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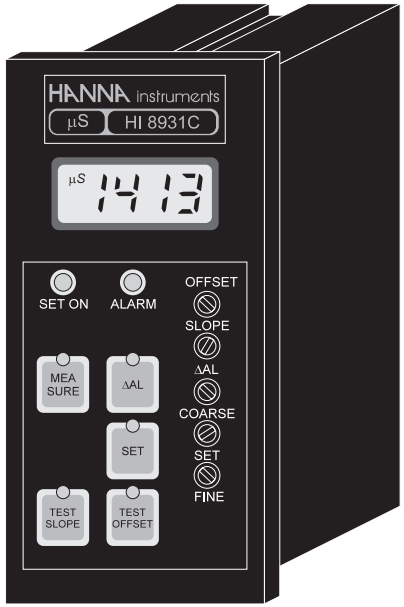
For e-mail contacts and complete list of Sales and Technical offices, please see ***www.hannainst.com***

Instruction Manual

HI 8931 • HI 8936 Series
HI 943500 Series

Conductivity Process Controllers and Transmitters



HANNA® instruments

www.hannainst.com

CE DECLARATION OF CONFORMITY

HANNA instruments

CE

DECLARATION OF CONFORMITY

We

Hanna Instruments Italia Srl
via E.Fermi, 10
35030 Sarmeola di Rubano - PD
ITALY

herewith certify that the process instruments

HI8931A HI8931B HI8931C HI8931D
HI8936A HI8936B HI8936C HI8936D
HI8936AL HI8936BL HI8936CL HI8936DL
HI943500A HI943500B HI943500C HI943500D

have been tested and found to be in compliance with EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC according to the following applicable normatives:

EN 50082-1: Electromagnetic Compatibility - Generic Immunity Standard
IEC 801-2 Electrostatic Discharge
IEC 801-3 RF Radiated
IEC 801-4 Fast Transient

EN 50081-1: Electromagnetic Compatibility - Generic Emission Standard
EN 55022 Radiated, Class B

EN61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use

Date of Issue: 3-12-1998

P. Cesa - Technical Director
On behalf of
Hanna Instruments S.r.l.

Recommendations for Users

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

Operation of these instruments in residential area could cause unacceptable interferences to radio and TV equipments, requiring the operator to take all necessary steps to correct interferences.

The trimmers are sensitive to electrostatic discharges. It is recommended to use antistatic screwdrivers.

Unplug the instrument from the power supply before replacing the fuse. External cables to be connected to the rear panel should end with cable lugs.

To maintain the EMC performance of this equipment, use the recommended cables mentioned on this instruction manual.

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.

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

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 use of the instruments, as well as a precise idea of thier versatility in a wide range of applications.

If you need additional technical information, do not hesitate to e-mail us at **tech@hannainst.com**

These instruments are in compliance with the CE directives.

TABLE OF CONTENTS

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.

Each model is supplied complete with:

- Mounting brackets (not for **HI 8936** series)
- Transparent splsh-proof cover (not for **HI 8936** series)
- Instruction manual

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

GENERAL DESCRIPTION

The **HI 8931** and **HI 943500** are panel-mounted conductivity controllers designed for simplicity of use in a wide range of industrial process applications.

The instruments are designed with a standard DIN panel mount with membrane keypads and large LCD on the front, and provide a series of auto-diagnostic functions.

Probes, power supply, contacts and recorders are connected on the rear panel through screw terminals.

Using **HI 8931** in conjunction with a 4-20 mA output transmitter (**HI 8936** or **HI 8936L** series) will assure you of a strong, interference-free signal at distances up to 300 meters (1000').

For in-line applications use the **HI 7635** probe, while for tanks the **HI 7638** with external threads is recommended. These probes are provided with built-in NTC sensor for temperature compensated conductivity measurements. The probe cable length is 3 meters (10').

HI 943500 features a direct connection up to 20 m (67'), without intermediate amplifiers, to the conductivity probe **HI 7638** with DIN connector and automatic temperature compensation.

WARRANTY

All HANNA instruments® **meters are warranted for two years** against defects in workmanship and materials when used for their intended purpose and maintained according to instructions.

The probes are warranted 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.

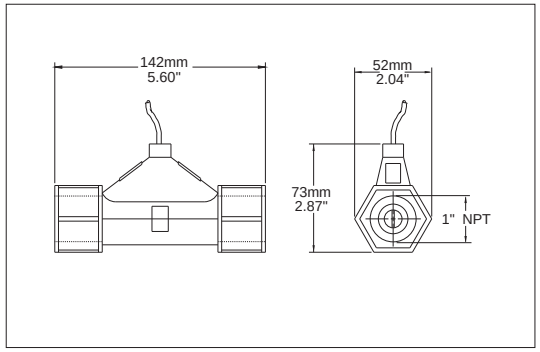
If the instrument is to be returned to HANNA instruments®, first obtain a Returned Goods Authorization Number from the Customer Service department and then send it with shipment costs prepaid.

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

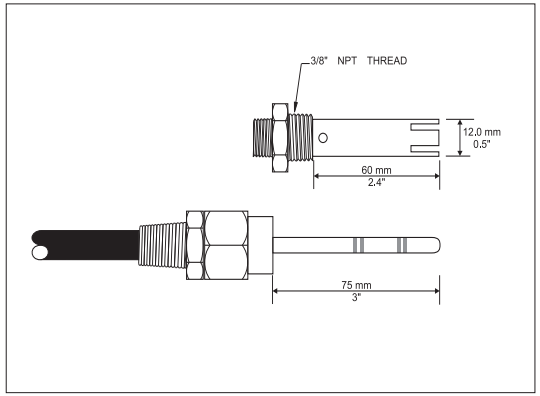
Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

CONDUCTIVITY PROBES

HI 7635 In-line conductivity probe with 3 m (10') cable (for **HI 8936** only)



HI 7638 Conductivity probe for tank installation, with 3 m (10') cable (for **HI 8936** or **HI 943500**)



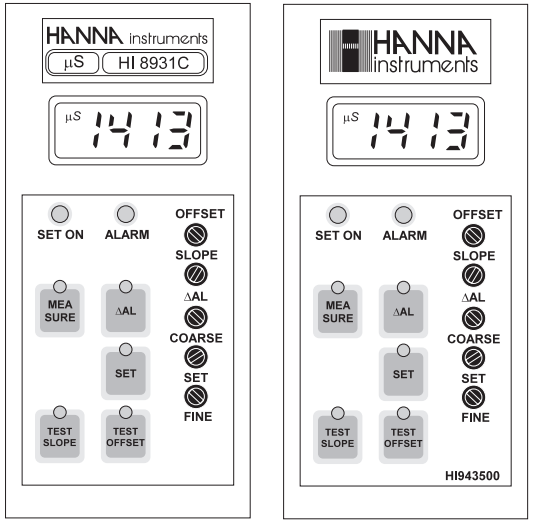
Four models with different measurement ranges are available to suit any application needs:

- **HI 8931A / HI 943500A / HI 8936A / HI 8936AL**
  from 0.0 to 199.9 mS/cm
- **HI 8931B / HI 943500B / HI 8936B / HI 8936BL**
  from 0.00 to 19.99 mS/cm
- **HI 8931C / HI 943500C / HI 8936C / HI 8936CL**
  from 0 to 1999 μS/cm
- **HI 8931D / HI 943500D / HI 8936D / HI 8936DL**
  from 0.0 to 199.9 μS/cm

Other features include: recorder output in 0-20 mA or 4-20 mA configuration; LED indicators (for **HI 8931** and **HI 943500**) which identify whether the controller is in operation mode or selection mode.

Each instrument of the **HI 8931** and **HI 943500** series, is supplied with a plastic front cover and two mounting brackets. Power cables are not included.

FUNCTIONAL DESCRIPTION HI 8931 & HI 943500



KEYPAD

MEASURE To read measurements and enable diagnostic tests
ΔAL To display set tolerance of the alarm
SET To set working point
TEST SLOPE Diagnostic function
TEST OFFSET Diagnostic function

When a key is pressed, the corresponding LED lights up to indicate that the function is active.

TRIMMERS

OFFSET For offset calibration
SLOPE For slope calibration
ΔAL To set the alarm tolerance
COARSE To coarsely adjust the set point
SET FINE To finely adjust the set point

LEDS

SET ON To indicate that the dosage is active
ALARM To indicate an alarm condition

ACCESSORIES

CONDUCTIVITY CALIBRATION SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7030M	12880 µS/cm calibration solution, 230 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7031M	1413 µS/cm calibration solution, 230 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7033M	84 µS/cm calibration solution, 230 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7034M	80000 µS/cm calibration solution, 230 mL
HI 7035L	111800 µS/cm calibration solution, 500mL
HI 7035M	111800 µS/cm calibration solution, 230 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7039M	5000 µS/cm calibration solution, 230 mL

OTHER ACCESSORIES

HI 731326	Calibration screwdrivers (20 pcs)
HI 779/P	6-wire cable (100 m/330' roll)
HI 8733	Portable conductivity meter with automatic temperature compensation

PROBE MAINTENANCE & CLEANING

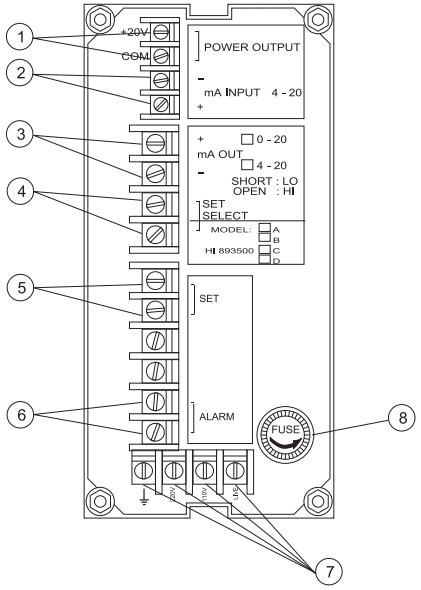
The probe can be compensated for normal contamination by a process of re-calibration.
It is recommended to remove the probe from its installation regularly for maintenance.

For **HI 7635** only:
Deposits on the conductivity probe can be removed by immersing the probe in 0.1 N hydrochloric acid for about 30 minutes. Heavier deposits may demand longer immersion periods.
Rinse the probe thoroughly with water prior to the reinstallation.
On reinstalling, check the seals carefully to ensure that a leak-free connection is obtained.

For **HI 7638** only:
Rinse the probe with tap water. If a more thorough cleaning is desired, unscrew the plastic sleeve and clean the sensors with a nonabrasive cloth or alcohol.
After cleaning the probe, re-calibrate the instrument. If the instrument will not calibrate with a clean probe, you must replace the probe.

Note: Always re-calibrate the meter when attaching a new probe.

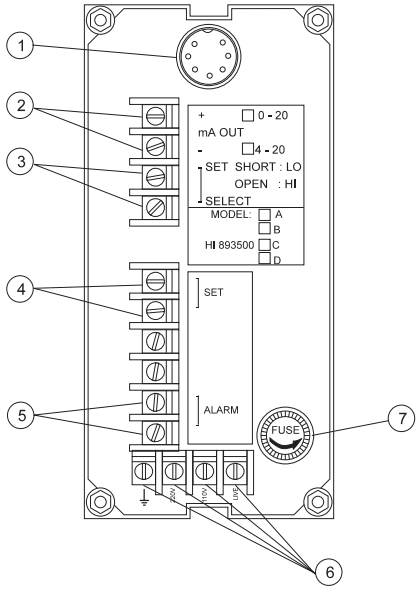
REAR PANEL OF HI 8931 SERIES



1. POWER OUTPUT terminals (+20 V and COM) for connection to a conductivity transmitter (**HI 8936**)
2. mA INPUT from a conductivity transmitter
3. mA OUTPUT terminals for connection to a recorder
4. SET SELECT terminals for reverse control operation
5. SET terminals for connection to a dosing pump
6. ALARM terminals for connection to an external alarm device
7. Power supply terminals
8. Fuse holder

⚠ Unplug the instrument from power supply before replacing the fuse.

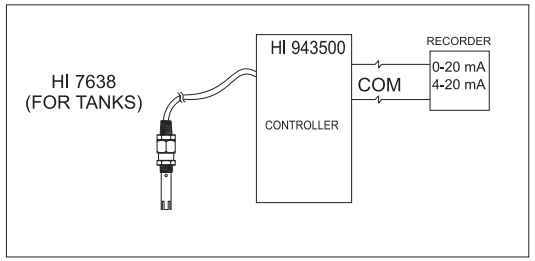
REAR PANEL OF HI 943500 SERIES



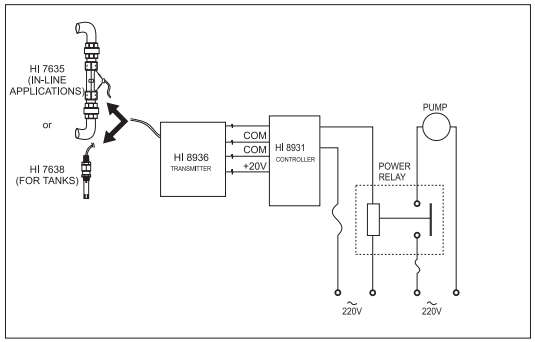
1. DIN connector for conductivity probe
2. mA OUTPUT terminals for connection to a recorder
3. SET SELECT terminals for reverse control operation
4. SET terminals for connection to a dosing pump
5. ALARM terminals for connection to an external alarm device
6. Power supply terminals
7. Fuse holder

⚠ Unplug the instrument from power supply before replacing the fuse.

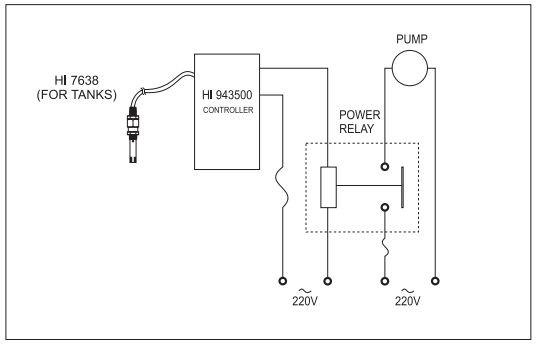
Example #3



Example #4



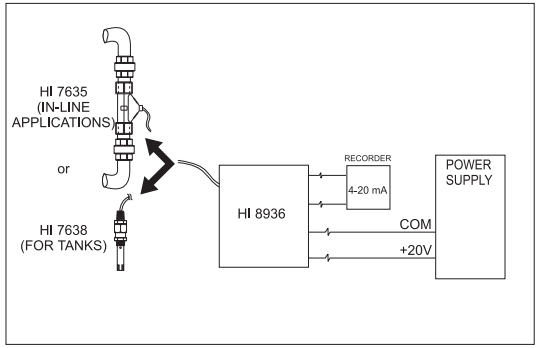
Example #5



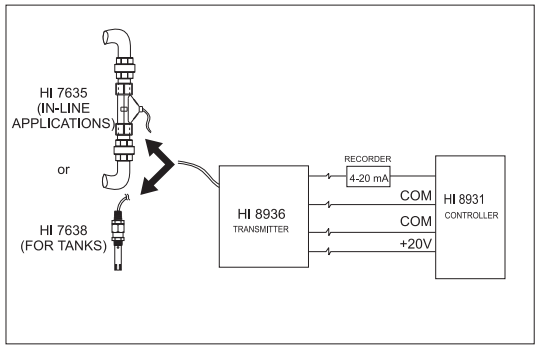
INSTALLATION EXAMPLES

Some typical installation setups are shown in the following examples:

Example #1

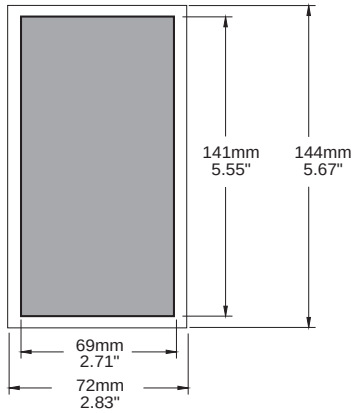


Example #2



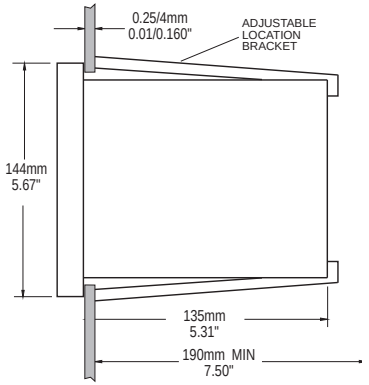
MECHANICAL DIMENSIONS OF HI 8931 AND HI 943500

Front view of the panel-mounted unit



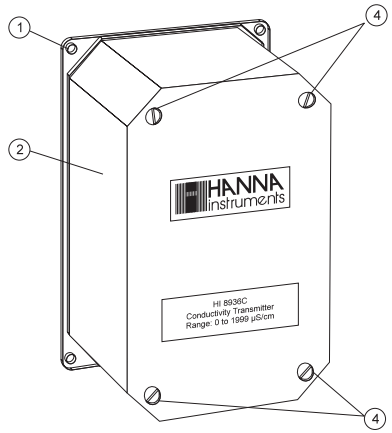
These dimensions show the cutout size for the installation.

Side view of the panel-mounted unit

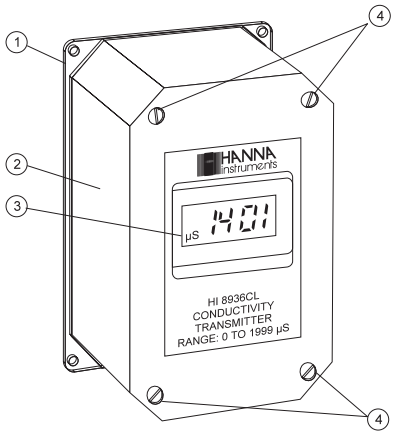


Adjustable location brackets (supplied with the meter) allow the indicator to slide into the cutout and will hold the unit securely in place. 190 mm (7.50") is the minimum amount of room required to install the indicator with the cables connected.

FUNCTIONAL DESCRIPTION HI 8936



HI 8936A
HI 8936B
HI 8936C
HI 8936D



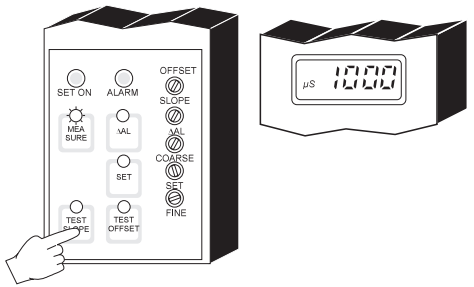
HI 8936AL
HI 8936BL
HI 8936CL
HI 8936DL

1. Back cover
2. Top cover
3. Liquid Crystal Display
4. Screws for fastening the top cover

B) **Test Slope**

Press the "TEST SLOPE" key and the display should indicate the following values:

HI 8931/HI 943500A	100.0 mS	±35.0 mS
HI 8931/HI 943500B	10.00 mS	±3.50 mS
HI 8931/HI 943500C	1000 µS	±350 µS
HI 8931/HI 943500D	100.0 µS	±35.0 µS

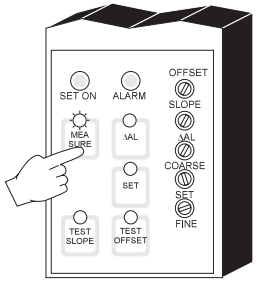


Note: The reading obtained by these functions will vary if the OFFSET and SLOPE trimmers on the front panel are adjusted.

DIAGNOSTIC TESTS

The **HI 8931** and **HI 943500** controllers are designed with built-in diagnostic functions to enable the user to check and troubleshoot the instrument. The checks performed are through the front panel keys and can be used to isolate the cause of malfunction.

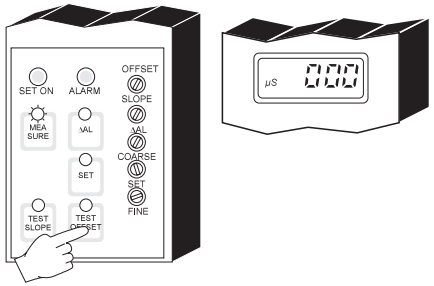
Press the "MEASURE" key before proceeding the following tests.



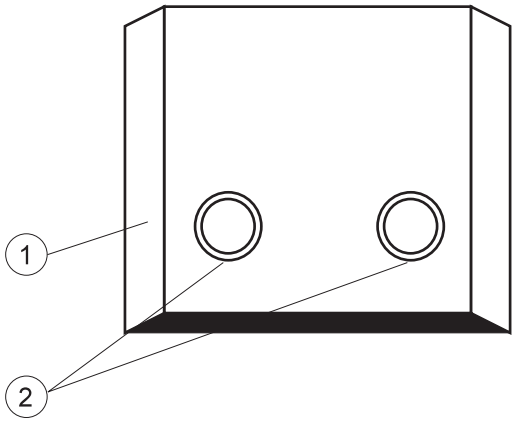
A) Test Offset

Press the "TEST OFFSET" key and the display should indicate the following values:

HI 8931/HI 943500A	0.0 mS	±1.0 mS
HI 8931/HI 943500B	0.00 mS	±0.10 mS
HI 8931/HI 943500C	000 µS	±100 µS
HI 8931/HI 943500D	0.0 µS	±1.0 µS

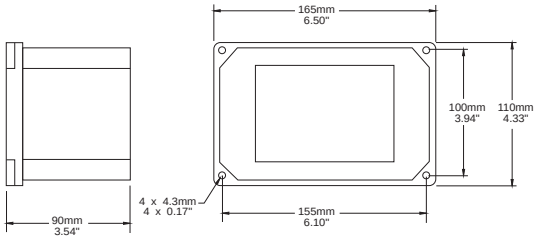


SIDE VIEW OF HI 8936 SERIES

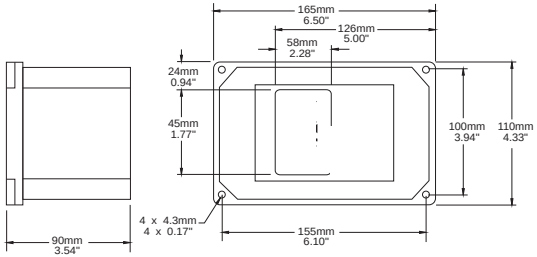


1. Top cover
2. Cable glands for wiring

MECHANICAL DIMENSIONS OF HI 8936A, HI 8936B, HI 8936C, HI 8936D



MECHANICAL DIMENSIONS OF HI 8936AL, HI 8936BL, HI 8936CL, HI 8936DL

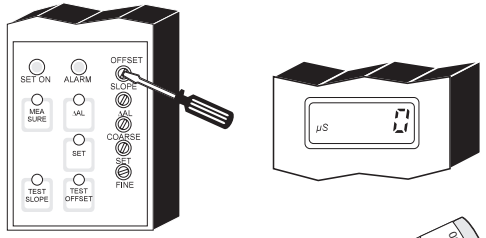


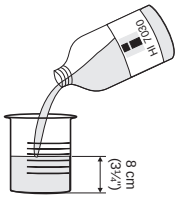
CONDUCTIVITY VERSUS TEMPERATURE CHART

°C	°F	HI 7030 (mS/cm)	HI 7031 (mS/cm)	HI 7033 (mS/cm)	HI 7034 (mS/cm)	HI 7035 (mS/cm)	HI 7039 (mS/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	4517
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

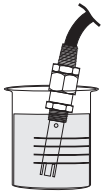
If you are calibrating **HI 8931A** or **HI 943500A** using **HI 7030** (12.88 mS/cm @25°C) standard solution, turn the SLOPE trimmer to display "12.88 mS", with a reference temperature of 25°C (77°F), while for a reference temperature of 20°C (68°F), the SLOPE trimmer should be adjusted to display "11.67 mS".

- If the LCD does not show "0", adjust the OFFSET trimmer.





- Pour at least 8 cm (3¼") of conductivity solution into a plastic beaker.



- Immerse the probe into the conductivity solution, while paying attention that the holes on the sleeve are completely submerged.
- Tap the probe repeatedly on the bottom of the beaker and stir it to ensure that no air bubbles remain trapped inside the sleeve.
- If the temperature of the probe is close to that of the solution, the display will stabilize quickly and provide a temperature compensated conductivity measurement.

  Allow a few minutes if there is a temperature difference of about 5°C (9°F) or more for the ATC circuitry to compensate completely.
- When the reading stabilizes, turn the SLOPE trimmer on the **HI943500** front panel until the LCD reads the same value of the calibration solution at 25°C (77°F), i.e.:

  80.0 mS using **HI 7034** with **HI 943500A**
  12.88 mS using **HI 7030** with **HI 943500B**
  1413 µS using **HI 7031** with **HI 943500C**
  84.0 µS using **HI 7033** with **HI 943500D**
- The calibration is now complete and the instrument is ready for use. All subsequent measurements will be compensated to 25°C (77°F).
- If the instrument will not calibrate refer to the "Probe Maintenance and Cleaning" section on page 46.

CONDUCTIVITY PROBES

HI 7635 In-line Conductivity Probe

HI 7635 is a one piece, molded conductivity probe with pipe threads (1" NPT) at both ends.

This allows the probe to attach to an in-line system, and to be used in conjunction with the **HI 8936** conductivity transmitter.

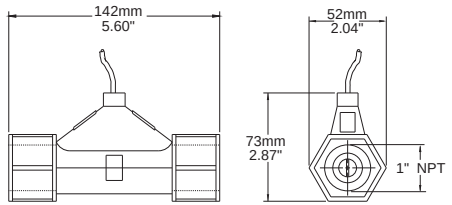
The **HI 7635** uses a 4-ring potentiometric measuring method. This method is highly accurate and requires very little maintenance.

The construction of the housing is rugged, fiber-reinforced polypropylene.

The maximum working pressure of this unit is 5 bar (72.5 psi).

Do not use in systems where the temperature exceeds 80°C (176°F).

HI 7635



HI7638 Tank Conductivity Probe

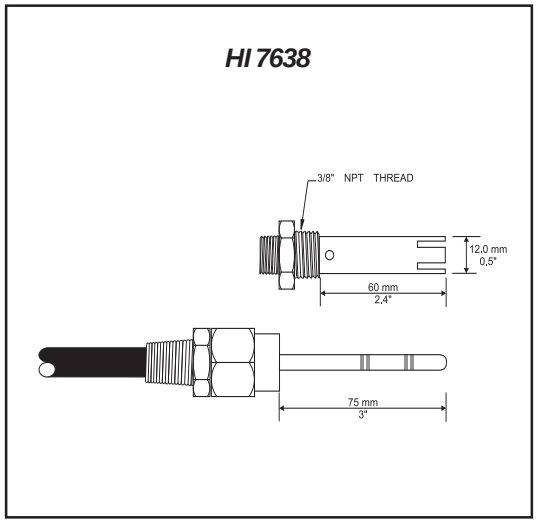
HI 7638 conductivity probe combines the proven 4-ring potentiometric method of measuring conductivity with the platinum sensor and stainless steel external thread.

This method incorporates a series of four platinum rings into the probe shaft and is highly accurate requiring very little maintenance.

The removable plastic cover resists the harmful effect of most chemicals and can be unscrewed for quick and simple maintenance.

This probe can withstand temperatures of up to 120°C (248°F) and pressure of up to 5 bar (72.5 psi).

This probe is supplied complete with a 7-pin DIN connector.



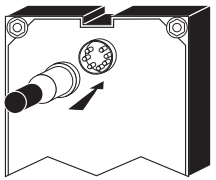
CALIBRATION PROCEDURE OF HI 943500 WITH HI 7638

Material needed

- **HI 7638** conductivity probe
- **HI 943500** conductivity controller
- Calibration solutions, according to the different models:
  HI 7034 80mS/cm @25°C for **HI 943500A**
  HI 7030 12.88mS/cm@25°C for **HI 943500B**
  HI 7031 1413 µS/cm @25°C for **HI 943500C**
  HI 7033 84 µS/cm @25°C for **HI 943500D**

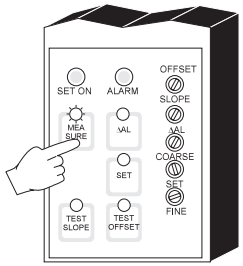
PROCEDURE

- Ensure that the probe is connected to the meter securely by aligning the pins with the socket, pushing the plug in and tightening the threaded ring.



- Insert the probe into the sleeve.

- With the conductivity probe in air, press the "MEASURE" key to set the meter to measurement mode.



- FOR HI 8931

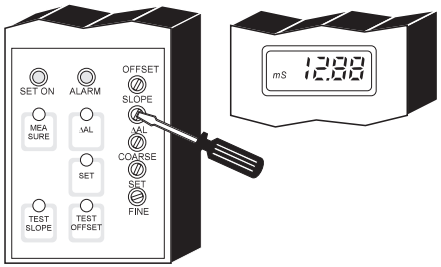
When the reading stabilizes, turn the SLOPE trimmer on the front of the **HI 8931** until the LCD reading is the same as the calibration solution at 25°C (77°F), i.e.

"80.0 mS" using **HI 7034** with **HI 8931A**

"12.88 mS" using **HI 7030** with **HI 8931B**

"1413 µS" using **HI 7031** with **HI 8931C**

"84.0 µS" using **HI 7033** with **HI 8931D**



- The calibration is now complete and the instrument is ready for use. All subsequent measurements will be compensated to 25°C (77°F).
- If the instrument will not calibrate, refer to the "Probe Maintenance and Cleaning" section on page 46.
- If the **HI 8936** is not used in conjunction with the **HI 8931** controller, connect the transmitter to an external power supply (see page 20), to the **HI 7638** conductivity probe (see page 24) and to an ammeter (see page 20).

  The calibration of the transmitters with LCD (**HI 8936L** series) does not require any ammeter.

  Follow the above calibration procedure performing the operations referred to the **HI 8936** transmitter only.

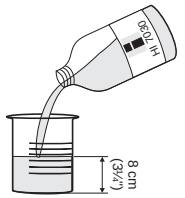
SPECIFICATIONS HI 8931 & HI 943500

Range	
HI 8931A - HI 943500A	0.0 to 199.9 mS/cm
HI 8931B - HI 943500B	0.00 to 19.99 mS/cm
HI 8931C - HI 943500C	0 to 1999 µS/cm
HI 8931D - HI 943500D	0.0 to 199.9 µS/cm
Accuracy (@20°C/68°F)	±2% of Full Scale excluding probe error
Typical EMC Deviation	±2.5% of Full Scale ±0.4 mA
4-20mA INPUT from Transmitter	
HI 8931A	**HI 8936 A** or **AL** (not included)
HI 8931B	**HI 8936 B** or **BL** (not included)
HI 8931C	**HI 8936 C** or **CL** (not included)
HI 8931D	**HI 8936 D** or **DL** (not included)
HI 943500	------
Conductivity Probe	**HI 7635** for in-line applications or **HI 7638** for tank (not included)
Calibration	Manual, 2 point, through offset and slope trimmers
Temp. Compensation	
HI 8931	See transmitter **HI 8936**
HI 943500	Automatic, 0 to 60°C with ß=2%
Recorder Output	4 to 20 mA (isolated)
Set Point Relay and Alarm Relay	Isolated, 2A, Max. 240V, resistive load, 1,000,000 strokes
Power Supply	115 or 230 Vac ±10% (user selectable); 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH 95%
Panel Cutout	141 x 69 mm (5.6 x 2.7")
Weight	1 kg (2.2 lb.)
Enclosure	DIN 43 700, 144x72 mm (5.7x2.8"), black anodized aluminum; front and back with shockproof ABS plastic, and transparent cover

SPECIFICATIONS HI 8936

Range **HI 8936 A/AL** **HI 8936 B/BL** **HI 8936 C/CL** **HI 8936 D/DL**	 0.0 to 199.9 mS/cm 0.00 to 19.99 mS/cm 0 to 1999 µS/cm 0.0 to 199.9 µS/cm
Accuracy **(@20°C/68°F)**	±2% of Full Scale excluding probe error
Typical EMC **Deviation**	±2% of Full Scale ±0.4 mA
Conductivity Probe	**HI 7635** for in-line applications or **HI 7638** for tank (not included)
Calibration	Manual, 2 point, through offset and slope trimmers
Temperature **Compensation**	Fixed or automatic from 0 to 50°C (32 to 122°F) with ß=2%
Output	4 to 20 mA not-isolated max. 500 Ohm
Power Supply **HI 8936 A/B/C/D** **HI 8936 AL/BL/CL/DL**	 12 to 30 Vdc 17 to 36 Vdc
Protection	IP 65
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	165 x 110 x 90 mm (6.5 x 4.3 x 3.5")
Weight	1 kg (2.2 lb.)

- Pour at least 8 cm (3¼") of conductivity solution into a plastic beaker.



- Immerse the probe into the conductivity solution. The holes on the sleeve must be completely submerged in the solution.

- Tap the probe repeatedly on the bottom of the beaker and stir it to ensure that no air bubbles remain trapped inside the sleeve.
- If the temperature of the probe is close to that of the solution, the display of **HI 8931** will stabilize quickly and provide a temperature compensated conductivity measurement. Allow a few minutes if there is a temperature difference of about 5°C (9°F) or more for the ATC circuitry to compensate completely.
- <u>For HI 8936</u>

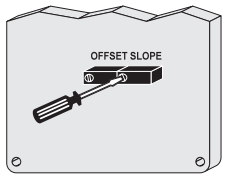
  Adjust the SLOPE trimmer of the **HI 8936** transmitter to read on the ammeter:

  "10.4 mA" using **HI 7034** and **HI 8936 A/AL**

  "14.304 mA" using **HI 7030** and **HI 8936 B/BL**

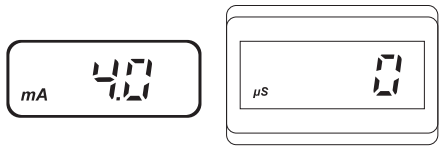
  "15.304 mA" using **HI 7031** and **HI 8936 C/CL**

  "10.72 mA" using **HI 7033** and **HI 8936 D/DL**



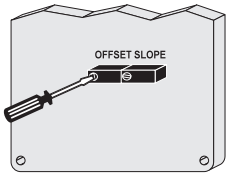
- Leave the **HI 7638** conductivity probe in air (dry probe).

- When the power is on, the ammeter should read "4.0 mA" or the **HI 8936** transmitter with LCD should display "0".



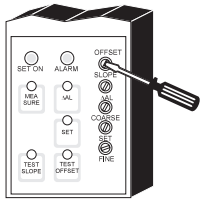
AMMETER HI8936 WITH LCD

- If not, adjust the **HI 8936** OFFSET trimmer to obtain "4 mA" or "0" on the **HI 8936L**.



- The **HI 8931** controller should display "0".

- If not, adjust the **HI 8931** OFFSET trimmer to display a zero reading.

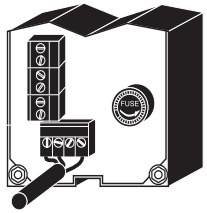


CONNECTIONS

REAR CONNECTIONS FOR HI 8931

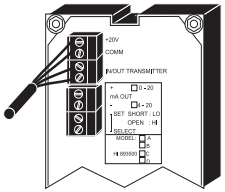
- **Power Connection Terminals**

4-screw-terminal-strip for connection to a 3-wire power cable according to the indicated voltage (115 or 230V).



- **IN/OUT Transmitter**

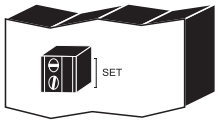
2 wires of the 4-core signal cable from the conductivity transmitter (**HI8936**) have to be connected to the mA input terminals and the other 2 wires to the "**+20 V**" and "**COM**" while paying careful attention to the polarity.



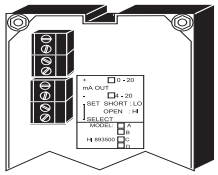
+20 V supply is the regulated DC supply required for the operation of the external conductivity transmitter HI 8936.

- **Set Contacts**

Dosing pumps or other control equipment may be connected to the "SET" (Max. 2A, 240 V) terminals. These contacts act only as a "dry" switch allowing electrical continuity, not as a power supply.



- Set Select



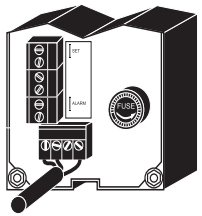
These contacts permit the activation of a Set Contact relay when the measured value is lower (connected terminals) or higher (open terminals) than the user's set value. See also page 28.

- +4-20 mA

These are the output terminals for connection to a recorder or other control equipment.

The output current varies from 4 to 20 mA and is proportional to the measured conductivity value.

- Alarm Contacts



During normal operation these terminals remain closed.

If the measured conductivity level is not within the tolerance of the set value, the alarm contact is open. These contacts act only as a switch. See also page 29.

CALIBRATION PROCEDURE OF HI 8931 & HI 8936 WITH HI 7638

Material needed:

- **HI 7638** conductivity probe
- **HI 8931** conductivity controller
- **HI 8936** conductivity transmitter
- An ammeter (for transmitters without LCD)
- Calibration solutions, according to the different models:

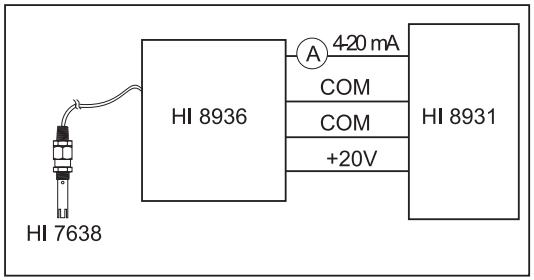
HI 7034	80 mS/cm @25°C for HI 8931A, HI 8936 A/AL
HI 7030	12.88 mS/cm @25°C for HI 8931B, HI 8936 B/BL
HI 7031	1413 µS/cm @25°C for HI 8931C, HI 8936 C/CL
HI 7033	84 µS/cm @25°C for HI 8931D, HI 8936 D/DL

PROCEDURE

- Connect the **HI 7638** to the **HI 8936** transmitter (see page 24).
- Connect the **HI 8936** transmitter to the **HI 8931** controller (see page 25).
- Connect the **HI 8931** controller to the mains (see page 25).

Before proceeding with the calibration, make sure that the meter is in measurement mode ("MEASURE" LED is on) and not in set mode.

- Connect the ammeter to the **HI 8936** transmitter to monitor the signal current (see below picture).



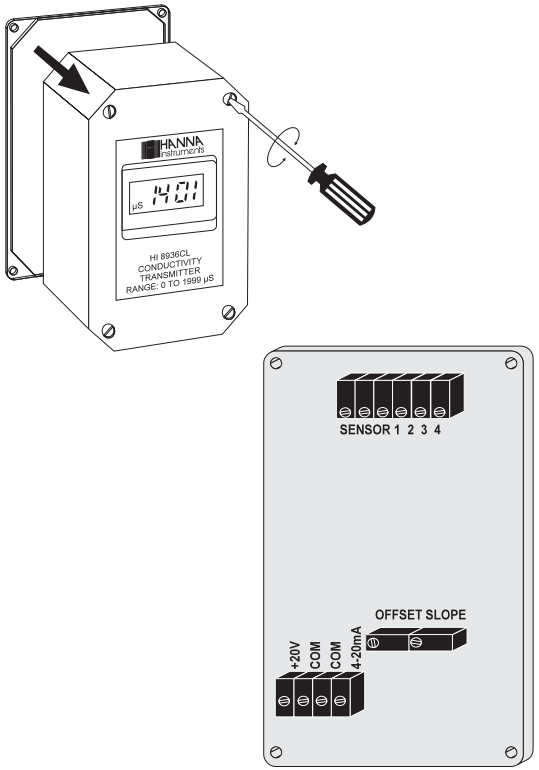
- The calibration is now complete and the instrument is ready for use. All subsequent measurements will be compensated to 25°C (77°F).
- If the instrument will not calibrate, refer to the "Probe Maintenance and Cleaning" section on page 46.
- If the **HI 8936** is not used in conjunction with the **HI 8931** controller, connect the transmitter to an external power supply (see page 20), to the **HI 7635** conductivity probe (see page 24) and to an ammeter (see page 20).

  The calibration of the transmitters with LCD (**HI 8936L** series) does not require an ammeter.

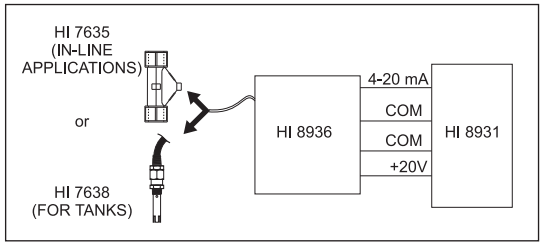
  Follow the above calibration procedure performing the operations referred to the **HI 8936** transmitter only.

TERMINAL BOARD CONNECTIONS FOR H8936

- Remove the 4 screws and the top cover of the **HI 8936** conductivity transmitter to obtain access to the terminal board connections.

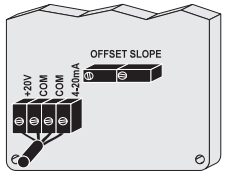


- HI 8936 used in conjunction with HI 8931 controller



Use a PVC insulated 4-core cable to connect the transmitter to the **HI 8931** conductivity controller (see also page 25).

The 4-core cable has to be connected to the transmitter according to the label instructions on the 4-terminal strip.

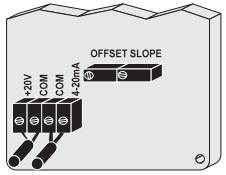


The regulated D.C. supply required for the proper operation of the transmitter is "+20 V", labeled "+20 V" and "COM". The current (mA) output terminals are labeled "4-20 mA" and "COM".

The transmitter is protected against inversion of supply voltage.

- <u>HI 8936 used in conjunction with an external power supply</u>

Use 2 PVC insulated 2-core cables.



Connect a +20 Vdc power supply directly to the terminals labeled "+20 V" and "COM", paying careful attention to polarity (see also page 24) or if necessary in series with the receiving device.

The regulated DC supply required for the proper functioning of the circuit is marked "+20 V" and "COM", and the transmitter current output is indicated "4-20 mA" and "COM".

The transmitter is protected against inversion of supply voltage.

Max. current required: 40 mA.

- <u>Use of an amplifier</u>

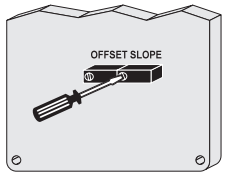
The maximum permissible distance between the power supply unit and the amplifier is 300 m (1000'). It is not necessary to use a shielded cable.

- The reading will be converted to mA by the following formula:
  mA = K (measured value x 16/2000) + 4
  K = conversion factor depending on the model

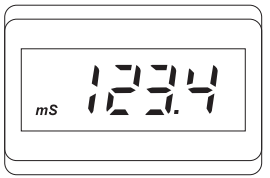
Model	Conversion factor K
HI 8936 A/AL	10
HI 8936 B/BL	100
HI 8936 C/CL	1
HI 8936 D/DL	10

For example, using an **HI 8936A**, if the measured value is 123.4 mS, then
output current = 10 x (123.4 x 16/2000)+4 = 13.9 mA

Adjust the **HI 8936** SLOPE trimmer to read "13.9 mA" on the ammeter, or the reading of the **HI 8733** (e.g. 123.4 mS) on the **HI 8936L** display. .

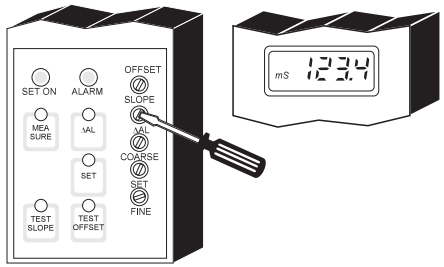


AMMETER

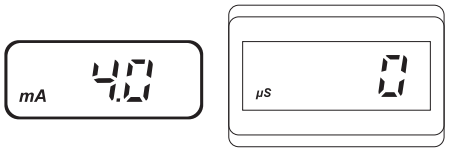


HI8936 WITH LCD

- Adjust the **HI 8931** SLOPE trimmer until the controller reading is the same as the one displayed by the **HI 8733** (e.g. 123.4 mS).

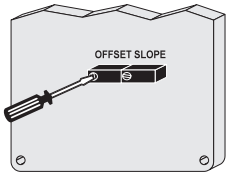


- Ensure that the **HI 7635** conductivity probe is dry.
- When the power is on, the ammeter should read "4.0 mA". The **HI 8936** transmitter with LCD should display "0".



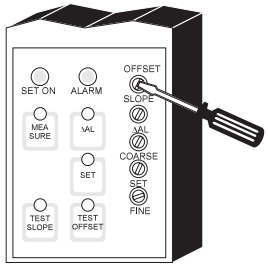
AMMETER HI8936 WITH LCD

- If not, adjust the transmitter OFFSET trimmer to read "4 mA" or "0" on the **HI 8936** LCD.

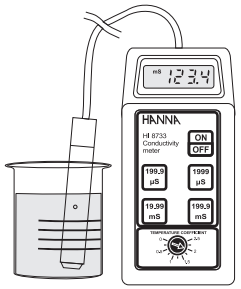


- The **HI 8931** controller should display "0" value.

- If not, adjust the **HI 8931** OFFSET trimmer to display a zero reading.

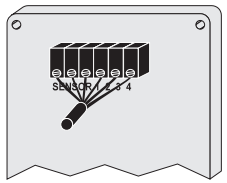


- Switch the flow on and allow the sample solution to flow through the **HI 7635** conductivity probe. Collect a sample of this solution in a beaker.
- Measure the conductivity of the solution with a reference conductivity meter with ATC (**HI 8733**). The value obtained will be used for the transmitter and controller calibration.



- <u>Probe Connection</u>

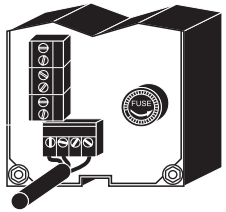
The conductivity probe is supplied with a 3 m (10'), 6 core cable. The cable is to be connected to the terminals provided (see also page 24 for proper connection scheme of **HI 7635** and **HI 7638**).



REAR CONNECTIONS FOR HI 943500

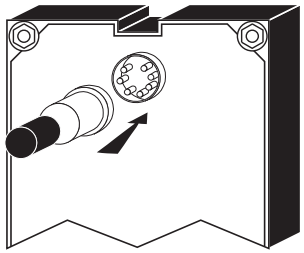
- **Power Connection Terminals**

4-screw-terminal-strip for connection to a 3-wire power cable according to the indicated voltage (115 or 230 V).



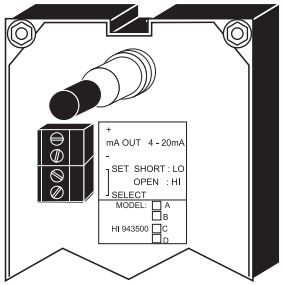
- **DIN connector socket**

For connection to the **HI 7638** conductivity probe.



- **+ mA output -**

The first and the second terminals are the **output terminals** for connection to a recorder or other control equipment. The output current varies from 4 to 20 mA and is proportional to the measured conductivity value.



- **Set Select**

These contacts permit the activation of the Set Contact relay when the measured value is lower (connected terminals) or higher (open terminals) than the user's set value. See also page 28.

CALIBRATION PROCEDURE OF HI 8931 & HI 8936 WITH HI 7635

Material needed:

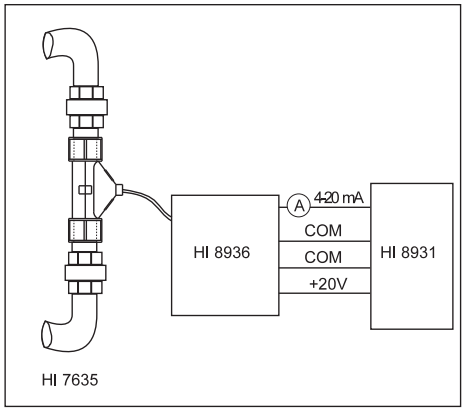
- **HI 7635** conductivity probe
- **HI 8931** conductivity controller
- **HI 8936** conductivity transmitter
- A 20 mA f.s. ammeter (for transmitters without LCD)
- A reference conductivity meter with automatic temperature compensation accurately calibrated (e.g. **HI 8733**).

PROCEDURE

- Connect the **HI 7635** probe to the **H I8936** transmitter (see page 24 for details).
- Connect the **HI 8936** transmitter to the **H I8931** controller (see page 25 for details).
- Connect the **HI 8931** controller to the mains (see page 25 for details).

Before proceeding with the calibration, make sure that the meter is in measurement mode ("MEASURE" LED is on) and not in set mode.

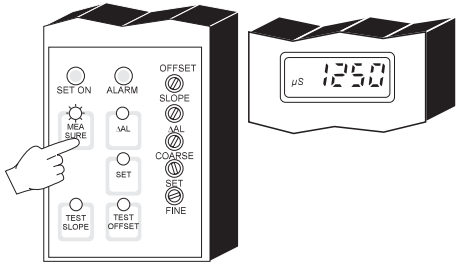
- Connect the ammeter to the **HI 8936** transmitter to monitor the signal current (see below picture).



The alarm contacts of **HI 8931** and **HI 943500** remain closed during normal operation. If the measured conductivity level is not within the tolerance of the set value, the alarm contact will be open.

TAKING MEASUREMENTS WITH HI 8931 AND HI 943500

After setting the working point and alarm value, press the "MEASURE" key. The actual conductivity value of the test solution will be displayed.



TAKING MEASUREMENTS WITH HI 8936AL, HI 8936BL, HI 8936CL, HI 8936DL

The conductivity transmitters with LCD will always display the measurement value when connected to the **HI 8931** controllers or a power supply.

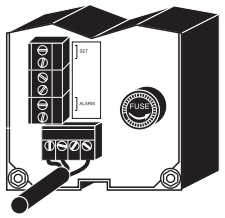
- **Set**

Dosing pumps or other control equipment may be connected to the "SET" (Max. 2A, 240 V) terminals. These contacts act only as a "dry" switch allowing electrical continuity, not as a power supply.

- **Alarm Contacts**

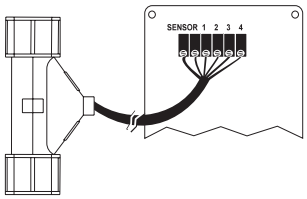
During normal operation these terminals remain closed.

If the measured conductivity level is not within the tolerance of the set value, the alarm contact is open. These contacts act only as a switch. See also page 29.



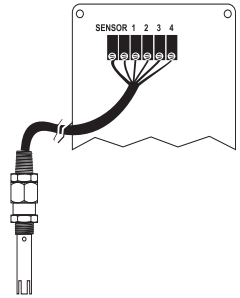
CONDUCTIVITY PROBE CONNECTIONS

The connections for **HI 7635** are color coded for easy installation and are as follows:

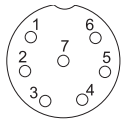


HI 7635 cable	HI 8936 transmitter
Black or Grey	NTC
Red or Pink	SENSOR
Brown or Orange	probe pin 1
Blue	probe pin 2
White	probe pin 3
Green or Yellow	probe pin 4

The connections for **HI 7638** are as follows:



HI 7638	HI 8936 transmitter
#1	probe pin 1
#2	probe pin 2
#3	probe pin 3
#4	probe pin 4
#5	NTC
#6	SENSOR



connector
inside view

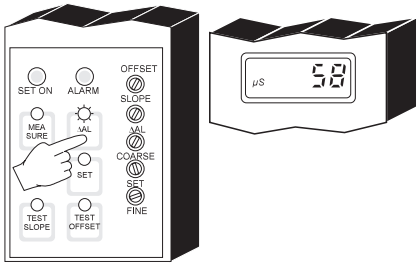
Note: NTC & SENSOR are equivalent, and are both labeled "SENSOR" on the **HI 8936** conductivity transmitter.

Below Setpoint Control Operation

Short the "SET SELECT" and "COM" connectors with a jumper wire. The set contact relay will close if the measured value is lower than the setpoint value, and the "SET ON" LED will light up.

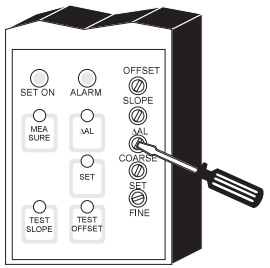
ALARM

Press the "ΔAL" key and the display will show the set tolerance for the alarm.



Use a small screwdriver to adjust the "ΔAL" trimmer until the desired tolerance is displayed.

For example, if the set value is 200 µS/cm and a ΔAlarm of 50 µS/cm is set, an alarm will be activated every time the measured value is higher than 250 µS/cm or lower than 150 µS/cm.



When an alarm occurs, the "ALARM" LED lights up.

OPERATING INFORMATION

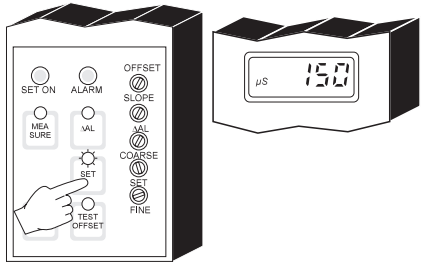
All parameters are set through the front panel keys and trimmers.

When any key is pressed, the corresponding LED lights up to indicate that the function is active.

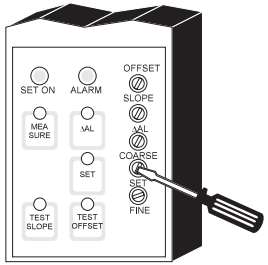
Make sure that the conductivity meter, transmitter and probe are calibrated before taking measurements (see pages 31, 35 and 39 for calibration procedures).

SET POINT

To set the working point of the controller, press the SET key. The display will indicate the current set value.

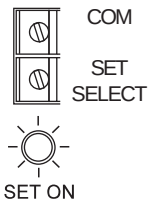


Use a small screwdriver to adjust the COARSE and FINE trimmers until the desired value is displayed.



Above Setpoint Control Operation

Leave the "SET SELECT" and "COM" connectors open. The set contacts relay will close if the measured value is higher than the setpoint value, and the "SET ON" LED will light up.



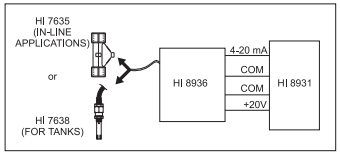
OPERATIONAL GUIDE

INITIAL PREPARATION & INSTALLATION

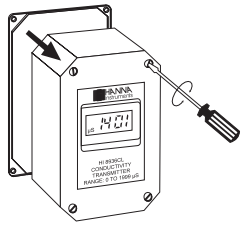
Material needed:

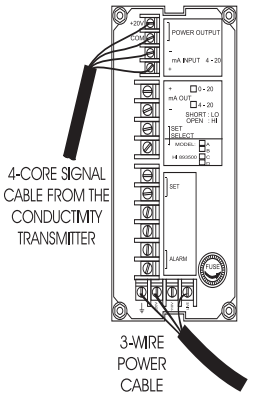
- a 3-wire power cable (to connec the **HI 8931** or **HI 943500** to the mains)
- a PVC insulated 4-core cable (to connect the **HI 8931** to **HI 8936**)
- rubber seals and a pipe sealant (for installation of **HI 7635**)

FOR HI 8931 AND HI 8936 ONLY



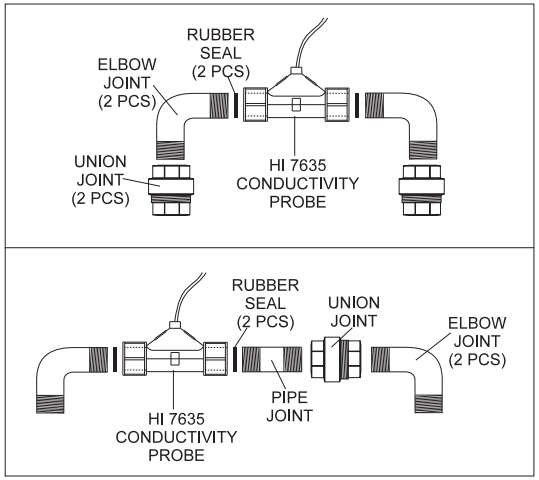
- Remove the 4 screws and the top of the **HI 8936** conductivity transmitter.
- Connect the 2 wires connected to the "4-20 mA" and "COM" terminals of the 4-core signal cable from the **HI 8936** to the terminals marked "mA input" paying careful attention to polarity. Connect the other 2 wires to the "+20 V" and "COM" terminals, while paying attention to the polarity.
- Connect the 3-wire power cable to the 4-screw terminal strip according to the voltage level as indicated, and pay particular attention to the correct live, earth and neutral terminal connections.



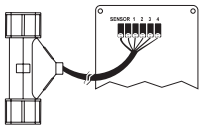


- The **HI 8936** transmitter may be wall-mounted at any convenient location close to the measurement site.
  To minimize thermal drifts due to extreme temperature fluctuations, particularly for outdoors measurements, it is recommended to protect the transmitter inside a casing.

- For the installation of the **HI 7635** conductivity probe, use rubber seals between the probe and the pipe or elbow joints. A pipe sealant is also recommended to ensure a leak free joint. When screwing the joints, take care not to overtighten as excessive pressures can damage the probe.



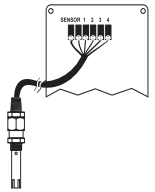
- The **HI 7635** conductivity probe is supplied with a 3 m (10') cable. The 6-core cable of the probe is connected to the **HI 8936** transmitter as shown. The connections are color coded for an easy installation.
  See page 24 for the proper connection scheme.



- It is recommended to install the **HI 7635** vertically. This is to ensure that trapped air bubbles or turbulent flows cause minimal interference to the measurement system. The maximum working pressure of this unit is 5 bar (72.5 psi).

WARNING: Do not use when temperature exceeds 80°C (176°F).

- The **HI 7638** process conductivity probe is also supplied with a 3 m (10') cable. The 6-core cable of this probe is connected to the **HI 8936** process conductivity transmitter as shown.



  The DIN connector has to be removed when this probe is used in conjunction with an **HI 8936** transmitter. See page 24 for the proper connection scheme.

FOR HI 943500 ONLY

Ensure that the **HI 7638** conductivity probe is connected to the meter securely by aligning the pins with the socket, pushing the plug in and tightening the threaded ring.