Shenzhen Vkinging Electronic Co. Ltd

Vk10s-cla laboratory charge amplifier
——Precision, precision and reliability

Vk10s laboratory charge amplifier

Introduction:

VH10S-CLA is a charge amplifier developed for R&D test occasions. This product adopts variable sensitivity charge conversion unit, input impedance conversion unit, low noise amplification unit, adjustable filter unit, low noise power supply unit, etc., so that this product has the advantages of flexible and adjustable impedance sensitivity, flexible matching of filters, high precision, wide measurement range and low temperature drift. It is suitable for various occasions of charge device measurement and evaluation test.

The charge amplifier in vk10s-cla laboratory adopts the mode of all metal shielding and separate shielding of internal core unit again, with double-layer isolation of interference. The power supply unit adopts the design of wide input range and high reliability. This product can be used in occasions with strong industrial interference, and has the advantages of moisture-proof and shockproof.

characteristic:

- **integrates a voltage measurement unit**
- **Charge sensitivity :100pc/V, 1nc/V, 10nc/V, 100nc/V adjustable**
- **Input impedance 1M, 10M, 100M, 1G adjustable**
- **Gain x1, X5, X10, X100 adjustable**
- **Integrated low pass and high pass adjustable filter, high Q power frequency notch filter**
- **Adopts precision devices with high stability**
- **Metal shielding shell, strong anti-interference ability**
- **BNC input and output, easily connected to instruments**

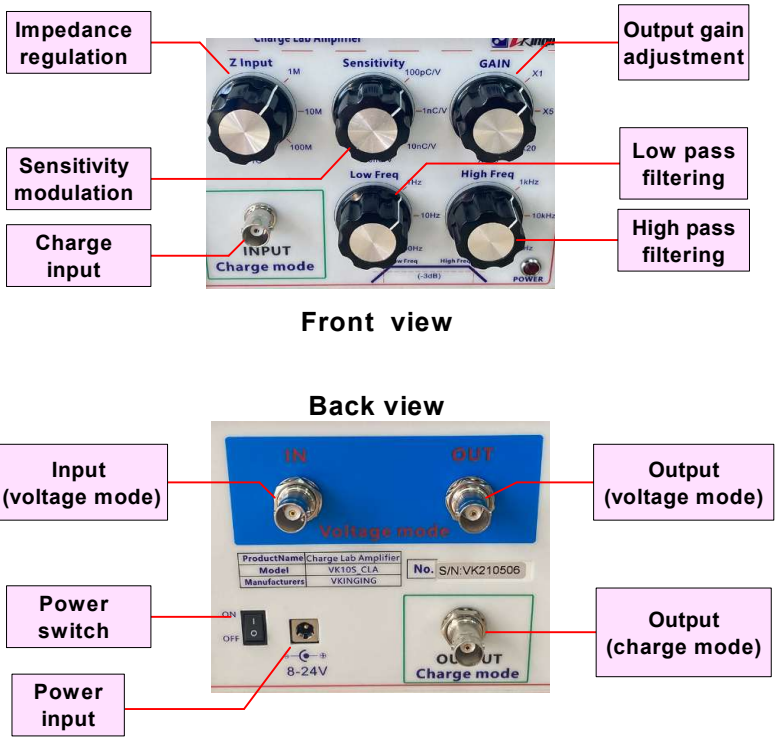
Application:

- Evaluation of piezoelectric materials for charge detection
- Measurement of piezoelectric effect and photoelectric effect
- Application of acceleration sensor
- Electrostatic detection

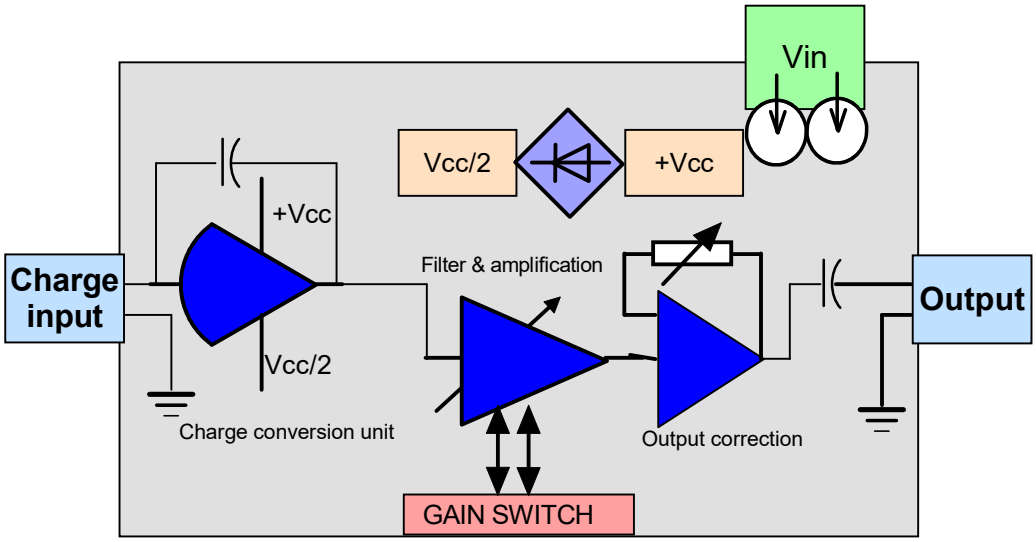
Basic parameters

Charge input range	100nc / V : 0 ~ ± 500000 PC 10nc / V : 0 ~ ± 50000pc 1nc / V : 0 ~ ± 5000pc 100pc / V : 0 ~ ± 500pc
Supply voltage	DC 8~24V
Frequency response	0.1Hz ~ 100Khz
Measurement accuracy	<1%
Input impedance	>1TΩ
Residual noise	<1mV

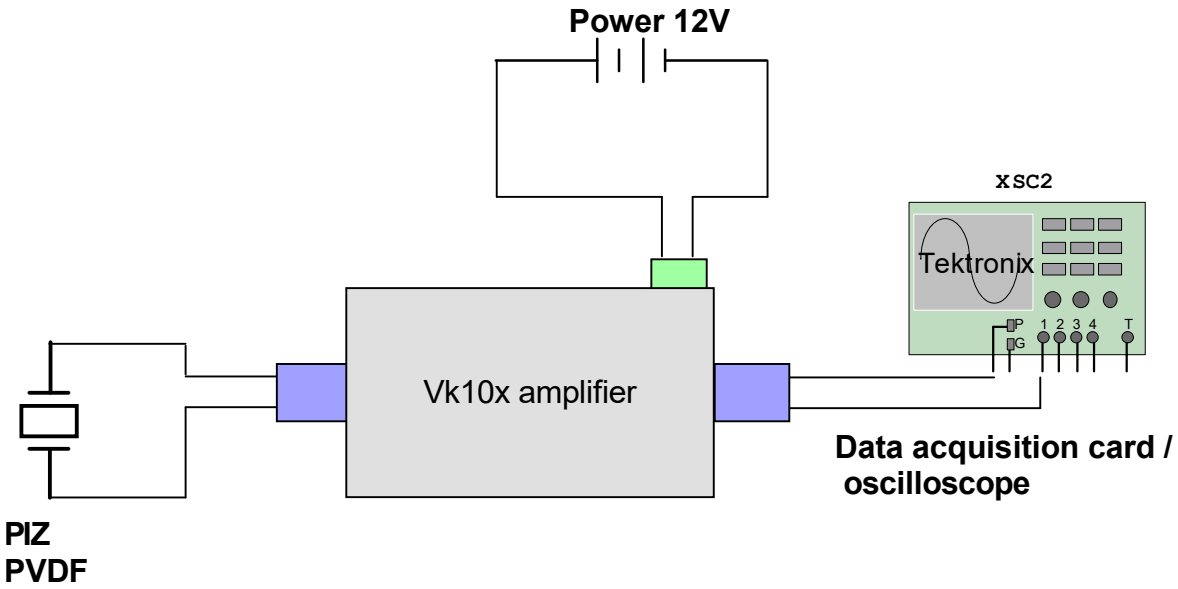
Port diagram



System block diagram



Typical application diagram



Vk10s laboratory charge amplifier

Electrical parameters

Item	Unit	Typical	Range
Supply voltage	V	8~24	5~30
Supply current	mA	200mA	150~300mA
Input mode		BNC single-ended input	
Input charge range		100nc / V gear: 0 ~ ± 500000 PC 10nc / V gear: 0 ~ ± 50000pc 1nc / V gear: 0 ~ ± 5000pc 100pc / V gear: 0 ~ ± 500pc	
Input charge frequency response range		0.1Hz ~ 100Khz	
Charge measurement accuracy		1% @filter off (AP gear)	
Filter type (high pass low pass)		Butterworth, 2 order HP, 8 order LP	
Equivalent input impedance switching range		1MΩ,10MΩ,100MΩ,1GΩ	
Low frequency filtering - 3dB frequency switching range		1Hz,10Hz,100Hz	
High frequency filtering - 3dB frequency switching range		1KHz,10KHz,100KHz	
DC input impedance	Ω	1T	
Output mode		BNC single ended output	
Output impedance	Ω	75	
Output voltage range	V	-4.5 ~ +4.5V	
Output bias voltage	mV	<1	
Working temperature	Centigrade	-40~ 85	
Storage temperature	Centigrade	-60~ 105	

Safe use value

Item	Unit		
Supply voltage	V	-1 ~ +35	*If the safe use value is exceeded, the device may be damaged and irreparable damage may be caused
Charge input port	V	+-2000 (with internal protection circuit)	
Output port	V	-1 ~ + 35V (internal protection circuit)	
All ports electrostatic input (ESD)	V	4000	

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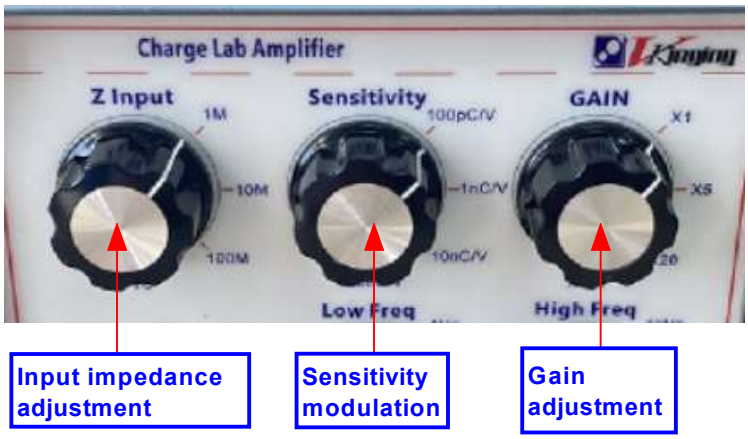
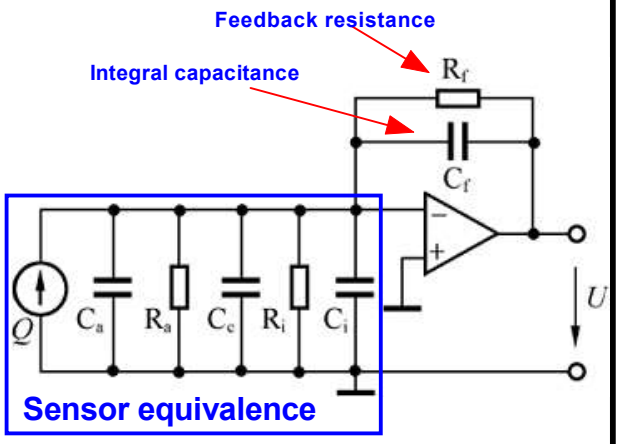
Use of amplifiers——
Input impedance (Z input), sensitivity (sensitivity), gain (gain)



Desktop charge amplifier panel



Charge amplification equivalent circuit

1. Input impedance (Z input)

The amplifier can switch four resistance values: 1MW, 10MW, 100MW and 1GW. The characteristic is that the smaller the input impedance is, the faster the discharge and attenuation of charge will be.Therefore, if the requirement for the rate of the signal is high, the low resistance value can be selected; on the contrary, if the requirement for the low-frequency signal is high, the high resistance value can be selected. It is usually used in conjunction with sensitivity

2、Sensitivity

There are four kinds of charge sensitivity: 100pc / V, 1nc / V, 10nc / V and 100nc / v. The higher the sensitivity, the smaller the corresponding CF value.It should be noted that it is used together with the input impedance (Z input) gear. The lower the sensitivity, the greater the CF value, and the less the charge is affected by the resistance.

Therefore, we suggest:

If low frequency response is required, it is configured as low sensitivity + high input impedance;

If high frequency response is required, it is configured as high sensitivity + low input impedance;

3、Gain

Gain is used for re amplification when the output signal is very weak.

Generally, we do not recommend using gain re amplification to keep it in X1 gear.

If it must be used, it is recommended to use gears 1 and 5 instead of X20 X100.

When it is necessary to use x20x100 gear to evaluate the signal, it is recommended to recheck whether the sensitivity is too small

Charge vs output voltage

The charge conversion sensitivity AC is:

Sensitivity AC = 100pc / V (100pc / V)

Sensitivity AC = 1000pc / V (1nc / V)

Sensitivity AC = 10000pc / V (10nc / V)

Sensitivity AC = 100000pc / V (100nc / V)

Then the charge CIN is equal to the output voltage Vout times the sensitivity AC

Cin = Vout * Ac

$$Cin = \frac{Vout \cdot Ac}{Gain}$$

However, if the gain is set, the gain gain must be calculated. The value of the charge conversion stage is the output voltage divided by the gain

CIN: amount of charge

AC: charge conversion sensitivity

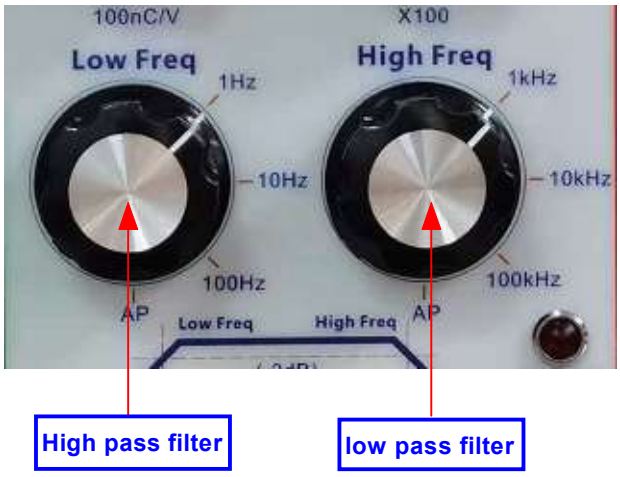
Gain: set magnification

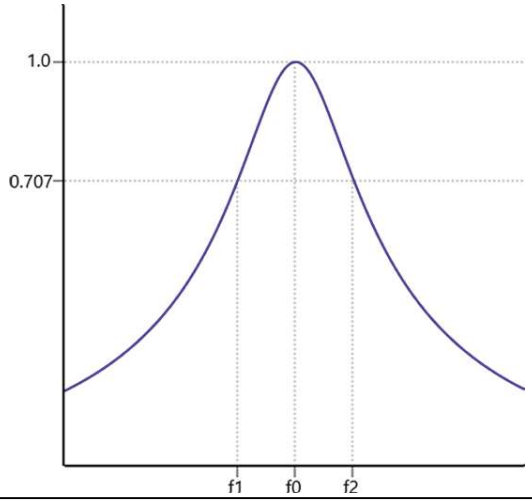
Vout: amplifier output voltage value

For example, if the sensitivity AC = 100nc / V is taken as an example, if the output is measured to 800mv peak, and the corresponding gain is gain = 20,

Then the charge is Cin = Vout * AC / gain = 100nc * 0.8v/20 = 4Nc

Use of amplifiers - filter 1





1. High pass filter (low freq knob)

The amplifier can set the turning frequency of high pass filter and has four options:
1Hz / 10Hz / 100Hz / AP direct.
For example, if 100Hz gear is selected, the frequency below 100Hz will be attenuated, and the frequency above 100Hz will pass directly.

AP pass through means that the filter is closed and the signal passes directly.

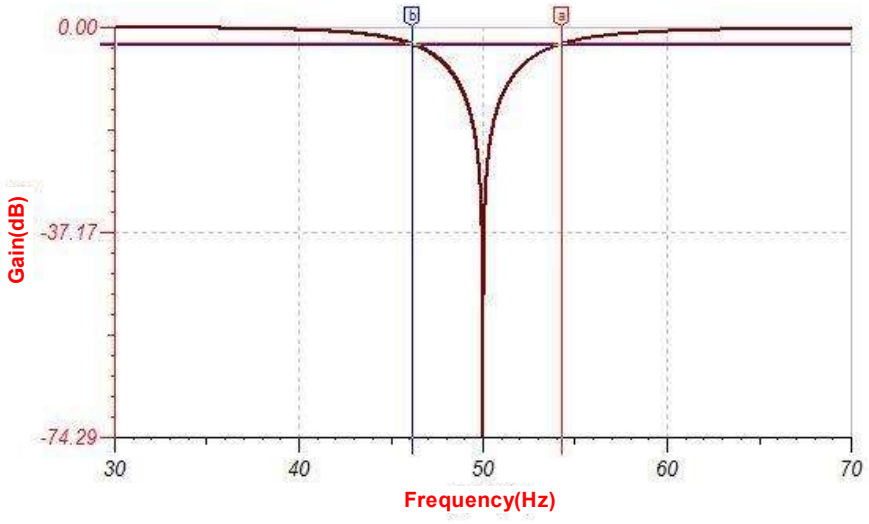
2. Low pass filter (high freq knob)

The amplifier can set the turning frequency of high pass filter and has four options: 1kHz / 10kHz / 100kHz / AP straight through.
For example, if 10kHz gear is selected, the frequency higher than 10kHz will be attenuated, and the frequency lower than 10kHz will pass directly.

AP pass through means that the filter is closed and the signal passes directly.

3. 50Hz notch filter

When the low-pass filter and the high pass filter are set at the AP gear at the same time, all signals are in the all pass state, and the additional 50Hz power frequency filter will be automatically started. Exit this mode as long as the high freq and low freq gears are not in AP gear at the same time. This function can be used in occasions with very high requirements for 50Hz interference, but the high pass and low-pass filters will be turned off automatically at the same time.

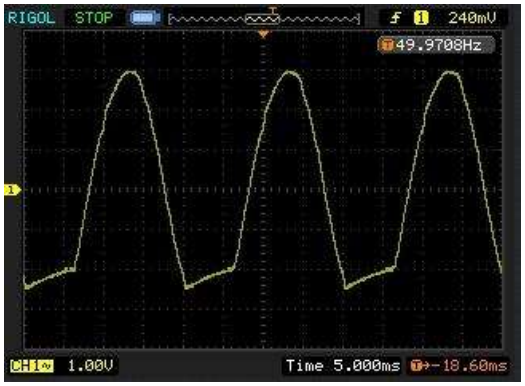


*If the measured frequency is between 40 and 6050Hz notch mode is not recommended

Use of amplifiers - filter 2

1. Adjust the filter to the maximum band-pass range (HP = 1Hz, LP = 100kHz) before determining the signal

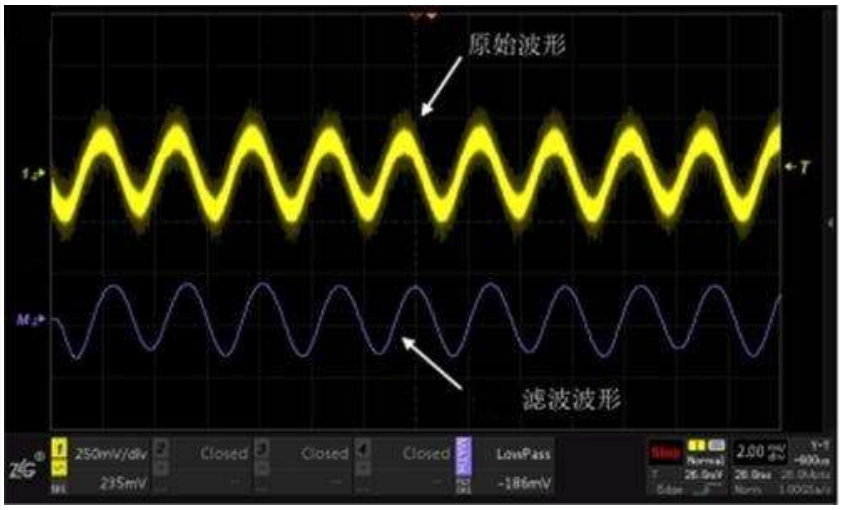
The function of filter is to filter out clutter. It is only a means to improve signal performance, not the ultimate method to solve the problem. Therefore, other means can be carried out only when the input waveform is not seriously deformed.



As shown in the figure, the signal below has been severely clipped because the input signal is too large. The adjustment direction at this time is to select greater charge sensitivity rather than filtering

Original signal defect

2. After improving the quality of the original signal as much as possible, turn on the filtering function selectively

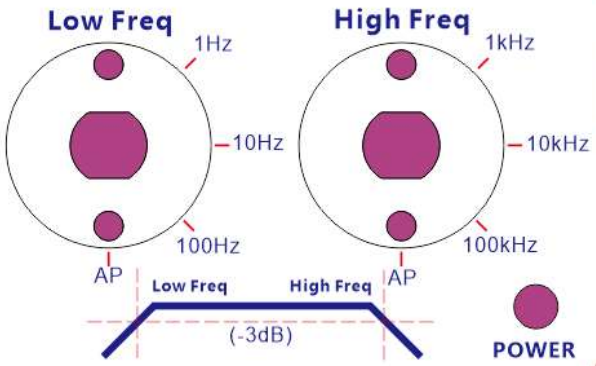


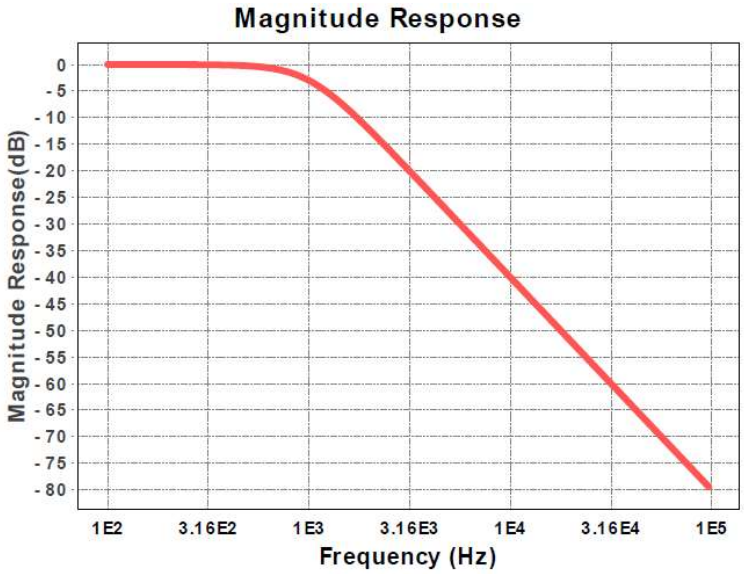
The original signal is good

As shown in the figure, the waveform shape is complete without serious distortion. It can be seen from the original waveform that "coarse hair" is caused by a variety of interference. At this time, turning on filtering and selecting appropriate filtering parameters will get good results

3. Bandpass filter is integrated in the amplifier, and the filter type is Butterworth

AP is all pass. When both filter gears are AP, the system automatically turns on the 50Hz notch filter





Frequency amplitude response characteristics of 1Khz filter

Voltage measurement mode

Voltage measurement mode

On the back of the charge amplifier is a separate voltage measurement mode function, and the corresponding input and output are independent interfaces.

In this mode, only the input impedance can be switched, and other filtering functions on the panel are no longer effective.

Input impedance switching (Z input)

The amplifier can switch 1MW, 10MW, 100MW and 1GW, with four resistance values in total. Switch the input resistance value on the front panel of the instrument to correspond to different attenuation ratios

***When measuring the voltage, adjust the input impedance of the front panel at the same timeInput impedance linked to voltage input mode**

Input gear	Input / output attenuation scale
1GΩ	1000：1
100MΩ	100：1
10MΩ	10：1
1MΩ	1：1

For example, when the gear is 100m, the voltage mode output Vout is measured as 4.2V, Then the actual input voltage is:

Vin= 4.2V*10=42V

At this time, the actual voltage at the input is 42V.

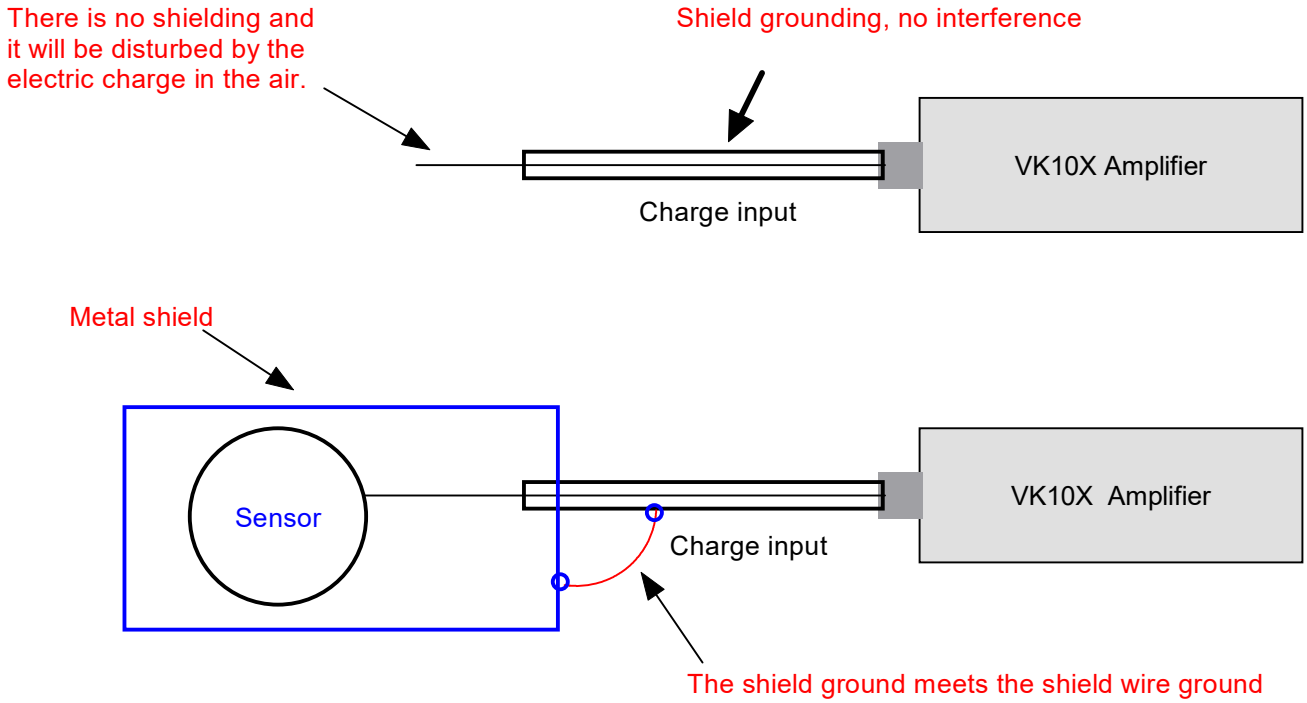
Precautions for use

Charge input processing

The input of the charge amplifier is the charge signal, and the unit is coulomb(C), 1 Coulomb(C) = 1,000,000 Micro coulomb(uC)

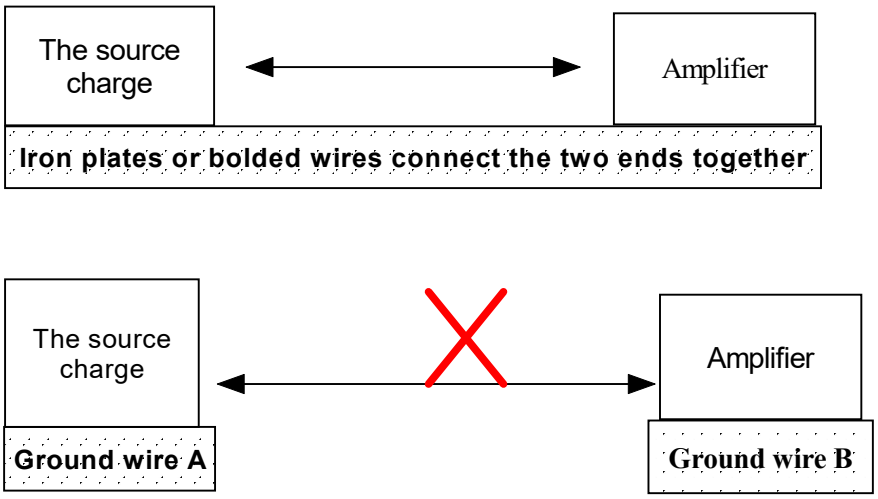
1 Micro coulomb(uC) = 1,000,000 Peel coulomb(pC)

Charge for limited unit electronic components of the weak signal, so extremely vulnerable to air humidity, temperature and the influence of space charge distribution in. Especially when there are strong electric field in the space, electric conduction through the air charge to charge input resulting in interference. So charge input shielding input wire or the input source device as far as possible, try to avoid input directly exposed to the air.



Reference processing of charge input

If be measured between charge and charge amplifier, if the ground plane is not very strong, there will be a weak electric potential difference. In charge measurements, weak electric potential difference will lead to the output of the strong interference. So if the measurement between the source and amplifier or far altogether to poor circumstances, try to improve the total conditions in order to achieve good results.



Outline & dimensions

Front view

Back view

Side view