



St9060

Radiometric Station for Photovoltaic Plants



St9060 - What is it?



The radiometric station **ST9060** has been designed **for the monitoring of the solar radiation for production plants of electrical energy from a photovoltaic source.** The ST9060 station **is configured to acquire radiometric and meteorological data**, according to **WMO** directives and in particular, **IEC 60904**. The measures acquisition is made with extreme precision as the TMF datalogger uses an A/D converter with a resolution of **24bit (> 16 millions of points)** which allows to directly interface both the **thermopile** of pyranometers and the **Pt100 4-wire** (thermistor). In this way typical errors introduced from sensors with amplified output i.e. $4 \div 20\text{mA}$ are avoided.

The TMF100 datalogger acquires the primary sample with typical scan of 2 seconds (programmable) and, thanks to the use of special algorithms where is inserted the **astronomic calculation of the sun's position (azimuth and zenith)**, the longitude and the latitude as well as the inclination's corner of photovoltaic panels, is able to calculate automatically the effective quantity of solar radiation (W/m^2) on the photovoltaic plant.

The solar radiation is recorded together with other meteo-climatic measures for:

- Obtain subsequently the **nominal plant's performance**, combining technical data of photovoltaic modules.
- Estimate and examine effects of **environmental factors** on the **functioning, management and maintenance** of the plant

The **data recording** is executed on 2 separate memory supports:

- 1) Fix support, internal to the control unit, capacity **32MB**, divided in 2 areas:
 - ⦿ Transmission Area
 - ⦿ Service / Bckup Area
- 2) Removable support (**USB memory**), with capacity from **2GB to 8 GB**, which guarantees an other safety backup of historical data.

These **data** are archived in **encrypted format** to guarantee their integrity and inalterability **until the verification of the real plant performance.**



St9060 How is it composed?

The **connection of sensors** to the TMF datalogger can be done **in 2 ways**:

- 1) **Cable (with 24bit resolution)..**
- 2) **Wireless** with ZigBee peripheral modules at 16bit resolution. These modules have an autonomy of **2-3 years** and allow to connect sensors up to a **distance of 150 meters** from the datalogger (higher distances are covered from any intermediate radio link) **avoiding so installation's costs of pipelines, cables, galvanic isolation and maintenance.**

Normally elaborations applied to radiometric data are: instantaneous, integral, arithmetic average. Other elaborations are available also by inserting of corrective customized formulas. The recording interval of the elaboration is programmable from 1 to 1440' (typ. 10').

The datalogger is **totally configurable** from **Internet browser** both in local, than in remote (teleprogramming), after authentication with username and password. The use of a **Linux operating system** allows also the development of application software with the possibility to customize them as specific request by the customer.

The **data downloading** can be done mainly in 4 ways:

- **On site: via LAN**, connecting a portable PC or similar with internet browser (es. Internet Explorer, Chrome, Firefox) with standard protocols **TCP-IP** or **Modbus**.
- **On site**: taking/replacing the **USB** memory.
- **Remotely**: by data transmission module **GPRS-UMTS**, connected to a serial port of the control unit, through **FTP protocol** (File Transfer Protocol) with user authentication.
- **Cable**: downloading data continuously or at intervals

Mainly components of a **ST-9060 system**, are:

Datalogger TMF100 o TMF500 for local registration of all acquired data from the connected instrumentation (sensors), and their transfer to a collection center, via GPRS, UMTS, or satellite, by FTP protocol. The acquisition can be programmed continuously, or at pre-programmed intervals acquisition.

RSG Sensor for measurement of global solar radiation with Secondary Standard Class precision, Class I or Class II.

TA Sensor according to WMO for the measure of air temperature for outdoor

TC Sensor for the measure of temperature of photovoltaic panel or on plan surfaces with adhesive contact.



Datalogger TMF100



Solar Radiation



Module's Temperature



Air Temperature



St9060 Performance

- **Pyranometers** according to **WMO** standard (World meteorological Organization), **WRR (World Radiometric Reference)**, **ISO 9060**.
- **Sensors-Datalogger Link:**
 - via cable with isolated signal **4...20mA**
 - **wireless standard ZigBee**
- **Datalogger: 24bit interfacing**, configuration and data downloading by **Internet browser** (not necessary specific software) and standard protocols **TCP/IP and Modbus**.
- **Programming:**
 - On site: via **LAN 10/100Mbit, USB**
 - From remote: via **GPRS, ADSL, modem, Wi-Lan, radio, satellite**
- **Alarms** and data management: displays, relays, analog outputs, **SM..**



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