Installation guide
H-5312-8503-08-A

RENISHAW
apply innovation™

RMP600 high accuracy radio machine probe

Renishaw part no: H-5312-8503-08-A
First issued: 01.2008
Revised: 10.2017

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Contents

Before you begin

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Disclaimer

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Trade marks

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.

Patents

Features of RMP600 and features of similar products are the subject of one or more of the following patents and/or patent applications:

CN 100416216
CN 100466003
CN 101142461
CN 101171493
CN 101198836
CN 101287958
CN 101476859
CN 101482402
EP 1185838
EP 1373995
EP 1425550
EP 1457786
EP 1477767
EP 1477768
EP 1576560
EP 1613921
EP 1701234
EP 1734426
EP 1804020
EP 1866602
EP 1880163
EP 1893937
EP 1931936
EP 1988439
EP 2154471
EP 2216761
IN 215787
IN 234921
IN 8707/DELNP/2008
IN 6963/DELNP/2007
IN 1869/DELNP/2008
IN 1870/DELNP/2008
IN 8669/DELNP/2007
IN 9914/DELNP/2007
IN 2518/DELNP/2008
JP 3967592
JP 4237051
JP 4575781
JP 4754427
JP 4773677
JP 4851488
JP 4852411
JP 5238749
JP 5283501
JP 5308811
JP 5357541
JP 5390719
JP 5611297
KR 1001244
TW I333052
US 6776344
US 6941671
US 7145468
US 7285935
US 7316077
US 7441707
US 7486195
US 7603789
US 7665219
US 7689379
US 7792654
US 7812736
US 7821420
US 8140287
US 9140547

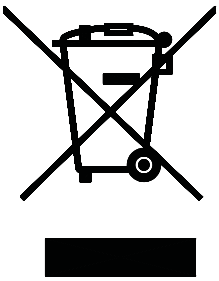
EC declaration of conformity

CE

Renishaw plc hereby declares that the RMP600 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Contact Renishaw plc or visit **www.renishaw.com/rmp600** 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 approvals

Argentina:	CNC ID: 16-9815
Australia:	E2067 R-NZ
Brazil:	3019-11-2812

ANATEL
3019-11-2812
(01)07898914243049

"Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário."

Canada:	IC: 3928A-RMP600
Europe: (28 EU member countries)	CE
India:	1787/2012/WRLO
Indonesia:	39649/SDPPI/2015
Israel:	51-29406
Japan:	004WWA0667
Malaysia:	RAVG/68W/1215/S(15-3353)
New Zealand:	E2067 R-NZ
Russia:	77-14/0359/2020
Singapore:	Reg. No: N0465-09

Complies with IDA Standards DA104642

South Africa:	TA-2011/1396

ICASA TA-2011/1396 APPROVED

South Korea:	REN-RMP600

Taiwan: CCAC08LP0330T1

附件一

低功率電波輻射性電機管理辦法

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，指依電信法規定作業之無線電通信。

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。

USA: FCC ID: KQGRMP600

Vietnam: C0119200815BE01A2

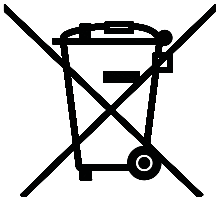
Iceland Liechtenstein Montenegro Norway Switzerland Turkey

China: Exempt

Safety

Information to the user

The RMP600 is supplied with two non-rechargeable AA alkaline batteries. Lithium-thionyl chloride non-rechargeable AA batteries (approved to BS EN 62133:2013 [IEC 62133:2012]) may also be used. 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 Section 5, “Maintenance”), and as indicated on the product. For specific battery operating, safety and disposal guidelines, please refer to the battery manufacturer’s literature.

- Do not attempt to recharge the batteries.
- Please dispose of waste batteries in accordance with your local environmental and safety laws.
- Replace the batteries only with the specified type.
- Ensure that all batteries are inserted with the correct polarity.
- Do not store batteries in direct sunlight.
- Do not heat or dispose of batteries in a fire.
- Do not short-circuit or force discharge 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.

The RMP600 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;
- 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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RMP600 basics

Introduction

The RMP600 offers an unrivalled combination of size, accuracy, reliability and robustness and, for the first time, allows high-accuracy probing on large 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 RMP60, the RMP600 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 RMP600 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 RMP600 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 “Installing the batteries” in Section 3, “System Installation” for further information).

On insertion of batteries, the LEDs will begin to flash (see “Reviewing the probe settings” in Section 4, “Trigger Logic™”).

System interface

The RMI and RMI-Q are integrated interfaces/ receivers used to communicate between the RMP600 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.

or

Current probe settings can be reviewed by simply removing the batteries for a minimum of 5 seconds, and then replacing them to activate the Trigger Logic review sequence.

Probe modes

The RMP600 probe can be in one of three modes:

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

NOTE: The RMP600 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
- Shank switch on/Shank switch off

RMP600 switch-on method Switch-on options are configurable	RMP600 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 1 second minimum.	**Spin off** Spin at 500 rev/min for 1 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 minimum. (The probe must be stationary for 2.5 seconds minimum after it has stopped spinning.)
Shank switch on	**Shank switch off**	3 seconds maximum.

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 1 second starts from the moment the spindle reaches 500 rev/min.

The RMP600 must be on for a minimum of 1 second before being switched off.

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 re-orientation moves. The auto-reset function in the RMP600 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 200 mm long stylus or heavy stylus configurations, a 1 second dwell is required. This will necessitate edits to the machine probing programme.

When in "auto-reset" mode, the probe will not trigger when moved below a speed of 3 mm/min.

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

Multiple probe mode

The RMP600 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 RMP600s 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 RMP600, as such, the option will not appear when the "radio on" option has been selected.

RMP600 probes which are set to "multiple probe mode on" can coexist alongside any number of RMP600 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 "Multiple probe settings" in Section 4, "Trigger Logic™".

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 "Changing the probe settings" in Section 4, "Trigger Logic™".

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 RMP600 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.

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 RMP600 or RMI/RMI-Q is changed.

NOTES:

Systems using the RMI-Q can be partnered with up to four RMP600s 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.

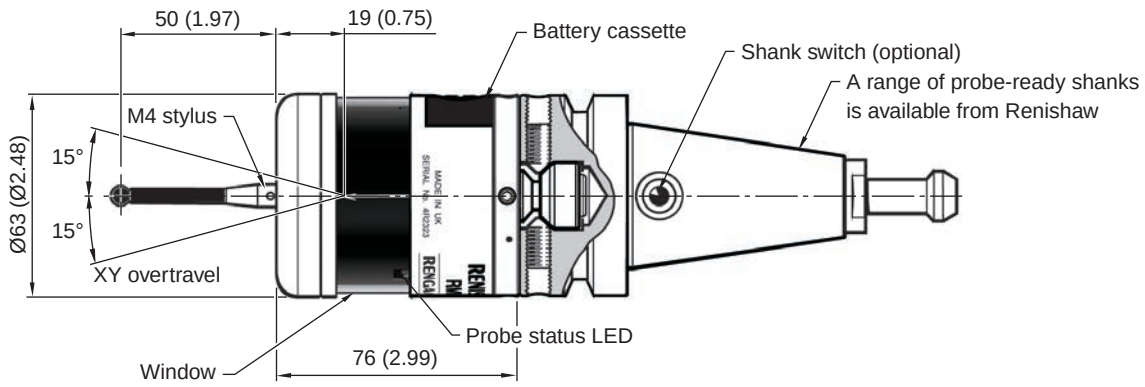
For more information or to download ReniKey free of charge visit:
www.renishaw.com/mtpsupport/renikey

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.

RMP600 dimensions



Dimensions given in mm (in)

Stylus overtravel limits		
Stylus length	**±X/±Y**	**Z**
50 (1.97)	18 (0.70)	11 (0.43)
100 (3.94)	31 (1.22)	11 (0.43)

RMP600 specification

Principal application	Workpiece inspection and job set-up on multi-tasking machines, machining centres and gantry machining centres.	
Dimensions	Length Diameter	76 mm (2.99 in) 63 mm (2.48 in)
Weight (without shank)	With batteries Without batteries	1010 g (35.65 oz) 940 g (33.18 oz)
Transmission type	Frequency hopping spread spectrum (FHSS) radio	
Radio frequency	2400 MHz to 2483.5 MHz	
Switch-on methods	Radio M-code, spin on or shank switch	
Switch-off methods	Radio M-code, timer, spin off or shank switch	
Probe feedrate (minimum)	3 mm/min (0.12 in/min) with auto-reset	
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	
Repeatability	0.25 µm (10 µin) 2σ – 50 mm stylus length (see note 1) 0.35 µm (14 µin) 2σ – 100 mm stylus length	
2D lobing in X, Y	±0.25 µm (10 µin) 2σ – 50 mm stylus length (see note 1) ±0.25 µm (10 µin) 2σ – 100 mm stylus length	
3D lobing in X, Y, Z	±1.00 µm (40 µin) 2σ – 50 mm stylus length (see note 1) ±1.75 µm (70 µin) 2σ – 100 mm stylus length	
Stylus trigger force (see notes 2 and 5) XY plane (typical minimum) +Z plane (typical minimum)	 0.20 N, 20 gf (0.72 ozf) 1.90 N, 194 gf (6.83 ozf)	
Stylus overtravel force XY plane (typical minimum) +Z plane (typical minimum)	 2.8 N, 285 gf (10.07 ozf) typical minimum (see note 3) 9.8 N, 999 gf (35.25 ozf) typical minimum (see note 4)	
Stylus overtravel XY plane +Z plane	 ±15° 11 mm (0.43 in)	

Note 1 Performance specification is tested at a standard test velocity of 240 mm/min (9.45 in/min). 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.

Note 3 Stylus overtravel force in the XY plane occurs 80 µm (3149.61 µin) after the trigger point and rises by 0.35 N/mm, 36 gf/mm (32 ozf/in) until the machine tool stops (in the high force direction and using a carbon fibre stylus).

Note 4 Stylus overtravel force in +Z direction occurs 7 µm to 8 µm (275.59 µin to 314.96 µin) after the trigger point and rises by 1.5 N/mm, 153 gf/mm (137 ozf/in) until the machine tool stops.

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

Environment	IP rating	IPX8 BS EN 60529:1992 + A2 2013 (IEC 60529:1989+AMD1:1999+AMD2:2013)
	IK rating	IK01 BS EN IEC 62262:2002
	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 × AA 1.5 V alkaline or 2 × AA 3.6 V lithium-thionyl chloride	
Battery reserve life	Approximately one week after a low battery warning is first given.	
Typical battery life	See table below.	
Rechargeable batteries	Either Nickel Cadmium (NiCd) or Nickel Metal Hydride (NiMh) can be used. However, when these battery types are fitted, expect a battery life of approximately 50% less than that quoted for alkaline batteries, together with a reduced low battery warning period.	

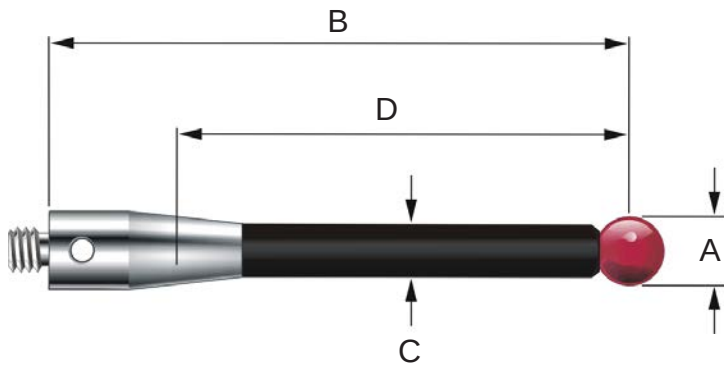
Typical battery life

Battery type	Shank or spin switch on		Radio switch on		Continuous use
	Standby life	5% usage (72 minutes/day)	Standby life	5% usage (72 minutes/day)	
Alkaline	650 days	100 days	130 days	60 days	115 hours
Lithium-thionyl chloride	1300 days	200 days	260 days	120 days	230 hours

NOTE: Using RMP600 with “fast radio on” mode will result in a 5% reduction in usage and standby battery life.

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 (0.24)	6.0 (0.24)	6.0 (0.24)	6.0 (0.24)
B	Length mm (inch)	50.0 (1.97)	100.0 (3.94)	150.0 (5.91)	200.0 (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 RMP600.

It is possible that the featured range of solid carbon fibre styli may not be suitable for every RMP600 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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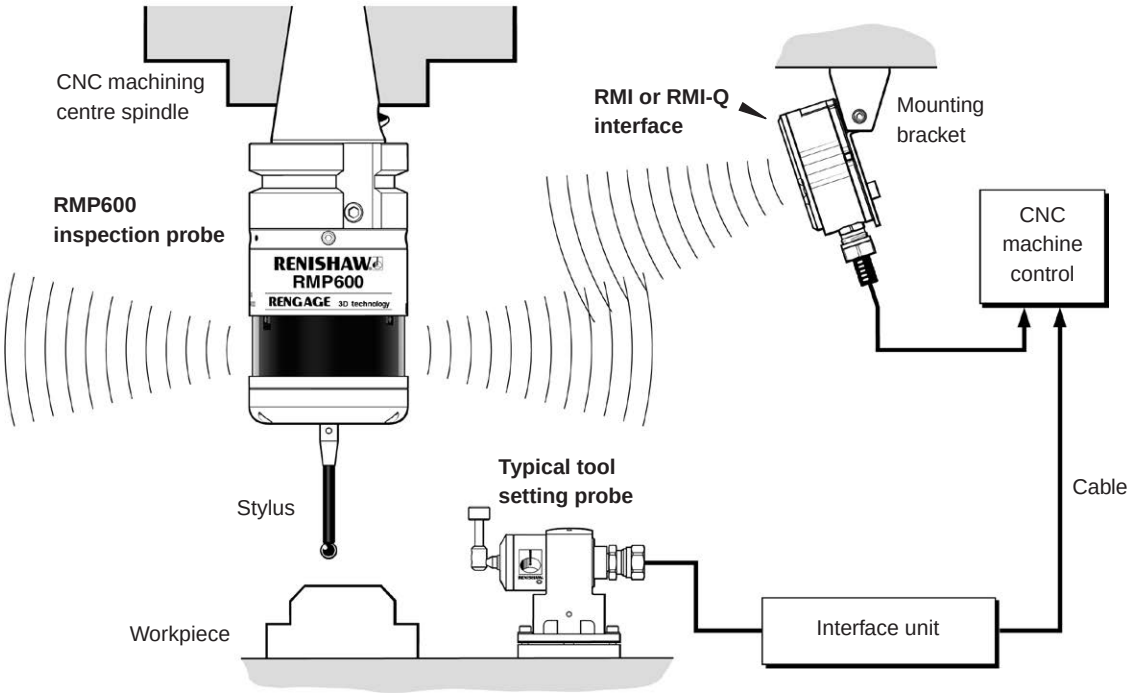
System installation

Installing the RMP600 with an RMI or RMI-Q



Operating envelope

Radio transmission does not require line-of-sight between the probe and transmitter, and will pass through very small 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 RMP600 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.

Positioning the RMP600 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.

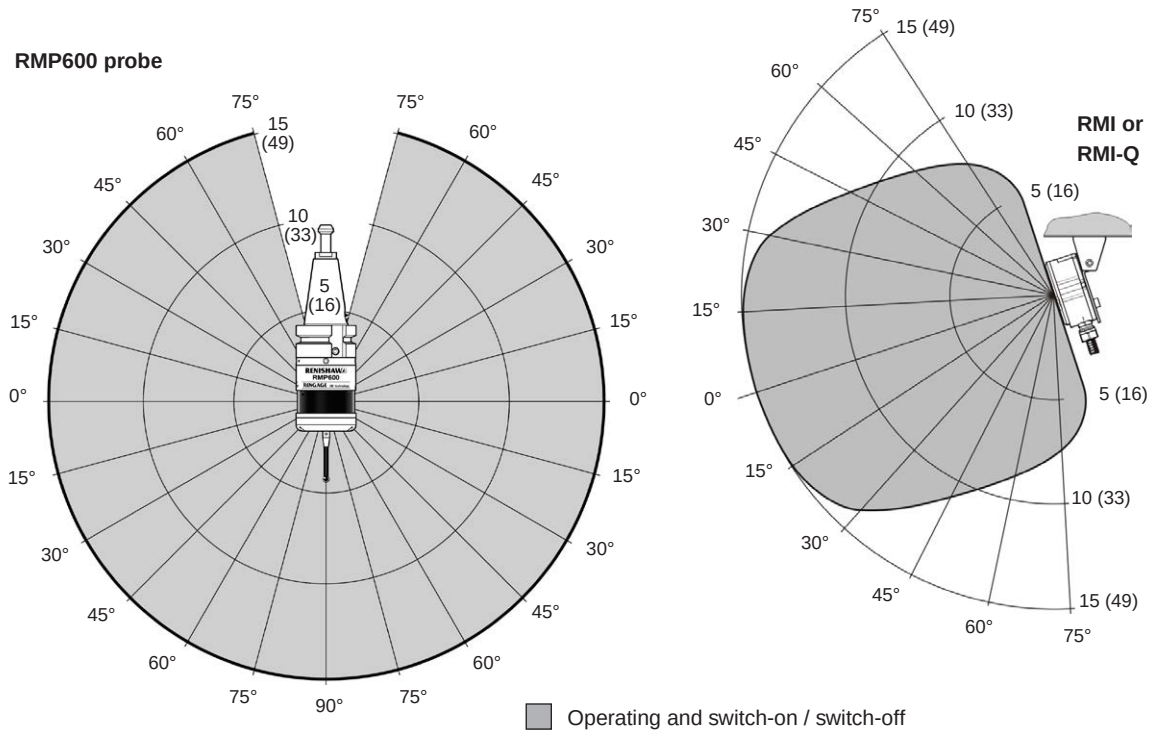
NOTE: Installing the RMP600 and RMI or RMI-Q with the RMP600 in radio-on configuration

The RMP600 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 RMP600 goes into hibernation mode 30 seconds after the RMI or RMI-Q is unpowered (or the RMP600 is out of range). When in hibernation mode, the RMP600 checks for a powered RMI or RMI-Q every 30 seconds. If found, the RMP600 goes from hibernation mode to standby mode, ready for radio-on.

Performance envelope

The RMP600 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, radio transmission does not require this, as any reflected radio paths will be less than the 15 m (49.2 ft) operating range.

Performance envelope when using the RMP600 with the RMI or RMI-Q



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

Preparing the RMP600 for use

Fitting the stylus

1

2

M-5000-3707

Installing the batteries

1

2

3

4

NOTES:

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

Ensure the product is clean and dry before inserting batteries.

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

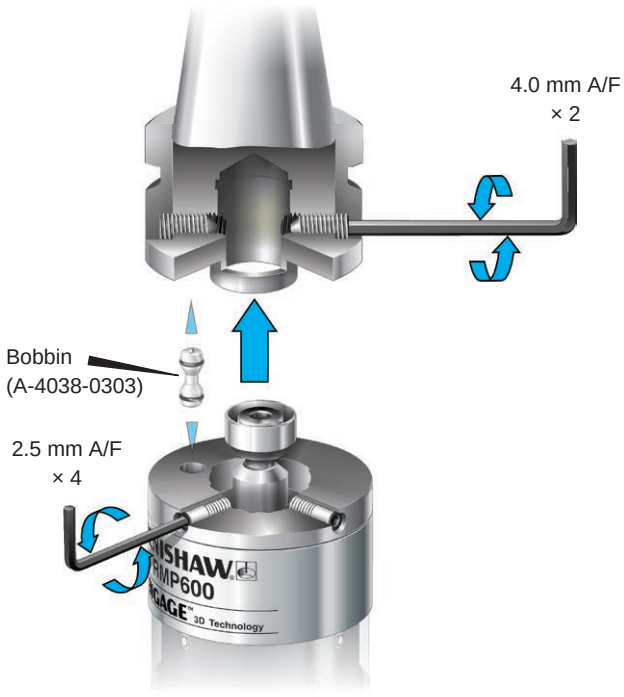
After the batteries have been inserted, the LEDs will display the current probe settings (for details, see Section 4, “Trigger Logic™”).

Mounting the probe on a shank

1

NOTE: Where the RMP600 is to be used with a shank switch, remove the plug from the rear of the probe using pliers and replace it with the bobbin (A-4038-0303).

2



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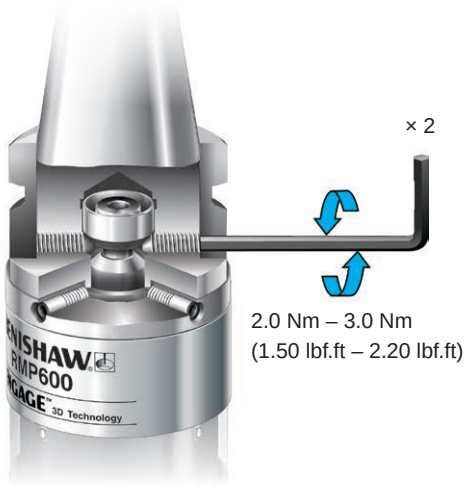


Stylus on-centre adjustment

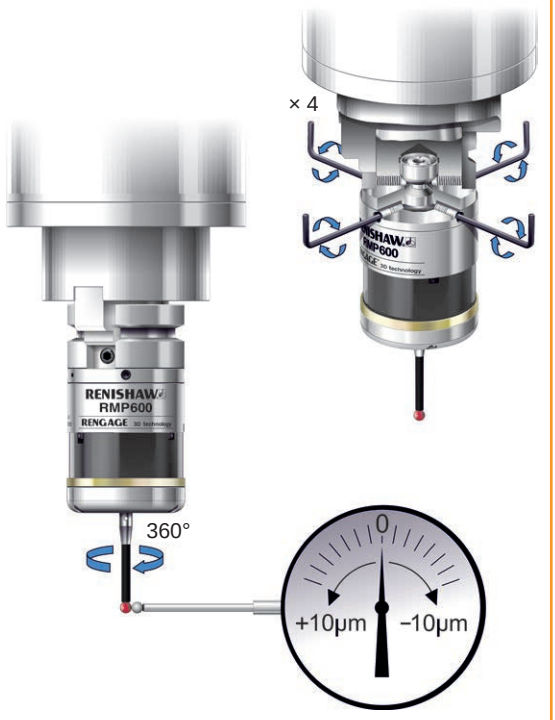
NOTES:

During adjustment, take care not to rotate the probe relative to the shank, as this can damage the bobbin (A-4038-0303), where fitted.

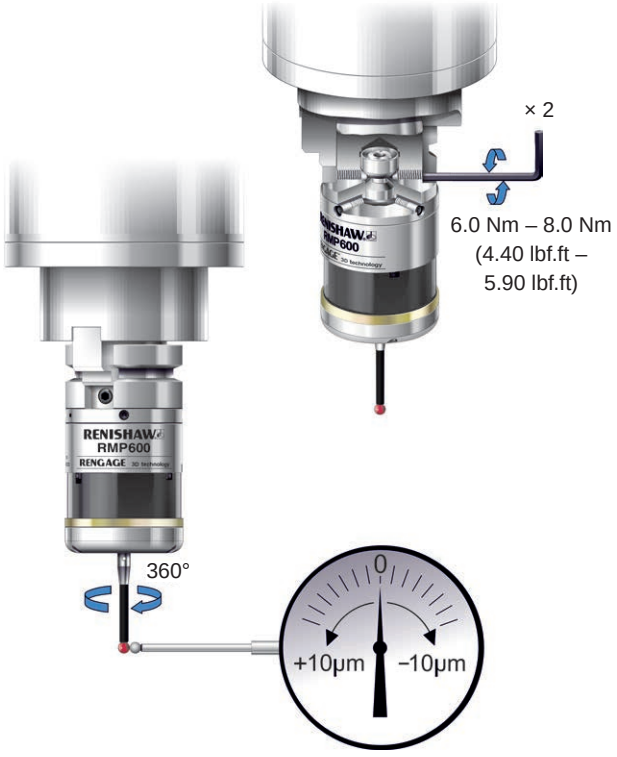
If a probe and shank assembly is dropped, it must be rechecked for correct on-centre adjustment.

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

1



2



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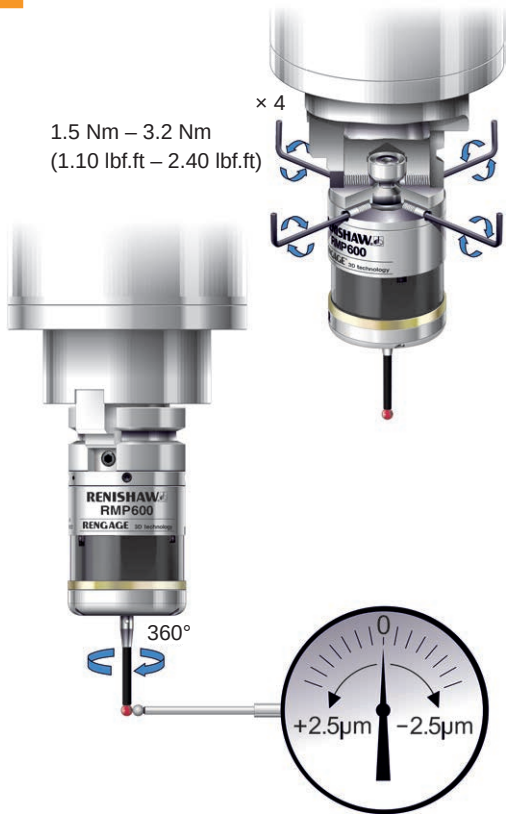

Calibrating the RMP600

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 “Stylus on-centre adjustment” in Section 3, “System installation” earlier in this section). 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 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.

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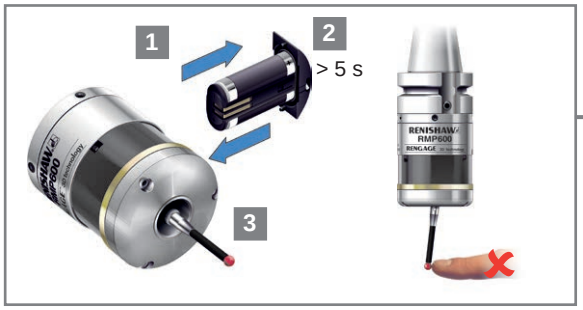
Trigger Logic™

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	Shank on	or	Spin on
● ● ▬		● ● ▬		● ● ▬

Switch-off method (omitted for shank on)

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

Enhanced trigger filter setting 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
● ● ▬		● ● ▬		● ● ▬		● ● ▬		● ● ▬

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
● ● ▬		● ● ▬		● ● ▬				● ● ▬

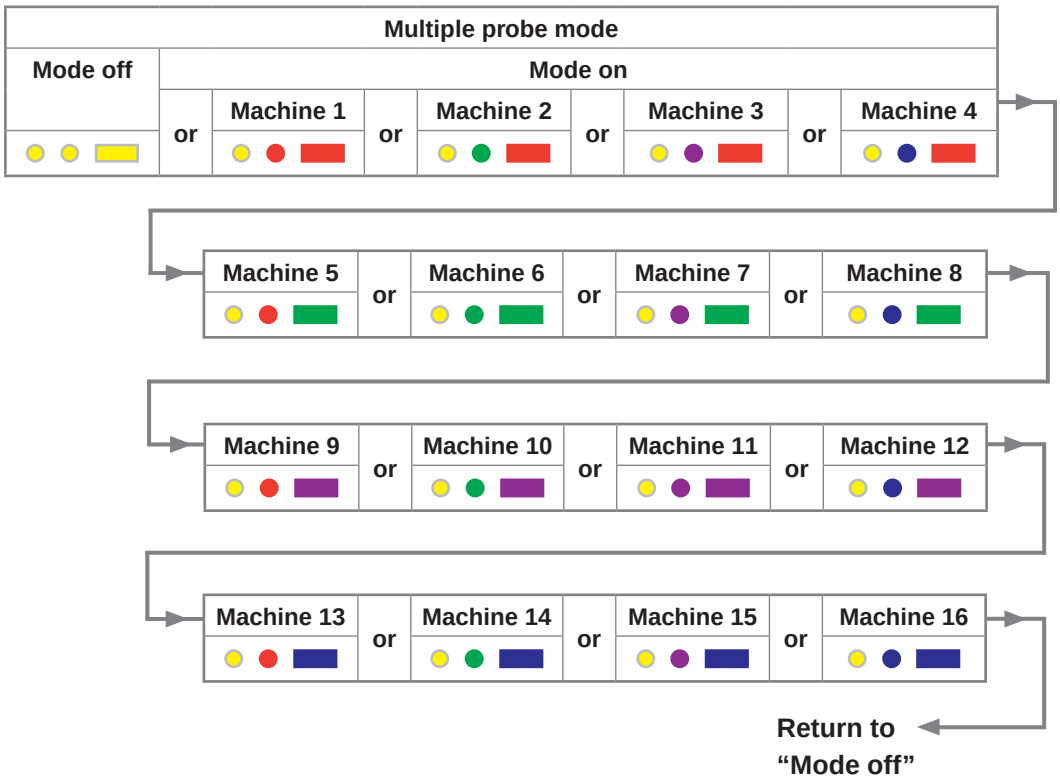
Battery status

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

Probe in standby mode
(after 5 seconds)

Multiple probe settings

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



Probe settings record

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

			✓ tick Factory settings	✓ tick New settings
Switch-on method	Radio on	● ● ▭	✓	
	Shank on	● ● ▬		
	Spin on	● ● ▬		
Switch-off method	Radio or spin	● ● ▬	✓	
	Short timeout (12 s)	● ● ▬		
	Medium timeout (33 s)	● ● ▬		
	Long timeout (134 s)	● ● ▭		
Enhanced trigger filter setting and auto-reset facility	Auto reset off/Filter on (8 ms)	● ● ▬		
	Auto reset off/Filter on (16 ms)	● ● ▬		
	Auto reset on/Filter on (8 ms)	● ● ▬	✓	
	Auto reset on/Filter on (16 ms)	● ● ▭		
	Auto reset off/Filter off	● ● ▬		
Multiple probe mode	Off (factory set)	○ ○ ▭	✓	
	On (machine number)	See "Multiple probe settings"		

Factory settings are for kit (A-5312-0001) only.

RMP600 serial no .....

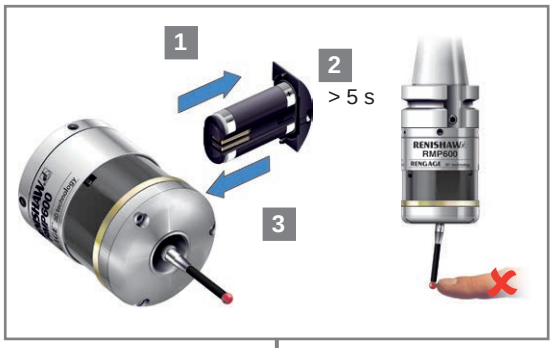
Changing the probe settings

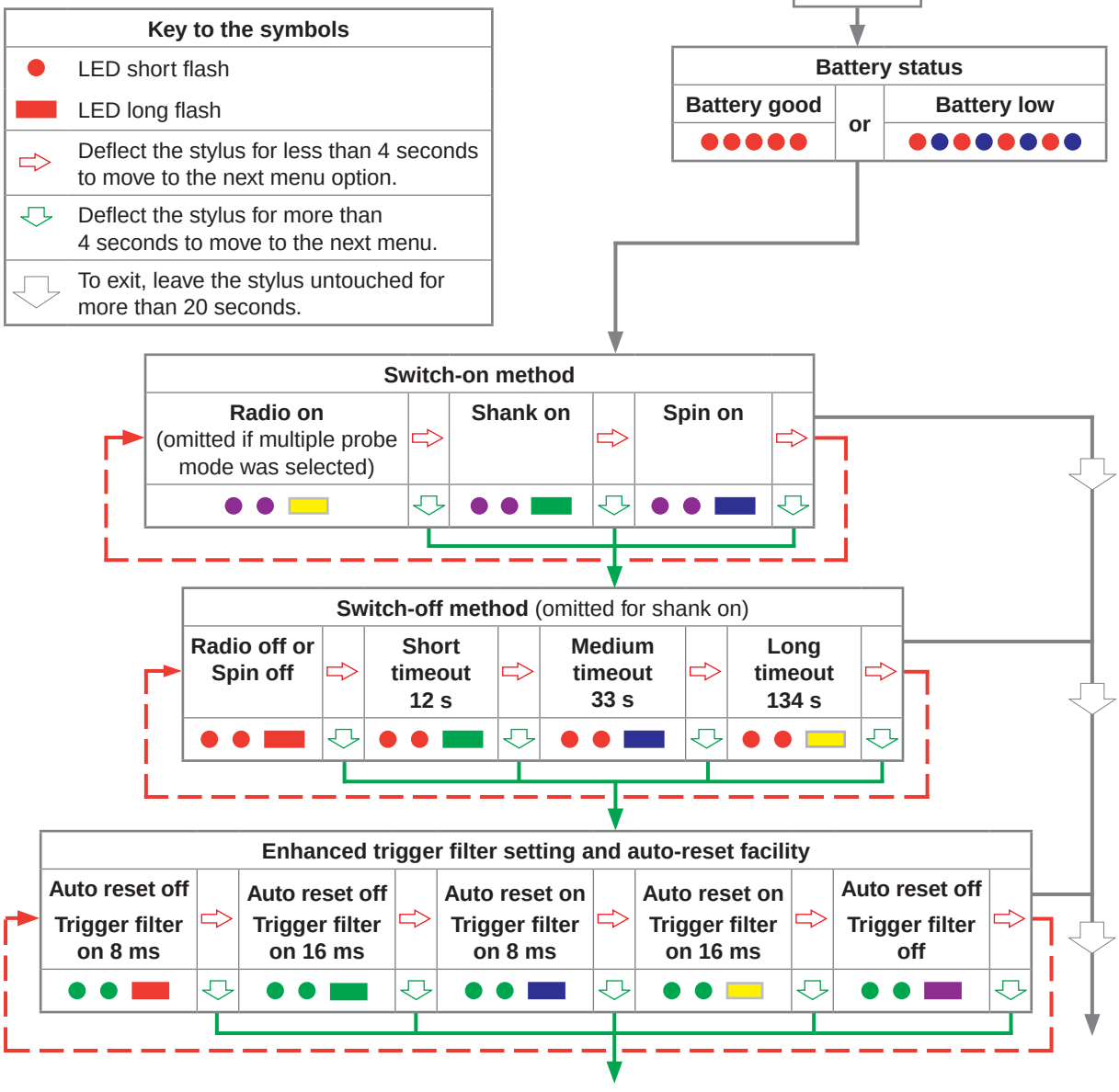
Insert the batteries or, if they have already been installed, remove them for five seconds and then refit them.

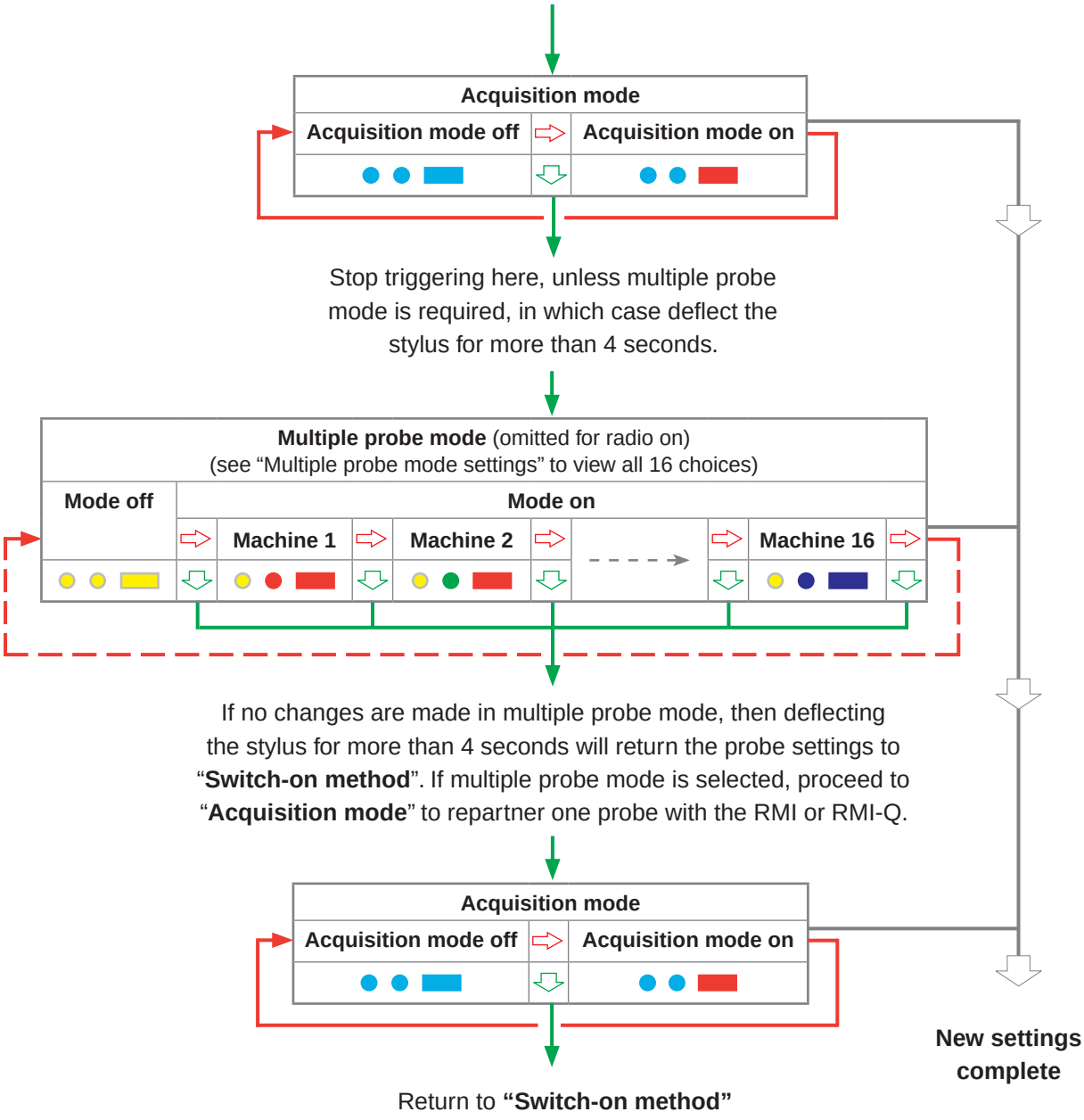
Following the LED check, immediately deflect the stylus and hold it deflected until five red flashes have been observed (if the battery power is low, each red flash will be followed by a blue flash).

Keep the stylus deflected until the "**Switch-on method**" setting is displayed, then release it. The probe is now in configuration mode and Trigger Logic™ is activated.

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







NOTE: If using mutiple 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 RMP600 with an RMI please see "RMP600 – RMI partnership". Once acquisition has been successful, the RMP600 will revert to "Acquisition mode off".

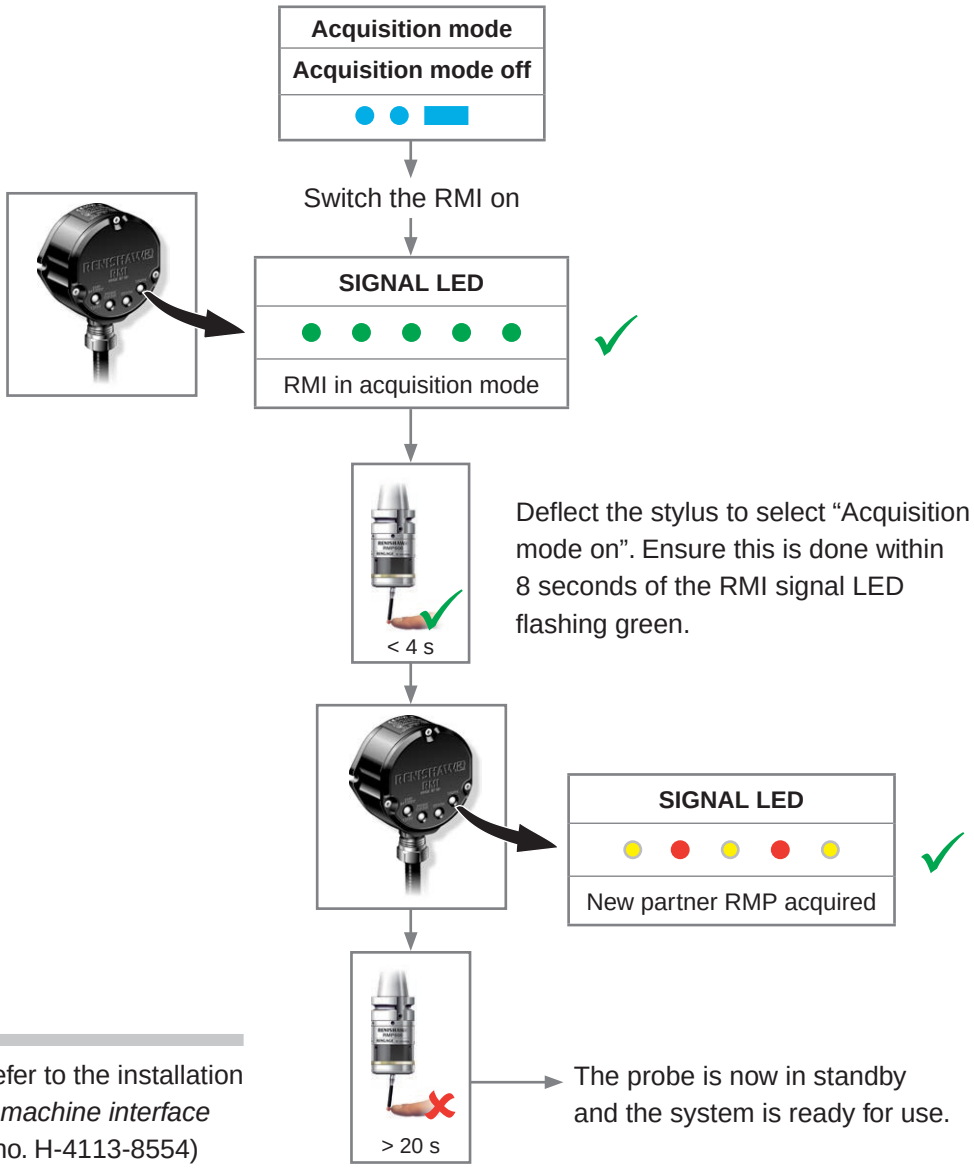
NOTE: To partner an RMP600 with an RMI-Q please see "RMP600 – RMI-Q partnership". Once acquisition has been successful, the RMP600 will revert to "Acquisition mode off".

RMP600 – 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 RMP600 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 RMP600.

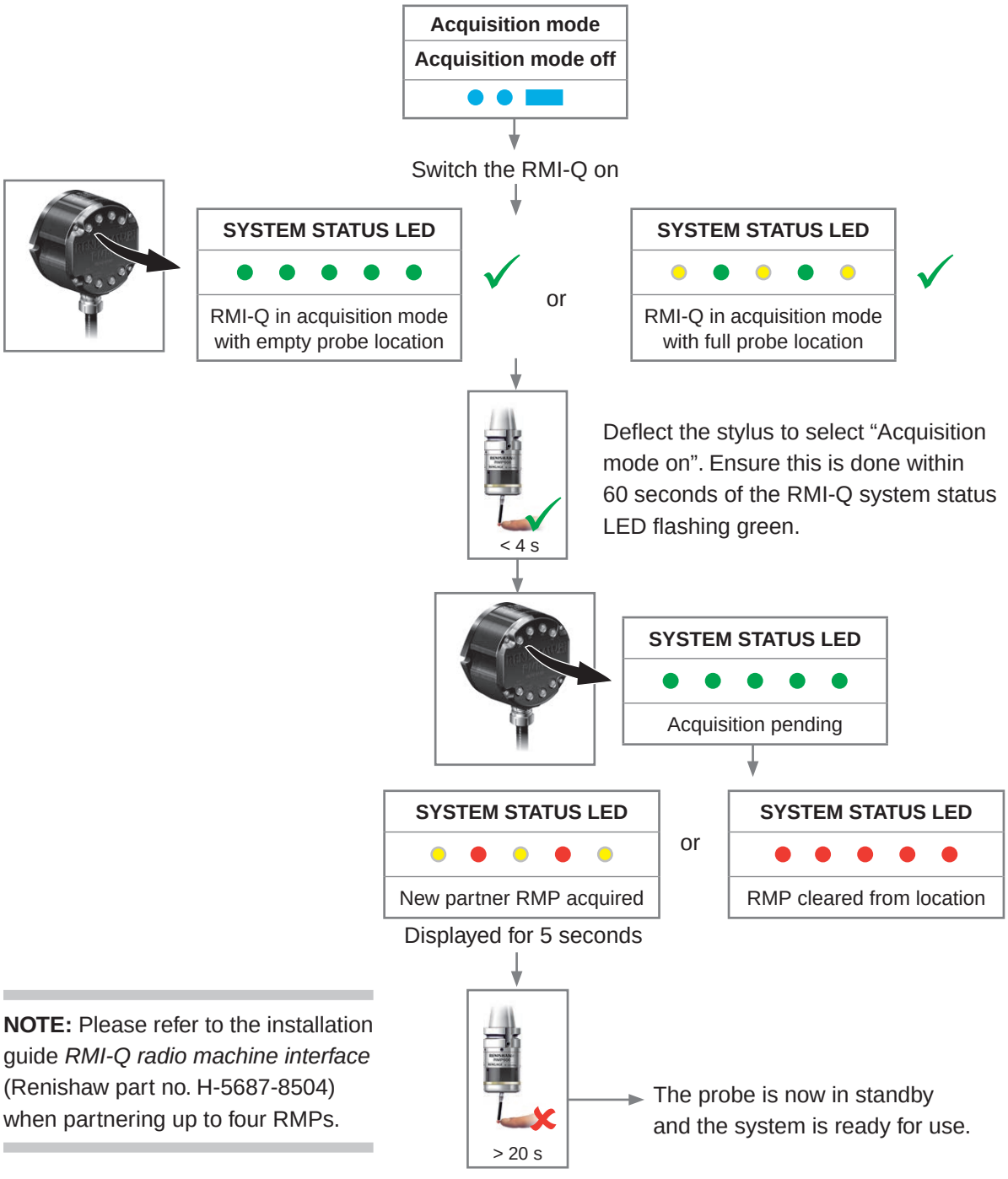
RMP600 – RMI-Q partnership

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 RMP600 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 RMP600 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.

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 “Reviewing the probe settings” earlier in this section).
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.

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 RMP600 has a glass window. Handle with care if broken to avoid injury.

Changing the batteries

1

CAUTIONS:

Do not leave dead batteries in the probe.

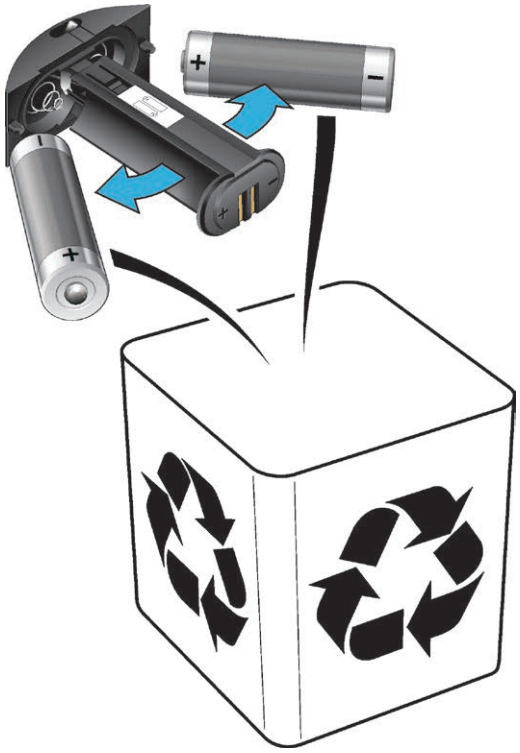
When changing batteries, do not allow coolant or debris to enter the battery compartment.

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

Take care to avoid damaging the battery cassette gasket.

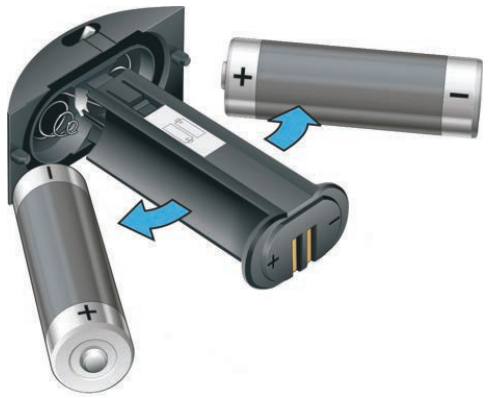
Only use specified batteries.

2



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

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 types			
Alkaline × 2	**Lithium-thionyl chloride × 2**		**Nickel Cadmium / Nickel Metal Hydride × 2**
AA 1.5 V ✓	**Saft:**	LS 14500	**AA 1.2 V** ✓
	Tadiran:	SL-760/S TL-5903/S, TL-2100/S ✓	
	Xeno:	XL-060F	

4

5

Diaphragm replacement

RMP600 diaphragms

The probe mechanism is protected from coolant and debris by two diaphragms. These provide adequate protection under normal working conditions.

You should periodically check the outer diaphragm for signs of damage. If this is evident, replace the outer diaphragm.

Do not remove the inner diaphragm. If it is damaged, return the probe to your supplier for repair.

Outer diaphragm inspection

1. Remove the stylus.
2. Undo the three M3 front cover screws and remove the front cover.
3. Inspect the outer diaphragm for damage.
4. To remove the outer diaphragm, grip by the outer edge and pull off.

Inner diaphragm inspection

Inspect the inner diaphragm for damage. If it is damaged, return the probe to your supplier. DO NOT REMOVE THE INNER DIAPHRAGM AS YOUR WARRANTY WILL BE INVALIDATED.

Outer diaphragm replacement

1. Fit the new diaphragm over the centre.
2. Locate the outer edge of the diaphragm to rest on the outer edge of the inner diaphragm.
3. Refit the front cover and M3 screws.
4. Refit the stylus and recalibrate the probe.

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.	Change 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.
	Probe out of range.	Check position of RMI or RMI-Q, see operating envelope.
	No RMI or RMI-Q “start/stop” signal (“radio on” mode only).	Check RMI or RMI-Q for green start LED.
	Incorrect spin speed (“spin switch-on” only).	Check spin speed and duration.
	Malfunctioning shank switch (“shank switch-mode” only).	Check switch operation.
	Incorrect switch-on method configured.	Check configuration and alter as required.
	Incorrect multiple probe mode setting configured.	Check configuration and alter as required.
	RMP600 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.

Symptom	Cause	Action
Machine stops unexpectedly during a probing cycle.	Radio link failure/RMP600 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.	Change 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 1 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.

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 and make speeds the same.
	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.
RMP600 status LEDs do not correspond to RMI or RMI-Q status LEDs.	Radio link failure – RMP600 out of RMI or RMI-Q range.	Check position of RMI or RMI-Q, see operating envelope.
	RMP600 has been enclosed/ shielded by metal.	Remove from obstruction.
	RMP600 and RMI or RMI-Q are not partnered.	Partner RMP600 and RMI or RMI-Q.

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.
	RMP600 and RMI or RMI-Q are not partnered.	Partner RMP600 with RMI or RMI-Q.
	Probe selection error.	Verify that one RMP is working and is correctly selected.
	“Fast” second 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.
	Malfunctioning shank switch (“shank switch” mode only).	Check switch operation.
	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.

Parts list

Item	Part number	Description
RMP600	A-5312-0001	RMP600 probe with batteries, tool kit and quick-start guide (factory-set to radio on/radio off).
Battery	P-BT03-0005	AA battery – alkaline – supplied as standard with probe (two required).
Battery	P-BT03-0008	AA battery – lithium-thionyl chloride (two required).
Stylus	A-5003-7306	50 mm long carbon fibre stylus with Ø6 mm ball.
Stylus	A-5003-6510	100 mm long carbon fibre stylus with Ø6 mm ball.
Stylus	A-5003-6511	150 mm long carbon fibre stylus with Ø6 mm ball.
Stylus	A-5003-6512	200 mm long carbon fibre stylus with Ø6 mm ball.
Tool kit	A-4038-0304	Probe tool kit comprising Ø1.98 mm stylus tool (× 1), 2.0 mm AF hexagon key (× 1), 2.5 mm AF hexagon key (× 2), 4.0 mm AF hexagon key (× 1) and shank grub screw (× 2).
Battery cassette	A-4038-0300	Battery cassette kit.
Battery gasket	A-4038-0301	Battery cap gasket kit.
Diaphragm kit	A-5312-0302	Diaphragm kit.
Bobbin kit	A-4038-0303	Bobbin kit for shank switch.
RMI	A-4113-0050	RMI (side exit) with 15 m (49.2 ft) cable, tool kit and quick-start 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 and releasing styli.
Publications. These can be downloaded from our website at **www.renishaw.com**.		
RMP600	H-5312-8500	Quick-start guide: for rapid set-up of the RMP600 probe.
RMI	A-4113-8550	Quick-start guide: for rapid set-up of the RMI.
RMI-Q	H-5687-8500	Quick-start guide: for rapid 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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