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RENISHAW
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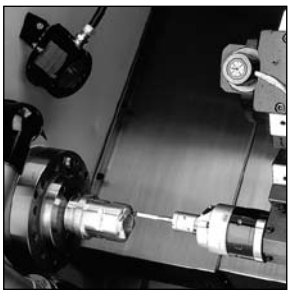
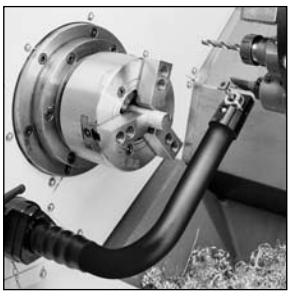
Probing systems for CNC machine tools

Introduction





The invention of the touch trigger probe in the early 1970s revolutionised the development of the CMM (co-ordinate measuring machine) as the industry standard for 3D measurement.

Although the potential for applying probe routines on machine tools was quickly realised, it was not until the mid-1980s and development of more sophisticated machine controls, that probing became adopted by the world's largest machine tool builders.

Historically, there had been a marked reluctance by users of machine tools to use probing; typical objections included "increased cycle times" and "machine tools are for cutting not for measuring". Both sentiments were largely based on misconceptions as to the real applications and benefits of probing, and also entrenched attitudes to improvements in methods of machine tool operation.

Today, the acceptance of quality control in the production environment, and drive towards maximising machine productivity, has finally seen probing accepted as standard practice in the field of production engineering.

Applications

Tool setting

Using slip gauges and entering offset data manually takes time and is prone to operator error. Tool setting probe systems are easily installed on machining centres and CNC (computer numerically controlled) lathes and allow automated operation with the following benefits:

- Significant time savings with reduced machine downtime
- Accurate tool length and diameter measurement
- Automatic tool offset calculation and correction
- Elimination of manual setting errors
- In-cycle tool breakage detection

Part set-up

Probing eliminates the need for expensive fixtures and manual setting with dial indicators. Probes are spindle-mounted on machining centres and turret-mounted on lathes, providing the following benefits:

- Reduced machine downtime
- Automatic fixture, part alignment and rotary axis set-up
- Elimination of manual setting errors
- Reduced scrap
- Increased productivity and batch size flexibility

Part inspection

Spindle and turret-mounted probes can also be used for in-cycle gauging and first-off inspection – manual gauges rely on operator skill and the removal of parts to CMMs is not always practical. Benefits include:

- In-cycle part measurement with automatic offset correction
- Increased confidence in unmanned machining
- First-off inspection with automatic offset update
- Reduced machine downtime from awaiting first-off results

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Contents

How to use this guide

This document has been designed to help you to select the ideal probing system for your machine tool application.

Renishaw's broad product range covers inspection and tool setting applications on CNC machining centres, lathes and grinders, and manual milling machines.

Comprehensive probing software, styli and accessories cater for every probing need. Where a standard product may not suit your exact requirements, Renishaw's custom design service is available to tailor a solution.

Probe system selection

The type of probing system that you need will depend on your machine tool and the nature of the probing application.

This document contains sections that focus on the main applications for probing on machine tools (see sections 3, 4, 5 and 6). At the start of each section is an introduction to the use of probing for that application, plus guidance on selection of the most appropriate system. The remainder of the section contains technical information about each probe.

For inspection probing systems, you also need to consider the type of transmission system that you require. Once again, this decision will depend on the size and configuration of your machine tool.

Selection procedure

Step 1

Which probing application do you require?

1. Inspection / part set-up
   Go to Step 2.
2. Tool setting / broken tool detection
   Go to Step 3.

Step 2

What type of transmission do you require for your inspection probing system?

Go to section 2 (Transmission selection), to identify the best transmission system for your machine tool. An overview will help you to choose, with a detailed specification of transmission performance on the subsequent data pages.

Step 3

Which probe is best for your application?

Go to the appropriate section (3, 4, 5 or 6) for your application. On the first page is an overview of Renishaw's products and a guide for probe selection. If no standard product meets your requirement, refer to section 11 (Custom design service).

Step 4

Check the probe details.

Check the technical information listed on the data page for the probe that you have selected to ensure that it meets your requirements. If yours is an inspection probing application, check that the probe can operate with the transmission system that you have chosen.

Step 5

Check the interface details.

The probe data page defines the compatible electrical interface unit for your chosen probe. Go to section 7 (Machine interface units) to check that the interface is suitable for your machine tool controller.

Step 6

Identify your shank adaptor requirements.

Section 8 (Shank adaptors) will help you either to make your own shank adaptor, or to choose from Renishaw's range of standard items.

Other accessories

Styli

Renishaw probes are supplied with styli suitable for most applications. Section 9 (Styli and accessories) gives further information on Renishaw's stylus range. For full details, refer to Renishaw's technical specification *Styli and accessories* (part no. H-1000-3200).

Software

Renishaw has a comprehensive range of probing software packages suitable for most probing applications. Check section 10 (Software) to see whether suitable probing software is available for your machine tool controller.

For more details of Renishaw's probing software, refer to the data sheets *Probe software for machine tools – program features* (part no. H-2000-2289) and *Probe software for machine tools – program selection list* (part no. H-2000-2298).

Overview

A Renishaw probe must be able to communicate with the control system (CNC) of the machine on which it is fitted. Signals must pass from the probe to the machine's controller to register contact of the probe's stylus with the component or tool. Similarly, signals must pass from the machine's controller to the probe to control the functioning of the probe.

The passage of these signals is handled by a **transmission system**. The choice of transmission system depends on the type of probe and the type of machine tool to which it is fitted.

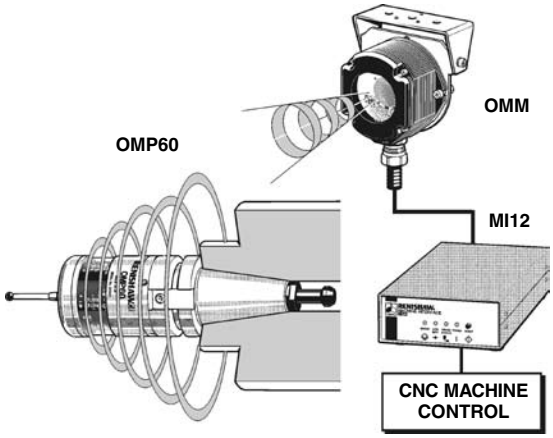
Inspection probes for machining centres are typically located in a tool carousel and are interchanged like conventional tools. On lathes, the probe is typically a semi-permanent feature of a rotating turret. In both case, signalling between probe and CNC generally has to be remote.

For **tool setting** applications, typically the probe is mounted in a fixed location, thereby allowing direct communication between probe and CNC.

Renishaw probes use four main types of transmission systems:

- Optical
- Radio
- Inductive
- Direct or 'hard-wired'

The following sections show typical examples of each of these systems:



Optical transmission systems

Overview

An optical transmission system uses infra-red technology for communicating between the probe and the CNC controller and comprises the following:

- **Probe module**

  The probe receives machine control signals and transmits probe status signals. There are two active modes, "standby" and "operating". In "standby" mode the probe is a receiver waiting for a signal to switch to operating mode. In "operating mode" it transmits probe information to the OMM receiver. Probe battery status information is also transmitted in the same manner.

- **Optical machine module (OMM)**

  The OMM is the reception/transmission communication partner for the probe module. It is hard-wired to a machine interface unit.

- **Machine interface unit (MI12)**

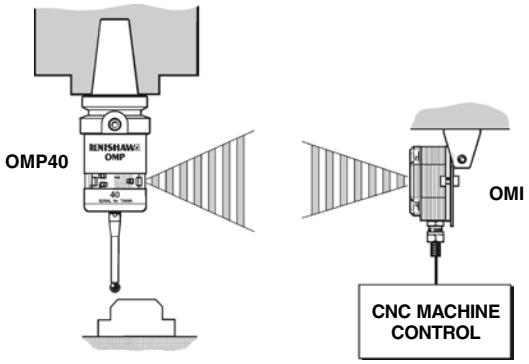
  The interface converts probe signal information into a form which is compatible with the machine controller. In addition, it has visual and/or audible indicators for probe status, system power, battery status and error diagnostics.

- **Optical machine interface (OMI)**

  The functions of the OMM and MI12 have been combined into a single module, the **optical machine interface (OMI),** offering functionality specifically optimised for the needs of smaller machine tools.

- **Optical machine interface (OMI-2/OMI-2C)**

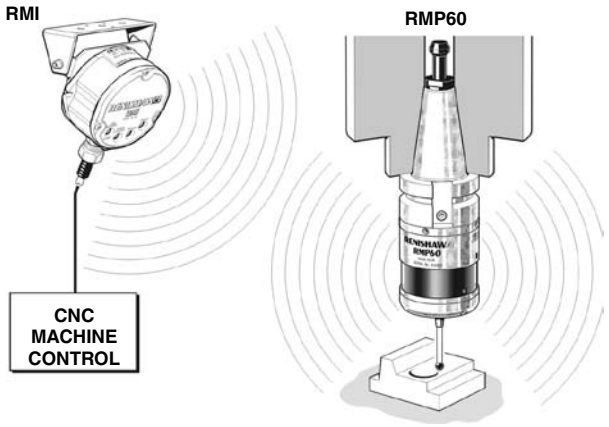
  These are new-generation optical receiver/interfaces that use modulated optical transmission for the rejection of light interference.



Applications

- Inspection systems on small to large sized machining centres and lathes.
  (See pages 2.4, 2.5 and 2.9 to 2.20 for further information).

Radio transmission systems



Overview

A radio transmission system provides long range (up to 15 m path length) of communication between the probe and the machine's controller. The system hops between channels, within the designated frequency band. The use of unique identifiers allow multiple radio systems to operate in close proximity. Radio probes are classified as short range devices and meet the requirements for licence-free operation.

A radio transmission system comprises the following:

- **Probe**

  The probe receives machine control signals and transmits probe status signals. There are two active modes, "standby" and "operating". In "standby" mode the probe is a receiver waiting for a signal to switch to "operating mode". In "operating mode" it transmits probe status information to the RMI receiver.
  Probe battery status information is also transmitted in the same manner.

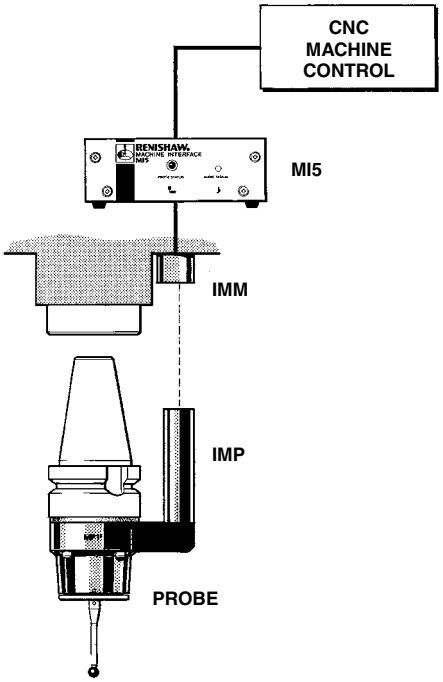
- **Machine interface (RMI)**

  The combined interface and antenna converts probe signal information into a form which is compatible with the machine's controller. In addition, it has visual indicators for start, low battery, probe status, error and signal strength.

Applications

- Workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turret lathes (VTL).

Inductive transmission systems



Overview

Inductive transmission works by passing power and probe signals across a small air gap between two induction modules. Typically, a probe fitted with an inductive transmission system comprises the following:

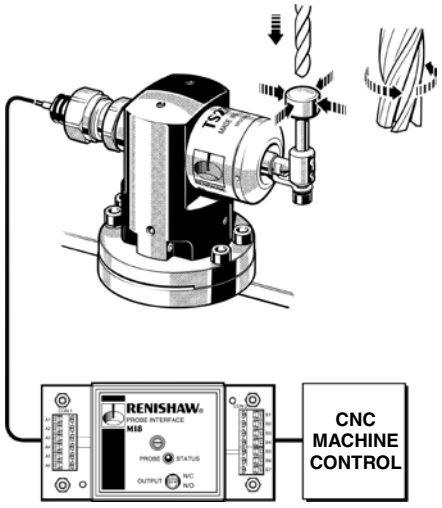
- **Probe and inductive probe module (IMP)**, mounted on a shank. The IMP receives power from, and passes probe signals to, the IMM.
- **Machine module (IMM)** communicates with the IMP. Mounted on the machine tool's spindle nose, the IMM is 'hard-wired' to a Machine Interface Unit.
- **Machine interface unit (MI5)** converts probe signals into a form which is compatible with the machine tool's controller. The interface also has visual and audible indicators of probe status.

Applications

- Inspection systems on machining centres and lathes. Inductive transmission is only suitable for fitting by machine builders.

Hard-wired transmission systems

An example of a contact tool setting system



Overview

A hard-wired probe system has the simplest form of transmission system and typically, comprises the following elements:

- **Signal cable** connects the probe to a machine interface unit, carrying power and probe signals.
- **Machine interface unit (MI8)** converts probe signals into a form which is compatible with the machine tool's controller. The interface also has visual indicators for probe status and error diagnostics.

Applications

Hard-wired transmission systems are ideal for the following applications:

- Tool setting on machining centres and lathes where the probe remains in a fixed location (see pages 4.3 to 4.7).
- Inspection on milling machines where the probe is manually placed in the machine spindle.

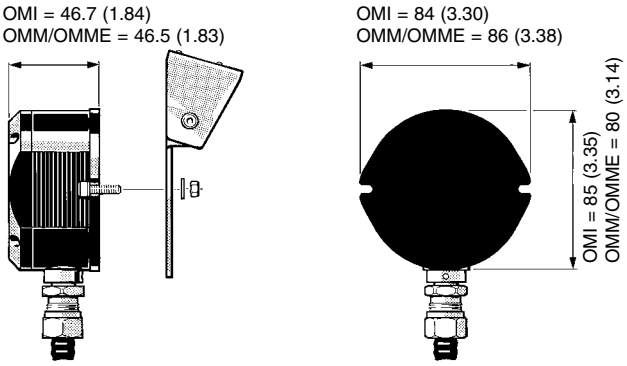
For further details of hard-wired transmission systems, refer to section 7 (Interfaces).

OMI/OMM/OMME

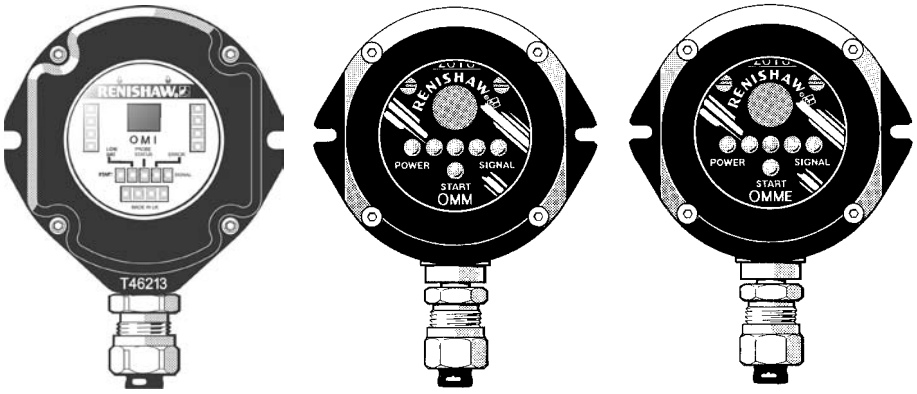
The OMI and OMM are optical transmitter/receivers which convey signals between a probe system and the CNC machine's control.

The OMI differs from the OMM by including machine interface circuitry which processes signals and can therefore be connected directly to the machine's control. The physically identical OMM requires an additional MI12 interface unit. Two OMMEs are typically used in conjunction with an MI12E interface.

All units contain LEDs which transmit and receive signals to and from the probe. There are also LEDs which indicate probe status, start signal status, battery condition and error condition.



All dimensions are in mm (in).



	OMI	OMM	OMME
PRINCIPAL APPLICATION	Small sized machining centres and lathes	Medium sized machining centres and lathes	Large and 5-axis machining centres
TRANSMISSION TYPE	Infra-red optical transmission	Infra-red optical transmission	Infra-red optical transmission
CABLE	Screened, 12-core x 8 m long	Screened, 5-core x 25 m long	Screened, 5-core x 25 m long
MOUNTING	A mounting bracket is available allowing directional setting		
SEALING	IPX8	IPX8	IPX8
COMPATIBLE INTERFACE¥	OMI does not require an additional interface	OMM requires MI12 Note that two OMMs can be connected to a single MI12	OMME requires MI12E Note that two OMMEs can be connected to a single MI12E
SUITABLE PROBES†	OMP40, MP10, MP12 and MP700 for machining centre inspection applications LTO2S, LTO2T, LTO3T and LTO2 for lathe inspection applications		

¥ See INTERFACES section for more details.

† See relevant application sections for more details.

OMI-2

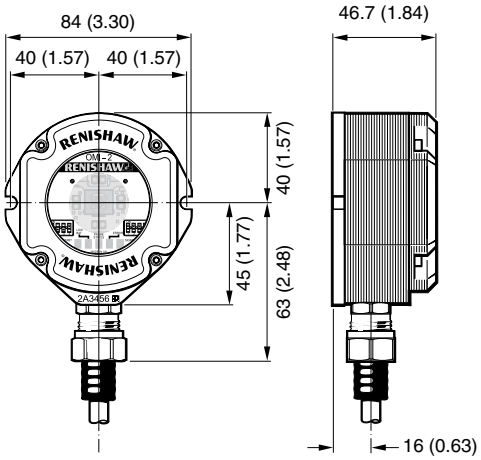
for use with OMPs with modulated optical transmission

The OMI-2 is a combined optical receiver/interface, which conveys and processes signals between an inspection probe and the CNC machine control.

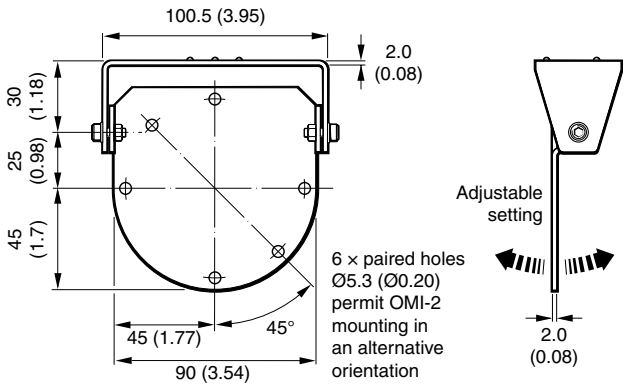
The OMI-2 is compatible for use with optical machine probes that utilise Renishaw's state-of-the-art modulated optical transmission method, to provide the highest level of resistance to light interference.

OMI-2 receiver/interface

All dimensions are in mm (in).



Mounting bracket – allows OMI-2 directional setting



	OMI-2
PRINCIPAL APPLICATION	Workpiece measurement and job set-up on small-to-medium sized machining centres and lathes.
POWER SUPPLY	12 V to 30 Vd.c Alternatively, power may also be supplied from a Renishaw PSU3 power supply
MOUNTING	Mounting bracket optional for side-exit configuration, to allow directional setting
CABLE	The OMI-2 standard cables are 8 m (26 ft) and 15 m (49 ft) long. Cable specification: Ø7.5 mm (0.29 in), 13-core screened cable, each core 18 × 0.1 mm
SEALING	IPX8
COMPATIBLE INTERFACE	The OMI-2 does not require an additional interface
SUITABLE PROBES†	Probes that use modulated optical transmission, i.e. OMP60, OMP400

† See relevant application sections for more details.

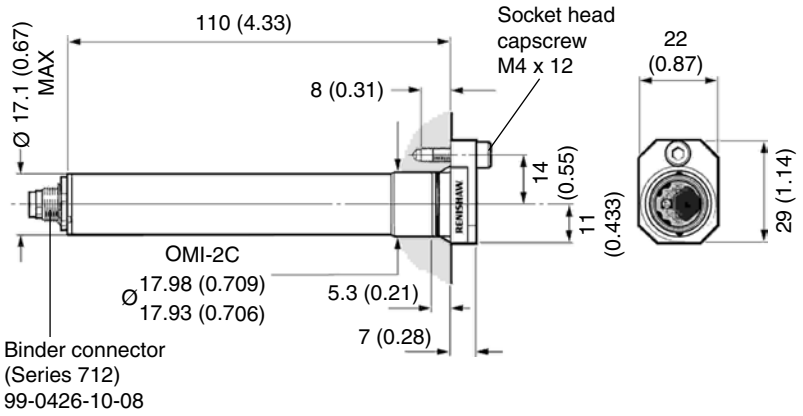
OMI-2C
for use with OMPs with modulated optical transmission

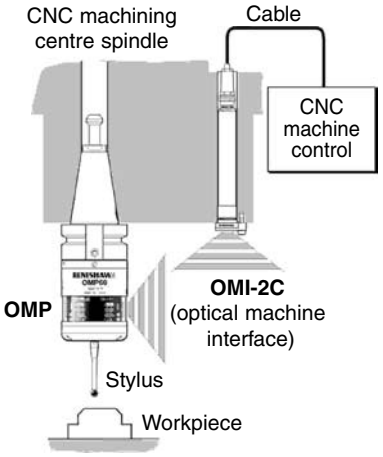
The OMI-2C is a combined optical receiver/interface and is an alternative to the OMI-2. It conveys and processes signals between an inspection probe and the CNC machine control.

The OMI-2C is compatible for use with optical machine probes that utilise Renishaw's state-of-the-art modulated optical transmission method, to provide the highest level of resistance to light interference.

OMI-2C
receiver/interface

All dimensions are in mm (in).





	OMI-2C
PRINCIPAL APPLICATION	Workpiece measurement and job set-up on small-to-medium sized machining centres and lathes.
POWER SUPPLY	15 V to 30 V d.c. Alternatively, power may also be supplied from a Renishaw PSU3 power supply.
MOUNTING	The OMI-2C is designed to be mounted onto the machine spindle housing.
CABLE	The OMI-2C standard cables are 8 m (26 ft) and 15 m (49 ft) long. Cable specification: Ø 5 mm (0.197 in), 12-core polyurethane screened cable, each core 7 × 0.1 mm.
SEALING	Sapphire glass window, sealed to IPX8 for machine tool environment.
COMPATIBLE INTERFACE	The OMI-2C does not require an additional interface.
SUITABLE PROBES†	Probes that use modulated optical transmission, i.e. OMP60, OMP400.
CONTROLLER SPECIFIC VARIANTS	The standard OMI-2C is compatible for use with Heidenhain/Siemens controllers.

† See relevant application sections for more details.

RMI interface
for use with the RMP60 probe

The RMI is a combined transmitter and receiver for use with the RMP60 radio probe.

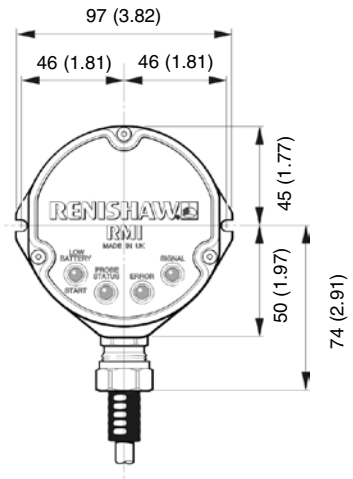
It is designed to be easily mounted within, or close to, the machine, resulting in a quick and simple installation.

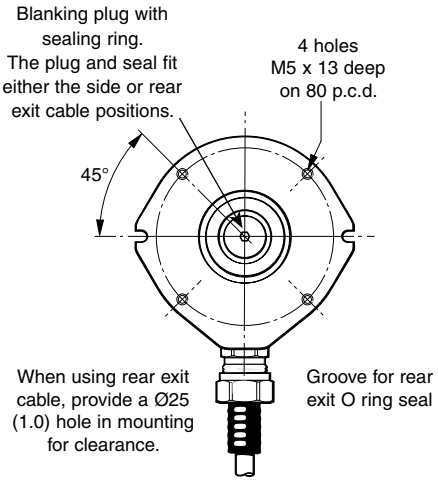
The RMP60 RMI system is ideal for retrofitting to existing machines.

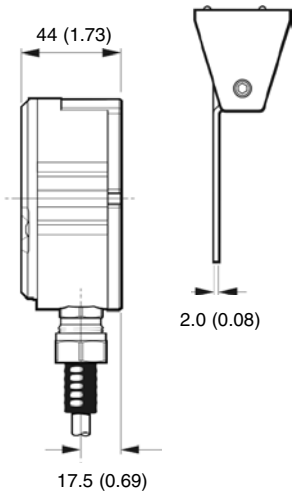
A visual indication of system status is provided by LEDs. Status is continuously updated and indication is provided for start, low battery, probe status, error and signal strength.

RMI interface

All dimensions are in mm (in).







	RMI
PRINCIPAL APPLICATION	Workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turret lathes
TRANSMISSION TYPE	Frequency hopping spread spectrum radio (FHSS)
CABLE	Ø7.5 mm (0.29 in), 13-core screened cable, each core 18 x 0.1 mm. The RMI is supplied with a 15 m cable assembly as standard. 30 m and 50 m cable assemblies are also available.
MOUNTING	An optional mounting bracket is available, allowing directional setting. The RMI cable can be reconfigured for rear exit.
SEALING	IPX8
COMPATIBLE INTERFACE	The RMI does not require an additional interface
SUITABLE PROBES†	RMP60 radio transmission probe

† See relevant application sections for more details.

IMM

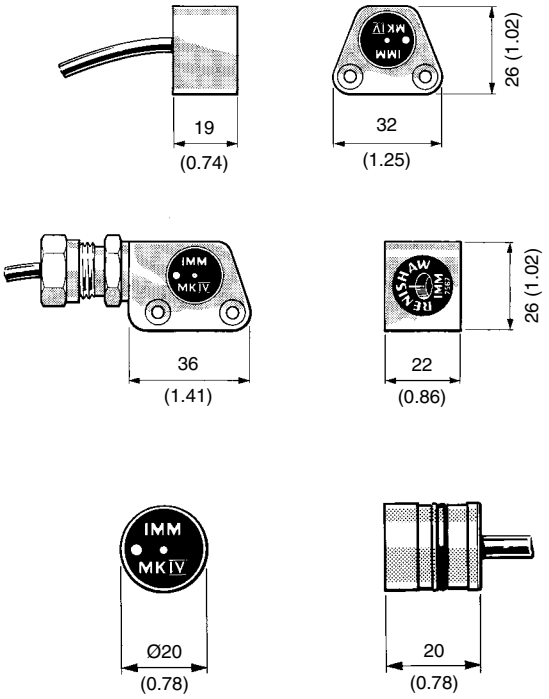
The IMM is an inductive module that may be attached to the spindle nose of a CNC machining centre. The preferred configuration has a rear exit cable.

An alternative configuration uses a side exit cable which can be supplied with various conduits to suit the application.

The IMM may also be fitted to the main casting at the rear of a tool turret on a CNC lathe. In this instance, the unit is cylindrical with a rear exit cable.

Inductive transmission is not recommended for retrofit installations. Machine builders should contact their Renishaw supplier for further details.

The IMM is also available with a ceramic face for applications where swarf may cause erosion to the standard face.



All dimensions are in mm (in).

	IMM
PRINCIPAL APPLICATION	Machining centres and lathes
TRANSMISSION TYPE	Electromagnetic induction
INDUCTIVE MODULE AIR GAP	0.1 mm (0.004 in) to 2.1 mm (0.08 in)
INDUCTIVE MODULE ECCENTRICITY	2.0 mm (0.08) max
CABLE Standard Extension	Screened, 3-core, 7/0.2 Ø4.3 mm (Ø0.17 in) x 5 m (16.4 ft) long Various 5.5 m (18.0 ft) to 25.5 m (83.6 ft) Max length permitted = 100 m (328 ft) Exposed cables **must** be located in protective conduit
CONDUIT (Side exit units only)	Ø11 mm (Ø0.43 in) flexible conduit Ø8 mm (Ø0.31 in) steel conduit
SEALING	IPX8
COMPATIBLE INTERFACE¥	MI5
SUITABLE PROBES†	MP1 or MP3 for machining centre applications LP2 for lathe applications

¥ See INTERFACES section for more details.

† See relevant application sections for more details.

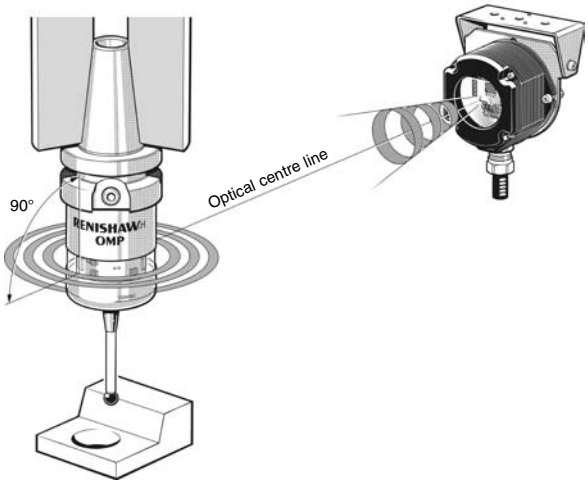
OMP40 transmission range

The diodes of the OMP40 probe and OMI or OMM must be in the other's field of view and within the performance envelope shown. The OMP40 performance envelope is based on the OMI or OMM being at 0° and vice-versa. Natural reflective surfaces in the machine may increase the signal transmission range.

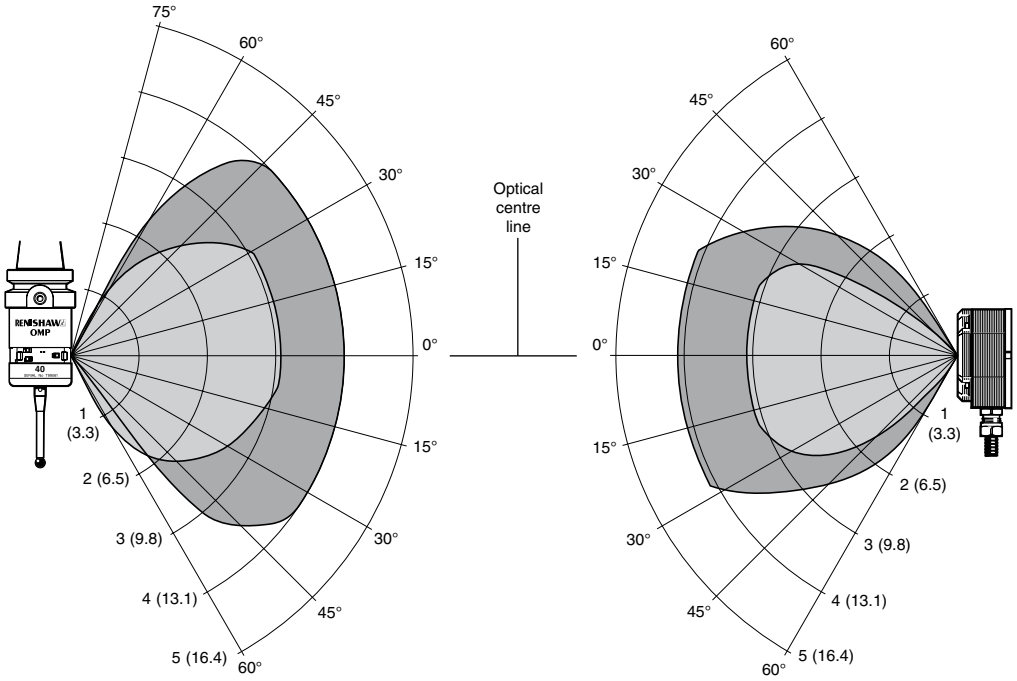
360° transmission around the probe axis in metres (feet)

Switch on/off Operating

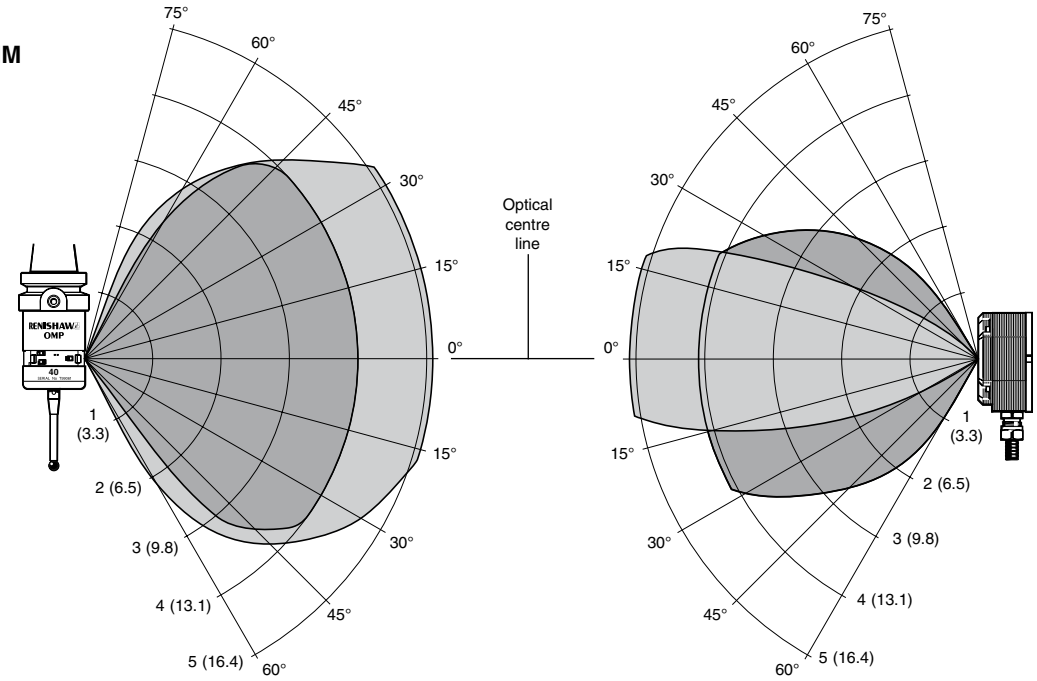
Transmission angles



OMP40 and OMI



OMP40 and OMM



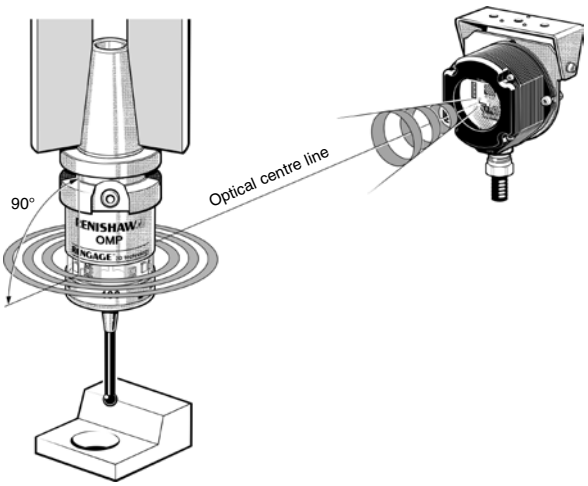
OMP400 transmission range with OMI-2 (modulated transmission)

The diodes of the OMP400 probe and OMI-2 must be in the other's field of view and within the performance envelope shown. The OMP400 performance envelope is based on the OMI-2 being at 0° and vice-versa. Natural reflective surfaces in the machine may increase the signal transmission range.

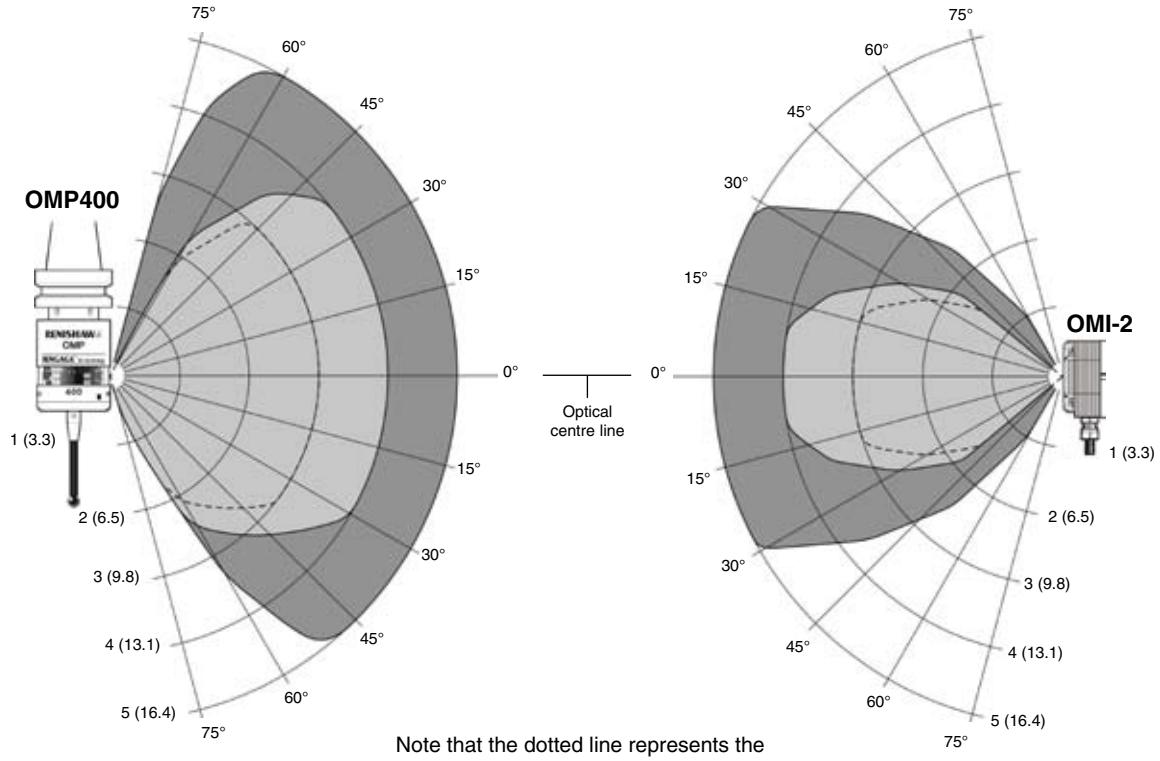
360° transmission around the probe axis in metres (feet)

Switch on/off Operating

Transmission angles



OMP400 and OMI-2



Note that the dotted line represents the operating range with OMP400 low optical power.

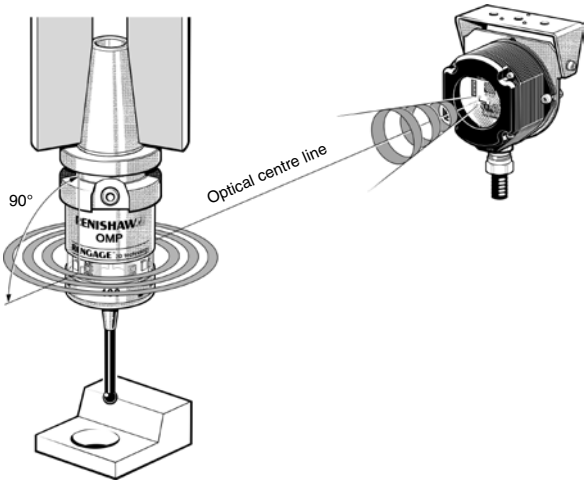
OMP400 transmission range with OMI (legacy transmission)

The diodes of the OMP400 probe and OMI must be in the other's field of view and within the performance envelope shown. The OMP400 performance envelope is based on the OMI being at 0° and vice-versa. Natural reflective surfaces in the machine may increase the signal transmission range.

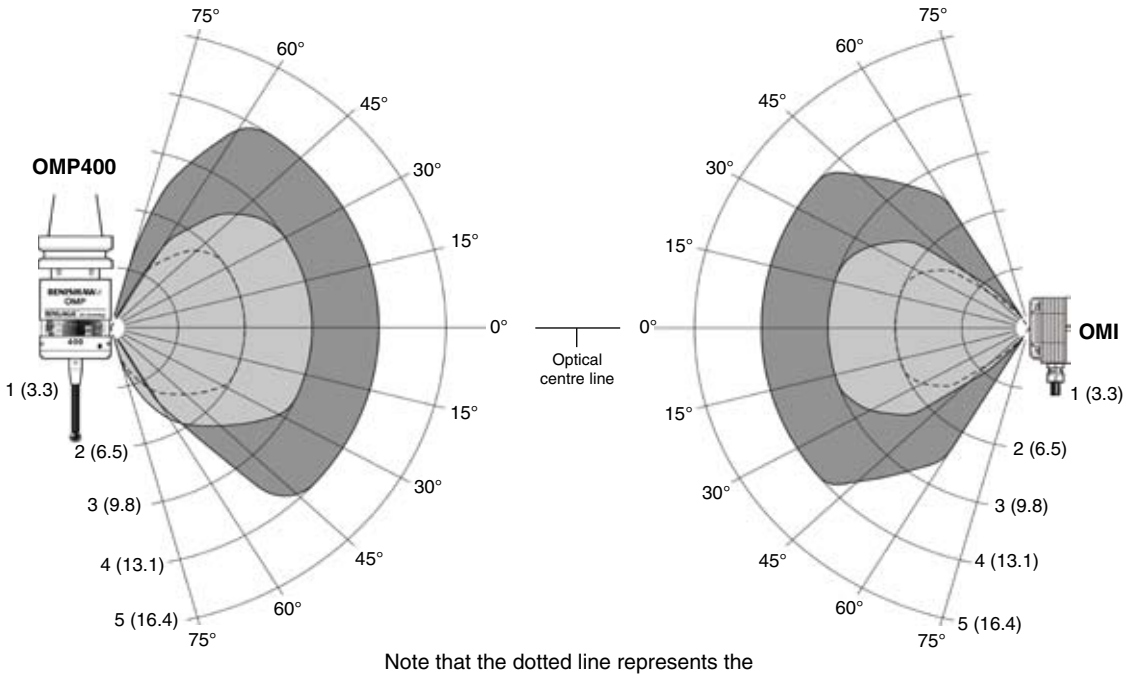
360° transmission around the probe axis in metres (feet)

Switch on/off Operating

Transmission angles



OMP400 with OMI (legacy transmission)



Note that the dotted line represents the operating range with OMP400 low optical power.

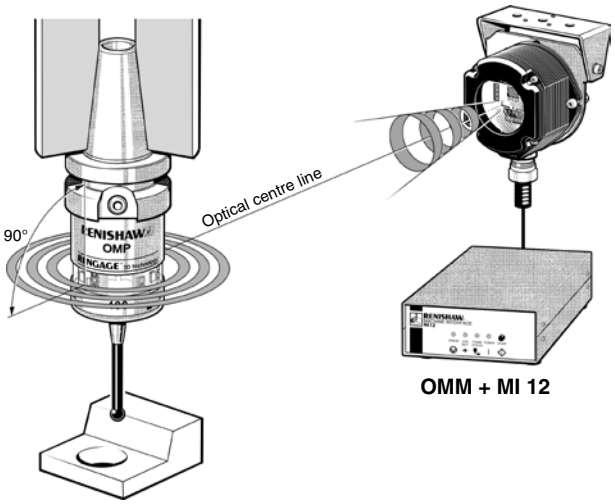
OMP400 transmission ranges with OMM/MI 12 (legacy transmission)

The diodes of the OMP400 probe and OMM must be in the other's field of view and within the performance envelope shown. The OMP400 performance envelope is based on the OMM being at 0° and vice-versa.

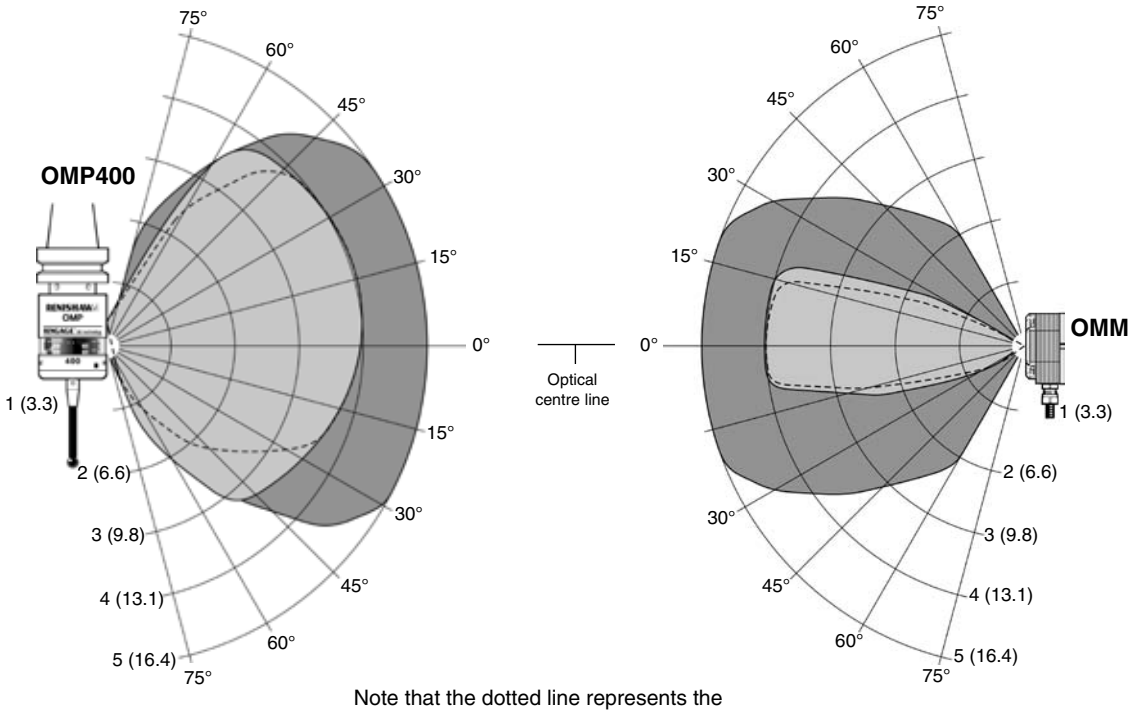
360° transmission around the probe axis in metres (feet).

Switch on/off Operating

Transmission angles



OMP400 with OMM (legacy transmission)



Note that the dotted line represents the operating range with OMP400 low optical power.

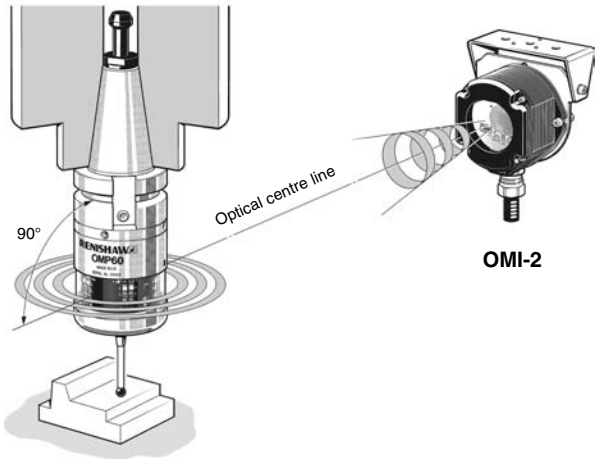
OMP60 transmission range with OMI-2 (modulated transmission)

The diodes of the OMP60 probe and OMI-2 must be in the other's field of view and within the performance envelope shown. The OMP60 performance envelope is based on the OMI-2 being at 0° and vice-versa.

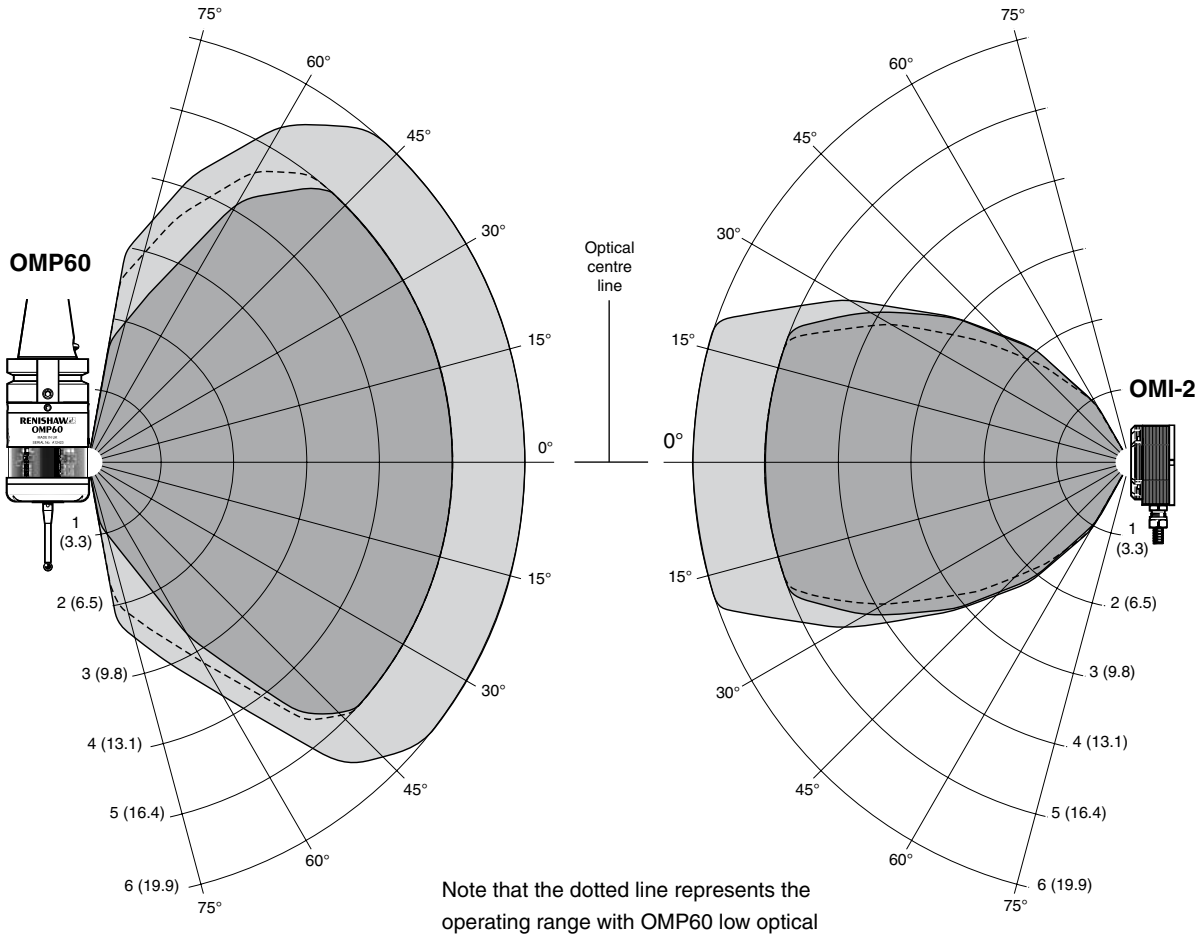
360° transmission around the probe axis in metres (feet).

Switch on/off Operating

Transmission angles



OMP60 with OMI-2 (modulated transmission)



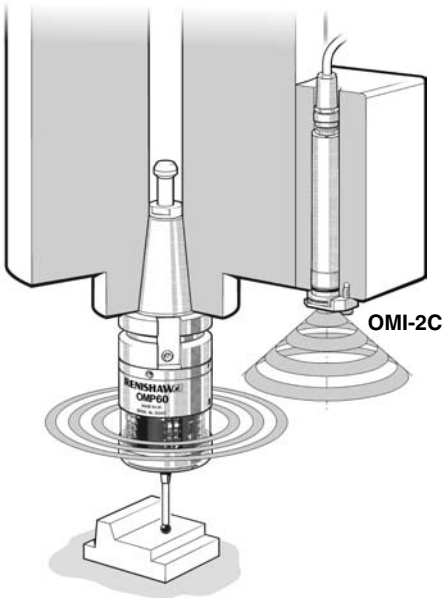
Note that the dotted line represents the operating range with OMP60 low optical power.

OMP60 transmission range with OMI-2C (modulated transmission)

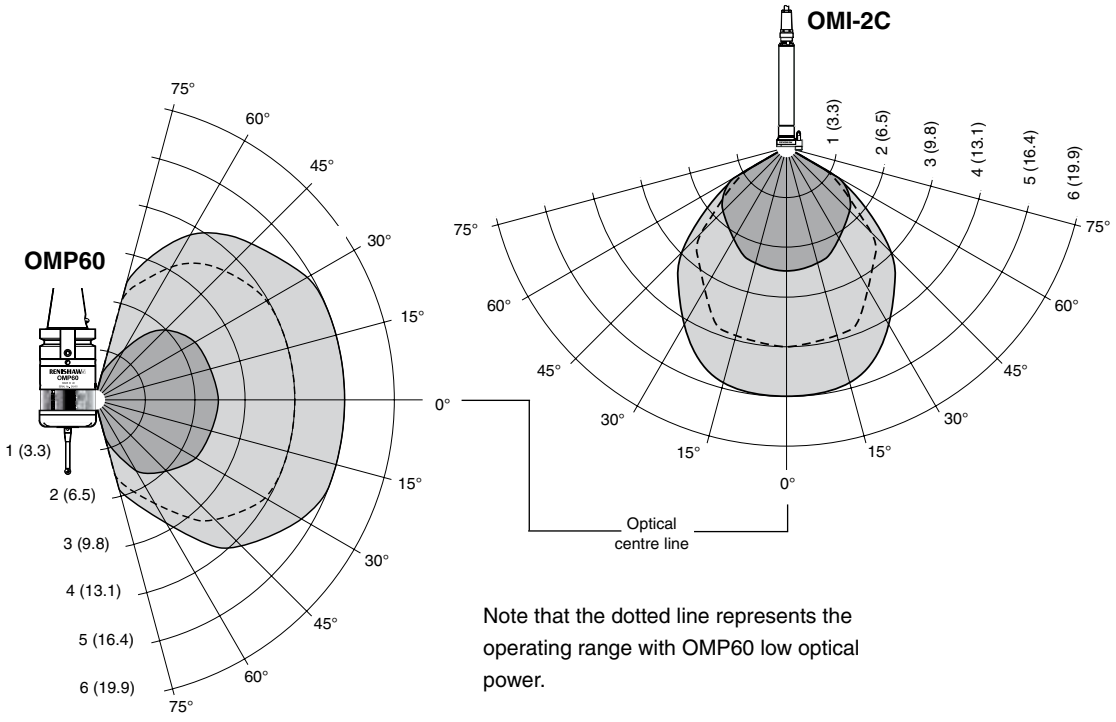
The diodes of the OMP60 probe and OMI-2C must be in the other's field of view and within the performance envelope shown.

360° transmission around the probe axis in metres (feet).

Switch on/off Operating



OMP60 with OMI-2C (modulated transmission)



Note that the dotted line represents the operating range with OMP60 low optical power.

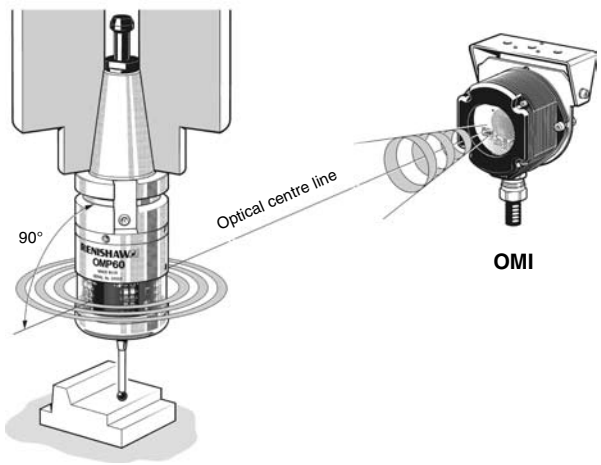
OMP60 transmission ranges with OMI (legacy transmission)

The diodes of the OMP60 probe and OMI must be in the other's field of view and within the performance envelope shown. The OMP60 performance envelope is based on the OMI being at 0° and vice-versa.

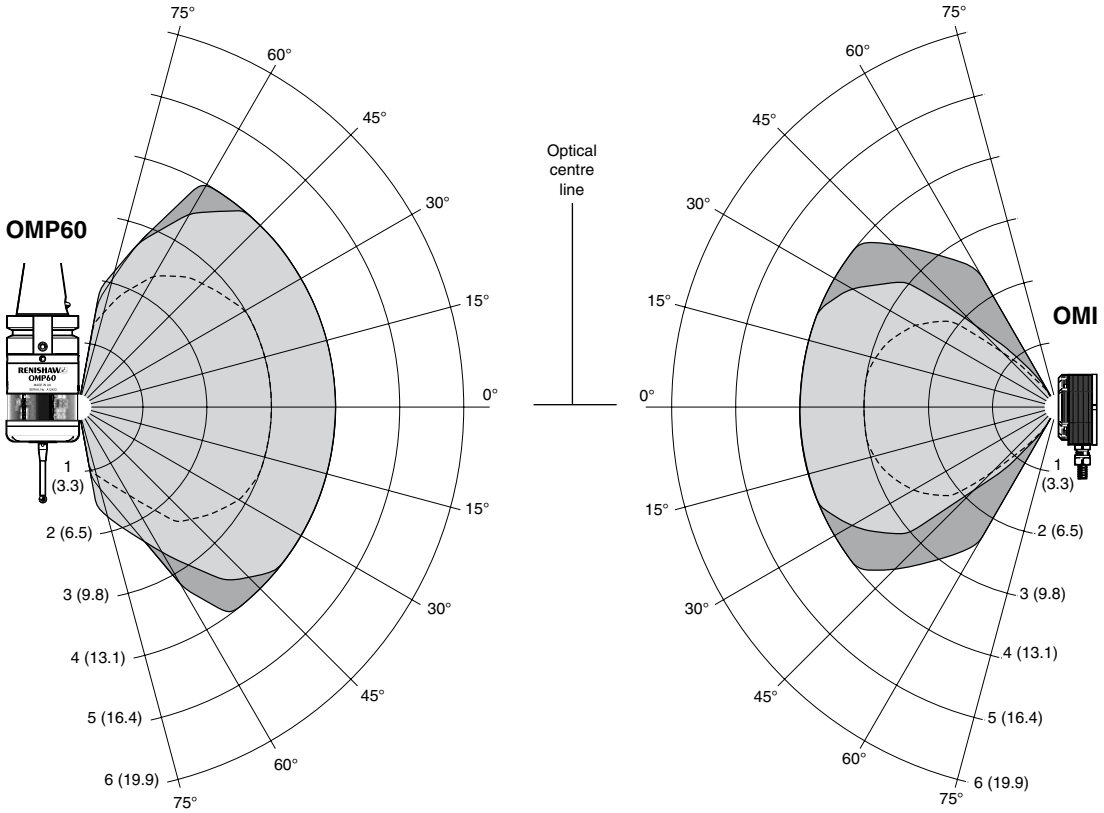
360° transmission around the probe axis in metres (feet).

Switch on/off Operating

Transmission angles



OMP60 with OMI (legacy transmission)



Note that the dotted line represents the operating range with OMP60 low optical power.

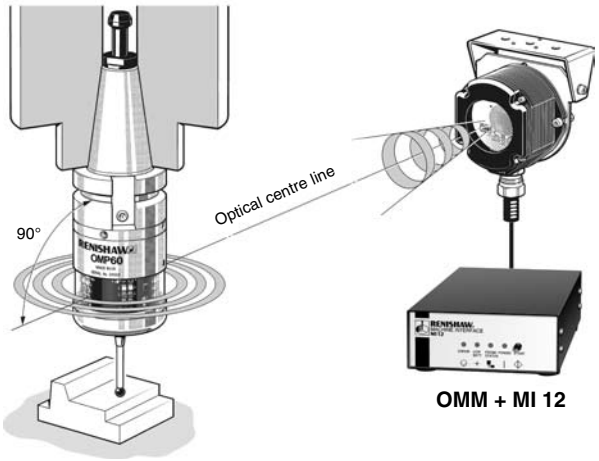
OMP60 transmission ranges with OMM/MI 12 (legacy transmission)

The diodes of the OMP60 probe and OMM must be in the other's field of view and within the performance envelope shown. The OMP60 performance envelope is based on the OMM being at 0° and vice-versa.

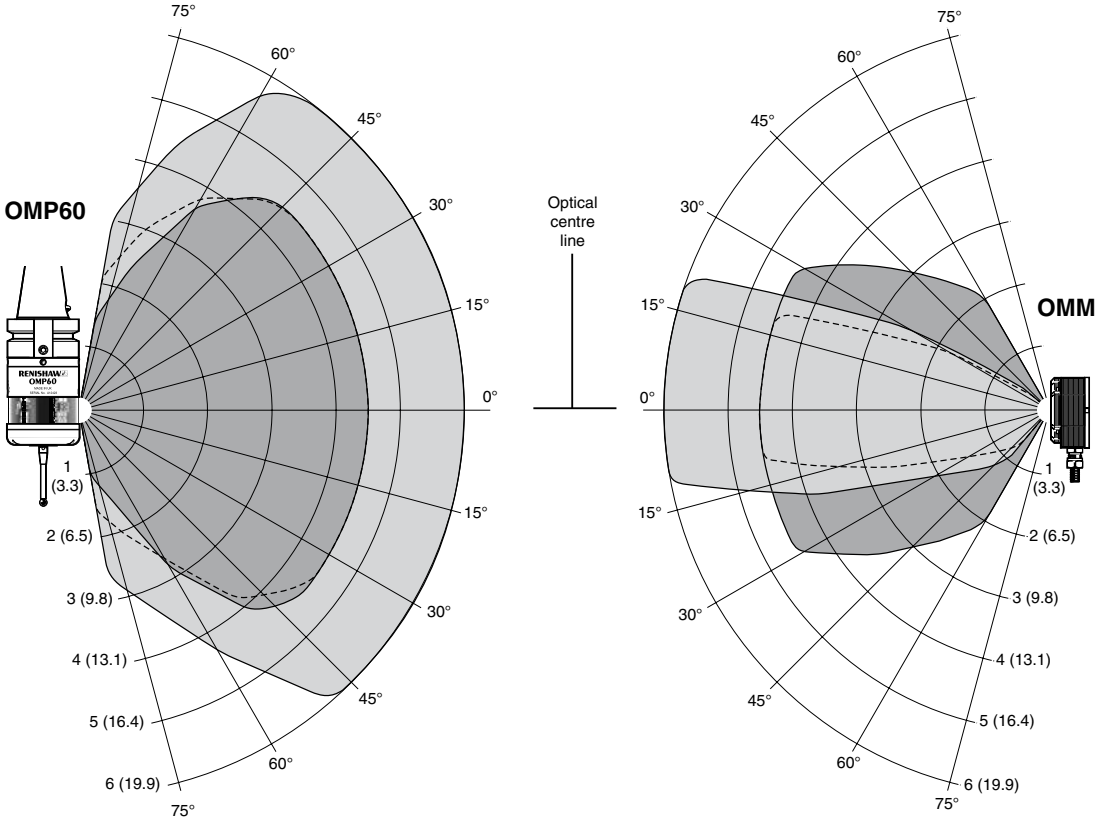
360° transmission around the probe axis in metres (feet).

Switch on/off Operating

Transmission angles



OMP60 with OMM (legacy transmission)



Note that the dotted line represents the operating range with OMP60 low optical power.

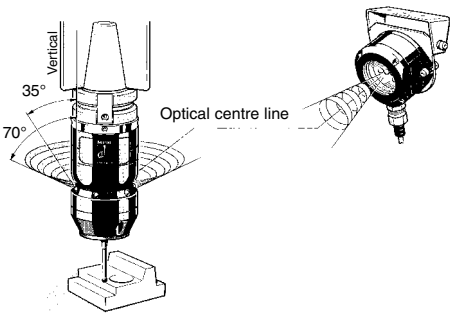
MP10/MP700 transmission range with OMI

The diodes of the MP10/MP700 probe and the OMI must be in the other's field of view and within the performance envelope shown. Natural reflective surfaces in the machine may increase the signal transmission range.

The MP10 and MP700 both have 360° optical transmission and "switch on". The optical range values quoted below apply for any spindle orientation.

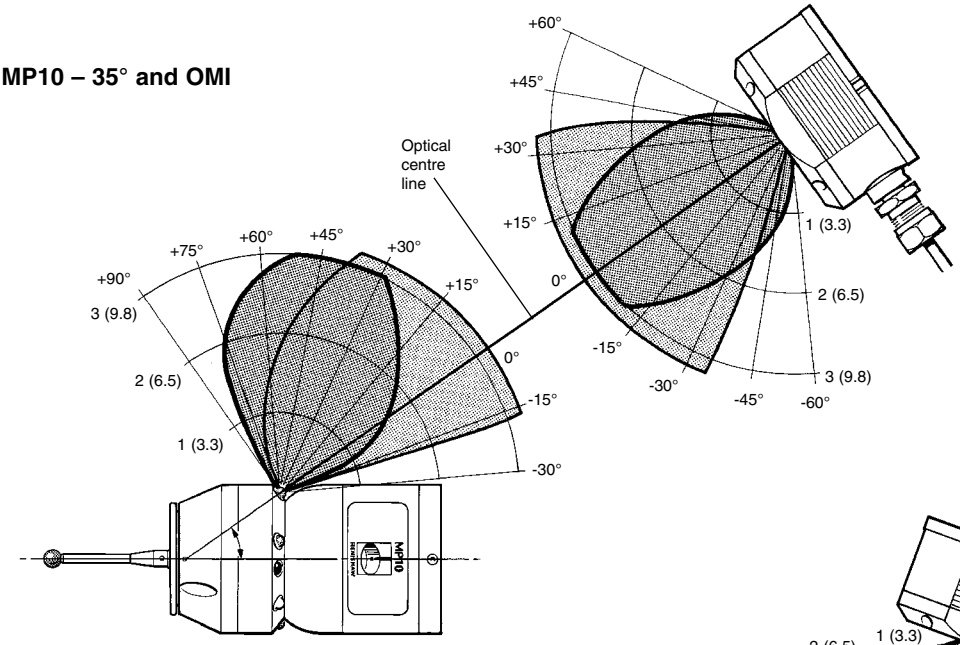
The OMI has a slightly different optical range than OMM, offering a wider field of view but a shorter transmit/receive range. This makes it ideal for small machine installations.

Transmission angles

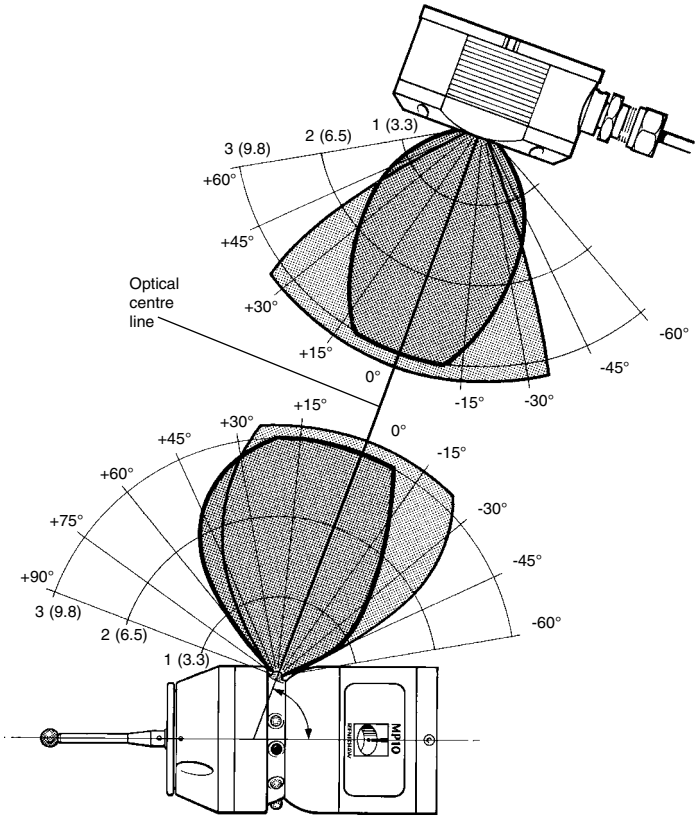


Switch on/off Operating

MP10 – 35° and OMI



MP10 – 70° and OMI



The MP10 and MP700 probes can be supplied with optical transmission at either 35° or 70° to the spindle axis.

MP10/MP700 transmission range with OMM

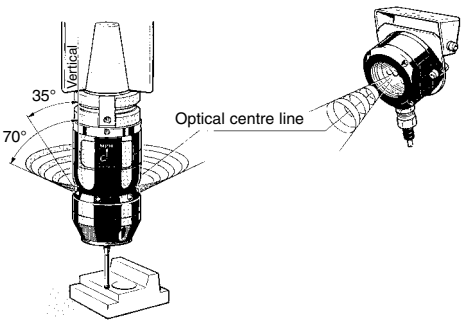
The diodes of the MP10/MP700 probe and the OMM must be in the other's field of view and within the performance envelope shown. Natural reflective surfaces in the machine may increase the signal transmission range.

The MP10 and MP700 both have 360° optical transmission and "switch on". The optical range values quoted below apply for any spindle orientation.

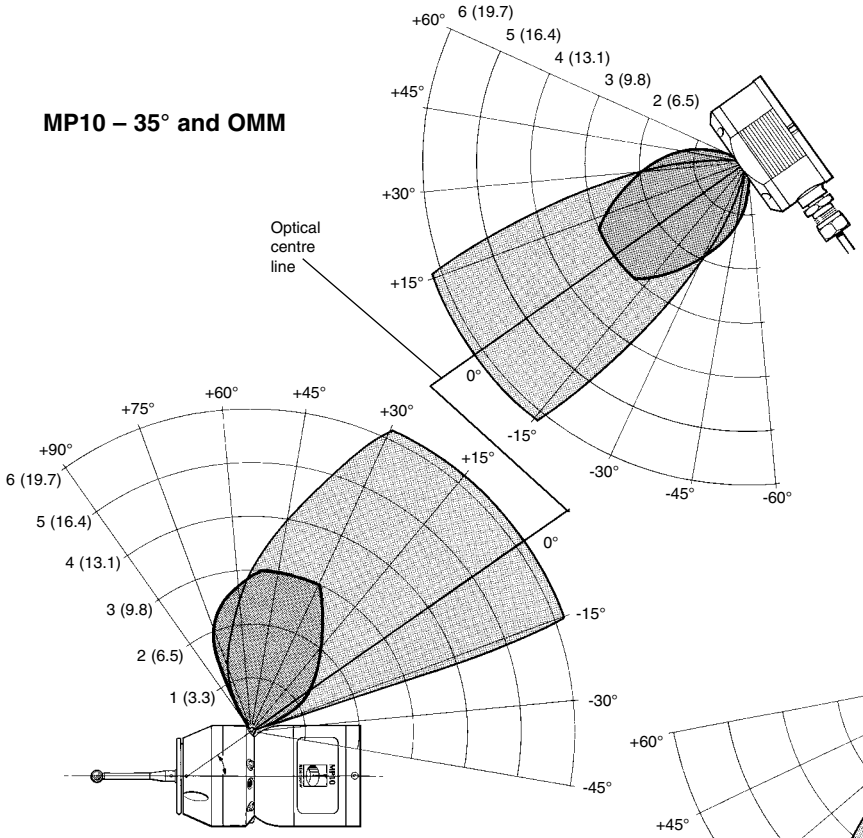
Two OMMs can be fitted on a single machine where sufficient coverage cannot be provided by a single receiver.

Switch on/off Operating

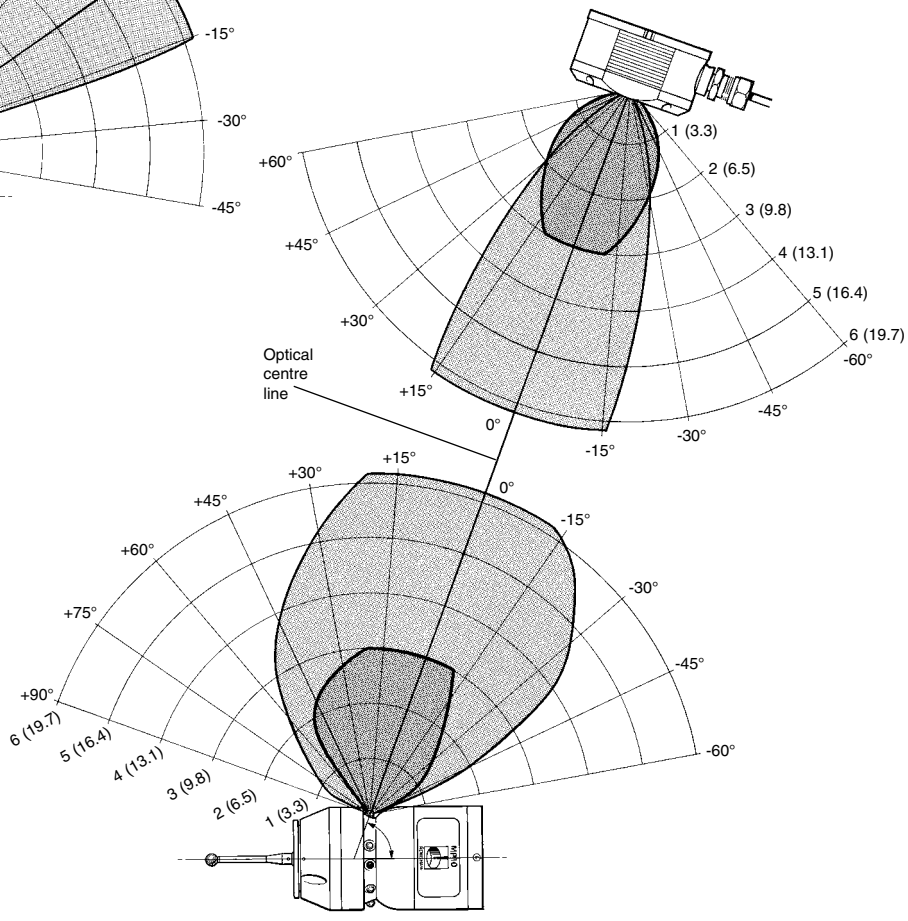
Transmission angles



MP10 – 35° and OMM



MP10 – 70° and OMM



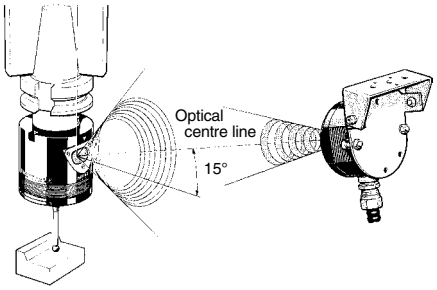
The MP10 and MP700 probes can be supplied with optical transmission at either 35° or 70° to the spindle axis.

MP12 transmission range

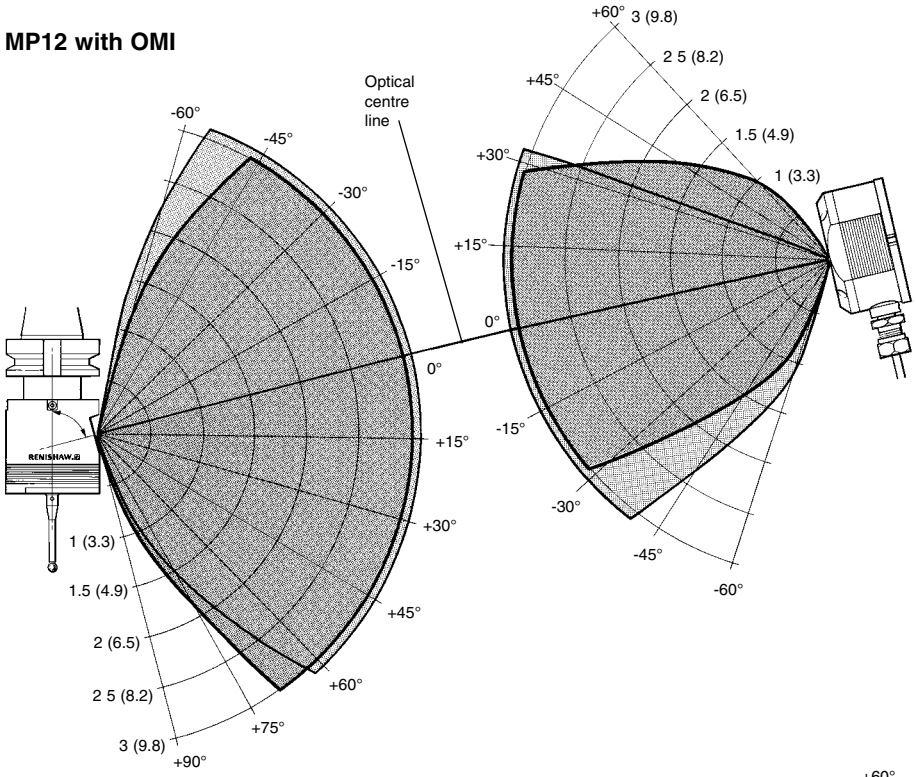
The MP12 features a uni-directional optical transmission system. This requires the machine's spindle to be orientated so the probe window is facing the receiver. The data given below assumes that the probe and receiver (OMM or OMI) are aligned.

Switch on/off Operating

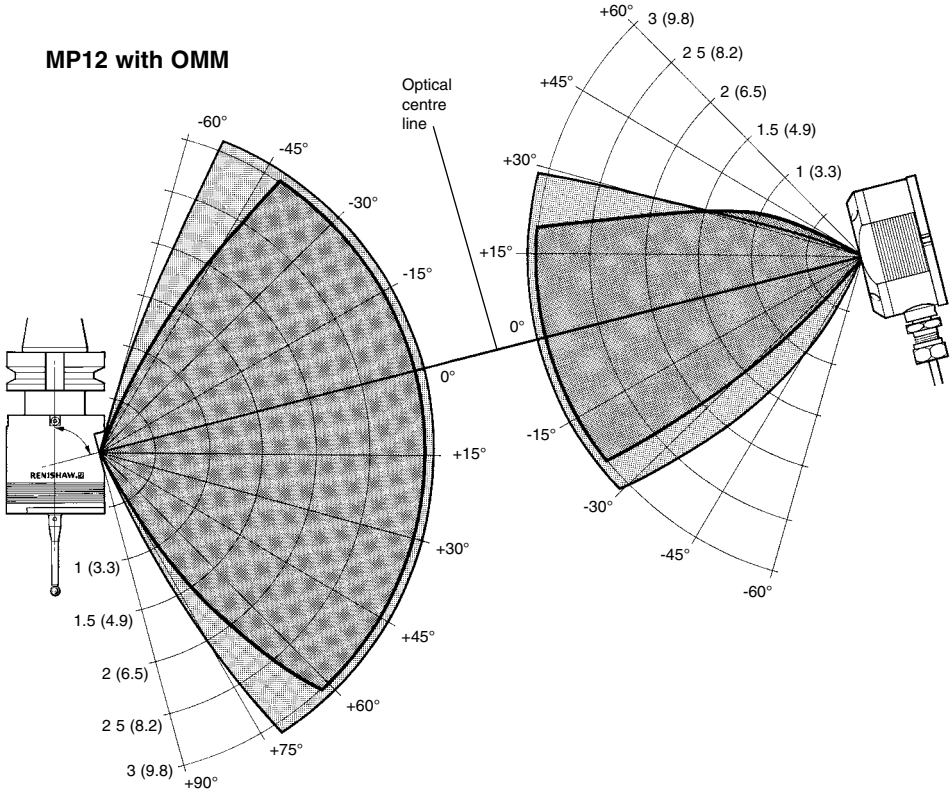
Transmission angles



MP12 with OMI



MP12 with OMM



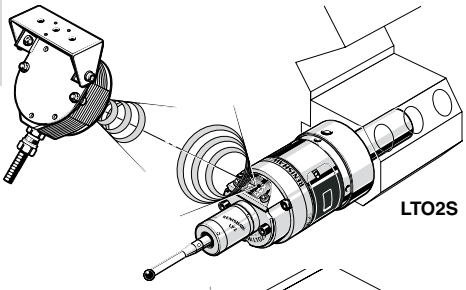
LTO2/LTO2T/LTO3T/LTO2S transmission range

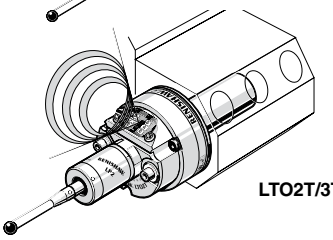
The LTO2 range is designed for lathe applications and uses a uni-directional optical transmission system

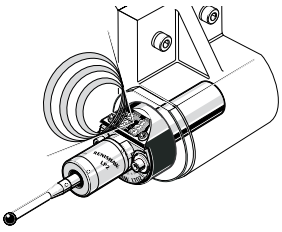
This requires the transmitter and receiver (OMM or OMI) to be approximately aligned when the probe is to be operated. The data given below assumes that the transmitter and receiver are aligned.

All distances are in metres (feet).

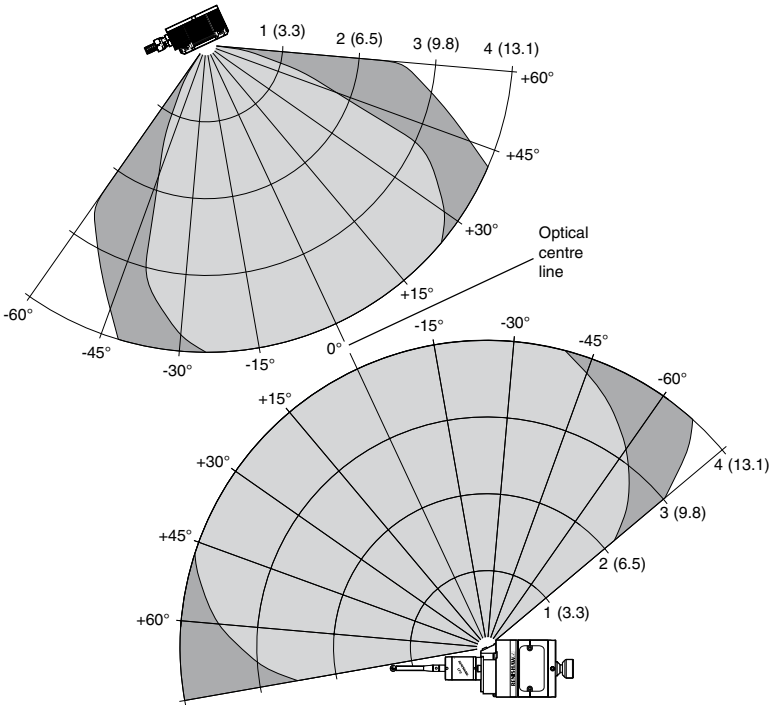
Switch on/off Operating



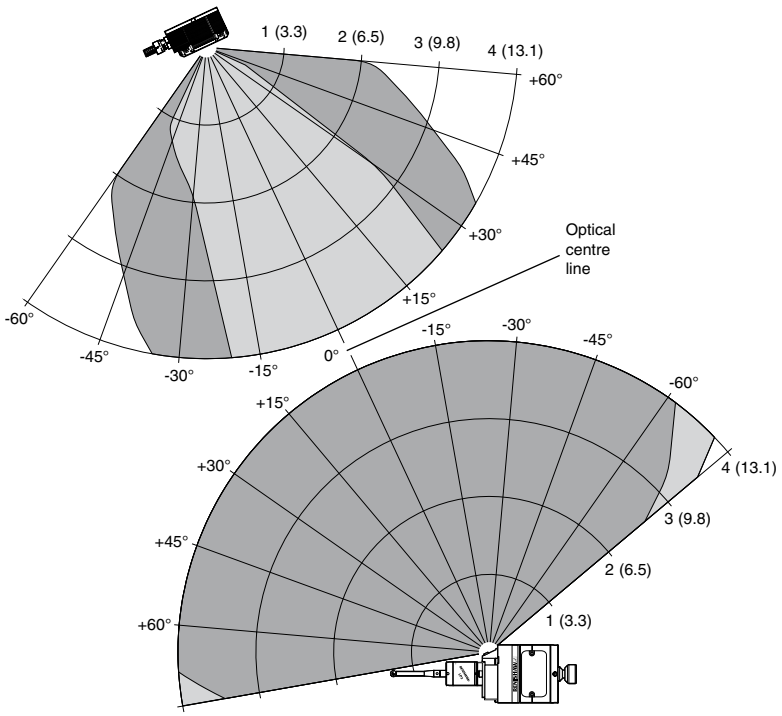




LTO2 family typical operating envelope with OMI



LTO2 family typical operating envelope with OMM



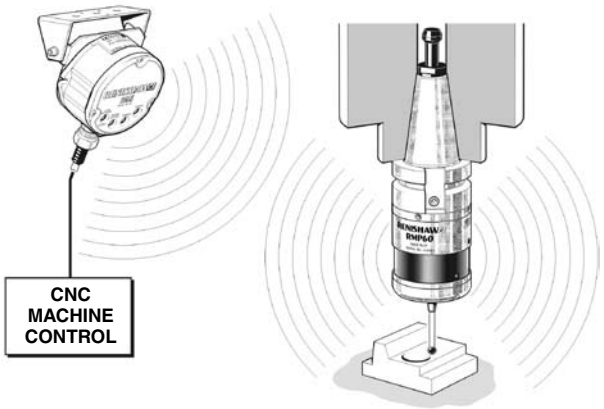
RMP60 transmission range with RMI

The RMP60 and RMI must be within the other's operating envelope. The operating envelope shows line-of-sight performance; however radio transmission does not require line-of-sight as long as any reflected signal path is less than the 15 m (49.2 ft) system operating range.

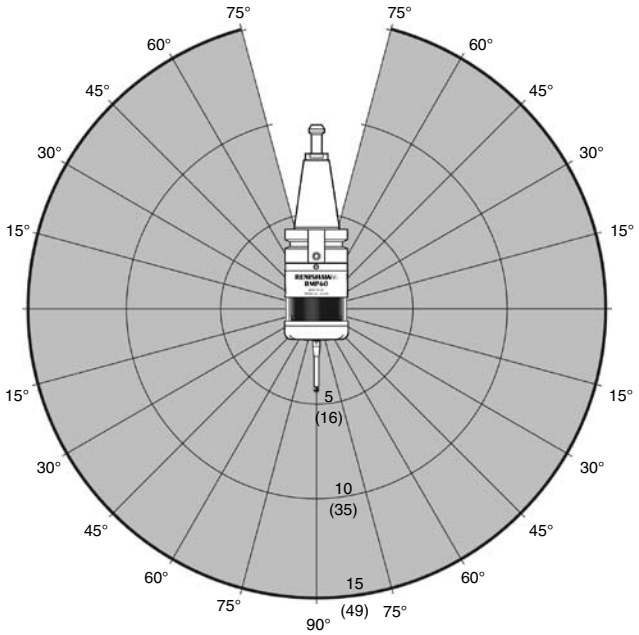
All distances are in metres (feet).

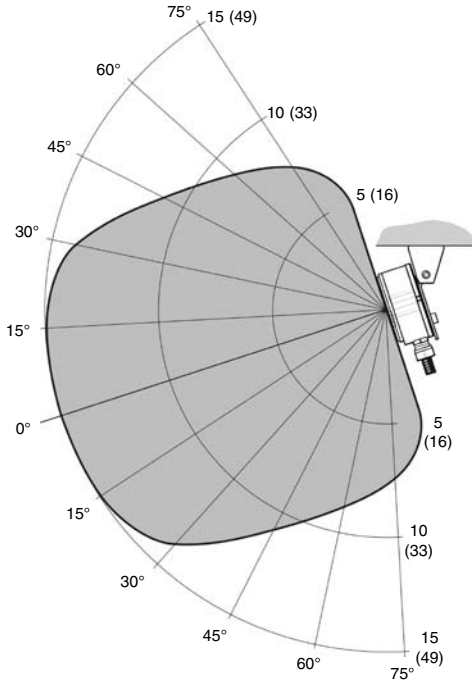
☐ Operating and switch on/off

Transmission angles



RMP60 operating envelope with RMI





CNC machining centre and milling machine inspection probing systems

Applications

Renishaw probes can be used on machining centres and milling machines for component setting and inspection applications.

Component setting

The probe identifies the position of the workpiece, automatically updating work offsets, and enabling parts to be made right first time.

This can also be used for:

- part identification for FMS installations.
- component location and also misload detection to avoid scrap.
- excess material identification to bring the cutter to the component quickly and safely.

First-off inspection

Inspection of the first component in a batch on the machine tool to:

- reduce the time the machine is idle awaiting feedback from an off-line inspection device.
- correct any errors automatically.

In-process inspection

Measure components following rough machining to:

- ensure critical final cuts are correct.
- highlight errors before they become faults.

The frequency of inspection will depend on the value of the component and confidence in the machine's performance. Inspection of key features on high value components is usually essential for unmanned machining operations.

Post process inspection

Inspection of the part once the machining is completed can be used to:

- provide information to certify that the component is within its specification.
- record part dimensions for statistical process control.

Probe selection

On machining centres, probes require a remote transmission system (see section 2, Transmission selection).

The following pages show some of the most common types of inspection probe applications on machining centres:

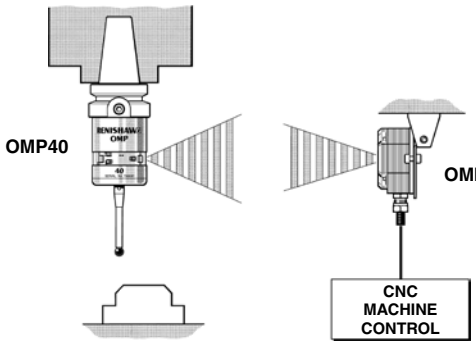
1. The **OMP40 and OMP400** have been designed specifically to meet the demands for small machining centres and the growing family of high-speed machines fitted with small HSK and small taper spindles.
2. A small, vertical machining centre fitted with an **MP12** compact inspection probe using optical transmission.
3. A horizontal machining centre fitted with an **OMP60** probe featuring 360° optical transmission. The OMP60 is also suitable for larger vertical machines.
4. The **RMP60** probe has been designed for use on all medium to large machines, particularly when non line-of-sight is required.

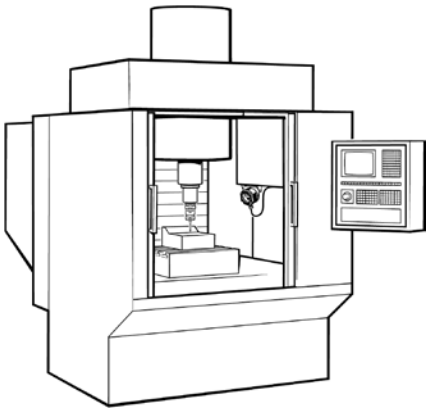
Other common applications include:

- Where high precision is required, Renishaw's **OMP400** and **MP700** 'strain gauge' probes are recommended. Using optical transmission, both probes are ideal for inspection of contoured components and components requiring long styli reach.
- On milling machines, simple hard-wired probes and 'job contact' probes are available.

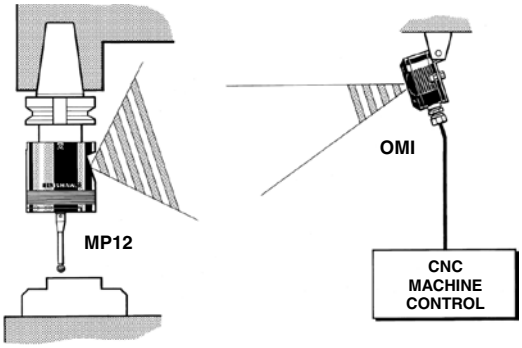
Machine	Small	Medium	Large
CNC machining centres			
Vertical	OMP40/MP12	RMP60/OMP60/MP10	RMP60
Horizontal	OMP40/OMP60/MP10	RMP60/OMP60/MP10	RMP60
High accuracy	MP700/OMP400	MP700/OMP400	
Milling machines			
CNC machines	MP15	MP11	MP11
Manual machines	Job contact probe		

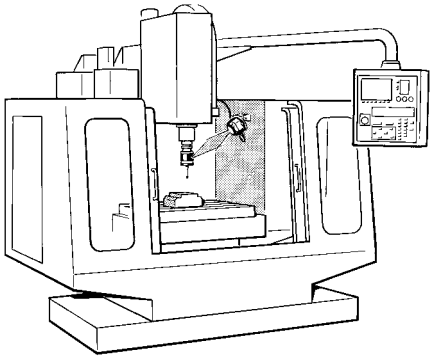
1. The OMP40 and OMP400 have been designed specifically to meet the demands for small machining centres and the growing family of high-speed machines fitted with small HSK and small taper spindles.



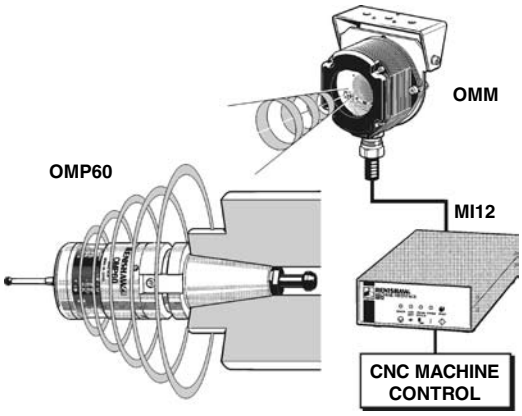


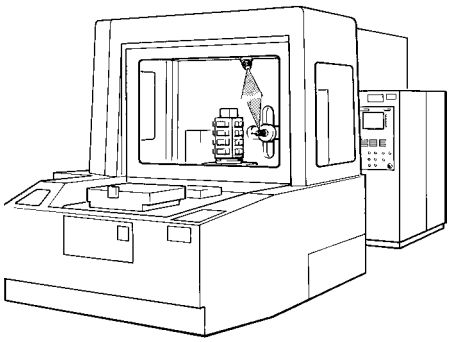
2. A **small vertical machining centre** fitted with an MP12 probe using optical transmission. In this installation the probe is coupled with an OMI with integral interface.



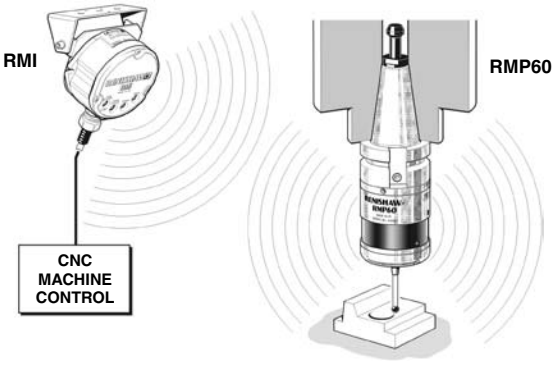


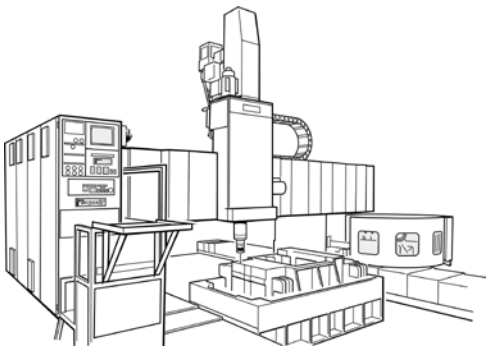
3. A **horizontal machining centre** fitted with an OMP60 probe using 360° optical transmission. An OMM with separate MI12 interface is used in this installation.





4. A **large machine** fitted with an RMP60 RMI system, designed for use on all medium to large machines, particularly when non-line-of-sight is required.



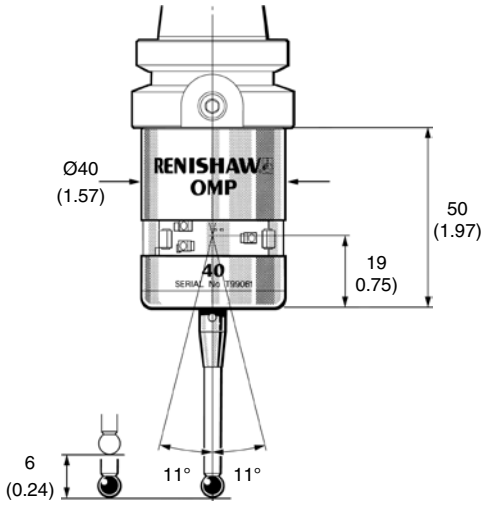


OMP40

The OMP40 has been designed specifically to meet the demands for small machining centres and the growing family of high-speed machines fitted with small HSK and small taper spindles.

OMP40 features and benefits:

- Miniaturisation of electronics without compromising performance
- Simplified installation – ideal for retrofit
- Long battery life, minimal downtime, industry-leading economy
- Shock and vibration resistant



All dimensions are in mm (in).

	OMP40
PRINCIPAL APPLICATION	Small machining centres and drill / tap machines
TRANSMISSION TYPE†	360° infrared optical transmission
MAXIMUM RANGE	3 m (9.84 ft)
TURN ON/OFF METHOD	Optical on/optical off **or** optical on/time out
SENSE DIRECTIONS	Omni-directional ±X ±Y +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)
WEIGHT	262 g (9.2 oz)
TRIGGER FORCE (factory setting)	Not adjustable
XY plane – lowest force	0.5 N (50 gf) 1.76 ozf
XY plane – highest force	0.9 N (90 gf) 3.17 ozf
Z direction	5.85 N (585 gf) 20.6 ozf
STYLUS OVERTRAVEL	
XY plane	±11°
Z direction	6 mm (0.23 in)
STANDARD STYLUS LENGTH	50 mm (1.97 in)
MAXIMUM STYLUS LENGTH	100 mm (3.94 in)
BATTERY TYPE AND LIFE	2 × 1/2 AA lithium thionyl chloride
Standard	(Low power mode)
Stand-by	1900 days (1900 days)
5% usage	100 days (150 days)
Continuous life	120 hours (180 hours)
SEALING	IPX8
SHANKS§	Various
COMPATIBLE INTERFACE¥	OMI or OMM/MI12

† See TRANSMISSION SYSTEMS section for more details.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details.

‡ Test conditions:

stylus length:	50 mm	1.97 in
stylus velocity:	480 mm/min	18.90 in/min
stylus force:	factory settings	

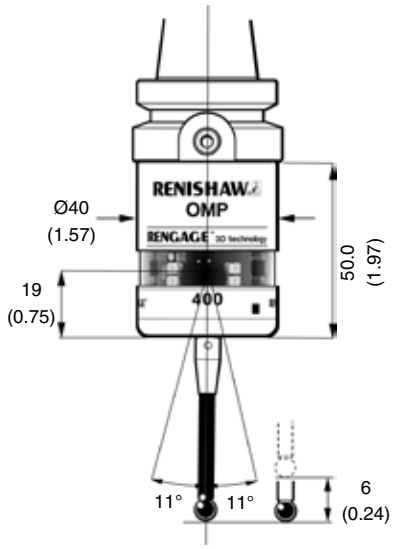
OMP400

The OMP400 has been designed specifically for use on small high speed machining centres and mould and die applications, especially where compact size and high 3D accuracy measurement of complex surfaces is demanded.

The OMP400 is compatible with all Renishaw receivers, allowing it to operate in modulated mode with OMI-2 and OMI-2C for very good resistance to light interference. It will also operate in legacy mode, enabling existing probe users to upgrade to take advantage of this compact and high accuracy probe.

OMP400 features and benefits:

- Superior 3D measurement performance probe repeatability of 0.25 µm (2σ)
- Provides improved accuracy even with long styli
- Incorporates patented RENGAGE™ sensing technology to provide high accuracy with improved durability
- Designed for use on small high speed and 5-axis machines
- High resistance to shock and vibration



All dimensions are in mm (in).

	OMP400
PRINCIPAL APPLICATION	Small high speed machines and mould and die applications
TRANSMISSION TYPE†	360° infrared optical transmission
MAXIMUM RANGE	OMP400 OMI-2 4 metres (13.1 ft) OMP400 OMI 3 metres (9.84 ft) OMP400 OMM 4 metres (13.1 ft)
TURN ON/OFF METHOD	Optical on/optical off **or** optical on/time out
SENSE DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	0.25 µm (0.00001 in)
PRE-TRAVEL VARIATION‡	
XY plane	±0.25 µm (±0.00001 in)
XYZ (variation from a true sphere)	±1.0 µm (±0.00004 in)
WEIGHT	262 g (9.2 oz)
TRIGGER FORCE (factory setting)	Not adjustable
XY plane – constant force	0.02 N (2 gf) 0.07 ozf
+Z direction	0.15 N (15 gf) 0.53 ozf
STYLUS OVERTRAVEL	
XY plane	±11°
+Z direction	6 mm (0.24 in)
STANDARD STYLUS LENGTH*	50 mm (1.97 in)
MAXIMUM STYLUS LENGTH*	200 mm (7.87 in)
BATTERY TYPE AND LIFE	2 × 1/2 AA lithium thionyl chloride
Standard	(Low power mode)
Stand-by	1900 days (1900 days)
5% usage	100 days (150 days)
Continuous life	120 hours (180 hours)
SEALING	IPX8
SHANKS§	Various
COMPATIBLE INTERFACE¥	OMM/MI12, OMI, OMI-2 and OMI-2C

† See TRANSMISSION SYSTEMS section for more details.
* M4 carbon fibre styli are recommended. See STYLI section.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details.

‡ Test conditions:

stylus length:	50 mm	1.97 in
stylus velocity:	480 mm/min	18.90 in/min
stylus force:	factory settings	

OMP60

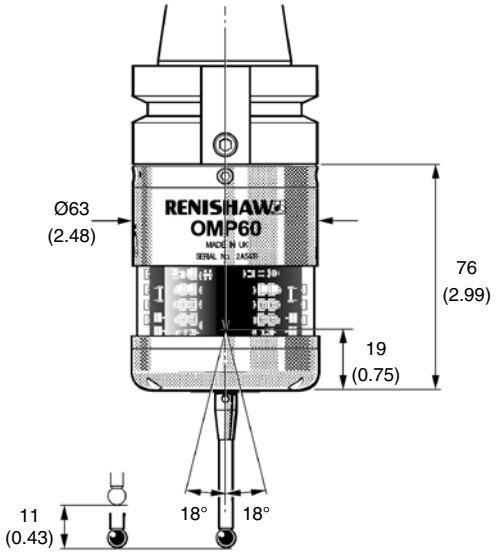
The OMP60 is an optical machining probe suitable for medium to large machining and mill-turn centres.

When the OMP60 is combined with the OMI-2, the system utilises a modulated optical transmission method to provide the highest level of resistance to light interference.

Being compatible with existing OMM/MI 12 and OMI receivers, the OMP60 can also be operated using the existing 'legacy' optical transmission method. This enables current MP7, MP8, MP9 and MP10 system users to benefit from its innovative features.

OMP60 features and benefits:

- Compact probe, measuring Ø63 mm × 76 mm long
- 360° infra-red transmission with 6 m typical operating range
- Rejection of optical interference when used with OMI-2
- Simple installation and configuration
- Multiple switch-on/switch-off methods
- Backward compatible with existing Renishaw receivers
- Uses AA batteries that are readily available



All dimensions are in mm (in).

	OMP60	
PRINCIPAL APPLICATION	Workpiece measurement and job set-up on medium to large sized machining centres and mill-turn centres	
TRANSMISSION TYPE†	360° infra-red optical transmission	
OPERATING RANGE	Up to 6 m (19.7 ft)	
TURN ON METHOD TURN OFF METHOD	Optical 'M' code, spin, shank switch Optical 'M' code, time out, spin, shank switch	
SENSE DIRECTIONS	Omni-directional ±X, ±Y, +Z	
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)	
WEIGHT (without shank) With batteries: Without batteries:	 878 g (30.79 oz) 834 g (29.42 oz)	
TRIGGER FORCE (XY plane factory setting) XY plane – lowest force XY plane – highest force Z direction	 0.75 N (75 gf) 2.64 ozf 1.4 N (140 gf) 4.92 ozf 5.3 N (530 gf) 18.69 ozf	
MAXIMUM ACCELERATION	150 m/s^2	
STYLUS OVERTRAVEL XY plane Z direction	 ±18° 11 mm (0.43 in)	
STANDARD STYLI LENGTHS RECOMMENDED MAX STYLUS LENGTH	50 mm (1.97 in), 100 mm (3.94 in) 150 mm (5.90 in) NOTE: Longer styli can be used - contact Renishaw.	
BATTERY TYPE AND LIFE Standby 5% usage Continuous life	2 × AA 1.5 V alkaline 468 days max. 111 days max. 172 hours max	2 × AA 3.6 V lithium thionyl chloride (alternative) 1019 days max. 339 days max. 595 hours max.
SEALING	IPX8	
SHANKS§	Various	
COMPATIBLE INTERFACES¥	OMM/MI 12, OMI, OMI-2 or OMI-2C	

† See TRANSMISSION SYSTEMS section for more details.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details.

‡ Test conditions: stylus length: 50 mm 1.97 in
stylus velocity: 480 mm/min 18.90 in/min
stylus force: factory settings

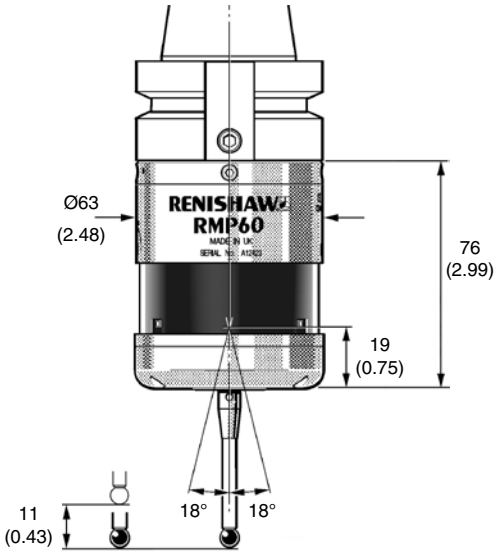
RMP60 radio transmission probe

The RMP60 inspection probe is the first to use frequency hopping spread spectrum (FHSS) transmission and offers rapid part set-up and part verification on machining centres of all sizes. It is paired with the RMI, a combined transmitter and receiver unit.

The RMP60's unique transmission system does not have a dedicated radio channel. Instead, the probe and receiver "hop" together through a sequence of frequencies.

RMP60 features and benefits:

- Compact probe measuring just Ø63 mm x 76 mm in length
- Stainless steel body to withstand harsh machine tool environments
- No channel selection requirements
- Operating range of up to 15 m (49.21 ft)



All dimensions are in mm (in).

	RMP60	
PRINCIPAL APPLICATION	Workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turret lathes.	
TERRITORY	EU, USA, Japan, Canada, Switzerland, Australia, New Zealand, Russia, Israel and China.	
TRANSMISSION TYPE†	Frequency hopping spread spectrum radio (FHSS)	
OPERATING RANGE	Up to 15 m (49.21 ft)	
NOMINAL FREQUENCY	2.402 – 2.481 GHz	
TURN ON METHOD TURN OFF METHOD	Radio 'M' code, spin, shank switch Radio 'M' code, time out, spin, shank switch	
SENSE DIRECTIONS	Omni-directional: ±X, ±Y, +Z	
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)	
WEIGHT	901 g (32 oz)	
TRIGGER FORCE XY plane – lowest force XY plane – highest force +Z axis	 0.75 N (75 gf) 2.64 ozf 1.40 N (140 gf) 4.92 ozf 5.30 N (530 gf) 18.69 ozf	
MAXIMUM ACCELERATION	150 m/s^2	
STYLUS OVERTRAVEL XY plane +Z direction	 ±18° 11 mm (0.43 in)	
MAX SPIN SPEED	1000 rev/min	
STANDARD STYLI LENGTHS RECOMMENDED MAX STYLUS LENGTH	50 mm (1.97 in), 100 mm (3.94 in) 150 mm (5.90 in) NOTE: Longer styli can be used - contact Renishaw.	
BATTERY TYPE AND LIFE Stand by 5 % usage Continuous life	2 × AA 1.5 V alkaline 650 days max. 100 days max. 140 hours max.	2 × AA 3.6 V lithium thionyl chloride (alternative) 1300 days max. 200 days max. 280 hours max.
SEALING	IPX8	
SHANKS§	Various	
COMPATIBLE INTERFACE¥	RMI	

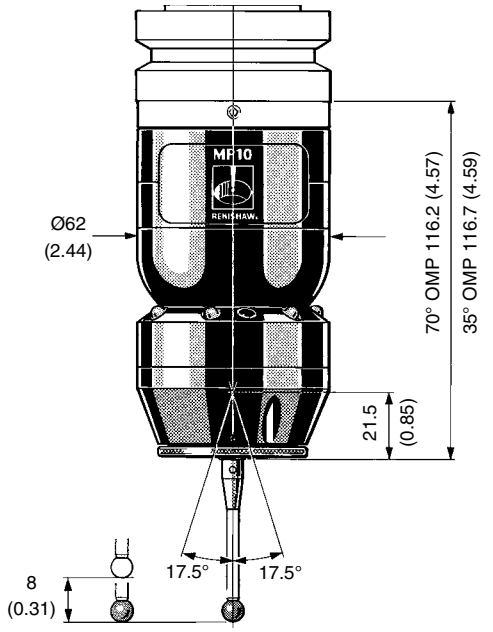
† See TRANSMISSION SYSTEMS section for more details.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details

‡ Test conditions

stylus length:	50 mm	1.97 in
stylus velocity:	480 mm/min	18.90 in/min
stylus force:	factory settings	

MP10

The MP10 is a robust inspection probe for workpiece set-up and workpiece inspection on small to medium sized CNC machining centres.



All dimensions are in mm (in).

MP10 features and benefits:

- Ideal for a wide range of machining centres
- Available with either 35° or 70° output and features wide beam transmission – up to 130°
- Continuous battery life of up to 140 hours
- Full 360° signal transmission and up to 6 m (19.6 ft) range.
- Adjustable trigger force

MP10	
PRINCIPAL APPLICATION	Vertical and horizontal machining centres
TRANSMISSION TYPE†	360° infrared optical transmission
35° and 70° angles	
MAXIMUM RANGE	MP10 OMI 3 metres (9.84 ft)
MP10 OMM/MI12	6 metres (19.69 ft)
TURN ON/OFF METHOD	Optical on/optical off **or** optical on/time out
SENSE DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)
WEIGHT	730 g (26 oz)
TRIGGER FORCE (factory setting)	Adjustable
XY plane – lowest force	0.75 N (75 gf) 2.64 ozf
XY plane – highest force	1.40 N (140 gf) 4.92 ozf
+Z direction	4.20 N (420 gf) 14.8 ozf
STYLUS OVERTRAVEL	
XY plane	±17.5°
+Z direction	8 mm (0.31 in)
STANDARD STYLI LENGTHS	50 mm (1.97 in), 100 mm (3.94 in)
RECOMMENDED MAX STYLUS LENGTH	150 mm (5.90 in) NOTE: Longer styli can be used - contact Renishaw.
BATTERY TYPE AND LIFE	1 × 6LR61 (PP3 9 V alkaline)
Stand-by	365 days
5% usage	98 days
Continuous life	140 hours
SEALING	IPX8
SHANKS§	Various
COMPATIBLE INTERFACE¥	OMI or OMM/MI12

† See TRANSMISSION SYSTEMS section for more details.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details.

‡ Test conditions:

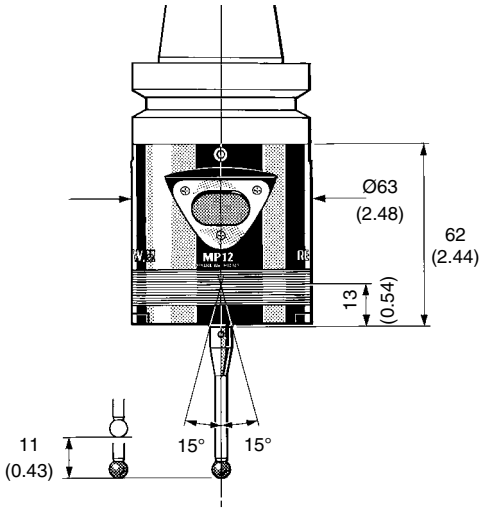
stylus length:	50 mm	1.97 in
stylus velocity:	480 mm/min	18.90 in/min
stylus force:	factory settings	

MP12

The MP12 is a compact 3D touch-trigger inspection probe, designed for workpiece set-up and inspection on small to medium sized CNC machining centres.

MP12 features and benefits:

- Typical battery life of 205 days at 5% usage
- Ideal for use on small to medium machining centres
- Stylus on-centre adjustment
- Sealed to IPX8 for reliable operation in the machine tool environment



All dimensions are in mm (in).

	MP12
PRINCIPAL APPLICATION	Small vertical machining centres
TRANSMISSION TYPE†	Uni-directional infrared optical transmission MP12 OMI 3 metres (9.84 ft) MP12 OMM / MI12 3 metres (9.84 ft)
TURN ON/OFF METHOD	Optical on/optical off **or** optical on/time out
SENSE DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)
WEIGHT	420 g (15 oz)
TRIGGER FORCE (factory setting) XY plane – lowest force XY plane – highest force +Z direction	Not adjustable 0.65 N (65 gf) 2.29 ozf 1.60 N (160 gf) 5.64 ozf 8.00 N (800 gf) 28.22 ozf
STYLUS OVERTRAVEL XY plane +Z direction	 ±15° 11 mm (0.43 in)
STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH	50 mm (1.97 in) 100 mm (3.94 in)
BATTERY TYPE AND LIFE Stand-by 5% usage Continuous life	4 × LR6 (AA 1.5 V alkaline) 471 days 205 days 425 hours
SEALING	IPX8
SHANKS§	Various
COMPATIBLE INTERFACE¥	OMI or OMM/MI12

† See TRANSMISSION SYSTEMS section for more details.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details.

‡ Test conditions: stylus length: 50 mm 1.97 in
stylus velocity: 480 mm/min 18.90 in/min
stylus force: factory setting

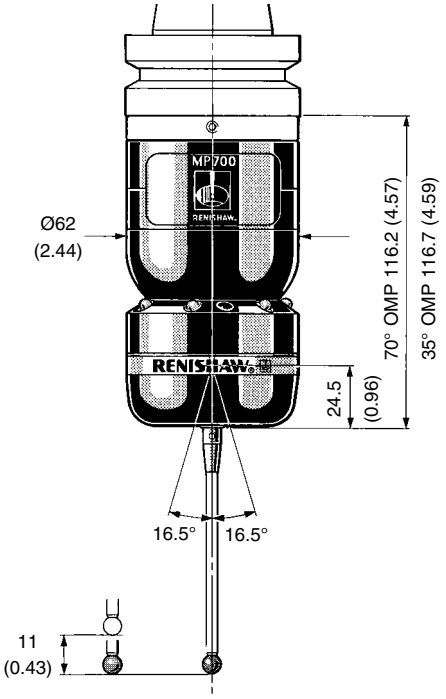
MP700

The MP700 high-accuracy probe uses solid-state strain gauge technology to sense contact between the stylus and the surface of a workpiece.

The MP700 allows probing with a low constant trigger force in any direction, after simple probe calibration.

MP700 features and benefits:

- Superior 3D measurement performance probe repeatability of 0.25 µm (2σ)
- Provides improved accuracy even with long styli
- Significantly longer life due to proven solid-state technology
- Designed for use on large and 5-axis machines
- High resistance to shock and vibration



All dimensions are in mm (in).

	MP700
PRINCIPAL APPLICATION	High accuracy inspection on vertical and horizontal machining centres
TRANSMISSION TYPE†	360° infrared optical transmission 35° and 70° angles (MP700E 70° only)
MAXIMUM RANGE	MP700 OMI 3 metres (9.84 ft) MP700 OMM/MI12 6 metres (19.69 ft)
TURN ON/OFF METHOD	Optical on/optical off **or** optical on/time out
SENSE DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	0.25 µm (0.00001 in)
PRE-TRAVEL VARIATION‡	
XY plane	±0.25 µm (±0.00001 in)
XYZ (variation from a true sphere)	±1.0 µm (±0.00004 in)
WEIGHT	700 g (25 oz)
TRIGGER FORCE (factory setting)	Not adjustable
XY plane – constant force	0.02 N (2 gf) 0.07 ozf
+Z direction	0.15 N (15 gf) 0.53 ozf
STYLUS OVERTRAVEL	
XY plane	±16.5°
+Z direction	11 mm (0.43 in)
STANDARD STYLUS LENGTH*	100 mm (3.94 in)
MAXIMUM STYLUS LENGTH*	200 mm (7.87 in)
BATTERY TYPE AND LIFE	1 × 6LR61 (PP3 9 V alkaline)
Stand-by	381 days
5% usage	36 days
Continuous life	43 hours
SEALING	IPX8
SHANKS§	Various
COMPATIBLE INTERFACE¥	OMM/MI12 or OMI

† See TRANSMISSION SYSTEMS section for more details.

* M4 carbon fibre styli are recommended. See STYLI section.

§ See SHANKS section for more details.

¥ See INTERFACES section for more details.

‡ Test conditions:

stylus length:	50 mm	1.97 in
stylus velocity:	240 mm/min	9.45 in/min
stylus force:	factory settings	

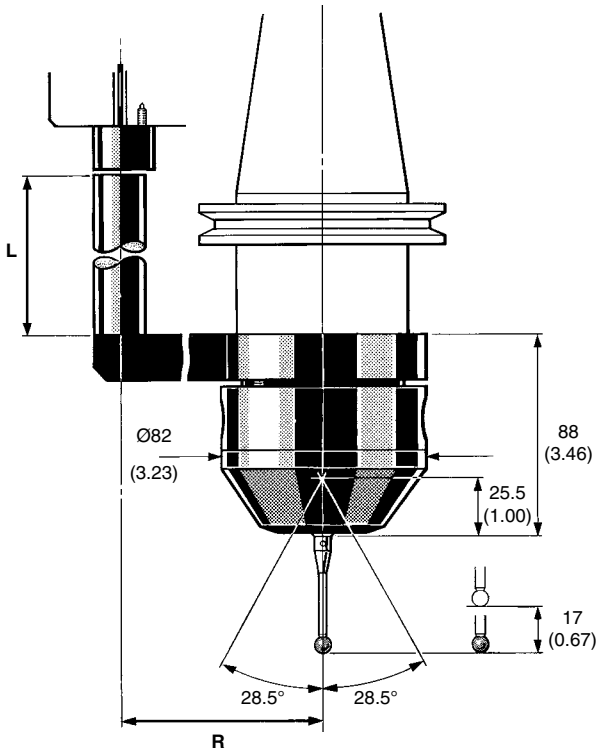
MP3 inductive

Supplied with an inductive transmission system, the MP3 inductive probe system has been designed for fitting by machine builders.

Battery-free, the probe offers generous overtravel for robust operation.

A range of IMP arms (defined by 'L' and 'R' dimensions) is available to suit different machine installations.

Inductive transmission is not recommended for retrofit installations. Machine builders should contact their Renishaw supplier for further details.



All dimensions are in mm (in).

	MP3 inductive
PRINCIPAL APPLICATION	Vertical and horizontal machining centres
TRANSMISSION TYPE†	Electromagnetic induction
PROBING DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)
WEIGHT	Varies depending on IMP arm dimensions
TRIGGER FORCE (factory setting) XY plane – lowest force XY plane – highest force +Z direction	Adjustable 0.75 N (75 gf) 2.6 ozf 1.50 N (150 gf) 5.2 ozf 4.90 N (490 gf) 17.3 ozf
STYLUS OVERTRAVEL XY plane +Z direction	 ±28.5° 17 mm (0.67 in)
DIMENSION 'L'	5 mm (0.20 in) to 60 mm (2.36 in)
DIMENSION 'R'	55 mm (2.16 in) to 115 mm (4.52 in)
STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH	100 mm (3.94 in) 150 mm (5.91 in)
SEALING	IPX8
SHANKS§	Various
COMPATIBLE INTERFACE¥	IMM/MI5

† See TRANSMISSION SYSTEMS section for more details.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details.

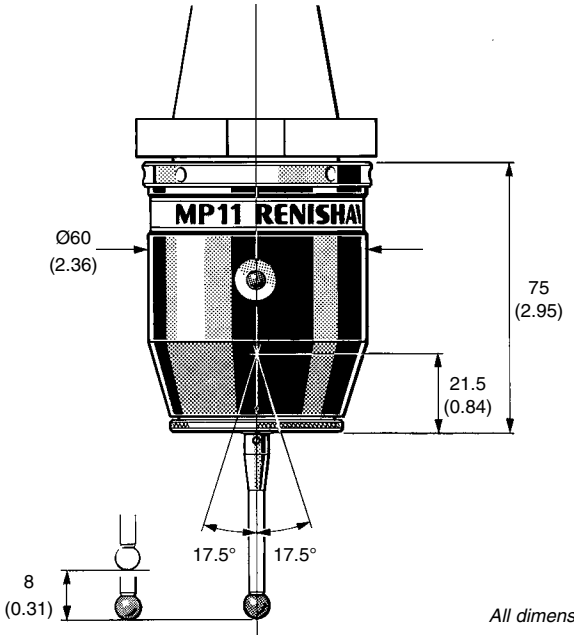
‡ Test conditions:

stylus length:	50 mm	1.97 in
stylus velocity:	480 mm/min	18.90 in/min
stylus force:	factory settings	

MP11

Designed for CNC milling machines, with manual tool change, the MP11 can be inserted manually into the machine's spindle.

The MP11 features an integral interface which processes signals between the probe and the CNC machine's control. Signals are transmitted through the curly cable, which connects to the probe via a plug.



All dimensions are in mm (in).

	MP11
PRINCIPAL APPLICATION	CNC milling machines
TRANSMISSION TYPE†	Hard-wired
SENSE DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)
WEIGHT	540 g (19 oz)
TRIGGER FORCE (factory setting) XY plane – lowest force XY plane – highest force +Z direction	Adjustable 0.5 N (50 gf) 1.76 ozf 1.5 N (150 gf) 5.29 ozf 1.8 N to 7.0 N (180 gf to 700 gf) 6.35 ozf to 24.69 ozf
STYLUS OVERTRAVEL XY plane +Z direction	 ±17.5° 8 mm (0.31 in)
STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH	50 mm (1.97 in) 100 mm (3.94 in)
SEALING	IP 66
SHANKS§	Various
COMPATIBLE INTERFACE¥	Integral interface

† See TRANSMISSION SYSTEMS section for more details.
§ See SHANKS section for more details.
¥ See INTERFACES section for more details.

‡ Test conditions:

stylus length:	50 mm	1.97 in
stylus velocity:	1000 mm/min	39.37 in / min
stylus force:	factory settings	

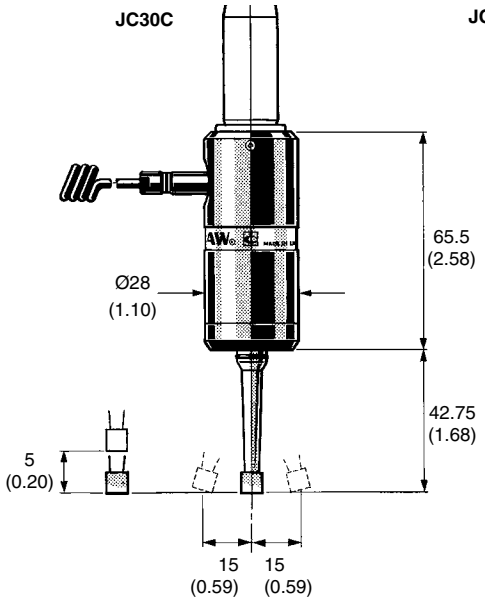
Job contact probes

Job contact probes have been designed for use on manual machines and are ideal for workpiece set-up and simple inspection.

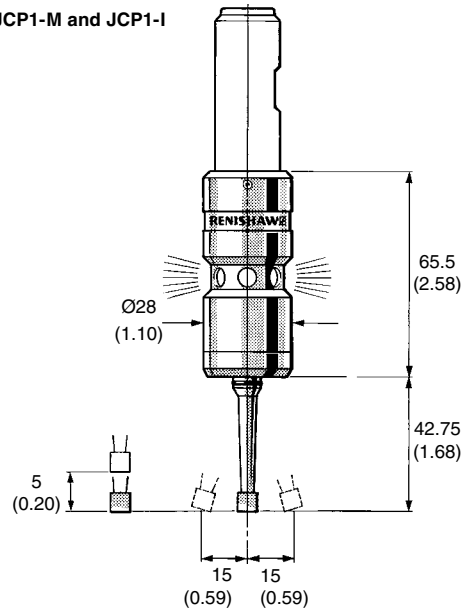
The JCP1, available with metric and imperial shanks, uses electrical conductivity to sense contact with a metallic workpiece. An LED is illuminated when the stylus touches the surface.

The JC30C variant provides a cable connection to digital readout counters with touch sensor inputs.

JC30C



JCP1-M and JCP1-I



All dimensions are in mm (in).

	JC30C / JCP1-M / JCP1-I	
PRINCIPAL APPLICATION	Manual milling machines	
TRANSMISSION TYPE	None or hard-wired to touch sensor inputs	
SENSE DIRECTIONS	Omni-directional: ±X, ±Y, +Z	
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)	
WEIGHT	240 g (8.5 oz)	
STYLUS OVERTRAVEL		
XY plane	±15 mm (±0.59 in)	
+Z direction	5 mm (0.20 in)	
STYLUS DIMENSIONS	JC30C / JCP1-M:	JCP1-I:
Fixed length	42.75 mm	1.68 in
Diameter	6 mm	0.24 in
BATTERY TYPE AND LIFE	2 × LR1 1.5 V	
Continuous life	30 hours	
SEALING	IP 44	
SHANKS	JC30C Ø16 mm	
	JCP1-M Ø20 mm	JCP1-I Ø0.75 in
COMPATIBLE INTERFACE	None required: JC30C version wires directly into a digital readout touch sensor input	

‡ Test conditions: stylus length: 50 mm 1.97 in
stylus velocity: 480 mm/min 18.90 in/min
stylus force: factory settings

CNC machining centre tool setting and breakage detection probing systems

Applications

Renishaw probes can be used on machining centres for tool setting, tool verification and tool breakage detection applications.

TS27R contact tool setter

Tool setting

Tools are driven against the probe's stylus with the tool either static or rotating:

- Static length setting for drills, taps etc.
- Rotating length setting for face mills and other large cutters.
- Rotating diameter setting for slot drills, boring bars etc.

Tool verification

Tool lengths and diameters can be checked before use to guard against errors in tool selection.

Tool breakage detection

Rapid checking of tool lengths to ensure that tools are still intact after machining.

Probe selection

On a typical machining centre, a tool setting probe can be located on the bed of the machine.

However, more complex machines may require an arm to introduce the probe to the tools.

The following page shows some of the most common tool setting probe applications on machining centres.

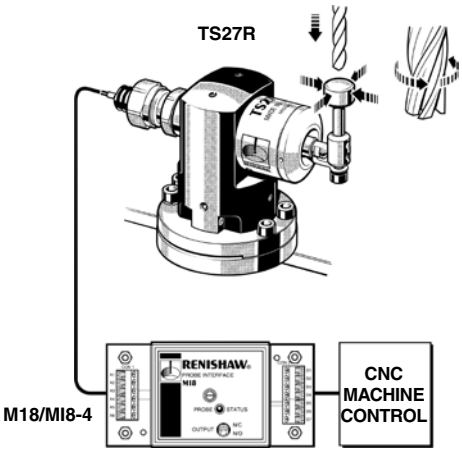
1. A typical vertical machining centre fitted with a **TS27R** compact tool setting probe. This simple probing system uses a hard-wired transmission.
2. A typical vertical machining centre fitted with a fixed **NC4** non-contact tool setting system. This system includes an adjuster pack for simple alignment to the machine's axes. Also available is the NC3 – a compact non-contact tool setter and broken tool detection system – and the NC2, which provides broken tool detection.
3. A **TRS1** non-contact broken tool detection device fitted to a typical vertical machining centre. This simple device wires directly into the machine controller.

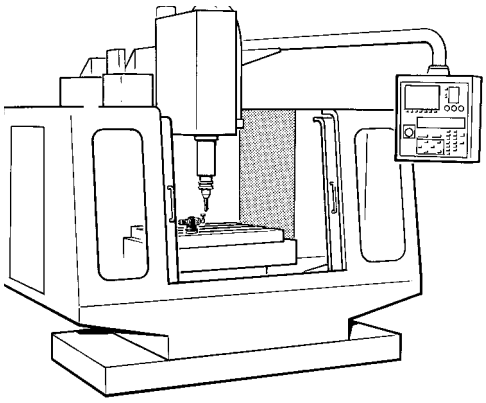
   Also available is the **TRS1-S** for short range applications on small machining centres.
4. A **HPMA** automatic tool setting arm fitted to a horizontal machining centre with a multi-pallet changer. This solution is ideal for FMS applications. For details about HPMA refer to the CNC lathe tool setting probing systems section.

In addition to rotary arms like the HPMA, Renishaw can also provide a range of customised tool setting solutions. Refer to the Custom Products and Accessories section for more details.

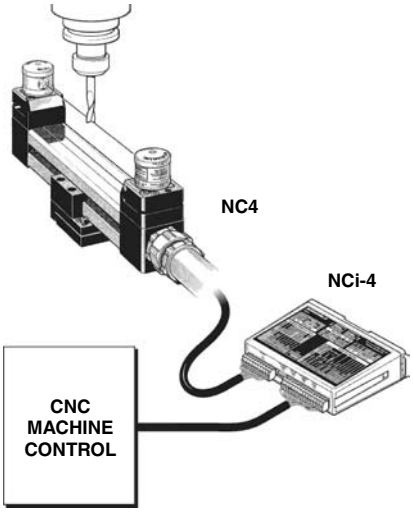
Application	Probing system
Vertical or horizontal machine with fixed bed	TS27R TRS1/NC3/ NC4
Horizontal machine with multi-pallet changer	HPMA/TRS1/ NC4

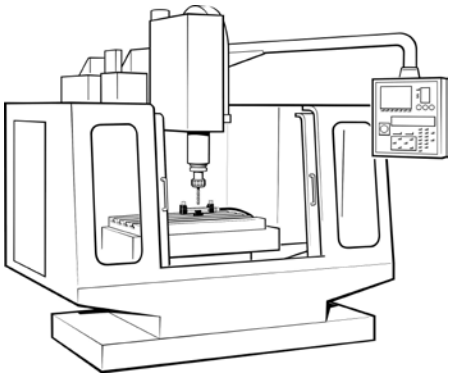
1. A **vertical machining centre** fitted with a TS27R tool setting probe. The TS27R is also available with styli to suit horizontal machining centre applications.



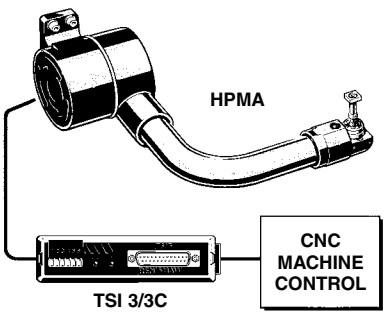


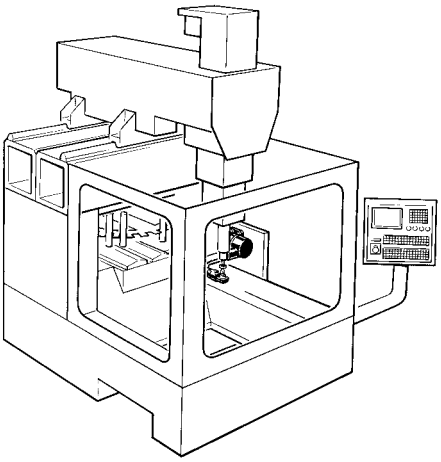
2. A **vertical machining centre** fitted with a fixed NC4 non-contact tool setting system, using laser-based transmitter and receiver units. NC4 is also available as a separate system.





3. A typical **FMS machine** fitted with a HPMA automatic tool setting. The HPMA provides an automated system with which the tool setting probe can be introduced to the tools exactly when required.





TRS1
Single-sided tool breakage detection

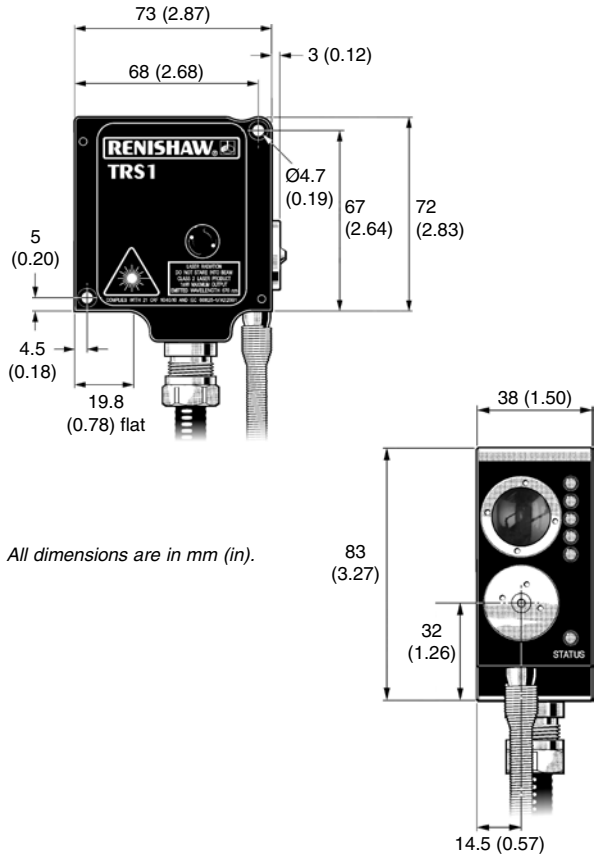
Conventional non-contact broken tool detection systems depend on the laser beam being blocked (tool OK) or not blocked (tool broken).

The TRS1 is different. It contains unique tool recognition technology that can distinguish between the tool or coolant and swarf. TRS1 responds to the pattern of light reflected from the tool, offering benefits over conventional systems. It is fast and reliable under real machining conditions.

The single unit means installation is quick and easy and the device can be mounted outside of the working environment, saving valuable space on the table.

TRS1 features and benefits:

- Cost effective, fast and reliable
- Features new tool recognition technology
- Ultra-quick detection. Tool spends approximately 1 second in the laser beam
- Simple installation and set up



All dimensions are in mm (in).

PRINCIPAL APPLICATION	High-speed non-contact tool breakage detection on VMC and HMC machines
LASER TYPE	Visible red light <1 mW 670 nm. Conforms to American (21 CRF 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 dated July 26, 2001) and European (IEC 60825-1:1993 + A1: 1997 + A2: 2001) laser safety standards
WORKING TEMPERATURE	5 °C to 50 °C
STORAGE TEMPERATURE	-10 °C to 70 °C
LIFE	Tested to > 1 million on/off cycles.
MINIMUM TOOL DIAMETER	Ø1 mm bright drill at 2 m (6.56 ft) and Ø0.5 mm bright drill at 0.3 m (0.984 ft), dependent on installation, set-up and tool type/condition.
PNEUMATIC SUPPLY	Ø4 mm air pipe. Recommended air pressure: 2 bar (29 psi) to 4.5 bar (65.25 psi), dependent on air pipe length. Air supply to the TRS1 air regulator unit must conform to ISO 8573-1: Class 5 particles and moisture-free. Air supply to the TRS1 unit must conform to ISO 8573-1: Air quality of class 1.7.2.
WEIGHT	0.75 kg (1.65 lb), including 10 m of cable.
DIMENSIONS	Height: 83 mm (3.27 in) Width: 38 mm (1.50 in) Depth: 73 mm (2.87 in)
INPUT VOLTAGE	Input voltage 11 Vdc to 30 Vdc.
CURRENT CONSUMPTION	Typically less than 45 mA.
CABLE	5-core plus screen cable. Each core 18/0.1 insulated. Ø5.0 mm (0.20 in) x 10 m (32 ft)
OUTPUT	Solid state relay (SSR) normally-open/normally-closed contact max. 40 mA (fused at 50 mA).
SEALING	Sealed to IPX8 with air on
MOUNTING	Mounting bracket provided with M4 mounting holes. Alternative mounting arrangement provided by M4 holes in the product housing.

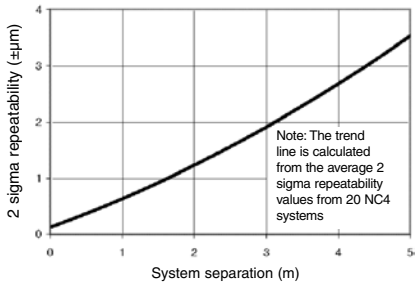
NC4
Non-contact tool setting and tool breakage detection device

The NC4 is a flexible laser system, with ultra-compact laser tool setting transmitter and receiver units that can be mounted onto separate brackets, or as a single fixed unit. The NC4 allows fast, non-contact tool setting and tool breakage detection on machines previously unsuitable for such applications.

NC4 features and benefits:

- Compact units measuring just Ø30 mm (1.18 in) and 35 mm (1.38 in) in height
- Separate systems available up to 5 metres
- New PassiveSeal™ protection device
- Simplified set-up and installation

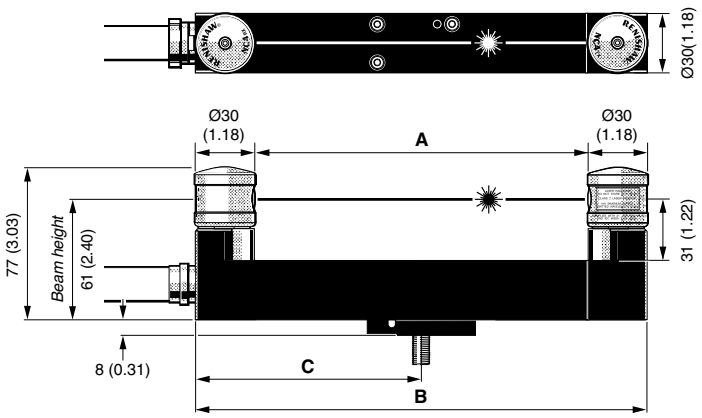
All dimensions are in mm (in).



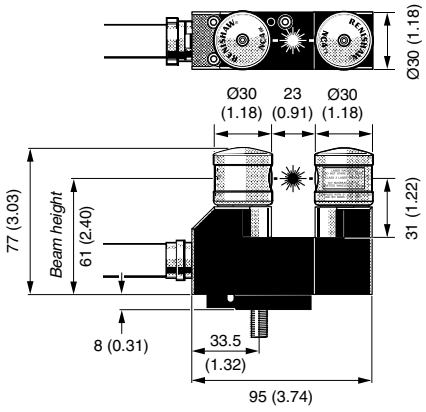
For guidance purposes only

Tx / Rx separation (m)		Minimum tool diameter (mm) when …	
		…measured	…detected
Compact fixed system	0.023	0.03	0.03
	0.055	0.07	0.04
	0.170	0.20	0.07
Modular fixed system	0.225	0.20	0.10
Separate system	0.50	0.30	0.10
	1.00	0.40	0.20
	2.00	0.50	0.20
	3.00	0.60	0.30
	4.00	1.00	0.30
	5.00	1.00	0.30

Compact fixed system – F115 and F230 models

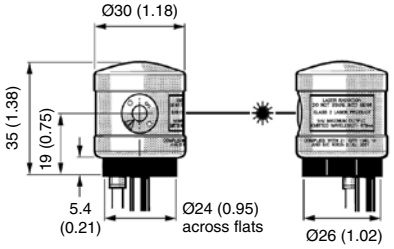


Compact fixed system – F95 model

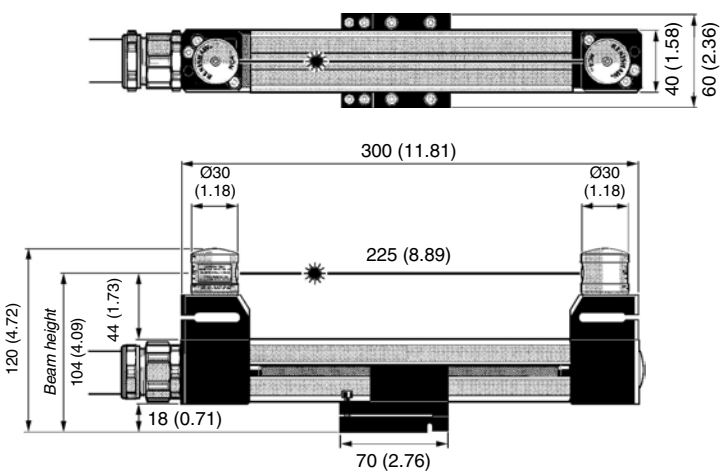


Model	Dimension A	Dimension B	Dimension C
NC4 F115	55	115	57,5
NC4 F230	170	230	115

Separate system



Modular fixed system



NC4
Non-contact tool setting and tool breakage detection device

	FIXED	SEPARATE
PRINCIPAL APPLICATION	High precision, high speed, non-contact tool measurement and broken tool detection on vertical and horizontal machining centres	
LASER TYPE	Visible red light <1 mW 670 nm. Conforms to American (21 CRF 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 dated July 26, 2001) and European (IEC 60852-1:1993 + A1: 1997 + A2: 2001) laser safety standards	
LASER BEAM ALIGNMENT	Adjuster pack	Optional mounting brackets available
ELECTRICAL CONNECTION ARRANGEMENT	Hard-wired cable on end of unit. Other options available on request	Hard-wired cable on underside of unit
REPEATABILITY OF TRIGGER POINTS	± 1.0 µm (2σ) at 1 m separation (see the graph on the previous page)	
MINIMUM TOOL DIAMETER FOR MEASUREMENT	0.03 mm (0.001 in) or larger, depending on separation and set-up	See the table on the previous page
MINIMUM TOOL DIAMETER FOR BREAKAGE DETECTION	0.03 mm (0.001 in) or larger (see the table on the previous page)	See the table on the previous page
AIR PROTECTION SYSTEM	Supply pressure greater than 3 bar, air usage 8 litres / min. Supply to the unit must conform to ISO 8573-1 : Air quality class 5.7.	
POWER SUPPLY	120 mA @ 12 V, 70 mA @ 24 V	
OUTPUT SIGNAL WITH NCi-4	Voltage-free SSR	Voltage-free SSR
TEMPERATURE LIMIT	Operating +5 °C to +50 °C. Storage -10 °C to +70 °C	
DIMENSIONS	See the previous page	30 mm (1.18 in) diameter × 35 mm (1.38 in) long
SEPARATIONS AVAILABLE	300 mm system, providing a 225 mm operating gap. 230 mm (170 mm) 115 mm (55 mm) 95 mm (23 mm)	0.5 m to 0.8 m 0.8 m to 1.5 m 1.5 m to 2 m 2 m to 3 m 3 m to 5 m Other options available on request
SEALING	IPX8 with or without air	IPX8 with or without air
MOUNTING	Single M10 or M12 fixing Alternative fixing arrangement available	Fixing for M3 screws
COMPATIBLE INTERFACE¥	NCi-4	NCi-4

¥ See INTERFACES section for more details.

NC3 compact laser system

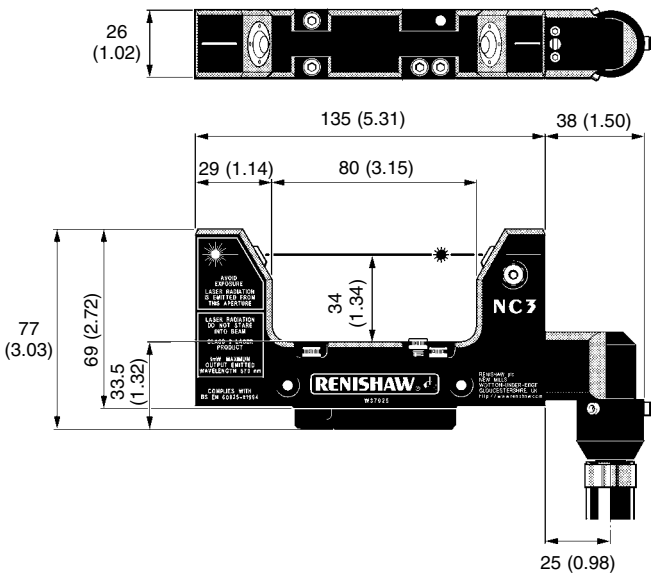
The NC3 is a compact 2-axis non-contact tool setting system, with broken tool detection capability.

Tools as small as 0.2 mm diameter can be measured anywhere along the laser beam.

Set-up is simpler than focused laser systems as there is no focal point to identify.

It is hard-wired to the NCi-4 interface unit, which features a unique 'drip rejection mode'. This 'drip rejection' feature offers protection against unwanted trigger signals.

The NC3 offers improved repeatability, reduction in air consumption and an improved rapid tool-breakage detection cycle and with faster operation, gives greater repeatability.



All dimensions are in mm (in).

NC3 features and benefits:

- Impressive repeatability of ±0.15 µm (2σ)
- High speed broken tool detection cycle
- Measure tools of Ø0.2 mm and larger.
- Detect broken tools as small as Ø0.1 mm

	NC3
PRINCIPAL APPLICATION	High-precision/high-speed, non-contact tool setting and tool breakage detection
LASER TYPE	Visible red light <1 mW 670 nm. Conforms to American (21 CRF 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 dated July 26, 2001) and European (IEC 60852-1:1993 + A1: 1997 + A2: 2001) laser safety standards
LASER BEAM ALIGNMENT	Adjuster pack – supplied. Options available.
ELECTRICAL CONNECTION ARRANGEMENT	Hard-wired
REPEATABILITY OF TRIGGER POINTS	± 0.15 µm (6 µin) 2σ
MINIMUM TOOL DIAMETER FOR MEASUREMENT	Ø0.2 mm (0.008 in)
MINIMUM TOOL DIAMETER FOR BREAKAGE DETECTION	Ø0.1 mm (0.004 in) or larger
AIR PROTECTION SYSTEM	Supply pressure greater than 3 bar, air usage 6 litres / min. Supply must conform to ISO 8573-1 : Air quality class 5.7. Nylon piping included.
POWER SUPPLY	12 V to 30 V, 120 mA.
POWER UP TIME	< 0.5 seconds
TEMPERATURE LIMIT	Operating +5 °C to +50 °C Storage -10 °C to +70 °C
OUTSIDE LENGTH/INTERNAL TRANSMITTER AND RECEIVER SEPARATION	135 mm (5.31 in) / 80 mm (3.15 in)
SEALING	IPX8
MOUNTING	Single M10/M12 fixing. M4 mounting holes also provided
COMPATIBLE INTERFACE¥	NCi-4

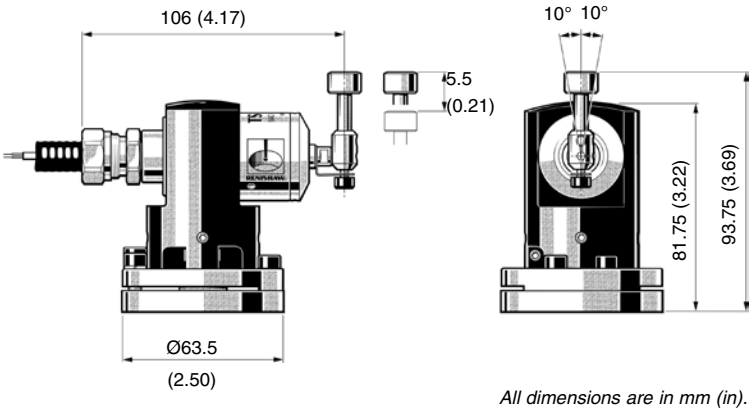
¥ See INTERFACES section for more details.

TS27R

The TS27R is the standard contact tool setting probe for machining centre applications. A compact, robust design allows simple fitting to the machine bed or bracket mounting where appropriate.

TS27R features and benefits:

- Cost-effective tool setting for all types of machining centres
- Tool length and diameter accurately measured on the machine
- Stylus protected by weak link preventing damage in the event of a collision



All dimensions are in mm (in).

	TS27R
PRINCIPAL APPLICATION	Vertical machining centres
TRANSMISSION TYPE	Hard wired
PROBING DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)
WEIGHT	650 g (23 oz)
TRIGGER FORCE (factory setting) Lowest force Highest force	Not adjustable 1.3 N (130 gf) 4.6 ozf 2.4 N (240 gf) 8.5 ozf
STYLUS OVERTRAVEL XY plane +Z direction	 ±10° 5.5 mm (0.21 in)
MAX RECOMMENDED STYLUS LENGTH	Cranked stylus 27 x 33 mm (1.06 x 1.3 in)
SEALING	IPX8
MOUNTING	Ø12.7 mm (0.5 in) T bolt (not supplied) Optional spiral pins to allow accurate remounting
COMPATIBLE INTERFACE¥	MI8 or MI8-4

¥ See INTERFACES section for more details.

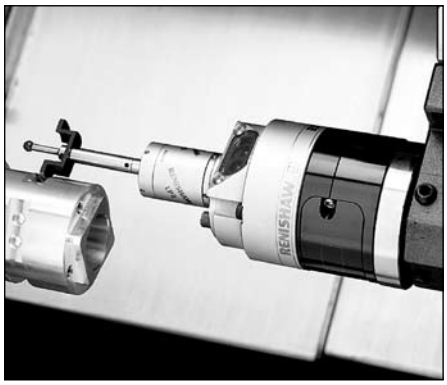
‡ Test conditions:

stylus length:	35 mm	1.38 in
stylus velocity in centre of stylus:	480 mm/min	18.90 in/min
stylus force:	factory settings	

CNC lathe and grinder inspection probing systems

Applications

Renishaw probes can be used on lathes and grinders for component setting and inspection applications.



Component setting

The probe identifies the position of the workpiece, automatically updating work offsets, enabling parts to be manufactured right first time.

This can also be used for:

- part identification for FMS installations.
- component location and also misload detection to avoid scrap.
- excess material identification to bring the cutter to the component fast and safely.

First-off inspection

Inspection of the first component in a batch on the machine tool to:

- reduce the time the machine is idle awaiting feedback from an off-line inspection device.
- correct any errors automatically.

In-process inspection

Measure components following rough machining to:

- ensure critical final cuts are correct.
- highlight errors before they become faults.

Post-process inspection

Inspection of the part once the machining is completed. This can be used to:

- provide information to certify that the component is within its specification.
- record part dimensions for statistical process control.

Probe selection

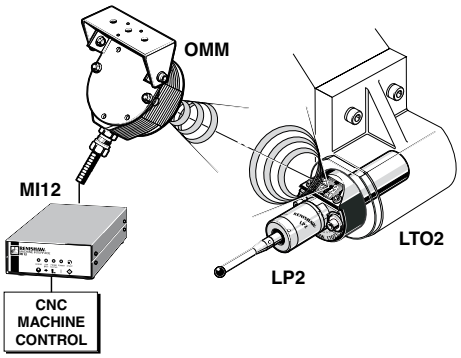
On lathes, inspection probes require a remote transmission system. On grinders, the probe is typically hard-wired to the CNC.
(see section 2, Transmission selection).

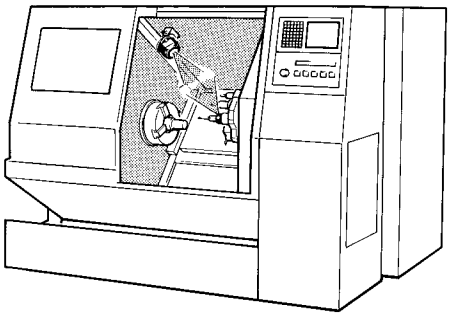
The next page shows some of the most common lathe and grinder inspection probe applications:

1. A small, horizontal lathe fitted with an **LP2** probe using the **LTO2** optical transmission.
2. A grinder fitted with a hard-wired **LP2H** probe, allowing the use of longer styli.
3. The **RMP60** probe has been designed for workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turret lathes (VTL).

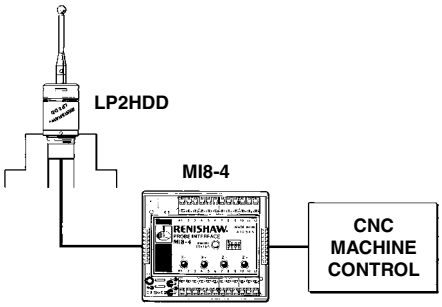
Probing systems for CNC machine tools

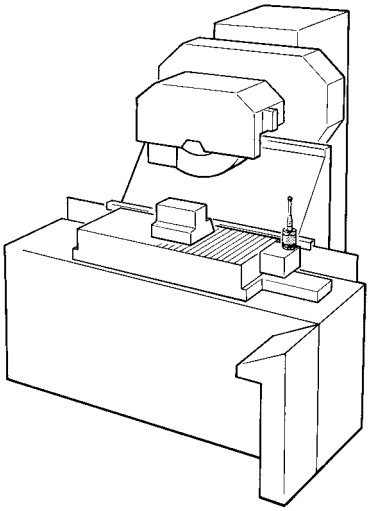
1. A **small horizontal lathe** fitted with an LP2 probe using the LTO2 optical transmission module. In this installation, signal transmissions are via an OMM and a separate MI12 interface.



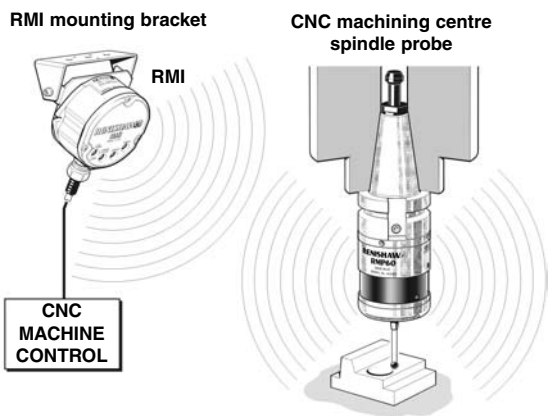


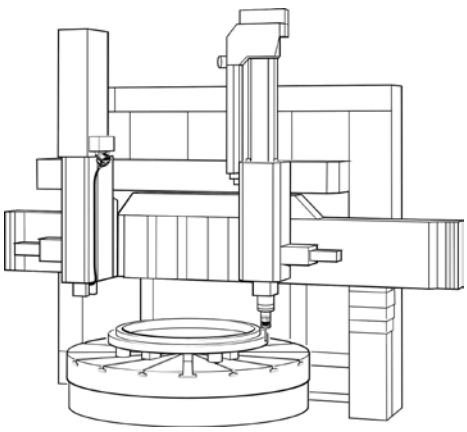
2. A **tool grinder** fitted with a hard-wired high spring force LP2H probe. This allows the use of longer styli than the standard LP2 and has a double diaphragm for use in grinding environments.





3. A **large vertical turret lathe** fitted with an RMP60 radio probe (refer to the CNC machining centre and milling machine inspection probing systems section for more details).

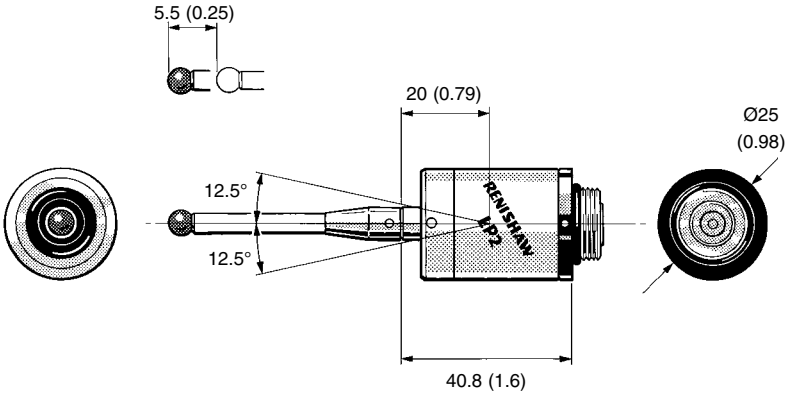




LP2 / LP2H

The LP2 and LP2H are high-performance, compact probes suitable for inspection and tool setting applications. The LP2H has a higher spring force, allowing the use of longer styli. It has greater resistance to machine vibration.

The LP2 and LP2H are suitable for attaching to the LTO2 family of optical transmission systems, as well as those using inductive transmission. They can also be hard-wired for grinder inspection applications.



All dimensions are in mm (in).

	LP2	**LP2H**
PRINCIPAL APPLICATION	Horizontal lathes	Horizontal lathes
PROBING DIRECTIONS	Omni-directional: ±X, ±Y, +Z	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)	2.0 µm (0.00008 in)
WEIGHT	65 g (2.3 oz)	65 g (2.3 oz)
TRIGGER FORCE (factory setting) XY plane - lowest force XY plane - highest force +Z direction	Adjustable 0.50 N (50 gf) 1.76 ozf 0.90 N (90 gf) 3.17 ozf 5.85 N (585 gf) 20.6 ozf	Not adjustable 2 N (200 gf) 7.05 ozf 4 N (400 gf) 14.1 ozf 30 N (3000 gf) 6.6 lbf
STYLUS OVERTRAVEL XY plane +Z direction	 ±12.5° 6.5 mm (0.25 in)	 ±12.5° 5.0 mm (0.20 in)
STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH	50 mm (1.97 in) 100 mm (3.94 in)	50 mm (1.97 in) 150 mm (5.91 in)
SEALING	IPX8	IPX8
MOUNTING	M16 thread for connection to LTO family, extension bars and adaptors.	
COMPATIBLE INTERFACE¥	OMI or OMM / MI12 if fitted with LTO2S / LTO2T / LTO3T / LTO2 MI5 / MI8 / MI8-4 if hard-wired MI5 if fitted with inductive transmission	

¥ See INTERFACES section for more details.

‡Test conditions:

Stylus length:	35 mm	1.37 in
Stylus velocity:	480 mm/min	18.90 in/min
Stylus force:	Factory settings	

FS1i and FS2i

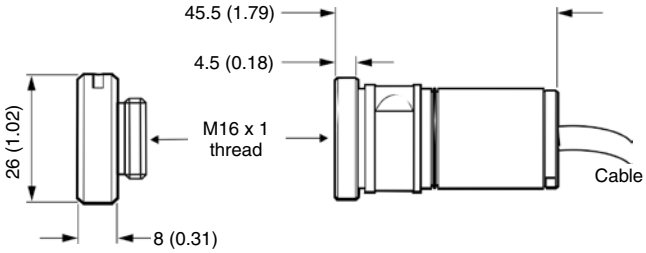
The FS1i and FS2i are female sockets, used for holding the LP2 or LP2H probes.

The **FS1i** can be radially adjusted by ± 4° for aligning the square stylus tip to the machine axes, where the **FS2i** is for fixed applications that do not require adjustment.

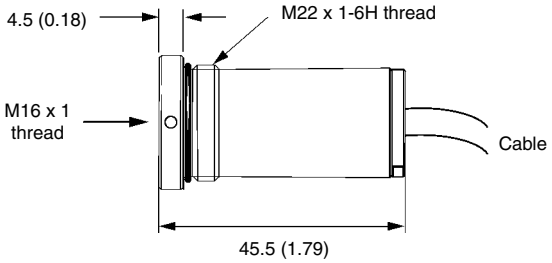
Powered from a 12 V to 30 V supply, they contain an integral interface which converts the probe's signal into a voltage-free solid state relay (SSR) output for transmission to the CNC machine control.

With the built-in interface and compact size of Ø 25 mm x 45.5 mm in length, these sockets eliminate the need for a separate interface within the control cabinet, making installation simple.

FS1i adjustable female socket



FS2i fixed female socket



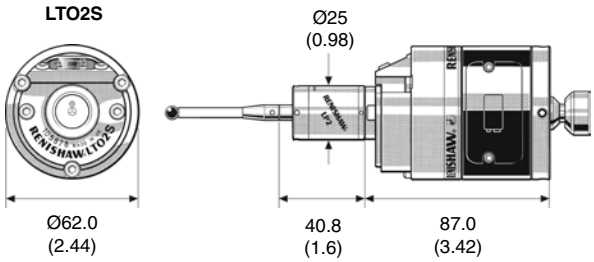
All dimensions are in mm (in).

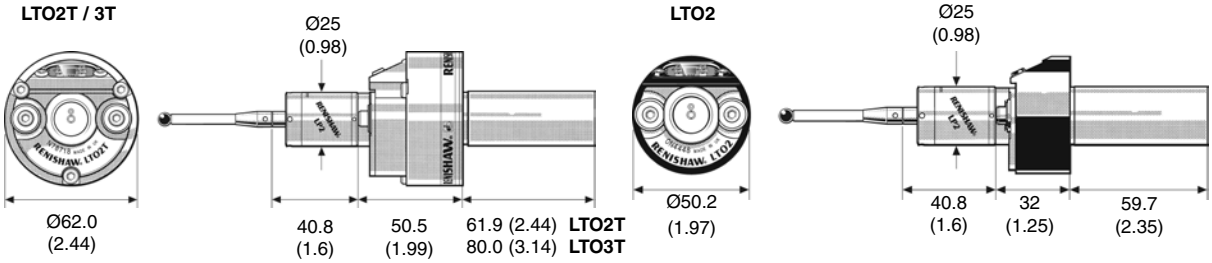
	FS1i	FS2i
PRINCIPAL APPLICATION	**Adjustable** female socket with integral interface used for holding the LP2 and LP2H probes	**Fixed** female socket with integral interface used for holding the LP2 and LP2H probes
LENGTH	45.5 mm (1.79 in)	45.5 mm (1.79 in)
DIAMETER	25 mm (0.98 in)	25 mm (0.98 in)
WEIGHT	70 g (2.4 oz)	70 g (2.4 oz)
STORAGE TEMPERATURE	-10 °C to +70 °C	-10 °C to +70 °C
OPERATING TEMPERATURE	+10 °C to +40 °C	+10 °C to +40 °C
IP RATING	IPX8	IPX8
CABLE	4-core screen cable with polyurethane sheath. Each core 7/0.2 insulated. Ø4.35 mm (0.17 in) × 1.0 m (3 ft 3 in)	5-core screen cable with polyurethane sheath. Each core 7/0.2 insulated. Ø4.35 mm (0.17 in) × 1.0 m (3 ft 3 in)
SUPPLY VOLTAGE	12 V to 30 V	12 V to 30 V
SUPPLY CURRENT	18 mA nominal, 25 mA max	18 mA nominal, 25 mA max.
MAX. OUTPUT CURRENT	50 mA	50 mA
OUTPUT TYPE	Voltage-free SSR	Voltage-free SSR
PROTECTION	Short circuit protected output **The interface must be powered from a suitably fused supply.**	Short circuit protected output. **The interface must be powered from a suitably fused supply**

LTO2S / LTO2T / LTO3T / LTO2 optical transmissions

The LTO family with optical transmission is ideal for turret mounting on all CNC lathes.

All LTO units can be fitted with LP2 or LP2H probes.



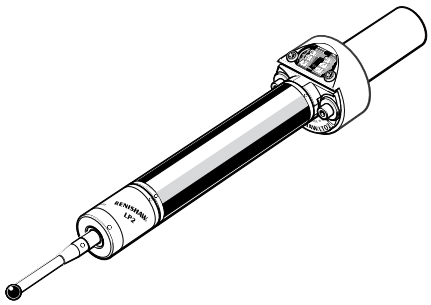


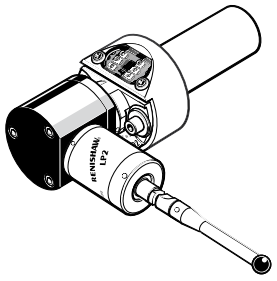
All dimensions are in mm (in).

	LTO2S	LTO2T	LTO3T	LTO2
TRANSMISSION TYPE†	Uni-directional infra-red optical transmission			
PRINCIPAL APPLICATION	Large/medium lathes	Medium lathes	Medium lathes	Small lathes
TURN ON/OFF METHOD	Optical on/optical off **or** optical on/timer off	Optical on/optical off **or** optical on/timer off	Optical on/optical off **or** optical on/timer off	Optical on/timer off
WEIGHT (including probe)	835 g	625 g	680 g	355 g
BATTERY TYPE AND LIFE Standby 5% usage Continuous life	6LR61 (PP3 9 V alkaline) 365 days 80 – 98 days 110 – 140 hours	DL123A 108 days 42 – 45 days 81 – 88 hours	DL123A (2 pieces) 280 days 110 – 114 days 183 – 225 hours	DL123A 65 days 35 days 88 hours
SEALING	IPX8	IPX8	IPX8	IPX8
SHANKS	Various Ø25.4 mm (1 in)	Ø25 mm (0.98 in) Ø25.4 mm (1 in)	Ø25 mm (0.98 in)	Ø25 mm (0.98 in)
COMPATIBLE INTERFACE¥	OMI or OMM/MI12	OMI or OMM/MI12	OMI or OMM/MI12	OMI or OMM/MI12

† See TRANSMISSION SYSTEMS section for more details.
¥ See INTERFACES section for more details.

Extension bars and adaptors are also available for special applications.





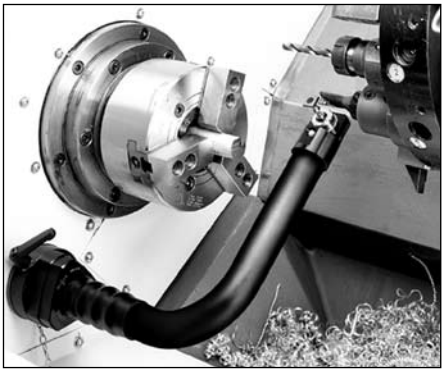
Inductive transmission

Inductive transmission is not recommended for retrofit installations. Machine builders should contact their Renishaw supplier for further details or visit website www.renishaw.com.

CNC lathe tool setting probing systems

Applications

Renishaw probes can be used on lathes for tool setting and tool breakage detection applications.



Tool setting

Tools are driven against the probe stylus with the tool either static or rotating:

- Static setting in X and Z directions for turning tools, part off tools etc.
- Rotating length and/or diameter setting in X and Z directions for powered tools such as drills, taps and slot drills.

Tool breakage detection

Rapid checking of tool dimensions to ensure that tools are still intact after machining.

Probe selection

Typically, tool setting probes cannot remain inside the machine frame of a lathe when not in use – they would obstruct the operation of the machine. However, Renishaw has developed a range of tool setting arms which allows a probe to be placed near the tools only when it is needed. Renishaw's lathe tool setting systems allow manual and fully automatic operation. Manual arms can be removed by hand, whilst automatic arms can be actuated by program commands.

Whether manual or automatic, all Renishaw tool setting arms provide a highly repeatable location for the probe. Manual systems are most suitable where tool set-ups are relatively infrequent. A fully automatic system is ideal where batch changeovers are frequent, or where in-process tool breakage detection is required to support unmanned operation. The next page shows some of the most common tool setting probe applications on lathes:

1. A typical horizontal lathe fitted with an **HPRA** manual tool setting arm.

2. The **HPPA** shown in a horizontal lathe.

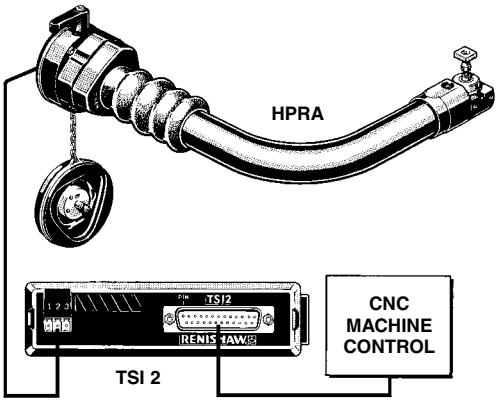
3. The same lathe fitted with a **HPMA** automatic tool setting arm.

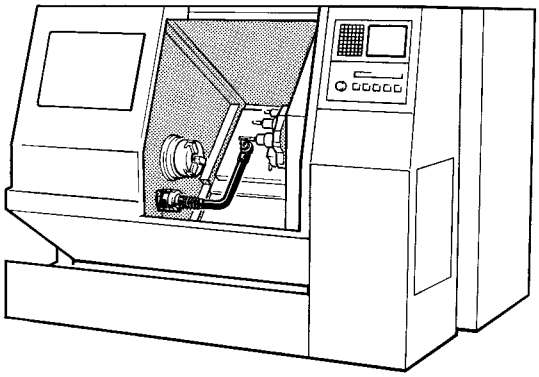
Renishaw tool setting probes can also be purchased separately for use in special applications.

The Renishaw range includes:

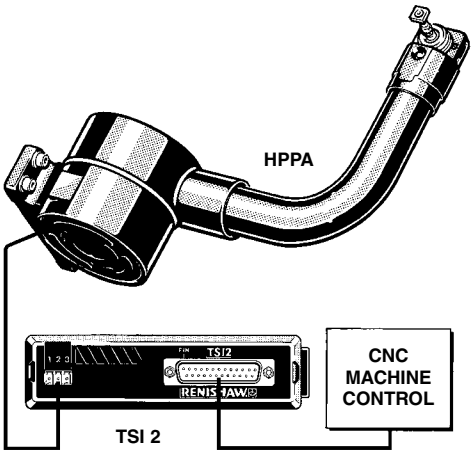
- **RP3** – a compact 5-axis tool setting probe, ideal for arm applications.
- **LP2** – a high specification probe for specialist applications.

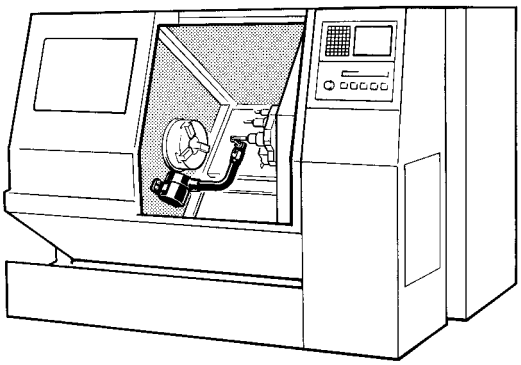
1. A **horizontal lathe** fitted with an HPRA manual tool setting system. The HPRA is locked to a permanent base when in use, and can be stored on a stand outside the machine tool when not required.



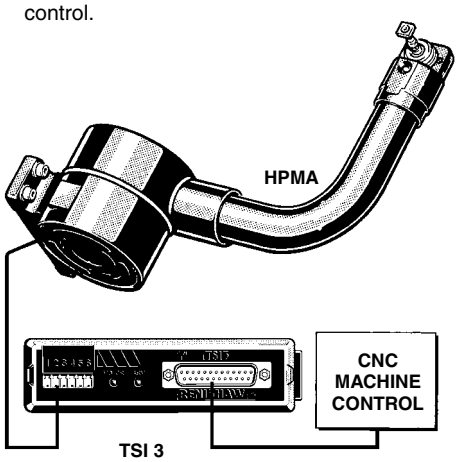


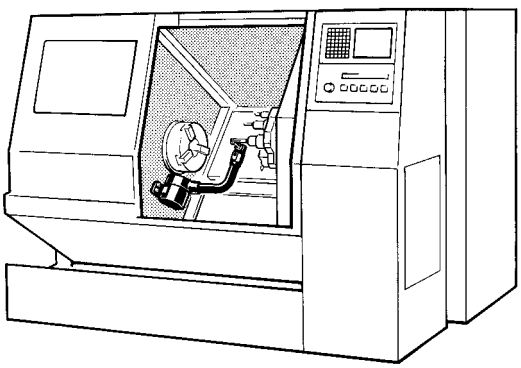
2. A **horizontal lathe** fitted with the HPPA manual operated 'pull down, push up' system, which is permanently located within the turning centre.





3. A **horizontal lathe** fitted with the HPMA automatic tool setting system. The HPMA remains inside the machine tool all the time, manoeuvring the tool setting probe into position when needed – under program control.





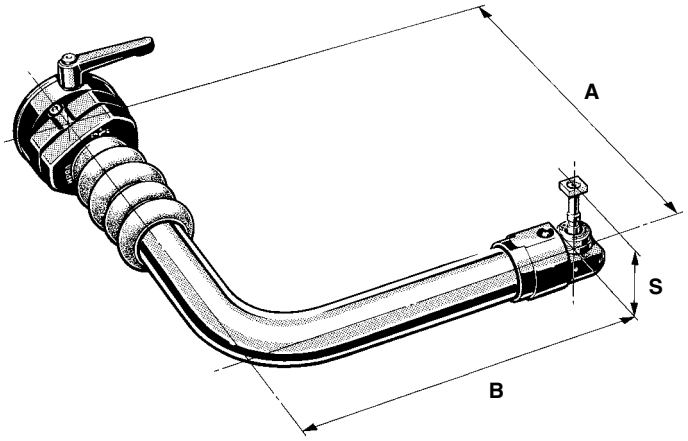
HPRA

High precision removable arm

The HPRA is a 'plug-in' arm which is manually located inside the machine for tool setting, and then removed once the process is complete.

The arm is locked into a repeatable kinematic location on a mounting base during operation, enabling the probe stylus to be re-located to within 5 µm (2σ).

When not in use the HPRA is stored on a stand located on or near the machine.



All dimensions are in mm (in).

	HPRA	
PRINCIPAL APPLICATION	Tool setting on 2-axis and 3-axis lathes	
TYPICAL POSITIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	5.0 µm 2σ 8.0 µm 2σ	0.0002 in (Arms for machines with 6 in to 15 in chucks) 0.0003 in (Arms for machines with 18 in and 24 in chucks)
ARM DIMENSIONS A B S (50 mm tooling)	**Maximum** 580 mm (22.85 in) 450 mm (17.73 in) 71 mm (2.80 in)	
ARM DIMENSIONS A B S (16 mm tooling)	**Minimum** 250 mm (9.84 in) 211 mm (8.31 in) 35.7 mm (1.41 in)	
BASE DIAMETER	85 mm (3.35 in)	
SEALING	IPX8	
PROBE	RP3	
COMPATIBLE INTERFACE¥	TSI 2	

¥ See INTERFACES section for more details.

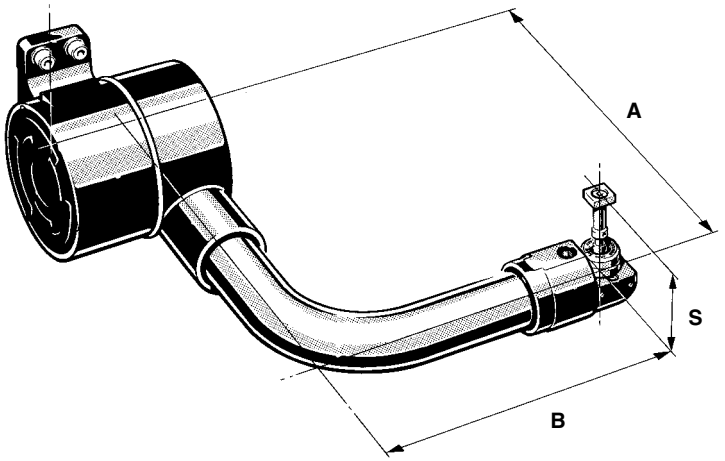
‡ Test conditions: stylus length: 22 mm 0.87 in
stylus velocity: 36 mm/min 1.42 in/min
stylus force: factory settings

HPPA

High precision pull-down arm

The HPPA is a simple, manually operated 'pull-down, push-up' system, which is permanently located within the turning centre and readily available for tool setting operations.

An innovative patented rotary device automatically locks the arm into a kinematic location, with no additional adjustment or locking device required. This enables the probe's stylus to be re-located to within 5 µm (2σ).



All dimensions are in mm (in).

	HPPA
PRINCIPAL APPLICATION	Tool setting on 2-axis and 3-axis lathes
TYPICAL POSITIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	5.0 µm 2σ x/z 0.0002 in (Arms for machines with 6 in to 15 in chucks) 8.0 µm 2σ x/z 0.0003 in (Arms for machines with 18 in and 24 in chucks)
ARM DIMENSIONS	**Maximum**
A	555 mm (21.87 in)
B	458.2 mm (18.04 in)
S (50 mm tooling)	71 mm (2.80 in)
ARM DIMENSIONS	**Minimum**
A	250 mm (9.84 in)
B	219.2 mm (8.63 in)
S (16 mm tooling)	35.7 mm (1.41 in)
SEALING	IPX8 (static)
PROBE	RP3
COMPATIBLE INTERFACE¥	TSI 2

¥ See INTERFACES section for more details

‡ Test conditions: stylus length: 22 mm 0.87 in
stylus velocity: 36 mm/min 1.42 in/min
stylus force: factory settings

HPMA

High precision motorised arm

The HPMA is an electrically powered arm allowing precision automated tool setting.

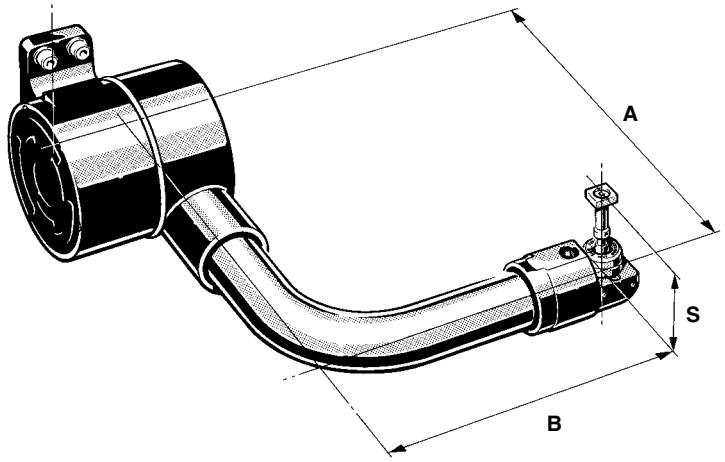
Rapid actuation allows in-process tool setting and broken tool detection without the need for operator intervention.

The arm swings down under program control and locks into position within 2 seconds.

After the tools have been set, a program command returns the arm to a safe position away from the machining operations.

An innovative patented rotary device automatically locks the arm into a kinematic location, with no additional adjustment or locking device required.

The HPMA is available in a range of standard arm dimensions. Alternatively, customised arms can be specified within the dimension limits outlined below.



All dimensions are in mm (in).

	HPMA
PRINCIPAL APPLICATION	Tool setting and tool breakage detection on 2-axis and 3-axis lathes
TYPICAL POSITIONAL REPEATABILITY	5.0 µm 2σ x/z 0.0002 in (Arms for machines with 6 in to 15 in chucks) 8.0 µm 2σ x/z 0.0003 in (Arms for machines with 18 in and 24 in chucks)
ARM DIMENSIONS A B S (50 mm tooling)	**Maximum** 555 mm (21.85 in) 458.2 mm (18.04 in) 71 mm (2.8 in)
ARM DIMENSIONS A B S (50 mm tooling)	**Minimum** 250 mm (9.84 in) 219.2 mm (8.63 in) 35.7 mm (1.4 in)
SEALING	IPX8 (static)
PROBE	RP3
COMPATIBLE INTERFACE¥	TSI 3

¥ See INTERFACES section for more details

‡ Test conditions: stylus length: 22 mm 0.87 in
stylus velocity: 36 mm/min 1.42 in/min
stylus force: factory settings

RP3 probe

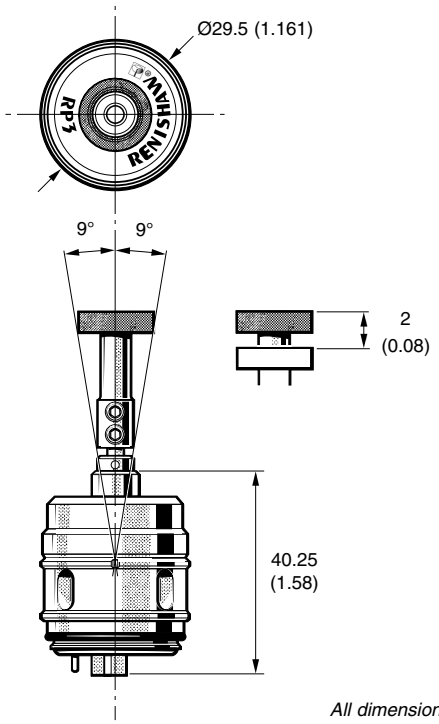
For Renishaw HP tool setting arms

The RP3 probe has been designed primarily for tool setting applications but can also be used in workpiece setup.

The RP3 probe is suitable for OEM installation into purpose built holders. It utilises a universal M4 stylus mounting, allowing the full range of Renishaw styli to be used.

When fitting the RP3 to an OEM tool holder, an OEM kit is available that enables easy connection from the probe connection terminals to the interface cable (for further details, please contact your local Renishaw office).

The probe is extremely short, resulting in significant advantages in tool setting applications and has the performance of traditional Renishaw touch trigger probes.



All dimensions are in mm (in).

	RP3
PRINCIPAL APPLICATION	Manual and automatic tool setting arms on 2-axis and 3-axis lathes
TRANSMISSION TYPE†	Hard-wired
PROBE OUTPUTS	OEM kit including connection PCB
PROBING DIRECTIONS	Omni-directional: ±X, ±Y, +Z
UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP‡	1.0 µm (0.00004 in)
WEIGHT	80 g (3 oz)
TRIGGER FORCE (factory setting) Lowest force Highest force +Z direction	not adjustable 1.5 N (150 gf) 5.3 ozf 3.5 N (350 gf) 12.3 ozf 12.0 N (1200 gf) 42.3 ozf
STYLUS OVERTRAVEL XY plane +Z direction	 ± 9 ° 2 mm (0.8 in)
MAX RECOMMENDED STYLUS LENGTH	48.25 mm (1.90 in)
SEALING	IPX8
MOUNTING	Refer to the user guide for customer integration details
COMPATIBLE INTERFACE¥	MI8-4

† See TRANSMISSION SYSTEMS section for more details.
¥ See INTERFACES section for more details.

‡ Test conditions:

stylus length:	35 mm	1.38 in
stylus velocity:	8 mm/sec	0.31 in/sec
stylus force:	factory settings	

Machine interface units

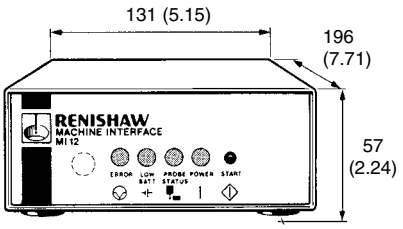
MI12/MI12E/MI12-B
(Optical transmission)

The MI12 and MI12-B interfaces process signals between one or two OMMs and the CNC machine control.

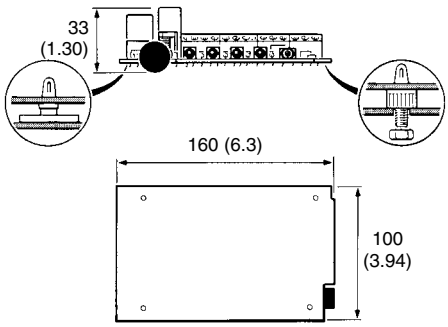
The standard MI12 unit is contained within a free-standing enclosure with an optional panel mounting kit also available. The MI12-B is a board-only version for mounting within the machine cabinet.

The MI12E interface forms part of the high power optical transmission system. It processes signals between one or two OMMEs and the CNC machine's control. For optimum system performance, the MI12E should only be used with OMME(s).

MI12 and MI12E



MI12-B

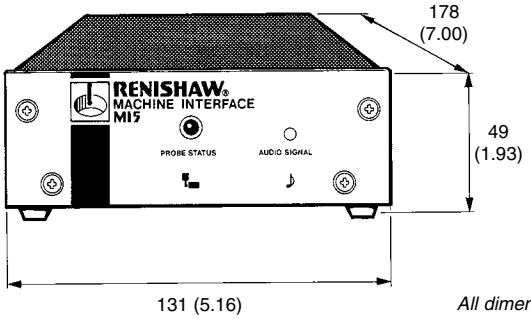


All dimensions are in mm (in).

	MI12 / MI12-B / MI12E	
PRINCIPAL APPLICATION	Optical transmission probing systems on machining centres and lathes	
MOUNTING	Free-standing enclosure (optional panel mount available) The MI12-B has self-adhesive feet or M4 support studs	
SYSTEM STATUS	Audible indicator	'Bleeper'
	Error LED	Illuminated when the beam is obstructed, the probe is out of range, or the probe is off
	Low battery LED	Indicates probe batteries should be replaced
	Probe status LED	Illuminated when the probe is seated. Off when the stylus is deflected
	Power LED	Illuminated when power is on
	Start button	Manual-start push-button on the front of the interface
MACHINE START OPTIONS	1. Machine start	OMM / OMME sends a start signal when commanded by the machine control
	2. Auto start	OMM / OMME sends a start signal once every second when the probe is not transmitting
OUTPUTS	Four solid state relay (SSR) outputs 1. Probe status (or complement) 2. Probe skip (or complement) 3. Probe error (or complement) 4. Low battery	
OUTPUT SIGNAL FORMAT	Output signals must be compatible with the machine control input	
Maximum current	±50 mA	
Maximum voltage	±50 V peak	
OTHER I/O	Remote audible indicator or lamp (not supplied by Renishaw)	
Maximum current	100 mA	
Maximum voltage	+50 Vdc	
Output duration	44 ms	
POWER SUPPLY	The interface can draw its supply from the CNC +15 V to + 30 Vdc and presents a load of up to 400 mA Alternatively, the Renishaw PSU3 power supply unit can be used	

MI5
(Inductive transmission)

The MI5 interface processes signals from Renishaw inductive probes and converts the signals into voltage-free solid-state relay (SSR) output, for transmission to the machine's controller.



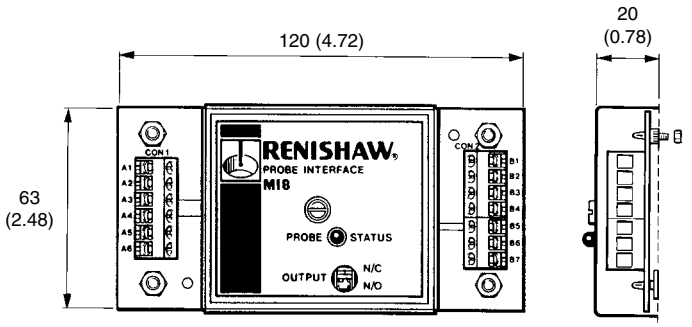
All dimensions are in mm (in).

	MI5	
PRINCIPAL APPLICATION	Inductive probing systems on machining centres and lathes	
MOUNTING	Free-standing enclosure	
SYSTEM STATUS	Audible indicator Probe Status LED	'Bleeper' On when the probe is seated. Off when the stylus is deflected or power is off
OUTPUT	1. Probe Status (or complement) 2. Probe Skip (or complement)	
OUTPUT SIGNAL FORMAT Maximum current Maximum voltage	Solid state relay (SSR) 40 mA peak ±50 V peak	
POWER SUPPLY	The MI5 can draw its supply from the CNC +18 V to + 30 Vdc The MI5 presents a load of up to 200 mA Alternatively, the Renishaw PSU3 power supply unit can be used	

MI8
(Hard-wired transmission)

The MI8 interface processes signals from Renishaw hard-wired probes and converts the signals into a voltage-free solid-state relay (SSR) output for connection to the machine's controller.

All dimensions are in mm (in).

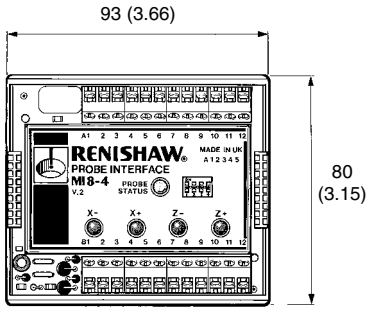


	MI8	
PRINCIPAL APPLICATION	Hard-wired probing systems on machining centres and lathes	
MOUNTING	Self adhesive feet, M4 studded support or DIN rail mounting	
SYSTEM STATUS	Probe status LED	On when the probe is seated. Off when the stylus is deflected or power is off
OUTPUT	1. Probe Status/Status Bar – configurable	
OUTPUT SIGNAL FORMAT Maximum current Maximum voltage	Solid state relay (SSR) 50 mA peak ±50 V peak	
OTHER I/O	Outputs are available for a remote probe status LED (not supplied by Renishaw). Nominal current is 10 mA	
POWER SUPPLY	The MI8 can draw its supply from the CNC +15 V to + 30 Vdc The MI8 presents a load of up to 50 mA Alternatively, the Renishaw PSU3 power supply unit can be used	

MI8-4
(Hard wired transmission)

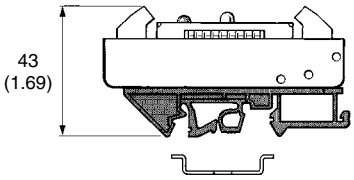
The MI8-4 interface processes the probe signal from a hard-wired probe and converts it to the correct format for connection to a controller's probe input.

The MI8-4 can also be connected to the 4-wire Fanuc automatic measurement input (XAE, ZAE). Four signals are required from the control to determine which of the four outputs should generate the probe's signal.

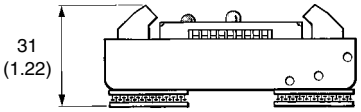


All dimensions are in mm (in).

DIN rail mounting



Dual lock pad mounting

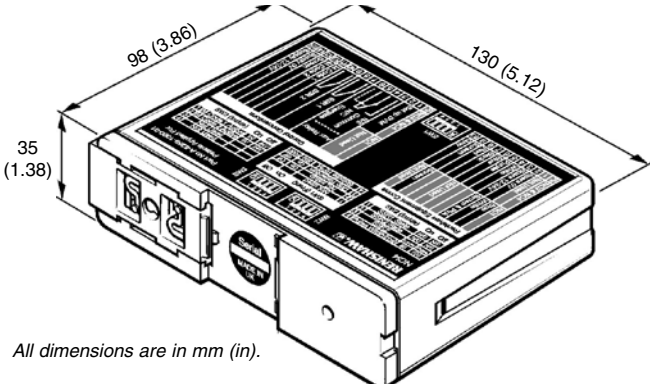


	MI8-4	
PRINCIPAL APPLICATION	Hard-wired probing systems on machining centres and lathes	
MOUNTING	Self-adhesive dual-locked fixing or DIN rail mounting	
SYSTEM STATUS	Probe status LED	Green when probe is seated. Red when stylus is deflected. Off when power is off.
	Four diagnostic LEDs	Illuminated to indicate direction of machine movement (for use with 4-wire output option).
STANDARD OUTPUT	1. Probe status (or complement)	
STANDARD OUTPUT SIGNAL FORMAT	Probe status output is an isolated totem-pole output which requires a 3-wire connection: signal, power and ground	
TTL COMPATIBILITY	Probe status output is TTL compatible with a 5 V ± 5% supply voltage. If this supply voltage is not available another voltage in the range 4.75 V to 30 V can then be used	
V_{out} high	2.5 V min at 2.5 mA	
V_{out} low	0.4 V max at 10 mA	
FANUC '4-WIRE' OUTPUTS	1. X- output (or complement) 2. X+ output (or complement) 3. Z- output (or complement) 4. Z+ output (or complement)	
'4-WIRE' OUTPUT FORMAT	Four wire outputs are totem-pole outputs supplied by the +15 V to +30 V power supply to the MI8-4 Four 'machine axis moving' inputs to the MI8-4 are open-collector transistor (OCT), totem-pole and relay compatible	
OTHER I/O	An inspection probe system output can be connected to the MI8-4 and then routed to the machine control. The selection of probe is controlled by a machine control input to the MI8-4 (M code)	
POWER SUPPLY	The MI8-4 can draw its supply from the CNC +15 V to + 30 Vdc. A voltage of +16.5 V to +28.5 V with 3 V peak ripple is also acceptable The MI8-4 presents a load of up to 80 mA (each XAE, ZAE output connection will add to the supply current)	

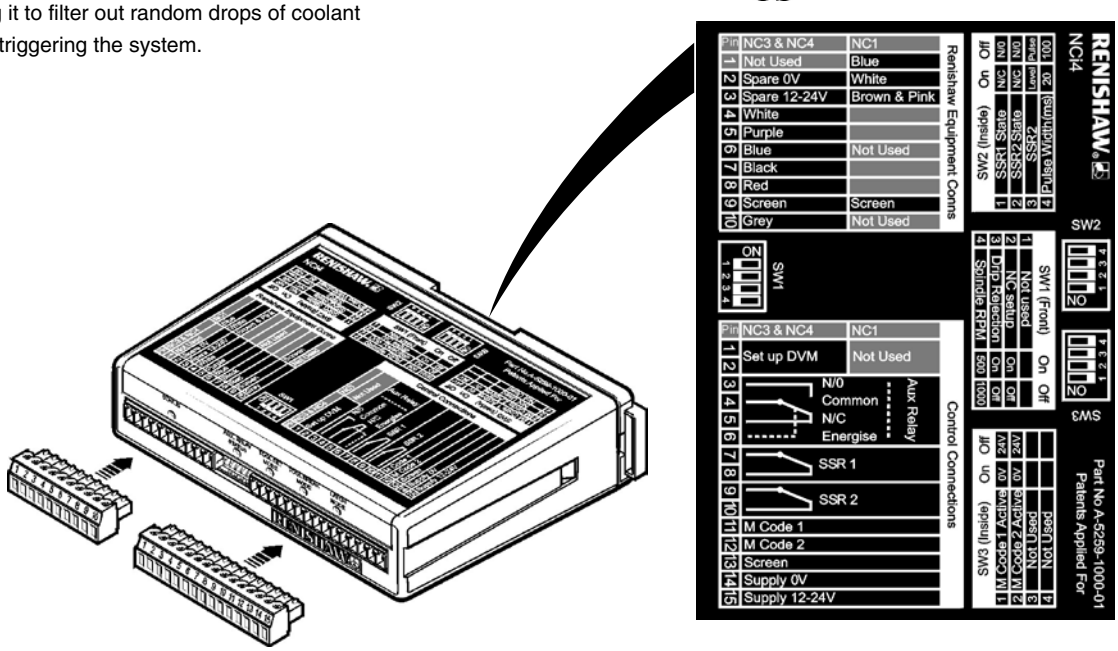
NCi-4
(for non-contact products)

The NCi-4 interface is used with the NC1, NC3 and NC4 non-contact tool setting systems, processing their signals and converting them into a voltage-free solid-state relay (SSR) outputs for transmission to the CNC machine's control.

The NCi-4 features a drip-rejection mode, allowing it to filter out random drops of coolant without triggering the system.



All dimensions are in mm (in).



	NCi-4
PRINCIPAL APPLICATION	The NCi-4 processes signals from the NC1, NC3 or NC4 and converts them into a voltage-free solid state (SSR) output, which is transmitted to the CNC machine control.
DIMENSIONS	Compact size 130 mm (5.12 in) x 98 mm (3.86 in) x 35 mm (1.38 in)
SUPPLY VOLTAGE	11 V to 30 Vdc
SUPPLY CURRENT - NC3 or NC4 CONNECTED	120 mA @ 12 V, 70 mA @ 24 V
SUPPLY CURRENT - NC1 CONNECTED	300 mA @ 12 V, 130 mA @ 24 V
OUTPUT SIGNAL	Two voltage-free solid-state relay (SSR) outputs, configurable normally-open or normally-closed, one of which can be configured pulsed or level.
AUXILIARY RELAY	Auxiliary relay for skip-sharing with a spindle probe system or controlling the transmitter separately from the receiver
TEMPERATURE OPERATING	+ 5 °C to + 50 °C
TEMPERATURE STORAGE	-10 °C to + 70 °C
POWER SUPPLY	12 V to 30 V
MOUNTING	DIN rail. Alternative mounting using screws
INPUT/OUTPUT PROTECTION	SSR outputs protected by 50 mA resettable fuses. Auxiliary relay output protected by a 200 mA resettable fuse
DIAGNOSTIC LEDs	Beam status, latch mode, high-speed tool-breakage detection mode, auxiliary relay, tool setting mode
MODES OF OPERATION	High-speed tool-breakage detection mode. Normal measurement mode. Latch mode for profile checking and cutting edge checking. Drip-rejection mode – rejects random drops of coolant falling through the beam.

TSI2 and TSI2-C (for tool setting arms)

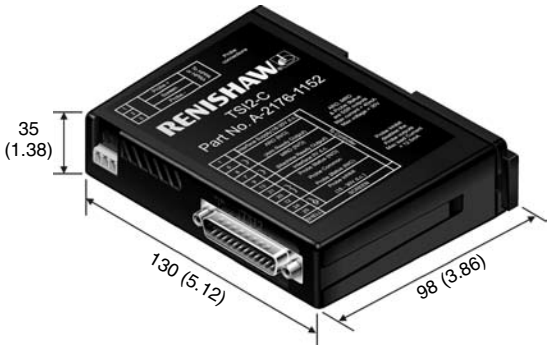
The TSI2 and TSI2-C interfaces process signals between the HPRA and HPPA tool setting arms and the machine's control.

The units are DIN rail-mounted and feature an 'easy fit' location mechanism.

The TSI2 interface is designed to be used with all standard +24 Vdc operated controllers e.g. Fanuc, Siemens etc.

For controllers that do not operate from standard +24 Vdc power supplies, e.g. OSP and Haas, the TSI2-C should be used instead. This features configurable solid state relay (SSR) outputs that are easily integrated into all non +24 V controllers.

All dimensions are in mm (in).



TSI2/TSI2-C

	TSI2	**TSI2-C**
PRINCIPAL APPLICATION	Hard-wired tool setting probe applications with HPRA and HPPA	Hard-wired tool setting probe applications with HPRA and HPPA
MOUNTING	DIN rail mounting	DIN rail mounting
STANDARD OUTPUTS	1. Probe status (no complement) 2. Position confirm signals (Machine Ready and Arm Ready)	1. Probe status 2. Position confirm signals (Machine Ready and Arm Ready)
STANDARD OUTPUT SIGNAL FORMAT	1. Unipolar active-high probe status outputs (non-configurable) 2. Unipolar active-high confirm outputs for Machine Ready and Arm Ready positions (non-configurable)	1. Voltage-free, solid-state relay (SSR) probe status output (Normally Open and Normally Closed option available) 2. Voltage-free, solid-state relay (SSR) confirm outputs for Machine Ready and Arm Ready positions (non-configurable)
TTL COMPATIBILITY	Not compatible	Probe Status output is voltage-free and compatible with TTL inputs
STANDARD INPUTS	1. Inhibit 2. Probe Select inputs	1. Inhibit 2. Probe Select inputs
STANDARD INPUT SIGNAL FORMAT	1. Internally pulled down (2k4) ACTIVE HIGH 2. Internally pulled down (2k4) ACTIVE HIGH	1. Internally pulled down (2k4) ACTIVE HIGH 2. Internally pulled down (2k4) ACTIVE HIGH
PROBE VIBRATION FILTER	A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI2 (PL2-1 and PL2-3)	A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI2-C (PL2-1 and PL2-3)
POWER SUPPLY	18 V – 30 Vdc Imax = 50 mA not including output loading. Fuse protected at 250 mA (FF).	18 V – 30 Vdc, Imax = 120 mA Fuse protected at 250 mA (FF).

TSI3 and TSI3-C
(for tool setting arms)

The TSI3 and TSI3-C interfaces process signals between the motorised HPMA tool setting arm and the machine's control.

These units are DIN rail-mounted and feature an 'easy fit' location mechanism.

The TSI3 interface is designed to be used with all standard +24 Vdc operated controllers e.g. Fanuc, Siemens etc.

For controllers that do not operate from standard +24 Vdc power supplies, e.g. OSP and Haas, the TSI3-C should be used instead. This features configurable solid state relay (SSR) outputs that are easily integrated into all non +24 V controllers.

All dimensions are in mm (in).

TSI3/TSI3-C

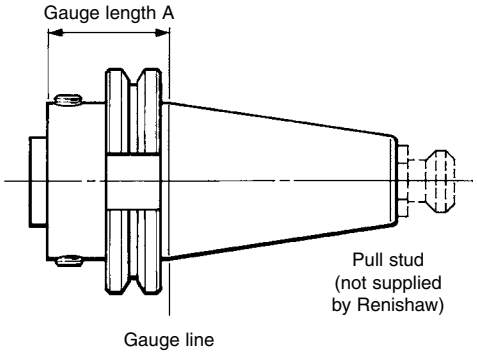
	TSI3	TSI3-C
PRINCIPAL APPLICATION	Hard-wired tool setting probe applications with HPMA	Hard-wired tool setting probe applications with HPMA
MOUNTING	DIN rail mounting	DIN rail mounting
STANDARD OUTPUTS	1. Probe status (no complement) 2. Position confirm signals (Machine Ready and Arm Ready)	1. Probe status (no complement) 2. Position confirm signals (Machine Ready and Arm Ready)
STANDARD OUTPUT SIGNAL FORMAT	1. Unipolar active-high probe status outputs (non-configurable) 2. Unipolar active-high confirm outputs for Machine Ready and Arm Ready positions (non-configurable)	1. Voltage-free, solid-state relay (SSR) probe status output (Normally Open and Normally Closed option available) 2. Voltage-free, solid-state relay (SSR) confirm outputs for Machine Ready and Arm Ready positions (non-configurable)
TTL COMPATIBILITY	Not compatible	Probe Status output is voltage-free and compatible with TTL inputs
STANDARD INPUTS	1. Inhibit, Arm Ready command, Machine Ready command 2. Probe Select inputs	1. Inhibit, Arm Ready command, Machine Ready command 2. Probe Select inputs
STANDARD INPUT SIGNAL FORMAT	1. Internally pulled down (2k4) ACTIVE HIGH 2. Internally pulled down (2k4) ACTIVE HIGH	1. Internally pulled down (2k4) ACTIVE HIGH 2. Internally pulled down (2k4) ACTIVE HIGH
PROBE VIBRATION FILTER	A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI3 (PL2-1 and PL2-3)	A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI3-C (PL2-1 and PL2-3)
POWER SUPPLY	**Interface voltage supply (1, 13, 25)** 18 V – 30 Vdc, Imax = 100 mA not including output loading. **Motor voltage supply (10, 22, 11, 23)** 24 Vdc + 20% -10%, Imax + 2.5 A for 4 s (worst case stall). Overcurrent and reverse connection protected. Self-resettable	**Interface voltage supply (1, 13)** 18 V – 30 Vdc, Imax = 140 mA **Motor voltage supply (10, 22, 11, 23)** 24 Vdc + 20% -10%, Imax + 2.5 A for 4 s (worst case stall). Overcurrent and reverse connection protected. Self-resettable
DIAGNOSTIC LEDS		1. Motor state LED 2. Arm state LED

Taper shanks for machine tool probes

Shanks for RMP60 / OMP60 (when not used in shank switch configuration)
MP10 / MP12 (non-shank switch version)
MP700 probes

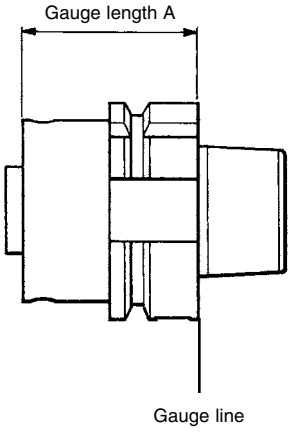
- **Please quote the part number when ordering equipment**
- **Shanks are supplied in a natural finish**
- **Dimensions mm (in)**
- **If you cannot find the shank you require, please contact your local Renishaw office for further details**

Taper shanks



Shank type	Part no.	Taper	Gauge length A
DIN 69871 A	M-2045-0064	30	35.25 (1.388)
	M-2045-0065	40	35.25 (1.388)
	M-2045-0067	50	35.25 (1.388)
BT - 1982	M-2045-0077	30	27.5 (1.083)
	M-2045-0027	40	32.0 (1.260)
	M-2045-0073	50	38.0 (1.496)
ANSI CAT B5.50-1985	M-2045-0137	40	35.25 (1.388)
(Imperial pull stud thread)	M-2045-0139	50	35.25 (1.388)
ANSI CAT B5.50-1985	M-2045-0208	40	40.00 (1.575)
(Metric pull stud thread)	M-2045-0238	50	35.25 (1.388)
DIN 2080	M-2045-0132	30	20.0 (0.787)
(Manual tool change)	M-2045-0024	40	13.6 (0.535)

HSK shanks

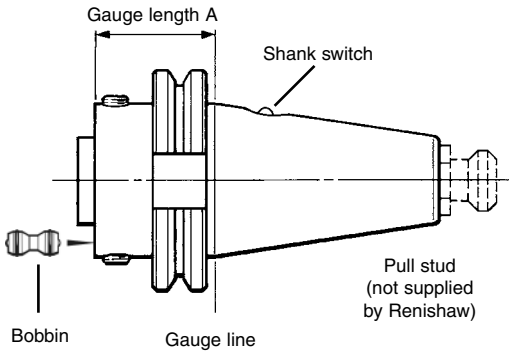


Shank type	Part no.	HSK	Gauge length A
DIN 69893 HSK Form A	M-2045-0232	A32	46 (1.811)
	M-2045-0186	A40	47 (1.850)
	M-2045-0187	A50	50 (1.969)
	M-2045-0188	A63	53 (2.087)
	M-2045-0189	A80	50 (1.969)
	M-2045-0190	A100	61 (2.402)
DIN 69893 HSK Form E	M-2045-0204	E40	38 (1.496)
DIN 69893 HSK Form F	M-2045-0287	F3	53 (2.087)
SANDVIK CAPTO	M-2045-0346	C5	32 (1.259)
	M-2045-0310	C6	42 (1.654)
	M-2045-0311	C8	50 (1.969)
KENNAMETAL KM	M-2045-0335	KM63	25.6 (1.07)
	M-2045-0344	KM63Y	30.0 (1.181)

Shanks for RMP60/OMP60 probes when used in shank switch configuration

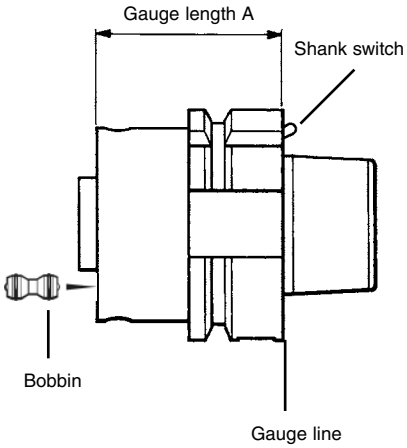
- **Please quote the part number when ordering equipment**
- **Shanks are supplied in a natural finish**
- **Bobbin supplied with shank**
- **Dimensions mm (in)**
- **If you cannot find the shank you require, please contact your local Renishaw office for further details**

Taper shanks



Shank type	Part no.	Taper	Gauge length A
DIN 69871 A	M-4038-0231	30	65.00 (2.559)
	M-4038-0053	40	35.25 (1.388)
	M-4038-0232	50	41.00 (1.614)
BT - 1982	M-4038-0233	30	65.00 (2.559)
	M-4038-0234	40	35.25 (1.388)
	M-4038-0235	50	41.00 (1.614)
ANSI CAT B5.50-1985	M-4038-0236	30	65.00 (2.559)
(Imperial pull stud thread)	M-4038-0237	40	35.25 (1.388)
	M-4038-0238	50	35.25 (1.388)
ANSI CAT B5.50-1985	M-4038-0239	40	35.25 (1.388)
(Metric pull stud thread)	M-4038-0240	50	35.25 (1.388)

HSK shanks



Shank type	Part no.	HSK	Gauge length A
DIN 69893 HSK Form A	A-4038-0070	A40	65.00 (2.559)
	A-4038-0050	A50	62.00 (2.441)
	A-4038-0063	A63	50.00 (1.969)
	A-4038-0241	A80	42.50 (1.673)
	A-4038-0242	A100	45.50 (1.791)
DIN 69893 HSK Form E	M-4038-0243	E40	65.00 (2.559)
	M-4038-0244	E50	62.00 (2.441)
	M-4038-0245	E63	50.00 (1.969)

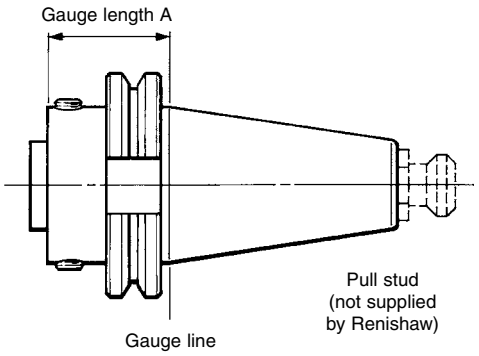
Bobbin for shank switch configuration

Part no.
A-4038-0303

Shanks for OMP40 probes

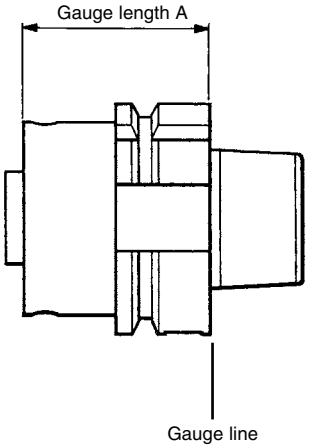
- **Please quote the part number when ordering equipment**
- **Shanks are supplied in a natural finish**
- **Dimensions mm (in)**
- **If you cannot find the shank you require, please contact your local Renishaw office for further details**

Taper shanks



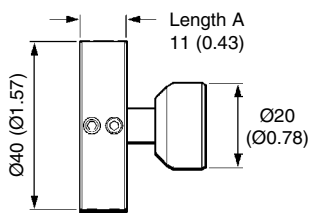
Shank type	Part no.	Taper	Gauge length A
DIN 69871 A	M-4071-0048	30	35.25 (1.388)
	M-4071-0069	40	41.60 (1.638)
	M-4071-0070	50	50.00 (1.969)
BT - 1982	M-4071-0049	30	27 (1.063)
	M-4071-0057	40	32 (1.260)
	M-4071-0071	50	50 (1.696)
ANSI CAT B5.50-1985 (Imperial pull stud thread)	M-4071-0050	30	35.3 (1.39)
	M-4071-0058	40	35.3 (1.39)
	M-4071-0072	50	35.3 (1.39)
ANSI CAT B5.50-1985 (Metric pull stud thread)	M-4071-0073	40	35 (1.378)
	M-4071-0064	50	35 (1.378)

HSK shanks



Shank type	Part no.	HSK	Gauge length A
DIN 69893 HSK Form A	M-4071-0045	A32	35.00 (1.378)
	M-4071-0046	A40	35.25 (1.388)
	M-4071-0047	A50	42.25 (1.663)
	M-4071-0029	A63	42.00 (1.654)
	M-4071-0075	A80	42.00 (1.654)
	M-4071-0076	A100	45.00 (1.772)
DIN 69893 HSK Form C	M-4071-0085	C40	35.25 (1.388)
DIN 69893 HSK Form E	M-4071-0044	E25	21.25 (1.837)
	M-4071-0055	E32	35.00 (1.378)
	M-4071-0054	E40	35.25 (1.388)
	M-4071-0077	E50	42.00 (1.654)
	M-4071-0078	E63	42.00 (1.654)
DIN 69893 HSK Form F	M-4071-0079	F63	42.00 (1.654)
SANDVIK CAPTO	M-4071-0066	C5	45 (1.772)
	M-4071-0067	C6	45 (0.772)
KENNAMETAL KM	M-4071-0065	KM63	30 (1.181)
	M-4071-0074	KM63Y	30 (1.181)

Shanks adapter to fit OMP40 onto MP10 / MP11 / MP12 MP700 type shanks



Part No.	Length A
A-4071-0031	11 mm (0.43)

Accuracy at the point of contact

As industry has developed its requirement for increasingly diverse and complex manufactured parts, inspection systems have had to work hard to keep up. The use of CMMs with probing systems and in-process inspection on machine tools are two of the solutions offered by Renishaw to help you maximise your productivity and maintain the highest possible standards of quality.

Successful gauging depends very much on the ability of the probe's stylus to access a feature and then maintain accuracy at the point of contact. Renishaw has used its expertise in probe and stylus design to develop a comprehensive range of CMM and machine tool styli to offer you the greatest possible precision.

Please refer to the styli and accessories technical specification (document H-1000-3200) for more details.

Stylus types

Renishaw's stylus range covers several different types for different applications:

Ruby ball styli

This is the standard stylus for most inspection applications. A hard, highly spherical tip ensures long life with excellent accuracy.

Ruby balls are available mounted to stems made from a variety of materials including non-magnetic stainless steel, ceramic and a specialised carbon fibre material, Renishaw GF.

Disc styli

These 'thin sections' of a large sphere are used to probe undercuts and grooves.

A simple disc requires datuming on only one diameter (usually a ring gauge), but limits effective probing to only the X and Y directions.

Tool setting styli

Typically fitted with a square tip, tool setting styli can have threaded or plain shaft attachments.

The stylus tip faces are ground to ensure high squareness and parallelism.

Note that the TS27R tool setting probe for machining centres can also be fitted with a tungsten carbide disc stylus.

Stylus accessories

Stylus extensions

Stylus extensions give greater reach and allow access to deep features without risk of damage to the probe.

Crash protection

Renishaw's stylus crash protection devices are designed to break, and protect the probe from damage.

Stylus crank

A crank can allow access to features that are otherwise difficult to reach, and are often used in lathe inspection applications.

Stylus selection tips

Your choice of stylus can have an impact on measurement results. A stylus should be as stiff as possible, so consider the following points:

1. **Use the shortest stylus** that allows access to all the features that you want to probe.
2. **Use the largest ball diameter** that allows the stylus to enter the smallest internal features. This keeps the stem diameter as large as possible.
3. **Minimise the number of joints** in the stylus assembly.

Regular stylus datuming will ensure that you achieve the best measurement accuracy.

Software

Renishaw has developed probing software for all probing applications on a broad range of machine tool controllers. Refer to the data sheets *Probe software for machine tools – program features* (part no. H-2000-2289) and *Probe software for machine tools – program selection list* (part no. H-2000-2298).

Probing packages available

EasyProbe

EasyProbe software for machining centres provides simple and fast job setup and measuring routines, for operators with minimal programming skill.

Inspection software for machining centres

Basic inspection / job setup software with the ability to set work offsets, update tool offsets and print inspection results (where this control option is available). Suitable for use by an operator or part programmer.

Additional software for machining centres

Several packages to enhance and extend the capabilities of the standard inspection software. Includes vector measuring and angle measure, plus a 5-axis option.

Inspection Plus software for machining centres

A totally integrated package of software that includes vector and angle measure options, print options (where this control option is available) and an extended range of cycles. Includes SPC cycle, 1-touch or 2-touch probing option, tool offset compensation by percentage of error and output data stored in an accessible variable stack.

Rotating tool setting software for machining centres

Uses the industry standard TS27R probe, which suits the majority of applications.

Non-contact tool setting software for machining centres

Preferred for applications using delicate tools, and other applications where the probe must not obstruct the machine's working envelope.

For further software information, please refer to Renishaw part numbers H-2000-2289 and H-2000-2298.

	Fanuc 0 - 18 / 10/21/31/32M	Fanuc 0 - 18 / 10/21/31/32T	Mazatrol (Mazak)	Mitsubishi Meldas	Yasnac	Fadal	Okuma OSP/U	Haas	Siemens 800 series	Siemens 840D/810D	Selca	GE2000	Toshiba Tosnuc	Brother 32	Heidenhain	Num	Traub	Hitachi-Seicos	OSAI series 10 / 510i	Mori Seiki	Makino Pro 3 / Pro 5
Machining centres																					
Inspection	●		●	●	●	●	●	●	●		●	●	●		●				●		
Inspection Plus	●		●	●	●		●	●		●			●	●		●		●		●	●
Inspection Plus for MP700	●		●	●	●			●		●								●		●	
Tool setting (contact)	●		●	●	●	●		●	●	●	●	●		●		●					
EasyProbe	●			●	●			●		●											
Tool setting (non-contact)	●		●	●	●	●	●	●		●				●	●			●	●	●	●
Lathes																					
Inspection		●	●	●	●			●	●	●							●	●			
Tool setting		●						●	●	●							●				
3-axis tool setting		●																			
Tool setting (non contact)			●																		

Productivity+ software

Program probing at the same time as toolpath generation

Are you looking to be more competitive? Looking to improve quality whilst reducing costs? Sounds a tall order, but Renishaw has years of experience in doing just this and now, with the release of Productivity+™, the implementation of probing has just been made easier.

The majority of Renishaw's customers use its probes to find and establish the position of parts and to update reference systems (work co-ordinates) within the machine's controller. These cycles are fully automated, including the machine controller updates, eliminating human error and the need for an operator.

Another common use for Renishaw probing is to identify metal conditions prior to finish machining. Roughing cuts are made and probed, with the results being fed back to the machine controller. The machine controller then automatically adjusts the final cutter path in accordance with the findings of the probe.

With the seamless merger of these probing routines into the production process, on-machine confidence and machine efficiency can be greatly increased.

The Productivity+™ family of software helps you do all of this, more quickly and efficiently. The products are PC based and allow the user to create probing routines in the office with the machine still cutting and still being productive.

Productivity+™ Active Editor Pro

Active Editor Pro is Renishaw's latest Productivity+™ solution. It has been created as a stand-alone application which allows users to import Parasolid® solid models that have been output from a CAD system.

Users can easily create probing simply by clicking on the model and following the easy-to-use dialogues. Existing machine programs can be read and probing added, removing the need for cutting and pasting into text editors or on-machine editing. The reduction of manual intervention means less room for mistakes in the program and consequently less time lost looking for errors. Furthermore, the inclusion of collision-detection in the software prevents the probe from making an inappropriate or potentially damaging move during its cycle. It gives the user greater confidence in the output and less requirement for proveout.

Productivity+™ Active Editor

No 3D model? – no problem! Active Editor is a dialogue based application capable of creating probing cycles ready for machine use. Existing machine programs, as with Active Editor Pro, can be read and probing added to remove the need for cutting and pasting into text editors or on-machine editing.

Easy-to-use dialogues with integrated help make writing probing programs easy. High levels of confidence reduce the need for proveout of the post-processed output.

Productivity+™ Active Editor, as with Active Editor Pro, can import existing metal cutting processes and insert Renishaw probing routines for tool setting, tool breakage detection, part set-up, or part inspection through the user-friendly GUI software.

GibbsCAM plug-in

Renishaw's Productivity+™ GibbsCAM® plug-in is the ideal solution for GibbsCAM® users wishing to add probing functionality to their software. Designed to operate within GibbsCAM® Version 6, 7 or 8, the Productivity+™ GibbsCAM® plug-in will enable you to simulate operations on screen and probe with a new level of confidence.

The Productivity+™ GibbsCAM® plug-in brings all the benefits and features of the stand-alone Active Editor Pro package, allowing the user to insert Renishaw probing routines for tool setting, tool breakage detection, part set-up, or part inspection. In addition, by using the familiar GibbsCAM® interface, creating routines is made that much easier. GibbsCAM® plug-in also incorporates the powerful collision detection found in Active Editor Pro.

The probe is treated simply as another tool in the magazine and probing cycles are created alongside metal cutting operations, becoming an integral part of the development process. The beauty of the GibbsCAM®/Productivity+™ relationship is the ability to introduce probing to the program before it is post-processed, eliminating the need to edit the file once on the machine.

Productivity+™ can also encourage or restore good working practice within a manufacturing environment. With probing now an integral part of the CAM process, the need for manual editing of probing cycles is removed.

For GibbsCAM® users, the Productivity+™ GibbsCAM® plug-in is the obvious choice for the easy and swift addition of probing cycles to your metal cutting operations.

A wide variety of machine tool controller types are supported by the Productivity+™ family of software, via Renishaw post processors. New post processors are continually being developed, please ask for more detail.

Renishaw OMV

On-machine verification software for machine tools

What is Renishaw OMV?

Renishaw OMV is a Microsoft Windows™ compatible software package, which allows you to perform verification processes using your machine tool.

With Renishaw OMV, you can:

- Save time and money by verifying the part before moving it from the machine.
- Verify free-form surfaces and geometric features.
- Display captured data on the CAD model.
- Produce clear and detailed graphical reports.

Simple graphical reports and an online results display give you an instant indication of the match of your part to the CAD model, allowing instant Go/No-go decisions. Renishaw OMV also features comprehensive best fit and alignment functions, to minimise the set-up time required when returning parts to the machine after an external process.

Renishaw OMV probing cycles can be produced and simulated in the design office, increasing confidence on the shop floor and reducing prove out time. No direct PC connection is required to run the generated program on the machine tool; the points collected can be read back into the machine using a floppy disk, Ethernet, or RS232.

Renishaw OMV features – three simple steps…

1. Select

Renishaw OMV supports all the major 3D model types, importing into its proven CAD manipulation engine. The model is displayed from any angle and can be viewed in solid, in wireframe, or even transparently. Full support and manipulation of CAD levels allows sections of the model to be hidden when not required.

Selection of geometric features is as easy as clicking on them. The software also gives full control over probing strategies, with automatic or user-defined point positioning. Surface inspection is simple, too – use the mouse to choose points and the probe path is automatically generated using the rules you set.

The entire range of Renishaw machine tool inspection probes is supported in Renishaw OMV, and new styli can be constructed using the supplied database of Renishaw parts. Renishaw recommends the use of the patented OMP400 and MP700 probes, which give accurate, repeatable results every time.

2. Measure

Renishaw OMV uses stored calibration data from Renishaw Inspection Plus probe set-up routines to give the best possible metrology performance. It supports most major machine controllers through its versatile post-processing system.

If you are using a customised system, additional software is included to allow the output to be tailored to your needs.

Renishaw OMV can also transfer data via a serial line, Ethernet, or by floppy disk. When using RS232, instant feedback during point collection indicates whether the part is within acceptable limits by displaying coloured tolerance indicators on the CAD model.

3. Report

Renishaw OMV produces reports in a graphical format, giving you the fastest possible recognition of data and a visual cue to any necessary re-machining. Colour-coded output provides a clear and instant indication of the tolerance level for each point of your part, whilst plotted charts indicate the spread of the measurements.

For more detail, structured numerical reports can be configured to display selected key statistics about the part, derived from the data. The format of the reports can be configured to your needs, lending each report a professional and personalised quality.

With surface data points, Renishaw OMV can perform a best-fit algorithm to determine the maximum deviation within the part. If the part has been newly placed onto the machine tool, chosen features can be used to generate a point-line-plane alignment and the probe path can be exported using that alignment to ensure a perfect fit.

Renishaw OMV

On-machine verification software for machine tools

CAD import

Renishaw OMV supports all the major 3D model types importing into its proven CAD manipulation engine. The model is displayed from any angle and can be viewed in solid, in wireframe, or even transparently. Full support and manipulation of CAD levels allows sections of the model to be hidden when not required.

- AutoCAD
- Cimatron*
- VDA/FS
- IGES
- Parasolids*
- ProE2000i2*
- ProE2001*
- ProE2001i*
- SDRC – Ideas*
- SET
- Solid Edge*
- Solid Works*
- STEP
- WildFire*
- CATIA V5*

Supported machine controllers

Renishaw OMV supports most major machine controllers through its versatile post-processing system. If you are using a customised system, additional software is included to allow the output to be tailored to your needs. If your controller type is not listed, please contact us:

- Acromatic A2100
- Fanuc
- Haas
- Heidenhain i530, 426/430 (controller options and software dependent)
- Hitachi Seiki/Seico 5
- Makino
- Mazak ISO
- Mitsubishi Meldas
- Mori Seiki
- Okuma
- Selca
- Siemens 810D/840D
- Yasnac

Custom design service

Total product service

- Design and manufacturing solutions based on Renishaw's knowledge and experience in product applications worldwide.
- Easy integration of Renishaw's probing products onto your machine.
- Best application of standard and custom products on customers' machines.
- Cost and delivery times minimised as standard parts are used where possible.

A team approach

The Styli and Custom Products Division is based at New Mills, Wotton-under-Edge, Gloucestershire, UK. It comprises a team that encompasses design, engineering, production and marketing, to ensure a comprehensive and efficient service.

Many years of experience in satisfying specific customer requirements exist within the group, which is backed by Renishaw's worldwide experience in probing related technology and applications.

The group works with Renishaw's customer support service, our distributors and ultimately our customer to ensure the most effective solution is found.

Access to Renishaw's custom design service

If your specialised needs cannot be met from the standard range of products, we will be pleased to make recommendations to your regular Renishaw supplier.

To help identify your particular needs, your supplier will assist you in completing a questionnaire. He will need full details of the specific application for which the system will be used, together with any environmental constraints. The make and model of the host machine tool must be specified, as should the required total accuracy of the probing system.

The required timescale is also important. The initial quantity and forecast of future requirements will naturally affect the final price quotation.