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# SYMAP<sup>®</sup> BAT

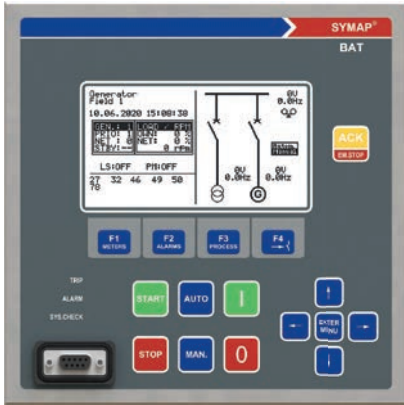
Protection relay for hybrid solutions  
and battery applications



Power Management  
system for static and  
dynamic energy sources



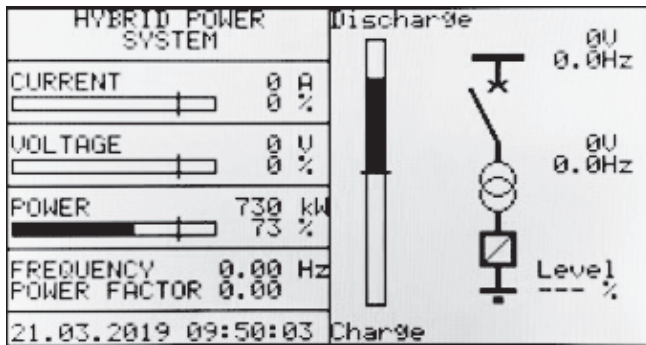
# Product overview



SYMAP®BAT is a flexible microprocessor-controlled digital protection and control device for use in low, medium and high voltage power systems. It is based on the SYMAP® platform and offers complete protection and control functions for battery converters including step-up transformer and optionally for other energy sources. Features are listed below.

- LV / MV protection of the battery converter output
- transformer differential current protection
- synchronization of the battery converter to the bus bar
- main breaker control
- load sharing control between generators and battery converter
- fixed power feeding to the battery converter for charging
- stand-by diesel start demand on low battery
- Modbus interface for SCADA

The display of SYMAP®BAT shows major electrical data information and a single line diagram including battery-relevant measurement values.

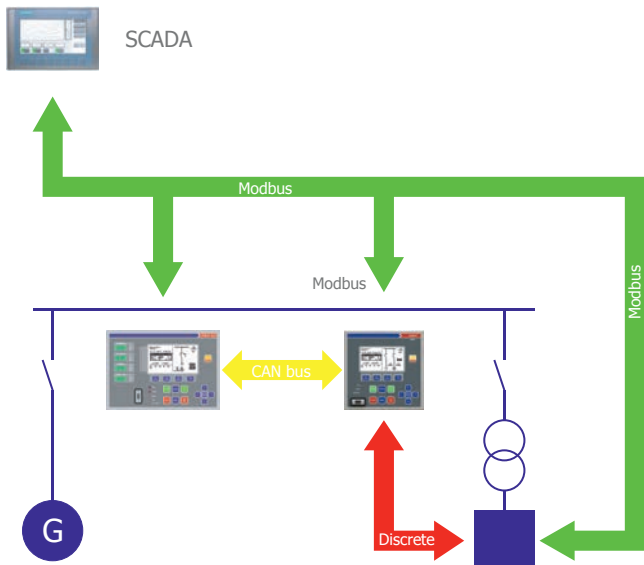


—————• BUSBAR VOLTAGE AND FREQUENCY

—————• TRANSFORMER OUTPUT VOLTAGE AND FREQUENCY

—————• BATTERY LEVEL

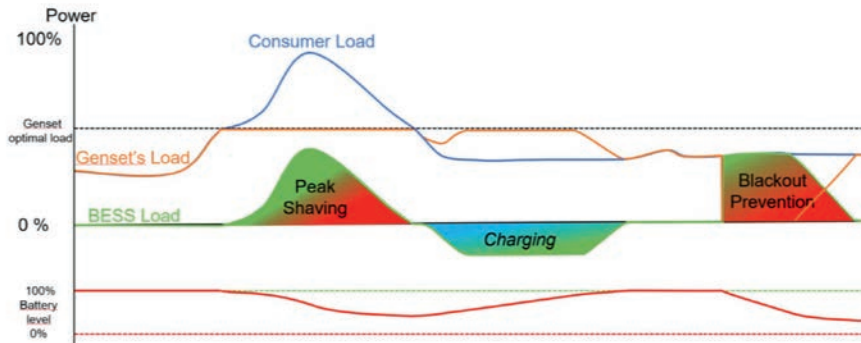
—————• ACTIVE POWER DIRECTION BARGRAPH



## SCADA interface by

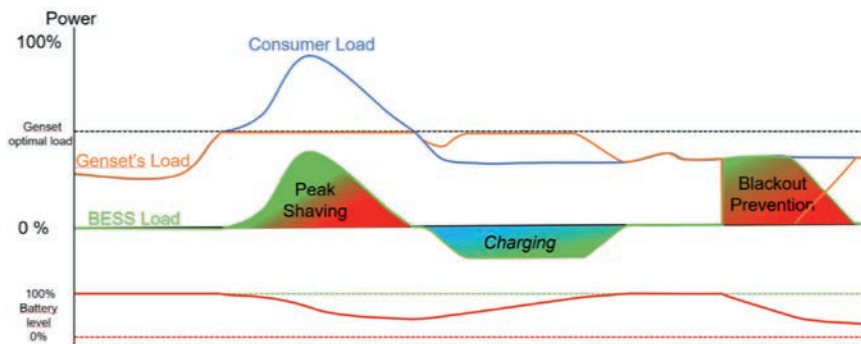
- Modbus RTU, single bus RS485/422 or
- Modbus TCP, redundant Ethernet
- CANBUS between SYMAP® devices
- discrete signals between SYMAP®BAT and the battery converter

## Modes of operation



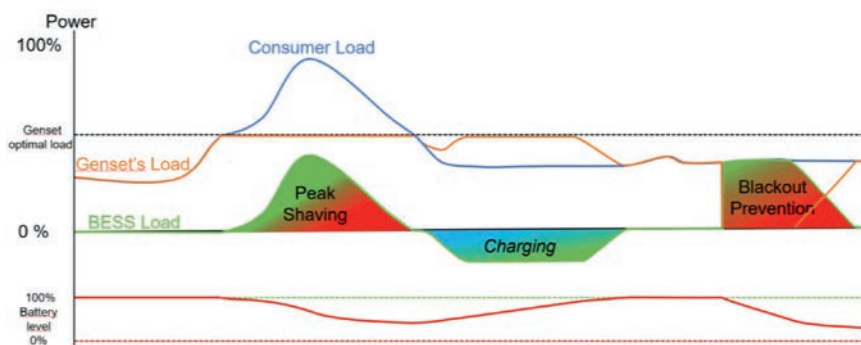
### Benefits of battery energy storage systems (BESS)

- increasing economic efficiency
- reduction of wearing due to lower number of start / stops of the auxiliary generators
- black-out prevention / short-time backup power



### Increasing economic efficiency

The fuel efficiency of the auxiliary generators is increased by running them at a high and constant level of power.



### Reduction of wearing

The number of starts and stops of the auxiliary generators can be drastically reduced by compensating the fluctuations of the on-board load with a battery energy storage system (BESS).

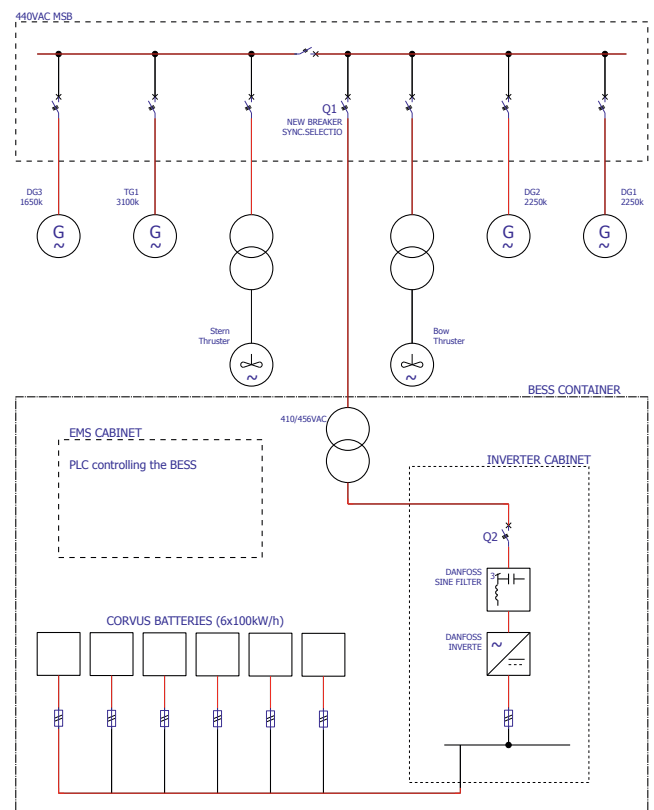
## Requirements for the battery converter/energy source

- electrically controllable and behavior like a diesel genset
- frequency static (droop); frequency reduction by active power output from converter
- voltage static (droop); voltage reduction by reactive power output from converter
- binary inputs to raise or lower the frequency and active power
- OR analog inputs 4... 20mA for frequency or active power setpoint
- binary inputs for emergency shutdown of the converter by protection

## Illustration of a retrofit project with a Battery Energy Storage System (BESS)

The BESS is controlled like a normal diesel generator (DG) and

- optimizes DG loads
- assures peak shaving by avoiding short-term operation of DGs during load peaks
- typically operates in droop mode
- minimizes risks of black-out



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