**Installation guide**
H-5470-8504-01-A

RENISHAW
apply innovation™

# Primo™ system

Renishaw part no: H-5470-8504-01-A

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# Before you begin



## Disclaimer

RENISHAW HAS MADE CONSIDERABLE EFFORTS TO ENSURE THE CONTENT OF THIS DOCUMENT IS CORRECT AT THE DATE OF PUBLICATION BUT MAKES NO WARRANTIES OR REPRESENTATIONS REGARDING THE CONTENT. RENISHAW EXCLUDES LIABILITY, HOWSOEVER ARISING, FOR ANY INACCURACIES IN THIS DOCUMENT.

## Trade marks

**RENISHAW** and the probe symbol used in the RENISHAW logo are registered trade marks of Renishaw plc in the United Kingdom and other countries. **apply innovation**, **Primo** and names and designations of other Renishaw products and technologies are trade marks of Renishaw plc or its subsidiaries.

All other brand names and product names used in this document are trade names, trade marks, or registered trade marks of their respective owners.

## Warranty

Equipment requiring attention under warranty must be returned to your equipment supplier.

Unless otherwise specifically agreed in writing between you and Renishaw, if you purchased the equipment from a Renishaw company, the warranty provisions contained in Renishaw's CONDITIONS OF SALE apply. You should consult these conditions in order to find out the details of your warranty, but in summary the main exclusions from the warranty are if the equipment has been:

- neglected, mishandled or inappropriately used; or
- modified or altered in any way except with the prior written agreement of Renishaw.

If you purchased the equipment from any other supplier, you should contact them to find out what repairs are covered by their warranty.

## Changes to equipment

Renishaw reserves the right to change equipment specifications without notice.

## CNC machines

CNC machine tools must always be operated by fully trained personnel in accordance with the manufacturer's instructions.

## Care of the Primo equipment

Keep systems clean and treat the equipment as precision tools.

## Patents

Features of the Primo system, and other similar Renishaw products, are the subject of one or more of the following patents and/or patent applications:

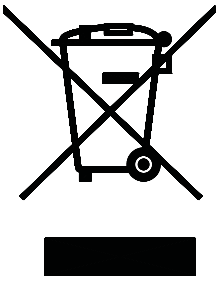
CN100416216
CN100466003
CN101476859
CN101354230
CN101354266
CN101482402
EP0695926
EP0967455
EP1185838
EP1373995
EP1425550
EP1457786
EP1477767
EP1477768
EP1576560
EP1613921
EP1701234
EP1734426
EP1804020
EP1988439
EP2018935
EP2019284
EP2216761
IN215787
IN234921
IN8707/DELNP/2008
JP3967592
JP4237051
JP4398011
JP4575781
JP4754427
JP4773677
JP4851488
JP4852411
JP5238749
JP5254692
JP5390719
JP5410700
JP5491646
KR1001244
TW1380025
TW201329660
TWI407278
US8700351
US2009/0028286
US2011/0002361
US2013/0159714
US5669151
US6275053
US6776344
US6941671
US7145468
US7285935
US7316077
US7441707
US7486195
US7812736
US7821420
US8437978
US8464054

## EC declaration of conformity

CE

Renishaw plc hereby declares that the Primo Radio Part Setter, Primo Radio 3D Tool Setter and Primo Interface are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Contact Renishaw plc or visit www.renishaw.com/primodownloads for the full EC declaration of conformity.



## WEEE directive

The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment. For more information, please contact your local waste disposal service or Renishaw distributor.

## FCC Information to user (USA only)

### 47 CFR Section 15.19

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

### 47 CFR Section 15.21

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

# Radio approval

## Radio equipment – Canadian warning statements

### English

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

### Français

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## Radio regulations

### Extract from Taiwanese radio regulations

低功率電波輻性電機管理辦法第十二條經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。第十四條低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信 規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

## Radio approvals

### Primo Radio Part Setter

| | |
|---|---|
| Canada | IC: 3928A-PRPS |
| China | CMIIT ID: 2014DJ0914 |
| Europe (28 EU member countries) | CE |
| Japan | 205-140186 |
| Singapore | Reg. No: N0522-14 |
| | Complies with IDA Standards DA104328 |
| South Korea | MSIP-CRM-R1P-PRPS |
| Taiwan | CCAL14LP0020T1 |
| USA | FCC ID: KQGPRPS |

Australia Iceland India Indonesia Liechtenstein Malaysia Montenegro New Zealand Norway Switzerland The Philippines Turkey Vietnam

**Primo Radio 3D Tool Setter**

| | |
|---|---|
| Canada | IC: 3928A-PR3DTS |
| China | CMIIT ID: 2014DJ0913 |
| Europe (28 EU member countries) | CE |
| Japan | 205-140187 |
| Singapore | Reg. No: N0521-14 |
| | Complies with IDA Standards DA104328 |
| South Korea | MSIP-CRM-R1P-PR3DTS |
| Taiwan | CCAL14LP0030T1 |
| USA | FCC ID: KQGPR3DTS |

Australia Iceland India Indonesia Liechtenstein Malaysia Montenegro New Zealand Norway Switzerland The Philippines Turkey Vietnam

**Primo Interface**

| | |
|---|---|
| Canada: | IC: 3928A-PI |
| China: | CMIIT ID: 2014DJ3490 |
| Europe: (28 EU member countries) | CE |
| Japan: | 205-140198 |
| Singapore: | Reg. No: N2032-14 |
| | Complies with IDA Standards DA104328 |
| South Korea: | MSIP-CRM-R1P-PI |
| Taiwan: | CCAL14LP0690T4 |
| USA: | FCC ID: KQGPI |

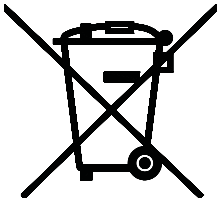
Australia Iceland India Indonesia Liechtenstein Malaysia Montenegro New Zealand Norway Switzerland The Philippines Turkey Vietnam

# Safety

## Information to the user

The part setter and the tool setter are each supplied with one CR2 3 V Lithium manganese dioxide battery. It is also possible to use ½ AA 3.6 V Lithium-thionyl chloride batteries (approved to IEC 62133). For more information, see “Permitted battery types” on page 6.4.

Once the charge in these batteries has depleted, do not attempt to recharge them.



The use of this symbol on the batteries and/or accompanying packaging indicates that the batteries should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of the batteries at a designated collection point to enable recycling. Correct disposal of the batteries will prevent negative effects on the environment. For more information, please contact your local waste disposal service.

Please ensure replacement batteries are of the correct type and are fitted in accordance with the instructions in this manual and as indicated on the product (for more information, see section 6, “Maintenance”). For specific battery operating, safety and disposal guidelines, please refer to the battery manufacturers' literature.

- Do not leave dead batteries in the equipment.
- Do not store batteries in direct sunlight or rain.
- Do not heat or dispose of batteries in a fire.
- Avoid forced discharge of the batteries.
- Do not short-circuit the batteries.
- Do not disassemble, pierce, deform or apply excessive pressure to the batteries.
- Do not swallow the batteries.
- Keep the batteries out of the reach of children.
- Do not get batteries wet.
- If a battery is damaged, exercise caution when handling it.

Please ensure that you comply with international and national battery transport regulations when transporting batteries or the products.

Lithium batteries are classified as dangerous goods and strict controls apply to their shipment by air. To reduce the risk of shipment delays, if you need to return the part setter or the tool setter to Renishaw for any reason, do not return any batteries.

In all applications involving the use of machine tools, eye protection is recommended.

The tool setter has a glass window. Handle with care if broken to avoid injury.

## Information to the machine supplier/installer

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product literature, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances, the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to halt the movement of the machine and always program an overtravel distance stop into the machining program.

## Information to the equipment installer

All Renishaw equipment is designed to comply with the relevant EC and FCC regulatory requirements. It is the responsibility of the equipment installer to ensure that the following guidelines are adhered to, in order for the product to function in accordance with these regulations:

- any interface MUST be installed in a position away from any potential sources of electrical noise, i.e. power transformers, servo drives etc;
- all 0 V/ground connections should be connected to the machine star point (the star point is a single point return for all equipment ground and screen cables). This is very important and failure to adhere to this can cause a potential difference between grounds;
- all screens must be connected as outlined in the user instructions;
- cables must not be routed alongside high-current sources, i.e. motor power supply cables etc, or be near high-speed data lines;
- cable lengths should always be kept to a minimum.

## Equipment operation

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

## Renishaw GoProbe cycles

Each Primo system is supplied with Renishaw GoProbe software and the Renishaw GoProbe training kit.

Renishaw GoProbe software is a unique 'all-in-one' probing solution that supports all the Renishaw GoProbe cycles. The GoProbe cycles use a single-line command to simplify the use of standard probing cycles.

GoProbe combines multiple GoProbe cycles for part setting, tool setting and probe set-up:

- 9901 – Part setting
- 9921 – Tool setting
- 9931 – System ready

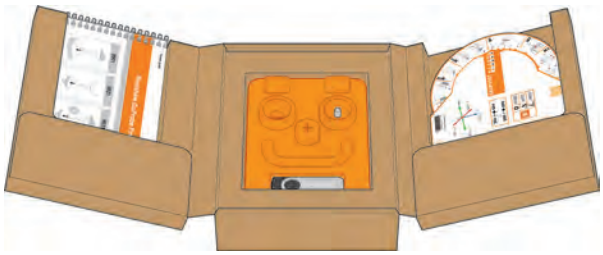

GoProbe provides:

- An easy and intuitive way to get started with setting cycles.
- A simple and consistent 'five step' method of operation.
- A choice of manual (jog) mode or automated mode.
- A solution that is compatible with a range of Renishaw probes as well as the Primo system.

## GoProbe training kit

To ensure the maximum benefit from the Primo system, Renishaw provides each Primo customer with a GoProbe training kit: the training kit helps new users to get up and running with their new probing system quickly and easily.

The training kit centres on the GoProbe training part, which has been designed to incorporate the most common features encountered during automated setting and manufacturing. The GoProbe training part is used to demonstrate all the probing cycles and is used in the e-learning practical exercises.



The GoProbe e-learning course is a PC-based course that will guide both new and experienced users through the basics of probing using a combination of intuitive tutorials, interactive quizzes and practical exercises.

By completing this training the user will be able to check that the Primo system is ready for use, and will be able to use part setting, tool setting and probe set-up cycles with confidence.

Other learning aids included in the training kit are the pocket guide and quick-reference tool, for convenient continual use at the machine. A GoProbe smartphone app is also available – see www.renishaw.com/goprobe for details.

Each Primo system should be supplied with a training kit from your machine tool supplier. If you have not received the training kit or if any elements are missing, please contact your local Renishaw office, which can be found by visiting www.renishaw.com/contact.

# Primo™ Radio Part Setter and Primo™ Radio 3D Tool Setter basics



## Introduction

When used within a Primo system:

- The part setter enables part set-up and inspection on machining centres.
- The tool setter enables tool setting and broken tool detection (length and diameter).

The part setter and tool setter deliver interference-tolerant radio transmission through the use of Frequency Hopping Spread Spectrum (FHSS), allowing multiple systems to work in the same machine shop without interference. Using radio transmission enables operation without line-of-sight.

## Getting started

The part setter and tool setter are fitted with LEDs to provide visual indication of their status as well as overall system status (see “Part setter and tool setter LED guide” on page 5.18).

For more information on LEDs, see “Interface LED signals” on page 5.20.

## Credit

The Primo system requires credit to function. Credit comes in the form of a credit token. This is inserted into the part setter (see “Installing the credit token cassette” on page 5.29, and “Changing the credit token” on page 5.30). The credit is then transferred to the interface (see “Credit transfer” on page 5.31).

## Modes of operation

**Standby mode:** the interface is waiting for a switch-on signal from the machine tool before it can send a switch-on signal to the equipment.

**Operational mode:** this is activated by a switch-on signal from the interface or by spinning the spindle (part setter only). The equipment is ready for use.

**Acquisition mode:** this is used to partner the part setter and tool setter with the interface (see “Acquisition method” on page 5.25).

**Credit transfer mode (part setter only):** this is used to transfer credit from the credit token via the part setter to the interface (see “Credit transfer” on page 5.31).

## Configurable settings

These settings can be configured by changing the DIP switches on the interface (see page 3.5).

| Function | | Description | Factory setting |
|---|---|---|---|
| Part setter switch-on/ switch-off method | Radio on/radio off | Commanded by machine output. Turn-on time is 1 second maximum. | Radio on/ radio off |
| | Spin on/spin off | Spin at 1000 rpm for 1.5 seconds minimum. | |
| Enhanced trigger filter | | The enhanced trigger filter improves the equipment's resistance to false triggers caused by rapid traversing or excessive vibration. | OFF |
| Hibernation mode | | When the part setter or tool setter is in standby mode and the interface is powered off or out of range, the equipment enters hibernation (low power) mode after a timeout. The part setter or tool setter 'wakes' from hibernation periodically to check for their partnered interface. The 'wake' signal is sent every 30 seconds when hibernation is enabled. | ENABLED |

### Tool setter switch-on/switch-off

The switch-on/switch-off method for the tool setter is not user-configurable. The method used is radio on/radio off.

### Enhanced trigger filter

When the filter is enabled, an additional 10 ms filter delay is introduced to the equipment output.

It may be necessary to reduce the part setter's approach speed to allow for the increased stylus overtravel during the extended time delay.

## Recalibration

If settings are changed via the interface DIP switches, it is vital that the equipment is recalibrated (see "Calibrating the Primo equipment" on page 5.16).

## Acquisition mode

The partnering of the part setter or tool setter with the interface is described in "Acquisition method" on page 5.25.

**NOTE:** To place the interface in acquisition mode, you will need to turn it off and then back on again.

Partnering is required during initial Primo system set-up or if the part setter switch-on method is changed.

Partnering will not be lost by reconfiguration of the equipment settings or when changing the batteries.

Partnering can take place anywhere within the performance envelope (see "Performance envelope" on page 5.2).

## Primo Credit Token

The Primo system **will not** work without credit being available in the system.

The standard credit token contains 6 months' worth of credit.

For more information on how to install the credit token, see “Installing the credit token cassette” on page 5.29.

### Primo Upgrade Credit Token

An upgrade credit token enables the Primo system to work for an unlimited period.


### Credit transfer

Credit is loaded into the Primo system by transferring credit from the credit token into the interface (see “Credit transfer” on page 5.31).

### How to purchase a credit token

You can purchase 6-month credit tokens and upgrade credit tokens from the Primo website www.renishaw.com/primo.

You can also contact your local Renishaw supplier (see www.renishaw.com/contact).

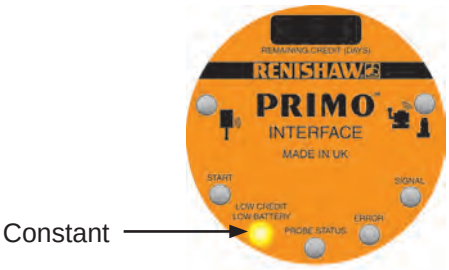
### Low credit indicators

When any of these low credit indicators are shown, it is recommended that a new credit token is loaded into the system.

1. Equipment LEDs flash yellow.

| | |
|---|---|
| Slow flash | Maximum 21 days' credit remaining |
| Fast flash | Maximum 10 days' credit remaining |

2. Interface low credit/low battery LED is illuminated (indicates low credit [maximum 21 days] or low battery).




3. Interface digital display (indicates the number of days of credit remaining). When the remaining credit display reads 0 days, the Primo system will stop working and new credit must be loaded into the system to continue operation.


4. Low credit/low battery solid state relay (SSR) output from the interface, which can be connected to the machine control. When credit is running low, the SSR changes state. The SSR can be configured normally open or normally closed (see page 3.5).

## Part setter operation

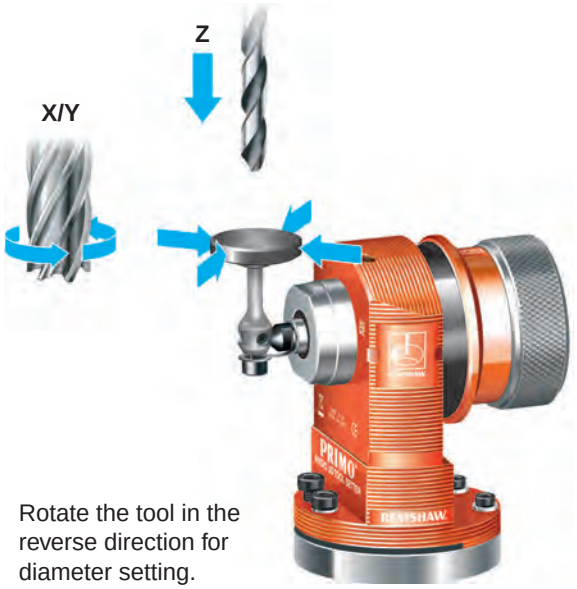
The part setter operates as a highly accurate and repeatable mechanical switch that triggers as the stylus deflects against a surface.

- The part setter can trigger in the X, Y and Z axes.
- The part setter can be used for work co-ordinate setting and for workpiece measurement.
- A trigger signal is sent directly to the CNC controller so that offsets can be updated – no manual intervention is required.


## Tool setter operation

The tool setter enables accurate machining by measuring the length and diameter of tools using the same highly accurate and repeatable switch mechanism as the part setter.

- The tool is set in the Z axis for tool length measurement and broken tool detection.
- Rotating tools are set in the X and Y axes for tool radius measurement.




Rotate the tool in the reverse direction for diameter setting.

## Software routines

GoProbe software caters for 3-axis applications and covers basic probing routines:

- Workpiece set-up
- Workpiece measurement
- Tool setting
- Broken tool detection
- Calibration

For further information, see the *GoProbe programming manual* (see www.renishaw.com/goprobe for further details).

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# Primo™ Interface basics



## Introduction

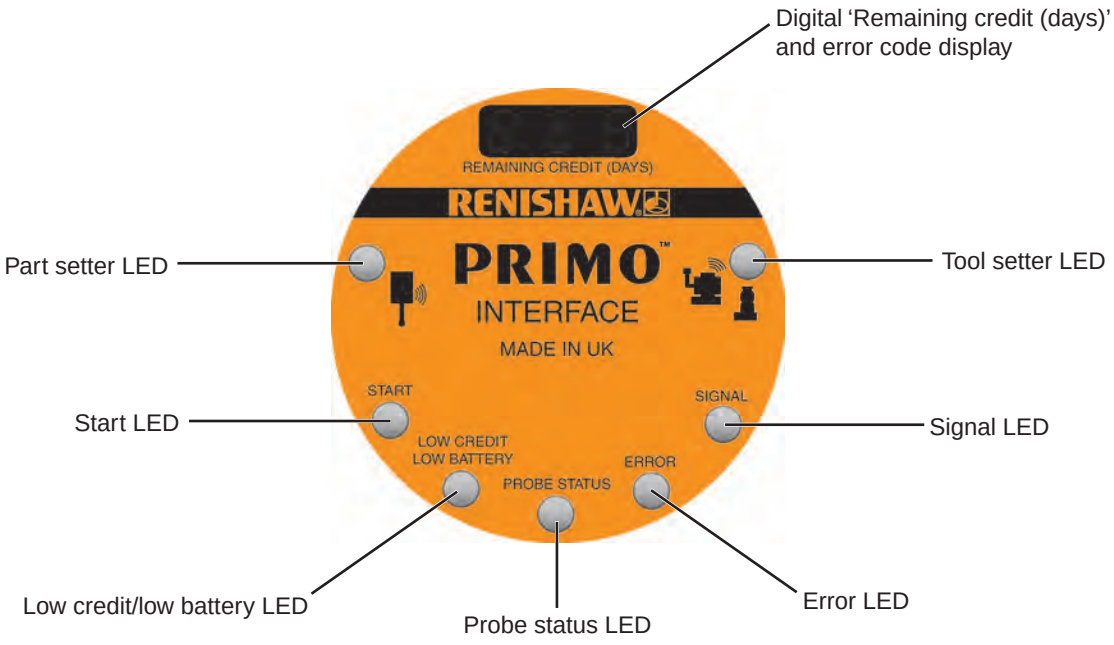
The interface enables communication between the machine tool, part setter and tool setter using radio frequency transmission.

### Power supply

The interface requires a 12 Vdc to 30 Vdc supply capable of supplying 150 mA minimum.

**NOTE:** If the Primo system is using an upgrade credit token and the interface is returned to Renishaw, then the upgrade credit token must be returned with the interface for identification purposes.


## Interface visual diagnostics



# Interface inputs

### Machine start inputs

'Machine start' is configurable as a level or pulsed signal.

| | | | |
|---|---|---|---|
| **SW2-3 set to level** | P1 | Active * | Part setter is switched on. |
| | P2 | Active * | Tool setter is switched on. |
| **SW2-3 set to pulsed** | P1 | Pulsed to alternately switch on and off the selected probe. | |
| | P2 | Active * | Tool setter is selected. |
| | P2 | OFF | Part setter is selected. |

* Active = +12 Vdc to +30 Vdc with respect to the machine start common

For the full interface switch settings, see page 3.5, and for the full interface wiring diagram, see page 5.13.

# Interface outputs

There are four SSR outputs:

- Probe status 1
- Probe status 2
- Error
- Low credit/low battery

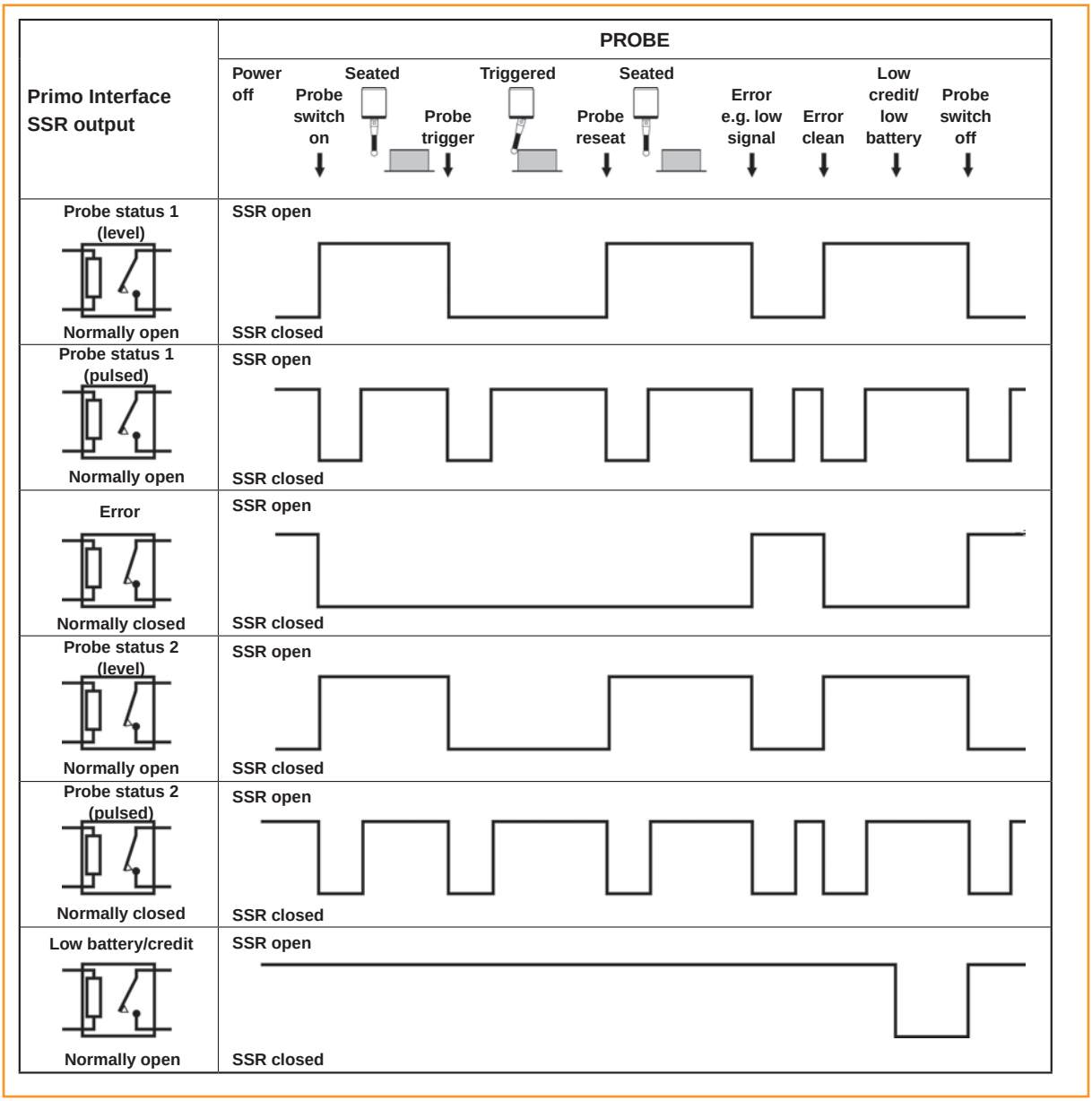
All outputs can be inverted by using the interface DIP switches SW1 and SW2 (for switch configurations, see page 3.5).

**NOTE:** The term **'Probe status'** refers to the measurement hardware in the system interacting with the interface and can therefore refer to the part setter or the tool setter.

## SSR outputs specifications

- Maximum 'on' resistance = 25 Ω
- Maximum load voltage = 30 V
- Maximum load current = 100 mA

# Interface output waveform

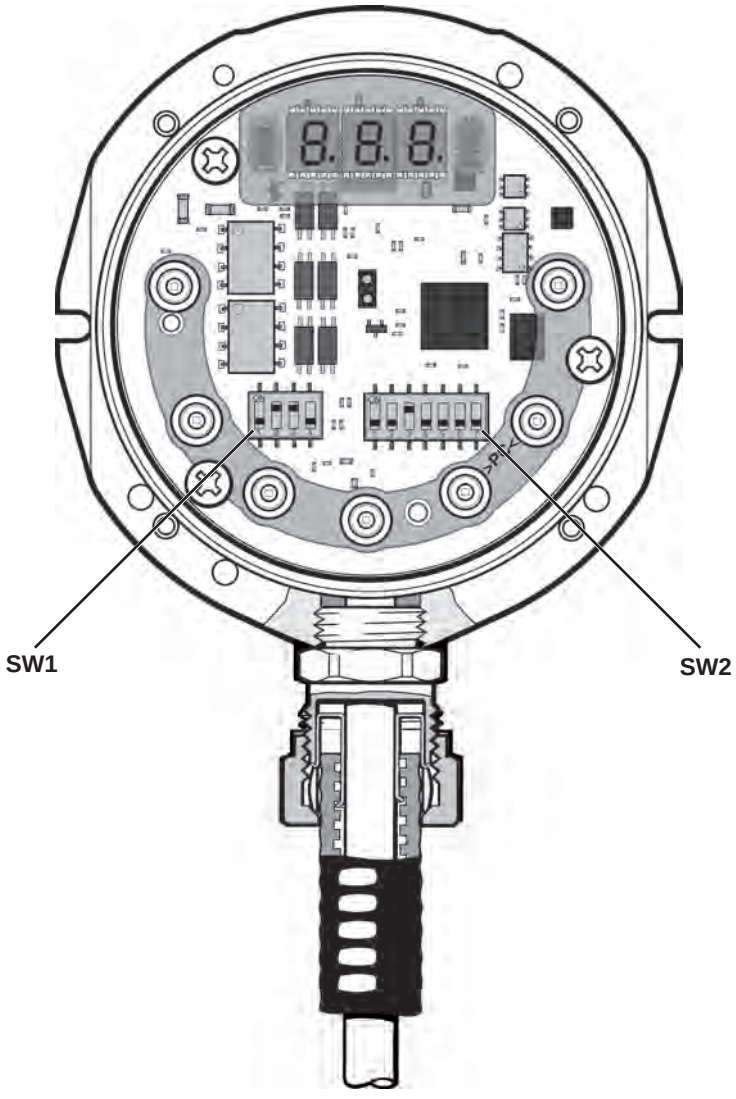



**Signal delays:**

1. **Transmission delay:** probe trigger to output change of state = 10 ms ±10 µs without enhanced trigger filter
2. **Start delay:** time from initiation of start signal to valid signal transmission = 1 second maximum for radio on/radio off (or 1.5 seconds for spin on/spin off).

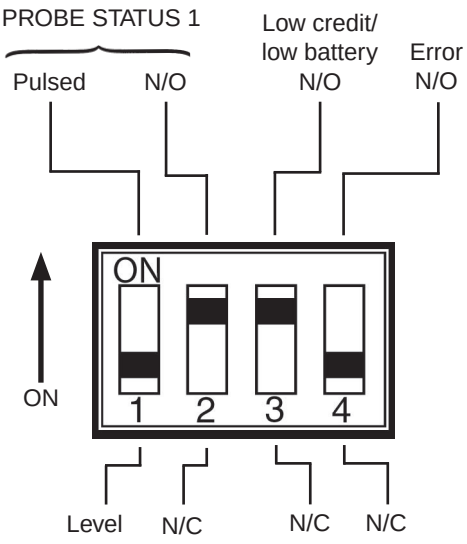
## Switches SW1 and SW2

**NOTE:** To gain access to the switches, remove the front cover (see “Removing the interface cover” on page 6.5).



## Switch SW1 output configuration

**NOTE:** If the error code **E08** appears on the Primo interface “Remaining credit (days)” digital display when a DIP switch setting has been changed, the part setter must be reacquired or the DIP switch returned to its original position.

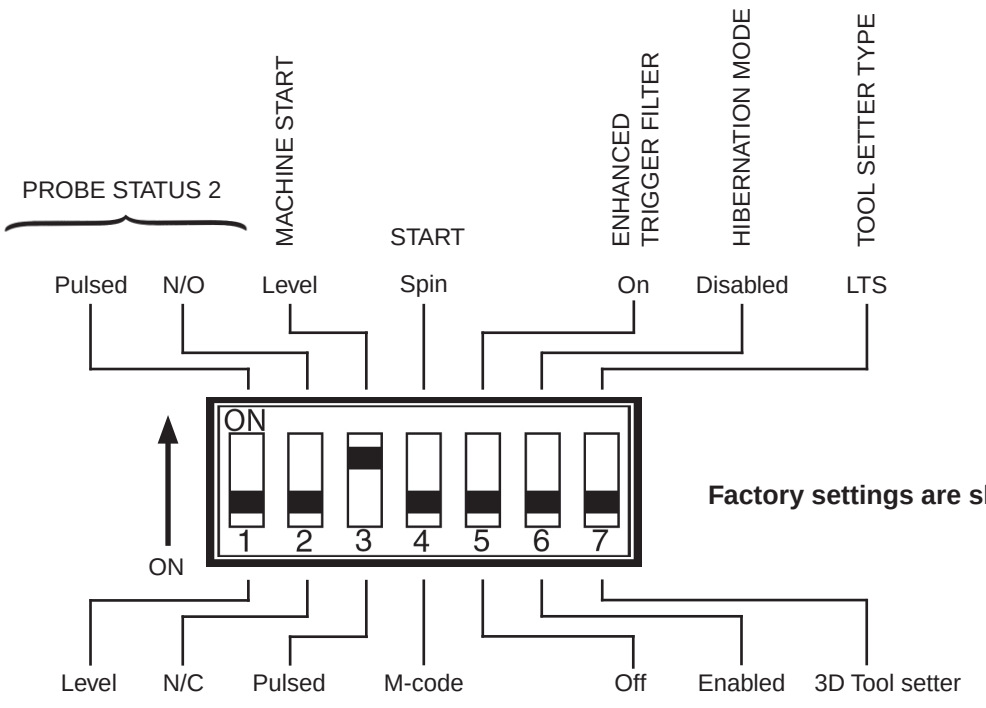



Abbreviations are as follows:
**N/O** = Normally open
**N/C** = Normally closed

**Factory settings are shown.**

⚠ **CAUTION:** Exercise caution when using error or probe SSR in N/O mode as a wiring fault could cause loss of error condition and therefore could result in a non-failsafe condition.

## Switch SW2 output configuration




**Factory settings are shown.**

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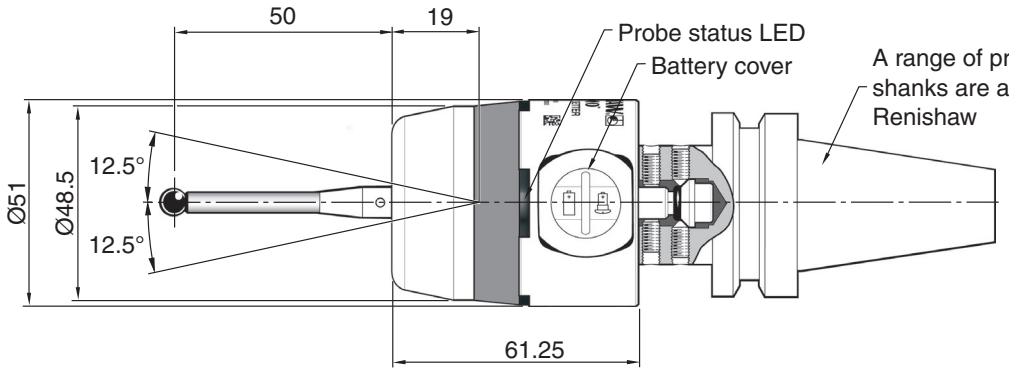
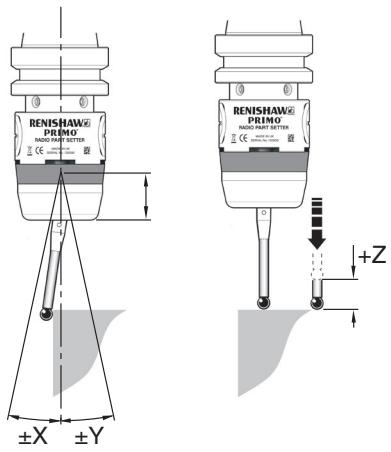
# Dimensions and specifications



## Part setter dimensions

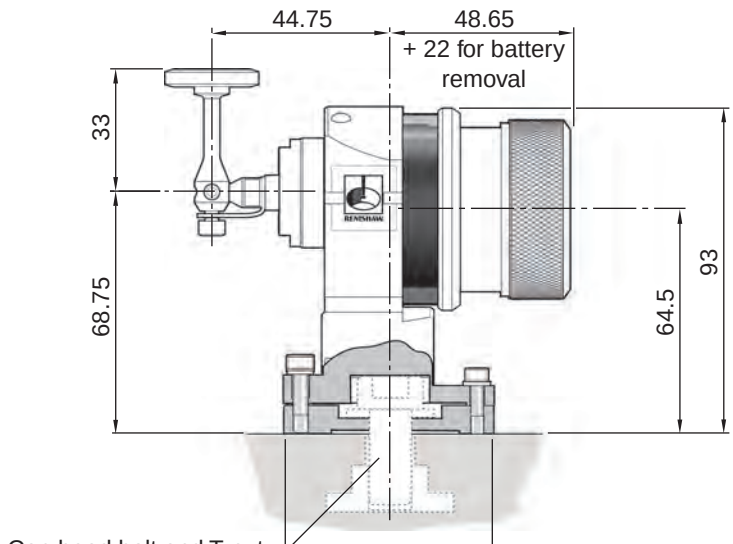


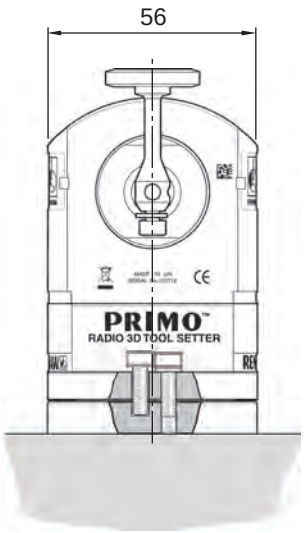

Dimensions given in mm (in)

| Stylus overtravel limits | | |
|---|---|---|
| Stylus length | ±X / ±Y | +Z |
| 50 | 12 | 6 |
| 100 | 22 | 6 |

# Tool setter dimensions



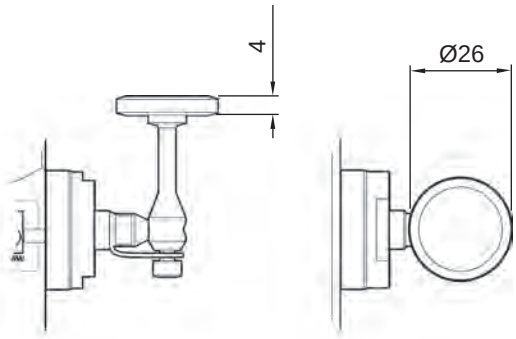

Cap head bolt and T nut
M10/M12 MAX
Typical bolt length 30
Supplied by user




| Stylus overtravel limits | | |
|---|---|---|
| Stylus length | ±X / ±Y | +Z |
| 35 | 3.5 | 6 |

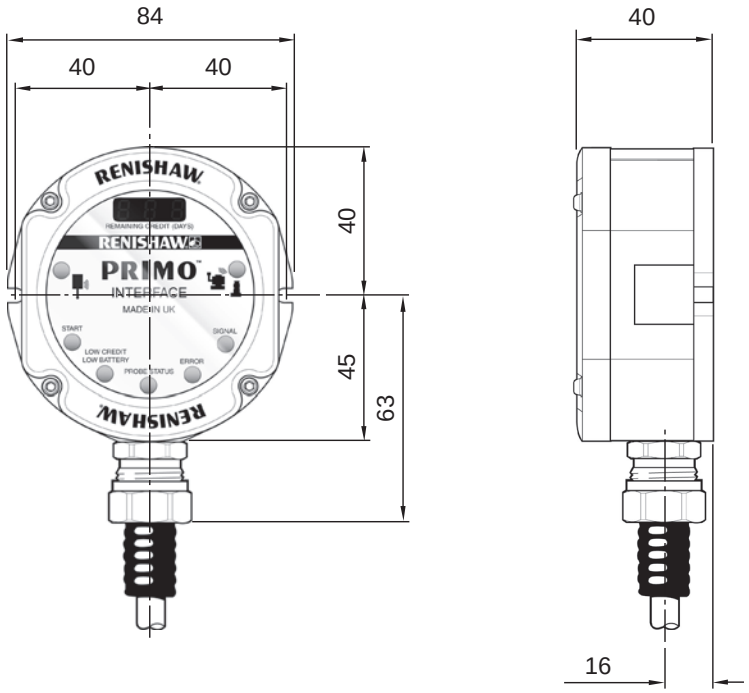
**Dimensions given in mm**

**Disc stylus**
Ø26 mm × 4 mm




**Dimensions given in mm**

# Interface dimensions




**Dimensions given in mm**

# Part setter specification

| | | | |
|---|---|---|---|
| **Principal application** | | Used for workpiece set-up and inspection. | |
| **Transmission type** | | Frequency Hopping Spread Spectrum (FHSS) radio<br>Radio frequency 2400 MHz to 2483.5 MHz | |
| **Operating range** | | Up to 10 m (32.8 ft) | |
| **Sealing** | | IPX8 (EN/IEC 60529) | |
| **Operating temperature** | | +5°C to +55°C (+41°F to +131°F) | |
| **Storage temperature** | | -25°C to +70°C (-13°F to +158°F) | |
| **Compatible interface** | | Primo Interface | |
| **Recommended styus** | | M4 stylus with 50 mm (1.97 in) ceramic stem and 6 mm (0.24 in) ruby ball. | |
| **Weight without shank (including battery and credit token)** | | 350 g (12.35 oz) | |
| **Switch-on / switch-off options** | | Radio on → Radio off<br>Spin on → Spin off | |
| **Battery types** | | ½ AA (3.6 V) Lithium-thionyl chloride | CR2 (3 V) Lithium manganese dioxide |
| **Battery life** | | See table on next page. | |
| **Sense directions** | | ±X, ±Y, +Z | |
| **Uni-directional repeatability** | | 1 µm (40 µin) 2 σ (see note 1) | |
| **Stylus trigger force**<br>(see notes 2 and 3)<br>XY low force<br>XY high force<br>+Z direction | | <br><br>0.50 N, 51 gf (1.80 ozf)<br>0.90 N, 92 gf (3.24 ozf)<br>5.85 N, 597 gf (21.04 ozf) | |
| **Mounting** | | Taper shank in machine tool spindle. | |
| **Low battery indication** | | Flashing blue LED while the part setter is seated (not triggered). | |
| **Dead battery indication** | | Continuous red LED | |
| **Low credit indication** | | Flashing yellow LED while the part setter is seated (not triggered). | |
| **No credit indication** | | Continuous yellow LED | |
| **Dimensions** | **Length** | 61.25 mm (2.41 in) | |
| | **Diameter** | 51 mm (2 in) | |
| **Spindle speed (maximum)** | | 1000 rev/min | |

Note 1 Performance specification is tested at a standard test velocity of 480 mm/min (18.9 in/min) with a 50 mm (1.97 in) stylus. Significantly higher velocity is possible, depending on application requirements.

Note 2 Trigger force, which is critical in some applications, is the force exerted on the component by the stylus when the probe triggers. The maximum force applied will occur after the trigger point (overtravel). The force value depends on related variables including measuring speed and machine deceleration.

Note 3 These are the factory settings, manual adjustment is not possible.

## Part setter specification continued

| Battery type | Standby life | 5% usage (72 minutes/day) | Continuous use |
|---|---|---|---|
| **CR2 Lithium manganese dioxide** | 270 days | 75 days | 155 hours |
| **½ AA Lithium-thionyl chloride** | 410 days | 125 days | 260 hours |

# Tool setter specification

| | | | |
|---|---|---|---|
| **Principal application** | | Tool measurement and broken tool detection on small to medium CNC machining centres. | |
| **Transmission type** | | Frequency Hopping Spread Spectrum (FHSS) radio<br>Radio frequency 2400 MHz to 2483.5 MHz | |
| **Operating range** | | Up to 10 m (32.8 ft) | |
| **Sealing** | | IPX8 (EN/IEC 60529) | |
| **Operating temperature** | | +5°C to +55°C (+41°F to +131°F) | |
| **Storage temperature** | | -25°C to +70°C (-13°F to +158°F) | |
| **Compatible interface** | | Primo Interface | |
| **Recommended stylus** | | 26 mm (1.02 in) diameter disc stylus, tungsten carbide | |
| **Weight with disc stylus (including battery)** | | 660 g (23.28 oz) | |
| **Switch-on/switch-off options** | | Radio on → Radio off | |
| **Battery types** | | ½ AA (3.6 V) Lithium-thionyl chloride | CR2 (3 V) Lithium manganese dioxide |
| **Battery life** | | See table on next page. | |
| **Sense directions** | | ±X, ±Y, +Z | |
| **Unidirectional repeatability** | | 1 µm (40 µin) 2σ (see note 1) | |
| **Stylus trigger force** (see notes 2 and 3) | | 1.30 N to 2.40 N, 133 gf to 245 gf (4.68 ozf to 8.63 ozf) depending on sense direction. | |
| **Mounting** | | The tool setter is mounted on the machine table using a cap head bolt and T nut (not supplied by Renishaw). | |
| **Low battery indication** | | Flashing blue LED while the tool setter is seated (not triggered). | |
| **Dead battery indication** | | Continuous red LED | |
| **Low credit indication** | | Flashing yellow LED while the tool setter is seated (not triggered). | |
| **No credit indication** | | Continuous yellow LED | |
| **Dimensions (with stylus)** | **Length** | 93.40 mm (3.68 in) | |
| | **Width** | 56 mm (2.20 in) | |
| | **Height** | 101.75 mm (4.01 in) | |

Note 1 Performance specification is tested at a standard test velocity of 480 mm/min (18.9 in/min) with a 35 mm (1.38 in) stylus. Significantly higher velocity is possible depending on application requirements.

Note 2 Trigger force, which is critical in some applications, is the force exerted on the component by the stylus when the probe triggers. The maximum force applied will occur after the trigger point (overtravel). The force value depends on related variables including measuring speed and machine deceleration.

Note 3 These are the factory settings, manual adjustment is not possible.

## Tool setter specification continued

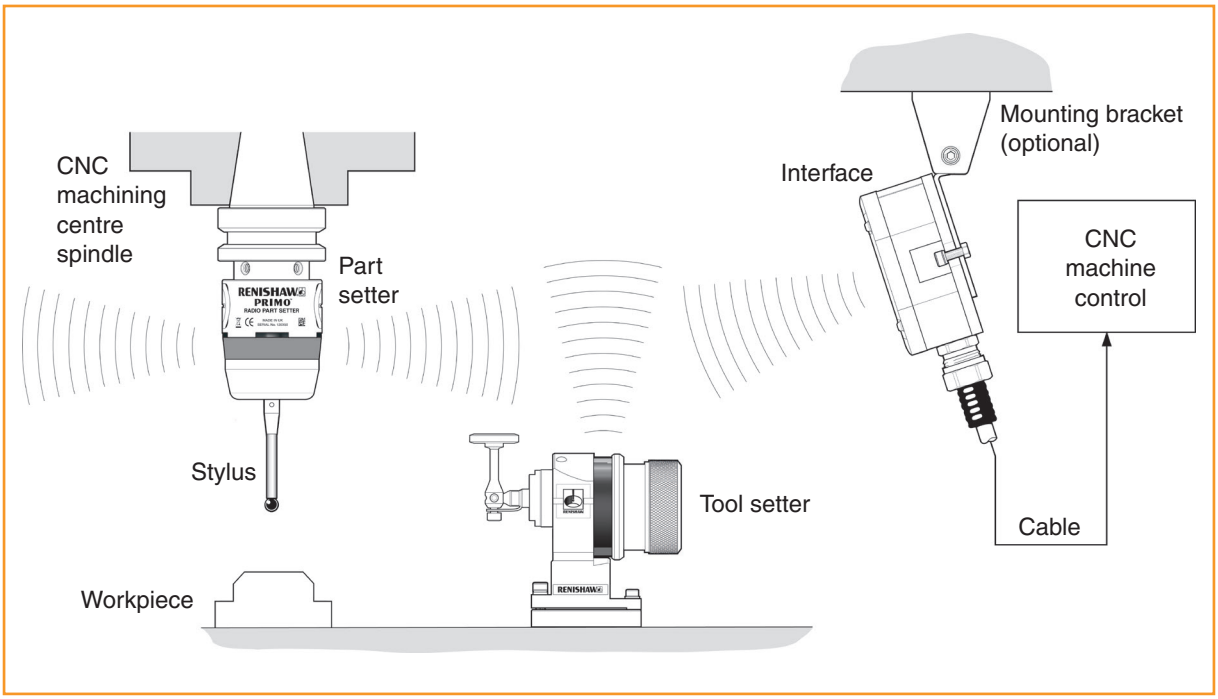
| Battery type | Standby life | 5% usage (72 minutes/day) | Continuous use |
|---|---|---|---|
| **CR2 Lithium manganese dioxide** | 270 days | 75 days | 155 hours |
| **½ AA Lithium-thionyl chloride** | 410 days | 125 days | 260 hours |

## Interface specification

| | | |
|---|---|---|
| **Principal application** | | Used to communicate signals between the part setter or tool setter and the CNC machining centre. |
| **Transmission type** | | Frequency Hopping Spread Spectrum (FHSS) radio<br>Radio frequency 2400 MHz to 2483.5 MHz |
| **Operating range** | | Up to 10 m (32.8 ft) |
| **Sealing** | | IPX8 (EN/IEC 60529) |
| **Operating temperature** | | +5°C to +55°C (+41°F to +131°F) |
| **Storage temperature** | | -25°C to +70°C (-13°F to +158°F) |
| **Compatible probes** | | Primo Radio Part Setter, Primo Radio 3D Tool Setter and Primo LTS |
| **Weight (with 8 m (26.2 ft) cable)** | | 950 g (33.51 oz) |
| **Supply voltage** | | 12 Vdc to 30 Vdc |
| **Supply current** | | 100 mA at 24 V peak, 30 mA typical |
| **Output signal** | | Four machine outputs, comprising four solid-state relays (SSR) configurable normally open or normally closed to be used for probe status 1, 2, error and low battery / low credit; all of which can be inverted. |
| **Input/output specification** | | SSR output is protected by a circuit which limits the current to 100 mA. M-code input: up to 30 V (10 mA at 24 V max) for part setter and tool setter. Power supply should be fused separately within the machine cabinet. |
| **Diagnostic LEDs** | | Digital ‘credit days remaining’ and error codes display, part setter, start, low credit / low battery, probe status, error, signal, tool setter / length tool setter. |
| **Cable** | **Specification** | Ø7.5 mm (0.29 in), 15-core screened cable, each core 18 × 0.1 mm |
| | **Length** | 8 m (26.2 ft) |
| **Mounting** | | Directional mounting with optional mounting bracket or flush mounting (both available separately). |
| **Conduit** | | A flexible conduit to aid protection of the interface cable can be purchased as an optional extra. See “interface cable” on page 5-14 for recommended conduit and installation information. |
| **Dimensions** | **Height** | 103 mm (4.05 in) |
| | **Width** | 84 mm (3.31 in) |
| | **Depth** | 40 mm (1.57 in) |

# System installation





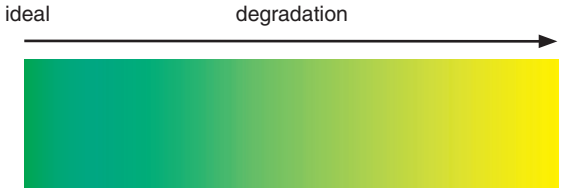

## Operating envelope

Radio transmission does not require line-of-sight and will pass through small gaps and machine tool windows, providing a reflected path (of less than 10 m [32.8 ft]) is available.

## Signal LED

The signal LED on the interface turns gradually from green to yellow as the environment causes signal degradation. When communication fails, the LED turns off.

The Primo system will continue to perform 100% effectively as long as there is signal.




To ensure unrestricted transmission performance:

- Keep all Primo system components within the performance envelope (see “Performance envelope” on page 5.2).
- A green signal LED represents an excellent signal, whereas yellow represents a reduced signal and is an indication to check radio communications (see “Part setter and tool setter LED guide” on page 5.18).
- Do not allow coolant or swarf residue to accumulate on the equipment.
- Regularly wipe clean the part setter body and the tool setter body.
- Reduction in transmission range may result when operating in temperatures outside the range of +5 °C to +55 °C (+41 °F to +131 °F).

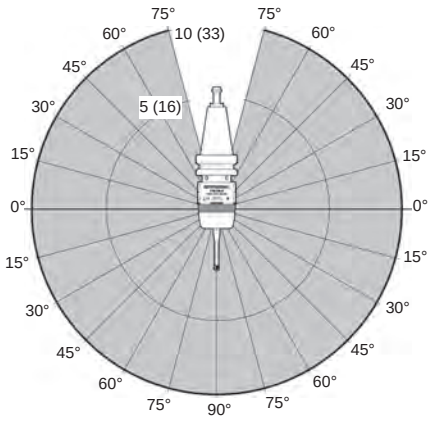
# Performance envelope

## Equipment positioning

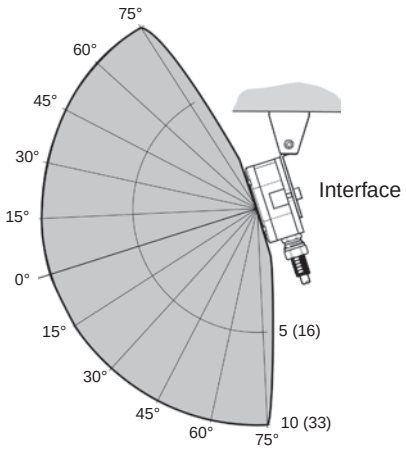
The system elements should be positioned so that:

- The optimum range can be achieved over the full travel of the machine's axes.
- The front cover of the interface is facing in the general direction of the machining area.

### Performance envelope for part setter




Part setter

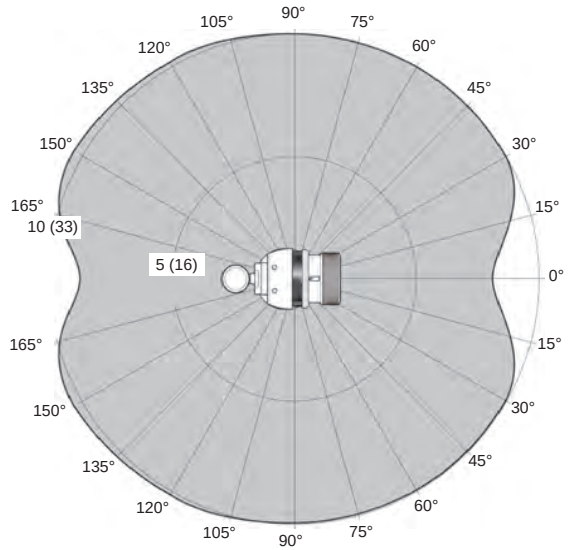



**Range given in m (ft)**

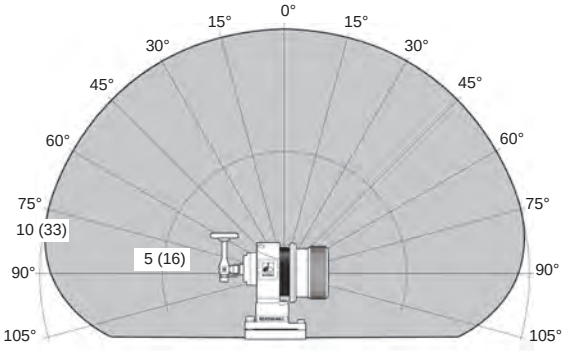
OPERATING AND SWITCH ON/OFF

Typical plot at +20 °C (68 °F)
Valid between temperatures of
+5 °C to +55 °C (+41 °F to +131 °F)

### Performance envelope for tool setter




Tool setter
top view




Tool setter
side view

**Range given in m (ft)**

OPERATING AND SWITCH ON/OFF

Valid between temperatures of
+5 °C to +55 °C (+41 °F to +131 °F)

# Preparing the part setter

## Fitting the stylus

To obtain the most accurate results from your part setter, it is recommended that you fit a Renishaw manufactured stylus.

1

2




M-5000-3707

## Installing the battery

**NOTES:**

See “Permitted battery types” on page 6.4 for a list of suitable battery types.

Do not allow coolant or debris to enter the battery compartment. When inserting the battery, check that the battery polarity is correct.

See “Safety” on page 1.6 for battery safety information.

1

2

3

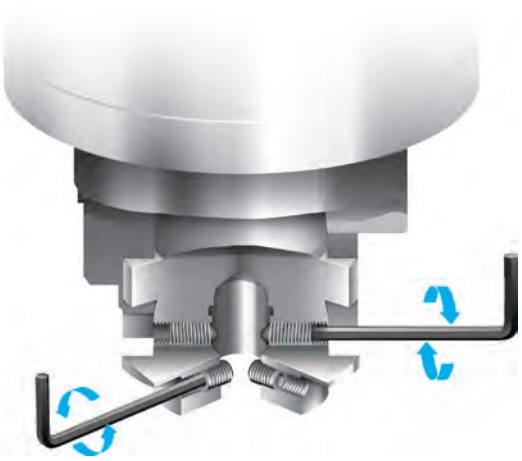
Please remove the battery isolation device from the battery compartment before use

4

5

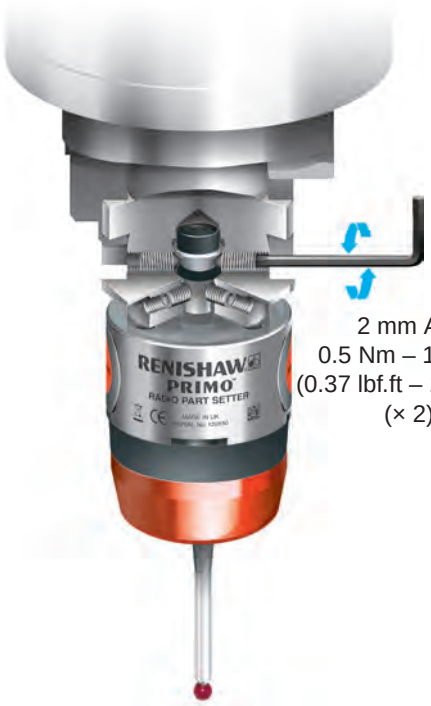
## Mounting the part setter on a shank

1



2


3




2 mm A/F
0.5 Nm – 1.5 Nm
(0.37 lbf.ft – 1.1 lbf.ft)
(× 2)

## Part setter stylus on-centre adjustment

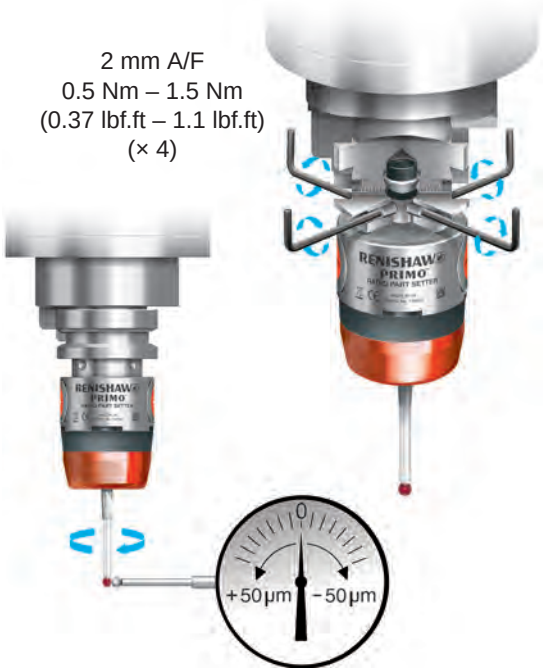
**NOTES:**

If a part setter and shank assembly is dropped, it must be rechecked for correct on-centre adjustment.

Do not hit the part setter to achieve on-centre adjustment.

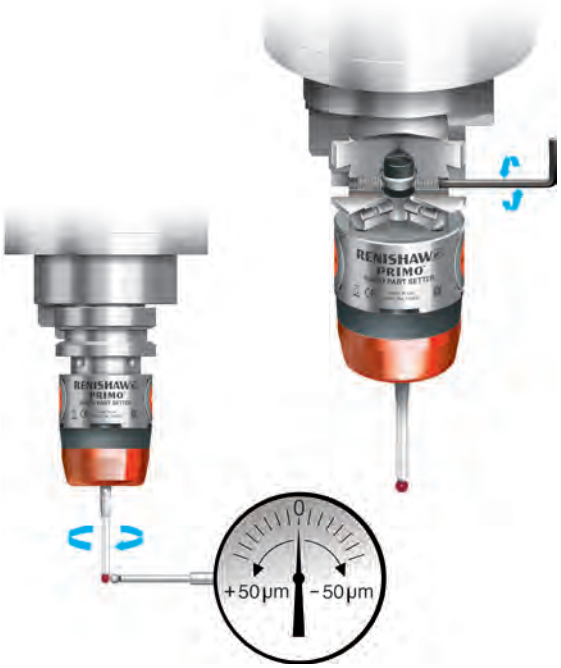
**1**

2 mm A/F
0.5 Nm – 1.5 Nm
(0.37 lbf.ft – 1.1 lbf.ft)
(× 4)



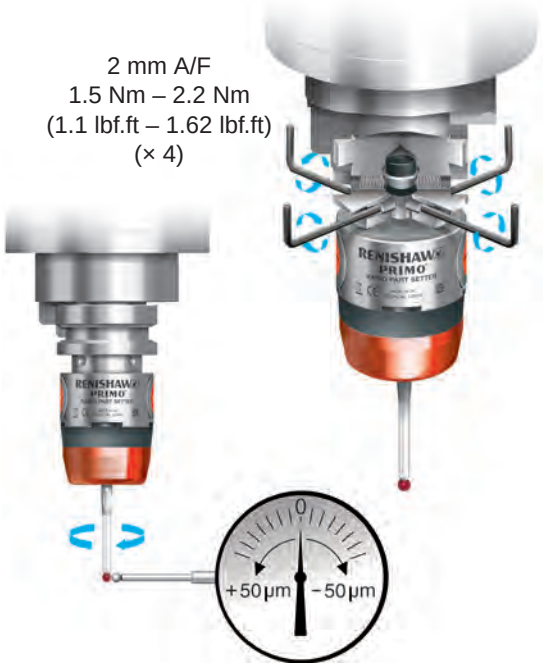

**2**

2 mm A/F
1.5 Nm – 2.2 Nm
(1.1 lbf.ft – 1.62 lbf.ft)
(× 2)




**3**

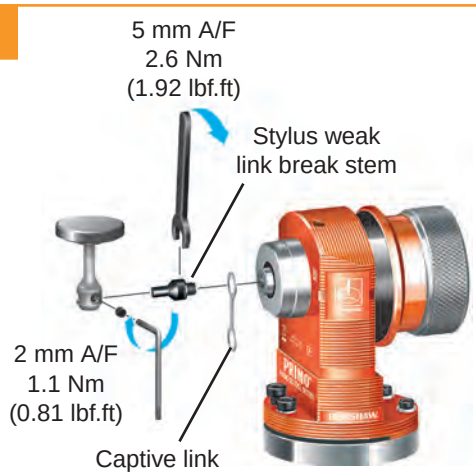
2 mm A/F
1.5 Nm – 2.2 Nm
(1.1 lbf.ft – 1.62 lbf.ft)
(× 4)



# Preparing the tool setter for use

## Fitting the stylus, break stem and captive link

**1**




**2**

**3**


### Stylus weak link break stem

Incorporated into the stylus, the break stem protects the mechanism from damage in the event of excessive stylus overtravel or a collision. There is a compartment within the battery housing of the tool setter for a spare break stem to be stored.

### Captive link

In the event of the break stem being damaged, the captive link ties the stylus to the probe.

## Installing the battery

**NOTES:**

See “Permitted battery types” on page 6.4 for a list of suitable battery types.

Do not allow coolant or debris to enter the battery compartment. When inserting the battery, check that the battery polarity is correct.

See “Safety” on page 1.6 for battery safety information.

1

2

3

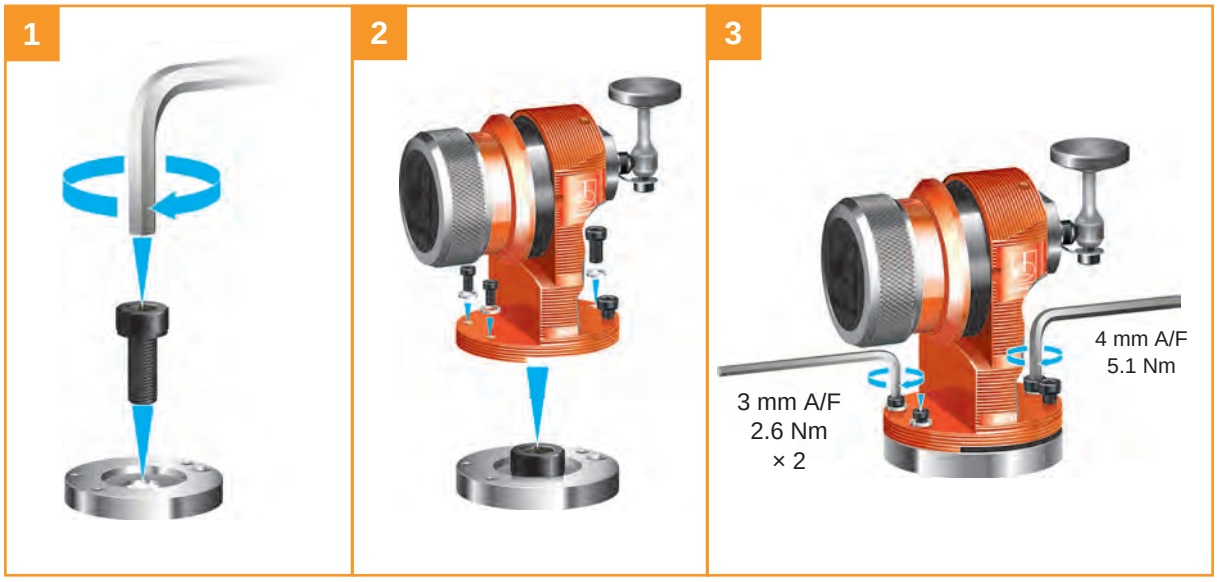
Please remove the battery isolation device from the battery compartment before use

4

5

## Mounting the tool setter on a machine table

1. Undo three of the four screws that hold the tool setter to the base.
2. Bolt the tool setter base to the table using an M12 or M10 cap head screw and washer (not supplied).
3. Reattach the tool setter to the base.



## Tool setter stylus level setting

The top surface of the stylus must be set level.

**Front to back level adjustment**

**NOTE:** It is strongly recommended that you make this adjustment first.

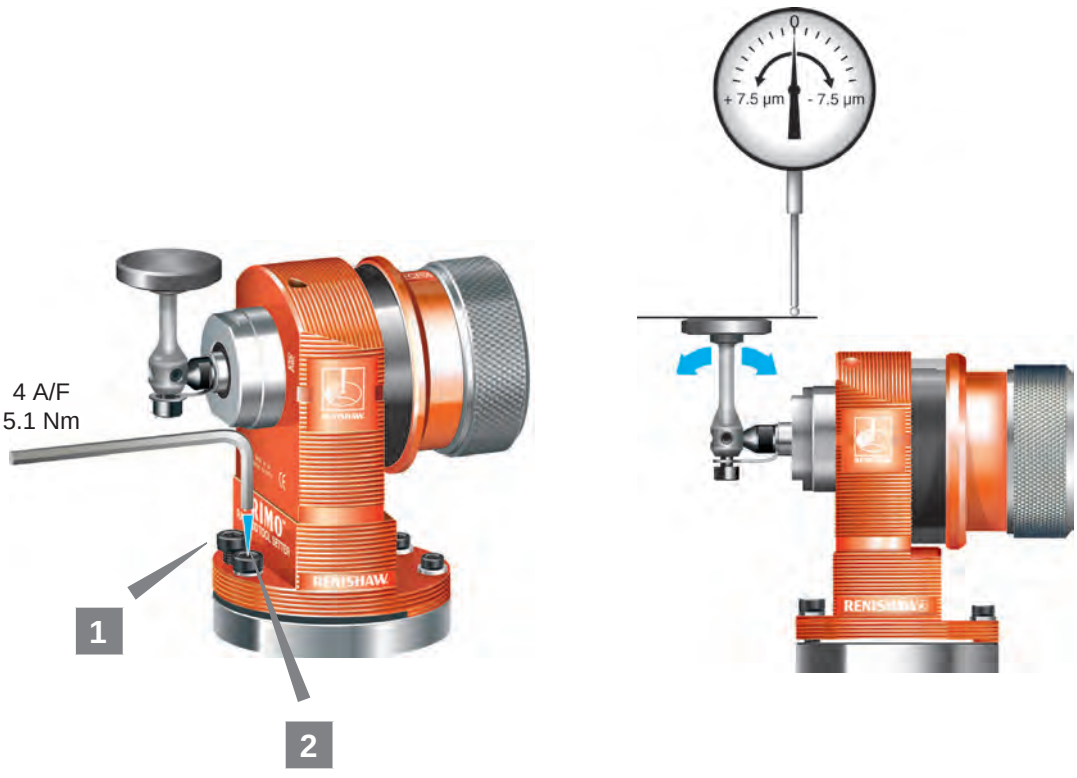
**To raise the front:**

Slacken screw 2 and adjust the height with screw 1 until the stylus is level. To lock the position, fully tighten screw 2.

**To lower the front:**

Slacken screw 1 and adjust screw 2 until the stylus is level. To lock the position, fully tighten screw 1.

1



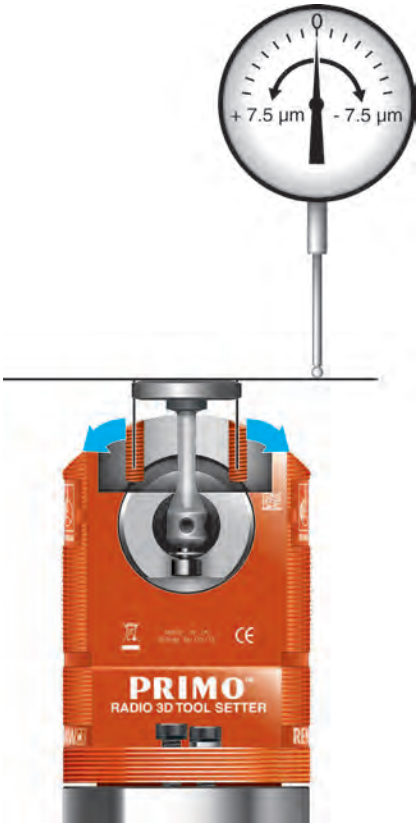
**Side to side level adjustment**

Alternately adjust the grub screws. This causes the tool setter to rotate and change the stylus level setting.

When the stylus surface is level, tighten the grub screws.

**2**

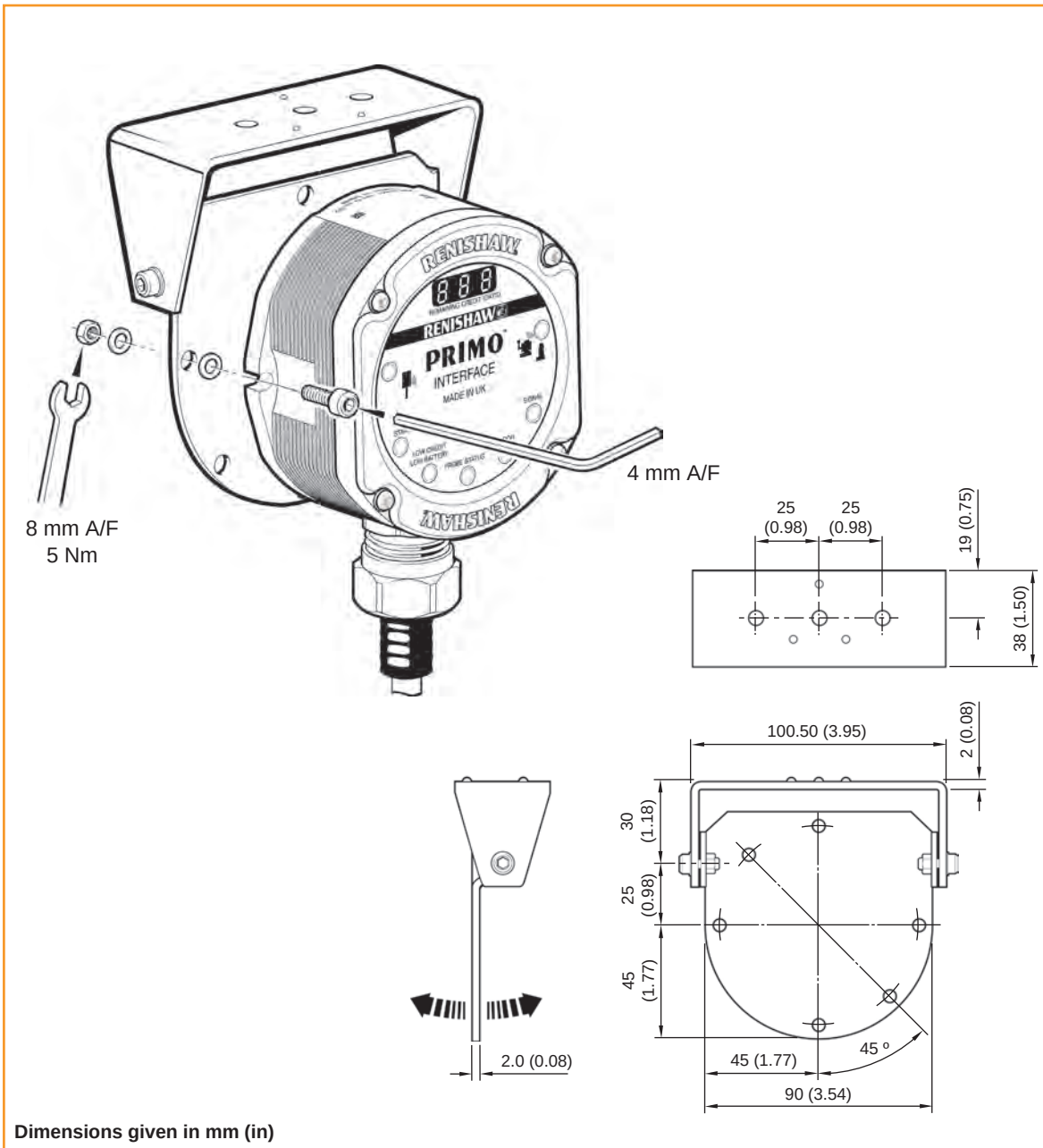
2.5 mm A/F
1.1 Nm
× 2

# Preparing the interface for use

## Mounting bracket (optional)

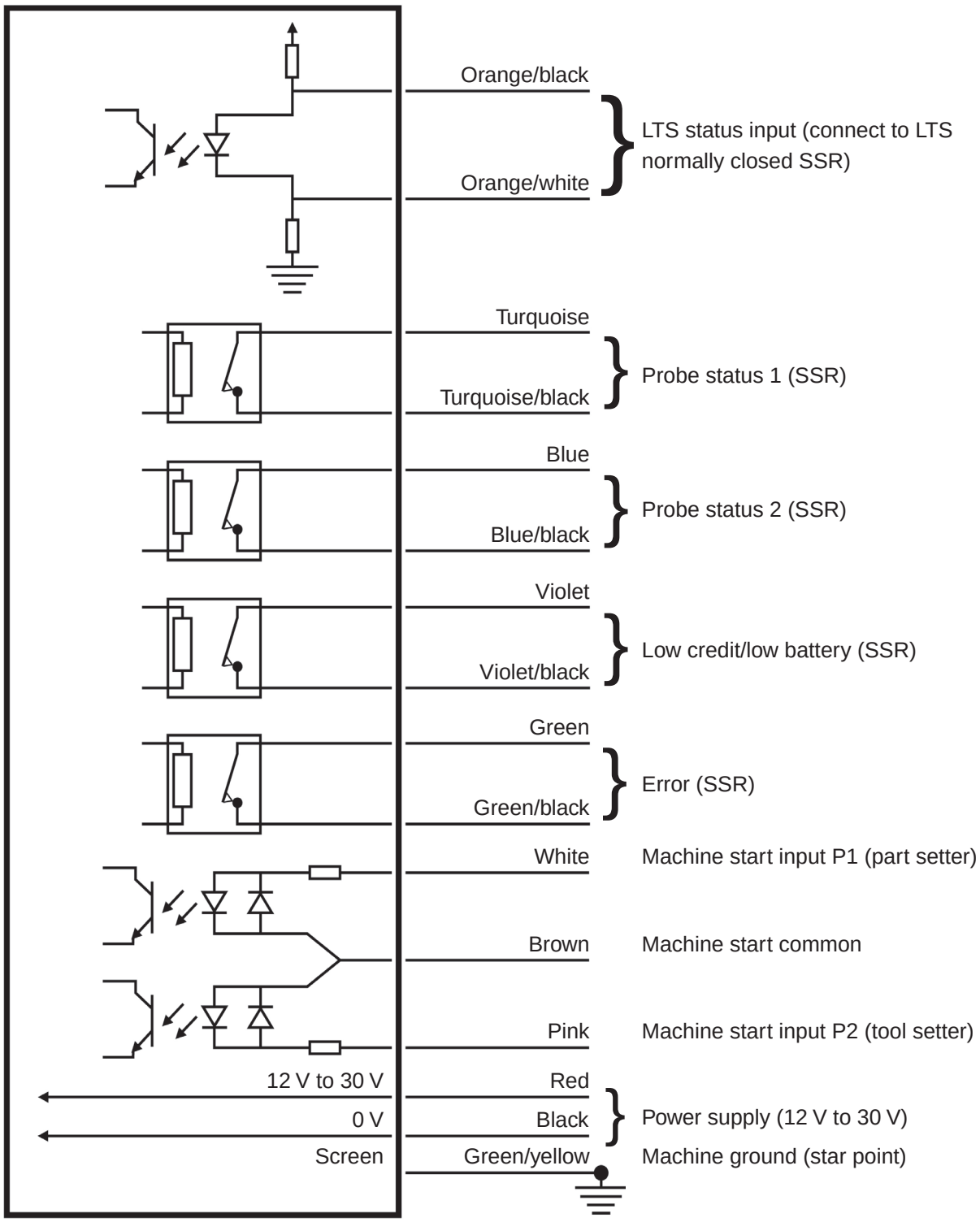
**NOTE:** Install the interface with the cable exiting from the lower side for good coolant run-off.




**Dimensions given in mm (in)**

## Interface wiring diagram

**CAUTION:** The power supply to the interface screen should be terminated at the machine ground (star point).



## Interface cable

### Cable specification

| | |
|---|---|
| Length | 8 m (26.25 ft) |
| Diameter | 7.5 mm (0.29 in) |
| Number of cores | 15 cores and screen |
| Dimensions of each core | 18 × 0.1 mm |

A ferrule should be crimped onto each cable wire for a more positive connection at the terminal box.

A cable sealing gland prevents coolant and dirt from entering the interface.

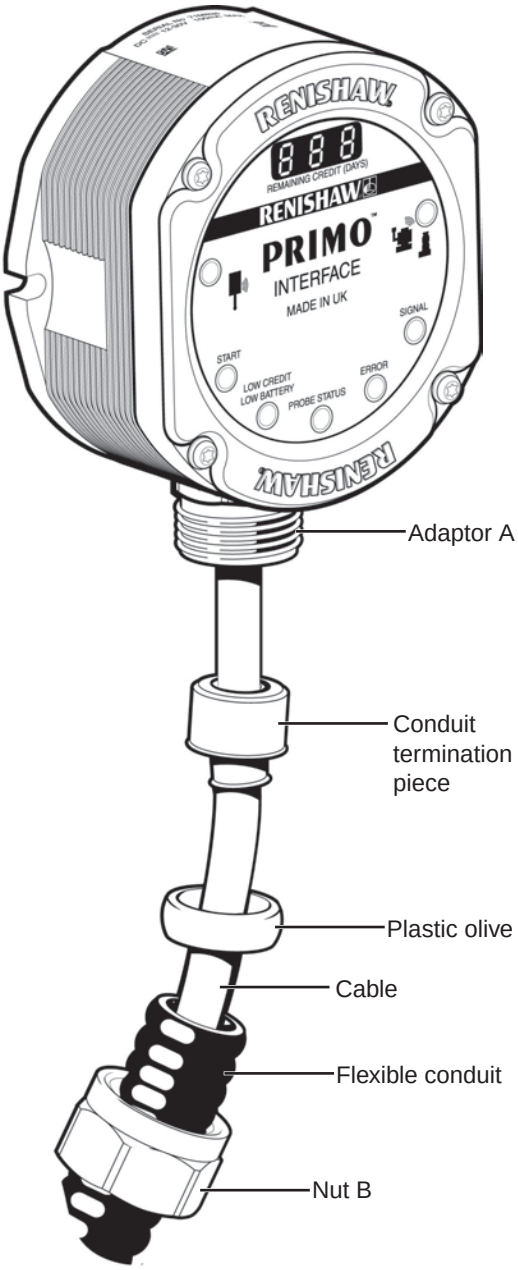
The interface cable can be further protected by a flexible conduit.

### Fitting flexible conduit

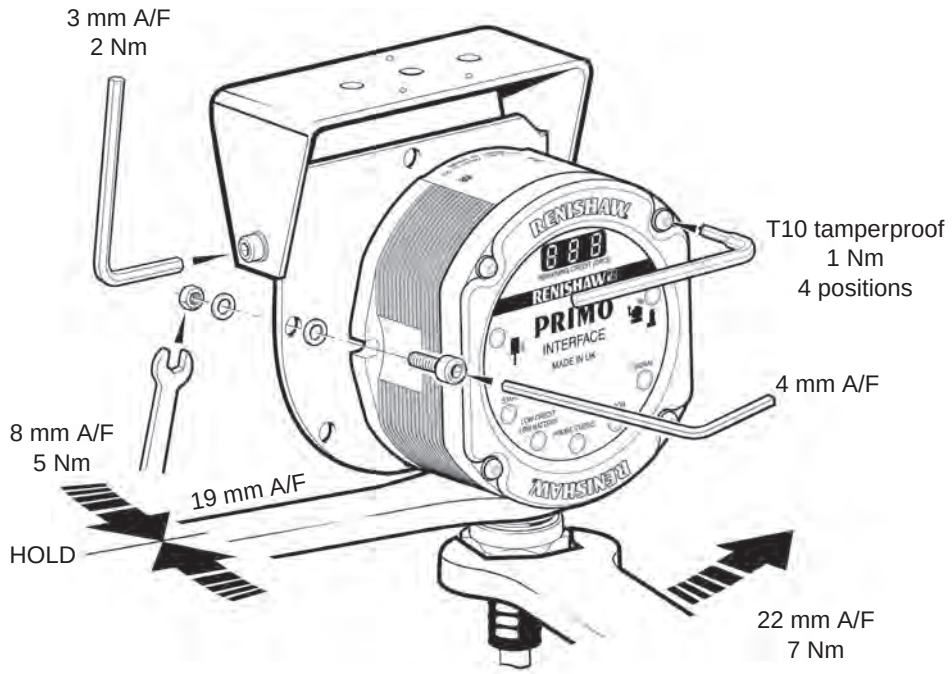
The recommended flexible conduit is Anamet Sealtite HFX (5/16 in) Polyurethane.

1. Slide nut B and the plastic olive onto the conduit.
2. Screw the conduit termination piece into the end of the conduit.
3. Fit the conduit to adaptor A and tighten nut B.

**CAUTION:** Failure to protect the cable can result in system failure due to either cable damage or coolant ingress through cores into the interface. Failure due to inadequate cable protection will invalidate the warranty.



## Interface screw torque values



# Calibrating the Primo equipment

## Why calibrate?

The part setter and tool setter are just two components of the measurement system which communicates with the machine tool. Each part of the system can introduce a constant difference between the position that the stylus touches and the position that is reported to the machine. If either probe is not calibrated, this difference will appear as an inaccuracy in the measurement. Calibration of the probes allows the probing software to compensate for this difference.

During normal use, the difference between the touch position and the reported position does not change, but it is important that you calibrate your probes in the following circumstances:

- when a probe system is to be used for the first time;
- when the probe settings are changed;
- when a new stylus is fitted to the probe;
- when it is suspected that the stylus has become distorted or that the probe has crashed;
- at regular intervals to compensate for mechanical changes of your machine tool.

To ensure accurate results during use of the Primo system it is vital that the measuring feedrates used to set parts and tools are the same as the feedrates used to calibrate the part setter and the tool setter. Using different feedrates will produce deviations in the measurement results and could lead to inaccuracies in machining.

It is good practice to set the tip of the part setter stylus on centre, because this reduces the effect of any variation in spindle and tool orientation (see “Part setter stylus on-centre adjustment” on page 5.6). A small amount of run-out is acceptable and can be compensated for as part of the normal calibration process.

When your tool setter is assembled and mounted on the machine table, it is necessary to align the stylus face with the machine axes to avoid probing errors when setting tools. It is worth taking care with this operation – you should try to get the face aligned to within 0.015 mm for normal use (see “Tool setter stylus level setting” on page 5.10). This is achieved by manually adjusting the stylus with the adjusting screws provided, and using a suitable instrument such as a dial test indicator (DTI) clock mounted in the machine spindle.

## Calibrating the part setter and tool setter together

GoProbe includes a cycle for calibrating the part setter and tool setter at the same time. It automatically stores calibration values for use during setting and measurement cycles. For more information, see the GoProbe pocket guide (please contact Renishaw for more information).

Alternatively the part setter or tool setter can be calibrated individually. This method is used when:

- using a non-standard stylus;
- only one probe is to be calibrated;
- accuracy of better than 10 µm is required;
- working on a 4-axis or 5-axis machine tool.

## GoProbe training part calibration

An alternative to calibrating the part setter and tool setter together is to use the GoProbe training part calibration cycle, designed for customers who do not have a tool setter. The GoProbe training part is supplied with the GoProbe training kit and includes a calibration artefact that provides calibration results as accurately as a ring gauge.

The GoProbe training part calibration cycle will calibrate the part setter in X and Y. This should be used along with the length calibration cycle that will calibrate the part setter in Z. The GoProbe training part and length calibration cycles use single-line commands from GoProbe which make calibration quick and easy.

To find out more about GoProbe training part calibration and the GoProbe training kit visit www.renishaw.com/goprobe.

## Calibrating the part setter only

Three different operations are to be used when calibrating the part setter. They are:

- calibrating either in a bored hole or on a turned diameter of known position;
- calibrating either in a ring gauge or on a datum sphere;
- calibrating the probe length.

### Calibrating in a bored hole or on a turned diameter

Calibrating a probe, either in a bored hole or on a turned diameter of known size, automatically stores values for the offset of the stylus ball relative to the spindle centre line. The stored values are then used automatically in the measuring cycles.

Measured values are compensated by these values so that they are relative to the true spindle centre line.

### Calibrating in a ring gauge or on a datum sphere

Calibrating a probe either in a ring gauge, or on a datum sphere with a known diameter, automatically stores one or more values for the radius of the stylus ball. The stored values are then used automatically by the measuring cycles to give the true size of the feature. The values are also used to give true positions of single surface features.

**NOTE:** The stored radius values are based on the true electronic trigger points. These values are different from the physical sizes.

## Calibrating the probe length

Calibrating a probe on a known reference surface determines the length of the probe, based on the electronic trigger point. The stored value for length is different from the physical length of the probe assembly. Additionally, the operation can automatically compensate for machine and fixture height errors by adjusting the probe length value that is stored.

### Calibrating the tool setter only

The purpose of calibration is to establish the trigger point values of the measuring face of the tool setter's stylus under normal measuring conditions.

Calibration should be run at the same speed as probing.

The calibration values are stored in macro variables for computation of the tool size during tool setting cycles.

Values obtained are axis trigger positions (in machine co-ordinates). Any errors due to machine and probe triggering characteristics are automatically calibrated out in this way. These values are the electronic trigger positions under dynamic operating conditions and are not necessarily the true physical stylus face positions.

# Part setter and tool setter LED guide

| Key to the symbols | |
|---|---|
| ● | LED short flash |
| ●● | LED double short flash |
| ▬ | LED medium flash |
| ▬▬ | LED long flash |

## Start-up

| LED colour | Status | Graphic hint |
|---|---|---|
| Red, green, blue | Newly changed battery or newly inserted credit token |  |

## Acquisition mode

For details of partnering in acquisition mode, see page 5.25.

| LED colour | Status | Graphic hint |
|---|---|---|
| 5 green flashes | Acquisition prompt (seated) |  |
| 5 red flashes | Acquisition prompt (triggered) |  |
| Flashing violet | Acquisition waiting |  |
| Continuous violet | Interface identified |  |
| Green for 5 seconds | Acquisition complete |  |

## **Operational mode** (all signals repeat)

| LED colour | Status | Graphic hint |
|---|---|---|
| Flashing green | Equipment seated – good credit, good battery |  |
| Flashing red | Equipment triggered * |  |
| Flashing blue | Equipment seated – good credit, low battery |  |
| Flashing yellow | Equipment seated – low credit, good battery |  |
| Flashing blue and yellow | Equipment seated – low credit, low battery |  |
| Double flashing yellow | Equipment seated – very low credit |  |

* When the probe is triggered, a flashing red signal overrides any other indication such as low credit or low battery. The status of these indicators can only be viewed when the probe is seated.

## Errors

| LED colour | Status | Graphic hint |
|---|---|---|
| Continuous violet | Contact Renishaw |  |
| Continuous red | Battery dead |  |
| Continuous yellow | Credit exhausted |  |

## **Credit transfer mode** (part setter only)

For details of credit transfer, see page 5.31.

| LED colour | Status | Graphic hint |
|---|---|---|
| Flashing yellow and green | Credit transfer mode (repeats until mode change) |  |
| Flashing yellow and red | Credit transfer unsuccessful (repeats 5 times) |  |
| Flashing yellow and blue | Credit transfer successful (repeats 5 times) |  |
| Flashing red and violet | Credit transfer mode – represents a lifetime system |  |

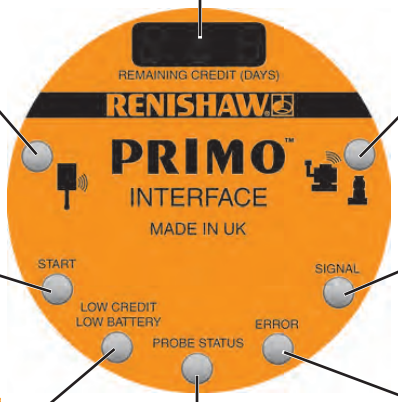
# Interface LED signals

| Key to LED symbols | |
|---|---|
| ● | Solid |
| ● ○ | Flashing |
| ▬ | Gradient |

| PART SETTER LED | |
|---|---|
| ● | Part setter switched on |
| ● | Part setter must be reacquired |
| OFF | Part setter switched off |

| REMAINING CREDIT DISPLAY |
|---|
| Number displayed indicates the remaining days of credit available |
| Error codes displayed |

| TOOL SETTER LED | |
|---|---|
| ● | Tool setter switched on |
| OFF | Tool setter switched off |




| START LED | |
|---|---|
| ○ | Probe starting |

| SIGNAL LED | |
|---|---|
| ▬ | Excellent signal |
| ▬ | Good signal |
| ▬ | Poor signal ✶ |

✶ Check radio communications.

| LOW CREDIT/LOW BATTERY LED | |
|---|---|
| ● | Low battery |
| ○ | Low credit |
| ● ○ | Low credit and low battery |
| OFF | Good credit and good battery |

| PROBE STATUS LED | |
|---|---|
| ● | Probe in standby or probe triggered |
| ● | Probe seated |

| ERROR LED | |
|---|---|
| ● | Error |
| OFF | No error |

## Acquisition mode

The LEDs provide the following information during acquisition (partnership).

| System status | Graphic display | | | | | | | Details |
|---|---|---|---|---|---|---|---|---|
| | Part setter | Start | Low credit/ low battery | Probe status | Error | Signal | Tool setter | |
| Interface in “Acquisition waiting” state | 🟡 ○ | ○ | ○ | 🔴 | 🔴 | ○ | 🟡 ○ | The part setter/ tool setter LEDs flash yellow/off (at least once) for up to 11 seconds or until a part setter/tool setter is discovered. |
| Interface identifies part setter | 🟢 ○ | ○ | ○ | 🔴 | 🔴 | ○ | 🟡 ○ | The part setter LED flashes green for up to 3 minutes or until an “acquisition ready” message is received from the part setter. |
| Interface identifies tool setter | 🟡 ○ | ○ | ○ | 🔴 | 🔴 | ○ | 🟢 ○ | The tool setter LED flashes green for up to 3 minutes or until an “acquisition ready” message is received from the tool setter. |
| Part setter and tool setter identified | 🟢 ○ | ○ | ○ | 🔴 | 🔴 | ○ | 🟢 ○ | Both LEDs flash green for up to 3 minutes or until an “acquisition ready” message is received from the equipment. |
| The part setter is acquired (tool setter acquisition pending) | 🟢 | ○ | ○ | 🔴 | 🔴 | ○ | 🟢 ○ | The part setter LED is on and the tool setter LED flashes for 3 minutes or until the tool setter is acquired. |
| Tool setter acquired (part setter acquisition pending) | 🟢 ○ | ○ | ○ | 🔴 | 🔴 | ○ | 🟢 | The tool setter LED is on and the part setter LED flashes for 3 minutes or until the part setter is acquired. |
| Part setter acquired | 🟢 | ○ | ○ | 🔴 | 🔴 | ○ | 🟡 ○ | The part setter LED stays on for 5 seconds. |
| Tool setter acquired | 🟡 ○ | ○ | ○ | 🔴 | 🔴 | ○ | 🟢 | The tool setter LED stays on for 5 seconds. |
| Part setter and tool setter acquired | 🟢 | ○ | ○ | 🔴 | 🔴 | ○ | 🟢 | The part setter and tool setter LEDs stay on for 5 seconds. |

## Operational mode

The LEDs provide the following information during operational mode.

| System status | Graphic display | | | | | | | Details |
|---|---|---|---|---|---|---|---|---|
| | Part setter | Start | Low credit/ low battery | Probe status | Error | Signal | Tool setter | |
| Standby | ○ | ○ | ○ | ● | ● | ○ | ○ | System in standby mode. |
| Start signal | ○ | ● | ○ | ● | ● | ○ | ○ | When set to level start, the start LED will stay yellow until the part setter or tool setter starts. When set to pulsed start, the start LED will stay yellow until the equipment starts, or for up to 30 seconds. If the probe fails to start, check for a dead battery or see “Fault-finding” on page 7.1. |
| Standby low credit | ○ | ○ | ● | ● | ● | ○ | ○ | When no equipment is operating, the low credit/low battery LED will be yellow if credit is low. |
| Part setter on and seated | ● | ○ | ○ | ● | ○ | ● | ○ | The part setter is not triggered on a surface. |
| Part setter on, seated with low credit | ● | ○ | ● | ● | ○ | ● | ○ | The part setter is not triggered on a surface but has low credit. |
| Part setter on, seated with low battery | ● | ○ | ● | ● | ○ | ● | ○ | The part setter is not triggered on a surface but has a low battery. |
| Part setter on, seated with low battery and low credit | ● | ○ | ● ● | ● | ○ | ● | ○ | The low credit/low battery LED will flash red and yellow while conditions persist. |
| Part setter on and triggered | ● | ○ | ○ | ● | ○ | ● | ○ | The part setter stylus has touched a surface and has unseated. |
| Part setter on, seated with good signal | ● | ○ | ○ | ● | ○ | ● | ○ | The signal LED is graded from green to yellow to show the part setter signal integrity. |
| Part setter triggered start (level start only) | ● | ○ | ○ | ● | ● | ● | ○ | If the part setter is triggered when it is started, the interface will stop the part setter from operating until it has returned to a seated position. |

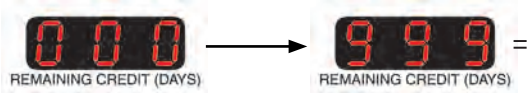
## Error states

The LEDs provide the following error information.

| System status | Graphic display | | | | | | | Details |
|---|---|---|---|---|---|---|---|---|
| | Part setter | Start | Low credit/ low battery | Probe status | Error | Signal | Tool setter | |
| New part setter acquisition required | ● | ○ | ○ | ● | ● | ○ | ○ | If the part setter spin/M-code DIP switch is changed after it is acquired, the part setter will need to be reacquired or the switch must be changed back. |
| Tool setter on, attempted switch-on of part setter | ● ○ | ○ | ○ | ● | ● | ○ | ● | The part setter LED will flash to indicate a multiple equipment error. The LED will continue to flash while conditions persist. |
| Attempted switch-on of both pieces of equipment simultaneously | ● ○ | ○ | ○ | ● | ● | ○ | ● ○ | The part setter and tool setter LEDs will flash to show a multiple equipment error. |
| System overcurrent | ○ | ○ | ● ○ | ● ○ | ● ○ | ○ | ○ | The low credit/low battery, status and error LEDs will flash. The error LEDs will continue to flash until the fault is cleared and the power is cycled. |
| Hardware validation failure | ○ | ○ | ○ | ● | ● | ● | ○ | Please contact Renishaw. |

## Interface digital display codes

### Credit codes




= Available credit in days


= Credit upgraded to unlimited (upgrade credit token)

### Error codes

E01 = Multiple M-code error

E02 = Multiple active equipment error

E08 = Acquisition required (incorrect DIP switch state for switch-on method)

E20 = Output overcurrent

### Flashing codes

= Credit transfer mode

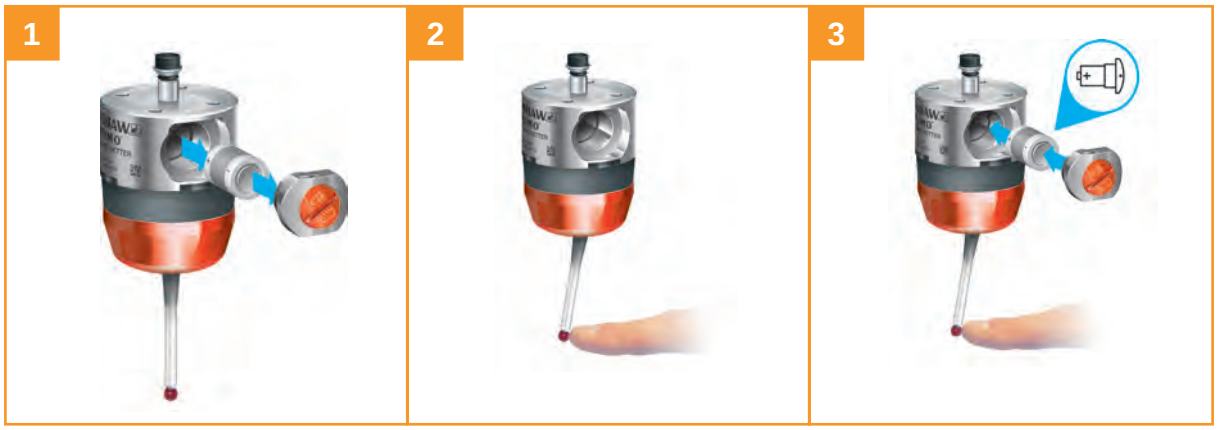
= Acquision mode

All other codes should be reported to Renishaw.

# Acquisition method

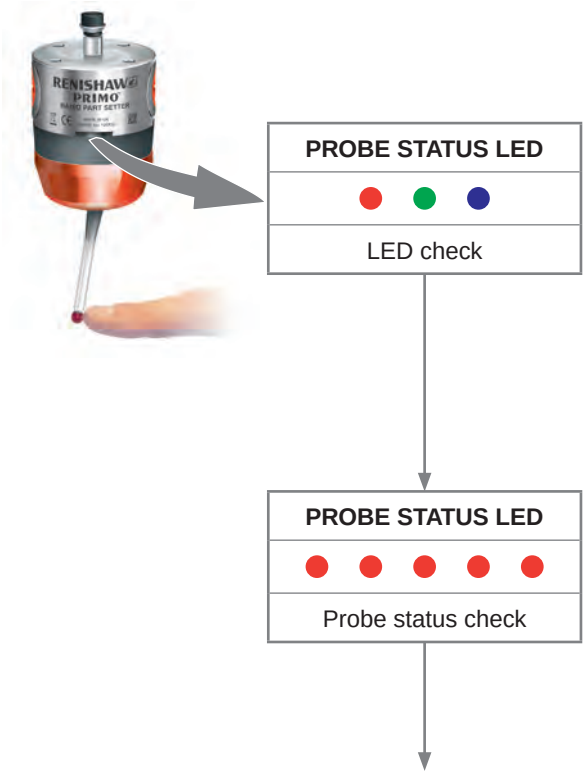
## Part setter

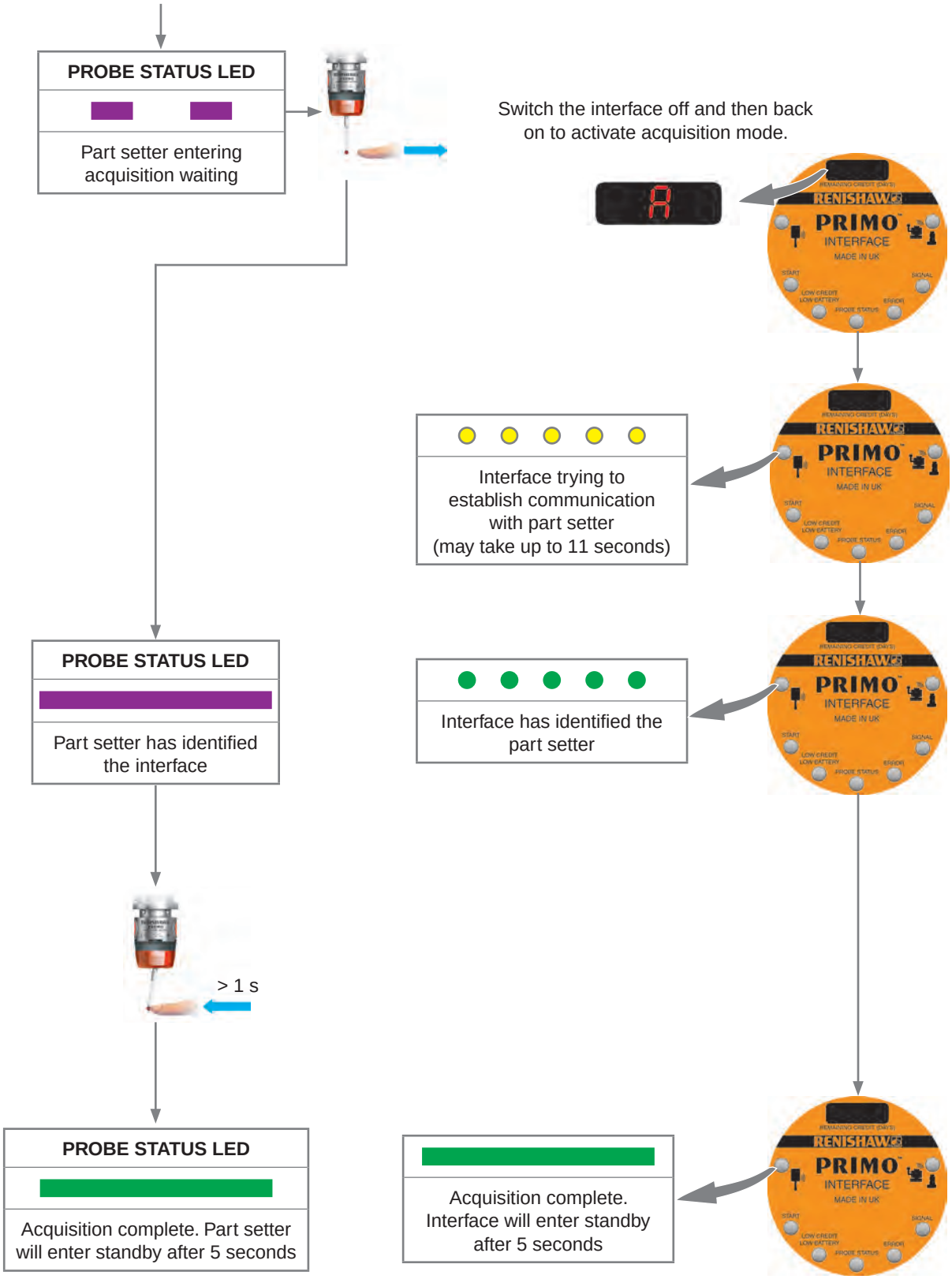
Both the part setter and the tool setter can be partnered with the interface simultaneously.




| Key to the symbols | |
|---|---|
| ● | LED short flash |
| ▬ | LED medium flash |
| ▬▬ | LED long flash |

**NOTE:** The interface will need to be switched off and on again during the part setter acquisition.

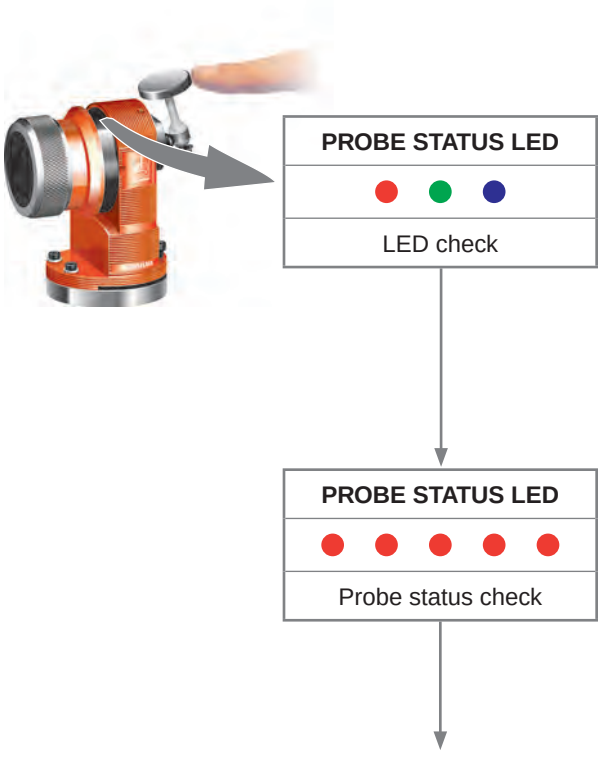


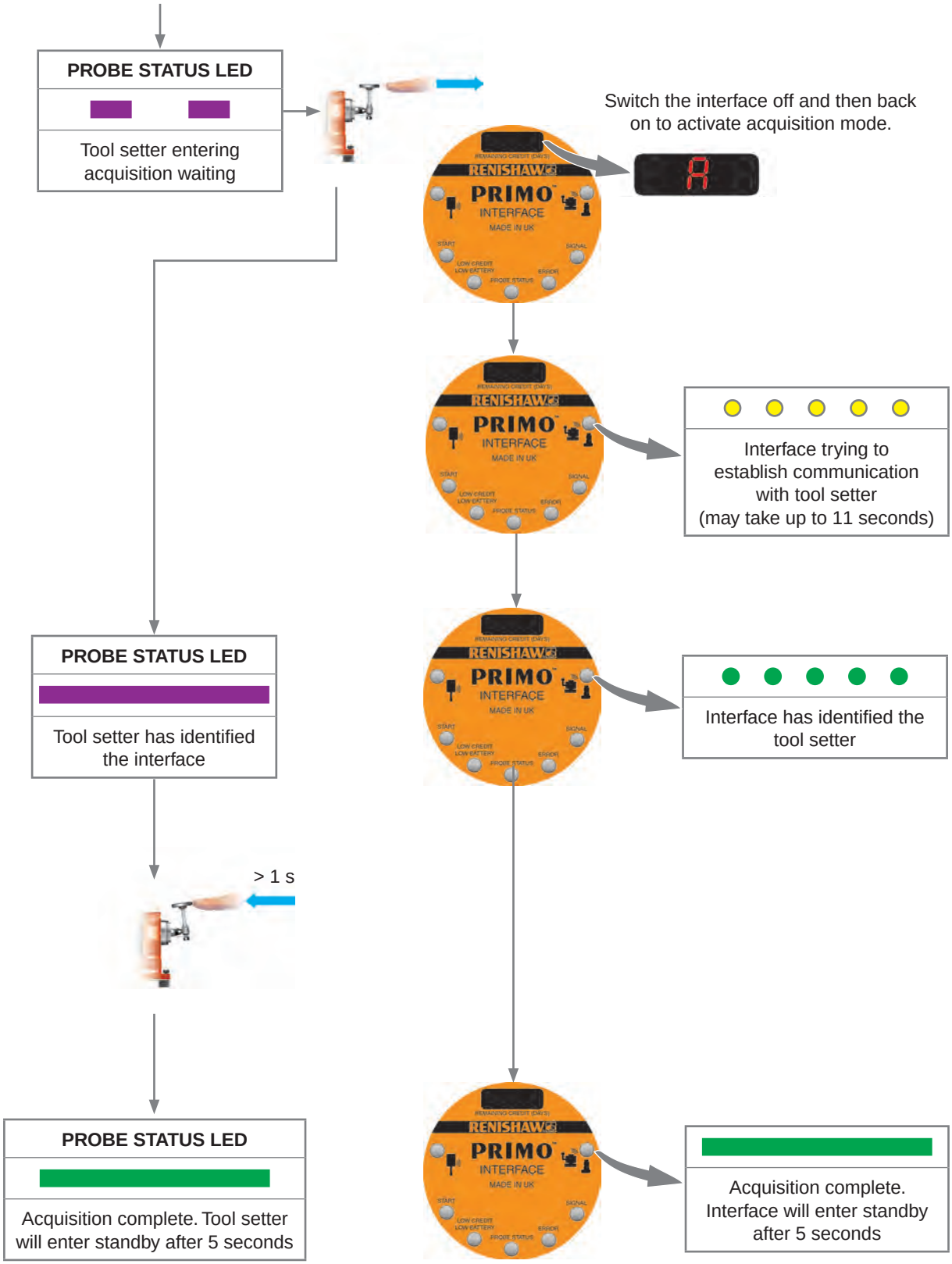

PROBE STATUS LED
Part setter entering acquisition waiting
Switch the interface off and then back on to activate acquisition mode.
A
RENISHAW
PRIMO
INTERFACE
MADE IN UK
Interface trying to establish communication with part setter (may take up to 11 seconds)
Interface has identified the part setter
PROBE STATUS LED
Part setter has identified the interface
> 1 s
PROBE STATUS LED
Acquisition complete. Part setter will enter standby after 5 seconds
Acquisition complete. Interface will enter standby after 5 seconds

## Tool setter


| Key to the symbols | |
|---|---|
| ● | LED short flash |
| ▬ | LED medium flash |
| ▬ | LED long flash |

**NOTE:** The interface will need to be switched off and on again during the tool setter acquisition.




PROBE STATUS LED
Tool setter entering acquisition waiting
Switch the interface off and then back on to activate acquisition mode.
RENISHAW
PRIMO
INTERFACE
MADE IN UK
Interface trying to establish communication with tool setter (may take up to 11 seconds)
PROBE STATUS LED
Tool setter has identified the interface
Interface has identified the tool setter
> 1 s
PROBE STATUS LED
Acquisition complete. Tool setter will enter standby after 5 seconds
Acquisition complete. Interface will enter standby after 5 seconds

# Installing the credit token cassette

1

2

3

4

5

The part setter will automatically enter credit transfer mode (see “Credit transfer” on page 5.31).

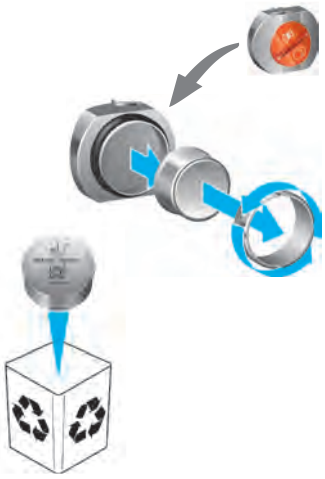
# Changing the credit token

**NOTE:** Please ensure that the credit token is installed in the part setter in the orientation shown in step 4. Failure to do this will result in the credit not being transferred.

1

2

3



4

Correct orientation


5

6

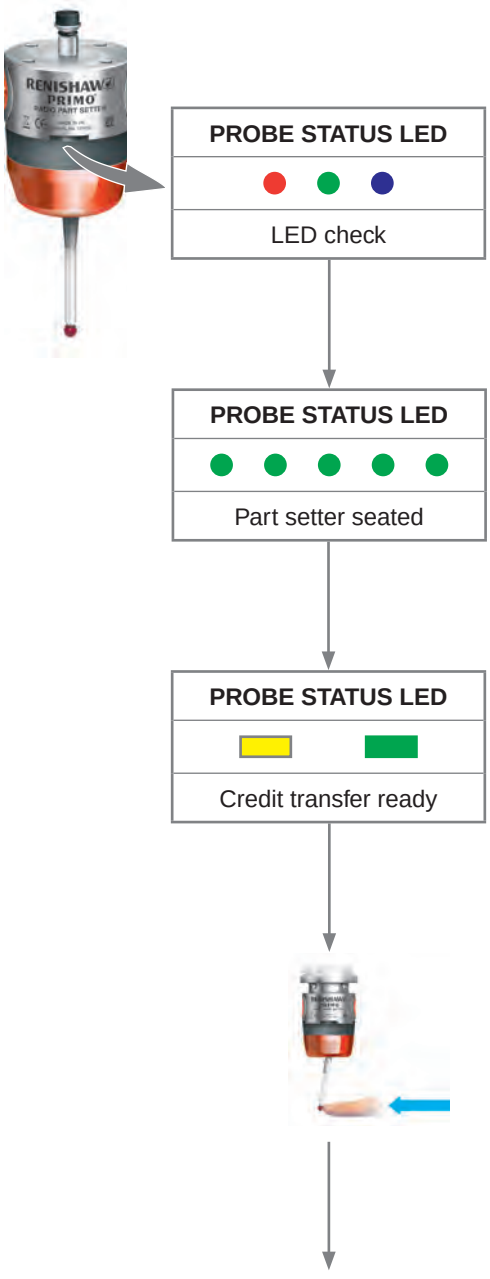
**NOTE:** The part setter will automatically enter credit transfer mode (see “Credit transfer” on page 5.31).

# Credit transfer

**NOTES:**

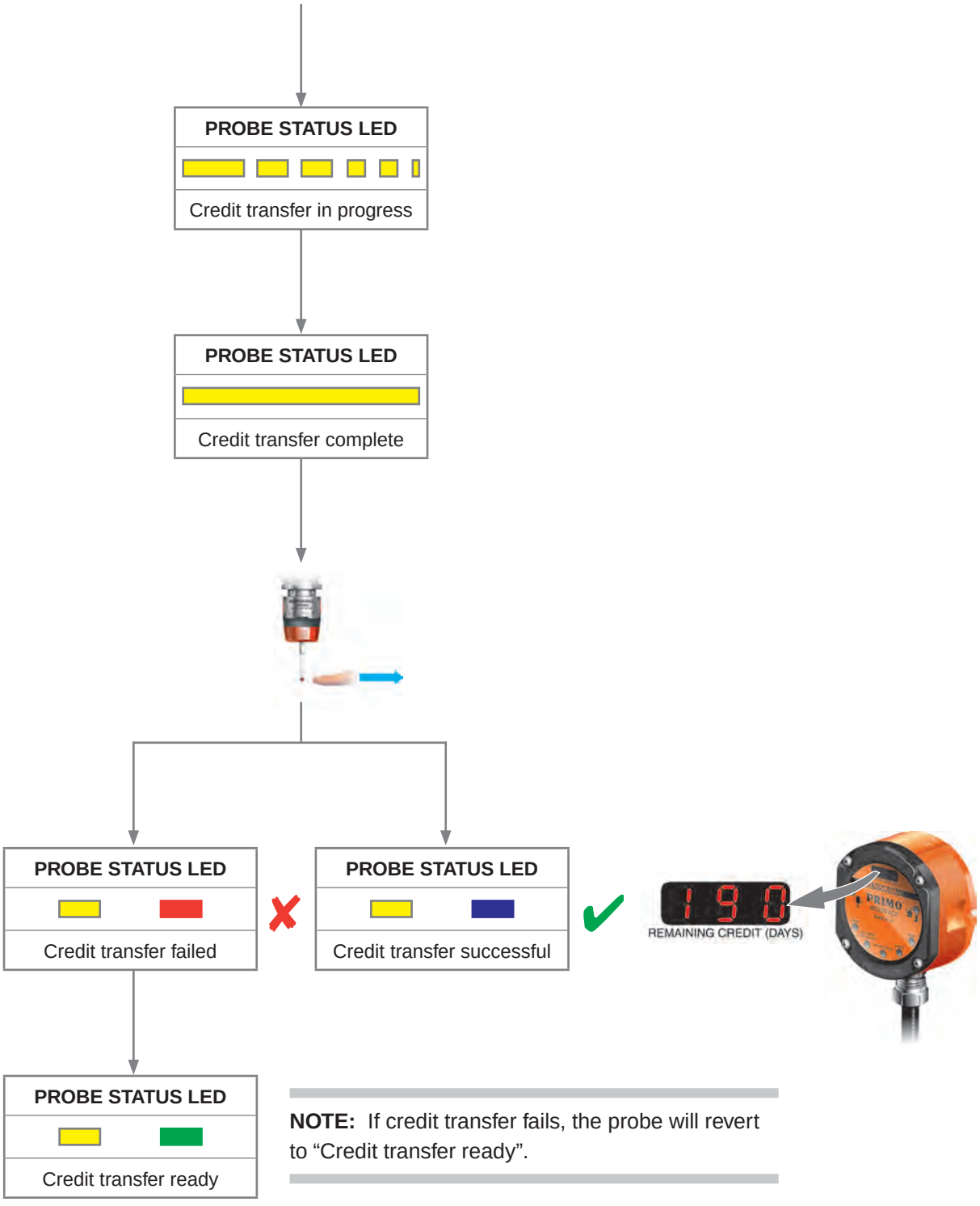
Once credit transfer has been initiated, it cannot be interrupted.

Once the credit has been transferred, do not remove the token from the part setter.




| Key to the symbols | |
|---|---|
| ● | LED short flash |
| ▬ | LED medium flash |
| ▬ | LED long flash |

**NOTE:** The interface **must** stay powered at all times during the credit transfer process.




**NOTE:** If credit transfer fails, the probe will revert to “Credit transfer ready”.

# Maintenance



## Maintenance

You may undertake the maintenance routines described in these instructions; further dismantling and repair of Renishaw equipment must be carried out by an authorised Renishaw Service Centre.

## Cleaning the equipment

Wipe the window of the tool setter and the body shell of the part setter with a clean cloth on a regular basis to remove machining residue.

# Changing the battery

## Part setter

See “Permitted battery types” on page 6.4 for a list of suitable battery types.

See “Safety” on page 1.6 for battery safety information.

**NOTES:**

Always ensure that the seal and mating surfaces are clean and free from dirt before reassembly.

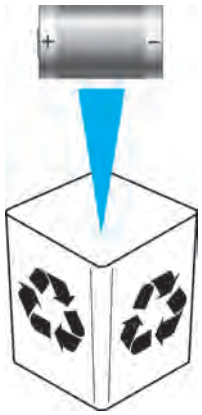
After removing the old battery, wait at least 5 seconds before inserting the new battery.

If a dead battery is inadvertently inserted into the probe, the LEDs will remain a constant red or off.

1

2

3



4

5

## Tool setter

See “Permitted battery types” on page 6.4 for a list of suitable battery types.

See “Safety” on page 1.6 for battery safety information.

**NOTES:**

Always ensure that the seal and mating surfaces are clean and free from dirt before reassembly.

After removing the old battery, wait at least 5 seconds before inserting the new battery.

If a dead battery is inadvertently inserted into the probe, the LEDs will remain a constant red or off.

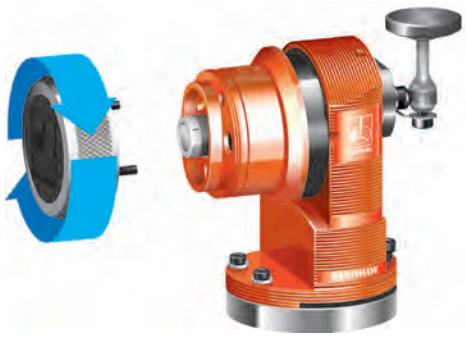
1

2

3

4

5



## Permitted battery types

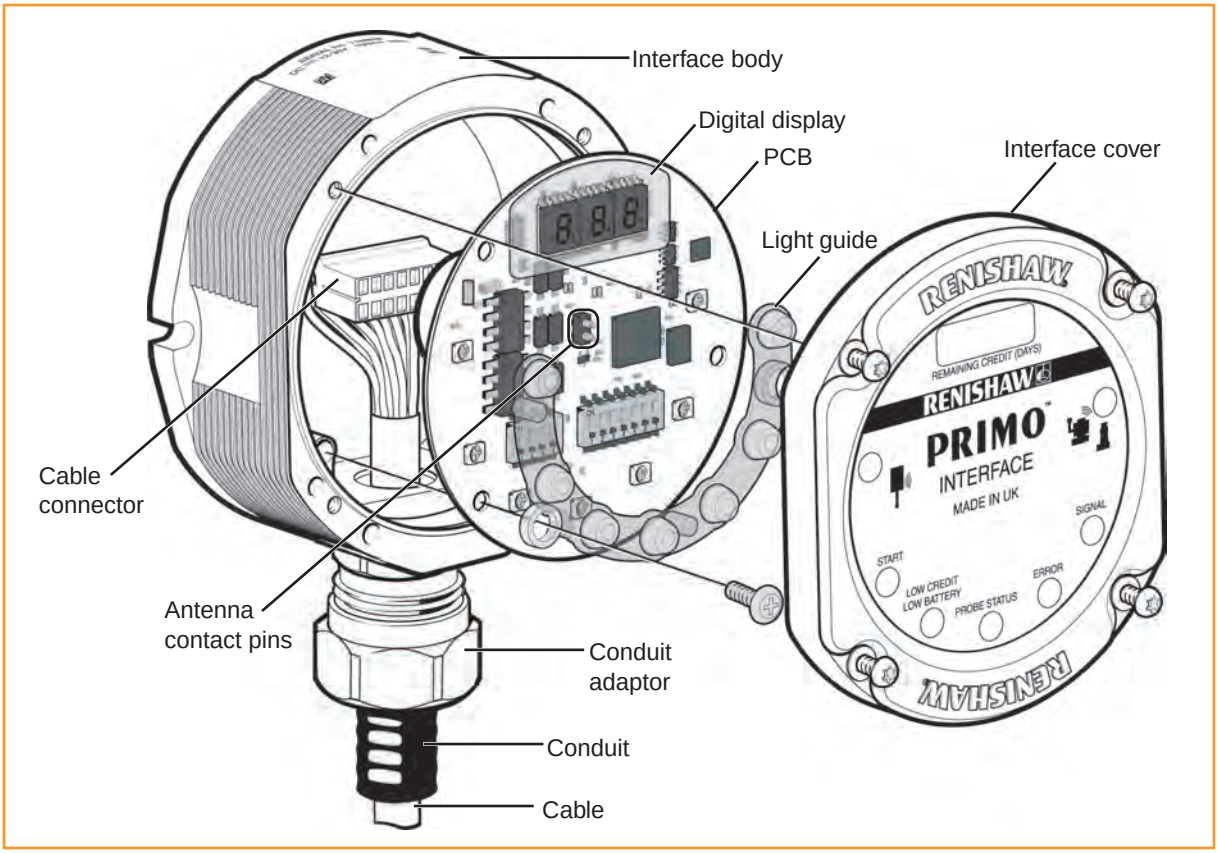
### CR2 (3 V) Lithium manganese dioxide × 1

| | | |
|---|---|---|
| ✔ | Energizer | EL1 CR2 |
| | Duracell | Ultra CR2 |

### ½ AA (3.6 V) Lithium-thionyl chloride × 1

| | | |
|---|---|---|
| ✔ | Ecocel | EB 1425, EB1426 |
| | Saft | LS 14250 C, LS 14250 |
| | Tadiran | SL-750 |
| | Xeno | XL-050F |

## Interface cover




The front cover may be removed and replaced to change the configuration of the DIP switches.

### Removing the interface cover

**1**

Clean thoroughly to ensure no debris or coolant enters the unit.

**2**

Unscrew (but DO NOT remove) each captive screw and washer evenly from the cover using the T10 tamper-proof key.

## Routine tool setter maintenance

Ensure the tool setter is securely mounted and keep all electrical connections clean. Inspect the diaphragm once a month.

**NOTE:** In the event of the diaphragm seal being damaged, return the tool setter to your supplier for repair.

### Inspecting the diaphragm seal

1

Remove the stylus/break stem assembly.

2

Remove the front cover.

3

Remove the metal eyelid and spring.

4

Wash the inside of the probe with clean coolant.

5

Inspect the diaphragm seal for signs of piercing or damage.

6

If there is no damage, reassemble the tool setter.

# Fault-finding



## Part setter

| Symptom | Cause | Action |
|---|---|---|
| **The part setter fails to power up (no LEDs illuminated).** | No credit token. | Insert a credit token (see page 5.29). |
| | The credit token was inserted incorrectly. | Check the credit token insertion and polarity (see page 5.30). |
| | Dead battery. | Change the battery (see page 6.2). |
| | Unsuitable battery. | Change the type of battery being used (see page 6.4). |
| | The battery was inserted incorrectly. | Check the battery insertion and polarity (see page 6.2). |
| | The battery was removed for too short a time and the part setter has not reset. | Remove the battery for a minimum of 5 seconds (see page 6.2). |
| | Poor contact between the battery cover mating surfaces and the contacts. | Remove any dirt and clean the contacts before reassembly (see page 6.2). |
| **Reduced range.** | There is local radio interference or obstruction. | Identify the source of interference or obstruction and remove it. |
| | Radio link failure or the part setter is out of range. | Check the position of the interface and remove any obstructions (see page 5.1). |
| **The part setter crashes.** | The workpiece is obstructing the path of the part setter. | Review the software and the program (please refer to the programming manual). |
| | The part setter's length offset is missing. | Review the software and the offsets (please refer to the programming manual). |

| Symptom | Cause | Action |
|---|---|---|
| **Poor part setter repeatability and/or accuracy.** | Debris on the part or the stylus. | Clean the part and the part setter's stylus. |
| | Poor tool change repeatability. | Recalibrate the part setter after each tool change (please refer to the programming manual). |
| | Loose part setter mounting on the shank or loose part setter stylus. | Check the part setter has been mounted correctly, adjust if required and tighten the stylus as appropriate (see pages 5.3 and 5.5). |
| | Calibration is out of date causing the calibration values to be inaccurate. | Recalibrate the part setter (please refer to the programming manual). |
| | An environmental or physical change (e.g. significant temperature change, new stylus etc) within the machine has caused a discrepancy in the calibrated offsets. | Review the program and repeat the calibration routine (please refer to the programming manual). |
| | Calibration and usage speeds are not the same. | Review the program and make the speeds the same (please refer to the programming manual). |
| | Measurement occurs as the stylus leaves the surface. | Review the program (please refer to the programming manual). |
| | Measurement occurs within the machine's acceleration and deceleration zone. | Review the part setter filter settings and the program to increase the back-off distance from the part (see page 3.5 and also refer to the programming manual). |
| | The movement speeds are too fast or too slow. | Review the program and perform simple repeatability trials at various speeds (please refer to the programming manual). |
| | Temperature variation causes machine and workpiece movement. | Minimise temperature changes (please refer to the machine tool documentation). |
| | The machine tool is faulty. | Perform health checks on the machine tool (please refer to the machine tool documentation). |
| | Excessive machine vibration. | Enable the enhanced trigger filter and recalibrate the part setter. Eliminate vibrations. (See page 2.2 and also refer to the machine tool documentation). |

| Symptom | Cause | Action |
|---|---|---|
| **The machine stops unexpectedly during a probing cycle.** | Radio link failure or the part setter is out of range. | Check the position of the interface and remove any obstruction (see page 5.1). |
| | Interface or machine fault. | Check the interface error code (see page 5.24) and the machine user's guide (please refer to the machine tool documentation). |
| | Dead battery. | Change the battery (see page 6.2). |
| | Exhausted credit (a yellow LED will be shown on the part setter, see page 5.19). | Insert a new credit token into the part setter (see page 5.29). |
| | The part setter is unable to find the target surface. | Check that the part is correctly positioned and the stylus has not broken (see pages 5.2 and 5.3). |
| | The stylus was not given sufficient time to settle from a rapid deceleration. | Add a short dwell before the probing move (the length of dwell will depend on the stylus length and rate of deceleration). The maximum dwell is one second (please refer to the programming manual). |
| | A false probe trigger. | Enable the enhanced trigger filter (see page 2.2 and 3.5) and recalibrate the part setter (please refer to the programming manual). |
| **The interface error LED is lit during the probing cycle.** | The part setter is not switched on or it is in hibernation mode. | Review the switch-off method (see page 2.2) and the program. |
| | Radio link failure or the part setter is out of range. | Check the position of the interface (see page 5.2) and remove any obstructions. |
| | Dead battery. | Change the battery (see page 6.2). |
| | The part setter and interface are not partnered. | Partner the part setter and the interface (see page 5.30). |
| **The interface low credit/low battery LED is lit yellow.** | There is low credit in the system (a flashing yellow LED will be shown on the part setter, see page 5.18). | Replace the credit token in the part setter soon (see page 5.30). |
| **The interface low credit/low battery LED is lit red.** | The part setter battery is low (a flashing blue LED will be shown on the part setter, see page 5.18). | Replace the battery in the part setter soon (see page 6.2). |

| Symptom | Cause | Action |
|---|---|---|
| **The interface low credit/low battery LED is flashing yellow/red.** | There is low credit in the system and the part setter battery is low (a flashing yellow/blue LED will be shown on the part setter, see page 5.18). | Replace the credit token (see page 5.30) and the battery (see page 6.2) in the part setter soon. |
| **The part setter fails to switch on.** | No credit token. | Insert a credit token (see page 5.29). |
| | Exhausted credit (a yellow LED will be shown on the part setter, see page 5.19). | Insert a new credit token into the part setter (see page 5.30). |
| | The credit token was inserted incorrectly. | Check the credit token insertion and polarity (see page 5.29). |
| | Dead battery. | Change the battery (see page 6.2). |
| | The battery was inserted incorrectly. | Check the battery insertion and polarity (see page 6.2). |
| | The part setter is out of range. | Check the position of the part setter and the interface (see “Performance envelope” on page 5.2). |
| | No interface “start/stop” signal (radio-on method only). | Check the interface for a yellow start LED (see page 5.20). |
| | Incorrect spin speed (spin-on method only). | Check the spin speed and duration (see page 2.2). |
| | Incorrect switch-on method configured. | Check the configuration and alter as required (see page 2.2). |
| | The part setter is in hibernation mode (radio-on method only). | Ensure the part setter is in range and wait for 30 seconds (see page 5.2). |
| **Machine raises alarm during cycle and stops.** | The part setter fails to switch off after the cycle is stopped. | Either reset the alarm, enter the required M-code or wait for the part setter to timeout (90 minutes after last probing cycle) (Please refer to programming manual). |
| | The part setter is out of range and it cannot be switched off. | Move the part setter into the range of the interface or the part setter will enter standby mode after 30 seconds and hibernation mode after a further 30 seconds if no signal is received. |

| Symptom | Cause | Action |
|---|---|---|
| **The part setter LED does not correspond to the interface LEDs.** | The part setter is not switched on or it is in hibernation mode. | Review the switch-on setting and change as required (see page 2.2). |
| | Radio link failure or the part setter is out of range. | Check the position of the part setter and the interface (see page 5.2). |
| | Dead battery. | Change the battery (see page 6.2). |
| | Exhausted credit (a yellow LED will be shown on the part setter, see page 5.19). | Insert a new credit token into the part setter (see page 5.30). |
| | The part setter and interface are not partnered. | Partner the part setter and the interface (see page 5.25). |
| **The part setter fails to switch off.** | Incorrect switch-off method configured. | Check the configuration and alter as required (see page 2.2). |
| | There is no interface “start/stop” signal (radio-on method only). | Check the interface for a yellow start LED (see page 5.20). |
| | The spin speed is incorrect (spin-on method only). | Check the spin speed (see page 2.2 and also refer to the programming manual). |
| | Radio link failure or the part setter is out of range. | Check the position of the interface and remove any obstructions (see page 5.1). |

## Tool setter

| Symptom | Cause | Action |
|---|---|---|
| **The tool setter fails to power up (LED not illuminated).** | Dead battery. | Change the battery (see page 6.3). |
| | Unsuitable battery. | Change the type of battery being used (see page 6.4). |
| | The battery is inserted incorrectly. | Check the battery insertion and polarity (see page 6.3). |
| | Poor contact between the battery cassette mating surfaces and the contacts. | Remove any dirt and clean the contacts before reassembly (see page 6.3). |
| **The tool setter fails to switch on.** | Dead battery. | Change the battery (see page 6.3) |
| | The battery is inserted incorrectly. | Check the battery insertion and polarity (see page 6.3). |
| | Exhausted credit (a yellow LED will be shown on the tool setter, see page 5.19). | Insert a new credit token into the part setter (see page 5.30). |
| | Radio link failure or the tool setter is out of range. | Check the position of the tool setter and the interface (see page 5.2). |
| | No interface “start/stop” signal. | Check the interface for a yellow start LED (see page 5.20). |
| | The tool setter is in hibernation mode. | Ensure the tool setter is in range and wait up to 30 seconds, then resend the switch-on signal (see page 5.2). |
| **The machine stops unexpectedly during a probing cycle.** | Radio link failure or the tool setter is out of range. | Check the position of the tool setter and the interface (see page 5.2). |
| | Interface or machine fault. | Check the interface error code (see page 5.24) and the machine tool user guide. |
| | Dead battery. | Change the battery (see page 6.3). |
| | Exhausted credit (a yellow LED will be shown on the tool setter, see page 5.19). | Insert a new credit token into the part setter (see page 5.30). |
| | False trigger. | Enable the enhanced trigger filter (see page 2.2) and recalibrate the tool setter (please refer to the programming guide). |

| Symptom | Cause | Action |
|---|---|---|
| **Poor tool setter repeatability and/or accuracy.** | Debris on the tool or the stylus. | Clean the tool setter and the stylus (see page 6.1). |
| | Loose tool setter mounting on the machine bed or a loose stylus. | Check and tighten as appropriate (see pages 5.7 and 5.9). |
| | Excessive machine vibration. | Enable the enhanced trigger filter (see page 2.2) and eliminate any vibrations (please refer to the programming manual). |
| | Calibration is out of date causing the calibration values to be inaccurate. | Recalibrate the tool setter (please refer to the programming manual). |
| | An environmental or physical change (e.g. significant temperature change, new stylus etc) within the machine has caused a discrepancy in the calibrated offsets. | Review the program and repeat the calibration (please refer to the programming manual). |
| | The calibration and measurement speeds are not the same. | Review the program and make the speeds the same (please refer to the programming manual). |
| | Measurement occurs as the tool leaves the stylus. | Review the program (please refer to the programming manual). |
| | Measurement occurs within the machine's acceleration or deceleration zone. | Check the tool setter filter settings and the program to increase the back-off distance of the tool from the stylus (see page 2.2 and also refer to the programming manual). |
| | The measurement speed is too high. | Review the program and perform simple repeatability trials at various speeds (please refer to the programming manual). |
| | Temperature variation causes machine and tool movement. | Minimise temperature variation (refer to the machine tool documentation). |
| | The machine tool is faulty. | Perform health checks on the machine tool (please refer to the machine tool documentation). |

| Symptom | Cause | Action |
|---|---|---|
| **The tool setter LED does not correspond to the interface LEDs.** | Radio link failure or the tool setter is out of range. | Check the position of the tool setter and the interface (see page 5.2). |
| | The tool setter has been enclosed or shielded by metal. | Remove the obstruction. |
| | The tool setter and interface are not partnered. | Partner the tool setter and the interface (see page 5.25). |
| **The interface error LED is lit.** | Dead battery | Change the battery (see page 6.3). |
| | The tool setter is not switched on or it is in hibernation mode. | Review the program (please refer to the programming manual). |
| | Radio link failure or the tool setter is out of range. | Check the position of the tool setter and the interface (see page 5.2). |
| | The tool setter and interface are not partnered. | Partner the tool setter and the interface (see page 5.25). |
| **The interface low credit/ low battery LED is lit yellow.** | There is low credit in the system (a flashing yellow LED will be shown on the tool setter, see page 5.18). | Replace the credit token in the part setter soon (see page 5.30). |
| **The interface low credit/ low battery LED is lit red.** | The tool setter battery is low (a flashing blue LED will be shown on the tool setter, see page 5.18). | Replace the battery in the tool setter soon (see page 6.3). |
| **The interface low credit/ low battery LED is flashing yellow/red.** | There is low credit in the system and the tool setter battery is low (a flashing yellow/blue LED will be shown on the tool setter, see page 5.18). | Replace the credit token in the part setter and the battery in the tool setter soon (see pages 5.30 and 6.3). |
| **Reduced range.** | There is local radio interference. | Identify the source of interference and remove it. |
| | Radio link failure or the tool setter is out of range. | Check the position of the tool setter and the interface (see page 5.2). |

| Symptom | Cause | Action |
|---|---|---|
| **The spindle or tool crashes into the tool setter.** | The tool length offset is incorrect. | Review the tool offsets (please refer to the programming manual). |
| **The tool setter fails to switch off.** | No interface “start/stop” signal. | Check the interface for a yellow start LED (see page 5.20). |
| | Radio link failure or the tool setter is out of range. | Check the position of the tool setter and the interface (see page 5.2). |
| **Machine raises alarm during cycle and stops.** | The tool setter fails to switch off after the cycle is stopped. | Either reset the alarm, enter the required M-code or wait for the tool setter to timeout (90 seconds after last probing cycle). (Please refer to programming manual). |
| | The tool setter is out of range and it cannot be switched off. | The tool setter will enter standby mode after 30 seconds and hibernation mode after a further 30 seconds if no signal is received. |
| | Radio link failure or the tool setter is out of range. | Check the position of the tool setter and the interface (see page 5.2). |

## Interface

| Symptom | Cause | Action |
|---|---|---|
| **No LEDs lit on the interface.** | No power to the interface. | Check the interface wiring (see page 5.13). |
| **The interface status LED does not correspond to the selected probe LEDs.** | Radio link failure or the selected probe is out of the interface range. | Check the position of the selected probe and the interface (see page 5.2). |
| | The selected probe has been enclosed or shielded by metal. | Remove the obstruction. |
| | The selected probe is not partnered with the interface. | Partner the selected probe to the interface (see pages 5.25 and 5.27). |
| **The interface probe status LED is continually lit red.** | Radio link failure or the selected probe is out of the interface range. | Check the position of the selected probe and the interface (see page 5.2). |
| **The interface low credit/low battery LED is lit yellow.** | There is low credit in the system (a flashing yellow LED will be shown on the selected probe, see page 5.18). | Replace the credit token in the part setter soon (see page 5.30). |
| **The interface low credit/low battery LED is lit red.** | The selected probe's battery is low (a flashing blue LED will be shown on the selected probe, see page 5.18). | Replace the battery as required (see pages 6.2 and 6.3). |
| **The interface low credit/low battery LED is flashing yellow/red.** | There is low credit in the system and the selected probe's battery is low (a flashing yellow/blue LED will be shown on the selected probe, see page 5.18). | Replace the credit token soon and replace the battery as required (see pages 5.30, 6.2 and 6.3). |
| **The interface error LED is lit during the probing cycle.** | Radio link failure or the selected probe is out of the interface range. | Check the position of the selected probe and the interface (see page 5.2). |
| | Dead battery in selected probe. | Check battery and replace as required (pages 6.2 and 6.3). |
| | Selected probe and interface are not partnered. | Partner selected probe and interface (pages 5.25 and 5.27). |
| | Hardware fault or electrical issue. | Review LED signals and error codes (see pages 5.20 to 5.24). |
| **Multiple interface LEDs are flashing red.** | Wiring fault. | Check the error codes, wiring and restart the machine (see page 5.13, 5.24 and please refer to the machine tool documentation). |
| **Reduced range.** | Local radio interference. | Identify the interference and remove it. |

# Parts list



| Type | Part number | Description |
|---|---|---|
| Primo™ Radio Part Setter | A-5471-2011 | Part setter with stylus, battery and quick-start guide. |
| Primo Radio 3D Tool Setter | A-5472-2001 | Tool setter with disc stylus, battery, tool setter and quick-start guide. |
| Primo Interface | A-5473-0049 | Interface with 8 m (26.2 ft) cable, tool kit and quick-start guide. |
| Primo LTS | A-5475-0001 | LTS with 8 m (26.2 ft) cable and quick-start guide. |
| GoProbe software | Contact Renishaw | GoProbe software package with cycles for part setting, tool setting and calibration. |
| GoProbe training kit | Contact Renishaw | GoProbe training kit with pocket guide, GoProbe training part, e-learning course and quick-reference tool. |
| Primo 6-Month Credit Token | A-5474-0006 | 6-month credit token and instruction leaflet. |
| Primo Upgrade Credit Token | A-5474-0099 | Upgrade credit token and instruction leaflet. |
| Battery | P-BT03-0014 | ½ AA Lithium-thionyl chloride 3.6 V battery. |
| Battery | P-BT03-0010 | CR2 Lithium manganese dioxide 3 V battery. |
| Stylus | A-5000-3709 | PS3-1C ceramic stylus, 50 mm long with Ø6 mm ball, for the part setter. |
| Stylus | A-5472-3000 | 26 mm diameter disc stylus, tungsten carbide with break stem for the tool setter. |
| Weak link | A-2085-0068 | Weak link (× 2) and 5 mm A/F spanner for the part setter. |
| Tool setter break stem kit | A-5472-3003 | Kit comprising: Break stem (× 2); captive link; support bar; M4 screws (× 2); M4 grub screws (× 3); 2 mm and 3 mm A/F hexagon keys and 5 mm A/F spanner. |
| Stylus tool | M-5000-3707 | Tool for tightening and releasing styli. |
| Part setter tool kit | A-4071-0060 | Kit comprising: Stylus tool; 2 mm A/F hexagon key, M4 cone point grub screws (× 2) and M4 flat point grub screws (× 4). |
| Tool setter tool kit | A-5472-0060 | Kit comprising: Break stem; captive link (× 2); M4 screws (× 2); M4 grub screws (× 3); 2 mm, 3 mm and 4 mm A/F hexagon keys and 5 mm A/F spanner. |

| Type | Part number | Description |
|---|---|---|
| Interface tool kit | A-5473-0300 | Kit comprising: T10 tamperproof key; 4 mm A/F hexagon key; ferrules (× 16); M5 screws (× 2); M5 nuts (× 2) and M5 washers (× 4). |
| Credit token cassette | A-5471-3000 | Replacement credit token cassette for the part setter. |
| Battery cover | A-5471-3001 | Replacement battery cover for the part setter. |
| Battery cover | A-5472-3001 | Replacement battery cover for the tool setter. |
| Battery cover O-rings | A-5471-3002 | Replacement O-rings for the part setter battery cover (× 2). |
| Battery cover O-ring | A-5472-3002 | Replacement O-ring for the tool setter battery cover. |
| Mounting bracket | A-2033-0830 | Mounting bracket with fixing screws, washers and nuts for the interface. |
| Conduit kit | A-4113-0306 | Conduit kit with 1 m (3.28 ft) of polyurethane conduit and bulkhead connector (M16 thread) for the interface. |
| Replacement window | A-5473-0305 | Replacement window for the interface. |
| Panel-mount kit | A-5473-0315 | Kit for mounting the interface in the machine panel rather than on the mounting bracket. |
| Publications. These can be downloaded from our website at www.renishaw.com/primodownloads | | |
| Quick-start guide | A-5470-8500 | For rapid set up of the Primo system, includes CD with installation guide. |
| Installation guide | H-5470-8504 | Detailed installation and set-up information for the Primo system. |
| Data sheet | H-5470-8200 | Technical information and specifications for the Primo system. |
| Programming manual | H-5990-8600 | GoProbe software. |
| Technical specification | H-1000-3200 | Styli and accessories. |
| Data sheet | H-2000-2011 | Details of taper shanks for machine tool probes. |

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