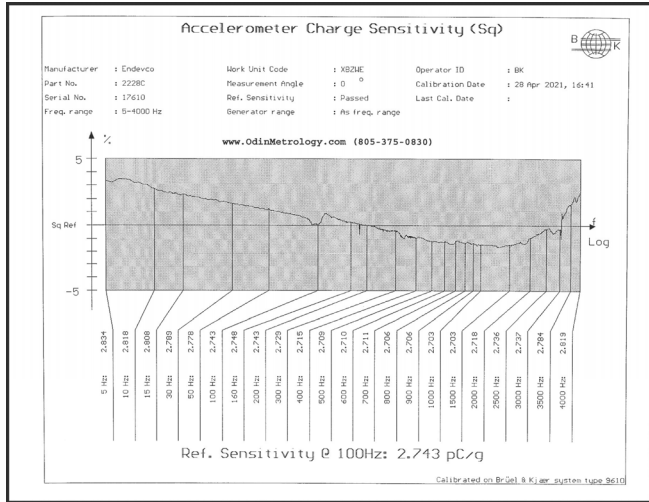
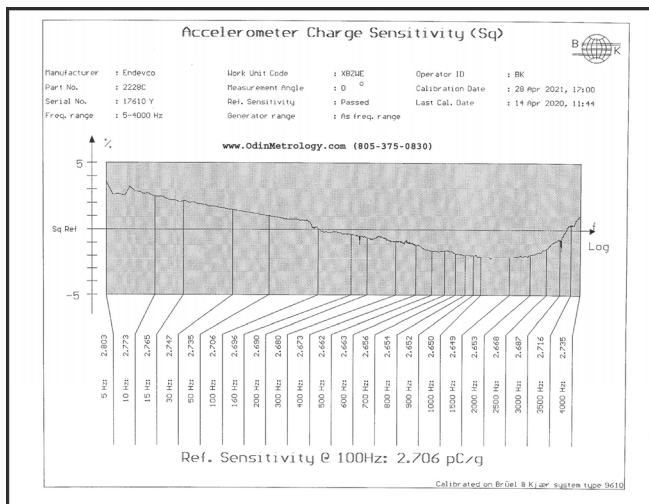


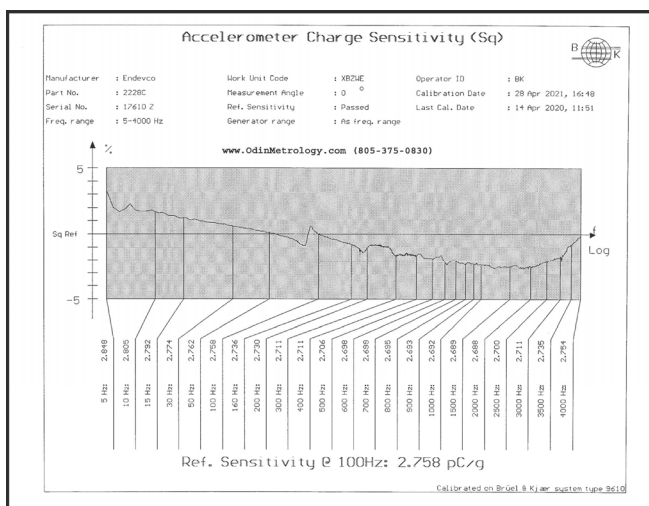
# Certificate of Calibration for Endevco Triaxial Accelerometer



X-Axis



Y-Axis



Z-Axis

Accelerometer type      **2228C**  
Serial no.                      **17610**  
Asset no.                        **N/A**  
Submitted by                  **Odin Metrology, Inc.**  
Purchase order no.          **N/A**

PERFORMANCE FOUND				
Axis	Sens. at 100 Hz	Unit	Sensitivity	Frequency Response
X	<b>2.743</b> <b>0.280</b>	pC/g pC/m/s <sup>2</sup>	<b>Within</b>	<b>Within</b>
Y	<b>2.706</b> <b>0.276</b>	pC/g pC/m/s <sup>2</sup>	<b>Within</b>	<b>Within</b>
Z	<b>2.758</b> <b>0.281</b>	pC/g pC/m/s <sup>2</sup>	<b>Within</b>	<b>Within</b>

Note: this device is not adjustable: data is "as found" and "as left."

This calibration is performed with a reference frequency of 100 Hz at a level of 2g RMS on Brüel & Kjær transducer calibration system type 9610 with calibration software WT 9301 version 1.12.04, June 25, 2001. This calibration system operates in conformance to ANSI/NCSS Z540-1 (1994), ISO 17025, and ISO 9001:2015. NQA certification number: 11252. Calibrated with Odin Metrology procedure OM-P-1003-Accelerometer-9610, last revised June 17, 2013.

REFERENCE STANDARDS			
Type no.	Serial no.	Cal. By	Cal. Due
8305/WH2335	1412753	B&K	24 JUN 2022

Expanded uncertainty of measurement ( $k = 2$ ): 0.5%  
NIST traceable number: **455764/455763**.

BEST UNCERTAINTY OF MEASUREMENT	
With 95% confidence level at 100 Hz	<b>1.30%</b>

CONDITION OF TEST		
Ambient Pressure	<b>992.29</b>	hPa
Temperature	<b>23</b>	°C
Relative Humidity	<b>35</b>	%
Date of Calibration	<b>28 APR 2021</b>	
Recalibration due on	<b>28 APR 2022</b>	

Calibration performed by

*Harold Lynch*

Harold Lynch, Service Manager

**ODIN METROLOGY, INC.**  
3533 OLD CONEJO ROAD, SUITE 125  
THOUSAND OAKS, CA 91320  
PHONE: (805) 375-0830; FAX: (805) 375-0405

# Odin Metrology, Inc.

Note: calibration on Brüel & Kjær accelerometer calibration system type 9610 is performed by random excitation and measured in frequency ranges from 5-5,000 Hz and from 10 to 10,000 Hz. The calibration method is that of the improved back-to-back calibration by substitution utilizing a two-channel FFT analyzer. The system obtains calibration results that not only provide the low uncertainty of approximately 1% but also provide consistent repeatability of the calibrations. Extremely good correlation is proven between calibrations performed on different type 9610 calibration systems and also to national calibration laboratories. The consistency and accuracy of 9610 calibrations are provided by the continuous control of the process ensuring coherence between the measuring channels and providing verifications between working accelerometer and reference accelerometer.

## Instrumentation used for calibration of accelerometers

Reference Item	Mfg.	Type No.	Serial No.	Cal. Date	Due Date	Cal. By
Reference Accelerometer	B&K	8305	1412753	24 JUN 2020	24 JUN 2022	B&K
Reference Accelerometer	B&K	8305	1435168	24 JUN 2020	24 JUN 2022	B&K
Measuring Amplifier	B&K	2525	2089234	24 JUN 2020	24 JUN 2022	B&K
Precision Barometer	Druck	141	299/95-10	07 DEC 2020	07 DEC 2021	CMI

## **Uncertainty of type 9610 calibrations**

The following tabulations for uncertainty of accelerometer calibrations performed on type 9610 are from Brüel & Kjær's instruction manual for type 9610 and are all based on a confidence level of 95%.

### **For charge calibration performed on 9610 shaker type 4808 (range: 5-5,000 Hz):**

100 & 160 Hz	5 Hz-10 Hz	10-40 Hz	40-2,000 Hz	2-4 kHz	4-5 kHz
1.30%	1.40%	1.30%	1.30%	1.80%	2.20%

### **For charge calibration performed on 9610 shaker type 4809 (range: 10-10,000 Hz):**

100 & 160 Hz	10-40 Hz	40-2,000 Hz	2-4 kHz	4-7 kHz	7-10 kHz
1.30%	1.40%	1.30%	1.30%	2.20%	2.50%

### **For voltage calibration performed on 9610 shaker type 4808 (range: 5-5,000 Hz):**

100 & 160 Hz	5 Hz-10 Hz	10-40 Hz	40-2,000 Hz	2-4 kHz	4-5 kHz
1.30%	2.00%	1.60%	1.40%	1.80%	2.20%

### **For voltage calibration performed on 9610 shaker type 4809 (range: 10-10,000 Hz):**

100 & 160 Hz	10-40 Hz	40-2,000 Hz	2-4 kHz	4-7 kHz	7-10 kHz
1.30%	2.00%	1.60%	1.40%	2.20%	2.50%

### **For velocity pickup calibration performed on 9610 shaker type 4808 (range: 5-2,000 Hz):**

100 & 160 Hz
2.73%

**This page revised: Rev. 26.3, 20201211**

# Accelerometer Charge Sensitivity (Sq)

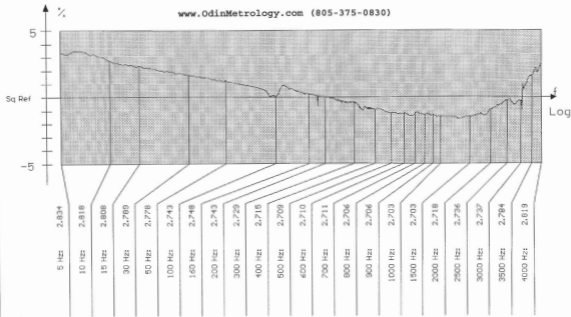


Manufacturer : Endevo  
 Part No. : 2228C  
 Serial No. : 17610  
 Freq. range : 5-4000 Hz

Work Unit Code : X82ME  
 Measurement angle : 0 °  
 Ref. Sensitivity : Passed  
 Generator range : As freq. range

Operator ID : BK  
 Calibration Date : 28 Apr 2021, 16:41  
 Last Cal. Date :

www.OdinMetrology.com (805-375-0830)



Ref. Sensitivity @ 100Hz: 2.743 pC/g

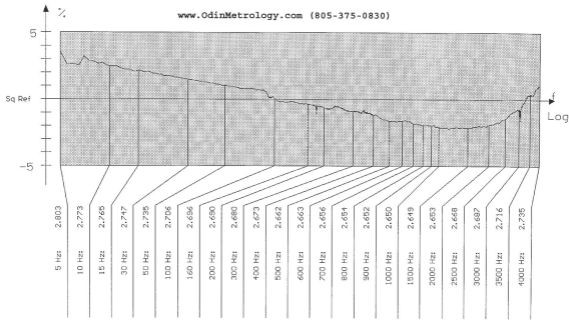
# Accelerometer Charge Sensitivity (Sq)



Manufacturer : Endevco  
 Part No. : 2228C  
 Serial No. : 17610 Y  
 Freq. range : 5-4000 Hz

Work Unit Code : XBZHE  
 Measurement Angle : 0 °  
 Ref. Sensitivity : Passed  
 Generator range : As freq. range

Operator ID : BK  
 Calibration Date : 28 Apr 2021, 17:00  
 Last Cal. Date : 14 Apr 2020, 11:44



Ref. Sensitivity @ 100Hz: 2.706 pC/g

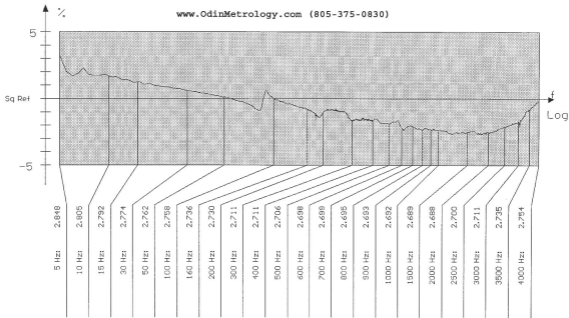
# Accelerometer Charge Sensitivity (Sq)



Manufacturer : Endevco  
 Part No. : 2228C  
 Serial No. : 17610 Z  
 Freq. range : 5-4000 Hz

Work Unit Code : XBZWE  
 Measurement Angle : 0 °  
 Ref. Sensitivity : Passed  
 Generator range : As freq. range

Operator ID : BK  
 Calibration Date : 28 Apr 2021, 16:48  
 Last Cal. Date : 14 Apr 2020, 11:51



Ref. Sensitivity @ 100Hz: 2.758 pC/g