



KONICA MINOLTA



# Rhopoint TAMS™ Total Appearance Measurement System



The ultimate quality control instrument that handles:

- Raw Material
- E-Coat
- C-Coat

Giving Shape to Ideas





## Instrumental analysis of surfaces appearance, roughness and waviness in the automotive painting process

A beautiful smooth finish is a key aim when painting a vehicle- the quality of this finish is determined by the surface roughness & waviness of the raw material to be painted and the effectiveness of each subsequent coating process as well as any polishing or sanding operations.

The final paint is built of many layers- as each layer is applied it tends to smooth the material. Measuring the surface at each stage gives opportunities to optimise the overall paint process and understand the factors which most influence the final appearance.

The Rhopoint TAMS™ can measure and map surfaces at all stages of paint processes from raw material to final topcoat. This innovative device has many of the advantages of the high-resolution analytical tools combined with the portability and accessibility of a handheld device.

Developed in cooperation with Volkswagen AG & AUDI AG



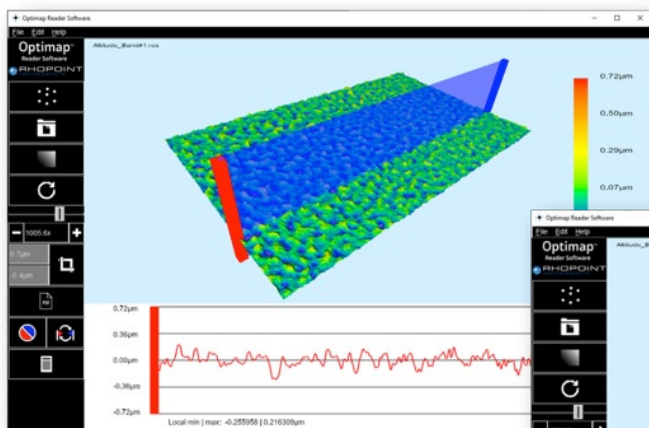
## Take it right from the source

To evaluate the suitability of raw materials, to optimize individual processes and to build a complete picture of how the quality of the final product is influenced at each paint stage, analytical data is needed to understand how each paint process fills, smooths and masks the underlying roughness from the base material such as steel and aluminum.

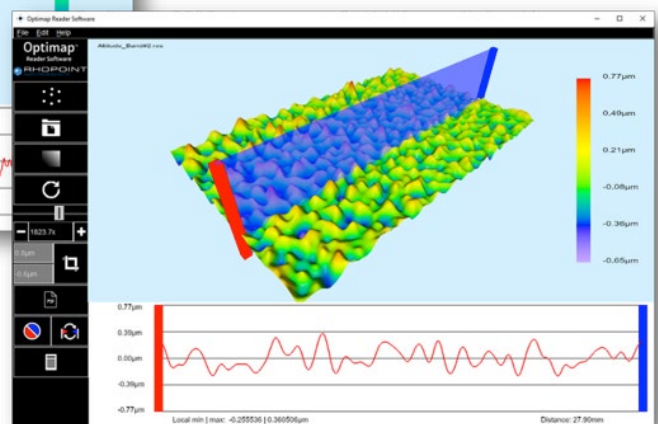
Widely used laboratory devices producing 3D topographical maps with a sub-micron accuracy and resolution can only be used off-line, and measurement time is also a limiting factor as capturing a representative area on a surface may take many minutes or even hours. The high costs of the equipment and complexity of use usually limit deployment of analytical tools to central development functions in the OEM.

The image-acquiring Rhopoint TAMS™ utilizes Phase Measurement Deflectometry (PMD) as one of its measurement technologies and provides ISO 16610 compliant high-resolution 3D altitude maps of raw materials and all surfaces in the painting process in less than five seconds.

Measurements are taken according to DIN EN ISO 4287 (like optical Ra), or DIN EN ISO 25178 for areal topographic information (like Sa), but all topographic information may be exported in open \*.res format for deeper analysis with commercial topographical analysis software. Of course, all measurements are also compatible with Rhopoint's own free image analysis software "Optimap Reader".



Analyzing two band filtered surfaces with the included Optimap Reader Software.





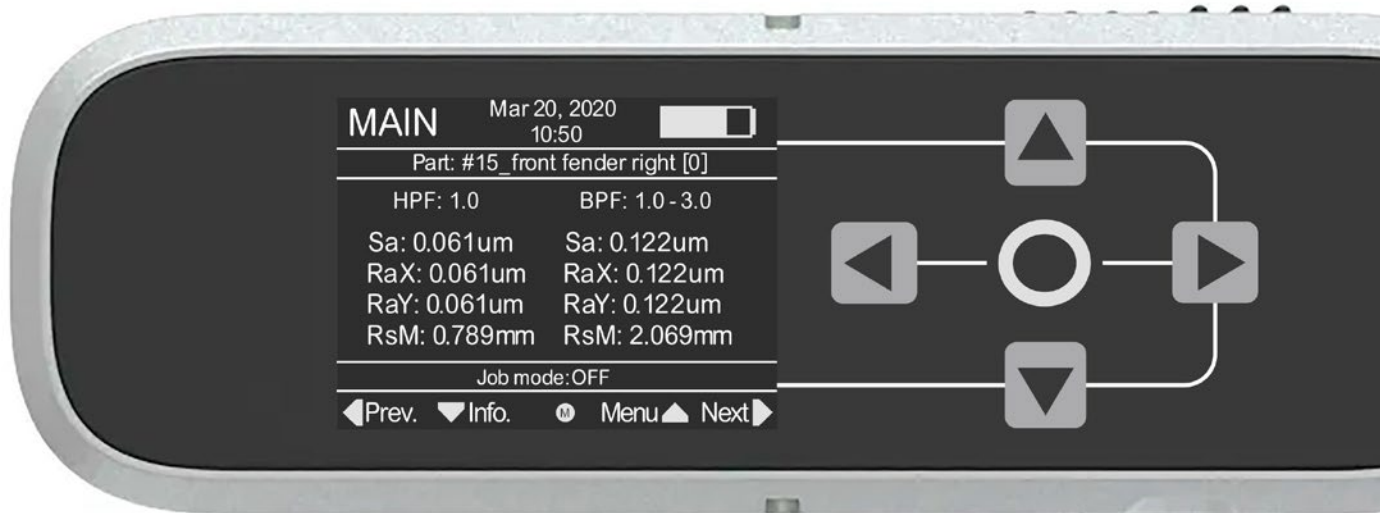
## Everything under control - in all intermediate steps

The intermediate production step of E-coating (also known as Electrophoretic Painting, Electrocoating, Electropainting etc.) is a high-tech process that has a huge impact on the final quality and thus requires as much control as any other production step.

Controlling the E-coat with Rhopoint TAMS™ and its advanced quality parameters, e.g. ISO GPS texture analysis compliant topographic roughness indices like Sa, gives you complete documentary overview of your paint process. This will result not only in better final quality but also in lower unit costs.

But not only can relevant topographic indices be analyzed. If you want to keep it simple, Rhopoint™ enables easy documentation and reporting by using Rhopoint Quality indices to judge overall quality of an E-coat.

Similar to the Raw Material mode, all topographic measurements taken are compatible with Rhopoint's Optimap Reader software or any commercial topographical analysis software.





## Clear coat measurement - judge the perceived Quality as your customer does

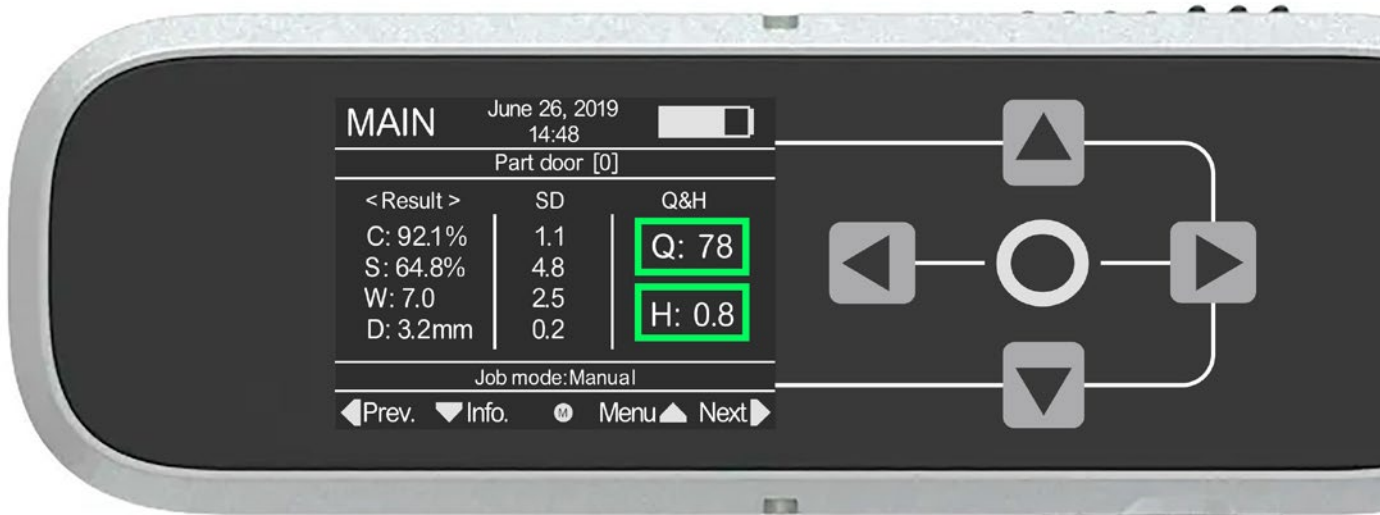
For maximum visual impact, an automotive paint finish must instantly produce an appealing visual sensation for the customer. Improved correlation to visual perception and its easily communicated parameters gives the Rhopoint TAMS™ a major advantage over methods that are currently in use and produce complex results.

The appearance quality, as judged by the consumer, is determined surface texture which reduces its visual impact.

Jointly developed by Rhopoint Instruments and Volkswagen AG over several years, Volkswagen are now preparing to introduce the TAMS globally for the appearance measurement of painted car bodies.

Clear coat measurements are made by the Rhopoint TAMS™ by measuring a 2D area of the surface from a fixed measurement position. In addition to providing major surface parameters Contrast, Sharpness, Waviness and Dominant Structure Size, customer visual preferences can be judged by unique Quality and Harmony indices.





## Measurements matching visual perception

### **QUALITY**

One single value predicting the visual rating of the total appearance quality of a surface, with 100% indicating a smooth finish with perfect image forming characteristics.

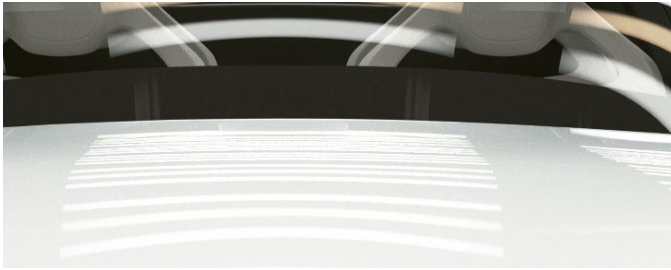
### **HARMONY**

Based on extensive human perception research by Volkswagen AG and AUDI AG this value indicates the acceptability of adjacent parts. A value of  $>1.0$  indicates that parts are not similar and if viewed together (e.g. door to door) will detract the eye from overall visual quality.

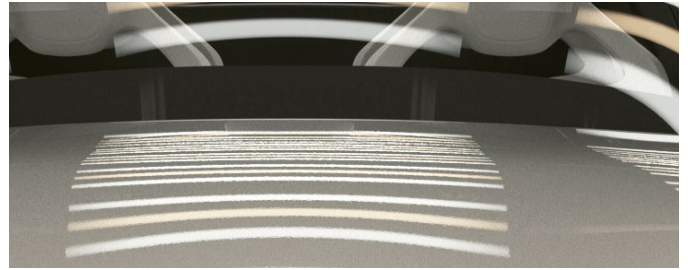


### CONTRAST "C"

Contrast is related to the colour of the surface; white and metallic surfaces have low contrast, a deep black measures 100%. Contrast quantifies the visual impact of orange peel and haze effects both being more visible on high contrast dark colours.



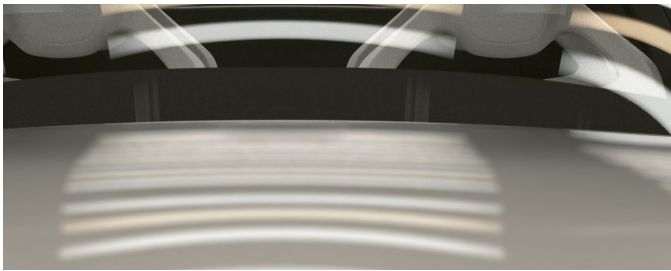
Low contrast



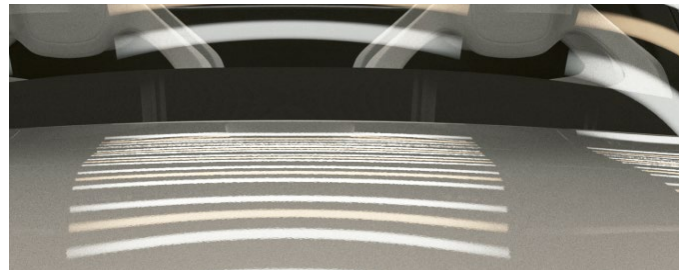
High contrast

### SHARPNESS "S"

Sharpness quantifies the accuracy of images reflected in the surface, 100% indicates a perfect reflection. At close distances (<0.5m) Sharpness measures how well surface reflects fine details. At showroom viewing distance (1.5m) Sharpness quantifies haze and clarity.



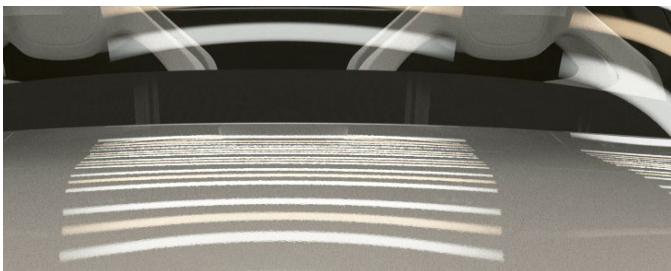
Low sharpness



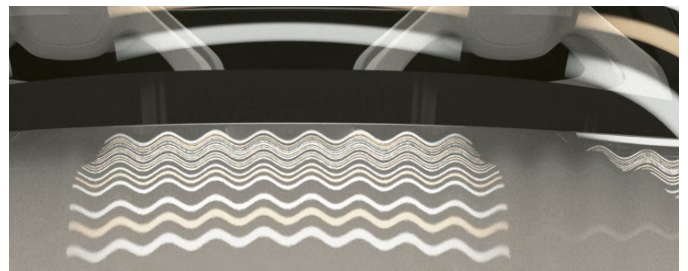
High sharpness

### WAVINESS "W"

Correlated to human perception, waviness quantifies the visible impact of surface waves to an observer at showroom distance (1.5m). The waviness of a surface is critical for determining appearance quality.



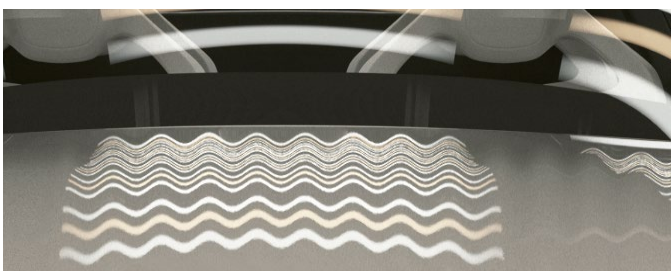
Low waviness



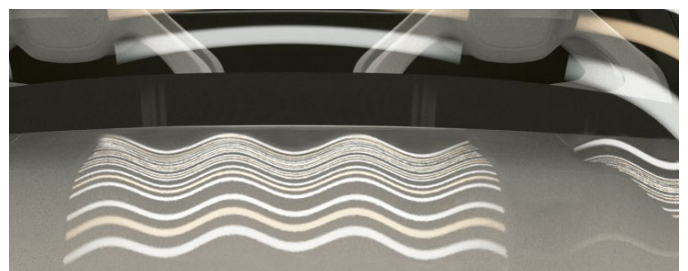
High waviness

### DOMINANT STRUCTURE SIZE "D"

Indicates the dominant structure size perceived at showroom viewing distance. Typical values are between 1–10mm, the dominant structure size is important in determining the harmony between adjacent parts.



Small dominant structure size



Large dominant structure size

# Specifications Rhopoint TAMS™

<b>Menu Interface</b>	5 Capacitive Sense buttons
<b>Measurement Operation</b>	Tactile button capacitive sensor push & start auto measurement system
<b>Measurement Time</b>	4 Second Image Capture 4 Second Processing
<b>Colour Screen</b>	Full colour IPS screen
<b>Power</b>	Removeable and rechargeable lithium polymer batteries
<b>Operation</b>	Up to 5 hours/charge
<b>Memory</b>	>100,000 readings 8GB internal / 8GB SD card
<b>Data Transfer</b>	SD Card (Ethernet upon request)
<b>Optical System</b>	Variable Focus Machine Vision
<b>Spatial Resolution (surface)</b>	37µm/pixel
<b>Field of View (surface)</b>	27 x 16mm
<b>Production Integration</b>	RFID TAG Reader (optional)
<b>Dimensions / Weight</b>	172 x 136 x 56 mm / approx 1000g
<b>Additional Sensors</b>	Accelerometer Orientationsensor 4 x Pressure (measurement)
<b>Construction</b>	Aluminium instrument case

WS-BANDS (C-/E-COAT)	Sa_A	Sa_B	Sa_C	Sa_D	Sa_E	Sa_SW	Sa_LW
<b>Bandpass Filter [mm]</b>	0.1 - 0.3	0.3 - 1.0	1.0 - 3.0	3.0 - 10.0	10.0 - 13.5	0.3 - 1.2	1.2 - 12.0
<b>Resolution (on display)</b>	0.1						
<b>Repeatability [SD]</b>	0.1						
<b>Reproducibility [SD, max]</b>	0.3						

C-COAT	Contrast	Sharpness	Waviness	Dominant Structure Size	Quality	Harmony
<b>Index [units]</b>	C [%]	S [%]	W [„W“ units]	D [mm]	Q [%]	H [„H“ units]
<b>Minimum</b>	0.0	0.0	0.0	0.5	0.0	0.5
<b>Maximum</b>	100.0	100.0	30.0	6.8	100.0	8.9
<b>Resolution (on display)</b>	0.1	0.1	0.1	0.1	0.1	0.1
<b>Repeatability [SD]</b>	0.5	0.5	0.5	0.5	0.5	0.2
<b>Reproducibility [SD, max]</b>	1.5	1.5	1.5	0.5	2.0	0.3

E-COAT / R-MAT (O-ROUGH)	Arithmetical mean height of surface area	Roughness Average in X-direction	Roughness Average in Y-direction	Mean width of profile elements
<b>Index [units]</b>	Sa [µm]	RaX [µm]	RaY [µm]	RsM [mm]
<b>Minimum</b>	0			0.3
<b>Maximum</b>	20			9
<b>Resolution (on display)</b>	0.1			
<b>Repeatability</b>	0.1			
<b>Reproducibility [SD, max]</b>	0.3			

Konica Minolta Sensing Europe B.V. is an authorized Distributor of Rhopoint Instruments Ltd.

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KONICA MINOLTA, Inc., Sakai Site  
Product design, manufacture/manufacturing  
management, calibration and service



Certificate No.: JQA-E-80027  
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