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PATENTED TECHNOLOGY

coat**master** Flex
User Manual

coat**master**.com

Version: **12-2024**

State: 10.12.2024

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Subject to technical changes and printing errors, the values given are approximate and are not to be understood as legally warranted characteristics. These values may vary according to component tolerance.

Last update: **05/2024**

Table of contents

1. Technical Data 5
2. Customer Requirements and Device Specification 6
3. Applications 7
4. Functionality and Measuring Principle 8
5. Safety and Responsibility 9
5.1. Warning Symbols 9
5.2. Signs and Icons 10
5.3. Improper Use 11
5.4. Product Safety 12
5.5. Compatibility with flame detectors 12
6. Delivery Scope 13
7. Set-Up 14
7.1. Battery 15
7.1.1. Battery Charging 15
7.1.2. Battery Installation 16
7.2. Navigation Panel 16
7.3. Turning the Power On/Off 16
7.4. Language Selection 17
7.5. Wi-Fi Settings 17
7.6. Activation 20
7.7. Operation with coatmaster® Local server 22
8. Operating Instructions 23
8.1. System Settings 23
8.1.1. Network Troubleshooter 24
8.1.2. Select license and server 24
8.1.3. User Level 25
8.1.4. Measurement Unit 26
8.1.5. Auto power off 26
8.1.6. Contact information 27
8.1.7. Factory Reset 27
8.1.8. Automation mode 28
8.2. Main Menu 29
8.3. Block Menu 30
8.3.1. Select a block 30
8.3.2. Create a new block 31
8.3.3. Rename a block 32
8.3.4. Remove a block 33
8.3.5. Favorite a block 34

8.4. Application Menu ... 34
8.4.1. Delete an application ... 36
8.4.2. Favorite an application ... 37
8.4.3. Advanced calibration report ... 38
8.4.4. Calibration Menu ... 38
8.4.5. Quick Application ... 39
8.4.6. Manual Application ... 39
8.4.7. Reference Measurements ... 41
8.4.8. Calibration Report ... 44
8.4.9. Rename application ... 45
8.4.10. Edit Materials Properties or DisplayOptions ... 46
8.4.11. Materials Properties ... 47
8.4.12. Display Options ... 47
8.4.13. Display Options (Bounds) ... 48
8.4.14. Example of a Calibration Process ... 51
8.4.15. Offset calibration ... 52
9. Measurement ... 53
10. Data Transfer/Cloud ... 55
10.1. Login ... 55
10.1.1. Applications ... 57
10.1.2. Monitor ... 57
10.1.3. Export ... 58
10.1.4. Help ... 59
11. Troubleshooting and Best Practice ... 60
11.1. Error Messages ... 60
11.2. Error Codes ... 61
11.3. Frequently Asked Questions (FAQs) ... 64
11.4. Hotline ... 64
12. Storage and Transportation ... 65
13. Maintenance and Repair ... 65
13.1. Replacement of the Inlet Filter ... 66
13.2. Cleaning and Care ... 66
13.3. Warranty ... 66
14. API-Interface Description ... 67

Foreword

Dear Customer,

with the purchase of a coat**master**® Flex, you have acquired a high-quality, precision product. In this manual we provide you with some instructions to help you to work successfully and productively with this device for many years. coat**master** AG has made every effort to manufacture a safe and high-quality device that complies with all applicable regulations. Our strict quality control procedures ensure high quality standards even for high volume production. Please apply your own controls and treat the device with care. Should you have any questions regarding the use of the equipment, please do not hesitate to contact us.

We wish you success and 'a perfect coating'.

The Founders Prof. Dr. N. A. Reinke and Andor Bariska
coat**master** AG

1.Technical Data

Characteristics	Tolerance/ Description
Measuring distance range	20 - 150 mm
Measurement angle / tolerance	±70°
Measuring point size	2 mm^2 at 75 mm distance
Measuring range thickness	10 - 500 µm (depending on coating type)
Standard deviation	Typical < 2% of the thickness
Measuring time	Typical 300 ms (depending on setting for coating thickness)
Storage conditions	-10 - 50°C max. 80% humidity (non-condensing)
Power supply	Bosch GAL 18V-40 2x Bosch ProCore 18V, 4 Ah
Number of measurements	Up to 1.300 measurements per battery charge (4 Ah)
Operating conditions	Temperature: 0 - 35°C, Rel. humidity: 10% -75%
Weight (without battery)	1.3 kg
Dimensions	374 x 91 x 203 mm
IP protection type	IP50

Table 1: *Technical data*

2. Customer Requirements and Device Specification

Measuring the coating thickness early in the process is the key to documenting and controlling coating processes, saving coating material, improving coating quality, and reducing production time and scrap. Coating processes are highly sensitive to changes in environmental conditions; therefore, it is crucial to have access to a thickness gauge that is easy to operate and works well in an aggressive (dust, high temperature) industrial environment.

The patented measurement process used by the coat**master**® Flex is non-contact (as opposed to systems based on magnetic induction or ultrasound) and non-destructive. It can be applied on wet, powder, and cured coatings, regardless of the coating material, thickness, or color (including white). In contrast to magnetic induction-based systems, the Flex device permits measurement of coating thickness early in the process, i.e., directly after the application of the coating material, before drying or curing. This allows:

- Savings of 10% - 30% coating material
- Reducing time for color changes
- Accelerating training of new personnel
- Avoiding cost intensive rejects & reworks
- Documenting coating processes
- Reducing environmental impact
- Establishing industry 4.0 standards
- Online-connection to ERP-System

coat**master**® Flex is the most advanced measurement gauge for non-contact thickness measurements. It outperforms any other photothermal, LED/laser-based, and ultrasound systems on the market in all industrial relevant aspects. It requires minimal calibration and is insensitive to the angle and distance of measurement. Its superior reliability, user-friendliness, safe usage, cost-effectiveness, precision, and accuracy is highly appreciated by major coating-line manufacturers, large paint manufacturers, renowned experts and most importantly by coaters around the globe.

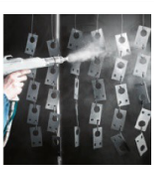
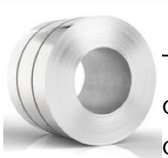
3. Applications

The coat**master**® Flex is a flexible and robust handheld device for non-contact measurement of coatings.

The coat**master**® Flex is unique and versatile and can be used in a wide variety of industries and industrial sectors:

• Automotive • Rail • Aerospace	• Building Industry • Furniture • Profiles	• Wind Power • Pipelines • Medical/Technical

The coat**master**® Flex is particularly suitable for the following applications:

Powder paints	
	Due to control of coating thickness measurement with Flex, up to 30% of powder quantity can be saved. Measurement early in the process prior to curing also saves time and reduces rework rates.
Wet paints	
	Precise measurements are possible even before drying. The measuring equipment capability is guaranteed. This saves material and time and ensures quality.
Functional coatings	
	Thickness measurement of functional coatings (i.e., e-coats, adhesives, anti-corrosive coatings) in wet and dried state. Highly accurate measurement even on rough surfaces and for soft coatings.

4. Functionality and Measuring Principle

The coat**master**® works according to the principle of advanced thermal optics (ATO). The surface of the coating is heated with a light pulse. After brief heating by a few degrees, the surface is cooled by heat conduction to deeper areas of the coating and the substrate. The cooling process on the surface depends on the thermal properties of the coating and the substrate. The thinner the coating, the faster the surface temperature decreases, provided it has a lower thermal conductivity than the substrate. The thickness and thermal properties of the coating are derived from the dynamics of the surface temperature.

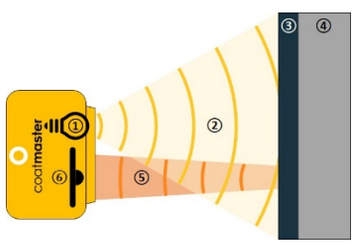


Figure 1: *Illustration of the measuring principle*

① Flash lamp
② Pulsed heat input
③ Coatings
④ Substrate
⑤ IR radiation
⑥ IR sensor

Generally, coatings have a very irregular surface. Powder coatings prior to curing have an even rougher surface but can nevertheless be measured with the coat**master**® Flex. The properties of this roughness are influenced by various factors, such as pre-treatment, the type and roughness of the substrate, the type of coating (e.g., particle size, distribution, and chemical composition), and the exact conditions (temperature distribution, baking time) during curing. The diagram below shows a microscopic sketch of this roughness. The ATO automatically compensates for the roughness described above, using an optical averaging process. This allows a reliable determination of the coating thickness, even with changing parameters.

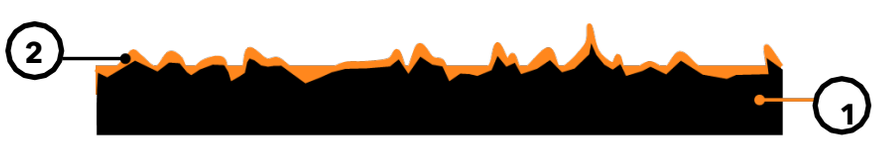


Figure 2: *Sketch of surface roughness of a powder coating after curing*

① Substrate
② Coating

5. Safety and Responsibility

This section provides an overview of all relevant safety features for optimum personal protection and safe and trouble-free operation. Keep the operating instructions with the safety instructions so that you can refer to them later.

5.1. Warning Symbols

For your safety, it is important to read and fully understand the following table showing the different warning signs and their definitions!

Symbol	Definition
DANGER	Warning of an immediate danger that, if not avoided, will result in death or very serious injury. • Measures to avoid the danger.
WARNING	Warning of an immediate danger that, if not avoided, will result in serious injury. • Measures to avoid the danger.
CAUTION	Indication of a hazardous situation that, if not avoided, may result in minor or moderate injury. • Measures to avoid the situation.
	Warning of optical radiation.
	Warning of electrical voltage.
	Warning of hazards associated with charging batteries.
CAUTION	Indication of a hazardous situation that, if not avoided, may result in property damage; however, no action is required with regard to personal injury. • Measures to avoid the damage.

Table 2: *Warning symbols*

5.2. Signs and Icons

Symbol	Definition
CE	This symbol means that your device meets the safety requirements of all applicable EU directives.
	This symbol means that you may only dispose the device at an approved local disposal site.
	Information: A highlight containing particularly important information for better understanding.

Table 3: *Signs and icons*

Intended Use

The coat**master**® Flex is intended exclusively for the measurement of coating thicknesses.

The device should only be used as a handheld device. The device should not be mounted on a robot or fixture or operated for an extended period of time.

The instrument may only be operated and cleaned by trained personnel. The intended use also includes compliance with these instructions and the maintenance intervals must be observed.

Have your device repaired only by qualified personnel and only with original spare parts. This ensures that the safety of the device is maintained.

The device is not approved for operation in environments with potentially explosive atmospheres.

Keep the device away from rain or moisture. Penetration of water into an electrical appliance increases the risk of electric shock. Do not place the measurement device in a place where components could come into contact with corrosive gases or salty air.

Do not block ventilation openings. The ventilation openings prevent the interior of the unit from overheating.

Remove the battery before cleaning. Do not use solvents for cleaning, to avoid damaging the housing surface. Use a clean, dry cloth.

In accordance with Directive 2012/19/EU, please take old parts to the appropriate recycling facilities for proper disposal, reprocessing, and reuse. Never throw electrical equipment into the household waste! By properly disposing of the electrical appliances, you help to protect valuable resources and prevent possible negative effects on health and the environment, which could otherwise occur due to improper waste disposal. Accessories and packaging should also be recycled in an environmentally friendly manner.

5.3. Improper Use

Use not mentioned above or use that does not comply with the technical specifications, is considered to be improper use. The operator is solely responsible for any damage caused by improper use.

The following applications are prohibited:

- Use of the equipment in environments where liquids may get into the device.
- Introduction of any objects into the coatmaster® Flex or similar devices.
- Unauthorized opening the device, other than for standard maintenance operations (*see section 13.*), voids the warranty and the manufacturer assumes no liability.

The following safety instructions point out dangers of a general nature that may occur when handling the device. The user must observe all the instructions listed to minimize possible hazards.

Additional warning messages can be found in this manual whenever the actions described could result in hazards.

Symbol	Description
ⓘ	**Integrated light source.** The coat**master**® Flex with SpectralBlue® contains a Xenon flash lamp. The Evaluation of the photobiological safety of a Xenon flashlight according to IEC-62471:2006 shows that the coat**master**® Flex flash lamp falls under the exempt group and thus does not pose any photobiological hazard.
CAUTION **Device damage may occur if the battery is changed during operation.** Never change the battery during operation, as this can lead to the device being damaged. Always switch off the device before changing the battery. ⏻	

Table 4: *Warning – improper use*

5.4. Product Safety

The measuring device has been designed and built with the latest state-of-the-art technology; however, risks to users, property, and the environment may arise if the measurement device is used carelessly or improperly, for which coat**master** AG bears no responsibility.

The following applications are prohibited:

- Use of the equipment in environments where liquids may get into the device.
- Introduction of any objects into the coat**master**® Flex or similar devices.
- Unauthorized opening the device, other than for standard maintenance operations (*see section 13.*), voids the warranty and the manufacturer assumes no liability.

The measurement process is started by pressing the trigger button Ⓣ. When pressing the trigger button to conduct a measurement, a light impulse is released.

The equipment has been tested in accordance with the safety requirements for electrical equipment for measurement, control, and laboratory use (IEC 61010-1:2010) and the Low Voltage Directive2014/35/EU.

To ensure photobiological safety for the user coat**master**® Flex (SpectralBlue® model) was thoroughly tested. The operation by the end-user is classified as safe according to IEC 62471:2006.

5.5. Compatibility with flame detectors

The coat**master**® Flex has been tested and is compatible in operation with the flame detectors listed below.

Manufacturer	Flame Detector Type
STS	FL 7-64, 8-64 and 9-64. Note: must be set to UV+IR mode!
Minimax	FMX 5000 UV, FMX 5000IR, YMX 5000 IR. Conditionally compatible: YMX 5000 FMX EX 90° IR (for distances > 1m)
Total Walther	UV-03

Table 5: *Flame detectors compatible with Flex*

Before operating the coat**master**® Flex in any environment, check if the measurement area is under surveillance of flame detectors. If the flame detector is not listed in the above table, use the Flex in that area after receiving written confirmation either from coat**master** AG or from the supplier of the flame detector only.

6. Delivery Scope

The coat**master**® Flex is delivered with the following components in a robust transport case (scope of delivery can vary):

Figure 3: *Delivery inclusions*

Ⓐ coat**master**® Flex
Ⓑ Local Server LS (opt.)
Ⓒ Local server power supply LSPS (opt.)
Ⓓ LSPS 230v mains cable (opt.)
Ⓔ LS antennae 2x (opt.),
Ⓔ Replacement filters
Ⓕ Battery charger (opt.) Bosch GAL 18V-160 C
Ⓖ Rechargeable battery 2x Bosch ProCore 18V,4 Ah (opt.)
Ⓗ Transport case

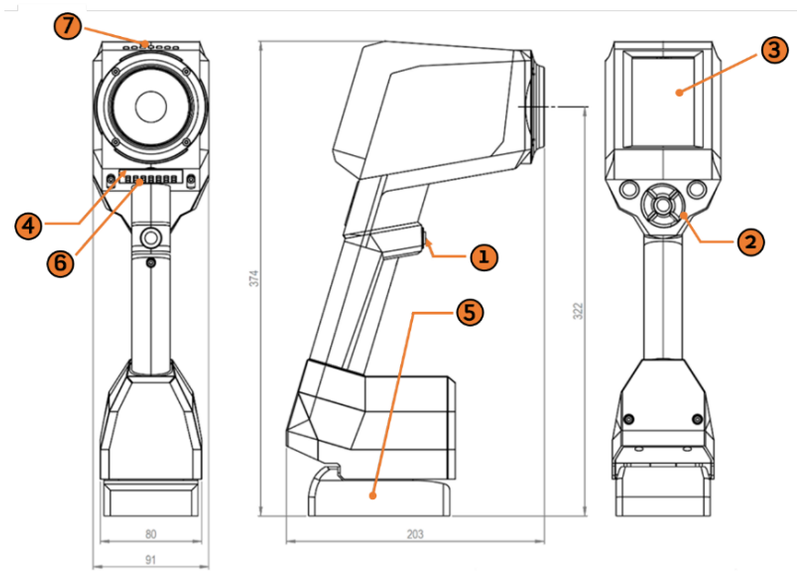
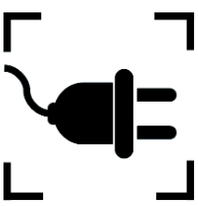


Figure 4: *Overview of dimensions and components*

① Trigger button
② Input panel
③ Display
④ Filter cover
⑤ Removable battery
⑥ Air intake
⑦ Air outlet



7. Set-Up

To use your coat**master**® Flex, you must set it up to connect to a Flex server by Wi-Fi connection. The Flex server can either be a coat**master**® Cloud server (through internet connection) or a coat**master**® Local server (no Internet required). To connect to the coat**master** Cloud server, a connection to the Internet is necessary.

Prior to the first usage of the Flex, the device must be activated using a 6-character license code and a 6-character activation key. License and key are provided by your Flex purchasing point. For the local Server, an additional license and key are available.

Depending on the type of server, different steps are required to activate your coat**master**® Flex:

A. coat**master**® Cloud server

To connect your Flex to the coat**master**® Cloud server, you need to have a Wi-Fi network which provides internet access. This can be your company Wi-Fi network, or any mobile Wi-Fi network provided by routers, laptops or mobile phones (hotspots). The following steps must be carried out:

1. Select Wi-Fi network and enter network credentials (*see section 7.5.*)
2. Select appropriate cloud server (*see section 7.6.*)
3. Enter license code and activation key received from your Flex purchasing point (*see section 7.6.*)

Symbol	Description
ⓘ	The Flex supports both **WPA2** and **WPA2-Enterprise** secured Wi-Fi connection.

B. coat**master**® Local server

To connect your Flex to the coat**master**® Local server, you need to have a local Server device located within reach of your Flex. The following steps should be carried out:

1. Select Wi-Fi network "flex-local" (*see section 7.7.*)
2. Select local server (*see section 7.7.*)
3. Enter local server license and key (*see section 7.7.*)

If you are using a local Wi-Fi network, the following steps should be carried out:

Language selection ⇨ **WiFi Settings** ⇨ **Activation** ⇨ ...

See sections **7.4** **7.5** **7.6**

7.1. Battery

7.1.1. Battery Charging

First charge the 18V battery pack by sliding the battery pack into the battery charger (*see* Figure 5: *Battery inserted in charger*). Use only the approved power charger.

Figure 5: *Battery inserted in charger*

Figure 6: *Standalone battery*

After battery charging, double-check the status of the battery by pressing the 'On' button of the battery pack. If the battery is fully charged, all 3 LEDs should be green (*see* Figure 5: *Battery charging*).

If the battery becomes defective, liquid can escape. Avoid contact. If contact accidentally occurs, flush with water. If liquid also comes into contact with the eyes, seek medical help. Liquid ejected from the battery may cause irritation or burns.

If the battery becomes defective, escaping liquid may come into contact with adjacent components. Check any affected parts. Clean such parts or replace them, if required.

7.1.2. Battery Installation

Push the fully charged battery into the designated holder at the bottom of the device until it snaps into place. ⓘ **Ensure that the red tab is completely engaged**.	 Figure 7: *Battery installation*

7.2. Navigation Panel

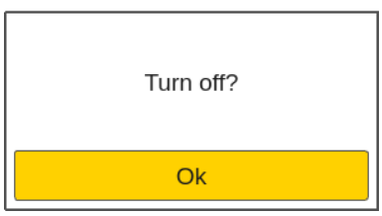
Figure 8: *Input panel - keys and elements* show an overview of the most important elements for navigating the menus.

 Figure 8: *Input - panel keys and elements*	Ⓐ On/Off button Ⓑ Back button (to go back to the previous display or, in the menu, one level up) © OK button Ⓓ Arrow keys

7.3. Turning the Power On/Off

ⓘ After you have connected to the Flex server, and the charged battery is inserted, turn on the unit by pressing the On/Off button Ⓐ in the input panel (*see* Figure 8: *Input panel - keys and elements*).

It takes about 20 seconds for the coat**master**® Flex to boot up. To see the time until the coat**master**® Flex is fully operational, view the boot window on the coat**master**® Flex screen; the boot indicator scale is shown in the display.

 Figure 9: *Turning off*	To switch off the device, press the On/Off button Ⓐ, then confirm the action by pressing the OK button ©.

CAUTION Do not remove the battery to turn off the device!

The device can be forced to shut down when the On/Off button is pressed for more than five seconds. With this shortcut procedure, a 'OK button ©' confirmation is not necessary.

7.4. Language Selection

After switching on the coat**master**® Flex, you will be directed to the language selection menu.

 Figure 10: *Language selection*	The default language is English. Available languages: Bulgarian, Czech, German, Greek, English, Spanish, Estonian, Finnish, French, Hebrew, Indonesian, Italian, Japanese, Korean, Polish, Portuguese, Romanian, Russian, Slovenian, Serbian, Thai, Turkish, Vietnamese, Indian, Chinese Move the cursor to your preferred language, using the up and down arrow keys ⊡⊡ ⓓ and the OK button © to confirm. You will then be taken to a 'Settings' menu.

7.5. Wi-Fi Settings

To use your coat**master**® Flex, you must set it up to connect to a Flex server by Wi-Fi connection. The Flex server can either be a coat**master**® Cloud server (through internet connection) or a coat**master**® Local server (no Internet required). To connect to the coat**master**® Cloud server, a connection to the Internet is necessary. If no Internet access is possible, a coat**master**® Local server must be used.

The Wi-Fi connection setup must be conducted only once for the activation of the coat**master**® Flex (*see* Figure 11). The login credentials are stored on the device, and afterwards the Flex will automatically try to connect to previously stored Wi-Fi networks.

If no connection is stored, the Flex will automatically start the Wi-Fi network connection process. To connect to a new Wi-Fi network, select the "Systems Settings" icon in the main display (*see* Figure 26), then select "Network".

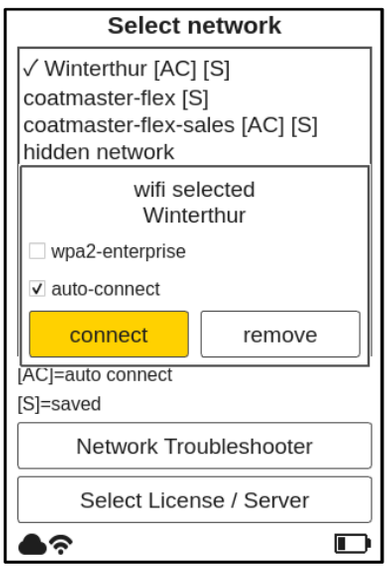


Figure 11: *Wi-Fi Settings*

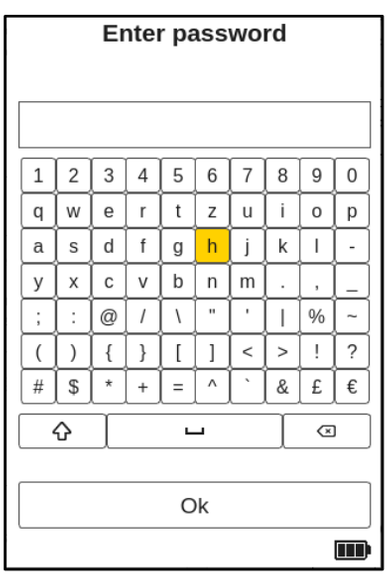


Figure 12: *Password*

The Wi-Fi symbol in the status line indicates the strength of the Wi-Fi signal:

high medium low none

When starting the coat**master**® Flex for the first time, it will automatically connect to the coat**master**® Local server, if available. If not, after language selection, the device opens the Wi-Fi network submenu so that you can select the network you wish to connect to.

Choose your local Wi-Fi network in the list using the up/down arrow keys ⍰⍰Ⓓand the OK button ©to validate.

The coat**master**® Flex supports two Wi-Fi security standards: WPA2 (only password required) and WPA2-Enterprise (username and password required).

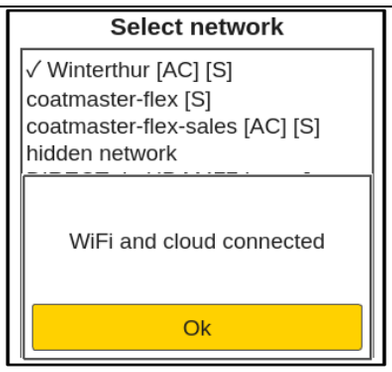
Select the desired Wi-Fi network, using the arrow keys Ⓓ to navigate the keyboard and press the OK button © to confirm the characters (*see* Figure 8: *Input panel - keys and elements*).

Activate the option “wpa2-enterprise” if the network requires this security level.

Activate the option “auto-connect” if you want to store the network credentials on the coat**master**® Flex for automatically connecting to this network if it is available upon boot time.

During the connection period, the following message in the status field appears:

When the Wi-Fi connection is successfully established, you must confirm using the OK button ©.

If you have conducted a factory reset and need to re-activate your coat**master**® Flex, the Wi-Fi network you were connected to before, resetting will be saved and the coat**master**® Flex will automatically connect to it.

Connection to the internet may be provided by mobile phone hotspots. Internet availability of course depends on mobile connection stability. Use an Android phone to connect to the coat**master**® Flex to the Internet. Usage of iOS devices may lead to connection errors.

7.6. Activation

When starting the device for the first time, or after a factory reset, with the device connected to the Internet (either with the provided local server or via the selection of a Wi-Fi network), the license code and the activation key must be entered to unlock your device. These details will have been provided separately by your purchasing point. If you are not prompted to enter the activation code and the coat**master**® Flex is working, we have already activated the device for you and no further action is required.

Before entering the license code and activation key, make sure to select the correct server from the drop-down menu as follows:

Location	Server to select
Europe	Europe
Americas	US
China	China
Asia (excl. China)	Europe
Local server	Local server License: **hkeqex** Key: **oxjzbe**
Custom servers	Custom, enter the IP address.

Figure 13: *Activating menu – select server*

If you are prompted to enter the activation key, the cursor moves to the License code field. When the OK button ©is pressed, a submenu with a keyboard opens. Here the code can be entered, using the arrow keys Ⓓ to navigate the keyboard in conjunction with the OK button © (*see* Figure 8: *Input panel - keys and elements*) to validate a character and move to the next one.
To save the license code, use the arrow keys Ⓓ to move the cursor down to the 'Enter' field, then press the OK button ©You can interrupt the operation at any time by moving the cursor to the 'Cancel' key and confirming with the OK button ©
After saving the license code, the submenu for the activation key will be opened.
Proceed in a similar way to enter and save the activation key.

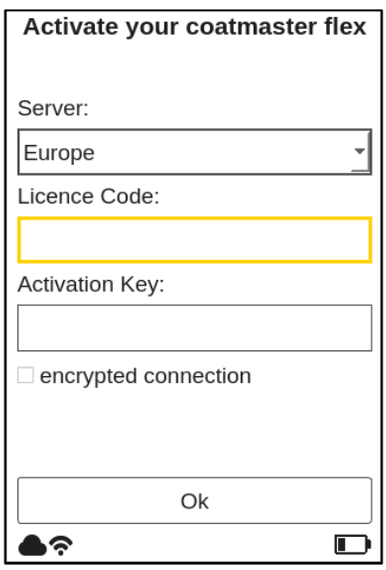


Figure 14: *Enter license code*

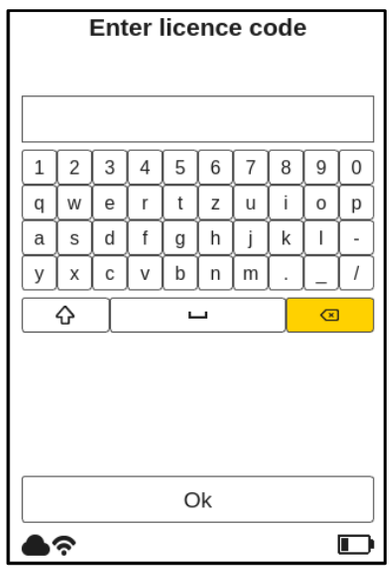


Figure 15: *Licence code*

After the activation key is saved, you will be automatically redirected to the main menu (*see* Figure 26: *Main display*).
Your coat**master**® Flex is now registered with the Flex server. Before you can start measuring, you need to select the appropriate user level and the units in which you want to measure (metric or imperial) (*see section 8.1.4*).

7.7. Operation with coatmaster® Local server

The coat**master**® Local server may be used in cases where no Internet access is available. It provides a solution for operating the Flex in a local environment, using a small computer (the local server) which provides its own Wi-Fi network.

Scope of delivery:

- Local server computer (no keyboard, no mouse, no display)
- External power supply
- 2 x Wi-Fi antenna
- 230V power cord

The local server computer is pre-configured and runs the coat**master**® server software; no additional software may be installed on this computer. Simply press the power button to start the local server.

It opens a Wi-Fi network called "flex-local", which requires no password to connect. Select this Wi-Fi from your network setting on the coat**master**® Flex.
The license code is **hkeqex**, the activation key is **oxjzbe**.

8. Operating Instructions

The following steps guide you step-by-step through the individual processes and menus. For the navigation in the following sections, the arrow keys and buttons of the input panel are used according to *section 7.2.* (Figure 8: *Input panel - keys and elements*).

8.1. System Settings

In the main menu, select the system settings icon in the top right corner by using the left or right arrow key ⍰⍰ ⓓand the OK button © to select and open the system settings menu.

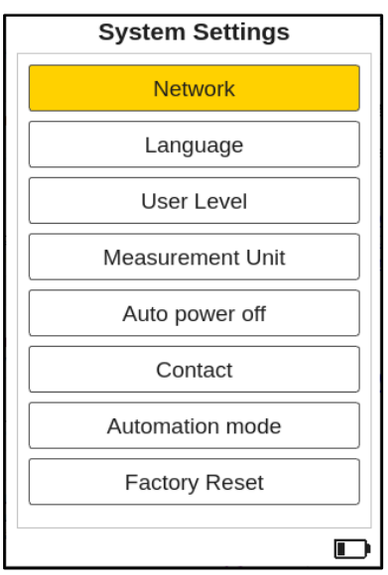


Figure *16: System settings menu*

System settings contain the following categories:

- **Network**
  To select and connect to a local Wi-Fi network (*see section 7.5.*).
- **Network Troubleshooter**
  (Sub menu of **Network**) To perform a network diagnosis and obtain information on the Wi-Fi status (*see section 8.1.1.*).
- **Language**
  To change the language (*see section 7.4.*).
- **User Level**
  To differentiate between the operational functionalities in the Standard or Advanced modes (*see section 8.1.3.*).
- **Measurement Unit**
  To configure and display measurement results in micrometres (µm) or in mils (*see section 8.1.4.*).
- **Auto power off**
  To change the time setting when the Flex should turn off automatically (*see section 8.1.5.*).
- Contact
  To display the contact information as well as the software version of the UI and the system.
- Automation mode
  To start and stop the automation mode (*see section 8.1.8.*).
- **Factory Reset**
  To return the system to the factory settings (*see section 8.1.7.*).

Choose the desired menu in the list, using the up/down arrow keys pq and the OK button © to validate.

8.1.1. Network Troubleshooter

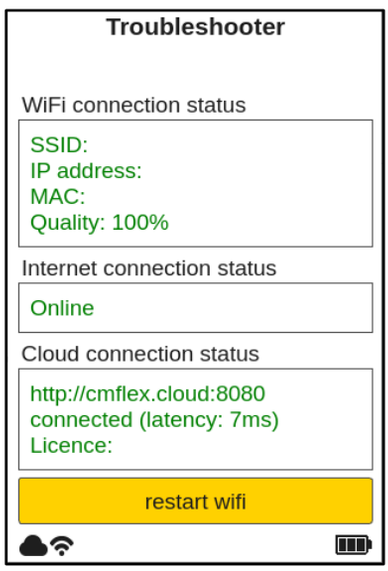


Figure *17: Troubleshooter*

Troubleshooter

By using the up/down arrow keys ⍰⍰ Ⓓand the OK button ©in the Network menu. When activated, the system performs a network diagnosis.

After a few seconds, the result of the network diagnosis will be shown in a report (*see* Figure 17: *Troubleshooter*).

To restart the Wi-Fi connection, push the OK button ©.

Colour coding:

- Green – functionality correct
- Red – functionality not correct

Use the back button Ⓑ to return to the main menu or to move one menu level up.

8.1.2. Select license and server

To change the license or the license server, the new license code can be entered, or the license server can be changed via the **Select License / Server** field.
The procedure is already described in *section 8.1.2. Select license and server*.

8.1.3. User Level

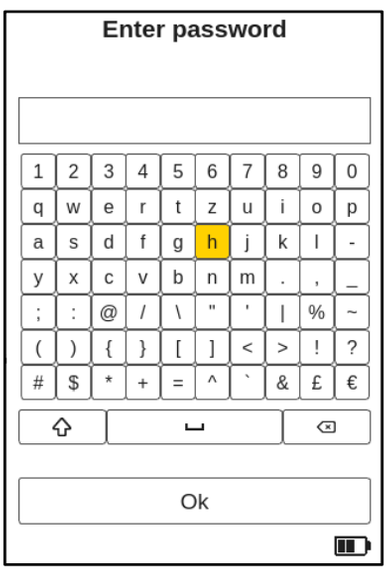


Figure *18: User level password*

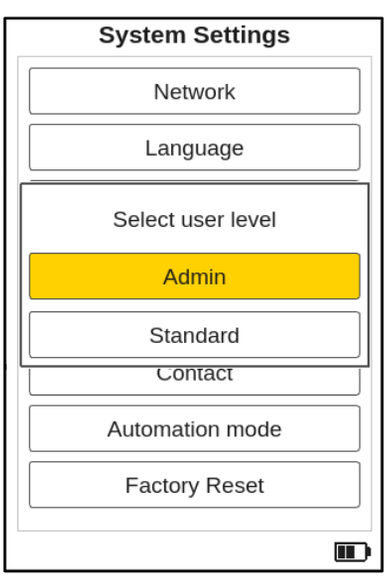


Figure *19: User level selection*

The coat**master**® Flex can be operated in two different User Level modes, the attributes of which are given in Table 6: User Levels.

You can toggle between the different modes by selecting the User Level menu. When this setting option is selected for the first time, you will be directed to a keyboard window to enter your user level password. The Administrator password is **admino041.**

Enter the password, using the arrow keys Ⓓ to navigate the keyboard, in conjunction with the OK button Ⓒ(*see* Figure 10: *Input panel - keys and elements*) to validate a character and move to the next one.

To validate the password, move the cursor down with the arrow keys and Ⓓ into the 'Enter' field, then press the OK button Ⓒ

You can interrupt the operation at any time by moving the cursor to the 'Cancel' key and confirming with the OK button Ⓒ

After validating the user level password, you must choose the user level (Standard/Admin). The default User Level is Admin. Once you have selected a user level, the level will be saved, even if you switch off your device.

Whenever you are switching from the Standard user level to the Admin user level, you must re-enter the password as described above.

After the user level selection, you will be directed back to the system settings.

User Level	Password protected	Measurement	Block Management	Application Management	Factory Reset
Standard	No	Measure	Select	Select	No
Admin	Yes Password: **admino041**	Measure	Add Select Rename Delete	Add Select Edit Delete Favorite Report	Yes

Table 6: *User level privileges*

8.1.4. Measurement Unit

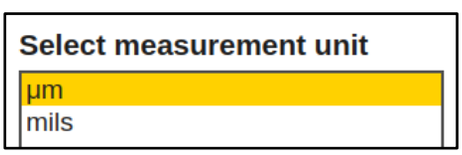


Figure *20: Measurement unit*

To configure the displayed measurement units in micrometers (µm) or in mils, choose the desired unit using the up/down arrow keys ⊡⊡ Ⓓ and the OK button Ⓒto validate the selection.

8.1.5. Auto power off

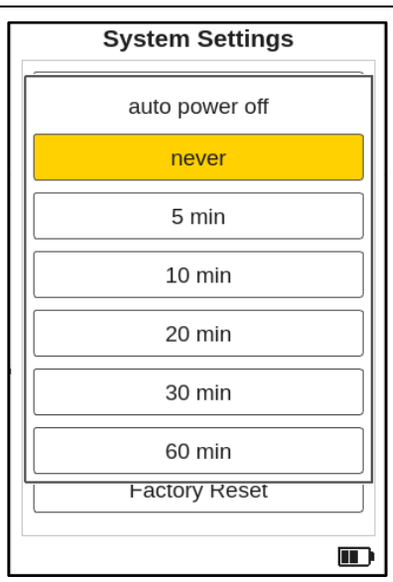


Figure *21: auto power off*

To change the time setting when the Flex should turn off automatically, use the up/down arrow keys ⊡⊡ Ⓓ to select the appropriate setting and the OK button Ⓒ to validate the selection.

8.1.6. Contact information

Figure *22: Contact information*

The contact information provides helpful information about the installed UI version as well as the system version number of the coat**master**® Flex.

This information is important for coat**master** AG service technicians to eventually support and find solutions to any problems regarding the measuring device.

Furthermore, the contact details of coat**master** AG are listed here.

It is also possible to access the current operating instructions of the Flex as a link by means of a QR code. For example, the QR reader of a smartphone or tablet can be used for this purpose.

8.1.7. Factory Reset

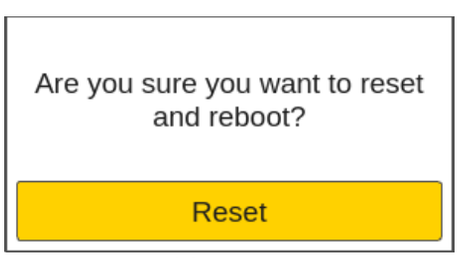


Figure *23: Factory reset*

Allows you to reset the system to the factory settings.

The factory reset will also reset the activation and will reboot the device!

Select the 'Reset' field, using the left/right arrow keys ⍰⍰ ⓓand the OK button ©to reset the device to the factory settings and deactivate the license. Alternatively, select the 'Cancel' field to return to the system settings menu.

Only users using the Flex in Admin mode can do a Factory reset. For the Standard User Level this option is greyed out and cannot be activated.

8.1.8. Automation mode

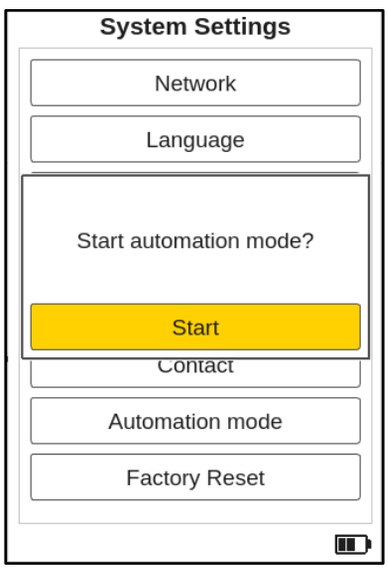
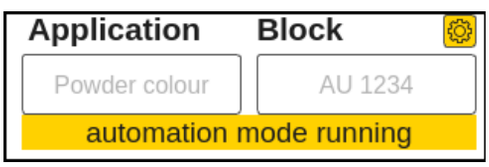


Figure *24: auto power off*

To start the automation mode, use in the settings menu the up/down arrow keys ⍰⍰ Ⓓ to select and push the OK button © to start.

In this state, the Flex can receive and process commands from a PLC system and enable system control. Applications and blocks can no longer be selected.
These are now specified by the PLC.

A message in the Flex display indicates that the automation mode is running.



To stop the automation mode repeat the procedure, by using the up/down arrow keys ⍰⍰ Ⓓ in the settings menu to select and push the OK button © to stop.

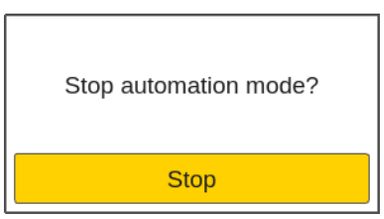


Figure *25: Stop automation mode*

8.2. Main Menu

The main menu, and descriptions of the elements of the coat**master**® Flex, are shown in Figure 26: *Main display*.

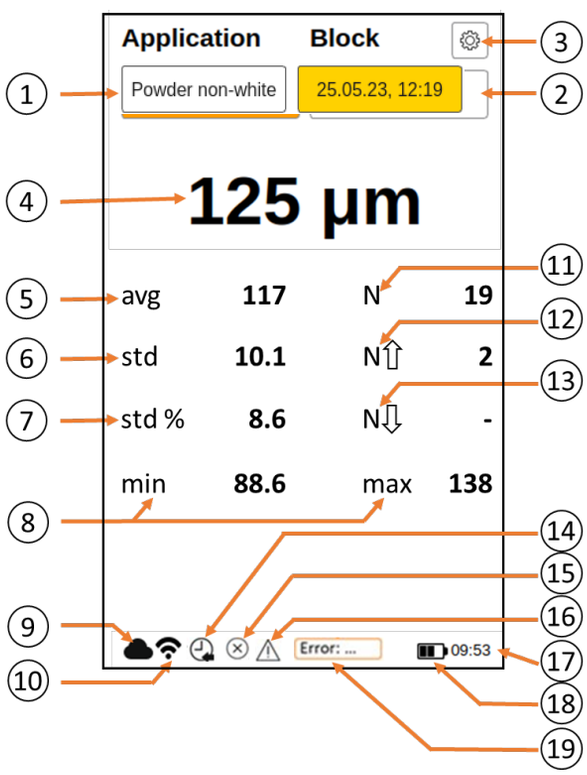


Figure *26: Main display*

Main Menu

① Active application
② Active block
③ System settings
④ Measured value in selected unit (µm)
⑤ Average value of block
⑥ Standard deviation of block
⑦ Relative standard deviation of block
⑧ Min. and max. values of block
⑪ Number of measurements in block
⑫ Number of measurements in block above upper limit
⑬ Number of measurements in below above upper limit
⑨ Cloud status
⑩ Wi-Fi signal level
⑭ Request for server
⑮ Error icon
⑯ Warn icon
⑰ Time
⑱ Battery level
⑲ Error-/Warning-/Status-message

The following options are available in the main menu:

a. Access to the application menu
Use the left or right arrow key ⍰ ⍰ Ⓓand the OK button © to select the application.

b. Access to the block menu
Use the left or right arrow key ⍰ ⍰ Ⓓand the OK button © to select the block.

c. Triggering a measurement
Press the Trigger button ① (*see* Figure 4: *Overview dimensions and components*) to start a measurement.

d. Display last twelve measurements
Use the up-arrow key ⍰Ⓓ to display the last twelve measured values numerically in the display. Use the down arrow key ⍰Ⓓ to return to the main menu.

e. Display trend chart
Use the down arrow key ⍰Ⓓ to display graphically the measured values in the trend chart. Use the up-arrow key ⍰Ⓓ to return to the main menu.

f. System settings
Use the left or right arrow key ⍰ ⍰ Ⓓ and the OK button © to select system settings (*see* 8.1 System Settings).

Use the back button Ⓑ to return to the main menu or to move one menu level up.

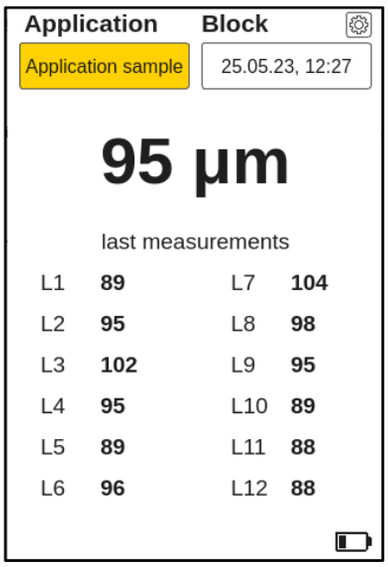


Figure *27: Display last twelve measurements*

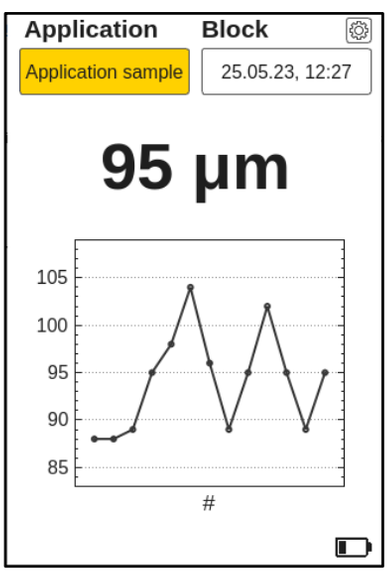


Figure *28: Display trend chart*

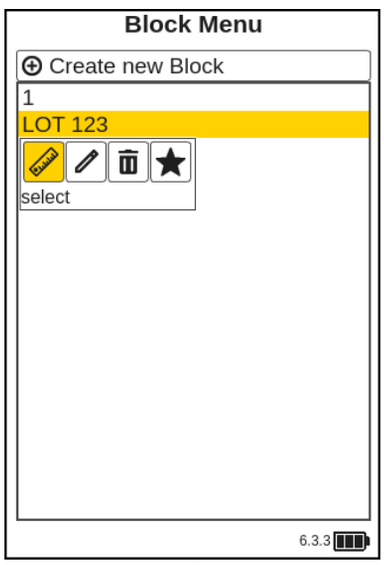
8.3. Block Menu

In the main menu use the left or right arrow key ⍰⍰ to select the 'Block' field and confirm with the OK button © according to *section 7.2.* (Figure 8: *Input panel - keys and elements*).

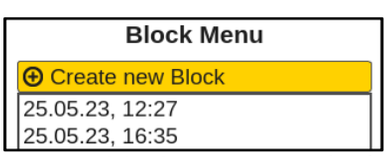
Ⓓ

The Block menu is accessible by all user levels, but with limited privileges for the Standard user level (*see section 8.1.2.*).

8.3.1. Select a block

Block saves different measurement series in separate directories. The statistics of the selected block are displayed in the main menu and in the trend chart. To use a block, select a block from the list and choose 'select'. You can select the desired block by using the up/down arrow keys ⍰ ⍰ Ⓓ and the OK button © from the input panel. If you choose a block within the list of available blocks the color will change to light orange. To activate one of the three icons ('select', 'rename' or 'remove') use in the block menu the left or right arrow key ⍰ ⍰ Ⓓand the OK button © from the input panel. To abort and return to the block menu, use the back button Ⓑ.	  Figure *29: Select block*

8.3.2. Create a new block

If you choose 'Create new Block' in the block menu, a new block with the current selected date and time or a consecutive number, depending on the setting in the WEB UI, will appear in the list. The current display switches directly back to the main display and the newly created block is immediately active and displayed with the block name in the block field.	 Figure *30: Create new Block*

8.3.3. Rename a block

To edit a block, select a block from the list and choose ‘rename’.

If you choose a block within the list of available blocks the color will change to light orange.
You can select the desired block by using the up/down arrow keys ⍰ ⍰ Ⓓ and the OK button © from the input panel.

To ‘rename’ the desired block, use in the block menu the left or right arrow key ⍰ ⍰ Ⓓand the OK button © from the input panel.
Select the ‘rename’ icon.
You must confirm with ‘OK’.

In the submenu you can rename the block by navigating the keyboard using the arrow keys Ⓓand entering the characters using the OK button © from the input panel.
Select ‘OK’ to confirm the new block name.

To abort and return to the block menu, use the back button Ⓑ.

Figure *31: Rename block*

8.3.4. Remove a block

To delete a block, select a block from the list and choose 'remove'.

If you choose a block within the list of available blocks the color will change to light orange. You can select the desired block by using the up/down arrow keys ⍰ ⍰ Ⓓ and the OK button © from the input panel.

To 'remove' the desired block, use in the block menu the left or right arrow key ⍰ ⍰ Ⓓand the OK button © from the input panel.
Select the 'remove' icon and confirm with 'OK'.

To abort and return to the block menu, use the back button Ⓑ.

Standard users cannot 'remove' blocks! This option is then greyed out and cannot be selected!

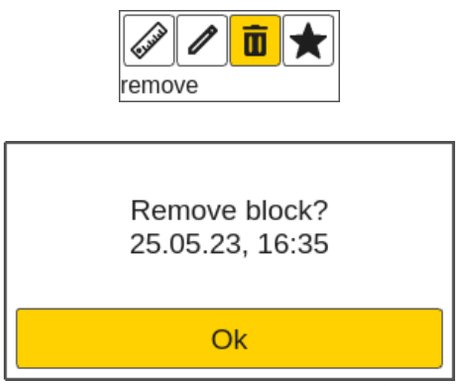


Figure *32: Remove block*

8.3.5. Favorite a block

You can set favorites within the blocklist. These are highlighted in yellow when enabled.

Favorite blocks are placed at the top of the blocklist.

If you select a block from the list of available blocks, the color will change to light orange. You can select the desired block using the up/down arrow keys (D) and the OK key (C) from the input field.

To enable or disable the "Favorite" icon, use the left or right arrow key (D) and the OK key (C) from the input field in the application menu.

To mark the desired block as a "favorite", confirm with the OK key (C) from the input field.

To cancel and return to the application menu, use the Back button (B).

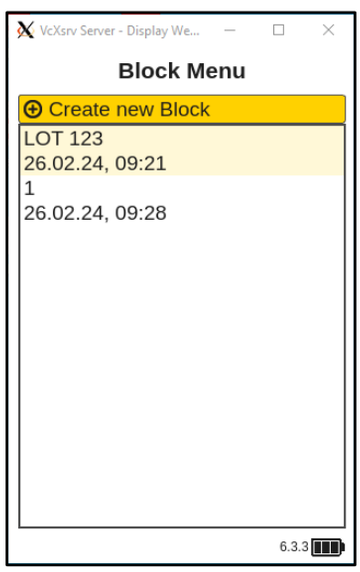
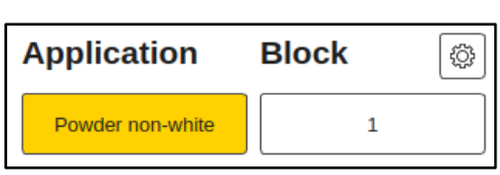


Figure 33: Favorite block

8.4. Application Menu



In the main menu, use the left and right arrow keys Ⓓ to select the 'Application' field, and confirm with the OK button ©, according to *section 7.2.* (Figure *8: Input panel -keys and elements*).

Standard users are only able to 'Select' applications! Other options are *greyed out* and cannot be chosen! Admin users have access to all options (*see* 8.1.2 User Level).

In the application menu, specific measurement parameters can be set. By using applications, these measurement parameters can be applied across a consistent set of measurements.
In the original state of the coat**master**® Flex, you will find five pre-set applications. They are displayed in **bold**.

- **Powder white** is a pre-set application for measuring white uncured powder.
- **Powder non-white** is a pre-set application for measuring uncured powder with any color except white.
- **Cured white** is a pre-set application for measuring cured white coating.
- **Cured non-white** is a pre-set application for measuring cured coating of any color except white.
- **Calibration standard** is a pre-set application for checking the calibration of your device with certified plates.

If you choose an application within the list of available applications, the color will change to light orange. You can select the desired application by using the up/down arrow keys ⍰⍰ Ⓓ and the OK button © from the input panel. Confirm the selection by pressing the OK button © from the input panel again.

Flash discharge: When changing from a white application to a non-white one, or vice versa, the flash generator in the coat**master**® Flex must discharge. A warning message is displayed and, when confirmed with 'Ok', a flash is immediately triggered.

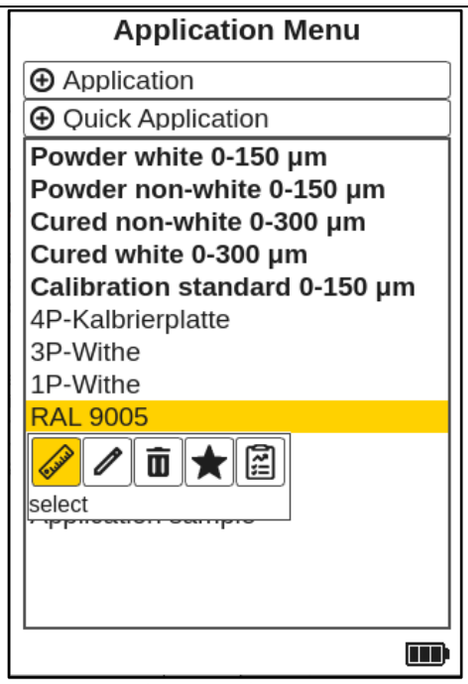


Figure *34: Application menu*

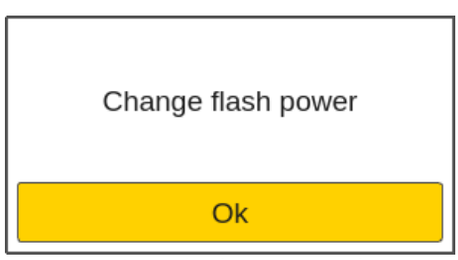


Figure *35: Flash energy change*

Greyed out applications written in italics cannot be selected and require further input, for which Admin level privileges are required. To complete such an application, it is necessary to perform at least one reference measurement with the corresponding layer thickness, as explained in the following section.

8.4.1. Delete an application

To remove an application, select an application from the list and choose ‘delete’.

If you choose an application within the list of available applications, the color will change to light orange. You can select the desired application by using the up/down arrow keys ⍰ ⍰ Ⓓ and the OK button © from the input panel.

To activate the ‘delete’ icon, use in the application menu the left or right arrow key ⍰ ⍰ Ⓓ and the OK button © from the input panel.

To ‘delete’ the desired application, you must confirm with ‘OK’.

To abort and return to the application menu, use the back button Ⓑ.

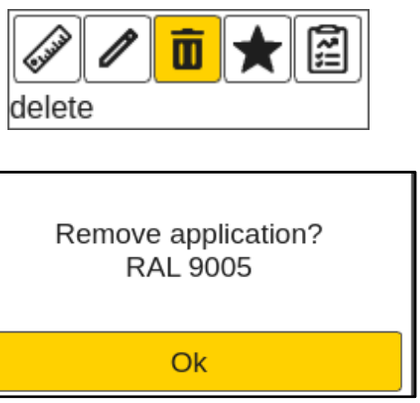


Figure *36: Remove an application*

Pre-set applications written in bold letters can be neither removed nor edited, even in the Admin mode.

8.4.2. Favorite an application

You can set favorites within the application list.
These are highlighted in yellow when activated.

Favorite applications are placed at the top of the application list.

If you choose an application within the list of available applications, the color will change to light orange. You can select the desired application by using the up/down arrow keys ⍰ ⍰ Ⓓ and the OK button © from the input panel.

To activate or deactivate the 'favorite' icon, use in the application menu the left or right arrow key ⍰⍰ Ⓓand the OK button © from the input panel.

To 'favorite' the desired application confirm with the OK button © from the input panel.

To abort and return to the application menu, use the back button Ⓑ.

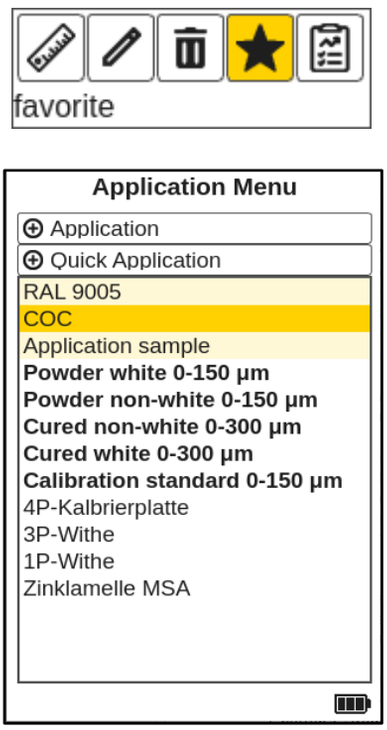


Figure *37: Favorite applications*

8.4.3. Advanced calibration report

A summary of the calibration parameters is displayed in the advanced calibration report. If all parameters are green, the calibration is successful.

For more Information see *section 8.4.4.4.*

The default report only shows a check mark next to the label in green for ok or red for not ok.
No graph will be displayed.

If you choose an application within the list of available applications, the color will change to light orange. You can select the desired application by using the up/down arrow keys Ⓓ and the OK button © from the input panel.

To activate the 'report' icon use in the application menu the left or right arrow key Ⓓ and the OK button © from the input panel.

To abort and return to the application menu, use the back button Ⓑ or confirm with 'OK'.

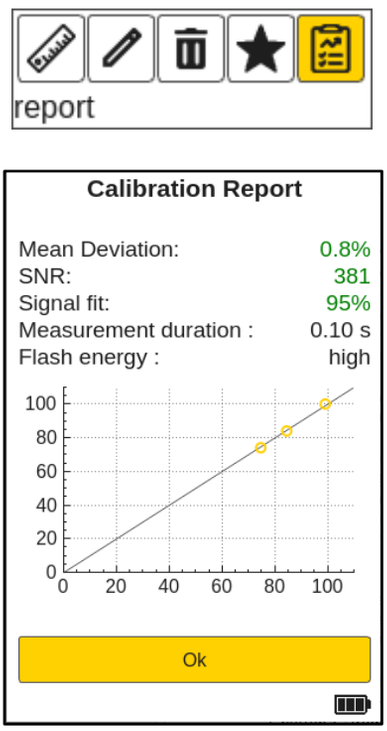


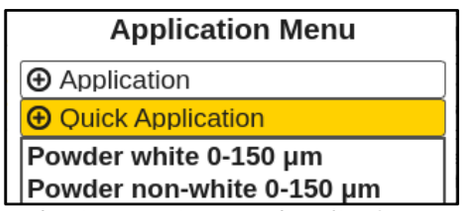
Figure *38: Advanced report*

8.4.4. Calibration Menu

If the existing factory applications are not suitable for your use, you can edit an existing, or add a new, application (only in the Admin user mode).
There are two ways to create a new application and thus a new calibration: Selecting 'edit' or '⊕ Application' (*see section 8.4.4.2.*) or '⊕ Quick Application' (*see section 8.4.4.1.*) in the application menu will direct you to the calibration menu.

8.4.5. Quick Application

When you select '⊕ Quick Application', the Reference Measurements display will appear (*see* Figure 38: *Reference Measurements*).



Follow the instruction on the display.

For next steps see *section 8.4.4.3.* Reference Measurements.

To abort and return to the application menu, use the back button Ⓑ.

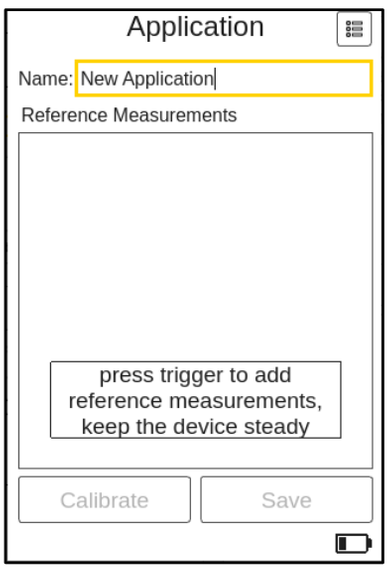
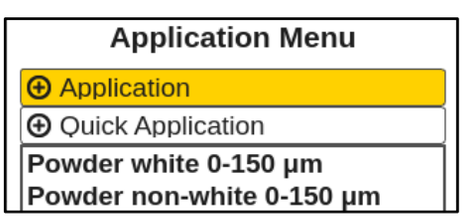


Figure *39: Reference Measurements*

8.4.6. Manual Application

When you select select '⊕ Application', a new display will appear (*see* Figure 39: *Material Properties*), which displays the calibration options that were initially chosen.



Use the up/down arrow keys ⍰ ⍰Ⓓ to navigate between the different fields and press the OK button © to open the corresponding drop-down menu. To select an option in the drop-down menu, proceed in the same way.

The 'Materials properties' menu offers the following options:

- Coating
  Cured, Powder uncured, Wet uncured
- Substrate

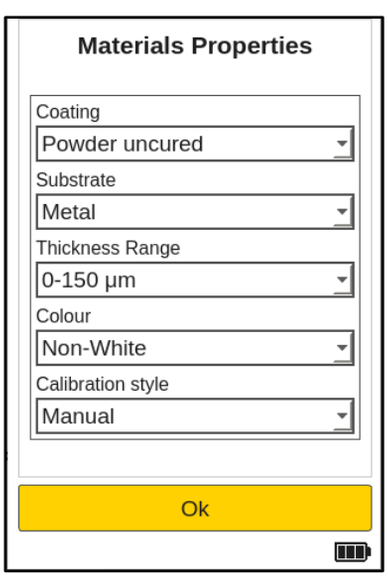


Figure *40: Material Properties*

Metal, Non-Metal

- Thickness range
  0-20 µm; 0-50 µm; 0-150 µm;
  0-300 µm; 0-1,000 µm
- Colour
  White, Non-white (any colour except white)
- Calibration Style
  Manual, Automatic

To continue confirm with 'OK'.

When you confirm the Materials Properties menu with 'OK' the Reference Measurement display will appear (*see* Figure 40: *Reference Measurements*).

Follow the instruction on the display.

For next steps see *section 8.4.4.3.* Reference Measurement.

To abort and return to the application menu, use the back button Ⓑ.

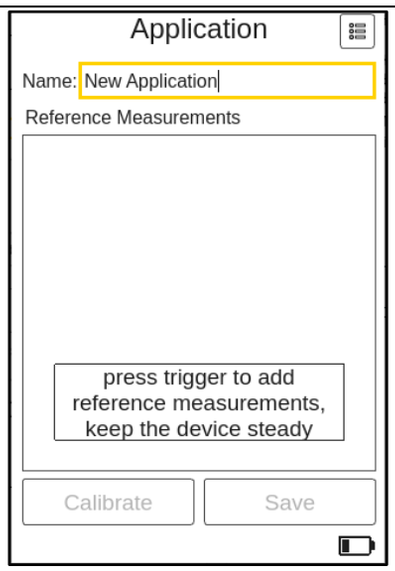


Figure *41: Reference Measurements*

8.4.7. Reference Measurements

Now you can proceed to conduct a reference measurement to calibrate your device for this new application.

At this point, position your coat**master**® Flex approximately **5 cm** away from the reference sample and press the trigger button Ⓣ (*see* Figure 41: *Reference / calibration measurement*).

A reference measurement will be taken, and this reference measurement will be displayed, with a calculated thickness value (100 µm), in the reference list (*see* Figure 42: *References*).

To take an additional reference measurement repeat the process.

A maximum of 5 reference measurements can be created. If more than 3 reference measurements are available, the algorithm automatically generates an off-set (*see section 8.4.6.*).

Figure 42: *Reference/calibration measurement*

To adjust or edit the reference measurement value, use the arrow keys Ⓓ and adjust the measuring value to a known thickness and use the OK button © from the input panel.

Using the up/down arrow keys ⍰⍰ Ⓓ will in- or decrease the number and the left or right arrow key ⍰⍰ Ⓓ will switch to the next numerical unit. You must confirm with the OK button © from the input panel.

Alternatively, you can 'Save' the application and edit the reference name and thickness at a later stage.

To abort and return to the application menu, use the back button Ⓑ.

If you choose a reference measurement within the list of available reference measurements, a light orange frame will appear around the selected reference measurement. You can select the desired reference measurement by using the up/down arrow keys ⍰⍰ Ⓓ and the OK button © from the input panel.

To delete a reference measurement, use the left or right arrow key ⍰ ⍰ Ⓓ and select the garbage can icon and OK button © from the input panel.

To delete the desired reference measurement, you must confirm with 'OK'.

To abort and return to the application menu, use the back button Ⓑ.

Measurements without a reference value are ignored in the calibration evaluation.
Once all settings for the new application are established, navigate with the arrow keys Ⓓ to the 'Calibrate' field ③ (*see* Figure 42: *References*).

① Application name
② Reference/calibration measurement(s)
③ 'Calibrate' (which starts the calibration process at the server).

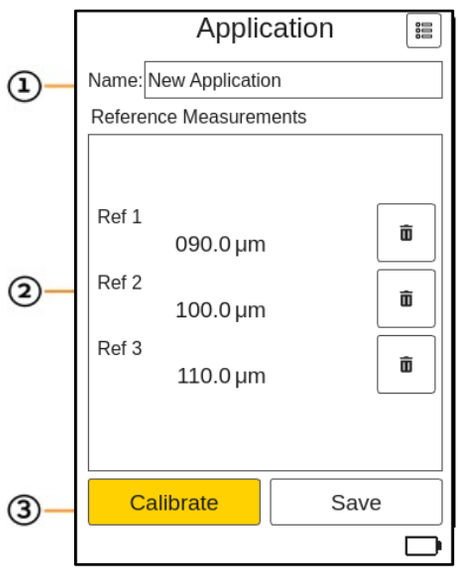


Figure *43: References*

In order to make more accurate measurements with a single application, you are advised to make at least two reference measurements with two different layer thicknesses with the coat**master**® Flex.
Trigger a reference measurement in the calibration menu by pressing the trigger button Ⓣ again.

Please be careful to enter the reference value in the units that were selected in the Settings Menu Measurement Unit (*see section 8.1.4.*).

A calibration report as shown in Figure 43: *Basic Calibration Report* will be generated by the coat**master**® Flex software.

The software will automatically check the results and will clearly display the status of the calibration process.

Select 'Ok' to return to the main menu.

To get a more detailed information about the calibration select 'Advanced report' (*see* Figure 44: *Advanced Calibration Report*).

A summary of the calibration parameters is displayed in the advanced calibration report. If all parameters are green, the calibration was successful.

The default Basic report only shows a check mark next to the label in green for ok or red for not ok.
No graph will be displayed.

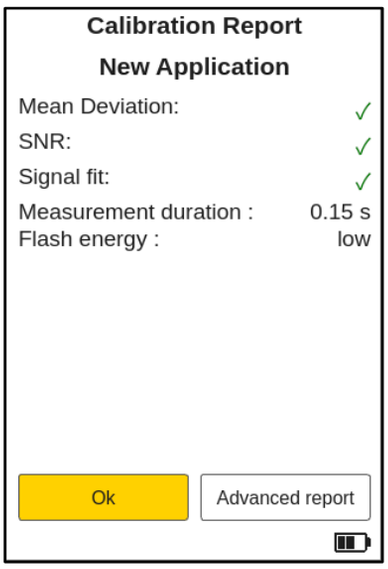


Figure *44: Basic Calibration Report*

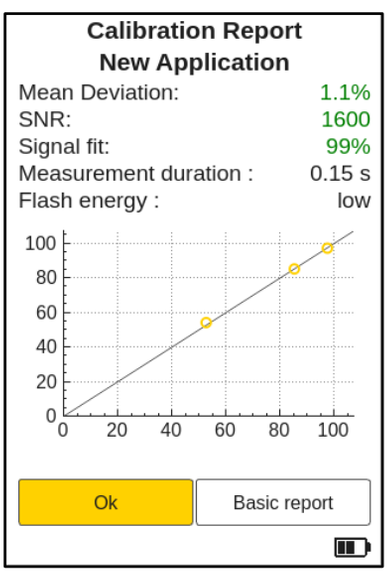


Figure *45: Advanced Calibration Report*

8.4.8. Calibration Report

The calibration report provides an evaluation of the calibration performed.
You will see the following values in the advanced report (*see* Figure 44: *Advanced Calibration Report*)

- **Mean Deviation** ((MD)of coat**master**® Flex from the reference value):
  The value should be less than 10%.
  The lower the value, the more accurate your measurement.
  If the value is greater than 10%, check the reference value.

- **SNR** (Signal to Noise Ratio):
  The SNR value should be greater than 100.
  The higher the value, the less sensitive to perturbations your measurements will be**.**
  If the value is less than 100, move the measuring device closer to the surface and increase the light energy, if necessary.

- Signal Fit (SF):
  The signal fit value should be greater than 90%.
  If the value is less than 90%, clean the optics with clean, dry, lint-free paper cloths and repeat the calibration procedure.
  If the signal adjustment is still below 90%, please contact our Technical Support hotline (contact details on page 2).

- Measurement duration:
  Depending on the to be measured coating thickness.
  When changing in the Materials Properties (*see* Figure 43: *Material Properties*) the Thickness Range regarding the expected dry film coating thickness the duration of the measuring time will be calculated.
  The higher the Thickness Range Is the higher will be the Measurement duration.

- Flash energy:
  Depending on the to be measured color of the coating material.
  When changing in the Materials Properties (*see* Figure 43: Material Properties) the Colour regarding the applied color of the coating material the Flash energy will be adjusted.
  White uses a high Flash energy and Non-White uses a low Flash energy.

The above values will be calculated and checked automatically by the coat**master**® Flex software after 'Calibrate' has been activated in the calibration menu.

8.4.9. Rename application

To edit the Application Name select the desired application in the application menu, using the up/down arrow keys ⍰ ⍰Ⓓand the OK button © from the input panel. If you choose an application within the list of available applications, the color will change to light orange.

To activate the 'edit' icon, use in the application menu the left or right arrow key ⍰ ⍰ Ⓓ and the OK button © from the input panel.

Use the up/down arrow keys ⍰ ⍰Ⓓto activate the field for name and press the OK button © from the input panel.

In the submenu (*see* Figure 45: *Application Name*) you can rename the application name by navigating the keyboard using the arrow keys Ⓓand entering the characters using the OK button © from the input panel.
Select 'OK' to confirm the new application name or abort your action with the back button Ⓑ.

Figure *46: Application Name*

8.4.10. Edit Materials Properties or DisplayOptions

To edit the Materials Properties and the Display Options, select the desired application in the application menu by using the up/down arrow keys ⍰ ⍰Ⓓ and the OK button ©from the input panel. If you choose an application within the list of available applications, the color will change to light orange.

To activate the 'edit' icon, use in the application menu the left or right arrow key ⍰ ⍰ Ⓓ and the OK button © from the input panel.

Use the up/down arrow keys ⍰ ⍰Ⓓto activate the property icon at the top right corner of the display and press the OK button © from the input panel.

The Advanced calibration options display will appear (*see* Figure 47: *Advanced calibration options*).

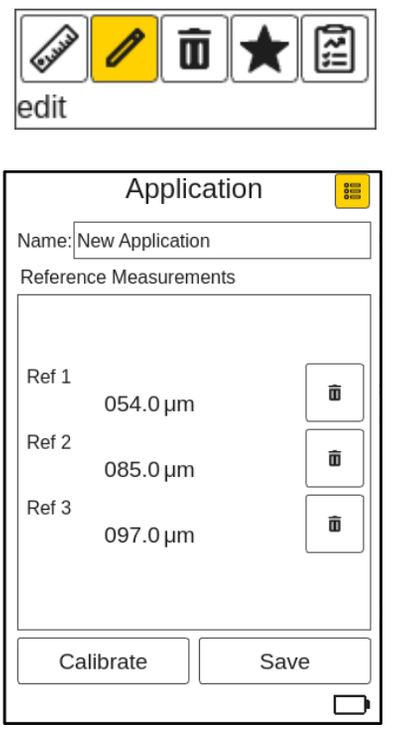


Figure *47: Property*

8.4.11. Materials Properties

Use the up/down arrow keys ⍰ ⍰Ⓓto select 'Materials Properties' (*see* Figure 47: *Advanced calibration options*) and press the OK button © from the input panel.

The Materials Properties display will appear (*see* Figure 48: *Materials Properties*).

For next steps see *section 8.4.4.2.* Manual Application.

To abort and return to the Advanced calibration options, use the back button Ⓑ.

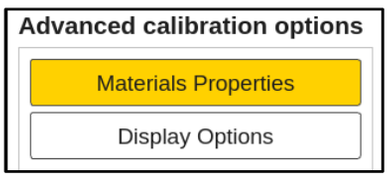


Figure *48: Advanced calibration options*

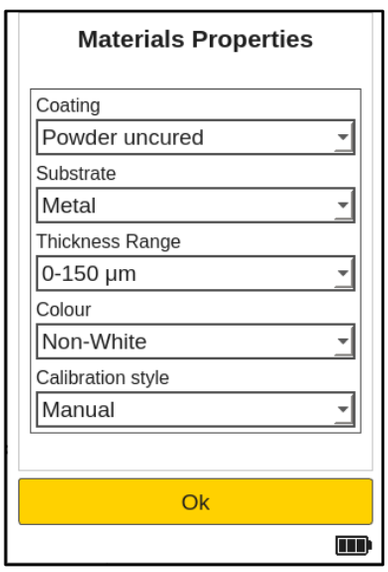


Figure *49: Material Properties*

8.4.12. Display Options

Use the up/down arrow keys ⍰ ⍰Ⓓ to select 'Display Options' (*see* Figure 49: *Advanced calibration options*) and press the OK button © from the input panel.

The Display Options display will appear (*see* Figure 50: *Display Options*).

For next steps see *section 8.4.4.9.* Display Options (Bounds).

To abort and return to the Advanced calibration options, use the back button Ⓑ.

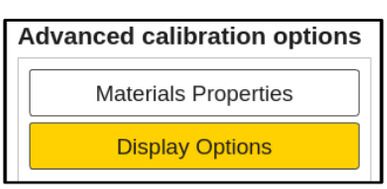


Figure *50: Advanced calibration options*

8.4.13. Display Options (Bounds)

The display options (*see* Figure 50: *Display Options*) will configure your display and the bounds in the trend chart (*see* Figure 49: *Principle of Application Bounds*).

Bounds (limits) can be configured and optionally displayed for the:

- Warning Bound
  Tolerance to initiate process changes
- Error Bound
  Quality tolerance
- Range Bound
  Display limits of the chart
- SNR Threshold
  Minimum value to avoid faulty measurements

To enable a bound, navigate with the up/down arrow keys ⍰ ⍰©to the desired field and enable by pressing the OK button ©. The fields with lower and upper descriptions will appear in the Display options display.

It is essential that the bounds values are chosen according to the units selected in the Settings menu Measurement Unit (*see section 8.1.4.*). Activate one of the bound fields by pressing the button ©.

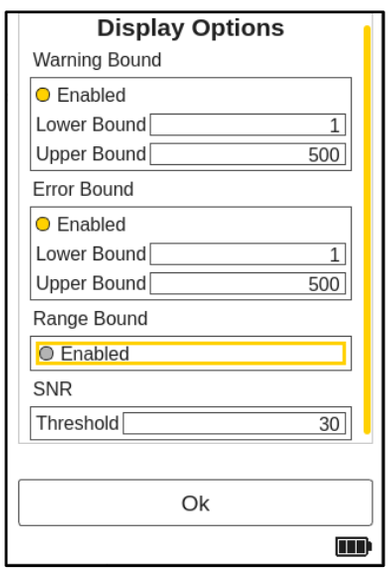


Figure *51: Display Options*

Setting Bounds

To understand the relationship between the bounds in the trend chart, see Figure 51: *Principles of Application Bounds* and the Display Options in the Application menu (*see* Figure 52: *Application Bounds*).

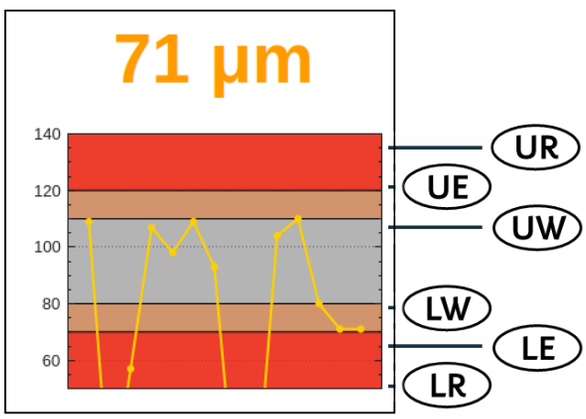


Figure *52: Principles of Application Bounds*

- Measurement values inside the red bands of the chart are outside quality tolerance levels.
- Measurement values inside the yellow bands of the chart are in a warning zone, and corrective measures for the process must be taken.
- Measurement values inside the white bands of the chart are satisfactory. No measure is required.

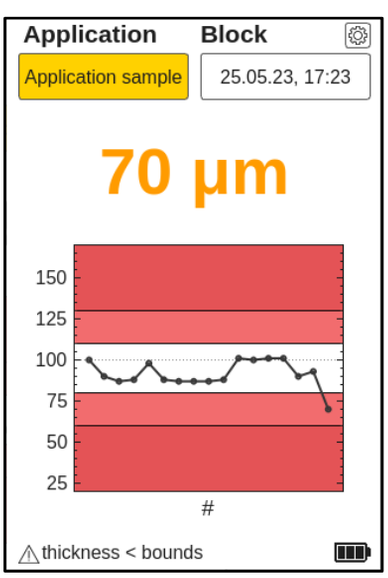


Figure *54: Lower Warning*

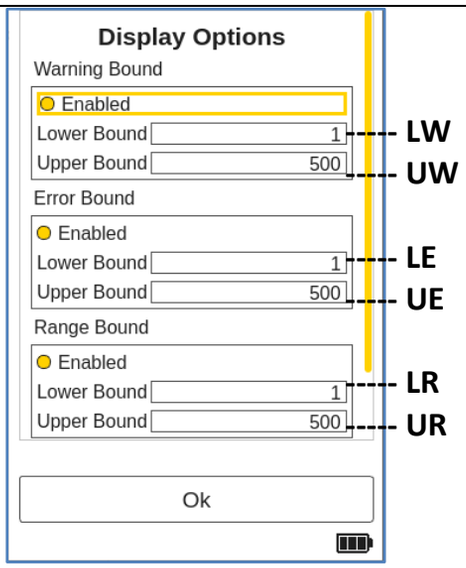


Figure *53: Application Bounds*

UR = Upper Range
UE = Upper Error
UW = Upper Warning
LW = Lower Warning
LE = Lower Error
LR = Lower Range

If the measured values are out of range, the color of the current measurement turn to orange for a Warning (*see* Figure 53: *Lower Warning*).and to red for an Error (*see* Figure 54: *Upper Error*).

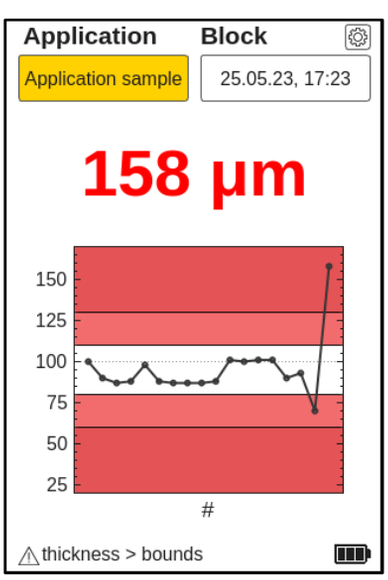


Figure *55: Upper Error*

The coating color type determines the intensity of the flash. This means that a white sample generally requires more energy to achieve the desired temperature change on the surface. The coating color type (i.e., White or Non-White) must be chosen before a reference measurement can be made.

In the 'Upper Bound' keyboard display e.g., you can enter the value of the bounds analogously with the up/down arrow keys ⍰ ⍰Ⓓand the OK button ©

Press the 'OK' button to validate the new bound value or use the back button Ⓑ.to return to the Advanced calibration options.

If the consistency of the bounds is not considered, or values are entered incorrectly, a red warning message will appear.

When you have established all your settings in the Display Options menu, select 'OK' to continue to the 'Calibration' display.

To abort and return to the Advanced calibration options, use the back button Ⓑ.

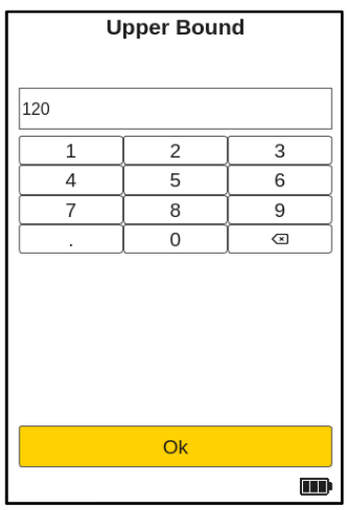


Figure *56: Bound setting*

Setting the SNR Threshold

The SNR threshold value is set in a second step after the calibration procedure has been completed. To do this, the coat**master**® Flex application must be edited again after completing the calibration for the first time. The reason for this is that the nominal value for the SNR threshold is only available in the calibration report after taking the reference measurements on the coating (*see section 8.4.4.4. calibration report*).

The SNR value measures the amplitude of the temperature response on the surface of the coating. In this example application, the SNR value shown in the calibration report is SNR = 2090 (dimensionless). If the coat**master**® Flex is aimed at another surface if it is too far away from the coating, the SNR value for the measurement will decrease. We can set an SNR threshold to determine the minimum SNR value required of a measurement to be acceptable. As a rule of thumb, you can use half of the value shown in the calibration report (i.e., in this example, set SNR Threshold = 1045). If you want higher selectivity for measurements, increase the SNR threshold. It should not be increased over the value from the calibration report

8.4.14. Example of a Calibration Process

For further clarification of the calibration procedure, we describe the procedure using an example of a dark powder coating (RAL9005) on aluminium:

Step 1: Prepare three samples with coatings that are as different as possible; for instance:

- Sample 1: 40–60 µm
- Sample 2: 80–100 µm
- Sample 3: 120–140 µm

Step 2: In the 'Application' menu, select '⊕ Application'.

Step 3: In the 'Material properties' enter the appropriate material properties (*see section 8.4.4.6.*).

In this case:

- Coating: Powder uncured
- Substrate: Metal
- Thickness range: 0–0-150µm
- Colour: Non-white
- Calibaration Style: Manual

To continue confirm with 'OK'.

Step 4: Edit the name of the application into 'RAL9005' in the 'Application Name' field (*see section 8.4.4.5.*). Select 'OK' to confirm the new application name.

Step 5: Make a reference measurement for each sample with a dedicated measuring point. Note which reference measurement in the coat**master**® Flex calibration menu belongs to which reference sample and dedicated measuring point. If the coat**master**® Flex is required for another purpose, the dialogue box can be closed with 'Save'. The samples may now be cured.

Step 6: In the 'Display Options' menu (*see Section 8.4.4.6.*), select the display options based on your quality management requirements. To continue confirm with 'Ok' and use the back button ®. to get back to the reference measurement menu.

Step 6: After the samples have cooled down, make a measurement with a standard contacting coating thickness gauge at the points noted in step 5.

Step 7: If the calibration menu has been closed, select 'RAL9005' in the application menu and then 'edit'. Press the OK button © from the input panel to access the reference measurement (*see section 8.4.4.6.*). Now the values from step 5 can be entered for the respective reference measurements and you can complete the calibration by selecting 'Calibration'.

A note on the number of samples required for calibration.
Calibration with just one sample will usually be accurate in the thickness range of that sample, but accuracy may be less when measuring at thickness which deviates from the thickness of the calibration sample. If you need higher accuracy across a longer thickness range, we suggest more calibration samples (for example three samples as described above).

A note on the thickness of the calibration samples
Calibration samples should cover the whole measurement range. If, for example, measurements with the Flex are to be conducted up to 150 µm, then a calibration

sample at 150 µm should be used to ensure maximum accuracy of the Flex measurement. If the measurement value exceeds the maximum calibration measurement by a factor of 2, the Flex will not display the measurement value because of potentially high inaccuracy.

Quick 5-minute calibration

A tutorial video showing a quick 5-minute calibration by using a hot air blower for curing is available on YouTube: https://youtu.be/_RTlbfQXAG4

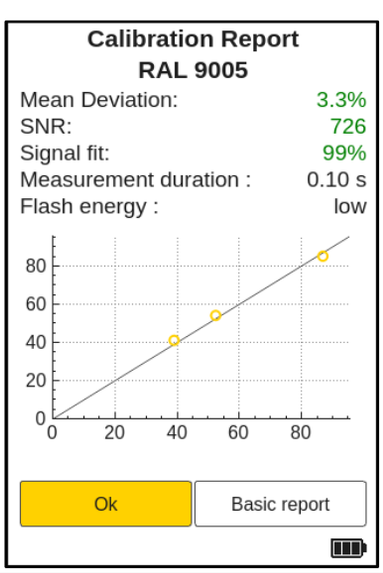
8.4.15. Offset calibration

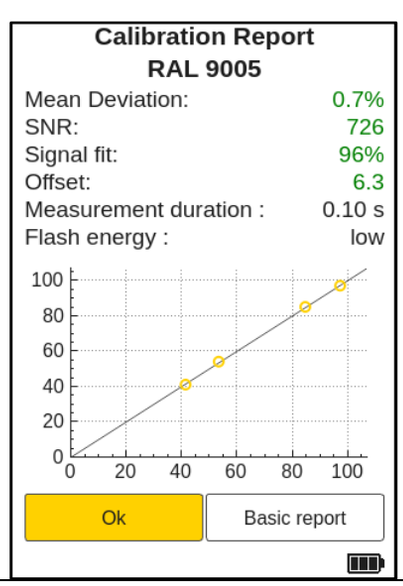
For some measurement applications it sometimes occurs that the Flex measurement results are accurate in one thickness range (usually, the thickness of the calibration sample), but there is a systematic deviation of the Flex measurement results at lower or higher thickness. For example, Flex thickness measurements are ok in the range of 80 µm, but we see that the Flex measures always around 10 µm too high in the range of 40 µm. Such systematic deviations can occur, for example, if an uncured coating is to be measured with the Flex on a cured coating. Another situation where such systematic differences arise is when measuring thin coatings at 10 µm or less.

If the deviation is systematic, it can be compensated with an offset calibration. To make an offset calibration with the Flex requires at least two calibration samples (in contrast to the standard application, where minimum one sample is required). In addition, the two samples must be different in coating thickness at least by a factor of two, in order to provide an accurate offset determination.

In our example, if we want to make an offset calibration to measure a coating up to 80 µm thickness, we need one sample with minimum 80 µm coating thickness and a second sample with maximum 40 µm coating thickness. For each sample, take two reference measurements. Offset calibration will be active only when these two conditions are satisfied: at least factor of two between thinnest and thickest coating, at least four reference measurements.

The result of the calibration is displayed in the calibration report (*see* below)





Calibration report for a standard calibration (no offset).	Calibration report for an offset calibration, showing the offset value (in this example -6.3 µm). As a rule of thumb, the absolute offset value should not be larger than the minimum coating thickness used in the application. Both positive and negative offset values are allowed.

9. Measurement

When the dedicated application and block have been chosen and the calibration has been made, the measurement series for the coating samples can be performed.

Make sure that the appropriate application has been selected in the application menu (*see section 8.4.*). Hold the coat**master**® Flex as steadily as possible at a distance of approximately **5 cm** from the sample (*see* Figure 52: *Measurement*). The measured surface is in the middle of the red circles and is approximately 2 mm^2 in diameter. The measurement process is started by pressing the trigger button Ⓣ. When pressing the trigger button to conduct a measurement, a light impulse is released.	 Figure *57: Measurement*

To display a trend chart for your measurements for the current block, use the down arrow key ⓪in the input panel. (see section 7.2.)

Use the up arrow key ⓪ to return to the previous main menu showing the numeric display.

The chart graphically shows the trend of the last 20 measurements for the selected block.

If a measurement is outside the range bounds, it will not be displayed on the trend chart!

The vertical axis measurement values are displayed in the chosen units (see section 8.1.4.).

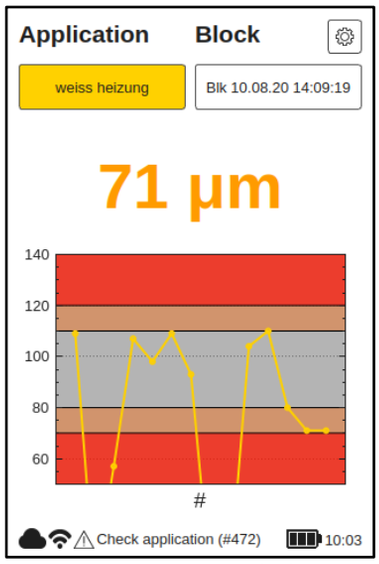


Figure *58: Trend chart*

If the part to be measured is moving, keep up with the movement of the part, so that the relative movement between the part and the coat**master**® Flex is as small as possible, thus ensuring a stable measurement.

10. Data Transfer/Cloud

Now that you have made a set of measurements, you may want to process and further analyze the recorded data. This can be done by accessing your coat**master**® Flex server.

10.1. Login

For a cloud server, you must log in to the coat**master**® cloud on your computer via the Internet to access the data. Alternatively, if you are using a coat**master**® local server, connect your computer to the local server Wi-Fi (*see section 7.7.*). Proceed as follows to access to connect to your server:

Depending on your coat**master**® Flex server, select the following URL to connect to your server:

Server	URL
Europe	http://coatmaster.cloud
US	http://useast.coatmaster.cloud
China	http://ningxia.coatmaster.online
Local server	http://10.10.0.1:9080
Custom servers	Enter the custom IP address.

Login with the provided **Username** and **Password** (i.e. license key and activation code). Validate your entries by clicking the Login button.

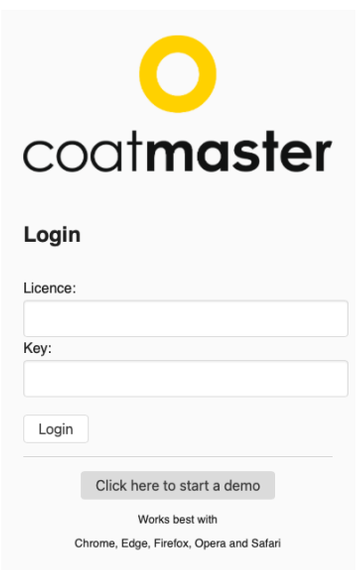


Figure *59: Cloud login*

You will automatically be directed to the home display of the coat**master**® cloud website, which has four main menu buttons on the upper left side (Figure 47: *Cloud main menu*):

- APPLICATIONS
- MONITOR
- TREND
- EXPORT
- SETTINGS
- HELP
- LIBRARY

On the lower left side, you can choose the language (Bulgarian, Czech, German, Greek, English, Spanish, Estonian, Finnish, French, Hebrew, Indonesian, Italian, Japanese, Korean, Polish, Portuguese, Romanian, Russian, Slovenian, Serbian, Thai, Turkish, Vietnamese, Indian, Chinese) or Logout.

For further an more details instruction, you can download the latest, complete coat**master**® Flex WEB UI manual from our website.

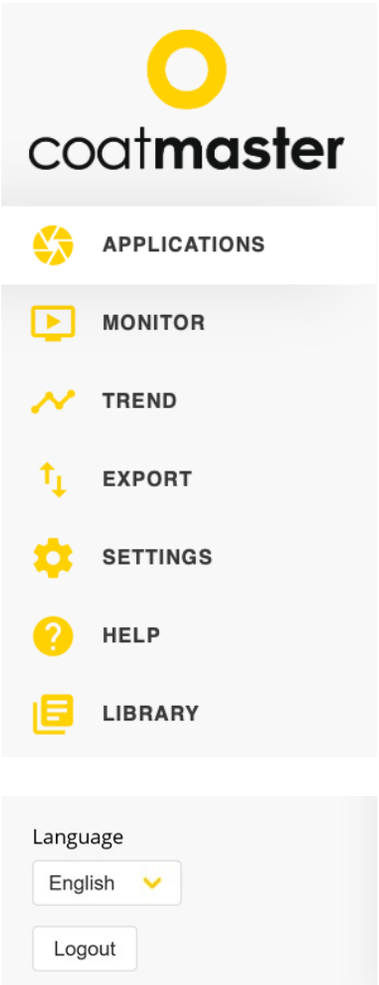


Figure *60: Cloud main menu*

10.1.1. Applications

The application menu in the coat**master**® cloud displays the available applications. The list provides details of the number of blocks and measurements per application.

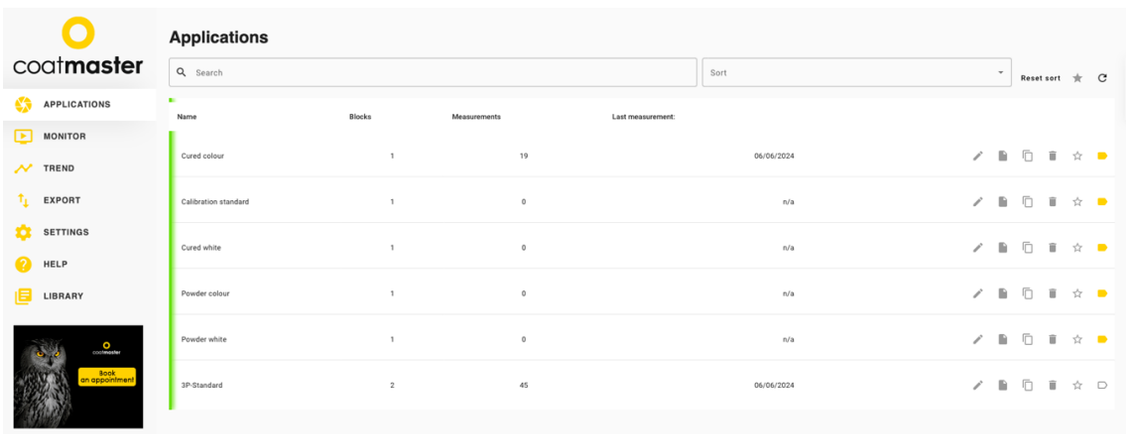


Figure *61: Cloud --application menu*

To select an application, click on one of the applications in the list.
You will automatically be directed to the TREND menu.

10.1.2. Monitor

Before you can review the trend chart of the application, which displays the measured thickness versus the time, you must select a block. Click on the block drop-down menu above the chart and select the desired block.
To display the selected block, press
the 'Refresh' button to reload the graph.

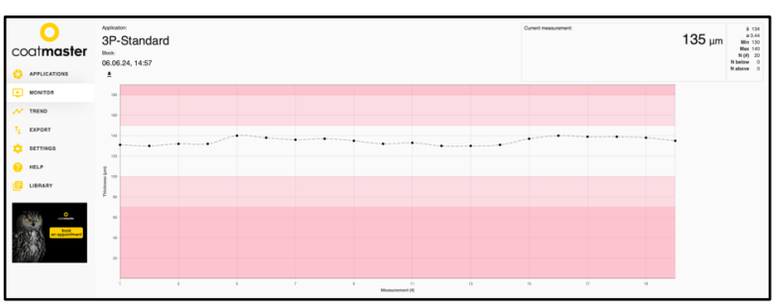


Figure *62: Cloud - monitor menu with block selection*

To download the current block, simply click on

A prompting message will enable you to save or open the corresponding Excel file.

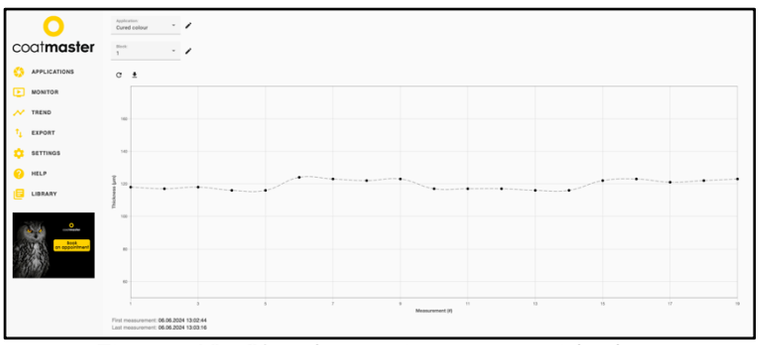


Figure *63: Cloud - monitor menu with chart*

10.1.3. Export

Within the export menu of the coat**master**® cloud, you can select dedicated data and download it to your computer.

Figure *64: Cloud - export menu - select application*

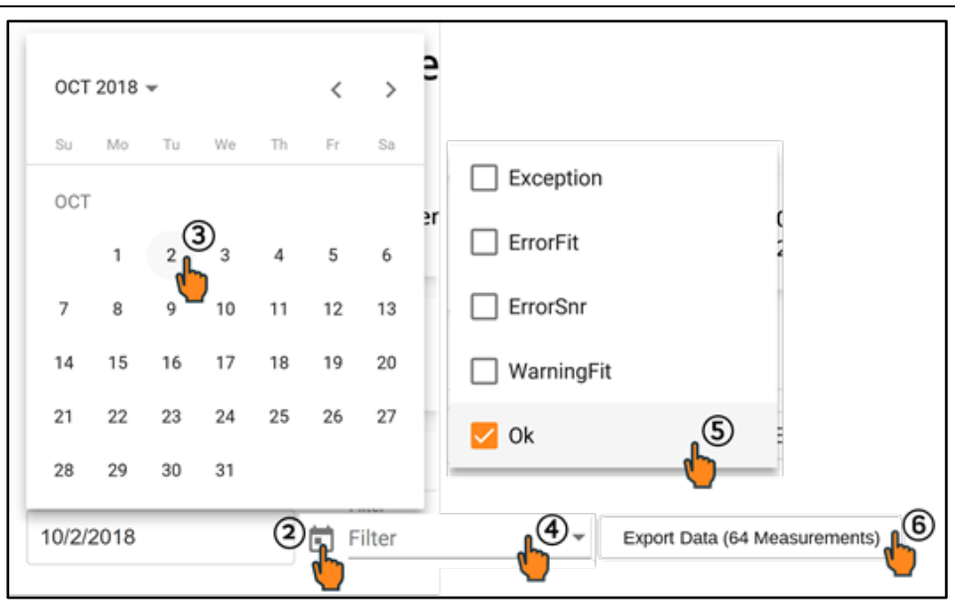


Figure *65: Cloud – export menu – limiting data select*

① Click on the desired application.
The selected application will be copied to the export list in the right half of the window. You can remove the selected applications by clicking on the red cross (see Figure 64: *Cloud - export menu - select application*).
To limit your data selection, choose a start date for the data export. Click on the calendar icon ② and select the start date ③ in the calendar menu. You can also enter the start date in the corresponding field by using the format MM/DD/YYYY (MM = number of the month, DD = number of the day, YYYY = Year)
Additionally, you can apply one or more filters to select dedicated measuring data using ④ and ⑤.
Validate your selection and download the chosen data by clicking on the 'Export Data' button ⑥. A prompt message will enable you to save or open the corresponding Excel file.

10.1.4. Help

From the 'Help' menu, you can access further support information.
Please contact our Technical Support hotline first (contact details on page 2).

11. Troubleshooting and Best Practice

11.1. Error Messages

Error Messages	Description • Corrective measure
Cloud	Did not receive a response from the cloud: • Check Internet status and perform a network diagnosis with 'Troubleshooter' (see section 8.1.1.). • Check the WLAN signal on the router. In the absence of a signal, reconnection of cables is required. If this is the case, reboot the router by switching the power off/on as necessary (*see section 7.*). • Check the status of your local Wi-Fi network.
Fit	Signal of sample does not match the application: • Select appropriate application (*see section 8.4.*). • If the application was working previously, look for dirt on the lens or flash. For cleaning, see *section 13.1.*.
SNR	Signal-to-noise ratio is too low: Either • use an application with a higher flash power (*see section 8.4.*) or • move the device closer to the sample. For the measuring distance, *see section 9.*.
Bounds	The measured thickness is outside the valid thickness limits set for the application: • Sample does not meet the defined quality limits; set the appropriate quality limits (bounds) (*see section 8.4.4.9.*).

Table 7: *Error messages and corrective measures*

11.2. Error Codes

Technical Errors	Description • Corrective measure
0	Received an 'Error' message from the cloud when measuring: • Check the Internet status and perform a network diagnosis with 'Troubleshooter' (*see section 8.1.1.*).
1	Wrong parameter: • Contact the Technical Support (details on page 2) for further assistance.
2	No data acquisition (DAQ) board: • Contact the Technical Support (details on page 2) for further assistance.
3	Data acquisition (DAQ) busy: • Contact the Technical Support (details on page 2) for further assistance.
4	Flash generator timeout: • Contact the Technical Support (details on page 2) for further assistance.
5	Data acquisition (DAQ) error: • Contact the Technical Support (details on page 2) for further assistance.
6	Raw data process error: • Contact the Technical Support (details on page 2) for further assistance
7	No light pulse detected: • Check whether you have selected the right energy level for your application (*see section 8.4.*). See Application menu. • Contact the Technical Support (details on page 2) for further assistance.
8	Wrong light pulse timing: • Contact the Technical Support (details on page 2) for further assistance.
9	Cannot open file: • Contact the Technical Support (details on page 2) for further assistance.
10	Cloud timeout: • Check your Wi-Fi settings. • Check the internet status and perform a network diagnosis with 'Troubleshooter' (*see section 8.1.1.*). • Contact the Technical Support (details on page 2) for further assistance.
11	Wrong message format: • Contact the Technical Support (details on page 2) for further assistance.
12	Http error: • Contact the Technical Support (details on page 2) for further assistance.
13	Unknown error: • Contact the Technical Support (details on page 2) for further assistance.
14	Unable to connect to Wi-Fi: • Check your Wi-Fi settings. • Check the internet status and perform a network diagnosis with 'Troubleshooter' (*see section 8.1.1.*). • Contact the Technical Support (details on page 2) for further assistance.
15	IR signal clipping: • Use a lower flash energy (that is in the case you are using White for color), select Non-White for your application. • If you measure on hot pieces, try to wait till the parts cool down. • Contact the Technical Support (details on page 2) for further assistance.
16	Photodetector signal clipping: • Contact the Technical Support (details on page 2) for further assistance.
17	Wrong acquisition parameter: • Contact the Technical Support (details on page 2) for further assistance.

119	Optimization start time not found: • Contact the Technical Support (details on page 2) for further assistance.
120	Photodiode cutoff not found: • Contact the Technical Support (details on page 2) for further assistance.
400	Bad Request: • The client's request was invalid or incomprehensible, e.g., due to incorrect syntax. • Contact the Technical Support (details on page 2) for further assistance.
401	Unauthorized: • Authentication required. The client must authenticate to proceed. • Contact the Technical Support (details on page 2) for further assistance.
403	Forbidden: • Access denied. The request was understood, but the server refuses to execute it. • Contact the Technical Support (details on page 2) for further assistance.
408	Request Timeout: • The client took too long to complete the request. • Contact the Technical Support (details on page 2) for further assistance.
409	Conflict: • A conflict exists with the current state of the resource, e.g., due to concurrent modifications. • Contact the Technical Support (details on page 2) for further assistance.
429	Too Many Requests: • The client has exceeded a request limit, often a sign of rate-limiting. • Contact the Technical Support (details on page 2) for further assistance.
500	Internal Server Error: • General server error without specific diagnosis. • Contact the Technical Support (details on page 2) for further assistance.
502	Bad Gateway: • A faulty gateway or proxy server received an invalid response. • Contact the Technical Support (details on page 2) for further assistance.
503	Service Unavailable: • The server is temporarily unavailable, e.g., due to overload or maintenance. • Contact the Technical Support (details on page 2) for further assistance.
504	Gateway Timeout: • The gateway or proxy server did not receive a timely response from the target server. • Contact the Technical Support (details on page 2) for further assistance.
471	Fit error: • Check application • If the application was working previously, look for dirt on the lens or flash. • Contact the Technical Support (details on page 2) for further assistance.
472	Fit warning: • Check application • If the application was working previously, look for dirt on the lens or flash. • Contact the Technical Support (details on page 2) for further assistance.
995	Range based error: • Contact the Technical Support (details on page 2) for further assistance.
999	Failure in algorithm: • Contact the Technical Support (details on page 2) for further assistance.
9992	Theta matrix inconsistent: • Contact the Technical Support (details on p. 2) for further assistance.

9993	Negative slope: • Contact the Technical Support (details on p. 2) for further assistance.

Table 8: *Error codes and corrective measures*

11.3. Frequently Asked Questions (FAQs)

Keyword	Description Reason • Corrective measure
No start	My coat**master**® Flex does not turn on: Battery almost empty. • Recharge battery.
Sudden shut-down	My coat**master**® Flex immediately shuts down after triggering a flash: If it happens rarely, • Leave it and restart the device. If it happens regularly, • Return Flex to your service partner given on page 2.
Fan not running	The fan of my coat**master**® Flex is not running: Measurements will become unstable. • Send the device back to your service partner (page 2) for repair.
Sudden flash without trigger	coat**master**® Flex triggers a flash or multiple flashes without pressing the trigger button: • Strong magnetic field (i.e. spark of powder coating gun).
Unstable results	Unstable measurements or varying thickness values when using the coat**master**® Flex: coatmaster® Flex is too hot. • Search for a cooler measuring environment, allow the coat**master**® Flex to cool down, and never leave the coat**master**® Flex in direct sunlight for an extended period of time. Parts to be measured are too far away. • Follow the instructions regarding sample distance in *section 9.*. Wrong flash intensity selected. • Select the appropriate color in the calibration menu (*see section 8.4.*).

Table 9: *Frequently Asked Questions*

11.4. Hotline

Technical Support for coat**master**® Flex: contact details on page 2

12. Storage and Transportation

To ensure that your coat**master**® Flex is always protected from dust, dirt, moisture and damage, always store the measurement device, router, and batteries safely in the transport case when not in use.

13. Maintenance and Repair

For any repair or service of the device, excluding light maintenance, please contact our Technical Support hotline (contact details on page 1).
Light maintenance: coatmaster® Flex needs to be inspected, at least weekly, for inlet filter cleanliness, and front glass transparency and cleanliness.
In case of any other tampering, or opening of the device, the warranty will immediately be terminated.
Table 9 gives you an overview of the items that need to be regularly maintained on your coatmaster® Flex:

Item	Description Level	Maintenance Level	Done by
Inlet filter	Regular maintenance	L1	User
Battery	Replace item when necessary	L1	User
Infrared Filter	Annual maintenance	L2	CSP
O-Ring	Annual maintenance	L2	CSP

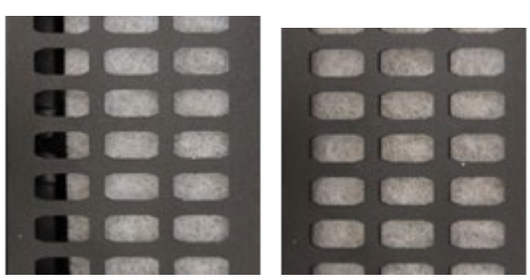
Table 10: *Items to be maintained and maintenance level*

Maintenance Level:
Level 1 (L1): can be done by the user of the coat**master**® Flex.
Level 2 (L2): must only be done by a coat**master** service partner (CSP).

Level 2 maintenance by the user, or any technician except an authorized coatmaster service partner, is prohibited. In such a case, the warranty will immediately be terminated.

13.1. Replacement of the Inlet Filter

The inlet filter must be inspected, at least weekly, by the user of the coat**master**® Flex to avoid a malfunction of the device. If it is dirty, change the filter; otherwise, change the filter every second week or after 80 hours of use, whichever is earlier.

Remove the bottom cover to examine the inlet filter of the coat**master**® Flex. The filter should be clean, as shown in Figure 65: *Inlet filter replacement*. If the inlet filter is dirty, please exchange the inlet filter for the one that has been provided with your delivery. Never reposition a reversed dirty filter in the filter holder since this will blow dust inside the coat**master**® and damage the device. Always use a clean, new filter.	 Figure *65: Inlet filter replacement*
Make sure that the filter is well positioned by pushing it toward the handle before closing the cover. The filter should cover the entire grid surface and no space should be visible after closing the filter cover, as shown in Figure 66: *Positioning of the inlet filter*.	 ***Wrong*** ***Correct*** Figure *66: Positioning of the inlet filter*
Never attempt to clean the inlet and outlet filters with compressed air, since this will blow the dust particles inside the coatmaster® Flex and possibly push the filters away from their correct position.	

13.2. Cleaning and Care

After cooling, clean the coat**master**® Flex with clean, dry, lint-free paper cloths. Never clean the front glass or the lens with alcohol-based cleaners!
Do not clean the device with compressed air!

13.3. Warranty

Your coat**master**® Flex is covered by a one-year warranty.

14. API-Interface Description

You will find the current API at:

https://coatmaster.com/fileadmin/bilder/coatmasterflex/coatmaster_Flex_API.pdf

Or scan the QR code:

coatmaster

measure up. contactless.

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