SevenCompact™ S220

pH/Ion meter
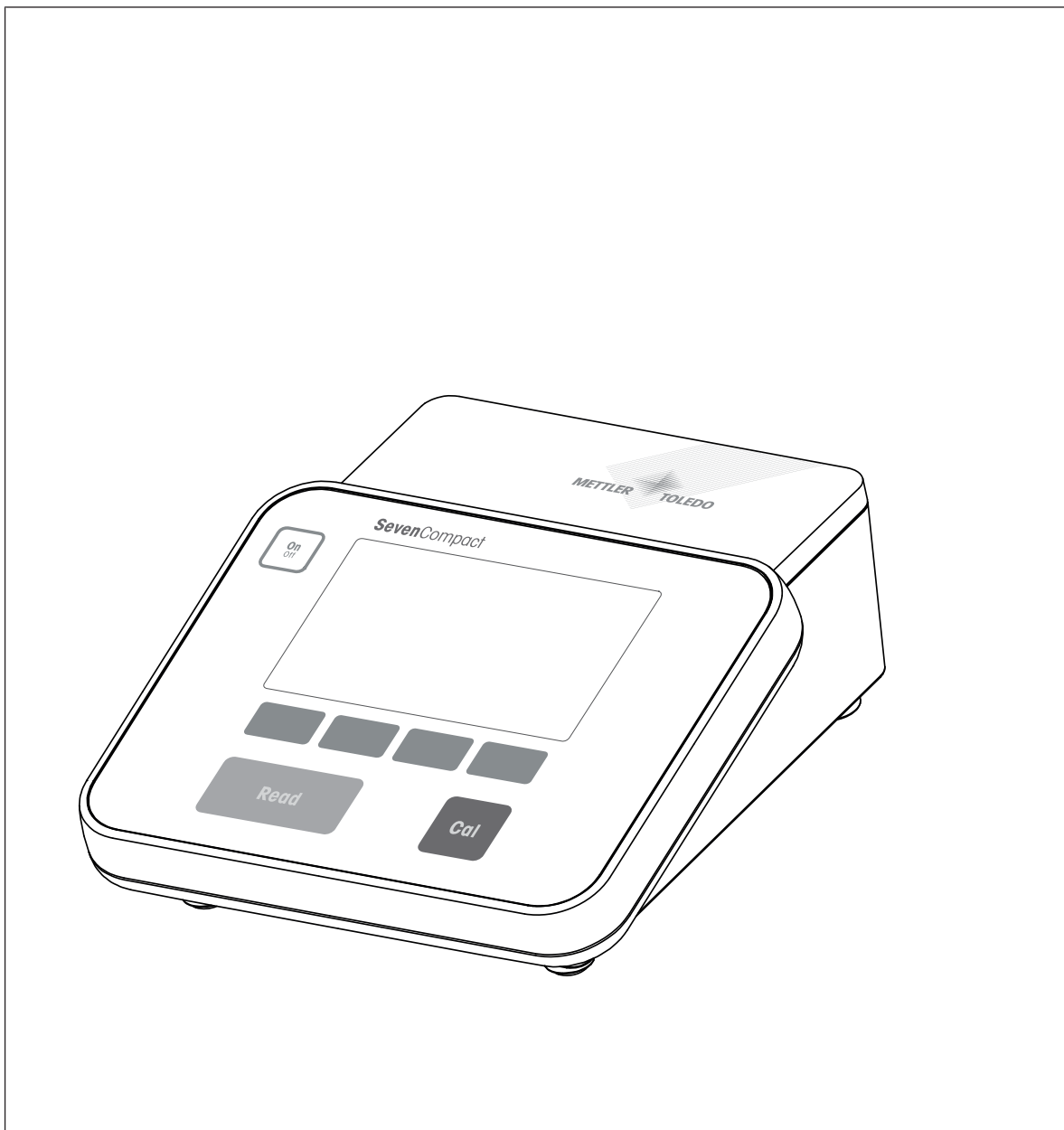
METTLER TOLEDO

Table of Contents

1 Introduction

Thank you for choosing a METTLER TOLEDO SevenCompact™ S220. The SevenCompact™ S220 is an easy-to-operate instrument for measuring pH and ion.

About this document

The instructions in this document refer to a pH/ion meter running firmware version 2.01.03 or higher.

If you have any additional questions, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

Conventions and symbols

Refers to an external document.

Note   for useful information about the product.

Elements of instructions

- Prerequisites
1 Steps
2 …
   ⇨ Intermediate results
⇨ Results

2 Safety information

- This Reference Manual contains a full description of the instrument and its use.
- Keep the Reference Manual for future reference.
- Include the Reference Manual if you transfer the instrument to other parties.

Only use the instrument according to the Reference Manual. If you do not use the instrument according to the Reference Manual or if it is modified, the safety of the instrument may be impaired and Mettler-Toledo GmbH assumes no liability.

2.1 Definitions of signal words and warning symbols

Safety notes contain important information on safety issues. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results. Safety notes are marked with the following signal words and warning symbols:

Signal words

WARNING A hazardous situation with medium risk, possibly resulting in death or severe injury if not avoided.

NOTICE A hazardous situation with low risk, resulting in damage to the instrument, other material damage, malfunctions and erroneous results, or loss of data.

Warning symbols

 Electrical shock

2.2 Product specific safety notes

Intended use

This instrument is designed to be used by trained staff. The SevenCompact™ S220 is intended for measuring pH and ion.

Any other type of use and operation beyond the limits of use stated by Mettler-Toledo GmbH without consent from Mettler-Toledo GmbH is considered as not intended.

Responsibilities of the instrument owner

The instrument owner is the person holding the legal title to the instrument and who uses the instrument or authorizes any person to use it, or the person who is deemed by law to be the operator of the instrument. The instrument owner is responsible for the safety of all users of the instrument and third parties.

METTLER TOLEDO assumes that the instrument owner trains users to safely use the instrument in their workplace and deal with potential hazards. METTLER TOLEDO assumes that the instrument owner provides the necessary protective gear.

Safety notes

 ⚠ **WARNING**

Danger of death or serious injury due to electric shock!

Contact with parts that carry a live current can lead to death or injury.

1 Only use the METTLER TOLEDO AC adapter designed for your instrument.
2 Keep all electrical cables and connections away from liquids and moisture.
3 Check the cables and the plugs for damage and replace damaged cables and plugs.

NOTICE
Risk of damage to the instrument due to the use of unsuitable parts!
Using unsuitable parts with the instrument can damage the instrument or cause it to malfunction.
– Only use parts from METTLER TOLEDO that are intended to be used with your instrument.

FCC Rules

This device complies with Part 15 of the FCC Rules and Radio Interference Requirements of the Canadian Department of Communications. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

3 Design and Function

3.1 Overview
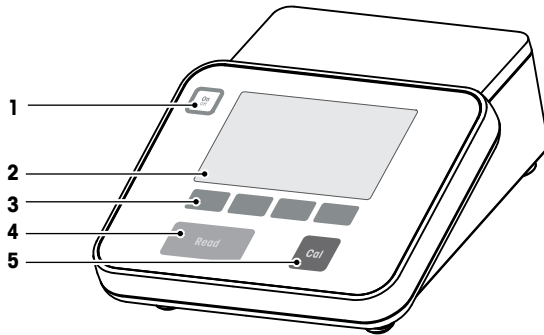
Number	Key	Press and release	Press and hold for 2 seconds
1	On Off	Switch meter on	Switch meter off
2	Display		
3	Softkeys	The function of the softkeys varies from screen to screen	
4	Read	• Start or end measurement (measurement screen) • Confirm input or start editing a table • Exit menu and go back to measurement screen	Switch between measurement close-up screen and full-information screen
5	Cal	Start calibration	Review the last calibration data

3.2 Rear panel connections
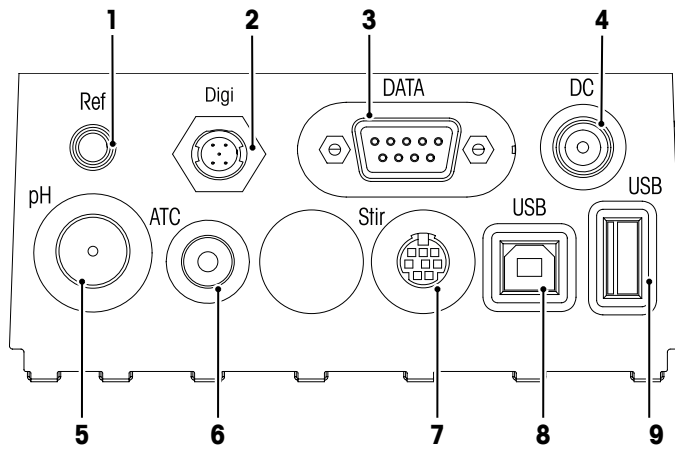
1	Reference socket for reference electrodes	2	Digital socket for digital electrodes
3	RS232 interface	4	DC power supply socket
5	BNC socket for mV/pH signal input	6	RCA (Cinch) socket for temperature signal input
7	Mini DIN socket for METTLER TOLEDO stirrer	8	USB-B interface
9	USB-A interface		

PIN assignment for the RS-232 interface. METTLER TOLEDO printers such as RS-P25 can be connected to this interface.
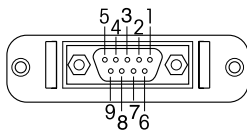
Pin 1	NC	Pin 6	NC
Pin 2	TxD (out)	Pin 7	NC
Pin 3	RxD (in)	Pin 8	NC
Pin 4	NC	Pin 9	NC
Pin 5	RSGND		

3.3 Display and icons

There are two modes available for the display representation: the full-information screen with all the information displayed, and the measurement close-up screen uFocus™, where the measurement information is shown in large font. To toggle between these views, press and hold **Read** during, after or before a measurement.
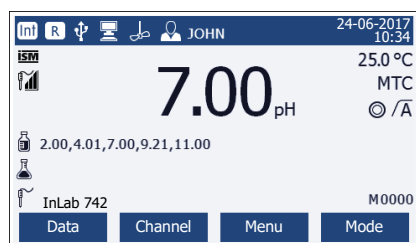
Standard view / uFocus™ view
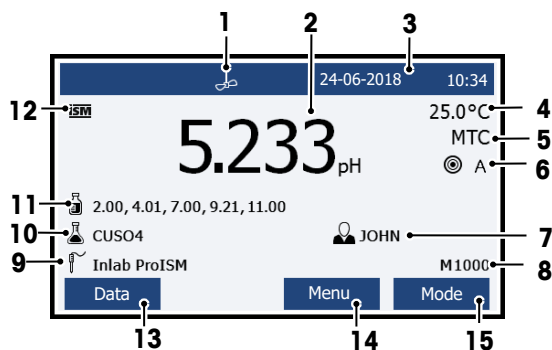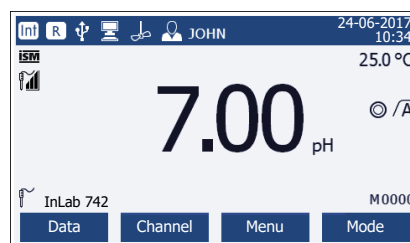
	Icon	Description
1		**Stirrer** icon (appears when stirring is active)
2	**7.000 pH**	Measurement value and used measurement unit
3	**24-06-2018 10:34**	Date and time
4	**25°C**	Measurement temperature
5	**MTC**	**Temperature Correction** **ATC**: Temperature sensor connected **MTC**: no temperature sensor connected or detected
6	◎	**Stability Criterion** ◉ **Strict** ◎ **Standard** ○ **Fast**
7	/A	**Endpoint Type** **A**: **Auto**; measurement stops automatically when the signal is stable **M**: **Manual**; to manually stop the measurement **T**: **Timed**; the measurement stops after the preset time
	/	**Stability Signal** appears if the signal is stable
8		**User ID**
9	**M**	Number of data sets in memory
10		**Sensor ID**
11		**Sample ID**
12		Buffer groups or standards

	Icon	Description
13	**iSM**	**ISM**® sensor connected
14		Softkeys are buttons whose function changes depending on the context.
15		See [Softkeys ▶ Page 9]
16		
17		

3.4 Softkeys

The meter has four softkeys. The functions assigned to them change during operation depending on the application. The assignment is shown on the bottom line of the screen.

Data	Access data menu		Mode	Change measurement mode
				Press and hold to change the channel selection
Menu	Access meter settings			
➡	Move one position to the right		➕	Increase value
⬅	Move one position to the left		➖	Decrease value
⬆	Scroll up in the menu		⌄	Scroll to next page of results
⬇	Scroll down in the menu		Calculate	Calculate the calibration values
Edit	Edit table or value		Select	Select the highlighted function or setting
Delete	Delete selected data		Start	Start the measurement
Save	Save data, setting or value		Interface	Choose the transfer interface.
Yes	Confirm an entry		Transfer	Transfer selected data
No	Reject an entry			

3.5 Key controls

Key	Press and release	Press and hold for 2 seconds
On/Off	Switch meter on	Switch meter off
Read	• Start or end measurement (measurement screen) • Confirm input or start editing a table • Exit menu and go back to measurement screen	Switch between measurement close-up screen and full-information screen
Cal	Start calibration	Review the last calibration data
Softkeys	The function of the softkeys varies from screen to screen	

3.6 Alphanumeric keypad

3.6.1 Entering alphanumeric characters

The meter has a screen keypad for entering IDs, SNs and PINs. Both numbers and letters are allowed for these entries. When entering a PIN, each character entered will be displayed as (*).

```
┌──────────────────────────────────┐
│ Enter Sample ID                  │
│ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─          │
│ [1] 2 3 4 5 6 7 8 9 0 _          │
│  Q W E R T Y U I O P             │
│  A S D F G H J K L « »           │
│  Z X C V B N M Delete  OK        │
│ ⓘ Press 'Read' to confirm        │
│ ┌──────┐ ┌───┐ ┌───┐ ┌───┐       │
│ │ Exit │ │ ← │ │ ↓ │ │ → │       │
│ └──────┘ └───┘ └───┘ └───┘       │
└──────────────────────────────────┘
```
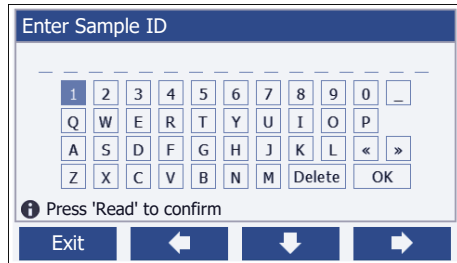
1 Move the cursor position using the **←** , **→** or **↓** keys.

2 Press **Read** to confirm an entry.

   ⇨ The position of the next character that is entered is blinking.

3 Repeat these steps to enter additional characters.
   - or -
   To delete an entry, select the character. Navigate to **Delete** and press **Read**.

4 To confirm and save the entries, navigate to **OK** and press **Read**.
   - or -
   To reject the entries, press **Exit**.

Entering IDs / PIN

The four softkeys and the **Read** key are used for navigating on the keypad and entering the ID/PIN.

Example text: WATER

1 If **1** is highlighted, press **↓** once.

   ⇨ **Q** is highlighted.

2 Press **→** once.

   ⇨ **W** is highlighted.

3 Press **Read** to enter **W**.

4 Reposition the selection to **A**, **T**, **E** and **R**, confirm each selection with **Read**.

5 Reposition the selection to **OK**, and press **Read** to save the ID.

Note

- Instead of entering an ID with the alphanumeric keypad, you can also use a USB-keyboard or a USB-barcode scanner. In case a character is entered or scanned that is not available on the instrument keyboard, the entry will be displayed as an underscore (_).

3.6.2 Editing values in tables

The meter allows you to enter, edit or remove values in tables. (for example, temperature and buffer values for a customized buffer group). This is accomplished by using the softkeys to navigate from cell to cell.

1 Press **Read** to start editing the cell in the table.

   ⇨ The softkeys on the display change.

2 Press **+** and **−** to enter the value and press **Read** to confirm.

   ⇨ The softkeys change back to **↑** and **↓**.

3 Navigate to a cell and press **Delete** to remove a value.

4 To finish editing the table, navigate with the **↑** and **↓** to highlight **Save**.

5 Press **Read** to confirm the action and exit the menu.

3.7 Navigating within a menu

1. Press **Menu** to enter the settings.
2. Move the selection to a menu item using the [↑] or [↓] keys and press **Select** to open the selection.
3. Apply the required settings using the navigation keys.
   - or -
   If applicable, move the selection to the next menu item in the hierarchy using the [↑] or [↓] keys.
4. Press **Exit** to return to the previous menu screen, or press **Read** to return to the measurement screen directly.

3.8 Navigating between menus

The meter display consists of a measurement frame, softkeys, areas for status icons and underlying menu areas. To access the menu areas and to navigate between them, use the softkeys.

1. Press **Menu** to enter the settings.
2. Move the selection to the top of the screen to select the tab using the [↑] or [↓] keys.
   ⇨ The navigation keys to navigate left and right are shown.
3. Move the selection to chose another tab using the [←] or [→] keys.
4. Press **Exit** to return to the measurement screen.

3.9 Endpoint types

A general setting that defines how the endpoint of the measurement is to be determined.

Automatic Endpoint → A	Measurement stopped automatically, reading was stable
→ M	Measurement stopped manually, reading was stable
Manual Endpoint → M	Measurement stopped manually, reading was not stable
→ T	Measurement stopped after time, reading was stable
Timed Endpoint → T	Measurement stopped after time, reading was not stable
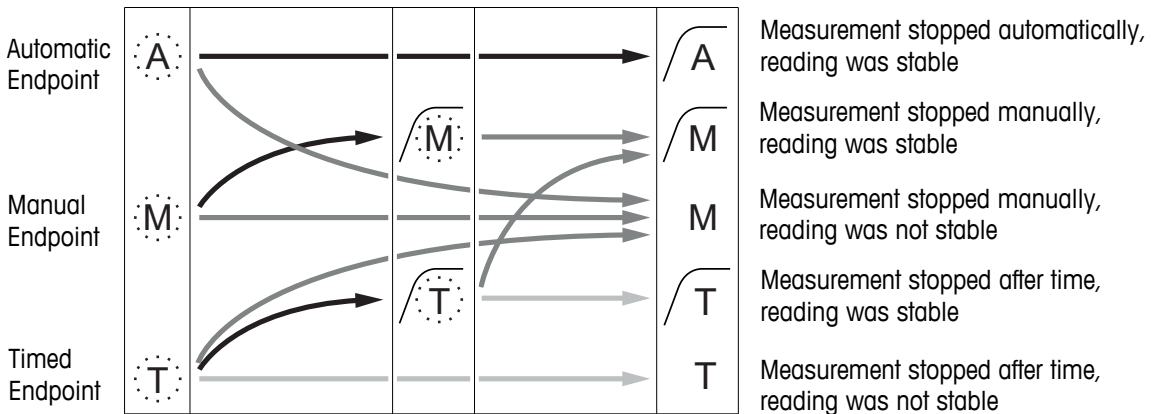
(blinking symbol)	Blinking letter
→	Defined measurement time elapsed
→	User presses **Read**
→	Signal becomes stable

4 Putting into Operation

4.1 Scope of delivery

Unpack the instrument and check the scope of delivery. Keep the calibration certificate in a safe place. Seven-Compact™ is delivered with:

- uPlace™ electrode arm
- Sensors (kit version only)
- Universal AC adapter
- Transparent protective cover
- CD-ROM with Reference Manual and User Manual (English, German, French, Italian, Spanish, Portuguese, Polish, Russian, Chinese, Japanese Korean, Thai)
- User Manual (print version, English, German, French, Italian, Spanish, Portuguese, Polish)
- Declaration of conformity
- Calibration certificate

4.2 Mounting uPlace™ electrode arm

The electrode arm can be used as stand alone or it can be attached to the instrument on the left or right side, according to your preferences. The height of the electrode arm can be varied by using the extension shaft part. Use the wrench to attach the extension part .
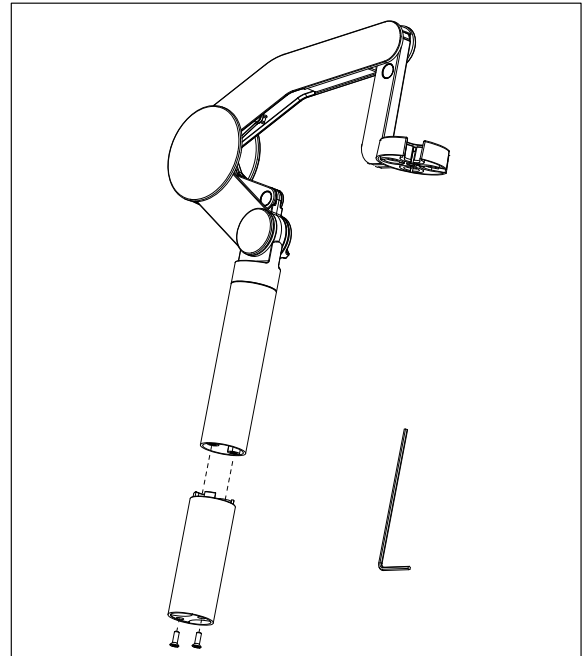
Assembly of the electrode arm

1 Use the wrench to attach the base to the electrode arm by tightening the screws. The electrode arm can now be used in the stand alone mode.
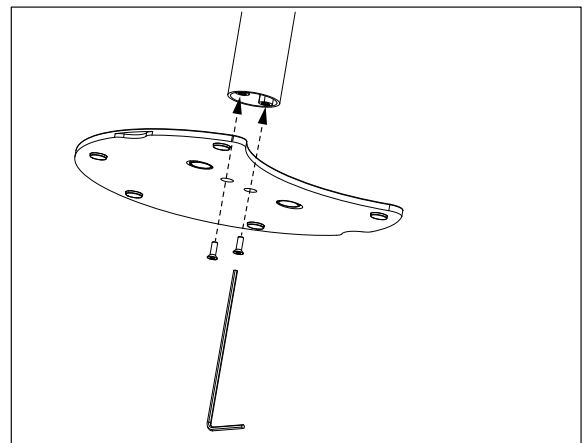
2 Then insert the foot of the meter to the arm base and shift the meter in the direction of the arrow to make the foot fit.
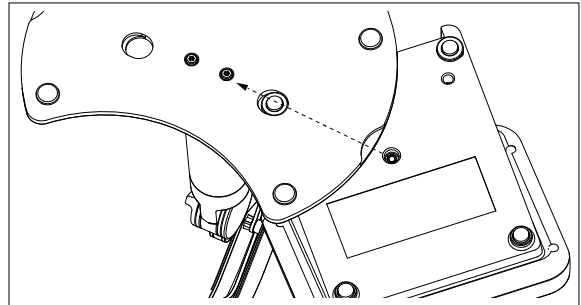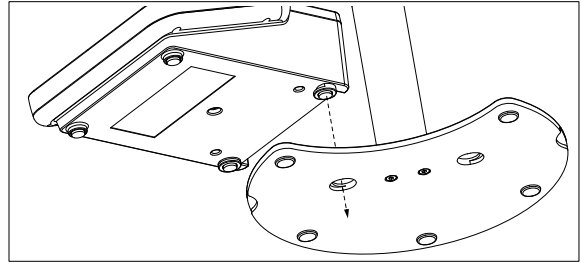
3 Use the lock screw to attach the meter to the base of the arm.
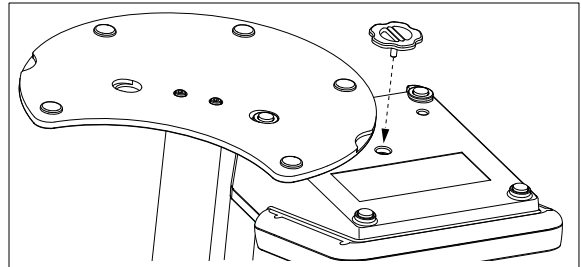
4.3 Installing power supply

⚠ **WARNING**

Danger of death or serious injury due to electric shock!

Contact with parts that carry a live current can lead to death or injury.

1 Only use the METTLER TOLEDO AC adapter designed for your instrument.
2 Keep all electrical cables and connections away from liquids and moisture.
3 Check the cables and the plugs for damage and replace damaged cables and plugs.

NOTICE

Danger of damage to the AC adapter due to overheating!

If the AC adapter is covered or in a container, it is not sufficiently cooled and overheats.

1 Do not cover the AC adapter.
2 Do not put the AC adapter in a container.

The instrument is operated using an AC adapter. The AC adapter is suitable for all supply line voltages ranging from 100...240 V AC ±10% and 50-60 Hz.

1 Insert the correct connector plug into the AC adapter until it is completely inserted.
2 Connect the cable of the AC adapter with the DC socket of the instrument.
3 Install the cables in such a way that they cannot be damaged or interfere with operation.
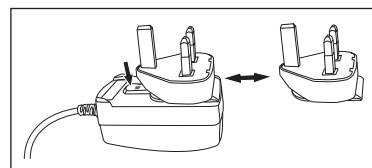
4   Insert the plug of the AC adapter in a power outlet that is easily accessible.

⇨   To remove the connector plug, push the release button and withdraw the connector plug.

4.4 Connecting sensors

When connecting a sensor, make sure that the plugs are properly inserted. If you are using a sensor with a built-in temperature probe or a separate temperature probe, connect the second cable to the ATC socket.

Example

– Connect a pH sensor to the BNC plug and if a temperature probe is integrated, connect the RCA (chinch) plug to the ATC input.
   - or -
   Connect a conductivity probe to the conductivity input, a temperature probe is always built in and does not need to be connected seperatly. If you have a digital sensor connect it to the digital input.

ISM® sensor

When connecting an ISM® sensor to the meter, one of the following conditions have to be met for the calibration data to be transferred automatically from the chip of the sensor into the meter and is used for further measurements. After attaching the ISM® sensor …

• The meter must be switched on.

• (If the meter is already switched on) the **Read** key is pressed.

• (If the meter is already switched on) the **Cal** key is pressed.

We strongly recommend you to switch off the meter when disconnecting an ISM sensor. In doing so, you make sure that the sensor is not removed while the instrument is reading data from or writing data to the ISM-chip of the sensor.

The **ISM** icon **ISM** appears on the display and the sensor ID of the sensor chip is registered and appears on the display.

The calibration history, the initial certificate and the maximum temperature can be reviewed and printed in the data memory.

4.5 Switching the instrument on and off

Switching on

– Press and release **On/Off** to switch on the instrument.

⇨   The firmware version, the serial number and the current date are displayed for a few seconds. After that the instrument is ready for use.

Switching off

– Press and hold the **On/Off** key until the instrument switches to standby mode.

Note

• In the standby mode, the control circuit for the **On/Off** switch is energized. The rest of the instrument is no longer energized.

4.6 Connectivity

Thanks to the plug & play capability, USB-sticks, barcode reader and printers are detected automatically.

Connection	Use
RS232 interface	RS-Printers
USB B interface	**EasyDirect pH** PC Software
USB A interface	USB-printer, USB barcode reader
	USB-stick with file format FAT12/FAT16/FAT32

The instrument adjusts the baud rate to the following settings in case no automatic baud rate synchronization occurs (only with printer types **RS-P25, RS-P26, RS-P28**):

Printer Baud rate:	1200
Data bits:	8
Parity:	none
Stop bits:	1
Handshake:	none

5 Configuring the Instrument

1.	Sample ID		5.	System Settings
	1. Enter Sample ID			1. Language
	2. Auto Sequential			2. Time and Date
	3. Select Sample ID			3. Access Control
	4. Delete Sample ID			4. Beep
2.	User ID			5. Routine/Expert Mode
	1. Enter User ID			6. Screen Settings
	2. Select User ID		6.	Service
	3. Delete User ID			1. Software Update
3.	Stirrer			2. Export Settings to USB-stick
	1. Stir Before Measurement			3. Factory Reset
	2. Stir During Measurement		7.	Instrument Self-test
	3. Stir Speed			
	4. Stirrer Voltage Settings			
4.	Data Storage			
	1. Storage Mode			
	2. Storage Destination			
	3. Time Interval Readings			
	4. Printout Format			

5.1 Sample ID

Navigation: Menu > ⚙ > Sample ID

Parameter	Description	Values
Enter Sample ID	Alphanumeric sample ID with up to 16 characters can be entered. A maximum of 10 sample IDs are stored in memory and listed for selection. If the maximum number of IDs has been stored, the meter will display the message **Memory is full**.	1…16 characters
Auto Sequential	**On**: Using this setting will automatically increment the sample ID by 1 for each reading. If the last character of the sample ID is not a number, then the number 1 will be added to the sample ID with the second sample. This requires the sample ID to have less than 16 characters. **Off**: The sample ID is not incremented automatically.	On	Off
Select Sample ID	To select a sample ID out of a list of already entered sample IDs.	List of available sample IDs
Delete Sample ID	To delete an existing sample ID out of the list, select the sample ID you want to delete and press **Read**.	List of available sample IDs

5.2 User ID

Navigation: Menu > ⚙ > User ID

Parameter	Description	Values
Enter User ID	Alphanumeric user IDs with up to 16 characters can be entered. A maximum of 10 user IDs are stored in memory and listed for selection. If the maximum number of IDs has been stored, the meter will display the message **Memory is full**.	1…16 characters
Select User ID	To select a user out of a list of existing users.	List of available user IDs
Delete User ID	To delete an existing user ID out of the list, select the user ID you want to delete and press **Read**.	List of available user IDs

5.3 Stirrer

You can connect the METTLER TOLEDO external magnetic stirrer to the instrument. This stirrer is powered by the instrument and will be automatically switched on/off according to the settings.

If a uMix or Compact stirrer is connected to the stirrer output, the option **Stir During Measurement** or **Stir Before Measurement** can be selected. When the stirrer is active, the symbol 🔧 is displayed.

Navigation: Menu > 🔧 > Stirrer

Parameter	Description	Values
Stir Before Measurement	**On**: Using this setting will include a stirring period before the measurement starts (after pressing **Read**). **Off**: No stirring before the measurement will take place.	On I Off
Enter Time	Defines the stir duration [s] if **Stir Before Measurement** is activated.	3…60
Stir During Measurement	**On**: Using this setting will results in stirring during the measurement. When the measurement is stopped, the stirrer is automatically switched off. **Off**: No stirring during the measurement will take place.	On I Off
Stir Speed	Defines the stir speed in steps, according to preferences and the characteristics of the sample.	1…5
Stirrer Voltage Settings	Defines the minimum and maximum voltages for the stirrer. **Stir Speed 1**: Defines the voltage for the lowest stirring speed. **Stir Speed 5**: Defines the voltage for the highest stirring speed.	0.5…8.0 V

5.4 Data storage

Navigation: Menu > 🔧 > Data Storage

The meter stores up to 1000 sets of measurement data in the memory. The number of data sets already stored in the memory is indicated by MXXXX on the display. A message appears on the display when the memory is full. To save further measurements if the memory is full, data has to be deleted first. You can select between automatic and manual storage. Press **Exit** to discard the endpoint readings.

Parameter	Description	Values
Storage Mode	**Automatic Storage**: Stores/transfers every found reading to the memory/interface or both automatically. **Manual Storage**: If selected, **Save** appears on the display as soon as a measurement has found an endpoint. Press **Save** to save or transfer the endpoint readings. The readings can only be stored once. When the data is stored, **Save** disappears from the measurement screen.	Automatic Storage I Manual Storage
Storage Destination	Select to transfer the data to the memory, Printer or **PC**. **Memory**: Data will be stored in the internal memory of the instrument. **Printer**: Data will be printed to the connected printer. **PC**: Data will be transferred to the connected PC, running **EasyDirect pH**.	Memory I Printer I PC
Interval Readings	Activates the function to measure at intervals. The measurement series stops according to the selected endpoint format or manually by pressing **Read**.	On I Off
Interval Time	Define the time interval between the measurement points in [s] if **Interval Readings** is activated.	1…3600

5.5 System settings

5.5.1 Language

Navigation: Menu > ⚒ > System Settings > Language

Parameter	Description	Values
Language	Defines the language for operation of the instrument.	English | Deutsch | French | Italian | Spanish | Portuguese | Russian | Polish | Chinese | Korean | Japanese | Thai | Turkish

5.5.2 Time and Date

Navigation: Menu > ⚒ > System Settings > Time and Date

When starting the meter for the first time, the display for entering time and date appears automatically.

Parameter	Description	Values
Time	Define the time and the time format for operation of the instrument. 24-hour format (for example, 06:56 and 18:56) 12-hour format (for example, 06:56 AM and 06:56 PM)	12h | 24h
Time and Date	Defines the date and the date format for operation of the instrument. **Date** 28-11-20xx (day-month-year) 11-28-20xx (month-day-year) 28-Nov-20xx (day-month-year) 28/11/20xx (day-month-year)	List of available date formats

5.5.3 Access Control

Navigation: Menu > ⚒ > System Settings > Access Control

A maximum of 6 characters can be entered as PIN. In the factory default settings, the PIN for deleting data is set to 000000 and is activated, no instrument login password is set.

Parameter	Description	Values
System Settings	To enable a PIN protection for the required access control ON. When selected, the window for entering an alphanumeric PIN appears.	1…6 characters
Deletion of Data	Defines if the deletion of data is PIN protected.	On | Off
Instrument Login	Defines if the instrument login is PIN protected.	On | Off

5.5.4 Audio signal

Navigation: Menu > ⚒ > System Settings > Beep

Parameter	Description	Values
Beep	Defines if an audio signal should be enabled.	Keypress | Alarm Messages | Measurement Endpoint

5.5.5 Operator mode

Navigation: Menu > ⚙ > System Settings > Routine / Expert Mode

The concept of the two working modes is a GLP feature that ensures that important settings and stored data cannot be deleted cannot be unintentionally changed under routine working conditions.

The meter only allows the following functions in the routine mode:

- Calibrating and measuring
- Editing user, sample and sensor IDs
- Editing the MTC temperature
- Editing data transfer settings
- Editing system-settings (PIN-protected)
- Running the instrument self-test
- Storing, viewing, printing and exporting data
- Exporting settings to USB-stick

Parameter	Description	Values
Routine / Expert Mode	**Routine Mode**: Some of the menu settings are blocked. **Expert Mode**: The factory default setting enables all functions of the meter.	Routine Mode I Expert Mode

5.5.6 Screen settings

Navigation: Menu > ⚙ > System Settings > Screen Settings

Parameter	Description	Values
Screen Brightness	Defines the screen brightness.	1…16
Screen Saver	Defines whether the screen saver should be used.	On I Off
Interval Time	Defines how long in [min] the system should wait after the user's last action on the terminal before activating the screen saver.	5…99
Screen Color	Defines the display background color.	Blue I Grey I Red I Green

5.6 Service

Navigation: Menu > ⚙ > Service > Software Update

> **NOTICE**
>
> **Danger of data loss due to reset!**
> When performing a software update, all settings will be set to default values and all data will be deleted.

You can perform a software update via USB-stick.

- Make sure that the firmware is in the root directory of the USB-stick and has a name S<xxx>v<yyy>.bin, with <xxx> being the number of the instrument type and <yyy> being the version number.

1 Connect the USB-stick to the instrument.

2 Select the option **Software Update**.

  ⇨ A message appears that the software update is in progress

3 When the software update is completed you need to restart the instrument for the changes to become effective.

Note

- The instrument will be reverted back to factory settings. All data will be deleted and the PIN will be set back to "000000".

- If the USB-stick is removed during the update process or the power supply is interrupted, the instrument is no longer functional. Please contact METTLER TOLEDO service for further assistance.

Export Settings to USB-stick

With this feature you can export the settings. These can for example be sent via e-mail to METTLER TOLEDO service.

1 Insert the USB stick into the corresponding interface of the meter
  ⇨ 🔌 appears on the display
2 Select **Export Settings to USB-stick** in the service menu to start the transfer.
⇨ The instrument has created a new folder on the USB-stick in which the name corresponds to the date in the international format. The date "25th November 2016" becomes "20161125".
⇨ The exported file is in text (extension .txt) format. The file name consists of the time in 24h format (hr min sec) with the prefix S. The time "15:12:25 (3:12:25 pm)" becomes "S151225.txt".

Note

- Pressing **Exit** during the export will cancel process.

Factory Reset

> **!** **NOTICE**
>
> **Danger of data loss due to reset!**
> When performing a factory reset, all settings will be set to default values and all data will be deleted.

1 Select the option **Factory Reset**.
  ⇨ A dialog box appears.
2 Press **Yes** to confirm the procedure.
⇨ The instrument has been reverted back to factory settings. All data has been deleted and the PIN will be set back to "000000".

5.7 Instrument Self-test

Navigation: Menu > 🔧 > Service > Instrument Self-test

The instrument self-test requires user interaction.

1 Select the option **Instrument Self-test**.
  ⇨ A display test is performed. Subsequently, the self-test screen appears.
2 Press the function keys on the keypad one by one in any order.
  ⇨ The self-test result is displayed after a few seconds.
  ⇨ The meter returns to the system settings menu automatically.

Note

- You need to finish pressing all the keys within two minutes, otherwise **Self-test failure** appears and the procedure has to be repeated.
- If error messages repeatedly appear, contact METTLER TOLEDO Service.

6 Measuring pH

6.1 Measurement settings

Navigation: Menu > pH/Ion

1.	Sensor ID / SN		4.	Endpoint Type
	1. Enter Sensor ID / SN		5.	Temperature Settings
	2. Select Sensor ID			1. Set MTC Temperature
	2. Delete Sensor ID			2. Temperature Unit
2.	Calibration Settings			3. Temp. Sensor Recognition
	1. Buffer Group / Standard		6.	Measurement Limits
	2. Calibration Mode			1. pH Limit
	3. Calibration Reminder			2. mV Limit
3.	Measurement Settings			3. Rel. mV Limit
	1. Resolution			4. Temperature Limit
	2. Stability Criterion			
	3. Rel. mV Offset			

6.1.1 Sensor ID / SN

Navigation: Menu > pH/Ion > Sensor ID

When connecting an **ISM® sensor** to the meter, the meter will:

- Automatically recognize the sensor when it's turned on (alternatively, when pressing **READ** or **CAL**)
- Load the stored sensor ID, sensor SN and sensor type as well as the latest calibration data of this sensor
- Use this calibration for the subsequent measurements

The sensor ID for ISM® sensors can be changed. Sensor SN and sensor type, however, are blocked for modification.

Parameter	Description	Values
Sensor ID	Enter alphanumeric IDs for sensors. A maximum of 30 sensor IDs are stored in the memory and listed for selection. If the maximum number of IDs has been stored, the meter will display the message **Memory is full**.	1…12 characters
Sensor SN	Enter alphanumeric serial numbers for sensors. Serial numbers of ISM® sensors are detected automatically.	1…12 characters

If a new sensor ID is entered, the theoretical calibration slope and offset for this type of electrode will be loaded. The sensor has to be newly calibrated.

If a sensor ID is entered, which is already in the memory of the meter and has been calibrated before, the specific calibration data for this sensor ID will be loaded.

Parameter	Description	Values
Select Sensor ID	To select a sensor out of a list of existing sensors. If a sensor ID is selected, which has been calibrated before, the specific calibration data for this sensor ID will be loaded.	List of available sensor IDs
Delete Sensor ID	To delete an existing sensor ID out of the list, select the sensor ID you want to delete and press **Read**.	List of available sensor IDs

6.1.2 Calibration Settings

Navigation: Menu > pH/Ion > Calibration Settings

Parameter	Description	Values
Buffer group	**Predefined Buffer Groups**: One of eight predefined buffer groups can be selected.	Predefined Buffer Groups I Customized Buffer Group
	Customized Buffer Group: A set of user-defined pH buffers with up to 5 different temperatures for each buffer can be created. The temperature difference must be at least 5 °C and the difference between the pH values must be at least 1.	
	When switching from predefined buffer group to customized buffer group, press **Save** in the table even if no values have changed.	

List of buffers

B1	1.68	4.01	7.00	10.01		(at 25°C)	Mettler US
B2	2.00	4.01	7.00	9.21	11.00	(at 25°C)	Mettler Europe
B3	2.00	4.00	7.00	9.00	12.00	(at 20°C)	Standard Merck buffer
B4	1.680	4.008	6.865	9.184	12.454	(at 25°C)	DIN19266:2000
B5	1.09	4.65	6.79	9.23	12.75	(at 25°C)	DIN19267
B6	1.680	4.003	6.864	9.182	12.460	(at 25°C)	Chinese
B7	2.00	4.01	7.00	10.00		(at 25°C)	Technical buffer
B8	1.679	4.008	6.865	9.180		(at 25°C)	JIS Z 8802

Temperature tables for these buffers are programmed in the meter and can be found in the "Appendix".

Parameter	Description	Values
Calibration Mode	**Segmented**: the calibration curve is made up of linear segments joining the individual calibration points. If high accuracy is required, the segment method is recommended.	Segmented I Linear
	Linear: the calibration curve is determined using linear regression. This method is recommended for samples with widely varying values.	
Calibration Reminder	If activated, a reminder to perform a calibration appears after a defined time period.	On I Off

> **NOTICE**
>
> **Risk of incorrect results due to temperature deviation!**
> A temperature deviation between calibration temperature and customized buffer will cause an error report.
> – Stop and redo calibration with the exact temperature.

6.1.3 Measurement Settings

Navigation: Menu > pH/Ion > Measurement Settings

Measurement Resolution	The resolution for pH needs to be set for the display. Up to 3 decimal places can be chosen depending on the unit of measurement.	**pH**

Decimal places

mV	X	no decimal places
pH, mV	X.X	one decimal place
pH	X.XX	two decimal places
pH	X.XXX	three decimal places

Parameter	Description	Values
Stability Criterion	**Strict**: The measured signal should not change by more than 0.03 mV in 8 seconds or by more than 0.1 mV in 20 seconds. **Standard**: The measured signal should not change by more than 0.1 mV in 6 seconds. **Fast** Stability-Fast icon The measured signal should not change by more than 0.6 mV in 4 seconds.	Strict | Standard | Fast
Rel. mV Offset	Rel. mV Offset: In the rel. mV mode the offset value is subtracted from the measured value. **Enter Offset Value**: An offset value can be entered. **Test a Reference Sample**: Determine by measuring the mV of a reference sample.	Enter Offset Value | Test a Reference Sample
Enter Offset Value	Enter an offset value in mV.	-1999.9…+1999.9

Test a Reference Sample

1 Place an electrode in the reference sample.
2 Press **Start** to begin the reference measurement and wait until the measurement display freezes.
   - or-
3 Press **Read** to manually end the measurement.
4 Press **Save** to enter the measured mV value as offset into the meter.

6.1.4 Endpoint Type

Navigation: Menu > pH/Ion > Endpoint Type

Parameter	Description	Values
Endpoint Type	**Auto EP**: The meter determines when a measurement is to be stopped, based on the programmed stability criteria. **Manual EP**: The user is required to stop the measurement manually. **Timed EP**: The meter stops the measurement after a defined time.	Auto EP | Manual EP | Timed EP
Enter Time	Period of time [s] until the endpoint of the measurement is reached if **Endpoint Type** is set to **Timed EP**.	5…3600 s

6.1.5 Temperature Settings

Navigation: Menu > pH/Ion > Temperature Settings

Parameter	Description	Values
Set MTC Temperature	If the meter does not detect a temperature probe, **MTC** appears on the display. In this case the sample temperature should be entered manually.	-30 °C…130 °C | -22 °F…266 °F
Temperature Unit	Defines the temperature unit applicable for the measurements. The temperature value is automatically converted between the two units.	°C | °F
Temp. Sensor Recognition	You can select between automatic recognition or manual selection of the temperature sensor type. For temperatures below 100 °C the instrument can reliably distinguish between NTC30 kΩ and Pt1000. At higher temperatures however, it is necessary to select the type of temperature sensor manually.	Automatic | Manual
Temp. Sensor Recognition	Defines the type of temperature sensor to be used if **Manual** is selected.	NTC30 kOhm | Pt 1000

6.1.6 Measurement Limits

The upper and lower limits for measurement data can be defined. If a limit is either not reached or exceeded (in other words, less than or greater than a specific value), a warning is displayed on the screen and may be accompanied by an acoustic signal. The message **Outside limits!** also appears on the GLP printout.

Navigation: Menu > pH/Ion > Measurement Limits

Parameter	Description	Values
pH Limit	Defines the upper and lower limit in [pH].	-2.000…20.000
mV Limit	Defines the upper and lower limit in [mV].	-1999.9…1999.9
Rel. mV Limit	Defines the upper and lower limit in [mV].	-1999.9…1999.9
Temperature Limit	Defines the upper and lower limit for the temperature.	-30…130 °C l -22.0…266 °F

6.2 Sensor Calibration

The meter allows you to perform calibrations with up to 5 points. Calibration is only possible in the full-information screen. When starting a calibration by pressing the **Cal** key while the instrument displays the close-up screen, it will automatically switch to the full-information screen.

Note

- The use of a temperature sensor or electrode with a built-in temperature sensor is recommended.
- If you use the **MTC** mode, you should enter the correct temperature value and keep all buffer and sample solutions at the set temperature.
- To ensure the most accurate pH readings, you should perform calibrations regularly.

6.2.1 Running a one-point pH calibration

Before performing a calibration, select the pH channel by using the **Channel** key.

- ▪ Press and hold **Read** to change the display mode (uFocus™).
- ▪ Ensure that the appropriate buffer group has been selected.
- 1 Place the sensor in a calibration buffer and press **Cal**.
    - ⇨ **Cal 1** appears on the display and the **Endpoint Type** icon is blinking.
- 2 The icon ⌐ appears as soon as the signal is stable, the measurement will stop automatically if **Endpoint Type** > **Auto** is selected.
    - or -
    To manually stop the measurement, press **Read**.
    - ⇨ Two soft buttons **Exit** and **Calculate** are shown.
- 3 Press **Calculate** to accept the calibration.
    - ⇨ The offset value and the slope are shown on the display.
- 4 Press **Save** to save the result.
    - or -
    Press **Exit** to reject the calibration and return to the measurement screen.

Note

- With the one-point calibration only the offset is adjusted. If the sensor was previously calibrated with a multipoint calibration the previously stored slope will remain. Otherwise the theoretical slope (-59.16 mV/pH) will be used.

6.2.2 Running a multi-point pH calibration

Before performing a calibration, select the pH channel by using the **Channel** key.

- Press and hold **Read** to change the display mode (uFocus™).
- Ensure that the appropriate buffers have been selected.

1 Place the sensor in a buffer and press **Cal**.

   ⇨ **Cal 1** appears on the display and the **Endpoint Type** icon is blinking.

2 The icon ⌒ appears as soon as the signal is stable, the measurement will stop automatically if **Endpoint Type** > **Auto** is selected.
   - or -
   To manually stop the measurement, press **Read**.

3 Rinse the sensor with deionized water and place the sensor in the next calibration buffer/standard.

4 Press **Cal**.

   ⇨ **Cal 2** appears on the display and the **Endpoint Type** icon is blinking.

5 The icon ⌒ appears as soon as the signal is stable, the measurement will stop automatically if **Endpoint Type** > **Auto** is selected.
   - or -
   To manually stop the measurement, press **Read**.

6 Rinse the sensor with deionized water and repeat the steps with all buffers.

7 Press **Calculate** to accept the calibration procedure. The meter will end the calibration automatically when 5 calibrations are performed.

   ⇨ The offset value and slope are shown on the display.

8 Press ⬇ to scroll down to next page of result.

9 Press **Save** to accept the calibration.
   - or -
   Press **Exit** to reject the calibration and return to the measurement screen.

6.3 Sample Measurement

- Press and hold **Read** to change the display mode (uFocus™).
- Press and hold **Mode** to change the channel selection if both channels are active. Then press **Mode** to change the measurement mode.

1 Place the sensor in the sample and press **Read** to start a measurement.

   ⇨ The **Endpoint Type** icon is blinking, indicating a measurement is in progress. The display shows the measurement value of the sample.

2 The icon ⌒ appears as soon as the signal is stable, the measurement will stop automatically if **Endpoint Type** > **Auto** is selected.
   - or -
   To manually stop the measurement, press **Read**.

⇨ The measurement has been stopped and the measured values are displayed.

Endpoint Type

- **Auto**: the measurement stops automatically when the signal is stable.
- **Manual**: press **Read** to manually stop the measurement.
- **Timed**: the measurement stops after the preset time.

7 Measuring Ion

7.1 Measurement settings

Navigation: Menu > pH/Ion

1.	Sensor ID / SN		4.	Endpoint Type
	1. Enter Sensor ID / SN		5.	Temperature Settings
	2. Select Sensor ID			1. Set MTC Temperature
2.	Calibration Settings			2. Temperature Unit
	1. Buffer Group / Standard			3. Temp. Sensor Recognition
	2. Calibration Mode		6.	Measurement Limits
	3. Calibration Reminder			1. pH Limit
3.	Measurement Settings			2. mV Limit
	1. Measurement Resolution			3. Rel. mV Limit
	2. Stability Criterion			4. Ion Limit
	3. Ion Measurement Unit			5. Temperature Limit
	4. Ion Type			
	5. Rel. mV Offset			

7.1.1 Sensor ID / SN

Navigation: Menu > pH/Ion > Sensor ID

When connecting an **ISM® sensor** to the meter, the meter will:

- Automatically recognize the sensor when it's turned on (alternatively, when pressing **READ** or **CAL**)
- Load the stored sensor ID, sensor SN and sensor type as well as the latest calibration data of this sensor
- Use this calibration for the subsequent measurements

The sensor ID for ISM® sensors can be changed. Sensor SN and sensor type, however, are blocked for modification.

Parameter	Description	Values
Sensor ID	Enter alphanumeric IDs for sensors. A maximum of 30 sensor IDs are stored in the memory and listed for selection. If the maximum number of IDs has been stored, the meter will display the message **Memory is full**.	1…12 characters
Sensor SN	Enter alphanumeric serial numbers for sensors. Serial numbers of ISM® sensors are detected automatically.	1…12 characters
Select Sensor ID	To select a sensor out of a list of existing sensors. If a sensor ID is selected, which has been calibrated before, the specific calibration data for this sensor ID will be loaded.	List of available sensor IDs

7.1.2 Calibration Settings

Navigation: Menu > pH/Ion > Calibration Settings

Parameter	Description	Values
Buffer group	**Ion-standards**: A group of predefined units. Concentration can be adjusted by pressing **Read**. Up to 5 ion standards per temperature can be user-defined. When switching from predefined buffer group to customized buffer group, press **Save** in the table even if no values have changed.	Ion-standards

Temperature tables for these buffers are programmed in the meter and can be found in the "Appendix".

Parameter	Description	Values
Calibration Mode	**Segmented**: the calibration curve is made up of linear segments joining the individual calibration points. If high accuracy is required, the segment method is recommended. **Linear**: the calibration curve is determined using linear regression. This method is recommended for samples with widely varying values.	Segmented l Linear
Calibration Reminder	If activated, a reminder to perform a calibration appears after a defined time period.	On l Off

> **NOTICE**
>
> **Risk of incorrect results due to temperature deviation!**
>
> If the temperature of the calibration deviates more than 0.5°C from the specified standard's temperature a warning will be displayed
>
> 1 Exit the warning adjust the temperature of the used calibration standard and redo the calibration
>
>   ⇨ OR
>
> 2 Accept and continue the calibration process accepting that the results have higher uncertainty.

7.1.3 Measurement Settings

Navigation: Menu > pH/Ion > Measurement Settings

In the ion mode, the measurement resolution depends on the concentration and the unit of the measured ion

Measurement Resolution	The resolution for mV needs to be set for the display. Up to 3 decimal places can be chosen depending on the unit of measurement. The measurement resolution depends on the concentration and the unit of the measured ion.	**mV**

Decimal places

mV	X	no decimal places
pH, mV	X.X	one decimal place
pH	X.XX	two decimal places
pH	X.XXX	three decimal places

Parameter	Description	Values
Stability Criterion	**Strict**: The measured signal should not change by more than 0.03 mV in 8 seconds or by more than 0.1 mV in 20 seconds. **Standard**: The measured signal should not change by more than 0.1 mV in 6 seconds. **Fast** Stability-Fast icon The measured signal should not change by more than 0.6 mV in 4 seconds.	Strict l Standard l Fast
Rel. mV Offset	Rel. mV Offset: In the rel. mV mode the offset value is subtracted from the measured value. **Enter Offset Value**: An offset value can be entered. **Test a Reference Sample**: Determine by measuring the mV of a reference sample.	Enter Offset Value l Test a Reference Sample
Enter Offset Value	Enter an offset value in mV.	-1999.9…+1999.9
Ion Measurement Unit	Select **Ion Type** for automatic calculation.	mmol/L l mol/L l ppm l mg/L l % l pX

Ion Type	Select **Ion Type** from predefined values.	Ca^{2+} | Cl^- | CN^- | Lu^{2+} | F^- | I^- | Ion^+ | Ion^- | Ion^{2+} | Ion^{2-} | K^+ | Li^+ | Na^+ | NO_3^- | NH_4^+ | Pb^{2+} | S^{2-}

Test a Reference Sample

1   Place an electrode in the reference sample.

2   Press **Start** to begin the reference measurement and wait until the measurement display freezes.
    - or-

3   Press **Read** to manually end the measurement.

4   Press **Save** to enter the measured mV value as offset into the meter.

7.1.4 Endpoint Type

Navigation: Menu > pH/Ion > Endpoint Type

Parameter	Description	Values
Endpoint Type	**Auto EP**: The meter determines when a measurement is to be stopped, based on the programmed stability criteria. **Manual EP**: The user is required to stop the measurement manually. **Timed EP**: The meter stops the measurement after a defined time.	Auto EP | Manual EP | Timed EP
Enter Time	Period of time [s] until the endpoint of the measurement is reached if **Endpoint Type** is set to **Timed EP**.	5…3600 s

7.1.5 Temperature Settings

Navigation: Menu > pH/Ion > Temperature Settings

Parameter	Description	Values
Set MTC Temperature	If the meter does not detect a temperature probe, **MTC** appears on the display. In this case the sample temperature should be entered manually.	-30 °C…130 °C | -22 °F…266 °F
Temperature Unit	Defines the temperature unit applicable for the measurements. The temperature value is automatically converted between the two units.	°C | °F
Temp. Sensor Recognition	You can select between automatic recognition or manual selection of the temperature sensor type. For temperatures below 100 °C the instrument can reliably distinguish between NTC30 kΩ and Pt1000. At higher temperatures however, it is necessary to select the type of temperature sensor manually.	Automatic | Manual
Temp. Sensor Recognition	Defines the type of temperature sensor to be used if **Manual** is selected.	NTC30 kOhm | Pt 1000

7.1.6 Measurement Limits

The upper and lower limits for measurement data can be defined. If a limit is either not reached or exceeded (in other words, less than or greater than a specific value), a warning is displayed on the screen and may be accompanied by an acoustic signal. The message **Outside limits!** also appears on the GLP printout.

Navigation: Menu > pH/Ion > Measurement Limits

Parameter	Description	Values
mV Limit	Defines the upper and lower limit in [mV].	-1999.9…1999.9
Rel. mV Limit	Defines the upper and lower limit in [mV].	-1999.9…1999.9

| Temperature Limit | Defines the upper and lower limit for the temperature. | -30…130 °C \| -22.0… 266 °F |
| Ion Limit | Defines the upper and lower limit for the selected unit. | 1.00e-09…9.99e+09 mmol/L \| 1.00e-09…9.99e+09 mol/L \| 0.001…9999 ppm \| 1.00e-09…9.99e +09 mg/L \| 0.001…999.9 % \| -2.000…20.000 pX |

7.2 Sample Measurement

- Press and hold **Read** to change the display mode (uFocus™).
- Press and hold **Mode** to change the channel selection if both channels are active. Then press **Mode** to change the measurement mode.

1 Place the sensor in the sample and press **Read** to start a measurement.
   ⇨ The **Endpoint Type** icon is blinking, indicating a measurement is in progress. The display shows the measurement value of the sample.
2 The icon ⌐ appears as soon as the signal is stable, the measurement will stop automatically if **Endpoint Type** > **Auto** is selected.
   - or -
   To manually stop the measurement, press **Read**.
⇨ The measurement has been stopped and the measured values are displayed.

Endpoint Type

- **Auto**: the measurement stops automatically when the signal is stable.
- **Manual**: press **Read** to manually stop the measurement.
- **Timed**: the measurement stops after the preset time.

8 Managing data

Navigation: Data

1.	Measurement Data		3.	ISM Data (Electrode Records)
	1. View			1. pH
	2. Transfer			1.1 Initial Calibration Data
	3. Delete			1.2 Calibration History
2.	Calibration Data			1.3 Electrode Records
	1. pH			1.4 Reset ISM
	1.1 View			2. Conductivity
	1.2 Transfer			2.1 Initial Calibration Data
	1.3 Delete			2.2 Calibration History
	2. Conductivity			2.3 Electrode Records
	2.1 View			2.4 Reset ISM
	2.2 Transfer		4.	Transfer Interfaces
	2.3 Delete			

8.1 Measurement data

Navigation: Data > Measurement Data

All stored measurement data can be reviewed, transferred to selected options, or deleted. Deletion is protected by a PIN. Upon delivery, the PIN is set to 000000. Change the PIN code to prevent unauthorized access. The measurement data can be filtered according to different criteria.

1 Select the desired action **View**, **Transfer** or **Delete**.

2 Select **All** to select all the data.
   - or -
   Select **Partial** to apply a filter to the selection.
   - or -
   Select **New** to select all not yet transferred data.

⇨ The selected action will be applied to the filtered data.

Filter options

Parameter	Description
Partial by Date/Time	– Enter the time range of the data and press **Select**. ⇨ The measurement data is displayed.
Partial by Channel	– Enter the channel of the data and press **Select**.
Partial by Memory Number	1 Enter the memory numbers of the data and press **Select**. ⇨ The measurement data is displayed. 2 Scroll through the measurement data to review all measurements between the two memory numbers.
Partial by Sample ID	1 Enter the sample ID and press **OK**. ⇨ The meter finds all stored measurements with this sample ID. 2 Scroll through the measurement data to review all measurements with the entered sample ID.
Partial by Measurement Mode	1 Select a measurement mode from list. The meter finds all stored measurements of the selected measurement mode. 2 Scroll through the measurement data of the selected measurement mode.

8.2 Calibration data

Navigation: Data > Calibration Data

All stored calibration data can be reviewed, transferred to selected options, or deleted. Deletion is protected by a PIN. Upon delivery, the PIN is set to 000000. Change the PIN code to prevent unauthorized access.

1 Select channel **pH** or **Conductivity**.

2 Select the desired action **View**, **Transfer** or **Delete**.

⇨ The list of calibrated sensor IDs appears.

3 Select a sensor from the list to start the selected action.

⇨ The selected action will be applied to the sensor.

Note

- After deletion, the sensor ID disappears from the list in the sensor ID menu.

8.3 ISM data

Navigation: Data > ISM Data

The SevenCompact meters incorporate Intelligent Sensor Management (ISM®) technology. This ingenious functionality provides extra security, safety and eliminates mistakes.

- After connecting the ISM® sensor, the sensor is automatically recognized and the sensor ID and serial number are transferred from the sensor chip to the meter. The data is also printed on the GLP printout.
- After calibration of the ISM® sensor, the calibration data is automatically stored from the meter to the sensor chip. The most recent data is always stored where it should be – on the sensor chip!
- After connecting the ISM® sensor, the five most recent calibrations are transferred to the meter. These can be reviewed to see the development of the sensor over time. This information provides an indication if the sensor should be cleaned or renewed.
- After connecting an ISM® sensor, the last set of calibration data is automatically used for measurements.

Initial calibration data pH sensors

When connecting a ISM® sensor, the initial calibration data in the sensor can be reviewed or transferred. The following data is included:

- Response time between pH 4.01 and 7.00
- Temperature tolerance
- Membrane resistance
- Slope (calibration with pH 4.01 and 7.00) and offset
- Type (and name) of electrode (for example, InLab Expert Pro-ISM®)
- Serial number (SN) and order number
- Production date

Initial calibration data conductivity sensors

When connecting a ISM® sensor, the initial calibration data in the sensor can be reviewed or transferred. The following data is included:

- Response time
- Temperature tolerance
- Cell constant
- Cell constant tolerance
- Type (and name) of electrode (for example, InLab 731-ISM®)
- Serial number (SN) and order number
- Production date

Options

Parameter	Description
Calibration History	The last 5 calibrations data stored in ISM® sensor including current calibration can be reviewed or transferred.
Maximum Temperature	The maximum temperature that the ISM® sensor has been exposed to during measurement is monitored automatically and can be reviewed for the evaluation of the electrode lifetime.

Parameter	Description
Reset ISM	The calibration history in this menu can be deleted. This menu is protected by a deletion PIN. Upon delivery, the PIN for deletion is set to 000000. Change the PIN to prevent unauthorized access.

8.4 Transfer Interfaces

Navigation: Data > Transfer Interfaces

All stored measurement data can be transferred to selected interface.

Parameter	Description	Values
Interface	**USB-stick**: Data will be stored to the connected USB-stick in *.txt format. **Printer**: Data will be printed to the connected printer. **PC**: Data will be transferred to the connected PC, running **EasyDirect pH**.	USB-stick I Printer I PC

9 Maintenance and Care

Do not open the housing of the instrument; it does not contain any parts that can be maintained, repaired or replaced by the user. If you experience problems with your instrument, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

9.1 Cleaning the Instrument

> **NOTICE**
>
> **Danger of damage to the instrument due to inappropriate cleaning agents!**
> The housing is made of acrylonitrile butadiene styrene/polycarbonate (ABS/PC). This material is sensitive to some organic solvents, such as toluene, xylene and methyl ethyl ketone (MEK). If liquids enter the housing they can damage the instrument.
> 1 Use only water and a mild detergent to clean the housing.
> 2 Wipe off any spills immediately.
> 3 The instrument is IP54 splash water proof: Do not immerse the instrument in liquid.

- The instrument is turned off and disconnected from the electrical outlet.
- Clean the housing of the instrument using a cloth dampened with water and a mild detergent.

9.2 Maintenance of electrodes

The instrument monitors the condition of the attached pH electrodes.

Slope: 95-105%
and offset: ± (0-20) mV
Electrode is in good condition

Slope: 90-94%
or offset: ± (20-35) mV
Electrode needs cleaning

Slope: 85-89%
or offset: ± (>35) mV
Electrode is defective or too old

When cleaning, always follow the instructions in the manual of the electrodes used. Make sure the pH electrode is always kept filled with the appropriate filling solution. For maximum accuracy, any filling solution that may have "crept" and encrusted the outside of the electrode should be removed with deionized water. Always store the electrode according to the manufacturer's instructions and do not allow it to dry out.

If the electrode slope falls rapidly, or if the response becomes sluggish, the following procedures may help. Try one of the following, depending on your sample.

Problem	Action
Fat or oil build-up	Either rinse the membrane with soap solution or aceton/ethanol or shortly soak the tip of the electrode in hot water. When rinsed with organic solvent, place the membrane overnight in 0.1 mol/L HCl.
pH electrode membrane has dried out	Soak the tip of the electrode overnight in 0.1 mol/L HCl. If this procedure has no effect, soak the tip of the electrode for a few minutes in reactivation solution for pH electrodes.
Protein build-up in the diaphragm of a pH electrode	Remove deposits by soaking the electrode in an HCl/pepsin solution.
Silver sulfide contamination of pH electrode	Remove deposits by soaking the electrode in a thiourea solution.

Run a new calibration after treatment.

Note

- Cleaning and filling solutions should be handled with the same care as that given to toxic or corrosive substances.
- The condition of the pH electrode can also be checked, using the provided METTLER TOLEDO method Sensor Test.

9.3 Transporting the instrument

Note the following instructions when transporting the instrument to a new location:

- Transport the instrument with care to avoid damage! The instrument may be damaged if not transported correctly.
- Unplug the instrument and remove all connected cables.
- Remove the electrode arm.
- To avoid damage to the instrument when transporting it over long distances, please use the original packaging.
- If the original packaging is no longer available, choose packaging that will ensure safe handling.

9.4 Disposal

In conformance with the European Directive 2012/19/EU 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.

10 Troubleshooting

10.1 Error messages

Message	Description and Resolution
pH/mV/ion/temperature exceeds max. limit pH/mV/ion/temperature below min. limit	Measurement limits are activated in the menu settings and measured value is outside these limits. • Check the sample. • Check sample temperature. • Make sure that the pH electrode wetting cap has been removed and that the electrode is properly connected and placed in the sample solution.
Memory is full	Max. 1000 measurement data can be stored in the memory. • Delete all or partial data in the memory, otherwise you will not be able to store new measurement data.
Please calibrate electrode	Calibration reminder has been switched on in the menu settings and last calibration has expired. • Calibrate the electrode.
Active sensor cannot be deleted	Deleting the calibration data of the selected sensor ID is not possible, because it is currently the active sensor ID in the meter shown on the display. • Enter new sensor ID in the menu settings. • Select another sensor ID from the list in the menu settings.
Wrong buffer	Meter cannot recognize the buffer or standard/buffer has been used twice for calibration/two buffers differ less than 60 mV. • Make sure that you have the correct buffer and that it is fresh. • Make sure that the buffer has not been used more than once during the calibration.
Slope out of range Offset out of range	The calibration result is outside the following limits: Slope < 85% or > 110%, Offset < -60 mV or > + 60 mV. • Make sure that you have the correct buffer and that it is fresh. • Check mV signal of electrode, clean or replace the electrode.
Standard temp. out of range Buffer temp. out of range	The ATC measured temperature is out of pH calibration buffer range: 5 … 50 °C. • Keep the buffer/standard temperature within the range. • Change the temperature setting.
Temperature deviation error (pH)	The calibration temperature deviates from the customized buffer. • Stop and redo calibration with the exact temperature.
Temperature deviation error (Ion)	The temperature of the calibration deviates more than 0.5°C from the specified standard's temperature. • Exit the warning adjust the temperature of the used calibration standard and redo the calibration. • Accept and continue the calibration process accepting that the results have higher uncertainty.
ISM® sensor communication error	Data has not been transferred correctly between ISM® sensor and meter. Reconnect the ISM® sensor and try again.
Self-test failure	Self-test has not been completed within 2 minutes or meter is defective. • Restart self-test and finish within 2 minutes. • Contact METTLER TOLEDO service if problem persists.

Message	Description and Resolution
Wrong settings	Entered value differs by less than 1 pH unit/5°C from other preset values. • Enter a higher/lower value in order to get a bigger difference.
Out of range	Either entered value is out of range. • Enter a value which is within the range shown on display. or Measured value out of range. • Make sure the electrode wetting cap has been removed and that the electrode is properly connected and placed in the sample solution. • If no electrode is connected, put the shorting clip in the socket.
Wrong password	The entered PIN is not correct. • Re-enter the PIN. • Reset to factory settings, all data and settings will be lost.
Passwords do not match	The confirmation PIN does not match with the entered PIN. • Reenter PIN.
Program memory error	Meter recognizes internal error during start-up. • Switch the meter off and back on. • Contact METTLER TOLEDO service if the problem persists.
Data memory error	The data could not be stored into memory. • Switch the meter off and back on. • Contact METTLER TOLEDO service if the problem persists.
No matching data found in memory	The entered filter criterion does not exist. • Enter a new filter criterion.
Sensor ID already exists, previous SN will be overwritten	Two sensors with the same ID but different SN are not allowed in the meter. If a different SN has been entered for this sensor ID previously, the old SN will be overwritten. • Enter a different Sensor ID in order to keep the previous ID and SN.
Update failed	The software update process failed. This could be due to the following reasons: • The USB stick is not connected or it is disconnected during the update process • The update software is not in the correct folder
Export failed	The exporting process failed. This could be due to the following reasons: • The USB stick is not connected or it is disconnected during the exporting process • The USB stick is full

10.2 Error limits

pH Channel

Message	Range not accepted	
pH exceeds max. limit	pH	< -2.000 or > 20.000
mV exceeds max. limit	mV	< -2000.0 or > 2000.0
Buffer temp. out of range/Standard temp. out of range	T (pH)	< 5 or > 50 °C

Message	Range not accepted	
Offset out of range	Eref1-Eb > 60 mV	
Slope out of range	Slope < 85% or > 110%	
Wrong buffer	ΔEref1 < 0 mV	

11 Sensors, Solutions and Accessories

pH Sensors

Parts	Order No.
ISM® sensors with multi-pin head	
InLab®Micro Pro-ISM, 3-in-1 pH sensor, glass shaft, 5 mm shaft diameter, ATC, refillable	51344163
InLab®Power Pro-ISM, 3-in-1 pH sensor, glass shaft, ATC, pressurized SteadyForce™ reference system	51344211
InLab®Pure Pro-ISM, 3-in-1 pH sensor, glass shaft, immovable glass sleeve, ATC, refillable	51344172
InLab®Routine Pro-ISM, 3-in-1 pH sensor, glass shaft, ATC, refillable	51344055
InLab®Science Pro-ISM, 3-in-1 pH sensor, glass shaft, movable glass sleeve, ATC, refillable	51344072
InLab®Solids Pro-ISM, 3-in-1 pH sensor, glass shaft, open junction, sharp membrane, ATC	51344155

Ion Sensors

Parts	Order No.
DX207-Li	51107673
DX218-NH4	51340900
DX219-F	51340500
DX224-Mg	51107684
DX226-CN	51107681
DX232-S	51107675
DX235-Cl	51340400
DX239-K	51340700
DX240-Ca	51340600
DX258-SCN	51107870
DX262-NO3	51340800
DX264-Cu	51107678
DX280-Br	51340300
DX287-BF4	51107676
DX312-Cd	51107672
DX327-I	51107680
DX337-Ba	51107674
DX407-Pb	51107873
perfectIONTM comb Ag/S	51344700
perfectIONTM comb Ca	51344703
perfectIONTM comb Cl	51344706
perfectIONTM comb CN	51344709
perfectIONTM comb Cu	51344712
perfectIONTM comb F	51344715
perfectIONTM comb I	51344718
perfectIONTM comb K	51344721
perfectIONTM comb Na	51344724
perfectIONTM comb NO3	51344727

Parts	Order No.
perfectIONTM comb Pb	51344730
NH3 GSE	51341000
NOx GSE (NH3 GSE & NOx electrolyte)	51341000 & 51340037
CO2 GSE (NH3 GSE & CO2 electrolyte)	51341000 & 51340038

pH solutions

Solutions	Order No.
pH 2.00 buffer sachets, 30 x 20 mL	30111134
pH 2.00 buffer solution, 250 mL	51350002
pH 2.00 buffer solution, 6 x 250 mL	51350016
pH 4.01 buffer sachets, 30 x 20 mL	51302069
pH 4.01 buffer solution, 250 mL	51350004
pH 4.01 buffer solution, 6 x 250 mL	51350018
pH 7.00 buffer sachets, 30 x 20 mL	51302047
pH 7.00 buffer solution, 250 mL	51350006
pH 7.00 buffer solution, 6 x 250 mL	51350020
pH 9.21 buffer sachets, 30 x 20 mL	51302070
pH 9.21 buffer solution, 250 mL	51350008
pH 9.21 buffer solution, 6 x 250 mL	51350022
pH 10.01 buffer sachets, 30 x 20 mL	51302079
pH 10.00 buffer solution, 250 mL	51350010
pH 10.00 buffer solution, 6 x 250 mL	51350024
pH 11.00 buffer sachets, 30 x 20 mL	30111135
pH 11.00 buffer solution, 250 mL	51350012
pH 11.00 buffer solution, 6 x 250 mL	51350026
Rainbow sachets I (10 sachets of pH 4.01 / 7.00 / 9.21)	51302068
Rainbow sachets II (10 sachets of pH 4.01 / 7.00 / 10.01)	51302080
Rainbow bottles I (2 x 250 mL of pH 4.01 / 7.00 / 9.21)	30095312
Rainbow bottles II (2 x 250 mL of pH 4.01 / 7.00 / 10.00)	30095313
InLab storage solution (for all InLab pH and redox electrodes), 250 mL	30111142
Electrolyte 3 mol/L KCl, 25 mL	51343180
Electrolyte 3 mol/L KCl, 250 mL	51350072
Electrolyte 3 mol/L KCl, 6 x 250 mL	51350080
HCl/Pepsin solution (removes protein contamination), 250 mL	51350100
Thiourea solution (removes silver sulfide contamination), 250 mL	51350102
Regeneration solution for pH electrodes, 25 mL	51350104

Ion solutions

Solutions	Order No.
electrolyte for DX207-Li, 20 mL	51107881
electrolyte for DX218-NH4, 20 mL	51340035
electrolyte for DX219-F, 20 mL	51107885
electrolyte for DX224-Mg, 20 mL	51344172

Solutions	Order No.
electrolyte for DX226-CN, 20 mL	51107893
electrolyte for DX232-S, 20 mL	51107894
electrolyte for DX235-Cl, 20 mL	51340030
electrolyte for DX239-K, 20 mL	51340033
electrolyte for DX240-Ca, 20 mL	51340032
electrolyte for DX258-SCN, 20 mL	51107872
electrolyte for DX262-NO3, 20 mL	51340034
electrolyte for DX264-Cu, 20 mL	51107889
electrolyte for DX280-Br, 20 mL	51340029
electrolyte for DX287-BF4, 20 mL	51107890
electrolyte for DX312-Cd, 20 mL	51107891
electrolyte for DX327-I, 20 mL	51107898
electrolyte for DX337-Ba, 20 mL	51107892
electrolyte for DX407-Pb, 20 mL	51107875
electrolyte for GSE NH3, 25 mL	51340036
electrolyte for GSE NOx, 25 mL	51340037
electrolyte for GSE CO2, 25 mL	51340038
Ion electrolyte A (Ca, F, S), 5x 60 mL	51344750
Ion electrolyte B (Cl, CN, Pb, Ag/S), 5x 60 mL	51344751
Ion electrolyte C (Ag), 5x 60 mL	51344752
Ion electrolyte D (Cu, I), 5x 60 mL	51344753
Ion electrolyte E (K), 5x 60 mL	51344754
Ion electrolyte F (NO3), 5x 60 mL	51344755
TISAB 3 Solution, 250 mL	51350106
ISA Alu Sulfate Solution (0.9 mol/L Al2(SO4)3), 250 mL	51350108
ISA for solid state ISE (Ag, Cl, CN, Cu, I, Pb), 475 mL	51344760
Calcium ISA, 475 mL	51344761
Potassium ISA, 475 mL	51344762
Nitrate ISA, 475 mL	51344763
Nitrate ISS (for supressing interference), 475 mL	51344764
Fluoride TISAB II, 3790 mL	51344765
Fluoride TISAB III, 475 mL	51344766
Ammonium 1000 ppm, 500 mL	30090859
Ammonium 100 ppm, 500 mL	30090860
Calcium 1000 ppm, 500 mL	51344771
Calcium 100 ppm, 500 mL	30090855
Calcium 10 ppm, 500 mL	30090856
Chloride 1000 ppm, 500 mL	51344772
Chloride 100 ppm, 500 mL	30090853
Chloride 10 ppm, 500 mL	30090854
Copper 1000 ppm, 500 mL	51344774
Cyanide 1000 ppm, 500 mL	51344773
Fluoride 1000 ppm, 500 mL	51344775
Fluoride 100 ppm, 500 mL	30090851

Solutions	Order No.
Fluoride 10 ppm, 500 mL	30090852
Iodide 1000 ppm, 500 mL	51344776
Lead 1000 ppm, 500 mL	51344780
Nitrate 1000 ppm, 500 mL	51344779
Potassium 1000 ppm, 500 mL	51344777
Silver 1000 ppm, 500 mL	51344770
Sodium 1000 ppm, 500 mL	51344778
Sodium 100 ppm, 500 mL	30090857
Sodium 10 ppm, 500 mL	30090858
Sulfide 1000 ppm, 500 mL	51344781

Parts	Order No.
Guide to pH measurement	51300047

12 Technical Data

General

Screen	Color TFT	
Interfaces	RS232	9-pin male D-sub (Printer, barcode reader, PC keyboard)
	USB-A	USB-Stick (FAT12/FAT16/FAT32)/ Printer
	USB-B	Computer
Stirrer	Socket	5-pin Mini-DIN
	Voltage range	0.5…18 V ⎓
	Current	Max. 300 mA
Ambient conditions	Ambient temperature	5…40 °C
	Relative humidity	5…80% (non-condensing)
	Overvoltage category	Class II
	Pollution degree	2
	Range of application	For indoor use only
	Maximum operating altitude	Up to 2000 m
Standards for safety and EMC	See Declaration of Conformity	
Dimensions	Width	204 mm
	Depth	174 mm
	Height	74 mm
	Weight	890 g
Power rating instrument	Input voltage	9 - 12 V ⎓
	Power consumption	2.5 W
Power rating AC adapter	Line voltage	100 - 240 V ∼ ±10 %
	Input frequency	50/60 Hz
	Input current	0.3 A
	Output voltage	12 V ⎓
	Output current	0.84 A
Materials	Housing	ABS/PC reinforced
	Window	Polymethyl methacrylate (PMMA)
	Keypad	Membrane keypad: Polyethelene terephtalate (PET)

pH measuring

Measurement range	pH	-2.000…20.000
	mV	-2000.0…+2000.0 mV
	Automatic temperature capture	-5…130 °C
	Manual temperature capture	-30…130 °C

Resolution	pH	0.1/0.01/0.001
	mV	1/0.1
	Temperature	0.1 °C
Limits of error	pH	± 0.002
	mV	± 0.1 mV (-1000…+1000 mV)
		± 0.2 mV (> ±1000 mV)
	Temperature	± 0.1 °C (-5…100 °C)
		± 0.3 °C (> 100 °C)
Isopotential point	pH 7.00	
pH input	BNC	Impedance > $3 \cdot 10^{12}$ Ω
Temperature input	RCA (Cinch)	NTC 30kΩ, Pt1000
Digital sensor input	Mini-LTW	
Calibration (pH)	Calibration points	5
	Predefined buffer groups	8
	User-defined buffer groups	1 user-defined group of 5 buffers
	Automatic buffer recognition	Yes
	Calibration methods	Linear, segmented

Ion measuring

Measurement range	ion	-1999.9…1999.9
	mV	-1999.9…1999.9
	Automatic temperature capture	-5…130 °C
	Manual temperature capture	-30…130 °C
Resolution	pH	0.1/0.01/0.001
	mV	1/0.1
	Temperature	0.1 °C
Limits of error	mV	± 0.1 mV (-1000…+1000 mV)
		± 0.2 mV (> ±1000 mV)
	Temperature	± 0.1 °C (-5…100 °C)
		± 0.3 °C (> 100 °C)
pH input	BNC	Impedance > $3 \cdot 10^{12}$ Ω
Temperature input	RCA (Cinch)	NTC 30kΩ, Pt1000

13 Appendix

13.1 Buffers

METTLER TOLEDO USA (Ref. 25°C)

T [°C]	1.68	4.01	7.00	10.01
5	1.67	4.00	7.09	10.25
10	1.67	4.00	7.06	10.18
15	1.67	4.00	7.04	10.12
20	1.68	4.00	7.02	10.06
25	**1.68**	**4.01**	**7.00**	**10.01**
30	1.68	4.01	6.99	9.97
35	1.69	4.02	6.98	9.93
40	1.69	4.03	6.97	9.89
45	1.70	4.04	6.97	9.86
50	1.71	4.06	6.97	9.83

METTLER TOLEDO Europe (Ref. 25°C)

T [°C]	2.00	4.01	7.00	9.21	11.00
5	2.02	4.01	7.09	9.45	11.72
10	2.01	4.00	7.06	9.38	11.54
15	2.00	4.00	7.04	9.32	11.36
20	2.00	4.00	7.02	9.26	11.18
25	**2.00**	**4.01**	**7.00**	**9.21**	**11.00**
30	1.99	4.01	6.99	9.16	10.82
35	1.99	4.02	6.98	9.11	10.64
40	1.98	4.03	6.97	9.06	10.46
45	1.98	4.04	6.97	9.03	10.28
50	1.98	4.06	6.97	8.99	10.10

MERCK (Ref. 20°C)

T [°C]	2.00	4.00	7.00	9.00	12.00
5	2.01	4.04	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	**2.00**	**4.00**	**7.00**	**9.00**	**12.00**
25	2.00	4.01	6.98	8.95	11.88
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.01	6.96	8.88	11.67
40	2.00	4.01	6.95	8.85	11.54
45	2.00	4.01	6.95	8.82	11.44
50	2.00	4.00	6.95	8.79	11.33

JIS Z 8802 (Ref. 25°C)

T [°C]	1.679	4.008	6.865	9.180
5	1.668	3.999	6.951	9.395
10	1.670	3.998	6.923	9.332
15	1.672	3.999	6.900	9.276
20	1.675	4.002	6.881	9.225
25	**1.679**	**4.008**	**6.865**	**9.180**
30	1.683	4.015	6.853	9.139
35	1.688	4.024	6.844	9.102
40	1.694	4.035	6.838	9.068
45	1.700	4.047	6.834	9.038
50	1.707	4.060	6.833	9.011

DIN(19266:2000) NIST (Ref. 25°C)

T [°C]	1.68	4.008	6.865	9.184	12.454
5	1.668	4.004	6.950	9.392	13.207
10	1.670	4.001	6.922	9.331	13.003
15	1.672	4.001	6.900	9.277	12.810
20	1.676	4.003	6.880	9.228	12.627
25	**1.680**	**4.008**	**6.865**	**9.184**	**12.454**
30	1.685	4.015	6.853	9.144	12.289
35	1.691	4.026	6.845	9.110	12.133
40	1.697	4.036	6.837	9.076	11.984
45	1.704	4.049	6.834	9.046	11.841
50	1.712	4.064	6.833	9.018	11.705

DIN(19267) (Ref. 25°C)

T [°C]	1.09	4.65	6.79	9.23	12.75
5	1.08	4.67	6.87	9.43	13.63
10	1.09	4.66	6.84	9.37	13.37
15	1.09	4.66	6.82	9.32	13.16
20	1.09	4.65	6.80	9.27	12.96
25	**1.09**	**4.65**	**6.79**	**9.23**	**12.75**
30	1.10	4.65	6.78	9.18	12.61
35	1.10	4.65	6.77	9.13	12.45
40	1.10	4.66	6.76	9.09	12.29
45	1.10	4.67	6.76	9.04	12.09
50	1.11	4.68	6.76	9.00	11.98

JJG119 (Ref. 25°C)

T [°C]	1.680	4.003	6.864	9.182	12.460
5	1.669	3.999	6.949	9.391	13.210
10	1.671	3.996	6.921	9.330	13.011
15	1.673	3.996	6.898	9.276	12.820
20	1.676	3.998	6.879	9.226	12.637
25	**1.680**	**4.003**	**6.864**	**9.182**	**12.460**
30	1.684	4.010	6.852	9.142	12.292
35	1.688	4.019	6.844	9.105	12.130
40	1.694	4.029	6.838	9.072	11.975
45	1.700	4.042	6.834	9.042	11.828
50	1.706	4.055	6.833	9.015	11.697

Technical (Ref. 25°C)

T [°C]	2.00	4.01	7.00	10.00
5	2.02	4.01	7.09	10.52
10	2.01	4.00	7.06	10.39
15	2.00	4.00	7.04	10.26
20	2.00	4.00	7.02	10.13
25	**2.00**	**4.01**	**7.00**	**10.00**
30	1.99	4.01	6.99	9.87
35	1.99	4.02	6.98	9.74
40	1.98	4.03	6.97	9.61
45	1.98	4.04	6.97	9.48
50	1.98	4.06	6.97	9.35

To protect your product's future:
METTLER TOLEDO Service assures the quality, measuring accuracy and preservation of value of this product for years to come.

Please request full details about our attractive terms of service.

www.mt.com/phlab

For more information

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