Moisture Analyzer
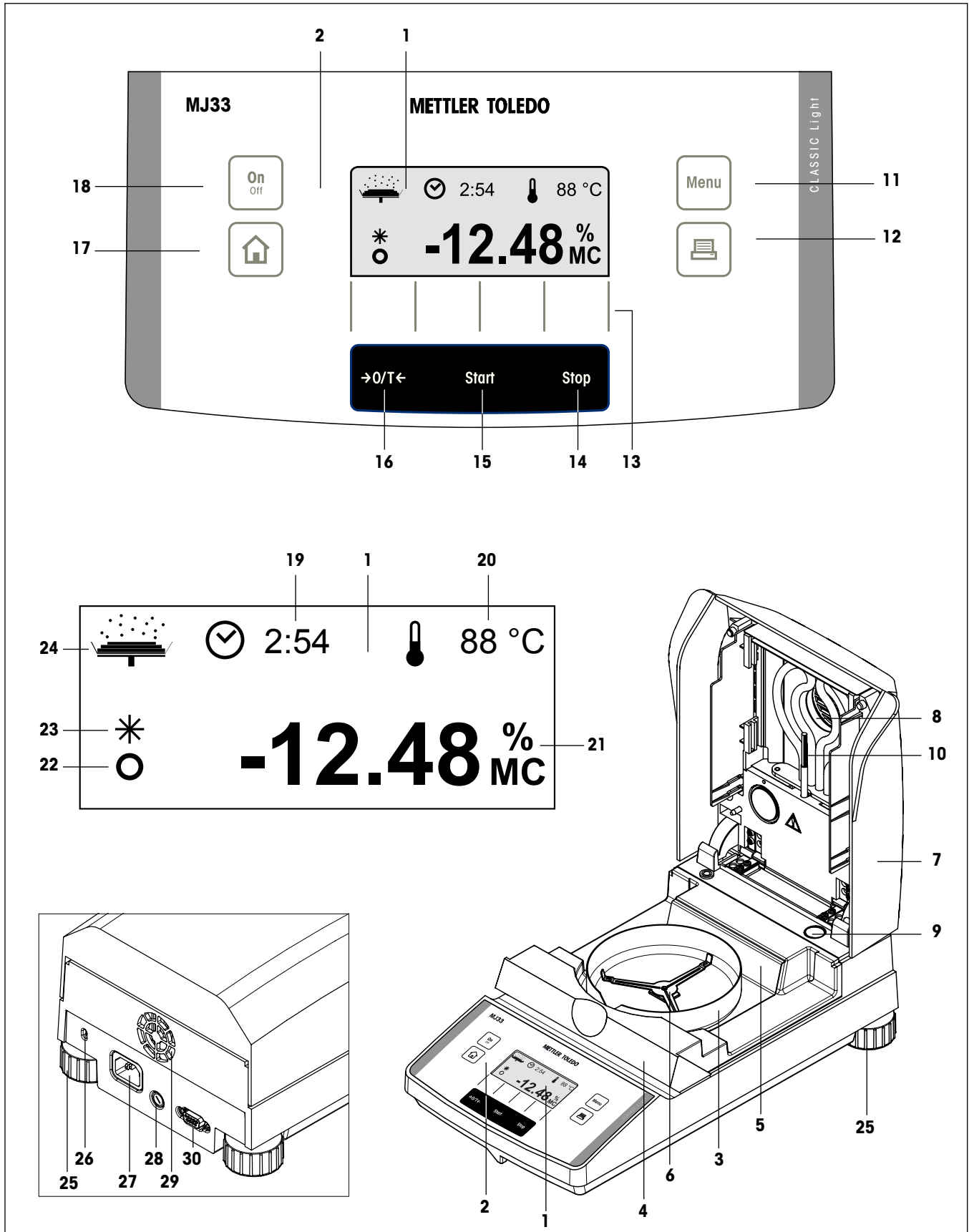## MJ33

MJ33

METTLER TOLEDO

-12.48 %MC

Menu

On/Off

Start   Stop

METTLER TOLEDO

Overview of your MJ33 Moisture Analyzer

Display, controls and connections of your MJ33

No.	Designation	Info s. Section
1	Display (example)	all
2	Keypad	all
3	Draft shield	2.3
4	Sample chamber	2.3/6.1
5	Heat shield	2.3
6	Sample pan support	2.3/2.4
7	Heating module	1.2/5.3
8	Inspection window and vent	5.3
9	Level indicator (level)	2.3
10	Temperature sensor	6.1
11	Key «Menu»	4/5
12	Key «🖶» (Print)	4.4/5.1
13	Softkeys (context-dependent keys)	4.2
14	Key «Stop» (stop drying)	4.5
15	Key «Start» (start of drying)	5.5.8
16	Key «–>0/T<–» (Zero/Tare)	2.4
17	Key «⌂» (for exiting the menu or stopping drying)	4.2/4.5
18	Key «On/Off»	2.4/4.5
19	Display of drying time	2.4/4.4.8
20	Display of drying temperature	2.4/4.4.4
21	Display of drying result	2.4/4.5
22	Stability detector	7.1/7.2
23	Symbol for calculated result	2.4
24	Status display ("User Guide")	2.4
25	Leveling screw	2.3
26	Antitheft device socket	2.3
27	Power supply receptacle	2.3
28	Power line fuse	6.2
29	Fan	1.3
30	RS232C interface connection	6.3/8.2

Contents

1   Getting to know your Moisture Analyzer

Please read through this Section carefully, it contains important information for safe and economical operation of your Moisture Analyzer.

1.1   Introduction

Thank you for deciding to purchase a Moisture Analyzer from METTLER TOLEDO – you have made a wise choice. Your Moisture Analyzer is fast and reliable. It offers a high level of operating convenience and useful functions to facilitate determination of the moisture content of your samples.

Behind your instrument stands METTLER TOLEDO, a leading manufacturer of not only balances and scales for the lab and production, but also analytical measuring instruments. A customer service network covering the entire globe with well trained personnel is at your service at all times, whether you are choosing accessories or require guidance for a specific application to ensure optimum utilization of your instrument.

To ensure you make full use of the possibilities offered by your Moisture Analyzer, we advise you to read through these operating instructions very carefully.

1.2   What is the MJ33 Moisture Analyzer used for

Your MJ33 Moisture Analyzer is used for determining the moisture content of almost any substance. The instrument works on the thermogravimetric principle. At the start of the measurement the Moisture Analyzer determines the weight of the sample, the sample is then heated by the built-in heating module and the moisture vaporizes. During the drying process the instrument continually measures the weight of the sample and displays the reduction in moisture. Once drying has been completed, the moisture or solids content of your sample is displayed as the final result.

Of decisive importance in practice is the rate of heating and even heating of the surface of the sample. The heating module of your instrument needs a only a short time to reach its maximum heating power. It also allows use of high temperatures, an additional factor in shortening the drying time. Uniform heating of the sample material ensures good repeatability of the drying results and makes it possible to use a smaller amount of sample.

All parameters of a measurement (drying temperature, drying time, etc.) can be preselected. But your Moisture Analyzer offers many other possibilities. To avoid exceeding the scope of this introduction, only a few of these are listed here:

– Automatic and time-controlled switch-off criteria are available

– You can choose between various types of result display

– Your settings and the measurement results can be recorded

– Your settings are protected even if there is a power failure

– The RS232C data interface fitted as standard allows your moisture analyzer to communicate with an external printer or with a computer.

This wealth of functions notwithstanding, your Moisture Analyzer is very simple to operate. The status display (User Guide) guides you step by step through the measurement cycle and you always know which particular stage in a measurement is currently being executed by the instrument and the next operating step. To exclude faulty handling in routine work, the keypad can be locked to prevent access to all but the elementary functions.

The Moisture Analyzer conforms with all common standards and directives. It supports stipulations, work techniques and result records as demanded by all international quality assurance systems, e.g. **GLP** (**G**ood **L**aboratory **P**ractice), **GMP** (**G**ood **M**anufacturing **P**ractice). The instrument has a CE declaration of conformity and METTLER TOLEDO as the manufacturer has been awarded ISO 9001 and ISO 14001 certification. This provides you with the assurance that your capital investment is protected in the long term by a high product quality and a comprehensive service package (repairs, maintenance, servicing, adjustment service).

1.3   Safety has priority

Your Moisture Analyzer employs state of the art technology and meets the latest demands regarding instrument safety. This notwithstanding, improper operation can endanger personnel and cause damage to tangibles. For safe and dependable operation, please comply with the following instructions:

–   The Moisture Analyzer is used for determining the moisture in samples. Please use the instrument exclusively for this purpose. Any other type of use can endanger personnel and damage the instrument or other tangibles.

–   The Moisture Analyzer must not be operated in a hazardous environment and only under the ambient conditions specified in these instructions.

–   The Moisture Analyzer may be operated only by trained personnel who are familiar with the properties of the samples used and with the handling of the instrument.

–   Your Moisture Analyzer is supplied with a 3-pin power cable with an equipment grounding conductor. Only extension cables which meet the relevant standards and also have an equipment grounding conductor may be used. Intentional disconnection of the equipment grounding conductor is prohibited.
Note: There are two versions of the instrument, 110 V and 230 V.

The Moisture Analyzer works with heat!
–   Ensure sufficient free space around the instrument to avoid heat accumulation and overheating (approx. 1 m free space above the instrument).

–   The vent over the sample must never be covered, plugged, taped over or tampered with in any other way. This also applies to the fan on the back of the instrument.

–   Do not place any combustible materials on, under or next to the instrument when it is connected to the power supply, since the area around the heating module becomes hot.

–   Exercise caution when removing the sample. The sample itself, the sample chamber, the draft shield, and sample container (if used) may still be very hot.

–   Be very careful if you open the heating module during operation, because the circular heating element can be very hot! For this reason, only ever touch the handles provided on the heating module.

–   No modifications must be made within the heating module. It is particularly dangerous to bend any components or remove them, or to make any other changes.

Certain samples require special care!

With certain types of samples, there is a possibility of danger to personnel or damage to tangibles through:

Fire or explosion:

– Flammable or explosive substances

– Substances containing solvents

– Substances which evolve flammable or explosive gases or vapors when heated.

   With such samples, work at a drying temperature that is low enough to prevent the formation of flames or an explosion and wear protective goggles. Should there be any uncertainty regarding the flammability of a sample, always work with a small amounts of sample (max. 1 gram). In such cases, **never leave** the instrument **unattended**! In cases of doubt, perform a careful risk analysis.

Poisoning, burning:

– Substances which contain toxic or caustic components. Such substances may be dried only in a fume cupboard.

Corrosion:

– Substances which evolve corrosive vapors when heated (e.g. acids). In the case of such substances, we advise you to work with small amounts of sample as the vapor can condense on cooler housing parts and cause corrosion.

Please note that the user always takes responsibility and assumes liability for damage caused by use of the types of samples mentioned above!

– Never make any modifications or constructional alterations to the instrument and use only original spare parts and optional equipment from METTLER TOLEDO.

– Your Moisture Analyzer is a rugged precision instrument – but you should still treat it carefully; it will then thank you with many years of trouble-free operation.

– Please comply with all notes and instructions in these operating instructions. Keep the instructions in a safe place where they are immediately to hand if any points are unclear. If you lose these instructions, please contact your METTLER TOLEDO dealer for an immediate replacement.

Moisture determination applications must be optimized and validated by the user according to local regulations. Application-specific data provided by METTLER TOLEDO is intended for guidance only.

1.4   Important information about these instructions

These instructions guide you step by step through the operation of your Moisture Analyzer. The first two Sections help you put the instrument into operation quickly, safely and properly and perform your first measurement within a short space of time. In Sections 3 through 5 you become intimately acquainted with the wide range of functions of your Moisture Analyzer. During this learning phase, you will find the table of contents and the detailed index in Section 9 a valuable orientation aid. Sections 6 through 8 contain additional information on the maintenance of your instrument, troubleshooting and the available options. As soon as you are familiar with your Moisture Analyzer, you will find the illustrations at the beginning of these instructions and the associated references (in the key) useful for quick access.

The following identifications and symbols are used in these instructions:

– Key designations are shown enclosed by twin angle brackets «», e.g. «On/Off» or «🖨».

– This symbol indicates safety and hazard instructions. If these are not complied with, injury to the user, damage to your instrument or other tangibles and malfunctions can result.
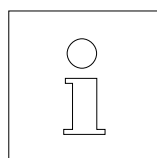
– This symbol indicates additional information and directions which facilitate your handling of the instrument and contribute to proper and economical use.

These instructions are also available in foreign languages. Should you require a set of instructions in a different language, please contact your METTLER TOLEDO dealer. You will find the address of your nearest dealer in the attached Declaration of Conformity 11780294.

1.5   Disposal
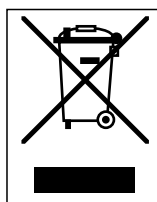
In conformance with the European Directive 2002/96/CE on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.
Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.
If you have any questions, please contact the responsible authority or the distributor from which you purchased this device.
Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.
Thank you for your contribution to environmental protection.

2 Your first measurement in next to no time

In the Section you will learn how to put your new Moisture Analyzer into operation and obtain measurement results within a very short space of time.

2.1 Unpacking and checking the standard equipment

Open the package and remove the instrument and the accessories. Check the completeness of the delivery. The following accessories are part of the standard equipment of your new Moisture Analyzer:

– 80 aluminum sample pans

– 1 sample pan support

– 1 sample pan handler

– 1 specimen sample (circular, absorbent glass fiber filter)

– 1 draft shield

– 1 power cable

– 1 Operating instructions

– 1 EC declaration of conformity (in separate brochure 11780294)

Remove the wrapping from the instrument.

Check the instrument for transport damage. Immediately inform your METTLER TOLEDO dealer if you have any complaints or parts are missing.
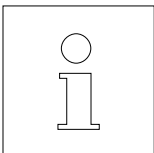
Store all parts of the packaging. This packaging guarantees the best possible protection for the transport of your instrument.

2.2   Selecting the location

Your Moisture Analyzer is a precision instrument. An optimum location guarantees accuracy and dependability:
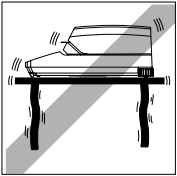
– Firm, horizontal location as free from vibrations as possible

– Avoid direct sunlight

– No excessive temperature fluctuations

– No powerful drafts

– Surroundings as free from dust as possible

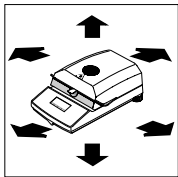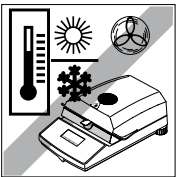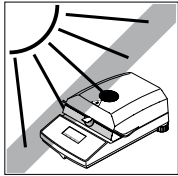– Enough space around the instrument to prevent build-up of heat

– Sufficient distance from heat-sensitive materials in the vicinity of the instrument.

2.3   Setting up, leveling and connecting to power supply

Exact horizontal positioning and stable installation are prerequisites for repeatable results. To compensate for small irregularities or inclinations (±2%) at the location, the instrument can be leveled
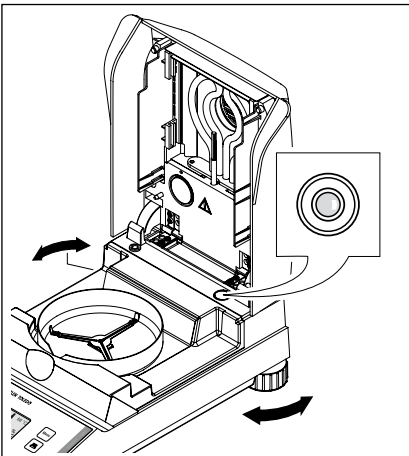
For exact horizontal positioning, the Moisture Analyzer has a level indicator (level) and 2 leveling screws. When the air bubble in the level indicator is exactly in the center, the instrument is standing perfectly horizontally. To level it, proceed as follows:

Position your Moisture Analyzer at the selected location.

Turn the two leveling screws until the air bubble is in the center of the level indicator.

Note: The instrument should be releveled each time its location is changed.
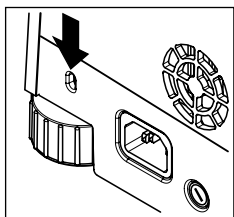
For protection against theft, your Moisture Analyzer is fitted with a socket for an antitheft device. Together with a lockable steel cable like those used to protect portable computers against theft, the socket can be used to secure the instrument. You can obtain a suitable antitheft cable from your METTLER TOLEDO dealer.
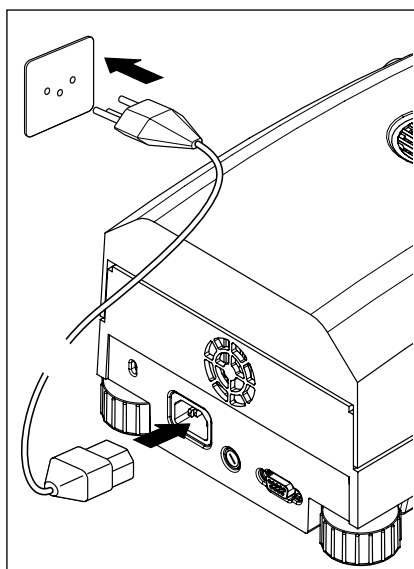
Connect the instrument to the power supply.

Warning
If the power cable supplied is not long enough, use only a **3-pin extension cable with equipment grounding conductor!**

Allow your instrument to warm up for 60 minutes. The instrument adapts itself to the ambient conditions during this time.
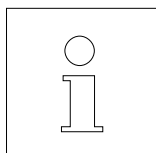
In the factory the Moisture Analyzer is matched to the particular line voltage of the country of destination (110 V AC or 230 V AC). If you are not sure whether the instrument is suitable for your local line voltage, check the voltage stated on the sticker to the right of the heating element before you connect the Moisture Analyzer to the power supply!

Connection to a line voltage that is too high can lead to blowing of the fuses, whereas a supply voltage that is too low will prolong the drying process.

Please note that some parts of your instrument are always live when the instrument is connected to the power supply.
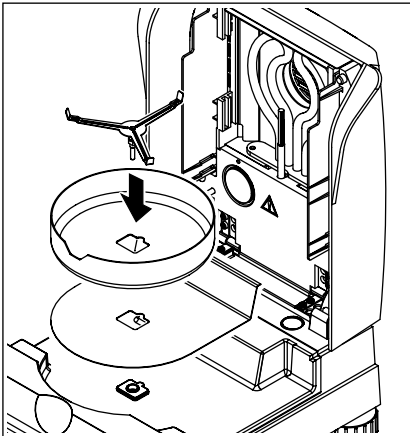
First lay the heat shield in the sample chamber. Then place the draft shield (can only be mounted in one position) and after that the sample pan support in position. Turn the sample pan support until it engages. In the engaged position the rear arm of the sample pan support lies exactly along the length of the instrument.

2.4   **Your first measurement**

After you have successfully put your new Moisture Analyzer into operation for the first time, you can immediately perform your first measurement. In doing so, you will become familiar with the instrument and the status display and at the same time perform a function check.

Please use the specimen sample supplied for your first measurement. This sample is an absorbent glass fiber filter.

For your first measurement the instrument is set to the factory settings and operates in the automatic mode, which guides you through the entire measurement procedure without you having to press a single key.

Press the «On/Off» key to switch the instrument on.
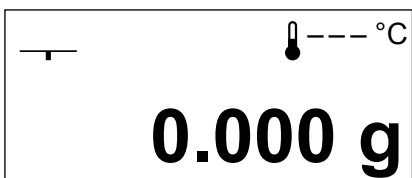
After it has been switched on, the instrument performs a self-test. Wait until the display shown opposite appears.
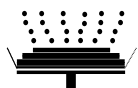
Your Moisture Analyzer has a graphical status display (User Guide) which you will become acquainted with in this Section. The status display informs you continuously about the current status of the instrument and prompts you to execute the next operating step (shown flashing).

Initial status with heating module closed.
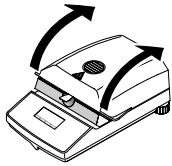
Open the heating module.

Status: Ready for taring
The status display flashes and prompts you to load the empty sample pan.
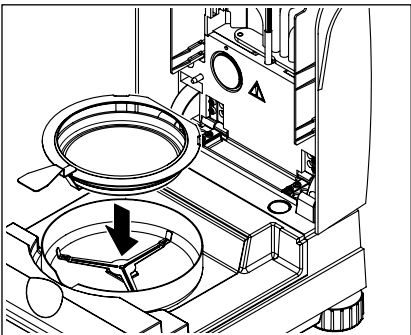
Place the empty sample pan in the sample pan handler (this is possible without tilting the sample pan if you insert this in the pan handler **from the side** directly below the round flange). Place the sample pan handler in the draft shield. Ensure that the tongue of the pan handler fits exactly in the slot of the draft shield. The sample pan must lie flat in the pan holder.

Note: We advise you to work with the sample pan handler at all times. The pan handler is ergonomic, safe and provides protection against possible burns due to the hot sample pan.
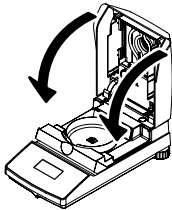
Close the heating module. This automatically sets the balance installed in the Moisture Analyzer to zero.

Status: Ready for weighing
After taring, the status display flashes and prompts you to place the sample in the sample pan.

Note on the stability detector: The circle symbol to the left of the weight display represents the stability detector. It is only visible while the weighing result has yet to stabilize. As soon as it disappears the weighing result is stable (see also Sections 7.1 and 7.2).
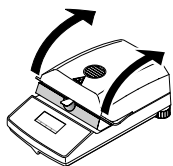
Open the heating module.
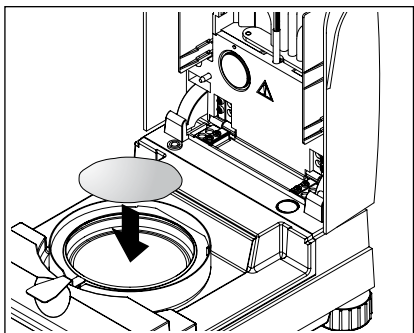
Place the provided specimen sample in the sample pan.
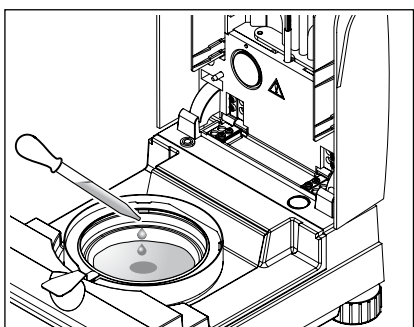
Wet the specimen sample with a few drops of water, so that the displayed weight is at least 0.5 grams (required minimum weight of sample).
Note: The drying process cannot start until the minimum sample weight has been reached.
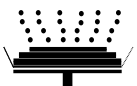
Status: Ready for start
The status display shows that the minimum sample weight has been reached and the instrument is ready for the drying process to start.
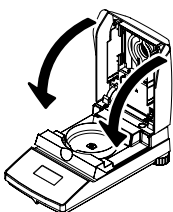
Close the heating module and the instrument then automatically begins the drying and measuring process.

Status: Drying and measurement

You can follow the drying and measurement process on the display:

– The status display uses rising bubbles to symbolize the drying process.

– The current temperature in the heating module is displayed (above 50 °C) as well as the elapsed drying time and the current drying value.

– If there is an external printer connected to your instrument, the measurement results will be printed out continually (at intervals of 30 seconds).

	⊘ 2:54	🌡 88 °C
✳	**-12.48**%MC	
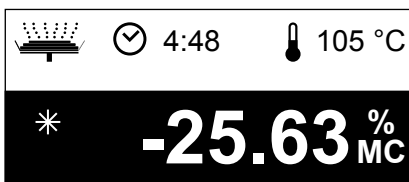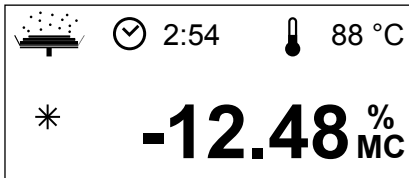
When drying is complete, an audio signal sounds and the bottom section of the display is shown in inverse (white font on dark background).

You can now read off the **moisture content** of your sample.

The star symbol to the left of the measurement result indicates that the result is a calculated result.
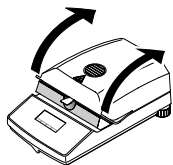
	⊘ 4:48	🌡 105 °C
✳	**-25.63**%MC	

Open the heating module.
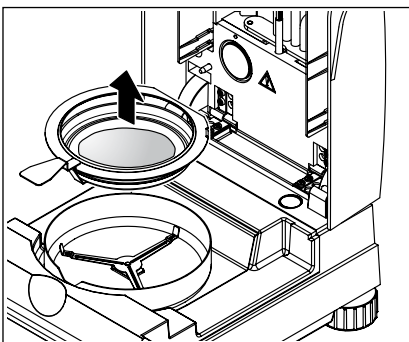
Carefully remove the sample pan handler from the sample chamber.

Warning: As the pan and sample may still be hot, you should let these cool down before removing the pan from the handler!

The Moisture Analyzer warns you that it is still hot: take note of the temperature display, which is continuously updated after the heating is switched off at the end of the measurement process.

The status display with the symbol opposite also shows that the instrument is still hot. This "Hot Mode" display disappears when the temperature falls below 50 °C or when you start the next cycle (in this case the status display indicates the next step).
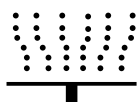
To remove the sample pan from the handler, lift the pan slightly from below and pull it sideways out of the handler (if you no longer need the sample and the pan, you can simply tilt the handler until the pan slides out).

Press the «⌂» key to delete the measurement result from the display. The instrument is now ready for the next measurement.

Congratulations!
You have just performed your first measurement with your new Moisture Analyzer. In the following Section you will find important information on the operating principle of your instrument, its adjustment and optimum preparation of your samples.

3　How to obtain the best results

Following your first practical work with the Moisture Analyzer, in this Section you will find important information on how to obtain optimum results. You will discover what parameters influence the measurement process and how you can match the instrument optimally to your particular measurement task.

3.1　Measurement principle of the MJ33 Moisture Analyzer
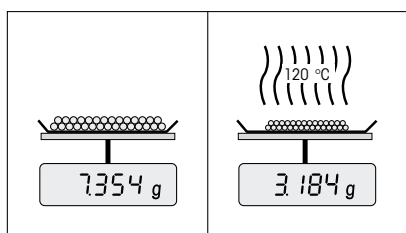
Your instrument performs measurements based on the **thermogravimetric principle**, i.e. the moisture is determined from the weight loss of a sample dried by heating.

In principle, your instrument thus comprises two instruments: a precision balance and a heating module.

Irrespective of the measurement method, the quality of the measurement results stands or falls by the **preparation of the sample and a correct choice of the important measurement parameters:**

– Sample size

– Drying temperature

– Switchoff mode

– Drying time

Inappropriate setting of these parameters can cause the results to be incorrect or misleading. For this reason, check that the results for each type of sample are what might reasonably be expected.

In practice, however, not only the quality of the measurement results, but also the **speed of the measurement process** is important. Thanks to its drying principle, the MJ33 Moisture Analyzer is very fast. You can increase the speed even further through optimum setting of the instrument.

The **optimum drying temperature and the drying time** are dependent on the nature and size of the sample and on the desired accuracy of the measurement results. These can be determined only by experiment.

3.2 Notes on adjustment of the balance and the heating module

To obtain optimal results, when you install the Moisture Analyzer at the place where it will be used, you should use the METTLER TOLEDO adjustment set to adjust the heating module under the prevailing operating conditions (e.g. in a fume cupboard). This ensures that any differences from the factory adjustment that may result from the specific local conditions are corrected.

You should adjust your Moisture Analyzer regularly (e.g. every six months) at the place where it is used and under the prevailing operating conditions. This may also be stipulated by your quality assurance system (e.g. GLP, GMP, ISO 9001).

By adjusting the heating module you can ensure comparability with results from other instruments of the same design. This is done by using an appropriate thermometer, which is provided in the form of a temperature adjustment set with calibration certificate (see Section 8.5). This adjustment set comprises a black plate with a thermometer, which allows a reproducible adjustment of the heating module.

The balance and the integral heating module in your instrument can be adjusted using the appropriate accessories (Section 8.5).

A Moisture Analyzer is typically used in place of or in addition to the oven method. In an oven heat energy is transferred by the flow of air, which establishes an equilibrium between the sample temperature and the ambient temperature. This is not the case in a Moisture Analyzer. The actual sample temperature primarily depends on the specific absorption properties of the sample ("dark" samples absorb more heat), which can change during the measurement process. There can also be differences between the temperature at the surface of the sample and the temperature inside the sample. The heat output is therefore not dependent on the true sample temperature but instead is regulated by a temperature sensor underneath the heating module.

For the reasons explained above, the temperature setting on the instrument will therefore deviate from the true sample temperature. By regularly adjusting the heating module, you will ensure a consistent and reproducible heat output for the entire lifetime of your instrument.

Note: METTLER TOLEDO offers an adjustment service – please contact your local dealer.

If you replace the heating module, you must adjust it using the temperature adjustment set, which is available as an accessory.

The procedure for adjusting the balance and heating module is described in Section 5.

3.3   Optimum sample preparation

Preparation of the sample is decisive for the speed of the measurement process and the quality of the measurement results.

Please note the following **basic rules** for the preparation of your sample:

The amount of sample you select should be as small as possible and only as large as necessary
Excessive amounts of sample require more time for drying and thus prolong the measurement process. If the amount of sample is too small, the measurement result may possibly not be representative. It is always the case that the greater the inhomogeneity of the sample, the larger the amount of sample needed to obtain a repeatable result (please see also the information in Section 8.1). Experience has shown a practical sample quantity go to be 3 – 5 g.

Distribute the sample evenly over the sample pan
You thus increase the surface area of the sample and facilitate heat absorption. The base of the pan should be evenly covered.

For liquid, fat-containing, melting and highly reflecting samples, you should use the glass fiber filters HA-F1 available as optional equipment (see Section 8.5). This also applies to samples which form a skin on their surface when heated. The glass fiber filter ensures even and rapid heat distribution and prevents the formation of a skin impervious to moisture on the sample surface.

4 Practical application of your Moisture Analyzer

In this Section we introduce you to the wide range of setting possibilities of your Moisture Analyzer and offer information and tips for optimum setting of the parameters.

4.1 The operating concept and the menu

You already performed your first measurement in Section 2. This measurement was carried out using the factory settings. However, your instrument offers a number of setting possibilities to match the measurement process to your specific requirements.

You can adapt your Moisture Analyzer to the particular sample that you are measuring. The following **method parameters** are available for this:

– The drying temperature
– The switch-off criterion
– The type of display

You make these settings on the **menu**. The menu also contains other options for carrying out adjustments and for the basic settings of your Moisture Analyzer. You will familiarize yourself with these functions and settings in Section 5. All menu settings are preserved even in the event of a power failure.

Press the «Menu» key to display the menu.

The menu options are shown in the top section of the display. The four fields at the bottom of the display contain the names of the "softkeys", i.e. the keys whose function depends on the position on the menu. The four "softkeys" are immediately underneath the display.

The option chosen from the menu is shown in inverse (white font on dark background). You can use the two arrow keys to select a different menu option by scrolling. If one of these two keys is no longer visible, you have reached the top or bottom of the list.

When you want to exit the menu, choose «Exit» (you can also exit the menu at any time by pressing the «⌂» key).

4.2   Defining method parameters

The method parameters are used to adapt your Moisture Analyzer to the sample being measured.

Temperature adj.			
Method parameters			
Language			
∧	∨	Sel.	Exit

Press the «Menu» key to display the menu.

Use the arrow keys to select the "Method parameters" menu option. Then press «Sel.» to call up the method parameters.

Temperature			**140 °C**
Switch-off mode			
	∨	Edit	↵

The display shows a list of all of the parameters of the method: Drying temperature, switch-off criterion and type of display.

4.2.1   Setting the drying temperature

Temperature			**140 °C**
Switch-off mode			
	∨	Edit	↵

Use the arrow keys to choose the parameter "Temperature" and press «Edit».

Temperature			**141 °C**
−	+		↵

The current drying temperature flashes. You can use the «+» and «−» keys to change the temperature in the range from 50 to 160 °C in 1 °C increments.

Confirm the new drying temperature with «↵».The next-higher menu level with then be displayed again and you can recheck the new drying temperature.

4.2.2 Selecting the switch-off criterion

Temperature	
Switch-off mode	**Auto**
Display mode	
∧	∨	Edit	↵

Use the arrow keys to choose the parameter "Switch-off mode" and press «Edit».

A switch-off criterion defines when the instrument should end the drying. Switch-off criteria save you having to keep checking your watch and stopping the drying manually. The following settings can be selected for the switch-off criterion:

– Automatic switch-off
– Timed switch-off

Switch-off mode	**Auto**
	Timed
	∨		↵

Automatic switch-off

This switch-off criterion is based on a weight loss per unit of time. As soon as the mean weight loss is less than a preset value during a specified time (1 mg in 30 seconds), the instrument considers drying to be complete and automatically discontinues the measurement process. During the drying, the time display shows you how long the measurement process has been in progress. The switch-off criterion is inactive during the first 90 seconds.

	Auto
Switch-off mode	**Timed**
∧			↵

Timed switch-off

With this switch-off criterion the measurement lasts until the preset drying time has elapsed (the time display provides you with continuous information on the drying time).

If you have chosen this setting, an additional menu option for setting the drying time becomes available (see Section 4.2.3).

Confirm the chosen switch-off criterion with «↵». If you have chosen the timed switch-off, you can now specify the drying time as described in the following Section.

4.2.3   Setting drying time for timed switch-off

Switch-off mode

Time	10 min
Display mode	
∧	∨	Edit	←

This menu option is only available if you have chosen the timed switch-off (Section 4.2.2) as switch-off criterion.

Use the arrow keys to choose the parameter "Time" and press «Edit».

Time	15 min
−	+		←

The current drying time flashes.You can use the «+» and «−» keys to change the drying time within the range from 1 to 99 minutes in 1 minute increments.

Confirm the new drying time with «←».The next-higher menu level will then be displayed again and you can recheck the drying time.

4.2.4   Selecting the display mode

Switch-off mode

Display mode	%MC
∧		Edit	←

Use the arrow keys to choose the parameter "Display mode" and press «Edit».

|	g
Display mode	%MC
	%DC
∧	∨		←

Four different types of result display are available to you.The particular one chosen also determines which values are shown on the records printed out.

You will find a description of all four types of display below.

g: Weight in grams

The weight of the sample is displayed (and printed out) in grams. During the drying the current weight is continuously displayed in grams.
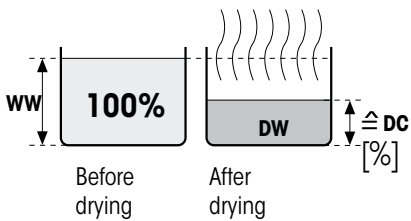
%MC: Moisture content
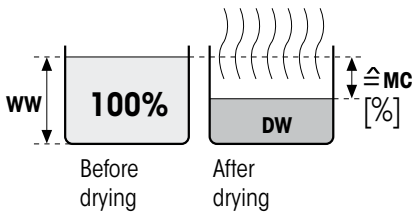
The moisture content of the sample is displayed (and printed out) as a percentage of the wet weight (= WW = initial weight = 100%). This is the factory setting. When the results are printed out, the moisture content is designated "%**MC**" (**M**oisture **C**ontent) (e.g. –11.35 %MC) and shown as a negative value. During the drying the current measured value is continuously displayed in percent.

$$MC\ [0...\text{-}100\%] = -\ \frac{\text{Wet weight } \mathbf{WW} - \text{Dry weight } \mathbf{DW}}{\text{Wet weight } \mathbf{WW}} * 100\%$$

%DC: Dry content

The dry content of the sample is displayed (and printed out) as a percentage of the wet weight (= WW = initial weight = 100%). When the results are printed out, the dry content is designated "%**DC**" (**D**ry **C**ontent) (e.g. 88.65 %DC). During the drying the current measured value is continuously displayed in percent.

$$DC\ [100...0\%] = \frac{\text{Dry weight } \mathbf{DW}}{\text{Wet weight } \mathbf{WW}} * 100\%$$

%AM: ATRO moisture content
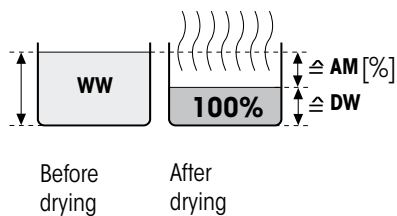
The moisture content of the sample is displayed (and printed out) as a percentage of the dry weight (= DW = final weight = 100%). When the results are printed out, the ATRO moisture content is designated "%**AM**" (**A**TRO **M**oisture Content) (e.g. –255.33 %AM) and shown as a negative value. During the drying the current measured value is continuously displayed in percent.

$$AM\ [0...\text{-}1000\%] = -\ \frac{\text{Wet weight } \mathbf{WW} - \text{Dry weight } \mathbf{DW}}{\text{Dry weight } \mathbf{DW}} * 100\%$$

Comment on the ATRO display mode
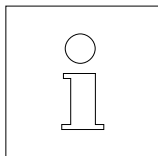
If the current measured value in the ATRO display mode is less than the predefined limit value (i.e. less than –999.99 %AM), a warning beep sounds and the instrument automatically switches the display mode (from %AM to %MC). A display in the ATRO mode is no longer possible in this case, even if you have started your drying operation in the %MC, %DC or "g" (grams) display mode.

4.3 Saving new method parameters and exiting menu

Save changes?	⚠
	No	Yes

After you have defined all of the method parameters, press the «↵» key repeatedly until you are asked whether you want to save the changes (each keystroke accesses the next-higher menu level). **Note:** Instead of the «↵» key you can also press the «⌂» key from any position on the menu. This exits the menu immediately. You will also be asked in this case whether you want to save the changes.

Press «Yes» to save the changes or «No» to exit the menu without saving. **Note:** If you do not want to save the changes, instead of the «No» you can also press the «⌂» key.

Once you have saved the method parameters, your Moisture Analyzer will immediately operate using the new settings.

4.4 Printing out records of method parameters

```
----LIST OF SETTINGS----
METTLER TOLEDO       MJ33
SNR            123456789
SW                  1.00
Method parameters
 Drying program      STD
 Temperature      150 °C
 Switch-off mode    Auto
 Display mode        %MC
Language         English
System settings
 Time format       24:MM
 Date format    DD.MM.YY
 Contrast          40 %
 Brightness        20 %
 Menu protection    Off
 Start mode        Auto
 Printout            On
 Print interval    30 s
Interface
 Baudrate          9600
 Bit / Parity      8/No
 Handshake     Xon/Xoff

---06.03.2007---16:51---
```

If from any position in the menu you press the «🖶» key, the menu settings are printed out. If you have made changes that have not yet been saved, you are asked whether you want to save them (the last set of parameters saved are always printed out). The Moisture Analyzer then reverts to the normal operating state.

The figure opposite shows a sample record.

Note

– As well as the method parameters, other menu settings are recorded; see section 5 for further details.

– Even outside the menu you can print out a record of the method parameters with the «🖶» key, provided there is no measurement being carried out. In this case, only the method parameters are printed out.

– The "STD" (Standard) setting for the "Drying program" parameter is hard-programmed into the device, and cannot be changed.

4.5 Performing a measurement

You are now familiar with all the method parameters of your Moisture Analyzer and have defined your own parameters for your samples. The instrument is now ready for the determination of the moisture content of your own samples. In this Section you will learn how to perform measurements, print out the measurement results and stop the measurement process.

Switch the instrument on with «On/Off» key.

The status display (User Guide) symbolizes the initial status of the instrument when the heating module is closed.

The instrument is set in the factory to operate in the automatic mode and you can perform the entire drying process without pressing any keys. You will find information on the manual mode in Section 5.5.8.
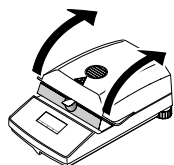
Open the heating module.

The status display (User Guide) now prompts you to load the empty sample pan.
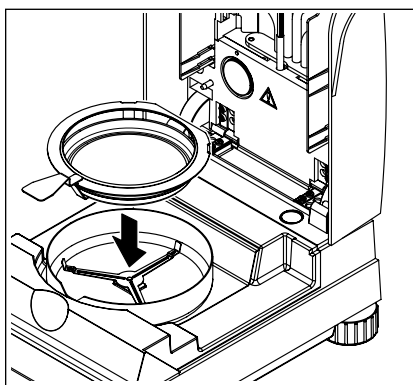
Position the empty sample pan in the sample pan handler. Place the sample pan handler in the draft shield. Ensure that the tongue of the sample pan handler lies exactly in the slot of the draft shield. The pan must lie flat in the pan holder.

Note: We advise you to work with the sample pan handler at all times. The pan handler is ergonomic, safe and provides protection against burns due to the hot sample pan.
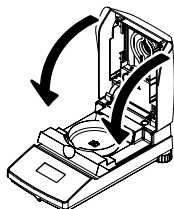
Close the heating module. The built-in balance is then automatically set to zero.

Following taring, the status display prompts you to add the sample to the sample pan.
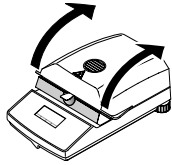
Open the heating module.
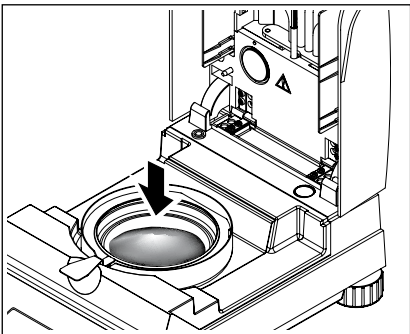
Add the sample to the sample pan. Please ensure that the sample is distributed evenly to obtain good analysis results.

The minimum sample weight required is 0.5 g.
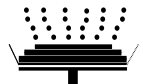
The status display indicates that you can now start the drying process.
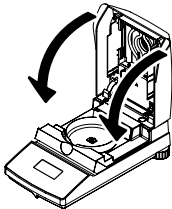
As soon as the sample has been put in, close the heating module and the instrument will automatically start the drying and measuring process.

You can follow the measurement process on the display: The status display uses ascending bubbles to symbolize the drying process with the following values being continuously updated and displayed:

⊘ 2:54   🌡 88 °C

✳   **-12.48** %MC

– current temperature in the heating module
– elapsed time since the start of the measurement process
– current result in the chosen display mode.
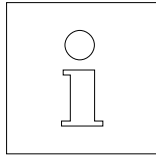
Your instrument is set in the factory so that the current intermediate result is printed out every 30 seconds if a printer is connected. If you want to, you can switch off printing out of records or set manual printing (using the «🖶») key . You will find information on the settings for the printer in Section 5.5. You will find an explanation of the measurement record in the next Section.

As soon as the switch-off criterion is met (or the selected drying time has elapsed), a beep is given.
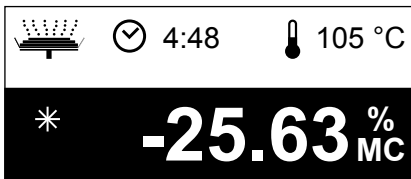
You can now read the measurement off the display. You will find information on the interpretation of the measurement results in Section 8.1. The result and time display remain at their final values, whereas the temperature continues to be updated.
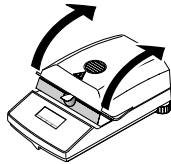
Open the heating module.
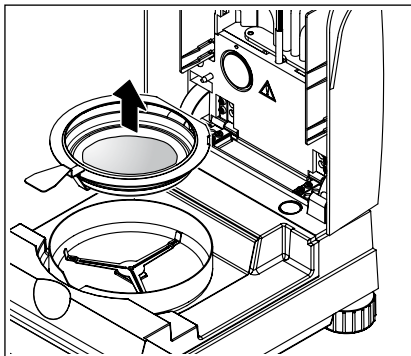
Carefully remove the sample pan handler from the sample chamber.

Warning: Pan and sample may still be hot! Allow them to cool before you remove the pan from the handler!

Press the «⌂» key to delete the final result and the time display (alternatively, you can also use the «Stop» or «–>0/T<–» keys).

If you do not wish to perform another measurement, switch the instrument off with the «On/Off» key and close the drying unit.

Stopping measurement
You can manually **stop** the measurement process **prematurely** at any time by pressing the «Stop» key. After a measuring time of at least 30 seconds, the result will be displayed from the time when the process is stopped.
If you stop the measurement process sooner, or terminate it with the «⌂» key or by opening the heating module, the measurement result will not be displayed, instead a message to the effect that the measurement has been stopped will appear. This message must be confirmed by pressing «OK».

4.6 Information on the measurement record

If your instrument is connected to a printer, and if the printer has been activated from the menu, the intermediate values will be printed out at the preselected intervals and the final result recorded on completion of the measurement. The following illustration shows a **sample record**. The record contains the following data:

```
A    -MOISTURE DETERMINATION-
B    METTLER TOLEDO        MJ33
C    SNR              12345678
D    SW                 1.00.03
E    Drying program         STD
F    Temperature        150 °C
G    Switch-off mode       Auto
H    Display mode           %MC

I    Initial wt.      0.731 g

J       0:30 min     -0.14 %MC
        1:00 min     -2.46 %MC
        1:30 min     -9.85 %MC
        2:00 min    -26.54 %MC
        2:30 min    -45.55 %MC
        3:00 min    -51.85 %MC

K    Total time       3:17 min
L    Dry weight       0.352 g
M    Result          -51.85 %MC

N    Sample ID: .............

O    Comment: ...............

P    Signature: ............

Q    ---02.03.2007---18:23---
```

A Record title

B Manufacturer and designation of the instrument

C Serial number of the instrument

D Version number of the software

E Drying program

F Drying temperature (set temperature)

G Switch-off criterion (or set drying time)

H Selected display mode

I Sample weight at start of drying

J Measured value at each print interval (the number of recorded measured values depends on the selected print interval and the measurement time)

K Total time of drying

L Indication of dry weight (final weight)

M Final result in the selected display mode

N Line for entry of the sample ID

O Line for entry for comments

P Line for signature

Q Date and time at the end of the measurement

Note: You will find information on the units of the results (% **MC,** % **DC** and % **AM**) in Section 4.2.4.

Special events are recorded on the measurement record as follows:

```
>>>>>>>MANUAL<<<<<<<<<
---29.01.2007---18:09---
```

You have stopped a measuring cycle prematurely after a measuring time of at least 30 seconds manually with the «Stop» key. The final result is printed out, but the record is specially labeled to indicate that measurement was aborted.

```
>>>>>>>>>ABORT<<<<<<<<<
---29.01.2007---17:58---
```

You have stopped a current measurement cycle after less than 30 seconds with the «Stop» key or in some other way (using the «⌂» key or opening the heating module). No final result is printed out and the record is labeled as shown opposite.

5   Basic settings of the instrument

In this Section you will learn how to define the settings your instrument uses for operation. You will also learn how to adjust the built-in balance and the heating module. These settings and functions are available on the menu with which you have already become familiar in Section 4.

5.1   Menu overview

Press the «Menu» key to call up the menu. The following menu options are available:

Weight adjust.	#1
Temperature adj.	
⌄	Start	Exit

With the two menu options "Weight adjust." and "Temperature adj." you can adjust the integrated balance and the heating module (Sections 5.2 and 5.3). After a balance or heating module adjustment has been performed, the instrument automatically quits the menu and returns to the standby mode.

Note: The numbers display the most recent adjustment. No adjustments have been carried out in the examples shown here.

Weight adjust	
Temperature adj.	#1
Method parameters	
⌃	⌄	Start	Exit

Temperature adj.	
Method parameters	
Language	
⌃	⌄	Sel.	Exit

The method parameters were covered in Section 4.

Method parameters	
Language	English
System settings	
⌃	⌄	Edit	Exit

The menu option "Language" allows you to specify the language in which the Moisture Analyzer is to communicate with you (Section 5.4).

Language	
System settings	
Interface	
⌃	⌄	Sel.	Exit

The "System settings" contain basic settings for Moisture Analyzer operation (for example, date and time, pressure interval, etc.). You will find further information in Section 5.5.

System settings			
Interface			
Factory reset			
⌃	⌄	Sel.	Exit

The menu option "Interface" allows you to specify the communication parameters of the built-in RS232C interface (Section 5.6).

Interface			
Factory reset			
⌃		Start	Exit

The option "Factory reset" resets most of the menu settings to the factory settings (Section 5.7).

```
----LIST OF SETTINGS----
METTLER TOLEDO       MJ33
SNR            123456789
SW                   1.00
Method parameters
 Drying program       STD
 Temperature      150 °C
 Switch-off mode    Auto
 Display mode        %MC
Language          English
System settings
 Time format       24:MM
 Date format    DD.MM.YY
 Contrast          40 %
 Brightness        20 %
 Menu protection     Off
 Start mode         Auto
 Printout             On
 Print interval    30 s
Interface
 Baudrate           9600
 Bit / Parity       8/No
 Handshake      Xon/Xoff

---06.03.2007---16:51---
```

If from any position in the menu you press the «🖶» key, the current settings are printed out. If you have made changes that have not yet been saved, you are asked whether you want to save them (the last set of parameters saved are always printed out). The Moisture Analyzer then reverts to the normal operating state.

The opposite example shows a sample record.

The following Sections will acquaint you with the individual menu items. The order corresponds exactly to that in the menu.

5.2   Adjusting the balance

With this menu item you can adjust the balance of your instrument. Consult Section 3.2 to learn when an adjustment is necessary. Before selecting the adjustment function, ensure that the sample pan is in position. Following a drying cycle, you should wait at least 30 minutes before undertaking an adjustment.
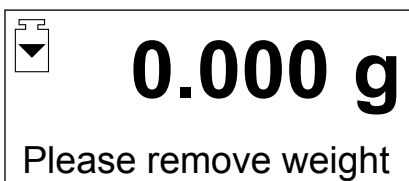
Weight adjust.   #1
Temperature adj.
∨	Start	Exit
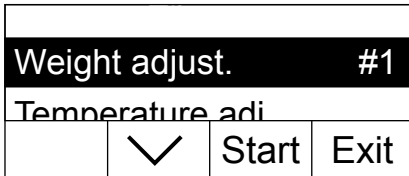
Choose the menu option "Weight adjust." and press «Start».

| |
|---|
| **20.000 g** |
| Please put weight on pan |
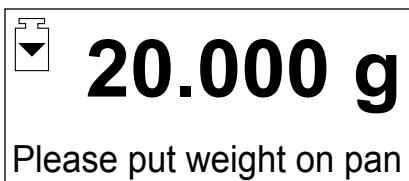
You are prompted to put the requested adjustment weight of 20 grams on the pan (the adjustment weight is available as optional equipment, see Section 8.5). Place the requested adjustment weight in the middle of the sample pan.

Note: You can use the «⌂» key to stop weight adjustment at any time.

0.000 g
Please remove weight

After a short time you will be asked to remove the adjustment weight. Remove the weight from the sample pan.

▪ ▪ ▪ ▪
Balance adjustment done
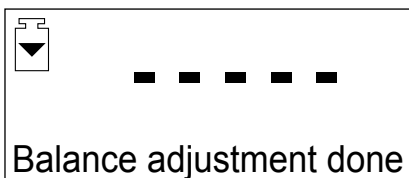
The instrument will provide brief confirmation of the completion of adjustment and then return to the normal operating state.

The Moisture Analyzer is now ready for further measurements.

```
A    ---BALANCE ADJUSTMENT---
B    METTLER TOLEDO        MJ33
C    SNR              12345678
D    SW                   1.00

E    Adjustment number       1
F    Adj. date      06.03.2007
G    Adj. time           16:45

H    Weight ID: .............

I    Weight          20.000 g

J    External adj. done

K    Signature: .............

     ----------END-----------
```

If you have connected a printer to your instrument and this is activated (see Section 5.5.9), on completion of the balance adjustment an adjustment record will be automatically printed out with the following data:

A Record title

B Manufacturer and designation of the instrument

C Serial number of the instrument

D Version number of the software

E Sequence number of the balance adjustment

F Date of the balance adjustment

G Time of the balance adjustment

H Line for entry of the number of the adjustment weight used

I Adjustment weight used

J Confirmation that the balance adjustment has been performed correctly

K Field for signature of the person who performed the balance adjustment

Please enter the number of the adjustment weight used, sign the record and store it in a safe place. This assures traceability, one of the basic requirements of every quality assurance system.

5.3   Adjusting the heating module

With this menu item you can adjust the temperature control of the heating module. Consult Section 3.2 to learn when an adjustment of the heating module is necessary. We advise you to wait 30 minutes after a drying cycle before performing the adjustment.

```
Weight adjust
Temperature adj.     #1
Method parameters
  ︿   ｜  ﹀  ｜ Start ｜ Exit
```
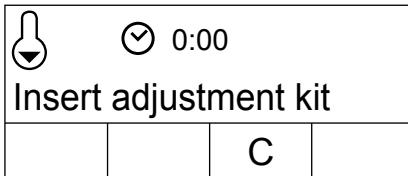
Choose the menu option "Temperature adj." and press «Start».

```
 ⌇      ⊘ 0:00

Remove pan holder
        ｜     ｜   C   ｜
```

You will be prompted to remove the pan holder from the sample chamber.

Remove the pan support.

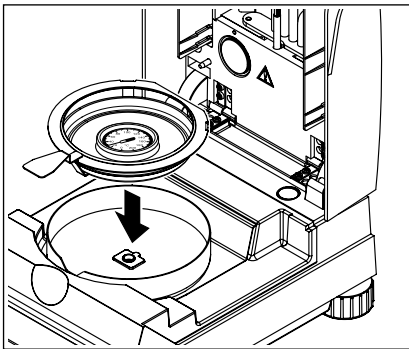|		
🌡⌄	⊘ 0:00	
Insert adjustment kit		
		C
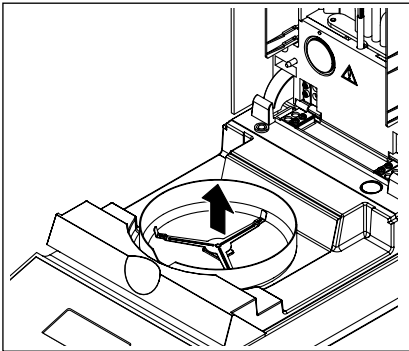
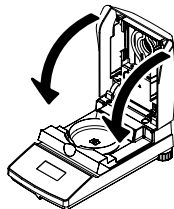You will be prompted to insert the adjustment set.

Note: Your can press «C» to stop temperature adjustment at any time.
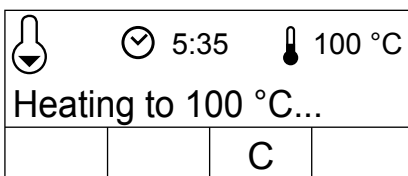
Insert the temperature adjustment set in the sample pan handler.

Place the sample pan handler in the sample chamber.

Note: The temperature adjustment set is available as optional equipment (see Section 8.5).

Close the heating module to start the adjustment process, and the heating module adjustment will begin.

🌡⌄	⊘ 5:35	🌡 100 °C	
Heating to 100 °C...			
		C	

The heating module is heated to a temperature of 100 °C. You can follow this process on the temperature display. The instrument now waits 15 minutes until the temperature adjustment set shows the correct temperature, a beep is then given.

🌡⌄	⊘ 15:00	🌡 100 °C	
Enter actual temp. 101 °C			
−	+		←
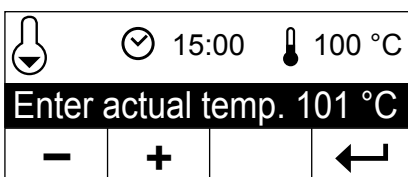
Read the temperature adjustment set through the inspection window of the heating module (the divisions correspond to 2 °C). Enter this temperature using the «+» and «−» keys. After entering the value, press «←». The temperature must be entered within 10 minutes after the start of the beep, otherwise the adjustment process will be terminated and an error message output.

```
 ⌂      ⊘ 22:44   🌡 160 °C

Heating to 160 °C...

┌──────┬──────┬──────┬──────┐
│      │      │  C   │      │
└──────┴──────┴──────┴──────┘
```
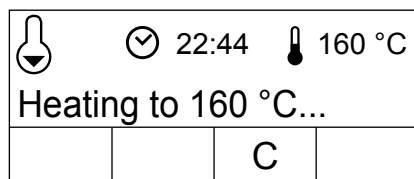
As this adjustment is a two-point adjustment (adjustment of the temperature is defined by two points, namely 100 °C and 160 °C), the heating module now heats to the second temperature (160 °C) . Proceed exactly as you did for the first temperature. After you have confirmed your entry with «⏎», the adjustment is at an end and the instrument automatically quits the menu and returns to the standby mode.

When the adjustment is complete, you can open the heating module and remove the sample pan support and temperature adjustment set.

Warning: As the temperature adjustment set can still be hot, allow them to cool down before you remove them from the handler.

If you have connected a printer to your instrument and activated it, (see Section 5.5.9), on completion of the heating module adjustment an adjustment record will be automatically printed out with the following data:

```
A   -DRYER UNIT ADJUSTMENT--
B   METTLER TOLEDO      MJ33
C   SNR            12345678
D   SW                  1.00

E   Adjustment number      1

F   Temp. reference ID: ....

G   Adj. date     06.03.2007
H   Adj. time        19:24
I   Temp. 100 °C:    101 °C
J   Temp. 160 °C:    159 °C

K   Dryer unit adj. done

L   Signature: .............

    ----------END-----------
```

A Record title

B Manufacturer and designation of the instrument

C Serial number of the instrument

D Version number of the software

E Sequence number of the heating module adjustment

F Line for entry of the number of the temperature adjustment set used (serial number of temperature adjustment set is printed on dial)

G Date of the heating module adjustment

H Time of the heating module adjustment

I Target and actual temperature for the first adjustment point

J Target and actual temperature for the second adjustment point

K Confirmation of the adjustment

L Field for signature of the person who performed the heating module adjustment.

Enter the number of the adjustment disk, sign the record and store it in a safe place. This assures traceability, one of the basic requirements of every quality assurance system.

5.4   Selecting the dialog language

You can choose the language in which your instrument is to communicate with you.

Method parameters	
Language	English
System settings	
⌃	⌄	Edit	Exit

Choose the menu option "Language" and press «Edit».

Language	English
	Deutsch
	⌄		↵

The following languages are available:

– English
– German ("Deutsch")
– French ("Français")
– Italian ("Italiano")
– Spanish ("Español")
– Portuguese ("Portuguese")
– Japanese ("Nihongo")
– Russian ("Russian")

Select the desired dialog language and then confirm your entry with «↵».

Note: The instrument is preset to the language of the country of destination.

5.5   System settings

You use this menu option to specify the basic settings for your instrument.

Language	
System settings	
Interface	
⌃	⌄	Sel.	Exit

Choose the menu option "System settings" and press «Sel.».

|	
Time	16.43
Date	
	⌄	Edit	↵

The display shows a list of all of the system settings. You will familiarize yourself with these settings in the following Sections.

To change a setting, choose it with the arrow keys then press «Edit».

With «↵» you return to the next-higher menu level.

5.5.1   Setting the time

Your Moisture Analyzer is fitted with a built-in clock. The current time and time (see next Section) are printed out on each report. When you put your new instrument into operation for the first time (and at the changeover from summer to winter time), you should enter the current time, this setting is retained even if you disconnect your instrument from the power supply.
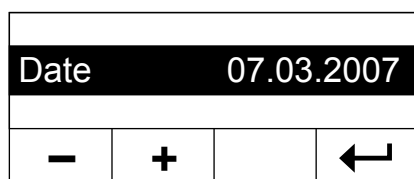
Time	17.44
–	**+**
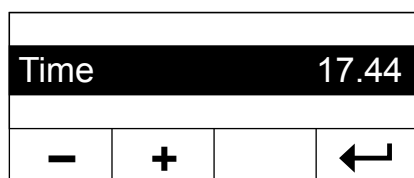
From the System settings menu choose the option "Time" and press «Edit».

You can use the «+» and «–» keys to set the time (in the chosen time format, see Section 5.5.3). **Note:** Pressing the key and holding it down adjusts the time in larger increments.

Confirm the new time with «↵». The next-higher menu level will then be displayed again.

5.5.2   Entering the date

Entering the date is only necessary the first time you put your instrument into operation. The current date is printed out on each report.

Date	07.03.2007
–	**+**

From the System settings menu choose the option "Date" and press «Edit».

You can use the «+» and «–» keys to set the date (in the chosen date format, see Section 5.5.4). **Note:** Pressing the key and holding it down adjusts the date in larger increments.

Confirm the new date with «↵». The next-higher menu level will then be displayed again.

5.5.3   Choosing time format

You can choose between different ways of displaying the time.

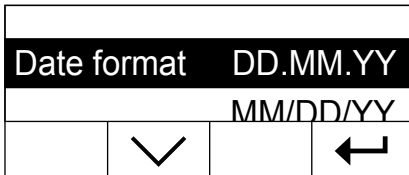| Time format	24:MM
	12:MM
∨	↵
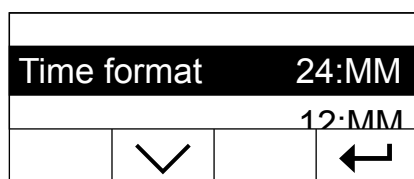
From the System settings menu choose the option "Time format" and press «Edit». Use the arrow keys to choose the required time format:

Setting	Display (example)
24:MM (factory setting)	16:42
12:MM	4:42 PM
24.MM	16.42
12.MM	4.42 PM

Confirm the new time format with «↵». The next-higher menu level will then be displayed again.

5.5.4   Choosing date format

You can choose between the European (day.month.year = factory setting) and the American date format (month/day/year).

Date format	DD.MM.YY
	MM/DD/YY
	∨		↵

From the System settings menu choose the option "Date format" and press «Edit».

Use the arrow keys to choose the required date format ("DD.MM.YY" = day.month.year, "MM/DD/YY" = month/day/year).

Confirm the new time format with «↵». The next-higher menu level will then be displayed again.

5.5.5   Setting display contrast

You can adjust the constrast of the display of your instrument to suit your needs.

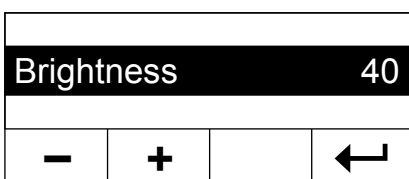| Contrast	50
−	+		↵

From the System settings menu choose the option "Contrast" and press «Edit».

You can use the «+» and «−» keys to set the contrast (range: 0 – 100).

Confirm the new setting with «↵». The next-higher menu level will then be displayed again.

5.5.6   Setting display brightness

You can adjust the brightness of the display of your instrument to suit your needs.

Brightness	40
−	+		↵

From the System settings menu choose the option "Brightness" and press «Edit».

You can use the «+» and «−» keys to set the brightness (range: 0 – 100).

Confirm the new setting with «↵». The next-higher menu level will then be displayed again.

5.5.7   How to activate the protection of menu settings

You can protect the menu settings against being changed unintentionally. **The instrument is set in the factory to allow the menu settings to be changed** (menu protection deactivated).

Menu protection		Off	
		On	
	∨		↵

From the System settings menu choose the option "Menu protection" and press «Edit».

If you wish to protect the settings against change, switch Menu protection on ("On").

Confirm the setting with «↵».The next-higher menu level will then be displayed again.

After Menu protection has been switched on, all of the menu settings are locked and the display shows the padlock symbol (instead of the «Edit» key). You can now only change the Menu protection setting.

5.5.8   Selecting the start mode for drying

You can select whether **drying** should be started **automatically or manually**. In the factory your instrument is already set to automatic drying.

In **automatic start mode** the instrument tares, determines the initial (wet) weight and begins drying when the heating module is closed. This "SmartStart" function enables you to perform the entire drying process without pressing a single key.

In **manual start mode** drying does not start automatically when the heating module is closed. When the «Start» key is pressed the initial (wet) weight, which is important for determining the moisture content, is recorded. This can be done with the heating module open or closed. Drying only begins when the heating module is subsequently closed. We recommend manual start mode for samples which contain highly volatile substances. In manual start mode you have time for further preparation of the sample (e.g. mixing the sample with silica sand, or distributing it evenly) because weight lost by evaporation during the preparation time is already recorded. In manual start mode you can even open the heating module while drying is taking place. If this is done, the drying process is not terminated (as it is in automatic mode) but only the heating is switched off until the heating module is closed again.

|			
Start mode		Auto	
		Manual	
	∨		↵
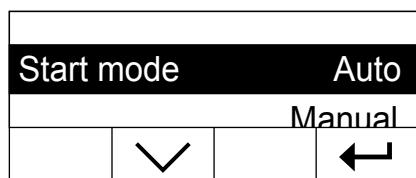
From the System settings menu choose the option "Start mode" and press «Edit».

Use the arrow key to choose the required operating mode.

Confirm the setting with «↵». The next-higher menu level will then be displayed again.

5.5.9 Switching the printer on or off

You can switch the external printer on or off. **In the factory this item is switched on**.

	Off
Printout	**On**
∧	↵
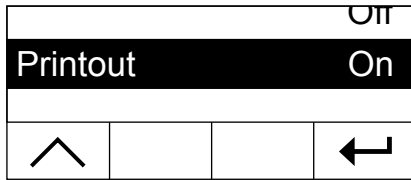
From the System settings menu choose the option "Printout" and press «Edit».

Switch the printer on or off with the arrow key.

Confirm the setting with «↵». The next-higher menu level will then be displayed again.

Note: The printer must be **switched off** if you want to connect the MJ33 to a computer via the serial interface. This prevents the MJ33 from sending characters to the computer in an uncontrolled manner. It permits data exchange to take place without interference using the MT-SICS interface commands (Section 8.4).

When you switch the printer on, you must ensure that the interface settings on the menu of the instrument (Section 5.6) match those of the printer.

When you have switched the printer on, an additional menu option is available, which will be explained in the following Section.

5.5.10 Defining the print interval

This setting option is only available if the printer is activated (see Section 5.5.9). The print interval determines the printout frequency of the intermediate results of an ongoing measurement.

	30s
Print interval	**1min**
	5min
∧	∨		↵
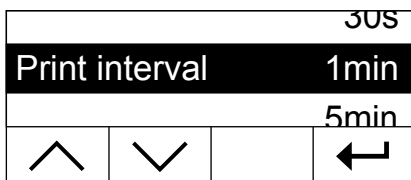
From the System settings menu choose the option "Print interval" and press «Edit».

Use the arrow keys to choose the required print interval. The three settings "30s" (factory setting), "1min" and "5min" allow automatic printout of the intermediate results at fixed intervals. This allows you to follow the drying process using the printed record. With the "Manual" setting there is no automatic printout. However, you can print out intermediate results at any time with the «🖶» key.

Confirm the setting with «↵». The next-higher menu level will then be displayed again.

5.6   Interface settings

A separate menu option is available for setting the communication parameters of the built-in serial RS232C interface.

System settings			
Interface			
Factory reset			
⌃	⌄	Sel.	Exit

Choose the menu option "Interface" and press «Sel.».

Baudrate			2400
Bit / Parity			
	⌄	Edit	↵

The display shows a list of all of the interface settings. You will familiarize yourself with these settings in the following Sections.

To change a setting, choose it with the arrow keys then press «Edit».

With «↵» you return to the next-higher menu level.

5.6.1   Setting the baud rate (data transmission speed)

The data transmission speed (baud rate) determines speed of transmission across the serial interface. The unit is the baud (1 baud (bd) = 1 bit/second).

			1200
Baudrate			**2400**
			9600
⌃	⌄		↵

From the Interface settings menu choose the option "Baud rate" and press «Edit».

Use the arrow keys to choose the required data transmission speed. The following settings are available: 1200 bd, 2400 bd (factory setting), 9600 bd, and 19200 bd.

Confirm the setting with «↵». The next-higher menu level will then be displayed again.

5.6.2 Setting bit / parity

With this menu item you can set the character format for transmission across the serial interface.

	7/No
Bit / Parity	**7/Even**
	7/Odd
∧	∨		↵
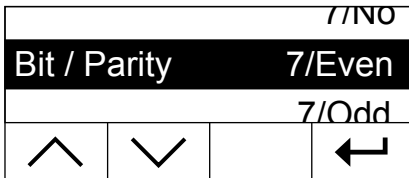
From the Interface settings menu choose the option "Bit / Parity" and press «Edit».

Use the arrow keys to choose the required setting. The following settings are available:
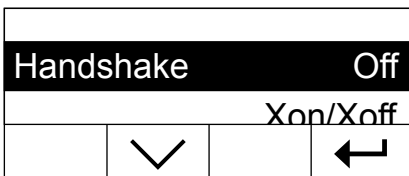
Setting	Effect
7/No	7 data bits, no parity
7/Even (factory setting)	7 data bits, even parity
7/Odd	7 data bits, odd parity
8/No	8 data bits, no parity

Note: For correct representation of special characters (umlauts, accents, etc.) on a printer you should use the setting "8/No".

Confirm the setting with «↵». The next-higher menu level will then be displayed again.

5.6.3 Setting the data flow control ("handshake")

With this menu option you can set data flow control ("handshake").

Handshake	**Off**
	Xon/Xoff
	∨		↵

From the Interface settings menu choose the option "Handshake" and press «Edit».

Use the arrow keys to choose the required setting. The following settings are available:

Setting	Effect
Off (factory setting)	No data flow control
Xon/Xoff	Data flow control via software
RTS/CTS	Data flow control via hardware

Confirm the setting with «↵». The next-higher menu level will then be displayed again.

5.7　Resetting to the factory settings

You have the option of resetting the basic settings of the instrument to the factory settings.

Interface			
Factory reset			
⌃		Start	Exit
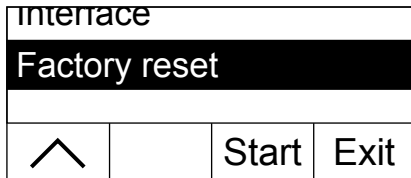
Choose the menu option "Factory reset" and press «Start». You are asked whether you really want to activate the factory settings.

Warning: If you answer the question with "Yes" all of the individual settings will be replaced with the factory settings! However, time, date, dialog language, contrast and brightness will not be reset.

After being reset to the factory settings, the instrument automatically returns from the menu to the normal operating state.

6 Servicing and replacing individual parts

In this Section you will learn how to keep your Moisture Analyzer in good condition and how to replace expendable parts.

6.1 Cleaning the heating module and the sample chamber

To obtain precise measurement results, we recommend you to clean the temperature sensor regularly. Please note the following directions for cleaning your instrument:
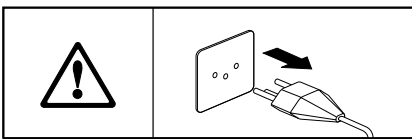
Disconnect the instrument from the power supply before cleaning.
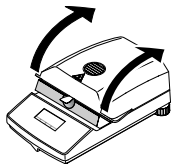
Open the heating module.
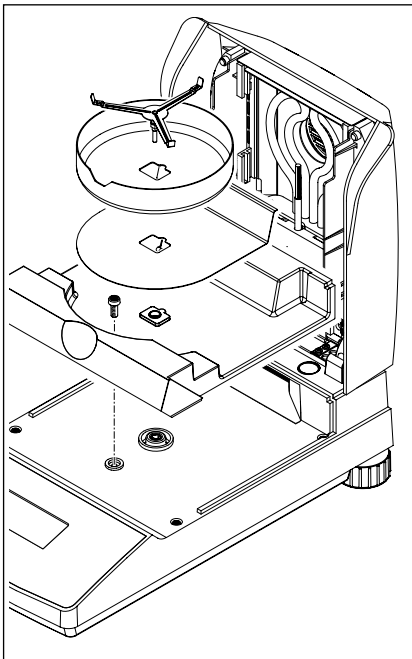
The draft shield, sample pan support and heat shield can be removed for cleaning without tools.

To dismantle the sample chamber you need a normal, commercially available screwdriver.

Use a lint-free cloth for cleaning.

Clean the exterior of the instrument with a mild cleaning agent. Although the housing is extremely rugged and resistant to solvents, never use abrasive cleaning agents or solvents!

Ensure that no liquid enters the interior of the instrument.
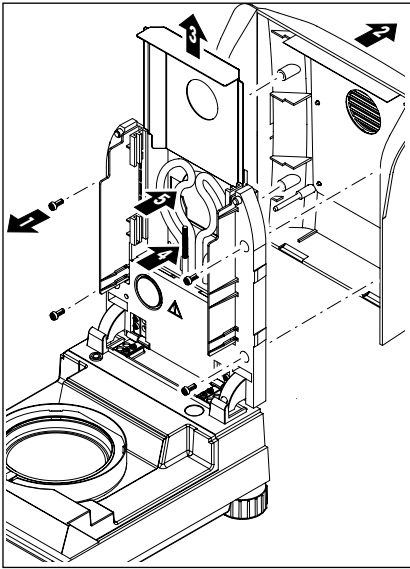
To dismantle the heating module the four screws (1) must be unscrewed. A screwdriver is needed for this purpose (Torx T-20).

Following this, the cover (2) of the heating module can be pulled off toward the back.

The reflector (3) can be pulled upward and out of the guide rails of the heating module.

Clean the reflector with a mild cleaning agent.

Carefully remove any deposits from the black temperature sensor (4) and from the heating element (5).

After the temperature sensor has been cleaned, we recommend you adjust the heating module (see Section 5.3).

6.2   Replacing the power line fuse

If the display of your instrument remains "dark" after switching on, this is most probably because the instrument's power line fuse is defective.
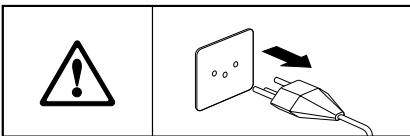
To change the fuse, proceed as follows:

Disconnect the instrument from the power supply.
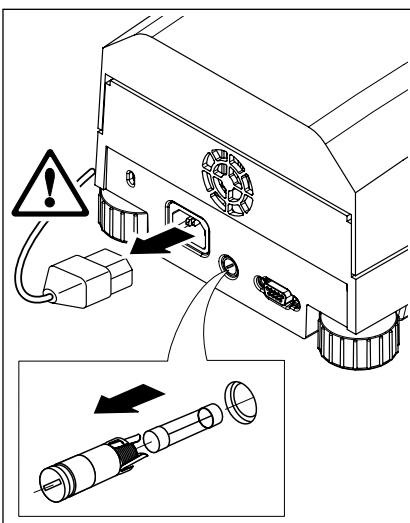
The power line fuse is located on the back of the instrument. Using a screwdriver, turn the fuse holder anticlockwise and pull it out of the instrument.
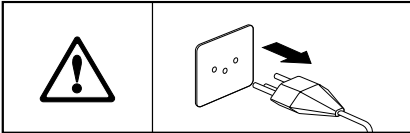
Check the condition of the fuse. Replace a blown fuse with a fuse of the same type and with the same rated value (5 x 20 mm, T6.3 H 250 V).
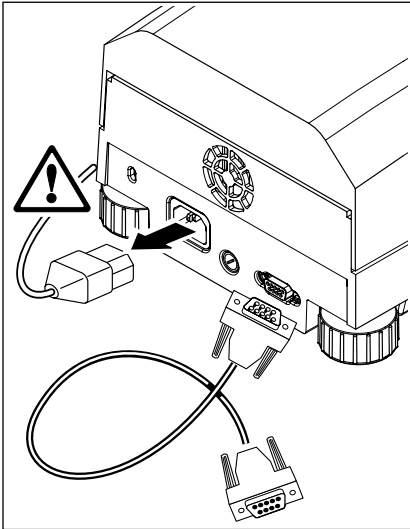
Do not use a fuse of a different type or rated value, or short out (bridge) the fuse, because this can put your safety at risk and damage the instrument!

6.3 Connecting to an external printer

To prepare the printer for use, proceed as follows:

Disconnect the instrument from the power supply.

Connect the printer. The MJ33 is fitted with a 9-pin (f) socket for this purpose. The METTLER TOLEDO RS-P42 and RS-P26 plain paper printers are provided with suitable connection cables.

Connect the instrument and the printer to the power supply.

The following settings are recommended for optimum function (Moisture Analyzer and printer):

Baud rate: 9600

Bits/parity: 8/No

Handshake: Xon/Xoff

Make sure the parameters of the printer and the MJ33 are set to the same values (see Sections 5.6.1 and 5.6.2, and the printer's operating instructions).

If your printer has several character sets (for example, RS-P26), choose the IBM/DOS set.

7   If problems arise on occasion

In this Section you will learn how errors can appear during operation of your Moisture Analyzer and how you can rectify these errors.

7.1   Error messages

Your instrument distinguishes between the three different types of errors explained in the following Sections.

7.1.1   Input errors

If you press a key that is not in use (for example, the «🖶» key with the printer switched off) or whose use is not permitted in the current operating state, your instrument will indicate this input error with a short beep.

7.1.2   Application errors

An application error occurs when the instrument cannot perform a procedure or a corrective action is necessary as the limits of a value range have been violated or because a general operating error exists. Application errors are reported by your instrument with a beep. Furthermore, the message "E" ("Error") appears in the display followed by the error number and error message text. Before you can continue working, you must delete the error message with «OK» or with the «⌂» key. You will find a list of all application errors below.

Display	Cause	Remedy
E1 Weight unstable	No stability during taring or adjustment	Ensure stable ambient conditions and an optimum location. Also take care that no part of the sample or the sample pan touch the draft shield or the sample pan handler. Highly volatile substances in the sample also prevent a stable weighing result being detected
E2 Wrong adjustment weight	Either no weight, or the wrong weight, has been placed on the sample pan during adjustment. This message is also displayed if you do not remove the weight when prompted to do so by your instrument	Repeat the adjustment process and load the required adjustment weight

Display	Cause	Remedy
E3 Sample weight too low	Sample weight below 0.5 g	Weigh in a sample of al least 0.5 g
E4 Missing tare weight	Sample pan has not been tared before the start of drying	Tare sample pan
E8 Temp. entry missing	During adjustment of the heating module, the wait time of 10 minutes for entry of the temperature value has been exceeded	Repeat heating module adjustment and enter temperature values before elapse of the wait time

7.1.3 Function errors

Function errors indicate that a program or hardware error exists. In such a case, disconnect the instrument from the power supply. Should the error reappear after reconnection to the power supply, contact your METTLER TOLEDO dealer to arrange an appointment for diagnosis and repair. Note the error number in order to facilitate the work of the service engineer.

Display	Cause	Remedy
E9 Function error + code	Undefined condition	Pull out the power supply plug and allow the instrument to cool for at least 5 minutes. If this error occurs repeatedly, please contact your METTLER TOLEDO dealer and inform him of the displayed code
E11 Adjustment data lost	The heating module and balance adjustment data, and the method and menu settings, have been lost. Cause: Power interruption while being stored	Do heating module and balance adjustment. Make settings

7.2   What if...?

... the display remains "dark" after switching on?
– no line voltage
– power cable not connected
– blown power line fuse
– instrument faulty

Ensure that the instrument is connected to the power supply and that power is actually supplied. Check the power line fuse of the instrument and replace if necessary (see Section 6.2). If the instrument still refuses to function, contact your METTLER TOLEDO dealer.

... after switching on "0.000" flashes on the display?
The sample pan holder is not installed. Install the sample pan holder.

... the symbol of the stability detector is continuously lit up immediately after the start?
As soon as the symbol of the stability detector fades, the weighing result is stable and is accepted as a "wet weight". If the symbol does not fade, your instrument is probably at an unsuitable location (vibrations, shocks, powerful drafts, etc.). Seek a more suitable location.

Samples containing readily volatile substances may never reach stability owing to continuous evaporation. In In this case you must select manual operating mode for the drying unit (see Section 5.5.8).

... the printer that is connected does not print?
Ensure that the printer is activated on the menu (see Section 5.5.9) and that the ribbon and paper are correctly installed. Check the transmission rate, bit/parity and handshake (see Section 5.6).

... incorrect characters are printed?
Change the bit/parity setting of your printer and MJ33 to "8/No". Check to see if both instruments have the same baud rate setting and use the same character set (see Sections 5.6 and 6.3).

... no drying time can be entered in the menu?
Entry of the drying time is possible only if you have selected the switch-off criterion "Timed switch-off", with all other switch-off criteria this input possibility is not available (see Sections 4.2.2. and 4.2.3).

... Menu settings cannot be changed?
You have protected the menu settings against change (see Section 5.5.7).

... the measurement takes too long?

An excessive amount of sample can be the cause of slow drying, likewise samples which tend to form a skin which hinders vaporization.

Perform experiment at higher temperature.

... the instrument does not heat following the start?

There may be a fault (e.g. a faulty heating module). In such a case, contact your METTLER TOLEDO dealer.

After a heating module is replaced we recommend that you readjust the heating module of your Moisture Analyzer (Section 5.3).

... the first measured value deviates significantly from the following measured values?

The instrument had not reached its steady operating temperature when the first measurment was taken. To prevent this from happening, perform an empty measurement (without sample) before the first actual measurement as a way of getting the device up to its steady operating temperature.

... the measurement results are not repeatable?

– The samples are not homogeneous, i.e. they have different compositions. The more inhomogeneous a sample, the larger the amount of sample needed to obtain a repeatable result.
– You have selected a drying time that is too short (for the "Timed switch-off" criterion). Extend the drying time or select the automatic switch-off (Section 4.2.2).
– The sample does not become completely dry (e.g. owing to skin formation). Dry the sample with the aid of glass fiber discs (see Section 3.3).
– You have selected a temperature that is too high and the sample has oxidized. Lower the drying temperature.
– The sample boils and the splashed drops continuously change the weight. Lower the drying temperature.
– Insufficient heating power because the heating module is dirty. Clean the heating module (see Section 6.1).
– The temperature sensor is contaminated or faulty. Clean the temperature sensor (see Section 6.1) or have it replaced by a service engineer.
– The support on which the instrument is standing is not sufficiently stable. Use a stable support.
– The surroundings are very unstable (vibrations etc.).

# 8 Further useful information

8.1 Notes on interpretation of the measurement results and the ideal sample weight

The accuracy of the measurement results depends on the wet weight and the original moisture of the sample. The relative accuracy of the measurement result improves with increasing wet weight. While the moisture of the sample is fixed, the weight of the sample can frequently be determined by the user. However, with increasing weight the drying process is lengthened. **We thus advise you to select the weight of your sample to obtain the repeatability you require.**

8.2 RS232C interface

So that your Moisture Analyzer can be connected to a peripheral device (e.g. printer or computer) it is fitted with an RS232C interface as standard.

9-pin socket
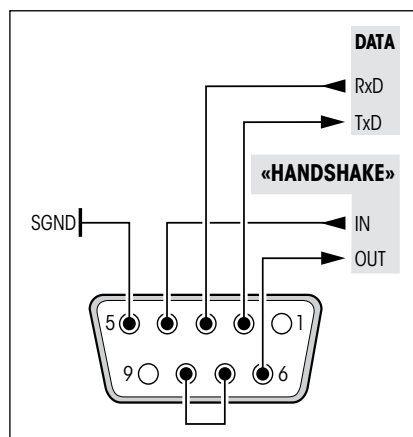
To adapt the MJ33 to the peripheral device the interface parameters can be set on the menu (see Section 5.6).

The many ways in which the MJ33 Moisture Analyzer can document results can only be fully utilized if a printer is connected, for example the METTLER TOLEDO RS-P26 or RS-P42. The printed results are a decisive contribution to simplifying working procedures in accordance with GLP/GMP.

For interface commands please refer to the "Reference Manual METTLER TOLEDO Standard Interface Command Set" 11781025, available from your METTLER TOLEDO dealer or downloadable from the Internet (**www.mt.com/moisture**). More Information is found in Section 8.4.

8.3   Technical data

Please note that the Moisture Analyzer will undergo continuous further development in the interest of the users. METTLER TOLEDO thus reserves the right to change all technical data at any time and without prior notification.

Dryer

Heating module:	Metal heating element
Temperature range:	50–160 °C
Temperature increment:	1 °C
Heating module adjustment:	with temperature adjustment set HA-TC or HA-TCC

Balance

Minimum sample weight:	0.5 g
Maximum sample weight:	35 g
Balance adjustment :	with external weight, 20 g ± 0.1 mg
Stability detector:	with symbol in display
Balance resolution:	1 mg
Result resolution:	0.01%
Repeatability (sd) with 2 g sample:	0.15%
Repeatability (sd) with 10 g sample:	0.05%

Data

Time, date	system clock, fail safe
Operational settings:	read-only memory, fail safe
Switch-off criteria:	automatic or timed
Drying program:	standard drying
Drying time:	1 minute to 99 minutes
Reset protection:	by locking the menu settings

Evaluation

Display modes:	4 modes: moisture content (MC), dry content (DC), weight (g), ATRO moisture content (AM)
Records:	Using external printer (optional)

Hardware

Audio signal:	Provided
Data interface:	Built-in RS232C interface
Inspection window:	in heating module
Leveling:	2 leveling screws and level indicator
Display:	Backlit matrix display
Status display (User Guide):	integrated in display
Sample pan, ø:	90 mm
Dimensions (w x h x d):	23 x 15 x 36 cm (see also following dimension diagram)
Weight, ready to measure:	4.3 kg

Admissible ambient conditions

	Use only in closed rooms
Height above mean sea level:	Up to 2000 m
Temperature range:	5 °C to 40 °C
Atmospheric humidity:	80% rh @ to 30 °C
Warm-up time:	At least 60 minutes after connecting the instrument to the power supply; when switched on from standby-mode, the instrument is ready for operation immediately.
Voltage fluctuations:	−15%+10%
Overvoltage category:	II
Pollution degree:	2
Power load:	Max. 450 W during drying process
Current consumption:	4 A or 2 A, according to the heating module
Power supply voltage:	100 V – 120 V or 200 V – 240 V, 50/60 Hz (the voltage is determined by the heating module)
Power line fuse:	1 piece, 5 x 20 mm, T6.3 H 250 V

Dimensions
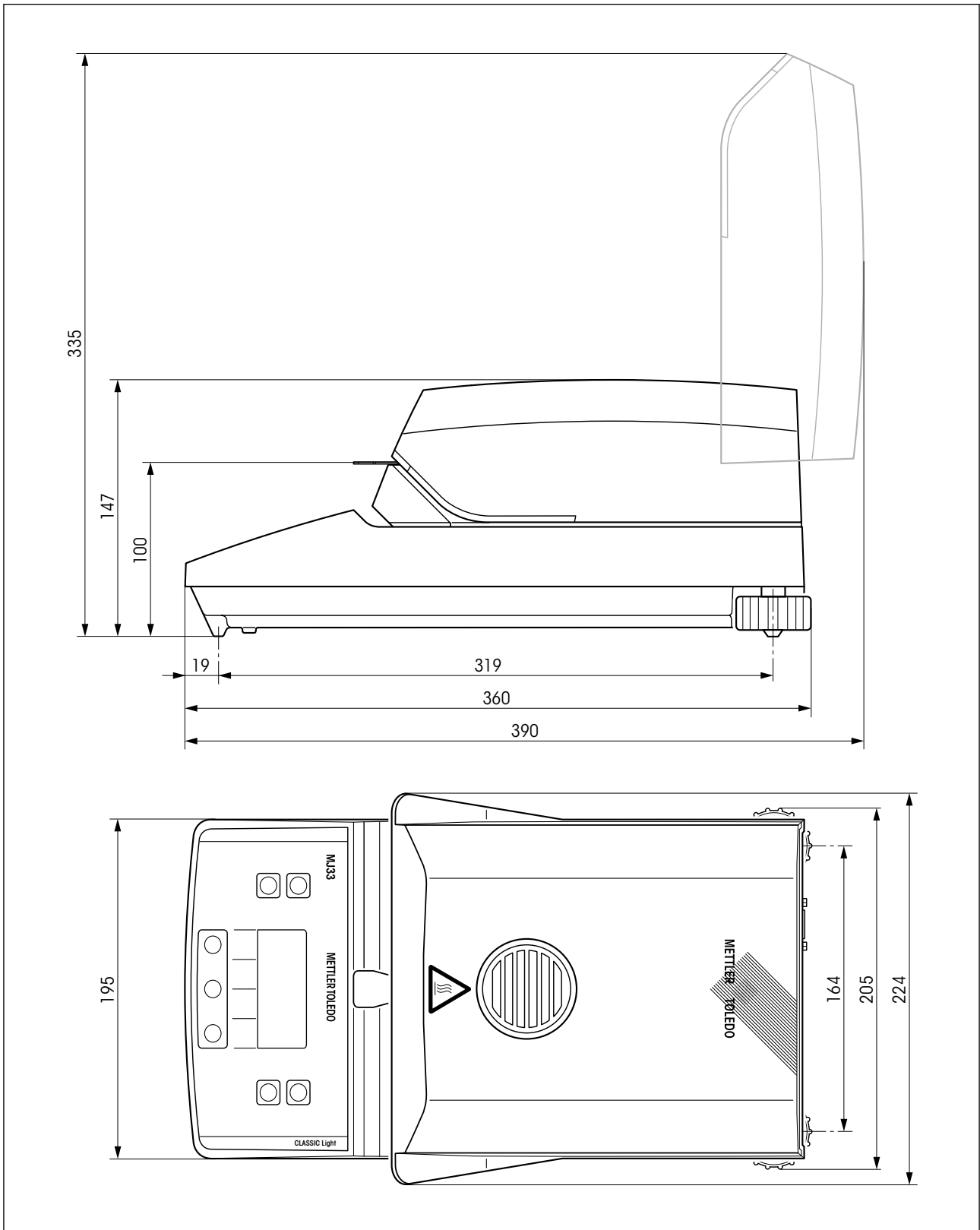
8.4 MT-SICS Interface commands and functions

Many of the instruments and scales used have to be capable of integration into a complex computer or data acquisition system. To enable you to integrate instruments into your system in a simple manner and utilize their capabilities to the full, most instrument functions are also available as appropriate commands via the data interface. All new METTLER TOLEDO instruments launched on the market support the standardized command set "METTLER TOLEDO Standard Interface Command Set" (MT-SICS). The commands available depend on the functionality of the instrument.

Basic information on data interchange with the instrument

The instrument receives commands from the system and acknowledges the command with an appropriate response.

Command formats

Commands sent to the instrument comprise one or more characters of the ASCII character set. Here, the following must be noted:

- Enter commands only in uppercase.
- The possible parameters of the command must be separated from one another and from the command name by a space (ASCII 32 dec., in this description represented as ␣).
- The possible input for "text" is a sequence of characters of the 8-bit ASCII character set from 32 dec to 255 dec.
- Each command must be terminated with C_RL_F (ASCII 13 dec., 10 dec.).

The characters C_RL_F, which can be inputted using the Enter or Return key of most entry keypads, are not listed in this description, but it is essential they be included for communication with the instrument.

Example: S – Send stable weight value

Command	`S`	Send the current stable net weight value.
Response	`S␣S␣WeightValue␣Unit`	
		Current stable weight value.
	`S␣I`	Command not executable (instrument is currently executing another command, e.g. taring, or timeout as stability was not reached).
	`S␣+`	Instrument in overload range.
	`S␣-`	Instrument in underload range.

Example

Command	`S`	Send a stable weight value.
Response	`S␣S␣␣␣␣␣30.000␣g`	
		The current, stable weight value is 30.000 g.

For the MT-SICS commands available for your instrument and further information please refer to the Reference Manual "MT-SICS for Moisture Analyzers 11781025" downloadable from the Internet under **www.mt.com/moisture**.

8.5 Optional equipment, consumables and spare parts

Designation	Order No.	Notes
Optional equipment:		
Adjustment weight 20 g (Class F1)	00158640	Adjustment of balance
Temperature adjustment set, HA-TC	00214455	Adjustment of heating module
Calibrated temperature adjustment set, HA-TCC (including test certificate)	00214528	Adjustment of heating module
Recalibration from HA-TCC, HA-TCCRe (including test certificate)	00214534	Recalibration with certificate
Reusable sample pan (steel, height: 6 mm), HA-DR1	00214462	Set of 3 pieces
Reusable sample pan (steel, height: 15 mm)	00013954	1 piece
Transport case	11113855	
Sample pan handler, HA-PH	00214526	3 pieces
Chemically resistant protective cover, HA-COVER	11113363	2 pieces
Printer RS-P42	00229265	
Connection cable	11101051	
Printer RS-P26	12120788	
Antitheft device	11600361	
Consumables:		
Printer paper	00072456	Set of 5 rolls
Paper roll (self-adhesive) for printer	11600388	1 piece
Ribbon (cassette, black) for printer	00065975	Set of 2 pieces
Aluminum sample pan ø 90 mm, HA-D90	00013865	Set of 80 pieces
Reinforced aluminum sample pan ø 90 mm	11113863	Set of 80 pieces
Glass fiber filter (for liquids), HA-F1	00214464	Set of 100 pieces

If you require other spare parts for your Moisture Analyzer, please contact your METTLER TOLEDO dealer.

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METTLER TOLEDO Service assures the quality, measuring accuracy and preservation of value of all METTLER TOLEDO products for years to come.

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• choose the appropriate balance
• reduce costs by optimizing testing procedures
• comply with the most common regulatory requirements

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