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CL309A-PLUS Automated Diagnostic 4-20 mA Calibrator



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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.



CL309A-PLUS

Automated Diagnostic 4-20 mA Calibrator Operating Instructions

• EASY TO USE

With the CL309A-PLUS you can check, calibrate and measure all your current signal instruments in a 4 to 20 milliamp DC loop. It can be used at any access point in your loop. Source & Read 0.000 to 24.000 mA, Simulate a 2 Wire Transmitter or use the CL309A-PLUS to simultaneously power your 2 Wire Transmitter and measure its output.

• EASY TO READ

Turn on the backlight to easily read the display in dark areas of the plant.

• TROUBLESHOOT LOOP PROBLEMS

Quickly diagnose ground fault and current leakage with the patented loop diagnostic technology (US Patent# 7,248,058).

• SOURCE MILLIAMPS

Calibrate recorders, digital indicators, stroke valves or any instruments that get their input from a 4 to 20 mA loop. Easily set any value quickly to within 0.001 mA with the adjustable digital potentiometer "DIAL" or use preset **4.000 mA (0.00%)** and **20.000 mA (100.00%)**

• AUTOMATIC OUTPUT STEPPING & RAMPING

Press & hold the dial to automatically step from 4 to 20 in 2, 3 or 5 steps or choose a continuous ramp.

• CALIBRATE USING LOOP POWER

Check loop wiring and receivers by using the CL309A-PLUS in place of a 2 Wire transmitter. The CL309A-PLUS uses any loop power from 2 to 60 V DC.

• READ LOOP CURRENT

Check controller outputs or measure the milliamp signal anywhere in the loop. The CL309A-PLUS measures 0.000 to 24.000 mA (-25.00 to 125.00%) signals with greater accuracy than a typical multimeter.

• POWER & MEASURE 2 WIRE TRANSMITTERS

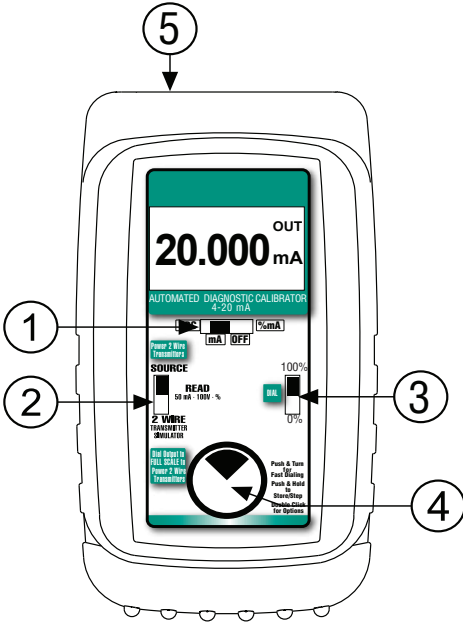
The CL309A-PLUS can simultaneously output 24V DC to power any and all devices in a process loop using the internal batteries and internal switching power supply, while measuring the output of a 2 Wire Transmitter and any other loop devices. Powers HART™ transmitters with built-in 250 ohm resistor simplifying hookups with HART communicators.

• READ DC VOLTS

The CL309A-PLUS can measure from -60.00 to +60.00 VDC with 10mV resolution. Use it to check loop power supplies, I/V converters, 1 to 5 Volt signals, and other voltages making it unnecessary to carry an additional multimeter.



Basic Operation



① POWER SWITCH

Select “mA” to display and calibrate in milliamps. Select “% 4 to 20 mA” to display and calibrate in percent. Select “READ VDC” to read volts DC. Return the slide switch to the “OFF” position when not in use.

Note:

Percent mode can also be used with chart recorders, valves or current trips that display in percent.

100.00%	=	20.000 mA
75.00%	=	16.000 mA
50.00%	=	12.000 mA
25.00%	=	8.000 mA
0.00%	=	4.000 mA

To convert from Milliamps to Percent:
 $\text{Percent} = (\text{Milliamps} - 4) / 0.16$

To convert from Percent to Milliamps:
 $\text{Milliamps} = \text{Percent} / 6.25 + 4$

② SOURCE / READ / 2 WIRE SWITCH

Select “SOURCE” to output in mA or percent. Select “READ” to read in mA or percent. Select “2 WIRE” to simulate a 2 Wire Transmitter.

③ OMEGA SWITCH

Instantly output 4.000 mA or 20.000 mA by moving the OMEGA® switch to the “4.00mA” / “0.0%” position or “20.00mA” / “100.0%” position. For fast three point checks select the “DIAL” position. The CL309A-PLUS will remember the last “DIAL” value, even with the power off.

Note: The same “DIAL” value is stored for both mA and %. The recalled value will be displayed in the units selected.

④ DIAL KNOB

Turn the knob to adjust output level. Turn clockwise to increase the output, counter clockwise to decrease the output 0.001 mA (0.01%) at a time. Push and turn the knob for faster dialing adjusting 0.100 mA (1.00%) at a time. Press and Hold the knob to start automatic stepping or ramping. Double click the knob for stepping and Ground Leak Detection setup.

⑤ EXTERNAL POWER JACK (Not Shown)

When used with the optional AC Adaptor, the external power jack will eliminate the drain on your batteries. This is handy for jobs that require extended bench use of the CL309A-PLUS. See accessories (page 10) for ordering information.

Note: This feature does not charge the batteries, it only supplies power to the CL309A-PLUS.

CHANGING BATTERIES

Low battery is indicated by “BAT” on the display. Approximately one to four hours of typical operation remain before the 434 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 & replace the boot. All stored configuration options are reset to factory settings when the batteries are removed.

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

Configuration

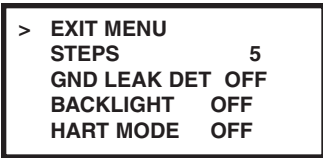
Configure the Calibrator

Move ① POWER SWITCH to “mA”, “% 4 to 20 mA” or “READ VDC”.

The following display will appear for 3 seconds:



Double click the ④ DIAL KNOB at any time the unit is on and the following display will appear for 30 seconds:



Turn the ④ DIAL KNOB to move through the menu. Press the ④ DIAL KNOB to toggle between OFF and ON. These settings are remembered even with the power off.

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 from 2, 3, 5 steps and RAMP.

2 steps will automatically switch between 4 & 20 mA (0 & 100%).

3 steps between 4, 12 & 20 mA (0, 50 & 100%).

5 steps between 4, 8, 12, 16 & 20 mA (0, 25, 50, 75 & 100%).

RAMP will continuously ramp the output between 4 & 20 mA (0 & 100%).

GROUND LEAK DETECTION - when ON the CL309A-PLUS has the ability to check for current leaks caused by ground faults, moisture or corrosion. This operates in Power/Measure mode while powering up a 2-wire transmitter or loop.

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 CL309A-PLUS in areas with enough ambient light to read the display.

HART MODE - when ON a 250 Ohm resistor is automatically inserted in series with the leads in all modes. This allows a HART Communicator to communicate with a HART Transmitter without adding an external resistor in the loop.

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.

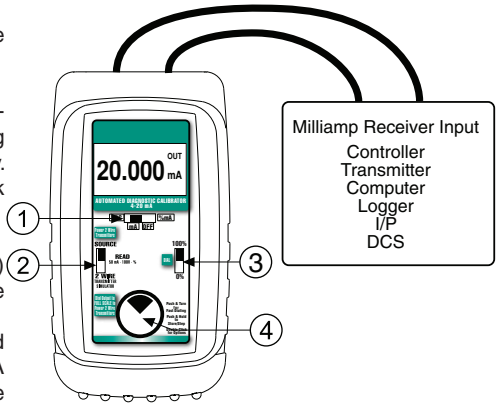
Note: All settings are remembered even with the power off. Removing the batteries resets the values to factory defaults.

Sourcing Milliamps

mA OUT, % OUT (Percent of 4 to 20 mA)

Choose this function to provide an output from 0.000 to 24.000 milliamps. The compliance voltage is a nominal 24 VDC to provide the driving power to your milliamp receivers.

- 1) Disconnect one or both input wires from the device to be calibrated.
- 2) Select "mA" or "% 4 to 20mA" with slide switch ①.
- 3) Select "SOURCE" using slide switch ②.
- 4) Connect the output leads of the CL309A-PLUS to the inputs of the device being calibrated, making sure to check polarity. Red lead to the plus (+) input and black lead to the minus (-) input.



The output is adjusted in 0.001 mA (0.01%) increments by turning the knob ④ while the OMEGA switch ③ is in the "DIAL" position, or the current can be set at the fixed points of 4.000mA (0.00%) or 20.000mA (100.00%) with switch ③. Press and turn the knob for faster dialing with 0.100 (1.00%) increments.

Start automatic stepping or ramping by pressing and holding the ④ DIAL KNOB for 3 seconds. The word STEPPING or RAMPING will flash on the display anytime the selected automatic function is running. The CL309A-PLUS will automatically step or ramp between 4mA & 20mA (or 20mA & 4mA) for 30 seconds then reverse direction. Stop the stepping or ramping by pressing or turning the knob or moving any switch.

Using Automatic Stepping & Ramping

Using Automatic STEP & RAMP output

Move ① POWER SWITCH to "mA", or "% 4 to 20 mA" and the ② SOURCE / READ / 2 WIRE SWITCH to "SOURCE" or "2 WIRE".

The starting point for automatic stepping & ramping is based on the ③ OMEGA SWITCH. Place the OMEGA switch at 20 mA and the automatic stepping or ramping will start at 20.000 mA (100.00%) and the values will decrease. Place the OMEGA switch at 4 mA and the automatic stepping or ramping will start at 4.000 mA (0.00%) and the values will increase.



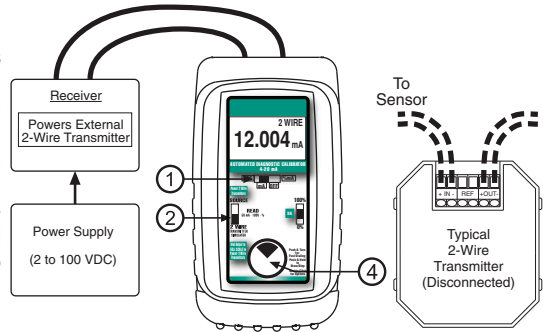
Start automatic stepping or ramping by pressing and holding the ④ DIAL KNOB for 3 seconds. The word STEPPING or RAMPING will flash on the display anytime the selected automatic function is running. The CL309A-PLUS will automatically step or ramp between 4mA & 20mA (or 20mA & 4mA) for 30 seconds then reverse direction. Stop the stepping or ramping by pressing or turning the knob or moving any switch.

Simulate 2-Wire Transmitters

2 Wire mA, 2 Wire % (Percent of 4 to 20 mA)

Choose this function to simulate a 2 Wire Transmitter output from 0.000 to 24.000 milliamps. Operates in loops with power supply voltages from 2 to 100 VDC

- 1) Disconnect one or both input wires from the device to be calibrated.
- 2) Select “mA” or “% 4 to 20mA” with slide switch ①.
- 3) Select “2 WIRE” using slide switch ②.
- 4) Connect the red input lead of the 434 to the plus (+) input of the field connections and the black lead to the minus (-).



Loop current is adjusted in 0.001 mA (0.01%) increments by turning the knob ④ while the OMEGA switch ③ is in the “DIAL” position, or the current can be set at the fixed points of 4.000mA (0.00%) or 20.000mA (100.00%) with switch ③. Press and turn the knob for faster dialing with 0.100 (1.00%) increments.

Start automatic stepping or ramping by pressing and holding the ④ DIAL KNOB for 3 seconds. The word STEPPING or RAMPING will flash on the display anytime the selected automatic function is running. The CL309A-PLUS will automatically step or ramp between 4mA & 20mA (or 20mA & 4mA) for 30 seconds then reverse direction. Stop the stepping or ramping by pressing or turning the knob or moving any switch.

Setting Up Automatic Stepping & Ramping

To change the Automatic Stepping & Ramping settings

Double click the ④ DIAL KNOB at any time the unit is on and the following display will appear for 30 seconds:

Turn the ④ DIAL KNOB to move through the menu. Press the ④ DIAL KNOB to toggle between OFF and ON or to change the steps setting. These settings are remembered even with the power off.

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 from 2, 3, 5 steps and RAMP.

2 steps will automatically switch between 4 & 20 mA (0 & 100%).

3 steps between 4, 12 & 20 mA (0, 50 & 100%).

5 steps between 4, 8, 12, 16 & 20 mA (0, 25, 50, 75 & 100%).

RAMP will continuously ramp the output between 4 & 20 mA (0 & 100%).

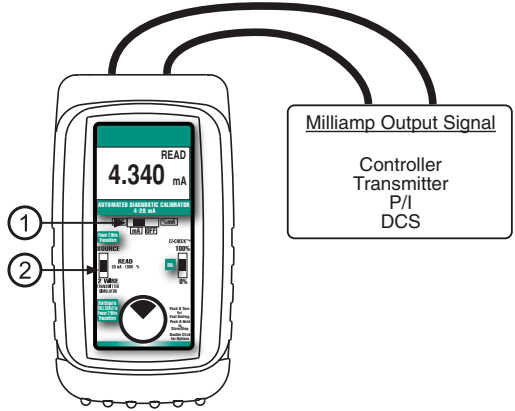
Reading Milliamp Outputs

READ mA, READ % (Percent of 4 to 20 mA)

Choose this function to measure from 0.000 to 24.000 milliamps or -25.00 to 125.00%.

- 1) Open the current loop at any convenient point along the signal path.
- 2) Select "mA" or "% 4 to 20mA" with slide switch ①.
- 3) Select "Read" using slide switch ②.
- 4) Connect the red input lead (+) of the CL309A-PLUS to the more positive point of the break and the black input to the more negative point.

Signals below 0 mA or open circuits are indicated by 0.000 mA (-25.00%) on the display. Signals above 52 mA are current limited by protection circuitry and "OVERRANGE" is flashed on the display.



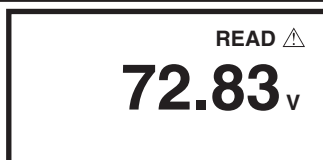
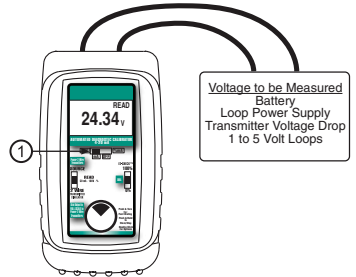
Read DC Volts

READ V

Choose this function to measure from -99.99 to +99.99V DC.

- 1) Select "VDC" with slide switch ①.
- 2) Connect the red (+) and black (-) leads of the CL309A-PLUS across the voltage source to be measured.

Any DC voltage from -60.00 to +60.00 volts may be measured. Loop power supplies, signal voltages at receivers, batteries and transmitter voltage drops may be measured. Signals exceeding ± 60.00 VDC are indicated by \triangle on the display. Signals exceeding ± 99.99 VDC will be indicated by "OVERRANGE" flashing on the display.



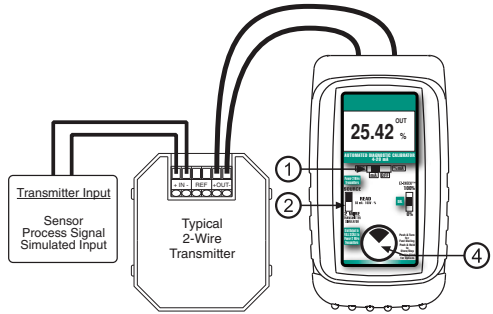
Signals exceeding ± 60.00 VDC are indicated by \triangle on the display.

Power & Measure 2-Wire Transmitters

mA OUT, % OUT (Percent of 4 to 20 mA)

Choose this function to simultaneously supply power to a 2 Wire Transmitter while displaying the 4 to 20 mA output of the transmitter.

- 1) Disconnect one or both input wires from the device to be calibrated.
- 2) Select “mA” or “% 4 to 20mA” with slide switch ①.
- 3) Select “SOURCE” using slide switch ②.
- 4) Press and turn the knob ④ clockwise several times until full scale output (24.000 mA/125.00%) is obtained. The display will indicate “PWR MEASURE”.
- 5) Connect the red source lead of the CL309A-PLUS to the plus (+) input of the device and the black source lead to the minus (-).



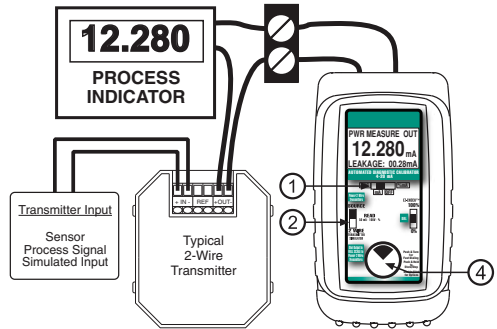
The CL309A-PLUS supplies a nominal 24 volts DC at 24 mA to the 2 Wire Transmitter. The current passed by the transmitter will be accurately displayed by the CL309A-PLUS. Calibrate the transmitter in the usual manner and disconnect the CL309A-PLUS. If Ground Leak Detection is enabled the amount of milliamps leaking in the transmitter or loop is indicated on the display.

Using Ground Leak Detection

mA OUT, % OUT (Percent of 4 to 20 mA)

Find current leaks in loops caused by ground faults, moisture or corrosion. The 434 simultaneously supplies power to a 2 Wire Transmitter (or loop with a transmitter) while displaying the 4 to 20 mA output and the amount of current leaking in the loop.

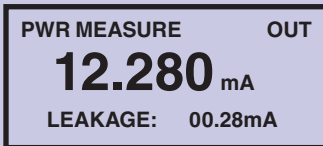
- 1) Disconnect one or both input wires from the device to be calibrated.
- 2) Select “mA” or “% 4 to 20mA” with slide switch ①.
- 3) Select “SOURCE” using slide switch ②.
- 4) Turn the knob ③ clockwise several times until full scale output (>24.000 mA/125.00%) The display will indicate “PWR MEASURE” and “LEAKAGE:”
- 5) Connect the red source lead of the CL309A-PLUS to the plus (+) input of the device and the black source lead to the minus (-).



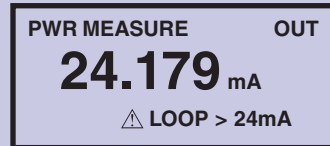
The CL309A-PLUS supplies a nominal 24 volts DC at 24 mA to the 2 Wire Transmitter or loop. The current passed by the transmitter will be accurately displayed by the CL309A-PLUS along with an indication of leakage current at the bottom of the display. If there is an uncontrolled loop, a transmitter with upscale burnout and bad or missing sensor or a short the display shows “⚠ LOOP > 24mA”

Note: Many installed transmitters will normally indicate 0.01 to 0.10 mA leakage without significant control problem. Unstable readings may indicate loose connections or the presence of moisture.

Typical Error Conditions



The CL309A-PLUS is supplying the loop voltage. A calibrated transmitter is limiting the loop current to 12.00 mA. An additional 0.28 mA is not controlled by the transmitter and is leaking somewhere in the loop.



The CL309A-PLUS is supplying the loop voltage. There is an control loop error. This may be a transmitter (set for upscale burnout) with a bad or missing sensor, or a short in the loop.

Setting Up Ground Leak Detection

Enabling Ground Leak Detection

Double click the ④ DIAL KNOB at any time the unit is on and the following display will appear for 30 seconds:

Turn the ④ DIAL KNOB to move through the menu. Press the ④ DIAL KNOB to toggle between OFF and ON or to change the steps setting. These settings are remembered even with the power off.

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

GROUND LEAK DETECTION - when ON the CL309A-PLUS has the ability to check for current leaks caused by ground faults, moisture or corrosion that bypass the current control element or transmitter.

Application Notes

GROUND LEAK DETECTION

If you find a loop where the transmitter is calibrate correctly but all the readings elsewhere in the loop have a fixed offset this is due to a zero shift. This zero shift is caused by some current in the loop bypassing the transmitter. This might be caused by ground faults, moisture or corrosion.

If you have some loops that are erratic after it rains there may be moisture present in a junction box or where insulation has broken down. Turn on Ground Leak Detection and use the CL309A-PLUS to power up the loop. Any current that isn't controlled by the transmitter or other current control element will be indicated as leakage on the CL309A-PLUS display.

The CL309A-PLUS powers up the 2-Wire transmitter or loop and indicates the total current and the uncontrolled current. This provides information useful in troubleshooting loop errors.

OUT OF RANGE SIGNALS

Signals below 0 mA or open circuits are indicated by 0.000 mA (-25.00%) on the display. Signals above 24 mA are current limited by protection circuitry to approximately 25 mA.

KEEPING THE PROCESS GOING

When an instrument in a critical control loop develops a problem it is important to maintain control of the process. The CL309A-PLUS can be substituted for a faulty controller or transmitter to provide temporary manual control of the process. One technician takes manual control of the process while a second technician retrieves, installs and configures a replacement instrument.

OPEN LOOPS

The display will indicate ERROR and 0.000 mA or -25.00% if there is an open loop or if the polarity is reversed. Check all the connections in the loop or try reversing the leads.

POWER TRANSMITTER

Adjusting the SOURCE output to full scale (>24 mA) supplies a nominal 24V DC to power a 2 Wire Transmitter while simultaneously displaying the 4 to 20 mA output of the transmitter.

READ MILLIAMPS

Select READ milliamps by moving slide switch ① to "mA" or "% 4 to 20mA" and moving slide switch ② to "READ". Place the CL309A-PLUS in the loop in series with the current to be measured.

SOURCE MILLIAMPS or 2-WIRE SIMULATOR

Select "SOURCE" using slide switch ② to output from 0.000 to 24.000 milliamps using the CL309A-PLUS's internal power source. This will provide 24V DC. Select "2-WIRE" to control the current in a loop that is using an existing power supply.

To change the output current adjust the dial knob ④. Turning clockwise will increase the output value, turning counter-clockwise will decrease the output value with 0.001 mA (0.01%) resolution. Press and turn the knob for faster dialing with 0.100 mA (1.00%) resolution. The output is adjustable in all OMEGA positions.

When returning to the "4.00mA"/"0.0%" and "20.00mA"/"100%" positions they will always return to 4.00 (0.0%) and 20.00 (100.0%) mA. This method is superior to keypad units. The zero and full scale positions can be adjusted smoothly making easy valve end stop testing, trip point testing, alarm testing, etc. There is virtually no overshoot/undershoot simplifying testing.

READ DC VOLTS

Select "VDC" using slide switch ① to read volts DC. Clip the leads across the voltage to be measured.

Stroking Valves

SETTING UP VALVES

When setting up a valve it is important to correctly set the end stops. Use the CL309A-PLUS to supply the 4 to 20 mA control signal to stroke the valve. Select "SOURCE" and the CL309A-PLUS will use the internal power source for outputting current or switch to 2-WIRE SIMULATOR to stroke a valve using any pre-existing installed loop power supply as the power source.

Example:

- 1) Disconnect the 4-20 mA control wires from the Current-to Pressure (I/P) converter or the actuator.
- 2) Connect the CL309A-PLUS following the connection diagrams on the previous pages for Simulate 2-Wire Transmitters
- 3) Move the OMEGA switch ③ to "**4.00 mA**"/"**0.0%**" and adjust the fully closed stop on the actuator.
- 4) Turn the CL309A-PLUS's knob ④ slowly counterclockwise and verify that the actuator and valve don't move. Repeat steps 3 & 4 until no movement is detected.
- 5) Move the OMEGA switch ③ to **DIAL** and quickly back to "**4.00 mA**"/"**0.0%**" then turn the CL309A-PLUS's knob ④ clockwise. The actuator and valve should begin to move.
- 6) Move the OMEGA switch ③ to "**20.00 mA**"/"**100.0%**" and adjust the fully open stop on the actuator.
- 7) Turn the CL309A-PLUS's knob ④ slowly clockwise and verify that the actuator and valve don't move. Repeat steps 6 & 7 until no movement is detected.
- 8) Move the OMEGA switch ③ to **DIAL** and quickly back to "**20.00 mA**"/"**100.0%**" then turn the CL309A-PLUS's knob counterclockwise. The actuator and valve should begin to move.

Additional Information

This product is calibrated on equipment traceable to NIST and includes a Certificate of Calibration. OMEGA ENGINEERING, INC. recommends a calibration interval of one year. Contact your local representative for recalibration and repair services.

CL309A-PLUS Specifications

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

General	
Operating Temperature Range	-20 to 60 °C (-5 to 140 °F)
Storage Temperature Range	-30 to 60 °C (-22 to 140 °F)
Relative Humidity Range	10 % ≤RH ≤90 % (0 to 35 °C), Non-condensing
	10 % ≤RH ≤70 % (35 to 60 °C), Non-condensing
Size	5.63 x 3.00 x 1.60 inches, 143 x 76 x 41 mm (L x W x H)
Weight	12.1 ounces, 0.34 kg (including boot & batteries)
Batteries	Four "AA" Alkaline 1.5V (LR6)
Optional AC Adaptors	120 VAC 50/60 Hz [Part # 020-0100] 240 VAC 50/60 Hz [Part # 020-0101]
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 135 vrms (rated for 30 seconds) or 240 vrms (rated for 15 seconds)
Display	High contrast graphic liquid crystal display with 0.315" (8.0 mm) high digits. LED backlighting for use in low lit areas.

Read mA	
Ranges and Resolution	0.000 to 24.000 mA or -25.00 to 125.00% of 4-20 mA
Accuracy	≤ ± (0.01 % of Reading +0.002 mA)
Voltage burden	≤ 2V at 50 mA
Overload/Current limit protection	25 mA nominal
Battery life	≥ 125 Hours nominal
	≥ 100 hrs with backlight on

CL309A-PLUS Specifications (continued)

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

Source/Power & Measure Two Wire Transmitters	
Ranges and Resolution	0.000 to 24.000 mA or -25.00 to 125.00% of 4-20 mA
Accuracy	$\leq \pm (0.01 \% \text{ of Reading} + 0.002 \text{ mA})$
Noise	$\leq \pm \frac{1}{2}$ Least Significant Digit
Temperature effect	$\leq \pm 0.005 \% / ^\circ\text{C}$ of FS
Loop compliance voltage	$\geq 24 \text{ DCV @ } 20.00\text{mA}$
Loop drive capability - Leak Detection Off	1200 Ω at 20 mA for 15 hours nominal; 950 Ω with Hart Resistor enabled
Loop drive capability - Leak Detection On	1000 Ω at 20 mA for 15 hours nominal; 750 Ω with Hart Resistor enabled
Battery life	≥ 30 hrs at 12 mA nominal; ≥ 25 hrs with backlight on

2-Wire Transmitter Simulation	
Accuracy	Same as Source/Power & Measure
Voltage burden	$\leq 2\text{V}$ at 20 mA
Overload/Current limit protection	24 mA nominal
Loop voltage limits	2 to 60 VDC (fuse-less protected from reverse polarity connections)
Battery life	≥ 125 hours nominal; ≥ 100 hrs with backlight on

Voltage Read	
Range and Resolution	-60.00 to +60.00 VDC Full Span (FS)
Accuracy	$\leq \pm 0.05 \% \text{ of FS}$
Temperature effect	$\leq \pm 100 \text{ ppm}/^\circ\text{C}$ of FS
Input resistance	$\geq 2 \text{ M}\Omega$
Battery life	≥ 125 hours nominal; ≥ 100 hrs with backlight on

Accessories

INCLUDED:

Carrying Case with Belt Loop
Test Leads - one pair: 1 meter (3') long with retractable shield banana plug & alligator clips

Part No. SC-530
Part No. 020-0207

OPTIONAL:

AC ADAPTOR (200 to 240 VAC)
AC ADAPTOR (100 to 120 VAC)

Part No. CL530-ADAPTOR-220
Part No. CL530-ADAPTOR



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.

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