

TRS2 non-contact tool breakage detection system

New improved tool recognition with ToolWise™ technology ensures reliable, high-speed, broken tool detection.

System components

- **TRS2 broken tool detection device**

The TRS2 is a cost-effective solution for high-speed broken tool detection of tools that are solid on-centre, e.g. drills, taps, etc.

- **Air filter / regulator**

Provides the TRS2 with clean, dry air to protect it against coolant and swarf.

- **Software for broken tool detection**

Renishaw has written software specifically for the TRS2. Software for a variety of different controllers is supplied with the system kit. It includes a high-speed spin cycle to remove coolant off the tool prior to checking. This cycle is recommended for optimum performance.

- **Air blast**

For greatest consistency, particularly at 1000 r/min and 200 r/min, the optional air blast kit is recommended for blowing coolant from the tool. A solenoid valve is also available to turn the air supply on and off.

- **PSU3 power supply**

Used when a 12 V to 24 V supply is not available from the CNC machine.

System features

Conventional non-contact tool breakage detection systems depend on the laser either being blocked (tool OK) or not blocked (tool broken). The TRS2 is different; featuring a new improved tool recognition system with ToolWise™ technology. *

* Patent applied for.



The unique tool recognition electronics determine whether a tool is present by analysing the reflective light pattern from the rotating tool. Random light patterns created by coolant and swarf are ignored, reducing the chances of not detecting a broken tool due to coolant blocking the beam.

ToolWise™ electronics recognise a tool that is rotating at 5000 r/min, 1000 r/min, or 200 r/min, making the TRS2 very flexible to use.

- Fast operation. Typically, a tool spends approximately 1 second in the laser beam.
- Inexpensive and easy to install, as all components are housed in a single unit.
- No M codes are required.
- Tools as small as Ø0.2 mm (0.008 in) can be checked. * *
- The TRS2 can detect tools between 0.3 m and 2.0 m away, making it suitable for a wide range of machines, although it is optimised for use at 1 m and less.
- Compact dimensions 38 mm W × 73 mm D × 83 mm H (1.50 in W × 2.87 in D × 3.27 in H).

* * depending on the range, tool surface finish, machine environment and installation.

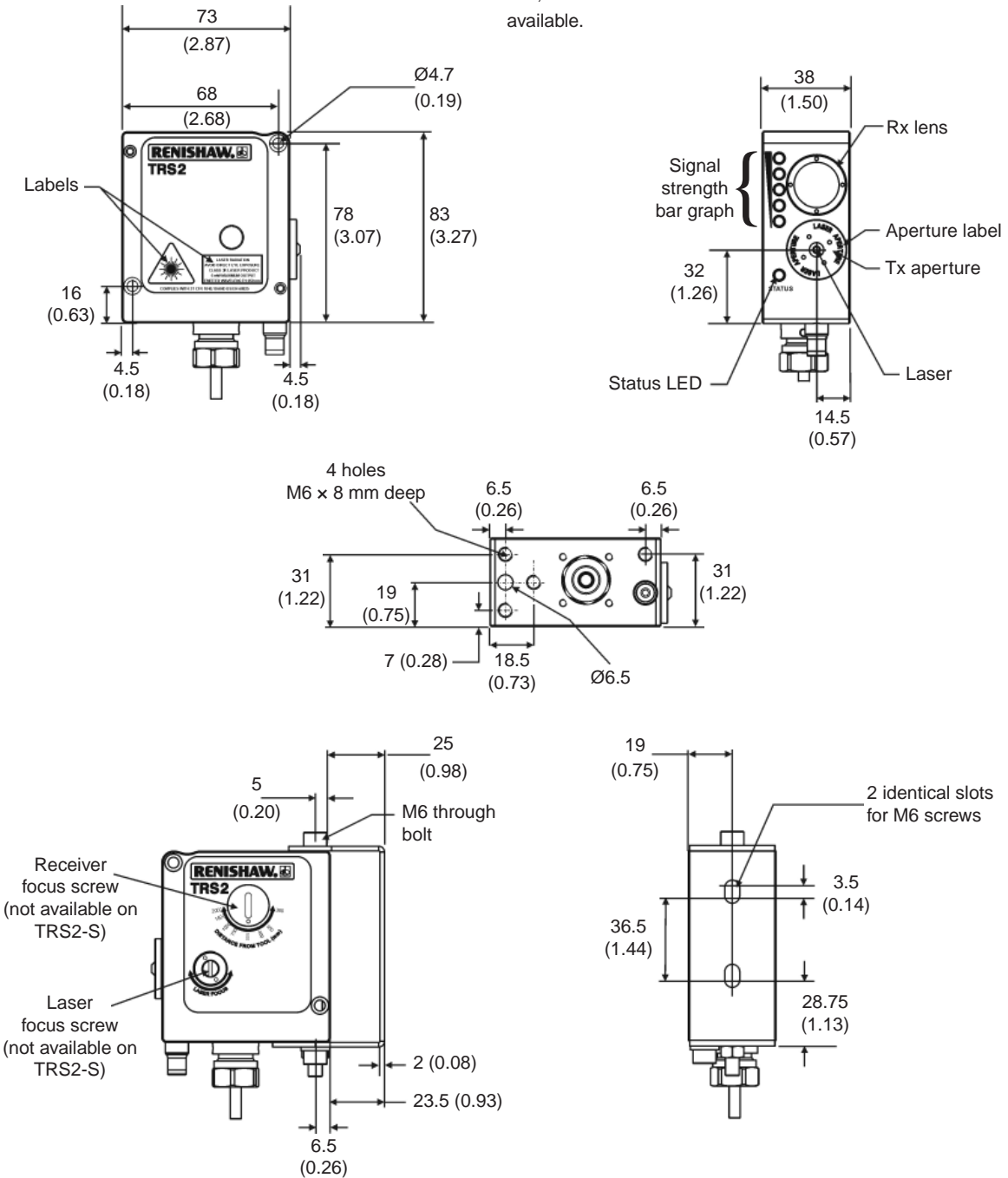
Data sheet

TRS2 non-contact broken tool detection system

Dimensions and laser warning symbols : TRS2 and TRS2-S

Dimensions in mm (in)

NOTE: These figures show a TRS2 unit. On the TRS2-S unit, the Receiver focus and Laser focus screws are not available.



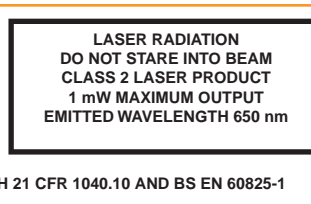
Laser focus screw
(not available on TRS2-S)

Receiver focus screw
(not available on TRS2-S)

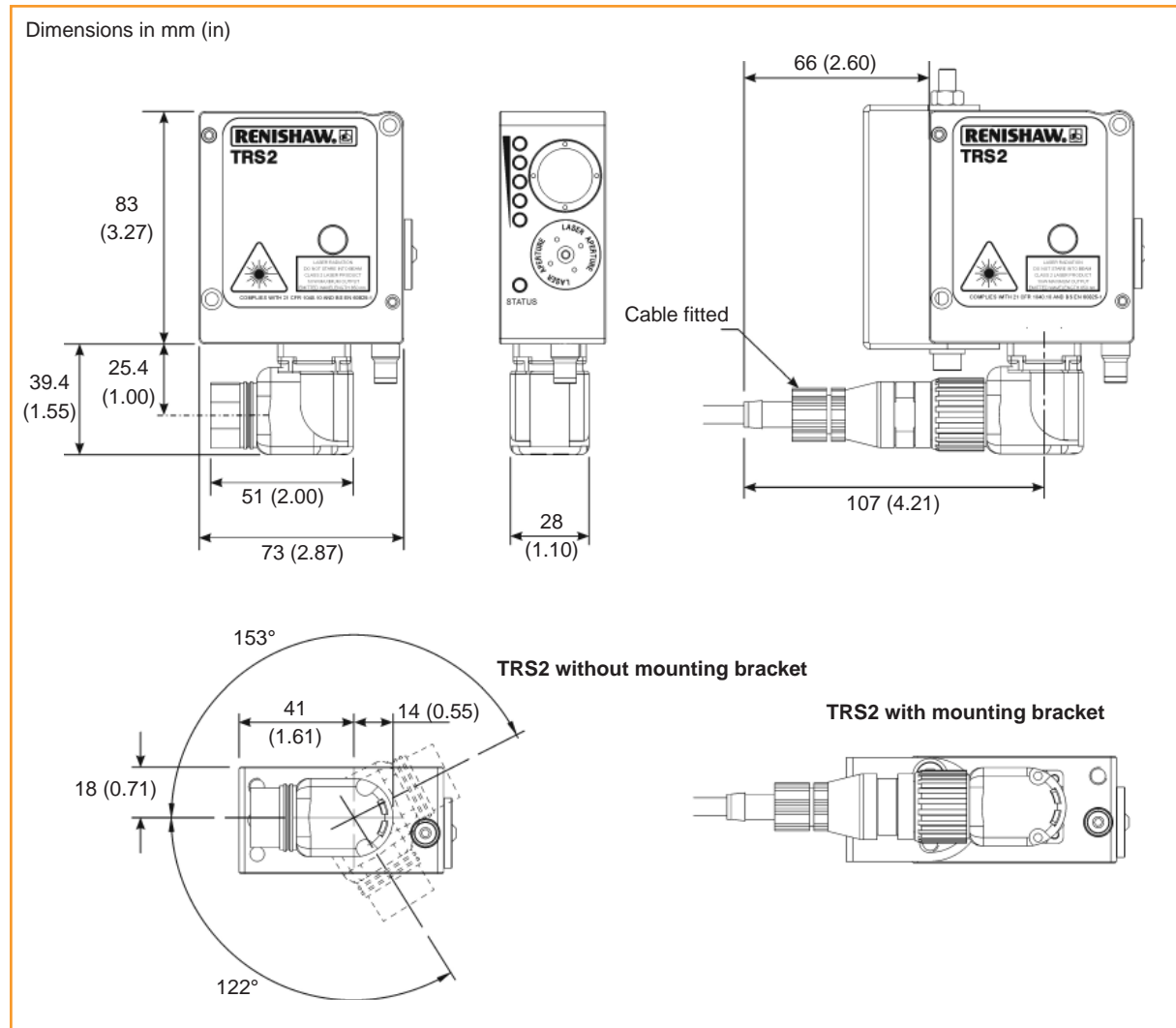
Warning label

Explanatory label

Aperture label



Dimensions : TRS2 and TRS2-S with cable connector



Receiver lens kit

Under severe conditions the receiver lens may become damaged or contaminated and therefore require replacement. A lens kit is available for this purpose.

Sapphire glass window kit

If the TRS2 receiver lens is likely to become scratched due to bombardment by swarf, it can be protected by a hard sapphire glass window.

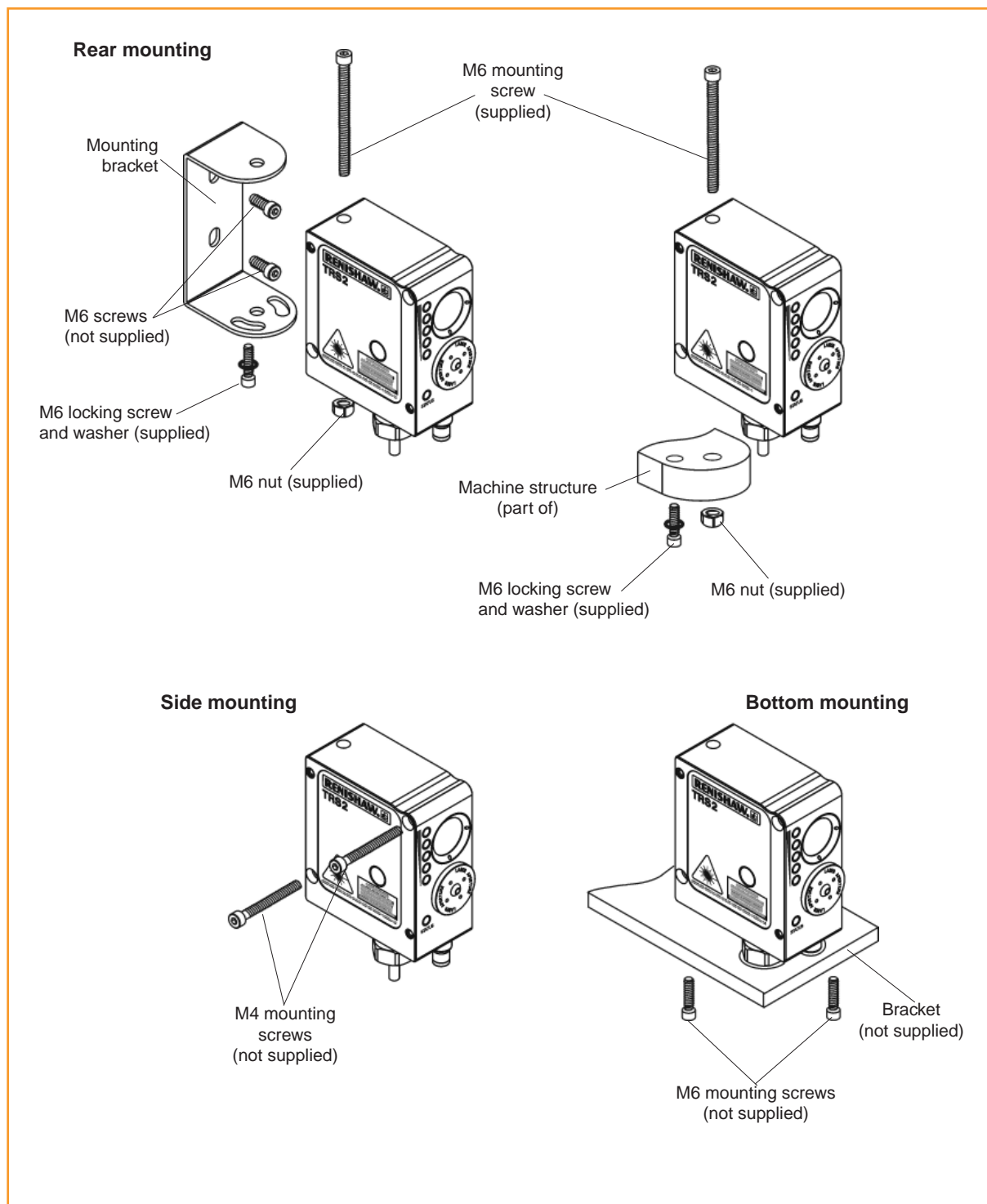
Air cap kit

If the air cap becomes damaged, it may be replaced with a new air cap.

Data sheet

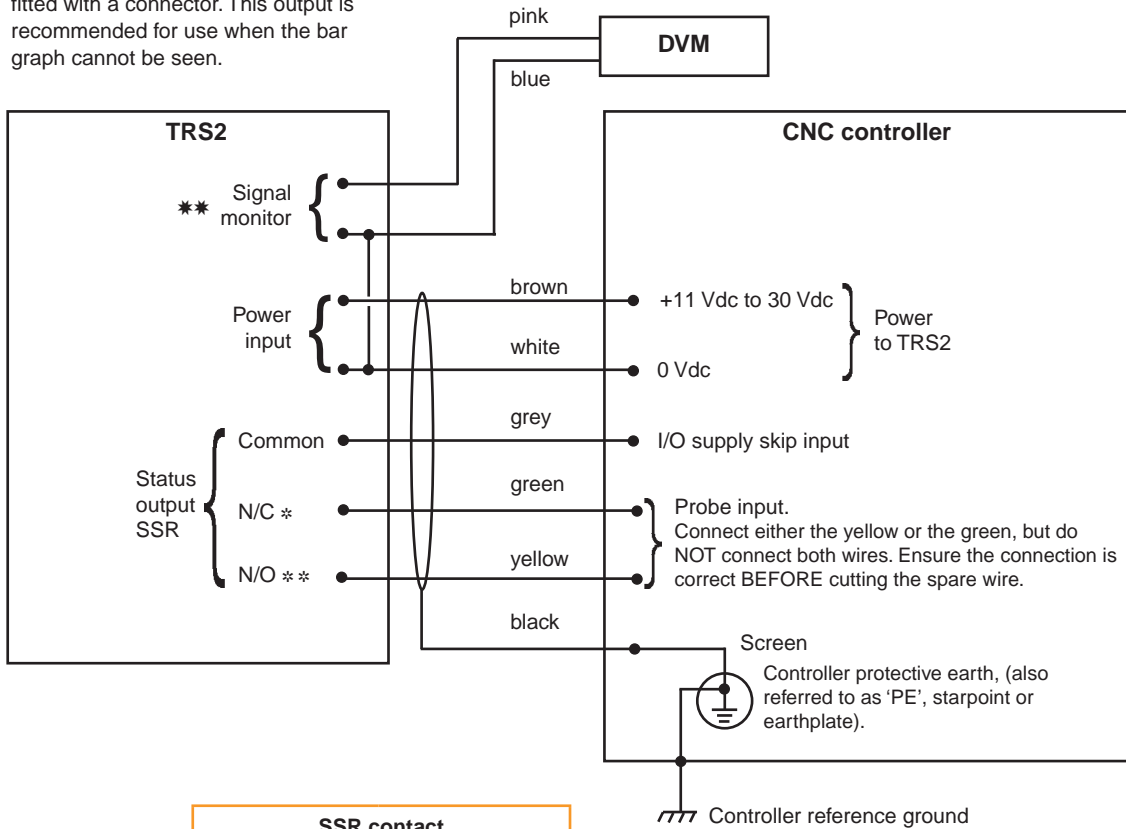
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Mounting details



Electrical connections

*** the signal monitor output is available only with the version of TRS2 that is fitted with a connector. This output is recommended for use when the bar graph cannot be seen.



	SSR contact	
Status	* Normally-closed (N/C)	** Normally-open (N/O)
Tool detected	Open	Closed
Tool not detected	Closed	Open

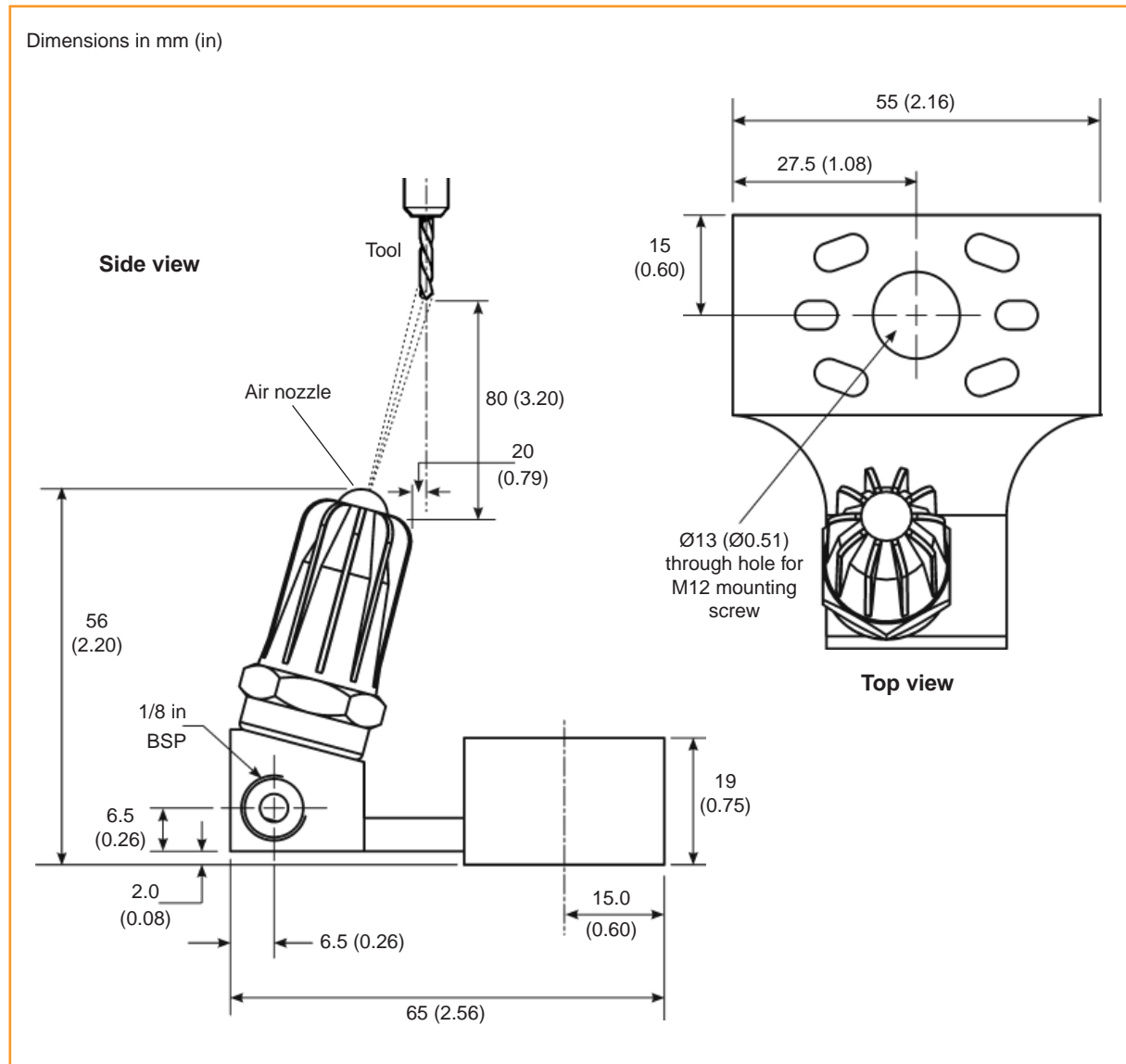
Spindle speed selection

For a tool to be detected by the TRS2 system, it must be rotating at a fixed speed of 5000 r/min, 1000 r/min or 200 r/min. The required spindle speed must be selected in the macro software.

- 5000 r/min. This is the default speed and gives the shortest detection time. It is recommended that this speed is used whenever possible. However, when selecting this speed you must ensure that it does not exceed the maximum speed indicated by the manufacturer.
- 1000 r/min. Select this speed when 5000 r/min is not suitable. Before detecting a tool at this speed, the tool must be cleaned, either by using a compressed air blast or by spinning the tool at a greater speed. Optionally, you can use an air blast kit that is available from Renishaw plc (see the Parts list).
- 200 r/min. This speed is reserved for use with deep hole drills. The detection time is likely to be significantly longer than at the two other speeds. Before detecting a tool at this speed, it is recommended that the tool is cleaned using a compressed air blast.

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A solenoid kit is available to control the flow of air to the air blast nozzle.



Specifications

Application	High speed non-contact tool breakage detection of solid tools.
Laser type	The laser emits visible red light at a wavelength of 650 nm and has a power output of less than 1 mW. It is driven by a continuous pulse train running at a frequency of 125 kHz. The pulse duration is 2 μ s and each pulse has a maximum energy of 7.2×10^{-9} J. The laser used is classified as a Class 2 product as defined by BS EN 60825-1:1994. It complies with 21CFR 1040.10 except for deviations pursuant to Laser Notice No. 50 dated July 26, 2001.
Working temperature	5 °C to 50 °C
Storage temperature	–10 °C to 70 °C
IP rating	IPX8 with air on.
Life	Tested to >1 million on/off cycles.
Tool diameter	Each TRS2 unit is tested with a $\varnothing 0.5$ mm, blue finish, HSS jobber drill (Farnell part no. 203778) at a range of 350 mm (13.8 in). Test conditions: Dry tool, spinning at 5000 r/min, which must be detected by the TRS2 within 1 second.
Pneumatic supply	$\varnothing 4$ mm air pipe. Air supply to the TRS2 system must conform to ISO 8573-1: Air quality of class 1.7.2.
Dimensions (without mounting bracket)	38 mm width \times 73 mm depth \times 83 mm height (1.50 in width \times 2.87 in depth \times 3.27 in height).
Weight	0.75 kg (1.65 lb) including 10 m of cable.
Mounting	Mounting bracket provided, with M6 clearance slots. An alternative mounting arrangement is provided by M4 tapped and clearance holes in the product housing.
Detection range TRS2 units TRS2-S unit	Adjustable between 300 mm (12 in) and 2 m (78 in). Factory set to 350 mm (13.8 in). Fixed at 350 mm (13.8 in).
Input voltage	11 Vdc to 30 Vdc. Power can be drawn from a CNC machine's 12 V to 24 V nominal dc supply. Alternatively, power can be obtained from a Renishaw PSU3 power supply unit.
Current consumption	Typically less than 65 mA at 12 Vdc and less than 43 mA at 24 Vdc.
Fuse	50 mA resettable fuse protects the solid state relay (SSR) output.
Cable	5-core plus screen cable. Each core 18/0.1 insulated. $\varnothing 5.0$ (0.20 in) \times 10 m (32 ft).
Output	Solid state relay (SSR), normally-open/normally-closed contact, max. 40 mA (fused at 50 mA).

More information

The TRS2 is available as a retrofit solution for existing machines, including probe software, installation and training.
Contact your Renishaw supplier for further details.

For further information on the products described in this data sheet, please visit www.renishaw.com then choose “Machine tool”.

Parts list — please quote the part number when ordering equipment

Type	Part number	Description
TRS2 (unit only)	A-5450-0400	TRS2 unit with 10 m cable, mounting bracket, pin spanner, product documentation and software on CD, beam terminator, and laser warning sign (P-LA01-1066).
TRS2 (full kit)	A-5450-1000	Contains all the items in kit A-5450-0400, plus 4 m cable conduit, air assembly kit, 25 m air pipe, and 2 x 2 m air pipe conduit.
TRS2 with cable connector (unit only)	A-5450-0420	TRS2 unit with cable connector, mounting bracket, pin spanner, product documentation and software on CD, beam terminator, laser warning sign (P-LA01-1066), TRS2 box insert, and box.
TRS2 with cable connector (full kit)	A-5450-1500	Contains all the items in kit A-5450-0420, plus 12.5 m cable with mating connector, air assembly kit, 4 m cable conduit, 2 x 2 m air pipe conduit, and packaging.
TRS2-S (unit only)	A-5450-0410	TRS2-S unit with 10 m cable, mounting bracket, pin spanner, product documentation and software on CD, beam terminator, laser warning sign (P-LA01-1066), TRS2 box insert, and box.
TRS2-S (full kit)	A-5450-1100	Contains all the items in kit A-5450-0410, plus air assembly kit, 4 m cable conduit, 2 x 2 m air pipe conduit, and packaging.
Air filter service kit	P-FI01-S002	Service kit for air regulator – parts for both filter bowls.
Deluxe air filter	P-FI01-0008	Air regulator with blocked filter indication and auto drain.
Air cap	A-5450-0440	Replacement air cap and O-ring.
Air blast kit	A-5450-0480	Nozzle, mounting bracket.
Solenoid kit	A-5450-0490	Solenoid (24 V), air fitting, 6 mm tee connector, 15 m x Ø6 mm black nylon tube, bulkhead fitting, tube clips (5 off).
Air pipe (Ø6 mm)	P-PF26-0008	10 m x Ø6 mm black nylon tube (used in conjunction with the solenoid kit).
Receiver lens	A-5450-0470	Replacement lens and O-ring.
Sapphire glass window	A-5450-0460	Hard sapphire glass protective window and locking ring.
Publications : Individual publications can be downloaded from our web site. Go to www.renishaw.com then choose "Machine tool".		
Product documentation and software CD	A-5450-8501	Contains a Quick start guide, Installation guides, programming guides, TRS2 system software and software installation instructions.

**For worldwide contact details, please visit our
main web site at www.renishaw.com/contact**



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