DISCOM GmbH
Systeme für die Akustische Qualitätsanalyse

Telefon: +(49) 551 / 54833-0
Telefax: +(49) 551 / 54833-43
E-Mail: discom.office@hbkworld.com
http://www.discom.de

User Manual

ICA10 – Charge to IEPE Converter

Please read this manual carefully and follow the instructions before installing the device.

1 Safety Instructions

Read this operating manual before operating the device for the first time. Any persons assigned to install, commission, operate or maintain the device must have read at least the sections of the operating manual of relevance to them. The operating manual forms part of the product. Keep it in a safe place so that it is permanently accessible to all users. If you pass the device on to a third party, always pass it on together with the relevant documents.

Intended Use

The ICA10 charge converter is to be used exclusively for measurement tasks and directly related control tasks (automation systems). Use for any purpose other than the above is deemed to be non-designated use. In the interests of safety, the device should only be operated as described in the operating manual. The device may only be powered by an IEPE-compatible constant current, for details see
the specifications.

Conditions at the Place of Installation

- Protect the device from direct contact with water.
- Protect the ICA10 from moisture and dampness or weather such as rain, snow, etc.
- Do not expose the device to direct sunlight.
- Please observe the permissible maximum ambient temperatures stated in the specifications.

- The permissible relative humidity at 31 °C is 95 % (non condensing); linear reduction up to 50 % at 40 °C.
- It is safe to operate the ICA10 up to an altitude of 2000 meters.

Conversions and Modifications

The device must not be modified from the design or safety engineering point of view except with our express agreement. In particular, any repair or soldering work on the printed circuit board is prohibited. The device must not be opened. ICA10 is delivered from the factory with a fixed hardware and firmware configuration. Changes can only be made within the possibilities documented in the operating manual.

Qualified Personnel

This device is only to be installed and used by qualified personnel (electricians or persons trained in electrical engineering), strictly in accordance with the safety regulations listed here. This includes personnel who meet at least one of the three following requirements, depending on their assigned tasks:

- Knowledge of the safety concepts of measurement and automation technology is a requirement and as project personnel, they must be familiar with these concepts.
- As measurement or automation system operating personnel, they have been instructed how to use the equipment. They are familiar with the operation of the equipment and technologies described in this document.
- As commissioning engineers or service engineers, you have successfully completed the training to repair the automation systems. You are also authorized to operate, ground and label circuits and equipment in accordance with safety engineering standards.

Residual Dangers

The ICA10 charge converter is a state-of-the art unit and as such is reliable. The scope of supply and performance of the ICA10 charge converter covers only a small area of measurement technology however. In addition, equipment planners, installers and operators should plan, implement and respond to the safety engineering considerations of measurement technology in such a way as to minimize residual dangers. For example, automation equipment and devices must be designed in such a way that adequate protection or locking against unintentional actuation is provided (e.g. access controls, password protection, etc.). When devices are working in a network, these networks must be designed in such a way that malfunctions in individual nodes can be detected and shut

down. Safety precautions must be taken both in terms of hardware and software, so that a line break or other interruptions to signal transmission do not cause undefined states or loss of data in the automation device.

Introduction

The ICA10 is an in-line charge amplifier for charge accelerometers, such as Discom's KS91D. The accelerometer's high-impedance charge signal is converted to a low impedance voltage signal. It is very easy to use due to its IEPE-compatible (ICP® or CCLD®) output interface, as the ICA's voltage output signal and the IEPE constant current supply use the same coaxial cable. The IEPE-supply is provided by all Discom's analog TAD input cards (TAD28, TAD48, TAD48+). As usual for charge amplifiers, the output is inverted.

General Installation Instructions

Installation should be done by personnel trained to do electrical installations. Please refer to your local security guidelines. To avoid failures and to increase lifetime of the device, make sure that the installation site meets the following criteria:

- It is not near very high heat sources,
- It is not near a magnetic device
- It is not in a damp and / or dusty environment
- It is in an environment free of aggressive chemicals

ICA Specific Installation Instructions

Cable connection: ICA to charge mode **<u>accelerometer</u>**:

- UNF-connector
- only with *low noise cable*
- the maximum recommended cable length is 1.5 m
- **ATTENTION:**
  Very high voltages or accumulated charges on the input cable or sensor can destroy the ICA10's internal FET input transistor. Therefore take care of the following:
  - *Before connecting* the input cable, discharge the sensor / cable by shorting the cable's center pin to the outer cable conductor with a metallic object.
  - *Avoid any contact* to the ICA's input terminal to any object that could hold an electric charge (incl. human body / hands).

Cable connection: ICA to TAS measurement **<u>frontend</u>**:

- BNC-connector
- standard shielded coaxial cable is recommended
- the maximum recommended cable length is 15 m (absolute allowed maximum length is 25 m)
- enable the IEPE supply of the connected TAD channel (in Tasalyser / TAS Settings / A/D Channel Settings / Coupling: select "ICP")

CAUTION:

- The ICA case and all cables must not have any electrical connection to anything but the TAS frontend! Make sure that all parts of the ICA10 and the BNC connectors are electrically isolated from the test stand.
- Avoid extension cables.
- For further cable routing instructions follow the guidelines described in the TAS frontend user manual.

Mounting

The ICA10 comes with twa plastic holders, which can be mounted to a suitable surface. The holders will accommodate M5 screws (screws are not part of delivery).

Figure 1: ICA10 with holders

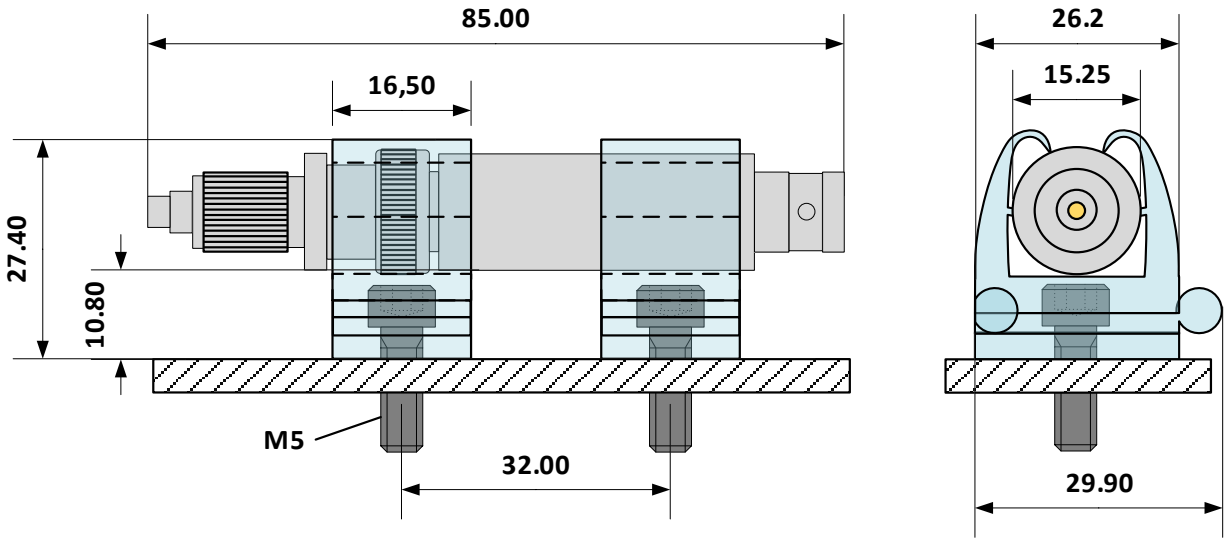

Figure 2: Dimensions of ICA10 with holders (in mm)

Operation Instructions

Self-Test

After having followed the cabling instructions above, a simple test can be performed within the Tasalyser by setting the connected TAD channel to ICP "Test" mode (in Tasalyser / TAS Settings / A/D Channel Settings / Coupling: select "ICP", and ICP operation: select "Test").
In ICP test mode the TAD's 30V input range is selected and the input is DC coupled, with the IEPE constant current still active. Thus, the ICA's output bias voltage can be monitored, which should be at about 12V ±2V DC.
When turning off test mode back to "Standard", the "Sensitivity" must be reset manually to 10V (or lower, 30V is not recommended for normal operation with maximum linear signal levels of $\pm 5V_{PEAK}$).

Sensitivity: Sensor Signal to Output Voltage

Discom's standard charge accelerometer **KS91D** has a sensitivity of:

$$\mathbf{S_{KS91D} = 2.5\ pC / g}$$

with:

g: gravitational acceleration, 1 g ≈ 9.81 m/s2
pC: pico Coulomb

The **ICA10** has a 100 pF gain capacitor, so with an electrical charge input of $\mathbf{Q_{IN}}$ its output voltage $\mathbf{V_{ICA10}}$ calculates as follows:

$$\mathbf{V_{ICA10} = Q_{IN} / 100\ pF}$$

Setting the charge input $\mathbf{Q_{IN}}$ to a reference value of 1 pC we can get the ICA's sensitivity $\mathbf{S_{ICA10}}$:

$$\mathbf{S_{ICA10} = 10\ mV / pC}$$ (that's for the "10" in ICA**10**)

Combining KS91D and ICA10 we get the following output voltage from the ICA10 depending on the acceleration applied to the sensor:

$$\mathbf{V_{OUT} = S_{KS91D} \cdot S_{ICA10} = 2.5\ pC / g \cdot 10\ mV / pC}$$

$$\mathbf{\rightarrow V_{OUT} = 25\ mV / g}$$

Note: As with most charge amplifiers, the ICA's output is ***inverted*** compared to the input signal!

Service, Maintenance, Repair

Calibration

Apart from on-site calibration, we recommend a calibration interval of 1 year.

Maintenance

Due to its tightly closed casing the ICA10 is basically maintenance free.
If the connectors are dirty, clean with lint-free cloth, if necessary carefully apply cleaning alcohol to the cloth.

Repair

In case of malfunctioning contact Discom for assistance.

ICA10 – Specifications			
Input Characteristics			
Sensitivity (Charge-to-Voltage Conversion)	10 mV/pC ±2 %		
Input Range	±500 pC		±5 V at output
Linear Frequency Range	±3 dB ±5 %	0.7 Hz .. 80 kHz 1.6 Hz .. 30 kHz	with 15 m output cable (capacitive load)
Sensor Cable Length	max. 2 m recommended		low capacitance cable
IEPE Requirements			also ICP®, CCLD®
Constant Current Supply	2 mA .. 4 mA		
Excitation Voltage	18 V .. 28 V		DC
Output Characteristics	IEPE compatible		also ICP®, CCLD®
Output Bias Voltage	10 V .. 15 V		over temperature range
Noise	< 50 μV_{RMS}		bandwidth 0.5 Hz .. 20 kHz
Total Harmonic Distortion	≤ 1 %		@ 1 kHz / full scale input
Output Impedance	< 100 Ω		@ 2.3 mA
Input / Output Phase	inversion		output signal is inverted compared to input signal (typical for charge amps)
Coaxial Cable Length	max. 15 m recommended max. 25 m allowed		
Mechanical & Environmental			
Dimensions with isolation and UNF-adapter	15.25 mm 85 mm		diameter length
Weight (without cable)	38 g		g: gram
Case Material	brass, nickel-plated		
Cable Connection	radial		
Socket / Connector	IEPE: BNC, female Sensor: UNF 10-32, female		
Mounting	bracket or provided plastic clips		
Isolation	by heat shrink tubing		*see installation instructions*
Temperature Range (Operation)	-20 °C to +85 °C		
IP Protection Grade	IP40		