

SPRINT™: Freeform Surface Toolkit

Toolkit overview

The SPRINT™ Freeform Surface Toolkit offers a unique solution for end users requiring fast and accurate measurement of free-form and complex 3D surfaces. The data provided by the Toolkit can be used in high-precision adaptive machining applications, advanced part set-up and in the production of mating components.

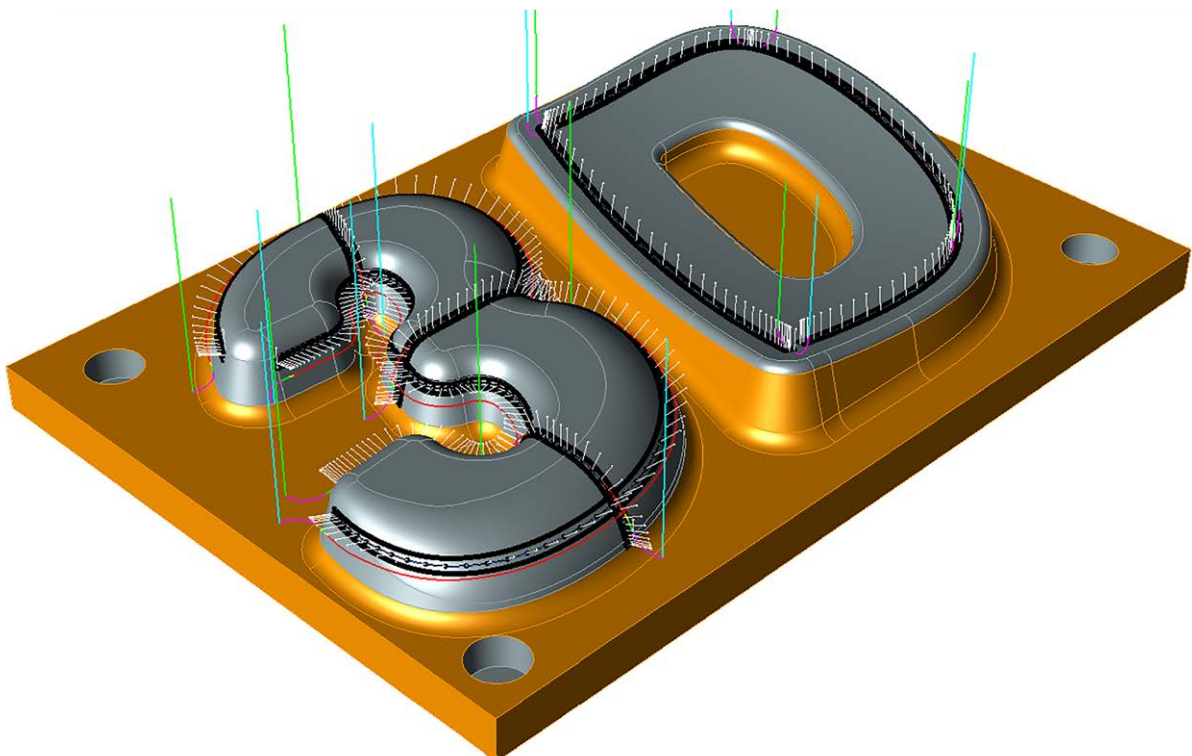
Collecting absolute XYZ surface data at 1,000 points per second from free-form surfaces, the Toolkit provides significant cycle time advantages and a uniquely accurate definition of complex 3D surfaces. Output of absolute – rather than comparative – data provides real feature measurement and true form when compared to a nominal surface.

In conjunction with the Productivity+™ CNC plug-in, measurements can be written to CNC variables, and results then used to control on-machine processes. Results can also be written to a file, providing the flexibility to analyse the data further, use the data for quality assurance purposes, or to control a downstream process.

The SPRINT Freeform Surface Toolkit can also be used as a drop-in replacement for an existing touch-trigger process. Equivalent data can be produced – meaning that the time required to integrate the system into existing or new processes is minimised – with the additional benefit of increases in speed and accuracy as delivered by the 1,000 3D data points per second that are measured by the OSP60 SPRINT probe.

The Freeform Surface Toolkit consists of two elements:

- An on-machine executable and analysis application: 'SPRINT Freeform Surface: On-machine'. This application is typically installed on an external data processor connected to the CNC machine tool and is responsible for data processing activities and returning measurement results to NC variables or a user defined file location.
- A PC-based, graphical programming element: 'SPRINT Freeform Surface: Editor'. This application, installed as an add-on to Productivity+™ Active Editor Pro, allows surface measurement programs to be generated quickly and easily.



Target industries and applications

Industries

The SPRINT Freeform Surface Toolkit provides rapid, accurate measurement performance and capability in high-precision manufacturing applications across all industries that produce components with complex 3D surfaces.

Applications

The technology provided by the Toolkit is particularly suitable for the collection of data for adaptive machining processes or quality assurance purposes, advanced part set-up, and the production of mating free-form components.

Benefits

The principal benefits of the SPRINT Freeform Surface Toolkit are:

- Capability to accurately measure complex 3D surfaces, including those with double curvature.
- Obtaining absolute XYZ surface position data from free-form surfaces at 1,000 points per second.
- Significant cycle time advantages in comparison with traditional touch-trigger systems.
- Availability as a drop-in replacement for existing touch-trigger machine tool probe systems.
- The range of operational benefits provided by closed loop process control.

Technology overview

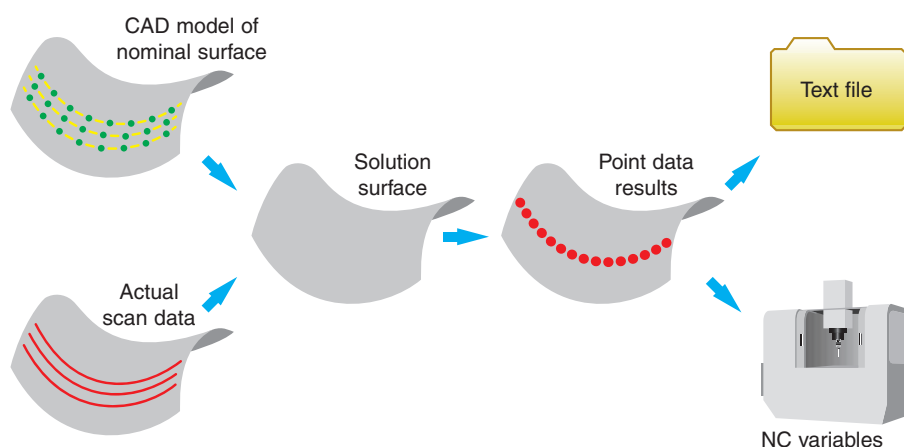
Freeform Surface cycles are designed for scanning complex 3D surfaces, including those with single and double curvature.

Using a CAD model and the SPRINT Freeform Surface: Editor add-on to Productivity+ Active Editor Pro, scan paths across the component surface are programmed, and a nominal surface is generated.

Analysis and processing of tip-centre data captured by the OSP60 SPRINT probe along these defined scan paths is used to create an accurate mathematical model of the component surface – known as the 'solution surface'. Definition of this surface can be adjusted to control the level of filtering that is applied, allowing the user to include or ignore local defects of a given size.

During programming, the user defines how measurement results – data points across the solution surface – are output. This flexibility makes it simple for the scanning process to replace an existing touch-trigger process, outputting sampled data as simulated touch-trigger points that can be passed to downstream processes. Compared with even the most accurate touch-trigger probes, each sampled point benefits from the greater accuracy that results from the high volume of scanning data combined with state-of-the-art scanning technology.

Data points returned by the scanning process contain information including the actual surface normal, deviation from nominal, the original nominal position and nominal surface normal. Depending on subsequent requirements, these results can be output to machine variables or a user defined file location.



Productive Process Pyramid™

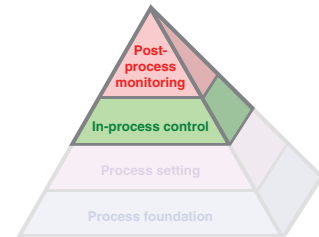
Process variation is the enemy of competitiveness and profitability. It causes waste and inefficiency, leads to high quality costs and manning levels, and results in late deliveries and poor traceability.

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.

The SPRINT Freeform Surface Toolkit addresses issues relating to the top two layers of the Productive Process Pyramid.

- Within the **informative layer**, the Freeform Surface Toolkit can be used to log data and build information about process capability for process monitoring purposes.
- Within the **active layer**, the Freeform Surface Toolkit can be used to measure 3D surfaces for on-machine gauging – providing an in-process control for active adjustment of set-up and tooling parameters – and for adaptive machining purposes.



Requirements and compatibility

Requirements

To use the SPRINT Freeform Surface Toolkit 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, Productivity+™ CNC plug-in: SPRINT™ option and SPRINT Freeform Surface: On-machine (on-machine software).
- Productivity+™ Active Editor Pro, Productivity+™ Active Editor Pro: SPRINT™ option and SPRINT Freeform Surface: Editor (PC-based software).

Optional:

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

Compatibility

The SPRINT Freeform Surface Toolkit is compatible with 5-axis milling machines fitted with a compatible controller.

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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Products include:

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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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