

Operating Instructions

Mode d'emploi

Instrucciones de manejo

SevenGo Duo pro™

pH/ORP/Ion/DO meter SG68

METTLER TOLEDO



Español

Français

English

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1 Introduction

Thank you for purchasing this METTLER TOLEDO meter. SevenGo Duo pro™ is not only a series of easy-to-operate dual channel portable meters for precise measurements, they also contain many exciting features:

- **New ISM®** (Intelligent Sensor Management) **technology**: the meter automatically recognizes the sensor and transfers the last set of calibration data from the sensor chip to the meter. The last five calibrations as well as the initial calibration certificate are also stored on the sensor chip. These can be reviewed, transferred and printed. ISM® provides additional security and helps eliminate mistakes.
- **Multi-language graphical user interface** on a backlit display with intuitive menu guidance, making the operating instructions primarily a source of reference.
- **Easy switching** between the various parameters before or after the measurement.
- **IP67 rating – fully water proof**. The rating refers to the meter, the sensor and the connections. The meter is perfectly suited for indoor as well as outdoor use.

In addition to the new features, SevenGo Duo pro™ meters provide the same high quality standards as in the single-channel SevenGo™ and SevenGo pro™, as well as the dual-channel SevenGo Duo™ models:

- **Excellent ergonomics** – as if the meter is part of you.
- **Great flexibility** in the mode of operation and transport, owing to a **vast collection of accessories**, such as the electrode clip, the rubber holster, washable field carry case or handy carry bag and Ergo™ – the ultimate aid for all measurements in the plant as well as in the field.

2 Safety measures

Measures for your protection



Risk of explosion

- Never work in an environment subject to explosion hazards! The housing of the instrument is not gas tight (explosion hazard due to spark formation, corrosion caused by the ingress of gases).



Risk of corrosion

- When using chemicals and solvents, comply with the instructions of the producer and the general lab safety rules!

Measures for your operational safety



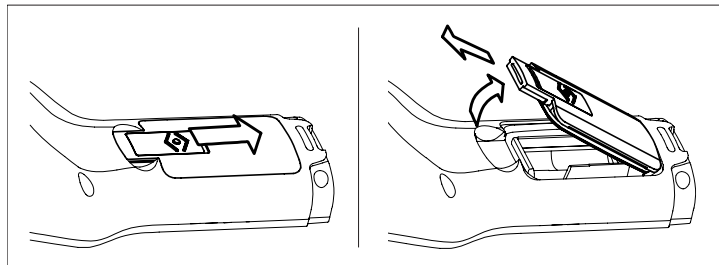
Caution

- Never unscrew the two halves of the housing!
- Have the meter serviced only by METTLER TOLEDO Service!
- Any spillage should be wiped off immediately! Some solvents might cause corrosion of the housing.
- Avoid the following environmental influences:
 - Powerful vibrations
 - Direct sunlight
 - Atmospheric humidity greater than 80%
 - Corrosive gas atmosphere
 - Temperatures below 5 °C and above 40 °C
 - Powerful electric or magnetic fields

3 Installation

Carefully unpack the meter. Keep the calibration certificate in a safe place.

3.1 Installing the batteries



- a) Slide the release button on the battery cover in the direction of the arrow.
- b) Hold the lid with two fingers and remove it.
- c) Insert the batteries in the battery compartment, as indicated by the arrows on the inside of the compartment.
- d) Replace the battery cover and push back the button to fix the lid in place.

Note

The IP67 rating requires the battery compartment to be perfectly sealed. The sealing ring around the battery cover must be replaced if it is damaged in any way.

3.2 Connecting a sensor

IP67 sensors

To connect the IP67 sensors, make sure that the plugs are properly inserted. Twist the RCA (Cinch) plug to ease the attachment of the sensor.

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 ...

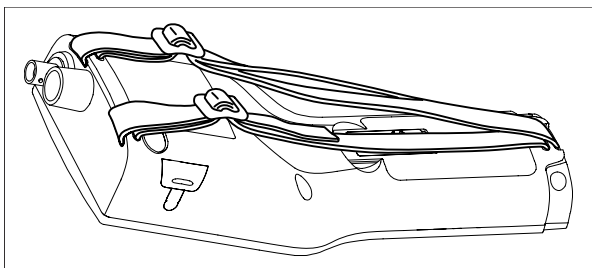
- The meter must be switched on.
- (If the meter is already switched on) the **READ** key is pressed.
- (If the meter is already switched on) the **CAL** key is pressed.

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.

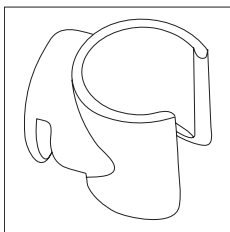
3.3 Fitting the wrist strap



Fit the wrist strap as shown in the diagram.

3.4 SevenGo™ clip

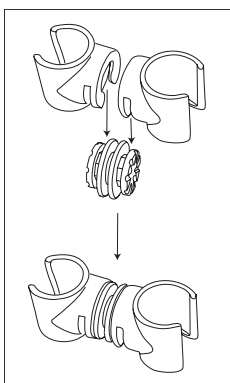
The SevenGo™ clip is an electrode holder that can be placed next to the display on either side of the housing.



- To mount the clip, remove the cover over the clip's fixing point using your thumbnail.
- Attach the clip by pressing it into the recess.
- Slide the shaft of the sensor into the clip from the top.
- Rotate the sensor around the clip's axis to switch between the storage and working positions.

3.5 SevenGo™ two-electrode clip

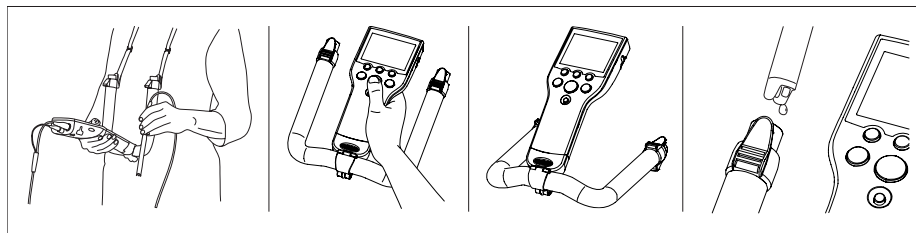
The SevenGo™ two-electrode clip is the ideal accessory for handling two electrodes in the field. Two electrode clips can be connected.



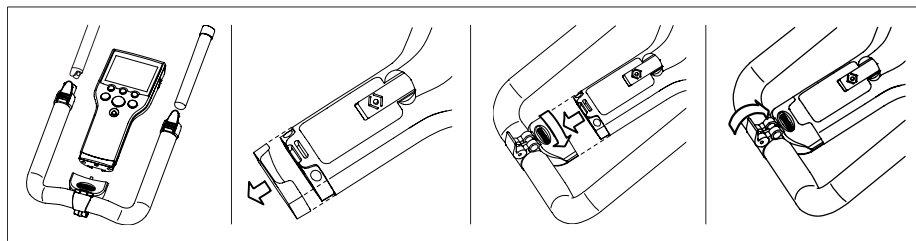
Attach the two clips by pressing them into the recesses of the clip connector.

3.6 Attaching the ErGo™

The ErGo™ protects the meter from shocks and safely stores the electrode(s). It is the perfect accessory for carrying and measuring in the plant or field, and for working comfortably when the meter is placed on a table or on the ground.

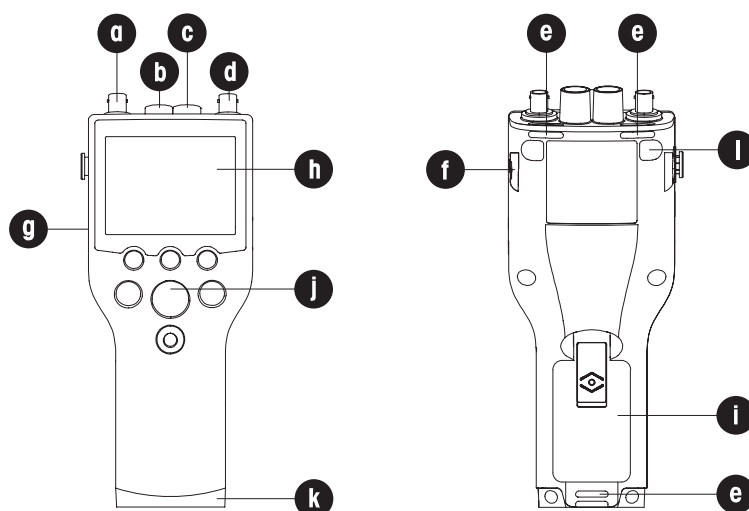


- a) Remove the blue bottom cap at the base of the meter.
- b) Screw the ErGo™ adapter onto the meter.
- c) Mount the ErGo™ as shown in the diagram.
- d) Fit the neck strap to both ends of the ErGo™.



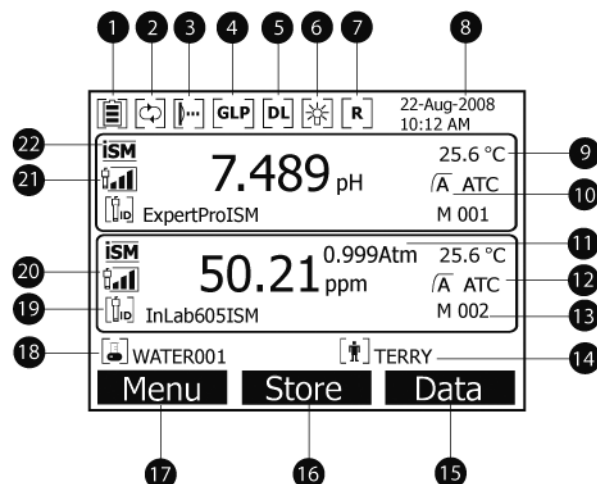
4 Operating the pH/ORP/Ion/DO meter SG68

4.1 Meter layout



- a **BNC socket** for mV/pH signal input
- b **RCA (Cinch) socket** for pH temperature signal input
- c **RCA (Cinch) socket** for DO temperature signal input
- d **BNC socket** for DO signal input
- e **Slots** for attaching the wrist strap
- f **Fixing points** for SevenGo™ clip (both sides)
- g **Infrared (IrDA) window**
- h **Display**
- i **Battery cover**
- j **Rubber key pad**
- k **Bottom cap (blue)** over the field assistant's fixing point
- l **Rubber feet** fixing points

4.2 The display





- 1 **Battery status** icon
- 2 **Auto-off override** icon
- 3 **IrDA infrared interface** icon
- 4 **GLP printout** icon
- 5 **Data logging** icon (timed interval reading)
- 6 **Backlight** icon
- 7 **Routine mode** icon (user access rights are restricted)
- 8 Date and time
- 9 Measurement temperature
- 10 Endpoint format
- 11 Atmospheric pressure
- 12 Temperature compensation
 - **ATC**: Temperature sensor connected
 - **MTC**: no temperature sensor connected or detected
- 13 Number of data sets in memory
- 14 User ID
- 15 Softkey
- 16 Softkey
- 17 Softkey
- 18 Sample ID
- 19 Sensor ID
- 20 **DO electrode condition** criteria

Slope: 80-125% Electrode is in good condition	Slope: 70-79% Electrode needs cleaning	Slope: 60-69% Electrode is faulty
--------------------------------------------------	-------------------------------------------	--------------------------------------
- 20,21 **icon**

--	--	--
- 21 **pH electrode condition** criteria

Slope: 95-105% Offset: $\pm(0-15)$ mV Electrode is in good condition	Slope: 94-90% Offset: $\pm(15-35)$ mV Electrode needs cleaning	Slope: 89-85% Offset: $\pm(>35)$ mV Electrode is faulty
----------------------------------------------------------------------------	----------------------------------------------------------------------	---------------------------------------------------------------
- 22 ISM® sensor connected
- 23 Stability criterion

Strict

Medium

Fast

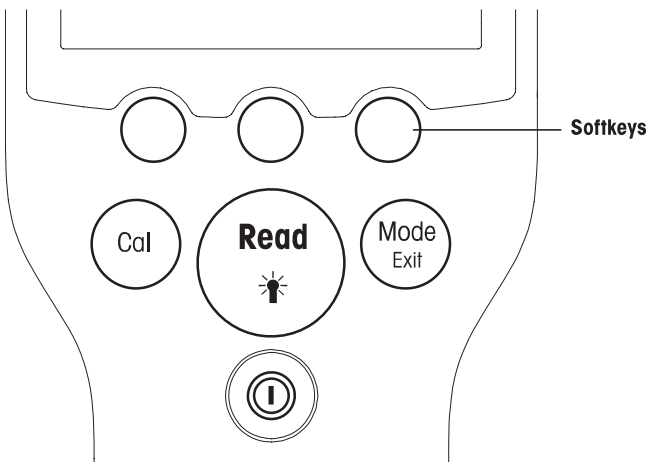
24

Warning messages

25

Buffer groups or standards

4.3 Key controls



Key	Press and release	Press and hold for 3 seconds
ON/OFF 	Switch meter on or off	Switch meter on or off
READ/BACKLIGHT 	Start or endpoint measurement (measurement screen) Confirm input or start editing a table Exit setting and go back to measurement screen	Turn backlight on or off
CAL 	Start calibration	Review the last calibration data
MODE or EXIT 	Switch mode in single channel (measurement screen) Discard setting and go back to previous menu (setting screens)	Switch between single and dual channel display (measurement screen)

Measurement modes

A single channel has to be selected first in order to switch the measurement mode.

- Press and release the **MODE** key in the single channel display to change between the different measurement modes.
- Press and hold the **MODE** key to switch between the dual and single channel measurement screen.

The sequence of the alternating measurement modes for pH/ion measurement is:

1. pH
2. mV
3. rel. mV
4. ion

For the DO measurement the sequence is:

1. saturation (%)

2. ppm
3. mg/L









4.4 Using the softkeys

The SevenGo Duo pro™ multi-parameter meter has three softkeys. The functions assigned to them change during operation depending on the application. The assignment is shown on the bottom line of the screen.

In the measurement screen, the three softkeys are assigned as follows:

Menu	Store	Data
Access meter settings	Save an endpointed measurement	Access data menu




The other softkey functions are:

	Move one position to the right	Edit	Edit table or value
	Move one position to the left	End	End calibration
	Scroll up in the menu	Yes	Confirm
	Scroll down in the menu	No	Reject
	Increase value	Review	Review selected data
	Decrease value	Save	Save data, setting or value
	Scroll to next data set in memory	Select	Select the highlighted function or setting
	Delete letters or numbers on alphanumeric keypad	Start	Begin the reference measurement
Delete	Delete selected data	Trans	Transfer selected data

4.5 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 various softkeys (see "Using the softkeys").

- a) Press **Menu**.
⇒ The **Setup** menu appears and **Sample ID** is highlighted.
- b) Press  to highlight the **Setup** tab.
- c) Press  to highlight the **pH/Ion** tab.
- d) Press  to highlight the **DO** tab.
- e) Press **MODE/EXIT** to return to the measurement screen.

4.6 Navigating within a menu

This example is based on the **Setup** menu, but the procedure applies to the other menus as well.

- a) Press **Menu**.
⇒ The **Setup** menu appears and **Sample ID** is highlighted.
- b) Press  as often as needed to navigate to a menu item.
- c) Press **Select** to move deeper in the menu for the chosen operation.
- d) Continue navigating with ,  or **Select** until the final destination is reached within the menu.
- e) Press **MODE/EXIT** to go back to the previous menu.
— or —
- f) Press **READ** to return to the measurement screen directly.

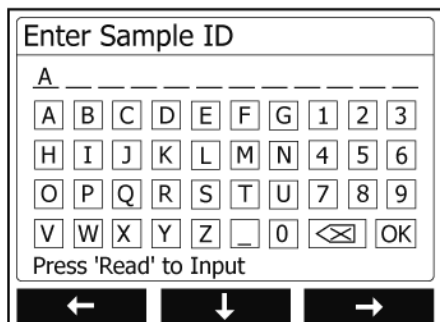
4.7 Using the alphanumeric keypad

4.7.1 Alphanumeric input

The meter has a screen keypad for entering IDs, SNs and PINs. Both numbers and letters are allowed for these entries.

Note

When entering a PIN, each character entered will be displayed as (*).



- Press **←** to move left to highlight number or letter, use **→** to move right, and **↓** to move downwards.
- Press **READ** to confirm the entry.
 - ⇒ The line where the position of alphanumeric character is being entered blinks.
- To end and confirm entry, use softkeys to highlight screen key **OK**, and press **READ** to save the ID.
 - or —
- To delete information, use softkeys to highlight **⊗** and press **READ** to delete the previously entered character.
 - or —
- Press **MODE/EXIT** to return to the upper level of the menu.
 - ⇒ The entries are rejected.

4.7.2 Entering IDs/PIN

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

Example: WATER

- If **A** is highlighted, press **↓** three times.
 - ⇒ **V** is highlighted.
- Press **→** once.
 - ⇒ **W** is highlighted.
- Press **READ** to enter **W**.
- Repositioning the highlighted bar to **A**, **T**, **E** and **R**, and press **READ** to enter each letter of sample ID in sequence as described in steps a - c.
- Reposition the highlighted bar to **OK**, and press **READ** to save the sample ID.

4.7.3 Editing values in a table

The meter has a feature, which allows the user 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 on the display to navigate from cell to cell.

- Press **READ** to start editing the cell in the table.
 - ⇒ The softkeys on the display change.

- b) Press **+** and **-** to enter the value and press **READ** to confirm.
⇒ The softkeys change back to **↑** and **↓**.
- c) Navigate to a cell and press **Delete** to remove a value.
- d) To finish editing the table, navigate with the **↑** and **↓** to highlight **Save**.
- e) Press **READ** to confirm the action and exit the menu.

4.8 Calibration

The SevenGo Duo pro™ pH/DO meter allows you to perform pH and ion calibrations for up to 5 points and DO calibrations for up to 2 points.

4.8.1 Running a one-point pH/ion calibration

- a) Press and hold **MODE** for 3 seconds to switch to single channel pH or ion measurement screen when in dual channel measurement.
- b) Place the electrode in a calibration buffer and press **CAL**.
⇒ **Cal 1** appears on the display.
- c) The meter endpoints according to the preselected endpoint mode after the signal has stabilized or after pressing **READ**.
⇒ The relevant buffer value is shown on the display.
- d) Press **End** to accept the calibration and return to sample measurement.
⇒ The calibration result (offset and slope for pH) is shown on the display.
— or —
- e) Press **Save** to keep the calibration.
- f) Press **EXIT** to reject the calibration.

Notes

- 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.

4.8.2 Running a multi-point pH/ion calibration

pH and ion calibrations can be run with this meter for up to 5 points.

- a) Run the calibration as described in "Running a one-point pH/ion or one-point conductivity calibration" (steps a - c).
- b) Rinse the electrode with deionized water.
- c) Place the electrode in the next calibration buffer.
- d) Press **CAL**.
⇒ **Cal 2** appears on the display. The meter endpoints according to the preselected endpoint mode after the signal has stabilized or after pressing **READ**. The relevant buffer value is shown on the display.
- e) Repeat the steps b - d for all calibration buffers.
- f) Press **End** to end the calibration procedure.
⇒ Alternatively, the meter ends the calibration automatically when 5 calibrations are performed. The offset value and slope are shown on the display.
- g) Press **Save** to keep the calibration.
- h) Press **EXIT** to reject the calibration.

Note

Up to 5 calibrations can be saved for a dedicated sensor ID. The oldest calibration data is automatically overwritten with the current calibration data.

4.8.3 Automatic buffer recognition

The meter features automatic pH buffer recognition for the predefined buffer groups (see "Appendix"). The buffers within a buffer group are automatically recognized by the meter and displayed during calibration. This feature allows the calibration in any order within a predefined pH buffer group.

There is no automatic pH buffer recognition for customized buffer groups; in this case, the defined order of the buffers needs to be followed.

4.8.4 Dissolved oxygen (DO) calibration

Preparing for calibration

Before running a calibration:

- The sensor has to be connected to the meter for at least 6 hours (polarization time).
- For the following digital ISM DO sensors (InPro6850i, InPro6950i), the meters need to be switched on in order for the sensor to be polarized.
- The "Auto override" function should be switched on.
- The membrane must be examined for damage or contamination. If the membrane is dirty, clean carefully with a soft, moist cloth.

Performing a one-point calibration

The first point of a DO calibration is always done in vapor saturated air (100% O₂).

- a) Make sure that the sensor has been gently cleaned and dried. Water droplets on the membrane must be removed, because they prevent the sensor from being correctly calibrated.
- b) Press and hold **MODE** for 3 seconds to switch to single channel measurement screen when in dual channel measurement.



- c) Place the electrode in a bottle 1 cm above the water surface as shown in the graphic above and press **CAL**.
 - ⇒ **Cal 1** appears on the display.
 - ⇒ The meter endpoints according to the preselected endpoint mode, automatically after the signal has stabilized or after pressing **READ**. The standard value is shown on the display.
- d) Press **End** to accept the calibration and return to sample measurement.
 - ⇒ The calibration result is shown on the display.
- e) Press **Exit** to reject the calibration.

Performing a two-point calibration

The second point of a DO calibration is done with a zero oxygen solution.

- a) Follow steps a - c for the first calibration point as described above.
- b) Rinse the sensor with deionized water.
- c) Place the electrode in the zero oxygen solution and press **CAL**.
 - ⇒ **Cal 2** appears on the display.
 - ⇒ The meter endpoints according to the preselected endpoint mode, automatically after the signal has stabilized or after pressing **READ**. The relevant buffer/standard value is shown on the display.

- d) Press **End** to accept the calibration and return to sample measurement.
⇒ The calibration result is shown on the display.
- e) Press **Exit** to reject the calibration.

Note

Zero-point calibrations are frequently a source of error. Due to the very low zero current of METTLER TOLEDO sensors, a zero-point calibration is unnecessary even for measurement at low oxygen concentrations.

4.9 Data transfer

It is possible to transfer either all data or a user-defined set of data from the memory to a METTLER TOLEDO printer (for example, RS-P26) or to a PC using this meter. The data is transferred with the IR interface on the left side of the meter.

Install the driver software (the latest drivers can be downloaded from www.mt.com/pHLab).

The following section describes how to proceed with the different configurations.

Data transfer from SevenGo Duo pro™ to an RS-P26 printer is done using an IR-RS232 adapter.

- a) Connect the RS232 plug to the corresponding interface on the backside of the printer.
- b) Point the instrument's IR window toward the IR receiver on the other end of the adapter cable.
- c) Start transfer in the data menu.

Adjust the settings for data transfer as follows:

- Baud rate: 1200
- Data bits: 8
- Parity: none
- Stop bits: 1

Data transfer from SevenGo Duo pro™ to a PC can be accomplished three different ways:

- Directly with an IrDA interface on the PC
 - Transfer with IR-RS232 adapter
 - Transfer with IR-USB adapter
- a) Open **LabX direct pH**, **Hyperterminal** or **BalanceLink**.
 - b) Adjust the settings for data transfer as follows:
 - ⇒ Baud rate: 9600
 - ⇒ Data bits: 8
 - ⇒ Parity: none
 - ⇒ Stop bits: 1
 - ⇒ Handshake: none
 - c) Connect the *adapter to the PC and point the IR window of the meter to the IR receiver.
 - d) Select the item in the data menu to start the transfer.

* If the computer has a built-in IR window, no adapter is needed.

4.10 Sample measurements

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

- ⇒ The display shows the readings of the sample in either the single channel or dual channel mode.

Note: to switch between the single and dual channel measurement screen, press and hold **MODE** for 3 seconds.

- ⇒ The endpoint format blinks, indicating a measurement is in progress.

- ⇒ As soon as the measurement is stable according to the selected stability criterion, the **Stability** icon appears.

Note

- If the "automatic endpoint" format is selected, the measurement stops automatically as soon as the **Stability** icon appears.
- If the "manual endpoint" format is selected, press **READ** to manually stop the measurement.
- If the "timed endpoint" format is selected, the measurement stops after the preset time.

4.1.1 Temperature compensation

We recommend the use of either a built-in or a separate temperature probe. If a temperature probe is used, ATC and the sample temperature are displayed. If no temperature sensor is used, MTC is displayed and the sample temperature should be entered manually. The meter accepts only an NTC 30 kΩ (pH) and an NTC 22 kΩ (DO) temperature sensor.

The meter calculates the temperature-adjusted electrode slope using this temperature and shows the temperature-compensated pH/ion value in the measurement display.

5 Setup

5.1 Menu structure of setup

The individual items of the menu setup are described on the pages following the list below.

1.	Sample ID		4.	Data Transfer Settings
	1. Enter Sample ID			1. Interface
	2. Select Sample ID			2. Printout Format
	3. Delete Sample ID		5.	System settings
2.	User ID			1. Language
	1. Enter User ID			2. Time and Date
	2. Select User ID			3. Access Control
	3. Delete User ID			4. Acoustic Signal
3.	Data Logging			5. Routine/Expert Mode
	1. Automatic Storage			6. Screen Settings
	2. Manual Storage			1. Screen Contrast
	3. Timed Interval Readings			2. Auto-Shutoff
				3. Backlight Off
	Continue at top of table		6.	Instrument Self-test

5.2 Sample ID

An alphanumeric sample ID with up to 12 characters can be **entered**. Alternatively, a previously entered sample ID can be **selected** from the list. If a sample ID has been entered, which is either purely numeric (for example, 123) or ends with a number (for example, WATER123), the following options are available:

1. <Auto Sequential> On
Using this setting will automatically increment the sample ID by 1 for each reading.
2. <Auto Sequential> Off
The sample ID is not incremented automatically.

A maximum of 5 sample IDs are stored in memory and listed for selection. If the maximum of 5 has already been entered, a sample ID can either be deleted manually or the oldest ID will be automatically overwritten by the new ID.

5.3 User ID

A user ID with up to 8 characters can be **entered**. Alternatively, a previously entered user ID can be **selected** from the list.

A maximum of 5 user IDs are stored in memory and listed for selection. If the maximum of 5 has already been entered, a user ID can either be deleted manually or the oldest ID will be automatically overwritten by the new ID.

5.4 Data logging

The meter stores up to 500 sets of measurement data in the memory. The number of data sets already stored in the memory is indicated by MXXX 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. When measuring in dual channel mode, both results will be stored separately. Therefore, the memory number in this case will increase by 2. You can select between automatic and manual storage or you can log your data into the memory in a user-defined interval:


1. **Automatic storage**
Stores every endpointed reading to the memory automatically.


2. Manual storage

If "Manual Storage" is set, **Store** appears on the display. Press **Store** to save endpoint readings.

The endpoint reading can only be stored once. When the data is stored, **Store** disappears from the measurement screen.

3. Timed interval readings

A reading is stored to memory every time after a certain interval (3 – 9999 s) defined in the menu has elapsed. When working in the timed-interval reading mode, the interval by can be defined by entering the seconds. The measurement series stops according to the selected endpoint format or manually by pressing **READ**. When timed-interval reading is "on", the **DL** icon  appears.

For readings lasting longer than 15 minutes, switch off the auto-shutoff function. The **Auto-off override** icon  appears on the display.

5.5 Data transfer settings

1. Interface

Select to transfer the data in the memory to a PC or to a printer. The meter adjusts the baud rate:

1. Printer

Baud rate: 1200

Data bits: 8

Parity: none

Stop bits: 1

Handshake: none

2. PC

Baud rate: 9600

Data bits: 8

Parity: none

Stop bits: 1

Handshake: none

3. LabX direct*

Baud rate: 9600

Data bits: 8

Parity: none

Stop bits: 1

Handshake: none

2. Printout format

Two different printout formats are available: GLP and Short.

* If LabX direct is selected, the printout format is always GLP and English. LabX PC direct software translates the received data into the selected PC language as defined in the regional and language options.

Examples: pH

pH printout GLP

```

GLP
10-Feb-2009
10:40:11 PM
Orange Juice
9.210 pH
-120.5 mV
25.5 °C ATC
Auto EP strict
InLabRoutine
7124938450
Last cal.: 5-Jan-2009
Michael
Signature:-----
Outside limits!
Calibration expired!

```

pH printout short

```

7.123 pH
25.5 °C ATC
Auto EP strict

```

Examples: DO

DO printout GLP

```

GLP
10-Feb-2009
10:40:11 PM
Orange Juice
300 ppm
25.5 °C ATC
971 mbar (A)
Auto EP
InLab605
7124938450
Last cal.: 5-Jan-2009
Michael
Signature:-----
Outside limits!
Calibration expired!

```

DO printout Short

```

300 ppm
25.5 °C ATC
971 mbar (A)
Auto EP

```

5.6 System settings

Note

The system settings menu is protected by a PIN. Upon delivery, the PIN is set to 000000 and is activated. Please change the PIN to prevent unauthorized access.

1. Language

The following languages are available for the system: English, German, French, Spanish, Italian, Portuguese, Chinese, Japanese, Korean and Russian.

2. Time and date

- **Time**
Two time display formats are available:
24-hour format (for example, 06:56 and 18:56)
12-hour format (for example, 06:56 AM and 06:56 PM)
- **Date**
Four date display formats are available:
28-11-2008 (day-month-year)
28-Nov-2008 (day-month-year)
28/11/2008 (day-month-year)
11-28-2008 (month-day-year)

3. Access control

System settings

PIN settings are available for:

1. System settings
2. Deleting data
3. Instrument login
 - a) Switch PIN protection for the required access control ON. The window for entering an alphanumeric PIN appears.
 - b) Enter an alphanumeric PIN (max. 6 characters).

⇒ The input window for PIN verification appears.
 - c) Confirm PIN.

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

4. Acoustic signal

An acoustic signal can be switched on in the following three cases:

1. Key is pressed
2. Alarm/warning message appears
3. Measurement is stable and has endpointed (stability signal appears)

5. Expert/Routine modes

The meter has two working modes:

- **Expert mode:** the factory default setting enables all functions of the meter.
- **Routine mode:** some of the menu settings are blocked.

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)
- Storing, viewing and printing data
- Running the instrument self-test

6. Screen settings


Screen contrast

The screen contrast can be set from levels 1 to 6.


Auto-shutoff

The meter will auto-shutoff when no key is pressed in a preset time to save the battery life. The time can be set (5 min, 10 min, 30 min, 1 hour, 2 hour) for the meter auto-shutoff or set to "Never" to disable this feature. If "never" is selected, the **Auto-off override** icon  appears on the display and you need to manually switch off the meter by pressing **ON/OFF**.

Backlight off

If the backlight feature is activated (**Backlight** icon  on the display), the backlight switches on with a key press and switches off again when no key is pressed for a preset time to save the battery life. The time can be set (10 s, 15 s, 30 s, 1 minute) after which backlighting automatically switches off, or set to "Never" to leave the backlighting always switched on.

Press and hold the **Backlight** key to deactivate backlighting.

⇒ The **Backlight** icon  disappears from the display.

5.7 Instrument self-test

The instrument self-test requires user interaction.

- a) In the **Setup** menu, select "6. Instrument Self-test".
 - ⇒ Selecting the menu item starts the self-test routine.
- b) 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.

Notes

- The user needs to finish pressing **all** seven keys within two minutes, otherwise "Self-test failed!" appears and the procedure has to be repeated.
- If error messages repeatedly appear, contact METTLER TOLEDO Service.

6 Menus and settings

6.1 Menu structure of pH/ion

1.	Temperature Settings		3.	Measurement Settings
	1. Set MTC Temperature			1. Measurement Resolution
	2. Temperature Unit			2. Stability Criterion
2.	Calibration Settings			3. Ion Measurement Unit
	1. Buffer Group/Standards			4. Rel. mV Offset
	2. Calibration Mode		4.	Endpoint Formats
	3. Calibration Reminder		5.	Measurement Limits
	Continue at top of table		6.	Sensor ID/SN

6.2 Menu structure of DO

1.	Temperature Settings			2. Barometric Compensation
	1. Set MTC Temperature			3. Barometric Unit
	2. Temperature Unit		4.	Endpoint Formats
2.	Calibration Reminder		5.	Measurement Limits
3.	Measurement Settings		6.	Sensor ID/SN
	1. Salinity Compensation			
	Continue at top of table			

6.3 Temperature settings

1. 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. An **MTC** value between -30 °C and 130 °C can be entered.

2. Temperature unit

Select the temperature unit: °C or °F. The temperature value is automatically converted between the two units.

6.4 pH/ion calibration settings

1. Buffer groups/standards

1. Predefined pH buffer groups

One of seven predefined buffer groups can be selected:

B1	1.68	4.01	7.00	10.01		(at 25°C)	Mettler US
B2	2.00	4.01	9.00	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	1.679	4.008	6.865	9.180		(at 25°C)	JIS Z 8802
B5	1.680	4.008	6.865	9.184	12.454	(at 25°C)	DIN19266
B6	1.09	4.65	6.79	9.23	12.75	(at 25°C)	DIN19267
B7	1.680	4.003	6.864	9.182	12.460	(at 25°C)	Chinese

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

2. Customized pH buffer group

A set of user-defined pH buffers with up to 5 different temperatures for each buffer can be created. The temperature difference between pH buffers 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.

3. Ion standards

Concentrations for up to 5 standards with one standard temperature can be defined (see "pH/ion measurement settings"). Five concentration units are available:

- mmol/L
- mol/L
- ppm
- mg/L
- %

2. Calibration mode

Two calibration modes are offered:

- **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.

Note

These settings applies to both pH and Ion calibration.

3. Calibration reminder

When the calibration reminder is "On", the user is reminded to perform a new calibration after a certain user-defined interval (maximum 9999 h) has elapsed.

Press **READ** to save the interval and another screen appears to select calibration expiration date.

Four different time spans can be programmed. In all four cases, a warning message appears that the electrode should be calibrated.

- **Immediately**
The meter is immediately blocked for measurement when the predefined interval has elapsed.
- **Reminder + 1h**
The meter is blocked for measurement 1 hour after the predefined interval has elapsed.
- **Reminder + 2h**
The meter is blocked for measurement 2 hours after the predefined interval has elapsed.
- **Continue Reading**
The user can continue measuring when the predefined interval has elapsed.

6.5 pH/ion measurement settings

1. Measurement Resolution

The resolution for pH and mV needs to be set for the display. Up to 3 decimal places can be chosen depending on the unit of measurement (see table below).

On display	Description	Option
X.XXX	three decimal places	pH
X.XX	two decimal places	pH
X.X	one decimal place	pH, mV
X	no decimal places	mV

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

2. Stability Criterion

The **Stability** icon appears according to the following stability criteria:

Stability criteria for pH and mV measurement**Strict**

The measured signal should not change by more than 0.03 mV in 8 seconds or by more than 0.1 mV in 30 seconds.

Medium

The measured signal should not change by more than 0.1 mV in 6 seconds.

Fast

The measured signal should not change by more than 0.6 mV in 4 seconds.

Stability criterion for ion measurement**Strict**

The measured signal should not change by more than 0.03 mV in 12 seconds or by more than 0.08 mV in 26 seconds.

Medium

The measured signal should not change by more than 0.08 mV in 8 seconds.

Fast

The measured signal should not change by more than 0.3 mV in 4 seconds.

3. Ion Measurement Units

The unit (mmol/L, mol/L, ppm, mg/L or %) for measurements and calibration can be defined.

Note

In some cases, changing units requires the user to first recalibrate before starting a measurement, otherwise an error message will appear.

The units of measurement are divided into two groups: **1.** mmol/L, mol/L and **2.** ppm, mg/L, %. Changing within a group doesn't require recalibration, but changing between the two groups does.

4. Rel. mV Offset

In the rel. mV mode the offset value is subtracted from the measured value. Either an offset value can be entered or it can be determined by measuring the mV of a reference sample.

1) Enter offset value

Enter an offset value in mV between -1999.9 and +1999.9 mV.

2) Test a reference sample

- a) Place electrode into the reference sample.
- b) Press **Start** to begin the reference measurement and wait until the measurement display freezes.
— or —
- c) Press **READ** to manually end the measurement.
- d) Press **Save** to enter the measured mV value as offset into the meter.

6.6 DO measurement settings

The stability criterion for dissolved oxygen measurements endpoints if the signal changes less than 0.052 nA in 30 seconds.

1. Salinity Compensation

A salinity correction is required in the oxygen concentration measurement of samples with a salt content of more than 1 ppt. The meter corrects automatically after you have entered the ion concentration in this menu (salinity range from 0.0 to 70.0 ppt = 70 g/L).

2. Barometric Compensation

A barometric compensation is required in the oxygen concentration measurement and calibration.

- **Auto**: the meter can automatically determine the current pressure by means of an integrated pressure sensor.
- **Manual**: the user can enter the absolute ambient atmospheric pressure.

3. Barometric Unit

There are four barometric units available for barometric reading:

mbar hPa Torr atm

Every unit can be calculated from the standard unit Pa using the following formulas: mbar = hPa = 100 Pa Torr = 133.322 Pa atm = 101325 Pa

6.6.1 DO calibration reminder

For details on the **DO calibration reminder**, see "pH/ion calibration settings".

6.7 Endpoint formats

Auto

With the automatic endpoint the selected stability criterion determines the end of an individual reading depending on the behavior of the sensor used. This ensures an easy, quick and precise measurement.

- Place sensor in the sample.
- Press **READ**.
 - ⇒ **A** appears on the display.
 - ⇒ The measurement ends automatically when the measured value is stable. \overline{A} appears.
 - ⇒ If **READ** is pressed before the signal is stable, the endpoint format changes to manual \overline{M} .

Manual

Unlike **Auto**, user interaction is required to stop the measurement reading in manual mode.

- Place sensor in the sample.
- Press **READ**.
 - ⇒ **M** appears on the display.
 - ⇒ \overline{M} appears on the display to signalize measurement stability.
- Press **READ** to end the measurement. \overline{M} appears.

Timed

The measurement stops after the set time, which can be set between 5 s and 3600 s.

- Place sensor in the sample.
- Press **READ**.
 - ⇒ **T** appears on the display.
 - ⇒ \overline{T} appears on the display to signalize measurement stability.
 - ⇒ The measurement ends automatically when the set time period expires. \overline{T} appears.
 - ⇒ If **READ** is pressed before the signal is stable, the endpoint format changes to manual \overline{M} .

Information on the display

The following symbols appear in the display, depending on the endpoint setting.

Preselected format	Start of measurement	Signal stability	Endpointed measurement ¹
Auto endpoint	A		
	A	Read	
Manual endpoint	M	Read	
	M	Read	
Timed endpoint	T		
	T	Read	

¹The actual endpoint format (last column) and not the preselected is stored with the data.

6.8 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.

6.9 Sensor ID/SN

1. Enter Sensor ID/SN

An alphanumeric sensor ID with up to 12 characters can be entered. The sensor ID will be assigned to each calibration and measurement value. This is valuable for tracing back data. Up to 5 sensor IDs can be entered for each sensor type.

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.

When a new **ion sensor ID** is entered, the electrode type can be selected.

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 analog ISM® sensors can be changed, However, this is not possible for digital ISM® sensors. Sensor SN and sensor type are blocked for entry.

2. Select Sensor ID

Already entered sensor IDs can be selected from a list.

If a sensor ID is selected, 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.

Note

You can delete a sensor ID with its calibrations in the calibration data menu.

7 Data management

7.1 Menu structure of data menu

1.	Measurement Data			3. DO
	1. Review			1. Review
	2. Transfer			2. Transfer
	3. Delete			3. Delete
2.	Calibration Data		3.	ISM Data
	1. pH			1. pH
	1. Review			1. Initial Calibration Data
	2. Transfer			2. Calibration History
	3. Delete			3. Maximum Temperature
	2. Ion			4. Reset ISM
	1. Review			2. DO
	2. Transfer			1. Initial Calibration Data
	3. Delete			2. Calibration History
				3. Maximum Temperature
				4. Oxygen Membrane
	Continue at top of table			5. Reset ISM

7.2 Measurement data

1. Review

All

All stored measurement data can be reviewed; the most recent data saved appears on the display.

Press **Trans** to send the measurement data (current single set) over the IR interface to the printer or PC.

Partial

The measurement data can be filtered according to 3 criteria.

- Memory number (MXXX)
- Sample ID
- Measurement mode

Memory number

- Enter the memory number of the data and press **Review**.
⇒ The measurement data is displayed.
- Press **Trans** to send the measurement data (current single set) over the IR interface to the printer or PC.

Sample ID

- Enter the sample ID and press **Review**.
⇒ The meter finds all stored measurements with this sample ID.
- Scroll through the measurement data to review all measurements with the entered sample ID.
- Press **Trans** to send the measurement data (current single set) over the IR interface to the printer or PC.

Measurement mode

- Select a measurement mode from list and press **Review**. The meter finds all stored measurements of the selected measurement mode.
- Scroll through the measurement data of the selected measurement mode.
- Press **Trans** to send the measurement data (current single set) over the IR interface to the printer or PC.

2. Transfer

All or partially stored measurement data can be transferred by filtering the measurement data. The filter works as described above in "1. Review".

Press **Trans** to send the filtered measurement data over the IR interface to the printer or PC.

3. Delete

All or partially stored measurement data can be deleted by filtering the measurement data. The filter works as described above in "1. Review".



Note

Deletion is protected by a PIN. Upon delivery, the PIN is set to 000000. Change the PIN code to prevent unauthorized access.



7.3 Calibration data

Calibration data can be reviewed, transferred and deleted. Up to 5 calibrations per sensor ID are stored in the memory.

Review

- a) Select between the sensor types: pH, ion or DO.
- b) Press **Review**.
⇒ A list of calibrated sensor IDs appears.
- c) Select a sensor ID from the list and press **Review**.
- d) Press  and  to navigate between the previous or next calibration data sets.
— or —
Press and hold **CAL** for 3 seconds in the single channel measurement screen.
⇒ The current calibration data is displayed.
- e) Press **Trans** to send the displayed calibration data over the IR interface to a printer or PC.

Transfer

- a) Select between the sensor types: pH, ion or DO.
- b) Press **Trans**.
⇒ A list of calibrated sensor IDs appears.
- c) Select a sensor ID from the list and press **Trans**.
- d) Press  and  to navigate between the previous or next calibration data sets.
- e) Press **Trans** to send all the calibration data of the selected sensor ID over the IR interface to a printer or PC.

Delete

- a) Select between the sensor types: pH, ion or DO.
- b) Press **Delete**.
⇒ A list of sensor IDs appears.
- c) Select a sensor ID from the list and press **Delete**.
- d) Press **Yes** when the message "This will delete all your selected data. Please confirm." appears
— or —
Press **No** to cancel and exit.
⇒ After deletion, the sensor ID disappears from the list in the sensor ID menu.

Notes

- An active sensor ID cannot be deleted.
- This menu is protected by a deletion PIN code. Upon delivery, the PIN code is set to 000000. Change the PIN code to prevent unauthorized access.

7.4 ISM data

SevenGo Duo pro™ meter incorporates Intelligent Sensor Management (ISM®) technology. This ingenious functionality provides extra security, safety and eliminates mistakes. The most important features are:

Extra security!

- 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!

Extra safety!

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.

Eliminate mistakes!

After connecting an ISM® sensor, the last set of calibration data is automatically used for measurements. Additional features are described below.

Initial calibration data

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

- Response time
- Temperature tolerance
- Membrane resistance
- Slope (at pH 7) and offset
- Type (and name) of electrode (for example, InLab Expert Pro ISM®)
- Serial number (SN) and ordering (ME) number
- Production date

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.

Oxygen membrane

If the membrane of the ISM oxygen sensor is changed, the date of the membrane exchange on the ISM chip can be entered.

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 Maintenance

8.1 Meter maintenance

Never unscrew the two halves of the housing!

The meters do not require any maintenance other than an occasional wipe with a damp cloth and the replacement of dead batteries. 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).

Any spillage should be wiped off immediately.

8.2 Electrode maintenance

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	Degrease the membrane with cotton wool soaked in either acetone or a soap solution.
pH sensor membrane has dried out	Soak the tip of the electrode overnight in 0.1 M HCl
Protein build-up in the diaphragm of a pH sensor	Remove deposits by soaking the electrode in an HCl/pepsin solution.
Silver sulfide contamination of pH sensor	Remove deposits by soaking electrode in a thio-urea 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.

8.3 Disposal



In compliance with European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE), this device must not be disposed of together with domestic waste. The same principle applies to countries outside the EU, in accordance with their national regulations.

Please dispose of this product in accordance with local regulations, in a separate collection point for electrical and electronic devices.

In cases of doubt, please contact your local authority or the dealer from whom you purchased the device.

If this device is passed on to a third party (e.g. for further use in a private or commercial/industrial context), the general principle of this regulation must be communicated at the same time.

Thank you for your contribution towards environmental protection.

8.4 Error messages

Message	Description and Resolution
pH/mV/ion/temperature/dissolved oxygen exceeds max. limit	Measurement limits are activated in the menu settings and measured value is outside these limits.
pH/mV/ion/temperature/dissolved oxygen below min. limit	<ul style="list-style-type: none"> Check the sample.

Message	Description and Resolution
Memory is full	Max. 500 measurement data can be stored in the memory. <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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	The calibration result is outside the following limits: Slope < 85% or > 105%, Offset < -35 mV or > + 35 mV. <ul style="list-style-type: none"> Make sure that you have the correct buffer and that it is fresh. Check mV signal of electrode, clean or replace the electrode,
Offset out of range	
Buffer temp. out of range	The ATC measured temperature is out of pH calibration buffer range: 5 ... 50 °C. <ul style="list-style-type: none"> Keep the buffer/standard temperature within the range. Change the temperature setting.
Standard temp. out of range	
Temperature differs from setting	ATC measured temperature differs by more than 0.5°C from the user-defined value/temperature range. <ul style="list-style-type: none"> Keep the buffer/standard temperature within the range. Change the temperature setting.
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. <ul style="list-style-type: none"> Restart self-test and finish within 2 minutes. Contact METTLER TOLEDO service if the problem persists.
Wrong settings	Entered value differs by less than 1 pH unit/5°C from other preset values. <ul style="list-style-type: none"> Enter a higher/lower value in order to get a larger difference.

Message	Description and Resolution
Out of range	<p>Either entered value is out of range.</p> <ul style="list-style-type: none"> Enter a value, which is within the range shown on the display. <p>or</p> <p>Measured value out of range.</p> <ul style="list-style-type: none"> 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	<p>The entered PIN is not correct.</p> <ul style="list-style-type: none"> Re-enter the PIN. Reset to factory settings, all data and settings will be lost.
Passwords do not match, try again	<p>The confirmation PIN does not match with the entered PIN.</p> <ul style="list-style-type: none"> Reenter PIN.
Program memory error	<p>Meter recognizes internal error during start-up.</p> <ul style="list-style-type: none"> Switch the meter off and back on. Contact METTLER TOLEDO service if problem persists.
Data memory error	<p>The data could not be stored in the memory.</p> <ul style="list-style-type: none"> Switch the meter off and back on. Contact METTLER TOLEDO service if problem persists.
No matching data found in memory	<p>The entered filter criterion does not exist.</p> <ul style="list-style-type: none"> Enter a new filter criterion.
Sensor ID already exists, previous SN will be overwritten	<p>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.</p> <ul style="list-style-type: none"> Enter a different Sensor ID in order to keep the previous ID and SN.

8.5 Error limits

Message	Range not accepted	
Out of range	pH	< -2.000 or > 19.999
	mV	< -1999.9 or > 1999.9
	[O ₂]	< 0.1% or > 600 %
	[O ₂]	< 0.01 mg/L or > 99 mg/L
	[O ₂]	< 0.01 ppm or > 99 ppm
Buffer/standard temp. out of range	T (pH)	< 5 or > 50 °C
	T (DO)	< 0 °C or > 60 °C
Offset out of range	Eref1 - Eb	> 60 mV
Slope out of range	Eref1 - Eb	> 60 mV
Wrong buffer	ΔEref1	< 10 mV
Invalid pH for user-defined buffer	ΔpH	< 1 pH
ATC measured temperature is different to the user-defined value	tATC - tbuffer	> 1 °C
Cal. 1 out of range	I	< 40 nA or > 110 nA
Cal. 2 out of range	T	< 0 nA or > 2 nA

9 Sensors, solutions and accessories

Parts	Order No.
IP67 sensors with fixed cable	
InLab®413 SG, rugged 3-in-1 pH sensor, IP67, PEEKshaft, ATC	51340288
InLab®413 SG-10m, rugged 3-in-1 pH sensor, IP67, PEEKshaft, ATC	51340289
InLab®605, robust DO sensor with exchangeable DO membrane	51340291
InLab®605-5m, robust DO sensor with exchangeable DO membrane	51340298
InLab®605-10m, robust DO sensor with exchangeable DO membrane	51340292
Parts	Order No.
ISM®IP67 sensors with fixed cable	
InLab®Expert Pro-ISM, rugged 3-in-1 pH sensor, IP67, PEEK shaft, ATC	51344102
InLab®Expert Pro ISM-5m, rugged 3-in-1 pH sensor, PEEK shaft, ATC	51344103
InLab®Expert Pro ISM-10m, rugged 3-in-1 pH sensor, IP67, PEEKshaft, ATC	51344104
InLab®605 ISM-2m, oxygen sensor	51344611
InLab®605 ISM-5m, oxygen sensor	51344612
InLab®605 ISM-10m, oxygen sensor	51344613
Parts	Order No.
ISM®IP67 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 Steady-Force™ reference system	51344112
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
ISM®cable-2 m	51344291
ISM®cable-5 m	51344292
Parts	Order No.
Solutions	
pH 4.01 buffer sachets, 30 x 20mL	51302069
pH 4.01 buffer solution, 6 x 250mL	51340058
pH 7.00 buffer sachets, 30 x 20mL	51302047
pH 7.00 buffer solution, 6 x 250mL	51340060
pH 9.21 buffer sachets, 30 x 20mL	51302070
pH 9.21 buffer solution, 6 x 250mL	51340058
pH 10.01 buffer sachets, 30 x 20mL	51302079
pH 10.01 buffer solution, 6 x 250mL	51340231
HCl/Pepsin solution (removes protein contamination)	51340068
Reactivation solution for pH electrodes	51340073
Thiourea solution (remove silver sulfide contamination)	51340070
Zero oxygen standard tablets, 20 pieces	51300140
Parts	Order No.
Communication	
IR-RS232 adapter	51302333
IR-USB adapter	51302332
RS-P25 printer	11124300
RS-P26 printer	11124303
RS-P28 printer	11124304
LabX®direct pH PC software	51302876

Parts	Order No.
Accessories	
Battery cover	51302328
Bottles	51300240
Bottom cap (blue)	51302324
Carry bag	51302361
Clip cover	51302327
Electrode weight	51303019
ErGo™	51302320
ErGo™ adapter	51302337
ErGo™ electrode tube	51302323
Field carry case (empty)	51302330
Field case accessory kit (field electrode arm, clip, 4 bottles)	51302360
Field compact case	51302359
Field electrode arm	51302334
InLab®605 calibration bottle	51340296
InLab®605 electrolyte (25 mL)	51340294
InLab®605 membrane kit (3 pcs. and electrolyte)	51340293
InLab®605 sealing kit	51340295
LTW-MiniDin adapter (conductivity sensor)	51302329
Neck strap	51302321
Rubber feet (2 pcs.)	51302335
Rubber holster	51302321
SevenGo™ clip	51302325
SevenGo™ sealing kit	51302336
SevenGo™ two-electrode clip	51302319
Wrist strap	51302331
Parts	Order No.
Guides	
Guide to conductivity and dissolved oxygen	51724716
Guide to ion selective measurement	51300075
Guide to pH measurement	51300047

10 Specifications

	SevenGo Duo pro™ pH/ORP/Ion/conductivity meter SG68	
Measurement range	pH	-2.000...19.999
	mV	-1999.9...1999.9 mV
	pH ATC	-5...130°C
	pH MTC	-30...130°C
	Ion	0.000...999.9% 0.000...9999 ppm 1.00E-9...9.99E+9 mg/L 1.00E-9...9.99E+9 mmol/L
	DO	0.00...99.99 mg/L 0.00...99.99 ppm 0.0...600.0 %
	Pressure	1100 mbar
	Temperature	0...60 °C
Resolution	0.1/0.01/0.001pH	
	1/0.1 mV	
	pH Temperature	0.1°C
	Ion	3 digits
	DO	0.01 mg/L 0.01 ppm 0.1 %
	Pressure	1 mbar
	DO temperature	0.1 °C
Limits of error pH	± 0.002 pH	
	± 0.2 mV	
	± 0.1°C	
Limits of error ion	± 0.5% (this limit only applies for meter)	
Limits of error DO	DO	±0.5 % of measured value
	Pressure	± 2 % of measured value
	Temperature	±0.1 °C
pH calibration	Up to 5 points	
Isopotential point	pH 7.00	
pH Calibration buffer	7 predefined groups	1 user-defined group of 5 buffers
DO calibration standard	Up to 2 points	Vapor-saturated air Zero oxygen solution
Outputs	IrDA	
Power requirements	Ratings	6 V DC, 70 mA
	Batteries	4 x AA/LR6 1.5 V or NiMH 1.2 V rechargeable
Size / weight	220 x 90x 45 mm 368 g	
Display	Liquid crystal	

pH input	BNC (IP67), impedance > $3 \cdot 10^{12} \Omega$	
DO input	BNC(IP67), impedance > $10^{12} \Omega$	
pH T input	Cinch(IP67), NTC 30k Ω	
DO T input	Cinch(IP67), NTC 30k Ω	
IP rating	IP67 with and without elec- trode	
Ambient conditions	Temperature	5...40°C
	Relative humidity	5%...80% (non-condensing)
	Installation category	II
	Pollution degree	2
Materials	Housing	ABS/PC reinforced
	Window	Polymethyl methacrylate (PMMA)
	Keypad	silicone rubber

11 Appendix

11.1 Buffer tables

SevenGo™ pH meters automatically correct for the temperature dependence of the pH buffer using the values given in the tables below.

11.1.1 Buffer group 1 (ref. 25 °C) METTLER TOLEDO US

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

11.1.2 Buffer group 2 (ref. 25 °C) METTLER TOLEDO Europe (default buffer)

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

11.1.3 Buffer group 3 (ref. 20 °C) Merck standard buffers

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

11.1.4 Buffer group 4 (ref. 25 °C) JIS Z 8802 (Japanese)

5	1.668	3.999	6.951	9.395
10	1.670	3.9998	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	1.704	4.060	6.833	9.011

11.1.5 Buffer group 5 (ref. 25 °C) DIN (19266)

5	6.95	4.00	9.40	1.67
10	6.92	4.00	9.33	1.67
15	6.90	4.00	9.28	1.67
20	6.88	4.00	9.22	1.68
25	6.86	4.01	9.18	1.68
30	6.85	4.02	9.14	1.68
35	6.84	4.02	9.10	1.69
40	6.84	4.04	9.07	1.69
45	6.83	4.05	9.04	1.70
50	6.83	4.06	9.01	1.71

11.1.6 Buffer group 6 (ref. 25 °C) DIN (19267)

5	1.08	4.67	6.87	9.43	13.63
10	1.09	4.67	6.84	9.37	13.37
15	1.09	4.66	6.82	9.32	13.16
20	1.09	4.66	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

11.1.7 Buffer group 7 (ref. 25 °C) JJG (Chinese)

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

11.2 Algorithm for oxygen concentration measurement

The (reading in ppm or mg/L) is given by the following equation:

$$C = \frac{I - I_0}{S_L} \cdot \frac{[C_s(p_n) - (Sal \cdot F(T))]}{X_{O_2} \cdot (p_n - p_w)}$$

I	Converted sensor current during measurement
I ₀	Sensor residual current (assumed to be zero)
c	O ₂ concentration (ppm or mg/L)
c _s	O ₂ solubility in water (mg/L) at p _n , (see Section 8.3)
p _n	Standard pressure (1013 mbar)
p _w	Water vapor pressure at calibration temperature (mbar)
X _{O₂}	Molar ratio of O ₂ in calibration gas (in air equal to 0.2095)
S _L	Sensor slope (pA/mbar)
Sal	Salinity of measuring solution (g/kg)
F(T)	Temperature-dependant salinity correction factor (see "Solubility of oxygen in water as a function of temperature and salinity")

To calculate the saturation [%], the term

$$[C_s(p_n) - (Sal \cdot F(T))]$$

is replaced by 100%

S_L the sensor slope is determined in the calibration using the following equation:

$$S_L = \frac{(I_{cal} - I_0)}{X_{O_2} \cdot [p_{cal} - (rH \cdot p_w)]}$$

S _L	Sensor slope (pA/mbar)
I _{cal}	Converted sensor current during calibration
I ₀	Sensor residual current (assumed to be zero)
X _{O₂}	Molar ratio of O ₂ in calibration gas (in air equal to 0.2095)
p _{cal}	Pressure of calibration gas (air pressure, in mbar)
rH	Relative humidity of calibration gas (0.0É1.0)
p _w	Water vapor pressure at calibration temperature (mbar)

11.3 Solubility of oxygen in water as a function of temperature and salinity

According to EN 25 814 and UNESCO tables (partly extrapolated)

Temperature (°C)	O ₂ solubility (mg/L)	Salinity correction factor F(T) (mg/L)
0	14.62	0.0875
1	14.22	0.0843
2	13.83	0.0818
3	13.46	0.0789
4	13.11	0.0760
5	12.77	0.0739
6	12.45	0.0714
7	12.14	0.0693
8	11.84	0.0671
9	11.56	0.0650
10	11.29	0.0632
11	11.03	0.0614
12	10.78	0.0593
13	10.54	0.0582
14	10.31	0.0561
15	10.08	0.0545
16	9.87	0.0532
17	9.66	0.0514
18	9.47	0.0500
19	9.28	0.0489
20	9.09	0.0475
21	8.91	0.0464
22	8.74	0.0453
23	8.58	0.0443
24	8.42	0.0432
25	8.26	0.0421
26	8.11	0.0407
27	7.97	0.0400
28	7.83	0.0389
29	7.69	0.0382
30	7.56	0.0371
31	7.43	0.0365
32	7.30	0.0353
33	7.18	0.0345
34	7.06	0.0339
35	6.95	0.0331
36	6.83	0.0323
37	6.72	0.0316
38	6.61	0.0309
39	6.51	0.0302
40	6.41	0.0296
41	6.32	0.0289
42	6.23	0.0283
43	6.14	0.0277
44	6.05	0.0272
45	5.96	0.0266
46	5.88	0.0261
47	5.79	0.0256

48	5.71	0.0251
49	5.63	0.0247
50	5.55	0.0242
51	5.47	0.0238
52	5.39	0.0234
53	5.31	0.0231
54	5.24	0.0228
55	5.16	0.0225
56	5.08	0.0222
57	5.00	0.0220
58	4.91	0.0218
59	4.83	0.0216
60	4.74	0.0215



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