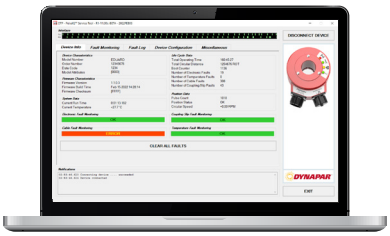
Encoder Installation Manual

PulseIQ™ Technology

SERIES HS35IQ

Heavy Duty Hollowshaft Encoder

Document No.: 703409-0002
Revision Level: B
Date: July 25, 2023



Description

The PulseIQ™ Technology enabled HS35iQ provides visual indication of encoder health through fault lights and digital output. This solution can specifically indicate common issues with recommended corrective actions to help fix the root cause and avoid repeat downtime.

Series HS35iQ is not only electrically & thermally isolated (for shaft sizes 1.125" and under) but also environmentally sealed with shaft seals at both ends.

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

Important Installation Information

Mounting the Encoder: Before installation, ensure power is disconnected from encoder and motor or machine.

CAUTION: *The loads applied to the encoder shaft must be in accordance with the specificatios of this device.*

WARNING *(Programmable Encoders only): Please ensure encoder settings are properly configured before installing. If you have questions please contact the OEM, distributor or Dynapar customer service.*

Important Wiring Instructions: Use of shielded cable is recommended for all encoder installations. The shield should be connected to signal-ground at the receiving device only.

Grounding: For applications with high ground potential differences, DO NOT ground the encoder through both machine and controls end. Connect the shield at the controls end only. NOTE: If the shield is connected at both ends, grounding problems that degrade system performance can result.

CE Grounding Measures: For best EMC immunity the cable screen must be grounded on both encoder and controls end. For cable lengths longer than 30m or outdoor applications, additional measures must be implemented to comply with CE requirements. Connection of the encoder to DC power supply network is prohibited if CE compliance is required. CE-compliant products are tested to EN61326-1 EMC.

In all cases, system CE compliance is ultimately the responsibility of the manufacturer integrating the encoder.

Connecting the shield at both ends can cause grounding problems that degrade system performance.

If possible, run the encoder cable through a dedicated conduit (not shared with other wiring). Use of conduit will protect the cable from physical damage and provide a degree of electrical isolation. Do not run the cable in close proximity to other conductors that carry current to heavy loads such as motors, motor starters, contactors, solenoids, etc. This practice can induce electrical transients in the encoder cable, potentially interfering with reliable data transmission.

Refer to Electrical Connections table for wiring information.
To avoid possible damage, do not connect or disconnect the encoder connector or wiring while power is applied to the system.

CAUTION: *Unused encoder signal wires must be individually insulated and under no circumstances be in contact with ground, voltage sources, or other signal lines.*

Mechanical Installation

A. General Overview

The following instructions are meant to assist in proper installation of PulseIQ™ Technology series HS35iQ hollowshaft encoders. The encoder is a speed and position transducer that when mounted to a rotating shaft, produces output pulses that are directly proportional to the shaft speed and direction. The hollowshaft encoder is attached to the motor shaft by using a clamp down collar. The HS35iQ can accommodate several machine shaft diameters by selecting the appropriate bore size. During installation, certain physical properties associated with the mechanical coupling must be observed to ensure a long operation life of the encoder. For proper Shaft slippage detection, standard Dynapar tethering shall be used. Alternate tethering solutions may result in improper detection.

B. Shaft Extension

Solid shaft preferred, keyway allowed; flatted shaft must not be used. The minimum shaft engagement length that will allow support to encoder housing is 1.25", Shaft engagement length of 1.60" (40.6 mm) or longer is recommended for reduced wobble. The longest shaft length as measured from the mounting face that will allow installation of the shaft cover is 2.60" (66 mm) maximum. Installations that employ a press-fit or screwed-on stub shaft adapter should align the stub shaft to 0.002" TIR or less with a dial indicator

C. Tether Point

For general industrial machinery and C-face motor installations, locate the tether hole at the nominal bolt circle location. The tether holes are slightly elongated, to allow for hole location tolerance and arcing of the tether, if the hole location is not flush with the tether surface.

Tether Type	Hole Locaton	Supplied Bolt Size
4.5" C-Face Tether	2.94" (75 mm)	3/8"
8.5" C-Face Tether	3.63" (92 mm)	1/2"
Slotted Tether	2.5"- 4.0" (63-102mm)	1/4", 5/16", 3/8"

Bolt Size	Recommended Torque
1/4-20	50-60 in-lbs
5/16-18	70-80 in-lbs
3/8-16	100-125 in-lbs
1/2-13	125-150 in-lbs

STEP 1: Preparation and Recommended Tools

Disconnect power from equipment and encoder cable. Ensure that you have the proper tools. Typical tools that may be needed depending on the options chosen are:

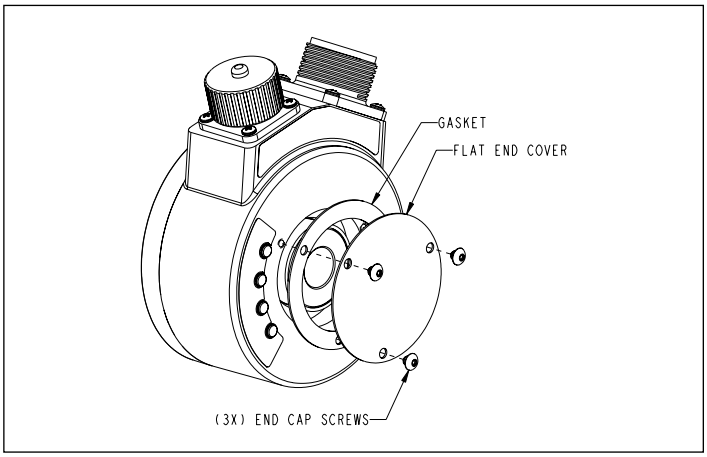
- #2 Phillips Screwdriver
- 5/32" Hex Wrench(US)
- Caliper Gauge
- Dial Indicator Gauge
- 3/8", 1/2" or 1/4" T- handle Wrenches (tether options)

STEP 2: Check and Clean the Mating Shaft

Ensure that the mating shaft is within proper tolerances. Recommended mating shaft diameter tolerances should be nominal +0.0000"/-0.0005" [0.00 to -0.013 mm] and shaft runout TIR should be under 0.002".

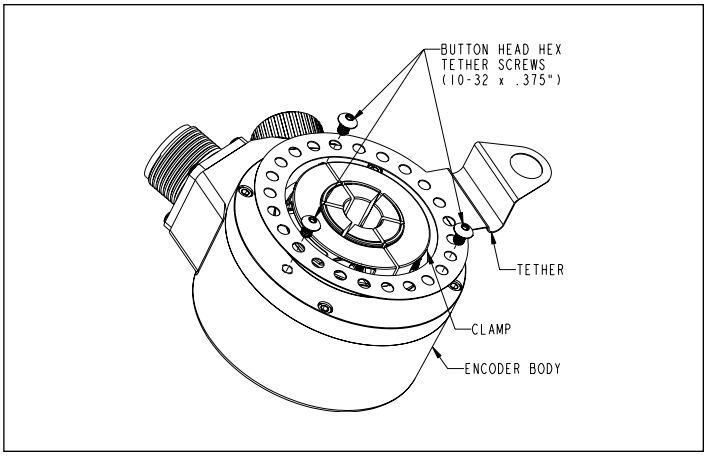
Clean the mating shaft of any burrs and check that mating shaft engagement is at least 1.25" inside the encoder shaft. Using a dial indicator gauge verify that the motor shaft Total Indicated Reading (TIR) is less than 0.002" [0.05 mm].

STEP 3: Install Endcap



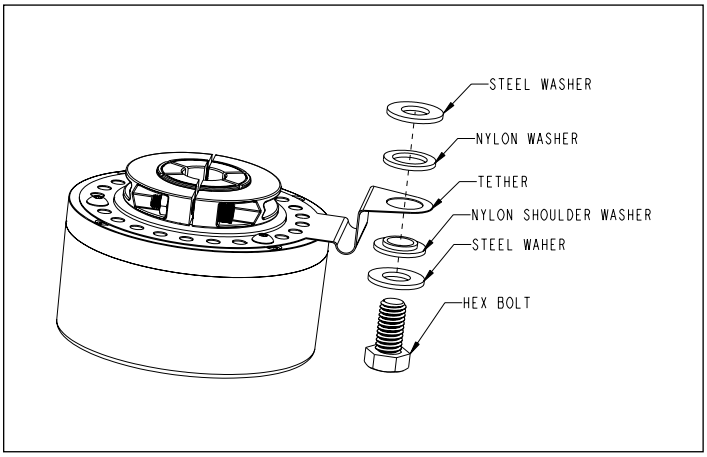
The encoder ships with an endcap to cover the back end of the encoder body and, although optional, it is recommended for additional environmental protection. To install, remove the factory installed three screws at the back of the encoder, properly discard the removed back plate and the three screws. Unpack the endcap, gasket and the three screws from the factory supplied kit. Align the three holes and fasten the gasket and end cap to the encoder body as shown.

STEP 4: Install the Tether on Encoder



Rotate the tether to the required orientation and tighten the tether arm to the encoder body using the three screws provided. The hollowshaft series encoder tethers can be rotated in 15 degree increments so that connector or cable exit can be conveniently located.

STEP 5: Install Washers on Tether

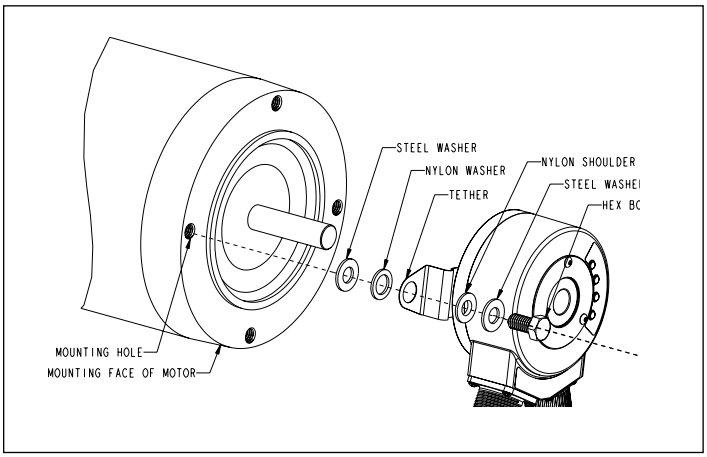


Slide the flat nylon washer on the side away from the bend and the flanged nylon washer on the side of the bend and press them together until they are fully seated in the tether hole. One steel washer is to be used on each side of the nylon washer.

STEP 6: Slide Encoder on Shaft

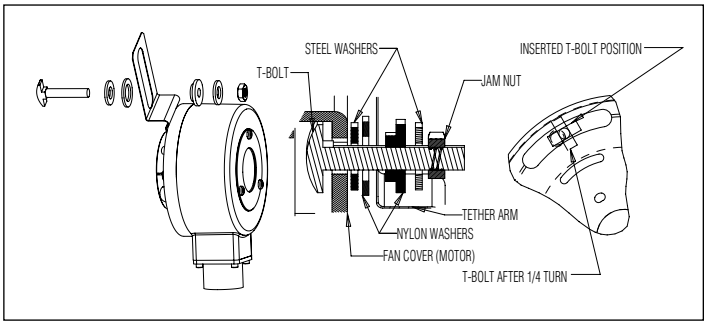
Carefully slide the encoder all the way down until the tether rests on the motor face without any stress on the tether. Do not tighten the shaft clamp on the encoder yet

STEP 7A: Secure Tether to Mounting Face (Motor Mount)



Rotate the tether arm until it is at the correct orientation and is aligned with the mounting holes on the the motor or equipment. Install one steel washer on both sides of the nylon washer. Refer figure above. Fasten the tether arm to the motor or machine housing using the supplied 3/8" bolt (4.5" C-face applications) or 1/2" bolt (8.5" C-face applications). Ensure that there is no stress or flexing of the tether arm when secured.

STEP 7B: Secure Tether to Mounting Face (Fan Cover Mount)



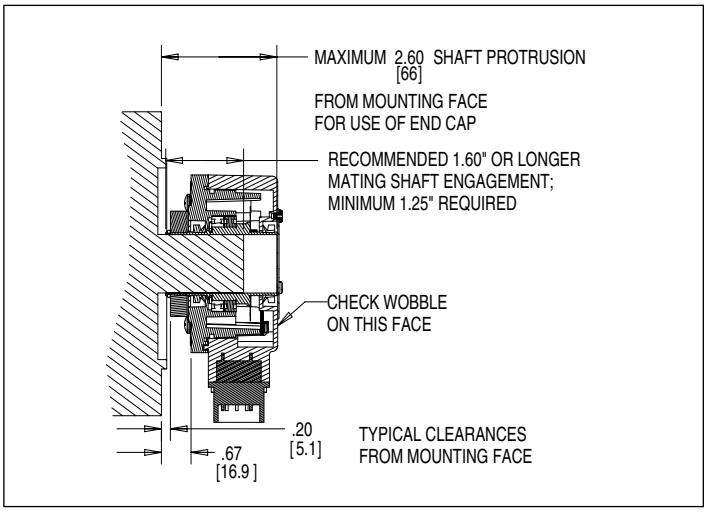
Slide and insert the T-bolt as shown in the figure into the fan cover. Use the supplied insulating hardware and washers as shown. Tighten the jamnut to firmly secure the tether.

STEP 8: Tighten Encoder Clamp onto Mating Shaft

Check to make sure that the tether is still in its "unstressed" condition. Adjust position of encoder on shaft if necessary and then tighten the shaft clamp on the encoder. Tighten clamp to stated torque value provided on encoder datasheet (50-55 in-lbs.).

***NOTE:* Encoder models with split clamps have two screws to tighten down. Please ensure that both screws on the clamp are tightened down securely. You may have to rotate the shaft to tighten both screws down.**

STEP 9: Good Installation Check Point

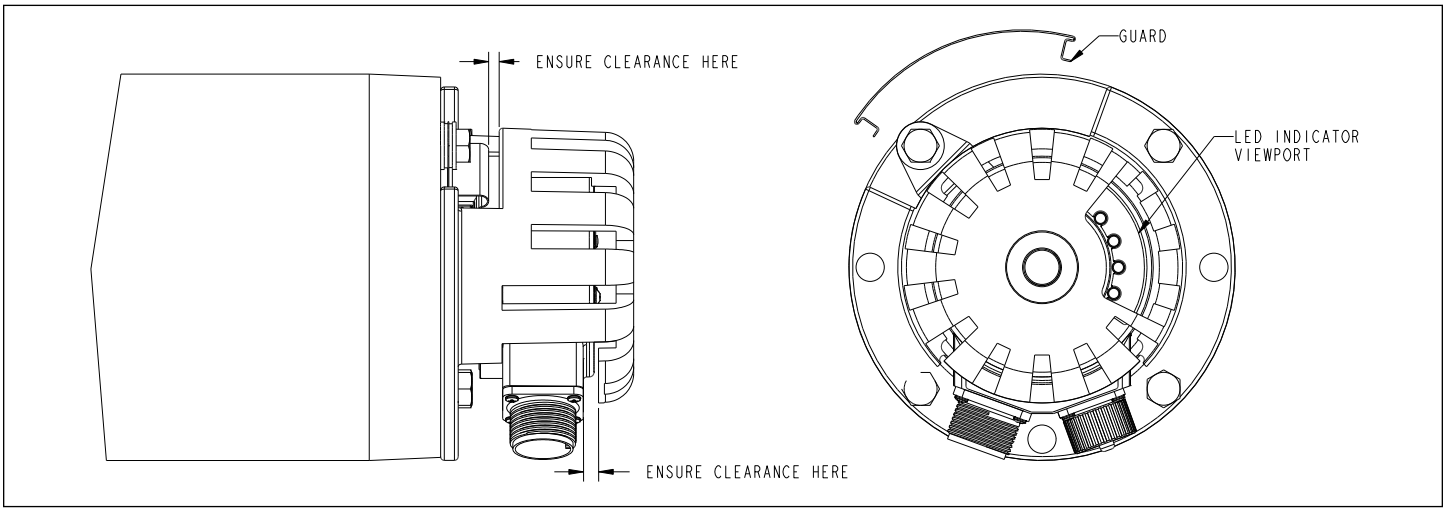


Follow the 3 step installation check to ensure a good installation thus far. Refer to figure above for key reference dimensions

A. Check clearances from mounting face. Ensure you have a minimum clearance of 1/16" between the encoder shaft and any non-rotating surface closest to the encoder shaft

B. Check tether installation. Make sure that the tether is unstressed. There should be no visible bending or deflection on any surface of the tether. Visible tether deflections should be corrected immediately. If the tether is bent or distorted, DO NOT USE, and call the factory for a replacement tether. Tether installation is critical to the long life of the bearings and improper tether installation will lead to excessive bearing loads and encoder failure.

STEP 10: Basket Guard Installation (optional)



After installation of the encoder place the accessory cover over the encoder with the large opening over the connector or cable and shorter opening positioned over the tether. Ensure the cover is fully seated on the motor face and secure with bolts and washers provided. When mounting to a fan cover instead of a 56C face cover, center cover and drill 3 mounting holes(0.17") in diameter. Then use the 3 #10-24 self tapping screws and washers provided. Install the warning label in the most conspicious position. Snap guard is to be used as shown (use if required).

Electrical Connections: Primary

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 NEMA4 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)

Electrical Connections: Primary

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 NEMA4 10 pin cable and connector assembly 118022-XXXX

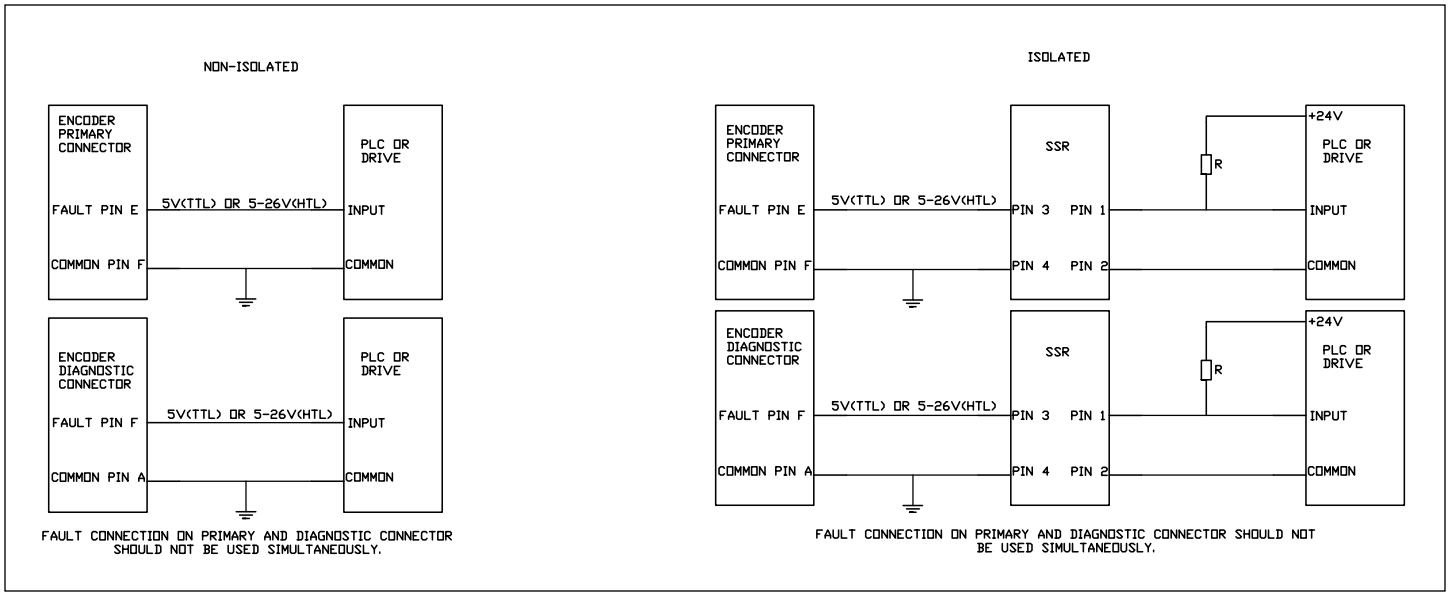
Electrical Connections: Diagnostic

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

Fault Connection

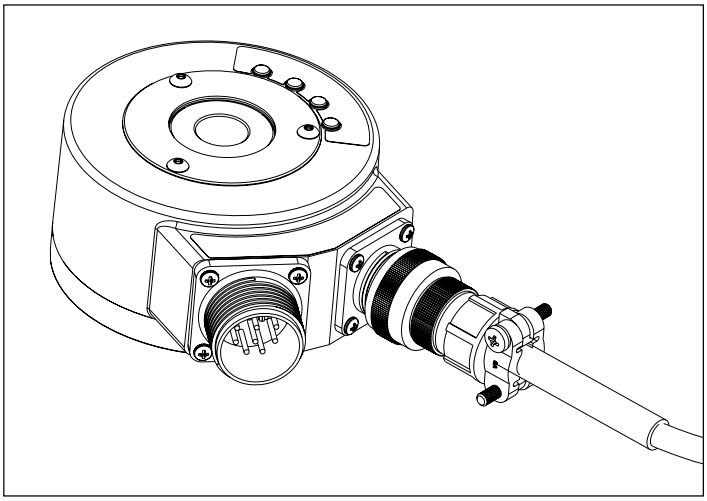
The fault output can be connected directly to a PLC or other I/O device. This can be accomplished with cable assembly part number 118023-XXXX. The fault output voltage can be configured for TTL (5VDC) or HTL (V_{out}=V_{in}). The amplitude for HTL will match the voltage supplied to the encoder and therefore can vary. Please refer to the part number and decode to determine which version you have ordered. If you require isolation from the encoder to the receiving device, then a Solid State Relay (SSR) provided by Dynapar can be used. Solid State Relay part number 608793-0001. Please refer to the diagram below for Isolated and Non-isolated configurations.



Programming / Diagnostic Connection

System Requirements

- Windows PC running .NET framework 4.0 or later (included in Windows 8 or later but can be installed on prior versions of Windows)
  - **Disclaimer:** Older versions of Windows can be installed with additional steps. Refer to HS35iQ PulseIQ Software Manual for more information.
- USB port capable of supply 500mA (if not powering encoder using Primary connector)
- Active internet connection to download FTDI drivers
- PulseIQ™ Technology Software (www.dynapar.com)



Diagnostic Connection

Connect 6 pin MS connector end of programming cable (part number 117995-0001) to diagnostic connector. Screw connectors together until hand tight. Plug other end of diagnostic cable into USB port of a compatible PC.

Be advised that some computers do not have enough current to power the encoder from the USB port so it is recommended to supply power through the primary port.

Refer to the PulseIQ™ Technology software manual for detailed instructions and use of the diagnostic and programming interface.

LED Operation

The HS35iQ encoder revolutionizes troubleshooting by indicating specific faults via four onboard LED indicators, a digital output, and recorded event log fault history via PulseIQ™ Software. These options all allow the user to make smarter decisions so you can get back up and running faster while simultaneously giving you positive confirmation that you have fixed the problem. A summary of the light patterns is shown in the table below. Under normal operation all LEDs will turn off or "Pulse" once every 2 seconds. The color of each of the lights also indicates the status of the defined fault conditions. A **green** light indicates normal operation and no problems have been detected. A **red** light indicates the encoder is currently and actively experiencing a fault. A "flicker" or rapidly flashing **blue** light indicates a fault happened within the last 30 minutes but has since been corrected. An **orange** light indicates that the encoder is currently and actively experiencing a warning which may transition to a fault near-term. Finally, a white light indicates that the fault is inactive or has been disabled.

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.

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

WWW.DYNAPAR.COM

DYNAPAR™ INNOVATION - CUSTOMIZATION - DELIVERY

Headquarters
2100 West Broad St.
Elizabethtown, NC 28337
USA

Customer Service:
Tel: +1.800.234.8731
custserv@dynapar.com

Technical Support
Tel.: +1.800.234.8731
support@dynapar.com

European Sales Representative
Hengstler GmbH
Uhlandstrasse 49, 78554 Aldingen
Germany
www.hengstler.com