

SERIES HS35iQ

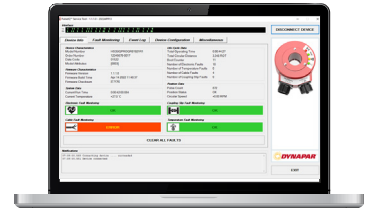


Hollowshaft Encoder with PulseIQ™ Technology

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

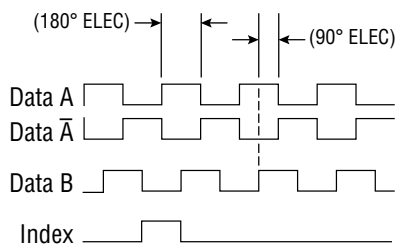
Humidity: Up to 98% (non-condensing)

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
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)	
Over-Temperature	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.
Shaft Slip/Overspeed	Detection of shaft slippage					N/A	Stop rotation. Tighten coupling. Restart and monitor.
	Overspeed detection						Check motor controls
Cable Integrity	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.
Encoder Internal Health	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
Pulses Per Revolution	1,024 PPR	1 to 20,000 PPR in 1 PPR increments
Phasing	A leads B, CW from clamp end	A leads B, CW from clamp end A leads B, CCW from clamp end
ABZ Signal Voltage	TTL (5VDC)	TTL (5VDC), HTL ($V_{out}=V_{in}$)
Z Index Pulse Polarity	Standard High	Standard High, Inverted Low
Z Index Pulse Position and Gating	180° electrical gated to B low	90°, 180° or 360° electrical, many gating options to A/B
Fault Signal Voltage	TTL (5VDC)	TTL (5VDC), HTL ($V_{out}=V_{in}$)

SERIES HS35iQ



See next page for standard unit options and part number information.

PROGRAMMABLE 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
HS35iQ	PROGR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Hollowshaft Encoder	Programmable Resolution Up to 20,000 PPR. Set as 1,024 PPR From Factory	0 6mm 1 1/4" 2 5/16" 3 8mm 4 3/8" 5 10mm 6 12mm 7 1/2" 8 5/8" 9 15mm A 16mm C 19mm D 3/4" E 20mm F 7/8" G 24mm H 1" J 1-1/8" M 14mm N 18mm P 25mm R 28mm Not Electrically Isolated K 1-1/4" S 30mm	0 None 1 Tether Kit, 4.5" C-Face Single Point with 3/8" Bolt 2 Tether Kit, 8.5" C-Face Single Point with 1/2" Bolt 3 Tether Kit, Slotted with T-bolts for Standard AC Motor Fan Covers 6 Same as 1 w/ Cover 7 Same as 3 w/ Cover 8 Same as 2 w/ Cover A Rod Tether B Rod Tether + Grounding Strap D Rod Tether + Grounding Strap + 4.5" C-Face Cover	0 ABZ, Single Ended, 5-26VDC (7272) 1 ABZ, Single Ended O/C (7273) 2 ABZ, Single Ended O/C w2.2kOhm (7273) H Same as "0" with Extended Temp Range J Same as "1" with Extended Temp Range K Same as "2" with Extended Temp Range Not Available When Code 6 is H 4 Differential AB Only (7272). 5-26VDC In, Programmable Vin or 5VDC Out C Differential AB Only (4469). 5-15VDC In, Programmable Vin or 5VDC Out L Same as "4" with Extended Temp Range Not Available When Code 6 is 1, 6, or H 7 Differential ABZ (7272). 5-26VDC In, Programmable Vin or 5VDC Out 9 Differential ABZ (4469). 5-15VDC In, Programmable Vin or 5VDC Out P Same as "7" with Extended Temp Range Note: Cable Integrity fault detection functionality only available for 7272 Differential Control Output Format (Options: 4, L, 7, P)	1 7 Pin MS* 6 7 Pin MS + Mating* 2 10 Pin MS 4 10 Pin Bayonet 7 10 Pin MS + Mating 9 10 Pin Bayonet + Mating H 5 pin M12* J 8 pin M12* A 0.5m (18") Cable C 1m (36") Cable D 2m (72") Cable E 3m (120") Cable G 0.3m (13") Cable *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. Note: "MS" type mating connectors and prebuilt cables are rated NEMA 4 or NEMA 12. "M12" Cable assemblies are rated IP67	P Programmable output TTL (5VDC) or HTL ($V_{out} = V_{in}$)	R1 Diagnostics and Output



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



COMPATIBLE ACCESSORIES

MATING CONNECTORS (NO CABLE)

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

ACCESSORY KITS

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

PRIMARY CABLE ASSEMBLIES WITH MS CONNECTOR*

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

PRIMARY CABLE ASSEMBLIES WITH M12 CONNECTOR*

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

DIAGNOSTIC CABLE ASSEMBLIES

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

SOLID STATE RELAY

608793-0001	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.



PRIMARY ELECTRICAL CONNECTIONS

7 & 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 w 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
Sig. A	A	BRN	A	BRN	A	BRN	5	BRN	BRN
Sig. B	B	ORN	B	ORN	B	ORN	8	ORN	ORN
Sig. Z**	—	—	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
COM	F	BLK	F	BLK	F	BLK	F	BLK	BLK
Case	G	GRN	G	GRN	G	GRN	G	GRN	GRN
Sig. \bar{A}	C	BRN/WHT	—	—	H	BRN/WHT	H	BRN/WHT	BRN/WHT
Sig. \bar{B}	E	ORN/WHT	—	—	I	ORN/WHT	J	ORN/WHT	ORN/WHT
Sig. \bar{Z}**	—	—	—	—	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 & 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
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
Sig. Z**	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
COM	3	BLU	7	BLK	7	BLK
Sig. \bar{A}	—	—	—	—	3	BRN/WHT
Sig. \bar{B}	—	—	—	—	5	ORG/WHT
Sig. \bar{Z}**	—	—	—	—	8	YEL/WHT

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

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

**Index not provided on all models. See ordering information.

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

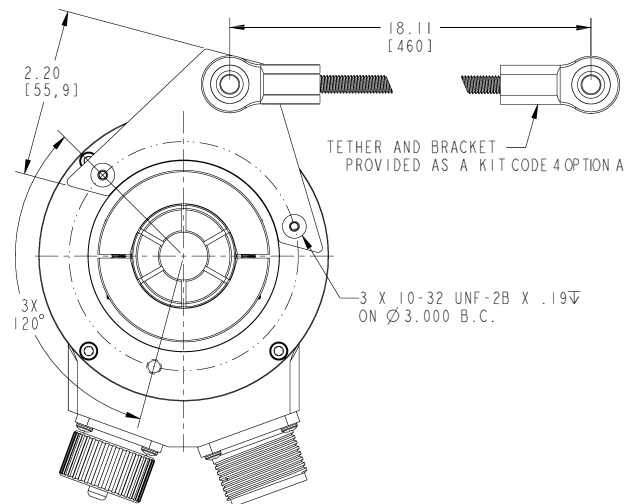
DIAGNOSTIC ELECTRICAL CONNECTION

Encoder Function	Cable #118023-XXXX 6 Pin MS to Flying Lead	
	Pin	Wire Color
COM	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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HS35IQ ENCODER

.stp format, 10 pin dual connector option

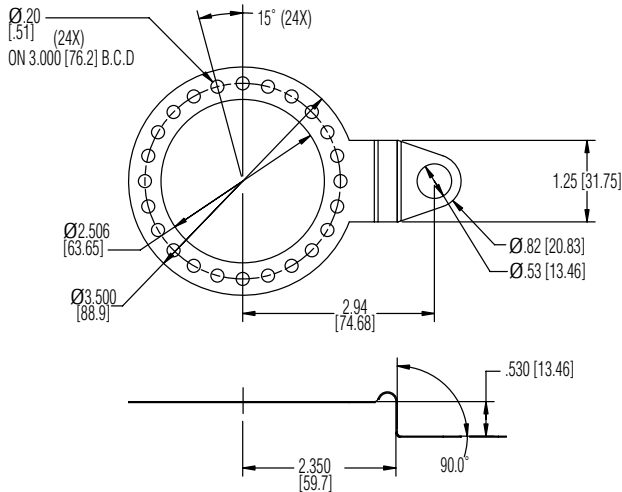


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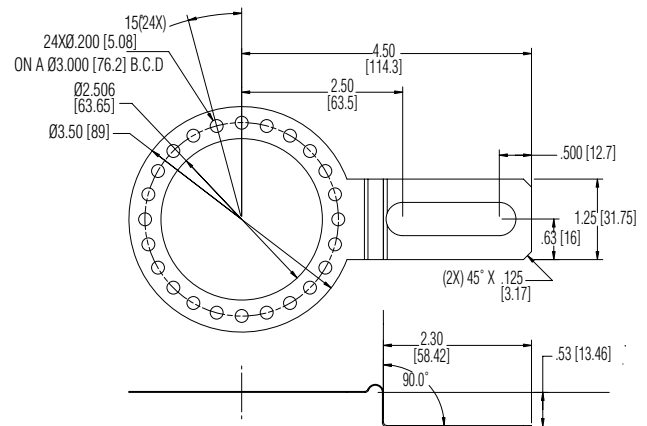
ACCESSORIES

Dimensions: inch (mm)

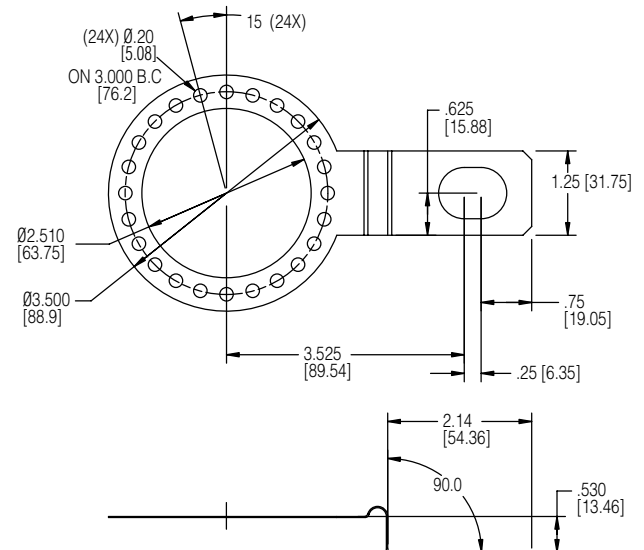
114573-0001 TETHER KIT



114574-0001 SLOTTED TETHER KIT



114575-0001 TETHER KIT



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