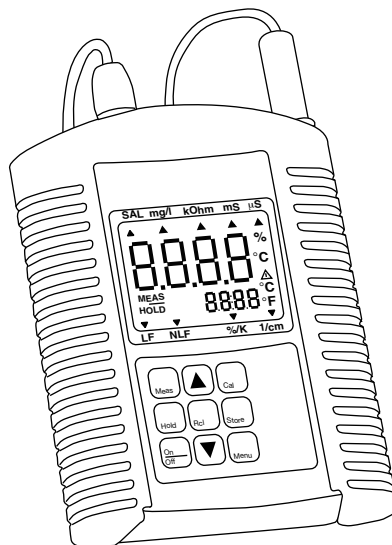# Camlab Water Model CW/6220

Conductivity/TDS/Salinity Meter- Instruction Manual
Ref: CW/72.22.20
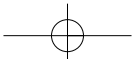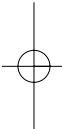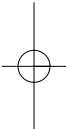
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1. Scope of delivery

Standard:

- Camlab Water CW6220 meter
- Batteries, 4*AA 1,5 V cells
- Operating instructions
- Carrying strap

Set:

- Camlab Water CW6220 meter
- Batteries, 4*AA 1,5 V cells
- 4 pole measuring sensor
- Carrying case
- Operating instructions
- Carrying strap

2. System description

The Camlab Water CW6220 is a sturdy, water-proof handheld meter designed for daily measurements in the area of field or laboratory analysis.

It is used to measure conductivity, total dissolved solids and salinity in surface water and groundwater as well as in the field of waste water or industrial water analysis.

The system complies with the requirements in EN 60529 relating to protection class IP67 and waterproof/dustproof properties.

The permanent protective plating on the unit serves not just as impact protection but also as a storage

compartment for the electrode and as an anti-slip de-
vice when the meter is used in an upright instrument
position.

A "Low Bat" indicator in the display shows the user
when it is time to change the batteries.

The required temperature compensation for the sy-
stem is performed automatically (ATC) following con-
nection of the temperature sensor (NTC 10 kOhm) that
is integrated in the conductivity electrode.

The Min/Max function enables the user to identify mi-
nimum or maximum results and to show these results
on the display.

Temperature compensation during measurement can
be carried out either in non-linear mode in accordan-
ce with EN 27888 or in linear mode. The system is
calibrated using standard solutions.

An internal memory for 20 results is integrated in the
unit as standard. The memory stores location, result
and temperature.

The memory is called up via the display.
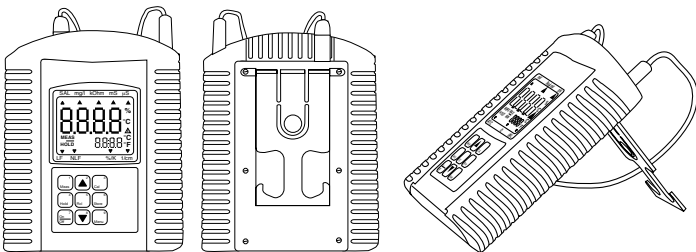
3. Connections
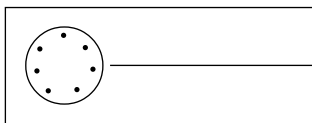
Conductivity measuring cell

4. Display

Main display:	Result or user prompt	
[SAL]	Salinity, g/kg	
[mg/l]	TDS	
	Total Dissolved Solids	
[kOhm]	Specific Resistance (1/conductivity) kOhm · cm	
[mS]	Conductivity ms/cm	
[µS]	Conductivity µS/cm	
Secondary display:	Result - temperature or user prompt	
[°C/°F]	Temperature unit	
[⚠]	Warning index - battery	
[LIN]	Linear temperature compensation	
[NLF]	Non-linear temperature compensation	
[%/K]	Unit for temperature compensation coefficient	
[1/cm]	Unit for cell constant correction	
[MAX/MIN/ HOLD]	show whether maximum, minimum or Hold value is shown	

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5. Operation

[Meas]	Continuous measurement,
	(standard setting)
[Hold]	Retain of current result
[On/Off]	On/Off
[▲] [▼]	Leaf through menu or memory or show maximum[▲] or minimum [▼] value
[Cal]	Calibration mode
[Rcl]	Display of stored results
[Store]	Storage of current result or acceptance of unit configuration
[Menu]	Unit configuration

Meas △ **Cal**

Hold **Rcl** **Store**

⏻ ▽ **Menu**

6. Startup

The unit is supplied with integrated batteries as standard and is therefore ready for immediate use.

You have to unscrew the unit to insert or change the batteries.

bAt ⚠
Display

Remove 6 screws →

Don`t touch

4 x AA 1,5 V
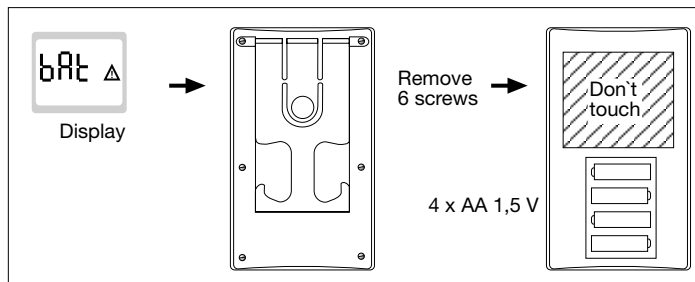
When inserting the batteries, ensure correct polarity!

Screw the unit back together carefully without exerting too much pressure on the gasket seal.

If the [Δ] symbol appears together with "bAt" in the lower section of the display, this means that the batteries are nearly empty and need replacing.

However, the unit will continue to function for a certain period of time.

bAt $\triangle$

If "bAt" appears in the upper section of the display, this means that the batteries are completely empty.

Only use the matching Camlab conductivity electrodes!

Other electrodes may cause serious damage to the meter and the electrode.

Switch off the unit before changing electrodes. Plug in the electrode before switching the unit back on.

The unit is factory-calibrated to the supplied electrode. If the electrode is replaced, the unit must be factory-calibrated.

The electrode must be plugged in before the unit is switched on.

Switch the unit on via the [ON/OFF] key.

Following measurement, please switch the unit off using the [ON/OFF] key.

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7. Measurement

Measuring mode MEAS

After the unit is switched on, it is automatically in the standard measuring mode MEAS.

Meas

You can "freeze" the result shown in the display by pressing the [Hold] key.

Hold

If you press the [Hold] key once again, the meter switches back to the continuous measuring mode.

Four display modes are supported:

Conductivity	(units – mS/cm and μS/cm)
Resistance	(unit – kOhm · cm)
Salinity	(unit – g/kg)
Total dissolved solids (TDS)	(unit – mg/l)

The conductivity mode supports 4 different measuring ranges:

0,0	...	200,0 μS/cm
0	...	2000 μS/cm
0,00	...	20,00 mS/cm
0,0	...	200,0 mS/cm

When the Auto Range feature is active, the meter automatically selects the most suitable resolution.

When the Auto Range feature is inactive, you can change to the next measuring range resolution by briefly pressing the [Meas] key. If the highest resolution is active when you press the key, the unit switches to the lowest measuring range resolution.

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8. Configuration of the unit

Menu
To configure the unit, press the [Menu] key.

The first menu item appears.

If you press the [Menu] key again, the display jumps to the next menu item.

△ + ▽
You can set the various parameters using the [▲] [▼] keys.

Store
Press the [Store] key to store and conclude configuration.

The unit then switches back to measuring mode.

Meas **Hold**
You can terminate the configuration process by pressing the [Meas] or [Hold] key.

Settings made up to this point are not stored.

The unit retains the previous settings.

8.1 ‚Unit': Selection of the display mode

SAL:	Salinity
mg/l:	TDS
kOhm:	Specific Resistance
mS/μS:	Conductivity

8.2 ‚Auto Range': automatic range selection in Conductivity measuring mode

off: the range is entered manually [▲] or [▼] keys)

on: the most suitable range is automatically set by the unit

t.Cor

8.3 'Temperature Compensation': Selection of temperature compensation

off: no temperature compensation

nLF: non-linear temperature compensation for natural water in acc. with EN27888 (DIN 38404).

(for analysis of groundwater or surface, drinking or ultrapure water)

Lin: linear temperature compensation

(for other aqueous solutions)

Non-linear temperature compensation 25°C for natural water is always used for measurement of total dissolved solids (TDS).

During salinity measurement, the unit automatically switches to non-linear temperature compensation in acc. with IOT (reference temperature = 15°C).

t.Lin
%/K

8.4 Setting of compensation coefficient (only when t.Cor = Lin)

0.300 … 3.000: temperature compensation coefficient in %/K.

The factor for the solution in question must be determined in pre-trials.

t.rEF

8.5 Selection of reference temperature (only when t.Cor = nLF or Lin)

20°C: Reference temperature 20°C

25°C: Reference temperature 25°C

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8.6 Input of TDS factor

0.40 ... 1.00: Conversion factor for TDS measurement.

The conversion factor depends on the composition of the medium and needs to be determined separately for each type of water.

8.7 Cell Constant 1/cm

The cell constant may change due to soiling, deposits or other mechanical influences on the measuring cell. If an exact standard reference solution is available, the measuring cell can be adjusted accordingly by changing the cell constants. Additionally, the cell constant can be automatically recorded by means of calibration.

• User calibration: **cELL**

• Manufacturing calibration: **CELL**

8.8 Selection of temperature unit °**C /**°**F**

°**C:**   All temperature values in degree Celsius

°**F:**   All temperature values in degree Fahrenheit

8.9 Zero point temperature offset

-2.0°C...2.0°C bzw. –3.6°F...3.6°F

The zero point for temperature measurement is offset by this value.

This enables the user to balance out any occurring sensor deviations:

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Displayed temperature =
measured temperature – offset

off: zero point offset is inactive (=0.0)

8.10 ‚Power off': automatic unit switch-off

If no key is pressed during the switch-off delay peri-od, the unit switches off automatically after the selected time has run down.

The desired delay time is entered in minutes.

If P.oFF = oFF, automatic unit switch-off is inactive.

9. Calibration of conductivity measurement

The individual electrode data of conductivity sensors are stable for extremely long periods of time.

If, however, you establish deviations during tests, you can improve measuring accuracy by performing calibration.

Tintometer standard conductivity solutions serve as a reference.

These solutions have a defined conductivity of

1413 μS/cm. Standard solutions with other conductivity levels may also be used to calibrate the system.

The shelf life of calibration solutions is limited and is shortened further by, among other things, inadequate cleaning and drying of the electrode prior to insertion.

This can lead to incorrect calibration!

You should therefore always use fresh solutions for calibration and clean the electrode using deionised or distilled water!

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Performing calibration

Prepare electrode and calibration solution.

Clean the electrode using deionised water and dry carefully.

Insert the electrode in the vessel containing the calibration solution and stir well.

Starting calibration: Press [Cal] key.

'CAL' appears momentarily in the display, then the previous cell constant is shown briefly:

CAL

CELL
0.629

Meas **Hold**

You can terminate calibration at any time by pressing the [Meas] key or [Hold] key. In this event, the previous calibration setting is retained.

Input of calibration solution

CAL
1413

Store

The flashing display shows the last-used calibration value or the factory-set 1413μS/cm. You can change this value via the [▲] or [▼] keys in the range from 1000...2000 μS/cm. The value you enter is the correct temperature (non-compensated) LF value. You then confirm and complete your choice by pressing the [Store] key. During calibration, CAL flashes in the display. If the value is stable, calibration is complete and the new cell constant is briefly shown in the display. If the cell constant calculated during calibration is outside the range 0.55 +/-0.11 1/cm, an error mes-

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sage is shown and the original calibration value is re-tained.

• User calibration **cELL**

• Manufacturing calibration **CELL**

9.1 Restoring the factory calibration setting

You can set the conductivity meter back to the factory setting by simultaneously pressing the [On/Off] and [Cal] keys when you switch the system on.

10. Result memory

A maximum of 20 results with the corresponding tem-peratures can be stored.

10.1 Storing results

You can store the current result in the result memory by pressing the [Store] key.

[Stor] and the number of the memory location appear briefly in the display.

10.2 Displaying stored results

You can call the stored results up in the display by pressing the [Rcl] (=Recall) key.

The first time you press the [Rcl] key, the number of the memory location and the corresponding value are displayed.

The second time you press the key, the temperature for this result is displayed. You can use the [▲] [▼] keys to switch between the stored results.

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Store **Meas**

As soon as you press the [Store], [Meas] or [Hold] key, the unit reverts to the corresponding measuring mode.

10.3 Delete stored results

If you press the [Store] key for longer than 2 seconds, the unit switches to the delete menu [CLR].

△ **+** ▽

You can use the [▲] [▼] keys to select the desired action and press the [Store] key to execute it.

Store

The unit then returns to the corresponding measuring mode.

[CLr-ALL]:   delete all stored results.

[CLr-LASt]:   delete the last-stored result.

[CLr-no]:   do not delete any result.

11. Error messages and troubleshooting

Display	Cause	Remedy
108 -bAt-	Weak battery voltage, the unit will only continue to function for a short time	Insert new batteries
bAt ⚠	Batteries empty	Insert new batteries
No display or strange symbols	Batteries empty	Insert new batteries
	Batteries incorrectly inserted	Check batteries
Unit does not react when keys are pressed	System error	Disconnect batteries, wait for a short time, reconnect the batteries
	Unit defective	Send in for repair
Err.1	Exceeds measuring range	Check: can value exceed admissible measuring range? -> Result too high!
	Sensor/Electrode defective	Send in for repair
Err.2	Below measuring range	Check: can value be below admissible measuring range? -> Result too low!
	Sensor/ Electrode defective	Send in for repair

Display	Cause	Remedy
Err.7	System error	Send in for repair
Err.11	Value could not be calculated	Temperature outside the admissible temperature measuring range

Calibration

Display	Cause	Remedy
CAL.-Err.1	Value was inadmissible, cell constant too high: electrode defective	Clean electrode, re-calibrate If error repeated -> replace electrode
	Buffer solution unusable	Use fresh buffer solution
CAL.-Err.2	Value was inadmissible, cell constant too low: electrode defective	Replace electrode
	Buffer solution unusable	Use fresh buffer solution
CAL.-Err.4	Wrong temperature during calibration	Calibration only possible in range from 10 … 40°C

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12. Technical data

Parameter	Indicating ranges	Resolution
Conductivity	0.0 ... 200.0 μS/cm	0.1 μS/cm
	0 ... 2000 μS/cm	1 μS/cm
	0.00 ... 20.00 mS/cm	0.01 mS/cm
	0.0 ... 200.0 mS/cm	0.1mS/cm
Specific Resistivity	0.005 ... 100.0 kOhm	0.001 kOhm · cm, 0.01 kOhm · cm 0.1 kOhm · cm
Total dissolved solids (TDS)	0 ... 1999 mg/l	1 mg/l
Salinity	0.0 ... 70.0	0.1
Temperature	-5.0 ... +100.0°C 23.0 ... 212°F	0.1°C bzw. 0.1°F

• **Accuracy**
(at nominal temperature)

conductivity, spec. resistance, TDS and salinity (3digits) ±0.5% of result ±0.5% FS

temperature ±0.3K

• **Cell correction**

determination with automatic calibration in the range from 0.55 to ± 0.11 1/cm

• **Temperature compensation**

choice of

- linear temperature compensation with a compensation factor of 0.3 to 3.0 %/K

- non-linear temperature compensation in acc. with EN 27888 (DIN 38404) reference temperatures 20°C and 25°C or without temperature compensation

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- **Calibration**   1-point calibration with conductivity solution in the range from 1000...2000μS/cm

- **Nominal temperature**   25°C

- **Operating temperature**

| unit: | 0 to +50°C |
| measuring cell: | -5 to 80°C (short-term to 100°C) |

- **Memory**   Measured values are stored for the ranges „conductivity", „resistivity", „TDS" and „salinity" together with the temperature at which the value occurred

- **Power supply**   4 x 1.5V batteries, type AA, operating life up to >1500h (depending on measuring mode)

- **Power consumption**   ca. 2.0 mA, max. 4.2 mA at 199.9 mS/cm

- **Battery change indicator**   ‚bAt '

- **Automatic „Off" function**   if no key is pressed and no data transfer transfer is occurring, the unit switches off after the switch-off delay time. May be set between 1 and 120 minutes or inactive.

- **Housing:** Water-tight in accordance with IP67
Integral protective plating
LCD
Film keypad

- **Measuring cell** 4-electrode conductivity measuring
cell with integrated temperature sensor
NTC 10 kOhm.

- **Electrode material** Special graphite

- **Shaft material** Epoxy,
Dimensions: black ø 12 mm,
120 mm long

- **CE** EN 55022: 6/1993 class B
EN 50082-1 (EN 61000-4-6, EN
61000-4-4, EN 61000-4-3,
EN 61000-4-2)

CW/72.22.00	Camlab Water CW6220
CW/72.22.20	Camlab Water CW6220 Set
CW/72.22.25	Spare probe
RN/CSKCL	Conductivity Standard 1413μS/cm 50ml
CW/72.50.20	Spare case
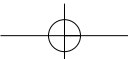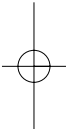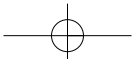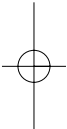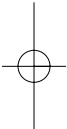
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