Installation guide
H-6570-8501-01-A

RENISHAW
apply innovation™

RMP400 high accuracy radio machine probe

Draft 5 16/04/18

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Before you begin

Before you begin

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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 probe

Keep system components clean and treat the probe as a precision tool.

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Patents

Features of the RMP400, and other similar Renishaw products, are the subject of one or more of the following patents and/or patent applications:

Patents will be listed here when we have them.. Possibly all RMP40 patents and strain gauge patents (Steve to confirm)

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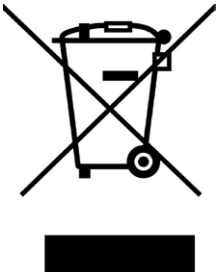
EU declaration of conformity

Renishaw plc declares that the RMP400 complies with the applicable standards and regulations.

Contact Renishaw plc or visit **www.renishaw.com/mtpdoc** for the full EU 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.

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Radio approval

Will be listed here, when there are some (testing to take place first).

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Safety

Information to the user

The RMP400 is supplied with two non-rechargeable ½AA lithium-thionyl chloride batteries (approved to BS EN 62133:2013 [IEC 62133:2012]). Once the charge in these batteries is depleted, do not attempt to recharge them.

The use of this symbol on the batteries, packaging or accompanying documents indicates that used batteries should not be mixed with general household waste. Please dispose of the used batteries at a designated collection point. This will prevent potential negative effects on the environment and human health which could otherwise arise from inappropriate waste handling. Please contact your local authority or waste disposal service concerning the separate collection and disposal of batteries. All lithium and rechargeable batteries must be fully discharged or protected from short circuiting prior to disposal.

Please ensure replacement batteries are of the correct type and are fitted in accordance with the instructions in this manual (see page 5.2, “Changing the batteries”), and as indicated on the product. For specific battery operating, safety and disposal guidelines, please refer to the battery manufacturer’s literature.

- Ensure that all batteries are inserted with the correct polarity.
- 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 products to Renishaw for any reason, do not return any batteries.

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

The RMP400 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.

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;

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- 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.

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RMP400 basics

Introduction

The RMP400 offers an unrivalled combination of size, accuracy, reliability and robustness and, allows high-accuracy probing on small to medium machining centres or other machines where line-of-sight problems affect optical signal transmission.

Successfully combining patented RENGAGE™ strain gauge technology with the patented frequency hopping radio transmission system of the RMP40, the RMP400 provides existing probe users with a simple upgrade to solid-state strain gauge technology and all the associated benefits this brings:

- excellent 3D performance to allow probing of contoured surfaces;
- improved repeatability in all probing directions;
- a low triggering force combined with low pre-travel variation to provide high accuracy, even when used with long styli;
- a proven ten-fold improvement in life (10 million triggers); ????
- the elimination of reseat failures;
- high resistance to machine tool vibration;
- resistance to shock and false triggering through the use of solid state accelerometers.

In addition to providing high-accuracy measurement on your machine tool, the RMP400 also offers:

- Faster calibration:

  On complex 3D parts, it is common to measure in several different directions. Each direction of a standard mechanical probe must be calibrated, to ensure that the pre-travel variation is compensated in the measurement.

  Performing this calibration for every 3D direction can be time-consuming.

  The RMP400 has almost no pre-travel variation, so a single calibration value may be used for any probing angle in 2D or 3D. This results in a vastly reduced calibration time. An additional benefit is a corresponding reduction in errors introduced by environmental changes within the machine during a long calibration cycle.

- The ability to be used in applications where axial and radial reorientations are used, enabled by the use of solid state accelerometers:

  The auto-reset function is required and recommendations should be followed for optimum metrology performance.

Getting started

Three multicolour probe LEDs provide visual indication of selected probe settings.

For example:

- Switch-on and switch-off methods
- Probe status – triggered or seated
- Battery condition

Batteries are inserted or removed as shown (see page 3.5, “Installing the batteries”) for further information).

On insertion of batteries, the LEDs will begin to flash (see page 4.1, “Reviewing the probe settings”).

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System interface

The RMI and RMI-Q are integrated interfaces/ receivers used to communicate between the RMP400 probe and the machine control.

Trigger Logic™

Trigger Logic (see Section 4, “Trigger Logic™”) is a method that allows the user to view and select all available mode settings in order to customise a probe to suit a specific application. Trigger Logic is activated by battery insertion and uses a sequence of stylus deflections (triggering) to systematically lead the user through the available choices to allow selection of the required mode options.

A Trigger Logic app is available that simplifies this process with clear, interactive instructions and informative videos and is available for download on the following app stores.

Download on the App Store

or

GET IT ON Google Play

Current probe settings can be reviewed by simply removing the batteries for a minimum of five seconds, and then replacing them to activate the Trigger Logic review sequence.

Probe modes

The RMP400 probe can be in one of three modes:

Standby mode – Probe is waiting for a switch-on signal.

NOTE: The RMP400 will enter hibernation mode should the system interface be powered off or out of range for a period of 30 seconds (only applicable to “radio on” mode).

Operational mode – When activated by one of the switch-on methods, the probe is switched on and ready for use.

Configuration mode – Ready to change the probe settings using Trigger Logic.

Configurable settings

Switch-on/switch-off methods

The following switch-on/switch-off options are user-configurable.

- Radio on/Radio off
- Radio on/Timer off
- Spin on/Spin off
- Spin on/Timer off

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RMP400 switch-on method Switch-on options are configurable	RMP400 switch-off method Switch-off options are configurable	Probe ready time
Radio on Radio switch on is commanded by machine input.	**Radio off** Radio switch off is commanded by machine input. A timer automatically switches the probe off 90 minutes after the last trigger if it is not turned off by machine input. **Timer off (timeout)** Timeout will occur 12, 33 or 134 seconds (user configurable) after the last probe trigger or reseat.	1.7 seconds maximum.
Spin on Spin at 500 rev/min for one second minimum.	**Spin off** Spin at 500 rev/min for one second minimum. A timer automatically switches the probe off 90 minutes after the last trigger if it is not spun. **Timer off (timeout)** Timeout will occur 12, 33 or 134 seconds (user configurable) after the last probe trigger or reseat.	2.5 seconds. (The probe must be stationary for 2.5 seconds minimum after it has stopped spinning.)

NOTES:

In “radio on” mode, the switch-on time is user selectable “fast” or “standard” when using RMI-Q (selection is made in RMI-Q). Otherwise 1.7 seconds.

For more information on the user selectable switch-on time when operating with RMI-Q, please refer to the installation guide *RMI-Q radio machine interface* (Renishaw part no. H-5687-8504).

In “radio on” mode, the switch-on time assumes a good radio communication link. In a poor RF environment this may rise to a maximum of 3.0 seconds.

In “spin on” mode, the one second starts from the moment the spindle reaches 500 rev/min.

The RMP400 must be on for a minimum of one second before being switched off.

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Enhanced trigger filter

Probes subjected to high levels of vibration or shock loads may output signals without having contacted any surface. The enhanced trigger filter improves the probe's resistance to these effects.

When the filter is enabled, a constant 8 ms or 16 ms delay is introduced to the probe's output. The factory setting is 8 ms. If false triggering is noticed, then consider increasing the filter delay to 16 ms.

Auto-reset function

In previous strain gauge products, the probe was required to be turned off during reorientation moves. The auto-reset function in the RMP400 can compensate for stylus forces, resulting from changes in probe orientation, that can cause the probe to trigger.

This feature is controlled by solid state accelerometers and is suitable for applications where axial and radial reorientation of the probe is applied.

To achieve optimum metrology performance when the auto-reset function is turned on, a dwell is recommended before making a programmed move that follows any reorientation of the probe.

When using a stylus of up to 150 mm long, a 0.2 second dwell is necessary. In most applications the machine response time will adequately provide this.

When using a heavy stylus configuration, or a stylus longer than 150 mm, it is recommended that the RMP400 should be turned off during reorientation moves.

Multiple probe mode

The RMP400 can be configured, using Trigger Logic, to allow multiple radio probes in "spin on/ spin off" or "shank on/shank off" to be used with a single RMI or RMI-Q.

Up to four RMP400s can be used with a single RMI-Q in "radio on/radio off" mode. For further details of this functionality, please refer to the installation guide *RMI-Q radio machine interface* (Renishaw part no. H-5687-8504).

NOTES:

Multiple probe mode is a function of the RMP400, as such, the option will not appear when the "radio on" option has been selected.

RMP400 probes which are set to "multiple probe mode on" can coexist alongside any number of RMP400 probes set to "multiple probe mode off".

To allow multiple radio probes to work in close proximity, and with a single RMI or RMI-Q, 16 choices of "mode on" colours are available, each representing a different machine tool installation. (see page 4.2, "Multiple probe settings").

All probes operating with a single RMI or RMI-Q must be set to the same "mode on" colour choice; any multiple probes located on adjacent machines must all be set to an alternative "mode on" colour choice.

NOTE: Each probe per "mode on" colour choice needs to be partnered with the RMI or RMI-Q. By configuring multiple probes to a single "mode on" colour choice, all probes using this "mode on" colour choice will have the same identity.

The probe to be partnered is partnered after selecting the multiple probe mode setting and choosing the "mode on" option. (see page 4.4, "Changing the probe settings").

There is no limit to the number of probes that can be used with a single RMI or RMI-Q so long as they all have the same "mode on" colour choice. All RMP400 probes are factory set to "mode off".

The addition of any further probe(s) into a single probe installation will require that all probes are reconfigured to the same "mode on" colour choice and that one of the probes is then repartnered with the RMI or RMI-Q.

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The addition of any further probe(s), or replacements, into a multi-probe installation can be achieved simply through the reconfiguration of the probe to the same “mode on” colour choice.

Acquisition mode

System set-up is achieved using Trigger Logic and powering-on the RMI or RMI-Q.

Partnering is only required during initial system set-up. Further partnering is only required if either the RMP400 or RMI/RMI-Q is changed.

NOTES:

Systems using the RMI-Q can be partnered with up to four RMP400s manually. Alternatively this can be achieved by using ReniKey; a Renishaw machine macro cycle which does not require the RMI-Q to be power cycled.

For more information or to download ReniKey free of charge visit:
www.renishaw.com/mtpsupport/renikey

Partnering by ReniKey is not available for RMI.

Partnering will not be lost by reconfiguration of probe settings or when changing batteries, except where multiple probe mode is selected.

Partnering can take place anywhere within the operating envelope.

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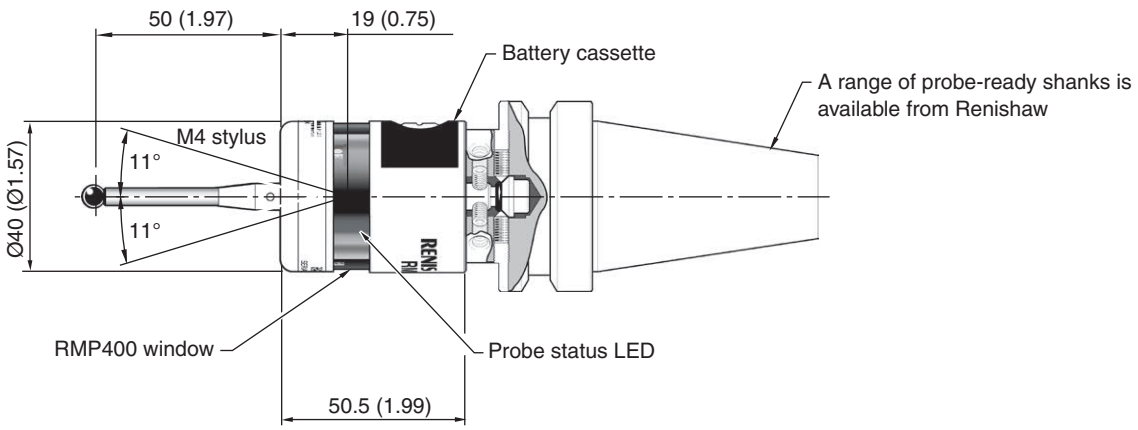
RMP400 dimensions



Dimensions given in mm (in)

Stylus overtravel limits		
Stylus length	±X/±Y	Z
50 (1.97)	12 (0.47)	6 (0.24)
100 (3.94)	22 (0.87)	6 (0.24)

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RMP400 specification

Principal application	Workpiece inspection and job set-up on multi-tasking machines, machining centres and gantry machining centres.	
Dimensions	Length Diameter	50.5 mm (1.99 in) 40 mm (1.57 in)
Weight (without shank)	With batteries Without batteries	262 g (9.24 oz) 242 g (8.54 oz)
Transmission type	Frequency hopping spread spectrum (FHSS) radio	
Radio frequency	2400 MHz to 2483.5 MHz	
Switch-on methods	Radio M-code or spin on	
Switch-off methods	Radio M-code, timer or spin off	
Probe feedrate (minimum)	3 mm/min (0.12 in/min) *(see note 6)*	
Spindle speed (maximum)	1000 rev/min	
Operating range	Up to 15 m (49.2 ft)	
Receiver/interface	RMI or RMI-Q combined interface and receiver unit	
Sense directions	±X, ±Y, +Z	
Unidirectional repeatability	0.25 µm (10 µin) 2σ – 50 mm stylus length *(see note 1)* 0.35 µm (14 µin) 2σ – 100 mm stylus length	
X, Y (2D) form measurement deviation	±0.25 µm (10 µin) – 50 mm stylus length *(see note 1)* ±0.25 µm (10 µin) – 100 mm stylus length	
X, Y, Z (3D) form measurement deviation	±1.00 µm (40 µin) – 50 mm stylus length *(see note 1)* ±1.75 µm (70 µin) – 100 mm stylus length	
Stylus trigger force *(see notes 2 and 5)* XY plane (typical minimum) +Z direction (typical minimum)	 0.06 N, 6 gf (0.22 ozf) TBC by end of March 2.55 N, 260 gf (9.17 ozf)	
Stylus overtravel force XY plane (typical minimum) +Z direction (typical minimum)	 1.04 N, 106 gf (3.74 ozf) *(see note 3)* 5.50 N, 561 gf (19.78 ozf) *(see note 4)*	
Stylus overtravel	XY plane +Z plane	±11° 6 mm (0.23 in)

Note 1 Performance specification is tested at a standard test velocity of 240 mm/min (9.45 in/min) with a 50 mm (1.97 in) carbon fibre 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. RENGAGE™ equipped probes offer ultra-low trigger forces. TBC

Note 3 Stylus overtravel force in the XY plane typically occurs 70 µm (2755.91 µin) after the trigger point and rises by 0.1 N mm 10 gf/mm (9.1 oz/in) until the machine tool stops (in the high force direction and using a 50 mm (1.97 in) carbon fibre stylus).

Note 4 Stylus overtravel force in the +Z direction occurs 10 µm (393.70 µin) to 11 µm (433.07 µin) after the trigger point and rises by 1.2 N/mm, 122 gf/mm (109.60 oz/in) until the machine tool stops.

Note 5 These are the factory settings, manual adjustment is not possible.

Note 6 Speeds below 3 mm/min commonly occur when manually moving the probe using the handwheel with a very fine feedrate.

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Environment	IP rating	IPX8, BS EN 60529:1992+A2:2013 (IEC 60529:1989+A1:1999+A2:2013)
	IK rating	IK01 (BS EN IEC 62262: 2002) [for glass window]
	Storage temperature	–10 °C to +70 °C (+14 °F to +158 °F)
	Operating temperature	+5 °C to +50 °C (+41 °F to +122 °F)
Battery types	2 × ½AA 3.6 V lithium-thionyl chloride (LTC)	
Battery reserve life	Approximately one week after a low battery warning is first given (based on 5% usage).	
Typical battery life	See the table below.	

Typical battery life

Battery type	Spin switch on		Radio switch on		Continuous use
	Standby life	5% usage (72 minutes/day)	Standby life	5% usage (72 minutes/day)	
Lithium-thionyl chloride	230 days	90 days	230 days	90 days	165 hours

NOTE: Using RMP400 with “fast radio on” mode will result in a 20% reduction in standby battery life and a 10% reduction in 5% usage battery life.

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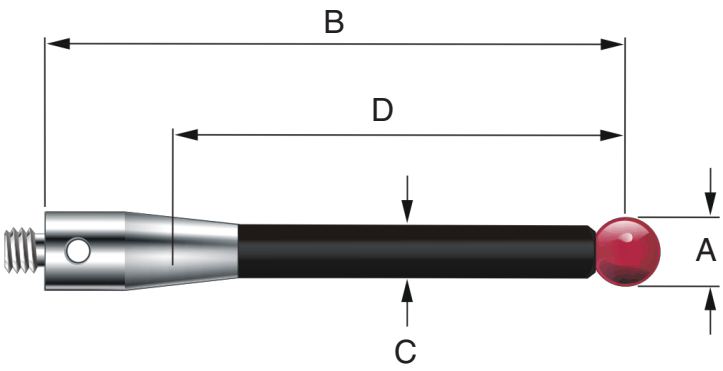
Recommended styli

High modulus carbon fibre styli are designed to minimise pre-travel and improve accuracy, as the stem material is extremely stiff. This inherent stiffness makes the following styli most suitable for strain gauge applications.



Part number		A-5003-7306 Carbon fibre	A-5003-6510 Carbon fibre	A-5003-6511 Carbon fibre	A-5003-6512 Carbon fibre
A	Ball diameter mm (inch)	6 (0.24)	6 (0.24)	6 (0.24)	6 (0.24)
B	Length mm (inch)	50 (1.97)	100 (3.94)	150 (5.91)	200 (7.88)
C	Stem diameter mm (inch)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
D	EWL mm (inch)	38.5 (1.52)	88.5 (3.48)	138.5 (5.45)	188.5 (7.42)
	Mass in g (oz)	4.1 (0.14)	6.2 (0.22)	7.5 (0.26)	8.7 (0.31)

The featured range of solid carbon fibre styli ensure the best possible performance of the RMP400.

It is possible that the featured range of solid carbon fibre styli may not be suitable for every RMP400 application and that it may be necessary to select specialised styli configurations to meet specific application requirements.

In applications where specialised styli are to be used, it may be beneficial to reduce the speed of probing moves. It has been seen in some cases that specialist styli configurations do not exhibit the probing characteristics and performance that would have otherwise been expected and achieved when using standard styli. Reducing the speed of the probing move may, in some cases, improve the performance of the probe.

When selecting components for an application specific stylus, it is recommended that a configuration with the least number of components is chosen. The stylus diameter should always be as large as possible and the overall stylus length kept to a minimum. If a stem with a reduced diameter is required, then it is recommended that an M4 stem with a short length and reduced diameter is selected.

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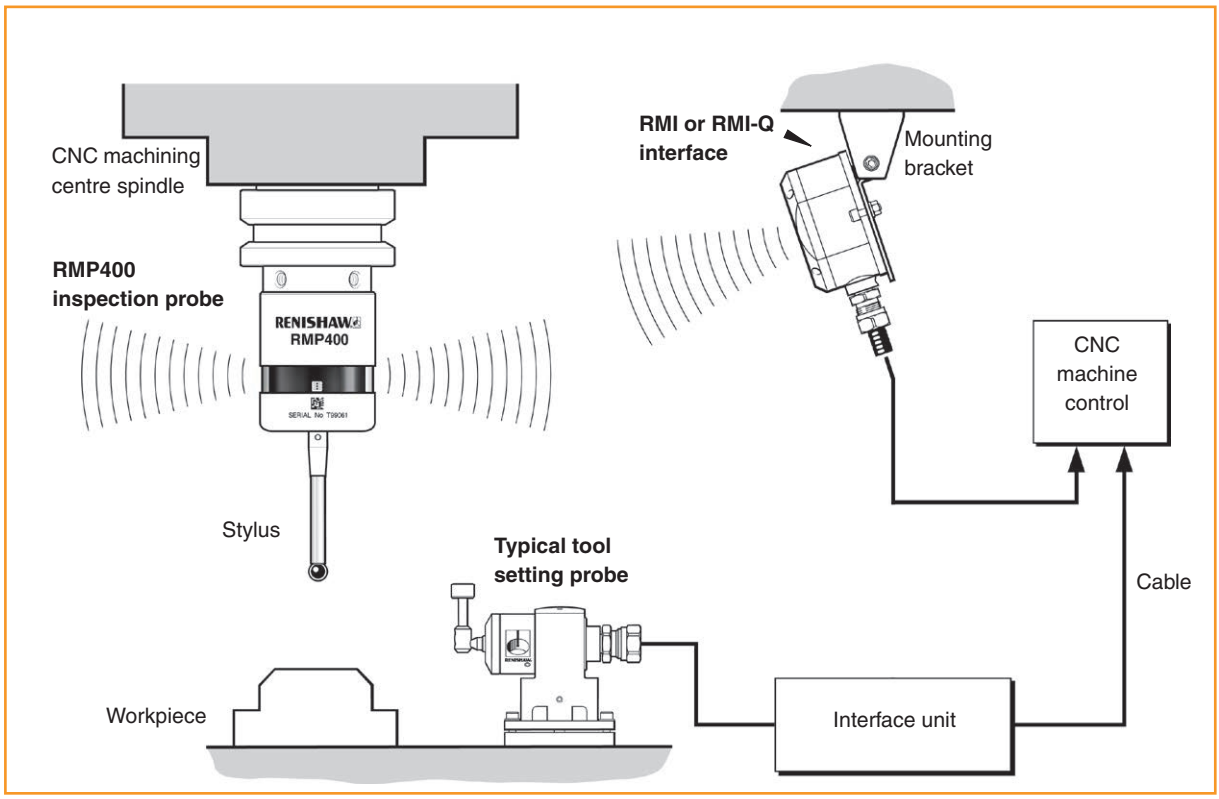
System installation

Installing the RMP400 with an RMI or RMI-Q



Operating envelope

Radio transmission does not require line-of-sight between the probe and interface as it works via reflected paths, and will pass through gaps and machine tool windows. This allows easy installation, either inside or outside the machine enclosure, as long as the probe and RMI or RMI-Q are kept within the performance envelope shown overleaf.

Coolant and swarf residue accumulating on the RMP400 and RMI or RMI-Q may have a detrimental effect on transmission performance. Wipe clean as often as is necessary to maintain unrestricted transmission.

When operating, do not cover the probe glass window, RMI or RMI-Q with your hands, as this will affect the performance.

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Positioning the RMP400 and RMI or RMI-Q

The probe system should be positioned so that the optimum range can be achieved over the full travel of the machine's axes. Always face the front cover of the RMI or RMI-Q in the general direction of the machining area and the tool magazine, ensuring both are within the performance envelope shown below. To assist in finding the optimum position of the RMI or RMI-Q, the signal quality is displayed on an RMI or RMI-Q signal LED.

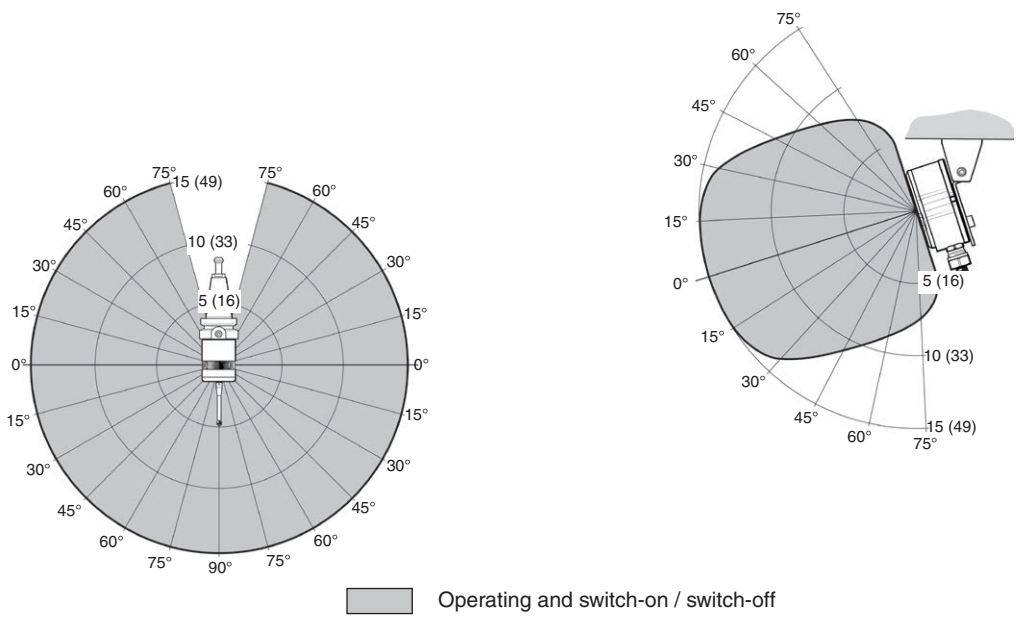
NOTE: Installing the RMP400 and RMI or RMI-Q with the RMP400 in radio-on configuration

The RMP400 has a built-in hibernation mode (battery-saving mode) that saves battery life when the RMI or RMI-Q is unpowered in radio-on (radio-off or timer-off) configurations. The RMP400 goes into hibernation mode 30 seconds after the RMI or RMI-Q is unpowered (or the RMP400 is out of range). When in hibernation mode, the RMP400 checks for a powered RMI or RMI-Q every 30 seconds. If found, the RMP400 goes from hibernation mode to standby mode, ready for radio-on.

Performance envelope

The RMP400 and RMI or RMI-Q must be within each other's performance envelope, as shown below. The performance envelope shows line-of-sight performance, however, this is not necessary for the RMP400 radio transmission as it will operate with any reflected radio path provided that the reflected path length does not exceed the 15 m (49.2 ft) operating range.

Performance envelope when using the RMP400 with the RMI or RMI-Q



Typical plot at +20 °C (+68 °F)
Transmission range in m (ft)

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Preparing the RMP400 for use

Fitting the stylus

1

2

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Installing the batteries

NOTES:

See (Section 5,“Maintenance”)for a list of suitable battery types.

If dead batteries are inadvertently inserted, the LEDs will remain a constant red.

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

After the batteries have been inserted, the LEDs will display the current probe settings, for details, (see Section 4, “Trigger Logic™”).

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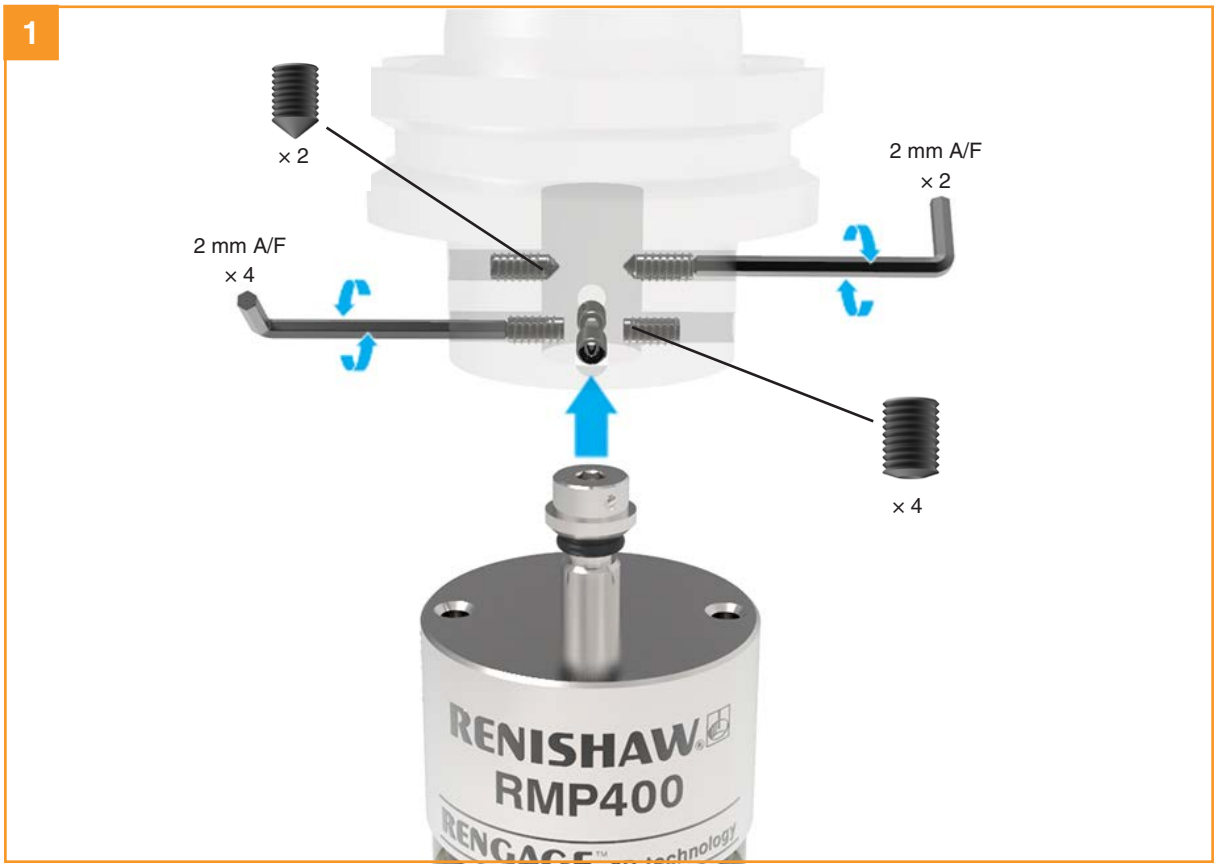
Mounting the probe on a shank

1



2

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Stylus on-centre adjustment

NOTES:

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

Do not hit or tap the probe to achieve on-centre adjustment.

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Calibrating the RMP400

Why calibrate a probe?

A spindle probe is just one component 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 the probe is not calibrated, this difference will appear as an inaccuracy in the measurement. Calibration of the probe 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 the probe is calibrated in the following circumstances:

- when a probe system is to be used for the first time;
- when the enhanced trigger filter delay is 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 been crashed;
- at regular intervals to compensate for mechanical changes of your machine tool;
- if repeatability of relocation of the probe shank is poor. In this case, the probe may need to be recalibrated each time it is selected.

It is good practice to set the tip of the stylus on-centre, because this reduces the effect of any variation in spindle and tool orientation (see page 3.6, “Stylus on-centre adjustment”). A small amount of run-out is acceptable, and can be compensated for as part of the normal calibration process.

Three different operations are to be used when calibrating a probe. 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 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 value 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.

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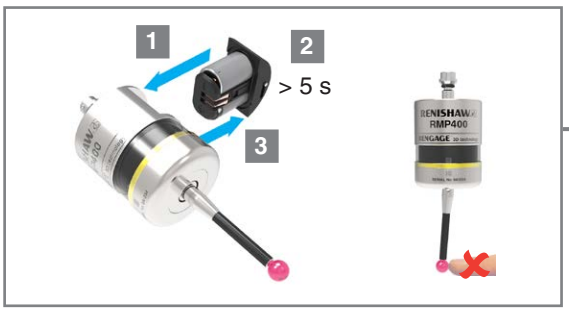
Trigger Logic™

Reviewing the probe settings

Key to the symbols	
●	LED short flash
▬	LED long flash



LED check
● ● ●

Switch-on method

Radio on (omitted if **"multiple probe mode"** is selected)	or	Spin on
● ● ▭		● ● ▬

Switch-off method

Radio off or Spin off	or	Short timeout 12 s	or	Medium timeout 33 s	or	Long timeout 134 s
● ● ▬		● ● ▬		● ● ▬		● ● ▭

Enhanced trigger filter and auto-reset facility

Auto-reset off Trigger filter on 8 ms	or	Auto-reset off Trigger filter on 16 ms	or	Auto-reset on Trigger filter on 8 ms	or	Auto-reset on Trigger filter on 16 ms	or	Auto-reset off Trigger filter off
● ● ▬		● ● ▬		● ● ▬		● ● ▭		● ● ▬

Hibernation mode (only for **"radio on"**)

On 30 s	or	On 5 s	or	Off
● ● ▬		● ● ▬		● ● ▬

Multiple probe mode (omitted for **"radio on"**)
see **"Multiple probe mode settings"** to view all 16 choices

Mode off	Mode on								
	or	Machine 1	or	Machine 2	or	- - - - →	or	Machine 16
● ● ▭		● ● ▬		● ● ▬				● ● ▬

Battery status

Battery good	or	Battery low
● ● ● ● ●		● ● ● ● ● ● ● ● ● ●

Probe in standby mode (after 5 seconds)

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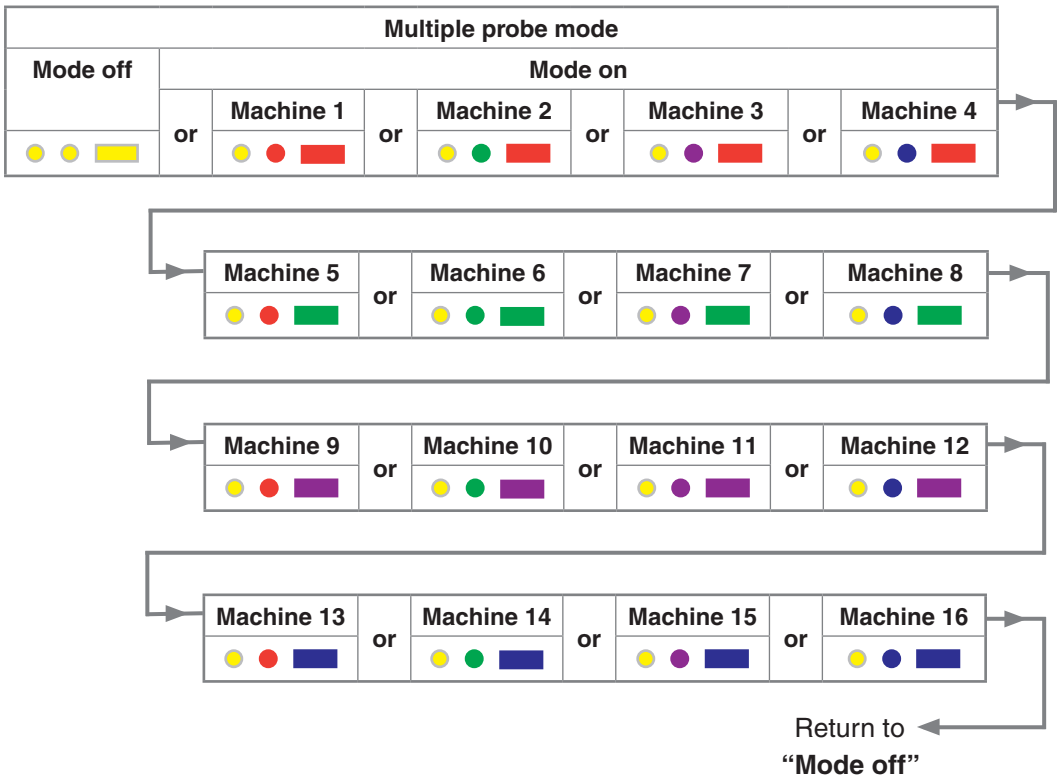
Multiple probe mode settings

Deflect the stylus for less than 4 seconds to cycle to the next setting.



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Probe settings record

This page is provided to note your probe's settings.

			✓ tick Factory settings	✓ tick New settings
Switch-on method	Radio on	● ● ▭	✓	
	Spin on	● ● ▬		
Switch-off method	Radio or spin	● ● ▬	✓	
	Short timeout (12 s)	● ● ▬		
	Medium timeout (33 s)	● ● ▬		
	Long timeout (134 s)	● ● ▭		
Auto-reset and enhanced trigger filter	Auto reset off / Trigger filter on (8 ms)	● ● ▬		
	Auto reset off / Trigger filter on (16 ms)	● ● ▬		
	Auto reset on / Trigger filter on (8 ms)	● ● ▬	✓	
	Auto reset on / Trigger filter on (16 ms)	● ● ▭		
	Auto reset off / Trigger filter off	● ● ▬		
Hibernation mode	On (30 s)	● ● ▬	✓	
	On (5 s)	● ● ▬		
	Off	● ● ▬		
Multiple probe mode	Off (factory set)	● ● ▭	✓	
	On (machine number)	See **"Multiple probe settings"**		

Factory settings are for kit (A-6570-0001) only.

RMP400 serial no .....

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Probe partnering function

The probe partnering function enables the RMP400 to be partnered with the RMI or RMI-Q independently of the configuration process for other probe settings. To partner RMP400 with RMI or RMI-Q, insert the batteries or, if they have already been installed, remove them for five seconds and then refit them.

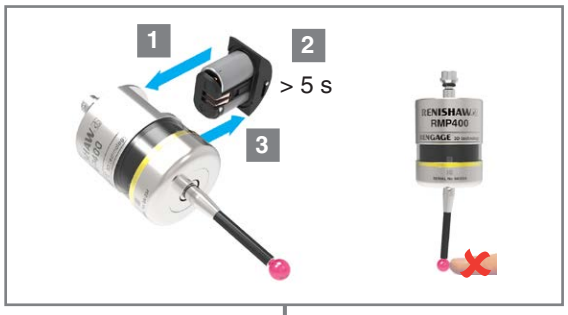
Following an LED check, the RMP400 will proceed to show the probe settings, this will end with "**Probe status**" being displayed. If the battery power is good, probe status will be eight green flashes. If battery power is low, each green flash will be followed by a blue flash.

Whilst the "**Probe status**" is being displayed, deflect and immediately release the stylus to enter "**Acquisition mode**".

"**Acquisition mode off**" will be displayed as a sequence of light blue flashes, at this point the RMI or RMI-Q must be turned on.

On the RMP400 select "**Acquisition mode on**" by deflecting the stylus for less than 4 seconds. After a successful acquisition, the RMP400 will timeout after 8 seconds and then go into standby. If "**Acquisition mode on**" is not selected, the RMP400 will timeout after 120 seconds and then go into standby (see page 4.10, "RMP400 – RMI partnership") or (see page 4.11, "RMP400 – RMI-Q partnership").

Key to the symbols	
●	LED short flash
▬	LED long flash
⇨	Deflect the stylus for less than 4 seconds to move to the next menu option.
↓	To exit, leave the stylus untouched for more than 120 seconds.
↓	Acquisition successful. Probe is now in standby.



LED check

● ● ●

All probe settings will be shown, ending with "**Probe status**" being displayed.

Probe status (seated)		
Battery good	**or**	**Battery low**
●●●●●●●●		●●●●●●●●●●●●●●●●

Whilst the "**Probe status**" is being displayed, deflect and release the stylus to enter "**Acquisition mode off**". Probe status will flash red to acknowledge this.

Probe status		
Battery good	**or**	**Battery low**
●●●●●●●● ●●●●●●●●		●●●●●●●●●●●●●●●● ●●●●●●●●●●●●●●●●

At this point turn on either the RMI or RMI-Q.

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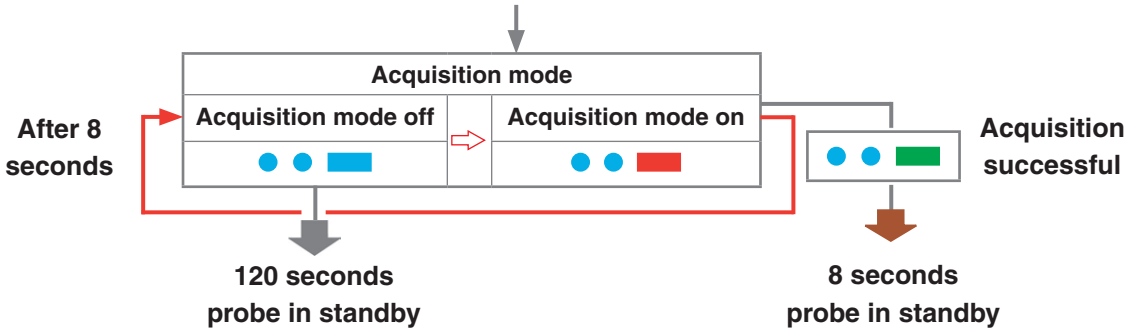

If acquisition is unsuccessful "**Acquisition mode off**" will be displayed again after 8 seconds.
Deflect the stylus for less than 4 seconds to select "**Acquisition mode on**" again.

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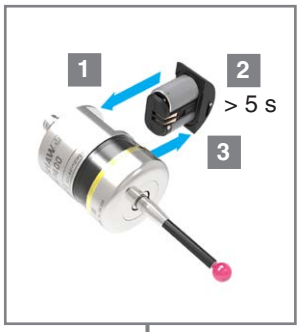
Changing the probe settings

Insert the batteries or, if they have already been installed, remove them for five seconds and then refit them.

Following the LED check, immediately deflect the stylus and hold it deflected until eight red flashes have been observed (if the battery power is low, each red flash will be followed by a blue flash).

Keep the stylus deflected until the "**Switch-on method**" setting is displayed, then release it.

CAUTION: Do not remove the batteries whilst in configuration mode. To exit, leave the stylus untouched for more than 20 seconds.



LED check

Probe status (triggered)		
Battery good	or	Battery low

Key to the symbols	
●	LED short flash
▬	LED long flash
⇨	Deflect the stylus for less than 4 seconds to move to the next menu option.
⇩	Deflect the stylus for more than 4 seconds to move to the next menu.
⬇	To exit, leave the stylus untouched for more than 120 seconds.
⇩	To exit, leave the stylus untouched for more than 20 seconds.

Switch-on method
(omitted if "**multiple probe mode**" was selected)

Radio on	Spin on

Switch-off method

Radio off or Spin off	Short timeout 12 s	Medium timeout 33 s	Long timeout 134 s

Enhanced trigger filter setting and auto-reset facility

Auto reset off Trigger filter on 8 ms	Auto reset off Trigger filter on 16 ms	Auto reset on Trigger filter on 8 ms	Auto reset on Trigger filter on 16 ms	Auto reset off Trigger filter off

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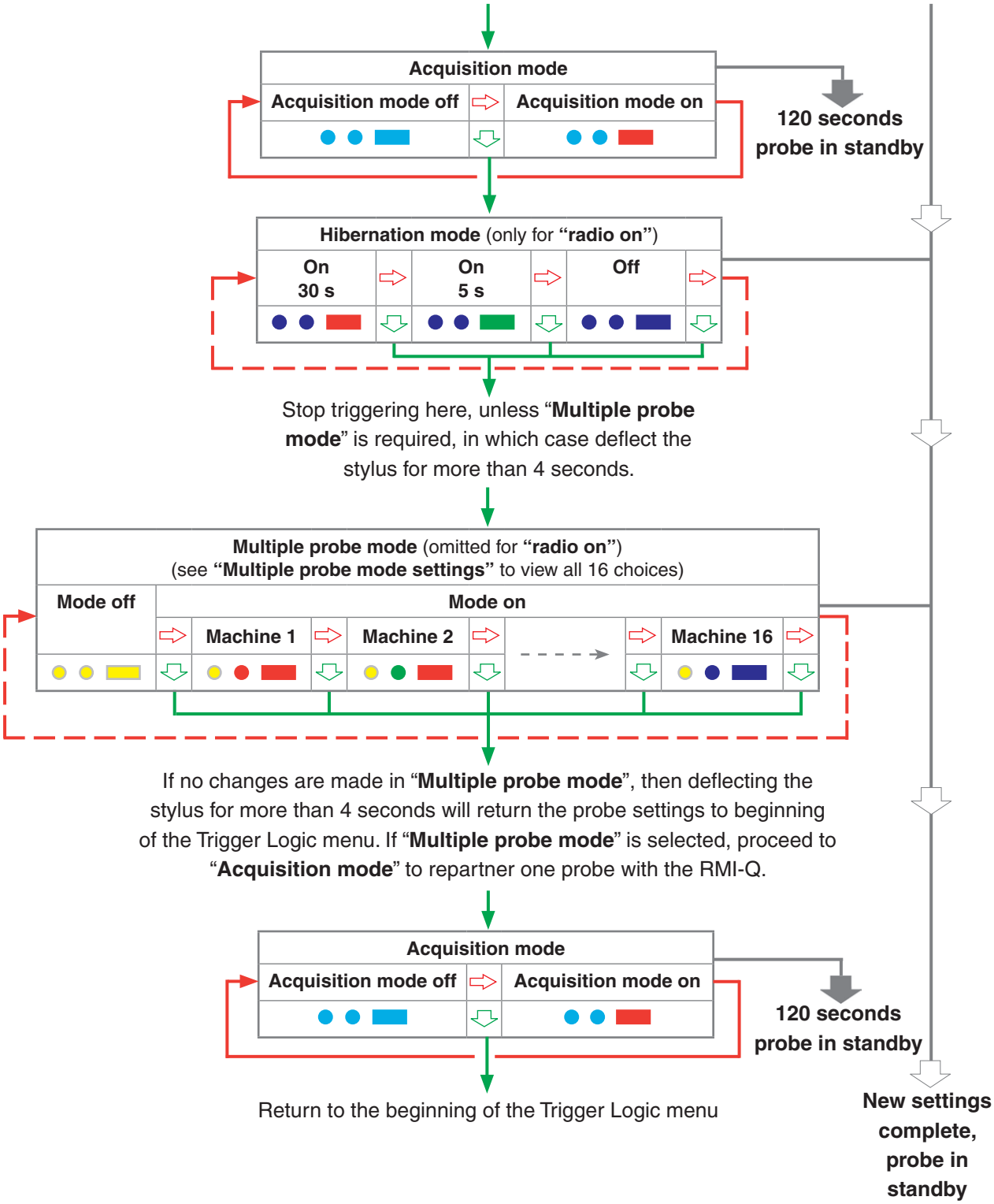

NOTE: If using "**Multiple probe mode**", refer to the installation guide *RMI radio machine interface* (Renishaw part no. H-4113-8554) or the installation guide *RMI-Q radio machine interface* (Renishaw part no. H-5687-8504).

NOTE: Further probes used require the same "**Multiple probe mode**" setting, but do not need to be partnered with the RMI or RMI-Q.

NOTE: To partner an RMP400 with an RMI please see "RMP400 – RMI partnership". Once acquisition has been successful, the RMP400 will revert to "**Acquisition mode off**".

NOTE: To partner an RMP400 with an RMI-Q please see "RMP400 – RMI-Q partnership". Once acquisition has been successful, the RMP400 will revert to "**Acquisition mode off**".

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Master reset function

RMP400 features a master reset function to assist user's who have mistakenly changed the probe settings into an unintended state.

The application of the master reset function will clear all current probe settings and return the probe to default settings.

The default settings are as follows:

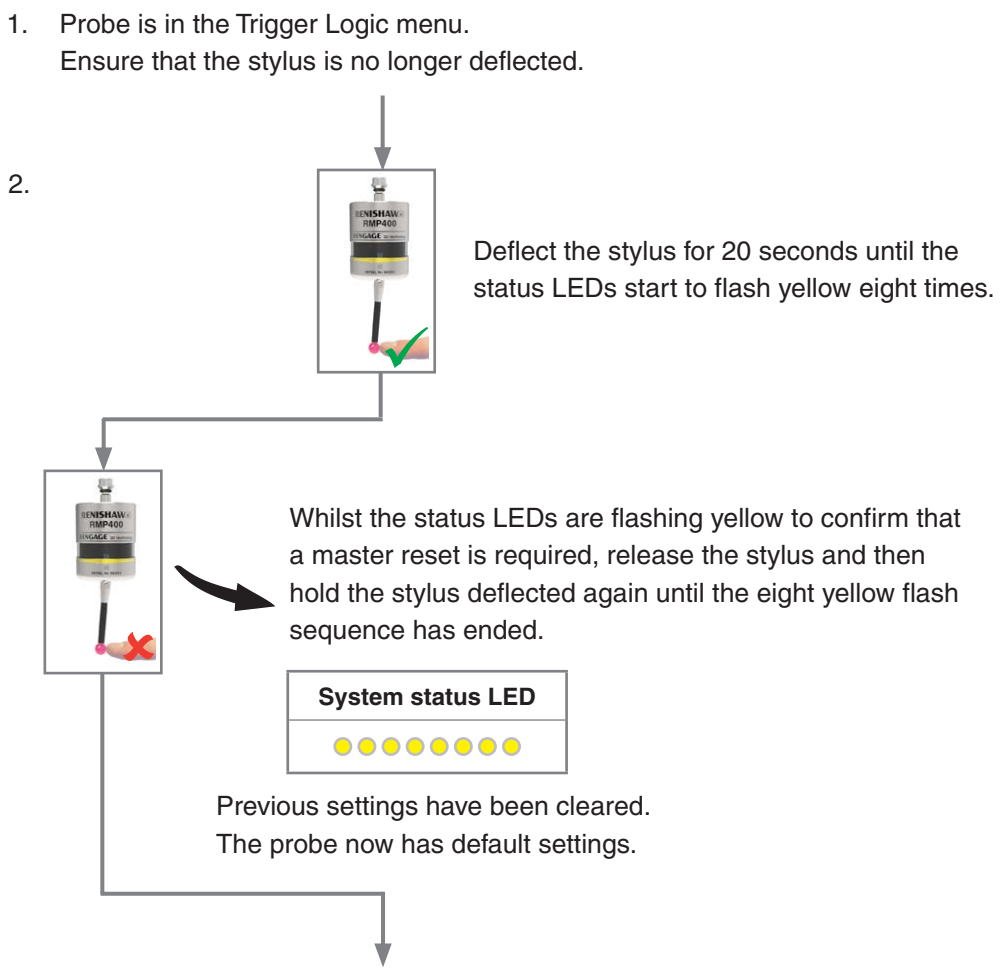
- Radio switch-on
- Radio switch-off
- Auto-reset on, Enhanced trigger filter on 8 ms
- Hibernation mode on 30 s
- Multiple probe mode off

The default settings may not be representative of the required probe settings. Further configuration of RMP400 may subsequently be necessary to achieve the required probe settings.

To reset the probe

1. First enter into the Trigger Logic™ menu and ensure that the stylus is no longer deflected.
2. From within the Trigger Logic menu, hold the stylus deflected for 20 seconds. After this the status LEDs will proceed to flash yellow eight times. A confirmation for master reset is required, if nothing is done the probe will timeout.

   To confirm that a master reset is required, release the stylus and then hold the stylus deflected again until the eight yellow flash sequence has ended. This action will clear all probe settings and return the probe to default settings. Following an LED check the RMP400 will then go back into Trigger Logic and will display "**Switch-on method**".
3. Further configuration using Trigger Logic may be necessary to achieve the required probe settings.



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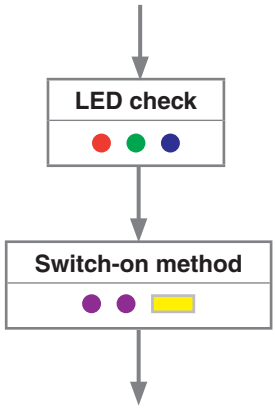

Probe is now back in the Trigger Logic menu and will display "**Switch-on method**".

3. Configure probe settings as required using Trigger Logic

NOTE: RMP400 will continue to be partnered with either the RMI or RMI-Q following the activation of the master reset function, unless "**Multiple probe mode**" has been used.

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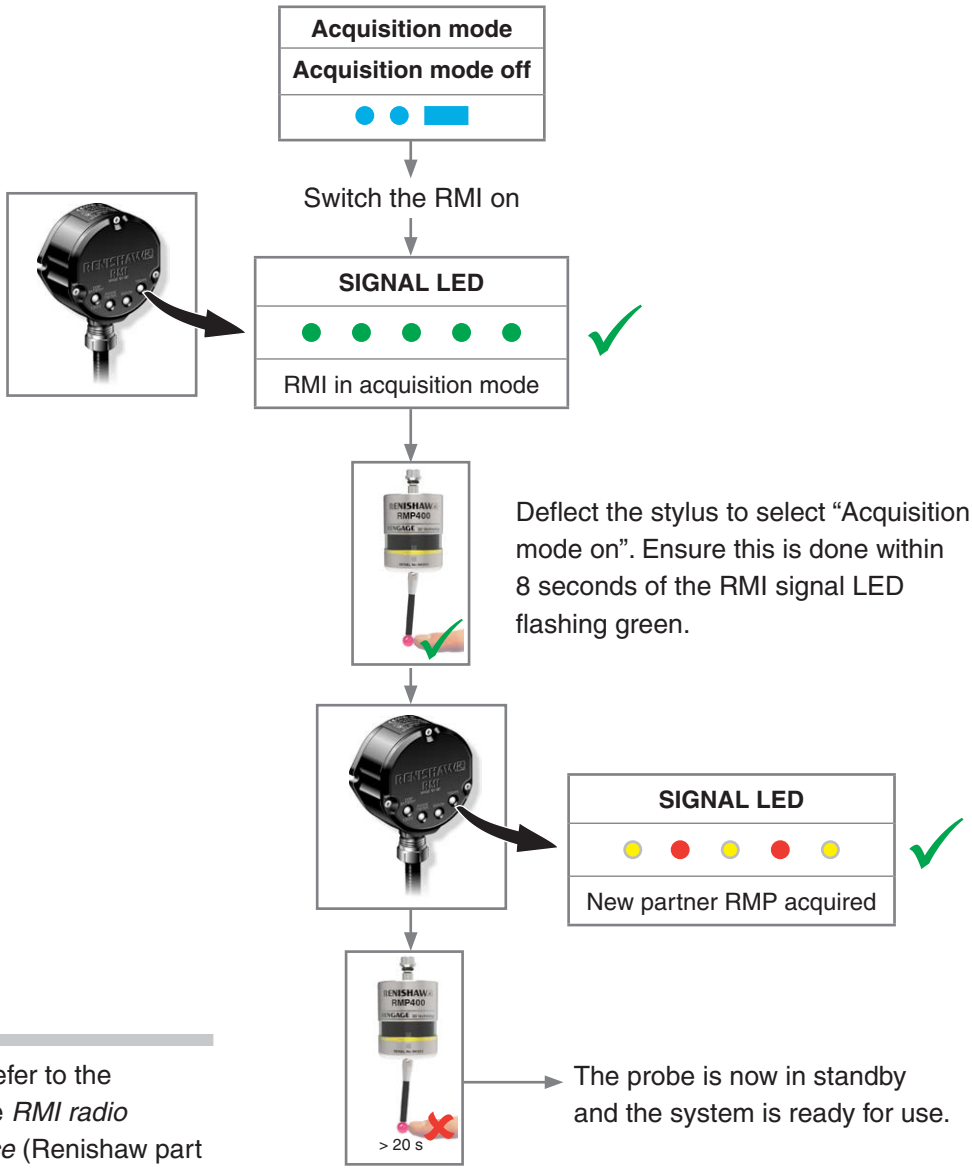
RMP400 – RMI partnership

System set-up is achieved using Trigger Logic and powering the RMI. Partnering is only required during initial system set-up. Further partnering will be required if either the RMP400 or RMI is changed, or if a system is reconfigured for multiple probes (multiple probe mode).

Partnering will not be lost by reconfiguring the probe settings or when changing batteries, except where multiple probe mode is selected. Partnering can take place anywhere within the operating envelope.

In configuration mode, configure the probe settings as required until you reach the "Acquisition mode" menu, which defaults to "Acquisition mode off".



NOTE: Please refer to the installation guide *RMI radio machine interface* (Renishaw part no. H-4113-8554) when partnering the RMP400.

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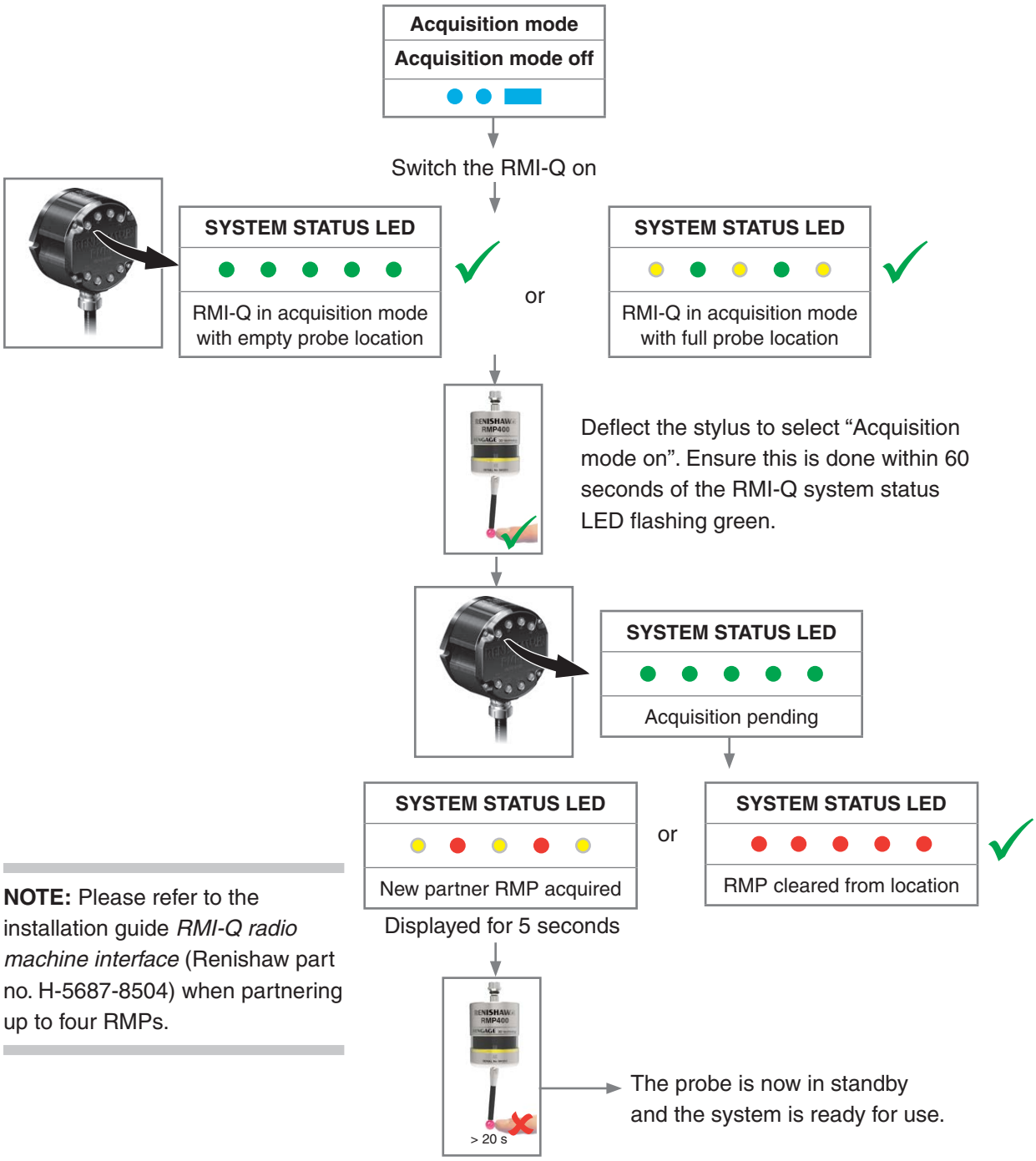
RMP400 – RMI-Q partnership

System set-up is achieved by using Trigger Logic and powering on the RMI-Q or applying ReniKey. Partnering is required during initial system set-up. Further partnering will be required if either the RMP400 or RMI-Q is changed.

Partnering will not be lost by reconfiguring the probe settings or changing the batteries. Partnering can take place anywhere within the operating envelope.

An RMP400 that is partnered with the RMI-Q but then used with another system will need to be repartnered before being used again with the RMI-Q.

In configuration mode, configure the probe settings as required until you reach the "Acquisition mode" menu, which defaults to "Acquisition mode off".



NOTE: Please refer to the installation guide *RMI-Q radio machine interface* (Renishaw part no. H-5687-8504) when partnering up to four RMPs.

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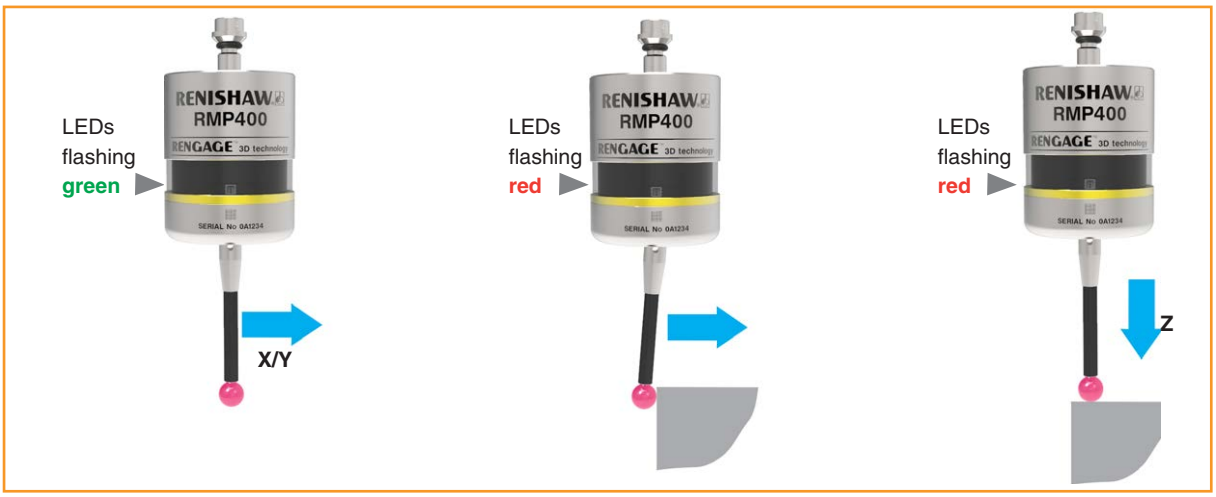
Operating mode



Probe status LEDs

LED colour	Probe status	Graphic hint
Flashing green	Probe seated in operating mode	● ● ●
Flashing red	Probe triggered in operating mode	● ● ●
Flashing green and blue	Probe seated in operating mode – low battery	●●●●●●
Flashing red and blue	Probe triggered in operating mode – low battery	●●●●●●
Constant red	Battery dead	▬
Flashing red or Flashing red and green or Sequence when batteries are inserted	Unsuitable battery	● ● ● ●●●●●● ●●●●●●
Constant blue	Probe damaged beyond use	▬

NOTE: Due to the nature of lithium-thionyl chloride batteries, if a “low battery” LED warning is ignored, it is possible for the following sequence of events to occur:

1. When the probe is active, the batteries discharge until battery power becomes too low for the probe to operate correctly.
2. The probe stops functioning, but then reactivates as the batteries recover sufficiently to provide the probe with power.
3. The probe begins to run through the LED review sequence (see page 4.1, “Reviewing the probe settings”).
4. Again, the batteries discharge and the probe ceases to function.
5. Again, the batteries recover sufficiently to provide the probe with power, and the sequence repeats itself.

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Maintenance

Maintenance

You may undertake the maintenance routines described in these instructions.

Further dismantling and repair of Renishaw equipment is a highly specialised operation, which must be carried out at an authorised Renishaw Service Centre.

Equipment requiring repair, overhaul or attention under warranty should be returned to your supplier.

Cleaning the probe

Wipe the window of the probe with a clean cloth to remove machining residue. This should be done on a regular basis to maintain optimum transmission.

CAUTION: The RMP400 has a glass window. Handle with care if broken to avoid injury.

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Changing the batteries

1

CAUTIONS:

Do not leave dead batteries in the probe.

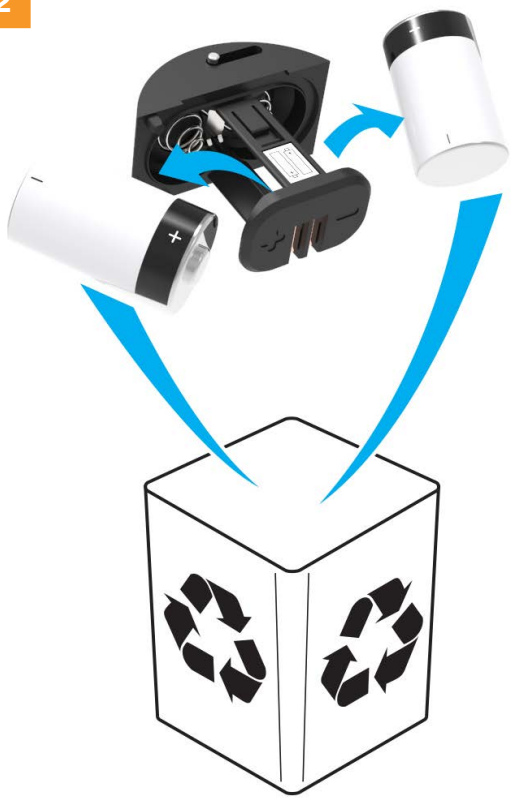
When changing batteries, do not allow coolant or debris to enter the battery compartment.

When changing batteries, check that the battery polarity is correct.

Take care to avoid damaging the battery cassette gasket.

Only use specified batteries.

2



CAUTION: Please dispose of dead batteries in accordance with local regulations. Never dispose of batteries in a fire.

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3

NOTES:

After removing the old batteries, wait more than 5 seconds before inserting the new batteries.

Do not mix new and used batteries or battery types, as this will result in reduced life and damage to the batteries.

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

If dead batteries are inadvertently inserted, the LEDs will remain a constant red.

Battery type					
½ AA lithium-thionyl chloride (3.6 V) × 2					
✓	**Ecocel** **Saft:** **Tadiran:** **Xeno:**	EB1426 LS 14250C LS 14250 SL-750 XL-050F	✗	**Dubilier:** **Maxell:** **Sanyo** **Tadiran:** **Varta:**	SB-AA02 ER3S CR 14250SE SL-350, SL-550, TL-4902, TL-5902, TL-2150, TL-5101 CR ½AA

4

5

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Fault-finding

Symptom	Cause	Action
Probe fails to power up (no LEDs illuminated or fails to indicate current probe settings).	Dead batteries.	Change batteries.
	Unsuitable batteries.	Fit suitable batteries.
	Batteries inserted incorrectly.	Check battery insertion/polarity.
	Batteries removed for too short a time and probe has not reset.	Remove batteries for a minimum of 5 seconds.
	Poor connection between battery cassette mating surfaces and contacts.	Remove any dirt and clean the contacts before reassembly.
Probe fails to switch on.	Dead batteries.	Change batteries.
	Batteries inserted incorrectly.	Check battery insertion/polarity.
	Probe out of range.	Check position of RMI or RMI-Q, (see operating envelope).
	No RMI or RMI-Q “start/stop” signal (“radio on” method only).	Check RMI or RMI-Q for green start LED.
	Incorrect spin speed (“spin on” method only).	Check spin speed and duration.
	Incorrect switch on method configured.	Check configuration and alter as required.
	Incorrect multiple probe mode setting configured.	Check configuration and alter as required.
	RMP400 in hibernation mode (radio on method only).	Ensure probe is in range and wait up to 30 seconds, then resend switch-on signal. Check position of RMI or RMI-Q, see operating envelope.
	Spin on is within 1 second of spin off.	Check for 1 second dwell following spin off.

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Symptom	Cause	Action
Machine stops unexpectedly during a probing cycle.	Radio link failure/RMP400 out of range.	Check interface/receiver and remove obstruction.
	RMI or RMI-Q receiver/machine fault.	Refer to receiver/machine user's guide.
	Dead batteries.	Change batteries.
	Excessive machine vibration causing false probe trigger.	Enable enhanced trigger filter.
	Probe unable to find target surface.	Check that part is correctly positioned and that stylus has not broken.
	Adjacent probe.	Reconfigure adjacent probe to low power mode and reduce range of receiver.
	Stylus not given sufficient time to settle from a rapid deceleration.	Add a short dwell before the probing move (length of dwell will depend on stylus length and rate of deceleration). Maximum dwell is one second.
Probe crashes.	Workpiece obstructing probe path.	Review probing software.
	Probe length offset missing	Review probing software.
	In cases where there is more than one probe on a machine, incorrect probe activated.	Review interface wiring or part program.
Probe permanently triggered.	Probe orientation has changed – i.e. from horizontal to vertical.	Select probe "Auto-reset" function.
	New stylus has been fitted.	Turn probe off and on again.
	Probe was switched on when stylus was deflected.	Turn probe off and on again. Ensure stylus is seated during switch on.
	Probe has not settled before a trigger move occurs following a rotation or rapid move ("Auto-reset" mode only).	Turn probe off and on again, and increase the dwell from 0.2 to 0.5 second dwell before probing move.
	Probe has collided with an object during a rotation or rapid move ("Auto-reset" mode only).	Turn probe off and on again.

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Symptom	Cause	Action
Poor probe repeatability and/or accuracy.	Debris on part or stylus.	Clean part and stylus.
	Poor tool change repeatability.	Redatum probe after each tool change.
	Loose probe mounting on shank or loose stylus.	Check and tighten as appropriate.
	Excessive machine vibration.	Enable enhanced trigger filter. Eliminate vibrations.
	Calibration out of date and/or incorrect offsets.	Review probing software.
	Calibration and probing speeds not the same.	Review probing software.
	Calibration feature has moved.	Correct the position.
	Measurement occurs as stylus leaves surface.	Review probing software.
	Measurement occurs within the machine's acceleration and deceleration zone.	Review probing software and probe filter settings.
	Probing speed too high or too slow.	Perform simple repeatability trials at various speeds.
	Temperature variation causes machine and workpiece movement.	Minimise temperature changes.
	Machine tool faulty.	Perform health checks on machine tool.
RMP400 status LEDs do not correspond to RMI or RMI-Q status LEDs.	Radio link failure – RMP400 out of RMI or RMI-Q range.	Check position of RMI or RMI-Q, see operating envelope.
	RMP400 has been enclosed/ shielded by metal.	Remove from obstruction.
	RMP400 and RMI or RMI-Q are not partnered.	Partner RMP400 and RMI or RMI-Q.

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Symptom	Cause	Action
RMI or RMI-Q error LED lit during probing cycle.	Probe not switched on or probe timed out.	Change setting. Review switch-off method.
	Probe out of range.	Check position of RMI or RMI-Q, see operating envelope.
	Dead batteries.	Change batteries.
	RMP400 and RMI or RMI-Q are not partnered.	Partner RMP400 with RMI or RMI-Q.
	Probe selection error.	Verify that one RMP is working and is correctly selected.
	“Fast” turn-on error.	Ensure that all RMPs are ‘Q’ marked probes, or change the RMI-Q turn-on time to “standard”.
RMI or RMI-Q low battery LED lit.	Low batteries.	Change batteries soon.
Reduced range.	Local radio interference.	Identify and remove.
Probe fails to switch off.	Incorrect “switch-off” method configured.	Check configuration and alter as required.
	No RMI or RMI-Q “start/stop” signal (“radio on” method only).	Check RMI or RMI-Q for green start LED.
	Probe in timeout mode and placed in tool magazine and being triggered by movement.	Use shorter timeout setting or use different switch-off method.
	Incorrect spin speed (spin switch on only).	Check spin speed.
	Spin off is within 1 second of a spin on	Check for a 1 second dwell following a spin on.
Probe goes into Trigger Logic™ configuration mode and cannot be reset.	Probe was triggered when batteries were inserted.	Do not touch the stylus or stylus mounting face during battery insertion.
Probe status LED shows a constant blue	Probe damaged beyond use.	Return the probe to your nearest Renishaw supplier for repair/ replacement.

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Parts list

Item	Part number	Description
RMP400	A-6570-0001	RMP400 probe with batteries, tool kit and quick-start guide (factory-set to radio on/radio off).
Battery	P-BT03-0007	½AA battery – lithium-thionyl chloride (pack of two).
Stylus	A-5003-7306	50.0 mm (1.97 in) long carbon fibre stylus with Ø6.0 mm (0.24 in) ball.
Stylus	A-5003-6510	100.0 mm (3.94 in) long carbon fibre stylus with Ø6.0 mm (0.24 in) ball.
Stylus	A-5003-6511	150.0 mm (5.91 in) long carbon fibre stylus with Ø6.0 mm (0.24 in) ball.
Stylus	A-5003-6512	200.0 mm (7.88 in) long carbon fibre stylus with Ø6.0 mm (0.24 in) ball.
Tool kit	A-4071-0060	Probe tool kit comprising Ø1.98 mm stylus tool, 2.00 mm AF hexagon key and shank grub screw (× 6).
Battery cassette	A-4071-0031	Battery cassette assembly.
Battery gasket	A-4038-0301	Battery cap gasket kit.
RMI	A-4113-0050	RMI (side exit) with 15 m (49.2 ft) cable, tool kit and user's guide.
RMI-Q	A-5687-0050	RMI-Q (side exit) with 15 m (49.2 ft) cable, tool kit and quick-start guide.
Mounting bracket	A-2033-0830	Mounting bracket with fixing screws, washers and nuts.
Styli tool	M-5000-3707	Tool for tightening/releasing styli.
Publications. These can be downloaded from our web site at **www.renishaw.com**.		
RMP400	H-6570-8500	Quick-start guide: for rapid set-up of the RMP400 probe.
RMI QSG	A-4113-8550	Quick-start guide: for rapid set-up of the RMI.
RMI IG	H-4113-8554	Installation guide: for set-up of the RMI.
RMI-Q QSG	H-5687-8500	Quick-start guide: for rapid set-up of the RMI-Q.
RMI-Q IG	H-5687-8504	Installation guide: for set-up of the RMI-Q.
Styli	H-1000-3200	Technical specifications guide: Styli and accessories – or visit our Web shop at **www.renishaw.com/shop**.
Probe software	H-2000-2298	Data sheet: Probe software for machine tools – programs and features.
Taper shanks	H-2000-2011	Data sheet: taper shanks for machine tool probes.

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