

TB-108: Encoders with Measuring Wheels

A common method for creating a linear measuring solution is to use a rotary encoder in conjunction with a measuring wheel. For many applications, a rotary encoder with a measuring wheel has several advantages over a linear scale encoder.

When using an encoder with a measuring wheel, rather than a linear scale encoder, the application is not limited by the length of the scale, allowing indefinite measurement in one direction without the need to return in the other direction. A rotary encoder may also be more durable and resistant to contamination as compared to a linear scale and read head.

While using an encoder with a measuring wheel has many advantages, it can also be challenging to assemble and put into use. EPC has decades of experience helping customers solve their linear measurement needs. We offer a number of encoders well suited for measuring wheel applications, an expansive selection of measuring wheels, and a versatile selection of mounting brackets specifically designed for challenging measuring wheel applications. EPC also offers the [Tru-Trac™](#) series, a family of integrated units that bring together a rotary encoder, precision measuring wheel, and spring-loaded torsion arm into a single, easy-to-use package.

Linear Measurement Solutions: Shaft Encoder with a Mounting Bracket

A common linear measurement solution is to mount a measuring wheel on the shaft of an encoder. There is the option to simply buy an encoder, a measuring wheel, and source or design a mounting bracket. This can lead to several problems, however.

- Complexity – systems designed together work seamlessly; with something cobbled-together, parts of each component can interfere with each other.
- Bulkiness – if the system wasn't designed together, you could wind up with something much larger than you need, potentially causing problems with installation and operation.
- Misalignment problems – alignment is absolutely key in linear measurement solutions. With systems designed as a unit and tested, that won't be an issue.

EPC offers a versatile selection of mounting brackets and precision measuring wheels that are specifically designed to fit a shafted encoder into an encoder/measuring wheel assembly.

Cube series encoders are well-suited for these applications because of their optional dual-shaft feature and widely spaced bearings, which provide better shaft support and increased bearing load capabilities. For greater flexibility, a dual-shafted encoder can be used with two measuring wheels. By putting a measuring wheel on each end of a dual-shafted Cube encoder, the same bearing loading can afford twice the amount of traction. This enhances the accuracy of the counting because if one wheel slips, the other wheel will take up the slack. The drawback to this is that the material being measured must be wider than the distance between the two wheels.

The programmable [Model 25SP](#), a standard Size 25 shaft encoder, can also be mounted in a bracket for linear measurement. It offers a maximum axial shaft load of 80 lb, making it an excellent option when your application needs a more mechanically and electronically configurable encoder. With the Model 25SP, output type, waveform, and resolution can be programmed on-site, with resolutions up to 65,536 CPR.

For absolute feedback, this bracket can be mounted with the absolute [Model MA63S](#). The Model MA63S offers both single turn and multi-turn resolution, and SSI or CANopen communication protocols.



A dual-shafted Cube Encoder on a Mounting Bracket



A mounting bracket designed to fit Size 25 Shaft Encoders, with a programmable Model 25SP

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Linear Measurement Solutions: Tru-Trac™

An integrated encoder and measuring wheel assembly available in one unit, Tru-Trac™ encoders are both easy-to-use and compact. Their spring-loaded torsion arms offer adjustable torsion load, allowing them to be mounted in almost any orientation – even upside-down. With the Model TR1, The threaded shaft on the pivot axis is field reversible, providing mounting access from either side. With operating speeds up to 3000 feet per minute and a wide variety of configuration options, the Tru-Trac™ line of encoders are excellent options for linear measurement.

Both the compact [Model TR1](#), and the heavy-duty [Model TR3](#) are available with a choice of measuring- wheel material (discussed in detail on the following page). In addition, the Model TR3 is available with single or dual measuring wheels.



Tru-Trac™ Model TR1 shown with urethane wheel and Model TR3 shown with dual, anodized aluminum wheels

Selecting the Proper Measuring Wheel

When selecting a measuring wheel surface, consider these general guidelines:

- Wheel material will expand and contract with temperature variations.
- Wheels wear down with usage.
- A harder wheel surface generally provides greater durability, but less traction.

Encoder Products Company offers numerous [measuring wheels](#) in different sizes, all made of high grade aluminum alloy. There are four different contact surfaces available (see also, image at right):



A selection of measuring wheels available from EPC, including two different urethane, hard anodized knurled aluminum, and rubber insert

Rubber Insert

Rubber provides better traction in most applications, but also may wear faster than other materials, depending on the application. The nature of replaceable O-rings allows easy completion of regularly scheduled maintenance. Rubber insert wheels are good for materials such as (but not limited to): paper, film, foil, hard plastic, and other smooth materials.

Urethane

This smooth, versatile material comes in different durometer ratings (that is, degrees of hardness). Urethane is good for materials such as (but not limited to): metal pipe, sandpaper, matting, cardboard/packaging, belting, insulated wire, metal, etc.

Knurled Aluminum

Knurled aluminum offers good traction, but should not be used with delicate materials. It is a good choice for materials such as (but not limited to): metal pipe, sandpaper, matting, cardboard/packaging, belting, insulated wire, metal, coarse fabric, cloth tape, rubber, rough wood, carpet, foam, insulation, or other rugged materials that won't damage easily from constant contact with the wheel.

Hard Anodized Knurled Aluminum

Anodizing hardens the aluminum and prevents corrosion, so these wheels are good for harsh environments where there may be washdown or exposure to corrosive elements. These wheels are also not meant for delicate materials, and are excellent for materials such as (but not limited to): coarse fabric, wood (i.e., lumber cut-to-length), or other durable materials.

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Resolution

When considering the correct size of measuring wheel for your application, consider the resolution required for your application. Generally, the bigger the wheel, the lower your resolution per unit of measure. Refer to product datasheets for resolution and RPM specifications.

Installation

Accurate alignment is crucial with installation of an encoder and measuring wheel. Mis-alignment will cause the wheel to skid; if measurements are not coming out as expected, mis-alignment is the most common cause. Continuous mis-alignment can also cause uneven wheel wear and pre-mature bearing failure.

When installing your Tru-Trac™ or encoder with measuring wheel, consider the thickness of the material. For instance, if the encoder or encoder and bracket are mounted firmly, without allowance for the thickness or varying thicknesses, of the material, the pressure of the wheel may damage the product. If the product is not soft, the pressure may damage the shaft of the encoder or cause extra wear on the bearings.

The Tru-Trac™ encoders and select pivot brackets include an adjustable spring-loaded torsion arm for optimal tracking friction. Brackets without spring loading, generally, rely on the weight of the encoder with its assembly – that is, the wheel or wheels, connecting cable, mounting bracket, etc. – to provide sufficient gravity loading for optimum tracking friction. If there is not sufficient tracking friction, weights may be added until proper tracking is achieved, however, always use the minimum force necessary and never exceed the rated bearing load.

The bearing life of the encoder is adversely affected by higher rotational speeds combined with excessive amounts of radial and axial shaft loading. If the wheel(s) are not in perfect tracking alignment with the material being measured, an axial force is impressed on the shaft and bearings. This axial force, combined with high rotational speeds will cause premature wear of the precision ball bearings. Also, if the material being measured is delicate, such as paper, any upset to the wheel(s) while running at high speeds can cause the material to be ripped or damaged in some way.

See also:

[TB-518: TR1 - Tru-Trac™ Installation & Removal](#)

[TB-526: TR3 - Heavy Duty Tru-Trac™ Installation Instructions](#)

If you have additional questions about using a measuring wheel with an encoder, or about using a Tru-Trac™ linear measurement solution, please [contact EPC](#) Customer Service at 800-366-5412 or email sales@encoder.com.