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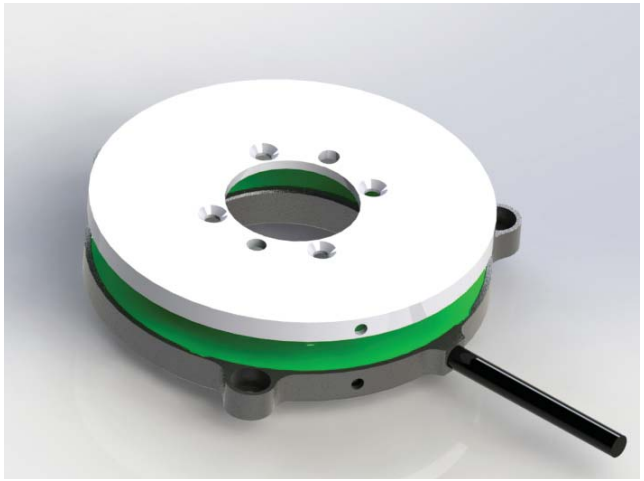
Rotary Absolute Position



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1. PREFACE

1.1 VERSION : 1.0 SEPTEMBER 2014

1.2 APPLICABLE DOCUMENTS

- DF-60-32-SG-S0 Electric Encoder data sheet

2. SAFETY

2.1 SAFETY ISSUES

2.2 ESD NOTES

The DF-60 Electric Encoder is insensitive to ESD and parasitic capacitive coupling from adjacent AC voltages. It is highly recommended to enable discharge path with less than several tens of kΩ between the machine shaft and the electronics ground.
Shielding: the Electric Encoder housing is built of Aluminum with non-conductive anodized layer.

The internal ground (return) path of the 5V power supply IS NOT CONNECTED to the cable shielding, it is highly recommended to ground the cable shielding through the connector buddy or by other means.

Note : ***During high speed rotation, bearings may isolate the shaft from its grounding. The shaft must be grounded using a sustainable method for the operation rotation speed.***

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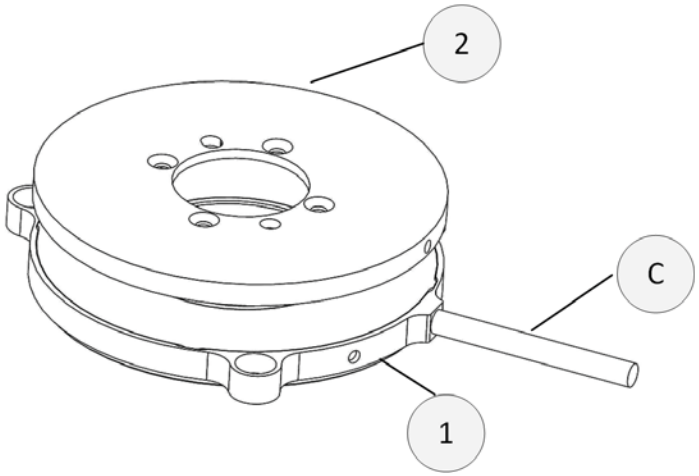
3. PRODUCT OVERVIEW

3.1 OVERVIEW

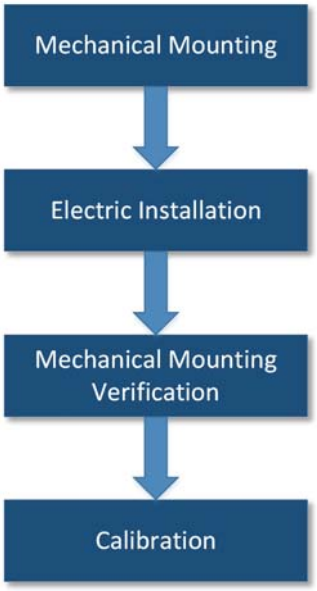
The **DF-60-32-SG-S0** absolute position Electric Encoder™ is a revolutionary position sensor , originally developed for harsh environment specialized applications, available for broader range of defense, homeland security, aerospace and industrial automation.

The Electric Encoder™ non-contact technology relies on interaction between the measured displacement and a space/ time modulated electric field.
The DF-60 Electric Encoder™ is modular, i.e. its rotor and stator are separate.

Encoder stator (1)
Encoder rotor (2)
Encoder cable (C)



3.2 INSTALLATION FLOWCHART



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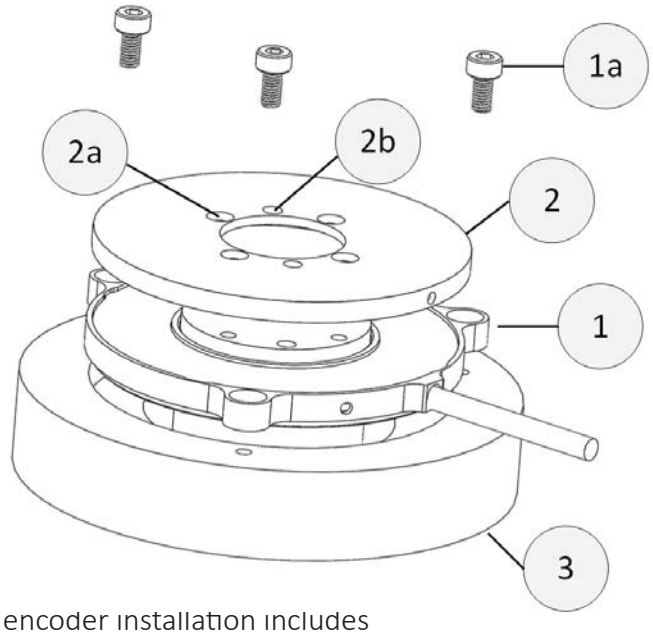
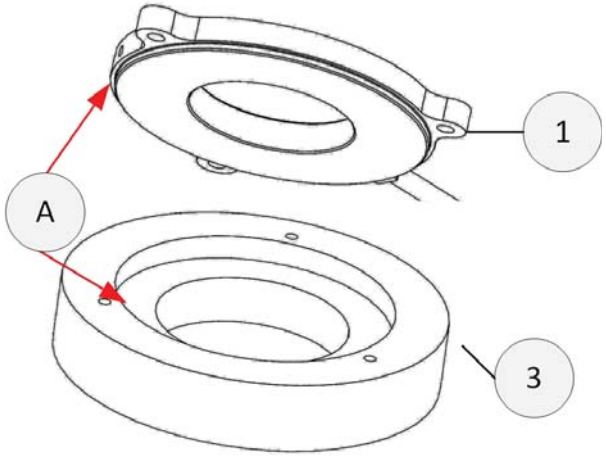
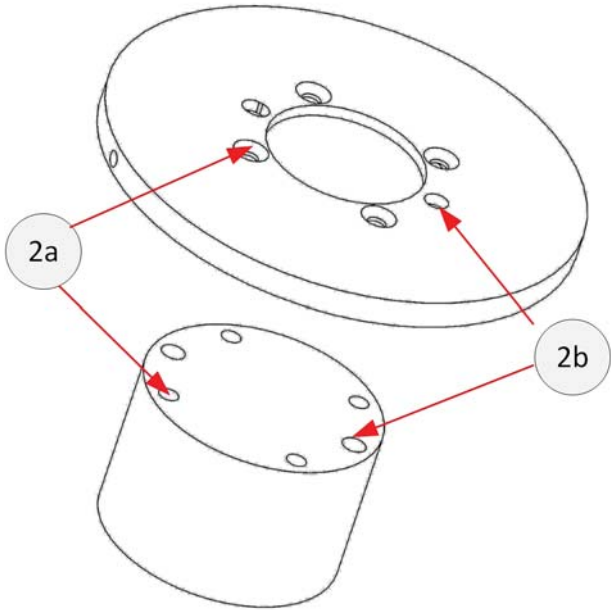
3.3 ENCODER MOUNTING







Typical encoder installation includes

- **Encoder stator (1)** – Encoder static part with mounting screws.
- **Stator** mounting screws **(1a)**
- **Encoder rotor (2)** –Encoder rotor part with mounting screws.
- **Rotor** shaft mounting hole **(2a)** and centralization hole **(2b)**
- **Encoder Seating / stator (host machine) (3)**- with appropriate
-

The encoder stator is connected to the application static section and should be centralized by the circumference step **(A)** and fixed by [3] three screws (1a), the encoder rotor should be fixed by [4] four screws and centralized by 2 pins (2b).

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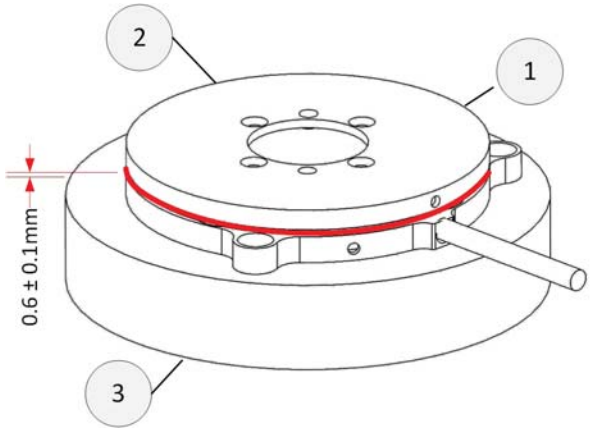
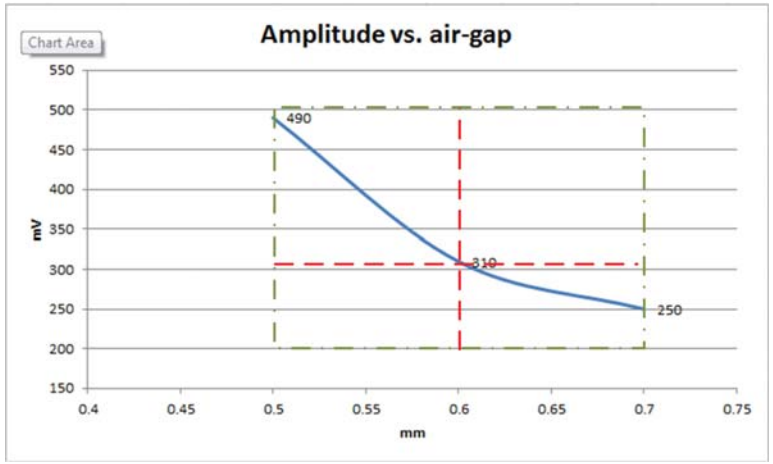
ENCODER STATOR / ROTOR RELATIVE POSITION

For proper performance the air gap should be 0.6mm +/- 0.1mm. [0.0236” +/- 0.0039”]



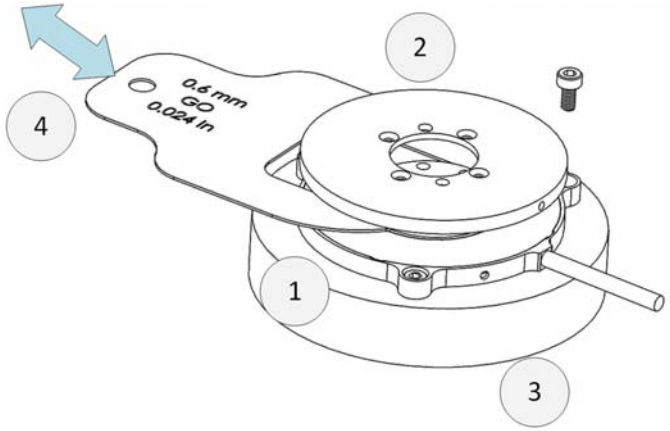
Proper mounting will ensure correct amplitude level of

Fine channel	200 - 500mV
Coarse channel	200 - 500mV

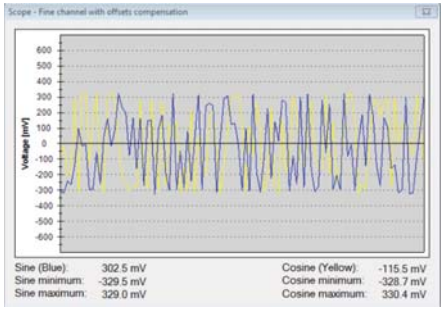


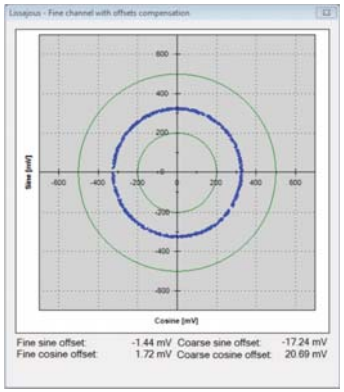
Mechanical mounting filler guage of 0.6mm can be used for verification

Filler guage (4) of 0.6mm (CAT No. MP-01014)



Proper rotor mounting can be verified by using the Encoder Explorer tools “signal analyzer” or “Mechanical installation verification”





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4. UNPACKING

4.1 STANDARD ORDER

standard **DF-60-32-SG-S0** package contain encoder only (stator / Rotor).

4.2 OPTIONAL ACCESSORIES

Optional accessories available :

Accessory CAT No.	Description
MP-01014	DF-60 ,0.6mm filler guage
RJ-DF-60	DF-60 demo jig
CNV-00003	RS-422/USB converter (with internal 5V P.S. USB path)

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5. ELECTRICAL CONNECTION

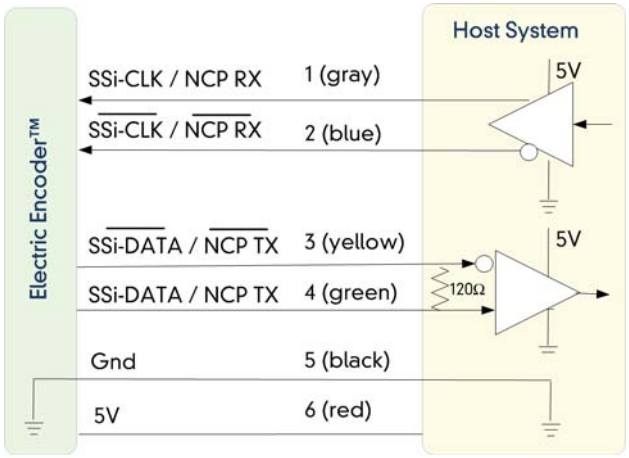
This chapter reviews the steps required to electrically connect the DF-60and includes the interconnection for :
- Digital SSi output with NCP option for calibration.

5.1 CONNECTING THE ENCODER

The DF-60Electric Encoder operates in dual modes,

(i) Absolute Position operational mode: by default on power up the encoder performs in absolute position- SSi interface

Figure 01: Encoder and Host Connections



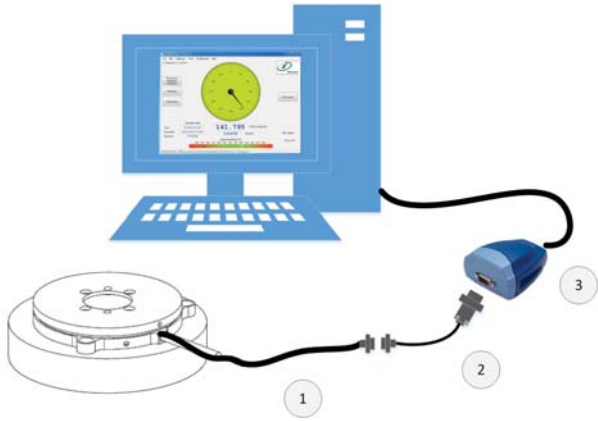
(ii) Configuration and setup mode: provides easy access through USB to a PC running Netzer Encoder Explorer application (on MS windows 7/8) , communication is done by Netzer Compact Protocol (NCP) over RS-422 by using the same set of wires .

Use the following pin assignment to connect the encoder to a 9-pins D-type connector of the RS-422/USB converter , standard Netzer connector or use the adaptor cable CAT No CV-0039

Table 1: Pin Assignments for 9 - Pins D-type Connector

Pin #	Name	Color	Function
2	Clock +	Grey	SSi Clock/ NCP RX
1	Clock -	Blue	
4	Data -	Yellow	SSi Data / NCP TX
3	Data +	Green	
5	GND	Black	Ground
8	+5V	Red	Power supply

(1) Encoder DF-60 mounted (demo jig example)
(2) Adapter cable- optional
(3) RS-422 / USB converter (CAT No. CNV-00003)



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5.3 ELECTRICAL CONNECTION AND GROUNDING

The DF-60-32-SG-S0 is provided with cable , however , grounding consideration should be in place ;

[1] The cable shield is not connected to the power supply return (minus) line.
[2] The encoder stator should be ground to the application stator by the terminal lug.
[3] The application shaft should be grounded.

Note : P.S should be 4.75 to 5.25 VDC

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6. SOFTWARE INSTALLATION

The Electrical Encoder Explorer (EEE) software is used for:

- *Mounting Verification*
- *Calibration*
- *General setup*

This chapter reviews the steps associated with installing the EEE software application:

6.1 SOFTWARE MINIMUM REQUIREMENTS

Verify that the host computer on which the EEE application is installed, includes the following configuration:

- Operating system: MS WIN 7 , 32 / 64 bit
- Memory: 4MB minimum
- Free disk space:
- Communication ports: USB 2
- Windows .NET Framework , V4 minimum

6.2 INSTALLING THE SOFTWARE

1. Run the Electric Encoder™ Explorer 2.01C.msi file , can be found on Netzer Precision Motion Sensors WEB site (www.netzerprecision.com under /support/SW Tools)

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7. MOUNTING VERIFICATION

Mounting verification should be performed before calibration to ensure optimal performance

Mounting verification can be performed by using the "verification" on the main screen of the Encoder Explorer or by using the signal analyzer under "tools"

7.1 STARTING THE ENCODER EXPLORER

1. Verify that tasks have been completed successfully:
   - Mechanical Mounting
   - Electrical Connection
   - Connecting Encoder for Calibration
   - Software Installation
2. Double-click the Encoder Explorer icon. The EEE main screen will be displayed.
3. Verify proper communication with the encoder using the following:
   - (c)The position dial display respond to rotation of the axle/rotor.
   - (a)The status bar indicates successful communication.
   - (b)Information associated with the encoder is displayed in the Encoder data area.(CAT No, serial No.)

7.2 MECHANICAL INSTALLATION VERIFICATION

Figure 02: Starting mechanical Installation Verification

The Mechanical Installation Verification (**a**)provides simple procedure to ensure proper mounting by collecting raw data of the coarse and fine channels during rotation.

1. Click the START button (**b**). Bar graph indicates the verification process.
2. Rotate the shaft for data collecting of the fine / coarse channels- process bar graph will be active.
3. Verify that the correct mechanical installation status is displayed. (**c**)

In case of "non successful" results- mechanical compensation should be deployed for proper amplitude levels .

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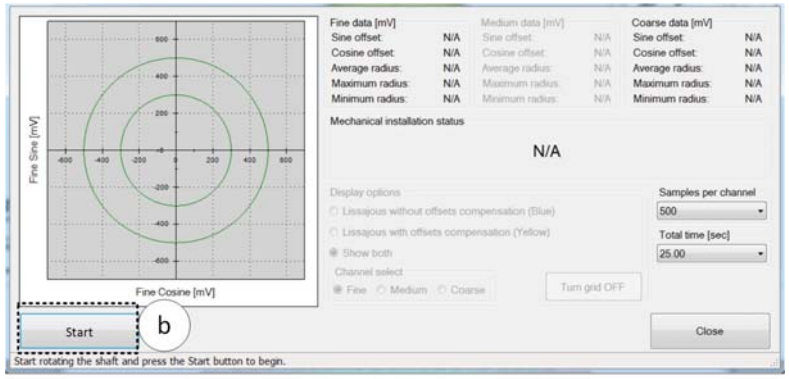
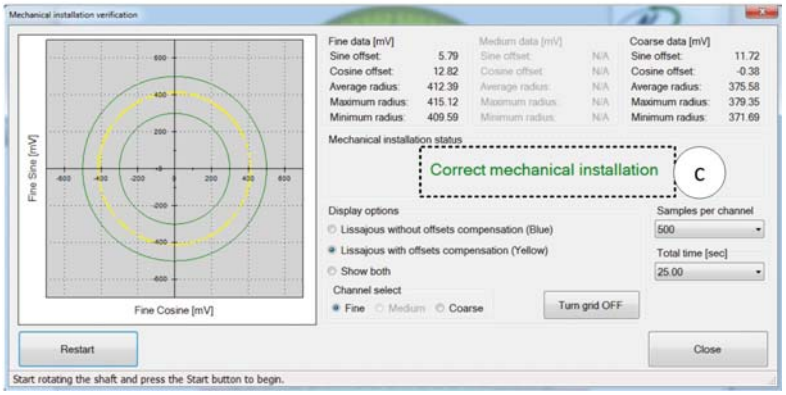
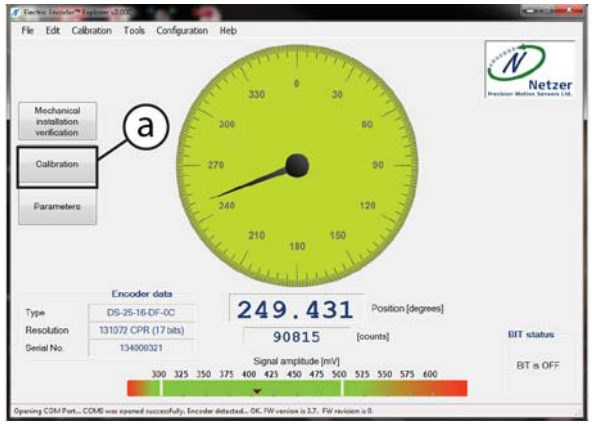




8. CALIBRATION

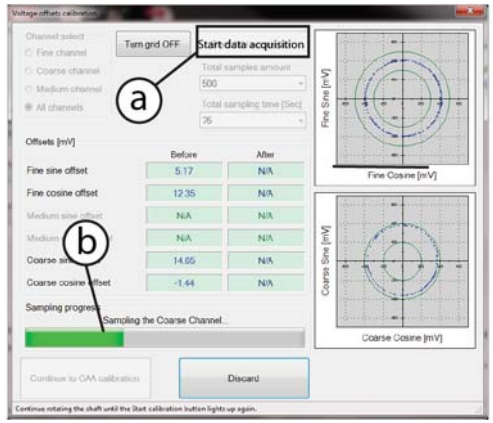
To optimize the DF-60-LM Electric Encoder performance calibration is needed (offsets) over the operational sector. Verify that the Mounting Verification procedure has been completed successfully.

1. From the main screen, click the CALIBRATION button.
2. Click the START DATA ACQUISITION button (a).



The bar graph (b) indicates the process progress.

Please rotate the axis during data collection- covering the working sector , limit to limit ,by default the procedure will



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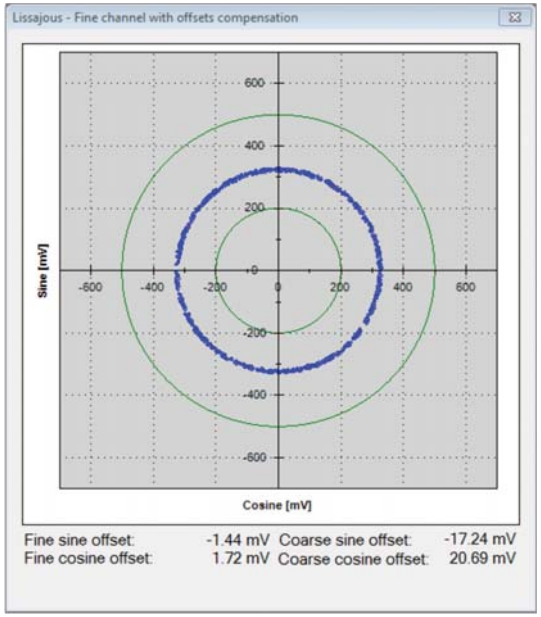
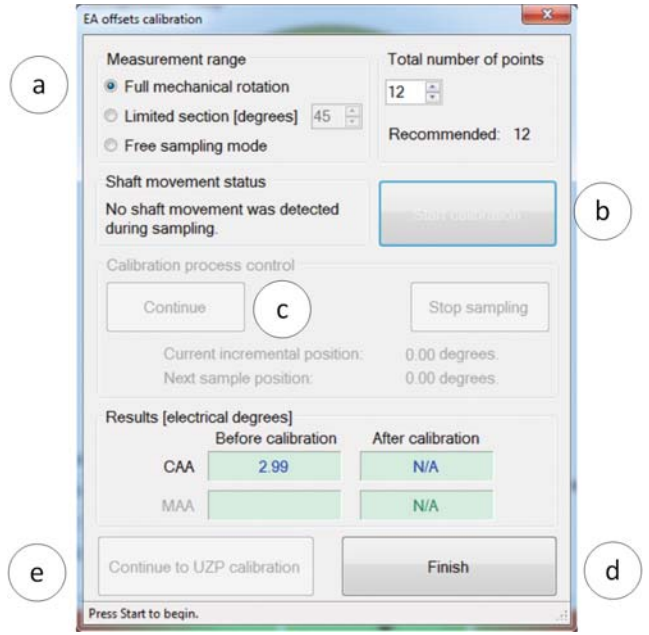
collect 500 points over 75 seconds. Rotation speed is not a parameter during data collection. Data collection indication will be presented for the fine / coarse channels , Clear circle should be presented in the center



in case the reading data (blue dots) are not evenly distributed as “clear thin circle” you may experience “noise” in your installation . (stator and or shaft grounding should be considered)

3. Click the CONTINUE TO CAA CALIBRATION button.
4. The CAA angle calibration window opens. Select the relevant option button from the Measurement range options:
   - Full mechanical rotation – shaft movment is over 10deg - recommended. (**a**)
   - *Limited section – define operation of the shaft in a limited angle defined by degrees in case of <10deg)*
   - *Free sampling modes*
5. Define the number of calibration points in the Total number of points text box. The system displays the recommended number of points by default. Please collect minimum of 9 points over the working sector.
6. Click the START CALIBRATION button (**b**)



The status (c) indicates the next required operation and the Shaft movement status (b) indicates the current position and the next target position to which the encoder should be rotated.

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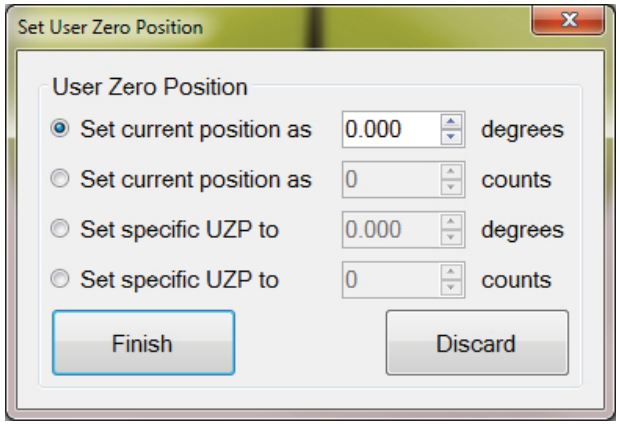
7. Rotate the shaft/encoder to the next position and click the CONTINUE button (**c**)- the shaft should be in STAND STILL during the calculation. Follow the indication / interactions during the cyclic process for position the shaft--> stand still --> reading calculation.
8. Repeat the above step for all the defined points. Finish (**d**)
9. Click the CONTINUE UZP CALIBRATION button (**e**).

8.1 SETTING THE ENCODER ZERO POINT

Application zero position can be defined in the working sector.

1. Rotate the shaft to the desired "0" mechanical position .
2. Select "Set current position as "0"" using the relevant option and click the FINISH button.

Figure 03: Connecting the Rotor



The encoder "0" can be defined all over the working sector , AP - absolute position indication will be positive from this point up to the resolution range.

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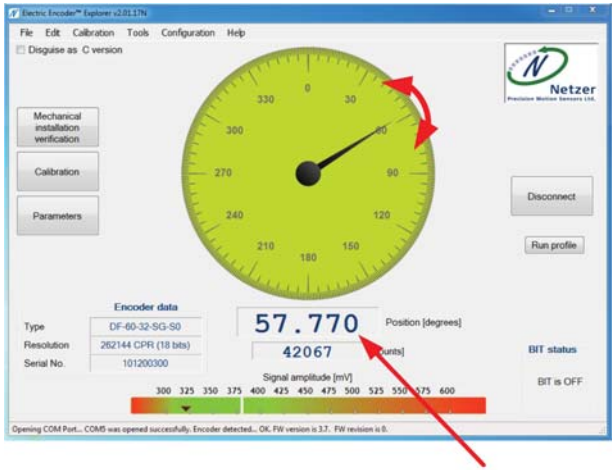
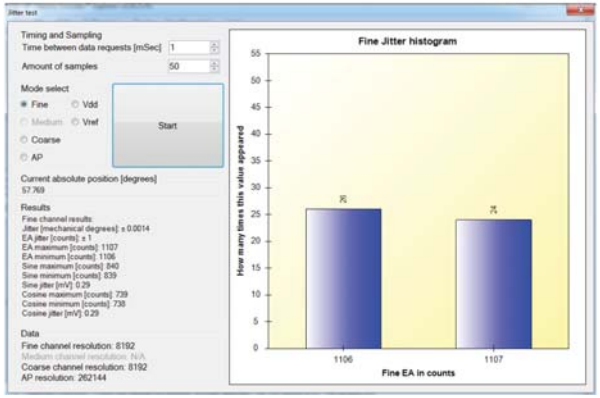
8.2 JITTER TEST

Jitter test can be performed to evaluate the quality of the installation , the jitter test presents the reading statistics of absolute position readings (counts) over time
Common jitter should be up +/- 3 counts , higher jitter may indicate for system noise.





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9. MECHANICAL ICD

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