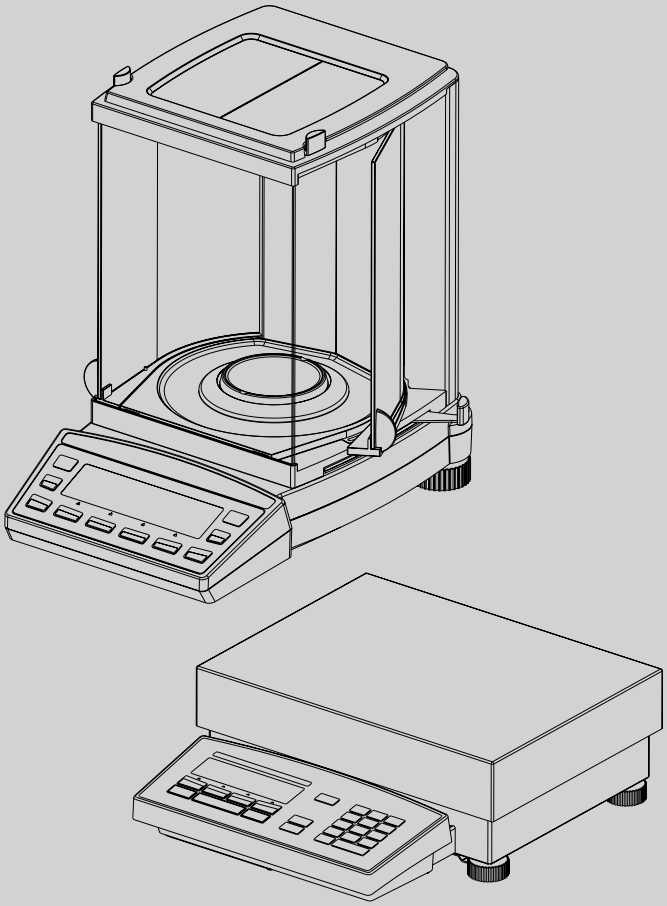

Precisa Balances Applications

Operating Instructions

Precisa

The Balance of Quality

350-8113-000b2

Applications

These Operating Instructions describe the special application programs for Precisa balances which are not already explained in the General Operating Instructions.

English

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Precisa Gravimetrics AG
Moosmattstrasse 32
CH-8953 Dietikon
Tel. +41-44-744 28 28
Fax. +41-44-744 28 38
email service@precisa.ch

http://www.precisa.com

1 Density ("DENSITY")

1.1 Explanatory notes on density determination

1.1.1 Methods of determination

You can use the "DENSITY" workflow to determine the density of solids and liquids.
You can choose between different methods of determination:

- "MODE LIQUID" : Density of a liquid (only with density determination kit 350-8515)
- "MODE SOLID IN AIR" : Density of a solid
- "MODE SOLID POROUS" : Density of a porous solid
- "MODE SOLID ON BOTTOM" : Density of a solid with a vessel on the weighing pan

1.1.2 Density index calculation

The density index indicates the percentage difference between two densities:

$$\text{Index} = \frac{\text{density\_1} \cdot \text{density\_2}}{\text{density\_1}} \cdot 100\ \%$$

The two densities are used such that density_1 is always > = density_2.

Either two consecutive densities are compared, or the last density determined is compared with the input reference density.

1.2 Selecting the density determination application

In order to activate the application menu, press the «**MENU**» key and select the "DENSITY" application.

• **SELECT APPLICATION**		
SET APP.	**OFF**	*Normal weighing mode*
	...	*...*
	...	*...*
	DENSITY	*Density determination*
	...	*...*
	...	*...*

The submenus which are required for defining the density determination are now displayed in the "SETUP APPLICATION" menu.

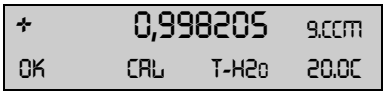
1.3 Configuring the density determination

• SETUP APPLICATION		
DENSITY	MODE SOLID ON BOTTOM	*Solids with a vessel on the weighing pan*
	MODE **SOLID IN AIR**	*Solids*
	MODE LIQUID	*Liquids*
	MODE SOLID POROUS	*Porous solids*
	INDEX ON/**OFF**	*Index calculation on/off*
	REFERENCE **8.000**	*Reference density for the index calculation in g/ccm (only used if REFERENCE < > 0.000)*
	TIME BASIS **2.0**	*Time basis for repetition in seconds (only used if TIME BASIS < > 0.0)*
	REF. DENSITY **0.998205**	*Density of the test liquid (Factory setting water at 20°C)*
	TEMPERATURE **20**	*Temperature of the water used for the measurement in °C (the REF. DENSITY is calculated accordingly)*

1.4 Starting and initializing the density program

Press «↻» briefly to go to the density program.

If "LIQUID MODE" is set, it goes directly to the density measurement. The following display appears in all other modes:



Current density of the test liquid

Functions

Configuration of the function keys:

Key	Functions
«**OK**»	Accept the density of the test liquid = = > Continue with the corresponding density measurement.
«**KAL**»	Determine the density of the test liquid (see chapter 1.5 "Density of a liquid "MODE LIQUID" (with density kit 350-8515)").
«**T-H2o 20.0C**»	Set the reference density of water (currently set at: 20.0°C).
«**T-H2o ---C**»	Set the reference density of water (currently not defined).

1.5 Density of a liquid "MODE LIQUID" (with density kit 350-8515)

This method is used to determine the density of a liquid. A glass vessel is used for this with a volume of 10 cm^3 or 100 cm^3.

Display	Key	Step
0,000 g AIR SET	«**T**»	*Taring*

Hang the glass vessel from the below-balance hook (fig. 1).

+ 24,971 g AIR SET	«⇛»	*As soon as the reading is stable, it is saved and displayed for 2 seconds.*

Place the container and liquid on the balance and lower in the glass vessel (the glass vessel must not touch the bottom) (fig. 2).

+ 14,985 g LIQUID SET	«⇛»	*As soon as the reading is stable, it is saved and displayed for 2 seconds.*
+ 0,9999 g/ccm DENSITY <->		*Liquid density display* *(provided it is within the 0,5 - 2.0 g/ccm range).*
+ 0,20 % INDEX <->	«⇑»	*Switch to the density index display* *(if Index is ON).*
0,000 g AIR SET	«**T**»	*Taring, the balance returns to the gram display and is ready for the next determination.*

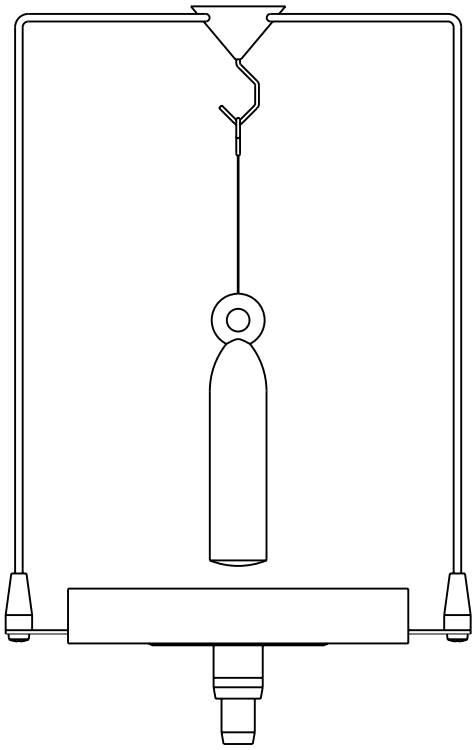


fig. 1

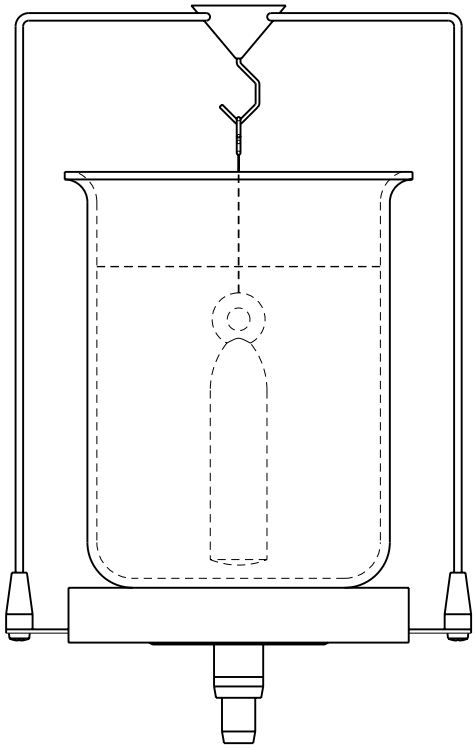


fig. 2

English

1.6 Density of a solid "MODE SOLID IN AIR"

This method is used to determine the density of a solid. The double beaker is required for this. The thermometer is used to monitor the temperature of the test liquid in the container.

Display	Key	Step
0,000 g AIR SET	«**T**»	*Taring*

Place the solid into the top beaker (fig. 3 resp 3a).

+ 24,972 g AIR SET	«⇛»	*As soon as the reading is stable, it is saved and displayed for 2 seconds.*

Place the solid into the bottom beaker (fig. 4 resp 4a).

+ 16,982 g LIQUID SET	«⇛»	*As soon as the reading is stable, it is saved and displayed for 2 seconds.*
+ 3,120 g/ccm DENSITY <->		*Solid density display* *(provided it is within the 0,1 - 25.0 g/ccm range).*
+ 2,05 % INDEX <->	«⇑»	*Switch to the density index display* *(if Index is ON).*
0,000 g AIR SET	«**T**»	*Taring, the balance returns to the gram display and is ready for the next determination.*

Density determination using a density determination set Order number see Accessories series 320

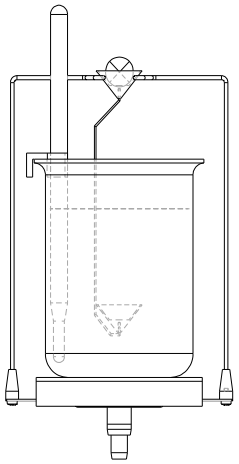


fig. 3

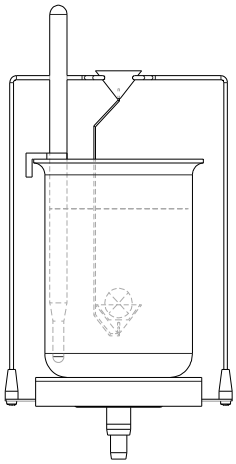


fig. 4

Density determination using below balance weighing Order number see Accessories of the respective series

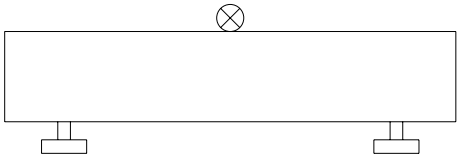


fig. 3a

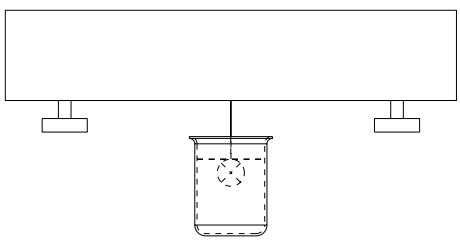


fig. 4a

1.7 Density of a porous solid "MODE SOLID POROUS"

This method is used to determine the density of a porous solid. The double beaker is required for this. The thermometer is used to monitor the temperature of the test liquid in the container.

Display	Key	Step
0,000 g AIR SET	«**T**»	*Taring*

Place the porous solid into the top beaker (fig. 5 resp 5a).

+ 24,974 g AIR SET	«⇛»	*As soon as the reading is stable, it is saved and displayed for 2 seconds.*

Seal the pores on the solid with wax, for example. Now place the solid into the top beaker (fig. 6 resp 6a).

+ 26,971 g CLOSED PORES SET	«⇛»	*As soon as the reading is stable, it is saved and displayed for 2 seconds.*

Place the solid into the bottom beaker (fig. 7 resp 7a)

+ 16,984 g LIQUID SET	«⇛»	*As soon as the reading is stable, it is saved and displayed for 2 seconds.*
+ 2,496 g/ccm DENSITY <->		*Solid density display* *(provided it is within the 0,1 - 25.0 g/ccm range).*
+ 2,05 % INDEX <->	«⇑»	*Switch to the density index display* *(if Index is ON).*
0,000 g AIR SET	«**T**»	*Taring, the balance returns to the gram display and is ready for the next determination.*

Density determination using a density determination set Order number see Accessories series 320

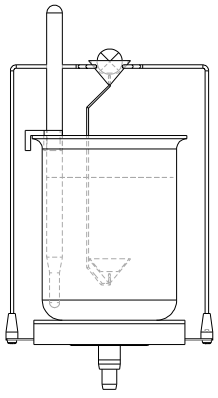


fig. 5

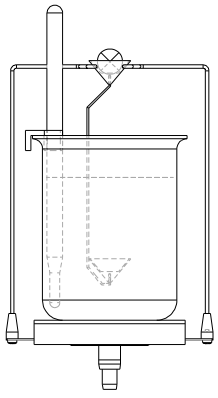


fig. 6

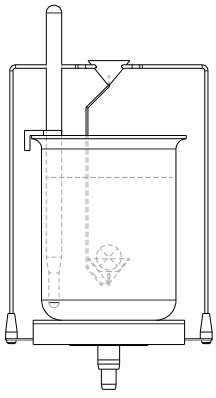


fig. 7

Density determination using below balance weighing Order number see Accessories of the respectiv series

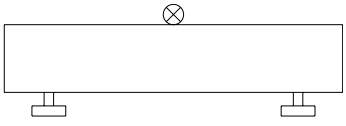


fig. 5a

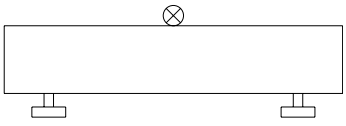


fig.6a

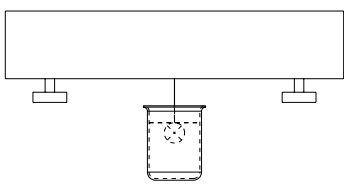


fig. 7a

English

1.8 Density of a solid "MODE SOLID ON THE BOTTOM"

This method is used to determine the density of a solid; however, no auxiliary apparatus is required. The thermometer is used to monitor the temperature of the test liquid.

Display	Key	Step
0,000 9 BOTTOM SET	«**T**»	Pour the tempered reference liquid (water) into a container, place it on the balance and tare it (fig. 8)

Place the solid in the bottom of the container (fig. 9).

+ 24,971 9 BOTTOM SET	«⇛»	As soon as the reading is stable, it is saved and displayed for 2 seconds.

Then raise the solid off the bottom, making sure it is still be fully immersed in the test liquid (fig. 10).

+ 9,988 9 LIQUID SET	«⇛»	As soon as the reading is stable, it is saved and displayed for 2 seconds.
+ 2,496 g.ccm DENSITY <->		*Solid density display* *(provided it is within the 0,1 - 25.0 g/ccm range).*
+ 7,36 % INDEX <->	«⇑»	*Switch to the density index display* *(if Index is ON).*
0,000 9 BOTTOM SET	«**T**»	*Taring, the balance returns to the gram display and is ready for the next determination.*

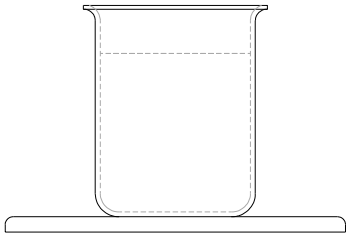


fig. 8

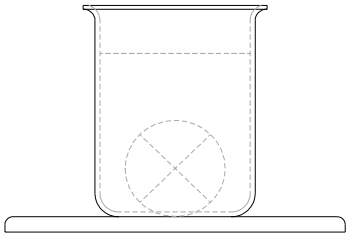


fig. 9

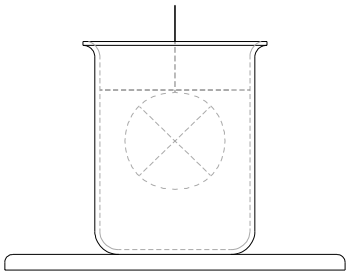


fig. 10

2 Differential weighing ("DIFF.-WEIGHT")

2.1 Explanatory notes on differential weighing

In the application differential weighing, samples are investigated for weight changes, the results logged in a report and collated in statistics.
In differential weighing the original weight of a sample is determined at the start of a measurement. Following the treatment of the sample, e.g. drying, ashing, vapor-depositing, coating, etc., the sample is re-weighed, and the balance determines the difference between the two measurements. Each sample can be re-weighed up to three times. There is a selection of different units available for the display of the results.

Up to 500 samples can be measured, divided into a maximum of 10 groups. Statistics are compiled for each individual group.

There are four semi-automatic measuring sequences available for recording the measurements:

- Individual measuring sequence
  Record complete sample details with the tare weight, original weight and residual weight(s). Then move on to the next sample.
- Group 1 measuring sequence
  Record the tare weight and original weight of all the samples in a group at the start. Then determine all the residual weights for a sample and, after that, measure the residual weights for the next sample.
- Group 2 measuring sequence
  Record the tare weight and original weight of all the samples in a group at the start. Then determine the first residual weight for all the samples, followed by the second residual weight for all the samples, etc.
- Series measuring sequence
  First of all enter the tare weights of all the samples in the group, then record the original weights of all the samples and, after that, re-weigh all the samples.

English

2.2 Selecting the differential weighing application

In order to activate the application menu, press the «**MENU**» key and select the "DIFF.-WEIGHT" application.

• **SELECT APPLICATION**		
SET APP.	**OFF**	*Normal weighing mode*
	...	*...*
	...	*...*
	DIFF.-WEIGHT	*Differential weighing*
	...	*...*
	...	*...*

The submenus which are required for defining the differential weighing are now displayed in the "SETUP APPLICATION" menu.

2.3 Configuring the differential weighing

Various user-specific settings for the application differential weighing can be defined in the menu under "SETUP APPLICATION".

2.3.1 Overview

• **SETUP APPLICATION**			
DIFF.-WEIGHT	GROUP	**1**	
	NAME	nnn	
	MODE	SINGLE GROUP1 **GROUP2** SERIES	
	TARE WEIGHING	**ON**/OFF	

	UNIT	WEIGHT LOSS **LOSS %** RESIDUAL % ATRO 1 ATRO 2 CALCULATED	*in the current unit of weight*
	DECIMALS	**2**	
	FACTOR	n.nnn e+n	*only if the "CALCULATED" unit has been selected*
	MODE	**F * DIFF.** F / DIFF.	*only if the "CALCULATED" unit has been selected*
	SET PRINT FORMAT		SAMPLE ID **ON**/OFF TIME ON/**OFF** TARE **ON**/OFF INITAL **ON**/OFF RESIDUAL **ON**/OFF

"GROUP"
Setting for the current group; 10 groups are possible.
The maximum of 500 samples which are possible can be freely distributed to the individual groups.

"NAME"
Definition of the group name with up to 10 characters. If all the samples in a group are deleted, the name of the group remains. The group name can only be deleted or changed in the menu under "SETUP APPLICATION".

"MODE"
There is a selection of four different measurement recording options (see chapter 2.4.1 "Mode, measurement recording").

"TARE WEIGHING"
Switching off the tare measurement. If the tare measurement function is switched off, this applies to all the measured samples.

"UNIT"
Setting for the unit in which the differential weight is to be calculated (see chapter 2.3.2 "Units").

"DECIMALS"
Definition of the number of decimal places to be shown in the result. The "WEIGHT LOSS" unit is displayed with the setting for the balance's current unit of weight.

"FACTOR"
Entry of the factor with which the difference in weight is to be offset. This option is only activated if the "CALCULATED" unit is selected.

"MODE"
Calculation method selection.
- Multiplying the factor by the difference between the original weight and the residual weight.
- Dividing the factor by the difference between the original weight and the residual weight.

This option is only activated if the "CALCULATED" unit is selected.

"SET PRINT FORMAT"
Definition of the report. The options marked "ON" are contained in the report and are printed (see chapter 2.4.6 "Report").

2.3.2 Units

The result of a differential weighing is displayed and printed for all the samples in the set unit. If the unit is changed, the analysis changes the calculation of the results for all the samples which have been measured previously. The selected unit is also used for the statistical analysis of a group.

Calculation of the units:

Unit	Calculation
"WEIGHT LOSS":	$-(I-R)$
"LOSS %" (loss in percent):	$-\frac{I-R}{I} \cdot 100\%$
"RESIDUAL %" (residue in percent):	$\frac{R}{I} \cdot 100\%$
"ATRO 1" (dry mass):	$\frac{I}{R} \cdot 100\%$
"ATRO 2" (moisture):	$-\frac{I-R}{R} \cdot 100\%$
"CALCULATED" (calculated with a factor F):	$(I-R) \cdot F$ or $\frac{F}{I-R}$

I: Original weight R: Residual weight F: Factor

2.4 Working with differential weighing

Press «↻» briefly to go to differential weighing.

Main menu differential weighing

Configuration of the function keys:

Key	Functions
«**SET**»	To start the measurement recording for the set group. In the case of an empty group, start with the first sample. If samples have already been recorded in this group, start from the position where the measurement recording process was interrupted.
«**GET**»	To get a measured sample. The set mode is switched to single until «**GET**» is exited by pressing the «**esc**» key. The selected sample is started from the position where the measurement recording process was interrupted.
«**DEL**»	Activates the Delete submenu. The user can delete individual samples, a whole group or all the read samples (see chapter 2.4.4 "Deleting samples, groups").
«**STA**»	To get a measured sample. The set mode is switched to single until «**STA**» is exited by pressing the «**esc**» key. The selected sample is started from the position where the measurement recording process was interrupted.

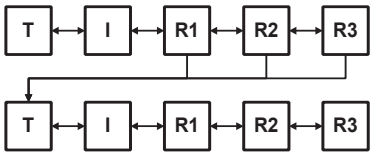
English

2.4.1 Mode, measurement recording

There are four different options available for semiautomatic measurement recording.

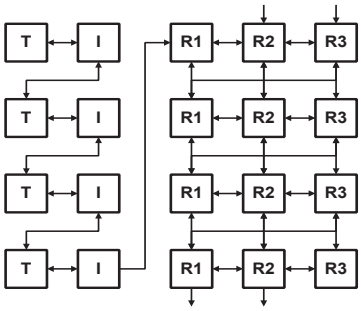
Key:
T: Tare I: Original weight R1-R3: Residual weight 1-3

Single



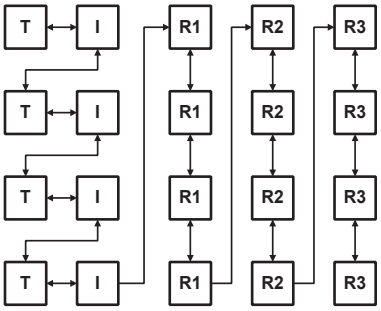
The tare weight, original weight and residual weight are recorded in consecutive order for each sample. Once the measurements for one sample have ended, the next one can be started.

Group 1



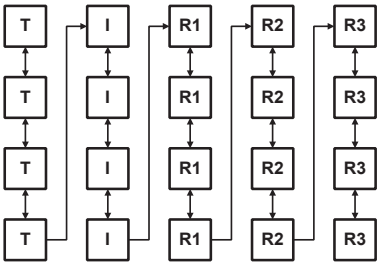
The tare weight and original weight for each sample are recorded at the start. The residual weights are then measured for all the samples.

Group 2



The tare weight and original weight for each sample are recorded at the start. Then determine the first residual weight for all the samples, followed by the second residual weight for all the samples, etc.

Series



The tare weight is measured for each sample at the start. Then record the original weight for all the samples and, after that, re-weigh all the samples.

Navigation

The differential weighing program works with semiautomatic measurement recording. Once one value has been measured, the program automatically navigates to the next one.

The user can navigate between the measured values using the arrow keys , as shown by the arrows in the graphics. If a reading has been measured incorrectly, the user can navigate back to it with the arrow keys provided this navigation is possible (see the graphic for the set mode).

If a reading has not been taken, the user cannot move on to the next one yet.

Navigation in single mode
The navigation for residual weights 2 and 3 must be done manually. The user gets to the next sample by pressing the «⇩» key.

Navigation in group 1 mode
The automatic navigation switches from tare weight to original weight for sample 1, followed by the tare weight and then original weight for sample 2, etc. Once all the original weights for the group have been measured, the user can switch to residual weight 1 for the first sample by pressing the «⇨» key.

The navigation for residual weights 2 and 3 must be done manually, which is also the case for switching to residual weight 1 for the next sample.

Once residual weights 1 or 2 for the last sample have been measured, the user can move on to residual weights 2 or 3 for the first sample by pressing the «⇩» key.

Navigation in group 2 mode
As in group 1 mode, the automatic navigation switches from tare weight to original weighting for sample 1, followed by the tare weight and then original weight for sample 2, etc. Once all the original weights for the group have been measured, the user can switch to residual weight 1 for the first sample by pressing the «⇨» key.

Subsequent navigation takes place automatically until all the readings in the group have been measured.

Navigation in series mode
Automatic navigation switches from tare sample 1 to tare sample 2, etc. Once all the tare weights for the series have been measured, the user can switch to the original weight for the first sample by pressing «⇨».

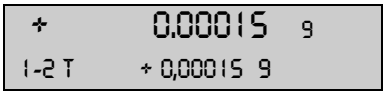
Subsequent navigation takes place automatically until all the readings in the series have been measured.

Press «**esc**» to return to the main menu.

2.4.2 Measurement

A differential weighing sequence is explained on the basis of an example. The balance must be switched on, and the application differential weighing must be activated.

During the measurement, the right «**T**» key corresponds to the «⏎» key and is used to accept the measurement. The left «**T**» key is required to tare the balance.

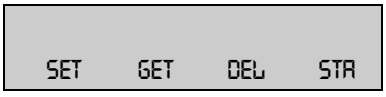
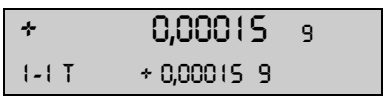


Measurement line
Info line

Measurement line:
Display the gross weight. The active balance unit is used as the weight unit.

Info line:
"1-2": Number of the current group (1) and sample number (2)
"T": Weight reading (tare) being measured
"+ 0.00015 g": The weight reading displayed always corresponds to the net weight of the sample.

"GROUP 1" mode is set and group 1 selected for the example. There are no samples in the selected group 1 yet. The result is indicated in the "LOSS %" unit with 2 decimal places.

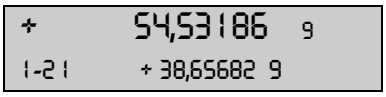
Display	Key	Step
	«⇦»	*Start the differential weighing.*
	«**T**»-left	*If necessary, tare the balance.*

The right «**T**» key corresponds to «⏎» and is used to accept the measurement reading.

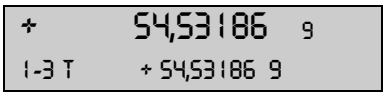
Measure tare value 1,
i.e. place on an empty container 1.

Display	Key	Step
	«⏎»	*Accept tare weight 1.*
		*Fill container 1 with original weight 1 and place it on.*
	«⏎»	*Accept original weight 1.*

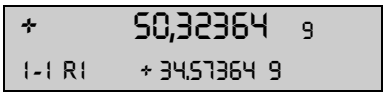
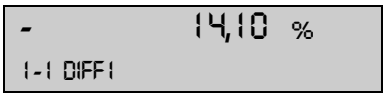
As group 1 mode is set, the program automatically switches to the tare measurement for sample 2. Remove original weight 1 from the weighing pan and, if necessary, tare the balance.

		*Measure tare weight 2, i.e. place on empty container 2.*
	«⏎»	*Accept tare weight 2.*
		*Fill the container with original weight 2 and place it on.*
	«⏎»	*Accept original weight 2.*

As group 1 mode is set, the program switches automatically to the tare measurement for sample 3.

	«⇨»	*Switch to residual weight 1 for the first sample.*

If necessary, tare the balance. The negative weight reading in the info line corresponds to tare weight 1.

		*Place residual weight 1 for the first sample (including the container) on the balance.*
	«⏎»	*Accept residual weight 1.*
		*Display the result of residual weight 1. (Loss in percent). Print out the sample report.*

In order to measure a second residual weight for the same sample, press the «⇨» key. In order to determine the residual weight 1 in the second sample, press the «⇩» key.

2.4.3 Sample information

The user can switch to the info display for the current sample during the measurement recording by pressing «↻».

Configuration of the function keys:

Key	Functions
«⇦», «⇨»	In the measurement display: switch between the readings shown In the results display: switch back to the measurement display
«⇧» «⇩»	If a residual weight is displayed: switch to the results display In the results display: switch to the result unit
«**esc**»	Exits the info display
«**PRINT**»	Prints the sample info, including all the measurement readings The result is printed in all the units (see chapter 2.4.6 "Report").

2.4.4 Deleting samples, groups

Press the «**DEL**» function key to go to the Delete submenu in the main menu.

Delete submenu

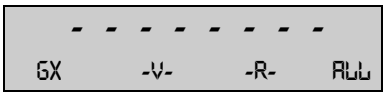
Configuration of the function keys:

Key	Functions
«**-S-**»	Delete a single sample. The sample to be deleted can be selected by pressing the «⇧», «⇩» keys. The sample is selected by pressing the «↵» key.
«**-G-**»	Delete all the samples in the selected group. The group to be deleted can be determined by pressing the «⇧», «⇩» keys. The group is selected by pressing the «↵» key.
«**ALL**»	Delete all the saved samples. As a safeguard, the deleting process must be confirmed by selecting "YES" and pressing «↵». Nothing is deleted if the user selects "NO" or presses «**esc**».

Press «**esc**» to exit the deleting process at any time without deleting.

2.4.5 Statistics

Press the «**STA**» function key to go to the Statistics submenu in the main menu.



Statistics submenu

Configuration of the function keys:

Key	Functions
«**-Gx-**»	Select the group for which statistics are to be compiled. "x" indicates the active group.
«**-V-**»	Prints the measurement readings for all the samples in the selected group. The result is only printed in the unit which is set.
«**-R-**»	Prints the statistics on the results for the selected group.
«**ALL**»	Starts the Statistics printout submenu.

2.4.5.1 Statistics printout

Statistics printout submenu

Configuration of the function keys:

Key	Functions
«**STD**»	Prints the measurement readings for all the samples and the statistics on the results for the selected group. The result is only printed in the unit which is set.
«**PC**»	Prints measurement readings and statistics on all the samples in the selected group in tabular form. The individual values are separated by a tab.

2.4.6 Report

The differential weighing report is printed after every residual weighing. Individual options in the report can be switched on and off.

If the «**PRINT**» key is pressed in sample information, the result is output in all the units.
If the «**PRINT**» key is pressed during the recording of the measurements, the current weight is printed in the

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current unit. If the result is displayed, the differential weighing report is printed.

Date 10.04.2004 Time 10:05:30	*Date and time, if they are switched on. (Can be set in the Configuration menu)*
Name : XR 125 SN Software : V00-0000 P00 Serialno : 3300-001	*Balance ID, if it is switched on. (Can be set in the Configuration menu)*
Sample : 1-1	*Sample ID, if it is switched on.*
Tare : + 15.85000 g Time : 08:15:25 10.04.04	*Tare and time, if they are switched on.*
Initial : +40.25000 g Time : 08:16:32 10.04.04	*Original weight and time, if they are switched on.*
Residual 1 : +34.57364 g Time : 09:48:12 10.04.04	*Residual weight 1 and time, if they are switched on.*
Lost : + 14.10 %	*Result of the differential weighing*
User : MUSTER	*Operator ID, if this is switched on. (Can be set in the Configuration menu)*

The statistics output with the options which can be selected.

Date 10.04.2004 Time 10:05:30	*Date and time, if they are switched on. (Can be set in the Configuration menu)*
Name : XR 125 SN Software : V00-0000 P00 Serialno : 3300-001	*Balance ID, if it is switched on. (Can be set in the Configuration menu)*
Group : 1	*Group name; if there is no group name defined, the number is output.*
Residual 1: Values : 2 Mean : - 45.95 % StdE : + 5.93 % StdE% : - 12.90 % Max : - 41.76 % Min : - 50.14 %	*Statistics on residual weight 1*
Residual 2: Values : 1	*Statistics on residual weight 2*
Residual 3: Values : 0	*Statistics on residual weight 3*
User : MUSTER	*Operator ID, if this is switched on (Can be set in the Configuration menu)*

If no statistics can be compiled on the residual weight, only the number of values is output. A minimum of 2 values is required for statistics.

2.4.7 Remote control commands

Command	Function
ADWSTATE	Returns the status of the sample memory. -Number of samples saved -Number of samples still to be saved -Number of samples per group
ADWx y	Prints the entire statistics, with measured values, on one or all of the groups. x defined the format. x = 0 standard format x = 1 PC format (separated by tabs) y indicates the group. y = 0 all groups y = 1..10 group y

3 Minimum original weight ("MIN.-WEIGHT")

3.1 Explanatory notes on the minimum sample weight application, MSW

MSW application is a minimum original weight solution which enables you to fulfill QM guidelines, such as GLP, GMP or USP.

3.1.1 Minimum original weight and quality management

Only very small quantities are used in many applications and, thus, only a small part of the balance's weighing capacity is used. However, the lower the original weight, the greater the relative measuring uncertainty.
What is the minimum original weight necessary to enable the quality management tolerance limits to be complied?
The minimum original weight which is required is determined on the basis of the QM criteria and of the statistical data from repeated weighing procedures.
If the weight is below the minimum original weight, a warning appears on the balance display warning you of this; these values are also marked in the printout.

- The **requisite minimum original weights** should be elicited on the basis of the QM specifications by means of the statistical analysis of certain series of measurements.
  (The balance's own "STATISTIC" function could be used for this purpose, for example. It is used to perform and subsequently log the requisite series of measurements.)

- Once the minimum original weight(s) has/have been determined, it/they can be input into the balance. Up to three tare ranges can be defined with the corresponding minimum original weights.

  The balance's weighing modes, as well as measuring time and stability, are also fixed in such a way as to guarantee compliance with tolerances in future measurements.

  Tare ranges, minimum original weights and weighing modes cannot be changed by the user.

- The values which are input can be logged by means of an application status print and could, along with the report on the statistical measurement series, be used as a **QM certificate**.
  If work is performed on the basis of the minimum original weight application, this serves to ensure that the weighing results conform to the certificate specifications and, thus, to your QM guidelines.

3.2 Selecting the minimum original weight application

In order to activate the application menu, press the «**MENU**» key and select the "MIN.-WEIGHT" application.

• **SELECT APPLICATION**		
SET APP.	**OFF**	*Normal weighing mode*
	...	*...*
	...	*...*
	MIN.-WEIGHT	*Minimum original weight*
	...	*...*
	...	*...*

The submenus which are required for defining the minimum original weight are now displayed in the "SETUP APPLICATION" menu.

3.3 Configuring the minimum original weight

• SETUP APPLICATION			
MIN.-WEIGHT	INFO LINE ON/**OFF**	*Display the info line permanently*	
	ZERO KEY ON/**OFF**	*Facilitate resetting*	
	SET PRINT FORMAT	MIN. WEIGHT	ON/**OFF**
	VIEW / SET PARAMETERS (CODE - - - -)	FLOATINGDISPLAY	0.16
		STABILITY	MEDIUM
		NEXT TEST	18 .01.05
		TEST-PARA.	k=3 U=0.1%
		RANGE 1	35.00000 g
		MIN.WGT 1	0.07500 g
		RANGE 2	85.00000 g
		MIN.WGT 2	0.10500 g
		RANGE 3	125.00000 g
		MIN.WGT 3	0.13500 g
		(CODE NEW	- - - -)

3.3.1 Variable menu settings

"INFO LINE"

– ON: The minimum original weight appears permanently in the balance display.
"Value under minimum original weight" is symbolized by a "P" in the balance display.
– OFF: The minimum original weight only appears in the balance display while "value under minimum original weight".

"ZERO KEY"

The reset function is assigned to the «⇑» key.
This function can be used to reset the weight display to zero, although the minimum original weight which was valid previously is retained (see chapter 3.4.3 "Resetting with the function key «>0<»").

"SET PRINT FORMAT" – "MIN. WEIGHT"

The minimum original weight appears additionally in the measurement printout.

3.3.2 Non-variable menu settings

"CODE"

This authorization code (four-digit number) enables the relevant person to change the following menu settings.

NOTE
Factory-set authorization code: **1452** / New code: _____

"FLOATINGDISPLAY"

This value relates to the quality of the balance location and must be set correctly in order to achieve optimum, reproducible results. Select:

– Optimum balance location: "FLOATINGDISPLAY 0.04" or "FLOATINGDISPLAY 0.08"
– Good balance location: "FLOATINGDISPLAY 0.16"
– Critical balance location: "FLOATINGDISPLAY 0.32"

"STABILITY"

This value relates to the quality of the balance location and must be correctly set in order to achieve optimum, reproducible results. Select:

– Optimum balance location: "STABILITY LOW"
– Good balance location: "STABILITY MEDIUM"
– Critical balance location: "STABILITY HIGH"

"NEXT TEST"

Indicates the date until which the set minimum original weights are deemed to be valid, or when the minimum original weights need to be re-determined by the quality coordinator(s).
They should be re-determined periodically in accordance with your QM specifications. This is also advisable

if there is a decisive change in the weighing criteria (ambient and application conditions).
Once the date has elapsed, a warning briefly appears in the balance display when the MSW application is started.

"TEST-PARA."
You can enter a text here which describes the parameters which you have used for determining the minimum original weight (extension factor, uncertainty).

"RANGE" / "MIN.WGT. 1-3"
Up to 3 tare ranges (the upper limit is specified in each case) can be defined with the corresponding minimum original weights.

"CODE NEW"
New code definable (four-digit number).

3.4 Working with the minimum original weight

Press «↻» briefly to go to the minimum original weight.

Display in the minimum original weight

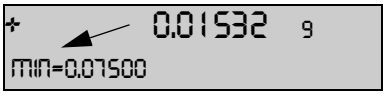
Configuration of the function keys:

Key	Functions
«**MIN = ...**»	Additional information on the minimum original weight is displayed at 2-second intervals
«**>0<**»	Resetting the weight display without changing the value of the minimum original weight.

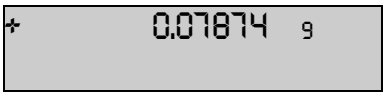
3.4.1 Indicator for "value below minimum original weight"

3.4.1.1 Indicator in the balance display "MIN = ..." or "P" or ⊖

- **"INFO LINE OFF"**

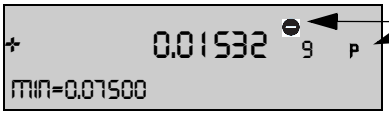


Minimum original weight has not been reached yet



Minimum original weight has been reached

- **"INFO LINE ON"**



Minimum original weight has not been reached yet

Minimum original weight has been reached

3.4.1.2 Indicator in the report printout ("*")

- **"SET PRINT FORMAT" – "MIN. WEIGHT OFF"**

*	+0.01532 g	*Minimum original weight has not been reached yet*
	+0.07874 g	*Minimum original weight has been reached*

English

- **"SET PRINT FORMAT" – "MIN. WEIGHT ON"**

Min.Wgt. : 0.07500 g Actual : * + 0.01532 g	*Minimum original weight has not been reached yet*
Min.Wgt. : 0.07500 g Actual : + 0.07874 g	*Minimum original weight has been reached*

3.4.2 Displaying additional information with the function key «MIN...»

Normal display ("INFO LINE OFF", "ZERO KEY OFF"):

Minimum original weight

Working sequence if «MIN = ...» («⇐») is pressed (displayed for 2 seconds):

Current tare

then:

Maximum tare for which the displayed minimum original weight applies

3.4.3 Resetting with the function key «>0<»

Display in the event of "ZERO KEY ON":

Resetting took place in an identical tare range to the previous one.

Resetting took place in a different tare range to the previous one. The minimum original weight in the new tare range would actually be smaller (<).

Printout:

Min. Wgt. : > 0.07500 g Actual : * 0.00000 g	*I.e. the logged minimum original weight is actually too large or the requisite minimum original weight would actually be smaller (see display above).*

- **Using the resetting:**

If you reset the balance display using the tare key «**T**», the balance automatically determines the tare range of the tare weight, which is placed on, and sets the minimum original weight in accordance with this range. If you now reset the display in a series of weighing procedures with identical or similar tare weights between weighing procedures and ensure that the same minimum original weight is set at all times, use the "ZERO KEY" «**>0<**» instead of the tare key.

3.5 Determining the minimum original weight periodically

The minimum original weight is dependent on the ambient conditions. Therefore, it must be determined on-site and must be reviewed periodically.

The following parameters influence the minimum original weight:

- **Repeatability:**
  The repeatability is determined by the standard deviation of the balance on-site. It is determined by the ambient conditions, the nature of the goods being weighed and the balance settings.
- **Tare weight**
- **Relative uncertainty (U):**
  The tolerable uncertainty is determined by the user or defined by standards.

- **Extension factor (k)** (generally 2 or 3)**:**
  The extension factor determines the likelihood of occurrence. The factor is defined by the user or is defaulted.

The minimum original weight is calculated as follows:

$$\text{Min. Weight[MIN]} = \frac{\text{Extension factor[k]} \cdot \text{Standard deviation[StdD]}}{\text{Relative uncertainity[U]}}$$

Example of figures for the MSW in accordance with the USP:
If work is conducted in accordance with the USP (United States Pharmacopoeia), the following parameters are given:

- **Repeatability:**
  Standard deviation if the same weight is placed on ten times.
- **Extension factor:**
  k = 3
- **Rel. uncertainty:**
  U = 0.1 %

The repeatability of an XR125SM in the tare range between 0 and 35 g was determined as a standard deviation on site by placing a weight on ten times and measures 0.025 mg.

The minimum original weight is thus calculated as follows:

$$\text{Min. Weight[MIN]} = \frac{3 \cdot 0.025\ \text{mg}}{0.1\%} \cdot 100\% = 75\ \text{mg}$$

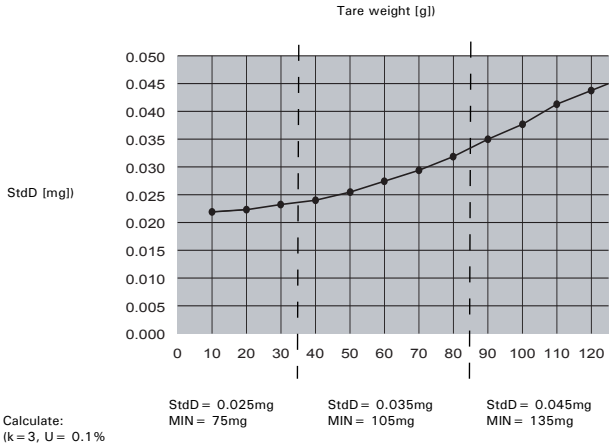
In compliance with USP24-NF19, the original weight on the XR125SM may not be less than a minimum of 75 mg.

Recommended procedure:

- Conduct the tests on-site and as close to the real situation as possible.
- Try to provide the best possible ambient conditions.
  Ensure that these conditions do not deteriorate significantly afterwards in normal operation.
- First of all, configure the "FLOATINGDISPLAY" and "STABILITY" weighing modes (see chapter 3.3.2 "Non-variable menu settings").
- Define the due-date for the next check, "NEXT TEST", in accordance with your QM specifications.
- Define the extension factor and relative uncertainty in accordance with your QM specifications and describe this under "Test parameters". The test parameters are merely for information purposes.
- Determine the minimum original weight(s) for your balance as follows:

  Determining repeatabilities / Defining tare ranges:
  First of all, test the behavior of the balance in different tare ranges:
  Divide the balance's weighing range into 10g intervals, for example, and measure the repeatability for each interval.
  Draw a graph of the entire weighing range by plotting all the results, joining them together and working

out the mean:



– On the basis of this graph it is relatively easy to define the max. 3 ranges with the corresponding repeatabilities. (If you know which tare weights are typically used, you can optimize the tare ranges in terms of these typical weights.)

Measuring the repeatability (StdD) with the aid of "STATISTIC": Apply the relevant tare weight permanently to the balance and tare it. Conduct the measurement series with a net weight of approx. 1g:

– *Example of how the STATISTIC function is used.*

1:	+	1.00287	g
2:	+	1.00291	g
		.....	
9:	+	1.00288	g
10:	+	1.00290	g

Values	:		
Mean	:	+ 1.00289	g
StdE	**:**	**+ 0.000022**	**g**
StdE %	:	0.00	%
Max	:	+ 1.00293	g
Min	:	+ 1.00287	g

– **Calculating the minimum original weight(s):**
Now calculate the minimum original weights using the equation shown above, on the basis of the repeatabilities belonging to the tare ranges.

– Configure the balance with the determined values.

4 Dynamic weighing ("DYN.-WEIGHT")

4.1 Introduction to the dynamic weighing application

The "DYN. WEIGHT" workflow supports accurate weighing on an unstable surface, e.g. on board ships. During the period of measurement defined by the user in the setup menu, the balance measures continuously, calculates the mean of the saved values at the end of the period of measurement and indicates the average measurement value which this yields.

4.2 Selecting the dynamic weighing application

In order to activate the application menu, press the «**MENU**» key and select the "DYN. WEIGHT" application.

• **SELECT APPLICATION**	
SET APP.**OFF**	*Normal weighing mode*
…	…
…	…
DYN. WEIGHT	*Dynamic weighing*
…	…
…	…

The submenus which are required for defining the dynamic weighing are now displayed in the "SETUP APPLICATION" menu.

4.3 Configuring dynamic weighing

In the setup, specify the period of measurement over which the mean is to be calculated.

• **SETUP APPLICATION**			
DYN. WEIGHT	MEASURETIME	4	*Enter the period of time in seconds*

4.4 Dynamic weighing

Press «↻» briefly to go to dynamic weighing.

Display during dynamic weighing

Configuration of the function keys:

Key	Functions
«**MAN**»	Manual activation of the measurement.
«**AUTO**»	Automatic activation of the measurement with a 1-second delay.
«**TARE**»	Determine the tare over the period of measurement and save it for other measurements.
«**STO**»	Statistics and storage function if statistics are activated.

English

5 Pipette calibration ("PIPETTE")

5.1 Introduction to pipette calibration

Quality management systems require volumetric measuring equipment to be checked regularly. This application allows you to check pipettes of any make by means of a gravimetric method.

You require a thermometer and a barometer in order to conduct this.

During the pipette test, the sample volume is always derived from the sample weight. The density of the test liquid (distilled water) and the buoyancy are taken into account during conversion.

The pipette application supports up to 20 pipettes. By simply selecting the pipette you require, its specifications are loaded into the application. You can then commence the pipette test straight away.

The pipette specification data must be defined once beforehand in accordance with the manufacturer's details. You can change this at any time later on.

If you wish to adjust the pipette, please consult the pipette manufacturer's instructions.

5.2 Selecting the pipette calibration application

In order to activate pipette calibration, press the «**MENU**» key and select the "PIPETTE" application.

• **SELECT APPLICATION**		
SET APP.	**OFF**	*Normal weighing mode*
	...	*...*
	...	*...*
	PIPETTE	*Pipette calibration*
	...	*...*
	...	*...*

5.3 Configuring the pipette calibration

In the "SETUP APPLICATION" menu, specify the measuring sequence and define the pipettes. The tolerances for inaccuracy and imprecision are manufacturer and model-specific. Refer to the pipette manufacturer's documentation for data.

• **SETUP APPLICATION**					
PIPETTE	SAMPLES **10**				
	EVAPORATION MEAS. **ON**/OFF				
	SET PIPETTES	PIPETTE- 1	NAME ttt...		
			SNO. ttt...		
			VOL.1	VOLUME 0.00000 ml INACCUR. <E> 0.0 % IMPREC. <STDE> 0.0 % CYCLE TIME 0.0 s	
			VOL.2	ditto	
			VOL.3	ditto	
		PIPETTE- 2	NAME ttt...		
			SNO. ttt...		
			VOL.1	VOLUME 0.00000 ml INACCUR. <E> 0.0 % IMPREC. <STDE> 0.0 % CYCLE TIME 0.0 s	
			VOL.2	ditto	
			VOL.3	ditto	
		.....	.....	.....	
		PIPETTE-20	ditto	ditto	

"SAMPLES"
Enter the number of random sample measurements per volume (setting range: 2-50).

"EVAPORATION MEAS."
- ON: The evaporation over the cycle time is automatically determined before the pipetting process starts, after the tare vessel is placed on, and the pipetting volumes are thus corrected accordingly.
- OFF: The evaporation rate is not taken into account.

"SET PIPETTES"
Select one of the 20 pipettes.

"NAME"
Enter a description for the selected pipette (max. 20 characters).

"SNO."
Enter a serial number for the selected pipette (max. 20 characters).
If a barcode marking on the pipette is used as the serial number, the pipette can be selected directly by reading in the barcode during the pipette test.

"VOL. 1, 2, 3"
Up to three test volumes can be selected per pipette. Pipettes with a variable volume are normally tested at 10%, 50% and 100% of the maximum volume.

"VOLUME"
Enter the test volume in [ml].

"INACCUR. <E>"
The permissible incorrectness is entered for each volume in terms of [%] of the test volume. The incorrectness describes the systematic error (setting range: (+/-) 0.1 - 9.9%).

"IMPREC. <STDE>"
The permissible imprecision (standard deviation) is entered for each volume in terms of [%] of the test volume. The imprecision describes the statistical error (setting range: 0.1 - 9.9%).

CYCLE TIME
The cycle time determines the duration of a single measurement (suck in liquid, discharge, wait for a stable weighing reading). The weighing reading is adopted at the end of the cycle time. This facilitates reproducible work. Short cycle times minimize evaporation losses; large volumes require longer cycle times (slow discharge of the pipette volume) (setting range: 0-120s).

5.4 Working with the pipette

The user can switch between weighing mode and pipette calibration by pressing the «↻» key.

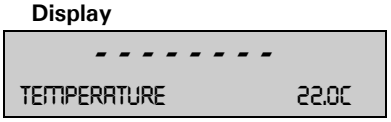
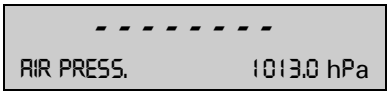
Main menu - Pipette

Configuration of the function keys:

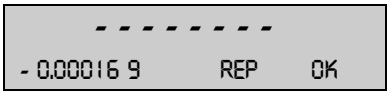
Key	Functions
«**DEMO-P**»	Pipette selection (can also be selected by means of a barcode reader)
«**1.00000 mL**»	Select the test volume ("VOL.1" is the default) (select with «↑» and «↓», confirm with «↵»)
«**RUN**»	Start the program (see chapter 5.4.1 "Conducting the pipette test")

5.4.1 Conducting the pipette test

Press «**esc**» to stop the procedure at any time.

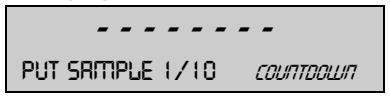
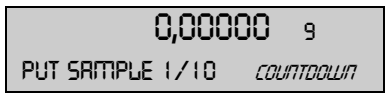
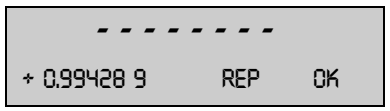
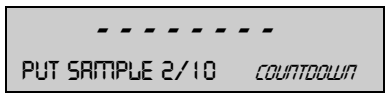
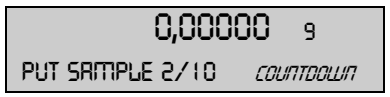
Display	Key	Step
	«⏎»	*If necessary, change the (starting) temperature*
	«⏎»	*If necessary, change the air pressure*
	«⇩»	*Place the container with the liquid receiver (distilled water) on the balance*

The balance is tared automatically. The **evaporation measurement** then starts if it is activated in the setup; otherwise, the first sample measurement starts.

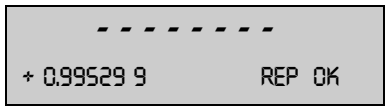
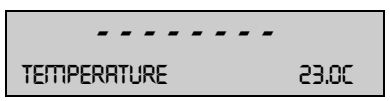
		*Evaporation measurement running*
	«⇧» or «⇩»	*Evaporation measurement ends. Press «**OK**» to confirm the measurement or «**REP**» to repeat it, where necessary.*

Note:
This must result in a **reduction** in weight! If the reading does not seem plausible, you should repeat the evaporation measurement.

The actual **pipette measurement** starts now:

Display	Key	Step
		*The balance is tared automatically.*
		*As soon as 0.00000g appears on the display, the 1st random sample can be pipetted in.*
	«⇧» or «⇩»	*1st random sample measurement ended. Press «**OK**» to confirm the measurement or «**REP**» to repeat it, where necessary.*
		*The balance is tared automatically.*
		*As soon as 0.00000g appears on the display, the 2nd random sample can be pipetted in.*

Perform the process for all n random samples. Rejected samples are not counted; their number is logged.

	«⇧» or «⇩»	*nth random sample measurement ended. Press «**OK**» to confirm the measurement or «**REP**» to repeat it, where necessary.*
	«⏎»	*If necessary, change the (end) temperature*

The result of the pipette test is displayed in the last step:

Display	Key	Step
	«⇧» or «⇩»	*Pipette test passed.*

Display	Key	Step
0,00000 9 FAILED INF END	«⇧» or «⇩»	*Pipette test failed.*

Press the «**PRINT**» key to print out the report on the pipette test or to send it to the PC.

Press «**INF**» («⇧») to display the results on the balance display as well:

Display	Key	Step
0,00000 9 MEAN 0.99823 mL	«⇧»	*Average*
0,00000 9 E. 0.00177 mL	«⇧»	*Incorrectness*
0,00000 9 E.-% - 0.18 %	«⇧»	*Incorrectness [%]*
0,00000 9 STDE. 0.00057 mL	«⇧»	*Imprecision as a standard deviation*
0,00000 9 STDE.-% 0.06 %	«⇧»	*Imprecision as a relative standard deviation [%]*
0,00000 9 MAX. 0.99884 mL	«⇧»	*Maximum volume*
0,00000 9 MIN. 0.99767 mL	«⇧»	*Minimum volume*
0,00000 9 1= 0.99782 mL	«⇧»	*1st measurement reading*
0,00000 9 _= _._____ mL	«⇧»	*all the other measurement readings follow*
0,00000 9 PASSED INF END	«⇧» or «⇩»	

Press «**END**» to exit the measurement series. WARNING: the values are not saved in the balance.

English

5.4.2 Report

```
------  PIPETTE-CHECK  -------

Date 28.07.2004  Time 10:03:16
Name      : XR 125 SM
Software  : V00-0000  P00
Serienr   : 2601-26

Pipetten-Name  : DEMO-PIPETTE
Serie-Nr.      : 7610700607077
Test Volume        : 1.00000 ml
Inaccuracy (E)     : 0.5 %
Imprrecision(StdE) : 0.2 %
Cycle Time         : 15 s

Temp. 1 :          22.0 C
Temp. 2 :          23.0 C
Air Pr. :        1013.0 hPa
Evapor. :    -  0.00016 ml

Mean    :    +  0.99823 ml
E       :    -  0.00177 ml
E %     :    -     0.18 %
StdE.   :    +  0.00057 ml
StdE. % :    +     0.06 %

Max     :    +  0.99884 ml
Min     :    +  0.99767 ml
Values  :            10
Reject. :             0

   1 :    +  0.99782 ml
   2 :    +  0.99859 ml
 ...
   9 :    +  0.99767 ml
  10 :    +  0.99884 ml

User :



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

6 Air buoyancy correction ("BEST")

6.1 Introduction to air buoyancy correction

The "BEST" (*Buoyancy Error Suppression Technology)* application can be used to correct errors which arise as a result of air buoyancy.
Balances are adjusted with steel weights with a density of 8 g/cm^3 to prevent errors occurring at this density.
As soon as goods of other densities are weighed, the air buoyancy causes an error which can be corrected by the factor K.

$$K = \frac{1 - \frac{\rho(air)}{\rho(steel)}}{1 - \frac{\rho(air)}{\rho material}}$$

ρ air:
Density of air in kg/m^3

ρ material:
Density of the material being weighed in kg/m^3

ρ steel:
constant 8000 kg/m^3

This correction is automatically conducted in the "BEST" application once the air and material density has been entered.

6.2 Selecting the air buoyancy correction application

In order to activate the application menu, press the «**MENU**» key and select the "BEST" application.

English

• **SELECT APPLICATION**		
SET APP.	**OFF**	*Normal weighing mode*
	...	...
	...	...
	BEST	*BEST (Buoyancy Error Suppression Technology)*
	...	...
	...	...

6.3 Configuring the air buoyancy correction

The "SETUP APPLICATION" menu now contains the settings for the air buoyancy correction.

• **SETUP APPLICATION**			
BEST	AIR DENSITY	1.200000	*Air density in kg/m^3 (0.9-1.5 kg/m^3)*
	MAT. DENSITY	8.000000	*Material density in g/cm^3 (0.1-1.25 g/ccm)*

6.4 Working with the air buoyancy correction

Press «↻» briefly to go to the air buoyancy correction.
When the air buoyancy correction starts, the user is prompted to confirm the air density.

1,200000	
OK	SET

Current air density in kg/m^3

Configuration of the function keys:

Key	Functions
«**OK**»	Accept or confirm the current air density
«**SET**»	Enter a new value for the current air density

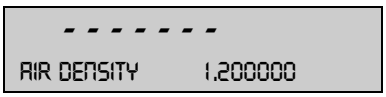
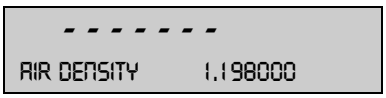
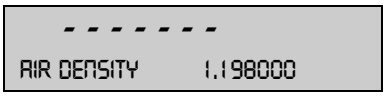
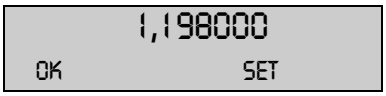
6.4.1 Weighing weights

Once you have accepted the current air density by pressing «**OK**», the balance can be used as in normal weighing mode, i.e. taring with «**T**» etc., for example.
For marking purposes, the weight display contains the weight reading, which has been offset against the air buoyancy correction; preferred readings are also marked with a small circle ("o"). This circle is included in the printout. The value of the material density, which is used for the correction, is specified in the info line.

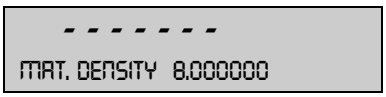
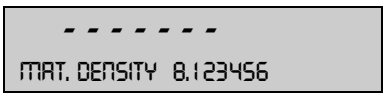
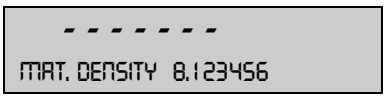
Current weight, "air buoyancy-corrected"

6.4.2 Changing the air density

Press «↻» briefly twice to confirm the air density.

Display	Key	Step
	«⇑»	*Switch to enter the new air density*
	«↵»	*Start the air density entry*
	«⇐»,«⇒» «⇑»,«⇓»	*Enter the new air density*
	«↵»	*Confirm the entry*
	«**esc**»	*Go back to the air density confirmation*

6.4.3 Changing the material density

Display	Key	Step
	«⇐»	*Switch to enter the new material density*
	«↵»	*Start entering the new material density*
	«⇐»,«⇒» «⇑»,«⇓»	*Enter the new material density*
	«↵»	*Confirm the entry*
	«**esc**»	*Go back to weighing with air buoyancy correction*