SICES®
Empowering your control

# Serial Port Communication, Modbus/RTU Protocol and SMS

SICES DEVICES
DST2600 – DST2700 – DST4400 –
AC3000 – DST4601 – DST4601/PX –
GC310 – GC315 – GC315Plus – GC315Link -
GC350 – GC500- GC500Plus - MC100 –
DST4602 – ATS100 – BTB100 – ATS115 –
HS315 – GC400 - GC600 – MC200 – BTB200 –
MC400

File name: EAAS034113EN.docx
Rev. 13 Data: 15/11/2018
ID Document: EAAS0341
Product: Serial Port Communication,
Modbus/RTU Protocol and SMS

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# 1. General

This document describes the SICES s.r.l. devices that use the serial port, including the way how the user might obtain information from the board or send commands to it. Serial port communication modes are described together with the related data formats and **protocols**. Moreover, the board program settings are described for serial port customization purposes. Serial port automatic procedures carried out by the board are also described.

The word "**devices**" will be used in the following part of this document referring to all the boards: DST2600, DST2700, DST4400, AC3000, DST4601, DST4601/PX, GC310, GC315, GC315Plus, GC315Link, GC400, HS315, GC350, GC500, GC500Plus, GC600, MC100, MC200, MC400, DST4602, ATS100, ATS115, ATS115 Plus, BTB100 and BTB200, instead the specific device names will be used when referring to a specific type of board.

# 2. Definitions

**LOCKOUT-** is used to indicate a fault that prevents the generator from operating and causes immediate GCB circuit breaker opening and immediate emergency engine shutdown.

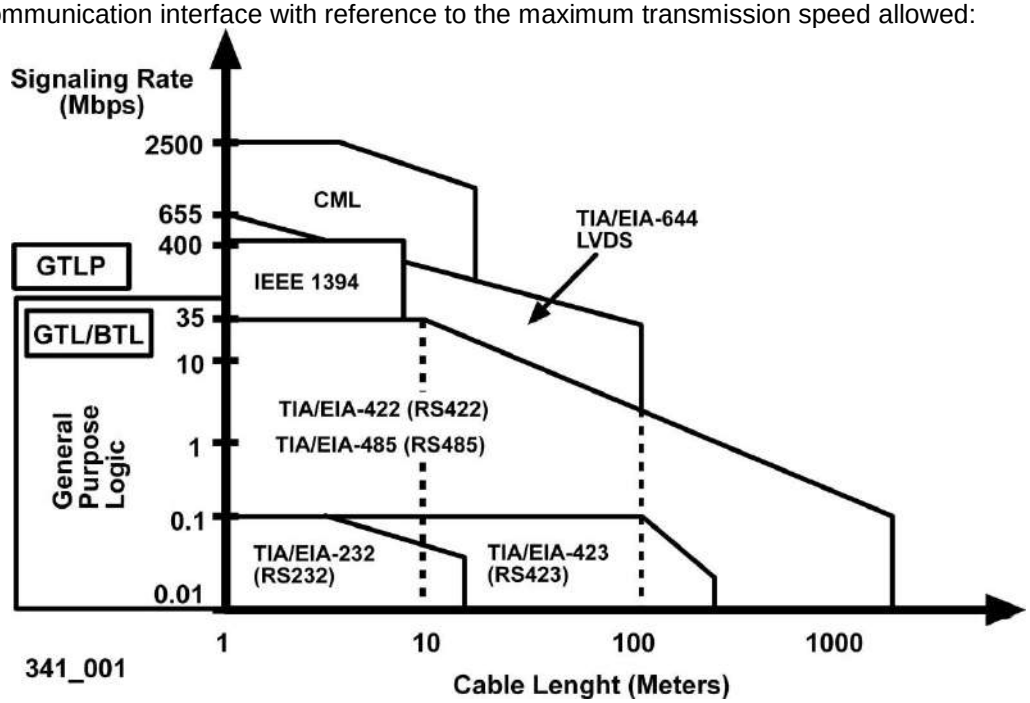
**UNLOAD-** is used to indicate a fault that prevents the generator from operating. The GCB circuit breaker is opened after power is transferred to mains or to other generators (if possible). After that the engine is stopped in standard way (including a cooling phase).

**DEACTIVATION-** is used to indicate a fault that prevents the generator from operating. The GCB circuit breaker is immediately opened, and the engine is stopped in standard way (including a cooling phase).

**WARNING -** is used to indicate a fault that requires the intervention of the operator without engine shutoff.

# 3. Connections properties

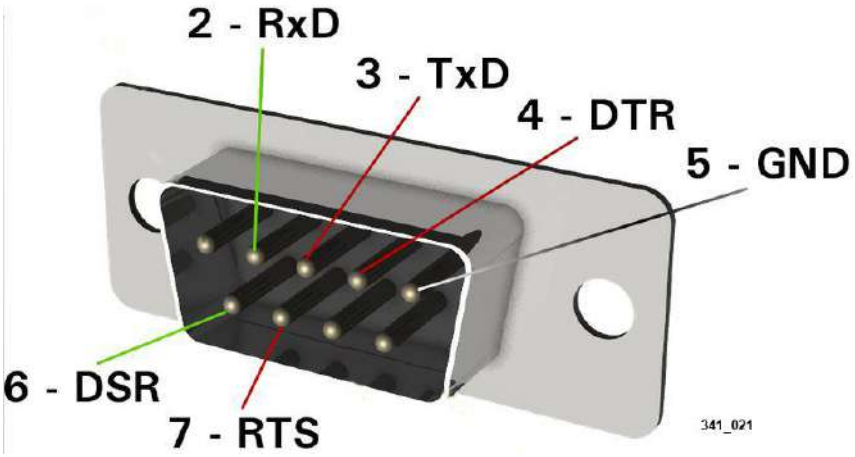
The following TIA (Telecommunications Industry Association) chart is for the choice of the serial communication interface with reference to the maximum transmission speed allowed:




## 3.1 First Main Serial Port

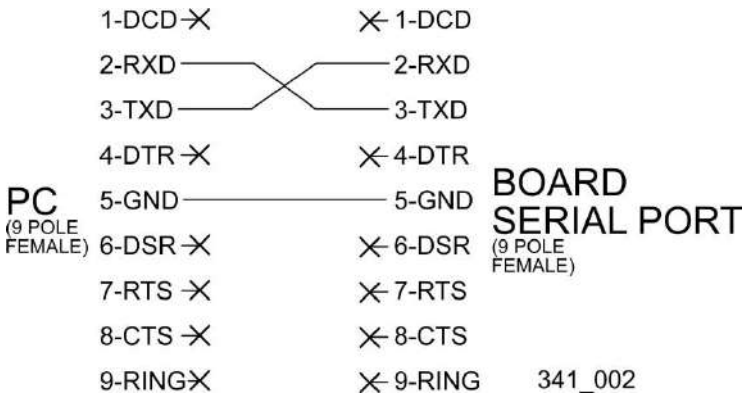
The devices are equipped with a serial port in accordance with EIA-RS232 standard. It can be accessed from the outside using a CANON DB 9 (nine) pin male connector, the same type as those used in the PC. The relevant pin functions are:

| Pin | Function |
|---|---|
| 1 | N.C. |
| 2 | RX |
| 3 | TX |
| 4 | DTR |
| 5 | GND |
| 6 | DSR |
| 7 | RTS |
| 8 | N.C. |
| 9 | N.C. |



### 3.1.1 RS_232 connection

To directly connect a PC or other RS_232 equipment to the devices, you need to use a CANON 9-pin Female on both sides crossed cable with a maximum length of 12 (twelve) metres (ref. 3.1 "Connections properties"). According to the following connection scheme.



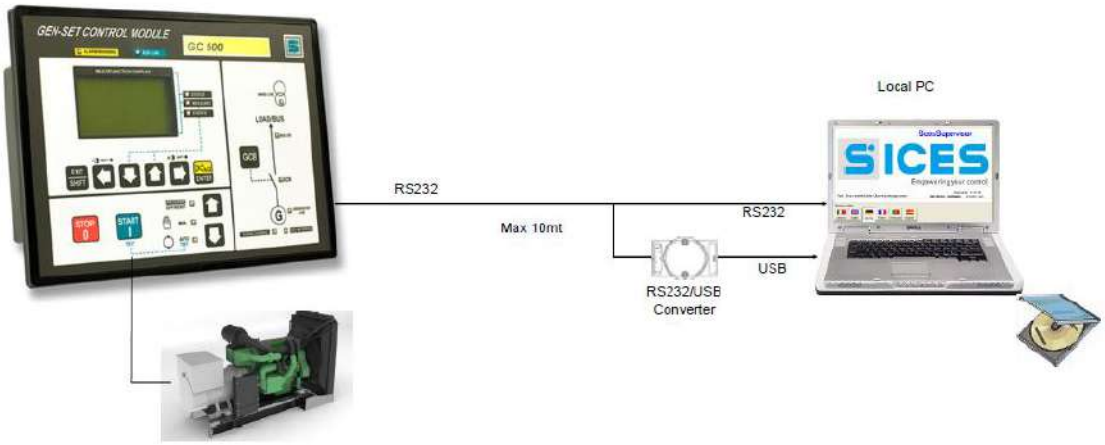

**PC RS232 serial not available:**

In the event that RS232 serial hardware is unavailable in the PC, in addition to the crossed F/F cable, it is necessary to acquire a USB/RS232 converter. These converters, usually self-powered from the same USB port, allow you to emulate, with the same characteristics, a Standard RS232 serial port.


In order to work, these converters are supplied with a specific driver for the PC. For installing the converter, refer to the installation guide supplied with the product.

After installing the driver and connecting the converter to the USB port, the operating system will detect a serial COM x port. Make sure that the serial port communication settings between the PC communication software and the control device are correct.
The factory settings of the devices are:

- Baud rate: **9600**
- Data Bits: **8**
- Parity: **none**
- Stop bits: **1**
- Flow control: **none**




## 3.1.2 RS_485 connection


All the control cards of the SICES gen set have a standard RS232 serial on-board. Some pins of this connector are used, in addition to the exchange of data, for handling the control signals of a modem or, as in this case, for managing serial line converters, like for example: RS232/RS485 o RS232/RS422. The RS485 line allows you to connect several devices (maximum 32 per BUS) in Master/slave mode, and to reach a connection distance of 1200 metres (ref. 3.1 “Connections properties”). Normally the MASTER device is a PC/Panel PC/PLC (Programmable Logic Controller) (with relative communication software installed) which will interrogate the SLAVE devices using the Modbus RTU communication protocol.

The SLAVE devices, and namely the control cards of the gen set, the I/O devices and the temperature controllers, have their own preconfigured serial address and respond to the information requests from the MASTER.

The converters need to have certain characteristics to be able to communicate with the control devices:

1) **Electrical protection.** To prevent communication problems and/or interference, the devices need to be immune to disturbances on the transients, which have protections on the power part and that are opto-insulated against differences in potential on the lines that, if very high, could not only compromise the correct functioning of the communication but damage the circuit itself.

2) **Communication:** They should be transparent with the communication data and/or compatible with the Modbus RTU protocol.

3) **Configurable:** If there are more Slave devices on the RS485 line, for correct serial communication all the devices should have the same configuration for: Baudrate, Data bits, Parity and Stop bits.
   All the devices, both Master and Slave, should be synchronised with each other in terms of speed and data format. For this reason, there are various types of devices that activate the TX/RX synchronisation in different ways: automatic, using dip switches, with control signals.

### 3.1.2.1 Connection with Control card

As an option, the devices are supplied upon request with a RS_232 → RS_485 converter. Converters allow to connect several devices (max. 32 each BUS) in Master/slave mode and to reach a connection distance of 1200 metres (ref. 3.1 “Connections properties”). The converter is opto-insulated and may be supplied by the same power supply unit connected to the devices.

This feature guarantees no transient disturbances on the signals that prevent their correct retransmission and potential differences on very high lines that could compromise the proper functioning of the communication, and even damage the circuits. The current RS232/RS485 serial communication devices produced by SICES are:

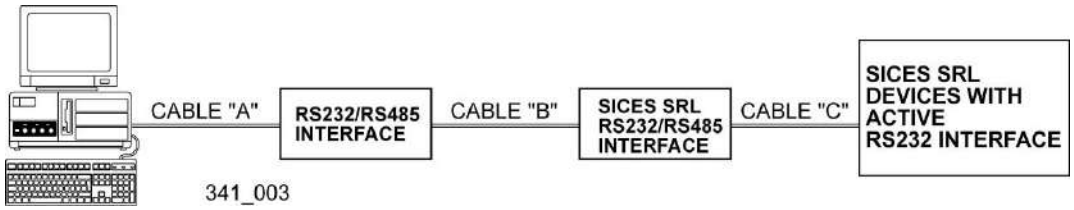
- **E610202170xxx** Converter RS232/485 24Vdc

- **E610212171xxx** Converter RS232/485 12Vdc

These converters can only be used with SICES devices since they require one pin as a TX/RX commutation signal.

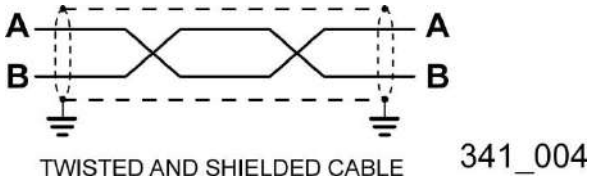
Unlike the commercial models, these devices are managed by the control card of the gen set, and therefore the communication settings and parameters are managed by the card itself.

An example of a connection between a PC device (Master) a control card (Slave)

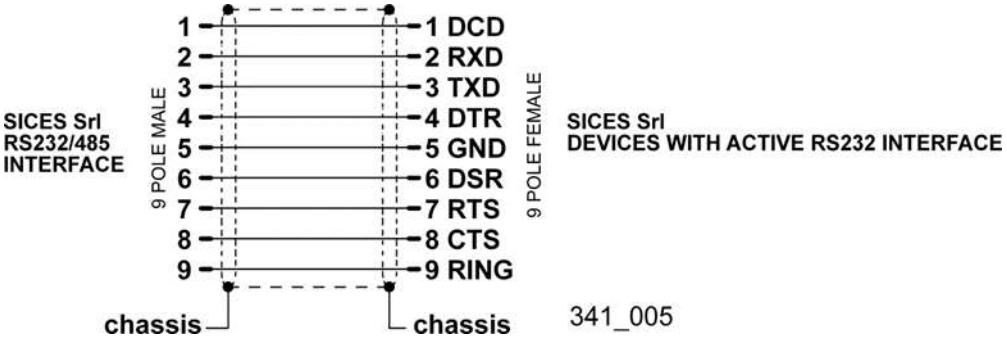



- Cable **"A"**: is usually supplied by the manufacturer of the commercial RS_232/RS_485 converter. In most cases it is a cable identical to type **"C"** described below.

- Cable **"B"**: is a twisted-pair cable composed of two wires and a shield. The cross-section of the cable can be 24 or 22AWG for medium distances, and should be increased in the event of long distances (for example: **BELDEN 3105A Multi-conductor-EIA Industrial RS-485 PLT/CM**). To minimise reflections, the first and last device of the BUS 485 network should have an electrical resistance terminal connected in parallel to the line with a value of 120 ohm. According to the following connection scheme.




- Cable "C": is a 9-wire straight cable shown here below: Follow the diagram:



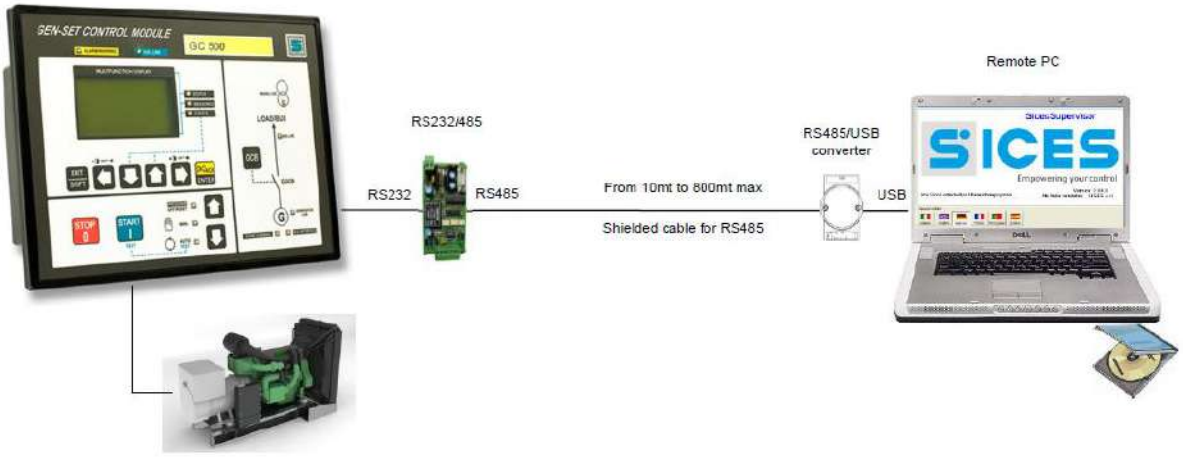

### 3.1.2.2 Connection with PC, Panel PC, PLC

The converters to be used for connecting the PC to the cards necessarily need to have synchronisation control on the data lines. These devices, in addition to automatically managing the data exchange, are usually auto-aligned by the USB port, and also galvanically isolated in order to provide stability in the event of differences of potential on the RS485 data lines.

Commercial devices, merely by way of example:

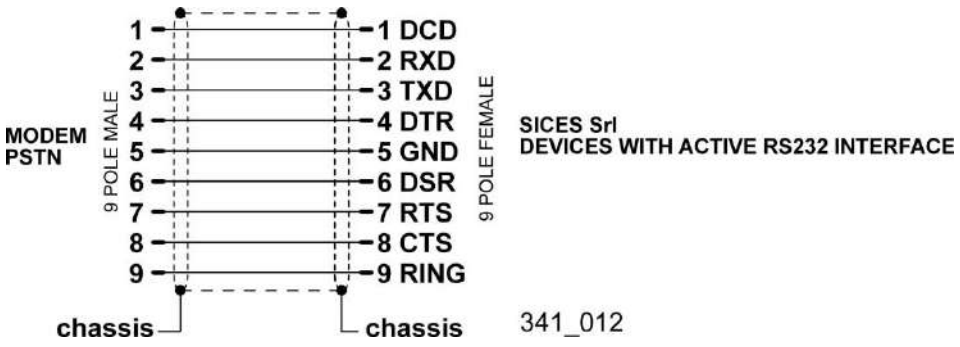


The connection scheme is:



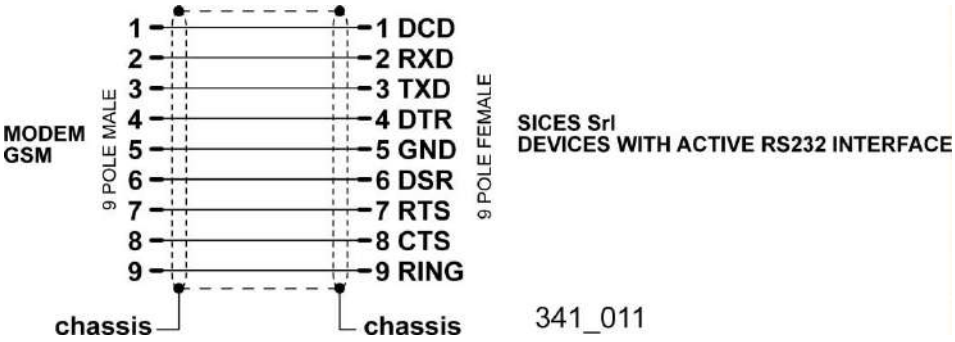

## 3.1.3 PSTN (analogue) modem connection.

As an option, the board might be supplied together with a PSTN analogue modem. The modem is installed inside the same power switchboard and supplied by the same power supply unit connected to the devices. It is ready to operate when connected (through an RJ11connector) to the switched PSTN phone line. The boards are pre-set to control the PSTN modem in order to answer the incoming calls and, if so configured, to generate outgoing calls, in case of specific events (warnings or alarms) occurring in the plant. The phone line should be dedicated to the device, in order to avoid that third persons answer the incoming calls or that the device answers incoming phone calls. The device/modem connecting cable is provided by SICES s.r.l.



### 3.1.4 GSM modem connection

As an option, the device might be supplied together with a GSM modem. The modem is intended to be installed inside the power switchboard. When the latter is being installed, the customer has to take care that the GSM antenna is installed in suitable location. Also the purchase of the SIM card is intended to be carried out by the customer who, in turn, might select the preferred GSM operator and the preferred contract type (see the notes relevant to the SIM card purchase). The board controls the GSM modem exactly in the same way as it controls the PSTN modem (it is therefore capable to answer incoming calls and to generate outgoing calls). In addition, with the GSM modem, the device may generate SMS (Short Message Service), in case of specific events (warnings, alarms or statuses) occurring in the plant. Moreover, it is capable to respond to inquiries and/or commands received by the incoming SMS. The device/modem connecting cable is provided by SICES s.r.l.




## 3.2 Second serial port (if installed)

The second serial port is optional in many devices. When present, it can be used in two different ways:

- For digital input/output expansions (DST4400, AC3000, DST4601, DST4601/PX). In this case, a proprietary protocol is used for communication between the device and the expansion boards, and the serial port cannot be connected to external PC.
- As a standard serial port (DST4400, AC3000, DST4601, DST4601/PX, GC315Plus, GC315Link, GC400, HS315, GC350, GC500, GC500Plus, GC600, ATS115 Plus, MC100, MC200, MC400, BTB200). In this case a standard MODBUS RTU protocol is used, in slave mode. The second serial port therefore becomes identical to the first, with the only difference being that there is no modem management.

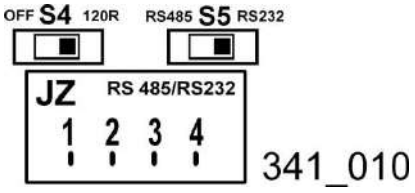
Devices that are not present in the previous two modes description don't have the second serial port. Devices that are present in both modes descriptions have a parameter to select the operating mode of the second serial port.

For some devices (GC315Plus, GC315Link, GC400, HS315, GC350, GC500, GC500Plus MC100, MC200, MC400, BTB200, ATS115 Plus, DST4602) the second serial port is not an option (it is always provided). It is possible to select between RS_232 and RS_485 for the second serial port when you order the device or (for some devices) by a lever selector.

***Warning: If the second serial ports are used for external power switchboard connections, they require suitable galvanically insulated converters (ex. E61020217XXXX insulated Converter RS232/RS485)!***

## 3.2.1 GC350, GC500, GC500Plus, MC100

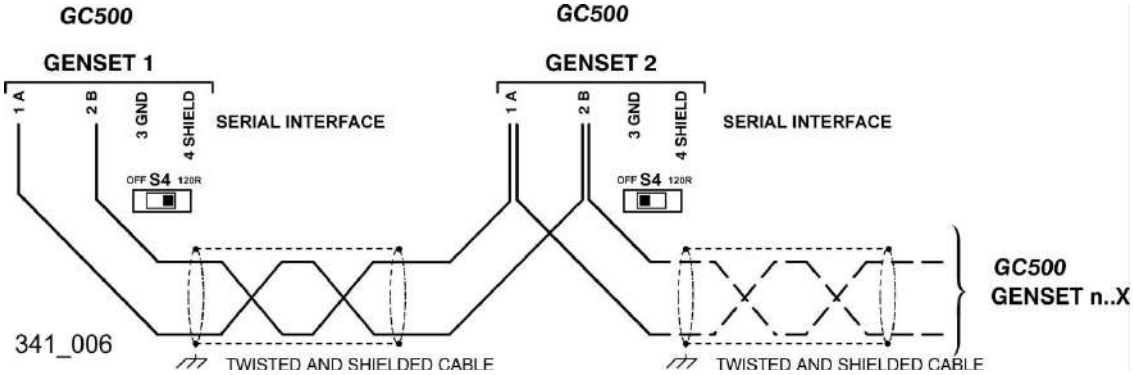
The second port is accessible by the external 4-pin JZ connector.




Next to the JZ connector there is a lever selector (S5) to select the RS232 or RS485 mode. The S4 selector closes the termination of the RS485 bus. The relevant pin functions are:

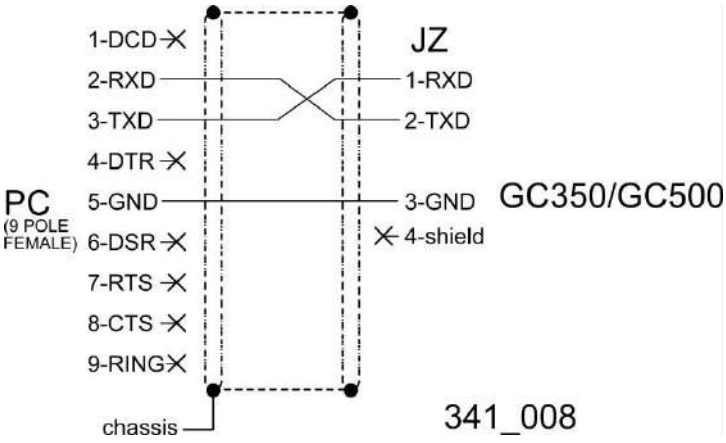
| Pin | Function if RS232 | Function if RS485 |
|---|---|---|
| 1 | RX | A |
| 2 | TX | B |
| 3 | GND | - |
| 4 | - | Shield |

RS485 connection between several boards, for ex. GC500 and GC500Plus




***<u>If the second serial ports are used for external power switchboard connections, they require suitable galvanically insulated converters (ex. E61020217XXXX insulated Converter RS232/RS485)! Refer to Par. 3.2.2</u>***

Connection scheme for RS232 connection, for example with PC serial port:

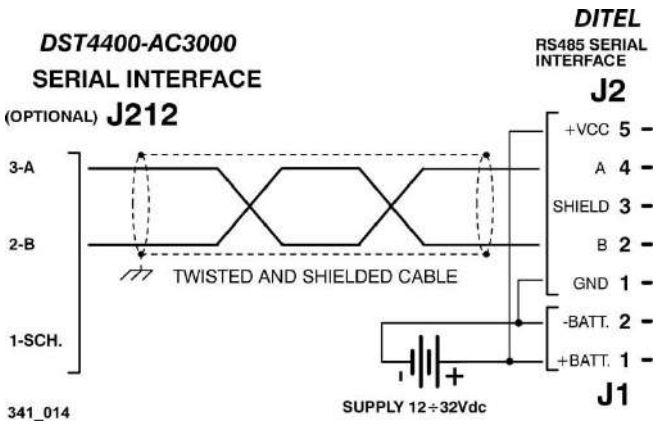



The twisted-pair cable is made up of two wires and shield.

## 3.2.2 DST4400, AC3000

***Notes: the device can be connected to the DST4400/AC3000 device with the E6202079102xx option.***

DITEL module RS485 connection:

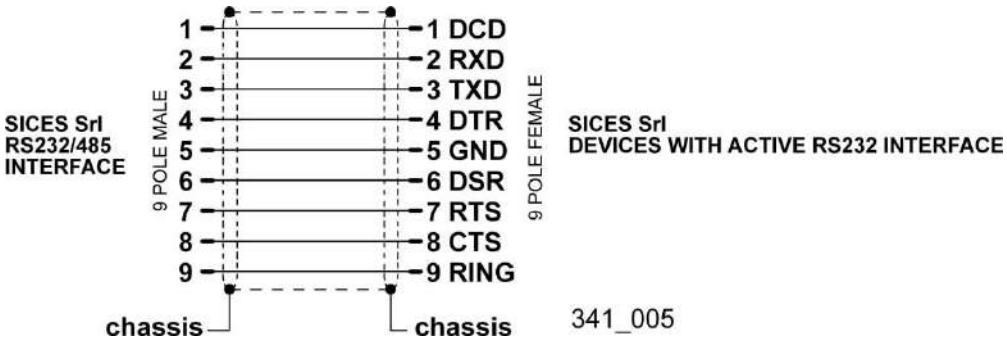



***Notes: see the EAAM0192XX manual for more information on the DITEL connection.***

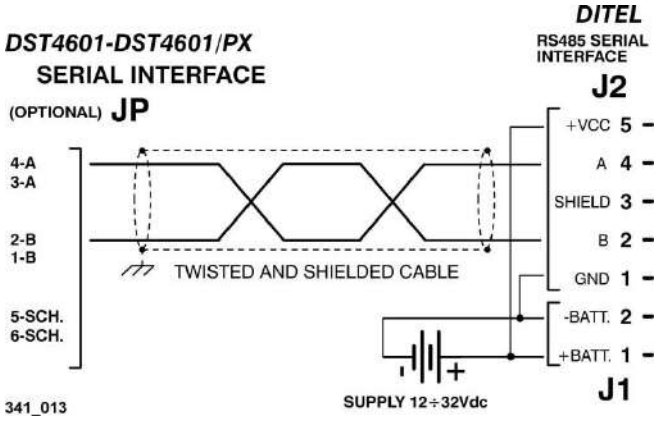
***Warning: If the second serial ports are used for external power switchboard connections, they require suitable galvanically insulated converters (ex. E61020217XXXX insulated Converter RS232/RS485)! Refer to Par. 3.2.2***

## 3.2.3 DST4601/DST4601PX

Connection scheme for RS232 connection, for example with PC serial port:




DITEL module RS485 connection:



The device can be connected directly to DST4601, DST4601/PX boards of any kind with the “Double CAN and RS485” E6202027117XX or “CAN-Control motor-RS485” E6202027119XX options.

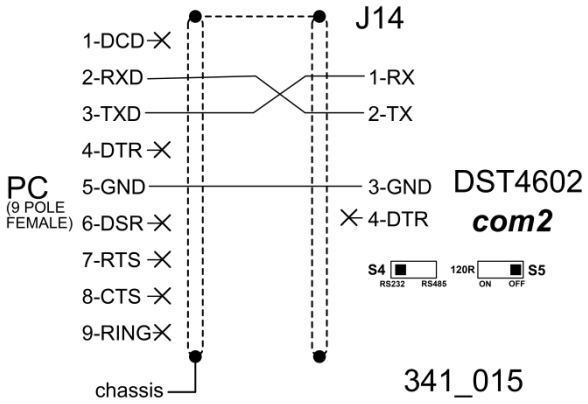
***Notes: see the EAAM0192XX manual for more information on the DITEL connection.***

***If the second serial ports are used for external power switchboard connections, they require suitable galvanically insulated converters (ex. E61020217XXXX insulated Converter RS232/RS485)! Refer to Par. 3.2.2***

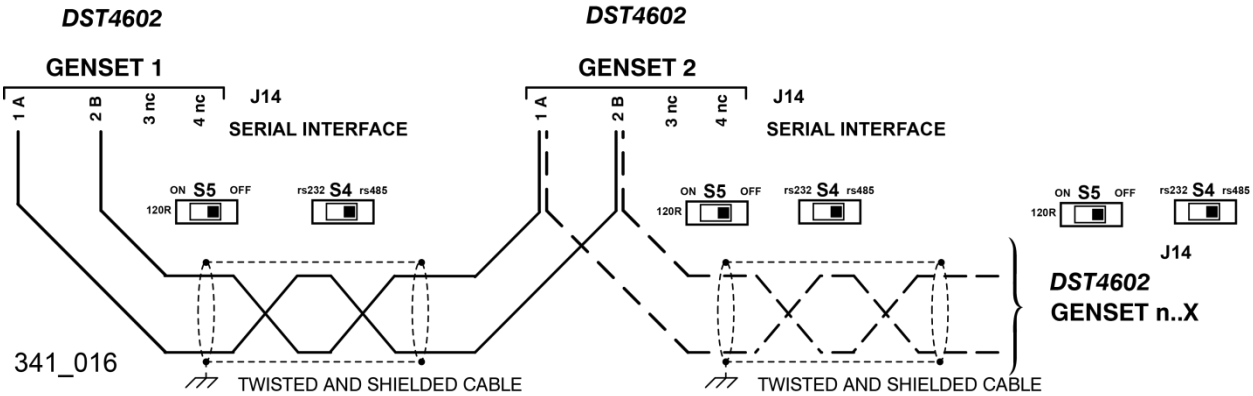
## 3.2.4 DST4602

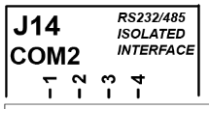
The connector J14 is the second serial RS232/RS485 connection, selectable with hardware switch; it has 1 connector with 4 pins. The selection RS232 or RS485 is made with the switch S4, while the switch S5 set the line impedance termination.

Ex sample of RS232 connection:




Example of RS485 connection with multiple devices:



| | |
|---|---|
| ***J14 – 2ª Serial RS232/RS485*** | |
| **RS232:** | switch S4= **RS232** switch S5= **OFF** |
| | 1-RX |
| | 2-TX |
| | 3-GND |
| | 4-DTR |
| **RS485:** | switch S4= **RS485** switch S5= = **ON (set the line impedance termination to 120 ohm)** |
| | 1-A |
| | 2-B |
| | 3-nc |
| | 4-nc |
|  | |



***INFORMATION! For correct operation of the 2nd Serial in RS232 mode, ensure that switch S5 is set to OFF.***

The serial port **J14** is available only in the ModBus standard mode and the parameter P.0471 has not effect.

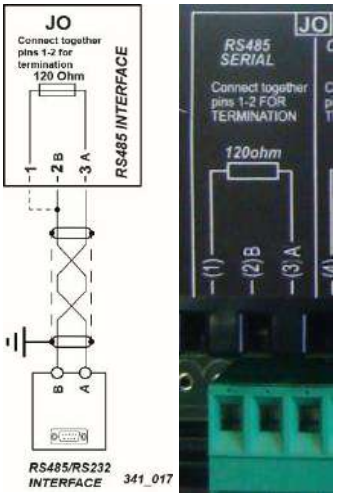
- In the RS232 mode the pin 4 (DTR) is used as control signal for the send/receive selection.

***Note: the second serial cannot be connected to a MODEM.***

This serial port can be configured with the parameters P.472 (Modbus address), P.473 (Baud rate) P.474 (parity, data bit number and stop bit number), P.475 (_Modbus registers order) and P.477 (delay before answering, ms).

## 3.2.5 GC315Plus, GC315Link, GC400, MC400, ATS115 Plus, HS315

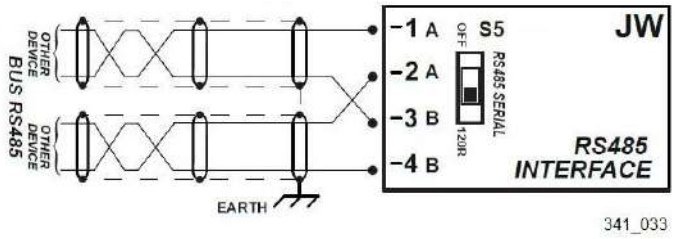
The secondary RS485 connection is included as standard. The connector **JO** is a 3-pin connector set up for balancing the 120 ohm line. The configuration of the serial port, for communication management, is carried out using the parameters P.0472, P.0473, P.0474, P.0475. To use the 120 ohm termination (line balancing) it is necessary to make a bridge between pin **1** and pin **2**. The RS485 line will be connected to pin 2(B) and pin 3(A). The type of conductor to be used is described in chapter "**3.2.2.1 Connecting with the control card**"




| | |
|---|---|
| **RS485:** | Termination **1** and **2:** **Closed** = Inserting 120 ohm termination between line **B** and A |
| | 1-A |
| | 2-B |

## 3.2.6 GC600, MC200, BTB200

The second port is accessible by the external 4-pin JW connector.




Next to the JW connector there is a lever selector (S5) to close the termination of the RS485 bus. The relevant pin functions are:

| Pin | Function if RS232 | Function if RS485 |
|---|---|---|
| 1 | RX | A |
| 2 | TX | B |
| 3 | GND | - |
| 4 | - | Shield |

## 3.3 Ethernet connection

The Ethernet connection allows you to connect the devices in an Ethernet network and to interrogate the device with the Modbus TCP/IP protocol in addition to the possibility of assigning a public (static) IP address directly to the device itself.

In particular, used with the SICES s.r.l. generator control devices and with the SICES s.r.l. supervisory software it allows managing the genset/s from the Personal Computers local network.

### 3.3.1.1 GC315Plus, GC315Link, ATS115 Plus, GC400, GC600, MC400, MC200, BTB200, HS315, DST4602-E

These devices can have the Ethernet port on board the card and it can be managed using the configuration parameters.

**E6102141101xx**: GC315Plus, GC315Link, ATS115 Plus, HS315 card with Ethernet port on board the card

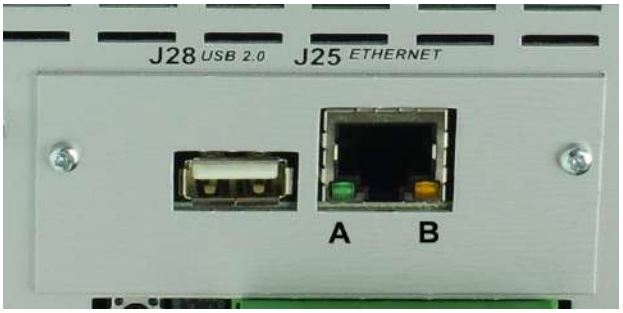
**E6112142500xx**: MC400 board

**E6112150600xx**: BTB200 board

**E6112150600xx**: MC200 board

**E610215010xxx**: GC600 board

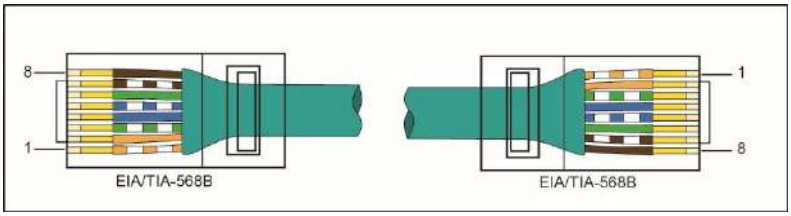
**E6202137102xx**: Optional DST4602-E Ethernet TCP/IP (Plug &Play: Connecting and using)

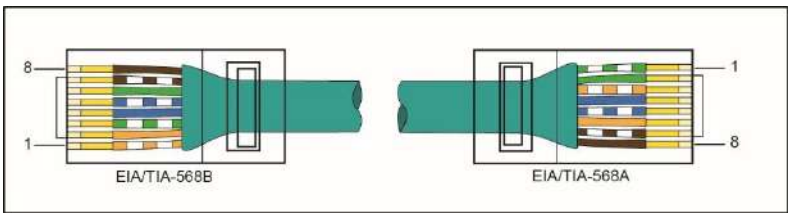

*DST4602-E*

*GC315Plus – GC315Link – HS315 – ATS115 – MC400*

Cable and connect a straight or crossover network cable with a UTP, STP or FTP and CAT5 category or above between the J25 connector of the DST4602 card and a cabled Ethernet network socket, network Switch or Ethernet HUB.
The wiring of the RJ45 connectors between the device and the Ethernet network socket should meet EIA/TIA-568A/B standards. All types of connections that can be found on sale are permitted (see diagrams below), type A or B straight cables and cross-over, since it is not necessary to worry about the type of Ethernet cable to use because the MDI/MDIX function for auto-negotiation is supported.




*Type of straight cable A*




*Type of crossover cable*

After connecting the network cable to the connector **J25 (DST4602-E)** and/or **JS (GC315Plus, GC315Link, GC400, MC400, HS315)** and/or **JY (GC600, MC200, BTB200)** and to the network socket, check that the green led "**A**" comes on that will behave differently depending on the connection speed:

Speed 10Mbps = Off
Speed 100Mbps = On flashing

Check that the yellow led "**B**" **Activity/Link** is on and flashing, indicating an exchange of data on the network.

***Information!: for further information, refer to the technical manual of the device/s.***

### 3.3.1.2 DST2600 – DST2700 – DST4400 – AC3000 – DST4601 – DST4601/PX –GC310 – GC315 – GC400 - HS315 - GC350 – GC500 – GC500Plus – GC600 – MC100 – MC200 – MC400 - DST4602 – ATS100 –ATS115 – BTB100 - BTB200

As an option, the board might be supplied together with a MODBUS TCP/RTU GATEWAY converter. The converter allows connecting one or more MODBUS RTU devices in an ETHERNET network. Up to 32 slaves can be managed simultaneously. Devices with different configurations can be connected to the same RTU line. The possibility to manage several TCP sockets and MODBUS transactions, for each TCP socket, allows communicating with different devices from more stations and from different applications of the same station.

Moreover, the device can be used "stand-alone" or to monitor/control the auxiliary signals because a web Server with four ON/OFF inputs and four ON/OFF outputs is implemented in the GATEWAY. The web Server function in addition to the existing functions: displays the data of the device connected through any web browser (Internet Google Chrome, Microsoft® Internet Explorer, Mozilla Firefox®, etc.). It is possible to carry out the remote customization and updating of the web page related to the device in order to display the selected information.

The converter is produced by SICES s.r.l. and is intended to be installed inside the power switchboard. The converter is supplied by the same power supply unit connected to the devices. It is provided with an RS_232 or RS485 port to connect to the device or to the devices. The cable connecting the converter with the device is supplied by SICES. The connection cable to the ETHERNET network is intended to be provided by the customer.

***Notes: Category 6 or 7 shielded Ethernet cables should be used in industrial environments subject to electromagnetic disturbances.***

While so connected to the ETHERNET network, the device operates as in the case of direct RS_232 connection.

## 3.3.2 USB connection

In some devices there is a USB 2.0 type B Slave connector with a Standard communication protocol.

These connectors are mainly used for updating the Firmware and for configuring the configuration parameters. A USB A Male/USB B Male type of USB commercial cable is used for the connection, with a maximum length of 3 metres




### 3.3.2.1 DST4602, DST4602-E

In these devices the USB (J9) socket is used for updating the device's firmware.

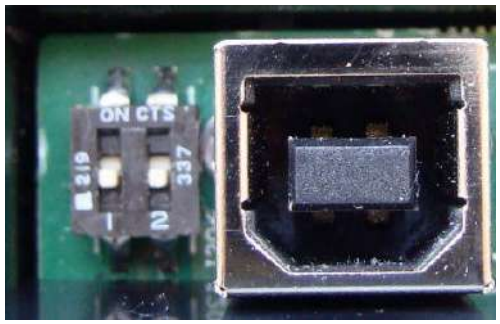


⚠ ***Information! The updating of the firmware should only be carried out by a specialist technician. Contact our technical assistance service for further information.***

### 3.3.2.2 GC315, GC315Plus, GC315Link, GC400, ATS115, ATS115 Plus, HS315, GC600, MC200, MC400, BTB200,

In these devices the USB socket is used for updating the card's Firmware and for setting the configuration parameters.

⚠ ***Information! The updating of the firmware should only be carried out by a specialist technician. Contact our technical assistance service for further information.***


*GC315Plus – GC315Link – GC400*

*MC400 - ATS115 – ATS115 Plus –*

*HS315*



*GC600 – MC200 – BTB200*

# 4. Device Configuration.

The devices use some specific parameters to configure their serial ports. Normally, each parameter has the same identification number on all devices. The MC100, MC400 and MC200 devices are an exception.

The following table shows the parameters and their identification number for all devices.

| Reference | Parameter Number | Parameter Description | DST2600-DST2700-GC310 | DST4400-AC3000-DST4601-DST4601/PX | GC350-GC500-GC500Plus | MC100 | MC400 | MC200 | DST4602 | GC315- GC315Plus - GC315Link ATS115 - ATS115Plus, HS315, GC400 - GC600 | BTB100 | BTB200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1° serial port* | P.0451 | Usage of the first serial port | X | X | X | | X | X | X | X | X | X |
| | P.4201 | | | | | X | | | | | | |
| | P.0452 | First serial port Modbus address | X | X | X | | X | X | X | X | X | X |
| | P.4202 | | | | | X | | | | | | |
| | P.0453 | First serial port Baud Rate | X | X | X | | X | X | X | X | X | X |
| | P.4203 | | | | | X | | | | | | |
| | P.0454 | First serial port Settings | X | X | X | | X | X | X | X | X | X |
| | P.4204 | | | | | X | | | | | | |
| | P.0470 | First serial port Modbus registers order | X | | X | | X | X | X | X | | X |
| | P.4205 | | | | | X | | | | | | |
| *2° serial port* | P.0476 | First serial port Modbus delay before answering (ms) | | | | | | | X | | | |
| | P.0470 | Usage of the second serial port | | X | | | | | | | | |
| | P.0471 | | | | | | | | X | X | | |
| | P.0472 | Second serial port Modbus device address | | X | X | | X | X | X | X | X | X |
| | P.4212 | | | | | X | | | | | | |
| | P.0473 | Second serial port Baud Rate | | X | X | | X | X | X | X | X | X |
| | P.4213 | | | | | X | | | | | | |
| | P.0474 | Second serial port Settings | | X | X | | X | X | X | X | X | X |
| | P.4214 | | | | | X | | | | | | |
| | P.0475 | Second serial port Modbus registers order | | | X | | X | X | X | X | X | X |
| | P.4215 | | | | | X | | | | | | |
| | P.0477 | Second serial port Modbus delay before answering (ms) | | | | X | | | | | | |
| *Password* | P.0469 | Serial port password | X | X | X | | X | X | X | X | X | X |
| | P.0004 | | | | | X | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Modem* | P.0455 | Communication events | X | X | X | | X | X | X | X | X |
| | P.4221 | | | | | X | | | | | |
| | P.0456 | Plant name | X | X | X | | X | X | X | X | X |
| | P.4222 | | | | | X | | | | | |
| | P.0457 | Phone number (1) | X | X | X | | X | X | X | X | X |
| | P.4223 | | | | | X | | | | | |
| | P.0458 | Phone type (1) | X | X | X | | X | X | X | X | X |
| | P.4224 | | | | | X | | | | | |
| | P.0459 | Phone number (2) | X | X | X | | X | X | X | X | X |
| | P.4225 | | | | | X | | | | | |
| | P.0460 | Phone type (2) | X | X | X | | X | X | X | X | X |
| | P.4226 | | | | | X | | | | | |
| | P.0461 | Phone number (3) | X | X | X | | X | X | X | X | X |
| | P.4227 | | | | | X | | | | | |
| | P.0462 | Phone type (3) | X | X | X | | X | X | X | X | X |
| | P.4228 | | | | | X | | | | | |
| | P.0463 | Phone number (4) | X | X | X | | X | X | X | X | X |
| | P.4229 | | | | | X | | | | | |
| | P.0464 | Phone type (4) | X | X | X | | X | X | X | X | X |
| | P.4230 | | | | | X | | | | | |
| | P.0465 | Dial mode | X | X | X | | X | X | X | X | X |
| | P.4231 | | | | | X | | | | | |
| | P.0466 | Number of ring before answer | X | X | X | | X | X | X | X | X |
| | P.4232 | | | | | X | | | | | |
| | P.0467 | Number of SMS for each event | X | X | X | | X | X | X | X | X |
| | P.4233 | | | | | X | | | | | |
| | P.0468 | Number of try for data calls | X | X | X | | X | X | X | X | X |
| | P.4234 | | | | | X | | | | | |

A description for these parameters follows.

- Main serial port.
  - **Usage of the first serial port** This parameter selects the serial port operation mode of the device. The values are just two:
    - "0" (RS232/RS485), for RS232, RS485 and ETHERNET connections.
    - "1" (RS232/MODEM) for PSTN and GSM modem connections. In case that the value "1", is selected, it is still possible to use a direct RS232 connection (the device detects automatically the modem), while it would not be possible to use the ETHERNET and RS485 connections.
  - **First serial port Modbus address** This parameter associates a numerical address (1-247) with the device. It is required by the MODBUS communication protocol that uses a numerical method to select the addressed user, in a (RS485) bus, to which more than one device is connected. In other words, if more devices are connected with an RS485 link, each device must have its own address parameter. The default value is "1"; it is recommended not to change this value unless more than one board is used. In fact, the plant supervisory software produced by SICES s.r.l. uses that default parameter (in any case the device parameter might be modified together with the modification of the communication software).
  - **First serial port Modbus address** This parameter selects the information exchange data rate. The available values are 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 and 57600 bauds. The default value is 9600, that is the mostly used rate for serial communications. That

value is considered by the SICES supervisory software; if such parameter is modified the supervisory software must be modified accordingly.

- **Usage of the first serial port** This parameter selects the number of bits (7 or 8) per character, the stop bits (1 or 2) and the parity bit (E=Even, O=Odd, N=No parity). While programming from the keyboard, the string “8, N,1” means eight data bits, no parity bit and one stop bit. The available string values are:
    - “8, N,1”.
    - “8, N,2”.
    - “8, E,1”.
    - “8, E,2”.
    - “8, O,1”.
    - “8, O,2”.
    - “7, N,1”.
    - “7, N,2”.
    - “7, E,1”.
    - “7, E,2”.
    - “7, O,1”.
    - “7, O,2”.

    The default value is “8, N,1” that is the mostly used in serial communications. The seven data bit characters are considered, although not compatible with the MODBUS RTU protocol implemented by the device (they are set for a future implementation of the MODBUS ASCII protocol).
- **First serial port Modbus registers order** Selects how the 32 bit data will be divided on the MODBUS registers:
    - 0: indicates that the lower index register contains the 16 least significant bits of the value.
    - 1: indicates that the lower index register contains the 16 most significant bits of the value.
- **First serial port Modbus address** It allows to insert a delay between the reception of the Modbus command and the sending of the related answer in ms (milliseconds).

- Second serial port.
    - **Usage of the second serial port** This parameter selects the second serial port operation mode of the device. The values are just two:
        - 0: for using with digital input/output expansion modules.
        - 1: for using as a standard MODBUS RTU slave device.
    - **Second serial port Modbus device address** The same as “Serial port address”, but applied to the second serial port.
    - **First serial port Modbus address** The same as “Baud Rate”, but applied to the second serial port.
    - **Second serial port Settings** The same as “Settings”, but applied to the second serial port.
    - **First serial port Modbus registers order** The same as “Modbus registers order”, but applied to the second serial port.
    - **Second serial port Modbus delay before answering** It allows to insert a delay between the reception of the Modbus command and the sending of the related answer in ms (milliseconds).

- Common
  - **Serial port password** Defines an alphanumeric password (max seven characters) to be included inside the SMS sent to the device, for direct RS232/485 communication to write the parameters and inside the device incoming and outgoing data calls.

***Information!: This parameter can be set and/or modified only on the operator panel.***

- Modem
  - **Communication events** This parameter selects the event types that generate an outgoing call of the device via modem (PSTN or GSM) or the transmission of an SMS via GSM modem. This parameter is not applicable in case that the modem is not connected. Please check for the specific device documentation for this parameter settings.
  - **Plant name** This parameter assigns a symbolic name (23 character max) to the plant. It is used to allow the calling plant identification by the SMS recipient.
  - **Phone number (1):** This parameter (max 23 characters) defines the first among 4 telephone numbers to call or to address the SMS in the cases previously listed.
  - **Phone type (1):** This parameter selects the SMS or data call modes relevant to the phone number #1.
  - **Phone number (2)**
  - **Phone type (2)**
  - **Phone number (3)**
  - **Phone type (3)**
  - **Phone number (4)**
  - **Phone type (4)**
  - **Dial mode** This parameter selects the pulse (“P”) or multi-frequency (“T”) dial modes of the device.
  - **Number of ring before answer** This parameter selects the number of rings before the modem answers the call (applicable to PSTN and GSM modems).
  - **Number of SMS for each event** Selects the number of SMS transmitted at each event.
  - **Number of try for data calls** Configure the number of try for data calls to a telephone number with a PSTN or GSM modem and call management software, e.g.: Sices Supervisor with data call option.

# 5. Data calls or SMS

When a modem (PSTN or GSM) is connected to the serial port of the device, it is able to advise the user about the events occurring at the supervised plant in two modes:

1. By sending one or more SMS (GSM modem only).
2. By data call (i.e.: by calling the number where a computer, suitably configured to answer the call and to download the device data and status information, is connected).

To this purpose it is necessary to:

1. Set one or more telephone numbers to call, together with the respective mode of transmission: via SMS or data call.
2. Set with the suitable “Communication events” parameter, in order to define the occurrence of events that generate the data calls or the SMS transmission.

Upon such settings, at the defined events occurrence, the device carries out automatically the calls and the SMS (Short Message Service) transmission. It must be noted that it is possible to use simultaneously both transmission modes if at least one phone number is set

for data calls. In the following part of this paragraph the actions taken by the device are described for each type of transmission.

## 5.1 SMS transmission

In case that the device is linked via GSM modem, it is configured with at least one phone number dedicated to SMS transmission and it is configured for at least one event inside the “Communication events” parameter, at the selected event occurrence the device performs the following step-by-step sequence:

1. Selects the first phone number configured for SMS transmission.
2. Sends an SMS to that number.
3. Checks if one or more SMS are set for each phone number. If not, or if all the programmed SMS transmissions have been performed, it carries out the following item 4 step. Otherwise it waits five seconds and carries out item 2 step.
4. Checks if further phone numbers configured for SMS transmission exist. In case that these exist, the device waits five seconds and carries out item 2 step. Otherwise it stops the step-by-step sequence, until the next warning event occurrence.

I.e.: at each new anomaly event (set for SMS transmission generation) occurrence, the quantity of programmed SMS is transmitted to each configured phone number, in accordance with “Number of SMS for each event” parameter configuration.

## 5.2 Data calls

Contrary to the SMS case, the calls could be performed via PSTN or GSM modems. In case that the device is linked via modem, it is configured with at least one phone number dedicated to data calls and it is configured for at least one event inside the “Communication events” parameter, at the selected event occurrence the device performs the following step-by-step sequence.

1. Selects the first phone number configured for data calls.
2. Performs the data call.
3. In case that the call was performed successfully and the corresponding user acknowledged the call validity (ref. to the description of the MODBUS protocol), the step-by-step sequence ends, to start again at the next anomaly event occurrence.
4. In case that the call was not successfully established or not acknowledged for validity by the addressed user side, the device waits one minute and goes to the following item 5 step.
5. Checks if further phone numbers, configured for data calls, exist. In case that these exist, the device goes back to the previous item 2 step, otherwise it continues with the following item 6 step.
6. Checks that all the programmed attempts are completed. If not, goes back to the item 1 step. If yes, the device checks the presence of the event that generated the data call sequence. In case the event still exists, the device waits five minutes, clears the attempts counter and restarts the sequence from step one. In case the event occurrence does not exist anymore by the end of the step-by-step sequence, the sequence ends and will restart at the next programmed event occurrence.

I.e. at each new anomaly event (set for data call generation) occurrence an attempt to call each configured phone number is carried out. In case that no user acknowledges the call validity while answering the call, the step by step call sequence is repeated for each number until the number of programmed attempts is carried out. To this point the procedure might abort, only in the case that the occurred event does not exist anymore. As an example, in the case that all the phone numbers are configured for five attempts of data calls, if there is no valid answer, twenty calls are made at one minute intervals. In case that the event still exists by the end of the step by step call sequence, the unit waits five minutes and restarts the twenty calls step by step sequence and so on.

The call validity recognition method consists in the writing of a not zero value in a specific allocation of the device, by using the MODBUS protocol. This operation is very important because acknowledges to the device that somebody has received the information about its situation. In fact, if the remote modem answers the call, while however the call management program is not active, or in case that the call is terminated before the data transmission about the device status is completed, the call cycle needs to continue.

While in case of SMS the event is immediately recognizable (by the SMS text), in case of data calls the remote program needs to understand the data transmission reason from the device archive. The recording in this archive is immediately frozen by the device when a fault occurs on the plant. Unlocking the archive can be done with a serial line command (the management programme should do it at the end of the record acquisition), or else locally by modifying the operating mode of the device first in OFF and then in any other position. The locked status of the archive is used at the end of the step-by-step call sequence (e.g. the 20 calls previously described) in order to allow the device to take the decision if to stop or to repeat the sequence. In fact, the locked status means that no call validity acknowledgement existed nor locally nor remotely and therefore the call cycle must repeat. It is noted however that, in some instances, the data call sequence is generated by change of status events that are not faults (as in case of mains unavailability and start or stop of the engine). In these cases, the archive will not be inhibited after the event registration, so that the call cycle is stopped at the relevant completion (the full number of configured call attempts is anyway performed).

During the intervals among the call attempts (one or five minutes), the device is still enabled to accept incoming calls or SMS. In case that an incoming call acknowledges the reception of the situation, the call sequence is stopped. In case that the incoming call, although not acknowledging the reception of the situation, enables the archive, the call cycle stops at the relevant completion, without any further re-cycling.

# 6. MODBUS – RTU Protocol

The devices implement the MODBUS communication protocol.

It is a widely used protocol that became a standard for industry applications. Two basic types of coding can be used for this protocol: the RTU coding that translates all the information in binary format (with resulting reduced message sizes) and ASCII coding, fully using the characters in ASCII format. In the latter case the size of the messages exchanged among the equipment is doubled respect to the RTU case. However, this approach allows using the MODBUS protocol in systems using seven bits per byte. The devices implement the **RTU coding only**.

Moreover, there are specific MODBUS modifications dedicated to specific communication hardware support (e.g. the "MODBUS -TCP" for use with ETHERNET networks). The devices implement the MODBUS protocol <1469>only in the standard version</1469>, for communicating on the serial line.

MODBUS is a "Master-Slave" protocol. I.e. there are a "Master/Client" unit sending requests and one or more answering "Slave/server" units. On a normal serial line (RS-232, RS-485), MODBUS no longer supports a "Master/Client". This is because the protocol does not provide any mechanism for regulating the times and modes with which the "Master/Client" uses the communication line. In other words, there it is no way to allow two "Master/Client" to share the link. The protocol allows however more "Slave/Server" units to share the link by the identification of each unit with a specific numeric address. The devices implement the MODBUS **protocol as "Slave/server"** only and allow configuring the relevant MODBUS address through a programming parameter.

The communication link characteristics (baud rate, parity, number of bits per byte, start and stop bits) are configured by using programming parameters.

MODBUS recognizes the transmission of two basic information types:

- Boolean information (using one bit only having 1/0 values i.e. true false on/off etch.).
- Numerical data (with 16 bits i.e. numbers from 0 to 65535, without sign, or from -32768 up to +32767, with sign).

Moreover, for each type, two modes of access are considered:

- Read only information
- Read/Write information

The devices implement **only the MODBUS commands that manage numerical information**, with **both the modes of access**. They do however **implement both types of access**.

The list of MODBUS commands implemented by the board follows. All the commands are in accordance with the MODBUS standard for MODBUS specifications.

| Code | Command | Description |
|---|---|---|
| 03 | Read Holding Register | Reads a number of read/write numerical information |
| 04 | Read Input Register | Reads a number of read only numerical information. |
| 06 | Preset Single Register | Writes read/write numerical information. |
| 16 | Preset Multiple Register | Writes one or more read/write numerical information. |
| 17 | Report slave ID | Provides some board identification codes. |
| 22 | Mask Write Register | Modifies only some bits of read/write numerical information. |
| 23 | Read/Write Multiple Registers | With a single command reads some few numerical information and writes some few others |
| 43 | Read Device ID | Provides some board identification codes. |

In case of commands 03, 04 and 16, the max number of registers per message is 125. For command 23, it is possible to write up to 121 registers and it is possible to read up to 125 registers. While attempting to read/write a larger number of registers an Exception answer results. The information relevant to register related commands is transmitted by using two binary bytes per register, with the most significant bits being in the first byte, while the second contains the less significant bits.

## 6.1 Nomenclature

According to the MODBUS protocol, the numerical items are identified as registers. The read only registers are defined as “Input Registers”, while the read/write registers are defined as “Holding registers”. Each register, of whatever type, has a numerical identifier ranging from 1 to 9999 with a header identifying the type of register. The “Input Registers” are identified by numbers ranging from 30001 to 39999 while the “Holding Registers” are identified by the numbers ranging from 40001 to 49999. NB: this is the standard nomenclature, but it is not the only one; many commercial supervision systems use the numbering of the registers between 0 and 9999.

## 6.2 Data Transfer Formats.

The devices only implement the commands for transferring numerical data. This is because MODBUS (see JBUS) has two sub-assemblies that do exactly this. Transferring all the information using only the above-mentioned MODBUS commands renders the devices compatible also with these protocols derived from MODBUS.

The above facts do not mean that the devices do not use bit information. In fact, the latter information is compacted in a (16 bits) MODBUS register that is to be interpreted bit by bit. In the specific device documents, a table showing the information associated with each bit is provided, together with the corresponding bit value (e.g. the generator warning and alarms are condensed in some few “Input Registers” where each active bit means a specific warning or alarm).

Numerical information acquired by the devices could be absolute or + values (the most part are absolute values). The + variables are transmitted by using the “complement to two” approach. With such an approach a negative value is transmitted by inverting all the bits of the relevant absolute value and summing 1. As a result, the negative values are identified by numbers having the most significant bit equal to 1. The numerical information value might require more than one register. In these cases, the device uses two consecutive MODBUS registers. By default, the low part of the value is posted in the lowest index register and the high part of the value in the highest index register. This behaviour can be changed with a parameter for programming the device, but it renders the device itself incompatible with the Sices management software. All the numerical pieces of information are displayed with the relevant physical measurement units (powers in KW, currents in Ampere). In some instances, the physical unit values are acquired and sometimes displayed by the board with a somewhat higher accuracy by including the decimals. That is, they contain a decimal part. The decimals are also transmitted via MODBUS. The tables shown in the specific device documents report for each register the availability of decimal values, together with the related number of bits. A zero decimal bits’ register has no decimal content. The decimal bits are positioned as the less significant bits. E.g. an eight decimal bits’ register has the decimal bits in the 8 less significant positions. To obtain the value of the register from the relevant binary information, the register must be divided by two raised to the number of decimal bits

We should bear in mind that what has been said until now (sign, use of several consecutive registers and a decimal part) can be applied also to just one piece of information. For example, the total reactive power of the system is information with a sign that contains a decimal part and that uses two consecutive registers.

In the following part of this paragraph are described in detail the codes used in this document (and in the specific device documents) to describe the information transferred through the MODBUS protocol.

### 6.2.1 BOOL_XX.

This code identifies a bit data information string. The information might be contained in one or more contiguous registers. The “XX” field identifies the number of registers used to the purpose of recording the information. In the specific device documents, a table is included providing the description of what is associated with each bit of the relevant MODBUS registers.

### 6.2.2 US_XX

This code indicates numerical information without a sign expressed with just one MODBUS register. Some few bits could represent the decimal part of the numerical information. The “XX” field indicates the number of decimal bits.

The minimum information value in this format is zero.

The max value is 65535 ((2^16)-1) divided by two raised to the number of decimal bits.

| N° of decimal bits | Formula | Maximum value |
|---|---|---|
| 0 | 65535 / (2^0) | 65535 |
| 4 | 65535 / (2^4) | 4095.9375 |
| 8 | 65535 / (2^8) | 255.99609375 |
| 12 | 65535 / (2^12) | 15.999755859375 |

Few examples follow:

1) **US_00** (no decimals bits)
   While reading 11405 (0x2C8D) from the MODBUS register, to find the actual value it is needed to:
   a) divide by two rose to the number of decimal bits → 11405 / (2^0) = 11405.
   I.e. the register number 11405 represents actually the value 11405.

2) **US_08** (eight decimal bits).
   While reading 11405 (0x2C8D) from the MODBUS register, to find the actual value it is needed to:
   a) divide by two rose to the number of decimal bits → 11405 / (2^8) = 44,55078125.
   I.e. the register number 11405 represents actually the value 44.55078125.

### 6.2.3 SS_XX

This code indicates numerical information without a sign expressed with just one MODBUS register. Some few bits could represent the decimal part of the numerical information. The “XX” field indicates the number of decimal bits. The register most significant bit indicates the sign. Therefore, there are 15 bits to represent the value.

The max information value is (2^15)-1 divided by two elevated to the number of decimal bits. The minimum value is - (2^15) divided by two elevated to the number of decimal bits.

| N° of decimal bits | Formula | Maximum value | Min value |
|---|---|---|---|
| 0 | 32767 / (2^0) | 32767 | -32768 |
| 4 | 32767 / (2^4) | 2047.9375 | -2048 |
| 8 | 32767 / (2^8) | 127.99609375 | -128 |
| 12 | 32767 / (2^12) | 7.999755859375 | -8 |

Few examples follow:

1) **SS_00** (no decimals bits).
   While reading 61536 (0xF060, 1111000001100000 in binary form) from the MODBUS Register, it is noted that the relevant bit 15 is one, so indicating a negative value. To find the actual value it is needed to:
   a) Invert all the bits → 3999 (0x0F9F, 0000111110011111 in binary form)
   b) Sum one → 4000 (0x0FA0, 0000111110100000 in binary form)
   c) Put the sign → -4000

2) **SS_00** (no decimals bits).
   While reading 1000 (0x03E8, 0000001111101000 in binary form) from the MODBUS. Register, it

is noted that the relevant bit 15 is zero, so indicating a positive value. The content of the register, therefore, is exactly the value of the associated information.

3) **SS_08** (eight decimal bits).
While reading 61536 (0xF060, 1111000001100000 in binary form) from the MODBUS Register, it is noted that the relevant bit 15 is one, so indicating a negative value. To find the actual value it is needed to:
a) Invert all the bits → 3999 (0x0F9F, 0000111110011111 in binary form)
b) Sum one → 4000 (0x0FA0, 0000111110100000 in binary form)
c) Put the sign → -4000
d) Divide by two raised to the number of decimal bits → -4000 / (2^8) = -15,625

4) **SS_08** (eight decimal bits).
While reading 1000 (0x03E8, 0000001111101000 in binary form) from the MODBUS Register, it is noted that the relevant bit 15 is zero, so indicating a positive value. To find the actual value it is needed to divide by two raised to the number of decimal bits → 1000 / (2^8) = 3,90625

### 6.2.4 UL_XX

This code indicates numerical information without a sign expressed with two MODBUS registers. Some few bits could represent the decimal part of the numerical information. The "XX" field indicates the number of decimal bits.

The minimum information value in this format is zero.

The max value is 4294967295 ((2^32) – 1) divided by two raised to the number of decimal bits.

| N° of decimal bits | Formula | Maximum value |
|---|---|---|
| 0 | 4294967295 / (2^0) | 4294967295 |
| 8 | 4294967295 / (2^8) | 16777215.99609375 |
| 16 | 4294967295 / (2^16) | 65535.9999847412109375 |
| 24 | 4294967295 / (2^24) | 255.99999994039535522460937 5 |

Below are some examples (assuming that the lower register contains the least significant part of the value):

1) **UL_00** (no decimals bits).
While reading 34464 in the lower index register and 1 in the upper index register, to find the actual value it is needed to:
a) Multiply the upper register by (2^16) → 1*65536 = 65536
b) Sum the lower register → 65536+34464 = 100000
c) Divide by two raised to the number of decimal bits → 100000 / (2^0) = 100000
Therefore the couple of registers 34464 (lower) and 1 (upper) represent the value 100000.

2) **UL_08** (eight decimal bits).
While reading 34464 in the lower index register and 1 in the upper index register, to find the actual value it is needed to:
a) Multiply the upper register by (2^16) → 1*65536 = 65536
b) Sum the lower register → 65536+34464 = 100000
c) Divide by two raised to the number of decimal bits → 100000 / (2^8) = 390.625
Therefore the couple of registers 34464 (lower) and 1 (upper) represent the value 390.625.

### 6.2.5 SL_XX

This code indicates numerical information with a sign expressed with two MODBUS registers. Some few bits could represent the decimal part of the numerical information. The "XX" field indicates the number of decimal bits. The register most significant bit indicates the sign. Therefore, there are 31 bits to represent the information value.

The max information value is ((2^31)-1) divided by two elevated to the number of decimal bits. The minimum value is - (2^31) divided by two elevated to the number of decimal bits.

| N° of decimal bits | Formula | Maximum value | Min value |
|---|---|---|---|
| 0 | 2147483647/ (2^0) | 2147483647 | -2147483648 |
| 8 | 2147483647/ (2^8) | 8388607.99609375 | -8388608 |
| 16 | 2147483647/ (2^16) | 32767.99998474 | -32768 |
| 24 | 2147483647/ (2^24) | 127.999999940395 | -128 |

Below are some examples (assuming that the lower register contains the least significant part of the value):

1) **SL_00** (no decimals bits).
Assuming reading the value 31072 in the lower index register, and 65534 in the upper index register. As we can see, bit 15 of the upper register is 1 and is therefore a negative value. To find the actual value it is needed to:
a) Multiply the upper register by (2^16) → 4294836224
b) Sum the lower register → 4294867296

c) Represent in hex → FFFE7960H → 11111111111111100111100101100000
d) Invert all bits → 0001869FH → 00000000000000011000011010011111
e) Sum one → 000186A0H → 00000000000000011000011010100000
f) Represent in decimal format → 100000
g) Divide by two raised to the number of decimal bits. → 100000 / (2^0) = 100000
h) Put the negative sign → -100000
Therefore the couple of registers 31072 (lower) e 65534 (upper) represent the value -100000.

2) **SL_00** (no decimals bits).
Assuming reading the value 34464 in the lower index register, and 1 in the upper index register. As we can see, bit 15 of the upper register is 0 and is therefore a positive value. To find the actual value it is needed to:
a) Multiply the upper register by (2^16) → 65536
b) Sum the lower register → 100000
c) Divide by two raised to the number of decimal bits → 100000 / (2^0) = 100000
Therefore the couple of registers 34464 (lower) and 1 (upper) represent the value 100000

3) **SL_08** (eight decimal bits).
Assuming reading the value 31072 in the lower index register, and 65534 in the upper index register. As we can see, bit 15 of the upper register is 1 and is therefore a negative value. To find the actual value it is needed to:
To find the actual value it is needed to:

a) Multiply the upper register by (2^16) → 4294836224
b) Sum the lower register → 4294867296
c) Represent in hex → FFFE7960H → 11111111111111100111100101100000
d) Invert all the bits → 0001869FH → 00000000000000011000011010011111
e) Sum one → 000186A0H → 00000000000000011000011010100000
f) Represent in decimal format → 100000
g) Divide by two raised to the number of decimal bits. → 100000 / (2^8) = 390,625
h) Put the negative sign → 390.625
Therefore the couple of registers 31072 (lower) e 65534 (upper) represent the value 390.625.

4) **SL_08** (eight decimal bits).
Assuming reading the value 34464 in the lower index register, and 1 in the upper index register. As we can see, bit 15 of the upper register is 0 and is therefore a positive value. To find the actual value it is needed to:
a) Multiply the upper register by (2^16) → 65536
b) Sum the lower register → 100000

c) Divide by two raised to the number of decimal bits → 100000 / (2^8) = 390.625
Therefore the couple of registers 34464 (lower) and 1 (upper) represent the value 390.625

### 6.2.6 STR_XX

This code identifies an ASCII type string of information. The information might be located in one or more contiguous registers. The XX field indicates the number of registers. The strings are transferred via MODBUS by recording two characters per register and using a number of consecutive registers. An example of the sequence could be the name of the system that is transferred in some devices using the "holding registers" 40829-40840 (that will be identified by the STR_12 format). The plant name consists therefore of max 24 characters (12 registers by 2 characters). The string terminator or ASCII 00 must also be included. As an example the name “NUOVO IMPIANTO” will be transferred as: It will be transferred as follows:

| Register | HEX Value | Lower Section | Upper Section |
|---|---|---|---|
| 40829 | 0x554E | 0x4E (“N”) | 0x55 (“U”) |
| 40830 | 0x564F | 0x4F (“O”) | 0x56 (“V”) |
| 40831 | 0x204F | 0x4F (“O”) | 0x20 (“ ”) |
| 40832 | 0x4D49 | 0x49 (“I”) | 0x4D (“M”) |
| 40833 | 0x4950 | 0x50 (“P“) | 0x49 (“I”) |
| 40834 | 0x4E41 | 0x41 (“A”) | 0x4E (“N“) |
| 40835 | 0x4F54 | 0x54 (“T”) | 0x4F (“O”) |
| 40836 | 0x0000 | 0x00 (terminator) | 0x00 (terminator) |
| 40837 | 0x0000 | 0x00 (terminator) | 0x00 (terminator) |
| 40838 | 0x0000 | 0x00 (terminator) | 0x00 (terminator) |
| 40839 | 0x0000 | 0x00 (terminator) | 0x00 (terminator) |
| 40840 | 0x0000 | 0x00 (terminator) | 0x00 (terminator) |

### 6.2.7 SHEX_XX

This code identifies an HEX type string of information. The information might be located in one or more contiguous registers. The XX field indicates the number of registers. The hex strings are transmitted via MODBUS by recording four hexadecimal digits per register and using a number of consecutive registers. An example the board serial number is transferred (in most devices) by using the 30108-30110 input registers (identified with the SHEX_03 code). The serial number consists therefore of 12 hex digits (# 3 registers by 4 digits each). To give an example, assume the serial number is “000008EF94C7”. It will be transferred as follows:

| Register | HEX Value |
|---|---|
| 30108 | 0x94C7 |
| 30109 | 0x08EF |
| 30110 | 0x0000 |

### 6.2.8 Registers assignment

Some registers are reserved to specific functions to be assigned later on. Some others have limited applicability, due to the board configuration, or limited accessibility (write or read only). Limitations are

identified with the # symbol in the following tables, at the fourth column. A detailed description is provided in the register description paragraph.

# 7. SMS Protocol

The SICES s.r.l. devices implement an SMS protocol in order to allow the remote access to the status and measurement, independently from the use of PCs and associated modems. Moreover, it allows the anomaly to be signalled immediately without a PC having to be on and ready for receiving notifications. Some status data might also be transmitted automatically.

This paragraph describes the SMS protocol in order to provide the user with the information needed to communicate with the device and the plant.

The SMS protocol is “CASE UNSENSITIVE”; i.e. **the messages might be written in capital or small letters.** Normally the separation between the message fields is the space, while commas are seldom used.

## 7.1 Requirements

The SMS protocol needs a GSM modem (SICES s.r.l. will supply a modem tested with the device upon request). The modem, for the communication part, should be connected to the device's main serial port (the connection cable is supplied with the modem) and, for the power part, it should be connected to the Battery voltage. The device automatically recognizes the modem: in order to operate with the modem, as an alternative of the RS_485 link, only the “Serial port type” parameter needs to be configured accordingly. During the operation, the telephone operator and the GSM network signal level may be displayed by the device.

## 7.2 Messages toward the Device

Three message types are available to be sent to the device:

- READ
- WRITE
- Commands (CMD …).

### 7.2.1 SMS password

⚠ ***Notes: The READ category is available to any person who knows the protocol and the plant phone number. In this case the plant will respond to the enquiry (it is noted however that the need to know the GSM number is still a protective measure for the plant).***

⚠ ***Important: the other two categories can, on the other hand, be protected with a password that should be set on the device beforehand. This password is unique for the two categories. In case that no password is set on the device, also the WRITE and COMMAND messages are available to any person with due knowledge. The password is a sequence of any letters, numbers and symbols for a maximum length of seven characters.***

### 7.2.2 Messages toward the device format

The messages toward the device have always the format:

[**P**XXXXXXX] parameters code

The first field is optional. If used it must start with the letter P. It allows the communication of the plant password (XXXXXXX). In the example there are seven X to represent the password: obviously in case that the password is shorter than seven chars, a reduced number of characters is required. A space must be included among the password and the following fields. The second field (code) must include a command, as described in the following part of this chapter. The third field is a function of the code field and might be missing.

| Message | DST2600 DST2700 | DST4400 AC3000 | DST4601 DST4601/PX | GC310-GC350-GC500-GC500Plus | MC100 | MC400 | MC200 | DST4602 | ATS100 – ATS115 | HS315 | GC315Plus - GC315Link GC400 - GC600 | BTB100 | BTB200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **READ NETWORK** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **READ MODEM** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **READ CONFIG** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **READ PARAMETER** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **READ STATUS** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **READ WARNINGS** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **READ ANALOG1** | X | X | X | X | | | | X | | X | X | X | X |
| **READ ANALOG2** | X | X | X | X | | | | X | X | X | X | X | X |
| **READ ANALOG3** | X | X | X | X | | | | X | | X | X | X | X |
| **READ SOURCE A** | | | | | | | | | X | | | | |
| **READ SOURCE B** | | | | | | | | | X | | | | |
| **READ LOAD** | | | | | | | | | X | | | | |
| **READ PLANT** | | | | | X | X | X | | | | | | |
| **READ MAINS** | | | | | X | X | X | | | | | | |
| **READ GENERATORS** | | | | | X | X | X | | | | | | |
| **READ EXTRA TEMP** | | | | | | X | X | X | | X | X | | |
| **READ EXTRA ANALOG** | | | | | | X | X | X | | X | X | | |
| **READ GPS** | | | | | | X | X | | | X | X | | |
| **READ IP** | | | | | | X | X | | | X | X | | X |
| **WRITE PARAMETER** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **CMD DISABLE SMS** | X | X | X | X | | X | X | X | X | X | X | | X |
| **CMD ENABLE SMS** | X | X | X | X | | X | X | X | X | X | X | | X |
| **CMD LOCK** | X | X | X | X | | X | X | X | | | X | | |
| **CMD UNLOCK** | X | X | X | X | | X | X | X | | | X | | |
| **CMD RESET ALARMS** | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **CMD STOP** | X | X | X | X | X | X | X | X | | X | X | | |
| **CMD TEST START** | X | X | X | X | X | X | X | X | | X | X | | |
| **CMD TEST STOP** | X | X | X | X | X | X | X | X | | X | X | | |
| **CMD REMOTE START** | X | X | X | X | X | X | X | X | | X | X | | |
| **CMD REMOTE STOP** | X | X | X | X | X | X | X | X | | X | X | | |
| **CMD FORCE A** | | | | | | | | | X | | | | |
| **CMD FORCE B** | | | | | | | | | X | | | | |
| **CMD FORCE N** | | | | | | | | | X | | | | |
| **CMD FORCE X** | | | | | | | | | X | | | | |
| **CMD OPEN** | | | | | | | | | | | | X | X |
| **CMD CLOSE A** | | | | | | | | | | | | X | X |
| **CMD CLOSE B** | | | | | | | | | | | | X | X |
| **CMD CLOSE X** | | | | | | | | | | | | X | X |

## 7.2.3 Read messages

These messages allow knowing all the status data relevant to the plant. Some messages allow receiving generic information of the plant status, while other messages enable to receive detailed information about specific parameter categories.

### 7.2.3.1 READ NETWORK

```
Syntax:     [PXXXXXXX] READ NETWORK
Syntax:     none.
Password:   not used.
```

This message allows receiving some information related with the GSM modem SIM board. The device answers this message with a single SMS:

- NETWORK CONFIGURATION

### 7.2.3.2 READ MODEM

```
Syntax:     [PXXXXXXX] READ MODEM QQQQ
Parameter:  QQQQ: alphanumeric string
Password:   not used.
```

This message is used to send a valid message to the GSM modem, in order to receive an answer via SMS. It is very useful as it allows receiving information about the GSM network (e.g. the signal level). Please refer to the modem handbook for available commands. Parameter QQQQ must contain the modem command without the “AT” prefix and without the “CLRF” terminator. The device answers this message with a single SMS:

- MODEM ANSWER

### 7.2.3.3 READ CONFIG

```
Syntax:     [PXXXXXXX] READ CONFIG
Syntax:     none.
Password:   not used.
```

This message allows receiving some information related with the device (software release etc.). The device answers this message with a single SMS:

- CONFIG

### 7.2.3.4 READ PARAMETER

```
Syntax:     [PXXXXXXX] READ PARAMETER CCCC IIII
Parameter:  CCCC: programming access code
            IIII: parameter numerical code (1-n)
Password:   not used.
```

This message allows receiving a device programming parameter value. The device associates a security level to each parameter. The user, installer and producer levels are defined. One password can be set for each level. To query for a parameter, the password corresponding to the relevant security level (or higher) must be used (see the user's manual and the parameters table associated to the device). The parameter index is the numerical code appearing at the device display at the left of parameter name. The device answers this message with a single SMS:

- SYNTAX ERROR: command parameters could be missing.
- INDEX OUT OF RANGE: invalid requested parameter index.
- NEED HIGHER ACCESS CODE: access password level not high enough.
- PARAMETER: requested value.

### 7.2.3.5 READ STATUS

```
Syntax:     [PXXXXXXX] READ STATUS
Syntax:     none.
Password:   not used.
```

This message allows to be informed about the generic status of the plant with no details. The device answers this message with a single SMS:

- STATUS

### 7.2.3.6 READ WARNINGS

```
Syntax:     [PXXXXXXX] READ WARNINGS
Syntax:     none.
Password:   not used.
```

This message allows receiving the full list of the warnings active at the moment of message transmission. The device answers this message with a single SMS:

- WARNINGS

### 7.2.3.7 READ ANALOG1

```
Syntax:     [PXXXXXXX] READ ANALOG1
Syntax:     none.
Password:   not used.
```

This message allows receiving the detailed analogue measurements relevant the generator set: the three phase's voltages and currents, the frequency and the status of the generator's circuit breaker (that is if the generator is loaded or not). The device answers this message with a single SMS:

- ANALOG1

### 7.2.3.8 READ ANALOG2

```
Syntax:     [PXXXXXXX] READ ANALOG2
Syntax:     none.
Password:   not used.
```

This message allows receiving the detailed the analogue measurements not strictly relevant the generator: the three phase's mains voltage and its frequency, the starter battery voltage, the coolant temperature, the oil pressure, the fuel level and the engine speed. The device answers this message with a single SMS:

- ANALOG2

### 7.2.3.9 READ ANALOG3

```
Syntax:     [PXXXXXXX] READ ANALOG3
Syntax:     none.
Password:   not used.
```

This message allows receiving the detailed power measurements performed by the device: power factor, load type, active power, reactive power, apparent power and the energy count. The device answers this message with a single SMS:

- ANALOG3

### 7.2.3.10 READ SOURCEA

```
Syntax:     [PXXXXXXX] READ SOURCEA
Syntax:     none.
Password:   not used.
```

This message (valid only for ATS100 and ATS115) allows receiving the detailed analogue measurements relevant the source A set: the type of source (mains or generator), the three phase's voltages and currents, the frequency, the status of the ACB circuit breaker (that is if the source A is loaded or not), the energy count and the operational hours. The device answers this message with a single SMS:

- SOURCEA

### 7.2.3.11 READ SOURCEB

```
Syntax:     PXXXXXXX] READ SOURCEB
Syntax:     none.
Password:   not used.
```

This message (valid only for ATS100 and ATS115) allows receiving the detailed analogue measurements relevant the source B set: the type of source (mains or generator), the three phase's voltages and currents, the frequency, the status of the BCB circuit breaker (that is if the source B is

loaded or not), the energy count and the operational hours. The device answers this message with a single SMS:

- SOURCEB

### 7.2.3.12 READ LOAD

```
Syntax:     [PXXXXXXX] READ LOAD
Syntax:     none.
Password:   not used.
```

This message (valid only for ATS100 and ATS115) allows receiving the detailed power measurements performed by the device: power factor, load type, active power, reactive power and apparent power. The device answers this message with a single SMS:

- LOAD

### 7.2.3.13 READ PLANT

```
Syntax:     [PXXXXXXX] READ PLANT
Syntax:     none.
Password:   not used.
```

This message (valid only for MC100, MC400 and MC200) allows knowing the detailed plant situation: which circuit breakers are closed and power and power factors values on each bus of the plant (mains, loads, generators). The device answers this message with a single SMS:

- PLANT

### 7.2.3.14 READ MAINS

```
Syntax:     [PXXXXXXX] READ MAINS
Syntax:     none.
Password:   not used.
```

This message (valid only for MC100, MC400 and MC200) allows knowing the detailed mains situation: voltages, frequency, currents and powers if current transformers are on the mains or on the loads with loads connected to the mains. The device answers this message with a single SMS:

- MAINS

### 7.2.3.15 READ GENERATORS

```
Syntax:     [PXXXXXXX] READ GENERATORS
Syntax:     none.
Password:   not used.
```

This message (valid only for MC100, MC400 and MC200) allows knowing the detailed generators situation: voltages, frequency, currents and powers if current transformers are on the generators or on the loads with loads connected to the generators. The device answers this message with a single SMS:

- GENERATORS

### 7.2.3.16 READ EXTRA TEMP

```
Syntax:     [PXXXXXXX] READ EXTRA TEMP [XX]

[XX]numerical mandatory field referred to the module to be read.
Syntax:     none.
Password:   not used.

Ex: READ EXTRA TEMP 1
Reading of the temperatures acquired by the module Ditemp 1.
```

This message (used only on DST4602, HS315, GC315Plus, GC315Link, GC400, GC600, MC400 e MC200) allows to know the details of all the temperature measures acquired by the modules DITEMP

(Ditherm/Digrin) connected to the board and configured. The device answers this message with a single SMS:

From [plant name P.0456]. Temperature extra:1

[Text Measure 1] = XXXX

[Text Measure 2] = XXXX

[Text Measure 3] = XXXX

***The number of values sent depends by the measurements configured on the Ditemp devices.***

#### 7.2.3.17 READ EXTRA ANALOG

```
Syntax:     [PXXXXXXX] READ EXTRA ANALOG [XX]

[XX]numerical mandatory field referred to the module to be read.
Syntax:     none.
Password:   not used.

Ex: READ EXTRA ANALOG 1
Reading of the temperatures acquired by the module Divit 1.
```

This message (used only on DST4602, HS315, GC315Plus, GC315Link, GC400, GC600, MC400 e MC200) allows to know the details of all the temperature measures acquired by the modules DIVIT connected to the board and configured. The device answers this message with a single SMS:

From [plant name P.0456]. Analog extra:1

[Text Measure 1] = XXXX

[Text Measure 2] = XXXX

[Text Measure 3] = XXXX

[Text Measure 4] = XXXX

***The number of values sent depends by the measurements configured on the Divit devices.***

### 7.2.4 Write messages

This category contains the messages that allow you to in some way modify the operation of the system where the gen set is installed.

#### 7.2.4.1 WRITE PARAMETER

```
Syntax:     [PXXXXXXX] WRITE PARAMETER CCCC IIII VVVV
Parameter:  CCCC: programming access code
            IIII: parameter numerical code (1-n)
            VVVV: value to write in the parameter
Password:   requested.
```

This message allows changing a device programming parameter value. The device associates a security level to each parameter. The user, installer and producer levels are defined. One password can be set for each level. To query for a parameter, the password (CCCC) corresponding to the relevant security level (or higher) must be used (see the user's manual and the parameters table associated to the device). The parameter index (IIII) is the numerical code appearing at the device display at the left of parameter name. The value (VVVV) to be written in the parameter must be formatted as it is displayed, followed, when applicable, by decimal digits separated by the full stop. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.

- SYNTAX ERROR: command parameters could be missing.
- INDEX OUT OF RANGE: invalid requested parameter index.
- NEED HIGHER ACCESS CODE: parameters access password level not high enough.
- VALUE OUT OF RANGE: parameter value outside the relevant available range.
- COMMAND EXECUTED: executed command.
-

## 7.2.5 Command messages

This type of messages results in the execution of commands through the SICES device.

⚠ ***the CMD commands do not change the current operation status (OFF/RESET, MAN or AUTO) of the device set manually by the operator on the panel.***

### 7.2.5.1 CMD DISABLE SMS

```
Syntax:     [PXXXXXXX] CMD DISABLE SMS
Parameters: none.
Password:   requested.
```

This command allows the user to disable the automatic transmission of SMS messages from the device, without any modification of the phone number assignment.

⚠ ***Read: if a single user disables the transmission of SMS, the SMS transmission is disabled to all the users. The device answers this message with a single SMS:***

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.

### 7.2.5.2 CMD ENABLE SMS

```
Syntax:     [PXXXXXXX] CMD ENABLE SMS
Parameters: none.
Password:   requested.
```

This command allows the user to re-enable the automatic SMS transmission from the device, in case the transmission was previously disabled by the “CMD DISABLE SMS” command. It is noted that this message is to be used in case that at least one phone number is configured in the device program. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.

### 7.2.5.3 CMD LOCK

```
Syntax:     [PXXXXXXX] CMD LOCK
Parameters: none.
Password:   requested.
```

This command allows the user to inhibit the use of the genset. After such command the genset cannot be started even if the device power supply is removed and restored. In case the engine is running when the device receives this command, it is immediately stopped. The device activates the inhibition condition and displays it (see the user's manual of the device). The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.

#### 7.2.5.4 CMD UNLOCK

```
Syntax:     [PXXXXXXX] CMD UNLOCK
Parameters: none.
Password:   requested.
```

This command allows the user to restore the genset operation in case it was disabled by the previously described message. After this, the alarms are reset in order to clear the warning condition of the device. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.

#### 7.2.5.5 CMD RESET ALARMS

```
Syntax:     [PXXXXXXX] CMD RESET ALARMS
Parameters: none.
Password:   requested.
```

This command allows the user to clear all the alarms recorded by the device. This control is like placing the device in OFF/RESET position. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.

#### 7.2.5.6 CMD STOP

```
Syntax:     [PXXXXXXX] CMD STOP
Parameters: none.
Password:   requested.
```

This command allows the user to stop the plant in the same way as if he presses the STOP push button on the device. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.

#### 7.2.5.7 CMD TEST START

```
Syntax:     [PXXXXXXX] CMD TEST START
Parameters: none.
Password:   requested.
```

This command allows the user to switch the device operating mode from AUTO to TEST. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: not executed command (e.g. while the device is not in AUTO mode).

Once the TEST mode is activated, it will stay active until the command to end the test is received or the time set by parameter on the device expires.

#### 7.2.5.8 CMD TEST STOP

```
Syntax:     [PXXXXXXX] CMD TEST STOP
Parameters: none.
Password:   requested.
```

This command allows the user to switch back the device operating mode from TEST to AUTO. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: not executed command (e.g. while the device is not in AUTO mode).
-

### 7.2.5.9 CMD REMOTE START

```
Syntax:     [PXXXXXXX] CMD REMOTE START
Parameters: none.
Password:   requested.
```

This command allows the user to switch the device operating mode from AUTO to REMOTE START. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: not executed command (e.g. while the device is not in AUTO mode).

Once the REMOTE START mode is activated, it will stay active until the opposite command is received.

### 7.2.5.10 CMD REMOTE STOP

```
Syntax:     [PXXXXXXX] CMD REMOTE STOP
Parameters: none.
Password:   requested.
```

This command allows the user to switch back the device operating mode from REMOTE START to AUTO. The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: command not carried out (for example, device not in remote start).

### 7.2.5.11 CMD FORCE A

```
Syntax:     [PXXXXXXX] CMD FORCE A
Parameters: none.
Password:   requested.
```

This command, available only for ATS100 and ATS115 devices, allows the user to force the device operating mode on source A.

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: not executed command (e.g. while the device is not in AUTO mode or source A is not available or already forced on source B or in neutral position).

### 7.2.5.12 CMD FORCE B

```
Syntax:     [PXXXXXXX] CMD FORCE B
Parameters: none.
```

```
Password:   requested.
```

This command, available only for ATS100 and ATS115 devices, allows the user to force the device operating mode on source B.

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: not executed command (e.g. while the device is not in AUTO mode or source B is not available or already forced on source A or in neutral position).

### 7.2.5.13 CMD FORCE N

```
Syntax:     [PXXXXXXX] CMD FORCE N
Parameters: none.
Password:   requested.
```

This command, available only for ATS100 and ATS115 devices, allows the user to force the device operating mode in neutral position (load not fed). The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: not executed command (e.g. while the device is not in AUTO mode).

### 7.2.5.14 CMD FORCE X

```
Syntax:     [PXXXXXXX] CMD FORCE X
Parameters: none.
Password:   requested.
```

This command, available only for ATS100 and ATS115 devices, allows the user to reset all the device forcing mode (A or B or N). The device answers this message with a single SMS:

- MISSING OR WRONG PASSWORD: wrong or missing password.
- COMMAND EXECUTED: executed command.
- CANNOT EXECUTE COMMAND: not executed command (e.g. while the device is not in AUTO mode).

### 7.2.5.15 CMD OPEN

```
Syntax:     [PXXXXXXX] CMD OPEN
Parameters: none.
Password:   requested.
```

With this command (only for the BTB100 e BTB200) the user has the possibility of commanding the switch BTB (connector) to open.

### 7.2.5.16 CMD CLOSE A

```
Syntax:     [PXXXXXXX] CMD CLOSE A
Parameters: none.
Password:   requested.
```

With this command (only for the BTB100 e BTB200) the user has the possibility of commanding the switch BTB (connector) closing with the synchronization from A to B.

### 7.2.5.17 CMD CLOSE B

```
Syntax:     [PXXXXXXX] CMD CLOSE B
Parameters: none.
Password:   requested.
```

With this command (only for the BTB100 e BTB200) the user has the possibility of commanding the switch BTB (connector) closing with the synchronization from B to A.

#### 7.2.5.18 CMD CLOSE X

```
Syntax:     [PXXXXXXX] CMD CLOSE X
Parameters: none.
Password:   requested.
```

With this command (only for the BTB100 e BTB200) the user has the possibility of commanding the switch BTB (connector) to close and the device with activate automatically whether synchronising from the BUSA towards the BUSB and vice-versa.

## 7.3 Messages transmitted by the device

Messages transmitted by the device are of two basic types:

- Answer Messages responding to incoming SMS
- Automatically generated messages.

Answer messages are sent one time only, while the automatically generated messages are transmitted N times at five seconds intervals, in order to assure the reception of at least one message by the addressed user. The N parameter is configurable together with the phone numbers and other related parameters (see the parameters table associated to the device).

### 7.3.1 Messages transmitted from the device format

The messages format is the same for both the mentioned types:

```
FROM: plant name. code (MSG N. n)
```

“Plant name” is a string having 23 characters’ max length; it must be previously stored in the device. “Code” is a message identifier described in the following paragraphs. The data field format and relevant value is a function of the field code. The last field, present only in case of automatically generated messages, indicates the number (1-.n) of the transmitted message. The message language is in accordance with the device settings. The English language strings are used in the following part of this document.

Answer messages

The following message types are included.

#### 7.3.1.1 UNKNOWN COMMAND

```
Syntax:     FROM: plant name UNKNOWN COMMAND (echo)
```

This answer message means that the device was unable to understand the message sent by the user. In this case the sent message syntax should be checked. “Echo” is the echo of the incoming unrecognized command.

#### 7.3.1.2 CANNOT EXECUTE COMMAND

```
Syntax:     FROM: plant name CANNOT EXECUTE COMMAND (echo)
```

This answer message means that the device recognized the incoming command sent by the user but it was unable to carry out the requested function (e.g. in case that the engine test start was commanded while the device was not in AUTO mode). “Echo” is the echo of the incoming not executed command.

#### 7.3.1.3 MISSING OR WRONG PASSWORD

```
Syntax:     FROM: plant name MISSING OR WRONG PASSWORD (echo)
```

This answer message means that the device recognized the incoming command sent by the user and that it is unable to carry out the requested function, because no or wrong password was transmitted. “Echo” is the echo of the incoming not executed command.

#### 7.3.1.4 SYNTAX ERROR

```
Syntax:     FROM: plant name SYNTAX ERROR (echo)
```

This answer message means that the device recognized the incoming command sent by the user and that it is unable to carry out the requested function because some needed command parameters are missing. “Echo” is the echo of the incoming not executed command.

#### 7.3.1.5 INDEX OUT OF RANGE

```
Syntax:     FROM: plant name INDEX OUT OF RANGE (echo)
```

This answer message means that the device recognized the incoming READ PARAMETER or WRITE PARAMETER commands sent by the user and that it is unable to carry out the requested function because the parameter index is invalid. “Echo” is the echo of the incoming not executed command.

#### 7.3.1.6 VALUE OUT OF RANGE

```
Syntax:     FROM: plant name VALUE OUT OF RANGE (echo)
```

This answer message means that the device recognized the incoming WRITE PARAMETER command sent by the user and that it is unable to carry out the requested function because the parameter value is outside the relevant available range. “Echo” is the echo of the incoming not executed command.

#### 7.3.1.7 NEED HIGHER ACCESS CODE

```
Syntax:     FROM: plant name NEED HIGHER ACCESS CODE (echo)
```

This answer message means that the device recognized the READ PARAMETER or WRITE PARAMETER commands but is unable to carry out the requested function because the access password level is not enough high to access the program parameter or it is wrong. “Echo” is the echo of the incoming not executed command.

#### 7.3.1.8 COMMAND EXECUTED

```
Syntax:     FROM: plant name COMMAND EXECUTED (echo)
```

This message is the answer whenever the device executed the sent command. “Echo” is the echo of the executed command.

#### 7.3.1.9 NETWORK CONFIGURATION

```
Syntax:     FROM: plant name NETWORK CONFIGURATION: PPPPPPPPPP, SIGNAL:
            xxx%
```

This message answers the READ NETWORK user message. It contains some GSM phone card (SIM) related information. The PPPPPPPPPP field contains a string identifying the current telephone operator (e.g. “I OMNITEL”). The "xxx" field provides the GSM signal level, percentage value.

#### 7.3.1.10 MODEM ANSWER

```
Syntax:     FROM: plant name MODEM ANSWER: xxx
```

This message answers the READ MODEM user message. The "xxx" field is the modem answer.

#### 7.3.1.11 CONFIG

```
Syntax:     FROM: plant name CONFIG: RELEASE LLLLLLLLLLLL dd/dd/dddd, ID
            CODE ssssssss
```

This message answers the READ CONFIG user message. It contains some board related information:

LLLLLLLLLLLL: device software review (SICES internal code).

"dd/dd/dddd" : software review compilation date.

"sssssss" : device serial number.

### 7.3.1.12 PARAMETER

```
Syntax:     FROM: plant name PARAMETER: III=VVV
```

This message answers the READ PARAMETER user message. The “III” field is the requested parameter index. The “VVV” field is the requested parameter value, formatted as it is displayed by the device (full stop is used as decimal separator when applicable).

### 7.3.1.13 STATUS (for all devices except MC100, MC400, MC200, ATS100, ATS115 and HS315)

```
Syntax:     FROM: plant name STATUS: field1, field2, field3, field4,
            field5, field6, field7
```

This message answers the READ STATUS message. The field description follows:

| **Field 1** | **Board operation mode** |
|---|---|
| OFF/RESET | OFF/RESET |
| MAN | MAN |
| AUTO | AUTO |
| TEST | TEST |
| REMOTE START | REMOTE START |

| **Field 2** | **“Alarms” status** |
|---|---|
| NO ALARMS | No alarm present |
| String associated with the first active alarm | At least one alarm is present |

| **Field 3** | **“Warning” status** |
|---|---|
| NO WARNINGS | No warning is present |
| String associated with the first active warning | At least one warning is present |

| **Field 4** | **Gen-set engine Status** |
|---|---|
| ENGINE RUNNING | Engine running |
| Engine stopped | Engine OFF. |

| **Field 5** | **Load switching breakers status** |
|---|---|
| KM/KR/CR/MCB CLOSED | load changed over to mains |
| KG/CG/GCB CLOSED | load changed over to gen-set |
| -- | load not fed (during changeover operation only) |

| **Field 6** | **Starting interlock contact status** |
|---|---|
| INHIBITED | Starting inhibition on |
| | Starting inhibition off |

| **Field 7** | **Generator operating hours** |
|---|---|
| HOURS XXXXX | XXXXX indicates the operational hours (re-settable) |

### 7.3.1.14 STATUS (only for MC100, MC400 AND MC200)

```
Syntax:     FROM: plant name STATUS: field1, field2, field3, field4,
            field5, field6, field7, xx.xVdc
```

This message answers the READ STATUS message. The field description follows:

| **Field 1** | **Board operation mode** |
|---|---|
| OFF/RESET | OFF/RESET |
| MAN | MAN |

| | |
|---|---|
| AUTO | AUTO |
| TEST | TEST |
| REMOTE START | REMOT START |

| **Field 2** | **“Alarms” status** |
|---|---|
| NO ALARMS | No alarm present |
| String associated with the first active alarm | At least one alarm is present |

| **Field 3** | **“Warning” status** |
|---|---|
| NO WARNINGS | No warning is present |
| String associated with the first active warning | At least one warning is present |

| **Field 4** | **“Start inhibitions” status** |
|---|---|
| START INHIB. | Starting inhibition on |
| | Starting inhibition off |

| **Field 5** | **“Load inhibitions” status** |
|---|---|
| LOAD INHIB. | At least one “load inhibition” is present. |
| | No “load inhibition” is present. |

| **Field 6** | **MCB status** |
|---|---|
| MCB CLOSED | Circuit breaker MCB closed |

| **Field 7** | **MGCB status** |
|---|---|
| MGCB CLOSED | Circuit breaker MGCB closed |

| **Field 8** | **Battery voltage** |
|---|---|
| xx.x Vdc | Battery voltage |

The circuit breakers statuses can be:

- CLOSED.
- OPEN.

If a circuit breaker doesn’t exist, the field is not present in the message.

The last field is the power supply voltage of the device.

### 7.3.1.15 STATUS (only for ATS100)

```
Syntax:     FROM: plant name STATUS: field1, field2, field3, field4,
            field5, field6
```

This message answers the READ STATUS message. The field description follows:

| **Field 1** | **Board operation mode** |
|---|---|
| OFF/RESET | OFF/RESET |
| MAN | MAN |
| AUTO | AUTO |
| TEST | TEST |
| REMOTE START | REMOTE START |

| **Field 2** | **“Alarms” status** |
|---|---|
| NO ALARMS | No alarm present |
| String associated with the first active alarm | At least one alarm is present |

| **Field 3** | **“Warning” status** |
|---|---|

| | |
|---|---|
| NO WARNINGS | No warning is present |
| String associated with the first active warning | At least one warning is present |

| **Field 4** | **Load switching breakers status** |
|---|---|
| ACB CLOSED | load changed over to source A |
| BCB CLOSED | load changed over to source B |
| -- | load not fed (neutral position) |

| **Field 5** | **Change-over to source A status** |
|---|---|
| CAN SWITCH TO A | Change-over to source A is possible |
| CANNOT SWITCH TO A | Change-over to source A is not possible |

| **Field 6** | **Change-over to source B status** |
|---|---|
| CAN SWITCH TO B | Change-over to source B is possible |
| CANNOT SWITCH TO B | Change-over to source B is not possible |

Notes:
Field 5 is managed only if BCB is closed or the system is in neutral position.
Field 6 is managed only if ACB is closed or the system is in neutral position.
The fields 5 and 6 aren't managed if the system is in neutral position.

### 7.3.1.16 STATUS (only for ATS115)

```
Syntax:     FROM: plant name STATUS: field1, field2, field3, field4,
            field5, field6, field7, field8, field9
```

This message answers the READ STATUS message. The field description follows:

| **Field 1** | **Board operation mode** |
|---|---|
| OFF/RESET | OFF/RESET |
| MAN | MAN |
| AUTO | AUTO |
| TEST | TEST |
| REMOTE START | REMOTE START |

| **Field 2** | **"Alarms" status** |
|---|---|
| NO ALARMS | No alarm present |
| String associated with the first active alarm | At least one alarm is present |

| **Field 3** | **"Warning" status** |
|---|---|
| NO WARNINGS | No warning is present |
| String associated with the first active warning | At least one warning is present |

| **Field 4** | **Load switching breakers status** |
|---|---|
| ACB CLOSED | load changed over to source A |
| BCB CLOSED | load changed over to source B |
| -- | load not fed (neutral position) |

| **Field 5** | **"Load inhibitions" status of source A** |
|---|---|
| LOAD INHIB. A | At least one "load inhibition" of source A is present. |
| | No "load inhibition" of source A is present. |

| **Field 6** | **"Load inhibitions" status of source B** |
|---|---|
| LOAD INHIB. B | At least one "load inhibition" of source B is present. |
| | No "load inhibition" of source B is present. |

| Field 7 | "Start inhibitions" status |
|---|---|
| START INHIB. | Starting inhibition on |
| | Starting inhibition off |

| Field 8 | Change-over to source A status |
|---|---|
| CAN SWITCH TO A | Change-over to source A is possible |
| CANNOT SWITCH TO A | Change-over to source A is not possible |

| Field 9 | Change-over to source B status |
|---|---|
| CAN SWITCH TO B | Change-over to source B is possible |
| CANNOT SWITCH TO B | Change-over to source B is not possible |

Notes:
Field 8 is managed only if BCB is closed or the system is in neutral position.
Field 9 is managed only if ACB is closed or the system is in neutral position.
The fields 8 and 9 aren't managed if the system is in neutral position.

### 7.3.1.17 STATUS (only for BTB100 and BTB200)

```
Syntax:     FROM: plant name STATUS: field1, field2, field3, field4, BTB
            xxxx, xx.xVdc
```

This message answers the READ STATUS message. The field description follows:

| Field 1 | Board operation mode |
|---|---|
| OFF/RESET | OFF/RESET |
| MAN | MAN |
| AUTO | AUTO |

| Field 2 | "Alarms" status |
|---|---|
| NO ALARMS | No alarm present |
| String associated with the first active alarm | At least one alarm is present |

| Field 3 | "Warning" status |
|---|---|
| NO WARNINGS | No warning is present |
| String associated with the first active warning | At least one warning is present |

| Field 4 | "Start inhibitions" status |
|---|---|
| BTB OPEN | Switch BTB open |
| BTB CLOSED | Switch BTB closed |

### 7.3.1.18 STATUS (only for HS315)

```
Syntax:     FROM: plant name STATUS: field1, field2, field3, field4,
            field5, field6, field7, field8, field9, field10
```

This message answers the READ STATUS message. The field description follows:

| Field 1 | Board operation mode |
|---|---|
| OFF/RESET | OFF/RESET |
| MAN | MAN |
| AUTO | AUTO |
| TEST | TEST |
| REMOTE START | REMOTE START |

| Field 2 | "Alarms" status |
|---|---|
| NO ALARMS | No alarm present |

| | |
|---|---|
| String associated with the first active alarm | At least one alarm is present |

| **Field 3** | **“Warning” status** |
|---|---|
| NO WARNINGS | No warning is present |
| String associated with the first active warning | At least one warning is present |

| **Field 4** | **Engine status** |
|---|---|
| ENGINE RUNNING | The engine is running |
| ENGINE STOPPED | The engine is stopper |

| **Field 5** | **GCB status** |
|---|---|
| GCB CLOSED | Circuit breaker GCB closed |

| **Field 6** | **BCB status** |
|---|---|
| BCB CLOSED | Circuit breaker BCB closed |

| **Field 7** | **LCB status** |
|---|---|
| LCB CLOSED | Circuit breaker LCB closed |

| **Field 8** | **ACB status** |
|---|---|
| ACB CLOSED | Circuit breaker ACB closed |

| **Field 9** | **“Start inhibition” status** |
|---|---|
| START INHIBITED | Automatic start of the engine is not allowed |

| **Field 10** | **“GCB closure inhibition” status** |
|---|---|
| GCB INHIBITED | Automatic GCB closure is not allowed |

| **Field 11** | **Engine running hours** |
|---|---|
| HOURS XXXXX | It shows the clearable counter of the running hours of the engine. |

Notes:

- The fields 5, 6, 7 and 8 are present only if the related circuit breakers are closed.
- The field 9 is present only if some “start inhibition” is present.
- The field 10 is present only if some “GCB closure inhibition” is present.

### 7.3.1.19 WARNINGS

```
Syntax:     FROM: plant name WARNINGS: list (separated by commas)
```

This message answers the READ WARNINGS message. The message data field contains the “NO WARNINGS” statement in case that no warning is pending. Otherwise it contains a list (where the fields are separated by commas) of all the active warnings.

### 7.3.1.20 ANALOG1 (for all devices except BTB100, BTB200 and HS315)

```
Syntax:     FROM: plant name ANALOG1: GENSET xxxV xxxV xxxV, xxxA xxxA
            xxxA, xx.xHz , KG/CG/GCB sssss
```

This message answers the READ ANALOG1 message. It contains all the analogue data relevant to the generator set. The three "xxx" fields followed by "V" contain the voltages relevant to the three generator phases. The three "xxx" fields followed by "A" contain the currents relevant to the three generator phases. The field "xx.xf" followed by "Hz" contains the frequency of the generator. The KG/CG/GCB field indicates that the generator is supplying the load (when stating CLOSED) or not (when stating OPEN). In case of single phase plants, the fields relevant to phases two and three do not exist.

### 7.3.1.21 ANALOG1 (only for BTB100 and BTB200)

```
Syntax:     FROM: plant name ANALOG1: BUSA xxxV xxxV xxxV, xx.xHz, BUSB
            xxxV xxxV xxxV, xx.xHz, xxxxA xxxxA xxxxA xxxxAn.
```

This message answers the READ ANALOG1 message. Contains all the analogue values that concern in detail the electrical measurements of the BUSA and the BUSB. The three fields "xxx" followed by “V” contain the voltages of the three phases of the BUSA and the BUSB. The three "xxx" fields followed by "A" contain the currents of the three phases circulating on the BTB connector. The field "xx.xf" followed by “Hz” contains the frequency of the BUSA and the frequency of the BUSB. In case of single phase plants, the fields relevant to phases two and three do not exist.

### 7.3.1.22 ANALOG1 (only for HS315)

```
Syntax:     FROM: plant name ANALOG1: GENERATOR xx.x Vdc, xx.x Adc, xxx kW,
            field1, BATTERY xx.x Vdc, xx.x Adc, xxx kW, xxx.x deg, field2.
```

This message answers the READ ANALOG1 message. Contains all the analogue values that concern in detail the electrical measurements of the generator and the plant battery.

| **Field 1** | **GCB status** |
|---|---|
| GCB CLOSED | Circuit breaker GCB closed |
| GCB OPEN | Circuit breaker GCB opened |

| **Field 2** | **BCB status** |
|---|---|
| BCB CLOSED | Circuit breaker BCB closed |
| BCB OPEN | Circuit breaker BCB opened |

The “field 1” is present only if a GCB circuit breaker is present in the plant. The “field 2” is present only if a BCB circuit breaker is present in the plant.

### 7.3.1.23 ANALOG2 (for all devices except ATS100, ATS115, BTB100, BTB200, HS315)

```
Syntax:     FROM: plant name ANALOG2: MAINS xxxV xxxV xxxV, xx.xHz, BATT
            xx.xV, TEMP xxx C, PRESS. xx.x Bar, FUEL LEVEL xxx %, SPEED
            xxxx Rpm
```

This message answers the READ ANALOG2 user message. It contains all the analogue data that are not contained in the ANALOG1 message. The three "xxx" fields followed by "V" are the voltages relevant to the three mains phases. The frequency (Hz) is present only for the devices GC310, GC350, GC500, GC500Plus. The "BATT" field contains the voltage relevant to the starter battery. The "TEMP" field contains the coolant temperature. The "PRESS." field contains the engine oil pressure. The "LEVEL" field contains the fuel tank level. The "SPEED" field contains the engine speed in revolutions per minute. If some measurements are not available, they are replaced with some dashes. In case of single phase plants, the fields relevant to phases two and three do not exist.

### 7.3.1.24 ANALOG2 (only for ATS100 and ATS115)

```
Syntax:     FROM: plant name ANALOG2: BATT xx.xV, message for the analogue
            input 1 xxxxxxxx Unit, message for the analogue input 2
            xxxxxxxx Unit, message for the analogue input 3 xxxxxxxx Unit.
```

This message answers the READ ANALOG2 user message (only for ATS100 and ATS115). It contains the analogue data, the name and the unit of the three analogue sensors of the board. The "BATT" field contains the voltage relevant to the starter battery. If some measurements are not available, they are replaced with some dashes.

### 7.3.1.25 ANALOG2 (only for BTB100 and BTB200)

```
Syntax:     FROM: plant name ANALOG2: BATT xx.xV, analogue input 1 name
            (AN.1:JW-1)xxxxxxxx U.M., analogue input 2 name (AN.2:JW-2)
            xxxxxxxx U.M., analogue input 3 name (AN.3:JM-1) xxxxxxxx U.M.
            , analogue input 4 name (AN.4:JM-2) xxxxxxxx U.M., analogue
```

```
input 5 name (AN.5:JM-3) xxxxxxxx U.M., analogue input 6 name
(AN.6:JM-4) xxxxxxxx U.M.
```

This message answers the READ ANALOG2 user message (only for BTB100 and BTB200). The "BATT" field contains the voltage relevant to the starter battery, the name, the value and the unit of measurement of the six analogue inputs of the card. If some measurements are not available, they are replaced with some dashes.

### 7.3.1.26 ANALOG2 (only for HS315)

```
Syntax:     FROM: plant name ANALOG2: LOADS xx.x Vdc, xx.x Adc, xxx kW,
            field1, AUXILIARY SOURCE xx.x Vdc, xx.x Adc, xxx kW, field2.
```

This message answers the READ ANALOG2 message. Contains all the analogue values that concern in detail the electrical measurements of the loads and the auxiliary source.

| **Field 1** | **LCB status** |
|---|---|
| LCB CLOSED | Circuit breaker LCB closed |
| LCB OPEN | Circuit breaker LCB opened |

| **Field 2** | **ACB status** |
|---|---|
| ACB CLOSED | Circuit breaker ACB closed |
| ACB OPEN | Circuit breaker ACB opened |

The “field 1” is present only if a LCB circuit breaker is present in the plant. The “field 2” is present only if a ACB circuit breaker is present in the plant.

### 7.3.1.27 ANALOG3 (for all devices except BTB100, BTB200, HS315)

```
Syntax:     FROM: plant name (ON MAINS) ANALOG3: P.F. x.xxi, xxxx.x kW,
            xxxx.x kvar, xxxx.x kVA, xxxxxxxx kWh
```

This message answers the READ ANALOG2 user message. It contains all the analogue data relevant to power measurements.

The words “ON MAINS” are displayed only when the board is measuring the power absorbed by the devices on the mains, not on the generator (current transformers must be connected to the devices and the board properly configured). This is possible only on the GC310, GC350, GC500 and GC500Plus devices.

The "P.F." field contains the power factor value, followed by the load type. “i” means inductive, “c” means capacitive. The "kW" field contains the active power. The "kvar" field contains the reactive power. The "kVA" field contains the apparent power. The "kWh" field contains the active energy counter.

### 7.3.1.28 ANALOG3 (only for BTB100 and BTB200)

```
Syntax:     FROM: plant name P.F. x.xx, xxxx.x kW, xxxx.x kvar, xxxx.x kVA,
            xxxxxxxx kWh A→B, xxxxxxxx kWh B→A.
```

This message answers the READ ANALOG2 user message. It contains all the analogue data relevant to power measurements.

The field "P.F." contains the power factor with sign. The "kW" field contains the active power. The "kvar" field contains the reactive power. The "kVA" field contains the apparent power. The field "kWh A→B" contains the counter of the active energy between the BUSA towards the BUSB. The field "kWh B→A" contains the counter of the active energy between the BUSB towards the BUSA.

### 7.3.1.29 ANALOG3 (only for HS315)

```
Syntax:     FROM: plant name. ANALOG3: BATT xx.x V, TEMP xxx deg, PRESS.
            xx.x Bar, FUEL LEVEL xxx %, SPEED xxxx Rpm
```

This message answers the READ ANALOG3 user message. It contains all the analogue data relevant to the engine. The "BATT" field contains the voltage relevant to the starter battery. The "TEMP" field

contains the coolant temperature. The "PRESS." field contains the engine oil pressure. The "LEVEL" field contains the fuel tank level. The "SPEED" field contains the engine speed in revolutions per minute. If some measurements are not available, they are replaced with some dashes.

### 7.3.1.30 SOURCEA (only for ATS100 and ATS115)

```
Syntax:     FROM: plant name SOURCEA: GENSET/MAINS xxxV xxxV xxxV, xxxA
            xxxA xxxA, xx.xHz , ACB sssss, xxxxxxxx kWh, xxxxxxxx hh
```

This message answers the READ SOURCEA message (only for ATS100 and ATS115). It contains all the analogue data relevant to the source A set. The first filed is the type of source (mains or generator). The three fields "xxx" followed by "V" contain the voltages of the three phases of source A. The three fields "xxx" followed by “A” contain the currents of the three phases of source A and are valid only if the TA are connected on source A or else if they are connected to the load and the switch ACB is closed. The field "xx.xf" followed by “Hz” contains the frequency of source A. The field ACB/BCB indicates whether source A is connected to the load (CLOSED) or not (OPEN). The field "kWh" contains the active energy meter and lastly the field “hh” contains the hours source A has been operating. In case of single phase systems, the fields relevant to phases two and three are not present.

### 7.3.1.31 SOURCEB (solo per ATS100 and ATS115)

```
Syntax:     FROM: plant name SOURCEA: GENSET/MAINS xxxV xxxV xxxV, xxxA
            xxxA xxxA, xx.xHz , BCB sssss, xxxxxxxx kWh, xxxxxxxx hh
```

This message answers the READ SOURCEB message (only for ATS100 and ATS115). It contains all the analogue data relevant to the source B set. The first filed is the type of source (mains or generator). The three fields "xxx" followed by “V” contain the voltages of the three phases of source B. The three fields "xxx" followed by “A” contain the currents of the three phases of source B and are valid only if the TA are connected on source B or else if they are connected to the load and the switch ACB is closed. The field "xx.xf" followed by “Hz” contains the frequency of source B. The field ACB/BCB indicates whether source B is connected to the load (CLOSED) or not (OPEN). The field "kWh" contains the active energy meter and lastly the field “hh” contains the hours source B has been operating. In case of single phase systems, the fields relevant to phases two and three are not present.

### 7.3.1.32 LOAD (solo per ATS100 and ATS115)

```
Syntax:     FROM: plant name (ON SOURCE A/SOURCE B) LOAD: P.F. x.xxi,
            xxxx.x kW, xxxx.x kvar, xxxx.x kVA
```

This message answers the READ LOAD user message. It contains all the analogue data relevant to power measurements.

The expression “ON SOURCE A” only appears when the device is measuring the power consumption of the utilities on source A. The expression “ON SOURCE B” only appears when the device is measuring the power consumption of the devices on source B. If power measurement is not available, the expression will be replaced with dashes (the current transformers should be connected to the utilities and the device should be suitably configured). This function is only available for the ATS100 and ATS115 devices.

The "P.F." field contains the power factor value, followed by the load type. “i” means inductive, “c” means capacitive. The "kW" field contains the active power. The "kvar" field contains the reactive power. The "kVA" field contains the apparent power.

### 7.3.1.33 PLANT (only for MC100, MC400 and MC200)

```
Syntax:     FROM: plant name PLANT: MAINS xxxx.xkW x.xxi, GENERATORS
            xxxx.xkW x.xxi, USERS xxxx.xkW x.xxi, MCB xxxxx, MGCB xxxxx, n
            GCB CLOSED.
```

This message answers the READ PLANT user message (only for MC100, MC400 and MC200). It contains the general status of the plant. Shows the active power and the power factor on a network, units and utilities (if some information is not available it displays dashes). It also contains the status of MCB and MGCB circuit breakers and the number of closed GCB circuit breakers. The circuit breakers that don’t exist are not shown.

#### 7.3.1.34 MAINS (only for MC100, MC400 and MC200)

```
Syntax:     FROM: plant name MAINS xxxV xxxV xxxV, xx.xHz, xxxA xxxA xxxA,
            xxxx.x kW, xxxx.x kvar, xxxx.x kVA, x.xxi, xxxxxxxx kWh,
            xxxxxxxx kvarh
```

This message answers the READ MAINS user message (only for MC100, MC400 and MC200). It contains all data related to the mains. The three fields followed by “V” are the voltages, followed by the frequency (Hz). All the next fields are shown only if current transformers are connected to the mains or to the loads when loads are supplied by the mains: currents, powers, power factor and energy counters. In case of single phase plants, the fields relevant to phases two and three do not exist.

#### 7.3.1.35 GENERATORS (only for MC100, MC400 and MC200)

```
Syntax:     FROM: plant name GENERATORS xxxV xxxV xxxV, xx.xHz, xxxA xxxA
            xxxA, xxxx.x kW, xxxx.x kvar, xxxx.x kVA, x.xxi, xxxxxxxx kWh,
            xxxxxxxx kvarh
```

This message answers the READ GENERATORS user message. This message answers the READ GENERATORS user message (only for MC100, MC400 and MC200). It contains all data related to the generators. The three fields followed by “V” are the voltages, followed by the frequency (Hz). All the next fields are shown only if current transformers are connected to the generators or to the loads when loads are supplied by the generators: currents, powers, power factor and energy counters. In case of single phase plants, the fields relevant to phases two and three do not exist.

## 7.4 Automatically generated messages.

The following message types are included.

### 7.4.1 Messages

#### 7.4.1.1 NEW ALARM

```
Syntax:     FROM: plant name NEW ALARM: XXXXXXXXXX (MSG N.1)
```

This message is transmitted whenever a mains status change is detected. The XXXXXXXXXX field indicates the alarm type. The values are the ones displayed by the device associated to the anomalies.

#### 7.4.1.2 NEW WARNING

```
Syntax:     FROM: plant name NEW WARNING: XXXXXXXXXX (MSG N.1)
```

This message is transmitted whenever a new warning is detected. The XXXXXXXXXX field indicates the warning type. The values are the ones displayed by the device associated to the anomalies.

### 7.4.1.3 NEW MAINS STATUS

Syntax: FROM: plant name NEW MAINS STATUS: SS (MSG N.1)

This message is transmitted whenever a mains status change is detected. The SS field indicates the new status: “ABSENT” or “PRESENT”. This message is not available for ATS100 and ATS115 devices.

### 7.4.1.4 NEW AUXILIARY SOURCE STATUS

Syntax: FROM: plant name NEW AUXILIARY SOURCE STATUS: SS (MSG N.1)

This message is transmitted whenever an auxiliary source status change is detected. The SS field indicates the new status: “ABSENT” or “PRESENT”. This message is available for HS315 devices only.

### 7.4.1.5 NEW ENGINE STATUS

Syntax: FROM: plant name NEW ENGINE STATUS: SS (MSG N.1)

This message is transmitted whenever the engine is started or stopped. The SS field indicates the new status: “OFF” or “RUNNING”. This message is not available for MC100 and ATS100 and ATS115 devices.

### 7.4.1.6 NEW SOURCE A STATUS (only for ATS100 and ATS115)

Syntax: FROM: plant name NEW SOURCE A STATUS: TT SS (MSG N.1)

This message is transmitted whenever a source A status change is detected. The TT field indicates the type of source: “ABSENT” or “PRESENT”. This message is available only for ATS100 and ATS115 devices.

### 7.4.1.7 NEW SOURCE B STATUS (only for ATS100 and ATS115)

Syntax: FROM: plant name NEW SOURCE B STATUS: TT SS (MSG N.1)

This message is transmitted whenever a source B status change is detected. The TT field indicates the type of source: “ABSENT” or “PRESENT”. This message is available only for ATS100 and ATS115 devices.

### 7.4.1.8 NEW SWITCH STATUS (only for ATS100 and ATS115)

Syntax: FROM: plant name NEW SWITCH STATUS: SS (MSG N.1)

This message is transmitted whenever a circuit-breaker status change is detected. The SS field indicates the new status: “ACB-CLOSED” or “BCB-CLOSED” o “------“if in neutral position. This message is available only for ATS100 and ATS115 devices.

### 7.4.1.9 NEW BUS A STATUS (only for BTB100 and BTB200)

Syntax: FROM: plant name NEW BUS A STATUS: SS (MSG N.1)

This message is transmitted whenever a source A status change is detected. The SS field indicates the type of source: “ABSENT” or “PRESENT”. This message is available only for BTB100 and BTB200 devices.

### 7.4.1.10 NEW BUS B STATUS (only for BTB100 and BTB200)

Syntax: FROM: plant name NEW BUS B STATUS: SS (MSG N.1)

This message is transmitted whenever a source B status change is detected. The SS field indicates the type of source: “ABSENT” or “PRESENT”. This message is available only for BTB100 and BTB200 devices.

# 8. Notes relevant to GSM use

***Read: in order to correctly operate with the GSM communication system, some few rules must be considered for installation and configuration purposes. This chapter is devoted to provide such needed information.***

## 8.1 SIM

### 8.1.1 General

The GSM modem SIM card is not provided by SICES s.r.l. The decision about the operator selection and the type of contract is left to the user.

In general, any kind of contract is applicable, however the GSM operator imposed conditions and restrictions of use should be carefully considered by the user.

***Information: In case that the GSM protocol is requested without data transmission options, any type of contract, only phone too, is applicable.***

***Information: For data transmission purposes some operators require the enabling of specialized phone numbers respectively for the phone and the data/fax services.***

In case the SIM supports more than one phone number, any one, among the available numbers, can be used for the SMS service under consideration.

***Note: Some kinds of contract allow the data transmission service only, with no reception available (data service available for outgoing calls only). The kind of contract to choose should be discussed with the service provider.***

### 8.1.2 Pre-paid cards

Pre-paid cards are compatible with the system under consideration.

Normally the pre-paid cards allow the data transmission service in case of outgoing calls only; however, there are pre-paid cards allowing the data service for both the outgoing and incoming call cases.

## 8.2 PIN

***Read: Read: the current supervisory SW issue, implemented by the device, does not manage the SIM card PIN number.***

***Therefore, the SIM card should be initially inserted in a mobile phone, in order to disable the PIN number function.***

## 8.3 SMS configuration

The SMS service centre phone number must be configured inside the SIM card. In general, the service centre phone number is set inside the card by the service provider. The relevant check can be performed by trying to send an SMS while the card is fitted inside a mobile phone.

## 8.4 Sending SMS from mobile phone to device

It is recommendable to check the transmission of query and command messages toward the device.

***Read: note that the phone number transmission must be enabled at the mobile phone; otherwise the system would not be able to answer the incoming call.***

## 8.5 Installation

The antenna position should be carefully selected. Note that positioning the antenna in a shielded position, like inside a cabinet or metallic container, might prevent the establishment of the communication link with the GSM network.
Afterward the device signal level indication could be used to check the suitability of the position and to optimize the signal level by moving the antenna position. Otherwise a mobile phone could be used to find the position for the optimal signal level.

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