The intelligent energy manager for PV-diesel hybrid systems.

The KACO FuelSave Controller.

The key to tapping the benefits of a PV Diesel hybrid system lies in the intelligent management of both energy sources: The KACO FuelSave Controller takes care of this. This versatile control system ensures that the largest amount of photovoltaic is incorporated and that the diesel generator is deployed in its optimum operating range at the same time. The standard version of the KACO FuelSave Controller simultaneously co-ordinates up to 20 inverters and 6 diesel generator sets of differing power ratings.

As such, the road ahead is clear for the conception of well-balanced systems for power requirements ranging from 30 kW up to far in the megawatt range. All of the system operating data including the necessary performance history can be called up remotely. In the same way the system controller can be re-configured remotely if, for example, the user profile changes.

If the controller is combined in a single system with additional storage capacity, the highest levels of operational efficiency are achieved along with increased comfort and a further reduction of the diesel operation.

Everything is therefore already prepared for the integration of batteries. That means that the connections and the system management for the control of our bluestorage 120.0 TL3 bidirectional charging inverter/rectifier are already incorporated. Even if the public grid is partially available, the KACO FuelSave controller is able to integrate the energy supply.

The KACO FuelSave controller thus guarantees the maximum PV contribution and minimum fuel costs whilst reducing the impact on people and the environment as far as possible. Depending on the application, diesel savings amount to 25% or more and the system itself can be amortised in 3 to 5 years. This results in over 200% return on investment (ROI) within 10 years. In addition to the product package, KACO new energy also offers system layout, commissioning and service of the hybrid power station.

The controller is compatible with all KACO new energy inverters from the blueplanet 5.0 TL3 right up to the blueplanet 1000 TL3 central inverter. Our project team will gladly help you to select the right inverter in combination with an existing diesel generator or indeed for constructing a whole new system. The necessary measuring devices for this function are included in the delivery scope. Talk to us about it!

You can get further information about our FuelSave system from our “FuelSave. PV-Diesel Hybrid Solutions.” brochure which you can download online at www.kaco-newenergy.com.

Available for immediate delivery.
KACO FuelSave Controller

### Technical data

#### Electrical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC power supply</td>
<td>85 … 264 V*</td>
</tr>
<tr>
<td>Frequency</td>
<td>47 … 63 Hz*</td>
</tr>
<tr>
<td>Nominal input power</td>
<td>~ 30 W</td>
</tr>
</tbody>
</table>

#### AC mains input

- Phase, neutral, PE: spring-type terminal (0.25 – 2.5 mm² fine stranded wire; 0.25 – 4.0 mm² solid wire)
- Recommended wiring rating: 16 A
- For recognition of diesel generator status (on/off): 6 digital inputs
- For recognition of diesel generator or utility grid mode: 1 digital input
- For load management: 1 changeover contact spring-type terminal (0.25 – 2.5 mm² fine stranded wire; 0.25 – 4.0 mm² solid wire)
- Digital outputs relay contacts: 1 max.: 16 A; U max.: 250 V

#### Communication

- Ethernet: RJ45 socket
- USB: type A socket
- RS485: spring-type terminal (0.25 – 2.5 mm² fine stranded wire; 0.25 – 4.0 mm² solid wire)
- RS485 bus topology: daisy chain, no star network layout
- RS485 cable length, cable type: max. 1,200 m, min. 0.25 mm², two-core shielded cable
- RS485 baud rate: 9600

#### Features

- Plug socket for user applications: grounding-type plug socket, max. 10 A
- Installation space for UMTS modem: 35 mm DIN rail
- Controller characteristics:
  - Max. number of Diesel generators: 6**
  - Max. number of inverters: 20**
  - Reaction time of controller incl. inverters in case of reverse power (i.e. energy is fed into diesel generator): < 1 sec.
- Utility grid detection: automatic PV output power adaption depending on public grid availability
- Load management: gives command for consumers to switch on/off via two digital outputs if enough PV power is available
- Remote control / monitoring: remote modification of user settings and visualization of measurements
- Controller setup:
  - User changeable FuelSave Controller setup parameters:
    - rated power of genset(s)
    - minimum load of genset(s)
    - switching on/off thresholds of gensets
    - sequence in which gensets switch on and off
    - spinning reserve demand

#### Protection rating

IP66

#### Mechanical data

- H x W x D: 615 x 400 x 236 mm
- Weight: ~12 kg
- Ambient temperature: -5°C … +55 °C
- Relative humidity: 15 % … 95 % non-condensing
- Max. altitude: 2.000 m
- Installation:
  - Requirements for installation at site:
    - Mounting of controller: cool and shaded
    - Special tools needed for installation: Ethernet cable, Notebook / PC with Internet Explorer
  - Protective measures:
    - Note: Protect controller against water and dust

The KACO FuelSave Controller, integrated into a PV-diesel hybrid system.
# Technical data

## Measurement point

<table>
<thead>
<tr>
<th><strong>Electrical data</strong></th>
<th><strong>Measurement point</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AC power supply</strong></td>
<td><strong>Voltage</strong> 230 / 240 V +/- 10 %, 50 / 60 Hz; further voltages/frequencies on request</td>
</tr>
<tr>
<td>Nominal input power</td>
<td>&lt; 3 VA</td>
</tr>
<tr>
<td><strong>Measurement ranges</strong></td>
<td><strong>Voltage (direct connection)</strong> up to 300 V rms (phase-neutral) or 519 V rms (phase-phase)</td>
</tr>
<tr>
<td>Voltage (with external voltage transformer)</td>
<td>primary: programmable (max. 400 kV); secondary: programmable (max. 300 V)</td>
</tr>
<tr>
<td>Current (with external current transformer)</td>
<td>primary: programmable (max. 10 kA); secondary: 1 or 5 A; 10 mA ... 20 kA</td>
</tr>
<tr>
<td>Frequency</td>
<td>45 ... 65 Hz</td>
</tr>
</tbody>
</table>

## Connections

<table>
<thead>
<tr>
<th><strong>AC mains input</strong></th>
<th>screw connector (max. 2.5 mm² fine stranded wire; max. 4.0 mm² solid wire)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measurement input</strong></td>
<td>spring-type terminal (0.25 – 2.5 mm² fine stranded wire; 0.25 – 4.0 mm² solid wire)</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>screw connector (max. 2.5 mm² fine stranded wire; max. 4.0 mm² solid wire)</td>
</tr>
</tbody>
</table>

## Mechanical data

<table>
<thead>
<tr>
<th><strong>H x W x D</strong></th>
<th>323 x 250 x 163 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>-10 ... +50 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>&lt; 95% non-condensing</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP66 (casing)</td>
</tr>
</tbody>
</table>

## Installation

Installation close to genset(s), inverter(s), and loads to eliminate measurement errors caused by long wires

Current transformers (CTs) required, not included! (1 or 5 A)