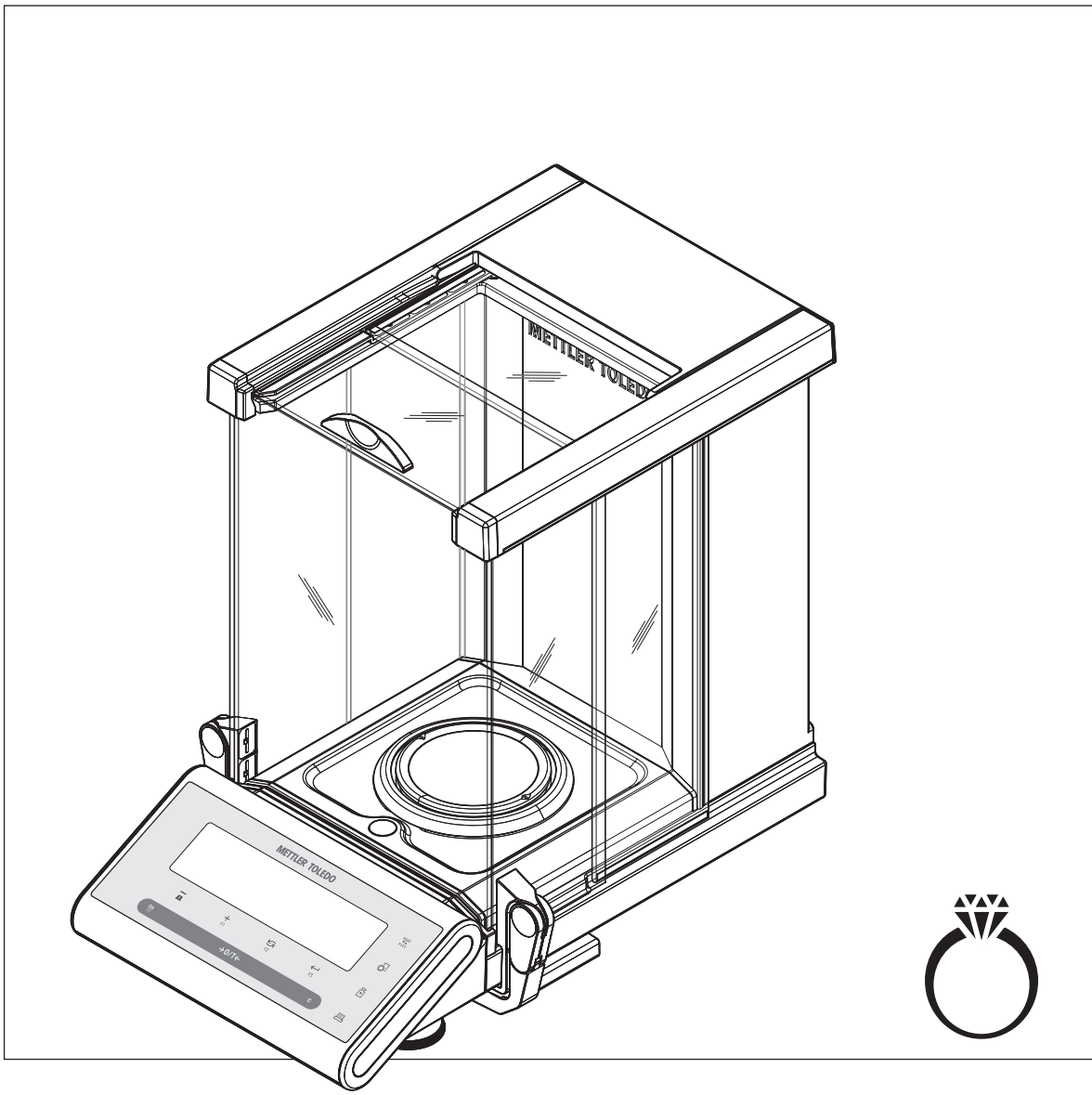
Operating Instructions

Jewelry Balances

JP Semi-Micro Models



METTLER TOLEDO

Table of contents

1 Introduction

Thank you for choosing a METTLER TOLEDO balance.

The precision balances of the Jewelry line combine a large number of weighing possibilities with easy operation.

These operating instructions

- apply to semi-micro balances JP models in the Jewelry line.
- are based on the initially installed firmware (software) version V2.00.

Please observe the following notes:

Some illustrations in these operating instructions are based on MS-S/MS-L models. They therefore might differ in some cases. However, functionality is not affected.

1.1 Conventions and Symbols Used in These Operating Instructions

Key designations are indicated by double angular brackets (e.g. «⌨»).

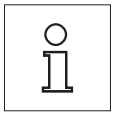
This symbol indicates press key briefly (less than 1.5 s).

This symbol indicates press and hold key down (longer than 1.5 s).

This symbol indicates a flashing display.

▼ This symbol indicates an automatic sequence.

These symbols indicate safety notes and hazard warnings which, if ignored, can cause personal danger to the user, damage to the balance or other equipment, or malfunctioning of the balance.



This symbol indicates additional information and notes. These make working with your balance easier, as well as ensuring that you use it correctly and economically.

2 Safety Precautions

Always operate and use your balance only in accordance with the instructions contained in this manual. The instructions for setting up your new balance must be strictly observed.

If the balance is not used according to these Operating Instructions, protection of the balance may be impaired and METTLER TOLEDO assumes no liability.

It is not permitted to use the balance in hazardous environments.

For use only in dry interior rooms.

Use only the original AC adapter delivered with your balance.

Do not use sharply pointed objects to operate the keyboard of your balance! Although your balance is very ruggedly constructed, it is nevertheless a precision instrument. Treat it with corresponding care.

Do not open the balance: It does not contain any parts which can be maintained, repaired, or replaced by the user. If you ever have problems with your balance, contact your METTLER TOLEDO dealer.

Use only balance accessories and peripheral devices from METTLER TOLEDO; they are optimally adapted to your balance.

Hazard of electric shock if the power cable is damaged! Check the power cable for damage regularly. Unplug the power cord immediately if the power cable is damaged.

Disposal

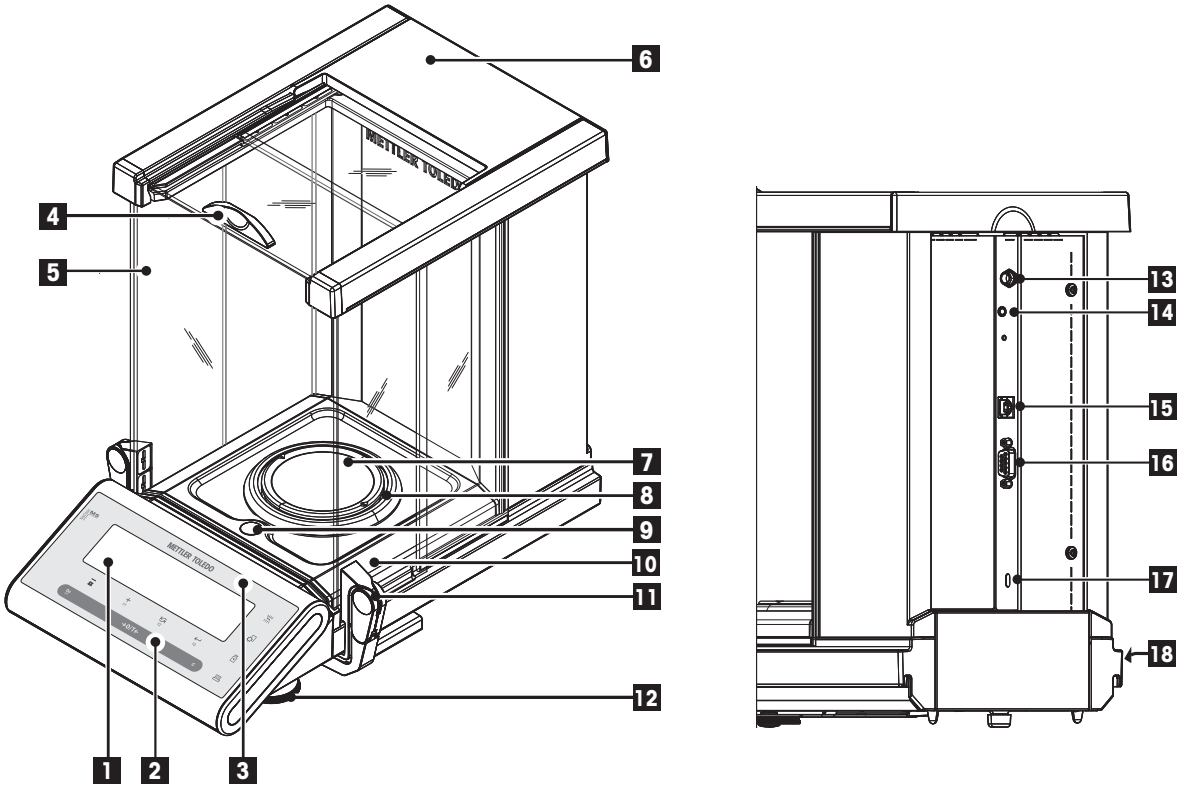
In conformance with the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

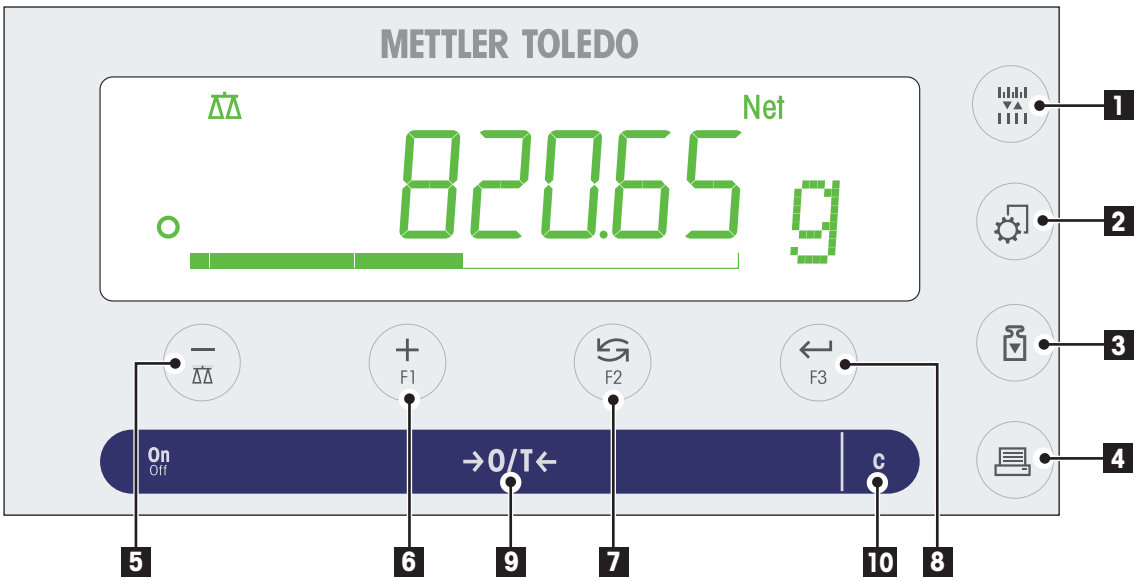
3 Overview

3.1 Components



Name and Function of Components				
1	Display		**10**	Drip tray
2	Operation keys		**11**	Handle/Coupling element for the operation of the draft shield doors
3	Model sticker (with approved models only)		**12**	Leveling feet
4	Handle for operation of the draft shield top door		**13**	Socket for AC Adapter
5	Glass draftshield		**14**	Aux (connection for "ErgoSens" or foot-switch)
6	Top cover		**15**	USB device interface
7	Weighing pan		**16**	RS232C serial interface
8	Draft ring		**17**	Kensington slot for anti-theft purposes
9	Level indicator		**18**	Product label

3.2 Operation Keys

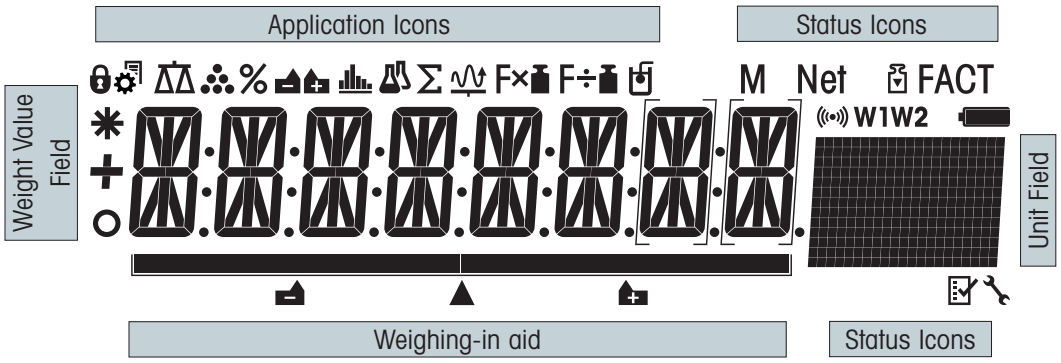


Key Functions

No.	Key	Press briefly (less than 1.5 s)	Press and hold (longer than 1.5 s)
1		• To change display resolution (1/10d function) while application is running **Note:** not available with approved models in selected countries.	no function
2		• Enter or leave menu (Parameter settings)	no function
3		• Execute predefined adjusting (calibration) procedure	no function
4		• Printout display value • Printout active user menu settings • Transfer data	no function
5		• To navigate back (scroll up) within menu topics or menu selections • Decrease (numerical) parameters within menu and in applications	• To select the weighing application • Decrease (numerical) parameters quickly within menu and in applications
6	F1	• To navigate forward (scroll down) within menu topics or menu selections • Increase (numerical) parameters within menu and in applications	• To select assigned F1 application and entering the parameter settings of application. • Default F1 application assignment: Piece counting • Increase (numerical) parameters quickly within menu and in applications

No.	Key	Press briefly (less than 1.5 s)	Press and hold (longer than 1.5 s)
7	F2	• With entries: scroll down • To navigate through menu topics or menu selections • To toggle between unit 1, recall value (if selected), unit 2 (if different from unit 1) and the application unit (if any)	• To select assigned F2 application and entering the parameter settings of application. • Default F2 application assignment: Percent weighing
8	F3	• To enter or leave menu selection (from / to menu topic) • To enter application parameter or switch to next parameter • To store parameter	• To select assigned F3 application and entering the parameter settings of application. • Default F3 application assignment: Statistics
9	→0/T←	• Switch on • Zero/Tare	• Switch off
10	C	• Cancel and to leave menu without saving (one step back in the menu).	no function

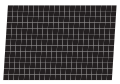
3.3 Display Panel



Application Icons			
	Menu locked		Application "Statistics"
	Menu setting activated	Σ	Application "Totaling"
	Application "Weighing"	F×	Application "Multiplication factor"
	Application "Piece counting"	F÷	Application "Division factor"
%	Application "Percent weighing"		Application "Density"

Status Icons			
M	Indicates stored value (Memory)		Applications "Diagnostics" and "Routine Test"
Net	Indicates Net weight values		Acoustic feedback for pressed keys activated
	Adjustments (calibration) started	W1	Weighing range 1 (Dual Range models only)
FACT	FACT activated	W2	Weighing range 2 (Dual Range models only)
	Service reminder		Not used

Weight Value Field and Weighing-in aid			
–	Indicates negative values	[ ]	Brackets to indicate uncertified digits (approved models only)
O	Indicates unstable values	▲	Marking of nominal or target weight
*	Indicates calculated values	+	Marking of tolerance limit T+
		–	Marking of tolerance limit T-

Unit Field						
	**g**	gram	**ozt**	troy ounce	**tls**	Singapore taels
	kg	kilogram	**GN**	grain	**tlt**	Taiwan taels
	mg	milligram	**dwt**	pennyweight	**tola**	tola
	ct	carat	**mom**	momme	**baht**	baht
	lb	pound	**msg**	mesghal		
	oz	ounce	**tlh**	Hong Kong taels		

4 Setting up the Balance

The balance must be disconnected from the power supply when carrying out all setup and mounting work.

4.1 Unpacking and Delivery Inspection

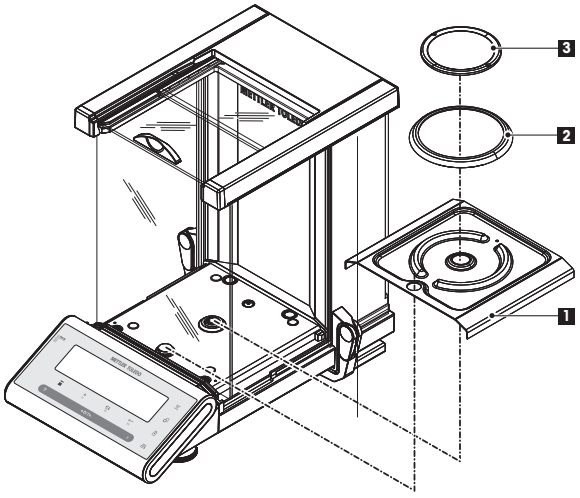
1 Open the packaging and carefully remove all components.

2 Check the delivered items.

The standard scope of delivery contains the following items:

- Balance with Draftshield
- Weighing pan with pan support
- Draft ring
- Drip tray
- Protective cover
- AC adapter
- Country specific power cable
- Operating instructions (this document)
- Quick Guide
- EC declaration of conformity

4.2 Installing the Components



Push the side glass doors back as far as will go and place the following components on the balance in the specified order:

1 Place the drip tray (1) into the correct position.

2 Place the weighing pan (3).

3 Place the draft ringt (2).

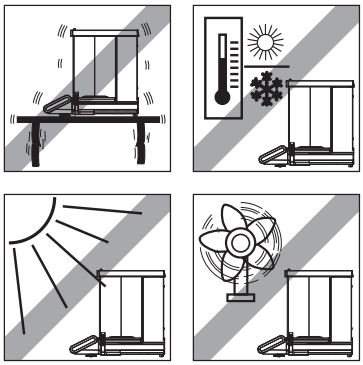
Note: Cleaning the draft shield see section "Maintenance and cleaning".

4.3 Selecting the Location and Leveling the Balance

Your balance is a precision instrument and will thank you for an optimum location with high accuracy and dependability.

4.3.1 Selecting the Location

Select a stable, vibration-free position that is as horizontal as possible. The surface must be able to safely carry the weight of a fully loaded balance.

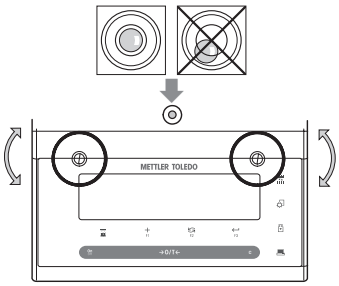


Observe ambient conditions (see Technical Data).

Avoid the following:

- Direct sunlight
- Powerful drafts (e.g. from fans or air conditioners)
- Excessive temperature fluctuations

4.3.2 Leveling the Balance



The balance has a level indicator and two adjustable leveling feet to compensate for slight irregularities in the surface of the weighing bench. The balance is exactly horizontal when the air bubble is in the middle of the level glass.

Note: The balance should be leveled and adjusted each time it is moved to a new location.

– Adjust the two leveling feet appropriately until the air bubble comes to rest exactly in the middle of the glass:

Air bubble at	"12 o'clock"	turn both feet clockwise
Air bubble at	"3 o'clock"	turn left foot clockwise, right foot counterclockwise
Air bubble at	"6 o'clock"	turn both feet counterclockwise
Air bubble at	"9 o'clock"	turn left foot counterclockwise, right foot clockwise

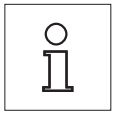
4.3.3 Power Supply

Your balance is supplied with an AC adapter with a country-specific power cable. The power supply is suitable for all line voltages in the range: 100 - 240 VAC, 50/60 Hz (for exact specifications, see section "technical data").

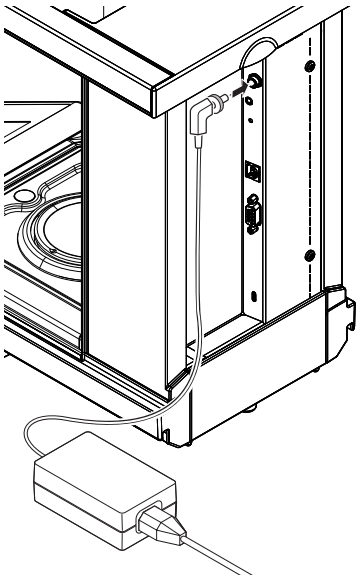
- First, check the local line voltage is in the range 100 - 240 VAC, 50/60 Hz and whether the power plug fits your local power supply connection. **If this is not the case, on no account connect the balance or the AC adapter to the power supply**, but contact the responsible METTLER TOLEDO dealer.
- **Only plug the adapter into a socket which is grounded.**

Important:

- Before operating, check all cables for damage.
- Guide the cables so that they cannot become damaged or interfere with the weighing process!
- Take care that the AC adapter cannot come into contact with liquids!
- The power plug must be always accessible.

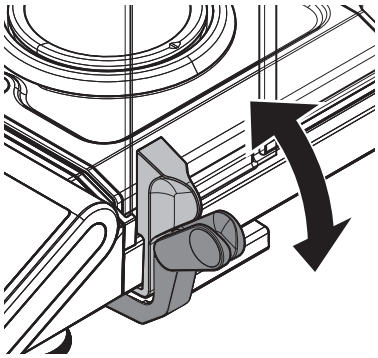


Allow your balance to warm up for 60 minutes to enable it to adapt itself to the ambient conditions.



Connect the AC adapter to the connection socket on the back of the balance (see figure) and to the power line. Secure the connection to the balance by screwing the plug tight.

4.3.4 Left/Right Operating of the Glass Draft Shield

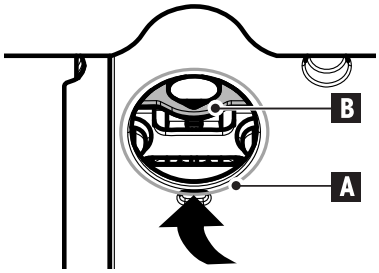


The glass draft shield of your balance can be adapted to the environmental conditions and your weighing style, as well as to the type of weighing and loading.

The position of the handles determines which door(s) of the draft shield (left, right, or both) is/are opened.

Try various different combinations by moving the external handles into the upper or lower position. We recommend you to set up the glass draft shield so that it only opens on the side where the balance is loaded. Your balance then works faster, because there are fewer troublesome currents of air than when both doors of the draft shield are opened together.

4.3.5 Weighing Below the Balance



So that weighings can be carried out below the working surface (below-the-balance weighing), your balance is provided with a special hanger.

1 Switch off the balance and unplug the cable of the AC adapter from the back of the balance.

2 Remove any interface cable.

3 Push the side doors and the top door of the glass draft shield completely to the back. **Note:** Top cover must be closed.

4 Remove the weighing pan, the draft ring and the drip tray.

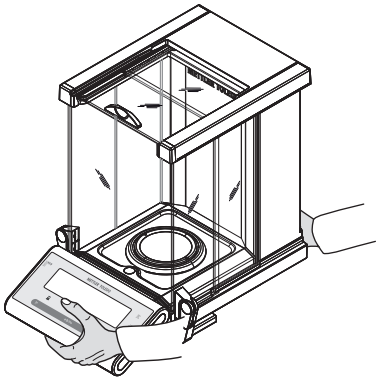
5 Carefully tip the balance over backwards, until it is lying on its back.

6 Remove the cap (A) and retain it. The hanger (B) for weighing below the balance is easily accessible now.

7 Carefully turn the balance to its normal position and reinstall all components in the reverse order.

4.3.6 Transporting the Balance

Transporting over short distances



1 Switch off the balance and remove the power cable and any other cables from the balance.

2 Hold the balance with both hands as shown. Carefully lift the balance and carry it to its new location.

3 Refer to the notes in Section "Selecting the location" regarding the choice of an optimal location.

Caution:
Please do not lift the balance by the glass draft shield as not to damage it.

Transporting over long distances

If you would like to transport or send your balance over long distances, **use the complete original packaging**.

4.4 Adjustment (Calibration)

To obtain accurate weighing results,

- the balance must be adjusted to match the gravitational acceleration at its location. Adjusting is necessary:
  - before the balance is used for the first time.
  - at regular intervals during weighing service.
  - after a change of location.
- the balance must be connected to the power supply for approximately,
  - 30 minutes for balances with redability of 0.01 ct / 0.001 g to 0.1 g
  - 60 minutes for balances with redability of 0.0001 ct / 0.01 mg to 0.001 ct / 0.1 mg

  in order to reach operating temperature before adjusting.

4.4.1 Fully Automatic Adjustment FACT

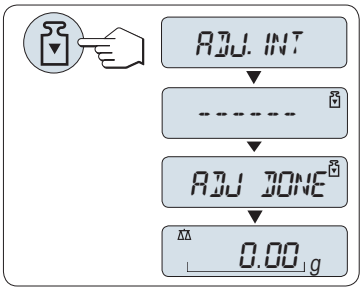
Note: On models with FACT only.

The **factory setting** is fully automatic adjustment **FACT** (**F**ully **A**utomatic **C**alibration **T**echnology) with the internal weight (see also section "The Menu"). In this setting, you have no need worry about adjusting your balance.

The balance adjusts itself automatically:

- after the warm-up phase on connection to the power supply.
- when a change in the ambient conditions, e.g. the temperature, could lead to a noticeable deviation in the measurement.
- on a predefined time. (see menu topic "FACT")
- time interval. (with OIML accuracy class II approved models)

4.4.2 Manual Adjustment with Internal Weight



Requirement: To carry out this operation, in the menu topic "CAL" (Adjustment) of advanced menu "ADJ.INT" must be selected.

1 Unload weighing pan

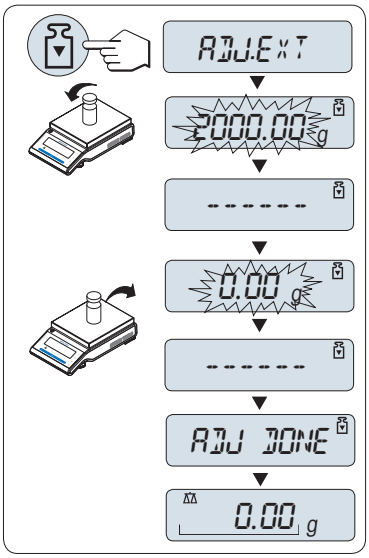
2 Press «⊡» to execute "Internal Adjustment".

The balance adjusts itself automatically. The adjusting is finished when the message "ADJ DONE" appears briefly on the display. The balance returns to the last active application and is ready for operation.

Sample adjustment printout using internal weight:

```
- Internal Adjustment --
21.Jan  2009       12:56

METTLER TOLEDO

Balance Type      MS4002S
SNR           1234567890

Temperature       22.5 °C
Diff                3 ppm

Adjustment done
-----------------------
```

4.4.3 Manual Adjustment with External Weight



Requirement: To carry out this operation, in the menu topic "CAL" (Adjustment) of advanced menu "ADJ.EXT" must be selected.

1 Have required adjustment weight ready.

2 Unload weighing pan.

3 Press «⊡» briefly to execute "External Adjustment". The required (predefined) adjustment weight value flashes on the display.

4 Place adjustment weight in center of pan. The balance adjusts itself automatically.

5 When "0.00 g" flashes, remove adjustment weight.

The adjusting is finished when the message "ADJ DONE" appears briefly on the display. The balance returns to the last active application and is ready for operation.

Sample adjustment printout using external weight:

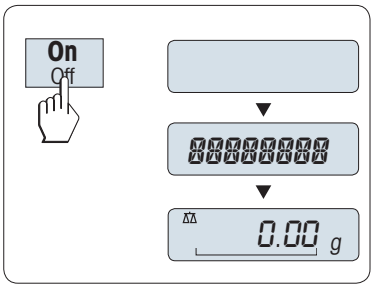
```
- External Adjustment --
21.Jan 2009        12:56

METTLER TOLEDO

Balance Type     MS4002S
SNR           1234567890

Temperature      22.5 °C
Nominal        2000.00 g
Actual         1999.99 g
Diff               5 ppm

Adjustment done

Signature


.....................
-----------------------
```

5 Weighing Made Simple

This section shows you how to perform simple weighings and how you can accelerate the weighing process.

5.1 Switching the Balance On and Off

This section shows you how to perform simple weighings and how you can accelerate the weighing process.



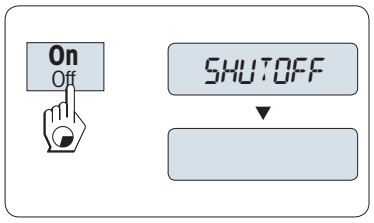
Switching On

1 Remove any load from weighing pan.

2 Press «**On**».

The balance performs a display test (all segments in the display light up briefly), "WELCOME", Software version, Maximum load and Readability appears briefly. (Startup "FULL" mode only)

The balance is ready for weighing or for operation with the last active application.



Switching Off

– Press and hold the «**Off**» key until "SHUTOFF" appears on the display. Release the key.

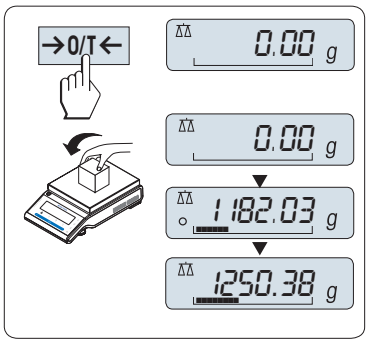
When Quickstart is selected (Advanced menu, topic "STARTUP" > "QUICK"): Once your balance has been switched off, it is in standby mode. In this case your balance needs no warm-up time in the standby mode and is immediately ready for weighing. If you wish to perform a weighing, you now only need to place the sample on the weighing pan and the balance immediately displays the result. There is no need to switch it on with the «**On/Off**» key.

- If your balance has been switched off after a preselected time, the display is dimly lit and shows date, time, maximum load and readability.
- If your balance has been switched off manually, the display is off.

Note:

- Quickstart is not possible with approved balances (only available in selected countries).
- Standby mode is available on line powered balances only.

5.2 Performing a Simple Weighing



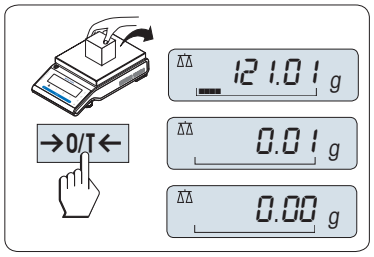
1 Press «→0/T←» to zero the balance.
Note: If your balance is not in the weighing mode, press and hold the «⚖» key down until "WEIGHING" appears in the display. Release the key. Your balance is in the weighing mode and set to zero.

2 Place weighing sample on the weighing pan.

3 Wait until the instability detector "○" disappears and the stability beep sounds.

4 Read the result.

5.3 Zero Setting / Taring

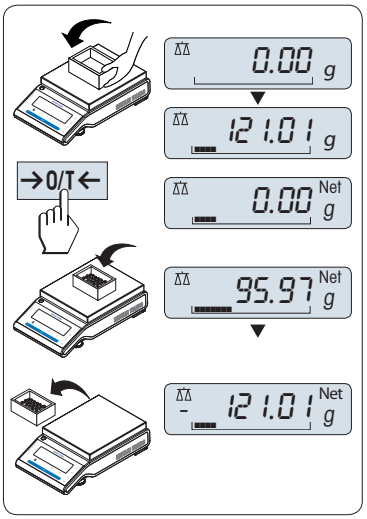


Zero setting

1 Unload the balance.

2 Press «→0/T←» to set the balance to zero. All weight values are measured in relation to this zero point (see menu topic "ZERO RNG").

Note: Use the «→0/T←» zeroing key before you start with a weighing.



Taring
If you are working with a weighing container, first set the balance to zero.

1 Place empty container on the balance. The weight is displayed.

2 Press «→0/T←» to tare the balance.

"0.00 g" and "**Net**" appears in the display. "**Net**" indicates that all weight values displayed are net values.

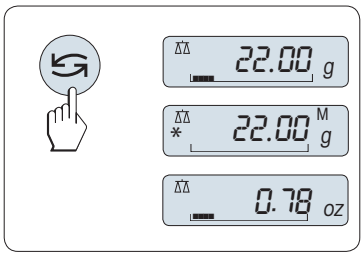
Note:

- If the container is removed from the balance, the tare weight will be shown as a negative value.
- The tare weight remains stored until the «→0/T←» key is pressed again or the balance is switched off.
- With METTLER TOLEDO DeltaRange balances, the fine range with its 10 times smaller display increments (depending on the model) is available again after every taring operation.

5.4 METTLER TOLEDO DualRange Balances

METTLER TOLEDO DualRange balances have two ranges. These models have a fix fine (semi-micro) range between 0 g and "Maximum load, fine range". In this fine range the balance shows the result with a higher resolution, i.e. with one decimal place more.

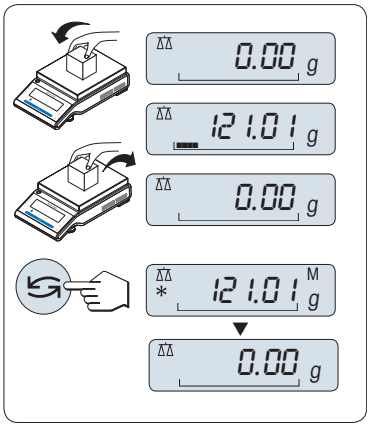
5.5 Switching Weight Units



The «⇆» key can be used at any time to toggle between weight unit "UNIT 1","RECALL" value (if selected) and weight unit "UNIT 2" (if different from weight unit 1) and the application unit (if any).

5.6 Recall / Recall Weight Value

Recall stores stable weights with an absolute display value bigger than 10d.
Requirement: The function "RECALL" must be activated in the menu.



1 Load weighing sample. The display shows weight value and stores stable value.

2 Remove weighing sample. When the weight is removed the Display shows zero.

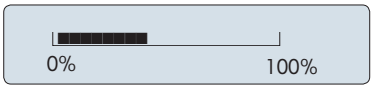
3 Press «⇆». The display shows last stored stable weight value for 5 seconds together with asterisk (*) and Memory (M) symbols. After 5 seconds the display goes back to zero. This can be repeated unlimited times.

Delete last weight value

As soon a new stable weight value is displayed, the old recall value becomes replaced by the new weight value. When pressing «→0/T←», the recall value is set to 0.

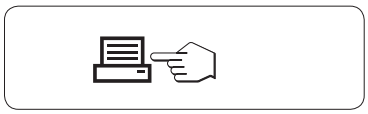
Note: If the power is switched off, the recall value is lost. The recall value can not be printed.

5.7 Weighing with the Weighing-in Aid



The weighing-in aid is a dynamic graphic indicator which shows the used amount of the total weighing range. You can thus recognize at a glance when the load on the balance approaches the maximum load.

5.8 Print / Transmit Data



Pressing the «🖶» key transmits the weighing results over the interface e.g. to a printer or a PC.

6 The Menu

6.1 What is in the Menu ?

The Menu allows you to match your balance to your specific weighing needs. In the menu you can change the settings of your balance and activate functions. The main menu has 4 different menus and these contains 46 different **topics**, each of which allows you various **selection** possibilities. For Menu "PROTECT" see chapter "Description of menu topics" section "Main menu".

Note: See Quick Guide for the graphical overview of the menu (Menu Map) with all setting possibilities.

Menu "BASIC**"**

Topic	Description
DATE	Setting the current date.
TIME	Setting the current time.
UNIT 1	Specification of the 1st weight unit in which the balance should show the result.
UNIT 2	Specification of the 2nd weight unit in which the balance should show the result.
KEY BEEP	Setting the key beep level.
STAB.BEEP	Setting the stability beep level.
RESET	Call up of the factory settings.

Menu "ADVANCED**"**

Topic	Description
ENVIRON.	Matching the balance to the ambient conditions.
CAL	Settings for the type of adjustment (calibration).
FACT	Settings for fully automatic balance adjustment based on a selected time.
FACT PRT.	Switching the automatic FACT printout on or off.
DATE.FORM	Setting the date format.
TIME.FORM	Preselection of the time format.
RECALL	Switching the application "Recall" for storing stable weights on or off.
STARTUP	Setting the mode which the balance powers up ("FULL" or "QUICK").
SHUTOFF	Setting the time after which the balance should be switched off automatically.
BCKLIGHT	Setting the time after which the display backlight should be switched off automatically.
DISPLAY	Adjusting the brightness and contrast of the display.
AUTOZERO	Switching the automatic zero correction (Autozero) on or off.
ZERO RNG	Setting the zero limit of the zero/tare key.
LANGUAGE	Setting the preferred language.
ASSIGN:F1	Selection of assigned F1 key application and entering their parameter settings.
ASSIGN:F2	Selection of assigned F2 key application and entering their parameter settings.
ASSIGN:F3	Selection of assigned F3 key application and entering their parameter settings.
DIAGNOSE	Starting a diagnostic application.
SERV.ICON	Switching the service icon (service reminder) on or off.
SRV.D.RST	Reset service date and hours (service reminder).

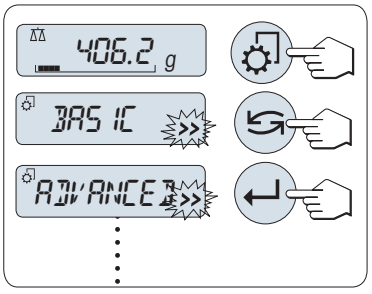
Menu "INT.FACE**"**

Topic	Description
RS232	Matching the serial interface RS232C to a peripheral unit.
HEADER	Setting the header for printout of individual values.
SINGLE	Setting the information for printout of individual values.
SIGN.L	Setting the footer for printout of individual values.
LINE.FEED	Setting line feed for printout of individual values.
ZERO PRT.	Setting the auto print function for printing zero.
COM.SET	Setting the data communication format of the serial interface RS232C.
BAUDRATE	Setting the transfer speed of the serial interface RS232C.

Topic	Description
BIT/PAR.	Setting the character format (Bit/Parity) of the serial interface RS232C.
STOPBIT	Setting the character format (stop bit) of the serial interface RS232C.
HD.SHAKE	Setting the transfer protocol (Handshake) of the serial interface RS232C.
RS E.O.L.	Setting the end of line format of the serial interface RS232C.
RS CHAR	Setting the char set of the serial interface RS232C.
USB	Matching the USB interface to a peripheral unit.
USB COM.S.	Setting the data communication format of the USB interface.
USB E.O.L.	Setting the end of line format of the USB interface.
USB CHAR	Setting the char set of the USB interface.
INTERVAL	Selection of the time interval for the simulated print key press.
ERGOSENS	Settings for external key e.g. METTLER TOLEDO "ErgoSens"

6.2 Menu Operation

In this section you will learn how to work with the menu.



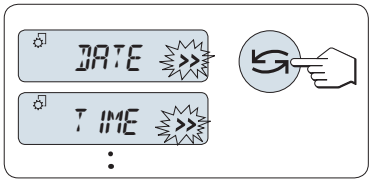
Select Menu

1 Press «⚙» to activate main menu. The first menu "BASIC" is displayed (except menu protection is active).

2 Press «↻» repeatedly to change menu (Scrolling down/up «+» / «–» keys).

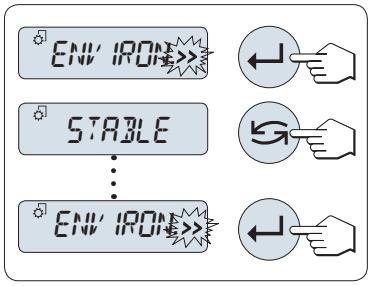
3 Press «↵» to confirm the selection.

Note: The menu selection "BASIC", "ADVANCED" or "INT.FACE" can not be saved. The selection "PROTECT" must be saved.



Select Menu Topic

– Press «↻». The next menu topic appears in the display. Each time the «↻» or the «+» key is pressed, the balance switches to the next menu topic; the «–» key to the previous menu topic.



Change Settings in a Selected Menu Topic

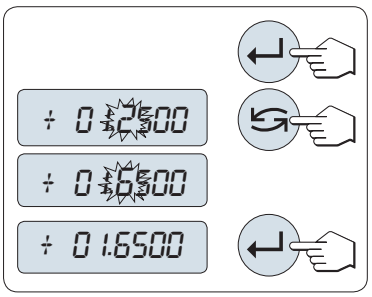
The "**>>**" flashing symbol in the display indicates selectable options available.

1 Press «↵».The display shows the current setting in the selected menu topic. Each time «↻» or «+» is pressed, the balance switches to the next selection; press «–» to the previous selection. After the last selection, the first is shown again.

2 Press «↵», the selected setting is accepted but not yet executed. The setting are executed only after "SAVE:YES" has been confirmed.

Change Settings in a Submenu Selection

The same procedure as for menu topics.



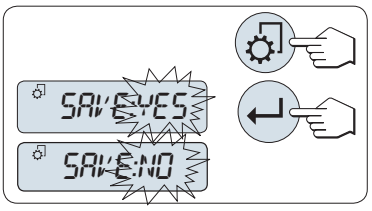
Input Principle of Numerical Values

1 Press «↵» for input of numerical values.

2 Press «↻» to select a digit or a value (depending on the application). The selected digit or the selected value is blinking.

3 For changing digits or values, press «**+**» to scroll up or «**–**» to scroll down.

4 Press «↵» to confirm the input.



Saving Settings and Closing the Menu

1 Press «⚙» briefly to leave menu topic.

2 Press «↵» to execute "SAVE:YES". Changes are saved.

3 Press «↵» to execute "SAVE:NO". Changes are not saved. To toggle between "SAVE:YES" and "SAVE:NO" press «↻».

Cancel

– For leaving menu topic or menu selection without saving press «**C**» (one step back in the menu).

Note: If no entry is made within 30 seconds, the balance reverts to last active application mode. Changes are not saved. If changes are made, the balance asks "SAVE:NO".

6.3 Description of Menu Topic

In this section you will find information regarding the individual menu topics and the available selections.

6.3.1 Main Menu

Selecting the menu.

"BASIC"	The small "BASIC" menu for simple weighing is displayed.
"ADVANCED"	The extended "ADVANCED" menu for further weighing settings is displayed.
"INT.FACE"	The menu "INT.FACE" for all interface parameter settings for peripheral devices e.g. printer is displayed.
"PROTECT"	Menu protection. Protection of balance configurations against unmeant manipulation.
"OFF"	Menu protection is off. (**Factory setting**)
"ON"	Menu protection is on. The menu BASIC, ADVANCED and INT.FACE are not displayed. This is indicated with "🔒" in the display.

Note:

- The menu selection "BASIC", "ADVANCED" or "INT.FACE" can not be saved.
- To activate "PROTECT" "ON" or "OFF", this selection must be saved.

6.3.2 Basic Menu

"DATE**" – Date**

Setting the current date according to date format.

Note: A reset of the balance will not change this setting.

"TIME**" – Time**

Setting the current time according to time format

"+1H"	Set the current time forwards by 1 hour (to adjust summer or winter time). **(Factory setting)**
"-1H"	Set the current time backwards by 1 hour (to adjust summer or winter time).
"SET TIME"	Enter the current time.

Note: A reset of the balance will not change this setting.

"UNIT 1**" – Weight Unit 1**

Depending on requirements, the balance can operate with the following units (depending on the model)

- Only those weight units allowed by the appropriate national legislation are selectable.
- With approved balances, this menu topic has a fixed setting and cannot be changed.
- Conversion table for weight units see chapter Appendix.

Units:

g [1]	Gram	**dwt**	Pennyweight
kg [2]	Kilogram	**mom**	Momme
mg [3]	Milligram	**msg**	Mesghal
ct	Carat	**tlh**	Tael Hong Kong
lb	Pound	**tls** [4]	Tael Singapore
oz	Ounce (avdp)	**tlt**	Tael Taiwan
ozt	Ounce (troy)	**tola**	Tola
GN	Grain	**baht**	Baht

[1] factory setting
[2] not with 0.01 mg, 0.1 mg and 1 mg balances
[3] with 0.01 mg, 0.1 mg and 1 mg balances
[4] the Malaysian tael has the same value

"UNIT 2**" – Weight Unit 2**

If it is required to show the weighing results in weighing mode in an additional unit, the desired second weight unit can be selected in this menu topic (depending on the model). Units see "UNIT 1". Select "NO", if you do not want to use "UNIT 2".

Note: Only those weight units allowed by the appropriate national legislation are selectable.

"KEY BEEP**" – Key Beep**

This menu topic allows you to select the volume of the key beep. The according key beep is emitted during the setting.

"MED"	**Medium** level (**Factory setting**)
"HIGH"	**High** level
"OFF"	Beep switched off
"LOW"	**Low** level

"STAB.BEEP**" – Stability Beep**

If the unstable symbol disappears, the stability beep becomes active. This menu topic allows you to preselect the volume of the stability beep.

"LOW"	**Low** level (**Factory setting**)
"MED"	**Medium** level
"HIGH"	**High** level
"OFF"	Beep switched off

"RESET**" – Reset Balance Settings**

This menu topic allows you to cal-up the factory settings.

To toggle between "YES?" and "NO?" press «⟲» (or «**+**» or «**–**»).

Note: A reset of the balance will not change the "DATE", "TIME" and "ZERO RNG" settings.

6.3.3 Advanced Menu

"ENVIRON.**" – Environment Settings**

This setting can be used to match your balance to the ambient conditions.

"STANDARD"	Setting for an average working environment subject to moderate variations in the ambient conditions. (**Factory setting**)
"UNSTABLE"	Setting for a working environment where the conditions are continuously changing.
"STABLE"	Setting for a working environment which is practically free from drafts and vibrations.

"CAL**" – Adjustment (calibration)**

In this menu topic you can preselect the function of the «⏻» key. Your balance can be adjusted with internal or external weights by pressing the «⏻» key. If you have attached a printer to your balance, the data of the adjustment (calibration) are printed out.

"ADJ.OFF"	The adjustment is **switched off**. The «⏻» key has no function.
"ADJ.INT"	**Internal** adjustment: adjustment is performed at a keystroke with the built-in weight (depending on the model, see technical data).
"ADJ.EXT"	**External** adjustment: adjustment is performed at a keystroke with a selectable external weight.
"100.00 g"	**Defining the external adjustment weight**: define the weight of the external adjustment weight (in grams). **Factory setting**: depends on the model.

"FACT**" – Fully Automatic Adjustment**

Fully automatic internal adjustment (calibration) **FACT** (**F**ully **A**utomatic **C**alibration **T**echnology) provides fully automatic balance adjustment based on temperature criteria and on preselected time. (depending on the model, see technical data)

"TIME"	Execute FACT (with selected time).
"12:00"	Specify the time for a fully automatic adjustment to take place every day. **Factory setting**: 12:00 (according to time format)
"OFF"	FACT is **switched off**.

"FACT PRT.**" – Protocol Trigger for Fact**

This setting specifies whether an adjustment report should be printed automatically.
Note: This menu topic does not affect the printing of adjustments with an internal or external adjustment weight.

"OFF"	**Protocol switched off**: if the balance adjusts automatically (FACT), a protocol is not printed out.
"ON"	Protocol switched on: a record is printed out after every automatic adjustment of the balance (FACT). **Note:** The protocol is printed out without a line for signatures.

"DATE.FORM**" – Date Format**

This menu topic allows you to preselect the date format.

The following date formats are available:

	Display examples	**Printing examples**
"DD.MM.Y"	01.02.2009	**01.02.2009**
"MM/DD/Y"	02/01/09	**02/01/2009**
"Y-MM-DD"	09-02-01	**2009-02-01**
"D.MMM Y"	1.FEB.09	**1.FEB 2009**
"MMM D Y"	FEB.1.09	**FEB 1 2009**

Factory setting: "DD.MM.Y"

"TIME.FORM**" – Time Format**

This menu topic allows you to preselect the time format.

The following date formats are available:

	Display examples
"24:MM"	15:04
"12:MM"	3:04 PM
"24.MM"	15.04
"12.MM"	3.04 PM

Factory setting: "24:MM"

"RECALL**" – Recall**

This menu topic allows you to switch the "RECALL" function on or off. When it is switched on recall stores the last stable weight if the absolute display value was bigger than 10d.

"OFF"	"RECALL" switched off **(Factory setting)**
"ON"	"RECALL" switched on

Note: The recall value is displayed with an asterisk and cannot be printed.

"STARTUP**" – Startup Mode**

You can set your balance such that it either immediately starts from the standby mode when you load a weight or it must be switched on with the «**ON/OFF**» key after which it then performs a display test.

Note: This topic in not visible with approved balances (only available in selected countries).

"QUICK"	**"Quickstart":** The balance can be started directly from the standby mode and is immediately ready for weighing. You can load the weight in the standby mode and the balance immediately shows the current weighing result. This is the **Factory setting** **Note:** Standby mode is available on line powered balances only.
"FULL"	**Start with display test**: You must switch on the balance with the «**ON/OFF**» key. After it has been switched on, it performs a display test for approx. 2 sec. in which all display elements lights up, it shows "WELCOME", software version, maximum load and readability. The balance is ready for weighing.

"SHUTOFF**" – Automatic Shutoff**

If the automatic shutoff function is activated, the balance automatically switches itself off after a preselected time of inactivity (i.e. with no key being pressed or changes of weight occurring etc.) and is switched to the standby mode.

"A.OFF 10" min	Automatic shutoff after **10 minutes** of inactivity. (**Factory setting**)
"A.OFF –"	Automatic shutoff **not** activated.
"A.OFF 2" min	Automatic shutoff after **2 minutes** of inactivity.
"A.OFF 5" min	Automatic shutoff after **5 minutes** of inactivity.

"BCKLIGHT**" – Backlight**

Under this menu topic, the display backlight can be switched off automatically. If the automatic switch-off is activated, the backlight will turn off automatically after the selected period of inactivity has elapsed. The backlight is reactivated when a key is pressed or the weight is changed.

"B.L. ON"	Backlight is always **on**. (**Factory setting**)
"B.L. 30" s	Automatic switch-off after **30 seconds** inactivity.
"B.L. 1" min	Automatic switch-off after **1 minute** inactivity.
"B.L. 2" min	Automatic switch-off after **2 minutes** inactivity.
"B.L. 5" min	Automatic switch-off after **5 minutes** inactivity.

"DISPLAY**" – Display Settings**

This menu topic allows you to adjust brightness and contrast of the display.

"BRIGHTN"	To set the brightness in 1% steps.
"50%"	**Factory setting:** 50%
"CONTRAST"	To set the contrast in 1% steps.
"75%"	**Factory setting:** 75%

"AUTOZERO**" – Automatic Zero Setting**

This menu topic allows you to switch the automatic zero setting on or off.

"ON"	"AUTOZERO" **switched on** (**Factory setting**). The automatic zero setting continuously corrects possible variations in the zero point that might be caused through small amounts of contamination on the weighing pan.
"OFF"	"AUTOZERO" **switched off**. The zero point is not automatically corrected. This setting is advantageous for special applications (e.g. evaporation measurements).

Note: With approved balances, this setting is not available (only available in selected countries).

"ZERO RNG**" – Zero Range**

This menu topic allows you to set a zero limit for the «→0/T←» key. Up to and including this limit the «→0/T←» key will execute a zero. Above this limit the «→0/T←» key will execute a tare.

"1.2 g"	To set the upper limit of the zero setting range as weight in the definition unit of the balance. (**Factory setting:** 0.5% of weighing range) **Note:** With approved balances, this setting is not available and fixed to 3e (only available in selected countries).

Note: A reset of the balance will not change this setting.

"LANGUAGE**" – Language**

Factory setting: Generally, the language of the destination country (if available) or English is set.

The following languages are available (depending on the language package installed):

"ENGLISH"	English	"POLSKI"	Polish
"DEUTSCH"	German	"CESKY"	Czech
"FRANCAIS"	French	"MAGYAR"	Hungarian
"ESPANOL"	Spanish	"NEDERL."	Dutch
"ITALIANO"	Italian	"BR.PORTUG."	Brazil Portuguese
"RUSSIAN" РУССКИИ	Russian		

"ASSIGN:F1**" – Assign Application Key F1**

At this menu topic you can assign an application to the «**F1**» key. The following applications are available (depending on the model):

"COUNTING"	Piece counting (**Factory setting**)
"PERCENT"	Percent weighing
"STAT"	Statistics
"FORMULA"	Formulation / Net-Total
"TOTALING"	Totaling
"FACTOR M"	Multiplication factor
"FACTOR D"	Division factor
"DENSITY"	Density

"ASSIGN:F2**" – Assign Application Key F2**

At this menu topic you can assign an application to the «**F2**» key. The following applications are available (depending on the model):

"PERCENT"	Percent weighing (**Factory setting**)
"STAT"	Statistics
"FORMULA"	Formulation / Net-Total
"TOTALING"	Totaling
"FACTOR M"	Multiplication factor
"FACTOR D"	Division factor
"DENSITY"	Density
"COUNTING"	Piece counting

"ASSIGN:F3**" – Assign Application Key F3**

At this menu topic you can assign an application to the «**F3**» key. The following applications are available (depending on the model):

"STAT"	Statistics (**Factory setting**)
"FORMULA"	Formulation / Net-Total
"TOTALING"	Totaling
"FACTOR M"	Multiplication factor
"FACTOR D"	Division factor
"DENSITY"	Density
"R. TEST"	Routine test
"COUNTING"	Piece counting
"PERCENT"	Percent weighing

"DIAGNOSE**" – Diagnostics Application**

At this menu topic you can start a diagnostic application. For more information see chapter application "Diagnostics".
The following diagnostics are available:

"REPEAT.T"	Repeatability test (models with internal weights only)
"DISPLAY"	Display test
"KEYPAD T"	Key test
"CAL.MOT. T"	Motor test (models with internal weights only)
"BAL.HIST"	Balance history
"CAL.HIST"	Calibration history
"BAL.INFO"	Balance information
"PROVIDER"	Service provider information

"SERV.ICON**" – Service Reminder**

This menu topic allows you to switch the service reminder "🔧" on or off.

"ON"	Service reminder "🔧" **switched on** (factory setting).You will be informed after a preset time (e.g. one Year or 8000 operating hours) to call service for recalibration. This will be indicated by the flashing service icon: "🔧". (**Factory setting**)
"OFF"	Service reminder "🔧" **switched off**.

"SRV.D.RST**" – Service Date Reset**

This menu topic allows you to reset service date and hours.
Note: This menu topic is only available if "SERV.ICON" setting "ON" was selected.

To toggle between "YES?" and "NO?" press «⟲» (or «+» or «-»)

6.3.4 Interface Menu

"RS232**" – RS232C Interface** [1)]

At this menu topic you can select the peripheral device connected to the RS232C interface and specify how the data is transmitted.

"PRINTER"		Connection to a **printer**. (**Factory setting**) **Note:** • Only one printer possible. • See recommended printer settings found in section "Appendix", as well as the printer-specific user's manual.
	"PRT.STAB"	If the «🖶» key is pressed, the next stable weight value will be printed. (**Factory setting**)
	"PRT.AUTO"	Every stable weight value will be printed, without pressing the «🖶» key.
	"PRT.ALL"	If the «🖶» key is pressed, the weight value will be printed regardless of stability.
"PC-DIR."		Connection to a **PC**: the balance can send data (as a Keyboard) to the PC used for PC applications e.g. Excel. **Note:** The balance sends the weight value without the unit to the PC.
	"PRT.STAB"	If the «🖶» key is pressed, the next stable weight value will be sent followed by an enter. (**Factory setting**)
	"PRT.AUTO"	Every stable weight value will be sent followed by an enter, without pressing the «🖶» key.

"PRT.ALL"	If the «🖶» key is pressed, the weight value will be sent followed by an enter regardless of stability.
"HOST"	Connection to a **PC**, Barcode Reader etc.: the balance can send data to the PC and receive commands or data from the PC).
"SEND.OFF"	Send mode switched off.(**Factory setting**)
"SEND.STB"	If the «🖶» key is pressed, the next stable weight value will be sent.
"SEND.CONT"	All weight value updates will be sent regardless of stability, without pressing the «🖶» key.
"SEND.AUTO"	Every stable weight value will be sent, without pressing the «🖶» key.
"SEND.ALL"	If the «🖶» key is pressed, the weight value will be sent regardless of stability.
"2.DISPLAY"	Connection of an **optional auxiliary display** unit **Note:** The transmission parameters cannot be selected. Settings are automatically set.

Attention:

- If you select 2nd Display "2.DISPLAY", first make sure that no other device is connected at COM1 as a 2nd display. Other devices could be damaged because of the voltage on connector Pin 9. Necessary for powering the 2nd display (see chapter "Interface Specification")

"HEADER**" – Options for the Printout Header of individual values**

This menu topic allows you to specify the information that is to be printed at the top of the printout for every individual weighing results (after pressing «🖶»).
Note: This menu topic is only available if "PRINTER" setting was selected.

"NO"	The header is not be printed (**Factory setting**)
"DAT / TIM"	Date and time are printed
"D / T / BAL"	Date, time and balance information (Balance type, SNR, Balance ID) are printed. **Note:** Balance ID only if set.

"SINGLE**" – Options for Printing out the Result of individual values**

This menu topic allows you to specify the information that is to be printed for every individual weighing result (after pressing «🖶»).
Note: This menu topic is only available if "PRINTER" setting was selected.

"NET"	The value of the Net weight from the current weighing is printed (**Factory setting**)
"G / T / N"	The values of the Gross weight, the Tare weight and the Net weight are printed

"SIGN.L**" – Options for the Printout Footer for Signature Line of individual values**

This menu topic allows you to set a footer for signature at the bottom of the printout for every individual weighing result (after pressing «🖶»).
Note: This menu topic is only available if "PRINTER" setting was selected.

"OFF"	The signature footer is not be printed. (**Factory setting**)
"ON"	The signature footer is printed

"LINE.FEED**" – Options for Complete the Printout of individual values**

This menu topic allows you to specify the number of blank lines to complete the printout (line feed) for every individual weighing result (after pressing «🖶») .
Note: This menu topic is only available if ″PRINTER″ setting was selected.

"0"	Possible numbers of blank lines: 0 to 99 (**Factory setting = 0**)

"ZERO PRT.**" – Options for "**PRT.AUTO**" [1)]**

This menu topic allows you to specify the auto print function ″PRT.AUTO″ for printing zero "YES" or "NO".

"OFF"	Zero is not be printed (Zero +/- 3d) (**Factory setting**)
"ON"	Zero is always printed

Note: This menu topic is only available if "PRT.AUTO" fuction of the "PRINTER" or "PC-DIR." was selected.

"COM.SET**" – Options for the Data Communication Format (RS232C)("**HOST**") [1)]**

This menu topic allows you to set the data format depending on which peripheral device is connected.
Note: This menu topic is only available if ″HOST″ setting was selected.

"MT-SICS"	The MT-SICS data transfer formats is used. (**Factory setting**) For more information see section ″MT-SICS Interface Commands and Functions″.	
"MT-PM"	The following PM balance commands are supported:	
	S	Send value
	SI	Send immediate value
	SIR	Send immediate value and repeat
	SR	Send value and repeat
	SNR	Send next value and repeat
	T	Tare
	TI	Tare immediately
	B	Base (Negative values are limited up to the current tare values)
	MI	Modify ambient vibration
	MZ	Modify Auto Zero
	M	Modified settings reset
	ID	Identify
	CA	Calibrate
	D	Display (only symbol N and G available)
"SART"	The following Sartorius commands are supported:	
	K	Ambient conditions: very stable
	L	Ambient conditions: stable
	M	Ambient conditions: unstable
	N	Ambient conditions: very unstable
	O	Block keys
	P	Print key (print, auto print; activate or block)
	Q	Acoustic signal
	R	Unblock keys
	S	Restart/self-test
	T	Tare key
	W	Calibration/adjustment (depending on the menu setting) *)

Z	Internal calibration/adjustment **)
f0_	Function key (F)
f1_	Function key (CAL)
s3_	C key
x0_	Perform internal calibration **)
x1_	Print balance/scale model
x2_	Print weighing cell serial number
x3_	Print software version

*) may be inaccessible on verified balances/scales

**) only on models with built-in motorized calibration weight

Functionality mapping

"HOST" **settings:**	**Sartorius printer settings:**
"SEND.OFF"	not applicable
"SEND.STB"	manually print with stability
"SEND.ALL"	manually print without stability
"SEND.CONT"	automatically print without stability
"SEND.AUTO"	similar applicable to automatically print when load is changed

"BAUDRATE**" – Baud rate RS232C 1)**

This menu topic allows you to match the data transmission to different serial RS232C receivers. The baud rate (data transfer rate) determines the speed of transmission via the serial interface. For problem-free data transmission the sending and receiving devices must be set at the same value.

The following settings are available:
600 bd, 1200 bd, 2400 bd, 4800 bd, 9600 bd, 19200 and 38400 bd. (default: **9600 bd**)

Note:

- Not visible for 2nd display.
- Each device has separate settings.

"BIT/PAR.**" – Bit/Parity RS232C 1)**

At this menu topic you can set the character format for the attached RS232C serial peripheral device.

"8/NO"	8 data bits/no parity (**Factory setting**)
"7/NO"	7 data bits/no parity
"7/MARK"	7 data bits/mark parity
"7/SPACE"	7 data bits/space parity
"7/EVEN"	7 data bits/even parity
"7/ODD"	7 data bits/odd parity

Note:

- Not visible for 2nd display.
- Each device has separate settings.

"STOPBIT**" – Stop Bits RS232C 1)**

At this menu topic you can set the stop bits of the transmitted data to different RS232C serial receivers.

"1 BIT"	1 Stop bit (**Factory setting**)
"2 BITS"	2 Stop bits

"HD.SHAKE**" – Handshake RS232C** [1)]

This menu topic allows you to match the data transmission to different RS232C serial receivers.

"XON/XOFF"	Software handshake (XON/XOFF) (**Factory setting**)
"RTS/CTS"	Hardware handshake (RTS/CTS)
"OFF"	No handshake

Note:

- Not visible for 2nd display.
- Each device has separate settings.

"RS E.O.L.**" – End of Line RS232C** [1)]

At this menu topic you can set the "End of Line" character of the transmitted data to different RS232C serial receivers.

"(CR)(LF)"	<CR><LF> Carriage Return followed by Line feed (ASCII-Codes 013+010) (**Factory setting**)
"(CR)"	<CR> Carriage Return (ASCII-Code 013)
"(LF)"	<LF> Line feed (ASCII-Code 010)

Note:

- Not visible for 2nd display.
- Each device has separate settings.

"RS CHAR**" – Char Set RS232C** [1)]

At this menu topic you can set the "Character Set" of the transmitted data to different RS232C serial receivers.

"IBM/DOS"	Char Set **IBM/DOS** (**Factory setting**)
"ANSI/WIN"	Char Set **ANSI/WINDOWS**

Note:

- Not visible for 2nd display.
- Each device has separate settings.

"USB**" – USB Interface**

At this menu topic you can select the mode of the "USB Device" interface and specify how the data is transmitted.

"USB"	Select the mode of the "USB Device" interface
"SEND.OFF"	Send mode switched off (**Factory setting**)
"SEND.STB"	If the «🖶» key is pressed, the next stable weight value will be sent.
"SEND.CONT"	All weight value updates will be sent regardless of stability, without pressing the «🖶» key.
"SEND.AUTO"	Every stable weight value will be sent, without pressing the «🖶» key.
"SEND.ALL"	If the «🖶» key is pressed, the weight value will be sent regardless of stability.

Note: This port is not usable for printers or displays.

"USB COM.S.**" – Options for the Data Communication Format (USB)**

This menu topic allows you to set the data format depending on which peripheral device is connected.

"MT-SICS"	The MT-SICS data transfer formats is used. (**Factory setting**) For more information see section ″MT-SICS Interface Commands and Functions″.

"MT-PM" The following PM balance commands are supported:

S	Send value
SI	Send immediate value
SIR	Send immediate value and repeat
SR	Send value and repeat
SNR	Send next value and repeat
T	Tare
TI	Tare immediately
B	Base (Negative values are limited up to the current tare values)
MI	Modify ambient vibration
MZ	Modify Auto Zero
M	Modified settings reset
ID	Identify
CA	Calibrate
D	Display (only symbol N and G available)

"SART" The following Sartorius commands are supported:

K	Ambient conditions: very stable
L	Ambient conditions: stable
M	Ambient conditions: unstable
N	Ambient conditions: very unstable
O	Block keys
P	Print key (print, auto print; activate or block)
Q	Acoustic signal
R	Unblock keys
S	Restart/self-test
T	Tare key
W	Calibration/adjustment (depending on the menu setting) *)
Z	Internal calibration/adjustment **)
f0_	Function key (F)
f1_	Function key (CAL)
s3_	C key
x0_	Perform internal calibration **)
x1_	Print balance/scale model
x2_	Print weighing cell serial number
x3_	Print software version

*) may be inaccessible on verified balances/scales

**) only on models with built-in motorized calibration weight

Functionality mapping

"HOST" **settings:**	**Sartorius printer settings:**
"SEND.OFF"	not applicable
"SEND.STB"	manually print with stability
"SEND.ALL"	manually print without stability
"SEND.CONT"	automatically print without stability

"SEND.AUTO"	similar applicable to automatically print when load is changed

"USB E.O.L.**" – End of Line USB**

At this menu topic you can set the "End of Line" character of the transmitted data to USB device.

"(CR)(LF)"	<CR><LF> Carriage Return followed by Line feed (ASCII-Codes 013+010) **(Factory setting)**
"(CR)"	<CR> Carriage Return (ASCII-Code 013)
"(LF)"	<LF> Line feed (ASCII-Code 010)

"USB CHAR**" – Char Set USB**

At this menu topic you can set the "Character Set" of the transmitted data to USB device.

"ANSI/WIN"	Char Set **ANSI/WINDOWS** (**Factory setting**)
"IBM/DOS"	Char Set **IBM/DOS**

"INTERVAL**" – Print Key Simulation**

At this menu topic you can activate a simulation of the «🖶» key. "INTERVAL" simulates a print key press every x seconds.

Range:	0 to 65535 seconds
0 sec:	disables the print key simulation

Factory setting: 0 sec

Note: The executed action is according to the configuration of the print key. (see interface setting)

"ERGOSENS**" – Settings for external key**

The METTLER TOLEDO "**ErgoSens**" or external contact switches (optional, see section accessories) can be connected to the "Aux" connection and these can be used to execute certain weighing functions.

"OFF"	Deactivate (**Factory setting**)
"->0<-"	Zero setting
"->T<-"	Taring
"PRINT"	Print «🖶»

---

1) Note for 2nd RS232C Interface

- If an optional 2nd interface is installed, the menu topic is displayed for each interface, e.g
  "BAUDRATE.1" for standard interface
  "BAUDRATE.2" for optional 2nd interface
- Only one printer can be set if two RS232 interfaces are existing.

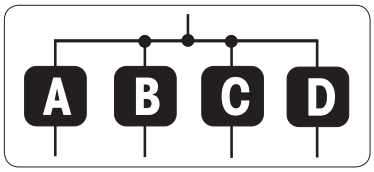
---

7 Applications

7.1 Application "Piece Counting"

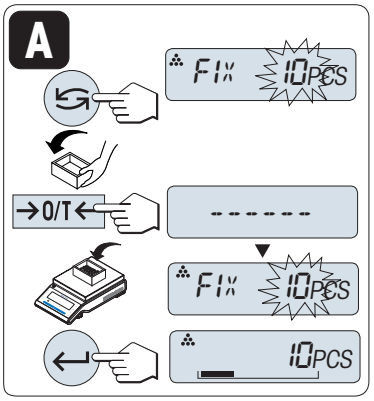
The "**Piece Counting**" application allows you to determine the number of pieces put on the weighing pan.
Requirement: The function "COUNTING" must be assigned to an «**F**x» key (see advanced menu topic "ASSIGN:Fx", factory setting: F1).

– Activate function "COUNTING" by pressing and holding the appropriate assigned «Fx» key (factory setting: F1).



Piece Counting first requires the setting of a reference weight, there are 4 possibilities:

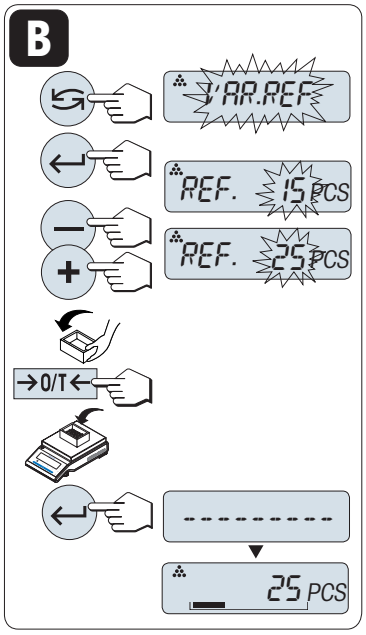
A Setting the reference **by multiple pieces with fix reference values**.
B Setting the reference **by multiple pieces with variable reference values**.
C Setting the reference **for 1 piece in weighing mode**.
D Setting the reference **for 1 piece in manual mode**.



Setting possibility

A Setting the reference by multiple pieces with fix reference values

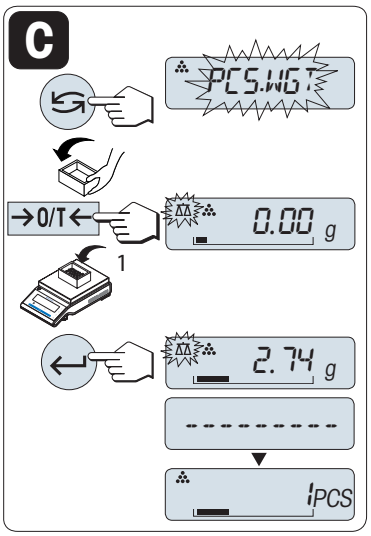
1 Select a number of reference pieces by scrolling with «↻». Possible numbers* are 5, 10, 20 and 50.
* with approved balances in selected countries: min 10
2 Press «→0/T←» to tare. If using: place empty container on the weighing pan first or tare again.
3 Add the selected number of reference pieces to container.
4 Press «↵» to confirm.



Setting possibility

B Setting the reference by multiple pieces with variable reference values

1 Select "VAR.REF" by scrolling with «↻». Press «↵» to confirm.
2 Select a number of reference pieces by scrolling up («+» key) or down («-» key). Speed up by press and hold. Possible numbers* are 1 to 999.
* with approved balances in selected countries: min 10
3 Press «→0/T←» to tare. If using: place empty container on the weighing pan first or tare again.
4 Add the selected number of reference pieces to container.
5 Press «↵» to confirm.



Setting possibility

C **Setting the reference for one piece in weighing mode**

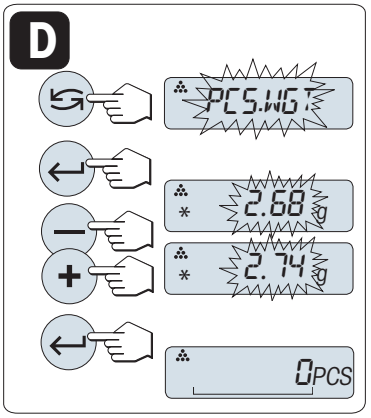
1 Select "PCS.WGT" by scrolling with «↻».

2 Press «→0/T←» to tare. If using: place empty container on the weighing pan first or tare again.

3 Add one reference piece to container. The weight of one piece is displayed.

4 Press «↵» to confirm.

Note: With approved balances, this setting is not available in selected countries.



Setting possibility

D **Setting the reference for one piece in manual mode**

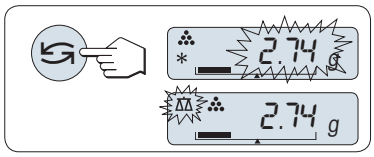
1 Select "PCS.WGT" by scrolling with «↻».

2 Press «↵» to confirm.

3 Enter the final reference one piece weight by scrolling up («**+**» key) or down («**-**» key). Speed up by press and hold.

4 Press «↵» to confirm.

Note: With approved balances, this setting is not available in selected countries.



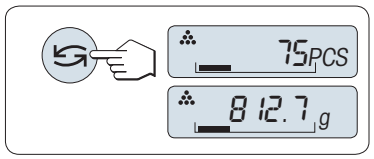
Switching between manual mode and weighing mode

– Press «↻» to switch between manual and weighing mode.

Note: By switching from weighing mode to manual mode the weight value will be transferred and can be changed manually.

Note: If without any key press within 60 seconds, the balance returns to the previous active application. Press «**C**» to cancel and returns to the previous active application.

On completion of the setting procedure, your balance is ready for piece counting.



Switching between piece count and weight display.

You can use the «↻» key at any time to switch the display between piece display, weighing unit "UNIT 1", "RECALL" value (if activated) and weighing unit "UNIT 2" (if different from "UNIT 1").

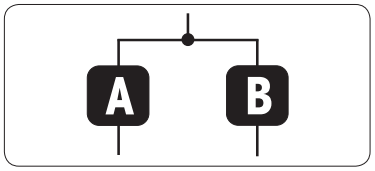
Note:

- The "RECALL" value is displayed with an asterisk (*) and icon "M" and can not be printed.
- Take into account minimum values: min. reference weight = 10d (10 digits), min. piece weight* = 1d (1 digit)!
  * with approved balances in selected countries: min 3e
- The current reference weight remains stored until the reference setting is changed.

7.2 Application "Percent Weighing"

The "**Percent Weighing**" application allows you to check a sample weight as percentage to a reference target weight.
Requirement: The function "PERCENT" must be assigned to an «**F**x» key (see advanced menu topic "ASSIGN:Fx", factory setting: F2).

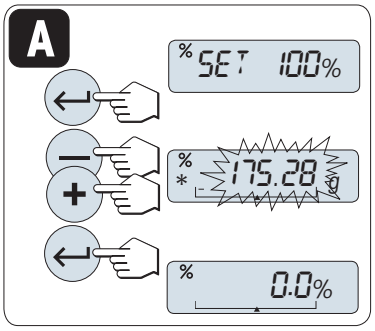
– Activate function percent weighing "PERCENT" by pressing and holding the appropriate assigned «**F**x» key (factory setting: F2).



Percent Weighing first requires the setting of a reference weight that should corresponds to 100%, there are 2 possibilities:

A Setting the reference **in manual mode (enter 100%)**.

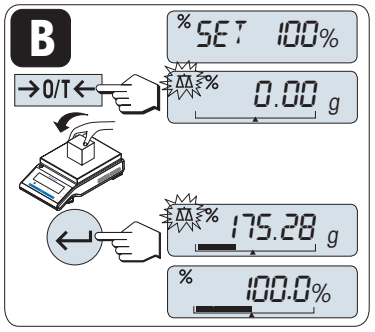
B Setting the reference **in weighing mode (weigh 100%)**.



Setting possibility

A **Setting the reference by manual mode (enter 100%)**

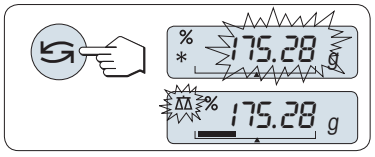
1 Press «↵» to activate manual mode.
2 Select the reference target weight (100%) by scrolling up («**+**» key) or down («**–**» key). Speed up by press and hold.
3 Press «↵» to confirm.



Setting possibility

B **Setting the reference by weighing mode (weigh 100%)**

1 Press «→0/T←» to tare the balance and to activate the weighing mode. If needed: place empty container on the weighing pan and tare again.
2 Load the reference weight (100%).
Note: Reference weight must be at least +/- 10d.
3 Press «↵» to confirm.



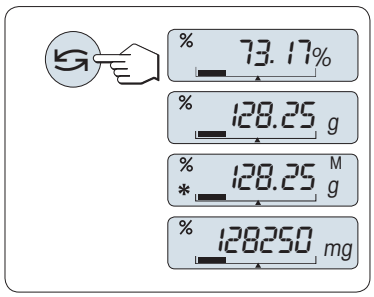
Switching between manual mode and weighing mode

– Press «⟲» to switch between manual and weighing mode.

Note: By switching from weighing mode to manual mode the weight value will be transferred and can be changed manually.

Note: If without any key press within 60 seconds, the balance returns to the previous active application.

On completion of the weighing-in procedure, your balance is ready for percent weighing.



Switching between percent and weight display

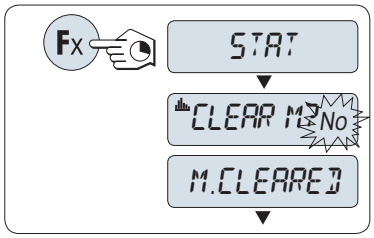
You can use the «⟲» key at any time to switch the display between percent display, weighing unit "UNIT 1", "RECALL" value (if activated) and weighing unit "UNIT 2" (if different from UNIT 1).

Note:

- The recall value is displayed with an asterisk (*) as well as icon "M" and can not be printed.
- The current set weight remains stored until it is redetermined.

7.3 Application "Statistics"

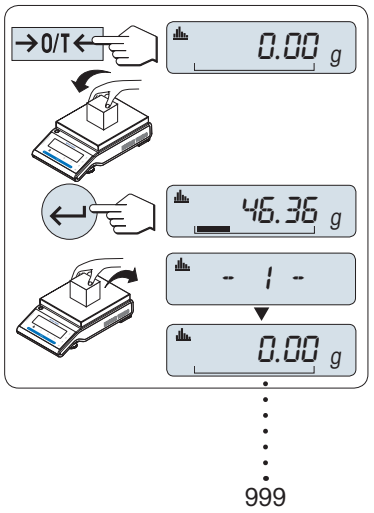
The "**Statistics**" application allows you to generate statistics of weighing values. 1 to 999 values are possible. **Requirement:** The function "STAT" must be assigned to an «**F**x» key (see advanced menu topic "ASSIGN:Fx").



1 Activate function "STAT" by pressing and holding the appropriate assigned «**F**x» key.

2 To continue the last statistics press «↵». For a new statistical evaluation press «⟳» to select "Yes" and press «↵» to clear the memory.

Note: If the memory is already cleared (sample counter is 0) the memory clear question will be not displayed.



Weighing the first sample weight:

1 Press «→0/T←» to zero/tare the balance if needed.

2 Load the first sample weight.

3 Press «↵». The display shows the sample count "- 1 -" and the current weight is stored as sample and the weight is printed out. **Note:** When the sample counter is displayed you may press «**C**» to undo (drop) this sample.

4 Unload the first sample weight.

Weighing further sample weights:

The same procedure as for the first sample weight.

- 1…999 samples are possible.
- The next value will be accepted if the sample weight is in the range 70% –130% of the current average value. "OUT OF RANGE" will be displayed if the sample is not accepted.

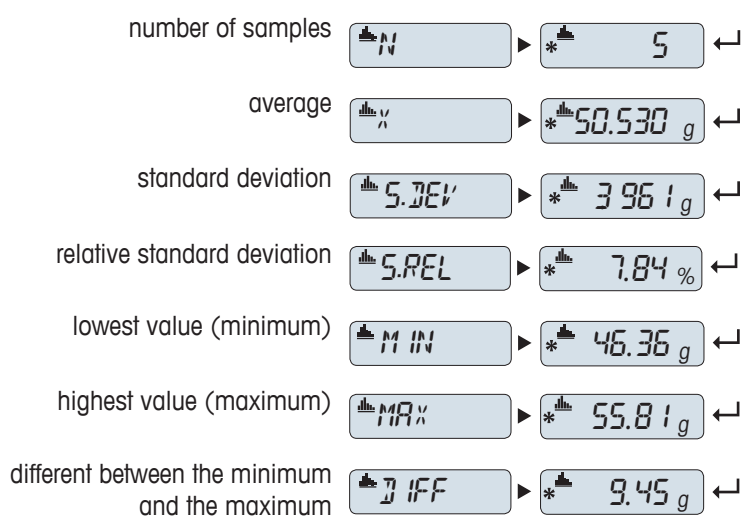
Results:

– If the numbers of sample are greater than or equal to 2, press «🖶», the results are displayed and printed.

Displayed results:

1 Press «↵» to show the next statistical value.

2 Press «**C**» to cancel displaying results and to continue weighing next sample.



Displayed results:

1 Press «↵» to show the next statistical value.

2 Press «**C**» to cancel displaying results and to continue weighing next sample.

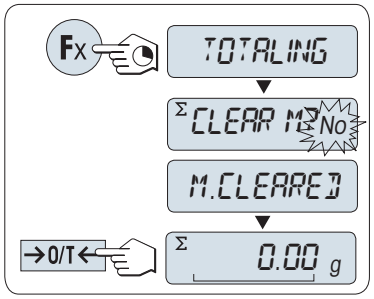
Printout:

```
------ Statistics ------
21.Jan 2009        12:56

METTLER TOLEDO

Balance Type     MS4002S
SNR           1234567890
------------------------
1                46.36 g
2                55.81 g
3                47.49 g
4                53.28 g
5                49.71 g
n                      5
x               50.530 g
s dev            3.961 g
s rel             7.84 g
Min.             46.36 g
Max.             55.81 g
Diff              9.45 g
Sum             252.65 g
------------------------
```

sum of all values 

7.4 Application "Totaling"

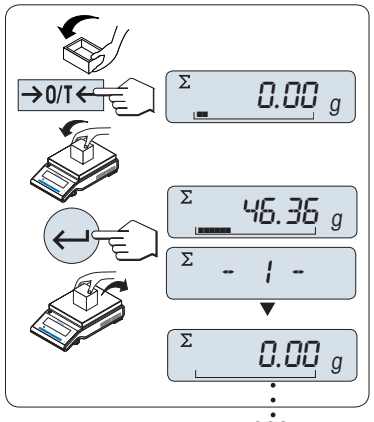
The "**TOTALING**" application allows you to weigh in different samples to add their weight values and to totalize them. 1 to 999 samples are possible.
Requirement: The function "TOTALING" must be assigned to an «**F**x» key (see advanced menu topic "ASSIGN:Fx").



1 Activate function "TOTALING" by pressing and holding the appropriate assigned «**F**x» key.

2 For a new totaling evaluation press «↻» (or «**+**» or «**–**») to enter "Yes" and press «↵» to clear the memory.
Note: If the memory is already cleared (sample counter is 0) the memory clear question will be not displayed.

3 Press «→0/T←» to zero or tare the balance.



Weighing in the sample weight:

1 If using a container: place empty container on the weighing pan and press «→0/T←» to zero or tare the balance.

2 Load the first sample weight.

3 Press «↵». The display shows the sample count "- 1 -" and the current weight is stored.
Note: When the sample counter is displayed you may press «**C**» to undo (drop) this sample.

4 Unload the first sample weight. The display shows zero.

Weighing in further sample weights:
The same procedure as for the first sample weight.

- 1…999 samples are possible.

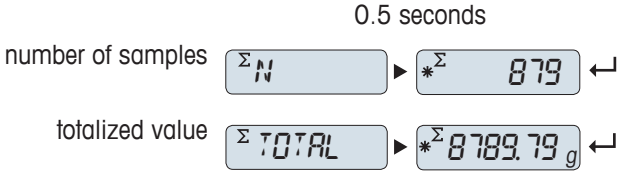
Results:

– If the numbers of sample are greater than or equal to 2, press «🖶», the results are displayed and printed.

Displayed results:

1 Press «↵» briefly to show the totalized value.

2 Press «**C**» briefly to cancel.



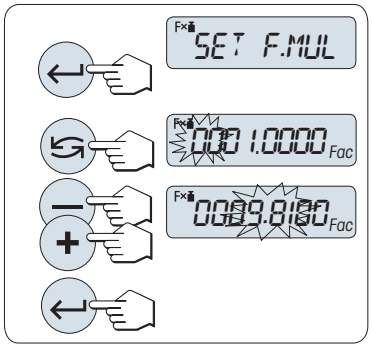
Printout:

```
------- Totaling -------
21.Jan 2009        12:56

METTLER TOLEDO

Balance Type     MS1602S
SNR           1234567890
------------------------
1                46.36 g
2                55.81 g
3                47.49 g
4                53.28 g
5                49.71 g
6                53.93 g
.
.
.
n                    879
Total          8789.79 g
------------------------
```

7.5 Application "Multiplication Factor Weighing"

The "**Multiplication Factor Weighing**" application allows you to multiply the weight value (in grams) by a predefined factor (result = factor * weight) and have it calculated to a predefined number of decimal places.
Requirement: The function "FACTOR M" must be assigned to an «**F**x» key (see advanced menu topic "ASSIGN:Fx").

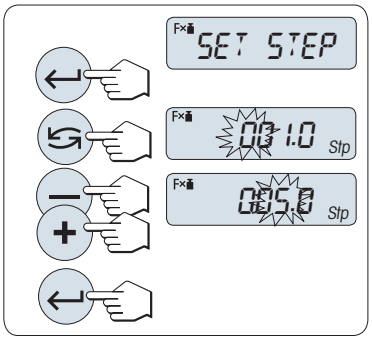
– Activate function "FACTOR M" by pressing and holding the appropriate assigned «**F**x» key.



1 **Setting the factor value:**

1 Press «↵» to execute "SET F.MUL". Either the factor 1 appears as default value or the factor that was saved most recently.
2 Press «↻» to select a digit. The selected digit is blinking.
3 For changing digits, press «**+**» to scroll up or «**–**» to scroll down.
4 Press «↵» to confirm the selected factor (no automatic acceptance).

Note: Zero for multiplication factor value is outside the allowed range, the error message "FACTOR OUT OF RANGE" will be displayed.



2 **Setting the step value:**

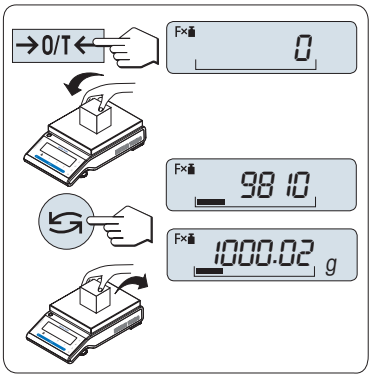
"SET STEP" appears in the display, and the program changes automatically to allow the display increments to be entered. The smallest possible display increment appears as default value, or the last value that was saved.

1 Press «↵» to execute "SET STEP".
2 Press «↻» to select a digit. The selected digit is blinking.
3 For changing digits, press «**+**» to scroll up or «**–**» to scroll down.
4 Press «↵» to confirm the selected step (no automatic acceptance).

Note: The allowed range for the step depends on the factor and the resolution of the balance. If it is outside the allowed range the error message "STEP OUT OF RANGE" will be displayed.

Note: If without any key press within 60 seconds, the balance returns to the previous active application. Press «**C**» to cancel.

On completion of the setting procedure, your balance is ready for multiplication factor weighing.



Weighing procedure

1 Press «→0/T←» to zero/tare.

2 Load sample weight on weighing pan.

3 Read the result. The appropriate calculation is then made using the weight of sample and the selected factor, the result being displayed with the selected display step.
Note: No units are displayed.

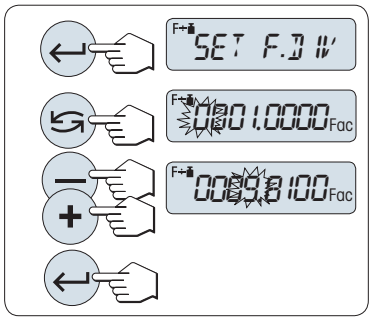
4 Unload sample weight.

Toggling between displaying the calculated value and the measured weight:
You can use the «⟲» key to toggle between the calculated Value, weight value "UNIT 1", "RECALL" value (if selected) and weight value "UNIT 2" (if different from "UNIT 1").

7.6 Application "Division Factor Weighing"

The "**Division Factor Weighing**" divide a predefined factor by the weight value (in grams) (result = factor / weight) and have it rounded to a predefined number of decimal places.
Requirement: The function "FACTOR D" must be assigned to an «**F**x» key (see advanced menu topic "ASSIGN:Fx".

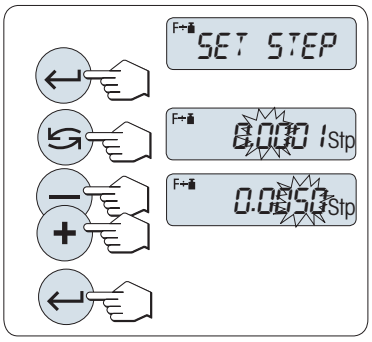
– Activate function "FACTOR D" by pressing and holding the «**F**x» key.



1 **Setting the Factor Value:**

1 Press «↵» to execute "SET F.DIV". Either the factor 1 appears as default value or the factor that was saved most recently.
2 Press «↻» to select a digit. The selected digit is blinking.
3 For changing digits, press «**+**» key to scroll up or «**–**» to scroll down.
4 Press «↵» briefly to confirm the selected factor (no automatic acceptance).

Note: Zero for division factor value is outside the allowed range, the error message "FACTOR OUT OF RANGE" will be displayed.



2 **Setting the step value:**

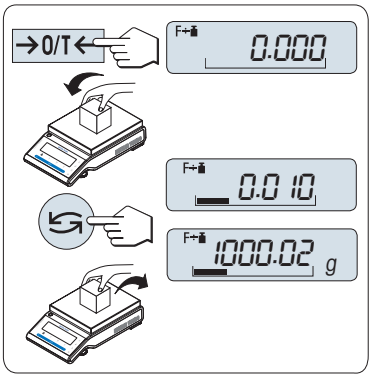
"SET STEP" appears in the display, and the program changes automatically to allow the display increments to be entered. The smallest possible display increment appears as default value, or the last value that was saved.

1 Press «↵» to execute "SET STEP".
2 Press «↻» to select a digit. The selected digit is blinking.
3 For changing digits, press «**+**» to scroll up or «**–**» to scroll down.
4 Press «↵» to confirm the selected step (no automatic acceptance).

Note: The allowed range for the step depends on the factor and the resolution of the balance. If it is outside the allowed range the error message "STEP OUT OF RANGE" will be displayed.

Note: If without any key press within 60 seconds, the balance returns to the previous active application. Press «**C**» to cancel and returns to the previous active application.

On completion of the setting procedure, your balance is ready for division factor weighing.



Weighing procedure

1 Press «→0/T←» to zero/tare.

2 Load sample weight on weighing pan.

3 Read the result. The appropriate calculation is then made using the weight of sample and the selected factor, the result being displayed with the selected display step.
Note: No units are displayed. To avoid a division by zero, the factor division is not calculated at zero.

4 Unload sample weight.

Toggling between displaying the calculated value and the measured weight:
You can use the «⟲» key to toggle between the calculated Value, weight value "UNIT 1", "RECALL" value (if selected) and weight value "UNIT 2" (if different from "UNIT 1").

7.7 Application "Density"

The "**Density**" application allows you to determine the density of solid bodies and liquids. Determination of the density uses **Archimedes' principle** according to which a body immersed in a fluid undergoes an apparent loss in weight which is equal to the weight of the fluid it displaces.

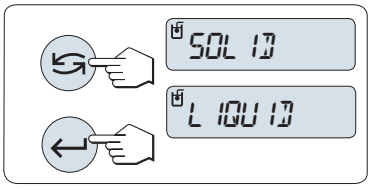
To determine the density of solid bodies, we recommended you to work with the optional density kit which contains all the attachements and aids needed for convenient and precise density determination. To determine the density of liquids, you additionally need a sinker which you can also obtain from your METTLER TOLEDO dealer.

Note for performing of density determinations:

- You can also use the hanger for weighing below the balance which belongs to your balance.
- We recommended you to consult the operating instructions enclosed with the density kit.
- If a METTLER TOLEDO printer is attached to your balance, the settings will be automatically recorded.

Requirement: The function "DENSITY" must be assigned to an «**F**x» key (see advanced menu topic "ASSIGN:Fx"). Density kit is installed.

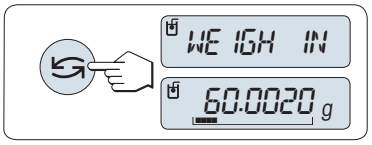
– Activate function "DENSITY" by pressing and holding the appropriate assigned «Fx» key.



Setting the method for density determination

1 Select:
"SOLID", the function for the density determination of solids, or
"LIQUID", the function for the density determination of liquids with a sinker.

2 Press «↵» to confirm the selection

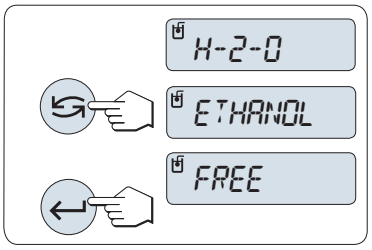


Switching the display between user guidance and weighing

– Press «⟳» to toggle the display between user guidance and weighing.

7.7.1 Density Determination of Solids

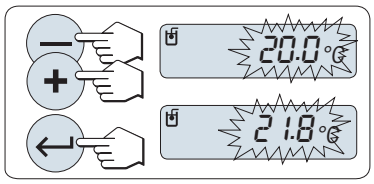
Requirement: The method "SOLID" is set.



Setting the parameter of the auxiliary liquid

1 Select the auxiliary liquid by scrolling with «⟳» (or «-» up / «+» down):
"H-2-O" for distilled water , "ETHANOL" or "FREE" for a freely definable auxiliary liquid.

2 Press «↵» to confirm the selection.

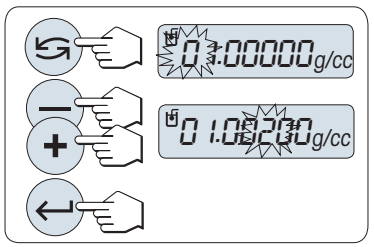


If you have selected water or ethanol as the auxiliary liquid:

1 Enter the current temperature of the auxiliary liquid (read off on thermometer). Change the value by scrolling up «+» or down «-». The temperature ranges from 10 °C to 30.9 °C.

2 Press «↵» to confirm the value.

Note: The densities of distilled water and ethanol in the range 10 °C to 30.9 °C are stored in the balance.



If you have selected a freely definable auxiliary liquid:

Enter the density of the auxiliary liquid at the current temperature (read off on thermometer).

1 Press «⟳» to select a digit. The selected digit is blinking.

2 For changing digits, press «+» to scroll up or «-» to scroll down.

3 Press «↵» to confirm the selected value.

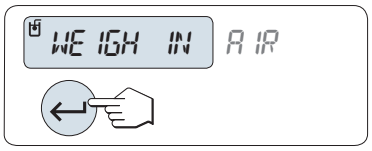
Note: If without any key press within 60 seconds or by pressing «**C**», the balance returns to the previous active application.

On completion of the settings, your balance is ready for performing the density determination of liquids.

Note: Taring the balance is possible at any time.

The balance prompts you: "PRESS ENTER TO START".

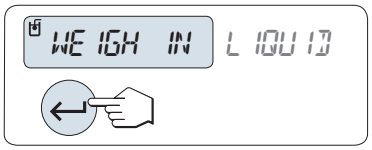
– Press «↵» to start. Tare/Zero is executed.



The balance prompts you to weigh the solid in air "WEIGH IN AIR".

1 Load the solid.

2 Press «↵» to initiate the measurement.



The balance prompts you to weigh the solid in the auxilliary liquid "WEIGH IN LIQUID".

1 Load the solid.

2 Press «↵» to initiate the measurement.

The balance now shows the determined density of the solid.

Note:

- This result has already been corrected for the air buoyancy. The buoyancy caused by the two immersed wires (Ø 0.6 mm) can be neglected.
- By pressing «**C**», the balance returns to "PRESS ENTER TO START".

Result:

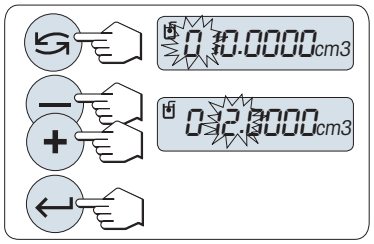
Press «🖶», the result will be printed.

Sample printout:

```
---- Density Solid -----
18.Mar 2010         20:14
Balance Type       MS204S
SNR            1234567890
------------------------

ID:      ................

Liquid:
H-2-O       0.99822 g/cm3
Temp.          20.0 °C
Weight in air:
            60.0020 g
Weight in liquid:
            49.9997 g
Volume of solid:
              1.625 cm3

Density:      5.988 g/cm3
              ===========

Signature

.........................
------------------------
```

7.7.2 Density Determination of Liquids

Requirement: The method "LIQUID" is set.



Setting the displacement volume of your sinker

Press «↵» to confirm the default value of 10.0 cm^3 or change it if needed:

1 Press «⟳» to select a digit. The selected digit is blinking.
2 For changing digits, press «+» to scroll up or «-» to scroll down
3 Press «↵» to confirm the selected value.

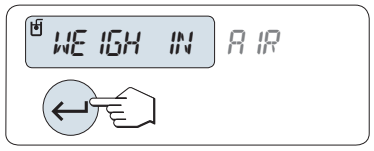
Note: If without any key press within 60 seconds or by pressing «**C**», the balance returns to the previous active application.

On completion of the settings, your balance is ready for performing the density determination of liquids.

Note: Taring the balance is possible at any time.

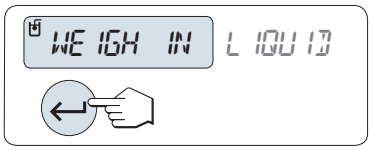
The balance prompts you: "PRESS ENTER TO START".

– Press «↵» to start.



The balance prompts you to weigh the sinker in air "WEIGH IN AIR".

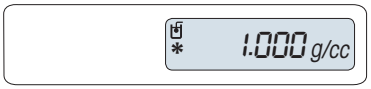
1 Position the sinker.
2 Press «↵» to initiate the measurement.



The balance prompts you to weigh the sinker in the liquid "WEIGH IN LIQUID".

1 Pour the liquid into the beaker. Make sure that the sinker is immersed by al least 1 cm in the liquid, and that there are no air bubbles in the container.

2 Press «↵» to initiate the measurement.



The balance now shows the determined density of the liquid at the current temperature (read off on the thermometer).

Note:

- This result has already been corrected for the air buoyancy. The buoyancy caused by the immersed wire (Ø 0.2 mm) of the sinker can be neglected.
- By pressing «**C**», the balance returns to "PRESS ENTER TO START".

Result:

Press «🖶», the result will be printed.

Sample printout:

```
---- Density Liquid -----
18.Mar 2010        20:14
Balance Type      MS204S
SNR           1234567890
------------------------

ID:     ................

Temp. of liquid:
            ............

Displaced liquid:
           10.0023 g

Density:     1.000 g/cm3
             ===========

Signature

.........................
------------------------
```

7.7.3 Formulae Used to Calculate Density

The "DENSITY" Application is based on the formulae listed below.

Formulae for determining the density of solids with compensation for air density

$$\rho = \frac{A}{A-B}(\rho_0 - \rho_L) + \rho_L$$

$$V = \alpha \frac{A - B}{\rho_0 - \rho_L}$$

ρ = Density of the sample

A = Weight of the sample in air

B = Weight of the sample in the auxiliary liquid

V = Volume of the sample

ρ_0 = Density of the auxiliary liquid

ρ_L = Density of Air (0.0012 g/cm^3)

α = Weight correction factor (0.99985), to take the atmospheric buoyancy of the adjustment weight into account

Formula for determining the density of liquids with compensation for air density

$$\rho = \alpha \frac{P}{V} + \rho_L$$

ρ = Density of the liquid

P = Weight of the displaced liquid

V = Volume of the sinker

ρ_L = Density of air (0.0012 g/cm^3)

α = Weight correction factor (0.99985), to take the atmospheric buoyancy of the adjustment weight into account

Density Table for Distilled Water

T/°C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
10.	0.99973	0.99972	0.99971	0.99970	0.99969	0.99968	0.99967	0.99966	0.99965	0.99964
11.	0.99963	0.99962	0.99961	0.99960	0.99959	0.99958	0.99957	0.99956	0.99955	0.99954
12.	0.99953	0.99951	0.99950	0.99949	0.99948	0.99947	0.99946	0.99944	0.99943	0.99942
13.	0.99941	0.99939	0.99938	0.99937	0.99935	0.99934	0.99933	0.99931	0.99930	0.99929
14.	0.99927	0.99926	0.99924	0.99923	0.99922	0.99920	0.99919	0.99917	0.99916	0.99914
15.	0.99913	0.99911	0.99910	0.99908	0.99907	0.99905	0.99904	0.99902	0.99900	0.99899
16.	0.99897	0.99896	0.99894	0.99892	0.99891	0.99889	0.99887	0.99885	0.99884	0.99882
17.	0.99880	0.99879	0.99877	0.99875	0.99873	0.99871	0.99870	0.99868	0.99866	0.99864
18.	0.99862	0.99860	0.99859	0.99857	0.99855	0.99853	0.99851	0.99849	0.99847	0.99845
19.	0.99843	0.99841	0.99839	0.99837	0.99835	0.99833	0.99831	0.99829	0.99827	0.99825
20.	0.99823	0.99821	0.99819	0.99817	0.99815	0.99813	0.99811	0.99808	0.99806	0.99804
21.	0.99802	0.99800	0.99798	0.99795	0.99793	0.99791	0.99789	0.99786	0.99784	0.99782
22.	0.99780	0.99777	0.99775	0.99773	0.99771	0.99768	0.99766	0.99764	0.99761	0.99759
23.	0.99756	0.99754	0.99752	0.99749	0.99747	0.99744	0.99742	0.99740	0.99737	0.99735
24.	0.99732	0.99730	0.99727	0.99725	0.99722	0.99720	0.99717	0.99715	0.99712	0.99710
25.	0.99707	0.99704	0.99702	0.99699	0.99697	0.99694	0.99691	0.99689	0.99686	0.99684
26.	0.99681	0.99678	0.99676	0.99673	0.99670	0.99668	0.99665	0.99662	0.99659	0.99657
27.	0.99654	0.99651	0.99648	0.99646	0.99643	0.99640	0.99637	0.99634	0.99632	0.99629
28.	0.99626	0.99623	0.99620	0.99617	0.99614	0.99612	0.99609	0.99606	0.99603	0.99600
29.	0.99597	0.99594	0.99591	0.99588	0.99585	0.99582	0.99579	0.99576	0.99573	0.99570
30.	0.99567	0.99564	0.99561	0.99558	0.99555	0.99552	0.99549	0.99546	0.99543	0.99540

Density Table for Ethanol

T/°C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
10.	0.79784	0.79775	0.79767	0.79758	0.79750	0.79741	0.79733	0.79725	0.79716	0.79708
11.	0.79699	0.79691	0.79682	0.79674	0.79665	0.79657	0.79648	0.79640	0.79631	0.79623
12.	0.79614	0.79606	0.79598	0.79589	0.79581	0.79572	0.79564	0.79555	0.79547	0.79538
13.	0.79530	0.79521	0.79513	0.79504	0.79496	0.79487	0.79479	0.79470	0.79462	0.79453
14.	0.79445	0.79436	0.79428	0.79419	0.79411	0.79402	0.79394	0.79385	0.79377	0.79368
15.	0.79360	0.79352	0.79343	0.79335	0.79326	0.79318	0.79309	0.79301	0.79292	0.79284
16.	0.79275	0.79267	0.79258	0.79250	0.79241	0.79232	0.79224	0.79215	0.79207	0.79198
17.	0.79190	0.79181	0.79173	0.79164	0.79156	0.79147	0.79139	0.79130	0.79122	0.79113
18.	0.79105	0.79096	0.79088	0.79079	0.79071	0.79062	0.79054	0.79045	0.79037	0.79028
19.	0.79020	0.79011	0.79002	0.78994	0.78985	0.78977	0.78968	0.78960	0.78951	0.78943
20.	0.78934	0.78926	0.78917	0.78909	0.78900	0.78892	0.78883	0.78874	0.78866	0.78857
21.	0.78849	0.78840	0.78832	0.78823	0.78815	0.78806	0.78797	0.78789	0.78780	0.78772
22.	0.78763	0.78755	0.78746	0.78738	0.78729	0.78720	0.78712	0.78703	0.78695	0.78686
23.	0.78678	0.78669	0.78660	0.78652	0.78643	0.78635	0.78626	0.78618	0.78609	0.78600
24.	0.78592	0.78583	0.78575	0.78566	0.78558	0.78549	0.78540	0.78532	0.78523	0.78515
25.	0.78506	0.78497	0.78489	0.78480	0.78472	0.78463	0.78454	0.78446	0.78437	0.78429
26.	0.78420	0.78411	0.78403	0.78394	0.78386	0.78377	0.78368	0.78360	0.78351	0.78343
27.	0.78334	0.78325	0.78317	0.78308	0.78299	0.78291	0.78282	0.78274	0.78265	0.78256
28.	0.78248	0.78239	0.78230	0.78222	0.78213	0.78205	0.78196	0.78187	0.78179	0.78170
29.	0.78161	0.78153	0.78144	0.78136	0.78127	0.78118	0.78110	0.78101	0.78092	0.78084
30.	0.78075	0.78066	0.78058	0.78049	0.78040	0.78032	0.78023	0.78014	0.78006	0.77997

Density of C_2H_5OH according to the "American Institute of Physics Handbook".

7.8 Application "Routine Test"

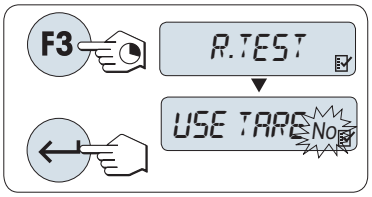
The "**Routine Test**" application allows you to determine the sensitivity of the balance. More about periodic sensitivity tests (routine tests) see: **GWP®** (Good Weighing Practice) on **www.mt.com/gwp**.
GWP gives clear recommendation for routine testing:

- how should I test my balance?
- how often?
- where can I reduce efforts?

More about test weights see **www.mt.com/weights**.

Requirement:

- The function "R. TEST" must be assigned to «**F3**» key (see advanced menu topic "ASSIGN:F3").
- It is recommended to connect a printer or a PC to the balance for showing the results.



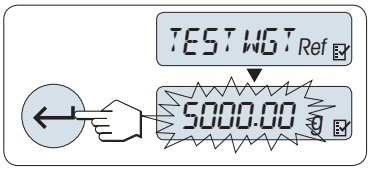
1 Activate function "R. TEST" by pressing and holding the assigned «**F3**» key.

2 Select "No" (no tare weight used).
If a tare weight is used during the test select "Yes" (use a tare weight). To toggle between "Yes" and "No" use «⇆» (or «**+**» or «**–**»).

3 Press «↵» to confirm the selection.

Note:

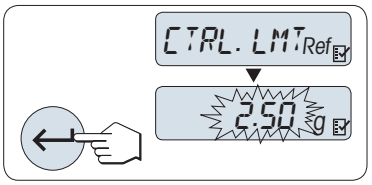
- It is recommended to test the sensitivity without tare load. (factory setting "No").
- If using tare: Make sure that tare weight plus test weight is not exceeding max. load.



Setting the reference test weight value
The default value of the test weight: Next smaller OIML weight than the maximum load of your balance according to the GWP® recommendation.

1 For changing the value, press «**+**» to scroll up or «**–**» to scroll down. Progressing speed by press and hold.

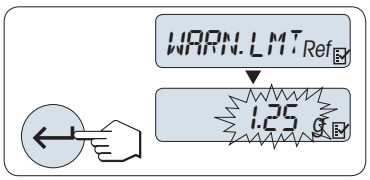
2 Press «↵» to confirm the value.



Setting the Control Limit
The default value of the control limit:
Test weight x weighing process tolerance / 2
Example: 5000 g x 0.1% / 2 = 2.50 g.

1 For changing the value, press «**+**» to scroll up or «**–**» to scroll down. Progressing speed by press and hold.

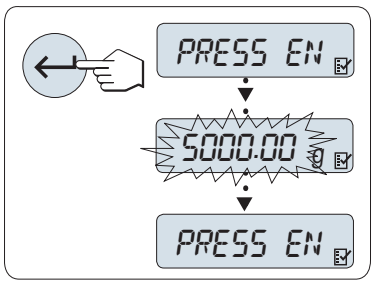
2 Press «↵» to confirm the value.



Setting the Warning Limit
The default value of the warning limit:
Warning limit = control limit / safety factor
Example: 2.5 g / 2 = 1.25 g.

1 For changing the value, press «+» to scroll up or «–» to scroll down. Progressing speed by press and hold.
2 Press «↵» to confirm the value.

Note: The default values of control limit and the warning limit are evaluated according the GWP recommendation. These are based under the assumption that the weighing process tolerance is 0.1% and the safety factor is 2.



On completion of the setting procedure, your balance is ready for the routine test procedure.
Note: The test weight must be acclimatized to the ambient temperature of the balance.

1 Press «↵» to start the test.
2 Follow the instructions on the display. If the test weight value is flashing: Load the test weight (displayed value).

The printout starts after the weighing pan is unloaded.

Exit the current test procedure:

– Press and hold «⚖», «F1», «F2» for executing a new application.

Printout:

```
----- Routine Test -----
21.Jan 2009        12:56

METTLER TOLEDO

Balance Type  MS6002S/01
SNR           1234567890

Sensitivity:
Test weight    5000.00 g
Value          5000.11 g
Warning L.        1.25 g
Control L.        2.50 g
Warning L.           OK
Control L.           OK

Signature


.......................
-----------------------
```

What if Warning Limit or Control Limit are "FAILED**"?**

The "SOP for Periodic Sensitivity Tests (Routine Tests)" provides information about measures when routine tests fail. Find a download version of these SOPs on **www.mt.com/gwp**, link "**GWP® The Program / Routine Operation**".

Content of SOP:

- Preparation
- Test procedure

- Evaluation
- Deviation
  - If Warning Limit "FAILED"
  - If Control Limit "FAILED"

7.9 Application "Diagnostics"

The "**Diagnostics**" application allows you to carry out predefined diagnostics tests and to view or print predefined sets of balance information. This diagnostics tool helps you find errors faster and more efficiently.
Requirement: A printer or a PC is connected to the balance for showing the results.

1 Activate "ADVANCED" menu. (See section menu operation)

2 Activate function "DIAGNOSE" by pressing «↵».

3 Use «⟳» to select appropriate tests.

7.9.1 Repeatability Test

The repeatability test allows you to repeat tests with internal weight for a given number of times.
Note: On models with internal weights only.

1 Press «↵» to activate repeatability test "REPEAT.T". "R. TST. 10" appears on the Display.

2 Enter the number of times (blinking) by pressing «**+**» or «**–**». Possible values are 5, 10 (default), 20, 50, 100 times.

3 Press «↵» to start the test. The message "RUNNING REPEAT TEST" is displayed till the tests are completed.

4 Press «🖶» to print the test information..

5 Press «↵» to scroll forward through the displayed list.

6 Press «**C**» to cancel the test procedure. The balance will return to the topic "DIAGNOSE".

Sample Information Displayed:

Displayed for 0.5 s	Display
"S DEV"	* 0.004 g
"MAX. TEMP"	21.2 °C
"MIN. TEMP"	21.0 °C
"MEAN. TEMP"	21.1 °C
"TOT.TIME"	00:01:26

Sample Printout:

```
-- Repeatability Test --
21.Jan 2009        11:34

METTLER TOLEDO

Balance Type  MS6002S/01
SNR           1234567890
SW                 V1.00
Temperature      21.3 °C
No. of tests          10
------------------------
1. Time         00:00:00
1. Temp.         21.3 °C
2. Time         00:00:04
2. Temp.         21.3 °C
.
.
.
------------------------
s Dev.          0.004 g
Max Temp.       21.2 °C
Min Temp.       21.0 °C
Mean Temp.      21.1 °C
Total Time     00:00:44
------------------------
```

Examples:

Repeatability test is a tool to do functional check with the balance. It may be performed:

- **To check function of balance**
  - during installation to store print out with installation documents.
  - after preventative maintenance to store print out with installation maintenance report.
  - when remarkable decrease of weighing performance occurs, so that you can email/fax print out to service support provider for diagnose purposes.
- **To develop the optimal environment settings** (see menu topic "ENVIRON.").
  Measure the time you need to perform repeatability test with each "STABLE", "STANDARD" and "UNSTABLE" setting. The setting with the fastest total time suits best for the existing environmental conditions.

7.9.2 Display Test

The display test allows you to test the display of the balance.

1 Press «↵» to start "DISPLAY".
All possible segments and icons on the display will illuminate.

2 Press «🖶» to print the test information.

3 Press «**C**» to cancel the test procedure. The balance will return to the topic "DIAGNOSE".

Sample Printout:

```
----- Display Test -----
21.Jan 2009        11:34

METTLER TOLEDO

Balance Type      MS204S
SNR           1234567890
SW                 V1.00
Display Test        DONE
------------------------
```

7.9.3 Key Test

The key test allows you to test the keys of the balance.

1 Press «↵» to start "KEYPAD T".

2 The message "KEY TEST - PRESS KEY TO BE TESTED" is displayed scrolling during the duration of the key test. Press every Key briefly. Each press of a key beeps and echoes with "OK" on the display.

3 Second press «**C**» key to print the test information. The test procedure will be cancelled and the balance will return to the topic "DIAGNOSE". If a key has not been tested before printing, then the test results will be indicated with a "----" line.

Sample Information Displayed:

Key	Display
«»	1/10 D OK
«»	MENU OK
«»	CAL OK
«»	PRINT OK
«–»	MINUS OK
«+»	PLUS OK
«»	TOGGLE OK
«↵»	ENTER OK
«**C**»	C OK
«→0/T←»	0/T OK

Sample Printout:

```
------- Key Test -------
21.Jan 2009        11:34

METTLER TOLEDO

Balance Type      MS204S
SNR           1234567890
SW                 V1.00
1/10 d Key            OK
Menu Key              OK
Cal Key               OK
Print Key             OK
Minus Key             OK
Plus Key              OK
Toggle Key            OK
Enter Key             OK
Zero/Tare Key         OK
Cancel Key            OK
------------------------
```

7.9.4 Motor Test

The motor test allows you to test the calibration motor of the balance.
Note: On models with internal weight only.

1 Press «↵» to start "CAL.MOT. T".
"RUNNING" is displayed during the Motor Test. A motor test is deemed successful when all the motor positions have been successfully tested. At the end of the test, the test information will be printed.

2 Press «🖶» for printout.

3 Press «**C**» to cancel the test procedure. The balance will return to the topic "DIAGNOSE".

Sample Printout:

```
------ Motor Test ------
21.Jan 2009        11:34

METTLER TOLEDO

Balance Type      MS204S
SNR           1234567890
SW                 V1.00
Motor Test            OK
------------------------
```

7.9.5 Balance History

The balance history function allows you to view and print the history of the balance.

1 Press «↵» to start "BAL.HIST" .

2 Press «🖶» for printout.

3 Press «↵» to scroll forward through the displayed list of balance history information.

4 Press «**C**» to cancel the test procedure. The balance will return to the topic "DIAGNOSE".

Sample Information Displayed:

Information	Display
Operation Time (year:day:hour)	00:018:04
Total load kg	115.7191 kg
Number of weighings	1255
Number of key pressed	4931
Number of motor movements	1012
Backlight time (year:day:hour)	00:018:04
Next service due date	01:01:2010

Sample Printout:

```
--- Statistical Info ---
21.Jan 2009        11:34

METTLER TOLEDO

Balance Type     MS4002S
SNR           1234567890
SW                 V1.00
------------------------
Operating time
                  18d 4h
Total weight loaded
             115.7191 kg
Number of weighings
                   1255
Number of key presses
                   4931
Motor movements
                   1012
Backlight operating time
                  18d 4h
Next service due date
              01.01.2010
------------------------
```

7.9.6 Calibration History

The "Calibration History" function allows you to view and print information of the last 30 (thirty) balance adjustment. Adjustments made by a service technician and normal user are counted together.

1 Press «↵» to start "CAL.HIST".

2 Press «🖶» for printout.

3 Press «↵» key to scroll forward through the displayed list of Adjustments history information.

4 Press «**C**» to cancel the test procedure. The balance will return to the topic "DIAGNOSE".

Sample Information Displayed:

Note	Display	
S = External adjusted service	05:03:09S	01
	-3 PPM	
F = FACT	05:03:09F	02
	2 PPM	
	. . .	. . .
I = Internal adjusted	04:03:09I	28

Note	Display	
I = Internal adjusted	-1 PPM	28
E = External adjusted user	03:03:09E	29
	4 PPM	
F = FACT	02:03:09F	30
	1 PPM	

Sample Printout:

```
------ Calibration -----
05.Mar 2009        11:34

METTLER TOLEDO

Balance Type      MS204S
SNR           1234567890
SW                  1.50
------------------------
01 05.Mar  2009    11:34
External ADJ SERVICE
                  23.5°C
Diff               -3ppm
------------------------
02 05.Mar  2009    09:00
FACT
                  22.4°C
Diff                2ppm
------------------------
.
.
.
28 03.Mar  2009    10:59
Internal ADJ
                  22.6°C
Diff               -1ppm
------------------------
29 02.Mar  2009    16:34
External ADJ USER
                  24.6°C
Diff                4ppm
------------------------
30 02.Mar  2009    18:36
FACT
                  22.4°C
Diff                1ppm
------------------------
```

7.9.7 Balance Information

The balance information function allows you to view and print information about your balance.

1 Press «↵» to start "BAL.INFO".

2 Press «🖶» for printout.

3 Press «↵» to scroll forward through the displayed list of Balance information.

4 Press «**C**» to cancel the test procedure. The balance will return to the topic "DIAGNOSE".

Sample information displayed:

Information	Display
Balance type	TYPE MS6002S
Max. load	MAX 6200 g
Software platform	PLATFORM RAINBOW
Serial number	SNR 1234567890
Type definition number	TDNR 9.6.3.411
Software version	SOFTWARE V1.00
Cell ID	CELL ID 1172400044
Cell type	CELL TYPE MMAI6000G2
Tolerance revision number	TOLERANCE NO2
Language	LANGUAGE ENGLISH

Sample Printout:

```
-- Balance Information -
05.Mar 2009        11:34

METTLER TOLEDO

Balance Type     MS6002S
SNR           1234567890
SW                 V1.00
Max               6200 g
Platform         Rainbow
TDNR      9.6.3.411.2-03
Cell ID       1172400044
Cell Type     MMAI6000G2
Tolerance Rev. no.     2
Language         English
------------------------
```

7.9.8 Service Provider Information

The service provider Information function allows you to print information about your service provider.

1 Press «↵» to start "PROVIDER". The service provider information will be displayed.

2 Press «🖶». The service provider information will be printed and the balance will return to the topic "DIAGNOSE".

Sample Printout:

```
--- Service Provider ---
21.Jan 2009        11:34

METTLER TOLEDO
Im Langacher
CH-8606 Greifensee
Switzerland
(+41) 044 944 22 11
------------------------
```

8 Communication with Peripheral Devices

8.1 Function PC-Direct

The numerical value displayed at the balance can be transferred to the cursor position in Windows Applications (e.g. Excel, Word) as by typing with the keyboard.

Note: The units will not be transferred.

Requirements

- PC with Microsoft Windows® operating system (Version 98, 98SE, ME, NT4.0, 2000, XP) and serial interface RS232.
- Windows Application (e.g. Excel).
- Balance to PC connection with cabel RS232 (e.g. No. 11101051 see chapter accessories).
- Balance Interface Setting (see Interface Menu):
  - Topic "RS232": set "PC-DIR." and select the most appropriate option for the desired weighing result.
  - Save changes.

Settings at the PC

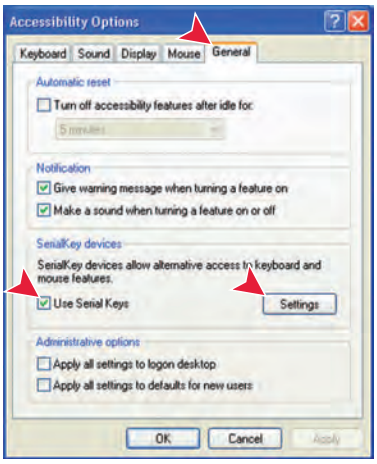
Note:

- With all country-specific keyboards, in which the "Shift" key must be pressed for entering numbers, "Caps Lock" must be activated for transferring of correct data (e.g. with french keyboards).
- The following examples are based on Windows XP.

1 Click "start".

2 Click "ControlPanel".

3 Click "Accessibility Options" in the Control Panel.

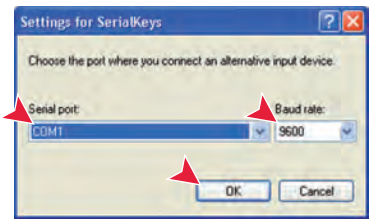


Accessibility Option

1 Click "General" Tab.

2 Enter a check mark at "Use Serial Keys".

3 Click "Settings".



Settings for SerialKeys

1 Select the serial port to be used for connection with the balance.

2 Set the baud rate to 9600

3 Click "OK".

Complete the settings

1 Click "Apply" when active (wait until active).

2 Click "OK" .

Note: If the "serial key" is enabled, applications that use the same port may not function correctly. Remove the check mark from the check box "Use Serial Keys" to disable serial key function.

Checking Operation

1 Start Excel (or another application) at the PC.

2 Activate a cell in Excel.

According to your selected "PC-DIR." option, the displayed values will appear in the column one after the other one in the different rows.

8.2 Installing USB Device Interface

To perform the functionality "HOST" with a PC equipped only with a USB Interface, you have to assign an appropriate USB Driver on the PC first. You can find the "NewClassic Balance USB Installer" on the METTLER-TOLEDO website at the following address:

www.mt.com/newclassic

Requirements

- Balance with USB Device Interface.
- PC with Microsoft Windows® operating system (Version , XP SP2, Vista 32 or 7 32).
- Internet connection and web browser (e.g. MS Internet Explorer).
- PC to balance USB connection cable.

Installing the "NewClassic Balance USB Installer" on the PC.

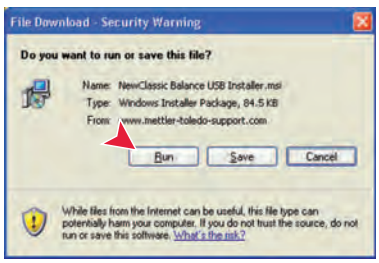
1 Connect to the Internet.

2 Go to the site "**www.mt.com/newclassic**".

3 Click "Support" tab on the NewClassic Balance Site.

4 Click "Download Center"

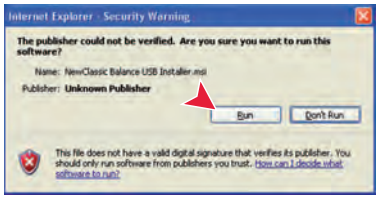
5 Click "USB Driver"



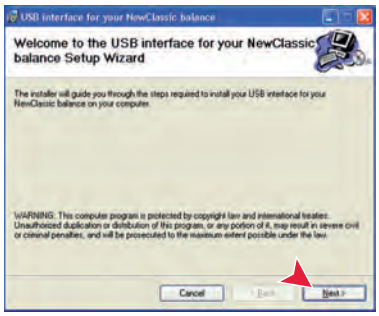
Install "NewClassic Balance USB Installer.msi

1 Click "Run" to install (recommended) or

2 Click "Save" to download.



– Click "Run".



– Click "Next" and follow the Installer's instructions.

Install your Balance

1 Switch the Balance "off".

2 Connect the Balance to the prefered USB Port on the PC.

3 Switch the Balance "on".

4 Follow the instructions of the Wizard and install the Software automatically (recommended)

Note: The Wizard apears again for each USB port, either on your PC or if another balance is connected.

Warning: Do not click "Cancel" as for the connected USB port, it might not be possible anymore to perform the installation process.

9 Firmware (Software) Updates

METTLER TOLEDO is continuously improving its balance firmware (software) for the benefit of customers. So that the customer can benefit quickly and easily from further developments, METTLER TOLEDO makes the latest firmware versions available on the Internet. The firmware made available on the Internet has been developed and tested by Mettler-Toledo AG using processes that meet the guidelines of ISO 9001. Mettler-Toledo AG does not, however, accept liability for consequences that might arise from using the firmware.

9.1 Operating Principle

You will find all the relevant information and updates for your balance on the METTLER TOLEDO website at the following address:

www.mettler-toledo-support.com

A program known as the "**e-Loader II**" is loaded onto your computer together with the firmware update. You can use this program to download the firmware to the balance. The "e-Loader II" can also save the settings in your balance before the new firmware is downloaded to it. You can reload the saved settings into the balance manually or automatically after the software is downloaded.

If the selected update includes an application that is not described in these instructions (or that has been updated in the meantime) you can download the corresponding instructions in Adobe Acrobat® PDF format.

Requirements

The minimum requirements for obtaining applications from the Internet and downloading them into your balance are as follows:

- PC with Microsoft Windows® operating system (Version 98, 98SE, ME, NT4.0, 2000, XP or Vista).
- Internet connection and web browser (e.g. MS Internet Explorer).
- PC to balance connection cable (e.g. No. 11101051 see chapter accessories)

9.2 Update Procedure

Installing the "e-Loader II" software from the Internet onto the PC.

1 Connect to the Internet.

2 Go to the site "**www.mettler-toledo-support.com**".

3 Enter the information required for registration on the METTLER TOLEDO Balance Support Site.

4 Click the "Customer Support" link and log in.

5 Click your Balance.

6 Click the firmware version you need and install it.

Loading the new firmware into the balance.

– Start the "e-Loader II" and follow the instructions, which will take you step-by-step through the installation.

10 Error and Status Messages

10.1 Error Messages

Error messages in the display draw your attention to incorrect operation or that the balance could not execute a procedure properly.

Error Message	Cause	Rectification
NO STABILITY	No stability.	Ensure more stable ambient conditions. If not possible, check settings for environment.
WRONG ADJUSTMENT WEIGHT	Wrong adjustment weight on pan or none at all.	Place required adjustment weight in center of pan.
REFERENCE TOO SMALL	Reference for piece counting too small.	Increase reference weight.
EEPROM ERROR - PLEASE CONTACT CUSTOMER SERVICE	EEPROM (memory) error.	Please contact METTLER TOLEDO customer service.
WRONG CELL DATA - PLEASE CONTACT CUSTOMER SERVICE	Wrong cell data.	Please contact METTLER TOLEDO customer service.
NO STANDARD ADJUSTMENT - PLEASE CONTACT CUSTOMER SERVICE	No standard calibration.	Please contact METTLER TOLEDO customer service.
PROGRAM MEMORY DEFECT - PLEASE CONTACT CUSTOMER SERVICE	Program memory defect.	Please contact METTLER TOLEDO customer service.
TEMP SENSOR DEFECT - PLEASE CONTACT CUSTOMER SERVICE	Temperature sensor defect.	Please contact METTLER TOLEDO customer service.
WRONG LOAD CELL BRAND - PLEASE CONTACT CUSTOMER SERVICE	Wrong load cell brand.	Please contact METTLER TOLEDO customer service.
WRONG TYPE DATA SET - PLEASE CONTACT CUSTOMER SERVICE	Wrong type data set.	Please contact METTLER TOLEDO customer service.
BATTERY BACKUP LOST - CHECK DATE TIME SETTINGS	Backup battery is empty. This battery ensures that the date and time are not lost when the balance is disconnected from power.	Battery must be replaced. Please contact METTLER TOLEDO customer service.
⌜-------⌝	Overload - The weight on the pan exceeds the weighing capacity of the balance.	Reduce the weight on the weighing pan.
⌞-------⌟	Underload	Check that the weighing pan is positioned correctly.
INITIAL ZERO RANGE EXCEEDED	Wrong weighing pan or pan is not empty.	Mount correct weighing pan or unload weighing pan.
BELOW INITIAL ZERO RANGE	Wrong weighing pan or pan is missing.	Mount correct weighing pan.
MEM FULL	Memory full.	Clear the memory and start a new evaluation.
FACTOR OUT OF RANGE	Factor is outside the allow range.	Select a new factor.
STEP OUT OF RANGE	Step is outside the allow range.	Select a new step.
OUT OF RANGE	Sample weight is outside the allow range.	Unload the pan and load a new sample weight.

10.2 Status Messages

Status messages are displayed by means of small icons. The status icons indicate the following:

Status Icon	Signification
	**Service Reminder** Your balance is due for servicing. Contact your dealer's customer service department as soon as possible to have a technician service your balance. (See menu topic "SERV.ICON")

11 Cleaning and Service

Every now and then, clean the weighing pan, draft shield element, bottom plate, draft shield (depending on the model) and housing of your balance. Your balance is made from high-quality, durable materials and can therefore be cleaned using a damp cloth or with a standard cleaning agent.

To thoroughly clean the draft shield glass panels, remove the draft shield from the balance. When reinstalling the draft shield, ensure that it is in the correct position.

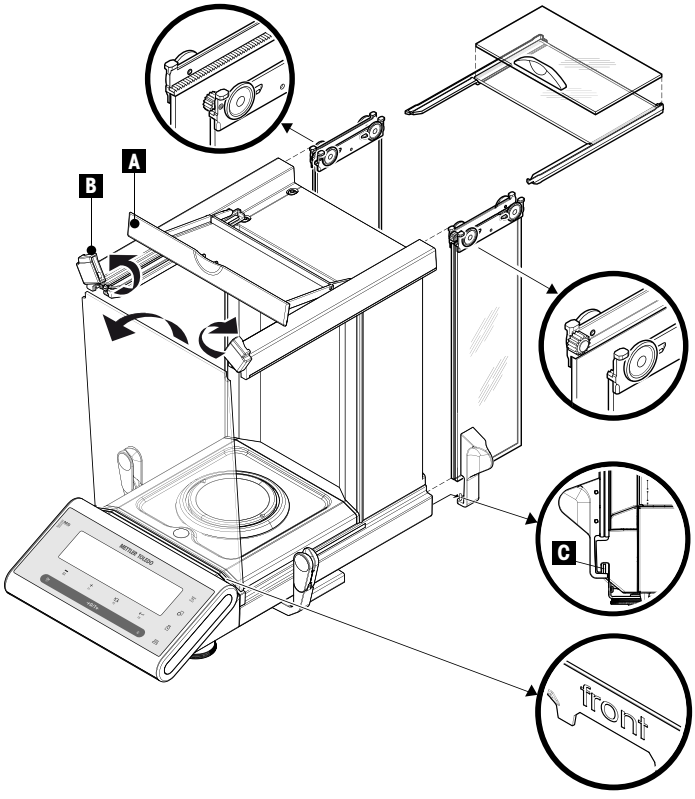
Please observe the following notes:

- The balance must be disconnected from the power supply
- Ensure that no liquid comes into contact with the balance or the AC adapter.
- Never open the balance or AC adapter – they contain no components, which can be cleaned, repaired or replaced by the user.

- On no account use cleaning agents which contain solvents or abrasive ingredients, as this can result in damage to the operation panel overlay.

Please contact your METTLER TOLEDO dealer for details of the available service options. Regular servicing by an authorized service engineer ensures constant accuracy for years to come and prolongs the service life of your balance.

11.1 Cleaning the Glass Draft Shield



Important note

Removing and inserting the side door glass panels and top door glass panels: Always hold the 2 parallel guided glass panels **together and parallel with one hand** (see illustrations).

1 Push all the glass panels as far as they will go to the back.

2 Turn the top cover (A) to the front.

3 Pull the side door glass panels and the top door glass panels towards the back and off. (observe the important note above)

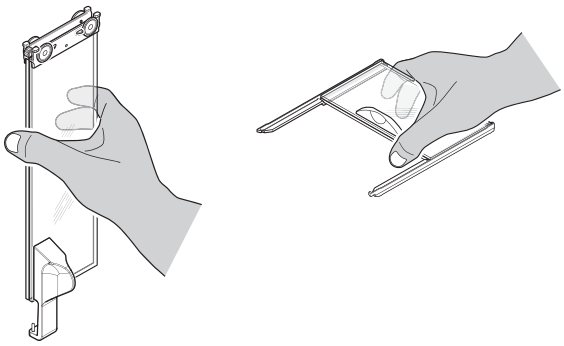
4 Turn the two lock covers (B) on the front as far as they will go to unlock the front glas.

5 Tilt the front glass forward and pull it out.

6 Remove draft ring.

7 Remove weighing pan.

8 Remove drip tray.



After cleaning reinstall all components in reverse order through the observance of the important notes.

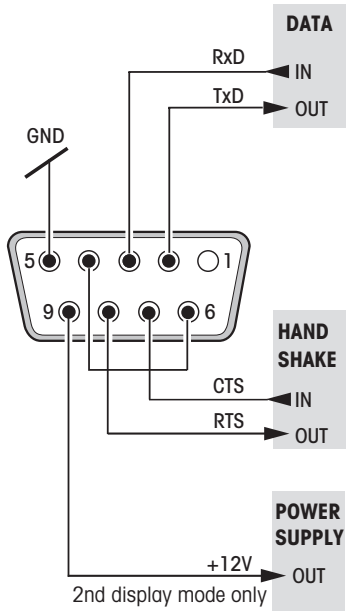
Important note

- Side door glass panels: The guide pin must be placed in the guide slot (C).
- After inserting the glass doors (side and top), close the top cover so that they can not fall out.
- Front glass: The writing "front" must be show forwards.

12 Interface Specification

12.1 RS232C Interface

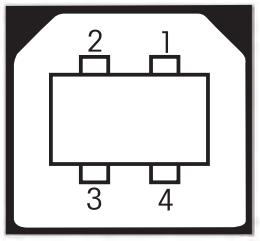
Each balance is equipped with an RS232C Interface as standard for the attachment of a peripheral device (e.g. printer or computer).

Schematic	Item	Specification
	Interface type	Voltage interface according to EIA RS-232C/DIN66020 CCITT V24/V.28)
	Max. cable length	15 m
	Signal level	Outputs: +5 V … +15 V (RL = 3–7 kΩ) –5 V … –15 V (RL = 3–7 kΩ) Inputs: +3 V … +25 V –3 V … -25 V
	Connector	Sub-D, 9-pole, female
	Operating mode	Full duplex
	Transmission mode	Bit-serial, asynchronous
	Transmission code	ASCII
	Baud rates	600, 1200, 2400, 4800, 9600, 19200, 38400 (software selectable)
	Bits/parity	7-bit/none, 7-bit/even, 7-bit/odd, 8-bit/none (software selectable)
	Stop bits	1 stop bit
	Handshake	None, XON/XOFF, RTS/CTS (software selectable)
	End-of-line	<CR><LF>, <CR>, <LF> (software selectable)
	Power supply for 2nd display	+ 12 V, max 40 mA (software selectable, 2nd display mode only)

12.2 USB Device Interface

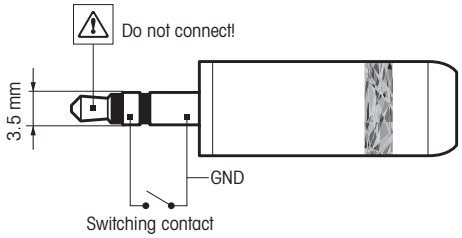
Each balance is equipped with an "USB Device" Interface as standard for the attachment of a peripheral device (e.g. computer).

Note: This interface is not suitable to communicate with a Printer.

Schematic	Item	Specification
 1 VBUS (+5 VDC) 2 D– (Data –) 3 D+ (Data +) 4 GND (Ground) Shield Shield	Standard	In conformity with USB Specification Revision 1.1
	Speed	Full speed 12 Mbps (requires shielded cable)
	Function	CDC (Communication Device Class) serial port emulation
	Power usage	Suspended device: Max 10 mA
	Connector	Type B

12.3 Aux Connection

You can connect the METTLER TOLEDO "ErgoSens" or an external switch to socket Aux. This allows you to start functions such as taring, zeroing or printing.



External connection

Connector:
3.5 mm stereo jack connector

Electrical data:
Max. voltage 12 V
Max. current 150 mA

12.4 MT-SICS Interface Commands and Functions

Many of the balances and scales used have to be capable of integration in a complex computer or data acquisition system.

To enable you to integrate balances in your system in a simple manner and utilize their capabilities to the full, most balance functions are also available as appropriate commands via the data interface.

All new METTLER TOLEDO balances launched on the market support the standardized command set "METTLER TOLEDO Standard Interface Command Set" (MT-SICS). The commands available depending on the functionality of the balance.

Basic information on data interchange with the balance

The balance receives commands from the system and acknowledges the command with an appropriate response.

Command formats

Commands sent to the balance comprise one or more characters of the ASCII character set. Here, the following must be noted:

- Enter commands only in uppercase.
- The possible parameters of the command must be separated from one another and from the command name by a space (ASCII 32 dec., in this description represented as ␣).
- The possible input for "text" is a sequence of characters of the 8-bit ASCII character set from 32 dec to 255 dec.
- Each command must be closed by C_RL_F (ASCII 13 dec., 10 dec.). The characters C_RL_F, which can be inputted using the Enter or Return key of most entry keypads, are not listed in this description, but it is essential they be included for communication with the balance.

Example

S – Send stable weight value

Command	`S`	Get the current stable net weight value.
Response	`S␣S␣WeightValue␣Unit`	Current stable weight value in unit actually set under unit 1.
	`S␣I`	Command not executable (balance is currently executing another command, e.g. taring, or timeout as stability was not reached).
	`S␣+`	Balance in overload range.
	`S␣-`	Balance in underload range.

Example

Command	`S`	Query a stable weight value.
Response	`S␣S␣␣␣␣␣␣100.00␣g`	The current stable weight value is 100.00 g.

The available MT-SICS commands are listed in the table (depending on the model). For further information please refer to the Reference Manual "MT-SICS 11780711" downloadable from the Internet under **www.mt.com/sics-newclassic**.

	Description		Description
@	Cancel (Reset)	**M46**	Print interval
C0	Query/Set adjustment settings	**PW**	Piece counting: Query/Set piece weight
C1	Start adjustment according to current settings	**PWR**	Power on/off (PWR 0 means switch off completely, if balance is powered by battery)
C2	Start adjustment with external weight	**S**	Send stable weight value
C3	Start adjustment with internal weight	**SI**	Send weight value immediately
D	Display text sent to balance	**SIR**	Send weight value immediately and repeat
DAT	Date query/set	**SIRU**	Send weight value with currently displayed unit immediately and repeat
DW	Display weight	**SIU**	Send weight value with currently displayed unit immediately
I0	Commands implemented	**SM0**	Dynamic weighing: cancel all SMx commands
I1	MT-SICS level and MT-SICS versions	**SM1**	Dynamic weighing: Start immediately and send the result
I2	Balance data	**SM2**	Dynamic weighing: start after a minimum load is exceeded and send result
I3	Software version, type definition number	**SM3**	Dynamic weighing: start after a minimum load is exceeded, send result and repeat
I4	Query serial number (SNR)	**SM4**	Dynamic weighing: query/set time interval
I5	Query SW-identification number	**SNR**	Send stable weight value and repeat on weight change
I10	Query/set balance ID	**SNRU**	Send stable weight valuewith currently displayed unit and repeat on weight change
I11	Query balance type	**SR**	Send weight value on weight change
I14	Query balance information	**SRU**	Send stable weight value with currently displayed unit on weight change
K	Keys: set configuration	**ST**	Send stable weight value on pressing (print) key
M02	Query/set environment	**SU**	Send stable weight value with currently displayed unit
M03	Query/set AutoZero	**T**	Tare
M08	Display brightness	**TA**	Get/Set tare weight value
M09	Display contrast	**TAC**	Clear tare value
M11	Beeper: Query/set volume	**TI**	Tare immediately
M14	List available language	**TIM**	Query/set time
M15	Query/set language	**TST0**	Query/set test function settings
M17	FACT: query/set single time criteria (no possibility to set "weekday"	**TST1**	Start test function according to current settings
M22	Custom unit definition Remarks: no possibility to set "name" of unit	**TST2**	Start test function with external weight
M25	Get application list	**TST3**	Start test function with internal weight
M26	Get/set current application	**UPD**	Query/set update rate of the host interface
M27	Adjustment history	**Z**	Zero
M30	+/- settings with nominal and tolerance	**ZI**	Zero immediately

13 Technical Data

13.1 General Data

Power Supply

Power input balance:	12VDC, 2.25A
AC/DC adapter:	Primary: 100V–240VAC, -15%/+10%, 50/60Hz Secondary: 12VDC ± 3%, 2.25 A (with electronic overload protection) ⚠ Use only with a tested AC Adapter with SELV output current. Ensure correct polarity ⊖—●—⊕
Cable to AC/DC adapter:	3-core, with country-specific plug

Protection and Standards

• Overvoltage category:	Class II
• Degree of pollution:	2
• Degree of Protection:	Protected against dust and water
• Standards for safety and EMC:	See Declaration of Conformity (separate document)
• Range of application:	For use only in closed interior rooms

Environmental conditions

• Height above mean sea level:	up to 4000 m
• Ambient temperature range:	10 to 30 °C
• Relative air humidity:	10% to 80 % at 31 °C, linearly decreasing to 50 % at 40 °C, non-condensing

Materials

• Housing/Terminal:	Die-cast aluminum / Plastic (PA12)
• Weighing pan:	Stainless steel X2CrNiMo 17-12-2 (1.4404)
• Draft shield element:	Stainless steel X2CrNiMo 17-12-2 (1.4404)
• Draft shield:	Plastic (PBT), glass
• In-use-cover:	Plastic (PET)

13.2 Explanatory Notes for the METTLER TOLEDO AC Adapter

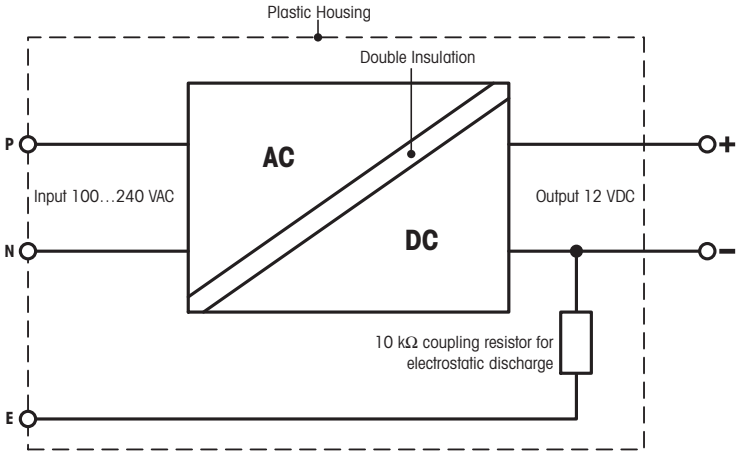
METTLER TOLEDO Balances are operated with a certified external power supply which conforms to the requirements for Class II double insulated equipment and it is not provided with a protective earth connection but with a functional earth connection for EMC purposes. Information about conformance of our products can be found in the "Declaration of Conformity" which is coming with each product.

Consequently an earth bonding test is not required. Similary it is not necessary to carry out an earth bonding test between the supply earth conductor and any exposed metalwork on the balance.

In case of testing with regard to the European Directive on general product safety the power supply and the balance has to be handled as Class II double insulated equipment.

Because high resolution balances can be sensitive to static charges a leakage resistor, typically 10 kOhm, is connected between the earth connector and the power supply output terminals. The arrangment is shown in the equivalent circuit diagram. This resistor is not part of the electrical safety arrangement and does not require testing at regular intervals.

Equivalent circuit diagram



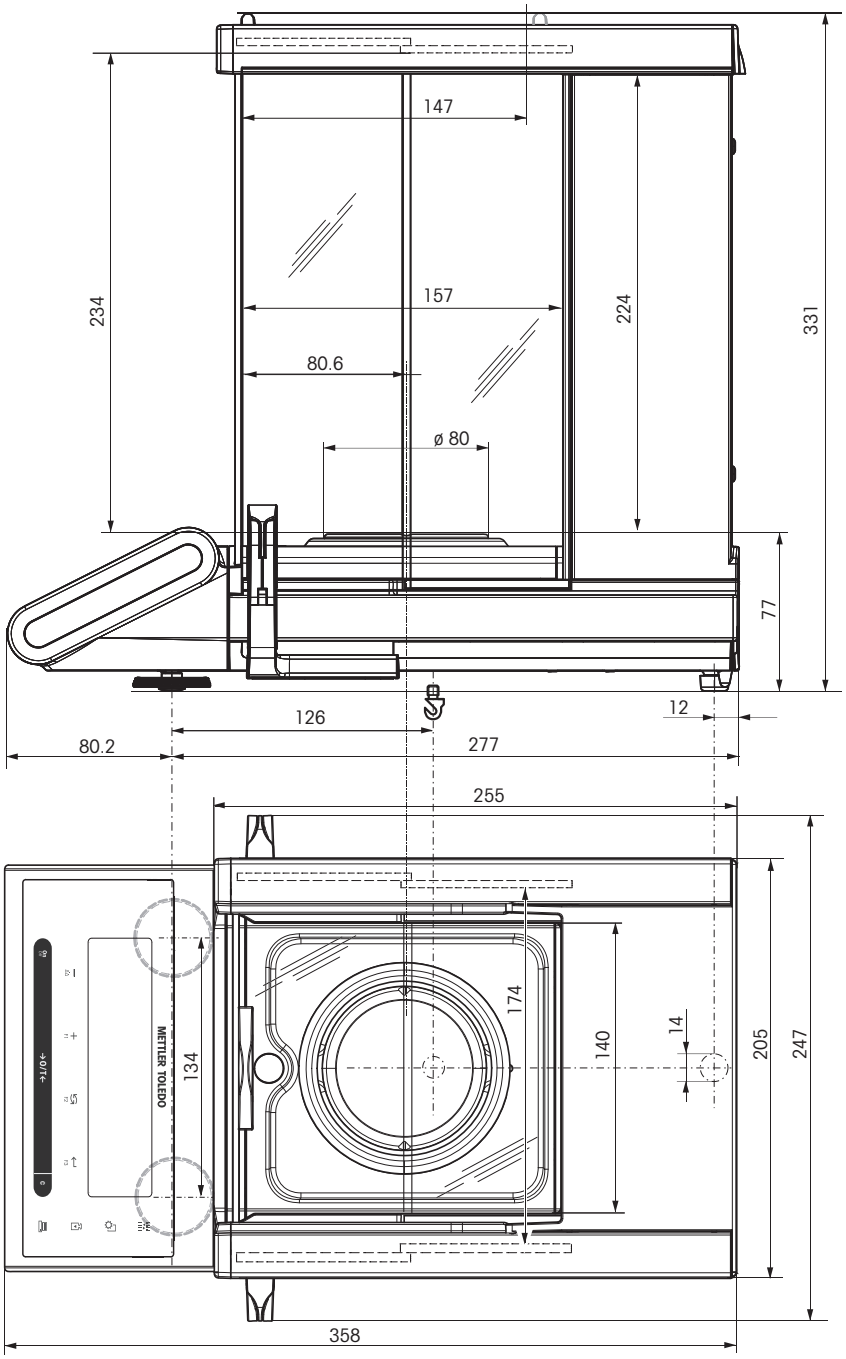
13.3 Model-Specific Data

Technical Data

Model	JP105DUG
Maximum load	120 g
Maximum load, fine range	42 g
Readability	0.1 mg
Readability, fine range	0.01 mg
Repeatability (sd)	0.08 mg (100 g)
Repeatability (sd) , typ.	0.06 mg (100 g)
Repeatability (sd), fine range	0.03 mg (40 g)
Repeatability (sd), fine range at low load	0.02 mg (20 g)
Repeatability (sd) at low load , typ.	0.015 mg (20 g) [2]
Linearity	0.15 mg
Linearity, typ. (within 10 g)	0.02 mg
Sensitivity offset [1]	0.4 mg (100 g)
Sensitivity offset, typ. [1]	0.3 mg (100 g)
Internal adjustment	yes, FACT
Weights for routine testing Large Weight/Class OIML/ASTM Small Weight/Class OIML/ASTM	 100 g / F2/4 5 g / E2/2
Minimum weight (acc. to USP), typ.	45 mg [2]
Minimum weight (U=1%, k=2), typ.	3 mg [2]
Minimum weight (OIML)	1 mg
Settling time, typ.	4 s / 8 s [2]
Usable height of draft shield [mm]	234
Weighing pan dimensions (WxD) [mm]	Ø 80
Balance dimensions (WxDxH) [mm]	247x358x331
Net Weight [kg]	6.6

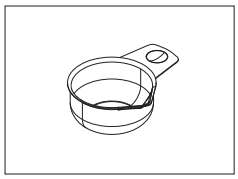
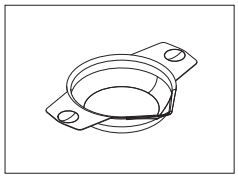
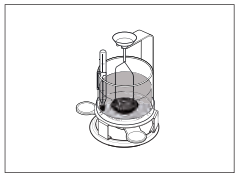
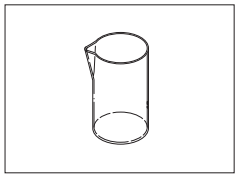
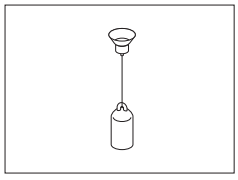
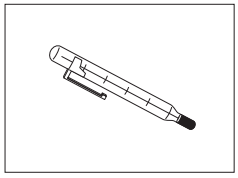
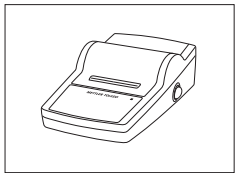
[1] After adustment with built-in reference weight or FACT self-adjustment is switched on [2] at fine range

13.4 Dimensions

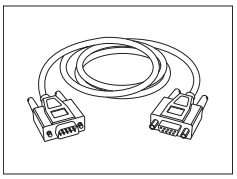


14 Accessories and Spare Parts

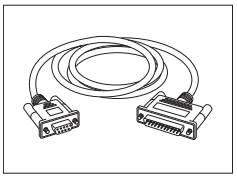
14.1 Accessories

	Description	Part No.
Carat Pans		
	Carat pan XS, Ø 50 mm / heigh 20 mm (set of 10 units)	12102565
	Carat pan S, Ø 80 mm / heigh 20 mm (set of 10 units)	12102645
Density Determination		
	Density kit MS-DNY-54 for NewClassic MS Semi-Micro Balances	30004077
	Glass beaker, height 100 mm, Ø 60 mm	00238167
	Sinker for density of liquids in conjunction with Density Kit Calibrated (sinker + certificate) Recalibrated (new certificate)	00210260 00210672 00210674
	Calibrated thermometer with certificate	11132685
Printers		
	RS-P28/11 printer with RS232C connection to balance (with date, time and applications	11124309

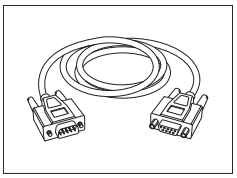
Cables for RS232C Interface



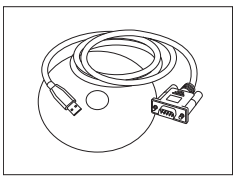
RS9 – RS9 (m/f): connection cable for PC, length = 1 m — 11101051



RS9 – RS25 (m/f): connection cable for PC, length = 1 m — 11101052

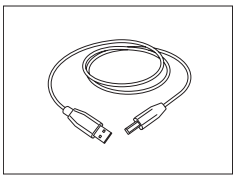


RS9 – RS9 (m/m): connection cable for devices with DB9 (f) socket, length = 1 m — 21250066



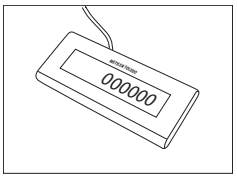
RS232 - USB converter – intelligent expansion module for connection to PC — 11103691

Cables for USB Interface



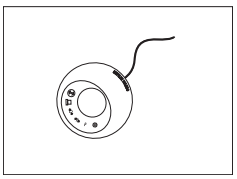
USB (A –B) connection cable for connection to PC, length = 1 m — 12130716

Auxiliary Displays

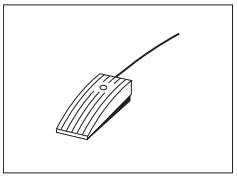


RS232 auxiliary display AD-RS-M7 — 12122381

External Switches

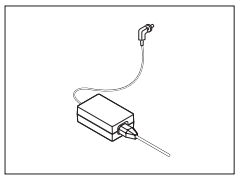


ErgoSens, optical sensor for hands-free operation — 11132601



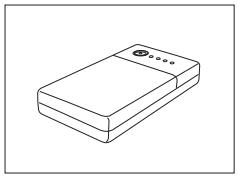
Auxiliary Footswitch with selectable function for balances — 11106741

Power supplies



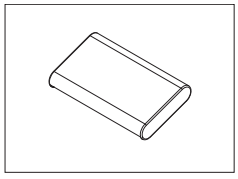
AC/DC adapter (without power cable) 100–240 VAC, 50/60 Hz, 0.3 A, 12 VDC 2.25 A — 11107909

Power cable CH	00087920
Power cable EU	00087925
Power cable USA	00088668
Power cable IT	00087457
Power cable DK	00087452
Power cable GB	00089405
Power cable AUS	00088751
Power cable SA	00089728



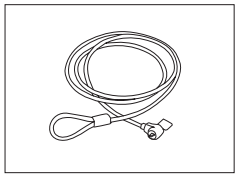
PowerPac-M-12V, for mains independent operation of balances, 12 VDC/1 A — 12122363

Protective covers



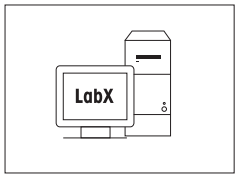
Protective cover for semi micro balances — 30006615

Anti-theft Devices



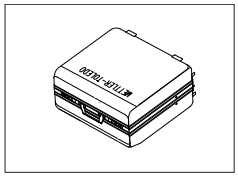
Steel cable — 11600361

Software



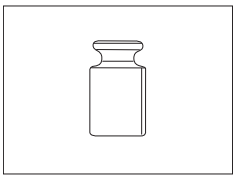
LabX direct balance (simple data transfer) — 11120340

Transport Cases



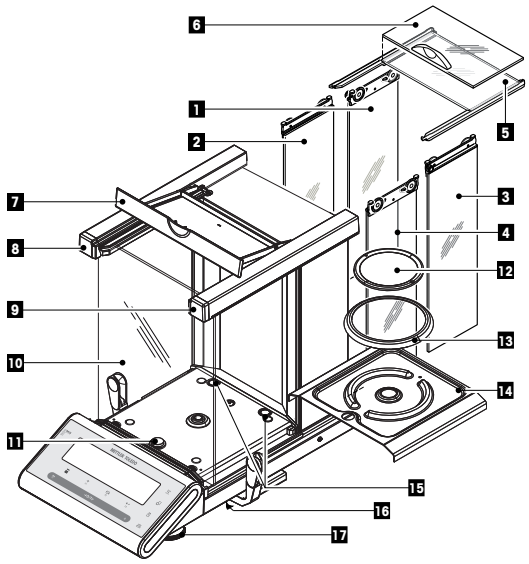
Transport case — 30006317

Adjustment weights



OIML / ASTM Weights (with calibration certificate) see **www.mt.com/weights**

14.2 Spare Parts

Drawing	Pos	Description	Part No.
	1	Side door back, left	11133079
	2	Side door front, left with handle	30003678
	3	Side door back, right	11133077
	4	Side door front, right with handle	30003677
	5	Top door back	11133081
	6	Top door front with handle	11133082
	7	Top cover	11142244
	8	Front glass lock, left	11142228
	9	Front glass lock, right	11142229
	10	Front glass panel	30003679
	11	Level window	11142253
	12	Weighing pan	30003777
	13	Draft ring	11142206
	14	Drip tray	30003778
	15	Plastic cap	11122623
	16	Weighing below balance cap	12104936
	17	Leveling foot	11106323

15 Appendix

15.1 Conversion Table for Weight Units

Kilogram	1 kg	=	1000.0	g	1 g	=	0.001	kg
Milligram	1 mg	=	0.001	g	1 g	=	1000.0	mg
Microgram	1 µg	=	0.000001	g	1 g	=	1000000.0	µg
Carat	1 ct	=	0.2	g	1 g	=	5.0	ct
Pound	1 lb	=	453.59237	g	1 g	≈	0.00220462262184878	lb
Ounce (avdp)	1 oz	=	28.349523125	g	1 g	≈	0.0352739619495804	oz
Ounce (troy)	1 ozt	=	31.1034768	g	1 g	≈	0.0321507465686280	ozt
Grain	1 GN	=	0.06479891	g	1 g	≈	15.4323583529414	GN
Pennyweight	1 dwt	=	1.55517384	g	1 g	≈	0.643014931372560	dwt
Momme	1 mom	=	3.75	g	1 g	≈	0.266666666666667	mom
Mesghal	1 msg	≈	4.6083	g	1 g	≈	0.217	msg
Tael Hong Kong	1 tlh	=	37.429	g	1 g	≈	0.0267172513291833	tlh
Tael Singapore (Malaysia)	1 tls	≈	37.7993641666667	g	1 g	≈	0.0264554714621853	tls
Tael Taiwan	1 tlt	=	37.5	g	1 g	≈	0.0266666666666667	tlt
Tola	1 tola	=	11.6638038	g	1 g	≈	0.0857353241830079	tola
Baht	1 baht	=	15.16	g	1 g	≈	0.0659630606860158	baht

15.2 Recommended Printer Settings

English, German, French, Spanish, Italian, Polish, Czech, Hungarian, Dutch

Printer		Balance	Balance / Printer				
Model	**Char Set**	**Char Set**	**Baudrate**	**Bit / Parity**	**Stop Bits**	**Handshake**	**End of Line**
RS-P25/26/28	ANSI/WIN Latin 1	ANSI/WIN	9600	8/NO	1	Xon/Xoff	<CR><LF> [1]
RS-P42/43/45	IBM/DOS [1]	IBM/DOS	1200	8/NO	1	Xon/Xoff	<CR><LF> [1]

Brazil Portuguese

Printer		Balance	Balance / Printer				
Model	**Char Set**	**Char Set**	**Baudrate**	**Bit / Parity**	**Stop Bits**	**Handshake**	**End of Line**
RS-P25/26/28	ANSI/WIN Latin 1	IBM/DOS	9600	8/NO	1	Xon/Xoff	<CR><LF> [1]
RS-P42/43/45	— [2]	— [2]	— [2]	— [2]	— [2]	— [2]	— [2]

Russian

Printer		Balance	Balance / Printer				
Model	**Char Set**	**Char Set**	**Baudrate**	**Bit / Parity**	**Stop Bits**	**Handshake**	**End of Line**
RS-P25/26/28	IBM/DOS Cyrillic	IBM/DOS	9600	8/NO	1	Xon/Xoff	<CR><LF> [1]
RS-P42/43/45	— [2]	— [2]	— [2]	— [2]	— [2]	— [2]	— [2]

[1] Printer settings not available.

[2] Required font for this language not available.

16 Index

GWP® – Good Weighing Practice™

The global weighing guideline GWP® reduces risks associated with your weighing processes and helps to

- choose the appropriate balance
- reduce costs by optimizing testing procedures
- comply with the most common regulatory requirements

▶ www.mt.com/GWP

www.mt.com/jewelry

For more information

Mettler-Toledo AG, Laboratory & Weighing Technologies
CH-8606 Greifensee, Switzerland
Tel. +41 (0)44 944 22 11
Fax +41 (0)44 944 30 60
www.mt.com

11781507 2.12

11781507