

String Box Control (SBC)

TW0SBC016

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Handbook

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The applied standards are the following:

IEC 60664 / IEC 60664A / VDE 0110-1 / VDE 0110-2

IEC 60326-3

IEC 61643-1 Classe II / VDE 0675-6

IEC EN 60947-3 / IEC EN 60364-7-712

The list of essential requirements is the following:

IEC 60664 / IEC 60664° VDE 0110-1 / VDE 0110-2	Insulation requirements for electrical low-voltage equipment installations and definitions sizing distances on air or on surface.
IEC 60326-3	Sizing of conductive tracks
IEC 61643-1 Classe II VDE 0675-6	Low voltage surge arresters.
IEC EN 60947-3 IEC EN 60364-7-712	Low voltage equipment circuit switch disconnectors.

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1. GENERAL

1.1 INTRODUCTION

Scope of this document is to introduce to initialization and use of String Box Control.

1.2 SECURITY RULES

Before installing the device read the manual carefully and warnings.

1.3 WARNINGS INTO THIS TEXT

In this guide the words *danger*, *attention* and *note* have the following meaning:

danger: an operation that, if not properly carried out, can be dangerous for the life of the staff;

attention: an operation that, if not properly carried out, can be dangerous for the staff;

note: an operation that requests a detailed explanation.

1.4 DEVICE DESCRIPTION

1.4.1 WORKING PRINCIPLES

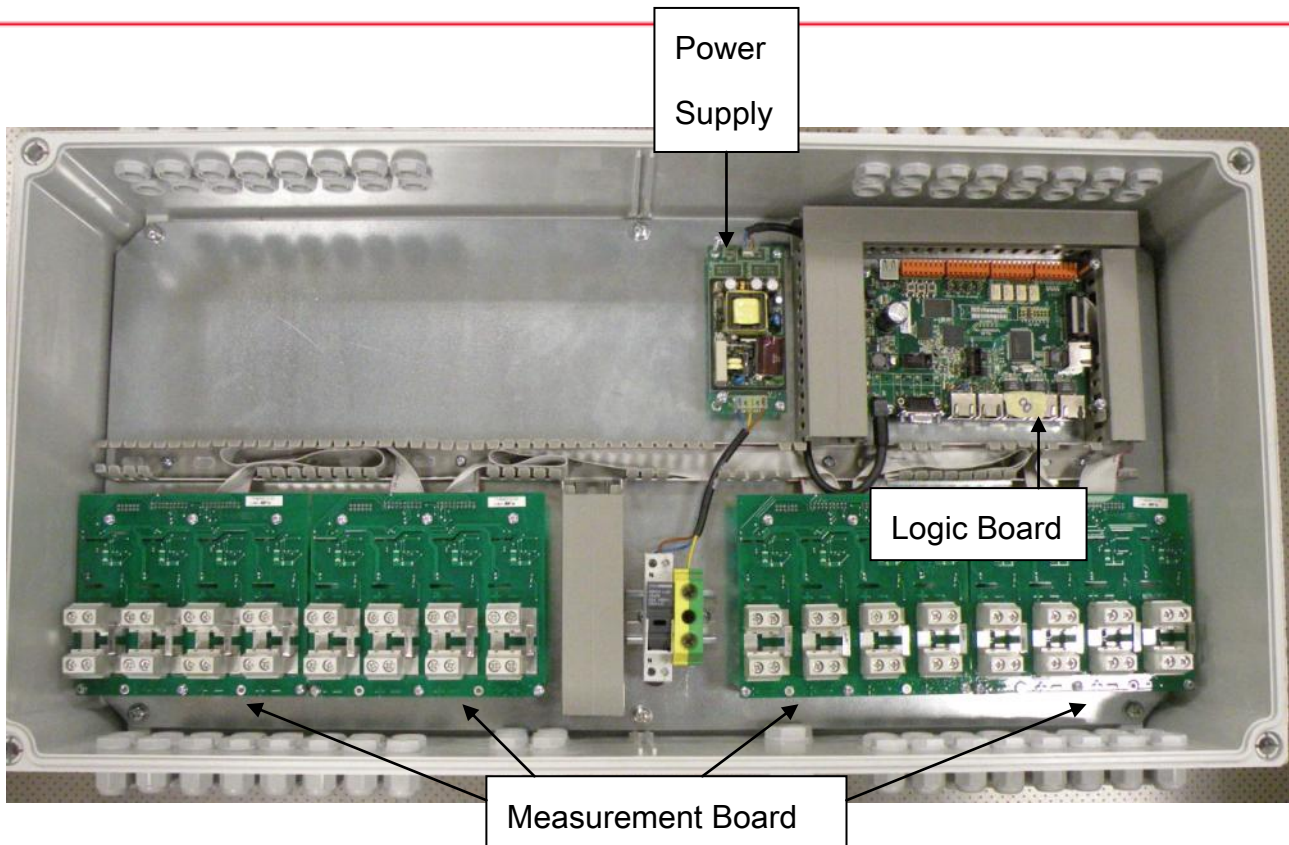
This device is used to measure the current and the voltage on 16 string of PV panel.

1.4.2 PHYSICAL DESCRIPTION

The device is protected of a polyester hot pressing, reinforced fiberglass cabinet 760mmx380mmx225mm.

1.4.3 COMPONENTS

The framework is composed of: 4 boards of measurement; a logic board that acquires the measure; a power supply AC/DC.



1.5 FUNCTIONAL DESCRIPTION

1.5.1 MEASUREMENT BOARD

This board has 8 bipolar connectors to connect 4 strings in Input and in Output measure the voltage and the current of the single string.

1.5.2 LOGIC BOARD

This board receive, processes and organizes the measure, communicates with the outside and more other.

1.5.3 POWER SUPPLY

This device transforms the AC 220V in DC 12V be provided to the Logic board.

1.6 COMMANDS AND INDICATORS

Refer to the document T14040053-ICD for communication protocol

2. SPECIFICATION

INPUT	
String number	16
Max Voltage (Vdc)	1000
Operating Voltage (Vdc)	350÷800
DC String Current (A)	10
Power Supply	230 Vac standard; Optional DC/DC Converter (from 350/1000V to 12V)
Connection	Suitable for 16 mm ² wire section
Consumption (W)	20
Ground Connection	Suitable for 50 mm ² wire section
DATA COMMUNICATION	
Interfaces	2 RS485; 1 I2C; 3 Ethernet; 1 Ethernet with PoE; 4 Analog input; 4 Digital output; 4 Digital input.
Monitoring	String Current / Voltage
System Control	TPortal
MECHANICAL SPECIFICATIONS	
Dimensions (mm)	760x380x225
Weight (Kg)	20
Operating temperature (°C)	-20 ÷ 60
Storage temperature (°C)	-40 ÷ 80
IP protection	IP55

3. INSTALLATION

3.1 INSTALLATION RULES

Installation is essentially divided into two phases: Mechanical and Electrical.

3.2 PRECAUTIONS AND RECCOMMENDATION

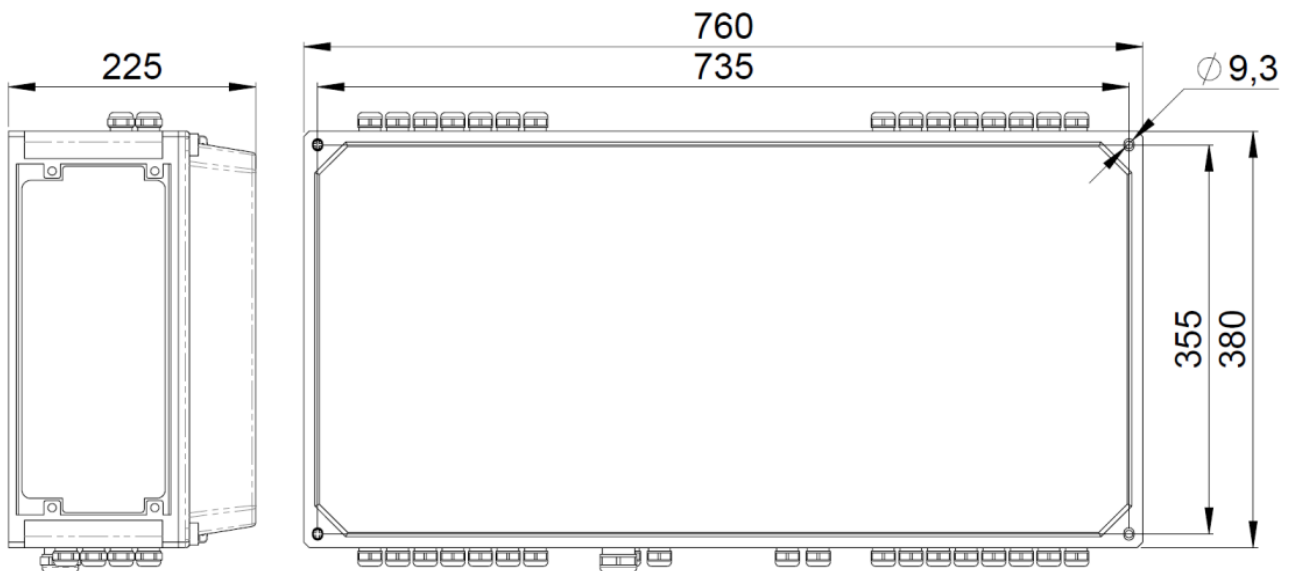
Follow accurately the steps presented above. Errors in the procedure described may lead to irreparable damages of the device.

3.3 MECHANICAL INSTALLATION

The standard mounting String Box Control involves the use of 4 screws \varnothing 10 mm max, (tightening torque of 20 Nm).

ATTENTION

Do not expose the String Box Control directly to the weather (solar radiation and precipitation)



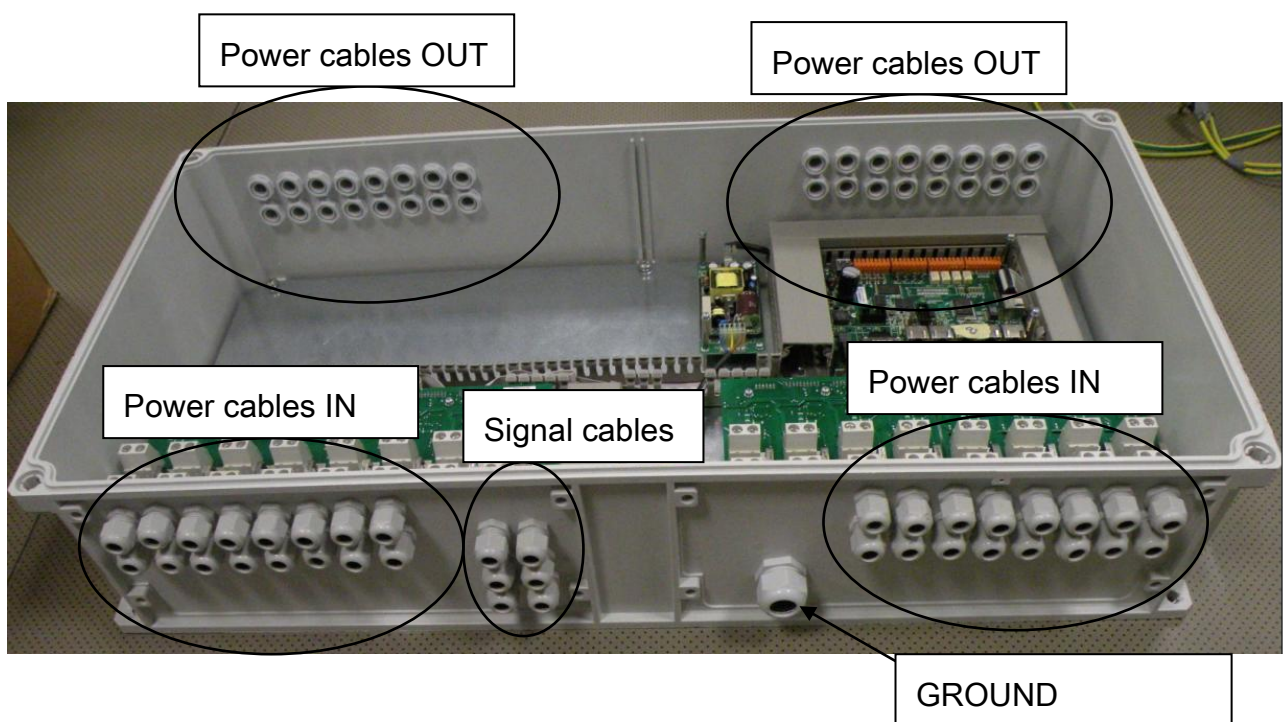
3.4 ELECTRICAL INSTALLATION

The power cables of the strings pass through the gland;

The power cables OUT leave of the closet through the gland from the top of the cabinet.

The ground wire passes through the gland indicated PE;

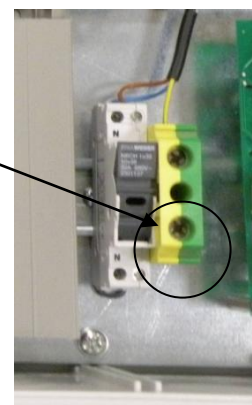
The Signal cables and the power supply AC pass through the gland J1÷J6



Inside the strings are connected, respectively, in the connectors on the Measurement board.

The Strings are connected from left to right, the connector to the left is for the string 1, the rightmost is for the string 16.

The ground is connected on the clamp green-yellow:



The power supply (230V_{AC}) is connected on the terminals of the clamp:



On the screw marked N is connected the Neutral.

The signal cable of communication is connected to the connector RJ5 (485/0)



3.5 PROTECTIONS

The device has 1 panels to protect the Logic Board.

The cabinet is connected to ground.

3.6 SETTING FOR USE

Communication with the Logic board is via RJ45 8-PIN and precisely using the MODBUS protocol.



The pin out on the connector RJ5 is:

PIN	Signal	Description
1	GND	0V
2	-	not connected
3	Data (-)	RS485 differential asynchronous data
4	-	not connected
5	-	not connected
6	Data (+)	RS485 differential asynchronous data
7	-	not connected
8	-	not connected

The **Modbus address** of the device is **17** and, as well as the other settings, cannot be changed.

Format of the messages is:

- Baud rate: 9600;
- number of bits: 8;
- parity: none;
- start bit: 1;
- stop bit: 1;
- supported Modbus function:
 - 0x02, read discrete inputs;
 - 0x04, read input register.

3.7 OTHER COMMUNICATIONS

In addition to RS485 / 0 are available:

- another RS485 with the same PIN-OUT on the connector RJ6;
- three Ethernet (0, 1, 2) with the following PIN-OUT on the connector RJ4, RJ3, RJ2:

PIN	Signal	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	-	not connected
5	-	not connected
6	RX-	Receive Data-
7	-	not connected
8	-	not connected

- an Power Over Ethernet on the connector RJ1 in which the pins 4 and 5 are grounded, while pins 7 and 8 to 48V;
- an I²C plus power supply on the connector J4:

PIN	Signal	Description
1	PW12V	+12V _{DC}
2	5Vreg	+5V _{DC}
3	GND	0V _{DC}
4	GND	0V _{DC}
5	GND	0V _{DC}
6	SDA	Serial Data Line-
7	SCL	Serial Clock Line
8	GND for I ² C	0V _{DC}

3.8 OTHER APPLICATIONS

This device has many potential:

1. measurement of 4 analog inputs on the connector J19 and converting into digital values. The PIN-OUT of J19 is in the follow table:

PIN	Signal	Description
1	Analog Input 1	Voltage o current Input
2	GND	0V
3	Analog Input 2	Voltage o current Input
4	GND	0V
5	Analog Input 3	Voltage o current Input
6	GND	0V
7	Analog Input 4	Voltage o current Input
8	GND	0V

It is possible read voltage between 0 to 10V or current between 0-20mA switching the dedicated switches



2. read of 4 digital inputs on the connector J14 whit the follow PIN-OUT:

PIN	Signal	Description
1	D1+	Digital Input (opto-isolated Anode)
2	D1-	Reference (opto-isolated Cathode)
3	D2+	Digital Input (opto-isolated Anode)
4	D2-	Reference (opto-isolated Cathode)
5	D3+	Digital Input (opto-isolated Anode)
6	D3-	Reference (opto-isolated Cathode)
7	D4+	Digital Input (opto-isolated Anode)
8	D4-	Reference (opto-isolated Cathode)

3. Management of 4 digital outputs on the connector J17. These outputs are made of the relay contacts between two pins.

PIN	Signal	Description
1-2	D1	Digital Output (normally open)
3-4	D2	Digital Output (normally open)
5-6	D3	Digital Output (normally open)
7-8	D4	Digital Output (normally open)

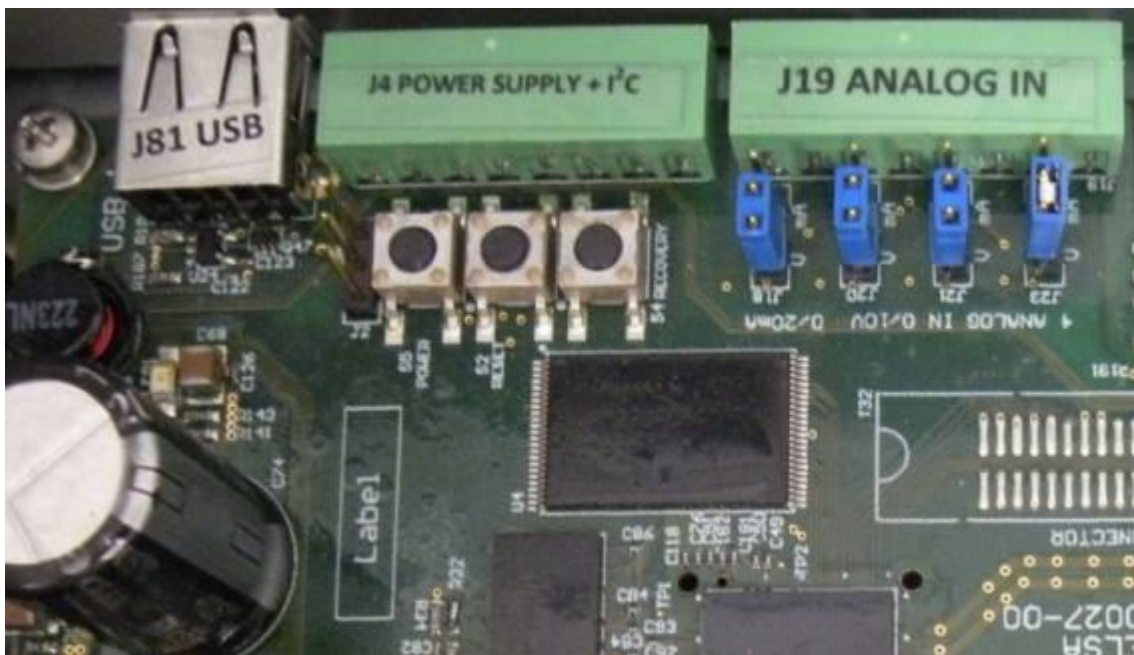
3.9 STARTING AND PRELIMINARY OPERATIONS

After AC powered device, wait until the fourth from left to right LED begins to light up intermittently, by this time you can communicate with the device.



3.9.1 MAINTENANCE AND REPAIR

If communication is interrupted try to reset the Logic board by pressing the Reset button (as shown in the figure) and wait for the start-up. If the communication is still absent trying to replace the cable.



3.10 CONFIGURATION OF WORKING PARAMETERS

Telsa String Box Control presents some intelligence on his board and communicate on its RS485 line through standard Modbus protocol (see *Telsa String Box Interface Control Document* for specifications).

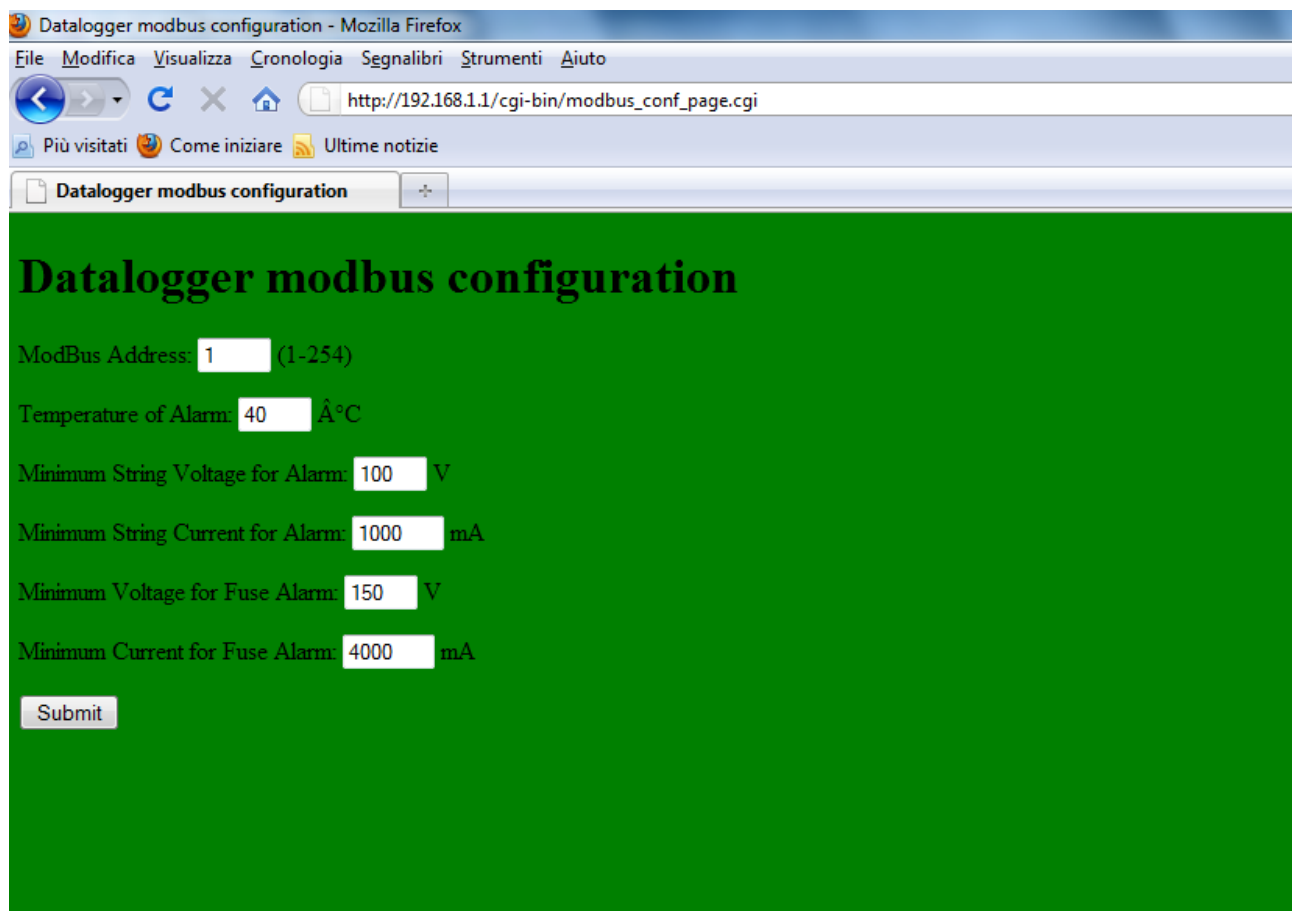
It is possible to configure several parameters that affects the functioning of the device both by sending Modbus messages and by accessing the web interface of the device; default IP address of the device is 192.168.1.1/24.

In order to configure the parameters through the web-interface, once the physical connection to any of the ETH port of the device has been established, one must put their

PC in the same subnet of the string box's control board (ex. IP: 192.168.1.2 netmask 255.255.255.0) and they must digit in his browser's address bar the address:

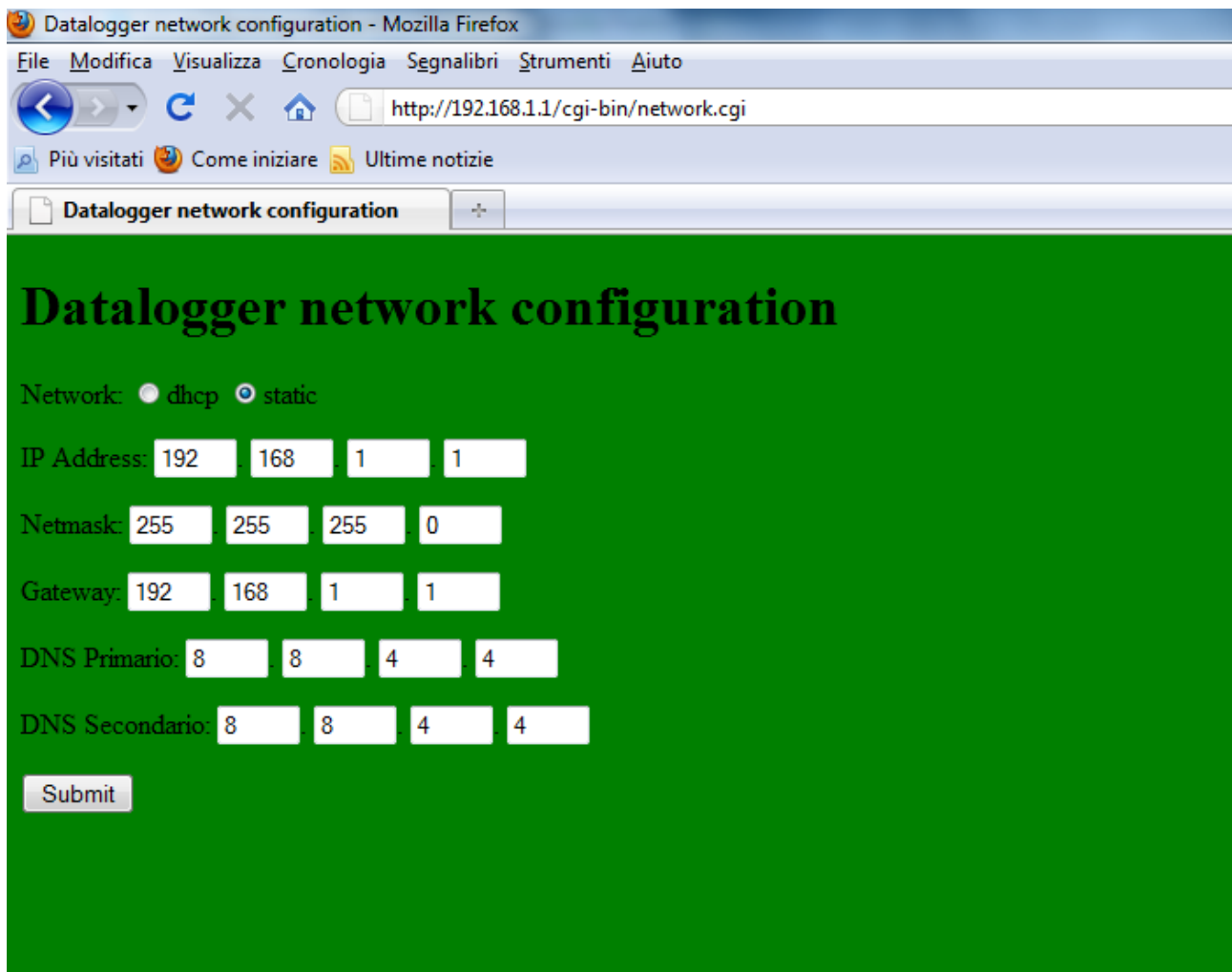
http://192.168.1.1/cgi-bin/Modbus_conf_page.cgi.

The following page will open.



Through this page it is possible to change the values that affect the notification of the alarms related to fuses malfunctioning as well as to abnormal values of the strings' current and voltage.

It is also possible to change the network parameter at page http://192.168.1.1/cgi-bin/Modbus_conf_page.cgi.



It's highly recommended not to change any values, unless one wants to put the device in a local TCP/IP network.