X2 Synergy

MA X2.A Moisture Analyzer
MA X2.IC.A Moisture Analyzer

USER MANUAL

IMMU-21-S-14-03-20-EN

www.radwag.com

CAUTION:
This is only a brief version of the user manual, it does not provide all product-related information. Prior to moisture analyzer operation it is recommended to read the full user manual version that is to be found on a CD delivered along with the device. The full user manual version describes data crucial for settings and device operation.

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Congratulations and thank you for selecting RADWAG product.
You have purchased a device that has been designed and manufactured to give you years of service.
Please read this user manual carefully, this shall guarantee reliable operation.

MARCH 2020

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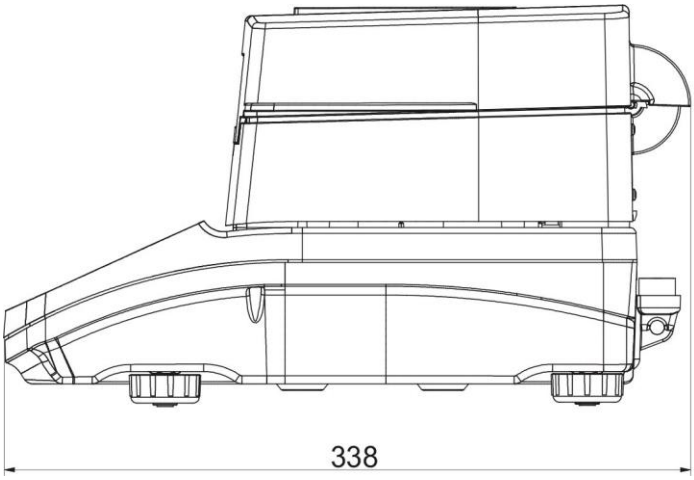
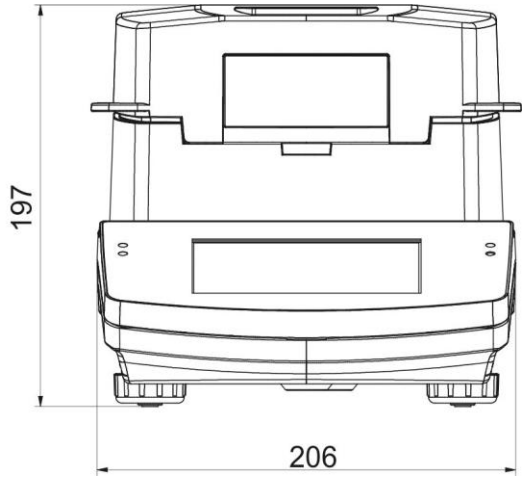
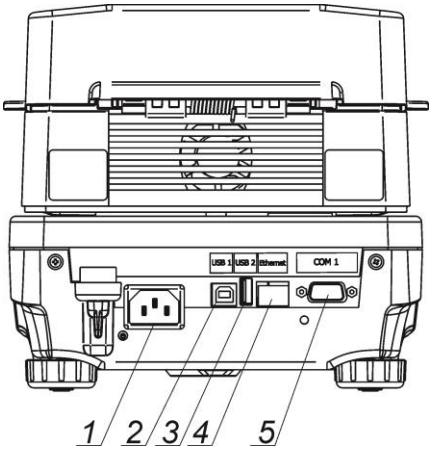
1. GENERAL INFORMATION

Dimensions:





Connectors:



1. power supply connector
2. USB 2 type B connector
3. USB 1 type A connector
4. ETHERNET connector
5. COM connector

TECHNICAL SPECIFICATIONS

Moisture analyzer type	**MA 50/1.X2.A**	**MA 50.X2.A**	**MA 110.X.A**	**MA 210.X2.A**
	MA 50/1.X2.IC.A	**MA 50.X2.IC.A**	**MA 110.X.IC.A**	**MA 210.X2.IC.A**
Max capacity	50 g	50 g	110 g	210 g
Reading unit	0.1 mg	1 mg	1 mg	1 mg
Tare range	- 50 g	- 50 g	- 110 g	- 210 g
Maximum sample weight	50 g	50 g	110 g	210 g
Moisture content readability	0.0001%	0.001 %		
Moisture content repeatability	+/- 0.05% (sample ~2g), +/- 0.01% (sample ~10g)			
Drying temperature range	Max. 160 °C Max. 250 °C (WH)			
Heating module	IR emitter (NP) halogen lamp (NH or WH) metal heater (NS)			
Drying method	4 drying profiles: standard, fast, step, mild			
Finish mode	3 modes: automatic, time-defined, manual			
Operating temperature	+10 °C - +40 °C			
Power supply	100-120V AC 50/60Hz			
Display	5” colour capacitive touch screen			
Weighing pan dimensions	ø 90 mm, h = 8 mm			
Drying chamber dimensions	120 x 120 x 20 mm			
Net/gross weight	~4.9 / 6.4 kg			
Packaging dimensions	470×380×336 mm			
Power consumption	6W during weighing max 450W during drying			
Ingress protection	IP 40			
Overvoltage category	II			
Pollution category	2			

All moisture analyzers are equipped with auto opened/closed drying chamber lid.
Moisture analyzers of MA xx.X2.IC.A series are additionally equipped with mechanism of auto adjustment.

2. BASIC SAFETY PRECAUTIONS

2.1. Warning Symbols and Signals

Safety precautions are marked with special descriptions and warning signs. They inform and warn an operator of possible dangers.
Ignoring the safety warnings may cause injuries, damage of the moisture analyzer, its inappropriate operation and errors of measurements.

2.1.1. Warning Descriptions

WARNING	Medium risk danger that can lead to a serious injury or death.
CAUTION	Low risk danger that can lead to moisture analyzer damage or dysfunction, loss of data or minor or moderate injury.
NOTE	Critical information on the moisture analyzer.

2.1.2. Warning Symbols

Electrocution

Acid/Corrosion

Potential danger

Flammable or explosive substances

Toxic substances

Hot surface

Mind your hands, crush injury risk

2.2. Precautions

WARNING!
The use of the moisture analyzer regardless of both, safety information and service manual guidelines may cause health damage and even death.

WARNING:
Nominal voltage for a moisture analyzer is 120V AC. It means that safety usage precautions for low voltage devices must be abide by while operating the device. Three-core power supply cable with grounding pin comes standard with a moisture analyzer. If necessary, an extension cord can be used as long as it meets the applicable standards and has a protective ground conductor. Intended disconnection of the grounding cable is forbidden.
Voltage range for moisture analyzers marked with AC 120V symbol:
100 V–120 V, 50/60 Hz,

CAUTION:
Drying chamber cannot be opened during operation (drying process). It is due to the fact that a halogen lamp and its glass shield may reach the temperature of up to 400°C.
When setting up the moisture analyzer leave enough space to prevent heat from building up and to keep your analyzer from overheating. Leave about 20 cm around the instrument and about 1 m above.
Air vents that are located in the housing cannot be covered, sealed or blocked in any other way.
Do not put any flammable substances on, under or near the moisture analyzer.
Be particularly careful when removing the sample from the drying chamber. The sample itself, the drying chamber, shields and the weighing pan can still be extremely hot.
In case of any maintenance work (cleaning the inside of the drying chamber), the moisture analyzer must be switched off.
Wait until all the components have cooled down.
Do not perform any modification to the heating module.

Same types of samples require taking particular safety precautions.
They can pose a danger for people and objects. It is always the user who is liable for possible damages caused by the use of an inappropriate sample.

CAUTION:
Corrosion Substances that release aggressive vapours (e.g. acids) during the heating process. In this case, it is recommended to work with small samples. Otherwise, vapours can condense on cold housing parts and cause corrosion.

WARNING:
Fire or explosion Flammable or explosive substances, substances containing solvents or releasing flammable or explosive gases or vapours. Perform a risk analysis when in doubt relating to the sample characteristics before carrying out the procedure. For this type of samples apply the drying temperatures as low as possible to prevent flames or explosion. During the analysis it is necessary to wear protective glasses and gloves. The samples should be relatively small.
Under no circumstances can the instrument be left unsupervised!

WARNING:
Substances containing toxic and caustic or corrosive components
Substances that release toxic gases or vapours can cause irritations (eyes, skin or respiratory system), illnesses or even death. Dry such substances only in fume cupboards.

WARNING:
Moisture analyzers are equipped with a mechanism for drying chamber lid closing and opening. Be extremely careful while operating the device so as to prevent potential crush injury during lid closing/opening.

Under no circumstances should the instrument be used in an area with any risk of explosion.
The moisture analyzer is not designed to operate in hazardous areas.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to **part 15 of the FCC Rules**. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.3. Intended Use

The moisture analyzer of MA X2 series is designed to determine: relative moisture content in small samples of various substances, dry mass content in small samples and mass of weighed objects.
The moisture analyzer ensures fast and precise determination of sample's moisture content.
With use of a graphic touch screen the operation and measurement is simplified. A moisture analyzer can be used to determine moisture content of different materials. At the initial stage of measurement, the device precisely determines the mass of an object placed on instrument’s weighing pan. As the mass reading is stabilized, the sample is quickly heated by a halogen lamp, an IR emitter or a metal heater causing humidity evaporation from the tested sample. While sampling, the moisture analyzer is continuously checking the loss of mass, and on calculation, it displays current moisture content in a tested sample.

Compared to conventional methods of humidity content determination of various substances, application of moisture analyzer considerably shortens measurement time and simplifies testing procedure.
MA X2 moisture analyzer allows setting multiple parameters which influence the procedure of moisture content determination in a sample, such as: temperature, time, drying modes, etc.

2.4. Good Weighing Practice

CAUTION!
Do not open the drying chamber during drying process. Moisture analyzer features a halogen lamp which is a very powerful heat source. Thus, operator should pay special attention no to touch those elements of a moisture analyzer that get hot while drying procedure (i.e.: disposable pan, pan handle, and inner shields of the drying chamber).
Remember that some of tested samples may become dangerous if heated (appearance of poisoning vapours, danger of ignition or explosion).
MA X2 moisture analyzer is not intended for dynamic weighing. Even if small amounts of a sample are added to or taken off the weighing pan, the mass readout should only be taken on stabilization of measurement result (upon displaying ◣◢ pictogram).
Do not place any magnetic materials on the weighing pan. This can cause damage of the measuring system of the instrument.
Be sure to avoid impact shock and overloading the moisture analyzer in excess of the prescribed maximum measuring range (max capacity), minus any possible tare weight that has been applied.
Never use the moisture analyzer in an environment endangered by explosion!
This moisture analyzer is not adjusted for operation in explosive areas.
There must not be any modification made to the moisture analyzer.

2.5. Precautions

RADWAG moisture analyzer adheres to all binding safety regulations. Nevertheless there are exceptional circumstances that may cause danger.
Do not open the instrument's housing. Inside there are no parts that would require maintenance, repair or replacement carried out by an operator. In case of any problems, contact RADWAG service or a distributor.
Use the device only as intended. Follow this user manual in terms of installation and configuration of the device.
Since use of the moisture analyzer conversely to safety precautions and service manual guidelines may be hazardous to operator's health and life, it is obligatory to read them carefully:

- Use the moisture analyzer to determine humidity content in samples and to determine mass of a tested sample; any other use of the moisture analyzer may be dangerous both to the device and the operator,
- Before commissioning the moisture analyzer, make sure that the nominal power of the device specified on its data plate is compatible with the supply in the mains to which the moisture analyzer is to be plugged in,
- **Halogen lamp and IR emitter can only be changed by an authorized service employee**,
- Protect moisture analyzer against contacts with liquids, it might lead to electrocution, fire, emission of substances containing toxic or caustic vapour, emission of explosive substances.

2.6. Warranty

The warranty does not cover:

- defects being an effect of not respecting service manual guidelines,
- using the moisture analyzer conversely to its intended use,
- any modifications of a moisture analyzer or cases when its housing has been opened (damaged protective stickers),
- mechanical defects or defects caused by liquids, water and natural wear,
- defects caused by inappropriate setting or by electrical wiring failures,
- overloading of the measuring mechanism.

2.7. Supervision over Metrological Parameters

Metrological parameters need to be checked in determined time intervals. Inspection frequency is conditioned by ambient conditions in which the moisture analyzer is used, kind of carried out processes and adopted quality management system.

2.8. Service Manual Significance

It is very important to read the service manual carefully before switching on and starting up moisture analyzer operation, even if you are experienced and have worked with this type of instrument before.

2.9. Staff Competence

The moisture analyzer should be utilized and supervised only by users who are trained and experienced in such type of instruments.
In order to use the moisture analyzer, first read the service manual. Keep these instructions for the future reference.

Do not make any design modifications. Additional equipment compatible with the moisture analyzer and spare parts should be supplied by RADWAG or an authorized distributor.

2.10. Protective Clothing

While working with the instrument use protective clothing, this is to take safety precautions against potential hazards source of which might be tested samples and ingredients.

Use the following while carrying out tests:

- protective apron,
- protective glasses,
- protective gloves (while working with hazardous chemical substances).

Before the use of the above-mentioned protective clothing, make sure that it has been designed to be used with specific samples and that it is not damaged.

3. TRANSPORT AND STORAGE

3.1. Delivery Check

Upon delivery it is necessary to check the package and the device, make sure that your package bears no signs of damage.

3.2. Packaging

Keep all package elements should your device be transported in the future. Remember that only original packaging can be used for shipping purposes. Prior packing, uncouple any cables, remove any separable components (weighing pan, shields, inserts). The device components must be packed into an original packaging providing protection against potential damage during transportation.

4. UNPACKING AND INSTALLATION

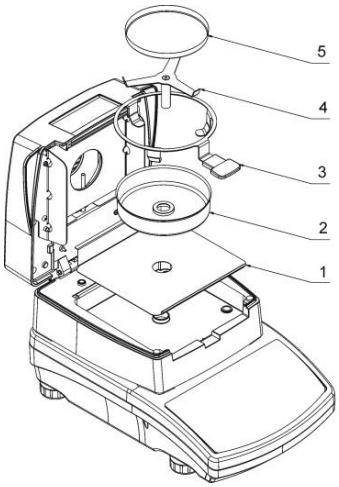
4.1. Place of Use

- Operate the device in a workroom free of vibrations and shakes, where there are no air drafts nor dust. The workstation has to be located up to 2000 m above sea level.
- When setting up the moisture analyzer leave enough space to prevent heat from building up and to keep your analyzer from overheating. Leave about 20 cm around the instrument and about 1 m above.
- Make sure that the ambient temperature ranges between: +10°C ÷ +40°C.
- Relative humidity cannot exceed 80% at the temperature of 31°C, decreasing linearly to 50% of the relative humidity at the temperature of 40°C.
- Place the moisture analyzer either on a robust-design table or on a wall bracket, which is both distant from heat sources and insusceptible to vibrations.
- Make sure that the moisture analyzer's power supply plug is easily accessed and can be quickly disconnected from the mains if necessary.
- Take special precaution while weighing magnetic objects, as part of the moisture analyzer is a strong magnet.

4.2. Unpacking

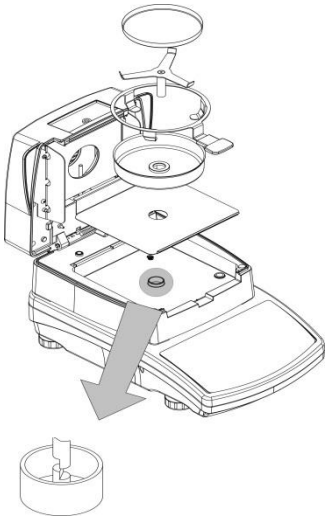
Carefully take the device out of the packaging, remove the transport lock and gently place the moisture analyzer at its workplace. Install the components, follow the diagram:

Install:



- drying chamber base insert (1),
- draft shield (2)
- weighing pan handle (3),
- weighing pan cross-shaped holder (4),
- disposable pan (5).

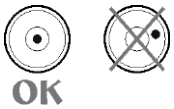
Positioning the cross-shaped holder:



When installing the cross-shaped holder (pan supporter) pay special attention to the correct positioning of its mandrel. The mandrel features a cut providing unique positioning of the holder against the pan handle, thus preventing their contact and friction.
Positioning the cross-shaped holder:

- assemble the holder onto the mandrel and turn it slightly so that the mandrel cuts are located in their unique and correct position,
- turn the mandrel gently so as not to damage moisture analyzer's measuring system.

4.3. Levelling



It is necessary to level the instrument prior connecting it to the mains. To level the moisture analyzer turn its feet until an air bubble takes central position.

4.4. Standard Delivery Components List

- Moisture analyzer
- Drying chamber base insert
- Drying chamber shield
- Weighing pan handle
- Cross-shaped holder
- Disposable pan
- Power cord
- User manual - CD version
- Brief user manual

4.5. Maintenance Activities

Maintenance activities:

1. Disassemble the weighing pan and other detachable components (the components differ depending on the weighing instrument model, read section: *UNPACKING AND INSTALLATION)*. Be careful while installing the components so as not to cause any damage to the moisture analyzer mechanism.
2. In order to ease cleaning of glass anti-draft chamber panes, it is permissible to remove them following the below instruction.

Caution:
In case of heavy dust occurring at the place of moisture analyzer operation, it is recommended to commission an inspection of the device to be carried out by RADWAG service every 6 months.
Cleaning the weighing pan while still installed may cause damage of the measuring system.

Cleaning ABS components:

To clean dry surfaces and avoid smudging, use clean non-colouring cloths made of cellulose or cotton. You can use a solution of water and detergent (soap, dishwashing detergent, glass cleaner). Gently rub the cleaned surface and let it dry. Repeat cleaning process if needed.

In the case of hard to remove contamination, e.g. residues of adhesive, rubber, resin, polyurethane foam etc., you can use a special cleaning agents based on a mixture of aliphatic hydrocarbons that do not dissolve plastics. Before using the cleanser for all surfaces we recommend carrying out tests. Do not use cleansers containing abrasive substances.

Cleaning anti-draft chamber panes:

Select dissolvent depending on a dirt. Never soak the glass panes in alkaline solutions since they interact with glass and may cause damage. Do not use cleansers containing abrasive substances.

For organic dirt use acetone first, next use water or detergent. For other than organic dirt use diluted acid solutions (soluble salts of hydrochloric or nitric acid) or base solutions (ammonium or sodium base).

To remove ACIDS use protophilic solvent (sodium carbonate), to remove BASE use protogenic solvent (mineral acid of various concentration).

In case of heavy contamination use brush and detergent, nevertheless avoid detergents containing large and hard molecules which could potentially scratch glass panes.

At the end of the cleaning process rinse the pane using distilled water.

Use soft brush with wooden or plastic handle exclusively in order to avoid risk of scratches. Do not use wire brush.

Rinsing is a necessary cleaning process stage allowing to remove remaining soap, detergents and other cleansers from the panes prior their reinstallation.

After preliminary cleaning process stage, rinse the pane using running water first, distilled next.

Avoid drying the panes either using paper towel or forced air circulation since some fibres, grains or contamination of other type could permeate into the panes thus causing weighing errors.

We do not recommend using driers when drying measuring glass tools.

It is a frequent treatment to leave glass components on a rack to dry.

Cleaning stainless steel components:

Avoid using cleansers containing any corrosive chemicals, e.g. bleach (including chlorine). Do not use cleansers containing abrasive substances. Always remove the dirt using microfiber cloth to avoid damage of protective coating.

In case of a daily maintenance:

1. *Remove the dirt using cloth dipped in warm water.*

2. *For best results, add a little bit of dishwashing detergent.*

Cleaning powder-coated components:

For preliminary cleaning process stage you need running water or wet sponge featuring large holes, this will help you to remove loose, heavy dirt.

Do not use cleansers containing abrasive substances.

Next, using cloth and cleanser-water solution (soap, dishwashing liquid) gently rub the cleaned surface.

Avoid using cleanser without water since it may result with damage of the cleaned surface, please mind that large amount of water mixed with cleanser is a must.

Cleaning Aluminium Components

While cleaning aluminium components use products acid by nature, e.g. spirit vinegar, lemon. Do not use cleansers containing abrasive substances. Avoid using hard brush, this may cause scratches. It is recommended to use microfibre cloth.

While polishing the surface use circular movements. Use clean, dry cloth to make the surface shine.

4.6. Connecting the Moisture Analyzer to the Mains

The moisture analyzer can be plugged to the mains only by means of an original power cord, which comes standard with the instrument. Rated voltage (specified on the device's data plate) must be compatible with the mains rated voltage.
Make sure that the moisture analyzer's power supply plug is easily accessed and can be quickly disconnected from the mains if necessary.
The power cord can be connected only to a socket with a ground contact. Plug the power cord to the moisture analyzer. The moisture analyzer's power plug is located at the back of its housing.
Moisture analyzer display shows name and software number first, next an indication 0.000 g (moisture analyzers with readability of 1 mg) or 0.0000 g (moisture analyzers with readability of 0.1 mg). If the indication is different than zero, press →0← key.

4.7. Temperature Stabilization Time

Before start of the measuring processes, it is necessary to wait until the moisture analyzer reaches thermal stabilisation.
Moisture analyzer stored in much lower temperatures, than the workroom temperature, before being plugged to the mains (e.g. during winter period) must be subjected to thermal stabilisation. The thermal stabilisation period takes about 4 hours. During the thermal stabilization, the indications on the screen can change. Potential workroom temperature change shall occur gradually and slowly in the course of the weighing instrument operation.

4.8. Connecting Peripheral Equipment

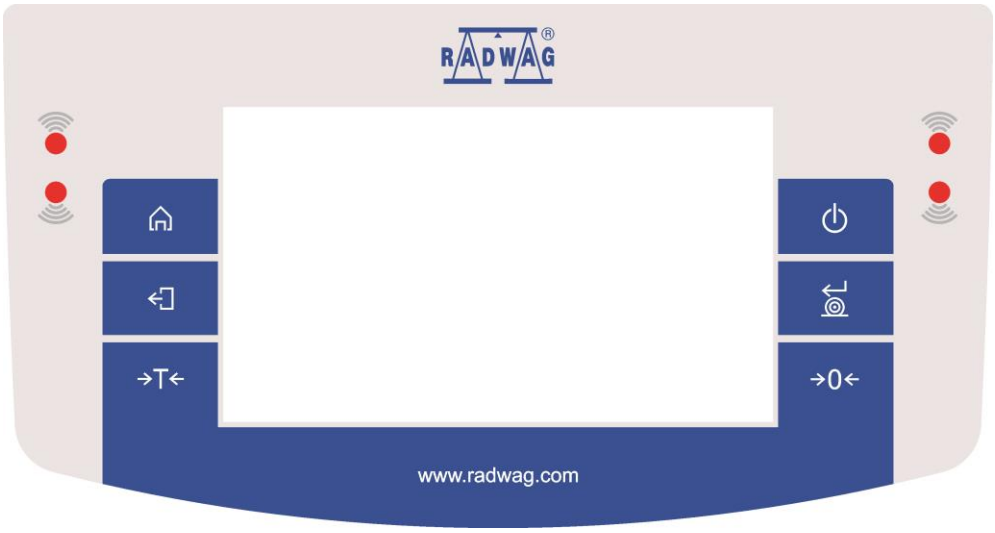
CAUTION:
It is possible to connect only SELV (Safety Extra-Low Voltage) and limited energy devices to the moisture analyzer interfaces.

Use only accessories and peripheral equipment recommended by the manufacturer. The moisture analyzer must be disconnected from the mains before connecting or disconnecting any peripherals (printer, PC computer, computer keyboard of USB type, additional display). Upon connecting the peripherals, plug the moisture analyzer to the mains.

5. START-UP

- Plug the power adapter to a socket, next connect the connector to port located at the back of the housing.
- Press ⏻ key located in the top right hand corner of the panel.
- Upon completed start-up, the home screen is displayed automatically.
- The moisture analyzer runs with no operator logged in. In order to start operation it is necessary to carry out logging procedure (for detailed logging procedure read later sections of this service manual).

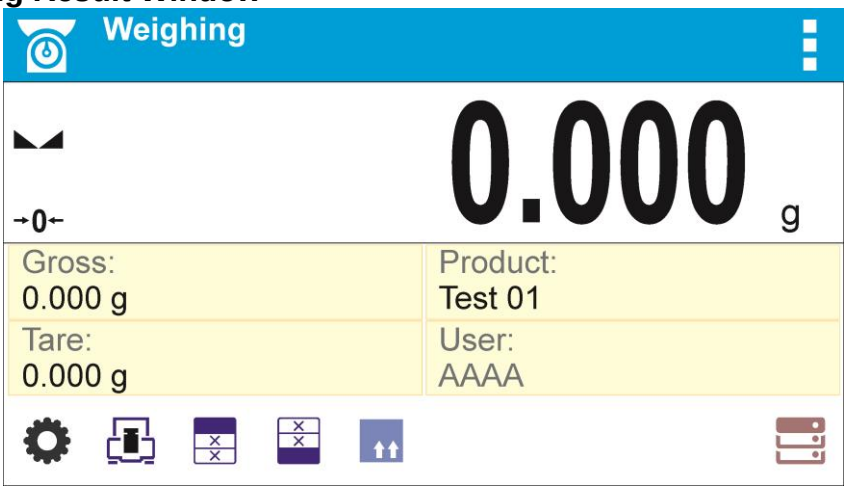
6. OPERATION PANEL



Key	Description
⏻	Press to switch the moisture analyzer ON/OFF
→0←	Press to zero the moisture analyzer
→T←	Press to tare the moisture analyzer
↵	Press to confirm modifications/ to send the weighing result to a printer or a computer
⎋	Function key <Esc>, press to abort parameter modifications or exit to previous menu level
⌂	Function key <Home>, press to exit to home screen
	Programmable proximity sensors, press to enable operation of freely selected functions

7. HOME SCREEN

7.1. Weighing Result Window



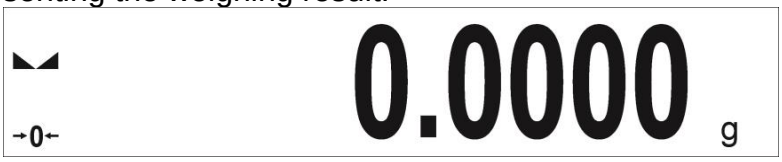
The home screen can be divided into 3 sections:

- Top section displaying data on active working mode (pictogram and name), metrologically important data and button enabling selection of functions available for a particular working mode:

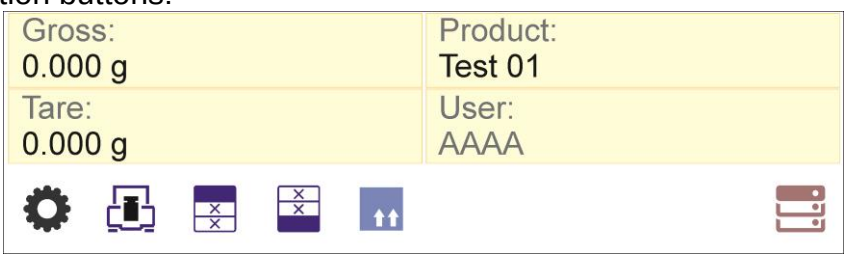
The top bar displays the following information:

Ważenie	Working mode name and symbol.
	Symbol informing that wireless communication is on.
	Symbol informing that communication with a USB flash drive is on.
	Symbol informing that PC keyboard is connected.
	Symbol informing that printer is connected via USB.
	Symbol informing that communication with a PC computer is on.
	Symbol informing that data is saved to moisture analyzer memory.
E2R	Symbol informing that the moisture analyzer connects with E2R system.
F	Symbol informing that the weighing profile is active.

- Section presenting the weighing result:



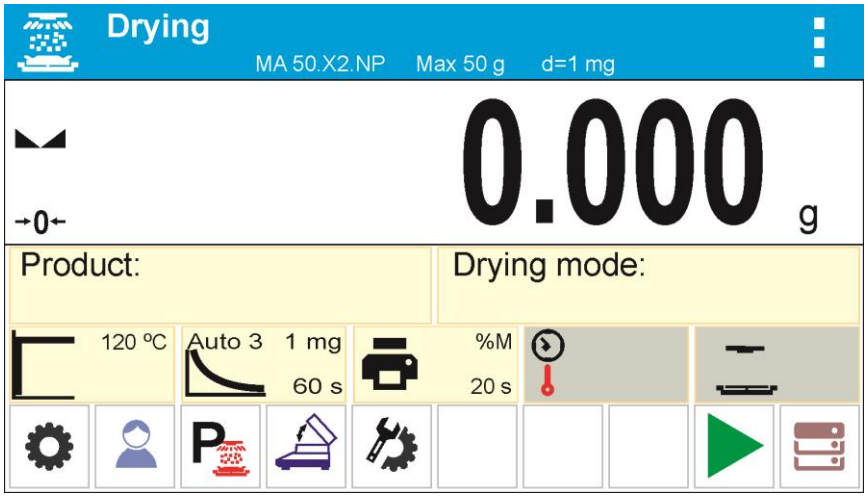
- Section comprising supplementary information on currently performed operations, and function buttons:



Caution:
Data and buttons contained in the workspace are freely configurable.

For detailed instruction read section 8 of this user manual.

7.2. Drying Process Window



The home screen can be divided into 3 sections:

- Top section displaying data on active working mode (pictogram and name), metrologically important data and button enabling selection of functions available for a particular working mode:

- Section presenting the weighing result:

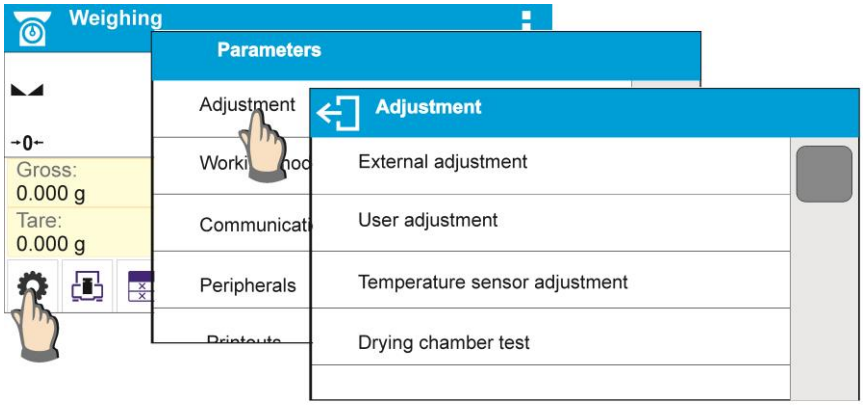
- Section comprising supplementary information on currently performed operations, and function buttons:

Caution:
Data and buttons contained in the workspace are freely configurable.
For detailed instruction read section 8 of this user manual.

8. OPERATING THE MENU

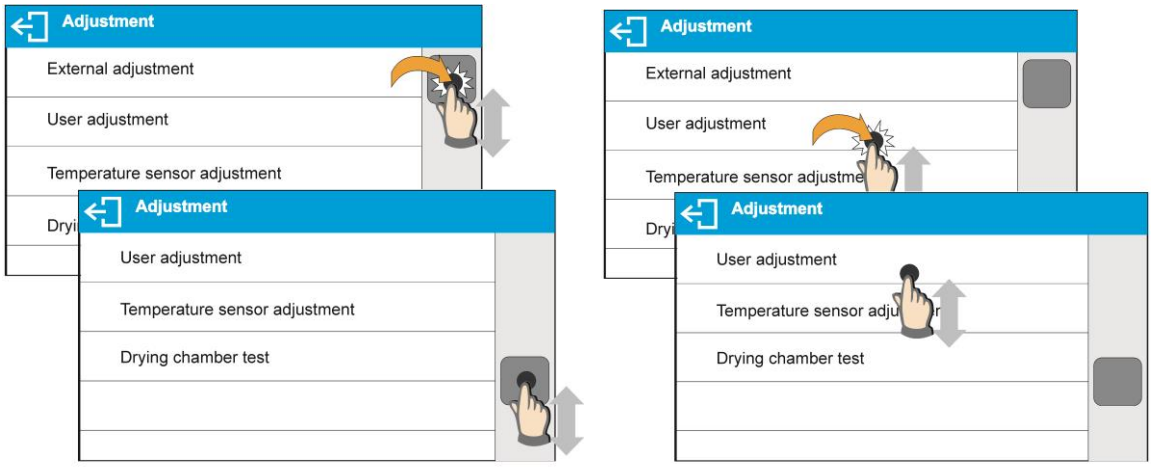
Operation of moisture analyzer program menu is intuitive. The touch screen makes the software operation easy. Pressing a function button or an area on the display initiates an assigned function or process.

8.1. Menu Accessing



In order to enter moisture analyzer menu press  <PARAMETERS> entry. Pressing any button comprised within workspace or pressing parameter name results with change of colour. If a given area has any function or action assigned, then it is performed automatically upon pressing (e.g. adjustment procedure), respectively a particular window with parameters or a list of appropriate settings is displayed.

8.2. Screen Scrolling



There are two methods for scrolling the screen of parameters window. The first one requires pressing, holding down and scrolling up or down the scrollbar located on the right. The second one requires pressing, holding down and scrolling up or down any point of the displayed window.

8.3. Soft Buttons List

	Press to enter home screen.		Press to clear edit box content.
	Press to scroll the menu up or down.		Press to switch the on-screen keyboard on/off.
	Press to confirm the introduced modifications.		Press to export database (active upon connecting a USB flash drive)
	Press to exit, parameter remains unmodified.		Press to import database (active upon connecting a USB flash drive)
	Press to add database record.	N	Press to search particular database entry by name.
	Press to print database entries.	C	Press to search particular database entry by code.
	Press to move (exit) one level up		Press to delete database entries.

9. WEIGHING

Load the weighing pan. Upon displaying ◣◢ marker on the left, you can read weighing result.
Record/printout of the measurement result is available on pressing <PRINT> key:

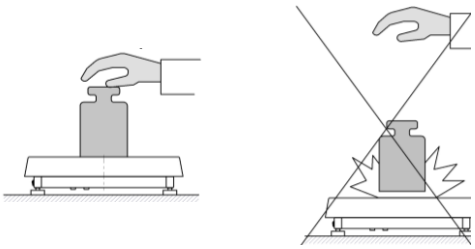
- for verified weighing instruments – only stable weighing result is recorded or printed (stability marker ◣◢ displayed),
- for non-verified weighing instruments – stable or unstable weighing result is recorded or printed (stability marker ◣◢ not displayed**)**; Unstable weighing result is marked with <**?**> on the printout, the question mark is printed next to the weight value.

9.1. Good Weighing Practice

To assure long-term operation and correct mass measurements, follow the rules presented below:

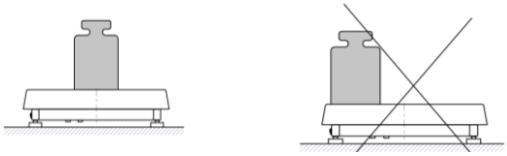
- Start the moisture analyzer with no load on the weighing pan (permissible value of load on the weighing pan at start is ±10% of the maximum capacity).
- Load the weighing pan steadily avoiding shocks:

YES NO



- Place weighed loads centrally on the weighing pan:

YES NO



- Avoid side loading, in particular side shocks:

NO NO

9.2. Log In Operation

In order to access operator-related parameters and in order to edit databases, you need to log in as an operator with **<Administrator>** permissions levels.

First log in operation:

- Go to home screen, press button, wait for the operators database to open.
- Select **<Admin>** operator, wait for the on-screen keyboard with a password box to open.
- Enter **„1111”** password and press button to confirm.
- The home screen is displayed.
- When logged, add operators and set permissions (*for detailed procedures read the user manual*).

While logging in again, select an operator from the list and enter the password; the program initiates operation with permissions set for the selected operator.

Log Out operation:

- Go to home screen, press button, wait for the operators database to open.
- Select **<Log out>** option (*1st position on the operators list*).
- The home screen is displayed.

Permissions

There are 3 permissions types: *administrator, advanced operator, operator*.

Access to operator-related parameters, databases and program functions is conditioned by permissions:

Permissions	*Available parameters and functions*
Operator	Operator can edit the following submenus: parameters of <Readout/Filter> submenu, set parameters of <Misc.> submenu (except for <Date and time>, <Permissions>, <Software update> parameters). Operator can run and carry out all weighing operations. Operator can preview <Databases> data, and define universal variables.

Advanced operator	Operator can edit the following submenus: <Readout>; <Working modes>; <Communication>; <Peripherals>; <Misc.> (operation of <Date and time>, <Permissions> and <Databases> edition excluded). Operator can run and carry out all weighing operations.
Administrator	Operator can edit all operator-related parameters and all databases, and use all functions.

10. ADJUSTMENT

In order to ensure the highest weighing accuracy, it is recommended to periodically introduce a corrective factor of indications to moisture analyzer memory, the said factor must be referred to a reference mass.

Adjustment has to be carried out:
- prior weighing,
- if long breaks between successive measuring series occur,
- if the weighing instrument temperature has changed by 2°C

Adjustment types:
- internal adjustment (*function enabled for MA xx.X2.IC.A moisture analyzers)*
- adjustment performed using an external weight of declared mass, which mass cannot be modified, or using an external weight of mass equal to or greater than 30% of the maximum capacity.

Caution:
Remember to carry out the adjustment process when there is no load on the pan! When the weighing pan is loaded, command ***<RANGE EXCEEDED>*** *is displayed. In such case, unload the weighing pan and repeat the adjustment. Adjustment process can be aborted if necessary, to do it press* ⏎ *key.*

10.1. Internal Adjustment

Caution: function enabled for MA xx.X2.IC.A moisture analyzers exclusively.

Internal adjustment is carried out by means of an internal adjustment weight. <⚖> button, when pressed, automatically triggers adjustment process. Upon adjustment process completion, a respective message is displayed informing on the process status.
Caution:
Moisture analyzer adjustment procedure requires stable conditions (no air drafts, no vibrations), the weighing pan must be unloaded in the course of adjustment.

10.2. External Adjustment

External adjustment is carried out using an external mass standard of the right accuracy and weight value, which value depends on weighing device model and capacity. Correction is carried out semi-automatically, successive process stages are signalled with prompts.

Procedure:
- Enter <Adjustment> submenu, next select “External adjustment” option.
- Message <Remove weight> is displayed.

- Unload the weighing pan and press ✓ button. The balance determines start mass, message: **<Adjustment; Please wait…>** is displayed.
- Upon completed start mass determination, message <Put weight> is displayed along with particular value of mass standard assigned to the moisture analyzer.
- Load the weighing pan with the required adjustment weight and press ✓ button.
- Upon completed procedure, message <Remove weight> is displayed.
- Take the weight off the weighing pan, the moisture analyzer displays the <Adjustment> submenu.

11. WORKING MODES – General Information

X2 series balances feature the following working modes:

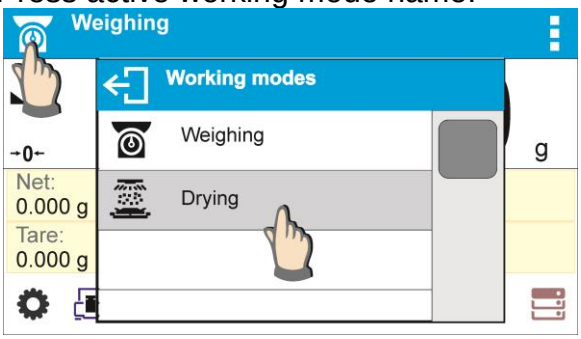
	Weighing Means of operation: weight of a load is determined through an indirect measurement. The moisture analyzer measures gravitational force which attracts the load. The obtained result is processed and displayed on the moisture analyzer screen in a digital format.
	Drying Means of operation: The moisture content value is obtained via evaporation of moisture from sample placed inside the drying chamber. The result is calculated automatically (and displayed) in real time, the calculation is made on the basis of sample mass at the beginning, in the course, and at the end of the process.

Particular working modes feature specific settings. The settings enable adapting mode operation to your individual needs. They are activated upon selecting a respective profile. For detailed description of specific working mode settings refer to the given working mode section.

11.1. Running Working Mode

To run working mode other than currently operated one:

- Press active working mode name.



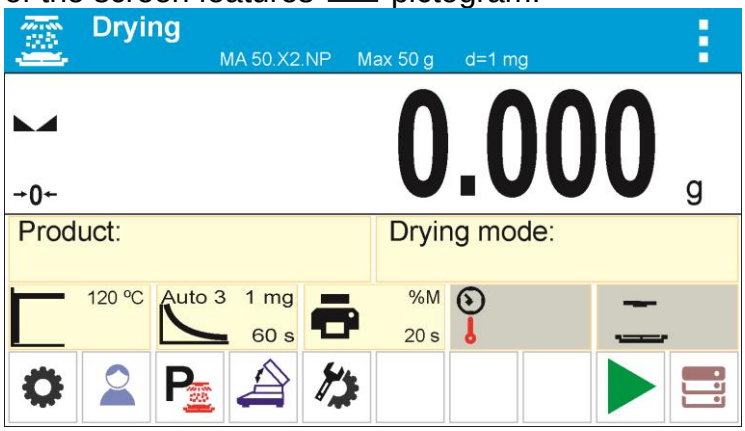
- List of working modes is displayed.
- Select the mode that is to be operated.

12. DRYING

DRYING mode enables to determine moisture content of a given sample. The moisture content value is obtained via evaporation of moisture from sample placed inside the drying chamber. The result is calculated automatically (and displayed) in real time, the calculation is made on the basis of sample mass at the beginning, in the course, and at the end of the process.

Procedure for activation of Drying mode:

- Select <Drying> mode, the home screen is displayed automatically, wherein the top bar of the screen features pictogram.



Info field provides the following information:

- Product
- Drying program
- Drying profile and drying temperature value
- Finish mode
- Printout parameters
- Info field displaying (in the course of drying) time and drying temperature values
- Info field displaying chamber status
- Buttons: parameters, user, drying program, open/close cover, drying mode settings, start, databases

12.1. Mode Related Settings

The supplementary settings enable you to adjust the working mode to your needs and requirements.

Drying profile
Parameter enabling you to select respective drying profile and set drying temperature.

Finish mode
Parameter enabling you to select respective finish mode and set its parameters.

Printout parameters
Parameter enabling you to set the drying process unit for both the display and the printout, and measurement result printout interval during drying.

Prognosis
Parameter enabling to turn on/off result prognosis function.

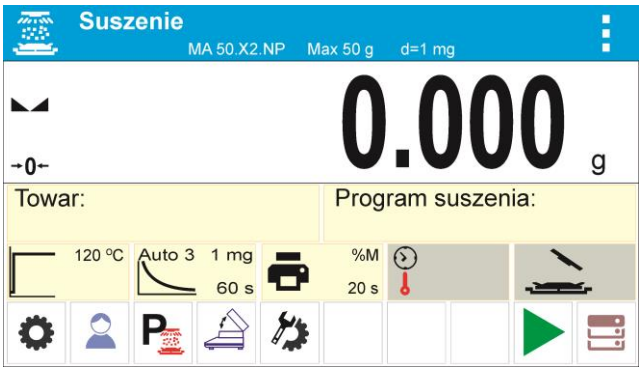
Close the cover and turn the moisture analyzer off
Parameter enabling you to activate/deactivate auto opening/closing of the drying chamber's lid upon switching the moisture analyzer off by pressing ⏻ button.

Drying process wizard
Parameter enabling to turn on/off hints for the next steps at the drying process start.
For means of operation of the remaining functions read point *9.11 WEIGHING Mode Settings*.

12.2. Drying – Quick Access Buttons

Each working mode features automatically displayed set of default buttons. The set can be modified, i.e. you can add out-of-list quick access buttons to it. Such operation requires particular permissions. List of quick access buttons is to be found in section 8.6 of this user manual.

13. DRYING PROCESS PERFORMED BY MEANS OF QUICK MENU

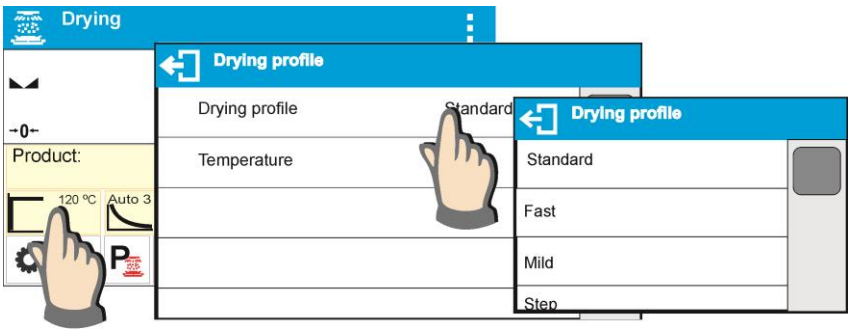


Default display in drying mode.

Current drying parameters are displayed in a form of pictograms in the middle of the workspace. To carry out drying process in accordance with other parameters, enter the settings and modify parameters. Press Settings pictogram to enter settings.

Prior to drying process start set the following parameters:
- drying profile and drying process parameters
- finish mode and finish mode parameters
- unit of a displayed and printed result
- interval of results printout during drying process

13.1. Drying Profile and Drying Process Parameters

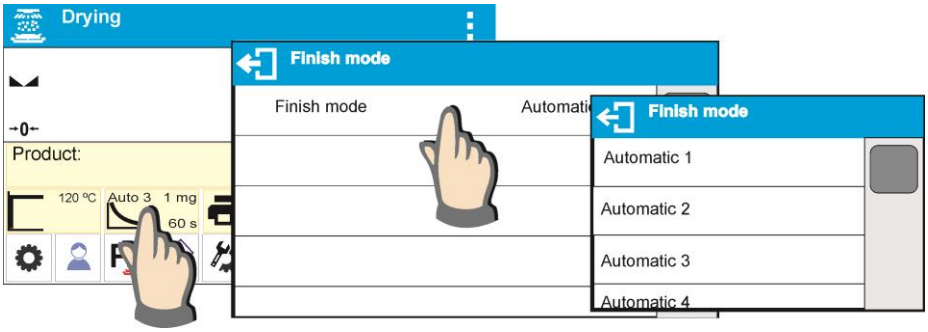


Enter drying profile settings and select respective drying profile. Upon selecting a profile, set its respective parameters. Parameters depend on selected profile.

Drying profile parameter's values:

- **STANDARD** drying profile
- **FAST** drying profile
- **MILD** profile
- **STEP** profile

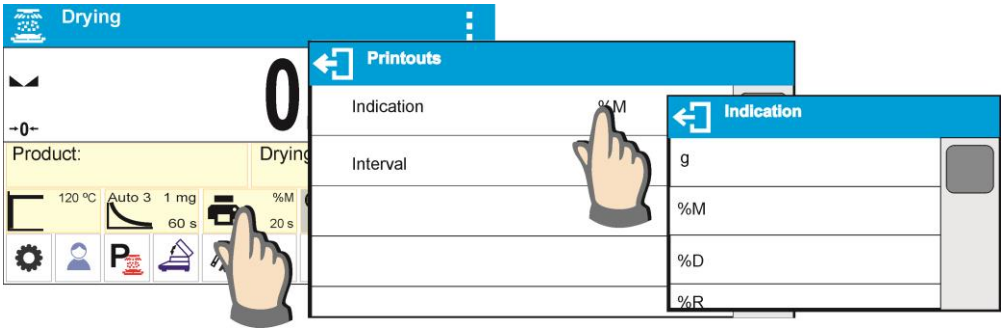
13.2. Finish Mode



Finish mode parameter's values:

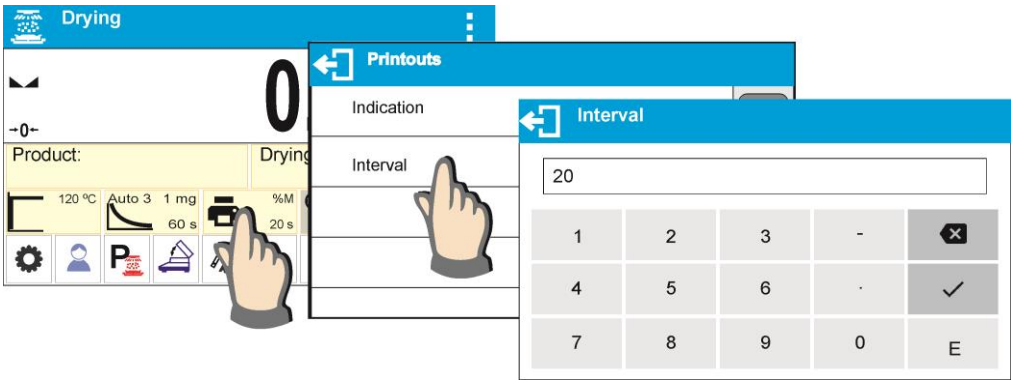
Automatic 1 - auto switch-off (1mg /10s),
Automatic 2 - auto switch-off (1mg /25s),
Automatic 3 - auto switch-off (1mg /60s),
Automatic 4 - auto switch-off (1mg /90s),
Automatic 5 - auto switch-off (1mg /120s),
Manual
Time-defined
Defined 1
Defined 2
Test

13.3. Unit of a Displayed and Printed Result



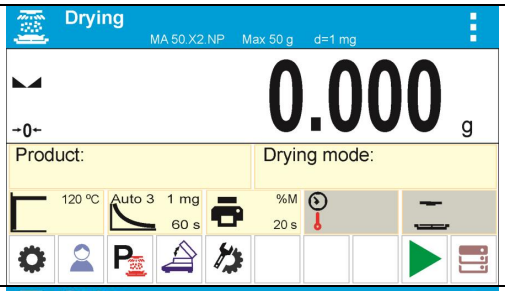
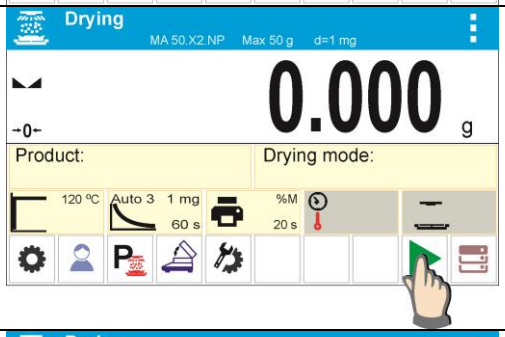
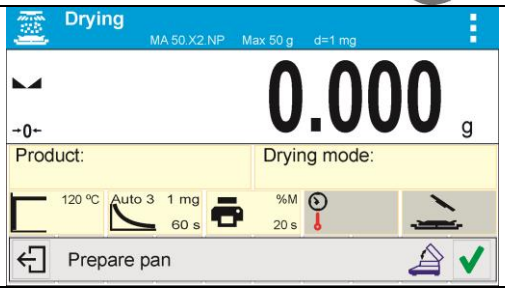
g - mass change; measurement result is mass change recorded during drying process.
%M - percent loss of weight, displays weight change recorded during drying process expressed in percent,
%D - part of dry mass obtained during drying process, expressed in percent, measurement result is part of mass that is remaining on a drying pan after humidity content evaporation,
%R - humid / dry ratio obtained as a result of drying process, expressed in percent, measurement result is part of mass that evaporated from the dried sample during drying process,

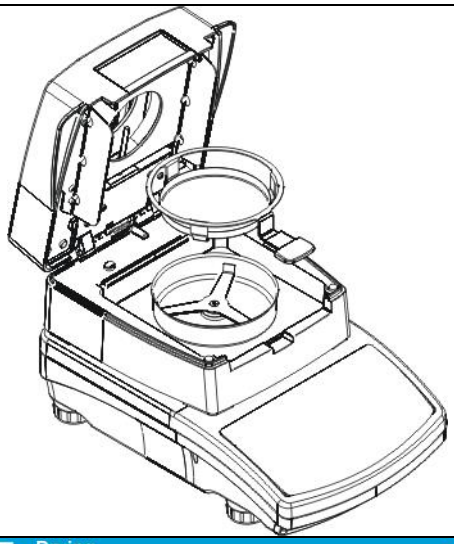
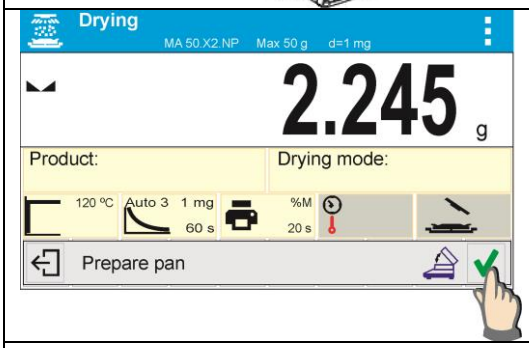
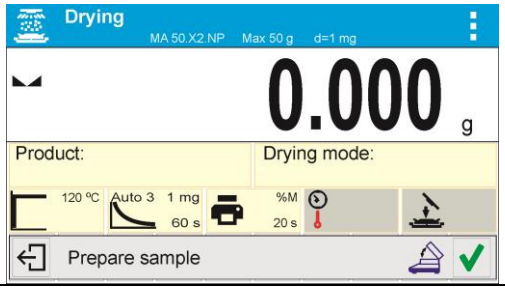
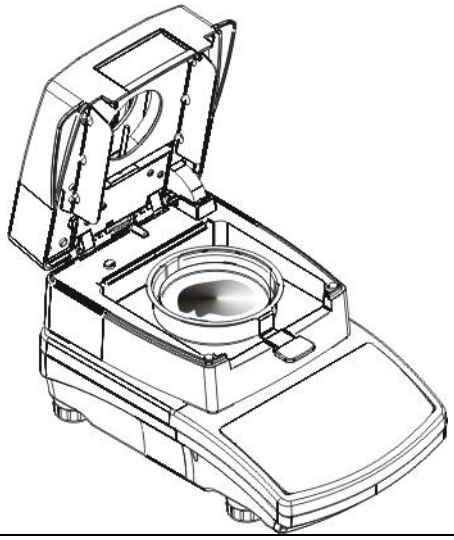
13.4. Printout Interval

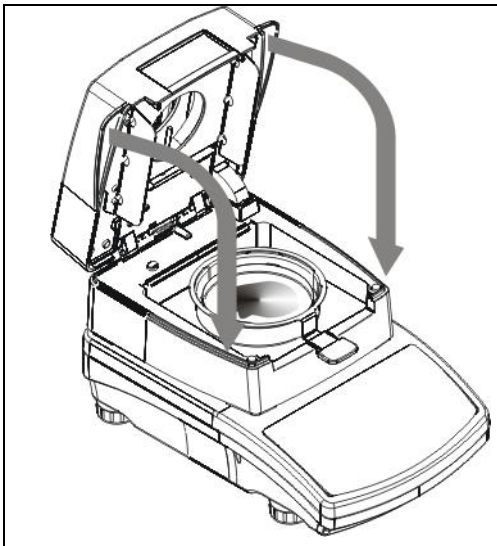


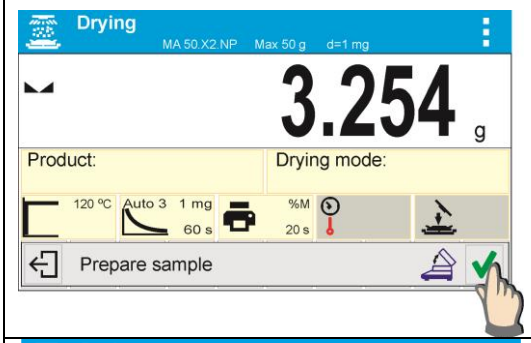
The time interval between printouts in seconds ranging from 0 to 120.

14. DRYING PROCESS

	Drying process settings are displayed in the information field above the buttons.
	Press Start button to start drying process. If the drying chamber's lid is closed, it gets opened automatically. Prompts and messages are displayed making moisture analyzer operation easier. Follow the displayed prompts to correctly prepare the sample and to perform the process of humidity content determination for a tested sample.
	Program prompts you to prepare a weighing pan. A respective pictogram on drying chamber status is displayed.
	Place the disposable weighing pan in a pan handle and set it on a cross-shaped holder. The display shows disposable pan weight. It is recommended to close the drying chamber in order to provide stable ambient conditions while taring, to do it press  button.

	
	Press ✓ button to zero the weighing pan weight.
	Indication equals ZERO, drying chamber's lid gets opened automatically, subsequent prompt is displayed and the pictogram on drying chamber status changes.
	Load the weighing pan with the sample. Sample mass shall be selected on the basis of prior experience and tested material characteristics.



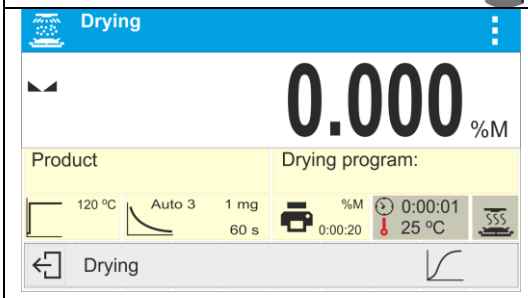


Upon sample preparation and result stabilization press ✓ button to confirm sample preparation completion.
Drying chamber's lid gets closed automatically, the drying process starts.

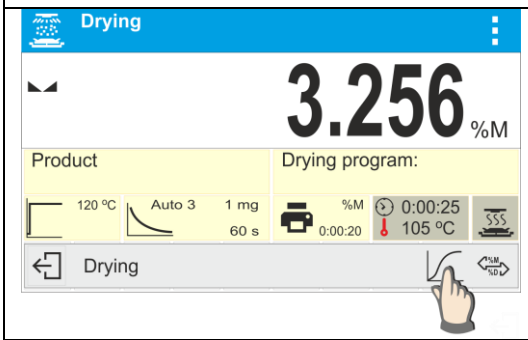
Optionally you can press  button to close the drying chamber. This will also trigger the drying process start.

It is likewise possible to:

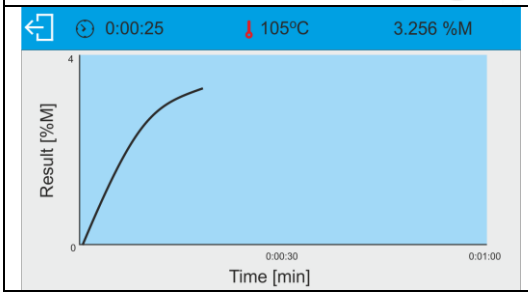
- close the drying chamber by clicking  pictogram first, and
- start drying by clicking ✓ pictogram next.

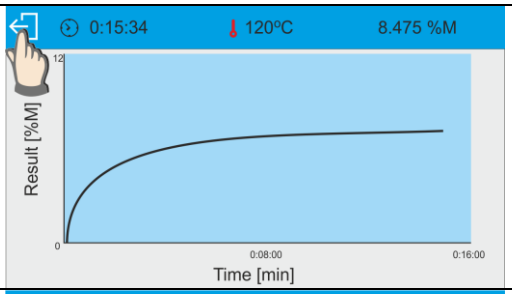
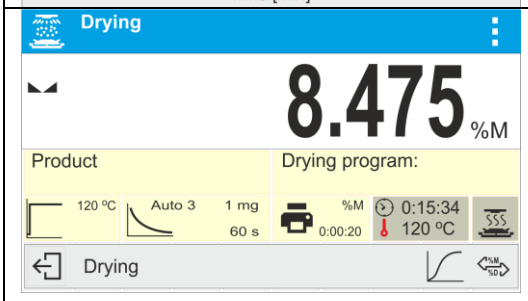
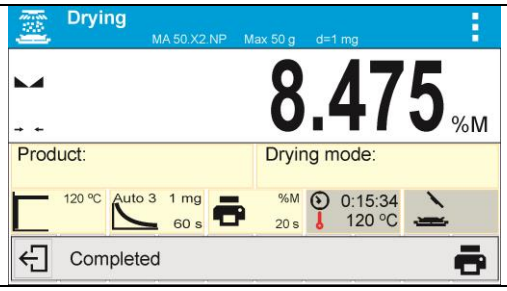


Information on the drying process is displayed, moisture analyzer proceeds to carrying it out accordingly to set parameters. Required mass measurements and calculations of tested sample moisture content are performed, wherein the calculations are a result of mass change.
Upon process start, printout header is sent to a selected interface (accordingly to set printout options – parameter group DRYING PROCESS REPORT/HEADER).



Press  button to preview drying process graph.



	Press ⏎ button to return to the home screen.
	In course of a drying process current weight results and information on the process is displayed (test duration, drying chamber temperature, etc.). In course of a drying process (accordingly to set printout options – parameter group DRYING PROCESS REPORT/MEASUREMENT) measurements are sent to a selected communication port in a preset time intervals (INTERVAL).
	Press %M/%D to swap between displayed result types.
	Upon drying process completion, summary of the test is displayed, final moisture content result is held, drying chamber's lid gets opened automatically. Upon process stop, printout footer is sent to a selected interface (accordingly to set printout options – parameter group DRYING PROCESS REPORT/FOOTER).

Drying process can be aborted at any time. Press ⏎ button to abort the drying process and press ✓ button to confirm.
Manual auto switch-off mode is an exception to the rule – for moisture analyzer working in this mode, the drying process ends upon pressing ⏎ button. There is no need to confirm by pressing ✓ button.

Drying report is printed again by pressing 🖶 button.

The report is automatically saved to reports database.

Press ⏎ button to return to home screen. Moisture analyzer returns to its initial state, completed process summary is blanked. The moisture analyzer is ready to perform another test.

15. COMMUNICATION

Communication menu is located in <Parameters> menu. It is accessed by pressing button. Communication between the PUE C315 indicator and the peripheral devices is established via the following ports:

- COM 1 (RS232),
- USB 1 type A
- USB 2 type B
- Ethernet,
- Wi-Fi.

In order to set the ports go to <Communication> submenu.

Press key, next select „Communication" parameter group.

16. PERIPHERALS

<Peripherals> menu is located in <Parameters> menu. It is accessed by pressing button. Peripherals menu provides list of devices that can be integrated with the moisture analyzer.

- Computer
- Printer
- Barcode Scanner

17. COMMUNICATION PROTOCOL

General Information

A. A character based communication protocol (moisture analyzer-indicator) is designed for establishing communication between a RADWAG moisture analyzer and a peripheral device.
B. The protocol consists of commands sent from a peripheral device to the weighing instrument and responses from the weighing instrument.
C. Responses are sent from the weighing instrument each time a command is received.
D. Commands, forming the communication protocol, enable obtaining data on weighing device status and facilitate influencing weighing device operation, e.g.: acquiring measurement results from the weighing device, zeroing, etc.

17.1. Manual Printout / Automatic Printout

The moisture analyzer enables generating manual or automatic printouts.

- Manual printout: upon indication stabilization press key.
- Automatic printout is generated automatically in accordance with the settings for automatic printout (read section 9).

The content of printout depends on settings of <Standard printout> menu - <GLP Printout> (read section 12.3).

Mass printout format:

1	2	3	4 -12	13	14	15	16	17	18
stability marker	space	stability	mass	space	unit			CR	LF

Stability marker	[space] if stable [?] if unstable [^] if high limit is out of range [v] if low limit is out of range
Character	[space] for positive values [-] for negative values
Mass	9 characters with decimal point, right justification
Unit	3 characters, left justification

Example:

_ _ _ _ _ _ **1 8 3 2 . 0** _ **g** _ _ **CR LF** - a printout generated, with reference to <GLP printout> settings, from a weighing device upon pressing  key:

Date	**NO**	Universal variable 3	**NO**
Time	**NO**	NET	**NO**
Operator	**NO**	Tare	**NO**
Product	**NO**	Gross	**NO**
Customer	**NO**	Current result	**YES**
Packaging	**NO**	Adjustment report	**NO**
Universal variable 1	**NO**	Non-standard printout	**NONE**
Universal variable 2	**NO**		

18. ERROR MESSAGES

Max weighing threshold exceeded
Unload the weighing pan

Min weighing threshold exceeded
Install weighing pan

Zeroing out of range
Press tarring button or restart the balance

Display capacity out of range
Unload the weighing pan

Tarring out of range
Press zeroing button or restart the balance

Start mass out of range
Install weighing pan

Zeroing/tarring time out of range
Weighing indication unstable

19. MOISTURE ANALYZER MEANS OF OPERATION

For measurement temperatures ranging from 161°C to 250°C the time of maintaining the temperature during the measurement is estimated proportionally, ~15 hours for 161°C – 10 min for 250°C.

For a drying process carried out in 250°C, Max temp is maintained for 10 min, next the program automatically lowers the temperature (drying is not interrupted) to 160°C.

Lowering temperature to 160°C takes ~10 min.

For QUICK drying mode Max drying temperature remanipulation is 30% but no more than Max temperature for a particular moisture analyzer.

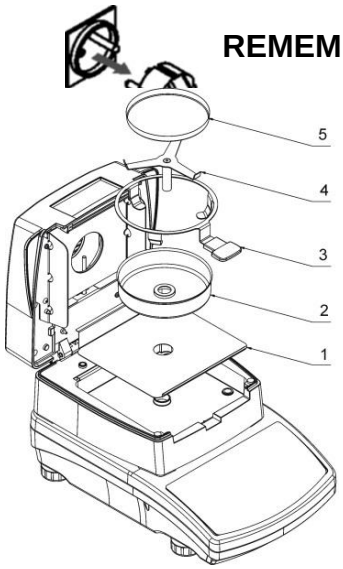
20. MAINTENANCE ACTIVITIES

This section describes how to maintain the moisture analyzer in good condition, and how to replace its faulty components (filaments, fuses).

Caution:
In case of heavy dust occurring at the place of moisture analyzer operation, it is recommended to commission an inspection of the device to be carried out by RADWAG service every 6 months.

20.1. Cleaning Moisture Analyzer Components

In order to ensure required measuring accuracy, the moisture analyzer has to be used and stored clean.
While cleaning the moisture analyzer, obey precautions provided in this section.



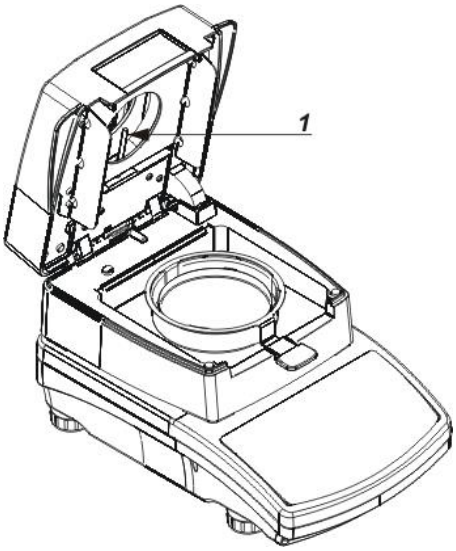
REMEMBER– before initiating any maintenance or cleaning activities switch off the moisture analyzer and make sure the power cord is unplugged from the mains!

Open moisture analyzer's cover and take out all components of the drying chamber: disposable pan, weighing pan handle, cross-shaped holder, weighing pan shield, drying chamber base insert. During maintenance activities follow the description from section 4.5 of this user manual.

Upon cleaning let the subassemblies dry.
Make sure no liquids or dirt get inside the drying chamber.

Install clean components following the diagram.

20.2. Cleaning Temperature Sensor



To ensure correct temperature measurement make sure that the temperature sensor is clean (1).
Take extra precautions while cleaning the device.
Clean the moisture analyzer using soft fabrics and mild cleaning agents. Do not use any abrasive agents or solvents as it may cause damage to the sensor.
Neither IR emitter nor halogen shall be touched in the course of cleaning activities, this is to prevent risk of damage.
It is possible to clean emitter's shields if there is such a necessity. To do that, use soft fabrics exclusively. Remember not to touch the emitters.

20.3. Troubleshooting

Problem: no reaction to pressing main switch on/off key (display remains dark).
Probable cause:

- no voltage in the mains,
- damaged power cord,
- damaged fuse of the moisture analyzer,
- damaged moisture analyzer.

Problem: too long pending time for drying process finish.
Probable cause:

- - incorrect finish mode selected - select it experimentally

Problem: lack of measurements repeatability
Probable cause:

- non-uniform sample content – prepare the sample using larger amount of substance.
- the drying time is too short – change finish mode.
- drying temperature is too high, causing sample's oxidizing - lower drying temperature.
- tested sample boils - lower drying temperature.
- the temperature sensor is contaminated or defected - clean the temperature sensor.
- the weighing table on which the moisture analyzer is located is unstable - move the device to a different workstation.
- the ambient area is incompatible with the requirements (vibrations, drafts, etc.) - change the ambient conditions for compatible ones according to the guidelines of this service manual.

RADWAG BALANCES AND SCALES
ADVANCED WEIGHING TECHNOLOGIES