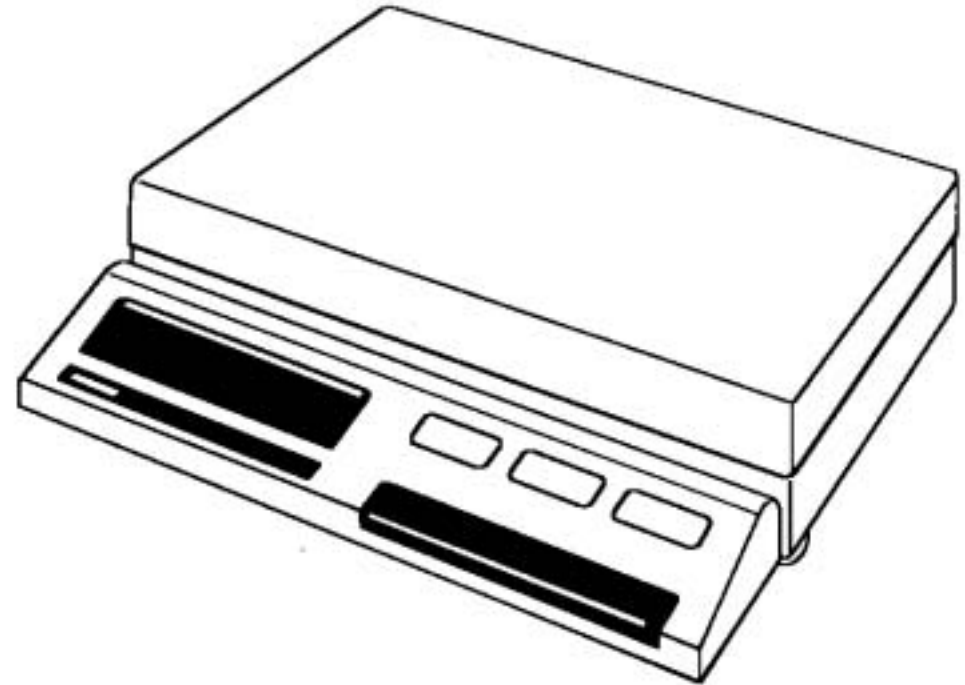


# Operating Instruction

## METTLER TOLEDO SM balances



**METTLER TOLEDO**

## Thank you very much

for having confidence in our products and for choosing a METTLER TOLEDO precision scale.

To put your SM Scale into practical use as soon as possible, we urge you to read the chapter PREPARATION in this comprehensive instruction manual, and to adhere closely to the instructions. Thereafter you will be in a position to continue your work by using the enclosed short form operating instructions. Within a short time you should become familiar with the outstanding properties of this scale, whether fully equipped or in standard configuration. We suggest that you refer to the comprehensive operating instructions for changing the configuration to meet special requirements, or for troubleshooting, etc.

The operating procedures are the same for all SM Scales. Differences exist within the weighing range.

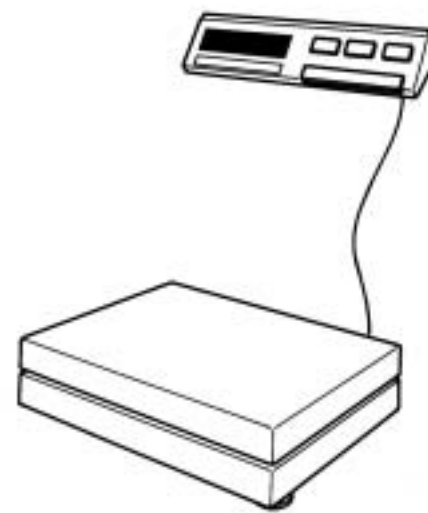
Several different mounting configurations of the ergonomically designed terminal permit a great variety of applications of your SM Scale.



Compact scale



Terminal on stand



Terminal mounted on wall

## Where to find what

<b>Preparation</b>	<b>Page</b>	<b>Configuration</b>	<b>Page</b>
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		Plus/minus - and percent weighing	37
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## Preparation

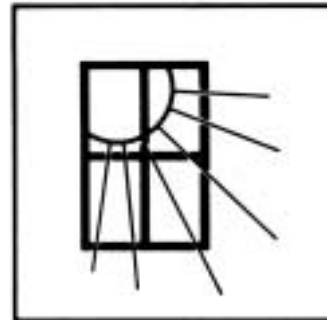
## Preparation

### Select a suitable location

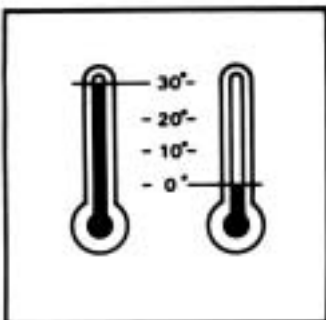
For best results, select a suitable location to install your scale.



Solid and vibration free support



Avoid exposure to direct sunlight



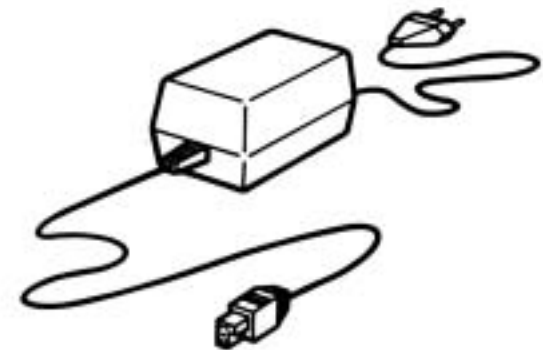
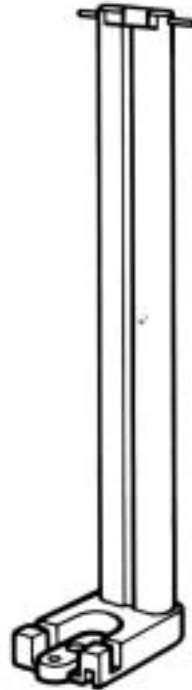
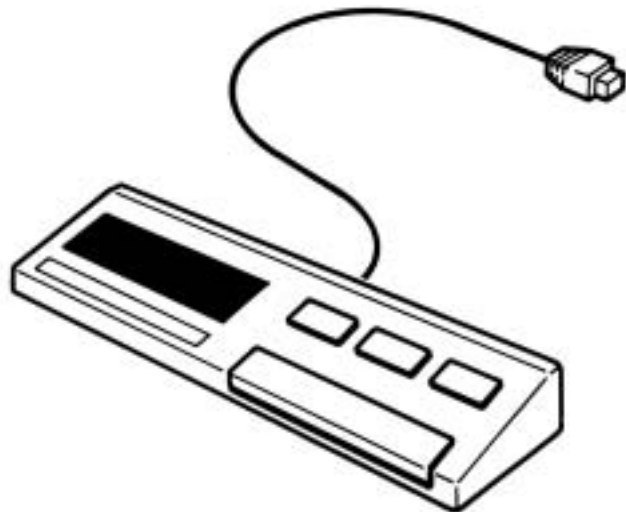
No excessive temperature changes



No draft

## Connecting scale

METTLER TOLEDO SM scales are based on a modular concept to permit you to establish your own scale configuration that best suits your particular needs. Please assemble your modules with the enclosed screwdriver; the explanations listed in this section include all possible mounting configurations.

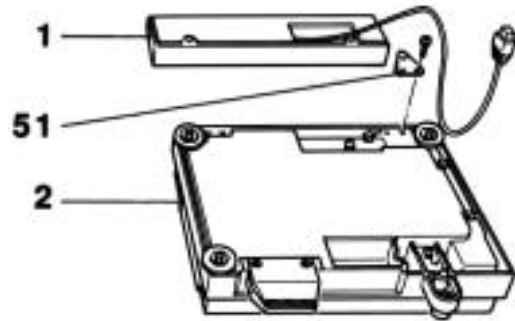


## Preparation

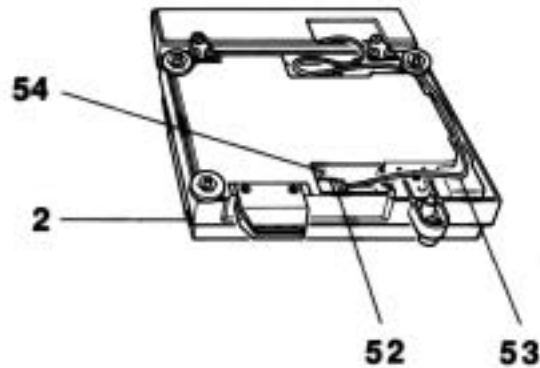
## Preparation

### Mounting terminal

After choosing any SM terminal, proceed as follows:



Fasten terminal **1** at the lower side of weighing platform **2**, using the two connecting brackets **51**.



Remove cap so that it is possible to plug in connector **52**.

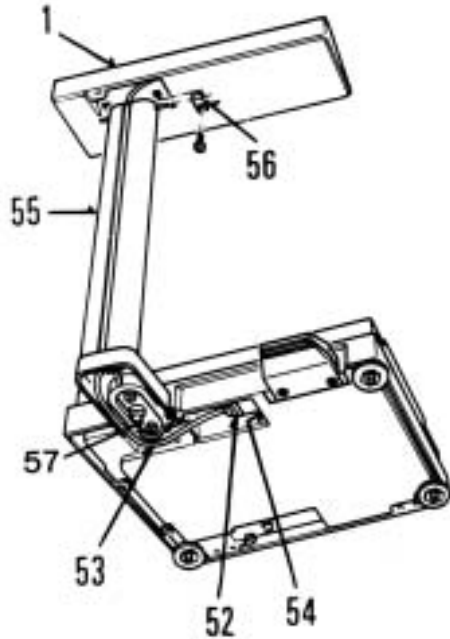
Insert connector **52** of the connecting cable **53** into receptacle **54** of weighing platform **2**. Next, insert connecting cable **53** into clips, according to figure.

Reinsert cap.

Note: It is of course up to your own discretion whether you wish to mount the terminal according to the above instructions (firmly attached to the front of the SM scale, or to leave it loose).

## Mounting terminal with stand

If you have selected the SM stand to go with your terminal, proceed as follows:



Feed power cable **53** of terminal **1** through SM stand **55**, then fasten both bearings **56** to terminal **1** using the appropriate screws (swivel terminal with adjustable tilting resistance; use the appropriate screws for adjusting).

Fasten SM stand **55** at the bottom of housing **57** with the appropriate screws. Insert connector **52** of connecting cable **53** into receptacle **54**.

Note: The SM scale may be turned over by 180 degrees and placed onto a table.

## Mounting wall bracket



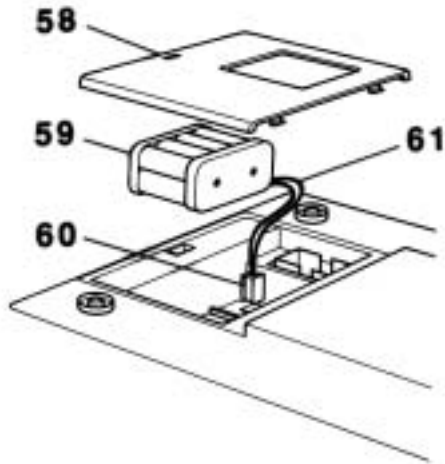
In conjunction with the 1.5m-long extension cable, the SM wall bracket allows you to attach terminal **1** to a wall. The SM wall bracket is to be mounted according to the corresponding mounting instructions.

## Preparation

## Preparation

### Insert PowerPac

If you have selected the PowerPac-SM for maintaining operation and for securing data during a power failure, proceed as follows:



If they are already mounted, remove weighing pan and pan support:

Remove cover **58**.

Insert PowerPac-SM **59** and plug in connector **60** of connecting cable **61**.

Replace cover **58**.

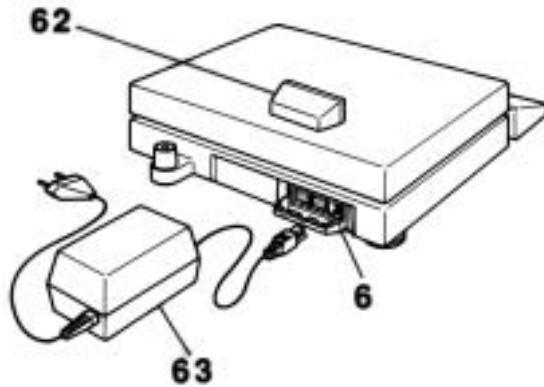
#### Notes:

- The PowerPac-SM permits scale operation for approx. 8h without power supply, provided that the terminal **1** with LCD display is being used, i.e. you are working with the SM-L or SM-AL terminal.
- If your work consists mostly in formulating, and power interruptions are occurring rather frequently, we recommend that the PowerPac-SM remains connected, even when working with the power supply. The advantage of this mode of operation is that, should a power failure occur, all data are saved, and upon power return, work can be continued as before.



## Connecting power supply

The power supply should be connected as follows:



Remove plastic cap **62** (snap-in lock!) at the rear of the scale (protection of power supply against splashing), which protects the connections.

Connect power supply **63** to power receptacle **6** and to power outlet.

Reinsert plastic cap **62**.

### We recommend:

For simultaneous connection of PowerPac-SM and SM-L or SM-AL terminal, we recommend that the power supply be disconnected while working and be reconnected when off.

## Preparation

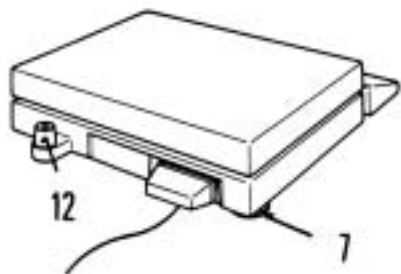
## Preparation

### Placing weighing pan on scale



Place pan support **13** and pan **11** on scale.

### ... and levelling scale



Level scale after each change of position. For this purpose, adjust the position of the bubble to the center of level indicator **12** by means of the three levelling screws **7**.

Note:

Adjust left rear levelling screw upward  $\uparrow$  (turn clockwise)

Adjust both front levelling screws until bubble is located in center; adjust rear levelling screw downward  $\downarrow$  until touching support (turn counterclockwise).

## Software



### **CAUTION!**

The program cassette **64** contains the software for controlling your SM scale; removing or reinserting this program cassette, while the scale is switched on, may cause interference!

Thus, for removing or reinserting this program cassette, the scale must always be switched off, i.e. press **OFF** key 4!

**First, please take a look at the short-form instructions to get familiarized with the easy operation procedures of your SM scale. Then, please note the detailed descriptions in the following sections.**

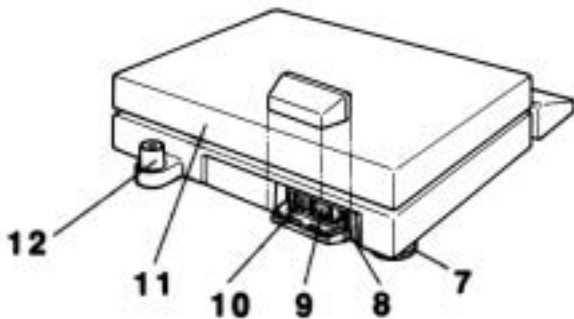
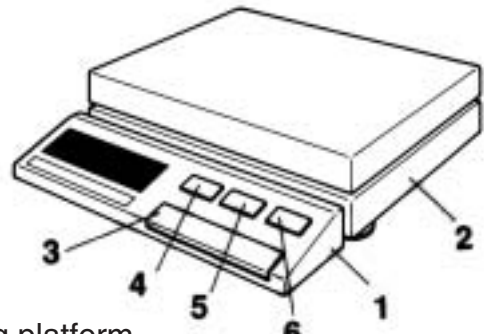
## Preparation

# Operation

## Introduction

We assume that you are now familiar with the outstanding properties of your SM scale in standard configuration from your short-form instructions, and that the straightforward operating procedures are not causing you any problems. The following detailed descriptions within this section -OPERATION- should help you to complement your knowledge.

### Controls and connections



- 1 Terminal
- 2 Weighing platform
- 3 Control bar (ON / MENU / TARE)
- 4 OFF key
- 5 Function key
- 6 PRINT key

- 7 Levelling screw
- 8 Receptacle for power supply
- 9 Receptacle for GM peripherals
- 10 Receptacle for data interface DATA I/O (CL/RS232C)
- 11 Pan
- 12 Level



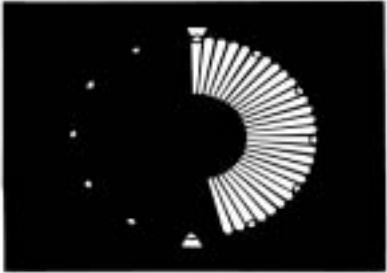
DISPLAY:

- 31 Status indicators
- 31a Vibration adapter
- 31b Weighing process adapter
- 31c Weight status
- 31d Autozero
- 31e Battery condition (discharge warning)
- 31f Special status of balance <sup>1)</sup>
- 32 Digital display
- 33 Weight units
- 34 DeltaTrac (dynamic graphic indicator and dispensing aid, with 60 display segments)
- 35 Tolerance limits

<sup>1)</sup> indicates calculated quantities such as mean values or values multiplied by constants, as well as data entered via the interface.

## METTLER DeltaTrac

This dynamic graphic indicator is an integral part of all SM precision scales. It contains 60 radial segments, thus opens up new optical dimensions in displaying weighing results, i.e. the METTLER DeltaTrac presents digital output information in a graphical display.



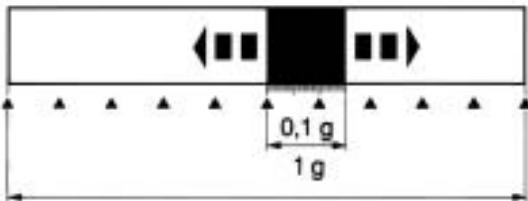
- 1 With absolute weighing, back weighing, weighing-in and formulating, the dynamic display automatically shows how much of the total weighing range has already been used, and how much is still available.



- 2 When controlling fill quantities, the dynamic display automatically shows the tolerance limits with the correct (+/-) sign, as well as positive or negative deviations from tolerances. Function key 5 initiates plus/minus and percent display.

In conjunction with various applications of METTLER TOLEDO Pacs, METTLER DeltaTrac is able to handle other functions as well (see datasheet "Technical data and accessories" 703890).

## METTLER DeltaRange®



Operation

The METTLER DeltaRange® scales include a fine range of 10 times normal accuracy. Pressing the tare key will activate the fine range at any time and within the entire weighing range of the scale. Note: This fine range of 10 times normal accuracy remains also available for back-weighing.

## Operation

### Switching on scale



Scale switched off.



*Briefly* press control bar **3**.

The display goes through an automatic checking sequence of display and scale, which lasts only a few seconds.



Subsequently, the display shows ZERO <0>.The number of decimal places displayed depends on the selected weight unit. Additional information on the selection of weight units is available in the subsequent file CONFIGURING.

### Switching off scale



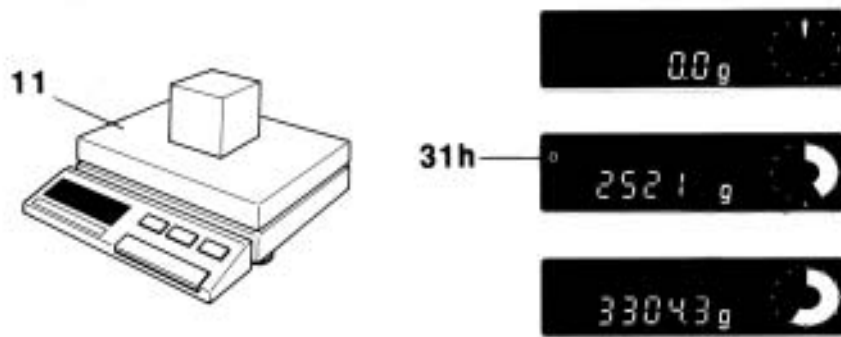
Press **OFF** key **4**.



The display goes off; the scale is switched off.

To switch scale back on, *briefly* press control bar **3**.

## Simple weighing



Place object to be weighed onto weighing pan **11**, ...

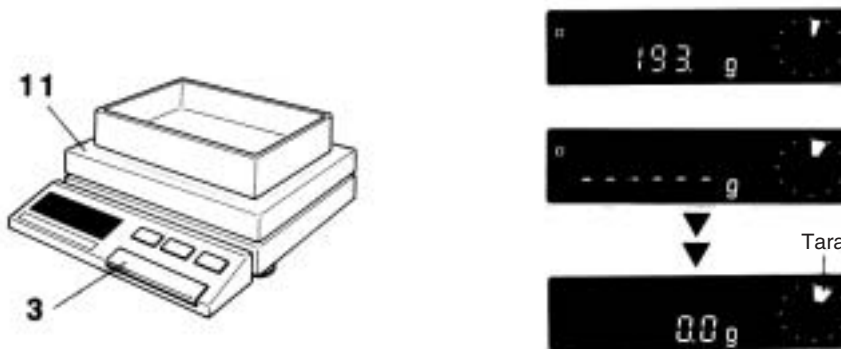
the display keeps on changing until ...

reaching stability. Stability exists as soon as the stability indicating symbol **31h** in the display goes off.

Observe also the DeltaTrac optical aid.

Note: A printer, as available from the list of accessories (see datasheet "Technical data and accessories" 703890), permits to print out results. A connector is located at the rear of the scale.

## Taring



Place empty (tare) container onto weighing pan **11**.

*Briefly* press control bar **3**; only dashes and the stability indicating symbol are now displayed,...

(Pressing the control bar twice, the stability detector is deactivated during the taring procedure. In that case, the taring is not precise and the scale possibly will not display 0.0 g.)

until the scale is stable.

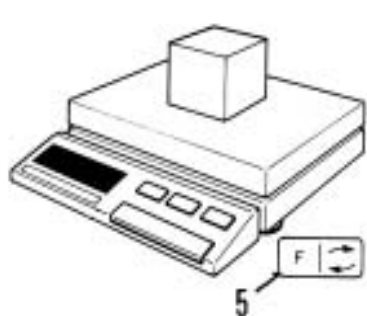
Note: A foot switch or manual key available from the list of accessories (see datasheet "Technical data and accessories" 703890), permits external taring. A connector is located at the rear of the scale.

## Operation

## Operation

### Weighing with plus/minus and percent display

The function key **5** on terminal **1** also permits plus/minus and percent weighing with your SM scale in connection with METTLER DeltaTrac. Note dual function of function key **5**. Proceed as follows:



Place target weight on scale (min. 10.0 g).

Press **F** key **5**; the target weight is being recorded automatically as 100%. Make sure you press the left hand side of the key!

Remove target weight; now plus/minus and percent display is activated!  
If the percent symbol is not being displayed, reset the scale to standard configuration. See section CONFIGURING.



Place object on pan:

METTLER DeltaTrac shows if the weight placed on the scale lies within the tolerance limits!

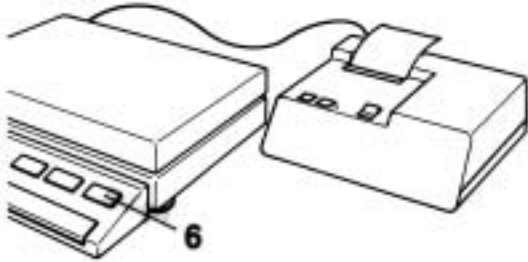
Tolerance limit  $\pm 2.5\%$ , 100% = target weight

#### Notes:

- Pressing the **F** key **5** permits switching between percent readout and weight readout
- With each new strike of the **F** key **5** the current weight on the scale will be recorded as the new target weight.
- The function key **5** may be used for counting pieces or for displaying a second weight unit.  
For details see section CONFIGURING.



## Print command



Provided a printer (e.g. METTLER TOLEDO GA44) is connected to the printer output DATA I/O, a print command is sent to the printer (or a transfer command to another computer) upon pressing PRINT key **6**.

Note: In animal weighing mode , pressing the PRINT key starts a new measuring cycle. For more information see section APPLICATIONS.

# Operation

## Menu

What is a menu, and what does it contain:

The menu comprises calibration, adjustment of the weighing process adapter, and the vibration adapter. These 3 menu steps can be activated, with the scale switched on, by continuous pressing of control bar **3**, thus permitting a rapid change of scale settings.

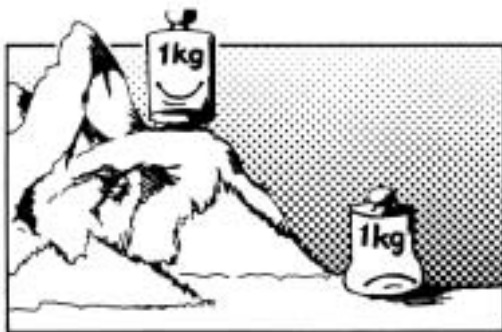


Calibration = Setting scale for proper weight indication

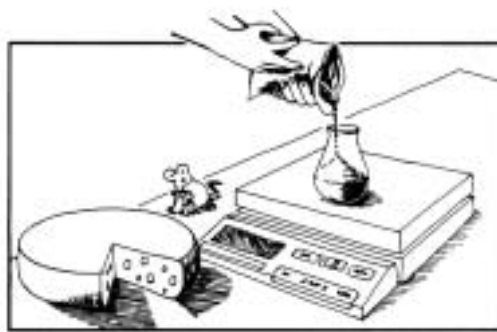
Weighing process adapter = Adjusting scale to type of weighing goods (e.g. a fine powder or a solid object)

Vibration adapter = Adjusting scale to environmental conditions (e.g. to a quiet or stable weighing location)

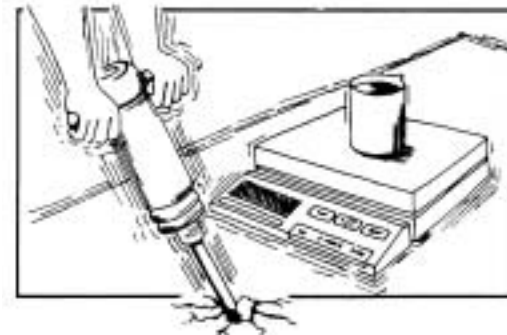
### Calibration



### Adjusting weighing process adapter



### Adjusting vibration

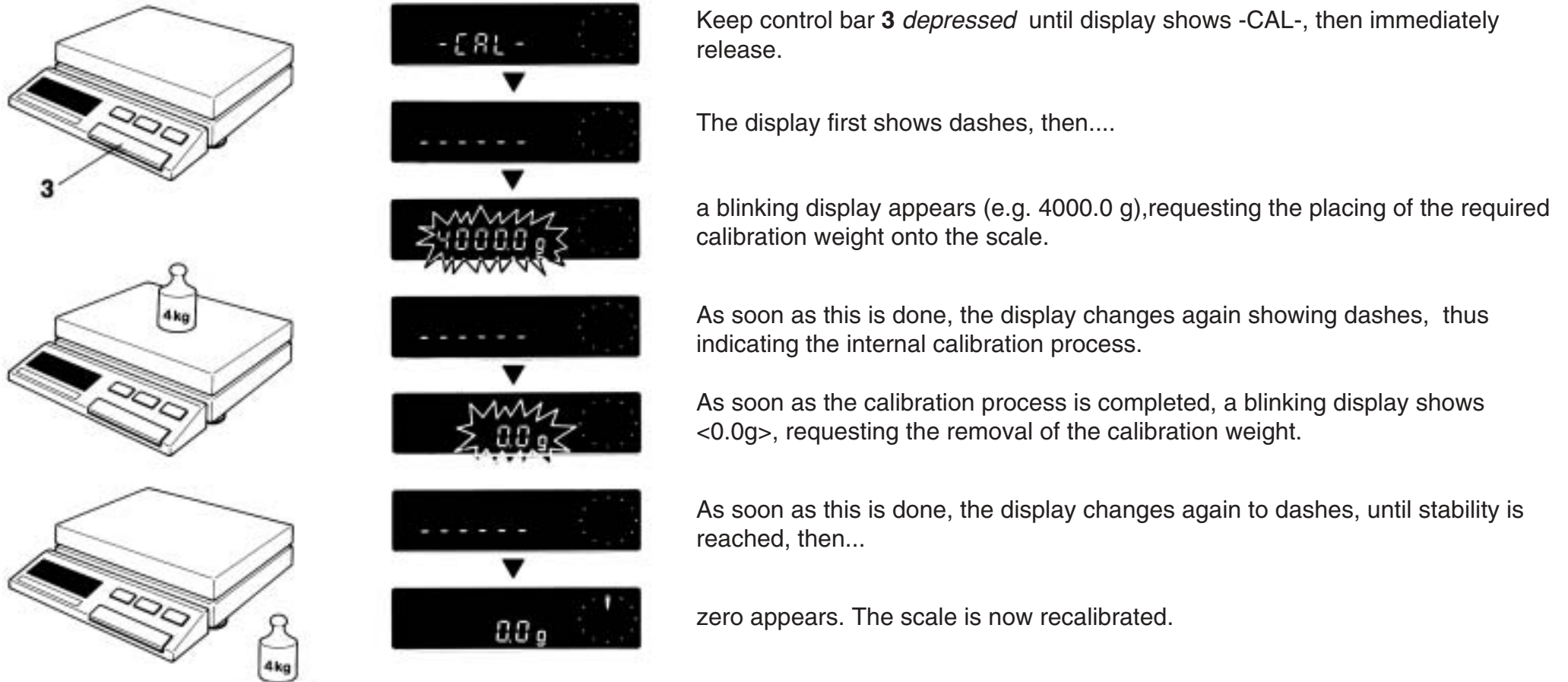


## Calibration

Not accessible in certain countries due to calibration rules

Your SM balance should always be recalibrated whenever moving it to a new location. The necessary test and calibration weight is listed in the datasheet "Technical data and accessories" 703890.

**IMPORTANT:** Your balance requires a certain warm-up time; therefore, it should be switched on at least 15 min. before calibration!



Note: If, during the blinking request for placing the calibration weight onto the scale, the wrong or no calibration weight has been put onto the scale, a few seconds later the display will show "Err 1". Thus, recalibration has not been accomplished!

## Operation

## Operation

### Adapt your scale to your weighing goods (Weighing process adapter)

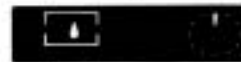
The weighing process adapter serves to adapt the scale to a particular type of weighing goods. For example, with absolute weighing of a solid object, the last decimal place of the result should only be displayed after stability has been reached; e.g. for slowly dispensing of a powderlike or liquid substance, the last decimal digit should be continuously readable.




Keep control bar **3** depressed *until* the display has changed automatically from ...



-CAL- to ...

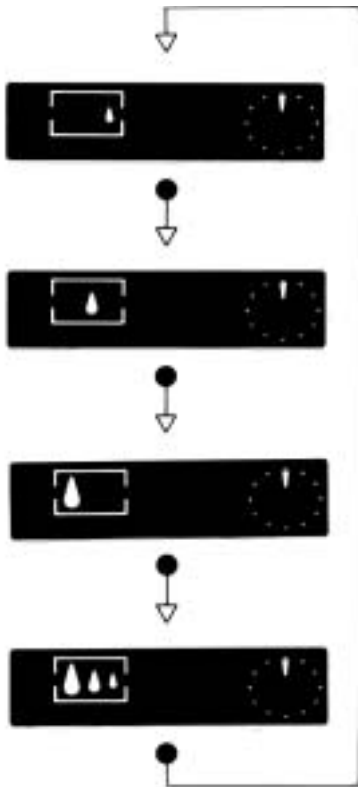


display , then *immediately* release control bar **3** and again *immediately* execute the following instructions.

*Immediately* select the symbol for the required setting by *briefly* pressing control bar **3**. The page below shows and describes the possible settings.

After each brief strike of the control bar, the weighing process adapter symbol changes. Approx. 3 sec. after last pressing the control bar, the setting is being automatically recorded, and the display returns to weighing mode.

Choose ...



... if your weighing goods are

a fine powder or small quantities  
of liquids to be weighed-in

universal

a solid object to be checked for  
absolute weight only

an animal  
(or if weighing environment is  
extremely unstable)

Remarks

All decimal places remain visible on the display =  
DeltaDisplay "off".

Standard setting  
With DeltaDisplay "on", the last decimal place is suppressed  
during coarse dispensing.

This setting permits fast verification of a weight value  
(absolute weighing). Only the final result is displayed.  
During the dynamic/unstable phase, the display indicates  
"Busy-Line".

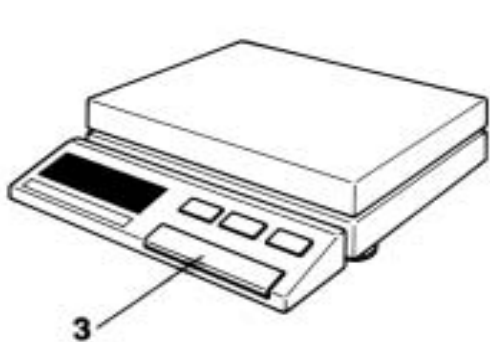
Your scale operates in the animal weighing mode, i.e. the  
movement of a living being does not affect the display. For  
a certain length of time, the values are being averaged,  
and then displayed.  
More information on animal weighing is available in  
section APPLICATIONS.

Operation

## Operation

### Adapt your scale to the environment (Vibration adapter)

The vibration adapter serves to adapt the scale to the prevailing environmental conditions. For instance, under quiet conditions, your scale should be set for obtaining quick results; under unfavorable conditions adjust your scale for obtaining reliable results. Apply the vibration adapter as follows:



Keep control bar **3** *depressed* until the display has changed automatically from -CAL- to ...



display , then to ...



display , then *immediately* release control bar **3**.

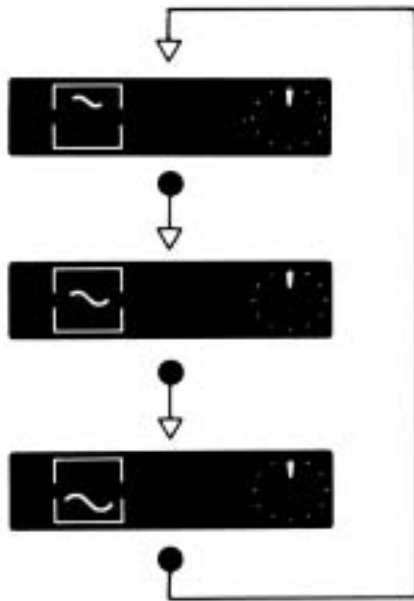
*Immediately* select the appropriate symbol for the required setting by *briefly* pressing the control bar **3**. Possible settings are shown and described on the page below.

After each brief strike of the control bar, the weighing process adapter symbol changes. Approx. 3 secs. after last pressing the control bar, the setting is automatically being recorded, and the display returns to weighing mode.

Choose ...

... if the environmental conditions are

Remarks



very quiet and stable

In this setting your scale works very fast (short weighing cycle); however, it is sensitive to external disturbances.

normal

Standard setting

unstable, e.g. draft or strong building vibrations

Your scale is less sensitive to external disturbances; however, its operation is slowed down.

By keeping the control bar **3** *depressed*, after having adjusted the **weighing process adapter**, both adjustments can be executed in a single step, i.e. the vibration adapter can be set immediately after setting the weighing process adapter.

After having gone through the detailed descriptions in this section, explaining all the settings of the standard configuration, the next section will inform you on how to configure your scale for special requirements.

## Operation

## Configuring

### Introduction

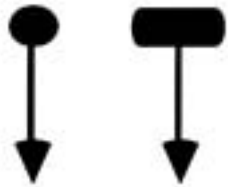
We assume that you are now quite familiar with the easy operating procedures of your SM scale. This section is meant to familiarize you with the process of configuring your SM scale for special requirements. The opposite page gives an overview of available settings and their selection, by *brief, or prolonged* pressing of the control bar **3**. It is important, when accessing the configuration file, to **first switch off** your SM scale by pressing the **OFF** key **4**. Once you have become familiar with the special key sequence, it should be easy for you to configure your SM scale. A detailed description, in six paragraphs, explaining the individual steps within the configuration file, can be found on the following double page. Following thereafter each possible setting is explained.



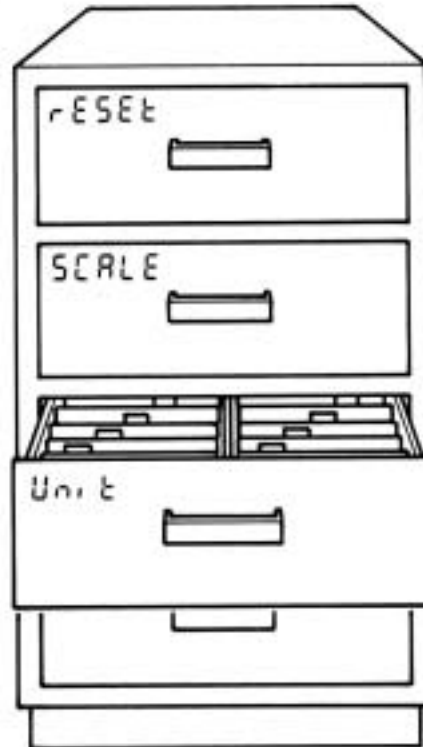
## Configuration file

**First switch off scale!**

**Please note key sequence:**



**brief**      **prolonged**  
**pressing**



**Configuring**

# Configuring

## Configure in 6 steps

### 1 Note these symbols:



*Briefly* press control bar **3**



Keep control bar **3** *depressed* until....

Note: If you ever make a mistake while configuring, keep *pressing* control bar **3** until display returns to weighing mode.

### 2 Open configuration file:



Scale **switched off**: Keep control bar **3** *depressed* until the display shows...



dashes, and then goes over to...



-CONF-; then release control bar **3**.



The display then automatically changes to -rESEt-.

Note: In case the configuration file cannot be accessed, the scale is <protected>. In this case, refer to the section "Protect your settings of the configuration file".

### 3 Choose the desired range: (e.g.Unit-)



*Briefly* press control bar **3**.



The display automatically changes to SCALE-. Once more press control bar **3** *briefly*.



The display automatically changes to -Unit-.

**4 Now, select a single segment (e.g. the segment -Unit 1-):**

Keep control bar **3** *depressed* ...

until the display has changed over to -Unit- 1, then release control bar **3**.

For -Unit 1-, the presently selected weight unit is displayed [e.g."g"].

**5 Now, change the setting:**

The SM scale factory setting of this segment is "g". Change this setting as follows:

*Briefly* press control bar **3** *once* ; the display changes to "kg", i.e. the scale, in first weight unit (-Unit 1-), is now configured in "kg".

**6 Close configuration file:**

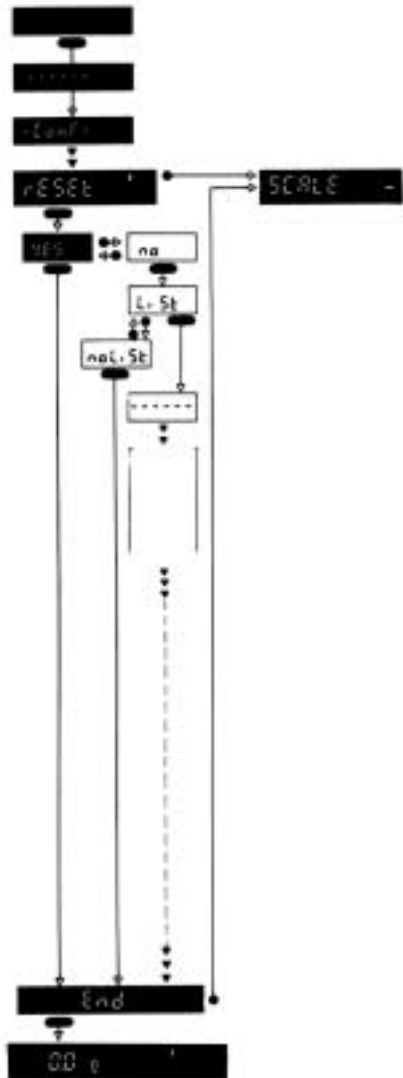
Keep control bar **3** *depressed until* the display shows -END- , and the scale returns to weighing mode.

Note: Releasing the control bar, when displaying -END-, permits to remain in the configuration file.

# Configuring

## "rESet"

From this sector you can return to the standard configuration, as well as print out the scale specification record.



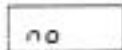
Briefly press control bar.



Press control bar and *hold* until desired display appears.



Standard setting



Selectable setting

### Please note:



After 40 seconds the scale automatically returns to weighing mode.



For returning to weighing mode, keep control bar depressed.



Display changes automatically.

<b>YES</b>	<b>Configuration</b>
------------	----------------------

-YES - permits return to standard configuration. Thus, your scale is back to factory setting.

<b>LiSt</b>	<b>Record printout</b> Yes / No?
-------------	----------------------------------

Printout of the following scale specification values and of the configuration selected.

Select **-LiSt-** to record a printout. Confirm this **-LiSt-** instruction with prolonged pressing of control bar **3**, until "- - - -" is displayed. Connecting a printer (e.g. METTLER TOLEDO GA44) allows printout of the following values:

Printout of scale specification values:

STANDARD (software version), TYPE (scale model), INR (Id number), Full (maximum load), d (readability), CAL (value of calibration weight)

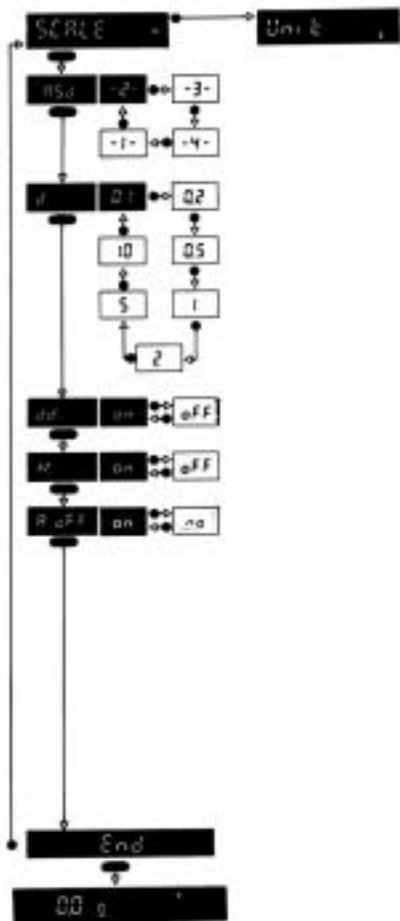
Printout of configuration selected (from version 10.42.00):

The CONFIGURATION parameters are explained on pages 29, 31 and 33 of the present Operating Instructions.

# Configuring

## "SCALE"

In this sector you can adjust the operational parameters of the scale.



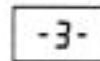
Briefly press control bar.



Press control bar and hold until desired display appears.



Standard setting



Selectable setting

### Please note:





After 40 seconds the scale automatically returns to weighing mode.



For returning to weighing mode, keep control bar depressed.

<b>ASd</b>	<b>Stability</b> (automatic stability detection)
------------	--

	Weighing speed	Reproducibility
ASd 1	very fast	good
ASd 2		
ASd 3		
ASd 4	slower	very good

The stability control is lit  when the balance is unstable. At the same time, the data interface is being blocked until the weighing result is stable (except whenever the data transfer mode **S** is set to **-S.All-** or **-S.Cont-**; see sector **-I-FACE-**).

<b>d.</b>	<b>Selection of display sequence</b> (readability)
-----------	--

Starting from the smallest step of "1 digit (d)", you can choose the following display steps:

1 d, 2 d, 5 d, 10 d, 20 d, 50 d, 100 d

<b>dd.</b>	<b>Weighing-in support</b> (DeltaDisplay)
------------	---

Switching on or off.

The weighing-in support serves to improve weighing-in speed and accuracy. The last decimal place is being suppressed as a function of weighing-in speed; during the concluding phase the balance automatically transfers to normal weighing mode.

<b>AZ</b>	<b>Automatic zero correction</b> (Autozero)
-----------	---

Switching on or off.

The automatic zero correction serves to compensate for zero point drift or for soiled weighing pan.

Note: In any case (on or off), the symbol **-AZ-** is only visible while making adjustments in the configuration file.

<b>A.oFF</b>	<b>Automatic switch-off</b>
--------------	-----------------------------

Switching on or off.

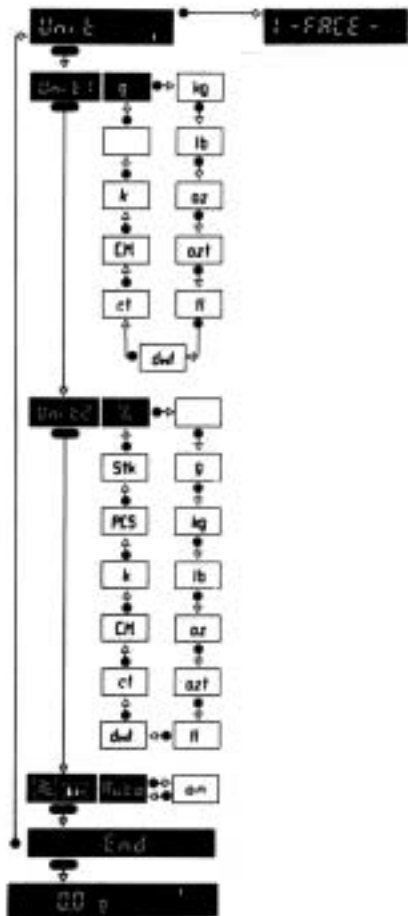
Without simultaneous power line operation, the scale automatically switches off, approx. 8 min. after last weighing.


## Configuring


# Configuring

## "Unit"

In this sector you can select weight units and other applications with function key 5.



 Briefly press control bar.

 Press control bar and hold until desired display appears.



Standard setting



Selectable setting

### Please note:



After 40 seconds the scale automatically returns to weighing mode.



For returning to weighing mode, keep control bar depressed.















<b>Unit 1</b>	<b>Scale Basic Unit (Unit)</b>
---------------	--------------------------------

The user may configure the scale for independent selection of the following weight units:

g gram; kg kilogram; lb pounds; oz ounces; ozt troy ounces; tl tael; dwt pennyweight; ct,C.M.,k ⇒ carat; no display of units.

Note: The number of decimal places depends on the weight unit selected.

#### Conversion factors:



Ounce	1 oz		28.349523125 g	1 g		0.035273962 oz
Pound	1 lb		453.59237 g	1 g		0.002204623 lb
Pennyweight	1 dwt		1.55517384 g	1 g		0.643014931 dwt
Troy Ounce	1 ozt		31.1034768 g	1 g		0.032150747 ozt
Carat	1 ct		0.2 g	1 g		5 ct
Tael	1 tl		37.429 g	1 g		0.026717251 tl

#### Decimal places of foreign units

g	0.0
kg	0.0000
lb	0.000
oz	0.00
ozt	0.00
tl	0.00
dwt	0.0
ct,C.M.,k	0

<b>Unit 2</b>	<b>Switchable</b> second unit, applications
---------------	---

In addition to the same basic units, as in Unit 1, Unit 2 permits the selection of % (plus/minus or percent) or PCS (counting pieces).

 	<b>Mode display</b>
---	---------------------

Switching on or off.

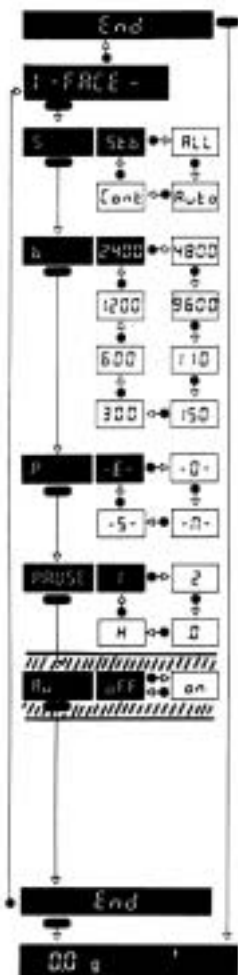
In position -Auto- the two status indicators go off automatically, approx. 3 min. after switching on the display; in position -on- the two status indicators remain lit.

## Configuring

# Configuring

## "I-FACE"

In this sector you can control interfaces.



Briefly press control bar.



Press control bar and *hold* until desired display appears.



Appears only for scales in certified configuration.



Standard setting



Selectable setting

### Please note:



After 40 seconds the scale automatically returns to weighing mode.



For returning to weighing mode, keep control bar depressed.

<b>S.</b>	<b>Data transfer mode</b>
-----------	---------------------------

**S.Stb** The next following stable value is transferred by pressing PRINT key.

**S.All** The momentary value, stable or dynamic, is transferred by pressing PRINT key.

**S.Auto** Stable values only are transferred automatically after each change of weight (necessary deviation 1 g)

**S.Cont** All values (dynamic "SD" and stable "S") are transferred automatically.

<b>b.</b>	<b>Baudrate</b>
-----------	-----------------

Data transfer rate for serial transfer mode in bit/sec.

Selection: 110, 150, 300, 600, 1200, 2400, 4800, 9600 Baud

<b>P</b>	<b>Parity</b>
----------	---------------

By means of parity test, simple bit fields can be recognized in data transmission.

Selection: **E** Even parity, **O** Odd parity, **M** Marked parity, **S** Space

<b>PAUSE</b>	<b>Pause between transmissions and handshake</b> (via hardware with RS232C)
--------------	---

The settings **-PAUSE 0 -**, **-1-** und **-2-** allow adaption of data transmission to data receivers of versions speeds (values in seconds).

With **-PAUSE H-** the handshake signal of RS232C is evaluated. The scale is ready for handshake mode.

CAUTION: In handshake mode, the transfer input may not be used. Use only appropriate cables (see "Accessories") and instruments supporting the handshake mode.

Each SM scale is factory equipped with a bidirectional interface (CL and RS232). More information is available from "Bidirectional Data Interface of the PM balance". See also datasheet "Technical data and accessories" 703890.

Data format of the scale interface: 1 start bit, 7 data bit, 1 parity bit, stop bit automatic (1RX / 2TX).

<b>AU</b>	<b>Peripherals</b>	Appears only in certified scales!
-----------	--------------------	-----------------------------------

If certified scales are connected with peripherals units which cannot process certification symbols (<.....>) (e.g. SQC systems), **-AU-** must be set to "on".

## Configuring

## Configuring

### And now protect your settings in the configuration file

After having configured your SM Scale, you can protect the settings from involuntary changes. Take the following steps:



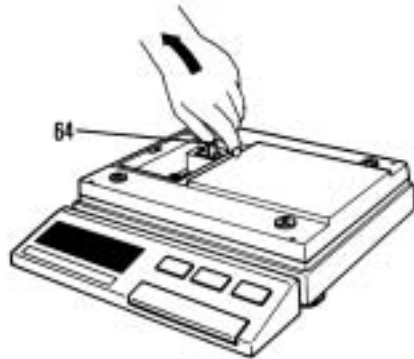
#### **CAUTION:**

The program cassette **64** may not be removed while the scale is switched on; this could cause interference within the software, i.e. the program stored in the program cassette:

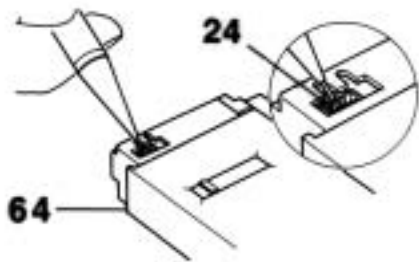
**Press OFF-key 4 !**



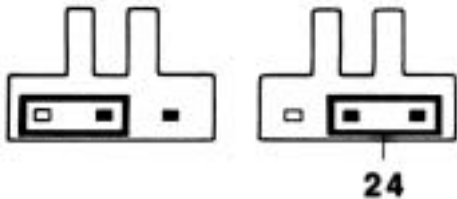
Remove pan **11**, pan support **13** and protecting cover **58**.



Grasp bracket on program cassette **64**, and carefully pull out cassette.



Within the aperture of the program cassette **64** the shorting plug **24** can now be seen; it must be lifted off from one of the contact pins (e.g. with a pencil).



Protect your settings within the configuration file by placing the shorting plug **24** over *both* contact pins.



Carefully reinsert program cassette **64** and push in to "stop" (cassette makes distinct noise when snapping in).

Reinstall protecting cover **58**.

Replace support **13** and weighing pan **11** and switch on scale.

**Your SM scale, i.e. your program cassette is now protected against involuntary changes within the configuration file!**

By now you should be familiar with the operation and configuration of your SM scale. Please also read section WHAT IF ...?, in order to be able to handle any possible malfunctions. The section MISCELLANEOUS contains information regarding service.

## Configuring

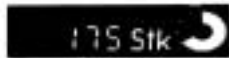
# Applications

## Introduction

Each SM Scale can be adjusted to permit the following applications in addition to standard weighing procedures:



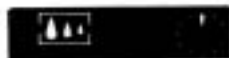
Plus / minus - and percent weighings



Counting pieces



Readout of 2nd weight unit



Animal weighing

Note the following APPLICATIONS described in detail.

## Plus / minus - and percent weighing

You were already introduced to plus/minus and percent weighing in the section OPERATION, "Weighing with METTLER DeltaTrac". If you should already have assigned a different function to function key **5**, which serves to execute this application, you can return to the original application as follows:



▼ Display changes automatically

### Switch off scale!

Press control bar **3** and *hold* until display shows <- - - ->, which is followed by...

-CONF-; release control bar **3** *immediately*;

the display changes automatically to -rESET-

Briefly press control bar **3** *once*;  
the display changes to -SCALE-

Briefly press control bar **3** *once more* ;  
the display changes to -Unit-

Now *press* and *hold* control bar **3** until display first changes to -UNIT 1-, then to...

-Unit 2-; release control bar **3** *immediately*;  
The display shows the momentarily selected 2nd unit.

Now *press* control bar **3** as many times as required until "**%-indication**" appears on the display.

Press control bar **3** and *hold* until the display returns to weighing mode.

Plus/minus- weighings can now be executed according to section OPERATION.

## Applications

## Counting pieces

Your SM scale can be configured for piece counting as follows:



### Switch off scale!

Press control bar **3** and *hold* until display shows <- - - ->, which is followed by...

-CONF-; *immediately* release control bar **3**;

the display changes automatically to -rESEt-.

*Briefly* press control bar **3** *once*;  
the display changes to -SCALE-.

*Briefly* press control bar **3** *once more*;  
the display changes to -Unit-.

Now, *press* and *hold* control bar **3** until display first changes to -Unit 1-, then to...

-Unit 2-; release control bar **3** *immediately*;  
the display shows the momentarily selected 2nd unit.

Now *press* control bar **3** as many times as required until "**PCS-indication**" appears on the display.

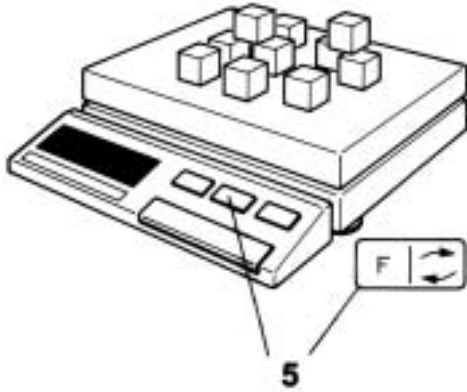
*Press* control bar **3** and *hold* until the display returns to weighing mode.

Piece counting can now be started according to the example shown below.



**Establishing reference for piece counting** (after the scale has been configured according to instructions on the above page).

Establish the reference weight as follows:



Place 10 pieces (at least 100 x the readability) onto the weighing pan and then ...

press **F key 5**; the reference weight is being automatically stored, and the display confirms -10 PCS-.

Now piece-counting can be started.

Note: Pressing the **F key 5** permits to switch between piece number and weight, and viceversa. Renewed pressing of **F key 5** stores the new, momentarily deposited weight as -10 PCS-.

Note: if you want to work with a variable reference (1...x thousands), we advice you to use the software "CountEasy-M", which can be ordered under the following number: 216051.

## Applications

### Read 2nd weight unit

Your SM scale can be configured for "Readout of a second weight unit":



#### Switch off scale!

Press control bar **3** and *hold* until display shows <- - - ->, which is followed by...

-CONF-; *immediately* release control bar **3**;

the display automatically changes to -rESEt-.

*Briefly* press control bar **3** once;  
the display changes to -SCALE-.

*Briefly* press control bar **3** *once more*;  
the display changes to -Unit-.

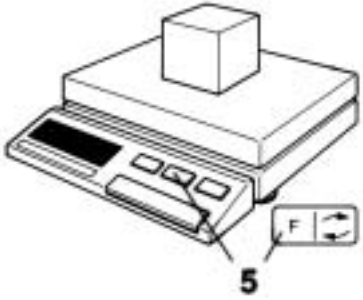
Now *press* and *hold* control bar **3** until display first changes to -Unit 1-, then to...

-Unit 2-; *immediately* release control bar **3**; the display shows the momentarily selected 2nd unit (e.g. "g").  
Now *press* control bar **3** as many times as required until the desired weight unit appears on the display:  
oz = ounce; lb = pound; dwt = pennyweight; ozt = troy ounce; tl = tael; ct, K, C.M. = carat  
Note: The units "PCS" and "STK" are no weight units; they are settings for piece-counting.

*Press* control bar **3** and *hold* until the display returns to weighing mode.

Start "Reading 2nd weight unit" according to the example on page below.

**Read 2nd weight unit** (after scale has been configured according to instructions on page above):



Press **F** key **5**; the display switches to the 2nd weight unit, which you have selected in the configuration file as -Unit 2-.

Place weighing goods onto scale and read weight value within the 2nd weight unit.  
Note: Pressing the **F** key **5** permits to read weight again within the first weight unit.






# Applications

## Animal weighing (or weighing in an extremely unstable environment)

To perform animal weighings with your scale, the adapter must be set as follows (see section OPERATION):

Set weighing process adapter to "Animal weighing"

Set vibration adapter to the desired time sequence (  3s    5s    7s)

You can initiate a measuring sequence as follows:

### 1 Manual

- With PRINT-key **6**  
Upon pressing the PRINT-key, there first appears a sequence of dashes <- - - -> indicating initiation of program; next, the result appears for 3 ... 5 seconds as a stable readout (the blinking indicator **31f** draws attention to the special condition of the display).
- With print key of the thermal printer GA44 (see datasheet "Technical data and accessories" 703890).
- With the external transfer keys (see datasheet "Technical data and accessories" 703890).

Note: If a printer is connected, the stable weight value is printed out automatically.

### 2 Automatic

Set data transfer mode to **-S.Auto-** (see section CONFIGURING, sector I-FACE)

Before starting a new sequence, the load on the scale, between two animal weighings, must be reduced to less than 10 g.

### Note:

For metrological reasons the result of an animal weighing must be preceded by an asterisk (\*). The asterisk can be suppressed for the data transmission via data line. With "AU-on", the asterisk is eliminated from the data string.



## Breakdowns are rare, but what if ...?

### Display



### Definition

Display off

### Cause

- No power
- Scale switched off
- Power supply disconnected (PowerPac discharged?)

### Remedy

- Check power system: Are all cables connected?
- Switch on scale
- Connect power supply  
Note: The battery is too small for operating the FD display.



Underload

- Temporary disturbance
- Pan support or/ and pan missing

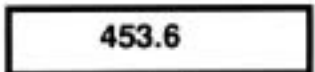
- Switch scale off/on
- Install missing pan support or/and missing pan



Overload

- Load beyond weighing range

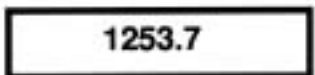
- Reduce load



Weighing result unstable

- Unstable weighing range
- Unsteady object on scale (e.g. animal)

- Adjust vibration adapter
- Place scale on stable support
- Set weighing process adapter to animal weighing


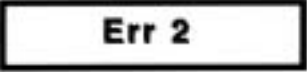
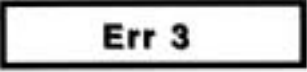


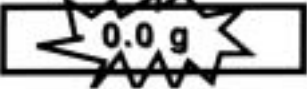


Incorrect result

- Weighing pan is touching
- Operational error
- Wrong unit

- Take off weight, tare and repeat weighing
- Check calibration
- Select correct unit



Display	Definition	Cause	Remedy
	Unstable when calibrating, taring or setting reference	<ul style="list-style-type: none"> <li>- Too much vibration</li> <li>- Stability detector setting too sensitive</li> <li>- Incorrect calibration weight</li> <li>- See overload/underload</li> </ul>	<ul style="list-style-type: none"> <li>- Adjust vibration adapter</li> <li>- Adjust stability detector</li> <li>- Use correct calibration weight</li> </ul>
	Taring in overload or underload condition		
	Reference insufficient or missing	<ul style="list-style-type: none"> <li>- Piece counting or +/- weighing: Reference weight too small</li> </ul>	<ul style="list-style-type: none"> <li>- Increase or apply reference weight</li> </ul>
	Error message of internal electronics monitor	<ul style="list-style-type: none"> <li>- Program cassette improperly inserted</li> </ul>	<ul style="list-style-type: none"> <li>- Insert program cassette correctly</li> </ul>
		<ul style="list-style-type: none"> <li>- Permitted temperature range exceeded</li> </ul>	<ul style="list-style-type: none"> <li>- Switch scale off/on. If error message persists, contact METTLER TOLEDO-Service.</li> </ul>
		<ul style="list-style-type: none"> <li>- Pan support and/or pan not mounted when scale was switched on</li> </ul>	<ul style="list-style-type: none"> <li>- Install support and pan; tare</li> </ul>
	Zero point is not defined		

What if ...?

## Changing the protective covers

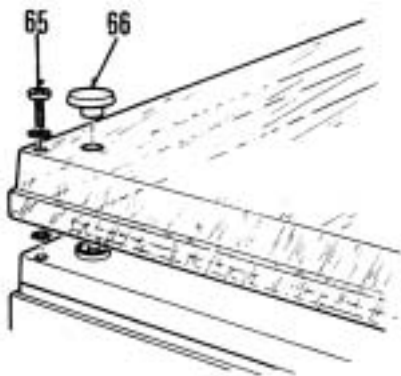
To protect the scale from dust, damage and chemically active weighing goods, the scale is supplied with an attached in-use protective cover, which does in no way interfere with the operation of the scale. A soiled protective cover can be exchanged as follows:



### Changing protective cover of terminal:

Grasp protective cover as shown in figure; pull upward.

Attach new protective cover.



### Changing protective cover of weighing platform:

Remove weighing pan and pan support, four screws **65** of housing and four plastic grommets **66**. Now remove protective cover.

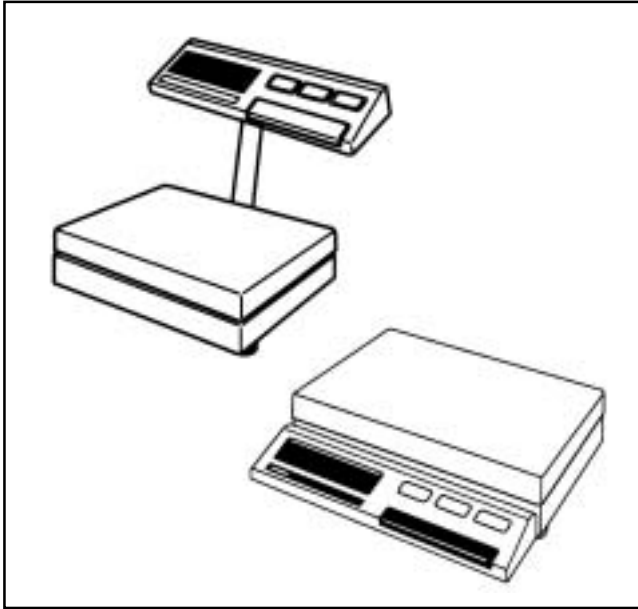
Attach new protective cover and fasten with four screws **65**. Make sure that the lock washers are placed at the bottom against the housing. Push in the four plastic grommets **66**. Replace pan support and weighing pan.

## Your scale should be cleaned regularly

For cleaning the scale, a cloth with soap and water is adequate. You can clean the stainless steel pan with any commercial cleaning agents. Never use any strong solvents.





## Precision scales with readability 0,1 g (1 g)



SM3000	Weighing capacity :	3,1 kg	
SM6000	Weighing capacity :	6,1 kg	
SM15000	Weighing capacity :	15,0 kg	
SM1520 DeltaRange	Fine range :	2,0 kg	(Coarse range: 15,0 kg)

SM scales are also available in an intrinsically-safe version. Ask your METTLER TOLEDO dealer.

			<b>SM3000</b>	<b>SM6000</b>	<b>SM15000</b>	<b>SM1520 DeltaRange</b>
Readability - Fine range (recallable)			0,1 g -	0,1 g -	0,1 g -	1 g 0,1 g
Weighing capacity - Fine range (recallable)			3100 g -	6100 g -	15000 g -	15000 g 2000 g
Taring range (by subtraction)			3100 g	6100 g	15000 g	15000 g
Repeatability (s) - Fine range			0,05 g -	0,05 g -	0,1 g -	0,3 g 0,1 g
Linearity - Fine range			± 0,1 g -	± 0,1 g -	± 0,2 g -	± 1 g ± 0,2 g
Sensitivity drift / °C (10 ... 30 °C)			8 x 10 <sup>-6</sup>	8 x 10 <sup>-6</sup>	6 x 10 <sup>-6</sup>	6 x 10 <sup>-6</sup>
Stabilization time <sup>1)</sup>			1/1,5/2,5 s	1/1,5/2,5 s	1,5/2/3 s	1,5/2/3 s
Update speed			0,13 s	0,13 s	0,13 s	0,13 s
Display <sup>2)</sup>			FD/LCD	FD/LCD	FD/LCD	FD/LCD
Result deviation in inclined position (1:1000)			0,5 g	0,5 g	0,5 g	1 g
Weighing platform (W x L) in mm			322 x 232	322 x 232	322 x 232	322 x 232
Calibration weight Class F1 <sup>3)</sup>			1000 g	2000 g	2 x 2000 g	2 x 2000 g
Net weight			8 kg	_____		
Scale housing H (W x D) in mm <sup>4)</sup>			328 x 350 x 85	_____		
Power consumption			9 VA	_____		

<sup>1)</sup> dependent on the setting of the vibration adapter

<sup>2)</sup> FD Fluorescent display, self-luminous: SM-F  
LCD Liquid crystal display, passive: SM-L

<sup>3)</sup> for noncertified version

<sup>4)</sup> incl. base terminal

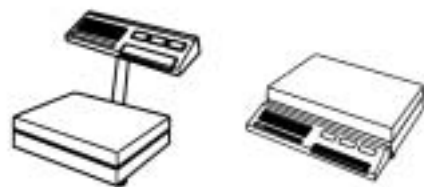
## General technical data

Basic unit of balance/scale, selectable <sup>1)</sup>	g, kg, lb, oz, ozt, tl, GN, dwt, ct, C.M., k
Switchable 2 <sup>nd</sup> unit <sup>1)</sup>	g, kg, lb, oz, ozt, tl, GN, dwt, ct, C.M., k
Applications, selectable	piece counting, +/- or % weighing, animal weighing
Digital display	7 digits
DeltaTrac <sup>2)</sup>	60 segments
Power connection SM	voltage selectable: 115/230 V, ±15 %, 50/60 Hz supply via AC adapter: 11 VDC/0.1 A battery operation: duration 8 h; charge time 16 h
Vibration adapter	choice of 3 settings, optical display
Weighing process adapter	choice of 4 settings, optical display
Stability detector	choice of 4 settings, optical display
<b>Data interface</b>	bidirectional RS232C/CL passive 20 mA
• Baud rate	110...9600 baud
• Parity	even, odd, mark, space
• Transmission	asynchronous 7-bit ASCII
• Plug-in connection	15-pin MiniMETTLER socket
• METTLER TOLEDO GM-interface	15-pin MiniMETTLER for connection of peripherals
<b>Admissible ambient conditions</b>	
• Temperature	0 °C...40 °C
• Relative humidity	15 %...85 %
• Height below/above sea level	-300 m...+600 m
• Vibration	0,3 m/s <sup>2</sup>

<sup>1)</sup> see decimal places for secondary units.

<sup>2)</sup> dynamic graphic indicator and dispensing aid.

SM scales are also available in an intrinsically safe version. Ask your METTLER TOLEDO dealer.

**Standard equipment**

SM1520  
SM3000  
SM6000  
SM15000

Molded in-use cover	-
Retainer ring for molded in-use cover	-
Molded in-use cover for weighing platform	✓
In-use cover for terminal	✓
All-purpose draft shield	-
Glass draft shield <sup>2)</sup>	-
Power cable (to national codes)	AC adapter
Spare power fuse	-
Screwdriver	✓
Hanger	34592
Leveling screws and level	✓
Data interface RS232C and CL	✓
METTLER TOLEDO GM interface	✓
Calibration weight (OIML E2)	-

**Weighing ranges in secondary units**

		<b>SM3000</b>	<b>SM6000</b>	<b>SM15000</b> <b>SM1520</b>	<b>SM1520</b> <b>(fine)</b>
Range in	g	3100	6100	15000	2000
	lb	6,834	13,45	33,01	4,41
	oz	109,35	215,1	529,1	70,6
	ozt	99,67	196,1	482,2	64,30
	tl	82,80	162,9	400,6	53,42
	GN	-	-	-	-
	dwt	1993	3922	9645	1285
	ct / k / C.M.	15500	30500	75000	10000

**Decimal places in secondary units**

Range in	g / dwt	0,0	0,0	0,0	0,0
	kg	0,0000	0,0000	0,0000	0,0000
	lb	0,000	0,000	0,000	0,000
	oz / ozt / tl	0,00	0,00	0,00	0,00
	GN	non settable	non settable	non settable	non settable
	ct / k / C.M.	0,	0,	0,	0,

**You can't know all the words**

<b>Calibrating</b>	Adapting the balance to a reference weight	<b>Indicators</b>	These indicate the status of the balance
<b>Configuration cycle</b>	A run through the configuration file	<b>Jumper</b>	A small plug for locking the configuration
<b>Configuration file</b>	A second level, lockable with the jumper with variable parameters and selectable applications as additions to the menu	<b>Menu</b>	The first level, with selectable settings
<b>Configuring</b>	The setting of parameters	<b>Repeatability</b>	The similarity of values obtained from repeated weighings on the same balance under the same conditions of measurement
<b>Control bar</b>	A single operating device for weighing, working through the menu and configuring your balance	<b>Segment</b>	A radial bar, 1/60th of the DeltaTrac
<b>DeltaDisplay</b>	An aid to fast, accurate weighing-in	<b>Standard setting</b>	The settings for normal user requirements
<b>DeltaRange</b>	Selectable fine range	<b>Standby</b>	The balance is ready for use (mains cable plugged in) but not switched on, i.e. display is blank
<b>DeltaTrac</b>	A dynamic graphic indicator with 60 radial segments	<b>Tare weight</b>	The weight of weighing vessels or packaging
<b>Digit (d)</b>	The smallest displayed value (e.g. METTLER TOLEDO SM 3000: 0.1 g)	<b>Taring</b>	Allowing for the tare weight(s), i.e. the digital readout shows zero
<b>Dispensing</b>	Precise weighing-in of powder or small amounts of liquid, etc.	<b>Vibration adapter</b>	A means of adapting the balance to its location
<b>Display</b>	The entire display unit	<b>Weighing process adapter</b>	A means of adapting the balance to the materials weighed

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Subject to technical changes and to the availability  
of the accessories supplied with the instruments.

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