Operating Instructions

FiveGo™ Conductivity Meter

F3

METTLER TOLEDO

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1 Introduction

Thank you for purchasing this high quality METTLER TOLEDO laboratory meter. With the FiveGo™ portables for pH, conductivity, and DO measurement, we wish to simplify your measuring process and your workflows.

The FiveGo™ portables are much more than just a series portable meters with an excellent price/performance ratio. The meters offer a number of user-friendly features, including

- **Waterproof operation**
  The IP67 waterproof rating that allows free operation in wet or damp environments
- **Optimized ease of use**
  Simple menus for quick and easy operation
- **Excellent ergonomics**
  Handle the instrument with comfort and ease

2 Safety Measures

2.1 Definition of signal warnings and symbols

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results.

Signal words

WARNING	for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided.
CAUTION	for a hazardous situation with low risk, resulting in damage to the device or the property or in loss of data, or minor or medium injuries if not avoided.
Attention	(no symbol) for important information about the product.
Note	(no symbol) for useful information about the product.

Warning symbols

General hazard

Toxic substance

Inflammable or explosive substance

2.2 Product specific safety notes

Your instrument represents state-of-the-art technology and complies with all recognized safety rules, however, certain hazards may arise in extraneous circumstances. 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.

Intended use

This instrument is designed for a wide range of applications in various areas and is suitable for measuring conductivity.

The use therefore requires knowledge and experience in working with toxic and caustic substances.

The manufacturer shall not be held liable for any damage resulting from incorrect usage divergent to the operating instructions. Furthermore, the manufacturer`s technical specifications and limits must be adhered to at all times and in no way exceeded.

Location

The instrument has been developed for indoor operation and may not be used in explosive environments.

Use the instrument in a location which is suitable for the operation, protected from direct sunlight and corrosive gases. Avoid powerful vibrations, excessive temperature fluctuations and temperatures below 0 °C and above 40 °C.

After use, place the instrument back in the carrying case to reduce instruments exposure to UV radiation and prolong material quality and appearance.

Protective Clothing

It is advisable to wear protective clothing in the laboratory when working with hazardous or toxic substances.

A lab coat should be worn.

Suitable eye protection such as goggles should be worn.

Use appropriate gloves when handling chemicals or hazardous substances, checking their integrity before use.

Safety notes

⚠ **WARNING**

Chemicals

All relevant safety measures are to be observed when working with chemicals.

a) Set up the instrument in a well-ventilated location.

b) Any spills should be wiped off immediately.

c) When using chemicals and solvents, comply with the instructions of the producer and the general lab safety rules.

⚠ **WARNING**

Flammable solvents

All relevant safety measures must be observed when working with flammable solvents and chemicals.

a) Keep all sources of flame away from the workplace.

b) When using chemicals and solvents, comply with the instructions of the producer and the general lab safety rules.

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
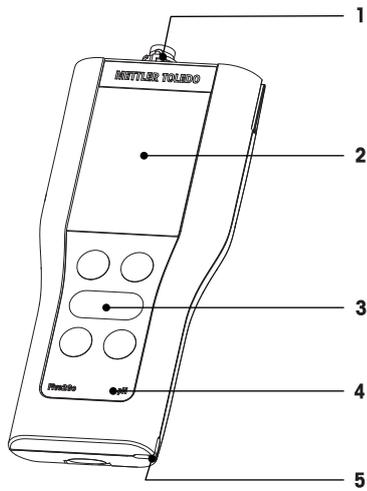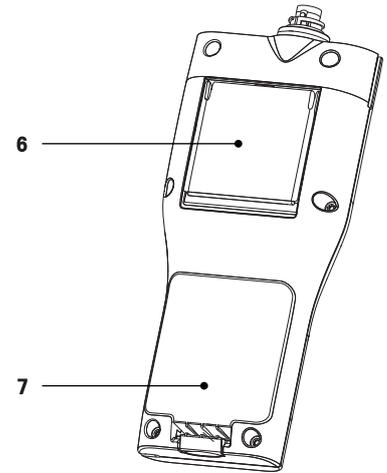
1	Sensor connections	**5**	Slot for wrist strap
2	Display	**6**	Table top stand
3	Keypad	**7**	Battery compartment
4	Type label		

3.2 Sensor connections
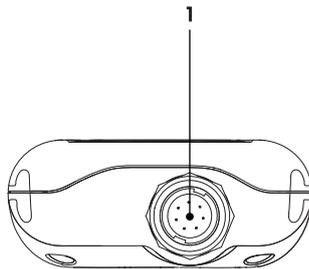
1   LTW socket for conductivity signal input

3.3 Keypad
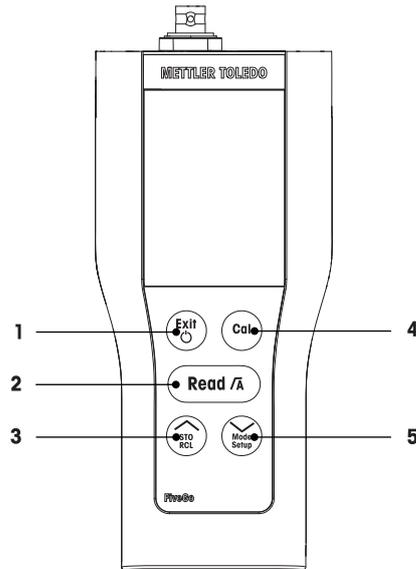
	Key	Naming	Press and release	Press and hold
1	Exit ⏻	On / Off / Exit	• Switch meter on • Back to measurement screen	• Switch meter off
2	Read /Ā	Read / Endpoint format	• Start or endpoint measurement • Confirm setting	• Turn auto endpoint on or off
3	STO RCL	Store / Recall	• Store current reading to memory • Increase value during setting • Scroll up through the memory	• Recall stored data
4	Cal	Calibration	• Start calibration	• Recall calibration data
5	Mode Setup	Mode / Setup	• Switch between conductivity and TDS • Decrease value during setting • Scroll down through the memory	• Enter setup mode

3.4 Display and icons

When turning on the instrument, the startup screen appears for 3 seconds. The startup screen shows all icons which can appear on the display. In the following table you find a short description about these icons.

Startup screen
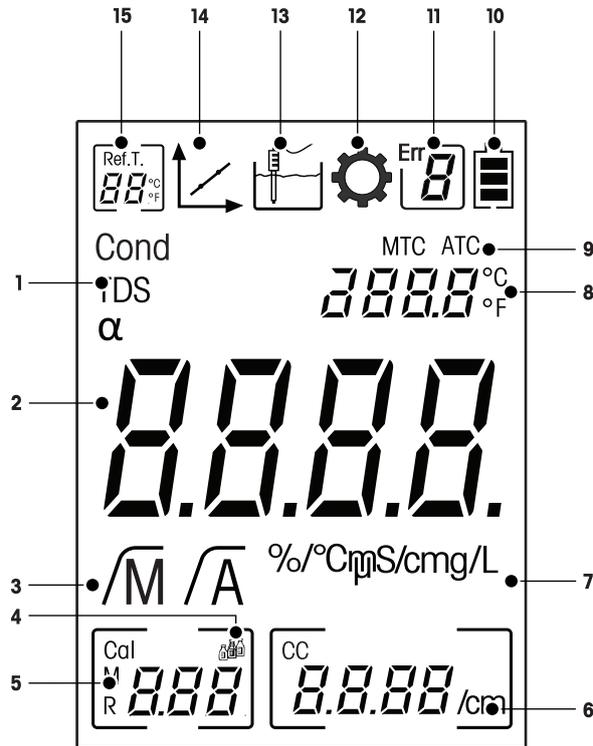
	Icon	Description
1	**Cond / TDS**	Current measurement method
2	---	Conductivity measurement value
3	$\overline{/M}$ / $\overline{/A}$	Endpoint format: $\overline{/A}$ Automatic $\overline{/M}$ Manual
4		Calibration settings
5	---	Memory information
6	---	Currently used cell constant
7	**mS/cm / µS/cm / mg/L**	Currently used measurement unit
8	---	Temperature information
9	**MTC / ATC**	**MTC** (Manual temperature capture) **ATC** (Automatic temperature capture)
10		Power status fully charged half charged lowly charged fully discharged
11	Err	Error code
12		Setup mode

	Icon	Description
13		Measurement mode
14		Calibration mode: Indicates calibration mode and appears whenever you are performing a calibration or reviewing calibration data.
15		Reference temperature

3.5 Setup menu navigation

For general navigation in the setup menu read the following information:

- Press and hold **Setup** to enter the setup menu.
- Press **Exit** to exit the setup menu.
- Use ⌒ and ⌄ do increase or decrease values.
- Press **Read** to confirm a change.

The following parameters can be changed in the order as shown.

Parameter	Description	Range
MTC	Manual temperature setting	0.0...100.0 °C / 32.0...212 °F
	Calibration standard setting	1, 2, 3
Ref.T.	Reference temperature	25 °C (68 °F), 20 °C (77 °F)
α	α-coefficient	0.0...10.00 %/°C
TDS	TDS factor	0.4…1.00
°C, °F	Temperature unit	°C, °F

3.6 Measurement modes

With the F3 conductivity meter it is possible to measure the following parameters of a sample:

- Conductivity (µS/cm and mS/cm)
- TDS (mg/L and g/L)

To change the unit, press **Mode** on the measurement screen until the desired appears.

4 Putting into Operation

4.1 Scope of delivery
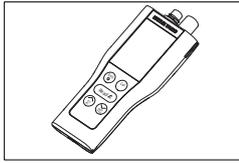
FiveGo™ F3 instrument
for conductivity measurement

Battery LRO3/AAA 1.5V
4 pcs.
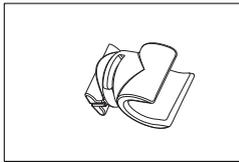
FiveGo™ electrode clip
1 pc.
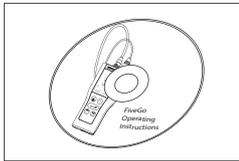
CD-ROM including operating instructions

4.2 Installing the batteries
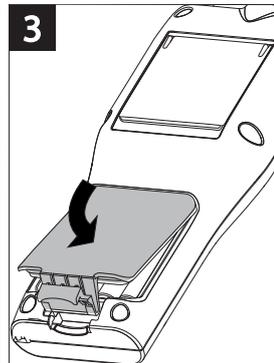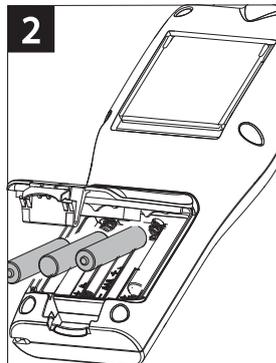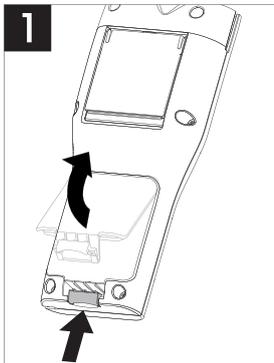
4.3 Connecting sensor
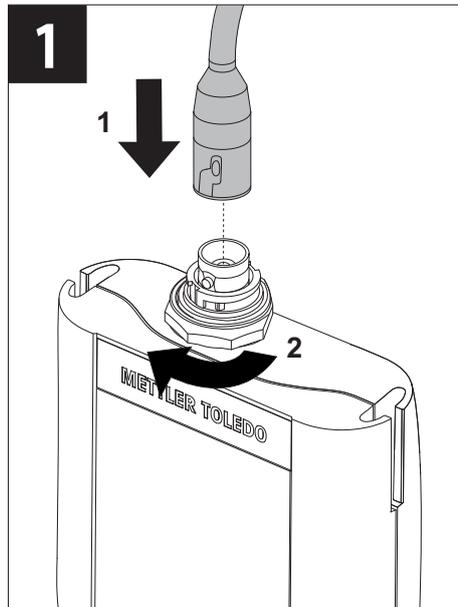
4.4 Installing optional equipment

4.4.1 FiveGo™ electrode clip

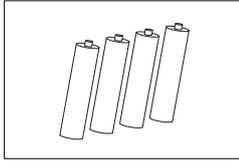For a safe placing of the electrode you can mount an electrode clip on the side of the instrument. The electrode clip is part of delivery. You can mount it on either sides of the instrument according to your preference.

- Remove the protective clips (1).
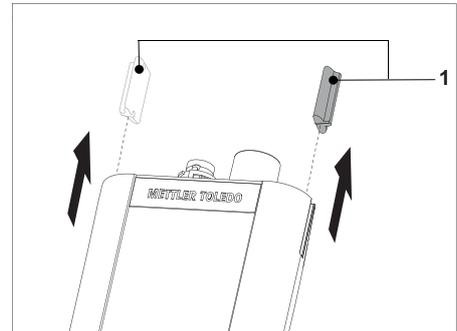
- Push the electrode clip (1) into the recess (2) of the instrument.
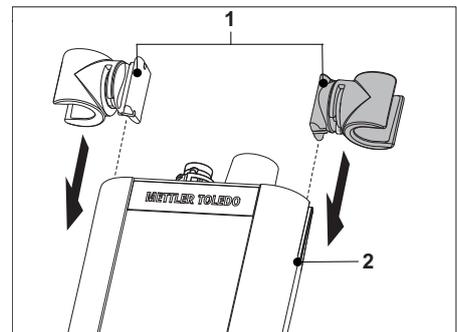
4.4.2 Wrist strap

For better protection against damage caused by dropping, you can mount the wrist strap as shown in the following diagrams.
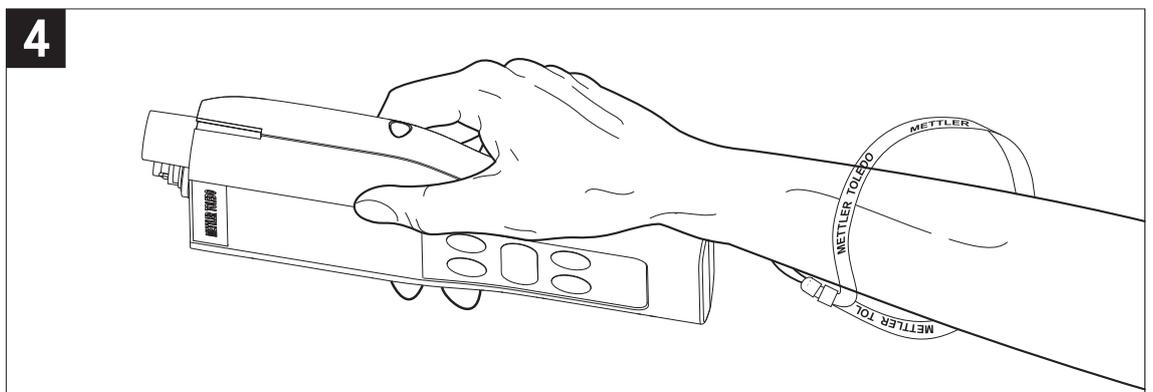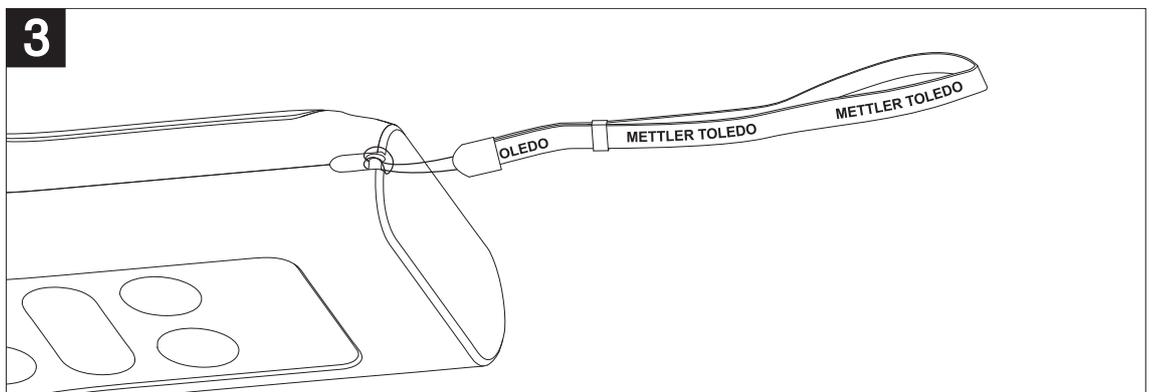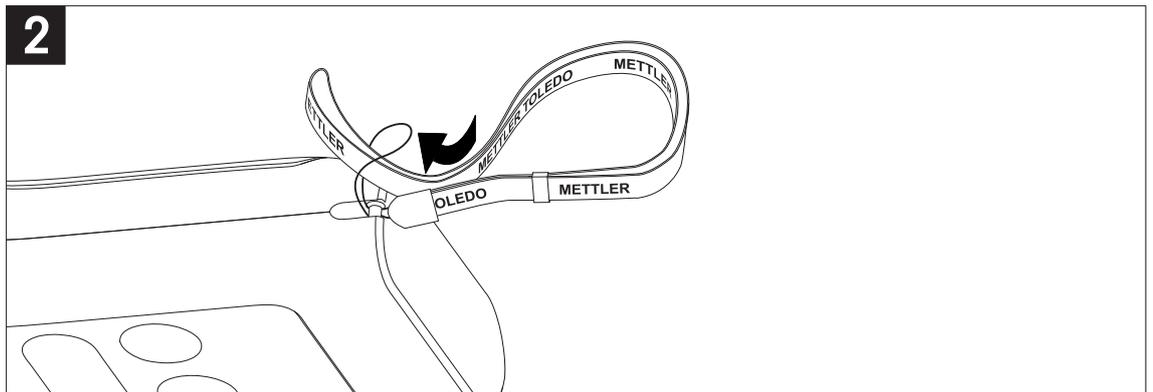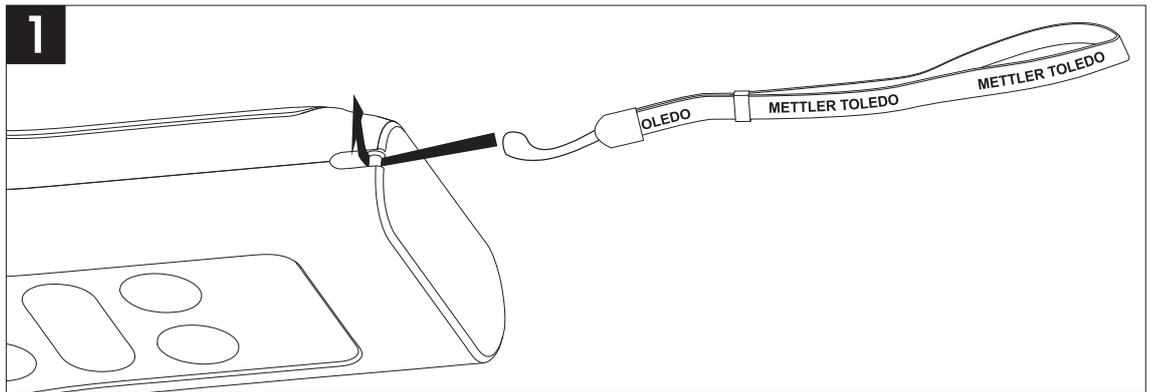
4.5 Switching the instrument on and off

1 Press and release ⏻ to switch on the instrument.
    ⇨ All segmented digital numbers and icons are
       displayed for 3 seconds. After that the installed
       software version appears (e.g. 1.00) and the
       instrument is ready for use.

2 Press ⏻ for 3 seconds and release to switch off the
    instrument.

Note

By default after 10 minutes not in use, the instrument
shuts down automatically.
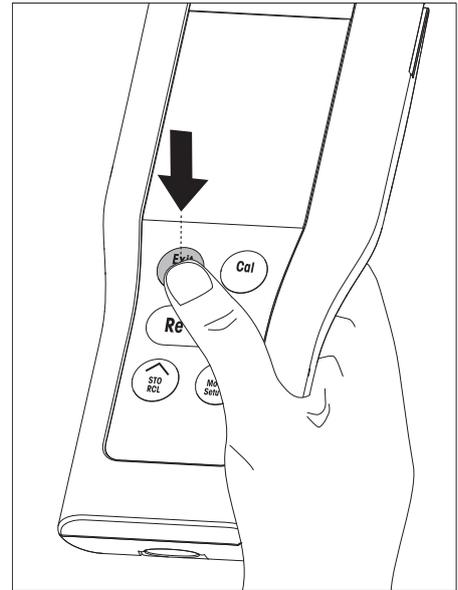
5 Operation of the Instrument

5.1 General settings

5.1.1 Endpoint Formats

The FiveGo™ offers two different endpoint formats, automatic and manual. To switch between the automatic and manual endpoint modes, press and hold **Read**.

Automatic endpoint

With the automatic endpoint, the measurement stops automatically as soon as the input signal is stable. This ensures an easy, quick and precise measurement.

Manual endpoint

Unlike the automatic endpoint, user interaction is required to stop the measurement reading in manual mode. To manually endpoint a measurement, press **Read**.

5.1.2 Temperature capture

Automatic temperature capture (ATC)

For better accuracy, we recommend the use of either a sensor with a built-in or a separate temperature probe. If a temperature probe is recognized by the meter, **ATC** and the sample temperature are displayed.

Note

The meter accepts NTC 30 kΩ temperature sensors.

Manual temperature capture (MTC)

If the meter does not detect a temperature probe, it automatically switches to the manual temperature mode and **MTC** appears. The entered MTC temperature is used for temperature compensation.

1   To set the MTC temperature, press and hold **Setup**.
    ⇨ The temperature value is blinking. The default setting is 25 °C.

2   Choose the temperature value by using ⌒ and ⌄.

3   Press **Read** to confirm your settings.

4   Continue with calibration standard selection or press **Exit** to return to measurement screen.

5.1.3 Calibration standards

The calibration standard is selected in the setup menu.
The following three standards are available:

- 84 µS/cm
- 1413 µS/cm
- 12.88 mS/cm

Tables for conductivity values at different temperatures are programmed in the meter for each standard, see Appendix [▶ 26].

▪ After confirmation of the MTC temperature, the current calibration standard is blinking.

1   Select the standard by using ⌒ and ⌄.

2   Press **Read** to confirm.

3   Continue with reference temperature selection or press **Exit** to return to measurement screen.

5.1.4 Reference temperature

You can select between the reference temperatures 20 °C and 25 °C. The conductivity of the sample is referenced to the selected temperature during measurement.

▪ After confirming the selection of the calibration standard, the reference temperature is blinking.

1   Select the targeted reference temperature using ⌒ and ⌄.

2   Press **Read** to confirm.

3   Continue with α-coefficient setting or press **Exit** to return to measurement screen.

5.1.5 α-coefficient

The conductivity of a solution increases when the temperature rises. With most solutions, a linear interrelationship between conductivity and temperature is given.

The measured conductivity is corrected and displayed using the following formula:

$G_{TRef} = G_T / (1 + α (T - T_{Ref}) / 100\%)$

whereras

- GT = conductivity measured at temperature T (mS/cm)
- GT_{Ref} = conductivity (mS/cm) displayed by the instrument, calculated back to the reference temperature T_{Ref}
- α = linear temperature correction coefficient (%/°C); α = 0: no temperature correction
- T = measured temperature (°C)
- T_{Ref} = Reference temperature (20 °C or 25 °C)
- After confirming the setup of the reference temperature, the α-coefficient value is blinking.

1   Set the α-coefficient value using ⌒ and ⌄ .

2   Press **Read** to confirm.

3   Continue with TDS factor setting or press **Exit** to return to measurement screen.

5.1.6 TDS factor

TDS is calculated by multiplying the conductivity value by the TDS factor.

- After confirming the α-coefficient, the TDS value is blinking.

1   Set the TDS factor using ⌒ and ⌄ .

2   Press **Read** to confirm.

3   Continue with the Temperature unit setting or press **Exit** to return to measurement screen.

5.1.7 Temperature unit

- After confirming the TDS setting, the temperature unit is blinking.

1   Select the temperature unit (°C or °F) using ⌒ and ⌄ .

2   Press **Read** to confirm and get back to the measurement screen.

5.2 Performing a calibration

To determine the cell constant of a conductivity sensor, perform a calibration as described below.

- ▪ A sensor is connected to the instrument.

1 Place the sensor in a calibration standard and press **Cal**.
   - ⇨ ⬡ and ⬡ appear on the display.
     The instrument endpoints according to the preselected endpoint mode (manual or auto). After the signal has stabilized or after pressing **Read** (manual endpoint) the meter displays and freezes the relevant standard value.
   - ⇨ ⬡ disappears from the display.
   - ⇨ The new cell constant of the sensor is shown at the bottom right of the display.

2 Press **Read** to save the calibration.
   – or –
   Press **Exit** to discard the data of the calibration.

Note

- • To ensure the most accurate conductivity readings, you should verify your cell constant with a standard solution once a day and recalibrate if necessary. Always use fresh standards.

5.3 Performing a measurement

5.3.1 Measurement mode

The FiveGo conductivity meter offers two different reading modes: conductivity and TDS.

- - Press the **Mode** button to switch between conductivity and TDS mode.

5.3.2 Performing a conductivity measurement

- ▪ An electrode is connected to the instrument.

- ▪ Make sure that the conductivity reading mode is selected.

- - Place the electrode in the sample and press **Read** to start the measurement.
   - ⇨ The decimal point blinks.
   - ⇨ The display shows the conductivity of the sample.
   - ⇨ If the automatic endpoint is chosen, and the signal has stabilized, the display freezes, $\overline{A}$ appears and the decimal point stops blinking.
     In case the **Read** button was pressed before the automatic endpoint, the display freezes and $\overline{M}$ appears.

Note

Press and hold **Read** to switch between the automatic and manual endpoint format.

5.3.3 Performing a TDS measurement

- ▪ An electrode is connected to the instrument.

- ▪ Make sure that the TDS mode is selected and the correct TDS factor is entered in the settings TDS factor [▷ 18].

- - Perform the same steps as described in the section Performing a conductivity measurement [▷ 19].

5.4 Using the memory

5.4.1 Storing a measurement result

The instrument can store up to 200 endpointed results.

- Press **STO** when the measurement has endpointed.
  ⇨ **M001** indicates that one result has been stored, and **M200** that the maximum of 200 results have been stored.

Note

If you press **STO** when **M200** is displayed, **Err 6** indicates that the memory is full. To store further data you will have to clear the memory.

5.4.2 Recalling from memory

1 Press and hold **RCL** to recall the stored values.

2 Press ⌒ or ⌄ to scroll through the stored results.
   ⇨ **MR 001** to **MR 200** indicates which result is currently displayed.

3 Press **Exit** to go back to the measurement screen.

5.4.3 Clearing the memory

1 Press and hold **RCL** to recall the stored values from memory.

2 Press **RCL** until **ALL** appears on the display.

3 Press **Read** to delete all measurement results.
   ⇨ **CLr** starts blinking on the display.

4 Press **Read** to confirm the deletion
   - or -
   Press **Exit** to cancel the deletion.

5.5 Self-diagnosis

1 Switch the meter on.

2 Press **Read** and **Cal** simultaneously until the meter displays the full screen.
   ⇨ Each icon blinks one after the other whereby you can check if all icons are correctly shown on the display.
   ⇨ After that, b starts to blink and 5 hardkey-icons are shown on the display.

3 Press any hardkey.
   ⇨ The specific icon disappears from the display.

4 Press each hardkey once.
⇨ When the self-diagnosis is completed successfully, **PAS** appears. If the self-diagnosis has failed, **Err 2** appears.

Note

You must press all hardkeys within 1 minute. Otherwise **FAL** appears and the self-diagnosis has to be redone.

5.6 Factory reset

Note

Loss of data!

With a factory reset all user-specific settings will be set to standard. Also all data memories will be deleted.

▪ The instrument is switched off.

1 Press and hold **Read**, **Cal** and **Exit** simultaneously for 2 seconds.
   ⇨ **RST** appears on the display.

2 Press **Read**.

3 Press **Exit**.
   ⇨ The instrument switches off.
   ⇨ All settings are reset.

6 Maintenance

6.1 Cleaning the housing

> **Note**
>
> **Damage to the instrument!**
>
> Ensure that no liquid enters the interior of the instrument.
>
> Wipe off any spills immediately.

The meter does not require any maintenance other than an occasional wipe with a damp cloth. The housing is made of acrylonitrile butadiene styrene (ABS). This material is sensitive to some organic solvents, such as toluene, xylene and methyl ethyl ketone (MEK).

- Clean the housing of the instrument using a cloth dampened with water and a mild detergent.

6.2 Error messages

Error	Description	Resolution
Err 1	Memory access error	Reset to factory settings
Err 2	Self-diagnosis failed	Repeat the self-diagnosis procedure and make sure that you finish pressing all five keys within one minute.
Err 3	Measured values out of range	Make sure that the sensor wetting cap has been removed and the sensor is properly connected and placed in the sample solution.
Err 4	Measured standard temperature out of range (5… 35 °C)	Keep the temperature within the range for calibration (5… 35 °C).
Err 5	Cell constant out of range	Disconnect, clean and/or replace the sensor.
Err 6	Memory is full	Clear the memory
Err 7	Measurement data cannot be stored twice	---

6.3 Disposal

In conformance with the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

7 Product Portfolio

Meter and Kits	Description	Order No.
F3-Meter	FiveGo™ conductivity meter without sensor	30266883
F3-Standard	FiveGo™ conductivity meter standard kit with LE703 IP67 sensor	30266888
F3-Field	FiveGo™ conductivity meter field kit with LE703 IP67 sensor and carrying case	30266887

8 Accessories

Parts	Order No.
FiveGo™ carrying case (incl. 4 sample bottles)	30239142
FiveGo™ electrode clip (1 pc) and electrode clip covers (2 pcs.)	30239144
Wrist strap (METTLER TOLEDO)	30122304
Battery cover	30254145
Table top stand	30254146
Sample bottles (4 pcs.)	30239143

Sensors	Order No.
LE703 IP67	30266974

Solutions	Order No.
84 µS/cm conductivity standard solution, 250 mL	51302153
84 µS/cm conductivity standard, 30 x 20 mL	30111140
1413 µS/cm conductivity standard solution, 30 x 20 mL	51302049
1413 µS/cm conductivity standard solution, 6 x 250 mL	51350096
12.88 mS/cm conductivity standard solution, 30 x 20 mL	51302050
12.88 mS/cm conductivity standard solution, 6 x 250 mL	51350098

Documents	Order No.
Guide to Conductivity Measurement	30099121

9 Technical Data

General

Power requirements	Batteries	4 x LR03/AAA 1.5 V Alkaline - or - 4 x AAA 1.2 V NiMH rechargeable
	Battery life	> 200 h
Dimensions	Height	188 mm
	Width	77 mm
	Depth	33 mm
	Weight (without batteries)	260 g
Display	LCD	3.1" Segmented LCD, b/w
Ambient conditions	Operating temperature	0…40 °C
	Relative humidity	5%…85% (non-condensing) at 31 °C, linearly descending to 50% at 40 °C
	Overvoltage category	Class II
	Pollution degree	2
	Maximum operating altitude	2000 m above sea level
	Range of application	For indoor use
Materials	Housing	ABS
	Window	Polymethyl methacrylate (PMMA)
	IP Protection class	IP67

Measurement

Parameters	mS/cm, µS/cm, mg/L, °C (°F)	
Sensor inputs	µS/cm, mg/L, °C (°F)	LTW, 7-pin
Conductivity	Measuring range	0.00 µS/cm…200.0 mS/cm
	Resolution	Automatic range
	Accuracy (sensor input)	± 0.5%
TDS	Measuring range	0.0 mg/L…200.0 g/L
	Resolution	Automatic range
Temperature	Measuring range	0…100 °C (32 °F…212 °F)
	Resolution	0.1 °C
	Limits of error	± 0.5 °C
	Compensation	Linear: 0.00 %/°C…10 %/°C Reference temperature: 20 and 25 °C
Calibration	Calibration points	1
	Predefined standards	3
	Calibration methods	Linear
Data security / storage	Memory size	200

10 Appendix

International Standard (at ref. temp. 25°C)

T [°C]	84 µS/cm	1413 µS/cm	12.88 mS/cm
5	53.02	896	8.22
10	60.34	1020	9.33
15	67.61	1147	10.48
20	75.80	1278	11.67
25	**84.00**	**1413**	**12.88**
30	92.19	1552	14.12
35	100.92	1667	15.39

Examples of temperature coefficients (α-value)

Substance at 25°C	Concentration [%]	Temperature coefficient alpha [%/°C]
HCl	10	1.56
KCl	10	1.88
CH_3COOH	10	1.69
NaCl	10	2.14
H_2SO_4	10	1.28
HF	1.5	7.20

α-coefficients of conductivity standards for a calculation to reference temperature of 25°C

Standard	Measurement temp.: 15 °C	Measurement temp.: 20 °C	Measurement temp.: 30 °C	Measurement temp.: 35 °C
84 µS/cm	1.95	1.95	1.95	2.01
1413 µS/cm	1.94	1.94	1.94	1.99
12.88 mS/cm	1.90	1.89	1.91	1.95

Conductivity to TDS conversion factors

Conductivity	TDS KCl		TDS NaCl	
at 25 °C	ppm value	factor	ppm value	factor
84 µS/cm	40.38	0.5048	38.04	0.4755
447 µS/cm	225.6	0.5047	215.5	0.4822
1413 µS/cm	744.7	0.5270	702.1	0.4969
1500 µS/cm	757.1	0.5047	737.1	0.4914
8974 µS/cm	5101	0.5685	4487	0.5000
12.880 µS/cm	7447	0.5782	7230	0.5613
15.000 µS/cm	8759	0.5839	8532	0.5688
80 mS/cm	52.168	0.6521	48.384	0.6048

FiveGo™ Conductivity Meter

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

* 3 0 2 6 6 9 1 5 *