

# MC3A

Force and Torque Sensor

**APPLICATIONS**

The MC3A force and torque sensor is particularly suitable for applications requiring simultaneous measurement of several forces and moments, or measurements of forces that change direction and position over time. Common applications for this transducer include research and development in robotics, ergonomics, production processes, biomechanics, and dynamics. A waterproof version is available for use in tow tanks, ocean engineering, and other underwater applications.

**DESCRIPTION**

AMTI's MC3A force and torque sensor is specifically designed for the precise measurement of forces and moments. The sensor measures the three orthogonal force and moment components along the X, Y, and Z axes, producing

a total of six outputs. The characteristics of this strain gage sensor make it ideal for research and testing environments; it has high stiffness, high sensitivity, low cross-talk, excellent repeatability and long term stability. It is simple, easy to use, and is available in either 100, 250, 500, 1000 pound (445, 1112, 2224, 4448 Newton) vertical capacities.

The body of the load cell is manufactured from a high-strength aluminium alloy with an anodized finish to protect the exterior from corrosion.

Elastomeric O-ring seals provide internal protection of the strain gages and wiring from industrial environments and moisture exposure.

**CALIBRATION**

Each sensor is inspected and tested in AMTI's calibration facility. The calibration procedure provides a ten-point calibration of each channel and a complete test of all system components.

**AMPLIFICATION**

The MC3A force and torque sensor incorporates strain gages mounted on a precision strain element designed to measure forces and moments. As with most conventional strain gage transducers, bridge excitation and signal amplification are required. The MC3A can be used with any strain gage amplifier, including AMTI's product line. AMTI's amplifiers are all high gain devices which provide excitation and amplification for multiple channels in one convenient package to suit different applications.

**SOFTWARE**

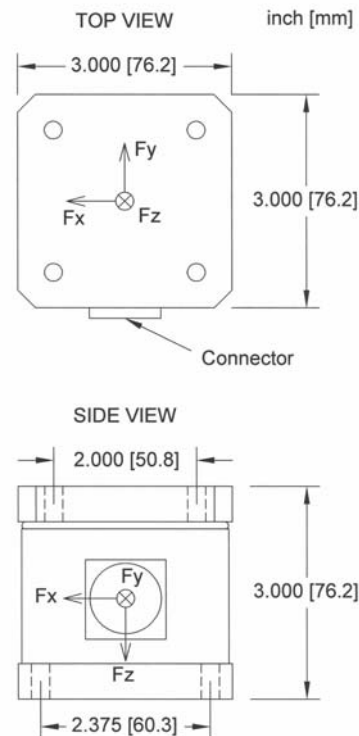
AMTI offers several software packages for use with the multi-component force sensors. Please contact the sales department for more details.

**CUSTOM**

AMTI also offers other transducers to meet your specific needs. Standard units with a diameter as small as 1 inch (2.25 cm) are available, and sensors with capacities as high as 3,000,000 pounds (13,345,000 Newtons) have also been constructed. Units are available in various sizes, load capacities, sensitivities, materials, and in pressure compensated waterproof versions.

| MC3A Series Specifications                                                  | 100             | 250             | 500            | 1000           |
|-----------------------------------------------------------------------------|-----------------|-----------------|----------------|----------------|
| Fz Capacity, lb (N)                                                         | 100<br>(445)    | 250<br>(1112)   | 500<br>(2224)  | 1000<br>(4448) |
| Fx, Fy Capacity, lb (N)                                                     | 50<br>(222)     | 125<br>(566)    | 250<br>(1112)  | 500<br>(2224)  |
| Mz Capacity in*lb (Nm)                                                      | 50<br>(5.6)     | 125<br>(14)     | 250<br>(28)    | 500<br>(56)    |
| Mx, My Capacity in*lb (Nm)                                                  | 100<br>(11)     | 250<br>(28)     | 500<br>(56)    | 1000<br>(113)  |
| Fz Sensitivity, mV/[V*lb]<br>(mV/[V*N])                                     | 6.0<br>(1.35)   | 2.4<br>(0.54)   | 1.2<br>(0.27)  | 0.6<br>(0.135) |
| Fx, Fy Sensitivity, mV/[V*lb]<br>(mV/[V*N])                                 | 24.0<br>(5.4)   | 9.6<br>(2.16)   | 4.8<br>(1.08)  | 2.4<br>(0.54)  |
| Mz Sensitivity, mV/[V*in*lb]<br>(mV/[V*Nm])                                 | 24.0<br>(213.0) | 9.6<br>(85.02)  | 4.8<br>(52.53) | 2.4<br>(21.25) |
| Mx, My Sensitivity, mV/[V*in*lb]<br>(mV/[V*Nm])                             | 30.0<br>(266.0) | 12.0<br>(106.3) | 6.0<br>(53.16) | 3.0<br>(26.57) |
| Fz Stiffness, x10 <sup>5</sup> lb/in<br>(x10 <sup>5</sup> N/m)              | 1.7<br>(298)    | 4.25<br>(745)   | 8.5<br>(1490)  | 17.0<br>(2981) |
| Fx, Fy Stiffness x 10 <sup>5</sup> lb/in<br>(x10 <sup>5</sup> N/m)          | 0.12<br>(21.0)  | 0.3<br>(52.6)   | 0.6<br>(105.2) | 1.2<br>(210)   |
| Mz Stiffness, x10 <sup>5</sup> in*lb/radian<br>(x10 <sup>5</sup> Nm/radian) | 0.2<br>(0.022)  | 5.0<br>(0.056)  | 1.0<br>(0.113) | 2.0<br>(0.226) |
| Weight, lb (kg)                                                             | 2<br>(0.9)      | 2<br>(0.9)      | 2<br>(0.9)     | 2<br>(0.9)     |
| Mx, My Lowest Resonant<br>Frequency, Hz                                     | 300             | 500             | 700            | 1000           |

MC3A Force and Torque Sensor



- Four threaded 1/4-20 inserts on 2.000 inch [50.8 mm] centres on top surface.
- Four 0.256 inch [6.5 mm] through holes on 2.375 inch [60.3 mm] centers on bottom surface.
- Metric threaded hold-down inserts available.

CONNECTOR TYPE: Souriau 851-02E16-26P50-44

GENERAL SPECIFICATIONS Recommended Excitation: 10V or less Crosstalk: Less than 2% on all channels

Temperature Range: 0 to 125°F, (-17 to 52°C) Fx, Fy, Fz hysteresis: ± 0.2 % Full Scale Output Fx, Fy, Fz non-linearity: ± 0.2% FullScale Output

Bridge Fz = 700 ohms  
Bridges Fx; Fy; Mx; My; Mz = 350 ohms

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