



For fracture mechanics studies, these **COD** gages are in compliance with standardized test methods, such as **ASTM E1820** for determination of fracture toughness properties of metallic materials.



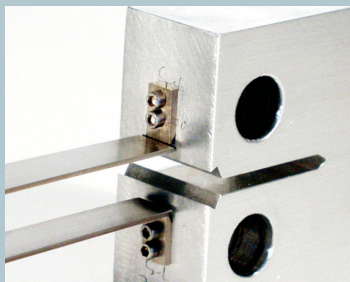
Model 3541 COD gage

The Model 3541 is designed for determination of fracture mechanics parameters such as JIC, KIC, R-curve, fatigue crack growth rate ( $da/dN$ ), and testing to standards such as E1820, E399, E647, etc. These COD gages conform to the requirements of E1820 (the replacement for E813 and E1737) for JIC and R-curve determination. Special configurations are available to meet the requirements of

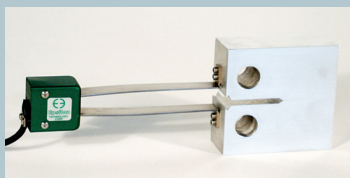
ASTM E399 for fracture toughness (*please consult the factory for these configurations*). In addition, the modified groove design complies with E1820 tests where greater stability and accuracy results from the sharper groove root. Clip-on gages are used for a variety of fracture mechanics tests, including compact tension, arc shaped, disk shaped, bend specimens or other specimen geometries in compliance with ASTM and other standards organization's test methods. Clip-on gages can be used directly on test specimens where the knife edges are integral with the test specimen or, alternately, with optional bolt-on knife edges mounted on the test specimen.

The Model 3541 extensometers are strain gaged devices, making them compatible with any electronics designed for strain gaged transducers. Most often they are connected to a test machine controller. The signal conditioning electronics for the extensometer is typically included with the test machine controller or may often be added. In this case the extensometer is shipped with the proper connector and wiring to plug directly into the electronics. For systems lacking the required electronics, Epsilon can provide a variety of solutions, allowing the extensometer output to be connected to data acquisition boards, chart recorders or other equipment.

See the electronics section of this catalog for available signal conditioners and strain meters.



Model 3541-004M-120M attached to bolt-on knife edges



Model 3541-004M-120M with 4 mm gauge length and  $\pm 12/-2$  mm measuring range

## Features

- **May be left on through specimen failure.**
- Full bridge, 350 ohm strain gaged design for compatibility with nearly any test system.
- Fully enclosed gages to protect from accidental damage.
- All standard units meet ASTM E1820, ISO 12135, and ISO 9513 Class 1 requirements for accuracy. A test certificate for ASTM E1820 is included. Models are available in 2.5 and 4.0 mm (0.10 and 0.15 inch) measuring ranges for ASTM E399 accuracy requirements. A test certificate for ASTM E399 is included with those models.
- Sharp grooves per ASTM E1820, E813, and E399 for improved stability when mounted.
- For KIC/JIC testing, maximum accuracy is achieved with the smallest measuring range and the largest gauge length that will perform the test.
- Maximum operating frequency may be from 5 Hz to >200 Hz depending on COD gage and test apparatus configurations.
- Includes high quality foam lined case.

## SPECIFICATIONS

**Excitation:** 5 to 10 VDC recommended, 12 VDC or VAC max.  
**Output:** 2 to 4 mV/V nominal, depending on model  
**Linearity:**  $\leq 0.15\%$  of full scale measuring range  
**Temperature Range:** Standard (-ST) is -40 °C to +100 °C (-40 °F to 210 °F)  
**Cable:** Integral, ultra-flexible cable, 2.5 m (8 ft) standard  
**Operating Force:** 9 to 14 N (2 to 3 lbs), depending on model

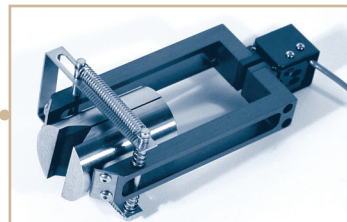
## OPTIONS

Connectors to interface to nearly any brand test equipment  
 Available in special versions  
 Bolt on knife edges  
 Severe environment versions available  
 Shunt calibration module (see page 120)



### Special Model for Other Fracture Mechanics Testing

Special units are available for other fracture mechanics tests. For example, the photo to the right shows a gage for ASTM E1304, *Standard Test Method for Plane-Strain (Chevron-Notch) Fracture Toughness of Metallic Materials*. This example was produced for a 1 inch diameter bar, with 0.4 inches of measuring range. Its performance, design, and accuracy is an enhancement of the design recommended in E1304.



## ORDERING INFORMATION

Model 3541 Available Versions: The following combinations of gauge length and measuring range listed below are available as standard, except as noted. All are available in any temperature range listed. Other configurations may be available with special order; please contact Epsilon to discuss your requirements.

Gauge Length		Measuring Range	
U.S.A.		U.S.A.	
-0010	0.100"	-100T <sup>1</sup>	+0.100"/-0.050"
-0020	0.200"	-150T <sup>1</sup>	+0.150"/-0.050"
-0030	0.300"	-200T	+0.200"/-0.050"
-0040	0.400"	-250T	+0.250"/-0.050"
-0047	0.475"	-500T	+0.500"/-0.100"
-0050	0.500"		
METRIC		METRIC	
-003M	3.0 mm	-025M <sup>1</sup>	+2.5 mm/-1.0 mm
-005M	5.0 mm	-040M <sup>1</sup>	+4.0 mm/-1.0 mm
-008M	8.0 mm	-070M	+7.0 mm/-1.0 mm
-010M	10.0 mm	-100M	+10.0 mm/-1.0 mm
-012M	12.0 mm	-120M	+12.0 mm/-2.0 mm
-020M	20.0 mm		

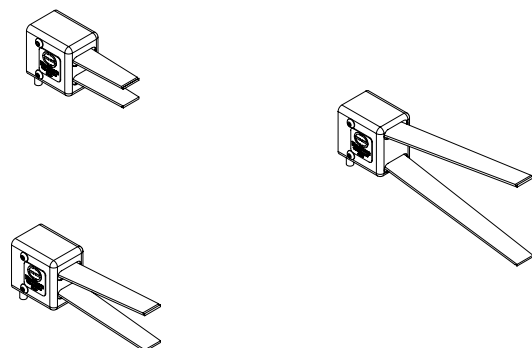
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Temperature Range	
-LT	-265 °C to 100 °C (-450 °F to 210 °F)
-ST	-40 °C to 100 °C (-40 °F to 210 °F)
-HT1	-40 °C to 150 °C (-40 °F to 300 °F)
-HT2	-40 °C to 200 °C (-40 °F to 400 °F)
-LHT	-265 °C to 200 °C (-450 °F to 400 °F)

<sup>1</sup> Available with special configuration to meet the requirements of ASTM E399. Please consult the factory.

Example: 3541-0050-200T-LT: 0.50 inch gauge length, +0.20 inch measuring range, low temperature option (-450 °F to 210 °F)

Visit our website at [www.epsilontech.com](http://www.epsilontech.com)  
 Contact us for your special testing requirements.



MODEL 3541 EXAMPLES