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MTE™ Series Encoders

Performance and Value Compact Linear Encoder

MicroE Systems®

RoHS
CE

Specifications

Resolution	5µm, 2.5µm, 1µm, .5µm
Linearity	Tape Scale: ≤ ±10µm over 1m
Outputs	A-quad-B, Index Window, Alarm
Scale Pitch	20µm

Benefits

- **Compact Footprint**
  Miniature sensor
  Compact tape scale

- **Energy Efficient**
  Low power consumption

- **Easy Installation**
  Wide alignment tolerances
  Top or side mount options
  Cut-to-length CET scale
  No external alignment tools

- **Status LED in the Sensor**
  Indicates system health

The Micro Tape Encoder (MTE) is optimized for linear applications with challenging space and cost constraints where rapid time to market and energy efficiency are critical. Using MicroE's patented optical detector design, MTE delivers industry-leading sensor size, energy efficiency, and alignment tolerances. The compact sensor is easily installed in top or side mount configuration without any alignment tools or oscilloscopes. An LED in the sensor provides real time indication of system health. Interpolation is performed in the sensor.

MTE works with Compact Encoder Tape (CET), which is only 6mm wide, installs quickly on virtually any surface with standard adhesive backing, and can easily be cut-to-length in the field to minimize inventory and simplify manufacturing logistics.

Model	Resolution	Output	Maximum Speed
MTE-40	.5µm	Digital	7.2m/s
MTE-20	1µm	Digital	7.2m/s
MTE-8	2.5µm	Digital	7.2m/s
MTE-4	5µm	Digital	7.2m/s

Built-in status LED shows encoder health.

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Specifications

System

MTE sensors are compatible with PurePrecision™ Compact Encoder Tape (CET™) Scale.

Scale Pitch   20µm

System Resolution 5µm, 2.5µm, 1µm, or .5µm
          (specify at time of ordering)

Linearity

Compact Encoder Tape Scale Linearity $\leq \pm$ 10µm/m*

*After two point correction in the customer's controller.

Sensor Size & Weight

Height	Width	Length
0.33 [8.4mm]	0.50 [12.7mm]	0.81 [20.6mm]
Weight	5g (without cable)	

Reliability Information

5 Year Expected Reliability >99.8% under normal operating conditions

Operating and Electrical Specifications

Power Supply	5VDC $\pm$5% @ 135mA max. when used with recommended termination, 80mA max. unterminated
Temperature Operating Storage	0 to 70°C -20 to 85°C
Humidity	10 to 90% RH non-condensing

Agency Standards Conformance: In accordance with Electro-magnetic Compatibility Directive 2004/108/EC:
EN 55011:2007
EN 61000-4-2, -3, -4, -6

Shock	300G 0.5 ms half sine
Vibration	30G at 17Hz
Sensor Cable	Double Shield Diameter 3.6mm (0.142") Flex Life 20x10⁶ cycles @ 20mm bending radius Standard 9 pin D-sub connector

Outputs
Digital A-quad-B, Index Window; A, B and IW outputs are differential. Alarm is single ended open drain.
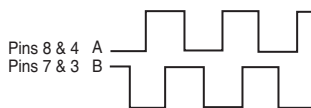
Signal Level
A/B/I (differential): RS-422 compatible
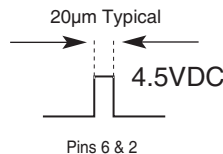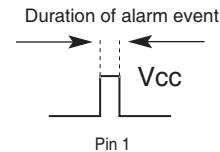A/B/I (single ended): High>4.2VDC, Low <0.2VDC
Alarm: 0.2VDC-Vcc

Digital Output Signals

Quadrature

Pins 8 & 4   A
Pins 7 & 3   B

Index

20µm Typical
4.5VDC
Pins 6 & 2

Alarm

Duration of alarm event
Vcc
Pin 1

Inverse signals are not shown for clarity.

Open drain, requires external pull-up.

Refer to interface drawing & installation manual for design details and recommendations.

# MTE™ Series Encoders
Performance and Value Compact Linear Encoder

MicroE Systems®

Dimensions for Top Mount Configuration

RoHS
CE

8.38

12.70

20.57

6.91
3.35
1.47
2x 4.22
SENSOR MOUNTING SURFACE
TAPE SCALE MOUNTING SURFACE
4.04
(0.20)

METAL TAPE SCALE
ADHESIVE BACKING
TAPE SCALE MOUNTING SURFACE

2.11
20.57
3.93
(10.29)
6.17
12.70
8.48
2X Ø2.69 THRU.
OPTICAL ₵
(Ø8.75)
2.03
16.51
4X R2.1
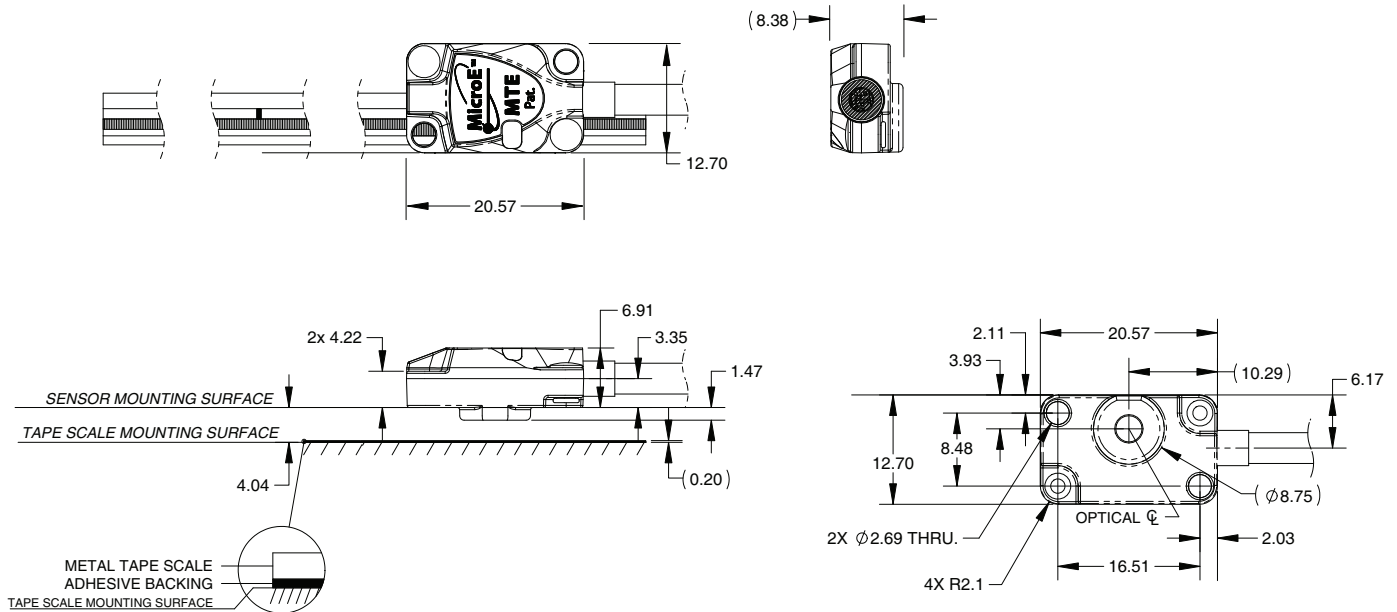
Wide Alignment Tolerances

MTE utilizes MicroE's patented optical detector design to achieve industry-leading small sensor size and alignment tolerances. The compact sensor is easily installed without any alignment tools or oscilloscopes.

MTE Series Sensor Alignment Tolerances	
Axis	**Alignment Tolerance**
X	Direction of Motion
Y	± 0.15mm
Z	± 0.15mm
θ_X	± 1.0°
θ_Y	± 2.0°
θ_Z	± 2.0°

θ_Z
X
Y
Z
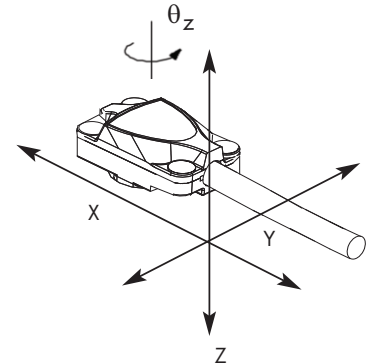
Status LED in the Sensor

An LED in the sensor provides real time indication of system health.*

Green = Optimal performance. Sensor is reading position with sufficient signal strength. Encoder system will function properly. LED will blink when passing over the index mark.

Yellow = Marginal performance. Sensor is reading position with marginal signal strength. Encoder system will function normally but signal strength is less than optimal.

Red = Improper performance. Sensor is reading position with weak signal strength or signals are saturated. Encoder system may not function properly. Alarm signal will be asserted.

*Alarm and LED operate up to a maximum speed of 2m/sec.

Refer to interface drawing & installation manual for design details and recommendations.

Dimensions and Configuration for Side Mount Bracket

(3X) BENCHING PADS

2X M2X0.4 - 6H THRU ALL

9.75

CLEARANCE
FOR CABLE EXIT

16.07

Ø9.30 THRU

32.50

2X M3X0.5 - 6H ⎺ 6.000
TAPPED BOTH SIDES

6.91

2.80

4.00 TO MTG
SURFACE

3.25   26.00

1.20 SENSOR BRKT TO
SCALE MTG SURFACE

0.20 SCALE AND ADHESIVE

SENSOR

METAL TAPE SCALE
ADHESIVE BACKING
TAPE SCALE MOUNTING SURFACE

1.00 SENSOR BRKT TO
TOP OF SCALE
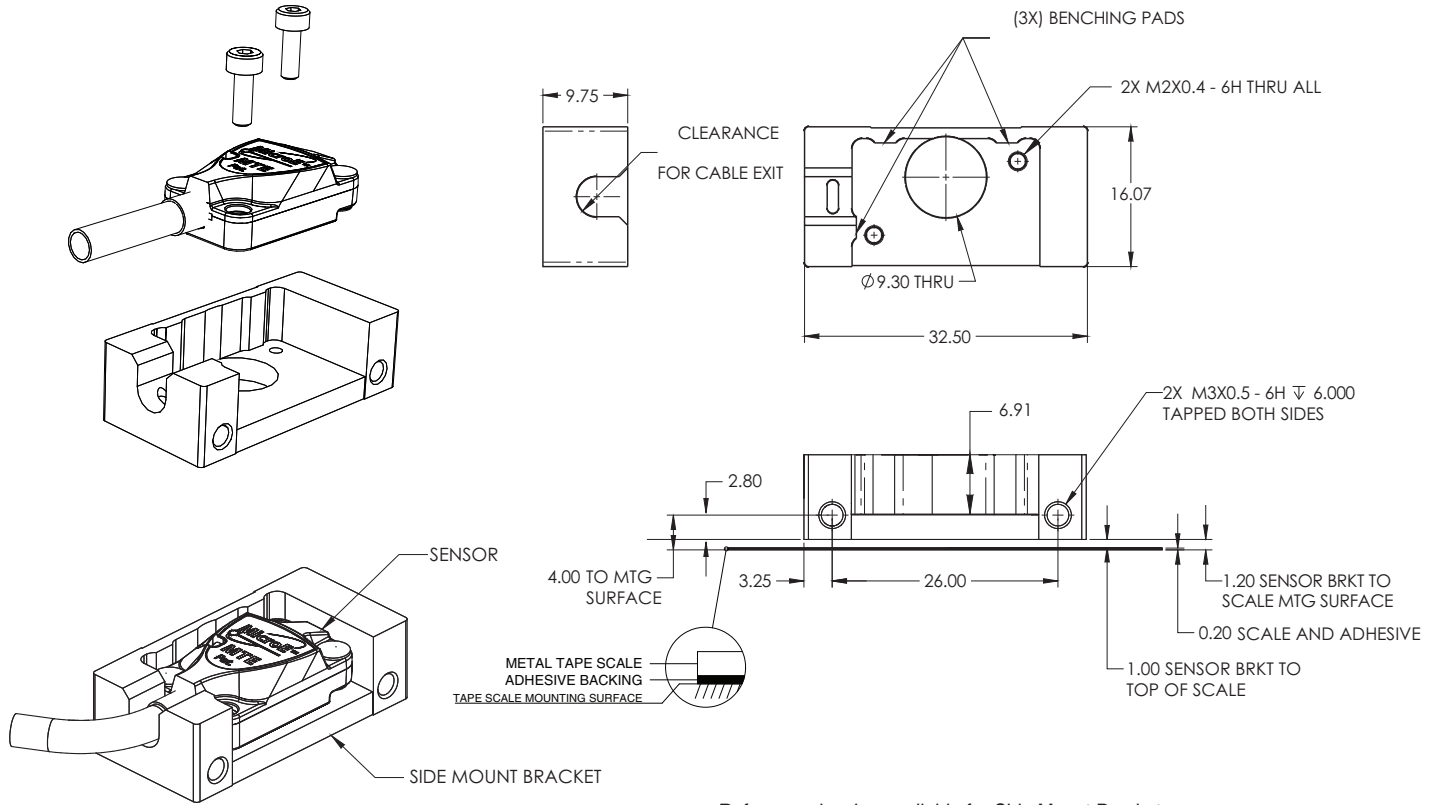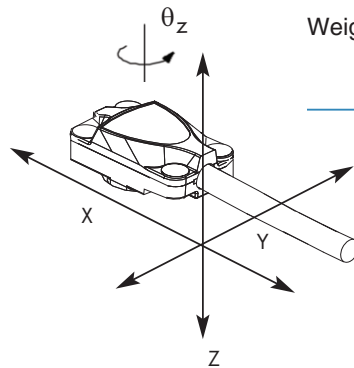
SIDE MOUNT BRACKET

Reference drawing available for Side Mount Bracket.
Contact MicroE Systems Application Engineering.

Wide Alignment Tolerances

MTE Series Sensor Alignment Tolerances	
Axis	**Alignment Tolerance**
X	Direction of Motion
Y	± 0.15mm
Z	± 0.15mm
θ_X	± 1.0°
θ_Y	± 2.0°
θ_Z	± 2.0°

θ_Z

X

Y

Z

Side Mount Bracket Size & Weight

Height	Width	Length
0.38 [9.75mm]	0.63 [16.07mm]	1.28 [32.51mm]
Weight	5g (sensor without cable) 11.5g (sensor with side mount bracket and mounting hardware)	

Refer to interface drawing & installation manual for design details and recommendations.
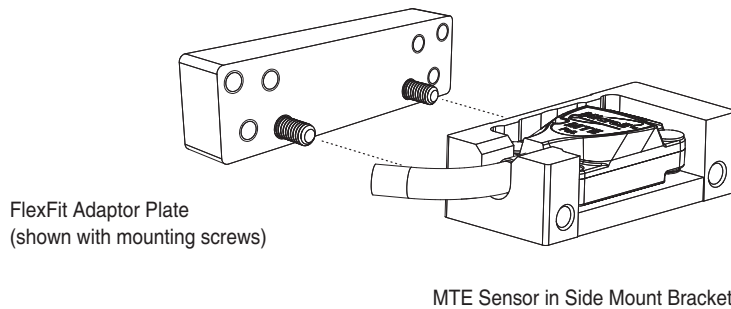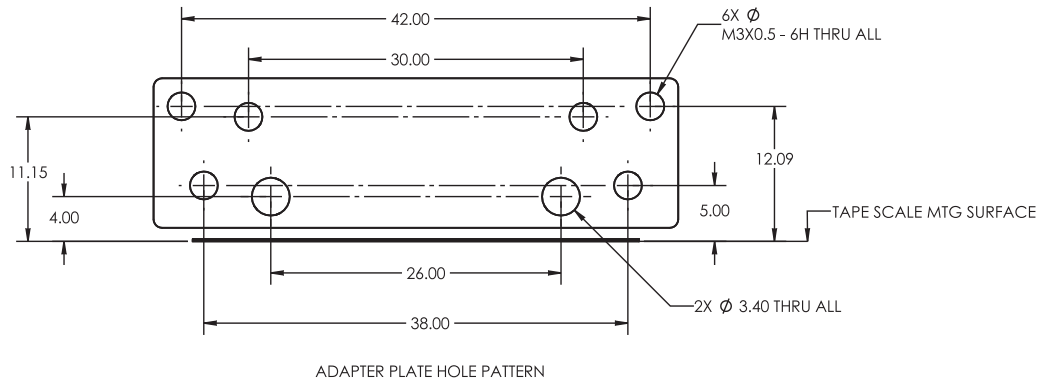
RoHS
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FlexFit™ Adaptor (optional)

The FlexFit adaptor for the MTE Side Mount Bracket kit enables flexible mounting configurations and is compatible with many industry-standard mounting hole patterns. MTE can be installed without re-designing your system hardware.
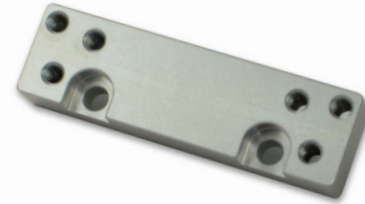
MTE with FlexFit Adaptor - Configuration Option

FlexFit Adaptor Plate
(shown with mounting screws)

MTE Sensor in Side Mount Bracket

FlexFit Adaptor with mounting hole dimensions
(dimensions in millimeters)

42.00
30.00
6X ∅ M3X0.5 – 6H THRU ALL
12.09
11.15
4.00
5.00
TAPE SCALE MTG SURFACE
26.00
38.00
2X ∅ 3.40 THRU ALL

ADAPTER PLATE HOLE PATTERN

Reference drawing available. Contact MicroE Systems Application Engineering.

FlexFit Adaptor Size and Weight

Length	Width	Height
1.85 [47.0mm]	0.32 [8.0mm]	0.53 [13.4mm]

Weight	
	11.5g (sensor and side mount bracket and mounting hardware)
	23.5g (sensor and side mount bracket with FlexFit Adaptor and mounting hardware)

Refer to interface drawing & installation manual for design details and recommendations.

MTE™ Series Encoders
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Connector Pin Configuration
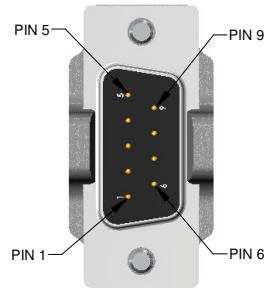
MTE 9P D-Sub Pinouts	
Pin#	Function
1	Alarm
2	Index Window +
3	B+
4	A+
5	5V
6	Index Window -
7	B-
8	A-
9	GND/Inner Shield

NOTE: GND and INNER SHIELD ARE INTERNALLY CONNECTED.
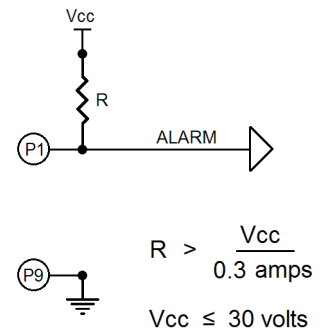
Recommended Signal Termination

Digital Outputs:
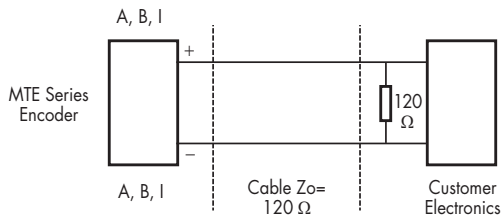
Standard RS-422 Line Receiver Circuitry

Alarm:
Alarm output is an open drain, N-channel MOSFET. Drain circuit is normally closed (current flows) and opens when the encoder signal is too low. Alarm requires the use of an external pull-up resistor. See customer supplied circuit example on right.
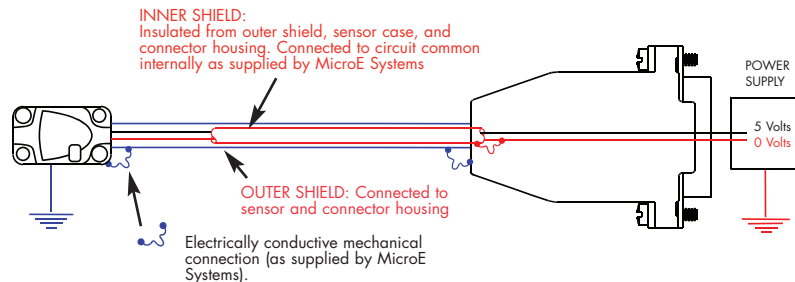

$$R > \frac{Vcc}{0.3 \text{ amps}}$$

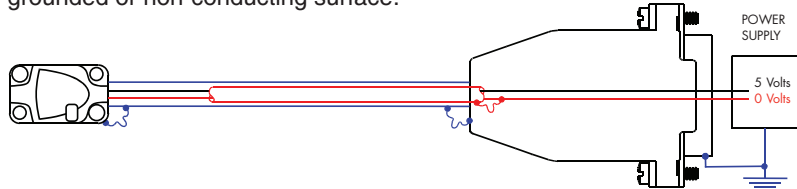$$Vcc \leq 30 \text{ volts}$$

Alarm circuit

Max cable length: 5m. Contact MicroE Applications Engineering if longer length required.

Grounding Considerations

Sensor mounted with good electrical contact to well grounded surface (preferred):

INNER SHIELD:
Insulated from outer shield, sensor case, and connector housing. Connected to circuit common internally as supplied by MicroE Systems

OUTER SHIELD: Connected to sensor and connector housing

Electrically conductive mechanical connection (as supplied by MicroE Systems).

POWER SUPPLY
5 Volts
0 Volts

Sensor mounted to poorly grounded or non-conducting surface:

POWER SUPPLY
5 Volts
0 Volts

Refer to interface drawing & installation manual for design details and recommendations.

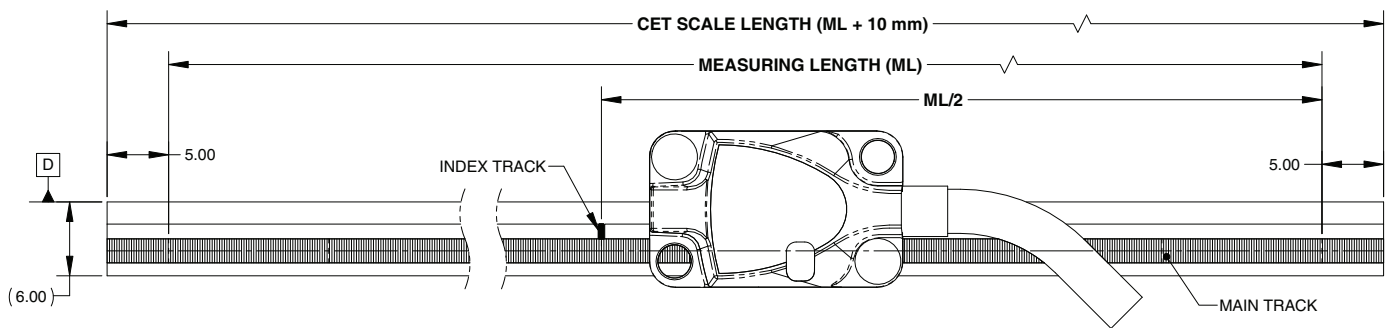# MTE™ Series Encoders
Performance and Value Compact Linear Encoder

PurePrecision™ Compact Encoder Tape (CET™) Scale

MTE works with MicroE's PurePrecision Compact Encoder Tape (CET). PurePrecision linear tape scales are only 6mm wide, are easily installed on virtually any surface with standard adhesive backing, and achieve industry-leading price/performance.

Compact Encoder Tape provides linearity of up to ±10µm/m, is easily cut-to-length in the field and can be ordered in customer-specified lengths up to 30m.

Compact Encoder Tape, with Factory-Encoded Index

CET SCALE LENGTH (ML + 10 mm)

MEASURING LENGTH (ML)

ML/2

D | 5.00 | INDEX TRACK | 5.00

(6.00) | MAIN TRACK

Specifications

Linearity	≤ ±10µm/m
Material	Inconel 625
Typical CTE	13ppm/°C; thermal behavior of the tape scale is typically matched to the substrate using epoxy at the ends of the tape scale

Tape Scale Applicator Tools for MTE Series

The Tape Scale Applicator Tool should be used for scale lengths greater than 1 meter. The Applicator Tool enables fast and accurate installation of long scale lengths which ensures optimal encoder performance.

For MTE Side Mount Bracket and FlexFit Adaptor configurations, Tape Scale Applicator Tool P/N: TSAT-SM-PPT should be used for scale lengths greather than 1 meter.

CET Applicator tool for top mount sensor configuration. P/N: TSAT-CET

Refer to interface drawing & installation manual for design details and recommendations.

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MTE™ Series Encoders
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MicroE Systems®

How to Order

Sensor

MTE – <u>40</u> – <u>2</u>

Cable Length*
1 = 1.0m
2 = 2.0m
5 = 5.0m

Interpolation (Resolution)
4 = x4 (5µm)
8 = x8 (2.5µm)
20 = x20 (1µm)
40 = x40 (.5µm)
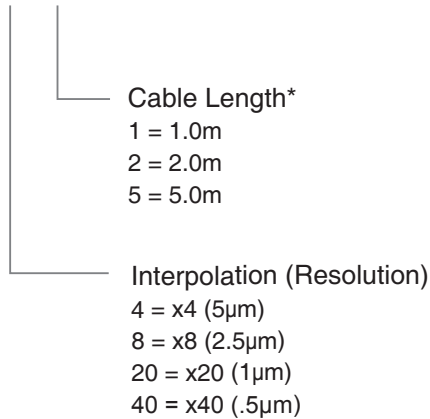
* Custom cable lengths and connectors are available. Contact MicroE Applications Engineering.

Sensor Installation Tools

ZG-CET   Z-Height Gauge, Compact Encoder Tape, top mount configuration

MTE Side Mount Bracket Kit

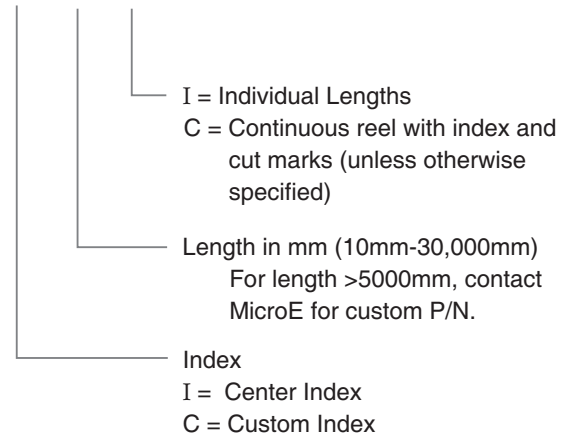**BK-SM-MTE**   Side Mount Bracket Kit. Reference design is available upon request.

FlexFit™ Adaptor

MK-FFA   FlexFit Adaptor Mounting Kit. Reference design is available upon request.

Scales

Compact Encoder Tape (CET™)

CET20 – N – A – <u>I</u> – <u>xxxx</u> – <u>C</u>

I = Individual Lengths
C = Continuous reel with index and cut marks (unless otherwise specified)

Length in mm (10mm-30,000mm)
For length >5000mm, contact MicroE for custom P/N.

Index
I = Center Index
C = Custom Index

Example 1: CET20-N-A-I-4550-C
= 4550mm long, single center index (2775mm from cut marks), continuous

Example 2: CET20-N-A-C-5xxx-I
= Multiple indexes, individually cut, with index dimensions per factory issued part # 5xxx (e.g., index at 50mm and 350mm, segment length 400mm)

Example 3: CET20-N-A-C-5xxx-C
= Single index which is offset from center of segment, continuous, with index dimensions per factory issued part # 5xxx (e.g., index at 50mm from left cut mark, segment length 400mm)

CET™ Tape Scale Applicator Tools (use for lengths >1m)

TSAT-CET   Tape Applicator Tool for MTE, top mount configuration

TSAT-SM-PPT   Tape Applicator Tool for MTE, side mount configuration

End Cap Kit, PurePrecision Tape Scales

EC   Optional Tape Scale End Caps

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All specifications subject to change.