

NexGen SLIM Tach HT55 Encoder

Key Features

- Hollowshaft Design Mounts Easily to Large Motor Shafts, up to 2.875" in Diameter**
- Single or Dual Isolated Outputs Available with Field-Serviceable Connector**
- Expanded Resolution up to 4096PPR**
- Redesigned Circuitry for On-Board Diagnostics with LED**
- Multiple Bore Sizes Available**
- Stainless Steel and Aluminum Construction**



SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Code: Incremental, Magnetic**Pulses per Revolution:** 256-4096PPR**Phasing Sense:** A leads B for CW shaft rotation viewing the shaft clamp end of the encoder**Quadrature Phasing:** 90° ± 45°**Symmetry:** 50% ±15%**Number of Output Modules:** Single or Dual

ELECTRICAL

Input Power Requirements: 5-26VDC, 120mA typical per sensor module, plus line driver load**Output Signals:** IC-WE Differential Line Driver: 150mA, sink or source**Frequency Response:** 0 - 180kHz Data & Index**Noise Immunity:** Tested to EN61326-1**Electrical Immunity:** Reverse polarity and short circuit protected

ELECTRICAL (Cont.)

Connector: 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65. Optional MS3102 10 pin, Pigtail Cable, or Latching connector on cable extension

MECHANICAL

Bore Size: 1/2" to 2-7/8"**Mounting Configuration:** Hollow Shaft mount with Anti-Rotation Tether**Max. Shaft Speed:**

Shaft Size ≤ 1.250 = 5000 RPM,

Shaft Size > 1.250 = 3600 RPM

Torque:

Shaft Size ≤ 1.250: Typical 6 oz-in

Shaft Size > 1.250: Typical 15 oz-in

Shaft Length Required: 1.60" Minimum**Acceleration Rate:** 3,600 rpm/sec max**Housing Material:** Hard Anodized Aluminum, W/Stainless Steel Shaft.**Weight:** 5 lbs.

ENVIRONMENTAL

Operating Temperature Range: -40°C to +85°C**Storage Temperature Range:** -40°C to +120°C**Shock:** 100 G's Min.**Vibration:** 20 G's @ 5-2000 Hz spectrum**Humidity:** Up to 98% (non-condensing)

ELECTRICAL CONNECTIONS

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 (5-26 VDC)	6	Red	D
Ā	7	Yellow	I
Ā	8	Gray	H
Ā	9	Orange	J
Shield	10	Braid	G

* Index (Z) optional. See Ordering Information

CONTENTS

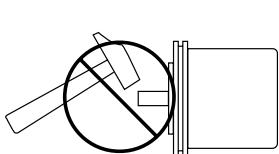
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IMPORTANT INSTALLATION INFORMATION

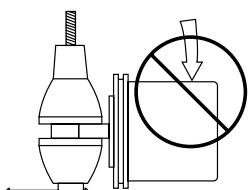
GENERAL GUIDELINES

Encoders provide quality measurements and long life when common sense, care, and accurate alignments are provided during installation. The following general guide-lines will help to ensure a trouble-free installation.

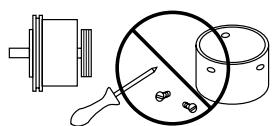
Mounting the Encoder



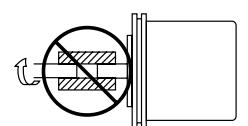
Do not shock the encoder.



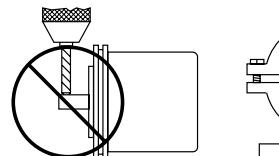
Do not subject the encoder to axial or radial shaft stresses.



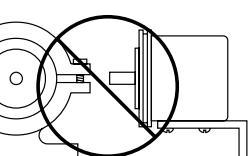
Do not disassemble the encoder.



Do not use a rigid coupling.



Do not tool the encoder or its shaft.



Do not use makeshift techniques to mount the encoder.

Wiring the Encoder

- Never connect or disconnect the encoder connector or wiring while power is ON. Doing so may damage the encoder.
- Power should always be connected to the + side of DC power.
- Common should always be connected to the - side of DC power.
- Never connect A, B, or Z to the + or - side of DC power.

ELECTRICAL CONNECTIONS

Cable - The use of shielded cable is recommended for all encoder installations. When a Dynapar brand encoder is ordered, the type of termination is generally defined (usually the last selectable code in Ordering Information). If a code for a cable was indicated, the encoder was manufactured to include a shielded cable. If any other type of termination was selected or if selection of termination type was not requested, a cable assembly must be ordered. (The cable assembly easily hooks onto the encoder's connector making it ready for wiring).

To determine which cable assembly to order, refer to the Electrical Connections table (in the encoder's manual).

ELECTRICAL CONNECTIONS (cont.)

In some cases, there may be more than one table or the table may be broken into sections due to different output types. If so, refer to the information listed for the output type selected for the encoder (in Ordering Information).

Wiring should be run through dedicated conduits or harnesses (not shared with any other wiring) which are spaced at least 12 inches apart. This protects the cable from physical damage while providing a degree of electrical isolation. Also, do not run cable in close proximity to other conductors which carry current to heavy loads such as motors, motor starters, contactors, or solenoids. Doing so could result in electrical transients in the encoder cable which cause undesired signal pulses.

NOTE: Never connect or disconnect the encoder connector or wiring while power is ON. Doing so may damage the encoder.

Grounding - DO NOT ground the encoder through both the machine and the cable wiring. Connect the shield at the input device only. **NOTE: If the shield is connected at both ends, grounding problems that degrade system performance may result.**

For European-based applications requiring CE compliance, cable length must not exceed 30m. Connect the shield to building ground on either the Encoder or Controls end. CE compliant products are tested to EN61326 EMC.

FEATURES

All encoders have the following electrical features:

- Power (+DC)
- Common
- Output Signal(s)

Power (also referred to as supply, power source, and power +V/VCC) is always +DC for encoders. **Therefore, power should always be connected to the positive (+) side of DC power.** In addition, encoder power should be regulated to within $\pm 5\%$ at the encoder and should be free of induced transients. Common (also referred to as Com, supply common, and ground) is generally a black wire (verify via Electrical Connections table). Common should always be connected to the negative (-) side of DC power.

All encoders have at least one output signal (A); however, it is common for encoders to have three signals A, B, Z (may also be referred to as C, X, or index). The outputs should each be connected to the receiving device at the appropriate terminal. **NOTE: Never connect A, B, or Z to the + or - side of DC power.**

IMPORTANT INSTALLATION INFORMATION

FEATURES (cont.)

When encoders have a differential line driver, there are two signals for each of the outputs. Each signal (A, B and Z) has a compliment or inverse (\bar{A} , \bar{B} and \bar{Z}) referred to as A not, B not, and Z not). The signal and its compliment (i.e. A and \bar{A}) are separate outputs. Connect each output to a separate input.

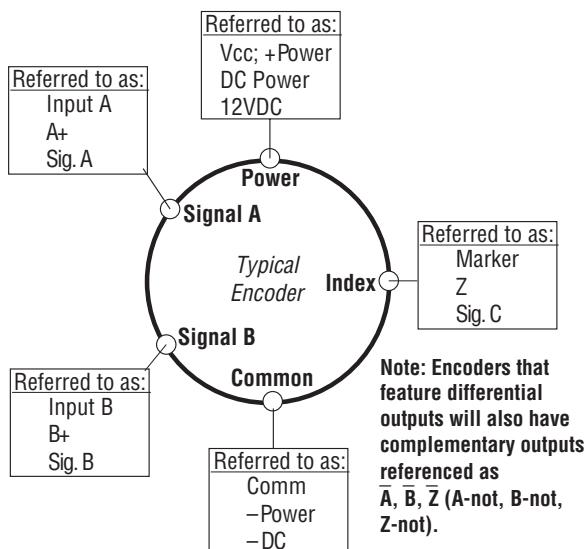
NOTE: Never connect these signals together or to the + or - side of DC power. Never connect differential signals to the same input.

CONNECTIONS

Obviously not all receiving devices are the same. However, connecting your encoder to one, no matter what type or brand it may be, is not difficult. As discussed in the previous section, all encoders have certain electrical features. Each of these features/functions are identified in the encoder's Electrical Connections table along with its corresponding pin and wire color. Each wire specified in the table must be connected to the receiving device.

Determining where to connect each wire is as easy as following the Electrical Connections table and matching each wire to the proper terminal on the receiving device. In general, no matter what type of receiving device you are using, the terminal strip is marked, indicating the proper location for each function/wire. These markings may either be numbers or text labels identifying functions. If they are numbers, the receiving device's manual should define what function corresponds to each number.

Since receiving devices are made by various manufacturers, not all text labels/references are the same. There are various ways to identify each function. Following are a few examples:



LED STATUS LIGHT:

A multicolor LED Status light will indicate to the user the overall condition of the encoder. The LED is built into the encoder and does not require any additional wiring or power to activate it. There are 4 basic status conditions for the light:

- 1) **LED off:** No power to Encoder, Low supply voltage (<3.0VDC), Total Failure of Encoder
- 2) **LED Green:** Correct Power to Encoder, Ready to operate, No wheel movement Detected
- 3) **LED Flashing:** Unit operating, Unit sending pulses out
- 4) **LED Flashing Red:** Low power to encoder (<4.5VDC), Line Driver Failure, Line Driver Over-Temperature (generally caused by external short circuit), Line Driver Logic Failure

FREQUENTLY ASKED QUESTIONS

There are additional colored wires which are not referred to in the Electrical Specifications table. What do I do with them?

Do not connect them to the receiving device. Any unused encoder signal wires must be individually insulated and tied back. They should NEVER be in contact with common, power sources, or other output signal lines.

The encoder is correctly connected to the receiving device per the Electrical Specifications table and the receiving device's terminal strip label; however, it's counting in the wrong direction. What's wrong?

In order to reverse the counting direction, the output signal connections must be switched. If the encoder has a single ended output, swap A and B. If the encoder has a differential line driver, swap A and \bar{A} .

I've connected the encoder and it doesn't work (No Outputs). What can I do?

Many encoders have internal protection circuits which shut down the encoder to prevent damage if the input power is not correct or the outputs are overloaded. Check the following: Input Voltage (is it too high?); Input Polarity (is it reversed?); and Output Wiring (are they wired properly?).

I've read and followed the technical manual and these guidelines and the encoder still doesn't work properly. Help!?

Calm down - help is at your fingertips! Simply pick up the phone and dial our Applications Engineering Department at 1-800-234-8731 (US & Canada) or 847-662-2666 from 8:00 AM to 4:45 PM (Central time) Monday - Friday. One of our engineers will gladly help you solve the problem.

MECHANICAL INSTALLATION

A. GENERAL OVERVIEW

The following instructions are meant to assist in proper installation of Dynapar brand, Series HT55 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 HT55 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.

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 1.60". 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.

HOLE LOCATION	BOLT SIZE	BOLT SIZE	RECOMMENDED TORQUE
2.94"(75 mm)	3/8"(9.5 mm)	1/4"(6mm)	50-60 in-lbs
3.63" (92 mm)	1/2" (12 mm)	5/16"(8mm)	70-80in-lbs
2.5"-3.25" (63-82mm)	1/4" (6 mm)	3/8"(9.5mm)	100-125 in-lbs
		1/2"(12mm)	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; 3mm Hex Wrench; Caliper Gauge; Dial Indicator Gauge; 3/8", 1/2" or 1/4" T- handle Wrenches (tether options); Dynapar M100 encoder tester.

STEP 2: CHECK AND CLEAN THE MATING SHAFT STEEL

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

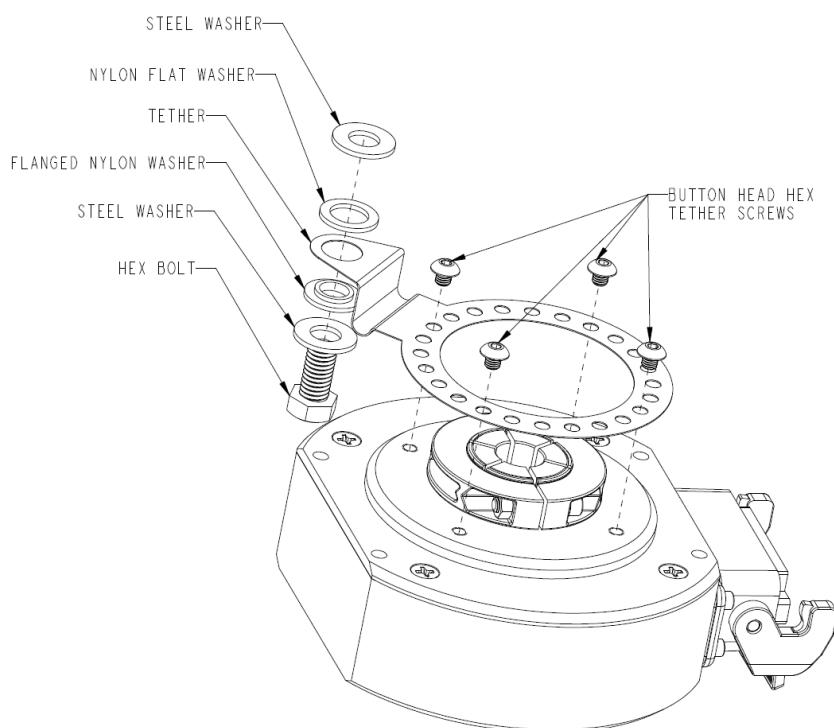
Clean the mating shaft of any burrs and check that mating shaft engagement is at least 1.60" inside the encoder shaft. Using a dial indicator gauge verify that the motor shaft Total Indicated Reading (TIR) is less than 0.002" [0.05 mm].

STEP 4: INSTALL THE TETHER ON ENCODER

Rotate the tether to the required orientation and tighten the tether arm to the encoder body using the four screws provided .The hollow-shaft 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.



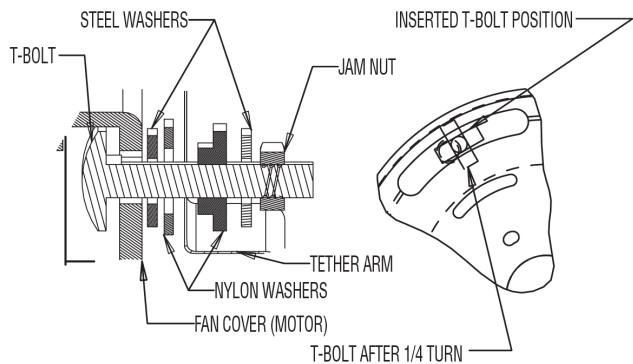
STEP 6: SLIDE ENCODER ON SHAFT

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

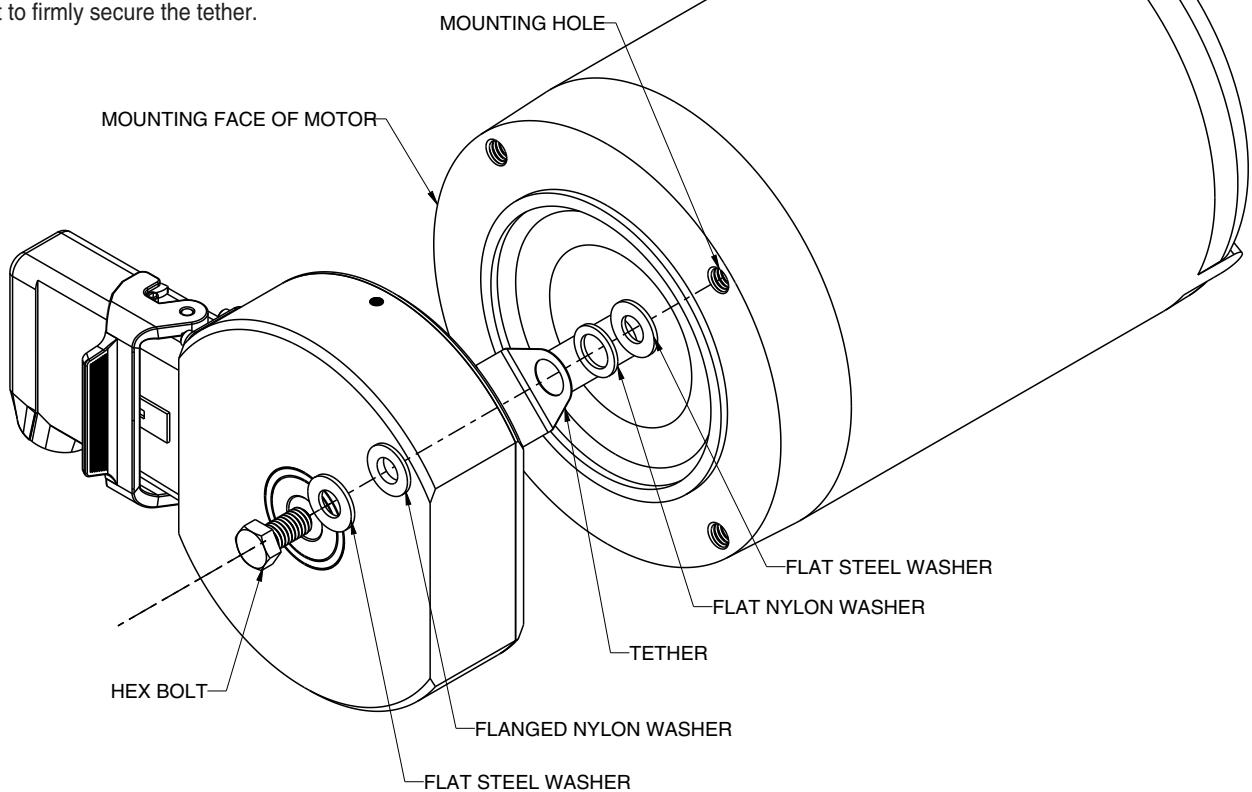
STEP 7A: SECURE TETHER TO MOUNTING FACE (MOTOR MOUNT)

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. 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

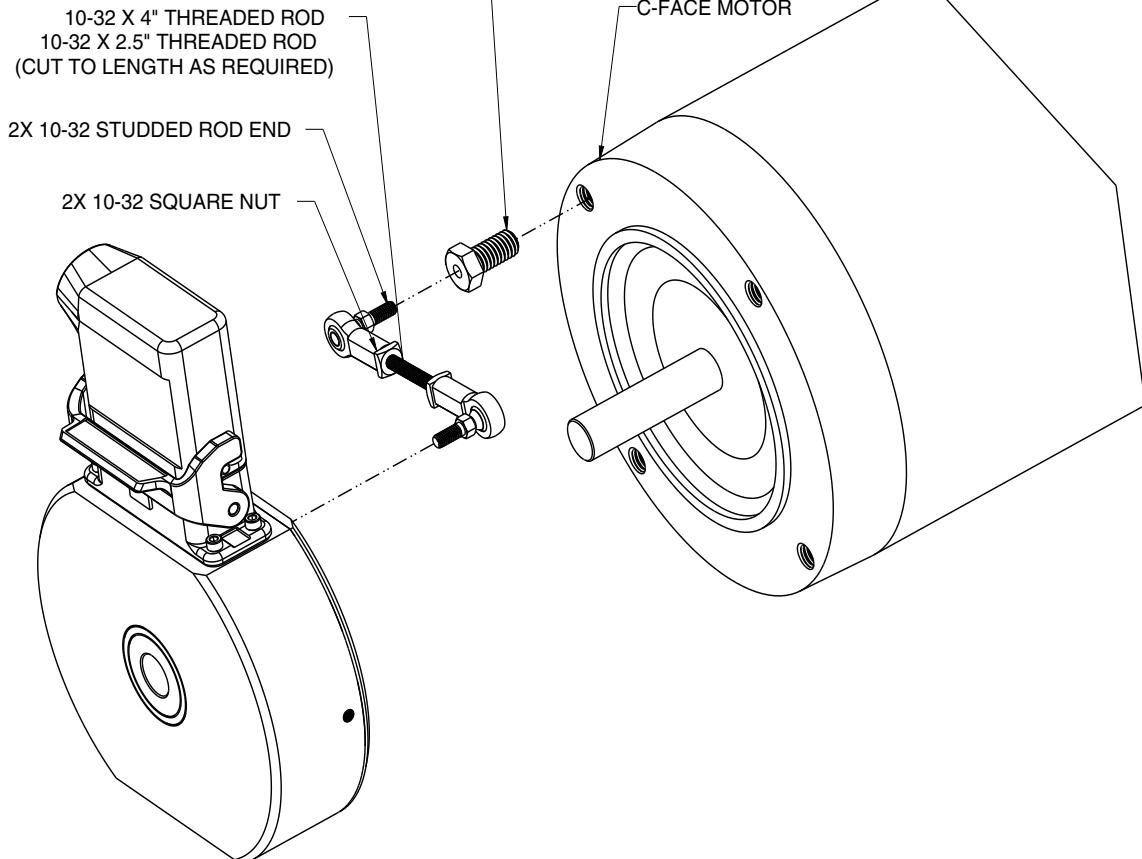
A. Check clearances from mounting face. Ensure you have a minimum clearance of 1/16" between the encoder shaft and any non-rotating surface closest to the encoder shaft

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.

C. Check wobble of encoder housing. Turn the shaft by hand and make sure that the shaft turns freely and does not produce excessive runout/wobble of the encoder. Most encoder installations will have wobble arising from shaft tolerances. Measure the wobble on the visible back face of the encoder. A wobble of less than 0.007" TIR will not have any adverse effect on encoder performance. In general, the lower the TIR of runout, the better.

MOUNTING TO A NEMA 4.5" OR 8.5 C-FACE MOTOR WITH ROD TETHER

MODIFIED 1/2-13 X 1" FOR 8.5" C-FACE
MODIFIED 3/8-16 X 3/4" FOR 4.5" C-FACE



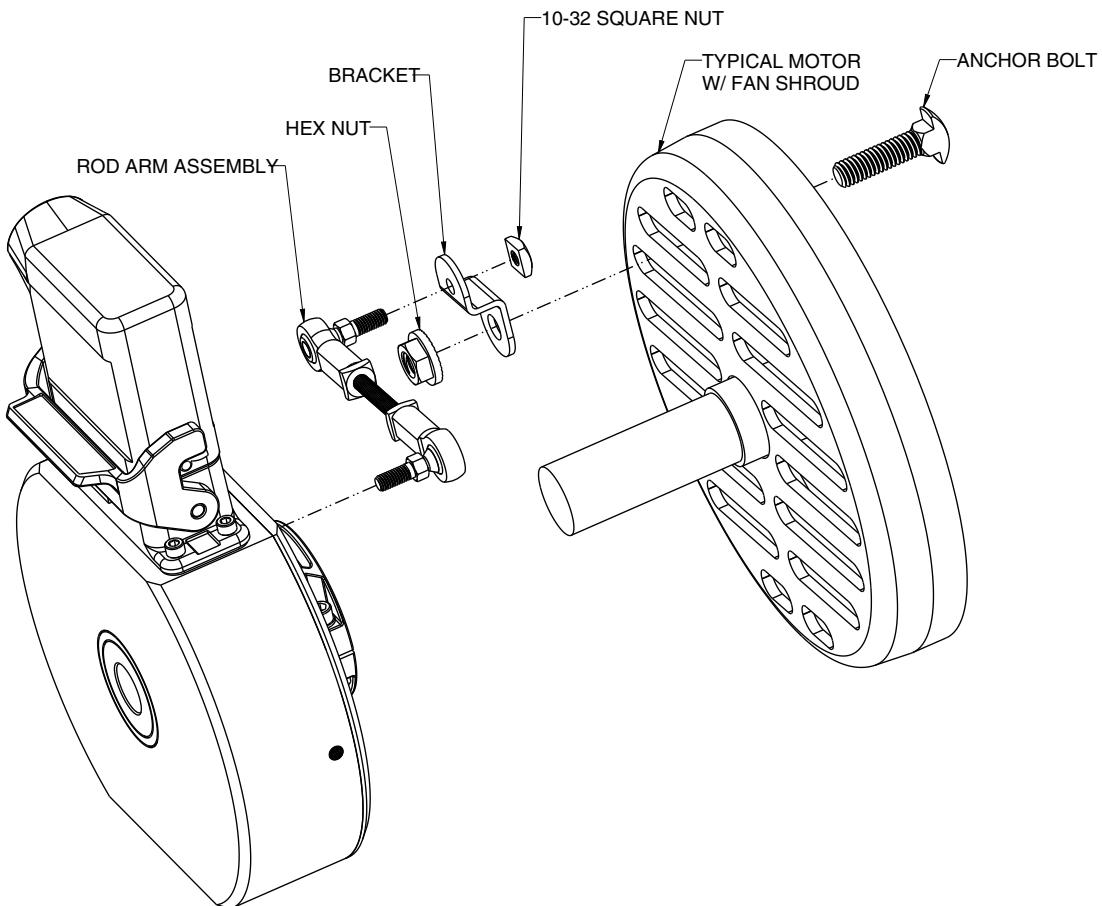
Components for Mounting on NEMA C-face motor.

1. Assemble rod end turnbuckle assembly per image above.
2. Locate rod end mounting hole on the HT55, mount rod end assembly to one of four holes on the HT55. Tighten to 40 in-lbs.
3. Insert the appropriate bolt (3/8"-16 UNC or 1/2"-13 UNC pending on C-Face size) into one of four threaded holes on motor C-Face. Tighten 3/8"-16 UNC to 200 in-lbs. Tighten 1/2"-13 UNC to 500 in-lbs.
4. Slide the HT55 over the motor shaft. After positioning the encoder to the best angular orientation, adjust rod arm length, (thread rod may be cut to length if necessary, for proper fit). While installing the encoder, engage the remaining end of the torque arm to the mounting bolt. Tighten to 40 in-lbs.
5. Attach the remaining end of the anti-rotation arm to the mounting bolt. Add a removable threaded locker and tighten the turnbuckle locking nuts.
6. Without the encoder being completely tightened, set the axial alignment so that no part of the torque arm assembly touches the motor, but is perpendicular to the encoder body. Position should be as close to C-face as possible but not flush with motor.
7. Tighten clamp screws holding the encoder on the shaft with the hex wrench provided.

NOTE: Verify installation by checking clearance between the torque arm assembly and motor C-face.

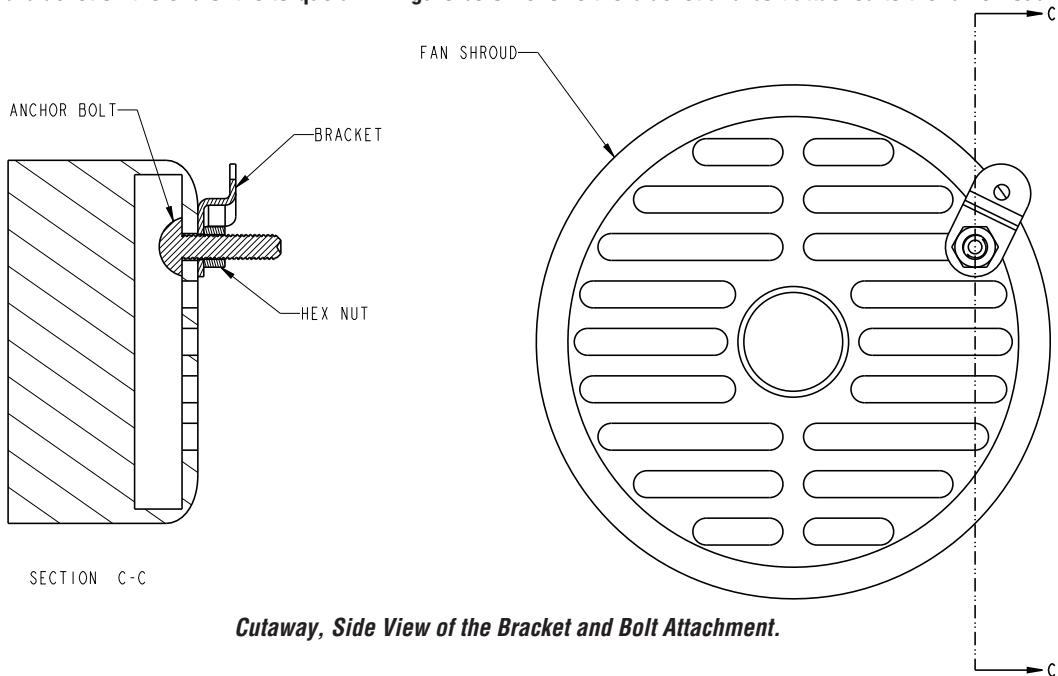
NOTE: Verify installation by checking clearance between the torque arm assembly and motor C-face. The minimum motor shaft length required should be approximately 1.6".

MOUNTING TO A MOTOR WITH A FAN SHROUD WITH ROD TETHER



Components for Mounting on Fan Shroud Motor.

NOTE: If only the opposite drive end of the motor is available and has a fan shroud, you must use the special anchor bolt and bracket on the end of the torque arm. Figure below shows the bracket and bolt attached to the fan shroud.



Cutaway, Side View of the Bracket and Bolt Attachment.

MOUNTING TO A MOTOR WITH A FAN SHROUD (CONT.)

1. Locate the torque arm mounting hole on the motor side of the encoder. Insert the 10-32 bolt through the rod end of the torque arm. Tighten the 10-32 bolt to 40 in-lbs.
2. Arrange the anchor bolt (1/4 bolt) and lug. Slide the anchor bolt head into the fan shroud through an available vent slot.
3. Rotate the bolt 90° so that the anchor bolt catches to the inside of the fan shroud. Align lug to form a straight line from shaft to anchor. Once positioned, tighten the hex nut with approximately 25in-lbs torque.
4. Slide the HT55, with the split shaft collar and torque arm loosely attached, over the motor shaft. While installing the encoder, engage the torque arm by inserting the 10-32 x 1/2" hex bolt into the tapped hole in the bracket. Tighten to 40 in-lbs.
5. Without the encoder being completely tightened, set the axial alignment so that no part of the torque arm assembly touches the motor, but is perpendicular to the encoder body. Position should be as close to C-face as possible but not flush with motor.
6. Tighten 10-32 x 1/2" bolt, in bracket to 40 in-lbs.
7. Tighten socket head cap screws, in split shaft collar, to 50 in-lbs. (Try maintaining the split in the shaft collar with notches in the motor mounting sleeve on the HT55.)

NOTE: Verify installation by checking clearance between the torque arm assembly and motor C-face. The minimum motor shaft length required should be approximately 1.6 ”.

1.2 ELECTRICAL INSTALLATION

IT IS VERY IMPORTANT that the mating connector and the encoder body be isolated from electrical ground in the wiring and conduit to prevent motor or machine shaft eddy currents from going to ground through the encoder bearings, as this will damage the bearings over time. To insure that this is being done, it is suggested that a plastic wiring/conduit adaptor or non-conductive conduit is used to isolate the connector from any metallic surface or conductive conduit. Please see special note under table 1, for proper encoder connector shielding. Also, to allow for proper encoder grounding, the motor must be wired and grounded per your local NEC Requirements.

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 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').

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

1.3 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.

3. 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.

4. 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.

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.**

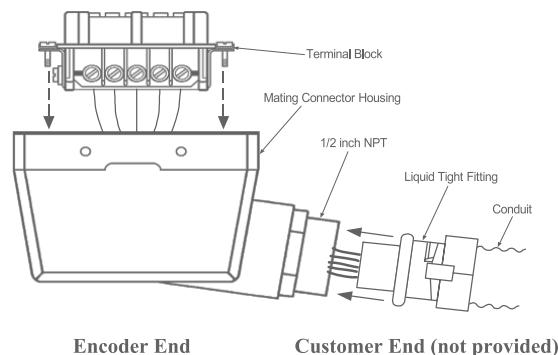
CE Grounding Measures – For best EMC immunity the cable screen must be grounded on both encoder and controls end. For cable lengths longer than 30m or outdoor applications, additional measures must be implemented to comply with CE requirements. Connection of the encoder to DC power supply network is 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.

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	N/A	E
Vcc (5-26 VDC)	6	Red	D
B	7	Yellow	I
A	8	Gray	H
Z*	9	Orange	J
Shield	10	Braid	G

* Index (Z) optional. See Ordering Information



INCREMENTAL ENCODERS

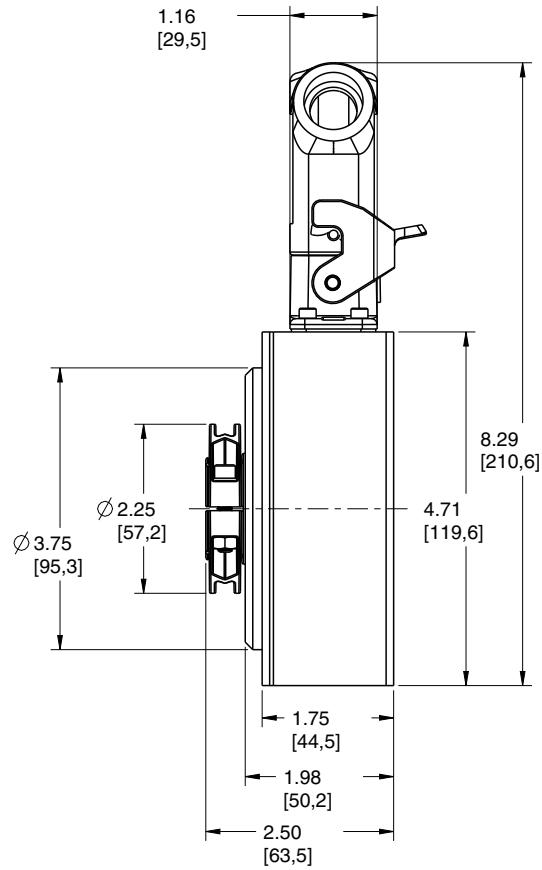
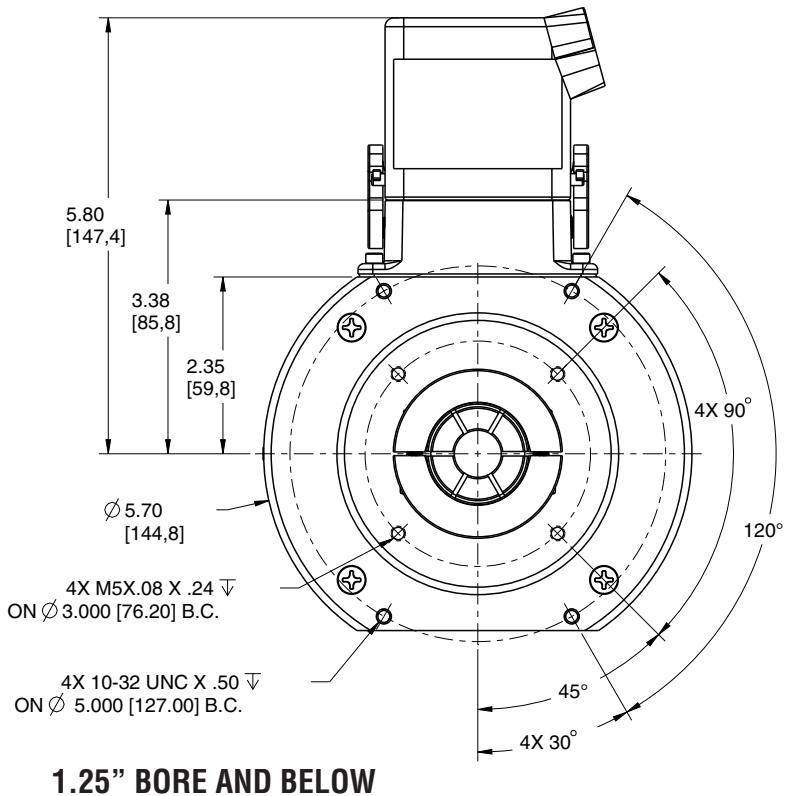
NorthStar™ brand

SERIES HT55

Ordering Information

To order, complete the model number with code numbers from the table below:

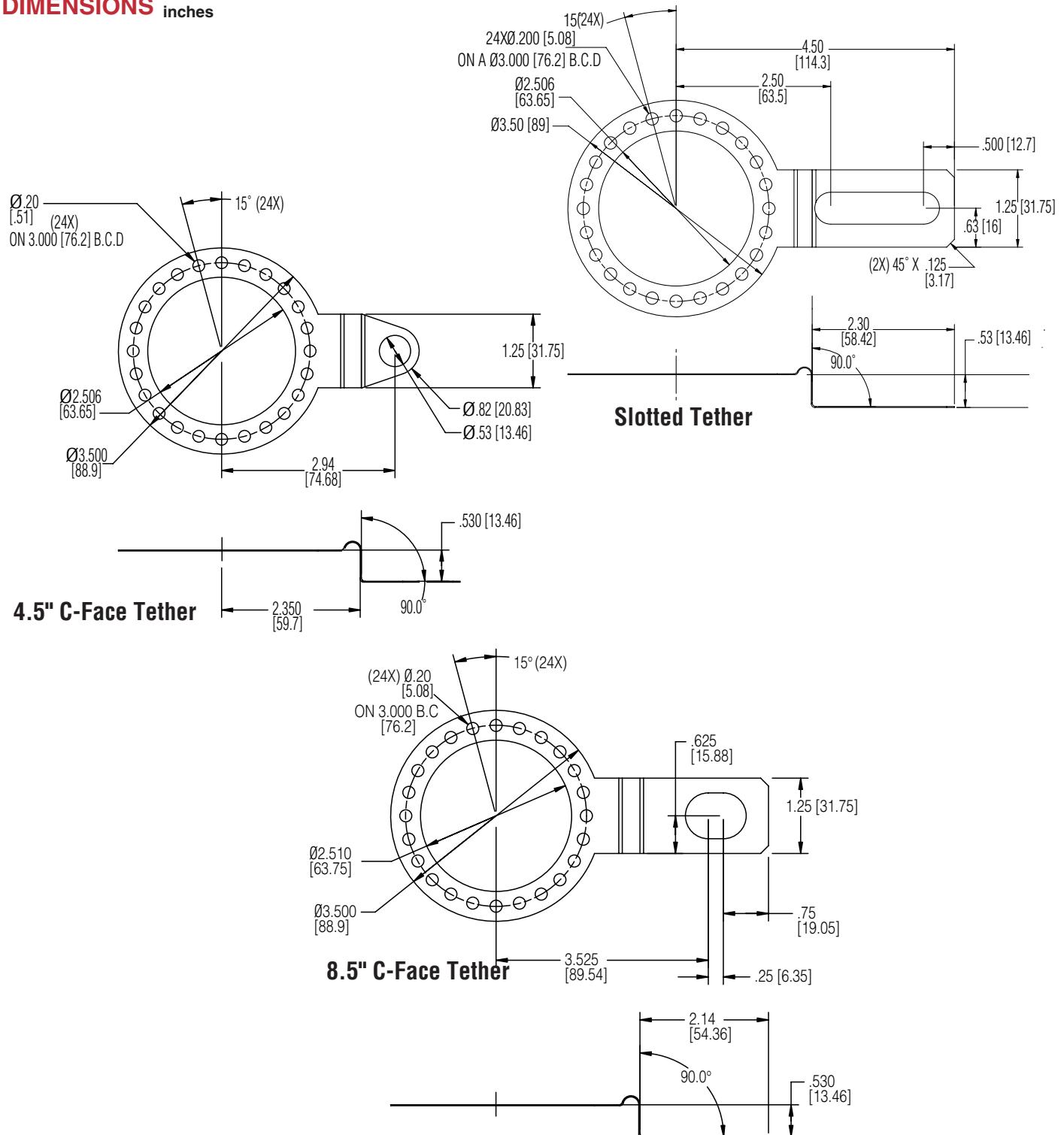
DIMENSIONS inches

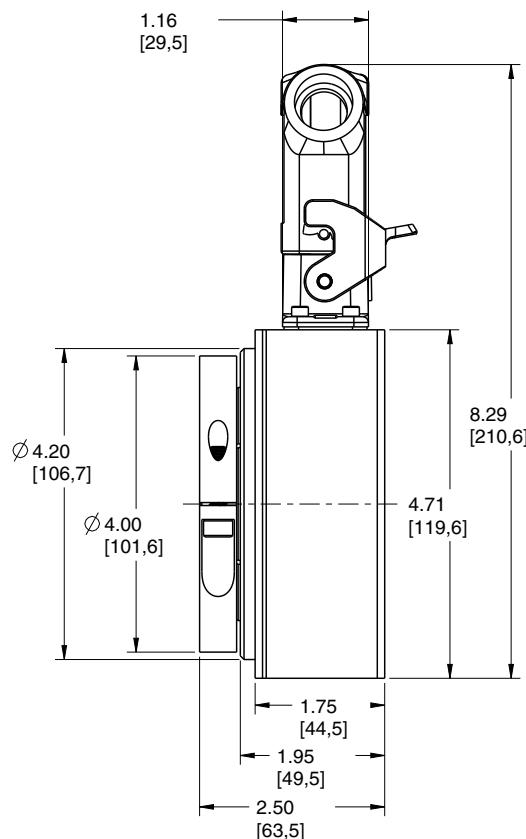
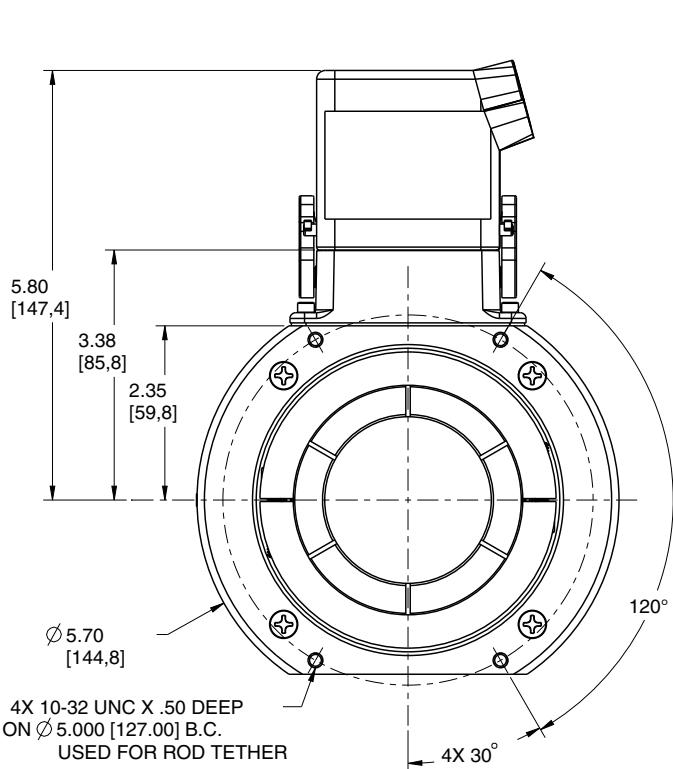


SERIES HT55

by  **DYNAPAR™**

DIMENSIONS inches



DIMENSIONS inches**BORES ABOVE 1.25"**

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