HANNA®
instruments

HI 504901

GSM Supervisor

Instruction Manual

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IMEI number.

Stick here the IMEI number label or write it down for your future reference.

_____

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

Dear Customer,

Thank you for choosing a Hanna Product.

Please read this instruction manual carefully before using the instrument. It will provide you with the necessary information for correct use of the instrument, as well as a precise idea of its versatility.

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

This instrument is in compliance with the $C\!\in$ directives.

WARRANTY

The **HI504901 interface is warranted for two years** against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. This warranty is limited to repair or replacement free of charge.

Damage due to accidents, 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.

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any noticeable damage, notify your Dealer or the nearest Hanna Customer Service Center immediately.

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

GENERAL DESCRIPTION

HI504901 instrument is an intelligent interface between Hanna meters with RS232 and RS485 port and an industrial GSM cellular phone for sending SMS messages or connecting through a local or a remote computer with **HI92500** Hanna application software.

HI504901 can acquire information about active alarms, errors, current status and real time values with following Hanna meters:

- **HI8001** and **HI8002** towards RS232 channel #1 and RS232 channel #2 serial port;
- **HI23** and **HI24** series, towards RS485 serial port;
- **HI700** and **HI710** series, towards RS485 serial port;
- **HI504** series, towards RS485 serial port;
- **HI504910**, towards RS485 serial port.

HI504901 device is also provided with one digital input (typically an alarm relay) from "non-intelligent" instruments, with only an alarm relay contact or another digital output signal. **HI504901** can be configured for all its parameters and features through the **HI504901SW** Windows® compatible application software provided with the instrument. Two models are available:

- **HI504901-1:** Dual-band 900/1900 MHz GSM
  Power supply: 12VDC to 115VAC
  power adapter (**HI710005**)
- **HI504901-2:** Dual-band 900/1800 MHz GSM
  Power supply: 12VDC to 230VAC
  power adapter (**HI710006**)

MAIN FEATURES

Here below are listed the main features of the **HI504901** interface:

- GSM phone inside for Short Messaging Service (SMS) sending.
- Possibility of a wireless remote interface configuration or connection to a computer workstation (equipped with a modem) through the cellular phone inside.
- RS232 auxiliary port (PC config) for configuration or connection purpose with a local computer connected through **HI920010** cable.
- RS232 ports (channel #1 and #2) for communication towards Hanna meters with RS232 port.
- RS485 port for communication towards Hanna meters with RS485 port, allowing connection of up to 32 instruments on the same wire.
- Digital input port (typically connected to an alarm relay) to acquire information from "non-intelligent" instruments.
- Digital output port, for which it is possible to change the status (open/closed) through an appropriate SMS sent to the interface.
- SMS enabling/disabling option through a dedicated port.
- LED indicators: four red LED's are provided for signaling error conditions or active alarms in the devices connected to the interface through RS232 ports (#1 and #2), RS485 port or digital input, depending on interface configuration; one green LED and one red LED are provided to give indication about SMS sending enable current status; two green LED's indicate the cellular phone signal quality; one yellow LED is dedicated to the current status of digital output contact, and another yellow LED to the operating status of the cellular phone terminal.
- Real time clock.
- Diagnostic features.
- Internal backup battery which provides power supply in case of mains power failure.

FUNCTIONAL DESCRIPTION

Front view

HANNA instruments

HI 504901

GSM Supervisor

Inside view
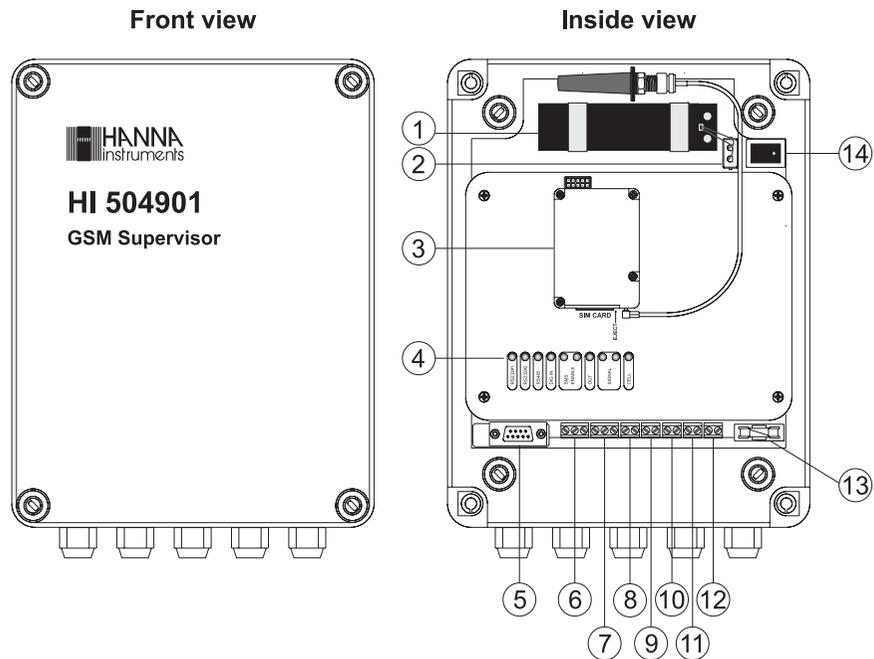
1. Backup battery (rechargeable, sealed lead-acid, 12V / 0.8Ah).
2. On board battery connector.
3. GSM module
4. LED indicators (see figure on next page).
5. RS232 auxiliary communication port (for local PC communication only)
6. RS232 channel #1 serial communication terminal.
7. RS232 channel #2 serial communication terminal.
8. Digital input terminal to acquire external information.
9. Digital input terminal to disable SMS sending.
10. Digital output terminal.
11. RS485 serial communications terminal.
12. Power supply input (12 VDC).
13. Fuse (1 A).
14. Power ON/OFF switch.

⚠ Unplug the meter before any electrical connection.

LED Indicators
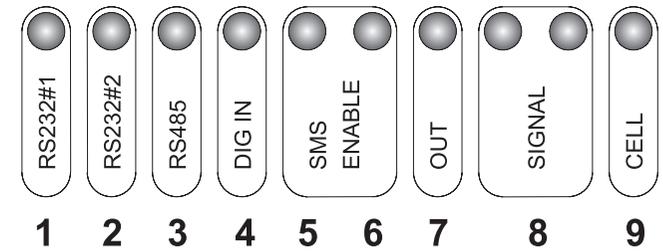
1. RS232 serial port, channel #1, red LED.
2. RS232 serial port, channel #2, red LED.
3. RS485 serial port red LED.
4. Digital input port red LED.
5. SMS enable green LED.
6. SMS disable red LED.
7. Digital output yellow LED.
8. Cellular signal strength green LED's.
9. Cellular operating status yellow LED.

MECHANICAL DIMENSIONS

Back view

Bottom view

200 mm (7.9")
140 mm (5.5")
240 mm (9.4")
194 mm (7.6")
100 mm (3.9") min. required
28 mm (1.1")
68 mm (2.7")
96 mm (3.8")
2 mm (0.1")
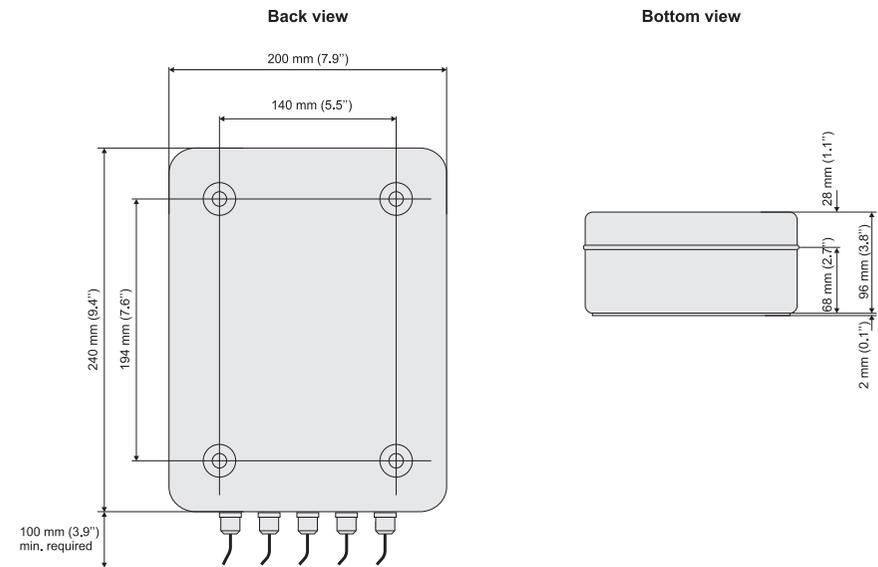
TECHNICAL DATA

Max output power	2 W for EGSM900; 1 W for GSM1800/1900
SIM interface	3V type SIM card
Antenna	Dual-band antenna (900/1800/1900 MHz)
RS232 channels towards instruments	For connection of an instrument with RS232, baud rate up to 9600 (limited by the instrument)
RS485 channel towards instruments	For connection of all instruments with RS485 in the same bus; baud rate up to 9600
Digital input channel	Supporting mechanical relays or open-collector outputs
Digital output channel	Open collector output, 5 mA / 30V max.
RS232 auxiliary port towards PC	D-Sub female connector, baud rate up to 9600
Installation Category	I
Power Supply	12 VDC adapter & internal rechargeable battery (12V / 0.8 Ah) for backing up
Power Consumption	6 VA max.
Environment	0 to 50 ºC; max. 85% RH non-condensing
Enclosure	ABS case, IP54
Dimensions	240 x 200 x 98 mm (9.4 x 7.9 x 3.9")

SAFETY INFORMATION

Radio devices have limitations in the vicinity of electronic devices.

- Unplug and turn off the unit in hospitals or near medical devices like pacemakers or hearing aids. The module may interfere with the operation of these devices.

- Unplug and turn off the unit when flying. Secure is so that it can not be powered inadvertently.

- Unplug and turn off the unit near petrol stations, fuel depots, chemical plants or blasting operations. The module can disturb the operation of technical equipment.

- Interference can occur if the device is used near televisions, radios or PCs.

In order to avoid possible damage, it is recommended to use only the Hanna Instruments accessories. They have been tested and shown to work well with this device. However, accessories are not covered by the warranty.

MAINTENANCE & SAFETY TIPS

- SIM card: do not bend or scratch the SIM card or expose it to static electricity.

- Wipe the module housing with a moist or antistatic cloth. Do not use a chemical cleaning agent.

- Do not expose the GSM module to any extreme environment where the temperature or humidity is high.

- Do not attempt to disassemble the unit. There are no user serviceable parts inside.

INSTALLATION
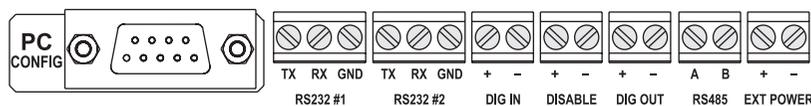
RS232 AUXILIARY PORT

HI504901 is provided with an auxiliary RS232 port (D-Sub 9-pole female plug) for connection to a local PC using an **HI920010** Hanna cable.

Note Use this RS232 auxiliary port **only** for local configuration of the interface with **HI504901SW** software or local communication session with an instrument connected to the **HI504901** interface (see "Interface Configuration" and "PC Communication" sections for details).

Note If the **HI920010** Hanna cable is too short for your application, please refer to "Appendix" for details about making a longer communication cable.

RS232 #1 AND RS232 #2 SERIAL PORT

HI504901 is provided with two serial ports (channel #1 and channel #2) for communication with Hanna **HI8001** and **HI8002** controllers.

Each port is a 3-pin terminal: TX, RX and GND.

To connect the **HI504901** interface to **HI8001** or **HI8002** controllers, use 9-pin D-Sub connector and shielded cable, and follow the below indications.

HI8001/HI8002 9-pin D-Sub male connector	HI504901 RS232-# terminal
Pin 2	TX
Pin 3	RX
Pin 5	GND

Note The RS232 standard allows to connect only one instrument to each serial port.

DIGITAL INPUT (DIG IN)

HI504901 is provided with a digital input, which can be configured with **HI504901SW** software (see "Interface Configuration" section) to send an alarm SMS when a DC voltage

from 5 to 30 V is applied or when it is disconnected.

This input can come from a relay contact or from an open collector output (for example from a PLC).

Connect the positive pole of an external power supply to the positive DIG-IN terminal; connect a command relay between the negative pole of the external power supply and the negative DIG-IN (see also below diagram).
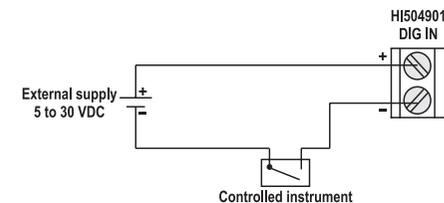
Note Never connect mains or AC voltage supply directly to the DIG-IN terminal.

Note The digital input is optoisolated.

DISABLE SMS (DISABLE)

This input works as a digital input (see previous subsection) and allows to ignore active errors and suspend SMS sending during operations as calibration, start-up, maintenance, etc.

DIGITAL OUTPUT (DIG OUT)

This optoisolated terminal is an open collector output, which can be used for external signaling through LED indicators or small relays (see below diagram).
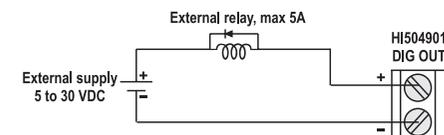
RS485 SERIAL PORT

HI504901 is also provided with a 2-pin RS485 terminal for communication with Hanna **HI23**, **HI24**, **HI700**, **HI710**, **HI504** meters series and **HI504910** digital transmitter.

The RS485 standard is a digital transmission method that allows long line connections. Its current loop system makes this standard suitable for data transmission in noisy environments.

Specifications:

The RS485 standard is implemented in **HI504901** interface with the following characteristic:

Data rate: up to 9600 (selected while configuring the interface through **HI504901SW** software)

Communication: bidirectional Half-Duplex

Line length: up to 1.2 Km typical, with 24 AWG cable

Loads: up to 32 typical

Internal termination: none

Connections:

The connections for the provided 2-pin RS485 terminal are as shown on the below diagram.

The instrument has no internal line termination: to terminate the line an external resistor equal to the characteristic line impedance (typically 120 Ω) must be added at both line ends.

HI504901 RS485 port can connect up to 32 instruments on the same physical network, with a total line length up to 1.2 Km using a 24 AWG cable.

RS485 line for up to 32 instruments

120Ω   120Ω

A B   A B   A   B   A B

Unit 1   Unit 2   HI504901   Unit n

All the instruments connected to the RS485 port are "slave" devices that are queried by the **HI504901** supervisor. In other words, the interface can work only as a "master" component, whereas the connected instruments work as remote terminal equipments answering to the commands only.

Each instrument (except the **HI504901** interface itself) is identified by its Process ID number, included within the 00 to 99 interval, which corresponds to the Process ID configured through the proper setup item (please refer to the instrument instruction manual for a complete explanation).
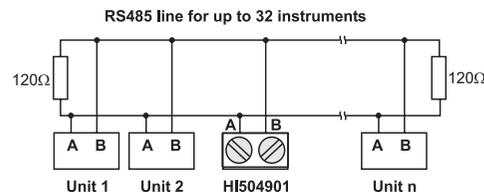
Note   If an instrument does not recognize the address within the command string, then it discard all the following bytes.

As additional feature, the **HI504901** interface is also provided with internal Fail Safe Open Line protection method.

To minimize electromagnetic interferences, it is recommended to use shielded and twisted pair cable to connect the units.

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POWER SUPPLY INPUT

Use a 12VDC adapter (**HI710005** or **HI710006**) and connect the black wire to the positive input terminal (marked "+") and the black & white wire to the negative one (marked "-").

External supply

Hanna adapter

All hard wiring can be accomplished through five watertight cable glands on the bottom side of the case, by passing wires through the rubber grommets and tightening the nuts.

Note   All connected cables should end with cable lugs.

BATTERY

screws

Battery

power switch
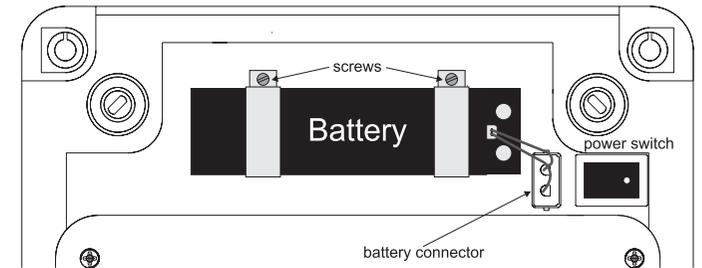
battery connector

⚠ **FOR SAVING BATTERY, THE HI504901 IS SUPPLIED WITH BATTERY NOT CONNECTED.**

PLUG THE BATTERY CONNECTOR BEFORE STARTING OPERATION.

⚠ Use only rechargeable sealed lead-acid battery with 12 V and 0.8 Ah capability.

To substitute battery, please follow below instructions:

1. turn off the **HI504901**: turn OFF the power switch and disconnect the interface from the mains;
2. remove the screws on the bottom of the two battery clips;
3. disconnect the battery cable from its connector;
4. substitute the old battery with a new one;
5. fix back the two girdles by tightening the screws;

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6. connect the battery cable to the connector;

7. connect the interface to the mains;

8. turn ON the power switch.

Note Pay attention that the battery cable is correctly connected to the battery connector, otherwise an alarm SMS will be sent immediately after the start-up procedure (see "Fault Condition" section for details).

Note If the interface is powered on immediately after a battery substitution, it is possible that an alarm SMS of "Battery failure" is sent. Ignore that message and check if the error is still active the day after. For avoiding this problem, connect the unit to the mains and wait for at least 10 hours before turning ON the power switch. In this manner the new battery can be charged.

SIM CARD INSERTION

Before using the **HI504901**, insert a SIM card.

• Press the SIM card holder ejector on the cellular module by using a sharp item (for example, a pen);

• Insert the SIM card in the holder and push it back in the housing.

GSM
module

SIM CARD

EJECT

Antenna
connector
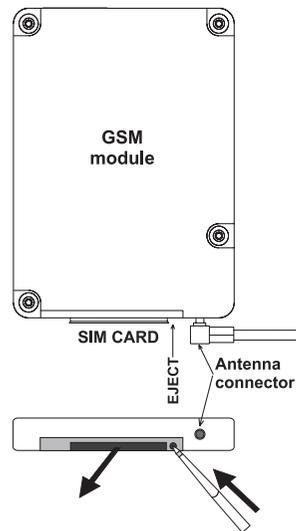
Note If the **HI504901** has to be used for sending alarm SMS, be sure that the SIM card can support voice calls. If the **HI504901** will be used for remote connection session, be sure that the SIM card supports data calls. Please contact the cellular network operator for information about SIM active services.

Note Do not remove the SIM card while voltage is applied to cellular phone. Before removing the card, turn off the interface. Failure to do so may seriously affect the serviceability of the **HI504901**.

Turn ON the power switch (#14 on page 8): the red SMS disable LED lights up and will stay in this state until the start-up procedure ended and the idle mode is entered.
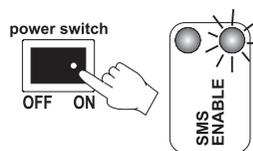
During start-up procedure the Real Time Clock (RTC) is checked to control if a reset occurred since last software initialization. In this case, the RTC is initialized with the default date and time 01/01/2000 - 00:00. An EEPROM reset does not affect the RTC settings.

The EEPROM is also checked to control if it is new. In this case, the default values are copied from ROM and the device enters normal mode. Otherwise an EEPROM checksum test is performed (the same is performed periodically during EEPROM selftest procedure, see "Fault Condition and Selftest Procedure" section for more details).

If checksum is not correct, the proper EEPROM error LED indication will be given as soon as the Idle state is entered.

During start-up, the internal cellular phone is turned ON and an initialization procedure is performed to insert PIN code (when needed) and make network registration for enabling incoming and outcoming calls. Moreover, the telephone answering service is disabled to avoid automatic network call forwarding if interface is busy and can not serve immediately incoming call.

Initialization procedure can last up to 30 seconds if no problem occurs, otherwise some more time could be needed and proper cellular LED indication will be given in idle state.

When the start-up procedure is complete, the interface enters the idle state.

Note When the **HI504901** is turned ON for the first time, it is possible to get a cellular error indication. This can happen if the SIM card requests a PIN code to be registered in the network and the interface was not yet configured (see "Local configuration" section for details).

The idle state is the normal operation state for the **HI504901** supervisor. While in idle state, the following main tasks are fulfilled:

- Management of incoming remote connection and configuration requests (see "Interface configuration" and "PC communication" sections for details);
- Management of incoming local connection and configuration requests;
- Polling procedure of connected devices;
- Diagnostic selftest procedures: battery test, cellular phone test, EEPROM corruption data test (see "Fault condition" and "SMS delivery" sections);
- Processing of incoming SMS's for digital output control (if enabled) and information SMS's request (see "SMS delivery" section);
- Sending of alarm SMS's or information SMS's upon user request (see "SMS delivery" section).

When in idle state, the **HI504901** can perform periodically some diagnostic selftest procedures as: internal backup battery test, cellular phone test, EEPROM corruption data test. If one of these tests does not pass, the interface advises the user with a visual indication about the problem using the red and green SMS enable/disable LED's. Please refer to "Fault conditions and Selftest Procedures" section for more complete indications about interface related fault conditions.

Moreover, every 30 seconds the two green LED's for cellular phone signal are updated with the current signal strength, and the indication meanings are listed in the table below:

LED	Status	Meaning
Cell Signal 1 (green)	OFF	No signal or
Cell Signal 2 (green)	OFF	cellular error found
Cell Signal 1 (green)	ON	Medium signal
Cell Signal 2 (green)	OFF	
Cell Signal 1 (green)	ON	Strong signal
Cell Signal 2 (green)	ON	

Also the digital output status LED is updated with the current status of the digital output contact. The digital output contact status can be changed by the user only by sending the proper SMS to the interface. The below table shows the digital output LED indication depending on the digital output status:

LED	Status	Meaning
Digital Output (yellow)	OFF	Dig.output contact open
	ON	Dig.output contact closed

Note The status of the digital output contact is saved in **HI504901** internal memory, so that the digital output is set to the correct value in case of a reset or after a start-up of the interface.

During polling procedure all devices connected to the interface through RS232, RS485 serial ports and digital input port (if correctly configured, see "Interface Configuration" section) are periodically queried to acquire their current status, measurement values and active alarms. The delay between a query operation and the following one is user selectable, and can vary from 1 to 10 minutes (see "Query Delay" field and "Interface Configuration" section).
If many devices are connected to the RS485 link and the cellular phone interface can not interrogate all the devices within the selected delay time, then the actual interval becomes longer than the set value.
When polling devices procedure is completed, if some alarm is active on the device connected to an RS232 port channel, the corresponding LED (#1 and #2 on page 9) will light up; besides, the RS485 serial port LED (#3 on page 9) lights up if an alarm is active at least in one of the instruments connected to the RS485 port (up to 32 devices can be connected on the same RS485 port); the digital input port LED turns on or off depending on the user-selected logic for closed contact (if control of digital input port was user-enabled during last interface configuration).
Moreover, if an active alarm found in a device connected to the **HI504901** matches with one of those selected by the user during last interface configuration, or if the digital input status matches with the condition selected for triggering an alarm message, then one (or more) SMS(s) are immediately submitted by the **HI504901** to the set cellular phone number(s) (see SMS delivery" section).

Note The "Query Delay" time value fixes the maximum delay between an alarm occurrence in a device and the related alarm SMS sending by the interface.

SMS can be submitted by the **HI504901** supervisor only if the SMS sending feature is enabled through an external switch (see further on for details); if the SMS sending is disabled, then no message will be sent upon alarm or fault condition on connected devices.

Note To make the **HI504901** queries the connected devices and sends SMS's, it is necessary to configure the interface, otherwise no polling procedure can take place and no alarm notification will be given by the interface. **HI504901** can not automatically detect which instruments are connected to the interface; moreover, the user must select for which type of alarms he wants to receive warning SMS's.

While in idle state, the SMS sending feature can be disabled or enabled by the user at any time, by simply closing (or opening) the proper external switch. If no error indication is already active, then the red and green LED's (# 5 and #6 on page 9) keep indication about the SMS sending enable/disable status:

External Switch	LED	Status	Meaning
Open	SMS enable (green)	ON	SMS sending enabled
	SMS disable (red)	OFF	
Close	SMS enable (green)	OFF	SMS sending disabled
	SMS disable (red)	ON	

Note Sometimes the updating of LED indication about SMS sending status can take a few seconds after changing the external switch status by the user. This happens if the interface is busy while performing procedures as polling devices, SMS sending, incoming call processing, etc.

While in idle state, **HI504901** can serve also incoming request for configuration or PC communication session activation (both local and remote), but remote sessions (both configuration and PC communication) can take place only if no cellular errors are active on the interface.

INTERFACE CONFIGURATION

The **HI504901** supervisor is not provided with keyboard or display for user interfacing purpose. For first installation and for successive changes of the system configuration, it is necessary to use the **HI504901SW** Windows® compatible application software provided with the instrument.

APPLICATION SOFTWARE INSTALLATION

To install the **HI504901** configuration software on the computer, it is necessary a 3.5'' drive. Insert the disk #1 in the floppy disk driver, execute *setup.exe* and then follow on-line instructions.

After installation, run the configuration software by simply double-clicking on **HI504901SW** icon and starting the configuration procedure.

STARTING CONFIGURATION

Before starting the configuration procedure, turn the **HI504901** on and make sure it ended the initialization procedure (see "Start-up" section).

The **HI504901** supervisor can be configured in two different ways: "Local configuration" and "Remote configuration", which can be selected on "Connection setting" window while running the application software.

Find here below a complete list of LED's status during configuration procedure:

LED	Status	Meaning
RS232 channel # (red)	OFF	---
RS485 channel (red)	OFF	---
Digital input (red)	OFF	---
SMS enable (green)	OFF	---
SMS enable (red)	ON	---
Digital output (yellow)	ON or OFF	indication about digital output previous status (ON: contact closed, OFF: open)
Cell Signal Quality (2, green)	OFF & OFF ON & OFF ON & ON	updated only when "Phone Status" button is pressed on application software while running on PC connected with **HI504901** device
Cell Status	ON or OFF or blinking	cellular phone real time operating status (fast blinking if a remote connection is taking place)

LOCAL CONFIGURATION

The "Local" configuration is the only one allowed for the first configuration of **HI504901** supervisor. This type of configuration takes place between the HI 504901 device and a PC (placed near) with **HI504901SW** installed, through a serial cable connection.

To connect the **HI504901** supervisor to the PC, use an **HI920010** cable. Plug one connector to the **HI504901** device RS232 auxiliary connector (PC config port) and the other one to a serial port of the PC. Before connecting the supervisor to the PC, read the computer manual.

To proceed with local configuration, select the "Local" connection type on **HI504901SW** "Configuration Settings" window, and on "Serial communication port" section the PC COM port to which the serial cable is connected. Then press "OK" to proceed (see "General Settings" section).

Note The first configuration of **HI504901** must be done through a local configuration because it is necessary to set up the SIM card PIN code and at least one cellular phone number for the alarm SMS sending.

Note If no answer is received from **HI504901**, an alarm window will be displayed by the application software. Check if the serial cable is correctly connected or if the **HI504901** is busy (a remote configuration or a remote connection or a polling procedure are taking place). Try later for a new local configuration attempt.

REMOTE CONFIGURATION

The "Remote" configuration takes place between the **HI504901** device and a PC with **HI504901SW** software installed, through a data call made by a modem connected to the PC. In this way all **HI504901** parameters can be re-configured (excluding the SIM card PIN number), even if the supervisor is located far from the PC, without requiring to move the PC where the **HI504901** is physically installed to make a local configuration through serial cable (see "Local Configuration" section).

To proceed with the remote configuration, select the "Remote" connection type on **HI504901SW**, by checking the proper box. On "HI 504901 phone number" field enter the phone number of the SIM card inserted in the **HI504901** and the password (only if it was set in a previous configuration).

In the "Advanced Settings" section it is possible to give to the modem connected to the PC a particular configuration for the initialization string and the dial string. Note that in the most common cases the default setting can be used. On "Serial Communication Port" section select the COM port to which the modem is connected.

When "OK" is pressed, the software will try to establish a data call between the PC and the **HI504901** device, and then it is possible to proceed with the configuration (see "Configuration Settings" section).

Note If no answer is received from **HI504901**, an alarm window will be displayed by application software. Check if the modem line is busy, or **HI504901** is busy (a remote configuration or a remote connection or a polling procedure are taking place), or **HI504901** cellular phone is over coverage. Try later for a new remote configuration attempt.

CONFIGURATION SETTINGS

The setup procedure is divided into four different sections, displayed on four different folders inside the main window:
- General Options Setting (see "General Options Setting")
- RS232 Options Setting (see "RS232 Options Settings")
- RS485 Options Setting (see "RS485 Options Settings")
- Digital I/O Options Setting (see "Digital I/O Options Settings")

Five buttons are available on the bottom of the window, which can be pressed for performing the following actions:

"Update All" button:

Press this button to send the complete configuration to the **HI504901** device. It is possible to test all RS232 and RS485 devices for connection or not. In this way the **HI504901** interface can be configured even if devices will be connected only on a second time to RS232, RS485 and digital input port.

If the PIN code is changed during configuration, it will be checked and this operation lasts about 30 seconds. If no error occurs, the message "HI504901 device correctly updated!" will be displayed. Otherwise the occurred errors list will be shown and the previous configuration will be kept in **HI504901** memory.

Note If no error occurs during configuration, the previous **HI504901** setup will be lost. At start-up, 3 attempts for entering the cellular PIN code are available (see "General options setting" section) and at each update with a wrong PIN value, an attempt will be lost. The SMS's stored in the SIM card will be erased.

Note If an error occurs on cellular phone before pressing the "Update All" button, the cellular phone will be turned off and on again for trying solving the error condition. This procedure lasts about 30 seconds.

"Load" button:

Press this button to load on the PC the last configuration stored in the **HI504901** memory.

Note By loading the **HI504901** configuration, all parameters modifications made till that moment will be lost. At program start-up, an automatic loading is performed.

Note At the start-up of **HI504901SW** program, the application

software advises the user with warning messages if some error occurs on the interface. The following fault conditions can be detected by **HI504901SW**:

- *"Error on cellular phone found"*: warning for generic error on cellular phone, e.g. cellular phone not network registered, SIM card missing, no network coverage, cellular phone not answering, etc.
- *"Wrong cellular PIN code"*: PIN code on **HI504901** is not correct.
- *"PIN code missing"*: PIN code needed for SIM card and not available on current **HI504901** configuration.
- *"Last SMS reached"*: no more SMS's are available on the SIM card (SIM card credit reached zero).
- *"Expiration date reached"*: SIM card expired.
- *"Error in current device configuration. Check data before proceeding with the new configuration"*: some corrupt data found on **HI504901** internal memory (EEPROM).

"Phone status" button:

Press this button to open a secondary window for seeing the cellular phone network registration status ("REGISTERED" or "NOT REGISTERED") and the signal quality.

Note The cellular status check during a remote configuration via modem may require a few seconds more than during a local configuration, and information may arrive with a small delay.

Note When the "Phone status" button is pressed, also the **HI504901** green LED's for cellular signal indication are updated with the new real value provided by cellular phone.

"Help" button:

Press this button to display the help file.

"Exit" button:

Press this button to exit the **HI504901** setup program during a local configuration.

"Disconnect" button (for remote configuration only):

Press this button to end the remote connection with the **HI504901**. The data call will be immediately stopped.

GENERAL OPTIONS SETTING

The following features are selectable in the general options setting folder:

Telephone numbers:

It is possible to set two telephone numbers for automatic sending of alarm messages and sending of information messages upon a call from one of these phones. Valid values are numbers of a maximum of 20 digits, with the country code in front and without spaces or "+" symbol (e.g. for Italy 39335.....)

Note At least a value for telephone number #1 must be inserted to proceed with configuration.

Note The country code is necessary, otherwise **HI504901** will not be able to send any SMS.

Note The set phone number are not saved on the phonebook area of the SIM card. If there are some phone numbers previously stored on any SIM card location, they will be not overwritten.

HI 504901 date and time:

Date and time present in the **HI504901** device can be read. These fields can not be modified manually. To align the **HI504901** to the PC date and time, simply click on "Update **HI504901** Date and Time" check-box: the new values will be displayed on the PC and the updating will take place when the "Update All" button is pressed.

SIM Card options:

- On "Remaining SMSs" field it is possible to set the number of remaining messages in the SIM card: this number gives indication about the charge level of the SIM card. To know the value to be inserted, divide the SIM card credit by the cost of one SMS. This number will be decreased at every sent message and when zero level is approaching, one or more messages will be sent by the **HI504901** device to warn the user about the need of SIM card recharging.

Note It is useful to enable this feature in case of a rechargeable SIM card, and disable it if an unlimited credit card is used. If the feature is enabled, it is necessary to insert a value to proceed with the configuration.

- On "Expiration Date" field it is possible to set the SIM card expiration date (dd/mm/yy): this is the date after which the SIM card expires if not recharged (usually after one year).

15 days, 7 days and 1 day before the expiration date, warning SMS messages will be sent to the programmed number(s).

Note It is useful to enable this feature in case of a rechargeable SIM card, and disable it if an unlimited credit card or a special rechargeable SIM card is used. If the feature is enabled, it is necessary to insert a date to proceed with the configuration.

SMS options:

- On "Repeated SMSs" field it is possible to set the number of repeated SMSs to be sent. Each alarm or warning SMS sent by the **HI504901** device requires an explicit confirmation by a back call from (one of) the cellular phone(s) that received the message: this call is not answered by the **HI504901**, but works as a confirmation about having read and understood the alarm/warning message (see "SMS delivery" section). If **HI504901** does not receive this confirmation within a fixed time interval (see the "SMS delay" section below), it will send the alarm message again. With the "Repeated SMSs" option, it is possible to set the maximum number of alarm messages that will be sent in these conditions.

Note Default value is 2 repeated SMS's.

Note Valid values are numbers from 0 (i.e. no repeated messages) to 5. If an out-of-range value is inserted, a warning message will be displayed and the maximum allowed value (i.e. 5) is automatically set.

- On "SMS Delay" field it is possible to set the delay between two subsequent alarm/warning SMS's (see "SMS's delivery" section). This delay is related to the number of "Repeated SMSs" (see above).

Note Default value is 10 minutes.

Note Valid values are from 5 to 60 minutes. If an out-of-range value is inserted, a warning message will be displayed and the default value is automatically set.

Note If a zero value is set in the "Repeated SMSs" section, this feature is disabled.

- On "Query Delay" field it is possible to set the delay between a query operation and the following one of the alarm situation for all the connected devices made by **HI504901**. With this option the maximum time for an alarm detection and the relating SMS sending is set (see "Idle state" section).

Note Default value is 1 minute.

Note Valid values are from 1 to 10 minutes. If an out-of-range value is inserted, a warning message will be displayed and the default value is automatically set.

Note The actual interval for the query operation can be bigger than the set value if many devices are connected to the RS485 link and the **HI504901** interface has not enough time to interrogate all the devices within the set time value.

Security options:

- On "HI504901 Password" field it is possible to set the password for the **HI504901** device. This password protects from unauthorized remote modem connection to one of the instruments connected to the cellular phone interface and from unauthorized remote configuration. This password does not block the local configuration of the instrument, i.e. no password is required to configure the **HI504901** device with its application software through the serial cable. The password can be disabled. Valid values are string of 6 to 20 characters (letters and numbers are allowed).

Note Letters typed in lower case will be automatically changed in upper case by the software. If the field is enabled, a value must be inserted.

- On "PIN number" field the SIM card PIN number has to be inserted (maximum 4 digits). When inserting this code the characters are masked. Valid values are numbers from 0000 to 9999. The PIN code must be inserted only in the first **HI504901** configuration and every time the SIM card PIN code is changed.

Note The SIM card PIN number must be inserted in any case and is required by the application software even if the PIN lock has been disabled through a normal cellular phone.

Note If an update with a wrong PIN code is made, an attempt for cellular PIN insertion is lost. At start-up, 3 attempts for entering the cellular PIN code are available, and at each update with a wrong PIN value, an attempt will be lost. After 3 wrong attempts, to unlock the SIM card, extract it and manually enter the PUK by using a cellular phone.

Note If the PIN code is changed during configuration it will be checked and this operation lasts about 30 seconds (the cellular phone will be turned off and on again to verify the PIN code correctness).

If the SIM card PIN number is longer than 4 digits, it has to be changed before using it in the **HI504901** interface. To do this, insert the SIM card in a cellular phone and change the old PIN number with a new one with value from 0000 to 9999, while paying attention to remember the new code (please refer to the cellular phone instruction manual for the correct procedure). After that, it is possible to insert the SIM card in the **HI504901** (see "Installation" section) and use the new PIN number in the next interface local configuration.

RS232 OPTIONS SETTING

In this section it is possible to set all options related to the RS232 communication channels towards the instruments within an RS232 output port. A channel can be enabled only if an instrument is connected to it. For each channel the following options have to be set:

- Instrument name: select the name of the instrument connected to the RS232 channel from a list (**HI8001** and **HI8002**).
- Baud rate: once the instrument has been selected, the default baud rate value is automatically proposed (i.e. 9600 bps). It is possible to select a different value from a list (1200, 2400, 4800 and 9600 bps).
- Password: click on the "Password" button to set the correct instrument password. Insert the password (masked display) and then confirm it. If no password is set in **HI8001** and **HI8002** controllers, use the default password (i.e. 0000).
- Messages options: to set the alarm message options, click on the "Message Options" button. The available options depend on the selected instrument (see also following sections).

HI8001 and HI8002 Message Options:

In this window it is possible to choose in which alarm conditions for **HI8001** and **HI8002** controllers an SMS will be sent to the selected phone number(s).

Available alarm conditions for **HI8001** and **HI 8002** are:

- "pH Sensor alarm": this alarm is triggered if the difference between the real time values of the two primary pH sensors exceed the specified maximum allowable difference.
- "EC Sensor alarm": this alarm is triggered if the difference between the real time values of the two primary EC sensors exceed the specified maximum allowable difference.

- "pH Range alarm": this alarm is triggered when the real time value of the pH sensor #1 is outside a dead band set by the user during instrument setup.
- "EC Range alarm": this alarm is triggered when the real time value of the EC sensor #1 is outside a dead band set by the user during instrument setup.
- "#n Filter dirty alarm": this alarm indicates that the "n"-th filter requires cleaning.
- "#n Fertilizer low level alarm": this alarm is triggered if the fertilizer level of the "n"-th designated tank reached a minimum value.
- "Acid low level alarm": this alarm is triggered if the level of the acid (or alkaline) tank reached a minimum value.
- "No water supply alarm": this alarm is triggered due to an incoming water supply failure event.

Please refer to the **HI8001** and **HI8002** Instruction Manual for a complete explanation of the above alarm conditions.

RS485 OPTIONS SETTING

In this section it is possible to set all options related to the RS485 communication channel towards the instruments with an RS485 output.

The maximum number of instruments that can be connected to the same bus is 32. To set the instrument options, click on one of the 32 available buttons and then set the following features:

- Instrument name: select the name of the instrument connected to the RS485 from a list (**HI700**, **HI710**, **HI23**, **HI24**, **HI504** and **HI504910**). To disable an instrument previously inserted, select "NO INSTRUMENT".
- Baud rate: once the instrument has been selected, the default baud rate value is automatically proposed. It is possible to select a different value from a list (1200, 2400, 4800 and 9600 bps).

Note All instruments connected to RS485 must be set with the same baud rate value. Once a new instrument is added in **HI504901** configuration, the current RS485 baud rate value is proposed: it is possible to change this value, but this modification will be applied to all the instruments previously configured.

- RS485 address: it is the RS485 address of the instrument (allowed values are within 0 to 99 range). Each instrument must have a different value for this field.

To enable one RS485 instrument, all the three previous options (instrument name, baud rate and RS485 address) must be set.

- Messages options: to set the alarm message options, click on the "Message Options" button. This feature depends on the instrument previously selected and it is only available for **HI504** and **HI504910** devices (see also the "HI504 and HI504910 Message Options" section).

Note For **HI700**, **HI710**, **HI23** or **HI24** instruments series it is possible only to enable or disable the sending of the alarm SMS.

HI504 and HI504910 Message Options:

In this window it is possible to choose in which alarm conditions for HI504 and HI504910 instruments an SMS will be sent to the selected telephone number(s).

Available alarm conditions for **HI504** are:
- Alarm for setpoint 1;
- Alarm for setpoint 2;
- Max relay ON time;
- Life check error;
- pH electrode broken;
- Reference electrode broken;
- Old pH probe;
- Dead pH probe;
- Calibration time-out;
- Temperature probe broken;
- Analog input;
- EEPROM corruption;
- Temperature level.

Available alarm conditions for **HI504910** are:
- Life check error;
- pH electrode broken;
- Reference electrode broken;
- Old pH probe;
- Dead pH probe;
- Temperature probe broken;
- EEPROM corruption.

Please refer to the **HI504** Instruction Manual or **HI504910** Instruction Manual for a complete explanation of the above alarm conditions.

DIGITAL I/O OPTIONS SETTING

Digital input section

This section includes all the specific options that apply to the digital input channel. This channel is intended for connection to a simple instrument without RS232 or RS485 port. For such instruments, an alarm output like an electromechanical relay or an open collector digital output can be connected to the **HI504901** interface to trigger the sending of an alarm SMS message. The complete options list is:

- Instrument enable: it is possible to enable this feature if an instrument is connected to the digital input simply by checking on the check-box.
- Instrument name: in this filed a description related to the instrument has to be inserted: for example "HI8711 - A" for an HI8711 connected to the digital input. The maximum length of this description is 20 characters.
- Information options: set the options related to the information SMSs to be received upon phone call:
- Red LED status when the contact is closed (ON/OFF).
- Description of the digital input status when the contact is closed (e.g. "ALARM!"). The maximum length of this description is 30 characters.
- Description of the digital input status when the contact is open (e.g. "OK"). The maximum length of this description is 30 characters.
- Alarm options: set the options related to the alarm SMSs:
- Enable alarm: the alarm SMSs sending can be enabled or disabled.
- The alarm can be triggered upon the closing or opening of a contact on digital output (default trigger event is closed contact).
- Alarm description string (e.g. "ALARM #1!"). The maximum length of this description is 30 characters.

Digital output section

It is possible to enable (or disable) the control of the digital output status connected to the **HI504901** by checking the proper check-box. Once enabled, it is possible to control the digital output simply sending the SMS "CLOSEP<cellular phone interface password>" to close the digital output contact, and "OPENP<cellular phone interface password>" to

open the digital output contact. If the digital output control is enabled, when an information will be requested to **HI504901**, an SMS with the digital output status will be sent.

Note By disabling this option, it will not be possible to set the digital output status and no information SMS about the digital output will be sent.

Note If the digital output management is disabled, the digital output will be automatically opened, even if it was previously closed.

Note If the password is not set, only "CLOSEP" or "OPENP" SMS must be sent.

Default values

The following table lists the default value for previous items, i.e. the factory values copy from ROM if **HI504901** was never configured.

Item	Default value
Telephone #1	empty field
Telephone #2	empty field
Date	from internal RTC
Time	from internal RTC
Remaining SMSs	disabled
Expiration date	disabled
Repeated SMSs	2
SMS delay	10 minutes
Query delay	1 minute
Password	disabled
PIN	empty field
RS232 options	no instrument configured
RS485 options	no instrument configured
Digital input	disabled
Digital output	disabled

SMS DELIVERY

HI504901 is able to send SMSs to one (or two) cellular phone number(s). **HI504901** can send two types of message: alarm SMSs (upon an alarm condition at least in one of the instruments connected to the interface) and information SMS (upon specific request from the user).

Note To use the SMS feature, a SIM card able to make a voice call must be used.

ALARM SMSs

Alarm messages are submitted by **HI504901** to the cellular phone number(s) when an error occurred on one of the instruments connected to the interface. A message about an alarm condition in one instrument will be sent by the interface only if the alarm is active and the specific alarm notification was enabled during last configuration, by checking the proper box on the "message option" window of the selected device (see "Interface configuration" section). If an alarm is active in one instrument connected to the interface but its notification was not enabled during last configuration, then no SMS will be sent (however **HI504901** gives indication to the user about the error condition by turning on the red LED for the RS232 channel or RS485 port or digital input port where the instrument is connected).

Note An alarm SMS can be sent only if SMS sending is user enabled through digital input terminal (#8 on page 8), otherwise no SMS will be issued.

The format of alarm messages for instruments connected to the RS232 ports will be:

"<INSTRUMENT NAME>; RS232-<NUMBER OF THE RS232 CHANNEL>; Alarms: <ALARM SPECIFIC TO THE INSTRUMENT>; Rem msg: <NUMBER OF REMAINING MESSAGES>"

The format of alarm messages for instruments connected to the RS485 port will be:

"<INSTRUMENT NAME>; RS485-<RS485 DEVICE ADDRESS>; Alarms: <ALARM SPECIFIC TO THE INSTRUMENT>; Rem msg: <NUMBER OF REMAINING MESSAGES>"

During alarm condition, the field <ALARM SPECIFIC TO THE INSTRUMENT> on the alarm message will contain the list of

only active alarms; when all active alarms can not be sent within one SMS (the maximum number of characters for an SMS is 160), more than one message will be sent, each one having as header the label "Alarms#p/#t:" with the indication of the progressive alarm SMS number (#p) and the total number of alarm SMSs (#t) that are going to be sent for the instrument.

The <INSTRUMENT NAME> label is a text string correspondent to the instrument model with active alarm(s).

The <NUMBER OF REMAINING MESSAGES> is a value (max. 4 digits) indicating the number of remaining messages in the SIM card (see "Interface configuration" section).

Following a complete list of all available alarm indications (and their coded notations) for all devices which can communicate with **HI504901** supervisor and some messages specific to **HI504901** interface itself.

Alarms for HI8001 and HI8002 controllers

Coded notation for <INSTRUMENT NAME> label is "HI8001" or "HI8002" (depending on controller model), while coded notations for active alarms are:

- "pHsensor": this alarm is triggered if the difference between the real time values of the two primary pH sensors exceed the specified maximum allowable difference.
- "ECsensor": this alarm is triggered if the difference between the real time values of the two primary EC sensors exceed the specified maximum allowable difference.
- "pHrange": this alarm is triggered when the real time value of the primary pH sensor is outside a dead band set by the user during instrument setup.
- "ECrange": this alarm is triggered when the real time value of the primary EC sensor is outside a dead band set by the user during instrument setup.
- "Dirty Filt*n*": this alarm indicates that the "*n*" filter requires cleaning.
- "Fert*n*": this alarm is triggered if the fertilizer level of the "*n*" tank reached a minimum value.
- "Acid": this alarm is triggered if the level of the acid (or alkaline) tank reached a minimum value.
- "Mixing": this alarm is triggered due to an incoming water supply failure event.

When all alarms are active, the message will include the entire list as following: "pHsensor; ECsensor; pHrange; ECrange; Dirty Filt1; Dirty Filt2; Fert1; Fert2; Fert3; Fert4; Acid; Mixing".

Alarms for HI23, HI24, HI700 and HI710 meters

Coded notation for <INSTRUMENT NAME> label is "HI23", "HI24", "HI700" or "HI710" (depending on meter model). For these models there is only one possible alarm notification (if an error occurred): "Alarm on" if the alarm is active.

Note The alarm condition includes also the case of broken temperature probe.

Alarms for HI504 meters

Coded notation for <INSTRUMENT NAME> label is "HI504", while coded notations for active alarms are:

- "Setpoint1": alarm for setpoint 1.
- "Setpoint2": alarm for setpoint 2.
- "Max relay on": maximum relay ON time error.
- "Life check": life check error.
- "pH electrode broken": pH electrode broken or leakage.
- "Reference electrode broken": reference electrode broken or leakage.
- "Old pH probe": old pH probe error.
- "Dead pH probe": dead pH probe error.
- "Calibration timeout": calibration time-out error.
- "Temperature broken probe": temperature probe broken error.
- "Analog input": analog input error.
- "EEPROM corruption": EEPROM corruption error.
- "Temperature level": temperature level error.

When all alarms are active, the message will include the entire list as following: "Setpoint1; Setpoint2; Max relay on; Life check; pH electrode broken; Reference electrode broken; Old pH probe; Dead pH probe; Calibration timeout; Temperature broken probe; Analog input; EEPROM corruption; Temperature level".

Note If during last polling test **HI504901** was not able to communicate with one of the instruments connected to the interface, then a specific alarm SMS will be sent. This happens if the cable between **HI504901** and the instrument is not correctly connected, the remote instrument was turned off, or

some parameters for serial communication (as baud rate or device RS485 address) are not correct (parameters values probably are not the same on **HI504901** and meter side; see "Interface configuration" section).

The format of this kind of alarm message for the instruments connected to the RS232 ports will be:

"<INSTRUMENT NAME>; RS232-<NUMBER OF THE RS232 CHANNEL>; Alarm: Device not responding; Rem msg: <NUMBER OF REMAINING MESSAGES>"

while for the instruments connected to the RS485 ports will be:

"<INSTRUMENT NAME>; RS485-<RS485 DEVICE AD-DRESS>; Alarm: Device not responding; Rem msg: <NUMBER OF REMAINING MESSAGES>"

Alarm SMSs for instrument connected to the digital input port

If the digital input was configured to send alarm SMSs and the present status of port matches with the condition selected for triggering an alarm message in the last **HI504901** configuration (see "Interface configuration" section), then the following SMS will be sent:

"<INSTRUMENT DESCRIPTION>; Digital input; <ALARM DESCRIPTION>; Rem msg: <NUMBER OF REMAINING MESSAGES>".

Previous fields represent strings inserted by the user with the **HI504901SW** software as following:

- <INSTRUMENT DESCRIPTION>: instrument description string, maximum length is 20 characters;
- <ALARM DESCRIPTION>: alarm description string, maximum length is 30 characters.

Alarm SMSs specific to the interface

Two alarm SMSs are provided to inform the user about troubles specific to the **HI504901** interface, the first one concerning the internal backup battery status, the second one about mains power supply status.

If a problem was found during last battery test (see "Fault conditions and selftest procedures" section), **HI504901** issues the following alarm SMS: "Alarm! Battery test failure; Rem msg: <NUMBER OF REMAINING MESSAGES>". After user confirmation of message reception (see further on), **HI504901** will send back the SMS: "Battery test failure; Rem msg: <NUMBER OF REMAINING MESSAGES>".

Instead, in case of mains power failure (see "Power failure" section), **HI504901** issues the following alarm SMS: "Alarm! Power failure; Rem msg: <NUMBER OF REMAINING MESSAGES>". After user confirmation of message reception (see further on), **HI504901** will send back the SMS: "Power failure; Rem msg: <NUMBER OF REMAINING MESSAGES>".

After a power failure event, when the mains power supply comes back, the following message will be sent to the set phone number(s) without any request: "Power is ok now; Rem msg: <NUMBER OF REMAINING MESSAGES>" (this message does not need confirmation by the user; see further on).

Note After submission of an alarm message, a phone call is made by the instrument to the programmed number(s). This is done because the SMS can be received with a considerable delay due to network overload, while the phone call takes place immediately and has a long ring, which is more likely to be heard. The phone call advises the user that something happened on the **HI504901** (or on one of the connected instruments) and an SMS is going to be received. It is not necessary to answer this phone call and it is suggested to simply close it. When an error occurs (and an alarm SMS is sent), the instrument wait for a confirmation of the message reception. The confirmation can be done calling the **HI504901** phone number (number for voice call of the GSM module). The interface will answer hanging up the incoming call and send one or more SMSs about the status of all instruments connected to the **HI504901** interface (this confirmation is managed as an information request; see further on for details). It is also possible to configure the instrument to send repeated messages if confirmation is not received immediately (see "Repeated SMS" and "SMS delay" items in "Interface configuration" section). This feature has been introduced to prevent loosing of warning messages due for example to overload of the telephone lines; "Repeated SMS" item represents the number of repeated SMSs to send, while "SMS delay" item sets the delay time between two subsequent alarm messages.

INFORMATION SMSs

In addition to the alarm messages already described, the cellular phone interface can send information messages upon request. These messages include all relevant information that can be

got from the controlled instruments, and could be requested, for example, after an alarm message regarding an error which should close without any intervention. The user could also want to be informed about the values of the measured magnitudes or current devices status.

The information messages can be requested:

1. by making a call from one of the phone numbers programmed for alarm messages sending: in this case the cellular phone interface recognizes the calling phone number, hangs up without answering and then sends to the calling number one (or more) information message(s) for each controlled instrument;

2. by sending an SMS from whatever cellular phone to the device. The message must have the following format: "P<CELLULAR PHONE INTERFACE PASSWORD>", i.e. the uppercase P letter followed by the cellular phone interface password in uppercase letters; if the password is disabled, just "P" is enough. Upon this requesting message, the interface will send one (or more) information message(s) for each controlled instrument to the cellular phone which issued the requesting SMS.

The format of the information messages is very similar to the one for alarm messages. The only difference is the "Info: <INFORMATION SPECIFIC TO THE INSTRUMENT>" string instead of "Alarms: <ALARM SPECIFIC TO THE INSTRUMENT>" (see previous subsection for details).

The format of information messages for the instruments connected to the RS232 ports will be:

"<INSTRUMENT NAME>; RS232-<NUMBER OF THE RS232 CHANNEL>; Info: <INFORMATION SPECIFIC TO THE INSTRUMENT>; Rem msg: <NUMBER OF REMAINING MESSAGES>"

while of information messages for the instruments connected to the RS485 ports will be:

"<INSTRUMENT NAME>; RS485-<RS485 DEVICE ADDRESS>; Info: <INFORMATION SPECIFIC TO THE INSTRUMENT>; Rem msg: <NUMBER OF REMAINING MESSAGES>".

For <INSTRUMENT NAME> and <NUMBER OF REMAINING MESSAGES> fields, please refer to the previous subsection.

When all information can not be sent with one SMS (the maximum number of characters for an SMS is 160), it will be sent more than one message, each one beginning with the label "Info#p/#t:" which gives the indication of the progressive information SMS number (#p) and the total number of information SMSs (#t) that are going to be sent for the current instrument.

Find here below a complete list of available information (and coded notations) for all devices which can communicate with the **HI504901** interface.

Information SMSs for HI8001 and HI8002 controllers

For these meters the <INFORMATION SPECIFIC TO THE INSTRUMENT> field reports the following information:

- "Ctrl: INIT or STOP or WORK or BLOCK or CHECK or HALTED": work status of the controller, which can be initialization or stop or work or block or tech-check or system-halted;
- "Alarm: ON or OFF": indicates if there is at least one active alarm in the system;
- "Anom: ##": anomalies total number;
- "pHn: ##.#": indicated values by pH sensors (1 and 2);
- "ECn: ##.#": indicated values by conductivity sensors (1, 2 and 3);
- "SR: ####": indicated value by solar radiation sensor;
- "IrPRG: ##": number of the active irrigation program; if no irrigation program is active, then this indication will be "IrPG:--";
- "P#: NOT or SET or RDY or ACT or FIN or WAIT or DEL": status of all irrigation programs (10), which can be not set or set or ready or active or finished or waiting or delayed;
- "C#: NOT or SET or RDY or ACT or FIN or WAIT or DEL": status of cleaning filter programs (2), which can be not set or set or ready or active or finished or waiting or delayed;
- "Pump: ON or OFF or BLK": status of pumps, which can be on or off or block;
- "CondStop": conditional stoppage input, if active;
- "TmpBrk": temporary break input, if active.

All these information will be reported in two SMSs; if some alarm is active in **HI8001** or **HI8002** controller, a third SMS will be sent, with the label "INFO3/3". This message will contain the

list of all active alarms with the previously described format (see section "Alarms for HI8001 and HI8002 controllers").

Information SMSs for HI700, HI710, HI23 and HI24 meters

For these meters the <INFORMATION SPECIFIC TO THE INSTRUMENT> field reports the following information:

- "EC: #### uS or mS": EC reading, available only when the meter is in control or idle mode; the measure unit, uS or mS, depends on the scale used by the instrument; if the reading is out of meter range, then this indication will be "EC:---- uS or mS";
- "Temperature: ##.#C": temperature reading; if the meter is not in control or idle mode, the controller answers with the last acquired reading when it was in control or idle mode; if the reading is out of meter range, then this indication will be "Temperature:----C";
- "TDS: #### ppm or ppt": TDS reading, available only for **HI710** and **HI24** devices in control or idle mode; the measure unit, ppm or ppt, depends on the scale used by the instrument; if the reading is out of meter range, then this indication will be "TDS:---- ppm or ppt";
- "Alarm on": if an alarm is active on current device.

Note If the meter is in control or idle mode, no information is available for EC and TDS values, and indication as that for reading out of range will be given in the alarm SMS.

Information SMSs for HI504 and HI504910 meters

For these meters the <INFORMATION SPECIFIC TO THE INSTRUMENT> field reports the following information:

- "ORP: #### mV": ORP reading, available only if the meter is set as ORP controller; if the reading is out of meter range (±2000 mV), then this indication will be "ORP: ---- mV";
- "pH: ##.##": pH reading, available only if the meter is set as pH controller; if the reading is out of meter range (-2.00 to 16.00 pH), then this indication will be "pH: ----- ";
- "Temperature: ###.#C": temperature reading, available only if the meter is set as pH controller; if the reading is out of meter range (-30.0 to 130.0°C), then this indication will be "Temperature:-----C";
- "HOLD": hold indication, if the controller is in hold mode;
- List of all active alarms as previously described (see "Alarms for HI504 meters" section).

Information SMSs for meter connected to the digital input port

If the digital input was configured to send information SMSs upon a user request message (see "Interface configuration" section), then the following SMS will be sent:

"<INSTRUMENT DESCRIPTION>; Digital input; <DESCRIPTION FOR THE DIGITAL INPUT STATUS>; Rem msg: <NUMBER OF REMAINING MESSAGES>".

<INSTRUMENT DESCRIPTION> field is the same as for the alarm SMS; <DESCRIPTION FOR THE DIGITAL INPUT STATUS> is one of the two description strings defined by the user with **HI504901SW** software on last interface configuration related to present digital input status (close or open).

Here is a message example: "HI8711-A; Digital input; pH IS OK; Rem msg: 32".

Note If no information is available regarding an instrument because it did not answer to **HI504901** during last polling procedure, then the following "Device not responding" string will appear for <INFORMATION SPECIFIC TO THE INSTRUMENT> field.

Note If no error is active on current device, then the text string "No alarms" will be added instead of the list of active alarms.

Note If SMS sending is disabled through the external switch, then **HI504901** sends only the message: "SMS disabled; Rem msg: <NUMBER OF REMAINING MESSAGES>".

Note The information about SIM charge and expiration date are not saved in the SIM card, but are managed by the network operator; the instrument can not get directly the information. To prevent the discharge of the SIM card, the user has to configure manually (according with the credit stored on the SIM card) the maximum number of SMSs that can be sent (see "Interface configuration" section).

Note Every time an SMS is submitted, the <NUMBER OF REMAINING MESSAGES> is updated and it will always indicate the remaining number of messages that can be sent by the instrument. When this number is going to reach zero, the message "Maximum number of SMSs reached. Please check the HI504901 SIM charge level; Rem msg: <NUMBER OF REMAINING MESSAGES>" will be sent by the instrument to the programmed cellular phone number(s). This particular situation is managed as an error occurrence and a confirmation is waited. When this happens, no more messages will be sent by the interface until the error is disactivated.

Also a cellular error indication is given by interface: green and red LEDs disable/enable blink together. To disactivate this error and restore the SMS service, it is necessary to re-charge the SIM card credit.
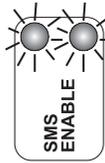
Note Every time a recharge of the cellular module SIM card is performed, the corresponding expiration date has to be manually updated with the application software **HI504901SW** (see "Interface configuration" section). A check is performed daily between the current (Real Time Clock) and the expiration date. Two weeks before the expiration date, the message "The HI504901 SIM card will expire on DD-MM-YYYY. Please re-charge or substitute it" is sent to the programmed phone number(s). The same message will be sent again also one week before and the day before the expiration date. This particular warning message does not need confirmation. In this case the user has to recharge or substitute the SIM card. The sending of the repeated warning messages will be reset when the expiration date is changed. If the expiration date is reached without any updating of the "Expiration Date" item (see "Interface configuration" section), then no more messages will be sent by the interface until error is disactivated and a cellular error indication will be given. To disactivate this error it is necessary to update the SIM expiration date.

Note If the user has unlimited credit on the SIM card (i.e. option was disabled during last interface configuration), the value of remaining messages will not be decrement and no check will be performed on the SIM card expiration date. Moreover, at the end of each SMS there will not be the remaining-messages information ("Rem msg: <NUMBER OF REMAINING MESSAGES>").

DIGITAL OUTPUT CONTROL

The user can control the digital output status simply sending an SMS to **HI504901** (one to close and one to open the port). Following messages can be sent from whatever cellular phone to change the status:

- "CLOSEP<cellular phone interface password>" to close the contact (if password is enabled)
- "CLOSEP" to close the contact (if password is disabled)
- "OPENP<cellular phone interface password>" to open the contact (if password is enabled)
- "OPENP" to open the contact (if password is disabled)

Note All the letters for <cellular phone interface password> in the message must be in uppercase format.

After one of these messages is received by the interface and the correspondent action performed, a message confirming the new status of the digital output port is sent back by the interface:

- "Digital Output: Contact Closed", if digital output contact is closed;
- "Digital Output: Contact Open", if digital output contact is open.

Previous messages are sent also by the interface upon an user information request, if digital output control was enabled.

Note If a communication problem with internal cellular phone occurs during the normal functioning of the interface, the cellular error indication will be switched on and no SMS can be submitted until the error will be disactivated (when this error occurs, the instrument will try repeatedly to initialize the cellular engine and the error will be disactivated only after a successful initialization).

PC COMMUNICATION

HI504901 interface can act as a gateway for a connection through a remote computer. With this feature a seamless data connection will be established between a computer and whatever instrument connected and previously correctly configured on the **HI504901** interface through **HI504901SW** application software (see "Interface configuration" section).

Through a PC communication session it is possible to download on the PC all information, alarms and fault conditions regarding all instruments connected to **HI504901** through only one data communication link towards **HI504901** interface (no need to perform as many data links as many instruments have to be queried). Actually, once data call is in progress, the user can select with which instrument (connected to the interface) he wants to communicate and switch among the various instruments at any time.

There are two ways for establishing a PC communication session: the "local" one with a serial cable, and the "remote" one through a modem connected to the PC (see below).

Data transmission to the PC from instruments connected to the interface (both local and remote) is possible with the **HI92500** Windows® compatible application software offered by Hanna Instruments.

The user-friendly **HI92500** offers a variety of features such as logging selected variables or plotting the recorded data. It is also provided with an on-line help feature to support the user through the operation.

HI92500 makes it possible to use the powerful means of the most diffuses spreadsheet programs (Excel©, Lotus 1-2-3©, etc.). Simply run the favorite spread sheet and open the file downloaded by **HI92500**. It is then possible to elaborate the data with the selected software (e.g. graphics, statistical analysis).

To install **HI92500** are required only a 3.5" drive and a few minutes to follow the instructions printed on the disk label.

Contact your Hanna Dealer to request a copy.

LOCAL COMMUNICATION

This type of communication session takes place between the **HI504901** device and one (placed near) PC with **HI92500** application software installed, towards a serial cable connection. To connect the **HI504901** supervisor to PC use an **HI920010** cable. Plug the connectors, one to the supervisor RS232 auxiliary connector (PC config port), and the other one to a serial port of the PC.

REMOTE COMMUNICATION

This type of communication session takes place between the **HI504901** device and one remote PC with the **HI92500** application software installed, through a data call made by a modem connected to the PC. The incoming call is answered by the interface and then a seamless data connection will be established between any connected instrument and remote computer. In this way it is possible to monitor a meter even if it is placed long far from the operator position.

Note During remote communication, yellow LED for cellular status (when available) blinks fast to indicate data call in progress.

Note **HI504901** will be able to establish a remote communication only if the used SIM card is enabled for data call. Please contact the cellular phone network operator for active services on the used SIM card.

No connection can be established towards an instrument not configured on **HI504901** interface, even if electric wiring is correctly performed between **HI504901** and the instrument itself. Please refer to the **HI92500** on-line help for more details.

Note If mains power supply failure occurs on **HI504901** side while a PC communication session is taking place, **HI504901** enters in power failure status (see "Power failure status" section) and communication session is immediately aborted. Moreover, in remote communication case cellular phone hangs up and telephone line is released.

Note While a PC communication session towards a remote computer is taking place, devices connected to **HI504901** are not polled. So if some new alarms occur meanwhile, no SMS is sent by the phone interface. Configured alarm messages are sent when the connection ends, if the correspondent alarm is still active. Also information messages are temporarily suspended.

PC COMMUNICATION PROTOCOL

Even if it is strongly recommended to use **HI92500** software to establish local or remote connections between **HI504901** and a PC, it is possible to try also without **HI92500** by building the application software for communication session management (i.e. session establishment, serial port channel selection and session termination). It is necessary to issue to the interface towards PC some simple commands accomplishing with the protocol implemented on **HI504901**.

Commands are composed of three parts: command identifier, parameter (when needed), end of command. The end of the commands corresponds to the CR char (0x0d).

Following is the complete list of available commands:

Command	Parameter	Remarks
PWD	<interface password>	Send the general password (*)
C	N R	Request to channel selection (**)
DSC	not available	Request to disconnect from present channel selection

(*) 6 to 20 characters long ASCII string representing interface password (letters in uppercase format)

(**) *NR* are ASCII characters corresponding to the channel (*N*) on the interface where is attached the instrument(s) with which the application software wants to communicate and the baud rate used (*R*) for communication with the corresponding device(s).

The character *N* for requested channel is coded like this:

N code	Selected port
0	RS485
1	RS232 channel 1
2	RS232 channel 2

The character *R* for requested channel is coded like this:

R code	Baud rate value
A	1200 bps
B	2400 bps
C	4800 bps
D	9600 bps

Local PC connection session establishment

To start a local PC connection the application software has to perform the following operations on PC side:

• Set baud rate at 9600 bps on the selected PC serial port.

• Pull up the DTR line of the serial port and wait for phone interface "RDY<CR>" answer. The DTR line must remain high while application software is running; if the DTR goes down while communication is taking place, then **HI504901** aborts immediately the current PC communication session.

• If the password was enabled in the phone interface during last configuration (see "Interface configuration" section), the application software must send the password through the command "PWD<interface password><CR>" and the interface will answer <ACK> (char 0x06) if the password is correct, or <CAN> (char 0x18) if password is wrong or <NAK> (char 0x15) if command syntax is wrong.

Remote PC connection session establishment

To open a remote PC connection the application software has to perform the following operations on PC side:

• Set the baud rate at 9600 bps for the serial port where modem is connected and continue to use this value for <u>all the time</u> the communication is in place;

• Make a data call to the cellular phone number using the modem;

• After the reception of the "CONNECT" notification string (i.e. the data connection establishment), wait for the string "RDY<CR>" issued by the interface: this means that the interface is ready to receive a command from the remote PC;

• If the password was enabled in the phone interface during last configuration (see "Interface configuration" section), the application software must send the password within 3 minutes through the command "PWD<interface password><CR>" and the interface will answer <ACK> (char 0x06) if the password is correct, or <CAN> (char 0x18) if password is not correct, or <NAK> (char 0x15) if command syntax is wrong, and hangs up the call when 3 minutes have elapsed.

Local channel selection

Before communicating with one of the instruments attached to **HI504901**, the application software on remote PC needs to

select which channel and baud rate the interface uses for communicating with the target device (i.e. the baud rate used by interface during polling procedure and set during last interface configuration). To do this, the *CNR*<CR> command with the proper values (channel *N* and rate *R*) has to be sent to cellular phone interface. For example, if target device is attached on RS232-1 port and its communication rate is 2400 bps, then the command C0B<CR> must be issued. The cellular phone interface will send back <ACK> if the command is correctly recognized, otherwise <NAK>. <CAN> is sent back if the required channel is not configured in the instrument or if the baud rate does not match the value set in the interface memory for the corresponding channel. When command is correctly recognized, baud rate in the local PC and the selected instrument are connected directly and everything works like a direct point-to-point connection (if we exclude the delay issues).

However, it is also possible to change RS232/RS485 channel for selecting another instrument without interrupting the connection. If selection of another instrument is requested and one connection is already in place, the application software must issue the "DSC<CR>" command three times at the baud rate of the present channel (channel disconnection). **HI504901** answers with <ACK> if the command sequence is correct, but no answer will be sent back by the phone interface if the syntax is wrong.

After that disconnection, another channel can be connected as described above (using the "*CNR*<CR>" command at 9600 bps baud rate).

Remote channel selection

Also in remote communication session the application software needs to select a channel, but the procedure is a bit different from the local one. Before communicating with one of the instruments attached to **HI504901**, the application software on remote PC needs to select which channel and baud rate are used by the interface for communicating with the target device. To do this, the *CNR*<CR> command with the proper values (channel *N* and rate *R*) has to be sent to cellular interface. The phone interface will send back "+++" (the "+++" is needed to return temporarily to command mode in the cell phone to change baud rate) and then, after several seconds, <ACK> if the command is correctly recognized, otherwise <NAK>.

<CAN> answer is sent back if the required channel is not configured in the instrument or if the baud rate does not match the value set in the interface memory for the corresponding channel. When command is correctly recognized, the local PC and the selected remote instrument are connected directly and everything is works like a direct point-to-point connection (if the delay issues are excluded). No need to change baud rate value on PC side as modem buffers handle automatically the baud rate difference (remember that the baud rate must be kept at 9600 bps in remote communication on PC).

To change RS485/RS232 channels for selecting another instrument without interrupting the call, the application software will issue the "DSC<CR>" command three times (9600 bps baud rate): after the third reception of this command, the phone interface will answer with "+++" and then, after several seconds, with <ACK>. If the syntax is wrong, no answer will be sent back by the phone interface. After that disconnection, another channel can be connected as described above (sending "*CNR*<CR>" command at 9600 bps baud rate).

Local PC connection closure

The application software can close a local PC connection pulling down the DTR line of the serial port at any moment.

Remote PC connection closure

The application software can close a remote PC connection hanging up the data call sending to the modem "+++" and then, after "OK" reception, "ATH<CR>" commands at any moment.

An automatic disconnection on **HI504901** side takes place if no character is received in 3 minutes.

LEDs STATUS DURING PC COMMUNICATION SESSION

Following is a table with all possible status of **HI504901** LEDs during a PC communication session:

LED	Status	Meaning
RS232 channel # (red)	OFF	PC communication in progress with another channel or not yet channel selection made by remote PC
	Blinking	Communication session in progress between remote PC and this channel
RS485 channel (red)	OFF	PC communication in progress with another channel or not yet channel selection made by remote PC
	Blinking	Communication session in progress between remote PC and one RS485 instrument
Digital input (red)	OFF	--- (no meaning)
SMS enable (green)	OFF	--- (no meaning)
SMS enable (red)	ON	--- (no meaning)
Digital output (yellow)	ON / OFF	Indication about digital output previous status (ON if contact closed, OFF if contact open)
Cell signal quality (2 green LEDs)	both OFF, or ON + OFF, or both ON	Indication about last cellular signal strength before PC communication session beginning
Cell status (yellow)	ON / OFF / blinking	Cellular phone real time operating status (fast blinking if remote communication is taking place)

POWER FAILURE

The power failure status is the working mode of **HI504901** when the mains power supply fails and the interface works using the internal backup battery.

In this situation the green "SMS enable" and red "SMS disable" LEDs are in the following conditions:

LED	Status	Meaning
SMS enable (green)	blinking	SMS sending enabled
SMS disable (red)	OFF	
SMS enable (green)	OFF	SMS sending disabled
SMS disable (red)	blinking	

All other LEDs (excluding the digital output LED when the digital output contact is closed) are turned off.

If the SMS sending is user enabled, then alarm SMS related to power failure event will be sent by **HI504901** to the programmed number(s) (see "SMS delivery" section).

After that, if

1. sending of maximum number of repeated messages is reached without user confirmation, or

2. **HI504901** receives a phone call from one of the programmed number(s) to confirm alarm SMS reception, or

3. SMS sending is disabled through external switch,

then **HI504901** turns off the cellular phone engine to prevent internal backup battery consumption.

Note If SMS sending was disabled before power supply failure event, then cellular phone is immediately turned off and no alarm will be issued by interface.

While in power failure status **HI504901** does not perform device polling procedure, so that new alarms on instruments connected to the interface can not be notified.

Also interface configuration and PC communications (both local & remote) are not allowed until mains supply comes back. When the mains power supply comes back, the cellular phone turns on and cellular initialization procedure takes place (it keeps about 30 seconds). As in start-up procedure, during cellular phone initialization the red LED for SMS disable turns on while the green LED (SMS enable) turns off. When cellular phone is ready, **HI504901** sends the SMS "Power is OK now!" to the programmed number(s), if SMS sending is enabled.

FAULT CONDITIONS & SELFTEST PROCEDURES

HI504901 is provided with some selftest procedures to prevent interface problems. The below fault conditions may be detected by the software:
• EEPROM data error
• Cellular phone error
• Battery test failure

If a problem is found, **HI504901** gives to the user a "visual" indication through green and red LEDs for SMS sending enable/disable (also for battery test failure an alarm SMS is submitted to the programmed number(s)).

EEPROM DATA ERROR

EEPROM data error can be detected through automatic EEPROM test procedure. **HI504901** performs this test at startup and once every hour.

When an EEPROM data error is detected (i.e. if a checksum control fails), **HI504901** tries to repair the corrupted data. If it does not succeed, a fault alarm is generated for EEPROM corruption error. To close this error a new local interface configuration is required.

As soon as an EEPROM error is detected, the following "visual" LED indication is provided by the interface:

LED	Status	Meaning
SMS enable (green)	ON	EEPROM data
SMS disable (red)	ON	corrupted

Note While EEPROM data error is active no polling operation is performed. Remote PC communication and remote interface configuration can not take place. Only a local PC configuration is allowed in order to let the user to verify EEPROM stored data and to correct the corrupted ones.

CELLULAR PHONE ERROR

During the normal functioning of the interface if a problem occurs in communication with the cellular engine, a cellular error will be switched on. **HI504901** performs periodically (every 10 minutes) a cellular test to be sure that the cellular phone engine is ready and network registered. Moreover, a cellular error can be generated if the SIM card expiration date is reached or when the number of remaining messages reached zero.

If cellular error is active, the following "visual" LED indica-

tion will be given by the interface:

LED	Status	Meaning
SMS enable (green)	blinking	Cellular phone
SMS disable (red)	blinking	error

When this error occurs, the instrument will try repeatedly to initialize the cellular phone engine and the error will be disactivated only after a successful initialization.

Note If SIM card expired or maximum number of remaining messages reached zero, the only way to disactivate cellular error is to recharge or substitute the SIM card.

While cellular error is active no remote configuration and PC communication session can take place until error will be disactivated. Also SMS service is not available.

BATTERY TEST FAILURE

HI504901 can test the internal backup battery in order to check if it is good and correctly connected on the main board. Interface performs the battery test at device start-up and once a day at 15:00 (3:00 pm).

If battery test is not successful, then an alarm SMS is submitted by **HI504901** supervisor to the programmed number(s) as described on the "SMS delivery" section. Also repeated SMSs are sent if no user confirmation is received.

Note Every day, after this test procedure, related alarm SMS for battery test failure will be submitted by the interface even if an user confirmation was received the day before (if there is still problem with internal battery). The only way to prevent alarm SMS sending is to solve the problem related to the internal battery. While battery problem persists green "SMS enable" and red "SMS disable" LEDs are in the following conditions:

LED	Status	Meaning
SMS enable (green)	blinking	Battery test failed and
SMS disable (red)	ON	SMS sending enabled
SMS enable (green)	ON	Battery test failed and
SMS disable (red)	blinking	SMS sending disabled

Note Before removing battery or checking its capability, make sure that the **HI504901** is turned off.

Note Even if a battery problem persists, all **HI504901** functions are still available.

LED INDICATORS

Find here below a brief explanation of all possible LEDs indications of **HI504901** interface.

RS232 CHANNEL# LED

This red LED keeps indication about device connected to the RS232 channel#.
- **LED off**
  - in idle state: instrument not configured or not in alarm
  - during PC communication session: a communication is in progress with another channel or not yet channel selection made by remote PC
- **LED on**, in idle state: instrument configured and in alarm
- **LED blinking**, during PC communication session: a communication is in progress between remote PC and device connected to this RS232 channel

RS485 PORT LED

This red LED keeps indication about devices connected to the RS485 port.
- **LED off**
  - in idle state: no instrument is configured or no alarm is on
  - during PC communication session: a communication is in progress with another channel or not yet channel selection made by remote PC
- **LED on**, in idle state: at least one instrument is configured and at least one alarm is on
- **LED blinking**, during PC communication session: a communication is in progress between remote PC and one of RS485 instruments

DIGITAL INPUT PORT LED

This red LED keeps indication about digital input status (if software enabled) depending on last interface configuration setting.
- **LED off**
  - in idle state: digital input not configured or digital contact close (if configured to be on when contact is open) or contact open (if configured to be on when contact is close)
  - during PC communication session: when a call is in progress with any instrument
- **LED on**, in idle state: digital input configured and close (if configured to be on when contact is close) or contact open (if configured to be on when contact is open)

SMS ENABLE/DISABLE LEDs

These two LEDs keep indication about SMS sending enable/disable status and are used on fault interface related condition to provide to the user a "visual" indication of actual problem.
- **green LED on & red LED off**, in idle state: SMS sending enabled
- **green LED off & red LED on** during interface start-up procedure or in idle state if SMS sending is disabled
- **green LED blinking & red LED off**, in power failure status: SMS sending enabled
- **green LED off & red LED blinking**, in power failure status: SMS sending disabled
- **green LED blinking & red LED on**, battery test failed and SMS sending enabled
- **green LED on & red LED blinking**, battery test failed and SMS sending disabled
- **green & red LEDs blinking**, cellular error is active
- **green & red LEDs on**, EEPROM data corruption

DIGITAL OUTPUT STATUS LED

This yellow LED keeps indication about digital output contact status (if software enabled).
- **LED off**, digital output contact open
- **LED on**, digital output contact close

CELLULAR SIGNAL LEDs

These green LEDs keep indication about signal strength for cellular phone module.
- **Cell signal #1 & Cell signal #2 LEDs off**, no signal or cellular error found or power failure status
- **Cell signal #1 LED on & Cell signal #2 LED off**, medium signal condition
- **Cell signal #1 & Cell signal #2 LEDs on**, strong signal condition

CELLULAR STATUS LED

When available, this yellow LED displays the operating status of the cellular phone terminal.
- **LED off**, cellular engine off
- **LED on**, cellular engine on but not registered to the network
- **LED blinking (slow)**, cellular engine on and registered to the network
- **LED blinking (fast)**, cellular engine registered to the network and a call is in progress

ERRORS PRIORITY

HI504901 is provided with some selftest procedures and related "visual" LED indications when some of these tests failed, in order to make the user understand the interface related problem (see "Fault conditions and selftest procedures" section).

Only two LEDs (green and red LEDs for SMS sending enable/disable) are available to give information to the user about active errors, and no more than one can be shown at the same time. For this reason every error type has an associated priority level, as described in the following table:

Error type	Priority level
Power failure	4
EEPROM data corruption	3
Cellular error	2
Battery test failure	1

If more than one fault condition occurs simultaneously, then errors with lower priority level are masked by error with high one: only error indication with higher priority will be visible by the user.

TROUBLESHOOTING GUIDE

If troubles occur with the **HI504901** device, follow the below guidelines.

INTERFACE CONFIGURATION

• *One (or more) device(s) is (are) not recognized by **HI504901** interface during interface configuration with provided application software **HI504901SW** on "test device" procedure.*

Possible causes	Solutions
Configuration parameters for serial communication between **HI504901** and connected device(s) are not correct.	Check if following parameters for serial communication set with **HI504901SW** application software (device model, baud rate, device address - only for instruments connected to RS485 port) match with the ones defined on connected instrument.
Remote device is turned off.	Turn on remote device.
Wiring not correctly performed.	Check if the remote device is correctly connected to the **HI504901** supervisor.

• *During local interface configuration attempt the **HI504901SW** software can not connect to the **HI504901** interface.*

Possible causes	Solutions
Wiring not correctly performed.	Check if the **HI920010** cable is correctly connected to the RS232 serial port on the PC and to the auxiliary serial port on the **HI504901** interface.
HI504901 interface is busy (a remote PC communication or remote interface configuration is already in place, interface is performing the polling procedure for a not responding device, etc.).	Try to connect later.
HI504901 is in power failure status.	Restore mains power supply or wait for power supply comes back.
HI504901 interface is turned off.	Turn on the **HI504901** interface.

• *During remote interface configuration attempt the* **HI504901SW** *software can not connect to the* **HI504901** *interface.*

Possible causes	Solutions
Modem on PC is turned off.	Turn on the modem and try again.
SIM card on **HI504901** is not able to make data calls.	Change the SIM card with one enabled for data calls. **Note**: Some SIM cards can be used both for data and voice calls. Please check the network operator for further details.
HI504901 interface is out of coverage.	Install **HI504901** interface in a place with good network coverage.
HI504901 interface is busy (PC communications or interface configurations, both remote and local, are already in place, interface is performing the polling procedure for a not responding device, etc.).	Try to connect later.
HI504901 is in power failure status.	Restore mains power supply or wait for power supply comes back.
HI504901 interface is turned off.	Turn on the **HI504901** interface.

PC COMMUNICATION

• *No local "PC communication session" can take place with* **HI504901** *interface : see case "During local interface configuration attempt the* **HI504901SW** *software can not connect to the* **HI504901** *interface" on the "Interface configuration troubleshooting" section.*

• *No remote "PC communication session" can take place with* **HI504901** *interface : see case "During remote interface configuration attempt the* **HI504901SW** *software can not connect to the* **HI504901** *interface" on the "Interface configuration troubleshooting" section.*

• *Can not communicate with one of the remote devices connected to* **HI504901** *interface.*

Possible causes	Solutions
Wiring not correctly performed.	Check if the remote device is correctly connected to **HI504901** interface.

Possible causes	Solutions
HI504901 not configured for communication with remote device.	Run **HI504901SW** application software and configure **HI504901** for communication with remote device. **Note**: No PC communication session can take place if a device is not configured in **HI504901**, even if electric wiring is correctly performed between interface and device.
Configuration parameters for serial communication between **HI504901** and remote device are not correct.	Check if following parameters for serial communication set with **HI504901SW** software (device model, baud rate, device address - only for instruments connected to RS485 port) match with the ones defined on connected instrument.
Remote device is turned off.	Turn on remote device.

SMS DELIVERY

• *Can not receive alarm SMS even if an alarm is active on a remote device connected to* **HI504901** *interface.*

Possible causes	Solutions
HI504901 not configured for communication with remote device.	Run **HI504901SW** application software and configure **HI504901** for communication with remote device.
HI504901 not configured for sending SMS upon an alarm active on device.	Run **HI504901SW** application software and enable the specific alarm notification checking the proper box on "message option" window of selected device.
Destination telephone number stored on interface is not correct or country code missing.	Run **HI504901SW** application software and check if destination telephone number is correct and if includes country code.
SMS sending disabled through external switch.	Enable SMS sending through external switch.
SIM card on **HI504901** expired or credit reached zero.	Recharge or substitute the SIM card.
SIM card on **HI504901** is not able to make voice calls.	Change the SIM card with one enabled for voice calls. **Note**: Some SIM cards can be used both for data and voice calls. Please check the network operator for further details.

• *Can not receive alarm SMSs regarding digital input port.*

Possible causes	Solutions
Wiring not correctly performed.	Check if wires on digital input port are correctly connected to **HI504901** supervisor.
HI504901 not configured to send alarm SMSs for digital input port status.	Run **HI504901SW** application software and configure **HI504901** for communication with remote device.
Current status of digital input port does not match with the one set on **HI504901** interface.	Run **HI504901SW** application software and change the options for SMS sending logic on "digital input" window.
SMS sending disabled through external switch.	Enable SMS sending through external switch.

• *Can not control digital output contact through SMS messages.*

Possible causes	Solutions
Wiring not correctly performed.	Check if wires on digital output port are correctly connected to **HI504901** supervisor.
HI504901 not configured to control and send information SMSs for digital output port status.	Run **HI504901SW** application software and configure **HI504901** for controlling and sending information SMSs related to digital output contact on "digital output" window.
Interface password on SMS message not correct or not inserted, but needed.	Insert or check the interface password on the SMS sent.

• *Can not receive the* **HI504901** *phone call after the reception of an alarm SMS.*

Possible causes	Solutions
SIM card on **HI504901** is not able to make voice calls.	Change the SIM card with one enabled for voice calls. **Note**: Some SIM cards can be used both for data and voice calls. Please check the network operator for further details.

ACCESSORIES

|	
HI 710005	12 VDC to 115 VAC power adapter, USA plug
HI 710006	12 VDC to 230 VAC power adapter, European plug
HI 710012	12 VDC to 230 VAC power adapter, UK plug
HI 710013	12 VDC to 230 VAC power adapter, South African plug
HI 710014	12 VDC to 230 VAC power adapter, Australian plug
HI 920010	9 to 9-pin RS232 connection cable
HI 92500	Windows® Compatible Application Software

APPENDIX

RS232 AUXILIARY PORT

HI504901 is provided with an auxiliary RS232 port (D-Sub 9-pole female plug) for connection to a local PC using an **HI920010** Hanna cable.

If the provided **HI920010** Hanna cable is too short for your application, it is possible to make a longer communication cable (up to 15 m long) by following the below table for pin connections.

PC side female connector pin	HI504901 side male connector pin
2	3
3	2
4	6
5	5
6	4

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 GSM Supervisor:

HI 504901

has 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 61000-4-2 Electrostatic Discharge
  IEC 61000-4-3 RF Radiated
  IEC 61000-4-4 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: 26/5/2003
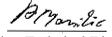
A.Marsilio - Technical Director
On behalf of
Hanna Instruments S.r.l.

Recommendations for Users

Before using this product, make sure that it is entirely suitable for the environment in which it is used.

Operation of this instrument in residential areas could cause unacceptable interferences to radio and TV equipment.

To maintain the EMC performance of equipment, the recommended cables noted in the user's manual must be used.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance.

To avoid electrical shock, do not use this instrument when voltage at the measurement surface exceed 24VAC or 60VDC.

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

External cables to be connected to the instrument should be terminated with cable lugs.

USER NOTES

TECHNICAL SERVICE CONTACTS

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Greece: Tel. (210) 823.5192 • Fax (210) 884.0210

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For additional Technical Support in your local language,
see ***www.hannainst.com***