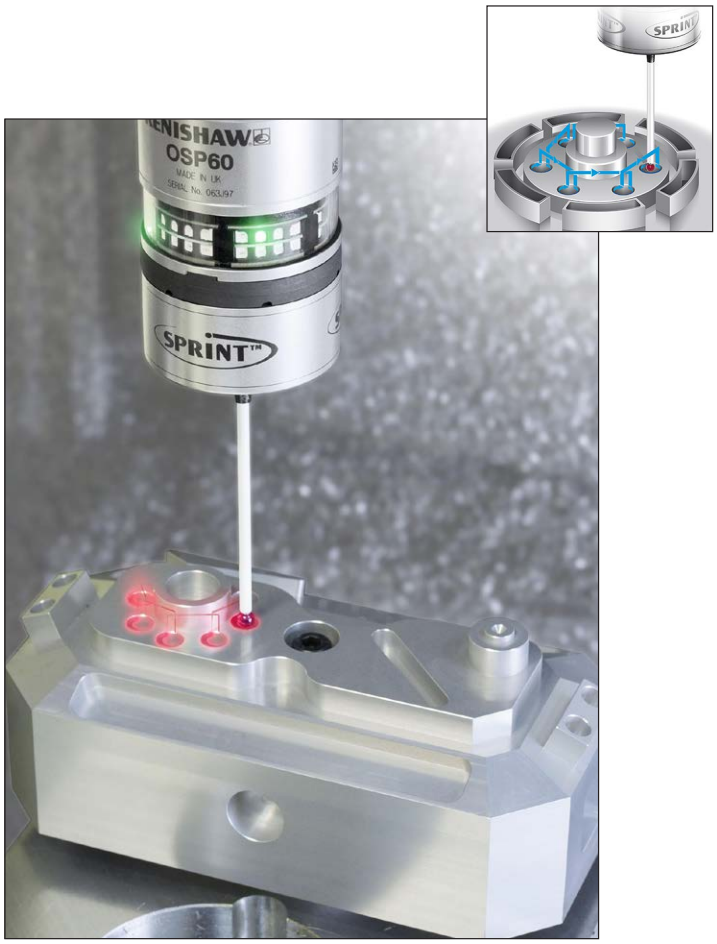
SPRINT™ system with Productivity+™: prismatic applications

Application overview



The SPRINT™ system with Productivity+™ provides a rapid and accurate means of performing workpiece set-up and process control activities by measuring prismatic features; outperforming the capabilities of traditional, touch-trigger probing solutions.

SPRINT scanning technology allows circles, arcs and planes to be measured at high speed. This provides significant cycle time advantages and uniquely accurate definition of tightly curved surfaces when compared with traditional on-machine technologies. Additionally, the system provides significant advantages in adaptive machining processes when compared to off-machine measurement methods; measuring on-machine eliminates manual handling and the myriad of issues associated with the transfer of components and set-ups between measurement devices. For traditional probing tasks, touch-trigger measurement is also supported.

Prismatic inspection programs for the SPRINT system can be generated quickly and easily using Productivity+™ Active Editor Pro, a simple-to-use, PC-based graphical programming tool.

The on-machine Productivity+™ CNC plug-in software provides users with an interactive front end for 'on-the-fly' editing and running of probe routines, using easy-to-understand screens instead of complex NC codes to display the program to the user. On-screen reports and graphical representations of scanned features allow results to be reviewed in real-time.

Measurement results returned can be used for quality assurance purposes, Go/No-go checks, updating machine parameters and for automatic on-machine process control. In addition, the system provides comprehensive geometric data, such as the component's circularity, flatness and straightness.

The CNC plug-in also features enhanced data handling capacity and analytical capability when compared to traditional macro software solutions. This allows fitting routines to provide more accurate results, including true form errors.

Target industries and applications

Industries

Use of the SPRINT system for prismatic measurement provides game-changing capability for companies in all high-value manufacturing sectors, such as medical, automotive, aerospace, mould and die, and power generation.

Applications

Use the prismatic measurement capability of the SPRINT system to accurately scan circles, arcs and planes on known parts for workpiece setting, in-process control and post-process inspection applications.

Inspection results, such as feature dimensions, geometric data, positional offset, angular offset and feature form information can then be recorded, or used to set or update a work co-ordinate system (WCS) or tool offset parameters.

Benefits

The principal benefits of using the SPRINT system for prismatic measurement applications are:

- Significant reductions in part setting and inspection cycle times when compared to traditional touch-trigger probing systems; the system is capable of scanning at speeds as high as 15,000 mm/minute.
- Enabling process control by using measurement results to update machine parameters or as part of logic statements in a downstream cutting process.
- Absolute confidence in measurement results due to the integrated nature of the system, leading to higher accuracy machining processes and part verification capability.

Technology overview

Circles, arcs and planes can all be rapidly and accurately measured using the prismatic measurement capability of the SPRINT system with Productivity+.

Using Productivity+™ Active Editor Pro, the SPRINT system is programmed to scan prismatic features based on solid model geometry, and to use the measurement results obtained to update the process running on the CNC controller. From the simple icon-driven menu, users can integrate process control elements such as part-specific alignment routines, discrete point or scanned measurement, and data output configuration.

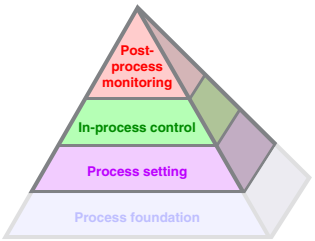
To provide an accurate description of a scanned feature, the on-machine Productivity+™ CNC plug-in software uses unique algorithms to combine probe deflection data with the synchronised true machine position data. This allows the exact location of the stylus tip to be determined, regardless of the machine's path following strategies and acceleration profiles.

To ensure accurate measurement, it is also vital that the probe's stylus tip precisely follows the surface of the feature that is being measured. The OSP60 SPRINT probe has a patented sensor mechanism that has been specifically designed for high-speed scanning. Even on tightly curved surfaces, the sensor responds rapidly to the surface undulations of the part. This allows the probe's stylus tip to maintain continuous contact with the surface of the part, even when scanning at speeds as high as 15,000 mm/minute.

Advanced calculations are made possible through close integration of the Productivity+™ CNC plug-in software with the machine tool controller. Advanced data fitting and analysis algorithms are employed to calculate the measured positions, sizes and forms of prismatic features using the thousands of data points acquired during scanning. The result is a step-change in measurement performance, whilst still providing measured results in a format that can be used by the machine tool controller to perform in-process control applications, such as adjusting cutter length, diameter compensations and updating work co-ordinates.

Productive Process Pyramid™

Process variation is the enemy of competitiveness and profitability. It causes waste and inefficiency, leads to high quality costs and manning levels, and results in late deliveries and poor traceability.



Renishaw's Productive Process Pyramid™ provides a framework within which to identify and control variation in your factory, backed by innovative technology, proven methods and expert support.

The Productive Process Pyramid shows how layers of control can build upon one another to systematically remove variation from the machining process, increasing throughput, maximising conformance and eliminating human error.

Using the SPRINT system for prismatic measurement applications addresses issues relating to the top three layers of the Productive Process Pyramid.

- Within the **informative layer**, measure prismatic features for process monitoring purposes. Data can be logged and analysed to obtain information about process capability.
- Within the **active layer**, on-machine measurement can be used for in-process control activities where cut-measure-cut routines actively adjust set-up and tooling parameters.
- Within the **predictive layer**, measurement results can be used for workpiece set-up and work co-ordinate system update tasks.

Requirements and compatibility

Requirements

To use the SPRINT system for prismatic measurement you need:

- A SPRINT system hardware installation (OSP60 SPRINT probe, OSI-S SPRINT system interface, OMM-S SPRINT system receiver) on the CNC machine tool.
- Productivity+™ CNC plug-in and Productivity+™ CNC plug-in: SPRINT™ option (on-machine software).
- Productivity+™ Active Editor Pro and Productivity+™ Active Editor Pro: SPRINT™ option (PC-based software).

Optional:

- An external data processor (DPU-2): dependent on controller type.

Compatibility

The SPRINT system is compatible with 3-axis machining centres and 5-axis milling machines fitted with a compatible controller.

For more information, see the Productivity+™ CNC plug-in data sheet (Renishaw part number H-5465-8200).

Certain controller options are also required in order to use the SPRINT system. For more information on these options, refer to the range of SPRINT system controller requirements documents available from Renishaw at **www.renishaw.com/sprint**.

A range of industry focused application toolkits have been developed by Renishaw for use with the SPRINT system. For more information on these applications, see **www.renishaw.com/sprint**.

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- Encoder systems for high-accuracy linear, angle and rotary position feedback
- Fixturing for CMMs (co-ordinate measuring machines) and gauging systems
- Gauging systems for comparative measurement of machined parts
- High-speed laser measurement and surveying systems for use in extreme environments
- Laser and ballbar systems for performance measurement and calibration of machines
- Medical devices for neurosurgical applications
- Probe systems and software for job set-up, tool setting and inspection on CNC machine tools
- Raman spectroscopy systems for non-destructive material analysis
- Sensor systems and software for measurement on CMMs
- Styli for CMM and machine tool probe applications

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