Optical Encoder and Accessories Catalog
Company History
Encoder Products Company Inc. (EPC) is a leading designer and world-wide manufacturer of motion sensing devices. Founded in 1969 by William Watt, EPC began operations with a small line of custom encoders. Today, more than 40 years later, EPC’s popular Accu-Coder™ brand is the most complete line of incremental and absolute shaft encoders in the industry. Our core philosophy is that each and every customer deserves quality products, superior customer service, and expert support.

Business Partnerships
Fostering long term business partnerships with satisfied customers is what we do best, and the heart of our mission. We take pride in providing superior customer service and supplying you an encoder that functions precisely, dependably, and flawlessly. Listening to our customers needs, and designing products that provide solutions for them, is a key to our success. It isn’t every company that can say they have satisfied their customers for over 40 years!

Innovative Design Team
At EPC, we concentrate on encoders, making us famous for paving the path of the encoder industry and providing encoder standards for our industry since 1969. First to design the cube style encoder, now an industry standard. First to resolve mounting installation problems by providing an industry first flexible-mounting system. First to include Opto-ASIC technology, which virtually eliminates miscounts by eliminating electrical noise, and enhancing signal quality. First to provide an encoder that operates at 120° C. First to provide 6000 CPR in a 1.5” diameter encoder. First to provide a 3 year standard warranty, demonstrating that we stand proudly behind the reliability of each of our products.

Solving Problems
For over 40 years, we have been solving encoder problems. Custom designs, faster delivery, and reliable products are all areas in which we excel. We believe that an encoder supplier should solve problems, not cause them.

Custom Encoders Our Specialty
Through years of experience, we understand each industrial environment is different; you need an encoder that fits your specific situation. This ultimately means not having to make due with someone else’s specifications or configurations, but having your own custom designed unit. Many of our customers have come to depend on us for this special area of customization. Using state of the art technology, we can design and deliver custom encoders faster than most suppliers standard products - often shipping your unique encoder in 2 to 6 days or sooner.

ISO 9001 Quality Systems
At EPC, quality is designed into every product. Before it’s offered for sale, each Accu-Coder™ model is developed using state-of-the-art design tools and fully tested against EPC’s exacting quality standards. But quality does not stop at design. During the manufacturing process, each Accu-Coder™ is subjected to a series of stringent quality control tests to ensure you are receiving the best encoder available. Our quality system has successfully been audited to the requirements of ISO 9001:2000, an internationally recognized standard for comprehensive Quality Systems. By paying close attention to detail, our Accu-Coder™ brand has become known throughout the industry for quality and reliability.
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Models 15T & 15H
- Resolutions to 10,000 CPR
- Up to 12 Pole Commutation Available
- Bore Sizes to 0.375", or 10 mm
- Operating Temps from -40° to +120° C
- Sealing Up to IP64

Model 260
- Resolutions to 10,000 CPR
- Bore Sizes to 0.625", or 15 mm
- A Variety of Flexible Mounting Brackets
- Operating Temps from -40° to +120° C
- Sealing Up to IP66

Model 25T
- Replaces 2.0" to 3.5" Encoders
- Resolutions to 10,000 CPR
- Bore Sizes to 1.125", or 28 mm
- Versatile Flexible Mounting Options
- Operating Temps from -20° to +105° C

Model 225
- Single Channel & Quadrature
- Economical Tachometer
- Motor Feedback
- Bore Sizes to 0.875", or 22 mm

Model 755A
- Resolutions to 30,000 CPR
- Bore Sizes to 0.750", or 14 mm
- A Variety of Flexible Mounting Brackets
- Operating Temps from -40° to +100° C
- Frequencies to 1 MHz

Model 121
- Patented Auto Aligning Modular Encoder
- Up to 12 Pole Commutation Available
- Bore Sizes to 0.625", or 15 mm
- Ideal for higher speed motor applications
- Resolutions to 2540 CPR

Models 775 & 776
- Slim Profile - to 1.36" Thru-Bores
- Resolutions to 4096 CPR
- Bore Sizes to 1.875", or 43 mm
- Large Selection of Connector Options
- Operating Temps from 0° to +100° C

Model 770
- Fits NEMA Frame Size 56C Thru 184C Motors
- Resolutions to 4096 CPR
- Bore Sizes to 1.00", or 24 mm
- Large Selection of Connector Options
- Operating Temps from 0° to +100° C

Model 771
- Fits NEMA Frame Size 182TC Thru 256TC
- Standard Double C-Face
- Resolutions to 4096 CPR
- Bore Sizes to 1.875", or 43 mm
- Optional protective cover affords IP65 Seal

Stainless Steel Encoders

Model 865T
- Fits NEMA Frame Size 56C Thru 184C Motors
- Slim 1” Profile Housing in 316 Stainless Steel
- Resolutions to 4096 CPR
- Bore Sizes to 1.00", or 24 mm
- Sealing Up to IP66 with Optional Cover

Model 802S
- 2.0" Industrial 316 Stainless Steel Housing
- 80 lb. Max. Radial and Axial Load
- Resolutions to 30,000 CPR
- Shaft Sizes to 0.375", or 10 mm
- Sealing Up to IP66

Model 858S
- 58 mm Industrial 316 Stainless Steel Housing
- 80 lb. Max. Radial and Axial Load
- Resolutions to 30,000 CPR
- Clamping or Synchro Flange Options
- Sealing Up to IP66
Incremental Shaft Encoders

Models 711, 715 & 716
- The Original Cube Encoders
- Single Channel, Quadrature and Timed Pulse
- Five Versatile Heavy Duty Housing Styles
- Resolutions to 10,000 CPR
- Single and Double Shaft Options

Model 725
- Industrial Isolated Flex Housing Available
- Resolutions to 30,000 CPR
- Frequencies to 1 MHz
- Operating Temps from 0° to +100° C
- Sealing Up to IP65

Model 702
- 80 lb. Max. Radial and Axial Load
- Resolutions to 30,000 CPR
- Shaft Sizes to 0.375", or 10 mm
- Operating Temps from 0° to +100° C
- Sealing Up to IP66

Model 725
- Industrial Isolated Flex Housing Available
- Resolutions to 30,000 CPR
- Frequencies to 1 MHz
- Operating Temps from 0° to +100° C
- Sealing Up to IP66

Absolute Encoders

Model 960
- Low Profile - 1.55" Single Turn Absolute
- Opto-ASIC Circuity in an All Metal Housing
- Resolutions to 11 Bits
- Bore Sizes to 0.375", or 10 mm
- A Variety of Flexible Mounting Brackets

Model 925
- Industrial Housed 2.5" Single Turn Absolute
- Gray, Natural Binary, and Excess Gray Codes
- Shaft Sizes to 0.375", or 10 mm
- Flange and Servo Mounts
- Sealing Up to IP66

Model 958
- Industrial Housed European Size 58 mm
- Gray, Natural Binary, and Excess Gray Codes
- Shaft Sizes to 0.375", or 10 mm
- Clamping or Synchro Flange Options
- Sealing Up to IP66

Linear Encoders

Model LCE
- Linear Cable Measurement Up to 50 Inches
- Resolutions From 2 to 500 Cycles Per Inch
- Low Cost Linear Solution
- Sealing Up to IP65
- Many Mounting/Cable Exit Configurations

Model TR1
- Integrated Encoder and Measuring Wheel
- Spring Loaded Torsion Arm Adjusts Wheel Pressure for Multi Surfaces; Easy Installation
- Resolutions to 10,000 CPR
- Sealing Up to IP65

Model TR2
- Integrated Encoder and Rack and Pinion Gear
- Spring Loaded Torsion Arm Installs in Vertical, Horizontal, or Upside-Down Orientation
- Resolutions to 10,000 CPR
- Sealing Up to IP65
Incremental encoders are available in two basic output types, single channel and quadrature. A single channel encoder, often called a tachometer, is normally used in systems that rotate in one direction only, and require simple position and velocity information. Quadrature encoders have dual channels (A and B), phased 90 electrical degrees apart. These two output signals determine the direction or rotation by detecting the leading or lagging signal in their phase relationship. Quadrature encoders provide very high speed bidirectional information for very complex motion control applications.

Incremental encoders can provide a once-per-revolution pulse (often called index, marker or reference) that occurs at the same mechanical point of encoder shaft revolution. This pulse is on a separate output channel (Z) from the signal channel or quadrature outputs. The index pulse is often used to position motion control applications to a known mechanical reference.

Resolution is a term used to describe the Cycles Per Revolution (CPR) for incremental encoders, or the total number of unique positions per revolution for an absolute encoder. Each incremental encoder had a defined number of cycles that are generated for each full 360 degree revolution. These cycles are monitored by a counter or motion controller and converted to counts for position or velocity control. Absolute encoders generate a unique code word for every resolvable shaft angle (often called bits or counts per revolution).
Typical Usage

Motor feedback is the most common way that rotary encoders are used. In this type of application, an encoder is either mounted directly to the motor, or indirectly using a measuring wheel or chain-and-sprocket arrangement. The parameter of interest is primarily the speed of the motor.

Web tensioning is an application in which the encoder is not usually mounted to the drive motor, but to one of the tensioning arm rollers. Any unevenness in the speed of this roller indicates that proper web tension is not being maintained and must be adjusted. The rotating speed of the tensioning roller is fed back to the controller, which then adjusts the drive motor so that web material is kept at an even tension.

Cut-to-Length is a very practical application of an encoder combined with simple mathematics. If, for example, a system were to be designed with a roller that is exactly one foot in circumference, the roller would feed one foot of material for every revolution of the roller. An encoder mounted to the roller would reflect this situation and could tell a controller how much material had been fed through the roller. The resolution of the encoder would also directly reflect the accuracy of the cut. In the above example, 96 PPR would yield cuts to an 1/8" accuracy.

Elevators are just one example where encoders can perform a dual role. They can determine the position of the elevator through a mathematical calculation similar to the above, and they can determine the speed of travel of the elevator.

Registration Mark Timing uses encoders to determine the position of a unit relative to a known point, and then to determine the unit’s speed relative to that mark. Radar antenna rotation is a good example of this type of application.

In Backstop Gauging the encoder is used to make sure that the unit, typically a machine tool, does not exceed a preset position or direction of travel. Very often, this is combined with a determination of the speed of travel of the table, tool head, or similar component. Filling applications is just one example where Table Positioning is critical since the item being filled must arrive at filling tube at the same time the fluid control is turned on.

Conveying is another common industry where encoders are widely used. They may be attached to the motor, to intermediate axle shafts, or to both. Encoders are an especially effective feedback device where the positioning and/or speed of multi-element conveying systems must be carefully coordinated.

Spooling (sometimes referred to as Level Wind) is another application where encoders can prove invaluable. Not only is it necessary that the speed of the supply and take-up reels be kept in proper relation to each other, but the amount of material being spooled must also often be tracked.

Electronics is just one industry that widely uses encoders in Pick and Place applications. Here many of the capabilities of encoders (rate, position, speed, velocity) can often be found combined in a single system.

Controller
- Received pulses from encoder indicating distance of material traveled. A signal is sent to the cutting assembly, actuating the blade, each time the correct amount of material passes.

Encoder (with measuring wheel)
- Movement of material under the measuring wheel causes the encoder shaft to rotate, sending pulses to the controller.

Cutting Assembly
- Receives signal from controller indicating the timing to initiate a cut to create material in the proper length.
Model 15T/H Ordering Guide

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

Features
- Very High Performance Economical Encoder
- Low Profile 1.0\" (25.4 mm) Height and 1.5\" (38 mm) Diameter
- Thru-Bore (sizes up to 0.375\" or 10 mm)
- Simple, Innovative Flex Mounting System (Global Mounting Standards)
- Up To 12 Pole Commutation Optional (for brushless motor control)

The Model 15T or 15H offers a high performance feedback solution in a low profile package. Unlike modular or kit encoders, the Model 15 utilizes an integral bearing set, and an innovative flexible mounting system which is much more tolerant to axial misalignment or radial shaft run-out. The slotted flex mounts provide 20 or 30 degrees of rotational adjustment for commutation or index pulse timing. Installation is quick and easy! For brushless servo motor applications, three 120° electrical phase tracks can provide up to 12 pole commutation feedback. The optional 100° C and 120° C temperature options allow servo motors to operate at higher power outputs and duty cycles. The Model 15 provides stable and reliable operation and is an excellent replacement for other manufacturers modular encoders where a high performance solution is desired.

Common Applications
Servo Motor Control, Robotics, Specialty Assembly Machines, Digital Plotters, High Power Motors

For specification assistance call
Customer Service at 1-800-366-5412

NOTES:
1 Contact Customer Service for additional options not shown.
2 Not available in all configurations, and not available with V1 Input Voltage. Contact Customer Service for availability.
3 Contact Customer Service for non-standard index gating or phase relationship options.
4 For non-standard English cable lengths enter ‘F’ plus cable length expressed in feet.
5 For non-standard metric cable lengths enter ‘M’ plus cable length expressed in meters.
7 This mount requires button head screws and a modified Hex wrench. Order appropriate Installation Kit listed under Specifications.
8 Not available with commutation. 5-pin not available with Line Driver (HV, OD, LO) outputs.
10 Not available in all configurations, and not available with V1 Input Voltage.
Model 15T Thru-Bore
Model 15H Hollow Bore

Model 15T/H Specifications

**Electrical**
- Input Voltage: 5 VDC ±10%, ±2% at 5 VDC max for temperatures up to 85°C
- Input Current: 100 mA (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 encoder mounting face.
- Output Types: Open Collector, 20 mA max per channel
- Index: Once per revolution
- Max Frequency: Standard Frequency Response is 20 kHz for CPR 1 to 2540
- Noise Immunity: Tested to BS EN61000-4-2; BS EN50081-2
- Symmetry: 180° (±15°) electrical
- Quad. Phasing: 90° (±2.5°) electrical
- Accuracy: Within 0.017° mechanical or 1 arc-minute from true position (for CPR>189)
- Commutation: Up to 12 poles Contact Customer Service for availability

**Mechanical**
- Max Shaft Speed: 8000 RPM. Higher speeds may be achievable, contact Customer Service.
- Bone Size: 0.1575" through 0.375 mm, 5 mm through 10 mm
- Bone Tolerance: ±0.005" or ±0.0006"
- User Shaft Tolerances: 0.005" max
- Radial Runout: ±0.008" max
- Axial Endplay: ±0.003" max
- Starting Torque: IP50 Hollow Bore: 0.2 oz-in
- IP50 Thru-Bore: 0.3 oz-in
- IP64: 0.6 oz-in
- IP50 Hollow Bore: 0.3 oz-in
- IP50: 0.2 oz-in
- IP64: 0.6 oz-in
- Moment of Inertia: 6.7 x 10^{-5} oz-in-sec^2
- Max Acceleration: 1 x 10^5 rad/sec^2
- Electrical Conn: 18" cable (foil and braid shield, 24 AWG conductors non-commutated, 28 AWG commutated), 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield)
- Mounting: 1.811" (46 mm) Slotted Flex Mount
- 1.811" (46 mm) Two Hole Flex Mount
- 1.575" (40 mm) Slotted Flex Mount
- 1.575" (40 mm) Two Hole Flex Mount
- Weight: 3 oz typical

**Environmental**
- Operating Temp: 20° to 40° C standard models
- -40° to 45° C for low temperature option
- 20° to 120° C for extreme temperature option
- Storage Temp: 25° to 65° C
- Humidity: 95% RH non-condensing
- Vibration: 10 g @ 500 Hz
- Shock: 80 g @ 11 ms duration
- Sealing: IP50 standard, IP64 available

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Waveform Diagrams

**Wiring Table**

Model 15T/H 1.811" (46 mm) Slotted Flex Mount (SF)

Model 15T/H 1.811" (46 mm) Two Hole Flex Mount (SA)

Model 15T/H Small Diameter Slotted Flex Mounts

1.142" (29 mm): SB
1.2795" (32.5 mm): SC
1.575" (40 mm): SD

Encoder Length and Diameter are the same as SF and SA mounts detailed above. All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified. Metric dimensions are given in brackets [mm].

*Order Appropriate No Charge Mounting and Installation Kit for SB, SC, or SD Option*

176150-01 Installation Kit, 4-40 Buttonhead Screws with 0.062" Shortened Hex Wrench
176149-01 Installation Kit, M 2.5 Buttonhead Screws with 1.5 mm Shortened Hex Wrench

Each kit contains 10 screws for mounting 5 encoders

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*SB* Slotted Flex Mount
Model 755A Hollow Bore

Features
- Miniature Size (1.5” Diameter)
- Up to 30,000 Cycles Per Revolution
- Flex Mounting
- Large Hollow Bore Option (up to 0.750”)
- High Temperature Option

The Model 755A Size 15 Accu-Coder™ is ideal for applications requiring a small, high precision, high performance encoder. Approximately 1.5” in diameter and 1.5” long, it will fit where many encoders cannot. All metal construction and shielded ball bearings provides years of trouble-free use. A variety of blind hollow bore sizes are available. Large bores allow for shafts up to 0.750” or 14 mm. Attaching directly to a motor is quick and simple with the innovative flex mount, first developed by EPC. This industry standard mount eliminates couplings, increases reliability, while reducing overall length and cost. Where critical alignment is required, a Slotted Flex (SF) is available. A perfect replacement encoder where high reliability is required.

Common Applications
Robotics, Assembly Machines, Motor-Mounted Feedback, Phototypesetters, Printers & Digital Plotters, Elevator Controls, Medical Diagnostic Equipment

Model 755A Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Model 755A CPR Options

<table>
<thead>
<tr>
<th>BORE SIZES</th>
<th>CHANNEL A Leads B</th>
<th>Channel B Leads A</th>
<th>NUMBER OF CHANNELS</th>
<th>MAXIMUM FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø1.5”</td>
<td>A</td>
<td>Q</td>
<td>3/16”, 0.1875”</td>
<td>1 MHz, &gt;10,000 CPR</td>
</tr>
<tr>
<td>01</td>
<td>S</td>
<td>R</td>
<td>1/4”, 0.250”</td>
<td>&gt;10,000 CPR</td>
</tr>
<tr>
<td>02</td>
<td>H</td>
<td>O</td>
<td>5/32”, 0.156”</td>
<td>&gt;6000 CPR</td>
</tr>
<tr>
<td>03</td>
<td>L</td>
<td>P</td>
<td>1/6&quot;, 0.166”</td>
<td>&gt;5000 CPR</td>
</tr>
<tr>
<td>04</td>
<td>K</td>
<td>Q</td>
<td>1/8&quot;, 0.125”</td>
<td>&gt;3000 CPR</td>
</tr>
<tr>
<td>05</td>
<td>M</td>
<td>R</td>
<td>1/16&quot;, 0.060”</td>
<td>&lt;200 kHz</td>
</tr>
<tr>
<td>06</td>
<td>N</td>
<td>S</td>
<td>1/32&quot;, 0.031”</td>
<td>&lt;100 kHz</td>
</tr>
<tr>
<td>07</td>
<td>O</td>
<td>T</td>
<td>1/64&quot;, 0.018”</td>
<td>5 kHz</td>
</tr>
</tbody>
</table>

NOTES:
1. Contact Customer Service for additional options.
2. 0° to 85° C for certain resolutions, see CPR Options.
3. Contact Customer Service for index gating options.
4. 250 kHz, >3000 CPR
5. 500 kHz, >6000 CPR
6. 1 MHz, >10,000 CPR
7. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable.
Model 755A Specifications

Electrical

- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 70° C; 4.75 to 24 VDC for temperatures between 70° C to 100° C
- **Input Current**: 100 mA max with no output load
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format**: Incremental - Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- **Output Types**: Open Collector- 100 mA max per channel, Pull-Up- 100 mA max per channel, Push-Pull- 20 mA max per channel
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format**: Incremental - Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- **Output Types**: Open Collector- 100 mA max per channel, Pull-Up- 100 mA max per channel, Push-Pull- 20 mA max per channel
- **Index**: Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- **Max Frequency**: Up to 1 MHz
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN65022 (with European compliance option); BS EN61000-6-2; BS EN50081-2
- **Symmetry**: 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
- **6001 to 20,480 CPR: 180° (±36°) electrical
- **Quad Phasing**: 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
- **6001 to 20,480 CPR: 90° (±36°)
- **Min Edge Sep**: 1 to 6000 CPR: 67.5° electrical at 100 kHz output
- **6001 to 20,480 CPR: 54° electrical
- **>20,480 CPR: 50° electrical
- **Rise Time**: Less than 1 microsecond
- **Accuracy**: Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

Mechanical

- **Max Shaft Speed**: 7500 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Bore Size**: 0.1875", 0.250", 0.3125", 0.375", 0.500", 0.625", 0.750", 4 mm, 5 mm, 6 mm, 8 mm, 10 mm, 12 mm, 14 mm
- **Bore Tolerance**: -0.0000" to +0.0006"
- **User Shaft Tolerances**: Radial Runout: 0.007" max
- **Axial End Play**: ±0.030" max
- **Starting Torque**: 0.14 oz-in capable of 40° C operation
- **Moment of Inertia**: 2.8 x 10^-4 oz-in-sec^2
- **Max Acceleration**: 1 x 10^5 rad/sec^2
- **Electrical Conn**: 18" cable (foil and braid shield, 24 AWG conductors), 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield), 8-pin Molex, Terminal Block
- **Housing**: Black non-corrosive finish
- **Bearings**: Precision ABEC ball bearings
- **Mounting**: Flex and Slotted Flex Mounting
- **Weight**: 3.50 oz typical

Environmental

- **Operating Temp**: 0° to 70° C for standard models
- **-40° to 70° C for low temperature option
- **0° to 100° C for high temperature option (0° to 85° C for certain resolutions, see CPR Options.)
- **Storage Temp**: -25° to +85° C
- **Humidity**: 88% RH non-condensing
- **Vibration**: 10 g @ 50 to 500 Hz
- **Shock**: 50 g @ 11 ms duration

Model 755A Hollow Bore

Optional Slotted Flex Mount (SF)

Model 755A Flex Mount (S)

Model 755A Large Bore Flex Mount (S)

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

Metric dimensions are given in brackets [mm]

Waveform Diagrams

Wiring Table
Model 121

Features
- Simple, Hassle Free Mounting
- Accepts Larger Shafts up to 5/8” (or 15 mm)
- Up to 12 Pole Commutation Available
- 0° to 100° C Operating Temperature Available
- Patented Design
- Includes New IP50 Dust Seal Kit

AT LAST! A reliable modular encoder that requires no calibration, gapping, or special tools to install! EPC has taken the performance of modular encoders to a new level with the Model 121 Auto-Aligning Modular Encoder. This new and innovative design provides simple, reliable, hassle free installation. Simply tighten the shaft clamp, install the mounting screws, and you’re done!

The Model 121 incorporates the latest Optical ASIC technology for greatly enhanced performance. Common problems with other modular encoder designs are warping and deflection, caused by their extensive use of plastic, both of which are virtually eliminated by the Model 121’s all metal construction. For brushless servo motor applications, the Model 121 can be specified with three commutation tracks to provide motor feedback. The optional 100° C temperature capability allows servo motors to operate at higher power outputs and duty cycles.

Common Applications
Servo Motor Control, Robotics, Specialty Assembly Machines, Digital Plotters, High Power Motors

Model 121 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Model 121 CPR Options
0200 0250 0254 0256 0300 0360 0500
0512 0600 0720 0800 0840 1000 1024
1200 1250 1600* 2000* 2048* 2500* 2540*

*Contact Customer Service for application analysis

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:
1 Not available in all configurations. Contact Customer Service for availability.
2 Contact Customer Service for additional options not shown.
3 Standard 0° to 70° C operating temperature only.
4 Contact Customer Service for non-standard index gating options.
5 For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable.

For specification assistance call
Customer Service at
1-800-366-5412
Model 121 Specifications

Electrical

- **Input Voltage**: 5 VDC ±10% Fixed Voltage
- **12 VDC ±10% Fixed Voltage**
- **Input Current**: 100 mA maximum 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 mounting face. Index optional
- **Output Types**: Open Collector- 20 mA per channel max
- **Push-Pull- 20 mA per channel max**
- **Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)**
- **Index**: Once per revolution gated to channel A. Contact Customer Service for additional gating options.
- **Max Frequency**: 100 kHz standard, 200 kHz, and 300 kHz optional
- **Symmetry**: 180° (±18°) electrical at 100 kHz
- **Quad. Phasing**: 90° (±22.5°) electrical at 100 kHz
- **Min. Edge Sep**: 67.5° electrical at 100 kHz
- **Accuracy**: Within 0.1° mechanical from one cycle to any other cycle, or 6 arc minutes
- **Commutation**: Optional- three 120° electrical phase tracks for commutation feedback. (4, 6, 8, or 12 poles. Others available upon request)
- **Comm. Accuracy**: 1° mechanical

Mechanical

- **Max. Shaft Speed**: Determined by maximum frequency response
- **Bore Size**: 0.250" through 0.625"
- **Bore Tolerance**: +0.0007" (max) -0.0000" (Based on H7 bore fit for g8 shaft Class LC5 per ANSI B-4.1 standard)
- **User Shaft Tolerance**:
- **Radial Runout**: 0.002" max
- **Axial End Play**: ±0.015" for CPR ≤ 512
  ±0.010" for CPR 513 to 1250
  ±0.005" for CPR > 1250
- **Moment of Inertia**: 2.5 x 10^-4 oz-in-sec²
- **Max. Acceleration**: 5 x 10⁵ rad/sec²
- **Electrical Conn**: 18" cable (foil and braid shield, 24 AWG conductors non-commutated, 28 AWG commutated)
- **Housing**: All Metal Aluminum and Zinc Alloy
- **Mounting**: Two screws on a 1.812" Dia. B.C. (4-40 or M3 maximum screw size)
- **Weight**: 4 oz typical

Environmental

- **Operating Temp**: 0° to 70° C for standard models
- **Storage Temp**: 0° to 100° C for high temperature option
- **Humidity**: 98% RH non-condensing
- **Vibration**: 10 g @ 58 to 500 Hz
- **Shock**: 50 g @ 11 ms duration
Model 260

Features
- Low Profile 1.19"
- Up to 12 Pole Commutation
- Thru-Bore and Hollow Bore (Blind) Styles
- Simple, Innovative Flexible Mounting System
- Incorporates Opto-ASIC Technology
- CE marking available

The Model 260’s larger bore (up to 0.625”) and low profile make it the perfect solution for many machine and motor applications. Available in two distinct formats - a Hollow Bore and a complete Thru-Bore - the Model 260 uses EPC’s pioneering Opto-ASIC design. The Model 260 uses EPC’s innovative anti-backlash mounting system, allowing simple, reliable, and precise encoder attachment. Unlike traditional kit or modular encoder designs, its integral bearing set provides stable and consistent operation without concerns for axial or radial shaft runout. For brushless servo motor applications, the Model 260 can be specified with three 120° electrical phase tracks to provide up to 12 pole commutation feedback. The optional extended temperature capability allows servos to operate at higher power outputs and duty cycles.

Common Applications
Brushless Servo Motor Commutation, Robotics, Motor-Mounted Feedback, Assembly Machines, Digital Plotters, High Power Motors

Model 260 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>260 Ultra Versatile Commutated Thru-Bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORE SIZE 1</td>
<td>01 1/4&quot;, 0.250&quot;</td>
</tr>
<tr>
<td></td>
<td>02 3/8&quot;, 0.375&quot;</td>
</tr>
<tr>
<td></td>
<td>10 1/2&quot;, 0.500&quot;</td>
</tr>
<tr>
<td></td>
<td>11 5/8&quot;, 0.625&quot;</td>
</tr>
<tr>
<td></td>
<td>06 5 mm</td>
</tr>
<tr>
<td></td>
<td>04 6 mm</td>
</tr>
<tr>
<td></td>
<td>05 10 mm</td>
</tr>
<tr>
<td></td>
<td>09 11 mm</td>
</tr>
<tr>
<td></td>
<td>12 12 mm</td>
</tr>
<tr>
<td></td>
<td>13 14 mm</td>
</tr>
<tr>
<td></td>
<td>15 15 mm</td>
</tr>
<tr>
<td>CYCLES PER REVOLUTION</td>
<td>1-10,000</td>
</tr>
<tr>
<td>OUTPUT TYPE</td>
<td>OC Open Collector</td>
</tr>
<tr>
<td></td>
<td>PP Push-Pull</td>
</tr>
<tr>
<td></td>
<td>HV Line Driver</td>
</tr>
<tr>
<td>NUMBER OF CHANNELS 1</td>
<td>Channel A Leads B</td>
</tr>
<tr>
<td></td>
<td>Q Quadrature A &amp; B</td>
</tr>
<tr>
<td></td>
<td>R Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td></td>
<td>Channel B Leads A</td>
</tr>
<tr>
<td></td>
<td>K Reverse Quadrature A &amp; B</td>
</tr>
<tr>
<td></td>
<td>D Reverse Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>MAXIMUM FREQUENCY</td>
<td>1 Standard</td>
</tr>
<tr>
<td></td>
<td>2 Extended</td>
</tr>
<tr>
<td></td>
<td>See Specifications For Explanation</td>
</tr>
<tr>
<td>MOUNTING</td>
<td>SD 1.575&quot; (40 mm) BC Flex Mount</td>
</tr>
<tr>
<td></td>
<td>SF 1.811&quot; (46 mm) BC Flex Mount</td>
</tr>
<tr>
<td></td>
<td>XF 2.250&quot; BC 3-point Flex Mount</td>
</tr>
<tr>
<td></td>
<td>NF 2.375&quot; BC 3-point Flex Mount</td>
</tr>
<tr>
<td></td>
<td>FA Flex Arm</td>
</tr>
<tr>
<td></td>
<td>FB Flex Arm</td>
</tr>
</tbody>
</table>

NOTES:
1 Contact Customer Service for additional options not shown.
2 Not available in all configurations. Contact Customer Service for availability.
3 5- to 16 VDC supply only for H option; 5 VDC supply only for V option.
4 Contact Customer Service for availability and additional information.
5 Contact Customer Service for non-standard index gating options.
6 For non-standard cable lengths add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
8 Not available with commutation or extreme temperature (V) option.

Model 260 CPR Options

<table>
<thead>
<tr>
<th>0001 thru 0189*</th>
<th>0200</th>
<th>0250</th>
<th>0254</th>
<th>0256</th>
<th>0305</th>
<th>0306</th>
<th>0400*</th>
<th>0500</th>
<th>0512</th>
<th>0600</th>
<th>0720</th>
<th>0800</th>
</tr>
</thead>
<tbody>
<tr>
<td>0840</td>
<td>1000</td>
<td>1024</td>
<td>1200</td>
<td>1220</td>
<td>1250</td>
<td>1270</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1500</td>
<td>1800*</td>
<td>2000</td>
<td>2048</td>
<td>2500</td>
<td>2540</td>
<td>3000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3600°</td>
<td>4096</td>
<td>5000</td>
<td>6000</td>
<td>8192</td>
<td>7200°</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Contact Customer Service for availability

Contact Customer Service for all disk resolutions; not all disk resolutions available with every commutation option.

For specification assistance call Customer Service at 1-800-366-5412

1-800-366-5412 • www.encoder.com • sales@encoder.com
## Model 260 Specifications

**Electrical**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>4.75 to 28 VDC for temperatures up to 70° C</td>
</tr>
<tr>
<td></td>
<td>5 to 16 VDC for 0° to 100° C operating temperature</td>
</tr>
<tr>
<td></td>
<td>5 VDC for 0° to 120° C operating temperature</td>
</tr>
<tr>
<td>Input Current</td>
<td>100 mA max with no output load</td>
</tr>
<tr>
<td>Output Format</td>
<td>Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. See Waveform Diagrams.</td>
</tr>
<tr>
<td>Output Types</td>
<td>Open Collector- 20 mA max per channel</td>
</tr>
<tr>
<td></td>
<td>Push-Pull- 20 mA max per channel</td>
</tr>
<tr>
<td></td>
<td>Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)</td>
</tr>
<tr>
<td>Index</td>
<td>Once per revolution gated to channel A. See Waveform Diagrams.</td>
</tr>
<tr>
<td>Max. Frequency</td>
<td>Standard Frequency Response is 200 kHz for CPR 1 to 2540</td>
</tr>
<tr>
<td></td>
<td>500 kHz for CPR 2541 to 3000</td>
</tr>
<tr>
<td></td>
<td>1 MHz for CPR 3001 to 10,000</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN50081-2</td>
</tr>
<tr>
<td>Symmetry</td>
<td>180° (+18°) electrical</td>
</tr>
<tr>
<td>Quad. Phasing</td>
<td>90° (+22.5°) electrical</td>
</tr>
<tr>
<td>Min. Edge Sep.</td>
<td>0.01° mechanical from one cycle to any other cycle, or 0.6 arc minutes.</td>
</tr>
<tr>
<td>Commutation</td>
<td>Up to 12-pole. Contact Customer Service for availability.</td>
</tr>
<tr>
<td>Comm. Accuracy</td>
<td>1° mechanical</td>
</tr>
</tbody>
</table>

**Mechanical**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Shaft Speed</td>
<td>7500 RPM. Higher shaft speeds may be achievable, contact Customer Service.</td>
</tr>
<tr>
<td></td>
<td>Note: For extreme temperature operation, de-rate temperature by 5° C for every 1000 RPM above 3000 RPM</td>
</tr>
<tr>
<td>Bore Size</td>
<td>0.250” through 0.625”</td>
</tr>
<tr>
<td></td>
<td>5 mm through 15 mm</td>
</tr>
<tr>
<td>Bore Tolerance</td>
<td>0.0000” / +0.006”</td>
</tr>
<tr>
<td>User Shaft Tolerances</td>
<td></td>
</tr>
<tr>
<td>Radial Runout</td>
<td>0.007” max</td>
</tr>
<tr>
<td>Axial Endplay</td>
<td>±0.030” max</td>
</tr>
<tr>
<td>Starting Torque</td>
<td>IP50 Thru-Bore: 0.50 oz-in</td>
</tr>
<tr>
<td></td>
<td>IP50 Hollow Bore: 0.30 oz-in</td>
</tr>
<tr>
<td></td>
<td>IP64 Thru-Bore: 2.50 oz-in</td>
</tr>
<tr>
<td></td>
<td>IP64 Hollow Bore: 2.0 oz-in</td>
</tr>
<tr>
<td>Moment of Inertia</td>
<td>3.9 X 10^-3 oz-in-sec</td>
</tr>
<tr>
<td>Max Acceleration</td>
<td>1 X 10^2 rad/sec</td>
</tr>
<tr>
<td>Electrical Conn</td>
<td>18” cable (foil and braid shield, 24 AWG conductors non-commutated, 28 AWG commutated), 5- or 6-pin M12 (12 mm) in-line connector with 18” cable (foil and braid shield)</td>
</tr>
<tr>
<td>Housing</td>
<td>Black non-corrosive finish</td>
</tr>
<tr>
<td>Mounting</td>
<td>Slotted Flex Mount standard, additional flex mount options available (see Ordering Guide)</td>
</tr>
<tr>
<td>Weight</td>
<td>3.5 oz typical</td>
</tr>
</tbody>
</table>

**Environmental**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temp</td>
<td>0° to 70° C for standard models</td>
</tr>
<tr>
<td></td>
<td>-40° to 70° C for low temperature option</td>
</tr>
<tr>
<td></td>
<td>0° to 100° C for high temperature option</td>
</tr>
<tr>
<td></td>
<td>0° to 120° C for extreme temperature option</td>
</tr>
<tr>
<td>Storage Temp</td>
<td>-40° to +100° C</td>
</tr>
<tr>
<td>Humidity</td>
<td>98% RH non-condensing</td>
</tr>
<tr>
<td>Vibration</td>
<td>10 g @ 58 to 500 Hz</td>
</tr>
<tr>
<td>Shock</td>
<td>50 g @ 31 ms duration</td>
</tr>
<tr>
<td>Sealing</td>
<td>IP50, IP64 available</td>
</tr>
</tbody>
</table>

---

**Model 260 With Front Shaft Clamp (T)**

**With 1.811” (46 mm) BC Slotted Flex (SF)**

**Model 260 Rear Clamp (R)**

**With 1.811” (46 mm) BC Slotted Flex (SF)**

---

**Model 260 Body Mount M12 (SMJ, SMK)**

---

All dimensions are in inches with a tolerance of ±0.005” or ±0.01” unless otherwise specified.
Model 260

Three Point Flex Mount (XF, NF)

1.575" (40 mm) BC Flex Mount (SD)

Flex Arm (FA)

Flex Arm (FB)

Waveform Diagrams

Wiring Table

Connector Pin-Outs

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
## Small Motor Solutions

<table>
<thead>
<tr>
<th>Model</th>
<th>Features/Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>260</td>
<td>Broadly versatile design enables application to low and fract HP NEMA motors with bore sizes up to 0.625&quot; or demanding hi-performance BLDC servos when configured with commutation tracks and 120° C temp rating. Largest bore size (0.625&quot; or 15 mm) in the 2.00&quot; O.D. class, making it a cost-effective replacement solution for many HS20 &amp; HS25 type installations.</td>
</tr>
<tr>
<td>121</td>
<td>Finely engineered for demanding high-speed applications above 10,000 RPM. The only all-metal modular encoder on the planet, featuring patented 1-2-3 gapping and centering design for quick and confident installation. With bore sizes up to 0.625&quot; or 15 mm and commutation optional, the Model 121 is a reliable upgrade replacement for competitor's plastic throw-away encoders.</td>
</tr>
<tr>
<td>15T/H</td>
<td>With a host of US, European &amp; Japanese flex mount options, and bore sizes up to 0.625&quot; or 15 mm, the Model 15T/H is a highly versatile solution for a broad range of both motor and non-motor-mount applications. A short 1.00&quot; over-all height, resolutions to 10,000 CPR, and optional commutation makes the Model 15T a viable upgrade replacement for competitor's plastic throw-away modulars.</td>
</tr>
<tr>
<td>755A NEMA</td>
<td>EPC still actively supports this integrated encoder and coupling mount design, originally employed by motor manufacturer's prior to the advent of today's high-temp, thru-bore encoders. The 755A-NEMA is still a viable alternative for new applications where motor shaft run-out exceeds comfortable limits of thru-bore flex mount designs. The 755A NEMA boasts resolutions up to 30,000 CPR, and a frequency response up to 1MHz.</td>
</tr>
<tr>
<td>225</td>
<td>Historically selected as low cost digital alternative to tachometers on Permanent Magnet motors. Expansive Metric and Inch-Standard bore options (22 mm or 0.875&quot;) enable application to even larger frame motors. Flex Arm mounting kit and multiple connection options provides universal application to most US and IEC motor designs.</td>
</tr>
<tr>
<td>15S</td>
<td>Metric and inch-standard shaft options compliment a host of US, European and Japanese mounting flange options making the Model 15S a versatile solution for a broad range of legacy field-replacement requirements. The small profile Model 15S has optional commutation, up to 10,000 CPR resolution, and the ability to handle the heat of high revving motors.</td>
</tr>
</tbody>
</table>
Model 225 Ordering Guide

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

Model 225A/Q CPR Options

225A
1-600 CPR, all resolutions

225Q
001 002 003 004 005 006 010 011
015 016 020 022 025 030 032 040
048 050 060 062 080 083 090 099
100

Contact Customer Service for other disk resolutions

Features

- Single Channel & Quadrature Models
- Easy To Mount Economical Thru-Bore Design
- Metal Construction
- Bore Sizes To 0.875" or 22 mm

Controlling motor speed is essential for many production assembly machines or robotic equipment. For tachometer feedback, or motor speed control applications, the Model 225 Accu-Coder™ is the ideal encoder choice. The Model 225 Accu-Coder™ is a Thru-Bore encoder available in both single channel (225A) and quadrature (225Q) models. Providing a cost effective solution for simple measurement. Features including an all metal housing, a variety of connector options, and easy installation due to the Thru-Bore design, make the Model 225 Accu-Coder™ ideal for many motion control and manufacturing applications.

Common Applications

Brushless Servo Motor Commutation, Robotics, Motor-Mounted Feedback, Assembly Machines, Digital Plotters, High Power Motors

For specification assistance call Customer Service at 1-800-366-5412

NOTES:
1. Shaft speed limited to 400 RPM.
2. For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: S/12 = 12 feet of cable.
Model 225

Model 225A Specifications
Single Channel

Electrical
- Input Voltage: 4.75 to 24 VDC
- Input Current: 32 mA max with Pull-Up option
- Input Ripple: 100 mV peak-to-peak at 0 to 100 kHz
- Output Format: Square wave 50% duty cycle
- Output Types: Open Collector - 100 mA max
- Pull-Up: 20 mA max (1.5K)
- Max Frequency: 0 to 6 kHz
- Rise Time: Less than 1 microsecond
- Cycles per Rev.: 1 to 600

Mechanical
- Max. Shaft Speed: 4000 RPM
- Bore Size: 0.250” to 0.875” (7 mm to 22 mm) (See Ordering Guide)
- Bore Tolerance: Bore H7 fit for g6 shaft Class LC5 per ANSI B-4.1 Standard
- Running Torque: 10 oz-in typical
- Housing: Black non-corrosive finish
- Bearings: Precision ABEC ball bearings
- Electrical Conn: 6 feet cable with strain relief (shielded, 24 AWG conductors), 9-pin D-subminiature, 5- or 8-pin M12 (12 mm), Terminal Block
- Weight: 8 oz typical

Environmental
- Operating Temp: 0° to +70° C
- Storage Temp: -25° to +85° C
- Humidity: 95% RH non-condensing
- Vibration: 3 g @ 5 to 1000 Hz
- Shock: 20 g @ 10 ms duration

Model 225Q Specifications
Quadrature

Electrical
- Input Voltage: 4.75 to 24 VDC
- Input Current: 64 mA max with Pull-Up option
- Input Ripple: 100 mV peak-to-peak at 0 to 100 kHz
- Output Format: Square wave 50% duty cycle in quadrature
- Output Types: Open Collector - 100 mA max per channel
- Pull-Up: 20 mA max per channel (1.5K)
- Max Frequency: 0 to 6 kHz
- Rise Time: Less than 1 microsecond
- Cycles Per Rev.: 1 to 100

Mechanical
- Max. Shaft Speed: 4000 RPM
- Bore Size: 0.250” to 0.875” (7 mm through 22 mm; see Ordering Guide)
- Bore Tolerance: Bore H7 fit for g6 shaft Class LC5 per ANSI B-4.1 Standard
- Running Torque: 10 oz-in typical
- Housing: Black non-corrosive finish
- Bearings: Precision ABEC ball bearings
- Electrical Conn: 6 feet cable with strain relief (shielded, 24 AWG conductors), 9-pin D-subminiature, 5- or 8-pin M12 (12 mm), Terminal Block
- Weight: 10 oz typical

Environmental
- Operating Temp: 0° to +70° C
- Storage Temp: -25° to +85° C
- Humidity: 95% RH non-condensing
- Vibration: 3 g @ 5 to 1000 Hz
- Shock: 20 g @ 10 ms duration

Model 225 Connector Options

Model 225 Mounting Option (F) Flex Arm Kit
To order Model 225 Flexible Mounting Arm Kit as an accessory, order Part # 140106-01. The kit may be mounted in either an up or down orientation.

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

Wiring Table

Waveform Diagram
Models 225A/Q
## Model 25T/H Ordering Guide

**Mechanical**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>BORE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>25T</td>
<td>01 1/4&quot;, 0.250&quot;</td>
</tr>
<tr>
<td></td>
<td>02 3/8&quot;, 0.375&quot;</td>
</tr>
<tr>
<td></td>
<td>03 5/16&quot;, 0.3125&quot;</td>
</tr>
<tr>
<td></td>
<td>05 1/2&quot;, 0.500&quot;</td>
</tr>
<tr>
<td></td>
<td>11 5/8&quot;, 0.625&quot;</td>
</tr>
<tr>
<td></td>
<td>34 3/4&quot;, 0.750&quot;</td>
</tr>
<tr>
<td></td>
<td>78 7/8&quot;, 0.875&quot;</td>
</tr>
<tr>
<td></td>
<td>42 1 1/8&quot;, 1.125&quot;</td>
</tr>
<tr>
<td></td>
<td>04 6 mm</td>
</tr>
<tr>
<td></td>
<td>09 11 mm</td>
</tr>
<tr>
<td></td>
<td>10 10 mm</td>
</tr>
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<td>12 12 mm</td>
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<td>15 15 mm</td>
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<td>16 16 mm</td>
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<td>19 19 mm</td>
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<tr>
<td></td>
<td>20 20 mm</td>
</tr>
<tr>
<td></td>
<td>24 24 mm</td>
</tr>
<tr>
<td></td>
<td>25 25 mm</td>
</tr>
<tr>
<td></td>
<td>28 28 mm</td>
</tr>
</tbody>
</table>

**Cycles Per Revolution**

See CPR Options below.

**Electrical**

<table>
<thead>
<tr>
<th>NUMBER OF CHANNELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

**Mounting**

- SE 2.25" to 2.75" B.C.
- SG 3.50" to 5.10" B.C.
- SJ 3.50" to 6.10" B.C.
- SH 2.72" to 3.42" B.C.

**Commutation**

- N None

**Input Voltage**

- 5 to 28 VDC

**Output Type**

- 5 - 28 V In/Out
- OC Open Collector
- PP Push-Pull
- HV Line Driver
- PU Pull-Up Resistor
- 5 - 28 V In/V5 Out
- H5 Line Driver
- P5 Push-Pull

**Operating Temperature**

- -20°C to +85°C Std
- T4 -20°C to +105°C

**Connector Type**

- SMW 6-pin MS Style
- SMY 7-pin MS Style
- SMX 10-pin MS Style
- SMK 5-pin M12 (12 mm)
- SMH 8-pin M12 (12 mm)
- SMH 10-pin Bayonet
- FO0 Gland, 24" Cable

**Sealing**

- SMH 7-pin MS Style
- SMK 5-pin M12 (12 mm)
- SMW 10-pin MS Style
- SMX 8-pin M12 (12 mm)
- SMY 10-pin Bayonet
- FO0 Gland, 24" Cable

**Technical Bulletin**

- TB100: When to Choose the CE Option

**Notes**

1. Contact Customer Service for additional options.
2. Contact Customer Service for non-standard index gaging options.
3. 24 VDC max for T4 temperature option.
4. Not available with 5-pin M12 or 6-pin MS style connectors. Available with 7-pin MS style connector without index Z.
5. With input voltage above 16 VDC, operating temperature is limited to 85°C max.
6. Standard operating temperature only.
7. For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable.
9. Not available with Pull-Up Output Type.
# Model 25T Thru-Bore, or Model 25H Hollow Bore (Blind)

## Model 25T/H Specifications

### Electrical
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 85°C
- **Temp Range**: 4.75 to 24 VDC max for temperatures between 85° and 105°C
- **Input Current**: 100 mA max with no output load

### Mechanical
- **Max Shaft Speed**: 6000 RPM, 8000 RPM intermittent
- **Bore Size**: 0.250" through 1.125"
- **Bore Tolerance**: +0.0005" or -0.0008"
- **User Shaft Tolerances**: 6-32 or M3

### Environmental
- **Humidity**: 98% RH non-condensing
- **Vibration**: 2 g @ 5 to 2000 Hz
- **Shock**: 10 g @ 11 ms duration
- **Sealing**: IP65, IP66 with shaft seals at both ends
- **Weight**: 8 oz typical

## Model 25T/H Connector Options

### Model 25T/H Mounting Options

## Wiring Table

### Waveform Diagram

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*Note: All tolerance references are electrical degrees.*

---

*CE Option: Cable shield (bare wire) is connected to internal case*
*CE Option: Read Technical Bulletin TB9111*
The sleek design of the Model 775 Thru-Bore Series Accu-Coder™ makes form and function a successful reality. The slim profile and Thru-Bore design, makes installation easy by simply slipping the bore over motor shafts up to 1.375" in diameter. The advanced Opto-ASIC based electronics provide the superior noise immunity necessary in many industrial applications. With a variety of bore sizes, resolutions, and connector types, application possibilities are endless.

Common Applications
Motor Feedback, Velocity & Position Control, Food Processing, Robotics, Material Handling

Model 775 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

For specification assistance call Customer Service at 1-800-366-5412
### Model 775 Specifications

#### Electrical
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 70° C  
- 4.75 to 24 VDC for temperatures between 70° C to 100° C
- **Input Current**: 100 mA max with no output load
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format**: Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. See Waveform Diagrams below.
- **Output Types**: Open Collector- 100 mA max per channel, Pull-Up- 100 mA max per channel, Push-Pull- 20 mA max per channel, Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- **Index**: Once per revolution. 0475 to 4096 CPR: Gated to output A, 0001 to 0474 CPR: Ungated. See Waveform Diagrams below.
- **Max Frequency**: 200 kHz
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2
- **Symmetry**: 180° (±18°) electrical
- **Quad. Phasing**: 90° (±22.5°) electrical
- **Min. Edge Sep**: 67.5° electrical
- **Rise Time**: Less than 1 microsecond

#### Mechanical
- **Max Shaft Speed**: 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Bore Size**: 0.625", 0.750", 0.875", 1.000", 14 mm, 19 mm, 24 mm, 1.125", 1.250", 1.375", 25 mm, 28 mm, 30 mm, 32 mm
- **Note**: Bore sizes 1.125", 1.250", 1.375”, 25 mm, 28 mm, 30 mm, 32 mm are clamp style. All others are collet style.
- **User Shaft Tolerances**: Radial Runout - 0.005”
- **Axial Endplay**: ±0.003” with appropriate flex mount
- **Moment of Inertia**: 3.3 X 10^2 oz-in-sec^2 typical
- **Electrical Conn**: Gland nut with 24" cable (foil and braid shield, 24 AWG conductors), 6-, 7-, or 10-pin MS Style, 5- or 8-pin M12 (12 mm), 9-pin D-subminiature
- **Housing**: All metal construction
- **Mounting**: Thru-Bore with collet clamp or single-screw clamp mount
- **Weight**: 1.0 lb with gland nut or D-sub connector option 1.5 lb with MS connector option
- **Note**: All weights typical

#### Environmental
- **Operating Temp**: 0° to 70° C for standard models  
- 0° to 100° C for high temperature option
- **Storage Temp**: -20° to 100° C
- **Humidity**: 98% RH non-condensing
- **Vibration**: 10 g @ 58 to 500 Hz
- **Shock**: 50 g @ 11 ms duration
- **Sealing**: IP50

---

**Model 775 Collet Clamp (A, B, C, D, H, I, K)**

**Model 775 Clamp Style (O, T, V, M, L, Q)**

**Model 775 Extended Housing (W, X, Y, J, K)**

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**Waveform Diagrams**

- Line Driver and Push-Pull
- Open Collector and Pull-Up

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**Wiring Table**
Model 776

Features
- Slim Profile - Only 1.36" In Depth
- Thru-Bore Design For Easy Mounting
- Incorporates Opto-ASIC Technology
- Resolutions to 4096
- Bore Options to 1.875"
- CE Marking Available

The Thru-Bore Series Accu-Coder™ Model 776 encoder is designed to fit directly on either a motor or other shaft where position, direction, or velocity information is needed. The advanced Opto-ASIC based electronics provide the superior noise immunity necessary in many industrial applications. The Model 776 conveniently features a clamp type mount for fast and easy mounting over a large range of shaft sizes. An optional anti-rotation flex mount maintains housing stability.

Common Applications
Motor Feedback, Velocity & Position Control, Robotics, Conveyors, Material Handling

Model 776 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

For specification assistance call Customer Service at 1-800-366-5412

Model 776 CPR Options
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<th>0060</th>
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<td>2500</td>
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</tr>
</tbody>
</table>

Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types

NOTES:
1. Contact Customer Service for index gating options.
2. 5 to 24 VDC max for high temperature option.
3. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: P/6 = 6 feet of cable.
5. Not available with 5-pin M12 or 6-pin MS connector. Available with 7-pin MS connector only without Index Z.
Model 776 Specifications

Electrical

Input Voltage..............4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C to 100° C
Input Current..............100 mA max with no output load
Input Ripple..............100 mV peak-to-peak at 0 to 100 kHz
Output Format..............Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. See Waveform Diagrams below.
Output Types..............Open Collector- 100 mA max per channel
Push-Pull- 20 mA max per channel
Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Index.....................Once per revolution.
0475 to 4096 CPR: Gated to output A
0001 to 0474 CPR: Ungated
See Waveform Diagrams below.
Max Frequency.............200 kHz
Noise Immunity............Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN55081-2
Symmetry................180° (±18°) electrical
Quad. Phasing..............90° (±22.5°) electrical
Min. Edge Sep..............67.5° electrical
Rise Time................Less than 1 microsecond

Mechanical

Max Shaft Speed........3500 RPM. Higher shaft speeds may be achievable, contact Customer Service.
Bore Size.................1.500", 1.625", 1.750", 1.875", 35 mm, 38 mm, 40 mm, 42 mm, 43 mm
User Shaft Tolerances
Radial Runout..............0.005"
Axial Endplay..............±0.030" with appropriate flex mount
Moment of Inertia........3.3 x 10^-3 oz-in-sec^2 typical
Electrical Conn............Gland nut with 24" cable (foil and braid shield, 24 AWG conductors), 6-, 7-, or 10-pin MS Style, 5- or 8-pin M12 (12 mm), or 9-pin D-sub miniature
Housing....................All metal construction
Mounting....................Thru bore with single-screw clamp mount
Weight....................1.0 lb with gland nut or D-sub connector option 1.5 lb with MS connector option
Note: All weights typical

Environmental

Operating Temp..............0° to 70° C for standard models
0° to 100° C for high temperature option
Storage Temp..............-25° to 100° C
Humidity.....................98% RH non-condensing
Vibration..............10 g @ 58 to 500 Hz
Shock....................50 g @ 11 ms duration
Sealing....................IP50

Waveform Diagrams

Line Driver and Push-Pull

Wiring Table

Open Collector and Pull-Up
Model 770

Features
- Slim Profile - Only 1.00” Deep
- Fits NEMA Size 56C Thru 184C Motor Faces (4.5” AK)
- Incorporates Opto-ASIC Technology
- Resolutions to 4096 CPR

The Model 770 C-face encoder is a rugged, high resolution encoder designed to mount directly on NEMA C-face motors. Both sides of the encoder are C-face mounts, allowing additional C-face devices to be mounted to this encoder. Unlike many C-face kit type encoders, the Model 770 contains precision bearings and an internal flex mount, virtually eliminating encoder failures and inaccuracies induced by motor shaft runout or axial endplay. The advanced Opto-ASIC design provides advanced noise immunity necessary for many industrial applications. This encoder is ideal for applications using induction motors and flux vector control. The Model 770 provides speed and position information for drive feedback in a slim profile - only 1.00” thick. The Thru-Bore design allows fast and simple mounting of the encoder directly to the accessory shaft or to the drive shaft of the motor, using the standard motor face (NEMA sizes 56C - 184C). The tough, all metal housing resists the vibration and hazards of an industrial environment.

Common Applications
Motor Feedback, Velocity & Position Control, Conveyors, Variable Speed Drives, Mixing & Blending Motors, Assembly & Specialty Machines

Model 770 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Model 770 CPR Options
0060 0100 0120 0240 0250 0256
0500 0512 0600 1000 1024 2048
2500 4096

Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types

For specification assistance call Customer Service at 1-800-366-5412

Model 770 Ordering Guide


Model 770 4.5” NEMA "AK" Dimension

OPERATING TEMPERATURE
S 0° to 70° C
H 0° to 100° C

OUTPUT TYPE
5 - 28V In/Out
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver

Cycles per Revolution
1 - 4096
See CPR Options below for available resolutions. Price adder for CPR >1024

NUMBER OF CHANNELS
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

Number of Channels
2

C-Face Gasket Kit Option
"B" Housing Only

Mating Connector
N No Connector
Y Yes

CERTIFICATION
N None
CE CE Marked

Connector Type
P 24" Cable with Gland Nut
B Terminal Strips in Conduit Box
X 10-pin MS Style on Conduit Box
Y 7-pin MS Style on Conduit Box
J 5-pin M12 on Conduit Box
K 6-pin M12 on Conduit Box
L 10-pin Industrial Clamp

BORE SIZE
A 5/8", 0.625"
B 3/4", 0.750"
C 7/8", 0.875"
D 1", 1.000"
H 14 mm
I 19 mm
K 24 mm

For specification assistance call Customer Service at 1-800-366-5412

NOTES:
1. Thru-Bore version may be IP65 sealed if mounted between two C-face devices with optional gasket kit. Select "Yes" under C-face Gasket Kit Option.
2. Contact Customer Service for index gating options.
3. 5 to 24 VDC max for high temperature option.
4. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: P/6 = 6 feet of cable.
6. Not available with 5-pin M12 connector. Available with 7-pin MS connector only without Index Z.
Model 770

Model 770 Specifications

**Electrical**
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 70°C, 4.75 to 24 VDC for temperatures between 70°C to 100°C
- **Input Current**: 100 mA max with no output load
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format**: Incremental - Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. See Waveform Diagrams below.
- **Output Types**:
  - Open Collector - 100 mA max per channel
  - Pull-Up - 100 mA max per channel
  - Push-Pull - 20 mA max per channel Line Driver - 20 mA max per channel (Meets IEC 61131-2)
- **Index**: Once per revolution.
- **Max Frequency**: 200 kHz
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS 5204; BS EN50022 (with European compliance option); BS EN61000-6-2; BS EN55022
- **Pull-Up**: 100 mA max per channel
- **Max Frequency**: 200 kHz
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS 5204; BS EN50022
- **Symmetry**: 180° (±18°) electrical
- **Quad. Phasing**: 90° (±22.5°) electrical
- **Min. Edge Sep.**: 67.5° electrical
- **Rise Time**: Less than 1 microsecond

**Mechanical**
- **Max Shaft Speed**: 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Bore Size**: 0.625, 0.750, 0.875, 1.000, 14 mm, 19 mm, and 24 mm
- **Bore Tolerance**: +0.0015”/-0.000”
- **Radial Runout**: 0.005”
- **Axial Endplay**: 0.005”
- **Moment of Inertia**: 3.3 x 10−3 oz-in-sec² typical
- **Electrical Cond**: Gland nut with 24” cable (foil and braid shield, 24 AWG conductors), Terminal Strip in conduit box, 7- or 10-pin MS Style, 5- or 8-pin M12 (12 mm), 10-pin Industrial Clamp
- **Housing**: All metal construction
- **Mounting**: NEMA 56C to 184C
- **Weight**: 3.00 lb with all other connector options

**Environmental**
- **Operating Temp**: 0° to 70°C for standard models
- **Storage Temp**: -25° to 100°C
- **Humidity**: 98% RH non-condensing
- **Vibration**: 1.65 g at 58 to 500 Hz
- **Shock**: 50 g @ 11 ms duration
- **Sealing**: IP65 for Option A housing style with gasket kit
- **Weight**: 2.60 lb with gland nut

This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123  www.barr-thorp.com
Model 771

Features
- Large Bore size to 1.875" or 43 mm
- Fits NEMA Size 182TC Thru 256TC Motor Faces (8.5" AK)
- Incorporates Opto-ASIC Technology
- Resolutions to 4096 CPR

The Model 771 C-face encoder is a rugged, high resolution encoder designed to mount directly on NEMA C-face motors. Both sides of the encoder are C-face mounts, allowing additional C-face devices to be easily mounted. Many competitive C-face units are kit type encoders, but the Model 771 contains precision bearings and an internal flex mount that virtually eliminates encoder failures and inaccuracies induced by motor shaft runout or axial endplay. The advanced Opto-ASIC design provides superior noise immunity necessary for many industrial applications. This encoder is ideal for applications using induction motors and flux vector control. A Thru-Bore design allows fast and simple mounting of the encoder directly to the accessory shaft or drive shaft of a motor using a NEMA standard motor face (sizes 182TC - 256TC). The tough, all metal housing resists the vibration and hazards of an industrial environment.

Common Applications
Motor Feedback, Velocity & Position Control, Servo Control Systems, Assembly & Specialty Machines, Elevator Controls

Model 771 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

For specification assistance call Customer Service at 1-800-366-5412

Model 771 CPR Options

<table>
<thead>
<tr>
<th></th>
<th>0060</th>
<th>0100</th>
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<th>0240</th>
<th>0250</th>
<th>0256</th>
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<th>1000</th>
<th>1024</th>
<th>2048</th>
<th>2500</th>
<th>4096</th>
</tr>
</thead>
</table>

For specification assistance call Customer Service for other disk resolutions; not all disk resolutions available with all output types

NOTES:
1. Thru-Bore version may be IP65 sealed if mounted between two C-face devices with optional gasket kit. Select "Yes" under C-face Gasket Kit Option.
2. Contact Customer Service for index gating options.
3. 5 to 24 VDC max for high temperature option.
4. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: P/6 = 6 feet of cable.
5. Not available with 5-pin M12 connector. Available with 7-pin MS connector only without Index Z.
Model 771 Specifications

**Electrical**
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 70° C.
- 4.75 to 24 VDC for temperatures between 70° C to 100° C.
- **Input Current**: 100 mA max with no output load.
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz.
- **Output Format**: Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. See Waveform Diagrams below.
- **Output Types**: Open Collector- 100 mA max per channel.
  - Pull-Up: 100 mA max per channel.
  - Push-Pull: 20 mA max per channel.
  - Pull-Up- 100 mA max per channel.
  - Line Driver: 20 mA max per channel (Meets RS 422 at 5 VDC supply).
- **Index**: Once per revolution.
- **Max Frequency**: 200 kHz.
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN550002 (with European compliance option); BS EN61000-6-2; BS EN55081-2.
- **Symmetry**: 180° (±18°) electrical.
- **Quad. Phasing**: 90° (±22.5°) electrical.
- **Min. Edge Sep.**: 67.5° electrical.
- **Rise Time**: Less than 1 microsecond.

**Mechanical**
- **Max Shaft Speed**: 3500 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- 6000 RPM for 1.125", 1.250", 1.375", 28 mm, 30 mm, 32 mm bore diameter.
- **Bore Size**: 0.625", 0.875", 1.00", 1.125", 1.250", 1.375", 1.500", 1.625", 1.750", 1.875", 28 mm, 30 mm, 32 mm, 35 mm, 38 mm, 40 mm, 42 mm, and 43 mm.
- **User Shaft Tolerances**:
  - Radial Runout: 0.005".
  - Axial Endplay: ±0.01".
- **Moment of Inertia**: 3.3 x 10^-3 oz-in-sec^2 typical.
- **Electrical Conn.**:
  - Gland nut with 24" cable (foil and braid shield, 24 AWG conductors), Terminal Strip in conduit box, 7- or 10-pin MS Style, 5- or 8-pin M12 (12 mm), 10-pin Industrial Clamp.
- **Housing**: All metal construction.
- **Mounting**: NEMA 182TC-256TC (8.5" AK).
- **Weight**: 7.0 lb typical.

**Environmental**
- **Operating Temp.**: 0° to 70° C for standard models.
- 0° to 100° C for high temperature option.
- **Storage Temp.**: -25° to 100° C.
- **Humidity**: 98% RH non-condensing.
- **Vibration**: 10 g @ 58 to 500 Hz.
- **Shock**: 50 g @ 11 ms duration.
- **Sealing**: IP65 for Option A housing style with gasket kit IP50 for Option B housing style.

---

Model 771 With Gland Nut Cable (P)

Model 771 With Conduit Box (B, X, Y, J, K)

Optional Housing Style (A)

Protective Cover

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

Waveform Diagrams

Wiring Table

Line Driver and Push-Pull

Open Collector and Pull-Up

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This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123 www.barr-thorp.com
Model 755A NEMA

Features
- Standard NEMA Mounting
- Up to 30,000 Cycles Per Revolution
- High Temperature Option

The Model 755A NEMA Mount Accu-Coder™ with its integral shaft coupling, mounts directly onto NEMA motors. It is designed for easy installation on industrial size 23 or 34 motor frames. It features standard bolt circle patterns, and can accommodate shaft sizes of 0.250", 0.375", or 6 mm. With its rugged all metal housing, and a wide range of CPR options, it will fit in many different applications, providing years of trouble free use.

Common Applications
Robotics, Assembly Machines, Motor-Mounted Feedback, Phototypesetters, Printers & Digital Plotters, Elevator Controls, Medical Diagnostic Equipment

Model 755A NEMA Ordering Guide

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

Model 755A NEMA CPR Options

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<thead>
<tr>
<th>CPR Value</th>
<th>Description</th>
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<td>0028</td>
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For enhanced connectivity, available with an M12 in-line connector.

For specification assistance call Customer Service at 1-800-366-5412

Model 755A NEMA - 31 - S - 1000 - R - HV - 1 - 23A - S - CE

CERTIFICATION
N None
CE CE Marked"
Model 755A NEMA Specifications

**Electrical**
- Input Voltage: 4.75 to 28 VDC max for temperatures up to 70° C. 4.75 to 24 VDC for temperatures between 70° C to 100° C.
- Input Current: 100 mA max with no output load.
- Input Ripple: 100 mV peak-to-peak at 0-100 kHz.
- Output Format: Incremental—Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- Output Types: Open Collector- 100 mA max per channel. Pull-Up- 100 mA max per channel. Line Driver- 20 mA max per channel.
- Index: Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- Max Frequency: Up to 1 MHz.
- Noise Immunity: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN50522 (with European compliance option); BS EN61000-6-2; BS EN50081-2;
- Symmetry: 1 to 6000 CPR: 180° ±18°) electrical at 100 kHz output 6001 to 20,480 CPR: 180° ±36°) electrical.
- Quad Phasing: 1 to 6000 CPR: 90° ±22.5°) electrical at 100 kHz output 6001 to 20,480 CPR: 90° ±36°)
- Min Edge Sep: 1 to 6000 CPR: 67.5° electrical at 100 kHz output 6001 to 20,480 CPR: 54° electrical, >20,480 CPR: 50° electrical.
- Rise Time: Less than 1 microsecond.
- Accuracy: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units >3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

**Mechanical**
- Max Shaft Speed: 7500 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- Coupling Bore: 0.250", 0.375", or 6 mm
- Starting Torque: 0.14 oz-in typical. 4.0 oz-in for -40° C operation.
- Moment of Inertia: 18" cable (lead and shield), 24 AWG conductors, 5- or 8-pin Molex, Terminal Block.
- Housing: Black non-corrosive finish.
- Bearings: Precision ABEC ball bearings.
- Mounting: NEMA 23 and 34.
- Weight: 4.50 oz typical on NEMA 23. 6.75 oz typical on NEMA 34.

**Environmental**
- Operating Temp: 0° to 70° C for standard models. 40° to 73° C for low temperature option. 0° to 100° C for high temperature option. (0° to 85° C for certain resolutions, see CPR Options.)
- Storage Temp: -25° to 85° C.
- Humidity: 98% RH non-condensing.
- Vibration: 10 g @ 58 to 500 Hz.
- Shock: 50 g @ 11 ms duration.

Model 755A Size 23 NEMA Mount (23A, 23B, 23C)

Model 755A Size 34 NEMA Mount (34A, 34B, 34C)

Waveform Diagrams

Wiring Table
Model 702 Motor Mount Ordering Guide

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

For specification assistance call Customer Service at 1-800-366-5412

Model 702 Motor Mount CPR Options

<table>
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NOTES:
1. 0° to 85° C for certain resolutions, see CPR Options.
2. Contact Customer Service for non-standard index gating options.
3. 24 VDC max for high temperature option.
4. Standard temperature, 60 to 3000 CPR only.
6. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
8. Not available with 5-pin M12 or 6-pin MS Type connector.
10. H5 and P5 outputs are not available with CE option.

* Contact Customer Service for High Temperature Option.

** High Temperature Option (H) limited to 85° C maximum for these CPR options.

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

Features
- Up to 30,000 CPR
- IP66 Sealing Available
- Mounting Flange Available With Boss

The Model 702 Motor Mount Accu-Coder™ is a heavy duty, ultra-rugged, reliable, yet compact industry standard 2-inch diameter encoder. It is designed to withstand harsh factory and plant floor environments. The mounting flange with integral shaft and coupling, allows the 702 encoder to be easily installed on a motor or shaft assembly, without the need for additional brackets or couplings. With the ability to handle shaft speeds of up to 8000 RPM, and withstand the shock and vibration of high speed servo motors, you are sure to be pleased with the 702 Motor Mount Accu-Coder™.

Common Applications
Model 702 Motor Mount Specifications

**Electrical**
- **Input Voltage:** 4.75 to 28 VDC max for temperatures up to 70° C; 4.75 to 24 VDC for temperatures between 70° C to 100° C
- **Input Current:** 100 mA max with no output load
- **Input Ripple:** 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format:** Incremental - Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- **Output Types:** Open Collector-100 mA max per channel; Pull-Up-100 mA max per channel; Push-Pull-20 mA max per channel; Line Driver-20 mA max per channel (Meets RS 422 at 5 VDC supply)
- **Index:** Occurs once per revolution. The index for units > 3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- **Max Frequency:** Up to 1 MHz
- **Noise Immunity:** Tested to: BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50224; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2
- **Symmetry:** For 2000 to 3000 CPR, 0.01° mechanical; for 2001 to 6000 CPR: 90° (±36°) electrical
- **Quad Phasing:** 1 to 6000 CPR: 90° (±36°) electrical
- **Min Edge Sep.:** 1 to 6000 CPR: 67.5° electrical at 100 kHz output; 6010 to 24,000 CPR: 54° electrical; >20,480 CPR: 50° electrical
- **Rise Time:** Less than 1 microsecond
- **Accuracy:** Instrument and Quadrature Error: For 2000 to 3000 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (6.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)
- **Max Acceleration:** 1 x 10⁵ rad/sec²
- **Moment of Inertia:** 5.2 x 10⁻⁴ oz-in-sec²
- **Starting Torque:** 1.0 oz-in typical with IP64 seal or no seal
- **Coupling Size:** 0.250", 0.375", or 0.500"
- **Mechanical Accuracy:** 0.005° or ±0.01° unless otherwise specified

**Environment**
- **Operating Temp.:** 0° to 70° C for standard models; 0° to 105° C for high temperature option (0° to 85° C for certain resolutions; see CPR Options)
- **Storage Temp.:** -25° to +85° C
- **Humidity:** 96% RH non-condensing
- **Vibration:** 20 g @ 50 to 500 Hz
- **Shock:** 75 g @ 11 ms duration
- **Sealing:** IP68 (NEMA 13 and 4/4X) with shaft seal; IP66 available

Model 702 With Integral Coupling And Boss (B)

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

Waveform Diagrams

Line Driver and Push-Pull

<table>
<thead>
<tr>
<th>Function</th>
<th>Gland</th>
<th>Cable Wire Color</th>
<th>5-pin MS</th>
<th>7-pin MS (HV, HV)</th>
<th>7-pin MS (HV)</th>
<th>8-pin MS</th>
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<th>10-pin Bayonet</th>
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<td>2</td>
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Open Collector and Pull-Up

1-800-366-5412 • www.encoder.com • sales@encoder.com
# Large Motor Solutions

<table>
<thead>
<tr>
<th>Model</th>
<th>Features/Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>260 Ø2.00&quot;</td>
<td>Small diameter bearing set enables operating speeds to 7500RPM. “FB” flex arm tether accommodates mounting to 56 C-face motors (O.D.E.). 5-28 VDC regulated input voltage allows power supply from most any PLC or Drive source. M12 body-mount &amp; in-line options complement system connector standardization.</td>
</tr>
<tr>
<td>25T Ø2.50&quot;</td>
<td>Large thru-bore capability - up to 1.125&quot; or 28 mm in Size 25 package. One encoder accommodates both small &amp; large frame motors. IP66 sealing provides extended protection in high-contaminant &amp; moisture environments. Proprietary Nylon composite housing enhances longevity in corrosive environments.</td>
</tr>
<tr>
<td>775 Ø4.3&quot;</td>
<td>Bore Sizes to 1.875” with Phenolic Inserts provide superior thermal and electrical isolation. Anti-rotation flex enables mounting to both 4.5&quot; &amp; 8.5”AK c-face’s (5.875” &amp; 7.250” BC’s). Host of cable/connector options including MS, M12 &amp; cable gland.</td>
</tr>
<tr>
<td>770 Ø6.50&quot;</td>
<td>Fits Industry Standard “56C” mounting. “Double C-Face” is standard, enabling the encoder to be “sandwiched” between the motor and another c-face device such as a brake or gearbox. Critical gapping, alignment, calibration assured via precision double bearing set; no special tools req’d! Host of cable/connector options. Only “56C” on the market with 4096 CPR capability for hi-performance velocity and position control loops.</td>
</tr>
<tr>
<td>865T Ø9.00&quot;</td>
<td>Fits Industry Standard “56C” mounting. 316 Stainless assures maximum corrosion protection in harsh food, beverage and chemical environments. IP66 combined with the 316 Stainless provides maximum wash-down protection. Only “56C” on the market with 4096 CPR capability for hi-performance velocity and position control loops.</td>
</tr>
<tr>
<td>771 Ø9.00&quot;</td>
<td>Fits larger motor frame sizes with 8.5” AK. “Double C-Face” is standard. Optional protective cover affords IP65 sealing. Host of cable/connector options including MS, Latching Industrial, M12 &amp; cable gland.</td>
</tr>
</tbody>
</table>
For Your Motor Feedback Needs

Why the Model 25T?

- One Encoder, Replaces HS20, HS25 and HS35 Encoders (see page 18 for details)
- Bore Sizes Range From 1-1/8” to 1/2” (Field Changeable with Optional Insert Kit)
- A Variety of Flexible Mounting Options
- Multiple Connector Options
- Resolutions to 10,000 CPR
- Operating Temperatures to 105°C
- Sealing to IP66

NOW AVAILABLE!

Encoder Kits for Your 56C Motor

Kit Includes:
- 25T Encoder
- Flex Mount
- Mating Connector
- 56C Protective Cover
- Mounting Hardware
Model 711 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

<table>
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<th>MODEL</th>
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**Common Applications**
Feedback For Counters, PLC's & Motors, Measuring For Packaging, Filling & Materials Handling Machines, Wire Winding, Film Extrusion

**Features**
- The Original Industry-Standard Cube
- Five Versatile Housing Styles
- Thousands of Configurations
- New Resolutions Available to 10,000!

The Model 711 Accu-Coder™ is the original, industry standard Cube encoder. Designed for compatibility with most programmable controllers, electronic counters, motion controllers, and motor drives, it is ideally suited for applications that require a simple, symmetrical, unidirectional square wave output in a single channel format. Increasing critical performance specifications for the most popular resolutions and features advanced Opto-ASIC circuitry, a single chip design that eliminates many board level components. This increases the reliability of an already dependable and durable encoder. With new options continually being added, we just keep getting better, and better!

**NOTES:**
1. Available with 0.250" shaft only.
2. Contact Customer Service for custom shaft lengths and diameters.
3. Standard housing only.
4. HD10 housing only.
5. Not available for HD or EX housings.
6. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
7. For HDR > 2500, Standard cable length only.
10. Standard or 5PY housing only.

**Incremental Shaft Encoders**
This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123 www.barr-thorp.com
Model 711 Specifications
Common to All Cube Housing Styles

**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 and 100°C.
- Input Current: 80 mA maximum with no output load.
- Input Ripple: 100 mV peak-to-peak at 0 to 100 kHz.
- Output Format: Incremental, Square wave with single channel.
- Output Types:
  - Open Collector: 250 mA max per channel
  - Pull-Up: 250 mA max per channel
  - Line Driver: 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- Max Frequency: 1 to 2500 CPR 125 kHz, 2501 to 5000 CPR 250 kHz, 5001 to 10,000 CPR 500 kHz
- Standard Cube: 0 to 20 kHz

**Mechanical**
- Symmetry: 180° (±18°) electrical
- Rise Time: Less than 1 microsecond
- Accuracy: Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes.
- Max Speed: 6000 RPM. Higher shaft speeds achievable, contact Customer Service.
- Shaft Material: 303 stainless steel
- Housing: Black non-corrosive finished 6063-T6 aluminum
- Bearings: Precision ABEC Ball Bearings

**Environmental**
- Operating Temp: 0° to 85°C or 0° to 100°C at 5 to 24 VDC
- Storage Temp: -25° to +85°C
- Humidity: 98% RH non-condensing
- Vibration: 10 g @ 58 to 500 Hz
- Shock: 50 g @ 11 ms duration

**Standard Cube Housing (S, S1)**

**Standard Cube Housing (S, S1) Specifications**

**Mechanical**
- Shaft Size: 0.250" or 0.375"
- Shaft Type: Single or double-ended (specify choice)
- Radial Loading: 15 lb maximum (0.250" diameter shaft)
- Axial Loading: 10 lb maximum (0.250" diameter shaft)
- Starting Torque: 0.13 oz-in typical for 0.250" shaft
- 0.38 oz-in typical for 0.375" shaft
- Moment of Inertia: 6.5 x 10^-6 oz-in-sec^2
- Mounting: Tapped mounting holes on three sides for base or face mounting
- Weight: 10 oz for standard housing
Model 715

Features
- The Original Industry-Standard Cube
- Five Versatile Housing Styles
- Thousands of Configurations
- Many New Resolutions Available!

The Model 715 Accu-Coder™ is ideally suited for applications requiring bi-directional feedback with a constant pulse width. The Model 715 is available in two versions. The Model 715-1 provides output pulses for clockwise shaft rotation on one channel and pulses for counterclockwise rotation on another. The Model 715-2 provides output pulses for counting on one channel while the other channel indicates direction of rotation. Increasing critical performance specifications for the most popular resolutions and features advanced Opto-ASIC circuitry, a single chip design that eliminates many board level components. This increases the reliability of an already dependable and durable encoder. With new options continually being added, we just keep getting better, and better!

Common Applications
Measuring for Cut-To-Length, Labeling & Filling, Position Control, Motion Following, or Slaving Applications

Model 715 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

For specification assistance call Customer Service at 1-800-366-5412

Incremental Shaft Encoders
Model 715 Specifications

Common to All Cube Housing Styles

**Electrical**
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 85°C; 4.75 to 24 VDC for temperatures between 85° to 100°C
- **Input Current**: 80 mA maximum with no output load
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format**: Incremental - Square wave with timed output
- **Output Types**: Open Collector - 250 mA max per channel
- **Max Frequency**: 0 to 125 kHz
- **Rise Time**: Less than 1 microsecond
- **Accuracy**: Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes

**Mechanical**
- **Max Speed**: 6000 RPM. Higher shaft speeds achievable, contact Customer Service.
- **Shaft Material**: 303 stainless steel
- **Housing**: Black non-corrosive finished 6063-T6 aluminum
- **Bearings**: Precision ABEC Ball Bearings
- **Electrical Conn.**: 5- or 8-pin M12 (12 mm), gland nut with 18” cable (foil and braid shield, 24 AWG conductors), Solder or Screw Terminal, with or without Conduit Box.

**Environmental**
- **Operating Temp**: 0° to 85°C or 0° to 100°C at 5 to 24 VDC
- **Storage Temp**: -25° to +85°C
- **Humidity**: 98% RH non-condensing
- **Vibration**: 10 g @ 58 to 500 Hz
- **Shock**: 50 g @ 11 ms duration

Model 715-1 - Bi-directional Encoder
The 715-1 provides two output channels, one with a constant pulse width output on one channel for clockwise shaft rotation, and on the other channel for counterclockwise shaft rotation. Specify PPR in any even numbered value between 2 and 5000 std cube, or 2 and 10,000 for E-Cube®. Specify any pulse width from 10 microseconds to 100 milliseconds and pulse polarity. Some options require Heavy Duty housing. The Line Driver output option is not available.

Model 715-2 - Bi-directional Encoder
The 715-2 provides two output channels, one channel has a constant pulse width output regardless of shaft rotation. The other channel an up/down direction line with logic level “1” for clockwise shaft rotation, and level “0” for counterclockwise shaft rotation. Options are the same as for the Model 715-1.

Waveform Diagrams

Wiring Table

### Standard Cube Housing (S, S1)

**Mechanical**
- **Shaft Size**: 0.250” or 0.375”
- **Shaft Type**: Single or double-ended (specify choice)
- **Radial Loading**: 15 lb maximum (0.250” diameter shaft)
- **Axial Loading**: 10 lb maximum (0.250” diameter shaft)
- **Starting Torque**: 0.13 oz-in typical for 0.250” shaft
- **Moment of Inertia**: 0.65 x 10⁻⁶ oz-in-sec²
- **Mounting**: Tapped mounting holes on three sides for base or face mounting
- **Weight**: 10 oz for standard housing

### Cube Housing With 1/4” Shaft (4)

### Cube Housing With 3/8” Shaft (6)
**Model 716**

**Features**
- The Original Industry-Standard Cube
- Five Versatile Housing Styles
- Thousands of Configurations
- New Resolutions Available to 10,000!

The Model 716 Accu-Coder™ is ideally suited for applications requiring a quadrature output. Designed for compatibility with most programmable controllers, electronic counters, motion controllers, and motor drives, it is ideally suited for industrial applications where it is important that the direction of rotation be known. Increasing critical performance specifications for the most popular resolutions and features advanced Opto-ASIC circuitry, a single chip design that eliminates many board level components. This increases the reliability of an already dependable and durable encoder. With new options continually being added, we just keep getting better, and better!

**Common Applications**
Feedback for counters, PLC’s & Motors, Cut To Length, Labeling, Measuring For Packaging, Filling & Materials Handling Machines, Wire Winding, Film Extrusion

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### Model 716 Ordering Guide

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

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<td>8192 10,000</td>
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*Price adder options: 0193 0198 0200 0205* 0210 0240 0250 0256 0276 0298 0300 0305 0308 0315 0333 0336 0350 0360 0400 0480 0500 0512 0580 0597 0600 0700 0720 0800 0840 0960 1000 1024 1200 1230 1270 1500 1800* 2000 2048 2500 3000 3600* 4096 5000 6000 7200* 8192 10,000

**For specification assistance call Customer Service at 1-800-366-5412**

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### Notes:
1. Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types.
2. For specification assistance call Customer Service at 1-800-366-5412
3. Contact Customer Service for custom shaft lengths and diameters.
4. Standard housing only.
5. HD10 housing only.
6. Not available for HD or EX housings.
7. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable. For CPR > 2500. Standard cable length only.
9. Complete only if Index Pulse option is selected.
10. For mating connectors, cables, and cordsets see www.encoder.com
11. Only available with 5/16” (0.3125”) shaft.
12. Standard or 5PY housing only.
Model 716 Specifications
Common to All Cube Housing Styles

**Electrical**
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 85°C
- **Input Current**: 80 mA maximum with no output load
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format**: Incremental - Square wave with single channel
- **Output Types**: Open Collector- 250 mA max per channel
- **Line Driver**: 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- **Max Frequency**: 0.1 to 2500 CPR 125 kHz, 2501 to 5000 CPR 250 kHz, 5001 to 10,000 CPR 500 kHz
- **Standard Cube**: 0 to 20 kHz

**Symmetry**: 180° (±18°) electrical
**Quad Phasing**: 90° (±22.5°) electrical

**Rise Time**: Less than 1 microsecond

**Accuracy**: Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes

**Mechanical**
- **Max Speed**: 6000 RPM. Higher shaft speeds achievable, contact Customer Service.
- **Shaft Material**: 303 stainless steel
- **Housing**: Black non-corrosive finished 6063-T6 aluminum
- **Bearings**: Precision ABEC Ball Bearings

**Environmental**
- **Operating Temp**: 0° to 85°C or 0° to 100°C at 5 to 24 VDC
- **Storage Temp**: -25° to +85°C
- **Humidity**: 98% RH non-condensing
- **Vibration**: 10 g @ 58 to 500 Hz
- **Shock**: 50 g @ 11 ms duration

**Waveform Diagrams**

**Standard Cube Housing (S, S1)**

**Standard Cube Housing (S, S1) Specifications**

- **Mechanical**
  - **Shaft Size**: 0.250" or 0.375"
  - **Shaft Type**: Single or double-ended (specify choice)
  - **Radial Loading**: 15 lb maximum (0.250" diameter shaft)
  - **Axial Loading**: 10 lb maximum (0.250" diameter shaft)
  - **Starting Torque**: 0.38 oz-in typical for 0.375" shaft
  - **Moment of Inertia**: 6.5 x 10^-6 oz-in-sec^2
  - **Mounting**: Tapped mounting holes on three sides for base or face mounting
  - **Weight**: 10 oz for standard housing

**Wiring Table**

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<th>Function</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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</table>

**Cube Housing With 1/4" Shaft (4)**

**Cube Housing With 3/8" Shaft (6)**
Cube Housings

Industrial Cube Housing (IND12)

Industrial Housing Features
This more robust unit meets requirements between Standard and Heavy Duty housings while retaining the Cube design. The Industrial 12 (IND12) model features an IP65 shaft seal. The tough, sealed aluminum housing has a wall thickness of 0.187” and offers greater protection from wash down, sprays, dust, moisture, shock, vibration, and other hazards found in industrial environments.

Industrial Cube Housing (IND12) Specifications
Refer to all Standard Cube Housing specifications except as follows:

Mechanical
Shaft Size ............... 0.375” diameter
Shaft Type ............... Single- or Double-Ended Shaft Available
Radial Loading .......... 40 lb Maximum
Axial Loading .......... 30 lb Maximum
Starting Torque ........ 1 oz-in; 3 oz-in w/IP65 Shaft Seal

Heavy Duty Cube Housing (HD12)

The Heavy Duty housing uses a separate 0.375” diameter external shaft and bearing assembly to rotate the shaft of an internally mounted Cube Housing. This provides mechanical isolation from external loads and stress. A flexible coupling between the external shaft and the encoder protects the internal unit from axial and radial loading. The 0.250” aluminum walls protect the encoder from external shock, vibration, and the outside environment.

Heavy Duty Cube Housing Options
• HD 1 Heavy Duty 3” X 6” housing
• HD 3 Heavy Duty w/conduit connector (threaded for 0.500” NPT Conduit) and terminal strip
• HD 5 Heavy Duty w/10 mm outer bearing
• HD 12” Heavy Duty w/IP65 rated outer shaft seal
• HD 14” Heavy Duty w/IP65 rated outer shaft seal, conduit connector (threaded for 0.500” NPT Conduit), and terminal strip

Ultra Heavy Duty Cube Housing (HD10)

The HD 10 Ultra Heavy Duty encoder is designed for use in applications with severe shaft loading conditions. The HD 10 offers two shaft sizes: 0.500” and 0.625”. Shaft material is 303 stainless steel. Bearings are conservatively rated at 95 lb radial and 60 lb axial shaft loading. IP65 shaft seal is standard on all units.

The HD 10 Ultra Heavy Duty housing uses a larger external shaft and R10 bearing assembly to rotate the shaft of an internally mounted Cube Housing. This provides mechanical isolation from external loads and stress. A flexible coupling between the external shaft and the encoder protects the internal unit from axial and radial loading. The 0.250” aluminum walls protect the encoder from external shock, vibration, and the outside environment.

Ultra Heavy Duty Cube Housing (HD 10) Specifications
Refer to all cube specifications except as follows:

Mechanical
Max Speed ............... 6000 RPM
Shaft Size ............... 0.375”
Rotation ............... Either direction
Radial Loading .......... 40 lb maximum (50 lb for HD 5)
Axial Loading .......... 30 lb maximum (35 lb for HD 5)
Bearings ............... Precision ABEC ball bearings
Bearing Life ............ 15,000 hours at rated load
Starting Torque ........ 1 oz-in; 3 oz-in w/IP65 seal
Mounting ............... Tapped holes face and base
Weight ................. 3.85 lb
Cube Housings

Ultra Heavy Duty Cube Housing (HD10)

Explosion-Proof Housing (EX)

An explosion-proof housing is available for installing the Cube Series Accu-Coder™ in hazardous locations. The Cube Series encoder is mounted within the explosion-proof housing and is coupled to the 0.375" shaft assembly by a flexible shaft coupling. This decreases radial and axial loading on the internal encoder shaft and bearings to ensure long life. Electrical connection to the Accu-Coder™ is by an internal barrier terminal strip. A threaded hole for 0.500" NPT conduit is provided.

Explosion-Proof Housing (EX) Specifications

The explosion-proof housing is designed to meet the following:

- NEC Class 1, Groups C and D
- NEC Class 2, Groups E, F, and G
- UL Standard 1203
- Class 1, Division 1, Groups C and D
- Class 2, Division 1, Groups E, F, and G
- CSA Standard C 22.2 No. 30-M 1988
- NEMA 7 and NEMA 9

Refer to all cube specifications except as follows:

**Mechanical**
- Max Speed: 4000 RPM
- Radial Loading: 30 lb operating
- Axial Loading: 10 lb operating
- Weight: 6 lb
- Finish: Unpainted Aluminum

Cube Series Optional 5PY Adapter (175443)

The all aluminum optional 5PY adapter allows any standard housing Cube Series encoder to replace DC tachometer technology. The 5PY adapter is interchangeable with any 5PY tach generator.

Ordering Information

Order standard housing Cube Series Accu-Coder™ with 5/16" shaft and specify Accessory Part #175443. 5PY adapter kit includes all necessary hardware to attach the adapter to the encoder.
Barr-Thorp Electric Co., Inc. | 800-473-9123 | www.barr-thorp.com

Model 15S

Features
- Very High Performance Economical Encoder
- Low Profile - Less Than 1.0" (25.4 mm) Height and 1.5" (38 mm) Diameter
- Extended Temperature Operating Ranges Available
- Up To 12 Pole Commutation Optional (for brushless motor control)

The Model 15S Accu-Coder™ offers a high performance feedback solution in a low profile package, making the Model 15S ideal for commercial and light-duty industrial applications. This industry standard size 15 (1.5" diameter) encoder features a precision bearing set, sealing available to IP64, a durable stainless steel shaft, and a selection of servo, flange, and face mount options. The Model 15S may also be specified with features such as extended operating temperatures from -20° C to +120° C, or up to 12 pole commutation for brushless motor control. The Model 15S features EPC's Opto-ASIC circuitry for a clean, reliable signal. Its durable, yet economical design makes it an ideal encoder for high precision OEM applications.

Common Applications
Servo Motor Control, Robotics, Medical Diagnostic Equipment, Specialty Assembly Machines, Digital Plotters, Printers, Typesetting Equipment

Model 15S Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Model 15S CPR Options

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<td>IP50 (Std)</td>
<td>Standard</td>
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<td>320° to +40° C Std</td>
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<td>5...12 VDC</td>
<td>F01 12&quot; Cable</td>
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<td>5...12 VDC</td>
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</table>

NOTES:
1. Contact Customer Service for additional options not shown.
2. Not available in all configurations, and not available with V1 Input Voltage. Contact Customer Service for availability.
3. Contact Customer Service for non-standard index gating or phase relationship options.
4. For non-standard English cable lengths enter 4° plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
5. For non-standard metric cable lengths enter ‘M’ plus cable length expressed in meters. Example: M06 = 6 meters of cable.
8. With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
9. Only available with 5 VDC Input Voltage

For specification assistance call Customer Service at 1-800-366-5412
Model 15S Specifications

Model 15S Standard Servo Mount M1

Model 15S Servo Mount M2 & M9

Model 15S Servo Mount M5

Model 15S Servo Mount M6

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

Metric dimensions are given in brackets [mm].
Model 15S

Model 15S Servo Mount M7

CABLE LENGTH
18" [457] STANDARD
M3 0.18 [4.57] DEEP
4X 90° Ø1.181 [30.00] B.C.

Ø0.7870 [Ø19.990] [ Ø09.990]

0.020 [0.51]
Ø0.2498 [Ø6.34]
0.158 [4.01]
0.76 [19.3]
1.5 [38]

15-Serv7

Model 15S Servo Mount M4

CABLE LENGTH
18" [457] STANDARD
Ø0.6875 [Ø17.462] Ø0.009 [Ø0.023]
0.020 [0.51]
Ø0.2498 [Ø6.34]
0.158 [4.01]
0.76 [19.3]
1.5 [38]

15-Serv4

Model 15S Square Flange M3

CABLE LENGTH
4X-40 UNC-2B
0.18 [4.57] DEEP
4X Ø1.000 B.C.

Ø0.7870 [Ø19.990] [ Ø09.990]

0.020 [0.51]
Ø0.2498 [Ø6.34]
0.158 [4.01]
0.76 [19.3]
1.5 [38]

Model 15S Servo Mount M8

CABLE LENGTH
18" [457] STANDARD
M3 0.18 [4.57] DEEP
3X 120° Ø1.181 [30.00] B.C.

Ø0.7870 [Ø19.990] [ Ø09.990]

0.020 [0.51]
Ø0.2498 [Ø6.34]
0.158 [4.01]
0.76 [19.3]
1.5 [38]

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified. Metric dimensions are given in brackets [mm].
Replacing your foreign encoder has never been simpler.

**Model 15S**

15S has more mounting face options than any other 1.5” shaft encoder. A variety of bosses and bolt hole patterns will provide cross-reference adaptability like no other encoder.

**Model 15T**

15T and 15H are the superior choice for your servo or stepper motor application. Endurance in High Temperatures, High Resolution Performance, Commutation, and Flexible Mounting Options make the 15T/H an unbeatable encoder.

**Cross References:**

The Model 15 can be crossed to many encoders—this is NOT a complete list. Please contact Customer Service for additional offerings and to ensure complete and accurate cross-referencing.

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<tr>
<td>Dynapar M15</td>
<td>SF</td>
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<tr>
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<td>Turck 8.3720</td>
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For specification assistance call Customer Service at 1-800-366-5412
Model 755A Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

For specification assistance call Customer Service at 1-800-366-5412

Model 755A CPR Options

<table>
<thead>
<tr>
<th>Model</th>
<th>0001*</th>
<th>0002*</th>
<th>0004*</th>
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<td>30,000*</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* Contact Customer Service for High Temperature Option.
a High Temperature Option (H) limited to 85°C maximum for these CPR options.

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

Features
- Miniature Size (1.5” Diameter)
- Up to 30,000 Cycles Per Revolution
- Servo or Flange Mounting
- 1 MHz Frequency Response Available
- Extended Temperature Operating Range Available

The Model 755A Size 15 Accu-Code™ is ideal for applications requiring a small, high precision, high performance encoder. Approximately 1.5” in diameter and 1.5” long, it will fit where many encoders cannot. Designed with all metal construction and shielded ball bearings, it will provide years of trouble-free use. The standard servo mount (S) version is available with a variety of shaft sizes and lengths. Three additional servo style mounts (S1, S2, S3) are also available. The optional flange mounting (MF) is ideal for applications requiring a bolt-on, high precision encoder. With its high reliability and quick delivery, the Model 755A encoder is the perfect replacement encoder for less reliable encoders of this size.

Common Applications
Robotics, Assembly Machines, Motor-Mounted Feedback, Phototypesetters, Printers & Digital Plotters, Elevator Controls, Medical Diagnostic Equipment

NOTES:
1. Contact Customer Service for additional options.
2. 0° to 85°C for certain resolutions, see CPR Options.
3. Contact Customer Service for index gating options.
4. 24 VDC max for high temperature option.
5. Standard temperature, 60 to 3000 CPR only.
7. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable.
8. Please refer to Technical Bulletin TB100: When to Choose the CE Option.
9. H5 and P5 outputs are not available with CE option.
Model 755A Specifications

**Electrical**
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 70°C, 4.75 to 24 VDC for temperatures between 70°C to 100°C.
- **Input Current**: 100 mA max with no output load.
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz.
- **Output Format**: Incremental - Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- **Output Types**: Open Collector - 100 mA max per channel, Pull-Up - 100 mA max per channel, Push-Pull - 20 mA max per channel.
- **Index**: Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- **Max Frequency**: 100 kHz std; Up to 1 MHz optional. (See Ordering Guide for availability).
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN65022 (with European compliance option); BS EN61000-6-2; BS EN55022 (with European compliance option).

**Mechanical**
- **Max Speed**: 7500 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Shaft Size**: 0.250", 5 mm, 6 mm.
- **Shaft Rotation**: Bi-directional.
- **Axial Shaft Load**: 5 lb.
- **Starting Torque**: 0.14 oz-in typical.
- **Moment of Inertia**: 2.8 x 10^-4 oz-in-sec².
- **Max Acceleration**: 1 x 10^5 rad/sec².
- **Electrical Conn**: 18" cable (foil and braid shield, 24 AWG conductors), 5- or 8-pin M12 (12 mm) in-line connector with 10" cable (braid shield), 8-pin Molex, Terminal Block.
- **Housing**: Black non-corrosive finish.
- **Bearings**: Precision ABEC ball bearings.
- **Mounting**: Servo or Optional Flange.
- **Weight**: 3.10 oz servo mount, typical.

**Environmental**
- **Operating Temp**: 0° to 70°C for standard models, -40° to 70°C for low temperature option, 0° to 100°C for high temperature option (0° to 85°C for certain resolutions, see CPR Options).
- **Storage Temp**: -25° to 485°C.
- **Humidity**: 98% RH non-condensing.
- **Vibration**: 10 g @ 56 to 500 Hz.
- **Shock**: 50 g @ 11 ms duration.

**Model 755A Standard Servo Mount S**

**Model 755A Servo Mounts S1 and S2**

**Model 755A Servo Mount S3**

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

**Model 755A Square Flange MF**

**Waveform Diagrams**

**Wiring Table**
Model 702 Shaft

Features
- Standard Size 20 Package (2” x 2”)
- Flange, and Servo Mounting
- Up to 30,000 CPR
- 80 lb Max. Axial and Radial Shaft Loading
- IP66 Sealing Available

The Model 702 Size 20 Accu-Coder™ is a heavy duty, extremely rugged, reliable, yet compact industry standard 2” diameter encoder, designed for harsh factory and plant floor environments. The double shielded ball bearings are rated at 80 lb maximum axial and radial shaft loading to ensure a long operating life. Made to withstand the harsh effects of the real world, both the flange and servo models are rated IP66 (NEMA 4 & 13) with the optional heavy duty shaft seal. With a variety of mounting options in both the flange and servo models, the Model 702 is ideal for both new applications and replacements. If you need an encoder that won’t let you down, the Model 702 is it.

Common Applications
- Motion Control Feedback
- Conveyors
- Elevator Controls
- Machine Control
- Food Processing
- Process Control
- Robotics
- Material Handling
- Textile Machines

Model 702 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>SHAFT SIZE</th>
<th>OPERATING TEMPERATURE</th>
<th>CYCLES PER REVOLUTION</th>
<th>OUTPUT TYPE</th>
<th>SEAL</th>
<th>CONNECTOR LOCATION</th>
<th>MOUNTING Flange Mounts</th>
<th>CE CERTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>702</td>
<td>Ø2.0&quot;</td>
<td>S 0° to 70° C</td>
<td>1-30,000</td>
<td>5 - 28V In/Out</td>
<td>N</td>
<td>E</td>
<td>F 1.81&quot; Female Pilot</td>
<td>CE Marked</td>
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<tr>
<td></td>
<td>07</td>
<td>1/4&quot;, 0.250&quot;</td>
<td></td>
<td>OC Open Collector</td>
<td>No Seal</td>
<td>End</td>
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<tr>
<td></td>
<td>20</td>
<td>3/8&quot;, 0.375&quot;</td>
<td></td>
<td>PU Pull-Up Resistor</td>
<td>1 IP66</td>
<td>Side</td>
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<td></td>
<td>21</td>
<td>10 mm</td>
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<td>PP Push-Pull</td>
<td>2 IP64</td>
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<td>30</td>
<td>3/8&quot;, 0.375&quot;</td>
<td></td>
<td>HV Line Driver</td>
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<tr>
<td></td>
<td>24</td>
<td>1/4&quot;, 0.250&quot; No Flat</td>
<td></td>
<td>10-pin Bayonet</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

CPR Options

| Model 702 CPR Options | | | |
| 0001*                 | 0002* | 0004* | 0005* | 0006* | 0007* | 0008* | 0010* | 0011* |
| 0012*                 | 0014* | 0020 | 0021* | 0024* | 0025* | 0028* | 0030* | 0032* |
| 0033*                 | 0034* | 0035* | 0038* | 0040* | 0042* | 0045* | 0050* | 0060* |
| 0064*                 | 0100 | 0125 | 0126* | 0144* | 0150* | 0160* | 0192* |
| 0200                 | 0240* | 0250 | 0254* | 0256* | 0300* | 0333* | 0360* | 0400* |
| 0500                 | 0512 | 0600 | 0625* | 0635 | 0655* | 0720 | 0768* | 0800* |
| 0889                 | 0900* | 1000 | 1024 | 1200* | 1201* | 1203* | 1204* | 1250* |
| 1270a                | 1440 | 1500 | 1800 | 2000 | 2048 | 2400* | 2500 | 2540* |
| 2880a                | 3000a | 3600a | 4000a | 4060a | 5000a | 6000a | 7200a | 7500a |
| 9000a                | 10,000a | 10,240a | 12,000a | 12,500a | 14,400a | 15,000a | 18,000a | 20,000a |
| 20,480a              | 25,000a | 30,000a |

* Contact Customer Service for High Temperature Option.

For Mating Connectors, Cables, and Cordsets see Electrical Accessories on the web at www.encoder.com.
Model 702 Specifications

**Electrical**
- Input Voltage: 4.75 to 28 VDC max for temperatures up to 70°C
- Input Current: 100 mA max with no output load
- Input Ripple: 100 mV peak-to-peak at 0 to 100 kHz
- Output Format: Incremental - Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams.
- Output Types: Open Collector - 100 mA max per channel
- Pull-Up - 100 mA max per channel
- Push-Pull - 20 mA max per channel
- Noise Immunity: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50142
- Accuracy: Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)
- Rise Time: Less than 1 microsecond

**Mechanical**
- Max Shaft Speed: 6000 RPM
- Shaft Size: 0.095" or 10 mm
- Shaft Rotation: Bi-directional
- Radial Shaft Load: 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions
- Axial Shaft Load: 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions
- Starting Torque: 1.0 oz-in typical with IP64 seal or no seal 3.0 oz-in typical with IP66 shaft seal
- Moment of Inertia: 0.5 x 10^-3 oz-in^2
- Max Acceleration: 1 x 10^5 rad/sec^2
- Connector Type: 6-, 7-, and 10-pin MS Style, 5- or 9-pin M12 (12 mm), 9-pin D-subminiature, or gland with 24 inches of cable (foil and braid shield, 24 AWG conductors), 10-pin Bayonet
- Housing: Black non-corrosive finish
- Bearings: Precision ABEC ball bearings
- Environmental: Various flange or servo mounts
- Weight: 11 oz typical

**Model 702 Flange Mount (F)**

**Model 702 With 2.5" Flange Mount (K)**

**Model 702 With 2.5" Servo Mount (J)**

**Connector Pin-Outs**

All dimensions are in inches with a tolerance of ±0.005” or ±0.01” unless otherwise specified.
Model 702 Servo Mounts

**Servo #1 (S)**

SERVO MOUNT #1
4-40 UNC-2B 0.25 DEEP
3X 120° Ø1.500 B.C.

**Servo #2 (C)**

SERVO MOUNT #2
10-32 UNF-2B 0.25 DEEP
4X 90° Ø1.625 B.C.

**Servo #3 (P)**

SERVO MOUNT #3
6-32 UNC-2B 0.25 DEEP
3X 120° Ø1.750 B.C.

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**Body For Servo Mounts #1, #2, #3**

SIDE OR END MOUNT CONNECTORS AVAILABLE

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**Optional Pilots For Flange And Servo Mounts**

(G, T, D, R) (L, U, E, Q)

---

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Ultra Rugged 2.0" Encoder

**Quick Specs**
- Rugged Industrial Encoder
- 2" x 2" Housing with Hollow Bore
- CPR to 30,000
- Flex Mount for Easy Installation
- Many Output Types
- RPM to 8000
- Sealing to IP66
- High Temperature Option

**Mounting Options**
The 702 Motor Mount comes with coupling and available with a Bossed Hub to attach directly to fast revving motors.

The 702 Shaft has many different servo mounts and mounting flanges available and able to handle heavy loads.

**Other Related Products**

The Model 802S Accu-Coder™ is an industry standard Size 20 (2.0" diameter) encoder housed in a heavy duty 316 stainless steel package. It's specifically designed for harsh factory and plant floor environments. It's available with a variety of flange and servo mounting styles, making it easy to use in a broad range of applications.

Model 725 Size 25 Accu-Coder™ optical shaft encoder is specifically designed for the challenges of an industrial environment. But don't let its tough, industrial package fool you; it still has the performance to reach resolutions up to 30,000 cycles per revolution.

The Model 858S European Size 58 Accu-Coder™ is a heavy duty, extremely rugged, reliable encoder, in a 316 stainless steel package. Its compact design is well suited for harsh factory and plant floor environments, calling for a metric solution.

**The Best Choice**
- A 3-Year Satisfaction Guaranteed Warranty
- Encoder Products Company has Specialized in Building Only Durable, Dependable Encoders for More Than 40 Years
- Superior Customer Service
- More Configurations Than Any Other Encoder Manufacturer
- Expert Cross Reference Service
- Next Day Expedite Delivery Available

For specification assistance call Customer Service at 1-800-366-5412
Model 725 Ordering Guide

Model 725 CPR Options

<table>
<thead>
<tr>
<th>Channel A Leads B</th>
<th>Channel B Leads A</th>
<th>Output Type</th>
<th>Mounting</th>
<th>Connector Type</th>
<th>Seal</th>
<th>Maximum Frequency</th>
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<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>Voltage</td>
<td>Style</td>
<td>E</td>
<td>N</td>
<td>Frequency</td>
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<tr>
<td></td>
<td></td>
<td>5 - 28V In/OuT</td>
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</tr>
</tbody>
</table>

**Features**
- Standard Size 25 Package (2.5" x 2.5")
- Up to 30,000 CPR
- Standard and Industrial Housings
- Servo and Flange Mounting
- IP66 Sealing Available

Model 725 Size 25 Accu-Coder™ optical shaft encoder is specifically designed for the challenges of an industrial environment. But don’t let its tough, industrial package fool you; it still has the performance to reach resolutions up to 30,000 cycles per revolution. The Model 725 is available with both flange and servo mounting options, along with two distinctive 2.5" diameter housing styles. The rugged Standard Housing (N) isolates the internal electronics from the shock and stress of the outer environment. The extra heavy-duty Industrial Housing (I) features a fully isolated internal encoder unit that prolongs bearing life by using an internal flexible mount to protect the encoder from severe axial and radial shaft loading.

**Common Applications**
- Motion Control Feedback, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines

For specification assistance call Customer Service at 1-800-366-5412

**NOTES:**
1. Available with I housing style only.
2. 0° to 85° C for certain resolutions, see CPR Options.
3. Contact Customer Service for index gating options.
4. 24 VDC max for high temperature option.
5. Standard temperature, 60 to 3000 CPR only.
7. For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: SGL® + 6 feet of cable.
9. Not available with 5-pin M12 or 6-pin MS connector. Available with 7-pin MS connector only without Index Z.
10. For Mating Connectors, Cables, and Cordsets see www.encoder.com.
11. HS and PS outputs not available with CE option, or any End Mount MS Connector.

**CERTIFICATION**
- CE
- CE Marked

www.Encoder.com

Model 725 Specifications

Electrical

- **Input Voltage**
  - 4.75 to 28 VDC max for temperatures up to 70° C
  - 4.75 to 24 VDC for temperatures between 70° C to 100° C
- **Input Current**
  - 100 mA max with no output load
  - 100 mA max per channel Push-Pull, 20 mA max per channel Line Driver, 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- **Input Ripple**
- **Output Format**
  - Incremental: Two square waves in quadrature, as viewed from the encoder mounting face. See Waveform Diagrams below.
  - **Output Types**
    - Open Collector: 100 mA max per channel
    - Pull-Up: 100 mA max per channel
    - Push-Pull: 20 mA max per channel
  - **Noise Immunity**
    - Tested to BS EN61000-4-2; IEC801-3; BS EN55022 (with European compliance option); BS EN55024-6-2; EN55024
  - **Max Frequency**
    - 1 MHz
- **Index**
  - Occurs once per revolution. The index for units > 3000 CPR is 90° gated to Outputs A and B. Refer to Waveform Diagrams below.
- **Quad Phasing**
  - 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
  - 6001 to 20,480 CPR: 180° (±36°) electrical
  - >20,480 CPR: 50° electrical
  - 6001 to 20,480 CPR: 54° electrical
- **Min Edge Sep**
  - 1 to 6000 CPR: 67.5° electrical at 100 kHz output
  - 6001 to 20,480 CPR: 90° (±36°) electrical
  - >20,480 CPR: 50° electrical
- **Error**
  - 0.005° mechanical (Total Optical Encoder Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)
- **Shaft Material**
  - 303 stainless steel
- **Shaft Rotation**
  - Bi-directional
- **Electrical Conn**
  - 6-, 7-, or 10-pin MS Style, 5- or 8-pin M12
- **Axial Shaft Load**
  - 40 lb max (standard housing)
  - 45 lb max (industrial housing)
- **Radial Shaft Load**
  - 35 lb max (standard housing)
- **Moment of Inertia**
  - 5.2 x 10⁻⁴ oz-in-sec²
- **Weight**
  - 20 oz typical
- **Shaft Size**
  - 0.375” (standard), 0.250”, 0.3125”, 6 mm, 8 mm, 10 mm

Mechanical

- **Max Shaft Speed**
  - 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Shaft Material**
  - 303 stainless steel
- **Shaft Rotation**
  - Bi-directional
- **Radial Shaft Load**
  - 35 lb max (standard housing)
- **Axial Shaft Load**
  - 40 lb max (standard housing)
- **Starting Torque**
  - 1.0 oz-in typical with IP64 seal or no seal
- **Moment of Inertia**
  - 0.2 x 10⁻¹⁰ oz-in-sec²
- **Max Acceleration**
  - 1 x 10¹² rad/sec²
- **Electrical Connectors**
  - 6, 7, or 10-pin MS Style, 5- or 8-pin M12, 0.050” (±0.01") electrical
- **Housing**
  - Black non-corrosive finish
- **Bearings**
  - Precision ABEC ball bearings
- **Mounting**
  - Flange, servo, or SPY
- **Weight**
  - 20 oz typical

Environmental

- **Operating Temp**
  - 0° to 70° C for standard models
  - 0° to 100° C for high temperature option (0° to 85° C for certain resolutions, see CPR Options)
- **Storage Temp**
  - -25° to +85° C
- **Humidity**
  - 95% RH non-condensing
- **Vibration**
  - 725N, 10 g @ 58 to 500 Hz
  - 725I, 10 g @ 20 to 500 Hz
- **Shock**
  - 725N, 10 g @ 11 ms duration
  - 725I, 10 g @ 11 ms duration
- **Sealing**
  - IP65 in standard, IP64 and IP68 (NEMA 13 and 4/4X) optional

All dimensions are in inches with a tolerance of ±0.005” or ±0.01” unless otherwise specified.
Model 725

**Model 725 Flange Mount (F)**

The optional 5PY adapter is made of all-aluminum construction and allows Model 725 encoder to replace DC tachometer technology. The 5PY adapter is mechanically interchangeable with any 5PY tach generator.

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

**Model 725 Optional 5PY Mounting (P)**

The optional 5PY adapter is made of all-aluminum construction and allows Model 725 encoder to replace DC tachometer technology. The 5PY adapter is mechanically interchangeable with any 5PY tach generator.

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

### Wiring Table

<table>
<thead>
<tr>
<th>Function</th>
<th>Gland Cable Wire Color</th>
<th>5-pin M12²</th>
<th>6-pin M12²</th>
<th>8-pin MS</th>
<th>5-pin MS</th>
<th>7-pin MS</th>
<th>8-pin MS</th>
<th>6-pin D-sub</th>
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</thead>
<tbody>
<tr>
<td>Com</td>
<td>Black</td>
<td>3</td>
<td>7</td>
<td>F</td>
<td>F</td>
<td>A</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>+VDC</td>
<td>Red</td>
<td>1</td>
<td>2</td>
<td>D</td>
<td>D</td>
<td>B</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>White</td>
<td>4</td>
<td>1</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>A'</td>
<td>Brown</td>
<td>---</td>
<td>3</td>
<td>H</td>
<td>C</td>
<td>---</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Blue</td>
<td>2</td>
<td>4</td>
<td>B</td>
<td>B</td>
<td>E</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>B'</td>
<td>Violet</td>
<td>---</td>
<td>5</td>
<td>I</td>
<td>E</td>
<td>---</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>Orange</td>
<td>5</td>
<td>6</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Z'</td>
<td>Yellow</td>
<td>8</td>
<td>J</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>Green</td>
<td>---</td>
<td>---</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Shield</td>
<td>Bare¹</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

¹CE Option: Cable shield (bare wire) is connected to internal case.

²CE Option: Read Technical Bulletin TB111.

### Connector Pin-Outs

![Connector Pin-Outs Diagram]
Size 25 encoders (2.5" diameter) are among the most popular encoders in the world. As a result, nearly every encoder manufacturer in the world makes them. The problem is, not every size 25 Encoder is built to the same exacting standards of quality and reliability as the Model 725 Accu-Coder™ from Encoder Products Company (EPC).

So, what's the problem? If you have used other size 25 encoders, you have probably experienced reliability problems such as sensor crashes and disk breakage. The typical construction of a size 25 Encoder (shown below) uses a single set of closely spaced shaft bearings and a large diameter (typically 2.0") glass disk mounted to the shaft. The glass disk is generally supported on the shaft hub by just 15% of the surface area and has a thickness of 0.030". In addition, these units commonly require a relatively narrow air gap (typically 0.002") between the disk and sensor in order to properly calibrate the signal. Because of this combination, a small amount of side loading (force from installation requirements, vibration, shock, or other conditions) to move the shaft enough for the attached disk to make contact with the sensor or some other portion of the stationary PCB. The result is damage to the disk or sensor, or even disk breakage.

Then, what's the solution? When design engineers at EPC set out to design a better size 25 Encoder, their goal was to solve the typical problems without affecting the price of the encoder. The result - the Model 725N, a size 25 Encoder worthy of the Accu-Coder™ name. The first goal was to make it more difficult for shaft movement from side load to cause damage. Using EPC's advanced sensor technology, the air gap between the disk and sensor doubled from 0.002" to 0.004", and the disk diameter was reduced from 2.0" to 1.3". The next goal was to increase the durability of the disk itself. Disk thickness was more than doubled (from 0.030" to 0.062"), manufactured using EPC's proprietary process, and supported by 30% of the disk surface area. Finally, it was time to improve the resistance to side load movement altogether, so the 725N was given dual heavy-duty bearings, generously spaced to disperse the load over a larger portion of the shaft.

But EPC's innovative engineering team wasn't satisfied. They really wanted to solve the problems of a truly rough environment. What they designed was the Model 725I - The industrial 725 housing option. An encoder that is as robust as possible within its price category. Using the improvements developed in the 725N, EPC's engineering team developed the "encoder-within-an-encoder" design. With this design, the 725I adds two extra, heavy-duty bearings to the two contained within the internal encoder for a total of four bearings! These two extra bearing sets are separated in such a way that side load stresses become isolated between the two bearing sets and never reach the inner encoder. In addition, the internal encoder is mounted to the 725I's housing using EPC's pioneering flex mount, further isolating the internal optics and electronics from outside forces.

Better - The Model 725N
EPC has designed out the common problems experienced by the average size 25 encoder. Notice the generous air gap (double that of typical size 25 encoders), thick code disk (more than twice the thickness), small diameter, large disk support area, and large bearing spacing - each an element which increases durability and reliability.

Best - The Model 725I
The design improvements made in the Model 725N, places them in their own internal encoder housing, and surrounds the internal unit with a second, rugged housing with a separate set of heavy duty bearings, all for an encoder that laughs at applications which eat other encoders alive!
Model 758 Ordering Guide

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

Model 758

Incremental Shaft Encoders

Features
- Standard Size 58 Mounting (58 mm Diameter)
- Up to 30,000 CPR
- 80 lb Max. Axial and Radial Shaft Loading
- High Temperature Option (100° C)
- IP66 Sealing Available

The Model 758 Size 58 Accu-Coder™ is a heavy duty, extremely rugged, reliable, yet compact European standard 58 millimeter diameter encoder, designed for harsh factory and plant floor environments. Shaft loading is no problem for the double shielded ball bearings; their 80 lb load rating ensures a long operating life. With the optional heavy-duty shaft seal, the Model 758 is rated IP66 (NEMA 4 & 13). Two European standard mounting options are available: Clamping Flange (20 type) or Synchro Flange (26 type). The Model 758 is the perfect replacement encoder for units requiring the European mount.

Common Applications
Motion Control Feedback, Machine & Elevator Controls, Food Processing, Robotics, Material Handling, Conveyors, Textile Machines

Model 758 Ordering Guide

<table>
<thead>
<tr>
<th>MODEL</th>
<th>OPERATING TEMPERATURE</th>
<th>CYCLES PER REVOLUTION</th>
<th>OUTPUT TYPE</th>
<th>MAXIMUM FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>758</td>
<td>S 0° to 70° C</td>
<td>1-30,000</td>
<td>5 - 28V In/Out</td>
<td>100 kHz Standard</td>
</tr>
<tr>
<td></td>
<td>H 0° to 100° C</td>
<td></td>
<td>DC Open Collector</td>
<td>200 kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PP Push-Pull</td>
<td>250 kHz, &gt;3000 CPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HV Line Driver</td>
<td>3000 CPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B - 28V In/5V Out</td>
<td>500 kHz, &gt;6000 CPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>H5 Line Driver</td>
<td>1 MHz, &gt;10,000 CPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P5 Push-Pull</td>
<td></td>
</tr>
<tr>
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</table>

<table>
<thead>
<tr>
<th>SEAL</th>
<th>CONNECTOR LOCATION</th>
<th>CONNECTOR TYPE</th>
<th>CERTIFICATION</th>
</tr>
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<tbody>
<tr>
<td>N</td>
<td>S Side</td>
<td>G</td>
<td>CE CE Marked</td>
</tr>
<tr>
<td></td>
<td>E End</td>
<td>R</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1) 0° to 85° C for certain resolutions, see CPR Options.
2) Contact Customer Service for index gating options.
3) 24 VDC max for high temperature option.
4) Standard temperature, 60 to 3000 CPR only.
6) For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: 5G/6 = 6 feet of cable.
7) Please refer to Technical Bulletin TB100: When to Choose the CE Option.
8) For mating connectors, cables, and cordsets, see Electrical Accessories on the web at www.encoder.com.
9) Not available with 5-pin M12 connector. Available with 7-pin MS Type Connector only without Index Z.
10) H5 and P5 outputs are not available with CE option, or any End Mount MS Connector.

For specification assistance call Customer Service at 1-800-366-5412

Model 758 CPR Options

<table>
<thead>
<tr>
<th>CPR Value</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001*</td>
<td>0.02%</td>
</tr>
<tr>
<td>0012*</td>
<td>0.04%</td>
</tr>
<tr>
<td>0033*</td>
<td>0.06%</td>
</tr>
<tr>
<td>0100*</td>
<td>0.20%</td>
</tr>
<tr>
<td>0200</td>
<td>0.40%</td>
</tr>
<tr>
<td>0500</td>
<td>0.90%</td>
</tr>
<tr>
<td>0999</td>
<td>1.90%</td>
</tr>
<tr>
<td>1270</td>
<td>2.50%</td>
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<tr>
<td>2860</td>
<td>5.60%</td>
</tr>
<tr>
<td>9000</td>
<td>19.00%</td>
</tr>
<tr>
<td>10,000</td>
<td>20.00%</td>
</tr>
</tbody>
</table>

* Contact Customer Service for High Temperature Option.

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

Accessory Mounting Bracket can be ordered separately as part # 140121. For more details www.Encoder.com

1-30,000 See CPR Options below for available resolutions. Price adder for CPR >1270

Common Applications
Motion Control Feedback, Machine & Elevator Controls, Food Processing, Robotics, Material Handling, Conveyors, Textile Machines

For specification assistance call Customer Service at 1-800-366-5412
Model 758 Specifications

**Electrical**
- **Input Voltage**
  - 4.75 to 28 VDC max for temperatures up to 70° C
  - 4.75 to 24 VDC for temperatures between 70° C to 100° C
- **Input Current**
  - 100 mA max with no output load
- **Input Ripple**
  - 100 mV peak-to-peak at 0 to 100 kHz
- **Output Format**
  - Incremental: Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- **Output Types**
  - Open Collector - 100 mA max per channel
  - Push-Pull - 20 mA max per channel
  - Line Driver - 20 mA max per channel (Meets RS 422 at 5 VDC supply)
  - Pull-Up - 100 mA max per channel
- **Index**
  - Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- **Max Frequency**
  - Up to 1 MHz
- **Noise Immunity**
  - Tested to BS EN61000-4-2; IEC801-3; BS 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2
  - Symmetry
    - 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
    - 6001 to 20,480 CPR: 90° (±36°) electrical at 100 kHz output
  - Quad Phasing
    - 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
    - 6001 to 20,480 CPR: 90° (±36°)
  - Min Edge Sep
    - 1 to 6000 CPR: 67.5° electrical at 100 kHz output
    - 6001 to 20,480 CPR: 90° (±36°)
  - Rise Time
    - Less than 1 microsecond
  - Accuracy
    - 1 to 2000 CPR: 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.017° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR) only within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

**Mechanical**
- **Max Shaft Speed**
  - 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Shaft Size**
  - 0.250", or 0.375", 6 mm, 10 mm
- **Shaft Rotation**
  - Bi-directional
- **Radial Shaft Load**
  - 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^6 revolutions
- **Axial Shaft Load**
  - 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^6 revolutions
- **Starting Torque**
  - 1.0 oz-in typical with IP64 seal or no seal
  - 3.0 oz-in typical with IP66 shaft seal
- **Moment of Inertia**
  - 5.2 x 10^-4 oz-in-sec^2 for 2000 to 3000 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.017° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR) only within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)
  - 3.9 oz-in typical with IP66 shaft seal

**Environmental**
- **Operating Temp**
  - 0° to 70° C for standard models
  - 0° to 100° C for high temperature option
  - 0° to 85° C for certain resolutions, see CPR Options
- **Storage Temp**
  - -25° to +85° C
- **Humidity**
  - 98% RH non-condensing
- **Vibration**
  - 30 g @ 50 to 200 Hz
- **Shock**
  - 75 g @ 11 ms duration
- **Sealing**
  - IP66 (NEMA 13 and 4/4X) shaft seal or IP64 shaft seal

---

Waveform Diagrams

In the Waveform Diagrams, the blue line represents channel A, and the red line represents channel B. For a clockwise shaft rotation, channel A leads channel B. The diagrams illustrate the output waveforms for various encoder configurations.

**Wiring Table**

<table>
<thead>
<tr>
<th>Function</th>
<th>Color</th>
<th>5-pin M12</th>
<th>8-pin M12</th>
<th>10-pin MS</th>
<th>12-pin MS</th>
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<tbody>
<tr>
<td>Com</td>
<td>Black</td>
<td>3</td>
<td>7</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>+VDC</td>
<td>Red</td>
<td>1</td>
<td>2</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>A</td>
<td>White</td>
<td>4</td>
<td>1</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>A'</td>
<td>Brown</td>
<td>3</td>
<td>H</td>
<td>C</td>
<td>---</td>
</tr>
<tr>
<td>B</td>
<td>Blue</td>
<td>2</td>
<td>4</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>B'</td>
<td>Violet</td>
<td>5</td>
<td>---</td>
<td>I</td>
<td>E</td>
</tr>
<tr>
<td>Z</td>
<td>Orange</td>
<td>5</td>
<td>6</td>
<td>C</td>
<td>---</td>
</tr>
<tr>
<td>Z'</td>
<td>Yellow</td>
<td>8</td>
<td>J</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Shield</td>
<td>Bare</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>+VDC Sense</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Com Sense</td>
<td>---</td>
<td>---</td>
<td>---</td>
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<tr>
<td>Case</td>
<td>Green</td>
<td>---</td>
<td>---</td>
<td>G</td>
<td>G</td>
</tr>
</tbody>
</table>

CE Option: Cable shield (bare wire) is connected to internal case
CE Option: Read Technical Bulletin TB111
Model TR1 - Tru-Trac™

Features
- Encoder And Measuring Wheel Solution Integrated Into One Compact Unit
- Spring Loaded Torsion Arm Makes Wheel Pressure Adjustments A Snap
- Easily Installed In A Vertical, Horizontal, or Upside-Down Orientation
- Operates Over A Variety Of Surfaces At Speeds Up To 3000 Feet Per Minute
- Integrated Module Simplifies Your System Design, Reducing Cost

FINALLY! An integrated encoder and spring loaded measuring wheel assembly available in one, easy-to-use, compact unit. The NEW Tru-Trac™ by Encoder Products Company is a versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application. It’s spring-loaded torsion arm provides a simple-to-adjust torsion load, allowing the Tru-Trac™ to be mounted in almost any orientation, even upside-down. The threaded shaft on the pivot axis is field reversible providing mounting access from either side. The Tru-Trac™ housing is a durable, conductive composite material that will eliminate static build up. With operating speeds up to 3000 feet per minute and a wide variety of configuration options, it’s easy to see the Tru-Trac™ is the ideal solution for countless applications.

Common Applications

Model TR1 - Tru-Trac™ Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Model TR1 - Tru-Trac™ CPR Options

<table>
<thead>
<tr>
<th>MODEL</th>
<th>TR1</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEEL TYPE &amp; CIRCUMFERENCE</td>
<td>U1  Urethane 6&quot; cir</td>
</tr>
<tr>
<td></td>
<td>19  No Wheel - 1/4&quot; shaft</td>
</tr>
</tbody>
</table>

CONNECTOR TYPE
- F00  18" Cable 1 (Std)
- F01  12" Cable
- F02  24" Cable
- F03  36" Cable
- M00  2M Cable 4
- J00  18" Cable with 5-pin
- K00  18" Cable with 8-pin

For specification assistance call Customer Service at 1-800-366-5412

NOTES:
1. See mechanical drawing. Shaft is reversible in the field.
2. Contact Customer Service for non-standard index gaging or phase relationship options.
3. 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.
4. For metric cable lengths enter “M” plus cable length expressed in meters. Example: M06 = 6 meters of cable.
7. With input Voltage above 16 VDC, operating temperature is limited to 85° C.
Model TR1 - 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 and 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 below.
- Output Types:
  - Open Collector - 20 mA max per channel
  - Pull-Up - Open collector with 2.2K ohm Pull-Up 20 mA max per channel
  - Push-Pull - 20 mA max per channel
  - Line Driver - 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- Index: Once per revolution.
- 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, and 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 EN50081.
- Symmetry: 180° (±18°) electrical
- Quad. Phasing: 90° (±22.5°) electrical
- Min. Edge Sep: 67.5° electrical
- Accuracy: Within 0.017° mechanical or 1 arc-minute from true position. (for CPR>189)

Mechanical
- Max Shaft Speed: 6000 RPM. Higher speeds may be achievable, contact Customer Service.
- Shaft Material: Stainless Steel
- Shaft Tolerance: +0.0000/-0.0004" (+0.000/0.010 mm)
- Radial Shaft Load: 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^10 revolutions
- Axial Shaft Load: 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^10 revolutions
- Starting Torque: IP50 0.05 oz-in, IP65 0.4 oz-in
- Electrical Conn.: 18" cable (foil and braid shield, 24 AWG conductors), 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield)
- Mounting: Pivot shaft can be mounted from either side of the Tru-Trac™ housing, and is reversible in the field. Specify 1/4-20 or M6 threads
- Housing: Stainless steel fibers in a high temperature nylon composite
- Wheel Width: 0.25"
- Weight: 5 oz typical

Environmental
- Operating Temp: -20° to +95°C for standard models
- Storage Temp: -25° to +95°C
- Humidity: 98% RH non-condensing
- Vibration: 10 g @ 58 to 500 Hz
- Shock: 80 g @ 11 ms duration
- Sealing: IP50 standard; IP65 available

Note: Width of Wheel is 0.25" [6.35]

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

Metric dimensions are given in brackets [mm]
Model TR2 - Tru-Trac™
Encoder with Rack and Pinion Gearing

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, Reducing Cost

Backlash B-Gone! At last, a linear encoder solution with no back-lash or slippage. The NEW TR2 Tru-Trac™ is a versatile solution for tracking velocity, position, or distance in almost any application, featuring 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. Due to the spring loaded torsion arm, which provides simple to adjust torsion load, the TR2 has all the flexibility and maneuverability of the original TR1 Tru-Trac™. It has the ability to be installed in a horizontal, vertical, or upside down position. The threaded shaft on the pivot axis is field reversible, providing mounting access from either side, and the durable conductive composite housing material will eliminate static build up. With so many configuration options in a simple integrated encoder solution, it is easy to see that the TR2 is on the right Track for success!

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.

<table>
<thead>
<tr>
<th>PINION GEAR</th>
<th>Mechanical</th>
<th>Electrical</th>
<th>Output Type</th>
<th>Operating Temperature</th>
<th>Sealing</th>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>40 Tooth Pinion Gear for Stainless Steel Rack</td>
<td></td>
<td>Open Collector</td>
<td>-40° to +85° C (Std)</td>
<td>S2</td>
<td>CE CE Marked</td>
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<tr>
<td>D2</td>
<td>40 Tooth Pinion Gear for Flexible Rack</td>
<td>0800</td>
<td>Pull-Up Resistor</td>
<td>T1 -40° to +85° C</td>
<td>S2</td>
<td>None (Std)</td>
</tr>
<tr>
<td>19</td>
<td>No Pinion- 1/4&quot; Shaft</td>
<td>V1</td>
<td>Line Driver</td>
<td>T2 -20° to +100° C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>No Pinion- 6 mm Shaft</td>
<td>A</td>
<td>Open Collector</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cycles Per Revolution
See Resolution Chart Below
Price adder +1999

Pivot Shaft Mounting
R4 Right side 1/4-20 thread
L4 Left side 1/4-20 thread
R6 Right side M6 thread
L6 Left side M6 thread

Input Voltage
5 to 26 VDC

Commutation
N None

Number of Channels
A Channel A
Channel A Leads B
Channel B Leads A

Connecting Type
F00 18" Cable (Std)
F01 12" Cable
F02 24" Cable
F03 36" Cable
M00 2M Cable
J00 18" Cable with 5-pin M12
K00 18" Cable with 8-pin M12

NOTES:
1. See mechanical drawing. Shaft is reversible in the field.
2. Contact Customer Service for non-standard index gating or phase relationship options.
3. 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.
4. For non-standard metric cable lengths enter ‘M’ plus cable length expressed in meters. Example: M06 = 6 meters of cable.
6. 5-pin not available with Line Driver (HV) output. Additional cables lengths available.
7. With Input Voltage above 16 VDC, operating temperature is limited to 85° C.

For specification assistance call
Customer Service at 1-800-366-5412
**Model TR2 - Tru-Trac™**

**Encoder with Rack and Pinion Gearing**

---

**Model TR2 - Tru-Trac™ Specifications**

**Electrical**
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 85°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 below.
- **Output Types**:
  - Push-Pull: 20 mA max per channel
  - Pull-Up: Open collector with 22.2 kΩ pullup
  - 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 Diagrams at right.
- **Accuracy**: Within 0.017° mechanical or 1 arc-minute bearing life of 1.2 x 10¹⁰ revolutions
- **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
  - 500 kHz for CPR 5001 to 10,000
  - 1 MHz for CPR 10,001 to 20,000
  - 2 MHz for CPR 20,001 to 40,000
- **Noise Immunity**: Tested to BS EN61000-4-2, BS EN61000-4-3, BS EN61000-4-6, BS EN50081-2, BS EN50082-3, BS EN61000-4-20
- **Vibration**: Waveform shown with optional complementary signals A, B, Z for HV and OD outputs only.
- **Humidity**: 98% RH non-condensing
- **Weight**: 5 oz typical
- **Housing**: Stainless steel fibers in a high temperature nylon composite
- **Mounting**: Pivot shaft can be mounted from either side of the Tru-Trac™ housing, and is reversible in the field. Specify 1/4-20 or M6 threads in the field. Specify 1/4-20 or M6 threads in the field.
- **Wiring Table**

<table>
<thead>
<tr>
<th>mm Per Pulse</th>
<th>Pulses Per Inch</th>
<th>Discs Cycles Per Revolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.04</td>
<td>25</td>
<td>2540</td>
</tr>
<tr>
<td>0.02</td>
<td>50</td>
<td>2540*</td>
</tr>
</tbody>
</table>

| 0.01         | 100            | 2540**                      |

---

**Mechanical**
- **Radial Shaft Load**: 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10¹⁰ revolutions
- **Axial Shaft Load**: 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10¹⁰ revolutions
- **Starting Torque**: 100 mA max (65 mA typical)
- **Electrical Connectors**:
  - 18" cable (foil and braid shield, 24 AWG conductors)
  - 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield)
- **Mounting**: Pivot shaft can be mounted from either side of the Tru-Trac™ housing, and is reversible in the field. Specify 1/4-20 or M6 threads in the field.
- **Housing**: Stainless steel fibers in a high temperature nylon composite
- **Weight**: 5 oz typical

---

**Environmental**
- **Operating Temp**: -20° to +85° C for standard models
- **Storage Temp**: -20° to +100° C for high temperature option
- **Humidity**: 98% RH non-condensing
- **Vibration**: 10 g @ 58 to 500 Hz
- **Shock**: 80 g @ 11 ms duration
- **Sealing**: IP50 standard; IP65 available

---

**Resolutions - English Units**

<table>
<thead>
<tr>
<th>Per Pulse</th>
<th>Per Inch</th>
<th>Discs Per Revolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>100</td>
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<td>800</td>
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<tr>
<td>0.004</td>
<td>250</td>
<td>1000</td>
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<td>0.002</td>
<td>500</td>
<td>2000</td>
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<tr>
<td>0.001</td>
<td>1000</td>
<td>5000**</td>
</tr>
<tr>
<td>0.0005</td>
<td>2000</td>
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<tr>
<td>0.0004</td>
<td>2500</td>
<td>2500**</td>
</tr>
<tr>
<td>0.0002</td>
<td>5000</td>
<td>2500**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discs Per Revolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0001</td>
</tr>
<tr>
<td>0.00001</td>
</tr>
</tbody>
</table>

---

**Resolutions - Metric Units**

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<th>Per Pulse</th>
<th>Per mm</th>
<th>Discs Cycles Per Revolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.04</td>
<td>25</td>
<td>2540</td>
</tr>
<tr>
<td>0.02</td>
<td>50</td>
<td>2540*</td>
</tr>
<tr>
<td>0.01</td>
<td>100</td>
<td>2540**</td>
</tr>
</tbody>
</table>

---

**Waveform Diagram**

Waveform shown with optional complementary signals A, B, Z for HV and OD outputs only.

---

**Wiring Table**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Accessory Angle Mounting**
Bracket for TR2 Tru-Trac™ can be ordered separately as part # 140104
Model TR2 - Tru-Trac™
Encoder with Rack and Pinion Gearing

Model TR2 - Tru-Trac™ Specifications for Stainless 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: Acetal
- Gearing Tolerance: AGMA 10, 20 degree pressure angle teeth
- Accuracy: ±0.0005 inch/inch max accumulated error
- Repeatability: ±0.001 inch

Mechanical - Flexible Rack
- Max Linear Speed: 200 Feet Per Minute
- Rack and Pinon
- Material: 303 Flexible
- 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

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
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.

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

Model TR2 - Tru-Trac™ Stainless Steel Rack

Precise AGMA 10 Pinion for Rigid Rack

Model TR2 - Tru-Trac™ Flexible Rack

Precise AGMA 10 Pinion for Flexible Rack
An integrated encoder and spring loaded measuring wheel assembly available in one, easy-to-use, compact unit.

The Tru-Trac™ by Encoder Products Company is a versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application.

Most companies spend costly hours designing measuring wheel and bracket assemblies attached to an encoder for measuring position or velocity. Once designed, adjusting the pressure of the measuring wheel is often a major problem. Thanks to our Tru-Trac™ Encoders, those days are a thing of the past!

Easy to use and very compact, the Tru-Trac™ Encoders are fully adjustable integrated encoders with spring loaded measuring wheel assemblies. Monitoring speed, velocity or position has never been easier or more cost effective. Designed for use in almost any position and orientation, installation possibilities are endless. The threaded shaft on the pivot axis makes these units reversible, allowing measuring from either side of the assembly.

A variety of available measuring wheels, together with the flexibility of the adjustable spring loaded torsion arm, prevents slippage over many different surfaces or textures. For applications with unique surfaces or measurements, you can provide your own measuring wheel. Simple torsion control provides easy wheel pressure adjustment in seconds, allowing various thicknesses of materials to be measured.


The Tru-Trac™ Encoders are perfect for linear applications and can be mounted above or below the moving object. The spring loaded torsion arm allows the tension on the wheel to be adjusted, so that measurement can be obtained over a variety of different surfaces and textures. Perfect for cut-to-length, packaging, conveyors, mail sorting and gantry applications.

The Tru-Trac™ Encoders can be mounted in any orientation to monitor velocity. This is perfect for many rotational applications such as web tension control drums, rotary tables, printing, spooling, etc.

For specification assistance call Customer Service at 1-800-366-5412

Please visit http://www.encoder.com/techbulletins for additional information.
Model LCE

Features
• Low Cost Linear Solution
• Resolutions from 2 to 500 Cycles Per Inch
• IP65 Sealing Available
• 0 Inch to 50 Inch Cable Measurement

The Linear Cable Encoder (LCE) provides a low cost alternative for obtaining accurate linear measurements. As opposed to typical rotary shaft style encoders, the LCE has a retractable stainless steel cable, allowing for numerous and unusual measuring configurations. Placing the LCE away from harsh environmental conditions, while still providing precise measurements, gives the LCE an outstanding advantage over shaft style encoders. Installation is easy with a variety of cable exit directions, and perfect parallel alignment no longer necessary. The heart of the LCE is the popular E-Cube Accu-Coder™, the finest cube style encoder available. The E-Cube advantage provides a reliable digital pulse train in either single channel or quadrature format, with resolutions down to 0.002” per cycle. The small overall size, a variety of resolutions, and many different connector types, makes the versatility of the LCE unbeatable!

Common Applications
Robotics, Extrusion Presses, Valve Positioning, Textile Machinery, Control Gate Positioning

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

Model LCE Resolution Table

<table>
<thead>
<tr>
<th>Cycles Per Inch</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>002</td>
<td>0.500”</td>
</tr>
<tr>
<td>020</td>
<td>0.050”</td>
</tr>
<tr>
<td>040</td>
<td>0.025”</td>
</tr>
<tr>
<td>050</td>
<td>0.020”</td>
</tr>
<tr>
<td>100</td>
<td>0.010”</td>
</tr>
<tr>
<td>200</td>
<td>0.005”</td>
</tr>
<tr>
<td>250</td>
<td>0.004”</td>
</tr>
<tr>
<td>500</td>
<td>0.002”</td>
</tr>
</tbody>
</table>

Contact Customer Service for other resolutions

NOTES:
1 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6=6 feet of cable.
2 For Mating Connectors, Cables, and Cordsets see Electrical Accessories on the web at www.encoder.com.
Model LCE 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° and 100° C
- Input Current: 80 mA maximum with no output load
- Input Ripple: 100 mV peak-to-peak at 0 to 100 kHz
- Output Format: Incremental - Square wave with channel A leading B during linear extension
- Output Type: Open Collector - 250 mA max per channel
  Pull-Up - 250 mA max per channel
  Push-Pull - 20 mA max per channel
  Line Driver - 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- Index: Once per 5" cable extension or retraction
- Max Frequency: 0 to 125 kHz
- Symmetry: 180° (±18°) electrical
- Quad Phasing: 90° (±22.5°) electrical
- Rise Time: Less than 1 microsecond
- Electrical Conn: 6-, 7-, or 10-pin MS Style, 5-, or 8-pin M12 (12 mm), Gland with 18" cable (foil and braid shield, 24 AWG conductors), Solder Terminal, or Solder Terminal with conduit box

Mechanical
- Full Stroke Length (FSL): 50" standard. Longer measuring ranges may be available, please contact Customer Service.
- Finish: Black powder coated aluminum
- Accuracy: ±0.10% of FSL
- Repeatability: ±0.015% of FSL
- Linear Resolution: Up to 500 cycles per inch (0.002" per cycle)
- Cable Material: 0.034" nylon coated stainless steel rope
- Cable Tension: 20 oz maximum typical
- Life (cycles): 1,000,000 predicted at zero angle cable exit

Environmental
- Operating Temp: 0° to 85° C, or 0° to 100° C for 5-24 VDC
- Sealing: IP65 for Industrial LCE

Optional Mounting Plate
- Attaches to Standard or Industrial LCE in three different orientations.
- Order Accessory Item 176064-01

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Model 802S

Features
- Industry Standard Size 20 (2" diameter) Stainless Steel Package
- Flange and Servo Mounting
- Up to 30,000 CPR
- 80 lb Maximum Axial and Radial Shaft Loading
- IP66 Sealing Available

The Model 802S Accu-Coder™ is a heavy duty, industry standard Size 20 (2.0" diameter) encoder specifically designed for harsh factory and plant floor environments. The Model 802S is available with a variety of flange and servo mounting styles, making it easy to use in a broad range of applications. Its heavy duty, double shielded ball bearings are rated at 80 pounds maximum axial and radial shaft load, ensuring long operating life. This ultra-rugged, yet compact encoder is housed in a type 316 stainless steel enclosure, making it ideal for applications where contamination or exposure to caustic chemicals is a concern. But don't let its tough exterior fool you, the Model 802S provides the precise, reliable output you've come to expect from Accu-Coder™.

Common Applications
Food Processing, Oil, Gas & Chemical Processing, Material Handling, Conveyors, Robotics, Elevator Controls, Textile Machines

Model 802S Ordering Guide

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

For specification assistance call Customer Service at 1-800-366-5412

Model 802S CPR Options

<table>
<thead>
<tr>
<th>Number</th>
<th>Channel A Leads B</th>
<th>Channel B Leads A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0011</td>
<td>K Reverse Quadrature A &amp; B with Index</td>
<td>J Reverse Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0015</td>
<td>I Quadrature A &amp; B with Index</td>
<td>I Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0017</td>
<td>H Quadrature A &amp; B with Index</td>
<td>H Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0019</td>
<td>G Quadrature A &amp; B with Index</td>
<td>G Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0022</td>
<td>F Quadrature A &amp; B with Index</td>
<td>F Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0024</td>
<td>E Quadrature A &amp; B with Index</td>
<td>E Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0026</td>
<td>D Quadrature A &amp; B with Index</td>
<td>D Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0028</td>
<td>C Quadrature A &amp; B with Index</td>
<td>C Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0030</td>
<td>B Quadrature A &amp; B with Index</td>
<td>B Quadrature A &amp; B with Index</td>
</tr>
<tr>
<td>0032</td>
<td>A Quadrature A &amp; B with Index</td>
<td>A Quadrature A &amp; B with Index</td>
</tr>
</tbody>
</table>

ICATIONS:
A Channel A
Q Quadrature A & B
R Quadrature A & B with Index
K Reverse Quadrature A & B
D Reverse Quadrature A & B

Maximun Frequencies
- 100 kHz (Standard)
- 200 kHz
- 250 kHz, >3000 CPR
- 500 kHz, >6000 CPR
- 1 MHz, >10,000 CPR

MOUNTING
- Flange Mounts
- Servo Mounts

OUTPUT TYPE
- 5 - 28V In/Out
- OC Open Collector
- PP Push-Pull
- HV Line Driver

CONTACT LOCATION
- E End
- S Side

CONNECTOR TYPE
- G Gland, 24" cable

For more details visit www.encoder.com

NOTES:
1. Contact Customer Service for additional options.
2. Shaft with Size 25 Mounting Adapter, J or K mounting only.
3. 0° to 85°C for certain resolutions, see CPR Options.
5. 24 VDC max for high temperature option.
6. Standard temperature, 60 to 3000 CPR only.
8. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G6/6 = 6 feet of cable.
10. CE not available with H5/P5 output type options.
Model 802S Specifications

**Electrical**
- **Input Voltage**: 4.75 to 28 VDC max for temperatures up to 70°C.
- **Input Current**: 100 mA max with no output load.
- **Input Ripple**: 100 mV peak-to-peak at 0 to 100 kHz.
- **Output Format**: Incremental—Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- **Output Types**: Open Collector- 100 mA max per channel, Pull-Up- 100 mA max per channel, Push-Pull- 20 mA max per channel.
- **Line Driver**: 20 mA max per channel (Meets RS 422 at 5 VDC supply).
- **Index**: Occurs once per revolution. The index for units > 3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- **Max Frequency**: Up to 1 MHz.
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS EN50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2.
- **Pull-Up**: 100 mA max per channel.
- **Max Frequency**: Up to 1 MHz.
- **Index**: Occurs once per revolution. The index for units > 3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- **Max Frequency**: Up to 1 MHz.
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS EN50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2.
- **Symmetry**: 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output.
- **Quad Phasing**: 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output.
- **Min Edge Sep**: 1 to 6000 CPR: 67.5° electrical at 100 kHz output.
- **Quad Phasing**: 1 to 6000 CPR: 54° electrical at 100 kHz output.
- **Min Edge Sep**: 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output.
- **Max Frequency**: Up to 1 MHz.
- **Noise Immunity**: Tested to BS EN61000-4-2; IEC801-3; BS EN50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2.
- **Symmetry**: 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output.
- **Quad Phasing**: 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output.
- **Min Edge Sep**: 1 to 6000 CPR: 67.5° electrical at 100 kHz output.
- **Quad Phasing**: 1 to 6000 CPR: 54° electrical at 100 kHz output.
- **Min Edge Sep**: 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output.
- **Rise Time**: Less than 1 microsecond.
- **Accuracy**: Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

**Mechanical**
- **Max Shaft Speed**: 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Shaft Size**: 0.250", 0.375", or 10 mm (achievable, contact Customer Service).
- **Radial Shaft Load**: 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions.
- **Axial Shaft Load**: 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions.
- **Starting Torque**: 1.0 oz-in typical with IP64 seal or no seal.
- **Moment of Inertia**: 5.2 x 10^-4 oz-in-sec^2.
- **Max Acceleration**: 1 x 10^5 rad/sec^2.
- **Electrical Conn**: Glund with 24" cable (foil and braid shield, 24 AWG conductors).
- **Housing**: Type 316 Stainless Steel.
- **Bearings**: Precision ABEC ball bearings.
- **Mounting**: Various flange or servo mount styles.
- **Weight**: 1.5 lb typical.

**Environmental**
- **Operating Temp**: 0° to 70° C for standard models, 0° to 100° C for high temperature option (0° to 85° C for certain resolutions, see CPR Options.)
- **Storage Temp**: -25° to +85° C.
- **Humidity**: 98% RH non-condensing.
- **Shock**: 75 g @ 5ms duration.
- **Sealing**: IP66 shaft seal (NEMA 13 and 4/4X); or IP64 bearing seal.

**Waveform Diagrams**
- Line Driver and Push-Pull
- Open Collector and Pull-Up

**Wiring Table**
- Open Collector and Pull-Up

* CE Option: Cable Shield (bare wire) is connected to internal case.
Model 858S Ordering Guide

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

Features
- Industry Standard Size 58 (58 mm Diameter) Stainless Steel Package
- Up to 30,000 CPR
- 80 lb Maximum Axial and Radial Shaft Loading
- 100° C Operating Temperature Available
- IP66 Sealing Available

The Model 858S European Size 58 Accu-Coder™ is a heavy duty, extremely rugged, reliable encoder, in a 316 stainless steel package. Its compact design is well suited for harsh factory and plant floor environments, calling for a metric solution. The double-shielded ball bearings are rated at 80 pound maximum axial and radial shaft loading, to ensure a long operating life. Shock rating is 75 g for 11 milliseconds duration. With the optional heavy-duty shaft seal installed, the Model 858S is rated at IP66 (NEMA 4 & 13). Two European standard mounting options are available, the Clamping Flange (20 Type), or the Synchro Flange (26 Type).

Common Applications
Food Processing, Oil, Gas & Chemical Processing, Material Handling, Conveyors, Robotics, Elevator Controls, Textile Machines

Model 858S CPR Options

<table>
<thead>
<tr>
<th>Connectors</th>
<th>Price Adder for CPR &gt;1270</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel A Leads B</td>
<td>1-30,000</td>
</tr>
<tr>
<td>Quadrature A &amp; B</td>
<td></td>
</tr>
<tr>
<td>Quadrature A &amp; B with index</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. 0° to 85° C for certain resolutions, see CPR Options.
2. Contact Customer Service for non-standard index gating options.
3. 24 VDC max for high temperature option.
4. Standard temperature, 60 to 3000 CPR only.
6. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
7. For additional information please refer to Technical Bulletin TB100: When to Choose the CE Option at www.encoder.com.
8. CE not available, H5/P5 output type options.

More details: www.Encoder.com

For specification assistance call Customer Service at 1-800-366-5412
### Model 858S Specifications

#### Electrical
- **Input Voltage**
  - 4.75 to 28 VDC max for temperatures up to 70° C
  - 4.75 to 24 VDC for temperatures between 70° C to 100° C
- **Input Current**
  - 100 mA max with no output load
  - 100 mA peak-to-peak at 0 to 100 kHz
- **Input Ripple**
  - Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See Waveform Diagrams below.
- **Output Format**
  - Open Collector- 100 mA max per channel
  - Pull-Up- 100 mA max per channel
  - Push-Pull- 20 mA max per channel
  - Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- **Index**
  - Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See Waveform Diagrams below.
- **Max Frequency**
  - Up to 1 MHz.
- **Noise Immunity**
  - Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2
- **Symmetry**
  - 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
  - 6000 to 20,480 CPR: 180° (±36°) electrical
- **Quad Phasing**
  - 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
  - 6000 to 20,480 CPR: 90° (±36°) electrical
- **Min Edge Sep**
  - 1 to 6000 CPR: 67.5° electrical at 100 kHz output
  - 6000 to 20,480 CPR: 54° electrical
  - >20,480 CPR: 50° electrical
- **Rise Time**
  - Less than 1 microsecond
- **Accuracy**
  - Instrument and Quadrature Error: For 200 to 1999 CPR, 0.01° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

#### Mechanical
- **Max Shaft Speed**
  - 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- **Shaft Size**
  - 0.250", 0.375", 6 mm, 10 mm
- **Radial Shaft Load**
  - 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions
- **Axial Shaft Load**
  - 80 lb max. Rated load of 20 to 40 lb for bearing life 1.5 x 10^9 revolutions
- **Starting Torque**
  - 1.0 oz-in typical with IP64 seal or no seal
  - 3.0 oz-in typical with IP66 shaft seal
- **Moment of Inertia**
  - 1.2 x 10^-6 oz-in-sec^2
- **Max Acceleration**
  - 1 x 10^5 rad/sec^2
- **Electrical Conn**
  - Gland with 24 inches of cable (foil and braid shield, 24 AWG conductors)
- **Housing**
  - Type 316 Stainless steel
- **Bearings**
  - Precision ABEC ball bearings
- **Mounting**
  - European Standard Clamping Flange (20 Type) and Synchro Flange (26 Type)
- **Weight**
  - 1.5 lb typical

#### Environmental
- **Operating Temp**
  - 0° to 70° C for standard models
  - 0° to 100° C for high temperature option (0° to 85° C for certain resolutions, see CPR Options.)
- **Storage Temp**
  - -25° to +85° C
- **Humidity**
  - 98% RH non-condensing
- **Vibration**
  - 20 g @ 59 to 500 Hz
- **Shock**
  - 75 g @ 11 ms duration
- **Sealing**
  - IP66 shaft seal (NEMA 13 and 4/4X); or IP64 bearing seal

---

### Model 858 Clamping Flange 20 Type (A)

### Model 858 Synchro Flange 26 Type (B)

---

**All dimensions are in millimeters with a tolerance of ±0.17 mm unless otherwise specified**

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**Waveform Diagrams**

- **Line Driver and Push-Pull**
- **Open Collector and Pull-Up**

**Wiring Table**

* CE Option: Cable Shield (bare wire) is connected to internal case
Model 865T

Features
- A C-Face Thru-Bore Encoder With Stainless Steel Housing
- Fits NEMA Size 56C Thru 184C Motor Faces (4.5" AK)
- Slim Profile - Only 1.00" Deep
- Incorporates Opto-ASIC Technology
- Resolutions to 4096 CPR

The Model 865T C-face encoder is a rugged, high resolution encoder designed to mount directly on NEMA C-face motors. Both sides of the encoder are C-face mounts, allowing additional C-face devices to be mounted to this encoder. Unlike many C-face kit type encoders, the Model 865T contains precision bearings and an internal flex mount, virtually eliminating encoder failures and inaccuracies induced by motor shaft runout or axial endplay. The advanced Opto-ASIC design provides advanced noise immunity necessary for many industrial applications. This encoder is ideal for applications using induction motors and flux vector control. The Model 865T provides speed and position information for drive feedback in a slim profile - only 1.00" thick. The Thru-Bore design allows fast and simple mounting of the encoder directly to the accessory shaft or to the drive shaft of the motor, using the standard motor face (NEMA sizes 56C - 184C). The tough, 316 stainless steel housing resists the corrosion and hazards of a caustic industrial environment.

Common Applications
Motor Feedback, Velocity & Position Control, Conveyors, Variable Speed Drives, Mixing & Blending Motors, Assembly & Specialty Machines

Model 865T Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

<table>
<thead>
<tr>
<th>Mechanical</th>
<th>Electrical</th>
<th>Optional Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>865T</td>
<td>34 H1</td>
<td></td>
</tr>
<tr>
<td>BORE SIZE</td>
<td>CYCLES PER REVOLUTION</td>
<td>OUTPUT TYPE</td>
</tr>
<tr>
<td>11 5/8&quot;, 0.625&quot;</td>
<td>See CPR Options below</td>
<td>OC Open Collector</td>
</tr>
<tr>
<td>34 3/4&quot;, 0.750&quot;</td>
<td>Price adder for CPR &gt;1024</td>
<td>Pull-Up Resistor</td>
</tr>
<tr>
<td>18 7/8&quot;, 0.875&quot;</td>
<td>V1 5 to 28 VDC</td>
<td>PP Push-Pull</td>
</tr>
<tr>
<td>80 1&quot;, 1.000&quot;</td>
<td></td>
<td>HV Line Driver</td>
</tr>
<tr>
<td>13 1.125 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 1.500 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 24 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HOUSING STYLE</th>
<th>INPUT VOLTAGE</th>
<th>OUTPUT TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 Thru-Bore housing version with IP50 dust seal</td>
<td>V1 5 to 28 VDC</td>
<td>OC Open Collector</td>
</tr>
<tr>
<td>H2 Cover completely encloses motor shaft and eliminates access to motor shaft</td>
<td></td>
<td>Pull-Up Resistor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMBER OF CHANNELS</th>
<th>OPERATING TEMPERATURE</th>
<th>CERTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Channel A Leads B</td>
<td>0° to 70° C (Std)</td>
<td>None Std</td>
</tr>
<tr>
<td>Q Quadrature A &amp; B</td>
<td>T4 0° to 100° C</td>
<td>CE CE Marked</td>
</tr>
<tr>
<td>R Quadrature A &amp; B with Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K Reverse Quadrature A &amp; B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D Reverse Quadrature A &amp; B with Index</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONNECTOR TYPE</th>
<th>For specification assistance call</th>
</tr>
</thead>
<tbody>
<tr>
<td>F02 24&quot; Cable with Gland Nut</td>
<td>Customer Service at 1-800-366-5412</td>
</tr>
</tbody>
</table>

NOTES:
1. Housing style H1 Thru-Bore version equipped with IP50 dust seal; unit must be mounted between two C-face devices with supplied gasket kit to be IP66 sealed.
2. Contact Customer Service for index gating options.
3. 5 to 24 VDC max for high temperature option.
4. For non-standard cable lengths enter ‘F’ plus cable length expressed in feet. Example: F06 = 6 feet of cable.
Model 865T Specifications

Electrical
- Input Voltage: 4.75 to 28 VDC max for temperatures up to 70° C, 4.75 to 24 VDC for temperatures between 70° C to 100° C
- Input Current: 100 mA max with no output load
- Input Ripple: 100 mV peak-to-peak at 0 to 100 kHz
- Output Format: Incremental, Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. See Waveform Diagrams below.
- Output Types: Open Collector- 100 mA max per channel, Pull-Up- 100 mA max per channel, Push-Pull- 20 mA max per channel, Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
- Index: Once per revolution, 0475 to 4096 CPR: Gated to output A, 0001 to 0474 CPR: Ungated. See Waveform Diagrams below.
- Max Frequency: 200 kHz
- Noise Immunity: Tested to BS EN61000-4-2, IEC801-3, BS EN61000-4-4, DDENV 50141, DDENV 50204, BS EN55022 (with European compliance option), BS EN61000-6-2, BS EN50081-2
- Symmetry: 180° (±18°) electrical
- Quad. Phasing: 90° (±22.5°) electrical
- Min. Edge Sep: 67.5° electrical
- Rise Time: Less than 1 microsecond

Mechanical
- Max Shaft Speed: 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.
- Bore Size: 0.625", 0.750", 0.875", 1.000", 14 mm, 19 mm, and 24 mm
- Bore Tolerance: +0.0015"/±0.000"
- User Shaft Tolerances: Radial Runout: ±0.050"
- Axial Endplay: ±0.050"
- Moment of Inertia: 3.3 x 10^-2 oz-in-sec^2 typical
- Electrical Conn: Gland nut with 24" cable (foil and braid shield, 24 AWG conductors)
- Housing: Type 316 Stainless Steel
- Mounting: NEMA 56C to 184C
- Weight: 6 lb typical

Environmental
- Operating Temp: 0° to 70° C for standard models, 0° to 100° C for high temperature option
- Storage Temp: 25° to 100° C
- Humidity: 98% RH non-condensing
- Vibration: 10 g @ 50 to 500 Hz
- Shock: 50 g @ 11 ms duration
- Sealing: IP66 when mounted between two C-face devices with supplied gasket kit, or with H1 cover. IP50 if not installed in either manner.

Model 865T With Gland Nut (P)

Waveform Diagrams

Wiring Table

Model 865T Optional Housing Cover (H2)

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Model 925

Features
- Standard Size 25 Package (2.5”)
- Resolutions Up To 12 Bit (4096 Counts)
- Incorporates Opto-ASIC Technology
- Industrial Grade, Heavy Duty Housing
- Wide Range of Operating Voltages (4.75 to 26 VDC)

The Model 925 Single Turn Absolute Accu-Coder™ is ideal for a wide variety of industrial applications that require an encoder with the capability of absolute positioning output. Its fully digital output and innovative use of Opto-ASIC technology make the Model 925 an excellent choice for all applications, especially ones with a high presence of noise. Available with either round servo or square flange mounting, and a variety of connector and cabling options, the Model 925 is easily designed into a variety of application requirements. The Model 925, with its wide selection of shaft sizes supported by industrial grade, heavy duty bearings, and its optional IP66 seal, is ideal for rough environments.

Common Applications
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners

Model 925 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Output Code           Counts Per Resolution
Gray Code  0256  0512  1024  2048  4096
Natural Binary 0250  0256  0360  0500  0512  0720  1000
               1024  1440  2000  2048  2880  4000  4096
Excess Gray  0180  0250  0360  0500  0720  1000  1440
               2000  2880  4000

NOTES:
2 For additional connector styles please contact Customer Service.
3 Standard cable length is 24”. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
4 Only available with 8 bit resolution encoder.
5 For mating connectors, cables, and cordsets, please see www.encoder.com.

Model 925 Resolution Table

<table>
<thead>
<tr>
<th>Output Code</th>
<th>Counts Per Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray Code</td>
<td>0256 0512 1024 2048 4096</td>
</tr>
<tr>
<td>Natural Binary</td>
<td>0250 0256 0360 0500 0512 0720 1000</td>
</tr>
<tr>
<td></td>
<td>1024 1440 2000 2048 2880 4000 4096</td>
</tr>
<tr>
<td>Excess Gray</td>
<td>0180 0250 0360 0500 0720 1000 1440</td>
</tr>
<tr>
<td></td>
<td>2000 2880 4000</td>
</tr>
</tbody>
</table>

*Contact Customer Service for availability.

For specification assistance call Customer Service at 1-800-366-5412
**Model 925 Specifications**

**Electrical**
- **Input Voltage**: 4.75 to 26 VDC max
- **Regulation**: 100 mV peak-to-peak, max ripple at 0 to 10 kHz
- **Input Current**: 100 mA max with no external load
- **Output Format**: Absolute, Parallel Outputs
- **Output Type**: Open Collector- 20 mA max per channel
- **Push-Pull**: 20 mA max per channel
- **Code**: Gray Code, Natural Binary Code, Excess Gray Code
- **Max Frequency**: 50 kHz (LSB)
- **Rise Time**: Less than 1 microsecond
- **Resolution**: Up to 12 bit
- **Accuracy**: ±1/2 LSB

**Control**
- **Directional Control**: Field selectable for increasing counts (CW or CCW)

**Mechanical**
- **Max Shaft Speed**: 6000 RPM continuous
- **Shaft Size**: 0.250", 0.3125", 0.375", 6 mm, 8 mm
- **Radial Shaft Load**: 35 lb max
- **Axial Shaft Load**: 40 lb max
- **Starting Torque**: 1.0 oz-in typical for no seal
- **Max Acceleration**: 1 x 10^5 rad/sec^2
- **Electrical Conn**: Gland with 24" cable (braid shield, 30 AWG conductors), 10-, 16-, and 19-pin
- **Housing**: Aluminum
- **Mounting**: Flange or servo type
- **Weight**: 22 oz typical

**Environmental**
- **Operating Temp**: 0° to 70° C
- **Storage Temp**: -20° to +85° C
- **Humidity**: 98% RH non-condensing
- **Vibration**: 10 g @ 58 to 500 Hz
- **Shock**: 20 g @ 11 ms duration
- **Sealing**: IP54 (standard), IP64, or IP66 (NEMA 13 and 4) optional

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**Model 925 Flange Mount (F)**

**Model 925 2.5" Servo Mount (S)**

---

**Wiring Table**

<table>
<thead>
<tr>
<th>Function</th>
<th>18-PIN</th>
<th>16-PIN</th>
<th>10-PIN</th>
<th>Gland Cable or Mating Conn.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 MSB</td>
<td>A 3</td>
<td>A</td>
<td>Brown</td>
<td>* Only available with 8-bit resolution encoders ** Where Fitted *** Direction Control Standard is CW Increasing when viewed from the shaft end. Direction pin is pulled high normally to 5V internally. Direction pin must be pulled low (GND, Common) to reverse count direction. Applied voltage to direction pin should not exceed 5V.</td>
</tr>
<tr>
<td>S2</td>
<td>B 5</td>
<td>B</td>
<td>White</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S3</td>
<td>C 6</td>
<td>C</td>
<td>Green</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S4</td>
<td>D 7</td>
<td>D</td>
<td>Orange</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S5</td>
<td>E 8</td>
<td>E</td>
<td>Blue</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S6</td>
<td>F 9</td>
<td>F</td>
<td>Violet</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S7</td>
<td>G 10</td>
<td>G</td>
<td>Pink</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S8 LSB 8-bit</td>
<td>H 11</td>
<td>H</td>
<td>Red/Green</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S9 LSB 8-bit</td>
<td>J 12</td>
<td>J</td>
<td>Red/Blue</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S10 LSB 10-bit</td>
<td>K 13</td>
<td>K</td>
<td>Red/Yellow</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S11 LSB 11-bit</td>
<td>L 14</td>
<td>L</td>
<td>Turquoise</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>S12 LSB 12-bit</td>
<td>M 15</td>
<td>M</td>
<td>Yellow</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>Direction**</td>
<td>R 4</td>
<td>R</td>
<td>Red/Blue</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>Case Ground</td>
<td>S 16</td>
<td>S</td>
<td>Drain/Screen</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>5V Common</td>
<td>T 1</td>
<td>J</td>
<td>Black</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>Special*</td>
<td>U —</td>
<td>—</td>
<td>White/Red</td>
<td><strong>Where Fitted</strong></td>
</tr>
<tr>
<td>4VDC</td>
<td>V 2</td>
<td>I</td>
<td>Red</td>
<td><strong>Where Fitted</strong></td>
</tr>
</tbody>
</table>

*NOTES:*
- *Only available with 8-bit resolution encoders*
- **Where Fitted**
- ***Direction Control**
- Standard is CW Increasing when viewed from the shaft end. Direction pin is pulled high normally to 5V internally. Direction pin must be pulled low (GND, Common) to reverse count direction. Applied voltage to direction pin should not exceed 5V.
The Model 958 Single Turn Absolute Accu-Coder™ is ideal for a wide variety of industrial applications requiring an encoder with European Size 58 (58 mm) mounting and absolute positioning output. A rugged, industrial grade housing allows the Model 958 to be used in a wide variety of applications calling for a reliable, heavy-duty encoder. In addition, its innovative Opto-ASIC circuitry, coupled with its digital output, make it an excellent choice in those applications plagued by unusually high levels of electrical noise. Available with a choice of either type 20 or type 26 servo mounting, and a variety of connector and cabling options, the Model 958 is easily designed into a variety of applications. The Model 958 can also be ordered with stainless steel housing, heavy duty bearings, and an IP66 seal. (Contact a friendly EPC sales representative for more information). With so many options that make the Model 958 ultra-durable, this absolute encoder can tolerate the worst environments!

Common Applications
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners

Model 958 Resolution Table

<table>
<thead>
<tr>
<th>Output Code</th>
<th>Counts Per Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray Code</td>
<td>0256 0512 1024 2048 4096</td>
</tr>
<tr>
<td>Natural Binary</td>
<td>0256 0512 1024 2048 2880 4000</td>
</tr>
<tr>
<td>Excess Gray</td>
<td>0180 0250 0380 0500 0720 1000 1440</td>
</tr>
</tbody>
</table>

*Contact Customer Service for availability.

NOTES:
2 For additional connector styles please contact Customer Service.
3 Standard cable length is 24”. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
4 Also available in stainless steel housing. Contact Customer Service for details.
5 For mating connectors, cables, and cordsets, please see www.encoder.com.
Model 958 Specifications

Electrical
- Input Voltage: 4.75 to 26 VDC max
- Regulation: 100 mV peak-to-peak, max ripple at 0 to 100 kHz
- Input Current: 100 mA max with no external load
- Output Format: Absolute- Parallel Outputs
- Output Type: Open Collector- 20 mA max per channel
- Code: Gray Code, Natural Binary Code, Excess Gray Code
- Max Frequency: 50 kHz (LSB)
- Rise Time: Less than 1 microsecond
- Resolution: Up to 12 bit
- Accuracy: +1/2 LSB

Control
- Directional Control: Field selectable for increasing counts (CW or CCW)

Mechanical
- Max Shaft Speed: 6000 RPM continuous
- Shaft Size: 0.250", 0.375", 6 mm, 10 mm
- Radial Shaft Load: 27 lb max
- Axial Shaft Load: 27 lb max
- Starting Torque: 1.0 oz-in typical for no seal
- Max Acceleration: 1 x 10^5 rad/sec^2
- Electrical Conn: Gland with 24" cable (braided shield, 30 AWG conductors), 16-, 19-pin
- Housing: Aluminum
- Mounting: European Standard Clamping Flange (20 Type) and Synchro Flange (26 Type)
- Weight: 22 oz typical

Environmental
- Operating Temp: 0° to 70° C
- Storage Temp: -20° to +85° C
- Humidity: 98% RH non-condensing
- Vibration: 10 g @ 58 to 500 Hz
- Shock: 20 g @ 11 ms duration
- Sealing: IP64 (standard), IP64, or IP66 (NEMA 13 and 4) optional

Wiring Table

<table>
<thead>
<tr>
<th>Function</th>
<th>10-PIN K/P01E14-10P</th>
<th>16-PIN Gland Cable or Mating Conn.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 MSB</td>
<td>A</td>
<td>P1</td>
</tr>
<tr>
<td>S2</td>
<td>B</td>
<td>P5</td>
</tr>
<tr>
<td>S3</td>
<td>C</td>
<td>P6</td>
</tr>
<tr>
<td>S4</td>
<td>D</td>
<td>P7</td>
</tr>
<tr>
<td>S5</td>
<td>E</td>
<td>P8</td>
</tr>
<tr>
<td>S6</td>
<td>F</td>
<td>P9</td>
</tr>
<tr>
<td>S7</td>
<td>G</td>
<td>P10</td>
</tr>
<tr>
<td>S8 LS8 8-bit</td>
<td>H</td>
<td>P11</td>
</tr>
<tr>
<td>S9 LS8 8-bit</td>
<td>J</td>
<td>P12</td>
</tr>
<tr>
<td>S10 LS8 10-bit</td>
<td>K</td>
<td>P13</td>
</tr>
<tr>
<td>S11 LS8 11-bit</td>
<td>L</td>
<td>P14</td>
</tr>
<tr>
<td>S12 LS8 12-bit</td>
<td>M</td>
<td>P15</td>
</tr>
<tr>
<td>Direction***</td>
<td>R</td>
<td>P4</td>
</tr>
<tr>
<td>Case Ground</td>
<td>S</td>
<td>P16</td>
</tr>
<tr>
<td>CV Common</td>
<td>T</td>
<td>P1</td>
</tr>
<tr>
<td>Special**</td>
<td>U</td>
<td></td>
</tr>
<tr>
<td>4VDC</td>
<td>V</td>
<td>P2</td>
</tr>
</tbody>
</table>

NOTES:
* Only available with 8-bit resolution encoders
** Where Fitted
*** Direction Control: Standard is CW increasing when viewed from the shaft end. Direction pin B is pulled high normally to 5V internally. Direction pin must be pulled low (GND, Common) to reverse count direction. Applied voltage to direction pin should not exceed 5V.
Model 960

Features
- Low-Profile - 1.55"
- Thru-Bore or Hollow Bore Styles
- Industrial Grade, Heavy Duty Housing
- State-of-the-Art Opto-ASIC Circuitry

The single-turn Model 960 Absolute Series Accu-Coder™ provides a unique solution to a wide variety of industrial applications requiring absolute position information. By providing a low profile package of just 1.55", a variety of hollow and thru-bore sizes, and an easy to use flexible mounting system, the Model 960 goes where traditional absolute encoders do not fit. In addition, its innovative Opto-ASIC circuitry, coupled with its digital output, make it an excellent choice for applications plagued by an unusually high level of electrical noise. The Model 960 can easily be mounted directly on a motor shaft, bringing the advantage of absolute positioning in an all metal housing while eliminating the fixtures, couplers and adapters required by other absolute encoder designs.

Common Applications
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners

Model 960 Ordering Guide
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

<table>
<thead>
<tr>
<th>MODEL 960 Absolute Series Thru-Bore</th>
<th>OUTPUT CODE</th>
<th>G Gray Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORE SIZE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01 1/4&quot;, 0.250&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>02 3/8&quot;, 0.375&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04 6 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 10 mm</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUTPUT TYPE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PP Push Pull (Standard)</td>
<td></td>
</tr>
<tr>
<td>OC Open Collector</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RESOLUTION (Bits, Counts Per Revolution)</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 8 bit, 0256</td>
</tr>
<tr>
<td>09 9 bit, 0512</td>
</tr>
<tr>
<td>10 10 bit, 1024</td>
</tr>
<tr>
<td>11 11 bit, 2048</td>
</tr>
<tr>
<td>16 9 bit, 360 (XS76)</td>
</tr>
<tr>
<td>72 10 bit, 720 (XS152)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONNECTOR TYPE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G Gland, 18&quot; Cable</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CERTIFICATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N None</td>
<td></td>
</tr>
<tr>
<td>CE CE Marked 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MOUNTING</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SF Standard Slotted Flex Mount</td>
<td></td>
</tr>
<tr>
<td>FA Flexible Arm</td>
<td></td>
</tr>
</tbody>
</table>

For specification assistance call
Customer Service at 1-800-366-5412

NOTES:
2. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G6 = 6 feet of cable.
Model 960 Specifications

Electrical
- Input Voltage: 4.75 to 26 VDC max
- Regulation: 100 mV peak-to-peak, max ripple at 0 to 10 kHz
- Input Current: 100 mA max with no external load
- Output Format: Absolute- Parallel Outputs
- Output Type: Open Collector- 20 mA max per channel
- Push-Pull- 20 mA max per channel
- Code: Gray Code, Excess Gray Code
- Max Frequency: 25.6 kHz (LSB)
- Rise Time: Less than 1 microsecond
- Resolution: Up to 11 bit
- Accuracy: ±1/2 LSB

Control
- Directional Control: Field selectable for increasing counts
  (CW or CCW). Standard configuration user selects the applicable MSB wire for direction of count. Direction control option allows user to select count direction by applying 0 VDC to an encoder input. See Absolute Wiring Tables below.

Mechanical
- Max Shaft Speed: 6000 RPM continuous
- Bore Size: 0.250", 0.3125", 0.375", 6 mm, 8 mm, 10 mm
- Bore Tolerance: -0.0000" / +0.0006"
- User Shaft Tolerances
- Radial Runout: 0.007"
- Axial Endplay: ±0.030"
- Starting Torque: 0.3 oz-in typical for thru-bore
- Max Acceleration: 1 x 10^5 rad/sec^2
- Electrical Conn: Gland with 18" cable (braid shield, 30 AWG conductors)
- Housing: Aluminum with non-corrosive finish
- Mounting: Slotted Flex Mount standard, Flex-Mount Arm optional
- Weight: 7 oz typical

Environmental
- Operating Temp: 0° to 70° C
- Storage Temp: -20° to +85° C
- Humidity: 96% RH non-condensing
- Vibration: 10 g @ 58 to 500 Hz
- Shock: 20 g @ 11 ms duration

---

Model 960 Slotted Flex Mount (SF)

Model 960 With Flex Arm (FA)

Wiring Table

<table>
<thead>
<tr>
<th>Function</th>
<th>Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>Red</td>
</tr>
<tr>
<td>S1 cw M6B</td>
<td>Brown</td>
</tr>
<tr>
<td>S1 cw M6B</td>
<td>Yellow</td>
</tr>
<tr>
<td>S2</td>
<td>White</td>
</tr>
<tr>
<td>S3</td>
<td>Green</td>
</tr>
<tr>
<td>S4</td>
<td>Orange</td>
</tr>
<tr>
<td>S5</td>
<td>Blue</td>
</tr>
<tr>
<td>S6</td>
<td>Gray</td>
</tr>
<tr>
<td>S7</td>
<td>Red</td>
</tr>
<tr>
<td>S8 L6B+6 ft</td>
<td>Red/Green</td>
</tr>
<tr>
<td>S9 L6B+6 ft</td>
<td>Red/Blue</td>
</tr>
<tr>
<td>S10 L6B+11 ft</td>
<td>Red/Red</td>
</tr>
<tr>
<td>11-bit</td>
<td>Red/Blue</td>
</tr>
</tbody>
</table>

*CE Option Only
*Standard in CW increasing count (when viewed from shaft end, and using brown wire for M6B). Red/Blue is pulled up internally to 5 VDC. To reverse count direction, Red/Blue must be pulled low (0 VDC). 15 VDC is applied to Red/Blue, unit remains in standard CW increasing count mode. Count direction can also be reversed by using the Yellow M6B wire instead of the Brown. At no time should voltage applied to Red/Blue exceed 5 VDC.

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
RX/TX Converter

Features
The RX/TX Converter converts a Push-Pull or NPN encoder output to an RS422 compatible differential Line Driver output. In addition, it will also convert Line Driver/RS422 encoder output, to single ended signals (Push-Pull) for compatibility with certain PLC's.

Each converter has two independent channels:

Channel 1 is equipped with a differential Line Receiver on the input. It then converts these differential signals (A, A', B, B', Z, Z') to Push-Pull output signals (A, B, Z), with an amplitude equivalent to Vcc.

Channel 2 will convert single ended signals from a Push-Pull or NPN Open Collector encoder to Differential Line Driver signals. Differential Line Driver signals include complementary outputs A', B', and Z' which offer greater immunity to electrical noise, signal distortion, and interference, especially with long cable runs.

Applications
• To provide differential signals for data transmission over long distances between a push-pull, or NPN open collector transmitter and receiver.
• To enable devices with different output/input circuits to be connected.
• To properly terminate differential signals to eliminate/reduce signal distortions.

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Source (Vcc)</td>
<td>5 to 24 VDC</td>
</tr>
<tr>
<td>Current Consumption</td>
<td>20 mA max (plus encoder and output load requirements)</td>
</tr>
<tr>
<td>Max Frequency</td>
<td>Up to 1 MHz</td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP54 (dust proof)</td>
</tr>
<tr>
<td>Earth Circuit</td>
<td>Grounded to Case</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>Channel 1: 24 VDC Max Diff</td>
</tr>
<tr>
<td></td>
<td>Channel 2: 5 VDC Max</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>Channel 1: Vcc</td>
</tr>
<tr>
<td></td>
<td>Channel 2: 5 VDC or Vcc</td>
</tr>
<tr>
<td>Output Current</td>
<td>30 mA/Channel Max</td>
</tr>
</tbody>
</table>

Ordering Information
(Specify stock # when ordering)
Differential = A, A', B, B', Z, Z'
Single Ended = A, B, Z

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified
Metric dimensions are given in brackets [mm]
RX/TX Repeater

Features
The RX/TX Repeater retransmits signals from an encoder output, in order to drive signals over a longer distance with reduced noise and distortion free waveforms. The input is equipped with a Differential Line Receiver, and a Differential Line Driver. It takes the differential signals (A, A', B, B', Z, Z'), squares the signals up, and then repeats the signals at the outputs.

Benefits are greater immunity from electrical noise, signal distortion, and interference, especially with long cable runs. The output signal can be 5 VDC or an amplitude equivalent to Vcc.

Applications
- Repeat differential signals for data transmission over long distances.
- To properly terminate differential signals to eliminate/reduce signal distortions.
- Increase output current drive capability in order to drive multiple receivers.

Specifications
- Supply Source (Vcc)..............5 to 24 VDC
- Current Consumption.............20 mA max (plus encoder and output load requirements)
- Max Frequency..................Up to 1 MHz
- Enclosure........................IP54 (dust proof)
- Earth Circuit......................Grounded to Case
- Input Voltage.....................24 VDC Max Diff
- Output Voltage...................5 VDC or Vcc
- Output Current...................30 mA/Channel Max

Ordering Information
(Specify stock # when ordering)

Differential = A, A', B, B', Z, Z
Single Ended = A, B, Z

All dimensions are in inches with a tolerance of +0.005” or +0.01” unless otherwise specified
Metric dimensions are given in brackets [mm]
RX/TX Splitter

**Features**
The RX/TX Splitter has one input and two separate output channels. There are two different types of inputs available. One input type is a differential line receiver. Differential input signals (A, A', B, B', Z, Z') are split into two identical differential output channels. OR, the input can be configured for a single ended Push-Pull, NPN, Open Collector, or Pull-Up encoder (A, B, Z), which will split the signal into two independent differential line driver outputs (A, A', B, B', Z, Z'). Refer to the block diagram below for the signal flow through the device. Line Driver signals include complementary outputs A', B', and Z', and offer greater immunity from electrical noise, signal distortion, and interference especially with long cable runs. The output signal can be approximately 5 VDC or a voltage amplitude equivalent to the RX/TX supply (Vcc).

To order, choose the type of input (differential or single ended), the expected encoder signal voltage and the voltage output options. Use the RX/TX Splitter ordering guide below to establish the stock number.

**Applications**
- To split differential, or single ended signals for data transmission over long or short distances to two different devices.
- To properly terminate differential signals to eliminate/reduce signal distortion.
- To increase output current drive capability in order to drive multiple receivers.
- To split the input signal and provide the two output channel drivers with differing voltage outputs.

**Specifications**
- Supply Source (Vcc).............. 5 to 24 VDC
- Current Consumption............. 20 mA max (plus encoder & output load requirements)
- Max Frequency..................... Up to 1 MHz
- Enclosure......................... IP54 (dust proof)
- Earth Circuit....................... Grounded to Case
- Input Voltage...................... 24 VDC Max Diff
- Output Voltage..................... 5 VDC or Vcc
- Output Current..................... 30 mA/Channel Max

**Ordering Information** (Specify stock # when ordering)
Connectors/Cables/Converters

Pre-Wired Cable and Mating Connector Assemblies

To order a pre-wired cable and connector assembly complete the boxes to indicate the connector style, cable length, and output configuration.

**Incremental Encoder Cable Assemblies** (Cable is 24 AWG double-shielded and is rated to 105° C)

- **Cable Type**
  - 3 = Standard
  - 4 = Twisted Pair

- **Connector Style**
  - 06 = 6-pin MS Type
  - 07 = 7-pin MS Type
  - 09 = 9-pin D-Sub Mini
  - 10 = 10-pin MS Type
  - 12 = 12-pin MS Type

- **Output Type**
  - ST = OC, PU, PP, S, O
  - HV = HV

- **Channel Configuration**
  - A = Single Channel
  - Q = Quadrature or Dual Channel
  - R = Quadrature Index Z

- **Cable Length**
  - Number of Feet

**Absolute Encoder Cable Assemblies** (Cable is 28 or 30 AWG, shielded, and is rated to 70° C)

- **Connector Style**
  - 10 = 10-pin MS Type
  - 16 = 16-pin Connector
  - 19 = 19-pin Connector

- **Cable Length**
  - Number of Feet

- **CE Compatible**
  - Y = Yes
  - N = No

**M12 (12 mm) Cordsets** (Always use a shielded cordset)

- **8-Conductor Cordsets** (For use with 8-pin M12 connectors.)
- **3, 4, and 5-Conductor Cordsets** (For use with 5-pin M12 connectors.)

- **Shield not connected to Coupling Nut**
  - **Stock #**
  - **Description**
  - **Length**

- **Shield connected to Coupling Nut**
  - **Stock #**
  - **Description**
  - **Length**

**Electrical Cable**

- **Stock #**
  - **Description**

**Accessories**

This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123 www.barr-thorp.com
Encoder Power Supply

Features
A clean source of dedicated power for your encoder is an important factor when designing a reliable system. Now available from EPC are small, easily mounted Din Rail power supplies specifically chosen to power encoders. Designed for space efficiency, these compact power supplies are available in 5, 12, or 24 VDC.

Easy to see LED indicators show the power supply is working properly. Screw type terminals easily accommodate wires from AWG 24 to 14. The shock proof housing is both UL and CE approved.

These supplies have been tested to work with all our Accu-Coders™. Save yourself time and money, call EPC today and order a power supply that you know will work with your encoder!

Specifications
Electrical
Nominal Input Voltage .......... 100 to 240 Vac / 47 to 63 Hz
Input Voltage Range .......... 90 to 265 Vac / 47 to 63 Hz or 120 to 370 VDC
Frequency .................. 100 kHz min
Inrush Surge Current ........... < 10 A @ 115 Vac, < 18 A @ 230 Vac
Input Fuse ................. T2A / 250 Vac

<table>
<thead>
<tr>
<th>EPS-5V</th>
<th>EPS-12V</th>
<th>EPS-24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Output Voltage</td>
<td>5 VDC</td>
<td>12 VDC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 1 %</td>
<td>± 1 %</td>
</tr>
<tr>
<td>Nominal Output Current</td>
<td>3 A</td>
<td>1.5 A</td>
</tr>
<tr>
<td>Efficiency</td>
<td>&gt; 75%</td>
<td>&gt; 77%</td>
</tr>
<tr>
<td>Ripple and Noise</td>
<td>50 mV</td>
<td>50 mV</td>
</tr>
</tbody>
</table>

Mechanical
Dimensions .................. 3.54” L x 0.89” W x 4.5” D
(90 mm L x 22.5 mm W x 115 mm D)
Connection Type ............... Screw Clamp Connection

Environmental
Operating Temperature ........... -10°C to +50°C
Storage Temperature ........... -25°C to +85°C
Relative Humidity .............. 85 % RH

Approvals and Standards
UL / cUL .................. UL508 / UL 1310 Listed, Class 2
TUV  .................. EN 60950
CE ..........  EN 50081-1 / EN 55022 Class B
.............. EN 61000-3-2
.............. EN 61000-3-3
.............. EN 50082-1 / EN 55024
FCC .................. Class B
### Shaft Couplings

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
<th>Length</th>
<th>From shaft size</th>
<th>To shaft size</th>
</tr>
</thead>
<tbody>
<tr>
<td>161307</td>
<td></td>
<td>1.00&quot;</td>
<td>0.250&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>161308</td>
<td></td>
<td>1.00&quot;</td>
<td>6 mm</td>
<td>6 mm</td>
</tr>
<tr>
<td>161309</td>
<td></td>
<td>1.00&quot;</td>
<td>6 mm</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>161314</td>
<td></td>
<td>1.00&quot;</td>
<td>6 mm</td>
<td>0.375&quot;</td>
</tr>
<tr>
<td>161313</td>
<td></td>
<td>1.00&quot;</td>
<td>0.250&quot;</td>
<td>0.375&quot;</td>
</tr>
<tr>
<td>161317</td>
<td></td>
<td>1.00&quot;</td>
<td>0.375&quot;</td>
<td>0.375&quot;</td>
</tr>
<tr>
<td>161319</td>
<td></td>
<td>1.50&quot;</td>
<td>0.375&quot;</td>
<td>0.500&quot;</td>
</tr>
</tbody>
</table>

### Magnetic Coupling

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>172682-01</td>
<td>For encoders with a 5/8&quot; (03625&quot;) bore Model 260 and Model 25T</td>
</tr>
</tbody>
</table>

### Bore Adaptor Kits

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>260-BK97</td>
<td>Small Metric Bore Adapter Kit for 260. Includes 6, 8, &amp; 10mm</td>
</tr>
<tr>
<td>260-BK98</td>
<td>Large Metric Bore Adapter Kit for 260. Includes 11, 12, &amp; 14mm</td>
</tr>
<tr>
<td>260-BK99</td>
<td>Inch Standard Bore Adapter Kit for 260. Includes 0.250&quot;, 0.375 and 0.500&quot;</td>
</tr>
<tr>
<td>25T-BK98</td>
<td>Metric Bore Adapter Kit for 25T. Includes 19, 20, 24, 25, 28mm</td>
</tr>
<tr>
<td>25T-BK99</td>
<td>Inch Standard Bore Adapter Kit for 25T. Includes 0.500&quot;, 0.625&quot;, 0.750&quot;, 0.875&quot;, 1.00&quot;</td>
</tr>
</tbody>
</table>

### Mounting Options

#### Mounting Hubs with Couplings for Size 15

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>175488-01</td>
<td>NEMA Size 34, 6 mm coupling</td>
</tr>
<tr>
<td>175489-01</td>
<td>NEMA Size 23, 6 mm coupling</td>
</tr>
<tr>
<td>175488-02</td>
<td>NEMA Size 34, 1/4&quot; coupling</td>
</tr>
<tr>
<td>175489-02</td>
<td>NEMA Size 23, 1/4&quot; coupling</td>
</tr>
<tr>
<td>175488-03</td>
<td>NEMA Size 34, 3/8&quot; coupling</td>
</tr>
<tr>
<td>175489-03</td>
<td>NEMA Size 23, 3/8&quot; coupling</td>
</tr>
</tbody>
</table>

#### Mounting Flanges and Adaptors

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>175124</td>
<td>Servo 755A</td>
</tr>
<tr>
<td>175125</td>
<td>Standard Cube in Explosion Proof Housing</td>
</tr>
<tr>
<td>175126</td>
<td>Standard Cube</td>
</tr>
<tr>
<td>175494</td>
<td>5PY Adapter for Size 25 Series</td>
</tr>
<tr>
<td>175443</td>
<td>5PY Adapter for 2.25&quot; Standard Cube Housing</td>
</tr>
<tr>
<td>175557-01</td>
<td>Cube Mounting Adapter for Size 20 Series</td>
</tr>
</tbody>
</table>

### Mounting Brackets

#### Cube Series Mounting Brackets (for Standard Cube Housing only)

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>140039</td>
<td>Single Pivot</td>
</tr>
<tr>
<td>140040</td>
<td>Double Pivot</td>
</tr>
<tr>
<td>140113</td>
<td>Spring Loaded Pivot Mounting Bracket</td>
</tr>
</tbody>
</table>

#### Uni-Brackets

Adapts the Model 260 or Model 702 Flex-Mount to fit a standard motor mount with a mounting bolt circle up to 5.875", such as a NEMA 4.5” AK mount or IEC equivalent.

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>175997-01</td>
<td>Uni-Bracket Kit</td>
</tr>
</tbody>
</table>

#### TR1-Tru-Trac™ Optional Mounting Bracket (Angle Mounting Bracket)

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>140104</td>
<td>TR1 Tru-Trac™</td>
</tr>
</tbody>
</table>

#### LCE Optional Mounting Plate

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>176064-01</td>
<td>Attaches to Standard or Industrial LCE in three different orientations.</td>
</tr>
</tbody>
</table>

#### Foot Mount Bracket

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>140121</td>
<td>Use with Clamping Flange 20 Type - 758, 858, 958</td>
</tr>
<tr>
<td>140122</td>
<td>Four Use with 702, 802S, 725 &amp; 925</td>
</tr>
</tbody>
</table>
### Mounting Options

#### Anti-Rotation Flex Mounts

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>140054-01</td>
<td>Flex mount and accessories</td>
</tr>
<tr>
<td>140106-01</td>
<td>225 Flexible Mounting Arm Kit</td>
</tr>
<tr>
<td>140108-01</td>
<td>260 and 702 Flexible Mounting Arm Kit</td>
</tr>
<tr>
<td>140055-01</td>
<td>260 SF Mounting Kit</td>
</tr>
<tr>
<td>140107-01</td>
<td>260 SD Mounting Kit</td>
</tr>
<tr>
<td>140071-01</td>
<td>260 FA Mounting Kit</td>
</tr>
<tr>
<td>140114-01</td>
<td>25T/SE Mounting Kit</td>
</tr>
<tr>
<td>140115-01</td>
<td>25T/H SG Mounting Kit</td>
</tr>
<tr>
<td>140116-01</td>
<td>25T/H SJ Mounting Kit</td>
</tr>
</tbody>
</table>

#### C-Face Gasket Kits for Models 770 and 771

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>770-Gasket-Kit</td>
<td>C-Face Gasket Kit for Model 770</td>
</tr>
<tr>
<td>771-Gasket-Kit</td>
<td>C-Face Gasket Kit for Model 771</td>
</tr>
<tr>
<td>121-Seal-Kit</td>
<td>121 Base Dust Seal (IP50)</td>
</tr>
</tbody>
</table>

### Protective Covers

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>175996-01</td>
<td>Uni-Cover Kit (includes bolts and washers). Compatible with Models 121, 225, 260, 755A, 702, 775, 776, and 960</td>
</tr>
<tr>
<td>770-000-02</td>
<td>770 Protective Cover Kit (includes mounting hardware) IP65 Sealing</td>
</tr>
<tr>
<td>771-000-02</td>
<td>771 Protective Cover Kit (includes mounting hardware) IP65 Sealing</td>
</tr>
<tr>
<td>865-000-02</td>
<td>865T Protective Cover Kit (includes mounting hardware) IP65 Sealing</td>
</tr>
<tr>
<td>176301-01</td>
<td>56C Cage Style Cover Kit for Model 25T and Model 260 (includes bolts and washers)</td>
</tr>
</tbody>
</table>

### Servo Clamps

For use with models 755A, 702, 725, 758 26 Type, 925 and 958 26 Type servo hubs. To determine the appropriate bolt circle diameter, add 0.270” to the maximum flange diameter.

#### Stock#  | Description                      |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>140083</td>
<td>Servo Clamp - Top Mount with 4-40 screws</td>
</tr>
</tbody>
</table>

### Linear Cable Accessories

50 inch Linear Cable Adapter for standard or industrial cube housings. Mounting hardware is included for an easy installation directly over the shaft of your existing cube encoder. See Technical Bulletin TB-517 for specific installation instructions.

On Encoder’s website, www.encoder.com, under the “Support” heading, go to the “Technical Bulletins” link.

#### Stock#  | Description                                           |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LCA01</td>
<td>50’ Linear Cable Adapter for Standard Cube Housing with 1/4” shaft</td>
</tr>
<tr>
<td>LCA02</td>
<td>50’ Linear Cable Adapter for Industrial Cube Housing with 3/8” shaft</td>
</tr>
<tr>
<td>176064-01</td>
<td>Optional Mounting Plate and hardware for cube style Linear Cable Encoders</td>
</tr>
</tbody>
</table>

### TR2 Racks & Accessories

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>176216</td>
<td>12” for Stainless Steel</td>
</tr>
<tr>
<td>176217</td>
<td>24” for Stainless Steel</td>
</tr>
<tr>
<td>176218</td>
<td>36” for Stainless Steel</td>
</tr>
<tr>
<td>176219</td>
<td>Spacer Block for Stainless Steel</td>
</tr>
<tr>
<td>161546</td>
<td>2 meter flexible rac</td>
</tr>
<tr>
<td>161548</td>
<td>Flexible rack clamps 10 pk (with M4x0.7 x 1) mm Phillips pan head machine screws.</td>
</tr>
<tr>
<td>161547</td>
<td>1 meter guide rail for flexible rack (does not work with 176220 gear)</td>
</tr>
<tr>
<td>140104</td>
<td>Angle Mounting Bracket</td>
</tr>
<tr>
<td>176220</td>
<td>40 Tooth Pinion Gear for use with Stainless Steel Rack</td>
</tr>
<tr>
<td>176302</td>
<td>40 Tooth Pinion Gear for use with Flexible Rack</td>
</tr>
</tbody>
</table>

For lengths over 36”, order multiple pieces of rack or the flexible plastic 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.
# Measuring Wheels

## Linear Measuring Wheels

### Faced Measuring Wheels

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Circumference</th>
<th>Rim Type</th>
<th>Bore</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>161360 (TR1)</td>
<td>6”</td>
<td>85 Urethane</td>
<td>1/4”</td>
<td>0.25”</td>
</tr>
<tr>
<td>161401 (TR1)</td>
<td>6”</td>
<td>Knurled</td>
<td>1/4”</td>
<td>0.25”</td>
</tr>
<tr>
<td>161370</td>
<td>6”</td>
<td>Knurled</td>
<td>1/4”</td>
<td>0.4”</td>
</tr>
<tr>
<td>161376</td>
<td>6”</td>
<td>Knurled</td>
<td>3/8”</td>
<td>0.4”</td>
</tr>
<tr>
<td>161362</td>
<td>12”</td>
<td>Knurled</td>
<td>1/4”</td>
<td>0.4”</td>
</tr>
<tr>
<td>161379</td>
<td>12”</td>
<td>Knurled</td>
<td>3/8”</td>
<td>0.4”</td>
</tr>
<tr>
<td>161332</td>
<td>12”</td>
<td>Knurled</td>
<td>1/4”</td>
<td>1”</td>
</tr>
<tr>
<td>161333</td>
<td>12”</td>
<td>Knurled</td>
<td>3/8”</td>
<td>1”</td>
</tr>
<tr>
<td>161310</td>
<td>12”</td>
<td>65a Urethane*</td>
<td>1/4”</td>
<td>1”</td>
</tr>
<tr>
<td>161331</td>
<td>12”</td>
<td>65a Urethane*</td>
<td>3/8”</td>
<td>1”</td>
</tr>
<tr>
<td>161334</td>
<td>12”</td>
<td>Grooved</td>
<td>1/4”</td>
<td>1/2”</td>
</tr>
<tr>
<td>161335</td>
<td>12”</td>
<td>Grooved</td>
<td>3/8”</td>
<td>1/2”</td>
</tr>
<tr>
<td>161336</td>
<td>12”</td>
<td>80 Urethane</td>
<td>1/4”</td>
<td>0.70”</td>
</tr>
<tr>
<td>161337</td>
<td>12”</td>
<td>80 Urethane</td>
<td>3/8”</td>
<td>0.70”</td>
</tr>
<tr>
<td>161338</td>
<td>12”</td>
<td>90 Urethane</td>
<td>1/4”</td>
<td>0.70”</td>
</tr>
<tr>
<td>161339</td>
<td>12”</td>
<td>90 Urethane</td>
<td>3/8”</td>
<td>0.70”</td>
</tr>
<tr>
<td>161346</td>
<td>12”</td>
<td>Rubber</td>
<td>1/4”</td>
<td>1/2”</td>
</tr>
<tr>
<td>161347</td>
<td>12”</td>
<td>Rubber</td>
<td>3/8”</td>
<td>1/2”</td>
</tr>
<tr>
<td>161349</td>
<td>12”</td>
<td>90 Urethane</td>
<td>5/8”</td>
<td>0.70”</td>
</tr>
<tr>
<td>161344</td>
<td>1/3 Meter</td>
<td>Urethane</td>
<td>1/4”</td>
<td>5/8”</td>
</tr>
<tr>
<td>161359</td>
<td>1/3 Meter</td>
<td>Urethane</td>
<td>3/8”</td>
<td>5/8”</td>
</tr>
<tr>
<td>161361</td>
<td>1/3 Meter</td>
<td>Knurled</td>
<td>1/4”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161380</td>
<td>1/3 Meter</td>
<td>Knurled</td>
<td>3/8”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161399 (TR1)</td>
<td>200 mm</td>
<td>85 Urethane</td>
<td>1/4”</td>
<td>0.25”</td>
</tr>
<tr>
<td>161400 (TR1)</td>
<td>200 mm</td>
<td>Knurled</td>
<td>1/4”</td>
<td>0.25”</td>
</tr>
<tr>
<td>161371</td>
<td>200 mm</td>
<td>Knurled</td>
<td>1/4”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161375</td>
<td>200 mm</td>
<td>Knurled</td>
<td>3/8”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161372</td>
<td>300 mm</td>
<td>Knurled</td>
<td>1/4”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161377</td>
<td>300 mm</td>
<td>Knurled</td>
<td>3/8”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161373</td>
<td>400 mm</td>
<td>Knurled</td>
<td>1/4”</td>
<td>10 mm</td>
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<tr>
<td>161378</td>
<td>400 mm</td>
<td>Knurled</td>
<td>3/8”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161374</td>
<td>500 mm</td>
<td>Knurled</td>
<td>1/4”</td>
<td>20 mm</td>
</tr>
<tr>
<td>161361</td>
<td>500 mm</td>
<td>Knurled</td>
<td>3/8”</td>
<td>20 mm</td>
</tr>
</tbody>
</table>

### Rubber Insert Measuring Wheels

<table>
<thead>
<tr>
<th>Stock#</th>
<th>Circumference</th>
<th># of Inserts</th>
<th>Bore</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>161363</td>
<td>200 mm</td>
<td>1</td>
<td>1/4”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161382</td>
<td>200 mm</td>
<td>1</td>
<td>3/8”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161364</td>
<td>300 mm</td>
<td>1</td>
<td>1/4”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161384</td>
<td>300 mm</td>
<td>1</td>
<td>3/8”</td>
<td>10 mm</td>
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<tr>
<td>161365</td>
<td>400 mm</td>
<td>1</td>
<td>1/4”</td>
<td>10 mm</td>
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<tr>
<td>161385</td>
<td>400 mm</td>
<td>1</td>
<td>3/8”</td>
<td>10 mm</td>
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<tr>
<td>161366</td>
<td>500 mm</td>
<td>2</td>
<td>1/4”</td>
<td>20 mm</td>
</tr>
<tr>
<td>161388</td>
<td>500 mm</td>
<td>2</td>
<td>3/8”</td>
<td>20 mm</td>
</tr>
<tr>
<td>161369</td>
<td>1/3 Meter</td>
<td>1</td>
<td>1/4”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161387</td>
<td>1/3 Meter</td>
<td>1</td>
<td>3/8”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161367</td>
<td>6”</td>
<td>1</td>
<td>1/4”</td>
<td>10 mm</td>
</tr>
<tr>
<td>161368</td>
<td>6”</td>
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<td>3/8”</td>
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<tr>
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<td>1/4”</td>
<td>10 mm</td>
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<tr>
<td>161368</td>
<td>12”</td>
<td>1</td>
<td>3/8”</td>
<td>10 mm</td>
</tr>
</tbody>
</table>

## Measuring Wheel Application Guide

<table>
<thead>
<tr>
<th>Knurled Faced</th>
<th>Rubber Faced</th>
<th>80 Urethane Faced*</th>
<th>90 Urethane Faced*</th>
<th>Rubber Insert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse Fabric</td>
<td>Fine Fabric</td>
<td>Soft Materials</td>
<td>Cardboard</td>
<td>Fine Fabric</td>
</tr>
<tr>
<td>Cloth Tape</td>
<td>Paper</td>
<td>Smooth Materials</td>
<td>Matting</td>
<td>Paper</td>
</tr>
<tr>
<td>Rubber</td>
<td>Metal (crease-free)</td>
<td>Sandpaper</td>
<td>Metal (crease-free)</td>
<td></td>
</tr>
<tr>
<td>Rough Wood</td>
<td>Film</td>
<td>Insulated Wire</td>
<td>Film</td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>Foil</td>
<td>Metal</td>
<td>Foil</td>
<td></td>
</tr>
<tr>
<td>Foam</td>
<td>Hard Plastic</td>
<td>Hard Plastic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation</td>
<td>Cable</td>
<td>Cable</td>
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## Measuring Wheel Dimensions

<table>
<thead>
<tr>
<th>Rim Facing</th>
<th>Circumference</th>
<th>(A) Rim Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knurled</td>
<td>12”</td>
<td>1”</td>
</tr>
<tr>
<td>Rubber</td>
<td>12”</td>
<td>1”</td>
</tr>
<tr>
<td>Grooved</td>
<td>12”</td>
<td>1/2”</td>
</tr>
<tr>
<td>90 Urethane</td>
<td>12”</td>
<td>0.70”</td>
</tr>
<tr>
<td>Rubber</td>
<td>12”</td>
<td>1/2”</td>
</tr>
<tr>
<td>Knurled</td>
<td>13 meter</td>
<td>5/8” or 1”</td>
</tr>
<tr>
<td>Rubber</td>
<td>13 meter</td>
<td>5/8” or 1”</td>
</tr>
</tbody>
</table>

## Temperature Specifications

<table>
<thead>
<tr>
<th>Rubber Faced</th>
<th>Urethane Faced</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40º F to +275º F</td>
<td>-40º F to +155º F</td>
</tr>
</tbody>
</table>

* 90 urethane is a more durable material and performs better for tracking rough or hard fibers than the slightly softer 80 urethane material. 65a urethane has replaced the rubber facing previously available on some measuring wheels. 65a urethane is the same consistency as rubber but provides a more durable surface. The above recommendations are only guidelines. Performance may vary depending on your application. Contact Customer Service for specification assistance.
Accu-Coder™ Quadrature Phasing and Index Gating Options

Standard Quadrature Phasing - A leads B during clockwise rotation when viewed from the shaft end or mounting face.

<table>
<thead>
<tr>
<th>If Your Model Is...</th>
<th>And your Output Type Is...</th>
<th>And You Need...</th>
<th>For Number of Channels Enter...</th>
<th>For Waveform See...</th>
</tr>
</thead>
<tbody>
<tr>
<td>15, 121, 260, 770, 771, 775, 776, 865T, or TR1</td>
<td>OC, PU, HV, PU, OD, or LO</td>
<td>Single channel only</td>
<td>A</td>
<td>Figure 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B</td>
<td>Q</td>
<td>Figure 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with 180° Index gated to A</td>
<td>R</td>
<td>Figure 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with 90° Index gated to A and B</td>
<td>R3</td>
<td>Figure 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with inverted 180° Index gated to A</td>
<td>R5</td>
<td>Figure 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with inverted 90° Index gated to A and B</td>
<td>R7</td>
<td>Figure 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If Your Model Is...</th>
<th>And your Output Type Is...</th>
<th>And You Need...</th>
<th>For Number of Channels Enter...</th>
<th>For Waveform See...</th>
</tr>
</thead>
<tbody>
<tr>
<td>755A, 702, 725, 758, 802S, or 858S</td>
<td>HV or PP</td>
<td>Quadrature A and B with 180° Index gated to A</td>
<td>R</td>
<td>Figure 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with 180° Index gated to B</td>
<td>R2</td>
<td>Figure 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with 90° Index gated to A and B</td>
<td>R3</td>
<td>Figure 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with ungated Index centered on A between 360° and 180°</td>
<td>R4</td>
<td>Figure 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with inverted 180° Index gated to A</td>
<td>R5</td>
<td>Figure 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with inverted 180° Index gated to B</td>
<td>R6</td>
<td>Figure 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with inverted 90° Index gated to A and B</td>
<td>R7</td>
<td>Figure 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with ungated inverted Index centered on A between 360° and 180°</td>
<td>R8</td>
<td>Figure 10</td>
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</table>

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<thead>
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<th>If Your Model Is...</th>
<th>And your Output Type Is...</th>
<th>And You Need...</th>
<th>For Number of Channels Enter...</th>
<th>For Waveform See...</th>
</tr>
</thead>
<tbody>
<tr>
<td>755A, 702, 725, 758, 802S, or 858S</td>
<td>OC or PU</td>
<td>Quadrature A and B with ungated Index centered on A low between 360° and 180°</td>
<td>R</td>
<td>Figure 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with 180° Index gated to B low</td>
<td>R2</td>
<td>Figure 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with 90° Index gated to A low and B low</td>
<td>R3</td>
<td>Figure 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with ungated Index centered on A low between 360° and 180°</td>
<td>R4</td>
<td>Figure 14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with inverted 180° Index gated to A low</td>
<td>R5</td>
<td>Figure 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quadrature A and B with inverted 180° Index gated to B low</td>
<td>R6</td>
<td>Figure 16</td>
</tr>
<tr>
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<td></td>
<td>Quadrature A and B with inverted 90° Index gated to A low and B low</td>
<td>R7</td>
<td>Figure 17</td>
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<tr>
<td></td>
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<td>Quadrature A and B with ungated inverted Index centered on A low between 360° and 180°</td>
<td>R8</td>
<td>Figure 18</td>
</tr>
</tbody>
</table>
### Accu-Coder™ Quadrature Phasing and Index Gating Options

Reverse Quadrature Phasing - B leads A during clockwise rotation when viewed from the shaft end or mounting face.

<table>
<thead>
<tr>
<th>If Your Model Is...</th>
<th>And your Output Type Is...</th>
<th>And You Need...</th>
<th>For Number of Channels Enter...</th>
<th>For Waveform See...</th>
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</thead>
<tbody>
<tr>
<td>15, 121, 260, 770, 771, 775, 776, 865Y, or TR1</td>
<td>OC, PU, HV, PU, OD, or LO</td>
<td>Reverse Quadrature A and B</td>
<td>K</td>
<td>Figure 19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with 180° Index gated to B low</td>
<td>D</td>
<td>Figure 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with 90° Index gated to A low and B low</td>
<td>D3</td>
<td>Figure 21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with inverted 180° Index gated to B low</td>
<td>D5</td>
<td>Figure 22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with inverted 90° Index gated to A low and B low</td>
<td>D7</td>
<td>Figure 23</td>
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</table>

<table>
<thead>
<tr>
<th>If Your Model Is...</th>
<th>And your Output Type Is...</th>
<th>And You Need...</th>
<th>For Number of Channels Enter...</th>
<th>For Waveform See...</th>
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<tbody>
<tr>
<td>755A, 702, 725, 758, 802S, or 858S</td>
<td>HV or PP</td>
<td>Reverse Quadrature A and B with 180° Index gated to B low</td>
<td>D</td>
<td>Figure 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with 180° Index gated to A low</td>
<td>D2</td>
<td>Figure 24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with 90° Index gated to A low and B low</td>
<td>D3</td>
<td>Figure 21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with ungated Index centered on B low between 360° and 180°</td>
<td>D4</td>
<td>Figure 25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with inverted 180° Index gated to B low</td>
<td>D5</td>
<td>Figure 22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with inverted 90° Index gated to A low and B low</td>
<td>D6</td>
<td>Figure 26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with ungated inverted Index centered on B low between 360° and 180°</td>
<td>D7</td>
<td>Figure 23</td>
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</table>

<table>
<thead>
<tr>
<th>If Your Model Is...</th>
<th>And your Output Type Is...</th>
<th>And You Need...</th>
<th>For Number of Channels Enter...</th>
<th>For Waveform See...</th>
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<tr>
<td>755A, 702, 725, 758, 802S, or 858S</td>
<td>OC or PU</td>
<td>Reverse Quadrature A and B with ungated Index centered on B low between 360° and 180°</td>
<td>D</td>
<td>Figure 28</td>
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<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with 180° Index gated to A low</td>
<td>D2</td>
<td>Figure 24</td>
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<tr>
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<td>Reverse Quadrature A and B with 90° Index gated to A low and B low</td>
<td>D3</td>
<td>Figure 21</td>
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<td>Reverse Quadrature A and B with ungated Index centered on B low between 360° and 180°</td>
<td>D4</td>
<td>Figure 25</td>
</tr>
<tr>
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<td>Reverse Quadrature A and B with inverted 180° Index gated to B low</td>
<td>D5</td>
<td>Figure 22</td>
</tr>
<tr>
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<td></td>
<td>Reverse Quadrature A and B with inverted 180° Index gated to A low</td>
<td>D6</td>
<td>Figure 26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with inverted 90° Index gated to A low and B low</td>
<td>D7</td>
<td>Figure 23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Quadrature A and B with ungated Index centered on B low between 360° and 180°</td>
<td>D8</td>
<td>Figure 27</td>
</tr>
</tbody>
</table>
Accu-Coder™ Waveform Diagrams

A

Channel A

Figure 1: Single channel only

Q

Channel A
Channel B

Figure 2: Quadrature A and B

R

Channel A
Channel B
Channel Z

Figure 3: Quadrature A and B with 180° Index gated to A

R3

Channel A
Channel B

Figure 4: Quadrature A and B with 90° Index gated to A and B

R5

Channel A
Channel B
Channel Z

Figure 5: Quadrature A and B with inverted 180° Index gated to A

R7

Channel A
Channel B
Channel Z

Figure 6: Quadrature A and B with inverted 90° Index gated to A and B

R2

Channel A
Channel B
Channel Z

Figure 7: Quadrature A and B with 180° Index gated to B

R4

Channel A
Channel B
Channel Z

Figure 8: Quadrature A and B with ungated Index centered on A between 360° and 180°

R6

Channel A
Channel B
Channel Z

Figure 9: Quadrature A and B with 180° Index gated to B

R8

Channel A
Channel B
Channel Z

Figure 10: Quadrature A and B with ungated Index centered on A between 360° and 180°

R

Channel A
Channel B
Channel Z

Figure 11: Quadrature A and B with ungated Index centered on A low between 360° and 180°

R2

Channel A
Channel B
Channel Z

Figure 12: Quadrature A and B with 180° Index gated to B low

R3

Channel A
Channel B
Channel Z

Figure 13: Quadrature A and B with 90° Index gated to A low and B low

R5

Channel A
Channel B
Channel Z

Figure 15: Quadrature A and B with inverted 180° Index gated to A low

R5

Channel A
Channel B
Channel Z

Figure 15: Quadrature A and B with inverted 180° Index gated to A low

R6

Channel A
Channel B
Channel Z

Figure 16: Quadrature A and B with inverted 180° Index gated to B low
Accu-Coder™ Waveform Diagrams

Call Sales/Customer Service at 800-366-5412
EPC is open for business from
8:00 a.m. to 7:30 p.m. Eastern Time
(5:00 a.m. to 4:30 p.m. Pacific Time)
Ordering/Repairs/Technical Support

Our Technical Support professionals are available to assist you in your application needs - whether its selecting the right encoder for your application, troubleshooting a new installation, or connecting your new encoder to your motion control system.

Encoder Products Company understands the importance of time when you have a machine down. Through its free Cross Reference and Retrofit Service, and thanks to a thorough library of specifications and dimensional information for a wide range of competitive encoders, EPC offers expert assistance for the cross-referencing and/or retrofit replacement of most domestic and foreign optical rotary encoders. In addition, serviceable replacements can often be found for encoders that use other technologies. As a final service, for those hard to find units, EPC can often suggest an alternative approach that will get you back up and running. We have provided an Expert Cross-Reference Service page on our website. It provides you with part numbers of competitors encoders, and compares them with Accu-Coder™ encoders, so that you can begin the cross-referencing process.

Each Accu-Coder™ manufactured by Encoder Products Company is backed by our best-in-the-industry three year warranty. If you experience a problem, call our trained professionals. We can often troubleshoot a problem over the phone and determine if a repair is needed. If its necessary to return the encoder for repair, our technicians will perform a complete evaluation and recommend a course of action. In an emergency situation our technicians can often have your evaluation and repair completed, and ready for return shipment, within a matter of hours after receiving your encoder.

If your application calls for a solution that cannot be solved using off-the-shelf-products, EPC’s Custom Design Service may be just what you need. A simple phone call to Customer Service will put our expertise to work for you.

Part Numbering
Accu-Coder™ part numbers are found on the model Datasheet located at www.encoder.com. Use the appropriate Ordering Guide for your particular model. It is important to specify the complete part number. If you are reordering, the serial number of the unit being replaced will help speed the ordering process. Ordering with incomplete information may delay product delivery. In addition, Encoder Products Company cannot assume responsibility for errors when a part number is incomplete. If you need help creating a part number, contact Customer Service. Encoder Products Company has distributors across the United States and Canada. Call 800-366-5412 and ask a Customer Service Representative for a distributor in your area.

Lead Time
Standard lead time is 4 to 6 business days. Expedite Service is available upon request. Accessories are generally in stock and available for quick delivery. Contact Customer Service to confirm lead times. Single-piece orders for many of our products can ship the next business day without an expedite charge. Contact Customer Service for details.

Expedited Service
One, two, and three working day expedited service is available upon request through authorized distributors. Contact Customer Service for applicable expedite charges. Expedited service is done on a “best efforts” basis. In some cases a part shortage or other unforeseen factor may cause an expedited order to ship late. In such a case, the expedite charge is prorated.

Telephone Orders
All telephone orders must be confirmed by mail or fax. Please be sure the order is clearly marked “confirmation”. Please check your purchase order against the acknowledgment that Encoder Products Company faxes to you. To ensure accuracy, a Customer Service Representative will check your confirmation against your order.

Change Orders
To change an order, ask for a Customer Service Representative. For faster service, either have your purchase order number or Encoder Products Company’s sales order number available. Service charges are assessed for some changes, including order cancellations. Contact Customer Service to determine applicable charges.

Orders will be shipped out by UPS or Federal Express. All shipments are F.O.B. factory. If you are a new OEM account or have a new OEM application, consignment or evaluation units may be available for up to 60 days. Contact Customer Service for complete details.
Warranty/Returns/Repairs

Warranty Policy
Products manufactured by Encoder Products Co., Inc. (EPC International, Inc.), are warranted against defects in materials and workmanship, and are warranted to meet the performance specifications as listed in the current catalog and/or data sheet for the specific product being warranted. This warranty applies to all standard catalog product configurations, with the exception of units with a rated operating temperature exceeding 70° C, for three (3) years following the date of shipment. For units with a rated operating temperature exceeding 70° C the warranty period shall be two (2) years following the date of shipment. During that period, EPC will, at its sole option, repair or replace, at no cost to the customer, products which prove to be defective, provided the defect or failure is not due to misuse or abuse of the product. Any unauthorized attempt to repair the product(s) by the customer, or any unauthorized modifications by the customer, can, at EPC’s sole option, cause this warranty to become null and void. In addition, this warranty does not apply to products that have been subjected to abuse or operated in environments that exceed their design specifications. The customer is responsible for shipment of the defective product to the EPC factory. Software products are supplied on a site license basis subject to the same performance warranty provisions; the materials and workmanship provision applies to the distribution media only. NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION IS EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO WARRANTY FOR MERCHANTABILITY OR FOR FITNESS OF PURPOSE. EPC SHALL, IN NO CASE, BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER. NOTWITHSTANDING, IN ANY CASE, EPC’S LIABILITY SHALL BE LIMITED TO REPAIR, REPLACEMENT, OR PURCHASE PRICE REFUND, AT ITS SOLE OPTION, ONLY AFTER THE RETURN OF SUCH GOODS WITH CONSENT IN ACCORDANCE WITH THE RETURN POLICY AND WITH SHIPPING CHARGES PREPAID. ANY WARRANTY SERVICE (CONSISTING OF TIME, TRAVEL, AND EXPENSES RELATED TO SUCH SERVICES) PERFORMED OTHER THAN AT ENCODER PRODUCTS COMPANY’S FACTORY, SHALL BE AT CUSTOMERS EXPENSE.

Return Policy
Only products currently stocked by Encoder Products Company may be returned for restocking. Products which have been manufactured or configured to customer specifications are not stocked and may not be returned. Returned products are subject to a restocking fee of $25 or 25% of the purchase price, whichever is greater, and must be returned within 30 days of the date shipped from Encoder Products Company.

All products being returned must be 100% complete and must be packaged in ORIGINAL PACKAGING. All packaging materials, manuals, other accessories and documentation must be included in the original packaging. Items sent for return consideration will be denied and Encoder Products Company’s return policy will not be honored, in the event that a return shipment is received by us improperly packaged, altered, or physically damaged. All items will be inspected and tested upon receipt.

A Return Materials Authorization (RMA) number is required for any item returned for credit. Returns should be sent to our Repair Department. RMA numbers may be obtained by contacting Customer Service in advance. RMA numbers will be issued to original purchaser only.

Repair Services
Each Accu-Coder™ manufactured by Encoder Products Company is backed by our best-in-the-industry three year warranty. If you experience a problem, call our trained professionals. We can often troubleshoot a problem over the phone and determine if a repair is needed. If its necessary to return the encoder for repair, our technicians will perform a complete evaluation and recommend a course of action. In an emergency situation our technicians can often have your evaluation and repair completed, and ready for return shipment, within a matter of hours after receiving your encoder.
The CE Mark Option

Please read carefully before choosing CE option.

The CE (Conformite European) mark indicates that a product complies with the European Union (EU) directives, and will affect you only if your system is to be sold in Europe. CE does not describe the quality of a product, only that it complies with relevant EU directives and can be incorporated into systems sold in the European market.

Select encoder Series manufactured by Encoder Products Company (EPC) are tested in accordance with harmonized standards to meet specific noise immunity and emission requirements for an industrial environment, so as to comply with European directives. These tests ensure that, when you order CE certified encoders from Encoder Products Company, they will operate without disturbing other equipment and without being disturbed themselves. Testing for CE certification is performed on encoders with 6 feet of cable or standard body mount connectors. These testing limitations should be taken into consideration any time the CE mark is ordered in combination with non-standard connectors or cable lengths in excess of 6 feet.

It should be understood that CE wiring techniques may cause severe ground loops if used with systems other than CE certified systems. Therefore, we strongly suggest that the CE encoder option only be used with CE wired systems, or in situations where the user has a clear understanding of the CE requirements. For markets other than the EU, Encoder Products Company maintains the strictest tests to ensure that non-CE units are shielded and grounded against electromagnetic phenomenon.
When the electrical signals are generated by an EPC Accu-Coder™ encoder, they are electrically “clean” in the sense of being noise free. However, due to a number of factors, these signals can be degraded by the time they reach their intended destination. Environmental factors, such as radiated and induced electrical noise, can introduce signal distortions. In addition, system design factors, such as cable capacitance (especially over long cable runs), impedance mismatches, poor cable quality, inadequate shielding, poor grounding, and poor cable termination can all contribute to signal loss and distortion.

**Cable Considerations**

All cables have small amounts of capacitance between adjacent conductors. The amount of capacitance present is a direct function of the cable’s length. As capacitance increases, it tends to round off the leading edge of the square wave signal, decreasing rise times. It can also distort the signal to the extent that errors are caused in the system. Signal distortion is not usually significant for lengths less than 30 ft (or 1000 picofarads). To minimize the distortion, a low capacitance cable (less than 35 picofarads per foot) is recommended. Cable lengths should also be as short as possible.

If it is necessary for the cable length to exceed 30 feet, the use of a Line Driver output (output option HV or H5 in the Ordering Guide) along with differential type receiver circuitry is strongly recommended. A low capacitance twisted-shielded pair cable should be used whenever using differential signals with cable lengths in excess of 30 ft. Contact Customer Service for additional information. For high frequency applications (>200kHz), this type of cable may be needed for all lengths. EPC’s standard cable has a braided and foil shield, but it is not twisted-shielded pair cable. Therefore, for high frequency applications, it is highly recommended that the user terminate the standard cable just outside the encoder, and then run a low capacitance twisted-shielded pair cable the remaining distance.

Proper cable termination is also extremely important with differential signals. You can try a simple, non-terminated configuration first. However, keep in mind that signal reflections may occur, resulting in severely distorted waveforms. For this type of signal distortion, parallel termination is recommended, which involves placing a resistor across the differential lines at the far (receiver) end of the line. This resistor should be approximately equivalent to, or up to 10% greater than, the characteristic impedance of the cable (Zo) [usually between 70-150 ohms]. This permits higher frequencies to be transmitted without significant distortion. Unfortunately, low valued resistors can increase the power dissipated by the Line Driver, and reduce the output signal level. In this case, a capacitor should be placed in series with the resistor. The capacitor value should be equal to the round trip delay of the cable divided by the cables Zo. Round trip delay is equal to the cable length multiplied by 1.7 ns/ft. (Note that the RC time constant of this type of termination can reduce the system frequency response.)

A parallel termination resistor of a larger value than given above can often provide adequate reduction of signal reflections, and still maintain adequate frequency response with low power dissipation. Experimentation in an application consisting of long cable runs will usually result in the best balance of all of these factors.

**Grounding Considerations**

A common cause of signal distortion in systems is poor grounding. The following tips will help eliminate distortions due to grounding:

1. It is extremely important that cable shields are connected to the receiver/instrument (counter, PLC, etc.) ground.
2. Always make sure the motor/machine for which the encoder is mounted is properly grounded.
3. The encoder case should also be grounded with the following conditions:
   a. DO NOT ground the encoder case through both the motor/machine and the cable wiring.
   b. DO NOT allow the encoder cable wiring to ground the motor/machine exclusively. High motor/machine ground currents could flow through the encoder wiring, potentially damaging the encoder and associated equipment.
Glossary

**Accuracy**
Related to the incremental encoding disk. It is the difference between the theoretical position of one increment or bit edge and the actual position of the edge.

**Axial Loading**
The force applied to a shaft end surface directed along the axis of rotation.

**Axial Load (maximum)**
Maximum axial load is the maximum force that may be applied to the shaft without reducing the rated operating life or causing deviation from the rated performance.

**Bi-directional**
Bi-directional refers to an encoder output code format from which direction of travel can be determined.

**CE (Conformite European or European Compliance)**
Sets essential electromagnetic compatibility, within the European markets, for all electrical and electronic equipment that may interfere with other equipment, or that may be interfered by other equipment.

**Channel**
Each channel is a unique incremental output of the encoder.

**Current Sinking Output**
A logic form that requires current flow out of the input of the PLC or counter and back to the output of the encoder. The encoder “sinks” this current, which is “sourced” by the input circuitry. This is the most common output circuit configuration. It uses an NPN output transistor in the encoder.

**Current Sourcing Output**
A logic form that requires current flow from the output of the encoder to the input of the counter or PLC. The encoder “sources” the current and the input circuitry of the counter or PLC “sinks” this current. This output circuit is seldom used. It usually requires a PNP output transistor in the encoder.

**Cycles Per Revolution**
Called CPR. The number of increments on the disk of an incremental encoder. A one thousand increment encoder has a CPR of 1000.

**Differential Output**
Differential output refers to the complementary outputs from a feedback device when the signals are excited by a Line Driver. Optimum performance is achieved when the receiver input impedance is matched to the input circuitry of the counter or PLC “sinks” this current. This output circuit is seldom used. It usually requires a PNP output transistor in the encoder.

**Disc**
Typically made of glass, metal or plastic with precise position incremental lines. These lines are also known as increments. The number of increments determines the resolution or CPR of the encoder.

**Encoder (shaft type)**
An encoder is an electro-mechanical device that translates mechanical motion (such as position, velocity, acceleration, speed, direction) into electrical signals.

**Frequency Response**
The maximum frequency in cycles per second.

**Incremental Encoder**
An incremental encoder is a device that provides a series of periodic signals due to mechanical motion. The number of successive cycles corresponds to the resolvable mechanical increments of motion.

**Index Reference**
The index is a separate output generated by a special track which produces a single cycle (or transition change) at a unique position or position such as center, home, zero, or reset point. Sometimes referred to as a marker pulse.

**IP50**
Protected against dust. Limited ingress (no harmful deposit).

**IP64**
Totally protected against dust. Protected against water sprayed from all directions. Limited ingress permitted.

**IP65**
Totally protected against dust. Protected against low pressure jets of water from all directions. Limited ingress permitted.

**IP66**
Totally protected against dust. Protected against strong jets of water. Limited ingress permitted.

**Line Driver**
A circuit that provides error-free output pulses in electrically noisy environments or over long transmission lines when used with a line receiver.

**Negative Going Pulse**
When activated, the pulse goes low (logic 0) or in a negative direction. Do not be confused by “negative going” meaning the pulse goes negative in relationship to the signal common or reference level. These statements are for “positive logic” only. All shaft encoders are based on positive logic.

**NEMA 4**
Enclosure rating intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; undamaged by the formation of ice on the enclosure.

**NEMA 13**
Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil and non-corrosive coolants.

**Open Collector Output**
When the signal is taken directly off the collector element of the output transistor, no Pull-Up is used. This is the electronic equivalent of a mechanical switch closure to common. The input device of the PLC or counter is effectively placed in a series circuit that includes the output transistor and input device, which is often an opto isolator and the positive voltage supply. When the output transistor turns on, the circuit is completed and current will flow. The output signal cannot be observed unless the circuit is completed externally.

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A circuit that provides error-free output pulses in electrically noisy environments or over long transmission lines when used with a line receiver.

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Positive Going Pulse
In the low or logic 0 state, it is in the quiescent state. It goes high or logic 1 when activated. This is a transition in the “positive going” direction.

Pulses Per Revolution
Number of pulses occurring in one revolution of the encoder shaft.

Pulse Polarity
Either positive going or negative going. A pulse has two logic states: activated or inactivated. These two states are opposite. When the pulse is in its quiescent state (high or low), it is at one particular logic level (1 or 0). When the pulse hits or is in the activated state, this logic level reverses itself for the duration of the pulse.

Pulse Width
The actual real time between the leading and trailing edge of a pulse. The pulse width of the output signal of most encoders is a 50% duty cycle on the clock outputs. Some models utilize a timed or “one shot” output. This provides a constant pulse width irrespective of the pulse repetition rate or shaft speed. The factors to be considered when determining pulse width specifications are: (1.) What is the minimum pulse width requirement of the counter or PLC? This information is available in the counter or PLC specifications. (2.) Pulse repetition rate versus pulse width. With a constant pulse width, the individual pulses become closer together as the pulse repetition rate or shaft speed increases. At some point the pulses will overlap and the output signal as a series of well defined pulses ceases. The pulse repetition rate varies inversely with the pulse width and vice versa.

Pull-Up Resistor
When added inside the encoder between the positive voltage and the collector element of the output transistor, it becomes a “pull-up” circuit. This is also know as a pulse output.

Push-Pull Output
An output circuit that will both sink and source current.

Quadrature
A dual output encoder used for bi-directional motion control. One channel leads the other by 90° electrical. By monitoring the phase shift of both channel A and B, direction can be determined. Another benefit of a quadrature encoder is count multiplication. With an appropriate counter, resolution can be multiplied up to four times. For instance, using this technique an encoder with CPR of 1000 can provide a resolution of up to 4000 pulses per shaft revolution.

Quadrature Error
Quadrature error is the phase error when the specified phase relationship between two channels is nominally 90° electrical.

Radial Load
The force applied at a specific point to the encoder shaft perpendicular to the axis of rotation.

Radial Load (maximum)
The maximum force that may be applied perpendicularly to the shaft without reducing the rated operating life or causing deviation from the rated performance.

Resolution
The number of increments on the encoder disk. For incremental encoders, resolution is defined as cycles per revolution.

Shaft Runout
Amount of shaft movement while spinning.

Single Channel
A single channel encoder produces one incremental output. They are often used for tachometry applications.

Torque (running)
Running torque is the rotary force required to keep an encoder shaft turning. It is typically expressed in oz-in.

Torque, Starting (breakaway)
Starting (breakaway) torque is the rotary force required to overcome static friction and cause the encoder shaft to begin rotating.

Unidirectional
Unidirectional refers to an encoder output code format from which direction of travel cannot be determined.

Technical Information
This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123 www.barr-thorp.com
No Matter What Information You Need, You Can Find It At www.encoder.com