

# Medium Duty Absolute Encoders (Metric Dimension Encoders)

## TRD-NA series

### Features

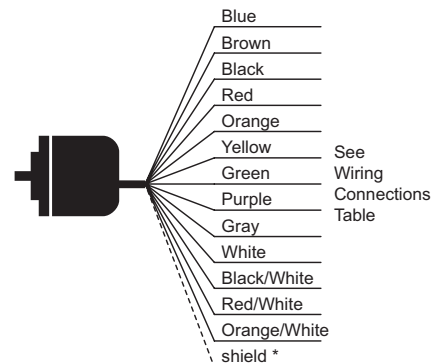
Why use an absolute encoder?

Absolute encoders provide their exact position at all times, allowing monitoring equipment to read the correct position, even when power cycles. Features include:

- Small body with 50mm diameter and 35mm depth
- Splash proof (IP65 rating)
- 8mm solid shaft
- Absolute resolution available from 32 pulses per revolution to 2048 pulses per revolution
- Open collector output
- Up to 20kHz response frequency



**Standard shaft (TRD-NA) model**



| Absolute Medium Duty Solid Shaft Encoders |          |                                              |               |                    |           |
|-------------------------------------------|----------|----------------------------------------------|---------------|--------------------|-----------|
| Part Number                               | Price    | Resolution                                   | Input Voltage | Output             | Body Dia. |
| <a href="#"><u>TRD-NA32NWD</u></a>        | \$366.00 | 5 bit gray code, 32 pulses per revolution    | 10-26 VDC     | NPN open collector | 50 mm     |
| <a href="#"><u>TRD-NA64NWD</u></a>        | \$366.00 | 6 bit gray code, 64 pulses per revolution    |               |                    |           |
| <a href="#"><u>TRD-NA128NWD</u></a>       | \$366.00 | 7 bit gray code, 128 pulses per revolution   |               |                    |           |
| <a href="#"><u>TRD-NA180NWD</u></a>       | \$366.00 | 8 bit gray code, 180 pulses per revolution   |               |                    |           |
| <a href="#"><u>TRD-NA256NWD</u></a>       | \$366.00 | 8 bit gray code, 256 pulses per revolution   |               |                    |           |
| <a href="#"><u>TRD-NA360NWD</u></a>       | \$366.00 | 9 bit gray code, 360 pulses per revolution   |               |                    |           |
| <a href="#"><u>TRD-NA512NWD</u></a>       | \$366.00 | 9 bit gray code, 512 pulses per revolution   |               |                    |           |
| <a href="#"><u>TRD-NA720NWD</u></a>       | \$366.00 | 10 bit gray code, 720 pulses per revolution  |               |                    |           |
| <a href="#"><u>TRD-NA1024NWD</u></a>      | \$366.00 | 10 bit gray code, 1024 pulses per revolution |               |                    |           |
| <a href="#"><u>TRD-NA2048NWD</u></a>      | \$366.00 | 11 bit gray code, 2048 pulses per revolution |               |                    |           |

| Wiring Connections                                                                                                                                                                                                                                                    |                   |                      |                    |                    |                    |                    |                    |                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Wire color                                                                                                                                                                                                                                                            | Connector Pin No. | Resolution           |                    |                    |                    |                    |                    |                    |
|                                                                                                                                                                                                                                                                       |                   | 2048                 | 1024 / 720         | 512 / 360          | 256 / 180          | 128                | 64                 | 32                 |
| Blue                                                                                                                                                                                                                                                                  | 1                 | 0V                   |                    |                    |                    |                    |                    |                    |
| Brown                                                                                                                                                                                                                                                                 | 2                 | 12/24V               |                    |                    |                    |                    |                    |                    |
| Black                                                                                                                                                                                                                                                                 | 3                 | bit 0 (20) *         | bit 0 (20) *       | no connection      |                    |                    |                    |                    |
| Red                                                                                                                                                                                                                                                                   | 4                 | bit 1 (21) *         | bit 1 (21) *       | bit 0 (20) *       | no connection      |                    |                    |                    |
| Orange                                                                                                                                                                                                                                                                | 5                 | bit 2 (22) *         | bit 2 (22) *       | bit 1 (21) *       | bit 0 (20) *       | no connection      |                    |                    |
| Yellow                                                                                                                                                                                                                                                                | 6                 | bit 3 (23) *         | bit 3 (23) *       | bit 2 (22) *       | bit 1 (21) *       | bit 0 (20) *       | no connection      |                    |
| Green                                                                                                                                                                                                                                                                 | 7                 | bit 4 (24) *         | bit 4 (24) *       | bit 3 (23) *       | bit 2 (22) *       | bit 1 (21) *       | bit 0 (20) *       | no connection      |
| Purple                                                                                                                                                                                                                                                                | 8                 | bit 5 (25) *         | bit 5 (25) *       | bit 4 (24) *       | bit 3 (23) *       | bit 2 (22) *       | bit 1 (21) *       | bit 0 (20) *       |
| Gray                                                                                                                                                                                                                                                                  | 9                 | bit 6 (26) *         | bit 6 (26) *       | bit 5 (25) *       | bit 4 (24) *       | bit 3 (23) *       | bit 2 (22) *       | bit 1 (21) *       |
| White                                                                                                                                                                                                                                                                 | 10                | bit 7 (27) *         | bit 7 (27) *       | bit 6 (26) *       | bit 5 (25) *       | bit 4 (24) *       | bit 3 (23) *       | bit 2 (22) *       |
| Black / White                                                                                                                                                                                                                                                         | 11                | bit 8 (28) *         | bit 8 (28) *       | bit 7 (27) *       | bit 6 (26) *       | bit 5 (25) *       | bit 4 (24) *       | bit 3 (23) *       |
| Red / White                                                                                                                                                                                                                                                           | 12                | bit 9 (29) *         | bit 9 (29) * (MSB) | bit 8 (28) * (MSB) | bit 7 (27) * (MSB) | bit 6 (26) * (MSB) | bit 5 (25) * (MSB) | bit 4 (24) * (MSB) |
| Orange / White                                                                                                                                                                                                                                                        | 13                | bit 10 (210) * (MSB) | no connection      |                    |                    |                    |                    |                    |
| Shield                                                                                                                                                                                                                                                                | —                 | GND **               |                    |                    |                    |                    |                    |                    |
| * Numbers in parentheses ( ) are the bits corresponding to binary code.<br>** GND (cable shield) is not connected to encoder body;<br>the enclosure is grounded through the 0VDC line.<br>Note: Numbers in parentheses ( ) are the bits corresponding to binary code. |                   |                      |                    |                    |                    |                    |                    |                    |

# Medium Duty Absolute Encoders (Metric Dimension Encoders)

## Specifications – TRD-NA series

| Electrical Specifications           |                                                                                                                     |                                                                                                                                                                |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model                               |                                                                                                                     | TRD-NAxxx-NWD                                                                                                                                                  |
| Power Supply                        | Operating Voltage *                                                                                                 | 12–24 VDC (nominal) *<br>Range: 10.8–26.4 VDC                                                                                                                  |
|                                     | Allowable Ripple                                                                                                    | 3% rms max.                                                                                                                                                    |
|                                     | Current Consumption                                                                                                 | 70mA max.                                                                                                                                                      |
| Output Code                         |                                                                                                                     | Gray binary (38 gray codes at 180 resolution, 76 at 360 resolution, and 152 at 720 resolution)                                                                 |
| Max. Response Frequency             |                                                                                                                     | 20kHz (Maximum revolution speed = (max. response frequency / resolution) x 60).<br>(The encoder does not respond to revolution faster than the maximum speed.) |
| Accuracy                            |                                                                                                                     | $\frac{360}{\text{Resolution}} = \text{degree of accuracy}$                                                                                                    |
| Direction of Rotation               |                                                                                                                     | Normal (CW) or reversed (CCW) (When viewed from the shaft, CW is clockwise direction, and CCW is counterclockwise direction)                                   |
| Rise/Fall Time                      |                                                                                                                     | 2μs max. (at 1kW load resistance and when cable length is 2m or less)                                                                                          |
| Output                              | Output Type                                                                                                         | NPN open collector                                                                                                                                             |
|                                     | Output Logic                                                                                                        | Negative logic (active low)                                                                                                                                    |
|                                     | Sinking Current                                                                                                     | 32mA max.                                                                                                                                                      |
|                                     | Residual Voltage                                                                                                    | 16mA or less: 0.4 V max.<br>16mA → 32mA: 1.5 V max.                                                                                                            |
|                                     | Load Power Voltage                                                                                                  | 35VDC max.                                                                                                                                                     |
| * To be supplied by Class II source |                                                                                                                     |                                                                                                                                                                |
| Mechanical Specifications           |                                                                                                                     |                                                                                                                                                                |
| Starting Torque                     | 0.03 N·m [0.02 lb·ft]                                                                                               |                                                                                                                                                                |
| Max. Allowable Shaft Load           | Radial: 50N [11.24 lbs] ; Axial: 30N [6.74 lbs]                                                                     |                                                                                                                                                                |
| Max. Allowable Speed                | Continuous: 3000 rpm, instantaneous: 5000 rpm; (highest speed that can support the mechanical integrity of encoder) |                                                                                                                                                                |
| Wire Size                           | 26 AWG                                                                                                              |                                                                                                                                                                |
| Weight                              | Approx. 300g (10.58 oz) with 2m cable                                                                               |                                                                                                                                                                |
| Environmental Specifications        |                                                                                                                     |                                                                                                                                                                |
| Ambient Temperature                 | -10 to 60 °C [-14 to 140 °F]                                                                                        |                                                                                                                                                                |
| Storage Temperature                 | -25 to 85 °C [-13 to 185 °F]                                                                                        |                                                                                                                                                                |
| Operating Humidity                  | 25–85% RH (with no condensation)                                                                                    |                                                                                                                                                                |
| Insulation Resistance               | 10MΩ min.                                                                                                           |                                                                                                                                                                |
| Vibration Resistance                | Durable for one hour along three axes at 10 to 55 Hz with 0.75 mm amplitude                                         |                                                                                                                                                                |
| Shock Resistance                    | 11ms with 980m/s <sup>2</sup> applied three times along three axes                                                  |                                                                                                                                                                |
| Mounting Orientation                | Can be mounted in any orientation                                                                                   |                                                                                                                                                                |
| Protection                          | IP65                                                                                                                |                                                                                                                                                                |
| Agency Approvals                    | cUL <sub>US</sub> (E189395)                                                                                         |                                                                                                                                                                |

## Accessories

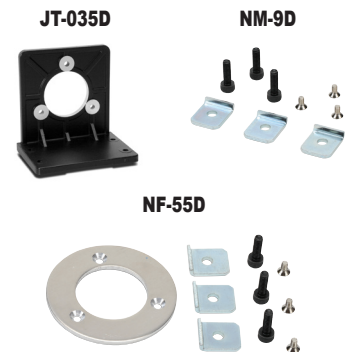
### Couplings

For encoders with a solid shaft, please select a coupling that fits your encoder. All couplings are typically in stock, ready to ship.

See the “Encoder Couplings” section for more information.

### Mounting Bracket & Clamps

| Mounting Accessories                                                                                      |         |                                                                                                   |
|-----------------------------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------|
| Part #                                                                                                    | Price   | Description                                                                                       |
| <a href="#"><u>JT-035D</u></a>                                                                            | \$18.00 | Mounting Bracket: Metal; for use with all TRD-N/NH/NA encoders                                    |
| <a href="#"><u>NM-9D*</u></a>                                                                             | \$8.00  | Mounting Clamp: Metal; for use with all TRD-N/NA encoders *                                       |
| <a href="#"><u>NF-55D*</u></a>                                                                            | \$20.00 | Mounting Flange Kit: includes aluminum flange & NM-9D clamp; for use with all TRD-N/NA encoders * |
| * Order NF-55D (flange & clamp) for new installations.<br>Order NM-9D (clamp) for replacement parts only. |         |                                                                                                   |

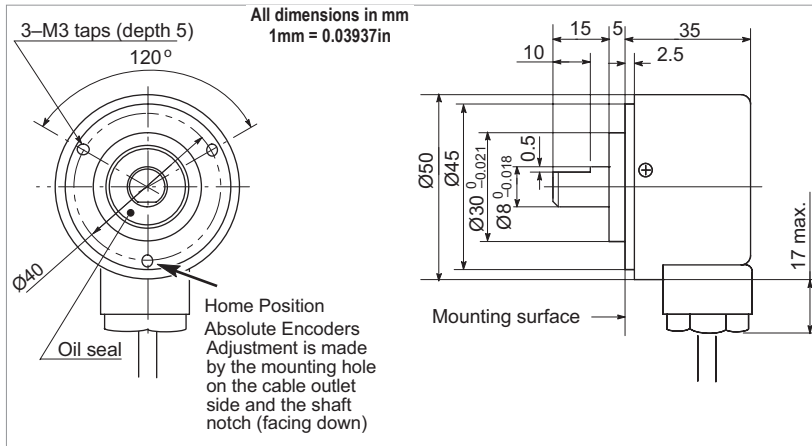


# Medium Duty Absolute and Incremental Encoders (Metric Dimension Encoders)

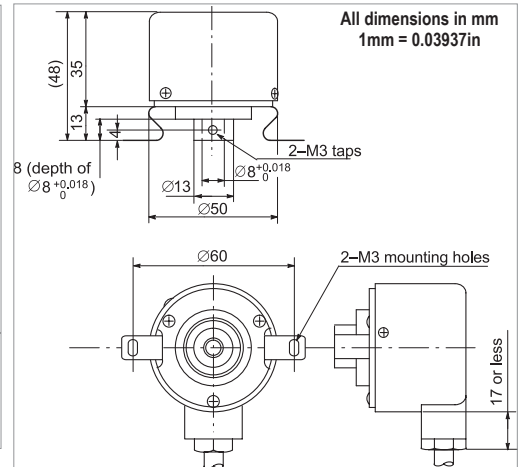
## Dimensions – TRD-N(H) & TRD-NA series

The following are the external dimensions of both incremental and absolute medium duty encoders and optional mounting accessories.

### Solid Shaft Incremental and Absolute Encoders (TRD-N, TRD-NA)



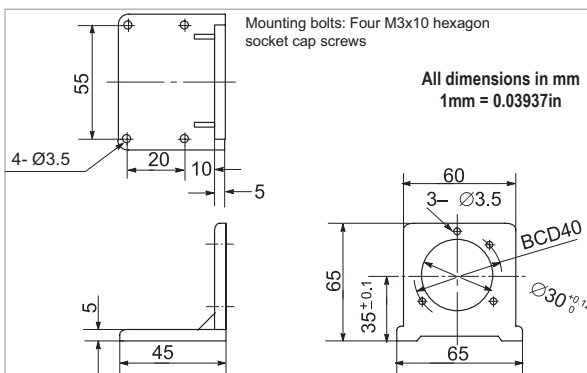
### Hollow Shaft Incremental Encoders only (TRD-NH)



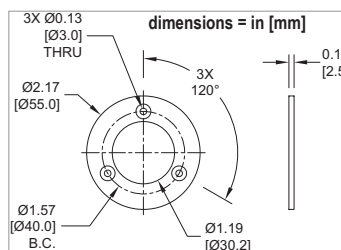
### Optional Mounting Flange and Brackets for Medium Duty Encoders

NOTE: NF-55D flange & included NM-9D bracket: Requires (3) M4 x 0.7 tapped holes equally spaced on a 64mm bolt circle in the mounting surface.

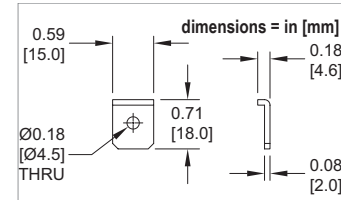
#### JT-035D (bracket)



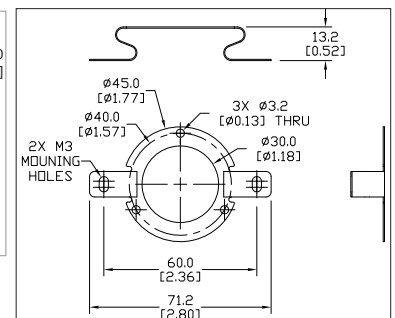
#### NF-55D (flange)



#### NM-9D (clamp)(included with NF-55D)



#### TRD-NH-BKT (bracket)

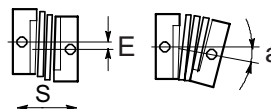


# Encoder Accessories – Couplings

## Encoder Couplings

Couplings provide a connection between solid-shaft encoders and solid shafts. We offer aluminum, fiberglass, and polymer couplings for metric, S.A.E. and metric-to-S.A.E. applications.

### Misalignment compensation



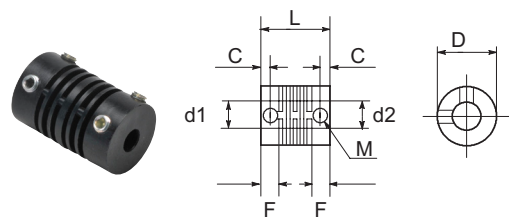
| Couplings Selection Guide and Dimensions |                                    |         |                                         |                |           |             |             |            |             |              |      |             |              |                |                    |                                        |
|------------------------------------------|------------------------------------|---------|-----------------------------------------|----------------|-----------|-------------|-------------|------------|-------------|--------------|------|-------------|--------------|----------------|--------------------|----------------------------------------|
| Type                                     | Part Number                        | Price   | Applicable Encoders (shaft size)        | Shaft Diameter |           | D           | L           | F          | C           | M            | a    | E           | S            | Working Torque | Torsional Rigidity | Material                               |
|                                          |                                    |         |                                         | d1             | d2        |             |             |            |             |              | max  |             |              |                |                    |                                        |
|                                          |                                    |         |                                         |                |           | ( mm [in] ) |             |            | ( mm [in] ) |              |      | ( N·m)      |              |                |                    |                                        |
| Fiberglass (metric)                      | <a href="#">GJ-4D</a>              | \$12.00 | TRD-MX (4mm)                            | 4mm            | 4mm       | 13 [0.51]   | 21 [0.83]   | 5.3 [0.21] | 3 [0.12]    | M3 set screw | 5°   | 0.4 [0.02]  | 0.4 [0.02]   | 0.6 N·m        | 6 N·m/rad          | Glass-fiber reinforced resin           |
|                                          | <a href="#">GJ-6D</a>              | \$9.25  | TRD-S/SR (6mm)                          | 6mm            | 6mm       | 15 [0.59]   | 22 [0.87]   | 5.2 [0.20] | 3 [0.12]    | M3 set screw | 6°   | 0.5 [0.02]  | 0.12 [0.005] | 0.8 N·m        | 10 N·m/rad         |                                        |
|                                          | <a href="#">GJ-8D</a>              | \$11.00 | TRD-N/NA (8mm)                          | 8mm            | 8mm       | 19 [0.75]   | 24 [0.94]   | 6.8 [0.27] | 3.5 [0.14]  | M4 set screw | 5°   | 0.5 [0.02]  | 0.4 [0.016]  | 1.5 N·m        | 20 N·m/rad         |                                        |
|                                          | <a href="#">GJ-10D</a>             | \$12.00 | TRD-GK (10 mm)                          | 10 mm          | 10 mm     | 22 [0.87]   | 26 [1.02]   | 7.1 [0.28] | 4 [0.16]    | M4 set screw | 5°   | 0.5 [0.02]  | 0.12 [0.005] | 2.0 N·m        | 32 N·m/rad         |                                        |
| Fiberglass (SAE)                         | <a href="#">GJ-635D</a>            | \$22.00 | TRDA-2E (0.25 in)                       | 0.25 in        | 0.25 in   | 15 [0.59]   | 22 [0.87]   | 5.2 [0.20] | 3 [0.12]    | M3 set screw | 5°   | 0.5 [0.02]  | 0.12 [0.005] | 0.8 N·m        | 10 N·m/rad         | Glass-fiber reinforced resin           |
|                                          | <a href="#">GJK-953D</a>           | \$27.00 | TRDA-20/25 (0.375 in)                   | 0.375 in       | 0.375 in  | 25 [0.98]   | 32 [1.26]   | 7.3 [0.29] | 3.5 [0.14]  | M4 set screw | 5°   | 0.5 [0.02]  | 0.12 [0.005] | 2.0 N·m        | 32 N·m/rad         |                                        |
| Polymer (SAE)                            | <a href="#">STP-MTRA-SC-1412</a>   | \$30.00 | TRDA-2E (0.25 in)                       | 0.25 in        | 0.50 in   | 25 [0.98]   | 38 [1.50]   | 9.9 [0.39] | 5.4 [0.21]  | M3 cap screw | 5°   | 0.3 [0.01]  | 0.12 [0.005] | 3.7 N·m        | 0.36 °/lb·in       | Engineered polymer                     |
|                                          | <a href="#">STP-MTRA-SC-3812</a>   | \$30.00 | TRDA-20/25 (0.375 in)                   | 0.375 in       | 0.50 in   | 25 [0.98]   | 38 [1.50]   | 9.9 [0.39] | 5.4 [0.21]  | M3 cap screw | 5°   | 0.3 [0.01]  | 0.12 [0.005] | 3.7 N·m        | 0.36 °/lb·in       |                                        |
| Aluminum (metric)                        | <a href="#">ARM-075-5-4D</a>       | \$51.50 | TRD-MX (4mm)                            | 4mm            | 5mm       | 19.1 [0.75] | 19.1 [0.75] | 4.6 [0.18] | 2.4 [0.09]  | M3 set screw | 5°   | 0.25 [0.01] | 0.25 [0.01]  | 2.3 N·m        | 8.2 N·m/rad        | Aluminum alloy                         |
|                                          | <a href="#">RU-075D</a>            | \$58.00 | TRD-S/SR (6mm)                          | 6mm            | 6mm       | 19.1 [0.75] | 19.1 [0.75] | 4.6 [0.18] | 2.4 [0.09]  | M3 set screw | 5°   | 0.25 [0.01] | 0.12 [0.005] | 1.0 N·m        | 8.2 N·m/rad        |                                        |
|                                          | <a href="#">JU-100D</a>            | \$51.50 | TRD-N/NA (8mm)                          | 8mm            | 8mm       | 25.4 [1.00] | 25.4 [1.00] | 6.6 [0.26] | 3.8 [0.15]  | M5 set screw | 5°   | 0.25 [0.01] | 0.25 [0.01]  | 1.6 N·m        | 14.3 N·m/rad       |                                        |
|                                          | <a href="#">RU-100D</a>            | \$60.00 | TRD-GK (10 mm)                          | 10 mm          | 10 mm     | 25.4 [1.00] | 25.4 [1.00] | 6.6 [0.26] | 3.8 [0.15]  | M5 set screw | 5°   | 0.25 [0.01] | 0.12 [0.005] | 1.6 N·m        | 14.3 N·m/rad       |                                        |
| Aluminum (metric-to-SAE)                 | <a href="#">ML13P-4-476D</a>       | \$51.50 | TRD-MX (4mm)                            | 4mm            | 0.1875 in | 13 [0.51]   | 19 [0.75]   | 5.5 [0.22] | 2.5 [0.10]  | M2 set screw | 5°   | 0.4 [0.02]  | 0.2 [0.01]   | 0.25 N·m       | 44 N·m/rad         | Aluminum alloy (Bent plate: Polyimide) |
|                                          | <a href="#">ML16P-4-635D</a>       | \$51.50 | TRD-MX (4mm)<br>TRDA-2E (0.25 in)       | 4mm            | 0.25 in   | 16 [0.63]   | 23 [0.91]   | 7 [0.28]   | 3 [0.12]    | M3 set screw | 5°   | 0.6 [0.02]  | 0.3 [0.01]   | 0.4 N·m        | 70 N·m/rad         |                                        |
|                                          | <a href="#">MCGL16-6-635</a>       | \$33.00 | TRD-S/SR (6mm)<br>TRDA-2E (0.25 in)     | 6mm            | 0.25 in   | 16 [0.63]   | 23.2 [0.91] | 7 [0.28]   | 3 [0.12]    | M3 set screw | 3.5° | 0.3 [0.01]  | 0.3 [0.01]   | 0.4 N·m        | 70 N·m/rad         |                                        |
|                                          | <a href="#">MCGL20-8-635</a>       | \$43.00 | TRD-N/NA (8mm)<br>TRDA-2E (0.25 in)     | 8mm            | 0.25 in   | 20 [0.79]   | 26 [1.02]   | 7.5 [0.30] | 3.7 [0.15]  | M3 set screw | 3.5° | 0.3 [0.01]  | 0.4 [0.02]   | 0.6 N·m        | 130 N·m/rad        |                                        |
|                                          | <a href="#">MCGL20-8-952</a>       | \$44.00 | TRD-N/NA (8mm)<br>TRDA-20/25 (0.375 in) | 8mm            | 0.375 in  | 20 [0.79]   | 26 [1.02]   | 7.5 [0.30] | 3.7 [0.15]  | M3 set screw | 3.5° | 0.3 [0.01]  | 0.4 [0.02]   | 0.6 N·m        | 130 N·m/rad        |                                        |
|                                          | <a href="#">MCGL25-10-635</a>      | \$54.00 | TRD-GK (10 mm)<br>TRDA-2E (0.25 in)     | 10 mm          | 0.25 in   | 25 [0.98]   | 30.2 [1.19] | 9 [0.35]   | 4 [0.16]    | M4 set screw | 3.5° | 0.3 [0.01]  | 0.5 [0.02]   | 1.4 N·m        | 240 N·m/rad        |                                        |
|                                          | <a href="#">MCGL25-10-952</a>      | \$55.00 | TRD-GK (10 mm)<br>TRDA-20/25 (0.375 in) | 10 mm          | 0.375 in  | 25 [0.98]   | 30.2 [1.19] | 9 [0.35]   | 4 [0.16]    | M4 set screw | 3.5° | 0.3 [0.01]  | 0.5 [0.02]   | 1.4 N·m        | 240 N·m/rad        |                                        |
| Aluminum (SAE)                           | <a href="#">ARM-075-635-635D</a>   | \$52.00 | TRDA-2E (0.25 in)                       | 0.25 in        | 0.25 in   | 19.1 [0.75] | 19.1 [0.75] | 4.6 [0.18] | 2.4 [0.09]  | M3 set screw | 5°   | 0.25 [0.01] | 0.25 [0.01]  | 1.0 N·m        | 8.2 N·m/rad        | Aluminum alloy                         |
|                                          | <a href="#">ARM-100-9525-9525D</a> | \$50.00 | TRDA-20/25 (0.375 in)                   | 0.375 in       | 0.375 in  | 25.4 [1.00] | 25.4 [1.00] | 6.6 [0.26] | 3.8 [0.15]  | M5 set screw | 5°   | 0.25 [0.01] | 0.25 [0.01]  | 1.6 N·m        | 14.3 N·m/rad       |                                        |
| * mm ÷ 25.4 = inches                     |                                    |         |                                         |                |           |             |             |            |             |              |      |             |              |                |                    |                                        |

\* mm ÷ 25.4 = inches

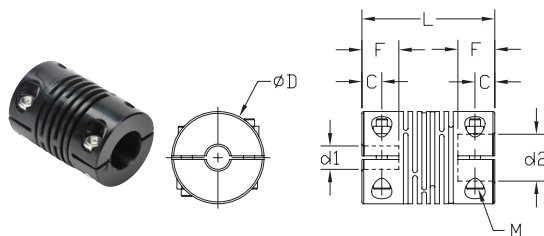
# Encoder Accessories – Couplings

## Encoder Couplings – Dimensions

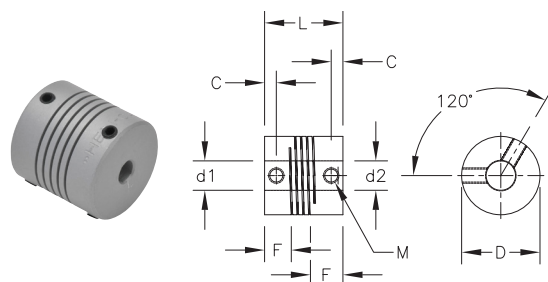
**GJ-xxD Fiberglass Couplings (metric) & GJx-xxxD Fiberglass Couplings (SAE)**



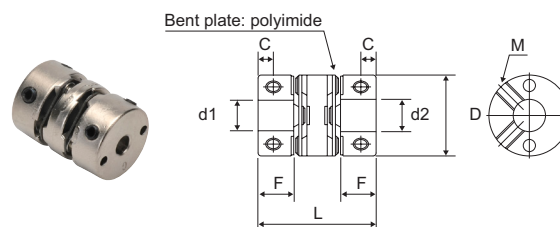
**STP-MTRA-SC-xxxx Polymer Couplings**



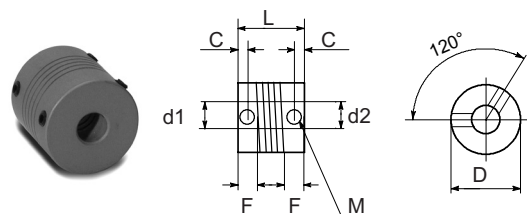
**ARM-xxxxxxD Aluminum Couplings (metric & SAE)**



**MCGLxx Aluminum Couplings & ML1xP-4-xxxD Aluminum Couplings**



**RU-075D, RU-100D, and JU-100D Aluminum Couplings**



# Encoder Selection Guide

## SAE Dimension Encoders & Metric Dimension Encoders

| Encoder Selection Guide |             |           |                           |                                                                                                  |                  |                                                                                                                 |              |                                           |                     |                    |                                                                                                                       |          |
|-------------------------|-------------|-----------|---------------------------|--------------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------|---------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|----------|
| Type                    | Duty        | Series    | Encoder Diameter          | Shaft Diameter                                                                                   | Shaft Type       | Operating Voltage (VDC) and Electrical Output                                                                   | IP Rating    | Cable                                     | Max Radial Load (N) | Max Axial Load (N) | Available Resolutions (PPR)                                                                                           | Brand    |
| Incremental             | Modular Kit | AMT       | 28mm, 42mm                | 2, 3, 4, 5, 6, 8 mm<br>3/16, 1/4, 3/8, 1/2, 5/8 inch                                             | Hollow           | 5V Line Driver (TTL) or 5V Push-Pull (Totem Pole)                                                               | IP20         | Custom cables sold separately             | N/A                 | N/A                | Programmable up to 4096                                                                                               | Same Sky |
|                         |             | MTRA      | 31mm                      | 5mm<br>1/4", 3/8"                                                                                | Hollow           | 5V Line Driver (TTL) or 5V Push-Pull (Totem Pole)                                                               | IP20         | Custom cables sold separately             | N/A                 | N/A                | 400, 1000                                                                                                             | SureStep |
|                         | Light Duty  | TRD-S(H)R | 38mm, 40mm                | 8mm                                                                                              | Solid or Hollow  | 5V Line Driver (TTL) or 5-26V NPN/PNP Open Collector (HTL)                                                      | IP50 or IP65 | Integral 2m pigtail cable                 | 20                  | 10                 | 100, 200, 360, 500, 600, 1000, 1024, 2000, 2500                                                                       | JTEKT    |
|                         |             | A41       | 41mm                      | 1/4"                                                                                             | Solid or Hollow  | 5-30VDC Universal output circuit: Push-Pull (Totem Pole), or NPN/PNP Open Collector (HTL), or Line Driver (TTL) | IP64         | Integral 2m pigtail cable                 | 20                  | 20                 | 100, 200, 360, 500, 1000, 1024, 200, 2048, 3600, 4096                                                                 | Lika     |
|                         | Medium Duty | A50       | 50mm                      | 1/4", 3/8"                                                                                       | Hollow           |                                                                                                                 | IP65         | M12 cables sold separately                | 20                  | 20                 | 360, 1000, 1024, 2048                                                                                                 |          |
|                         |             | A80       | 80mm                      | 30mm (reducer bushings available for 19 & 20mm, 5/8", 7/8", 1, and 1 1/8")                       | Hollow           |                                                                                                                 | IP64         | M23 cables sold separately                | 30                  | 30                 | 1024                                                                                                                  |          |
|                         |             | AQ58/59   | 58mm, 59mm                | 3/8" solid, 15mm hollow (reducer bushings available for 6, 8, 10, 11, 12 mm; 1/4, 3/8, 1/2 inch) | Solid or Hollow  |                                                                                                                 | IP65         | M12 cables sold separately                | 100                 | 100                | Programmable from 1 to 16,384 (default 1024)                                                                          |          |
|                         |             | AR01      | 58mm                      | 15mm                                                                                             | Solid Dual-shaft |                                                                                                                 | IP65         | M12 cables sold separately                | 50                  | 50                 | 250 (linear res: 0.36 deg/cts)<br>1250 (linear res: 0.072 deg/cts)                                                    |          |
|                         | Heavy Duty  | TRDA-20   | 2"                        | 3/8"                                                                                             | Solid            | 5VDC Line Driver (TTL) or 5-30VDC Push-Pull (Totem Pole)                                                        | IP50         | Integral 2m pigtail cable                 | 50                  | 30                 | 100, 360, 500, 1000, 1024, 2500                                                                                       | JTEKT    |
|                         |             | TRDA-25   | 2.5" flange (w/2.0" body) | 3/8"                                                                                             | Solid            |                                                                                                                 | IP65         | Military Spec (MS) cables sold separately | 50                  | 30                 | 100, 360, 500, 1000, 1014, 2500                                                                                       |          |
|                         |             | TRD-N(H)  | 50mm                      | 8mm                                                                                              | Solid or Hollow  |                                                                                                                 | IP65         | Integral 2m pigtail cable                 | 50                  | 30                 | 3, 4, 5, 10, 30, 40, 50, 60, 100, 120, 200, 240, 250, 300, 360, 400, 480, 500, 600, 750, 1000, 1024, 1200, 2000, 2500 |          |
|                         |             | TRD-GK    | 78mm                      | 10mm                                                                                             | Solid            |                                                                                                                 | IP65         | Integral 2m pigtail cable                 | 100                 | 50                 | 30, 100, 120, 200, 240, 250, 300, 360, 400, 500, 600, 1000, 1200, 2000, 2500, 3600, 5000                              |          |
|                         |             | TRD-NA    | 50mm                      | 8mm                                                                                              | Solid            |                                                                                                                 | IP65         | Integral 2m pigtail cable                 | 50                  | 30                 | 32, 64, 128, 180, 256, 360, 512, 720, 1024 (gray code)                                                                |          |
| Absolute                | Medium Duty | TRD-NA    | 50mm                      | 8mm                                                                                              | Solid            | 10-30V NPN/PNP Open Collector (HTL)                                                                             | IP65         | Integral 2m pigtail cable                 | 50                  | 30                 | 32, 64, 128, 180, 256, 360, 512, 720, 1024 (gray code)                                                                |          |