

## Airborne Charge Amplifier Type 1702

Airborne Charge Amplifier Type 1702 is a small, rugged unit suitable for use in industrial environments and in-flight measurements. It can be electronically configured to meet specific requirements with respect to sensitivity and frequency range. Different variants are marked with a unique identification code that denotes the main specifications and electronics installed.

The charge amplifier is intended for use in confined locations and is therefore housed in a small, robust metal cabinet.



### Uses and Features

- |  |  |
|--|--|
| <p><b>Uses</b></p> <ul style="list-style-type: none"> <li>• Charge amplification of single-ended piezoelectric charge transducers</li> <li>• Measurements in aircraft</li> <li>• Measurements in confined locations</li> </ul> | <p><b>Features</b></p> <ul style="list-style-type: none"> <li>• 10–32 UNF input connector and a 5-pole output/supply connector (Viking VR5/4AG15)</li> <li>• Potentiometer for sensitivity adjustment</li> <li>• Mounting flanges</li> </ul> |
|--|--|

### Variants

**Table 1**  
Charge Amplifier  
Type 1702 variants

Variant	Sensitivity	Frequency Range	Preset Sensitivity
Type 1702-A	5 to 50 mV/pC	5 Hz to 1 kHz	10.0 mV/pC
Type 1702-B		5 Hz to 2 kHz	
Type 1702-C	0.2 to 2 mV/pC	5 Hz to 5 kHz	1.0 mV/pC
Type 1702-D		5 Hz to 2 kHz	
Type 1702-E	0.1 to 1 mV/pC	5 Hz to 5 kHz	0.5 mV/pC
Type 1702-F	10 to 100 mV/pC		20.0 mV/pC

### Description


Charge Amplifier Type 1702 is designed for use with single-ended piezoelectric transducers and is well suited to airborne vibration measurements.

The connectors on the front of the charge amplifier are a 10–32 UNF input and a 5-pole output/supply. The 5-pole connector holds terminals for powering from an external supply, and there are two outputs – a biased and an unbiased – with equivalent conditioning gain.

An internal potentiometer for sensitivity adjustment can be reached through a hole in the housing. After setting the required sensitivity, use the provided accessory screw to plug the hole. An O-ring is also provided so that the charge amplifier can be hermetically sealed if desired.

The charge amplifiers have mounting flanges with 4 mm diameter holes on the front and rear panels of the housing.

## Compliance with Standards

	<p>The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives</p> <p>RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME</p> <p>China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China</p> <p>WEEE mark indicates compliance with the EU WEEE Directive</p>
<b>Safety</b>	EN/IEC 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use ANSI/UL 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use
<b>EMC Emission</b>	EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments EN/IEC 61000–6–4: Generic emission standard for industrial environments CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits FCC Rules, Part 15: Complies with the limits for a Class B digital device This ISM device complies with Canadian ICES–001 (standard for interference-causing equipment)
<b>EMC Immunity</b>	EN/IEC 61000–6–1: Generic standards – Immunity for residential, commercial and light industrial environments EN/IEC 61000–6–2: Generic standards – Immunity for industrial environments EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements <b>Note:</b> The above is only guaranteed using accessories listed in this Product Data sheet
<b>Temperature</b>	IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat Operating Temperature: –40 to +85 °C (–40 to 185 °F) Storage Temperature: –25 to +70 °C (–13 to 158 °F)
<b>Humidity</b>	IEC 60068–2–78: Damp Heat: 93% RH (non-condensing at 40 °C (104 °F))
<b>Mechanical</b>	Non-operating: IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s <sup>2</sup> , 10 – 500 Hz IEC 60068–2–27: Shock: 1000 m/s <sup>2</sup> IEC 60068–2–29: Bump: 1000 bumps at 250 m/s <sup>2</sup>

## Specifications – Airborne Charge Amplifier Type 1702

### CHARGE INPUT

Single-ended via 10–32 UNF connector with body connected to signal ground and isolated from housing. Source capacitance should be less than 10 nF to meet all specifications

### AMPLIFIER SENSITIVITY

Adjustable from:

- 10 to 100 mV/pC for F variant
- 5 to 50 mV/pC for A and B variants
- 0.2 to 2 mV/pC for C and D variants
- 0.1 to 1 mV/pC for E variant

### OVERLOAD RECOVERY

At any sensitivity set, a half sine impulse of 1 ms duration and an amplitude of:

- 500 pC for F variant
- 1,000 pC for A and B variants
- 25,000 pC for C and D variants
- 50,000 pC for E variant

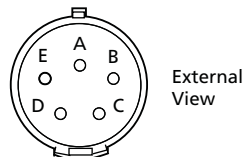
causes no spurious effects other than clipping at amplifier outputs

### OUTPUT/SUPPLY CONNECTIONS

5-pole Viking VR5/4AG15 connector:

- Pin A: Supply voltage
- Pin B: Unbiased output
- Pin C: Biased output
- Pin D: Power and signal ground
- Pin E: Case ground

The case is isolated from signal ground, but must be connected to signal ground somewhere in the system setup



### OUTPUT CHARACTERISTICS

#### Output Impedance:

- Biased: » 50 Ω, direct coupled
- Unbiased: » 50 Ω, in series with at least 16 μF

Both outputs are single-ended with one side connected to signal ground. If both outputs are used, the parallel loading should not be below 10 kΩ

#### DC Output Bias Voltage:

- Biased: +2.5 V DC ±3%
- Unbiased: Max offset from 0 V DC is +10 mV

#### AC Output Signal Level:

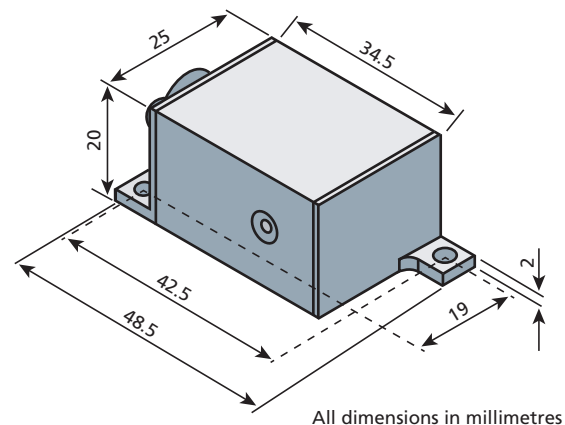
Both outputs: At least 1.5 V<sub>RMS-sine</sub> (±2.12 V<sub>peak</sub> at unbiased output) is handled within the linear range

**Distortion:** <0.2%, 5 Hz to upper limiting frequency (see Frequency response curve, Fig. 2)

### WEIGHT AND DIMENSIONS

**Weight:** 31 g (1.1 oz)

*Fig. 1 Dimensions of Type 1702*



## RESIDUAL NOISE AND DYNAMIC RANGE

Table 2 shows residual broadband noise levels ( $V_{RMS}$  in a 5 Hz – 20 kHz bandwidth) at the output (biased or unbiased) of each charge amplifier variant with its potentiometer for sensitivity adjustment turned to minimum (clockwise) or maximum (counterclockwise) sensitivity. Noise figures are maximum statements measured under standard laboratory conditions with an averaging time of 2 s and with a 1 nF

capacitor (shorted to signal ground) at the charge amplifier's input. The case ground is shorted to the signal ground during measurements. Equivalent charge input levels are also indicated in the table. The last column shows the dynamic range associated with each variant, again with the sensitivity set to minimum or maximum. The dynamic range will be significantly larger when focused at discrete frequencies

**Table 2** Broadband noise levels

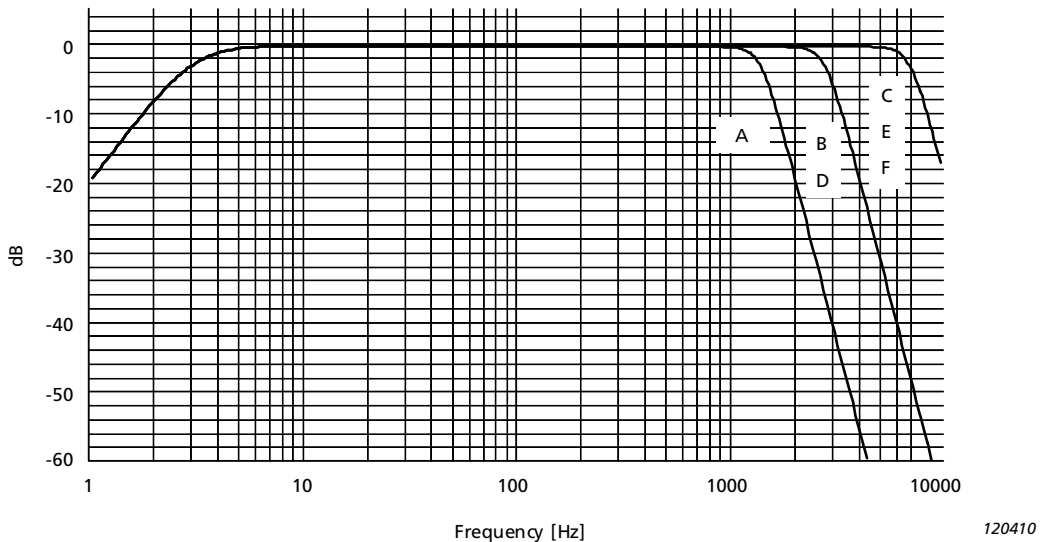
Type 1702 Variant	Sensitivity Setting	Output Residual Noise RMS, 5 Hz – 20 kHz Voltage, (eqv. Charge In)	Max. Charge In for 2.12 V <sub>peak</sub> Out	Dynamic Linear Range (Max. peak to Residual Noise)
A, B	5.0 mV/pC	50 μV (≈ 0.01 pC)	424.0 pC <sub>peak</sub>	92 dB
	50.0 mV/pC	500 μV (≈ 0.01 pC)	42.4 pC <sub>peak</sub>	72 dB
C, D	0.2 mV/pC	15 μV (≈ 0.08 pC)	10600.0 pC <sub>peak</sub>	102 dB
	2.0 mV/pC	120 μV (≈ 0.06 pC)	1060.0 pC <sub>peak</sub>	85 dB
E	0.1 mV/pC	20 μV (≈ 0.20 pC)	21200.0 pC <sub>peak</sub>	100 dB
	1.0 mV/pC	120 μV (≈ 0.12 pC)	2120.0 pC <sub>peak</sub>	85 dB
F	10.0 mV/pC	100 μV (≈ 0.01 pC)	212.0 pC <sub>peak</sub>	86 dB
	100.0 mV/pC	1 mV (≈ 0.01 pC)	21.2 pC <sub>peak</sub>	66 dB

## FREQUENCY CHARACTERISTICS

The nominal frequency characteristics for the five variants are shown in Fig. 2. A 2-pole HP filter is associated with the built-in charge converter, and a 6-pole Butterworth low-pass filter rejects high

frequencies, dependent on the specific variant. Within feed-through limits stated for the five variants, frequency response will be flat to within ±5% relative to gain at 159 Hz

**Fig. 2** Frequency response curves for Type 1702 variants



## GAIN STABILITY

Gain will change less than:

- 0.25% with changes in supply voltage over specified limits
- 0.05% per 1000 pF change in source capacity at the input

## POWER SUPPLY

- Supply Voltage: 24 to 32 V DC (nominally 28 V DC)
- Supply Current: <10 mA
- Warm-up Time: 30 s to meet specifications

## ENVIRONMENTAL SUSCEPTIBILITY

(referred to input, 1 nF source capacitance)

**Note:** the values given in the table below are based on tests using Type 1702-B

Magnetic Field	<0.2 fC/(A/m)
Electromagnetic Field	<3.0 fC/(V/m)
Conducted RF	<12 fC/V

## Ordering Information

<b>Type 1702-A</b>	<b>Airborne Charge Amplifier</b> 5 to 50 mV/pC, 5 Hz to 1 kHz, 6-pole low-pass filter
<b>Type 1702-B</b>	<b>Airborne Charge Amplifier</b> 5 to 50 mV/pC, 5 Hz to 2 kHz, 6-pole low-pass filter
<b>Type 1702-C</b>	<b>Airborne Charge Amplifier</b> 0.2 to 2 mV/pC, 5 Hz to 5 kHz, 6-pole low-pass filter
<b>Type 1702-D</b>	<b>Airborne Charge Amplifier</b> 0.2 to 2 mV/pC, 5 Hz to 2 kHz, 6-pole low-pass filter
<b>Type 1702-E</b>	<b>Airborne Charge Amplifier</b> 0.1 to 1 mV/pC, 5 Hz to 5 kHz, 6-pole low-pass filter
<b>Type 1702-F</b>	<b>Airborne Charge Amplifier</b> 10 to 100 mV/pC, 5 Hz to 5 kHz, 6-pole low-pass filter

All types include the following accessories:

- WJ-0420: Cable Plug Assembly
- WZ-1073: Torx-key
- WZ-1074: Trimming Screwdriver
- WY-0213: Screw M2.5 × 2.5 (for blocking adjustment hole)
- WQ-2961: O-ring (for a hermetic seal)

### OPTIONAL CABLES

AO-1382-D-XXX\* Low-noise, double-screened cable AC-0104,  
10–32 UNF connectors, 250 °C (482 °F)

### SERVICE PRODUCTS

1702-CTI Traceable initial calibration

\* XXX = length in decimetres: 003, 010, 012, 030, 050, 070, 100 or 300

Brüel & Kjær and all other trademarks, service marks, trade names, logos and product names are the property of Brüel & Kjær or a third-party company.

Brüel & Kjær Sound & Vibration Measurement A/S  
DK-2850 Nærum · Denmark · Telephone: +45 77 41 20 00 · Fax: +45 45 80 14 05  
www.bksv.com · info@bksv.com  
Local representatives and service organizations worldwide

Although reasonable care has been taken to ensure the information in this document is accurate, nothing herein can be construed to imply representation or warranty as to its accuracy, currency or completeness, nor is it intended to form the basis of any contract. Content is subject to change without notice – contact Brüel & Kjær for the latest version of this document.

**Brüel & Kjær** 

