CONNET
Control Network
ELECTRONICS FOR THE GREEN ECONOMY

ENERGY MANAGER
CLEVER

Photovoltaic plant control systems connected to the single-phase and three-phase network
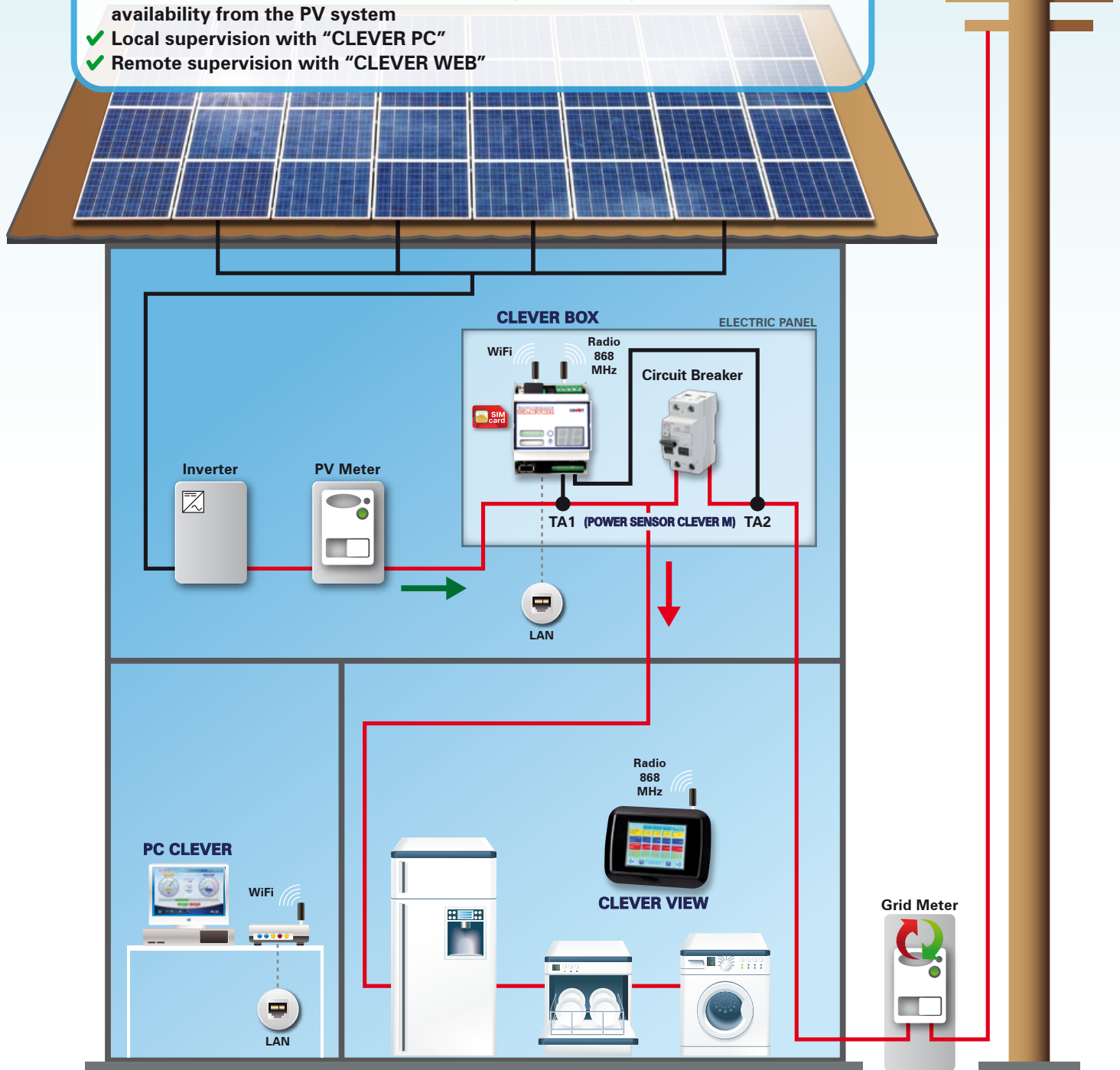
SINGLE-PHASE

THREE-PHASE

TOTAL CONTROL OF YOUR PHOTOVOLTAIC SYSTEM
FOR EXCHANGE MANAGEMENT AND MAXIMIZE THE GOAL OF SELF-CONSUMPTION

SINGLE-PHASE CLEVER Energy Manager from 1 to 6 kWp

Designed for energy management in homes with photovoltaic installations.

- ✔ Monitoring the PV system
- ✔ Drawing off / Transferring Energy to the Grid
- ✔ Guide to the best Energy consumption
- ✔ SELF-CONSUMPTION measurement
- ✔ Incentive calculation
- ✔ Activate the home automatic relay according to the energy production and availability from the PV system
- ✔ Local supervision with "CLEVER PC"
- ✔ Remote supervision with "CLEVER WEB"

CLEVER BOX

ELECTRIC PANEL

WiFi

Radio 868 MHz

Circuit Breaker

SIM card

Inverter

PV Meter

TA1 (POWER SENSOR CLEVER M) TA2

LAN

Radio 868 MHz

PC CLEVER
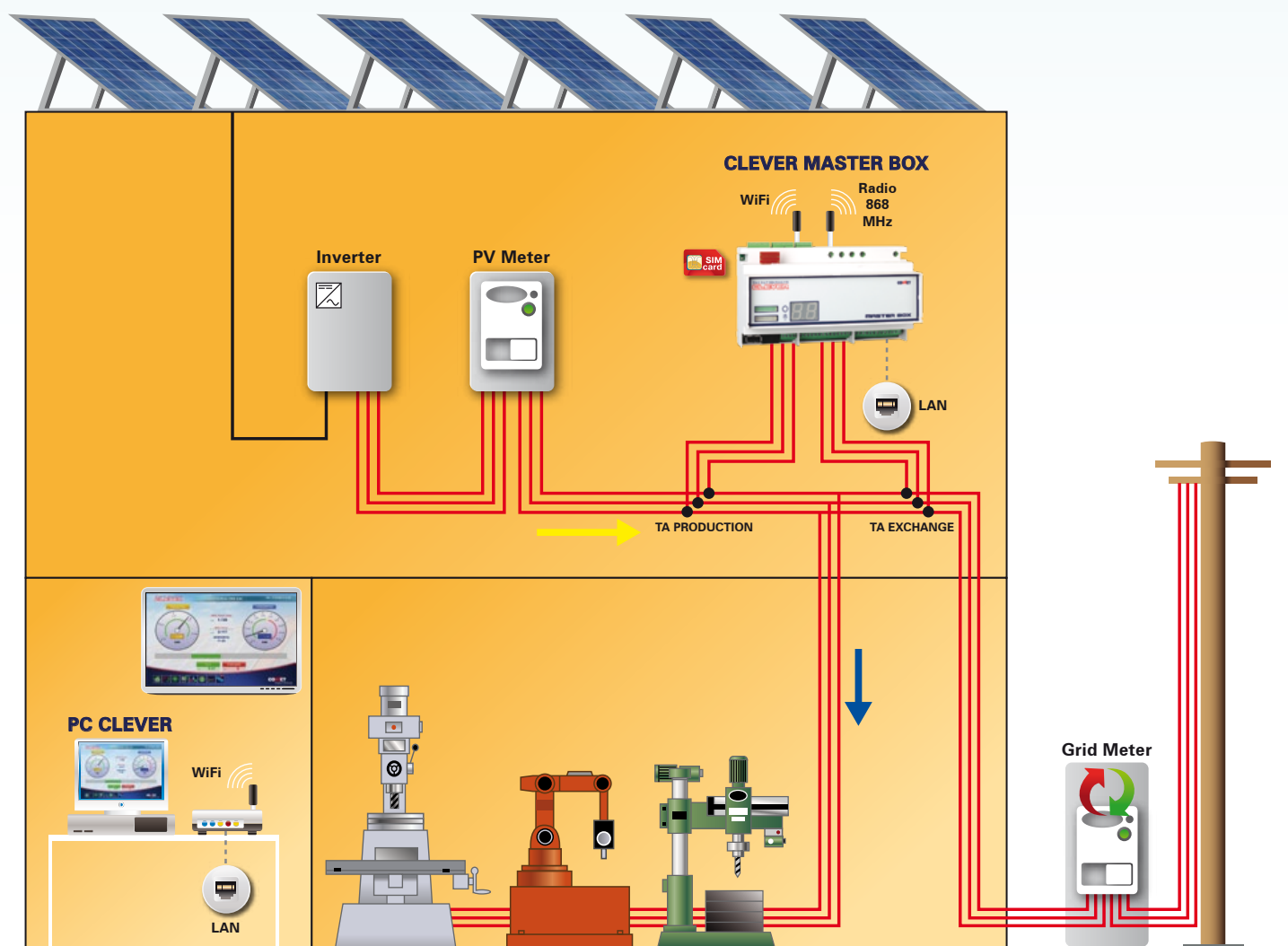
WiFi

CLEVER VIEW

Grid Meter

LAN

CLEVER is installed in a few minutes, is easy to configure and user friendly.

A simple, powerful device supported by "CLEVER WEB", an efficient supervision service offered by the **Connet Control Center** to monitor the photovoltaic system production and to manage the users.

THREE-PHASE CLEVER Energy Manager from 6 to 200 kWp (and higher)

Designed for energy management in offices and industry with photovoltaic installations.

- ✔ **Monitoring the PV system**
- ✔ **Drawing off / Transferring Energy to the Grid**
- ✔ **Guide to the best Energy consumption**
- ✔ **Consumption analysis**
    - **- REACTIVE POWER**
    - **- COS φ**
    - **- PHASE DISPLACEMENT POWER**
    - **- PENALTY MEASURE FOR LOAD PHASE DISPLACEMENT**
- ✔ **SELF-CONSUMPTION measurement**
- ✔ **Incentive calculation**
- ✔ **Activate 5 remote control relays**

CLEVER MASTER BOX

WiFi — Radio 868 MHz

SIM card

Inverter

PV Meter

LAN

TA PRODUCTION

TA EXCHANGE

PC CLEVER

WiFi

LAN

Grid Meter

The Energy Manager CLEVER Three-Phase can be connected to the grid in *"feed-in only mode"* or in *"exchange mode"*. When installed in exchange mode the CLEVER performs not only as a supervisor of the photovoltaic system but also as an analyzer of the electric loads and of the energy exchange with the grid.

CLEVER Energy Manager: a web device that can link to the internet in 3 different ways: LAN, WiFi or GPRS in order to ensure connectivity in all circumstances.

The system monitoring and management software can be consulted locally by a home PC using the **"CLEVER PC"** software or the smart CLEVER VIEW monitor, or remotely by internet link using the **"CLEVER WEB"** service connecting to the internet by PC, Tablet or Smartphone.

Through the CLEVER WEB service from the Connet Control Center the User and Installer are able to **receive signals and alarm messages** in the event of production drops or malfunctions. With the CLEVER WEB service from the Connet Control Center, both the User and Installer have constant updates of the latest software and firmware, which can be downloaded online and also loaded to the CLEVER BOX using the USB port in the equipment.
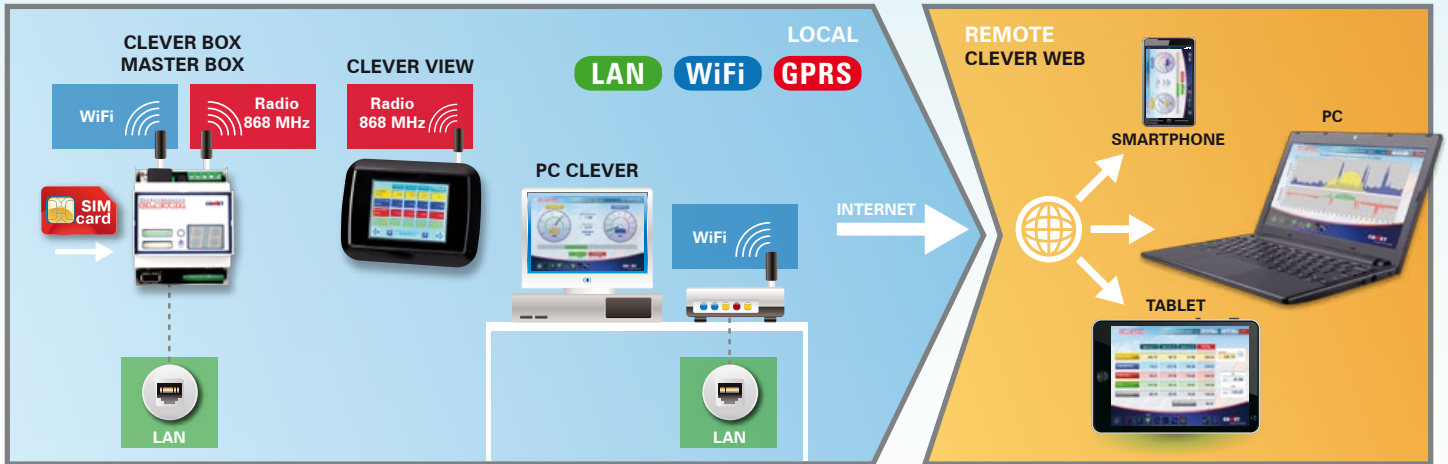
Using the **remote control relay** in the single-phase CLEVER control unit, **users can be automatically activated** (air conditioning, appliances, blinds, etc.) as the sun radiation changes, maximising personal consumption and return on investment. The same appliances can also be activated or deactivated at any time by the User by web link to the portal.

There are 5 remote control relays in the CLEVER three-phase control unit, and they can also be activated according to the settable digital signals (0-5V; 0-10V, 4-20mA), the connected loads can be piloted automatically or by User command (locally or remotely through the portal).

CLEVER USER INTERFACE

Effortless and total control of the photovoltaic system and the users both on the CLEVER VIEW monitor and on the PC, by means of the installed PC CLEVER software, or by remote link to the web from a PC, Tablet or Smartphone.

METER

Energy produced, Consumed, Purchase, Sold and Personal consumption in the 3 time bands and as a total. View the All-inclusive Rate incentive and the incentive from the Personal Production Bonus; View the CO_2 that has not been issued and the oil not used.
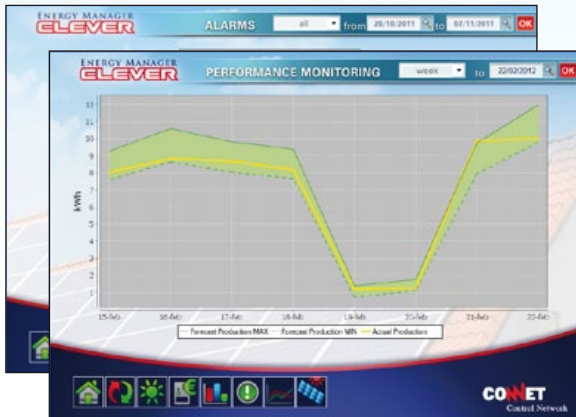
POWER IN REAL TIME

Instant production/consumption data and consumption optimisation bar.

DAILY ANALYSIS

Diagrams showing power consumed/produced and at the same time,
the energy bought and sold in that day.
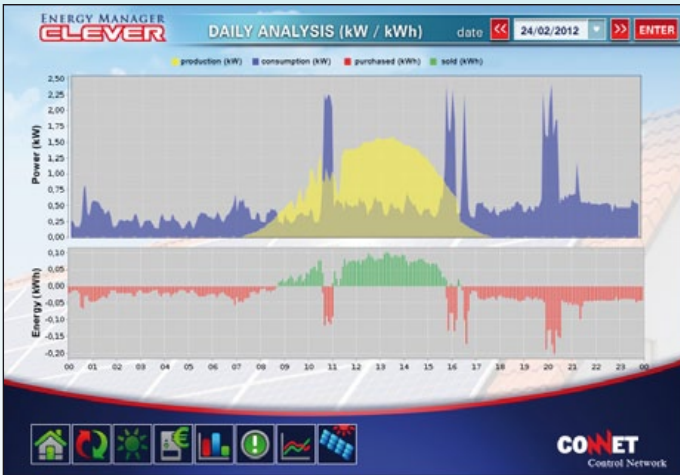
HISTORIC ANALYSIS

Diagram of energy produced, consumed,
bought and sold in that period.

PRODUCTIVITY MONITORING

Diagram of effective production compared to forecast
production (CLEVER WEB service).

ALARMS

Mask of the signals/alarms (CLEVER WEB service).

MANUALS – CONFIGURATIONS

CLEVER VIEW
Additional three-phase interfaces

ACTIVE/REACTIVE POWER DAILY ANALYSIS

Diagrams showing the trend of
active power bought/sold,
reactive power and
Power Factor in that day.

POWER IN REAL TIME THREE-PHASE

Instant analysis of Active Power bought/sold and Reactive Power for
the three phases F1, F2 and F3: Instant Power Factor analysis.
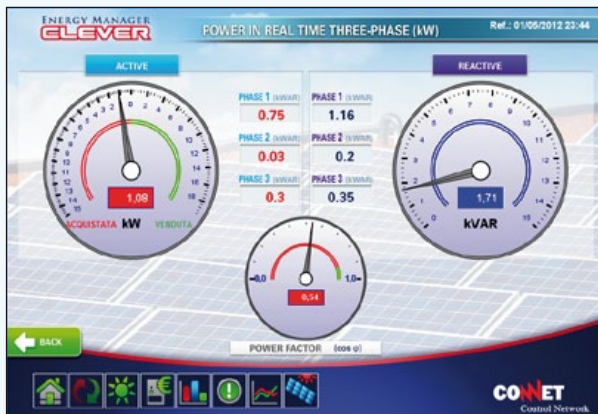
POWER FACTOR ANALYSIS

Analysis of bought energy to determine the Power Factor
in a given period.

The CLEVER WEB service provides Users, Installers and Distributors dedicated portals to interact with the PV plant and electricity users that are connected, each one within its specific field of skills and aims.

The subscription service gives access to the following functions:
- Remote supervision for the User and Installer
- Active monitoring with plant performance analysis with respect to maximum expected productivity
- Sending malfunction or performance drop warnings to the portal and via email to the User's and Installer's addresses
- Update the equipment software and firmware
- Automatic data backup in the Connet Control Centre
- User Home Automation function

USER PORTAL

- The **INSTALLER** can see his USERS' installations
- The **DISTRIBUTOR** can see the installations by his INSTALLERS but cannot see the USERS

DISTRIBUTOR PORTAL

INSTALLERS PORTAL

CLEVER is not just a device to monitor the photovoltaic installation, it is also a complete powerful local and remote management and optimisation system for the electricity users.

Datalog production and exchange values in different time slots

Installation power, energy produced, exchanged and consumed, self-consumption as a total and percentages, are all parameters that are constantly acquired and stored locally by CLEVER and by the Connet Control Center. These data are available in the local network by the CLEVER PC software, on the internet by browser and on the local CLEVER VIEW user interface by time slot, year, month, week, day and hour.

Consumption optimisation and personal consumption guide

Using the **energy consumption data of the house**, CLEVER tells the user when the photovoltaic system is producing excess energy with respect to consumption or, if there is a consumption peak, when it is being taken from the grid. A red-green display on the control unit and the interface guides the user about energy use when the system is producing an excess, thus maximising self- consumption and the return on investment.

Real time monitoring of the photovoltaic system productivity with respect to forecast performance

The productivity of each photovoltaic system that is monitored by CLEVER is assessed with respect to the sun radiation satellite data in the installation area in real time. These data, and those collected by the other photovoltaic systems in the area, enable the Connet Control Center to process the forecast system productivity, and promptly inform the user and installer of any falls in performance or system stops by sending messages and alarms.

Alarms and signals for faults and performance drops:

If there is a fall in performance or the system stops for any reason, a signal is sent to the user and installer within a few hours, which means the necessary maintenance work can be promptly carried out without losing precious production hours.

Connectivity to the hub units by high efficiency 868 MHz radio signal

CLEVER interfaces with the CLEVER VIEW user interface by means of a **high efficiency 868 MHZ radio signal connection**.

Internet: available in LAN, WiFi or GPRS versions

3 link methods to the web with 3 versions: **CLEVER LAN** for LAN connection (Ethernet cable), **CLEVER WiFi** for WiFi connection (incorporated antenna), **CLEVER GPRS** if no ADSL connectivity is available (with SIM card).

ANALYSIS OF THREE-PHASE USERS

Analysis of all the user electric parameters

Analysis of the user reactive power

Besides monitoring the PV system, the CLEVER MASTER BOX enables analysing the exchanged electric parameters, giving the measurement of the power and reactive energy exchanged with the grid.

User-friendly interface

The smart CLEVER VIEW user interface is normally installed where the majority of electric appliances are situated (the kitchen), so that the consumption optimiser indicator is always in sight. The TFT 3.5" colour touch screen enables viewing the parameters and the signals from the Connet Control Center to keep the entire system under control. It is powered by the main supply, and is equipped with a long life rechargeable lithium battery. It is connected to the CLEVER BOX by an 868 MHz radio signal.

Home automation relay

CLEVER is equipped with relays for remote control of electricity users, which can be activated automatically or piloted remotely from the portal. The single-phase version has 1 relay, which can be activated according to the electric output reached by the PV system, while the three-phase versions has 5 relays, which can be activated according to the PV output to the settable digital signals. These relays can also be used as an alarm signal output (siren, combiner, phone) in case of inverter alarms, theft, differential opening, etc.

Real calendar time slots

CLEVER analyses **production and consumption in different time slots** referred to a specific calendar, or according to the days of the week and weekends by month and year by calendar year. The extracted data enable assessing the effective home energy budget.

Automatic software update

The PC View supervision software and the other software loaded in the CLEVER BOX and VIEW are **automatically updated** by the user through the Connet Control Center service.

Easy to install, indispensible for efficient system maintenance

CLEVER is sold in KITS complete with preset production and exchange TA with a precision level of 0.2%. **It takes just a few minutes to install CLEVER** in the home control board where it is powered and where it carries out the readings by means of the supplied TA. It does not have to interface with the inverter and production and exchange meters and it communicates with the other system devices via an 868 MHz radio signal. With CLEVER and the Connet Control Center service the installer is able to monitor each photovoltaic system installed from his own portal in order to provide his customers with effective maintenance contracts and guarantee prompt response in the case of fault. Through the standard digital inputs and (optional) RS485 interface in CLEVER, the alarms can be provided of the most commonly used inverters, by activating the alarm relay.

SINGLE-PHASE

KIT BOX and KIT VIEW: available in 3 versions: LAN, WIFI and GPRS all equipped with 868 MHz radio apparatus to communicate with the CLEVER VIEW user interface and any other equipment that is able to communicate in this frequency.

KIT BOX
CLEVER SINGLE-PHASE

N. 1 **LAN/WiFi/GPRS** RADIO SINGLE-PHASE CLEVER BOX
N. 2 POWER SENSORS M (TA1 AND TA2)
N. 1 SW LICENCE FOR PC CLEVER SYSTEM MONITORING AND MANAGEMENT

KIT VIEW
CLEVER SINGLE-PHASE

N. 1 **LAN/WiFi/GPRS** RADIO SINGLE-PHASE CLEVER BOX
N. 2 POWER SENSORS M (TA1 AND TA2)
N. 1 CLEVER VIEW
N. 1 CLEVER VIEW AC/DC POWER PACK
N. 1 SW LICENCE FOR PC CLEVER SYSTEM MONITORING AND MANAGEMENT

It is possible to complete the **CLEVER VIEW** monitoring equipment with 868 MHz radio for communications with **CLEVER BOX**.

CLEVER VIEW

POWER SENSOR M

CLEVER ANTENNA WIFI

CLEVER ANTENNA GPRS

CLEVER PICK-UP

ROUTER LAN

ACCESS POINT WIFI

THREE-PHASE

KIT BOX and KIT VIEW: available in 3 versions: LAN, WIFI and GPRS all equipped with 868 MHz radio apparatus to communicate with the CLEVER VIEW user interface and any other equipment that is able to communicate in this frequency.

KIT MASTER BOX
CLEVER THREE- PHASE

N. 1 **LAN/WiFi/GPRS** RADIO - RS485 THREE-PHASE CLEVER MASTER BOX
N. 6 CLEVER POWER SENSORS
N. 1 SW LICENCE FOR PC CLEVER SYSTEM MONITORING AND MANAGEMENT

KIT MASTER VIEW
CLEVER THREE- PHASE

N. 1 **LAN/WiFi/GPRS** RADIO - RS485 THREE-PHASE CLEVER MASTER BOX
N. 6 CLEVER POWER SENSORS
N. 1 CLEVER VIEW
N. 1 CLEVER VIEW AC/DC POWER PACK
N. 1 SW LICENCE FOR PC CLEVER SYSTEM MONITORING AND MANAGEMENT

It is possible to complete the **CLEVER VIEW** monitoring equipment with 868 MHz radio for communications with **CLEVER BOX**.

CLEVER MASTER BOX

CLEVER SLAVE BOX
For controlling and managing three-phase users connected to the CLEVER MASTER BOX.

POWER SENSOR 100/200
In closed and open version for three-phase 100 kW, 200kW and 400kW powers, higher power are available on request.

SERVICES   Connet Control Center

The CLEVER Energy Manager enables the User to have complete supervision of the PV system and electricity users through the CLEVER VIEW interface or by PC where the CLEVER PC software is downloaded.
By activating the CLEVER WEB service, these additional services can be obtained:

Function	Equipment	Who	Where	Means
Remote-control relay activation	Single and three-phase LAN, WiFi and GPRS	User	Internet access	PC, Tablet, Smartphone
Performance satellite monitoring	Single and three-phase LAN, WiFi and GPRS	User and Installer	Internet access	PC, Tablet, Smartphone
Emails for alarms and performance drops	Single and three-phase LAN, WiFi and GPRS	User and Installer	Internet access	PC, Tablet, Smartphone
Automatic data backup from the Centre	Single and three-phase LAN, WiFi and GPRS	User and Installer	Internet access	PC, Tablet, Smartphone
Remote installation viewing	Single and three-phase LAN, WiFi and GPRS	User and Installer	Internet access	PC, Tablet, Smartphone
Software and firmware updates	Single and three-phase LAN, WiFi and GPRS	User and Installer	Internet access	PC, Tablet, Smartphone

The DISTRIBUTOR is able to see the CLEVER that have been activated after the installation has been configured.

The CLEVER WEB service is free for the first 2 months from the date the installation is configured.
After these two months, the CLEVER WEB service subscription can be extended for a further 12 months.
Payment is made online in the Portal. The cost of the service is minimum and may be paid by either the User or the Installer.

For applications where there is no internet link, Connet has devised the **CLEVER Energy Manager in GPRS version**, prepared for housing a SIM data card by the user.

CONNET
Control Network

ISO 9001:2008

CONNET was founded in 1990 with highly specialised skills in systems integration and supervision and automation systems. Abreast with the times, the company has always known when to grasp and successfully exploit new technology for processing platforms, operating systems, radar location, data transmission and communications and system integration standards.

The company proposals are addressed to various application fields, including:
- Remote control of water supplies
- Remote control of technical gas tanks and distribution systems
- Remote control of cathode protection systems
- Hydroponics
- Biomass stove controllers
- Operative vehicle fleet management for public and commercial transport
- Remote control of photovoltaic systems
- Monitoring electricity users
- Public and industrial lighting

The technical team makes leverage on these and its wide range of additional skills to be constantly abreast of the rapidly developing technology in these fields.

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