

## Operating Manual

### Model 4600 & 4602 Accelerometer



Measurement Specialties, Inc.  
Vibration Sensors Design Center  
32 Journey, Suite 150  
Aliso Viejo, CA 92656 USA  
Tel: 949-716-7324

[www.meas-spec.com](http://www.meas-spec.com)  
[vibration@meas-spec.com](mailto:vibration@meas-spec.com)

## Warranty

Measurement Specialties, Inc. accelerometers are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer, at his expense, during such period and which has not been subjected to misuse, neglect, improper installation, repair, alteration, or accident. Seller shall have the right to final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warrant is in lieu of any other warranty, expressed, implied, or statutory; and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

## Receiving Inspection

Every Measurement Specialties, Inc. accelerometer is carefully inspected and is in perfect working condition at the time of shipment. Each accelerometer should be checked as soon as it is received. If the unit is damaged in any way, or fails to operate, a claim should immediately be filed with the transportation company.

## Service Concerns

If a Measurement Specialties, Inc. instrument requires service, first contact the nearest Measurement Specialties, Inc. representative. They may be able to solve the problem without returning the unit to the factory. If it is determined that factory service is required, call Customer Service at the regional headquarters for an RMA number before return.

## Returns

All units being returned to the factory require an RMA (Return Material Authorization) number before they will be accepted. This number may be obtained by calling Customer Service at the regional headquarters with the

following information; model number(s), quantity, serial number(s), and symptoms of the problem, if being returned for service. You must include the original purchase order number if under warranty.

## Recalibration Services

The Vibration Sensors Design Center and its two manufacturing facilities in China and France offer factory re-calibration services for Piezoresistive, Piezoelectric and Integrated Electronics Piezoelectric (IEPE, ISOTRON, ICP, etc.) accelerometers. NIST (US), DKD (Germany), COFRAC (France) traceable calibration services on sensitivity at 100 Hz (102 or 120 Hz in Europe) and full frequency sweeps are offered. Contact the regional headquarters for pricing information.

## Inquiries

Address all inquiries on operation or applications to your nearest Sales Representative, or to the Vibration Applications Support as follows:

### *Global Headquarters*

1000 Lucas Way  
Hampton, VA 23666, USA  
Tel: +1 757 766 1500

### *Vibration Sensors Design Center*

32 Journey, Suite 150  
Aliso Viejo, CA 92656, USA  
Tel: +1 949 716 7324

### *European Headquarters*

105 av. du Général Eisenhower  
BP 1036, 31023 Toulouse Cedex, France  
Tel: +33 (0) 561 194 543

### *Asian Headquarters*

Measurement Specialties (China), Ltd.  
F1.6-4D, Tian An Development Compund  
Shenzhen, China 518048  
Tel: +86 755 8330 1004

Email: [vibration@meas-spec.com](mailto:vibration@meas-spec.com)

Web: [www.meas-spec.com/vibration](http://www.meas-spec.com/vibration)

### Description

The Model 4600 & 4602 are low noise signal conditioned accelerometer designed for both static and dynamic measurements in critical and demanding applications. The accelerometers are available in ranges from  $\pm 2$  to  $\pm 500g$  and offers outstanding thermal performance. The model 4600 is temperature compensated from  $-40^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  while the model 4602 is compensated from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . The accelerometers incorporate a gas damped MEMS sensing element with integral over-range stops for high-g shock protection.

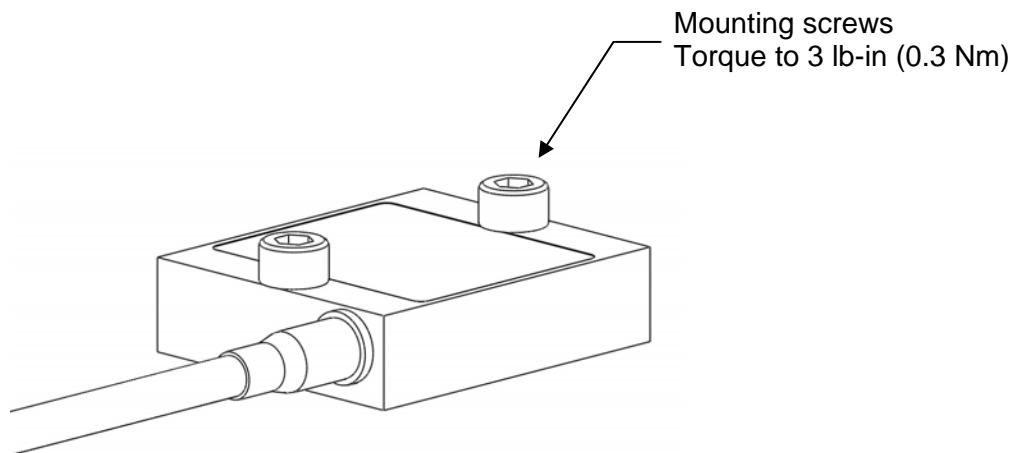
### Installation

The model 4600 & 4602 accelerometers are designed to be screw mounted but can also be adhesively mounted if the installation does not allow for screw mounting.

#### *Screw Mounting*

For screw mounting of accelerometers the following guidelines should be followed:

- The mounting surface should be clean and free of any residue or foreign material.
- The mounting surface should be smooth, flat, and with a maximum surface roughness of 32 micro-inches rms.
- Apply a light coating of coupling fluid (machine oil or silicone grease) on the mating surface to maximize the usable frequency range.
- Torque screws to recommended limits. Use manual torque wrench (do not use electric tools).



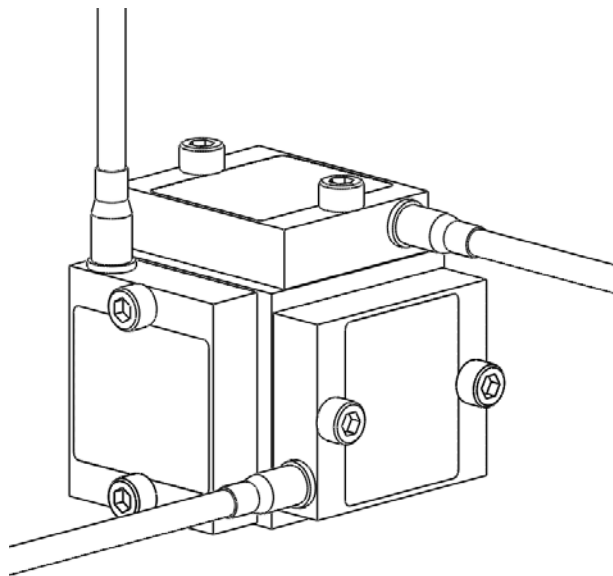
### *Adhesive Mounting*

To avoid damaging the accelerometer during subsequent removal, it is recommended to use an adhesive mounting adaptor for this method of attachment (model AC-D02744 adaptor is offered). For adhesively mounting of accelerometers the following guidelines should be followed:

- The mounting surface should be clean and free of any residue or foreign material.
- The mounting surface should be smooth, flat, and with a maximum surface roughness of 64 micro-inches rms.
- For best high frequency performance a cyanoacrylate adhesive is recommend. A thin layer offers best frequency response.
- Soften adhesive cured adhesive with a chemical debonder (eg. acetone) prior to removal. Gently shear accelerometer loose from the mounting surface after waiting a few minutes for the debonding agent to penetrate the epoxy. Make sure not to use excessive force as this may damage the accelerometer.

### *Triaxial Mounting*

For triaxial measurements it is recommended that the AC-D02669 triaxial mounting block is used. The triaxial block is supplied with both #8-36 UNF and M4x0.7 mounting screws. Alternatively, the triaxial block can also be mounted with a 10-32 UNF mounting stud.

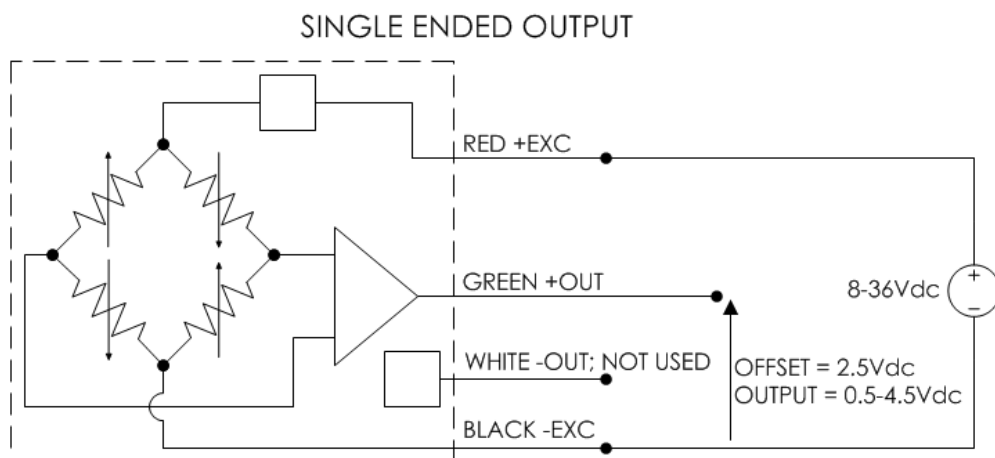


## Wiring

The accelerometer is designed to be operated from 8-36Vdc excitation and provide a  $\pm 2V$  full scale output with a 2.5V reference voltage. The output is DC-coupled and can be used in either single-ended or differential mode. Differential mode offers the best performance since common mode errors are minimized. The electrical hookup for both modes of operation is detailed below.

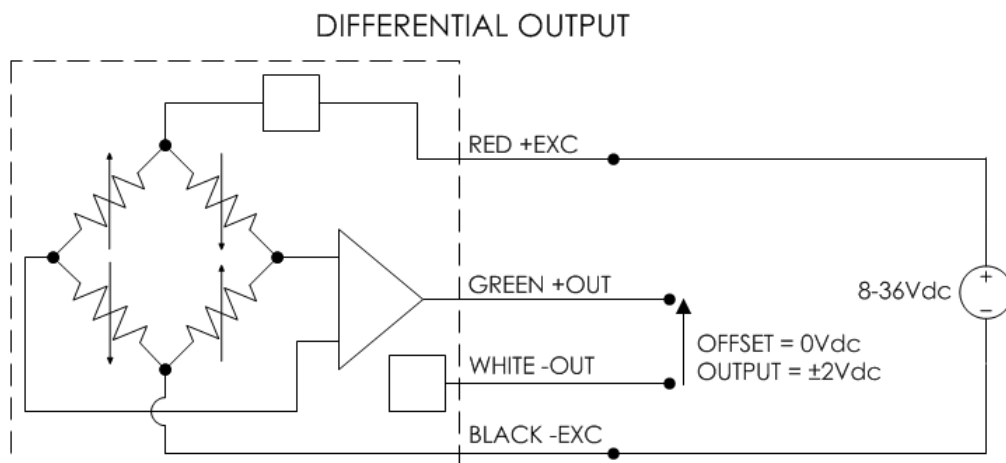
### Single-Ended Operation

For single-ended operation a 2.5Vdc bias will be present on the output leads and the output of the accelerometer will be 0.5-4.5V full scale. For single-ended operation the accelerometer should be connected to the signal conditioner as detailed below. **To minimize noise, the white wire should not be connected to ground.**



### Differential Operation

For differential operation the output of the accelerometer will be  $\pm 2V$  full scale without a bias voltage present. For differential operation the accelerometer should be connected to the signal conditioner as detailed below.



### *Programming Wire*

The model 4600 & 4602 accelerometers have a 5<sup>th</sup> brown wire in the cable leads. This wire is used for programming of the programmable signal conditioner and should not be connected to any input or shield. ***Do not attempt to hook-up this wire to any instrumentation.***

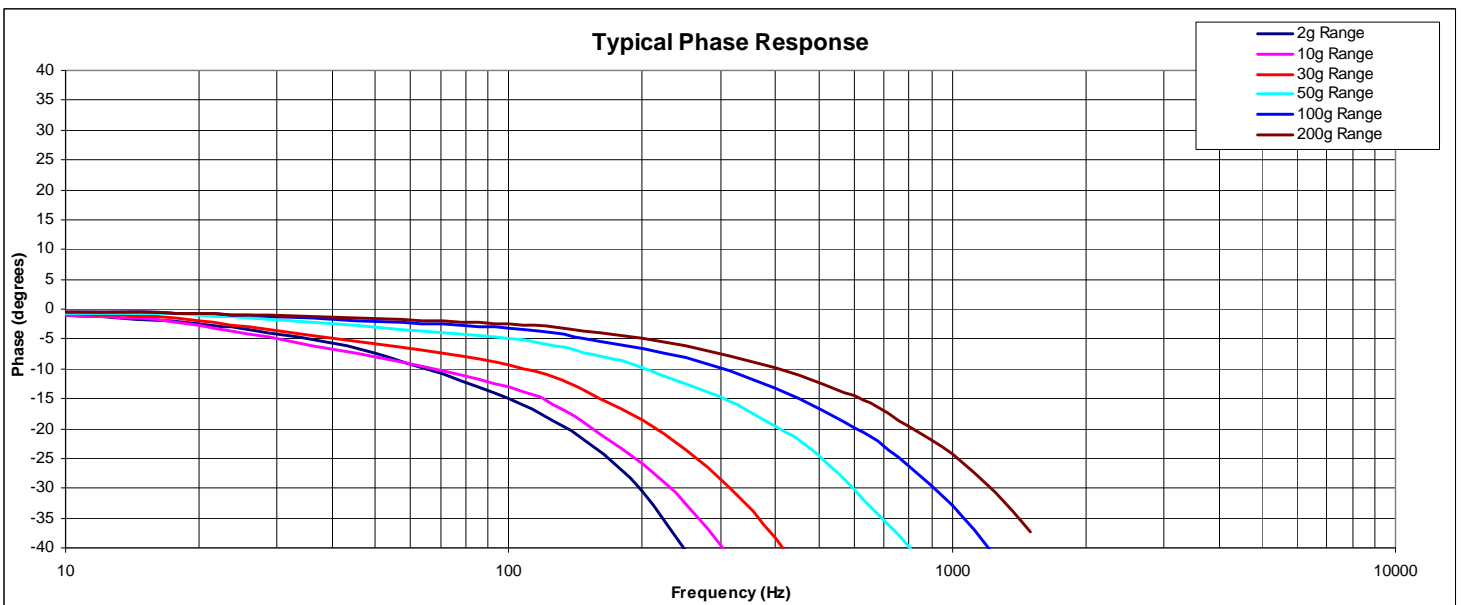
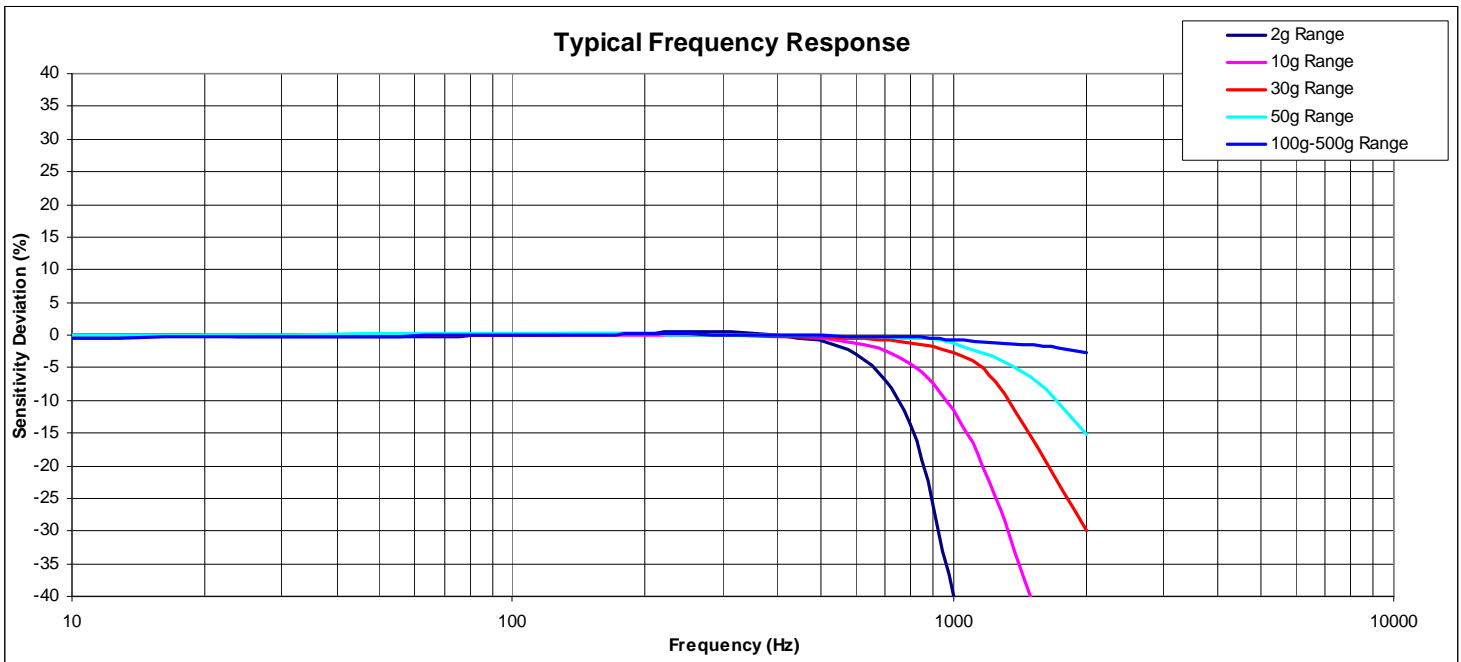
### **Cable Routing**

The model 4600 & 4602 accelerometers incorporate a TPE jacketed cable with an integral shield. The cable assembly should be properly secured at regular intervals during testing. It is recommended to use clamps, wax, or tape to secure the cable to minimize cable motion that can add noise to the output signal. The initial attachment should be within two to three inches of the accelerometer.

Avoid routing cables near high-voltage wires and also ground the shield at the signal conditioner to minimize ground loops.

### Frequency Response & Phase Deviation Curves

The typical frequency response and phase deviation curves for the model 4600 & 4602 accelerometers are illustrated below.

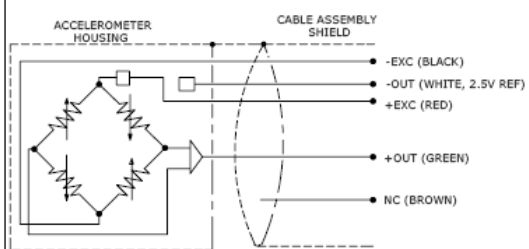


### Model 4600 Specifications:

**SPECIFICATIONS:**  
All values are typical at +24°C (+75°F), and 12Vdc excitation unless otherwise stated.

PARAMETERS	VALUE						UNITS	
DASH NO.	-002	-010	-030	-050	-100	-200	-500	
DYNAMIC RANGE	±2	±10	±30	±50	±100	±200	±500	g
SENSITIVITY ±10%	1000	200	67	40	20	10	4	mV/g
FREQUENCY RESPONSE ±5%	0-200	0-400	0-700	0-1000	0-1500	0-1500	0-1500	Hz
RESIDUAL NOISE (PASSBAND)	500	300	350	400	400	400	400	µV RMS
NATURAL FREQUENCY	700	1000	1500	4000	6000	8000	10000	Hz
DAMPING	0.7	0.7	0.7	0.7	0.7	0.6	0.5	
SHOCK LIMIT	10000	10000	10000	10000	10000	10000	10000	g

PARAMETERS	VALUE	UNITS
ZERO ACCELERATION OUTPUT (DIFFERENTIAL)	±.50	mV
TRANSVERSE SENSITIVITY	<.3	%
NON-LINEARITY (FSL)	±1	% FSO
THERMAL ZERO SHIFT, -40 to +100°C (-40 to +212°F), REFERENCE 24°C (75°F)	±2.5	% FSO
THERMAL SENSITIVITY SHIFT, -40 to +100°C (-40 to +212°F), REFERENCE 24°C (75°F)	±3	%
EXCITATION VOLTAGE	8 to 36	Vdc
EXCITATION CURRENT	<.5	mA
BIAS VOLTAGE	2.5	Vdc
FULL SCALE OUTPUT VOLTAGE	±2	Vdc (F50=2V)
OUTPUT IMPEDANCE	<100	Ω
INSULATION RESISTANCE (@100Vdc)	>100	MΩ
TURN ON TIME	<100	msec
OPERATING AND STORAGE TEMPERATURE	-54 to +121 (-65 to +250)	°C (°F)
HUMIDITY (ACTIVE ELEMENT & ELECTRONICS)	Hermetic Solder Seal	
HUMIDITY (HOUSING)	Epoxy Sealed	
WEIGHT (CABLE NOT INCLUDED)	8	Grams
Mounting Torque	6 (0.7)	lb-in (N-m)



**NOTES:**

- ELECTRICAL ISOLATION IS PROVIDED BY ANODIZED ALUMINUM HOUSING.
- FOR #4-40 (UNIFIED SCREW THREAD) OR M3 METRIC SOCKET HEAD CAP SCREW.

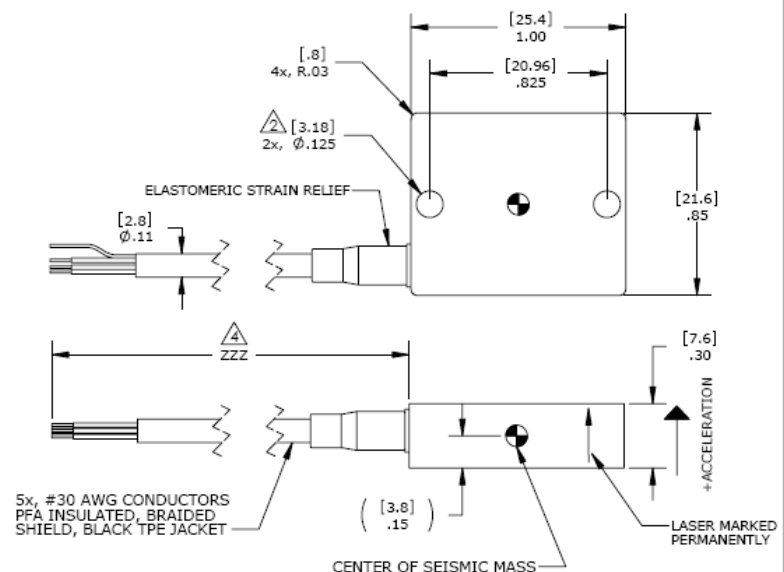
3. MODEL NUMBER:  
4600-XXX-ZZZ

CABLE LENGTH (INCHES) [e.g. 120 IS 120 INCHES OF CABLE]  
RANGE (g) [e.g. 100 IS 100g RANGE]

CABLE LENGTH TOLERANCE SEE TABULATION.

TABULATION	TOLERANCE
ZZZ	+1 [25] -0 [0]
≤12 [305]	+2 [51] -0 [0]
>12 [305] & ≤ 60 [1524]	+4 [102] -0 [0]
>60 [1524] & ≤ 120 [3048]	+5 [152] -0 [0]
>120 [3048] & ≤ 360 [9144]	+12 [305] -0 [0]

REVISIONS				
REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPR./DATE
A	INITIAL RELEASE PER ECO30189	DW/4-27-06	CH/4-27-06	DW/4-27-06
B	REVISED PER ECO30228	DW/3-8-07	CH/3-8-07	TC/3-8-07
C	REVISED PER ECO30314	AR/4-10-08	IZ/4-10-08	TFC/4-10-08
D	REVISED PER ECO30372	AR/1-20-09	IZ/1-20-09	TFC/1-20-09
E	REVISED PER ECO30437	AR/12-8-09	IZ/12-8-09	TFC/12-8-09



UNLESS OTHERWISE SPECIFIED:	NAME	DATE
DIMENSIONS ARE IN INCHES (MM)	DRAWN: D.Wastwick	4-27-06
TOLERANCES:	CHECKED: C.West	4-27-06
ANGULAR ±.5°	ENG APPR: D.Wastwick	4-27-06
TWO PLACE DECIMAL ±.03 [0.8]	MFG APPR:	
THREE PLACE DECIMALS .010 [0.25]	Q.A. APPR:	
MATERIAL:	COMMENTS:	
FINISH:	DO NOT SCALE DRAWING	
	INTERPRET GEOMETRIC TOLERANCING PER ANSI Y14.5M-1994	

measurement SPECIALTIES  
Aliso Viejo, CA 92656

TITLE:  
**MODEL 4600, ACCELEROMETER**

SIZE DWG. NO.	REV
B	E
SCALE:	WEIGHT:
SHEET 1 OF 1	



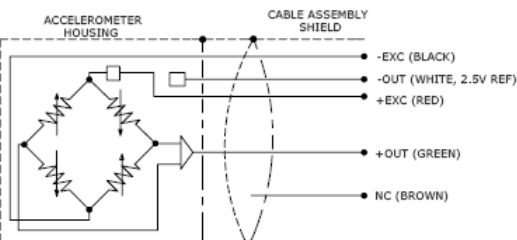
### Model 4602 Specifications:

**SPECIFICATIONS:**

All values are typical at +24°C (+75°F), and 12Vdc excitation unless otherwise stated.

PARAMETERS	VALUE								UNITS
DASH NO.	-002	-010	-030	-050	-100	-200	-500		
DYNAMIC RANGE	±2	±10	±30	±80	±100	±200	±500	g	
SENSITIVITY ±10%	1000	200	67	40	20	10	4	mv/g	
FREQUENCY RESPONSE ±8%	0-200	0-400	0-700	0-1000	0-1500	0-1500	0-1500	Hz	
RESIDUAL NOISE (PASSBAND)	500	300	350	400	400	400	400	µV RMS	
NATURAL FREQUENCY	700	1000	1500	4000	6000	8000	10000	Hz	
DAMPING	0.7	0.7	0.7	0.7	0.7	0.6	0.5		
SHOCK LIMIT	10000	10000	10000	10000	10000	10000	10000	g	

PARAMETERS	VALUE	UNITS
ZERO ACCELERATION OUTPUT (DIFFERENTIAL)	± 30	mv
TRANSVERSE SENSITIVITY	<3	%
NON-LINEARITY (BFSL)	±1	% FSO
THERMAL ZERO SHIFT, -54 to +121°C (-65 to +250°F), REFERENCE 24°C (75°F)	±3	% FSO
THERMAL SENSITIVITY SHIFT, -54 to +121°C (-65 to +250°F), REFERENCE 24°C (75°F)	±3.5	%
EXCITATION VOLTAGE	8 to 36	Vdc
EXCITATION CURRENT	<5	mA
BIAS VOLTAGE	2.5	Vdc
FULL SCALE OUTPUT VOLTAGE	±2	Vpk (FSO=2V)
OUTPUT IMPEDANCE	<100	Ω
INSULATION RESISTANCE (@100Vdc)	>100	MΩ
TURN ON TIME	<100	msec
OPERATING AND STORAGE TEMPERATURE	-54 to +121 (-65 to +250)	°C (°F)
HUMIDITY (ACTIVE ELEMENT & ELECTRONICS)	Hermetic Solder Seal	
HUMIDITY (HOUSING)	Epoxy Sealed	
WEIGHT (CABLE NOT INCLUDED)	8	Grams
MOUNTING TORQUE	6 (0.7)	lb-in (N-m)



TABULATION	TOLERANCE
ZZZ	+1 [25] -0 [0]
≤12 [305]	+2 [51] -0 [0]
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>120 [3048] & ≤ 360 [9144]	+12 [305] -0 [0]
>360 [9144]	+12 [305] -0 [0]

**NOTES:**

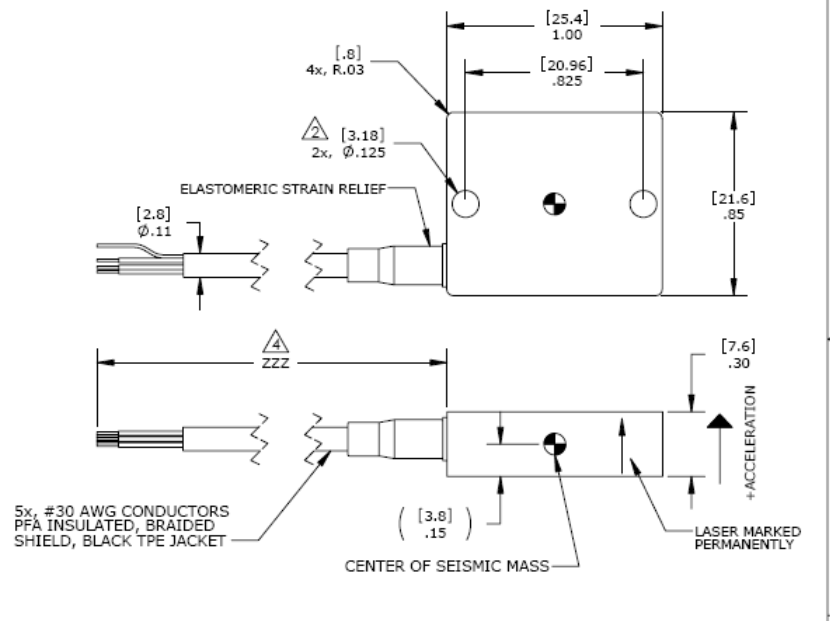
- ELECTRICAL ISOLATION IS PROVIDED BY ANODIZED ALUMINUM HOUSING.
- FOR #4-40 (UNIFIED SCREW THREAD) OR M3 METRIC SOCKET HEAD CAP SCREW.
- MODEL NUMBER:  
4602-XXX-ZZZ

CABLE LENGTH (INCHES) [e.g. 120 IS 120 INCHES OF CABLE]  
RANGE (g) [e.g. 100 IS 100g RANGE]

CABLE LENGTH TOLERANCE SEE TABULATION.

**REVISIONS**

REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPR./DATE
A	INITIAL RELEASE PER ECO30191	DW/4-27-06	CH/4-27-06	DW/4-27-06
B	REVISED PER ECO30229	DW/3-8-07	CH/3-8-07	TC/3-8-07
C	REVISED PER ECO30314	AR/4-10-08	IZ/4-10-08	TFC/4-10-08
D	REVISED PER ECO30372	AR/1-20-09	IZ/1-20-09	TFC/1-20-09
E	REVISED PER ECO30437	AR/12-8-09	IZ/12-8-09	TFC/12-8-09



UNLESS OTHERWISE SPECIFIED:	NAME	DATE
DIMENSIONS ARE IN INCHES (MM)	DRAWN	D. Wastwick 4-27-06
TOLERANCES:	CHECKED	C. West 4-27-06
ANGULAR	ENG APPR.	D. Wastwick 4-27-06
TWO PLACE DECIMAL 0.01 [0.25]	MFG APPR.	
THREE PLACE DECIMAL 0.001 [0.025]	Q.A. APPR.	
MATERIAL:		
FINISH:		
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MEASUREMENT SPECIALTIES, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MEASUREMENT SPECIALTIES, INC. IS PROHIBITED.	COMMENTS:	
	DO NOT SCALE DRAWING	
	INTERNET GEOMETRIC TOLERANCING PER ANSI Y14.5M-1994	

**measurement SPECIALTIES**  
Aliso Viejo, CA 92656

**TITLE:**  
MODEL 4602, ACCELEROMETER

**SIZE DWG. NO.** B OD-4602 **REV** E

**SCALE:** **WEIGHT:** **SHEET 1 OF 1**