

# Surtronic® Duo



Portable surface roughness testers

# Surtronic® Duo

## What it does

The Surtronic Duo is superior portable surface roughness tester that measure multiple roughness parameters with a 1-button click. Roughness measurement parameters such as Ra, Rz, Rp, Rv and Rt are displayed on a brightly lit intuitive 2.4" LCD colour display. Its rechargeable battery operation makes it a convenient way of performing fast, easy and precise on-the-spot measurements in almost any environment and surface.

## How it does it

The hard-wearing diamond stylus is drawn across the part with a precision motorised traverse mechanism to ensure that the correct horizontal distance is travelled. Vertical movement of the stylus is detected by a high quality piezo-electric pick-up as it travels across peaks and valleys which converts mechanical movement into electrical signals. The electrical signal is digitised and sent to a microprocessor for instant calculation of surface parameters using standardised algorithms.



## USB Mini charging

The mini USB port can be used for charging with the included mains charger (or with any standard USB charger).



### Bluetooth technology

Quick, reliable communication between traverse and display/control unit.

### Measure

Tactile measurement button great for challenging orientations

### Separates

The Duo splits into a display/control unit and traverse unit via a slide and lock mechanism.

### Diamond stylus and piezoelectric pick-up

The hard wearing, robust piezo-electric pick-up stylus with diamond tip assures very reliable measurement.

### Li-Poly battery

Most advanced rechargeable battery technology for unrivalled reliability and battery life.



**Profile graph**

Clear detailed graph showing measurement area – excellent for visually identifying defects.

**Simple 3-button navigation**

Instant access to menu options and settings.

**USB mini charging port**

Charge from mains or any standard USB charging port.

**Rubberised moulding**

Enhanced durability and improved grip provides unbeatable protection in harsh shop floor environments.

## Keeping it simple

The Surtronic philosophy keeps the process simple. It is the perfect tool for any inspector to check surface roughness even in the most demanding applications.

- Incoming inspections
- Final inspection before shipment
- Process control on the production line
- Checking large components or structures

## Standards and traceability

The reference standard supplied can be used both to calibrate the instrument and check for stylus wear to ensure the most accurate results are always being achieved.

Measurement	Best capability
Roughness standards (Ra)	$\pm(2\% + 0.004 \mu\text{m})$
Workpiece or component surface texture (Ra)	$\pm 3\%$ of measured value per trace

## UKAS calibration and testing

Taylor Hobson provides full certification for artefacts and instruments in our purpose built ISO graded clean room UKAS facility. Our UKAS laboratory is able to measure all of the parameters associated with surface texture, including French, German, USA and Japanese derivatives.



# Tough, fast and reliable handheld roughness testers...

Durable roughness testers for shop floor, industrial & inspection room applications



## Fast and reliable

Simply press the measurement button and in a few seconds a full set of traceable measurement results including a detailed profile graph is displayed.

## Built to last, by design...

Impact resistant rubberised mouldings surround a recessed, Mylar protected high durability screen making the unit robust enough for even the most demanding industrial environments.

## InstantOn

By utilising InstantOn technology these instruments are ready to measure in less than 5 seconds from switching on!

## In situ measurements

Monitor wear and roughness changes in situ during product's life. E.g. monitoring changes in turbine blade roughness as an early warning sign for defects and efficiency losses.

## User-friendly, not user-hostile!

The Surtronic Duo are as simple and easy-to-use as any SmartPhone. Users have the advantage of the intuitive quick access 3-button menu and its crisp 2.4" daylight readable industrial colour LCD screen

## Bluetooth connectivity

This next generation bluetooth technology boasts super efficient connectivity allowing wireless communication between the display unit and traverse unit.

## Built for power...

Powered by heavy duty reliable Li-Poly technology, the Surtronic Duo operates 24/7 with over 2000 measurements from a single charge.

### Parameters available: ISO 4287 Roughness\*

**Rt** – total profile height

**Rp** – maximum profile peak height

**Rv** – maximum profile valley depth

**Rz** – maximum height of the profile

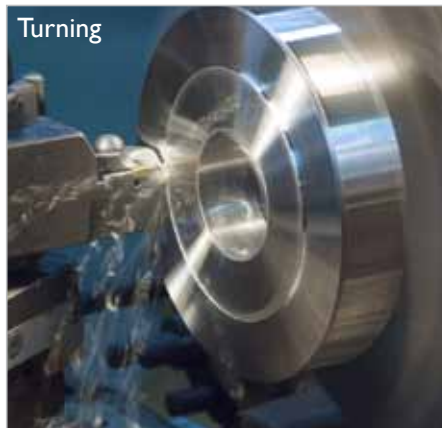
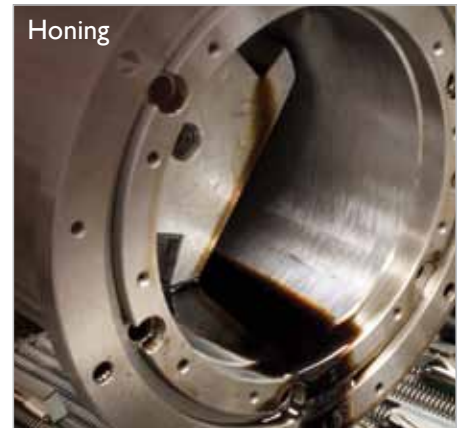
**Ra** – arithmetic mean deviation

Other parameters include:

Rsk, Rku, Rq, Rz1 max

\* Includes primary parameters

# Applications



and many more...

**Process control** – Grinding, turning, milling, honing, polishing, extrusion

**Heavy industry** – Shipbuilding, pipelines, sheet steel

**Aerospace** – Turbine blades, turbine shafts, wing composites

**Other** – Print rollers, flooring, bonding, glass

# Technical specification

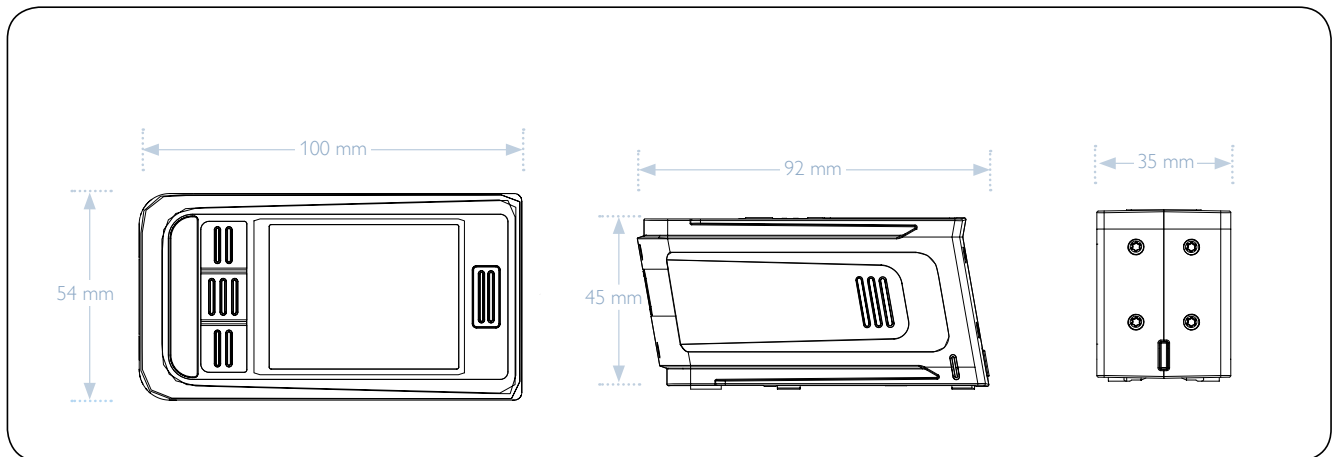
Instrument performance		Surtronic® Duo
Gauge	Resolution	0.01 $\mu\text{m}$ (0.4 $\mu\text{in}$ )
Measurement	Range (Ra)	Up to 40 $\mu\text{m}$ (1600 $\mu\text{in}$ )
	Range (Rz, Rv, Rp, Rt)	Up to 199 $\mu\text{m}$ (7800 $\mu\text{in}$ )
	Repeatability	2 % of value + noise
	Accuracy	5 % of reading + 0.1 $\mu\text{m}$ (4 $\mu\text{in}$ )
	Noise	0.1 $\mu\text{m}$ (4 $\mu\text{in}$ )
Calibration	Process	Automatic software calibration
	Standard	Able to calibrate to ISO 4287 Roughness Standards
Parameters	Standards	ISO 4287
	ISO 4287 (Roughness)	Ra, Rz, Rp, Rv, Rt, Rz1max, Rsk, Rq, Rku
	ISO 4287 (Primary)	Pa, Pz, Pp, Pv, Pt

Technical		Surtronic® Duo
Data output	On-screen	Up to 5 results per page, selectable on-screen graph
Battery	Charger	Mini USB 5V 1A 110-240VAC 50 / 60 Hz
	Charging time	4 hours
Power	Battery life	> 10,000 measurements per charge
	Standby time	5,000 Hours
	InstantOn	Max 5 sec from standby to ready to measure
	Auto-sleep function	5 minutes

Instrument capability		Surtronic® Duo
Pick-up assembly	Pick-up type	Piezoelectric
	Stylus type	Diamond, Radius 5 $\mu\text{m}$ (200 $\mu\text{in}$ )
Gauge	Gauge force	200 mg
	Measurement type	Skidded
Filter	Filter type	Gaussian
	Filter cut-off	0.8 mm
Traverse	Traverse length	5 mm (0.2 in)
	Traverse Speed	2 mm/sec (0.08 in/sec)
Display	Units	$\mu\text{m}$ / $\mu\text{in}$

Environmental / physical		Surtronic® Duo
Physical specifications	Weight including pickup	0.4 Kg (14 oz)
	Power source	Li-Poly rechargeable battery
Operating conditions	Temperature	5 - 40 °C (41 - 104 °F)
	Humidity	0 - 80 % non-condensing
Storage conditions	Temperature	0 - 50 °C (32 - 122 °F)
	Humidity	0 - 80 % non-condensing

# Surtronic® Duo dimensions



## What is a skid?

Surtronic Duo is a skidded device. The skid guides the pick-up along the workpiece, with the workpiece itself forming the datum for measurement. This method usually eases set-up by reducing the need for leveling. It also reduces the effects of vibration due to a much smaller measuring loop.

The skid is an integral part of the gauge and has a radius large enough to prevent movement in and out the roughness characteristics of the surface. The stylus and the skid are independent in their height (Z) movement but move together in the measurement direction. Surface deviations are recorded as the difference between the stylus and the skid movement in the Z direction.

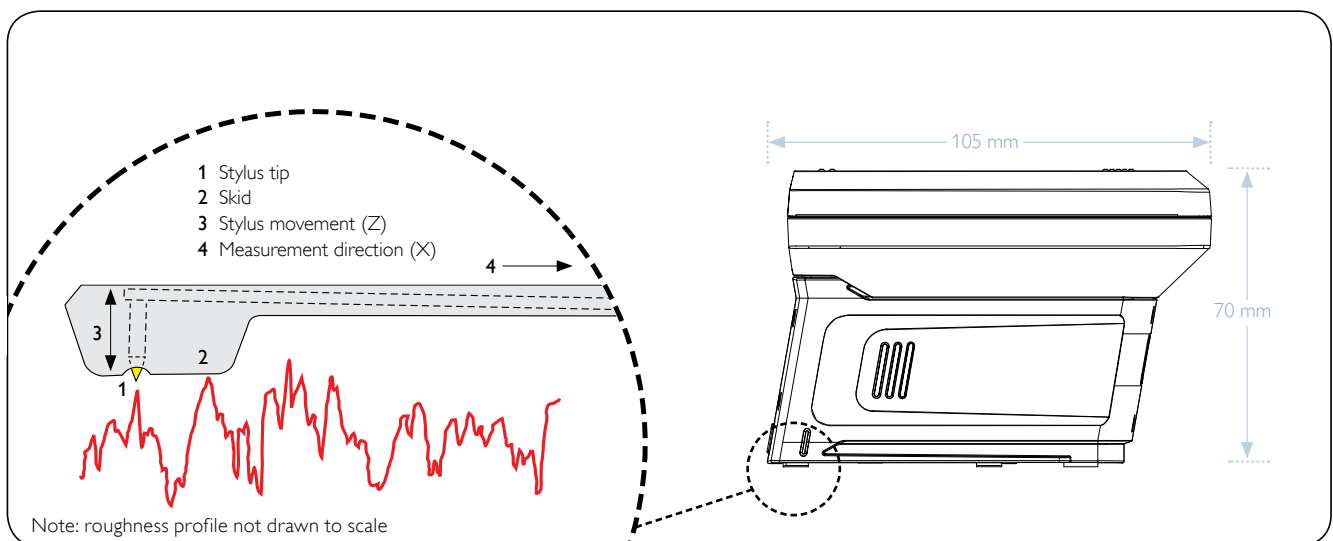
The skid will act as a mechanical filter, taking out much of the general form of the component. Also, wavelengths greater than the diameter of the skid will not register.

## How much difference does the stylus tip size make?

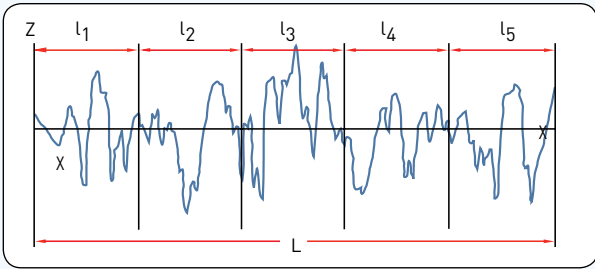
These instruments use a 5  $\mu\text{m}$  (200  $\mu\text{in}$ ) stylus tip radius. This suits their purpose as a portable tool for checking roughness in three ways:

- **Durability** – It is less likely to be damaged even when subjected to mishandling.
- **Maintenance** – It is easier to remove dirt and oil that collects on the tip during use.
- **Suitability** – It acts as a filter to remove the highest surface frequencies that are more reliably measured in a controlled environment.

Other Taylor Hobson instruments use a stylus with a tip radius of 2  $\mu\text{m}$  (80  $\mu\text{in}$ ). This smaller radius coupled with an inductive gauge head having low contact force enables analysis of even the smallest surface imperfections.



# Amplitude parameters



**Ra, Rq, Pa, Pq**

$l_1 - l_5$  are consecutive and equal sampling lengths (1 the sampling length corresponds to filter cut-off length  $\lambda_c$ ).

The evaluation length 'L' is defined as the length of profile used for assessing surface roughness parameters (usually containing several sampling lengths; five consecutive sampling lengths are taken as standard).

**Ra** is the universally recognised, and most used, international parameter of roughness. It is the arithmetic mean of the absolute departures of the roughness profile from the mean line.

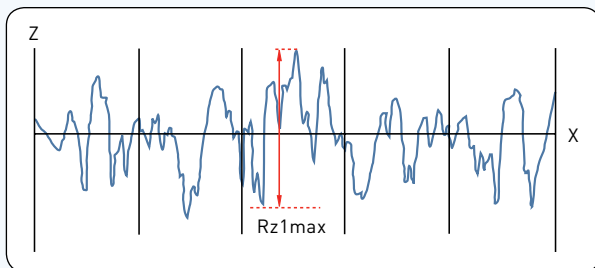
$$Ra = \frac{1}{l} \int_0^l |z(x)| dx$$

**Rq** is the rms root-mean-square (rms) value of the departures of the profile from the mean line.

$$Rq = \sqrt{\frac{1}{l} \int_0^l z^2(x) dx}$$

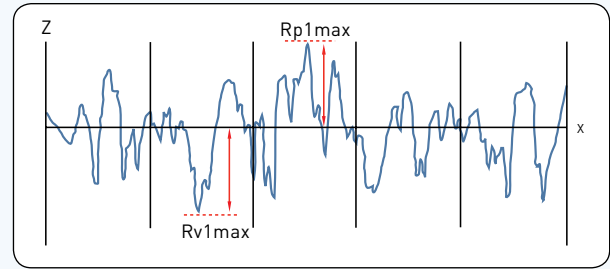
**Pa** and **Pq** are the corresponding parameters from the primary profile.

Note: Rq is sometimes referred to as RMS.



**Rz1max**

**Rz1max** is the largest peak to valley in any sampling length within the evaluation length.



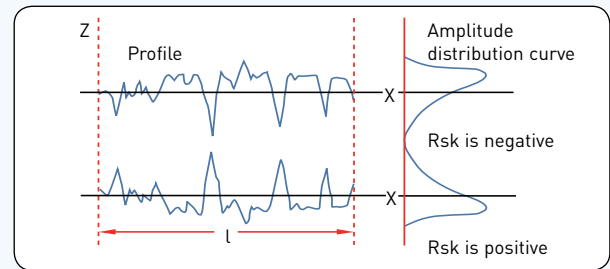
**Rv, Rp, Rt, Pv, Pp, Pt,**

\***Rv** is the maximum depth of the profile below the mean line within the sampling length.

\***Rp** is the maximum height of the profile above the mean line within the sampling length.

**Rt** is the maximum peak to valley height of the profile in the evaluation length.

**Pv, Pp** and **Pt** are the corresponding parameters from the waviness and primary profiles, respectively.



**Rsk, Rku**

**Rsk – Skewness** – is the measure of the symmetry of the profile about the mean line. It will distinguish between asymmetrical profiles of the same **Ra** or **Rq**.

$$Rsk = \frac{1}{Rq^3} \left[ \frac{1}{l} \int_0^l z^3(x) dx \right]$$

**Rku – Kurtosis** – is a measure of the sharpness of the surface profile.

$$Rku = \frac{1}{Rq^4} \left[ \frac{1}{l} \int_0^l z^4(x) dx \right]$$

**Rsk** and **Rku** are calculated within the sampling length.

\* Most parameters are defined over one sample length, however in practice more than one sample length is assessed (usually five) and the mean calculated. This provides a better statistical estimate of the parameter's measured value.



# Surface finish fundamentals

The surface of every component has some form of texture which varies according to its structure and the way it has been manufactured. These surfaces can be broken down into three main categories: Roughness, Waviness and Form. In order to control the manufacturing process or predict a component's behaviour during use, it is necessary to quantify surface characteristics by using surface texture parameters.

Surface texture parameters can be separated into three basic types:

**Amplitude parameters** – Measurement of the vertical characteristics of the surface deviations

**Spacing parameters** – Measurement of the horizontal characteristics of the surface deviations

**Hybrid parameters** – Combinations of spacing and amplitude parameters

**Sample length** – The profile is divided into sample lengths  $l$ , which are long enough to include a statistically reliable amount of data. For roughness and waviness analysis, the sample length is equal to the selected cut-off.

**Cut-off ( $l_c$ )** – A cut-off is a filter that uses either electronic or mathematical means to remove or reduce unwanted data in order to look at wavelengths in the region of interest. The sample length is also known as the cut-off length.

**Evaluation length** – The length in the direction of the X axis used for assessing the profile under evaluation. The evaluation length may contain one or more sample lengths. For the primary profiles the evaluation length is equal to the sample length.

**Standards** – Where appropriate Taylor Hobson equipment follows procedures as determined in ISO 3274-1996, ISO 4287-1997, ISO 4288-1996, ISO 11 562 and other international standards.

All parameters using either Roughness, Waviness or Primary Profiles conform to the following assumptions:

T = Type of profile, either R (Roughness) or W (Waviness) or P (Primary)

n = Parameter suffix, e.g. q, t, p, v, etc.

N = Number of measured sampling lengths

When a parameter is displayed as  $T_n$  (e.g.  $R_p$ ), then it is assumed that the value has been measured over 5 sampling lengths. If the number of measured sampling lengths is other than 5 sampling lengths, then the parameter shall display this number thus  $T_nN$ , e.g.  $R_{p2}$ .

**Max rule** – If a parameter also displays max (e.g.  $R_{z1max}$ ) then the measured value shall not be greater than the specified tolerance value. If max is not displayed (e.g.  $R_p$ ) then 16% of the measured values are allowed to be greater than the specified tolerance value.

See ISO 4288-1996 for more details of the Max and 16% rules.

Recommended cut-off ISO 4288-1996				
Periodic profiles	Non-periodic profiles		Cut-offs	Sampling length/ evaluation length
Spacing distance $S_m$ (mm)	$R_z$ ( $\mu m$ )	$R_a$ ( $\mu m$ )	$l_c$ (mm)	$l_c/L$ (mm)
>0.013 to 0.04	(0.025) to 0.1	(0.006) to 0.02	0.08	0.08/0.4
>0.04 to 0.13	>0.1 to 0.5	>0.02 to 0.1	0.25	0.25/1.25
>0.13 to 0.4	>0.5 to 10	>0.1 to 2	0.8	0.8/4
>0.4 to 1.3	>10 to 50	>2 to 10	2.5	2.5/12.5
>1.3 to 4	>50 to 200	>10 to 80	8	8/40

# Accessories and spares

## 1 Portable hybrid solar rechargeable power bank\*

Portable power bank for charging the Surtronic Duo on the go. Can be charged by USB, mains AC or sunlight.

Code SC-15



## 2 Compact portable carry bag

Helps secure the Surtronic Duo and prevent accidental drops especially for applications involving measuring at heights.

Code SA-51



## 3 USB charger

Mini USB charger  
5V 1A 110-240VAC  
50/60 Hz with international adapters

Code SC-10



## 4 Hard transport case\*

Air and water tight case that provides the Surtronic Duo with extra protection for safe storage and/or transportation.

Code SA-55

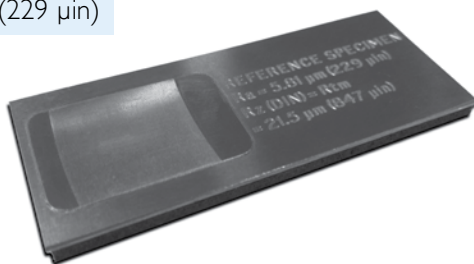


## 5 Calibration standard

For calibrating and checking the Surtronic Duo instrument.

Code CS-20

Ra 5.81  $\mu\text{m}$  (229  $\mu\text{in}$ )



## 6 Magnetic base\*

Lightweight compact base specially designed to allow for measurements in multiple orientations including upside down on metallic surfaces.

Code SA-41



### \* Not supplied as standard with Surtronic Duo

All accessories listed above are available for order. Please contact your local Taylor Hobson representative for additional or special requirements.

# Surtronic® product range

**Surtronic® S100-series** offers high speed roughness with a large display and simple menu structure. Battery powered and offering total portability with a built-in memory for up to 100 readings.

- Unique stylus lift for total flexibility
- Long traverse length & extended pick-up reach
- Powerful PC software included

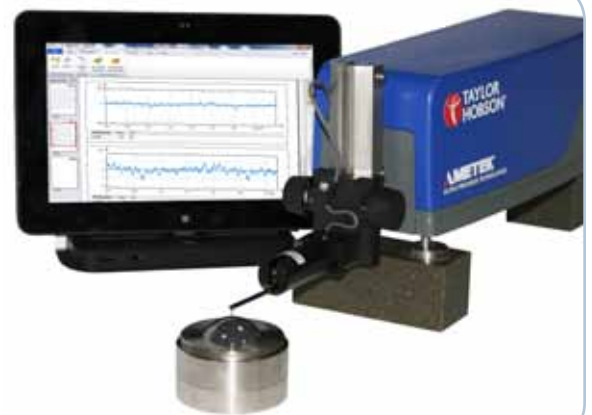
Features	
Gauge range / resolution	400 µm (0.012 in) / 0.01 µm (0.4 µin)
Accuracy (5 µm diamond tip)	1% of reading + LSD µm



**IntraTouch** measures roughness, waviness and contour. A low cost, portable system for high level surface texture analysis on the shop floor.

- 50mm (1.97in) traverse with straightness datum
- Automatic calibration over a sphere ensures that radius and form measurements are correct

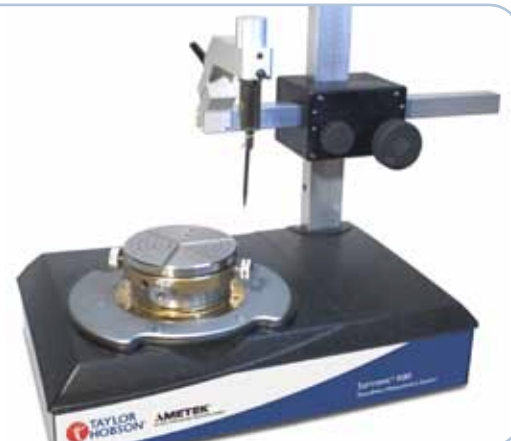
Features	
Gauge range / resolution	16 nm @ 1mm range (0.63 µin @ 0.04 in) / 3 nm @ 0.2 mm range (0.12 µin @ 0.008 in)
Straightness accuracy	0.2 µm over any 20 mm (8 µin over any 0.78 in)



**The Surtronic® R-50/R-80** is robust enough for the shop floor but accurate for any inspection area, giving a flexible solution for all roundness and form measurements.

- Patented gauge orientation
- Robust enough for 24/7 operation
- Easy-to-use touchscreen software

Features	
Gauge resolution	30 nm (1.18 µin)
Spindle accuracy	±25 nm (0.98 µin)



**Surtronic® R-100 Series** builds on the robustness and ease-of-use of the R-50/R-80, offering a higher throughput and improved feature set that includes advanced harmonic analyses and a higher gauge resolution.

- Robust, fast and easy-to-use
- Includes Rapid Centre™\*
- Throughput 3 parts/minute including set-up

Features	
Gauge resolution	6 nm (0.24 µin)
Spindle accuracy	±25 nm (0.98 µin)



\*Centering attachment is supplied as standard with R-120/R-125 models, or available to purchase as an accessory on other models.

### The metrology experts

Taylor Hobson is world renowned as a manufacturer of precision measuring instruments used for inspection in research and production facilities. Our equipment performs at nanometric levels of resolution and accuracy.

To complement our precision manufacturing capability we also offer a host of metrology support services to provide our customers with complete solutions to their measuring needs and total confidence in their results.

[www.taylor-hobson.com](http://www.taylor-hobson.com)

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- **Design engineering** – special purpose, dedicated metrology systems for demanding applications
- **Precision manufacturing** – contract machining services for high precision applications and industries

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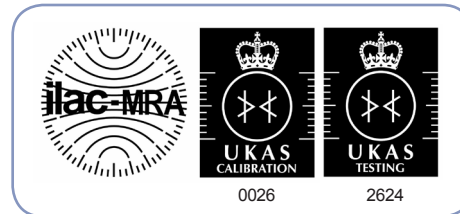
- **Preventative maintenance** – protect your metrology investment with an Amecare support agreement

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- **Inspection services** – measurement of your production parts by skilled technicians using industry leading instruments in accord with ISO standards
- **Metrology training** – practical, hands-on training courses for roundness and surface finish conducted by experienced metrologists
- **Operator training** – on-site instruction will lead to greater proficiency and higher productivity
- **UKAS calibration and testing** – certification for artifacts or instruments in our laboratory or at customer's site



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