

# VSMA53/VSMA202



## MOISTURE ANALYSER

Product Code: VSMA53

**0110**  
**Klipspringer**

Compliance with confidence

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**Easy Reference:**

Model name of the analyser:	
Serial number of the unit:	
Software revision number (Displayed when power is first turned on):	
Date of Purchase:	
Name of the supplier and place:	

# 1.0 CONTENTS

<b>1.0</b>	<b>CONTENTS</b>	<b>1</b>
<b>2.0</b>	<b>INTRODUCTION</b>	<b>3</b>
<b>3.0</b>	<b>SET UP</b>	<b>5</b>
3.1	UNPACKING AND SETTING UP YOUR ANALYSER	5
3.2	ASSEMBLING THE ANALYSER	6
3.3	LEVELLING THE ANALYSER	7
3.4	WARM-UP TIME	7
3.5	LOCATING AND PROTECTING YOUR ANALYSER	8
3.6	SAFETY	9
<b>4.0</b>	<b>DISPLAY and KEYPAD</b>	<b>12</b>
4.1	NUMERIC ENTRY METHOD	14
<b>5.0</b>	<b>REAR PANEL INTERFACES</b>	<b>15</b>
5.1	POWER	15
5.2	DATA INTERFACES	15
5.2.1	FILES ON A USB MEMORY DEVICE	16
5.3	SECURITY LOCK	17
6.1	SETUP OF METHOD	18
6.1.1	MANUALLY SETTING TEST PROCEDURES	21
6.1.2	PRINT CURRENT SETTINGS	26
6.2	STORE TEST SETTINGS	27
6.3	RECALL TEST SETTINGS	28
6.4	DELETE TEST SETTINGS	29
6.5	REVIEW TEST SETTINGS	29
6.6	STORE and RECALLING TEST SETTINGS FROM USB MEMORY	29
<b>7.0</b>	<b>RUNNING A TEST</b>	<b>33</b>
<b>8.0</b>	<b>PRINT AND STORE RESULTS</b>	<b>37</b>
8.1	PRINTING FINAL TEST RESULTS	37
8.2	STORING TEST RESULTS	37
8.3	RECALLING TEST RESULTS	38
8.4	DELETING TEST RESULTS	38
<b>9.0</b>	<b>STORING RESULTS IN USB MEMORY</b>	<b>40</b>
<b>10.0</b>	<b>ANALYSER MENUS</b>	<b>42</b>
10.1	SUPERVISOR MENUS	42
10.1.1	SERIAL INTERFACE PARAMETERS	44
10.1.2	SETUP PARAMETERS	45
10.1.3	CALIBRATION	47
10.1.3.1	MASS CALIBRATION	47
10.1.3.2	TEMPERATURE CALIBRATION	48
10.1.3.3	CALIBRATION REPORT	51
10.1.4	PASSCODES	52
10.1.4.1	FORGOTTEN PASSCODES	52
10.2	STORE AND RECALL MOISTURE ANALYSER SETTING FROM USB	53
<b>11.0</b>	<b>SERIAL INTERFACE</b>	<b>56</b>
11.1	RS-232 HARDWARE	56
11.2	USB SERIAL HARDWARE	56
11.3	INPUT COMMANDS	57
11.4	PRINTING RESULTS	57
11.5	ANALYSER CONFIGURATION THROUGH THE SERIAL INTERFACE	60
11.5.1	TEST PARAMETERS	60
11.5.2	MOISTURE ANALYSER SETUP	61
11.5.3	ANALYSER RECALL PARAMETERS	62
11.5.4	REQUEST VALUES OF PARAMETERS	62
11.6	CONTINUOUS OUTPUT	63
<b>12.0</b>	<b>SPECIFICATIONS &amp; FEATURES</b>	<b>64</b>
<b>13.0</b>	<b>MENU STRUCTURE</b>	<b>67</b>
<b>14.0</b>	<b>SAMPLE PREPARATION</b>	<b>73</b>
<b>15.0</b>	<b>GUIDANCE NOTES</b>	<b>75</b>
<b>16.0</b>	<b>WARRANTY STATEMENT</b>	<b>79</b>



## 2.0 INTRODUCTION

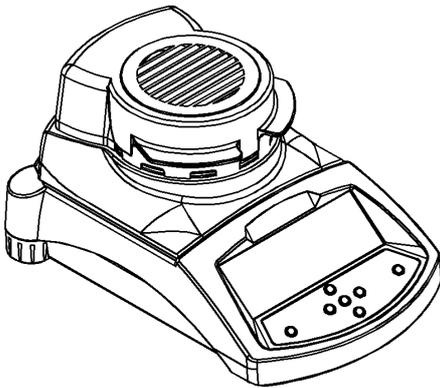
Thank you for selecting the Moisture Analyser.

This Instruction Manual will familiarize you with the installation, accessories, trouble-shooting, after sales service information, general maintenance of the analyser, etc. and will guide you through the various applications.

Please read this Manual thoroughly before starting the operation. If you need any clarifications, feel free to contact your supplier or Klipringer Limited.

## PRODUCT OVERVIEW

The Moisture analyzers are ideal for laboratory moisture determination.



### FEATURES:

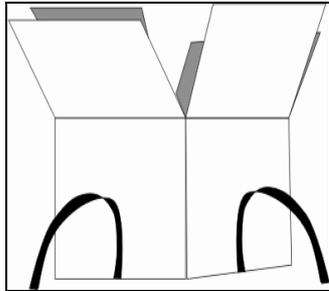
- Large easy to read LCD display with backlight
- Bi-directional RS-232 interface and USB interface.
- USB Host connection for memory device
- Can be configured to print a GLP Compliant report after each calibration to include the time, date, analyser number and a verification of the calibration
- 400 watt Halogen Heater
- Rapid heat Function
- Capacity tracker
- Date and time
- Easy to use, sealed keypad
- Password protection
- Security locking point
- Multiple languages for display and printing



## 3.0 SET UP

### 3.1 UNPACKING AND SETTING UP YOUR ANALYSER

Remove the Moisture Analyser from the packing by carefully lifting it out of the box. Inside the box you will find everything needed to start using the analyser-



- ✓ AC power cable
- ✓ Pan Support
- ✓ Stainless Steel Lower Chamber Insert
- ✓ Sample Pan Lifter
- ✓ Sample Pans (x10)
- ✓ Spare Fuse 5A, Time Lag, High capacity
- ✓ This User Manual

Supplied from the USA use:

- ✓ RS-232 Interface Cable for use with a PC
- ✓ USB to PC cable
- ✓ USB driver software on CD

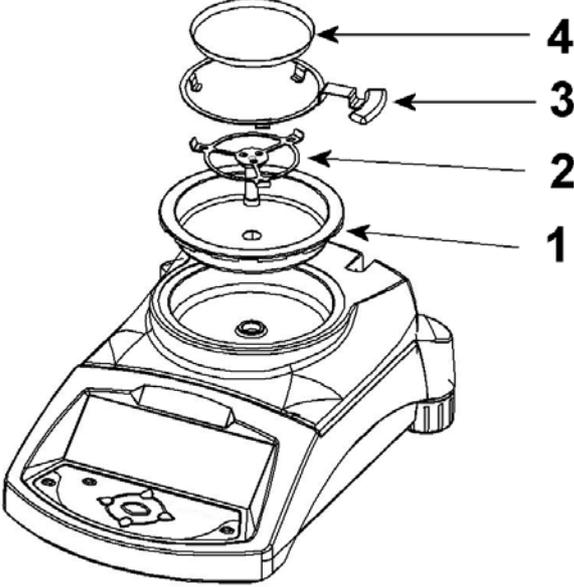
#### IMPORTANT:

Before applying power make sure the Moisture Analyser is configured for the power in your area. The analyser will have a label on the rear panel showing the voltage required. 115VAC ( $\pm 10\%$ ) or 230VAC ( $\pm 10\%$ ). If the label does not match your power do not attempt to use the analyser, damage to the Moisture Analyser could result.

The Moisture Analyser should be positioned to allow easy access to the mains power connection on the rear panel. Ensure the power cable is fully engaged to ensure safe operation.

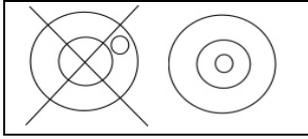
### 3.2 ASSEMBLING THE ANALYSER

For best performance, let the analyser warm up for 30 minutes before using.

	<ul style="list-style-type: none"><li>● Locate the Moisture Analyser on a solid surface, free from vibration with good ventilation around it.</li></ul>
	<ul style="list-style-type: none"><li>● Place the lower reflector (1) into the base of the weighing chamber</li></ul>
	<ul style="list-style-type: none"><li>● Gently place the pan support (2) into the access hole. Rotate to position.</li></ul>
	<ul style="list-style-type: none"><li>● Place the sample pan lifter (3) into the weighing chamber, rotate so the tangs on the lifter do not interfere with the pan supports and the handle exits the chamber using one of the gaps in the cover.</li></ul>
	<ul style="list-style-type: none"><li>● Place an empty aluminium weighing tray (4) on the pan support</li></ul>
	<ul style="list-style-type: none"><li>● Level the Moisture Analyser using the adjustable feet and spirit level</li></ul>

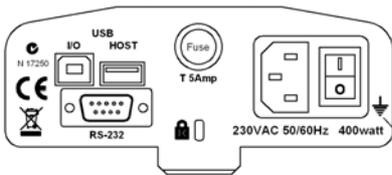
For some applications it is desirable to run the analyser in a dummy run to warm up the weighing chamber and the surrounding area before doing the actual test. See section 14 for other ideas to help ensure accurate test results.

### 3.3 LEVELLING THE ANALYSER



After placing the unit on a suitable location, level it by using the spirit level on the rear of the analyser. To level the unit turn the two adjustable feet at the rear of the analyser until the bubble in the spirit level is centred.

### 3.4 WARM-UP TIME



Attach the power supply cable to the connector on the rear of the analyser. The master power switch is on the rear panel, next to the mains cable. Turn the power on.

The display will indicate the serial number and the software revision number followed by the capacity. Next the analyser will run a self-test by displaying all segments. The display will then show zero weight accompanied by the **→0←** symbol.

Before you start weighing, you have to wait for the analyser to achieve a stable internal temperature. In addition it may be necessary for some material test to preheat the weighing chamber so that the delay to reach operating temperature is minimised.



A stable sign  $\sim$  is shown when the unit is in stable condition. It will turn off if the reading is not stable.

Exact zero is shown when the "**→0←**" symbol is on to the left of the display area.

### 3.5 LOCATING AND PROTECTING YOUR ANALYSER

In order to keep your analyser functioning at its best we suggest that you do the following:



Avoid extremes of temperature. Do not place in direct sunlight or near air conditioning vents.



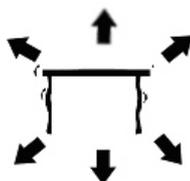
Make sure there are no heat sensitive or flammable material above the analyser. The exhaust from the weighing chamber can be very hot.



Make sure the analyser is located on a strong table and free from vibration.



Avoid unstable power sources. Do not use near large users of electricity such as welding equipment or large motors.



Keep free from vibration. Do not place near heavy or vibrating machinery.



Avoid high humidity that might cause condensation. Keep away from direct contact with water. Do not spray or immerse the analyzers in water.



Do not place near open windows, air-conditioning vents or fans that may cause a draft and unstable readings.

Keep the analyzers clean. Clean up spills in the weighing chamber before they become baked on.

### 3.6 SAFETY



This Moisture Analyser complies with the European Council Directives and international standards for electromagnetic compatibility, and safety requirements.

Improper use or handling can result in damage or injury.

To prevent damage to the equipment, read these operating instructions thoroughly. Keep these instructions in a safe place.

For safe and dependable operation please follow these instructions.

- The Moisture Analyser is used for determination of the moisture in samples. Do not use it for any other purpose. Improper use is dangerous and can cause injury or damage to other property.
- The Moisture Analyser must be operated as described in this manual. The environment must be controlled so that hazardous materials or conditions are not present.
- The Moisture Analyser must be operated only by trained personnel who are familiar with the properties of the samples used and with the operation of the instrument. Do not leave the analyser unattended when running a test.
- Make sure before getting started that the voltage printed on the rear panel is identical to your local voltage.
- Your Moisture Analyser is supplied with a 3-pin power cable with a grounding conductor. Use cables that meet the safety standards for your location and include the earth ground conductor.
- DO NOT disconnect the earth ground connection.
- The mains cable should not touch the enclosure where it can be heated during the test.
- Remove the power cable if the Moisture Analyser is serviced.

- Protect the Moisture Analyser from external liquids. Clean any spills immediately.
- If there are any visible damage to the Moisture Analyser or the power cable, Stop using the instrument immediately. Unplug the power and isolate the analyser. Do not use until the faults have been repaired.
- All repairs must be done by a trained technician. There are no user serviceable parts in the enclosure.
- Contact Klipspringer Limited or your dealer for assistance.

## HOT SURFACES

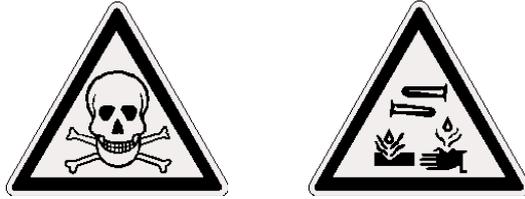


- During test the cover of the heating chamber can become very hot, especially near the top vent. Keep all material away from the vent area. Do not touch hot surfaces.
- Leave 20 cm (about 8 inches) around the moisture analyser and 1 m (3 ft.) above.
- Samples will be hot after a test. Do not use bare fingers to pick up any samples pans or touch the materials. The internal surfaces of the weighing chamber may be hot for some time after a test.

## MATERIALS



- The Moisture Analyser is not suitable for all materials. During the drying process samples will be heated to high temperatures. Materials that are flammable or explosive should not be tested.

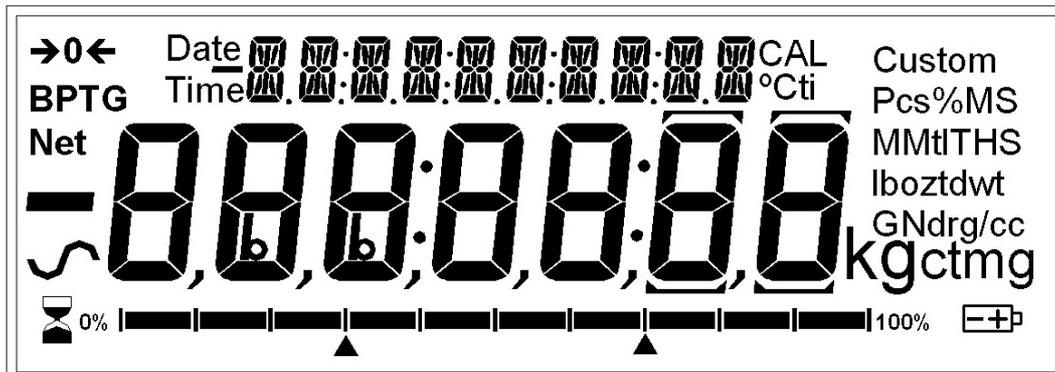


- Materials that emit toxic, caustic or noxious fumes should only be tested in suitable fume hoods or with other ventilation.
- Materials that will have a film on the surface during drying may cause high internal pressures to be present. These materials should not be tested using this method.
- Materials that emit aggressive or corrosive fumes (such as acids) should be tested using small quantities of material in an area with good ventilation.
- See Section 14 for further information on sample preparation.

**The user shall be liable and responsible for any damage that arises in connection with this moisture analyser.**

## 4.0 DISPLAY AND KEYPAD

The LCD has unique symbols to indicate the following:



→0←	Zero
S	Stable
Net	Net weight
	A bar graph indicating the proportion of the analyser capacity being used by the weight on the pan

Note: Some symbols shown on the display are not used in the analyzers. During the moisture test the main display will show the percent moisture. It can be switched to other values using the **[DspI/↑]** key. For example current mass.

The secondary display will show the elapsed time and temperature during a test.

Typical Displays that would be used are:



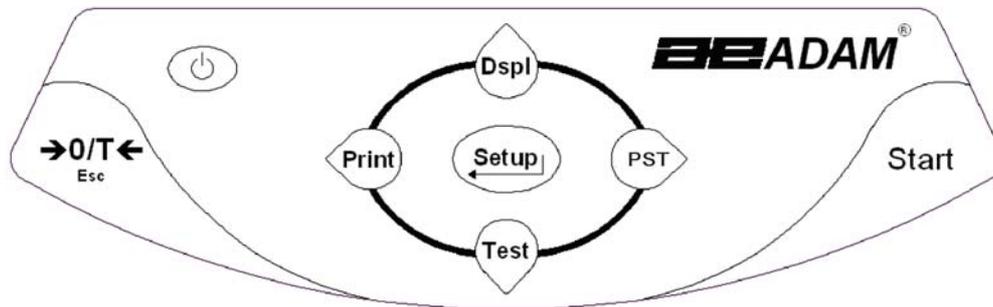
Weighing:

Showing no weight on the pan, stable and at zero point.

During a typical Moisture test:



Showing a test in progress for 13:25, with a current temperature of 123°C and 20.05% moisture, the test is still running.



The keypad has second function keys to allow a selected menu item or value to be incremented or changed. Right/left shift to change the active digit and up/down to increment or decrement a value.

The keypad has the following keys to operate the analyser.

Keys	Primary function	Secondary function
	To turn the analyser to ON or Standby	-
<b>[→0/T← / Esc]</b>	A combined zero and tare function	To escape from setup functions and modes
<b>[Start]</b>	To begin the moisture test after all settings and sample preparation has been completed. During a test, used to stop the test.	-
<b>[Test/↓]</b>	Selects moisture test parameters such as temperature, method, results.	-Scrolls through menu options To decrement or change a displayed value

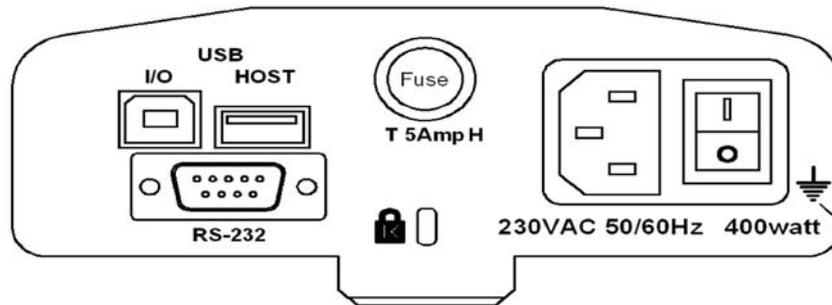
<b>[PST/→]</b>	Store or Recall pre-stored test parameters.	To advance a flashing digit by one position to the right. To go back by one step during setup functions
<b>[Print/←]</b>	Instructs the analyser to print data	To advance a flashing digit by one position to the left
<b>[Dspl/↑]</b>	Changes the display to read other data during a moisture test.	To increase or change a displayed value or scroll through options forward
<b>[Setup/Enter]</b> ←	Enters the Setup parameters (Supervisor Menus)	Enters a function or saves a value while manually entering unit weight or check weighing limits

#### **4.1 NUMERIC ENTRY METHOD**

To set a value when required, use the keys as given below-

- **[Dspl/↑]** and **[Test/↓]** keys to increase or decrease the flashing digit
- **[Print/←]** and **[PST/→]** keys to advance or move back the digit
- **[Setup/Enter]** key to accept the value

## 5.0 REAR PANEL INTERFACES



The rear panel has connectors for the data interface, fuse holder, security lock location and power supply input.

### 5.1 POWER

Make certain your unit is compatible with the mains power supply in your area. If the voltage is not the same the analyser can be damaged. Contact your supplier if you require assistance.

The power connection uses a standard IEC C13 socket on the cable with a plug suitable for the location. Do not use adaptors if the plug does not match your power supply.

The fuse should only be replaced with a time lag type fuse with high breaking capacity, 5Amp current rating. The fuse is a standard 5 x 20mm size. To replace the fuse remove all power from the analyser, unscrew the fuse holder cover to extract the old fuse, replace with a new fuse. If the fuse should blow again, the analyser must be serviced by a qualified service representative. There are no user serviceable parts inside. Contact your supplier.

### 5.2 DATA INTERFACES

The unit has data interfaces for a variety of applications.

The RS232 interface is a general purpose serial interface for communications with the analyser, using a DE-9P type connector. Refer to section 11.0 for details of the interface.

The USB I/O interface is similar to the RS-232 in that it is also a serial interface. The functions of the RS-232 and USB I/O are similar. See section 11.0 for more details on using the USB I/O.

The USB Host is designed to allow a USB memory device to be used as an external memory for the analyzers. The set-up parameters for operation and test procedures can be stored and up-loaded from the memory device. Results of drying test can be stored in the USB memory device. See sections 6.5 and 9.0 for further details on using the USB Host with a memory device.

Klipspringer Limited supply Data Collection software that will allow the user to use the full capabilities of the data interfaces. Contact your supplier or Klipspringer Limited for more details.

#### 5.2.1 FILES ON A USB MEMORY DEVICE

When a USB memory device is used the analyser will create a series of folders used to store files. These folders are called, REPORT, PRESET, CONFIG and RESULT, all under a master folder called MOISTURE.

X:\ MOISTURE

X:\ MOISTURE\REPORT

X:\ MOISTURE \PRESET

X:\ MOISTURE \CONFIG

X:\ MOISTURE \RESULT

Where X is the device letter your computer will assign to the memory device.

When the memory device is first plugged into the unit the memory is inspected and the folders will be created if they do not already exist. This process may take a few seconds before the analyser will show a display allowing access to the USB memory.

All files are stored in a text format with a file type of .txt. The files used by the analyser are all small enough that any size memory device will work.

### **5.3 SECURITY LOCK**

The centre of the rear panel has a location to mount a Kensington type security lock. Refer to the instructions that come with the lock for details.

## 6.0 BASIC OPERATION

When first turned on the unit will act as a basic balance showing grams weight on the display.

If a passcode has been set to limit access to the weighing functions of the analyser the display will show "PASSCODES". The display will change to show 7 digits set to zero with the rightmost digit flashing. Use the numeric entry method (see section 4.1) to enter the code. Make sure to enter the correct passcode to continue. See the Section 10.1.4 for details.

While in the weighing mode the test conditions for a drying test can be set.

### 6.1 SETUP OF METHOD

The unit is set to perform a drying test using a method determined by the user. The drying method can be input from a number of different sources.

- Using the keyboard
- Recalled from the internal memory of the analyser
- Recalled from a memory stick plugged into the USB host connector
- Entered from a PC using the RS232 or USB interface.

Regardless of the method used it will be necessary to program the analyser with the following:

#### **Type of test:**

- % moisture =  $100 * ((\text{initial mass} - \text{dry mass}) / \text{initial mass})$
- % solid =  $100 * (\text{dry mass} / \text{initial mass})$
- % moisture vs. dry weight =  $100 * ((\text{initial mass} - \text{dry mass}) / \text{dry mass})$   
Also called ATRO Moisture
- % solid vs. dry weight =  $100 * (\text{Initial mass} / \text{dry mass})$   
Also called ATRO Solid

ATRO Moisture or Solid test are special applications specific to some industries. %Moisture and %Solid are the more common calculations.

## Heat Control

- Single temperature, heat to a set temperature.
- Ramp to temperature, Ramp to final temperature in a user set time.
- Step temperature, heat to Temp 1, for X minutes, then temp 2 for X minutes, then Temp 3 for X minutes. A maximum of 3 steps can be used.

Set temperatures as required for these options. 50-160°C.

For Ramp set the time to final temperature.

For Step set the temperature and the time at each step.

## Interval

Set the time interval at which the results are computed and printed. Range is 1 to 99 seconds.

## Rapid heat

Set the rapid heat function to be on, off or under user control.

Rapid heat will cause the target temperature to be 145% (or 160°C, whichever is less) of the value set for Single or the first Step for a time of 3 minutes. For example if the Single temperature is 105°C, the rapid heat will heat to  $105 \times 1.45 = 152^\circ\text{C}$  for 3 minutes then maintain 105° after that time.

If set to Rapid = Off

The rapid heat function is disabled.

Rapid =On

The rapid heat function will occur every time a test is started.

Rapid = MANUAL

When a test is started manually, the user will be asked if Rapid heat should be used or not.

## **End Point Determination (manual stop active in all tests)**

- Time, Test ends at the end of a preset time.
- Stable result, test ends if the results are stable within a value set by the user.
- Time or stable result, combines both methods. Stop whichever occurs first, a stable result or the end of a preset time.

For timed test the user sets a time of typically 5 minutes to 99 minutes

Set stable results criteria. The test will stop when the weight changes less than a preset amount in a preset time. The default setting is 0.002g in 15 seconds for Moisture Analyser 53, and 0.02g in 15 seconds for 202. The user can set other values depending upon model.

## **Start Criteria**

- Start Manually when the **[Start]** key is pressed
- Start Automatically when cover lowered.

Delays 5 seconds after cover is down before beginning.

## **Print settings:**

To set if the analyser should print and store results and when printing if the complete test results or only the summary is printed and stored in the analyzers internal memory.

## **Default settings (stored in PST 00, see section 6.3 are:**

% Moisture

Single Temperature = 110°C

Rapid = Off

Interval Time = 5 seconds

End Point Determination = Time and stable result

Time 60 minutes, and

Stable Moisture Analyser 53 = 0.002g/15 seconds or Stable Moisture Ana

202 = 0.02g/15 seconds Start Criteria = manual start.

Print Test = on

Print Format = Complete

## 6.1.1 MANUALLY SETTING TEST PROCEDURES

Press the **[Test/↓]** key to set the test procedure. During the process use the numeric entry procedure described in section 4.1 to enter or change a setting.

Pressing **[Print/←]** at any time during this procedure will print a list of the current settings. See 6.1.2

Pressing **[→0/T← / Esc]** will always escape back to normal weighing without a change to the parameter being displayed. Any parameter changed before this time will be accepted.

### **PROCEDURE**

Press **[Test/↓]** to show “rESULT” with the current setting displayed,  
Options are “Moisture”, “Solid”, “ATRO Moist”, “ATRO Solid”

Use arrow keys, **[Dspl/↑]** and **[Test/↓]**, to change and press **[Setup/Enter]** to continue.

MOISTURE
result

ATRO MOIST
result

Heating Control, show “HEAT”

Options are: “Single”, “Ramp”, “Step”

SINGLE
Keat

The next settings will depend upon which heating option was selected:

“Single” Selected

Show “Single” “123 C” with the left digit flashing. The user can use the **[PST/→]** key to select another digit or the **[Dspl/↑]** and **[Test/↓]** to set the temperature, Range is 050 C to 160 C

SINGLE °C
123

### “Ramp” Selected

Show “Ramp” the temperature as above for setting the temperature and then change to “Ramp Time” and “ XX:XX ”, minutes and seconds.

Use the arrow keys to select the digit to change. The user can select a time up to 99:59.

RAMP °C
123

RAMP TIME
10:00

RAMP TIME
06:00

The ramp time should be set long enough to allow the heater to warm the sample gently.

### “Step” Selected

Show “Step 1” and set the temperature of step one as for the single heat settings above. When the value is set the display will show “Time 1” to set the time the first step is held. Enter the value as above. The minimum time for step 1 is 3 minutes.

When set press [**Setup/Enter**] to show “Step 2” and set this temperature and time and then go to “Step 3” and set this temperature and time.

If only 2 steps are required set the time for step 3 to 00:00. The analyser will ignore this setting.

### Interval Setting

The next setting will be to set the time interval the analyser uses to determine results and to print the current result. The analyser will compute the percent moisture or solid at the time interval desired. The new result will be displayed and printed as described below.

Display "Interval" "Sec XX" The user can change the value using the arrow keys. Range is 01 to 99 Seconds. Typical results will be computed every 5-15 seconds.

INTERVAL
se[10

The next setting is the operation of the Rapid heat Function.

Display will show "Rapid"

OFF
rapid

ON
rapid

USER
rapid

Options are to set Rapid heat to Off, On or User selectable.

The Rapid heat function is only active for single or step heating. For ramp heating it is disabled.

The next setting is the End Point Determination or Stop Condition.

Display will show "STOP"

TIME
StOp

TIME/STAB
StOp

Options are "Time", "Stable" or "Time/Stab"

The next steps will depend upon the option selected.

“Time” selected

Enter the time the test should run. The test will stop when this time is reached.

Display will show “Min XX”. This sets the minutes to run a test. The range is 04 to 99 minutes.

STOP TIME
Min 30

“Stable” selected

Enter the conditions to be used to determine if the results are stable. The amount of weight change to be used to determine if the test is finished, followed by the time to be used for the weight to change. For example 0.006g in 15 seconds would be a typical setting. Longer times or smaller weight changes could be used to ensure better stability or shorter times or larger weight changes to ensure a faster determination. For example 0.006g in 5 seconds will end a test quicker (but possibly less accurately) than 0.002g in 15 seconds. The user sets the weight first, then the time.

Display shows “STAB RANGE” “ XXX”. Set the range for the weight change. Set from 0.001 to 0.099 for Moisture 53 or 0.01 to 0.99 for Moisture 202.

Then the display shows “Stop Time” “ Sec XX”. Range is 01 to 99 seconds.

STABLE	STAB RANGE	STAB TIME
StOp	02	sec15

Time/Stable will combine these 2 settings.

TIME/ STAB	STOP TIME	STOP RANGE	STOP TIME
StOp	min 30	02	sec15

## Start Method

The last setting is the Start method. The analyser will either start a test automatically whenever the cover is lowered (after a 5 second delay to allow stability), or manually when the **[Start]** key is pressed.

Display will show "START"

Options are "Manual" or "Auto"

MANUAL
start

## Print Control

To allow the analyser to print the results during the test. If the print is set to ON the analyser will also store the results to memory using the file name given by the user. See Section 7.0

Display will show

PRINT TEST
On

Options are "On" or "Off"

The display then changes to the format of the print test.

FORMAT
COMP

FORMAT
SUMM

Options are "Complete" or "Summary" test results. See section 11.3

After setting the last parameter press **[→0/T← / Esc]** to return to normal weighing and ready to begin a new test.

## 6.1.2 PRINT CURRENT SETTINGS

When setting the test parameters the **[Print/←]** key will cause the current parameters to be printed as shown below. However if the display is awaiting a numeric entry the **[Print/←]** key will move the flashing digit to the left.

For example (English language version shown):

<pre> CURRENT TEST SETTINGS  DATE:  08/01/2009 TIME:   14:44:49 SER  NO:AE00001234  USER NO:1234567  Preset: PST 01         ABCD-01234  Result  %MOISTURE Heating:Ramp         112 C         27:00  Rapid   Manual Interval: 05 Sec Stop:    TIME/STABLE         60 Min         0.002 g         15 Sec  Start:  MANUAL </pre>	<p>From the Real Time Clock</p> <p>Analyser Serial number</p> <p>User ID number</p> <p>If Preset test is used, blank if not from a preset test.</p> <p>Current test settings for heating</p> <p>Printing interval</p> <p>Stop Criteria</p> <p>Start Criteria</p>
---	--

## 6.2 STORE TEST SETTINGS

It will be possible to store up to 49 test procedures/settings. There is also a factory default that is permanently stored as PST 00. See sec. 6.1

To Store the current settings press the **[PST/→]** key. The display will give the user the option to store, recall or delete a Preset Test. The display will show “PST STORE” or “PST RECALL” or “PST DELETE”. Use the up/down arrow keys, **[Dspl/↑]** and **[Test/↓]**, to select either store or recall.

PST STORE

If Store is selected the display will then show “PST STORE XX” with the number showing the ID for the next empty location. For example if PST 01, 02, & 03 are already stored the next number is PST 04. If the user wishes to overwrite a previously stored value they can change the number and continue. Using the up/down arrow keys, **[Dspl/↑]** and **[Test/↓]**. If the user has stored positions 1,2, and 4 then when this process begins the first blank location is PST 03, so that is the value to be displayed. Then the next time PST 05 would be shown.

PST STORE
05

Press **[Setup/Enter]** to select the PST number shown. If this number already has a test method stored then ask if the test should be overwritten. To continue the user must press **[Setup/Enter]** to overwrite the old results and store new ones.

OVERWRITE?

Pressing the **[→0/T← / Esc]** key will escape without clearing the old result.

When storing a test procedure the user has the option of adding a text or numeric name to the test. The top display will show "PST NAME" then show "-----". To enter a name, use the **[Dspl/↑]** or **[Test/↓]** keys to cycle through numbers and letters. Use the **[PST/→]** or **[Print/←]** key to move the flashing digit to the left or right.

—./0123456789ABCDEFGHIJKLMN OPQRSTUVWXYZ

Up to 10 characters can be used to describe the test. Press **[Setup/Enter]** at any time to finish the description. If no name is added the field will be shown as blanks when the name is shown during the recalling process.

PST NAME

BREAD-4

### 6.3 RECALL TEST SETTINGS

Recalling the test settings can be done by selecting "PST RECALL" then scrolling through the stored settings using the **[Dspl/↑]** or **[Test/↓]** keys to find the desired settings and then pressing the **[Setup/Enter]** key to recall them. When the PST XX number has been selected the name given to the test will be displayed

If PST 00 is selected the default test settings are recalled. These can never be cleared or overwritten. If a test is not stored it is not displayed, i.e. If only 3 tests are stored then only those 3 plus the default are seen when recalling the test settings.

BREAD-3
PST 07

Press the **[Setup/Enter]** key to recall PST 07.

The display will show:

RECALL OK

The analyser will then return to normal.

#### **6.4 DELETE TEST SETTINGS**

To delete any the test setting select “PST DELETE” then scrolling through the stored settings using the **[Dspl/↑]** or **[Test/↓]** arrow keys to find the desired settings and then pressing the **[Setup/Enter]** key to delete it.

The display will then show the next test setting stored or if the memory is empty a message will be shown. Press **[→0/T← / Esc]** to return to normal.

#### **6.5 REVIEW TEST SETTINGS**

To review the current settings press the **[Test/↓]** key then advance through the settings pressing the **[Setup/Enter]** key at each option to retain the current value. If any setting needs to be changed it can be modified as described in section 6.1.

At the beginning of a test the display will preview the current settings if the user parameter to allow the preview is enabled. See section 10.1.2.

If you need to abort the test before it begins press the **[Start]** or **[→0/T← / Esc]** key to return to normal.

#### **6.6 STORE AND RECALLING TEST SETTINGS FROM USB MEMORY**

To store or recall test settings stored on a USB memory device, simply plug the device into the USB hub interface. The analyser will detect the memory has been inserted and display a screen to guide you.

The display will show a message showing the USB device is inserted:

CONFIG LD
USB

To select the option of storing all of the test settings stored in the analyser memory to the USB memory device press the **[Dsp/↑]** key to change the menu option to select Preset Store, "PST ST".

PST ST
USB

Press **[Setup/Enter]** to enter the test saving function.

Once the file has been saved the display will show

SUCCESS
USB

For 2 seconds then return to the USB display.

PST ST
USB

To recall any stored test procedure press the **[Dsp/↑]** key to show the test load screen.

PST LD
USB

Press the **[Setup/Enter]** key to enter the test load function. The display will show the file name of the first test file found.

PST 01
PSt

To load this file press the **[Setup/Enter]** key again. Or to choose a different file press the **[Dspl/↑]** key to advance through the other files available, pressing the **[Setup/Enter]** key when the desired file is shown.

PST 06
PST

After loading the file the display will show a Success message and return to the USB screen. To continue, the USB device should be removed. The analyser will return to normal weighing automatically. Or press the **[→0/T← / Esc]** key to escape back to normal weighing.

To store or recall other test files plug the USB memory device back into the analyser.

The test files contain data to set the parameters of the test procedures in a text file. All files will be in English regardless of the language selected for the display. A typical test file will appear as:

```

Result=0;
Heat=1;
Ramp Temp=112;
Ramp Time=27:00;
Interval Time=05;
Stop mode=2;
Stop time=60;
Stable Range=0.002;
Stable Time=15;
Start mode=0;
Name=ABCD-0123
Rapid=1
savepos=01;

```

The meaning of the text in the file is given below. Different test settings will create a file with different information. Not all settings are printed if they are not used by the test program.

<b>Text message</b>	<b>Description</b>	<b>Range of Values</b>
Result=1;	Calculation of results	0=%M, 1=%S, 2=%Atro_M, 3=%Atro_S
Heat=1;	Heating profile to be used	0=Single, 1=Step, 2=Ramp
Single Temp=100;	Temperature for single heat setting	50C to 160C
Step temp1=050;	Temperature for first heat of a step profile	50C to 160C, 000C is off
Step Time1=30:00;	Time for the first heat of a step profile	Time 02:00 to 99:00
Step temp2=080;	Temperature for 2 <sup>nd</sup> heat of a step profile	50C to 160C, 000C is off
Step Time2=30:00;	Time for the 2 <sup>nd</sup> heat of a step profile	Time 02:00 to 99:00
Step temp3=050;	Temperature for 3 <sup>rd</sup> heat of a step profile	50C to 160C, 000C is off
Step Time3=30:00;	Time for the 3 <sup>rd</sup> heat of a step profile	Time 02:00 to 99:00
Ramp Temp=100;	Final temperature of a ramp profile	50C to 160C
Ramp Time=30:00;	Time to reach final temperature	Time 02:00 to 99:00
Interval Time=20;	Time period used to print interim test results	5 sec to 99 sec
Rapid=0;	Rapid heat function setting,	0= Off, 1= On, 2= User
Stop mode=0;	Stop mode for drying test	0=Time, 1=Stable, 2=Stab and Time
Stop time=10;	Time to stop test	time = 03 to 99 min
Stable Range=0.002;	Weight the analyzers uses to determine if the results are stable at the end of test.	Set from 0.001 to 0.099 for unit 53 or 0.01 to 0.99 for unit 202
Stable Time=10;	Time used to compare weight during a test to determine if the results are stable at the end of test.	05 sec to 99 sec
Start mode=0;	Start test manually or when the cover is closed	0=Manual 1=Auto
Name=ABCDE12345;	Name assigned by the user if the test results are to be stored	Exactly 10 characters of alpha-numeric characters, plus . / -
savepos=01;	Memory location the results are stored in.	01 to 49

## 7.0 RUNNING A TEST

If necessary the user can set a new set of values for a test setting or recall a pre-stored set of values. See section 6. The last used set of values are stored so they are always shown initially, even after power has been turned off. That way if the last test settings are still valid the user can immediately use them.

The basic operation after test settings are set is as follows:

Place an empty sample pan on the analyser.

Press [**→0/T← / Esc**] to zero the weight.

MASS	23°C
0.000 <sub>g</sub>	

Fill the sample pan with the sample. See Section 14 for assistance in how to prepare a sample.

Place the filled pan on the analyser.

MASS	23°C
5.670 <sub>g</sub>	

Lower the lid of the weighing chamber, if automatic start has been selected the test will begin after a 5 second delay or after the test settings have been previewed.

If Manual start has been selected press the [**Start**] key.

The test will begin. If the test setting Preview has been enabled (See section 10.1.2) the display will show the current test settings one after the other. The drying test begins immediately after the preview is completed. ..

If you need to abort the test before it begins press the [**Start**] or [**→0/T← / Esc**] key to return to normal.

If the rapid heat function has been set to MANUAL the display will ask if the user wants the rapid heat function to operate during this test.

The display will show the last setting used, either:

OFF
rapid

ON
rapid

Use the **[Dspl/↑]** or **[Test/↓]** keys to change the option, then press **[Enter]** to continue the test.

The top line will show the time elapsed time of the test and the chamber temperature. The main display will show the current result, updated at the interval time selected when setting test parameters.

03:45 RA 100°C
16.12%

If the Rapid heat is active a “RA” will be displayed in front of the temperature reading.

An “A” will be on the left side of the display if %Moisture /Dry or %Solid/Dry is the result selected. The %M or %S will be on the right side of the display showing %Moisture or %Solid.

The display will continue to be updated at the time interval set for the test. During the test the **[Dspl/↑]** key can be pressed to see other information such as current mass, other results such as %Solid, time remaining if time limit is set for the test. Each alternate display is shown for 5 seconds then return to normal display, or if **[Dspl/↑]** is pressed again go to the next alternate display.

	03:45 100°C
Current Mass	4.756 <sub>g</sub>
	SOLID
% Solid	83.88%
	ATRO MOIST
Atro Moisture	3.78%
	TIME LEFT
Time Left (if time limit is set)	14:21

The Alternate displays in order are:

- Mass
- % Moisture
- % Solid
- % Atro Moisture
- % Atro Solid
- Time Remaining for test if time limit set

During the test the user can stop the test at any time by pressing the **[Start]** key again. Otherwise it continues until the stop condition is met.

When the test has stopped the beeper will sound 3 short beeps (if enabled, see sec. 10.1.2) and the display will show the end result:

12:44 ASTOP
76.47%

This display shows the test was automatically stopped as stability was reached in 12:44 minutes. If it had stopped at the end of the time period it would have TSTOP on the top line and if manually stopped it would have MSTOP.

At this time the final results are displayed. These results will include elapsed time of the test and final % result.

Display other data by pressing the **[Dsp/↑]** key. To show the initial mass, final mass and the file name used by the analyser to store the results in internal memory.

START MASS	END MASS	RES00033
5.670 <sub>g</sub>	1.334 <sub>g</sub>	STORED

The final values for the results can be printed again to the Serial interface by pressing the **[Print/←]** key. See section 8.

To return to normal weighing press the **[→0/T← / Esc]** key.

## 8.0 PRINT AND STORE RESULTS

If the test parameters are set to allow the test results to be printed (see section 6.1.1) then the results of the test are printed both before and after the test is complete. The initial part of the printout will show the test conditions. If the test printing parameter has been set to complete then the results will be printed at the interval time. When a test is completed, the user can print a result from the test. At the same time as the printing is happening the results are stored in the Moisture Analyser memory. The results can be recalled from the memory for printing over the serial interface.

### 8.1 PRINTING FINAL TEST RESULTS

While the final values for the test are being displayed after the test has ended, press the **[Print/←]** key to output the final results. The format of these results are the same as the last lines of the complete printout:

LAST TEMP:	111C
TEST TIME:	05:30 Min
FINAL MASS:	11.820 g
MASS LOSS:	0.521 g
RESULT:	4.27 %M

### 8.2 STORING TEST RESULTS

If the test settings include the printing of results being enabled the analyser will store the results of the test into memory. (See section 6.1.1) The test results will be stored using the file name given to it automatically by the Unit. In the form RESxxxxx

The Moisture Analyser is capable of holding up to 99 test results. If the analyser memory is full the display will show an MEM FULL message. Delete some of the stored results to make room for new test results. See section 8.4.

### 8.3 RECALLING TEST RESULTS

When a test result has been stored in the units memory it can be recalled to the display.

During normal weighing mode press the **[Dspl/↑]** key. The display shows

PRINT

Pressing the **[Dspl/↑]** or **[Test/↓]** will change the option to PRINT, DELETE or DELETE ALL.

When the selection shows PRINT, press **[Setup/Enter]** and the display will show the first stored test result using the file name given it when stored.

RES00032

Press the **[Dspl/↑]** or **[Test/↓]** key to change the file name to the next available. When the test result desired is found press the **[Setup/Enter]** Key to recall the details and print them in the same format they were stored in, See section 11.0

Pressing **[→0/T← / Esc]** will return the analyser to normal operation.

### 8.4 DELETING TEST RESULTS

When a test result has been stored in the units memory they can be deleted individually or all at one time.

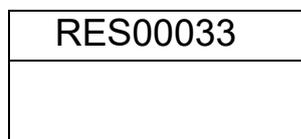
To delete all test results from memory, during normal weighing mode press the **[Dspl/↑]** key until the display shows



When the selection shows DELETE ALL, press **[Setup/Enter]** to delete all test results. The display will ask if you are sure you want to delete all results. Press **[Setup/Enter]** again. The display will count down from 99 to 0 during the time it takes to remove all the files.

To delete an individual test result continue as above except press the **[Dspl/↑]** or **[Test/↓]** will change the option to DELETE.

When the selection shows DELETE, press **[Setup/Enter]** and the display will show the first stored test result using the file name given it when stored.



Press the **[Dspl/↑]** or **[Test/↓]** key to change the file name to the next available. When the desired test result is found press the **[Setup/Enter]** Key to delete just this file. The display will then show DELETED then the next available file. Press **[Setup/Enter]** to delete this file if desired.

Pressing **[→0/T← / Esc]** will return the analyser to normal operation.

## 9.0 STORING RESULTS IN USB MEMORY

A memory stick plugged into the USB host connector will allow for mass storage of test results. The procedure is similar to the method used to store test settings, See section 6.5.

To store the results of a drying test on a USB memory, simply plug the memory into the USB hub interface. The analyser will detect the memory has been inserted and display a screen to guide you.

The display will show a message showing the USB memory is installed:

VERIFY
USB

Then it will display the first selection of actions that can be performed.

RESULT ST
USB

To select other options press the **[Dsp/↑]** key to change the display to select Result Store, PST Store, PST Load, Configuration store or Configuration load.

To Store test results select

RESULT ST
USB

Press **[Setup/Enter]** to enter the test saving function. All of the test results stored in the analyser memory will be copied to the USB memory. The file names will be the same as those used to store internally.

Once the file has been saved the display will show

STORE OK
<b>USB</b>

For 2 seconds then return to the USB display.

CONFIG LD
<b>USB</b>

The test data file is a text file that has the same arrangement as the Serial Interface sample given in section 11.

## 10.0 ANALYSER MENUS

The unit has a number of submenus for setting the operation of the analyser and the communications. The main topics are:

### PASSCODES

To control unauthorised access to the menu system.

### MOISTURE ANALYSER SETTINGS

Setting of date and time  
Date format, YMD, MDY, DMY  
User ID  
Key Buzzer On/Off  
Test Buzzer On/Off  
Backlight, On, Off, Auto  
Filter and Auto zero settings  
Language Selection

### SERIAL I/O

Baud rate  
Parity  
Continuous output  
Time for continuous output

### CALIBRATION

Weight Calibrate  
Temperature Calibration  
Cal Report On/Off

## 10.1 SUPERVISOR MENUS

Pressing the [**Setup/Enter**] key while in normal weighing gives access to the menus.

When **[Setup/Enter]** is pressed and passcodes are not enabled the display will show the first section of the menus, Serial interface. If passcodes are enabled, the analyser will ask for it by displaying:

PASSCODE
000000

With the right digit flashing.

Enter the correct passcode using the numeric entry method.

If a wrong code is entered the analyser will return to weighing mode

If the passcode has been enabled and entered, the analyser will allow the operator to access the Supervisor's menus

The **[Dspl/↑]** and **[Test/↓]** keys will cycle through the main headings, pressing the **[Setup/Enter]** key will enter the heading and sub-parameters or options can be set. Press **[PST/→]** to come out of a sub-menu and go up one level or **[→0/T← / Esc]** to return to normal weighing from any menu

### 10.1.1 SERIAL INTERFACE PARAMETERS

The parameters affecting the serial setup are set in a similar manner to the other parameters.

Press [**Setup/Enter**] when “SERIAL” is displayed to enter the sub-menu.

The parameters that can be set are shown below, default values are in **bold**:

BAUD RATE	Set the Baud Rate to 2400, <b>4800</b> , 9600, 19200 or 38400
PARITY	Set the Parity to <b>OFF</b> , EVEN or ODD
CONTINUOUS	To output the weight only at the interval time set in the INTERVAL parameter. Overrides the printing of any test results. Option is ON or <b>OFF</b> .
INTERVAL	Sets the time in seconds between output of weight values, if CONTINUOUS output is turned on.

These parameters apply to both the RS-232 and the USB Serial Interfaces. The interfaces operate in parallel so they both output the same data at the same time. It is up to the user to beware to prevent possible conflicts if both interfaces could receive data at the same time.

## 10.1.2 SETUP PARAMETERS

The user parameters that control the unit are shown under the SETUP. When “SETUP” is displayed, press the **[Setup/Enter]** key. The options for each parameter can be scrolled through by using the **[Dspl/↑]** or **[Test/↓]** keys.

TIME	Set Time using the numeric entry method (see section 6.1)
DATE FORMAT EUROPE (dd/mm/yy) USA (mm/dd/yy) ASIA (yy/mm/dd)	Select the format the date will be shown in.
DATE	Set Date using the numeric entry method (see section 6.1) Set year, month date when requested.
USER ID	Enter a user number to identify this analyser
KEY BEEPER	When enabled will beep any time a key is pressed.  On= Enable OFF= Disable
TEST BEEPER	When enabled will beep 3 times quickly when a drying test is completed.  On= Enable OFF= Disable
BACKLIGHT	On OFF AUTO

FILTER	Set the amount of filtering used for weighing. If sever vibration is present a slower filter may be helpful, for maximum speed use the fast filter. Select SLOW, NORMAL or FAST
LANGUAGE	Select the language, English, German, French or Spanish
PREVIEW	Allows the test settings to be previewed on the display at the start of a test. Select On or Off.

The sub-menu is entered by pressing [**Setup/Enter**] –

Use the [**Dspl/↑**] and [**Test/↓**] keys to increase or decrease the value for setting. Press [**Setup/Enter**] to accept the setting and advance to the next item in the menu

Press [**PST/→**] to advance to setting of the next parameter or [**→0/T← / Esc**]to return to normal weighing

### 10.1.3 CALIBRATION

This menu allows the user to calibrate the weight or the chamber temperature.

Press **[Setup/Enter]** when “CALIBRATE” is displayed.

The options for each parameter can be scrolled through by using the **[Dsp/↑]** or **[Test/↓]** key

CAL MASS	Begin the mass calibration function. Return to weighing when finished.
CAL TEMP	Begin the temperature calibration of the weighing chamber, Return to weighing when finished.
CAL REPORT	On = Enabled. Prints out Calibration report after successful calibration (either mass or temperature) OFF = Disabled

Press **[PST/→]** to advance to setting of the next menu which is “PASSCODES” or **[→0/T← / Esc]** to return to normal weighing.

#### 10.1.3.1 MASS CALIBRATION

Enter the menu for Calibration section. Select CAL MASS. Press **[Setup/Enter]**.

Display will guide you through the steps.

Display will show “Load 0g”, Unload the pan and remove the sample pan. Press **[Setup/Enter]**.

The display will prompt to select the mass to be used for calibration, i.e. “LOAD 50g”, Use the **[Dsp/↑]** or **[Test/↓]** keys to select the alternate

mass size if desired. For Moisture 53 calibrate using 20 or 50grams, for Moisture 163 calibrate using 100 or 150g and for Moisture 202 calibrate with 100 or 200grams. Press **[Setup/Enter]**.

Place the calibration weight shown on the centre of the weighing pan, when the stable indicator is on press **[Setup/Enter]**. The analyser will calibrate to the weight selected.

When calibration is complete the display will return to weighing. If there is a problem an error message will be show. If the weight is unstable “Error Stab” will be displayed, If the weight is too small “Error Low” will be shown, If the weight is too large “Error High” will be shown. After calibration the analyser will return to normal operation and print the calibration report if it has been enabled. The determination of being high or low will depend upon the calibration values stored during the dealer calibration.

#### 10.1.3.2 TEMPERATURE CALIBRATION

You must have a method to measure the temperature inside the weighing chamber during a special heating test in order to complete the temperature calibration. Contact your dealer or Klipspringer for more information. The calibration will require 30-40 minutes to complete.

Place a sample pan on the pan support during this test.

Place the temperature probe to be used to monitor the temperature within the weighing chamber on or near the sample pan.

Close the chamber.

Enter the menu for calibration section. Select the Temperature Calibration option, CAL TEMP.

Press the **[Setup/Enter]** key.

The display will guide you through the steps necessary to calibrate the temperature of the heating chamber.

When the analyser chamber is closed the display will show

FIRST
00:00

with the timer running. The timer will count up to 10:00 to allow time for the chamber to come to a steady (room) temperature. During this time observe the temperature in the chamber.

During this time the beeper will sound every minute to remind you that a calibration is in progress.

Note the temperature inside the chamber. When the temperature is stable and constant for some time press **[Setup/Enter]** to enter the lower temperature value.

The display will change to allow the value to be entered.

FIRST
000

Using the numeric entry method, enter the temperature inside the chamber, for example 23°C you would enter:

FIRST TEMP
023

Press **[Setup/Enter]** to continue the test.

The heaters will turn on and begin heating the test chamber. The timer will show the elapsed time as before. The chamber will be heated to approximately 150°C.

At the end of 30 minutes the beeper will sound, read the temperature in the chamber. Press **[Setup/Enter]** to enter the second temperature value.

Enter this value as before, pressing **[Setup/Enter]** to confirm and store the value.

SEC TEMP
000

The Moisture Analyser will return to normal weighing.

Leave the analyser to cool

During the 30 minute soaking time you can force the timers to stop if you observe the chamber temperature is stable by pressing the **[Setup/Enter]** key. Then enter the temperature as described.

If the test is not completed as shown above, the temperature calibration will be abandoned, the display will show "TEMP CAL FAIL" and the analyser will return to normal without the temperature calibration changing. The test will be stopped if the second temperature is not entered with 30 minutes of starting the high temperature test.

These values will be accepted only if they are within acceptable limits of the values stored during the dealer calibration.

### 10.1.3.3 CALIBRATION REPORT

During weight or temperature calibration the analyser can print a report showing details of the calibration. The format of the reports are:

<p>MASS CALIBRATION</p> <p>DATE: 21/02/2009 TIME: 14:21:32</p> <p>SER NO: AE001234</p> <p>USER NO: 123456</p> <p>WT REF: _ _ _ _ _</p> <p>MASS: 50 g</p> <p>CALIBRATION BY:</p> <p>_ _ _ _ _</p>	<p>TEMPERATURE CALIB.</p> <p>DATE: 21/02/2009 TIME: 14:37:12</p> <p>SER NO: AE001234</p> <p>USER NO: 123456</p> <p>TEMP REF: _ _ _ _ _</p> <p>TESTED 23°C/ 142°C</p> <p>CALIBRATION BY:</p> <p>_ _ _ _ _</p>	<p>From Analyser RTC</p> <p>From Memory</p> <p>From memory, blank if not set</p> <p>User to fill in details</p> <p>Text, showing cal wt used or temperature settings used.</p> <p>Room to sign</p> <p>Extra line feeds</p>
--	--	--

English language version shown in the example.

#### 10.1.4 PASSCODES

To enable the security features in the unit it is necessary to set passcodes. There are 2 passcodes called Operator Passcode and Supervisor Passcode. The Operator Passcode allows an authorised user to operate the basic weighing functions of the analyser but will not allow access to the Supervisor Menus if the Supervisor Passcode has been set.

To change or disable a Passcode it will be necessary to enter the current passcode.

Press [**Setup/Enter**] when “PASSCODES” is displayed to enter this section.

OPERATOR	Enter the current passcode (OLD) first then enter a new passcode if desired. A passcode set to zero will disable the security feature and allow unlimited access.
SUPERVISOR	First enter the current passcode (OLD) and then enter a new passcode if desired. A passcode set to zero will disable the security feature and allow unlimited access.

##### 10.1.4.1 FORGOTTEN PASSCODES

Keep a record of the passcode to ensure you can access this section again. If however you have forgotten your passcode you can still gain access by entering a universal code.

If you have forgotten the current passcode a code of “15” will always allow you to enter the Supervisor area.

Using the Supervisor menus go to the PASSCODE section and reset the operator or Supervisor passcode using the “15” code as the old number when requested.

## 10.2 STORE AND RECALL MOISTURE ANALYSER SETTING FROM USB MEMORY

To store or recall Moisture settings on a USB memory, simply plug the memory into the USB hub interface. The analyser will detect the memory has been inserted and display a screen to guide you.

The display will show a message showing the USB is installed:

CONFIG LD
USB

To select the option of storing the configuration data to the memory press the **[Dsp/↑]** key to change the display to select Configuration Store

CONF STORE
USB

Press **[Setup/Enter]** to enter the configuration saving function. The display will show a suggested file name. The name will be the next logical name for the configuration file based on what data is already on the USB memory. For example if CONFIG1 and CONFIG2 are already stored, then it will display CONFIG3.

CONFIG3
USB

CONFIG3
Store

Press **[Setup/Enter]** to confirm the action.

Or press **[→0/T← / Esc]** to

escape back to the original USB display.

Once the file has been saved the display will show

STORE OK
USB

For 2 seconds then return to the USB display.

CONFIG LD
USB

To recall any stored test procedure press the **[Dspl/↑]** key to show the configuration load screen.

CONFIG LD
USB

Press the **[Setup/Enter]** key to enter the test load function. The display will show the file name of the first file found.

CONFIG1
USB

To load this file press the **[Setup/Enter]** key again. Or to choose a different file press the **[Dspl/↑]** key to advance through the other files available.

CONFIG1
LOAD

To continue the USB device should be removed. The analyser will return to normal weighing automatically. Or press the **[→0/T← / Esc]** key to escape back to normal weighing.

To store or recall other files, plug the USB memory back into the analyser.

The configuration file is a text file that would appear as the left column below. All configuration files will be in English regardless of the language selected for the analyzers.

```
Baud Rate=2;                #0=2400,1=4800,2=9600,3=19200,4=38400,default=1;
Parity=0;                   #0=none,1=Even,2=Odd ,default= 0;
Print Test=1;              #0=off,1=on, default=1;
Output Format=0;           #0=complete 1=summary ,default=0;
Continuous=1;             #0=off,1=on, default=0;
Interval=20;              #00-99 ,default=1;
Date Format=1;             #0=Europe,1=USA,2=ASIA default=0;
User ID=1234567890;       #length=10 alpha-numeric characters;
Key Beeper=1;             #0=off;1=on default=1;
Test Beeper=1;           #0=off;1=on default=1;
Backlight=2;             #0=off,1=on,2=auto default=2;
Filter=1;                 #0=slow,1=normal,2=fast, default=1;
Stability=2;             #0=1d,1=2d,2=5d,3=10d default=2;
Auto Zero=3;             #0=off,1=1d,2=2d,3=5d default=5;
Operator=000000;         #operator password ,must be 6 bytes;
Supervisor=000000;      #Supervisor password ,must be 6 bytes;
Calibration Report=1;    #0=off,1=on default=1;
Language=1;              #0=English, 1=German, 2=French, 3= Spanish
```

If there is a problem loading a configuration or PST file from the USB the display will show the message FAIL. A report will be written on the USB memory in the reports folder. Open the report file using Notebook or other word processor to read the message. The message will give a brief description of the reason for the failed attempt. A line of data may have an incorrect value or command or it may not be possible to complete the command as it is restricted to the service personal.

Try correcting the command or removing the line the command is on and repeating the loading procedure.

## 11.0 SERIAL INTERFACE

The unit has the ability to send or receive data over the serial interface. Using either the RS-232 or the USB serial interface.

The test data can be sent over the interface either automatically or when the user presses the **[Print/←]** key.

The user has control over what data is to be printed.

### 11.1 RS-232 HARDWARE

The RS-232 interface is a simple 3 wire connection. The input and output connections are:

Connector:	9 pin D-sub miniature plug	
	Pin 2 Input to analyser	RXD
	Pin 3 Output from analyser	TXD
	Pin 5 Signal ground	GND

Handshaking is not applied.

Baud rate: 2400, 4800, 9600, 19200, 38400

Parity: NONE (=8N1), EVEN (=8E1) or ODD (=8 O 1)

All lines are terminated with carriage return and line feed (<CR><LF>).

In continuous output mode, the serial output format will be a single line in the form "12.567 g<CR><LF>".

### 11.2 USB SERIAL HARDWARE

The USB interface is a standard USB connection. To use the USB interface it is necessary to plug the analyser into the USB port of a PC.

The PC will recognise the new device and search for a suitable driver. If none are found a message will be displayed to guide the user through the installation of suitable software.

The drivers for the USB interface are available from the Klipspringer web site. Go to [www.klipspringer.com](http://www.klipspringer.com). Download the software and activate the install program, follow the instructions to install the software. Once the software is installed the PC will list a new COMM port for use with programs or applications.

### **11.3 INPUT COMMANDS**

The unit can be controlled with the following commands sent using remote keys such as from a PC. The commands can be sent in both upper case letters and lower case letter, i.e. “!KT” or “!kt” are both acceptable. Press the Enter key of the PC after each command (the action of Carriage Return is denoted as <CR> as shown below).

#### **Basic Input Commands:**

<b>!KT&lt;CR&gt;</b>	<b>Tares the analyser to display the net weight. This is the same as pressing the [→0/T← / Esc] key when the analyser is in the normal weighing mode.</b>
<b>!KS&lt;CR&gt;</b>	<b>Will begin or end a drying test, the same as pressing the [Start] key.</b>

Note: The RS-232 and USB can both be connected to by external equipment. The interfaces operate in parallel so they both output the same data at the same time. It is up to the user to beware in order to prevent possible conflicts if both interfaces could receive data at the same time. This may cause some commands to be received with errors.

### **11.4 PRINTING RESULTS**

The unit can print results during a test at the time intervals selected, see section 6.1.1. In this case the format of the printing will be as shown below. The first section will print the initial conditions and the settings used for a test. During the test the current results will be printed. At the end of the test the final results will be printed.

A typical test report will look as:

<pre> MOISTURE TEST FILE NAME: RES00032 DATE:      13/12/2008 TIME:      09:38:07 SER NO:    AE12345678  TEST NO:   _ _ _ _ _  USER NO:   9876543210  Preset:    PST 05            Bread-4  Result:    % Moisture Heating:   Step Temp:      Step 1 120 C            Time 1 04:00            Step 2 110 C            Time 2 90:00  Rapid      On Interval:  30 Sec Stop:      Time/Stable            60 Min            0.002 g            30 Sec  Start:     Manual  INIT MASS: 12.341 g  MODE TEMP   TIME      RESULT Step0    65C    00:30    1.26 %M Step0    159C   01:00    2.11 %M Step0    157C   01:30    3.15 %M Step0    158C   02:00    3.79 %M Step0    156C   02:30    4.11 %M Step1    157C   03:00    4.19 %M Step1    149C   03:30    4.22 %M Step1    140C   04:00    4.24 %M Step2    131C   04:30    4.26 %M Step2    120C   05:00    4.27 %M Step2    111C   05:30    4.27 %M ***** AUTO STOP *****  LAST TEMP: 111C TEST TIME: 05:30 Min FINAL MASS: 11.820 g MASS LOSS: 0.521 g RESULT:    4.27 %M </pre>	<p>Heading File name used by analyser to store result From Analyser</p> <p>Serial number</p> <p>A blank line for users to fill in a number if they wish.</p> <p>User number</p> <p>Preset method if used.</p> <p>Test settings</p> <p>Measured initial mass.</p> <p>Test Heading Results printed once every 30 seconds as set by the INCR time. Note temperature during first part of test is 120C X 130% as the Rapid function was enabled. Step0 signifies the rapid function is active. After 3 minutes the Step1 value is the target.</p> <p>TIME STOP if timed out or MAN STOP if user stopped</p> <p>Summary of the test</p>
---	--

English language version shown in the example.

After the test has finished the user can print either the complete test again or only a summary by pressing the **[Print/←]** key before returning to normal weighing.

The complete report is a copy of the data as shown above. If the summary report is selected then the following is printed. Similar to the above except without the interval readings.

<pre> MOISTURE TEST FILE NAME: RES00032 DATE:      13/12/2008 TIME:      09:38:07 SER NO:    XXXXXXXXXXXX  USER NO:   XXXXXXXXXXXX  TEST NO:   - - - - -  Preset:    PST 05            Bread-4  Result:    % Moisture Heating:   Step Temp:      Step 1 120 C            Time 1 04:00            Step 2 110 C            Time 2 90:00  Rapid      Manual Interval:  30 Sec Stop:      Time/Stable            60 Min            0.002 g            30 Sec Start:     Manual  INIT MASS: 12.341 g  ***** AUTO STOP *****  LAST TEMP: 111C TEST TIME: 05:30 Min FINAL MASS: 11.820 g MASS LOSS: 0.521 g RESULT:    4.27 %M </pre>	<p>Heading File name used by analyser to store result</p> <p>From Analyser Add serial number</p> <p>Add user number</p> <p>Leave a blank line for users to fill in a number if they wish, not from Analyser memory Settings of the test conditions</p> <p>Measured initial mass.</p> <p>TIME STOP if timed out or MAN STOP if user stopped</p> <p>Summary of results</p> <p>Extra LF's at end of the report</p>
--	---

## 11.5 ANALYSER CONFIGURATION THROUGH THE SERIAL INTERFACE

The analyser can use the serial interface to set parameters for weighing test and for analyser configuration. The parameters are set by sending a line of data that has the description and the setting desired.

It is possible to create a text file that contains all the data necessary to set the test conditions for a particular test (or analyser configuration) and send this to the analyser. The commands are not case sensitive, i.e. parity=0 and PARITY=0 are both accepted.

### 11.5.1 TEST PARAMETERS

The parameters that control a test are listed below. To change a test parameter it is necessary to send a command for the parameter to modify along with the value to change.

For example to change the test parameters to use a single heat and set the temperature to 115°C send 2 commands.

```
Heat=0<cr><lf>
Single Temp=115<cr><lf>
```

All commands are in English regardless of the language selected for the analyser operation. The commands can be sent in both upper case letters and lower case letter, i.e. “!KT” or “!kt” are both acceptable.

```
Moisture Result=1;          #0=%M, 1=%S, 2=%Atro_M, 3=%Atro_S    default=0;
Heat=1;                    #0=Single, 1=Ramp, 2=Step                    default=0;
Single Temp=100;          #050C to 160C,                                default=100;
Step temp1=050;          #050C to 160C,                                default=100;
Stem Time1=30:00;        #Time 03:00 to 99:00                          default=30:00;
Step temp2=080;          #050C to 160C, 000C is off                    default=100;
Stem Time2=30:00;        #Time 03:00 to 99:00                          default=30:00;
Step temp3=050;          #050C to 160C, 000C is off                    default=100;
Stem Time3=30:00;        #Time 03:00 to 99:00                          default=30:00;
Ramp Temp=100;           #050C to 160C,                                default=100;
Ramp Time=30:00;         #Time 03:00 to 99:00                          default=30:00;
Rapid=0;                  #Rapid heat 0=Off, 1=On, 2=Manual             default=0;
Interval Time=20;        #05 sec to 99 sec                             default=15;
Stop mode=0;              #0=Time, 1=Stable, 2=Stab+Time                default=3;
Stop time=10;            #time = 03 to 99 min                          default=20;
Stable Range=0.010;      #grams default=0.010          53, 0.10 for 202;
Stable Time=10;          #seconds, 01-99                             default=02;
Start mode=0;            #0=Manual 1=Auto                             default=0;
savepos=01;              #memory location 01 to 49;
```

Care must be used as some commands depend upon others to be effective, For example sending a command for setting the heat to use a ramp but not sending a temperature or time to use may cause incorrect operation if they are not set to reasonable values.

The current settings can be printed or observed as described in sections 6.1.2 and 6.3.

### 11.5.2 MOISTURE ANALYSER SETUP PARAMETERS

The parameters related to analyser configuration are listed below. To change a test parameter it is necessary to send a command for the parameter to modify along with the value to change.

All commands are in English regardless of the language selected for the analyser operation. The commands can be sent in both upper case letters and lower case letter, i.e. "PARITY=0" or "parity=0" are both acceptable.

```
Baud Rate=2;           #0=2400,1=4800,2=9600,3=19200,4=28400, default=1;
Parity=0;              #0=none,1=Even,2=Odd ,default= 0;
Print Test=1;         #0=off,1=on, default=1;
Output Format=0;      #0=complete 1=summary ,default=0;
Continuous=1;        #0=off,1=on, default=0;
Interval=20;         #00-99 ,default=1;
Date Format=1;        #0=Europe,1=USA,2=ASIA default=0;
User ID=1234567890;  #length=10 alpha-numeric characters;
Key Beeper=1;        #0=off;1=on default=1;
Test Beeper=1;       #0=off;1=on default=1;
Backlight=2;         #0=off,1=on,2=auto default=2;
Filter=1;            #0=slow,1=normal,2=fast, default=1;
Stability=2;         #0=1d,1=2d,2=5d,3=10d default=2;
Auto Zero=3;         #0=off,1=1d,2=2d,3=5d default=5;
Operator=000000;     #operator password ,must be 6 bytes;
Supervisor=000000;  #Supervisor password ,must be 6 bytes;
Calibration Report=1; #0=off,1=on default=1;
Language=0;          #0=English, 1=German, 2=French, 3=Spanish
```

These commands are the same as will be set using the SETUP menu as described in section 10. For example to change the beeper so it does not sound at the end of a drying test, send the command

test Beeper=0<cr><lf>

When the analyser receives a valid command, it will return the message E0. But if an invalid input command is received, then the command is returned as follows-

Message returned	Remarks
E1	The analyser can not recognise this command.
E2	String length is not right. i.e. key beeper=20<cr><if>
E3	String exceeds range. i.e. key beeper=2<cr><if>
E4	The string contains non-numeric character. i.e. key beeper=a<cr><if>
E5	You do not have the authority to use this commands.

### 11.5.3 ANALYSER RECALL PARAMETERS

When parameters and results are saved in the memory. To recall all the saved records, it is necessary to send a command as follows-

Recall result<cr><lf>	Get all the test result
Recall config<cr><lf>	Get all the set up parameters
Recall preset<cr><lf>	Get all the preset parameters

The unit will return the list of parameters or data stored in the analyser menu. The test results, test presets and analyser configuration are all stored separately.

To recall an individual parameter send the parameter name followed by a question mark. For example sending heat=?<cr><lf> , the analyser will send back a message HEAT=1 for ramp heating applications.

### 11.5.4 REQUEST VALUES OF PARAMETERS

If the command for a parameter is sent with a “?” the unit will send the value currently stored in the analyser. For example send:

Single temp=?<cr><lf> the unit will send back

Single Temp=115<cr><lf>

## **11.6 CONTINUOUS OUTPUT**

The unit can use the interface to send the weight only to the output. This setting is configured in the Serial Communications parameters, see section 10.1.1. When the output is set for Continuous the test reports are not printed during a drying test and test results are not stored.

The weight will be printed using the time interval set with the Continuous parameters, from 01 to 99 seconds.

The format is xxxxxxxx<cr><lf> where the first 9 characters are the weight with leading zeros replaced by spaces. First character is a “-“ for negative weight.

The output will appear as:

\_\_\_ 12.345

\_\_\_ 12.345

etc.

## 12.0 SPECIFICATIONS & FEATURES

	<b>53</b>	<b>163</b>	<b>202</b>
Capacity	50g	160g	200g
Readability(S.D)+/-	0.001g / 0.01%		0.01g / 0.05%
Repeatability weighing(S.D)+/-	0.002g		0.02g
Stabilisation Time Weighing	Typically 3 sec		
Suggested Minimum Sample size	2g		5g
Repeatability moisture determination (Sample is sodium tartrate dihydrate)	3g sample 0.15% 10g sample 0.05%		5g sample 0.4% 10g sample 0.2%
Pan size	90mm		
Test method	%moisture %solids %moisture / dry weight %solid / dry weight		
End Criteria	Manual stop Auto Stop with time Auto stop change < set amount/time		
Maximum test time	99 minutes (1.5+ hours)		
Heaters	Custom Halogen Lamp 400W 230VAC or 115VAC 50/60Hz.		

Temperature chamber	50 -160C set in 1C steps		
Temperature profile	Standard (one step) Step, up to 3 temperatures Ramp, vs. time Rapid option for Single and Step methods, 130% target for 3 minutes at start of test.		
I/O	RS-232 Bi-directional Serial port USB Serial Output USB HUB Serial interface		
Stored Test Setting	1 Default setting, 49 User Settings Stored by number and alpha/numeric name		
Stored Test results	Up to 99 test results stored by name		
Data Output	Ability to send data out via RS232 or USB Serial port. Ability to store test results and test settings to USB memory device using USB Host interface.		
Beeper	To sound when keys are pressed or to announce end of a test, independently enable/disable		
Language	English, German, French or Spanish		
RTC	Real Time Clock Date formats, YMD, DMY, MDY Time 24 hour clock		
Calibration	Manual calibration using external mass		
	20 or 50g	50 or 150g	100 or 200g
Power	Factory set, 115VAC or 230VAC, 50-60Hz., 400 watt.		
Fuse	5A, time lag, High Breaking capacity, 5 x20mm		
Environment	0°C to 40°C, up to 90% RH. non-condensing		



## 13.0 MENU STRUCTURE

### WEIGHING

#### OPERATOR

[0/I] key	Standby/operate
[→0/T← / Esc]	Zero/Tare function
[Print/←] key	Print results
[Start] key	Begin drying a sample
[Dsp/↑] key	Display alternate data on LCD
[PST/→] key	Store/Recall preset Test
	PST Store          PST XX
	If PST XX is available then
	Store Current test
	If PST is used then display
	OVERWRITE?
	{Setup/Enter} to Store current test
	or ESC then return to weighing
	PST Recal I          PST XX          Get stored data
	Delete                  PST XX
	Delete PST number shown

[Test/↓] key Set Test Conditions

	Result	% moisture
		% Solid
		% ATRO Moisture
		% ATRO Solid
Heat	Single	Set Temperature
	Step	Set Temperature 1
		Set Time 1
		Set Temperature 2
	Set Time 2	
	Set Temperature 3	
	Set Time 3	
Ramp	Set Temperature	
	Set Time	
Rapid heat	On	
	Off	
	Manual	
Interval	Set Interval time	
Stop	Time	Set maximum time
	Stable	Set Stable value
		Set Stable Time
	Time/Stable	Set maximum time
		Set Stable value
	Set Stable Time	

Start	Manual
	Auto
Print Test	On
	Off
Format	Complete
	Summary

<b>[Setup/Enter]</b> key	Sup. Passcode enabled?	No	Display Supervisor menus
		Yes	Enter Supervisor Passcode
			Display Supervisor menus

## SUPERVISOR MENU

<b>SERIAL</b>	Setup Interface Parameters	<b>Baud Rate</b>	2400/4800/9600/19200/38400	
		<b>Parity</b>	Off / Even/ Odd	
		<b>Continuous</b>	On/Off	
		<b>Interval</b>	01 to 99 seconds	
<b>SETUP</b>	Setup analyser parameters	<b>Time</b>	Hour	Set 00 to 23
			Minute	Set 00 to 59
			Second	set 00 to 59
		<b>Date Format</b>	Europe (dd/mm/yy)	
			USA (mm/dd/yy)	
			ASIA (yy/mm/dd)	
		<b>Date</b>	Year	Set 00 to 99
			Month	set 00 to 12
			Day	set date (00 to 31)
			Weekday	Set day of the week (Sun-Sat)
			<b>User ID</b>	Set ID number , 10 alpha-numeric characters
		<b>Key Beeper</b>	OFF / ON	
		<b>Test Beeper</b>	OFF / ON	
		<b>Backlight</b>	OFF / ON / Auto	
<b>Filter</b>	Set Filter slow, normal, fast			
<b>Language</b>	Set to English, German, French or Spanish			
<b>Preview</b>	Set On or Off			

## **CALIBRATION**

**CAL Mass**

Start weight calibration

**CAL Temp**

Start Chamber Temperature Calibration

**Calibration Report**

OFF / ON

**PASSCODES**    Set Passcodes

**Operator**

Enter old

Enter new

**Supervisor**

Enter old

Enter new



## **14.0 SAMPLE PREPARATION**

Sample preparation is the single most important item for accurate results. The sample must be prepared so the whole of the sample is heated uniformly and the moisture is near the surface of the material.

For powders no further preparation is necessary. For most other materials the sample should be ground, chopped, grated or otherwise made as fine as possible. Liquids or paste may need to be spread onto or sandwiched between glass fibre pads to distribute them evenly and thinly. Some materials that may splatter as they are heated (oils, butter) may need to be spread on the glass fibre pads or mixed with dry sand. If a substance is likely to form a surface skin when heated from above then it should be covered by a pad.

Trial and error is often the only method to find the best method for the material.

When the sample is placed on the weighing pan it should be spread as thin and evenly as possible, do not compact the material. Ensure enough material is used to assure good repeatability of the results. Typically samples of 3 to 8 grams are used. Larger sample sizes will usually produce more accurate and consistent results.

Some materials will require special preparation. For example when testing cheese, if the cheese is very soft it may be necessary to use dry sand as a buffer material so it does not splatter or form a skin. To do this it would be necessary to prepare the sand by drying it in an oven until you were certain no moisture remains. Put the sand on the sample pan and tare the analyser. Mix the sand with the cheese so you have smooth mixture, spread this mixture on the sample pan and then do the test.

An alternative to this preparation is to spread the cheese on dry spun glass gauze to assist in spreading the heat and preventing splatter or skins forming. Remember to tare the analyser with the gauze in the weighing pan for accurate results.

Other materials will hold water within them in a way that is not suitable for this type of test. For example sugar will bind the water to the sugar molecules so strongly that heat will not remove the water before the sugar is burned.

Some plastics also are not suitable for this type of method due to the very low percent moisture and the heat required to extract this moisture.

## KNOW THE MATERIAL

In addition it is important to know enough about the materials so that you do not endanger or inconvenience others. For example some solvents have very low flash points that are not suitable for drying with heat sources that can reach 100°C. Other materials will cause odour or fumes that will be dangerous or objectionable, consider drying fertilizer slurry without using a vent to extract the odour.

## **15.0 GUIDANCE NOTES**

The following guide notes are offered as examples of temperature, display update time and expected results when drying various substances. The preparation, distribution and amount of product can all significantly effect the results. It is important to find suitable procedures to process the material, usually by trial and error.

In general it is recommended that a temperature of 100°C, a time interval of 10 seconds, and a sample sized 3-8g be selected for initial test. After a number of tests with these conditions this will provide a basis for comparing other times, temperatures or sample preparations.

The items in the following table are taken from actual test results. The user of the Moisture analyser will need to determine the best procedures for their samples.



## MOISTURE ANALYSER EXAMPLES

MATERIAL	SAMPLE MASS (g)	DRYING TEMPERATURE.(° C)	STROBE TIME(s)	AVERAGE WATER CONTENT	STANDARD DEVIATION	DRYING TIME(min)
BUTTER	2-5	138	15	16.3	0.1	4.5
CEMENT	8-12	138	15	0.8	0.1	4-5
CHARCOAL	8-10	120	10	3.8	0.1	8-10
CHOCOLATE POWDER	2-4	100	5	1.9	0.1	4
COCOA POWDER	2-3	106	20	0.1	0.1	2
COFFEE CREAMER POWDER	2-3	130	15	3 to 8%	0.1	6-8
CORNFLAKES	2-4	120	15	9.7	0	5-7
DRY APPLE PULP	5-8	100	10	76.5	0.1	10-15
DUST	5-10	104	10	7.3	0.3	8-15
FLOUR	8-10	130	10	12.5	0.1	4-5
GROUND COFFEE	2-3	106	5	2.8	0.1	4
MARGARINE	3-4	138	20	16	0.1	10
MAYONNAISE	1-2	138	20	56.5	0.4	10
MILK	2-3	120	15	88	0.2	6-8
MILK CHOCOLATE	2-5	106	15	1.3	0.1	3.5
MILK POWDER	2-4	90	15	5	0.2	6
MUSTARD	2-3	130	20	76.4	0.7	10
PAPER	2-4	106	20	6.4	0.1	10
POLYAMIDE	2-5	138	20	2	0.2	75
POTATO FLAKES	3-4	106	15	6.9	0.1	7.5
POWDERED SOUP	2-3	80	15	3	0.2	4.5-7
RED WINE	3-5	100	15	97.4	0.1	15-20
SLIME	11-12	130	15	80	-	90
SUGAR	4-5	138	15	11.9	0.1	10
SUNFLOWER OIL	10-14	138	20	0.1	0	2
WET APPLE	5-8	100	10	7.5	0	5-10
WHITE GLUE	2-5	136	15	54.3	0.1	6-8
YOGHURT	2-3	110	15	86.5	0	4.5-6.5

This list will be extended as information becomes available. If you wish to supply any information that may help others, please contact Klipspringer Ltd or your dealer.

## **16.0 WARRANTY STATEMENT**

Klipspringer offers Limited Warranty (Parts and Labor) for the components failed due to defects in materials or workmanship. Warranty starts from the date of delivery.

During the warranty period, should any repairs be necessary, the customer must inform the supplier or Klipspringer Ltd. The company or its authorised Technician reserves the right to repair or replace any components at its own discretion. Any shipping costs involved in sending the faulty units to a service centre is the customer's responsibility.

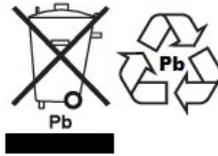
The warranty will cease to operate if the equipment is not returned in the original packaging and with correct documentation for a claim to be processed. All claims are at the sole discretion of Klipspringer Ltd.

This warranty does not cover equipment where defects or poor performance is due to misuse, accidental damage, exposure to radioactive or corrosive materials, negligence, faulty installation, unauthorised modifications or attempted repair or failure to observe the requirements and recommendations as given in this User Manual.

Repairs carried out under the warranty does not extend the warranty period. Components removed during the warranty repairs become the company property.

The statutory right of the purchaser is not affected by this warranty. The terms of this warranty is governed by the UK law. For complete details on Warranty Information, see the terms and conditions of sale available on our web-site

## WEEE 2012/19/EU



This device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements. Disposal of batteries (if fitted) must conform to local laws and restrictions.

Cet appareil ne peut être éliminé avec les déchets ménagers. L'élimination de la batterie doit être effectuée conformément aux lois et restrictions locales.

Dieses Gerät nicht mit dem Hausmüll entsorgt.

Dispositivo no puede ser desechado junto con los residuos domésticos

Dispositivo non può essere smaltito nei rifiuti domestici.

### FCC / IC CLASS A DIGITAL DEVICE EMC VERIFICATION STATEMENT

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules and Canadian ICES-003/NMB-003 regulation. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### CALIFORNIA PROPOSITION 65 - MANDATORY STATEMENT

WARNING: This product includes a sealed lead-acid battery which contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.



Klipspringer Ltd products have been tested with, and are always supplied with mains power adaptors which meet all legal requirements for the intended country or region of operation, including electrical safety, interference and energy efficiency. As we often update adaptor products to meet changing legislation it is not possible to refer to the exact model in this manual. Please contact us if you need specifications or safety information for your particular item. Do not attempt to connect or use an adaptor not supplied by us.

**Klipspringer Ltd** is an ISO 9001:2008 certified global company with more than 40 years' experience in the production and sale of electronic weighing equipment.

Klipspringer Ltd products are predominantly designed for the Laboratory, Educational, Health and Fitness, Retail and Industrial Segments. The product range can be described as follows:

- Analytical and Precision Laboratory Balances
- Compact and Portable Balances
- High Capacity Balances
- Moisture analysers / balances
- Mechanical Scales
- Counting Scales
- Digital Weighing/Check-weighing Scales
- High performance Platform Scales
- Crane scales
- Mechanical and Digital Electronic Health and Fitness Scales
- Retail Scales for Price computing

For a complete listing of all Klipspringer Ltd products visit our website at [www.klipspringer.com](http://www.klipspringer.com)

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Klipspringer Limited reserves the right to make changes to the technology, features, specifications and design of the equipment without notice.

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