

3 YEAR
WARRANTY

MADE IN
USA



User's Guide



Shop online at

omega.com

Ω OMEGA

omega.com

e-mail: info@omega.com

For latest product manuals:
omegamanual.info

ISO 9001
CERTIFIED
CORPORATE QUALITY
STAMFORD, CT

ISO 9001
CERTIFIED
CORPORATE QUALITY
MANCHESTER, UK

CL541-PLUS Automated Thermocouple Calibrator



OMEGAnet® Online Service omega.com	Internet e-mail info@omega.com
---	---

Servicing North America:

U.S.A.: Omega Engineering, Inc., One Omega Drive, P.O. Box 4047
ISO 9001 Certified Stamford, CT 06907-0047
Toll-Free: 1-800-826-6342 Tel: (203) 359-1660
FAX: (203) 359-7700 e-mail: info@omega.com

Canada: 976 Bergar
Laval (Quebec), H7L 5A1 Canada
Toll-Free: 1-800-826-6342 TEL: (514) 856-6928
FAX: (514) 856-6886 e-mail: info@omega.ca

For immediate technical or application assistance:

U.S.A. and Canada: Sales Service: 1-800-826-6342/1-800-TC-OMEGA®
Customer Service: 1-800-622-2378/1-800-622-BEST®
Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

Mexico Latin America En Español: 001 (203) 359-7803 FAX: 001 (203) 359-7807
info@omega.com.mx e-mail: espanol@omega.com

Servicing Europe:

Benelux: Managed by the United Kingdom Office
Toll-Free: 0800 099 3344 TEL: +31 20 347 21 21
FAX: +31 20 643 46 43 e-mail: sales@omegaeng.nl

Czech Republic: Frystatska 184
733 01 Karviná, Czech Republic
Toll-Free: 0800-1-66342 TEL: +420-59-6311899
FAX: +420-59-6311114 e-mail: info@omegashop.cz

France: Managed by the United Kingdom Office
Toll-Free: 0800 466 342 TEL: +33 (0) 161 37 29 00
FAX: +33 (0) 130 57 54 27 e-mail: sales@omega.fr

Germany/Austria: Daimlerstrasse 26
D-75392 Deckenpfronn, Germany
Toll-Free: 0800 6397678 TEL: +49 (0) 7056 9398-0
FAX: +49 (0) 7056 9398-29 e-mail: info@omega.de

United Kingdom: OMEGA Engineering Ltd.
ISO 9001 Certified One Omega Drive, River Bend Technology Centre, Northbank
Irlam, Manchester M44 5BD United Kingdom
Toll-Free: 0800-488-488 TEL: +44 (0) 161 777-6611
FAX: +44 (0) 161 777-6622 e-mail: sales@omega.co.uk

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

Product Description

- **Easy to use**

With the CL541-PLUS you can check & calibrate all your thermocouple instruments and measure thermocouple Sensors. Automatic indication of connections on the display for simple hookups.

- **Take it without into the shop, plant or field**

Carry it without worry - it comes protected with a rubber boot and rugged, low profile switch. Easy to operate even in the dark areas of the plant with the backlit display.

- **Calibrate directly in temperature (°C & °F)**

Stop carrying around a millivolt source and thermocouple tables. The CL541-PLUS works with the T/Cs you use including types J, K, T & E. Easily set any value quickly to within 0.1° with the adjustable digital potentiometer "DIAL" plus store any three temperatures for instant recall with the Omega switch.

- **Calibrate quickly with automatic output stepping**

Choose between 2, 3, 5, 11 and 21 steps to automatically increment the output in 100%, 50%, 25%, 10% or 5% of span. Select the step time to match your system from 5, 6, 7, 8, 10, 15, 20, 25, 30 and 60 seconds.

- **Compatible with all process instruments**

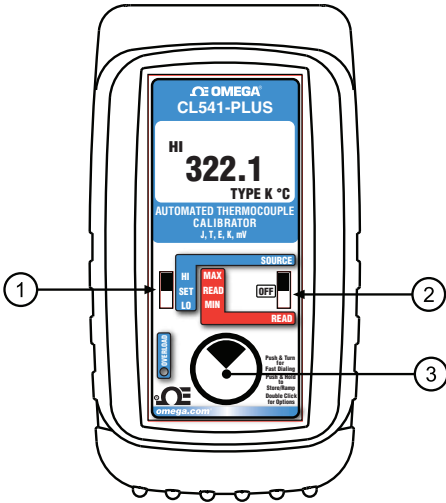
Connect directly to the thermocouple inputs of smart transmitters, PLCs, DCS and multichannel recorders and verify their outputs or displays.

- **Measure Thermocouple Sensors**

Trouble shoot sensor connections and find broken wires or high resistance junctions. Connect your sensor and the CL541-PLUS automatically measures the thermocouple in degrees C or F.



Basic Operation



① OMEGA SWITCH

SOURCE: Instantly output two preset thermocouple temperatures by moving the OMEGA switch to the “LO” position or “HI” position. For fast three point checks select the “DIAL” position. The CL541-PLUS will remember the last “DIAL” value, even with the power off.

These values can easily be changed to suit the calibration requirements. The temperatures stored in the HI and LO positions are also used for Auto Stepping.

READ: Slide the switch to the DIAL position. The CL541-PLUS will display the current temperature from the thermocouple sensor. Slide the switch to HI and the highest temperature measured since turn-on or reset will be displayed; slide the switch to LO and the lowest temperature measured since turn-on or reset will be displayed.

② SOURCE/OFF/READ Switch

Select “SOURCE” to output in °C, °F, or millivolts. Select “READ” to read a thermocouple sensor or millivolts.

③ PUSH-BUTTON KNOB

SOURCE: Turn the knob to adjust the output level. Turn clockwise to increase the output, counter clockwise to decrease the output in 0.1° steps at a time. Push down and turn the PUSH-BUTTON knob for faster dialing.

Press and hold the knob for two seconds to store desired OMEGA HI/LO points in SOURCE mode. Continue to press and hold the knob for two more seconds to start the automatic ramping.

READ: Press and hold to transfer the current temperature into the Omega switch HI/LO points. This resets the HI/LO temperature readings which will update as the temperature changes.

Double click the knob to get into the CL541-PLUS Configuration Mode. Use configuration to select °C or °F, T/C Type, Backlight On/Off, Step Size, Step Time and Auto Off On/Off.

CHANGING BATTERIES

Low battery is indicated by “BAT” on the display. Approximately one to four hours of typical operation remain before the CL541-PLUS will automatically turn off. To change the batteries; remove the rubber boot, remove the battery door from the back of the unit by sliding the door downward. This allows access to the battery compartment. Replace with four (4) “AA” 1.5V batteries being careful to check the polarity. Replace the battery door and replace the boot. All stored configuration options (T/C Type, OMEGA switch Memories, etc., are reset to factory settings when the batteries are removed.

Note: Alkaline batteries are supplied and recommended for maximum battery life and performance.

Configuration

Configure the Calibrator

Move ② POWER SWITCH to “SOURCE” or “READ”.

**MODEL CL541-PLUS
DOUBLE CLICK
PUSH-BUTTON KNOB
FOR CONFIGURATION**

Setup

Double click the ③ PUSH-BUTTON knob at any time the unit is on and the following displays will appear for 15 seconds:

> EXIT	15
TEMP UNITS	°C
T/C	K
BACKLIGHT	ON

> EXIT	15
STEPS	3
STEP TIME	8
AUTO OFF	ON

Turn the ③ PUSH-BUTTON knob to move through the menu. Press the ③ PUSH-BUTTON knob to toggle between OFF and ON or to scroll through the settings.

EXIT MENU - exits this menu immediately and saves any changes. Menu will automatically exit after 15 seconds of inactivity (countdown timer is displayed).

TEMP UNITS - pressing the knob will toggle between °C and °F.

T/C - pressing the knob will cycle through T/C types J, K, T, E and mV.

BACKLIGHT - If BACKLIGHT is ON the backlight will light all the time the unit is powered up. For maximum battery life turn the backlight off when using the calibrator in areas with enough ambient light to read the display.

STEPS - pressing the knob will cycle through 2, 3, 5, 11 and 21 steps. The endpoints of the steps are based on the values stored in the **HI** and **LO** OMEGA outputs.

STEP TIME - pressing the knob will cycle through 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 and 60 seconds.

AUTO OFF - If AUTO OFF is ON, the unit will turn off after 30 minutes of inactivity to save battery life. If AUTO OFF is OFF the unit will stay on until the POWER SWITCH is moved to the off position.

Note: All settings are remembered even with the power off. Removing the batteries resets the values to factory defaults.

Basic Operation

Connecting the Calibrator

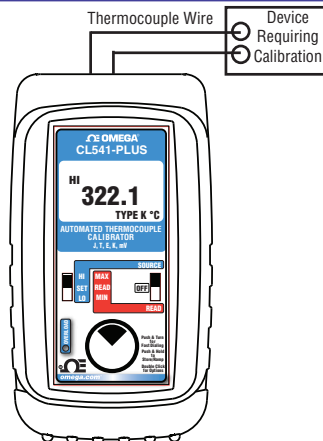
Thermocouple

Sourcing or reading thermocouples requires the use of thermocouple or extension grade thermocouple wire between the CL541-PLUS and the device being calibrated.

The CL541-PLUS has a female miniature thermocouple connector mounted in the top end of the housing for fast, easy connection of wires.

Millivolt

The CL541-PLUS has two banana jacks mounted in the top end of the housing. These jacks are not temperature compensated and are to be used only for generating and measuring millivolt signals.



Sourcing Thermocouple

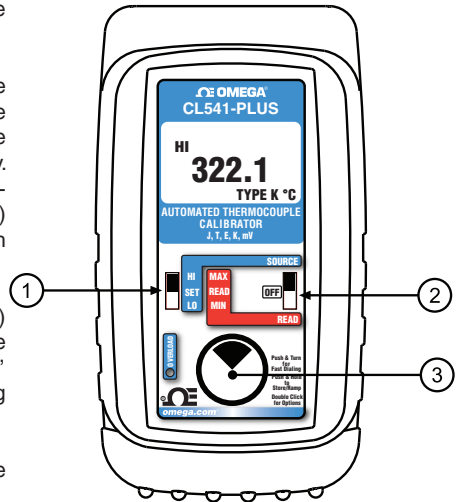
SOURCE

Choose this function to provide a simulated thermocouple signal into controllers, temperature transmitters, indicators or any input devices that measure thermocouple sensors..

- 1) Disconnect the thermocouple sensor from the device to be calibrated.
- 2) Select **"SOURCE"** with slide switch ②.
- 3) Connect a thermocouple wire (matching the type of wire to sensor being simulated) with miniature male T/C connector to the inputs of the device being calibrated, making sure to check polarity. Millivolt outputs (without cold junction compensation) may be connected with a copper (white) miniature thermocouple connector or through the banana jacks with cooper wire.

The output is adjusted in 0.1° (or 0.001 mV) increments by turning the knob ③ while the OMEGA switch ① is in the "HI", "LO" or "SET" position. Press and turn the knob for faster dialing with 10° (or 0.100) increments.

The OVERLOAD indicator will light if excessive voltage or current is detected by the calibrator.



Reading Thermocouple Sensors

READ

Choose this function to measure temperatures with a thermocouple probe or sensor.

- 1) Disconnect the thermocouple sensor from any other device.
- 2) Select **"READ"** with slide switch ②.
- 3) Place the OMEGA switch into the READ position.
- 4) Connect a thermocouple probe (matching the type of wire to sensor being measured) with miniature male T/C connector to the sensor, making sure to check polarity. Millivolt outputs (without cold junction compensation) may be connected with a copper (white) miniature thermocouple connector or through the banana jacks with cooper wire.

The CL541-PLUS measures the temperature signal and constantly updates the display with the current temperature reading. Move the OMEGA switch to MAX to see the highest temperature reading and to MIN to see the lowest temperature reading. Press and hold the knob ③ to clear the MAX and MIN readings.

The OVERLOAD indicator will light if excessive voltage or current is detected by the calibrator.

Storing OMEGA Switch Outputs

STORING HI and LO OMEGA Switch Outputs

Choose this function to provide a simulated thermocouple signal into controllers, temperature transmitters, indicators or any other input device that measure thermocouple sensors.

- 1) Store your high (SPAN) output temperature by moving the OMEGA switch to the **HI** position and turn the ③ PUSH-BUTTON knob until the desired temperature is on the display. Press and hold the PUSH-BUTTON knob until **STORED** appears to store the value. Release the PUSH-BUTTON knob.
- 2) Store your low (ZERO) output temperature by moving the OMEGA switch to the **LO** position. and turn the ③ PUSH-BUTTON knob until the desired temperature is on the display. Press and hold the PUSH-BUTTON knob until **STORED** appears to store the value. Release the PUSH-BUTTON knob.
- 3) Instantly output your SPAN and ZERO temperature outputs by moving the OMEGA switch between HI and LO. You may also select any third temperature output (such as mid-range) using the SET position on the OMEGA switch.

Automatic Stepping

To change the Automatic Stepping settings

Double click the ③ PUSH-BUTTON at any time the unit is on and the following display will appear for 30 seconds:

Turn the ③ PUSH-BUTTON to move through the menu. Press the Push-Button to toggle between OFF and ON or to change the STEPS and the STEP TIME settings. These settings are remembered even with the power off.

③	EXIT	15
>	STEPS	3
	STEP TIME	8
	AUTO OFF	ON

EXIT MENU - exits this menu immediately and saves any changes. Menu will automatically exit after 30 seconds of inactivity.

STEPS - pressing the knob will cycle through 2, 3, 5, 11 and 21 steps then reverse direction. The endpoints of the steps are based on the values stored in the **HI** and **LO** OMEGA switch outputs.

2 steps will automatically switch between the values stored in the HI & LO OMEGA switch (0 & 100%).

3 steps between the HI, Midpoint and LO OMEGA switch (0, 50 & 100%).

5 steps between the HI and LO OMEGA switch in 25% increments (0, 25, 50, 75 & 100%).

11 steps between the HI and LO OMEGA switch in 10% increments (0, 10, 20...80, 90 & 100%).

21 steps between the HI and LO OMEGA switch in 5% increments (0, 5, 10... 90, 95 & 100%).

STEP TIME - pressing the knob will cycle through 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 and 60 seconds.

To start Automatic Stepping

Start automatic stepping or ramping by placing the OMEGA Switch into the HI or LO position then press and hold the ③ PUSH-BUTTON knob for 6 seconds (the word STORE will appear on the display after 3 seconds - continue to press the PUSH-BUTTON knob) until the word STEPPING appears on the display. The word STEPPING will appear on the display anytime the selected automatic function is running. Stop the stepping by again pressing and holding the ③ PUSH-BUTTON knob for 3 seconds.

Ranges & Accuracies

T/C Type	Degrees C Range	Accuracy	Degrees F Range	Accuracy	T/C Material	ISA/ANSI Color
J	-200.0 to -180.0	±0.3°	-346.0 to -292.0	±0.5	+Iron	White
	-180.0 to -50.0	±0.2°	-292.0 to -58.0	±0.4	-Constantan	Red
	-50.0 to 500.0	±0.1°	-58.0 to 932.0	±0.2	Jacket	Black
	500.0 to 1200.0	±0.2°	932.0 to 2192.0	±0.4°		
K	-230.0 to -100.0	±0.6°	-382.0 to -148.0	±1.1°	+Chromel©	Yellow
	-100.0 to 1050.0	±0.2°	-148.0 to 1922.0	±0.4°	-Alumel©	Red
	1050.0 to 1371.1	±0.3°	1922.0 to 2500.0	±0.5°	Jacket	Yellow
T	-260.0 to -200.0	±1.0°	-436.0 to -328.0	±1.8°	+Copper	Blue
	-200.0 to -50.0	±0.5°	-328.0 to -58.0	±0.9°	-Constantan	Red
	-50.0 to 0.0	±0.2°	-58.0 to 32.0	±0.4°	Jacket	Blue
	0.0 to 400.0	±0.1°	32.0 to 752.0	±0.2°		
E	-240.0 to -200.0	±0.4°	-400.0 to -328.0	±0.7°	+Chromel	Purple
	-200.0 to -100.0	±0.2°	-328.0 to -148.0	±0.4°	-Constantan	Red
	-100.0 to 850.0	±0.1°	-148.0 to 1562.0	±0.2°	Jacket	Purple
	850.0 to 1000.0	±0.2°	1562.0 to 1832.0	±0.4°		

CL541-PLUS Specifications

(Unless otherwise indicated all specifications are rated from a nominal 23 °C, 70% RH for 1 year from calibration)

General	
Accuracy	$\pm(0.008\% \text{ of Reading} + 0.006 \text{ mV})$
Cold Junction Compensation	$\pm 0.1^\circ\text{F} (\pm 0.06^\circ\text{C})$
Operating Temperature Range	-25 to 60°C (-10 to 140°F)
Relative Humidity Range	10% \leq RH \leq 90% (0 to 35°C), Non-condensing
	10% \leq RH \leq 70% (35 to 60°C), Non-condensing
Size	L=5.63 x W=3.00 x H=1.60 inches
Weight	12.1 ounces (including boot & batteries)
Batteries	Four "AA" Alkaline 1.5V (LR6)
Battery Life	50 Hours
Optional NiMh Rechargeable battery kit	120 VAC for North America Only; charger, four NiMh batteries, AC & DC cords [Part # 020-0103]
Low Battery	Low battery indication with nominal 1 hour of operation left
Protection against misconnection	Over-voltage protection to 60 Vdc (rated for 30 seconds)
Display	High contrast graphic liquid crystal display. LED backlighting for use in low lit areas.

Read	
Input Impedance	>10 Megohms
Open Thermocouple Threshold Pulse	10,000 Ohms nominal <10 microamp pulse for 300 milliseconds
Normal Mode Rejection	50/60 Hz, 50 dB
Common Mode Rejection	50/60 Hz, 120 dB

Source	
Output Impedance	<0.3 Ohms
Source Current	>20 mA (drives 80 mV into 10 Ohms)
Noise	≤ 4 microvolts p-p for frequencies of 10 Hz or below

Additional Information

This product is calibrated on equipment traceable to NIST and includes a Certificate of Calibration. Test Data is available for an additional charge.

Notes:



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **37 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **three (3) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2010 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!** *Shop online at omega.comSM*

TEMPERATURE

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

FLOW/LEVEL

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

pH/CONDUCTIVITY

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Data Logging Systems
- ☑ Recorders, Printers & Plotters

HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments