A worldwide leader in precision measurement solutions

ACCUMEASURE™ DM SERIES

CAPACITANCE DISPLACEMENT

True Direct Digital Capacitive Displacement Sensor
Up to 0.01% FSR Linearity
Sub-nanometer Resolution

Standard and Custom Capacitance Probes Available
Core Features

- **Highest resolution in the industry with 0.01% linearity**

- **Digitally Controlled (user adjustable):**
  - Range Extension. One probe - multiple ranges
  - Selectable Frequency Filter. 0.1Hz to 5kHz
  - Sample Rate. 20kHz

- **24 bit ADC bit count**

- **TI Basic Software included**

- **NI LabVIEW™ Driver Included**

- **.NET (VB, C, C++) compatible, DLL drivers available**

- **Multiple Unit Synchronization** - synchronizes several units together for multiple point measurement, such as sheet metal thickness, semiconductor measurements, etc.

Quadrature Encoder Input

The standard feature quadrature encoder input, provides probe positional information simultaneously with its displacement signal. Capacitance displacement amplifiers used with quadrature encoder inputs synchronize displacement measurements to the probe position to provide accurate surface profiles of various target types.

- **Synchronized Probe Position and Probe Displacement Measurements**

- **Accepts A Quad B**

- **Digital TTL type inputs up to 24VDC encoder input**

- **200kHz Speed**

- **Up to 2 encoder channels**

Digital and Analog Output

- **0.1 nanometer resolution (24 bit)**

- **Connects to PLC or PC**

- **Total System Solution**
  - No external ADC or DAC needed
  - Ethernet or USB Digital Output

- **User Adjustable Analog Output Ranges**

- **User Adjustable Low Pass Filter**

MTI’s Digital Accumeasure series comes standard with 24 bit USB/Ethernet digital output. The analog output model includes the analog output in addition to the standard digital output. Both may be used simultaneously. This is ideal for closed loop applications or integration into systems that require analog.

With the analog output models, users can select 0-5V, 0-10V, -5 to +5V or -10 to +10V output range/ span. The analog output has a fast 20μs latency with a fixed 5 pole 5kHz filter, an important feature for analog closed loop applications.
The Accumeasure D series amplifier is a true revolutionary design that uses the latest technology to convert a highly reliable capacitive electric field measurement (displacement) directly into a highly precise 24 bit digital reading.

Our new capacitance amplifier converts the probe capacitance directly to target gap (distance). This direct conversion approach eliminates errors that traditional analog amplifiers have due to analog filtering, linearization, range extension and the summing of channels to obtain thickness or step measurements.

With the Accumeasure D series, filter frequency response, sample rate, linearization and probe range are all digitally controlled. This ensures the most accurate data capture, lossless processing and the freedom from having to purchase additional acquisition hardware.

**What's in the Box**

- 1, 2, 3 or 4-channel amplifier
- Detachable terminal blocks
- DIN rail mount
- Ethernet cable (2m) • Cat 6 network cable
- USB cable • Type A to Micro-B
- USB flashdrive with • MTI basic software • Users manual • Drivers

**Configurations**

**Grounded Target Measurement**

MTI’s Digital Accumeasure accepts from 1 to 4 single electrode probes working against a grounded target for 4 independent displacement readings.

It also includes 2 quadrature encoder Inputs that can be used to track up to two separate probe positions or an X-Y input for two dimensional tracking of a probe position.

Sample Application: To monitor a rotating shaft run out signal (Amplitude versus shaft position) where the shaft also had a rotary encoder attached.

**Floating Target Mode of Operation**

Two configurations available for targets that cannot be grounded.

- **SINGLE-ENDED**
  - MTI's Digital Accumeasure accepts from 1 to 4 single electrode probes working against a grounded target for 4 independent displacement readings.
  - It also includes 2 quadrature encoder Inputs that can be used to track up to two separate probe positions or an X-Y input for two dimensional tracking of a probe position.

- **180°**
  - Requires two single-ended capacitance probes that work in tandem. Each is operated 180 out of phase with each other. One probe injects current the other drains it.
  - This allows either displacement or thickness mode of operation when the target cannot be grounded.

- **PUSH/ PULL**
  - Each probe consists of two capacitance sensors, built into one probe body. The sensors are driven at the same voltage but 180 degree phase shift between signals. These probes have fewer operational restrictions when measuring to floating targets as capacitive fringing effects are cancelled as the two probes have identical characteristics.

  One Push/Pull probe is ideal for displacement measurement, and 2 Push/Pull Probes for accurate thickness measurement.

- **For use with:**
  - D1.xx • D3.xx
  - D2.xx • D4.xx

**Visit our technology section on our website for comprehensive information on Quadrature encoder input and 180° operating principles.**
### Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Range</td>
<td>0 to 12.5mm³</td>
</tr>
<tr>
<td>Noise</td>
<td>0.0006% FSR at 50Hz³</td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.00085% FSR (at a fixed point, 1 Hz bandwidth)²</td>
</tr>
<tr>
<td>Minimum System Resolution</td>
<td>0.100 nm²</td>
</tr>
<tr>
<td>Long Term Stability/Drift</td>
<td>20 ppm/month or better at (±1 °C)</td>
</tr>
<tr>
<td>Linearity Accuracy</td>
<td>±0.01% FSR</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>5 kHz</td>
</tr>
<tr>
<td>Output Data Rate</td>
<td>100 min. to 20,000 max. (samples per second)</td>
</tr>
<tr>
<td>Temperature Stability</td>
<td>100 ppm digital (over 0 to 40 °C)</td>
</tr>
<tr>
<td>Butterworth Filter</td>
<td>50, 100, 500, 1 kHz, or 5 kHz</td>
</tr>
<tr>
<td>Range Extension</td>
<td>1x and 2x Default. Up to 10X max. optional</td>
</tr>
<tr>
<td>ADC Bit Count</td>
<td>24-bits</td>
</tr>
<tr>
<td>Exponential Filter</td>
<td>No Filtering, 0.1, 1 or 10 Hz</td>
</tr>
<tr>
<td>Basic Interface</td>
<td>Command-Response, ASCI commands</td>
</tr>
<tr>
<td>Digital Output</td>
<td>Micro USB or RJ-45 Ethernet 10/100/1000</td>
</tr>
<tr>
<td>Analog Output Span</td>
<td>0-5V (14 bit resolution), 0-10V (15 bit resolution), -10V to +10V (16 bit resolution), -5V to +5V (15 bit resolution)</td>
</tr>
<tr>
<td>Analog Output Impedance</td>
<td>50, 0, 5kHz, 5 pole Butterworth Low Pass Filter Limited</td>
</tr>
<tr>
<td>Encoder input</td>
<td>0-24VDC max, Threshold ~1.2 V, 32 bit, Z input/ reset input</td>
</tr>
<tr>
<td>Included Software</td>
<td>MTI Basic Software, LabVIEW, .NET, and DLL Drivers</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 – 40 °C, 95% non-condensing (designed)</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>20 °C, 100kPa, 50%RH (nominal)</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>IP40 (particles to 1 mm/ no water protection)</td>
</tr>
<tr>
<td>Target Ground Return</td>
<td>Integrated with Power Connector</td>
</tr>
<tr>
<td>Input Protection</td>
<td>Reverse Polarity (Over Volt to 35VDC)</td>
</tr>
<tr>
<td>ESD Protection</td>
<td>±4kV Contact and ±8kV Air</td>
</tr>
<tr>
<td>Case Dimensions</td>
<td>2” (53mm) H x 4” (103mm) W x 4.7” (120mm) D</td>
</tr>
<tr>
<td>Case Mount</td>
<td>DIN Mount Kit</td>
</tr>
<tr>
<td>Probe Connectors</td>
<td>SMA Female</td>
</tr>
</tbody>
</table>

**Note:**
- Measurement Range is determined by probe selected and amplifier gain (Range Extension).
- Actual resolution is a function of measurement range and frequency response please refer to probe brochures for specifications.
- 0.00000085 x Frequency Response x FSR

### Probe Configuration

- **0** = single-ended probe(s)
- **1** = Push/Pull configuration
- **2** = 180° configuration

*Applicable to 2 or 4 channels only.

### Output Type

- **0** = standard digital output
- **1** = add analog output

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**Tip for Accurate Ordering Process**

- **Amplifier Main Product Code:** 8000-6234-xxxx
- **# of channels:** Choose from 1 to 4 channels amplifier
- **Output Type:** 0 = standard digital output
- **1 = add analog output**

**Probe Configuration**

- **0** = single-ended probe(s)
- **1** = Push/Pull configuration
- **2** = 180° configuration

*Applicable to 2 or 4 channels only.

**Sample Product Code:** 8000-6234-411

*Code means you ordered: A 4-channel digital Accumeasure with an analog output and with a Push/Pull Configuration.

**MTI Basic Software Included**

- Easy user interface allows exporting data to image files or Excel® CSV files or data logging for data analysis and reports. The user settings tab allows adjustment of range, filter, data rate and other items.

Refer to MTI Accumeasure probe brochures for probe choices.

MTI offers a wide variety of standard capacitance probes. Many of our probes also operate at multiple ranges through digital range extension. Consult the probe brochures to determine the maximum range a probe may be extended.