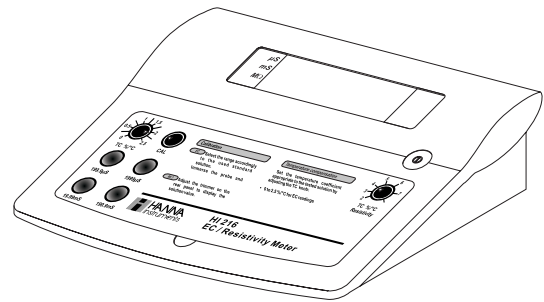

Instruction Manual

HI 216

EC/Resistivity Meter



Dear Customer,
 Thank you for choosing a Hanna Instruments Product.
 Please read this instruction manual carefully before using the instrument. This manual will provide you with all the necessary information for correct operation.
 If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com.
 This instrument is in compliance with the **CE** directives.

TABLE OF CONTENTS	
PRELIMINARY EXAMINATION	3
GENERAL DESCRIPTION	3
FUNCTIONAL DESCRIPTION	4
SPECIFICATIONS	5
OPERATIONAL GUIDE	6
CALIBRATION	8
DETERMINATION OF THE TEMPERATURE COEFFICIENT	10
CONDUCTIVITY PROBE MAINTENANCE	11
ACCESSORIES	12
WARRANTY	14

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any damage, notify your dealer.

Each meter is supplied complete with:

- **HI 76303** conductivity probe
- **HI 3316D** resistivity probe
- 12 Vdc adapter
- Instruction manual

Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packing with the supplied accessories.

GENERAL DESCRIPTION

HI 216 is a combination bench meter that can read conductivity in 4 different ranges, and resistivity.

For conductivity measurements, the calibration is a simple 1 point procedure through the easy-to-operate front panel knob, and the supplied probe does not require re-calibration when switching from one range to another.

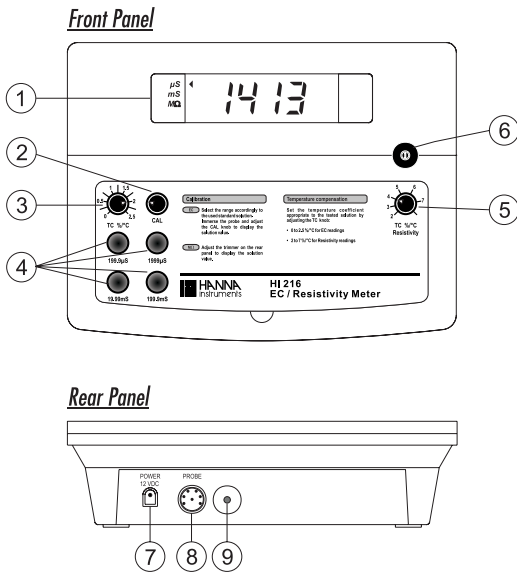
The 4-platinum-ring probe has a built-in temperature sensor that automatically compensates for temperature changes, and the temperature coefficient can be adjusted from 0 to 2.5% through a knob on the front panel.

For resistivity measurements, the meter is factory calibrated and, if necessary, calibration can be adjusted by acting on the trimmer located on the rear panel.

The **HI 3316D** resistivity probe is easy to clean and requires little maintenance. It also features a built-in temperature sensor to automatically compensate for temperature variations, with a user-selectable (from 2 to more than 7%) temperature coefficient.

Both probes use the same DIN plug on the rear panel, and the meter automatically recognizes which probe is connected.

FUNCTIONAL DESCRIPTION



- 1) Liquid Crystal Display (LCD)
- 2) Conductivity calibration knob
- 3) Conductivity temperature coefficient knob
- 4) Range keys, to select the 199.9 $\mu\text{S}/\text{cm}$, 1999 $\mu\text{S}/\text{cm}$, 19.99 mS/cm or 199.9 mS/cm range
- 5) Resistivity temperature coefficient knob
- 6) ON/OFF switch
- 7) Power adapter socket
- 8) Probe connector
- 9) Resistivity calibration trimmer

SPECIFICATIONS

Range	199.9 $\mu\text{S}/\text{cm}$ / 0 to 1999 $\mu\text{S}/\text{cm}$ 19.99 mS/cm / 199.9 mS/cm 0 to 19.90 $\text{M}\Omega\cdot\text{cm}$
Resolution	0.1 $\mu\text{S}/\text{cm}$ / 1 $\mu\text{S}/\text{cm}$ 0.01 mS/cm / 0.1 mS/cm 0.10 $\text{M}\Omega\cdot\text{cm}$
Accuracy (@20°C/68°F)	$\pm 1\%$ FS for EC $\pm 2\%$ FS for resistivity
Calibration	Manual, 1 point, for both EC and resistivity
Temperature Compensation	Automatic from 0 to 50°C with β selectable from 0 to 2.5%/°C for EC and from 2 to 7%/°C for resistivity
Probes (included)	HI 76303 for conductivity measurements HI 3316D for resistivity measurements
Power Supply	12 Vdc (power adapter included)
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	240 x 182 x 74 mm (9.4x7.1x2.9")
Weight	1.0 kg (2.3 lb.)

OPERATIONAL GUIDE

PRELIMINARY OPERATIONS

- Plug the supplied 12 Vdc adapter into the power supply socket on the rear panel.

Note: Make sure the main line is protected by a fuse.

- Connect the desired probe (HI 76303 for conductivity or HI 3316D for resistivity measurements) to the DIN socket on the rear panel. The instrument will automatically recognize which probe is connected.

Note: Make sure that the instrument has been calibrated before taking conductivity measurements (see "Calibration" section).

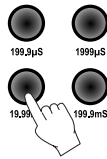
Note: If possible, use plastic beakers to minimize EMC interferences.

- Switch the meter on by pressing the ON/OFF key.



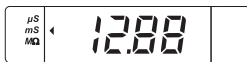
TAKING CONDUCTIVITY MEASUREMENTS

- Immerse the HI 76303 probe in the solution, while making sure that the holes of the sleeve are completely submerged. Tap the probe lightly on the bottom of the beaker to remove any air bubbles trapped inside the sleeve.
- Adjust the conductivity TC knob to the temperature coefficient value of the solution (see "Determination of the temperature coefficient of a solution" section for details).
- Select the appropriate conductivity range, by pressing the corresponding key.



Note: If the display shows "1", the reading is over-range. Select the next higher range.

- Allow a few minutes for the reading to stabilize, and the LCD will display the temperature compensated conductivity reading.



TAKING RESISTIVITY MEASUREMENTS

- Immerse the HI 3316D probe in the solution, while making sure that the hole on the probe body is completely submerged.
- Wait for a few seconds to allow stabilization of reading. The resistivity value of the solution will be displayed on the LCD.



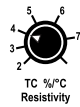
Note: If the display shows "1", the reading is over-range.

- The reading is automatically corrected for temperature variations by using the linear compensation method:

$$R_{25} = R_t(1 + \beta(t-25))$$

where R_t is the resistivity at the temperature t , and the reference temperature is 25°C.

- The temperature coefficient β is selectable through a front knob, from 2 to 7%/°C.



CALIBRATION

CONDUCTIVITY CALIBRATION

- It is recommended to calibrate the instrument for the conductivity range at least once a month, or when the probe is changed.
- For better accuracy, choose a solution with a conductivity value close to the sample to be measured.

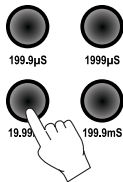
If you are measuring in the mS ranges, calibrate the meter using the **HI 7030** (12.88 mS/cm @25°C) or **HI 7034** (80 mS/cm @25°C) conductivity solution.

For the μ S ranges, use **HI 7031** (1413 μ S/cm @25°C) when calibrating in the range from 0 to 1999 μ S/cm, or **HI 7033** (84 μ S/cm @25°C) for the 0 to 199.9 μ S/cm range.

- Rinse the probe thoroughly with distilled water and, if possible, use plastic beakers to minimize any EMC interferences.
- Pour a small quantity of the desired conductivity solution into a plastic beaker, and immerse the probe while making sure that the holes of the sleeve are completely submerged. Tap the probe lightly on the bottom of the beaker to remove any air bubbles trapped inside the sleeve.
- Adjust the conductivity TC knob to 2%/°C.
- Select the appropriate measurement range: 199.9 μ S if calibrating with **HI 7033** solution, 1999 μ S for **HI 7031**, 19.99 mS for **HI 7030**, or 199.9 mS for **HI 7034**.

Note: If the display shows "1", the reading is over-range. Select the next higher range.

- Allow a few minutes for the reading to stabilize and adjust the calibration knob to read the calibration solution value @25°C.
- All subsequent measurements will be referenced to 25°C (77°F).
- If you need to reference the measurements to 20°C (68°F), adjust the calibration knob to read the calibration solution value @20°C. See conductivity vs. temperature chart.
- Calibration is now complete and the instrument is ready for use.

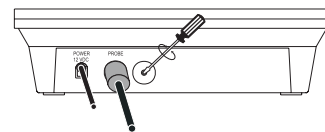


CONDUCTIVITY VS. TEMPERATURE CHART

°C	°F	HI 7030 (μ S/cm)	HI 7031 (μ S/cm)	HI 7033 (μ S/cm)	HI 7034 (μ S/cm)	HI 7035 (μ S/cm)	HI 7039 (μ S/cm)
0	32	7150	776	64	48300	65400	2760
5	41	8220	896	65	53500	74100	3180
10	50	9330	1020	67	59600	83200	3615
15	59	10480	1147	68	65400	92500	4063
16	60.8	10720	1173	70	67200	94400	4155
17	62.6	10950	1199	71	68500	96300	4245
18	64.4	11190	1225	73	69800	98200	4337
19	66.2	11430	1251	74	71300	100200	4429
20	68	11670	1278	76	72400	102100	4523
21	69.8	11910	1305	78	74000	104000	4617
22	71.6	12150	1332	79	75200	105900	4711
23	73.4	12390	1359	81	76500	107900	4805
24	75.2	12640	1386	82	78300	109800	4902
25	77	12880	1413	84	80000	111800	5000
26	78.8	13130	1440	86	81300	113800	5096
27	80.6	13370	1467	87	83000	115700	5190
28	82.4	13620	1494	89	84900	117700	5286
29	84.2	13870	1521	90	86300	119700	5383
30	86	14120	1548	92	88200	121800	5479
31	87.8	14370	1575	94	90000	123900	5575

RESISTIVITY CALIBRATION

- The meter is factory calibrated for resistivity range, and usually needs recalibration only after a resistivity probe replacement. In this case, follow the below instructions.
- Immerse the probe in a solution of known resistivity value, and wait for the reading to stabilize.
- Adjust the calibration trimmer on the rear panel until the resistivity value of the reference solution is displayed.



DETERMINATION OF THE TEMPERATURE COEFFICIENT OF A SOLUTION

- Immerse the probe into a sample of the solution and adjust the conductivity TC knob to 0% (i.e. no compensation).
- Condition sample and probe at 25°C, and note the conductivity reading C_{25} .
- Condition sample and probe to a temperature T, approximately 5°C to 10°C different from 25°C, and note the conductivity reading C_T .
- The temperature coefficient β of the solution is calculated with the following formula: $\beta = 100 \times (C_T - C_{25}) / [(T - 25) \times C_{25}]$

The above procedure is suitable for determining the temperature coefficient in the laboratory where the temperature of the solution can be determined and controlled. If this is not possible, e.g. during field measurements, the following procedure should be used:

- Immerse the probe into the test solution and turn the conductivity TC knob to 0% (no compensation).
- Allow the reading to stabilize (the reading should not change by more than ± 0.2 mS within 1 minute) and record the value, C.
- Repeat the procedure with the temperature of the solution changed by more than 10°C. Wait for the conductivity reading to stabilize.
- Adjust the conductivity TC knob until the display shows the previously recorded C value.
- The value indicated by the knob is the temperature coefficient of the solution.

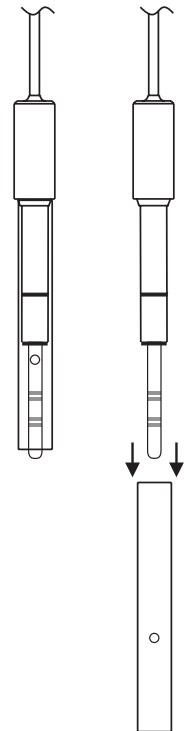
CONDUCTIVITY PROBE MAINTENANCE

Rinse the probe with tap water after every series of measurements.

If a more thorough cleaning is required, remove the sleeve and clean the probe with a cloth or a non-abrasive detergent.

After cleaning, re-calibrate the instrument.

The 4-platinum-ring probe body is made with glass. For this reason, great care must be taken while handling the probe.



ACCESSORIES

CONDUCTIVITY CALIBRATION SOLUTIONS

HI 7030M	12880 $\mu\text{S}/\text{cm}$, 230 mL bottle
HI 7030L	12880 $\mu\text{S}/\text{cm}$, 500 mL bottle
HI 8030L	12880 $\mu\text{S}/\text{cm}$, 500 mL FDA bottle
HI 7031M	1413 $\mu\text{S}/\text{cm}$, 230 mL bottle
HI 7031L	1413 $\mu\text{S}/\text{cm}$, 500 mL bottle
HI 8031L	1413 $\mu\text{S}/\text{cm}$, 500 mL FDA bottle
HI 7033M	84 $\mu\text{S}/\text{cm}$, 230 mL bottle
HI 7033L	84 $\mu\text{S}/\text{cm}$, 500 mL bottle
HI 8033L	84 $\mu\text{S}/\text{cm}$, 500 mL FDA bottle
HI 7034M	80000 $\mu\text{S}/\text{cm}$, 230 mL bottle
HI 7034L	80000 $\mu\text{S}/\text{cm}$, 500 mL bottle
HI 8034L	80000 $\mu\text{S}/\text{cm}$, 500 mL FDA bottle
HI 7035M	111800 $\mu\text{S}/\text{cm}$, 230 mL bottle
HI 7035L	111800 $\mu\text{S}/\text{cm}$, 500 mL bottle
HI 8035L	111800 $\mu\text{S}/\text{cm}$, 500 mL FDA bottle
HI 7039M	5000 $\mu\text{S}/\text{cm}$, 230 mL bottle
HI 7039L	5000 $\mu\text{S}/\text{cm}$, 500 mL bottle
HI 8039L	5000 $\mu\text{S}/\text{cm}$, 500 mL FDA bottle

CLEANING SOLUTIONS

HI 7061M	Cleaning solution for general use, 230 mL
HI 7061L	Cleaning solution for general use, 500 mL
HI 8061M	Cleaning solution for general use in 230 mL FDA bottle
HI 8061L	Cleaning solution for general use in 500 mL FDA bottle

PROBES

HI 76303	Platinum 4-ring conductivity probe with built-in temperature sensor, DIN connector and 1 m (3.3') cable
HI 3316D	Resistivity probe with built-in temperature sensor, DIN connector and 1 m (3.3') cable

OTHER ACCESSORIES

HI 710005	115 Vac/12 Vdc power adapter, US plug
HI 710006	230 Vac/12 Vdc power adapter, European plug
HI 740036	100 mL plastic beaker (6 pcs)
HI 740034	Cap for 100 mL beaker (6 pcs)
HI 76405	Electrode holder

WARRANTY

All Hanna Instruments meters are guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions.

The probes are guaranteed for a period of six months.

This warranty is limited to repair or replacement free of charge.

Damages due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact the dealer from whom you purchased the instrument.

If under warranty, report the model number, date of purchase, serial number and the nature of the failure.

If the repair is not covered by the warranty, you will be notified of the charges incurred.

If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Customer Service department and then send it with shipping costs prepaid.

When shipping any instrument, make sure it is properly packaged for complete protection.

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Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

Recommendations for Users

Before using this product, make sure that it is entirely suitable for the environment in which they are used. Operation of this instrument in residential area could cause unacceptable interferences to radio and TV equipments, requiring the operator to take all necessary steps to correct interferences.

The metal band at the end of the sensor is sensitive to electrostatic discharges. Avoid touching this metal band at all times. During calibration of instruments, ESD wrist straps should be worn to avoid possible damage to the sensor by electrostatic discharge.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance. To avoid electrical shock, do not use these instruments when voltages at the measurement surface exceed 24 Vac or 60 Vdc. Use plastic beakers to minimize any EMC interferences.

To avoid damages or burns, do not perform any measurement in microwave ovens.

