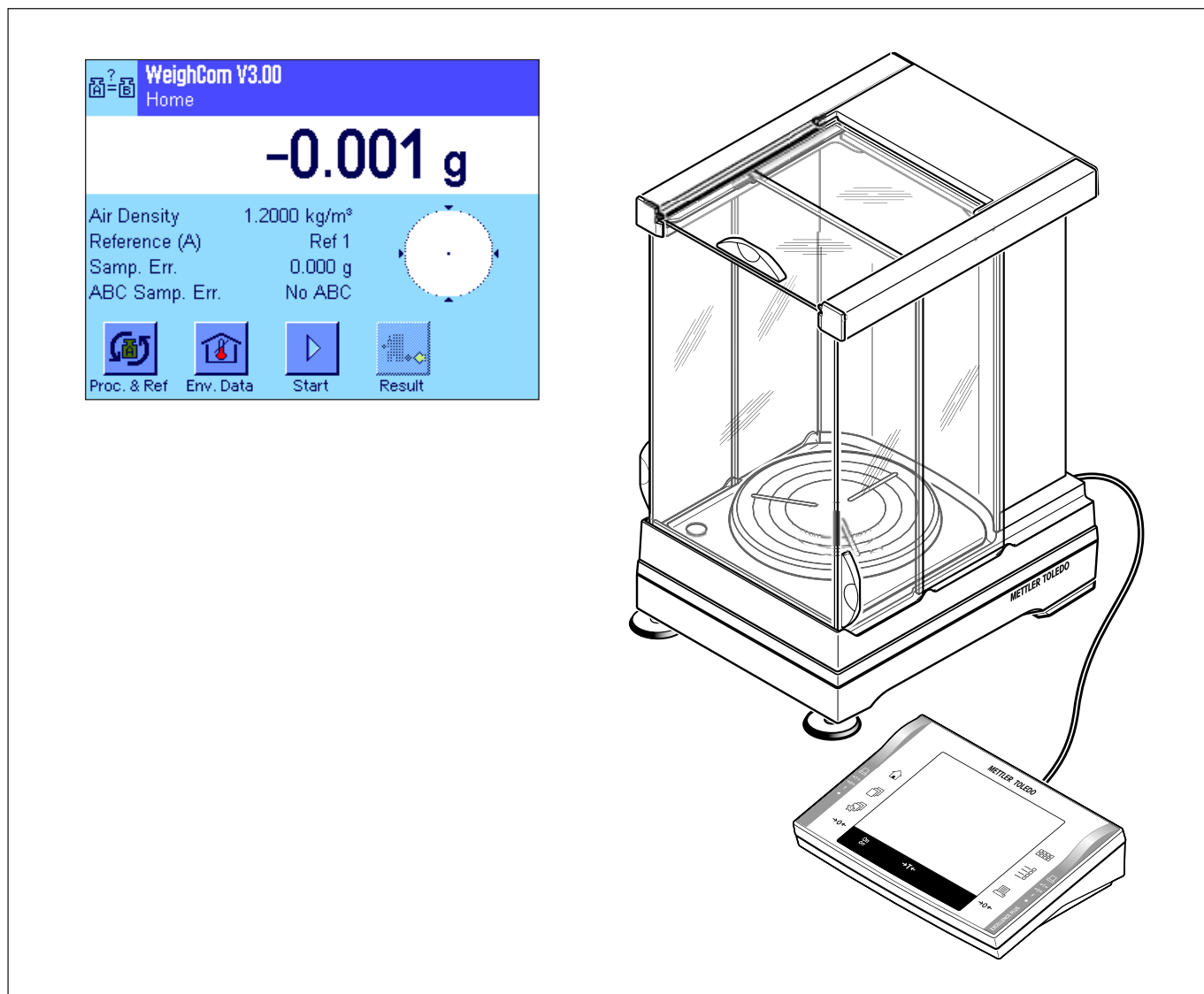# Operating Instructions

METTLER TOLEDO
WeighCom Application for XP Mass Comparators

Version 3.0x

METTLER TOLEDO

Contents

1 Introducing the "WeighCom" application

To ensure the traceability of weights to the prototype kilogram, the mass of the weights to be determined must be compared with the mass of the reference weight. This procedure requires great care on the part of the operator to avoid confusing the weights. The procedure is made certain and reliable by the "WeighCom" application, which enables a guided mass comparison of weights of any manufacturer to be performed on the XP mass comparators.

2 Important notes

These instructions only describe

– «guided» mass comparison using the "WeighCom" application.

These instructions assume that you know how to use an XP balance. You will find corresponding information in the Operating Instructions for the XP balances or XP mass comparators, and it is assumed that you have already read these.

In the operating instructions you are now reading, you will find information about practical work with the "WeighCom" application and the application-specific settings for this application. You will find information about the non-application-specific system settings and user-specific settings in Sections 5 and 6 of the Operating Instructions for the XP Balance.

3 Selecting the "WeighCom" application
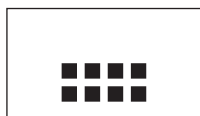
If the "WeighCom" application is not already active, touch the «::::» key. In the selection window, touch the symbol for the application.
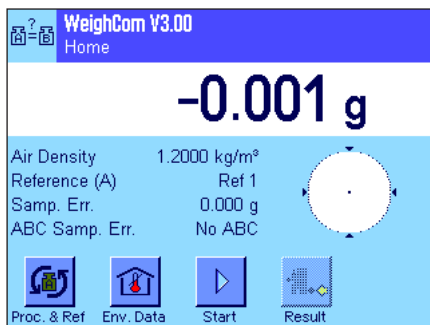
After you have selected the application, the main window of the application opens. The special function keys and information fields for the "WeighCom" application were set at the factory. You can change these and other settings to suit your needs as described in the sections that follow.

4 Settings for the "WeighCom" application

A range of application-specific settings are available for "WeighCom", which you can use to adjust the application to your needs.
**Note:** Except for the process and reference settings, which apply to all users, all other settings are saved under the active user profile. Ensure that the desired profile has been selected before you make the settings.

4.1 Overview

The application-specific settings can be accessed with the «≡» key. After you touch this key, the first of 4 menu pages appears with the application-dependent settings for "WeighCom". Some of the settings are identical to the settings for the "Weighing" application (see Section 7 in the Operating Instructions for the XP Balance). Only the settings that are different are described below.
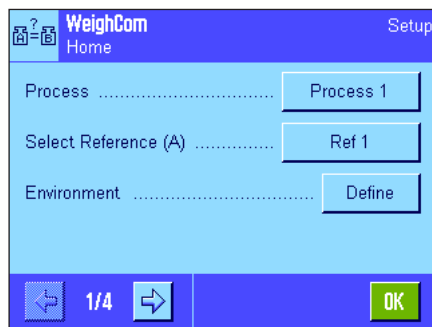
Process"	Select Process (Section 4.2).	
"**Select Reference (A)**"	Select the reference weight (Section 4.3).	
"**Environment**"	Here you enter the current values for the ambient air (Section 4.4).	
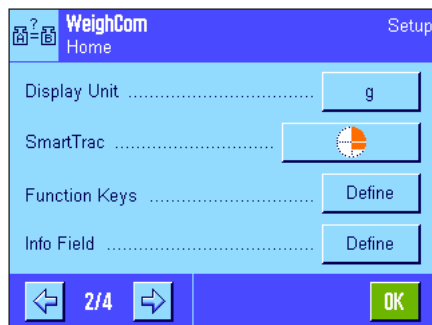
"**Function Keys**"	Here you can specify which function keys should appear at the bottom edge of the display. These allow direct access to certain functions (Section 4.5).
"**Info Field**"	Here you specify which information fields should be displayed in the main window of the application (Section 4.6).

"**Process 1-8**"	Here you specify the parameters for the individual processes (comparison weighings) (Section 4.7).
"**Reference 1-32**"	Enter the parameters of the reference weights (Section 4.8).
"**Report**"	Specifies the information to appear on the measurement reports (Section 4.9).

4.2 Select process

Here you select the process on which your comparison measurement should be based. There is a choice of 8 processes.

You configure the individual processes under the menu item "Process 1-8" (see Section 4.7).

4.3 Select reference weight

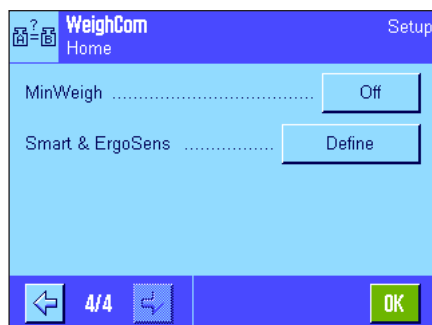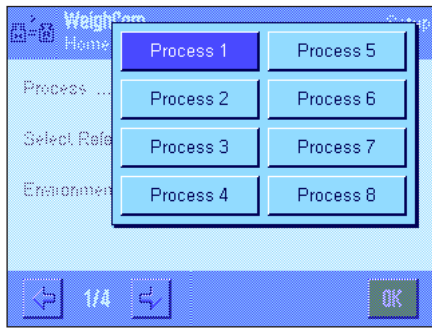Here you select the reference weight that should be used for your comparison measurement. There is a choice of 32 reference weights (on 4 menu pages).

You configure the individual reference weights under the menu item "Reference 1-32" (see Section 4.8).

4.4 Specify air data

In this menu you enter the current values for the ambient air:
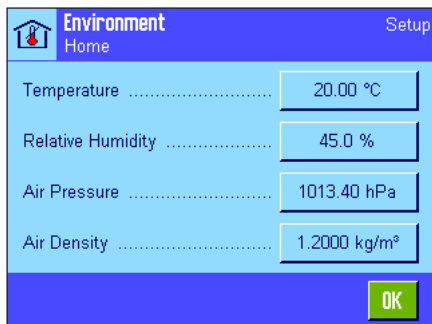
"**Temperature**"
Current ambient temperature in "°C"
Input range: 10.00 °C ... 30.00 °C
Factory setting: 20.00 °C

"**Relative Humidity**"
Current relative air humidity in "%"
Input range: 0.0 % ... 100.0 %
Factory setting: 45.0 %

"**Air Pressure**"
Current air pressure in "hPa"
Input range: 600.00 hPa ... 1200.00 hPa
Factory setting: 1013.40 hPa

"**Air Density**"
The air density (in "kg/m³") is calculated automatically from the preceding values and cannot be changed.
Note: The air density is used to calculate the air buoyancy correction. You will find the formula that is used to calculate the air density in Section 6.1.

4.5   Special function keys for WeighCom

The function key menu contains additional function keys for WeighCom.
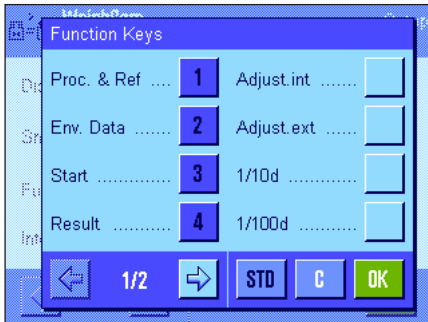
"**Proc. & Ref**"   Opens the menus for selection of the process and reference weight.

"**Env. Data**"   Opens the menu for inputting the current values of the ambient air.

"**Start**"   Starts the WeighCom application.

"**Result**"   Displays the data from the last comparison measurement.

"**Adjust int.**"   Starts the adjustment with the internal dialing weights.

All other function keys are the same as for the "Weighing" application.

Factory setting: "**Proc. & Ref**", "**Env. Data**", "**Start**" and "**Result**" are activated.

4.6   Special information fields for WeighCom

In the Info Fields menu you specify which information fields (max. 4) should be displayed in the main window of the application. For WeighCom you have the choice of the following information fields:

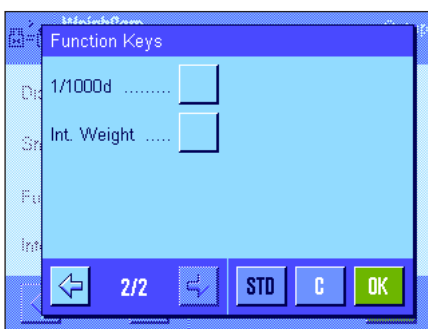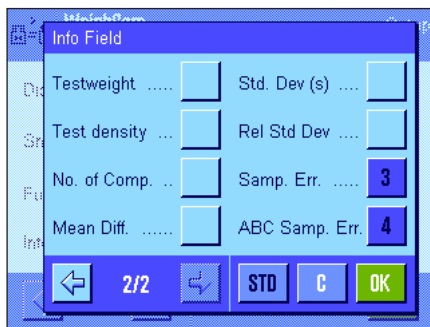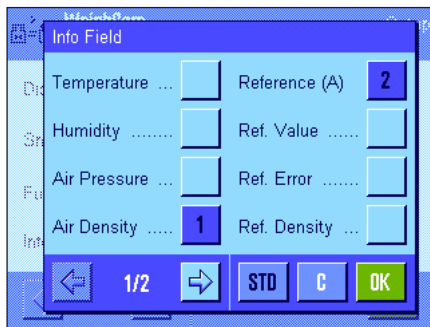|	
"**Temperature**"	The value entered for the temperature.
"**Humidity**"	The value entered for the relative air humidity.
"**Air Pressure**"	The value entered for the air pressure.
"**Air Density**"	The calculated value for the air density.
"**Reference (A)**"	The selected reference weight.
"**Ref. Value**"	The nominal value of the selected reference weight.
"**Ref. Error**"	Error in the selected reference weight according to the definition in the database.
"**Ref. Density**"	Density of the selected reference weight.
"**Testweight**"	Designation of the selected test weight.
"**Test density**"	Density of the selected test weight.
"**No. of Comp.**"	Selected number of comparative weighings.
"**Mean Diff.**"	Mean of the differences [between reference (A) and test weight (B)].
"**Std Dev (s)**"	Calculated value for the absolute standard deviation.
"**Rel Std Dev**"	Calculated value for the relative standard deviation (in %).
"**Samp. Err.**"	Calculated absolute error of the test weight (details see Section 6).
"**ABC Samp. Err.**"	Absolute error of the test weight corrected for air buoyancy (details see Section 6). Displays "No ABC" if the air buoyancy correction is deactivated.
Factory setting:	"**Air Density**", "**Reference (A)**", "**Samp. Err.**" and "**ABC Samp. Err.**" are activated.

4.7 Define processes "Process 1-8"

With WeighCom you can define up to **8 different processes that can be changed again at any time**. The individual settings for a process are described below.

Note: The process settings are valid for all users. To prevent unauthorized users from making unwanted changes to the process data, access to the process settings can be blocked. To do this, access to the system settings for the respective users must be protected with the Administrator ID (Specifying Access Rights, Section 5 in the Operating Instructions for the XP Balance).
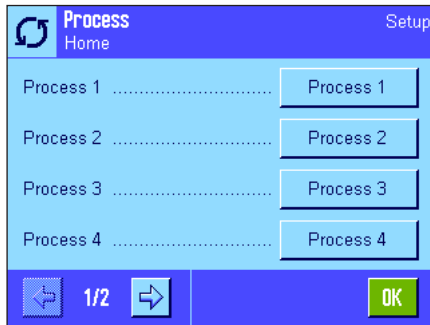
Select the processes that you want to change.
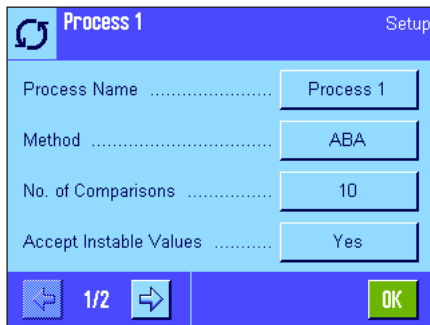
When you have selected the process, you can specify the settings for it as follows:

"**Process Name**"	Name of the process (max. 24 characters).
	Factory setting: "Process 1" to "Process 8"
"**Method**"	With this setting you specify the method that should be used to perform this process. The method determines the sequence of the weights that will be measured. You can choose method "**ABA**" or "**ABBA**" where **A is the reference weight and B the test weight**.
	Factory setting: "ABA"
"**No. of Comparisons**"	Here you enter the number of comparison measurements (measurement cycles "ABA" or "ABBA").
	Input range: 1 ... 30
	Factory setting: "10"
"**Accept. unstable Values**"	With this setting you specify whether or not an unstable measurement value should be accepted after the stabilization time.

"**Yes**": After the stabilization time, the first measurement value is accepted irrespective of whether or not it is stable.

"**No**": The first stable measurement value after the stabilization time is accepted.

Factory setting: "No"

Process 1	Setup
Stabilization Time	10
Test weight ID	No ID Entry
Air buoyancy correction	No
Automatic printout	Yes
⇐ 2/2 ⇒	OK

"**Stabilization Time**"   Enter the time in seconds that should elapse between placing the weight on the balance and reading the weighing value.
Note: You must specify a time that is sufficient to allow the item being weighed to stabilize. The stabilization time that you select must take account of the ambient conditions.

Input range   1 ... 60 seconds
Factory setting: 10 seconds

"**Test weight ID**"   With this setting you specify whether the ID of the test weight should be entered from the keyboard or whether a dotted line should be printed to allow the test weight ID to be input by hand.

"**ID Entry**":   Enter the test weight ID from the keyboard during the comparison weighing.

"**No ID Entry**":   The ID must be written on the dotted line of the report printout by hand.

Factory setting: "No ID Entry"

"**Air buoyancy correction**"   With this setting you specify whether or not the air buoyancy correction should be calculated for this process.

"**Yes**":   The air buoyancy correction will be calculated. At the start of the comparison measurement, the density of the test weight in kg/m^3 must be entered.

"**No**":   The air buoyancy correction will not be calculated. The density of the test weight will be automatically set to 8000.00 kg/m^3.

Factory setting: "No"

Note: You will find the formulas that are used in WeighCom to calculate the air buoyancy correction in Section 6.2.

"**Automatic printout**"   With this setting you specify whether or not the report should be automatically printed out as soon as the comparison measurement is complete.

"**Yes**":   The report will be printed out automatically as soon as the comparison measurement is complete.

"**No**":   The report printout will not be printed out automatically when the comparison measurement is complete. To start the printout, the "Print" key must be pressed.
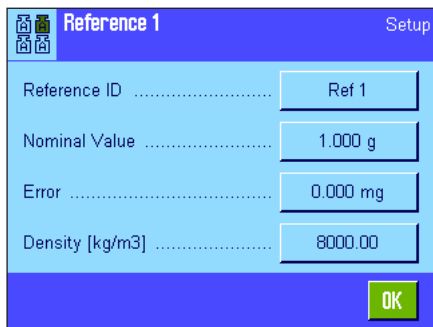
Factory setting: "Yes"

4.8   Define reference weight "Reference 1-32"

In WeighCom, up to **32** different reference weights can be defined and subsequently changed at any time. The individual settings for the definition of a reference weight are described below.

Note: The settings for the reference weights are valid for all users. To prevent unauthorized users from making unwanted changes to the reference data, access to the reference settings can be blocked. To block access, the system settings for the respective users must be protected with the Administrator ID (Specifying Access Rights, see Section 5 in the Operating Instructions for the XP Balance).
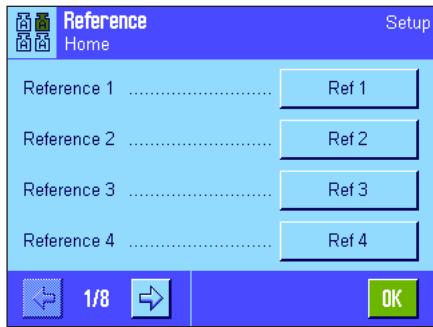
Select the reference weight whose data you want to change.

After you have selected the reference weight, you can make the following settings for it:

"**Reference ID**"   Define the designation for the reference weight. (max. 24 characters)
Factory setting: "Ref 1" to "Ref 32"

"**Nominal Value**"   Enter the nominal value for the reference weight.

Input range: Maximum weighing range of the balance
Factory setting: 1.000 g

"**Error**"   Enter the error of the reference weight (conventional mass value from the calibration certificate).

Input range: Maximum weighing range of the balance
Factory setting: 0.00 mg

Note: Use the "**+/–**" key in the numerical entry field to specify the sign of the error.

"**Density [kg/m3]**"   Density of the reference weight in kg/m^3.

Input range: 490 kg/m^3 to 24,100.00 kg/m^3
Factory setting: 8000 kg/m^3

4.9 Define report

In this menu you specify the information to appear on the reports.
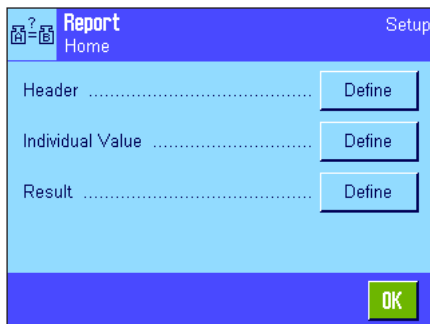
To make it clearer, this menu is divided into 3 submenus in which you can specify the options for:

– the title of the report

– the reporting of the individual values

– the result.

Options for the report titles

By touching the corresponding box, you activate or deactivate the desired information. The checked information will be printed on the record. You can use "**STD**" to reset to the factory settings, or touch "**C**" to quit the input window without saving the changes. If you wish to save your changes, touch "**OK**".
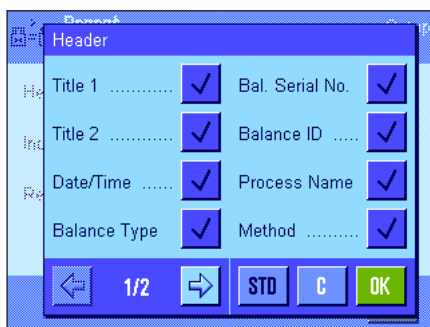
| "**Title 1**"	The copyright mark and the name and version of the application are printed.
"**Title 2**"	The title "----- Test Report -----" is printed.
"**Date/Time**"	The current date and time are printed.
"**Balance Type**"	The balance type is read from the type data of the balance and cannot be changed by the user.
"**Bal. Serial No.**"	The serial number of the balance is read from the type data of the balance and cannot be changed by the user.
"**Balance ID**"	The specified balance identification is printed out.
"**Process Name**"	The name of the process is printed.
"**Method**"	The specified measurement method is printed.
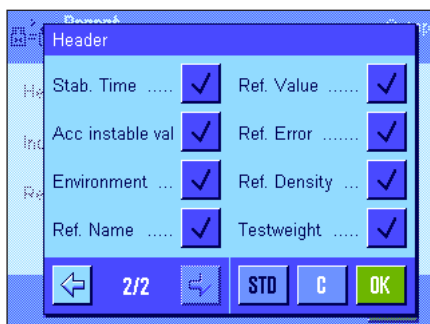
| "**Stab. Time**"	The specified stabilization time is printed out.
"**Acc instable val**"	The selected setting for acceptance of the measurement value after expiration of the stabilization time is printed.
"**Environment**"	The specified ambient conditions are printed out.
"**Ref. Name**"	The designation of the selected reference weight (A) is printed out.
"**Ref. Value**"	The nominal value of the reference weight (A) is printed out.
"**Ref. Error**"	The error of the reference weight (conventional mass value from the calibration certificate) is printed out.
"**Ref. Density**"	The reference weight density that was input is printed.
"**Testweight**"	The designation of the selected test weight (B) is printed.

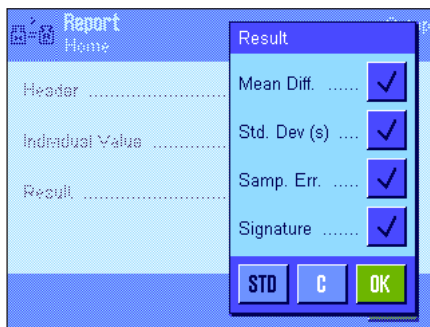| **Factory setting:**	All header information is activated.
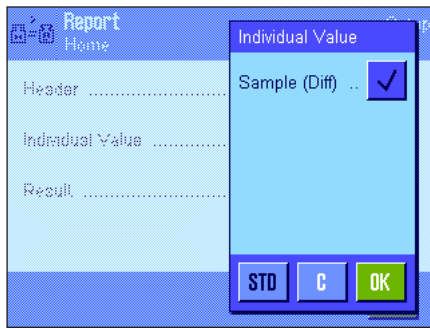
Option for individual value

"**Sample (Diff)**"   The difference value of **each completed measurement cycle** (e.g. ABA) is printed out.

Factory setting: Difference value activated.

Option for the results

"**Mean Diff.**"   The mean value of the differences [between reference (A) and test weight (B)] is printed out.

"**Std Dev (s)**"   The relative (%) and absolute (value) standard deviation of all measurement cycles is printed out.

"**Samp. Err.**"   The calculated absolute error of the test weight is printed.

"**Signature**"   Adds an extra line to the report for a signature.

Factory setting: All result information is activated.

5   Working with the "WeighCom" application

This Section explains how to work with the "WeighCom" application in practice. It is assumed that the "WeighCom" application has been selected and the application-specific settings have been made (Section 4).

The application guides you with the display and also acoustically (audible signal) from one step to the next.

5.1   Preparatory tasks

Before starting measurements the following tasks must be performed:

- In the user settings, set the sound volume in the range 25 to 100 % (see Section 6 of the Operating Instructions for the XP Balance)
- Define the process (Section 4.7)
- Define the reference weight (Section 4.8)
- Define the report (Section 4.9)
- Select the process (Section 4.2)
- Select the reference weight (Section 4.3)
- Enter the data for the ambient air (Section 4.4)
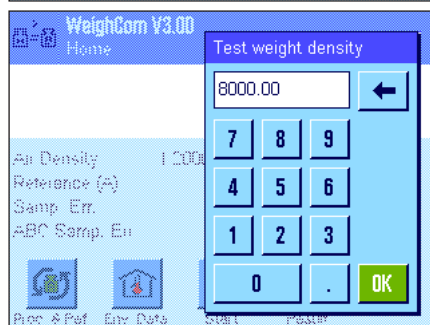
5.2   Performing WeighCom

Touch the "**Start**" function key to start WeighCom.

Note: The glass draft shield opens and closes automatically (if this function is supported by your balance).

If in the process definition you set the parameter "Test weight ID" to "ID Entry", you will first be prompted to enter the test weight ID. Confirm your input with "**OK**".

If in the process definition you set the "Air buoyancy correction" parameter to "Yes", you will now be prompted to enter the density of the test weight in kg/m^3. Confirm your input with "**OK**".
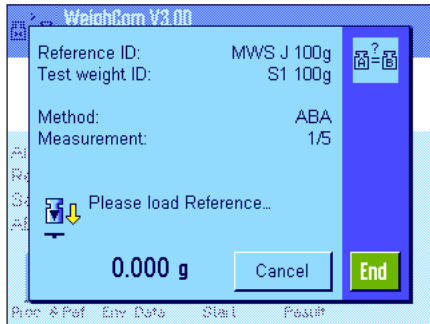
You are prompted to load the reference weight **(A)**. The following settings are shown on the display:

"**Reference ID**"	The selected reference weight ("MWS J 100g")
"**Test weight ID**"	The ID of the test weight
	Note: If no ID is displayed, this means that in the process definition you set the parameter "Test weight ID" to "No ID Entry" and must write the ID of the test weight onto the printout by hand.
"**Method**"	The selected measurement method for this process ("ABA").
"**Measurement**"	The current measurement cycle ("1/5" means that you are in measurement cycle 1 of a total of 5).

Note: You can terminate a measurement series at any time by pressing the "**End**" or "**Cancel**" key. For further information, see the notes on event messages at the end of this section.
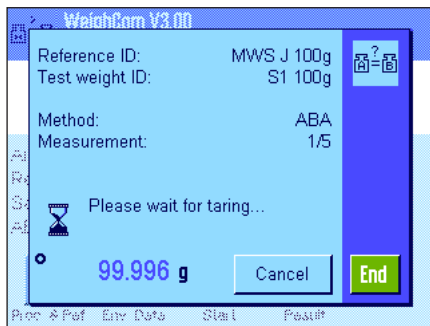
After you have placed the reference weight **(A)** on the balance, the display is set to zero. While the balance is zeroizing, it displays the message "Please wait for taring...".
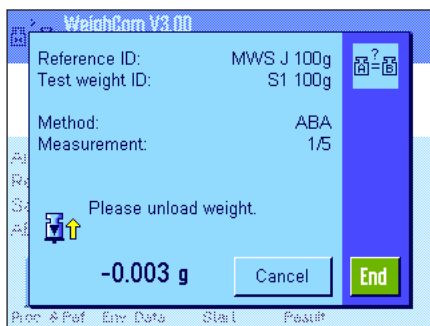
You will be prompted to remove the weight. As soon as you have removed the weight, the message "Please wait ..." appears briefly, and then ...
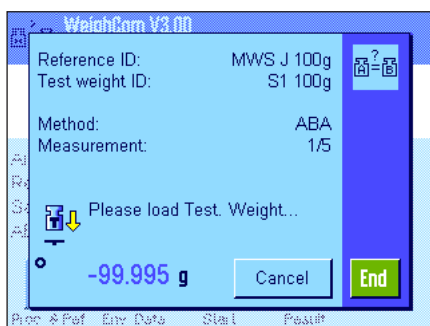
... you are prompted to place the test weight **(B)** on the balance.

As soon as you have placed the test weight on the balance, the message "Please wait ..." appears until the measurement value has been determined, and then ...
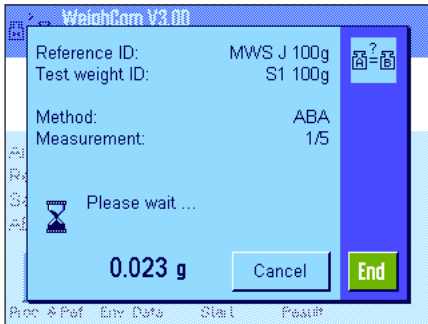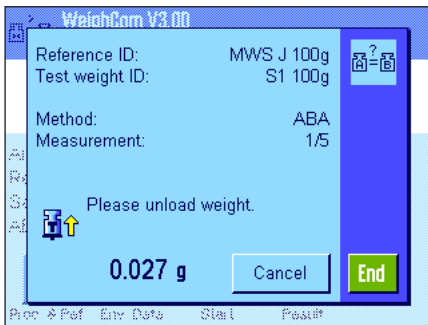
... you are prompted to remove the weight. As soon as you have removed the weight, the message "Please wait ..." appears briefly, and then ...

... you are prompted to place the reference weight **(A)** on the balance.

As soon as you have placed the reference weight on the balance, the message "Please wait ..." appears until the measurement value has been determined, and then ...
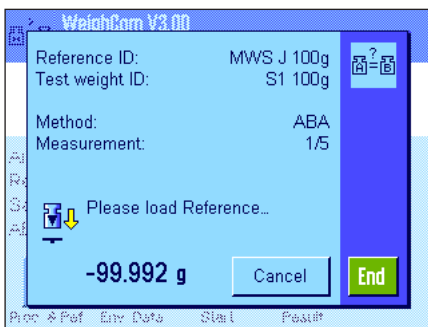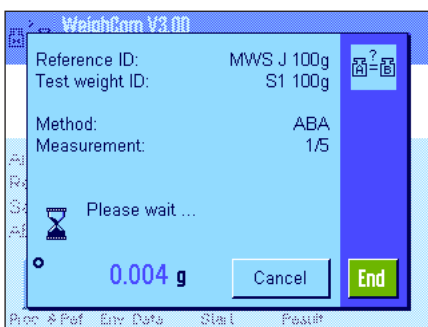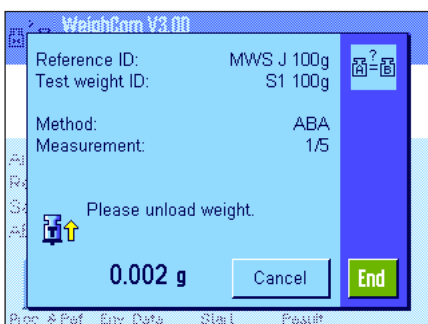
... you are prompted to remove the weight.

This working cycle is repeated until the number of measurement cycles that you input for this process has been performed.

When the comparative measurements are complete, the result is shown on the display. The results window contains the following results:

"**No. of Comparisons**"   Number of comparative weighings completed

"**Mean Diff.**"   Mean value of the differences "ABA" or "ABBA"

"**Std Dev (s)**"   Standard deviation in % and as absolute value

"**Samp. Err.**"   Calculated absolute error of the test weight

"**ABC Samp. Err.**"   Absolute error of the test weight corrected for air buoyancy

Note: The "ABC Samp. Err." is only displayed if in the process definition you set the "Air buoyancy correction" parameter to "Yes".

You can use the "**Print**" key to print the report. Pressing the "**Next weight**" key closes the results window and starts a new comparison measurement with the same process and reference data. Pressing the "**C**" key completes the operation and the results window is closed.

Event messages while working with WeighCom

This message appears if you press the "**Cancel**" message during a measurement cycle.
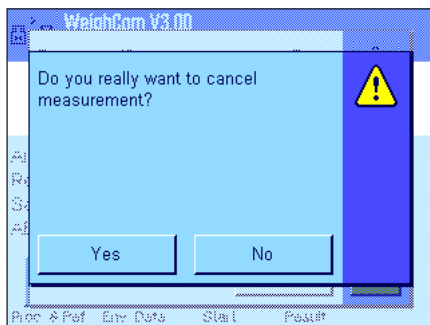
– Press the "**Yes**" key if you really want to cancel the measurement cycle. The measurement values of the measurement cycles that were completed up to this point in time are rejected and you return to the main menu of the application.

– If you do not want to cancel the measurement cycle, press the "**No**" key. You return to the last display in the measurement cycle.

This message appears if you press the "**End**" key during a measurement cycle.
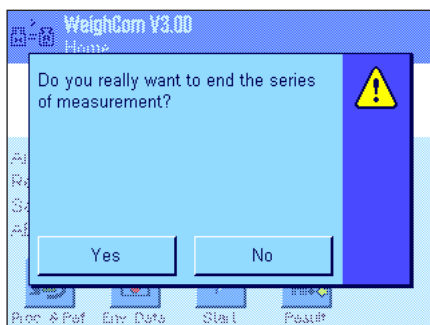
– If you really want to terminate the measurement cycle, press the "**Yes**" key. The measurement values of the measurement cycles that were completed up to this point in time are displayed in the results window.

– If you do not want to terminate the measurement cycle, press the "**No**" key. You return to the last display in the measurement cycle.

This message appears if during a measurement cycle you did not perform any action for longer than 10 minutes.
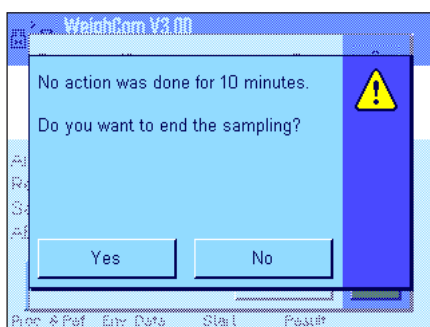
– Press the "**Yes**" key if you really want to terminate the measurement cycle. The measurement values of the measurement cycles that were completed up to this point in time are displayed in the result window.

– If you do not really want to terminate the measurement cycle, you return to the last display in the measurement cycle.

5.3 Displaying and printing the result
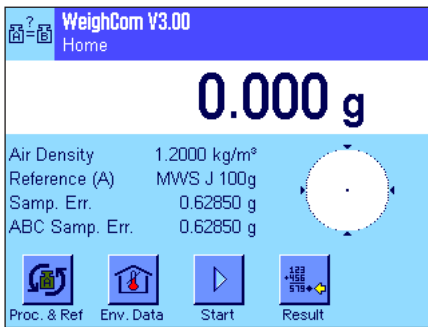
If you have completed a comparison weighing (process), you can call up the results window in the main window of WeighCom at any time.

Press the "**Result**" function key

The result window appears. By pressing the "**Print**" key, you can print out the report for the last comparison measurement (example report, see Section 5.3.1).

5.3.1 Example report

The following illustration shows an example report of a comparison weighing with activated air buoyancy correction. Report entries that are shaded gray on the example report are only printed for comparison measurements with activated air buoyancy correction.
Note: For this example report, all options in the report settings were selected (see Section 5.9).

```
-- Mettler Toledo AG ---
-- WeighCom XP V3.00 ---
-----  TEST REPORT -----
3.Nov 2006          15:32
Balance Type      XP5003S
WeighBridge SNR:
              1227121890
Terminal SNR: 1127121625
Balance ID XP5003S NE235


Setup
Process           OIML E1
Method                ABA
No. of Comp.            5
Stab. Time           12 s
Acc instable val       No


Temperature   20.00 °C
Humidity       45.0 %
Pressure    1013.40 hPa
Air Density 1.2000 kg/m3


Reference
ID            MWS J 100g
Nominal        100.00 g
Error            5.00 mg
Density     8000.00 kg/m3


Testweight
ID              S1 100g
Density      8000.00 kg/m3


Diff. 1      0.88100 g
Diff. 2      0.36650 g
Diff. 3      1.48750 g
Diff. 4      0.38250 g
Diff. 5      0.00000 g


Mean Diff.  0.62350 g
s 0.57209%  0.57569 g
Samp. Err.  0.62850 g
ABC Samp. Err.
             0.62850 g


Signature


.......................
```

Field	Description
"**Title 1**" (Lines 1 and 2)	Copyright mark and the name and version of the application
"**Title 2**" (Line 3)	Report title
"**Date/Time**"	Current date and time
"**Balance Type**"	Designation of the balance type
"**WeighBridge SNR**"	Serial number of the weighing platform
"**Terminal SNR**"	Serial number of the terminal
"**Balance ID**"	ID of the balance
"**Process**"	Name of the process
"**Method**"	Measurement method selected ("ABA" or "ABBA")
"**No. of Comp.**"	Number of comparison measurements selected
"**Stab.Time**"	Stabilization time
"**Acc instable val**"	Selected setting for the acceptance of measurements after expiration of the stabilization time
"**Temperature**"	Input ambient temperature
"**Humidity**"	Input ambient humidity
"**Pressure**"	Input air pressure
"**Air Density**"	Air density values calculated from the air data
"**ID**"	Designation of the selected reference weight (A)
"**Nominal**"	Nominal value of the reference weight (A).
"**Error**"	Error of the reference weight (conventional weighing value from the calibration certificate)
"**Density**"	Input density of the reference weight
"**ID**"	Input designation of the selected test weight (B) **Note:** If no name was input, a dotted line is printed for the designation to be entered by hand
"**Density**"	Density of the test weight
"**Diff. 1**" to "**Diff. n**"	Calculated difference value of each fully completed measurement cycle (e.g. "ABA")
"**Diff. mean value**"	Mean value of the difference values
"**s**"	Relative (%) and standard deviation (absolute value) of measurement cycles
"**Samp. Error**"	Calculated absolute error of the test weight
"**ABC Samp. Err.**"	Absoute error of the test weight corrected for air buoyancy
"**Signature**"	Printed line on which to sign the report

6 Formulas used in WeighCom

6.1 Formula for air density correction

The air density calculation in WeighCom is based on the following formula (Source: OIML R111-1 E 3-1):

$$\rho_a = \frac{(0.34848 \times p) - (0.009 \times hr \times \exp(0.061 \times t))}{273.15 + t}$$

ρ_a= air density [kg/m³]
t= air temperature [°C]
hr= relative air humidity [%]
p= air pressure [hPa]

6.2 Formulas for calculation of the air buoyancy correction

The air buoyancy correction in WeighCom is based on the following formula (Source: OIML R111-1 10.2):

$$m_{ct} = m_{cr} \times (1+C) + \overline{\Delta m_c}$$

$$C = (\rho_a - \rho_0) \times \left[\frac{1}{\rho_t} - \frac{1}{\rho_r} \right]$$

m_{ct}= Mass of the test weight corrected for air buoyancy [kg]
m_{cr}= Mass of the reference weight according to the value defined in the database [kg]
Δm_c= Mean value of the measured difference values [kg]
C= Air buoyancy correction factor according to the above formula
ρ_a= Air density [kg/m³] (according to the calculation in Section 6.1)
ρ_0= Standard value for the air density 1.2 kg/m³
ρ_r= Density of the reference weight according to the value defined in the database [kg/m³]
ρ_t= Density of the test weight according to the value defined in the database [kg/m³]

6.3   Example calculations

Example calculation 1

m_{CR} = 1 kg + 0.18 mg
Δm_C = −0.34 mg
ρ_a = 1.145 kg/m³
ρ_r = 8006.24 kg/m³
ρ_t = 7994.56 kg/m³

$$C = (\rho_a - \rho_0) \times \left[\frac{1}{\rho_t} - \frac{1}{\rho_r} \right] = (1.145 - 1.2) \times \left[\frac{1}{7994.56} - \frac{1}{8006.24} \right] = -0.000\,000\,010\,037$$

$m_T = m_{CR} \times (1 + C) + \Delta m_C = [1.000\,000\,180 \text{ kg} \times (1 + (-0.000\,000\,010\,037)] + (-0.34 \text{ mg})$

$m_T = [1.000\,000\,180 \text{ kg} \times 0.999\,999\,989\,963] -0.34 \text{ mg} = 0.999\,999\,829\,963 \text{ kg}$

$\Delta m_T = m_T - 1 \text{ kg} = 0.999\,999\,829\,963 \text{ kg} - 1 \text{ kg} = -0.000\,000\,170\,037 \text{ kg} = -0.170\,037 \text{ mg}$

Example calculation 2

m_{CR} = 20 kg + 0.68 mg
Δm_C = 0.52 mg
ρ_a = 1.112 kg/m3
ρ_r = 8006.24 kg/m3
ρ_t = 8004.56 kg/m3

$$C = (\rho_a - \rho_0) \times \left[\frac{1}{\rho_t} - \frac{1}{\rho_r} \right] = (1.112 - 1.2) \times \left[\frac{1}{8004.56} - \frac{1}{8006.24} \right] = -0.000\,000\,002\,307$$

$m_T = m_{CR} \times (1 + C) + \Delta m_C = [20.000\,000\,680 \text{ kg} \times (1 + (-0.000\,000\,002\,307)] + 0.52 \text{ mg}$

$m_T = [20.000\,000\,680 \text{ kg} \times 0.999\,999\,997\,693] + 0.52 \text{ mg} = 20.000\,001\,153\,862 \text{ kg}$

$\Delta m_T = m_T - 20 \text{ kg} = 20.000\,001\,153\,862 \text{ kg} - 20 \text{ kg} = 0.000\,001\,153\,862 \text{ kg} = 1.153\,862 \text{ mg}$

6.4   Calculation of the mean of the weight differences

6.4.1   Calculation of the mean value of the drift-corrected differences ABA or ABBA ("Mean Diff.")

Note: (A = reference weight, B = test weight)

Calculation for method "ABA"

$$\text{Diff1} = \text{B1} - \frac{(\text{A1} + \text{A2})}{2}$$

$$\text{Diff2} = \frac{(\text{B2} + \text{B3})}{2} - \text{A3}$$

$$\text{Diff3} = \text{B4} - \frac{(\text{A4} + \text{A5})}{2}$$

$$\text{Mean Diff.} = \left(\frac{\text{Diff1} + \text{Diff2} + \text{Diffn}}{n} \right)$$

Calculation for method "ABBA"

$$\text{Diff1} = \frac{(\text{B1} + \text{B2})}{2} - \frac{(\text{A1} + \text{A2})}{2}$$

$$\text{Diff2} = \frac{(\text{B3} + \text{B4})}{2} - \frac{(\text{A3} + \text{A4})}{2}$$

$$\text{Diff3} = \frac{(\text{B5} + \text{B6})}{2} - \frac{(\text{A5} + \text{A6})}{2}$$

$$\text{Mean Diff.} = \left(\frac{\text{Diff1} + \text{Diff2} + \text{Diffn}}{n} \right)$$

6.4.2   Calculation of the standard deviation of the drift-corrected differences ("Std Dev.")

Standard deviation in % =

$$\frac{\text{Standard deviation}}{\text{Weight of test weight (nominal value of reference weight + error of reference + mean value of differences)}}$$

Standard deviation as value =

$$\sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (\text{Diff}_i - \text{Mean Diff.})^2}$$

6.4.3   Calculation of the conventional mass value of the test weight ("Error of Test Weight")

Error of test weight = reference error (ref. error) + mean value of the differences (Mean Diff.)

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Subject to technical changes and to changes in
the accessories supplied with the instruments.