

D19C  
D196



Operating Manual

**gretagmacbeth**  
YOUR COLOR. PRECISELY.



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# 1 General

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# 1.1 D19C and D196 densitometer

Dear GretagMacbeth customer,

Congratulations! You have just purchased a D19C or D190 densitometer. With its user-friendly operation, high measuring accuracy and rugged design, this unit is a truly unique instrument. You can therefore purchase the densitometer that will exactly meet your requirements. It's modular design also allows you to order additional functions which are not yet included in your D19C unit at any time later on.

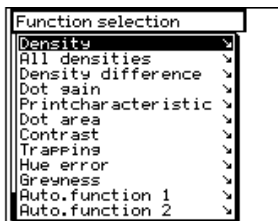
In the following, the operation instructions generally refer to the D190 densitometer. The designation 'D190' thereby stands for either 'D19C' or 'D196', depending on the type of unit you own. The D19C and D196 units only differ in the number of available measuring functions. Otherwise, the units are exactly identical and are also operated in the same way.

If a certain function is not available in your unit, then the respective menu lines will not be displayed on your unit either. In this manual, all the functions which are available for a D190 are described in detail. It is possible, therefore, that the description also includes functions which are not available in your unit. However, if you order an additional function later on, you will find the corresponding instructions in your present manual.

On your unit, the menu display of the function selection may be presented itself, for example,

like this (D196 densitometer)

or like this (D19C densitometer with the functions Density, Dot gain and Trapping)



Each individual function provided with your densitometer can be temporarily switched of. In this case, the respective function will not appear in the menu.

## 1.2 Documentation structure

This operating manual is divided into separate chapters to guide you step by step in the operation of the D190 remission densitometer.

Most of the examples in this manual are based on the D196 or the equivalent D19C densitometer. In the manual you find the description of all functions which can be available in the D19C, also those which are not included in the D196.

To ensure the correct setting of the instrument and the proper measurement of the densitometric functions, it is essential that the instructions are strictly observed.

## 1.3 User

With the conception of the D190 remission densitometer, particular attention has been paid to user-friendly and easy operation. Prerequisite for proper operating is a formal training in the field of printing or reprographic techniques or a specific personal introduction in the operation of the remission densitometer.

## 1.4 Safety

For safe operation, the reading and understanding of the operating manual and the compliance with the instructions is essential.

### 1.4.1 Reference signs

Important remarks in the operating manual are emphasized by the following three reference signs:



**NOTE sign:** Important operating references. Information which in case of non-observance may lead to losses or troubles.

.....



**CAUTION sign:** Information which in case of non-observance may result in material damage.

.....



**STOP-sign:** Information which in case of non-observance may result in personal danger.

.....



## 1.4.2 Safety information



The D190 remission densitometer is not intrinsically safe. It must therefore not be operated in a hazardous environment.



The D190 remission densitometer must only be operated and maintained by trained persons who are familiar with the instrument. The D190 remission densitometer must only be operated under the specified operating conditions. Use only original GretagMacbeth accessories and spare parts. Non-compliance with the safety information and instructions may lead to incorrect measuring results and the loss of data as well as personal and material damage.



Protect the GretagMacbeth calibration card from heat and direct sunlight, chemicals, mechanical influences, etc. A defective calibration card may lead to an incorrect calibration and therefore to incorrect measuring results. Always use the original shock-absorbing packaging to transport the instrument. In addition, protect the instrument from strong electromagnetic fields, open fire or sparks, chemicals, corrosive vapors, mechanical overloading and shock effects. No emission of noise (silent).

## 1.5 Packaging and transport

Every D190 remission densitometer leaves the factory packed in a cardboard box with shock-absorbing inserts. Since this box gives the unit optimum protection against damage during transport, please use it if you must return the unit to our factory or to one of our authorized representatives for any reason.



**Switching on and off the electronic safeguard; refer to chapter 2.6**



# 2 Function elements

- 2.1 Overview**
- 2.2 Operating elements**
  - 2.2.1 Control ball
  - 2.2.2 Measurement key
- 2.3 Display**
- 2.4 Menu line symbols**
- 2.5 Setting protection**
- 2.6 Electronic safeguard**
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- 2.7 Charging the battery**
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    - 2.7.1.1 Display for partially discharged battery
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  - 2.7.2 Charger
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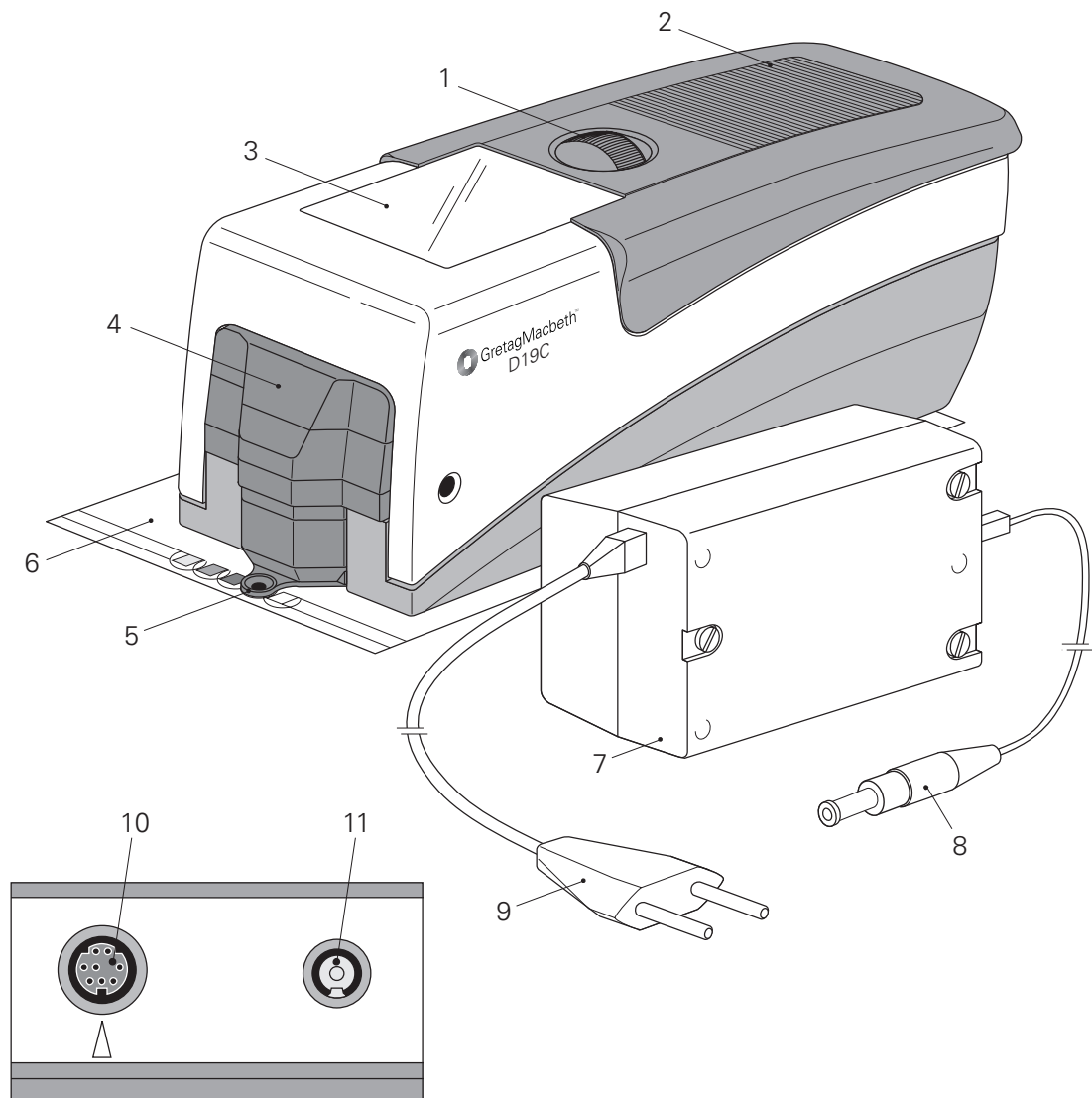
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## 2.1 Overview



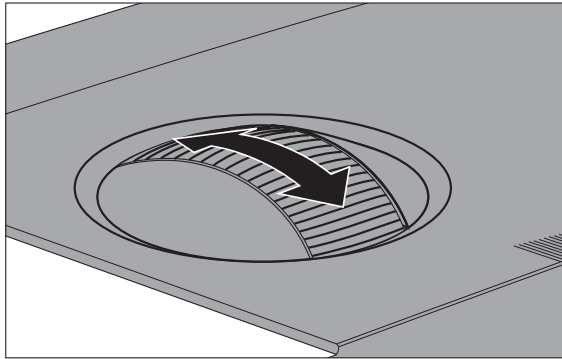
### Legend

- |                      |                   |
|----------------------|-------------------|
| 1 Control ball       | 7 Charger         |
| 2 Measurement key    | 8 Charger plug    |
| 3 Display            | 9 Power cable     |
| 4 Measuring module   | 10 Data interface |
| 5 Measuring aperture | 11 Charger socket |
| 6 Calibration card   |                   |

## 2.2 Operating elements

The unit is operated with two operating elements, the <Control ball> and the <Measurement key>.

### 2.2.1 Control ball



The <Control ball> is turned backwards and forwards with the index finger or the thumb. It has the following functions:

- Moving the graphics bar for the selection of menu lines on the display.
- Entering or changing of numerical values such as, for example, calibration values, reference values, target values, tolerance values, number of references per order, time, codes of the safeguard.
- Entering or changing of names such as, for example, names of orders.
- Activate display.

### 2.2.2 Measurement key

The <Measurement key> is briefly pressed down with the ball of the thumb and then released again. It has the following functions:

- Activating the function marked by the graphics bar.
- Initiating a measurement.
- Accepting and storing of the data entered.
- Rejecting of entered data.
- Activate display.



By pressing down the <Measurement key> for approx. 3 seconds:

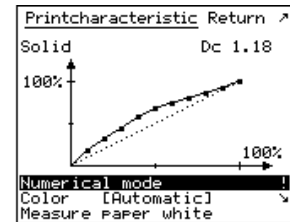
- the current activity will be terminated.
- the entered data will be rejected.
- the program will jump to the next higher program level.

## 2.3 Display

The high-resolution display allows to show the results of a complete measurement sequence as well as graphic representations.

Dot gain		Return ↗
<b>Solid</b>	D <sub>c</sub>	<b>1.40</b>
Halftone 80%	G <sub>c</sub>	<b>7%</b>
Halftone 40%	G <sub>c</sub>	<b>11%</b>
Color [Automatic] ↘		
Measure Paper white		

Auto.function 2		Return ↗
B<4> C<1> M<2> Y<3>		
D	1.60	1.40 1.30 1.10
G80%	9%	7% 8%
G40%	10%	11% 11%
T	88%	95% 95%
Sample T <sub>c</sub> 95%		
Measure Paper white		



To improve the readability of the display the contrast can be adjusted under **Settings** → **Device settings** → **LCD-contrast**.

## 2.4 Menu line symbols

The menu line symbols have the following meaning:

↘	After pressing the <Measurement key>, the program jumps to the next lower menu level.
↗	After pressing the <Measurement key>, the program jumps to the next higher menu level.
!	After pressing the <Measurement key>, the next activity will be initiated. After pressing the <Measurement key>, the entered data are accepted and stored. After pressing the <Measurement key>, the entered data are rejected.
±	By turning the <Control ball>, the current value will be changed.
✓	Indicates the current status such as, for example, activated densitometric functions, current filter selection (automatic or manual filter selection), current white base (paper white base or absolute white base), current order, current reference, current printer, current handshake, etc.

## 2.5 Setting protection



.....  
In the D19C you can activate a password protection of your settings (optional feature which is not included in all instruments).  
.....



.....  
If the settings are protected, you will be able to select the menu '**settings**' only by using a password. Please don't lose this password! Otherwise please contact your GretagMacbeth service-center.  
.....





.....  
Switch on the setting protection refer to **settings → device settings → setting protection**.  
.....

For detailed description of the setting protection refer to 6.6.



## 2.6 Electronic safeguard

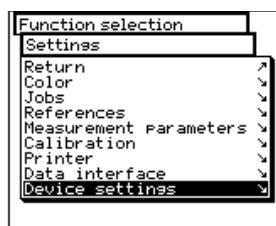
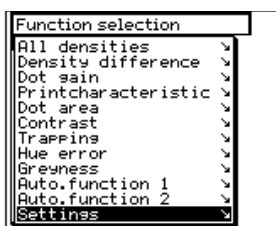
 The D190 remission densitometer is equipped with an electronic safeguard. It prevents the measuring module from being extended if vibrations occur during transport.

 The electronic safeguard can be switched on and off under **Settings** → **Device settings** → **Transport protection**.

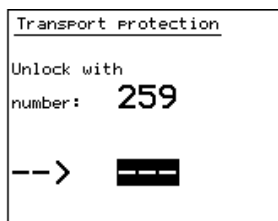
### 2.6.1 Switching on the electronic safeguard

#### Procedure:


- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Device settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Transport protection** by turning the <Control ball>.



- Switch on the electronic safeguard by pressing the <Measurement key>.
- The display shows a code number for the release of the electronic safeguard.

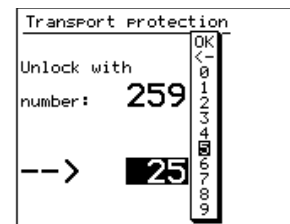
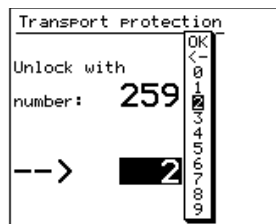
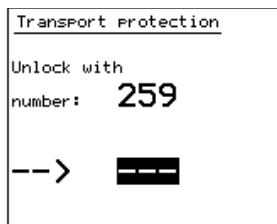


## 2.6.2 Switching off the electronic safeguard

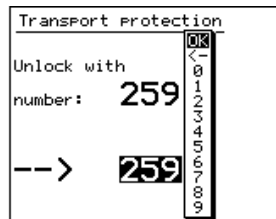
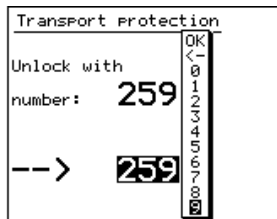
 After turning the <Control ball> or after actuating the <Measurement key> with the electronic safeguard switched on, a code number for the release of the electronic safeguard will be displayed.


### Procedure:

- Press the <Measurement key> for approx. 3 seconds to delete any entries that may accidentally have occurred through vibrations during transport.
- Briefly press the <Measurement key>.
- A field for the entry of the code number appears on the display.
- Use the <Control ball> to select the first figure of the code number.
- Press the <Measurement key> to enter the first figure.
- Use the <Control ball> to select the second figure of the code number.
- Press the <Measurement key> to enter the second figure.



- Use the <Control ball> to select the third figure of the code number.
- Press the <Measurement key> to enter the third figure.
- Select the entry line **OK** by turning the <Control ball>.
- Press the <Measurement key> repeatedly to return the program to the main menu.



 To delete incorrectly entered code numbers, press the <Measurement key> for approx. 3 seconds. To delete a figure, select the entry line ← and press the <Measurement key>.

## 2.7 Charging the battery



Battery type refer to **Settings → Device Settings → Battery**.

### 2.7.1 Battery status indication



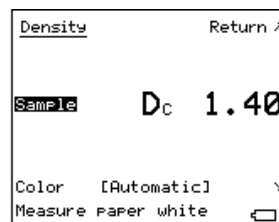
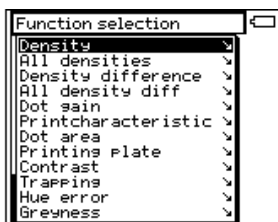
The battery status is permanently indicated on the display. If the battery is discharged, the unit will display a message and must then be recharged.

#### 2.7.1.1 Display for partially discharged battery



Whenever the display of the D190 indicates that the battery is partially discharged, it is advisable to connect the unit to the charger again until the battery is completely recharged.

The display of the D190 indicates a partially discharged battery as follows:



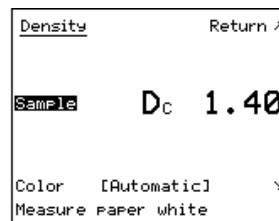
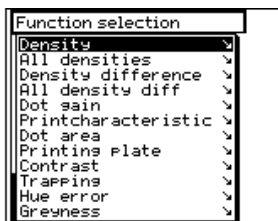
The symbol of an empty battery at the top or bottom right of the display indicates that the capacity has been reduced to only a few hundred measurements and that the charger should occasionally be connected to the D190.

#### 2.7.1.2 Display for charged battery



If the battery is charged, we recommend to operate the unit without the charger until the display indicates that the battery is partially discharged.

The display of the D190 indicates a charged battery as follows:



The symbol of an empty battery is not displayed as long as the battery is fully charged.

### 2.7.1.3 Display for fully discharged battery

---



If the battery is discharged, the unit will display the message 'battery empty' and must then be recharged.

---

### 2.7.2 Charger

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Use only original GretagMacbeth accessories and spare parts; see chapter 9 Options.

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Make sure that the voltage indicated on the charger corresponds with the local line voltage. If this is not the case, contact your nearest GretagMacbeth representative to have the charger switched over or exchanged. Chargers must only be opened and switched over by qualified specialists.

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### 2.7.3 Charging procedure

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Before the D190 remission densitometer is used for the first time, it must be charged with the supplied charger. A fully charged battery allows for approx. 4000 measurements.

---

**Procedure:**

- Connect the charger to the power supply via the power cable.
  - Connect the charger to the D190 remission densitometer via the charger cable.
  - Charge the battery for approx. 3 hours.
  - Remove the charger cable and disconnect the charger from the power supply.
- 



The rapid charge of the battery results in a noticeable temperature increase in the housing. This temperature increase is not of importance and will disappear when the battery is fully charged.

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## 2.8 Data protection

The data storage is backed up by a buffer battery with a service life of about 10 years. This prevents a loss of data even if the rechargeable battery is not installed.

# 3 **Function selection**

- 3.1 **Overview of functions**
- 3.2 **Switching functions on/off**
- 3.3 **Function selection**
- 3.4 **Heading printout**



Based on its versatility, the D190 remission densitometer is a unique instrument which decisively optimizes quality control in reprographics.

It is designed to perform all conventional measurements and features a wide variety of additional technical improvements.

The main menu contains a list of these functions.

The selection of a function is carried out with the operating elements <Control ball> and <Measurement key>.

## 3.1 Overview of functions

The following functions can be selected:

Densitometer D19C (all functions included)	Densitometer D196
<ul style="list-style-type: none"> <li>• Density</li> <li>• All densities</li> <li>• Density difference</li> <li>• All Density diff</li> <li>• Dot gain</li> <li>• Print characteristic</li> <li>• Dot area</li> <li>• Printing plate</li> <li>• Contrast</li> <li>• Trapping</li> <li>• Hue error</li> <li>• Greyness</li> <li>• Automatic function selection 1</li> <li>• Automatic function selection 2</li> <li>• Print header (refer to 3.4)</li> <li>• Settings</li> </ul>	<ul style="list-style-type: none"> <li>• Density</li> <li>• All densities</li> <li>• Density difference</li>   <li>• Dot gain</li> <li>• Print characteristics</li> <li>• Dot area</li>   <li>• Contrast</li> <li>• Trapping</li> <li>• Hue error</li> <li>• Greyness</li> <li>• Automatic function selection 1</li> <li>• Automatic function selection 2</li> <li>• Print header (refer to 3.4)</li> <li>• Settings</li> </ul>

## 3.2 Switching functions on/off



.....  
 The densitometer D190 includes different number of functions. Features not available in your instrument will not be shown in the main menu!  
 .....

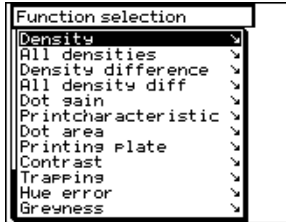



.....  
 The functions can be switched on/off under **Settings → Device settings → Available functions** (refer to 6.5)  
 .....

Switched-off functions will not be shown in the main menu!  
 .....


### 3.3 Function selection

- Select the desired menu line by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.



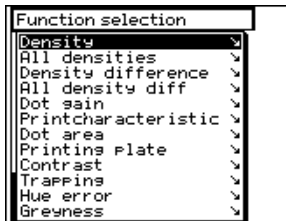
 The menu line **Print header** will be displayed if the D190 printer protocol is switched on and if the function print header is activated.

### 3.4 Heading printout

-  • Configure and connect your printer to the D190 remission densitometer.
- Configure data interface under **Settings → Data interface**.
  - Select the D190 printer protocol under **Settings → Printer → Printer protocol**.
  - Configure the header **Settings → Printer → Header**.

**Procedure:**

- Select the menu line **Print header** by turning the <Control ball>
- Activate the printout of the header by pressing the <Measurement key>.





# 4 Densitometric functions

## 4.1 General

- 4.1.1 Switching functions on/off
- 4.1.2 Select paper white or absolute white base
- 4.1.3 Automatic or manual color selection
  - 4.1.3.1 Manual color selection in a densitometric function
  - 4.1.3.2 Automatic color selection in a densitometric function
- 4.1.4 Printout of measuring results

## 4.2 Density

## 4.3 All densities

## 4.4 Density difference

- 4.4.1 Procedure if reference values have to be entered first
- 4.4.2 Procedure with preset reference values

## 4.5 All density differences

- 4.5.1 Procedure if reference values have to be entered first
- 4.5.2 Procedure with preset reference values

## 4.6 Dot gain

## 4.7 Print characteristic

- 4.7.1 Print out of the print characteristic

## 4.8 Dot area

## 4.9 Printing plate

## 4.10 Contrast

## 4.11 Trapping

## 4.12 Hue error

## 4.13 Greyness

## 4.14 Auto. function 1

## 4.15 Auto. function 2

- 4.15.1 Print out of the measuring results

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## 4.1 General

### 4.1.1 Switching functions on/off



The functions can be switched on/off under **Settings → Device settings → Available functions** (refer to 6.5)

Switched-off functions will not be shown in the main menu! Functions not available in your instrument will also not be shown in the main menu!

### 4.1.2 Select paper white or absolute white base

In most of the countries measurements against paper white base are in use.

In USA, for photofinishing applications and for other applications where no paper white exists measurements against absolute white base are in use.



Select paper white or absolute white base under **Settings → Measurement parameters → White base** (refer to 5.5.2)

### 4.1.3 Automatic or manual color selection

Generally the measurements will be done with automatic color selection. Special colors can be measured with manual filter selection or with the “Density all” function but the use of a GretagMacbeth spectrophotometer is recommended in this case.

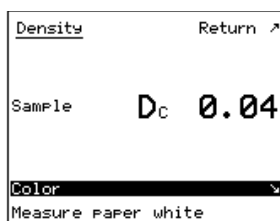
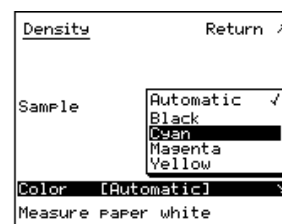
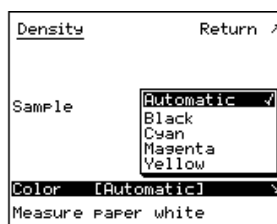
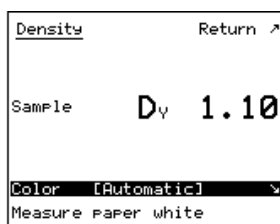


Select automatic or manual color selection under **Settings → Color** or in the selected densitometric function under the menu line **Color** (refer to 5.2)

#### 4.1.3.1 Manual color selection in a densitometric function

##### Procedure:

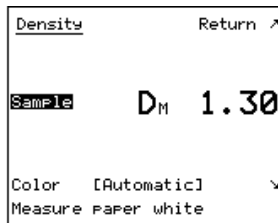
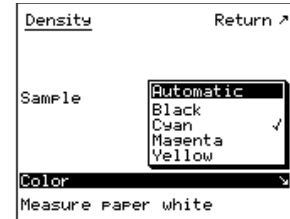
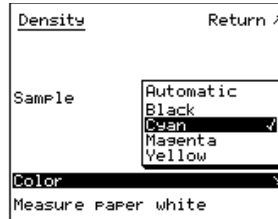
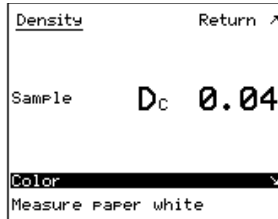
- Select the menu line **Color** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the desired color **Black, Cyan, Magenta or Yellow**.
- Activate the manual color selection by pressing the <Measurement key>.



### 4.1.3.2 Automatic color selection in a densitometric function

**Procedure:**

- Select the menu line Color by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the automatic color selection.
- Activate the automatic color selection by pressing the <Measurement key>.



### 4.1.4 Printout of measuring results

**Procedure:**

- Configure your printer interface with the corresponding operating manual.



- Baudrate setting
- Handshake setting
- Data format

- Connect the D190 with your printer.



- Chapter 9.12 Connection to printer PC or Mac

- Configure the D190 interface under **Settings → Data Interface**.



- Chapter 5.8 Baudrate setting
- Chapter 5.8 Handshake setting


- Select the D190 printer protocol under **Settings → Printer → Printer protocol**.




- Chapter 5.7 Select printer type
- Chapter 5.7 Select D190 printer protocol
- Chapter 5.7 Select date and time printing

- The measuring result will be printed after each measurement.

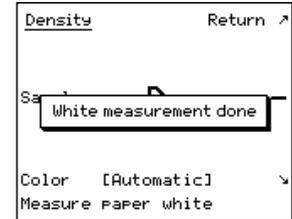
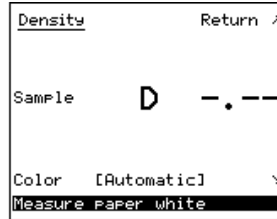
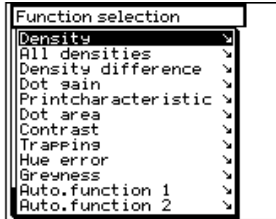
## 4.2 Density

 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base**.

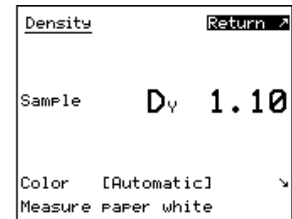
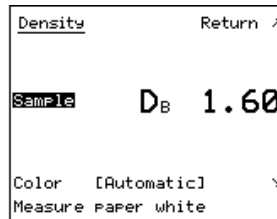
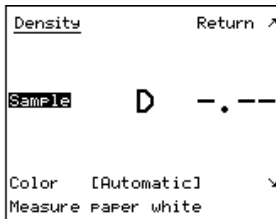
 Select automatic or manual color selection under **Settings** → **Color** or in the selected densitometric function under the menu line **Color**.

### Procedure:

- Select the menu line **Density** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.




- Position the measuring aperture on the color sample and initiate a measurement by pressing the <Measurement key>.
- The measured density value is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and actuate the <Measurement key> to return to the main menu.



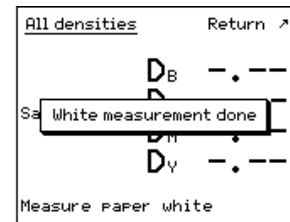
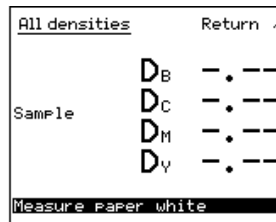
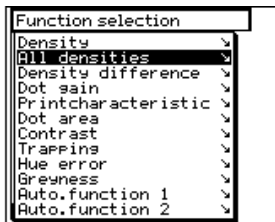
## 4.3 All densities

The function '**All densities**' will be used if you are interested in all absorptions of a printed color, not only the main absorption (e.g. for measuring the gray-balance).

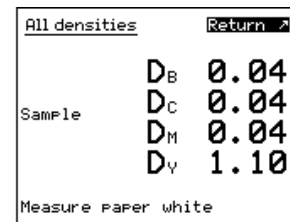
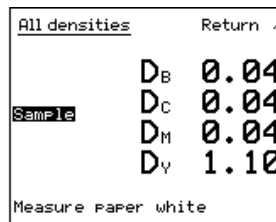
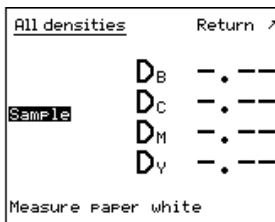
 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **white base**.

### Procedure:


- Select the menu line **All densities** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.





- Position the measuring aperture on the color sample and initiate a measurement by pressing the <Measurement key>.
- The measured density values are shown on the display.
- Select the menu line **Return** by turning the <Control ball> and actuate the <Measurement key> to return to the main menu.



## 4.4 Density difference

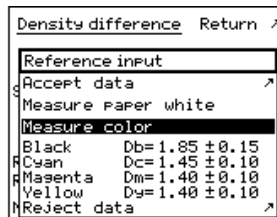
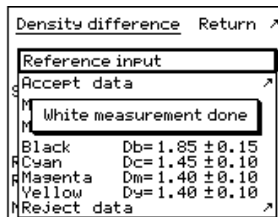
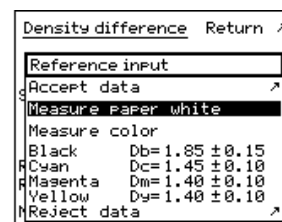
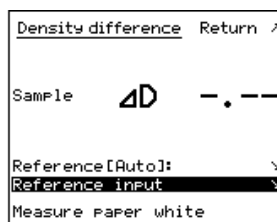
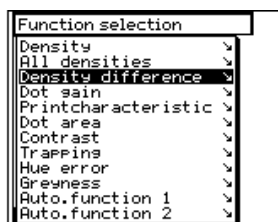
 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base**.

 For density difference measurements, it is necessary to measure or enter reference values. Preset tolerance values can be overwritten. Four jobs with four to eight references each can be defined. The names of the jobs can be freely selected under **Settings** → **Jobs**. The names of the references one to four are preset; the names of the references five to eight can be freely selected under **Settings** → **Reference** → **Reference input** or in the density difference function under **Reference input**.

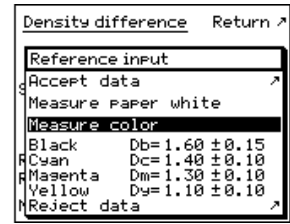
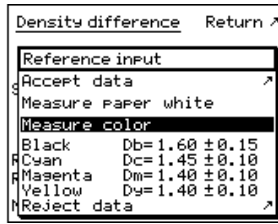
 Use the references black, cyan, magenta, yellow for the corresponding process-colors and the other references for special-colors. If there are 5 or more references defined in a job, you can define the assignment of the references.

### 4.4.1 Procedure if reference values have to be entered first:

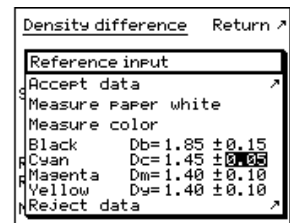
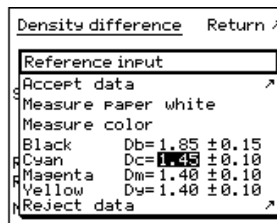
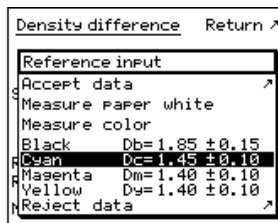
- Select the menu line **Density difference** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Reference input** by turning the <Control ball>.
- Activate the reference entry by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.
- Select the menu line **Measure color** by turning the <Control ball>.



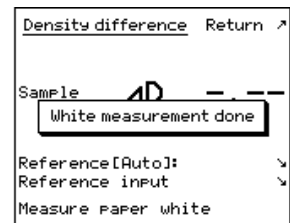
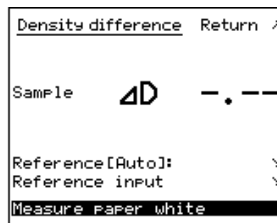
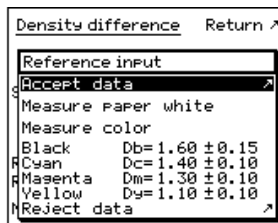
- Position the measuring aperture on the color samples Black, Cyan, Magenta and Yellow, and initiate the measurements by pressing the <Measurement key>.



- Select the entry line to be corrected by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The entry field for the density reference value appears on the display.
- Correct the density reference value by turning the <Control ball> and terminate the entry by pressing the <Measurement key>.
- The entry field for the density tolerance value appears on the display.
- Correct the density tolerance value by turning the <Control ball> and terminate the entry by pressing the <Measurement key>.

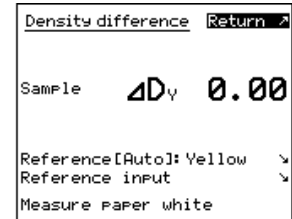
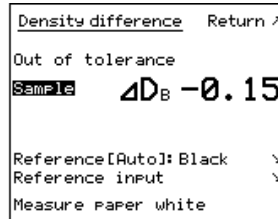
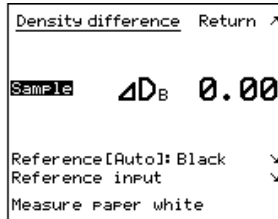


- Select the menu line **Accept data** by turning the <Control ball>.
- Accept the reference and tolerance values by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.







- Position the measuring aperture on the color sample and initiate a measurement by pressing the <Measurement key>.
- The measured density difference  $\Delta D$  appears on the display.  
If the preset tolerance value for the density difference is exceeded, the note **Out of tolerance** will additionally be shown.
- Select the menu line **Return** by turning the <Control ball> and actuate the <Measurement key> to return to main menu.



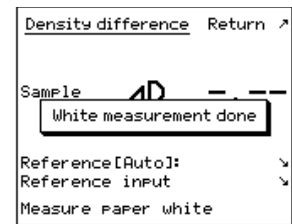
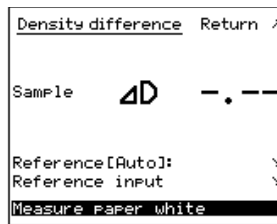
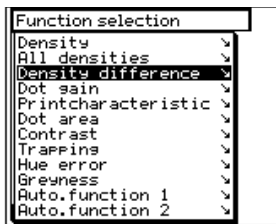
## 4.4.2 Procedure with preset reference values

 Define the names of your jobs and the number of references per job under **Settings** → **Jobs**.

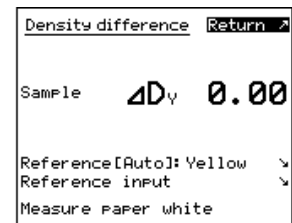
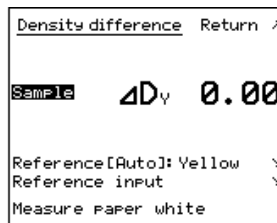
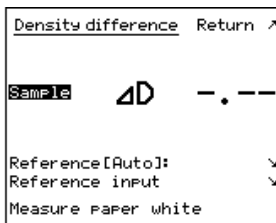
 Enter or measure the reference values and enter the tolerances under **Settings** → **References** → **Reference Input**.

 Select the desired job under **Settings** → **Jobs** → **Select job** or **Settings** → **References** → **Reference** → **Job**.

- Select the menu line **Density difference** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.





- Position the measuring aperture on the desired color sample and initiate a measurement by pressing the <Measurement key>.
- The measured density difference of the respective color is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.




## 4.5 All density differences

The function 'All density differences' will be used if you are interested in the differences of all absorptions of a printed color, not only the main absorption (e.g. for measuring the gray-balance).

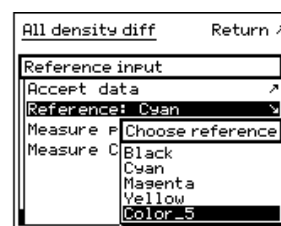
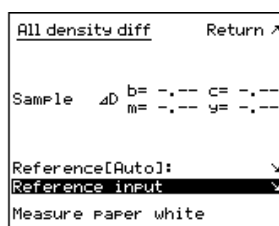
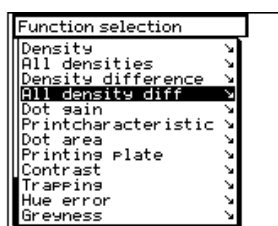
 Select paper white or absolute white base under **Settings → Measurement parameters → White base**.

 For density difference measurements, it is necessary to measure or enter reference values. Preset tolerance values can be overwritten. Four jobs with four to eight references each can be defined. The names of the jobs can be freely selected under **Settings → Jobs**. The names of the references one to four are preset; the names of the references five to eight can be freely selected under **Settings → Reference → Reference input** or in the all density differences function under **Reference input**.

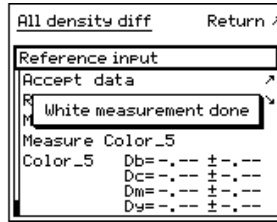
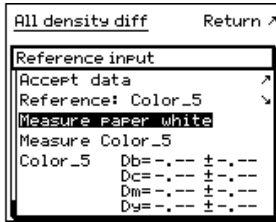
 By entering the references manually, you have to enter all densities of the reference value. Therefore, you have to enter the values under **All density diff → Reference input** or under **Settings → Reference → All densities**.

### 4.5.1 Procedure if reference values are not defined:

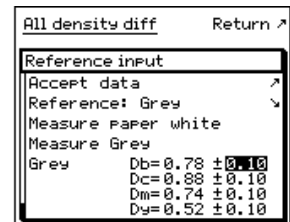
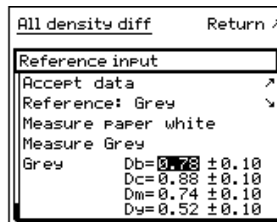
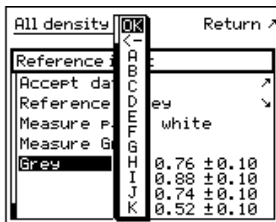
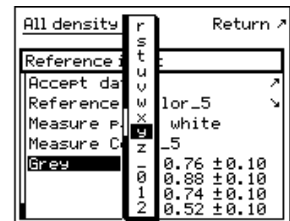
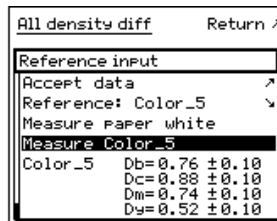
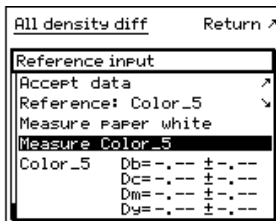
- Select the menu line **All density diff** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Reference input** by turning the <Control ball>.
- Activate the reference entry by pressing the <Measurement key>.
- Select the menu line **Reference** by turning the <Control ball>.
- Activate the reference selection by pressing the <Measurement key>.
- Select the color by turning the <Control ball>.
- Activate the selected color by pressing the <Measurement key>.



- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.

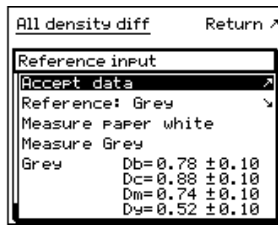


- Select the menu line **Measure 'color'** by turning the <Control ball>.
- Position the measuring aperture on the color sample and initiate the measurements by pressing the <Measurement key>.
- The density values of the measured color are shown on the display.
- Select the menu line where you want to change the name or the value of the reference.
- Activate the selection by pressing the <Measurement key>.
- Change the values.
- Activate the changes by pressing the <Measurement key>.

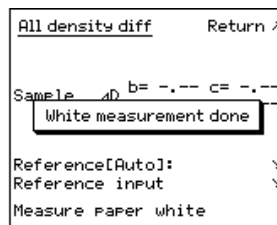
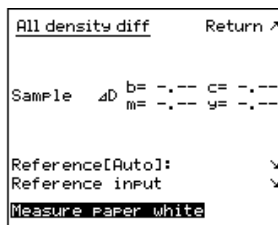


- Repeat all this steps until all values of the reference are corrected.
- Repeat all this steps until all colors are defined as references.

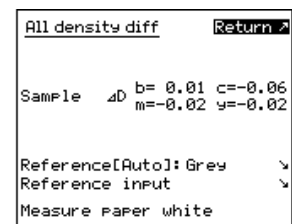
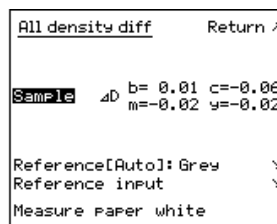
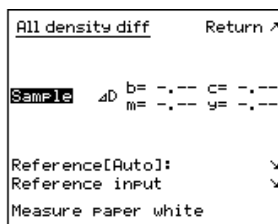
- Select the menu line **Accept data** by turning the <Control ball>.
- Accept the reference and tolerance values by pressing the <Measurement key>.




- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.





- Position the measuring aperture on the color sample and initiate a measurement by pressing the <Measurement key>.
- The measured density differences  $\Delta D$  appear on the display.  
If one or more preset tolerance values for the density difference are exceeded, the note **Out of tolerance** will additionally be shown.
- Select the menu line **Return** by turning the <Control ball> and actuate the <Measurement key> to return to main menu.



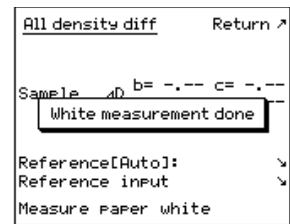
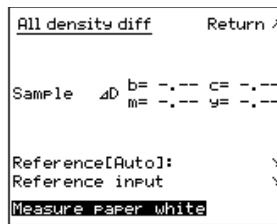
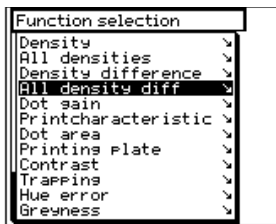
## 4.5.2 Procedure with preset reference values

 Define the names of your jobs and the number of references per job under **Settings** → **Jobs**.

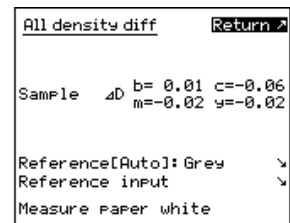
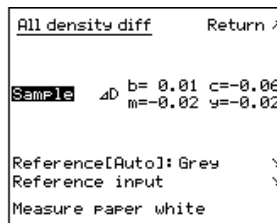
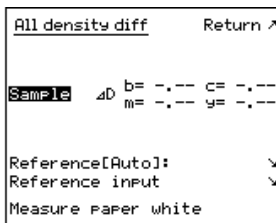
 Select the desired job under **All density diff** → **Reference Input** → **Job** or **Settings** → **Jobs** → **Select job**.

 Enter or measure the reference values and enter the tolerances under **All density diff** → **Reference Input**.


- Select the menu line **All density diff** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.




- Position the measuring aperture on the desired color sample and initiate a measurement by pressing the <Measurement key>.
- The measured density differences of the respective color is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



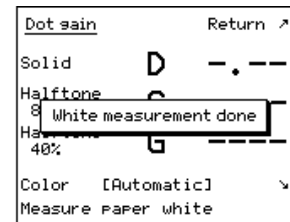
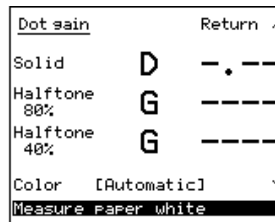
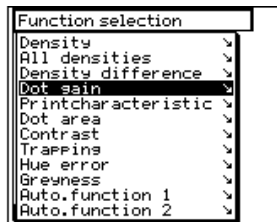
## 4.6 Dot gain

 Select automatic or manual filter selection under **Settings** → **Color** or in the selected densitometric function under the menu line **Color**.

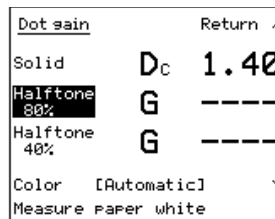
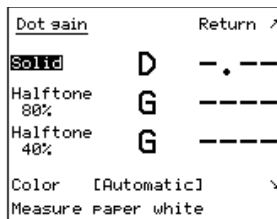
 Enter the measurement parameters for the dot gain under **Settings** → **Measurement parameters** → **Dot gain**. One, two or three film reference values may be entered.

### Procedure:

- Select the menu line **Dot gain** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



- Position the measuring aperture on the solid tone patch and initiate a measurement by pressing the <Measurement key>.
- The density value of the solid tone patch is shown on the display.



- Position the measuring aperture on the 80% halftone patch and initiate a measurement by pressing the <Measurement key>.
- The display shows the dot gain of the 80% halftone patch.
- Position the measuring aperture on the 40% halftone patch and initiate a measurement by pressing the <Measurement key>.
- The display shows the dot gain of the 40% halftone patch.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.


Dot gain		Return ↗
Solid	D <sub>C</sub>	1.40
Halftone 80%	G <sub>C</sub>	7%
Halftone 40%	G	----
Color	[Automatic]	▼
Measure Paper white		


Dot gain		Return ↗
Solid	D <sub>C</sub>	1.40
Halftone 80%	G <sub>C</sub>	7%
Halftone 40%	G <sub>C</sub>	11%
Color	[Automatic]	▼
Measure Paper white		

Dot gain		Return ↗
Solid	D <sub>C</sub>	1.40
Halftone 80%	G <sub>C</sub>	7%
Halftone 40%	G <sub>C</sub>	11%
Color	[Automatic]	▼
Measure Paper white		



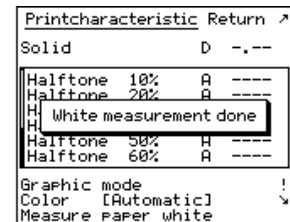
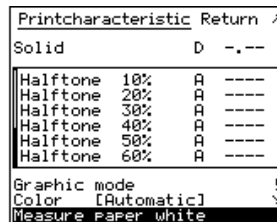
## 4.7 Print characteristic

 Select automatic or manual filter selection under **Settings** → **Color** or in the selected densitometric function under the menu line **Color**.

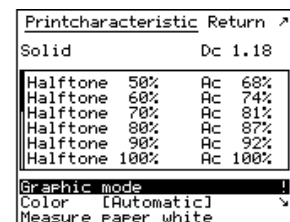
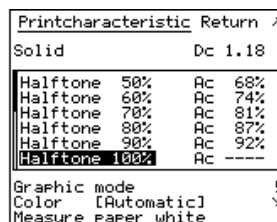
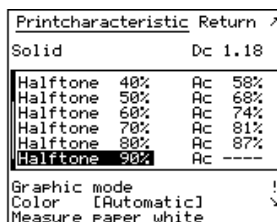
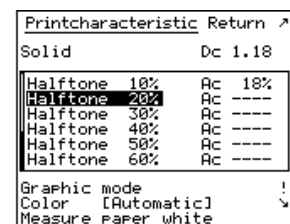
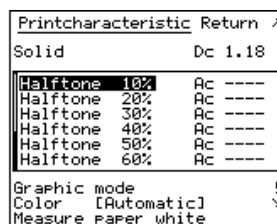
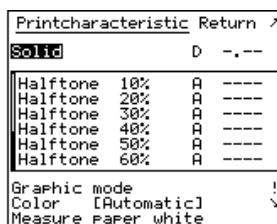
 Enter the measurement parameters for the print characteristic under **Settings** → **Measurement parameters** → **Print characteristic**.

### Procedure:

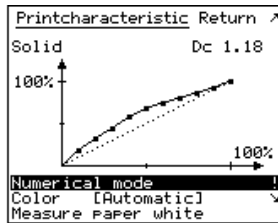
- Select the menu line **Print characteristic** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



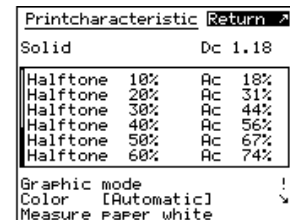
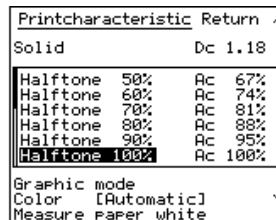
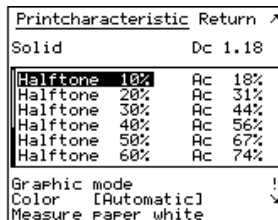
- Position the measuring aperture on the solid tone patch and initiate a measurement by pressing the <Measurement key>.
- The density value of the solid tone patch is shown on the display.
- Position the measuring aperture on the halftone patches one after the other and initiate the measurements by pressing the <Measurement key>.
- After the measurement of the 100% halftone patch, the menu line “Graphic mode” is shown in reversed video.



- After pressing the <Measurement key>, the graphic mode is shown on the display.



- Pressing the <Measurement key> again will switch the display to the numerical mode.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



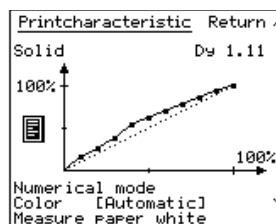
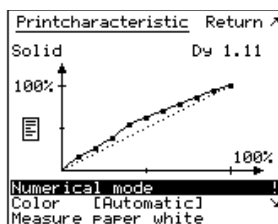
#### 4.7.1 Print out of the print characteristic




- Configure and connect your printer to the D190 remission densitometer.
- Configure data interface under **Settings → Data interface**.
- Select the D190 printer protocol under **Settings → Printer → Printer protocol**.
- Return to the main menu.


##### Procedure:

- Select the **Print symbol** by turning the <Control ball>.
- Activate the printout of the print characteristic by pressing the <Measurement key>.



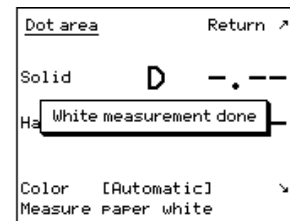
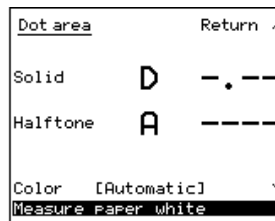
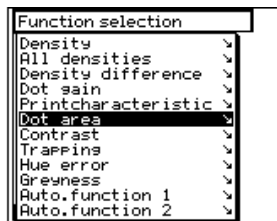
## 4.8 Dot area

 Select automatic or manual filter selection under **Settings** → **Color** or in the selected densitometric function under the menu line **Color**.

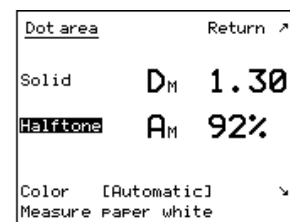
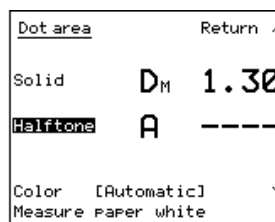
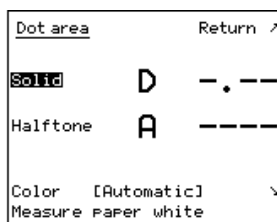
 Enter the measurement parameters for the dot area under **Settings** → **Measurement parameters** → **Dot area**. The calculation of the dot area can be made according to Murray-Davies or according to Yule-Nielsen.

### Procedure:

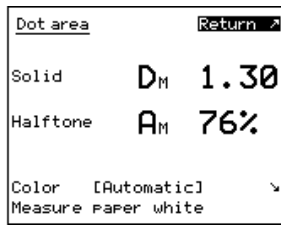
- Select the menu line **Dot area** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



- Position the measuring aperture on the solid tone patch and initiate a measurement by pressing the <Measurement key>.
- The density value of the solid tone patch is shown on the display.
- Position the measuring aperture on the halftone patch and initiate a measurement by pressing the <Measurement key>.
- The dot area of the halftone patch is shown on the display.



- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



## 4.9 Printing plate

The function **'printing plate'** is used for measuring the dot area on printing plates for offset printing. The operating procedure is similar to the procedure of the function 'dot area', but instead of the paper white you have to measure the plate ground of the printing plate. The measurements of the solid tone and halftone have to be performed on the corresponding fields on the printing plate.

The calculations of the dot area is done using the are the Yule-Nielsen. For the printing plate you can define a special Yule-Nielsen-coefficient which can be different to the coefficients of the dot area function. On most printing plates you will achieve good results with coefficient values from 1.08 to 1.24 (typically 1.15).

For excellent results you have to determine the Y-N-coefficient for your printing plate using a microscope for measuring the dot area.

You can also switch off the Yule-Nielsen-correction by setting the Y-N-coefficient to 1.0.



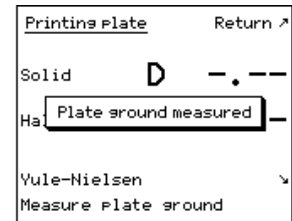
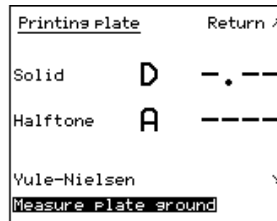
Select automatic or manual filter selection under **Settings** → **Color** or in the selected densitometric function under the menu line **Color**.



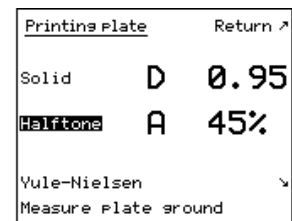
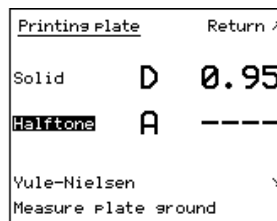
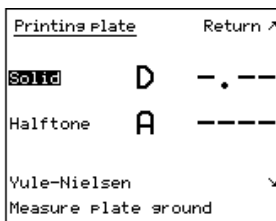
Enter the Yule-Nielsen-coefficient in the function **'Printing plate'** under the menu line **Yule-Nielsen**.

### Procedure:

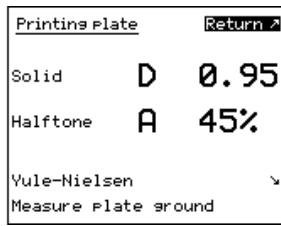
- Select the menu line **Printing plate** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure plate ground** by turning the <Control ball>.
- Position the measuring aperture on the plate ground and initiate a measurement by pressing the <Measurement key>.
- The display **Plate ground measured** is shown for about 1 second.




- Position the measuring aperture on the solid tone patch and initiate a measurement by pressing the <Measurement key>.
- The density value of the solid tone patch is shown on the display.
- Position the measuring aperture on the halftone patch and initiate a measurement by pressing the <Measurement key>.
- The dot area of the halftone patch is shown on the display.




- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



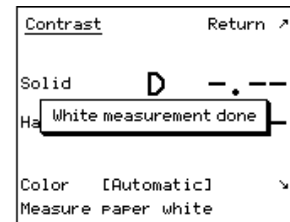
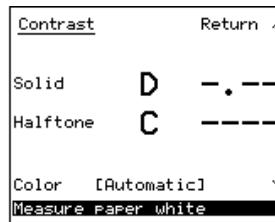
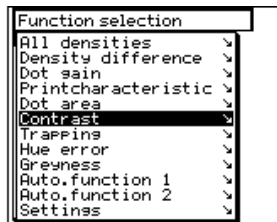
## 4.10 Contrast

 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base**.

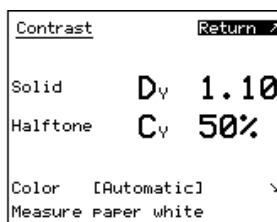
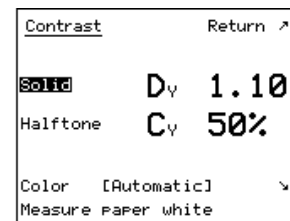
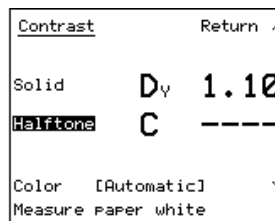
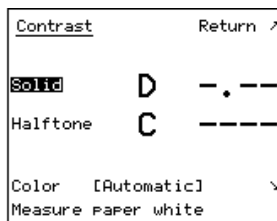
 Select automatic or manual filter selection under **Settings** → **Color** or in the selected densitometric function under the menu line **Color**.

### Procedure:


- Select the menu line **Contrast** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.




- Position the measuring aperture on the solid tone patch and initiate a measurement by pressing the <Measurement key>.
- The density value of the solid tone patch is shown on the display.
- Position the measuring aperture on the halftone patch and initiate a measurement by pressing the <Measurement key>.
- The relative print contrast is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



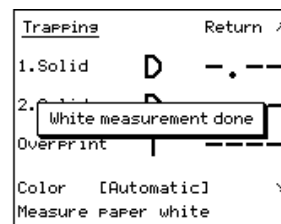
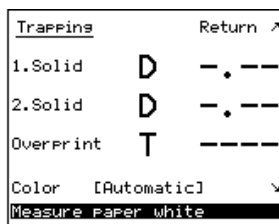
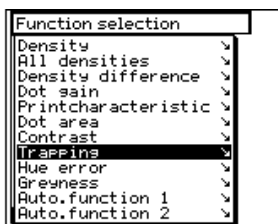
## 4.11 Trapping

 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base**.

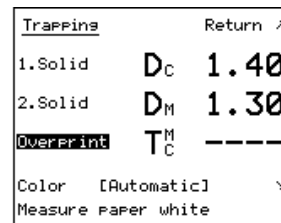
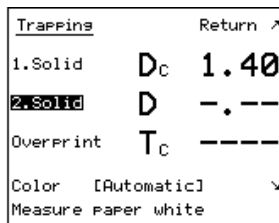
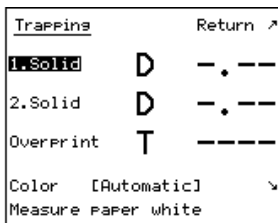
 Select automatic or manual filter selection under **Settings** → **Color** or in the selected densitometric function under the menu line **Color**.

### Procedure:

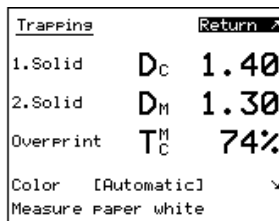
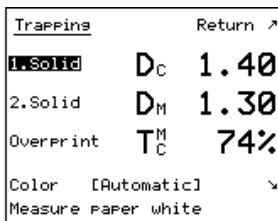
- Select the menu line **Trapping** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



- Position the measuring aperture on the solid tone patch printed first and initiate a measurement by pressing the <Measurement key>.
- The density value of the first solid tone patch is shown on the display.
- Position the measuring aperture on the solid tone patch printed second and initiate a measurement by pressing the <Measurement key>.
- The density value of the second solid tone patch is shown on the display.




- Position the measuring aperture on the overprint and initiate a measurement by pressing the <Measurement key>.
- The overprint value T is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



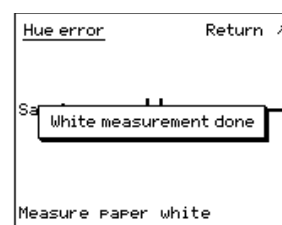
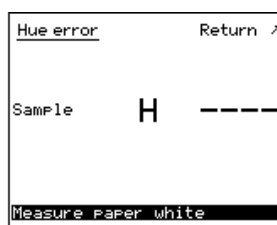
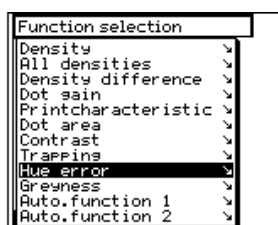


## 4.12 Hue error

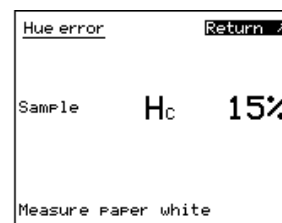
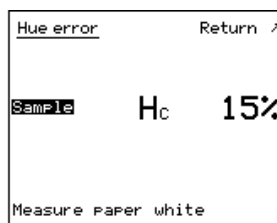
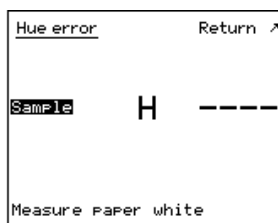
 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base.**

### Procedure:


- Select the menu line **Hue error** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



- Position the measuring aperture on the color patch to be measured and initiate a measurement by pressing the <Measurement key>.
- The hue error H is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.

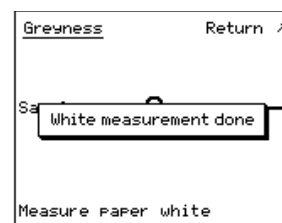
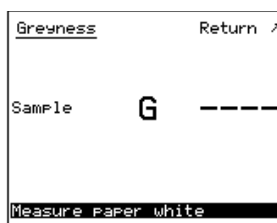
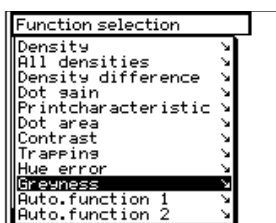


## 4.13 Greyness

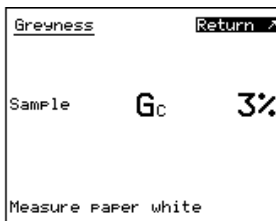
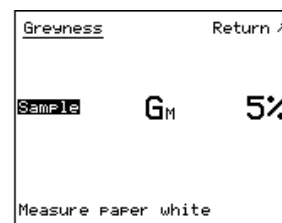
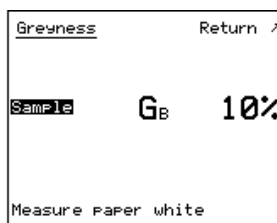
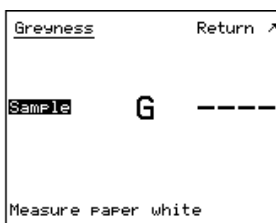
 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base.**

### Procedure:


- Select the menu line **Greyness** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.





- Position the measuring aperture on the color patch to be measured and initiate a measurement by pressing the <Measurement key>.
- The greyness value G is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



## 4.14 Auto. function 1

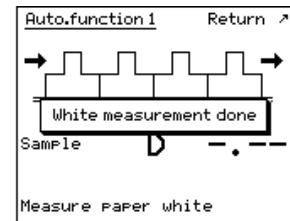
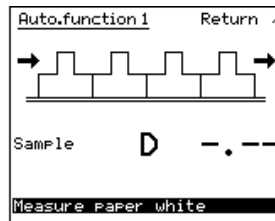
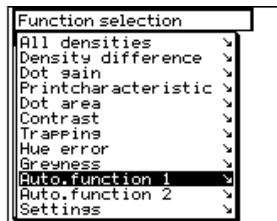
 Auto. function 1 includes the automatic color recognition (Automatic) and the automatic function recognition for density, dot gain and trapping. The display indicates the printing sequence with the density values of the standard colors and the corresponding measured values for density, dot gain or trapping.

 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base**.

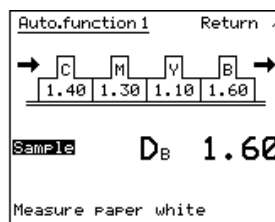
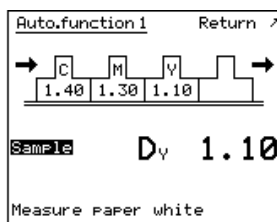
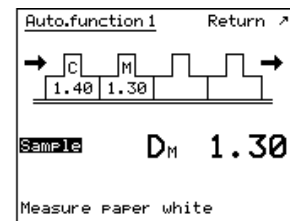
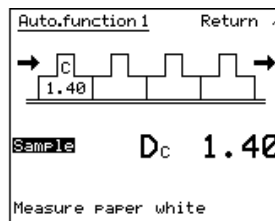
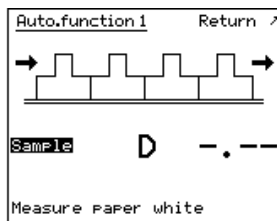
 Switching over between Auto. function 1 to Auto. function 2 is possible.

### Procedure:

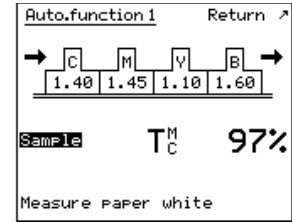
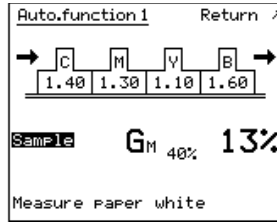
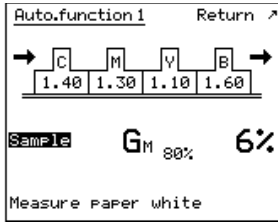
- Select the menu line **Auto. function 1** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



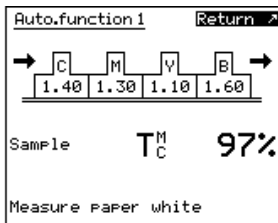
- Position the measuring aperture on the standard colors in the given printing sequence and initiate a measurement of each color by pressing the <Measurement key>.
- The solid tone density values of the standard colors are shown on the display.



- Position the measuring aperture on a solid tone patch, a halftone patch or an overprint patch and initiate a measurement by pressing the <Measurement key>.
- The display indicates the printing sequence with the density values of the standard colors and the corresponding measured values for density, dot gain or trapping.





- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.




The measurements in this example were made with reference to paper white. Measurements were made of the solid tone patches according to the printing sequence, a 80% halftone patch, a 40% halftone patch and an overprint patch.

## 4.15 Auto. function 2

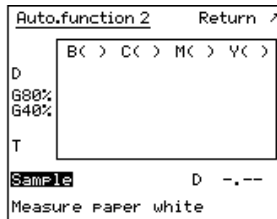
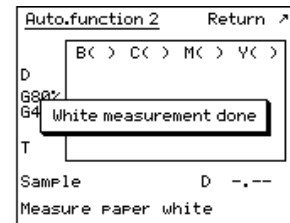
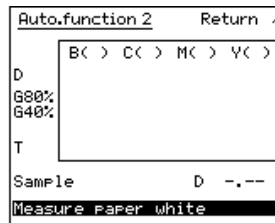
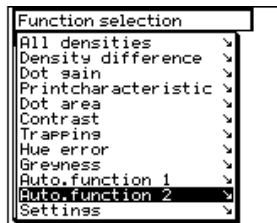
 Auto. function 2 includes the automatic color recognition (Automatic) and the automatic function recognition for density, dot gain and trapping. The display indicates the printing sequence with the density values of the standard colors and the corresponding measured values for density, dot gain or trapping at the same time.

 Select paper white or absolute white base under **Settings** → **Measurement parameters** → **White base**.

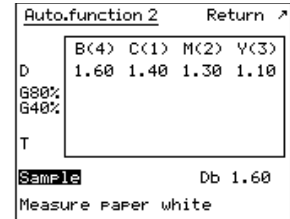
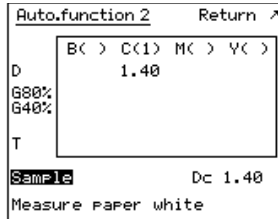
 Switching over between Auto. function 1 to Auto. function 2 is possible.

### Procedure:

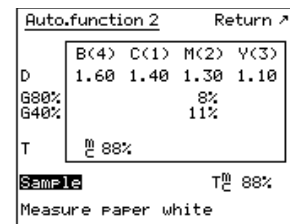
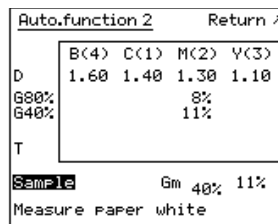
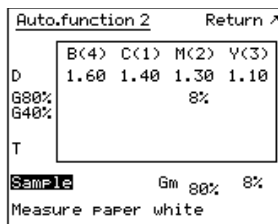
- Select the menu line **Auto. function 2** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Measure paper white** by turning the <Control ball>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



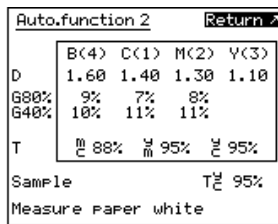
- Position the measuring aperture on the standard colors in the given printing sequence and initiate a measurement of each color by pressing the <Measurement key>.
- The display indicates the solid tone density values of the standard colors; the printing sequence is shown in brackets; in the example: B ( 4 ) , C ( 1 ) , M ( 2 ) , Y ( 3 ) .




- Position the measuring aperture on a solid tone patch, a halftone patch or an overprint patch and initiate a measurement by pressing the <Measurement key>.
- The display indicates the printing sequence with the density values of the standard colors and the corresponding measured values for density, dot gain or trapping.



- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> to return to the main menu.



 The measurements in this example were made with reference to paper white. Measurements were made of the solid tone patches according to the printing sequence, a 80% halftone patch, a 40% halftone patch and an overprint patch.

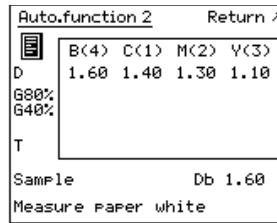
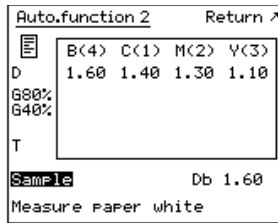
## 4.15.1 Print out of the measuring results



- Configure and connect your printer to the D190 remission densitometer.
- Configure data interface under **Settings → Data interface.**
- Select the D190 printer protocol under **Settings → Printer → Printer protocol.**
- Return to the main menu.

### Procedure:

- Select the **Print symbol** by turning the <Control ball>.
- Activate the printout of the measuring results by pressing the <Measurement key>.







# 5 Settings

## 5.1 Overview

- 5.1.1 Function selection
  - 5.1.1.1 Function selection if the settings are not protected
  - 5.1.1.2 Function selection if the settings are protected

## 5.2 Color

- 5.2.1 Manual color selection
- 5.2.2 Automatic color recognition

## 5.3 Jobs

- 5.3.1 Job definition
  - 5.3.1.1 Accept data
  - 5.3.1.2 Setting of default values
  - 5.3.1.3 Reject data
- 5.3.2 Job selection

## 5.4 References

- 5.4.1 Reference entry by measurement
  - 5.4.1.1 Accept data
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- 5.4.2 Assignment of measured values to reference values
  - 5.4.2.1 Assignment of measured values to a specific reference
  - 5.4.2.2 Automatic assignment of measured values to references
- 5.4.3 Entry or correction of reference and tolerance values
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- 5.4.4 Job selection
- 5.4.5 Reference entry
  - 5.4.5.1 Accept data
  - 5.4.5.2 Reject data

## 5.5 Measurement parameters

- 5.5.1 Overview
  - 5.5.1.1 Function selection
- 5.5.2 Measurement parameters for white base
  - 5.5.2.1 Setting of paper white base
  - 5.5.2.2 Setting of absolute white base
- 5.5.3 Measurement parameters for dot gain
  - 5.5.3.1 Entry of halftone reference values
    - 5.5.3.1.1 Accept data
    - 5.5.3.1.2 Reject data
- 5.5.4 Measurement parameters for print characteristic
  - 5.5.4.1 Entry of scale graduation
  - 5.5.4.2 Numerical or graphic representation of print characteristic

1

2

3

4

5

6

7

8

9

10

11

- 5.5.5 Measurement parameters for dot area
  - 5.5.5.1 Setting for dot area calculation according to Murray-Davies
  - 5.5.5.2 Setting for dot area calculation according to Yule-Nielsen
- 5.5.6 Measurement parameters for printing plate
  - 5.5.6.1 Setting of the Yule-Nielsen coefficient for measuring printing plates

## **5.6 Calibration**

- 5.6.1 GretagMacbeth calibration cards
- 5.6.2 Calibration with paper white base
  - 5.6.2.1 Reject data
- 5.6.3 Check calibration with paper white base
- 5.6.4 Calibration with absolute white base
  - 5.6.4.1 Reject data
- 5.6.5 Check calibration with absolute white base

## **5.7 Printer**

- 5.7.1 Printer or PC
- 5.7.2 Printer protocol
- 5.7.3 Printing date and time
- 5.7.4 Header printout
  - 5.7.4.1 Header settings
    - 5.7.4.1.1 Printing date and time
    - 5.7.4.1.2 Printing reference values
    - 5.7.4.1.3 User specifications

## **5.8 Data interface**

- 5.8.1 Baud rate setting
- 5.8.2 Handshake setting

# 5.1 Overview

The following functions can be selected:

- **Color** *Manual color selection and automatic color recognition*
- **Jobs** *Definition and selection of jobs*
- **References** *Measurement or entering of reference and tolerance values*
- **Measurement parameters**
  - *White base*
  - *Dot gain*
  - *Print characteristic*
  - *Dot area*
  - *Printing plate*
- **Calibration**
  - *Paper white calibration*
  - *Absolute white calibration*
  - *Check calibration*
- **Printer**
  - *Printer selection*
  - *Protocol on/off*
  - *Input of user specifications*
  - *Printing date and time*
  - *Header setting*
- **Data interface**
  - *Baud rate setting*
  - *Handshake selection*
- **Device settings refer to 6**

## 5.1.1 Function selection



In the D19C you can protect the settings by means of a password (optional feature which is not included in all instruments).



If the settings are protected, you will be able to enter the menu **'settings'** only by using a password. Please don't lose this password! Otherwise please contact your GretagMacbeth representative.

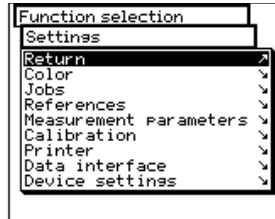
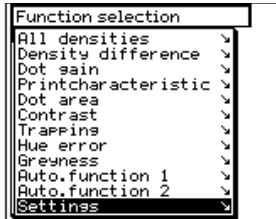


To switch on the setting protection refer to **settings → device settings → setting protection.**

### 5.1.1.1 Function selection if the settings are not protected

**Procedure:**

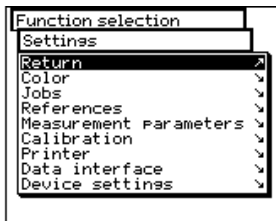
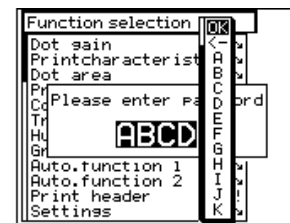
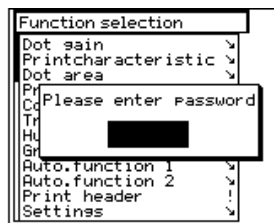
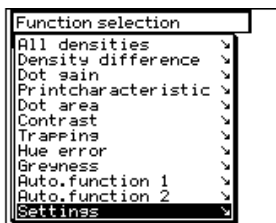
- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the desired menu line by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



### 5.1.1.2 Function selection if the settings are protected

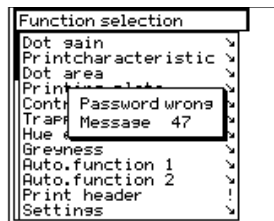
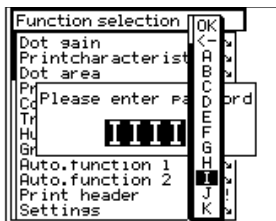
**Procedure:**

- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Press the <Measurement key> again for entering the password.
- Select the characters of the password by turning the <Control ball> and confirm the selections by pressing the <Measurement key>.
- After entering the password select the menu line **OK** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- You are in the menu **Settings** now.
- Select the desired menu line by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



**Wrong password**

- If the password is not correct, the display **Password wrong** will be shown and you cannot enter into the menu Settings.



## 5.2 Color

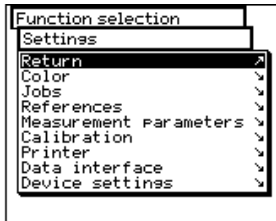
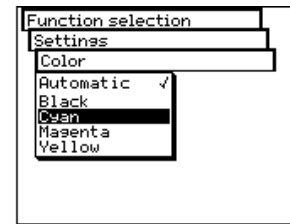
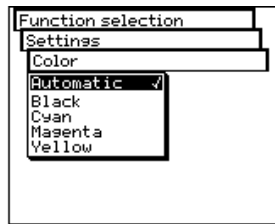
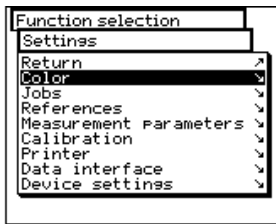


The setting for automatic or manual color selection can also be made in the menu line **Color** of the densitometric functions.

### 5.2.1 Manual color selection

**Procedure:**

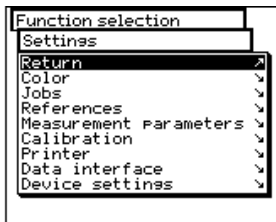
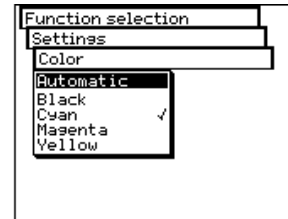
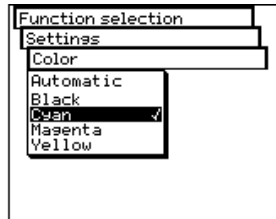
- Select the menu line **Color** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the desired color **Black, Cyan, Magenta or Yellow** by turning the <Control ball>.
- Activate the selected color by pressing the <Measurement key>.
- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> to return to the next higher menu level.



## 5.2.2 Automatic color recognition

### Procedure:

- Select the menu line **Color** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Automatic** by turning the <Control ball>.
- Activate the automatic color recognition by pressing the <Measurement key>.
- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> to return to the next higher menu level.



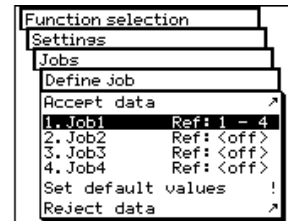
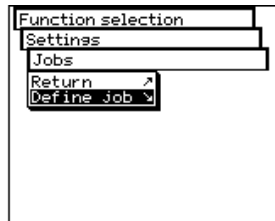
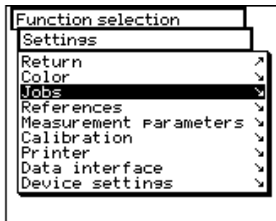
## 5.3 Jobs

For density difference measurements, it is necessary to measure or enter reference values. Tolerance values can be overwritten. Four jobs with four to eight references each can be defined. The names of the jobs can be freely selected. The names of the references one to four are preset. The names of the references five to eight can be freely selected. Preset default reference values and tolerance values may be set.

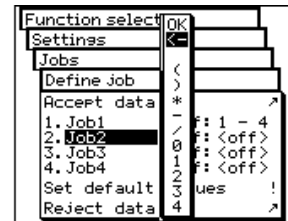
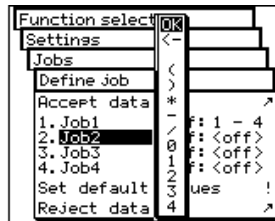
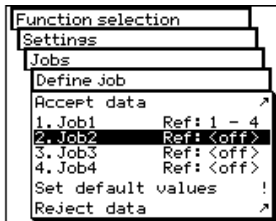
### 5.3.1 Job definition

#### Procedure if no job has been defined:

- Select the menu line **Jobs** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows **Define job** in reverse video.
- Activate the function by pressing the <Measurement key>.
- Four job names are shown on the display.

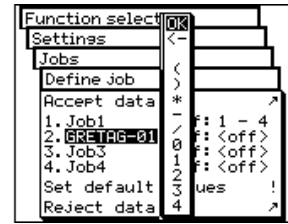
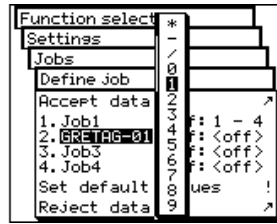
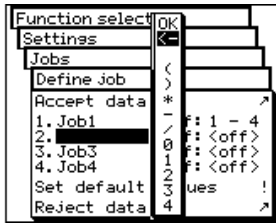


- Select the desired job by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The entry field of the current job name is shown in reverse video on the display.
- Use the <Control ball> to select the menu line ◀ in the entry field.

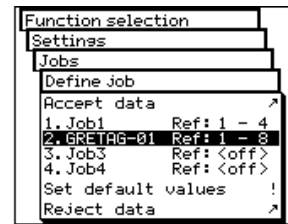
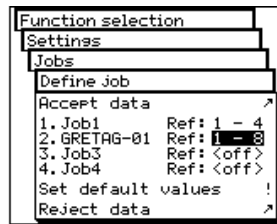
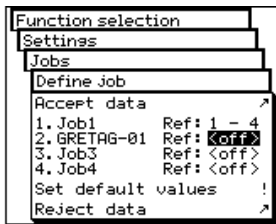




- Delete the current job name by repeatedly pressing the <Measurement key>.
- Enter the new job name with the <Control ball>.
- Select the menu line **OK** with the <Control ball> and press the <Measurement key>.



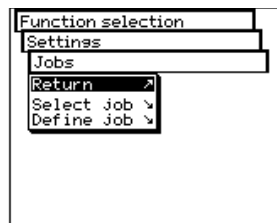
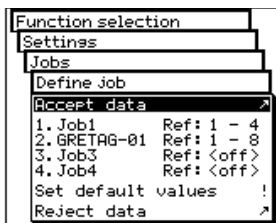
- The display shows **<off>** in reverse video, i.e. the reference with the name GRETAG-01 is switched off.
- Enter the number of reference values you wish to store under the name GRETAG-01. Four to eight reference values can be stored.
- Terminate the entry by pressing the <Measurement key>.



### 5.3.1.1 Accept data

#### Procedure:

- Select the menu line **Accept data** by turning the <Control ball> and confirm this action by pressing the <Measurement key>.  
The new data are stored.
- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> several times to return to the main menu.

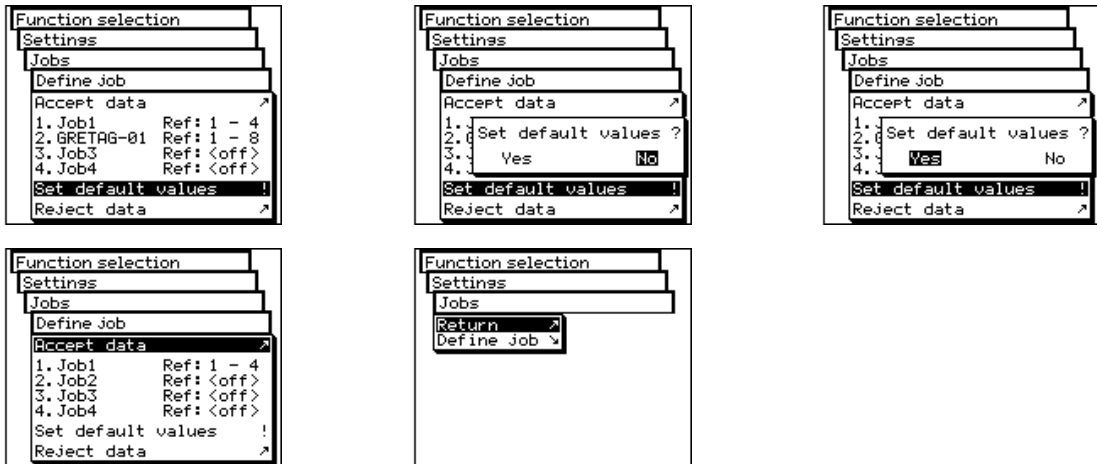


Job1 cannot be switched off

### 5.3.1.2 Setting of default values

**Procedure:**

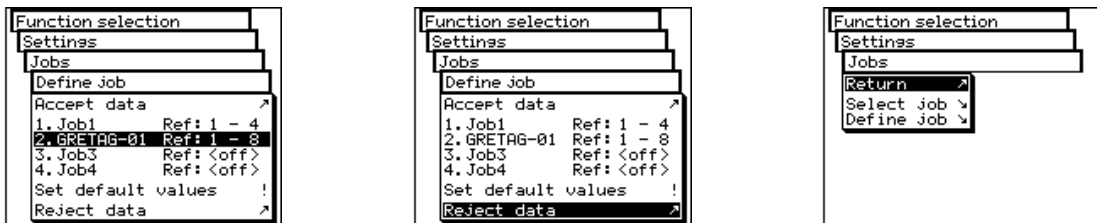
- Select the menu line **Set default values** by turning the <Control ball> and press the <Measurement key>.
- The display shows **No** in reverse video.
- Press the <Measurement key> if you wish to terminate the procedure.
- Select **Yes** by turning the <Control ball>.
- Press the <Measurement key> if you wish to set default values.
- The display shows **Accept data** in reverse video.
- Press the <Measurement key> to set all jobs to the default values.



### 5.3.1.3 Reject data

**Procedure:**

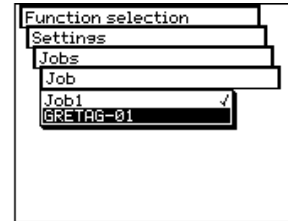
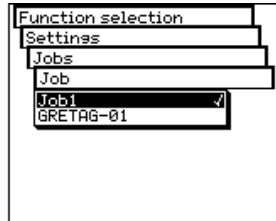
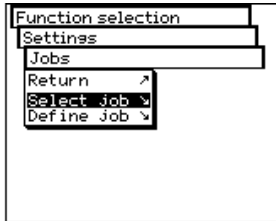
- Select the menu line **Reject data** by turning the <Control ball> and confirm this action by pressing the <Measurement key>.
- The new data will not be stored; stored data are retained.
- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> several times to return to the main menu.



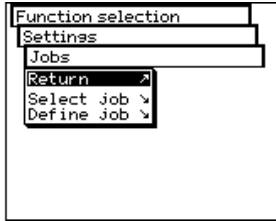
## 5.3.2 Job selection

### Procedure if jobs have already been defined:

- Select the menu line **Select job** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- The display shows a table with the names of previously defined jobs.
- Select the desired job by turning the <Control ball> and confirm the entry by pressing the <Measurement key>.



- The display shows **Return** in reverse video.
- Press the <Measurement key> several times to return to the main menu.



The selection of jobs can also be made in the densitometric function **Density difference**.

## 5.4 References

For density difference measurements, it is necessary to measure or enter reference values. Tolerance values can be overwritten. Four jobs with four to eight references each can be defined. The names of the jobs can be freely selected. The names of the references one to four are preset. The names of the references five to eight can be freely selected. Preset default reference and tolerance values may be set.

Are the references entered manually, it depend in which function the references are used:

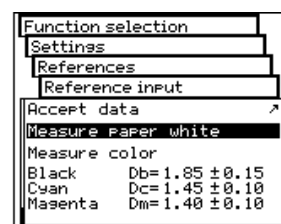
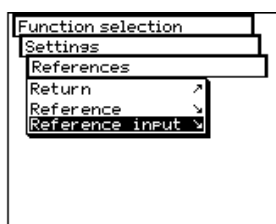
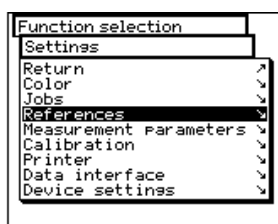
- For normal density difference (function **Density difference**) you have to enter the values in the menu **Reference input**.
- For density differences in all absorbtions (function **All density diff** for gray-balance-measurement) you have to enter the values in the menu **All densities**. Are the references measured by the instrument you can use both menus.

This is the description of the menu **Reference input**. For a description of the menu **All densities** refer to 4.5 'All density diff'.

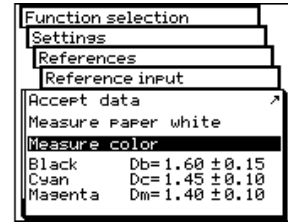
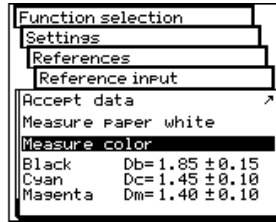
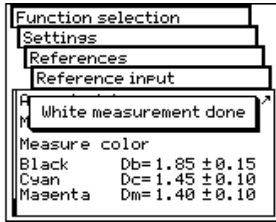
### 5.4.1 Reference entry by measurement

#### Procedure if no jobs have been defined:

- Select the menu line **References** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows **Reference input** in reverse video.
- Activate the function by pressing the <Measurement key>.
- The display shows **Measure paper white** in reverse video.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.



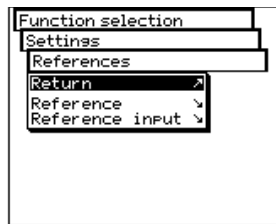
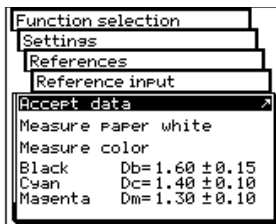
- The display shows **White measurement done** for about 1 second.
- Then the display shows **Measure color** in reverse video.
- Position the measuring aperture on the color samples Black, Cyan, Magenta and Yellow, and initiate the measurements by pressing the <Measurement key>.



### 5.4.1.1 Accept data

**Procedure:**

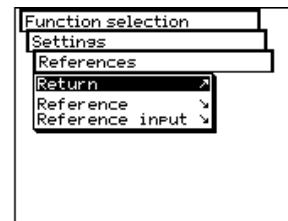
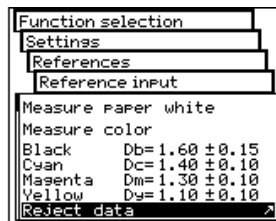
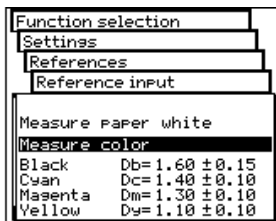
- Accept the reference values by pressing the <Measurement key>.
- The display shows **Return** in reverse video.
- Press the <Measurement key> several times to return to the main menu.



### 5.4.1.2 Reject data

**Procedure:**

- Select the menu line **Reject data** by turning the <Control ball> and confirm the action by pressing the <Measurement key>.
- The new data will not be stored; stored data are retained.
- The display shows the menu line **Return** in reverse video.
- Press the <Measurement key> several times to return to the main menu.



## 5.4.2 Assignment of measured values to reference values

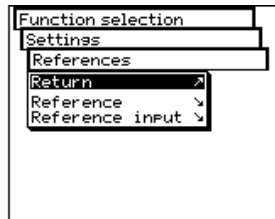
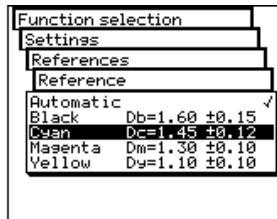
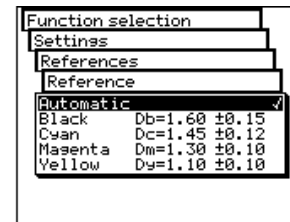
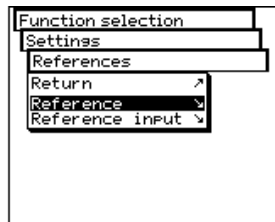
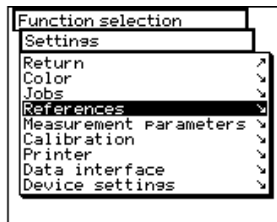


The measured values can be assigned either to a specific reference value or they can be automatically assigned to the "nearest" reference value.

### 5.4.2.1 Assignment of measured values to a specific reference

#### Procedure if no jobs have been defined:

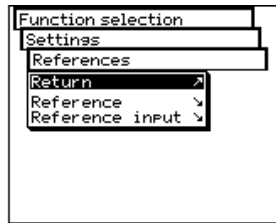
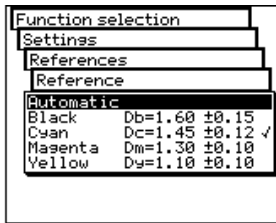
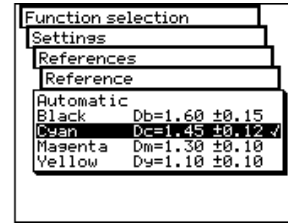
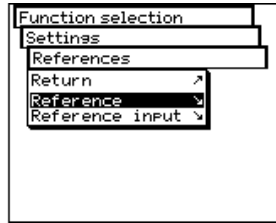
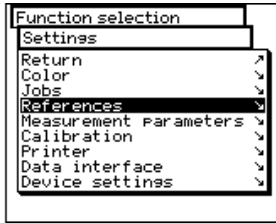
- Select the menu line **References** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Reference entry**.
- Activate the function by pressing the <Measurement key>.
- The display shows a table with the menu lines **Automatic, Black, Cyan, Magenta and Yellow**.
- Select the desired color by turning the <Control ball>.
- Activate the assignment of the measured values to the selected color by pressing the <Measurement key>.



## 5.4.2.2 Automatic assignment of measured values to references

### Procedure if no jobs have been defined:

- Select the menu line **References** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Reference**.
- Activate the function by pressing the <Measurement key>.
- The display shows a table with the menu lines **Automatic, Black, Cyan, Magenta and Yellow**.
- Select **Automatic** by turning the <Control ball>.
- Activate the automatic assignment of the measured values to the references by pressing the <Measurement key>.



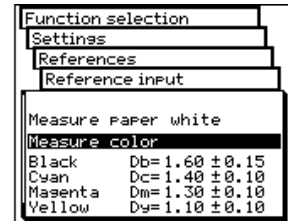
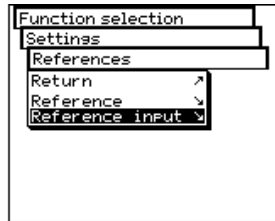
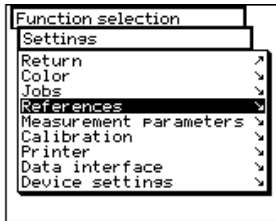
### 5.4.3 Entry or correction of reference and tolerance values



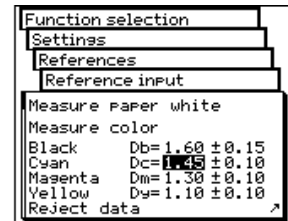
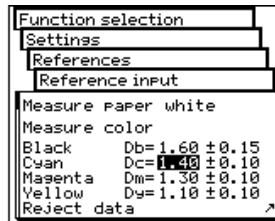
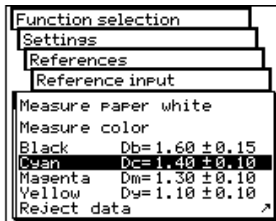
After entering reference or tolerance values, the current values are indicated in the respective entry fields.

#### Procedure:

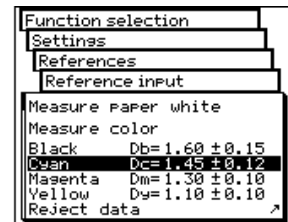
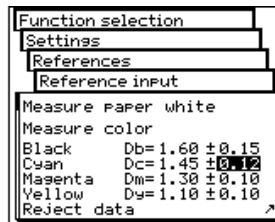
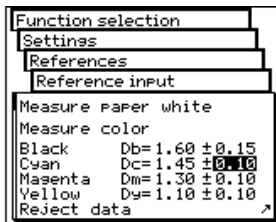
- Select the menu line **References** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows **Reference input** in reverse video.
- Activate the function by pressing the <Measurement key>.
- The display shows **Measure paper white** in reverse video.



- Select the menu line of the desired color by turning the <Control ball> and press the <Measurement key>.
- The entry field for the entering or correction of the reference value appears in reverse video on the display.
- Enter the new reference value or correct the current value and terminate the entry by pressing the <Measurement key>.



- The entry field for the entering or correction of the tolerance value is shown in reverse video on the display.
- Enter the new tolerance value or correct the current value and terminate the entry by pressing the <Measurement key>.
- The display shows the menu line with the newly entered values in reverse video.

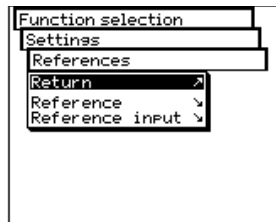
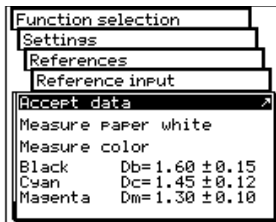




### 5.4.3.1 Accept data

**Procedure:**

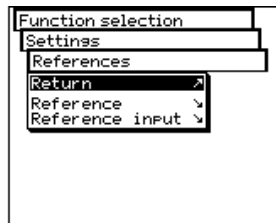
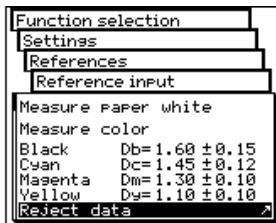
- Accept the reference values by pressing the <Measurement key>. The new data are stored.
- The display shows **Return** in reverse video.
- Press the <Measurement key> several times to return to the main menu.



### 5.4.3.2 Reject data

**Procedure:**

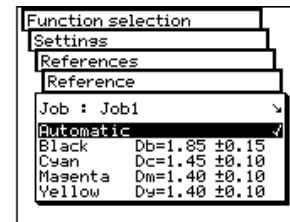
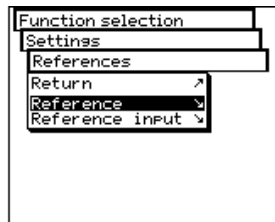
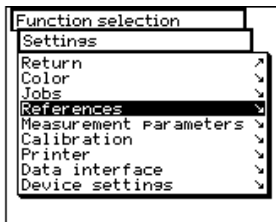
- Select the menu line **Reject data** by turning the <Control ball> and confirm the action by pressing the <Measuring key>. The new data will not be stored; stored data are retained.
- The display shows the menu line **Return** in reverse video.
- Press the <Measurement key> several times to return to the main menu.



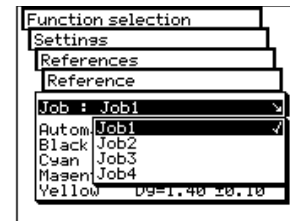
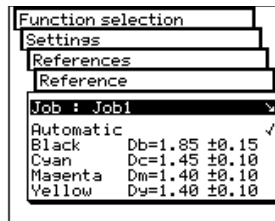
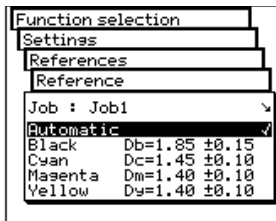
## 5.4.4 Job selection

### Procedure if jobs have been defined:

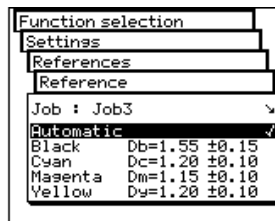
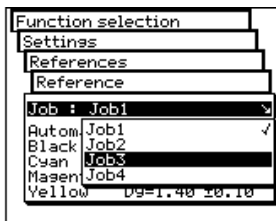
- Select the menu line **References** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows **Reference** in reverse video.
- Activate the function by pressing the <Measurement key>.
- The display shows **Automatic** in reverse video.



- Select the menu line **Job : Job...** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows a table with the names of the jobs.  
The current job is shown in reverse video.
- Select the desired job by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



- The display shows **Automatic** in reverse video.
- Press the <Measurement key> if you wish to automatically assign the measured values to the reference values.
- The display shows **Return**.
- Press the <Measurement key> several times to return to the main menu.

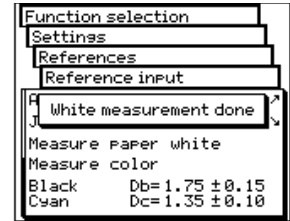
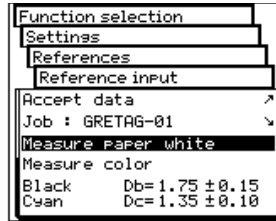
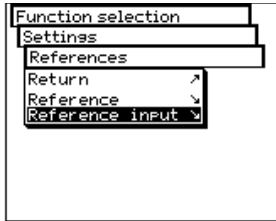


➡ Assignment of measured values to reference values, see section 5.4.2.

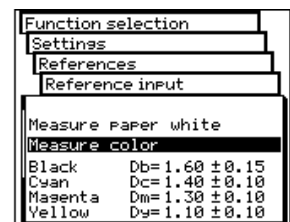
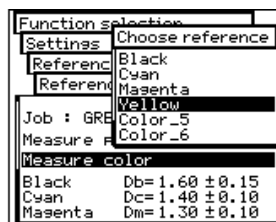
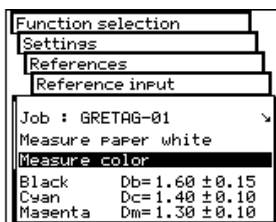
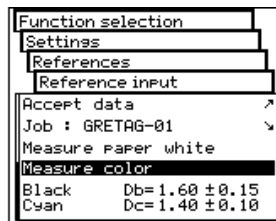
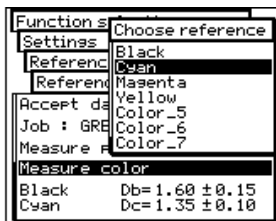
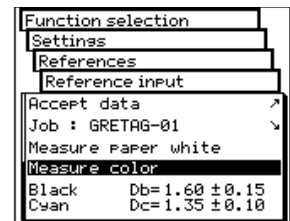
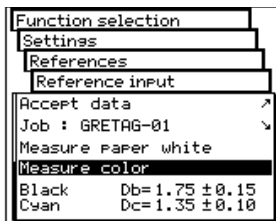
## 5.4.5 Reference entry

### Procedure:

- Select the menu line **Reference entry** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Activate the function by pressing the <Measurement key>.
- The display shows **Measure paper white** in reverse video.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display **White measurement done** is shown for about 1 second.



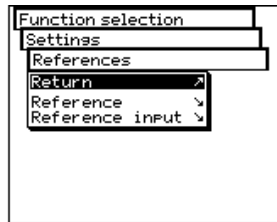
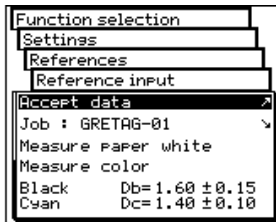
- The display shows **Measure color** in reverse video.
- Position the measuring aperture on the color samples Black, Cyan, Magenta and Yellow, and initiate the measurements by pressing the <Measurement key>.
- If more than four references have been defined for this job, a table with a proposal for the assignment of the reference will be shown in reverse video after every measurement.
- Select the respective reference by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



### 5.4.5.1 Accept data

**Procedure:**

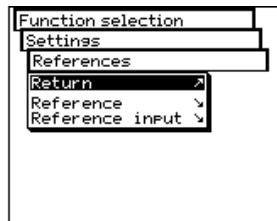
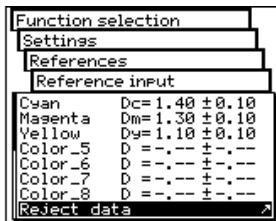
- Accept the reference values by pressing the <Measurement key>.
- The display shows **Return** in reverse video.
- Press the <Measurement key> several times to return to the main menu.



### 5.4.5.2 Reject data

**Procedure:**

- Select the menu line **Reject data** by turning the <Control ball> and confirm the action by pressing the <Measurement key>.
- The new data will not be stored; stored data are retained.
- The display shows the menu line **Return** in reverse video.
- Press the <Measurement key> several times to return to the main menu.



## 5.5 Measurement parameters

### 5.5.1 Overview

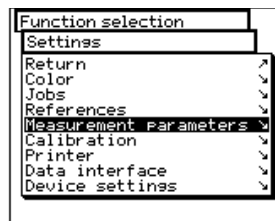
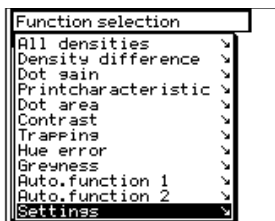
In the menu **Measurement parameters**, the following settings can be made:

- Selection of paper white or absolute white as white base.
- Entry of one to three halftone reference values for dot gain measurements.
- Entry of the halftone wedge gradation and the presetting for numerical or graphic representation of the print characteristic.
- Selection of the desired formula for the calculation of the dot area according to Murray-Davies or Yule-Nielsen as well as the entry of the Yule-Nielsen coefficients for Black, Cyan, Magenta and Yellow.
- Entry of the Yule-Nielsen coefficient for the calculation of the dot area of printing plate.

#### 5.5.1.1 Function selection

**Procedure:**

- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Measurement parameters** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the desired menu line by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.



## 5.5.2 Measurement parameters for white base

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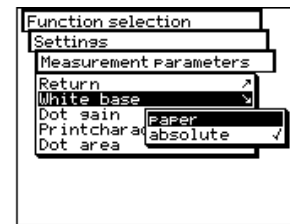
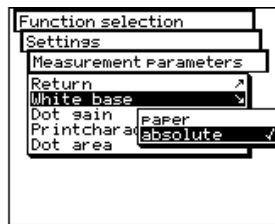
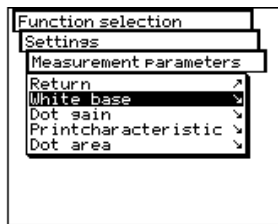
The white base can be set to paper white or absolute white.

---

### 5.5.2.1 Setting of paper white base

#### Procedure:

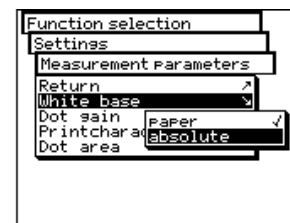
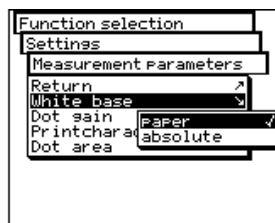
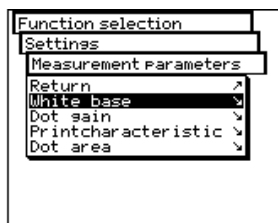
- Select the menu line **White base** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the white base **paper** by turning the <Control ball>.
- Confirm the selection by pressing the <Measurement key>.
- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> several times to return to the main menu.



### 5.5.2.2 Setting of absolute white base

#### Procedure:

- Select the menu line **White base** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the white base **absolute** by turning the <Control ball>.
- Confirm the selection by pressing the <Measurement key>.
- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> several times to return to the main menu.



### 5.5.3 Measurement parameters for dot gain

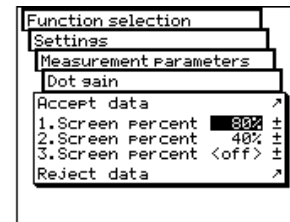
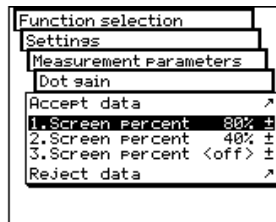
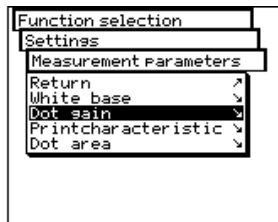


One to three halftone reference values in the range between 0% and 100% can be entered. At the upper and lower ends of this range, the selected halftone values can be switched off. This will be confirmed with **<off>** on the display.

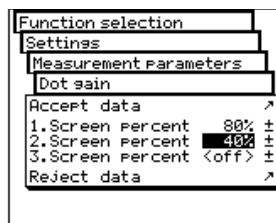
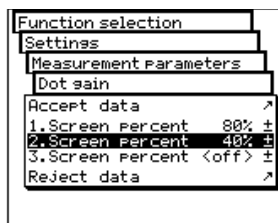
#### 5.5.3.1 Entry of halftone reference values

##### Procedure:

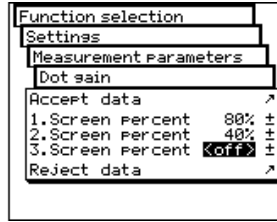
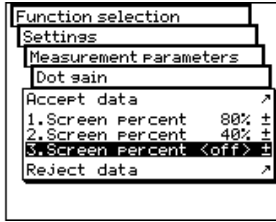
- Select the menu line **Dot gain** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- An entry field for three halftone percentages is shown on the display.
- Select the menu line **1.Screen percent** and confirm the selection by pressing the <Measurement key>.
- The entry field for the 1st halftone reference value is shown on the display.
- Enter the 1st halftone reference value by turning the <Control ball> and confirm the entry by pressing the <Measurement key>.



- Select the menu line **2.Screen percent** and confirm the selection by pressing the <Measurement key>.
- The entry field for the 2nd halftone reference value is shown on the display.
- Enter the 2nd halftone reference value by turning the <Control ball> and confirm the entry by pressing the <Measurement key>.



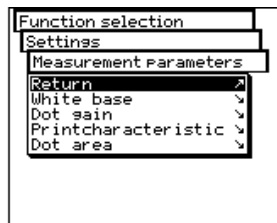
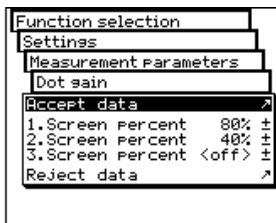
- Select the menu line **3.Screen percent** and confirm the selection by pressing the <Measurement key>.
- The display shows the entry field for the 3rd halftone reference value.
- Enter the 3rd halftone reference value by turning the <Control ball> and confirm the entry by pressing the <Measurement key>.



### 5.5.3.1.1 Accept data

#### Procedure:

- Select the menu line **Accept data** by turning the <Control ball> and confirm the action by pressing the <Measurement key>.
- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> several times to return to the main menu.



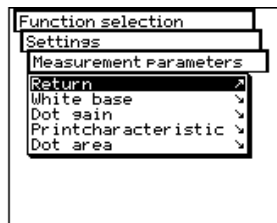
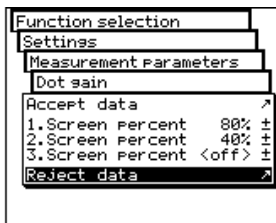
### 5.5.3.1.2 Reject data

#### Procedure:

- Select the menu line **Reject data** by turning the <Control ball> and confirm the action by pressing the <Measurement key>.

The new data will not be stored; previously stored data are retained.

- The menu line **Return** is shown in reverse video on the display.
- Press the <Measurement key> several times to return to the main menu.





## 5.5.4 Measurement parameters for print characteristic

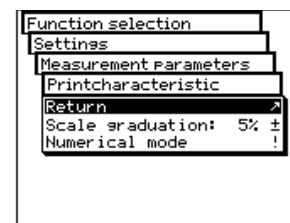
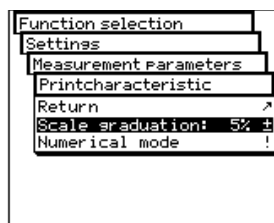
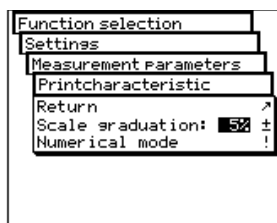
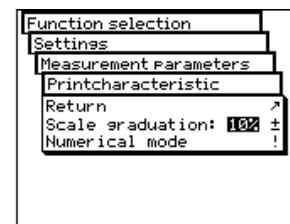
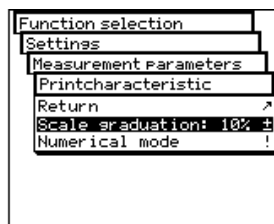
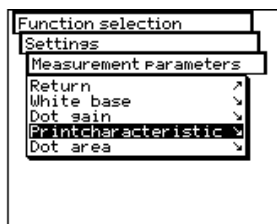


Entry of the halftone step wedge graduation in the range between 5% and 99%.  
Presetting for the numerical or graphic representation of the print characteristic.

### 5.5.4.1 Entry of scale graduation

#### Procedure:

- Select the menu line **Print characteristic** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Scale graduation** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Press the <Measurement key>; the entry field for the scale graduation is shown in reverse video on the display.
- Enter the desired scale graduation with the <Control ball>.
- Terminate the entry by pressing the <Measurement key>.
- Select the menu line **Return** with the <Control ball>.
- Press the <Measurement key> several times to return to the main menu.



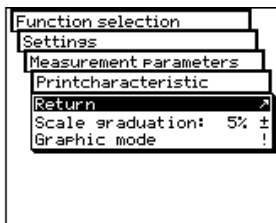
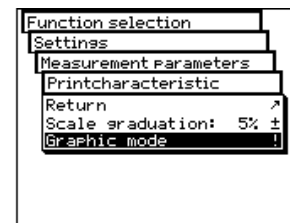
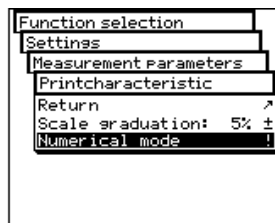
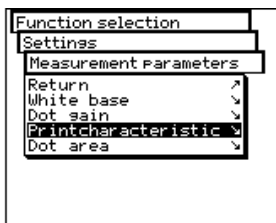
## 5.5.4.2 Numerical or graphic representation of print characteristic




The presetting for numerical or graphic representation of the print characteristic determines the type of representation that will be used with the densitometric function Print characteristic. This function also allows to switch between the representation types.


### Procedure

- Select the menu line **Print characteristic** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Numerical mode / Graphic mode** with the <Control ball> and select the desired type of representation by pressing the <Measurement key>.
- Select the menu line **Return** with the <Control ball>.
- Press the <Measurement key> several times to return to the main menu.



## 5.5.5 Measurement parameters for dot area

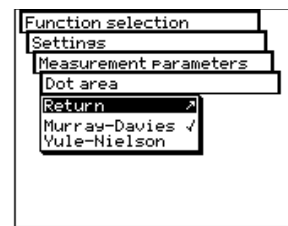
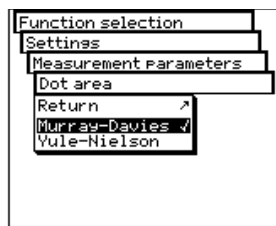
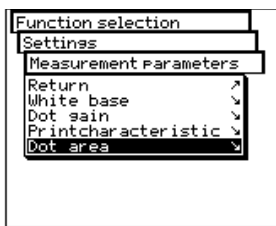
 Selection of the desired formula for the dot area calculation according to Murray- Davies or Yule-Nielsen and entry of the Yule-Nielsen coefficients for Black, Cyan, Magenta and Yellow.

 Usually the formula of Murray-Davies is in use. You have to select the formula of Yule-Nielsen if you want to measure the geometrical dot area.

### 5.5.5.1 Setting for dot area calculation according to Murray-Davies

**Procedure:**

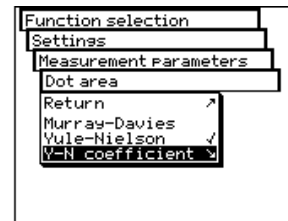
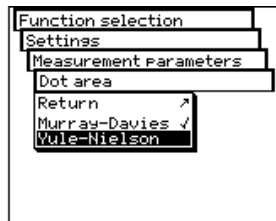
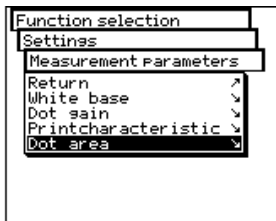
- Select the menu line **Dot area** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Murray-Davies** by turning the <Control ball> and confirm the function by pressing the <Measurement key>.
- Select the menu line **Return** with the <Control ball>.
- Press the <Measurement key> several times to return to the main menu.



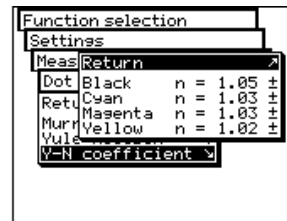
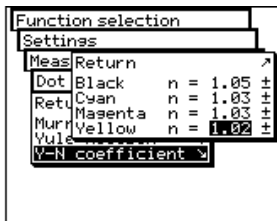
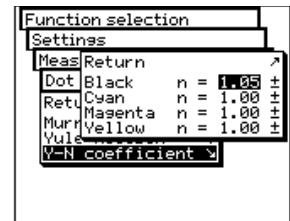
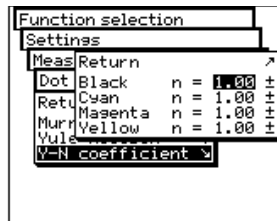
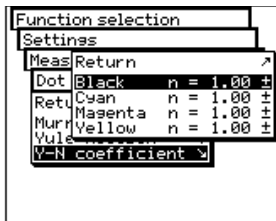
### 5.5.5.2 Setting for dot area calculation according to Yule-Nielsen

**Procedure:**

- Select the menu line **Dot area** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Yule-Nielsen** by turning the <Control ball> and confirm the function by pressing the <Measurement key>.
- Select the menu line **Y-N coefficients** with the <Control ball> and confirm the function by pressing the <Measurement key>.



- The entry field for the Yule-Nielsen coefficients is shown on the display.
- Select the desired color for example Black by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Press the <Measurement key>; the Y-N coefficient for Black is shown in reverse video on the display.
- Enter the Y-N coefficient for Black with the <Control ball> and confirm the entry by pressing the <Measurement key>.
- Enter the Y-N coefficients for Cyan, Magenta and Black as described above.
- The display shows **Return** in reverse video.
- Terminate the entry by pressing the <Measurement key>.
- Select the menu line **Return** with the <Control ball>.
- Press the <Measurement key> several times to return to the main menu.



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## 5.5.6 Measurement parameters for printing plate



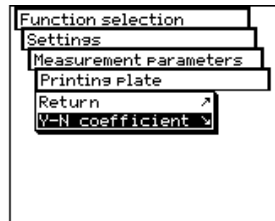
The light trap effect will be corrected by using the Yule-Nielsen formula for the calculation of the dot area of printing plate. The Yule-Nielsen coefficient has to be entered. On most printing plates you achieve good results with coefficient values from 1.08 to 1.24 (typically 1.15).

You can also switch off the Yule-Nielsen-correction by setting the Y-N-coefficient to 1.0.

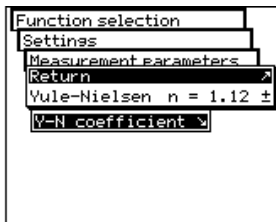
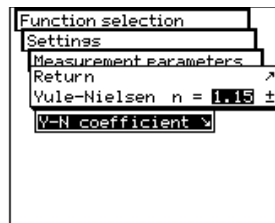
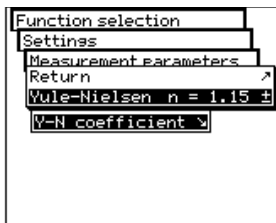
### 5.5.6.1 Setting of the Yule-Nielsen coefficient for measuring printing plates

#### Procedure:

- Select the menu line **Printing plate** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Y-N coefficient** with the <Control ball> and confirm the function by pressing the <Measurement key>.



- The entry field for the Yule-Nielsen coefficient is shown on the display.
- Press the <Measurement key>; the Y-N coefficient is shown in reverse video on the display.
- Enter the Y-N coefficient with the <Control ball> and confirm the entry by pressing the <Measurement key>.
- The display shows **Return** in reverse video.
- Terminate the entry by pressing the <Measurement key>.
- Select the menu line **Return** with the <Control ball>.
- Press the <Measurement key> several times to return to the main menu.



## 5.6 Calibration



The unit can be calibrated with paper white base or with absolute white base.

The desired white base, paper white or absolute white, can be selected in the menu **Settings**  
**→ Measurement parameters → White base.**

Measuring with paper white base is the preferred operating mode in the graphic industry.

All measurement results are related to paper white.

The calibration is to be checked once a month and the unit recalibrated if necessary.

Measurements with absolute white base are required for applications which specifically call for absolute white as white base, e.g. the ANSI-T reference and photofinishing or where no paper white is available.

All measurement results are related to absolute white.

With this operating mode, the calibration is to be checked once a week, or whenever the ambient temperature has changed by more than 10° C, and the unit recalibrated if necessary.

### 5.6.1 GretagMacbeth calibration cards



The expiration date of the density calibration reference is printed on the card.

The GretagMacbeth calibration card must be kept in its protective cover in a dry place.

The calibration fields must not be scratched or soiled.

The calibration fields must only be cleaned with a soft cloth.

**DENSITY CALIBRATION REFERENCE**

	<b>Paper</b>		<b>Absolute</b>																	
	color		color																	
<div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">■</div> <div style="margin-right: 5px;">B</div> </div> <hr style="width: 100%;"/> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">■</div> <div style="margin-right: 5px;">C</div> </div> <hr style="width: 100%;"/> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">■</div> <div style="margin-right: 5px;">M</div> </div> <hr style="width: 100%;"/> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">■</div> <div style="margin-right: 5px;">Y</div> </div> <hr style="width: 100%;"/> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">□</div> <div style="margin-right: 5px;">white</div> </div>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">0.00</td><td style="text-align: center;">2.03</td></tr> <tr><td style="text-align: center;">0.00</td><td style="text-align: center;">1.55</td></tr> <tr><td style="text-align: center;">0.00</td><td style="text-align: center;">1.56</td></tr> <tr><td style="text-align: center;">0.00</td><td style="text-align: center;">1.26</td></tr> </table>	0.00	2.03	0.00	1.55	0.00	1.56	0.00	1.26	<hr style="width: 100%;"/> <hr style="width: 100%;"/> <hr style="width: 100%;"/> <hr style="width: 100%;"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">0.08</td><td style="text-align: center;">2.06</td></tr> <tr><td style="text-align: center;">0.08</td><td style="text-align: center;">1.63</td></tr> <tr><td style="text-align: center;">0.08</td><td style="text-align: center;">1.64</td></tr> <tr><td style="text-align: center;">0.03</td><td style="text-align: center;">1.26</td></tr> </table>	0.08	2.06	0.08	1.63	0.08	1.64	0.03	1.26	Type: <input style="width: 80%;" type="text" value="47B/P"/> Density Standard: <input style="width: 80%;" type="text" value="DIN 16536"/> Filter: <input style="width: 80%;" type="text" value="Polarized"/> Part Number: <input style="width: 80%;" type="text" value="34.19.12"/> Serial Number: <input style="width: 80%;" type="text" value="10002"/> Expiration Date: <input style="width: 80%;" type="text"/>
0.00	2.03																			
0.00	1.55																			
0.00	1.56																			
0.00	1.26																			
0.08	2.06																			
0.08	1.63																			
0.08	1.64																			
0.03	1.26																			

**GretagMacbeth™**

Part Number 34.17.73

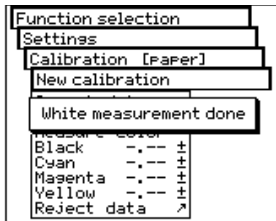
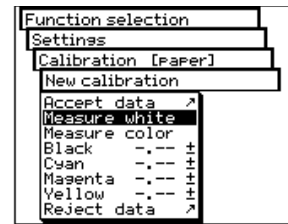
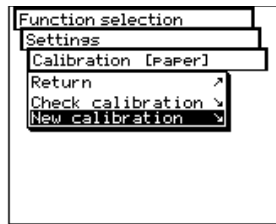
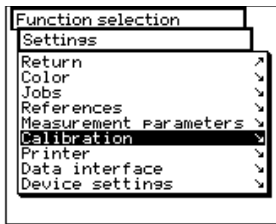
## 5.6.2 Calibration with paper white base

### Procedure:



Select paper white base under **Settings** → **Measurement parameters** → **White base**.

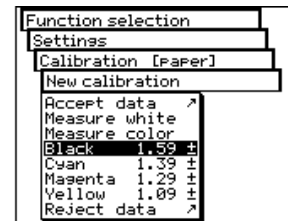
- Select the menu line **Calibration** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **New calibration** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display shows **White measurement done** for about 1 second.
- Then the request **Measure color** is shown on the display.



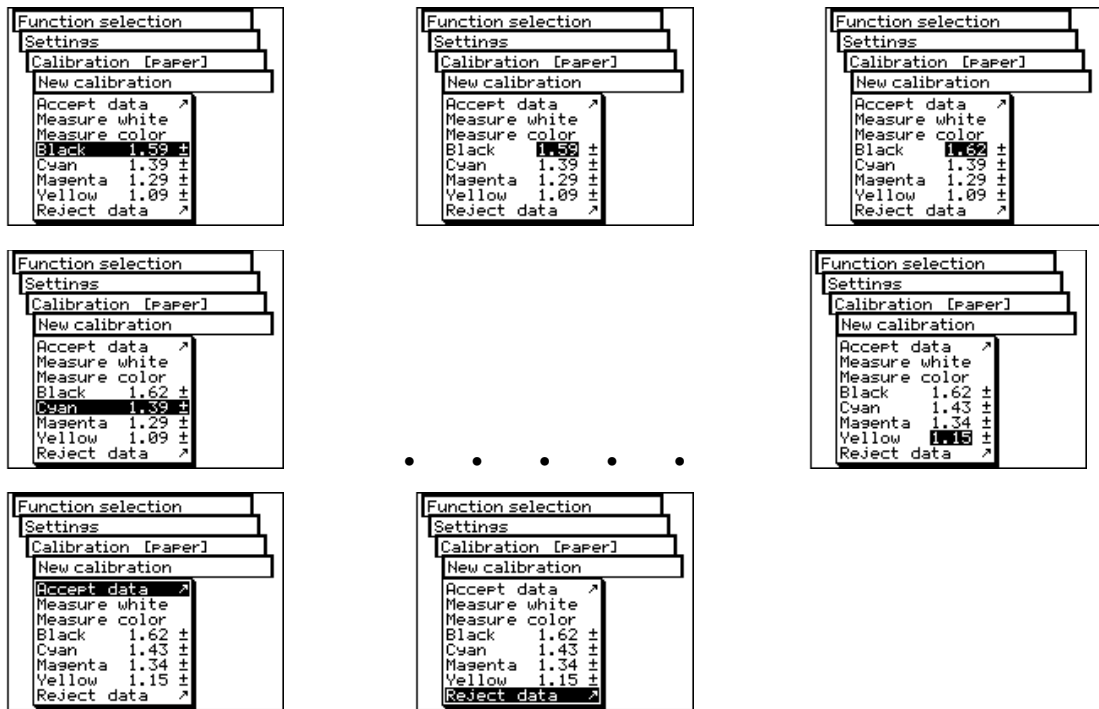
- Position the measuring aperture on the color fields to be measured and initiate a measurement each by pressing the <Measurement key>. The measurements can be made in any order.
- The uncorrected calibration values and the corresponding colors are shown on the display one after the other.
- After the last measurement, the graphics bar will jump to the color Black.



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- Press the <Measurement key> to get into the entry field of the color Black.
- Turn the <Control ball> to correct the calibration value until it corresponds with the target value indicated on the calibration card.
- Terminate the entry by pressing the <Measurement key>.
- Correct the calibration values of the colors Cyan, Magenta and Yellow one after the other.
- The graphics bar jumps to the menu line **Accept data**.
- Store the calibration data by pressing the <Measurement key>.
- The display shows **Check calibration** in reverse video.



### 5.6.2.1 Reject data

Procedure:

- Select the menu line **Reject data** by turning the <Control ball> and confirm this action by pressing the <Measurement key>.
  - The new data will not be stored; previously stored data are retained.
- The menu lines **Return**, **Check calibration** and **New calibration** appear on the display.
- Select the desired menu line and confirm the selection by pressing the <Measurement key>.



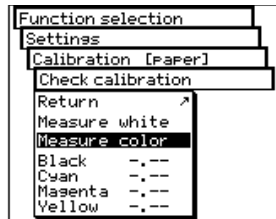
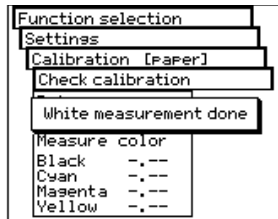
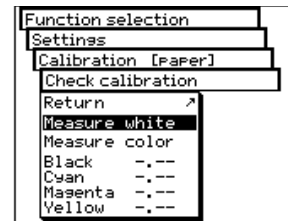
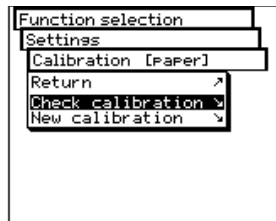
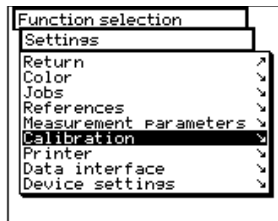
### 5.6.3 Check calibration with paper white base

#### Procedure:

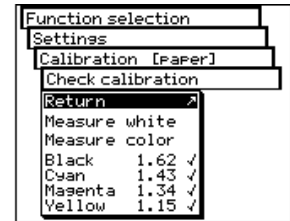
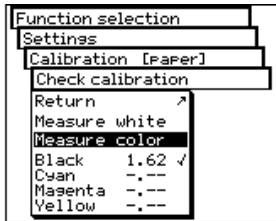


Select paper white base under **Settings** → **Measurement parameters** → **White base**.

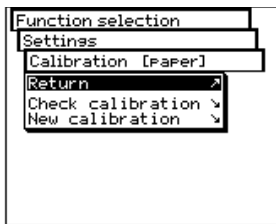
- Select the menu line **Calibration** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Check calibration** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display shows **White measurement done** for about 1 second.
- Then the request **Measure color** is shown on the display.



- Position the measuring aperture on the color fields to be measured and initiate a measurement each by pressing the <Measurement key>.
- The calibration values and the corresponding colors appear on the display one after the other.
  - Compare the calibration values with the target values on the calibration card. If the values agree or if the difference is not more than  $\pm 0.02$  D, it is not necessary to recalibrate the densitometer.
  - The sign ✓ behind the calibration values on the display indicates that the measured values are within the specified tolerance.
- After the color Yellow has been measured, and if all calibration values are within the specified tolerance, the graphics bar will jump to the menu line **Return**.
- Press the <Measurement key> several times to return to the main menu.



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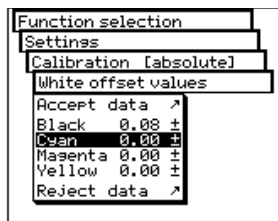
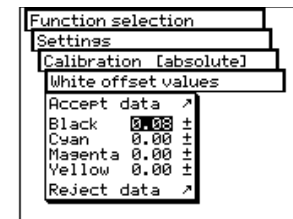
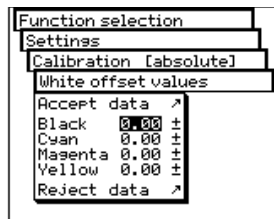
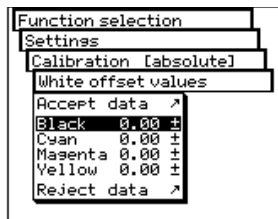
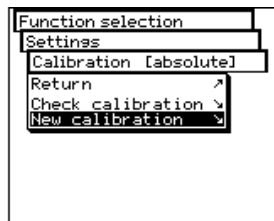
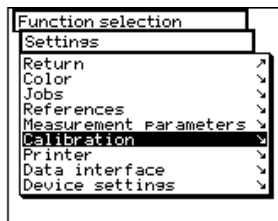
## 5.6.4 Calibration with absolute white base

### Procedure:

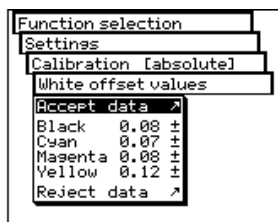
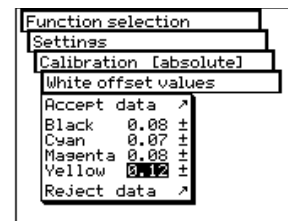


Select absolute white base under **Settings** → **Measurement parameters** → **White base**.

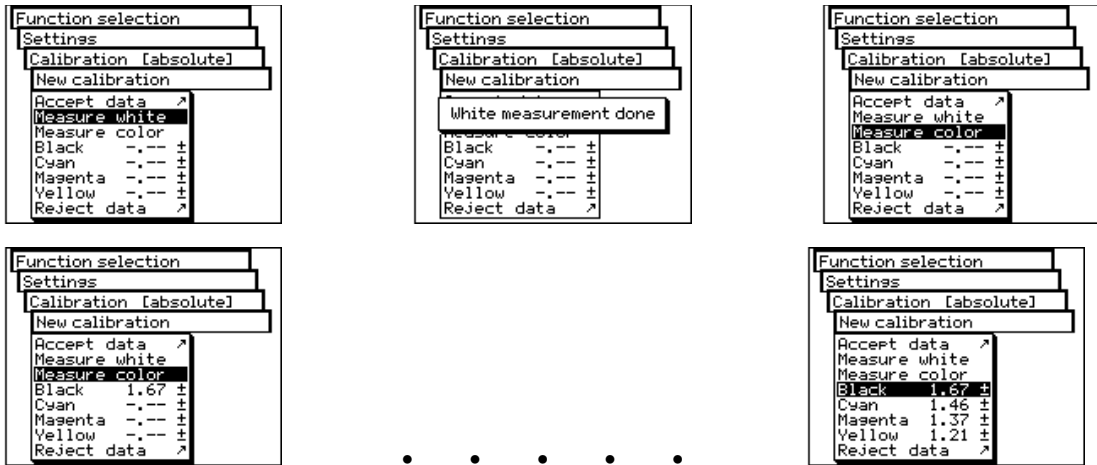
- Select the menu line **Calibration** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **New calibration** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- The entry field for the **White-offset values** is shown on the display.
- Press the <Measurement key> to get into the entry field for the white-offset value of the color Black.
- Enter the white-offset value for the color Black by turning the <Control ball> and terminate the entry by pressing the <Measurement key>.
- Enter the white-offset values for the colors Cyan, Magenta and Yellow.
- After the white-offset value for the color Yellow has been entered, the graphics bar will jump to the menu line **Accept data**.
- Store the white-offset values by pressing the <Measurement key>.



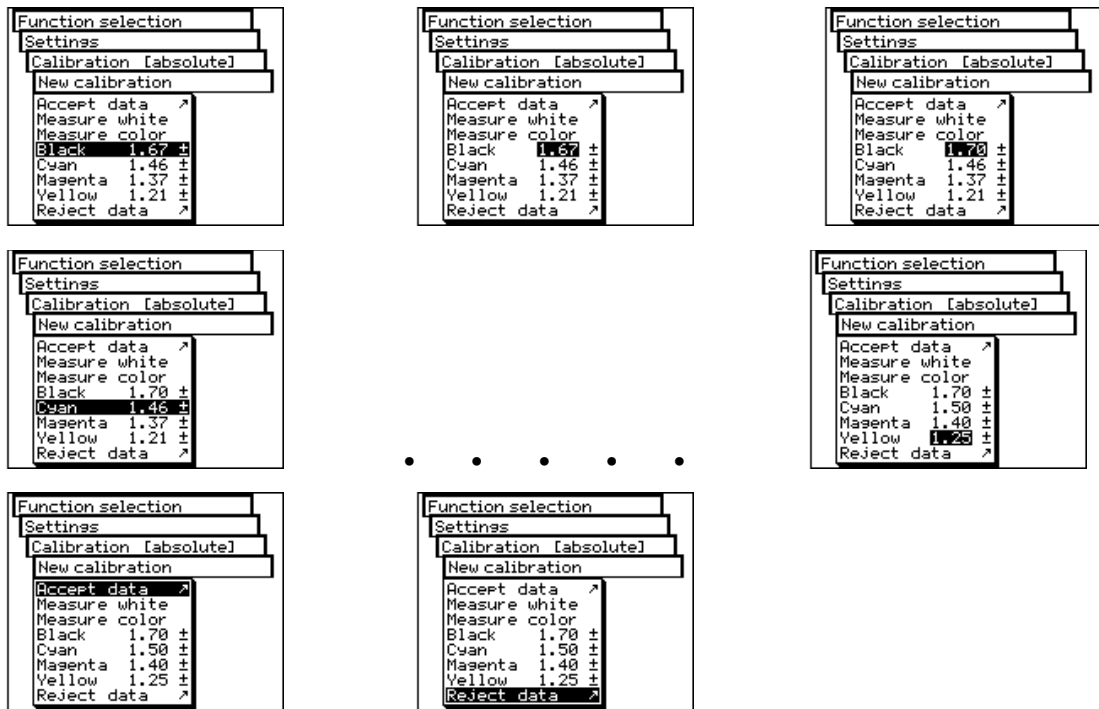
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- Position the measuring aperture on the paper white and initiate a measurement by pressing the <Measurement key>.
- The display shows **White measurement done** for about 1 second.
- Then the request **Measure color** is shown on the display.
- Position the measuring aperture on the color fields to be measured and initiate a measurement each by pressing the <Measurement key>.
- The uncorrected calibration values and the corresponding colors appear on the display one after the other.
- After the last measurement, the graphics bar will jump to the color Black.



- Press the <Measurement key> to get into the entry field for the color Black.
- Turn the <Control ball> to correct the calibration value until it corresponds with the target value indicated on the calibration card.
- Terminate the entry by pressing the <Measurement key>.
- Correct the calibration values of the colors Cyan, Magenta and Yellow one after the other.
- The graphics bar then jumps to the menu line **Accept data**.
- Store the calibration data by pressing the <Measurement key>.
- The display shows **Check calibration** in reverse video.



### 5.6.4.1 Reject data

Procedure:

- Select the menu line **Reject data** by turning the <Control ball> and confirm the action by pressing the <Measurement key>.  
The new data will not be stored; previously stored data are retained.
- The menu lines **Return**, **Check calibration** and **New calibration** appear on the display.
- Select the desired menu line and confirm the selection by pressing the <Measurement key>.

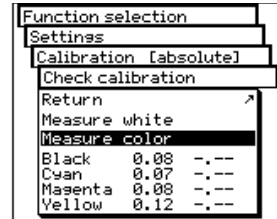
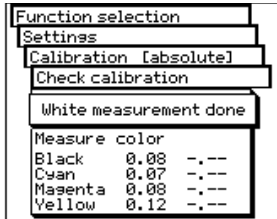
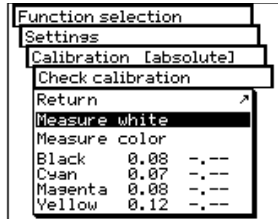
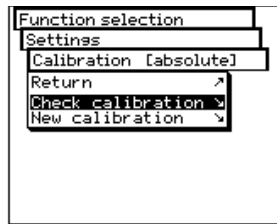
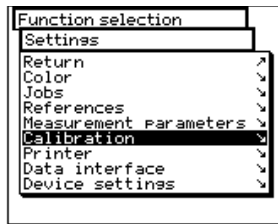
## 5.6.5 Check calibration with absolute white base

### Procedure:

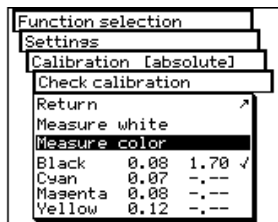


Select absolute white base **Setting** → **Measurement parameters** → **White base**.

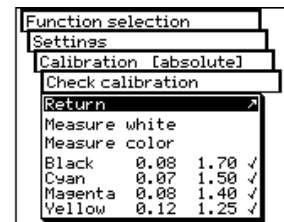
- Select the menu line **Calibration** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
  - Select the menu line **Check calibration** by turning the <Control ball>.
  - Activate the selected function by pressing the <Measurement key>.
  - Position the measuring aperture on the white field of the calibration card and initiate a measurement by pressing the <Measurement key>.
- The display shows **White measurement done** for about 1 second.
- Then the request **Measure color** is shown on the display.



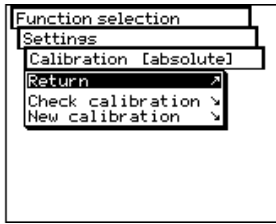
- Position the measuring aperture on the color fields to be measured and initiate a measurement each by pressing the <Measurement key>.
- The calibration values and the corresponding colors appear on the display one after the other.
- Compare the calibration values with the target values on the calibration card.  
If the values agree or if the difference is not more than  $\pm 0.02$  D, then it is not necessary to recalibrate the densitometer.
- The sign ✓ behind the calibration values on the display indicates that the measured values are within the specified tolerance.



• • • • •



- After the color Yellow has been measured, and if all calibration values are within the specified tolerance, the graphics bar will jump to the menu line **Return**.
- Press the <Measurement key> several times to return to the main menu.



## 5.7 Printer

The D190 remission densitometer can be connected to different types of printers or computers.



The D190 and the printer must be configured correctly.

- Printout of measuring results (refer to chapter 4.1.4).
- Baudrate setting (refer to chapter 5.8.1).
- Handshake setting (refer to chapter 5.8.2).
- Baudrate setting of printer
- Handshake setting of printer
- Data format setting of printer



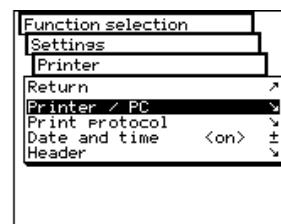
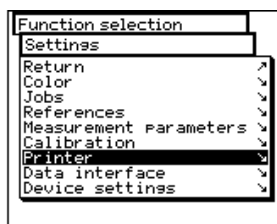
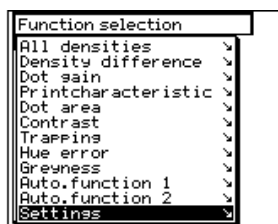
The **Printer** function allows you to carry out the following settings:

- Printer or PC selection. The PC protocol does not contain control characters for the printer (escape sequences). If your printer can not be selected in the D190, you can select a similar printer (e.g. a printer of the same printer manufacturer). If print results are bad with this selection, please select 'PC'; the printouts should be good but without any graphics.
- Selection of printer protocol.
- Entry of user specifications.

### 5.7.1 Printer or PC

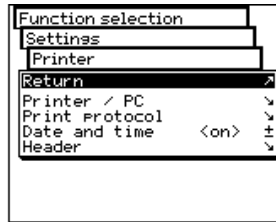
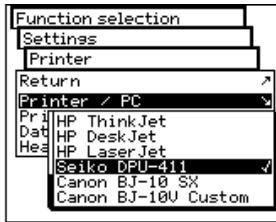
#### Procedure:

- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Printer** by turning the <Control ball> and confirm the selection by turning the <Measurement key>.
- Select the menu line **Printer/PC** by turning the <Control ball>.






- Activate the selected function by pressing the <Measurement key>.
- Select the desired type of printer or PC by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Return** and press the <Measurement key> several times to return to the main menu.



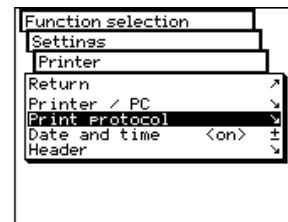
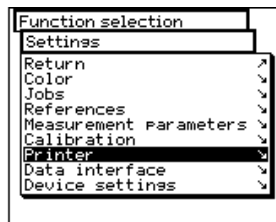
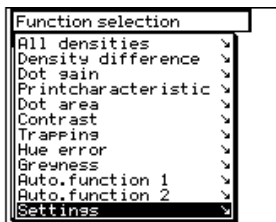
## 5.7.2 Printer protocol

 The **Printer protocol** function allows you to carry out the following settings:

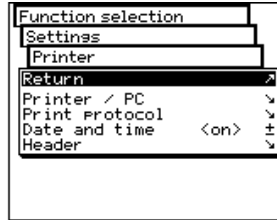
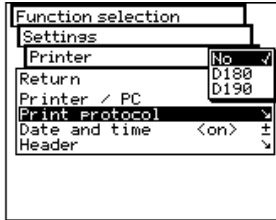
- D190 protocol for complete and good looking print-outs of the measuring results.
- D180 protocol is fully compatible to that of the D180 densitometer.

### Procedure:

- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Printer** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Printer protocol** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



- The display shows the menu lines **No**, **D180** and **D190**
- Select the desired menu line by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Return** and press the <Measurement key> several times to return to the main menu.



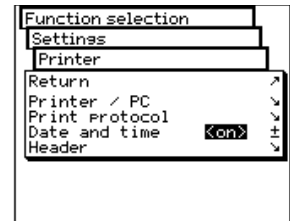
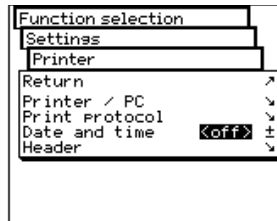
Printer protocols:    No    ➔    No protocol  
                                   D180 ➔    Protocol for D180 densitometer series  
                                   D190 ➔    Protocol for D190 densitometer series

### 5.7.3 Date and time printing

All D19C and all D196 densitometers manufactured after 1.1.1995 have a built-in-clock. These instruments are able to print out date and time of the measurements.

Procedure:

- Select the menu **Settings ➔ Printer**.
- Select the menu line **Date and time** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select **on** or **off** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.




## 5.7.4 Header printout

If the D190 protocol is selected and the function 'Print header' is activated, the function **Print header** is shown in the main menu. By pressing the <Measurement key> a header which is helpful for a perfect documentation of your measuring results will be printed.

The header can be individually defined and can show information about your customer, your job, your company, the operator, date and time and the reference values.

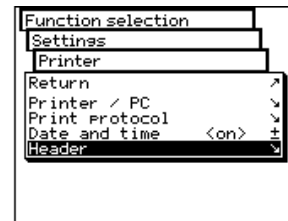
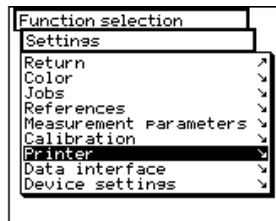
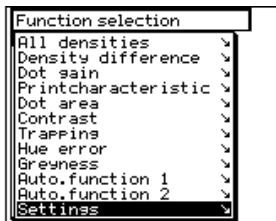
The following header is an example of a header configuration:

					
Type:	D19C				
Density std:	47B/P				
Serial number:	10123				
„Firm“					
Job: _____					
Customer: _____					
Article: _____					
Measured by: _____					
Date: _____ Time: _____					
Signature: _____					
Reference Value:	S 1.8	C 1.7	M 1.6	Y 1.4	Rot 2.3
Tolerance:	±0.1	±0.1	±0.1	±0.2	±0.2

### 5.7.4.1 Header settings

Procedure:

- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Printer** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Header** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.

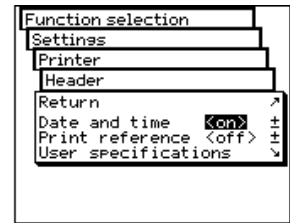
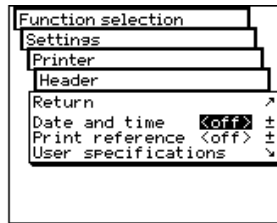
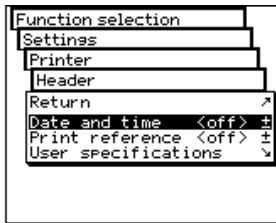


### 5.7.4.1.1 Printing date and time

All D19C and all D196 densitometers manufactured after 1.1.1995 have a built-in-clock. These instruments are able to print out date and time of the header printing.

Procedure:

- Select the menu **Settings** → **Printer** → **Header**.
- Select the menu line **Date and time** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select **on** or **off** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.

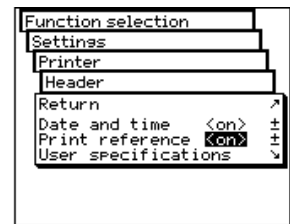
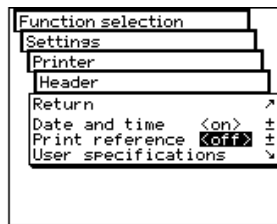
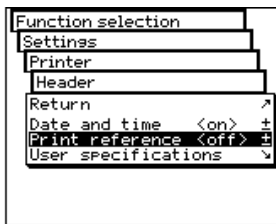


### 5.7.4.1.2 Printing reference values

It is possible to print out the reference values in the header.

Procedure:

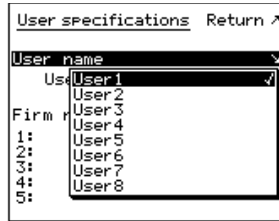
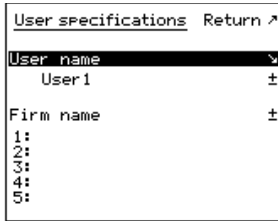
- Select the menu **Settings** → **Printer** → **Header**.
- Select the menu line **Print reference** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select **on** or **off** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



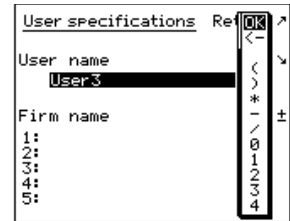
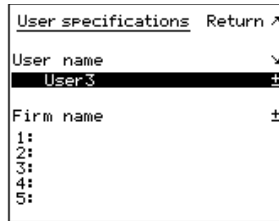
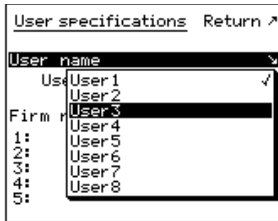
### 5.7.4.1.3 User specifications

**Procedure:**

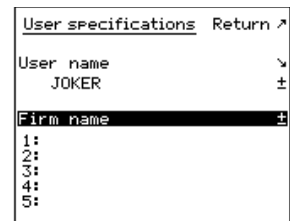
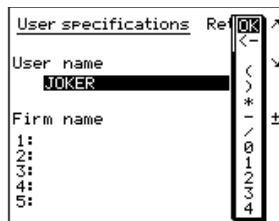
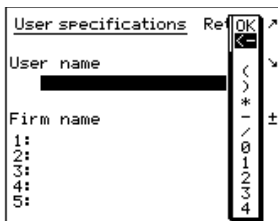
- Select the menu **Settings** → **Printer** → **Header**.
- Select the menu line **User specification** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Press the <Measurement key> to get into the selection field for the **User name**.



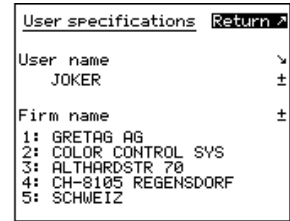
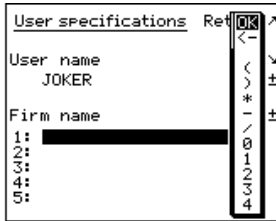
- Select the desired user (User1 ....User8) by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select e.g. the menu line User3 by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line User3 by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows the entry field for a new user name after pressing the <Measurement key>.



- Select the menu line ← by turning the <Control ball> and delete the actual user name by repeatedly pressing the <Measurement key>.
- Enter the new user name:
  - Select entry line with <Control ball>.
  - Terminate entry with <Measurement key>.
- Select the menu line **OK** and terminate the entry by pressing the <Measurement key>.
- Select the menu line **Firm name** by turning the <Control ball>.



- The display shows the first line of the entry field after pressing the <Measurement key>.
- Select the menu line ← by turning the <Control ball> and delete the actual firm name by repeatedly pressing the <Measurement key>.
- Enter the new firm name:
  - Select entry line with <Control ball>.
  - Terminate entry with <Measurement key>.
- Select the menu line **OK** and terminate the entry by pressing the <Measurement key>.
- The display shows now the second line of the entry field; and so on.
- Select the menu line **Return** and press the <Measurement key> several times to return to the main menu.



## 5.8 Data interface



The D190 remission densitometer features a serial RS232 interface with adjustable baud rate. The following settings are available: No handshake, Software handshake (Xon/Xoff) or Hardware handshake.

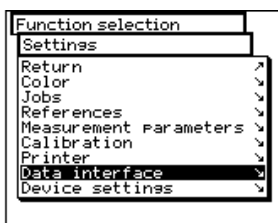


The **Data interface** function includes:

- Baud rate setting (110, 150, 300, 600, 1200, 2400, 4800, 9600 or 19200).
- Handshake setting: Xon/Xoff, Hardware or No.

### Procedure:

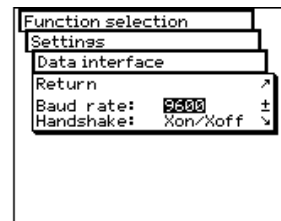
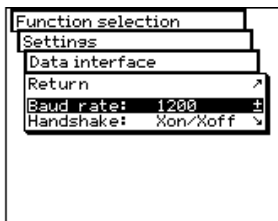
- Select the menu line **Data interface** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The menu for the configuration of the interface is shown on the display.



### 5.8.1 Baud rate setting

#### Procedure:

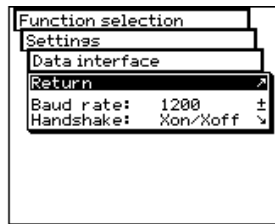
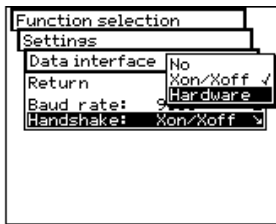
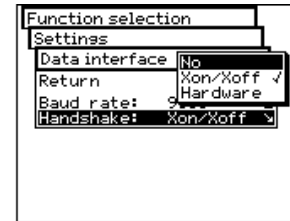
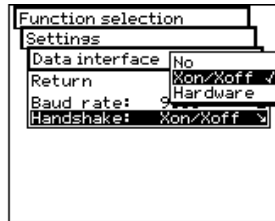
- Select the menu line **Baud rate** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The entry field for the baud rate selection is shown in reverse video on the display.
- Enter the desired baud rate by turning the <Control ball> and terminate the entry by pressing the <Measurement key>.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.



## 5.8.2 Handshake setting

### Procedure:

- Select the menu line **Handshake** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the desired operating mode **Xon/Xoff**, **Hardware** or **No** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.





# 6 Device settings

## 6.1 Overview

6.1.1 Function selection

## 6.2 Turn display

## 6.3 LCD contrast

## 6.4 Decimal places

## 6.5 Available functions

6.5.1 All functions

6.5.2 User-defined functions

6.5.3 New functions

## 6.6 Setting protection

6.6.1 Activate the setting protection

## 6.7 Battery

6.7.1 Battery type

## 6.8 Date and Time

6.8.1 The menu date and time

6.8.2 Select the format of date and time

6.8.3 Set date

6.8.4 Set time

6.8.5 Clock adjustment

## 6.9 Service

6.9.1 Measuring system

6.9.1.1 Switching the lamp on/off

6.9.1.2 Channel sensitivities and dark pulse number

6.9.1.3 Measurement counter

6.9.2 Initialise device

## 6.10 Type data

6.10.1 Display of type data

## 6.11 Electronic safeguard

6.11.1 Switching on the electronic safeguard

6.11.2 Switching off the electronic safeguard

## 6.12 Language

6.12.1 Language selection

6.12.2 Procedure to refind the menu language

1

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11



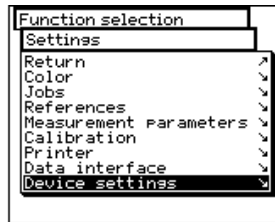
## 6.1 Overview

The following device settings can be selected or displayed:

- **Turn display** - *Display reversal by 180° for left or right-hand operation*
- **LCD contrast** - *LCD contrast setting*
- **Decimal places** - *Number of decimal places*
- **Available functions** - *All functions*  
- *User-defined*  
- *New functions*
- **Setting protection** - *Switch on/off the setting protection*  
- *Define the password*
- **Battery** - *Battery type*
- **Date and time** - *Actual date and time*  
- *Set date and time*  
- *Select format of date and time*  
- *Clock adjustment*
- **Service** - *Tests of the measuring system*  
- *Device initialization*
- **Type data** - *Type*  
- *Part number*  
- *Serial number*  
- *Density standard*  
- *Polarizers Yes/No*  
- *Software version*
- **Transport protection** - *Electronic safeguard*
- **Language** - *English*  
- *Deutsch*  
- *Español*  
- *Français*  
- *Italiano*  
- *Nederlands*  
- *Svenska*  
- *Suomi*  
- *Japanese*

## 6.1.1 Function selection

- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key> (setting protection refer to 5.).
- Select the menu line **Device settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



- Select the desired menu line by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.



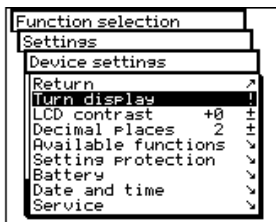
## 6.2 Turn display



The display of the D190 remission densitometer can be reversed 180°. In this way, the unit can be operated with either the left or the right hand.

### Procedure:

- Select the menu line **Turn display** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- The display on the screen is reversed 180°.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.



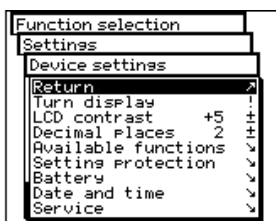
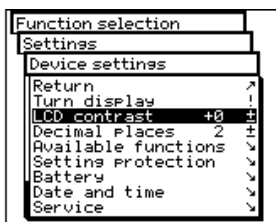
## 6.3 LCD contrast



On the D190 remission densitometer, the contrast of the display can be adjusted.

### Procedure:

- Select the menu line **LCD contrast** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- The display shows the entry field for the contrast adjustment.
- Turn the <Control ball> to obtain the optimum contrast setting and terminate the entry by pressing the <Measurement key>.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.



## 6.4 Decimal places

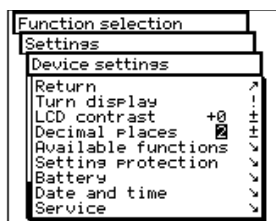
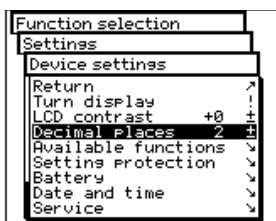


The resolution of the density values displayed by the D190 remission densitometer can be defined by the user.

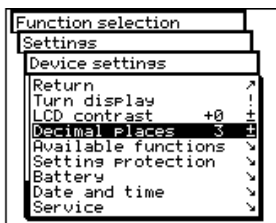
Density values can be displayed with one to three decimal places.

### Procedure:

- Select the menu line **Decimal places** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- The entry field for defining the number of decimal places is shown on the display.
- Enter the desired number of decimal places by turning the <Control ball>.



- Terminate the entry by pressing the <Measurement key>.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.



## 6.5 Available functions

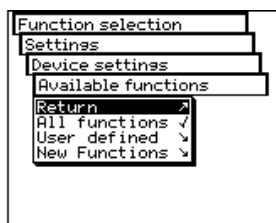
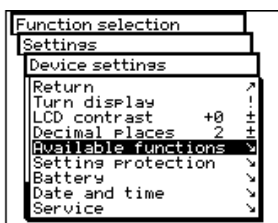


The user of a D190 remission densitometer can activate or deactivate densitometric functions. Only activated functions will be displayed in the main menu. Also the menus for the settings of these functions are not shown.

If the user doesn't need all features of his instrument, he can make it very simple because the instrument shows only the functions he really uses.

### Procedure:

- Select the menu line **Available functions** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- The available basic settings are indicated on the display.



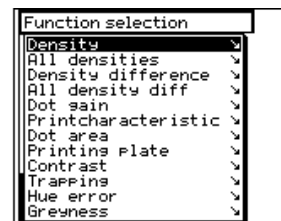
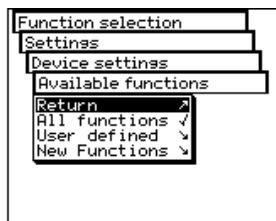
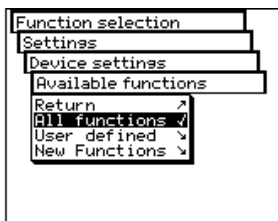
### 6.5.1 All functions



Selecting 'All functions' shows all functions which are included in your D190 in the main menu

### Procedure:

- Select the menu line **All functions** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.
- All functions are shown on the display.



## 6.5.2 User-defined functions



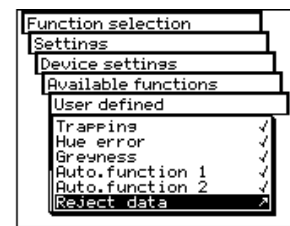
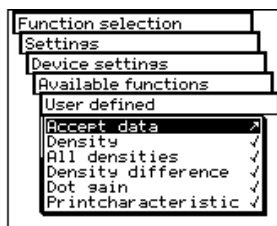
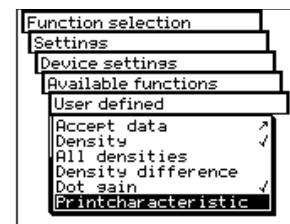
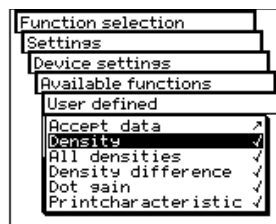
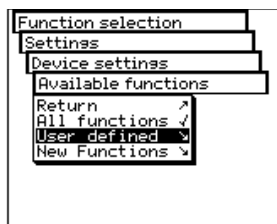
The user can define which functions are selectable in the main menu of the D190.

### Procedure:

- Select the menu line **User-defined** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the desired functions by turning the <Control ball>.
- Switch the selected functions on/off by pressing the <Measurement key>.
- Select the menu line **Accept data** by turning the <Control ball> and terminate the entry by pressing the <Measurement key>.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.
- Or select the menu line **Reject data** by turning the <Control ball> and confirm the action by pressing the <Measurement key>.

The new data will not be stored; previously stored data will be retained.

- Only the functions you have selected are shown on the display.





### 6.5.3 New functions

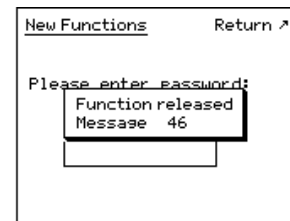
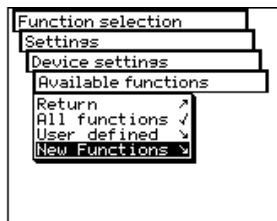


If you are an owner of a D19C, you can buy additional functions for your instrument. You can buy and enter all functions described in this manual into your D19C. This is possible at least 10 years after delivery of the instrument.

If you buy a new function you get a code number which has to be entered into the D19C. After entering the code, the function is available in your densitometer.

#### Procedure:

- Select the menu **Settings → Device settings → Available functions**.
- Select the menu line **New functions** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line with the square by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the numbers of the code by turning the <Control ball> and confirm each selection by pressing the <Measurement key>.
- After entering the whole code select the menu line **OK** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- If the code was OK, the message **Function released** is shown on the display.
- If the code was wrong, the message **Password wrong** is shown on the display.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu. The new functions are shown on the display.



## 6.6 Setting protection



In the D19C you can protect the settings by means of a password (optional feature which is not included in all instruments).



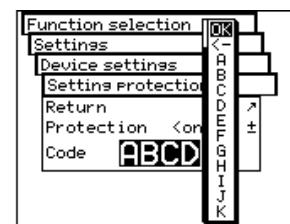
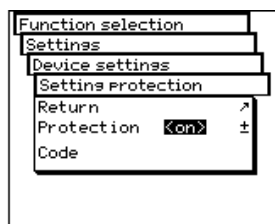
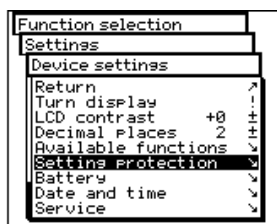
If the settings are protected, you will be able to enter the menu '**Settings**' only by using a password. Please don't lose this password! Otherwise please contact your GretagMacbeth representative.

Refer to 5.1.1.2 for entering the settings using the password protection.

### 6.6.1 Activate the setting protection

#### Procedure:

- Select the menu line **Setting protection** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- Select the menu line **Protection on/off** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select <on> or <off> by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- If your selection is <on>, you have to define the password: Select the menu line **Code** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the characters of the password by turning the <Control ball> and confirm each selection by pressing the <Measurement key>.
- After entering the password select the menu line **OK** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu. If the setting protection is switched on, you will need the password for entering into the menu **Settings**.



## 6.7 Battery



The D190 remission densitometer can be operated with either nickel-cadmium or nickel-metal hydride batteries.



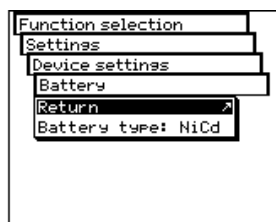
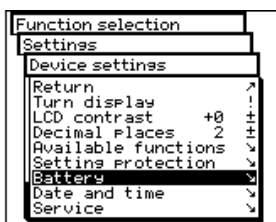
The **Battery** function includes:

- Indication of the **Battery type**.

### 6.7.1 Battery type

#### Procedure:

- Select the menu **Settings** → **Device settings**.
- Select the menu line **Battery** by turning the <Control ball>.
- Activate the selected function by pressing the <Measurement key>.
- The display shows the currently used **Battery type**.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.



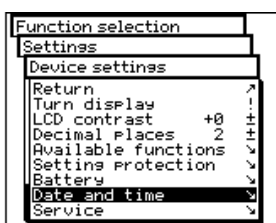
## 6.8 Date and time

All D19C and all D196 densitometers manufactured after 1.1.1995 have a built-in-clock. These instruments are able to print out date and time of the measurements. You can set and adjust the clock and you can choose the time format.

### 6.8.1 The menu Date and time

**Procedure:**

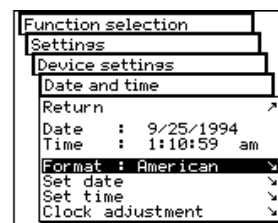
- Select the menu **Settings** → **Device settings**.
- Select the menu line **Date and time** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.



### 6.8.2 Select the format of date and time

**Procedure:**

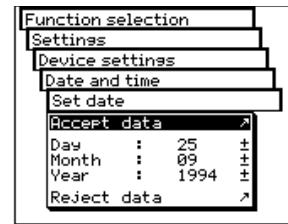
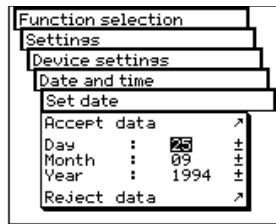
- Select the menu **Settings** → **Device settings** → **Date and time** (refer to 6.8.1).
- Select the menu line **Format** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select European for the format
- date: dd.mm.jjjj
- time: hh:mm:ss
- Select American for the format
- date: mm/dd/jjjj
- time: hh:mm:ss am/pm
- Confirm the selection by pressing the <Measurement key>.



### 6.8.3 Set date

#### Procedure:

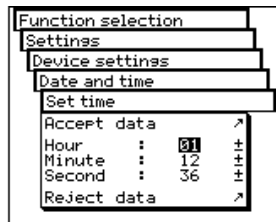
- Select the menu **Settings** → **Device settings** → **Set date and time** (refer to 6.8.1).
- Select the menu line **Set date** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Day** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Enter the day by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Proceed in the same way for entering month and year.
- Select the menu line **Accept data** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>. The moment you are pressing the <Measurement key>, the clock setting is defined. Selecting the menu line **reject date** doesn't change the date of the internal clock.



### 6.8.4 Set time

#### Procedure:

- Select the menu **Settings** → **Device settings** → **Set date and time** (refer to 6.8.1).
- Select the menu line **Set time** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Hour** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Enter the hour by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Proceed in the same way things for entering minute and second.
- Select the menu line **Accept data** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>. In the moment you are pressing the <Measurement key>, the clock setting is defined. Selecting the menu line **reject date** doesn't change the time of the internal clock.

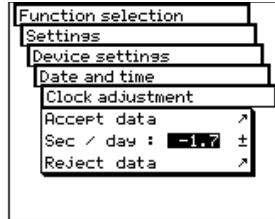


## 6.8.5 Clock adjustment


The internal clock can be adjusted. If the clock of your instrument is too fast e.g. 2 seconds per day the setting value in sec/day should be corrected by -2.0.

### Procedure:

- Select the menu **Settings** → **Device settings** → **Set date and time** (refer to 6.8.1).
- Select the menu line **Clock adjustment** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Sec/day** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Enter the correction by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Proceed in the same way for entering minute and second.
- Select the menu line **Accept data** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>. Selecting the menu line **reject date** doesn't change the adjustment of the internal clock.

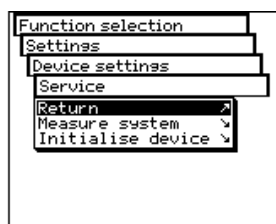
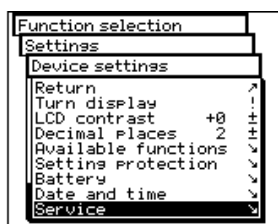


## 6.9 Service


 The software of the D190 remission densitometer has different capabilities for servicing the instrument (test features and initialization). In normal application, this features are not used by the operator.


### Procedure:

- Select the menu line **Service** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The menu lines **Return, Measure system and Initialize device** are shown on the display.



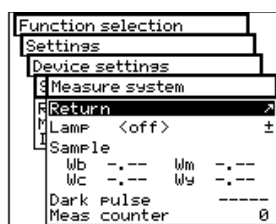
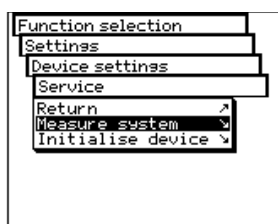
### 6.9.1 Measuring system

 The D190 remission densitometer features test functions for the measuring lamp and the measuring system as well as a counter for the number of measurements. Test functions for the measuring system and the measurement counter are used for maintenance purposes only.

-  The function **Measuring system** includes:
- Switching the measuring lamp on/off to check the lamp and to adjust the measuring aperture.
  - Determining of channel sensitivities.
  - Determining of dark pulse numbers.
  - Indicating the number of measurements performed.

### Procedure:

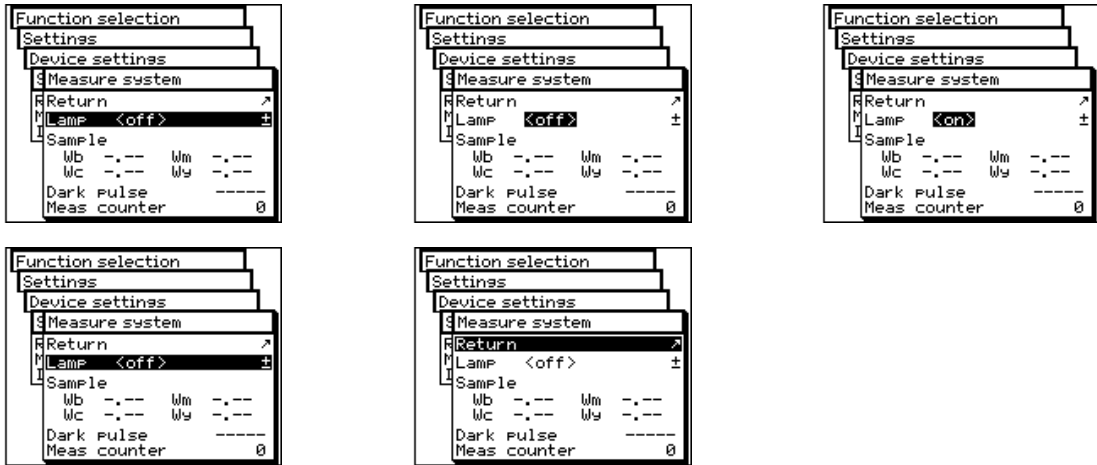
- Select the menu line **Measure system** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The menu lines **Return, Lamp** and **Sample** as well as a display field for the channel sensitivities, dark pulses and the number of performed measurements are shown on the display.



### 6.9.1.1 Switching the lamp on/off

**Procedure:**

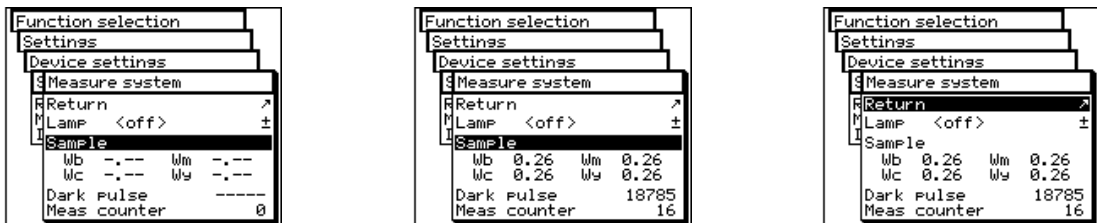
- Select the menu line **Lamp** by turning the <Control ball>.
- Press the <Measurement key>; the display shows **<off>**.
- Switch the lamp **on** or **off** by turning the <Control ball>.
- Press the <Measurement key>; the display shows **Lamp <off>** in reverse video.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.



### 6.9.1.2 Channel sensitivities and dark pulse number

**Procedure:**

- Select the menu line **Sample** by turning the <Control ball>.
- Position the measuring aperture on the white field of the calibration card and initiate a measurement by pressing the <Measurement key>.
- The display shows the channel sensitivity values of the individual colors and the dark pulse number as well as the number of measurements performed up to this time.
- Select the menu line **Return** by turning the <Control ball> and press the <Measurement key> several times to return to the main menu.



- The Channel sensitivities and Dark pulse number should be in the range:

Color	Measuring range	Channel sensitivities
B, C, M, Y	0.00 D ... 2.50 D	0.00 ... 0.70 typ. 0.30
Y (NB)	0.00 D ... 2.20 D	0.00 ... 1.00 typ. 0.60

Dark pulse number
12000 ... 24000 typ.18000



### 6.9.1.3 Measurement counter

The measurement counter indicates the number of performed measurements.



The measurement counter is reset to zero with the function **Initialize device** .  
See **Settings → Device settings → Initialize device** .

### 6.9.2 Initialize device



The D190 densitometer can be reset to factory-stored basic values with the function **Initialize device**.

The user defined values will be replaced by default values!

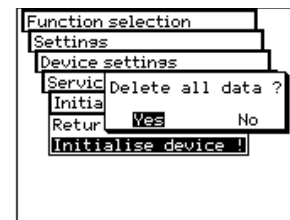
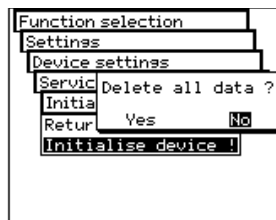
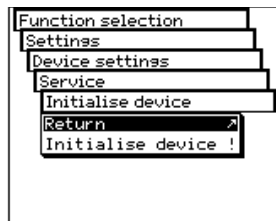


The function **Initialize device** includes:

- Deleting user-defined functions and switching on all functions
- Setting the manual color selection to automatic color recognition
- Deleting user-defined orders and activating the basic setting
- Deleting user-defined reference and tolerance values and setting basic values
- Deleting user-defined parameters and setting basic values
- Deleting calibration values for paper white and absolute white base
- Changing the Device settings to basic values

#### Procedure:

- Select the menu line **Initialize device** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows **Return** in reverse video.
- Select the menu line **Initialize device** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The display shows **Delete all data ? No.**
- Turn the <Control ball> to select **No** or **Yes**.
  - Yes:** • After pressing the <Measurement key>, the unit will be re-initialized and the display deleted.
  - No:** • The display shows **Return** in reverse video.
- After repeatedly pressing the <Measurement key>, the program will return to the main menu.



## 6.10 Type data



The storage of the D190 remission densitometer contains unit-specific data.



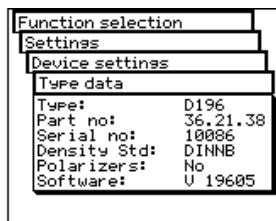
The **Type data** function includes:

- Unit type
- Part number
- Serial number
- Density standard
- Polarizers Yes/No
- Software version


### 6.10.1 Display of type data


#### Procedure:

- Select the menu line **Type data** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- The unit-specific data are shown on the display.
- Press the <Measurement key> several times to return to the main menu.



## 6.11 Electronic safeguard

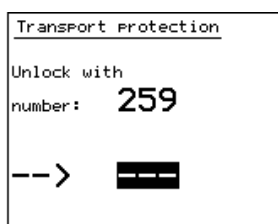
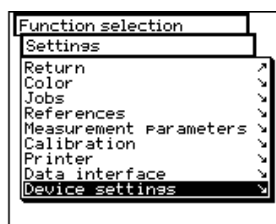
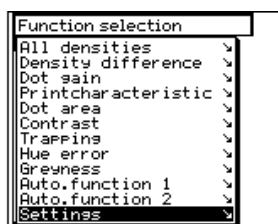
 The D190 remission densitometer is equipped with an electronic safeguard. It prevents the measuring module from being extended if vibrations occur during transport.

 The Electronic safeguard can be switched on/off under **Settings → Device settings → Transport protection**.

### 6.11.1 Switching on the electronic safeguard

#### Procedure:

- Select the menu line **Settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Device settings** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the menu line **Transport protection** by turning the <Control ball>.
- Switch on the electronic safeguard by pressing the <Measurement key>.
- The display shows a code number for the release of the electronic safeguard.



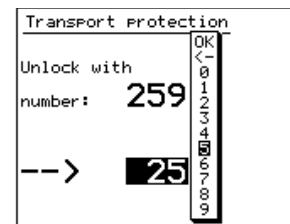
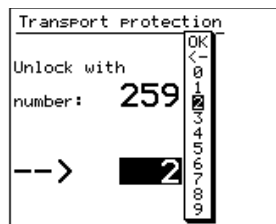
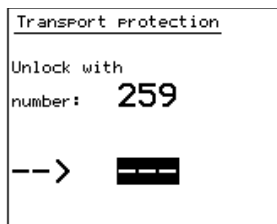
## 6.11.2 Switching off the electronic safeguard



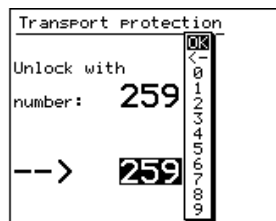
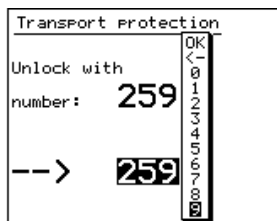
After turning the <Control ball> or pressing the <Measurement key> with the electronic safeguard switched on, a code number for the release of the electronic safeguard will be displayed.

### Procedure:

- Press the <Measurement key> for approx. 3 seconds to delete any entries that may accidentally have occurred through vibrations during transport.
- Briefly press the <Measurement key>.
- A field for the entry of the code number is shown on the display.
- Turn the <Control ball> to select the first figure of the code number.
- Press the <Measurement key> to enter the first figure.
- Turn the <Control ball> to select the second figure of the code number.
- Press the <Measurement key> to enter the second figure.




- Turn the <Control ball> to select the third figure of the code number.
- Press the <Measurement key> to enter the third figure.
- Select the entry line **OK** by turning the <Control ball>.
- Press the <Measurement key> several times to return the program to the main menu.




To delete incorrectly entered code numbers, press the <Measurement key> for approx. 3 seconds.

To delete a figure, select the entry line ← and press the <Measurement key>.

## 6.12 Language

.....  
 The D190 remission densitometer offers a selection of different operating languages.  
.....

.....  
 The **Language** function includes:

- Deutsch
  - English
  - Français
  - Italiano
  - Español
  - Nederlands
  - Svenska
  - Suomi
  - Japanese
- .....


### 6.12.1 Language selection

#### Procedure:

- Select the menu line **Language** by turning the <Control ball> and confirm the selection by pressing the <Measurement key>.
- Select the desired language by turning the <Control ball>.
- Activate the selected language by pressing the <Measurement key>.
- The graphic bar then jumps to the menu line **Return**.
- Press the <Measurement key> several times to return to the main menu.



### 6.12.2 Procedure to refind the menu language

.....  
 In case you get lost in a foreign language carry out the following steps to refind the language selection menu.  
.....

#### Procedure:

- I Press the <measuring key> for about 15 seconds; the menu language is shown on the display.
- II Select the desired language and press the <Measurement key>.



# 7 Help

- 7.1 Texts in a foreign language
- 7.2 No measurements can be performed
- 7.3 Desired function cannot be found
- 7.4 Doubtful measuring results
- 7.5 Bad readability of the display
- 7.6 Printer does not print or no communication with the computer
- 7.7 Messages

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## 7.1 Texts in a foreign language

Procedure to refind the menu Language (refer to 6.12.2)

## 7.2 No measurements can be performed

No measurements can be performed with an activated safe guard for transportation (refer to 6.11.2 Switching off the electronic safe guard).

## 7.3 Desired function cannot be found

Non active functions cannot be selected in the main menu.  
Activation or deactivation of measuring functions refer to 6.5 Available functions.  
The densitometers D190 contain different numbers of functions. Features which are not available in your instrument will not be shown in the main menu. If you need an additional function, please contact the GretagMacbeth service center.

## 7.4 Doubtful measuring results

Check paper white base or absolute white base selection (refer to 5.5.2 Measurement parameters for white base).  
Check zeroing on paper white.  
Check calibration on paper white respectively on absolute white.

## 7.5 Bad readability of the display

The contrast of the display is not sufficient (refer to 6.3 LCD contrast).

## 7.6 Printer does not print or no communication with the computer

- Check connections:  
Check connections between D190 and printer or computer
- Check power supplies:  
Check power supplies of printer or computer.
- Check D190 settings:
  - Printer or computer protocol selected ➔ refer to 5.7.2 Printer protocol.
  - Printer type selection O.K. ➔ refer to 5.7.1 Printer or PC.
  - Baudrate setting O.K. ➔ refer to 5.8.2.
  - Handshake setting O.K. ➔ refer to 5.8.2.
- Check printer or computer settings:
  - Baudrate setting O.K. ➔ refer to printer operating manual.
  - Handshake setting O.K. ➔ refer to printer operating manual.
  - Data format O.K. ➔ refer to Appendix B serial interface

## 7.7 Messages



Messages are shown on the display as follows:

Message: (1...n)

Brief description

Message numbers in brackets are not shown on the display.

Message No.	Message on display	Error source	Actions
3	Motor blocked	Drive of measuring module blocked or defective	If no further measurements can be performed please contact your GretagMacbeth representative
4	Lamp failure	Measuring lamp defective	Exchange measuring lamp
7	No printer connected	The printer does not send a reply to the query of the D190	Connect printer Check settings of printer and D190
9	Measure locked	The measurements were disabled by remote control commands	Enable measurements by remote control commands
13	EPROM failure	EEPROM defective	Please contact your GretagMacbeth representative to exchange the EEPROM
22	Division by zero	A division by zero was detected during the calculation.	Check measurement sequence and measurement results. Insert the measurement results in the corresponding formula given in appendix A. Select the measurement values in a way that no division by zero occurs.

<b>Message No.</b>	<b>Message on display</b>	<b>Error source</b>	<b>Remède</b>
23	Not calibrated	Missing calibration values	Calibrate instrument
24	Temperature failure	The instrument's temperature exceeded the limit of 50°C during the charging of the battery. The ambient temperature was too high.	Charge the battery at room temperature conditions
(25)	Measure different color	The same color was measured two times in the trapping function.	Perform the correct measuring sequence: Measure 1st printed color Measure 2nd printed color Measure overprint
(26)	Measure solid tones first	In the Auto functions, an overprint field has been measured before the solid fields.	Measure first the appropriated solid fields.
(27)	Battery charging approx. 3h	The battery will be charged in less than 3 hours	
(28)	Battery charging approx. 15h	The battery will be charged in approx. 15 hours with low power GretagMacbeth chargers (12V DC, 450mA)	
29	No battery	The rechargeable battery is not connected	Connect rechargeable battery
(32)	Battery empty	The battery is discharged; no further operations are possible	Connect charger
(33)	Battery full	The battery is fully charged	Disconnect charger

<b>Message No.</b>	<b>Message on display</b>	<b>Error source</b>	<b>Remède</b>
(34)	Charger connected	A charger is connected to the D190	
(35)	Charger disconnected	The charger was disconnected before the battery was fully charged	Connect charger again to fully charge the battery
39	Charge time-out	The charging procedure was not duly completed	Check battery and replace it if necessary
43	A/D failure	The values from the analogue to digital converter are wrong	Please contact your GretagMacbeth representative
45	Drive error	The filter wheel position pulses are missing	Please contact your GretagMacbeth representative
46	Function released	The password was entered correctly and the new function is now available.	
47	Password wrong	A wrong password has been entered.	Check entry. If the password is OK, please contact your Gretag-Macbeth representative
48	Trapping not available	In the Auto function an overprint field has been measured without having the trapping function	If you wish to measure overprint fields, you can by the function. Contact your GretagMacbeth representative
49	Dot gain not available	In the Auto function a halftone field has been measured without having the dot gain function	If you wish to measure halftone fields, you can by the function. Contact your GretagMacbeth representative



# 8 Maintenance

8.1 Battery replacement

8.2 Adjustment of the measuring aperture

8.3 Replacement of measuring lamp and tube

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The D190 remission densitometer can be operated either with a nickel-cadmium or a metal-hydride battery.

The battery type is coded on the connector and will be registered by the software.



Use only original GretagMacbeth accessories and spare parts.

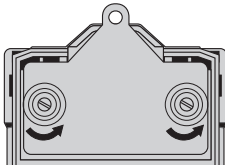
## 8.1 Battery replacement

The battery can be replaced without tools by the user.

### Procedure:

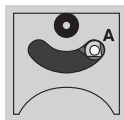
- Open battery compartment cover (snap connection).
- Remove battery and disconnect plug.
- Plug in cable of new battery (coded plug).
- Insert new battery in compartment and close cover.

## 8.2 Adjustment of the measuring aperture

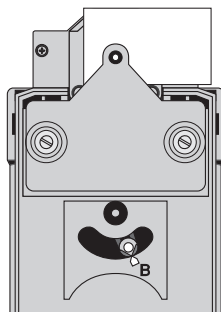


### Procedure:

- Unscrew mounting screws of measuring aperture until aperture can be moved.

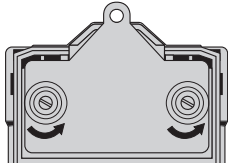


- Manually set adjustment knob to position **A**.



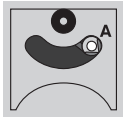
- Withdraw measuring module manually until adjustment knob is in position **B** (matched arrows).
- Insert white paper between measuring module and measuring aperture.
- Switch on measuring lamp: **Settings** → **Device settings** → **Measure system** → **Lamp <on>**.
- Center measuring aperture on light spot.
- Retighten mounting screws.

## 8.3 Replacement of measuring lamp and tube

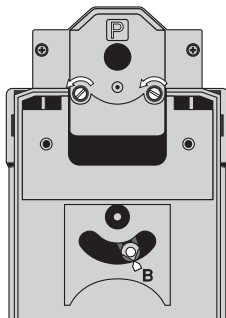


**Procedure:**

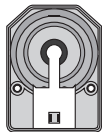
- Undo mounting screws and remove measuring aperture.



- Manually set adjustment knob to position **A**.



- Withdraw measuring module manually until adjustment knob is in position **B** (matched arrows).
- Undo screws and remove tube.



- Replace lamp module (snap connection).
- Insert tube and screw tight.
- Install and then adjust measuring aperture (see chapter 8.2).

# 9 Options

- 9.1 Overview
- 9.2 Measuring functions
- 9.3 Printers
- 9.4 Cases
- 9.5 Filter sets
- 9.6 Optical tubes
- 9.7 Measuring lamps
- 9.8 Calibration cards
- 9.9 Measuring apertures
- 9.10 Rechargeable batteries
- 9.11 Chargers
- 9.12 Data cables and converters
  - 9.12.1 Connection to printer or PC
  - 9.12.2 Connection to Mac

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## 9.1 Overview



### Available options:

- Measuring functions ( for D19C)
- Printers
- Cases
- Filter sets according to DIN or ANSI standards
- Optical tubes for measurements with or without polarization filters
- Measuring lamps
- Calibration cards for DIN or ANSI standards
- Measuring apertures
- Rechargeable batteries
- Chargers
- Data cables and converters

## 9.2 Measuring functions



You can buy additional functions for your D19C without sending the instrument to the service center.

Part number	GretagMacbeth designation of the D19C function
36.51.81	All densities
36.51.82	Density difference
36.51.83	All Density diff
36.51.84	Dot gain
36.51.85	Print characteristic
36.51.86	Dot area
36.51.87	Printing plate
36.51.88	Contrast
36.51.89	Trapping
36.51.90	Hue error
36.51.91	Greyness
36.51.92	Automatic function selection 1
36.51.93	Automatic function selection 2
36.51.94	Setting protection

## 9.3 Printers



The densitometers D190 are able to print out measuring results directly to a printer. Inkjet- or thermal printers are recommended.

Part number	GretagMacbeth designation	Density standard
36.50.98 36.50.99	Thermal printer 220V Thermal printer 110V	Thermal printer for small size output (110 mm (4.3 in.)) for connection to D190
36.50.46	Printer Canon BJ10, 220V	Inkjet printer (paper Size A4) for connection to D190 or PC

## 9.4 Cases



There are two cases available for the densitometers D190, a small case for the densitometer and a large case for the densitometer and the printer.

Part number	GretagMacbeth designation	Density standard
36.51.38	Case small D190	Case for densitometer D190
36.51.39	Case large D190	Case for densitometer D190 and thermal printer.

## 9.5 Filter sets



Filter sets can be replaced by your nearest GretagMacbeth representative or GretagMacbeth Service agent.

Part number	GretagMacbeth designation	Density standard
34.16.61	Filter set 47B	DIN 16536
34.16.62	Filter set ANSI STATUS T	ANSI Status T
34.16.63	Filter set NB (narrow band)	DIN 16536 narrow band

## 9.6 Optical tubes



The replacement of tubes is described in chapter 8 Maintenance.

Part number	GretagMacbeth designation	Remarks
34.15.04	Tube P	Tube with polarization filters measuring spot Ø 3mm (1/8 in.)
34.15.05	Tube U	Tube without polarization filter measuring spot Ø 3mm (1/8 in.)
34.13.68	Tube R	Tube without polarization filter measuring spot Ø 1mm (5/128 in.)

## 9.7 Measuring lamps



The replacement of the measuring lamp is described in chapter 8 Maintenance.

Part number	GretagMacbeth designation	Remarks
34.17.64	Standard lamp	Measuring spot Ø 3 mm (1/8 in.)
34.17.65	Repro lamp	Measuring spot Ø 1 mm (1/8 in.)
34.17.66	Coarse Screen lamp	Measuring spot Ø 3 mm (5/128 in.)

## 9.8 Calibration cards



Calibration cards must be ordered according to the designation on the type plate of the unit.

Part number	GretagMacbeth designation	Remarks
34.19.12	Calibration card 47B/P	Measurement with polarization filter
34.19.13	ANSI Status T/P	Measurement with polarization filter
34.19.14	NB/P	Measurement with polarization filter
34.19.15	Calibration card 47B/U	Measurement without polarization filter
34.19.16	ANSI Status T/U	Measurement without polarization filter
34.19.17	NB/U	Measurement without polarization filter

## 9.9 Measuring apertures



The replacement of the measuring aperture is described in chapter 7 Maintenance.

Part number	GretagMacbeth designation	Remarks
34.13.35	Measuring aperture Ø 3.6 mm	
34.16.60	Measuring aperture Ø 1.6 mm	



## 9.10 Rechargeable batteries



Use only original GretagMacbeth spare parts.



The replacement of the battery is described in chapter 8 Maintenance.

Número artículo	Denominación GretagMacbeth	Comentarios
32.49.58	Acumulador Ni - Cd	acumulador Níquel - Cadmio
36.21.32	Acumulador Ni - MH	acumulador hidruro Níquel Metálico

## 9.11 Chargers



The supply voltage indicated on the type plate must correspond with the local line voltage.

Use only original GretagMacbeth spare parts.

Part number	GretagMacbeth designation	Remarks
36.57.66	Charger Worldwide	85 VAC to 270 VAC
36.27.52	Charger 220 V Universal	200 VAC to 260 VAC
36.27.53	Charger 110 V Universal	100 VAC to 130 VAC
36.50.85	Charger NDX 230 V	187 VAC to 264 VAC
36.50.86	Charger NDX 115 V	90 VAC to 127 VAC

## 9.12 Data cables and converters



The densitometer D190 can be connected to different other equipment like serial printers, parallel printers, computers IBM PC or computers Apple Macintosh. Refer to this manual for the corresponding cables and converters.



Printout of measuring results refer to 4.1.4.

### 9.12.1 Connection to printer or PC

Part number	GretagMacbeth designation	Connections
36.50.54	Mini DIN cable	D190 ↔ Adapter set
36.50.52	Adapter set	Mini DIN cable ↔ PC Mini DIN cable ↔ Printer with serial interface
36.50.92	Converter serial/parallel	Mini DIN cable ↔ Printer with parallel interface
36.51.37	Adapter Seiko-Printer	Mini DIN cable ↔ Thermal printer with serial interface

### 9.12.2 Connection to Mac

Part number	GretagMacbeth designation	Remarks
36.50.54	Mini DIN cable	D190 ↔ Mac

**10 Technical data**

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# 10 Technical data

<b>Operation</b>	Control ball and measurement key	
<b>Display</b>	Digital, LCD, 160 x 128 pixels, full graphics	
<b>Measuring geometry</b>	0° / 45°, ring lens system	
<b>Light source</b>	Incandescent lamp, approx. 3000 K (DIN) or approx. 2856 K (ANSI)	
<b>Receiver</b>	Si photodiode	
<b>Densitometric standard</b>	DIN 16536 ANSI Status T DIN 16536 narrow band CIE ANSI PH 2.18 (other filters on request)	Filter set 47B Filter set 47 Interference filter set V (λ) filter Visual filter
<b>Measuring range</b>	0.00 D - 2.50 D 0.00 D - 2.20 D yellow (interference filter)	
<b>Reproducibility</b>	± 0.01 D ± 1% for dot area	
<b>Linearity</b>	± 0.01 D ± 1% for dot area	
<b>Interinstrument agreement</b>	± 0.02 D ± 2% for dot area	
<b>Measuring aperture</b>	Ø 3.6 mm Ø 1.6 mm for tube repro	
<b>Calibration:</b>	<b>Slope</b>	For density measurement Automatic
	<b>Zero</b>	
<b>Polarization filter</b>	2x linear (tube P)	
<b>Warm-up time</b>	None	
<b>Power supply</b>	Rechargeable battery, Ni-MH, rated 7.2 V, 1000 mAh Rechargeable battery, Ni-Cd, rated 7.2 V, 600 mAh	
<b>Charging time</b>	Approx. 3 hours, automatic switching-off	
<b>Charge status</b>	Automatic monitoring and display	
<b>Data protection</b>	Lithium battery	
<b>Measurements per charge</b>	Approx. 6000 (Battery Ni-MH) Approx. 4000 (Battery Ni-Cd)	
<b>Measuring time</b>	Approx. 0.8 seconds	

<b>Data interface</b>	RS232C, remote operation of remission densitometer with computer
<b>Weight</b>	Approx. 890 g
<b>Dimensions</b>	8.3 x 8.0 x 24.5 cm
<b>Accessories</b>	Calibration card Charger Operating Manual



**Subject to technical modifications**

---

# 11 Appendices

## APPENDIX A

### 1 Formulas and terms

- 1.1 Remission, R
- 1.2 Density, D
- 1.3 Density difference,  $\Delta D$
- 1.4 Dot gain, G
- 1.5 Dot area, A
  - 1.5.1 Dot area according to Murray-Davies
  - 1.5.2 Dot area according to Yule-Nielsen
- 1.6 Printing plate, A
- 1.7 Relative print contrast, C
- 1.8 Trapping, T
- 1.9 Greyness, G
- 1.10 Hue error, H

## APPENDIX B

### 1 Serial interface

- 1.1 Specifications
- 1.2 Parameters
- 1.3 Pin assignment of Mini DIN socket
- 1.4 Typical connections to a peripheral unit

## APPENDIX C

### GretagMacbeth Reflection Densitometer Calibration to support ISO 9000

#### 1 GretagMacbeth Density Calibration Reference

- 1.1 Expiration date
- 1.2 Handling

#### 2 Calibration of GretagMacbeth Reflection Densitometers

- 2.1 Calibration using paper white as white base
- 2.2 Calibration using absolute white as white base

#### 3 „Zeroing“ the GretagMacbeth Reflection Densitometer





# Appendix A

## 1 Formulas and terms

### 1.1 Remission, R

$$R = \Phi_1 / \Phi_0 \quad [0 \leq R \leq 1]$$

$$R = 10^{-D}$$

$\Phi_0$ : Luminous flux before sample

$\Phi_1$ : Luminous flux after sample

D: Density

### 1.2 Density, D

$$D = \log_{10} (1 / R)$$

$$D = -\log_{10} (R)$$

### 1.3 Density difference, $\Delta D$

$$\Delta D = D_{\text{Meas}} - D_{\text{Ref}}$$

$\Delta D$ : Density difference

$D_{\text{Meas}}$ : Density measurement value

$D_{\text{Ref}}$ : Density reference value

### 1.4 Dot gain, G

$$G = A\%_{\text{Print}} - A\%_{\text{Film}}$$

A%Print: Dot area of print

A%Film: Dot area of film

### 1.5 Dot area, A

#### 1.5.1 Dot area according to Murray-Davies

$$A \% \text{ pos} = \frac{1 - 10^{-D_R}}{1 - 10^{-D_V}} \times 100\%$$

$D_R$ : Density of halftone patch

$D_V$ : Density of solid tone patch

#### 1.5.2 Dot area according to Yule-Nielsen

$$A \% \text{ pos} = \frac{1 - 10^{-D_R/n}}{1 - 10^{-D_V/n}} \times 100\%$$

$D_R$ : Density of halftone patch

$D_V$ : Density of solid tone patch

n: Yule-Nielsen coefficients

## 1.6 Printing plate, A

Dot area according to Yule-Nielsen

$$A \% \text{ pos} = \frac{1 - 10^{-D_R/n}}{1 - 10^{-D_V/n}} \times 100\%$$

$D_R$ : Density of halftone patch  
 $D_V$ : Density of solid tone patch  
 $n$ : Yule-Nielsen coefficient

## 1.7 Relative print contrast, C

$$C = \frac{D_V - D_R}{D_V} \times 100\%$$

$D_V$ : Density of solid tone patch  
 $D_R$ : Density of halftone patch

## 1.8 Trapping, T

$$T = \frac{D_3 - D_1}{D_2} \times 100\%$$

$D_1$ : First printed color  
 $D_2$ : Second printed color  
 $D_3$ : Overprint

## 1.9 Greyness, G

$$G = \frac{D_{\min}}{D_{\max}} \times 100\%$$

$D_{\min}$ : Minimum density  
 $D_{\max}$ : Maximum density

## 1.10 Hue error, H

$$H = \frac{D_{\text{mean}} - D_{\min}}{D_{\max} - D_{\min}} \times 100\%$$

$D_{\min}$ : Minimum density  
 $D_{\max}$ : Maximum density  
 $D_{\text{mean}}$ : Mean density

# Appendix B

## 1 Serial interface

All D190 remission densitometers are equipped with a true serial RS232 interface with bipolar levels.

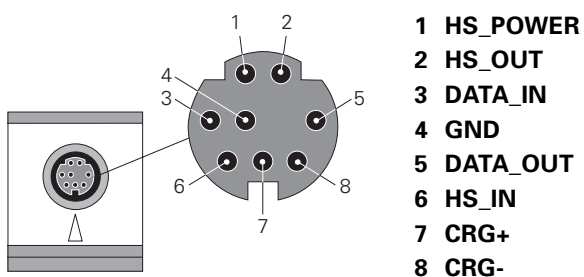
### 1.1 Specifications

Description	D190 input	D190 output
Level for logic 0	-15.0 V ...+ 0.5 V	- 8.0 V ... - 5.0 V at $I_L < 1.6$ mA
Level for logic 1	+ 3.5 V ...+15.0 V	+8.0 V ... +5.0 V at $I_L < 1.6$ mA
Input resistance	> 6 kOhm	

### 1.2 Parameters

Parameter	Specification	Remarks
Data transmission rate	110 ... 19200 baud	
Data bits	8	
Parity bit	no parity bit	
Stop bits	1	
Handshake	no „handshake“ software handshake: Xon/Xoff hardware handshake	Xon = ASCII (17), Xoff = ASCII (19) see 1.4

### 1.3 Pin assignment of Mini DIN socket



## 1.4 Typical connections to a peripheral unit

D-Sub 25 pin	Signal			Mini DIN	Signal
20	DTR	→	DATA TERMINAL READY	→	1 HS_POWER
5	CTS	→	CLEAR TO SEND	←	2 HS_OUT
6	DSR	→	DATA SET READY		
3	RD	→	READ DATA	←	5 DATA_OUT
2	TD	→	TRANSMIT DATA	→	3 DATA_IN
4	RTS	→	REQUEST TO SEND	→	6 HS_IN
7	GND	→	GROUND		4 GND
1	FG	→	FRAME GROUND		

# Appendix C

## GretagMacbeth Reflection Densitometer Calibration to support ISO 9000

### 1 GretagMacbeth Density Calibration Reference

#### 1.1 Expiration date

The expiration date of the density calibration reference is printed on the card.  
The Density Calibration Reference has to be replaced after the expiration date.

#### 1.2 Handling

Always keep your density calibration reference in its protective cover in a dry place.  
Do not soil or scratch calibration elements  
Clean the density calibration reference only with a soft cloth.

### 2 Calibration of GretagMacbeth Reflection Densitometers

GretagMacbeth reflection densitometers of the D190 series (D19C, D196, D118C) and of the D180 series (D181, D182, D183, D194, D15, D186) with monitor functions can be calibrated for absolute white base or paper white base.

#### 2.1 Calibration using paper white as white base

This is the preferred mode in the graphics industry.  
Only those calibration values on the density calibration reference with "Paper" designation may be used.  
All measurements are based on paper white.  
The calibration should be checked once a month. The densitometer must be recalibrated if necessary.

#### 2.2 Calibration using absolute white as white base

Measurements against absolute white are used for applications that require absolute white as white base e.g. in connection with the ANSI STATUS T reference and photofinishing or if there is no paper white available.  
Only those calibration values on the density calibration reference with "Absolute" designation may be used.  
All measurements are based on absolute white.  
The "white offset values" (white) must also be entered during the calibration.  
The calibration should be checked once a week or if the ambient temperature changes more than 10°C. The densitometer must be recalibrated if necessary.

### **3 „Zeroing“ the GretagMacbeth Reflection Densitometer**

The unit must be “zeroed” for all measurements based on paper white and for all relative measurements (dot area, dot gain trapping, contrast) with absolute white as white base before starting a measurement series on a new paper.

Zeroing must be performed at least once daily or if the ambient temperature changes more than 10°C.







**Konformitätserklärung**  
**Declaration of conformity**  
**Déclaration de conformité**  
**Declaración de Conformidad**  
**Verklaring de overeenstemming**  
**Dichiarazione di conformità**



Wir/We/Nous/WIJ/Noi:

**Gretag-Macbeth AG**  
**Althardstrasse 70**  
**CH-8105 Regensdorf**

erklären, in alleiniger Verantwortung, dass dieses Produkt,  
declare under our sole responsibility that the product,  
déclarons sous notre seule responsabilité que le produit,  
declaramos, bajo nuestra sola responsabilidad, que el producto,  
verklaren onder onze verantwoordelijkheid, dat het product,  
dichiariamo sotto nostra unica responsabilità, che il prodotto,

## **Type D118C, D19C, D196**

auf das sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.  
to which this declaration relates is in conformity with the following standard(s) or other normative document(s).

auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).

al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).

waarnaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoordt.

a cui si riferisce questa dichiarazione è conforme alla/e seguente/i norma/e o documento/i normativo/i.

### **CE-Konformität / CE Conformity / Conformité CE**

89/336/EWG; 91/236/EWG; 92/31EWG; 93/68/EWG EMV-Richtlinie / EMC Directive / Directive concernant la CEM

### **Andere Richtlinien und Normen / Other Directives and Standards / Autres documents**

**Regensdorf 1998**

Vice – Director  
T. Senn

Program Manager  
G. Bonafini

Handwritten signature of T. Senn in black ink.

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