

MODEL TR2 – LINEAR SOLUTION ENCODER



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

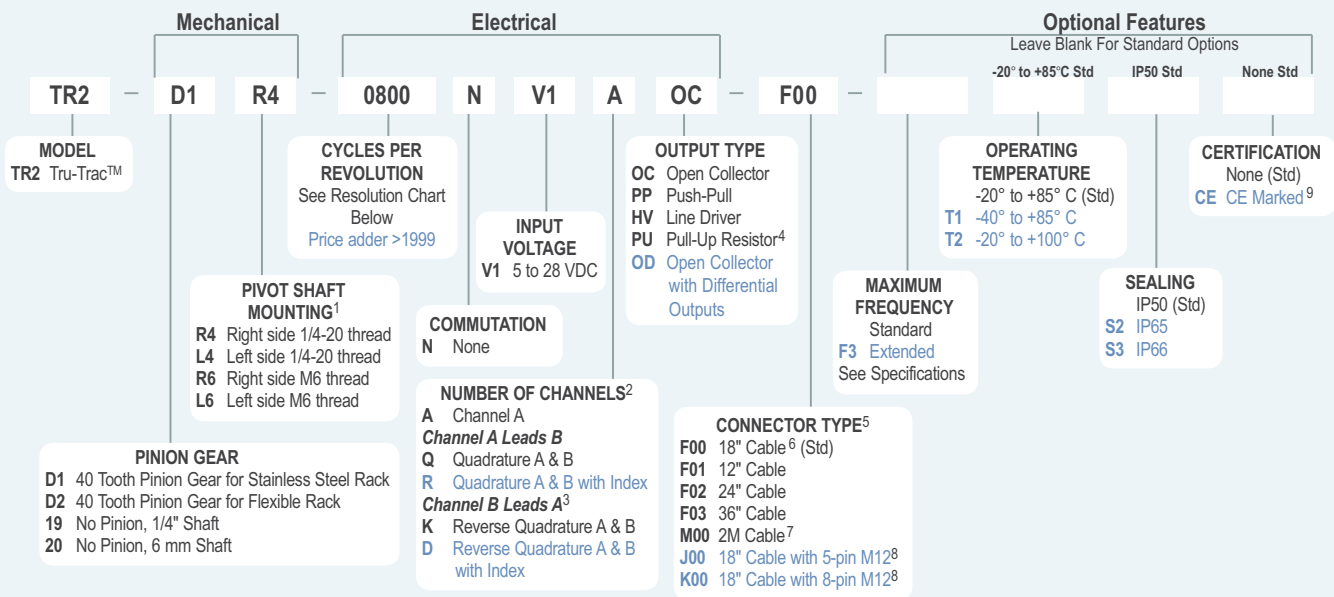
The TR2 Tru-Trac™ is a versatile solution for tracking velocity, position, or distance in almost any application and features an integrated encoder with a rack and pinion gear assembly. Using the rack and pinion gear system, encoder readings can be obtained with repeatable positioning, providing excellent 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 will eliminate static build up.

COMMON APPLICATIONS

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

MODEL TR2 TRU-TRAC™ ORDERING GUIDE

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



MODEL TR2 TRU-TRAC™ CPR OPTIONS

0001 thru 0189*	0198	0200	0250	0256	0300	0315	0360
0400	0500	0512	0580	0600	0750	0800	1000
1125	1200	1250	1500	1800	2000	2048	2500
3000	3600	4000	4096	5000	6000	7200	8192
							10,000

Blue resolutions are common. See resolution charts for more information.

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.

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 PU output type.
- With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
- For mating connectors, cables, and cordsets see Encoder Accessories on page 102 or visit www.encoder.com. For Pin Configuration Diagrams, see page 107 or visit www.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.
- 5-pin not available with Line Driver (HV) output. Additional cables lengths available.
- Please refer to **Technical Bulletin TB100: When to Choose the CE Option** at www.encoder.com.

MODEL TR2 TRU-TRAC™ 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 Diagram*.

Output Types..... Open Collector- 20 mA max per channel
 Push-Pull- 20 mA max per channel
 Pull-Up- Open collector with 2.2K ohm
 Pull-Up Resistor- 20mA max per channel
 Line Driver- 20 mA max per channel
 (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
 0190 to 10,000 CPR: Gated to output A.
 0001 to 0189 CPR: Ungated
 See *Waveform Diagram*.

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

Noise Immunity..... Tested to BS EN61000-6-2; BS EN50081-2;
 BS EN61000-4-2; BS EN61000-4-3;
 BS EN61000-4-6, BS EN500811

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 1.2×10^{10} revolutions

Axial Shaft Load 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2×10^{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

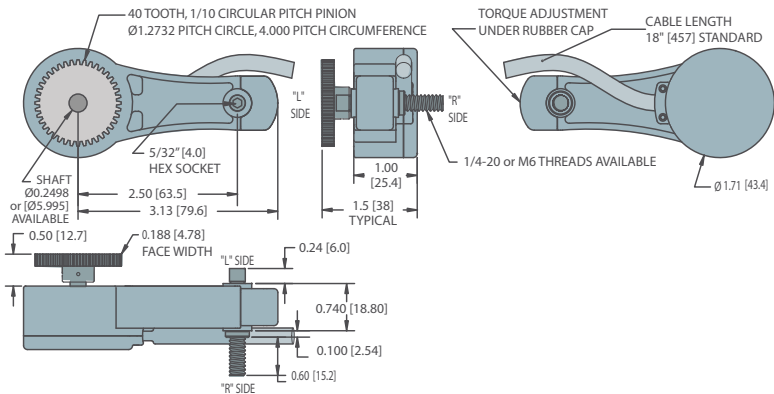
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

Shock..... 80 g @ 11 ms duration

Sealing IP50 standard; IP65 or IP66 available

MODEL TR2 TRU-TRAC™



All dimensions are in inches with a tolerance of $\pm 0.005"$ or $\pm 0.01"$ unless otherwise specified. Metric dimensions are given in brackets [mm].

WIRING TABLE

Function	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.

**Non-CE Option: Cable shield is connected to M12 connector body. CE Option: Cable shield is connected to M12 connector body and internal case.

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

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.

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****

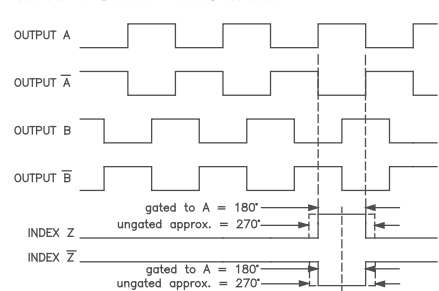
*Requires 2x external quadrature counting.

**Requires 4x external quadrature counting.

*Requires 2x Interpolation.

***Requires 4x Interpolation.

WAVEFORM DIAGRAM



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
 WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

MODEL TR2 TRU-TRAC™ SPECIFICATIONS

For Steel & Flexible Rack

Mechanical - Stainless Steel Rack

Max Linear Speed 400 Feet Per Minute. Speeds over 200 FPM require lubricant, such as MoS₂ 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™ APPLICATIONS

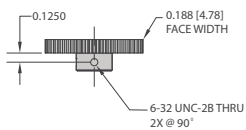


For reciprocating linear motion applications, the TR2 provides accurate reliable feedback. The adjustable spring inside the torsion arm allows the TR2 to be oriented in any direction, while still ensuring the pinion gear is properly engaged with the rack. The precision pinion gear, when paired with EPC's stainless steel or flexible rack system provides feedback with virtually no backlash.

Left: The TR2 is ideal for gauging and backstop applications typically found on a variety of metal working equipment.

Above Right: The TR2 is applied to provide vertical speed and position feedback for a fork lift tower.

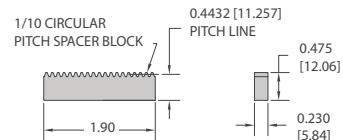
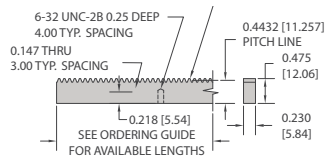
PINION GEAR FOR STAINLESS STEEL RACK



40 TOOTH, 1/10 CIRCULAR PITCH PINION
1.2732 PITCH CIRCLE, 4.000 PITCH CIRCUMFERENCE

PRECISION AGMA 10 PINION FOR RIGID RACK

0.2498 THRU [6.345]

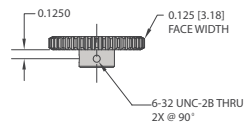


Racks and Accessories for the TR2 (rack must be ordered separately)

Part #	Length
176216	12" for Stainless Steel
176217	24" for Stainless Steel
176218	36" for Stainless Steel
176219	Spacer Block for Stainless Steel
161546	2 meter Flexible Rack
161548	Flexible rack clamps 10pk (with M4x0.7 x 1) mm Phillips pan head machine screws.
161547	1 meter guide rail for flexible rack (does not work with 176220 gear)
140104	Angle Mounting Bracket
176220	40 Tooth Pinion Gear (for use with Stainless Steel Rack)
176302	40 Tooth Pinion Gear (for use with Flexible Rack)

See drawings for rack dimensions. For lengths over 36", order multiple pieces of stainless steel rack or the flexible option. A spacer block must be used to accurately join two or more pieces of rack. See **Technical Bulletin TB-522** or **TB-523** for details.

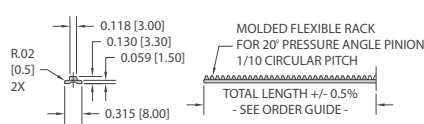
PINION GEAR FOR FLEXIBLE RACK



40 TOOTH, 1/10 CIRCULAR PITCH PINION
1.2732 PITCH CIRCLE, 4.000 PITCH CIRCUMFERENCE

0.125 FACE WIDTH PINION FOR FLEXIBLE RACK

0.2498 THRU [6.345]



Additional Pinion Gears for TR2 Tru-Trac™ can be ordered separately as part #176220 (stainless steel rack) or part #176302 (flexible rack).



TR2 Tru-Trac™ flexible rack.

Accessory Angle Mounting Bracket for TR2 Tru-Trac™ can be ordered separately as part #140104. Dimensional drawing available at www.encoder.com.

