Digital Accumeasure Gen 3

CAPACITANCE DISPLACEMENT

ANALOG

DIGITAL

with Quadrature Encoder Input

mti SDK

COMPATIBLE WITH
NATIONAL INSTRUMENTS
LabVIEW

Microsoft® **.NET**

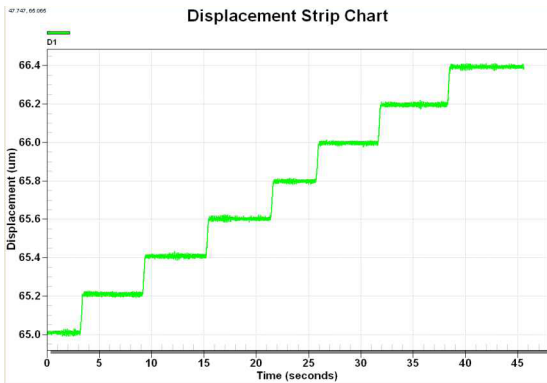Standard and Custom Capacitance Probes Available

True Direct Digital Capacitive Displacement Sensor

Up to 0.01% FSR Linearity

Sub-nanometer Resolution

Core Features

Highest resolution in the industry with 0.01% linearity

Displacement Strip Chart

✓ **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**

✓ **MTI Basic Software included**

✓ **TM NI LabVIEW Driver Included**

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

✓ **Thickness Mode** 2 and 4 channel amplifier configuration. A pair of probes needed for thickness.

✓ **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.

The Accumeasure Basic software allows calibration and display of the encoder position for profile visualization. Additionally, the DLL allows programmers to set up encoder calibration in custom programs.

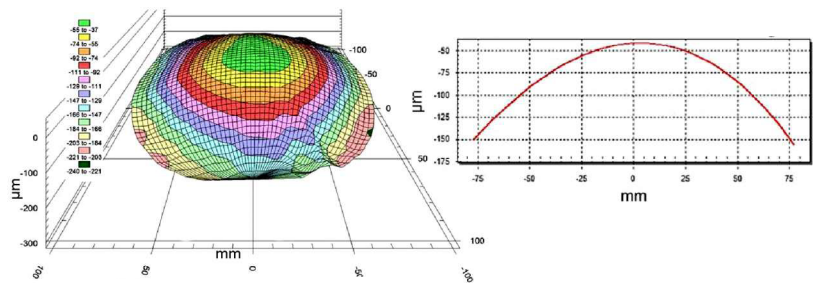✓ **Synchronized Probe Position and Probe Displacement**

✓ **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 Gen 3 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.
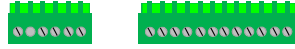
What's in the Box

1, 2, 3 or 4-channel amplifier

DIN rail mount

Detachable terminal blocks

USB flashdrive with
- MTI basic software
- Users manual
- Drivers

Ethernet cable (2m)
- Cat 6 network cable

USB cable
- Type A to Micro-B

The Accumeasure Gen 3 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.

Where:
C=Capacitance
ε= Dielectric constant of the gap medium, typically air
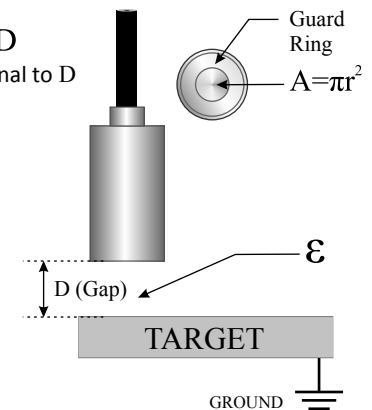D= Gap distance between the probe and grounded target
A= Probe sensing area

$$C=A\varepsilon/D$$
C is proportional to D

Guard Ring

$A=\pi r^2$

D (Gap)

ε

TARGET

GROUND

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 Gen 3, 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.

Configurations

Grounded Target Measurement

SINGLE-ENDED

MTI's Digital Accumeasure Gen 3 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.

For use with:
- D1xx
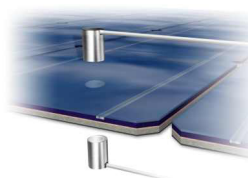- D2xx
- D3xx
- D4xx

Floating Target Mode of Operation
Two configurations available for targets that cannot be grounded.

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.

Ideal for measuring thickness of floating targets either conductive or insulating.

For use with:
- D2xx
- D4xx

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:
- D2xx
- D4xx

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

Tip for Accurate Ordering Process ◎

Amplifier Main Product Code

$$8\ 0\ 0\ 0\ -\ 6\ 4\ 5\ 4\ -\ \textit{x}\,\textit{x}\,\textit{x}$$

Probe Configuration
0=single-ended probe(s)
***1**= Push/Pull configuration
***2**=180° configuration
* *applicable to 2 or 4 channels only*

# of channels
Choose from **1** to **4**
channels amplifier

Output Type
0=standard digital output
1= add analog output

single-ended

T A R G E T
⏚ GROUND

180°

T A R G E T
FLOATING

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

push/
pull

T A R G E T
FLOATING

Specifications ◎

Measurement Range	0 to 12.5mm[1]
Noise	0.000001√Hz FSR
Repeatability	0.000085% FSR (at a fixed point, 1 Hz bandwith)[2]
Minimum System Resolution	0.100 nm[2]
Long Term Stability/Drift	20ppm /month or better at *(±1° C)*
Linearity Accuracy	±0.01% FSR[2]
Frequency Response	5kHz
Output Data Rate	100 min. to 20,000 max. (samples per second)
Temperature Stability	100 ppm digital (over 0 to 40°C)
Butterworth Filter	50, 100, 500, 1kHz, or 5kHz
Range Extension	1x and 2x Default. *Up to 10X max. optional* *(see probe charts for max probe range extension permissable)*
ADC Bit Count	24-bits
Exponential Filter	No Filtering, 0.1 , 1 or 10 Hz
Basic Interface	Command-Response, ASCII commands
Digital Output	Micro USB or RJ-45 Ethernet 10/100/1000
Analog Output Span	0-5V (14 bit resolution), 0-10V(15 bit resolution), -10V to +10V (16 bit resolution), -5V to +5V (15 bit resolution)
Analog Output Impedance	50 Ω, 5kHz, 5 pole Butterworth Low Pass Filter Limited
Encoder Input	0-24VDC max, Threshold ~1.2 V, 32 bit, Z input/ reset input
Included Software	MTI Basic Software, LabVIEW, .NET, and DLL Drivers
Operating Temperature	0 – 40°C, 95% non-condensing (designed) 20°C, 100kPa, 50%RH (nominal)
Operating Environment	IP40 (particles to 1mm/ no water protection)
Power Requirements	24VDC±1V 50mV ripple, switching speed >60kHz. <8W estimated
Target Ground Return	Integrated with Power Connector
Input Protection	Reverse Polarity (Over Volt to 35VDC)
ESD Protection	±4kV Contact and ±8kV Air
Case Dimensions	2" (53mm) H × 4" (103mm) W × 4.7" (120mm) D
Case Mount	DIN Mount Kit
Probe Connectors	SMA Female

[1] Measurement range is determined by probe selected and amplifier gain (Range Extension)
[2] actual resolution is a function of measurement range and frequency response (please refer to probe brochure for specifications
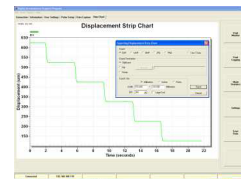
MTI Basic Software Included

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.

MTII 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.

mtiinstruments

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