

Operating Instructions

METTLER TOLEDO

MCP Multichannel Pipette Calibration Systems



Figure A: Overview

- 1 Evaluation unit (for details, see figure D)
- 2 Motor control unit
- 3 Measuring unit (for details, see figure C)

Figure B: Connections (back of the instrument)

Evaluation unit:

- 4 CAN socket (connection to the motor control unit)
- 5 DB-25 socket, female (connection to the measuring unit)
- 6 Connection socket for AC adapter

Motor control unit:

- 7 9-pin D-SUB socket, female (connection to the PC via converter/hub)
- 8 CAN socket (connection to the evaluation unit)
- 9 15-pin D-SUB socket, female (connection to the measuring unit)
- 10 Connection socket for AC adapter

Measuring unit:

- 11 15-pin D-SUB socket, female (connection to the motor control unit)
- 12 DB-25 socket, female (connection to the evaluation unit)





Figure C: Detailed view of the measuring unit

- 13 Leveling screw
- 14 Rack with containers
- 15 Slide for rack cover
- 16 Rack cover
- 17 Level indicator
- 18 Housing with weighing cell and transport mechanism
- 19 Weighing yoke
- 20 Rack support





Figure D: Detailed view of the evaluation unit

- 21 Status indicators for vibration adapter, weighing process adapter and repeatability (from left to right)
- 22 Alphanumeric display (weight value, menu, messages)
- 23 Calibration symbol (appears when weighing cell requires calibration)
- 24 Operator keys with the following functions:

In measuring mode:

	Press briefly	Press and hold down
«1/10d», «Cal»	Change the display resolution	Internal calibration of the weighing cell
«  », «Menu»	No function	Call the menu
«Start», «  »	Start measuring cycle or reference measurement	Trigger a reference measurement
«On/Off», «  /T  », «C»	Switch on the MCP Cancel a process in progress Set the display to zero	Switch off the MCP

In the menu:

	Press briefly	Press and hold down
«1/10d», «Cal»	No function	No function
«  », «Menu»	Select the next menu item	Exit the menu after storing the settings
«Start», «  »	Change the setting	No function
«On/Off», «  /T  », «C»	Exit the menu without storing	No function

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1 Getting to know the MCP

This section provides basic information about your MCP multichannel pipette calibration system. Please read this section carefully, even if you already have experience with similar systems and be sure to familiarize yourself with the safety instructions.

1.1 Introduction

Thank you for choosing the MCP from METTLER TOLEDO.

The MCP enables you to determine the precise volume of pipettes with one or more channels (max. 12 channels). To do this, the MCP determines the amount of water pipetted for each channel and transfers this data to a computer, where it is converted into volume values and processed further. A special application is available from METTLER TOLEDO for evaluating the data, however, the MCP can also be integrated into existing applications.


The MCP supports pipette calibration in accordance with common standards (such as **ISO 8655**) while considerably reducing the time required for the measuring sequence. Several MCP can be combined with one another to speed up the operating sequence further. With an array of five MCP for example, the calibration of a 12-channel pipette requires less than a quarter of an hour (three volumes with 10 measurements each, according to ISO 8655).

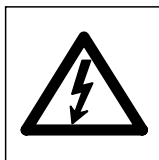
The built-in moisture trap and an additional measurement to compensate for evaporation reduce measurement errors, which can occur due to evaporation of the medium during the measuring cycle.

The MCP is suitable for mobile use: All system components are housed in a stable transport case, which provides optimum protection.

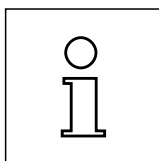
1.2 What you should know about these instructions

The following conventions apply to the operating instructions as a whole:

Key designations are enclosed in double angle brackets (e.g. «**On/Off**» or «»).



These symbols indicate safety and hazard instructions. If these are not complied with, injury to the user, damage to the MCP or other tangibles and malfunctions can result.



This symbol indicates additional information and directions, which if observed, facilitate your handling of the MCP and contribute to proper and economical use of the system.

1.3 Safety has priority

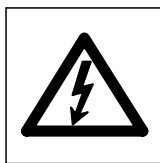
Operate and use the MCP only according to the directions in these operating instructions.

It is essential to follow the startup instructions for the MCP.

If the system is not used according to the manufacturer's operating instructions, the instrument protection provided may be impaired (see also section 5.4.4 of EN 60101:01).



The MCP may only be used in closed rooms. Operation in hazardous environments is not permitted.



Only use the AC adapter supplied with the MCP and ensure that the voltage values printed on it correspond to the local line voltage. Only connect the adapter to sockets with ground connection.



All components of the MCP have a rugged construction, but are still precision instruments. Treat them with appropriate care.

Do not open the components of the MCP, they do not contain any parts that can be maintained, repaired or replaced by the user. Should you have problems with your MCP on the odd occasion, please contact your responsible METTLER TOLEDO dealer.

Only use optional equipment and peripherals supplied by METTLER TOLEDO with the MCP; these have been designed to work optimally in the system.



Disposal

In conformance with the European Directive 2002/96/EC 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 Standard equipment

Following receipt of the MCP, you should first check the scope of delivery. If this does not correspond to your order or the delivery note, please contact the responsible METTLER TOLEDO dealer. The illustrations in this section also show you the correct way to pack all the parts should you ever need to transport the MCP to another location.

2.1 Contents of the large transport case

The MCP is supplied in a rugged transport case, which reliably protects the system components during transport.

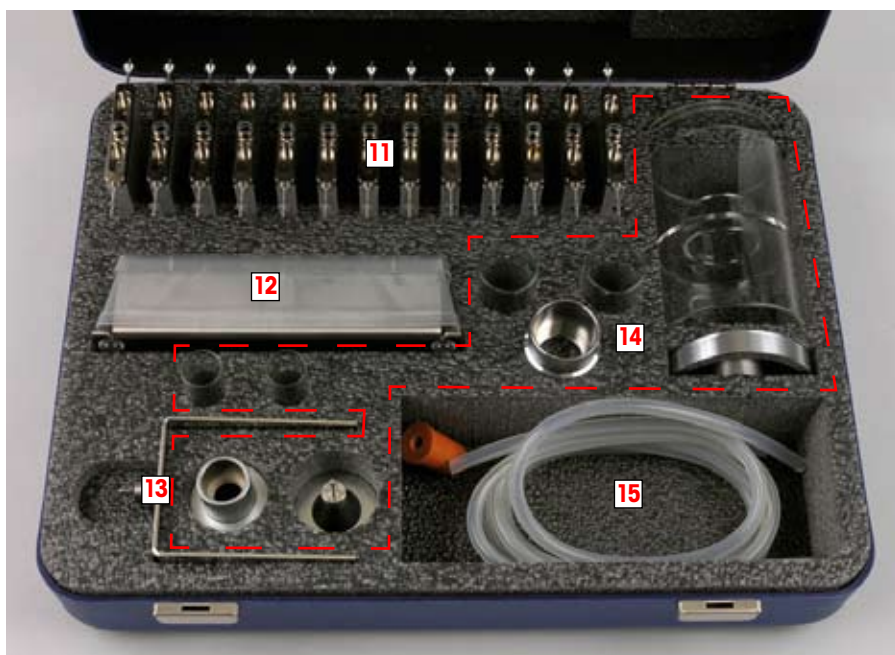


1	Small transport case (for contents see section 2.2)
2	Evaluation unit
3	Motor control unit
4	Measuring unit
5	Rack with mounted rack cover and slide

6	Rack support
7	AC adapter for evaluation unit (primary: 230 V AC or 115V AC, 50/60Hz; secondary: 12V AC) including wall mounting plate
8	Cable set consisting of: 2 power cables for the AC adapters of the evaluation unit and the motor control unit. If the scope of delivery includes a suction pump (item 10), an additional power cable is supplied. 1 balance cable (connection cable for evaluation unit/measuring unit 60 cm long, 25-pin, m/m) 1 CAN cable (connection cable for evaluation unit/motor control unit 30 cm long, m/m) 1 control cable (connection cable for motor control unit/measuring unit 60 cm long, 15-pin, m/m) 1 USB/serial converter
9	AC adapter for motor control unit (primary: 100 - 240 V AC, 50/60Hz, 0.8A; secondary: 12VDC, 2.25A). If the scope of delivery includes a suction pump (item 10), an additional AC adapter for the pump is supplied.
10	Single-channel suction pump for emptying the containers (Note: For systems that include several MCP, only one single-channel suction pump is supplied). An optional 4-channel suction pump is available to increase efficiency when emptying the containers, see section 8.8.

2.2 Contents of the small transport case

The small transport case is housed in the large case and contains the following parts:



11	Containers (13 pieces)
12	Water reservoir with cover and holder
13	Weighing yoke (Caution: Do not squeeze the yoke when removing from the case!)
14	Single-channel kit (parts inside the dashed red frame). After installation of this kit the MCP is ready for the calibration of single-channel pipettes.
15	Small parts (rubber cone for removing the glass tubes of containers, tubes for the suction pump, etc.)

2.3 Other components supplied

A **USB/serial converter** including driver software and instructions is also supplied with each MCP. This can be used to connect the MCP to a PC using a USB interface. For systems that include several MCP, a **USB hub** is also supplied (including a power supply with a mains plug adaptor specific to the country). Each MCP in the system is connected to the hub via the USB/serial converter, which in turn is connected to the PC (**Note:** Depending on the current technology used and availability, a hub with an integrated USB/serial converter may be supplied). Alternatively, each MCP can be connected directly to an RS232C interface on the PC.

Depending on the scope of your order, the delivery may include other optional items, which are not listed above (e.g., PC software, calibration kit for the control of inspection, measuring and test equipment, etc.).

3 System setup and cabling

This section provides information about setting up and selecting the location for the MCP.

3.1 Selecting the location

Please observe the following notes when selecting a suitable location:

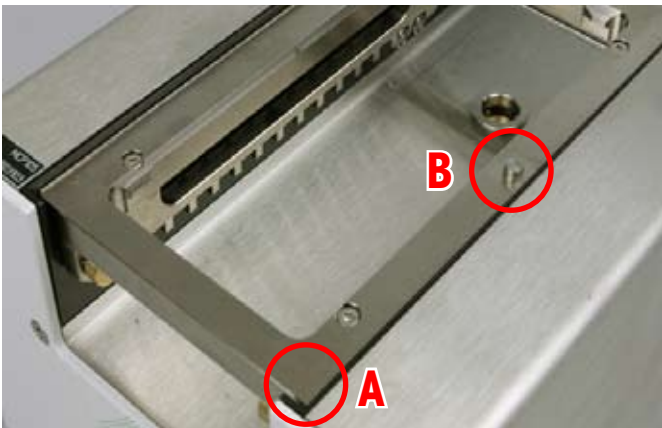
- Dry, closed room
- Stable, vibration-free and horizontal surface
- No strong fluctuations in the ambient temperature or atmospheric humidity. **For good results the ambient humidity should be in the range of 50 - 60 % rh.** No drafts (windows, doors, air conditioning units, extraction hoods, etc.) and no direct sunlight.
- Operation in hazardous environments is not permitted

3.2 Assembling and leveling the measuring unit

The evaluation unit and motor control unit are supplied ready for cabling and do not need to be mounted. The measuring unit consists of different components which must be assembled. There are two assembly procedures, one for the calibration of multichannel pipettes and one for single-channel pipettes. The next two sections cover both procedures separately.

3.2.1 Preparing the MCP for the verification of multichannel pipettes

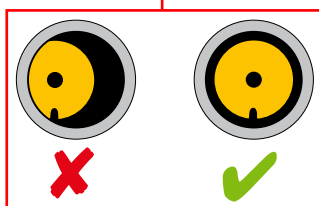
Place the measuring unit at the selected location.

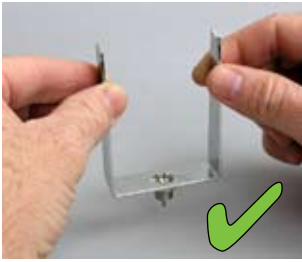


Insert the **rack support** in the front position (towards the front panel) in the measuring unit (**A**). The pin on the rack support must be on the right-hand side (**B**). **Note:** If the rack support is not installed correctly, it will not be level and the MCP will not work properly.



During transportation, the **weighing yoke support of the measuring cell** may become misaligned, i.e. it is not located in the center of the opening in the measuring unit. In this case, use a small item (thin pencil, clip or the like) to center the weighing yoke support again.





Carefully take the **weighing yoke** out of the small transport case. Handle the weighing yoke as shown in the opposite figure (left) and make sure not to squeeze it!



Carefully insert the **weighing yoke** in the opening provided in the base of the measuring unit. **Important:** A large and small pin are located at the foot of the weighing yoke, which center the yoke in the weighing cell. Ensure that both pins are in the corresponding holes in the weighing cell.



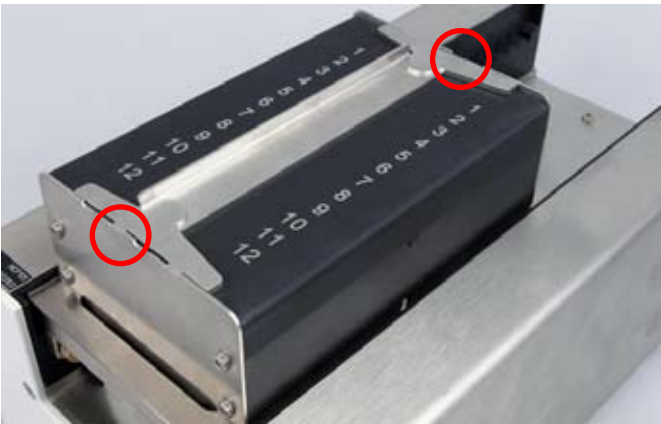
Carefully insert the **rack** in the rack support. The rack only engages correctly in the cam on the rack support when both slots are on the right-hand side. When inserting the rack, ensure that the weighing yoke remains in its place.



Place the 12 **containers** in the rack. Ensure that the conical centering spigots of the containers are on the outside of the indented guide rail on both sides.



Place the **rack cover** on the rack. The cam on the side of the cover must point towards the right and engage in the corresponding slot on the rack.



Place the **slide** on the rack cover. Ensure that the cams on the slide engage in the corresponding slots on the rack. The illustration opposite shows the slide in the open state with free access to the containers. To seal the filler openings, hold the slide on the tab and slide it to the left.

Note: The slide can also be mounted at a 180° angle, thus enabling user-friendly operation for right and left-handed users.

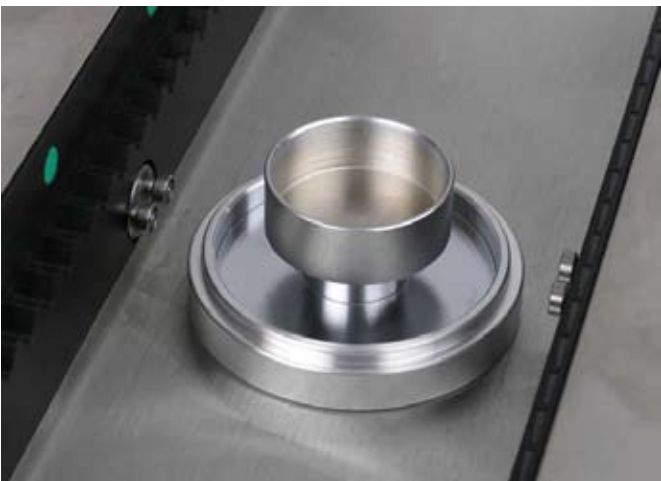
Level the measuring unit (see section 3.2.3).

3.2.2 Preparing the MCP for the calibration of single-channel pipettes

The calibration of single-channel pipettes requires the so-called "**single-channel kit**". You will find the respective parts in the small transport case (see section 2.2). In case these parts are not included in the standard delivery you will have to order the single-channel kit separately.

Place the measuring unit at the selected location.

Install the **centering ring** and the **weighing pan**.





Install the large or small **glass tube holder** depending on your requirements, then insert the appropriate **glass tube** (the figure shows the large glass tube holder).



Install the **evaporation trap** and put on the **glass cover**.

Level the measuring unit (see section 3.2.3).

3.2.3 Leveling the measuring unit

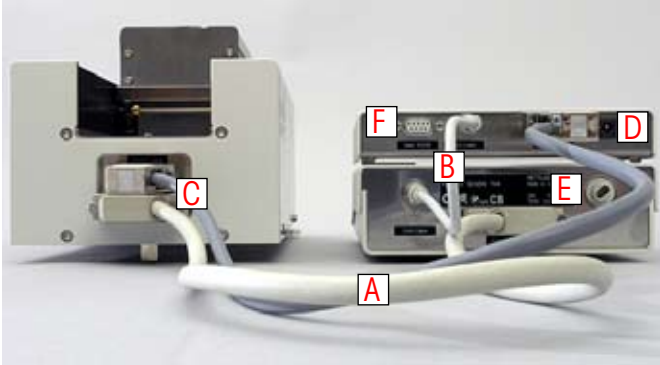


Turn both **leveling screws** on the front of the measuring unit until the air bubble is in the center of the **level indicator**.

Note: An incorrectly leveled measuring unit can result in measurement errors.

3.3 System cabling

Place the evaluation unit next to the measuring unit and then place the motor control unit on the evaluation unit. The components are now ready to be cabled. **Note: For systems that include several MCP, only cable the associated components. In this case, please note the serial numbers on the evaluation unit and the measuring unit. They must be identical.**



Cable the components as follows:

- A** Connect the evaluation unit to the measuring unit. To do this, use the 60 cm balance cable with the 25-pin connectors (m/m).
- B** Connect the evaluation unit to the motor control unit. To do this, use the 30 cm CAN cable (m/m).
- C** Connect the motor control unit to the measuring unit. To do this, use the 60 cm control cable with the 15-pin connectors (m/m).

- D First** connect the motor control unit to the power supply. To do this, use only one of the two AC adapters supplied (primary: 100 - 240 VAC, 50/60Hz, 0.8A; secondary: 12VDC, 2.25A). **Note:** If the motor control unit is connected to the power supply **after** the evaluation unit, problem-free operation of the system is not guaranteed.
- E** Connect the evaluation unit to the power supply (the motor control unit must already be connected to the power supply, see above). To do this, use only the AC adapter supplied (primary: 230VAC, 50/60Hz, 90mA; secondary: 12VAC, 1.25A).
- F** Connection of the motor control unit to the PC by means of the supplied USB/serial converter. The type of connection to the PC varies depending on the MCP system type and the scope of delivery. For the moment, we recommend that you do not yet connect the MCP to the PC but first familiarize yourself with the operation of the MCP in the next section. The connection to the PC and the corresponding configuration are described in section 9.

4 Startup and menu settings

This section provides information about starting up the MCP and the menu system, which can be used to adapt your MCP to the relevant operating conditions. It is assumed that all the components of the MCP have been cabled correctly (section 3).

4.1 Switching the MCP on and off

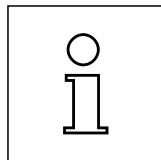
As soon as the evaluation unit is connected to the power supply, the MCP starts up automatically.



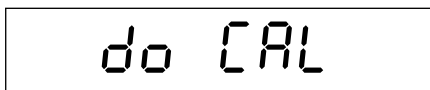
To switch off the system, press and hold down the «On/Off» key until "OFF" appears in the display. When you release the key, the display goes blank.



To switch the system on again, briefly press the «On/Off» key. The start-up procedure takes a few seconds and during this time various segments of the display show up briefly. As soon as the weight display or a message appears in the display, the system is ready to operate.



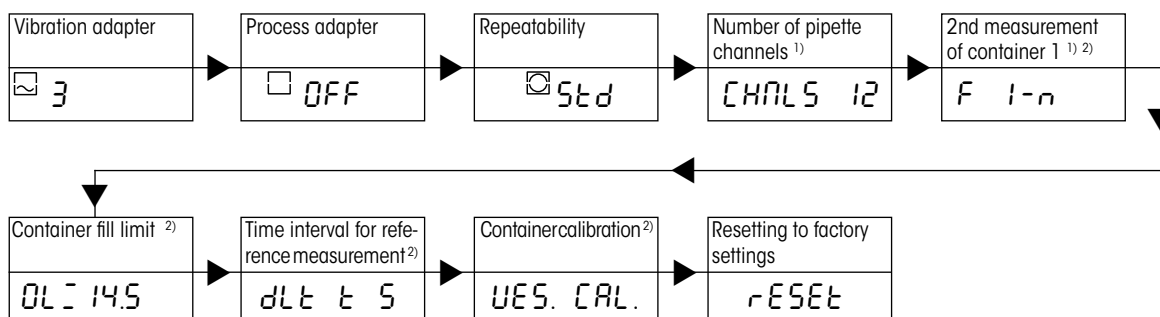
We recommend that you only use the «On/Off» key to switch off the MCP and do not disconnect it from the power supply. Thus the system requires does not require a warm-up time. However, if the MCP is disconnected from the power supply, you must wait **at least 1 hour** after switching on for the system to reach thermal equilibrium and be ready to operate.



On initial startup, the message opposite appears in the display. This means that the MCP requires basic calibration of the containers in the measuring unit. This calibration is performed in the menu that is described in the sections below. **Note:** Briefly pressing the «Start» key while the message is displayed launches the container calibration procedure directly (the calibration procedure is described in section 4.11).

4.2 Menu overview

In the menu you can adapt the MCP to your specific requirements, change settings and call functions. The menu contains 9 menu items, each of which offers various selection options.



¹⁾ This setting is usually configured via the PC application software.

²⁾ This setting is not required for the calibration of single-channel pipettes, hence it is ignored.

Information about using the menu and the individual menu items can be found in the sections below.

4.3 Using the menu

MENU



3

3



OFF

⋮

RESET

CHNLS 4



CHNLS 5

Stored



0.00000 g

Calling the menu

Press and hold down the «Menu» key until "MENU" appears in the display. When you release the key, the first menu item appears (Vibration adapter).

Selecting the menu items

Briefly press the «↵» key in the menu. The next menu item appears each time the key is pressed. After the last menu item (Reset to factory settings), the first menu item is shown again (Vibration adapter).

Changing the setting in the selected menu item

Briefly press the «↶» key. The next available setting appears each time the key is pressed. After the last setting, the first setting is shown again. Once you have selected the desired setting, briefly press the «↵» key to switch to the next menu item (see above).

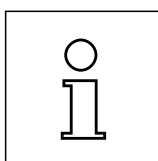
Storing the settings and exiting the menu

Once you have made all the desired settings, press and hold down the «Menu» key until the MCP returns to the normal operating mode. Before the weight display appears, the option to store the settings is briefly confirmed ("StorEd").

Exiting the menu without storing the settings

You can exit the menu at any time by briefly pressing the «C» key. Any changes you have made in the menu will not be stored.

Note: If you do not press any keys for some time in the menu, the MCP automatically returns to the normal operating mode without storing any changes.



4.4 Setting the vibration adapter

In the first menu item (Vibration adapter), the MCP can be adapted to the ambient conditions at the point of installation (vibrations, drafts, etc.).



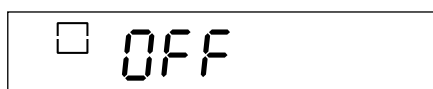
The MCP is preset for operation in unstable environments ex works (setting "3", symbolized by the large wave).

If you are working in a stable or very stable environment, you can select one of the two other settings and thus increase the operating speed of the MCP:

Setting "1" (small wave): For extremely stable environments.

Setting "2" (medium wave): For stable environments.

4.5 Setting the process adapter

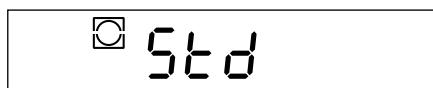


The process adapter can be used to adapt a balance to different types of weighing.

As normal weighing tasks are not usually performed by the MCP, the process adapter is switched off (setting "OFF"). **We recommend that you do not change this setting as this can adversely affect the measuring performance.**

4.6 Selecting repeatability

The circular icon for the stability detector is located in the bottom left corner of the display. As soon as the measurement result is within the specified limit values over a certain time interval, the measurement result is considered stable and the icon for the stability detector fades. The repeatability ("Repro-Set") setting is used to determine the time interval over which the result must be within the limit values in order for it to be considered stable. The better the repeatability, the longer the measurement process lasts.



The MCP is preset for standard repeatability ex works ("Std"), i.e. the measurement value is released as stable very quickly. We recommend that you do not change this setting so as not to prolong the measurement process unnecessarily.

In addition to the factory settings, 4 other settings are available:

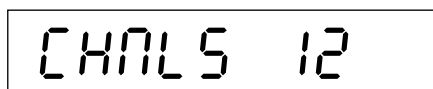
"Good": Quick release of the measurement value.

"better": Slow release of the measurement value.

"Best": Once stability has been achieved, the measurement value is only released if it has not changed for a few seconds.

"OFF": The function is switched off, each measurement value is considered stable and released immediately.

4.7 Selecting the number of pipette channels



This menu item is used to define the number of channels for the pipette to be tested. This is usually 1, 8 or 12 channels. The MCP is preset for 12-channel pipettes ex works, but any number of channels between 1 and 12 can be selected.

Important: If you select "1" in this menu item, you must prepare the measuring unit for the calibration of single-channel pipettes as described in section 3.2.2.

4.8 Activating/deactivating the second measurement of container 1

The MCP has a function for a second measurement of container 1, which can be activated or deactivated in this menu item.

Note: This menu item applies to the calibration of multichannel pipettes only.

F 1-n

Second measurement deactivated (factory setting): There is no second measurement of the first container (the place holder _ is inserted in the data record instead of the weight value of the second measurement, see section 9.3).

F 1-n .1

Second measurement activated: Once pipetting is complete, the liquid in the first container is weighed again (second measurement). Based on the difference in weight and the time that has elapsed between the two measurements the evaporation rate may be calculated. The weight value of the second measurement is added to the data record for the current measuring cycle (see section 9.3). **Important:** The values recorded for the individual pipette channels are not changed, only additional information (weight value of the second measurement) is available, which can be evaluated if necessary.

4.9 Defining the fill limit of the containers

This menu item can be used to define the fill limit for the 12 containers in the measuring unit. As soon as this limit is reached, the "ERR" level warning appears in the display, which prompts you to empty the containers. **Note:** This menu item applies to the calibration of multichannel pipettes only.

OL = 14.5

The fill limit is set to 14.5 g ex works. Each time the «G» key is pressed, the value changes by 0.1 g (setting range: 10.0 ... 16.0 g). To prevent containers from overflowing, you should set the limit so that there is a safety margin, which corresponds to the largest volume to be pipetted (fill limit = 16.0 g minus the largest volume to be pipetted).

4.10 Defining the time interval for reference measurement

Following each measuring cycle, the MCP uses the recorded values as a reference for the next pipetting operation (this process corresponds to taring on a standard balance). The longer the time between two measuring cycles, the greater the danger that the reference values will no longer be valid due to evaporation and the subsequent measurement will therefore be inaccurate. This menu item can be used to define the time permitted between two measuring cycles. If this time limit is exceeded, the "REF" message appears in the display, which prompts you to determine the reference again (by briefly pressing the «Start» key). **Note:** This menu item applies to the calibration of multichannel pipettes only.

dL t 5

The time interval for reference measurement is set to 5 (minutes) ex works. Each time the «G» key is pressed, the value changes by 1 minute (setting range: 1 ... 10 minutes).

4.11 Calibrating the containers

On initial startup, the MCP prompts you to calibrate the 12 containers in the measuring unit with the "do CAL" message. The fill limits of the containers are based on the empty weights of the containers (section 4.9).

When the "do CAL" message is shown in the display, you may launch the calibration procedure by pressing the «Start» key briefly. The message "CAL Start" confirms that the calibration procedure has started (see below). However, you may initiate container calibration at any time via the menu, as described below (this is recommended after every change of location). **Note: This menu item applies to the calibration of multichannel pipettes only.**



Note: Only perform this calibration operation if you are sure that the containers are empty and dry, otherwise the "ERROR" level warning appears too late during pipetting and the containers can overflow.

UES. CAL.

If you want to calibrate the containers, press and hold down the «E» key until:

CAL Start

The message opposite appears in the display, which confirms the start of the calibration operation (the calibration operation can be canceled at anytime using the «C» key). The rack of the measuring unit then moves backwards step-by-step and one of the containers is weighed with each step. You can follow the progress of measurement process in the display. Once the last container has been weighed, the rack moves back to the initial position.

CAL done

Following successful completion of calibration, the confirmation opposite appears briefly and the MCP exits the menu and returns to the normal operating mode.

Note: If the "Abort" message appears instead of the confirmation, the calibration operation could not be performed properly (e.g. due to a draft or vibrations) and must be restarted.

4.12 Resetting to factory settings

This menu item can be used to reset all menu settings to the factory settings.



Note: All the individual menu settings are lost in the event of a reset. The calibration values of the containers are also deleted and the calibration operation must be repeated with empty containers (section 4.11). We therefore recommend that you only execute a reset if you are sure that you really want to carry out the required calibration with empty containers.

rESEt

If you want to reset to the factory settings, press and hold down the «E» key until:

r done

The confirmation opposite appears in the display. The MCP then exits the menu and returns to the normal operating mode.

Note: Following reset, the "do CAL" message appears in the normal operating mode, which prompts you to calibrate the containers (section 4.11).

5 Working with the MCP

This section provides information about how to work with the MCP. It only explains how to work on the MCP, information about evaluating the data on the PC and about using the optional PC application software can be found in the documentation supplied with the software.

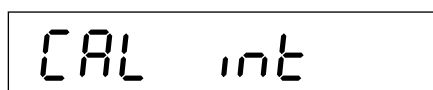
5.1 Calibrating the weighing cell

In order to ensure the accuracy of the measurement results, the weighing cell built into in the measuring unit must be calibrated on the following occasions:

- On initial startup (allow at least 60 minutes warm-up time before carrying out the calibration)
- After every change of location
- When the small “**Cal**” symbol appears in the upper part of the display (the weighing cell is permanently monitored and the “Cal” symbol appears automatically as soon as the cell requires re-calibration). The “Cal” symbol disappears upon successful completion of the calibration.

Regardless of the above calibration intervals we strongly recommend to calibrate the weighing cell at least once a day. The calibration is performed with built-in weights.

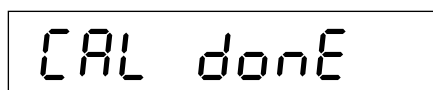
Switch the MCP on with the «**On/Off**» key. **Note:** If the MCP was disconnected from the power supply, wait at least an hour after switching on for the system to reach thermal equilibrium.



Press and hold down the «**Cal**» key until the display opposite appears. When you release the key, calibration begins.

You can follow the progress of the calibration operation in the display: First, short horizontal bars are displayed while the zero point is being determined. The maximum load in grams (“100.00000”) then appears in the display, followed by the zero load (“0.00000”).

Note: The calibration operation can be canceled at any time by pressing the «**C**» key.



Successful completion of calibration is briefly confirmed with the message opposite and the MCP then returns to the normal operating mode.

Note: If the MCP aborts the calibration operation with the “Abort” message; unstable ambient conditions (draft, vibrations, etc.) are usually the cause. Clear the message by briefly pressing the «**C**» key, make sure the ambient conditions are stable and restart the calibration operation.

5.2 Preparing the work station



Place the **water reservoir** supplied on your work station and fill it with distilled water. Wait at least 1 hour before starting pipetting. This ensures that the water is at ambient temperature.

Note: If you do not work with the MCP for an extended period of time (e.g. over night), you should place the cover supplied over the reservoir in order to prevent the water becoming contaminated.

The water reservoir should be replaced from time to time, as despite the use of distilled water, a slimy deposit can form over time due to impurities in the air. Replacement reservoirs can be ordered from METTLER TOLEDO (section 8).

5.3 Testing multichannel pipettes

The descriptions in this section assume that the following work has already been carried out:

- Correct cabling of all system components (section 3.3)
- Assembly of the measuring unit for the verification of multichannel pipettes (section 3.2.1)
- Setting of the number of pipette channels (section 4.7)
- Calibration of the containers (section 4.11)
- Other menu settings, if required (section 4)
- Calibration of the weighing cell (section 5.1).

5.3.1 Filling the moisture trap

The MCP is fitted with a moisture trap. The moisture trap consists of six elongated containers in the rack to the left and right of the containers. The moisture trap is filled with distilled water, which slowly evaporates and thus creates a saturated atmosphere in the rack. This atmosphere minimizes evaporation from the containers and thus associated measuring inaccuracies.



Remove the rack cover and the slide. We recommend to remove the containers so that you have free access to the moisture trap. Fill all containers of the moisture trap on both sides with distilled water.

Note: Fill with water carefully so that no other parts of the MCP become wet. Do not overfill the moisture trap, otherwise the water could spill out when the rack is moved. There is a risk of corrosion. Furthermore, the weighing system is not watertight and the penetration of water into the weighing cell below the rack could damage the MCP.

Place the containers back in the rack and replace the cover and slide.

We recommend that you check the level of the liquid in the moisture trap regularly and refill with distilled water, if necessary.

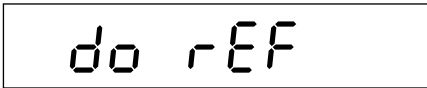
Important note for transport: Before you move the MCP to another location, remove all the containers and empty the moisture trap.

5.3.2 Reference measurement

Note: If you have already started up the MCP for the first time, you are prompted to calibrate the containers with the “ d_0 CAL” message. First, carry out this operating step (for a description see 4.11).

If you switch on the MCP when you start work, the “ d_0 REF” message usually appears first and prompts you to perform a reference measurement. During reference measurement, the containers are weighed with their contents and the measurement values are used as a basis (reference) for the next measurement. This message appears each time the time interval specified for reference measurement is exceeded (this can be defined in the menu, see section 4.10). This can also occur during the working day if the time between two measurement processes exceeds the time interval specified. However, if the time between two measurement processes is within the time interval, the “ d_0 REF” message does not appear, as the values of the previous measurement are used as a basis for the subsequent measuring cycle.

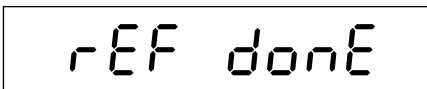
Note: You may trigger a reference measurement at any time (without the "do rEF" message being displayed). This may be required if you think a previous measurement did not produce reasonable results. In this case make sure the display shows "rEAdy", then press and hold the «Start» key to launch the reference measurement.



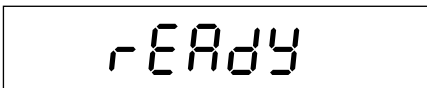
Each time the "do rEF" message appears in the display, briefly press the «Start» key to perform a reference measurement. **Note:** Reference measurement can be canceled at any time using the «C» key and then restarted.



The rack of the measuring unit then moves backwards step-by-step and one of the containers is weighed with each step. You can follow the measurement process in the display: The weight of each container is displayed and as soon as the stability detector (the small circle in the bottom left corner of the display) fades, the value is accepted. Once the last container has been weighed, the rack moves back to the initial position.



Following successful completion of reference measurement, the confirmation opposite appears briefly and then:



The MCP indicates that it is ready for pipetting.

Note: If the "do rEF" message reappears instead of the confirmation, reference measurement could not be performed properly (e.g. due to a draft or vibrations) or you have canceled the measurement with the «C» key. Restart reference measurement.

5.3.3 Performing the measurement



Make sure again that you have selected the correct number of channels in the menu for your pipette (section 4.7).

Set the volume for the first measurement process at the pipette (e.g. 10 % of the nominal volume). Please observe any other specifications for preparing the pipette (e.g. according to ISO 8655).



Start the data acquisition program on the PC. **Note:** The configuration and operation of the data acquisition program are not described in this section. If you are working with the optional software from METTLER TOLEDO, please observe the operating instructions supplied with it.

Use the pipette to draw the set volume from the water reservoir, open the slide on the rack cover and empty the pipette into the container. Please note all regulations regarding correct pipetting (e.g. according to ISO 8655).

Note

- Pipetting must always begin with container 1 (note the marking "1" on the rack cover) and the orientation of the pipette must not be changed during a measuring cycle (do not turn the pipette!).
- If an error occurs and you would like to repeat the pipetting process, hold down the «Start» key for a long time. This triggers a new reference measurement (section 5.3.2) and you can then start pipetting again.

- You may speed up the measurement by reducing the resolution of the measured values to 4 decimal places (instead of 5). Briefly press the «1/10» key to toggle the resolution between 4 and 5 decimal places. However, the low resolution is recommended only for large-volume pipettes where a resolution of 4 decimal places is sufficient. **Note:** The selected resolution is not limited to the display of measured values but also affects the data records transferred via the MCP interface (section 9.3).

Close the slide and briefly press the «Start» key to trigger the measurement process. **Note:** The measurement process can be canceled at any time using the «C» key, however, the MCP then requires a new reference measurement.

The rack of the measuring unit then moves backwards step-by-step and one of the containers is weighed with each step. Once the last container has been measured, the rack returns to the initial position. **Note:** If you have activated the second measurement of container 1 in the menu (section 4.8), the first container is weighed a second time to complete the measurement.



Successful completion of the measurement is confirmed briefly with the message opposite. The "done" message then appears and the MCP is ready for the next measurement.

5.3.4 Emptying the containers



As soon as one of the containers has reached the fill limit specified in the menu (section 4.9), the request opposite to empty the containers appears.



Connect the suction pump supplied to the power supply via the relevant AC adapter. **Note:** An optional 4-channel suction pump is available to increase efficiency when emptying the containers, see section 8.8.

Connect the suction tube (with the probe) to the input ("IN") on the pump. Connect the second tube to the output on the pump ("OUT") and place the free end in a suitable collector.

Carefully insert the suction probe in the first container. Press the "ON" switch on the pump and empty the container. This only takes a few seconds. Repeat this process until all the containers have been emptied.



Note: Do not allow the pump to run dry for too long as it may become damaged. When handling the probe, make sure that no other parts of the MCP become wet. There is a risk of corrosion. Furthermore, the weighing system is not watertight. The penetration of water into the weighing cell below the rack can damage the MCP.

The next time the «Start» key is pressed, the MCP rechecks the liquid level. If there is still more than 2 ml of liquid in one of the containers, the "EMPTY" message appears again.

5.4 Testing single-channel pipettes

The descriptions in this section assume that the following work has already been carried out:

- Correct cabling of all system components (section 3.3)
- Assembly of the measuring unit for the verification of single-channel pipettes (section 3.2.2)
- Setting the number of pipette channels to "1" (section 4.7)
- Calibration of the weighing cell (section 5.1).

5.4.1 Filling the moisture trap



Remove the glass cover from the evaporation trap.

Fill the evaporation trap with distilled water.

Note: Fill with water carefully so that no other parts of the MCP become wet. There is a risk of corrosion. Furthermore, the weighing system is not watertight and the penetration of water into the weighing cell below the rack could damage the MCP.

Put on the glass cover again.

We recommend that you check the level of the liquid in the moisture trap regularly and refill with distilled water, if necessary.

5.4.2 Performing the measurement



Set the volume for the first measurement process at the pipette (e.g. 10% of the nominal volume). Please observe any other specifications for preparing the pipette (e.g. according to ISO 8655).

Start the data acquisition program on the PC. **Note:** The configuration and operation of the data acquisition program are not described in this section. If you are working with the optional software from METTLER TOLEDO, please observe the operating instructions supplied with it.



A digital scale display showing the weight of the liquid. The display is a rectangular box with a small icon of three concentric circles on the left side. The text on the display reads "0.02016 g".

Draw the set volume from the water reservoir, then empty the pipette into the glass tube. Please note all regulations regarding correct pipetting (e.g. according to ISO 8655).



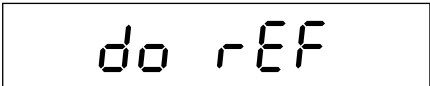
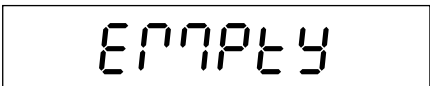
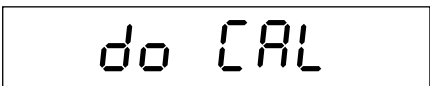
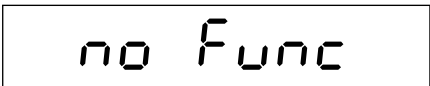

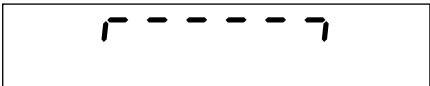

The measured weight value appears in the display. Press the **«Start»** key to transfer the value via the interface. Three concentric circles are displayed at the top edge of the display while data transfer is in progress. As soon as the three circles disappear, data transfer is complete and the MCP is ready for the next measurement.

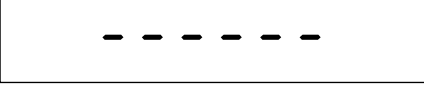
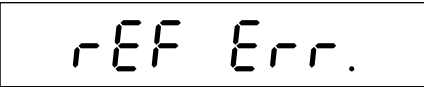
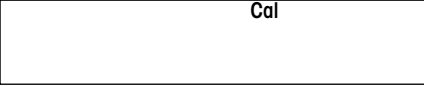
Note

- Pressing the **«Start»** key transmits the displayed value via the interface. This value is **cumulative**, i.e. the MCP continuously sums up all measurements. In case your particular data acquisition program requires the weight value of every single measurement you will have to reset the MCP display to zero (with the **«→0/T←»** key) before starting the next measurement.
- You may speed up the measurement by reducing the resolution of the measured values to 4 decimal places (instead of 5). Briefly press the **«1/10»** key to toggle the resolution between 4 and 5 decimal places. However, the low resolution is recommended only for large-volume pipettes where a resolution of 4 decimal places is sufficient. **Note:** The selected resolution is not limited to the display of measured values but also affects the data records transferred via the MCP interface (section 9.3).

6 Status and error messages

The MCP displays messages to inform you about the current instrument status, actions to be carried out and any errors.

Message	Meaning	Action required/note
	The MCP is ready for the next measurement	None
	The measurement was successfully completed.	The message disappears after a few seconds.
	Reference measurement required	Perform reference measurement (section 5.3.2). If reference measurement does not start and the message reappears, check the hardware (correct installation of the weighing yoke, containers, moisture in the weighing system, etc.).
	Container fill limit has been reached.	Empty containers (section 5.3.4).
	Basic calibration of the containers required.	The message only appears on initial startup and when the menu settings have been reset to the factory settings. Perform basic calibration (section 4.11).
	You have pressed a key, which does not have a function in this context.	Press the correct key.
	A measurement or calibration operation (calibration of the containers or internal calibration of the weighing cell) could not be completed properly.	Make sure the ambient conditions are stable and restart the measurement or calibration operation (section 4.11 and 5.1). If necessary, change the location of the MCP.
	Overload	Check that the weighing yoke is installed correctly (sec.3.2.1). If the rack is in the initial position, no weight may be placed on the cantilever arm.
	Underload	Check that the weighing yoke is installed correctly (section 3.2.1).

Message	Meaning	Action required/note
	The MCP is searching for the zero point (waiting to reach stability).	None
	You have attempted to start a measurement even though a reference measurement must first be performed. This message only appears if you control the MCP via SICS commands from a PC (section 9).	First, perform a reference measurement (via the MCP keypad or with the relevant SICS command) and then restart the measuring cycle.
	The weighing cell requires calibration.	Calibrate the weighing cell as soon as possible (section 5.1). The "Cal" symbol disappears upon successful completion of the calibration.

7 Cleaning and service

Clean all the components of the MCP every once in a while using a slightly dampened cloth. If necessary, use a commercially available, mild cleaning agent. To clean the measuring unit thoroughly, proceed as follows:



Disconnect the AC adapter of the measuring unit from the power supply.

Unplug all the connectors from the back of the measuring unit.

Remove the slide and the rack cover.

Carefully lift all 12 containers from the rack. **Caution: The glass tubes are fragile!**

Carefully lift the rack vertically from the rack support.

Remove the weighing yoke.

Lift the rack support out of the measuring unit.

Clean all the parts using a slightly dampened cloth. **Note:** Make sure that no moisture penetrates the weighing cell. If necessary, cover the weighing yoke opening with adhesive tape.



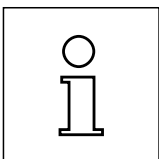
For cleaning purposes the **glass tubes of the containers** may be removed as follows: Slide the supplied rubber cone over the glass tube and withdraw the tube from the container. After cleaning, dry the outside of the glass tube and the tube guide of the container cover carefully (due to capillary action increased evaporation may occur if these parts are wet)! Relocate the glass tube. **Note:** The glass tubes should be firmly seated thus they cannot be removed by hand. In case a glass tube is not firmly seated, remove it and then slightly squeeze the container on both sides. Relocate the glass tube and check for proper seating again.

After cleaning, replace all the parts in the measuring unit (section 3.2.1). Then check whether the measuring unit is still leveled correctly (section 3.2.3). Reconnect the measuring unit to the evaluation unit and the motor control unit. Connect the AC adapter to the measuring unit and connect the measuring unit to the power supply.

Important notes



- Never use cleaning agents, which contain solvents or abrasive ingredients. Such agents can cause scratched surfaces, especially in the case of the cover glass of the display on the evaluation unit.
- Make sure that no liquid penetrates the individual components of the MCP or comes into contact with the connections on the back of the housing.
- Never open the housing of MCP components, they do not contain any parts that can be cleaned, repaired or replaced by the user.



Ask your METTLER TOLEDO dealer about the service options available – regular servicing by an authorized service technician ensures measuring accuracy for years and prolongs the service life of your MCP.

8 Technical data and accessories

This section contains the technical data of the MCP and information about optional accessories that are currently available. Information about standard equipment can be found in section 2.

8.1 MCP105 data

Number of channels:	1 ... 12
Volume of the containers:	16 ml (level warning configured in the menu)
Measuring time for 8/12 channels:	70 s/110 s (incl. repeated measurement of the first container)
Moisture trap:	Built-in
Evaporation rate calculation :	By remeasuring the first container, can be activated via the menu
Minimum measuring volume:	10 µl (for measurements according to ISO 8655)
Weighing module data (built into the measuring unit):	
Readability:	0.01 mg
Max. load:	101 g
Measurement uncertainty:	0.02 mg
Stabilization time:	approx. 5 sec

This data is only valid if the MCP is operated within the specified ambient conditions (section 8.2).

8.2 Ambient conditions

Problem-free operation of the MCP and compliance with the weighing module technical specifications (section 8.1) are only ensured under the following ambient conditions:

Installation location:	Closed, dry rooms. Operation in hazardous environments is not permitted.
Height above sea level:	Up to 4000 m
Ambient temperature:	5 – 40 °C (41 – 104 °F)
Relative atmospheric humidity:	Max. 80 % at 31 °C, linear decrease of up to 50 % at 40 °C, non-condensing
Warm-up time:	60 minutes, minimum following connection to the power supply (if the evaluation unit and motor control unit are permanently connected to the power supply, the MCP requires no warm-up time after switching on with the «On/Off» key and is immediately ready to operate).

8.3 Protection and standards

Installation category:	Class 2
Pollution degree:	2
Protection:	Protected against dust and water
Safety and EMC:	See declaration of conformity (separate brochure 11780294)

8.4 Power supply

Only the AC adapters supplied should be used to supply power to the evaluation unit, motor control unit and suction pump with country-specific power cables and 3-pin connectors. The measuring unit does not require connection to the mains, it is supplied by the evaluation unit and the motor control unit.

AC adapter for the evaluation unit (supplied with wall mounting plate)

One of the following AC adapters is supplied depending on the destination country:

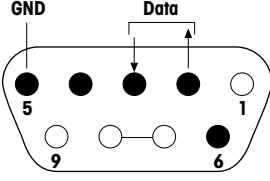
Primary:	115 VAC (-20/+15%), 50/60Hz, 195mA,	secondary: 12VAC, 1.25A
Primary:	230 VAC (-20/+15%), 50/60Hz, 90mA,	secondary: 12VAC, 1.25A

AC adapter for the motor control unit and suction pump

Primary:	100 - 240 VAC (-15/+10%), 50/60Hz, 0.8A
Secondary:	12 VDC ($\pm 5\%$), 2.25A max. (electronic protection against overload)

8.5 RS232C interface data

The built-in RS232C interface in the motor control unit is used as the MCP connection to a PC (direct or via USB/serial converter). The interface has the following specifications:

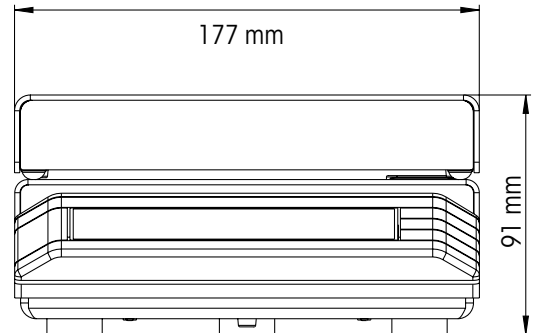
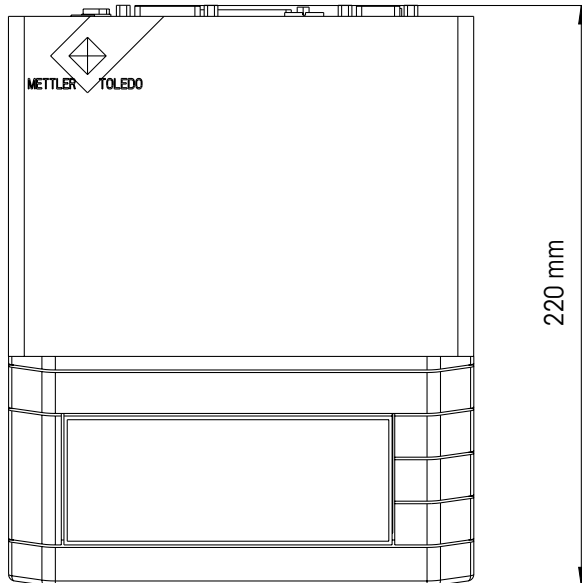
Interface type:	Voltage-controlled interface according to EIA RS-232C/DIN 66020 (CCITT V.24/V.28)	
Max. cable length:	15 m	
Signal level:	Outputs:	Inputs:
	+5 V ... +15 V (RL = 3 - 7 k Ω)	+3 V ... 25 V
	-5 V ... -15 V (RL = 3 - 7 k Ω)	-3 V ... 25 V
Connection:	9-pin D-SUB, female	
Operating mode:	Full duplex	
Transmission mode:	Bit-serial, asynchronous	
Transmission code:	ASCII	
Baud rates:	600, 1200, 2400, 4800, 9600 (factory setting) ¹⁾	
Bits/parity:	7 bit/even, 7 bit/odd, 7 bit/none, 8 bit/none (factory setting) ¹⁾	
Stop bits:	1 stop bit (factory setting) ²⁾ , 2 stop bits	
Handshake:	None, XON/XOFF (factory setting), RTS/CTS ¹⁾	
End of line:	<CR><LF> ²⁾	
Pin assignment: 	Pin 2: MCP transmitting line (TxD)	
	Pin 3: MCP receiving line (RxD)	
	Pin 4: Ready to receive (hardware handshake) (DTR)	
	Pin 5: Signal ground (GND)	
	Pin 6: Clear to send (hardware handshake) (DSR)	
	Pin 9: Signal ground (GND)	

¹⁾ Factory setting can be modified by METTLER TOLEDO service technicians

²⁾ Setting cannot be modified

8.6 Dimensions and weights

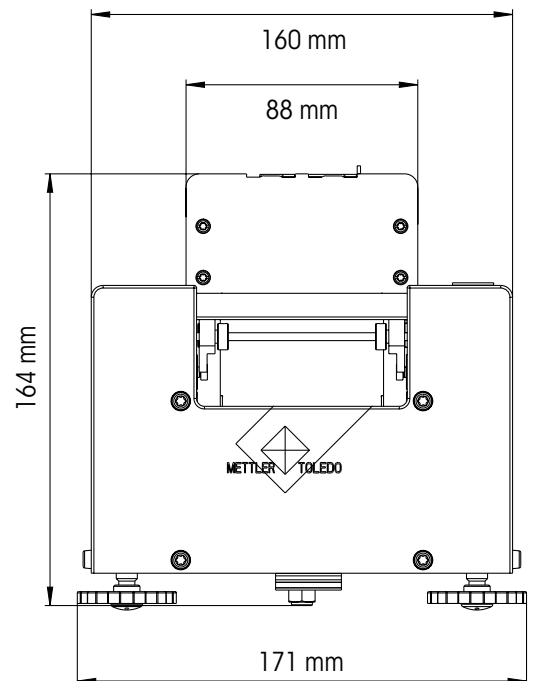
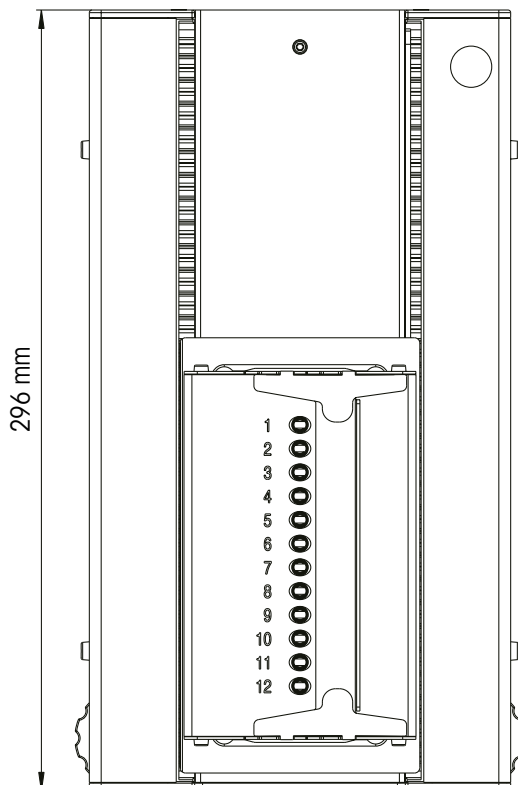
Evaluation unit and motor control unit



Weight of motor control unit: 0.6 kg

Weight of evaluation unit: 1.2 kg

Measuring unit



Weight of measuring unit: 6 kg

8.7 MCP technical specifications

The following table contains the times measured by METTLER TOLEDO for testing a pipette on systems consisting of 1 to 5 MCP. Depending on the MCP model, the relevant environment and the work technique, the measuring times may in practice deviate from those provided.

To calculate the measuring times, the following two test methods were used that are based on the most commonly used test methods:

- **Method A: 10 measurements** each at 10 %, 50 % and 100 % of the nominal volume of the pipette, this complies with the requirements of ISO 8655.
- **Method B: 4 measurements** each at 10 %, 50 % and 100 % of the nominal volume of the pipette.

Number of MCP →		1 * MCP	2 * MCP	3 * MCP	4 * MCP	5 * MCP
Method	Channels					
A	12	59	30	21	17	14
A	8	51	26	18	15	12
B	12	24	13.5	10	8	7.5
B	8	21	11.5	8.5	7	6.5

All measuring times are specified in minutes, based on measurements made with the MCP105 model.

Assumed handling time required to determine the measuring times

Multichannel pipettes: Per pipetting operation 10 seconds

Volume change: Per change 10 seconds

8.8 Accessories

Designation	Article no.
"Calibry software" (Microsoft Windows®) with operating instructions, single workstation version	11138419
"Calibry software" (Microsoft Windows®) with operating instructions, single workstation version Light	11138423
"Calibry software" (Microsoft Windows®) with operating instructions, network-compatible version	11138420
Calibry Update	11123915
Program Cassette MCP	11138300
Calibration kit for control of inspection, measuring and test equipment (calibration of the weighing module using external weights)	11138254
4-channel suction pump for emptying the containers	11138252
Single-channel kit 100 µl	11138008
Single-channel kit 20 ml	11138006
Working table MCP5 (140 x 140 x 78 cm)	11138043
Working table MCP2 (80 x 80 x 78 cm)	11138040

8.9 Spare parts

Designation	Article no.
Water reservoir (as a replacement for the water reservoir supplied), set of 5 pcs	11600616
Water container (including glass tube)	11138266
Glass tubes (for the water containers), set of 5 pcs	11138253
Slide for rack cover	11138123
Rack cover	11138121
Rack	11138265
Support for evaluation unit	11138024
Spare parts for single-channel pipettes	
Glass cover	00210863
Evaporation trap	00210862
Glass tube small 15 mm diameter	00210864
Glass tube holder for 15 mm glass tube	00210870
Glass tube large 24 mm diameter	00210865
Glass tube holder for 24 mm glass tube	00210869
Weighing pan	11138259
Centering ring	00210872
Cables	
Power adaptor for motor control unit and suction pump	11107909
AC adaptor for evaluation unit	00224570
Power cables for the AC adapters	
DK	00087452
GB	00089405
USA	00088668
AUS	00088751
SA	00089728
Euro (grd)	00087925
CH	00087920
I	00087457
1 "Balance Cable" (connection cable for evaluation unit/measuring unit 60 cm long, 25-pin, m/m)	00211535
1 "CAN Cable" (connection cable for evaluation unit/motor control unit 30 cm long, m/m)	00239259
1 "Control Cable" (connection cable for motor control unit/measuring unit 60 cm long, 15-pin, m/m)	11138403
1 USB/serial converter	11103691
USB Hub	11600611
Single-channel suction pump	11138268
Tube for suction pump	11138132
Metal tip for tube	11600621
Large transport case	11138351
Small transport case	11138350

9 Appendix: MCP and host computer

This section provides information about connecting one or more MCP to a host computer (PC), setting up a network with several MCP and the SICS commands that are supported by the MCP.



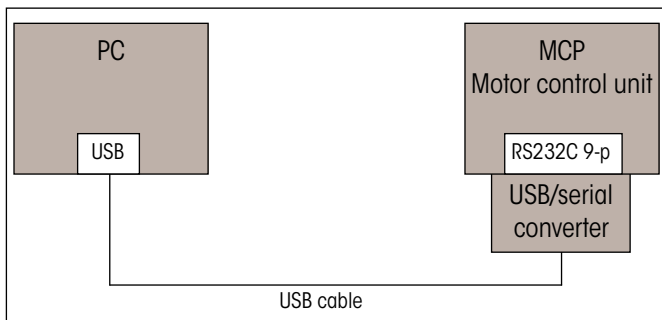
Caution: Do not place the PC keyboard on the same working surface as the MCP! Using the keyboard produces vibrations which may cause the MCPxxx to abort a running action (such as a reference measurement). The MCP then requires to perform the appropriate action again before further commands can be processed.

9.1 Connection to the host computer

The MCP system is usually connected to the host computer (PC) via a **USB** (Universal Serial Bus) and all parts required for this are included in the scope of delivery. In principle, a direct connection to the RS232C interface(s) on the computer is also possible. An RS232C interface must therefore be available on the computer for each MCP. The various options for **connecting via USB** are explained below.



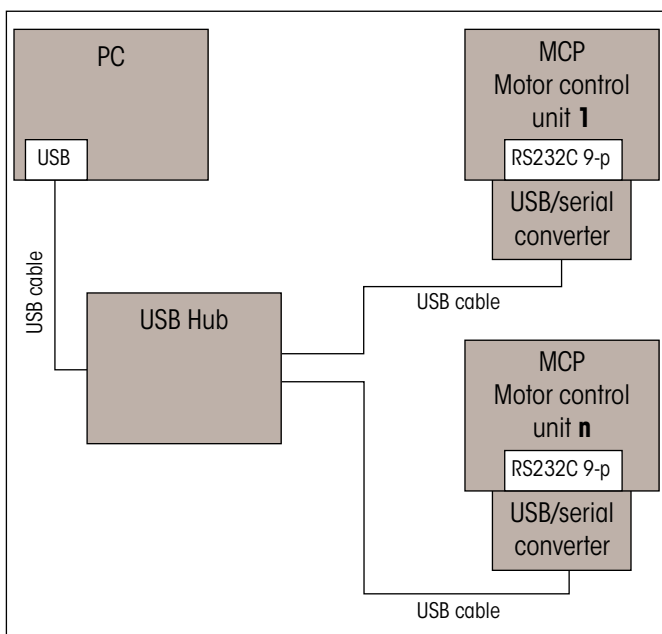
The PC connection is done via the 9-pin RS232C interface connector located on the back panel of the motor control unit.



System consisting of a single MCP, supplied with a USB/serial converter

Insert the 9-pin connector of the USB/serial converter into the RS232C interface of the motor control unit.

Insert the USB cable of the converter in a free USB interface on your PC.

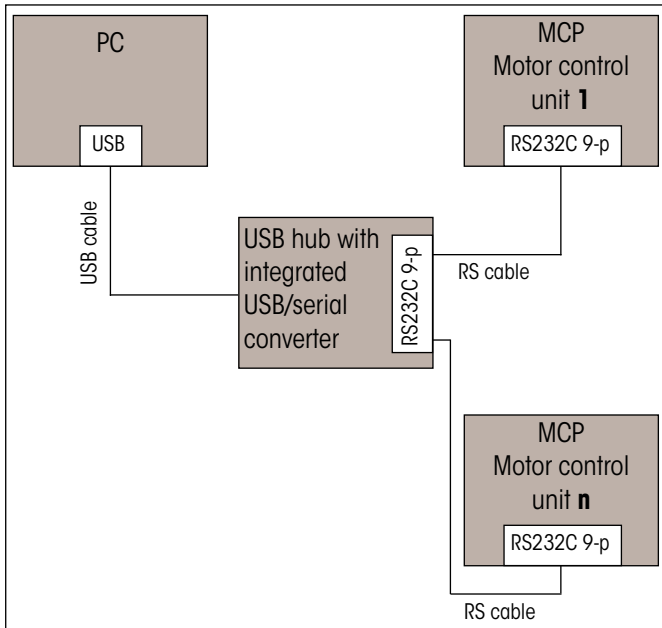


System consisting of several MCP, supplied with several USB serial converters and a USB hub

Insert the 9-pin connector of the USB/serial converters into the RS232C interface of the motor control units.

Connect the USB cable of each converter to the USB hub.

Connect the hub to a free USB interface on your PC.



System consisting of several MCP, supplied with a USB hub with an integrated USB/serial converter

Connect the free end of the RS cable of each MCP motor control unit directly to an RS connection on the hub.

Connect the hub to a free USB interface on your PC.

9.2 PC software

The network-compatible and validatable **"Calibry" software** available from METTLER TOLEDO can be used on the PC as an option. Alternatively, the MCP can be integrated into individual (existing or specially created) applications. This section briefly explains the functions of the software and provides an overview of the interaction between the user, MCP and software.

9.2.1 PC software functions

In principle, the PC software carries out the following tasks:

- Configuring the connected MCP
- Distinguishing between data and control commands
- Assigning COM ports to individual measurement procedures and canceling the assignment following completion of the measurement (the reservation of COM ports is described below)
- Starting reference measurements (using SICS commands, see section 9.3)
- Monitoring the number of pipetting operations completed and still in progress
- Storing measurement data

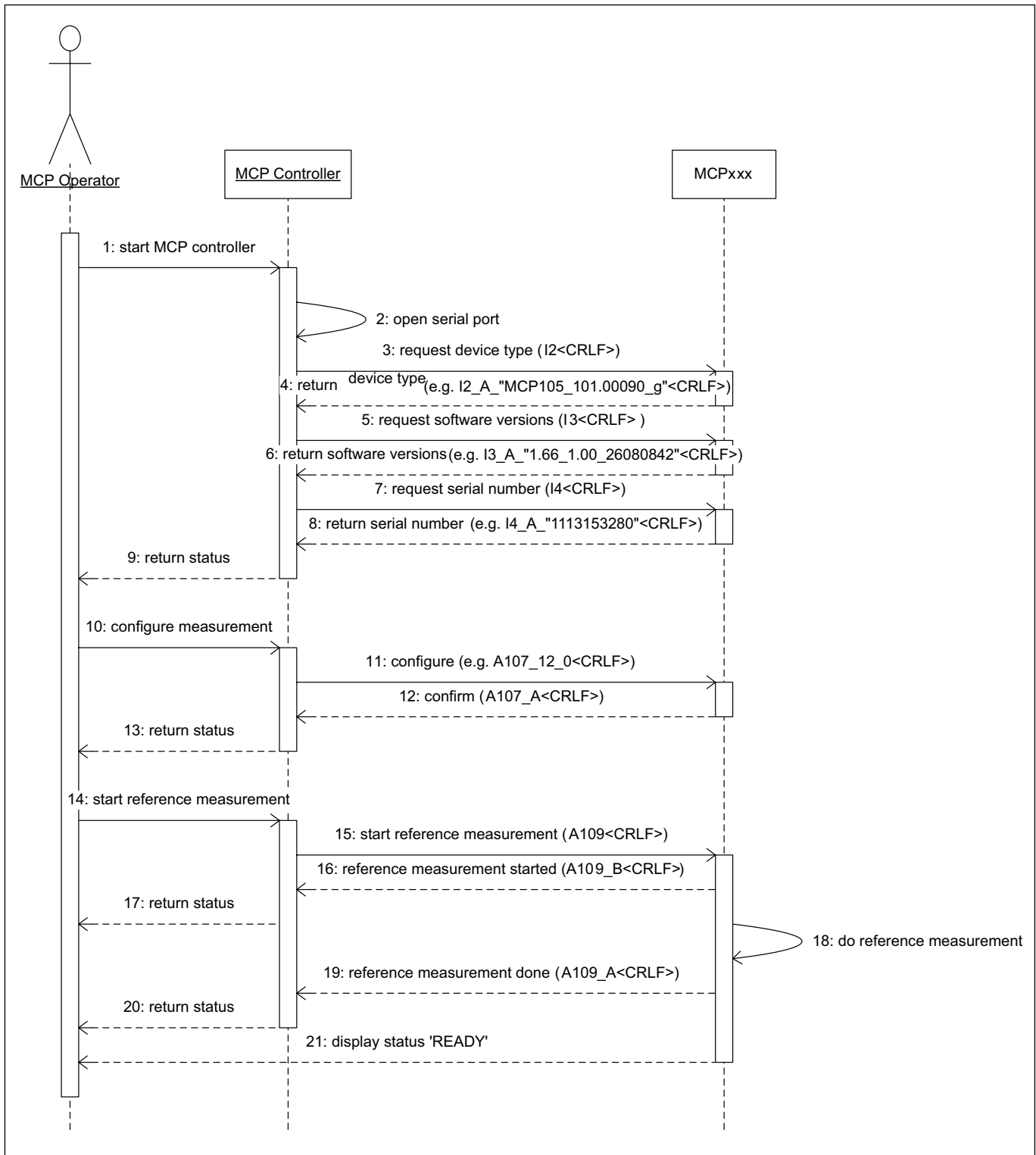
The PC software is not used to control the measurement procedure, this is executed by the MCP alone (the PC software can only trigger a measurement/reference measurement or cancel a process that is in progress). The PC software does not request any data, this is transferred independently by the MCP.

The diagrams in the subsequent sections show the workflow upon initialization and configuration of the measuring system, the reference measurement, and the measurement of pipettes. Please note the following:

- The diagrams show just one MCP. If a system includes several MCPxxx, the commands are sent to each unit.
- Spaces are designated with "_", "<CRLF>" means ASCII characters 0x0D 0x0A, <TAB> means ASCII character 0x09.
- All values shown in the diagrams are examples.

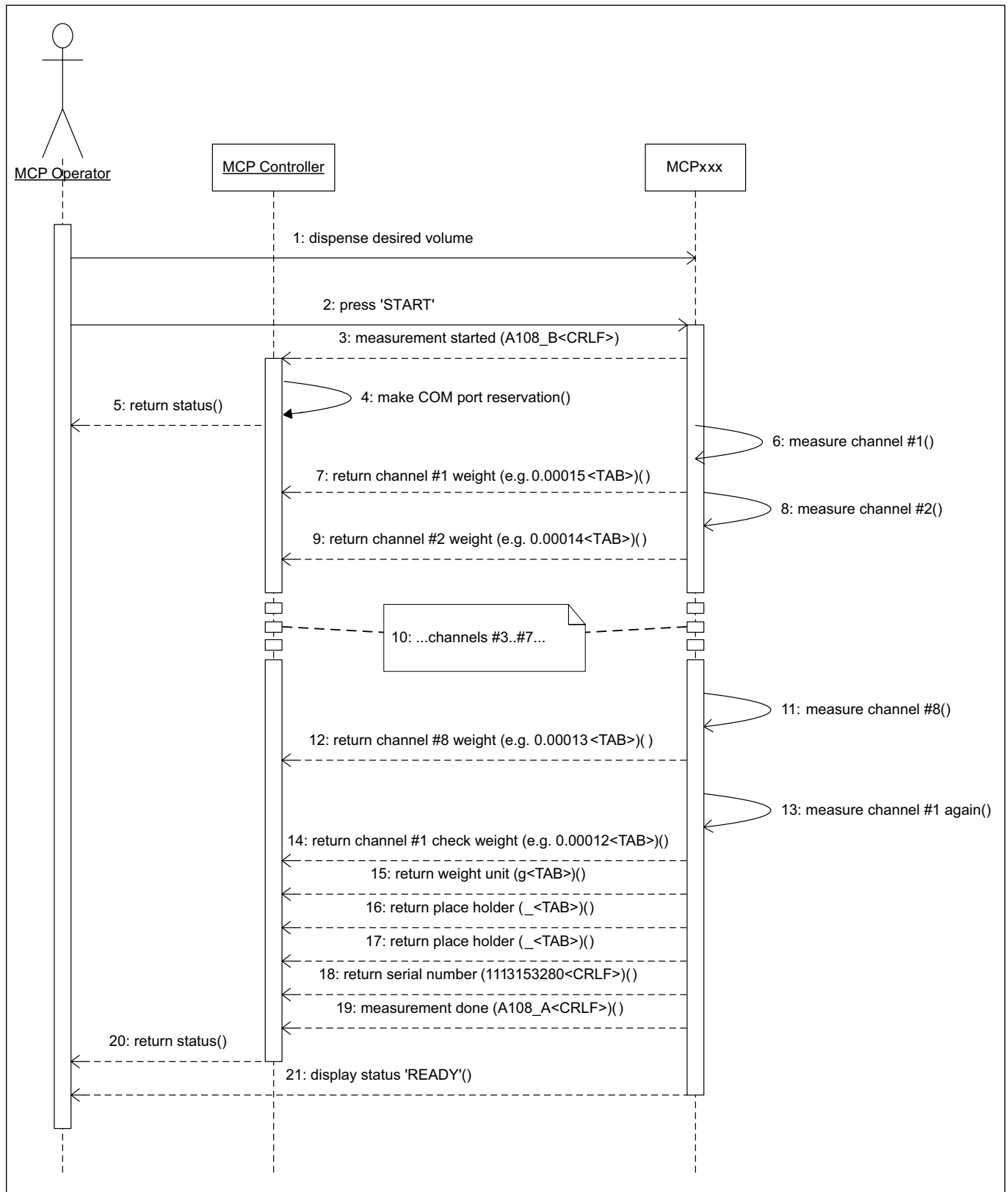
9.2.2 Initialization and configuration of the measuring system

The following illustration shows the interaction between the user, PC software and MCP when initializing and configuring the measuring system.



9.2.3 Measurement procedure

The following illustration shows the sequence of a measurement process.



The **“Make COM port reservation”** function is the most important function. It can be used to manage data from an unknown number of instruments.

Example: Three MCP are connected to the computer (to COM ports 8, 9 and 10) and 3 volumes with 10 measurements each are to be taken. The measurement counter is set to zero in the PC software.

The user presses the **«Start»** key on the first instrument (at COM port 9). The instrument sends the “A108 B” confirmation. This increases the measurement counter by one. All data that is then received at port 9 is assigned to the “Index = Measurement counter = 1” measuring data area. Therefore, port 9 is connected to “Index = 1”. **Note:** The MCP supplies the measurement data automatically to the host interface. The data is transferred continuously, which in turn enables continuous monitoring.

The user then starts the measurement on the second instrument (COM port 10). This means that the measurement counter increases by one again. All data that is then received at port 10 is assigned to the “Index = Measurement counter = 2” measuring data area.

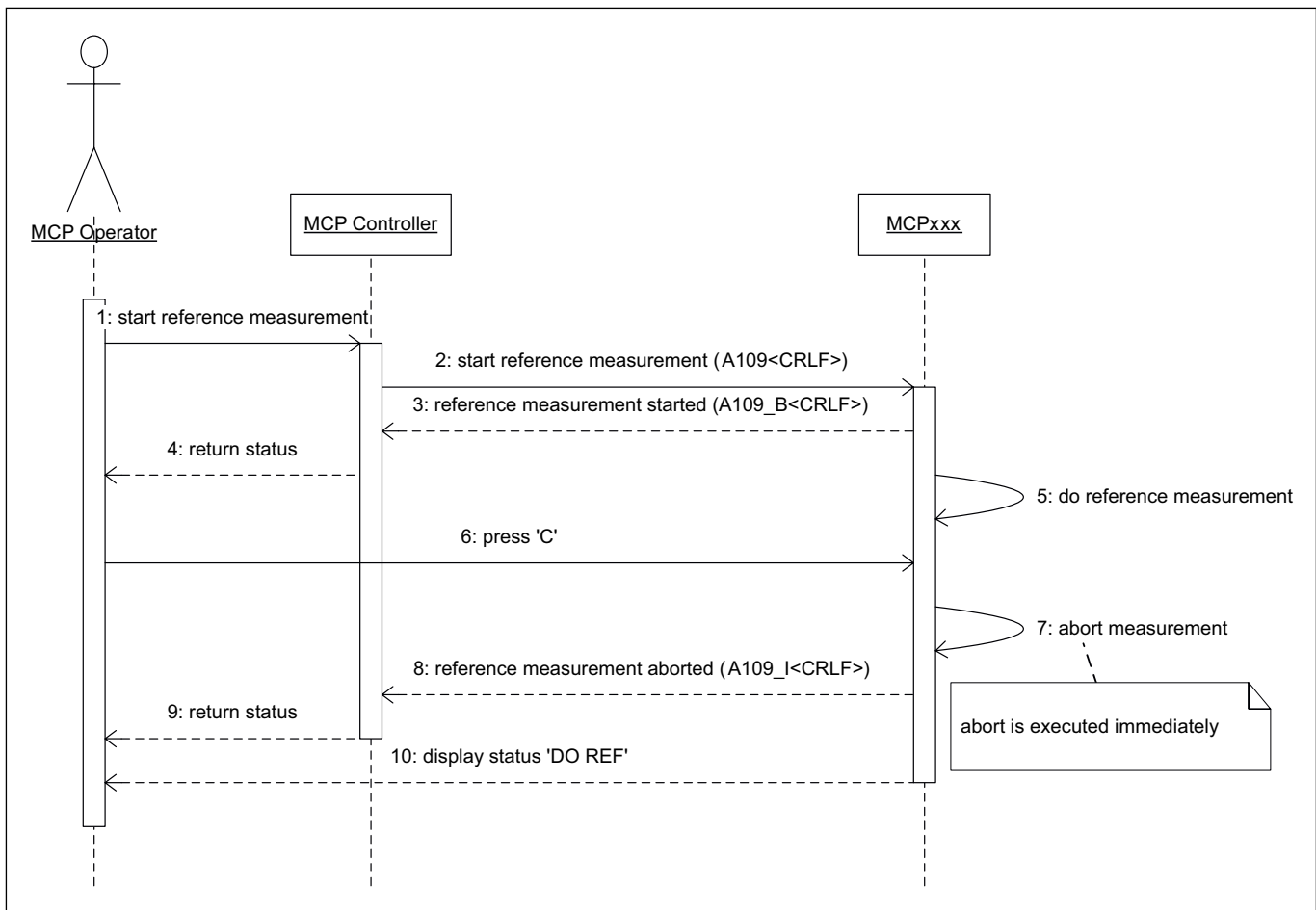
If the MCP at port 9 sends an “A108 A” confirmation (“Measurement completed”, see section 9.4.3), the connection can be removed.

If the user then starts another measurement on the instrument at COM port 9, the measurement counter increases by one again and there is a new connection from port 9 to “Index = 3”.

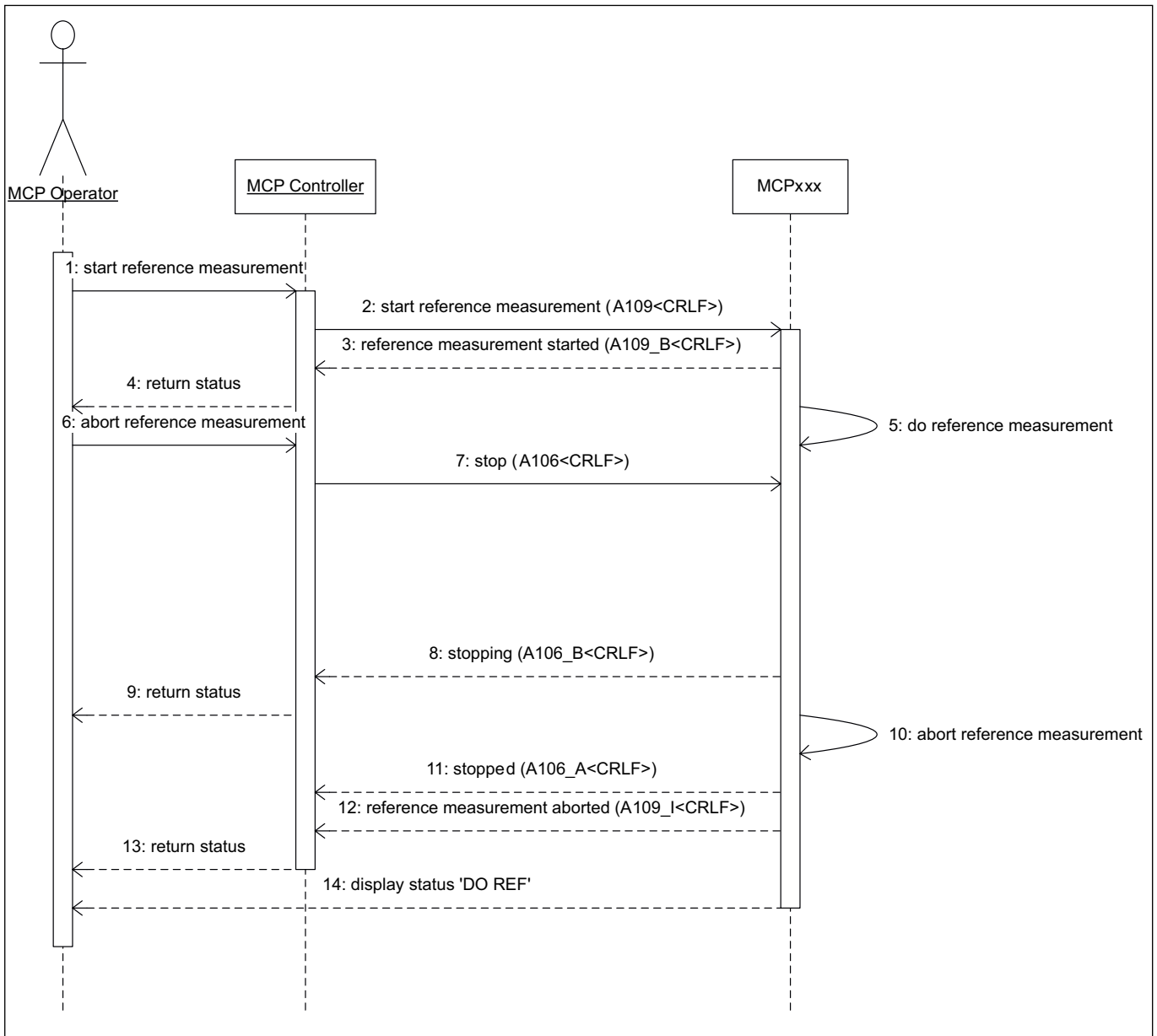
9.2.4 Aborting a reference measurement

The following illustrations show the sequence when a reference measurement is aborted, either via the **«C»** key of the MCP or via an external controller.

Aborting a reference measurement with the **«C»** key of the MCP evaluation unit



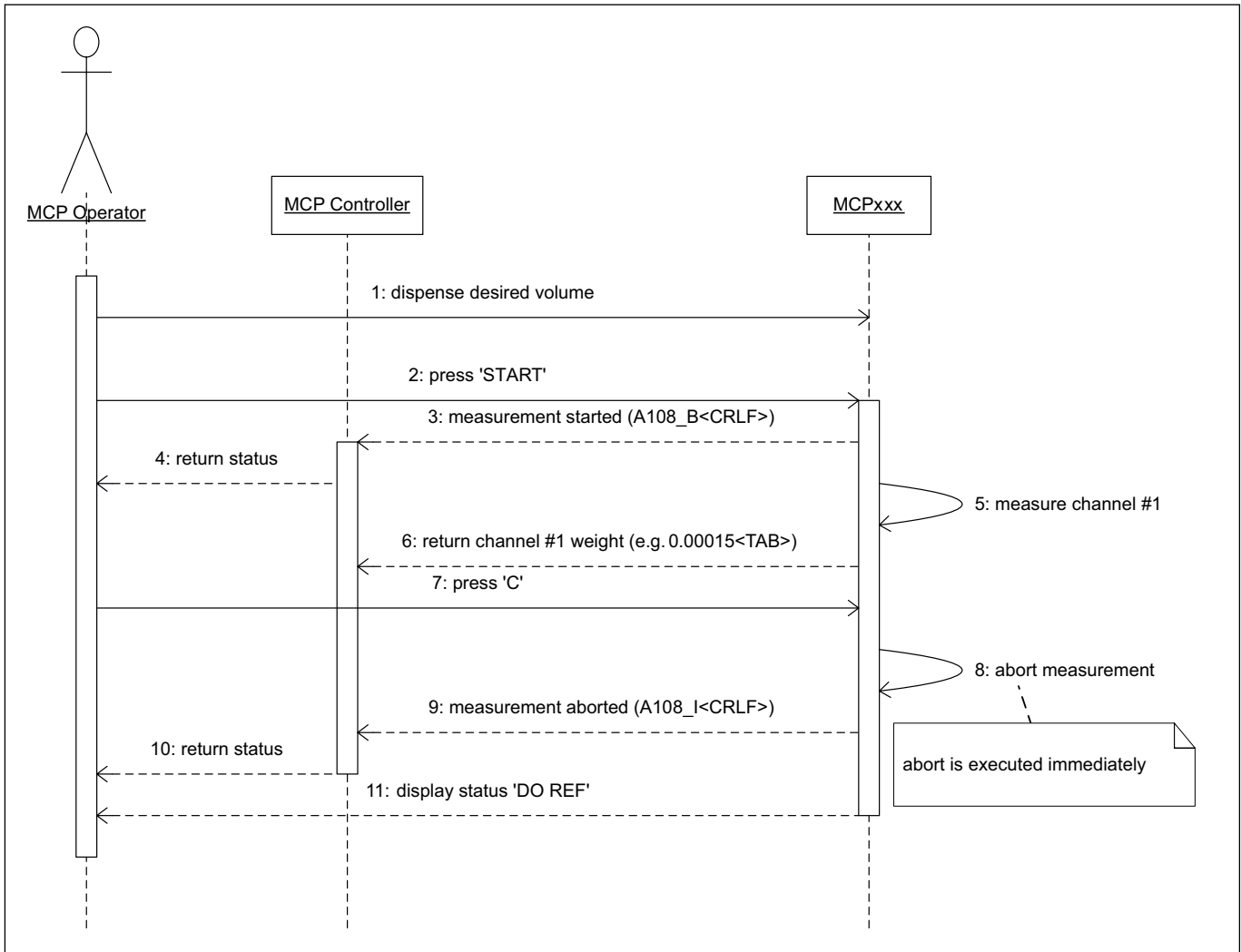
Aborting a reference measurement via an external controller (external software)



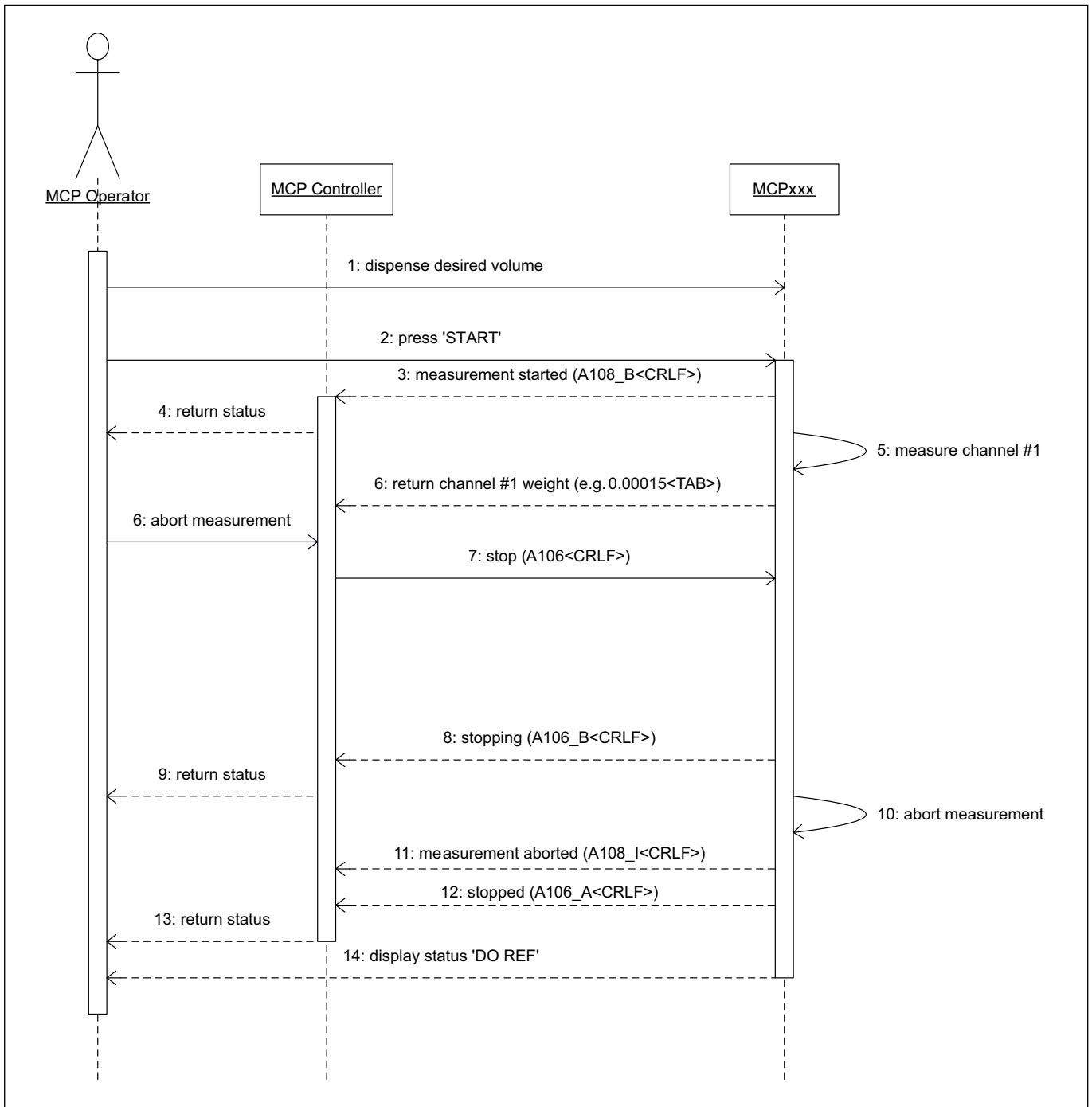
9.2.5 Aborting a pipette measurement

The following illustrations show the sequence when a pipette measurement is aborted, either via the «C» key of the MCP or via an external controller.

Aborting a pipette measurement with the «C» key of the MCP evaluation unit



Aborting a pipette measurement via an external controller (external software)



9.3 Data format

The following **example** shows a typical data record for the MCP. This data record resulted from the **measurement of an 8-channel pipette** with an additional second measurement of the first container.

0.00015	0.00014	0.00016	0.00014	0.00016	0.00023	0.00015	0.00013	0.00012	g	_	_	1113153280
1	2	3	4	5	6	7	8	a	b	c	d	e

Value	Meaning
1 ... n	Weight values of the liquid pipetted in the containers (n = number of pipette channels, in this example n = 8)
a	Weight value of the second measurement of container 1
b	Unit of measurement of weight values (always gram)
c	Reserved for future use, the place holder "_" is entered instead of a value
d	Reserved for future use, the place holder "_" is entered instead of a value
e	Serial number of the MCP from which the data is taken

Note

- All values are separated by tabs and the data record is terminated by $C_R L_F$.
- The number of decimal places of the weight values (4 or 5) depends on the resolution setting of the MCP which can be changed with the «1/10d» key or via a specific SICS command (section 9.4.3). If a particular measurement and the associated reference values have a different number of decimal places, the corresponding data record will always be based on the lower number of decimal places.
- If the second measurement of container 1 was deactivated in the menu (section 4.8), item "a" does not have a value. In order to ensure uniform formatting of the data records, the place holder "_" is entered instead.

9.4 MT SICS commands

The PC software and MCP interact via MT SICS commands, which can be integrated into individual applications (MT SICS = **M**ETTLER **T**OLEDO **S**tandard **I**nterface **C**ommand **S**et).

The MCP supports a range of standard SICS commands, which are listed briefly below (section 9.4.2). Detailed information about these commands can be found in the "MT SICS Reference Manual" brochure (only available in English, 00705184).

In addition to standard commands, **specific SICS commands also exist for the MCP**. These commands are not included in the "MT SICS Reference Manual" but are explained in detail in section 9.4.3 below.

9.4.1 Notes on the command format

SICS commands consist of one or more characters from the ASCII character set. Please observe the notes below:

- Enter the command using uppercase letters only.
- The possible parameters of the command must be separated from one another and from the command name by a space (ASCII 32 decimal, shown here as \square).
- Each command must be terminated with $C_R L_F$ (ASCII 13 decimal, 10 decimal).

9.4.2 Standard SICS commands

The MCP supports the following commands from the standard SICS command set:

- Commands according to **SICS Level 0**: "I0", "I1", "I2", "I3", "I4", "S", "SI", "SIR", "Z", "@".
- Commands according to **SICS Level 1**: "D", "DW", "K", "SR", "T", "TA", "TAC", "TI". (**Note**: If a measurement is in progress while the "D" command is received, the text will appear in the MCP display only after the measurement has been completed).
- Commands according to **SICS Level 2**: "C3", "I11".

Detailed information about these commands can be found in the "**MT SICS Reference Manual**" (only available in English, 00705184).

9.4.3 Specific SICS commands for the MCP

A105 – Position the rack and request the status

Command	A105 ␣ Position	Position: 0 ... 13 Target position, to which the rack should be moved (0 = start position, 13 = end position).
Response	A105 ␣ B	Command is executed (the response is repeated each time a position is passed).
	A105 ␣ A	Target position reached.
	A105 ␣ L	Incorrect number of parameters or parameters outside the permissible value range (0 ... 13).
	A105 ␣ I	Command cannot be executed (e.g. because a positioning command or a measurement process is already in progress or because there is an error).
Command	A105	Request the status of the rack.
Response	A105 ␣ A ␣ Position ␣ Error	Position: 0 ... 13 Normal positions 99 Intermediate position
	A105 ␣ I	Error: 0 No error 1 Initialization not yet completed 2 Increment pulse generator time-out 3 Limit switch error
	A105 ␣ I	Command cannot be executed (e.g. because a positioning command or a measurement process is in progress).

A106 – Stop

Command	A106	Stop the rack immediately. Any measurement process that is in progress is thus aborted.
Response	A106 ␣ B	Command is executed.
	A106 ␣ A	Drive stopped.
	A106 ␣ I	Command cannot be executed.

A107 – Configure the measurement procedure and request the current configuration (see also section 4.7 and 4.8)

Command	A107 ␣ Channels ␣ Meas. mode	Channels: 1 ... 12 Number of channels of the pipette to be tested Measuring mode (second measurement of container 1, see section 4.8): 0 Measurement with second measurement of container 1 1 Measurement without second measurement of container 1
Response	A107 ␣ A A107 ␣ L A107 ␣ I	MCP configured successfully. Incorrect number of parameters or parameters outside the permissible value range (1 ... 12). Command cannot be executed at present (e.g. because a measurement process is in progress or because the MCP menu is open).
Command	A107	Request current configuration.
Response	A107 ␣ A ␣ Channels ␣ Meas. mode A107 ␣ I	Channels: 1 ... 12 Number of channels of the pipette to be tested Measuring mode (second measurement of container 1): 0 Measurement with second measurement of container 1 1 Measurement without second measurement of container 1 Request cannot be executed as the MCP menu is open.

A108 – Start measurement process

Command	A108	Start measurement process.
Response	A108 ␣ B A108 ␣ A A108 ␣ I	Measurement process and continuous transfer of the measured values started (the data format is described in section 9.3). Note: This response is also sent when the measurement was initiated via the « Start » key of the MCP (also see diagram in section 9.2.3). Measurement process complete. Command cannot be executed (e.g. because a positioning command or a measurement process is already in progress or because there is an error, or the measurement process was aborted).

A109 – Start reference measurement

Command	A109	Start reference measurement.
Response	A109 ␣ B A109 ␣ A A109 ␣ I	Reference measurement started, continuous transfer of measured values Reference measurement complete. Command cannot be executed (e.g. because a positioning command or a measurement process is already in progress or because there is an error, or the reference measurement was aborted).

A111 – Time remaining until next reference measurement

Command	A111	Inquiry of time remaining until next reference measurement (during this time the unit will be available for a measurement).
Response	A111 ␣ Value	<p>Value: Time [s] remaining until next reference measurement: Value >0: Unit is available for measurement for xx seconds. Value <0: Unit is not available for measurement since reference measurement is overdue for xx seconds.</p>

A112 – Start measurement process and supply data in MT-SICS A format

Command	A112	Start measurement process.
Response	A112 ␣ x1 ␣ x2 ␣ x3 ␣ x4 ␣ x5	<p>x1 State of measurement process: A Measurement process complete, last value B Measurement in progress, further values to follow</p> <p>x2 Value identifier: 0 Measurement process started 1 First measurement 2 Second measurement for the calculation of the evaporation rate 3 Evaporation rate (currently not used) 4 Serial number of the unit performing the measurement</p> <p>x3 Consecutive number of measurement (channel) (available only with value identifiers 1 and 2)</p> <p>x4 Measured value (available only with value identifiers 1, 2 and 3)</p> <p>x5 Unit of measured value (available only with value identifiers 1, 2 and 3)</p>

Example for 8-channel measurement including the calculation of the evaporation rate

Example	A112 A112 ␣ B ␣ 0 A112 ␣ B ␣ 1 ␣ 1 ␣ 0.00015 ␣ g A112 ␣ B ␣ 1 ␣ 2 ␣ 0.00014 ␣ g A112 ␣ B ␣ 1 ␣ 3 ␣ 0.00016 ␣ g A112 ␣ B ␣ 1 ␣ 4 ␣ 0.00014 ␣ g A112 ␣ B ␣ 1 ␣ 5 ␣ 0.00016 ␣ g A112 ␣ B ␣ 1 ␣ 6 ␣ 0.00023 ␣ g A112 ␣ B ␣ 1 ␣ 7 ␣ 0.00015 ␣ g A112 ␣ B ␣ 1 ␣ 8 ␣ 0.00013 ␣ g A112 ␣ B ␣ 2 ␣ 1 ␣ 0.00012 ␣ g A112 ␣ A ␣ 4 ␣ "1112345678"	Start the measurement process Measurement process started First measurement of channel 1, result 0.00015 g First measurement of channel 2, result 0.00014 g First measurement of channel 3, result 0.00016 g First measurement of channel 4, result 0.00014 g First measurement of channel 5, result 0.00016 g First measurement of channel 6, result 0.00023 g First measurement of channel 7, result 0.00015 g First measurement of channel 8, result 0.00013 g Second measurement of channel 1, result 0.00012 g Measurement process complete ("A"), serial number of unit.
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A113 – Configure the time interval for reference measurement (refer to section 4.10)

Command	A113┐Time	Time: 1 ... 10 maximum admissible time interval (in minutes) between two reference measurements.
Response	A113┐A A113┐L A113┐I	Time interval for reference measurement configured successfully. Incorrect number of parameters or parameters outside the permissible value range (1 ... 10). Command cannot be executed at present (e.g. because a measurement process is in progress or because the MCP menu is open).
Command	A113	Request current time interval for reference measurement.
Response	A113┐A┐Time A113┐I	Time: 1 ... 10 Current time interval in minutes Request cannot be executed as the MCP menu is open.

A114 – Switch the resolution of measured values (1/10d, see the notes in sections 5.3.3, 5.4.2 and 9.3)

Command	A114┐Value	Value: 0 1 digit resolution of measured values (5 decimal places) 1 10 digits resolution of measured values (4 decimal places).
Response	A114┐A A114┐L A114┐I	Resolution of measured values configured successfully. Incorrect number of parameters or parameters outside the permissible value range (0 or 1). Command cannot be executed at present (e.g. because a measurement process is in progress or because the MCP menu is open).
Command	A114	Request current resolution of measured values.
Response	A114┐A┐Value A114┐I	Value: 0 Resolution of measured values is 1 digit (5 decimal places) 1 Resolution of measured values is 10 digits (4 decimal places) Request cannot be executed as the MCP menu is open.

A115 – Configure the vibration adapter (see section 4.4)

Command	A115 ␣ Value	Value: 1 Setting for extremely stable environments 2 Setting for stable environments 3 Setting for unstable environments.
Response	A115 ␣ A	Vibration adapter configured successfully.
	A115 ␣ L	Incorrect number of parameters or parameters outside the permissible value range (1 ... 3).
	A115 ␣ I	Command cannot be executed at present (e.g. because a measurement process is in progress or because the MCP menu is open).
Command	A115	Request current setting of the vibration adapter.
Response	A115 ␣ A ␣ Value	Value: 1 Setting for extremely stable environments 2 Setting for stable environments 3 Setting for unstable environments.
	A115 ␣ I	Request cannot be executed as the MCP menu is open.

A116 – Configure the process adapter (see section 4.5)

Command	A116 ␣ Value	Value: 0 Process adapter switched off ("OFF"), recommended setting for MCP 1 Not recommended, may affect the measuring performance! 2 Not recommended, may affect the measuring performance! 3 Not recommended, may affect the measuring performance!
Response	A116 ␣ A	Process adapter configured successfully.
	A116 ␣ L	Incorrect number of parameters or parameters outside the permissible value range (0 ... 3).
	A116 ␣ I	Command cannot be executed at present (e.g. because a measurement process is in progress or because the MCP menu is open).
Command	A116	Request current setting of the process adapter.
Response	A116 ␣ A ␣ Value	Value: 0 Process adapter switched off ("OFF"), recommended setting for MCP 1 Not recommended, may affect the measuring performance! 2 Not recommended, may affect the measuring performance! 3 Not recommended, may affect the measuring performance!
	A116 ␣ I	Request cannot be executed as the MCP menu is open.

A117 – Select the repeatability (see section 4.6)

Command	A117□Value	<p>Value:</p> <ul style="list-style-type: none"> 0 Function switched off, each measurement value is considered stable and released immediately (“OFF”) 1 Very quick release of the measurement value (“5td”) 2 Quick release of the measurement value (“Eood”) 3 Slow release of the measurement value (“bEttEr”) 4 Once stability has been achieved, the measurement value is only released if it has not changed for a few seconds (“bESt”).
Response	A117□A A117□L A117□I	<p>Repeatability configured successfully.</p> <p>Incorrect number of parameters or parameters outside the permissible value range (0 ... 4).</p> <p>Command cannot be executed at present (e.g. because a measurement process is in progress or because the MCP menu is open).</p>
Command	A117	Request current setting of the repeatability.
Response	A117□A□Value	<p>Value:</p> <ul style="list-style-type: none"> 0 Function switched off, each measurement value is considered stable and released immediately (“OFF”) 1 Very quick release of the measurement value (“5td”) 2 Quick release of the measurement value (“Eood”) 3 Slow release of the measurement value (“bEttEr”) 4 Once stability has been achieved, the measurement value is only released if it has not changed for a few seconds (“bESt”).
	A117□I	Request cannot be executed as the MCP menu is open.

10 Recommendations for practical use

We recommend the following preventive maintenance work to keep the measuring performance of the MCP at top level:

Keep the unit clean and dry. Distilled or deionized water is very aggressive and causes superficial corrosion (rust film) to wet metallic surfaces even if these are made of high-quality stainless steel.

10.1 Internal calibration

Once a day, preferably in the morning before the first measurement, the MCP should be calibrated internally (press and hold «**Cal**» key, see section 5.1). Do not disconnect the MCP from the mains when the unit is not used. When the unit was disconnected from the mains or in case of power failure make sure to let the MCP warm up for at least 60 minutes before performing measurements.

10.2 Verification of the weighing cell calibration

After a certain period of time (depending to customer's particular requirements) the MCP's internal calibration should be verified with an external weight using the optional calibration kit (ordering information is found in section 8.8). The verification interval to be defined by the customer is meant to limit possible information campaigns or recall actions that may be mandatory in case of measurement errors. Section 11 explains how to use the optional calibration kit.

Maximum admissible calibration tolerances of the MCP for pipette calibration according to ISO 8655:

Application tolerances	measured with 20 g F1 or better (E2)
Tolerance for 0.03 % (alert limit)	0.00700 g
Tolerance for 0.10 % (action limit)	0.02100 g

The calibration tolerance values mentioned above ensure that all pipette calibrations (single-channel or multichannel) meet the ISO 8655 requirements even in case the tolerances specified by the pipette manufacturer are up to five times more restrictive.

When will it be necessary to inform your clients in case of measurement errors?

In case the 0.10 % tolerance is exceeded, you should first verify the real impact on pipette calibration. If, for example, the admissible tolerance for balance calibration errors is exceeded by a factor of 10 (i.e. 1 %), this just means that the pipette calibration data stated in the calibration protocols are too high or too low by 1 %. Depending on customer's quality standards this may or may not justify a recall action.

10.3 Excess evaporation

If you encounter excess evaporation although the MCP is operated well within the specified ambient conditions, the following problem may be present: If the containers are overfilled or have been inclined, following transportation or after the tubes have been removed, there may be residual water in the area where the tube enters the container. This residual liquid may cause capillary action that moves the water out of the container which leads to excess evaporation.

In this case, remove the glass tube from the container (section 7). Use Kleenex or other suitable cleaning paper to carefully dry the outside of the tube as well as the tube guide in the upper part of the container, then relocate the tube. Prevent overfilling or inclining the containers. Check the critical area (where the glass tube enters the container) on a regular schedule and dry, as required.

11 Working with the optional calibration kit

The optional calibration kit (ordering information see section 8.8) is used to verify the internal calibration of the MCP. This section describes the installation and use of the optional calibration kit. Information on the frequency of verifications and the tolerances are found in section 10.

11.1 Contents of the calibration kit

The calibration kit is supplied in a plastic case and includes the following items:



1	Centering ring
2	Weighing pan
3	Draft shield
4	Cover glass
5	Calibration weight 20 g in protective box (certificate included)
6	Tweezers in sleeve

11.2 Installation of the calibration kit

Switch the MCP off and remove all assembly parts from the measuring unit (containers, rack, weighing yoke, etc.).



Install the centering ring.



Mount the weighing pan.



Install the draft shield and put on the cover glass.

11.3 Carrying out the verification



Briefly press the « →0/T← » key to reset the MCP display to zero.



Lift off the draft shield and cover glass, then use the tweezers to locate the calibration weight (20 g) exactly at the center of the weighing pan. Relocate the draft shield and the cover glass.

19.99996 g

Wait until the display reaches stability, then note the weight value displayed.

CAL int

Remove the calibration weight, then perform an internal calibration (section 5.1).

CAL done

19.99999 g

Upon completion of the internal calibration, reset the MCP display to zero and put on the calibration weight again. Once the display reaches stability, the weight value must be within the admissible tolerances (application tolerances see section 10, specifications of the weighing module see section 8.1). If the value is out of either tolerance you should contact the METTLER TOLEDO service department without delay.

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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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Thank you.**



Subject to technical changes and to the availability of the
accessories supplied with the instruments.

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