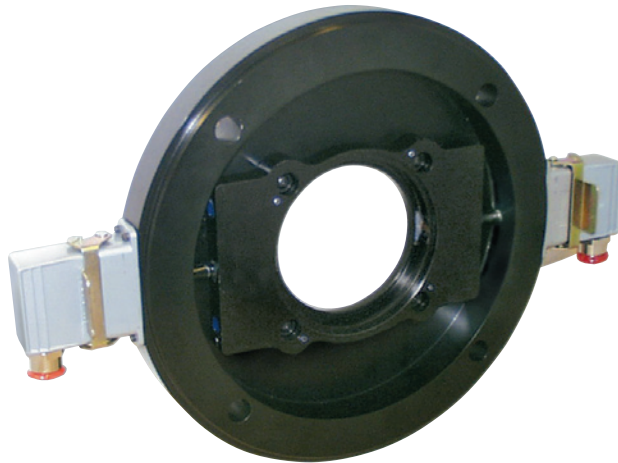


# **NorthStar™ brand** **Instruction Manual**

**Slim Tach SL1250**  
**Magneto-resistive Encoder**

*Designed for use in*  
**0.625" to 3.75" Diameter**  
**Thru-Shaft Applications**



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**\*791-1053-00 Rev. E\***



**Table of Contents**

Chapter/Paragraph/Illustration	Page
<b>1 Introduction</b> .....	<b>4</b>
1.0 Safety Summary .....	4
1.1 General .....	5
1.2 Description .....	5
<i>Figure 1: SLIM Tach® 1250 Exploded View</i> .....	5
1.3 Specifications .....	6
<b>2 Installation</b> .....	<b>7</b>
2.0 Inspection and Unpacking .....	7
2.1 Motor Facing and Shaft .....	7
<i>Figure 2: Typical 12.5-Inch Diameter Type C-Face Mounting Surface</i> .....	7
2.2 Encoder Installation – J Series/Spoked Wheel .....	8
<i>Figure 3: J-Series/Spoked Pulse Wheel Orientation</i> .....	8
2.3 Encoder Installation – K Series/Clamp Wheel .....	9
<i>Figure 4: K Series/Clamp Pulse Wheel Orientation</i> .....	9
2.4 Electrical Installation .....	10
2.5 Quick Release Connector Hood Wiring .....	10
<i>Figure 5: Sealed Industrial Latching Connector</i> .....	11
2.6 Returning Equipment to NorthStar .....	11

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## CHAPTER 1 INTRODUCTION

### 1.0 Safety Summary

High current, voltage, and rotating parts can cause serious or fatal injury. The use of electric machinery, like all other uses of concentrated power and rotating equipment, may be hazardous. Installing, operating, and maintaining electric machinery should be performed by qualified personnel, in accordance with applicable provisions of the National Electrical Code and sound local practices. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. NorthStar Technologies, Inc. assumes no liability for the customer's failure to comply with these requirements.

#### Rotating Machinery

Avoid contact with rotating parts. Avoid by-passing or rendering inoperative any safety guards or protection devices. Avoid extended exposure in close proximity to machinery with high noise levels. Use proper care and procedures in handling, lifting, installing, operating and maintaining the equipment.

#### Before Installation

Safe maintenance practices with qualified personnel is imperative. Before starting maintenance procedures, be positive that, (1) equipment connected to the shaft will not cause mechanical rotation, (2) main machine windings have been disconnected and secured from all electrical power sources, and (3) all accessory devices associates with the work area have been de-energized. If high potential insulation test is required, follow procedures and precautions outlined in NEMA standards MG-1.

#### Grounding

Improperly grounding the frame of the machine can cause serious or fatal injury to personnel. Grounding of the machine frame and structure should comply with the National Electrical Code and with sound local practices. Check wiring diagram before connecting power.

#### Do Not Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes. Operating any electrical instrument in such an environment constitutes a definite safety hazard.

#### Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. To avoid injuries, always disconnect power and discharge circuits before touching them.

#### Do Not Substitute Parts Or Modify Instrument

Do not install substitute parts or perform any unauthorized modification to the instrument. Introducing additional hazards is dangerous. Return the instrument to an authorized NorthStar Technologies, Inc. representative for service and repair to ensure that safety features are maintained.



**CAUTION!:** Crucial information, that *must* be read and followed regarding safety and unit functioning.



**DO THIS!:** Additional procedure, that must be read and followed, without safety issues.



**NOTE:** Useful information that should be read.



**QUESTION:** Helpful hints to answer your possible questions.

**1.1 General**

These instructions do not claim to cover all details of variation in equipment or to provide for every possible contingency or hazard to be met in connection with installation, operation, and service. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, please contact NorthStar Cryotronics, Inc., or one of its designated representatives.

**1.2 Description**

The NorthStar SLIM Tach® SL1250 is a modular digital encoder. This magnetoresistive encoder sensor-based unit has been designed for fast, easy mounting onto a standard NEMA 12.5C motor face. The basic design philosophy is as follows: The encoder frame is mounted onto the C-face flange of a motor. This positions the sensor and contains the electronics. The magnetic pulse wheel on the motor shaft has magnetic pulses imprinted on its outside surface. As the motor spins, the passing magnetic pulses actuate the magnetoresistive sensor. The resulting electronic signals are processed into square wave signals by the internal electronics.

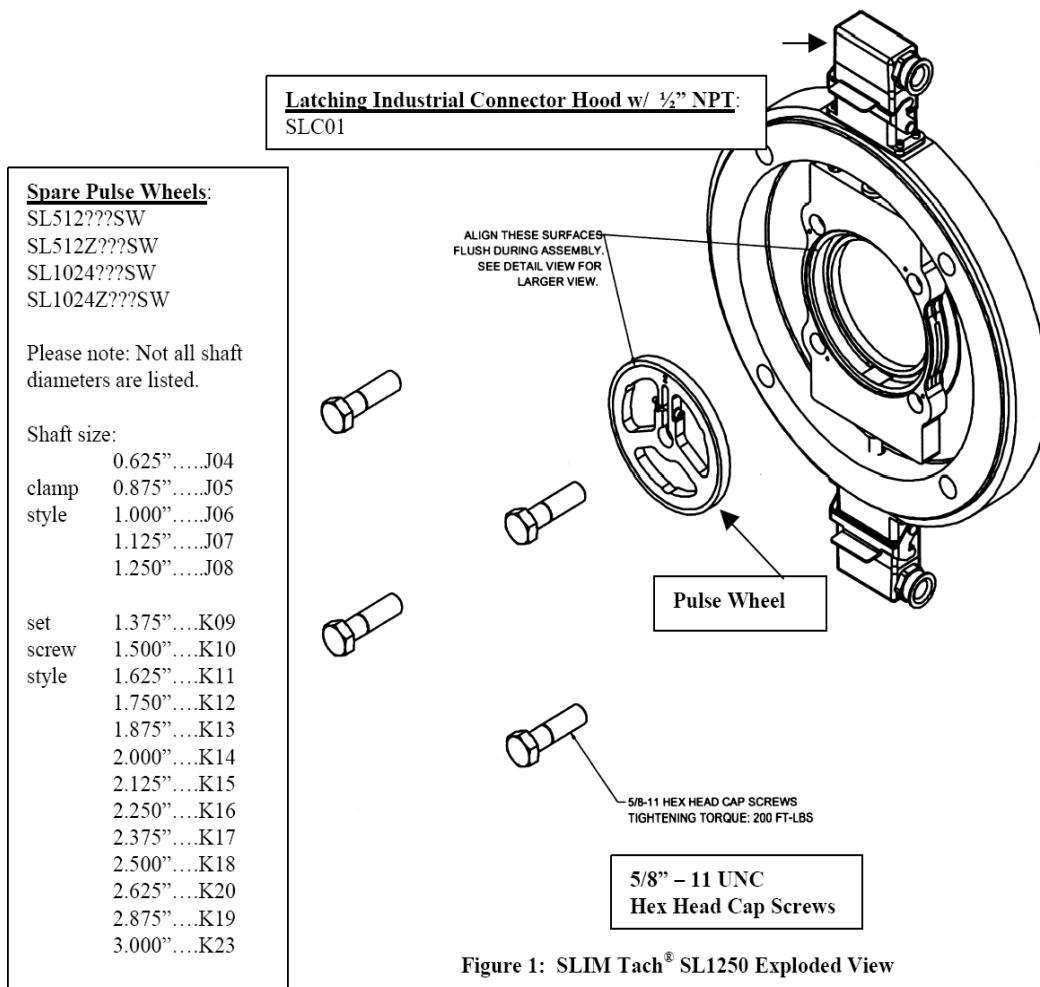


Figure 1: SLIM Tach® SL1250 Exploded View

**NOTE:** If you have further questions, please call NorthStar customer service 800-326-6216 with serial number ready.

## 1.3 Specifications\*

Electrical Specifications	
Pulses per Revolution (Resolution)	64,128,256,512,512Z, 1024, 1024Z, 2048, 2048Z PPR
Frequency Response	0 to 120kHz
Output Format	A, B phase @quadrature, Z (index) phase once per rev (gated) and complements (A/, B/, Z/)
Supply Voltage	5-24 VDC
Pulse Duty Cycle	50 ±30 % (within defined mechanical specs)
Quadrature Accuracy	90° ± 22° (within defined mechanical specs)
Output Type	High speed, differential line driver
Rise and Fall Time	Less than 500 ns @ 10,000 pf typical load with 5-15VDC line driver OR Less than 1µs @ 10,000 pf typical load with 5-24VDC line driver
Current Consumption	40 mA typical plus line driver load with 5-15VDC line driver OR 65 mA typical plus line driver load with 5-24VDC line driver
ESD Protection	2 kV
Current Output	150 mA with 5-15 VDC line driver OR 250 mA with 5-24VDC line driver
Connector	18" Pigtail, Latching Industrial connector, Latching industrial connector on 18" cable
Suggested Cable	22 AWG, 8 conductor, 18" length, 4 twisted shield pairs
Input Voltage	+5.0 to +15.0 VDC
Output Voltage Levels	Differential output; (Supply Voltage less 0.6V) during on cycle, ground during off cycle
Output Circuit Type	5-15 VDC Line Driver (standard) OR 5-24 VDC Line Driver (optional)
Electrical Protection	Reverse polarity and short circuit protected
Mechanical Specifications	
Maximum Operational Speed	6,000 RPM
Available Shaft Sizes	0.625" to 3.75" thru-shaft. See ordering table for sizes.
Nominal Air Gap	0.019 ± 0.008 inch
Shaft Radial Runout	0.002" (0.05mm) Total indicated runout
Shaft Axial End Play	Up to ± 0.045 inch maximum (1.14mm)
C-Face Runout (Mounting Flange)	0.004" (0.1mm) Total indicated runout
Number of Encoder Outputs	Single (standard), Dual (optional)
Nominal Encoder Diameter	18" (457.2mm)
Enclosure Configuration	12.5" Diameter motor face to meet NEMA MG1-4 standards (excluding C face runout)
Enclosure Material	Anodized Aluminum
Acceleration Rate	12,000 RPM per second
Unit Weight	11lbs. (24.25kg)
Common Environmental Specifications	
Operational Temperature Ranges	-40° to + 90° C or -40° to +120° C
Storage Temperature	-40° to +120° C
Operational Humidity	98% condensing
Chemical Resistance	Salt Spray, Most Solvents, Mild Acids and Bases
Environmental Rating	IP65, NEMA 4 & 12 (sensor, electronics, connector)
Vibration	5 to 2000 Hz at 18 Gs
Shock (Encoder Housing)	1 meter drop tested, min 30 G's

\*Specifications subject to change without notice

## CHAPTER 2

### INSTALLATION

#### 2.0 Inspection and Unpacking

Inspect shipping container for external damage. All claims for damage (apparent or concealed) or partial loss of shipment must be made in writing to NorthStar within (5) days from receipt of goods. If damage or loss is apparent, please notify the shipping agent immediately.

Open shipping container and locate the packing list. The packing list is included to verify that all components, accessories, and manual were received. Please use the packing list to check off each item as the unit is unpacked. Inspect for damage. NorthStar recommends that the shipping container be retained for future shipping, storage, or return to factory purposes.

If any equipment was damaged in transit, be sure to file proper claims promptly with the carrier and insurance company. Please advise NorthStar of such filing. In case of parts shortages, advise NorthStar immediately. NorthStar cannot be responsible for any missing parts unless notified within 60 days of shipment. The standard NorthStar warranty is included on page 2 of this manual.

#### 2.1 Motor Facing and Shaft

To prepare the motor facing and shaft for installation, perform the following steps. See Figure 2.

1. Clean outer rim and surface of motor facing and shaft of paint, grease, dirt, and other debris where SLIM Tach® SL1250 unit contacts motor or accessory. Also ensure that mating surfaces have not been damaged and that unit will fit squarely on motor.
2. Apply a thin layer of corrosion preventative or oil to motor facing and shaft to aid assembly and provide some corrosion protection



Ensure there is no paint, burrs, protrusions, or deformations on the motor facing or shaft. If the enclosure does not fit squarely on the motor facing, the alignment between the sensor module and the magnetic pulse wheel may be degraded.

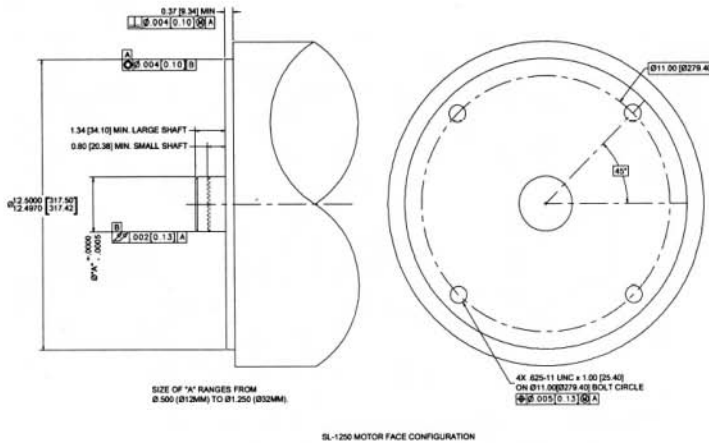


Figure 2: Typical 12.5-Inch Diameter Type C-Face Mounting Surface

## 2.2 Encoder Installation – J Series / Spoked -Set Screw Style Pulse wheel

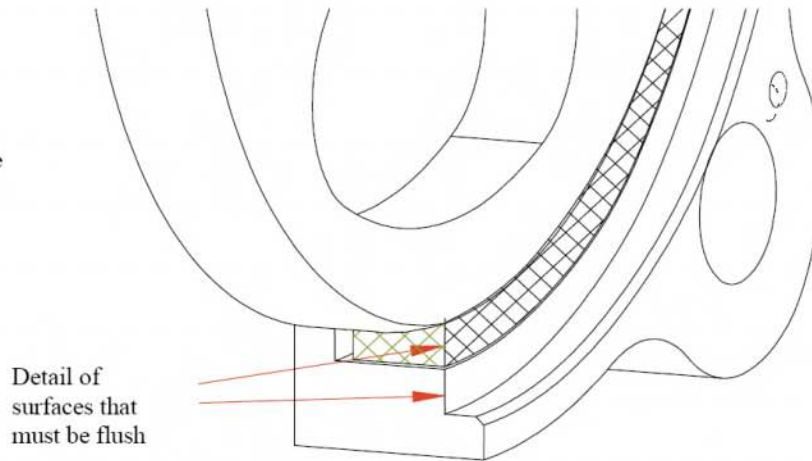
To install the encoder frame, perform the following steps.

1. Orient the encoder frame so the 12.5 inch I.D. surface will fit over the 12.5 inch C flange. Mount frame onto the motor flange. Insert the four 5/8 inch x 11 UNC hex head cap screws through the frame and into the motor frame. Use a 5/16 inch hex wrench to tighten a nominal 200 foot pounds.
2. Rotate the pulse wheel so the set screw or label “This Side Out” are visible, away from the motor. Slide the pulse wheel onto the motor shaft. Push the wheel along the shaft until the edge of the pulse wheel is flush with the machined recess in the encoder frame. See Figure 3. We recommend you use a straight edge for this purpose. For best results, align the two surfaces to within  $\pm 0.010$  inch. The purpose of this step is to properly center the pulse wheel under the sensor.
3. With the pulse wheel properly aligned, use a 9/64 inch hex wrench to tighten the 8 x 32 UNC socket head cap screw in the pulse wheel clamp to a nominal 30 in-pounds.
4. Pulse wheels which utilize the set screws should be tightened to a nominal 30 in-lbs torque. Be sure the wheel does not have excessive wobble greater than 0.010 inch. Rotate the motor shaft by hand. It should freely rotate and not touch the frame at any time. If everything is mechanically correct, the resulting sensor to pulse wheel air gap will be a nominal 0.019 inch.



Be sure the letter “Z” or the sticker “This Side Out” are visible on the face of the pulse wheel after installation.

**Figure 3: J Series/Spoked Pulse Wheel Orientation**



## 2.3 Encoder Installation – K Series / Clamp Style - Pulse wheel



To install the encoder, perform the following steps.

1. Orient the encoder frame so the 12.5 inch I.D. surface will fit over the 12.5 inch C flange. Mount frame onto the motor flange. Insert the four 5/8 inch x 11 UNC hex head cap screws through the frame and into the motor frame. Use a 5/16 inch hex wrench to tighten a maximum 200 foot pounds.
2. Push the clamping plate along the motor shaft until it is flush against the motor face.
3. Push the wire ring along the motor shaft until it is flush against the clamping plate.
4. Push the pulse wheel along the shaft until it is in contact with the wire ring.
5. Align the unthreaded holes on the pulse wheel with the threaded holes on the clamping plate
6. Insert screws and tighten , to snug, by hand .
7. Align the pulse wheel so that it is flush with the machined recess in the encoder frame. We recommend that you use a straight edge for this purpose. For best results, align the two surfaces to within  $\pm 0.010$  inch. The purpose of this step is to properly center the pulse wheel under the sensor. .
8. Once the pulse wheel is correctly aligned, tighten the screws in a star pattern to 30 inch pounds of torque.

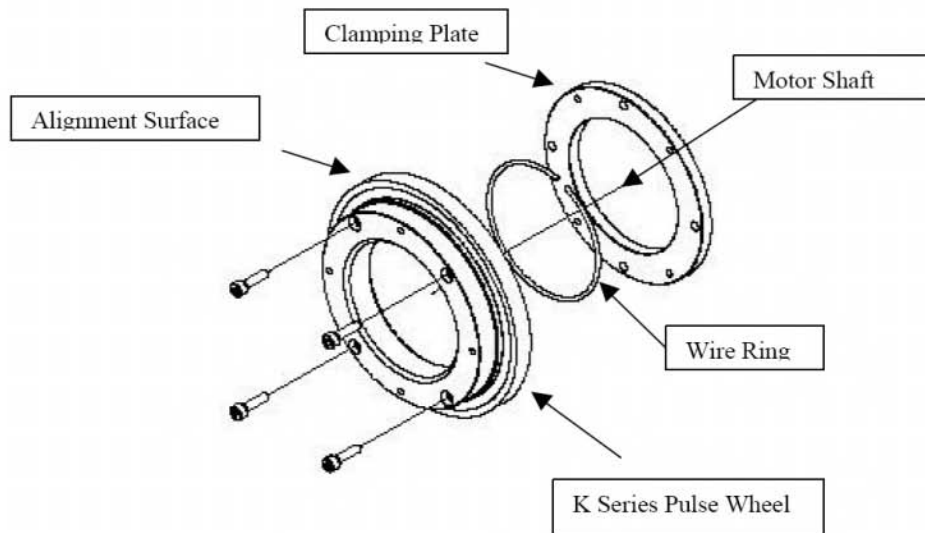


Figure 4: K Series/Clamp Pulse Wheel Orientation

2.4 Electrical Installation

**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.

Electrical connections are made to the sensor module through a standard 1/2 inch NPT liquid tight flexible conduit. The nipple length may be changed to extend the outlet box if desired. Interconnection cable recommendations are as follows: stranded copper, 22 through 16 gage, braided or foil with drain wire shielding 0.05  $\mu$ F maximum total mutual or direct capacitance, outer sheath insulated. Shrink tubing may be placed over any wires without insulation. For lengths over 100 feet, use 18 gage or larger, to a maximum of 1000 feet. If shielded twisted pair wire is used, do not cross channels. Keep each pair of complementary channel outputs together in a single twisted pair (e.g., A and A complement).

Reversing power and common will not damage the unit. However, applying power to any of the sensor outputs may cause damage.

Table 1. Signal Coding Table

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	F
B	2	Green	B
A	3	Blue	A
Z *	4	Violet	C
No Connection	5	----	E
Vcc (5-15 VDC)	6	Red	D
/B	7	Yellow	I
/A	8	Gray	H
/Z *	9	Orange	J
Shield	10	Braid	G

\* Applies only to units with index pulse capability.  
 # Pinouts are for the sensors with the MS 3102E18IT connector



The shield in the sensor module is isolated from the frame of the encoder for maximum noise immunity. The shield wire or pin should be connected to the shield of the cable and that of the drive or other receiving device.

## 2.5 Quick Release Connector Hood Wiring

To install the Quick Release Connector, perform the following steps.

1. Remove the four screws from the mating connector housing that hold the terminal block in place. Remove terminal block from housing.
2. Insert wiring through liquid tight flexible seal and mating connector housing. Leave enough wire exposed to comfortably reach the terminal block. Wire to terminal block according to wire code in Table 1. A similar wiring list is attached to enclosure.



There are two orientations of the connector hood. The terminal block can be inserted either way so that the connector hood points up or down. Choose the direction best for your application.

4. Tighten Liquid Tight fitting on housing. **OPTIONAL:** In some hostile environments, seal between connector body and Sensor Module can be improved by smearing a sealant (silicone grease, etc.) on the neoprene seal of the connector.
5. Mate connector into place on sensor mount and snap the two latches into place. If only one sensor is being installed, ensure cover plate is installed over other sensor hole.

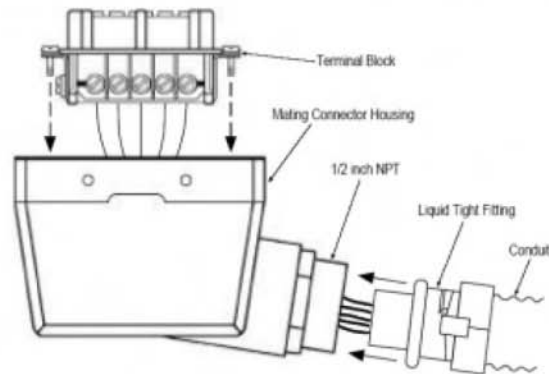


Figure 5: Sealed Industrial Latching Connector

## 2.5 Returning Equipment to Dynapar

If it is necessary to return the unit for repair or replacement, a Return Goods Authorization (RGA) number must be obtained from a factory representative before returning the equipment to our service department. When returning an instrument for service, the following information must be provided before we can attempt any repair.

1. Instrument model and serial number
2. User's name, company, address, and phone number
3. Malfunction symptoms
4. Description of system
5. Returned Goods Authorization number

Consult the factory for shipping instructions.



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