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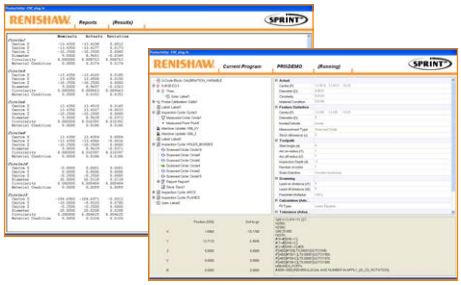
Productivity+™ CNC plug-in

The Productivity+™ CNC plug-in is a unique software application for CNC machine tools, offering unparalleled opportunities for workpiece measurement, inspection and on-machine process control.

Providing significantly enhanced data handling capacity and analytical capability in comparison with traditional software offerings, the application is a core component of the Productivity+™ Scanning Suite.

OSP60 probe support



On-machine results display and program editing

Superior analytical capability

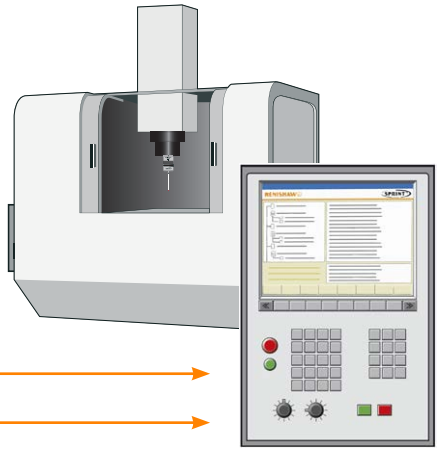
CNC plug-in fundamentals

The Productivity+ CNC plug-in is installed directly onto a PC-based CNC machine tool controller (or onto a connected PC) providing a real-time link between the CNC machine tool and the software. This allows true process control to take place utilising measurements and analytical processes which would previously have been impossible to perform within a CNC machining process.

The CNC plug-in is one of the core components of the Productivity+ Scanning Suite, and it is a combination of new hardware and software technologies that opens up the potential for a wide range of applications that must be performed in-cycle, but require a high density of accurate data. For example, adaptive machining, high-speed process control and job set-up where advanced fitting is required.

***Scanning data processing**: the CNC plug-in is a core component of the Productivity+ Scanning Suite. It manages the system in both scanning and discrete-point modes, whilst also providing the operator with probe feedback including calibration status, temperature and in-process information derived from measurement results.*

OSP60 probe *

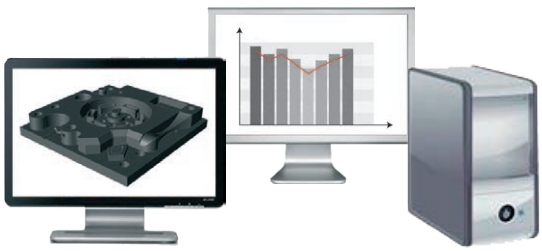


CNC with Productivity+ CNC plug-in

***Unobtrusive operation**: once installed, the CNC plug-in resides and operates silently in the background. The operator simply selects the CNC program as usual and the software automatically identifies that CNC plug-in processing is needed. The program then runs with no requirement for operator intervention.*

Program using Productivity+™ Active Editor Pro

***Data flexibility**: the CNC plug-in features an on-CNC editing package for shop-floor program creation and editing. Programs can also be authored in a stand-alone editor, or in the CAM environment using a Productivity+ enabled system.*



Share data with CAD/CAM systems and export results to data analysis packages

***Extensive compatibility**: the application provides full support for calling external applications as part of the CNC machining process. For example, automatic transfer of measurement data to a CAM system allows a new adaptive toolpath to be automatically generated, uploaded and activated on the CNC machine tool, with no requirement for operator intervention. For large processing tasks, the system also allows data to be processed whilst another activity is being performed – so on-machine time is never wasted.*

* The CNC plug-in is also compatible with the full range of Renishaw touch-trigger probes

Software overview

Program generation and execution

Measurement and inspection routines can be generated directly within the CNC plug-in using the built-in editor tool. Alternatively, users may prefer to utilise the off-line programming capability provided by Productivity+ Active Editor Pro, taking advantage of the solid model import capability and 'point-and-click' programming functionality it provides.

Whichever method is adopted, users have the ability to program a wide range of geometric and scanned surface features, add in-cycle logic functions for intelligent decision making, perform automated machine and tool updates, and embed custom code and calculations.

Running a CNC plug-in program initiates a live, on-screen display of returned measurement data and a visual indication of progress through the overall inspection program. Additional screens allow users to review any errors and warnings encountered and – for programs containing report elements – a basic tabular view of measurement and inspection results.

Current Program

The Current Program screen forms the 'home page' of the CNC plug-in application. When a CNC plug-in program is selected from the program directory, it is automatically loaded to, and visible within, this screen.

The screen comprises four sections:

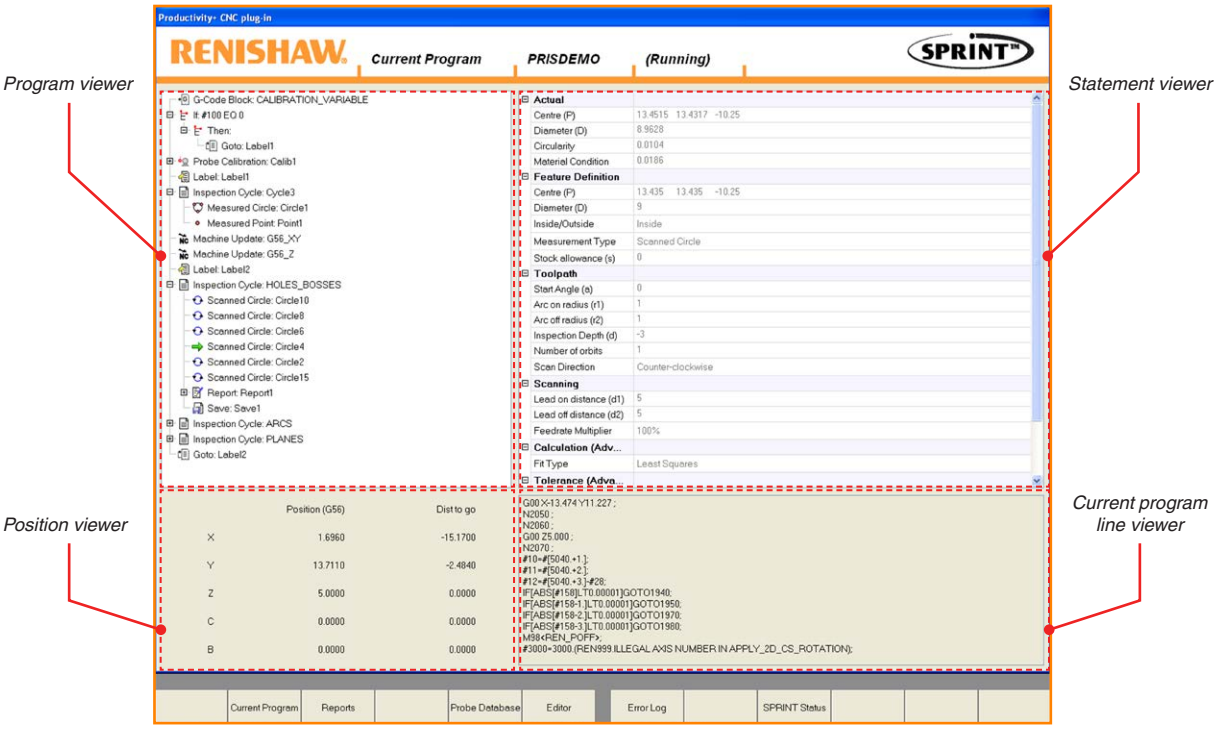
- **Program viewer**: displays the currently loaded program as a series of elements in an expandable tree structure, defining the order of measurement, process logic and reporting. As the program is run, this section highlights the currently executing element, providing a continual, visual indication of progress through the overall program.

  Users can select an element from the program tree to display the individual property fields, and once inspected, actual measurement data for that element is available for review in the Statement viewer.

- **Statement viewer**: displays the properties of the selected element. Depending on element type, these can include X, Y, Z co-ordinate data, toolpath information (such as type and retract height), scanning properties (when using an OSP60 probe), tolerance and update type.

- **Position viewer**: provides a continually updating view of the current X, Y, Z machine position (plus rotary position information where applicable) and the 'distance to go' for the current inspection move.

- **Current program line viewer**: displays the currently executing section of the program's G-code.



Current Program screen

Reports

Where programs contain report elements, users can navigate to the Reports screen and view results data in a simple tabular format.

The soft key menu on this screen provides options to:

- **Show summary**: a basic list indicating the number of features (and their names) that are out of tolerance.
- **Print report**: produce a hard copy (where machine configuration allows) of the report data via a local or networked printer.
- **Clear report**: clear all currently displayed report information.
- **Save report**: save report data in a comma separated (.csv) or text-based format.

Settings

This screen allows configuration of the CNC plug-in options including report layout, OSP60 probe settings, and top-level system settings such as language, colours, file locations and font type.

Probe Database

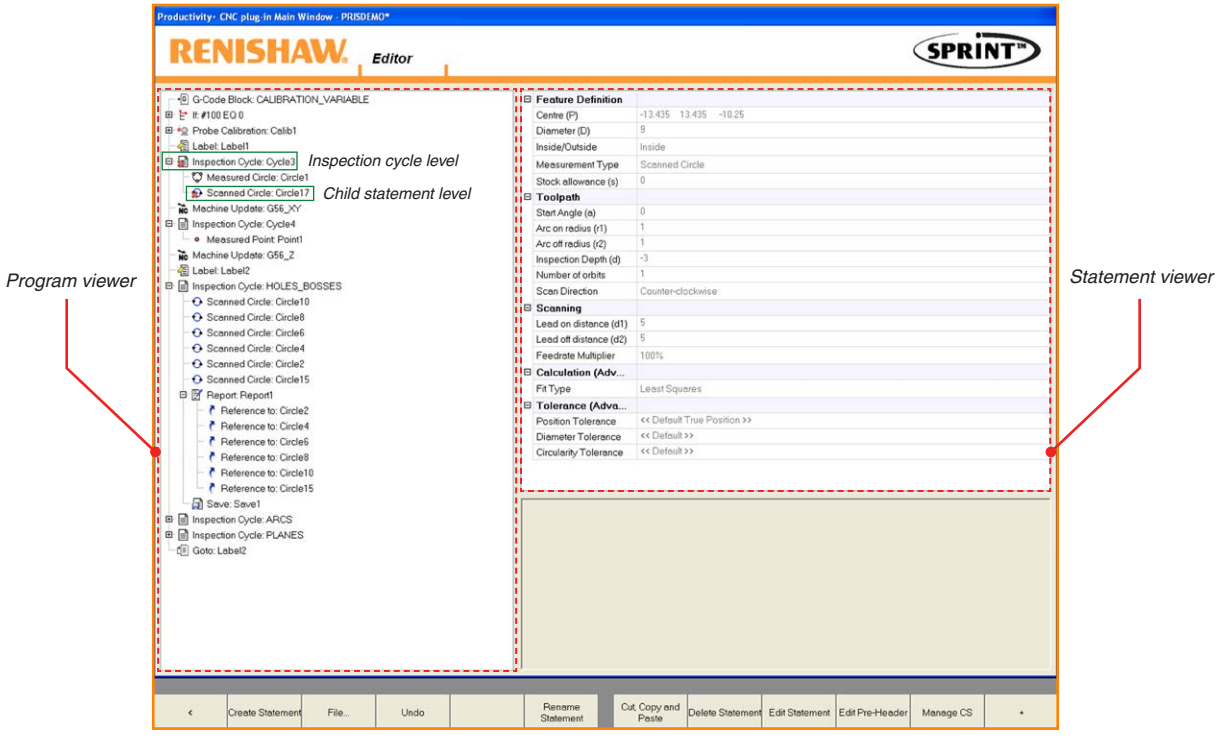
The Probe Database screen provides details of inspection probe hardware available for use with the Productivity+ CNC plug-in. Standard Renishaw touch-trigger probes and OSP60 scanning probes can be selected directly, and custom probe configurations can be generated by selecting from available probe modules, extensions, stylus length and ball diameter options.

This screen also provides users of Productivity+ Active Editor Pro with the option to import an existing probe database.

Editor

This screen provides users with on-machine access to the tools required for creating and editing Productivity+ CNC plug-in programs.

Program elements are displayed in a tree structure in the Program viewer window, allowing branches to be expanded and edited as required. Tool tips and a dialog-based programming structure incorporating feature related graphics simplify program generation. Any errors that the system detects during programming are indicated visually at the inspection cycle and child statement level.



Editor screen

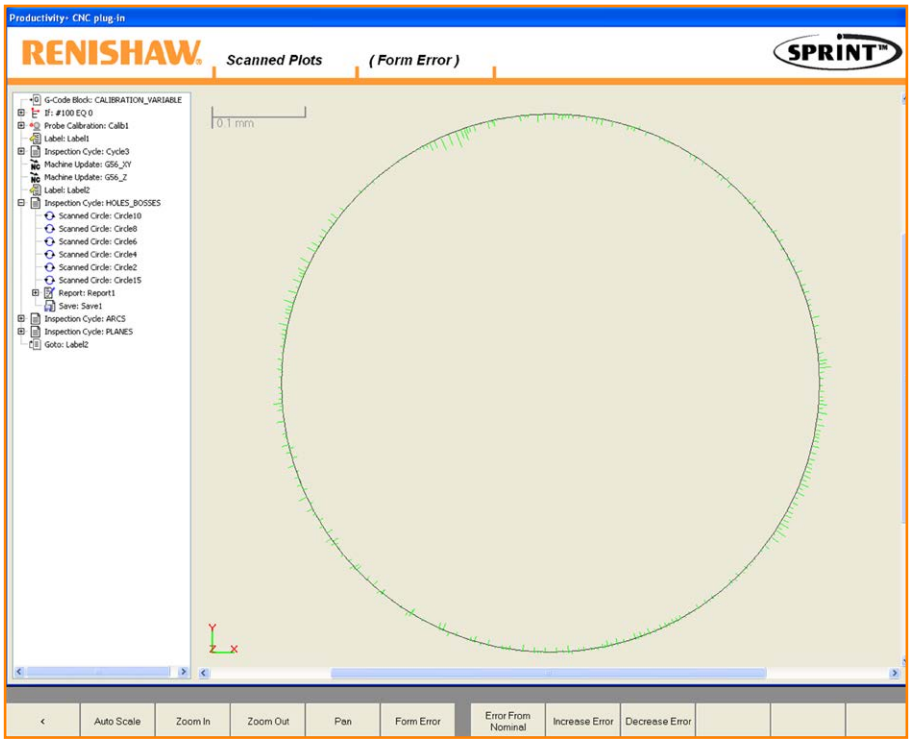
Error Log

Any errors that are encountered during program execution are listed and available to view on this screen.

The soft-key menu provides options to clear the error log, save it in a text-based format, and – subject to machine configuration – print a hard copy.

Scanned Plots (scanned statements only)

This screen provides a graphical view of measurement results data obtained from an executed program, and can assist in the detection of potential surface defect positions. Essentially this screen provides a visual 'plot' of surface form.



Scanned Plots screen

SPRINT Status

Where an OSP60 probe is loaded to the machine spindle and switched on, this screen provides current status information about the probe.

Information given includes probe name, current temperature, calibration status and a low battery indication, as well as machine position (from current work co-ordinate system) and probe deflection data.

Software capability: measurement functionality

Feature	Measured statement	Scanned statement (OSP60 applications only)	Constructed statement	Machine updates					Reporting (save / print report)
				WCS	Tool length	Tool diameter	Machine variable	Rotation	
Point	✓		✓	✓	✓	✓	✓		✓
Circle	✓	✓	✓	✓		✓	✓		✓
Line	✓		✓	✓	✓	✓	✓	✓	✓
Plane	✓	✓	✓	✓	✓	✓	✓	✓	✓
2D corner	✓			✓		✓	✓	✓	✓
3D corner	✓			✓	✓	✓	✓		✓
Pocket	✓			✓		✓	✓	✓	✓

Miscellaneous features:
Inspection cycle, Calibrate probe, G-code block, Custom Macro, Control statements (If, Then, Else If, Goto, Label)

Specifications, compatibility and options

CNC specification

The Productivity+ CNC plug-in requires a PC-based CNC with Microsoft Windows 7 (or later) operating system.

Alternatively, the application can be loaded to a remote PC (with Microsoft Windows 7 (or later) operating system), which is linked to the CNC.

Where CNC configuration allows, use of a mouse and keyboard will help to simplify programming, data entry and navigation through the application.

Compatibility

The Productivity+ CNC plug-in is compatible with the full range of Renishaw touch-trigger workpiece inspection probes and the OSP60 scanning probe.

For touch-trigger applications, Renishaw recommends the use of non-lobing probes such as the OMP400 and RMP600 for the best metrology performance. Use of touch-trigger probes that do not contain strain gauge technology will result in decreased performance.

Renishaw does not support the use of non-Renishaw probes with the Productivity+ CNC plug-in.

The Productivity+ CNC plug-in is currently compatible with Siemens 840D, Fanuc Series 3x*i*, Mazak (Matrix 2 and SmoothX) and Okuma OSP-P300 controllers. Please contact your local Renishaw representative for the latest compatibility developments.

Options

Although it is possible to program a complete measurement and inspection routine – including probe calibration – within the CNC plug-in, users may prefer to take advantage of the speed and flexibility provided by off-machine programming, and use an installation of Productivity+ Active Editor Pro. Using this PC-based application, programs can be generated directly from the component solid model within an intuitive, icon driven, 'point-and-click' programming environment.

This programming method provides the additional benefit of program visualisation, allowing on-screen simulation and 'prove out' of generated program files before they are exported to, and executed on, the machine tool.

A number of options exist to maximise the programming capability offered by Productivity+ Active Editor Pro:

- The *Productivity+ Active Editor Pro: CNC plug-in option* enables users to generate CNC plug-in programs utilising Renishaw touch-trigger probes.
- The *Productivity+ Active Editor Pro: SPRINT option* enables users to generate CNC plug-in programs utilising Renishaw touch-trigger probes and the OSP60 scanning probe.*

* This option also exists for the machine resident Productivity+ CNC plug-in application

Part numbers – Productivity+ software suite

Part number	Description
Software kits: Productivity+™ CNC plug-in and Productivity+™ CNC plug-in SPRINT™ option	
A-4007-1800	Productivity+ CNC plug-in SPRINT™ kit (Siemens 840D) comprises A-4007-1700 Productivity+ CNC plug-in (Siemens 840D) and A-4007-4600 Productivity+ CNC plug-in SPRINT option
A-4007-1810	Productivity+ CNC plug-in SPRINT™ kit (Fanuc 3x*i*) comprises A-4007-1710 Productivity+ CNC plug-in (Fanuc 3x*i*) and A-4007-4600 Productivity+ CNC plug-in SPRINT option
A-4007-1820	Productivity+ CNC plug-in SPRINT™ kit (Mori Seiki MAPPS with Fanuc Series 31*i*) comprises A-4007-1720 Productivity+ CNC plug-in (Mori Seiki MAPPS with Fanuc Series 31*i*) and A-4007-4600 Productivity+ CNC plug-in SPRINT option
A-4007-1830	Productivity+ CNC plug-in SPRINT™ kit (Mazak) comprises A-4007-1730 Productivity+ CNC plug-in (Mazak) and A-4007-4600 Productivity+ CNC plug-in SPRINT option
A-4007-1840	Productivity+ CNC plug-in SPRINT™ kit (Okuma) comprises A-4007-1740 Productivity+ CNC plug-in (Okuma) and A-4007-4600 Productivity+ CNC plug-in SPRINT option
Software: Productivity+™ Active Editor Pro and options	
A-4007-1400	Productivity+ Active Editor Pro
A-5226-2010	Productivity+ Active Editor Pro: SPRINT option
A-5226-2020	Productivity+ Active Editor Pro: CNC plug-in option
CAD importers (for use with Productivity+ Active Editor Pro)	
A-5226-0007	Creo Elements/Pro (Pro/ENGINEER) CAD importer
A-5226-0008	CATIA CAD importer
A-5226-0009	NX (Unigraphics) CAD importer
A-5226-0010	ACIS CAD importer
A-5226-0011	SolidWorks CAD importer
A-5226-0012	AutoDesk Inventor CAD importer
A-5226-0020	3 or more CAD importers

Consultancy

The Productivity+ CNC plug-in enables a wide range of measurement and process control solutions which have never before been possible. Working in conjunction with manufacturing organisations in key target industries, Renishaw has developed a series of software toolkits for data processing, each focused on a specific industrial application. In addition to the out-of-the-box functionality provided by these toolkits, Renishaw can, in some cases, provide programming and support capability for on-machine, contact scanning applications.

Focusing on measurement integrity and process robustness, we deliver systems that optimise manufacturing process efficiency and effectiveness. For further details, contact your local Renishaw representative about customised on-machine, contact scanning solutions.

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About Renishaw

Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Products include:

- Additive manufacturing and vacuum casting technologies for design, prototyping, and production applications
- Dental CAD/CAM scanning systems and supply of dental structures
- 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

For worldwide contact details, visit www.renishaw.com/contact

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