ω and Cu10, 25 Ω in all other measurement ranges
Temperature coefficient	± 50 ppm/K max.
Temperature range	-200 to +850 °C [-328 to +1562 °F]
Conversion time	36 to 240 ms, adjustable
Common mode input voltage range	Channel to channel: max. $\pm 2V$ Channel to voltage supply: max. $\pm 50V$
Reverse polarity protection	Yes
Module diagnosis	Yes
Individual channel diagnosis	Yes
Supply	
Supply voltage for system, inputs and outputs	24 VDC +20% / -15%
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 20 mA
Weight	
Weight (operational status)	91g

Terminal Connections





UR20 Analog Input Modules

UR20-4AI-TC-DIAG

The analog input module UR20-4AI-TC-DIAG can detect up to 4 analog thermocouple sensors or voltages between ± 15 mV and ± 2 V. The resolution is 16 bit per channel.

- Sensor type and temperature range are set using parameterization.
- Mixed operation using different sensors is possible.
- For each channel, an internal or external cold-junction compensation (CJC) can be parameterized.
- A status LED is assigned to each channel.
- The inputs are protected against voltage surges and overcurrent.
- Voltages that exceed ± 30 V may cause the destruction of the module.
- The module provides individual channel diagnosis with channel related error messages.

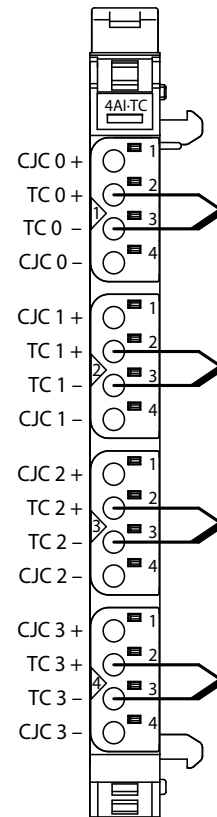


CAUTION: VOLTAGES THAT EXCEED ± 30 V MAY CAUSE THE DESTRUCTION OF THE MODULE.

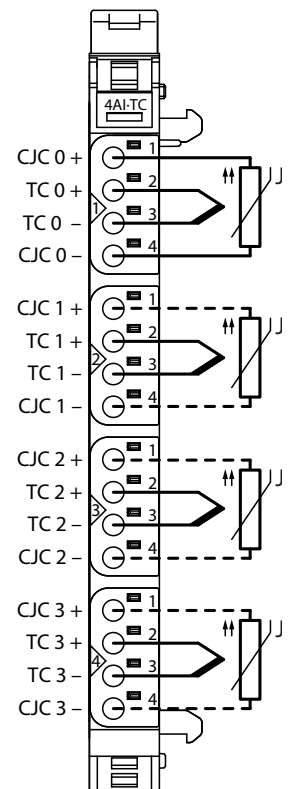


Technical Specifications - UR20-4AI-TC-DIAG	
Price	\$386.00
Drawing	PDF
Inputs	
Number	4
Sensor types	J, K, T, B, N, E, R, S, L, U, C, mV
Resolution	16 bits
Accuracy	Conversion time ≥ 80 ms: $10 \mu\text{V} + 0.1\%$ of voltage measurement range (without cold-junction measurement error)
Sensor connection	2-wire
Sensor current	0.25 mA for the cold-junction compensation with a Pt1000
Cold-junction compensation	Internal and external (Pt1000), internal accuracy ≤ 3 K
Temperature coefficient	± 50 ppm/K max.
Temperature range	-200 to $+2315$ °C [-328 to 4199 °F]
Conversion time	36 to 240 ms, adjustable
Common mode input voltage range	Channel to channel: max. ± 2 V Channel to voltage supply: max. ± 50 V
Internal resistance	> 1 M Ω
Reverse polarity protection	Yes
Module diagnosis	Yes
Individual channel diagnosis	Yes
Supply	
Supply voltage for system, inputs and outputs	24 VDC $+20\%$ / -15%
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	20 mA
Weight	
Weight (operational status)	86g

Terminal Connections



Internal CJC



External CJC



UR20 Module Specifications

Environmental Specifications - UR20 I/O Modules		
Degree of protection (IEC 60529)		IP20
Flammability rating UL 94		V-0
Material of power contacts and data contacts		Ni-Au, 3µm
Temperature	Operation	-20 + 60 °C [-4 to +140 °F]
	Storage, transport	-40 to +85 °C [-40 to +185 °F]
Humidity	Operation	95%, non-condensing as per IEC 61131-2
	Storage, transport	95%, non-condensing as per IEC 61131-2
Air pressure	Operation	≥ 795 hPa [11.5 psi] (altitude ≤ 2000 m) as per IEC 61131-2
	Storage, transport	≥ 700 hPa [10.2 psi] (altitude ≤ 3000 m) as per IEC 61131-2
Vibration resistance		5 Hz ≤ f ≤ 8.4 Hz: 3.5mm amplitude as per IEC 60068-2-6 8.4 Hz ≤ f ≤ 150 Hz: 1g acceleration as per IEC 60068-2-6
Shock resistance		15g over 11 ms, half sinewave, as per IEC 60068-2-27
Potential isolation	Test voltage	Max. 28.8V within one channel 500 VDC field/system (as per EN 60079-15:2017)
	Pollution severity level	2 (as per DIN EN 60664-1:2008)
	Overvoltage category	II (as per DIN EN 50178)
Approvals		CE, RoHS, UKCA, cULus E141197