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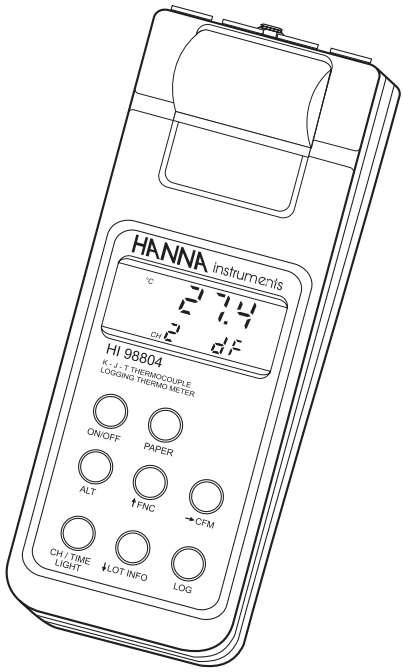
Instruction Manual

HI 98701 • HI 98801
HI 98704 • HI 98804

Printing and Logging K-J-T Thermocouple Thermometers



HANNA instruments
www.hannainst.com

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 the correct use of the instrument, as well as a precise idea of its 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 CE directives.

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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 damage, notify your Dealer.

Each thermometer is supplied complete with:

- Paper rolls (5 pcs)
- Batteries (4 x 1.5V AA alkaline)
- Instruction manual
- Rugged carrying case

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

GENERAL DESCRIPTION

This series of HANNA instruments® portable thermocouple thermometers with built-in printer and microprocessor technology, provides accurate temperature measurements and data record.

The meters can support K, J or T thermocouple probes, one for models **HI 98701** and **HI 98801**, up to four for **HI 98704** and **HI 98804**.

The thermocouple type is user selectable.

The meters are equipped with an easy-to-read LCD with backlight feature for comfortable reading even in dark environments.

The meters provide a controlled access to calibration and GLP settings through a password protection method.

An alarm time-out is available to alert the user if too much time has elapsed since the last calibration and that re-calibration may be required.

To prolong battery life, the backlight and printing features are disabled when the batteries are getting low; "LOBAT" indication is displayed on LCD to warn the user of this condition. However, the meter continues to measure correctly even when the low battery indication is displayed. The Battery Error Preventing System (BEPS) automatically switches the meter off when the batteries are too weak to support proper function.

The meters are equipped with an internal lithium battery that powers the clock circuit even in the absence of power supplies.

For long term field and lab applications, these instruments can be connected to a 12 Vdc adapter.

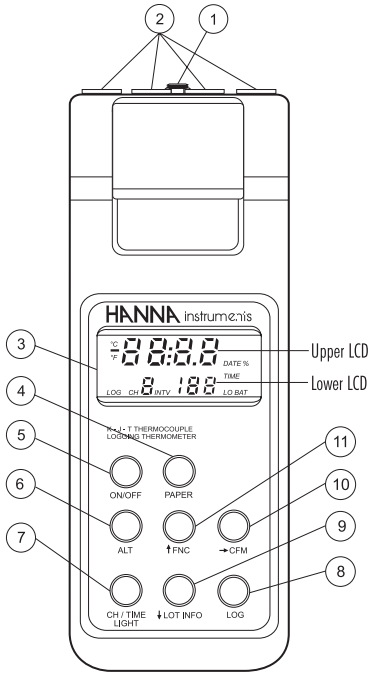
HI 98801 and **HI 98804** can store the measurements in memory at a user selectable interval from 1 to 180 minutes. This information can be retrieved at a later time and also printed.

HI 98801 and **HI 98804** also allow the transfer of stored data to a computer via the **HI 9200** infrared transmitter connected to the computer RS232 port.

Each meter can also be uniquely identified by the user by assigning an ID code.

HANNA instruments® produces a wide range of K-type thermocouple probes that can be used with these thermometers for many applications (**HI 766** series, see "Accessories" section).

FUNCTIONAL DESCRIPTION



1) Power adapter plug
2) Temperature probe connectors (1 or 4, depending on model)
3) Liquid Crystal Display (LCD)
4) **PAPER** key, to move the paper up
5) **ON/OFF** key, to turn the meter on or off
6) **ALT** key, to alternate key function
7) **CH/TIME** key (**HI 98704** and **HI 98804**), to select input channels, view date & time, and (with ALT) enable backlight
   TEMP/TIME key (**HI 98701** and **HI 98801**), to select temperature reading, view date & time, and (with ALT) enable backlight
8) **LOG** key, to store and/or print measurements
9) **↓LOT INFO** key (**HI 98801** and **HI 98804**), to move down or (with ALT) view logging information
   ↓ key (**HI 98701** and **HI 98704**), to move down
10) **→CFM** key, to move right or (with ALT) confirm values
11) **↑FNC** key, to move up or (with ALT) select function codes

SPECIFICATIONS

Range (*)	**K**	-200.0 to 999.9 °C ; 1000 to 1370 °C -300.0 to 999.9 °F ; 1000 to 2500 °F
	J	-200.0 to 760.0 °C -300.0 to 999.9 °F ; 1000 to 1400 °F
	T	-200.0 to 400.0 °C -300.0 to 750.0 °F
Resolution	**K**	0.1°C (-99.9 to 999.9 °C); 1°C (1000 to 1370 °C) 0.2 °C (-200.0 to -100.0 °C) 0.2°F (-199.9 to 999.9 °F); 1°F (1000 to 2500°F) 0.3 °F (-300.0 to -200.0 °F)
	J	0.1 °C (-149.9 to 760.0 °C) 0.2 °C (-200.0 to -150.0 °C) 0.1 °F (32.0 to 999.9 °F); 1 °F (1000 to 1400 °F) 0.2 °F (-300.0 to 32.0 °F)
	T	0.1 °C (-99.9 to 400.0 °C) 0.2 °C (-200.0 to -100.0 °C) 0.1°F (300.0 to 750.0°F);0.2°F (-149.9 to 300.0°F) 0.3 °F (-300.0 to -150.0 °F)
Accuracy (@20°C/68°F)		±0.5 °C (-200.0 to 999.9 °C); ±1°C outside ±1°F for one year (excluding probe error)
Typical EMC Dev.		±5 °C; ±9 °F
Channels		**HI 98701** / **HI 98801**: 1 channel **HI 98704** / **HI98804**: 4 channels
Probe		K , J or T-type thermocouple
Cold Junction		NTC 10K ; 0.1°C resolution ; ±0.3°C accuracy
Printer		Low power impact, 14 characters per line using 38 mm plain paper (**HI 710034**)
Printing/Logging Interval		Selectable at 1, 2, 5, 10, 15, 30, 60, 120 or 180 minutes
Auto-off		Selectable after 5, 10, 15, 30, 45 or 60 minutes
Power supply		4 x 1.5V AA batteries / approx. 350 hours of use (without printing and backlight); or 12 Vdc input
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		220 x 82 x 66 mm (8.7 x 3.2 x 2.6")
Weight		550 g (1.2 lb.)

(*) Tables from NIST Monograph 175 revised to ITS-90 are used

INITIAL PREPARATION

Each meter is supplied complete with batteries. Remove the back cover, unwrap the batteries and install them while paying attention to the polarity.

Alternatively, connect a 12 Vdc voltage adapter to the power adapter plug on the top of the instrument.

To prepare the instrument for use, choose the most appropriate temperature probe(s) for your application (see "Accessories" section for a complete list) and connect it (them) to the connector(s) on the top of the instrument.

With the meter facing you, channel #1 is the first connector on the top left hand side.

To switch the meter on, press the ON/OFF key. The batteries charge status or "LINE" message (if external power adapter is connected) will be displayed on the LCD for a few seconds.

The meter is now ready to operate.

To maximize battery life, the meter is automatically switched off after a user selectable period of non-use (this feature is enabled and set to 5 minutes by default; it can be disabled or changed through setup code #40).

If in logging mode, after the period of non-use, the meter will continue to monitor the temperature periodically at the end of every logging interval. Only the "LOG" indication will be displayed.

While storing data in memory, during the sleep mode, the reading will appear briefly on the LCD.

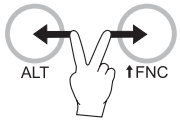
To reactivate the display press the ON/OFF key.

Note: When the use of an alternate function (FNC, CFM and LOT INFO) is requested, press and hold the ALT key first and then the second key.

SETUP MODE

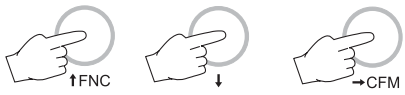
Setup can be used to view data regarding instrument status (e.g. battery charge) or GLP data (e.g. calibration date) or to view or print the logged data. It also allows the user to change the meter parameters (e.g. time) and to gain access to stored data.

- To enter this mode ensure the meter is not logging and then press the ALT and FNC keys.



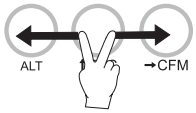
- The scrolling message "Insert the function code or press "ALT" - "FNC" to escape" in the upper LCD and the indication "F 00" with the first digit blinking in the lower LCD will be displayed.

- Enter the first digit of the code of the parameter you want to set using the ↑ or ↓ key and pass to the next digit with →. The second digit will start blinking.

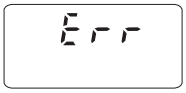


- Enter the second digit using the ↑ or ↓ key.

- Press ALT and CFM to confirm the code.



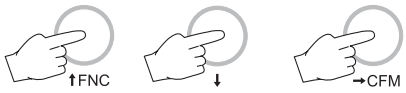
- If the entered code doesn't exist the "Err" message will be displayed for a few seconds and then the message "Insert the function code or press ALT - FNC to escape" will recommence scrolling in the upper LCD.



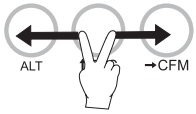
PASSWORD PROTECTION

Setting of the GLP parameters (calibration alarm time-out, instrument ID code, time and date) can be password protected. If password is set to a value different from 0000 (factory setting), the user will be asked to enter the password.

- Select the desired GLP parameter code.
- Enter the password by the arrow keys.



- Press the ALT and CFM keys to confirm.



- If password is wrong the meter will return to the function selection mode without any warning message.
- If password is correct, the meter provides access to the parameter.

PARAMETERS SETTING

- Once the parameter code has been entered, the appropriate message will scroll across the LCD for a few seconds.
- The current value of the selected parameter on the upper LCD and the parameter code on the lower LCD will be displayed. The first digit will blink if the parameter can assume continuous values. All the digits will blink if the parameter can assume only a fixed set of values.
- Enter the new value using the arrow keys.
- Press ALT and CFM to confirm the value.

The following table lists the setup codes along with the description of the specific setup items, their valid values and the factory settings (default):

Code	Valid values	Default
00 Lot data printing/scrolling[1]	00÷16	00
01 Print lots data summary[1]		
02 Printer enable[1]	On(enabled); Off(disabled)	On
03 Logging interval	1,2,5,10,15,30,60,120,180	1
05 Log on demand delete[1] or Reset sample number[2]		
06 Timed data delete[1]		

Code	Valid values	Default
10 Show GLP data		
11 Calibration alarm time-out	On(enabled); Off(disabled)	On
20 Instrument ID code	0000 ÷ 9999	0000
30 Current time[3]	hh:mm	00:00
31 Current day[3]	dd	01
32 Current month[3]	MM	01
33 Current year[3]	YYYY	1998
40 Auto-Off/Power down time-out	Off,5,10,15,30,45,60	5
41 Battery level test		
50 RS232 baud rate[1]	1200, 2400, 4800	4800
60 Firmware version		
70 Thermocouple type selection	"dEF"(K) ; "J"(J) ; "t"(T)	"dEF"
71 Celsius/Fahrenheit selection	°C ; °F	°C
99 Password[4]	0000 ÷ 9999	0000

Note: If a wrong code is entered the "Err" message is displayed on LCD for a few seconds.

Note: Code 05 has a different function in HI9880x and HI9870x series as explained in detail in the following.

1 In HI 98801 and HI 98804 only.

2 In HI 98701 and HI 98704 only.

3 The meter automatically checks for entered time/date accuracy as follows:
0≤hh≤23; 0≤mm≤59; 01≤dd≤28/29/30/31; 1≤MM≤12; 1998≤YYYY≤2097.

4 To change the password, the correct code must be entered first. If the password has been forgotten, the password protected features are no longer accessible; in this case contact your nearest Hanna Service Center.

SETUP MESSAGES LIST

cod. 00: Lot data Printing
cod. 01: Lot table Printing
cod. 02: Printer enable
cod. 03: Log Interval
cod. 05: Press "ALT CFM" to reset the sample number or "ALT FNC" to escape[2]
or: Press "ALT CFM" to delete Lot00 or "ALT FNC" to escape[1]
cod. 06: Press "ALT CFM" to delete Lot 01-16 or "ALT FNC" to escape
cod. 10: GLP
cod. 11: Calibration alarm time-out
cod. 20: Instrument ID Code
cod. 30: Hour - Minute
cod. 31: Day
cod. 32: Month

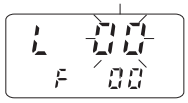
cod. 33: Year
cod. 40: Auto OFF
cod. 41: Battery test
cod. 50: Baud rate
cod. 60: Release code
cod. 70: Thermocouple type
cod. 71: Celsius or Fahrenheit
cod. 99: Pass Code

Some of the most important functions are explained below in a step by step sequence.

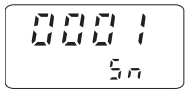
TO SCAN LOGGED DATA (HI98801 and HI98804 only)

COD. 00 - Lot data Printing / Scrolling

- Select the code 00.
- The message "Lot data Printing" will scroll twice across LCD.
- The upper LCD will then display L 00 with the 00 blinking.



- Set the desired lot by the arrow keys. L00 is the lot of data of the "log on demand" and L 01 to L 16 are the lots of the "timed log".
- Press the ALT and CFM keys to confirm the lot number.
- If the lot doesn't contain data, the "no data" message will scroll across the LCD twice and the meter will return to setup mode.
- If the lot contains one or more data the LCD will display the sample number in its upper part and Sn in the lower part.



Note: In the L 00 lot (log on demand) the sample number will be displayed with 3 digits (001).

- Select the sample number to scan by the arrow keys.

Printing logged data

- Press ALT and CFM to print logged data.
- If the selected sample number is invalid (equal to 0 or bigger than the number of samples), the "Err" message will be displayed for a few seconds.
- If the sample number is correct, the samples starting from the selected one to the last sample of the lot will be printed. To stop printing before the last sample is reached, press and hold the ALT and PAPER keys until the printer stops.
- During printout the LCD will display the sample number being printed at that moment. If printout is stopped the LCD will show

the last printed sample number. It is then possible to select another sample.

- Press the ALT and FNC keys to return to setup mode.

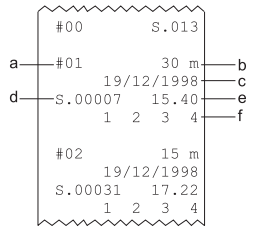
Viewing logged data

- Press CH/TIME (HI98804 only) or TEMP/TIME (HI98801 only) to view data of the selected sample. Data will be displayed in the following order:
  channel 1 temperature reading
  channel 2 temperature reading (HI 98804 only)
  channel 3 temperature reading (HI 98804 only)
  channel 4 temperature reading (HI 98804 only)
  date
  time
- If CH/TIME or TEMP/TIME is pressed when the time is displayed, the LCD will pass to the next Sample number.
- It is then possible to scroll the data of the next sample by pressing CH/TIME or TEMP/TIME or select a different sample by the arrow keys.
- to return to setup mode, press ALT and FNC when the meter displays the sample number.

Cod. 02 - Lot summary printout

- Select the code 02.
- The message "Lot table Printing" will scroll twice across LCD.
- The meter will then print a complete set of information based on the data stored in memory:

a - lot number
b - logging interval
c - starting date
d - number of samples
e - starting time
f - logged channels numbers.



Note For lot 00 the number of samples only will be printed.

DELETE LOGGED DATA (HI98801 and HI98804 only)

- Select code 05 to delete the Log on Demand data or code 06 to delete the Timed Log Data.
- A scrolling message will be displayed.
- Press the ALT and CFM keys to confirm deletion.
- It is also possible to escape without data deletion pressing the ALT and FNC keys.

TO RESET PRINTING SAMPLE NUMBER

(HI98701 and HI98704 only)

This feature resets the print on demand sample number to 001.

- Select the code 05
- A scrolling message will be displayed.
- Press the ALT and CFM keys to confirm reset or ALT and FNC to escape.

GLP DATA

Cod. 10 - viewing GLP data

- Select the code 10
- A message will scroll twice across LCD.
- The LCD will then display the instrument identification (ID) code.
- Press ↑ to scan remaining data, in the following order:
  channel 1 last calibration date (DD.MM)
  channel 1 last calibration year

Note: Data can be viewed in reverse order pressing the ↓ key.

- Press ALT and FNC to return to function selection mode.

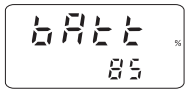
Code 20 - setting the identification (ID) code

When using several identical meters it may be useful to uniquely identify them by assigning an ID code to each meter.

- Select code 20. A message will scroll across LCD.
- Enter a 4-digit value using the arrow keys.
- Press ALT and CFM to confirm the value.

TESTING BATTERY LEVEL

- Select code 41. The message "Battery test" will scroll across LCD.
- If the meter is connected to an external power adapter, the LCD will display "LINE" otherwise it will display bAtt on the upper display, and the remaining percentage of battery charge (100% means fully charged battery and 0% corresponds to the minimum battery voltage that allows the meter to operate).



SELECTING THE THERMOCOUPLE TYPE

Three types of thermocouple can be connected to the meter:K, J and T.

- Select code 70.
- The types are indicated with "dEF" for K-type, "J" for J-type and "t" for T-type. Choose the desired type using the arrow keys.
- Press ALT and CFM to confirm the value.

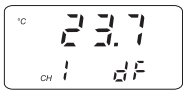
TAKING TEMPERATURE MEASUREMENTS

To prepare the instrument for use, choose the most appropriate temperature probe for your application (see "Accessories" section) and connect it to the instrument.

The factory default thermocouple type is K, represented with the "dF" indication. If needed, select a different type (J and T types also available) through setup code #70.

With the meter facing you, channel #1 is the first connector on the top left hand side.

Press the ON/OFF key to power on the instrument, and insert the probe in the sample to be tested and allow the reading to stabilize.



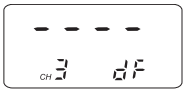
The temperature is displayed on the upper LCD. The lower LCD shows the selected channel number (**HI 98704** and **HI 98804** only).

The meter selects channel 1 as default. Press CH/TIME (**HI 98704** and **HI 98804**) or TEMP/TIME (**HI 98701** and **HI 98801**) to view the reading of the other channels, the cold junction temperature, date and time in the following order:

- channel 2 temperature reading (4-channel versions only)
- channel 3 temperature reading (4-channel versions only)
- channel 4 temperature reading (4-channel versions only)
- cold junction temperature reading ("C J" appears in the lower LCD)
- date
- time

Pressing CH/TIME or TEMP/TIME again, the meter returns to channel 1 temperature reading.

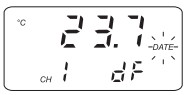
If the reading is out of range or the probe is not connected to a channel, the LCD will display dashes in place of the reading.



Note: To choose between "°C " and "°F" unit, enter the setup code 71.

Note: The meter is factory calibrated.

After 1 year since last thermocouple calibration the "DATE" symbol starts blinking on the LCD to warn the user that a recalibration is suggested to maintain the meter accuracy.



Contact the nearest HANNA service center for an accurate recalibration of your thermometer.

TEMPERATURE CALIBRATION PROCEDURE (for technical personnel only)

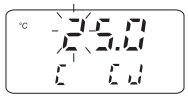
The meter is factory calibrated. However, as a general rule, it is recommended to have all thermometers recalibrated at least once a year. It is recommended that recalibration is performed by authorized technical personnel only to assure the accuracy of the instrument. Contact the nearest HANNA service center for an accurate annual recalibration.

Both thermocouple inputs and cold junction can be calibrated.

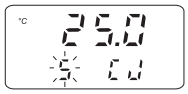
A two-point calibration at 0.000 mV and 41.269 mV has to be performed in order to store the new thermocouple calibration data in memory. Cold junction calibration is at one point only, corresponding to the environment temperature.

COLD JUNCTION CALIBRATION

1. Press CH/TIME or TEMP/TIME until the cold junction temperature reading is displayed.
2. Press ALT, CFM and PAPER simultaneously while the meter is not printing nor logging to enter calibration mode.
3. User is prompted to enter password if it has been set to a value different from 0000, otherwise skip to step 6.
4. Enter the password using the arrow keys.
5. Press ALT and CFM to confirm the password or CH/TIME or TEMP/TIME to exit.
6. If password is correct or not set, the meter will display "25.0°C" (or "77.0°F"), with the "2" (or "7") blinking, on the upper LCD and "C CJ" on its lower part; if wrong, it will return to measurement mode without any message.



7. Enter the actual cold junction temperature (the environment temperature measured with a reference thermometer) using the arrow keys (temperature must be between 0 and 50 °C).
8. When the "S" symbol blinks in the lower LCD, the reading is stable and calibration can be confirmed pressing ALT and CFM.



9. The LCD will display CALC for a few seconds and then the meter returns to normal operational mode.

THERMOCOUPLE CALIBRATION

1. With a mV simulator, input 0.000 mV at channel #1 of the meter.
2. Ensure the meter is not displaying the cold junction temperature and press ALT, CFM and PAPER simultaneously while the meter is not printing nor logging to enter calibration mode.
3. User is prompted to enter password if it has been set to a value different from 0000, otherwise skip to step 6.
4. Enter the password using the arrow keys.
5. Press ALT and CFM to confirm or CH/TIME or TEMP/TIME to exit.
6. If password is correct or not set, the meter will display "0°C" on the upper LCD and "C 0" on its lower part; if wrong, it will return to measurement mode without any message.

7. When the "S" symbol blinks in the lower LCD, the reading is stable and calibration can be confirmed pressing ALT and CFM.

8. The LCD will display CALC for a few seconds.
9. The second calibration point "1000°C" will be displayed on the upper LCD and "C 0" on its lower part.

10. Input 41.269 mV at channel #1 of the meter.
11. When the "S" symbol blinks in the lower LCD, the reading is stable and calibration can be confirmed pressing ALT and CFM.

12. "CALC" is displayed on the upper LCD for a few seconds and then the meter returns to normal operational mode.

Note: Even though only channel #1 is used during calibration, all the channels and all the thermocouple types are calibrated.

Note: If a wrong input is connected or channel #1 is left open, when confirming the calibration point the LCD will display "Err".

Note: To escape before ending the calibration procedure press CH/TIME or TEMP/TIME.

Note: When connecting a mV simulator to the meter use two wires of the same material of the simulator terminals to avoid undesired thermocouple junctions that could alter the mV input of the meter.

Note: Avoid touching the meter connectors if possible and wait about 15 minutes for temperature stabilization after connections before proceeding with the calibration steps.

HI 98801 - HI 98804
PRINTING / LOGGING FUNCTIONS

Two different modes to print / log data are available:

1. **Timed logging**; samples are stored and printed (if print function is active) at fixed time intervals. Data are stored in the lots 01 to 16.
2. **Log on demand**; samples are stored and printed (if print function is active) when the LOG key is pressed. Data are stored in the lot 00. It's possible to perform the Log on demand either in normal mode or in Timed logging mode.

It is possible to switch from logging without printing to logging with printing in two ways:

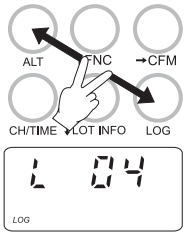
- set the function code 02 to "On" to enable printing, to "Off" to disable printing
- press ALT and PAPER to toggle between printer enabled and printer disabled while in Timed logging.

Note: In timed logging mode, channels with no probe connected are not logged nor printed. If all the channels are disconnected, the message "no connected probe" will scroll across the LCD.

Note: cold junction temperature is not logged nor printed.

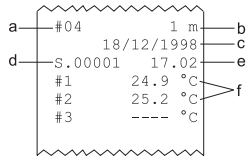
TIMED LOGGING MODE

To start Timed logging, press ALT and LOG. The lot number will be displayed for a few seconds then the LOG symbol will appear on LCD and if printer is enabled a first set of data will be printed. The "LOG" symbol will be fixed if printer is enabled and will blink if printer is disabled.



The printout provides the following information:

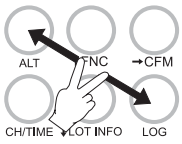
a - Lot number
b - Logging interval
c - Date (only for the first printed sample of the lot or of the day)
d - Sample number
e - Time
f - Readings ("----" means out of range).



Note: If no keys are pressed, the meter enters standby mode to prolong the battery life and only the "LOG" indication will be visible on LCD. While logging, during the sleep mode, the last

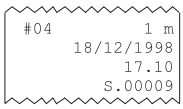
logged reading will appear briefly on the LCD. To reactivate the LCD press ON/OFF.

TO STOP LOGGING



In order to stop the recording mode, press ALT and LOG keys (press ON/OFF first, if meter is in sleep mode).

A last printout reporting the number of logged samples (e.g. S.00009) will be produced if printer is enabled.

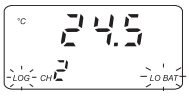


Notes:

- It is recommended to use the adapter during logging in printing mode, especially when many printouts are going to be taken.
- Before proceeding with logging with printing, make sure there is enough paper for your measurements. When the paper is finished the meter will not advise the operator and the printouts could be lost. If this happens, data will continue to be stored in memory, and it is always possible to print the data at a later time through setup code 00.
- It is possible to insert a new paper roll during logging session.
- Once in the logging mode, the interval cannot be changed. Exit the logging mode first (pressing the ALT and LOG keys) to set a new interval.
- If the LOG key is pressed while in logging with printing mode, a printout is produced without affecting the running sample number and the value is stored in Log on demand area.

LOW BATTERY CONDITION

Printout is automatically disabled when battery charge weakens. The last message "Stop log" will be printed and data will continue to be stored in memory with the LOG and LOBAT symbols blinking on LCD. If the user attempts to enable the printer while in low battery condition the message "bAtt" will appear for a few seconds on the LCD.



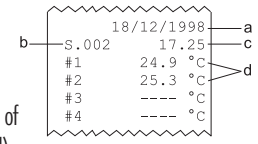
Note: When an external adapter or new batteries are connected, the printing must be manually enabled in order to return to logging with printing mode.

LOG ON DEMAND

In measuring or Timed log mode, press LOG to store the current reading. The LCD will display "Stor" and

the value will be stored in the lot 00 (log on demand data area). If the print function is enabled, a printout is also produced providing the following information:

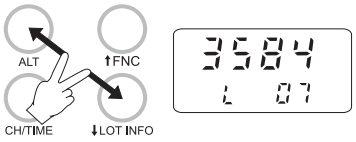
- a - Date
- b - Sample number
- c - Time
- d - Readings ("----" means out of range or probe not connected)



Note: When the Log on demand data area is full and the LOG key is pressed, the sample will not be stored and the LCD will display "FULL". In this case it is necessary to delete the Log on demand data to proceed.

TO VIEW LOGGING INFORMATION

If the ALT and LOT INFO keys are pressed during logging, the meter displays for a few seconds the current lot and the number of logged samples. The meter then returns to normal operational mode automatically.



If ALT and LOT INFO are pressed while the meter is not logging, the last logged lot in the lower LCD and the number of logged samples in the upper LCD are displayed. It is then possible to scroll through the following lot information with the → key:

- lot starting date (dd.mm)
- lot starting year
- lot starting time (hh.mm)
- lot logging interval
- logged channels (HI 98804 only)

By pressing the → key again, the meter displays the number of logged samples again.

When the number of logged samples is displayed, it possible to pass to another lot with the ↑ and ↓ keys. Press ↓ to view the older lots or ↑ to view the more recent ones.

If ↑ is pressed when the last lot is displayed, the meter displays the lot 00 (log on demand). By pressing the ↑ key again, the meter will pass to the oldest lot.

Note For lot 00, only the number of samples will be displayed.

To exit from the logging info viewing mode press ALT and LOT INFO again or CH/TIME (HI98804 only) or TEMP/TIME (HI98801 only).

TO RETRIEVE LOGGED DATA

Logged data can be viewed on LCD or printed. To view or print logged data see "TO SCAN LOGGED DATA" in the "SETUP MODE" paragraph.

The logging meters also allow the downloading of logged data to PC. To download data to PC see "DATA TRANSFER TO PC" paragraph.

HI 98701 - HI 98704
PRINTING FUNCTIONS

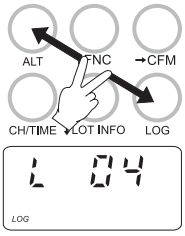
Two different modes to print data are available:

1. **Timed printing**; samples are printed at fixed time intervals. Data lots from 01 to 16 are available.
2. **Print on demand**; samples are printed when the LOG key is pressed. It's possible to perform the print on demand either in normal mode or in Timed printing mode.

Note: In timed printing mode, channels with no probe connected are not printed. If all the channels are disconnected, the message "no connected probe" will scroll across the LCD.

Note: cold junction temperature is not printed.

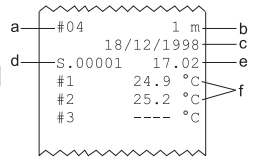
TIMED PRINTING MODE



To start Timed printing, press ALT and LOG. The lot number will be displayed for a few seconds then the LOG symbol will appear on LCD and a first set of data will be printed.

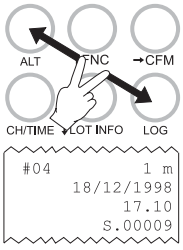
The printout provides the following information:

a - Lot number
b - Logging interval
c - Date (only for the first printed sample of the lot or of the day)
d - Sample number
e - Time
f - Readings ("----" means out of range).



Note: If no keys are pressed, the meter enters standby mode to prolong the battery life and only the "LOG" indication will be visible on LCD. While timed printing during the sleep mode, the last printed reading will appear briefly on the LCD. To reactivate the LCD press ON/OFF.

TO STOP PRINTING



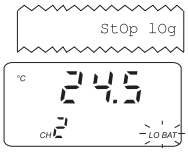
In order to stop the recording mode, press ALT and LOG keys (press ON/OFF first, if meter is in sleep mode).

A last printout reporting the number of printed samples (e.g. S.00009) will be produced.

Notes:

- It is recommended to use the adapter during printing mode, especially when many printouts are going to be taken.
- Before proceeding with printing, make sure there is enough paper for your measurements. When the paper is finished the meter will not advise the operator and the printouts could be lost.
- It is possible to insert a new paper roll during printing session.
- Once in the timed printing mode, the interval cannot be changed. Exit the timed printing mode first (pressing the ALT and LOG keys) to set a new interval.
- If the LOG key is pressed while in timed printing mode, a printout is produced without affecting the running sample number.

LOW BATTERY CONDITION



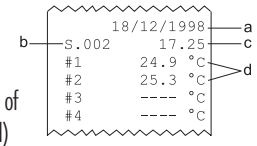
Printing is automatically interrupted when battery charge weakens. The last message "Stop log" will be printed and the LOBAT symbol will blink on LCD.

Note: When an external adapter or new batteries are connected, a new printing session must be manually restarted.

LOG ON DEMAND

In measuring or timed printing mode, press LOG to print the current readings. The printout provides the following information:

a - Date
b - Sample number
c - Time
d - Readings ("----" means out of range or probe not connected)



Note: If the user attempts to print while in low battery condition the message "bAtt" will appear for a few seconds on the LCD.

Note: It is possible to reset the sample number of the print on demand to 001 (see "TO RESET PRINTING SAMPLE NUMBER" in "SETUP MODE" paragraph).

GOOD LABORATORY PRACTICE (GLP)

GLP is a set of functions that allows the storage or retrieval (when necessary) of data regarding the maintenance and status of the meter.

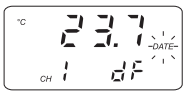
LAST CALIBRATION DATE

Last calibration date is stored automatically after a successful calibration. The last calibration date can be displayed through the setup code #10 (see "Setup Mode" section for details).

CALIBRATION ALARM TIME-OUT

Every time it is turned on, the meter checks if the time-out, fixed at 1 year, has expired. It is possible to enable/disable this feature through setup code #11. The default value is "On".

If the time has expired, the message "Cal date" scrolls across the LCD. The "DATE" symbol will blink to remind to the user to perform a new calibration soon.



Note: The alarm time-out is based on thermocouple calibration only.

GLP AND RS232 (HI 98801 and HI 98804 only)

GLP data (ID code and last calibration date) can be retrieved from a PC through the RS232 communication feature (see "Data transfer to PC").

OTHER FEATURES

LCD BACKLIGHT

The backlit LCD allows an easy use of the instrument even in dark environments. This feature can be enabled/disabled pressing the ALT and LIGHT keys. The LCD backlight can be disabled in order to save power, and it is automatically disabled when a low battery level is detected.

Note: When an external power supply is applied to the instrument, the backlight is not automatically enabled.

Note: When "LOBAT" appears on the LCD it is not possible to enable backlight. If the user attempts to enable the LCD backlight in low battery condition, the meter displays the "batt" message.

Real Time Clock (RTC)

The instrument has an internal Real Time Clock (RTC) circuit with a backup lithium battery. This allows the meter to update time and date even when both batteries and external power adapter are disconnected.

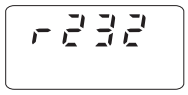
DATA TRANSFER TO PC
HI 98801 - HI 98804 only

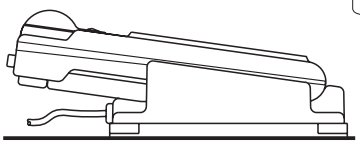
HI 98801 and **HI 98804** can transfer data to a computer, through the HI 9200 infrared interface and a serial port on the PC.

Ensure there isn't any logging process active.

Press CH/TIME or TEMP/TIME to set the meter to time or date mode and simply place the meter on a **HI 9200** transmitter (ensuring that the two infrared LEDs are placed on top of each other) and the memory content can then be downloaded to your PC through a serial port. Just ensure that baud rate on instrument (setup code #50) and on PC downloading program are set to the same value.

During the data transfer the instrument displays the message "r 232".





To stop communication, press CH/TIME or TEMP/TIME to display the temperature reading or take the meter out of the transmitter when it's not displaying "r232".

Using the **HI 9200** transmitter, all recorded data can be fed to your PC for easy reproduction, storage or elaboration without the need of cables between the meter and the transmitter.

Data transmission from the instrument to the PC is now much easier with the **HI 92000** Windows® compatible application software offered by HANNA instruments®.

HI 92000 allows you to use the powerful capabilities of most spread sheet programs (e.g. Excel©, Lotus 1-2-3©). Simply open your file downloaded by **HI 92000** from your spread sheet program and then it is possible to make any elaboration available with your software (e.g. graphics, statistic analysis). **HI 92000** offers a variety of features and has an on line help to support you throughout any situation.

To install **HI 92000** you need a 3.5" drive and a few minutes to follow the instructions conveniently printed on the disk label.

MEMORY ORGANIZATION
HI 98801 - HI 98804 only

Logged data are stored in the internal EEPROM and are retained even if batteries and external power are disconnected.

MEMORY CAPACITY

- 14000 data samples divided into 16 lots (lots 01 to 16)
- 9999 data samples maximum for a single channel
- 300 data samples for the Log on demand (lot 00).

TIMED LOG (lots 01 to 16)

Each time a new logging period starts, it automatically starts from the next available lot. If the last lot was the 16th, the new logging period restarts from lot 01 overwriting previously logged data.

When Timed logging memory is full, the meter overwrites the oldest lot data progressively reducing the old lots. In this case the starting time, date and the dimension of the old lot are updated.

Note: The oldest lot data are erased without any warning message.

Note: Timed logging memory can be entirely erased through the setup code 06.

If the meter is powered only by the external power supply and there is a temporary power black out during logging, when power returns, the logging continues normally if no samples have been lost, otherwise the current lot is ended and a new lot starts. If printer is enabled, the "...Stop..." message will be printed. In any case, during scrolling the former lot will be preceded by the "Interrupted Lot" message and the latter by "Continuation Lot" to indicate the interruption.

LOG ON DEMAND (Lot 00)

When Log on demand data area is full the meter shows the "FULL" message to warn the user that the data are not stored in memory. Erase the memory area through setup code 05 to continue logging data on demand.

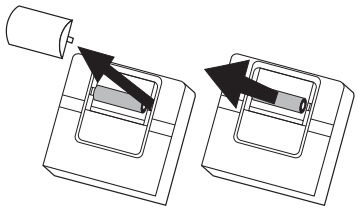
PRINTER MAINTENANCE

TO CHANGE THE INK CARTRIDGE

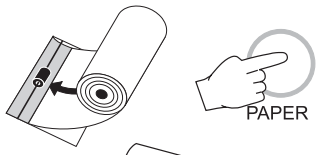
When printouts become faint, it might be necessary to change the ink cartridge. Contact your Hanna authorized center.

TO INSERT THE PAPER ROLL

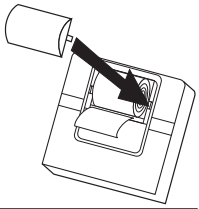
The meters use plain paper rolls 38 mm width. To insert a new roll open the paper cover pulling it gently and take the cylinder away.



Insert the paper edge in the printer slot and feed the printer by pressing the PAPER key.



Allow about 5 cm (2") of paper to exit from the printer and replace the paper cover.



FAULT CONDITIONS

The printing/logging thermometers are factory programmed to automatically diagnose a fault and to display error codes on the LCD.

PRINTER ERROR

Whenever a printer fault condition is detected, the printer stops and the message "Printer error" scrolls across the upper LCD with the error code (see below) fixed on the secondary one.

1 = Motor locked
2 = Printer clutch jammed
3 = Selection lever fault

I^2C BUS ERROR

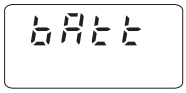
In case of an I^2C bus fatal error due for example to a defective EEPROM or RTC, the message "Serial bus error" keeps scrolling across LCD from right to left indefinitely. Meter should be returned for repair (see warranty section).

BATTERY REPLACEMENT

When the batteries are inserted and no power adapter is connected, the meter can recognize different batteries charge levels.

1. **Fully charged batteries**. The backlight and printer can be enabled.
2. **Weakening batteries** - "LOBAT" symbol blinks on LCD. The backlight and printer are automatically disabled and it is not possible to enable them until new batteries are inserted or an external power adapter is connected.
3. **Weak batteries** - "LOBAT" symbol stays still on lower LCD. Backlight and printer are disabled and meter can work for about 20 hours. If in Timed logging mode with the power down function enabled this time can be longer.
4. **Dead batteries** - LCD shuts off. The instrument stops working to avoid erroneous readings.

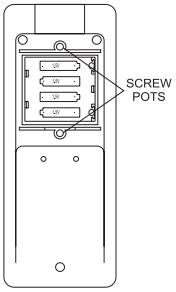
Note It is not possible to activate backlight and printer when the instrument is in a low battery condition. If the user attempts to enable these functions without replacing the batteries or connecting the external power adapter, the meter will show "batt" on LCD.



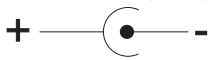
Battery replacement must only take place in a non hazardous area using 1.5V alkaline AA type batteries.

In order to replace run down batteries, simply remove the two screws on the rear cover of the instrument and replace the four 1.5V AA batteries with new ones, paying attention to the correct polarity.

A 12VDC power adapter can also be used to power the unit (see the accessories paragraph).



Note: The instrument uses the following configuration.



The HANNA **HI 710005** or **HI 710006** voltage adapters are recommended, because they use the proper polarity configuration.

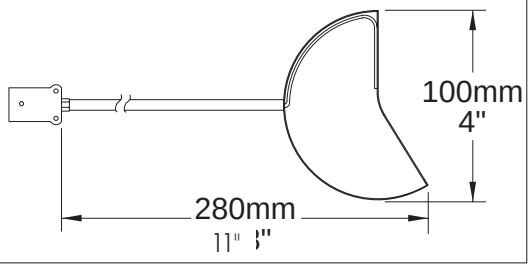
However, the meters can be used with other adapters. In this case, remember to check the correct polarity of the adapter before connecting it to the meter.

K-TYPE THERMOCOUPLE PROBES

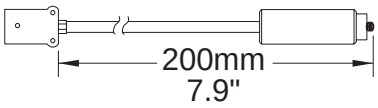
WITH DETACHABLE HANDLE & MINI-CONNECTOR

(to be plugged into HI 766HD probe handle)

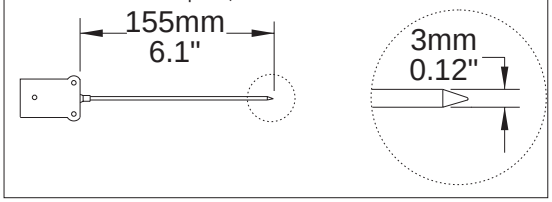
HI 766PA Roller surface probe, max 320°C/600°F



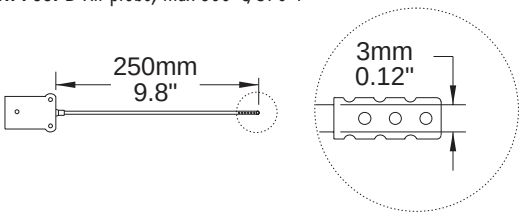
HI 766PB Surface probe, max 650°C/1200°F



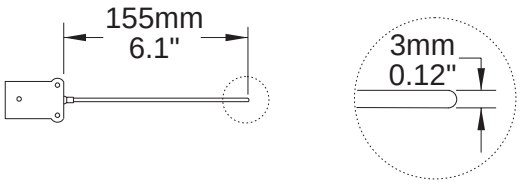
HI 766PC Penetration probe, max 900°C/1650°F



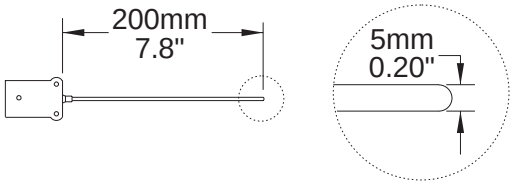
HI 766PD Air probe, max 300°C/570°F



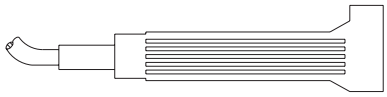
HI 766PE1 General use probe, max 900°C/1650°F



HI 766PE2 General use probe, max 900°C/1650°F

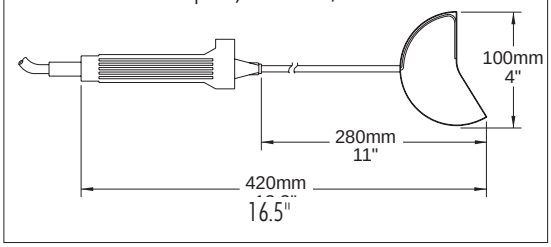


HI 766HD Rugged thermocouple probe handle with 1m (3.3') cable fitted with a mini-connector

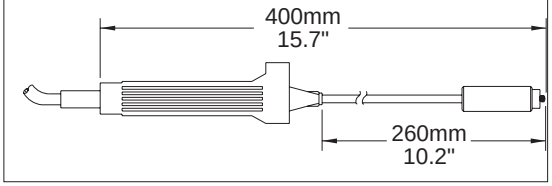


WITH INTEGRAL HANDLE, 1 m CABLE & MINI-CONNECTOR

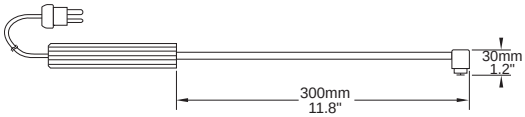
HI 766A Roller surface probe, max 320°C/600°F



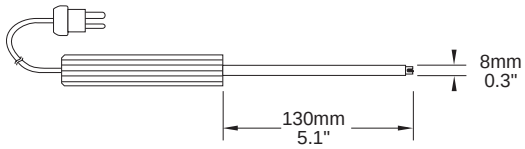
HI 766B Surface probe, max 650°C/1200°F



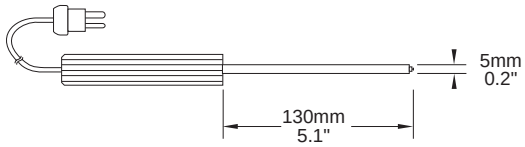
HI 766B1 90° surface probe, max 450°C/840°F



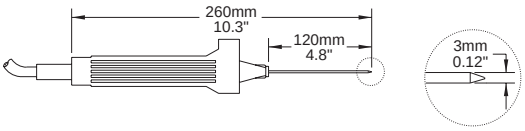
HI 766B2 Surface probe, max 900°C/1650°F



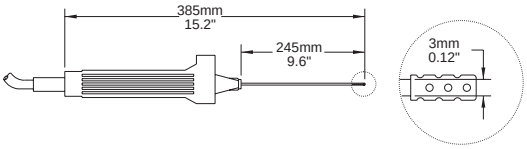
HI 766B3 Small surface probe with insulated shaft, max 200°C/390°F



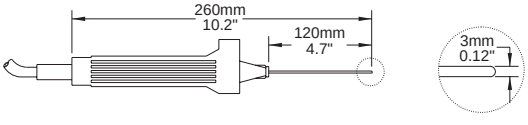
HI 766C Penetration probe, max 900°C/1650°F



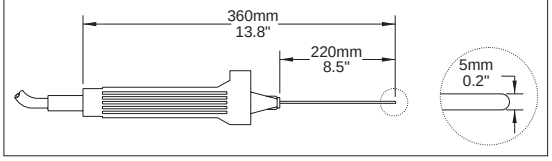
HI 766D Air probe, max 300°C/570°F



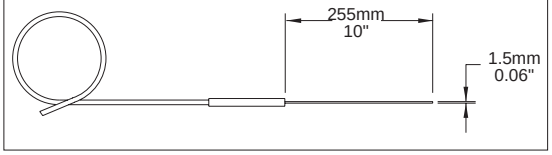
HI 766E1 General use probe, max 900°C/1650°F



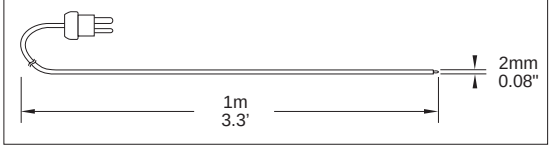
HI 766E2 General use probe, max 900°C/1650°F



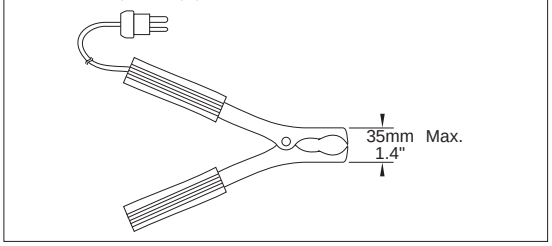
HI 766F High temperature wire probe without handle, max 1100°C/2000°F



HI 766F1 Flexible probe without handle, max 480°C/900°F



HI 766TV1 Pipe clamp probe, max 200°C/390°F



ACCESSORIES

HI 710005	115 Vac / 12 Vdc voltage adapter, US plug
HI 710006	230 Vac / 12 Vdc voltage adapter, European plug
HI 710031	Rugged carrying case
HI 710034	Paper Roll (10 pcs)
HI 710035	Ink cartridge
HI 9200	Infrared transmitter (for HI 98801 and HI 98804)
HI 92000	Windows® compatible software for data transfer to PC (for HI 98801 and HI98804)

Windows® is registered Trademark of "Microsoft Co."

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 electrodes and 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 shipping 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.

CE DECLARATION OF CONFORMITY

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.

Any variation introduced by the user to the supplied equipment may degrade the instrument's 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.

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 printing/logging thermocouple thermometers

HI 98701 HI 98704 HI 98801 HI 98804

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: 10-12-1998

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