

## MODEL TR2 TRU-TRAC™ - LINEAR MEASUREMENT SOLUTION



### FEATURES

Encoder with rack and pinion gear integrated into one compact unit  
 Easily installed in a vertical, horizontal, or upside-down orientation  
 Operates at speeds up to 400 feet per minute  
 Spring-loaded torsion arm eliminates gear backlash  
 Integrated module simplifies your system design

The TR2 Tru-Trac™ is a versatile solution for tracking velocity, position, or distance in almost any application and features an integrated encoder with a rack-and-pinion gear assembly. Using the rack-and-pinion gear system, encoder readings can be obtained with repeatable positioning, providing excellent accuracy. Racks can be ordered in varying lengths, and with the accessory spacer block, multiple lengths of rack can be joined for easy installation. The spring loaded torsion arm provides easily adjustable torsion load, giving the TR2 all the flexibility and maneuverability of the original TR1 Tru-Trac™. It can be installed in a horizontal, vertical, or upside down position. The threaded shaft on the TR2's pivot axis is field reversible, providing mounting access from either side. And the durable conductive composite housing material reduces static build up.

### COMMON APPLICATIONS

X-Y Tables, Gantry Systems, Packaging Machinery, Cut-to-Length, Printing, Labeling, Document Handling, Machine Shop Equipment

### MODEL TR2 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical		Electrical				Optional Features - Leave blank for standard options		
TR2	D1 R4	0800	N	V1	A	OC	F00	-20° to 85° C Std IP50 Std None Std
<b>MODEL</b> TR2 Tru-Trac™	<b>CYCLES PER REVOLUTION</b> See CPR Options below Price adder for >1999	<b>INPUT VOLTAGE</b> V1 5 to 28 VDC					<b>CONNECTOR TYPE<sup>6</sup></b> F00 18" Cable <sup>7</sup> (Std) F01 12" Cable F02 24" Cable F03 36" Cable M00 2M Cable <sup>7</sup> J00 18" Cable with 5-pin M12 <sup>4</sup> K00 18" Cable with 8-pin M12	<b>OPERATING TEMPERATURE</b> -20° to 85° C (Std) T1 -40° to 85° C T2 -20° to 100° C
	<b>PIVOT SHAFT MOUNTING<sup>1</sup></b> R4 Right side 1/4-20 thread L4 Left side 1/4-20 thread R6 Right side M6 thread L6 Left side M6 thread							<b>CERTIFICATION</b> None (Std) CE CE Marked <sup>9</sup>
<b>PINION GEAR</b> D1 40 tooth pinion gear for stainless steel rack D2 40 tooth pinion gear for flexible rack 19 No pinion, 1/4" shaft 20 No pinion, 6 mm shaft		<b>NUMBER OF CHANNELS<sup>2</sup></b> A Channel A Channel A Leads B Q Quadrature A & B R Quadrature A & B with Index Channel B Leads A <sup>3</sup> K Reverse Quadrature A & B D Reverse Quadrature A & B with Index	<b>OUTPUT TYPE</b> OC Open Collector PP Push-Pull HV Line Driver <sup>4</sup> PU Pull-Up Resistor <sup>3,5</sup> OD Open Collector with Differential Outputs	<b>MAXIMUM FREQUENCY</b> Standard F3 Extended See Specifications	<b>SEALING</b> IP50 (Std) S2 IP65 S3 IP66			

#### NOTES:

- See mechanical drawing. Shaft is reversible in the field.
- Contact Customer Service for non-standard index gating or phase relationship options.
- Reverse Quadrature not available with Pull-Up Resistor Output Type.
- Line Driver output not available with 5-pin M12 connector. Additional cable lengths available. Please consult Customer Service.
- With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
- For mating connectors, cables, and cordsets, see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Connector Pin Configuration Diagrams at encoder.com.
- For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
- For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
- Please refer to Technical Bulletin TB-100: When to Choose the CE Mark at encoder.com.

#### Model TR2 CPR Options

0001 thru 0189*	0198	0200	0250	0256	0300	0315
0360	0400	0500	0512	0580	0600	0800
1000	1024	1200	1250	1500	1800	2048
2500	2540	3000	3600	4000	4096	5000
7200	8192	10,000				6000

\*Contact customer service for availability

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

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## MODEL TR2 SPECIFICATIONS

### Electrical

Input Voltage.....	4.75 to 28 VDC max for temperatures up to 85° C 4.75 to 24 VDC for temperatures between 85° C to 100° C
Input Current.....	100 mA max (65 mA typical) with no output load
Output Format .....	Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the wheel side. See Waveform Diagrams.
Output Types .....	Open Collector- 20 mA max per channel Push-Pull – 20 mA max per channel Pull-Up – Open Collector with 2.2K ohm internal resistor, 20 mA max per channel Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Index.....	Once per revolution. 1 to 400 CPR: Ungated 401 to 10,000 CPR: Gated to output A See Waveform Diagrams.
Max. Frequency.....	Standard Frequency Response is 200 kHz for CPR 1 to 2540 500 kHz for CPR 2541 to 5000 1 MHz for CPR 5001 to 10,000 Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, & 2540
Electrical Protection.....	Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Noise Immunity .....	Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN50081-1
Quadrature.....	67.5° electrical or better is typical,
Edge Separation.....	54° electrical minimum at temperatures > 99° C
Waveform Symmetry.....	180°(±18°) electrical (single channel encoder)
Accuracy.....	Within 0.017° mechanical or 1 arc-minute from true position (for CPR>189)

### Mechanical

Radial Shaft Load .....	5 lb max. Rated load of 2 to 3 lb for bearing life of $1.2 \times 10^{10}$ revolutions
Axial Shaft Load.....	5 lb max. Rated load of 2 to 3 lb for bearing life of $1.2 \times 10^{10}$ revolutions
Starting Torque .....	IP50 0.05 oz-in IP65 0.4 oz-in IP66 0.8 oz-in
Housing.....	Stainless steel fibers in a high temperature nylon composite
Weight.....	5 oz typical

### Environmental

Storage Temp.....	-25° to 85° C
Humidity .....	98% RH non-condensing
Vibration .....	10 g @ 58 to 500 Hz
Shock.....	80 g @ 11 ms duration
Sealing.....	IP50 standard; IP65 or IP66 available

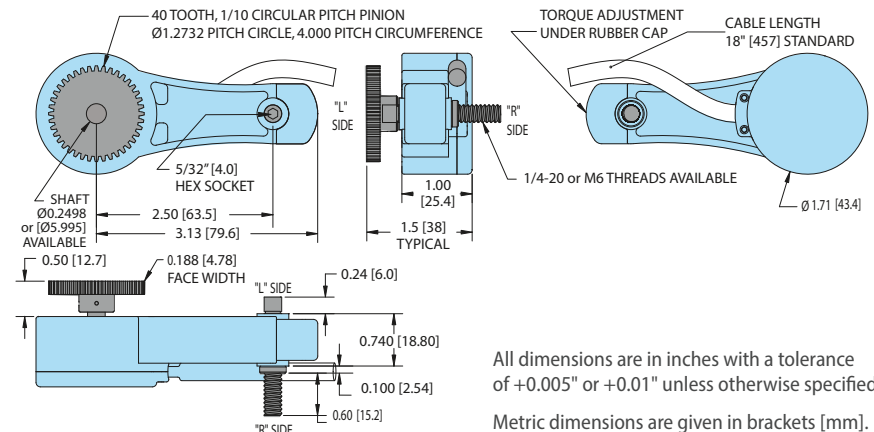
### Mechanical – Stainless Steel Rack

Max Linear Speed.....	400 Feet Per Minute. Speeds over 200 FPM require lubricant, such as MoS <sub>2</sub> paste, to reduce gearing wear. Higher speeds may be achievable, contact Customer Service.
Rack Material .....	303 Stainless Steel
Gearing Tolerance.....	AGMA 10, 20 degree pressure angle teeth
Accuracy.....	±0.0005 inch/inch max accumulated error
Repeatability.....	±0.0001 inch

### Mechanical – Flexible Rack

Max Linear Speed.....	200 Feet Per Minute
Rack Material .....	Acetal
Gearing Geometry.....	20° pressure angle teeth
Accuracy.....	±0.002 inch/inch max accumulated error
Repeatability.....	±0.001 inch for Flexible Rack

## MODEL TR2 TRU-TRAC™



All dimensions are in inches with a tolerance of +0.005" or +0.01" unless otherwise specified.

Metric dimensions are given in brackets [mm].

## WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.

Trim back all unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	White	1	2
A	Brown	4	1
A'	Yellow	---	3
B	Red	2	4
B'	Green	---	5
Z	Orange	5	6
Z'	Blue	---	8
Shield	Bare*	---	---

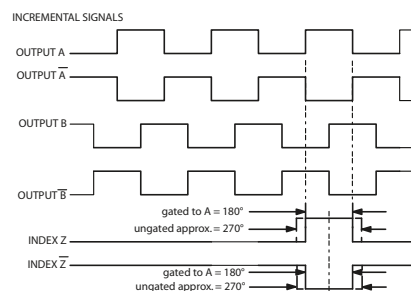
\*CE Option: Cable shield (bare wire) is connected to internal case.

†Standard cable is 24 AWG conductors with foil and braid shield.

\*\*CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

## WAVEFORM DIAGRAM

Incremental signals



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. Waveform shown with optional complementary signals  $\bar{A}$ ,  $\bar{B}$ ,  $\bar{Z}$  for HV output only.

## RESOLUTIONS

### English units

Inches per Pulse	Pulses per Inch	Disc Cycles per Revolution
0.01	100	400
0.005	200	800
0.004	250	1000
0.002	500	2000
0.001	1000	2000*
0.0005	2000	2000**
0.0004	2500	2500**
0.0002	5000	2500**+
0.0001	10,000	2500**++

\*Requires 2x external quadrature counting.

\*\*Requires 4x external quadrature counting.

+Requires 2x Interpolation.

++Requires 4x Interpolation.

## RESOLUTIONS

### Metric Units

mm per Pulse	Pulses per mm	Disc Cycles per Revolution
0.04	25	2540
0.02	50	2540*
0.01	100	2540**

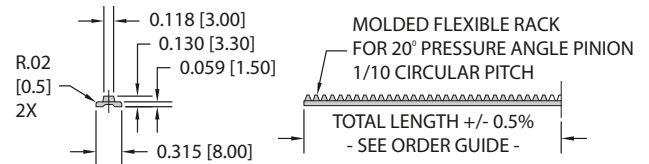
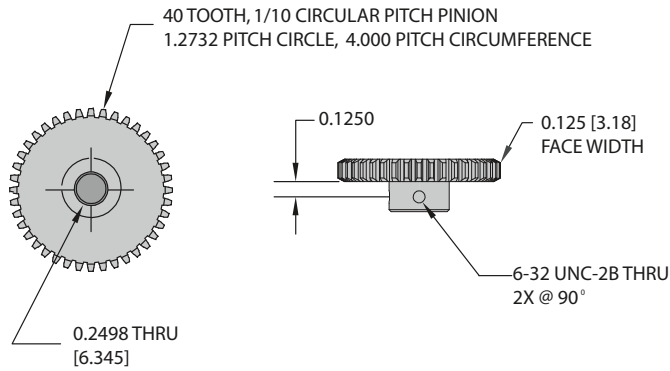
\*Requires 2x external quadrature counting.

\*\*Requires 4x external quadrature counting.

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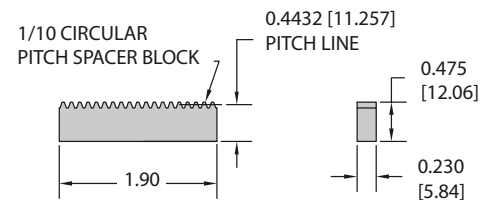
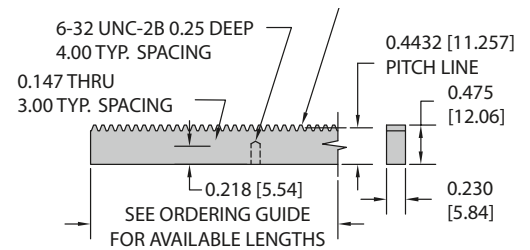
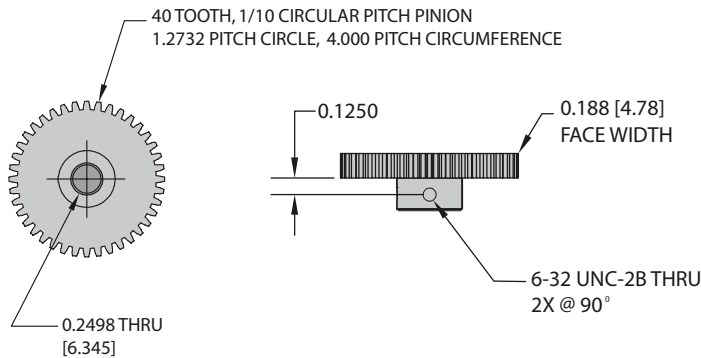
### PINION GEAR FOR FLEXIBLE RACK

0.125 face width pinion for flexible rack



### PINION GEAR FOR STAINLESS STEEL RACK

Precision Agma 10 pinion for rigid rack



### TRU-TRAC™ MOUNTING BRACKET

Allows for a variety of mounting positions and makes installation of the Model TR2 even easier.

