THE IMPORTANCE OF UP-TO-DATE SYSTEM MONITORING.

The evolution of data logging systems and their functionalities.

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Solar Energy

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Executive summary

PV system monitoring has been one of the main factors to increase solar PV's reliability over the years, while driving innovative solutions in the PV industry. In order to get reliable online monitoring, all the recorded data of a PV system should be stored somewhere but need to be sent to an online portal through a reliable communication infrastructure.

This paper outlines the evolution of Fronius system monitoring and its associated infrastructure for online monitoring via Fronius Solar.web. The old data storage and data forwarding solutions for the inverters Fronius IG, IG central, IG Plus and CL inverters are shown and compared to a state-of-the-art monitoring solution. Every PV system with a Fronius inverter can be easily upgraded to the newest standards in order to use Fronius Solar.web as a key tool for customer support and further business.

Up-to-date monitoring solution

The Fronius Datamanager 2.0 is the current hardware generation for data logging, monitoring and communications. It is on-board with inverters of the SnapINverter generation and it is also possible to retrofit it to all other (older) inverters. Whenever it is connected to the internet via Ethernet or Wi-Fi, the Fronius Datamanager 2.0 sends data of a PV system directly to the Fronius Solar.web online portal, thus facilitating optimal system monitoring. This provides a detailed overview of how the system is performing at any time.

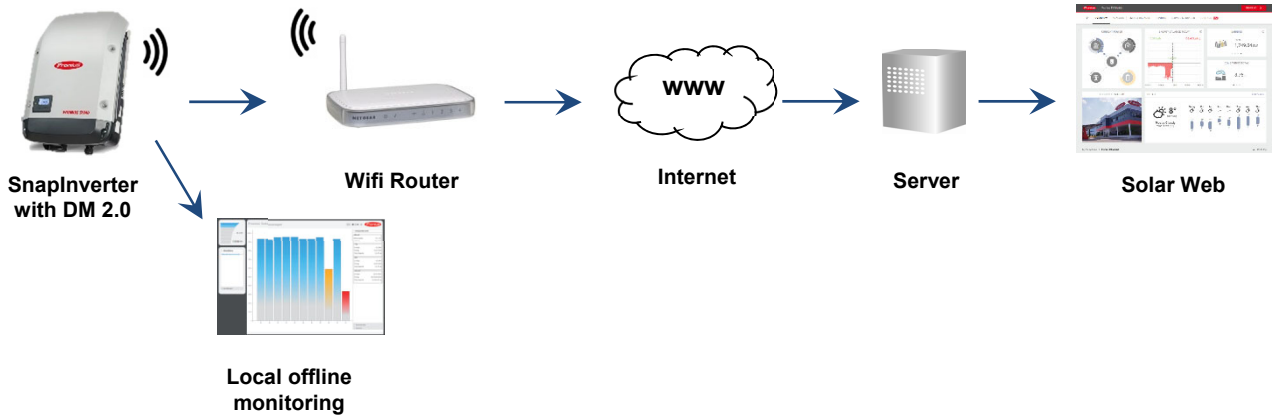

Figure 1: Communication infrastructure with Datamanager 2.0

Thanks to several on-board interfaces and features, the Datamanager 2.0 allows Fronius inverters to be seamlessly linked to third-party systems and run in parallel with Fronius Solar.web for the most effective data monitoring possible.

The state-of-the-art solution can also be easily integrated in older PV systems as follows:

1) Repowering older systems with a Fronius SnapINverter:
   In this scenerio Fronius SnapINverters replaces IG, IG plus, CL inverters or inverters from other manufacturers. The new solution is realized with ease as the Datamanager 2.0 is integrated in the SnapINverters.

2) Retrofitting Datamanager 2.0 into an older Fronius system:
   If a new inverter is not needed, the above communication can also be established by just replacing an old Fronius Datalogger easy/pro or Datalogger Web (of an IG, IG Plus or CL Inverter) with the new Datamanager 2.0 (Card / Box).

1.1 State-of-the-art: Fronius Datamanager 2.0 (since 2014)

Fronius being one of the pioneers of solar PV industry offering data loggers since the year 2002 for all Fronius inverters. The successor in form of the Fronius Datalogger Web was introduced in the year 2008. Whereas, the Fronius Datamanager 2.0 (Card / Box) came in the market as an integral part of the SnapINverter series in year 2014.

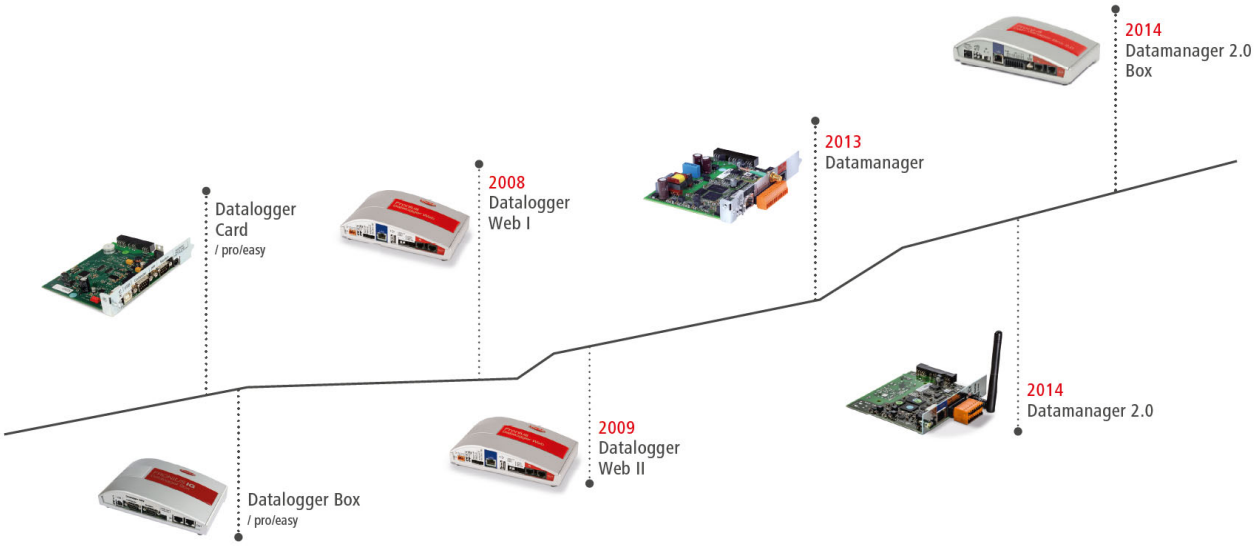

Figure 2: Evolution for Fronius Datalogging Hardware

The Fronius Datamanager is the communication centre for Fronius inverters in every type of application. Whenever it is connected to the internet via a LAN or WLAN, the Fronius Datamanager sends the PV system's values directly to the Fronius Solar.web online portal. This provides every user with an overview of how the system is operating at all times.

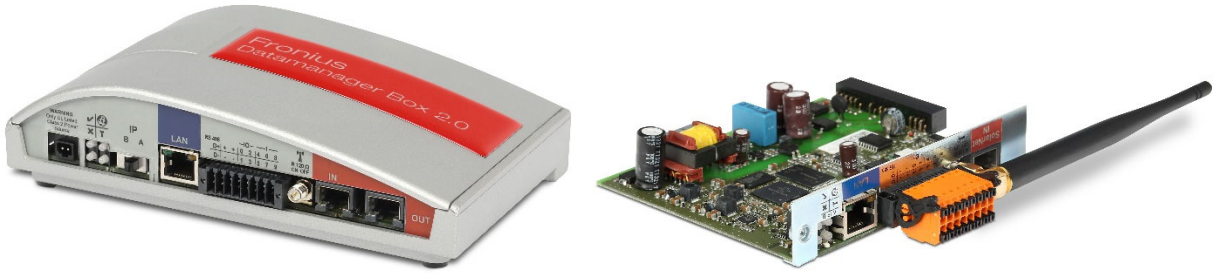

Figure 3: Fronius Datamanager 2.0 (Box / Card)

The Fronius Datamanager enables inverters to be connected directly to the internet via WLAN. Furthermore, optimum system monitoring and configuration of the Datamanager can be carried out via the dedicated website on the integrated web server of the Fronius Datamanager.

The integrated Modbus RTU SunSpec, Modbus TCP SunSpec and Fronius Solar API (JSON format) interfaces of the Datamanager 2.0 allow Fronius inverters to be seamlessly linked to third-party systems and run in parallel with Fronius Solar.web. The Modbus protocol function allows to integrate a Fronius Smart Meter into the system in order to monitor and manage all the energy flows in a household.

Additionally, an easy set-up commissioning wizard makes set-up quick and comfortable for every user, whether using a laptop, mobile phone or tablet.

1.2 Fronius Datamanager 1.0 (2013 - 2014)

Figure 4: Fronius Datamanager 1.0 Card

Fronius Datamanager 1.0 is as well as the Datamanager 2.0 a network-compatible multi-function device which offers various smart features. When connected to the Fronius Solar.web server, the real-time and archive data of a PV system can be easily accessed via a web browser or the Fronius Solar.web App (for smart devices). Easy configuration and commissioning can be done due to an on-board webserver.
In comparison, the Fronius Datamanager 2.0 has additional Modbus function to connect a Fronius Smart Meter as well as a WiFi hotspot to wirelessly connect to smart devices for even easier commissioning.

Obsolete monitoring solutions

1.3 Years 2008-2009

The older Fronius inverter generation is also connected with Fronius Solar.web. But the data transfer works a bit different. There are many systems with an integrated data logging component called Fronius Datalogger Web. In these systems, all data can be sent automatically to the Fronius Solar.web internet platform. This enables to access real-time as well as archive data via the worldwide web 24/7. The communication infrastructure for the Datalogger Web is shown below.

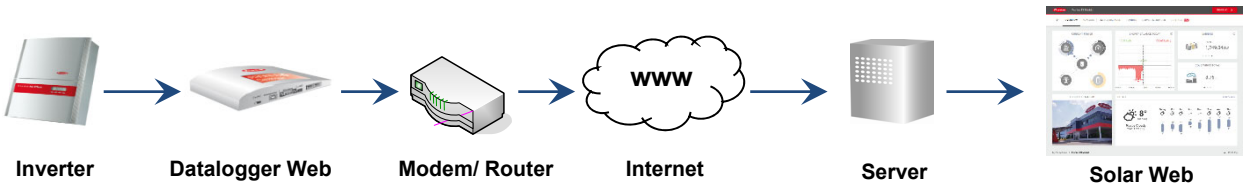

Figure 5: Communication infrastructure with Datalogger Web

1.4 Fronius Datalogger Web

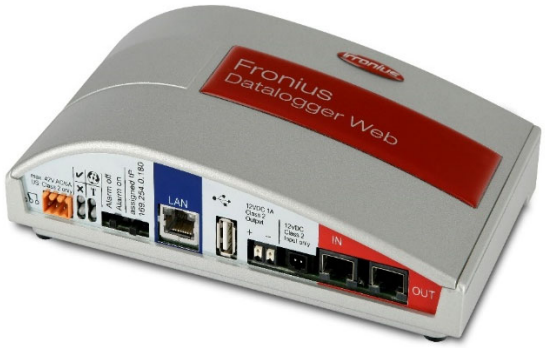

Figure 6: Fronius Datalogger Web

The Fronius Datalogger Web is an interface between the inverter and a computer. It is used for logging and monitoring PV system data. It can be integrated into existing networks using the Ethernet interface. This can also be done using an optional WLAN stick. Up-to-date information from systems with up to 100 inverters can be read in real time.

Although it is possible to generate real-time data with the Datalogger Web, top energy management for self-consumption optimization is difficult to achieve, due to the fact that the Datalogger Web does not offer an interface to integrate a Fronius Smart Meter into the system.

1.5 Years before 2008

The Fronius inverters such as IG, IG central, IG Plus and CL use Datalogger easy/pro either as a card or box to record data from inverter and the sensor box.

One way to send the data to our monitoring platform Solar.web is via TIXI modem. An analogue line is required with a TIXI modem to send data to the Solar.web, while the archive data is sent only once a day as an E-mail to Solar.web.

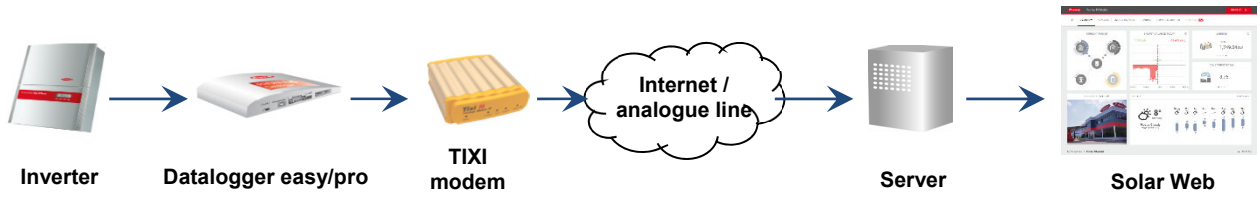

Figure 7: Communication infrastructure with Fronius Datalogger easy/pro and Tixi modem

Alternatively, the data can be forwarded to Solar.web for online monitoring via a PC, provided the PC has an internet connection. Connection between Datalogger easy/pro and computer can be established via RS232, modem or USB. Onsite monitoring is possible through the free Fronius Solar.access software which provides advanced, onsite data analysis and archiving options for the PC.

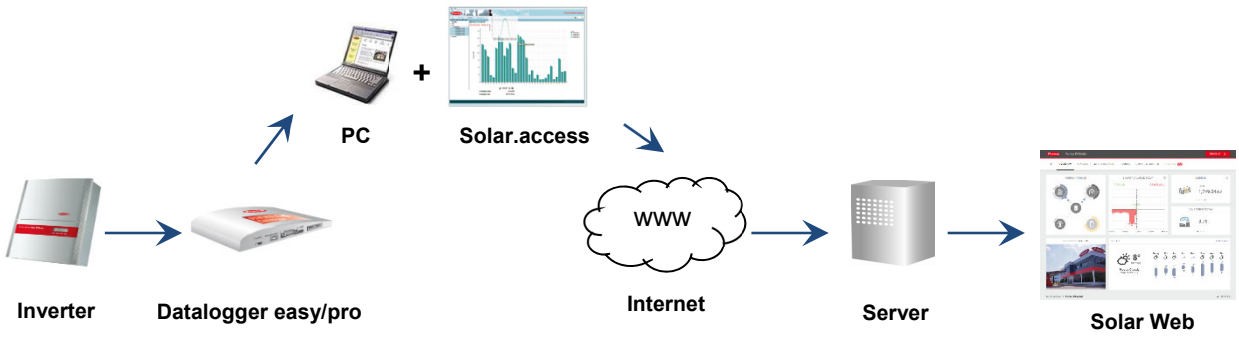

Figure 8: Communication infrastructure with Datalogger easy/pro

1.6 Fronius Datalogger easy/pro

Figure 9: Fronius Datalogger easy/pro (Box / Card)

The Fronius Datalogger is the interface between the inverter and a computer. It collects the data and prepares it for further processing (i.e. by means of software Fronius Solar.access). The Fronius Datalogger easy (Card / Box) is suitable for systems with one inverter. Systems with several inverters require the Fronius Datalogger pro (Card / Box). The data forwarding to Fronius Solar.web can be done either via TIXI modem or via Solar.access on a PC. The TIXI modem solution sends the data just once a day to Solar.web. The Solar.access solution requires an operating PC (24/7) and can send the data each hour but real-time values are still not possible.

Compared to Datamanager 2.0, getting real-time values are not possible with the Datalogger easy/pro. In addition, due to the lack of a Modbus interface, no Fronius Smart Meter can be integrated into the system. Thus, it is not possible to visualize any consumption data in Solar.web, which would be essential for efficient energy management.

Advantages of online monitoring

Today, system monitoring is essential for every PV system. But it is not only a tool for monitoring static production data, it is also a main part in generating long-term business success.

A modern PV system with an integrated Fronius Datamanager 2.0, a Fronius Smart Meter and the Fronius Solar.web online portal allows operators to easily and conveniently monitor, analyse and compare their photovoltaic systems. Intelligent analysis functions ensure that yield losses are reliably avoided.
The online monitoring portal makes energy flows transparent. Fronius Solar.web displays PV yields on screen and helps to do efficient energy management to optimise the energy consumption ratio.

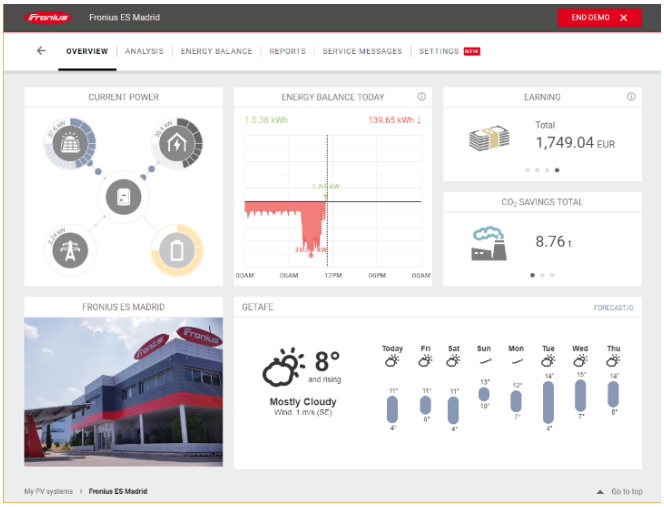

*Figure 10: www.solarweb.com – **An overview of a PV System***

You can check the output and yields, and compare the values across several inverters or time periods. This offers a convenient way of monitoring one or multiple PV systems. The system sends automatic notifications in the event of PV system faults and automatically creates reports.

It is also easy to see your self-consumption rate using Fronius Solar.web. For operators who want to record more detailed system data over a longer period of time, Fronius Solar.web Premium contains additional functions. These include a comprehensive self-consumption analysis and a permanent overview of power consumption.

It's easy to export the data and then process it in other programs, helping you to control and optimize your energy costs. Energy storage systems can also be monitored closely, thanks to the clear visualization. A comprehensive overview of your photovoltaic system is thus always in your grasp.

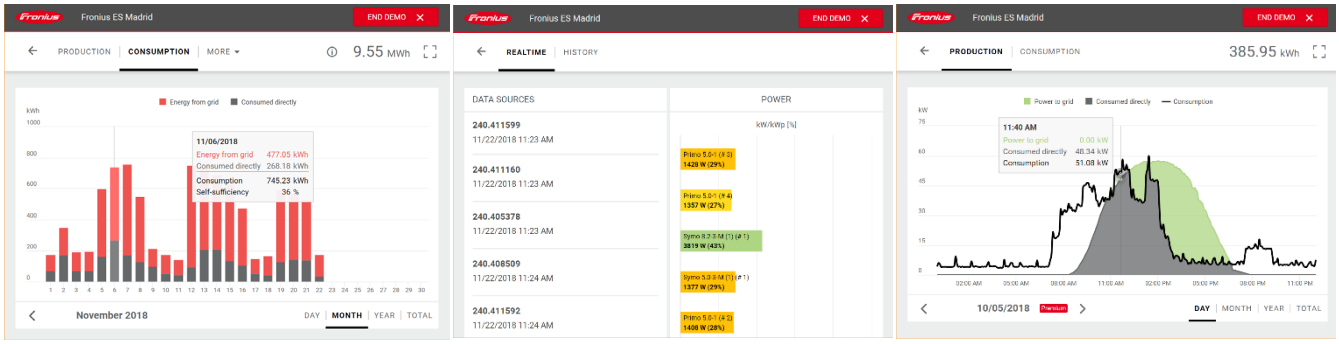

*Figure 11: www.solarweb.com – **Detailed information and visualization on production and consumption data***

The only requirement in terms of hardware is a Fronius inverter with a Datamanager function. This is integrated as standard in a Fronius Galvo, Fronius Primo, Fronius Symo, Fronius Eco or Fronius Symo Hybrid inverters. The Fronius Datamanager 2.0 can also be easily retrofitted to all other models.

Benefits of online monitoring at a glance:

1.7 Fronius Solar.web

/ Clear presentation and evaluation of current and archive data
/ Automatic yield comparisons across several inverters or time periods
/ Comparison of photovoltaic system data against sensor data (target/actual comparison)
/ Automatic notifications and regular reports
/ Easy management of several systems
/ Simple self-consumption display
/ Free of charge

1.8 Fronius Solar.web Premium

/ Comprehensive self-consumption analysis
/ Permanent overview of power consumption for cost control
/ Visualization and analysis of energy storage systems
/ CSV export of self-consumption data

www.Fronius.com

Fronius International GmbH
Solar Energy

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