Nikon's DigiMicro Position Encoders

Nanometer Resolution with Sub-Micron Accuracy

Available in North America through NanoWave, Inc.

The DigiMicro Family

The DigiMicro product line from Nikon is a family of optically-based position feedback encoders. They are often used as digital height gauges but have many other uses and applications in motion control systems. The encoders feature resolution down to 5 nanometers with sub-micron accuracy, and are built with Nikon's traditional superior quality and reliability to combat harsh industrial environments.

Three models of the DigiMicro encoder heads are available through NanoWave with measurement ranges from 12mm up to 100mm. All models work with a mating interpolator also sold and supported by NanoWave. These plunger-type probes have extremely smooth mechanical action and feature a Nikon exclusive diffraction-type optical encoder. The encoder mechanism is enclosed in a sealed compact extruded-aluminum housing which resists contamination and dirt. The encoders install quickly, are easy to set-up, and have a wide variety of industrial and research applications.

Applications

- Motion Control
- Laboratory Instruments
- Medical Equipment
- Robotics
- Industrial Automation
- Milling Machines
- Semiconductor Equipment

Incremental Encoders for Motion Control

For motion control systems, the DigiMicro encoders combined with the interpolators provide a compact solution with an obtainable resolution of 5 nanometers. The VFU-X1600S interpolator outputs standard A-Quad-B digital signals which are compatible with many commercially available encoders, counters, and motion control boards. Because the interpolators are "on-axis" measurement instruments, they can easily be mounted on the relevant measurement plane. Abbe errors are also greatly reduced or even eliminated (vs. side-mounted encoders placed on underlying translational stages) when measuring "on-axis". Because they are self contained optical encoder units, there is no need to mount and align read-heads with diffraction grating scales. This avoids many mechanical complications saving expensive engineering time while also eliminating a host of measurement errors and reliability problems typical of this type of installations.

Shop Floor or Laboratory Instruments

For shop floor and laboratory measurement instruments, Nikon DigiMicro encoder heads are used as digital height gages and are typically used with the TC-101 digital read out display. A customer can read resolutions from as small as 10 nanometers up to 5 microns. The TC-101 and other DigiMicro accessories, such as measurement stands and a variety of probe tips, are also available through NanoWave.

Nikon's compact lightweight MH-12M DigiMicro encoder head

The Nikon VFU-X1600s high resolution interpolator for motion control

The Nikon TC-101 interpolator with digital read-out

A Reputation for Excellence

Recognized as a leader in shop-floor digital height gages, the DigiMicro product line from Nikon has established a reputation for high-precision and high reliability throughout Japan and Asia. When used as position encoders in motion control systems, DigiMicro products fulfill some of the most demanding applications in semi-conductor and other manufacturing processes.

Features

- Nanometer Precision
- Quick easy integration
- High Reliability and Durable
- Greater than 1M Cycle operation
- 5/12V operation
- Standard A Quad B output
- Rugged extruded aluminum enclosures

In these capacities, the encoders are ideal for both laboratory motion controlled systems as well as embedded use as in robotic systems and industrial automation equipment.

Distributed & Supported by NanoWave

NanoWave is pleased to bring these advanced measurement instruments to the North American market with technical support and advanced engineering services. We have over 30 years of combined experience in high-performance, high-precision measurement and motion control systems. NanoWave has teamed with Nikon Corporation to leverage their advanced encoder technologies and widely respected manufacturing expertise into new market opportunities, working closely with established VARs, OEMs, industrial distributors, and large end-users of precision measurement systems.

Please see specifications below and on the pages that follow.
Specifications subject to change without notice.

DigiMicro Encoder Heads

Specifications	MH-12M	MF-501 or MF-501-5V	MF-1001 or MF-1001-5V
travel range (plunger stroke)	12 mm	50 mm	100 mm
minimum resolution	5 nm	5 nm	5 nm
response speed (@ 5 nm res.)	25 mm/s	25 mm/s	25 mm/s
response speed (@ 10 nm res.)	50 mm/s	50 mm/s	50 mm/s
output signal (analog)	A Quad B	A Quad B	A Quad B
lifetime without degradation	> 1,000,000 cycles	> 1,000,000 cycles	> 1,000,000 cycles
Accuracy (@ 20 C +/- 1 C)			
across full travel range	+/- 700 nm or better	1 micron	3 micron
repeatibility (per JIS 8.7509-8-4)	+/- 200 nm	+/- 500 nm	+/-500 nm
return error	+/- 150 nm	+/-500 nm	+/-500 nm
certification & unit accuracy profile	(optional)	(optional)	(optional)
Physical Characteristics			
size (excl. plunger casing, plunger & tip)	58 x 31 x 24 mm	163 x 42 x 30 mm	274 x 42 x 30 mm
plunger casing diameter	8 mm	25 mm	25 mm
total mass	145 g	310 g	480 g
mass of moving parts	20 g	37 g	56 g
force to compress plunger spring*	0.44 to 0.64 N	0.39 to 1.42 N	0.39 to 1.42 N
operating radial force tolerance	0.981 N	0.981 N	0.981 N
operating torsion tolerance	0.0049 Nm	0.0049 Nm	0.0049 Nm
non-operating radial force tolerance	9.8 N	1.961 N	1.961 N
non-operating torsion tolerance	0.39 Nm	0.294 Nm	0.294 Nm
**Default, adjustable at factory*			
Electrical			
operating DC voltage options*	5 V Only	12 V or 5 V	12 V or 5 V
signal & DC power cable supplied**	500 +/-50 mm	2000 +/-50 mm	2000 +/-50 mm
** specify "-5V" extension for 5V version*			
***connects to DigiMicro VFU or TC-101*			
Environmental			
operating temperature	20 C to 40 C	20 C to 40 C	20 C to 40 C
non-operating temperature	-20 C to 60 C	-20 C to 60 C	-20 C to 60 C
operating humidity	< 95% non-condensing	< 95% non-condensing	< 95% non-condensing
non-operatinng humidity	< 95% non-condensing	< 95% non-condensing	< 95% non-condensing
non-operatinng humidity	< 80% (@ 40 to 60 C)	< 80% (@ 40 to 60 C)	< 80% (@ 40 to 60 C)

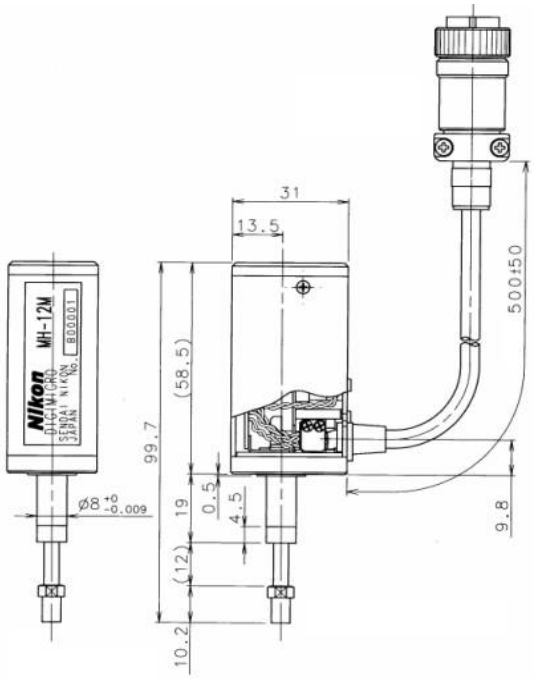
DigiMicro Interpolators

Specifications	VFU-X1600S	TC-101
digital readout display	no	yes
provides A Quad B output	yes	no
interpolation factor	1600	up to 800
minimum resoluiton	5 nm	10 nm
resolution settings - user adustable	(5 nm only)	10nm, 50nm 100nm, 500nm, 1um, 5um
DigiMicro encoder heads supported	MH-12M, MF-501-5V, MF-1001-5V	MF-501, MF-1001 (12 Volt versions)
Applications & Features		
	best suited for real-time motion control rugged metal casing suitabale for hidden industrial mounting	best suited for human read-out 10 Digits, 7-segment LED reset, preset, pulse check, error alm
Physical Characteristics		
size	126.5 x 41 x 29 mm	176 x 150 x 67 mm
mass	~ 200 g	~ 1 kg (excl. power supply)
Electrical		
output connector*	Tajimi Musen R04-R12M	RS-232 for data option
output signal (See Notes 1 & 2 below)	Digital A Quad B (pulsed 5 MHz)	Async 8 bit characters
external DC power supply included	no (to be procured by user)	yes (12 V, 2.5 A)
DC power cable length	N/A (user customized)	1 m
AC input to external power supply	N/A (user customized)	100 to 120 VAC, 50 to 60 Hz
external power supply required	+5 VDC (+/- 5% ripple)	N/A
power supply noise tolerance	+/- 50 V (50 ns/ 1us pulse)	N/A
induced noise tolerance	+/- 1 kV (50 ns/ 1us pulse)	N/A
power consumption with encoder	0.5 W (103 mA)	6 W
**a mating is connector supplied with VFU*		
Environmental		
operating temperature	0 C to 40 C	21 C to 40 C
non-operating temperature	-20 C to 60 C	-20 C to 60 C
operating humidity	< 95% non-condensing	< 95% non-condensing
non-operatinng humidity	< 95% non-condensing	< 95% non-condensing
non-operatinng humidity	< 80% (@ 40 to 60 C)	< 80% (@ 40 to 60 C)

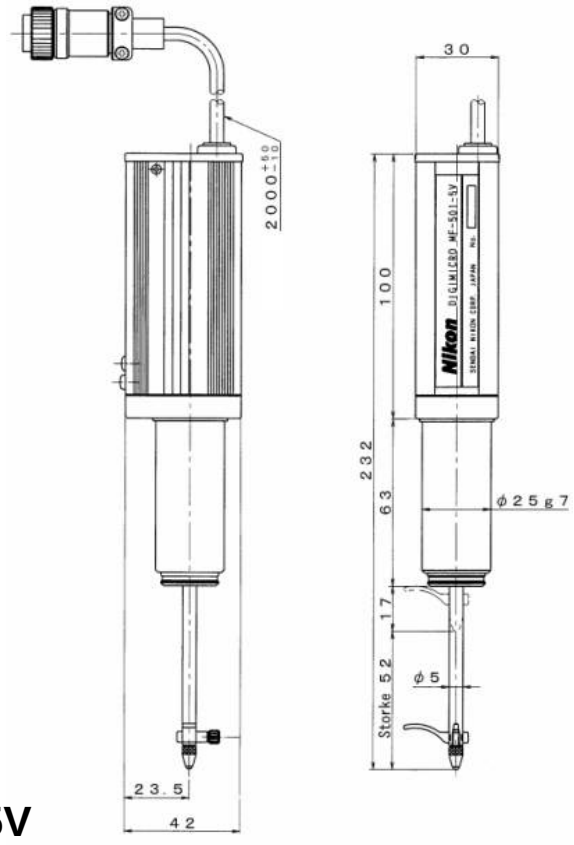
NOTE 1: The encoder counter board to be connected to the VFU-X1600S A Quad B digital output should be capable of detecting faster than a 5 MHz clock edge for reliable pulse counts. The user must make the connecting cable using the supplied mating connector.

NOTE 2: The RS-232 output of the TC-101 is intended for measurement data capture only. The TC-101 is not suitable for motion control.

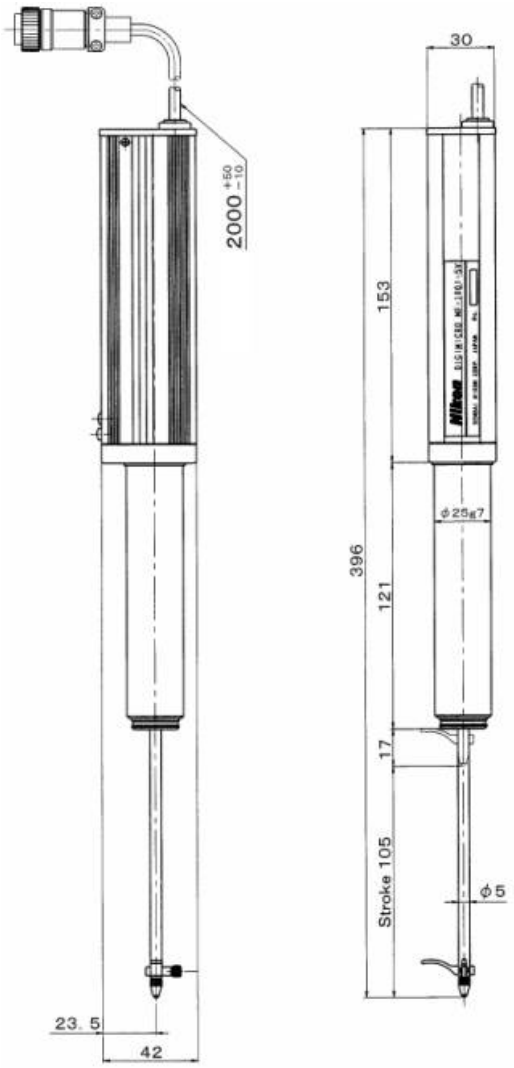
DigiMicro Encoder Heads - Mechanical Drawings



MH-12M



MF-501
MF-501-5V



MF-1001
MF-1001-5V

Please visit our website at www.nanowave.com for more information on products and services.

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