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A Renishaw solution approach to AM part quality

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Software Manager
Renishaw PLC

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About Renishaw

World leading metrology & engineering company

A FTSE 250 company with headquarters in United Kingdom

Advancing operational performance

Transforming manufacturing efficiencies and raising product quality

Maximising research capabilities

Improving medical procedures and patient outcomes

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Global overview

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“Additive is not an island”

The key to Renishaw’s approach is to provide not only the equipment needed to build AM parts, but the end to end system required to provide a validated solution to users at each stage of manufacturing.

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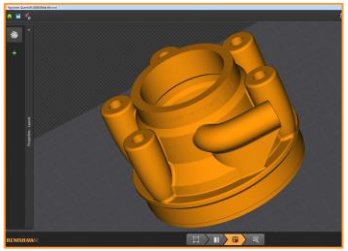
The solution approach

Software



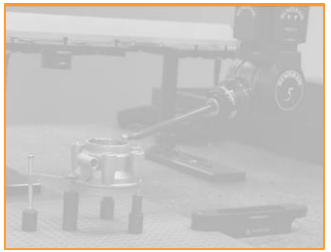
QuantAM

AM build

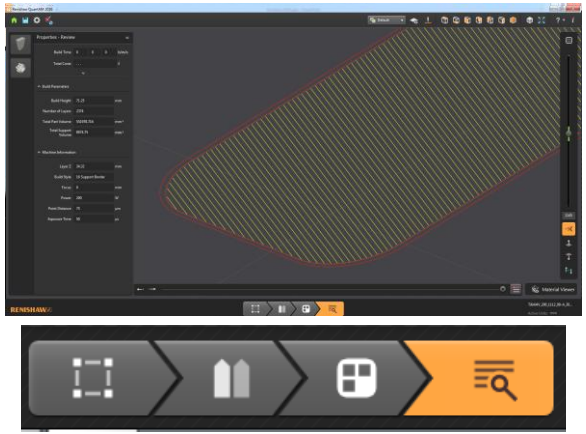
Gauging

Machining

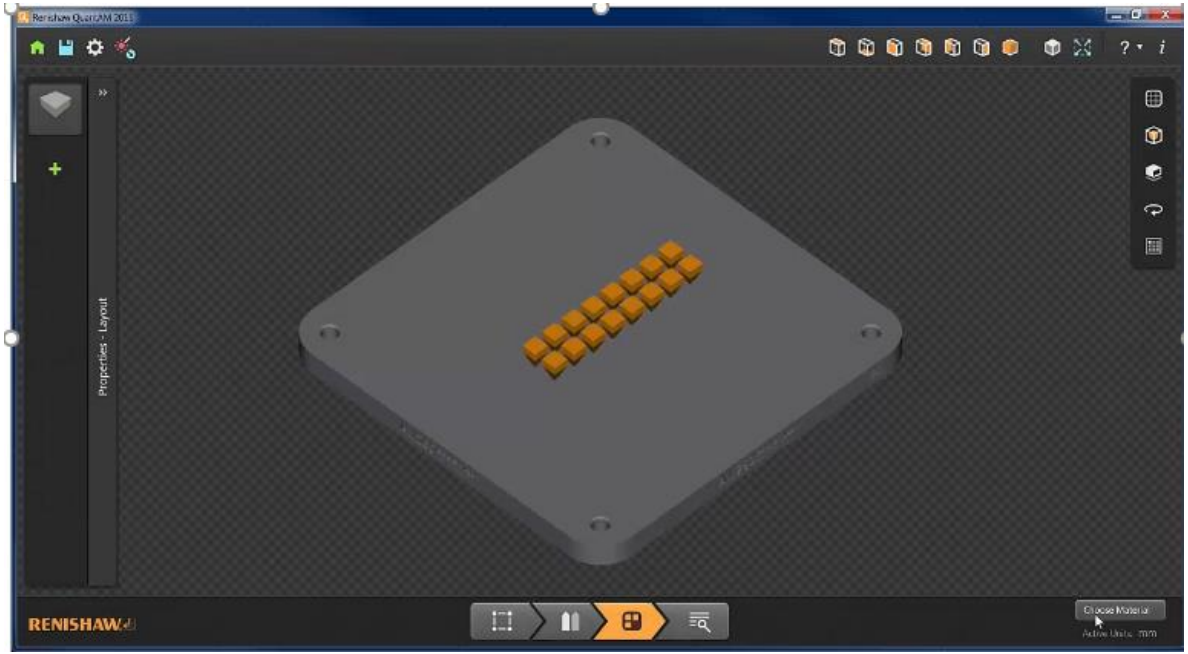
Inspection



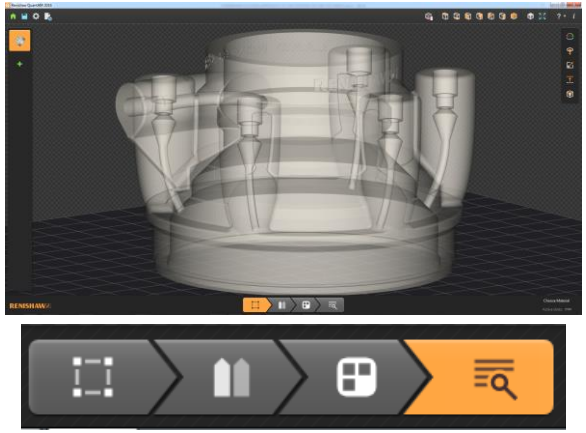
QuantAM – Open Access Platform



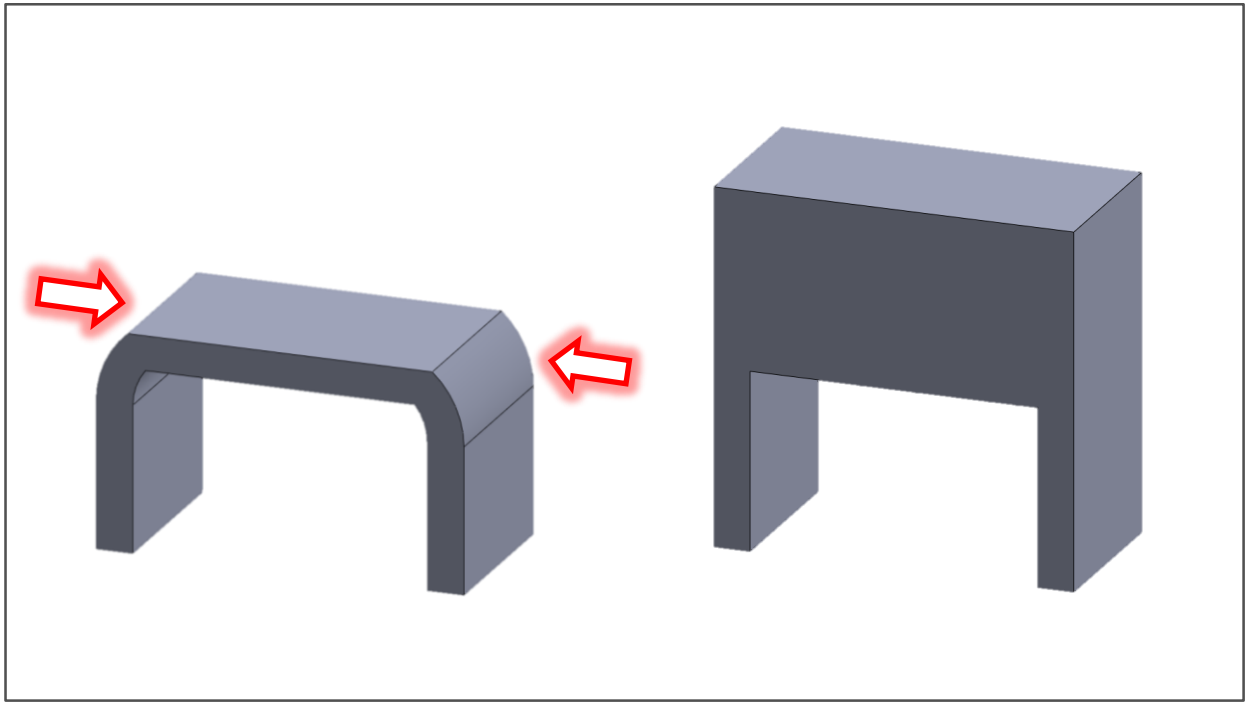
- Orientation
- Support
- Build Setup
- Toolpath review
- Material Development



QuantAM – Bridging Distortions



Bridging Distortions
Bridging distortions are caused by the shrinkage of large cross sectional area layers that form the bridge between separate part islands



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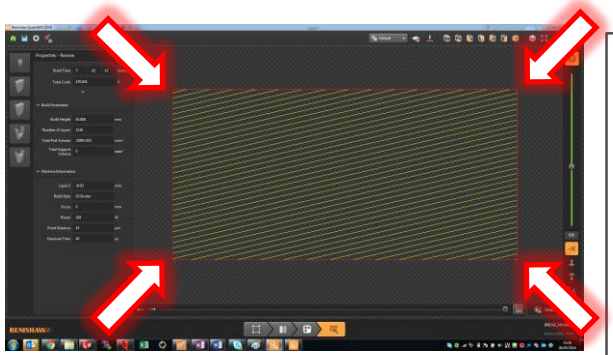
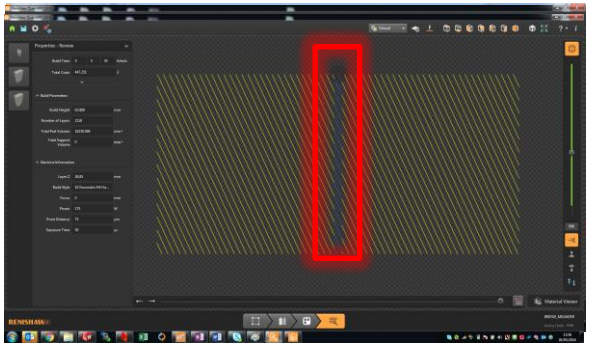
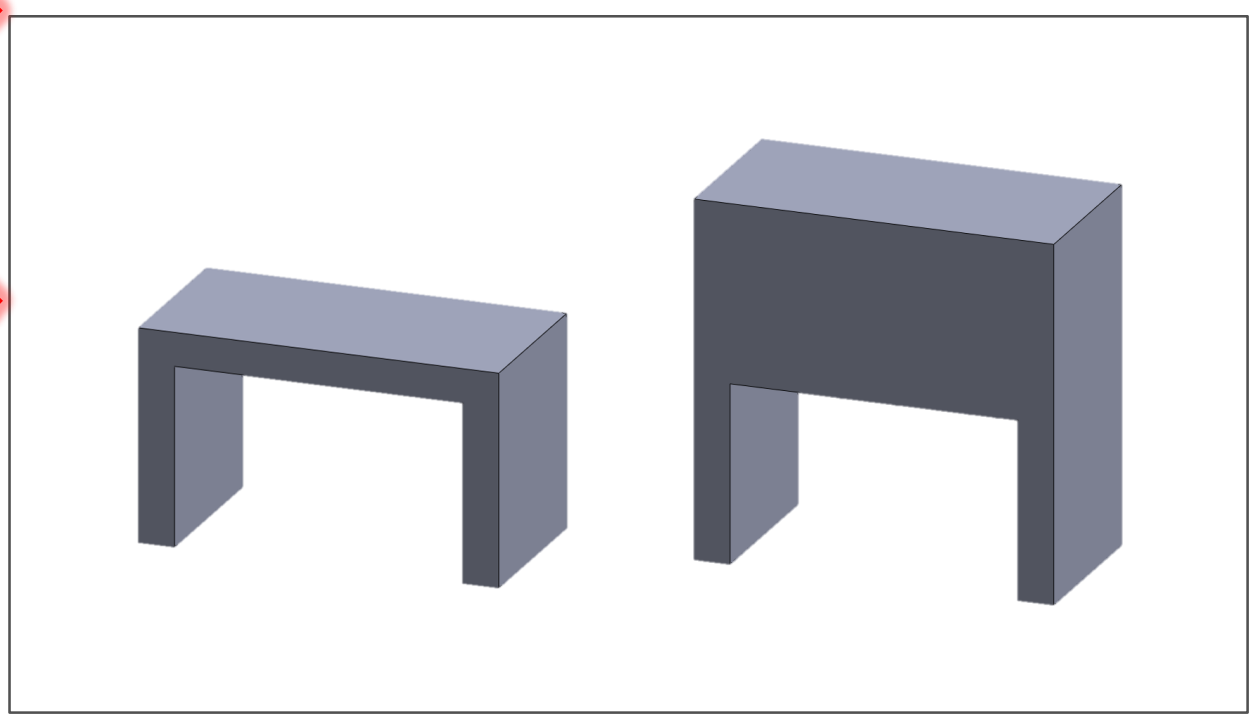
QuantAM – Bridge Scanning Strategy







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CAD optimisation and simulation

3DEXPERIENCE

CATIA
Generative Design (Topological optimisation)

DELMIA
Toolpath generation powered by QuantAM

SIMULIA
Part and build simulation

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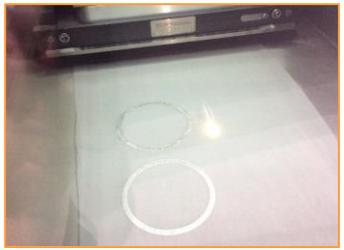
The solution approach

Build preparation

AM build

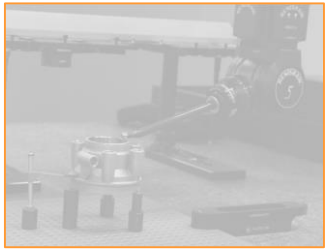


RenAM 500M /
InfiniAM

Gauging

Machining

Inspection



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RenAM 500M

- 500 W ytterbium fibre laser
- Build volume 250 mm x 250 mm x 350 mm
- Automated powder sieving and recirculation
- Patented high capacity dual gas filter system
- Open access parameter editing

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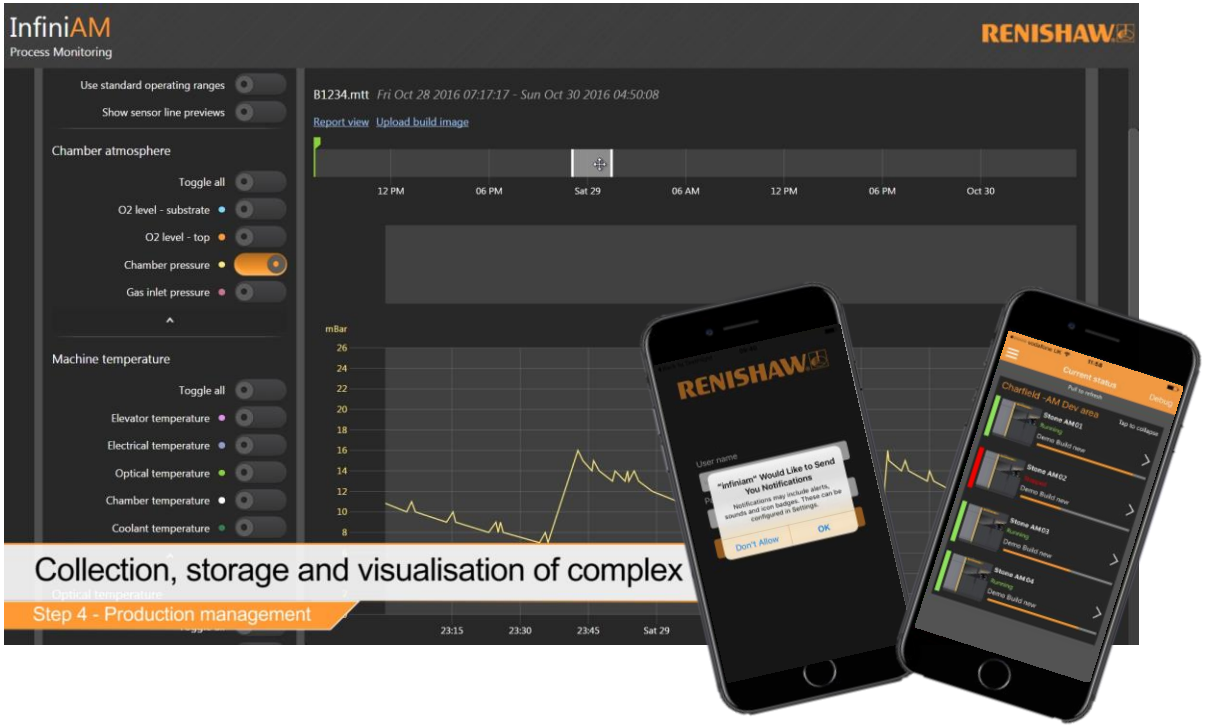
InfiniAM – Process Monitoring

Process monitoring

Data reporting

Mobile apps



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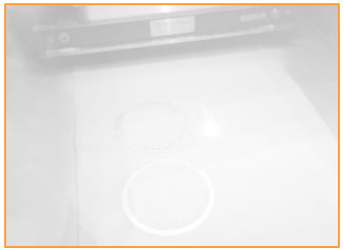
The solution approach

Build preparation

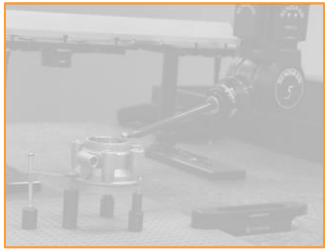
AM build



Gauging

Machining

Inspection



Equator

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EQUATOR™ *versatile* gauging system

Equator Features

Parallel kinematic constraint mechanism

Controlling tolerances to ±2µm

TP20 touch trigger probe

SP25 3-axis analogue scanning probe

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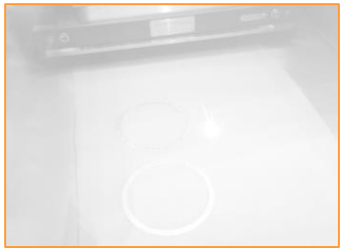
The solution approach

Build preparation

AM build



Gauging

Machining

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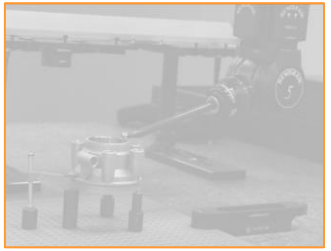

SPRINT

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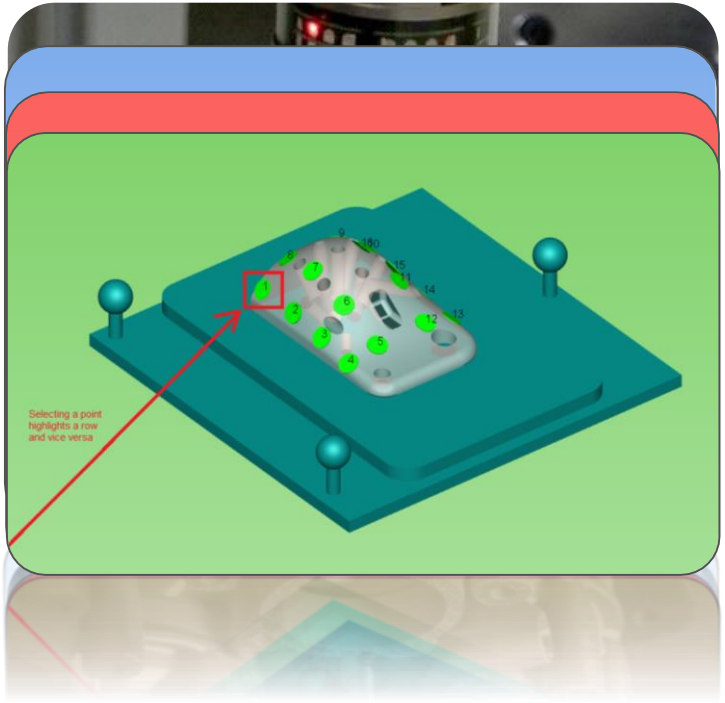
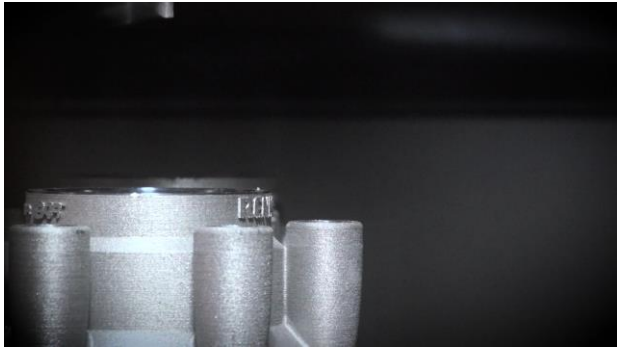
SPRINT™ and NC-PerfectPart™





SPRINT

On-machine contact scanning system

Touch trigger part setup

3-axis scanning

NC-PerfectPart

Complex 5-axis toolpath alignment

Distortion compensation

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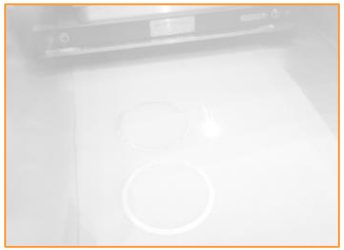
The solution approach

Build preparation

AM build



Gauging

Machining

Inspection

Modus 2 / REVO

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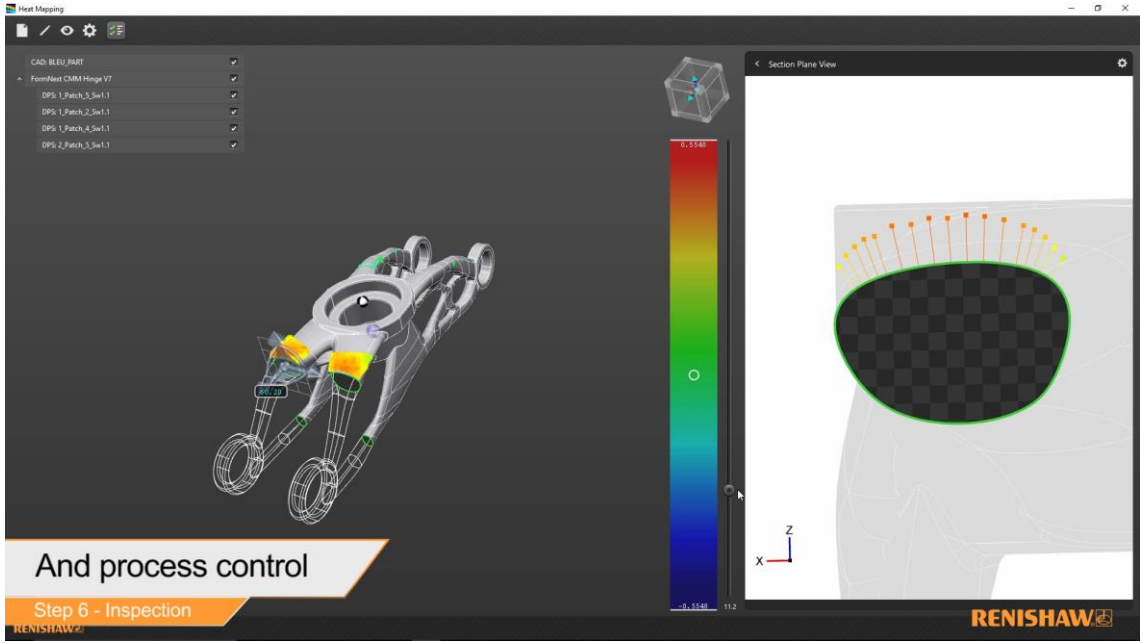
MODUS™ 2 & APEX™



MODUS 2

MODUS software provides a powerful platform to develop and run inspection programs

Measurement path planning for REVO

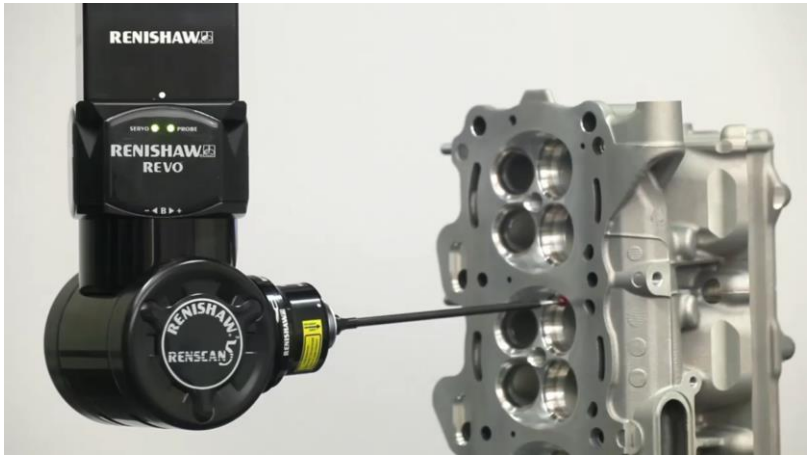
Applications for visualisation of millions of scanned data points

Inspection planning

Freeform surfaces

Error mapping

REVO™ 5-axis measurement



REVO

Synchronised motion and 5-axis measurement technology

Minimised dynamic effects of CMM motion at ultra high measurement speeds.

3D touch-trigger measurement and 2D/3D – scanning

Available styli extensions up to 800mm long

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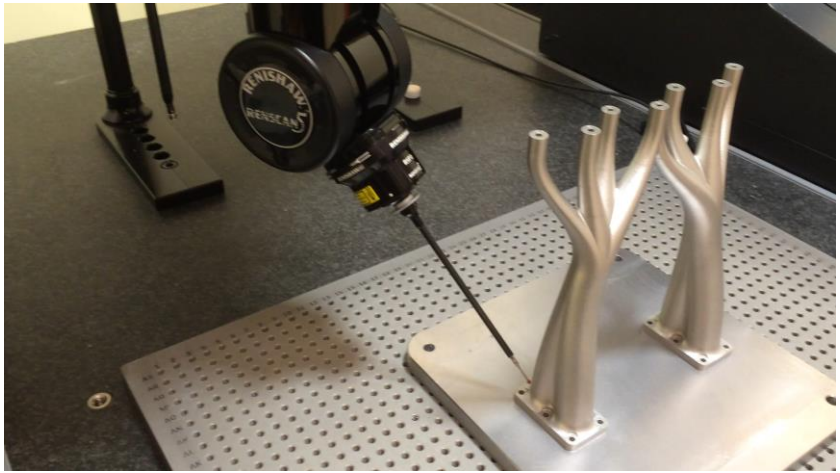
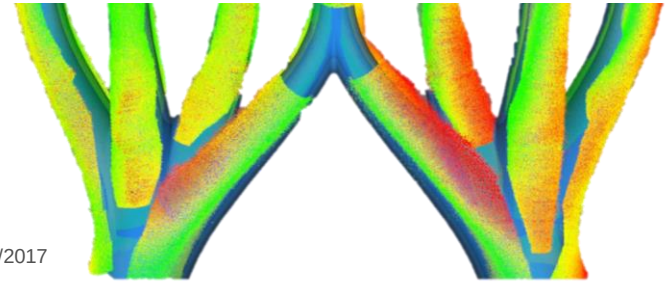
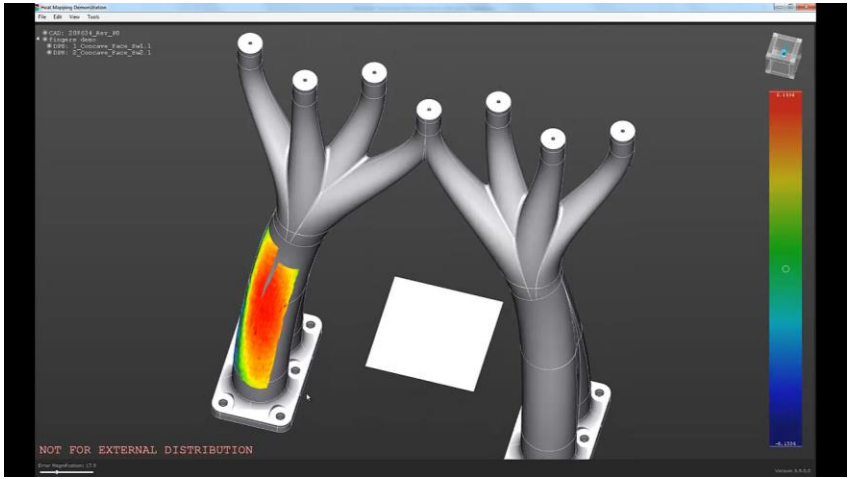
Point mapping



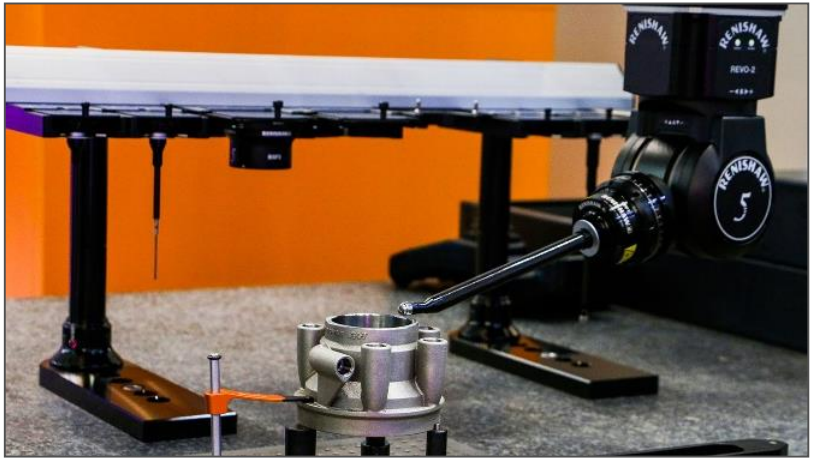


Error mapping allows the user to see layer by layer how distortion occurs and propagates

Defects such as bridging distortions can be visualised to better understand the defect cause and develop solutions



REVO – Surface Finish Probe (SFP)



REVO – Surface finish probe

Utilises the infinite positioning capability of REVO

Surface measurement capability is from 6.3 µm - 0.05 µm RA

(250 µin to 2 µin) Ra

Achievable accuracy is ±10 %

Characterisation of both unfinished and machined AM surfaces.

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REVO – Vision Probe (RVP)

Module specification	VM10	VM11
		
Measurement range	1 mm diameter hole/feature	0.5 mm diameter hole/feature
Field of view	50 mm x 40 mm	12.5 mm x 10 mm
Stand-off	80 mm	120 mm
Depth of field	5 mm	5 mm
Resolution	40 µm	20 µm
LED illumination	24 LEDs	10 LEDs
Backlight compatibility	Yes	Yes

REVO – Vision Probe

Non contact inspection

1.3 megapixel global shutter CMOS sensor

For measuring small holes and delicate features

Sub 40µm and 20µm respective resolutions

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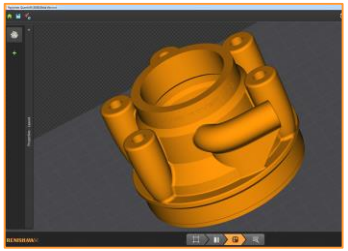
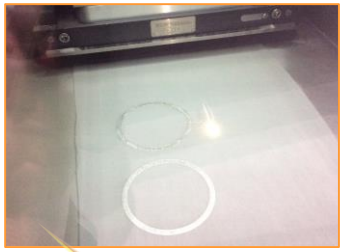
The solution approach

Build preparation



AM build



Gauging

Machining

Inspection

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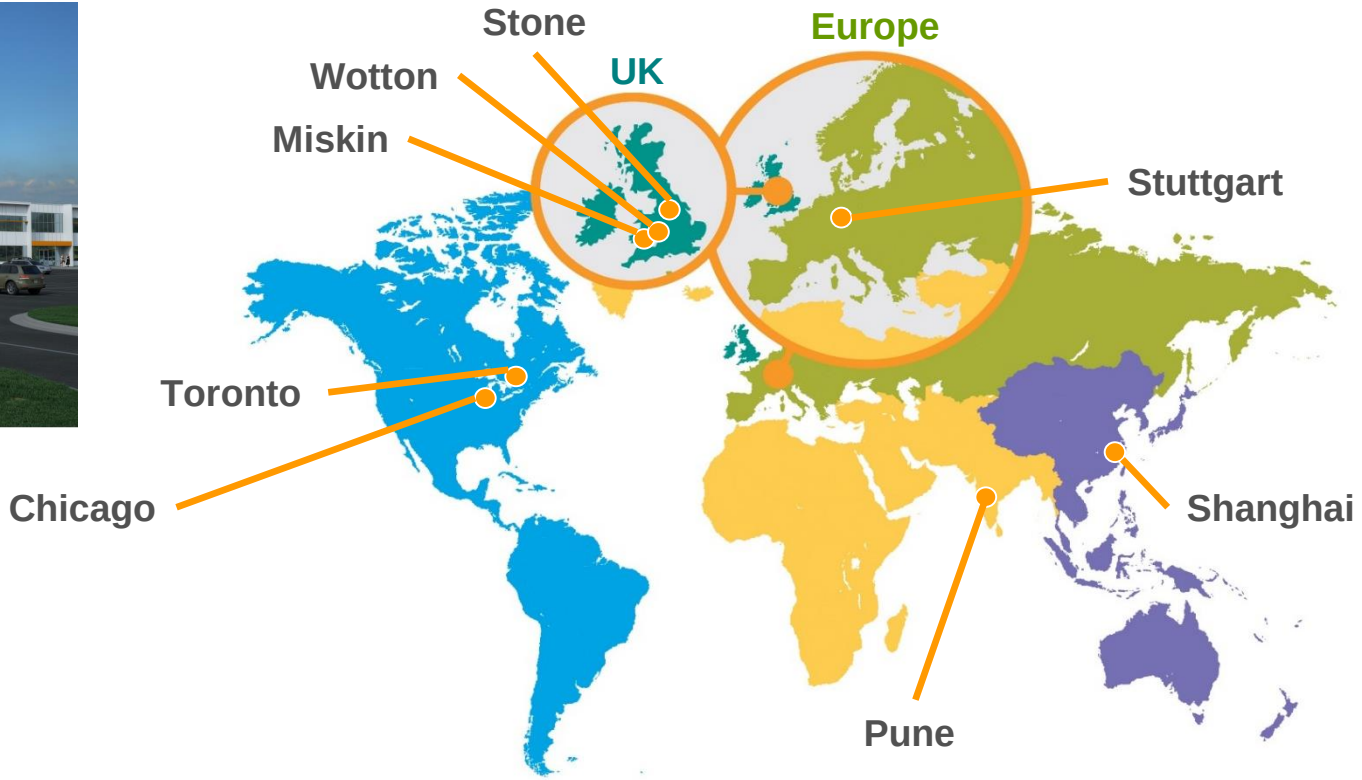
Global network of Solutions Centers



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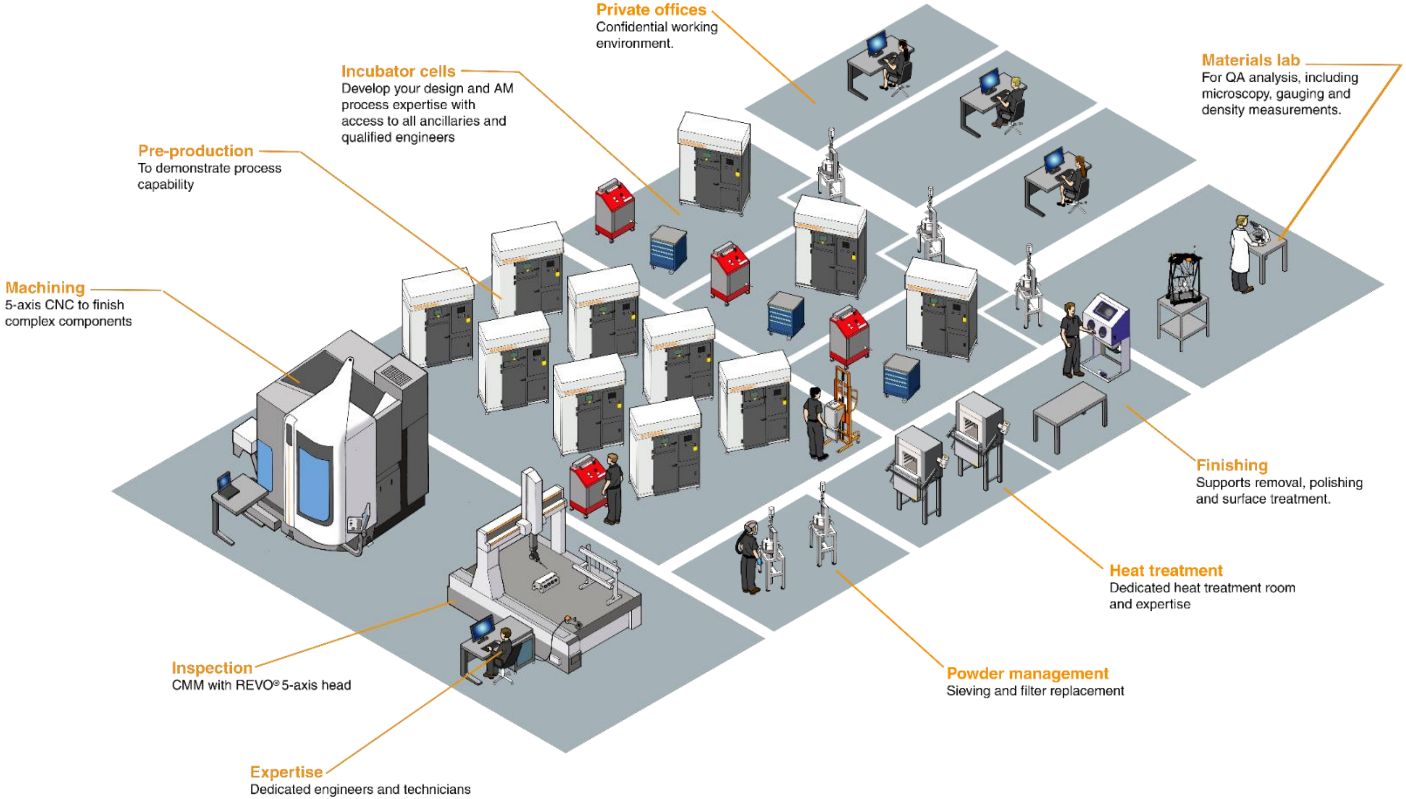
Solutions Centre facilities



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Solution Centre

1 Design for AM concept

Concept embodies AM benefits

2 Proof of concept

Benchmark part: benefits tangible

3 Process validation

Optimise process & verify part

4 Process capability

Demonstrate process stability

5 Production deployment

AM & finishing processes to make saleable product

Application engineering support | Dedicated incubator cell | Pre-production facility | Your supply chain

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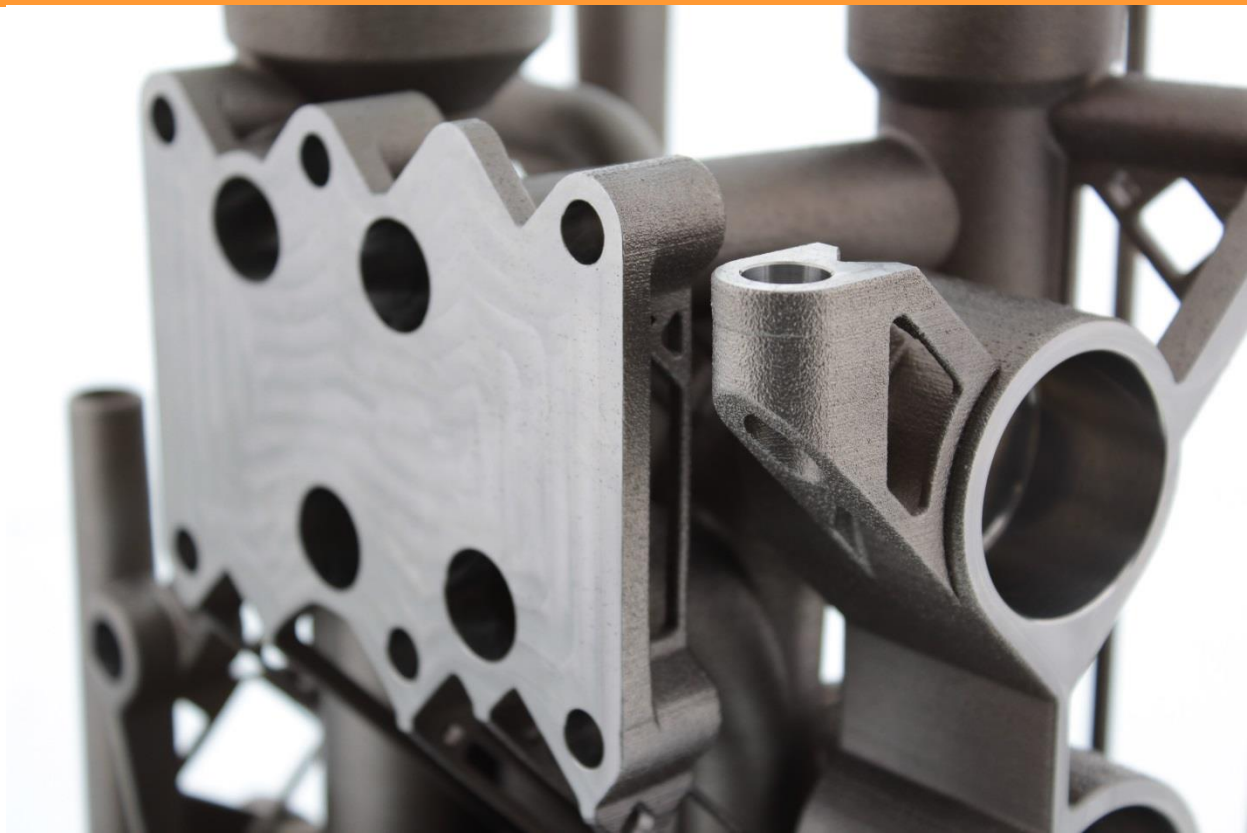
“Additive is not an island”



Thank You

Michael McClelland (MEng)

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Group Software

Renishaw plc
Wotton-under-Edge,
Gloucestershire,
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