Quantum Devices, Inc. Model QML35 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 QML35’s versatile electrical configurations include line counts up to 8192 and several commutation options. The QML35’s patent lock-n-twist mechanism simplifies installation, saving production time and money. The QML35 is the newest solution to your motion control needs.

DESIGN FEATURES

- Bearingless modular design
- Single-ended outputs
- Low profile assembled height of 0.43”
- Resolutions up to 8192 lines per revolution
- 4, 6, 8 or 10 pole commutation
- 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

Recommended Connector: BERG (FCI) P/N 90312-008 LF


<table>
<thead>
<tr>
<th>Configuration Options:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution³</td>
</tr>
<tr>
<td>360°, 500, 512, 1000, 1024, 2000, 2048, 2500, 4000, 4096, 5000, 5120, 8000, 8192</td>
</tr>
<tr>
<td>0 = No Comm 4 = 4 Pole 6 = 6 Pole 8 = 8 Pole 10 = 10 Pole</td>
</tr>
<tr>
<td>A = Hole in Cover B = Closed Cover (shaft &lt; 0.512”) C = Closed Cover (shaft &lt; 0.450”)</td>
</tr>
<tr>
<td>C = 5 mm D = 6 mm E = 8 mm K = 0.1875” L = 0.250” M = 0.3125” N = 0.375”</td>
</tr>
<tr>
<td>A = 1.280” B = 1.812”</td>
</tr>
<tr>
<td>A = 90° A &amp; B High B = 90° A &amp; B Low</td>
</tr>
</tbody>
</table>

Note:

1. 4 poles has four states per revolution (2 pole pair), or two 360° electrical cycles per revolution
2. 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
**ELECTRICAL SPECIFICATIONS**

- **Input Voltage**
  - A = 5 VDC ± 5%
  - B = 3.3 VDC ± 5%

- **Input Current Requirements**
  - 65 mA typical, 100 mA max plus interface loads

- **Input Ripple**
  - 2% peak to peak @ 5 VDC

- **Output Circuits**
  - Single-ended TTL, sink or source 4 mA max (compatible with Renco PP option)

- **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
  - 2500PPR = 5x
  - 4000/4096 PPR = 8x
  - 5000/5120 PPR = 10x
  - 8000/8192 PPR = 16x

**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 10^3 oz-in·s²

**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

---

*Quantum Devices, Inc. reserves the right to make changes in design, specifications and other information at any time without prior notice.*
MECHANICAL DIMENSIONS

Model QML35 – 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.

MOUNTING REQUIREMENTS

Mounting Option A (1.280” Bolt Circle)

Mounting Option B (1.812” Bolt Circle)

Servo Size 15 Mounting (Mounting Option A)

Patent Protection:
• US Patent 9,857,205
• US Patent 6,563,108
# HARDWARE OPTIONS – ORDERING INFORMATION

## MOUNTING OPTION A (1.280" BOLT CIRCLE)

**#3-48 x 1/16" Set Screw**
1/16" set screw required for 0.375" bore

<table>
<thead>
<tr>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Metric</td>
</tr>
<tr>
<td>Option A</td>
<td>Option D</td>
</tr>
</tbody>
</table>

**#3-48 x 3/32" Set Screw**
3/32" set screw has deeper hex pocket to improve assembly tool life

<table>
<thead>
<tr>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Metric</td>
</tr>
<tr>
<td>Option E</td>
<td>Option F</td>
</tr>
</tbody>
</table>

## MOUNTING OPTION B (1.812" BOLT CIRCLE)

**#3-48 x 1/16" Set Screw**
1/16" set screw required for 0.375" bore

<table>
<thead>
<tr>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Metric</td>
</tr>
<tr>
<td>Option K</td>
<td>Option L</td>
</tr>
</tbody>
</table>

**#3-48 x 3/32" Set Screw**
3/32" set screw has deeper hex pocket to improve assembly tool life

<table>
<thead>
<tr>
<th>Mounting Screws</th>
<th>Mounting Screws with Thread Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Metric</td>
</tr>
<tr>
<td>Option M</td>
<td>Option N</td>
</tr>
</tbody>
</table>

**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 and S 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 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 593.**

## HARDWARE SELECTION BREAKOUT

<table>
<thead>
<tr>
<th>Option A</th>
<th>Option B</th>
<th>Option C</th>
<th>Option D</th>
<th>Option E</th>
<th>Option F</th>
<th>Option G</th>
<th>Option H</th>
<th>Option I</th>
<th>Option J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Ox #3-48 x 1/16&quot;</td>
<td>Black Ox #3-48 x 1/16&quot;</td>
<td>Black Ox #3-48 x 1/16&quot;</td>
<td>Black Ox #3-48 x 1/16&quot;</td>
<td>Black Ox #3-48 x 1/16&quot;</td>
<td>Black Ox #3-48 x 3/32&quot;</td>
<td>Black Ox #3-48 x 3/32&quot;</td>
<td>Black Ox #3-48 x 3/32&quot;</td>
<td>Black Ox #3-48 x 3/32&quot;</td>
<td>Black Ox #3-48 x 3/32&quot;</td>
</tr>
<tr>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
<td>0.050&quot; Hex</td>
</tr>
<tr>
<td>Part Number 1826ZG002</td>
<td>Part Number 1826ZG002</td>
<td>Part Number 1826ZG002</td>
<td>Part Number 1826ZG002</td>
<td>Part Number 1826ZG002</td>
<td>Part Number 1834AG102</td>
<td>Part Number 1834AG102</td>
<td>Part Number 1834AG102</td>
<td>Part Number 1834AG102</td>
<td>Part Number 1834AG102</td>
</tr>
</tbody>
</table>

*Quantum Devices, Inc. reserves the right to make changes in design, specifications and other information at any time without prior notice.*
CABLE ACCESSORIES

(2161AG039, 2163AG039, 2162AG019, 2164AG019)
Consult Factory for Custom Lengths

One Meter Cable Both Ends Terminated:
2161AG039 = 8 conductor 28 AWG for UVW Commutation
2163AG039 = 5 conductor 28 AWG for non-Commutation
Connector = BERG (FCI) P/N 90312-008 LF

Half Meter Cable One End Terminated:
2162AG019 = 8 conductor 28 AWG for UVW Commutation
2164AG019 = 5 conductor 28 AWG for non-Commutation
Connector = BERG (FCI) P/N 90312-008 LF

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

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Encoder Pin</th>
<th>2161AG039 Wire Color</th>
<th>2162AG019 Wire Color</th>
<th>2163AG039 Wire Color</th>
<th>2164AG019 Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>Black</td>
<td>Black</td>
<td>Black</td>
<td>Black</td>
</tr>
<tr>
<td>2</td>
<td>Z</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>4</td>
<td>Vcc</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>Blue</td>
<td>Blue</td>
<td>Blue</td>
<td>Blue</td>
</tr>
<tr>
<td>6</td>
<td>U</td>
<td>Green</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>V</td>
<td>Brown</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>W</td>
<td>White</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

Note: BERG (FCI) P/N 90312-008 LF connector using 77138-001LF pins is compatible with 26-30 AWG wire.

*Quantum Devices, Inc. reserves the right to make changes in design, specifications and other information at any time without prior notice.*