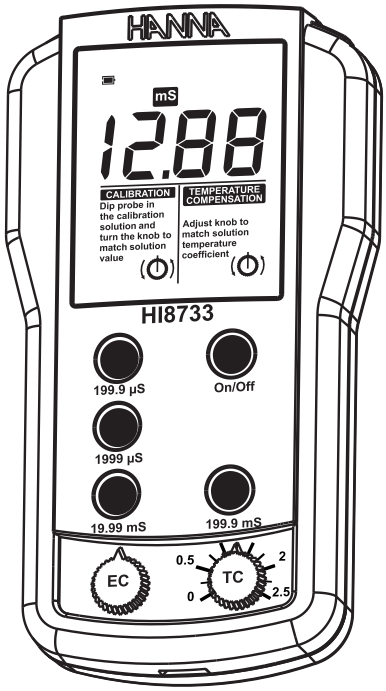
**Instruction Manual**

# HI 8633
# HI 8733 - HI 8734

## Reliable and Waterproof Multi-Range Conductivity Meters




HANNA® instruments

Dear Customer,

Thank you for choosing a Hanna Instruments product.

Please read this instruction manual carefully before using these instruments.

This manual will provide you with the necessary information for correct use of these instruments, as well as a precise idea of their versatility.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list at www.hannainst.com.

## WARRANTY

**HI 8633**, **HI 8733** and **HI 8734** are guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. Electrodes and probes are guaranteed for six months. This warranty is limited to repair or replacement free of charge.

Damage due to accidents, misuse, tampering or lack of prescribed maintenance is 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 problem. 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 Technical Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packed for complete protection.

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## 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 noticeable damage, notify your Dealer or the nearest Hanna office immediately.

Each meter is supplied with:

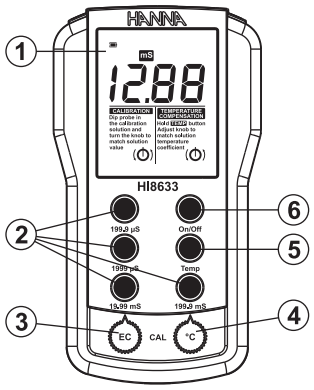
- Conductivity probe with DIN connector and 1 m (3.3') cable:
  - **HI 76301D** for **HI 8633** and **HI 8734**
  - **HI 76302W** for **HI 8733**
- Calibration solution sachet
- Instruction manual
- 1 x 9V alkaline battery

**Note**: Save all packing materials until you are sure that the instrument functions correctly. Any damaged or defective item must be returned in its original packing materials together with the supplied accessories.

## GENERAL DESCRIPTION

**HI 8633** and **HI 8733** have been designed specifically for use in the areas of production and quality control. It is often necessary to test samples with different concentrations ranging from deionized water to brine.
Both models can be manually calibrated at 1 point.
The **HI 8733**, with a built-in temperature sensor and Automatic Temperature Compensation, is the perfect instrument for measuring samples with fluctuating temperature.
**HI 8734** has been specially designed for the water conditioning industry, particularly in the softening, demineralization, reverse osmosis and drinking water applications.
Three ranges of measurement assure the highest accuracy possible. In addition, Manual Temperature Compensation is possible through a knob on the front panel.
The ratio between conductivity and TDS is factory set at 0.5.
Moreover, the 4-ring potentiometric probes supplied with the meters are made of rugged PVC - ideal for indoor, as well as outdoor measurements.

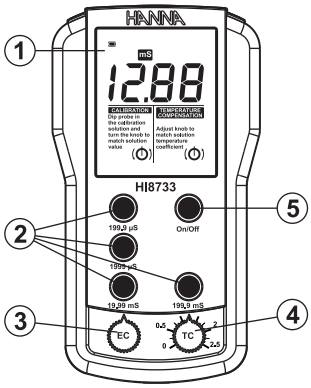
# FUNCTIONAL DESCRIPTION & SPECIFICATIONS OF HI 8633




1) Liquid Crystal Display
2) Measurement range selection keys
3) EC calibration knob
4) Manual temperature compensation knob
5) Temperature selection key
6) On/Off key

| | |
|---|---|
| **Range** | 0.0 to 199.9 / 0 to 1999 µS/cm<br>0.00 to 19.99 / 0.0 to 199.9 mS/cm |
| **Resolution** | 0.1 / 1 µS/cm<br>0.01 / 0.1 mS/cm |
| **Accuracy (@ 20 °C/68 °F)** | ±1% Full scale<br>excluding probe error |
| **Typical EMC Deviation** | ±2% Full Scale |
| **Calibration** | Manual, 1 point, through EC knob |
| **Temperature Compensation** | Manual, 0 to 50 °C (32 to 122 °F)<br>with β=2%/°C |
| **Probe (included)** | **HI 76301D** with 1m (3.3') cable |
| **Environment** | 0 to 50 °C (32 to 122 °F); RH max 100% |
| **Battery Type** | 1 x 9V alkaline |
| **Battery Life** | Approx. 100 hours of continuouse use |
| **Dimensions** | 145 x 80 x 36 mm (5.7 x 3.1 x 1.4 ") |
| **Weight** | 230 g (8.1 oz.) |

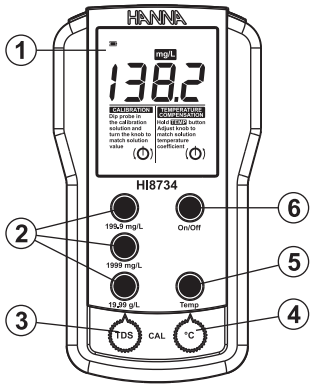
# FUNCTIONAL DESCRIPTION & SPECIFICATIONS OF HI 8733




1) Liquid Crystal Display
2) Measurement range selection keys
3) EC calibration knob
4) Automatic Temperature Compensation coefficient knob
5) On/Off key

| | |
|---|---|
| **Range** | 0.0 to 199.9 / 0 to 1999 µS/cm<br>0.00 to 19.99 / 0.0 to 199.9 mS/cm |
| **Resolution** | 0.1 / 1 µS/cm<br>0.01 / 0.1 mS/cm |
| **Accuracy (@ 20 °C/68 °F)** | ±1% Full scale<br>excluding probe error |
| **Typical EMC Deviation** | ±2% Full Scale |
| **Calibration** | Manual, 1 point, through EC knob |
| **Temperature Compensation** | Automatic, 0 to 50 °C (32 to 122 °F)<br>with β adjustable from 0 to 2.5% / °C |
| **Probe (included)** | **HI 76302W** ATC with 1m (3.3') cable |
| **Environment** | 0 to 50 °C (32 to 122 °F); RH max 100% |
| **Battery Type** | 1 x 9V alkaline |
| **Battery Life** | Approx. 100 hours of continuouse use |
| **Dimensions** | 145 x 80 x 36 mm (5.7 x 3.1 x 1.4 ") |
| **Weight** | 230 g (8.1 oz.) |

# FUNCTIONAL DESCRIPTION & SPECIFICATIONS OF HI 8734



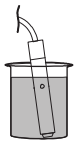

1) Liquid Crystal Display
2) Measurement range selection keys
3) TDS calibration knob
4) Manual temperature compensation knob
5) Temperature selection key
6) On/Off key

| | |
|---|---|
| **Range** | 0.0 to 199.9 / 0 to 1999 mg/L<br>0.00 to 19.99 g/L |
| **Resolution** | 0.1 / 1 mg/L<br>0.01 g/L |
| **Accuracy (@ 20 °C/68 °F)** | ±1% Full scale<br>excluding probe error |
| **Typical EMC Deviation** | ±2% Full Scale |
| **Calibration** | Manual, 1 point, through TDS knob |
| **Temperature Compensation** | Manual, 0 to 50 °C (32 to 122 °F)<br>with β=2% / °C |
| **TDS factor** | 0.5 |
| **Probe (included)** | **HI 76301D** with 1m (3.3') cable |
| **Environment** | 0 to 50 °C (32 to 122 °F); RH max 100% |
| **Battery Type** | 1 x 9V alkaline |
| **Battery Life** | Approx. 100 hours of continuouse use |
| **Dimensions** | 145 x 80 x 36 mm (5.7 x 3.1 x 1.4 ") |
| **Weight** | 230 g (8.1 oz.) |

## OPERATIONAL GUIDE

- Each meter is supplied complete with a 9V battery. Remove the battery compartment cover on the back of the meter (see page 16). Install the battery while observing its polarity.
- Connect the probe to the meter securely by aligning the pins with the socket and pushing the plug in.


- Make sure that the meter has been calibrated before taking any measurements (see "Calibration" section).
- Immerse the conductivity probe into the sample, with the holes on the shaft completely submerged.
  If possible, use plastic beakers or containers to minimize any EMC interference.

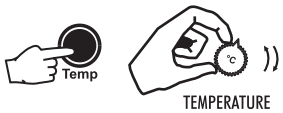


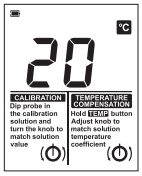
- Tap the probe lightly on the bottom of the beaker to remove any air bubbles which may be trapped inside the PVC sleeve.
- Turn the instrument on by pressing the **On/Off** key.

**For HI 8633 and HI 8734:**

- Take the temperature of the solution with a ChecktempC or another accurate thermometer following LCD indication.

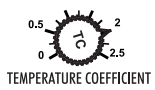
- Press and hold down the **Temp** key to display the temperature and adjust the temperature knob to that of the solution e.g. 20°C.



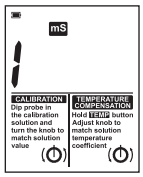

**For HI 8733:**

- Adjust the TEMPERATURE COEFFICIENT knob to 2% to compensate for the temperature effect of average solutions (to determine exact value for a particular solution, see page 15).




- Select the appropriate measurement range.

**Note:** If the display shows only a "1" on the far left hand side, the meter is out of range. Select the next (higher) range.




- Wait for a couple of minutes for the temperature sensor to reach thermal equilibrium with the sample before taking measurements.
- After the measurement has been completed, the instrument should be switched off and the probe should be cleaned and dried (see "Probe Maintenance" on page 17).

## CALIBRATION

Accessories needed:

- Use any calibration solution within the meter's range. The solution should ideally be close to the samples being measured. Use for example **HI 7030** or **HI 8030**, 12880 µS/cm (=12.88 mS/cm) conductivity solution, for **HI 8633** and **HI 8733**, and **HI 7032**, 1382 mg/L (=2764 µS/cm) TDS solution, for **HI 8734**.
- ChecktempC or another accurate thermometer with 0.1°C resolution (not necessary for **HI 8733**).

### PROCEDURE FOR HI 8633 AND HI 8734

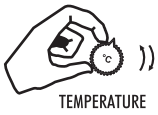
- Pour sufficient quantity of a conductivity (**HI 8633**) or TDS (**HI 8734**) calibration solution (e.g. **HI 7030** or **HI 7032**) into a beaker to cover the holes on the probe. If possible, use plastic beakers to minimize any EMC interference.

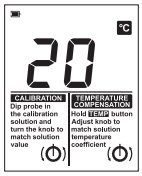
- Immerse the conductivity probe, making sure that holes are completely submerged, and the ChecktempC in the solution.
- Wait for a couple of minutes for thermal equilibrium to be reached.
- Tap the probe on the bottom, then shake it while rotating to make sure no air bubbles remain trapped in the sleeve.

- Record the temperature of the buffer solution from the thermometer (e.g. 20°C).
- Switch the instrument on by pressing **On/Off**.

- Press and hold down **Temp** to display the temperature.

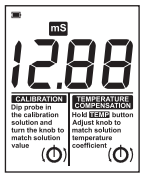

- Adjust the TEMPERATURE knob to display 20°C.

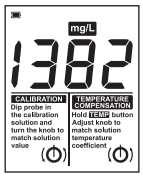



- Release **Temp** key to display conductivity measurement.
- Select 19.99 mS/cm (**HI 8633**) or 1999 mg/L (**HI 8734**) range by pressing the appropriate range key.


- Follow LCD calibration indication. Adjust the calibration knob until the display shows for **HI 8633** the conductivity reading at 25°C (see the conductivity vs. temperature table), e.g. @ 25°C, 12880 µS/cm = 12.88 mS/cm, or for **HI 8734** the TDS reading at 25°C (see the TDS vs. temperature chart), e.g. @25°C, 1382 mg/L.




- All subsequent measurements will be compensated to 25°C (77°F). If you prefer to standardize the temperature compensation to 20°C (68°F) rather than 25°C (77°F), leave the TEMPERATURE knob at 18°C (if the temperature of the solution is 18°C), adjust the knob to read "**11.67 mS**" (see the conductivity vs. temperature chart) or "**1251 mg/L**" (see the TDS vs. temperature chart). All subsequent measurements will be compensated to 20°C.
- The calibration is now complete and the instrument is ready for use.

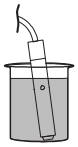
The instrument should be recalibrated at least once a month, or when the probe is changed.

Note: For more accurate results, it is advisable to use a calibration solution close to the measurement range. See the "Accessories" section for a wide selection of conductivity solutions.

## PROCEDURE FOR HI 8733

- Pour sufficient quantity of a conductivity calibration solution (e.g. **HI 7030**/ **HI 8030**) into a beaker to cover the holes on the probe. If possible, use plastic beakers to minimize any EMC interference.

- Immerse the conductivity probe in the solution, making sure that holes are completely submerged.
- Wait for a couple of minutes for thermal equilibrium to be reached.



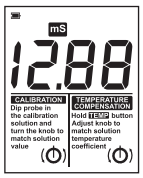
- Tap the probe on the bottom, then shake it while rotating to make sure no air bubbles remain trapped in the sleeve.
- Switch the instrument on by pressing **On/Off**.


- Set the temperature coefficient knob to 2% to compensate for the temperature effect of average solutions (to determine exact value for a particular solution, see page 15).


- Select 19.99 mS/cm range by pressing the appropriate range key.

- Follow LCD calibration indication. Adjust the calibration knob until the display shows "**12.88 mS**" i.e. the conductivity reading @ 25°C.


EC CALIBRATION




- All subsequent measurements will be compensated to 25°C (77°F). If you prefer to standardize the temperature compensation to 20°C (68°F) rather than 25°C (77°F), adjust the knob to read "**11.67 mS**" (see the conductivity vs. temperature chart on page 13). All subsequent measurements will be compensated to 20°C.
- The calibration is now complete and the instrument is ready for use.

The instrument should be recalibrated at least once a month, or when the probe is changed.

**Note**: For more accurate results, it is advisable to use a calibration solution close to the range to be measured. See the "Accessories" section for a wide selection of conductivity solutions.

# CONDUCTIVITY VERSUS TEMPERATURE CHART

The conductivity of an aqueous solution is the measure of its ability to carry an electrical current by means of ionic motion.

The conductivity invariably increases with increasing temperature.

It is affected by the type and number of ions in the solution and by the viscosity of the solution itself. Both parameters are temperature dependent. The dependency of conductivity on temperature is expressed as a relative change per degree Celsius at a particular temperature, commonly as percent per °C.

| °C | °F | HI7030 HI8030 (µS/cm) | HI7031 HI8031 (µS/cm) | HI7033 HI8033 (µS/cm) | HI7034 HI8034 (µS/cm) | HI7035 HI8035 (µS/cm) | HI7039 HI8039 (µS/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 |

For manual temperature compensation, refer to the following chart:

For instance, the conductivity values of the calibration solutions at 25°C are 12880 µS/cm, 1413 µS/cm or 5000 µS/cm when using **HI 7030**, **HI 7031** or **HI 7039**, respectively.

At 20°C, the values are 11670 µS/cm, 1278 µS/cm or 4523 µS/cm, respectively.

With the solutions at 30°C, the values are 14120 µS/cm, 1548 µS/cm or 5479 µS/cm, respectively.

## TDS VALUES TABLE

The TDS value in aqueous solutions is directly proportional to conductivity. The ratio between the two parameters depends on the solution and usually it is set to a factor of 0.5 (corresponding to a solution of $CaCO_3$). This means that 1 µS/cm is equal to 0.5 mg/L (ppm) of TDS.

For manual temperature compensation, refer to the following chart:

| °C | °F | HI7032 mg/L (ppm) | HI7036 g/L (ppt) |
|---|---|---|---|
| 0 | 32 | 758 | 6.82 |
| 5 | 41 | 876 | 7.88 |
| 10 | 50 | 999 | 8.99 |
| 15 | 59 | 1122 | 10.10 |
| 16 | 60.8 | 1148 | 10.33 |
| 17 | 62.6 | 1173 | 10.56 |
| 18 | 64.4 | 1200 | 10.78 |
| 19 | 66.2 | 1224 | 11.01 |
| 20 | 68 | 1251 | 11.24 |
| 21 | 69.8 | 1277 | 11.47 |
| 22 | 71.6 | 1303 | 11.71 |
| 23 | 73.4 | 1329 | 11.94 |
| 24 | 75.2 | 1358 | 12.18 |
| 25 | 77 | 1382 | 12.41 |
| 26 | 78.8 | 1408 | 12.65 |
| 27 | 80.6 | 1438 | 12.89 |
| 28 | 82.4 | 1461 | 13.13 |
| 29 | 84.2 | 1476 | 13.37 |
| 30 | 86 | 1515 | 13.61 |
| 31 | 87.8 | 1541 | 13.85 |

For instance, the TDS values of the calibration solutions at 25°C are 1382 mg/L or 12.41 g/L when using **HI 7032** or **HI 7036**, respectively.

At 20°C, the values are 1251 mg/L or 11.24 g/L, respectively.

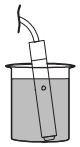
With the solutions at 30°C, the values are 1515 mg/L or 13.61 g/L, respectively.

## DETERMINING THE TEMPERATURE COEFFICIENT OF A SOLUTION (HI 8733)

Highly acidic, alkaline samples or solutions with high salt content might have a different coefficient than the customary 2% per degree °C.

In order to calculate this coefficient follow the procedure below:

- Immerse the probe of **HI 8733** in the sample and adjust the TEMPERATURE COEFFICIENT knob to 0% (i.e. no compensation).




- Condition the sample and probe to 25°C and note the conductivity reading, $C_{25}$.
- Condition the sample and probe to a different temperature t°C (approximately 10°C different from 25°C) and note the conductivity reading $C_t$.
- The temperature coefficient $\beta$ of the solution is calculated as given by the following formula:

$$\beta = 100 \times \frac{(C_t - C_{25})}{(t - 25) \times C_{25}}$$

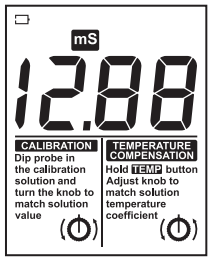
The above procedure is suitable for determining the temperature coefficient in a laboratory or where the temperature of the solution can be controlled.

If this is not possible (e.g. on-site measurements), the following procedure can be used providing the sample temperature varies by at least 5°C or preferably 10°C:

- Immerse the probe of **HI 8733** in the test solution and turn the TEMPERATURE COEFFICIENT knob to 0% (no compensation).
- Check the conductivity reading and record the value. Make sure the reading is stable, i.e. no greater variations than $\pm$0.2 mS/cm within a minute.
- Repeat the procedure when the temperature of the test solution has changed by at least 5°C. Wait for the conductivity reading to stabilize.
- Adjust the TEMPERATURE COEFFICIENT knob until the display shows the same value as recorded earlier.
- The value indicated by the knob is the temperature coefficient of the solution.

## BATTERY REPLACEMENT

When battery becomes weak the meter will display the battery symbol as empty.

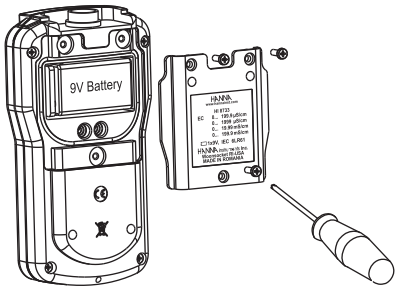



When the low battery indicator appears, the battery has only a few hours left. A low battery will result in unreliable measurements.

It is recommended to replace the battery immediately.

Battery replacement must only take place in a nonhazardous area using a 9V alkaline battery.

Unscrew the three screws on the rear of the meter, remove the battery compartment cover and replace the 9V battery with a new one.



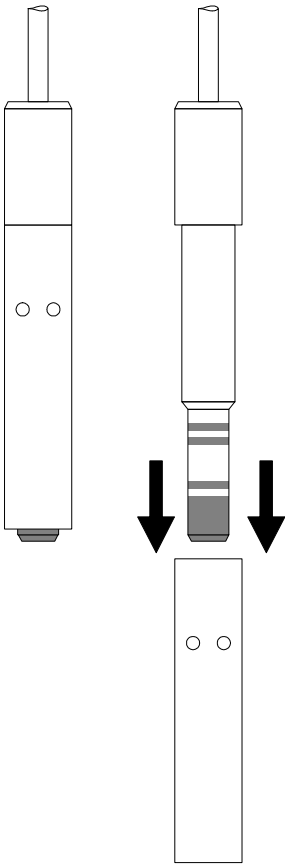

Make sure the battery contacts are tight and secure before replacing the cover.

## PROBE MAINTENANCE

Rinse the probe with tap water after every series of measurements. If a more thorough cleaning is required, remove the PVC sleeve and clean the probe with a cloth or a nonabrasive detergent. When reinserting the sleeve onto the probe, be sure that the sleeve is in the right direction with the four holes towards the cable end.

After cleaning the probe, recalibrate the instrument.

The probe body is in PVC. For this reason it must never come into close contact with a heat source. If the probe is exposed to high temperatures (above 50°C/122°F), the rings might become loose or detached, resulting in a serious impairment of the probe. In such cases, the probe has to be replaced.



# ACCESSORIES

## CALIBRATION SOLUTIONS

| | |
|---|---|
| **HI 7030L** | 12880 µS/cm, 500 mL bottle |
| **HI 7030M** | 12880 µS/cm, 230 mL bottle |
| **HI 7031L** | 1413 µS/cm, 500 mL bottle |
| **HI 7031M** | 1413 µS/cm, 230 mL bottle |
| **HI 7033L** | 84 µS/cm, 500 mL bottle |
| **HI 7033M** | 84 µS/cm, 230 mL bottle |
| **HI 7034L** | 80000 µS/cm, 500 mL bottle |
| **HI 7034M** | 80000 µS/cm, 230 mL bottle |
| **HI 7035L** | 111800 µS/cm, 500 mL bottle |
| **HI 7035M** | 111800 µS/cm, 230 mL bottle |
| **HI 7039L** | 5000 µS/cm, 500 mL bottle |
| **HI 7039M** | 5000 µS/cm, 230 mL bottle |
| **HI 7032L** | 1382 ppm (mg/L), 500 mL bottle |
| **HI 7032M** | 1382 ppm (mg/L), 230 mL bottle |
| **HI 7036L** | 12.41 ppt (g/L), 500 mL bottle |
| **HI 7036M** | 12.41 ppt (g/L), 230 mL bottle |

## CONDUCTIVITY PROBES

| | |
|---|---|
| **HI 76301D** | Conductivity probe with 1m (3.3') cable and DIN connector |
| **HI 76302W** | Conductivity probe with built-in temperature sensor, 1m (3.3') cable and DIN connector |

## OTHER ACCESSORIES

| | |
|---|---|
| **HI 98501** | Electronic thermometer (range: -50.0 to 150.0°C) |
| **HI 710007** | Shockproof rubber boot, blue |
| **HI 710008** | Shockproof rubber boot, orange |
| **HI 710050** | Spare protective case |

## RECOMMENDATIONS FOR USERS

Before using these products, make sure they are entirely suitable for the environment in which they are used.

Operation of these instruments in residential areas could cause unacceptable interferences to radio and TV equipment, requiring the operator to follow all necessary steps to correct interferences.

The metal band at the end of the probe is sensitive to electrostatic discharges. Avoid touching this metal band at all times.

During operation, ESD wrist straps should be worn to avoid possible damage to the probe by electrostatic discharges.

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 damage or burns, do not perform any measurement in microwave ovens.

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Printed in EUROPE
(ROMANIA)

MAN8734Y 07/10