

## TS27R – tool setting probe



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<b>DE</b>		Für dieses Produkt stehen weitere Informationen zur Verfügung. Scannen Sie dazu den Barcode oder besuchen Sie <b><a href="http://www.renishaw.de/ts27r">www.renishaw.de/ts27r</a></b> .	
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IT		<p>Le pubblicazioni relative a questo prodotto sono disponibili scansionando il codice a lato oppure visitando il sito:  <b><a href="http://www.renishaw.it/ts27r">www.renishaw.it/ts27r</a></b>.</p>	
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## Safety

### Information to the user

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

Refer to the machine supplier's operating instructions.

The TS27R system must be installed by a competent person, observing relevant safety precautions. Before starting work, ensure that the machine tool is in a safe condition with the power switched OFF and the power supply to the HSI-C / HSI / MI 8-4 is disconnected.

### 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.

If the probe fails, the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to halt the movement of the machine.

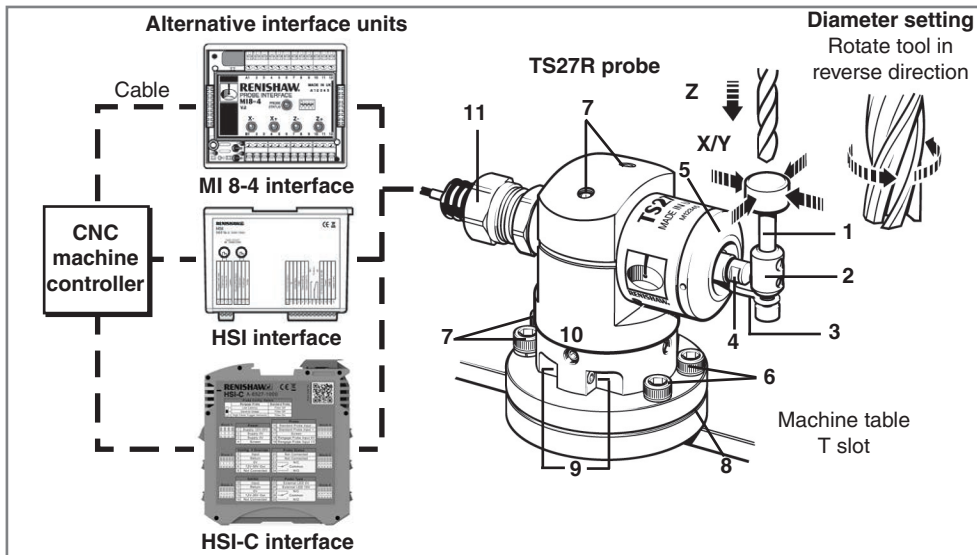
### Information to the equipment installer

All Renishaw equipment is designed to comply with the relevant EU 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 (for example, power transformers, servo drives);
- 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 (for example, motor power supply cables), 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.



1. Stylus
2. Stylus holder for disc or square styli
3. Captive link
4. Break stem
5. Front cover
6. Probe base holding screws
7. Stylus level alignment – adjusting screws
8. Plinth
9. Square stylus axes alignment – adjusting screws
10. Square stylus axes alignment – locking screws
11. Conduit adaptor



## Introduction

The TS27R probe is used for tool setting on CNC machining centres.

For tool length measurements and broken tool detection, the tool is driven against the probe's stylus in the Z axis. Rotating tools can be set in the X and Y axes for tool radius offsets.

Screw adjusters allow the stylus to be aligned with the machine's axes.

An interface unit processes signals between the probe and the CNC controller.

### Achievable set-up tolerances

The tolerances to which tools can be set depend upon the flatness and parallelism of the stylus tip setting. A value of 5  $\mu\text{m}$  (0.0002 in) front to back and side to side is easily achievable over the flat portion of the stylus tip, and 5  $\mu\text{m}$  (0.0002 in) parallelism is easily achievable with the axes of a square tip stylus. This setting accuracy is sufficient for the majority of tool setting applications.

### Recommended rotating tool feedrates

Cutters should be rotated in reverse to the cutting direction.

### First touch – machine spindle rev/min

Rev/min for the first move against the probe stylus is calculated from a surface cutting speed of 60 m/min (197 ft/min).

Spindle speed should be maintained within the range 150 rev/min to 800 rev/min and relates to cutters of  $\varnothing 24$  mm to  $\varnothing 127$  mm ( $\varnothing 0.95$  in to  $\varnothing 5.0$  in).

The surface cutting speed is not maintained if cutters smaller than  $\varnothing 24$  mm ( $\varnothing 0.95$ ) or larger than  $\varnothing 127$  mm ( $\varnothing 5.0$  in) are used.

### First touch – machine feedrate

The feedrate (f) is calculated as follows:

$$f = 0.16 \times \text{rev/min} \quad f \text{ units mm/min (diameter set)}$$

$$f = 0.12 \times \text{rev/min} \quad f \text{ units mm/min (length set)}$$

### Second touch – machine feedrate

800 rev/min, 4 mm/min (0.16 in/min) feedrate.

### Software routines

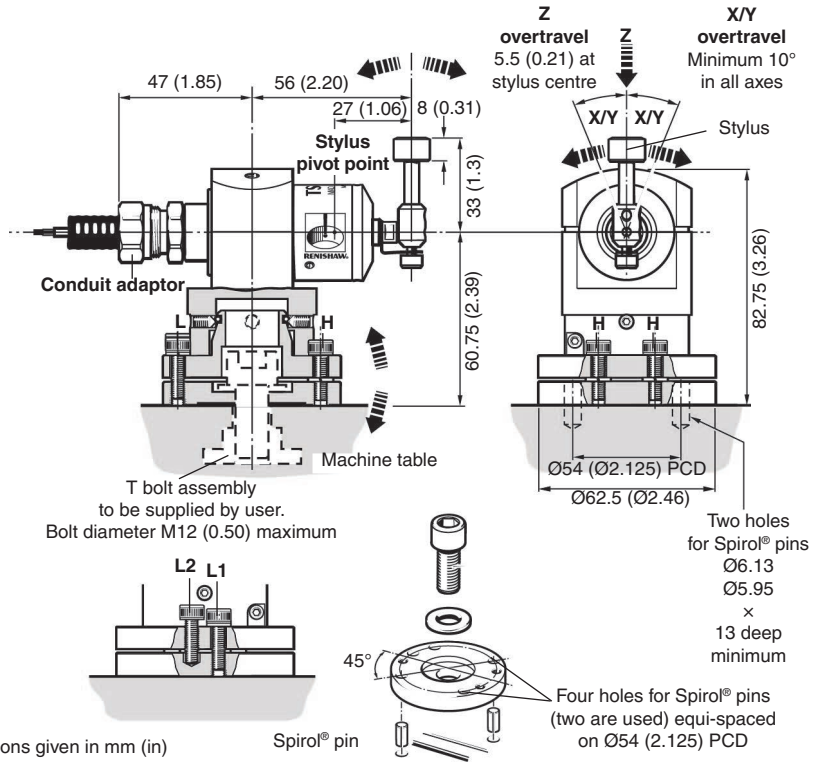
Software routines for tool setting are available from Renishaw for various machine controllers and are described in the *Probe software for machine tools – programs and features* data sheet (Renishaw part no. H-2000-2298).

<b>Principal application</b>		Tool measuring and broken tool detection on all sizes of vertical and horizontal machining centres and all gantry machining centres.
<b>Transmission type</b>		Hard-wired transmission
<b>Receiver/interface</b>		MI 8-4, HSI or HSI-C
<b>Recommended styli</b>		Disc stylus (tungsten carbide, 75 Rockwell C) or Square tip stylus (ceramic tip, 75 Rockwell C)
<b>Weight with disc stylus</b>		1055 g (37.21 oz)
<b>Cable</b> (to interface)	<b>Specification</b>	Ø4.4 mm (0.17 in), 4-core screened cable, each core 7 × 0.2 mm
	<b>Length</b>	10 m (32.8 ft)
	<b>Electrical connection</b>	Cable on the end of unit
<b>Sense directions</b>		±X, ±Y, +Z
<b>Unidirectional repeatability</b>		1.00 µm (40 µin) 2σ (see note 1)
<b>Stylus trigger force</b> (see notes 2 and 3)		1.30 N to 2.40 N, 133 gf to 245 gf (4.68 ozf to 8.63 ozf) depending on sense direction
<b>Sealing</b>		IPX8, BS EN 60529:1992+A2:2013 (IEC 60529:1989+A1:1999+A2:2013)
<b>Mounting</b>		M12 (1/2 in) T bolt (not supplied) Optional Spirol pins to allow accurate remounting
<b>Storage temperature</b>		-10 °C to +70 °C (+14 °F to +158 °F)
<b>Operating temperature</b>		+5 °C to +60 °C (+41 °F to +140 °F)

- Note 1 Performance specification is tested at a standard test velocity of 480 mm/min (18.9 in/min) with a 35 mm 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. Trigger force is measured with a 50 mm (1.97 in) stylus.
- Note 3 These are the factory settings; manual adjustment is not possible.
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**NOTE:** For stylus recommendations, refer to the *Styli and accessories* technical specification (Renishaw part no. H-1000-3200).

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## Mounting the probe on the machine table

1. Select a position for the probe on the machine table.
2. Detach the probe base and the plinth from the probe by removing the two screws H and the screw L1 using a 4 mm A/F hexagon key.
3. Fit the T bolt (not supplied by Renishaw).
4. Tighten the T bolt to secure the probe base to the machine table.
5. Refit the probe and plinth onto the base and fit the screws. Tighten the two screws H firmly. Keep the adjusting screws L1 and L2 loose before setting the stylus alignment (see page 18).
6. Fit the stylus (see pages 16 and 17).

## Spirol® pins (see page 9)

The T bolt provides adequate clamping for all normal circumstances. However two Spirol® pins (supplied in the probe kit) may be fitted on installations where there is a requirement to remove and remount the TS27R. To fit the Spirol® pins, drill two holes in the machine table to correspond with two of the probe base holes. Place the Spirol® pins in the holes and refit the probe base.

## Cable

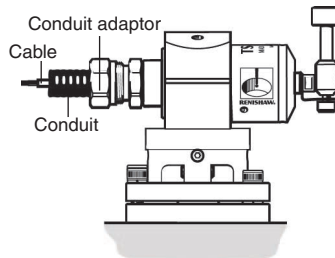
Four-core 7/0.2 polyurethane insulated and screened cable 10 m (32.8 ft) long. Cable diameter 4.4 mm (0.17 in). Probe circuit – red and blue cores (yellow and green not used).

**Extension cable** (15 m [49 ft] maximum extension)

Maximum permitted cable length:

Probe to interface – 25 m (82 ft) long

Two-core 7/0.2 mm polyurethane insulated and screened cable. Maintain the screen through the joins.



### Conduit for cable protection

Renishaw recommends that Thomas and Betts Type EF conduit, or a suitable alternative, is fitted to all installations. The TS27R conduit adaptor accepts Ø11 mm (0.43 in) flexible conduit.

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**NOTE:** The cable screen is connected to the machine via a 100 nF capacitor inside the TS27R to prevent possible earth loops. Ensure the cable screen is connected to the appropriate input on the interface. The interface units are fully described in the following publications: *MI 8-4 interface unit* installation and user's guide (Renishaw part no. H-2000-5008), *HSI hard-wired system interface* installation guide (Renishaw part no. H-5500-8554) and *HSI-C hard-wired system interface – configurable* installation guide (Renishaw part no. H-6527-8501).

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### Interfaces

The MI 8-4 interface is used with the standard G31 SKIP input. The probe's status output operates between 4.75 Vdc and 30 Vdc.

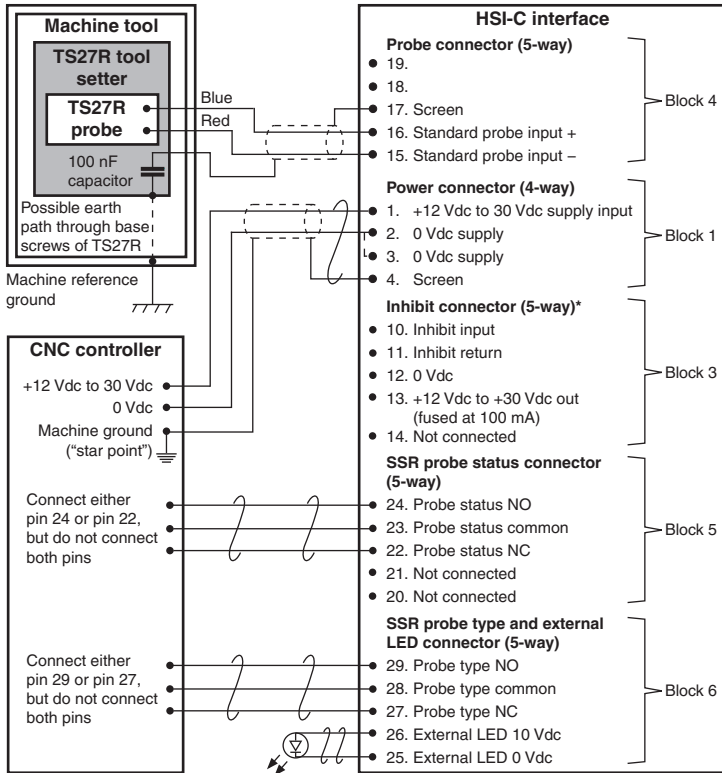
All inputs are fully configurable for ACTIVE HIGH and ACTIVE LOW operation.

The interface also includes an 'inhibit' function, as well as a facility for simple selection between the tool setting probe and an inspection probe.

The HSI and HSI-C interfaces are used with the standard G31 SKIP input. Probe status output is a voltage-free SSR (solid-state relay) which can be connected as normally open (NO) or normally closed (NC).

Maximum current    50 mA peak  
Maximum voltage    ±50 V peak

An inhibit function is included, and a facility to drive an external probe status LED.

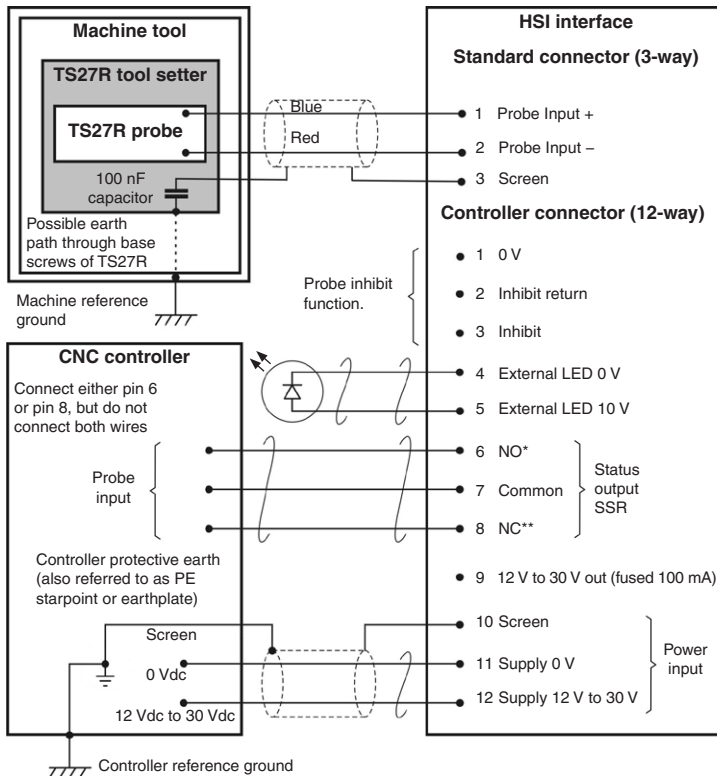


**NOTE:** When connecting the TS27R probe to the HSI-C interface, please use the connection labelled **STANDARD PROBE**.

\* Probe inhibit function. Refer to the *HSI-C hard-wired system interface – configurable installation guide* (Renishaw part no. H-6527-8501) for connection information

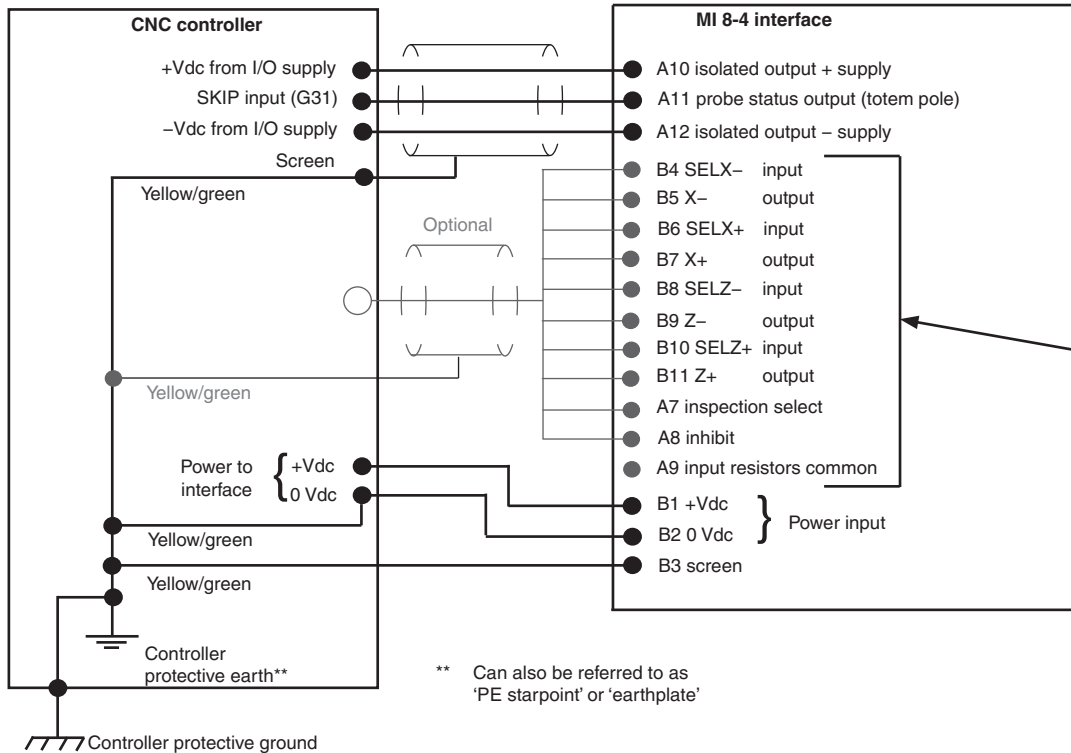
Probe status	Normally open (NO)	Normally closed (NC)
Probe triggered	Closed	Open
Probe seated	Open	Closed

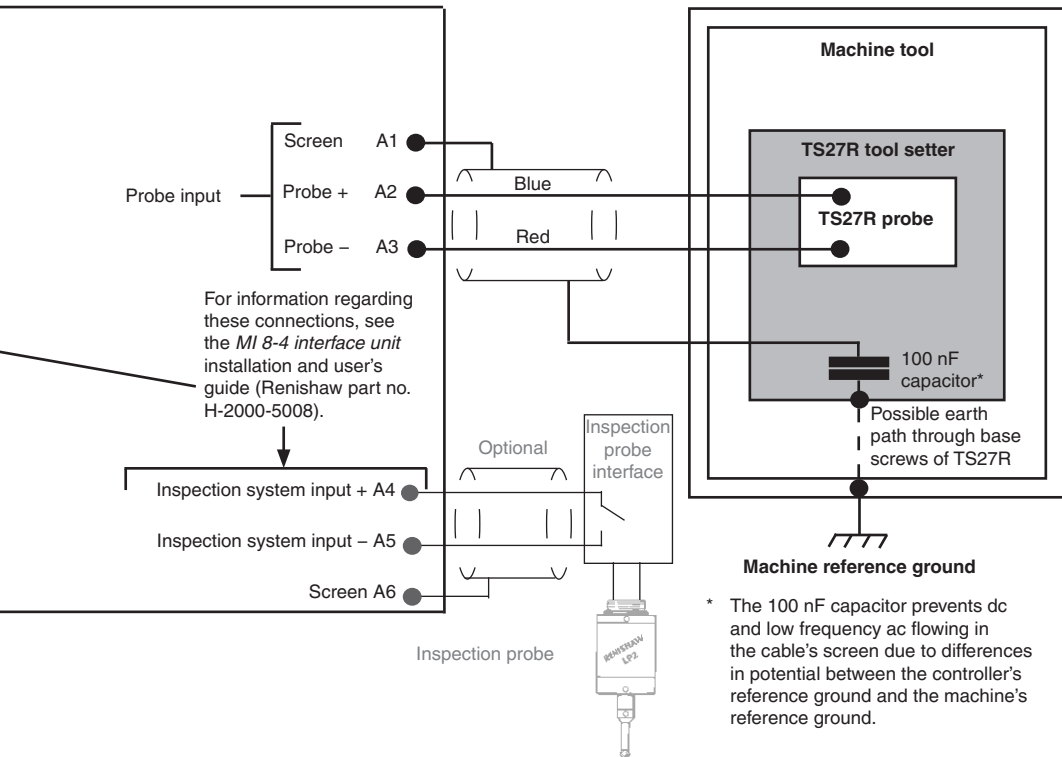


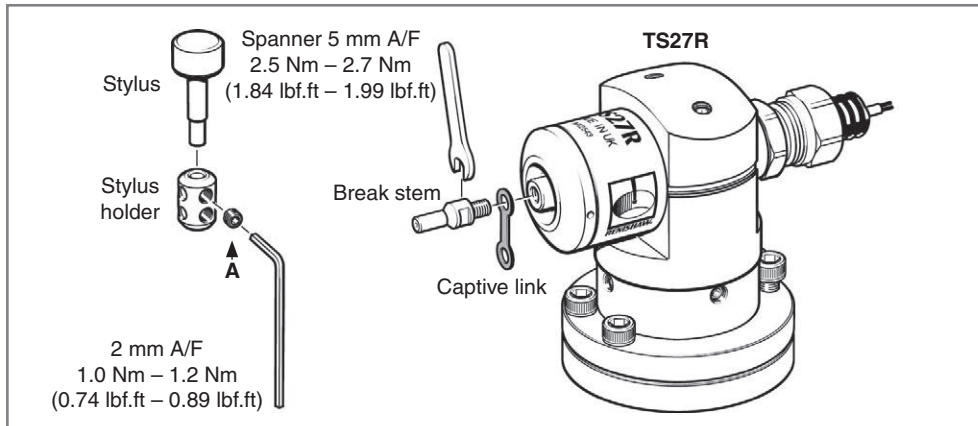


**NOTE:** When connecting the TS27R probe to the HSI interface, please use the connection labelled **STANDARD PROBE**.

Probe status	*Normally open (NO)	**Normally closed (NC)
Probe triggered	Closed	Open
Probe seated	Open	Closed







### Screw torque values

Tighten all the screws to the torque values shown, remembering to use the support bar whenever adding or removing parts attached to the break stem (see page 17).

### Fitting the stylus

The stylus is retained in the stylus holder by tightening grub screw **A**.

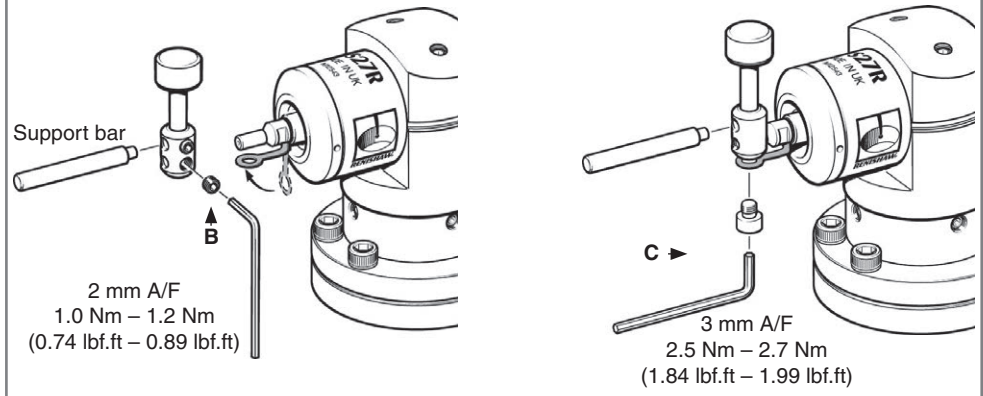
### Captive link

In the event of excessive stylus overtravel, the break stem breaks at its weakest point, preventing damage to the probe mechanism.

The captive link connected to the probe and stylus holds onto the stylus, otherwise the stylus could fall into the machine and become lost.

When a new captive link is fitted, it must be bent to accept screw **C** (see page 17).

**CAUTION:** Always hold the support bar in position to counteract twisting forces and avoid over-stressing the stylus break stem.



### Stylus and holder

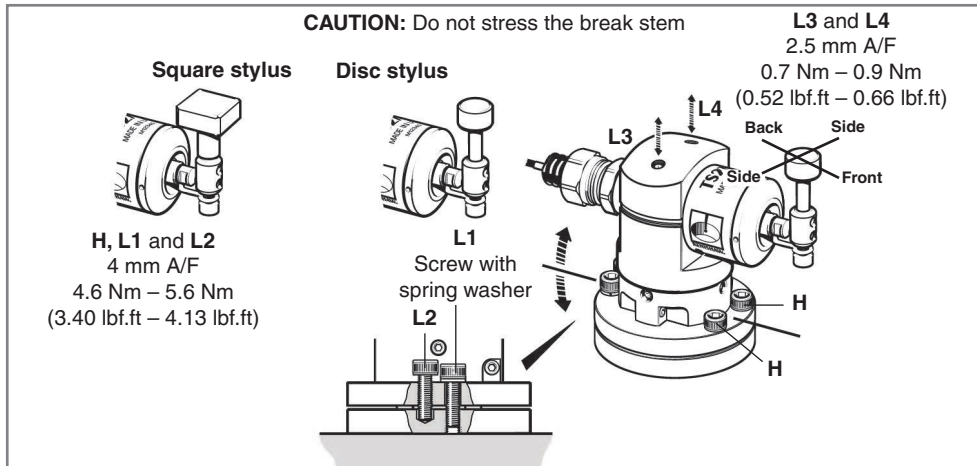
Place the stylus and holder onto the break stem and loosely fit grubscrew **B**.

Fit screw **C** through the captive link and into the stylus holder, then tighten all the screws.

### Replacing the break stem

Remove the broken parts and rebuild in the sequence shown above.

**NOTE:** Earlier versions of the TS27R were supplied with cup-pointed grubscrews and a different break stem. Only fit current components supplied with this probe or with the break stem retrofit kit.



### Stylus types

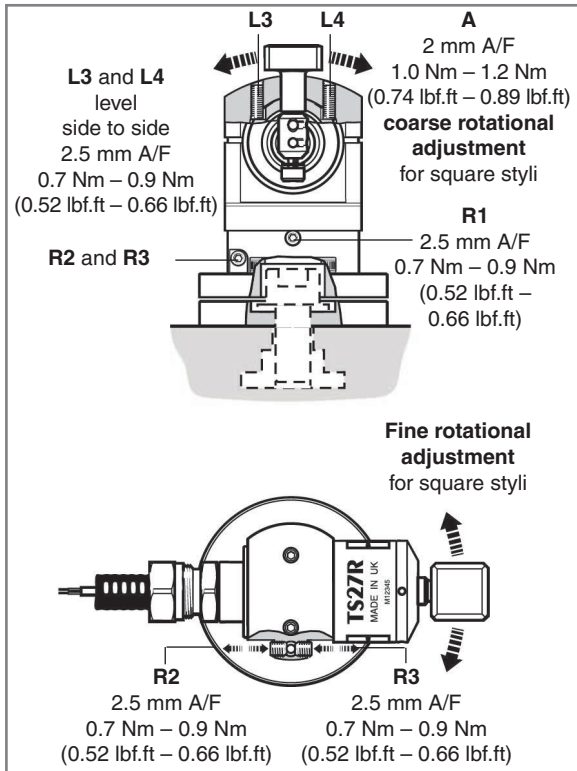
<b>Disc stylus</b>	Ø12.7 mm (Ø0.5 in)
<b>Square stylus</b>	19.05 mm × 19.05 mm (0.75 in × 0.75 in).

### Stylus level setting

The top surface of the stylus must be set level, front to back and side to side.

The front to back stylus level is obtained by alternately adjusting screws **L1** and **L2**, which causes the probe cable end to rise or lower, changing the stylus level setting. When a level stylus surface is obtained, tighten screws **L1** and **L2**.

Side to side level is obtained by alternately adjusting grub screws **L3** and **L4**, which causes the probe module to rotate and change the stylus level setting. When a level stylus surface is obtained, tighten screws **L3** and **L4**.



**CAUTION:** Always hold the support bar in position to counteract twisting forces and avoid over-stressing the stylus break stem.

### Additional setting for square styli

Stylus level setting is the same for disc and square styli. In addition, square styli side faces can be aligned with the machine's X/Y axes.

**Coarse rotational adjustment** is obtained by slackening the stylus holder grub screw **A** (see page 16), rotating the stylus in its holder, then retightening grub screw **A**. (Always use the support bar – see page 17.)

**Fine rotational adjustment** is obtained by loosening the four grub screws **R1** and alternately adjusting the two probe rotational adjuster screws **R2** and **R3** until the required tip parallelism to the axes is achieved. Retighten grub screws **R1**, **R2** and **R3**.

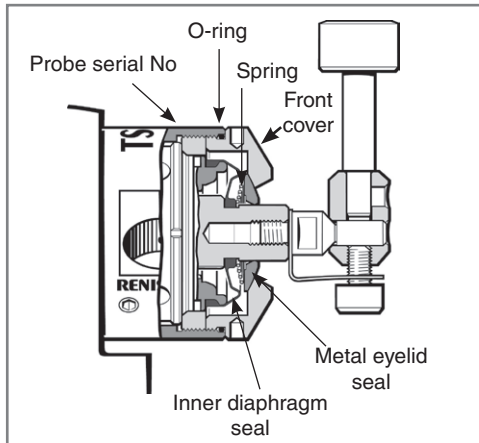
**CAUTION:** Ensure all screws are tight after adjustment.

## Service

You may undertake the maintenance routines described in this handbook.

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

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



## Maintenance

**The probe is a precision tool and must be handled with care.**

**Ensure the probe is firmly secured to its mounting.**

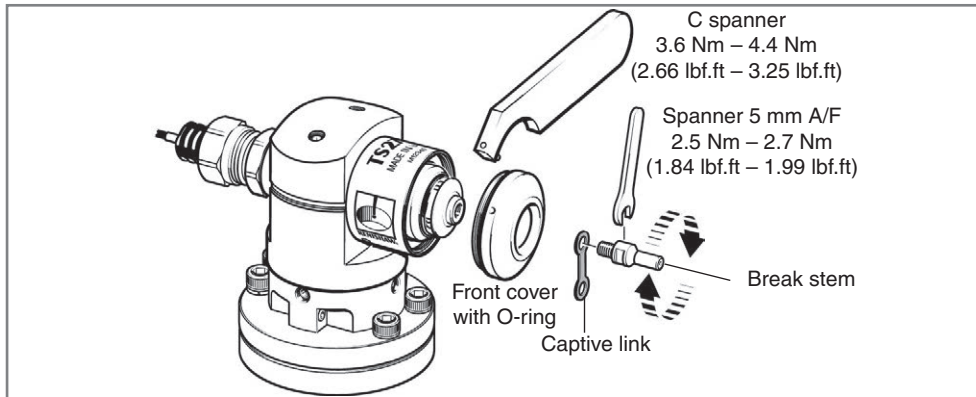
The probe requires minimal maintenance as it is designed to operate as a permanent fixture on CNC machining centres, where it is subject to a hot chip and coolant environment.

- Do not allow excessive waste material to build up around the probe.
- Keep all electrical connections clean.
- The probe mechanism is protected by an outer metal eyelid seal and an inner flexible diaphragm seal.

Approximately once a month, inspect the probe inner diaphragm seal. If it is pierced or damaged, return the probe to your supplier for repair.

The service interval may be extended or reduced depending on environment and operating conditions.





1. Remove the stylus and holder (see page 17).
  2. Remove the break stem using the 5 mm A/F spanner.
  3. Use a C spanner to remove the probe's front cover. This will expose the metal eyelid seal and the inner diaphragm seal. Remove the metal eyelid and spring.
  4. Wash inside the probe, using clean coolant.
- 
- CAUTION:** Do not use sharp metal objects to clean out debris.
- 
5. Inspect the diaphragm seal for signs of piercing or damage. In the event of damage, return the probe to your supplier for repair, as coolant entering the probe mechanism could cause the probe to fail.
  6. Refit the spring and metal eyelid (the spring's widest diameter is against the metal eyelid).
  7. Refit the remaining components (see pages 16 and 17).

Type	Part Number	Description
TS27R (disc) with MI 8-4	A-2008-0397	TS27R holder, probe module, break stem (× 2), disc stylus Ø12.7 mm (Ø0.5 in) and MI 8-4 interface.
TS27R (square) with MI 8-4	A-2008-0396	TS27R holder, probe module, break stem (× 2), square tip stylus 19.05 mm (0.75 in) and MI 8-4 interface.
TS27R (disc) with HSI	A-2008-0359	TS27R holder, probe module, break stem (× 2), disc stylus Ø12.7 mm (Ø0.5 in) and HSI interface.
TS27R (square) with HSI	A-2008-0362	TS27R holder, probe module, break stem (× 2), square tip stylus 19.05 mm (0.75 in) and HSI interface.
TS27R (disc)	A-2008-0368	TS27R holder, probe module, break stem (× 2) and disc stylus Ø12.7 mm (Ø0.5 in).
TS27R	A-2008-0388	TS27R holder, probe module, break stem (× 2) and stylus holder (without stylus).
Break stem kit	A-5003-5171	Stylus protection kit comprising break stem, captive link, grubscrew flat ended (× 3), caphead screw (× 2) and tools (hexagon wrenches, spanner 5 mm AF, and support bar).
Stylus holder kit	A-2008-0389	Stylus holder kit comprising stylus holder and screws.
Stylus holder	M-2008-0378	Stylus holder.
Plinth	M-2008-1007	Spacer.
Disc stylus	A-2008-0382	Disc stylus Ø12.7 mm (Ø0.5 in), tungsten carbide, 75 Rockwell C.

Type	Part Number	Description
Square stylus	A-2008-0384	Square tip stylus 19.05 mm (0.75 in), ceramic tip, 75 Rockwell C.
Grubscrew	P-SC11-0404	Grubscrew (flat end) for stylus holder M4 × 4 mm (two required).
Screw	P-SC01-X406	M4 cap head screw for stylus holder (one required).
C spanner	A-2008-0332	C spanner – used for removing the probe's front cover.
MI 8-4 interface	A-2157-0001	MI 8-4 interface unit with dual lock pads and DIN rail mounting, installation and user's guide and packaging.
HSI interface	A-5500-1000	HSI probe system interface with DIN rail mounting and three terminal blocks, quick-start guide and packaging.
HSI-C interface	A-6527-1000	HSI-C probe system interface, quick-start guide and packaging.
Terminal block (HSI-C only)	P-CN47-0082	4-way terminal block (1 off required).
Terminal block (HSI-C only)	P-CN47-0083	5-way terminal block (5 off required).
Terminal label set (HSI-C only)	M-5358-0202	HSI-C terminal labels.

Type	Part Number	Description
<b>Publications.</b> These can be downloaded from our website at <a href="http://www.renishaw.com">www.renishaw.com</a> .		
TS27R	H-2000-5018	Installation and user's guide: TS27R tool setting probe.
MI 8-4	H-2000-5008	Installation and user's guide: MI 8-4 interface unit.
HSI QSG	H-5500-8550	Quick-start guide: for rapid set-up of the HSI interface.
HSI IG	H-5500-8554	Installation guide: for set-up of the HSI interface.
HSI-C QSG	H-6527-8500	Quick-start guide: for rapid set-up of the HSI-C interface.
HSI-C IG	H-6527-8501	Installation guide: for set-up of the HSI-C interface.
Styli	H-1000-3200	Technical specifications: Styli and accessories.
Probe software	H-2000-2298	Data sheet: <i>Probe software for machine tools – programs and features.</i>

## Disclaimer

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

## Warranty

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

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

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

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

## China RoHS

For more information on China RoHS visit:  
[www.renishaw.com/mtpchinarohs](http://www.renishaw.com/mtpchinarohs)

### 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.

### EU declaration of conformity



Renishaw plc declares under its sole responsibility that the TS27R is in conformity with all relevant Union legislation.

The full text of the EU declaration of conformity is available at:

[www.renishaw.com/mtpdoc](http://www.renishaw.com/mtpdoc)

## 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.

## REACH regulation

Information required by Article 33(1) of Regulation (EC) No. 1907/2006 (“REACH”) relating to products containing substances of very high concern (SVHCs) is available at:

**[www.renishaw.com/REACH](http://www.renishaw.com/REACH)**

## 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.

**47 CFR Section 15.105**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



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## 安全须知

### 用户须知

在所有涉及使用机床或坐标测量机 (CMM) 的应用中，建议采取保护眼睛的措施。

请参阅机床供应商的操作说明书。

TS27R系统必须由有资质的人员在遵守相关安全措施的前提下进行安装。在开始工作之前，须确保机床电源关闭，处于安全状态，并且HSI-C / HSI / MI 8-4的电源已断开。

### 机床供应商/安装商须知

机床制造商有责任确保用户了解操作中存在的任何危险，包括雷尼绍产品说明书中所述的危险，并确保提供充分的防护装置和安全联动装置。

如果测头测量失败，则有误发测头已复位状态信号的可能。切勿单凭测头信号来停止机床运动。

### 设备安装商须知

雷尼绍所有设备的设计均符合相关的EU和FCC监管要求。为使产品按照这些规定工作，设备安装商有责任保证遵守以下指导原则：

- 任何接口的安装位置必须远离任何潜在的电噪声源，如变压器、伺服系统驱动装置等；
- 所有0伏/接地连接都应当连接到机床接地终端上（“接地终端”是所有设备地线和屏蔽电缆的单点回路）。这一点非常重要，不遵守此规定会造成接地之间存在电位差；
- 所有屏蔽装置都必须按使用说明书中所述进行连接；
- 电缆线路不得与电机电源电缆等高电流源并行或靠近高速数据传输线；
- 电缆长度应始终保持最短。

### 设备操作

如果设备使用方式与制造商要求的方式不符，设备提供的保护功能可能会减弱。





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