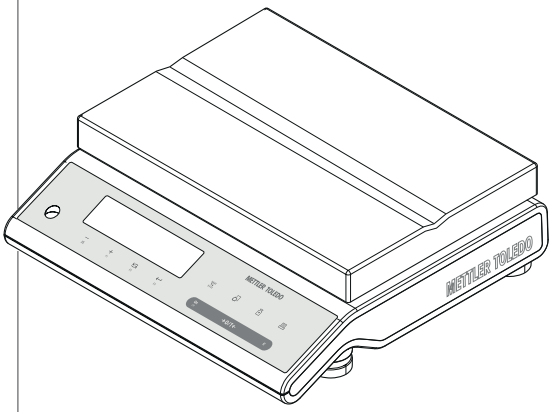
User Manual

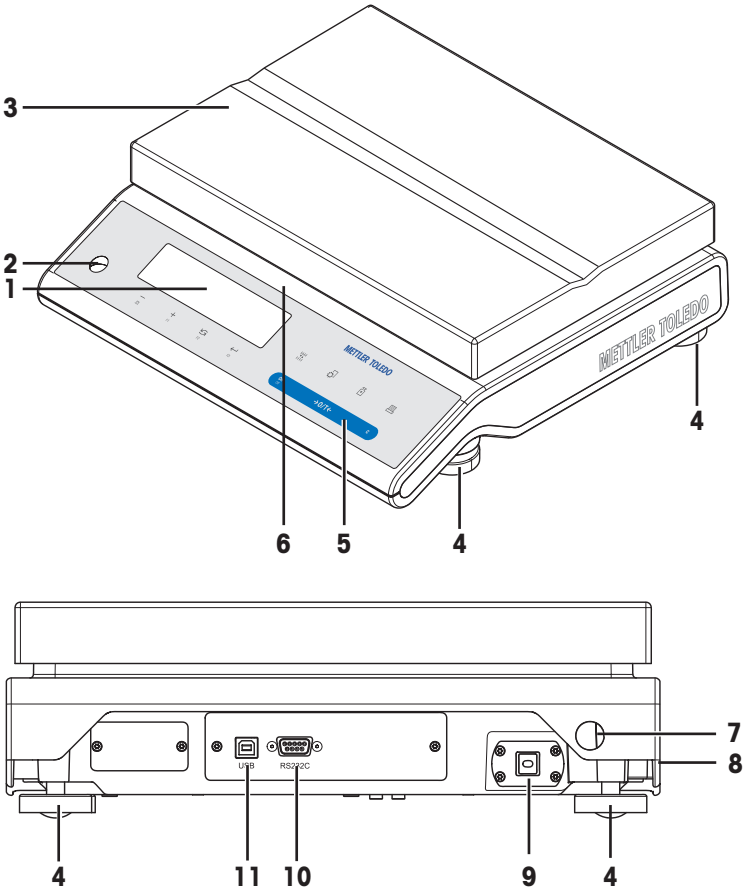
Precision Balances

MS-L



METTLER TOLEDO

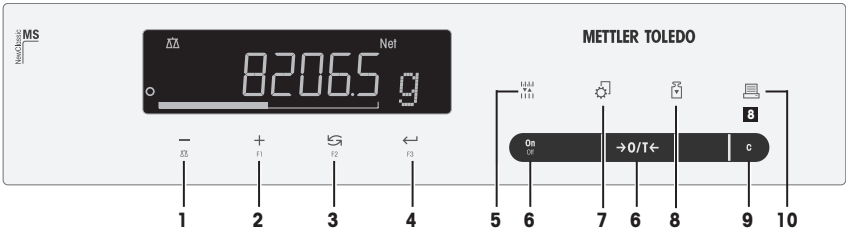
Overview L platform



Legend L platform

1	Display	**2**	Level indicator
3	Weighing pan	**4**	Leveling foot
5	Operation keys	**6**	Model sticker (with approved models only)
7	Security slot for anti-theft purposes	**8**	Product label
9	Socket for AC adapter	**10**	RS232C serial interface
11	USB device interface		

Overview operation keys



Legend key functions

No.	Key	Press briefly (less than 1.5 s)	Press and hold (longer than 1.5 s)
1		• 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
2	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
3	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
4	F3	• To enter or leave menu selection (from / to menu topic) • To enter application parameter or switch to next parameter • To confirm parameter	• To select assigned F3 application and entering the parameter settings of application. • Default F3 application assignment: Formulation
5		• To change display resolution (1/10d function) while application is running • **Note** not available with approved models in selected countries.	no function
6	**ON**/OFF →0/T←	• Switch on • Zero/Tare	• Switch off
7		• Enter or leave menu (Parameter settings) • Save parameters	no function
8		• Execute predefined adjusting (calibration) procedure	no function
9	**C**	• Cancel and to leave menu without saving (one step back in the menu).	no function

No.	Key	Press briefly (less than 1.5 s)	Press and hold (longer than 1.5 s)
10		• Printout display value • Printout active user menu settings • Transfer data	no function

1 Safety Information

1.1 Definition of signal warnings and symbols

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results.

WARNING for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided.

CAUTION for a hazardous situation with low risk, resulting in damage to the device or the property or in loss of data, or minor or medium injuries if not avoided.

NOTICE (no symbol)
for important information about the product.

Note (no symbol)
for useful information about the product.

General hazard

Electrical shock

1.2 Product safety information

Intended use

Your balance is used for weighing. Use the balance exclusively for this purpose. Any other type of use and operation beyond the limits of technical specifications without written consent from Mettler-Toledo GmbH, is considered as not intended.

It is not permitted to use the instrument in explosive atmosphere of gases, steam, fog, dust and flammable dust (hazardous environments).

General safety information

This balance complies with current industry standards and the recognized safety regulations; however, it can constitute a hazard in use. Do not open the balance housing: The balance contains no user-serviceable parts. In the event of problems, please contact a METTLER TOLEDO representative.

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

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

Staff safety

These printed document must be read and understood before using the balance. These printed document must be retained for future reference.

The balance must not be altered or modified in any way. Only use METTLER TOLEDO original spare parts and accessories.

⚠ WARNING

Risk of electric shock

Use only the original universal AC/DC adapter delivered with your balance, and check that the voltage printed on it is the same as your local power supply voltage. Only plug the adapter into a socket which is grounded.

⚠ CAUTION

Damage to the balance

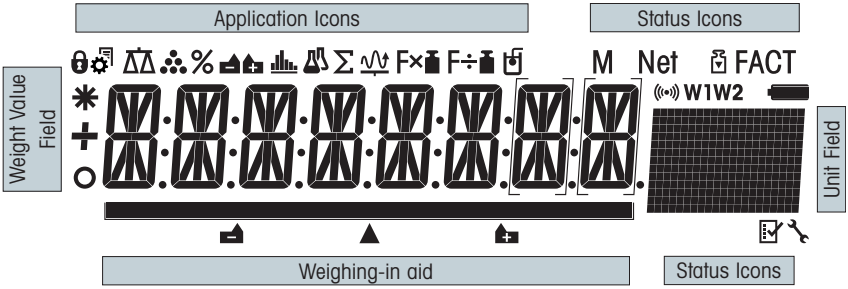
1 Only use indoors in dry locations.

2 Do not use pointed objects to operate the touch screen!
The balance is of a very sturdy design, but is still a precision instrument. It must be handled with care.

3 Do not open the balance:
The balance contains no user-serviceable parts. In the event of problems, please contact a METTLER TOLEDO representative.

4 Only use METTLER TOLEDO original accessories and peripheral devices for the balance.
These are specifically designed for the balance.

2 Display



Application Icons			
	Menu locked		Application "Formulation / Net-Total"
	Menu setting activated		Application "Totaling"
	Application "Weighing"		Application "Dynamic weighing"
	Application "Piece counting"	F×■	Application "Multiplication factor"
	Application "Percent weighing"	F÷■	Application "Division factor"
	Application "Check weighing"		Application "Density"
	Application "Statistics"		

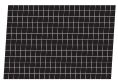
Note

While an application is running, the corresponding application icon appears at the top of the display.

Status Icons			
M	Indicates stored value (Memory)		Service reminder
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)
	Applications "Diagnostics" and "Routine Test"		Charge of battery: full, 2/3, 1/3, discharged (Battery operated models only)

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+

Weight Value Field and Weighing-in aid			
			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		

3 Installation and Putting into Operation

Finding more information

▶ www.mt.com/ms-precision

3.1 Unpacking and delivery inspection

1 Open the packaging and carefully remove all components.

2 Check the delivered items.

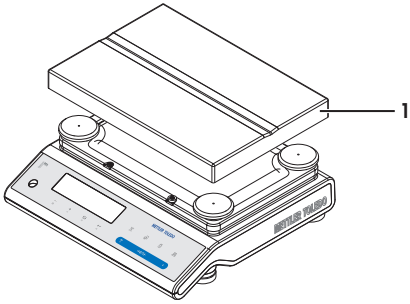
The standard scope of delivery contains the following items:

- Balance
- Weighing pan 246 × 351 mm
- AC/DC adapter with country-specific power cable
- Protective cover
- Mounted country specific power cable
- Operating instructions or User Manual; printed or on CD-ROM, depending on country of use
- EC declaration of conformity

3.2 Installing the components

Balances with readability to 0.1 g and 1 g, L platform

– Place the weighing pan (1) on the balance.



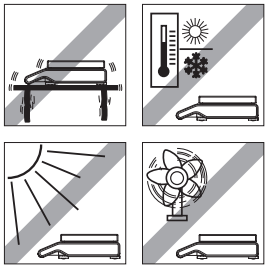
3.3 Selecting the location

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



3.4 Connecting the balance

⚠ WARNING

Risk of electric shock

1 To connect the balance, only use the supplied three-core power cable with equipment grounding conductor.
2 Only connect the balance to a three-pin power socket with earthing contact.
3 Only standardized extension cable with equipment grounding conductor must be used for operation of the balance.
4 Intentional disconnection of the equipment grounding conductor is forbidden.

The balance is supplied with an AC adapter and a country-specific power cable. The AC adapter is suitable for use with the following voltage range:

100 – 240 V AC, 50/60 Hz.

NOTICE

- Check whether your local power supply falls within this range. If this is not the case, under no circumstances connect the AC adapter to the power supply, but contact a METTLER TOLEDO representative.
- The power plug must be accessible at all times.
- Prior to use, check the power cable for damage.
- Route the cable in such a way that it cannot be damaged or cause a hindrance when working.
- Ensure that no liquid comes into contact with the AC adapter.

– Connect power cable to the power supply.

3.5 Setting up the balance

3.5.1 Switching on the balance

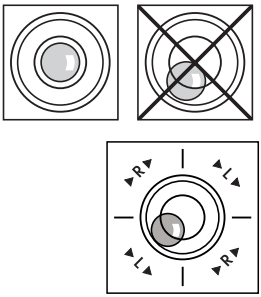
Before working with the balance, it must be warmed up in order to obtain accurate weighing results. To reach operating temperature, the balance must be connected to the power supply for at least 30 minutes.

3.5.2 Leveling the balance

Note

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

1 Align the balance horizontally.
2 Turning the leveling screws of the housing until the air bubble is in the inner circle of the level indicator.
⇨ The position of the air bubble illustrates which leveling screw you need to turn (L = left leveling screw, R = right leveling screw) and in which direction so that the air bubble moves to the center.



Example
In this example, turn the left leveling screw counterclockwise.

3.5.3 Adjusting the balance

To obtain accurate weighing results, the balance must be adjusted to match the gravitational acceleration at its location and depending on the ambient conditions. After reaching the operation temperature, adjusting is necessary

- before the balance is used for the first time.
- after a change of the location.
- at regular intervals during weighing service.

See also

Adjustment (calibration) [▶ 12]

3.6 Adjustment (calibration)

NOTICE

Before adjusting the balance, it must be warmed up.

3.6.1 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").

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)

3.6.2 Manual adjustment with internal weight

Note

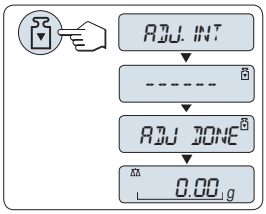
On models with internal weight only (see technical data).

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
-----------------------
```

3.6.3 Manual adjustment with external weight

Note

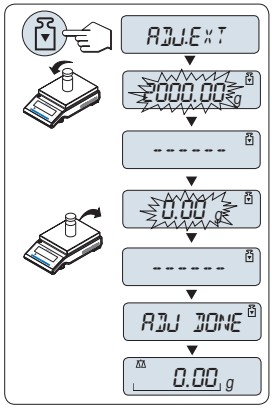
Because of certification legislation, the approved models cannot be adjusted with an external weight * (depend on selected countries' certification legislation).
* except OIML accuracy class I approved models.

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

Note
We recommend to disable FACT.

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


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

3.6.4 Customer fine adjustment

NOTICE

This function should be executed only by trained personnel.

The function customer fine adjustment "**ADJ.CUST.F**" allows you to adjust the value of the internal adjustment weight with your own adjustment weight. The adjustable range of the adjustment weight is possible only in a very small range. Customer fine adjustment impacts the function of internal adjustment. The customer fine adjustment can be deactivated at any time.

Note

- This feature is available on models with internal weight only.
- Because of certification legislation, approved models cannot be adjusted with customer fine adjustment (depending on selected countries' certification legislation).
- Use certificated weights.
- Balance and test weight have to be on operating temperature.
- Observe the correct environmental conditions.

Execute customer fine adjustment

- The balance is under measuring condition.

1 Have required adjustment weight ready.

2 Unload weighing pan

3 Select in the menu "**ADVANCED**": **ADJ.CUST.F**

4 Confirm "**ADJ.CUST.F**" with «↵».

5 To carry out this operation select "**EXECUTE**"

6 Start Adjustment with «↵»
   ⇨ "**SET REF.**" appears briefly.
   ⇨ The last saved value flashes on the display.

7 Select the target adjustment weight.
   • For coarse setting, press «↻» to change the value.
   • For fine setting, press «**+**» to increase the value or press "**-**" to decrease the value.

8 Press and hold «↵» to confirm and execute "**ADJ.CUST.F**".
   ⇨ The required adjustment weight value flashes in the display. This could take some time.

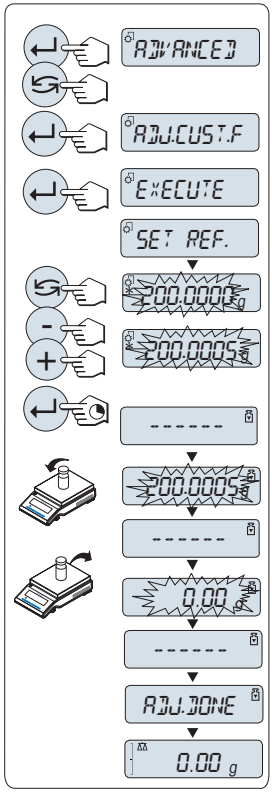
9 Place required adjustment weight in center of pan.

10 Remove adjustment weight when zero is flashing.

11 Wait until "**ADJ DONE**" briefly appears.

⇨ 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

⇨ If the error message "**WRONG ADJUSTMENT WEIGHT**" appears, the weight is not within the allowed value range and could not be accepted. "**ADJ.CUST.F**" could not be executed.



Note
Storing the adjustment is not required.

Deactivate customer fine adjustment

1 Select in the menu "**ADVANCE.**": "**ADJ.CUST.F**".

2 Confirm "**ADJ.CUST.F**" with «↵».

3 To carry out this operation select "**RESET**"

4 Start **RESET** by pressing «↵»
   ⇨ "**NO?**" appears.

5 Select "**YES?**" and confirm with«↵».

⇨ 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 with initial adjustment.

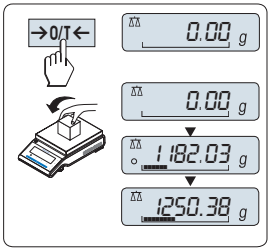
3.7 Performing a simple weighing

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.



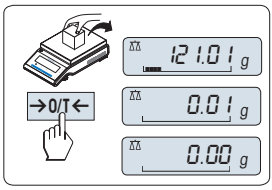
Zeroing

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").

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



Taring

Taring

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

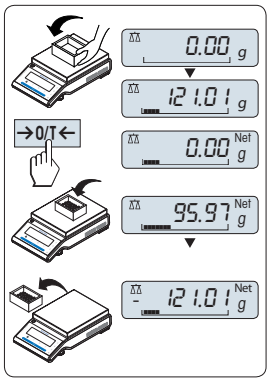
1 Place empty container on the balance. The weight is displayed.

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.



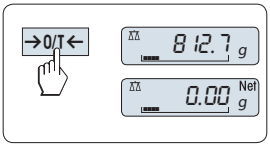
METTLER TOLEDO DeltaRange balances

METTLER TOLEDO DeltaRange balances have a movable fine range with 10 times smaller display increments over their entire weighing range. In this fine range an additional decimal place always appears in the display.

The balance operates in the fine range

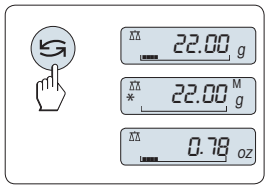
- after switching on.
- after every taring operation.

If the fine range is exceeded, the balance display automatically switches to coarser display increments.



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).



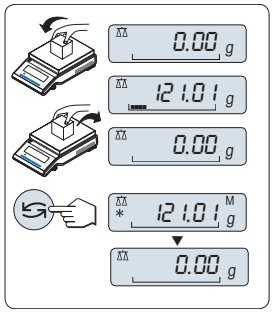
Recall / Recall weight value

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.



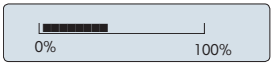
Delete last weight value

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.

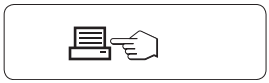
Weighing with the weighing-in aid

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.



Print / Transmit data

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

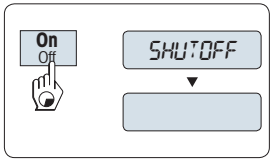


Switching off

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

⇨ Mains operated balances switch into standby mode.

⇨ Battery operated balances switch off completely.



Note

- After switching on from standby mode, your balance needs no warm-up time and is immediately ready for weighing.
- Standby mode is not possible with approved balances (only available in selected countries).
- 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.
- To completely switch off mains operated balances, they must be disconnected from the power supply.

3.8 Transporting the balance

Observe the following instructions to transport your balance to a new location.

Switching off the balance

1 Press and hold [**ON/OFF**] key.

2 Disconnect the balance from the power supply.

3 Disconnect all interface cables.

Transporting over long distances

The complete original packaging must be used for transportation or shipment of the balance over long distances or if it cannot be ensured that the balance will be transported upright.

4 Maintenance

4.1 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:

⚠ WARNING

Risk of electric shock

1 Disconnect the balance from the power supply prior to cleaning and maintenance.
2 Only use METTLER TOLEDO power cable, if these need to be replaced.
3 Ensure that no liquid comes into contact with the balance, terminal or AC adapter.
4 Do not open the balance or AC adapter.
These contain no user-serviceable parts.

⚠ CAUTION

Damage to balance

Under no circumstances use cleaning agents containing solvents or abrasive agents, as this can damage the operation panel overlay.

Do not clean the IP65 protected models using high-pressure or high-temperature water.

Note

Contact a METTLER TOLEDO representative to find about the service options available – regular maintenance by an authorized service engineer will ensure consistent weighing accuracy over the long term and extend the service life of the balance.

4.2 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.

5 Technical Data

5.1 General data

⚠ CAUTION

Use only with a tested AC Adapter with SELV output current.
Ensure correct polarity ⊖—(●)—⊕

Power supply

AC adapter:	Primary: 100 – 240 V AC, -15%/+10%, 50/60 Hz Secondary: 12 V DC ±3%, 2.5 A (with electronic overload protection)
Cable for AC adapter:	3-core, with country-specific plug
Balance power supply:	12 V DC ±3%, 2.5 A, maximum ripple: 80 mVpp

Protection and standards

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

Environmental conditions

Height above mean sea level:	Up to 4000 m
Ambient temperature:	5–40 °C
Relative air humidity:	10% up to 80% at 31 °C, linearly decreasing to 50% at 40 °C, non-condensing
Warm-up time:	At least **30** minutes after connecting the balance to the power supply or switched on in battery operation at least

Materials

Housing:	Die-cast aluminum, lacquered
Weighing pan	Stainless steel X5CrNiMo 18-10 (1.4301)
In-use-cover	Plastic (PET)

GWP®

Good Weighing Practice™

GWP® is the global weighing standard, ensuring consistent accuracy of weighing processes, applicable to all equipment from any manufacturer It helps to:

- Choose the appropriate balance or scale
- Calibrate and operate your weighing equipment with security
- Comply with quality and compliance standards in laboratory and manufacturing

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For more information

Mettler-Toledo GmbH
Im Langacher 44
8606 Greifensee, Switzerland
www.mt.com/contact

30324951A en

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