

QM35

DESIGN FEATURES

- Bearingless modular design
- Low profile assembled height
- Resolutions up to 8192 lines per revolution
- 4, 6, 8 or 10 pole commutation
- Easy lock-n-twist assembly feature
- Through shaft sizes up to 0.375" diameter
- Up to 1Mhz 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



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 pending lock-n-twist mechanism simplifies installation; saving production time and money. The QM35 is the newest solution to your motion control needs.



Configuration Options:

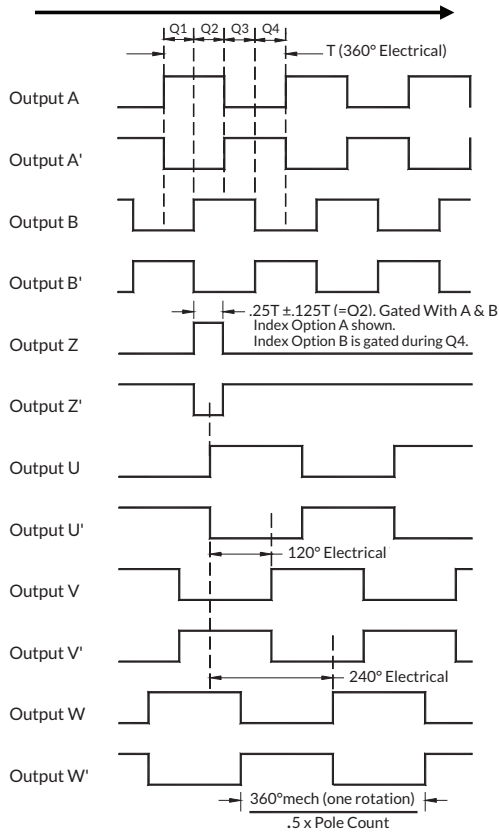
Resolution	Commutation	Output	Cover	Bore Size	Mounting	Index	Hardware
360, 500, 512, 1000, 1024, 2000, 2048, 2500, 4000, 4096, 5000, 5120, 8000, 8192	0 = No Comm 4 = 4 Pole 6 = 6 Pole 8 = 8 Pole 10 = 10 Pole	A = Line Driver B = Line Driver (ABZ) / Open Collector (UVW) C = Dual Voltage Line Driver (ABZ) / Open Collector (UVW)	A = Hole in Cover B = Closed Cover (shaft < .512") C = Closed Cover (shaft < .450")	C = 5mm D = 6mm E = 8mm K = .1875" L = .250" N = .375"	A = 1.280" B = 1.812"	A = 90° A & B High B = 90° A & B Low	Please refer to hardware options on page 4

Note:

- 1.) 4 poles has four states per revolution (2 pole pair), or two 360° electrical cycles per revolution.
- 2.) RS422 is compatible with Renco options: TTL, PP, VC or LD. Open collector compatible with VO configurations.
- 3.) Mounting option A allows for resolver size 15.
- 4.) Consult factory for configurations not shown.
- 5.) 360PPR not available with 6, 8 or 10 poles.

OUTPUT WAVEFORMS

CCW Shaft Rotation as Viewed Looking at Encoder Top.



$$Q1 + Q2 = 0.5T \pm 0.125T$$

$$Q2 + Q3 = 0.5T \pm 0.125T$$

$$Q_n = 0.25T \pm 0.125T \quad (n = 1, 2, 3, 4)$$

ELECTRICAL SPECIFICATIONS

Input Voltage	5 VDC \pm 5%						
Input Current Requirements	65mA Typ., 100mA max plus interface loads						
Input Ripple	2% peak to peak @ 5 VDC						
Output Circuits	26C31 RS 422A line driver (TTL compatible) Optional UVW open collector (No U' V' W')						
Incremental Output Format	Quadrature A leading B for CCW rotation viewed from encoder top.						
Max Operating Frequency	<ul style="list-style-type: none"> < 5000PPR = 500Khz or 15,000RPM 5000PPR - 7999PPR = 675Khz \geq 8000PPR = 1.0Mhz 						
Commutation Format	Three phase 4, 6, 8 or 10 poles						
Commutation Accuracy (U-V-W)	\pm 2° mechanical						
Interpolation Factors	<table border="0"> <tr> <td>1000/1024PPR = 2x</td> <td>2000/2048PPR = 4x</td> </tr> <tr> <td>2500PPR = 5x</td> <td>4000/4096PPR = 8x</td> </tr> <tr> <td>5000/5120PPR = 10x</td> <td>8000/8192PPR = 16x</td> </tr> </table>	1000/1024PPR = 2x	2000/2048PPR = 4x	2500PPR = 5x	4000/4096PPR = 8x	5000/5120PPR = 10x	8000/8192PPR = 16x
1000/1024PPR = 2x	2000/2048PPR = 4x						
2500PPR = 5x	4000/4096PPR = 8x						
5000/5120PPR = 10x	8000/8192PPR = 16x						

ENVIRONMENTAL SPECIFICATIONS

Storage Temperature	-40 to 125° C
Operating Temperature	-30 to 115° C
IP Rating	40
Humidity	90% Non-condensing
Vibration	20 g's @ 25 to 2,000 Hz
Shock	100 g's @ 6mS duration

MECHANICAL SPECIFICATION

Hub Minimum Diameter	Hub size +0.0002"
Recommended Shaft Tolerance	-0.0005, +0.0000"
Minimum Shaft Engagement	.400" [10.2mm]
Allowable Shaft Run Out	0.05mm, 0.002" TIR [+/- .0010" shaft radial play from initial shaft position of assembled encoder]
Allowable Axial Shaft Movement	\pm 0.25mm, \pm 0.010"
Mounting	1.28", 1.812" bolt circle, resolver mount
Dynamic Commutation Adjustment Range	30° mechanical
Moment of Inertia	8.0×10^{-6} oz-in-S ²

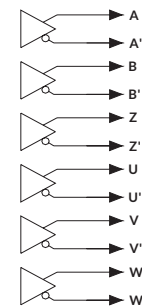
ELECTRICAL PIN FUNCTIONS

Pin Number	Electrical Option		
	Option A	Option B	Option C
1	A	A	A
2	A-	A-	A-
3	B	B	B
4	B-	B-	B-
5	Z	Z	Z
6	Z-	Z-	Z-
7	U	U	U
8	U-	NC	GND2
9	V	V	V
10	V-	NC	+5v2
11	W	W	W
12	W-	NC	NC
13	Vcc	Vcc	Vcc
14	GND	GND	GND
15	NC	NC	NC

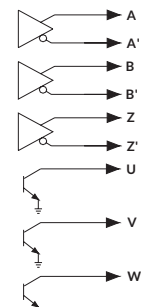
Options C, Commutation power +5v2 & GND2 is isolated from GND. U, V and W outputs are referenced to GND2. +5v2 provides power for pull up resistors (normally not installed) for this configuration.

ELECTRICAL OPTIONS

Option A) 26C31 (RS422)



Option B & C) 26C31 ABZ, Open Collector UVW
Option C) U, V and W referenced to GND2



- 26C31 sink/source current (max) = 20ma (meets RS-422 at 5vdc supply).
- Open collector sink current (max) = 30ma.
- Open collector pull up voltage (max) = 30vdc.
- U, V and W are "no connect" for pole option 0.

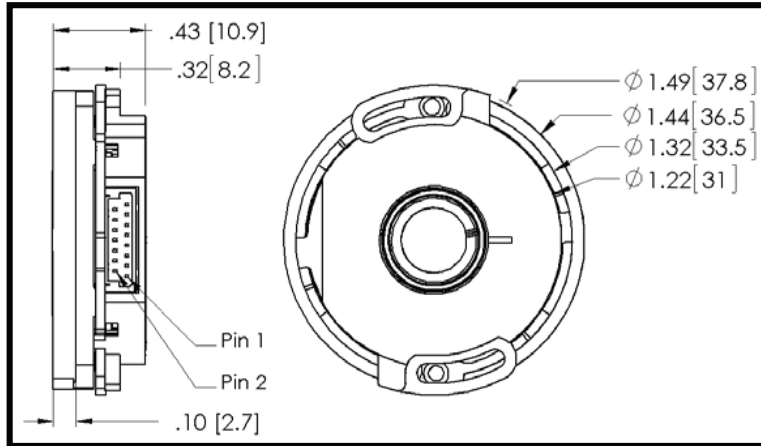
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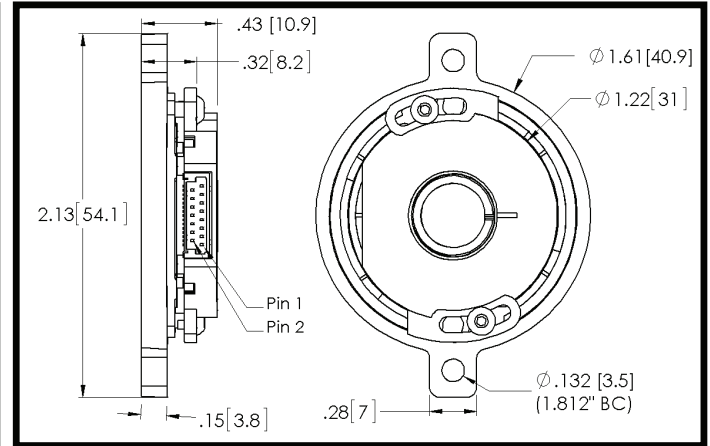
**Quantum
Devices**

MECHANICAL DIMENSIONS

Model QM35 - 1.280" Bolt Circle (Mounting Option A)



Model QM35 - 1.812" Bolt Circle (Mounting Option B)

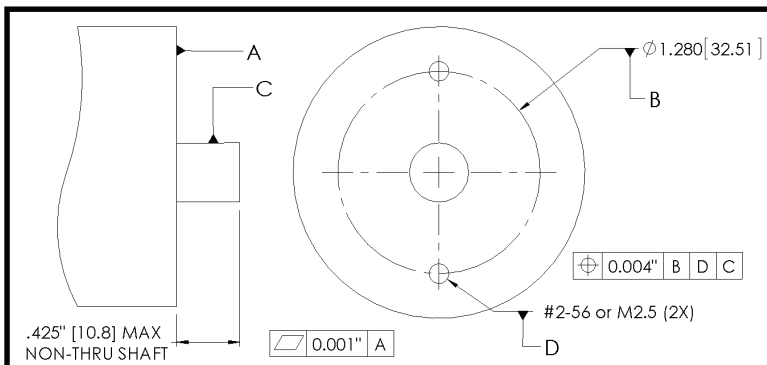


Note:

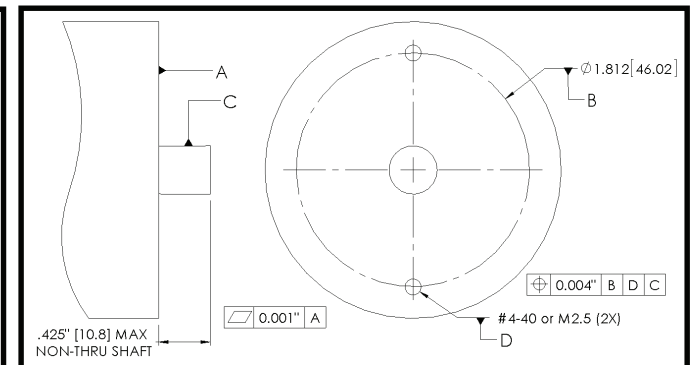
- Closed Cover Option B - Maximum shaft engagement up to .512" [13.0]. Overall height increases from .43 [10.9] to .57 [14.5]. This additional height has a cylinder diameter .56 [14.2], centered on the cover top.
- Closed Cover Option C - Maximum shaft engagement up to .450" [11.4]. Overall height increases from .43 [10.9] to .51 [13.0]. This additional height has a cylinder diameter .56 [14.2], centered on the cover top.

MOUNTING REQUIREMENTS

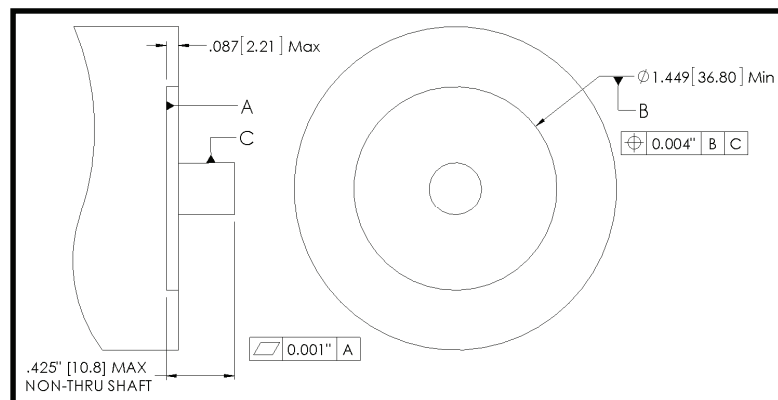
Mounting Option A (1.280" Bolt Circle)



Mounting Option B (1.812" Bolt Circle)



Servo Size 15 Mounting (Mounting Option A)



Patent Protection:

- Patent pending
- US Patent 6,563,108

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SELECTION CHARTS

MOUNTING OPTION A 1.280" BOLT CIRCLE							
3-48 x 1/16" Set Screw 1/16" set screw required for .375" bore				3-48 x 3/32" Set Screw 3/32" set screw has deeper hex pocket to improve assembly tool life			
Mounting Screws with No Thread Lock		Mounting Screws with Thread Lock		Mounting Screws with No Thread Lock		Mounting Screws with Thread Lock	
English	Metric	English	Metric	English	Metric	English	Metric
Option A	Option B	Option D	Option E	Option F	Option G	Option H	Option J

MOUNTING OPTION B 1.812" BOLT CIRCLE							
3-48 x 1/16" Set Screw 1/16" set screw required for .375" bore				3-48 x 3/32" Set Screw 3/32" set screw has deeper hex pocket to improve assembly tool life			
Mounting Screws with No Thread Lock		Mounting Screws with Thread Lock		Mounting Screws with No Thread Lock		Mounting Screws with Thread Lock	
English	Metric	English	Metric	English	Metric	English	Metric
Option K	Option L	Option M	Option N	Option P	Option Q	Option R	Option S

Option C = No Hardware

Note:

- Options A, B, D, E, K, L, M, N are required for Hub Size = N (.375"). These options can be used with all other hub sizes.
- Options F, G, H, J, P, Q, R, S are not compatible with Hub Size = N (.375"). These kits have longer set screw 3-48 x 3/32".
- Thread lock application to 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 593S.

HARDWARE SELECTION BREAKOUT

	Option A	Option B	Option D	Option E	Option F	Option G	Option H	Option J
Set Screws (Qty. 2 each)	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 3/32" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG015	Black Ox 3-48 x 3/32" .05" Hex (Torque = 28 - 32 oz-in) Part Number 1829ZG015	Black Ox 3-48 x 3/32" .05" Hex (Torque = 28 - 32 oz-in) Part Number 1829ZG015	Black Ox 3-48 x 3/32" .05" Hex (Torque = 28 - 32 oz-in) Part Number 1829ZG015
Mounting Screws (Qty. 2 each)	2-56 x 1/4" Button Head, .05" Hex (Torque = 45 - 51 oz-in) Part Number 1834ZG002	M2.5 x 6mm Button Head (max dia. 4.5mm) 1.5mm Hex (Torque = 45 - 51 oz-in) Part Number 1834ZG050	2-56 x 1/4" Button Head, .05" Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1834AG102	M2.5 x 6mm Button Head (max dia. 4.5mm) 1.5mm Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1834AG150	2-56 x 1/4" Button Head, .05" Hex (Torque = 45 - 51 oz-in) Part Number 1834ZG002	M2.5 x 6mm Button Head (max dia. 4.5mm) 1.5mm Hex (Torque = 45 - 51 oz-in) Part Number 1834ZG050	2-56 x 1/4" Button Head, .05" Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1834AG102	M2.5 x 6mm Button Head (max dia. 4.5mm) 1.5mm Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1834AG150
Cover Screws (Qty. 2 each)	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002
	Option K	Option L	Option M	Option N	Option P	Option Q	Option R	Option S
Set Screws (Qty. 2 each)	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 1/16" .05" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox 3-48 x 3/32" .05" Hex (Torque = 28 - 32 oz-in) Part Number 1829ZG015	Black Ox 3-48 x 3/32" .05" Hex (Torque = 28 - 32 oz-in) Part Number 1829ZG015	Black Ox 3-48 x 3/32" .05" Hex (Torque = 28 - 32 oz-in) Part Number 1829ZG015	Black Ox 3-48 x 3/32" .05" Hex (Torque = 28 - 32 oz-in) Part Number 1829ZG015
Mounting Screws (Qty. 2 each)	4-40 x 5/16" Button Head, .062" Hex (Torque = 45 - 51 oz-in) Part Number 1835ZG004	M2.5 x 8mm Button Head, 1.5mm Hex (Torque = 45 - 51 oz-in) Part Number 1834ZG051	4-40 x 5/16" Button Head, .062" Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1835ZG104	M2.5 x 8mm Button Head, 1.5mm Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1834AG151	4-40 x 5/16" Button Head, .062" Hex (Torque = 45 - 51 oz-in) Part Number 1835ZG004	M2.5 x 8mm Button Head, 1.5mm Hex (Torque = 45 - 51 oz-in) Part Number 1834ZG051	4-40 x 5/16" Button Head, .062" Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1835ZG104	M2.5 x 8mm Button Head, 1.5mm Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1834AG151
Cover Screws (Qty. 2 each)	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002

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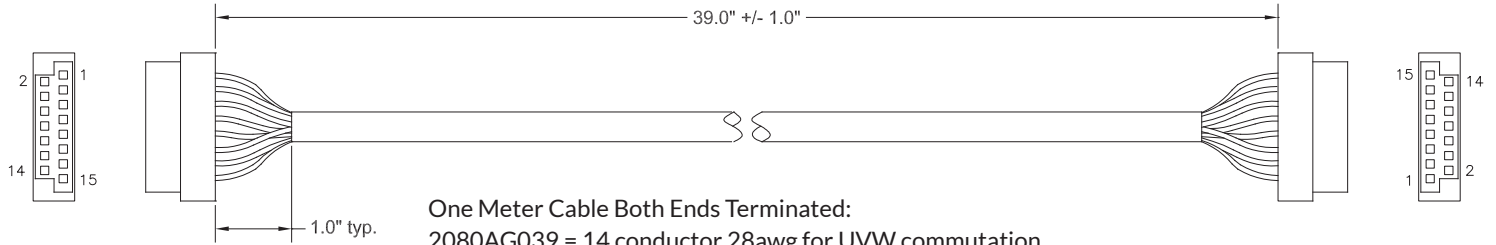
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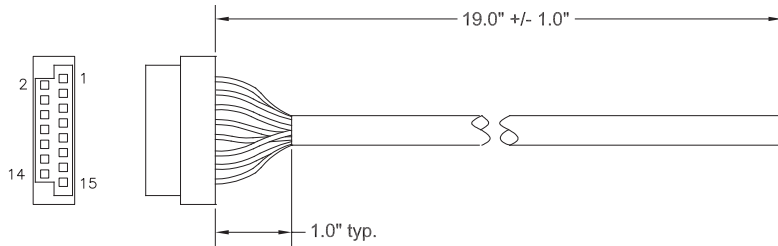
CABLE ACCESSORIES

(2080AG039, 2082AG039, 2081AG019, 2083AG019)

Consult Factory for Custom Lengths



One Meter Cable Both Ends Terminated:
 2080AG039 = 14 conductor 28awg for UVW commutation
 2082AG039 = 8 conductor 28awg for Non-commutation
 Connector = JAE FI-W15S



Half Meter Cable One End Terminated:
 2081AG019 = 14 conductor 28awg for UVW commutation
 2083AG019 = 8 conductor 28awg for Non-commutation
 Connector = JAE FI-W15S

Pin Number	Signal Function	2080AG039 2081AG019 Wire Color	2082AG039 2083AG019 Wire Color
1	A	Brown	Brown
2	A -	White	White
3	B	Blue	Blue
4	B -	Green	Green
5	Z	Orange	Orange
6	Z -	Yellow	Yellow
7	U	Violet	
8	U -	Gray	
9	V	White/Brown	
10	V -	White/Red	
11	W	White/Orange	
12	W -	White/Yellow	
13	Vcc	Red	Red
14	GND	Black	Black
15	No Connect		

Note:

1. Cable has internal foil shield with 28awg 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.

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