SOFTWARE CONFIGURATION MANUAL

ITR 2.0

LACECAL

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2   DESCRIPTION

The ITR 2.0 device is a fully programmable and flexible control and monitoring system that will allow you to regulate the photovoltaic production to the value chosen by the user. In cases of self-consumption, this production will be regulated to approach the instantaneous consumption but without exceeding it, so that the energy discharged to the grid is zero.
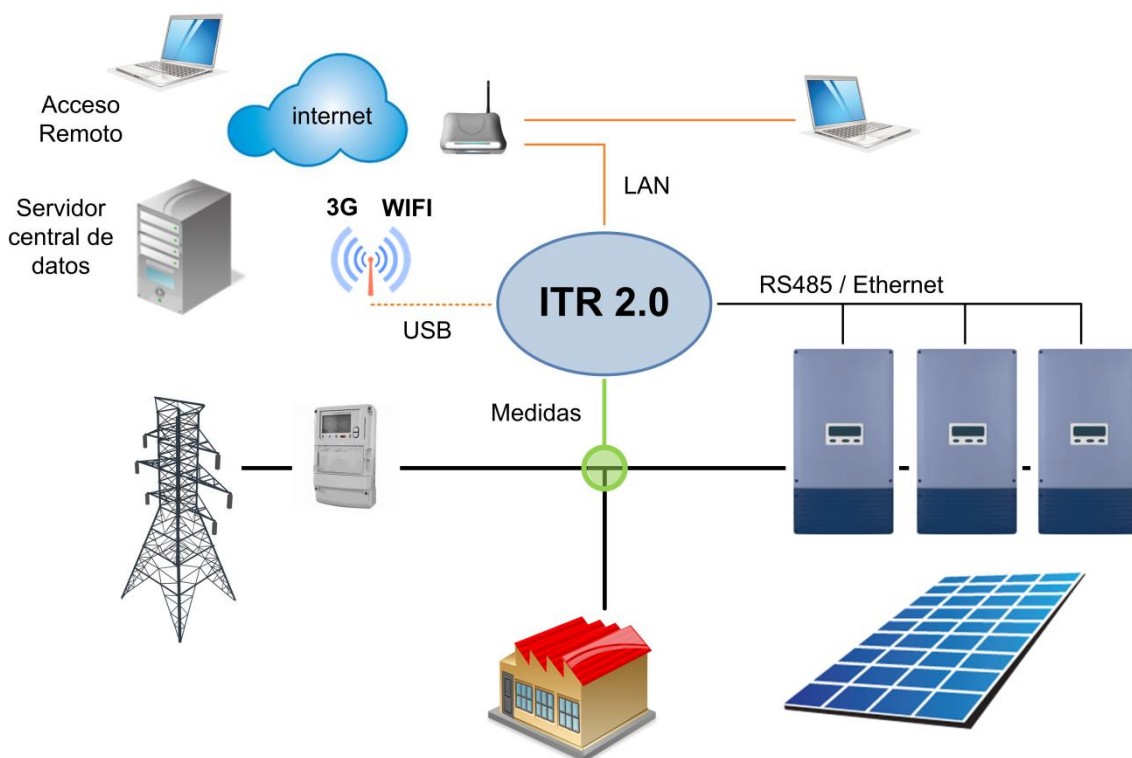
The ITR 2.0 system also offers added value to the installation, since it performs consumption monitoring tasks, power quality control, and may also allow the user to control certain loads of the installation according to production, providing remote management capabilities.

The ITR 2.0 monitors the power at the point of connection between the grid, the consumption of the loads of the installation and the photovoltaic generation, regulating, through communication, the maximum power that can be generated by the inverters at any given moment so that energy is never dumped into the grid.

3   INSTALLATION

For the installation of the equipment, please refer to its connection guide. You should also refer to the specific connection and configuration guide for the brand of inverter used in the installation.

4   EQUIPMENT CONFIGURATION

4.1   POWER-ON AND STATUS LEDS

Once all connections have been made, voltage can be applied to the ITR 2.0, which will start its start-up sequence. The current status can be obtained by means of the LEDs on the front panel, the meaning of which is shown below.

STATUS LED AND START-UP SEQUENCE

When power is supplied to the equipment, the three LEDs on the front panel will light up permanently.

After a few seconds they will turn off and the 'Status' LED will flash, first rapidly and then at a rate of half a second on and half a second off.

When the system software has finished initialization and the ITR 2.0 is operational, the 'Status' LED is permanently lit. Otherwise the system is not working properly, please contact technical support.

CONTROL LED

This LED indicates the status of the communication with the inverters.

If no inverters are configured, it remains off.

A short flash indicates that communication with one of the configured inverters has been lost, and each flash indicates a new communication attempt.

In normal state (if inverters are configured and all are accessible via communication) it stays on and turns off briefly each time the ITR 2.0 establishes communication with the inverters.

SERVER LED

Lights up if the ITR 2.0 has access to the internet and has established a connection to the central data server. The connection status is checked every two minutes or so, so it may take that long for the LED to reflect the current connection status.

4.2   WEB CONFIGURATION SERVER

The initial configuration is done through the WEB server implemented in the equipment. To do this, it is sufficient to directly connect a conventional Ethernet cable between the RJ45 ports of the computer and the ITR 2.0.

The factory programmed IP is **192.168.137.99**, so it is necessary to properly configure the properties of the computer's local area connection:
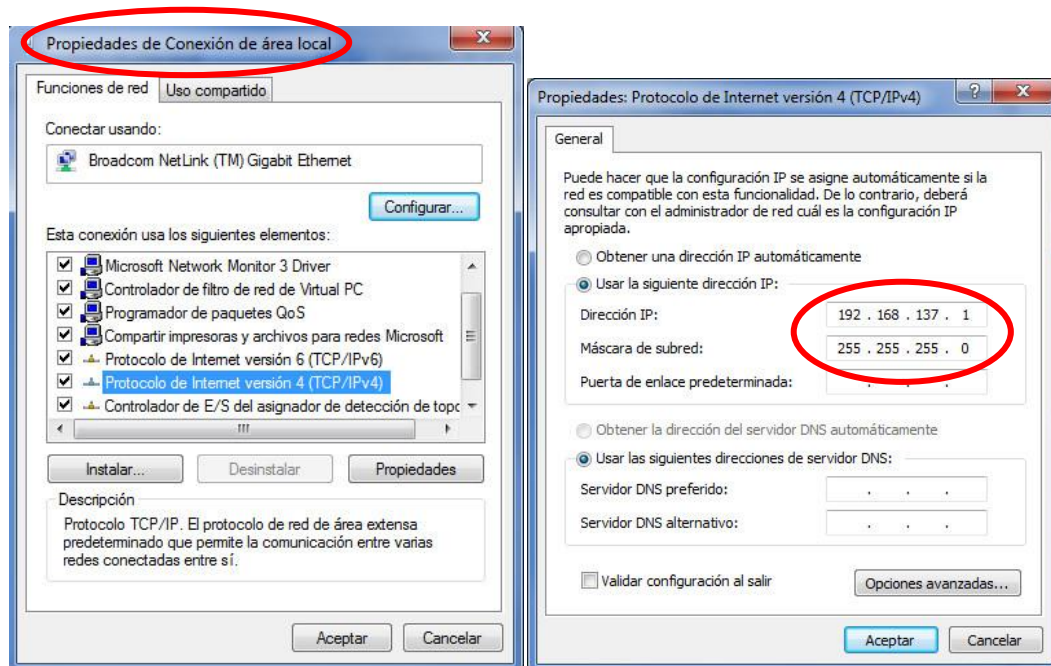
In the TCP/IPv4 protocol, the IP address 192.168.137.1 with subnet mask 255.255.255.255.0 will be configured.

Starting with firmware version 7.0.0.0 it is possible to locate the ITRs using the 'ITRsearch' software, available for download on the web, without the need for the IPs of the ITR and the computer to be on the same subnet. The program will show all the ITRs present, their serial number, and the IP they have configured. It also allows their modification.

From the list of network devices on the computer, select the one that has access to the same network as the Ethernet connection of the ITR, and then click on the 'Search ITR' button.
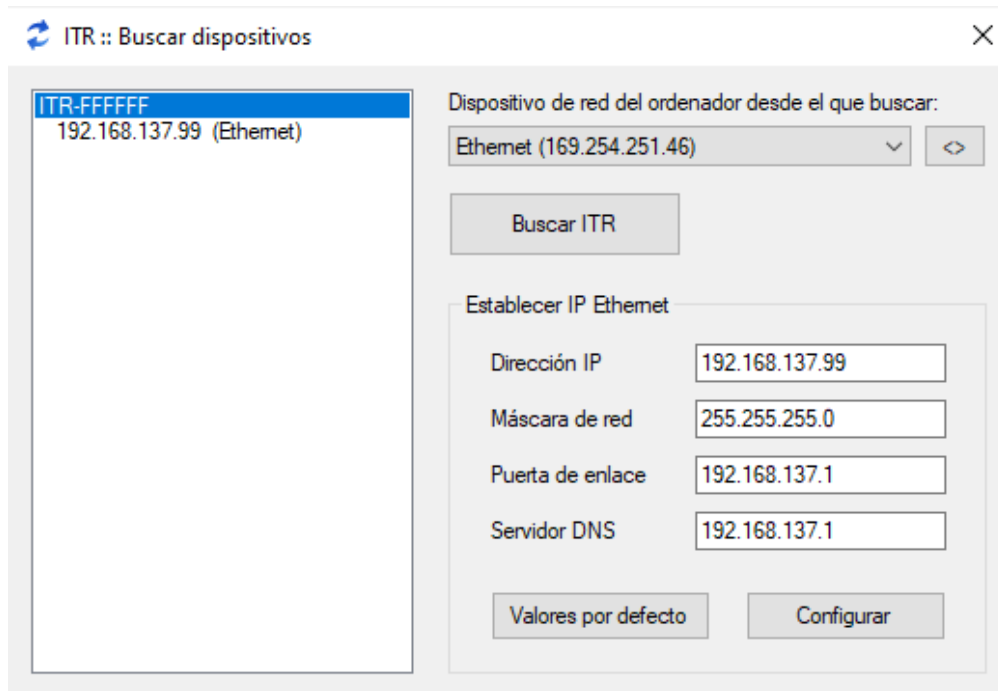
The next step is to access with the browser to the address http://192.168.137.99, or to the IP address that has been assigned with the software, entering the main measurement page of the WEB server of the ITR 2.0. For this it is necessary that the computer and the ITR are in the same subnet.

In the initial 'Plant status' screen you can see the rms values of all the measurements: voltages, currents and power per phase of the measurements taken.

⚠	**Check that the measurements match what is expected to detect possible errors in the connection**.

The most common errors are:

- The change of direction of some current due to the exchange of input and output signals in one of the transformers. This can be detected because with the inverters off the active power associated with that current is negative.
- The exchange of some phase current with respect to its voltage. This error is more difficult to detect, since depending on the consumption, all the power readings may be positive. In general, this error will generate power factors far away from those expected in the installation.

The first time you access the 'Configuration' menu you must use the generic user password (**ITR1234**). Only the ITR 2.0 connectivity options can be configured using this password.

In this first login you will be asked to create your installer password, which must always be 8 characters long:

	Write down the installer password assigned to the ITR 2.0 in a safe place, as you will not be able to retrieve it. We recommend that you always use the same one in all your equipment.

Using your installer password, you can set the configuration and operating data of the plant and inverters.

4.3   HARDWARE CONFIGURATION

- **Change direction of current C1:** Allows to change by software the direction of all the currents associated to the measurement channel C1 in case the physical connection has been made in the opposite direction to the one indicated in the connection section.

- **Change current direction C2:** Same as the previous option but in the measurement channel C2.

- **Current measurements:** Allows you to select which measurement is connected to each of the channels. The available options are:
  o   C1 measures the mains current and C2 the consumption.
  o   C2 measures the mains current and C1 the consumption.

- o C1 measures the grid current and C2 measures the PV production.
- o C2 measures the grid current and C1 measures the PV production.
- o C1 measures consumption and C2 measures PV production.
- o C2 measures consumption and C1 measures PV production.
- o C1 measures the mains current and consumption is not measured.
- o C2 measures the mains current and consumption is not measured.
- o The mains current is the sum of channels C1 and C2 and the consumption is not measured.

- **Primary current C1:** Indicates the rated current in amperes of the transformer primary connected to measurement channel C1.
- **Primary current C2:** Indicates the rated current in amperes of the transformer primary connected to measurement channel C2.
- **Rated voltage:** For information only. Indicates the nominal measurement voltage of the equipment (usually 230V).
- **Manufacturer**: Selects the manufacturer and communication mode (in case there are several options for the same manufacturer) of the inverters connected to the ITR 2.0.
    - o SMA (SpeedWire)
    - o SMA (RS485)
    - o Kostal (Ethernet)
    - o Fronius Lite
    - o Fronius + DataManager
    - o Huawei (RS485)
    - o Huawei + Smarlogger
    - o Ingeteam (RS485)
    - o Ingeteam (TCP Gateway)
    - o Danfoss
    - o REFUsol
- **Time zone**: Allows you to indicate the time zone in which the installation is located, so that the winter and summer time changes will be automatically applied in the data record.
- **Serial number, Hardware version and Software version** are for information only.
- **Change installer password:** allows you to modify the access password with installer permissions programmed in the ITR.

4.4   CONFIGURATION OF SAFETY RELAY

The safety relay is an element that, in the event of any failure of the control system that could lead to a discharge of energy into the power grid, disconnects the generating plant, preventing the injection of energy.

This menu allows configuring the relay control system that in turn will control the opening of the contactor at the output of the photovoltaic generation.

Two relay control options are available: via one of the outputs of the load control connector located on the top of the ITR or via a remote device controlled by MODBUS TCP protocol.

4.4.1 INTEGRATED OUTPUT CONTROL

By selecting the 'Output Connector' option in the 'Relay Connection Type' box, one of the three potential-free contact outputs available on Load Control Connector B can be used.

Once this option has been selected, the following configuration possibilities will appear:

- **Configuration:** Allows selection of the output to which the relay is connected and the default status of this output in normal operating mode.
- **Operating mode:** Select whether the relay trips according to the lower of the phase powers or according to the total three-phase power.

- **Trip power:** Indicate the power value below which the alarm mode of the relay will be activated.
- **Reaction time:** Indicate the time that the power must be kept below the limit indicated in the previous option for the alarm mode to be triggered.
- **Reset power:** Indicate the minimum power that must be consumed from the mains to be able to reactivate the normal operating mode.
- **Minimum reset time:** Indicate the minimum time that the alarm state of the relay must be maintained once it has been activated.

4.4.2   MODBUS TCP DEVICE CONTROL

Selecting this option will modify the configuration options available for entering the data associated with the control device.

- **Destination IP address:** Enter the IP address of the relay control device.
- **Port number:** Enter the TCP port number on which the MODBUS server of the control device is located.
- **Write MODBUS address:** Indicate the MODBUS map address associated with the relay control.
- **Value in normal state:** Indicate the value to be written to the above address to place the relay in normal operating mode.
- **Value in alarm state:** Indicate the value to be written to the above address to place the relay in alarm mode.

4.5   INVERTER TABLE

Allows you to define which inverters are connected in the plant, assigning them a name that will be used to identify each of them in the registers.

If the inverters are single-phase in a three-phase installation, it is also possible to indicate in which phase each inverter is connected.

⚠️	**Depending on the inverter brand and the communication mode, different configuration options are available** A specific configuration manual is available for each brand of inverter supported.

4.6   C ONTROL CONFIGURATION

- **Power control mode:** In single-phase installations 'Per phase' should always be selected. In three-phase installations, if 'Per phase' is selected, the power of the inverters will be limited so that no energy is dumped into the grid by any of the phases. If 'Three-phase' is selected, the power of the inverters will be limited so that there is no energy spillage in the total of the three phases.

- **Inverter control:** Selecting 'On' will perform zero feed-in control over the installation. Selecting 'Off' will limit the inverter output to a fixed value between 0% and 100% of its nominal power.

- **Minimum consumption per phase**: Indicates in watts the minimum consumption from the mains desired in each phase. Values slightly higher than zero reduce possible sporadic energy discharges. A suitable starting value would be 0.5% of the installed PV power.

- **Control speed**: Speed of response of the power control.

- **Inverter response**: Inverter response speed to power limitation variations.

4.7   CONNECTION CONFIGURATION ETHERNET CONNECTION

- **Connection type:** offers the different connection options available.
  - o **Manually set IP** allows you to assign the IP address and the rest of the network parameters directly.
  - o **Obtain IP** will **automatically** use the DHCP server of the local network (usually the router connecting to the Internet) to obtain the IP address and the rest of the network parameters.
  - o **Internet access sharing** will create an access point and the ITR 2.0 will behave as a router, with a fixed IP (192.168.138.1) and a DHCP server that can assign IP addresses to other devices connected on the Ethernet network.

> ⚠️ **Do not use this type of connection if you connect the equipment to an existing Ethernet network with its own router.**

The main utility of this type of connection is to allow inverters with Ethernet connection to send data to their own servers using the WIFI or 3G connection of the ITR 2.0. The network configuration to be programmed in the inverters would be as follows:

- ▪ **IP**: 192.168.138.xxx (With xxx between 2 and 254)
- ▪ **Netmask**: 255.255.255.0
- ▪ Gateway: 192.168.138.1
- ▪ **DNS**: 192.168.138.1

- **IP:** in case of manual configuration, IP address assigned to the ITR 2.0.
- **Mask:** in case of manual configuration, mask of the network to which the ITR is connected.
- **Gateway:** in case of manual configuration, IP address of the local network equipment that performs the gateway function to the Internet (usually the local network router).

- **DNS:** in case of manual configuration, IP address of the network name resolution server (usually the local network router). If you do not know it you can configure one of the google public name servers: 8.8.8.8.8 or 8.8.4.4.4

> ⚠️ **In case of manual configuration, consult the administrator of the local network to which you are connecting to** provide you with the appropriate values for IP address, netmask, gateway and DNS server.

- **Internet connection**: indicates whether the local Ethernet network to which the ITR 2.0 is connected has Internet access. If 'Yes' is selected, this connection will be used for communication with the central data server.

> ⚠️ **You must select 'No' if the local network does not have internet access to allow connection to the data server via WIFI or 3G networks.**

> ⚠️ **Changes to the network will be applied immediately when you click on the 'Update' button.**
>
> If you are accessing the ITR 2.0 via the Ethernet connection the communication will be lost, and you will have to physically connect the equipment to the new network.

4.8   WIFI CONNECTION CONFIGURATION

If a USB WIFI device is connected to the ITR 2.0, this menu allows you to connect to one of the available networks and configure its properties.

A list of available networks will appear and you can connect to the desired one by clicking on the antenna icon on the right. Connection is only possible to networks with security enabled, otherwise the connection icon does not appear.

When you click on connect, the following window will appear, allowing you to configure the connection options.

- **Password:** enter the password of the WFI network to which you are connecting.
- **DHCP:** select 'Yes' so that the access point to which you are connecting will configure the rest of the network parameters automatically. This is the usual option when connecting to WIFI networks. If 'No' is selected, the IP, Mask, Gateway and DNS parameters will be configured with the same criteria as indicated in the manual Ethernet configuration.
- **Internet connection**: indicates whether the WIFI network to which the ITR 2.0 is connected has internet access. If 'Yes' is selected, this connection will be used for communication with the central data server.

> ⚠️ **You must select 'No' if the WIFI network does not have internet access to allow the connection to the data server to be made via the 3G network.**

You can also configure the connection to a WIFI network that is currently unavailable, and the ITR 2.0 will connect to it when it is in range. To do this, click on the 'Create connection' button on the initial screen, and in addition to the data indicated above, the network name and security type must be entered.

4.9   3G MOBILE NETWORK CONFIGURATION

You can use a 3G USB modem connected directly to the ITR 2.0 to access the Internet. The modem will be configured automatically, in this screen you can check if the modem has been detected and the connection status.

> ⚠️ **The ITR 2.0 is only compatible with HUAWEI HiLink series models, such as the E303.**

4.10   BACKUP

This option allows you to perform three different tasks.

In the first section you can download the current configuration of the ITR and also the historical measurement records month by month. These historical files can be later uploaded to the WEB application, in case the ITR 2.0 does not have internet access, in order to visualize the operation from anywhere.

The second section allows you to restore a previously downloaded configuration file.

Finally, the third section restores the default configuration, deleting all historical data records and configurations made. The IP will also change to the default value: 192.168.137.99.

4.11   TICKET WEB PLATFORM.

If you have an internet connection, the ITR 2.0 will automatically send the recorded data to our servers. In order to access the visualization of this data and the remote management of the installation in the WEB platform, it is necessary to have a user account and register the ITR 2.0 in this account.
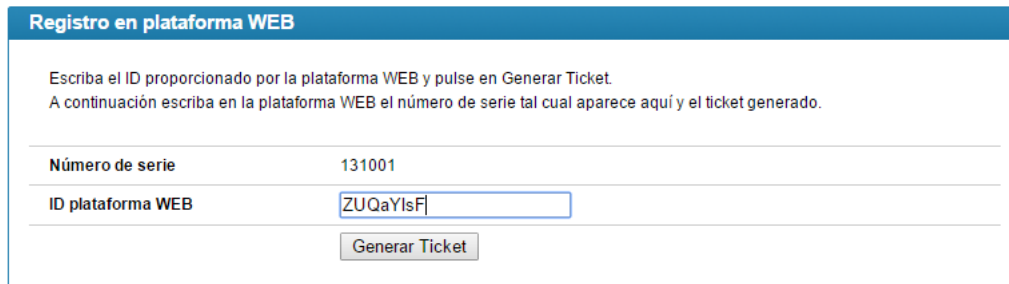
To do this we will use this option in the ITR 2.0 configuration menu and we must also access the WEB application at http://itr.lacecal.es.

In the connection page of the WEB application select the option 'Register user', where the steps to follow will appear:

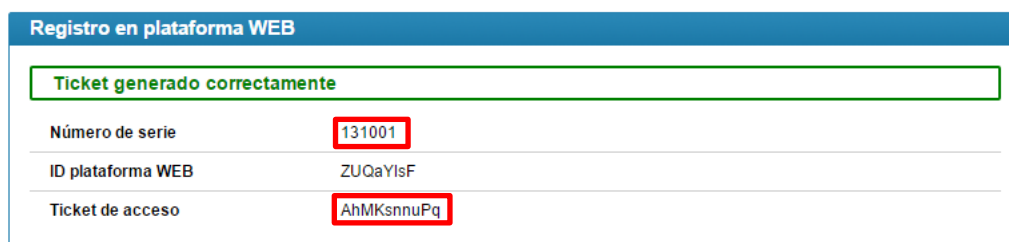Copy the code identified as 'WEB platform ID' and paste it in the 'WEB platform ticket' option of the ITR 2.0:
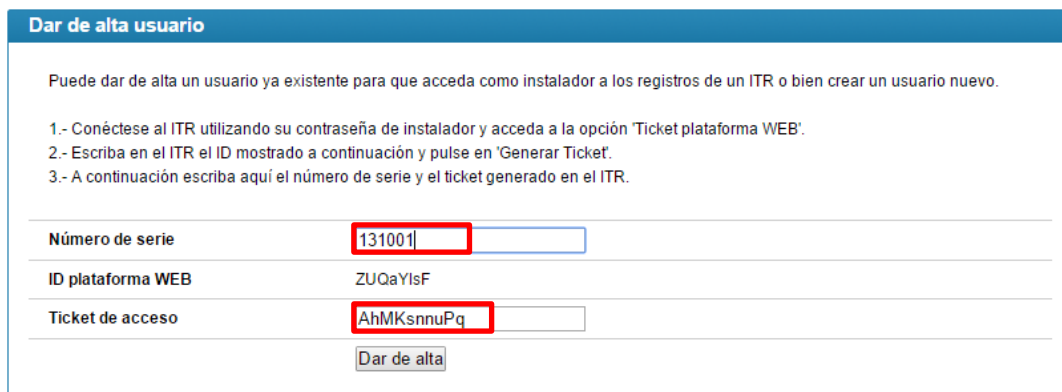
Registro en plataforma WEB

Escriba el ID proporcionado por la plataforma WEB y pulse en Generar Ticket.
A continuación escriba en la plataforma WEB el número de serie tal cual aparece aquí y el ticket generado.

Número de serie	131001
ID plataforma WEB	ZUQaYIsF

Generar Ticket

Then click on Generate Ticket, and ITR 2.0 will generate the necessary code to register in the WEB platform.

Registro en plataforma WEB

Ticket generado correctamente

Número de serie	131001
ID plataforma WEB	ZUQaYIsF
Ticket de acceso	AhMKsnnuPq

Again in the WEB platform, enter the data provided by the ITR 2.0 and click on the 'Register' button.

Dar de alta usuario

Puede dar de alta un usuario ya existente para que acceda como instalador a los registros de un ITR o bien crear un usuario nuevo.

1.- Conéctese al ITR utilizando su contraseña de instalador y acceda a la opción 'Ticket plataforma WEB'.
2.- Escriba en el ITR el ID mostrado a continuación y pulse en 'Generar Ticket'.
3.- A continuación escriba aquí el número de serie y el ticket generado en el ITR.

Número de serie	131001
ID plataforma WEB	ZUQaYIsF
Ticket de acceso	AhMKsnnuPq

Dar de alta

If you already have a user account on the WEB platform, you can add ITR 2.0 to your account by simply logging in with your username and password.

If you do not have an account, or you want to create a new one to manage this installation, you can do so by clicking on the toggle icon, highlighted in red.

5   PLANT STATUS

In the 'Plant Status' menu we have access to three screens that allow us to visualize the current status of the installation.

5.1   RMS VALUES

This screen shows the current values measured in each phase for voltage, current, active, reactive, apparent and apparent power and power factor. By checking the 'Automatic update' option, the values will be refreshed periodically for a few minutes.

Valores eficaces				Actualización automática ☐
RED	**Total**	**Fase R**	**Fase S**	**Fase T**
Tensión:	--	235,8 V	234,7 V	235,1 V
Intensidad:	--	35,0 A	46,5 A	32,8 A
Potencia Activa:	13,764 kW	2,845 kW	7,086 kW	3,833 kW
Potencia Reactiva:	1,955 kVAr	-1,406 kVAr	1,087 kVAr	2,273 kVAr
Potencia Aparente:	13,902 kVA	8,241 kVA	10,911 kVA	7,707 kVA
Factor de Potencia:	0,990	0,345	0,649	0,497
FOTOVOLTAICA	**Total**	**Fase R**	**Fase S**	**Fase T**
Tensión:	--	235,8 V	234,7 V	235,1 V
Intensidad:	--	36,2 A	36,1 A	36,0 A
Potencia Activa:	25,450 kW	8,514 kW	8,473 kW	8,463 kW
Potencia Reactiva:	0,572 kVAr	0,582 kVAr	-0,050 kVAr	0,040 kVAr
Potencia Aparente:	25,457 kVA	8,534 kVA	8,473 kVA	8,463 kVA
Factor de Potencia:	1,000	0,998	1,000	1,000
CONSUMO	**Total**	**Fase R**	**Fase S**	**Fase T**
Tensión:	--	235,8 V	234,7 V	235,1 V
Intensidad:	--	57,1 A	74,4 A	59,2 A
Potencia Activa:	39,215 kW	11,359 kW	15,559 kW	12,296 kW
Potencia Reactiva:	2,526 kVAr	-0,824 kVAr	1,037 kVAr	2,313 kVAr
Potencia Aparente:	39,296 kVA	13,457 kVA	17,475 kVA	13,907 kVA
Factor de Potencia:	0,998	0,844	0,890	0,884

5.2   INSTANTANEOUS VALUES

This screen allows you to view the waveforms of the voltages, currents and power of each of the phases. It also shows the harmonic analysis up to harmonic number 15.
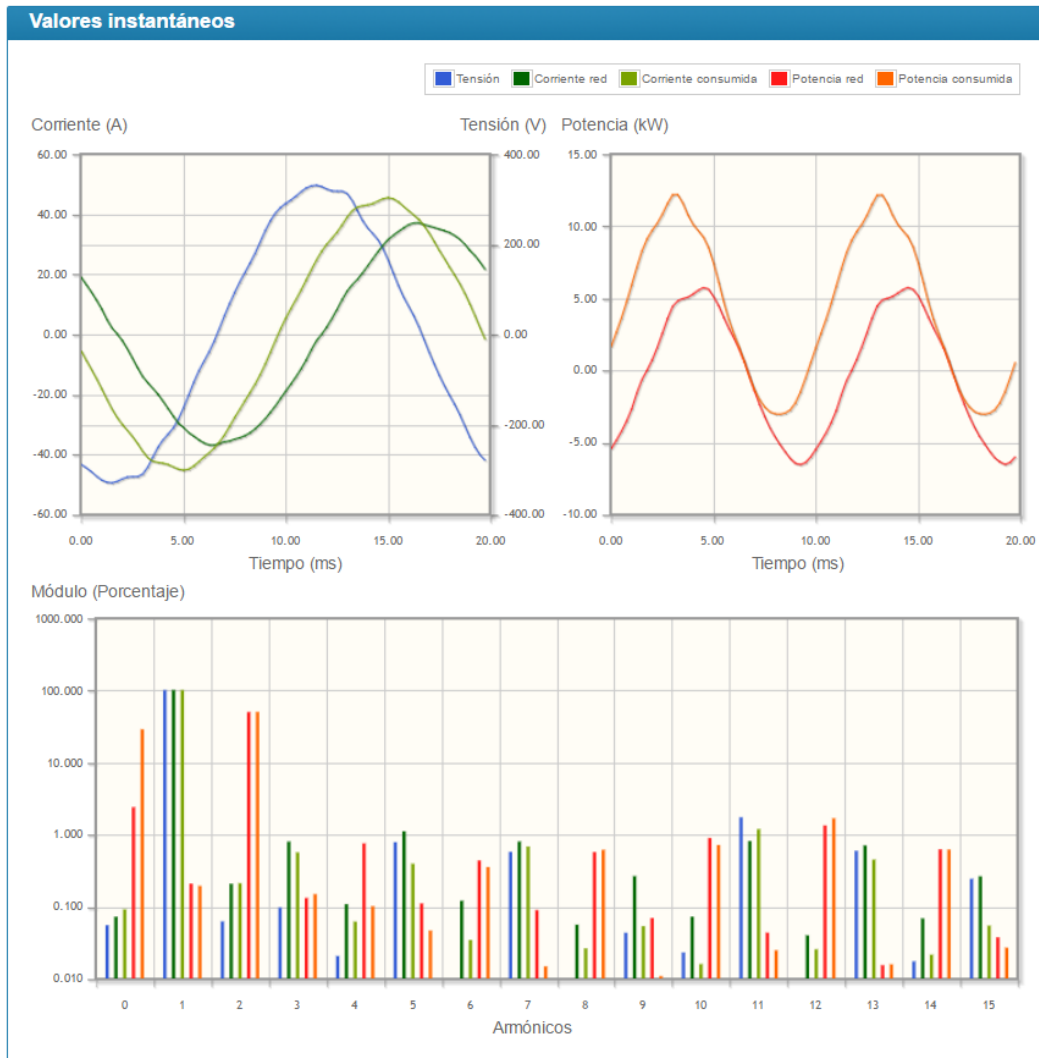
5.3   CONTROLLED DEVICES

In this screen you can check the status of each inverter connected to the ITR 2.0: current power, percentage of power regulation being applied and status of communication with the inverter.

In addition, in 'Other Devices' the status of the controlled loads will be displayed.

Estado de los Inversores

Nombre	Modelo	Fase	Pot. actual (W)	Límite (%)	Estado
Inversor 1	Primo 8,2-1	Fase R	0	100	FALLO

Estado de Otros Dispositivos

Modelo	Nombre	Estado
Conector de Salidas ITR	Salida 1	Desconectado (16.4 min)
Conector de Salidas ITR	Salida 2	·⬤
Conector de Salidas ITR	Salida 3	·⬤
Controlador de Carga ITR.vLD	*** Nuevo controlador ***	Salida 1: 100% Salida 2: 0% OK Salida 3: 0%

6   DATA REGISTRATION

The 'Data Logging' option provides a history of the data collected from the installation, both consumption and total PV production and from each of the inverters.

Menú

> Monitorización planta
>
> Producción inversores

Opciones

Fecha
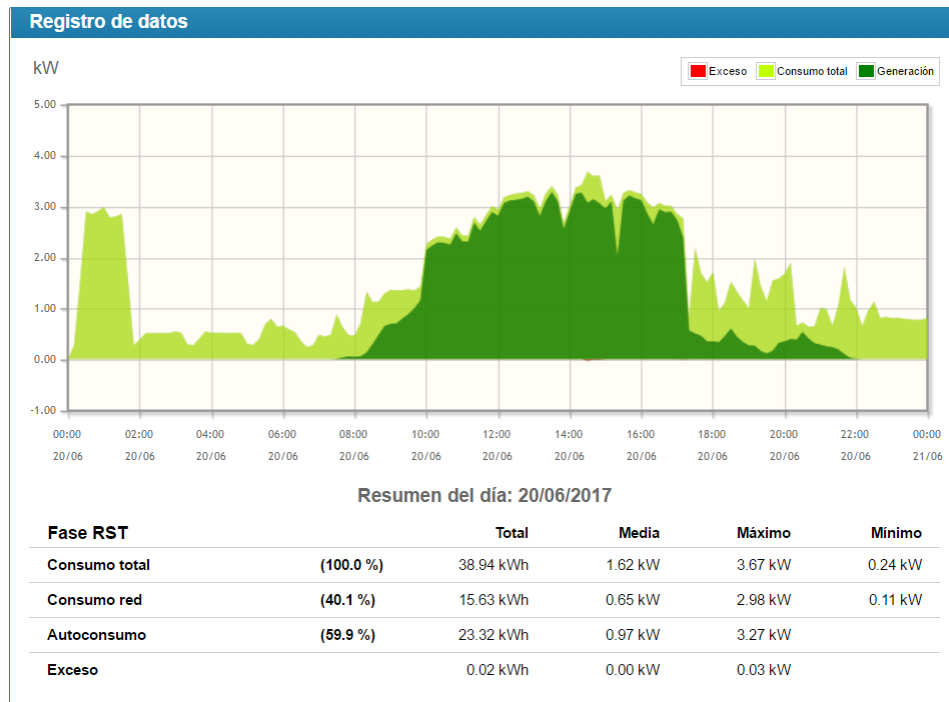
22/01/2015

Comparar fases

No comparar ▼

Fase

RST◉   R◯ S◯ T◯
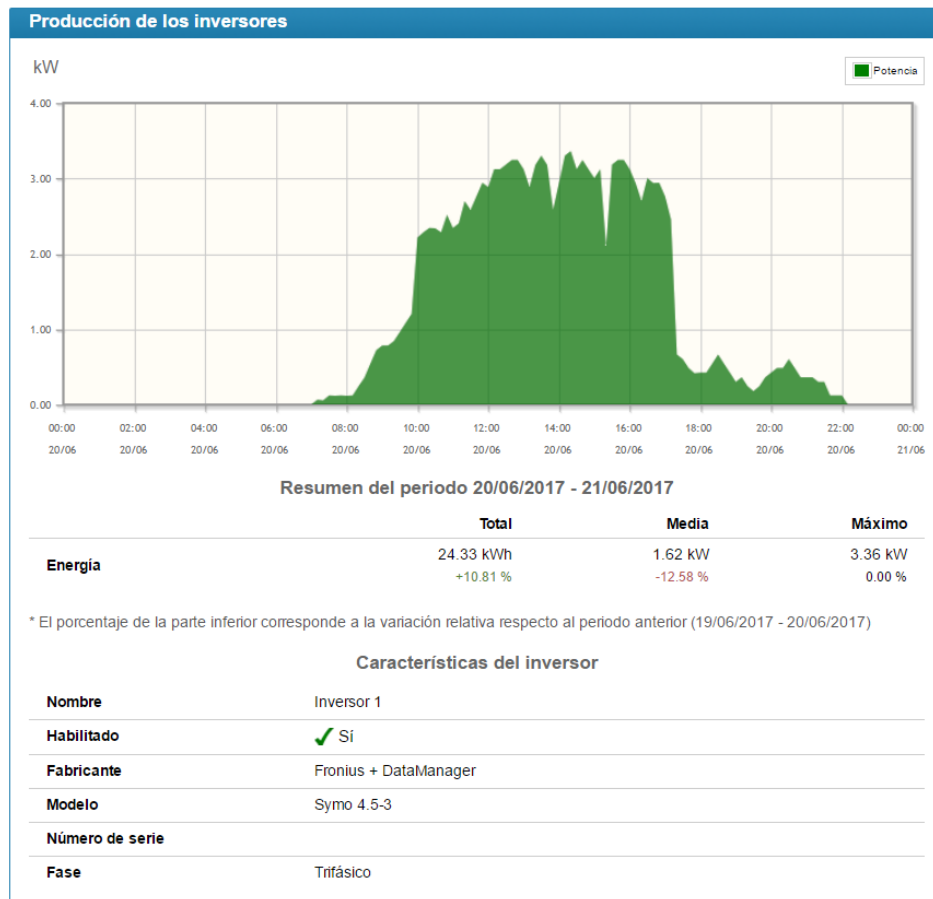
Unidades

Potencia◉   Energía◯

Actualizar

6.1   PLANT MONITORING

It graphically displays the evolution of total consumption and photovoltaic production on a specific date. Total data can be displayed in three-phase or per phase.

Registro de datos

Resumen del día: 20/06/2017

Fase RST		Total	Media	Máximo	Mínimo
Consumo total	(100.0 %)	38.94 kWh	1.62 kW	3.67 kW	0.24 kW
Consumo red	(40.1 %)	15.63 kWh	0.65 kW	2.98 kW	0.11 kW
Autoconsumo	(59.9 %)	23.32 kWh	0.97 kW	3.27 kW	
Exceso		0.02 kWh	0.00 kW	0.03 kW	

6.2 INVERTER PRODUCTION

The power and energy profile generated on a given date can be displayed for each inverter in the plant.

Producción de los inversores

Resumen del periodo 20/06/2017 - 21/06/2017

	Total	Media	Máximo
Energía	24.33 kWh	1.62 kW	3.36 kW
	+10.81 %	-12.58 %	0.00 %

* El porcentaje de la parte inferior corresponde a la variación relativa respecto al periodo anterior (19/06/2017 - 20/06/2017)

Características del inversor

Nombre	Inversor 1
Habilitado	✓ Sí
Fabricante	Fronius + DataManager
Modelo	Symo 4.5-3
Número de serie	
Fase	Trifásico

7   LOAD MANAGEMENT

The ITR 2.0 can manage the energy consumed in the installation by turning on and off specific loads through the relays connected to its digital outputs. Up to three independent loads can be switched on and off.

The active outputs can be selected and programmed in the load control configuration menu.

7.1   AVAILABLE LOADS

The list of loads will show all the available outputs for load control, and the data associated with each output can be edited using the pencil icon on the right.

The data that can be configured in each output are:

- **Assigned name:** allows you to assign a name to this output to more easily identify the load connected to it.
- **Enable load control:** allows you to activate or deactivate all the schedules assigned to a load without having to delete them.
- **State to connect the load:** determines whether to activate the load the output of the ITR 2.0 should be switched on or off. This would allow the use of relays with normally open or normally closed contacts depending on the need.

7.2   LOAD SCHEDULING

In this list you can add all the desired load connection and disconnection conditions. Each schedule also includes a time restriction in which it is valid (time interval and days of the week). It is also possible to define periods in which the load is always on or off regardless of any other condition.

Nombre	Días	Condición de conexión	Condición de desconexión	➕
Salida 1	L M X J V S D 00:00 a 23:59	Exceso Inversores (R+S+T) mayor de 100 W	Consumo Red (R+S+T) mayor de 100 W	🔽 ➕ 🗑 ✏
Salida 1	S D 00:00 a 23:59	---	Siempre desconectada	🔼 ➕ 🗑 ✏

Programación de las cargas

The 'Always on' or 'Always off' type schedules have priority over the rest.

For the rest of the programs, the order of priority for connection is the one shown in the list. The order can be changed by pressing the up and down arrows to the right of each program. For disconnection, the order will be the reverse of the order in the list.

You can add a new program using the '+' icon, delete a program using the trash can icon and edit an existing program using the pencil icon.

The programming of the switch-on and switch-off conditions is carried out intuitively by means of the following option box, where you simply follow the indications:

Editar datos del programa

Asignar el programa a la carga	Salida 1 ▾
Activar el programa los días de la semana	☑L ☑M ☑X ☑J ☑V ☑S ☑D
entre la hora inicial	00:00 (hh:mm)
y la hora final	23:59 (hh:mm)
El estado de la carga será	Controlada por programa ▾
CONECTAR LA CARGA CUANDO...	
... el valor promedio durante los últimos ...	60 segundos
... de ...	El exceso de potencia en inversores ▾
... en la fase ...	R+S+T ▾
... es mayor de ...	100 W
... y la carga lleva apagada al menos	300 segundos
DESCONECTAR LA CARGA CUANDO...	
... el valor promedio durante los últimos ...	60 segundos
... de la potencia consumida de red en la fase ...	R+S+T ▾
... es mayor de ...	100 W
... y la carga lleva encendida al menos	300 segundos
	Guardar Cancelar

The load connection condition can be set according to the excess energy available in the inverters, or according to the energy consumed from the power grid.

Depending on whether the load is single-phase or three-phase and the type of control desired, it can also be established whether the conditions apply to the power of one of the phases or of the total three-phase.

In addition, the conditions are applied on a time average of the selected power to avoid the influence of momentary variations in consumption.

To avoid too fast connections and disconnections, a condition is also included that establishes a minimum time that the load must remain in each of the states before it can change.