

Manfred Weber

Metra Mess- und Frequenztechnik Radebeul

D-01445 Radebeul

Meissner Str. 58

Internet: www.MMF.de

Phone +49-351-836 2191 Fax 836 2940

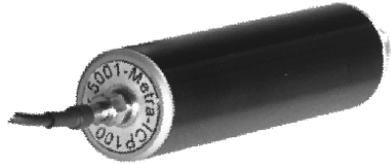
Email: Info@MMF.de



Operator's Manual

Charge Preamplifiers

ICP100 / 110 / 120



Application

The Charge Preamplifiers ICP1x0 are used for piezoelectric transducers with charge output. These types of transducers are frequently given preference over ICP[®] compatible transducers because of their smaller dimensions and their higher dynamic range. Sometimes high temperature at the measuring point does not allow electronic circuits near to this place.

The Charge Preamplifiers ICP1x0 have an ICP[®] compatible voltage output with low impedance. The output signal can be transmitted over long distances using inexpensive coaxial cables.

The ICP1x0 is supplied by constant current via the output cable. Therefore, a special cable for power supply is not required.

Function

The abbreviation ICP[®] means "Integrated Circuit Piezoelectric". It has been established between many other brand names as industrial standard for piezoelectric transducers. The integrated circuit of the Charge Preamplifier transforms the charge signal of the piezo ceramics, with its very high impedance and high sensitivity against interference, into a voltage signal with low impedance. This signal may be transmitted and processed much easier than the high impedance charge signal.

The distinguishing feature of the integrated circuits for impedance transformation is, that power supply and measuring signal are transmitted via the same cable. Figure 1 shows the circuit diagram. For easy separation of the low impedance output signal from the power supply, the amplifier circuit is supplied with constant current. This constant current has to be fed into the measuring line.

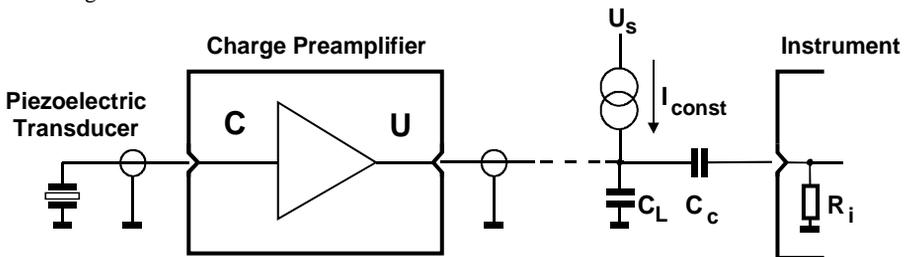


Figure 1: Principle of ICP[®]

U_s is the supply or compliance voltage of the constant current source. C_1 is the capacitance of the cable. The capacitor C_c decouples the direct current share of the output voltage of the Charge Preamplifier from the following measuring instrument.

When feeding the Charge Preamplifier with constant current, a positive DC voltage arises at the output. This voltage varies in dependence of the constant current and amounts to values from 9 V to 13.5 V. Round this bias voltage the measuring signal may oscillate with an amplitude of ± 3 V. The maximum voltage at the output of the Charge Preamplifier, consequently, is the sum of the maximum bias voltage and the maximum modulation: $U_{\text{amax}} = 13.5 \text{ V} + 3 \text{ V} = 16.5 \text{ V}$. Therefore, the voltage of the power supply has to be higher than U_{amax} . That means, the supply voltage of the constant current source has to be higher than 16.5 V. Many measuring instruments are already equipped with ICP[®] compatible inputs providing a constant current source and coupling capacitor. The Sensor Supply Unit Model M28 and the Signal Conditioners M32, M108, M116 and M68, for instance, are well suited for constant current supply.

The output voltage of a measuring chain consisting of piezoelectric accelerometer and Charge Preamplifier is the product of the acceleration at the measuring point (a), the charge sensitivity of the transducer (B_{qa}), and the gain of the Charge Preamplifier (B_{uq}):

$$U_a = a \cdot B_{\text{qa}} \cdot B_{\text{uq}} .$$

Connection

The piezoelectric transducer is connected to the Charge Preamplifier via an UNF 10-32 socket. Because of the high sensitivity of the charge input against interference it is recommended to use special low noise cable only, for example Metra's Model 009 or 010. With other cables the shielding effect is often insufficient. At mechanical strain, for example bending strain, an interfering signal, as the result of the so-called triboelectrical effect, may falsify the measuring value. At special low-noise cable material this effect has been minimized by coating the dielectric with a conductive plastic layer.

The length of the cable between accelerometer and Charge Preamplifier must be chosen in any case as short as possible. A length of more than 10 m is not recommended.

Any contamination of the charge input socket must be avoided.

The input of the Charge Preamplifier is protected against overvoltage pulses up to 1000 V. Such pulses may occur at shock load of accelerometers with charge output.

The cable between the Charge Preamplifier and the measuring instrument, however, may have a length of more than some 100 m. It is connected to the Charge Preamplifier through a BNC socket. Normal coaxial cable is sufficient for this purpose. Please pay attention to a low inner capacitance of the cable. The mentioned data refer to an inner cable capacitance of $C_1 < 10 \text{ nF}$. This corresponds, for example, to a length of about 100 m of standard cable material with a diameter of 5 mm, offered by Metra. A higher cable capacitance is possible, but will reduce the dynamic range at higher frequencies.

Mounting

For fixing the Charge Preamplifier, a pipe or cable clip (22 mm) is recommended. Doing this, pay attention to the fact, that the case of the Charge Preamplifier is grounded.

Technical Data

Gain (B_{uq})	
ICP100:	0.1 mV/pC \pm 2 %
ICP110:	1 mV/pC \pm 2 %
ICP120:	10 mV/pC \pm 2 %
Frequency range ($C_1 < 10$ nF):	0.25 .. 25 000 Hz (-3dB) 0.4 .. 12 000 Hz (-10%)
Input:	Charge input, UNF 10-32 socket
Overvoltage input protection:	up to 1000 V pulse
Output:	ICP [®] compatible, BNC socket
Dynamic range at the output: ($C_1 < 10$ nF)	$> 6 V_{p-p} / 2.3 V_{rms}$; at higher load capacity the dynamic range decreases at higher frequencies
Output impedance:	$< 50 \Omega$
Output bias voltage:	9 .. 13.5 V
Distortion factor ($C_1 < 10$ nF):	$< 0.5 \%$
Noise floor at the output at 25°C:	$< 200 \mu V$
Power supply:	Constant current 4 .. 20 mA Compliance voltage $> 16.5 V$
Gain stability in dependence of supply current:	$< 0.05 \%$ / mA
Operating temperature range:	-20 .. 80 °C
Case:	Aluminum, lateral surface anodized, grounded
Dimensions without sockets:	72 mm x 22 mm (1 x \emptyset)
Weight:	35 g

Limited Warranty

Metra warrants for a period of

24 months

that its products will be free from defects in material or workmanship and shall conform to the specifications current at the time of shipment.

The warranty period starts with the date of invoice.

The customer must provide the dated bill of sale as evidence.

The warranty period ends after 24 months. Repairs do not extend the warranty period.

This limited warranty covers only defects which arise as a result of normal use according to the instruction manual.

Metra's responsibility under this warranty does not apply to any improper or inadequate maintenance or modification and operation outside the product's specifications.

Shipment to Metra will be paid by the customer.

The repaired or replaced product will be sent back at Metra's expense.



Declaration of Conformity

Product: Charge Preamplifier

Models: ICP100 / 110 / 120

Hereby is certified that the above mentioned products comply with the demands pursuant to the following standards:

EN 50081-1

EN 50082-1

Responsible for this declaration is the producer

Metra Mess- und Frequenztechnik in Radebeul e.K.

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Declared by

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