Instruction Manual

CON 700 Conductivity/ºC/ºF Bench Meter

OAKTON®

EUTECH INSTRUMENTS

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Part of Thermo Fisher Scientific

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1. INTRODUCTION

Thank you for purchasing our Con 700 series benchtop meter. This microprocessor-based meter is economical and simple to use. The design incorporates a large LCD for clear viewing, yet offers a small footprint to conserve space.

The CON 700 measures conductivity or TDS, and temperature (ºC or ºF) simultaneously.

Each meter includes a convenient slide-out card for quick reference.

Some configurations include an electrode arm and metal bracket which can be easily attached to the left or right side of the meter according to your preference.

The CON 700 series benchtop meter replaces our popular CON 510 series meter that was introduced in 2002.

We take great pride in every instrument we manufacture and hope this one serves you well.

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2. GETTING STARTED

2.1 Keypad Functions

	Powers the meter on and off. Upon power on, the meter automatically begins in the mode that was last used. Calibration and memory values are retained even if meter is unplugged.
	Toggle between available measurement modes—Conductivity with Temperature or TDS with Temperature. Also used to switch to Temperature calibration during Conductivity or TDS calibration mode. **Press and hold for 5 seconds to enter SETUP mode.**
	Toggles between measurement and calibration modes. In SETUP mode, returns user to the measurement mode.
	Confirms calibration values in CAL mode. Confirms selections in SETUP mode. Changes range and resolution in MEAS mode. View recalled values in memory mode.
	MI (Memory Insert) stores values into memory. ▲ Increase value. Scroll up in SETUP & CAL modes.
	MR (Memory Recall) recalls values from memory ▼ Decrease value. Scroll down in SETUP & CAL modes.
	Freezes measured reading. Press again to resume live reading.

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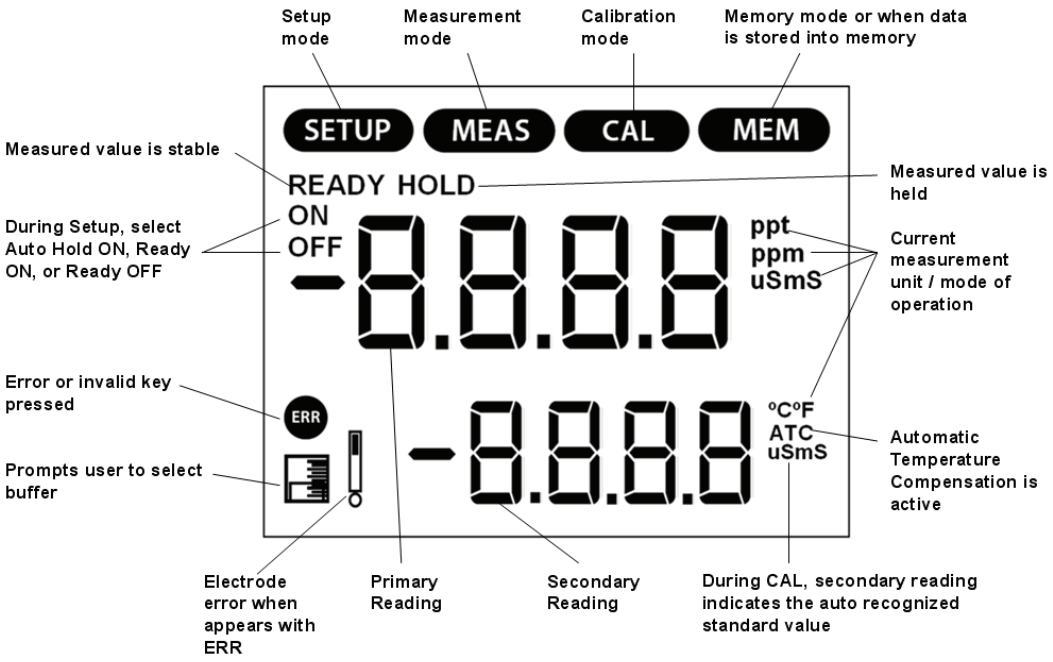
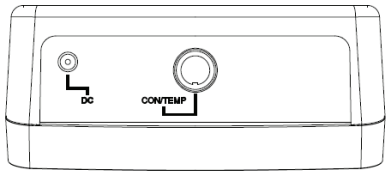
2.2 LCD Annunciators



2.3 Meter Connections



CON/ Temp	8-pin DIN connection for 2-cell Con/TDS/Temp electrode
DC	Power supply

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3. ELECTRODE INFORMATION

The CON700 includes an electrode with a nominal cell constant of k = 1.0, built-in temperature sensor, and 1 meter cable. The Ultem body housing has good chemical resistant properties. The electrode design offers fast temperature response and reduces air entrapment, ensuring accurate, repeatable, and stable readings.

The wetted materials of the probe include:

- Polyetherimide (Ultem) – protective probe guard
- Polybutylterphalate (Valox) – sensor housing
- Stainless Steel (SS 304) – 2 bands

The protective probe guard can be removed temporarily for cleaning however it must be re-attached during measurement and calibration. ***Erroneous results will occur while the probe guard is removed.***

Always immerse the probe beyond upper steel band for best results. Use the fill line on the outside of the probe guard for reference.

4. CALIBRATION

4.1 Automatic or Manual Calibration

The CON 700 is capable of automatic or manual calibration for conductivity, and manual calibration for TDS.

In the automatic calibration mode, the meter will automatically select one of (4) conductivity calibration standard values depending on the range and normalization temperature being used (**TABLE 1**).

If you only use calibration standards that are listed in **TABLE 1**, automatic calibration is recommended. If you intend to calibrate with one or more standards that are not listed in **TABLE 1**, the CON 700 must be set for manual calibration instead.

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The factory default is automatic conductivity calibration. See *Section 6.10* to change this setting. There is no automatic calibration value available for conductivity range 1.

TABLE 1

Range #	Conductivity Range	Automatic Calibration Values	
		Normalization Temperature	
		25 ºC	20 ºC
r 1	0.00 – 20.00 µS	None	None
r 2	20.1 – 200.0 µS	84 µS	76 µS
r 3	201 – 2000 µS	1413 µS	1278 µS
r 4	2.01 – 20.00 mS	12.88 mS	11.67 mS
r 5	20.1 – 200.0 mS	111.8 mS	102.1 mS

Range #	TDS Range (using 0.5 TDS factor)	Automatic Calibration Values
r 1	0 – 10.00 ppm	none
r 2	10.1 – 100.0 ppm	none
r 3	101 – 1000 ppm	none
r 4	1.01 – 10.00 ppt	none
r 5	10.1 – 100 ppt	none

4.2 Single or Multi-Point Calibration

Use Single-Point Calibration to apply a single calibration value across all ranges.

Use Multi-Point Calibration for individual calibration in each range. This will restrict an individual calibration so that it is applied to one range only. When using multi-point calibration, perform a calibration in each range that you expect to use for best results.

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The factory default is Single-Point Calibration. See *Section 6.11* to change this setting.

4.3 General Calibration Tips

For best results, periodic calibration with known accurate standards is recommended. A maximum of one calibration point per range can be performed. If multiple calibration points are used in the same range, the most recent one will replace the previous one.

When the electrode is replaced, it is best to clear the calibration to the factory default values (see *Section 6.13*).

Rinse or immerse the probe before calibration and between samples with clean water (deionized water is ideal).

The CON 700 has non-volatile memory which will retain all calibration values, as well as meter settings and memory values upon meter shut down or unexpected power loss.

To protect from erroneous calibrations, the allowable tolerance is ±40% of the factory default value.

Low conductivity standard solutions (less than 20 µS) are unstable and are very temperature dependent. As a result, reproducible calibration results are challenging in lowest measurement range #1 (0.00 to 20.0 µS).

4.4 Automatic Conductivity Calibration Procedure

1) Press

as needed to select conductivity (µS or mS).

2) Dip the electrode into the conductivity standard and press

. Provide stirring for best results.

3) The primary display will show the factory default value, while the secondary display will lock on the appropriate automatic standard value from **TABLE 1**.

4) When the **READY** indicator appears, press

to accept. The primary reading will flash briefly before returning to measurement mode upon successful calibration.

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4.5 Manual Conductivity & TDS Calibration Procedure

1) Press MODE as needed to select conductivity (µS or mS) or TDS (ppm or ppt) calibration.
2) Dip the electrode into the calibration standard and press CAL/MEAS. Provide stirring for best results.
3) The primary display will show the current reading, while the secondary display will be the factory default value. Adjust the temperature reading using MI or MR. Press ENTER/RANGE to accept. The primary reading will flash briefly before returning to measurement mode upon successful calibration.

4.6 Temperature Calibration

The thermistor sensor used for automatic temperature compensation and measurement is accurate and stable, so frequent calibration isn't required. Temperature calibration is recommended upon probe replacement, whenever the temperature reading is suspect, or if matching against a certified thermometer is desired.

1) Place the probe into a solution with a known accurate temperature such as a constant temperature bath.
2) Press CAL/MEAS followed by MODE. The primary display shows the measured temperature while the secondary display shows the factory default temperature.
4) Adjust the temperature using MI or MR. Press ENTER/RANGE to accept or CAL/MEAS to cancel. The meter allows an adjustable maximum value of ± 5°C (or ± 9°F) from the factory default temperature.

5. MEASUREMENT

5.1 Taking Measurements

1) Rinse the electrode with de-ionized or distilled water before use to remove any impurities. Gently shake excess water droplets.

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2) Dip the probe into the sample beyond the upper steel band (utilize the fill line on the outside of the probe guard for reference).

3) Allow time for the reading to stabilize. Note the reading on the display. The clear yellow protective probe guard must be attached during measurement. Erroneous results will occur while the probe guard is removed.

5.2 Automatic and Manual Ranging

The CON 700 automatically selects the optimum range in which your readings appear. Refer to **TABLE 1** for a list of the available ranges.

To turn-off automatic ranging, press . **MEAS** will flash, indicating that manual ranging is active. To manually select the next range, press again. After range 5, automatic ranging is resumed.

For example, a reading of 465 µS will automatically settle in range 3. Using manual range advancement this will read as 0.47 mS in range 4, and 0.5 mS in range 5. For best resolution, use auto-ranging.

5.3 HOLD Function

For prolonged observation of a reading, press during measurement mode to freeze the display. The “HOLD” indicator will display when the reading is held. To release the held value and resume measurement, press again or insert the held value into memory by pressing .

5.4 Storing and Recalling Data

The CON 700 can retain up to 100 data points into memory for later retrieval.

1) In the measurement mode, press to insert the measured value into memory. The stored memory location value (StO) is briefly displayed.

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2) To recall data from memory, press MR. The location of the most recent stored data is displayed first. Press MI or MR to select the location of the desired data, then press ENTER/RANGE to accept.

3) Press ENTER/RANGE to return to the stored data location. Press CAL/MEAS to return to measurement mode. To erase stored data, see Section 6.14.

6. SETUP FUNCTIONS

Use the set up mode to customize your instrument operation. During measurement, press and hold MODE for 5 seconds to enter SETUP mode.

Press MI or MR to change programs or change options.

Press ENTER/RANGE to select the program or confirm selection.

Press CAL/MEAS to go back one level or return to measurement mode.

6.1 P1.0 CAL (Calibration)

Press ENTER/RANGE to view stored calibration points in each range.

6.2 P2.0 ELE (Electrode Information)

Press ENTER/RANGE to view cell efficiency in each range.

6.3 P3.0 ConF (Configuration)

Press ENTER/RANGE to access set-up programs 3.1 thru 3.9.

6.4 P3.1 rdY (Ready / Stability Indicator)

Press ENTER/RANGE.

Press MI or MR to choose READY “On”, READY “OFF”, or Auto HOLd.

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Press to confirm.

6.5 P3.2 ºC ºF (Celcius Or Fahrenheit)

Press .

Press or to select ºC or ºF.

Press to confirm.

6.6 P3.3 AtC (Automatic Temperature Compensation)

Press .

Press or to select “Yes” or “No”.

Press to confirm.

6.7 P3.4 tdS (Total Dissolved Solids factor)

Press .

Press or to select the desired TDS factor (.40 to 1.00).

Press to confirm.

6.8 P3.5 t.CO (Temperature Coefficient)

The temperature coefficient is the amount of change in conductivity per degree temperature (% per ºC). The CON 700 is factory set to a temperature coefficient of 2.1 % per ºC. For most applications this will provide good results. The meter allows adjustment from 0.0 to 10.0.

TIP: Select 0.0% for uncompensated measurements. The temperature will be measured by the electrode and displayed in measurement mode—without compensation.

See *Section 8* – Calculating Temperature Coefficients.

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Press .

Press or to select the desired value (0.00 to 10.0).

Press to confirm.

6.9 P3.6 t.nr (Normalization Temperature in ºC)

When Automatic Temperature Compensation is used, measurements are adjusted by the temperature coefficient to the normalization temperature. The default value is 25 ºC.

Press .

Press or to select the desired value (15.0 to 30.0).

Press to confirm.

6.10 P3.7 ACAL (Automatic Conductivity Calibration)

See Section 4.1 for more details on Automatic Conductivity Calibration.

Press .

Press or to select “Yes” (Automatic) or “No” (Manual).

Press to confirm.

6.11 P3.8 SPC (Single Point Calibration)

See Section 4.2 for details on Single Point & Multi Point Calibration.

Press .

Press or to select “Yes” (Single) or “No” (Multi).

Press to confirm.

6.12 P3.9 CELL (Nominal Cell Constant)

The CON 700 includes a probe with a nominal cell constant (k) of 1.0. Use probes with k = 0.1 and 10 (sold separately) for improved

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performance in extreme sample ranges. Use this setup function to change the cell constant if necessary. Meter default is 1.0 to match the included probe.
k = 0.1 ideal for low measurements <20 µS (<10 ppm).
k = 1.0 ideal for mid-range measurements
k = 10 ideal for high measurements >20 mS (>10 ppt).

Press ENTER RANGE.

Press MI or MR to select 0.1, 1.0, or 10.0

Press ENTER RANGE to confirm.

6.13 P4.0 rSt (Reset)

Press ENTER RANGE.

Press MI or MR to select “Yes” (Reset) or “No” (Cancel).

If “Yes”, press MI or MR to select “Cal” (calibration reset only) or “FCt” (complete reset to factory default settings).

Press ENTER RANGE to confirm.

6.14 P5.0 CLr (Clear Memory)

Press ENTER RANGE.

Press MI or MR to select “Yes” (Erase memory) or “No”.

Press ENTER RANGE to confirm.

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7. CALCULATING TDS CONVERSION FACTOR

You can calibrate TDS using the value of the calibration standard solution at a standard temperature such as 25 ºC. To determine the conductivity-to-TDS conversion factor use the following formula:

Factor = Actual TDS ÷ Actual Conductivity @ 25 ºC

- Actual TDS: Value from the solution bottle label or as a standard made using high purity water and precisely weighed salts.
  ppm = milligram of salt(s) per liter of water = mg/L
  ppt = gram of salt(s) per liter of water = g/L

- Actual Conductivity: Value measured using a properly calibrated Conductivity/Temperature meter.

Both the Actual TDS and the Actual Conductivity values must be in the same magnitude of units. For example, if the TDS value is in ppm the conductivity value must be in µS; if the TDS value is in ppt the conductivity value must be in mS.

Check your factor by multiplying the conductivity reading by the factor in the above formula. The result should be in TDS value.

When the TDS factor is set to 1.0, Conductivity = TDS.

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8. CALCULATING TEMPERATURE COEFFICIENTS

To determine the temperature coefficient of your sample solution use this formula:

$$tc = 100 \text{ x } \frac{C_{T2} - C_{T1}}{C_{T1}(T_2 - 25) - C_{T2}(T_1 - 25)}$$

Where:

tc = Temperature coefficient	25 = 25 ºC
C_{T1} = Conductivity at Temp 1	C_{T2} = Conductivity at Temp 2
T1 = Temp 1	T2 = Temp 2

NOTE: A controlled temperature water bath is ideal for this procedure.

1. Immerse the probe into a sample of your solution and adjust the temperature coefficient to 0% (that is, no compensation) by following instructions as described in *Section 6.8.*
2. Wait for 5 minutes. Note T1 and CT1 (conductivity at T1).
3. Condition the sample solution and probe to a temperature (T2) that is about 5 ºC to 10 ºC different from T1, and note the conductivity reading C_{T2}.

NOTE: Record your results for future reference. Ideally T1 and T2 should bracket your measurement temperature, and should not differ by more than 5 ºC.

4. Calculate the temperature coefficient of your solution according to the formula shown above.
5. Enter the calculated temperature coefficient into the meter.

The calculated temperature coefficient will now be applied to all the meter readings.

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9. REPLACEMENTS AND ACCESSORIES

Item Description	Part number Ordering Code	
	Eutech Instruments	Oakton Instruments
CON 700 Benchtop with electrode and integral stand,100/240 VAC	ECCON70043S	35411-00
Replacement electrode, k = 1.0	CONSEN9501D	35608-74
Epoxy/platinum electrode, k = 0.1	93X546101	35608-72
Glass/platinum electrode, k = 1.0	-	35608-76
Epoxy/platinum electrode, k = 10.0	93X546102	35608-78
SMPS, 100/240 VAC, 9V, 6W power adapter	60X030130	35615-07
10 µS, (20) x 20mL Sachets	ECCON10BS	35653-09
84 µS, 480 mL bottle*	ECCON84BT	00653-16
100 µS, 480 mL bottle	ECCON100BT	-
447 µS, 480 mL bottle	ECCON447BS	00653-47
500 µS, 480 mL bottle	ECCON500BT	-
1413 µS, 480 mL bottle*	ECCON1413BT	00653-18
1413 µS, (20) x 20mL Sachets*	ECCON1413BS	35653-11
2764 µS, 480 mL bottle	ECCON2764BT	00653-20
2764 µS, (20) x 20mL Sachets	ECCON2764BS	35653-12
5.0 mS, 480 mL bottle	ECCON5000BT	-
12.88 mS, 480 mL bottle*	ECCON1288BT	00606-10
15 mS, (20) x 20mL Sachets	ECCON15000BS	35653-13
111.8 mS, 480 mL bottle*	ECCON1118BT	-

** Calibration Standard Value at 25 ºC*

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10. TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	SOLUTION
No display	Main power not switched on. AC Adapter socket not inserted properly.	a) Switch on the power supply. b) Re-insert AC Adapter.
"Ur" (Under range) "Or" (Over range) in primary or secondary display	Measured value is out of range. Electrodes not connected. Electrode clogged, dirty or broken. Meter not calibrated. Wrong temp value.	Check electrode is connected. Clean or replace electrode. Recalibrate the meter. Confirm measurement condition. Treat samples to bring within meter measuring range. Reset meter.
Slow response	Dirty electrode. Temperature of sample is changing.	Clean the electrode. Allow temperature to stabilize.
Meter not responding to key press	Manual HOLD or Auto HOLD is active. Worn keypad.	Press to deactivate manual HOLD. See Section 6.4 to disable Auto Hold feature if enabled. Contact Technical Service.
 Secondary display continually scrolls	Invalid key; Button is not functional in the current operation mode. Conductivity calibration standard is not within 40% of expected value during automatic calibration.	Press alternate key. Select valid key depending on current mode. **Ensure electrode guard has not been removed.** Use fresh or different calibration standard.

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11. SPECIFICATIONS

Conductivity Range	..µS to 200.0 mS
Conductivitity Resolution	0.01 / 0.1 / 1 µS ; 0.01 / 0.1 mS
TDS Range	.. to 100.0 ppt @ 0.5 fact (200.0 @ 1 factor)
Resolution	0.01 / 0.1 / 1 ppm ; 0.01 / 0.1 ppt
Accuracy	±1% Full Scale
Cell Constant	0.1, 1.0, 10.0 (selectable)
TDS Factor	0.40 to 1.00 (adjustable)
Calibration points	Automatic (4 points); Maximum 1 per range Manual (5 points); Maximum 1 per range
Temperature	
Range (Meter)	0.0 to 100.0 ºC / 32.0 to 212.0 ºF
Compensation Type & Range	Automatic with supplied cell or Manual. 0.0 to 100 ºC / 32.0 to 212.0 ºF, 0.0 to 80 ºC / 32.0 to 176.0 ºF with supplied cell
Resolution	0.1 ºC / 0.1 ºF
Accuracy	± 0.5ºC / ± 0.9ºF
Calibration	Offset in 0.1 º increments; Offset range: ± 5.0 ºC / ± 9.0 ºF
Coefficient	0.0 to 10.00 per ºC
Auto-ranging	Yes
Hold Function	Yes
Memory	100 data sets
Input	8-pin DIN
Power	AC/DC 9V, 6W Adapter (100/240 VAC, 50-60Hz)
Dimensions (mm)	meter only = 175 (L) x 155 (W) x 69 (H)

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12. WARRANTY

This meter is supplied with a warranty against significant deviations in material and workmanship for a period of THREE years from date of purchase whereas probe with a SIX month warranty.

If repair or adjustment is necessary and has not been the result of abuse or misuse within the designated period, please return – freight prepaid – and correction will be made without charge. Eutech Instruments/Oakton Instruments will determine if the product problem is due to deviations or customer misuse.

Out of warranty products will be repaired on a charged basis.

The warranty on your instrument shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

13. RETURN OF ITEMS

Authorization must be obtained from our Customer Service Department or authorized distributor before returning items for any reason. A “Return Material Authorization” (RMA) form is available through our authorized distributor. Please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Eutech Instruments will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: Eutech Instruments Pte Ltd /Oakton Instruments reserve the right to make improvements in design, construction, and appearance of products without notice.

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