

APStorage: energy storage (capacity from 5 kWh to 1.280 MWh)

The need to store energy is an important aspect of a modern energy system as it improves power balance and eliminates the resulting power disturbance. APStorage increases the efficiency of energy usage and management of supply and demand, it actively improves energy quality, evens out voltage peaks and load profiles, as well as enables the island operation mode.

Applications of APStorage:

- distribution system operators (DSOs),
- production plants,
- prosumers: micro-grids in housing estates, individual consumers, etc.

Description of the device:

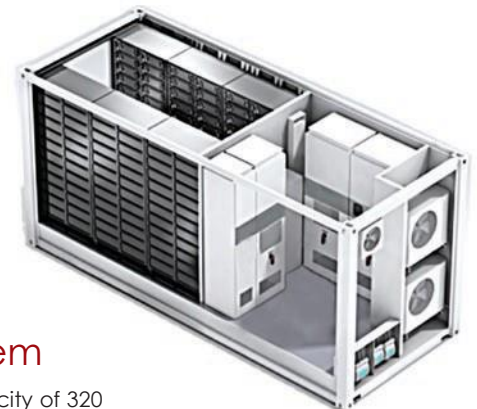
APStorage is a small scale energy storage (energy from several watt-hours to several megawatt-hours). The device consists of a bidirectional inverter, a controller (with algorithms to set the values and flow direction of active and reactive power during system operation) and a chemical energy storage (we can use the following batteries depending on the required charge and discharge currents, economic situation and the environment where the energy storage is installed: lithium-ion, lead-acid, nickel-cadmium and metal-hydride).

APStorage is available in two configurations:



Cabinet system

The cabinet system (with power capacity of 5 kWh to 320 kWh); in this system the bidirectional inverter is installed in a cabinet, the energy storage controller is integrated with the inverter's controller, the chemical battery is placed on stands or installed in the cabinet.



Container system

The container system (with power capacity of 320 kWh to 1.280 MWh); in a 20 ft. container with integrated anti-intrusion, fire fighting and A/C systems.

Energy storage functions:

DSOs: local voltage control and stabilization, increase of energy quality, evening out peaks (peak power limitation and elimination of voltage dips), energy transmission losses limitation, reactive power compensation, local island mode operation and micro-grid balancing.

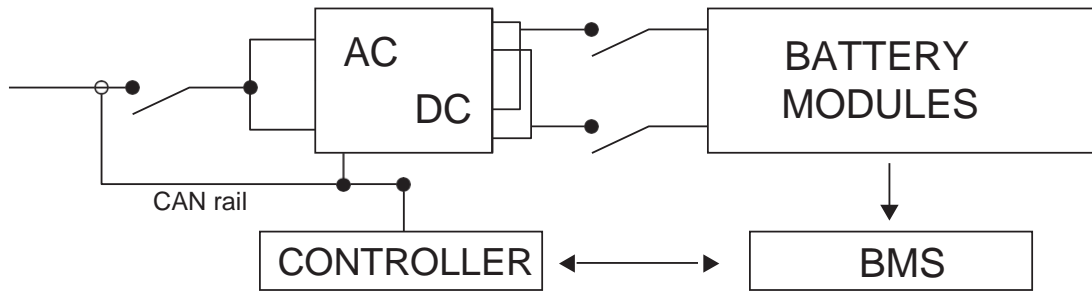
Prosumers: postponing the energy supply, e.g. at good value tariffs, local island mode operation and reactive power compensation.

The energy storage controller operates by means of an active and reactive power determining block and an operating mode selection block (automatic, remote and local). Functions are performed based on network algorithms which are modified to suit the type of energy storage operation and the required functions.

System characteristics:

- functions adjusted to user requirements,
- scalability and extendibility,
- modular construction,
- full automation,
- communication with MODBUS RTU, DNP-3, IEC 870-5-103 master systems,
- constant monitoring of the status of all device components, controlling their operation and signalling potential failures,
- displaying the device operation status on the console - LCD screen and LEDs,
- CAN-open communication between the energy storage components,
- on-grid & off-grid operation modes.

Schematic diagram of APStorage:



TECHNICAL PARAMETERS OF APSTORAGE – CABINET SYSTEM

Energy capacity	kWh	5 to 320
Power	kW	5 to 400
Nominal supply voltage	VAC	3x400 +/-15%
Supply voltage frequency	Hz	50 +/-5%
Auxiliary supply voltage	VAC	230/400 +/-15%
Chemical battery voltage	VDC	24, 48, 110, 220, 400, 690
Nominal grid supply voltage	VAC	3x400
ENCLOSURE		
Type of enclosure		Rittal, ZPAS or equivalent type industrial cabinet
Protection class (EN 60529)	IP	20 to 54
Fixing		stand-alone
Cable routing		from the bottom
Colour	RAL	7035 or chosen by the customer

TECHNICAL PARAMETERS OF APSTORAGE – CONTAINER SYSTEM

Energy capacity	kWh	320 to 1,280
Power	kW	320 to 2,000
Nominal supply voltage	VAC	3x400 +/-15%
Supply voltage frequency	Hz	50 +/-5%
Auxiliary supply voltage	VAC	230/400 +/-15%
Chemical battery voltage	VDC	690 V
Nominal grid supply voltage	VAC	SN 6 kV, 15 kV
ENCLOSURE		
Type of enclosure		20 ft. or 40 ft. container
Size	IP	20 ft. for 320 kWh capacity
Optional container systems		fire fighting system, A/C, anti-intrusion system
Colour	RAL	chosen by the customer

APSTORAGE CHEMICAL BATTERY SELECTION PARAMETERS, CABINET AND CONTAINER SYSTEMS

Parameter/battery type	Pb-LA	Ni-Cd	Ni-MH	Li-Ion NMC	Li-Ion LFP	Li-Ion LTO
Nominal voltage [V]	2	1.2	1.2	3.6	3.2	2.8
Energy density [Wh/kg]	20 to 30	30 to 40	50	150 to 200	120 to 140	80 to 100
Efficiency [%]	65 to 80	70 to 80	80 to 90	85 to 95	85 to 95	85 to 90
Charge current [n-times the C capacity]	0.1 C (max. 0.3 C)	0.1 C (max. 0.3 C)	1 to 2 C	2 to 3 C	2 to 4 C	5 to 10 C
Discharge current [n-times the C capacity]	up to 10 C	up to 10 C	2 to 5 C	2 to 3 C	2 to 4 C	5 to 10 C
Cycle number	600 to 1,500	800 to 1,200	1,000	up to 5,000	up to 3,000	10,000 to 20,000
Service life [years]	5 to 15	10 to 20	10 to 15	15 to 20	15 to 20	15 to 20
Operating temperature range [°C]	0 to 35	-20 to 50	0 to 35	-10 to 70	-20 to 55	-10 to 50

The manufacturer reserves the right to change device parameters. Other types and solutions are available upon request.

