

Primo™ LTS (length tool setter)



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Before you begin

1.1

Disclaimer

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

Trade marks

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

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

Warranty

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

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

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

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

Changes to equipment

Renishaw reserves the right to change equipment specifications without notice.

CNC machines

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

Care of the Primo™ LTS

Keep the LTS clean and treat it as a precision tool.

Patents

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

GB 1507875.1

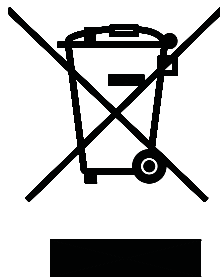
EC declaration of conformity



Renishaw plc hereby declares that the Primo LTS is in compliance with the essential requirements and other relevant provisions of Directive 2004/108/EC.

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

WEEE directive



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

FCC Information to user (USA only)

47 CFR Section 15.19

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

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

47 CFR Section 15.21

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

Safety

Information to the user

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

Refer to the machine supplier's operating instructions.

The LTS must be installed by a competent person, observing all relevant safety precautions. Before starting work, ensure that the machine tool is in a safe condition with the power switched off.

Information to the machine supplier/installer

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

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

Information to the equipment installer

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

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

Equipment operation

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

Primo™ LTS (length tool setter) basics

2.1

Introduction

The Primo™ LTS is a single-axis length tool setter which, when used in conjunction with LTS application software, provides users with the ability to:

- set tool length;
- check for tool wear and tool breakage;
- compensate for the thermal growth of the CNC machining centre on which it is mounted.

The LTS is suitable for use, mounted either vertically or horizontally, on small to large CNC machining centres and is designed to resist false triggering and shock.

During the tool setting cycle, the tool is driven in the Z axis onto the contact pad. When the contact pad is deflected to the metrology point, the LTS generates a precise trigger signal which is then sent to the CNC machine controller via the connection cable.

The tool must not be rotating during the measuring cycle.

When setting tools with inserts, it will be necessary to manually rotate the tool to ensure that each insert is measured.

Tool rotation should not be driven by the machine.

The LTS is a highly accurate and repeatable product that is resilient to the harsh environment within a CNC machining centre. It is equipped with an overtravel warning switch which, when correctly integrated, provides crash protection in the Z axis.

Software routines

CNC controller-specific LTS application software provides the following routines:

- calibration;
- tool setting;
- broken tool detection;
- thermal compensation;
- LTS set-up check.

An LTS application software package is available for download from www.renishaw.com/primodownloads.

For further information about LTS application software, refer to www.renishaw.com/primolts.

Power supply

The LTS requires a 12 to 30 Vdc electrical power supply, which must be capable of supplying 50 mA minimum. When power is supplied, the LTS is switched on (see pages 4.6 and 4.7 for full wiring diagrams).

Input voltage ripple

The input voltage ripple must not cause the voltage to the LTS to fall below 12 V or to rise above 30 V.

LTS outputs

Probe status solid state relay (SSR) output

This can be wired either normally open (N/O) or normally closed (N/C).

Status SSR specification

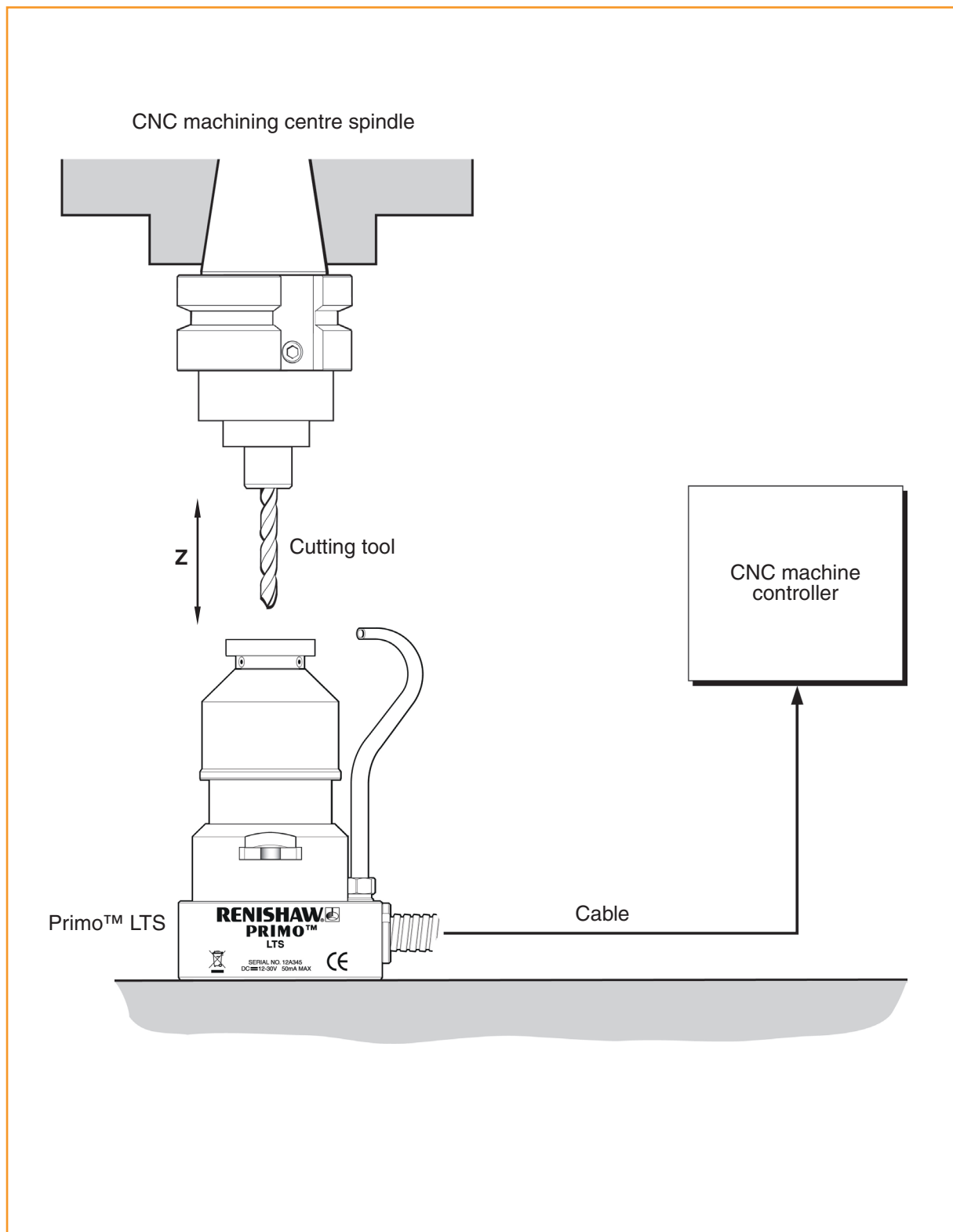
- Maximum 'on' resistance = 25 ohm.
- Maximum load voltage = 30 V.
- Maximum load current = 100 mA.

Primo LTS specification

Principal application	Tool length setting, broken tool detection and thermal compensation on all sizes of CNC machines.	
Tool compatibility	Static cutting tools down to Ø0.1 mm (Ø0.004 in).	
Dimensions	Height	100 mm (3.93 in) nominal
	Width	60 mm (2.36 in)
	Depth	50 mm (1.96 in)
	Contact pad	Ø26 mm (1.02 in)
Weight	Including cable and conduit	726 g (25.61 oz)
Transmission type	Hard-wired	
Interface	Integrated interface 12 to 30 Vdc capable of supplying 50 mA minimum.	
Cable	Specification	Ø5 mm (0.2 in), 7-core screened cable, each core 7 × 0.1 mm
	Length	8 m (26.24 ft)
	Dynamic bend radius	35 mm (1.38 in) minimum
Sense directions	+Z axis	
Repeatability	1 µm (40 µin) 2σ	
Trigger force	3 N / 306 gf (10.79 ozf) Z direction	
Trigger position (from rest)	Z axis	0.8 mm (0.03 in) nominal
Overtravel switch position (from rest)	Z axis	7.5 mm (0.29 in) nominal
Hard stop position (from rest)	Z axis	12 mm (0.47 in) nominal
Mounting	M5 × 25 mm cap head screws (× 4) – (not supplied)	
Environment	IP rating	IPX6, IPX8 (EN/IEC 60529)
	Storage temperature	-25 °C to +70 °C (-13 °F to +158 °F)
	Operating temperature	+5 °C to +55 °C (+41 °F to +131 °F)

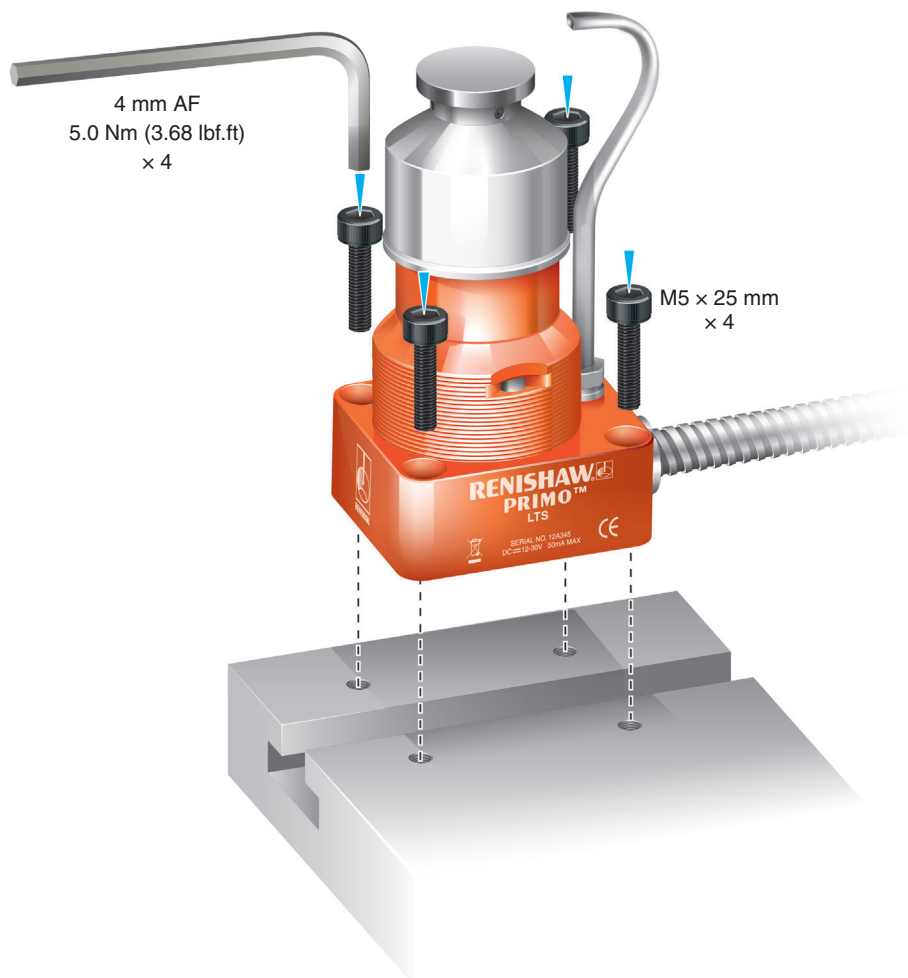
System installation

4.1



Mounting the Primo LTS on a CNC machine tool table

1. Select a suitable position for the LTS on the table of the CNC machine tool, ensuring that, when mounted, the LTS will not come into contact with the moving parts of the CNC machine tool.
2. Drill and tap four holes in the machine table to suit the application of M5 × 25 mm cap head screws. See “Primo LTS dimensions” on page 3.1 for all necessary hole positions.
3. Mount the LTS to the table of the CNC machine tool and secure in position with four M5 × 25 mm cap head screws (not supplied).
4. Tighten the four M5 × 25 mm cap head screws to 5.0 Nm (3.68 lbf.ft).



Mounting the Primo LTS using an optional adaptor

NOTE: After fitting, the top face of the adaptor may need to be skimmed on the machine to meet metrology requirements.

1. Select a suitable position for the LTS on the table of the CNC machine tool, ensuring that, when mounted, the LTS will not come into contact with the moving parts of the CNC machine tool.
2. Mount the adaptor using a bolt and T-nut (not supplied). The size of the bolt must be M12 (0.5 in) maximum.

3. Mount the LTS to the adaptor and secure in position with four M5 × 25 mm cap head screws (not supplied).

4. Tighten the four M5 × 25 mm cap head screws to 5.0 Nm (3.68 lbf.ft).

NOTE: The optional adaptor is available from Renishaw. Please refer to the parts list on page 7.1.



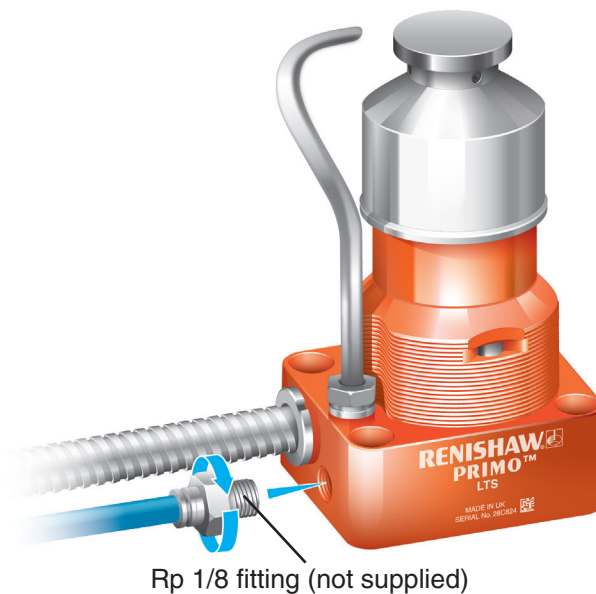
Using the air blast function

To help clear swarf from the contact pad, the LTS allows a flow of compressed air to be directed through the air blast pipe provided onto the pad surface. This air blast function requires the connection of a clean compressed air supply, via an Rp 1/8 fitting (not supplied), to the air inlet port within the base of the LTS.

Air supply requirements

A minimum air pressure of 0.2 MPa (29 psi) is required for the effective operation of the air blast function. The air supply pressure must not exceed 0.7 MPa (101.5 psi). For air actuation control, please refer to the parts list on page 7.1.

1



2



Connecting the cable

The LTS has a permanently fixed cable that is protected by a detachable conduit.

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

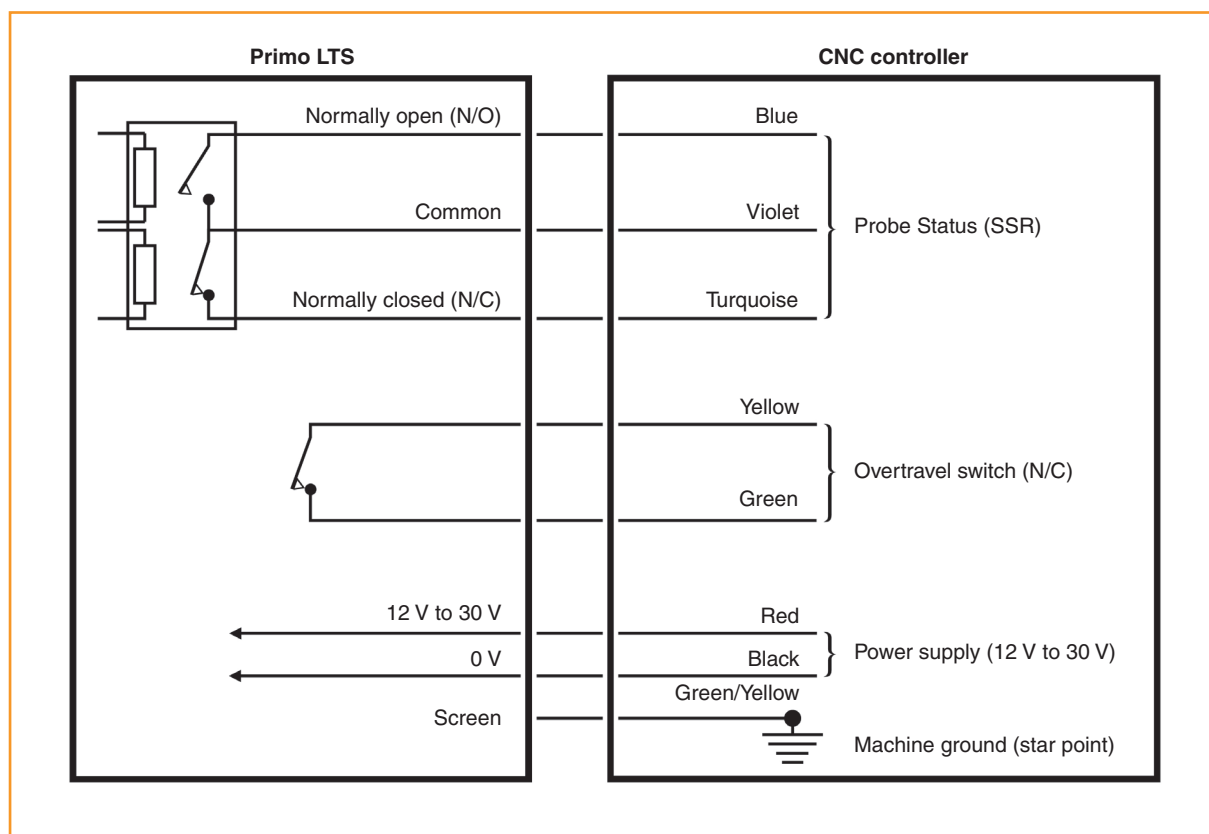
Using the Primo LTS as a standalone product

Wiring diagram (output groupings shown)

The probe status SSR should be connected to a machine skip channel.

CAUTION: Ensure that the screen is terminated at the machine ground (star point). A fused supply should be used.

CAUTION: Exercise caution when using the probe status SSR in normally open (N/O) mode as a wiring fault could result in a non fail-safe condition. To provide a fail safe operation, ensure that the overtravel switch is used.



Using the overtravel switch

The integration of the overtravel switch provides crash protection in the Z axis.

The overtravel switch is connected directly into the machine emergency stop circuit. When the contact pad is deflected by 7.5 mm, an overtravel signal is sent which activates the emergency stop circuit and causes the machine to immediately stop moving.

To clear the alarm, it is recommended that a non-latching normally open (N/O) switch (not supplied) is connected in the overtravel switch circuit in parallel to the overtravel switch. When the switch is held closed, the operator will be able to back-off the spindle and remove the overtravel signal.

Using the Primo LTS with a Primo Interface

Wiring the LTS to the CNC machine tool controller, such that it is used in conjunction with a Primo Interface, provides a skip sharing solution when multiple probes are used on the same CNC machine tool. An additional benefit of using the LTS with a Primo Interface is that the interface display will provide an indication of probe status when the LTS is in operation.

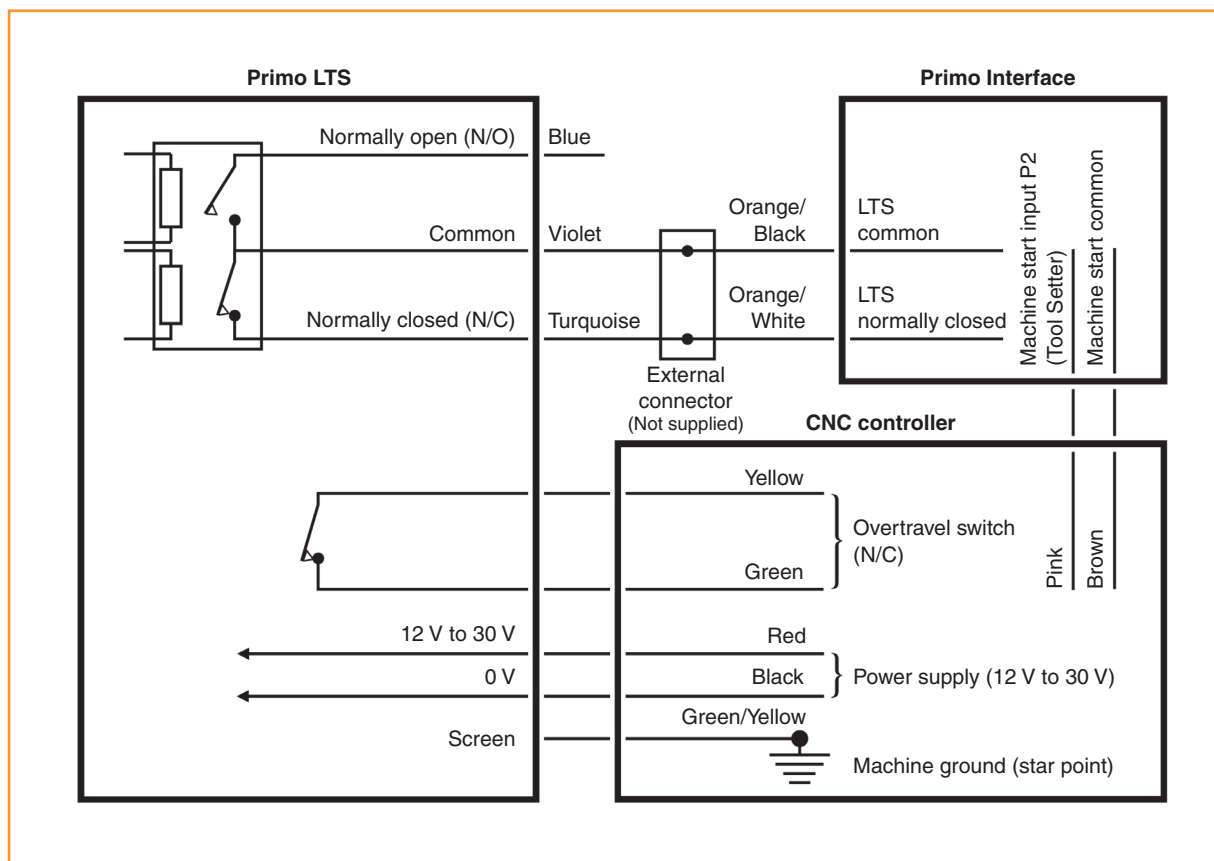
Operation of the LTS, when used in conjunction with a Primo Interface, is via M-code selection.

For further information about using the LTS in conjunction with the Primo Interface, see the *Primo system installation guide* (Renishaw part no. H-5470-8504).

Wiring diagram (output groupings shown)




CAUTION: Ensure that the screen is terminated at the machine ground (star point). A fused supply should be used.

CAUTION: Exercise caution when using the probe status SSR in normally open (N/O) mode as a wiring fault could result in a non fail-safe condition.

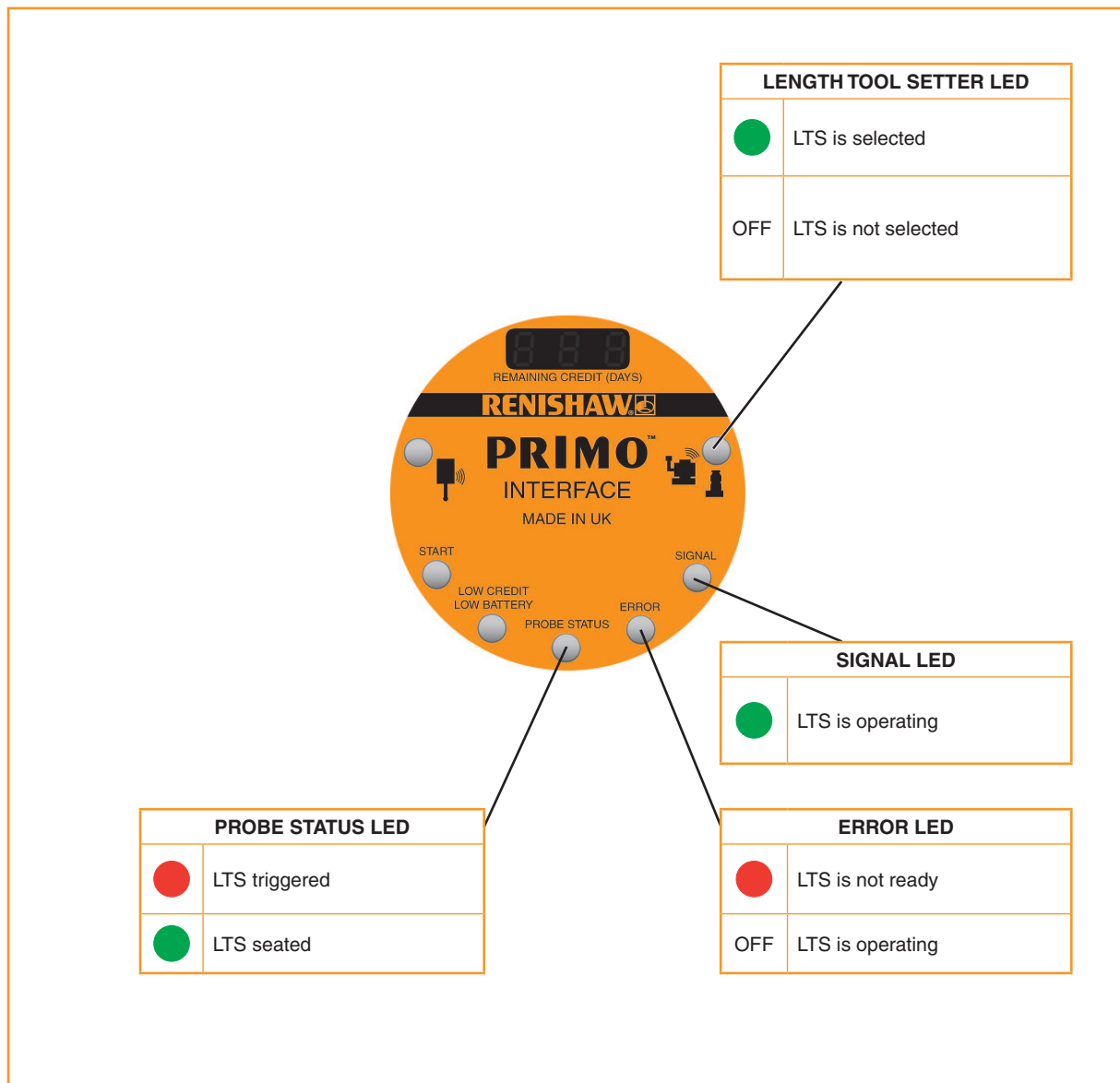


Primo LTS status LED



STATUS LED	
	LTS seated
	LTS triggered
	Electrical overload error
OFF	LTS switched off

Probe status indication shown on the Primo Interface



Calibrating the Primo LTS

Why calibrate?

The LTS is just one component of the measurement system that communicates with the machine tool. Each part of the system can introduce a constant difference between the actual position at which the cutting tool triggers the LTS and the position that is reported to the machine. If the LTS is not calibrated, this difference will appear as an inaccuracy in the measurement. Calibration of the LTS 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 LTS is calibrated in the following circumstances:

- when it is to be used for the first time;
- at regular intervals as part of its maintenance routine;
- when a new contact pad is fitted;
- when it is suspected that the contact pad has become distorted or a crash has occurred;
- when equipment settings are changed.

For calibration software routines, refer to the LTS application software user guide for your specific controller type.

Maintenance

5.1

Maintenance

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

The Primo™ LTS is a precision tool and must be handled with care. The LTS requires minimal maintenance and, as it is designed to function as a permanent fixture on a CNC machining centre, is fully capable of operating within a harsh metal-cutting environment.

To maintain the LTS:

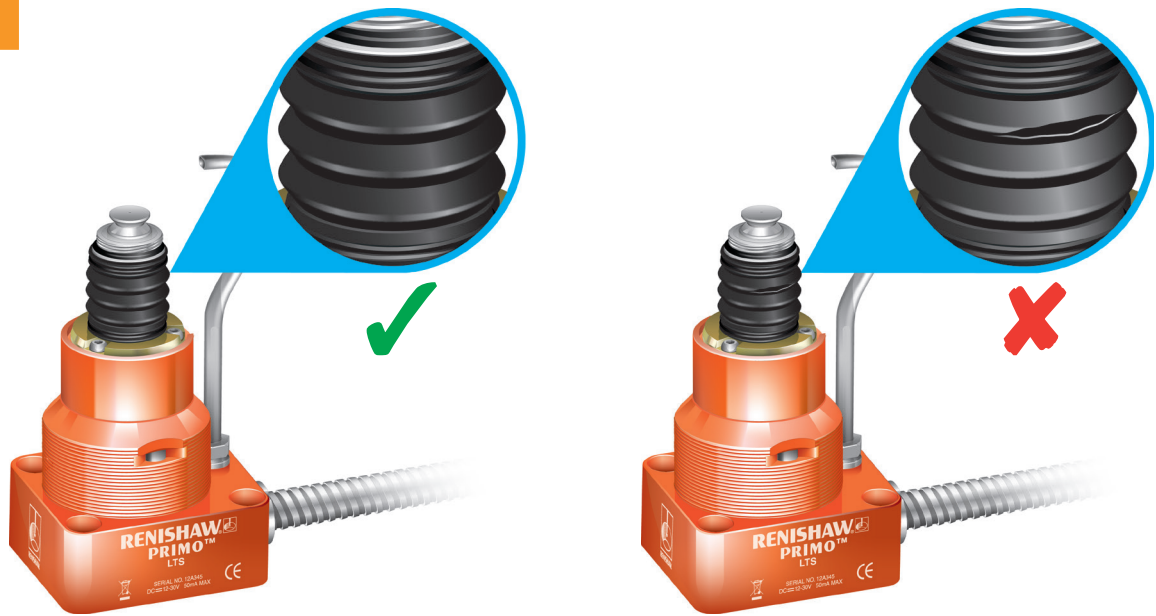
1. Ensure that it is securely mounted.
2. Do not allow excessive waste material to build up around it.
3. Keep all electrical connections clean.
4. Periodically inspect the bellows seal that protects the internal mechanism. If it is found to be pierced, torn, or otherwise damaged, return the complete LTS to your supplier for repair.
5. Recalibrate it regularly.

Inspecting the bellows seal

Periodically inspect the bellows seal under the cover for damage. If no damage is found, reassemble and calibrate the LTS. If the bellows are found to be pierced, torn, or otherwise damaged, contact your local Renishaw office.



4



5



6

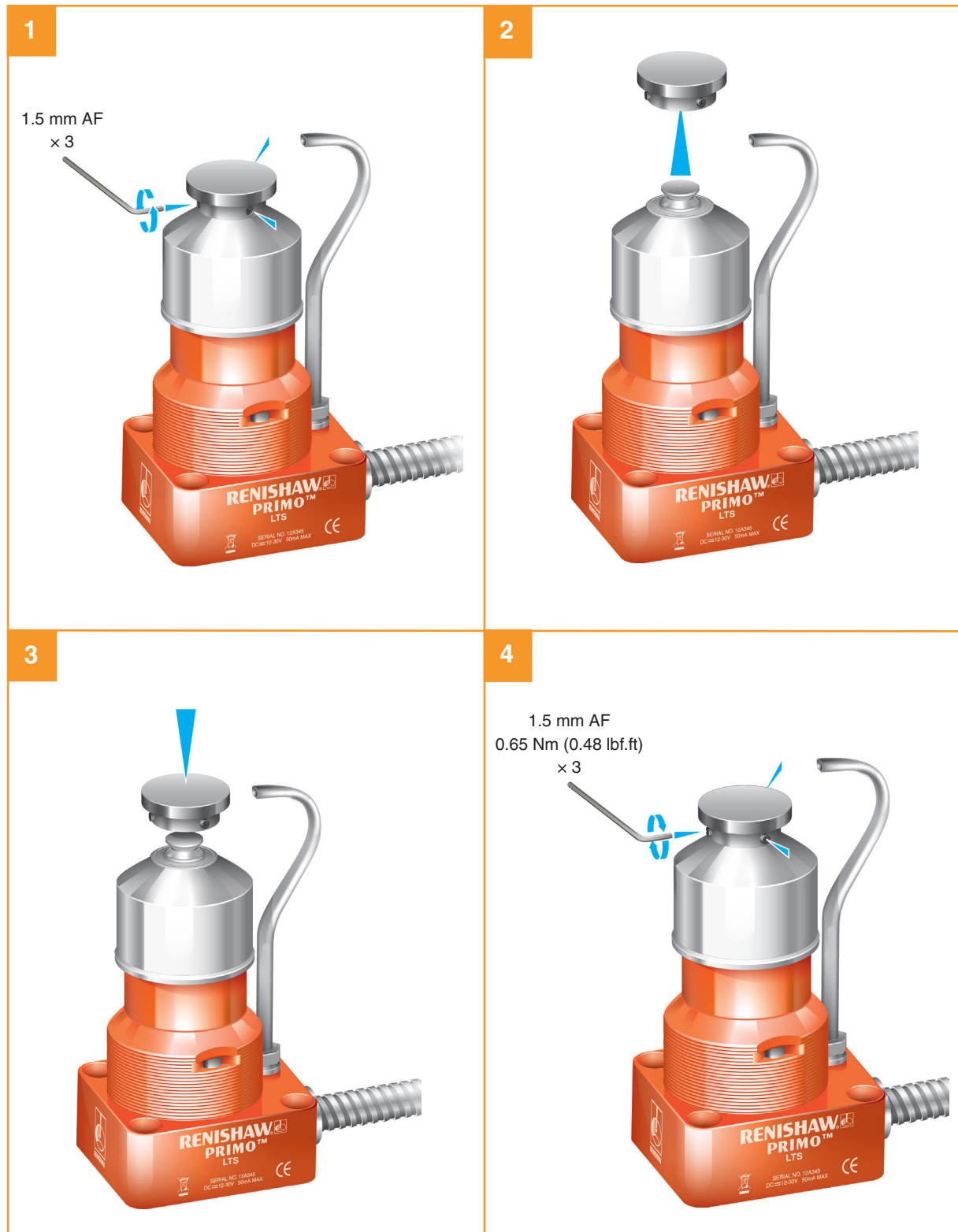


7



Replacing the contact pad

Should the contact pad become damaged, it can be easily replaced by slackening off the three grub screws, removing the damaged pad, mounting the new pad and then tightening the three grub screws to secure the new pad in position. Replacement contact pads are available from Renishaw (see the “Parts list” on page 7.1).



Fault-finding

6.1

Symptom	Cause	Action
LTS fails to power up (LEDs are not illuminated).	Incorrect wiring.	Review wiring.
LTS LEDs are amber.	Electrical overload error.	Review wiring.
Machine stops unexpectedly during a length tool setting cycle.	There has been an unexpected contact on the contact pad, causing an overtravel condition.	Review program.
Spindle crashes into the LTS.	Tool length offset incorrect.	Review offsets.
Poor repeatability and/or accuracy.	Debris on the contact pad.	Ensure that the contact pad is clean.
	Loose LTS mounting.	Check and tighten as appropriate.
	Loose contact pad.	Check and tighten as appropriate.
	Calibration out of date and/or incorrect offsets.	Review the LTS software. Repeat calibration routine.
	Machine tool faulty.	Perform health checks on machine tool.
LTS is non-operational, or fails to power up.	LTS faulty due to a previous 'crash' event.	Contact Renishaw for assistance.

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Parts list

7.1

Type	Part number	Description
LTS	A-5475-0001	Primo LTS with Ø26 mm contact pad and quick-start guide.
LTS (with adaptor)	A-5475-0002	Primo LTS with Ø26 mm contact pad, adaptor and quick-start guide.
Installation kit	A-5475-0401	Installation kit comprising: M5 cap head screws (× 4), air pipe fitting (× 1), air flow regulator (× 1), 5 m × Ø6 mm air pipe.
Contact pad	A-5475-0402	Ø26 mm (Ø1.02 in) contact pad (tungsten carbide), tool kit.
Air pipe	A-5475-0403	Primo LTS air pipe.
Adaptor	A-5475-0404	Primo LTS adaptor for T-slot mounting.
Tool kit	A-5475-0060	Tool kit comprising: ferrules (× 3), 1.5 mm hexagon key (× 1).
Solenoid valve kit	A-5299-2933	Solenoid valve kit for air actuation control.
LTS software	A-5475-8700	Primo LTS application software package, available for download from our website at www.renishaw.com/primodownloads .
Publications. These can be downloaded from our website at www.renishaw.com/primodownloads .		
Quick-start guide	H-5475-8550	For the rapid set-up of the Primo LTS.
Software user guide (Fanuc)	H-5475-8600	For the operation of the Primo LTS with Fanuc/Meldas CNC machine tool controllers (Far East).
Software user guide (Fanuc)	H-5475-8601	For the operation of the Primo LTS with Fanuc/Meldas CNC machine tool controllers (Europe).
Software user guide (Fanuc)	H-5475-8602	For the operation of the Primo LTS with Fanuc/Meldas CNC machine tool controllers (ROW).
Software user guide (Siemens)	H-5475-8603	For the operation of the Primo LTS with Siemens CNC machine tool controllers (Far East).
Software user guide (Siemens)	H-5475-8604	For the operation of the Primo LTS with Siemens CNC machine tool controllers (Europe).
Software user guide (Siemens)	H-5475-8605	For the operation of the Primo LTS with Siemens CNC machine tool controllers (ROW).

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