

multi-angle spectrophotometer

Operating
Instructions

Betriebsanleitung

Mode d'emploi

Modo d'uso

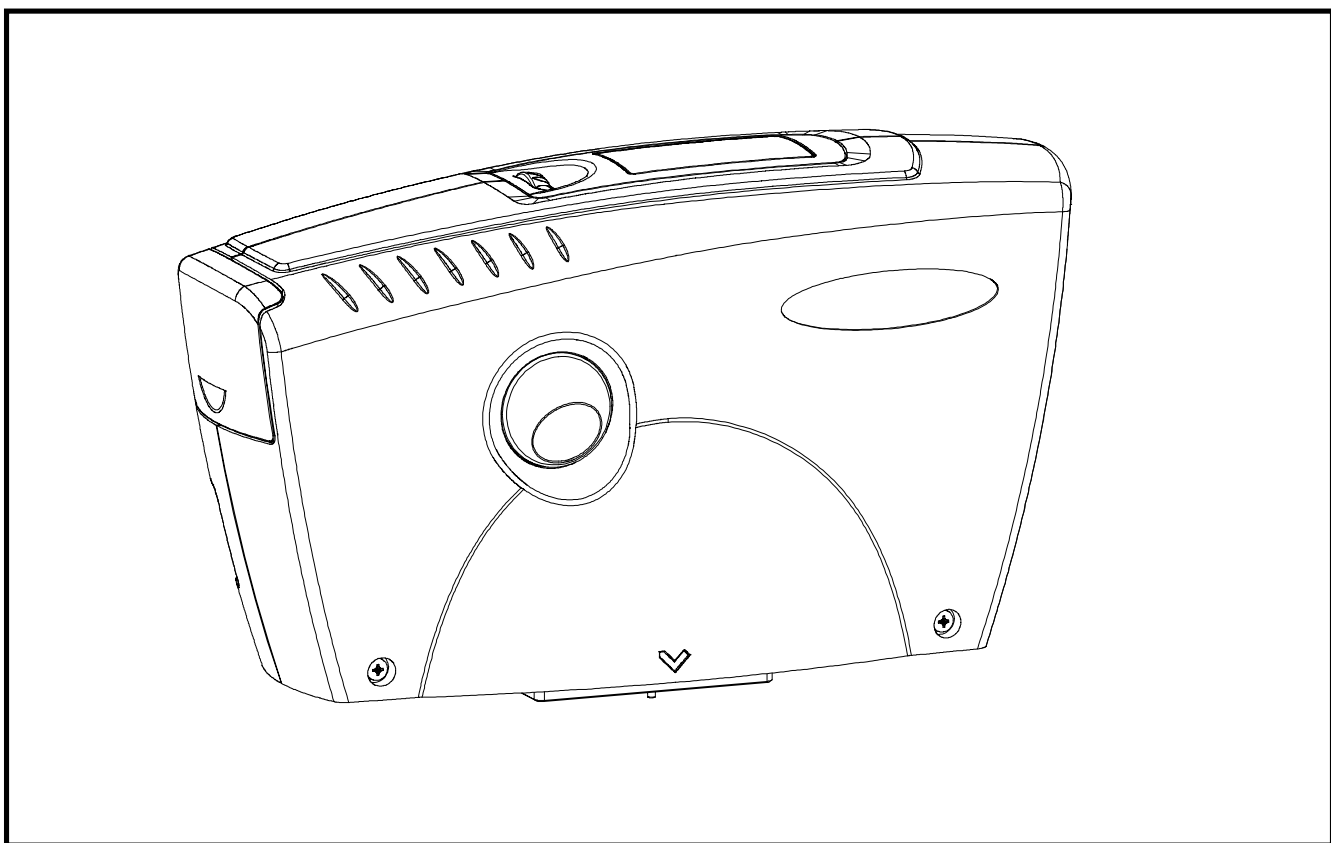
Instrucciones
de uso



For Equipment and
Service please visit:
www.multiangle.net

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Operating instructions
Betriebsanleitung
Mode d'emploi
Manuale d'uso
Instrucciones de uso



Patent pending
Patent angemeldet
Demande de brevet en cours
Domanda di brevetto inoltrata
Patente solicitada

English

Deutsch

Français

Italiano

Español

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Specifications subject to change without notice

1 Description of the System

The multi-angle spectrophotometer is a custom instrument for the use with the DuPont Performance Coatings computer system. The instrument is an easy to use tool for measuring the color of automotive paint finishes and storing the information for the uploading data to the respective software provided by DuPont Performance Coatings.

The instrument is operated by the Operate button and the menu - scroll wheel. Both, the Operate button and the scroll - wheel are used to switch on the instrument.

The display can be configured in English, German, French, Italian or Spanish.

The instrument complies with the following standards: DIN 5033, 5036, 6174; ISO 7724; ASTM D2244, E308, E2194.



- No claims of product liability or warranty can be honored if the device is not operated in accordance with the operating instructions or the instructions on the instrument.



- If you use the unit and accessories properly, there are no hazards to fear – none of a mechanical nature and none caused by electrical shock.

The following paragraphs contain information about the safe use of the device.



- Please use only accessories that are available for the unit. See “Delivery Notes” and the “Technical and Standard Data” for further information.



- Avoid exposure to continuous humidity and condensation (see Technical and Standard Data). Avoid splashing with water, chemicals or other liquids.



- Do not perform any repairs on the unit, neither mechanical nor electrical yourself. The unit must be opened by trained professionals only. Please contact our customer service department in such cases. They will be happy to assist you as quickly as possible.



- Only devices that meet the requirements for low-voltage safety may be connected to the RS 232 interface.



- You can disconnect the measurement device and accessories from the power supply by removing the battery box from the battery compartment.



- When working with the batteries and the battery compartment, make certain there is no short circuit on the contacts. Metallic objects must not come in contact with the bare contacts.



- Safety advices for batteries: Do not crush or dismantle, do not heat or incinerate, do not immerse in any liquid. This may cause explosion or release harmful substances.



- In case you intend not to use the instrument for a longer period of time, take out the batteries in order to avoid that the batteries leaks inside the instrument and thus causes damage.



- **Caution:** Batteries and rechargeable batteries are special waste and must therefore not be disposed of with household trash. Make certain to observe the disposal instructions of the battery or rechargeable battery manufacturer.



- You will find the technical data for all system components such as the measurement unit and battery compartment on the respective manufacturer's plates and in the section Technical and Standard Data



- Defects and extraordinary loads
If safe operation can no longer be presumed, shut down the device and secure it against unintended operation.
The device must be presumed unsafe to operate:

- if visible damage is evident
- if the instrument is no longer working
- if it has been stored for long periods under adverse conditions
- after harsh treatment during shipping.



- Please read the instruction manual before placing the instrument in service and observe the safety instructions.

The measurement unit consists of sensitive optical and electronic precision parts. Treat the unit as an expensive camera. Prevent it from being dropped, bumped or shaken!

Do not hold the unit by the measurement aperture. You should not allow any foreign objects to get into this opening.

Do not expose the unit to direct sunlight for extended periods of time. Do not store it in a hot or dusty environment. The case that comes with the unit offers the best protection when the unit is being stored.

Avoid prolonged high relative humidity and do not allow water to form from condensation (see Technical and Standard data).

Protect the measuring unit from moisture, chemicals and corrosive vapors.

The unit housing is resistant to many solvents. However, we cannot guarantee resistance to all chemicals. You should therefore use a soft, moist cloth for cleaning. For clean excessive dirt and dust, use ethanol or cleaning alcohol. **Do not use any acetone!**

If the device is exposed to excessive static electricity, it may happen that the display goes blank. If this happens, wait until the instrument turns itself off automatically and then turn it on again.

Please note that batteries are special refuse and shall not be disposed of together with household refuse. Pay attention to the producers instruction or how to dispose of the battery.

Before putting the unit in operation, read the operating instructions and pay attention to the safety instructions and general instructions in Section 2. Unpack the device and check the delivery for completeness (for scope of delivery, see Section Delivery notes).

Power supply battery - operated

The batteries must be placed in the measuring unit for operation. The device runs on four AA 1.5-V alkaline batteries.

Use only alkaline batteries (AA /LR6)!

Depending on the exact brand, the capacity of each battery-set is sufficient for about 3.000 measurements. When the battery voltage falls below the required minimum voltage in the course of operation, the following message appears on the display

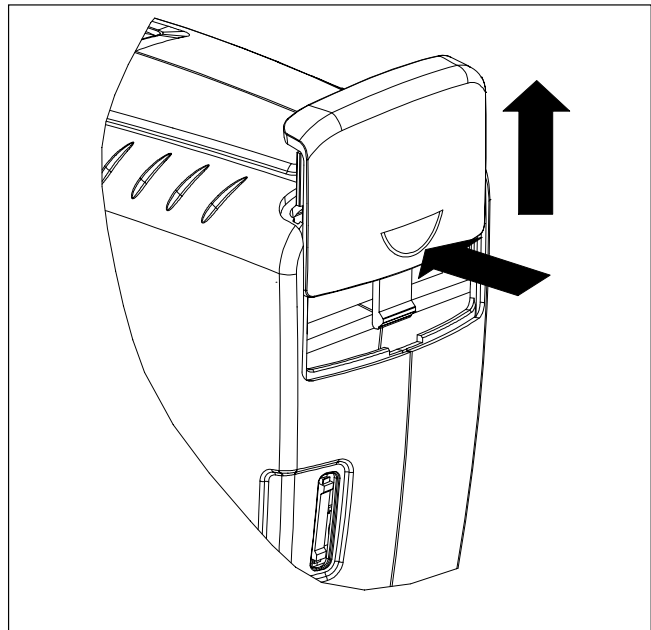
Battery empty!

To ensure that the unit is always ready for operation, it is recommended to have spare batteries handy, especially when performing measurements in the field.

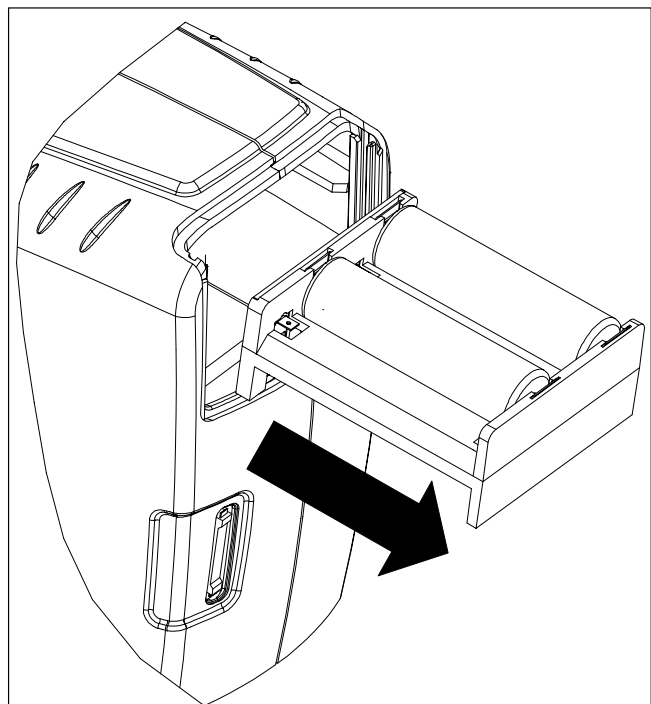
Changing the battery

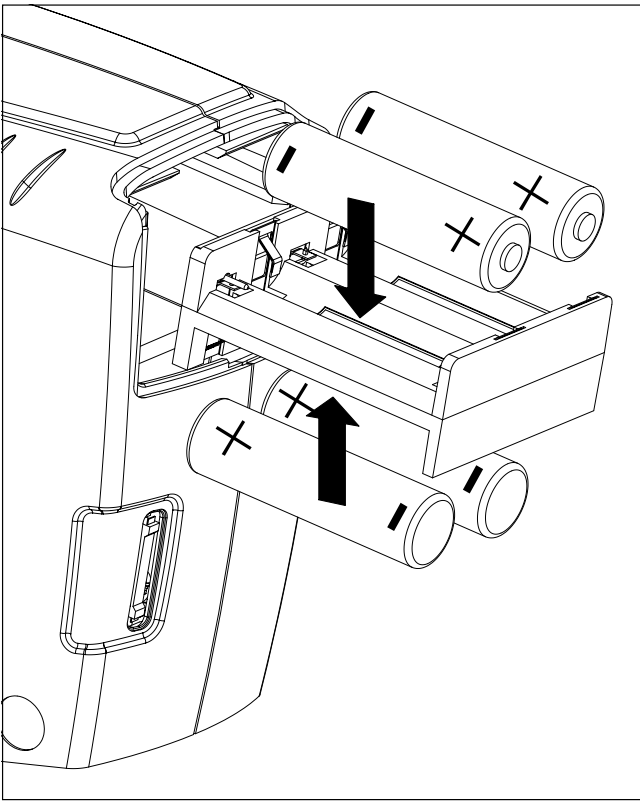
To insert or change the batteries, open the lid of the battery compartment (1) and take out the battery box as shown below (2).

1



2

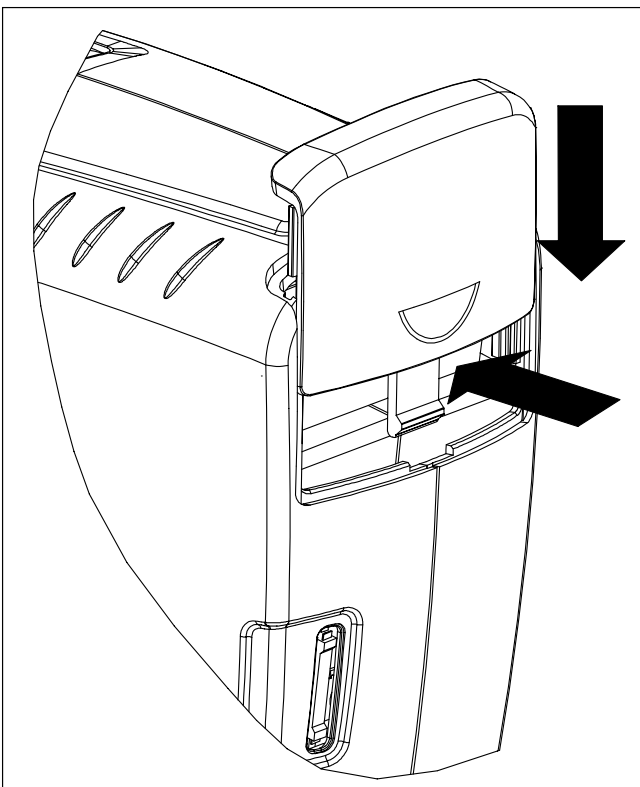




Insert the new batteries.



Make sure that the batteries are correctly oriented in the battery box according to the (+) and (-) marks.

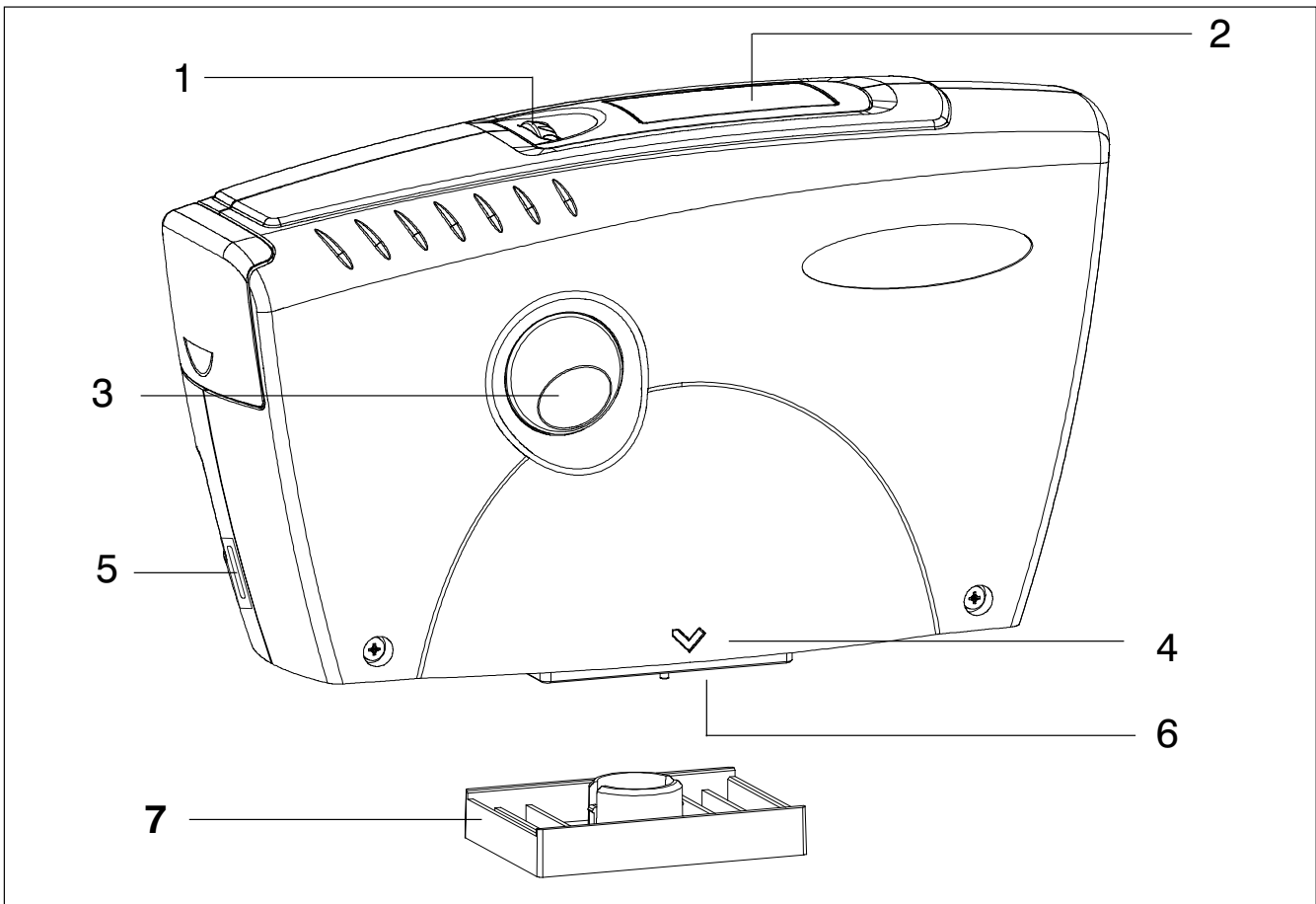


Insert the battery box into the battery compartment and press it inside with one finger. Set the battery compartment cover in the guidance again. Lock the cover by sliding it downwards until it snaps.

5

Controls

English

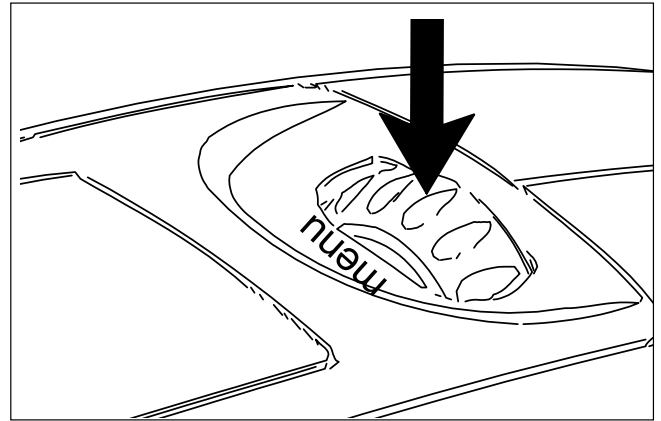


Measurement unit

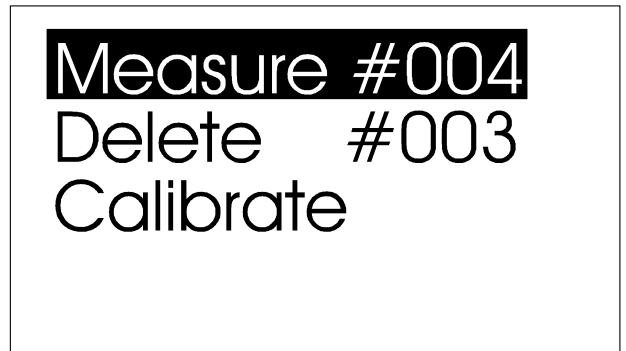
- 1 Menu scroll wheel: turn on and menu selection
- 2 Display for user guidance and displaying measurement values
- 3 Operate button (measurement button): turn on and measure
- 4 Alignment mark
- 5 Interface for connecting to a PC
- 6 Micro switches for detection of correct placement during measurement
- 7 Protective cap

Turning on the unit

To turn on the unit, press the menu scroll wheel or the operate button.

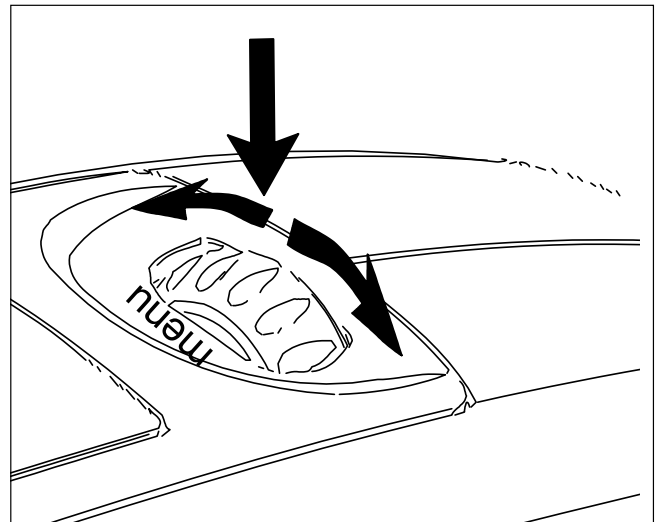


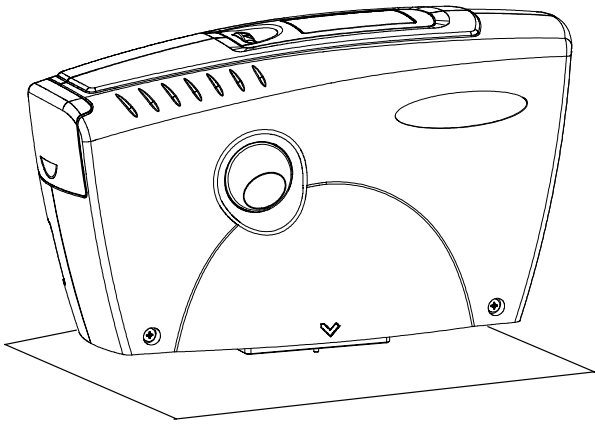
The selection menu appears:



Navigation

The operate button and scroll wheel are used to control the system. Pressing the wheel or the operate button turns the unit on. All settings within the menu are made by turning the wheel and pressing the operate button. Pressing the operate button starts measurements or performs functions that are displayed. System operation is supported by comments and error messages, which appear in the display.





Measurement techniques

In order to obtain accurate and repeatable measurements, the bottom of the instrument must be aligned flat on the surface to be measured. Do not move the instrument while measuring. This can cause the measurement angles to vary, greatly affecting measurement values on metallic paint finishes.

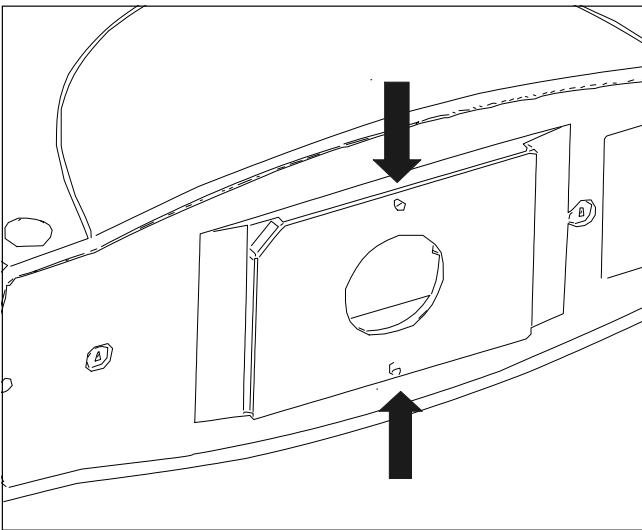
Use the alignment marks on both sides of the instrument to center the measurement aperture over the desired area.

To perform a measurement, both switches on the bottom must be activated and the operate key is pressed.

A measurement requires three readings to be taken around the repair area to complete one stored measurement.

After a reading is completed, the instrument must be lifted and placed on a different spot to re-activate the switches again.

The display will guide you through the readings.



Measure

Select the menu item Measure by pressing the operate button.

The display indicates the number of the current reading and the step within the reading itself.

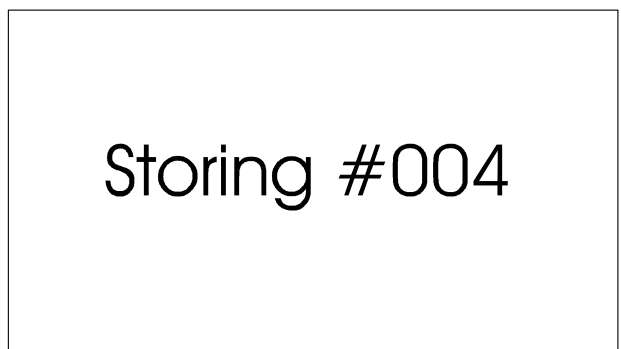
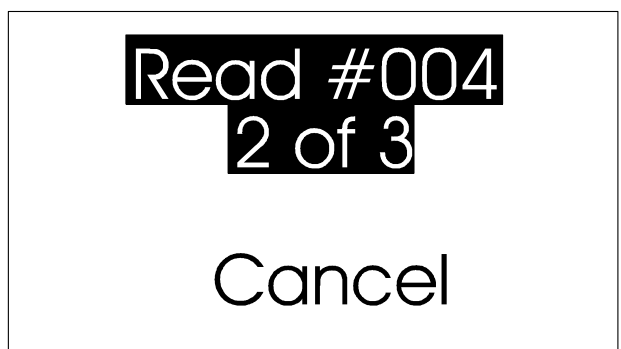
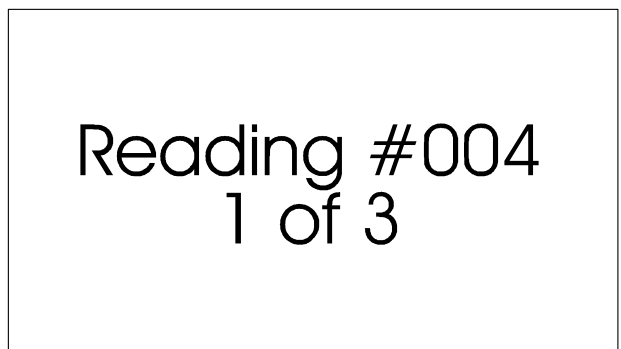
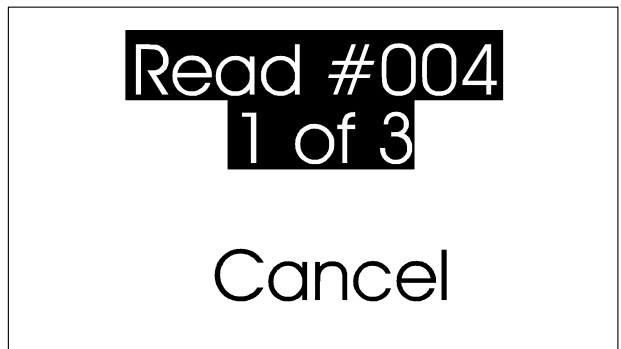
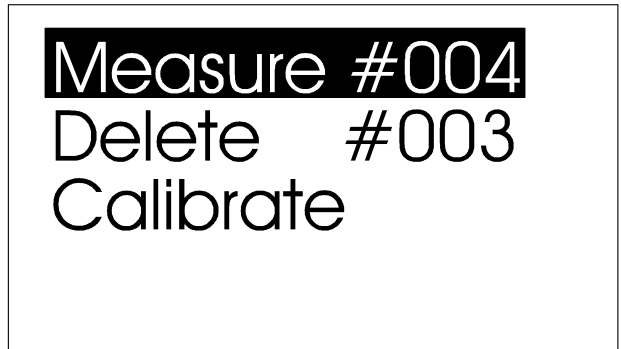
If you haven't positioned your instrument until now, place it on the spot you intend to measure and press the operate button.

The measurement is indicated in the display.

Do not move the instrument while taking a reading.

The instrument is now ready for the next reading. Lift the instrument, place it on the next spot and press the operate button again to perform the next reading. Repeat this step to perform the last reading.

When the last reading is finished, data will be stored.



Calibration Information

English

The device must be calibrated every 7 calendar days. When calibration is required, the device will display a message to calibrate before allowing the user to read a vehicle.

You should recalibrate the device if ambient conditions have changed. This applies especially when changing location and if major changes in temperature and relative humidity may be expected as a result (for example inside/outside).

When moving from cold areas to warm areas, there is a danger of condensation. For this reason, after there has been a change in ambient conditions, you should wait for an appropriate amount of time to allow the optical components to adjust before calibrating and using the unit.

Calibration Notes

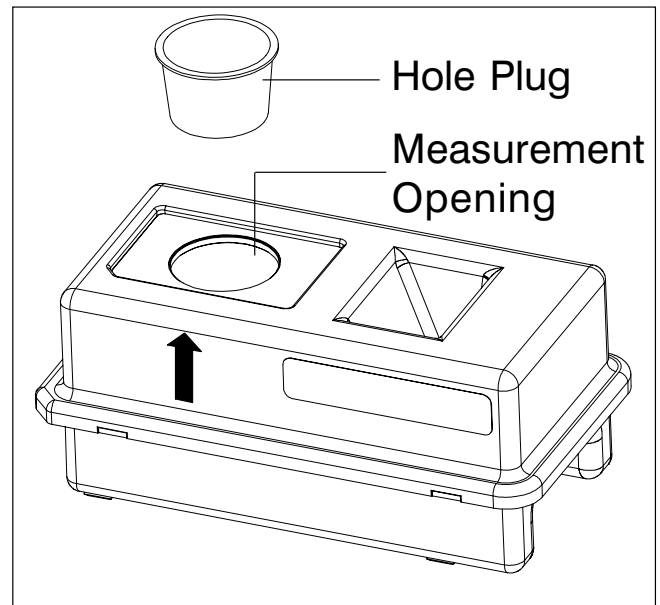
- Dirt or dust in the optics area will cause an inaccurate calibration reading. Therefore, always use the protective cap if no readings are taken.
- The white standard is dramatically affected by dirt, dust and finger prints. For cleaning procedure see section "Cleaning and Maintenance".
- The black trap should be cleaned periodically. It can be taken apart for easy cleaning. For cleaning procedure see section "Cleaning and Maintenance".
- Before you position the instrument on the black trap, make sure that you have removed the hole plug. After having calibrated the instrument, close the black trap with the hole plug again. Always store black trap with hole plug in place when not in use.
- Use the alignment marks on the instrument, the white standard and the black trap when you position the instrument into the indentation of the white standard or the black trap.
- Do not move the instrument while taking a calibration measurement. If motion is detected, an error message will be displayed and calibration aborted.

Black Trap

The black trap is used to perform the zero reflectance measurement. Remove the hole plug and position the instrument over the opening. The instrument snaps into the indentation of the black trap and can only be positioned in one direction. Use the alignment marks on the instrument and the black trap as guides.

The black trap can be taken apart for cleaning. Refer to chapter Cleaning and Maintenance.

Always store black trap with hole plug in place when not in use.

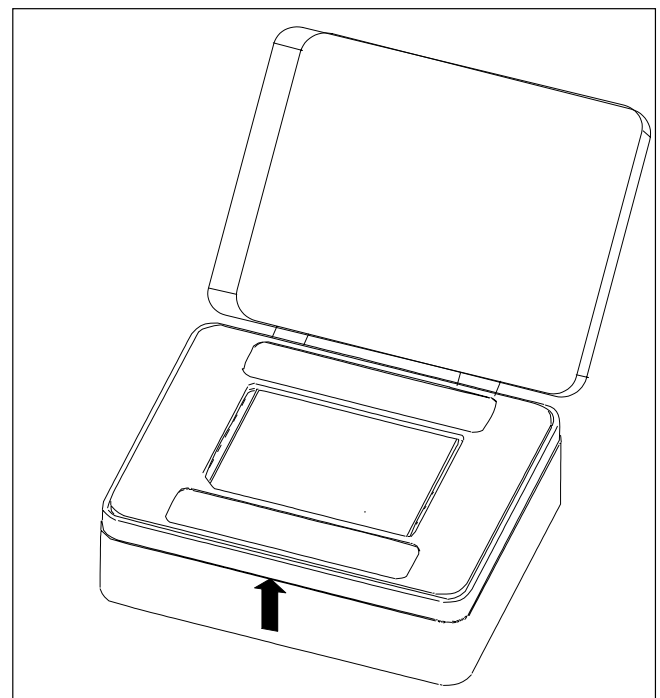


Black Trap

White Calibration Standard

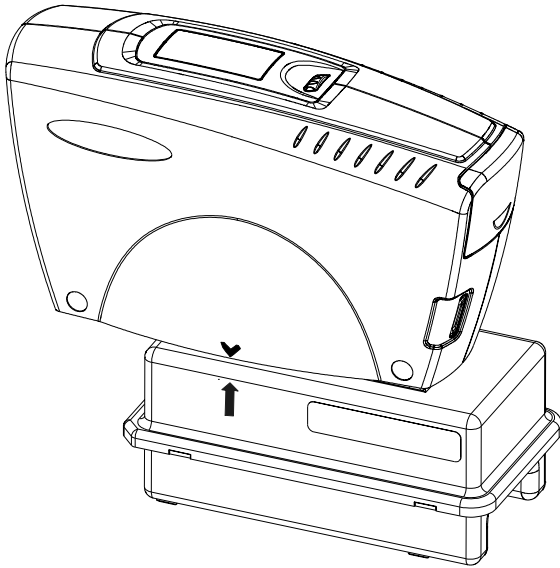
The white calibration plaque is concealed in a case that has a hinged cover. Open the cover and position the instrument on the white standard. The instrument snaps into the indentation of the standard and can only be positioned in one direction. Use the alignment marks on the instrument and the standard as guides.

Note: Make sure that the white calibration standard and the black trap are clean. Refer to section "Cleaning and Maintenance".



White Calibration Standard

Measure #004
Delete #003
Calibrate



Read Black

Cancel

Calibrate

Turn the unit on by pressing either the menu scroll wheel or the operate button.

Choose the menu item Calibrate from the main menu with the menu scroll wheel and activate it by pressing the operate button.

Read Black is displayed.

Place the instrument on the **black trap**. Make sure that the red marks on the instrument and the black trap are neatly aligned and that the instrument fits into the indentation of the black trap.

Press the operate button to perform the black reading.

You get an indication of the reading process in the display.

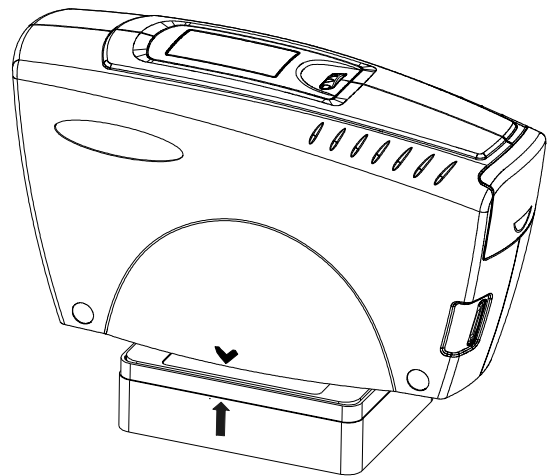
"Reading Black"

Note: Choosing Cancel will abort the calibration procedure and calibration will not be updated.

When Reading Black is completed, the instrument must be placed on the **white standard**. Read White is indicated in the display.



Position the instrument as thoroughly on the **white standard** as it is described for the black trap and press the operate button.



You get an indication of the reading process in the display.

"Reading White"

When calibration is complete, an affirmation is shown in the display.



Note: If an error occurs during calibration, try to read the plaque again. If the error message still occurs, refer to section "Errors and warning messages".

Measure #007
Delete #006
 Calibrate

Delete #006

Cancel

Measure #006
 Delete #005
 Calibrate

Delete

In case of a measurement error you can delete measurements.

Select the menu item Delete by turning the menu scroll wheel and pressing the operate button. The number of the last measurement is displayed together with the delete function. To proceed press the operate button.

You can now delete the indicated measurement or abort the delete operation by highlighting Cancel and pressing the operate button.

Choosing cancel aborts the process. The instrument returns to the main menu.

To delete the measurement press the operate button.

You get an indication of the delete process in the display.

"Deleting #006"

After deleting, the instrument returns to the main menu.

The measure and the delete counter are diminished by one.

Joblist

In case you must enforce test series with recurrent courses, you can select names from a pre-defined joblist. This list must be created on a PC and be sent to the instrument in advance.

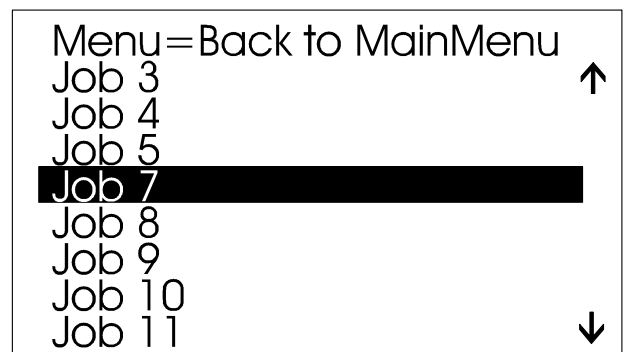
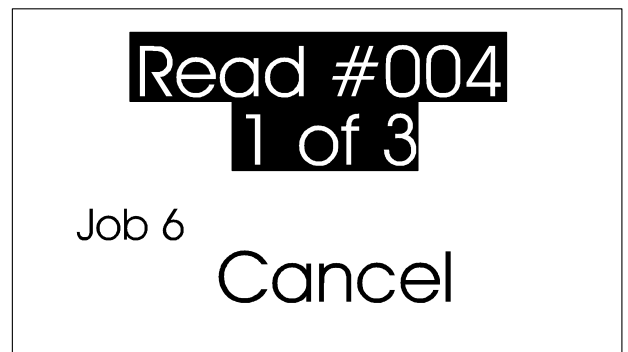
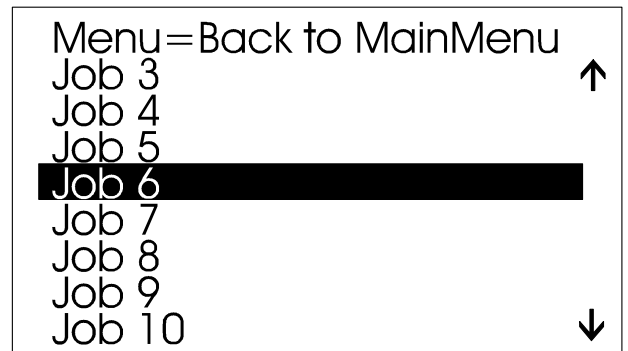
Select the menu item Joblist by turning the menu scroll wheel and pressing the operate button.

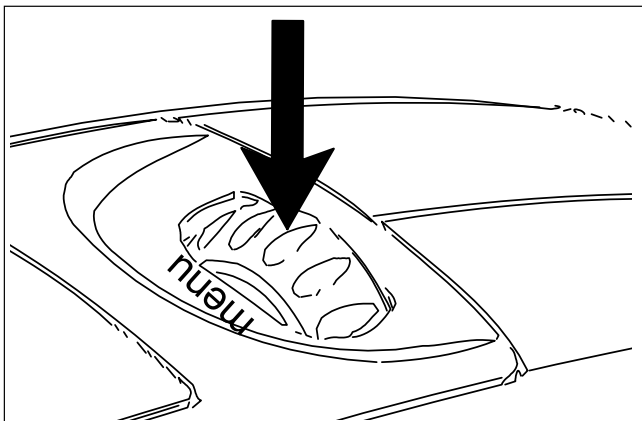
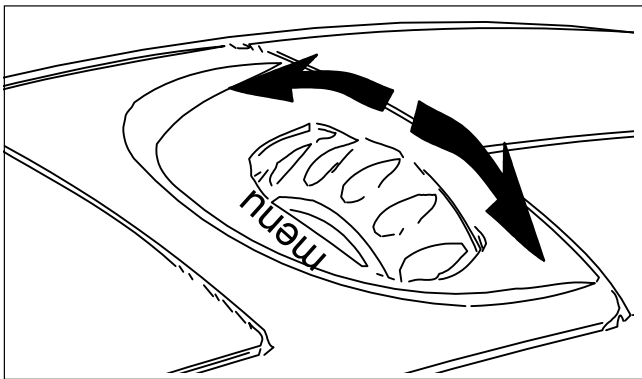
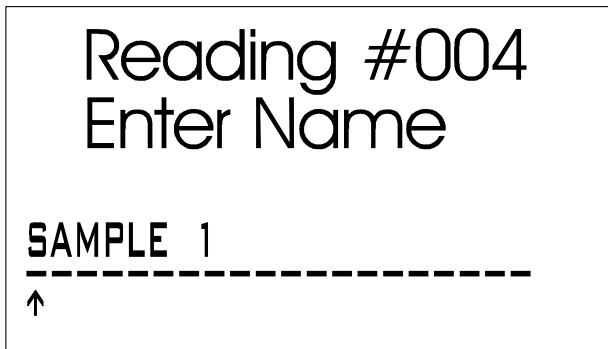
The jobnames available appear in the display. Select a name by turning the wheel and then pressing operate.

The instrument starts with the measuring procedure. The jobname is indicated in the display.

Pressing operate starts the measurement. After three readings, measurement is done and the data is stored as described above.

You can use a jobname only once. When you select Joblist again, the previous name is removed from the list.





Change names

Before the instrument is storing the measurement data, you are asked to enter a name.

In case a job is selected from the joblist, the corresponding name appears as default in the display. The arrow pointing upward marks the position, that can be altered.

To change the character, turn the scroll wheel. When you press the wheel, the arrow moves to the next character. If you have done a wrong input inadvertently, you have to press the scroll wheel until the arrow returns to the wrong character.

You can enter up to 20 characters or numbers.

After you have adjusted the last character or number, confirm your input by pressing operate.

The instrument now stores this reading together with the assigned name.

Browse

To get an overview over all measured samples, you can use the Browse function.

Select the menu item Browse by turning the menu scroll wheel and pressing the operate button.

All measurements are shown in the display.

The arrows directional upward or downward show that there are more names to be found in the direction of the arrows.

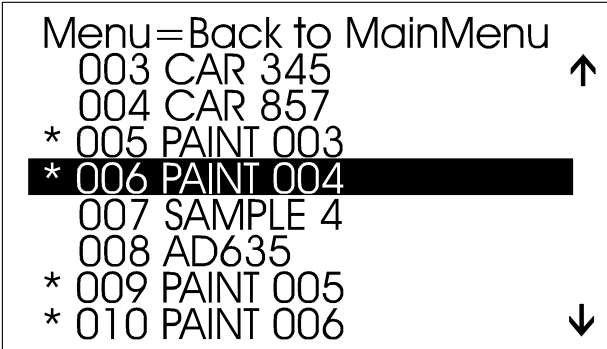
With the scroll wheel you can move the bar through the displayed names.

An asterisk in front of the name indicates that this is a name, which was chosen from the joblist.

To return to the Main Menu press the scroll wheel.



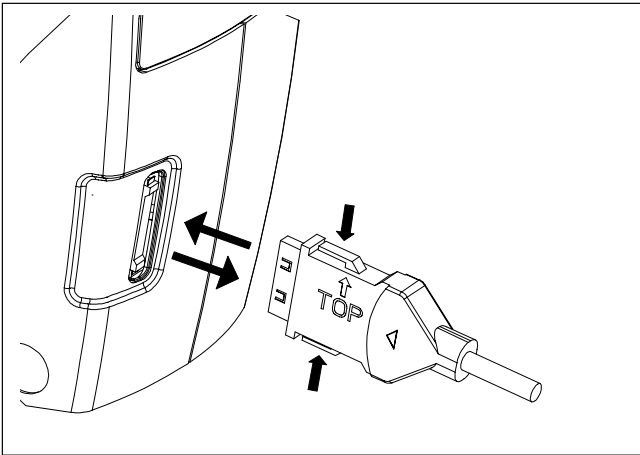
Delete # 003
Calibrate
Joblist
Browse



Menu=Back to MainMenu
003 CAR 345 ↑
004 CAR 857
* 005 PAINT 003
*** 006 PAINT 004**
007 SAMPLE 4
008 AD635
* 009 PAINT 005
* 010 PAINT 006 ↓

The measurement device is equipped with a serial interface that allows direct communication with a PC.

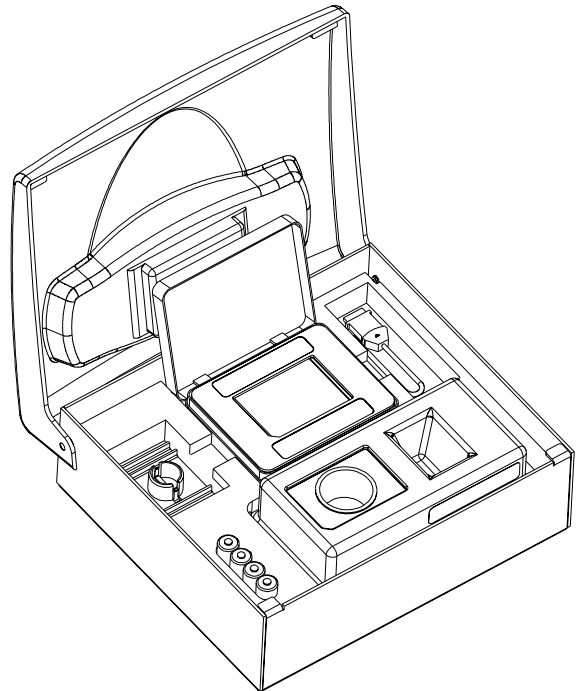
Measurement data can be transferred from the instrument to the PC according to the software used.



You can make the connection to your PC with the enclosed PC cable. Plug the side with the flat connector (designed so it can only be connected with the correct polarity) into the measurement device and the 9-pin sub-D plug into the PC.

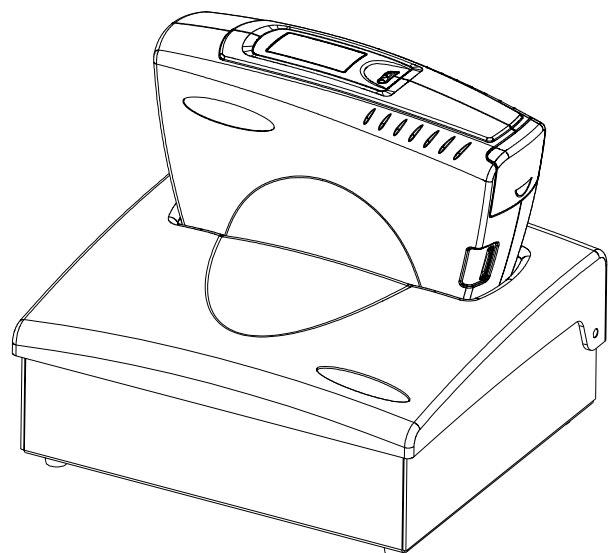
The base station is designed to keep all the accessories enclosed together and handy.

With the white standard and black trap inserted it makes calibration very easy.



In the closed position it is a stand for the instrument. The instrument fits into the indentation of the cover.

We suggest you to use the protective stand for inhouse operation and the carrying case for operation outdoors.



16 Technical and Standard Data

General technical data:

Temperature range	- 10 °C to +60 °C (14 °F to 140 °F) for storage +15 °C to +40 °C (59 °F to 104 °F) for operation
Rel. humidity	Up to 85% non-condensing/35°C (95 °F)

Measurement unit:

Geometry	Illumination 45°, observation 15°, 45°, 110° aspecular
Measurement aperture	Ø23mm (0.91 in.)
Spectral range	400 - 700 nm
Spectral interval	10 nm
Repeatability	0.03 ΔE^* , 1 σ 20 consecutive readings on white tile
Reproducibility	0.3 ΔE^* , 1 σ average on 12 BCRA II tiles
Memory	500 samples
Power supply	4 AA Alkaline Batteries
Dimensions (LxWxH)	234x75x136mm 9.21x2.95x5.35 in.
Weight	approx. 1280g/ 2.82 lbs (with batteries)
Interface	RS-232 serial for PC or printer

- DIN 5033 Colorimetry;basic concepts.
- DIN 5036 Radiometric and photometric properties of materials; definitions characteristic.
- DIN 6174 Colorimetric evaluation of colour differences of surface colours according to the CIELAB formula.
- ISO 7724 Paints and varnishes - Colorimetry
- ASTM D 2244 Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.
- ASTM E 308 Standard Practice for Computing the Colors of Objects by Using the CIE System.
- ASTM E 1164 Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation.
- ASTM E 2194 Standard Practice for Multiangle Color Measurement of Metal Flake Pigmented Materials

Description	Order number
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Spectrophotometer according to DIN, ISO, ASTM	
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multi-angle spectrophotometer	
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	6320
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Comes complete with:

Measurement device, protective cap, PC cable, operating instructions, 4 AA batteries, carrying case, base station.

Calibration standards

Black Trap	
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	6322
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White Calibration Standard	
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	6321
--	------

Accessories and spare parts

PC cable	
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	253017655V
--	------------

Base Station	
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	6323
--	------

Appears when bottom pins are not pressed before or during a reading

Please Place
on Surface
Repeat Reading!

Appears when instrument has not been lifted up between two readings

Lift Instrument
Repeat Reading!

Appears when Black or White calibration is done on a wrong standard

Wrong Standard
Repeat Reading!

Appears when memory is full

Memory Full!

18 Errors and Warning Messages

English

Memory Empty!

Appears when "Delete" is selected and memory is empty

Please
Calibrate!

Appears when instrument is not calibrated on Black and White standard

Battery Empty!

Appears when Battery is empty

Temperature!

Appears when temperature is outside the range of +10°C to +40°C (50°F to 104°F)

Do not attempt to make any repairs yourself! If a malfunction occurs on your measuring device, our Customer Service department will be happy to help you as quickly as possible.



- Do not insert any objects into the measurement aperture for cleaning. The instrument could get damaged - affecting a proper and safe operation.



- The instrument housing is resistant to a number of solvents, but cannot be guaranteed to withstand all chemicals. You should therefore use a soft, moist cloth for cleaning. For cleaning excessive dirt, use ethanol or cleaning alcohol. **Do not use any acetone!**



- **Cleaning standards**

The accuracy of the measurement can be significantly impacted by using dirty or damaged standards.

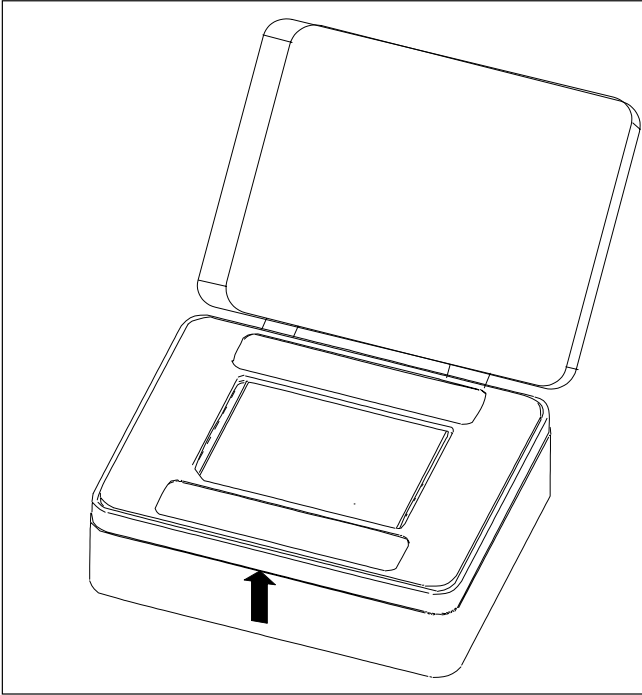
Since the surfaces of the standards are highly sensitive, cleaning must be undertaken with great care.

To clean standards, use a new lint-free cloth, dust-free lens paper or an optical cloth.

Apply only slight pressure as you clean and make certain there are no large particles stuck in the cloth that could damage the surface. **Do not use any acetone!**

For dirt that is difficult to remove, use an optical cloth dipped in liquid. Then wipe the surface with a dry optical cloth.

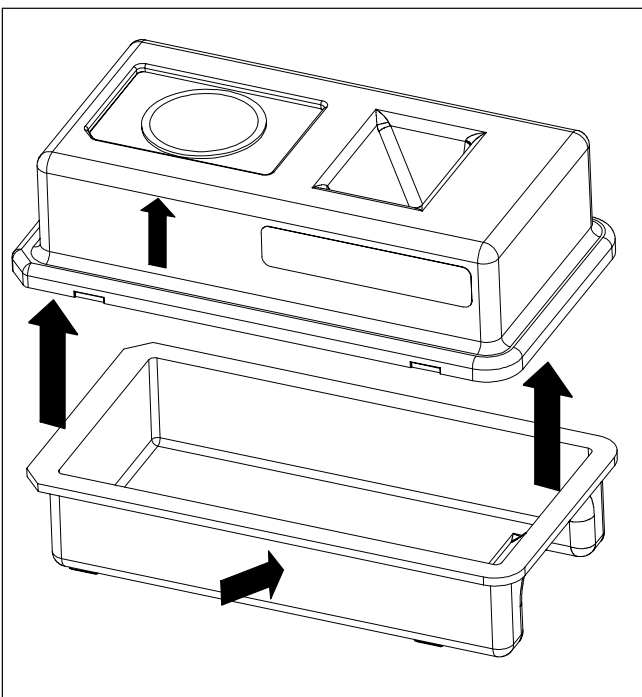
Exact calibration is not possible unless the standard is in perfect condition. If the condition of the standard seems doubtful because of its appearance or measurement errors, we will be happy to check it for you.



It is highly recommended to handle the standards with great care. They should always be stored enclosed. You can use either the carrying case or the base station for storage.

Cleaning the White Calibration Standard

The ceramic standard should be cleaned using a mild soap and warm water solution, thoroughly rinsed with warm water, and wiped dry with a clean, lint-free cloth. You must let the standard dry completely before taking a calibration reading.



Cleaning the Black Trap

The black trap should be cleaned with clean, dry air from time to time to remove any dust or contamination.

The black trap is taken apart by compressing the lower part on both sides of the case with your fingers, and then separating the two sections.

We BYK-Gardner GmbH
Lausitzer Strasse 8
82538 Geretsried

declare in accordance with EC Directive

89/336/EEC:
Electromagnetic Compatibility

Design type of product:

multi-angle spectrophotometer


was developed, constructed and manufactured in conformity with the EC directives cited above.

The corresponding relevant standards were taken into consideration. This are especially EN55022 B, EN 55024, EN 61000-4-6/-3/-2

Technical documentation is available.

Geretsried, November 3, 2003

BYK-Gardner GmbH



Dr. Georg Schroeder
Managing Director

Wir BYK-Gardner GmbH
Lausitzer Strasse 8
82538 Geretsried

erklären im Sinne der EG-Richtlinien

89/336/EWG:
Elektromagnetische Verträglichkeit

Die Bauart des Produktes:

multi-angle spectrophotometer

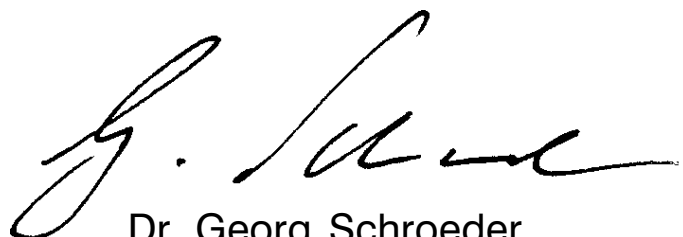
ist entwickelt, konstruiert und gefertigt in Übereinstimmung mit vorge-
nannten EG-Richtlinien.

Entsprechende angewandte Normen wurden berücksichtigt. Diese
sind im speziellen EN55022 B, EN 55024, EN 61000-4-6/-3/-2

Eine technische Dokumentation ist vorhanden.

Geretsried, 3. November 2003

BYK-Gardner GmbH



Dr. Georg Schroeder
Geschäftsführer

Nous, BYK-Gardner GmbH
Lausitzer Strasse 8
82538 Geretsried

déclarons, conformément à la directive CE

89/336/CEE
Compatibilité électromagnétique,

que les produits suivants:

multi-angle spectrophotometer

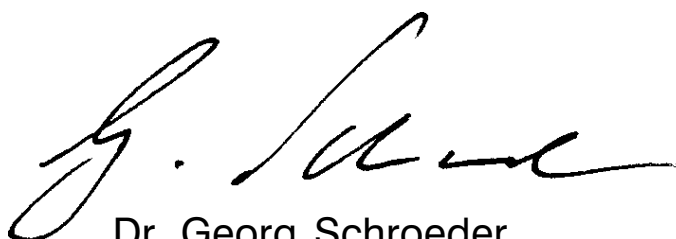
ont été développés, conçus et fabriqués conformément à la directive européenne susnommée.

Les niveaux pertinents correspondants ont été prises en considération. C'est surtout, EN55022 B, EN 55024, EN 61000-4-6/-3/-2,

Une documentation technique est disponible.

Geretsried, 3. novembre 2003

BYK-Gardner GmbH



Dr. Georg Schroeder
Directeur général

20 Dichiarazione di Conformità CE

Noi BYK-Gardner GmbH
Lausitzer Strasse 8
82538 Geretsried

nel rispetto delle normative di CE

89/336/EEC:
Compatibilità elettromagnetica

Tipo del disegno di prodotto:

multi-angle spectrophotometer

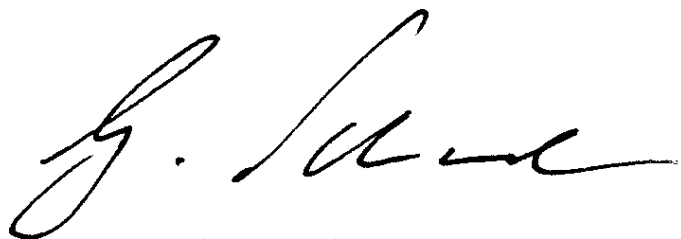
fu sviluppato, progettato e prodotto nel rispetto delle sudette norme CE.

Gli standard attinenti e corrispondenti furono presi nell'esame. Questo è EN55022 B, EN 55024, EN 61000-4-6/-3/-2 specialmente.

La documentazione tecnica è disponibile.

Geretsried, il 3 novembre, 2003

BYK-Gardner GmbH



Dr. Georg Schroeder
Amministratore delegato

Declaración de Conformidad de CE 20

Nosotros
BYK-Gardner GmbH
Lausitzer Strasse 8
82538 Geretsried

declaramos respecto a la directiva de CEE

89/336/EEC:
La compatibilidad electromagnética

El modelo de producto:

multi-angle spectrophotometer

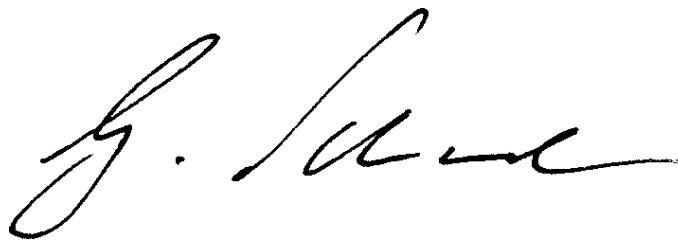
se ha desarrollado, construido y fabricado en consonancia con la directiva de CEE mencionada.

Las normas pertinentes correspondientes se tuvieron en la cuenta. Éste es sobre todo EN55022 B, EN 55024, EN 61000-4-6/-3/-2,

La documentación técnica está disponible.

Geretsried, el 3 de noviembre, 2003

BYK-Gardner GmbH



Dr. Georg Schroeder
Gerente

D EG-Konformitätserklärung

Wir, BYK-Gardner GmbH, erklären hiermit, dass o.g. Produkte/Geräte entwickelt, konstruiert und gefertigt wurden in Übereinstimmung mit den vorgenannten EG-Richtlinien.

GB Declaration of Conformity

We, BYK-Gardner GmbH, hereby declare that the aforementioned product/instrument has been developed, constructed and built in accordance with the stated EC-Directives.

F Déclaration de conformité

Nous, BYK-Gardner GmbH, déclarons que les produits/instruments ci-dessus mentionnés ont été développés, produits et construits en conformité avec les directives CEE établies.

DK Konformitetserklæring

Vi, BYK-Gardner GmbH, erklærer herved, at ovennævnte produkt/instrument er udviklet, konstrueret og produceret i overensstemmelse med de angivne EU Direktiver.

E Declaración de Conformidad

Nosotros, BYK-Gardner GmbH, declaramos, que los productos/aparatos arriba mencionados, han sido desarrollados, construídos y fabricados en consonancia con las directrices de la CEE indicadas.

FIN EU-yhteensopivuusjulistus

Me, BYK-Gardner GmbH, julistamme, että yllä mainittu tuote/laite on kehitetty, rakennettu ja valmistettu asetettujen EU-Direktiivien mukaisesti.

I Dichiarazione di Conformità

Noi, BYK-Gardner GmbH, dichiariamo che il suddetto prodotto/strumento è stato sviluppato, costruito e prodotto in conformità con le Direttive EC stabilite.

NL Overeenkomstigheidsverklaring

Wij, BYK-Gardner GmbH, verklaren hierbij dat bovengenoemd produkt/instrument is ontworpen, gekonstrueerd en vervaardigd overeenkomstig de genoemde EG-richtlijnen.

P Declaração de Conformidade

Nós, BYK-Gardner GmbH, declaramos pela presente, que o produto/aparelho acima indicado foi desenvolvido, construído e produzido de acordo com as Directivas CE mencionadas.

S Deklaration av överensstämmelse

Vi, BYK-Gardner GmbH, deklarerar härmed att ovanstående produkt/ instrument har blivit utvecklad och tillverkad i enlighet med gällande EU direktiv.

GR Δήλωση EK-συμμορφωσης

Εμείς, η BYK-Gardner GmbH, δηλώνουμε με το παρόν ότι τα ως άνω αναθερομένα προϊόντα / συσκευές αναπτύχθηκαν σχεδιαστήκαν και κατασκευαστήκαν σε συμθονία με τις προαναθερομένες οδηγίες EK.

253 017 659 EDFIS 0408 Europe