STARTER 3100C
Bench Conductivity Meter
Instruction Manual

Manual de instrucciones del Conductivímetro de mesa STARTER 3100C

STARTER 3100C
Appareil de mesure de la conductivité de laboratoire
Manuel d’instructions

STARTER 3100C
Medidor de Condutividade de Bancada
Manual de Instruções

TABLE OF CONTENTS

1 INTRODUCTION

☺ Thank you for choosing OHAUS. Please read the manual completely before using the STARTER 3100C bench conductivity meter to avoid incorrect operation.

The STARTER 3100C has an excellent performance/price ratio and is designed with many useful features.
Starter 3100C offers many practical features such as:

- Backlight liquid crystal screen which make the display more clearly
- Auto/manual endpoint
- Quick Guide attached under meter to assist with operation
- RS232 port and memory to store up to 99 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

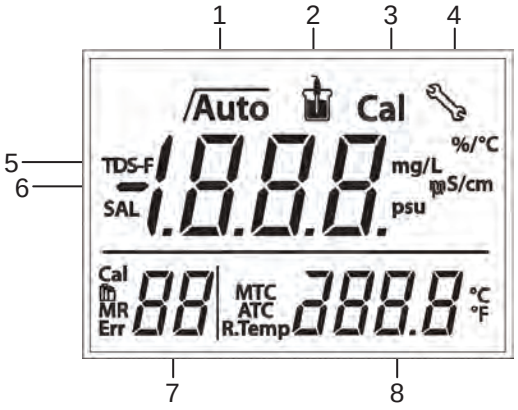
1.2 Safety Precautions

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 Endpoint stability / Auto endpoint **Auto**

2 Measurement icon - measurement or calibration is running

3 Calibration icon **Cal** - calibration in progress

4 Setup icon - instrument is in the setup mode

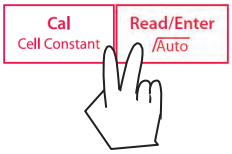
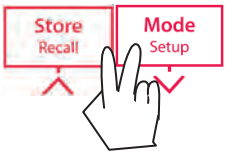
5 TDS factor in the setup mode

6 Conductivity / TDS / Salinity / Cell Constant

7 Standard / Error index **Err**

8 Temperature during measurement or reference temperature in setup mode

Controls

Button	Press & release	Press & hold for 3 seconds
	- Start or endpoint measurement - Confirm setting, store entered value	- Turn auto endpoint on / off /**Auto**, /
	- Start calibration	- Review the latest calibration data (cell constant)
	- Meter turn on - Return to measurement screen	- Meter turn off
	- Store current reading to memory - Increase value during setting - Scroll up through the memory	- Recall stored data - Print current memory data
	- Switch between pH and mV measuring modes - Decrease value during setting - Scroll down through the memory	- Enter setup mode
	- Start self-diagnosis	
		Turn on/off the backlight of the LCD

2 INSTALLATION

Carefully unpack the meter.

2.1 Package contents

The ST3100C-B package has the following items

ST3100C-B	**Units**
STARTER 3100C meter	1
Stand alone electrode holder	1
1413 µS/cm standard solution	1 bottle (about 20ml)
12.88 mS/cm standard solution	1 bottle (about 20ml)
In use cover	1

In addition to ST3100C-B content, the ST3100C-F package also includes the following:

STCON3 conductivity electrode	1

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

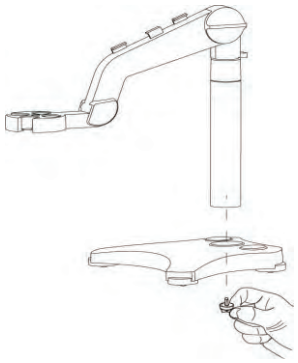
Accessories:

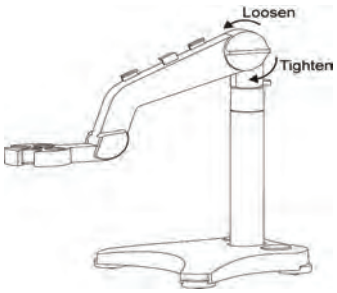
Model	Description	P/N
STCON3	4-ring cond. electrode (70 µS/cm-200mS/cm, 0.5% accuracy;) (2-70 µS/cm, 1-5% accuracy)	83033972
STCON7	Pure water cond. electrode (0.02µS/cm-200 µS /cm; 0.02 µS/cm accuracy)	30080693

Standard Conduct 10 µS/cm 250ml	30100441
Standard Conduct 84 µS/cm 250ml	30100442
Standard Conduct 1413 µS/cm 250ml	30100443
Standard Conduct12.88mS/cm 250ml	30100444
Electrode holder stand alone (3100/3100C)	30058733
In use cover	30058734

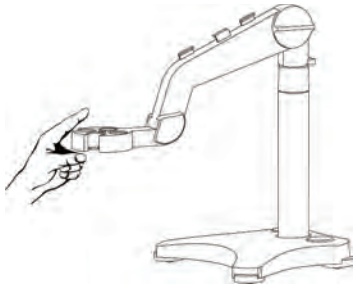
2.2 Installing the stand-alone electrode holder

Install the electrode arm on the base,



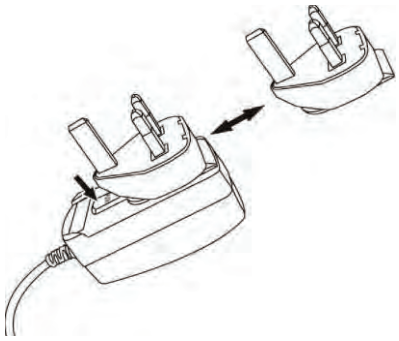


After adjusting the tension knob to some extent, you can move up and down. When the electrode is installed on the arm, the storage bottle of pH electrode fits into the base hole.



2.3 Installing the power adapter

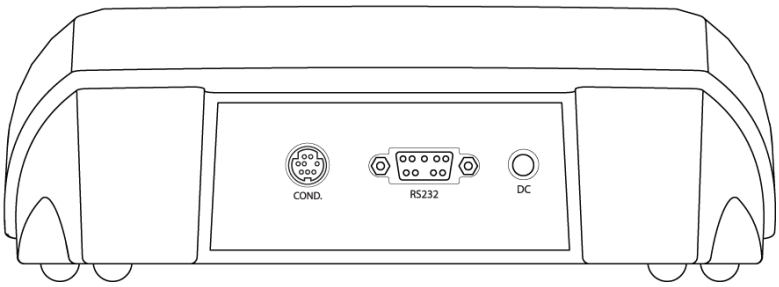
Insert the right adapter clip into the power adapter slot.



The Ohaus balance power supply is also 12V which could be used for the pH meter.

2.4 Connect the conductivity electrode

There is one socket “COND.” for conductivity electrode.



2.5 Meter stand for adjusting view angle

One unique design of the STARTER 3100C is the meter stand, which can be used to adjust the view angle of the display in case of working on high lab table.

2.6 Attached quick guide

Another unique design of the STARTER 3100C is the attached quick guide, the quick guide is attached into the bottom housing of the meter, you can use finger to pull it out.

3 SETUP

3.1 Set temperature unit

- Power the meter on by pressing Exit.
- Press and hold Mode Setup until the set up icon appears on the display and the current temperature unit blinks. (°C or °F)
- 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: °C = 5/9 (°F -32)

3.2 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.

3.3 Set calibration standard

After the MTC temperature value setting, the meter goes to setup calibration standard.

Use 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 or press Exit to go back to the measurement screen.

3.4 Set temperature correction coefficient

After the calibration standard setting, the meter goes to the temperature correction coefficient setting.

Use 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 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.

3.5 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 STARTER 3100C OPERATION

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.

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.

4.1 Calibration

4.1.1 Selecting a standard

When using the STARTER 3100C 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 4 predefined standards are:

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

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

4.1.2 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.**

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.

Place the conductivity sensor in the selected calibration standard, wait 10-15s, then press Cal Cell Constant.

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 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.

4.2 Sample measurement

Place the conductivity sensor 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 probe in 6 seconds.

4.3 TDS and Salinity measurement

To perform a TDS or salinity measurement, follow the same procedure as for a conductivity measurement. Press Mode Setup to switch between conductivity and TDS measurement mode.

4.4 Using the memory

4.4.1 Storing a reading

The STARTER 3100C can store up to 99 endpoint results.

- Press 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 3.4.3)

4.4.2 Recalling from memory

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

4.4.3 Clearing the memory

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

Now we can two choices:

❖ 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.

4.5 Printing

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

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
Manual 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
Manual 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

5 MAINTENANCE

5.1 Error message

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 there is an error, the meter will beep 3 times to alert.

5.2 Meter maintenance

Never unscrew the two halves of the housing!
The STARTER 3100C does not require any maintenance. To clean, use a damp cloth.
The housing is made of acrylonitrile butadiene styrene (ABS). This material is susceptible to damage by some organic solvents, such as toluene, xylene and methyl ethyl ketone (MEK). Any spillage should be immediately wiped off.

5.3 Self diagnosis

Press and hold Read/Enter /Auto and Cal Cell Constant 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 6 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 two minutes, otherwise **Err 1** appears and you will have to repeat the procedure.

5.4 Recover Factory Setup

- When the meter is off , press and hold Read/Enter /Auto & Cal Cell Constant & Exit ⏻ together for 3 seconds, the screen displays RST and blinks, means “Reset”. Then we have 2 choice:
  - ❖ 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, display NO then turn off the meter.

6 TECHNICAL DATA

6.1 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

Model	ST3100C
Measuring range	0.0 µS/cm…199.9 mS/cm 0.1 mg/l…199.9 g/l (TDS) 0.00 ... 100.0 psu (Salinity) 0 °C…100 °C
Resolution	Automatic range 0.1 °C
Error limits/Accuracy	± 0.5 % of the measured value ± 0.3 °C
Calibration	1 point 4 predefined standards
Memory	99 measurements The last calibration data
Power supply	AC Adapter Input: 100-240V ~ X.XA 50/60 Hz AC Adapter Output: 12V ⎓ X.XA
Size/weight	220 W x 175 D x 78 H mm / 0.75 kg
Display	White backlit Liquid crystal
Input	Mini-Din
Temperature-compensation	Linear: 0.00 %/°C…10.00 %/°C Reference temperature: 20 & 25 °C
Housing	ABS

6.2 Compliance

This product conforms to the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC.

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.

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.

7 APPENDIX

7.1 Conductivity standards

T(°C)	**10 µS/cm**	**84 µS/cm**	**1413 µS/cm**	**12.88 mS/cm**
5	6.1 µS/cm	53 µS/cm	896 µS/cm	8.22 mS/cm
10	7.0 µS/cm	60 µS/cm	1020 µS/cm	9.33 mS/cm
15	8.0 µS/cm	68 µS/cm	1147 µS/cm	10.48 mS/cm
20	9.0 µS/cm	76 µS/cm	1278 µS/cm	11.67 mS/cm
25	10.0 µS/cm	84 µS/cm	1413 µS/cm	12.88 mS/cm
30	11.0 µS/cm	92 µS/cm	1552 µS/cm	14.12 mS/cm
35	12.1 µS/cm	101 µS/cm	1667 µS/cm	15.39 mS/cm

7.2 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 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

7.3 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.