Installation and user's guide

H-1000-5144-02-A

RENISHAW
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FARO SENSOR

Renishaw part no: H-1000-5144-02-A

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FARO SENSOR

Installation and user's guide

CE

Care of equipment

Renishaw probes and associated systems are precision tools used for obtaining precise measurements and must therefore be treated with care.

CAUTION: The product should not be included in general rubbish.

Changes to equipment

Renishaw reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously sold.

Warranty

Renishaw plc warrants its equipment provided that it is installed exactly as defined in associated Renishaw documentation.

Prior consent must be obtained from Renishaw if non-Renishaw equipment (e.g. interfaces and/or cabling) is to be used or substituted for Renishaw equipment. Failure to comply with this will invalidate the Renishaw warranty.

Claims under warranty must be made from authorised service centres only, which may be advised by the supplier or distributor.

Patents

Aspects of the FARO SENSOR system have patents applied for.

CAUTION: The FARO SENSOR will only work with genuine FARO SENSOR styli. When switching on the probe ensure a genuine stylus is fitted and that the stylus is not in contact with any surface until the probe status LED turns green.

EC DECLARATION OF CONFORMITY

Renishaw plc declare that the product:

Name(s): MSP3

Description: Faro sensor

Part no.: A-3053-2131

has been manufactured in conformity with the following standards:

BS EN 61326-1:2006 — Electrical equipment used for measurement, control and laboratory use - EMC requirements - Part 1: General requirements Immunity to Table 2 - industrial locations. Emission to Class A - industrial locations.

and that it complies with the requirements of the following directives (as amended):

89/336/EEC Electromagnetic compatibility (EMC)

Signature .....

David Whittle
Design Verification Manager
Group Engineering
Renishaw plc

Dated: 27th November 2007 Reference no. ECD2007/24

Contents

1 Introduction

This installation and user's guide is for the Renishaw FARO SENSOR (see figure 1):

The FARO SENSOR is a dual function touch-trigger probe/scanning probe and is only compatible with the FARO QUANTUM arm.

Figure 1 - The FARO SENSOR

2 Product description

2.1 The FARO SENSOR kit

The standard FARO SENSOR kit (see figure 2) comprises the following primary components:

- One FARO SENSOR body
- 2 x FARO SENSOR styli - Ø 3 mm (0.12 in) and Ø 6 mm (0.24 in)
- Wrench
- M4 stylus tools
- Cleaning kit
- Documentation CD

2.1.1 The FARO SENSOR

The probe body incorporates a standard FARO 1¼" - 20 UN screw connector mount.

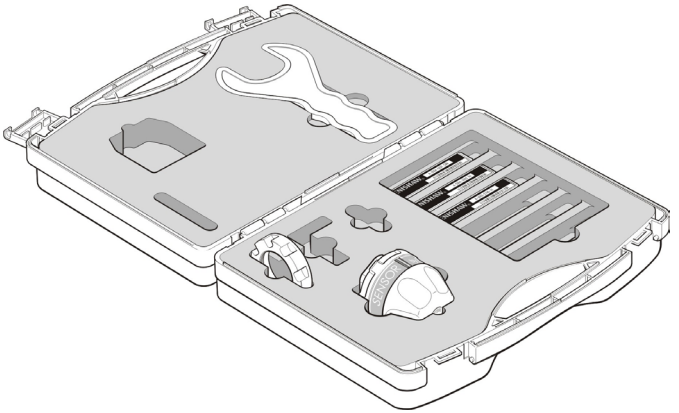

Figure 2 - The FARO SENSOR boxed kit

The following FARO SENSOR styli are available from your Renishaw or FARO supplier:

Part number	Ball Ø mm (in)	Length mm (in)	ELW* mm (in)
A-5004-0291	3 (0.12)	30 (1.18)	6.5 (0.26)
A-5004-0293	6 (0.24)	30 (1.18)	25.4 (1.0)
A-5004-1188	4 (0.16)	30 (1.18)	6.5 (0.26)
A-5004-1189	6 (0.24)	60 (2.36)	55.5 (2.19)

* Effective working length.

All kits contain:

- FARO SENSOR A-3053-2131
- Ø 6 mm (0.24 in) x 30 mm (1.18 in) stylus A-5004-0293
- Ø 3 mm (0.12 in) x 30 mm (1.18 in) stylus A-5004-0291
- M4 stylus tools (boxed) A-3053-2196
- Wrench M-3053-2188
- Cleaning kit A-1085-0016
- System installation and user's guide CD H-1000-5145
- Kit box A-1015-8466

3 Product installation

3.1 Fitting the FARO SENSOR onto an arm

To fit the FARO sensor onto an arm, carry out the following procedure (see figure 3):

1. By hand, screw the threaded end of the probe body into the 1¼" - 20 UN thread of the arm head and finger tighten to secure.
2. Locate the wrench (supplied) onto the probe body as shown in figure 3.

NOTE: Do not use any other tooling.

3. Using the wrench, tighten the FARO SENSOR into the arm (1.75 Nm – 15.5 ibf.in).

NOTE: Extensive force will result in damage to the sensor or arm.

3.2 Fitting a stylus onto the FARO SENSOR

To fit a stylus onto the FARO SENSOR, carry out the following procedure (see figure 3):

NOTE: For advice on stylus selection, refer to the applications guide later in this publication.

1. Screw the threaded end of your chosen stylus into the M4 stylus mount of the probe module and finger tighten to secure.
2. Using the M4 stylus tools provided, fully tighten the stylus into the stylus mount to achieve the recommended tightening torque up to 2 Nm - 17.7 ibf.in.

NOTE: Do not use any other tools to tighten the stylus.

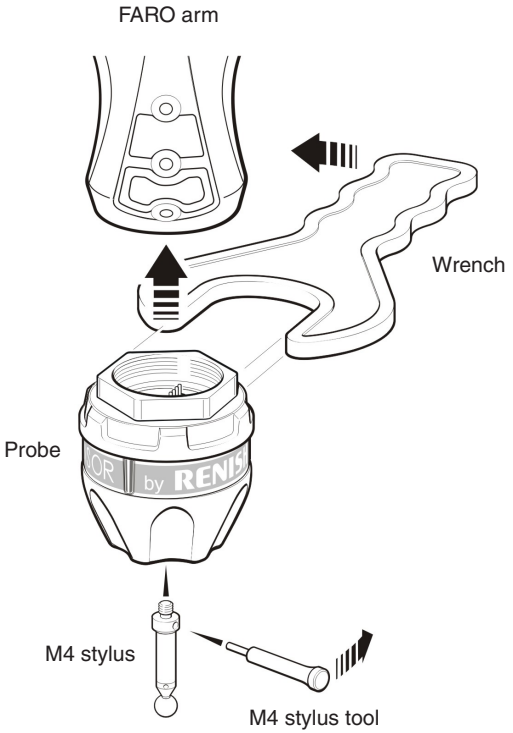

Figure 3 - Fitting the FARO SENSOR onto an arm

4 Product operation

4.1 Operational modes

The various modes of the probe are indicated by the two status LEDs on the side of the probe:

Solid Blue	Probe is in sleep mode. If the arm is not used for a period of time the probe is switched into sleep mode. To wake the probe up, move the arm from the stowed position.
Flashing Blue	Probe is auto-zeroing which may take 8 seconds to find optimum sensitivity for the stylus connected.
Solid Green	Probe has auto-zeroed successfully and is ready to measure. Green also indicates the probe is not in contact with a surface.
Solid Red	Probe auto-zeroed successfully and is in measuring mode contacting the surface. Position data signals to the arm are being generated.
Flashing Red	Probe failed to auto-zero and will NOT take data points. Check that a stylus is present and that the stylus is correctly tightened. Stow the arm to re-tune.

NOTE: Whilst the probe is auto-zeroing ensure the stylus does NOT come into contact with any surface.

Always recalibrate the probe and stylus if the stylus has been removed.

4.2 Operation

When moving the arm from the stowed position the FARO SENSOR performs an auto zero (LEDs flash blue) and if successful will turn green.

NOTE: When the stylus has been replaced or changed, auto zeroing may take up to 8 seconds.

FARO SENSOR auto zero results in flashing red:

- Ensure that the stylus mounting threads on the stylus and the FARO SENSOR are clean
- Ensure the stylus ball and shank are entirely free of contact during the auto-zeroing process
- You must only use FARO SENSOR styli

NOTE: While flashing red, the probe will not sense surfaces.

4.3 Accuracy of measurement

Operator variability when measuring with the FARO SENSOR can be significantly reduced by careful selection of the measuring mode and probe configuration for the job in hand. Following these simple rules will result in successful data collection.

Use scanning mode only when:

- The part is rigid – for example an engine block.
- A short (30 mm (1.18 in) or less) stylus can complete the measurements.
- A 3 mm (0.12 in) diameter stylus or greater is used.

Always use point measurement mode when:

- The part is not rigid (sheet metal or plastic components).
- A long (50 mm (1.97 in) or greater) stylus is to be used.
- A small stylus tip (less then 3 mm (0.12 in)) diameter is to be used.

Whilst measuring :

- Do not touch the stylus tip or shank with any part of the body as this will prevent surface from being detected.
- Only touch the surface being measured with the stylus tip.
- Use consistent amount of force between the stylus tip and part.
- Use consistent amount of force when calibrating and when measuring.
- Use the minimum amount of force required to trigger the probe when measuring.
- Allow the probe to re-zero every 5 minutes by moving the arm to the stowed position.

4.4 Calibration

The Single Hole calibration can impose large bending loads on the FARO SENSOR styli if under 3 mm (0.12 in) diameter or over 50 mm (2 in) in length. Where these styli are required the Sphere method of calibration should be used.

5 Technical data

5.1 Measuring performance

NOTE: The following data is derived from a high accuracy test rig with a Ø 6 mm (0.24 in) x 30 mm (1.18 in) stylus measurements and may not represent the performance achievable on an arm.

5.1.1 Technical specification

Product compatibility	The FARO SENSOR is suitable for use with FARO QUANTUM range of arms.	
Dimensions		
Diameter	51 mm (2.01 in)	
Length	55.25 mm (2.18 in)	
Probe mount	Thread 1¼-20 UN	
Stylus mount	Thread M4 x 0.7 mm	
Sensing directions	6-way	(±X, ±Y, ±Z)
Sealing	IP30	
Repeatibility	1 µm 2 σ (0.0000394 in)	
Trigger force	0.02-0.04 Nm (2 gf – 4 gf)	
Pre-travel	4.5 µm (0.000177 in)	
Pre-travel variation	1 µm (0.0000349 in)	
Weight	145 g (5.11 oz)	

6 Applications guide

6.1 Stylus selection

The FARO SENSOR comes supplied with two matching styli which are specially designed for the highest accuracy and sensitivity. The stylus design is carefully matched to the probe contact sensing system. Third party styli should not be used.

NOTE: Choosing the best stylus for a given application is an important factor in achieving optimum probe performance.

When selecting a stylus, it is important that the stylus length is kept to the minimum required to access all features to be measured.

It is also important to ensure that the stylus ball diameter chosen is as large as is practical. This not only ensures that the stylus will be as stiff as possible, but also reduces the stylus susceptibility to surface form and surface finish.

6.1.1 The list of available styli

Part number	Ball Ø mm (in)	Length mm (in)	ELW* mm (in)
A-5004-0291	3 (0.12)	30 (1.18)	6.5 (0.26)
A-5004-0293	6 (0.24)	30 (1.18)	25.4 (1.0)
A-5004-1188	4 (0.16)	30 (1.18)	6.5 (0.26)
A-5004-1189	6 (0.24)	60 (2.36)	55.5 (2.19)

* Effective working length.

6.1.2 Recommended stylus limits

Owing to the modular construction of the FARO SENSOR, it is recommended that the limits shown in figure 4 are applied when selecting styli to be used. For point taking the stylus of 300 mm can be used.

- No star or cranked styli

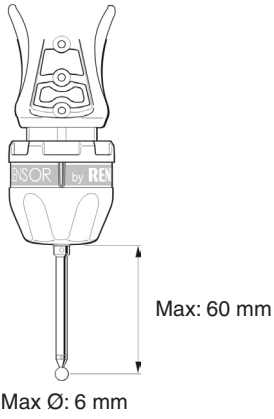

Figure 4 - Recommended stylus limits

7 Product maintenance

NOTE: Maintenance of the FARO SENSOR is restricted to the periodic cleaning of the stylus M4 mating faces and the conical location seat. To aid cleaning of these couplings, each FARO SENSOR is supplied with a Renishaw cleaning kit.

Each Renishaw cleaning kit contains a specialised material to effectively remove contamination from location faces.

Styli that are not attached to the probe should be stored in their transport boxes, to prevent contamination.

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