Installation Instructions

Inline Charge Amplifier IA...

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The national and local regulations for environmental protection and raw material recovery must be observed when disposing of charge amplifiers that are no longer usable. Please dispose of separately from regular household waste. For further information on disposal, please contact the local authorities or the dealer from whom you purchased the product.

The information presented in this document reflects the current state of knowledge. ConSenses reserves the right to make technical changes. Liability for consequential damages resulting from the use of ConSenses products is excluded.

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Content

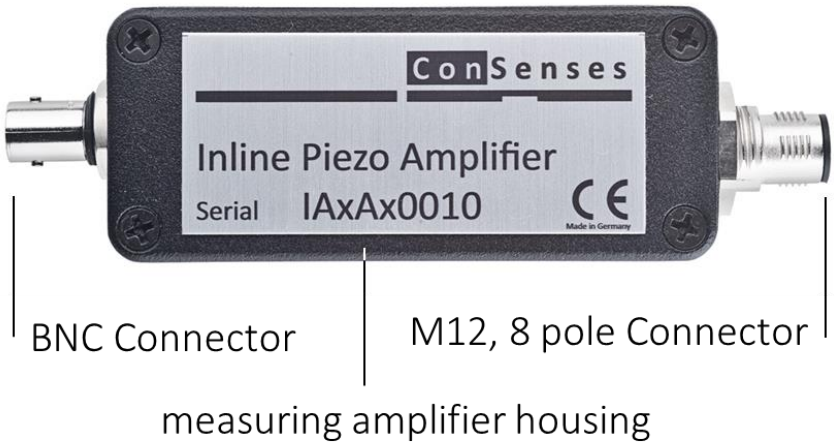
Failure to observe safety instructions may result in damage to persons or the machine. Therefore, please observe the safety instructions before each use.

If you have any questions about this product, please contact the manufacturer:

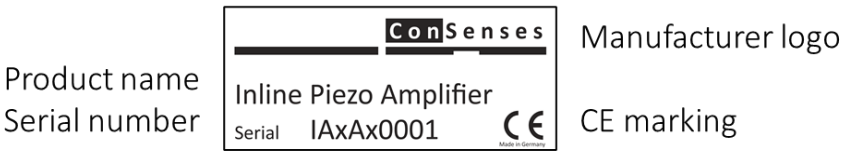
ConSenses GmbH, Arheilger Weg 11, 64380 Roßdorf
Email: info@consenses.de

1. Scope of delivery and accessories

The measuring amplifier is delivered with test protocol for each input range.



Labeling:



The plug connection on the charge amplifier is detachable. The measuring amplifier is available under the following order number:

Order number	Description
01.30008	Inline Charge Amplifier IA

Suitable signal cables in various lengths, as well as solutions for cable routing on moving assemblies, are available on request.

2. Operating principle and instructions for use

The advantages of the Inline Charge Amplifier IA include:

- One charge amplifier channel with three gain options, selected via DIP switches or digital inputs (3.3… 30 V)
- Internal and external switching capability; external input automatically overrides internal if connected
- Nominal voltage supply 24 VDC (18 ... 30 V, unregulated)
- Galvanically isolated measuring signal, power supply and digital inputs.

2.1. Operating principle

This charge amplifier works on the principle of an electronic integrator. The capacitive negative feedback of a high-impedance operational amplifier converts positive and negative charge displacements into an analog voltage signal. A digital signal (0...2.7 V corresponds to "OFF", 3.3...30 V corresponds to "ON") is used to switch between the operating modes "Operate" (ON) and "Reset" (OFF) by specifying a measurement window at D-In 1. The signal for pre-setting the measuring window is galvanically isolated from the charging electronics by an optocoupler.

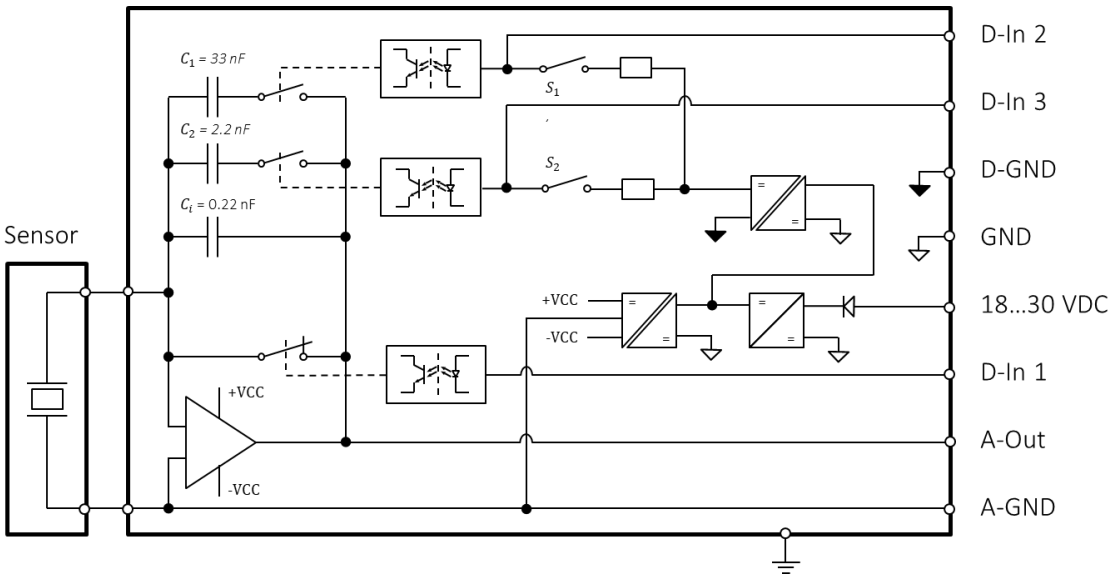


Figure 1: Block wiring diagram

In "Operate" mode, a continuous time integration of the charge shifts by the connected piezoelectric sensor takes place. In "Reset" mode, a short-circuit of the input capacitance triggers an equalization of the charge shift.

The device has one channel for signal conversion with 3-fold adjustable amplification.

2.2. Setting options

By selecting or deselecting input capacitances, the -10 ... 10 V analog signal can be adapted to different charge ranges. Thus, the output signal can be amplified when low charge ranges are present.

The following gain settings are possible as a result (the factory setting is in **bold**):

S1 (D-In 2)	S2 (DIn-3)	Input capacity nominal	Gain	Charge range
1	**1**	**35,4 nF**	**1**	**± 354.200 pC**
1	0	33,2 nF	1,1	± 332.200 pC
0	1	2,4 nF	14,6	± 24.200 pC
0	0	0,22 nF	161	± 2.200 pC

Table 1: Possible amplification settings

Gain can be set either by means of DIP switches or by digital switching signal. A third variant of the pre-setting arises in connection with potential-free switches.

2.2.1. Setting using the internal DIP switches

Open the housing cover to adjust the gain. To do this, the four fastening screws must be removed (see Figure 2). Please make sure that the device is de-energized, for example by removing the connection cable on the side of the M12 connector.

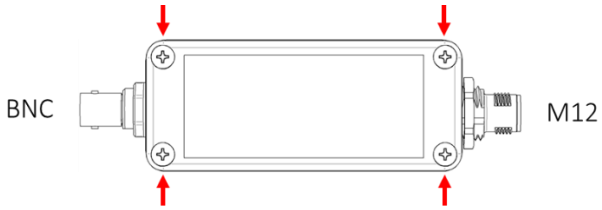


Figure 2: Fastening screws on the cover

Inside the device there are two DIP switches with two positions each, "ON"(1) and "OFF"(0):

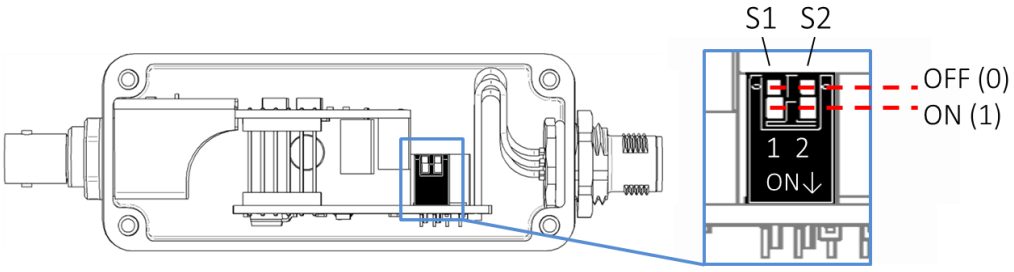


Figure 3: Arrangement of the DIP switches in the device

Using the switch setting, the desired gain settings can be made according to Table 1.

Then replace the cover and screw it tight. Make sure that the seal is correctly seated and observe the tightening torque of 0.25 ... 0.30 Nm for the fastening screws.

2.2.2. Setting using a digital signal

Independent of the position of the internal DIP switches, a digital signal can be applied to digital inputs 2 and 3 to set the gain. The following voltage ranges are provided:

- 0 ... 2.7 V corresponds to "low"
- 3.3 ... 30 V corresponds to "high"

The digital output used must be capable of delivering or receiving a maximum current of 5 mA. The latter is only important if at least one of the DIP switches is set to "On". If it is ensured that both DIP switches are set to "Off", no capability for current consumption is required.

2.2.3. Setting using potential-free contacts

If the gain ranges are to be set by means of potential-free contacts or jumpers, the following procedure is recommended:

- Set the two DIP switches to "On" (factory setting)
- Switch the desired digital inputs 2 and/or 3 against D-GND by closing the potential-free contact(s) or by setting one or two jumper(s) for contacting.

The potential-free contact or the jumper causes a "pull-down" with a maximum of 5 mW power loss at the respective digital input of the charge amplifier.

3. Safety information

3.1. Intended use

The Inline Charge Amplifier IA is designed for use as a signal converter in measuring chains for measuring quasi-static and dynamic charge displacements within the input signal limits specified by the technical data of the respective measuring range. Use as a signal converter within a measuring chain for monitoring machine functions also requires compliance with safety factors.

Any other use is not in accordance with the intended use.

To ensure safe operation, the product may be used only in accordance with the information in these installation instructions and in compliance with the following safety regulations and the technical data provided. During use, the legal and safety regulations required for the respective application must also be observed. This also applies analogously to the use of accessories.

The charge amplifiers are not intended for use as safety components. Proper transport, storage and installation, as well as careful operation and maintenance, are prerequisites for trouble-free and safe operation of the charge amplifiers.

3.2. Operating personnel

This product is to be installed and operated exclusively by qualified personnel in accordance with the technical data in connection with the safety rules and regulations detailed below.

Qualified personnel includes persons who have been instructed in the handling and safety concepts of the system to be examined as operating personnel and who are familiar with the operation of the product described in this documentation. They must have carefully read and understood the installation instructions and the safety instructions.

When using the charge amplifiers, the legal and safety regulations required for the respective application must also be observed. This also applies analogously to the use of accessories.

Ensure that you work in a safety-conscious manner and comply with the relevant accident prevention regulations, e.g. those of the employers' liability insurance associations.

3.3. Safety regulations and load limits

For safe operation of the charge amplifier, it is essential to observe the installation instructions and load limits. The maximum loads specified in the technical data sheets must not be exceeded under any circumstances. This concerns:

- Maximum charge displacement at the measurement input with the corresponding gain setting
- Procedure for adjusting amplification factors
- Temperature limits.

Signal lines of the sensors must be installed in such a way that electromagnetic emissions do not cause any impairment of the transmitter function.

Before each commissioning, a project planning and risk analysis must be carried out that takes into account all safety aspects of the surrounding technology. In particular, this concerns personal and facility protection.

In order to avoid defects or faults in systems that could result in personal injury, system damage or loss of data, supplementary safety precautions must be taken.

3.4. Supplementary safety precautions

As measuring amplifiers, charge amplifiers cannot assume any safety-relevant functions. This requires additional components and equipment for which the installer and operator must take care. Electronics which process such a measuring signal must be designed in such a way that no consequential damage can occur in the event of a measuring signal failure.

In the event of a fault, in which people or property may be harmed by the release or malfunction of the product, the user must take precautions to ensure a safe operating state. Such precautions can be taken, for example, by means of separating or non-separating protective devices or similar and must at a minimum meet the requirements of the relevant accident prevention regulations.

3.5. General hazards due to failure to observe the safety instructions

The charge amplifiers correspond to the state of the art and are safe to operate. There are residual risks in the event of improper use. For this reason, every person who is responsible for the installation, commissioning and dismantling of the charge amplifier must read and understand the operating instructions and, in particular, the safety instructions.

Damage, malfunction, failure or loosening of the charge amplifier may result from improper use of the charge amplifier or from failure to observe the safety regulations. In particular, loosening of the charge amplifier can cause damage to property or persons in the vicinity of the charge amplifier.

The performance and scope of delivery of the product covers a charge amplifier up to the standardized connection and is only one part of a measuring chain. Safety-related aspects of the measuring chain must additionally be planned, implemented and answered for by the system planner/equipment supplier/operator in such a way that residual hazards are minimized in accordance with applicable regulations and are identified as intended. Relevant regulations and guidelines are to be observed.

3.6. Modifications and change

The product may not be modified without the express consent of the manufacturer. Any modification excludes liability of the manufacturer for resulting damages.

4. Mechanical installation

4.1. General installation guidelines

Ensure that charge amplifiers IA are protected from adverse conditions such as salt water, snow, rain or ice.

Protect the contact points from contamination and do not touch the connections. False signals occur when the insulation resistance of the electrical measurement setup consisting of piezo sensor, signal line and signal converter decreases. Signs of insufficient insulation resistance are positive or negative signal drifts of the output signal already without applied force.

You should avoid using the charge amplifier in extreme humidity (>90 % rel. humidity, or thawing atmosphere). Charge amplifiers with connected signal line have protection class IP67 according to DIN EN 60529. This protection class is guaranteed only if the plug is properly mounted to the measuring amplifier and the housing including the seal is correctly screwed together.

Ensure that the measuring amplifiers do not come into contact with chemicals that can affect the surface. Also protect the signal line from aggressive chemicals. Acids and other substances that have a corrosive effect release ions that can cause the charge amplifier to fail. In this case, please initiate appropriate protective measures.

Make sure that the charge amplifier is not overloaded (see Section 3.3). In the event of an overload, there is a risk of defect, which may result in hazards for operating personnel and the facility. Take suitable measures to protect against overload or to safeguard against the consequences of a defect.

4.2. Installation

The charge amplifiers can be mounted either within a cable harness or by means of a fastening screw at the screw-in point on the rear.

The screw-in torque for the M5 screw-in rivets is between 4 and 6 Nm, depending on the thread condition and friction conditions. The maximum screw-in depth must not exceed 12.5 mm.

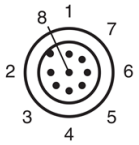
During assembly, ensure that the charge amplifier is not mechanically overloaded.

5. Connection

Screw the data line onto the charge amplifier by hand and avoid using tools. Make sure that the connection point is easily accessible.

Please ensure that the following assignment is observed for the connection cable:

1	0V
2	18 ... 30 VDC
3	D-In 1 (Reset/Operate)
4	D-In 2 (33 nF)
5	D-In 3 (2.2 nF)
6	A-GND
7	Analog signal (-10 ... 10 V)
8	D-GND



Pin configuration

Figure 4: Pin configuration

If you purchase cables from ConSenses original accessories, the following specifications apply to the shielded connection cable with open ends:

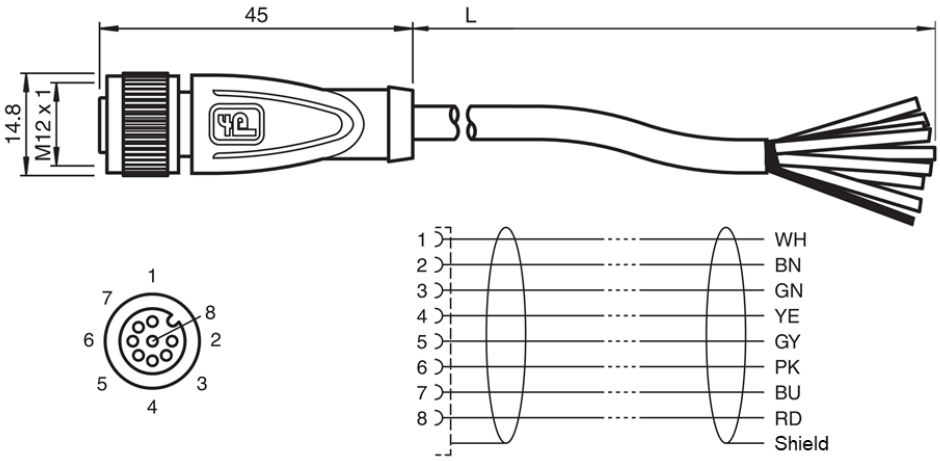


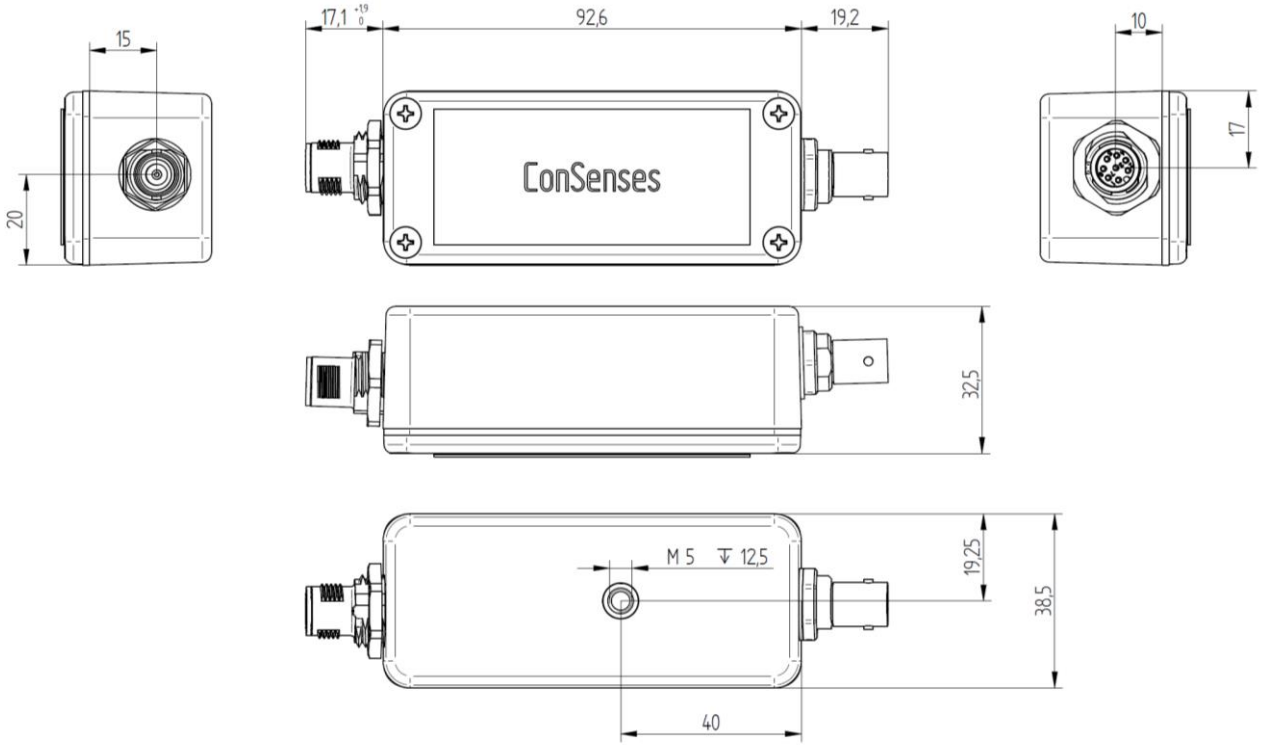
Figure 5: Cable assignment

When laying the cable, please ensure that the cable is moved as little as possible and preferably remains still. The minimum cable bending radius is 45 mm.

Avoid stray fields from motors, transformers and contactors and do not lay signal lines in the immediate vicinity of power lines or on hot parts.

6. Technical data

6.1. Dimensions



6.2. General data

Digital inputs	V	0…2.7 “OFF” (0); 3.3…30 “ON” (1)
Maximum power dissipation D-In 2 & 3	mW	5
Supply voltage	V	DC 18 … 30, recommended: 24
Current consumption	mA	max. 100 @ 24 VDC
Output voltage	V	nominal -10 … 10 (maximum -12 … 12)
Overload limit charge input	%	200
Operating temperature range	°C	-20 … 70
Protection class according to DIN EN 60529 (with cable connected)		IP67
Weight	g	135

7. Declaration of conformity

CE

We,

ConSenses GmbH, Arheilger Weg 11, D-64380 Roßdorf, Germany

declare under sole responsibility that the product

Charge Amplifier

in the versions

IA...

complies with the following regulation of the European Union:

Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility

The relevant standards or normative documents used as a basis are listed below:

EN 61326-1: 2013 Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

EN 61326-2-3:2013 Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3 Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

Signed for and on behalf of:

ConSenses GmbH

Roßdorf, December 1, 2021

Dr. Matthias Brenneis, Executive Director