RHOPOINT
AMERICAS

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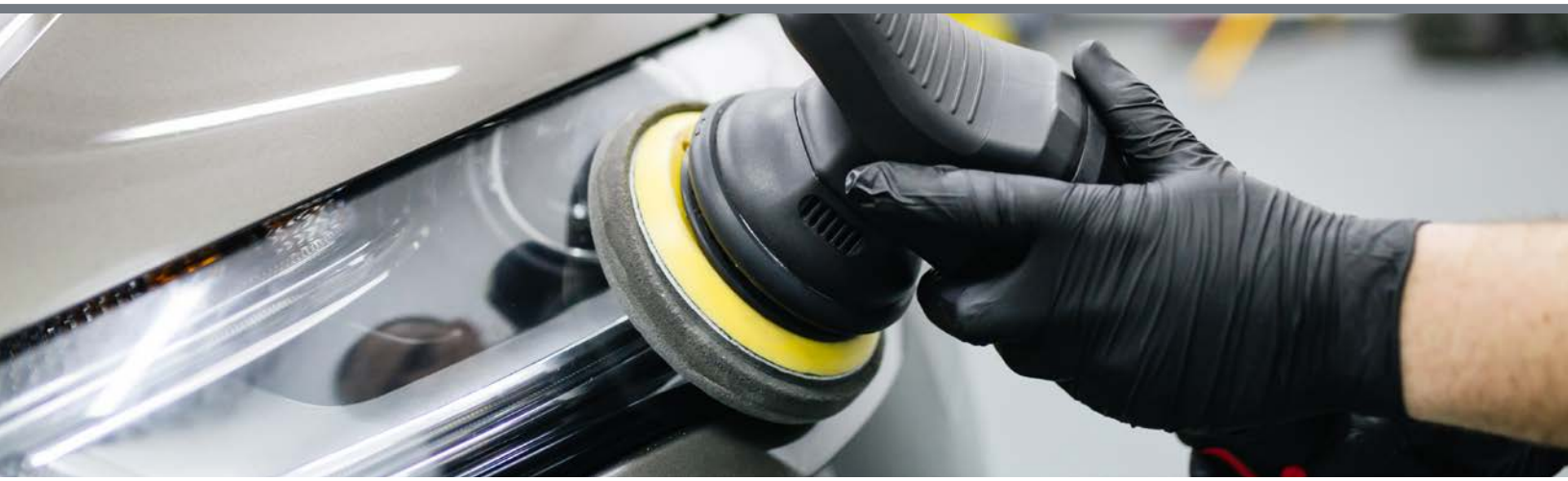
Manufactured by Rhopoint Instruments in the United Kingdom

TAMS™

Rhopoint TAMS® (Total Appearance Measurement System)

- Raw Material
- E-Coat
- C-Coat
- Primer



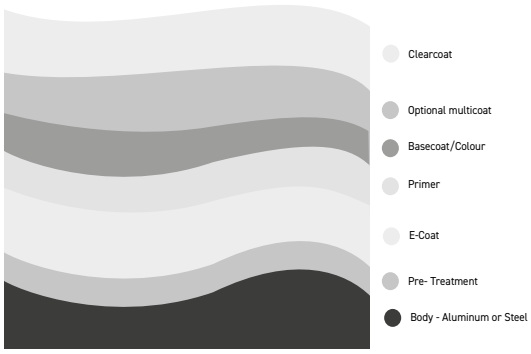
What is the Rhopoint TAMS®?

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

A product jointly developed by Rhopoint Instruments and Volkswagen AG. 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 coating system 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.

Vehicle Coatings



The Rhopoint TAMS® can be used at each stage of the coating process.

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 hand held device.

What does Rhopoint TAMS® measure?

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.

Fully portable TAMS® measures these surfaces with sub micron resolution, in situ in under 10 seconds . Measurements are taken according to DIN EN ISO 4287 (like optical Ra), or DIN EN ISO 25178 for a real topographic information (like Sa), but all topographic information may be exported in open *.res format for deeper analysis with commercial topographical analysis software.

The Rhopoint TAMS® can measure:

- Waviness
- Contrast
- Dominant Structure Size
- Sharpness

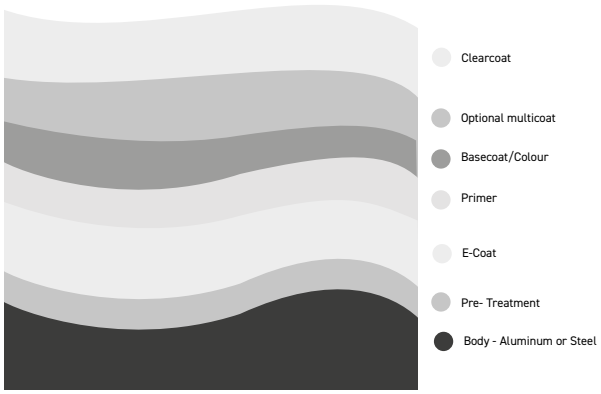
The Rhopoint TAMS® Technologies:

- Phase Measurement Deflectometry (PMD)
- Provides ISO 16610 compliant high-resolution 3D altiude maps
- Consistent readings of raw materials, surfaces in the painting process

The Rhopoint TAMS® creates a reading within 10 seconds.

The production of E-coating

Vehicle Coatings



The intermediate production step of E-coating (also known as Electrophoretic Painting, Electrocoating, Electropainting etc.) is a high-tech process that has a 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 topographic roughness indices like Sa, gives complete documentary overview of the paint process.

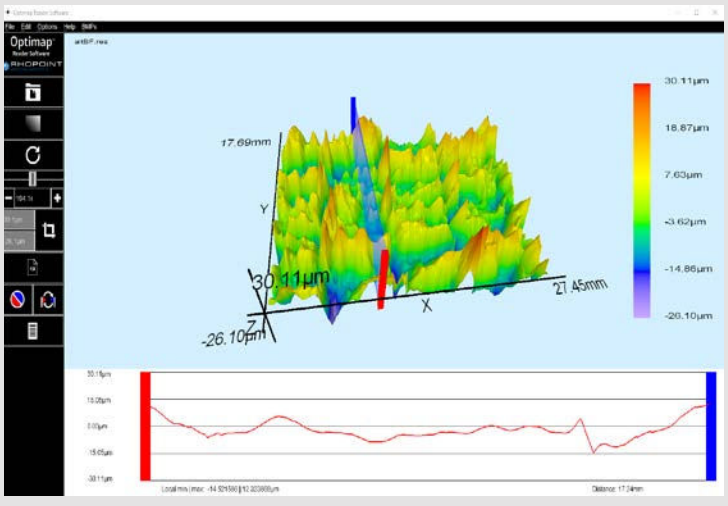
This can result not only in better final quality but also in lower unit costs.

Topographical Analysis Software

All measurements are compatible with Rhopoint's own free image analysis software "Optimap Reader" included in the price of the TAMS®.

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

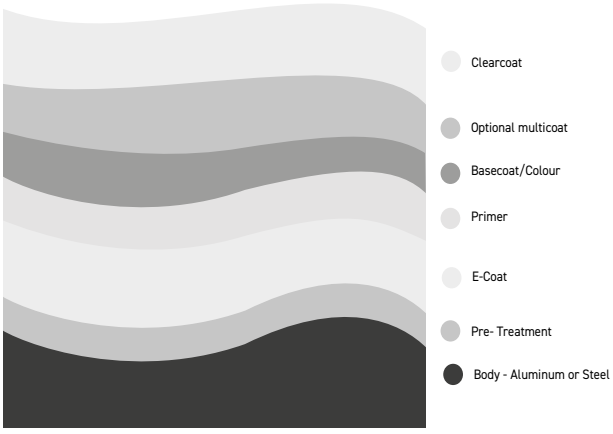
Not only relevant topographic indices can be analyzed. For simplicity, Rhopoint TAMS® enables easy documentation and reporting by using *Rhopoint Quality* indices to judge overall quality of an E-coat.



Clear coat measurement

For maximum visual impact, an automotive paint finish must instantly produce an appealing visual sensation for the customer

Vehicle Coatings



Clear coat measurements are made by the Rhopoint TAMS® by measuring a 2D area of the surface from a fixed measurement position.

Improved correlation to visual perception and its easily communicated parameters gives the Rhopoint TAMS® a major advantage other methods currently used in the automotive industry which product complex results.

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

The Rhopoint TAMS® measures surface texture.

Rhopoint TAMS® measurement

The measurement parameters of the Rhopoint TAMS® provides values for the individual elements that contribute to how the surface is viewed by the consumer (final appearance)

SHARPNESS

Sharpness quantifies the accuracy of images reflected in the surface. 100% indicates a perfect reflection.

At close distances (<0.5m) Sharpness measures how well a surface reflects fine details. At showroom viewing distance, (1.5m) Sharpness quantifies haze and clarity.

CONTRAST

Contrast is related to the color of the surface; white and metallic surfaces have low contrast, a deep black measures 100%.

Contrast influences the visual impact of orange peel and haze effects, both being more visible on high contrast dark colours.

DOMINANT STRUCTURE SIZE

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.

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.

WAVINESS

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.

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.

Rhopoint TAMS® measurement

The measurement parameters of the Rhopoint TAMS® provides values for the individual elements that contribute to how the surface is viewed by the consumer (final appearance)

CONTRAST

Low Contrast

High Contrast

Contrast is related to the colour of the surface; white and metallic surfaces have low contrast, a deep black measures 100%.

Contrast influences the visual impact of orange peel and haze effects, both being more visible on high contrast dark colours.

DOMINANT STRUCTURE SIZE

Small Dominant Structure

Large Dominant Structure

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.

SHARPNESS

Low Sharpness

High Sharpness

Sharpness quantifies the accuracy of images reflected in the surface. 100% indicates a perfect reflection.

At close distances (<0.5m) Sharpness measures how well a surface reflects fine details. At showroom viewing distance, (1.5m) Sharpness quantifies haze and clarity.

WAVINESS

Low Waviness

High Waviness

Correlated to human perception, waviness quantifies the visible impact of surface waves to an observer at showroom distance (1.5m).

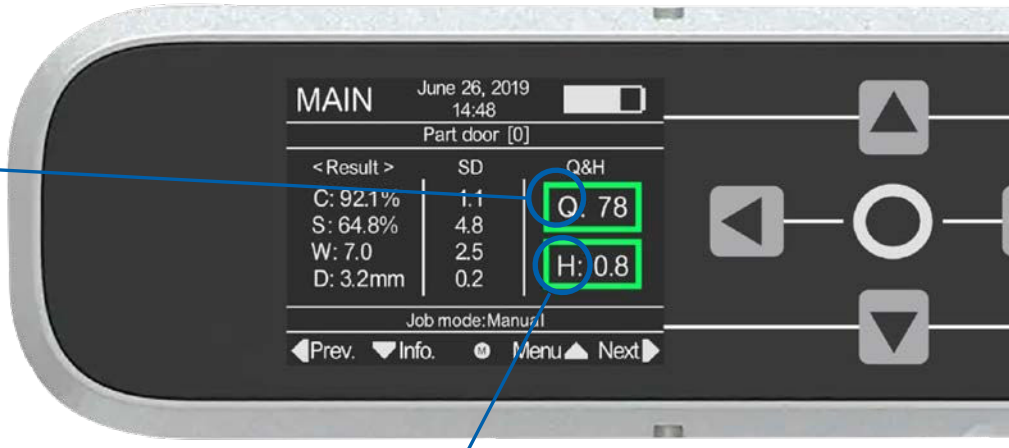
The waviness of a surface is critical for determining appearance quality.

Measurements that match visual perception

In addition to providing major surface parameters, customer visual preferences can be judged by unique Quality and Harmony indices

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.

Ethically Sustainable

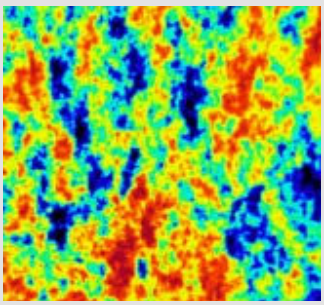
The Rhopoint TAMS is made from an all aluminium construction which means it can be recycled at the end of its long life.

Sample results and correlation

Rhopoint TAMS® allows the quality of each stage of a typical coatings process to be measured and quantified

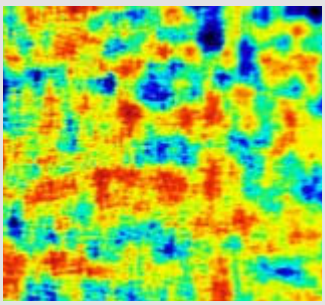
Steel

TAMS®
Q=67.8



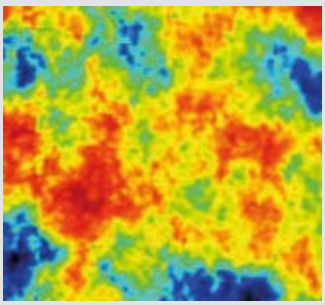
RAW

$Ra_{0.8}$=0.4µm
$Wa_{10\text{-}50}$=0.59µm



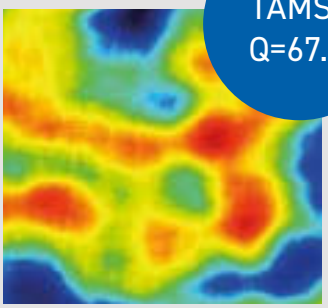
E-COAT

$Ra_{0.8}$=0.10µm
$Wa_{10\text{-}50}$=0.17µm



B-COAT

$Ra_{0.8}$=0.19µm
$Wa_{10\text{-}50}$=0.34µm

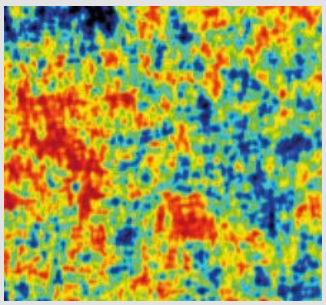


C-COAT

$Ra_{0.8}$=0.02µm
$Wa_{10\text{-}50}$=0.21µm

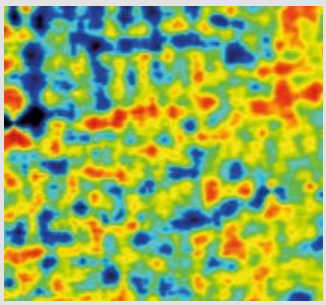
Aluminium

TAMS®
Q=61.2



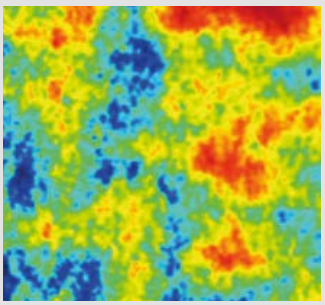
RAW

Ra0.8=0.32µm
Wa10-50=0.32µm



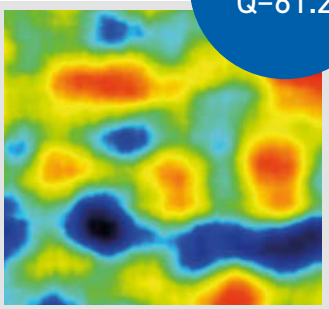
E-COAT

Ra0.8=0.13µm
Wa10-50=0.21µm



B-COAT

Ra0.8=0.14µm
Wa10-50=0.29µm



C-COAT

Ra0.8=0.03µm
Wa10-50=0.29µm

Features

Easy to use interface

5 capacitive sense buttons

Colour Screen

Full colour IPS screen

Soft-touch

Does not damage delicate surfaces

Measurement Operation

Tactile button & capacitive sensors with a push auto system

Processing Time

Capture and processing time = 10 seconds

Long Lasting

Rechargeable & removeable lithium polymer batteries

Included Accessories

- Docking station
- Batteries (x2)
- Calibration tile
- SD Card
- Optimap reader license
- Wrist strap
- Instrument calibration certificate
- Carry case

Specifications

WS-BANDS (C-/E-COAT)	Sa_A	Sa_B	Sa_C	Sa_D	Sa..E	Sa_LW	Sa_SW
Bandpass Filter [mm]	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
Resolution (on display)				0.1			
Repeatability [SD]				0.1			
Reproducibility [SD max]				0.3			

C-COAT	Contrast	Sharpness	Waviness	Dominant Structure Size	Quality	Harmony
Index [units]	**C [%]**	**S [%]**	**W[„W“units]**	**D [mm]**	**Q [%]**	**H [„H“ units]**
Minimum	0.0	0.0	0.0	0.5	0.0	0.5
Maximum	100.0	100.0	30.0	6.8	100.0	8.9
Resolution [on display]	0.1	0.1	0.1	0.1	0.1	0.1
Repeatability [SD]	0.1	0.1	0.1	0.1	0.1	
Reproducibility [SD max]	0.5	1	0.2	0.2	1.2	

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
Index [units]	**Sa [µm]**	**RaX [µm]**	**RaY [µm]**	**RsM [mm]**
Minimum		0.0		0.3
Maximum		20		9
Resolution [on display]		0.1		
Repeatability [SD]		0.1		
Reproducibility [SD max]		0.3		

Free extended 2 year warranty: Requires registration at www.rhopointinstruments.com within 28 days of purchase. Without registration, 1 year standard warranty applies.

Calibration and service: Fast and economical service via our global network of accredited calibration and service centres. Please visit www.rhopointinstruments.com for detailed information.

Specifications

Instrument Information	
Battery Type	Rechargeable lithium-ion
Power Supply	9VDC 2.0A
Readings per charge	1200
Memory	>100,000 readings
SD Card Slot	up to 32GB (only for data transfer)
Interfaces	SD Card, micro USB
Operating Temperature	15-40 deg Cell
Commodity Code	9027 5000
Calibration Temperature/humidity	22deg Cel ±2.5 Humidity ≤ 55%
Storage Temperature/humidity	0°C - 45°C
Display	LCD: Color IPS screen
Control	5 touch keys, 2 physical buttons, Sensor system
Additional Sensor	Accelerometer for instrument orientation recording
Resolution (surface)	37µm/pixel
FOV	27mm x 16mm
Data Management	Smart manager, Export via SD Card

Dimensions & Weights	
Dimensions	172mm (H) x 129mm (W) x 53mm (D)
Weight	1kg (including batteries)
Packed Weight	9.15kg
Packed Dimensions	51 (H)x 51 (W) x 51 (D)

Measurement Time	
Typical Acquisition Time	5s
Typical Computation Time	2s (dependent on selected image saving and filtering option)

Order Codes	
Total Appereance Measurement System (TAMS) with Docking Station - Region A	A7100-001-DA
Total Appearance Measurement System (TAMS) with Docking Station - Region B	A7100-002-DB

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