STARTER 3100M
Multi-parameter Bench Meter
Instruction Manual

TABLE OF CONTENTS

1 INTRODUCTION

Thank you for choosing OHAUS!
Please read the manual completely before using the STARTER 3100M multi-parameter bench meter to ensure proper setup, operation and maintenance. STARTER 3100M multi-parameter bench meter can measure pH, ORP; Temperature; Conductivity/TDS/Resistivity/Salinity values.

STARTER 3100M multi-parameter bench meter has an excellent performance/price ratio and is designed with many useful features including a stand-alone electrode holder and a beeper for error alert. Other accessories such as pH electrodes and buffer solutions are also available.

STARTER 3100M multi-parameter bench meter offers many practical features and functions such as:

- Large backlit LCD with Quick Guide attached under the meter to assist with user operation
- Stand-alone electrode holder for maximum flexibility
- Electrode condition icon automatically showing you the health of your pH electrode
- memory to store up to 99 pH measurements and 99 conductivity measurements

1.1 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 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 injuries if not avoided.
Attention	For important information about the product.
Note	For useful information about the product

Warning Symbols


General hazard


Explosion hazard


Corrosive hazard

∈ Alternating current

⊂ Direct current

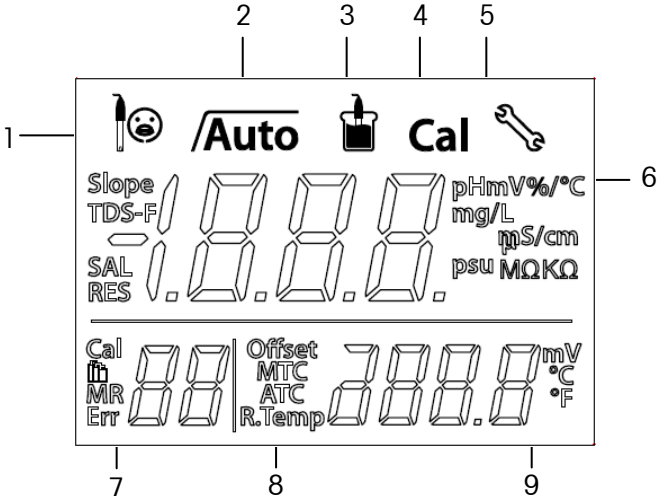
1.2 Safety Precautions

CAUTION: Read all safety warnings before installing, making connections, or servicing this equipment. Failure to comply with these warnings could result in personal injury and/or property damage. Retain all instructions for future reference.

- Verify that the input voltage range printed on the data label and the plug type matches the local AC power to be used.
- Make sure that the power cord does not pose a potential obstacle or tripping hazard.
- Use the equipment only in dry locations.
- Dry off any liquid spills immediately. The instrument is not watertight.
- When using chemicals and solvents, comply with the instructions of the chemical producer and the general lab safety rules.
- Use only approved accessories and peripherals.
- Operate the equipment only under ambient conditions specified in these instructions.
- Disconnect the equipment from the power supply when cleaning.
- Do not operate the equipment in hazardous or unstable environments.
- Service should only be performed by authorized personnel.

1.3 Display and controls

Displays



1 pH Electrode condition

Slope: more than 95% and offset: ± (0-15) mV Electrode condition is good	Slope: 90-95% or offset: ± (15-35) mV Electrode condition is acceptable	Slope: less than 90% or offset: ± (35-60) mV Electrode condition is not good or needs cleaning

2 Endpoint stability icon ; Auto endpoint icon **Auto**.

3 Measurement icon - ; means measurement or calibration is running when blinks.

4 Calibration icon - **Cal**; means calibration in progress when display.

5 Setup icon - ; instrument is in the setup mode, can set temperature(MTC), buffer group etc.

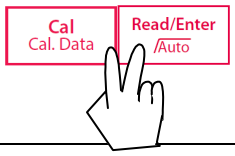
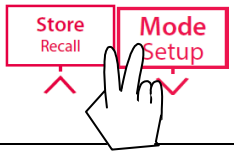
6 pH/mV reading, or slope of pH electrode calibration; or Conductivity/TDS/Salinity/Resistivity value, or cell constant of conductivity electrode.

7 Calibration point **Cal** / Buffer group /Memory number **MR**/ Error index **Err**.

8 Auto temperature compensation - **ATC** ; Manual temperature compensation – **MTC**; Conductivity reference temperature - **R.Temp**

9 Temperature value during measurement or offset (mV) value in pH calibration process.

Controls

Button	Press & release	Press & hold for 3 seconds
pH/mV COND. /TDS	- Switch between pH(mV) parameter and conductivity(TDS/Salinity/Resistivity) parameter when at measurement interface	
Read/Enter /Auto	- Start or finish measurement - Confirm setting, store entered value	- Turn auto endpoint on / off /Auto, /
Cal Cal. Data	- Start calibration	- Recall the latest calibration data : slope and offset
Exit ⏻	- Meter turn on - Exit and return to measurement screen	- Meter turn off
Store Recall ^	- Store current reading to memory - Increase value during setting - Scroll up through the memory	- Recall stored data - Print current memory data
Mode Setup v	- Switch between pH and mV - Switch between conductivity, TDS, Salinity and Resitivity - Decrease value during setting - Scroll down through the memory	- Enter setup mode
	- Start self-diagnosis	
		Turn on/turn off the backlight of the LCD

2 INSTALLATION

Carefully unpack the box.

2.1 Package contents

The model ST3100M-B multi-parameter bench meter (basic package) has the following items:

ST3100M-B	Units
STARTER 3100M	1
Stand-alone electrode holder (include holder base, screw and arm)	1 set
In use cover	1
1413 µS/cm standard solution	1 bottle (about 20ml)
12.88 mS/cm standard solution	1 bottle (about 20ml)
12V Power supply	1 set
RS232 Interface, Scout (Mini-din to RS232 cable)	1

In addition to ST3100M-B multi-parameter bench meter content, the ST3100M-F multi-parameter bench meter package also includes the following:

pH Buffer Powder Set (4.01, 7.00, 10.01)	1 set
ST310 3-in-1 refillable pH electrode	1
STCON3 4-ring conductivity electrode	1

Each pH buffer powder should be dissolved in 250ml pure water or deionized water in a volumetric flask.

The best measurement range for STCON3 4-ring (or 4-pole) conductivity electrode is 70µS/cm-200mS/cm. In this range the measurement accuracy can reach 0.5%.
If you use STCON3 to measure pure water which conductivity value is below 70µS/cm; the measurement will be less accurate (approximately 1% to 5%).
Do not use STCON3 to measure conductivity value less than 2µS/cm, the accuracy is not good.

We have STCON7 pure water conductivity electrode which measurement range is 0.02µS/cm-200µS /cm, with accuracy of 0.02µS/cm.

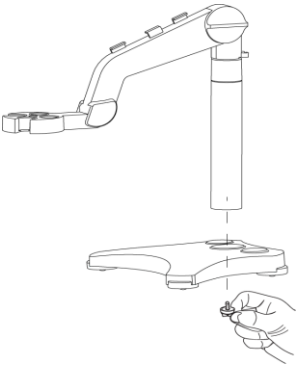
Additional electrodes available include the followings:

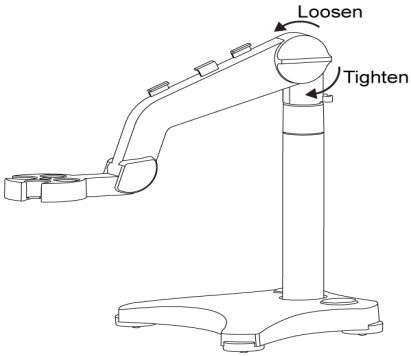
Model	Description
STCON3	4-ring conductivity electrode (70 µS/cm-200 mS/cm.)
STCON7	Pure water 2-pole conductivity electrode (0.02µS/cm-200 µS /cm)
ST310	3-in-1 plastic refillable pH electrode

ST320	3-in-1 plastic gel pH electrode(no need to fill)
ST350	3-in-1 glass refillable pH electrode
ST210	2-in-1 plastic refillable pH electrode
ST230	2-in 1 glass muddy sample pH electrode
ST260	2-in 1 glass tris-buffer pH electrode
ST270	2-in 1 glass pierce pH electrode
STORP1	Gel plastic ORP electrode
STORP2	Refillable glass ORP electrode
STTEMP30	Temperature Electrode

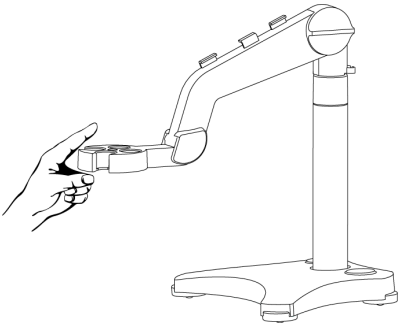
2.2 Installing the stand-alone electrode holder

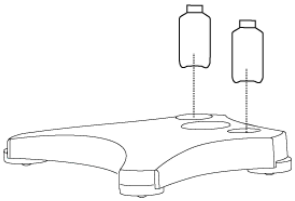
Install the electrode arm on the base,





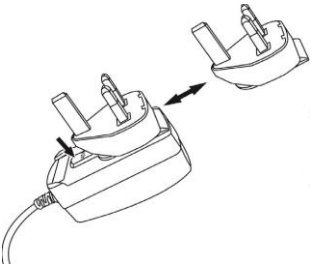
After adjusting the tension knob to some extent, you can move the upper arm up and down. When the pH electrode is installed on the arm, the storage bottle of pH electrode fits into the base hole.





2.3 Installing the power adapter

Insert the right adapter clip into the power adapter slot. The Ohaus balance power supply is also 12V which could also be used for the pH meter.



2.4 Connect the electrodes

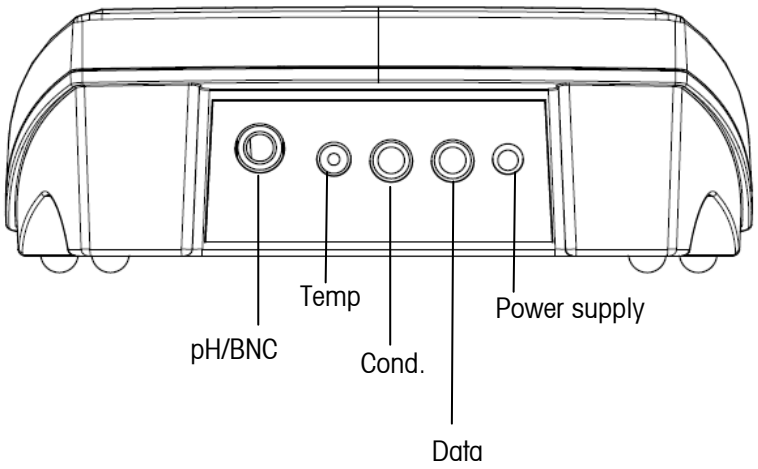
There are several sockets for ST3100M.

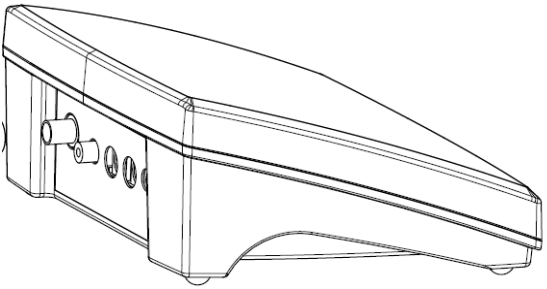
“BNC” socket for pH electrode,

“TEMP.” Socket (Cinch) for temperature electrode,

“Min-Din” Socket for conductivity electrode,

"Data" socket can connect printer through a connect cable (RS232 Interface, Scout ; from the mini-din to RS232, item NO 30268982) which is included in the kits.





For ST310 electrode connect to the BNC and Cinch socket. For 2-in-1 pH electrode (e.g. ST210) you only need to connect to the BNC. Temp. socket is for a separate temperature electrode.

STCON3 or STCON7 have a built-in temperature sensor which do not need a separate temperature electrode.

2.5 Meter stand for adjusting viewing angle

One unique design feature of the STARTER 3100M is the meter stand, which can be used to adjust the viewing angle of the display in case of working on a high table.

2.6 Attached quick guide

Another unique design feature of the STARTER 3100M is the attached quick guide, the quick guide is attached into the bottom housing of the meter.

3 ST3100M pH Operation

WARNING Do not operate the equipment in hazardous environments. The equipment is not explosion protected.

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

3.1 Setup

3.1.1 Set temperature unit and MTC value

Please note:

If a temperature electrode is used, Automatic Temperature Compensation (**ATC)** and the sample temperature are displayed on the screen. You may then choose to skip MTC setup (below).

If the meter does not detect a temperature electrode or one is not used, the meter automatically switches to Manual Temperature Compensation (**MTC**) mode and **MTC** appears on the screen.

MTC can be set as follows:

- Power on the meter by pressing [Exit ⏻].
- Press and hold [Mode Setup ⌄] until the setup icon appears on the display and the current temperature unit blinks (°C or °F).
- Press [Store Recall ^] or [Mode Setup ⌄] to switch between °C and °F.
- Press [Read/Enter Auto] to confirm your selection.

Then

- ❖ Continue with MTC temperature setting by using [Store Recall ^] or [Mode Setup ⌄] to adjust temperature compensation accordingly
- ❖ Press [Read/Enter Auto] to confirm the setting
- ❖ Press [Exit ⏻] to return to the measurement screen.

The default MTC temperature value setting is 25 °C (77° F).

Note: °C = 5/9 (° F - 32)

Note: STARTER 3100M accepts **NTC 30 kΩ** temperature sensor.

3.1.2 Selecting a predefined buffer group

After confirming the MTC compensation temperature value, make the buffer group selection. Use Store Recall ^ or Mode Setup v to select a buffer group among 6 buffer groups . Press Read/Enter /Auto to confirm the setting or press Exit ⏻ to leave to return to the measurement screen.

The default buffer group is **b1**.

b1	1.68	4.01	7.00	10.01

Please note:

There are 6 buffer groups in the meter, you can select the buffer group you prefer, the buffer value will be automatically recognized during calibration. The 6 predefined buffer groups are (at 25°C):

b1 (US)	**1.68**	**4.01**	**7.00**	**10.01**	
b2 (EU)	2.00	4.01	7.00	9.21	11.00
b3 (MERCK)	2.00	4.00	7.00	9.00	12.00
b4 (DIN)	1.09	4.65	6.79	9.23	12.75
b5 (JJG)	1.68	4.00	6.86	9.18	12.46
b6 (JIS Z)	1.68	4.01	6.86	9.18	

ST3100M automatically corrects for the temperature dependence of the buffer pH values given in the following table - buffer group **b1**.

This means, if the buffer solutions' temperature is 15°C, the calibration value you will get should be pH1.67 (buffer 1.68), pH4.00 (buffer 4.01), pH7.04 (buffer 7.00) and pH10.12 (buffer 10.01).

5 °C	1.67	4.01	7.09	10.25
10 °C	1.67	4.00	7.06	10.18
15 °C	***1.67***	***4.00***	***7.04***	***10.12***
20 °C	1.68	4.00	7.02	10.06
25 °C	**1.68**	**4.01**	**7.00**	**10.01**
30 °C	1.68	4.01	6.99	9.97
35 °C	1.69	4.02	6.98	9.93
40 °C	1.69	4.03	6.97	9.89
45 °C	1.70	4.05	6.97	9.86
50 °C	1.71	4.06	6.96	9.83

3.2 Calibration

Standard procedure of pH measurement is as follows:

a) pH electrode preparation
b) buffer preparation and pH electrode calibration
c) sample preparation
d) pH measurement
e) Record measurement results or print
f) Rinse the pH electrode and properly store

pH electrode preparation: pH electrode should be rinsed with pure water before and after use. Check if the electrode is physically damaged. (Be careful with the glass bulb)
Note: please calibrate the pH electrode before measurement.

STARTER 3100M can perform **1-, 2-** or **3- point** calibrations.

Calibration: pH electrodes need to be calibrated with pH standard buffer solution before a proper pH measurement can be made. **Calibration** is to display the correct **pH** value when meter receive the **mV** value signal from the pH electrode.

Slope: the linear coefficient between mV and pH according to theoretical value (e.g. -59.16mV/pH @ 25°C which means 100% slope);
Offset: the mV value when pH value is 7.00. (Theoretical value is 0 mV);

3.2.1 Performing 1-point calibration

When performing calibration, Ohaus recommends using **Auto End Point Mode.** After powering the meter on, be sure the top of the screen shows Auto to ensure the meter is in **Auto End point Mode.**

Auto or Manual End point Mode:

- Press and hold Read/Enter Auto to change the **End Point Mode**.
- When in Manual Mode, to manually reach a pH measurement or calibration value, you need to press button-Read/Enter Auto when reading is stable and displays : then the sample reading or calibration value freezes, blinks 3 times and freezes on the display.
- When in Auto End Point Mode, the meter determines when the reading is stable then displays and locks the reading or calibration value automatically, the reading freezes and blinks 3 times then disappears; Auto blinks 3 times and freezes on the display.

Note: With the 1-point calibration only the **offset** is adjusted. If the sensor was previously calibrated with multi-point calibration the previously stored **slope** will remain. Otherwise theoretical **100% slope** (-59.16 mV / pH) will be used.
When STARTER 3100M is in **pH measurement mode**; place the pH electrode in a calibration buffer, stir 5 seconds, wait for 30 seconds, then:

- Press Cal Cal. Data "*Cal* 1" displays on the bottom left of the screen and "*Cal* " is blinking. **Cal** and appear on the top of the screen, is blinking during calibration.
- The meter reaches **endpoint** automatically according to the **preselected auto-endpoint mode**, the calibration point pH value (e.g. 7.00) with the temperature display on the screen.

The 1-point calibration is finished; There are now 3 options (OHAUS recommends conducting at least a 2 point calibration);

1. Press Cal Cal. Data to do the 2-point calibration.
2. Press Read/Enter /Auto to store the 1-point calibration and exit, the **offset** and the **slope** are shown on the display for 3 seconds then return to the measurement screen.
3. Press Exit to reject the calibration, return to the measurement screen.

3.2.2 Performing 2-point calibration

- Perform 1-point calibration as described above.
- Rinse the pH electrode with pure water and wipe off with tissue.
- Place the electrode in the next calibration buffer, stir and wait, then press Cal Cal. Data, "*Cal* 2" displays on the bottom left of the screen and "*Cal* " is blinking. On the top of the screen **Cal** and appear, is blinking during calibration.
- The meter reaches endpoint according to the endpoint mode, the calibration point pH value (e.g. 4.01) with the temperature display on the screen.

The 2-point calibration is finished. There are 3 options:

1. Press Cal Cal. Data to do the 3-point calibration.
2. Press Read/Enter /Auto to store the 2-point calibration and exit, the **offset** and **slope** are shown on the display for 3 seconds then return to the measurement screen.
3. Press Exit to reject the calibration, return to the measurement screen.

Note: To perform a 3 point calibration, follow the instructions for performing a 2 point calibration using a third buffer.

3.3 Sample Measurement

3.3.1 pH measurement

- Place the pH electrode in the sample. Stir for 5 seconds; wait for 30 seconds.
- Press [Read/Enter /Auto] to start the pH measurement, appears on the display. is blinking during measurement.
- When meter reaches endpoint, the pH value with the temperature display on the screen.

3.3.2 mV measurement

- Press [Mode Setup ∨] to switch between **pH measurement mode** and **mV measurement mode**.
- Follow the same procedure as for pH measurement to perform mV measurement.

4 ST3100M Conductivity Operation

After turning on the meter by pressing [Exit ⏻], press [pH/mV / COND. /TDS] to switch from pH parameter to conductivity parameter.

4.1 Setup

4.1.1 Set temperature unit

- Press and hold [Mode Setup ∨] until the set up icon appears on the display and the current temperature unit blinks. (℃ or ℉)
- Use [Store Recall ∧] or [Mode Setup ∨] buttons to select temperature unit .
- Press [Read/Enter /Auto] to confirm your setting. Continue with temperature value setting by following or press [Exit ⏻] to go back to the measurement screen.

Note: ℃ = 5/9 (℉ -32)

4.1.2 Set MTC temperature value

After the temperature unit setting, the meter goes to setup manual temperature (MTC) value setting.

Use [Store Recall ∧] or [Mode Setup ∨] buttons to adjust the temperature value.

Press Read/Enter /Auto to confirm your setting. Continue with calibration standard setting by following or press Exit to go back to the measurement screen.

4.1.3 Set calibration standard point

After the MTC temperature value setting, the meter goes to setup calibration standard.
The 5 predefined standard points are:

10 µS/cm	84 µS/cm	500 µS/cm	1413 µS/cm	12.88 mS/cm

Use the Store Recall or Mode Setup buttons to select calibration standard.
Press Read/Enter /Auto to confirm your setting. Continue with temperature correction coefficient setting by following the steps in 4.1.4 or press Exit to go back to the measurement screen.

4.1.4 Set temperature correction coefficient

After the calibration standard setting, the meter goes to the temperature correction coefficient setting.
Use the Store Recall or Mode Setup buttons to adjust the temperature correction value. (0.00 to 10.00 %/°C).
Press Read/Enter /Auto to confirm your setting. Continue with reference temperature setting by following the steps or press Exit to go back to the measurement screen.

Note:
If you set the temperature correction coefficient value as 0 %/°C , that means **no Temperature Compensation** for the conductivity measurement. The meter displays the real conductivity value at current temperature without compensation.

4.1.5 Set TDS factor

After selecting the reference temperature, the current TDS factor blinks.
Use Store Recall or Mode Setup buttons to adjust the TDS factor value. Press Read/Enter /Auto to confirm your setting or press Exit to go back to the measurement screen.

4.2 Calibration

The first time you use the conductivity electrode, it should be calibrated before taking any measurement. Please also read the conductivity electrode instruction manual for reference.

4.2.1 Selecting a standard

When using the STARTER 3100M conductivity meter, you have to select a standard for calibration (see 3.3).

Press and hold the Mode Setup enter setup mode, after press Read/Enter /Auto to confirm the temperature unit and value. Then the current standard blinks. Use Store Recall or Mode Setup buttons to select the standards, press Read/Enter /Auto to confirm. Press Exit to leave the setup mode.

The 5 predefined standards are:

10 µS/cm	84 µS/cm	500 µS/cm	1413 µS/cm	12.88 mS/cm

Tables for automatic temperature compensation are programmed in the meter for each standard (see appendix).

4.2.2 Performing a calibration

When performing calibration, Ohaus recommends using **Auto End Point Mode.** After powering the meter on, be sure the top of the screen shows /Auto to ensure the meter is in **Auto End point Mode.**

About Auto or Manual End point Mode, please see 3.2.1.

Place the conductivity electrode in the selected calibration standard solution, wait 10-15s, then press Cal Cal. Data.

The calibration icon Cal and the measurement icon appear on the display. The icon is blinking during calibration measurement. The meter reaches endpoint automatically according to the preselected auto-endpoint mode after the signal has stabilized.

When the calibration is finished, the standard value is displayed and stored; the measurement icon blinks 3 times and disappears.

To finish the calibration and return to the sample measurement, press Read/Enter /Auto. The cal. data--cell constant is then shown on the display for 3 seconds.

Note:

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

For STCON3 the normal cell constant range is 1.50 – 2.00. (e.g. 1.71 /cm) if the cell constant is outside the range due to an improper calibration, you may need to recover factory settings (see 5.4), then repeat calibration.

4.3 Sample measurement

4.3.1 Conductivity measurement

- Place the conductivity electrode in the sample, wait 10-15s, then press Read/Enter /Auto to start the measurement.
- The measurement icon appears on the display. The measurement icon is blinking during measurement and the display shows the conductivity of the sample.
- When it reaches endpoint (auto endpoint or manual endpoint), you can record the result.

Stability criterion for conductivity measurement: The sensor input signal of the meter may not change by more than 0.4% from the measured average conductivity of the electrode in 6 seconds.

4.3.2 TDS, Salinity or Resistivity measurement

- Press Mode Setup to switch between **conductivity, TDS, Salinity and Resistivity measurement mode**.
- Follow the same procedure as for conductivity measurement.

Ohaus conductivity electrodes STCON3 and STCON7 already have a built-in temperature sensor to measure the temperature automatically.

5 Using the memory

5.1 Storing a reading

The STARTER 3100M can store up to 99 pH endpoint results and another 99 conductivity endpoint results.

- Press button Store/Recall when the measurement reaches endpoint. **M01** indicates that one result has been stored.

If you press Store/Recall when **M99** is displayed, **FUL** displays to indicate the memory is full. To store further data you will have to clear the memory. (See 4.4.3)

5.2 Recalling from memory

- Press and hold Store/Recall to recall the stored values from memory when the current measurement reaches endpoint.
- Press button Store/Recall or Mode/Setup to scroll through the stored results. **R01** to **R99** indicates which result is being displayed.
- Press Exit to exit.

5.3 Clearing the memory

- Press Store/Recall or Mode/Setup to scroll through the stored results until "MRCL" appears.
- Press Read/Enter/Auto, **CLr** blinks;

There are now 2 options:

❖ Press Read/Enter/Auto to confirm the deletion of all the stored data.

❖ Press Exit to return to the measurement mode without deleting the memory.

6 Printing

If the printer is connected to the STARTER 3100M (e.g. SF-F40A) green light means connection success.
Printer baud rate 9600bps; 8 data bit; none parity bit; 1 stop bit,
A print-out is automatically generated after each end pointed measurement or calibration.

When ST3100M is in pH parameter:
The format for the print-out following a pH measurement is:
End Point, Value, Temp., ATC/MTC
Auto EP, 4.01pH, 25.0ºC, MTC

The details for the second line are:
Auto EP, 4.01pH, 25.0ºC , MTC
| | | |---- Manual Temperature Compensation
| | |---------- Temperature value and unit ºC
| |---------- pH value
|---------- Auto End Point

The format for the print-out following a mV measurement is:
End Point, Value, Temp., ATC/MTC
Auto EP, 182mV, 23.2ºC, ATC

The print-out in case of an error message is:
End Point, Value, Temp., ATC/MTC
Error3

The print-out for a 2-point calibration is:
Buffer1: 4.01pH
mV1: 178mV
Temp.1: 25.0ºC
Buffer2: 7.00pH
mV2: 3mV
Temp.2: 25.0ºC
Slope: 99%
Offset: 5mV
ATC/MTC: MTC

The print-out for a 3-point calibration is:
Buffer1: 4.01pH
mV1: 178mV
Temp.1: 25.0ºC
Buffer2: 7.00pH
mV2: 0mV
Temp.2: 25.0ºC
Buffer3: 9.21pH
mV3: -130mV
Temp.3: 25.0ºC
Slope: 100%
Offset: 0mV
ATC/MTC: ATC

Printing from memory:
When scrolling through the memory you can print the entry that is currently viewed by pressing and holding(3 seconds) 

. The printout format is as follows:
Recall 01:
End Point, Value, Temp., ATC/MTC
Auto EP, 4.01pH, 35.6ºC, ATC

When ST3100M is in conductivity parameter:

The format for the print-out following a Cond. measurement is:
End Point, Value, Temp., ATC/MTC
Auto EP, 68.8µS/cm, 26.8°C , ATC
Ref.25°C , T.Comp.Coeff. 2.00%/°C

The details for the second line are:
Auto EP, 85.1µS/cm, 26.8°C, ATC
| | | |---- Auto Temp. Compensation
| | |----------Temperature value and unit
| |---------- Conductivity value
|---------- Auto End Point
The details for the third line are:
Ref.25°C , T.Comp.Coeff. 2.00%/°C
| |
| |---------- Temperature compensation coefficient value
|---------- Reference temperature, 20 or 25 °C

The format for the print-out following a TDS measurement is:
End Point, Value, Temp., ATC/MTC
Auto EP, 38.0mg/L, 23.2°C , ATC
Ref.25°C , T.Comp.Coeff. 2.00%/°C
TDS-F 0.5

The format for the print-out following a Salinity measurement is:
End Point, Value, Temp., ATC/MTC
Auto EP, 0.08psu, 25.0°C , MTC
The print-out in case of an error message is:
End Point, Value, Temp., ATC/MTC
Error4

The print-out for a successful calibration is:
Standard: 1413µS/cm
Temperature: 30.0 °C
Calibration value: 1552µS/cm
Cell Constant: 1.66 cm-1
ATC/MTC: ATC

Printing from memory:
When scrolling through the memory you can print the entry that is currently viewed by pressing and holding 

for 2 seconds. The printout format is followings:
Recall 08:
EndPoint, Value, Temp., ATC/MTC
Auto EP, 68.8µS/cm, 26.8°C , ATC
Ref.25°C , T.Comp.Coeff. 2.00%/°C

7 MAINTENANCE

7.1 Error message

When ST3100M is in pH mode:

Error 0	Memory access error	Reset to factory settings
Error 1	Self-diagnosis failed	Repeat the self-diagnosis procedure and make sure that you finish pressing all five keys within two minutes
Error 2	Measured values out of range	Check if the electrode is properly connected and placed in the sample solution.
Error 3	Measured buffer temperature out of range (<5 or >40 °C)	Keep the pH buffer temperature within the range for calibration
Error 4	Offset out of range offset > 60mV or < - 60 mV	Make sure the pH buffer is correct and fresh; Clean or replace the pH electrode.
Error 5	Slope out of range	Make sure the buffer is correct and fresh; Clean or replace the pH electrode.
Error 6	Meter cannot recognize the buffer	Make sure the buffer is correct and fresh; check if the buffer has not been used more than once.
Error 9	The current data set has already been stored once	An endpoint reading can only be stored once. Perform a new measurement to store.
Error 10	The sample temperature is out of range	Check the sample temperature, the temperature sensor.

When ST3100M is in conductivity mode:

Error 0	Memory access error	Reset to factory settings
Error 1	Self-diagnosis failed	Repeat the self-diagnosis procedure and make sure that you finish pressing all five keys within two minutes.
Error 2	Measured values out of range C: > 199.9 mS/cm TDS: < 0.1 mg/L or > 199.9 g/L SAL: > 100.0 psu	Make if the electrode is properly connected and placed in the sample solution
Error 3	Measured standard temperature out of range (5 ... 35 °C)	Keep the standard temperature within the range for calibration
Error 4	Measuring temperature out of range (0 ... 100 °C)	Check if the electrode is properly connected and keep the sample temperature within the range
Error 9	The current data set has already been stored once	An endpoint reading can only be stored once. Perform a new measurement to store.

If an error occurs, the meter will also **beep 3 times** to alert.
For further technical support please contact Ohaus. (US please contact 1-800-672-7722).

7.2 Meter maintenance

Never unscrew the two halves of the housing!

The STARTER 3100M series instruments do not require any maintenance other than occasional wipe with a damp cloth and the replacement of depleted batteries.

The housing is made of acrylonitrile butadiene styrene (ABS). This material is attacked by some organic solvents, such as toluene, xylene and methyl ethyl ketone (MEK). Any spillage should be immediately wiped off.

About the maintenance of the pH electrode or conductivity electrode, please see the electrode manual instructions.

7.3 Self-diagnosis

- When the meter is on, press and hold Read/Enter /Auto and Cal Cal. Data simultaneously until the meter displays the full screen. Each icon blinks one after the other.

This way you may check whether all icons are correctly shown. The next step is to check that the keys are functioning correctly. This requires user interaction.

When b blinks, five icons are displayed.

- Press the five keys in any order. Each time you press a key an icon disappears from the screen, continue to press the other keys until all the icons have disappeared.

When the self-diagnosis has been completed successfully, **PAS** appears. If self-diagnosis fails, error message **Err 1** appears.

Note: You have to finish pressing all five keys within **2 minutes**, otherwise **Err 1** appears and you will have to repeat the procedure.

7.4 Recover factory settings

- When the meter is off, press and hold Read/Enter /Auto & Cal Cal. Data & Exit ⏻ simultaneously for 3 seconds, the screen displays RST and blinks, this means “Reset”. There are 2 options:
  - ❖ Press Read/Enter /Auto to reset factory settings (MTC, slope and offset, etc.), display YES then restart the meter.
  - ❖ Or press Exit ⏻ to quit the setting, the screen displays NO and the meter is then turned off.

8 TECHNICAL DATA

8.1 Specifications

Ambient conditions

- Indoor use only
- Altitude: Up to 2000 m
- Specified Temperature range: 5°C to 40°C
- Humidity: maximum relative humidity 80 % for temperatures up to 30°C decreasing linearly to 50% relative humidity at 40°C
- Mains supply voltage fluctuations: up to ±10% of the nominal voltage
- Installation category II
- Pollution degree: 2
- Operability is assured at ambient temperatures between 5°C to 40°C

Spec.		ST3100M
Measurement Range	pH	–2.00…20.00 pH
	mV	–2000…+2000mV
	Conductivity	0.0 µS/cm…199.9mS/cm
	TDS	0.1mg/l…199.9 g/l(TDS)
	Resistivity	0…20MΩ•cm
	Salinity	0-100 psu
	Temperature	-5°C…110 °C
Resolution	pH	0.01pH
	mV	1mV
	Conductivity	0.01 µS/cm Auto range
	TDS	0.01 mg/L Auto range
	Resistivity	0.01 Ω•cm Auto range
	Salinity	0.01 psu
	Temperature	0.1 °C
Error Limits/Accuracy	pH	± 0.01 pH
	mV	± 1mV
	Conductivity etc.	± 0.5 %F.S.
	Temperature	± 0.3 °C
Calibration	pH	Up to 3 point, 6 buffer groups
	Conductivity	5 predefined conductivity standard points
Memory		99 sets pH and 99 sets conductivity data, last calibration data

Power/Battery		AC Adapter Input: 100-240V ~ X.XA 50/60 Hz AC Adapter Output: 12V ⎓ X.XA
Size/weight		Approximately 220 W x 175 D x 78 H mm / 0.95 kg
Display		LCD with backlight
Input	pH	BNC, impedance >10e+12 Ω
	Conductivity	Mini-Din
	Temperature	Cinch, NTC 30 kΩ
Data		RS232
Temp Compensation		ATC or MTC
Temp Compensation Range	pH	0 °C…100 °C for pH
	Conductivity	Temperature Coefficient range: 0.00 %/°C…10.00 %/°C
		Ref T: 20 or 25 °C
Housing		ABS

8.2 Compliance

This product conforms to the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC. The Declaration of Conformity is available online at europe.ohaus.com/europe/en/home/support/compliance.aspx.

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. Disposal instructions in Europe are available online at europe.ohaus.com/europe/en/home/support/weee.aspx. Thank you for your contribution to environmental protection.

FCC Note: 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.

ISO 9001 Registration

In 1994, OHAUS Corporation, USA, was awarded a certificate of registration to ISO 9001 by Bureau Veritus Quality International (BVQI), confirming that the OHAUS quality management system is compliant with the ISO 9001 standards requirements. On June 21, 2012, OHAUS Corporation, USA, was re-registered to the ISO 9001:2008 standard.

9 Appendix

9.1 pH Buffer Groups

STARTER 3100M automatically correct for the temperature dependence of the buffer group pH value given in the following tables (**b2, b3, b4, b5, b6**), you can find **b1** in 3.1.2 .

Buffer group **b2 Europe standard**

Temp℃	pH2.00	pH4.01	pH7.00	pH9.21	pH11.00
5	2.02	4.01	7.09	9.45	11.72
10	2.01	4.00	7.06	9.38	11.54
15	2.00	4.00	7.04	9.32	11.36
20	2.00	4.00	7.02	9.26	11.18
25	**2.00**	**4.01**	**7.00**	**9.21**	**11.00**
30	1.99	4.01	6.99	9.16	10.82
35	1.99	4.02	6.98	9.11	10.64
40	1.98	4.03	6.97	9.06	10.46
45	1.98	4.04	6.97	9.03	10.28
50	1.98	4.06	6.97	8.99	10.10

Buffer group **b3 MERCK (Ref. 20°C)**

Temp °C	pH 2.00	pH4.00	pH7.00	pH9.00	pH12.00
5	2.01	4.04	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	2.00	4.00	7.00	9.00	12.00
25	**2.00**	**4.01**	**6.98**	**8.95**	**11.88**
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.01	6.96	8.88	11.67
40	2.00	4.01	6.95	8.85	11.54
45	2.00	4.01	6.95	8.82	11.44
50	2.00	4.00	6.95	8.79	11.33

Buffer group **b4 DIN (19267) (Ref. 25°C)**

Temp °C	pH1.09	pH4.65	pH6.79	pH9.23	pH12.75
5	1.08	4.67	6.87	9.43	13.63
10	1.09	4.66	6.84	9.37	13.37
15	1.09	4.66	6.82	9.32	13.16
20	1.09	4.65	6.80	9.27	12.96
25	**1.09**	**4.65**	**6.79**	**9.23**	**12.75**
30	1.10	4.65	6.78	9.18	12.61
35	1.10	4.65	6.77	9.13	12.45
40	1.10	4.66	6.76	9.09	12.29
45	1.10	4.67	6.76	9.04	12.09
50	1.11	4.68	6.76	9.00	11.98

Buffer group **b5 JJG119**

Temp℃	pH1.68	pH4.00	pH6.86	pH9.18	pH12.46
5	1.67	4.00	6.95	9.39	13.21
10	1.67	4.00	6.92	9.33	13.01
15	1.67	4.00	6.90	9.28	12.82
20	1.68	4.00	6.88	9.23	12.64
25	**1.68**	**4.00**	**6.86**	**9.18**	**12.46**
30	1.68	4.01	6.85	9.14	12.29
35	1.69	4.02	6.84	9.11	12.13
40	1.69	4.03	6.84	9.07	11.98
45	1.70	4.04	6.83	9.04	11.83
50	1.71	4.06	6.83	9.02	11.70

Buffer group **b6 J IS Z 8802 (Japanese)**

Temp℃	pH1.68	pH4.01	pH6.86	pH9.18
5	1.67	4.00	6.95	9.40
10	1.67	4.00	6.92	9.33
15	1.67	4.00	6.90	9.28
20	1.68	4.00	6.88	9.23
25	**1.68**	**4.01**	**6.86**	**9.18**
30	1.68	4.02	6.85	9.14
35	1.69	4.02	6.84	9.10
40	1.69	4.04	6.84	9.07

9.2 Conductivity standards

T(°C)	10 µS/cm	84 µS/cm	500µS/cm	1413µS/cm	12.88 mS/cm
5	6.1 µS/cm	53 µS/cm	315.3µS/cm	896 µS/cm	8.22 mS/cm
10	7.1 µS/cm	60 µS/cm	359.63µS/cm	1020 µS/cm	9.33 mS/cm
15	8.0 µS/cm	68 µS/cm	402.93µS/cm	1147 µS/cm	10.48 mS/cm
20	9.0 µS/cm	76 µS/cm	451.53µS/cm	1278 µS/cm	11.67 mS/cm
25	10.0 µS/cm	84 µS/cm	500.03µS/cm	1413 µS/cm	12.88 mS/cm
30	11.0 µS/cm	92 µS/cm	548.5µS/cm	1552 µS/cm	14.12 mS/cm
35	12.1 µS/cm	101 µS/cm	602.53µS/cm	1667 µS/cm	15.39mS/cm

9.3 Examples of temperature coefficients (α-value)

Substance at 25 °C	Concentration [%]	Temperature coefficient α [%/°C]
HCl	10	1.56
KCl	10	1.88
CH3COOH	10	1.69
NaCl	10	2.14
H2SO4	10	1.28
HF	1.5	7.20

α-coefficients of conductivity standards for a calculation to a 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

9.4 Conductivity to TDS conversion factors

Conductivity	TDS KCl		TDS NaCl	
At 25 °C	ppm value	Factor	ppm value	Factor
84 µS	40.38	0.5048	38.04	0.4755
447 µS	225.6	0.5047	215.5	0.4822
1413 µS	744.7	0.527	702.1	0.4969
1500 µS	757.1	0.5047	737.1	0.4914
8974 µS	5101	0.5685	4487	0.5000
12.88 µS	7447	0.5782	7230	0.5613
15 µS	8759	0.5839	8532	0.5688
80 mS	52.168	0.6521	48.384	0.6048

LIMITED WARRANTY

Ohaus products are warranted against defects in materials and workmanship from the date of delivery through the duration of the warranty period. During the warranty period Ohaus will repair, or, at its option, replace any component(s) that proves to be defective at no charge, provided that the product is returned, freight prepaid, to Ohaus.

This warranty does not apply if the product has been damaged by accident or misuse, exposed to radioactive or corrosive materials, has foreign material penetrating to the inside of the product, or as a result of service or modification by other than Ohaus. In lieu of a properly returned warranty registration card, the warranty period shall begin on the date of shipment to the authorized dealer. No other express or implied warranty is given by Ohaus Corporation. Ohaus Corporation shall not be liable for any consequential damages.

As warranty legislation differs from state to state and country to country, please contact Ohaus or your local Ohaus dealer for further details.

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