Quantum Devices, Inc. Model QM35 is a high performance, low profile modular design ideal for high volume OEM applications and priced competitively for all sizes of motion control projects. The QM35’s versatile electrical configurations include lines counts up to 8192 and several commutation options. The QM35’s patent lock-n-twist mechanism simplifies installation; saving production time and money. The QM35 is the newest solution to your motion control needs.

**DESIGN FEATURES**

- Bearingless modular design
- Full complement outputs
- Low profile assembled height of 0.43”
- Resolutions up to 8192 lines per revolution
- 4, 6, 8 or 10 pole commutation³
- Easy lock-n-twist assembly feature
- Through bore sizes up to 0.375” diameter
- Up to 1 MHz frequency response
- High noise immunity
- RoHS construction
- Hub to shaft uses two #3-48 set screws
- Hermetically sealed LED
- Multiple mounting options including resolver size 15

Configuration Options:

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Commutation</th>
<th>Output</th>
<th>Cover</th>
<th>Bore Size</th>
<th>Mounting</th>
<th>Index</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>360°, 500, 512, 1000, 1024, 2000, 2048, 2500, 4000, 4096, 5000, 5120, 8000, 8192</td>
<td>0 = No Comm 4 = 4 Pole 6 = 6 Pole 8 = 8 Pole T0 = 10 Pole</td>
<td>A = Line Driver B = Line Driver (ABZ) / Open Collector (UVW) C = Dual Voltage - Line Driver (ABZ) / Open Collector (UVW)</td>
<td>A = Hole in Cover B = Closed Cover (shaft &lt; 0.512”) C = Closed Cover (shaft &lt; 0.450”)</td>
<td>C = 5 mm D = 6 mm E = 8 mm K = 0.1875° L = 0.250° M = 0.3125° N = 0.375</td>
<td>A = 1.280° B = 1.812°</td>
<td>A = 90° A &amp; B High B = 90° A &amp; B Low</td>
<td>Please refer to hardware options on page 4</td>
</tr>
</tbody>
</table>

**Note:**

1. 4 poles has four states per revolution (2 pole pair), or two 360° electrical cycles per revolution
2. 1. Mounting option A allows for resolver size 15
3. Consult factory for configurations not shown
4. 360 PPR not presently available with 6, 8 or 10 poles
5. Line Driver (RS-422) is compatible with Renco options: TTL, PP, VC or LD. Open collector compatible with VO configurations
**ELECTRICAL SPECIFICATIONS**

- **Input Voltage**: 5 VDC ± 5%
- **Input Current Requirements**: 65 mA typical, 100 mA max plus interface loads
- **Input Ripple**: 2% peak to peak @ 5 VDC
- **Output Circuits**:
  - A = 26C31 line driver (RS-422 or single-ended TTL)
  - B = ABZ 26C31 line driver, UVW open collector (no U' V' W')
  - C = ABZ 26C31 line driver, UVW open collector (no U' V' W')
- **Incremental Output Format**: Quadrature with A leading B for CCW rotation viewed from the encoder top
- **Max Operating Frequency**:
  - < 5000 PPR = 500 kHz or 15,000 RPM
  - 5000 PPR – 7999 PPR = 675 kHz
  - ≥ 8000 PPR = 1.0 MHz
- **Commutation Format**: Three phase 4, 6, 8 or 10 poles (other pole counts upon request)
- **Commutation Accuracy (UVW)**: ± 2° mechanical
- **Interpolation Factors**:
  - 1000/1024 PPR = 2x
  - 2000/2048 PPR = 4x
  - 2500 PPR = 5x
  - 4000/4096 PPR = 8x
  - 5000/5120 PPR = 10x
  - 8000/8192 PPR = 16x

**ENVIRONMENTAL SPECIFICATIONS**

- **Storage Temperature**: -40 to 125°C
- **Operating Temperature**: -30 to 115°C
- **IP Rating**: IP40
- **Humidity**: 90% non-condensing
- **Vibration**: 20 g’s @ 25 to 2000 Hz
- **Shock**: 100 g’s @ 6 ms duration

**MECHANICAL SPECIFICATIONS**

- **Bore Minimum Diameter**: Bore size +0.0002”
- **Recommended Shaft Tolerance**: +0.0000/-0.0005”
- **Minimum Shaft Engagement**: 0.400” [10.2 mm]
- **Allowable Shaft Runout**: 0.002” [0.05 mm] TIR (± 0.001” shaft radial play from initial shaft position of assembled encoder)
- **Allowable Axial Shaft Movement**: ± 0.010” [± 0.25 mm]
- **Mounting**:
  - A = 1.280” bolt circle/size 15 resolver, B = 1.812” bolt circle
- **Dynamic Commutation Adjustment Range**: 30° mechanical
- **Moment of Inertia**: 8.0 x 10⁻⁶ oz·in·s²

**OUTPUT WAVEFORMS**

CCW Shaft Rotation as Viewed Looking at the Encoder Top

**OUTPUT WAVEFORMS**

CCW Shaft Rotation as Viewed Looking at the Encoder Top

**ELECTRICAL PIN FUNCTIONS**

<table>
<thead>
<tr>
<th>Output Option</th>
<th>Pin Number</th>
<th>Option A</th>
<th>Option B</th>
<th>Option C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A'</td>
<td>A'</td>
<td>A'</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>B'</td>
<td>B'</td>
<td>B'</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Z'</td>
<td>Z'</td>
<td>Z'</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>U'</td>
<td>NC</td>
<td>GND2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>V'</td>
<td>NC</td>
<td>Vcc2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>W'</td>
<td>NC</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Vcc</td>
<td>Vcc</td>
<td>Vcc</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td></td>
</tr>
</tbody>
</table>

Option C: Commutation power Vcc2 & GND2 are isolated from GND. U, V and W outputs are referenced to GND2. Vcc2 provides power to U, V and W internal pull up resistors (normally not installed) – call factory for this configuration.

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**MOUNTING REQUIREMENTS**

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**Model QM35 – 1.280" Bolt Circle (Mounting Option A)**

- **Note:**
  - Shown with Cover option A (hole in cover).
  - Cover option B (closed) – Maximum shaft length up to 0.512" [13.0 mm]. Overall height increases from 0.43" [10.9 mm] to 0.57" [14.5 mm]. This additional height has a cylinder diameter 0.56" [14.2 mm], centered on the cover top.
  - Cover option C (closed) – Maximum shaft length up to 0.450" [11.4 mm]. Overall height increases from 0.43" [10.9 mm] to 0.51" [13.0 mm]. This additional height has a cylinder diameter 0.56" [14.2 mm], centered on the cover top.

**Model QM35 – 1.812" Bolt Circle (Mounting Option B)**

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**Servo Size 15 Mounting (Mounting Option A)**

**Patent Protection:**
- US Patent 9,857,205
- US Patent 6,563,108

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## SELECTION CHARTS

### MOUNTING OPTION A (1.280" BOLT CIRCLE)

<table>
<thead>
<tr>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Metric</td>
<td>English</td>
<td>Metric</td>
</tr>
<tr>
<td>Option A</td>
<td>Option B</td>
<td>Option D</td>
<td>Option E</td>
</tr>
<tr>
<td>Option F</td>
<td>Option G</td>
<td>Option H</td>
<td>Option J</td>
</tr>
</tbody>
</table>

### MOUNTING OPTION B (1.812" BOLT CIRCLE)

<table>
<thead>
<tr>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Metric</td>
<td>English</td>
<td>Metric</td>
</tr>
<tr>
<td>Option K</td>
<td>Option L</td>
<td>Option M</td>
<td>Option N</td>
</tr>
<tr>
<td>Option P</td>
<td>Option Q</td>
<td>Option R</td>
<td>Option S</td>
</tr>
</tbody>
</table>

### HARDWARE SELECTION BREAKOUT

**Note:**

1. **Bore Size Option N (0.375")** requires Hardware option A, B, D, E, K, L, M or N. This hardware can optionally be used with all other hub sizes.
2. **Hardware options F, G, H, J, P, Q, R, S and have longer #3-48 set screws (3/32")** and are not compatible with Bore Size option N (0.375”).
3. **Hardware options D, E, H, J, M, N, R and S contain a thread lock which is applied to the mounting screws only. This preapplied thread locking product contains a microencapsulated epoxy resin that is suspended in a hardener.** The force of thread engagement crushes the microscopic capsules of epoxy resin, mixing the reactant components, and initiating a chemical reaction which locks the parts together. This product series provides consistent and predictable torque values and requires no heat or primers for curing.

Product - ND Industries 5935.

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CABLE ACCESSORIES

One Meter Cable Both Ends Terminated:
2080AG039 = 14 conductor 28 AWG for UVW Commutation
2082AG039 = 8 conductor 28 AWG for non-Commutation
Connector = JAE FI-W15S

Half Meter Cable One End Terminated:
2081AG019 = 14 conductor 28 AWG for UVW Commutation
2083AG019 = 8 conductor 28 AWG for non-Commutation
Connector = JAE FI-W15S

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Encoder Pin Function</th>
<th>2080AG039 Wire Color</th>
<th>2081AG019 Wire Color</th>
<th>2082AG039 Wire Color</th>
<th>2083AG019 Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>Brown</td>
<td>Brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A'</td>
<td>White</td>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>Blue</td>
<td>Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>B'</td>
<td>Green</td>
<td>Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Z</td>
<td>Orange</td>
<td>Orange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Z'</td>
<td>Yellow</td>
<td>Yellow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>U</td>
<td>Violet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>U'</td>
<td>Gray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>V</td>
<td>White/Brown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>V'</td>
<td>White/Red</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>W</td>
<td>White/Orange</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>W'</td>
<td>White/Yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Vcc</td>
<td>Red</td>
<td>Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td>Black</td>
<td>Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>No Connect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
1. Cable has internal foil shield with 28 AWG drain wire trimmed to jacket edge
2. Unused wires to be locally isolated from adjacent signal wires, Vcc and GND to prevent damage to encoder signals
3. For Output option C, refer to Electrical Pin Function chart for signal function

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