

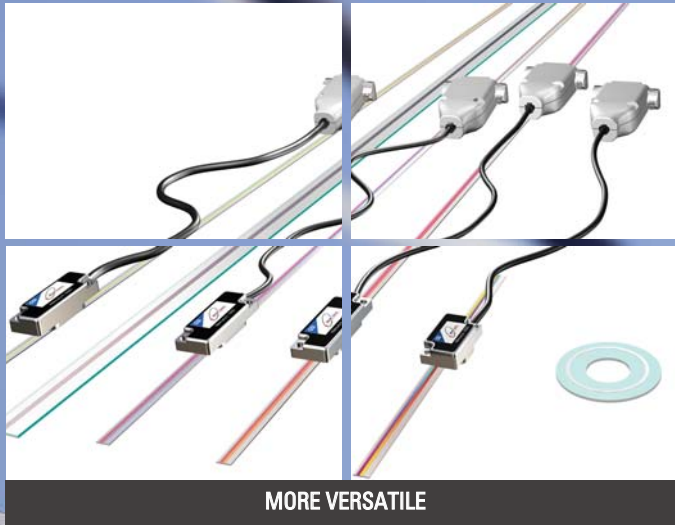


Mercury II™ Family of Encoders

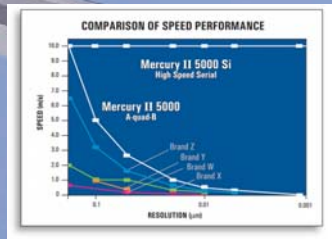
*Superior Performance.
World-Class Reliability.*



SMALLER



MORE VERSATILE



FASTER



SMARTER

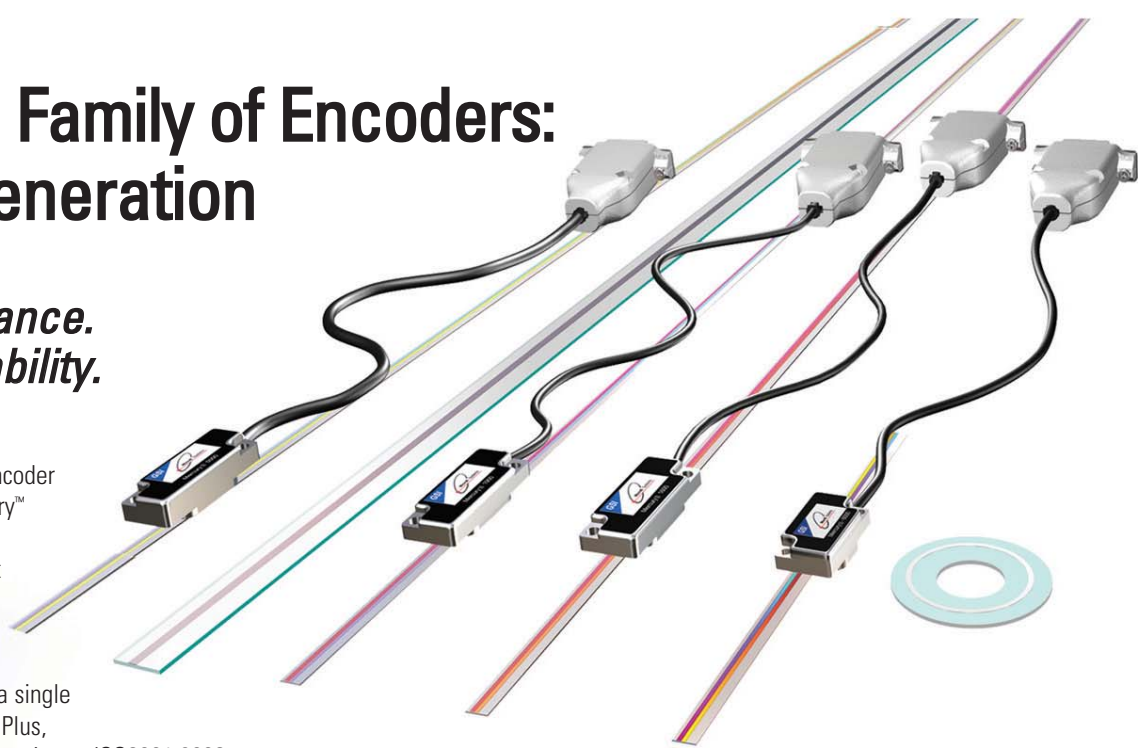


EASIER

Mercury II™ Family of Encoders: The Next Generation

**Superior Performance.
World-Class Reliability.**

MicroE Systems revolutionized encoder technology with the original Mercury™ encoder family. Smaller, faster, and smarter than anything before, it set the standard for innovation. Now, the growing Mercury II line of encoders takes another giant step forward by giving you all this from a single system, without making trade-offs. Plus, comprehensive testing and manufacturing to ISO9001:2008 quality standards makes for world-class robustness and reliability.



PERFORMANCE WITHOUT COMPROMISE

Mercury II's encoder technology achieves the highest resolution and accuracy in its class, with low jitter and low power consumption.

Model	Resolution	Output	Maximum Speed	Scales
MII 6000	5µm - 1.2nm	Digital	10m/s	Tape or Glass; Linear & Rotary
MII 5000	5µm - 1.2nm	Digital	10m/s	Tape or Glass; Linear & Rotary
MII 1900	5µm - 1.2nm	Analog	7.2m/s	Tape or Glass; Linear
MII 1600	5µm - 0.5µm	Digital	20m/s	Tape; Linear

Accuracy	Short Travel*	Long Travel
With Tape Scale (Linear)	±30nm typical	≤ ±5µm/m**
With Glass Scales (Linear)	±20nm typical	High accuracy grade: up to ±1µm† Standard accuracy grade: ±1.5µm†

* MII 6000/5000 accuracy within a 20µm signal period

† See data sheet for full specifications

**After two-point linearization in the customer's controller

ROBUSTNESS WITHOUT COMPROMISE

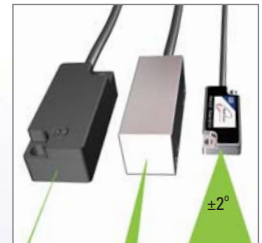
- *Advanced Optical Design*
 - Contamination Resistant
 - Automatic Gain Control
- *Fail-safe Discrete Left and Right Limits (MII 6000 & MII 5000 Models)*
- *High Noise Immunity*
 - Double-Shielded Cable
 - Differential Outputs
- *RoHS and CE Compliant*

UNSURPASSED EASE OF USE

- *Broadest Alignment Tolerances*
- *Setup LED's*
- *Stick-on Optical Index and Limit* Markers*
- *Cut-to-Length Tape Scale*

Broadest Alignment Tolerances for Easy Installation and Setup

Mercury II has the broadest alignment tolerances in the industry, a full ±2 degrees. That makes it the easiest and the fastest sensor to align and setup. No instrumentation is needed; you can align the Mercury II sensor in under 30 seconds.



Stick-on Optical Index & Limits* for Tape & Glass Scales

Mercury II's stick-on optical index is bi-directional and repeatable at full speed. Install index and limit* markers on laser tape or linear glass scales.

* Limits available on MII 6000 & MII 5000 models



PurePrecision™ Laser Tape in Continuous Lengths up to 30 Meters

Laser tape scale reduces inventory costs and long lead times. The unique dispenser is convenient for cutting tape scale to length and for storage.



Innovative Mercury II™ Technology

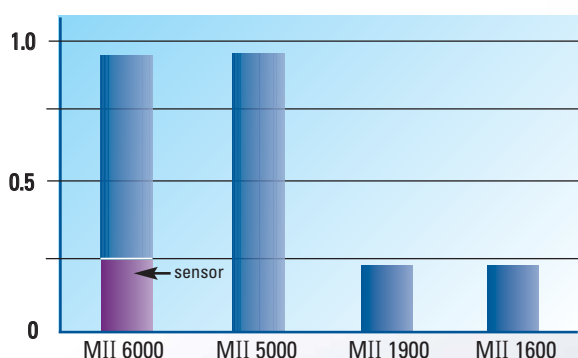
**Integrated Sensor Design =
Less Power Consumption,
Smaller Sensors**



LOWEST POWER CONSUMPTION IN THE INDUSTRY

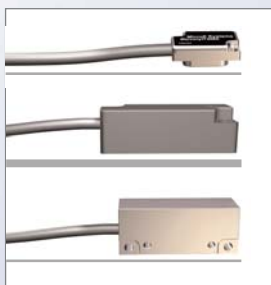
- Mercury II's patented optical system and integrated sensor design dramatically cuts power consumption - and sensor size

Power Consumption with All Outputs Terminated (Watts)



VERSATILITY WITHOUT COMPROMISE

- Low Z-Height Sensor: as low as 8.2mm
- Low Mass Sensor: as low as 3g
- Cut-to-Length Laser Tape up to 30 Meters in Length
- SmartPrecision™ II Software

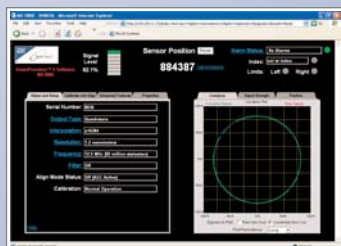


Small Sensor for Faster, More Compact Motion Systems

With Mercury II, you get the smallest 1.2nm capable sensor for compact system designs; plus, you can select the best scale for your application: tape or glass, linear or rotary.

SmartPrecision II Software for Unmatched Monitoring and Diagnostics

Our encoder software enables setup, real time monitoring, and a variety of data plots; programmable resolution, output frequency and output filtering can be set with MII 6000 and MII 5000 models.



Mercury II™ Encoder Selector Chart

MERCURY II 6000

Smallest Sensor, High Resolution and Accuracy with Tape or Glass Scales

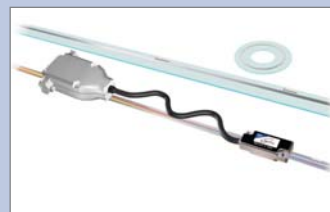
- Resolution: 5µm – 1.22nm Linear, to 268M CPR Rotary
- Output: Digital A-quad-B or High Speed Serial
- Scales: 20µm Tape or Glass, Linear or Rotary
- Vacuum models for up to 10⁻⁹ torr



MERCURY II 5000

Ultra-High Performance, Digital Output from the Sensor, Tape or Glass Scales

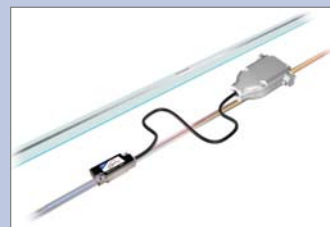
- Resolution: 5µm – 1.2nm Linear, to 268M CPR Rotary
- Output: Digital A-quad-B or High Speed Serial
- Scales: 20µm Tape or Glass, Linear or Rotary



MERCURY II 1900

High Performance Analog Output, Tape or Glass Scales

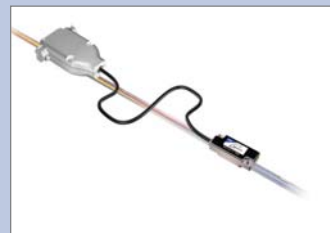
- Resolution: 5µm – 1.2nm Linear
- Output: Analog Sin/Cos
- Scales: 20µm Tape or Glass



MERCURY II 1600

Up to 0.5µm Resolution Digital Output, Tape Scales

- Resolution: 5µm - 0.5µm Linear
- Output: Digital A-quad-B
- Scales: 20µm Tape



Mercury II™ 6000

Smallest Sensor, Ultra-High Resolution and Accuracy Digital Output Encoder

Smallest Sensor

Atmospheric and Vacuum Models

Uses Metal Tape, Linear Glass, or Rotary Glass Scales with Stick-On Index and Limits

Mercury II 6000's programmable resolutions range from 5µm to 1.2nm, with accuracy up to ±1µm; the same sensor works with tape or glass scales, either linear or rotary. High short-range accuracy means smooth velocity control. Performance, small sensor size, robustness, versatility and ease of use make MII 6000 the high performance choice.

System Performance at a Glance

Resolution	Linear	Rotary
	5µm to 1.2nm	20k CPR to 268M CPR
Accuracy	Short travel*	Long travel
With Tape Scale (Linear)	±30nm typical	≤ ±5µm/m**
With Glass Scales (Linear)	±20nm typical	High accuracy grade: up to ±1µm† Std. accuracy grade: up to ±1.5µm†

*Accuracy within a 20µm signal period

**After two-point linearization in the customer's controller † See data sheet for full specifications

MII 6000 IS THE ONLY DIGITAL-OUTPUT ENCODER WITH ALL THESE FEATURES:

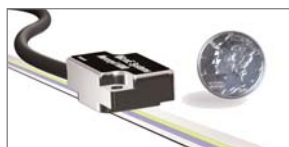
- 8.2mm sensor Z-height
- Stick-on index and limits
- Programmable resolution and settings
- Integral dual limits
- Up to 1.2nm resolution
- A-quad-B or high speed serial word outputs

MII 6000 APPLICATIONS

- Nanometer-Scale Motion
- Piezo-Motor Stages
- Wafer Inspection & Processing
- Automated Optical Inspection
- Metrology
- XY Stages
- Tunable Optic Systems
- Microscope Stages

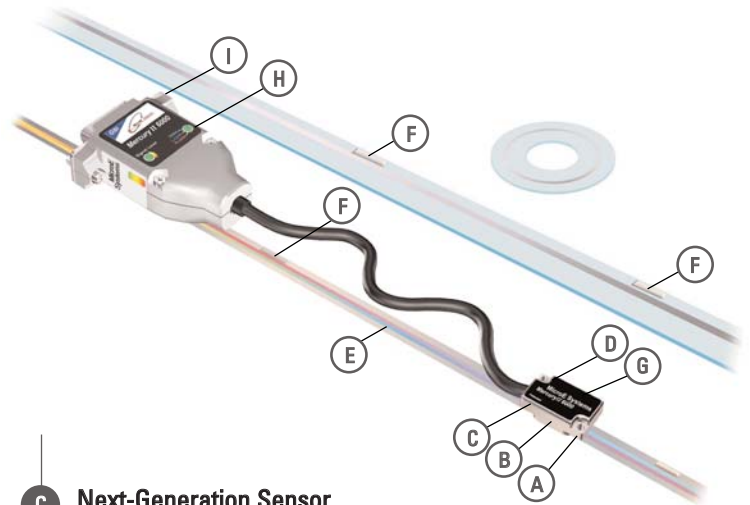
A Compact Z Height Design

MII 6000's sensor is only 8.2mm high, enabling more compact motion systems.



B Broadest Alignment Tolerances in the Industry

Mercury encoders have the widest Z and theta-Z tolerances for fast setup.



C Next-Generation Sensor for Resistance to Contamination

Mercury II's sensor has an improved optical design for contamination resistance: fingerprints, oil, dust, etc.

D One Sensor: Tape or Glass, Linear or Rotary Scales

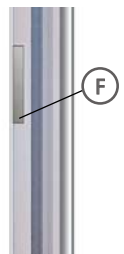
With MII 6000, the same sensor works with tape and glass scales, saving design time and reducing the number of unique parts.

E PurePrecision™ Tape or High Accuracy Linear Glass Scales

PurePrecision laser tape is the easiest tape to install and use. Cut it to any length you need; adhesive backing and our unique application tool make installation fast and accurate. Use linear glass scales for the highest accuracy and precise thermal management.

F The Only Stick-On Optical Index and Limits

Cut-to-length tape scales require an adjustable index. Hall sensors are large and hard to install. Mercury II has the first and only stick-on optical index and limits. The bi-directional optical index provides 1 LSB repeatability at all speeds, while fail-safe left and right optical limits enhance safety and reduce cabling.



G Programmable Features for System Flexibility

MII 6000 provides user programmable or factory-set resolution, output bandwidth, and low-pass filtering. No other encoder offers this capability to accelerate motion system prototyping or greater flexibility for complex motion systems.

H Status LED's Show System Status at a Glance

Status LED's show signal strength and index/limits conditions at all times.

I SmartPrecision™ II Software Adds Unique Functionality

MII 6000's Software allows setup, monitoring, diagnostics and data plots. Ethernet connectivity enables secure, remote viewing of parameters.



Mercury II™ 5000

Miniature, Ultra-High Resolution and Accuracy Digital Output Encoder

Ideal for High Performance 0.1µm Digital From-the-Sensor Applications

Uses Metal Tape, Linear Glass, or Rotary Glass Scales with Stick-On Index and Limits

Mercury II 5000's programmable resolutions range from 5µm to 1.2nm, with accuracy up to ±1µm; the same sensor works with tape or glass scales, either linear or rotary. High short-range accuracy means smooth velocity control. Performance, robustness, versatility and ease of use make MII 5000 the high performance choice.

System Performance at a Glance

Resolution	Linear	Rotary
	5µm to 1.2nm	20k CPR to 268M CPR
Accuracy	Short travel*	Long travel
With Tape Scale (Linear)	±30nm typical	≤ ±5µm/m**
With Glass Scales (Linear)	±20nm typical	High accuracy grade: up to ±1µm† Std. accuracy grade: up to ±1.5µm†

*Accuracy within a 20µm signal period

**After two-point linearization in the customer's controller † See data sheet for full specifications

MII 5000 IS THE ONLY DIGITAL-OUTPUT ENCODER WITH ALL THESE FEATURES:

- 11mm sensor Z-height
- Stick-on index and limits
- Programmable resolution and settings
- Integral dual limits
- Up to 1.2nm resolution
- A-quad-B or high speed serial word outputs

MII 5000 APPLICATIONS

- Linear Motors
- FPD Manufacturing
- Wafer Inspection & Processing
- Automated Optical Inspection
- Metrology
- XY Stages and Gantries
- Tunable Optic Systems
- Microscope Stages

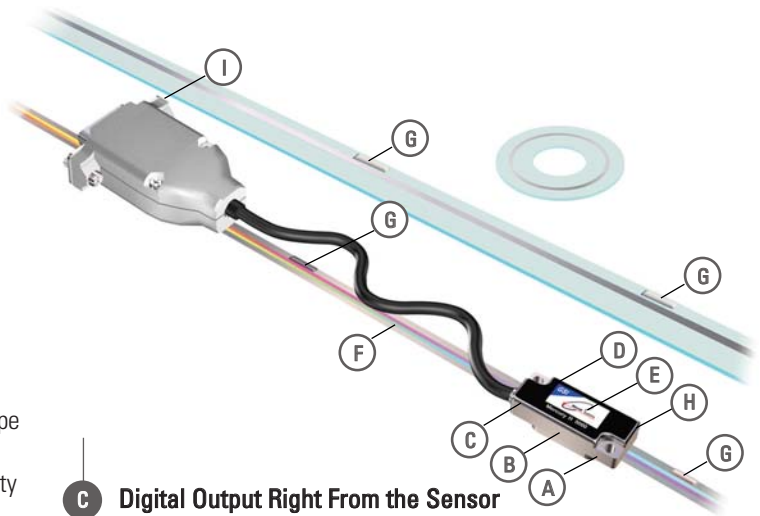
A Compact Z Height Design

MII 5000's sensor is only 11mm high, enabling more compact motion systems.



B Broadest Alignment Tolerances in the Industry

Mercury encoders have the widest Z and theta-Z tolerances for fast setup.



C Digital Output Right From the Sensor

All electronics are in the sensor, including programmable features and interpolation up to x16384. You get the highest system reliability, the smallest footprint, and a variety of connector options - even your own connector.

D Next-Generation Sensor for Resistance to Contamination

Mercury II's sensor has an improved optical design for contamination resistance: fingerprints, oil, dust, etc.

E One Sensor: Tape or Glass, Linear or Rotary Scales

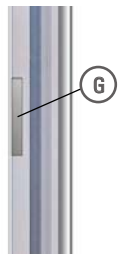
With MII 5000, the same sensor works with tape and glass scales, saving design time and reducing the number of unique parts.

F PurePrecision™ Tape or High Accuracy Linear Glass Scales

PurePrecision laser tape is the easiest tape to install and use. Cut it to any length you need; adhesive backing and our unique application tool make installation fast and accurate. Use linear glass scales for the highest accuracy and precise thermal management.

G The Only Stick-On Optical Index and Limits

Cut-to-length tape scales require an adjustable index. Hall sensors are large and hard to install. Mercury II has the first and only stick-on optical index and limits. The bi-directional optical index provides 1 LSB repeatability at all speeds, while fail-safe left and right optical limits enhance safety and reduce cabling.

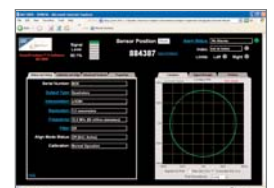


H Programmable Features for System Flexibility

MII 5000 provides user programmable or factory-set resolution, output bandwidth, and low-pass filtering. No other encoder offers this capability to accelerate motion system prototyping or greater flexibility for complex motion systems.

I SmartPrecision™ II Software Adds Unique Functionality

MII 5000's Software allows setup, monitoring, diagnostics and data plots. Ethernet connectivity enables secure, remote viewing of parameters.



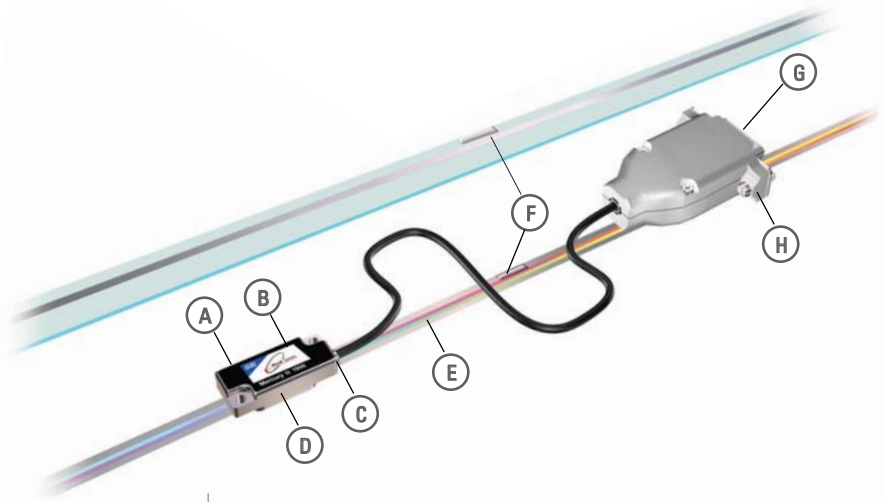
Mercury II™ 1900

Miniature, High Performance Analog Output Encoder

All Electronics in the Sensor

Uses 20µm Metal Tape or Linear Glass Scales to Achieve the Highest Resolution with Your Interpolation Electronics

For high performance with linear tape or glass scales, the Mercury II 1900 analog encoder delivers. It fits compact designs and provides high accuracy, speed, and high-fidelity signals for resolution from 5µm to 1.2nm, depending on your controller. Cut-to-length tape scale applies quickly; linear glass scales provide high accuracy – up to ±1µm. The stick-on index and broad sensor alignment tolerances mean setup in seconds.



System Performance at a Glance

Resolution	Linear
	5µm to 1.2nm, depending on customer interpolation
Accuracy	Long travel
With Tape Scale (Linear)	≤ ±5µm/m*
With Glass Scales (Linear)	High accuracy grade: up to ±1µm† Standard accuracy grade: up to ±1.5µm†

*After two-point linearization in the customer's controller † See data sheet for full specifications

- 1Vpp sin/cos output
- Speeds up to 7.2m/s
- Bi-directional optical index with repeatability at full system speed
- High EMI noise immunity and tolerance to contamination

MII 1900 APPLICATIONS

- XY Stages and Gantries
- FPD Manufacturing
- Wire & Die Bonders
- Pick and Place Systems
- Linear Motors
- Wafer Processing
- Metrology
- Wafer Inspection

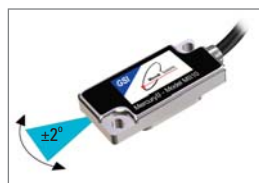
A Compact Z Height Design

MII 1900's sensor is only 8.7mm high, enabling more compact motion system designs.



B Broadest Alignment Tolerances in the Industry

Our next-generation sensor design has the widest Z and theta-Z tolerances for fast setup.



C Analog Output Right from the Sensor

All electronics are in the sensor. You get the highest system reliability, the smallest footprint, and a variety of connector options - even your own connector.

D Next-Generation Sensor for Resistance to Contamination

Mercury II's sensor has an improved optical design for contamination resistance: fingerprints, oil, dust, etc.

E PurePrecision™ Tape or High Accuracy Linear Glass Scales

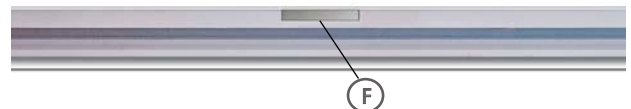
PurePrecision laser tape is the easiest tape to install and use. Cut it to any length you need; adhesive backing and our unique application tool make installation fast and accurate.

Use linear glass scales for the highest accuracy and precise thermal management.

With MII 1900, the same sensor works with both types of scales, saving design time and reducing the number of unique parts in your system design.

F The Only Stick-On Optical Index

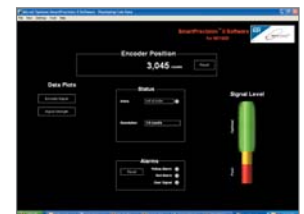
Cut-to-length tape scales require an adjustable index. Hall sensors are large and hard to install. Mercury II solves this problem with the first and only stick-on optical index. It provides bi-directional repeatability at all encoder speeds.



G Choice of Connector Styles

Choose from a fully-shielded 15-pin D-sub connector or customer-specified connector.

H SmartPrecision™ II Software for Setup, Monitoring and Diagnostics



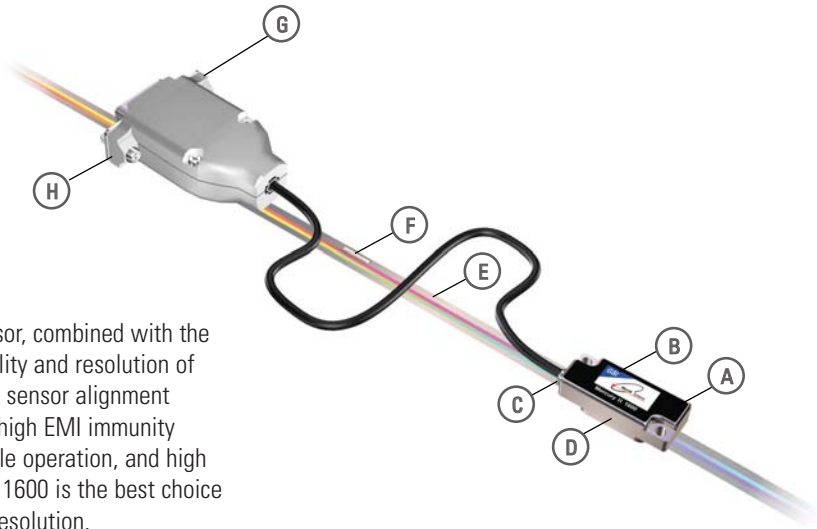
Mercury II™ 1600

Up to 0.5µm Resolution Digital Output Encoder

All Electronics in the Sensor

Uses Metal Tape Scales for Economical Motion Control Designs

The tiny Mercury II 1600 digital output sensor, combined with the cut-to-length tape scale, provides repeatability and resolution of 5µm to 0.5µm. The stick-on index and broad sensor alignment tolerances mean that setup takes seconds, high EMI immunity and tolerance to contamination mean reliable operation, and high bandwidth means speeds up to 20m/s. MII 1600 is the best choice for applications requiring 5µm to 0.5µm of resolution.



System Performance at a Glance

- Resolution and repeatability: 5µm to 0.5µm
- Accuracy: $\leq \pm 5\mu\text{m}/\text{m}$ (after two-point linearization in the customer's controller)
- Speeds up to 20m/s
- Bi-directional optical index with repeatability at full speed
- High EMI noise immunity and tolerance to contamination

MII 1600 APPLICATIONS

- Linear Motors and Stages
- Lab Automation
- Metrology and Inspection
- Medical Equipment
- XY Positioning Tables
- Assembly Automation
- Pick and Place Systems
- Printing Equipment

A Compact Z Height Design

MII 1600's sensor is only 8.7mm high, enabling more compact system designs.



B Broadest Alignment Tolerances in the Industry

Mercury encoders have the widest Z and theta-Z tolerances for fast setup.



C Digital Output Right from the Sensor

All electronics are in the sensor, including up to x40 interpolation. You get the highest system reliability, the smallest footprint, and a variety of connector options - even your own connector.

D Next-Generation Sensor for Resistance to Contamination

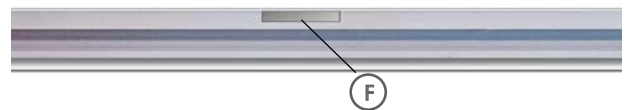
Mercury II's sensor has an improved optical design for contamination resistance: fingerprints, oil, dust, etc.

E PurePrecision™ Tape, the Next Generation Tape Scale

PurePrecision laser tape is the easiest tape to install and use. Cut it to any length you need; adhesive backing and our unique application tool make installation fast and accurate.

F The Only Stick-On Optical Index

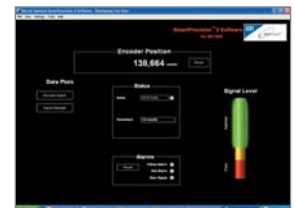
Cut-to-length tape scales require an adjustable index. Hall sensors are large and hard to install. Mercury II solves this problem with the first and only stick-on optical index. It provides bi-directional repeatability at all encoder speeds.



G Choice of Connector Styles

Choose from a fully-shielded 15-pin D-sub connector or customer-specified connector.

H SmartPrecision™ II Software for Setup, Monitoring and Diagnostics

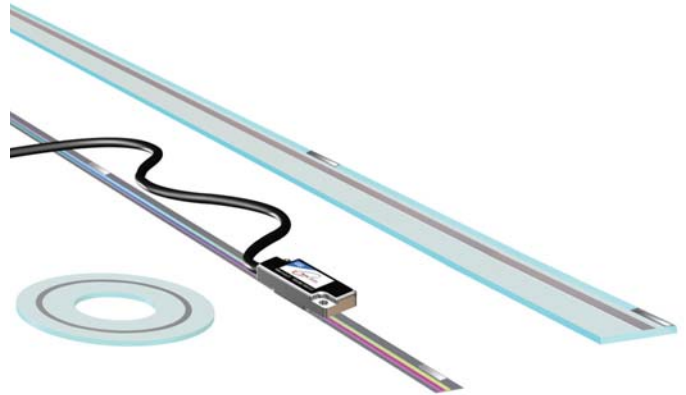


PurePrecision™ Tape and Glass Scales

For Easy Installation and Superior Performance, Mercury II™ is the Only Encoder That Works With Cut-to-Length Tape or Glass Scales, Linear or Rotary

Tape & Glass Features at a Glance

- Easiest tape to use – cut to length and install using convenient application tool, saving time and reducing costs
- Exclusive stick-on optical index and limits* – easy to install, saves time, and saves space; tape scale width is just 6mm, including index and limits
- High contamination tolerance for robust performance
- Glass scales for highest accuracy and thermal stability
- Custom glass scales – special widths, thicknesses, near-zero CTE materials, diameters, or rotary arc segments for OEM orders



CUT TO LENGTH TAPE SCALES OR GLASS SCALES

The Best Tape Scale Solution Available



PurePrecision laser tape scale sets the standard for flexibility and ease of use. There is no need to mount a tape installation tool and there are no index magnets to adjust. Adhesive-mount PurePrecision laser tape has a 20µm pitch and is available in lengths up to 30 meters.

Glass Scales for Highest Precision

Mercury II's 20µm pitch glass scales are available in lengths from 10mm to 1m; rotary diameters up to 121mm. Custom scales are also available.



Use Glass Scales When You Need:

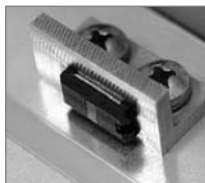
- Accuracy to $\pm 1\mu\text{m}$
- Uniform thermal behavior
- Ultra-smooth velocity control
- Short travel lengths
- Custom configurations
- Rotary scales

Space-Saving Stick-On Index and Limits

Unlike other encoders, Mercury II's stick-on optical index and limits* require no additional space. They mount directly on the 6mm wide tape scale - no screwdrivers, no adjustments.



Mercury II



Other encoders

SCALES AND STICK-ON MARKERS FOR MERCURY II MODELS

Model	Tape Scale	Linear Glass Scales	Rotary Scales	Stick-On Index	Stick-On Limits
MII 6000	•	•	•	•	•
MII 5000	•	•	•	•	•
MII 1900	•	•		•	
MII 1600	•			•	

Note: Contact MicroE Systems for tape-on-a-radius rotary and MII 1900/1600 rotary applications

EASY TAPE INSTALLATION

Step One: Apply Tape to Substrate

Cut the desired length from the dispenser, feed it into the installation tool, and roll it out along a benching edge. The tape can then be fixed at its ends, matching it to the thermal performance of the substrate.

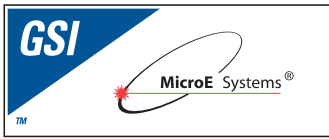


Step Two: Apply Stick-On Optical Index and Limits*

Mercury II lets you place the index and limits* anywhere in seconds. There is no need to mix epoxy or drill holes to mount bulky magnets or limit switches. The markers even work on linear glass scales.






* Limits available on MII 6000 and MII 5000 models



MicroE Systems

Encoder Selector Chart

	Model	Features	Specifications
MERCURY II™ ENCODERS <ul style="list-style-type: none"> ■ Digital or analog output from the sensor ■ Tape or glass scales with stick-on index markers 	Mercury II 6000 Series Encoders	Smallest sensor; programmable resolution and filtering; stick-on index and limits; easy alignment; setup software; vacuum models for up to 10 ⁻⁸ torr	<ul style="list-style-type: none"> • Linear Resolution: 5µm – 0.0012µm* • Rotary Resolution: 66k CPR – 268M CPR* • Output: A-quad-B, Index, Dual Limits and Alarm; High Speed Serial Interface • Tape, Linear Glass or Rotary Glass Scales
	Mercury II 5000 Series Encoders	Programmable resolution and filtering; small sensor; stick-on index and limits; easy alignment; setup software	<ul style="list-style-type: none"> • Linear Resolution: 5µm – 0.0012µm* • Rotary Resolution: 66k CPR – 268M CPR* • Output: A-quad-B, Index, Dual Limits and Alarm; High Speed Serial Interface • Tape, Linear Glass or Rotary Glass Scales
	Mercury II 1900 Encoders	Analog output encoder, resolution set by customer controller, small sensor, stick-on index, easy alignment, setup software	<ul style="list-style-type: none"> • Linear Resolution: 5µm – 0.0012µm • Output: Analog Sin/Cos with Index • Linear Tape or Glass Scales
	Mercury II 1600 Encoders	Digital output with up to 0.5µm resolution, small sensor, stick-on index, easy alignment, setup software	<ul style="list-style-type: none"> • Linear Resolution: 5µm – 0.5µm • Output: A-quad-B with Index • Tape Scales
MERCURY™ ENCODERS <ul style="list-style-type: none"> ■ Smallest sensor ■ Glass scales ■ Cable & connector, or PCB mount 	Mercury Programmable Encoders	Programmable resolution, output frequency & alarms; small sensor, easy alignment; setup software	<ul style="list-style-type: none"> • Linear Resolution: 5µm – 0.005µm* • Rotary Resolution: 6.6k CPR – 67.1M CPR* • Output: A-quad-B with Index; Serial Interface • Linear or Rotary Glass Scales
	Mercury Digital Output Encoders	Digital output with fixed resolution, small sensor, easy alignment, setup software	<ul style="list-style-type: none"> • Linear Resolution : 5µm – 0.5µm • Rotary Resolution: 6.6k CPR – 655k CPR • Output: A-quad-B with Index • Linear or Rotary Glass Scales
	Mercury Analog Output Encoders	Analog output encoder, resolution set by customer controller, small sensor, easy alignment, setup software	<ul style="list-style-type: none"> • Linear Resolution : 5µm – 0.078µm • Rotary Resolution: 6.6k CPR - 4.2M CPR • Output: Sin/Cos with Index • Linear or Rotary Glass Scales
MERCURY VACUUM ENCODERS <ul style="list-style-type: none"> ■ Smallest vacuum sensor ■ Glass scales 	Mercury Vacuum Encoders	Small sensor; programmable resolution, output frequency & alarms; easy alignment; setup software; rated to 10 ⁻⁸ torr	<ul style="list-style-type: none"> • Linear Resolution: 5µm – 0.0012µm* • Rotary Resolution: 6.6k CPR – 268M CPR* • Output: A-quad-B with Index; Serial Interface; Analog Sin/Cos with Index • Linear or Rotary Glass Scales

See data sheets for accuracy and additional specifications.

*Resolution, output and scale options vary by model.

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