GRIDCON® ACF ESS

GREAT COMBINATION – ACTIVE FILTER AND ENERGY STORAGE.

WWW.REINHAUSEN.COM

ENERGY STORAGE SYSTEMS IMPROVE FLEXIBILITY.

Energy storage systems are an attractive solution in all situations where energy supply and consumption need to be made synchronous or asynchronous. New technologies in the fields of inverters, storage cells, and capacitors are making ever more comprehensive and cost-effective forms of use possible.

In principle, the storage of electrical energy is nothing new. For decades pump storage power plants have converted energy between electrical and potential energy, greatly boosting grid stability. They allow thermal power plants to generate constant electric power at a favorable operating point regardless of actual demand for energy.

Instead of potential energy, new kinds of energy storage systems use chemical, kinetic or electric accumulators to influence the ratio of consumption to supply. They tap into the advances being made in material science and power electronics and, compared with pump storage power plants, their benefits include the ability to be scaled up to large sizes, the fact that they do not need a local water supply, and the dynamism with which they can take in and give out energy.

Energy storage systems are used in public, industrial, and private grids. In public grids they are especially relevant when renewable sources of energy are integrated, because they are able to take in energy generated by the sun or wind if there is not sufficient load for this energy to be consumed directly at that time. They thereby allow solar power to be used at night and wind power to be used during periods of calm weather. If energy storage systems are installed locally in public grids, they also help to reduce the extent to which the grid has to be extended when renewable sources of energy are added. This is because they can locally balance excess supply or demand and energy does not therefore have to be transported over long distances. Depending on the power electronics used, energy storage systems can also help to improve or stabilize the power quality in public grids.

In industrial grids, energy storage systems help to optimize energy costs. They reduce peak loads, level out energy consumption, and optimize the management of in-house generation systems, such as PV and CHP. What's more, they generate income, which can be offset against energy costs by flexibly offering excess energy to the frequency control market. Using special emergency power or UPS functions, they can also help to stabilize industrial processes and improve availability.

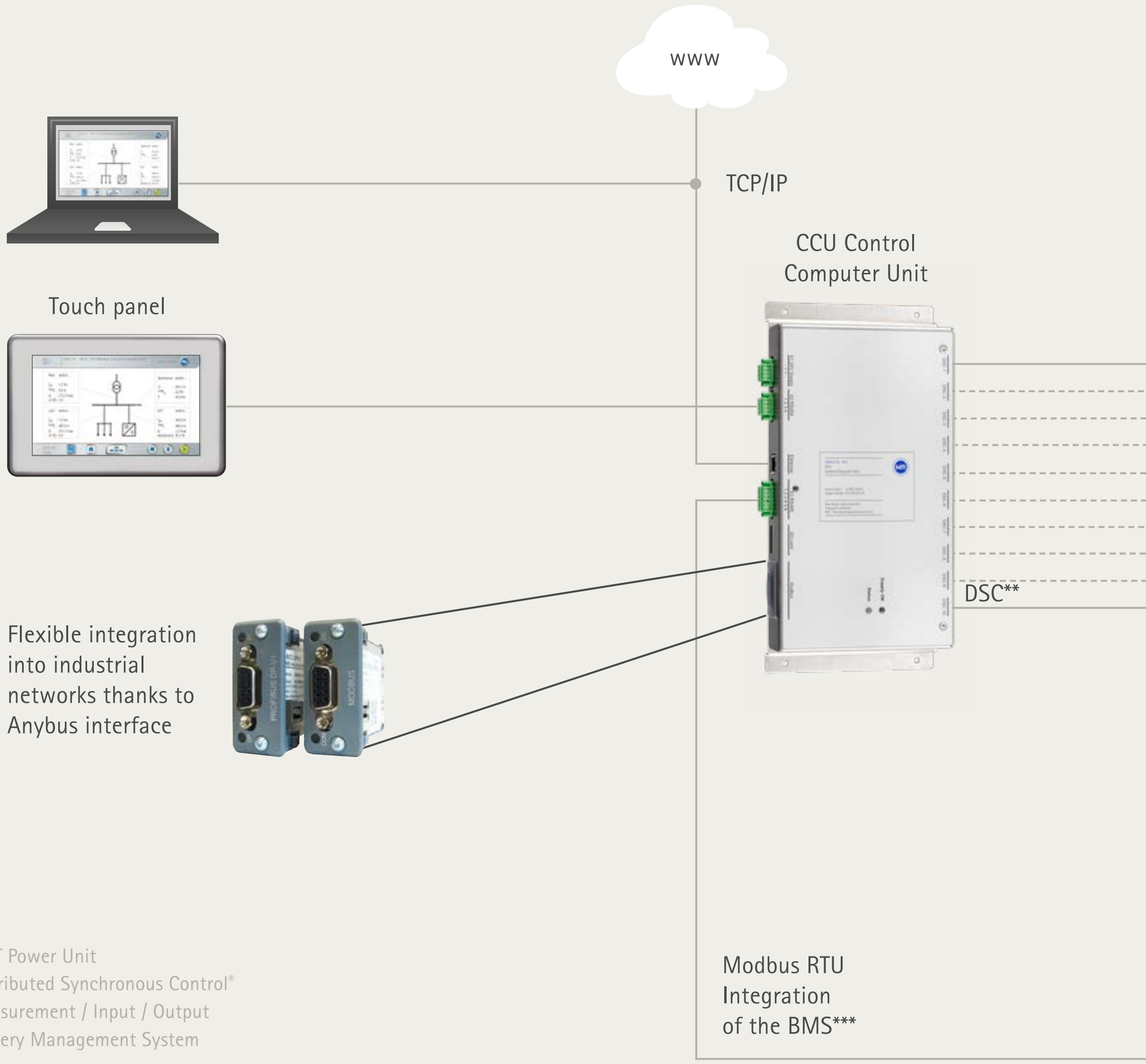
Finally, for private island grids, energy storage systems are of central importance for providing a continuous supply of energy with a high power quality. This is especially the case if the main sources for private island grids are volatile renewable energies.

EFFICIENT INVERTER ARCHITECTURE.

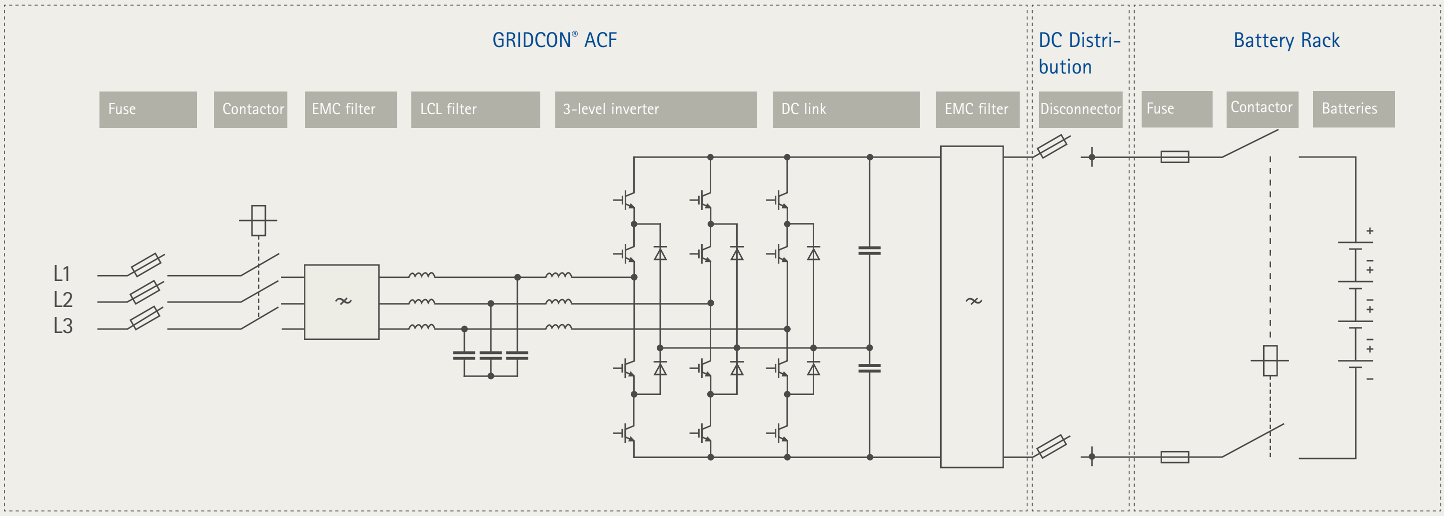
Networked, flexible, simple.

GRIDCON® ACF ESS is based on an inverter architecture which has proved itself in an industrial environment and has now had an energy storage added to it.

- Combination of reactive power compensation, active filter, and energy storage in one system
- Modular concept for individual, application-specific adaptation and retrofitting
- Connection voltage of up to 480 V (+/-10%)
- Output range of 400 kW in one system (more possible in integrated network)
- Energy storage of up to 2.4 MWh in one system (more possible in integrated network)
- Existing ACF systems can be retrofitted with an energy accumulator
- Energy storages using different technologies and from different manufacturers can be linked to suit the application
- High levels of safety and availability thanks to an extensive protective concept at inverter level and constant modularity

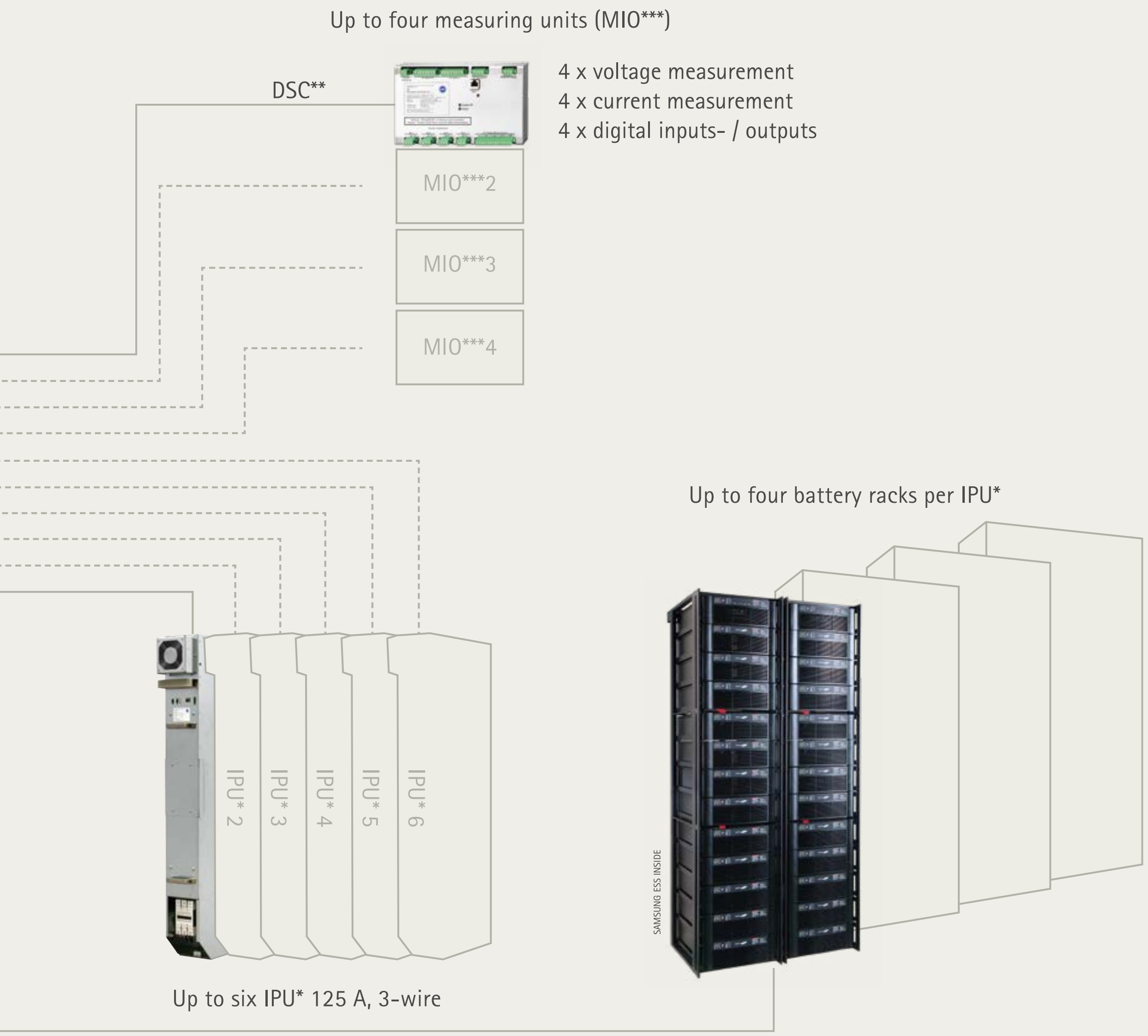


IPU*	IGBT Power Unit
DSC**	Distributed Synchronous Control®
MIO***	Measurement / Input / Output
BMS****	Battery Management System

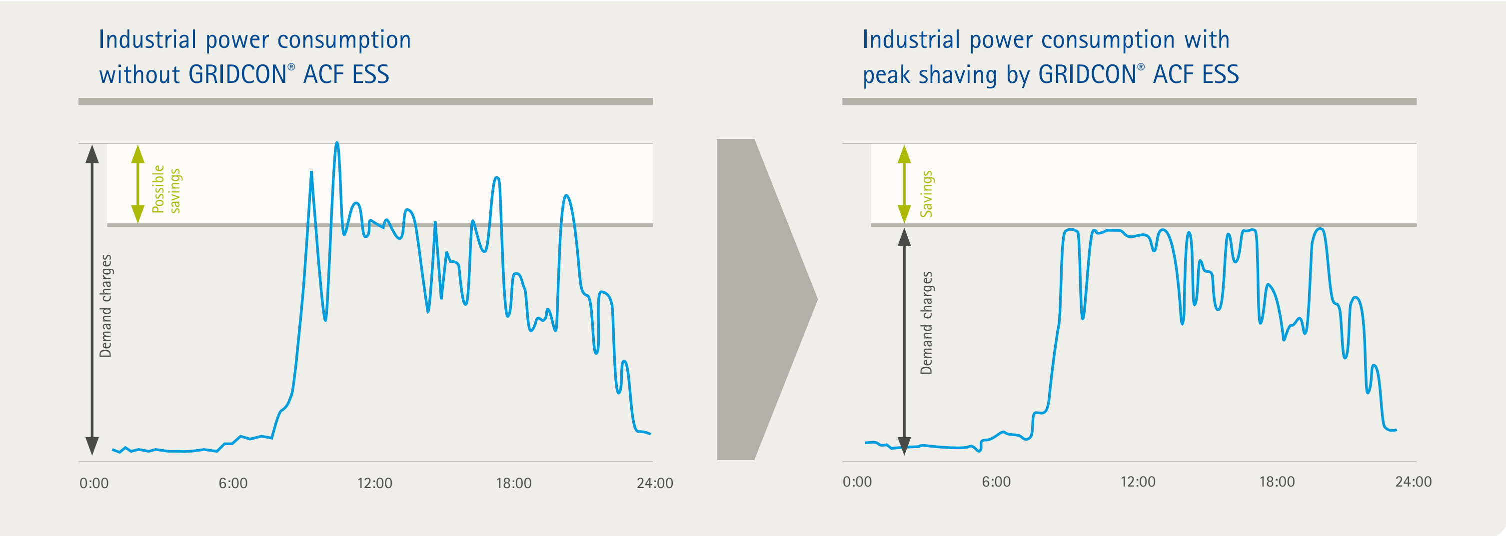


3-level technology – small losses and high dielectric strength

The 3-level circuit of the GRIDCON® ACF ESS is based on twelve IGBTs, whereas the conventional 2-level version only has six. The special circuitry halves the voltage loads on the power semiconductors. On the one hand, this produces fewer losses and, on the other hand, enables high rectification voltages for directly connecting batteries without additional converters. Another benefit of the 3-level technology is the lower ripple of the output current compared with a 2-level architecture.



VARIOUS FIELDS OF USE.



Peak shaving reduces energy costs

Energy providers and commercial customers reach contractual agreement on a price per kilowatt. The annual energy costs incurred are therefore mainly determined by maximum load. The higher a peak load, even if only occurs once, the higher the total annual energy costs. The more an industrial facility can reduce its maximum load, the more energy costs it can save. Energy storage systems come into play here by taking in energy if the load is below a defined maximum level and supplying energy if the load threatens to exceed the limit.

Other fields of use.

Increase in in-house consumption
Optimization of earnings from PV, CHP, wind turbines in own grid

Back-up power operation
Back-up power supply should the grid fail

UPS operation
Improvement in security of supply

Primary control
Balancing power available within 30 s

Secondary control
Balancing power available within 5 min

Power leveling
Adaptation of grid supply to schedules with renewable energy generation

Voltage stability
Stabilization of voltage in distribution grids with a high share of renewable energies

Island grid operation
Integration of renewable energy generators in tiny grids to reduce operating costs

Minutes reserve
Balancing power available within 15 minutes

Technical Data	GRIDCON® ACF ESS optimized for energy							
Rated voltage	400 V (maximum 480 V) +/- 10%							
Rated frequency	50 Hz / 60 Hz							
AC peak current	2 x rated current							
AC cable connection	3-phase + PE, a neutral conductor is not necessary (grids: TN, TT, IT)							
Power loss converter	< 2,5 % of power output in maximum, < 2,2 % at typ.operation, < 0,4 % at no load, < 100 W at standby							
Switching frequency	10 kHz (low loss)							
Control	Internal control-computer with two digital signal processors							
System setup and display	Via touchpanel with grafic display or internal webserver (TCP/IP) and PC no additional software necessary							
Reaction time	<< 1 ms							
Communication interfaces	Ethernet (TCP/IP) several field-bus systems with optional Anybus plug-in modules (e.g. Profibus, Modbus) 4 x digital output (potential free, programmable) for status messages 4 x digital input (24 VDC, programmable) for external control an parameter change							
Current transformer	Either 2-phase or 3-phase current measurement, xx/5 A or xx/1 A (parameterized) Current transformers are not included, 15 VA, class 1 or better recommended							
Converter	3-Level IGBT with voltage link (DC film capacitors)							
Colouring	Standard: RAL 7035 light grey (other colors and designs on request)							
Dimensions ACF cabinet (approx. W x D x H)	800 x 600 x 2000 mm 800 x 600 x 2200 mm with optional base (needed for main air supply from front or back), without DC-coupling cabinet							
Cooling	Standard: Air cooling with speed-controlled fans Optional: Liquid cooling with connection to external cooling system via heat exchanger unit							
IP protection degree	Standard: IP20, optional: IP21 .. IP54							
Environmental conditions	Maximum ambient temperature without derating: 40° C Recommended ambient temperature for continuous operation: < 25° C Minimum operating temperature: 0° C, relative humidity: maximum 95% non condensing Transport / storage: -20° C .. 70° C							
EMC class	EN 55011, class A1 (industrial environment)							
Standards	EN 50178, EN 61439-1, EN 61439-2, EN 61000-6-2, EN 61000-6-4, EN 55011							
AC voltage	optimized for power with rated voltage 400 VAC				optimized for energy with rated voltage 400 VAC			
Number of IPUs	1	2	3	4	1	2	3	4
Rated current AC	125 A	250 A	375 A	500 A	125 A	250 A	375 A	500 A
Rated apparent power S	87 kVA	173 kVA	260 kVA	346 kVA	87 kVA	173 kVA	260 kVA	346 kVA
Rated DC Current (continuos)	132 A	264 A	397 A	529 A	132 A	264 A	397 A	529 A
Weight	ca. 390 kg	ca. 530 kg	ca. 670 kg	ca. 820 kg	ca. 390 kg	ca. 530 kg	ca. 670 kg	ca. 820 kg
Technical data	Example: Battery rack optimized for power				Example: Battery rack optimized for energy			
DC voltage min. / max.	794 V / 1050 V				768 V / 964 V			
Rated energy E	64 kWh				152 kWh			
Active power P rated / max.	127 KW / 254 KW				79 KW / 108 KW			
C-rate / C-rate max.	2,0 / 4,0				0,5 / 0,7			
Dimensions battery rack (W x D x H)	1066 x 690 x 1613 mm - with base				1069 x 687 x 2290 mm			
Weight	980 kg				1408 kg			
IP protection degree	IPXO (with optional side plate and back plate)				IPXO (with optional side plate and back plate)			
Environmental conditions	Operating ambient temperature: 23±5° C; Temperature uniformity: less than 3° C recommended Operating Humidity: <85% non condensing Module Storage Temperature: -20~60° C, recommend: 25° C							
Technical data	1 - 4 battery racks per ACF ESS				1 - 16 battery racks per ACF ESS			
Rated energy E	64 kWh - 256 kWh				152 kWh - 2432 kWh			
Rated active power range P	87 kW - 346 kW				79 kW - 346 kW			
C-rate / C-rate max.	0,3 / 0,3 - 0,5 / 0,7 depending on combination of inverter and rack rating							
Technical data	DC disconnector panel							
Dimensions (W x D x H)	400 x 800 x 2000 mm 400 x 800 x 2200 mm with optional base (needed for main air supply from front or back) Dimensions depend on individual configuration of protection devices and number of battery racks							

LOW-VOLTAGE SOLUTIONS:
Maschinenfabrik Reinhausen GmbH
Power Quality Berlin
Urban Tech Republic | Building H / ZKSI
Airport Tegel 1
13405 Berlin, Germany
Phone: +49 30 330915-0
E-mail: support.pq@reinhausen.com

MEDIUM-VOLTAGE SOLUTIONS:
Maschinenfabrik Reinhausen GmbH
Power Quality Erfurt
Gustav-Weißkopf-Str. 4, 1. floor
99092 Erfurt, Germany
Phone: +49 361 3010 3-0
E-mail: support.pq@reinhausen.com

Maschinenfabrik Reinhausen GmbH
Falkensteinstrasse 8
93059 Regensburg, Germany
Phone: +49 941 4090-0
E-mail: info@reinhausen.com

www.reinhausen.com

IN4847609/00 EN – GRIDCON® ACF ESS –
F0338500 – 10/23 – uw

THE POWER BEHIND POWER.