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Cyclone - the complete scanning system for reverse manufacturing

Automated unmanned scanning with easy-to-use software

Scanned data manipulation and output for CAD/CAM systems

Comprehensive CAM software to produce CNC part programs

Cyclone stand-alone scanning machine...

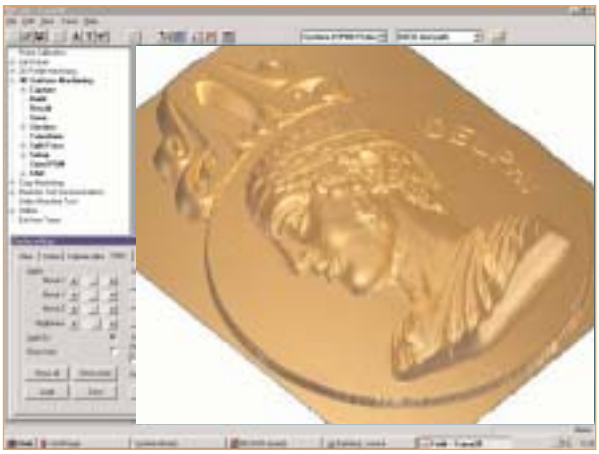
Cyclone is a purpose built machine for high speed data acquisition, used in conjunction with Renishaw's Tracecut digitising software for reverse manufacturing.

The machine can operate in a normal office/workshop environment for fast, unmanned scanning of unknown surfaces. It is of light weight construction, so very fast scanning speeds can be achieved.

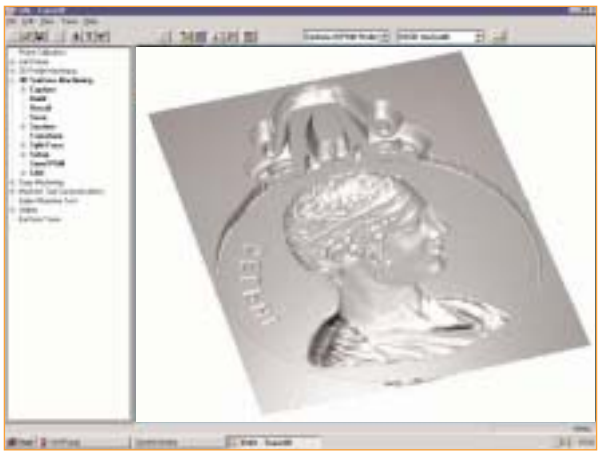
Cyclone stand-alone scanning machine

Tracecut - capture, manipulation, output to CNC program or CAD

- The heart of all Renishaw's scanning systems is Tracecut software - it controls data capture, enables you to manipulate data, then create a CNC program or CAD output.
- Tracecut offers a complete CAM package, with a variety of powerful machining strategies to create gouge proof machining programmes for any CNC machine tool.
- CAD outputs include:
  - IGES points/STL binary
  - ASCII data
  - DXF polyline
  - VDA points
  - IGES surfaces
- System specific outputs also available for leading CAD/CAM suppliers.



Tracecut data capture



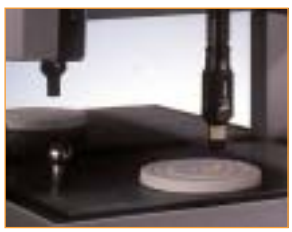
Tracecut data manipulation

Contact or non-contact sensor?

Contact scanning probe

For most applications, the highest accuracy and quality of surface finish are obtained using contact sensors, which have several fundamental advantages over the majority of available non-contact systems:

- Treatment of surfaces to prevent reflections is not required.
- Vertical faces can be accurately scanned.
- Data density is not fixed, and is automatically controlled by the shape of the component.
- Time-consuming manual editing of data to remove stray points is not required.



Non-contact laser scanning probe

When very soft or fragile materials are to be scanned, Renishaw offers an advanced non-contact laser system.

Unlike other non-contact systems, it automatically controls data density and eliminates stray data points.

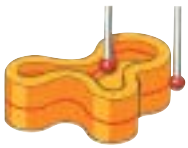
...from original to finished product

Stage 1 - Data Capture

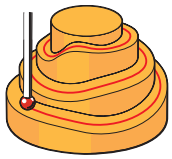
Cyclone and Tracecut offer various methods of data capture -

Single 2D profile

Multiple 2D profiles (various Z heights)

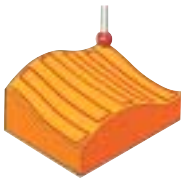


Multiple 2D profiles (single Z height)

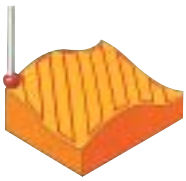


Capture of profiles with variable Z

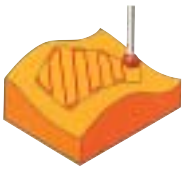
X



Y



Any angle



When scanning in x,y or angular a polygonal boundary may be defined

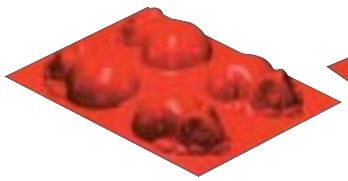
Radial

Pencil mode (on Cyclone)

Stage 2 - Data Manipulation

Tracecut can be used to easily manipulate the captured data for multiple practical applications -

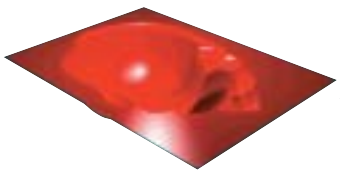
Original



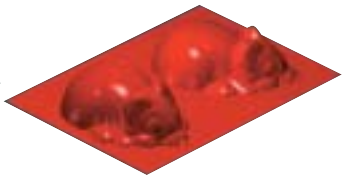
Combine models to create multi-impression tools, including mirroring in X and Y axis

Scale XYZ

Triple zone scaling



Male/female



Rotate

Merge two or more models

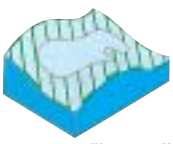
Generate split face

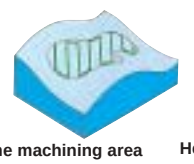
Stage 3 - Machining of finished product

Different machining paths can be chosen to suit each individual job -

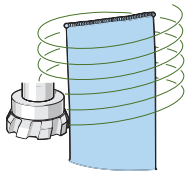
Concentric

Radial

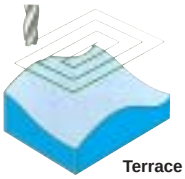




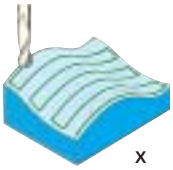
2D Profiles can limit the machining area



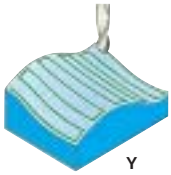
Helical machining (turbine blade module only)



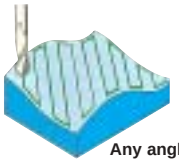
Terrace



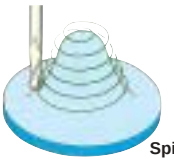
X



Y



Any angle



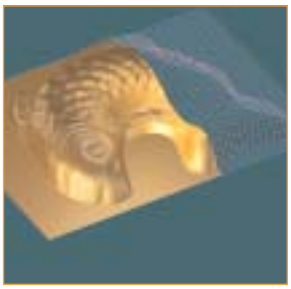
Spiral

...the whole scanning process in one complete system

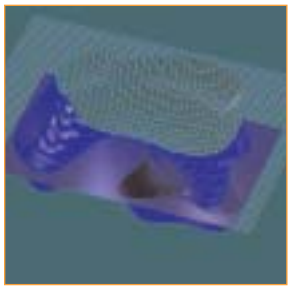
Scanning is the process of gathering data from an undefined 3-dimensional surface, where there is a need to reproduce a complex, freeform shape.

- An analogue contact or non-contact probe moves across the unknown surface, after the area and orientation in which to scan has been defined by the user.
- As the probe follows the surface, the system records information in the form of numerical position data.
- This data can be manipulated and used to create a CNC programme to machine a replica or geometric variant of the shape.
- Alternatively, the data can be exported in various formats to a CAD/CAM system for further processing.

Original



Stage 1 - data capture



Stage 2 - manipulation

Stage 3 - machining

Advantages of stand alone scanning systems

- Dedicated off line scanning leaves machine tools free to cut metal.
- High speed scanning reduces lead times from pattern to finished item/tool.
- Very low probing forces allow scanning of delicate materials.
- Ability to use extremely small styli allows the scanning of very fine detail.
- Magnetic break away of stylus provides crash protection for workpiece/stylus.
- Availability of a non-contact laser probe (Cyclone series 2) for medical or delicate parts.
- Quiet and clean in operation - allows installation in an office-like environment.

Real world scanning solutions for every industry

Scanning applications include

- automotive dies
- plastic mouldings
- forgings
- spectacle lenses
- hearing aids
- teeth
- jewellery
- watches
- coins and medals
- bottles
- heart pacemakers
- hip replacements
- prosthetic limbs
- footwear

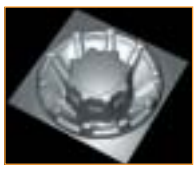
Scanning of a shoe last

Shoe last (top)

Shoe last (bottom)

Automatic split line generation from existing 2D profile

Brake backplate for car



Wheel hub

Glass paperweight

Polish medal

Badge

Plastic face for model display

Chocolate mould

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Specifications and accessories

Machine specification

Axis travel	600 mm x 500 mm x 400 mm nominal
Maximum workpiece weight	200 kg
Repeatability	5 µm
Axis resolution	1 µm
Scanning speed	Up to 3 metres per minute
Scanning rate	400 points per second
Probe rate	1.2 N/mm nominal
Crash protection	Detachable magnetic stylus holder
Weight	162 kg
Table	Composite granite tile with grid of M8 holes
Operating temperature	+10° C to +38° C
Storage temperature	-10° C to +50° C
Humidity operating range	20 to 80%

Machine supply requirements

Electrical power supply	90-265 V ac, 47-60 Hz
Air supply	5.5 to 10 bar (80 to 145 psi)
Power consumption	80 watts
Air consumption	40 litres per minute
Noise	52 dB at 1.6 metres from floor and 1 metre from the front of the machine

Cyclone accessories

Enable increased machine flexibility and scanning of larger, more complicated components

- **Table riser**
  This fabricated assembly is used to extend the Z-range by 280 mm whilst retaining the 400 mm stroke.

- **Long bed**
  Allows the user to scan larger components on the standard size machine. Max load weight of two tonnes.

- **Indexer (automatic)**
  Incorporates the use of the RX10 rotary table to enable automatic rotation of the workpiece.

- **Clamping kit**
  Allows the user to clamp pieces easily on the bed of the machine.

- **Stylus kit**
  This boxed kit contains several types and variations of scanning styli for use on Cyclone.

- **Anti-vibration kit**
  Consists of 4 feet which will eliminate vibration throughout the machine structure, giving more accurate results.

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Renishaw applies innovation to provide solutions to your problems

Renishaw is an established world leader in metrology, providing high performance, cost-effective solutions for measurement and increased productivity. A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Renishaw designs, develops and manufactures products which conform to ISO 9001 standards.

Renishaw provides innovative solutions using the following products:

- **Probe systems for inspection on CMMs (co-ordinate measuring machines).**
- **Systems for job set-up, tool setting and inspection on machine tools.**
- **Scanning and digitising systems.**
- **Laser and automated ballbar systems for performance measurement and calibration of machines.**
- **Encoder systems for high accuracy position feedback.**
- **Spectroscopy systems for non-destructive material analysis in laboratory and process environments.**
- **Styli for inspection and tool setting probes.**
- **Customised solutions for your applications.**

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