TQC PowderTAG

LD5850

User Guide
V1.1 0117

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Warranty

TQC will grant a warranty for a period of 12 months for TQC PowderTAG and 12 months for all related equipment from the date of delivery in respect of any evidence of faulty workmanship and materials. Should a delivered consignment prove to be contrary to contract upon inspection, the customer shall grant TQC the opportunity hereunder of removing the fault, or else the customer may demand a replacement. Should the supply or delivery of any improvement or replacement not prove possible, the customer may choose between having the purchase price reduced or in demanding the contract of sale to be rescinded (conversion). Damage resulting from natural wear and tear, mechanical or chemical damage, an act of God or non-compliance with the operating instructions shall be excluded from the warranty as well as mechanical interference by the customer or by third parties with TQC PowderTAG and related equipment without TQC's written permission. No liability will be accepted for defects, damage or injury caused due to use not carried out in accordance with the manufacturer's user instructions.

To claim warranty, the rejected product has to be sent to TQC together with the original invoice, any exchange before the product has been returned to TQC is not possible. TQC reserves the right to repair, exchange or supply an equivalent substitute. TQC is not liable for handling or transport costs. Warranty on the purchase price is limited, all liability for consequential damages or changes in technology is expelled.

This product complies to
- Low Voltage Directive 2006/95 / EC
- EMC Directive 2004/108 / EC

This product is RoHS 2 compliant (2011/65/EU)

DO'S AND DON'TS

- Bright colours may need extra calibration! (see chapter 6)
- Probe distance is important, measuring angle NOT
- User calibration settings always relate to a specific powder from a specific manufacturer and NOT to a specific colour.
- The measurement object needs to be cooled down when the measurement is performed.
- The cured setting is not meant for QC applications as per formed by a regular coating thickness gauge. It mainly comes in handy on curved objects and corners that cannot be measured with a regular coating film thickness gauge
- In case of new combinations of materials check measured PowderTAG values against a regular coating thickness gauge.
- When a second layer of coating is applied the PowderTAG will add 25% of the layer thickness of the first (cured) layer to the measured value of the second layer. To calculate the actual layer thickness of the second layer this 25% has to be substracted from the measured value.

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CONTENT

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CONTENT

1. INTRODUCTION

The PowderTAG is a photo-thermal gauge which measures film thickness non -contact and non-destructive. It complies with standard: DIN EN 15042-2. The small and robust instrument is suitable for fast and precise coating thickness measurement of powder coatings on metallic substrates before and after cure. The measurement system consists of a sensor and a display device. The sensor is connected to the display device with a cable.

Please note that the performance-, range- and accuracy of the PowderTAG is depending on the structure and specific colour of the powder coating. The majority of powder coatings can be measured without any problems. In rare occasions the coating is not compatible with the photo thermal technology or special settings are required.

Special settings always relate to a specific powder from a specific manufacturer and NOT to a specific colour.

Because heat disturbs the photo-thermal measuring principle, the measurement object needs to be cooled down to approx 40°C when the measurement is performed.

1.1 Information on the Instructions
This manual allows for the safe and efficient use of the instrument. The manual is part of a measuring instrument and must at all times be kept accessible and nearby the gauge for the staff.
The personnel must have read and understood this manual carefully before starting work.
Basic requirement for safe working is the observance of all specified safety and handling instructions in this manual.
Moreover, the local work safety regulations and general safety regulations for the application of the PowderTAG shall apply.
Illustrations in this manual are provided for basic understanding and may differ from the actual design.

1.2 Safety
All warnings must be read and observed in order to work safely and securely with the gauge.
Never make the warning labels on the instrument unrecognizable. Keep these instructions in a safe place and pass them with the instrument.
Observe the detailed safety instructions in section 8.2!

1.3 Copyright
The copyright of this operating manual remains with TQC.
This operating manual is intended solely for the user and his personnel. Its instructions and guidelines may not be duplicated, circulated or otherwise passed on to others, neither fully, nor partly. Infringement of these restrictions may lead to legal action may be taken if this restrictions are infringed upon.

1.4 Manufacturer's/Supplier's address

TQC	The Netherlands,
Molenbaan 19	T +31(0)10-7900100,
2908 LL Capelle aan den IJssel	F +31 (0)10-7900129

2. THE INSTRUMENT

2.1 General
The PowderTAG is delivered in a rugged hard carrying case.

The package includes:
- A photo-thermal coating thickness sensor with cable
- A display unit for displaying the coating thickness readings
- Four Li-Ion batteries plus extra pack of four Li-Ion batteries
- Quad Charger for Li-Ion batteries
- Rubber harness to protect the display unit
- Verification tool (see chapter 4.4)
- Manual

The display unit has a large graphic display (128 x 64 pixels) with backlight that allows easy reading even in the dark.

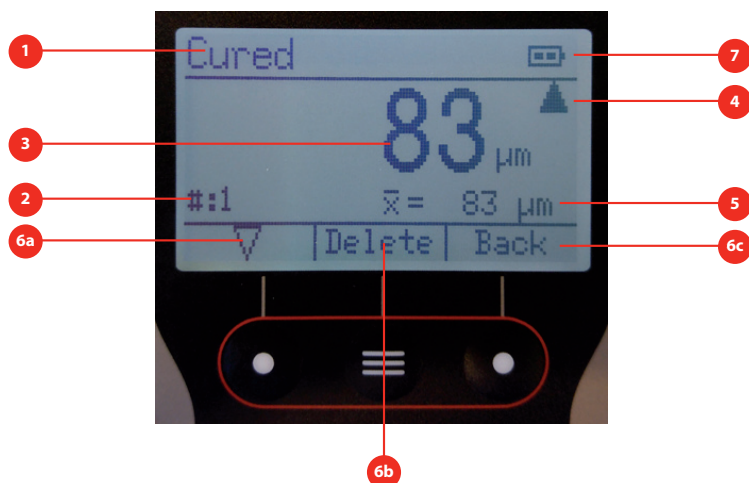## 2.2 Details

a.	On/Off button
b.	Measurement button
c.	Context-sensitive function buttons
d.	Sensor with led pointers
e.	Coating thickness sensor plug
f.	Display unit socket
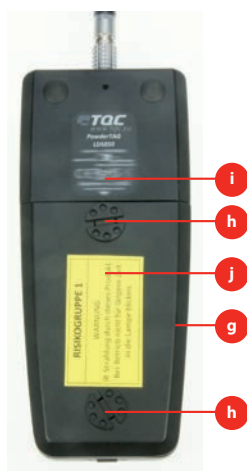
g.	Battery compartment lid
h.	Fixation screws
i.	Rating plate with serial number
j.	IR warning sign

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1. Measure settings	5. Statistic function:
2. Number of measurements	⨯ Mean value
3. Measurement value	σ Max deviation
4. Compliance to set limit values	⊤ Highest value
▲ Too high	⊥ Lowest value
○ Compliance	6. Description context-sensitive function buttons
▼ Too low	7. Battery level

2.3 Operating principle

The on-off button (a) is used to turn the instrument on or off.
Activating the sensor and triggering of measurements is carried out with the large, easy identifiable measure button (b) in the middle of the device. The triggering of measurements is only possible when the measurement or calibration function is selected and the probe (d) is plugged (e) in the display unit socket (f).
The menu is easy to operate with three context-sensitive function buttons (c). The functions of the buttons are shown in the menus (6) on the respective buttons.

2.4 Power Supply
The PowderTAG is powered by four Li-Ion batteries 3.7V type (included). It is not suitable for operation with conventional 1.5V AA batteries.
To charge the batteries, an external battery charger (included) must be used. This charger is exclusively designed for Li-ion batteries.
For safe handling of the batteries, please refer to Section 6.3.

NOTES
- Remove the batteries from the unit when the instrument will not be used for an extended period. The battery level indicator (7) in the measurement menu shows the battery level in 4 steps.
- A blinking empty battery icon indicates that the batteries are nearly discharged.
- When the battery level drops below a critical voltage, the meter turns off to prevent itself from a deep discharging of the batteries.
- Even though the meter is designed for long operating times, we suggest to take a set of fully loaded spare batteries with you in case you want to perform on-site measurements.
- Measurement errors due to discharged batteries are not possible because the meter shuts down upfront or cannot be turned on.
- Defective batteries are hazardous waste and must be disposed of in accordance with the statutory provisions.

3 GETTING STARTED

This chapter is intended for first-time users of the instrument. It is a quick introduction to the use of the instrument and highlights the essential functions shortly.

3.1 Insert batteries and connect sensor

1. Take the instrument and the batteries out of the storage case.
2. Take the instrument from the rubber harness and remove the screws (h) on the battery compartment lid (g) manually or, for example, using a coin.
3. Insert the batteries into the battery compartment. Pay attention to the correct polarity (see battery compartment).
4. Close the battery compartment lid (g) and secure it with the screws(h).
5. Slide the display unit back into the rubber harness.
6. Take the sensor out of the case and push the plug on the cable end (e) into the corresponding socket (f) at the top of the display unit. There is only one correct way: the red spot on the plug and the red spot on the socket should face each other.

3.2 Starting the PowderTAG and perform measurements

1. Press the on-off button (a) for 2 seconds to turn the PowderTAG on. The instrument is immediately ready for operation. The display shows the selected application (1).
2. In the initial start-up the factory calibration is preselected. This is suitable for simple, fast measurements. It should however be noted that, depending on the measurement task, larger measurement inaccuracies may occur.
3. Activate the sensor by pressing the measurement button (b) once. An active sensor is acoustically confirmed and indicated by a steady light of the LED pointers (d); Do not stare in it directly. The instrument is now ready to measure.

4. Point the sensor to the object. Make sure the three LED pointers combine into one point on the object. This is the correct measuring distance.

5. Press the measurement button to trigger the measurement (b). Start and end of the measurement are indicated by a brief flash of the positioning LEDs and an acoustic signal.
6. The measurement result (3) is shown on the display. The meter is ready for the next measurement.
7.   If you want to delete the measurement press delete (c6) shortly. If you want to start over with the statistics (if enabled), press delete (c6) long and all measurements will be deleted.

4 USER INTERFACE

4.1 Main menu
After turning the unit on the measurement screen appears. The context sensitive function button on the right (c3) has the function 'back'. This can be read in the display (6c). It takes you back to the main menu.

The context sensitive function buttons (c) should be used to navigate (6) through the menu:

Measure:
Opens the measurement screen with the recently used calibration and the last recorded values. Previously commenced measurements can be continued immediately.

Measure settings
Opens the menu to select a new calibration.

The following applications (calibrations) are available:

Powder:	Measures the expected dry film thickness after cure of powders with an expected dry film thickness under 200 µm. This function probably will be used mainly.
Powder Thick:	Measures the expected dry film thickness after cure of powders with an expected dry film thickness of 200 µm and up. If the expected coating thickness is more than 150µm or 200µm and errors occur during measurements, we advise to choose this setting and continue with the measurements.
Cured:	Measures the dry film thickness after cure. The cured setting is not meant for QC applications as performed by a regular coating thickness gauge. It mainly comes in handy on curved objects and corners that cannot be measured with a regular coating film thickness gauge
User Calibration:	See chapter 6
Limits:	Activate and set min max limits

Instrument Settings
Opens the menu for basic settings and provides access to language, statistics, units, precision mode, sound, power saving, check instrument, factory reset and information.

4.2 Measurement screen
The measurement screen shows layer thickness measurements and statistical information can be read.

By pressing the left context sensitive function button (6a) the display of statistical values
(if enabled) can be switched between the following statistic functions:

$\overline{X}$ Mean value

σ Max deviation

$\overline{T}$ Highest value

$\underline{\perp}$ Lowest value

When coating thickness limits are defined (see Section 4.3.1), the left context sensitive function
button description (6) shows compliance (O) or higher (▲) is - or lower (▼)
Pressing the center function button shortly, deletes the last recorded measured value. Pressing it
long deletes all recorded values.
Pressing the right function button opens the main menu.

4.3 Measure settings
The Measure Settings menu allows you to load, edit, create and delete calibrations, and set limits.
Use the arrow (6) keys (c) to highlight the corresponding calibration and press OK. You will
immediately be redirected to the measurement screen. The desired calibration (1) appears in the
display and you can start a measurement immediately.
For more information on creating and editing calibrations, see Chapter 6.

NOTE   It is not possible to delete or edit factory calibrations.

4.3.1 Limit values
Selecting the function 'limit values' (at the end of the measure settings menu list) opens a cor-
responding menu for selecting and activating limit values.
You can switch the limit values on or off by pressing the OK button (c2) when the desired
function is selected. To change the Min and Max values, press the arrow function button (c1)
until the cursor is at the position you want to change. Press the arrow function button (c1) again
to change the value (position) and confirm with the OK function button. The cursor jumps to the
next digit. Repeat this for each digit. Use the arrow button (c1) to change or confirm with the OK
button (c2).
Compliance with or under-/overshoot of activated limit values are indicated symbolically (4) in
the measurement screen
Selecting the Back button (c3) saves the settings you have made and returns you to the Measure
Settings menu.

4.4 Instrument Settings

The following functions can be changed in the Instrument Settings menu:

Language: English, German, Dutch*
Statistics: On or Off* When on is selected the display shows the statistics (5)
                       while measuring
Units: Micron (μm) or mils*
Precision mode: On or Off*
Sound: On or Off*
Power Saving: Always 0n, 3, 6, or 10 min*
Check Instrument: Checks the IR source. If the result is "not okay' for five times in a row,
                       even after changing batteries, the instrument needs to be returned to
                       TQC.
Factory reset: Deletes all measured values, user calibrations, and user settings
Information: Displays the version and date

*To change the settings, select (c1) the correct setting and press the OK button (c2).

4.4.1 Check instrument

1. Go to the instrument settings menu and choose Check instrument
2. Take the reference socket / verification tool out of the case
3. Place the sensor on the reference socket verification tool as shown on the picture
4. Press the OK button to start the check
5. The displays shows if the test function (IR source) is OK or not (NOK)
6. If the result is "not okay' for five times in a row, even after changing batteries, the instrument
    needs to be returned to TQC.

5 MEASURING MODE

5.1 Notes for coating thickness measurement
To carry out the correct film thickness measurements not only a proper handling of the measuring instrument are an advantage, but also a basic knowledge of general handling of coating thickness gauges and the corresponding metrological requirements.

This mainly concerns the following topics:
- Selecting the suitable measuring method
- Statistical evaluation methods of measurement series
- Interpretation of measured values

We recommend in case of new (and random sample-based) combinations of materials, to check measured values of the PowderTAG against values obtained by other layer thickness measurement methods (such as a regular coating thickness gauge). If necessary the PowderTAG values can be corrected via a user calibration. (see section 6.3)

5.2 Preparation for Measurement
Select the calibration that suits the measurement task. Depending on the application, you can select an existing factory calibration (powder, powder thick, cured). Measurements with maximum measuring accuracy can be achieved with calibrations that have been created from the combination of materials to be examined. (See Chapter 6).

NOTE When a second layer of coating is applied the PowderTAG will add 25% of the layer thickness of the first (cured) layer to the measured value of the second layer. To calculate the actual layer thickness of the second layer this 25% has to be substracted from the measured value.
E.G.: the first layer (cured) is 100 µm. The PowderTAG measures 85 µm on the second layer. Then the actual thickness of the second layer is 60 µm. (25% of 100 µm = 25 µm. 85µ - 25 µm = 60 µm)

5.3 Performing measurements

5.3.1 Freehand measurements
Photo-thermal measuring processes are non-contact thus non-destructive.
While performing a freehand thickness measurement it is important to keep the correct working distance to the object. The LED-pointer helps to achieve this. The pointer consists of three on the sensor positioned LEDs. When the three LED pointers combine into one point on the object the correct distance is achieved and a measurement can be performed.

5.3.2 Measurements with distance cap
Generally, the use of a distance cap (Art. No LD5852, to be ordered separately) is recommended for touch-sensitive materials. This makes it possible to maintain an accurate working distance without the risk of touching an object.

5.3.3 Measurements with Tripod
For the contactless measurement of small parts and geometries, we recommend using a tripod.

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6 CALIBRATIONS

6.1 General guide lines

Measure settings menu of the PowderTAG shows all the Calibration options. Three factory calibrations are available: Powder, Powder Thick and Cured.

It is possible to create user calibrations based on the factory calibrations. The PowderTAG has the option of single-point or two-point calibration.

To ensure an optimum calibration the following should be observed:
The quality of a calibration influences how precisely the layer thicknesses of a material system can be determined. A careful approach is therefore essential.

Please note that the powder coatings may vary greatly in nature and composition. Since the color in the photo-thermal layer thickness measurement also plays an important role, under certain circumstances, despite calibration it occasionally may come to unsatisfactory measurement results in the color range of bright yellow, orange and red!

Calibration should be performed on a calibration object. The material properties of this calibration object should match the material properties of the object to be measured as closely as possible. The better both objects match the better the calibration, thus the accuracy of measurement.

The results of a film thickness measurement only covers the measured positions of an object. It is therefore important to ensure that the measurement position matches the created calibration and the measurement position of the reference method. Moreover, it should in certain circumstances be ensured (by means of statistical methods), that the layer thickness information of the reference measurement and the calibration measurement are obtained from the same measurement area. This is particularly important with rough objects.

6.2 Factory calibrations

The PowderTAG has three factory calibrations (powder, powder thick and cured, see 4.1)

Powder	Measures the expected dry film thickness after cure of powders with an expected dry film thickness under 200 µm.
Powder Thick	Measures the expected dry film thickness after cure of powders with an expected dry film thickness of 200 µm and up.
Cured	Measures the dry film thickness after cure

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NOTE   The "Check Instrument" function in the "Instrument Settings" menu is no calibration tool. It only checks the IR-source (see 4.4)

6.3 User Calibration
The PowderTAG allows the use of up to 20 calibrations. You can create a new calibration by selecting New Calibration (Measurement Settings> User Calibration> New Calibration). In the field type a factory calibration (powder, cured, powder thick) suitable for the material system to be examined can be selected. It contains basic information like measuring times and measuring method. After saving the new calibration, the menu for single-point calibration or two-point calibration pops up. This allows for rapid calibration.

6.4 Calibration Methods

6.4.1 Single point calibration - Powder
After confirming Powder and single-point calibration, you end up in the measured value recording of the calibration menu. Here you can make measurements, and adjust the measurement value manually.

We suggest the following calibration procedure for Powder application:
• Create a reference object and choose the area you want to measure.
• Take a series of 5 measurements of this area with the PowderTAG. Use the measurement button (b) to perform the measurement. The PowderTAG displays the mean of all measurements.
• Remember the area you have measured.
• Cure the reference object.
• Take a series of 5 measurements of the cured reference object on the same area, but with another layer thickness measurement method (such as a regular dry film thickness gauge). The mean of this measurements is the desired value.
• Use the cursor and the arrow key to correct the recorded (average) PowderTAG value to the desired value. The value consist of 3 digits that has to be adjusted and confirmed separately. Use Function button 6a to change each digit.
  Use Function button 6b to confirm each digit and to confirm the final value.

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= offset   1A = measured point   1B = calibrated point
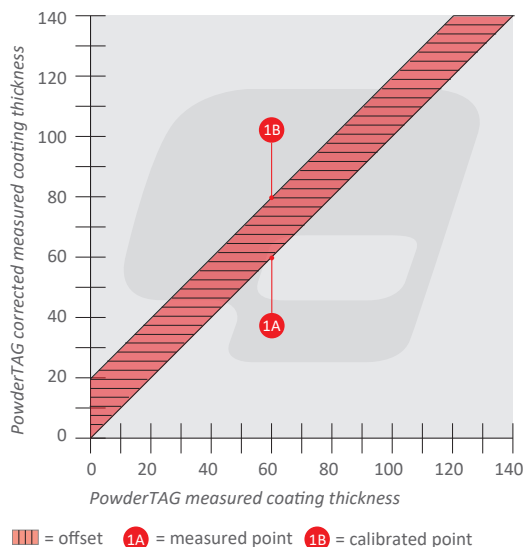
Example: With a regular coating thickness gauge you have determined that the average layer thickness of a certain spot is 80µm. On this same spot the PowderTAG averagely measures 60µm. This way you have determined that a specific powder deviates +20µ to the actual layer thickness. By correcting the value to 80µm (and store it), the deviation is compensated.

NOTE   If no reference values are available during the calibration (for example, because these must be determined by a destructive procedure after calibration), the calibration can be saved and corrected at a later time after a repeated call.

6.4.2 Two-point calibration - Powder

Two-point calibration provides better accuracy than single-point calibration. The results are optimal for layer thicknesses between the reference thicknesses used. It is therefore recommended to use calibration objects which layer thicknesses are at the outer limits of the expected measuring range (for example, components which are at the upper or lower limit of the tolerance range).

To set the calibration, simply follow the procedure described in Section 6.4.1 twice. Once with a low layer thickness and once with a high layer thickness.

= offset 1A = measured point 1B = calibrated point
         2A = measured point 2B = calibrated point
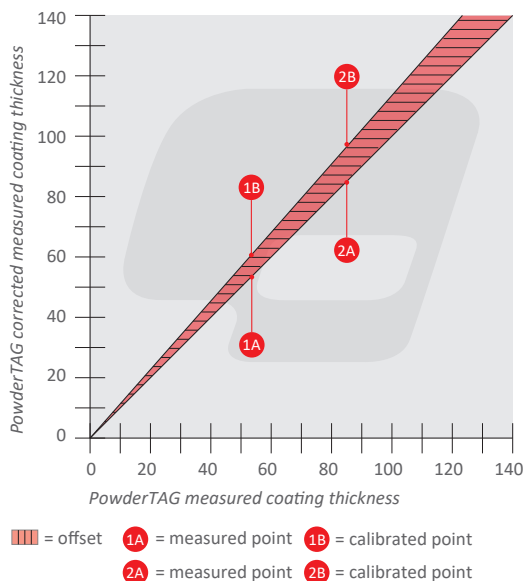
Example: With a regular coating thickness gauge you have determined that the lower layer thickness averagely is 60µm. On this same area the PowderTAG measured a mean of 53µm.
The average higher layer thickness of another area is 100µm, measured with a regular coating thickness gauge, whereas the PowderTAG measures 85µm on this area.

This way you have determined that a specific powder deviates +7µ to the low layer thickness and + 15 µm to the higher layer thickness. This offset is calculated throughout the range, as shown in the chart below.

NOTE If no reference values are available during the calibration (for example, because these must be determined by a destructive procedure after calibration), the calibration can be saved and corrected at a later time after a repeated call.

6.5 Loading Calibrations
Both factory set calibrations and user calibrations can be loaded in the measurement settings menu.
Factory set calibrations are powder, powder thick and cured. User calibrations are listed separately in measure settings > user calibration>load.
After selecting the appropriate calibration the calibration is activated and the PowderTAG switches to the Measurement display.

6.6 Editing User Calibrations

`NOTE` Factory calibrations cannot be deleted or changed!

Go to measure settings > user calibration>edit.
Select the desired user calibration and press OK.
Now you are back in the registered measured value for the calibration. For instance the value of the example as described in Section 6.4.1 will be Offset +20µm.

Use the cursor and the arrow key (6a) to correct the offset. The value consist of 3 digits that has to be adjusted and confirmed separately. Use Function button 6b to confirm each digit. By changing the first digit you can also change the + - offset. The new offset is automatically stored when you touch the back button (6c)

`NOTE` In the edit menu it is also possible to delete the user calibration. When the sentence "Delete Calibration" is marked black, and the OK button (6b) is pushed the user calibration will be deleted.

6.7 Deleting User Calibrations

`NOTE` All measured values and user calibrations can be deleted immediately via the menu Instrument settings >> Factory reset. The PowderTAG returns to the measurement screen. All User settings will be reset as well. (See also section 4.4)

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7 CARE AND MAINTENANCE

7.1 Transport and Storage
The meter should always be stored and transported in the supplied case. It should be noted that the sensor and the display unit should always be placed in the appropriate compartment.

NOTE   Improper storage may cause damage to the instrument.

Carrying case and instrument must be stored under the following conditions
- Do not store outdoors
- Store in a dry and dust free
- Do not expose to aggressive media
- Protect from direct sunlight
- Avoid mechanical vibrations
- Storage temperature: 0 to 55 ° C
- Relative humidity: max. 80%, at temperatures of 32 ° C max. 50%
See also section 7.4.1 Batteries in carry-on baggage (aircraft cabin)

7.2 Maintenance
All maintenance work must be carried out exclusively by the company TQC. In particular, the casing of the display unit must never be opened. For accumulating maintenance the company TQC must be consulted.

7.3 Cleaning
1. Turn off the monitor and unplug the mains plug
2. Wipe display unit and sensor gently with a slightly damp, soft cloth

NOTE   Use of corrosive, abrasive and scratching cleaners can cause considerable damage to the sensor and the display unit.
- Never use solvents for cleaning.
- Always wipe display unit and sensor with a damp, soft cloth.

7.4 Batteries

The supplied Li-ion batteries may only be charged with the supplied charger. The electronics of the charger control the charge-dependent charging current and monitores the correct maintenance-charge voltage. Charging the battery should never take place in the presence of flammable materials!

For optimum storage of Li-ion battery state of charge should be 55-75%, cool storage is favorable. The electrolytes in the cell must not freeze, which corresponds to a minimum temperature of -25 ° C. Recommended storage temperature is 15 ° C at a charge level of 60%. A battery should be recharged every six months to 55-75%.

7.4.1 Precautions - Batteries in carry-on baggage (aircraft cabin)

The battery employed in PowderTAG is a generic single cell Lithium-Ion battery, 3.7V 850mAh. The battery employed in PowderTAG has a capacity of 3.11 Watt-hours, and is rated for low-power use only. A protection circuitry has been applied to the PowderTAG mainboard as per best practice.

Based on US DOT regulations (49 CFR, Sec. 175.10), the CurveX 3 Basic battery satisfies most demands

- The battery is rated below 100 Watt-hours per battery
- The battery is protected from damage and short circuit

The battery is assembled into an end product and classified to be freely transported on aircraft both in carry-on and check-in luggage. When carried-on, please keep the provided product documentation with the instrument in order to be able to provide regulatory agencies relevant information about your instrument when requested.

8 SPECIFICATIONS

8.1 Equipment Specifications

8.1.1 Environmental conditions
Data Value Unit

Altitude	<2000 m
Relative humidity	5 - 80%
Relative humidity	(32 ° C) 5 - 50%
Temperature (operating)	5 - 40 ° C
Temperature (storage)	0 - 55 ° C
Estimated operating time approx	5000 h

8.1.2 Display unit

Depth	42.5 mm
Width	80 mm
Height	180 mm
Weight approx	700g
Power 4 Li-Ion batteries type	14500

8.1.3 Sensor

Length	160 mm
Diameter	45 mm
Weight approx	225g
Measurement period	1024 - 2048 ms
LED - Risk Group	1
Optical power max.	1.5 W
Wavelength	980 nm
Measuring field size	2x2mm
Measuring distance	35 mm
Distance tolerance ± 3 mm	
Angle tolerance	± 15 °

The following values are dependent on the material properties. Indicated are exemplary, typical values.

Resolution about	1% *
Accuracy about	3% *
Layer thickness typ. *	1-300 microns

* Depending on the material properties

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8.2 Safety

8.2.1 Designated purpose

The photo-thermal meter "PowderTAG" is exclusively designed to determine the thickness of wet and dry organic coatings for quality assurance and production-related testing in the laboratory environment as described within the specifications.
Other applications will be considered improper use. TQC will not be held liable for damage resulting from improper use. Designated purpose also includes proper observing all instructions in the operation manual, and adhere to inspection and maintenance schedules.

WARNING!   Misuse of PowderTAG can lead to dangerous situations.
- Never use PowderTAG for medical purposes.
- Never immerse PowderTAG in liquids.

8.2.2 Safety signs

The following symbols and signs are on the instrument. They relate to the immediate environment in which they are mounted.

Position: sensor   Position: Rear of display unit

WARNING!   Danger of illegible signs!
Over time stickers and signs can become dirty or unrecognizable in any other way, so that risks are not recognized and necessary operating instructions are not followed.
This may result in injury.
All safety, warning and operating instructions should be kept clearly legible.
Replace damaged signs or labels immediately.

8.2.3 Hazards by invisible infrared radiation

WARNING!   Health hazard due to invisible infrared radiation!
- Irradiation of the skin near the outlet opening may result in minor burns.
- The red luminous dots are merely a tool and serve to focus correctly on the measuring point. They shine when the instrument configured and ready to measure. The excitation radiation itself is not visible!
- Never point the infrared sensor directly to the eyes and skin.
- Never look into the infrared ray with optical instruments such as magnifying glasses or microscopes.
- If the sensor gets damaged, no longer use the instrument and send it immediately to TQC.

WARNING!   Danger to life in case of fire due to heat development of the infrared beam!
The infrared beam may inflame flammable materials, liquids or gases and cause serious or even fatal injuries.
- Do not use PowderTAG in hazardous areas.
- Don't point the infrared beam directly to highly flammable materials.

8.2.4 dangers involved in using lithium-ion batteries
- Avoid mechanical and thermal loads.
  Mechanical damage can lead to internal short-circuits. Fire hazard!

- Protect batteries from moisture.
  In case of batteries on fire do not extinguish with water, but use for example sand instead.

- *Electrolyte solution is usually combustible. 'Leaking electrolyte solution of Li-ion batteries can* be washed away from the battery with water.'
- Do not short circuit Li-ion batteries.
  Be careful when using tools and metal jewelry. Fire hazard!

8.2.5 Notes on Using the charger
The charger must only be used for charging batteries of the type 14500th
It is recommended to load the batteries at least in pairs (2 or 4 pieces)
in slot 1 and 3 and / or 2 and 4.

The charger is only designed for use indoors.
The operating temperature of the charger is 0 °C -40 °C, heat and humidity should be avoided.

8.3 Disposal
When the instrument has reached its end-of-use, the disposal should be dealt with safely and in a manner that will not harm the environment. Follow the local regulations.

NOTE   When disposed of incorrectly risks to the environment can arise.

9 DISCLAIMER

The right of technical modifications is reserved.

The information given in this manual is not intended to be exhaustive and any person using the product for any purpose other than that specifically recommended in this manual without first obtaining written confirmation from us as to the suitability of the product for the intended purpose does so at his own risk. Whilst we endeavour to ensure that all advice we give about the product (whether in this manual or otherwise) is correct we have no control over either the quality or condition of the product or the many factors affecting the use and application of the product. Therefore, unless we specifically agree in writing to do so, we do
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