

Charge Attenuator

for Electrical Charge Signals

Type 5361A...

Attenuator for electrical charge signals. By using the charge attenuator the largest measuring range of a charge amplifier is multiplied by a factor x .

Description

The charge attenuator consists of two highly insulating capacitors, one being connected in parallel to the INPUT (parallel capacitor), the other one between INPUT and OUTPUT terminals (series capacitor). Deliverable attenuation ratios in accordance with the following table. Dividing ratios as listed above are available. Thus the range of a connected charge amplifier is extended by a division ratio. The case has BNC connectors at either end (input: pos., output: neg.) so that the attenuator can be connected directly between a transducer cable (e.g. Type 1631C...) and an extension cable (e.g. Type 1603B...) or between cable and amplifier input.

Applications

The charge attenuator is used when the least sensitive (largest) measuring range of a charge amplifier is insufficient and therefore needs to be expanded.

Example

Measurement of 500 kN e.g. with a load washer Type 9081A or Type 9091A or several load washers connected in parallel. A sensor sensitivity of $\sim 1,7$ pC/N results in a charge of 850 000 pC.

For example, the charge signal can be converted into a 5 V voltage signal by means of an industrial charge amplifier Type 5038A1 and a series-connected charge attenuator 10:1 Type 5361A...



Technical Data

Charge Attenuator		
Insulation resistance	Ω	$>10^{14}$
Input signal	Connector	BNC neg.
Output signal	Connector	BNC pos.
Dimensions	mm	57,1x35x28,7
Weight	g	80

Division Ratios

Type	Attenuation	Parallel Capacitor nF	Series Capacitor nF
5361AY0157	2 : 1	50	50
5361AY0156	5 : 1	100	20 // 5
5361A	10 : 1	100	11,100
5361AY0140	20 : 1	100	5 // 270 pF
5361AY0118	100 : 1	990	10
5361AY0380	200 : 1	990	5
5361AY0264	1 000 : 1	100	100 pF

Dimensions Charge Attenuator Type 5361A...

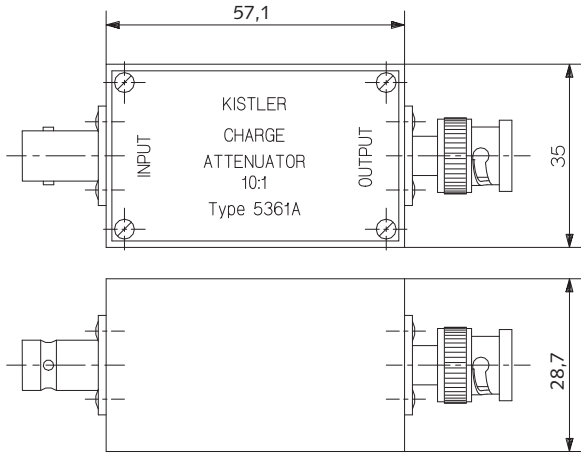


Fig. 1: Dimensions charge attenuator Type 5361A...

Operation

The charge attenuator is normally connected between the connecting cable and the extension cable. The advantages of this arrangement: the charge attenuator is very visible, so that the user does not forget that it is connected; the parallel capacitance at the INPUT of the charge attenuator – consisting of transducer and connecting cable capacitance – remains negligibly small; depending on the transducer it is 60 ... 600 pF and produces a signal attenuation of 0,06 ... 0,6 %. The cable capacitance of the extension cable (at the OUTPUT of the charge attenuator) is not included in the attenuation ratio. In the case of a short extension cable, the charge attenuator can also be plugged directly into the input of the charge amplifier.

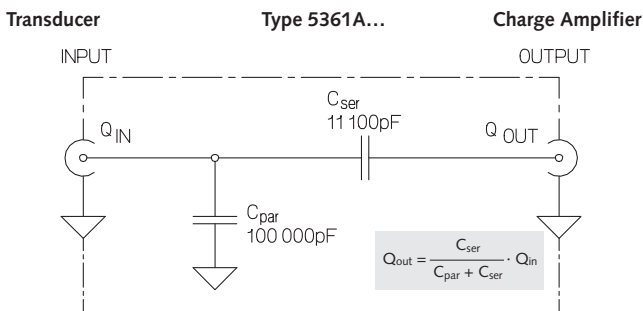


Fig. 2: Block schematic diagram

In General:

$$Q_{cal} = \frac{C_{cal} + C_{par} + C_{ser}}{C_{par} + C_{ser}} \cdot Q_{sim}$$

Q_{cal} ... charge to be set at the charge calibrator

Q_{sim} ... charge to be simulated

C_{cal} ... range capacitor in the charge calibrator

C_{par} ... parallel capacitor in the charge attenuator

C_{ser} ... series capacitor in the charge attenuator

For the Type 5361A:

$$Q_{cal} [pC] = \frac{C_{cal} [pF] + 111\,100 [pF]}{111\,100 [pF]} \cdot Q_{sim} [pC]$$

Charge Calibration

A true charge calibration of a measuring channel containing a charge attenuator is not possible, as only part of the charge set on the charge calibrator arrives at the charge amplifier.

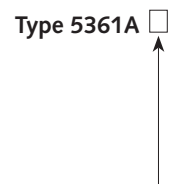
By using a charge calibrator with a 100 000 pF capacitor (e.g. Type 5357 on range 999 000 pC) the ratio between charge set on the charge calibrator and charge being active at the charge attenuator (10 : 1) is 1,90; i.e. the charge calibrator must be set to 1,90 times the charge wanted.

A load of ~310 kN can be simulated (999 000 pC : 1,90 = 525 789 pC : 1,7 pC/N = 309 288 N) using the charge calibrator Type 5357 – in combination with a charge attenuator (10 : 1) – with the setting at 999 000 pC.

The calculation is based on the example of an application with a preloaded load washer Type 9081A or Type 9091A and a sensitivity of ~1,7 pC/N.

Ordering Key

Division Ratio	
2 : 1	Y0157
5 : 1	Y0156
10 : 1	–
20 : 1	Y0140
100 : 1	Y0118
200 : 1	Y0380
1 000 : 1	Y0264



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