

## MULTI-COMPONENT TRANSDUCERS

# MCL6 SERIES FORCE/TORQUE SENSORS

### DESCRIPTION

The MCL6 Lathe Dynamometers are precision multiaxis force and moment sensors designed for measuring the forces in lathe operations. They feature high stiffness, high sensitivity, low crosstalk, excellent repeatability and long-term stability. These sensors exhibit the inherent ruggedness of bonded strain gage transducers and they incorporate special seals to prevent oil and water contamination.

The MCL6 is available with one to six outputs corresponding to the applied loads  $F_x$  ( $F_q$ ),  $F_y$  ( $F_r$ ),  $F_z$  ( $F_p$ ),  $M_x$ ,  $M_y$ , and  $M_z$ . The  $M_x$  and  $M_z$  signals can be used to determine  $F_z$  and  $F_x$  respectively with greater sensitivity. Standard vertical load capacities are 1000, 2000, and 4000 pounds. Horizontal load capacities are half of the vertical rating. Models with custom capacities and layouts are available for special applications.

Along with the tool holder the instrument has a top mounting surface (6.5 inches square) equipped with mounting holes and threaded inserts for convenient attachment of other devices. A high-strength aluminum alloy (7075-T6) is used throughout to withstand machining environments. A durable anodized finish protects the exterior from corrosion while elastomeric O-ring seals protect the strain gages and wiring. Internal potting of the strain gages further insures long life and consistent, reliable performance.

### AMPLIFICATION

The MCL6 transducer incorporates strain gages and four precision elements in a patented design\* to isolate and measure applied forces and moments. As with all conventional strain gage transducers, bridge excitation and signal amplification are required. AMTI's MCA series amplifiers are high-gain devices which provide excitation and amplification for multiple channels in one convenient package. These amplifiers process the signals from a transducer and provide outputs suitable for an A/D converter and digital computer or other recording instrument.

### APPLICATIONS

This instrument is particularly suitable for measuring forces in lathe operations. It is equipped with a one-inch square toolholder, set screws to clamp the lathe-tool or insert-holder in position, and a plated-steel high-stiffness base.

Common applications for this transducer include research and development in machining, including lubrication, materials machinability, and tool wear studies. They are also used to optimize machining techniques for production processes.



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### SPECIFICATIONS

The accompanying specifications are for estimating purposes. Actual precision calibrations are furnished with each instrument. The manufacturer reserves the right to alter the specifications without notice.

MCL6 SERIES SPECIFICATIONS (English Units)					
Model:	MCL6-X-	1000	2000	4000	
CAPACITY					
$F_z$	1000	2000	4000	lb	
$F_x$ , $F_y$	500	1000	2000	lb	
$M_z$	1500	3000	6000	in-lb	
$M_x$ , $M_y$	3000	6000	12000	in-lb	
TYPICAL SENSITIVITY					
$F_z$	0.76	0.38	0.19	$\frac{\mu\text{V}}{\text{V}}$	**
$F_x$ , $F_y$	3.00	1.50	0.75	$\frac{\text{V-lb}}{\text{V}}$	
$M_z$	1.50	0.75	0.37	$\frac{\mu\text{V}}{\text{V}}$	**
$M_x$ , $M_y$	0.85	0.42	0.21	$\frac{\text{V-in-lb}}{\text{V-in-lb}}$	
STIFFNESS					
$F_z$	0.80	1.30	2.00	$\times 10^6$ lb/in	
$F_x$ , $F_y$	0.12	0.25	0.50		
NON-LINEARITY					
$F_x$ , $F_y$ , $F_z$	0.20	0.20	0.20	$\pm \text{ %FSO}$	***
HYSTERESIS					
$F_x$ , $F_y$ , $F_z$	0.20	0.20	0.20	$\text{ %FSO}$	***
RESONANT FREQUENCY					
$F_z$	620	875	1200	Hertz	
$F_x$ , $F_y$	550	800	1000	Hertz	

\*\*  $\mu\text{V}$  = microvolts, \*\*\* %FSO = %Full Scale Output

**AMTI**  
FORCE AND MOTION

ISO 9001:2000 certified

# MCL6 SERIES

## FORCE/TORQUE SENSORS

### MCL6 SERIES SPECIFICATIONS (Metric Units)

Model: MCL6-X- 1000 2000 4000

#### CAPACITY

Fz	4500	9000	18000	N
Fx, Fy	2250	4500	9000	N
Mz	170	340	680	N-m
Mx, My	340	680	1360	N-m

#### TYPICAL SENSITIVITY

Fz	0.17	0.08	0.04	$\mu$ V	**
Fx, Fy	0.67	0.33	0.17	V-N	
Mz	13.27	6.63	3.32	$\mu$ V	**
Mx, My	7.52	3.76	1.88	V-N-m	

#### STIFFNESS

Fz	14	23	35	$\times 10^7$ N/m
Fx, Fy	2.1	4.4	8.8	

#### NON-LINEARITY

Fx, Fy, Fz	0.20	0.20	0.20	$\pm$ %FSO
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#### HYSTERESIS

Fx, Fy, Fz	0.20	0.20	0.20	%FSO
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#### RESONANT FREQUENCY

Fz	620	875	1200	Hertz
Fx, Fy	550	800	1000	Hertz

### GENERAL SPECIFICATIONS

Excitation: 10V

Temperature Range: 0 to 125°F (-17 to 52°C)

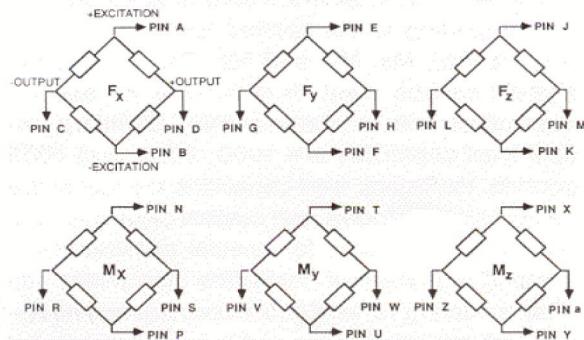
Sensitivity change with temperature:

0.02%/°F (0.01%/°C)

Crosstalk: Less than 2% on all channels

Weight: 40 lb (18.2 Kg)

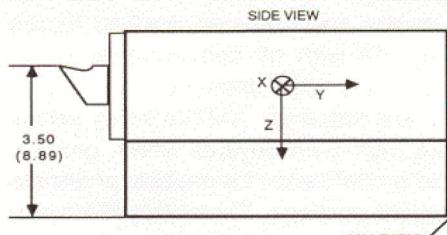
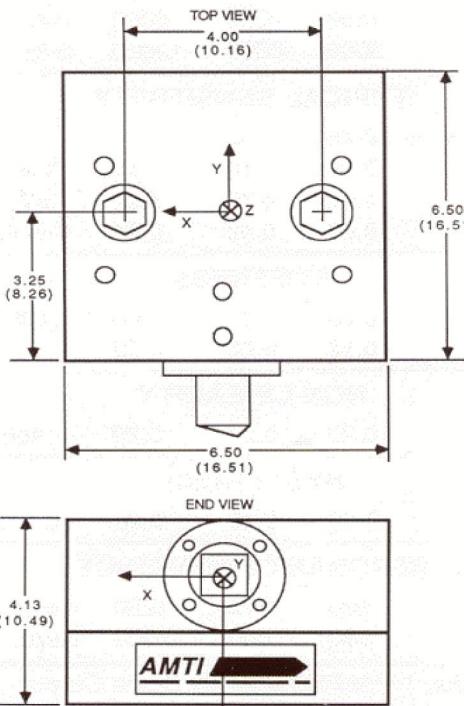
### WIRING



Connector Type: Burndy BTO2E16-26P

MCL6-X-XXXX

Series \_\_\_\_\_  
No. of Channels \_\_\_\_\_  
Capacity \_\_\_\_\_



- Two 1/2" base mounting holes on 4 inch (10.16 cm) centers with protective caps.
- Four 3/8-16 thread auxiliary inserts on 2 by 5 inch (5.08 by 12.70 cm) centers.
- One inch square toolholder mounting is standard; 3/4" and 1/2" are available.

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FORCE AND MOTION

ISO 9001:2000 certified

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