ABB LV ESI inverters for energy storage applications
Your energy storage system easier than ever

New energy storage devices such as latest generation of batteries, flywheel and super capacitors provide the opportunity to store energy from the electricity grid and return it when required. It opens new opportunities to strengthen and enhance the performance, quality and reliability of smart electricity grids. Such systems requires specific and versatile inverters. It is exactly what ABB offers with its ESI range of low voltage Energy Storage Inverters. ABB ESI inverters come from ABB long experience in power electronics. As a result, ESI inverters are already equipped with many advanced features such as various communication facilities and unique power quality capabilities for customer best benefit.

Experienced and reliable inverter technology

ABB is a world leader in inverter technology. We propose for energy storage applications a totally proven and reliable design based on our experience of drives and PQF power quality filters.

Flexible, modular and redundant

ESI inverter is a modular design. Up to 32 inverters can be connected together which provides a wide range of power. Furthermore redundancy functionnality permits compliance with even the most stringent requirements on redundancy imposed in critical applications.

Power quality

ABB ESI inverter propose unsurpassed functionnality in term of power quality such as:

- Reactive power compensation of both inductive and capacitive loads
- Unprecedented harmonic filtering efficiency
- Load balancing in both 3 and 4-wire systems

Benefits

- Power system load leveling (deferred network and generation investment)
- Grid stabilisation (increased use of renewables)
- Grid compliance for renewable and generation systems
- Power quality improvement

Features

- Allows a range of energy storage devices to be coupled to the grids
- Dynamic power control (P)
- Dynamic reactive power control (Q)
- Harmonic mitigation
- Islanding mode
- CAN communication

Technical specifications

Model	ESI-I	ESI-M	ESI-S
Ratings			
Inverter maximum power at 415V_{AC} (3-phase)	Up to 323kw in one unit	Up to 108kw in one unit	Up to 72kw in one unit
Battery voltage range	V1: 600-830V_{DC} at 415V_{AC} V2: 975-1200V_{DC} at 690V_{AC}	600-830V_{DC} at 415V_{AC}	600-830V_{DC} at 415V_{AC} (3-phase) 170-830V_{DC} at 120V_{AC} (single-phase)
Electrical characteristics			
Connection method	3-phase	3-phase	3-phase/4-phase/single-phase
AC Nominal Network voltage	V1: 208-480V_{AC} V2: 480-690V_{AC}	V1: 208-480V_{AC}	208-240V_{AC} (3-phase) 380-415V_{AC} (3-phase) 120-415V_{AC} (single-phase)
Network frequency	50 Hz/60 Hz - +/- 5%		
AC Line current per inverter(A_{rms})	V1: 300 A, 450 A V2: 180 A, 320 A	70 A, 100 A, 130 A, 150 A	30 A, 45 A, 60 A, 70 A, 80 A, 90 A, 100 A
Neutral current rating per inverter (A_{rms})	-	-	3 times the line current rating[1]
Modularity	Maximum 32 inverters can be combined		
Redundancy[2]	Master/master or master/slave arrangement		
Equipment losses	3% of the equipment rated power typically		
Internal power circuit protection	Circuit breaker	Fuse box disconnector (optional)	-
Power Quality characteristics			
Reactive power compensation: target cos φ	Programmable from 0.6 (inductive) to 0.6 (capacitive)[3]		
Harmonic mitigation			
Harmonic range	Up to 2nd to 50th harmonic		
Harmonics selectable	20 individual harmonics		3-wire: 20 harmonics 4-wire: 15 harmonics
Filtering target	Programmable for each harmonic in absolute Ampere value		
Harmonic attenuation factor (I_H (source)/I_H (load))	Better than 97% at rated load		
Reaction time	< 500 µs instantaneous response		
Response time	2 networks cycles typically (10-90% filtering)		
Load balancing characteristics	Balance the currents between phases and/or between phases and neutral		
Programming/Communication			
Digital I/O	2 digital inputs/6 digital outputs (potential free)		
Alarm contact	1 NO/NC alarm contact (potential free)		
Programming/Monitoring	Using PQF-Manager GUI Using Modbus RTU interface (optional) Using PQF-Link software (optional)		
Battery Management System communication	CAN		
Islanding mode	Available in both 3 and 4-wire		

[1] Neutral current rating of PQFS 100 A units is limited to 270 A_{rms}.

[2] For full redundancy combine only master units. If limited redundancy is acceptable, master and slave units can be combined. The desired redundancy level can be obtained by selecting more or less master units.

[3] If cos φ of the installation is higher than the target cos φ, the filter will not downgrade the existing cos φ

Technical specifications

Model	ESI-I	ESI-M	ESI-S
Physical aspects (per base unit)			
Mounting	Free floor standing cubicle (ESI-I-M) or IP00 plate (ESI-M)		Wall-mount enclosure
Dimensions per inverter (W x D x H)	800 x 600 x 2150 mm	600 x 600 x 2150 mm (cubicle) 498 x 432 x 1697 mm (plate)	585 x 310 x 700 mm
Approximate weight (unpacked)	180 A/250 A units: 525 kg 320 A/450 A units: 620 kg	270 kg (cubicle) 150 kg (plate)	120 kg
Color	RAL 7035 (light gray)		
IP protection	IP21 Optional: IP41[1]	Plate version: IP00 Cubicle version: IP21 Optional: IP41[1]	IP30
Installation aspects			
Altitude	Indoor installation in clean environnment up to 1000 m altitude[2]		
Ambient temperature	-10°C to 40°C[2]		
Humidity	Maximum 95% relative humidity, non-condensing[3]		
Cable entry	Bottom	Top or bottom (to be specified at time of ordering)	Bottom
CT requirements	Only required for Power Quality features		
Standards			
UL	UL-508		-
IEC	60439-1 (EMC class) EMC Immunity: 61000-6-2 EMC Emissions: 61000-6-4		

[1] For IP41 models, 10% derating applies.

[2] Higher altitudes (up to 2000 m/ 6600 ft max.) and temperatures (up to 50°C/122°F max.) with suitable derating.

[3] The maximum relative humidity for operational purposes is 95%. When the units are stored for a longer time, do not exceed a relative humidity of 85%.

For more information please contact:

ABB n.v.
Power Quality Products
Avenue Centrale, 10
Zoning Industriel de Jumet
B-6040 Charleroi (Jumet), Belgium
Phone: +32 (0) 71 250 811
Fax: +32 (0) 71 344 007
E-Mail: Power.Quality@be.abb.com

www.abb.com/lowvoltage

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