The HS35 combines the rugged, heavy-duty features usually associated with shafted encoders into a hollow shaft style. Its design includes dual bearings and shaft seals for NEMA 4, 13 and IP65 environmental ratings, a rugged metal housing, and a sealed connector or cable gland. The HS35 accommodates shafts up to 1" in diameter. With optional insulating inserts, it can be mounted on smaller diameter shafts. It can be mounted on a through shaft or a blind shaft with a closed cover to maintain its environmental rating.

The HS35 is also available with a dual output option (inset) to provide redundant encoder signals, dual resolutions, or to supply two separate controllers from a single encoder. Applications include motor feedback and vector control, printing industries, robotic control, oil service industries, and web process control.

The HS35 Incremental Encoder is available with the following certifications:

- EN 55011 and EN 61000-6-2
- U.S. Standards Class I, Group A, B, C & D; Class II Group E, F & G
- Canadian Standards Class I, Zone 0, Group IIC
- EN 50011 and EN 61000-6-2
- CSA Class I, Div 1 Group C & D
- CENELEC EEX ia IIC T4
- Groups: A, B, C, D, E, F & G

Environmental Specifications

- Enclosure Rating: NEMA 4 & 13 (IP65) when ordered with shaft seal (on units with an MS connector) or a cable gland (on units with cable termination)
- Temperature: Operating, 0º to 70º C, extended temperature testing up to 105º C available (see note 8); Storage, -25º to 90º C unless extended temperature option called out
- Shock: 50 g’s for 11 msec duration
- Vibration: 5 to 2000 Hz @ 20 g’s
- Humidity: 98% RH without condensation

Notes & Tables: All notes and tables referred to in the text can be found on the back of this page.

### Mechanical Specifications

- **Shaft Bore:** 1.00", 0.875", 0.750", 0.625", 0.500".
- All are supplied with insulating sleeves.
- **Allowable Misalignment:** 0.005" T.I.R. on mating shaft 0.75" from shaft end
- **Bore Runout:** 0.001" T.I.R. maximum
- **Starting Torque:** Through shaft version (SS) = 7 in-oz (max); Blind shaft version (BS) = 4 in-oz (max)
- **Bearings:** 52100 SAE High carbon steel
- **Shaft Material:** 416 stainless steel
- **Bearing Housing:** Die cast aluminum with protective finish
- **Cover:** Die cast aluminum with protective finish
- **Bearing Life:** 7.5 X 10^6 revs (50,000 hrs at 2500 RPM)
- **Maximum RPM:** 6,000 RPM (see Frequency Response below)
- **Moment of Inertia:** 0.019 oz-in-sec
- **Weight:** 18 oz typical

### Electrical Specifications

- **Code:** Incremental
- **Output Format:** 2 channels in quadrature, 1/2 cycle index gated with negative B channel
- **Cycles Per Shaft Turn:** 1 to 80,000 (see table A, page 25). For resolutions above 5000 see interpolation options on pages 36 and 37
- **Supply Voltage:** 5 to 28 VDC available (see note 5)
- **Current Requirements:** 100 mA typical + output load, 250 mA (max)
- **Voltage/Output:** (see note 5)
  - 15V: Line Driver, 5–15 VDC in, Vout = Vin
  - 28V: Line Driver, 5–28 VDC in, Vout = Vin
  - 28V/OC: Line Driver, 5–28 VDC in, Vout = 5 VDC
  - 28V/OC: Open Collector, 5–28 VDC in, OOut
- **Protection Level:** Reverse, overvoltage and output short circuit (See note 5)
- **Frequency Response:** 150 kHz up to 5000 cpr resolution; 300 kHz above 5000 cpr, also see note 7
- **Output Terminations:** See table 1 page 65
- **Note:** Consult factory for other electrical options

### Environmental Specifications

Enclosure Rating: NEMA 4 & 13 (IP65) when ordered with shaft seal (on units with an MS connector) or a cable gland (on units with cable termination)

- **Temperature:** Operating, 0º to 70º C, extended temperature testing up to 105º C available (see note 8); Storage, -25º to 90º C unless extended temperature option called out
- **Shock:** 50 g’s for 11 msec duration
- **Vibration:** 5 to 2000 Hz @ 20 g’s
- **Humidity:** 98% RH without condensation

### NOTES & TABLES:

- All notes and tables referred to in the text can be found on the back of this page.

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**HS35 Incremental Ordering Options**

**FOR ASSISTANCE CALL 800-350-2727**

Use this diagram, working from left to right to construct your model number (example: HS35F-100- R1-SS-2048-ABZC-28V/V-SM18).

All notes and tables referred to can be found on the back of this page.

- **TYPE:**
  - **HS** = Hollow Shaft
  - **35** = 3.5" Encoder Diameter
- **SHAFT BORE:**
  - 100 = 1.00"
  - 87 = 0.875"
  - 76 = 0.750"
  - 62 = 0.625"
  - 50 = 0.500" etc.
  - Metric bores available
- **TETHER:**
  - None
  - BS = Blind Shaft Rubber Seal
  - SS = Through Shaft Rubber Seal
  - FS = Through Shaft Felt Seal
  - BFS = Blind Shaft Felt Seal
  - TB = Terminal Block
  - Blank = None
- **Cycles Per Shaft Turn:** (Enter Cycles) See table A on this page
- **NO. OF CHANNELS:**
  - A = Complementary
  - B = Standard
  - Z = Special
- **VOLTAGE/OUTPUT:**
  - 15V/V: Line Driver, 5–15 VDC in, Vout = Vin
  - 28V/V: Line Driver, 5–28 VDC in, Vout = Vin
  - 28V/OC: Line Driver, 5–28 VDC in, Vout = 5 VDC
  - 28V/OC: Open Collector, 5–28 VDC in, OOut
  - 28V/5: Line Driver, 5–28 VDC in, Vout = 5 VDC
  - 28V/OC: Open Collector, 5–28 VDC in, OOut
- **OUTPUT TERMINATION:**
  - M12 = MS31212-12P
  - M16 = MS3102R16S-1P
  - M18 = MS3102R18-1P
  - (Indicate “S” for single or “D” for Dual (i.e. DM18 = Dual)
  - SCS = Shielded, Jacketed Cable with cable gland seal and cable length in inches. (i.e. SCS18 = 18 inches)
  - TB = Terminal Block (See table 1 & note 9)

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These commodities, technology or software if exported from the United States must be in accordance with the Bureau of Industry, and Security, Export Administration regulations. Diversion contrary to U.S. law is prohibited.
The connector style will determine pinouts. For example, an encoder with resolutions highlighted with are available as standard.

### Table 1: Incremental Output Terminations

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>DA 15P Connector</th>
<th>Channels Designated in Model No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHITE</td>
<td>13</td>
<td>ABZ A ABZ A</td>
</tr>
<tr>
<td>BLUE</td>
<td>14</td>
<td>B B B</td>
</tr>
<tr>
<td>GRY</td>
<td>15</td>
<td>B B B</td>
</tr>
<tr>
<td>WHT</td>
<td>16</td>
<td>B B B</td>
</tr>
<tr>
<td>ORN</td>
<td>11</td>
<td>B B B</td>
</tr>
<tr>
<td>RDW</td>
<td>12</td>
<td>B B B</td>
</tr>
<tr>
<td>RED</td>
<td>10</td>
<td>B B B</td>
</tr>
<tr>
<td>RED</td>
<td>6</td>
<td>B B B</td>
</tr>
<tr>
<td>BLK</td>
<td>1</td>
<td>3 V CIRCUIT COMMUNA</td>
</tr>
<tr>
<td>YEL</td>
<td>9</td>
<td>3 V CIRCUIT COMMUNA</td>
</tr>
<tr>
<td>WHT</td>
<td>10</td>
<td>CAS (SWITCHED)</td>
</tr>
<tr>
<td>ORN</td>
<td>8</td>
<td>CAS (SWITCHED)</td>
</tr>
<tr>
<td>RED</td>
<td>7</td>
<td>CAS (SWITCHED)</td>
</tr>
<tr>
<td>WHT</td>
<td>6</td>
<td>CAS (SWITCHED)</td>
</tr>
<tr>
<td>ORN</td>
<td>5</td>
<td>CAS (SWITCHED)</td>
</tr>
<tr>
<td>RDW</td>
<td>4</td>
<td>CAS (SWITCHED)</td>
</tr>
</tbody>
</table>

**Notes:***
- **1.** Mounting is usually done either using the D-style square flange mount, E or G-style servo mounts, or one of the standard face mounts. Consult factory for additional face mount options.
- **2.** The connector style will determine pinouts. For example, an encoder with resolutions highlighted with are available as standard.
- **3.** The rubber shaft seal is recommended in virtually all installations. The most common exceptions are applications requiring a very low starting torque or those requiring operation at both high temperature and high speed. For these exceptions, a felt shaft seal is recommended. Felt shaft seals in virtually all applications will have less than 1/10th of the starting torque specified under Mechanical Configurations.
- **4.** For interpolation please specify the required value. The resolutions given are applicable only to 80,000-Z16. Other resolutions may be used; consult factory for more specific information.
- **5.** High frequency interference may be present. Please consult the factory.
- **6.** Extended temperature ratings are available in the following ranges:
  - -40°C to 70°C, -40°C to 85°C, -40°C to 90°C, and -40°C to 105°C, depending on the particular model.
- **7.** Mounted straight-line receptacles may be ordered from the factory.

### Table A: HS35 Disc Resolutions

<table>
<thead>
<tr>
<th>Model</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 100</td>
<td>250 360 420 500 512</td>
</tr>
<tr>
<td>600 720</td>
<td>1000 1024 1200</td>
</tr>
<tr>
<td>1500 1650</td>
<td>1800 2000 2100</td>
</tr>
<tr>
<td>2048 2500</td>
<td>2881 2884 3600</td>
</tr>
<tr>
<td>3710 4096</td>
<td>5000</td>
</tr>
</tbody>
</table>

For interpolation please specify the multiplied output (up to 80,000 for the HS35) in the model number, i.e., 80,000-T16. Other resolutions available—consult factory.

**Notes:**
- **1.** Dual resolutions available, consult factory.
- **2.** Standard, internally regulated with 5V (TTL compatible) logic
- **3.** Output IC's: Multi-voltage Line Driver (4409P): 100 mA sourcing, input voltage 5 to 15 VDC +/- 5% standard (Note: Vcc = 5V, TTL compatible when used with 5 volt supply. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 50 mA typical (plus load current).)**
- **4.** For interpolation please specify the required value. The resolutions given are applicable only to 80,000-Z16. Other resolutions may be used; consult factory for more specific information.
- **5.** High frequency interference may be present. Please consult the factory.