

# SERIES HS35iQ



## Hollowshaft Encoder with PulseIQ™ Technology

### Key Features

- Revolutionary Visual Fault Forewarning For:
  - Encoder Health: Signal Quality, Low Voltage
  - Over/Under Encoder Temperature
  - Cable Integrity Issues
  - Shaft Slip/Loose Clamp
  - Overspeed Detection
- Fault Notification to Controls
- Advanced Diagnostics Via Software Service Tool
- Programmable Encoder Option to 20,000 PPR

IND  
Industrial Duty



### SPECIFICATIONS

#### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental, Optical  
**Resolution:** Selectable resolution up to 20,000 PPR upon order or programmable resolution up to 20,000 PPR with factory default setting of 1,024 PPR  
**Format:** Two channel quadrature (AB) with optional Index (Z), and complementary outputs  
**Phase Sense:** A leads B for CW shaft rotation viewing the shaft clamp end of the encoder  
**Quadrature Phasing:** 90° ±30° electrical  
**Symmetry:** 180° ±25° electrical  
**Index:** 180° default gated to B low, with 90° and 360° programmable options  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

#### ELECTRICAL

**Input Power:** 5-26VDC (7272, 7273 line driver options), 5-15VDC (4469 line driver option), 250 mA max. not including output loads.  
**Primary Outputs:**  
 7272 Differential Line Driver: 40 mA, sink or source  
 7273 Open Collector: 40mA, sink max  
 4469 Differential Line Driver: 100mA, sink or source  
**Fault Outputs (active low):** TTL (5VDC) or HTL ( $V_{out} = V_{in}$ ), 12 mA max  
**Frequency Response:** 200 kHz (data and index)  
**Noise Immunity:** Tested to EN61326-1  
**Electrical Immunity:** Reverse polarity, short circuit protected with 7272 or 7273 line drivers only  
**Termination:** MS Connector; M12 Connector; cable exit w/seal. See Ordering Information  
**Mating Connector:**  
 7 pin MS, style MS3106A-16S-1S (MCN-N5)  
 10 pin MS, style MS3106A-18-1S (MCN-N6)  
 10 pin, NEMA 4 style (MCN-N6N4)  
 10 pin Bayonet, MS3116-F12-10S (MCN-B1)  
 Cable w/ 5 pin M12 Connector(112859-XXXX)  
 Cable w/ 8 pin M12 Connector(112860-XXXX)  
**Note:** "MS" type mating connectors and prebuilt cables are rated NEMA 4 or NEMA 12. "M12" Cable assemblies are rated IP67

#### MECHANICAL

**Bore Diameter:** 6mm to 28mm, 1/4" to 1-1/8", electrically isolated  
**Mating Shaft Length:** 1.25", Minimum, 1.60", Recommended  
**Shaft Speed:** 6000 RPM, Maximum (Enclosure Rating is IP64 at speed over 5000 RPM)  
**Starting Torque:** 10 in.-oz. typical (at 25°C)  
**Running Torque:** 5 in.-oz. typical (at 25°C)  
**Bearings:** ABEC 1  
**Housing and Cover:** Powder Coated Aluminum  
**Shaft Material:** 6061-T6 Aluminum, Stainless Steel for Extended Temp Option  
**Disc Material:** Aluminum  
**Weight:** 2.10 lb (34 oz) Typical

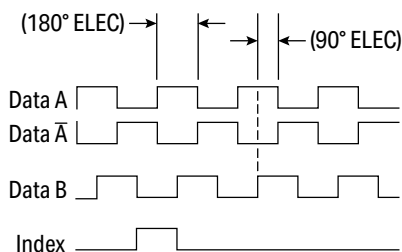
#### ENVIRONMENTAL

**Standard Operating Temperature:** -40 to +85°C (0 to +70°C with 4469 line driver, see "Ordering Information"). At shaft speed above 3000 RPM, derate 10°C per 1000 RPM  
**Extended Temperature Range:** -40 to +100°C (See ordering information)  
**Storage Temperature:** -40 to +100°C  
**Shock:** 400G, 6ms  
**Vibration:** 5 to 3000 Hz, 20G  
**Humidity:** Up to 98% (non-condensing)  
**Enclosure Rating:** IP67\* (IP64 at shaft speed above 5000 RPM)

\* Ingress protection rating dependent on mating connector rating

#### STANDARD DATA AND INDEX

Not all complements shown  
 $\bar{A}$  shown for reference



Index Width: 180° Default  
 A leads B, CW (from clamp end)

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**PULSEIQ™ TECHNOLOGY SPECIFICATIONS**

**FAULT FOREWARNING**

The HS35iQ Encoder with PulseIQ™ Technology provides fault forewarning for common encoder issues. Notification to the user is via status lights on the encoder and a digital output to the control system. Fault signal is provided as TTL (5VDC) or HTL ( $V_{out} = V_{in}$ ).

Fault	Fault Condition	Operation					Corrective Action Sequence
		White	Green	Red	Blue (Fault Recovery)	Orange (Warning)	
<b>Over-Temperature</b>	Internal encoder temperature exceeds operating conditions	LED pulses white when fault is disabled	LED pulses green during normal operation	LED pulses red during fault condition	LED "flickers" (rapidly flashes) blue for 30 minutes after fault is corrected or cleared. Event logged in onboard memory.	LED pulses orange for temperature warning	Verify ambient temperature on and around the encoder is within acceptable limits.
<b>Shaft Slip/Overspeed</b>	Detection of shaft slippage					N/A	Stop rotation. Tighten coupling. Restart and monitor.
	Overspeed detection					Check motor controls	
<b>Cable Integrity</b>	Cable open or short condition such as damaged cable, touching or loose conductors*					N/A	Verify all cables are properly secured to the encoder and no damage or shorts are noticed.
<b>Encoder Internal Health</b>	Electronics and voltage monitoring	LED pulses orange for encoder health warning	Check for sufficient voltage at encoder connector and/or review Instructional Manual for additional guidance.				

\*Cable Integrity fault detection only available for certain decodes. Refer to decode table for more information.

**PROGRAMMABILITY (OPTIONAL)**

For programmable units, specifications can be customized from factory default settings to the programmable options below when using included software in expert mode. Please see manual for details.

Specification	Factory Default Setting	Programmable Options
<b>Pulses Per Revolution</b>	1,024 PPR	1 to 20,000 PPR in 1 PPR increments
<b>Phasing</b>	A leads B, CW from clamp end	A leads B, CW from clamp end A leads B, CCW from clamp end
<b>ABZ Signal Voltage</b>	TTL (5VDC)	TTL (5VDC), HTL ( $V_{out} = V_{in}$ )
<b>Z Index Pulse Polarity</b>	Standard High	Standard High, Inverted Low
<b>Z Index Pulse Position and Gating</b>	180° electrical gated to B low	90°, 180° or 360° electrical, many gating options to A/B
<b>Fault Signal Voltage</b>	TTL (5VDC)	TTL (5VDC), HTL ( $V_{out} = V_{in}$ )



# STANDARD VERSION



STANDARD UNIT ORDERING INFORMATION							
To order, complete the model number with code numbers from the table below:							
Code 1: Model	Code 2: PPR	Code 3: Bore Size	Code 4: Fixing	Code 5: Control Output Format	Code 6: Termination	Code 7: Fault Output Format	Code 8: Options
<b>HS35iQ</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Hollowshaft Encoder	Enter Any Quadrature Resolution (PPR) From 00001-20000. Example: 00001 = 1 PPR	0 6mm	0 None	0 ABZ, Single Ended, 5-26VDC (7272)	1 7 Pin MS*	0 TTL (5VDC)	R1 Diagnostics and Output
		1 1/4"	1 Tether Kit, 4.5" C-Face Single Point with 3/8" Bolt	1 ABZ, Single Ended O/C (7273)	6 7 Pin MS + Mating*	1 HTL ( $V_{out} = V_{in}$ )	
		2 5/16"	2 Tether Kit, 8.5" C-Face Single Point with 1/2" Bolt	2 ABZ, Single Ended O/C w2.2kOhm (7273)	2 10 Pin MS		
		3 8mm	3 Tether Kit, Slotted with T-bolts for Standard AC Motor Fan Covers	H Same as "0" with Extended Temp Range	4 10 Pin Bayonet		
		4 3/8"		J Same as "1" with Extended Temp Range	7 10 Pin MS + Mating		
		5 10mm		K Same as "2" with Extended Temp Range	9 10 Pin Bayonet + Mating		
		6 12mm		Not Available When Code 6 is H	H 5 pin M12*		
		7 1/2"		4 Differential AB Only, 5-26VDC, 5-26VDC out (7272)	J 8 pin M12*		
		8 5/8"		5 Differential AB Only, 5-26VDC In, 5VDC Out (7272)	A 0.5m (18") Cable		
		9 15mm		A Differential AB Only, 5-26VDC In, 5VDC Out (4469)	C 1m (36") Cable		
		A 16mm		C Differential AB Only, 5-15VDC in, 5-15VDC Out (4469)	D 2m (72") Cable		
		C 19mm		L Same as "4" with Extended Temp Range	E 3m (120") Cable		
		D 3/4"		M Same as "5" with Extended Temp Range	G 0.3m (13") Cable		
		E 20mm		Not Available When Code 6 is 1, 6, or H	*Fault Output Not Available on Primary Connector for 7 Pin Differential and All M12 Connectors. Fault Output Available on Primary Connector 7 pin Single Ended, 10 pin MS and Bayonet and cable exit. Always Available on Secondary Diagnostic Connector for All Options.		
		F 7/8"		6 Differential ABZ, 5-26VDC In, 5VDC Out (7272)	Note: "MS" type mating connectors and prebuilt cables are rated NEMA 4 or NEMA 12. "M12" Cable assemblies are rated IP67		
		G 24mm		7 Differential ABZ (7272), 5-26V In, 5-26V Out			
		H 1"		8 Differential ABZ, 5-26VDC In, 5VDC Out (4469)			
		J 1-1/8"		9 Differential ABZ (4469), 5-15V In, 5-15V Out			
		M 14mm		N Same as "6" with Extended Temp Range			
		N 18mm		P Same as "7" with Extended Temp Range			
		P 25mm		Note: Cable Integrity fault detection functionality only available for 7272 Differential Control Output Format (Options: 4, 5, L, M, 6, 7, N, P)			
		R 28mm					
		Not Electrically Isolated	A Rod Tether				
		K 1-1/4"	B Rod Tether + Grounding Strap				
		S 30mm	D Rod Tether + Grounding Strap + 4.5" C-Face Cover				

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## COMPATIBLE ACCESSORIES

### MATING CONNECTORS (NO CABLE)

<b>MCN-N5</b>	7 pin, style MS3106A-16S-1S
<b>MCN-N6</b>	10 pin, style MS3106A-18-1S
<b>MCN-N6N4</b>	10 pin, NEMA 4 style
<b>MCN-B1</b>	10 pin bayonet, style MS3116-F12-10S

### ACCESSORY KITS

<b>114573-0001</b>	Tether Kit, 4.5" C-Face Single Point with 3/8" Bolt
<b>114574-0001</b>	Tether Kit, Slotted with T-bolts for Standard AC Motor Fan Covers
<b>114575-0001</b>	Tether Kit, 8.5" C-Face Single Point with 1/2" Bolt
<b>118024-0001</b>	Cover Kit, 4.5" C-Face
<b>118025-0001</b>	Cover Kit, 8.5" C-Face
<b>118026-0001</b>	Cover Kit, Fan Cover for Standard AC Motor
<b>116233-0001</b>	Rod Tether Only
<b>118267-0001</b>	Rod Tether + 56 C-Face Cover (Single)
<b>116233-0004</b>	Rod Tether + Grounding Strap
<b>118027-0004</b>	Rod Tether + Grounding Strap + 4.5" C-Face Cover

### PRIMARY CABLE ASSEMBLIES WITH MS CONNECTOR\*

<b>118019-XXXX</b>	7 Pin MS, Cable Assembly. For Use with Single Ended Outputs w/ Fault Output
<b>108596-XXXX</b>	7 Pin MS, Cable Assembly. For Use with Differential Line Driver w/o Index Outputs w/o Fault Output
<b>118020-XXXX</b>	10 Pin MS, Cable Assembly. For Use with Differential Line Driver with Index Outputs
<b>118021-XXXX</b>	10 Pin Bayonet, Cable Assembly. For Use with Differential Line Driver with Index Outputs
<b>118022-XXXX</b>	NEMA 4 10 pin MS, Cable Assembly. For Use with Differential Line Driver with Index Outputs

### PRIMARY CABLE ASSEMBLIES WITH M12 CONNECTOR\*

<b>112859-XXXX</b>	5 Pin M12, Cable Assembly. For Use with Single Ended Outputs
<b>112860-XXXX</b>	8 Pin M12, Cable Assembly. For Use with Single Ended and Differential Line Driver Outputs

### DIAGNOSTIC CABLE ASSEMBLIES

<b>117995-0001</b>	6ft Diagnostic and Programming Cable to PC. 6 Pin MS to USB.
<b>118023-XXXX</b>	Cable Assembly for Fault Output on Secondary Connector. 6 Pin MS to Flying leads

### SOLID STATE RELAY

<b>608793-0001</b>	Solid State Relay for Non Isolated Use of Fault Output. 60VDC max 3A
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\*Note: Standard cable length is 10 feet but may be ordered in any length in 5 foot increments. For example, for a 20 foot cable, replace XXXX with -0020.

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## PRIMARY ELECTRICAL CONNECTIONS

### 7 AND 10 PIN MS CONNECTORS AND CABLES - CODE 6 = 1 TO 9

Connector and mate/accessory cable assembly pin numbers and wire color information is provided here for reference. Models with direct cable exit carry the same color coding as shown for each output configuration.

Encoder Function	Cable #108596-XXXX 7 Pin Differential Line Driver without Index		Cable #118019-XXXX 7 Pin MS Single Ended		Cable #118020-XXXX 10 Pin MS or #118022-XXXX* NEMA 4 10 Pin Differential with Index		Cable #118021-XXXX 10 Pin MS Bayonet		Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Wire Color
Signal A	A	BRN	A	BRN	A	BRN	5	BRN	BRN
Signal B	B	ORN	B	ORN	B	ORN	8	ORN	ORN
Signal Z <sup>†</sup>	—	—	C	YEL	C	YEL	C	YEL	YEL
Power +V	D	RED	D	RED	D	RED	D	RED	RED
Fault	—	—	E	BLK/WHT	E	BLK/WHT	E	BLK/WHT	BLK/WHT
Common	F	BLK	F	BLK	F	BLK	F	BLK	BLK
Case	G	GRN	G	GRN	G	GRN	G	GRN	GRN
Signal $\bar{A}$	C	BRN/WHT	—	—	H	BRN/WHT	H	BRN/WHT	BRN/WHT
Signal $\bar{B}$	E	ORN/WHT	—	—	I	ORN/WHT	J	ORN/WHT	ORN/WHT
Signal $\bar{Z}^{\dagger}$	—	—	—	—	J	YEL/WHT	K	YEL/WHT	YEL/WHT

Cable Configuration: PVC jacket, 105°C rated, overall foil shield; 3 twisted pairs 24 AWG (output signals), plus 2 twisted pairs 22 AWG (input power)

## PRIMARY ELECTRICAL CONNECTIONS

### 5 AND 8 PIN M12 ACCESSORY CABLES WHEN CODE 6 = H OR J

Connector pin numbers and cable assembly wire color information is provided here for reference.

Encoder Function	Cable #112859-XXXX 5 Pin Single Ended		Cable #112860-XXXX 8 Pin Single Ended		Cable #112860-XXXX 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Signal A	4	BLK	1	BRN	1	BRN
Signal B	2	WHT	4	ORG	4	ORG
Signal Z <sup>†</sup>	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Common	3	BLU	7	BLK	7	BLK
Signal $\bar{A}$	—	—	—	—	3	BRN/WHT
Signal $\bar{B}$	—	—	—	—	5	ORG/WHT
Signal $\bar{Z}^{\dagger}$	—	—	—	—	8	YEL/WHT

Cable Configuration: PVC jacket, 105°C rated, overall foil shield; 24 AWG conductors, minimum

## DIAGNOSTIC ELECTRICAL CONNECTION

Encoder Function	Cable #118023-XXXX 6 Pin MS to Flying Lead	
	Pin	Wire Color
Common	A	BLK
—	B	N/C
—	C	N/C
—	D	N/C
—	E	N/C
Fault	F	BLK/WHT
118023-XXXX comes with an additional shield wire		

Encoder Diagnostic and Programming Cable (6ft)	Cable #117995-0001 6 Pin MS to USB
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**Notes:**

Standard cable length is 10 feet but may be ordered in any length in 5 foot increments. For example, for a 20 foot cable, replace -XXXX with -0020

\*"MS" Type mating connectors and pre-build cables are rated NEMA 12

\*"M12" Cable assemblies are rated IP67

\*For watertight applications, use NEMA 4 10 pin cable and connector 118022-XXXX

<sup>†</sup>Index not provided on all models. See ordering information

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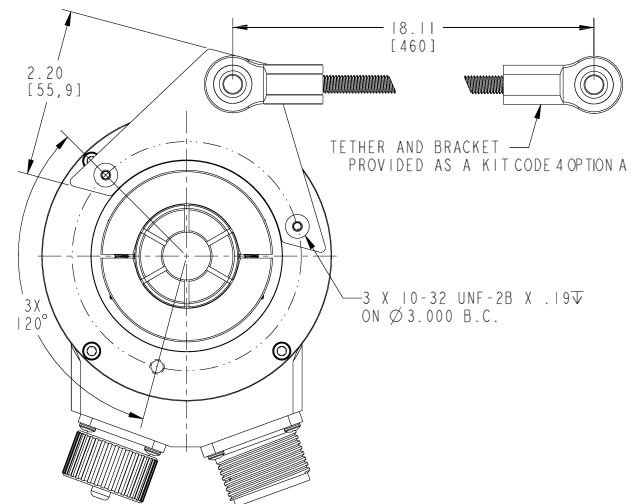
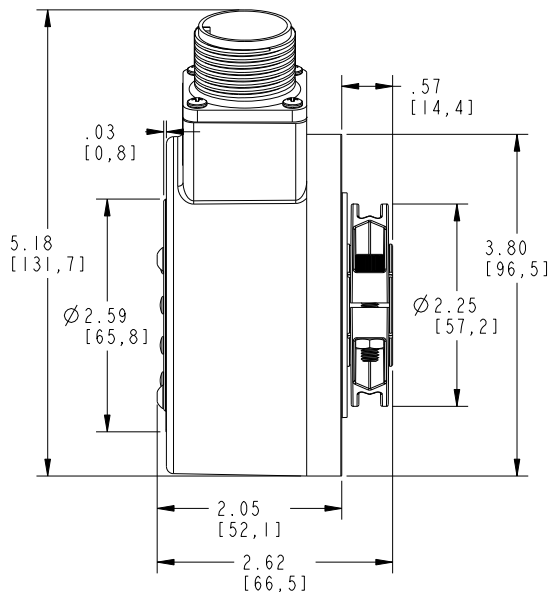
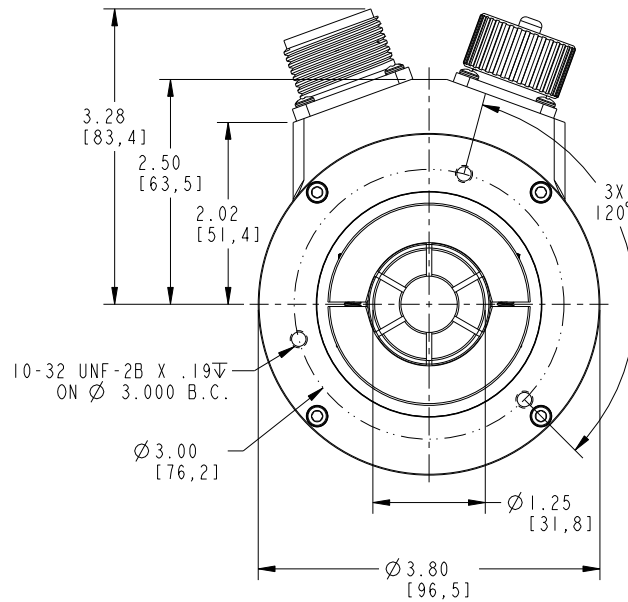
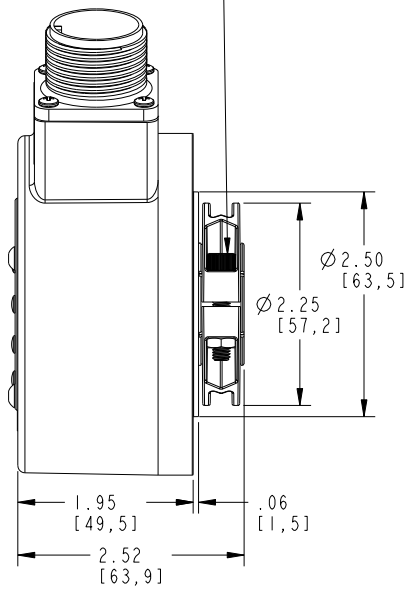
Dimensions: inch (mm)

## HS35iQ ENCODER

[Download Sample 3D Model File Here >](#)

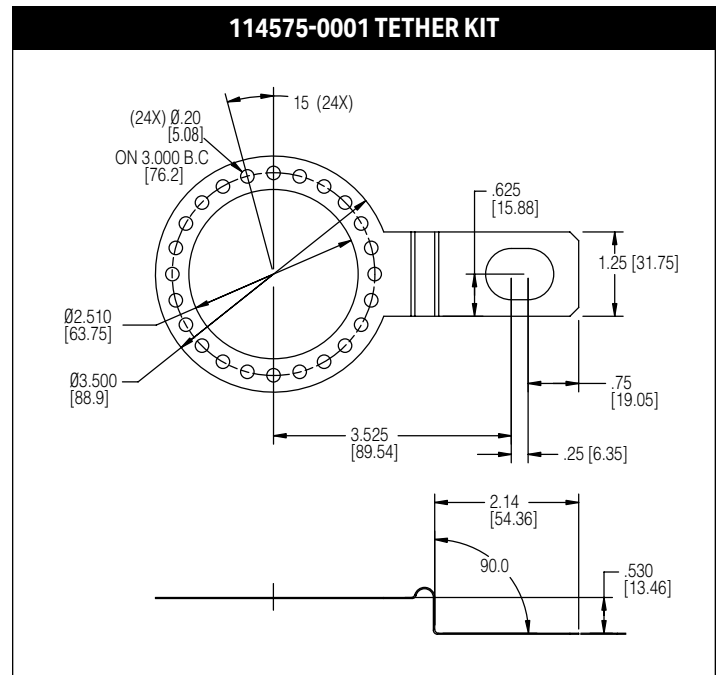
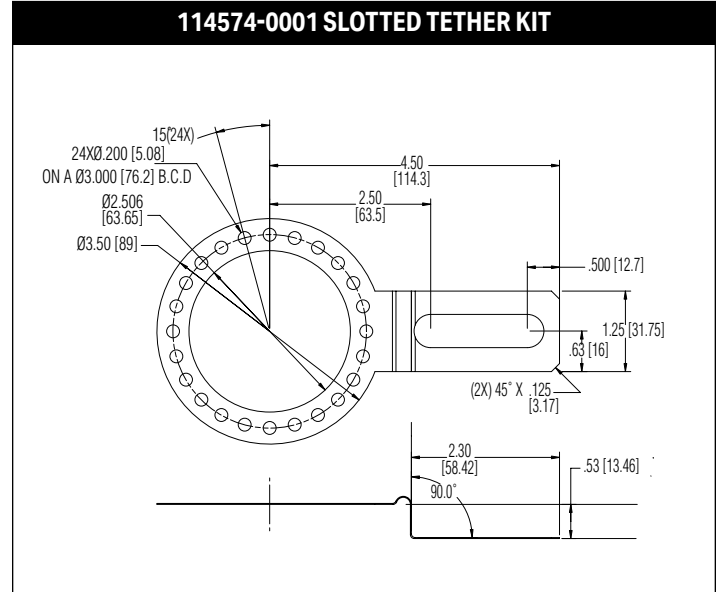
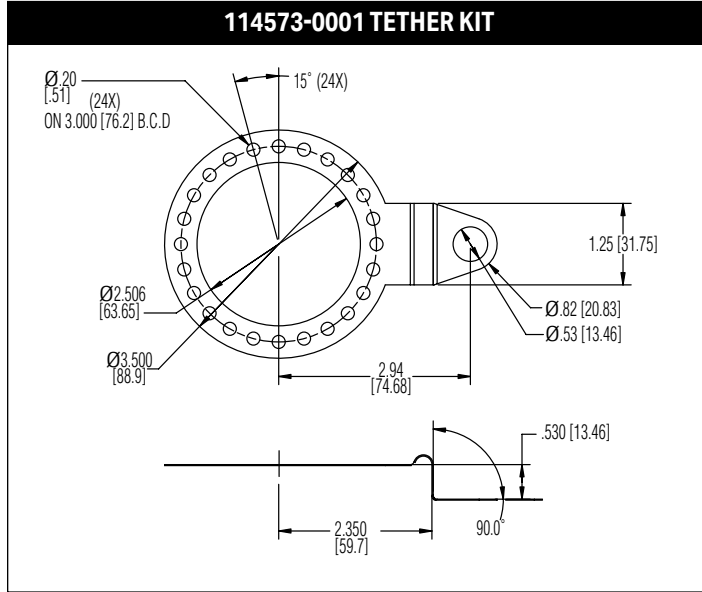
.stp format, 10 pin dual connector option

2 X 10-32 UNF CLAMP SCREW  
TORQUE TO 50-55 IN-LBS



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Dimensions: inch (mm)



Worldwide Brands: NorthStar™ • Dynapar™ • Hengstler™ • Harowe™

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