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Mod. **Tlc-solar**



**GWl solar TECHNICAL CHARACTERISTICS**

- Power supply: 12V AC from TMC 10/12 as shown in the diagram
- Absorption: 100mA max
- Output
  - two bistable relays with change-over contact
  - power circuit breaker: 8(5)A / 250V AC
- Signalling LEDs:
  - Two red leds for output relay status signalling
  - Two green leds for digital input status signalling
  - Multicolour leds for device status signalling
- GSM Quad Band module (900-950-1800-1900 MHz)
- SMA-F connector for external antenna provided with 3 m long cable
- Working conditions: 0÷50 °C / 10÷90% non-condensing
- Degree of protection: IP40
- Insulation class: II
- Container: 4 DIN modules
- Backup battery capacity: approximately 1 hour

**GWl solar DEVICE STATUS**

The device status is signalled by the led ☿:

SWITCHED OFF → no power supply to device  
RED BLINKING → sim card not inserted or pin active  
RED STEADY → insufficient gsm field  
GREEN STEADY → initialising instrument/network search  
GREEN BLINKING → gsm network connection  
GREEN BLINKING VELOCE → command (ring tone or text message) incoming  
GREEN/RED BLINKING → active programming mode  
YELLOW BLINKING → gsm network connection but battery flat  
QUICKLY BLINKING RED → modem error or failure (if still flashing)  
Note: blinking = 1 lamp / second  
quickly blinking = 5 lamps / second

**User manual**  
**GSM COMMUNICATION INTERFACE**  
**Read all instructions carefully**



- **Tlc-solar** is a system for the remote control of photovoltaic systems by sending text messages or ring tones to certified users. The heart of the system is made up of GWl solar which compares the signal coming from the produced energy meter on the system and that coming from the radiation sensor to check if production complies with the radiation conditions, thus enabling any malfunctions to be found in time. Any fall in production is automatically communicated by the system by sending text messages to the selected users. Furthermore, GWl solar has another input available for connecting a burglar alarm and two outputs which can be activated manually or following an alarm.

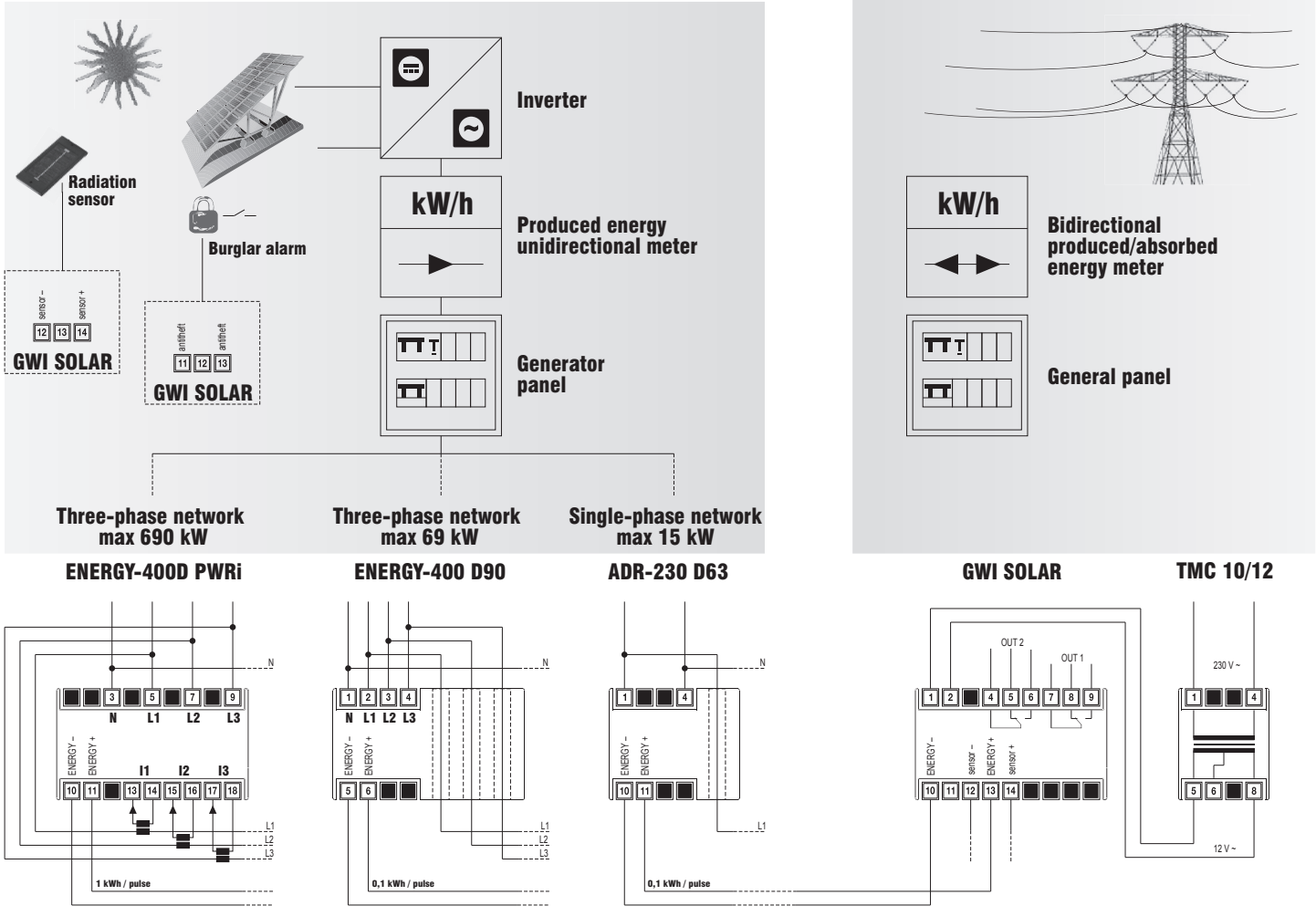
**SAFETY WARNINGS**

- During the installation and operation of the device observe the following instructions:*
- 1) The instrument must be installed by a qualified person**
  - 2) The instrument must be installed and activated in compliance with current electric systems standards**
  - 3) After installation, inaccessibility to the connection terminals without appropriate tools must be granted**
  - 4) Do not use the instrument for purposes other than indicated**
  - 5) The device must be installed in a electric closed panel well protected**
  - 6) A two-pole disconnect device shall be provided as part of the building installation**
  - 7) A protection device against over-currents should be installed in the electrical system, upstream of the device**
  - 8) Carefully respect the wiring diagrams to install the instrument**
  - 9) Before accessing the connection terminals, verify that the leads are not live**
  - 10) Do not power or connect the instrument if any part of it is damaged**
  - 11) The use of a GSM device can cause interference with the functioning of electronic devices non-screened from radiofrequency signals (electromedical devices, pacemakers, hearing aids etc.)**
  - 12) In case of fault, do not service the device yourself but contact the after-sales service**
  - 13) The instrument is aimed for use in place with over-voltage category III and pollution degree 2, as per standards EN 60730-1.**

Code	Model	Description
<b>KT018000</b>	Tlc-solar 230	Kit telecontrol for single-phase systems up to 15 kW
<b>KT018500</b>	Tlc-solar 400	Kit telecontrol for three-phase systems up to 69 kW
<b>KT021500</b>	Tlc-solar 400TA	Kit telecontrol for three-phase systems up to 690 kW

- The Tlc-solar is made up of:
- **GWl solar** control unit (code VE326500)
  - radiation sensor (code VE327300)
  - **TMC 10/12** transformer (code VN314100)
  - **ADR-D 230 D63** energy meter (code VE035200) (single-phase systems) or **ENERGY-400 D90** (code VN984100) (three-phase 69kW systems) or **ENERGY-400D PWRI** (code VE120200) (three-phase 690kW systems)

**CONNECTION DIAGRAM**

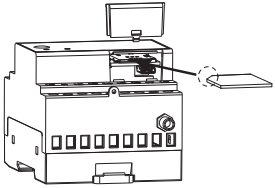


**INSTALLATION**

• **Preparation**

Disable the pin code request from the sim card which will be inserted into the GWl solar.

Insert the sim card into the slot (type push-push). The direction of insertion provides that the bevel of the sim card goes inside in the left.



**Note: the rechargeable sim needs a periodical minimum top-up (usually once a year) in order to be valid. Check with your operator about the renewal mode.**

**Note. The sim card insertion and removal operations should be carried out with the instrument switched off and not powered up (please see the relative chapter for switching off the instrument).**

• **Wiring**

- Attach the radiation sensor near the photovoltaic panels with the same inclination and connect it to the analog input of the GWl solar (the white/black wire to terminal 14, the black one to terminal 12).  
Caution: the sensor must be positioned so that the solar rays do not hit it before they hit the panels, in order to avoid false alarms being sent, for example, at dawn.
- connect the energy meter down from the solar production inverter, and connect the pulse output meter at input 1 of the GWl solar (DIG1 - terminals 10 and 13)
- connect any burglar system (presence sensors, microswitches, ...) at digital input 2 GWl solar (DIG2 - terminals 11 and 13)
- connect the transformer to the GWl solar and the network voltage.

For a detailed description of the connections, please see the diagram “Connection diagram”.

Once the kit has been powered up, the led ☿ of the GWl solar relating to the device status will remain on steady green for around 30 seconds, this will end when it starts blinking green once a second, signalling the correct reception of the gsm network. If this should not be the case, please see the overview “Device state”.

• **Basic configuration**

Consists in defining the admin number, which has full control of the system (usually for the owner) to whom alarm messages are sent

MEMORISING ADMINISTRATIVE NUMBERS

- press the “**1**” key of the GWl solar for 5 seconds until the led ☿ starts blinking red/green alternately
- carry out a ring tone with the number which you want to set as admin number.  
The caller will receive a confirmation text message that this has taken place.

**Note: after having set the admin number, the GWl solar will carry out a self-calibration procedure, during which time it analyses all the parameters of the system where it is installed. To carry out this operation the GWl solar needs a few hours of sunshine. At the end, the admin number will receive a text message and from then on, it will begin to monitor the produced energy.**

**OPERATION**

• **Default settings**

- The factory settings for the kit provide for the admin number to receive a series of text messages:
- send a monthly text message to the administrator with the value of produced energy
  - send a text message containing the value of produced energy and instantaneous power following a ring tone
  - forward messages destined to the GWl solar and not recognisable as commands (for example a text message from a telephone service provider) to the administrator

Furthermore a text message is sent to the administrator in cases of:

- radiation sensor malfunction alarm
- no meter pulses alarm
- production below threshold alarm
- no electrical network or buffer battery flat alarm

For each of the alarms listed above, an alarm return text message is sent.

By default the pulse weight received from input DIG1 is 0.1 kWh (modifiable).

• **Advanced configuration**

In this phase it is possible to add other telephone numbers as well as the administrator's (staff numbers) where alarm signals will be sent, by choosing for each number which type of alarm to send. Furthermore, it is possible to modify the automatic forwarding plan for messages with planned set times or activate automatic switching function for an output following a specific alarm condition.

**STRUCTURE OF A COMMAND TEXT MESSAGE**

The general structure of a text message is as follows:

[password] [separator] [command] [separator] [parameter1] [separator]..[parameterNo.]  
where:

- [password] → numerical field of a maximum of 8 figures
- [separator] → comprised of one or more space characters
- [command] → command recognised by the device
- [parameter..] → series of parameters relative to the command

**The password field may be omitted if the command is given by a registered number. Several commands may be included in one text message. In this case, the**

**commands executed will only be those whose reply is contained in a standard text message (160 characters). To enter numbers with the decimal separator, you need to use a full stop.**

The structure of a reply to a command is similar to the command itself, with the addition of the “=” symbol to indicate the current status. For example:

OUTKEY BLOCK → OUTKEY=BLOCK

**MODIFY PULSE WEIGHTS (for admin only)**

By default the pulse weight that the GWl solar receives from the energy meter is 0.1 kWh. If it is necessary to modify this value use the command:

**WIMP** [pulse weight] where

[pulse weight] → new value to be given to a pulse

In the case of decimal values, use a decimal point as a separator.  
To read the current value use the command WIMP with no parameters.

For example:  
WIMP 1 gives the value 1.00 kWh to each pulse  
WIMP 0.1 gives the value 0.10 kWh to each pulse  
WIMP restores the current weight of the pulse

**MEMORISING STAFF NUMBERS (for admin only)**

- It is possible to create a telephone book containing up to 10 telephone numbers (staff numbers) which can:
- receive text message (or ring tone) in case of alarms
  - receive text message with the produced energy and the instantaneous power following a ring tone
  - receive text message following a scheduled event.

The staff numbers are identified progressively from 1 to 10.  
The first 5 staff numbers are already associated by default to 5 well defined alarm situations (please see “Alarms management”) even if they can be modified.

To add a staff number:

- send the following command from the admin number:

**STAFF** [index] [telephone number] where,

- [index] → position in the staff telephone book where the new number is saved
- [telephone number] → number to be added to the telephone book

For example, to insert the staff number 392123445 in position 4:  
STAFF 4 392123445

It is also possible to enter several staff numbers using one command only:  
For example, if you want to insert the numbers 044177458, 392123445 and 12345678 in positions 2, 4, and 7:  
STAFF 2 044177458 4 392123445 7 12345678

To cancel a staff number, use the word NULL.  
For example, if you want to cancel the staff number 4, leaving the position in the telephone book empty:  
STAFF 4 null

To have a complete overview of the telephone book write STAFF without parameters.

**Note: the admin number is inserted by default as staff number position 1.**

**ALARMS MANAGEMENT**

The possible alarm sources are reported in the following table:

Table 1	
Type of alarm	Alarm description
DIG2	Alarm from digital input 2
RDIG2	Alarm return from digital input 2
LOWBAT	Low battery alarm
POWERF	No network alarm
RPOWERF	Alarm return for no mains
SCHED	Message for periodic forwarding
LUX	Radiation sensor malfunction
RLUX	Alarm return radiation sensor
IMP	Inverter malfunction
RIMP	Alarm return inverter malfunction
DELTA	Alarm energy production lower than predicted
RDELTA	Alarm return energy production
POK	Production exceeds the threshold defined with SETPOK
RPOK	Alarm return energy production above the threshold

It is possible to define which types of alarms are sent to each staff number and in which format (text message or ring tone). The first 5 staff numbers are set as follows:

Table 2		
Number	Communications received	Mode
STAFF 1	Each alarm event	Text message
STAFF 2	Scheduled event only: SCHED	Text message
STAFF 3	Alarms only: LUX/RLUX, IMP/RIMP, DELTA/RDELTA	Text message
STAFF 4	Burglar alarm only: DIG2/RDIG2	Text message
STAFF 5	No electrical network only: POWERF/RPOWERF, LOWBAT	Text message

To define the behaviour of other staff numbers or modify the behaviour of the pre-set ones, use the command:

**SENDALARM** [type of alarm] [recipient][type of signalling]...[recipient] [type of signalling]

[type of alarm]  
[receiver]  
[signal type]  
Some examples:  
SENDALARM DIG2 1 SMS 2 RING 3 RING

→ (please see table 1)  
→ index of a staff number  
→ SMS to receive a message, RING a ringtone

→ when there is an alarm on digital input 2, it sends a text message to contact staff member 1 and a ring tone to staff members 2 and 3

SENDALARM RPOWERF 2 SMS 6 RING → when there is an alarm return due to no power supply an alarm text message is sent to staff member 2 and a ring tone to staff member 6

SENDALARM with [alarm type] displays the alarm warning parameters for the type of selected alarm  
Example: by sending the command SENDALARM DIG2 the device responds with DIG2=1M,2R,---,---,---, which means: send a text message to STAFF 1 and RING STAFF 2 if there is an alarm on Digital 2

**Note: a new setting SENDALARM for a given type of alarm will overwrite the present one, for which it is necessary to indicate all the receivers of the alarms in one single command.**  
**NB: to cancel a SENDALARM setting, enter ‘0’ as the recipient.**

Example:  
SENDALARM DIG2 0 → cancels the send alarm settings for DIG2 → DIG2=---,---,---,---,---

- Set the alarm ringing time (for admin only)**

If you have chosen to send alarms ringing through phone (see control sendalarm) you can set the length of the ring with the command:

**MAXRING** [number] where  
[number] → duration of the ringing in seconds (values between 0 and 255).  
By default, the duration of the ringing is 15 seconds.

- Planned message sending function (for admin only)**

The instrument is set by default to send to the admin number on a monthly basis (and to the staff member 2 if defined) a text message with the value of produced energy. The SCHEDTIME and SCHEDTXT commands enable the period and the text of the message to be modified, respectively.

**SCHEDTIME** [period] [offset start] where  
[period] → interval expressed in hours between one forwarding and another.  
[offset start] → start delay expressed in minutes

For example:  
SCHEDTIME 24 15 → send text message every 24 hours, the first in 15 minutes  
SCHEDTIME 260 60 → send text message every 15 days, the first in one hour

SCHEDTIME 0 → disable sending

**SCHEDTXT** [text] where  
[text] → text message that will be sent

The text can contain a few special characters (symbols) which indicate the meter or pulse meter values . These characters are solved by the instrument when the message is sent.  
For example:  
SCHEDTXT Produced energy #P1 kWh  
The text that will be sent could be “Energy produced 32 kWh” (with the value of meter P1 at 32)

The possible symbols are the following:

Table 3	
Tag	Description
#PT1	pulse meter total (not zeroable) associated with digital input 1
#P1	pulse meter associated to digital input 1
#P1R	pulse meter associated to digital input 1 with auto reset after forwarding
#D2	digital input 2 status. In the message are the words: OPEN/LO or CLOSE/HI
#O1	Output status 1. In the message are the words: ON or OFF
#O2	Output status 2. In the message are the words: ON or OFF
#CKS	date and time of the forwarding of the last scheduled event
#CK	current date and time

If tag #P1 or #P2 are followed by a numeric value this is used as a multiplicative factor for the meter display.  
Example:  
SCHEDTXT Energy produced today #P1 1.34 kWh  
The value of the pulse meter is shown as multiplied by 1.34 and on the forwarded message in place of #P1 1.34 will be a number obtained by multiplying 1.34 by the value of the pulse meter associated with digital input1.

**NB: The number of decimal numbers is the same as the multiplier, in the case of previous example 2**  
**NB: Each tag must be separated by at least 1 space inside the text.**

- Setting text message time (for admin only)**

It is possible to synchronise the date and time of the instrument with the command:

**RTCSMS**  
To synchronise, the instrument reads the date and time in the received text message.

If there is a prolonged black-out with the battery going flat, it is necessary to repeat the command.  
If this command is not carried out, the instrument substitutes date and time with “---,---,---,---,---”  
It is also possible to link this command to the end of any command text message.  
For example:  
OUTALARM 2 OFF POWERF AUTO RTCSMS

- Disable alarm messages (For admin only)**

Command MSG manages enablement or not of forwarding messages to the staff.  
If MSG is OFF, the forwarding of all the messages or signalling of alarms managed by SENDALARM is disabled

**MSG ON** Enables the transmission of messages and ringtones  
**MSG OFF** Disables the transmission of messages and ringtones

## OTHER FUNCTIONS

- Set threshold production**

By the command SETPOK you can set a threshold of production which, if exceeded, generates an alarm condition (alarm POK). In this way you can, for example, to switch a relay output when the power exceeds the threshold defined. The syntax is:

**SETPOK** [threshold] [differential] where:  
[threshold] → represents the threshold in kW for alarm (POK)  
[differential] → represents the hysteresis in kW for the return alarm (RPOK)

For example:  
SETPOK 48 3.5 → if the power produced is greater than 48kW the POK alarm is generated.  
When the power drops below 44.5kW (48-3.5) generates the alarm RPOK.

SETPOK NO → remove the production threshold currently setting

**Note: The behaviour of the instrument in case of alarm conditions (POK, RPOK) is determined by commands OUTALARM (activation outputs) or SENDALARM (for sending sms or ring).**

- Automatic activation of an output on alarm conditions (for admin only)**

It is possible to make the outputs switch automatically when there is one of following alarm:

Table 4	
Type of alarm	Alarm description
DIG2	Alarm from digital input 2
LOWBAT	Low battery alarm
POWERF	No network alarm
POK	Production exceeds the threshold defined with SETPOK

**The output OUT2 is preset to switch for 30 seconds when there is an alarm at digital input DIG2.**

The OUTALARM command enables the output behaviour to be modified.

**OUTALARM** [output number][output status][cause of alarm][reset alarm mode]  
[output number] → 1 or 2  
[output status] → ON, OFF or DISABLE  
[cause of alarm] → (please see table 4)  
[reset alarm mode] → MAN manual, AUTO at the end of an alarm condition or timing (maximum around 18 hours) with unit of measurement: s seconds, m minutes, h hours

Examples:  
OUTALARM 2 OFF DIG2 MAN → in the case of digital alarm 2 output 2 becomes OFF and remains in such status  
OUTALARM 1 OFF POWERF AUTO → The output 1 goes OFF in case of no network and remains in this status until an alarm return  
OUTALARM 2 OFF DIG2 25 M → output 2 goes OFF for 25 minutes in case of alarm on digital 2  
OUTALARM 2 DISABLE → function disabled

- Setting the output status**

The output status can be piloted simply with the command:

**OUT** [output number][output status][status holding time][unit of measurement], where  
– [output number] → indicates the output to which reference is made (1 or 2)  
– [output status] → can assume the values ON, OFF  
– [permanence status time] → maximum settable time (~130 years) (optional parameter)  
– [unit of measurement] → s seconds, m minutes, h hours (optional parameter)

Some examples:  
OUT 1 OFF 10 S → sets the relay 1 OFF for 10 seconds  
OUT 2 ON 12 S → sets the relay 2 ON for 12 hours

- Send text message to sender setting (for admin only)**

The instrument can be set to send the sender a text message of confirmation upon receiving a command via a text message. The command is

**OUTRISP** [status] with status that can assume the values:

- ON → enables the sending of a text message of reply to the sender  
- OFF → disables the sending of a text message of reply to the sender

If the status is omitted, the reply will be the current instrument status.

- Setting display**  
The device can be queried to know the relevant configuration, using the command:

**OUTINFO**  
Here is an example of a possible reply:  
OUT 1=ON OUT 2=OFF OUTRISP=ON RINGRISP=ON OUTKEY=TOGGLE meaning:  
output 1 ON, output 2 OFF, reply to enabled text message, reply to enabled ring tone, and change output status by pressing the relative key.

Here is an example of a possible reply:  
OUT 1=ON OUT 2=OFF OUTRISP=ON RINGRISP=ON OUTKEY=TOGGLE meaning:  
output 1 ON, output 2 OFF, reply to enabled text message, reply to enabled ring tone, and change output status by pressing the relative key.

- Modify output name (for admin only)**  
To assign a name to the output that recalls the device to which it is connected, use the command:

**OUTTXT** [output number] [output label]  
Some examples:  
OUTTXT 1 siren assigns the name siren to output 1  
OUTTXT 2 valve assigns the name valve to output 2  
OUTTXT 2 NO restores the original name to output 2

**A string of a maximum of 10 characters with no spaces can be assigned as a name. If an alternative number for an output is defined, it is possible to use this name to indicate the output in the transmitted commands. For example:**

valve ON 10 M activates output 2 (valve) for 10 minutes

## INPUTS MANAGEMENT

GWl solar has two digital inputs whose status is signalled by two green leds (on → input is short-circuited, off → input open) and an analog input.  
The digital input DIG1 and the analog input are pre-set to be connected to the to the pulse output of the energy meter and the radiation sensor, respectively. Their behaviour cannot be modified.  
The digital input DIG2 can, on the other hand, be used with the discretion of the user, for example for connecting a burglar alarm system.  
In particular, digital input 2, can be connected to:

– signals from switches (ON/OFF)

**Note. The minimum measurable pulse length is 20ms (max frequency 25Hz).**

- Set working mode for digital input 2 (for admin only)**

To set the working mode of the of digital input 2 use the command:

**DIG 2** [working mode][timing alarm][unit], where  
[working mode] → OPEN, CLOSE for the alarm with regard to the open or closed status of the input.  
[timing alarm] → alarm delay time (around 18 hours)  
[unit] → h=hours, m=minutes s=seconds  
Example:  
DIG 2 CLOSE 20 M → alarm if the status of input 2 remains closed for 20 minutes

- Setting alarm text (for admin only)**

To set the text which will be sent to the staff numbers, use command:

**DIGTXT 2** [alarm text] # [alarm return text] where  
[alarm text] → string of max 60 characters of text that are sent to staff in case of alarm  
[#] → separator for alarm return text  
[alarm return text] → string of max 60 characters of text that are sent to staff in case of alarm return  
Example:  
DIGTXT 2 burglar alarm # burglar alarm end

- Setting display**  
To know the configuration of the DIG2 input use the command:

**DIGINFO**  
Here is an example of a possible reply:  
DIG 2=OPEN ALARM CLOSE 10S which means:  
Digital input 2 open, alarm defined when input 2 remains closed for 10 consecutive seconds.

## ADVANCED INSTRUMENT MANAGEMENT

- Modify admin number (for admin only)**

The admin number can be modified by sending the following command (from the current admin number):

**ADMIN** [new admin number]  
The new admin number will receive a confirmation text message.

**Note. If the admin number is lost, it can be changed only by forcing a reset, thus losing all the previously enabled numbers. To avoid having to re-enter them manually, please refer to section “Sim card management”.**

- Sim card management (for admin only)**

The staff telephone numbers are saved in the memory of the device. In case of reset, this implies the loss of all the enabled utilities. To avoid having to re-enter all the numbers manually, it is possible to make a backup copy of the sim card through the following commands, to be given by the administrator only:

**STORE** creates a copy in the sim card of all the saved staff numbers  
**RESTORE** only restores the numbers previously saved with STORE

Therefore, once all the telephone utilities have been enabled, it is advisable to make a backup of the phone book.

- Forwarding management function (for admin only)**

The instrument can be set to redirect to a specified number all the text messages it receives and does not recognise as commands. The command is:

**FORWARD** [number]

By default the number to which these text messages will be forwarded is the admin number.  
FORWARD OFF disables the function.  
The text messages which are forwarded to the specified number begin with the string “FW: ”.

- Password management (for admin only)**

A text message sent from the admin number enables an instrument protection password to be changed, to be used in case you wish to send a command via text message from a disabled number. The command is:

**PASS** [new password] with new password which should have a maximum of 8 figures  
For example:  
PASS 11223344

- Assigning system name (for admin only)**

It is possible to assign a name to the plant where the Tlc-solar is installed.  
In this way, each alarm text message or reply from the GWl solar will be headed by its given name.  
The command is:

**NAME** [name system]  
A name with a maximum string of 20 characters can be assigned.  
To cancel write:  
NAME disabled

- Count sms sent (for admin only)**

You can check the number of text messages sent by the tool with the command:

**NSMS**  
The instrument responds to the sender with a text message containing the number of SMS sent (in count includes both sms sms alert that the response to commands).  
NSMS RESET lets you reset the counter.


- Key operating mode setting (for admin only)**

By briefly pressing a key, the relevant output can be adjusted. Output behaviour can be defined with the following command:


**OUTKEY** [functionality] with functionality that can assume the values:  
– TOGGLE → when the key is pressed the output switches ON/OFF in a bistable manner  
– BLOCK → disables the key functions (it will no longer be possible to access the programming mode)  
If the value is omitted, the current instrument status will be the reply.

## SWITCHING ON/SWITCHING OFF AND RESET THE GWl SOLAR


- Turn off the instrument:**

➤ Hold approximately 10 seconds for either the “1-SET” or “2” until all LEDs off.  
During the pression of the key, the output led  blinks quickly and the led blinks green (or yellow) for the first 5 seconds and green/ red for the other 5 seconds.

- Turn on the instrument without reset**

➤ Press “2”. The LED  will be green initially fixed and then begin to flashing green (or yellow), indicating the correct reception of the GSM signal.

- Turn on the instrument with reset**

➤ Press the “1-SET”. All LEDs will illuminate for a few seconds indicating that the reset occurred, after which the LED  begins to flash green (or yellow) indicating the correct reception of the GSM signal.

**Note: The reset erases all data, settings and users stored tool and restore factory defaults (see box on).**

Password	12345678
Relay output status	Off
ADMIN number	Undefined
STAFF numbers	Not defined
STAFF behaviour 1÷5	Predefined (please see table 2)
Caller control	Active
Automatic call answer	Enabled
Reply to text message commands	Active
Forwarding unknown text messages	Active (to Admin)
No power supply warning	Active

## REFERENCE STANDARDS

Compliance with Community Directives:  
2006/95/EC (low voltage)  
2004/108/EC (Electromagnetic compatibility)  
1995/5/EC R&TTE  
is declared with reference to Harmonised Standards:

- EN 61010-1
- EN 61000-6-2, EN 61000-6-4
- EN 60950-1
- EN 301489-1, EN 301489-7