

Inline amplifier for force and strain sensors for full-bridge strain gage configuration

X-201-IN09



Inline housing

Measuring amplifier with simultaneous 4... 20 mA and 0... 10 V analog output
Digital zero point adjustment via external control signal or onboard button

Features

- Permanent storage of the zero point adjustment even in the event of a power failure, without limitation of the taring processes
- Large input range from 1.0 mV/ V to 4.0 mV/V for universal connection of strain, force and weight sensors with strain gauges full-bridge configuration
- Analog signal path with large bandwidth and fast response time

Application

The measuring amplifiers from X Sensors are suitable for universal signal processing from force and strain sensors with strain gauge full-bridge configurations.

The zero point adjustment is carried out by a digital zero point adjustment mechanism and is permanently saved. A non-volatile, stable zero point is available regardless of the cycle times. Therefore these measuring amplifiers are suitable for all dynamic as well as static applications. They can be used in all applications that require a periodic tare process or a one-time installation tare.

The connection to a sensor and to the control can be made either via terminals or via an M12 plug socket.

Ordering code

Description	Input sensitivity	Output-signal	Characteristic	Specifications
X-201-IN09-x-M12-3-M12-1	0 ... 1.0 mV/V	0... 10 V 4... 20 mA (simultaneously)	Inline housing, aluminum Sensor side: M12, 5 pins Control side: M12, 8 pins	Page 3
	0 ... 1.25 mV/V			
	0 ... 1.5 mV/V			
	0 ... 2.0 mV/V			
	0 ... 3.0 mV/V			
	0 ... 4.0 mV/V			
X-201-IN09-x-KL-3-M12-1	0 ... 1.0 mV/V	0... 10 V 4... 20 mA (simultaneously)	Inline housing, aluminum Sensor side: Screw terminal Control side: M12, 8 pins	Page 4
	0 ... 1.25 mV/V			
	0 ... 1.5 mV/V			
	0 ... 2.0 mV/V			
	0 ... 3.0 mV/V			
	0 ... 4.0 mV/V			

Options:

- Pre-configured setting
- Calibrated measuring chain (amplifier and sensor)

Accessories

Description	Function	Characteristic	Article No.
Cable connector M12 male - 4-pin	Electrical connections	For sensor connection, M12 cable connector, straight, 4-pin.	300126
Cable socket M12 Female - 8 pin	Electrical connections	For control connection, M12 cable socket, straight, 8-pin.	302870
Connection cable M12, 1m	Electrical connections	For control connection with M12 socket, 1 m Side A: M12 cable socket, straight, 8-pin. Side B: Free ends	100793
Connection cable M12, 2m	Electrical connections	For control connection with M12 socket, 2 m Side A: M12 cable socket, straight, 8-pin. Side B: Free ends	100794
Connection cable 8 core, 5m	Electrical connections	For control connection with M12 socket, 5 m Side A: M12 cable socket, straight, 8-pin. Side B: Free ends	100795
X-914-0	Junction box	For connecting 4 strain gauge sensors to an amplifier	104063
	Mounting plate	Enables simple flange mounting of the measuring amplifier	

X-201-IN09-x-M12-3-M12-1

With M12 socket (sensor) and
M12 plug (control)



Specifications

Performance

Sensitivity	0 ... 1.0 mV/V 0 ... 1.25 mV/V 0 ... 1.5 mV/V 0 ... 2.0 mV/V 0 ... 3.0 mV/V 0 ... 4.0 mV/V
Linearity	<0.01 % from full scale
Zero point temperature coefficient	< 0.01 % / °C
Bandwidth	DC...5kHz (-3dB)
Signal path	Analogue

Electrical data

Power supply	18...30 VDC, <60mA
Output signal at full scale	± 10 V / 4-20 mA
Output signal at overload	± 14.5 V / 0-25 mA
Resistance of strain gauge bridge	4 V: 120...10kΩ 8 V: 350 ...10kΩ

External zero reset

Measurement mode	<3 V or open
Zero point adjustment	8...30 V
Galvanic isolation of supply	< 50 V
Minimal pulse duration	0.5 ms
Duration entire adjustment process	5 ms
Taring range	±2.0 mV/V
Maximum number of zero point adjustment cycles	Unlimited

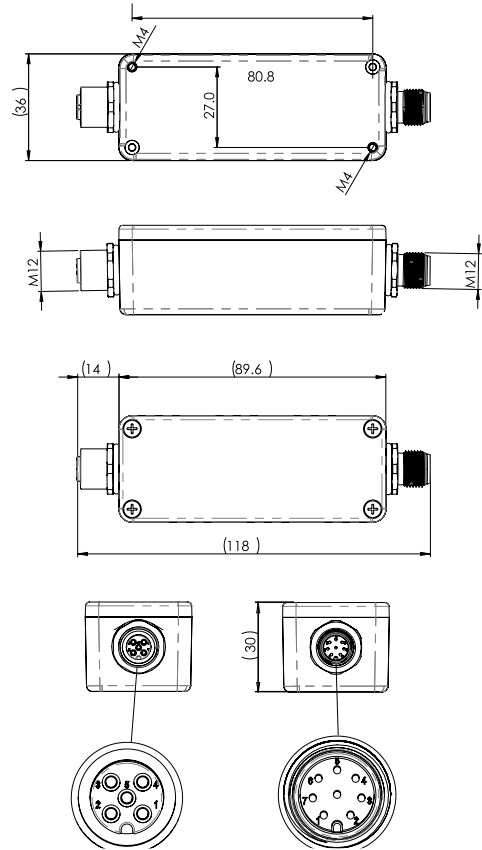
Mechanical data

Material	Aluminum
Electrical connection sensor	M12 socket (5-pin, A coded, female)
Electrical connection control	M12 plug (8 pin, A coded, male)
Mounting 2x M4 countersunk screw. (27x 80.8mm)	Thread depth: 6 mm

Environmental data

Ambient temperature	0 ... +70 ° C
Storage temperature	-40 ...+85 ° C
EMV standards	EN 61000-4
Protection rate	IP67

Mechanical dimensions



X-201-IN09-x-KL-3-M12-1

With screw terminal (sensor) and
M12 plug (control)



Specifications

Performance

Sensitivity	0 ... 1.0 mV/V 0 ... 1.25 mV/V 0 ... 1.5 mV/V 0 ... 2.0 mV/V 0 ... 3.0 mV/V 0 ... 4.0 mV/V
Linearity	<0.01 % from full scale
Zero point temperature coefficient	< 0.01 % / °C
Bandwidth	DC...5kHz (-3dB)
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Power supply	18...30 VDC, <60mA
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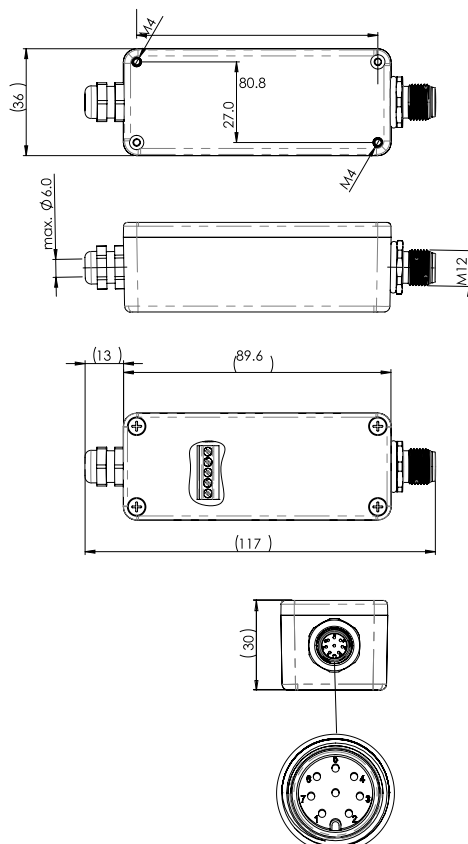
Mechanical data

Material	Aluminum
Electrical connection sensor	Terminals for cable connection
Electrical connection control	M12 plug (8 pin, A coded, male)
Mounting 2x M4 countersunk screw. (27x 80.8mm)	Thread depth: 6 mm

Environmental data

Ambient temperature	0 ... +70 ° C
Storage temperature	-40 ...+85 ° C
EMV standards	EN 61000-4
Protection rate	IP67

Mechanical dimensions



Pin assignment M12

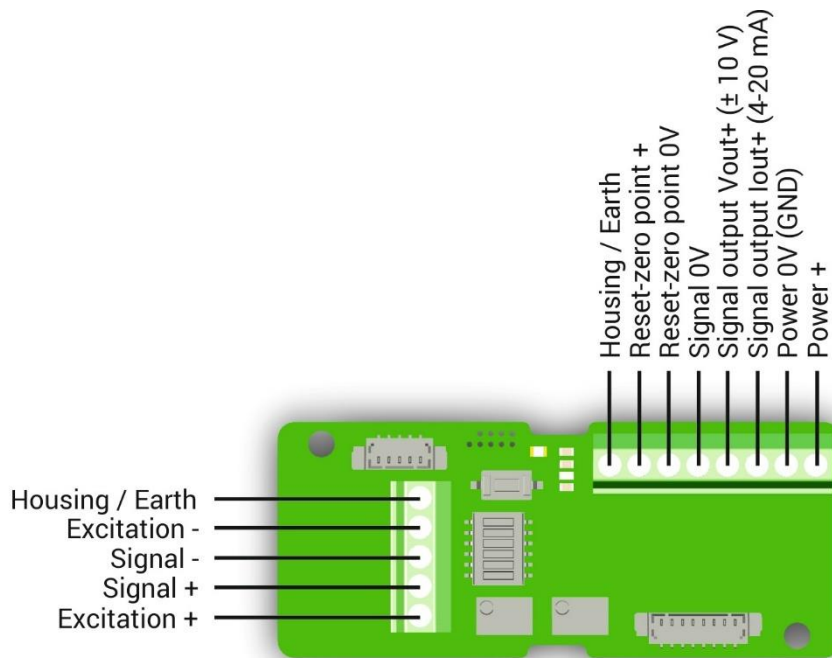
Built-in socket M12, 5-pin, female on the sensor side

Pin code	Function
1	Excitation +
2	Signal +
3	Signal -
4	Excitation -
5	Housing / Earth
Pin 5 does not have to be connected	

M12 plug for PLC connection, 8-pole, male

Pin code	Function
1	Power +
2	Housing / Earth
3	Reset-zero point 0V
4	Reset-zero point +
5	Signal output Vout+ (± 10 V)
6	Power 0V (GND)
7	Signal 0V
8	Signal output Iout+ (4-20 mA)
Pins 6 and 7 are galvanically connected	

Pin assignment of screw terminals, wire cross-section: 1.5 mm²



Zero point adjustment "control input"

The zero point adjustment of these measuring amplifiers is carried out by a digital zero point adjustment mechanism. The zero point setting is saved permanently. This means that the zero point correction is still available even after a power failure.

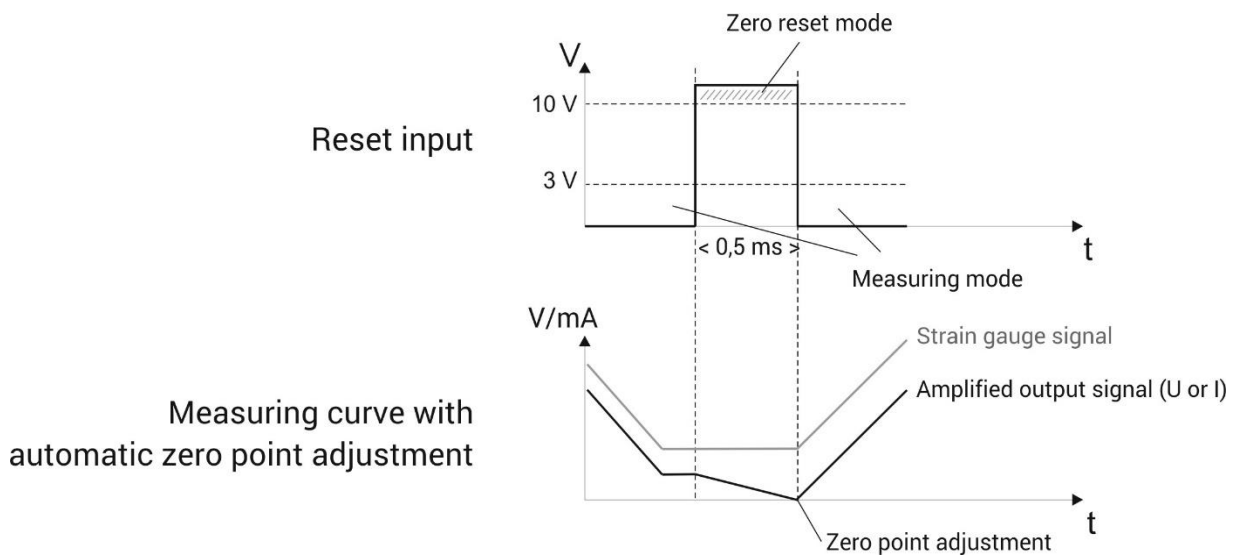
The number of zero point taring processes is unlimited. Therefore, these measuring amplifiers are suitable for both dynamic and static applications. They can be used in any application that requires a periodic process tare or a one-time installation tare.

The taring mechanism for adjusting the zero point is available with an "Active Low" and "Active High" logic.

The following characteristic values are applicable for the external zero point adjustment:

External zero reset	Active low	Active High
Measurement mode	> 10 V or open	< 3 V or open
Zero point adjustment	< 3 V	> 10 V
Minimal pulse duration	0.5 ms	0.5 ms

The following diagram describes the behavior of the amplifier in reference to the zero adjustment control input:



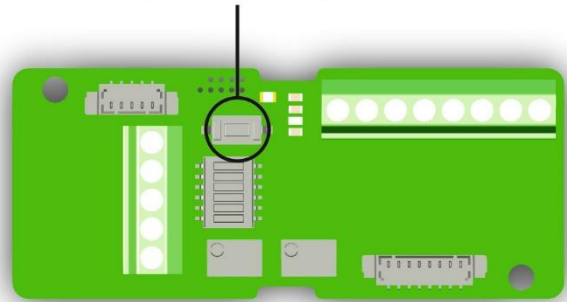
Zero point adjustment "Onboard"

The zero point can be taught in by pressing a button.

The zero point adjustment is carried out as long as the Zero button is pressed. The output signal is set to zero at this moment.

The zero point correction learned by pressing the «Zero» key is always saved as an installation tare and cannot be lost. This means that the zero point correction is still available even after a power failure.

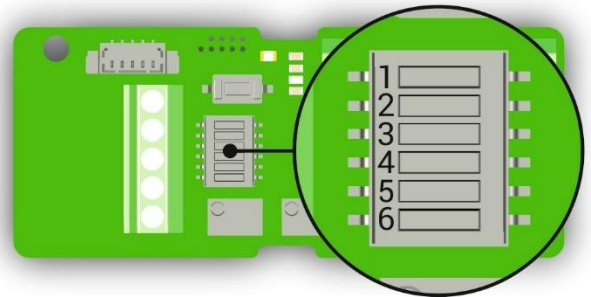
Onboard Zero-Reset



Supply voltage of strain gauge bridge

The bridge supply can be set to 4 V and 8 V using the corresponding DIP switches. The following applies: Low-resistance sensors should be fed with 4 V, while high-resistance sensors should be fed with 8 V. In order to keep the self-heating as low as possible, the lower supply voltage should always be selected in case of doubt.

DIP Switch 1:
4 V (ON) / 8 V (OFF)



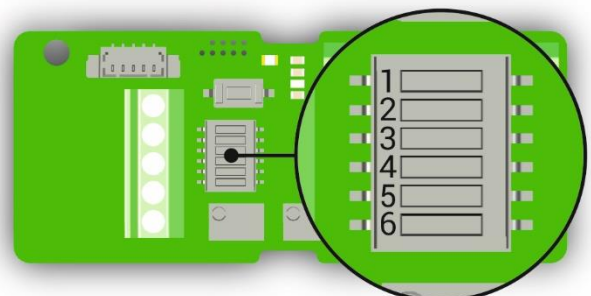
Supply voltage of strain gauge bridge

DIP switch	Voltage	Bridges resistance	Factory setting
SW 1 ON	4 V DC	120...10 kΩ	Default
SW 1 OFF	8 V DC	350...10 kΩ	-

Configuration current output

The current output can be configured between 4 ... 20 mA and 0 ... 20 mA using a DIP switch.

DIP Switch 6:
0 mA (OFF) / 4 mA (ON)



Configuration of current output with DIP switches

DIP switch	Current output	Factory setting
SW 6 ON	4...20 mA	Default
SW 6 OFF	0...20 mA	-

Factory setting / Sensor sensitivity adjustment

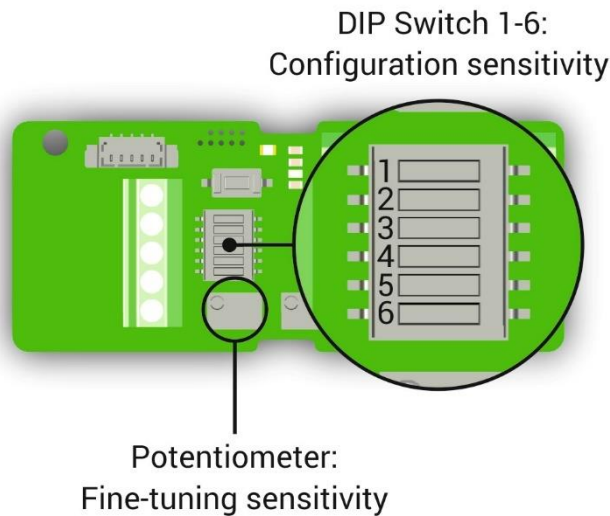
The measuring amplifier has a preset input sensitivity. With the DIP switches and the potentiometer, the input sensitivity can be set in a wide range as required. Please note, however, that this will result in the loss of the factory calibration.

The following applies to the bridge supply: Low-resistance sensors should be supplied with 4 V, while high-resistance sensors should be supplied with 8 V. In order to keep the self-heating as low as possible, the lower supply voltage should always be selected in case of doubt.

The following areas can be selected using the DIP switches:

SW 1 (supply)	SW 2 (RG100)	SW 3 (RG200)	SW 4 (RG400)	SW 5 (RG1200)	Sensor sensitivity
ON (4V)	OFF	OFF	OFF	ON	0...0.6 bis 0...1.8 mV/V
ON (4V)	OFF	ON	ON	OFF	0...1.2 bis 0...3.6 mV/V
ON (4V)	OFF	OFF	ON	OFF	0...1.8 bis 0...5.4 mV/V
OFF (8V)	OFF	OFF	OFF	ON	0...0.3 bis 0...0.9 mV/V
OFF (8V)	OFF	ON	ON	OFF	0...0.6 bis 0...1.8 mV/V
OFF (8V)	OFF	OFF	ON	OFF	0...0.9 bis 0...2.7 mV/V
OFF (8V)	OFF	ON	OFF	OFF	0...1.8 bis 0...5.4 mV/V

The final value can be fine-tuned with a potentiometer. Compare the final value simulated using a strain gauge simulator. You can set the final value to the desired value by turning the potentiometer.



Output

The measuring amplifier offers two calibrated signal outputs, a voltage output and a current output. The relationship between current and voltage output is set in such a way that the current output 100% is controlled when the voltage output is also controlled to 100 %.

$U_{out} 0... 10 \text{ V} = I_{out} 0... 20 \text{ mA}$ (or $4... 20 \text{ mA}$)