micro-TRI-gloss
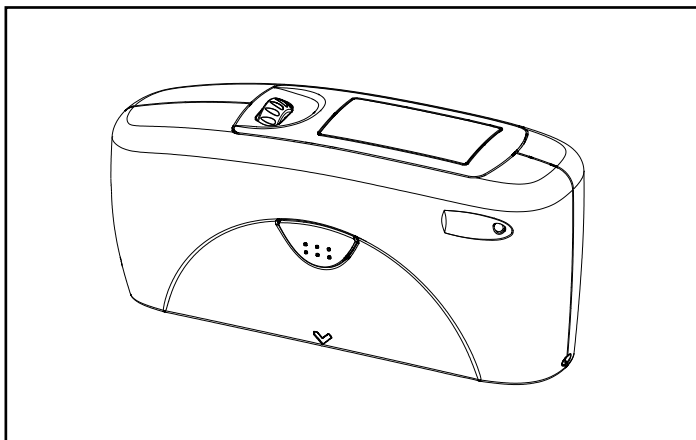# micro-gloss

Operating instructions
Betriebsanleitung
Mode d'emploi

Patent pending
Patent angemeldet
Demande de brevet en cours

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Specifications subject to change without notice

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Technische Änderungen vorbehalten

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Sous réserve des modifications techniques

1 Description of the system

Measurement units of the micro-gloss family can be used to determine the gloss level of paint coatings, plastics, ceramics and metal surfaces.

Light is directed at the surface of the sample at a defined angle and the reflected light is measured photoelectrically (reflectometer).

Depending on the typical gloss level of the test object, reflectometers that direct light onto the surface at different angles (geometry) can be used.

Measurement units are equipped with standard geometries of 20°, 60° or 85°. All three of these geometries are integrated into the micro-TRI-gloss. Functions described in this manual in terms of geometry selection are only available with the three angle device.

In addition to measuring individual gloss values, it is also possible to record, save and statistically evaluate series of measurements consisting of up to 999 values.

The operate button and scroll wheel are used to control the system. System operation is supported by display messages (autodiagnosis and error messages). You can select German, English, French, Spanish, Italian or Japanese (Katakana) as the display language.

The measurement unit conforms to the standards DIN 67530, ISO 2813, ASTM D 523 and BS 3900 Part D 5.

In addition, it was tested by the "Bundesanstalt für Material-forschung und -prüfung (BAM)" (German Federal Institute for Materials Research and Testing) and found to be properly categorized and to meet requirements as set by DIN 67530.

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

⚠ The manufacturer assumes no liability for damages caused by failure to observe the safety and general instructions.

⚠ Please use only accessories that are available for the unit. Improper use of accessories will render the warranty null and void.

⚠ If there is reason to believe that the unit can longer be operated without presenting a hazard, it should be taken out of operation and prevented from being turned on unintentionally. Operation without presenting a hazard is no longer possible if the unit shows visible signs of damage or if it is no longer working.

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

2   **Safety instructions**

Only instruments complying with the requirements for safety extra low voltage may be connected to the RS 232 interface.

In case an external power supply is used, please pay attention that the nominal voltage of the power supply (see identification plate on the power supply) corresponds to the mains voltage of the mains socket.

Your instrument is cutt off from power supply by

a) taking out the battery or

b) in case of external power supply by pulling the power supply out of the mains socket.

Please take care that the power supply is accessible at any time.

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

• The measurement unit consists of sensitive optical and electronic precision parts. Provent it from being dropped or bumped or jostled!

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

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

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

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

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

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

4 Commissioning and power supply

Before putting the unit in operating, read the operating instructions and pay attention to operation the safety instructions and general instructions in Section 2. Unpack the device and check to make certain all pieces have been included with delivery (for scope of delivery, see Section 21).

a) Power supply battery - operated

The battery must be placed in the measuring unit for operation service. The device runs on one AA 1.5-V alkaline battery.

<u>Use only alkaline batteries as the primary battery type Mignon AA or Mignon LR6!</u>

Depending on the exact brand, the capacity of each battery is sufficient for about 10,000 measurements. When the battery voltage falls below the required minimum voltage in the course of operation, the following message appears on the display

    Battery low!

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

Changing the battery

To insert or change the battery open the battery compartment. The easiest way to do this is by turning the cover with a coin one-eighth of a rotation to the left. Turn the device back around and allow the old battery and the battery compartment cover to slide into your hand.

Insert the new battery with the po-sitive (top) end first into the battery compartment and set the battery compartment cover in place again. Lock the cover by turning it one-eighth of a rotation to the right.
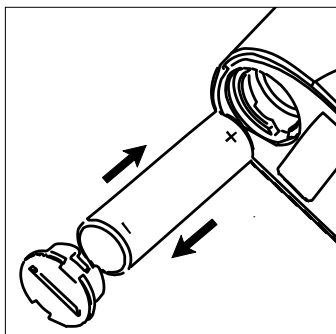
Changing the battery

**b) Power supply by external po-
wer supply (optional) see
Delivery notes, Accessories**

<u>**Please note: In case you operate
the instrument with a power
supply, it is vital that you take
the battery out of the battery
compartment. Else the
instrument is continued to be
powered by the battery.**</u>

In order der connect the instrument
to the external power supply, the
suitable end of the power supply
cable has to be inserted in the
interface of the instrument.

The connection to the PC is done
via the sub-D 9-pins plug of the po-
wer supply cable.

For more information about the
operation with RS 232 please refer
to the chapter Interface.
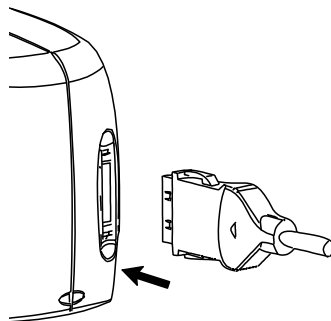
5   **Control elements**
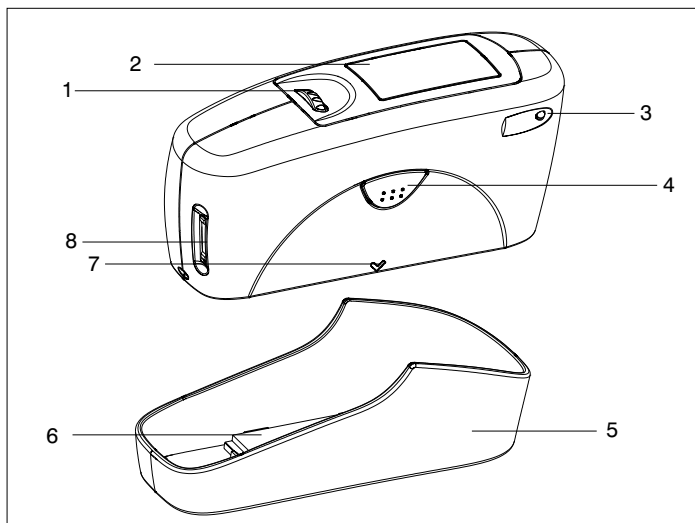
Measurement unit and protective holder

1   Mode scroll wheel: used to turn the unit on and for menu selection

2   Display for user guidance and displaying measurement values

3   Green signal lamp: measurement active; red: error

4   Operate button (measurement button): used to activate measurements

5   Protective holder

6   Calibrating standard

7   Mark for the measurement aperture

8   Interface for connecting to a PC

The basic system consists of the measuring device and the protective holder.

The protective holder is used for calibration and to store the measurement unit. Calibration is performed inside the holder automatically at the touch of a button. The gloss standard required for this purpose is kept in the holder and is positioned in such a manner that calibration is always performed at the same point.

When the device is turned on inside the holder, it performs a self-test (autodiagnosis).

If you will not be using the measuring unit, please store it in the protective holder. In this way the measurement optics are protected from dirt and dust and the calibration standard is always readily available.

The operate button and scroll wheel are used to control the system. Pressing the wheel turns the unit on and causes a menu to be displayed. All settings within the menus are made by turning and pressing the wheel.
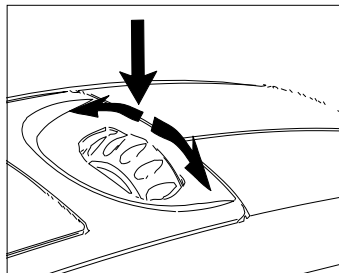
Pressing the operate button starts measurements or performs functions that are displayed. In addition, you can return from the various menus to mode with the operate button. System operation is supported by an autodiagnosis test, comments and error messages. Measurement values and comments appear in the display.

6 Getting started
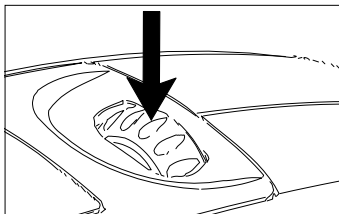
Turning on the unit and measuring

To turn on the unit, press the mode scroll wheel.

Information on the date and last certification appears in the display. If the device was turned on in its holder, the autodiagnosis test is performed (see the section on Calibration).

Autodiagnosis

20°	OK
60°	OK
85°	OK

Then the unit switches into the last measurement mode to be selected.

Pressing operate initiates measurements.

The display of measurement results on the screen may be broken down into the following elements:

A: When Difference measurement is turned on, the name of the reference that is selected is displayed here.

B: If Save is selected, the memory area that is selected appears at the top left and for

C: the sample name (block name).

D: If Statistics or Continuous is turned on, the number of measure-ments performed or selected is displayed here.

A   B   C   D

M20°60°	SAMPLE 001
STANDARD 1	

n=02/03

	value	$\bar{x}$	p / f
20°	56.5	56.3	FAIL
60°	82.9	82.4	Pass

The measurement values appear in the lower part of the display area. The size of the numbers depends on whether Statistics or Difference measurement has been activated and on the number of geometries displayed. Depending on the measurement mode, a header line also appears for the measurement values.

Navigation

All control functions are controlled by the mode scroll wheel. Pressing the wheel causes a menu to appear in the display. Turning the wheel allows you to move the black mark to the desired function and to select or activate it by pressing the wheel.

What functions are displayed in the menu depends on the settings in the main menu. The main menu is the "central" level and can always be reached quickly.

Certain rules apply within the menus to make it easier to navigate:

A black triangle to the right of a function indicates that selecting this function will take you to a sub-menu.

A check mark on the right indicates that the function in question has been activated.
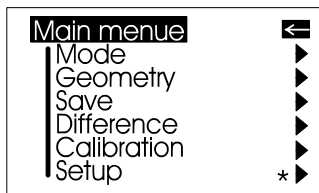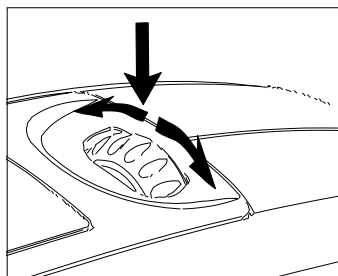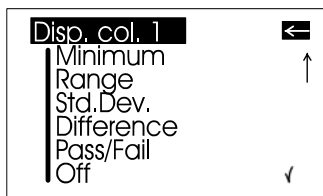
← You can use the arrow at the top right to switch the display back by one level.

```
┌─────────────────────────┐
│ Disp. col. 1        ←   │
│ │Minimum            ↑   │
│ │Range                  │
│ │Std.Dev.               │
│ │Difference             │
│ │Pass/Fail              │
│ │Off                √   │
└─────────────────────────┘
```

Arrows pointing up or down indicate that there are other menu options above or below the part of the menu that is visible. To reach these menu options, simply turn the scroll wheel in the direction in which the arrow is pointing.

You can quickly switch back from the menus to the measurement display by using the operate button. In some cases this button also has another function, but that will be indicated in the display (for example Confirm -> operate).

Change names/numbers

```
┌─────────────────────────┐
│                         │
│     Display time        │
│                         │
│  Seconds:   25          │
│             ↑           │
│  Cancel ---> [operate]  │
│                         │
└─────────────────────────┘
```
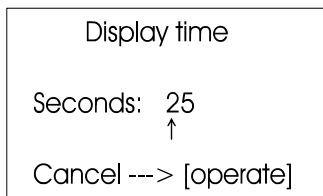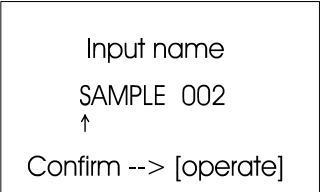
For some functions, you can enter or change the date or name. The arrow pointing upward marks the position that can be changed. To change the character, turn the scroll wheel. When you press the wheel, the arrow jumps to the next character.

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

When you enter the name, the
arrow jumps to the first character.
This allows you to correct any
inadvertent incorrect entries. You
can confirm the name in these
menus at any time with the operate
key.

```
   Input name
  SAMPLE  002
  ↑
Confirm --> [operate]
```

7   Overview of main menu

Mode
Sample mode	Measurement without statistical evaluation.
Statistics	Multiple measurement with statistics.
Continuous	Measurement repetition (measuring interval adjustable).
Basic mode	Simplest mode: without saving and difference
Advanced mode	Opens the "Mode" menu again with the previous setting.

Geometry
Geometry selection (available only with three angle device).

Save
Save functions for samples:
Save	Turn saving on/off.
Select memory	Select memory area from list.
Create memory	Up to 50 memory areas can be created.
Delete memory	Pre-set memory areas (M60°...) cannot be deleted.
Display memory	Bring up contents of memory (use scroll wheel).

Difference
Settings for difference mode:
Difference	Turn difference measurement on/off.
Measure reference	Measure reference.
Select reference	Select reference (if saved).
Create reference	Save up to 50 references and enter limit values for Pass/Fail.
Delete reference	Delete individual references.
Change reference	Enter/change limit values for Pass/Fail.

Calibration
Calibrate, change cal. values GU - % scale.

Setup
Language, Display time, Date/Time, Beeper.

The following can be used together simultaneously:

- Save with: Sample mode, Statistics, Continuous
- Difference with: Sample mode, Statistics

You can select from among different types of measurement recording and evaluation in the Mode menu. The mode that is activated is identified by a check mark.

```
Mode                    ←
       Sample mode  ☐
       Statistics
       Continuous
       Basic mode
```
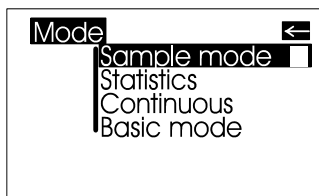
Single measurements can be performed without statistical evaluation in Sample mode.

The results can be saved and compared with a reference.

```
Main menu
 ▶Save
 ▶Difference
```

When Save is turned on, a name is suggested after every measurement. You can confirm this name directly or change it.

```
        Input name

        SAMPLE  002
            ↑
   Confirm --> [operate]
```
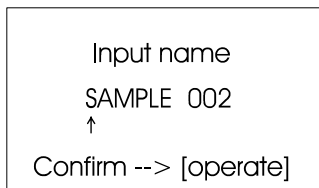
If you would like to delete the last measurement, press the scroll wheel and select the appropriate menu item.

```
Sample mode             ←
  Main menu          * ▶
  Delete measurement
```
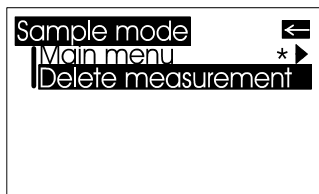
9   **Statistics**

Main menu
▶Mode
  ▶Statistics

You can make multiple measurements with each sample in Statistics mode. These measurements will be evaluated statistically and displayed.

The results can be saved and compared with a reference. These functions must be previously activated:

```
                    n=02/03
        value     x̄    stdev
   20°  54.7    54.1    0.3
   60°  81.6    82.1    0.2
```

Main menu
▶Save
▶Difference

```
      Input name

      SAMPLE  002
      ↑

   Confirm --> [operate]
```

When Save is turned on, a name is suggested after all measurements of a sample (block). You can confirm this name directly or change it.

When the Statistics function is turned on, additional functions are available depending on the context after you press the scroll wheel.

```
Statistics        ⬅
▌Main menu        *▶
▌Number of meas.   ▶
▌Display           ▶
▌Exit block        ▶
▌Delete block      ▶
▌Delete meas.      ▶
```
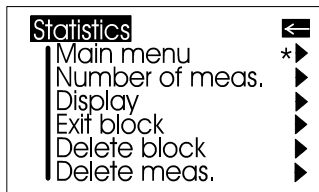
Number of measurements▶

You can adjust the number of measurements per sample or per block with this option, from 2 - 99.

```
Number of readings
per mean value

      n=03
        ↑
Cancel --> [operate]
```
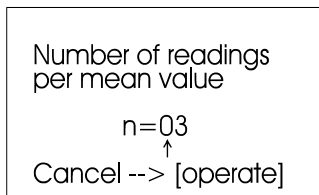
You can find this value in the measurement display by looking for "n=" after the forward slash. The number of measurements (which increases by one each time a measurement is performed) appears before the slash.

```
              n=02/03
      value    x̄    stdev
20°   54.7   54.1   0.3
60°   81.6   82.1   0.2
```
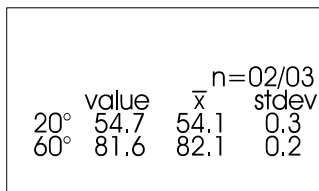
Display ▶

```
┌─────────────────────────────┐
│ Stat. display          ⬅   │
│  │ Column 1:  value ▶       │
│  │ Column 2:    x̄    ▶      │
│  │ Column 3:  stdev.▶       │
│  │                          │
│  │                          │
└─────────────────────────────┘
```

In the Statistics measurement display, you can assign the following data freely to three columns:

Value:

Last value to be measured

```
┌─────────────────────────────┐
│ Disp. col. 1           ⬅   │
│ │Value                      │
│ │Mean value                 │
│ │Maximum                    │
│ │Minimum                    │
│ │Range                      │
│ │Dev.Std.               ↓   │
└─────────────────────────────┘
```

Mean value:

Arithmetic mean $\bar{x}$ of the sample (block).

Maximum:

Highest measurement value of the sample

```
┌─────────────────────────────┐
│ Disp. col. 1           ⬅   │
│ │Minimum                    │
│ │Range                  ↑   │
│ │Std.Dev.                   │
│ │Difference                 │
│ │Pass/Fail                  │
│ │Off                    √   │
└─────────────────────────────┘
```

Minimum:

Lowest measurement value of the sample

Range:

The difference between the maximum and minimum value.

Std. Dev.:

The standard deviation of the sample

$$S = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2}$$

Difference*:

The difference between the sample and a target value.

Pass/Fail*:

Pass is displayed if the sample value falls within the specified limits, or Fail if it falls outside.

Off:

Turns off the display of the selected column.

* To be able to use these functions, a reference must be measured, created or selected. In particular, a limit value must be defined.

9   **Statistics**

```
Statistics
▶ Exit block
▶ Delete block
▶ Delete meas.
```

```
Input name

SAMPLE  002
↑
Confirm --> [operate]
```

```
Delete block

SAMPLE  023

Confirm --> [mode]
Cancel  -->  [operate]
```

Exit block ▶

This function terminates the block before it reaches the required number of measurements n. It is useful if you have selected a high number of measurements for n, for example in the case of large samples.

If Save is turned on, a display appears to enter a block name for the sample.

Delete block ▶

This function deletes the current block.

Delete measurement ▶

This function deletes the last measurement value.

Continuous 10

You can use this function to perform up to 99 measurements at an adjustable measurement interval. This is helpful when you are covering large samples and you want to evaluate the homogeneity of the surface.

If you select this function, you will first be asked to enter the time that defines the interval. The longest measurement interval possible is 9 seconds. A setting of 0 seconds indicates the shortest interval possible, one that is identical to the duration of the measurement, which is about 0.5 seconds per geometry.

To start a continuous measurement, press the operate button (a note in the display also tells you this). If you would like to exit the continuous measurement, press mode.

To start the measurement, press operate. The unit now performs measurements up to 99 times at the set interval. Measurement values are shown in the display after each measurement. You can interrupt the continuous measurement by pressing the operate button (hold it down briefly). The number of measurements, the mean value, the minimum and the maximum appear in the display. Press the operate button to continue with the continuous measurement. To end the measurement, press mode.

Main menu
▶Mode
  ▶Continuous

Measuring interval

 Seconds: 9
           ↑
Cancel --> [operate]

Continuous

Start: operate
Stop: hold operate

Continue: operate

	n=25/99		
	$\overline{x}$	min	max
20°	48.9	46.3	50.4
60°	79.5	75.1	81.5

Main menu
▶Mode
  ▶Basic mode

The selection options are limited to the most essential in basic mode. This also greatly simplifies operation in this mode.

20°   **31.4**

60°   **63.7**

You can select the geometry and perform calibration. In addition, all functions in the Setup menu item are available.

Basic mode is useful if you want to interrupt a series of measurements and quickly perform some other measurements in the middle without leaving the series of measurements.

Main menue   ←
  Advanced mode ▶
  Geometry ▶
  Calibration ▶
  Setup   * ▶

Once these other measurements are complete, you can use

Main menu
▶Advanced mode

to return to the point where you interrupted the series of measurements.

Geometry selection is only possible with the three angle device. You can select between display of one, two or all three geometries in the measurement display.

Main menu
▶Geometry

The currently set angle combination is indicated in the Geometry menu by a check mark.

Geometry   ⟵
20°
60°   √
85°
20°60°
60°85°
20°60°85°
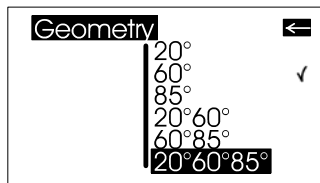
Select the desired combination with the scroll wheel and then confirm by pressing mode.

When Save is turned on, switching the geometry automatically causes the program to switch to the appropriate predefined area of memory.

Geometry

20° 60° 85°

13   Save
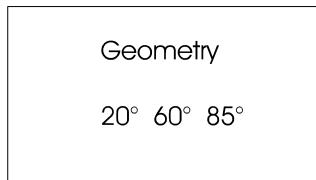
Main menu
▶Save

Up to 999 measurements can be stored. To save measurement values, you must activate the Save function before measuring or else select or create an area in memory. A fixed memory area is already created for each geometry or combination (e.g. M60°). These memory areas cannot be deleted. A total of 50 memory areas can be created.

Save   ⬅
Save   √
Select memory   ▶
Create memory   ▶
Delete memory   ▶
Display memory   ▶
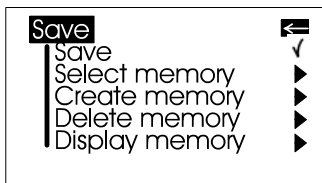
The Save function can be used for sample mode, Statistics and Continuous measurements. The layout of the memory is such that the measurement mode and reference can be changed within a memory area, but not the geometry.

Save ▶

You can use this function to turn saving on or off. A check mark indicates if the function has been activated.

M20°60°   SAMPLE C01

20°   **57.6**

60°   **72.4**

Turning on Save automatically selects the area in memory that is predefined for the currently set geometry (for example M20°60°).

Select memory ▶

All available areas of memory are listed in this menu, beginning with the one that is predefined.

The number of measurements saved for each area in memory is shown on the right.

Select the appropriate memory area with the scroll wheel and activate the selection by pressing mode.

This automatically turns on Save and switches the geometry if necessary (if the selected memory area is defined for other geometries than what was previously set).

```
┌──────────────────────────────┐
│ Select memory            ⟵   │
│        M60°           0  ↑    │
│        M85°           0       │
│        M20°60°        5       │
│        M60°85°        0       │
│        M20°60°85°     0       │
│        MEMORY 001 4          │
└──────────────────────────────┘
```
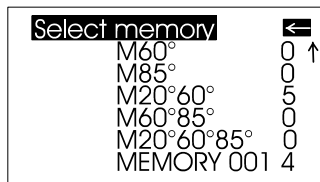
Create memory ▶

Users can set up their own memory areas with this function. Select the required geometry before you activate this function. Then you must enter the name of a memory area. You can confirm the suggested name directly with the operate button or change it with the scroll wheel. After you confirm, Save is automatically turned on.

```
┌──────────────────────────────┐
│                              │
│  Create memory               │
│      MEMORY  001             │
│        ↑                     │
│  Confirm --> [operate]       │
│                              │
└──────────────────────────────┘
```
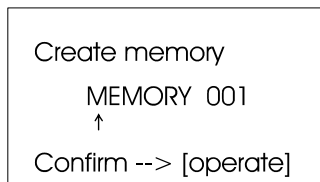
Delete memory ▶

```
Delete memory      ←
    M60°          0 ↑
    M85°          0
    M20°60°       5
    M60°85°       0
    M20°60°85°    0
    MEMORY 001    4
```

This menu lists all memory areas that have been created with the number of values stored in each one.

Use the scroll wheel to move the mark to the memory area you would like to delete and press the wheel.

```
Delete
  ▶Measurements
  ▶Memory
```

A menu appears in which you can decide whether you would like to delete just the content of the memory area or the entire memory area.

For pre-defined memory areas, you can only delete the measurement values.

Display memory ▶

```
Display memory     ←
    M60°         12↑
    M85°         18
    M20°60°       5
    M60°85°      20
    M20°60°85°   15
    MEMORY 001   35
```

You can transfer data that has been saved to a PC via the interface. The values can also be shown in the display at any time.

The "Display memory" function opens a menu in which all memory areas that have been created are listed. Select the desired area of memory with the scroll wheel.

The values of the first measurement appear in the display. The sample name is displayed in the highlighted field.

M20°60°   SAMPLE 005

20°   45.1

60°   72.3

Turning the wheel switches the display to the next sample with its corresponding values.

Which values are displayed in the columns (for example mean value, min., max.) depends on the display currently selected for Statistics.

M20°60°   SAMPLE 008

20°   47.2

60°   76.1

14 Difference measurement and Pass/Fail
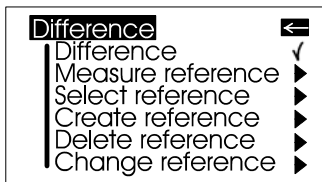
You can compare the measurement value of a sample with the target value of a saved reference. You can also display whether the test specimen falls within the limits (Pass) or outside (Fail).

```
Difference                 ⟵
 │Difference               √
 │Measure reference        ▶
 │Select reference         ▶
 │Create reference         ▶
 │Delete reference         ▶
 │Change reference         ▶
```

Up to 50 references can be saved. They are stored in a separate area of memory. For each geometry you can determine:

- The target value for the difference
- Maximum and/or minimum for Pass/Fail

The target value can also be set equal to the maximum or minimum value (see Create reference or Change reference).

Difference

You can use this menu option to turn Difference measurement on or off. A check mark indicates if the function has been activated.

When Difference is turned on, the last reference to be used is automatically selected.

Measure reference ▶

You can use this function to measure a standard to be used as a reference for later measurements.

We recommend you perform a number of measurements on the standard with Statistics turned on.

Activate "Measure reference". Initiate the measurement with operate. After the last measurement, a window appears where you can enter the reference name.

If you inadvertently select a name that has already been used, a message will appear in the display to this effect and the marker arrow will jump back to the first position of the name.

Measured values are saved as a target value of the reference. At the same time, Difference measurement is turned on and the measured reference is activated. If you would like to define additional limit values, you can use the "Change reference" function.

```
Main menu
▶Difference
   ▶ Measure reference
```

```
Measure reference
              n=01/03
20°    34.6
60°    83.4
85°    86.8
```

```
Reference name:

  STANDARD  1
  ↑

Confirm --> [operate]
```

14 Difference measurement and Pass/Fail

Reference **STANDARD 1**

	Val.	Min	Max
20°	45.0	40.0	50.0
60°	80.0	80.0	90.0
85°	0.0	0.0	2000

Select reference

STANDARD 2

Select reference ▶

To select an existing reference, use the arrow to move the mark to Select reference and then press the wheel.

The first reference appears in the display. The target value, minimum and maximum are displayed. For values that are not defined, 0.0 or 2000 is displayed. The name of the reference appears inverted at the top right.

Turning the scroll wheel causes the next reference to be displayed.

When you have selected the desired reference in the display, activate it by pressing on the wheel.

A reference to the selected data will appear in the display.

In addition, Difference measurement is turned on and the selected reference is activated.

Create reference ▶

References can also be saved by entering the limit and target value with the scroll wheel. Move the mark to "Create reference" and activate the function.

```
Main menu
▶Difference
   ▶ Create reference
```

A display appears in which you must assign a name for the new reference. If you inadvertently select a name that has already been used, a message will appear to this effect and the marker arrow will jump back to the first position of the name. Confirm the name with the operate button.

```
Reference name:

  STANDARD  1
  ↑
Confirm --> [operate]
```

In the next step you can define the target and limit values of your reference.

Define reference
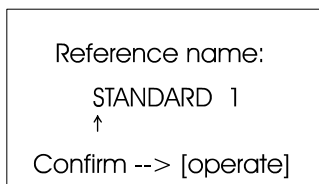
With the three angle device, a menu first appears in which you can select the geometry.

```
Define reference      ⬅
           20°        ▶
           60°        ▶
           85°        ▶
```

After that, the menu appears for selecting the target value, minimum and maximum.
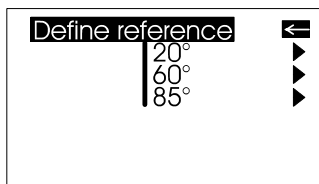
Select the desired variable and press on the scroll wheel.

```
Define reference      ⬅
        Target value  ▶
        Minimum       ▶
        Maximum       ▶
```

14 Difference measurement and Pass/Fail

```
Define reference
STANDARD 5


Value   20°    0000.0
                 ↑
Cancel  --> [operate]
```

Now you can adjust the corresponding value.

After the last number is activated, the display jumps back to the previous menu.

In this manner you can enter additional target and/or limit values for the reference one after the other if need be. After the entries are complete, Difference measurement is turned on with the new reference.

Change reference ▶

```
Change reference    ⬅
          STANDARD  1
          STANDARD  2
          STANDARD  3
          STANDARD  4
          STANDARD  7
          STANDARD  5↓
```

You can use this function to change target values and limit values of saved references. You can also use it to define limit values subsequently (for example for a measured reference). Use the scroll wheel to move the mark to Change reference and press the wheel.

All references are listed one after the other in the following menu. Select the desired reference and press the scroll wheel.

In the next step you can define the target and limit values as described above.

Delete reference ▶

Use the selection wheel to move the mark to Delete reference in the Difference menu and then press the wheel.

The Delete reference menu appears. All saved references are listed in this menu.

If there are more references than can be shown in the display, arrows on the right edge of the display will point to additional references.

Use the scroll wheel to move the mark to the desired reference and press the wheel.

The reference to be deleted is listed again in the display. Confirm by pressing the mode scroll wheel.

The unit then reverts to the previous menu.

```
Main menu
▶Difference
    ▶ Delete reference
```
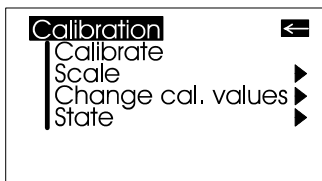
```
Delete reference      ⬅
        STANDARD  1
        STANDARD  2
        STANDARD  3
        STANDARD  4
        STANDARD  7
        STANDARD  5↓
```

```
Delete reference

   STANDARD 5

Confirm  --> [mode]
Cancel  -->  [operate]
```

15   Calibration and Autodiagnosis

```
Calibration            ←
  Calibrate
  Scale                ▶
  Change cal. values   ▶
  State                ▶
```

Calibration

The holder with the integrated glass standard is used for calibration. Always keep the measurement unit in the holder. This protects the measurement optics and ensures that the standard is always at hand.

If you have several devices of this type, you must put the unit in the holder which belongs to the unit (see the serial number).

Make certain that the standard is clean and there are no cracks on it.

When you place the device in the holder, make certain that it ships firmly into place.

Autodiagnosis

Whenever you turn on the device in the holder, it first performs a self-test. During this test, any changes in the measurement signal are tested against saved calibration data. This allows for a long-term calibration so that a new calibration is required only about once a week. Beyond that, calibration is only necessary if there are significant weather changes (see under Calibrate). It is recommended that you perform the self-test in the hol-der regularly (every day).

The autodiagnosis generally takes about 2 seconds. "Please clean standard" or "Please test standard" may be displayed. For more information on cleaning, see page 43.

A message will appear in the display informing you that the autodiagnosis has been completed successfully.

In some cases, the system may suggest that you repeat the calibration. The reason for this may be changed ambient conditions. It is also possible, however, that the standard still has small amounts of residue left over from cleaning. This problem can generally be alleviated by cleaning with a dry optical cleaning cloth.
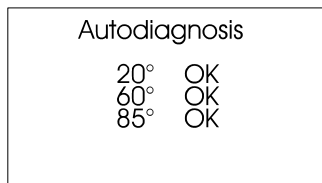
Calibrate ▶

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

When moving from cold areas to warm areas, there is a danger of condensation. For this reason, after there has been a change in a3mbient conditions, you should wait for an appropriate amount of

```
Autodiagnosis

    20°   OK
    60°   OK
    85°   OK
```

15 Calibration and Autodiagnosis

Main menu
▶Calibration
  ▶ Calibrate

Calibration

20°   93.3
60°   95.7
85°   99.4

State   ⬅

20°   ERROR 02
60°   95.7
85°   99.4

Last Calib.   01.01.03

time to allow the optical components to adjust before calibrating and using the unit.

You can use the path shown on the left side to reach the Calibrate menu option.

To begin calibration, press the scroll wheel.

The calibration process is performed automatically for all three geometries. The saved calibration values of the standard appear in the display.

The unit then switches into Measurement mode (Mode).

State ▶

This menu item provides you with information on the calibration status of the unit.

In particular, you can check here whether the saved calibration values match those of the holder. The display also indicates if an error message was generated as a result of the last autodiagnosis or calibration. If this has happened, further information is available under Section 22: Errors and warning messages.

Scale ▶

You can use the Scale menu option to switch back and forth between Gloss Units and Reflectance (see the Section on Practical measuring suggestions). Move the mark to the desired entry and press mode. A check mark identifies the Scale that is selected. After you switch the Scale, the unit must not be recalibrated.

```
Scale                    ←
 |Gloss Units    GU    √
 |Reflectance    %
```
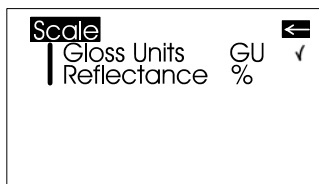
Change cal.values ▶

The gloss values of the calibration standard in the holder included with delivery are saved in the measuring device. During automatic calibration, this data is assigned to the standard in the hol-der.
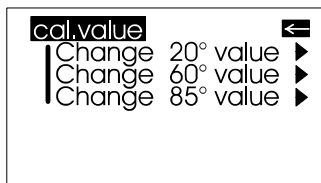
In some cases it will be necessary to enter data for a new calibration standard, for example if the previous standard has been damaged or scratched.

To ensure exact calibration, only original standards from the manufacturer should be used.

You can use the path shown on the right side to reach the Change cal.values menu option.
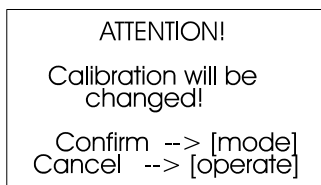
```
Main menu
▶Calibration
   ▶Change cal. values
```

15   Calibration and Autodiagnosis

```
┌─────────────────────────────┐
│ cal.value              ◄─   │
│  Change   20° value    ▶    │
│  Change   60° value    ▶    │
│  Change   85° value    ▶    │
│                             │
│                             │
└─────────────────────────────┘
```
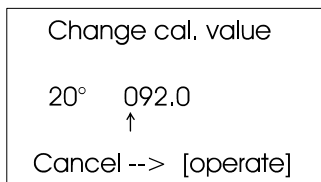
In some cases, a selection menu may appear for geometries. Select the desired geometry and press the scroll wheel.

A warning message appears. You can cancel this process by pressing the operate button.

```
┌─────────────────────────────┐
│       ATTENTION!            │
│                             │
│    Calibration will be      │
│        changed!             │
│                             │
│   Confirm  --> [mode]       │
│   Cancel   --> [operate]    │
└─────────────────────────────┘
```
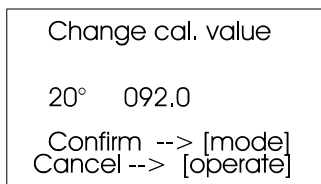
If you press the scroll wheel, you will continue with the process of changing calibration values.

In the next display you can enter new calibration values.

```
┌─────────────────────────────┐
│    Change cal. value        │
│                             │
│   20°    092.0              │
│            ↑                │
│  Cancel -->  [operate]      │
└─────────────────────────────┘
```

After you have entered the new value, a warning message appears again in the display. You can again abort the process with operate.

If you confirm the new value by pressing the scroll wheel, the value will be accepted.

```
┌─────────────────────────────┐
│    Change cal. value        │
│                             │
│   20°    092.0              │
│                             │
│   Confirm  --> [mode]       │
│   Cancel -->  [operate]     │
└─────────────────────────────┘
```

After you have changed all necessary values, you should recalibrate the measurement device as usual.

Calibrating standards

To ensure exact calibration, only original standards from the manufacturer should be used. These are calibrated against tested primary standards. Their surface must not be touched and must be protected against scratches. Due to environmental influences, however, the values of standards can change over the course of time even if they are handled gently. For this reason, you should have the calibration standards tested by the manufacturer at regular intervals (we recommend annually).

Checking standard

We recommend the regular use of a separate test standard for control of test equipment. The frequency of this verification depends on the conditions of usage (for example monthly). The gloss standards are integrated into an aluminum guide in which the measurement device is positioned exactly. Perform the measurement as you would normally, for example in Basic mode. The displayed measurement value must not deviate from the value printed on the standard by more than one unit. Otherwise you should check whether there is dirt and dust on the high gloss standard in the holder or test standard.

If cleaning and recalibration do not offer any improvement, please get in touch with our Customer Service.

Cleaning standards

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

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

To clean standards, use a new lint-free cloth, dust-free lens paper or an optical cloth as included with the device.

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

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

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

Main menu
▶Setup

You can make general settings in the Setup menu, for example Language or Display time.

Date/Time ▶

Date/Time

29.09.02 11:45:37
↑

Confirm --->[operate]

The unit contains an integrated clock. This makes the date and time of the measurement available for data transfer to a PC. The date and time are not lost even when the battery is changed. If you would like to change the time setting, use the scroll wheel to move the mark to Date/Time and then press mode. The display for setting the date and time appears.

Beeper √

You can use this menu option to turn the beeper on or off. Use the scroll wheel to move the mark to Beeper and press the wheel.

When the beeper is turned on, a check mark appears at the end of the line.

Display time ▶

To save electricity, the unit automatically turns off after a certain amount of time. You can determine this time yourself with Display time.

```
Display time

Seconds:   25
            ↑
Cancel ---> [operate]
```
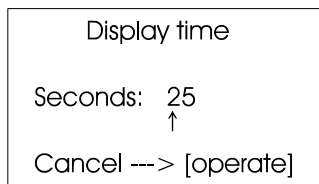
Language ▶
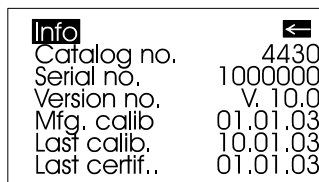
You can use this menu to select the display language.

Use the scroll wheel to move the mark to the desired language and press the wheel.

```
Language              ⬅
     Deutsch
     English        √
     Français
     Italiano
     Español
     ニホノ
```
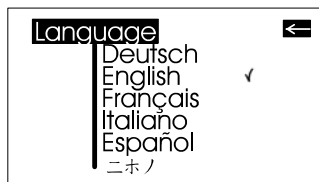
Info ▶

You can use this menu option to find the following information:

- Catalog No.
- Serial No.
- Version number of the firmware
- Date of the factory calibration
- Date of the last calibration
- Date of the last certification

```
Info                  ⬅
Catalog no.        4430
Serial no.      1000000
Version no.     V. 10.0
Mfg. calib      01.01.03
Last calib.     10.01.03
Last certif..   01.01.03
```

17   Practical measuring suggestions

In accordance with the standard, the reflectometer value is related to a black glass standard at a defined index of refraction (generally 1.567) which is thus equal to 100 units.

Reflectometers are differentiated by the angle of incidence of the illuminating mechanism. Geometries are set in the standards at 20°, 60° and 85°.


Paints and varnishes, plastics and similar materials

The various geometries are distinguished according to their fields of application as follows:

Semi-gloss surfaces are measured at an angle of incidence of 60° and should fall within a range from 10 to 70 gloss units.

Highly reflective surfaces with measurement values exceeding 70 units in the 60° geometry should be measured at 20°.

On the other hand, matte surfaces with less than 10 gloss units (at 60°) should be measured at the 85° geometry.
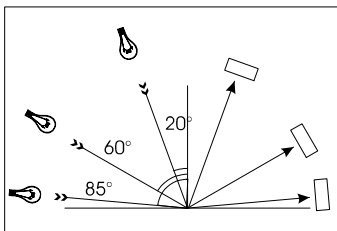
Anodized aluminum and other metal surfaces

The measuring unit is equipped with an extended measuring range for measuring samples with a very high reflectance.

The reflectance of non-metallic surfaces increases with the angle of incidence. The reflective properties of metals do not always behave in this manner. Because of double reflection, the light is partially reflected on the coating and partially on the metal underneath. For a complete understanding of the reflective properties of such surfaces, it is recommended to measure them at all geometries.

In addition to the reference to a black glass standard (gloss units), it is also common in the area of metals to relate the reflectometer value to the amount of irradiated light and to express it as a % (reflectance). You can select this in the Scale menu.

Main menu
▶ Calibration
  ▶ Scale

Notes

Proper measurements are only possible on level surfaces.

Measurements on dirty, scratched or otherwise distorted areas of the test specimen are not meaningful except as a way of determining the degree of such imperfections by means of a gloss measurement.

Since it cannot be assumed that the gloss capacity is not constant over the entire surface of the test specimen, the reflectometer value can be measured at several different places and the standard deviation can be determined.

If the sample exhibits structures or directionally dependent gloss properties, the structural features and the direction of the incident light should be specified for the measurement in the test report.

Samples that must be measured several times over the course of an examination (for example weathering samples) should be marked accordingly to ensure that the measurement is made at the same point during repeated tests.

18   Standards

DIN 67 530   The reflectometer as an aid in evaluating gloss on level paint and plastic surfaces (Reflektometer als Hilfsmittel zur Glanzbeurteilung an ebenen Anstrich - und Kunststoffoberflächen).

ISO 2813   Paints and varnishes - Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°

(Peintures et vernis - Mesurage de la réflexion spéculaire de feuls de peinture non métallisée à 20°, 60° et 85°).

ASTM D 523   Standard Test Method for Specular Gloss

ASTM D 2457   Standard Test Method for Specular Gloss of Plastic Film

BS 3900   British Standard Methods of Test for Paints
(Part D5)   Gloss (Specular Reflection Value)

JIS Z 8741   Method of Measurement for Specular Glossiness

ISO 7668   Anodized aluminium and aluminium alloys - Measurement of specular reflectance and specular gloss at angles of 20°, 60° and 85°.

(Aluminium et alliages d'aluminium anodisés - Mesurage des caractéristiques de réflectance et de brillant spéculaires à angle fixe de 20°, 45°, 60° ou 85°).

BS 6161   British Standard Methods of Test for Anodic oxidation
(Part 12)   coatings on aluminium and its alloys.

Measurement of specular reflectance and specular gloss at angles of 20°, 45°, 60° and 85°.

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

Measurement data can be transferred from memory or directly after each measurement.

The easy-link program is included with delivery for this purpose. Your transferred data is displayed immediately in a test report.

You can make the connection to your PC with the enclosed PC cable. Plug the side with the flat connector (designed so it can only be connected with the correct polarity) into the measurement device and the 9-pin sub-D plug into the PC.
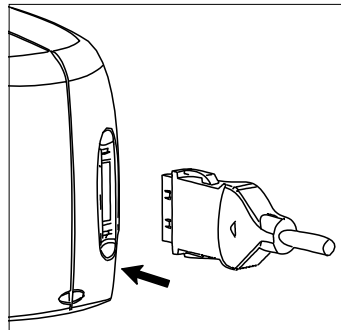
A USB adapter is also available. You will find ordering information ordering in the delivery notes.

Please also note the section 4 Commissioning and power supply when operating the device with an external plug power supply.

20 Technical data

Measurement geometry	20°	60°	85°
Size of measurement spot (mm)	10 x 10	9 x 15	5 x 38

Color sensitivity in spectral adjustment to CIE luminosity function $\bar{y}$ (2°) under CIE illuminat C

Memory 999 measurements with date and time, in up to 50 memory areas

Difference measurement Memory for 50 references

Interface Serial RS 232

Evaluation software easy-link included

Power supply 1,5V DC 0,1 A

Battery operation 1,5V DC Alkaline battery Mignon AA or Mignon LR6 about 10,000 measurements

Mains operation External plug power supply for technical data. Please refer to the information on the plug power supply

Dimensions (WxLxH) 48 x 155 x 73 mm

Weight 400 g

Temperature range - 10 °C to +60 °C for storage

+15 °C to +40 °C for operation

Rel. humidity Up to 85% non-condensing

Measurement range 0-2000 GE (20°)

0-1000 GE (60°)

0- 160 GE (85°)

Precision

Range	Repeatability	Reproducibility
0 − 99.9 GE	0,2 GE	0,5 GE
100 -2000 GE	0,2 %	0,5 %

Description	Order number

Reflectometer according to DIN, ISO, ASTM

micro-gloss 20°	4420
micro-gloss 60°	4460
micro-gloss 85°	4485
micro-TRI-gloss	4430

Comes complete with:

Measurement device, holder with integrated calibration standard, tracable certificate, easy-link software, PC cable, operating instructions, battery, carrying case.

Checking standards

Test standard 20°	4422
Test standard 60°	4462
Test standard 85°	4487
Test standard TRI	4432
Test standard mirror	4433

Accessories and spare parts

Power supply, European plug	4403
Power supply, plug for USA	4404
USB adapter	4401
easy-link software	4545
PC cable	4400