

DATASHEET

Active load balancers

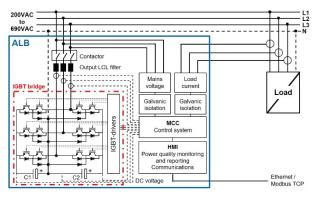
Active load balancers (ALB) are the ultimate answer to power quality problems in installations caused by unbalanced load conditions for a range of segments and applications. They are a high performance, compact, flexible, modular and costeffective type of active power filters (APF) that provide an instantaneous and effective response to power quality problems in low or high voltage electric power systems. They enable longer equipment lifetime, higher process reliability, improved power system capacity and stability, and reduced energy losses, complying with most demanding power quality standards and grid codes.



ALB module rated 400V 50/60Hz 100A

Using single-phase loads on a three-phase electric power system (connected phase-to-phase or phase-to-neutral) results in unbalanced load conditions in the system. Unbalanced load currents result in unbalanced voltages and affect other loads connected at the point of common coupling. Unbalanced load conditions also cause excessive neutral current, resulting in overheating motors and transformers, power losses and lower system efficiencies. Load balancing is necessary to improve the power quality and efficiency of the system.

Properly designed and rated ALBs can balance any unbalanced load from the supply system point of view. Any unbalanced load can be converted to a symmetrical three-phase active power load only.



Typical design of an ALB

Highlights

- Full range: Specifications from 50A to 200A (200V-690V) in 3- and 4-wire systems can be covered by a single module. Unlimited amount of ALB modules can be connected in parallel.
- Simple connection to high voltage systems.
- 3-level NPC inverter topology reduces losses, noise, size and extends module's lifetime.
- Overall response time <100 microseconds.
- Excellent load balancing performance for negative and zero sequence components, mitigating also neutral currents and unloading of neutral wires.
- Suitable for networks with harmonic distortion.
- Compact and modular design optimized for installation, commissioning and maintenance.

Typical segments

ALBs can be applied to small, medium or large applications in few specialized segments.

Markets	Segments	Applications
Smart grid	Renewable generation	
	Non-renewable generation	
	Transmission & distribution	
	Microgrids	
Raw material	Mining	
extraction & processing	Oil & gas	
	Minerals & cement	
	Steel & metals	
Manufacturing & infrastructure	Conventional manufacturing	
	Critical process industries	
	Transport	
	Water & wastewater	
Green buildings & smart cities	Healthcare facilities	
	Critical process facilities	
	Industrial & office facilities	
	Retail & leisure facilities	

Applications: Green - primary, yellow - secondary, red - none.

Typical applications

ALBs have few low and high voltage potential applications where their use offers many benefits.

- Arc welding machines: Shielded metal arc, gas tungsten arc, gas metal arc, flux-cored arc, submerged arc and electroslag welding.
- Resistance welding machines: Spot, seam, butt, flash, projection and upset welding.
- Single-phase loads not well distributed in a three-phase system: Computers, printers, lighting, air conditioners, electric vehicles, etc.
- Railway electrification systems: Trains & trams
- Single-phase electric arc furnaces.
- Single-phase generators such as small wind turbines and photovoltaics connected to the distribution network via single-phase power electronic inverters.



ELCO POWER (MALAYSIA) SDN BHD

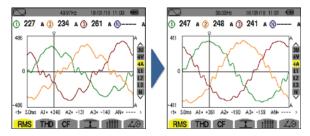
11 Jln SS13/3A, Subang Jaya Industrial Estate, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia. Tel: +6 (03) 5637 7302 Fax: +6 (03) 5634 3961 Email: sales@elcopower.com.my Website: www.elcopower.com.my



Operating principle

An ALB is a power electronics-based device connected in parallel with the load that requires load balancing. The ALB works as a controlled current source providing any kind of current waveform in real time.

ALBs are using current control to deliver load balancing functionality in 3- and 4-wire systems with their full rated capacity. How this relates to power depends on variables like load power factor. They inject capacitive or inductive negative sequence current that has an opposite phase to the load negative sequence current. As a result, the network sees symmetrical load and phase voltages, and currents are balanced without exchanging active power between the network and the ALB.



ALB operating principle

Benefits

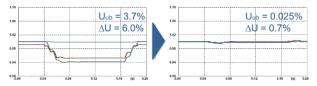
Main benefits of ALBs can be summarized as:

- Improve voltage unbalance on the phases and reduce neutral current which increases the safety of the installation and allows sensitive loads to operate.
- Avoid transformers' saturation & overloading.
- Reduce power losses and voltage drop in neutral conductors.
- Reduce the oscillating torque in the rotating machines that appears because of load variations in the system.
- Avoid electrical equipment overheating and efficiency loss that causes premature failures.

Application examples

Welding machines

Single-phase welding machines (normally 50kVA to 150kVA) are usually supplied through two phases in a three-phase electric power system. The current taken by these welding machines is not continuous and it lasts only for few power cycles (typically 12-15). The machines are usually manually operated and there is no synchronism, so the distribution transformer invariably sees, momentary, yet large unbalance within the phase currents.

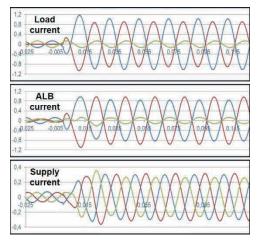


ALB in welding machine application

Unbalanced buildings

System designers and electricians usually try to balance loads across a three-phase system during installation. In practice, three-phase systems are rarely perfectly balanced at installation phase. The situation becomes more critical over the years if different loads have been added to the system without carefully planning.

ALBs can balance the whole system in real time. Alternatives like rewiring all the loads of the site are more costly and time-consuming.



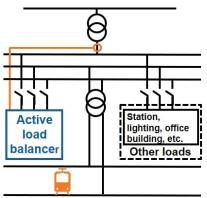
ALB in unbalanced building

Railway electrification systems

ALBs can be used for dynamically balancing the asymmetry between phases caused by the feeding of railways (usually taking the power between two phases in a three-phase system). They can balance in an efficient and cost-effective way the heavy and strongly time-varying single-phase loads ensuring that the conditions set out in the local grid code about power quality at the point of connection to the grid of the traction feeder are fulfilled.

ALBs can also filter (if needed) in real time the harmonics generated by thyristor and diode locomotives up to the 50th harmonic order (including the triplen harmonics) avoiding the need for passive harmonic filters.

Alternatives like building new overhead lines are more costly and time-consuming plus not optimal from the environmental point of view.



ALB in railway electrification system



ELCO POWER (MALAYSIA) SDN BHD

11 Jln SS13/3A, Subang Jaya Industrial Estate, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia. Tel: +6 (03) 5637 7302 Fax: +6 (03) 5634 3961 Email: sales@elcopower.com.my Website: www.elcopower.com.my



Technical specifications – 200-480VAC devices

LOOSE MODULES	A2-50	A2-60	A2-75	A2-100	A2-120	A2-150	A2-200	
				Electrical ratings				
Rated voltage		200-480VAC +/-100	% (auto sensing). Co	onnection to higher volta		step-up transformer.		
Rated frequency	50/60Hz (auto sensing).							
Phase RMS current output	50A	60A	75A	100A	120A	150A	200A	
Neutral RMS current output	150A	180A	225A	300A	360A	450A	600A	
				Electrical features				
Reaction / response time	Reaction	time <50 microseco	nds / Overall respon	ise time <100 microseco	onds (1 network cycle	if working in selectab	le mode).	
Electrical system compatibility			3-ph	ase 3-wire and 3-phase	4-wire.			
Inverter features			3-level NPC inverter	r topology (IGBT). Switcl	ning frequency 20kHz	•		
Controller / redundancy	Each module h	as an independent c	ontroller. In parallel o	operation of several mod	ules, if any module fa	ils, the rest will contin	ue in operation.	
Load balancing	Negative sequence current injected to balance fundamental current on the system (inherently corrects displacement power factor).							
		Load balancing degree can be set from 0% to 100% of the output current of the module.						
Protection functions		Overcuri	rent, overvoltage, un	dervoltage, overtempera	ture and ripple circuit	overload.		
Stand-by & AutoStart	Stand-by stops	the IGBTs if required	d compensation curi	rent is below a certain lir	nit. AutoStart allows a	automatic start after a	network failure.	
Remote discrete control				Remote run/stop.				
		Connections						
Digital inputs	3 po ^r	ential free inputs 15-4	48VDC or up to 277	VAC. Any input can be p	rogrammed as trigger	r for stand-by, trip or a	larm.	
Digital outputs	6 potential free or	tputs DC or up to 27	7VAC. 4 can be pro	grammed for trip, alarm,	running & force, or a	Il can be used for cap	acitor bank steps.	
Current transformers (CT)	· · · ·			A secondary (5A preferr				
CT location	Open loop			nd closed loop (current t			s possible.	
CT polarity				it is possible to change				
Number of CTs required				of 1 module: 3 CTs. Close				
Connection of parallel modules				ting combinations up to				
		ed oodidoliity. Farance	roperation of any ra	Interfaces				
HMI / display		7" touch a	creen multilingual g	raphical HMI (new langu	ages can be added o	n request)		
Monitoring and reporting				pabilities. Reports data c				
v		On-site and re		Ethernet and Modbus TC		s up to 50 days.		
Communication capability								
Software update				Via Ethernet or USB driv				
				Mechanical features				
Mounting arrangement				ule ready for cubicle or w				
Enclosure features				galvanized steel enclosu				
Cooling method	FO	rced air by easy to se	ervice automatically	controlled DC cooling fa	ns adjusted by modu	le temperature via PW	M.	
Losses				<2.3%		-	-	
Noise level (ISO 3746)	60dB	60dB	64dB	64dB	65dB	67dB	68dB	
Dimensions WxHxD	225x850x500mm	225x850x500mm	225x850x500mm		225x850x500mm	225x1150x500mm	225x1150x500mm	
Weight	70kg	70kg	70kg	70kg	70kg	110kg	110kg	
				nstallation and operat				
Temperature (without derating)		+5°C to	o +40°C.		+5°C to +30°C.	+5°C to) +40°C.	
Humidity			Maxir	mum 85% RH, non-conc	lensing.			
Altitude (without derating)				Up to 1000m.				
Needed airflow for the module			400 m³/h	450 m³/h	500 m³/h	750 m³/h	1000 m³/h	
Tor the mount	350 m³/h	350 m³/h	400 m-/n	100 111 /11			1000111111	
Ventilation requirements	350 m³/h			w and above the module	required for air ventil	ation.		
	350 m³/h NH00 gL/gG 63A		nm free space belo				NH00 gL/gG 250A	
Ventilation requirements		300r	nm free space belo	w and above the module				
Ventilation requirements Main circuit fuses		300r	nm free space belo NH00 gL/gG 100A	w and above the module NH00 gL/gG 125A	NH00 gL/gG 160A			
Ventilation requirements Main circuit fuses		300r	nm free space belo NH00 gL/gG 100A	w and above the module NH00 gL/gG 125A Top or bottom.	NH00 gL/gG 160A			
Ventilation requirements Main circuit fuses Cable entry Electrical safety		300r	nm free space beloo NH00 gL/gG 100A	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat	NH00 gL/gG 160A			
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility		300r	nm free space beloo NH00 gL/gG 100A	w and above the module NH00 gL/gG 125A Top or bottom. candards and certificat EN 50178	NH00 gL/gG 160A			
Ventilation requirements Main circuit fuses Cable entry		300r	nm free space beloo NH00 gL/gG 100A	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity:	NH00 gL/gG 160A			
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electrical safety Electromagnetic compatibility		300r	nm free space belo NH00 gL/gG 100/ St Emissions: EN/IE	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity:	NH00 gL/gG 160A ions EN/IEC 61000-6-2.			
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals		300r	nm free space belo NH00 gL/gG 100/ St Emissions: EN/IE	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL.	NH00 gL/gG 160A ions EN/IEC 61000-6-2.			
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals		300r NH00 gL/gG 80A	m free space belo NH00 gL/gG 100A St Emissions: EN/IE	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. Ddules installed in cub Electrical ratings	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles	NH00 gL/gG 200A		
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage		300r NH00 gL/gG 80A 200-480VAC +/-10 ^c	nm free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo & (auto sensing). Co	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. CE, UL. Celules installed in cub Electrical ratings ponnection to higher volta	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable s	NH00 gL/gG 200A		
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage		300r NH00 gL/gG 80A 200-480VAC +/-10 ^c	nm free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo (auto sensing). Cc is possible. Unlimite	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. bodules installed in cub Electrical ratings onnection to higher volta ed parallel operation of a	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable ny rating combination	NH00 gL/gG 200A		
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output		300r NH00 gL/gG 80A 200-480VAC +/-10 ^c	nm free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo (auto sensing). Cc is possible. Unlimite	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. bdules installed in cub Electrical ratings onnection to higher volta de parallel operation of an lectrical features (cub)	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable ny rating combination	NH00 gL/gG 200A		
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test		300r NH00 gL/gG 80A 200-480VAC +/-10 ^c	nm free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo (auto sensing). Cc is possible. Unlimite	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. bodules installed in cub Electrical ratings onnection to higher volta ed parallel operation of a	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable ny rating combination	NH00 gL/gG 200A		
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage		300r NH00 gL/gG 80A 200-480VAC +/-10 ^c	m free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo (auto sensing). CC is possible. Unlimite El	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 EC 61000-6-4. Immunity: CE, UL. Dedules installed in cub Electrical ratings ponnection to higher volta diparallel operation of an lectrical features (cub 2.5kV/1min 6kV	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable : ny rating combination cle)	NH00 gL/gG 200A		
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^r Any output	nm free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo & (auto sensing). Co is possible. Unlimite E 65kA	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 EC 61000-6-4. Immunity: CE, UL. bodules installed in cub Electrical ratings ponnection to higher volta deparallel operation of an lectrical features (cub 2.5kV/Imin 6kV krms (3 seconds) / 143k	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable in rating combination cle) A peak.	NH00 gL/gG 200A	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^c Any output CB or fuse-switch. Ge	nm free space belo NH00 gL/gG 100A St Emissions: EN/IE (auto sensing). Cc is possible. Unlimite E 65kA eneral design rule is	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. certical ratings onnection to higher volta deparallel operation of at lectrical features (cub 2.5kV/1min 6kV to select the protection 1	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable hy rating combination cle) A peak. evel 1.3 times the noi	NH00 gL/gG 200A	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^c Any output CB or fuse-switch. Ge	m free space belo NH00 gL/gG 100/ St Emissions: EN/IE (auto sensing). CC (auto sensing). CC (auto sensing). CC (auto sensing). CC (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. bdules installed in cub Electrical ratings onnection to higher volta ed parallel operation of at lectrical features (cub 2.5kV/1min 6kV xrms (3 seconds) / 143k to select the protection I s, 16mm ² Cu conductor	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable : y rating combination cle) A peak. evel 1.3 times the nor is the minimum recor	NH00 gL/gG 200A	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection Earthing	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^c Any output CB or fuse-switch. Ge	m free space belo NH00 gL/gG 100/ St Emissions: EN/IE (auto sensing). CC (auto sensing). CC (auto sensing). CC (auto sensing). CC (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. Dedules installed in cub Electrical ratings ponnection to higher volta diparallel operation of an lectrical features (cub 2.5kV/1min 6kV xrms (3 seconds) / 143k to select the protection I s, 16mm ² Cu conductor chanical features (cub	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable : yy rating combination cle) A peak. evel 1.3 times the nor is the minimum recor picle)	NH00 gL/gG 200A	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection Earthing Mounting arrangement	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^o Any output 2B or fuse-switch. Ge Accordin	m free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo % (auto sensing). Co is possible. Unlimite 65kA eneral design rule is g to local regulations Me	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. bodules installed in cub Electrical ratings ponnection to higher volta dp arallel operation of an lectrical features (cub 2.5kV/1min 6kV trms (3 seconds) / 143k to select the protection I s, 16mm ² Cu conductor chanical features (cub Tree-standing cubicle	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable s ny rating combination cle) A peak. evel 1.3 times the nor is the minimum recor picle)	NH00 gL/gG 200A	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection Earthing Mounting arrangement Enclosure IP class	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^r Any output 2B or fuse-switch. Ge Accordin IP20 to IP42	m free space belo NH00 gL/gG 100A St Emissions: EN/IE Mo (auto sensing). Co is possible. Unlimite 65kA eneral design rule is g to local regulations Me for indoor installation	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. Dodules installed in cub Electrical ratings ponnection to higher volta ad parallel operation of at lectrical features (cub 2.5kV/Imin 6kV trms (3 seconds) / 143k to select the protection I s, 16mm ² Cu conductor ochanical features (cut Free-standing cubicle h (other classes or outdo	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable s ny rating combination cle) A peak. evel 1.3 times the noi is the minimum recor picle) or installation cubicle	NH00 gL/gG 200A step-up transformer. of modules. ninal current of the de nmended. s on request).	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection Earthing Mounting arrangement Enclosure IP class Enclosure material and colour	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^r Any output 2B or fuse-switch. Ge Accordin IP20 to IP42	m free space belo NH00 gL/gG 1004 St Emissions: EN/IE (auto sensing). Co is possible. Unlimite 65kA eneral design rule is g to local regulations Me for indoor installation anized steel, light gre	w and above the module NH00 gL/g0 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. bdules installed in cub Electrical ratings onnection to higher volta de parallel operation of at fectrical features (cub 2.5kV/1min 6kV ms (3 seconds) / 143k to select the protection 1 s, 16mm² Cu conductor chanical features (cub Free-standing cubicle (other classes or outdow ey RAL7035 (other mate	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable environment y rating combination cle) A peak. evel 1.3 times the not is the minimum recor picle) or installation cubicle rials or colours on recor	NH00 gL/gG 200A step-up transformer. of modules. ninal current of the de nmended. s on request).	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection Earthing Mounting arrangement Enclosure IP class Enclosure material and colour Panel thickness and treatment	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^r Any output 2B or fuse-switch. Ge Accordin IP20 to IP42	min free space belo NH00 gL/gG 1004 St Emissions: EN/IE (auto sensing). Cr (auto sensing)	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. Delues installed in cub Electrical ratings onnection to higher volta de parallel operation of an lectrical features (cub 2.5kV/1min 6kV rms (3 seconds) / 143k to select the protection I s, 16mm ² Cu conductor chanical features (cub rece-standing cubicle h (other classes or outdo ay RAL7035 (other mate mm. Epoxy powder coa	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable i y rating combination cle) A peak. evel 1.3 times the nor is the minimum recor picle) or installation cubicle rials or colours on rec ting.	NH00 gL/gG 200A step-up transformer. of modules. ninal current of the de nmended. s on request).	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection Earthing Mounting arrangement Enclosure IP class Enclosure IP class Enclosure material and colour Panel thickness and treatment Cooling method	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^r Any output 2B or fuse-switch. Ge Accordin IP20 to IP42	min free space belo NH00 gL/gG 1004 St Emissions: EN/IE (auto sensing). Cr (auto sensing)	w and above the module NH00 gL/gG 125A Top or bottom. tandards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. Description of an experiment certical ratings ponnection to higher volta d parallel operation of an lectrical features (cub 2.5KV/1min 6KV .rms (3 seconds) / 143k to select the protection I s.16mm ² Cu conductor chanical features (cul Free-standing cubicle (other classes or outdor ey RAL7035 (other mate m. Epoxy powder coa orced air or heat exchar	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable i y rating combination cle) A peak. evel 1.3 times the nor is the minimum recor picle) or installation cubicle rials or colours on rec ting.	NH00 gL/gG 200A step-up transformer. of modules. ninal current of the de nmended. s on request).	NH00 gL/gG 250A	
Ventilation requirements Main circuit fuses Cable entry Electrical safety Electromagnetic compatibility Third party approvals ASSEMBLED MODULES Rated voltage RMS current output Power frequency voltage test Impulse withstand voltage Short-circuit current Power circuit protection Earthing Mounting arrangement Enclosure IP class Enclosure material and colour Panel thickness and treatment	NH00 gL/gG 63A	300r NH00 gL/gG 80A 200-480VAC +/-10 ^o Any output 2B or fuse-switch. Ge Accordin IP20 to IP42 · Galva	nm free space belo NH00 gL/gG 100A St Emissions: EN/IE (auto sensing). Co is possible. Unlimite 65kA eneral design rule is g to local regulations Me for indoor installatior anized steel, light gre 2 F	w and above the module NH00 gL/gG 125A Top or bottom. andards and certificat EN 50178 C 61000-6-4. Immunity: CE, UL. Delues installed in cub Electrical ratings onnection to higher volta de parallel operation of an lectrical features (cub 2.5kV/1min 6kV rms (3 seconds) / 143k to select the protection I s, 16mm ² Cu conductor chanical features (cub rece-standing cubicle h (other classes or outdo ay RAL7035 (other mate mm. Epoxy powder coa	NH00 gL/gG 160A ions EN/IEC 61000-6-2. icles ges through suitable s hy rating combination cle) A peak. evel 1.3 times the nor is the minimum recor picle) por installation cubicle rials or colours on rec ting. ger.	NH00 gL/gG 200A	NH00 gL/gG 250A	





Technical specifications – 500-690VAC devices

LOOSE MODULES	A2-50-E	A2-60-E	A2-75-E	A2-100-E	A2-120-E			
			Electrical ratings					
Rated voltage	500-69	0VAC +/-10% (auto sensing)	. Connection to higher voltages t	hrough suitable step-up trans	sformer.			
Rated frequency			50/60Hz (auto sensing).		,			
Phase RMS current output	50A	60A	75A	100A	120A			
Neutral RMS current output	150A	180A	225A	300A	360A			
			Electrical features					
Reaction / response time	Reaction time <50 microseconds / Overall response time <100 microseconds (1 network cycle if working in selectable mode).							
Electrical system compatibility			AC modules) and 3-phase 4-wir					
Inverter features	Each weather have an in		rter topology (IGBT). Switching f					
Controller / redundancy	Each module has an independent controller. In parallel operation of several modules, if any module fails, the rest will continue in operation.							
Load balancing	Negative sequence current injected to balance fundamental current on the system (inherently corrects displacement power factor).							
Protection functions	Load balancing degree can be set from 0% to 100% of the output current of the module. Overcurrent, overvoltage, undervoltage, overtemperature and ripple circuit overload.							
Stand-by & AutoStart	Stand-by stops the IGB		current is below a certain limit. A		art after a network failure			
Remote discrete control		ra in required compensation of	Remote run/stop.		art alter a network failure.			
	Connections							
Digital inputs	3 potential fre	e inputs 15-48VDC or up to 2	77VAC. Any input can be progra	mmed as trigger for stand-b	v trip or alarm			
Digital outputs			programmed for trip, alarm, runn					
Current transformers (CT)			or 5A secondary (5A preferred).		and the second s			
CT location	Open loop (current		and closed loop (current transf		onnections possible.			
CT polarity			ity, it is possible to change the lo					
Number of CTs required			on of 1 module: 3 CTs. Closed lo					
Connection of parallel modules			rating combinations up to 7 mo					
			Interfaces					
HMI / display		7" touch screen multilingua	al graphical HMI (new languages	can be added on request).				
Monitoring and reporting	0	n-site and remote monitoring	capabilities. Reports data of pow	ver quality events up to 30 da	ays.			
Communication capability			Ethernet and Modbus TCP.					
Software update			Via Ethernet or USB drive.					
			Mechanical features					
Mounting arrangement			odule ready for cubicle or wall in					
Enclosure features			20 galvanized steel enclosure in					
Cooling method	Forced air l	by easy to service automatica	ally controlled DC cooling fans a	djusted by module temperatu	ire via PWM.			
Losses			<2.8%					
Noise level (ISO 3746)	67dB	67dB	67dB	67dB	68dB			
Dimensions WxHxD	225x1150x500mm	225x1150x500mm	225x1150x500mm	225x1150x500mm	225x1150x500mm			
Weight	120kg	120kg	120kg Installation and operation	120kg	120kg			
Temperature (without derating)			+5°C to +40°C.					
Humidity		M	aximum 85% RH, non-condensi	a				
Altitude (without derating)		101	Up to 1000m.	ig.				
Needed airflow for the module	350 m³/h	350 m³/h	400 m³/h	450 m³/h	500 m³/h			
Ventilation requirements			elow and above the module requ					
Main circuit fuses	NH00 gL/gG 63A	NH00 gL/gG 80A	NH00 gL/gG 100A	NH00 gL/gG 125A	NH00 gL/gG 160A			
Cable entry			Top or bottom.	8 8				
			Standards and certifications					
Electrical safety	EN 50178							
Electromagnetic compatibility	Emissions: EN/IEC 61000-6-4. Immunity: EN/IEC 61000-6-2.							
Third party approvals	CE, UL.							
ASSEMBLED MODULES			Modules installed in cubicles					
	Electrical ratings							
Rated voltage			. Connection to higher voltages t		sformer.			
RMS current output	Any output is possible. Unlimited parallel operation of any rating combination of modules.							
			Electrical features (cubicle)					
Power frequency voltage test	2.5kV/1min							
Impulse withstand voltage			6kV					
Short-circuit current	1000		5kA rms (3 seconds) / 143kA per		t of the order does			
Design of the state of the stat	MCCB or fuse-switch. General design rule is to select the protection level 1.3 times the nominal current of the device. According to local regulations, 16mm ² Cu conductor is the minimum recommended.							
			ous information to conductor is the	minimum recommended.				
Power circuit protection Earthing								
Earthing			Mechanical features (cubicle)					
Earthing Mounting arrangement			Mechanical features (cubicle) Free-standing cubicle.		*\			
Earthing Mounting arrangement Enclosure IP class		P20 to IP42 for indoor installa	Mechanical features (cubicle) Free-standing cubicle. tion (other classes or outdoor in	stallation cubicles on reques	t).			
Earthing Mounting arrangement Enclosure IP class Enclosure material and colour		P20 to IP42 for indoor installa	Mechanical features (cubicle) Free-standing cubicle. tion (other classes or outdoor in grey RAL7035 (other materials	stallation cubicles on reques	t).			
Mounting arrangement Enclosure IP class Enclosure material and colour Panel thickness and treatment		P20 to IP42 for indoor installa	Mechanical features (cubicle) Free-standing cubicle. tion (other classes or outdoor in grey RAL7035 (other materials 2mm. Epoxy powder coating.	stallation cubicles on reques	t).			
Earthing Mounting arrangement Enclosure IP class Enclosure material and colour Panel thickness and treatment Cooling method		P20 to IP42 for indoor installa	Mechanical features (cubicle) Free-standing cubicle. tion (other classes or outdoor in grey RAL7035 (other materials 2mm. Epoxy powder coating. Forced air or heat exchanger.	stallation cubicles on reques	t).			
Earthing Mounting arrangement Enclosure IP class Enclosure material and colour Panel thickness and treatment		P20 to IP42 for indoor installa Galvanized steel, light	Mechanical features (cubicle) Free-standing cubicle. tion (other classes or outdoor in grey RAL7035 (other materials 2mm. Epoxy powder coating.	stallation cubicles on reques or colours on request).	t).			

