Grid Solutions

LV COMPENSATION & FILTERING PRODUCTS

Providing Power Quality and Energy Efficiency

Low Voltage (LV) reactive power compensation and harmonic filtering solutions help customers to improve the performance of installations through energy savings and better power quality, enabling end users to save money and reduce the environmental impact of their operations.

GE Vernova offers compensation equipment, a wide range of products and one-off solutions at low voltage levels. Specialists analyse the exact needs of the application and engineer the rightsolutions for optimal efficiency and economy.

APPLICATIONS	PRODUCTS	CUSTOMER TYPES
Real-time harmonic filtering and reactive power compensation in distorted networks	Active Filters	• Wind parks • Companies with fast variable loads like welding machinery, cranes or lifts • Electrical contractors
Reactive power compensation and harmonic filtering in distorted networks	Tuned Harmonic Filter Capacitor Banks (Automatic or Fixed)	• Buildings with non-linear loads • Industries of all kinds • Electrical contractors
Reactive power compensation and harmonic filtering in slightly distorted networks	Detuned Harmonic Filter Capacitor Banks (Automatic or Fixed)	• Buildings with non-linear loads • Industries of all kinds • Electrical contractors
Reactive power compensation in networks without harmonics	Capacitor Banks Without Reactors (Automatic or Fixed)	• Buildings of all kinds • Industries of all kinds • Electrical contractors
Basic components for all types of capacitor banks	Capacitor Units Reactors (Iron-Core) Power Factor Controllers Electronic Discharge Devices	• LV panelbuilders • LV switchboard manufacturers • Maintenance companies

Key Benefits

- Reduce harmonics
- Compact solutions
- Lower losses
- Improved power quality
- Cost saving

GE VERNOVA

NOKIAN CAPACITORS

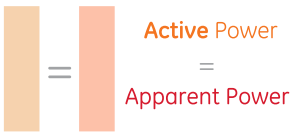
Why do we need reactive power compensation and harmonic filtering?

Reactive Power Compensation

Connected equipment (transformers, motors, air-conditioning, refrigerators, etc.) cause a phase angle between current and voltage. When the current is phase-shifted, it takes more current to deliver the same amount of active power.

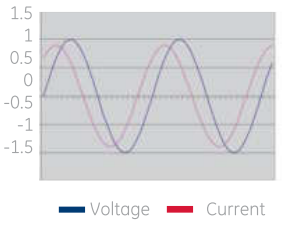
Voltage and current
▶ should be like this...

(maximum active power)



▶ but are like that.

(deteriorated active power)



Power factor = Active power / Apparent power

Dephasing between current and voltage decreases the active power (only the active power is converted into useful mechanical power)

IMPACT OF REACTIVE POWER

- Transmission equipment has to be sized for the apparent power, yet only active power is useful
- Increased losses in the network
- You pay for apparent power but use active power (higher electricity bill)
- Reactive power energy fees to customers with a low power factor installation (example < 0.95)

WHO

- Power consumers, network operators, electric utilities, power industry, hospitals, offices, public and commercial buildings, factories

SOLUTION

- The power factor of a facility can be improved by installing capacitor banks

Harmonic Filtering

Variable speed drives (process industries, lifts, air conditioning pumps, etc.), uninterruptible power supplies for computers, electronic equipment, etc. distort the current (introduce harmonics).

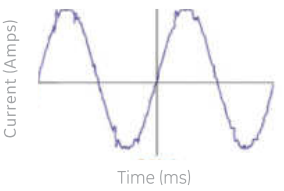
IMPACT OF HARMONICS ON TRANSMISSION / DISTRIBUTION EQUIPMENT

- Additional losses (paid for by the end user)
- Heating in power cables
- Audible noise (transformers)
- Penalty fees to customers with a low power factor (example < 0.95)

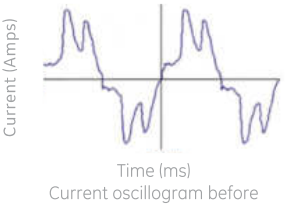
IMPACT OF HARMONICS ON EQUIPMENT CONNECTED

- Decreased machinery efficiency
- Costly process shutdowns
- Disturbed electronic equipment (computers, telephones)

Current
▶ should be like this...



▶ but is like that.



Current oscillogram before filtration

WHO

- Power consumers, network operators, power supplies, power industry

SOLUTION

- Harmonics can be filtered through a combination of reactors and capacitors (passive filtering) or by injecting the exact opposite of the harmonics detected (active filter) into the network.

Reactive Power Compensation and Harmonic Filtering Brings

ECONOMIC BENEFITS

- Saving the costs of reactive power
- Additional savings through reduced active power losses
- Reduction in investment cost

Return on investment is generally below 18 months.

ENVIRONMENTAL BENEFITS

- Reduced CO_2 emissions
  Customers see environmental benefits through energy savings and more efficient power systems.

By saving millions of tons of CO_2, power compensation makes an active contribution to protecting the environment.

N-Series Low Voltage Capacitor Units

Product Features

Capacitor elements made of metallised polypropylene film are selfhealing and dry without impregnation liquid. Each capacitor element is individually protected with patented internal fuse protection.

Capacitors have low losses, and are constructed to be compact size and light in weight. The low voltage power capacitors comply with most national and international standards.

Standard series, for 50 Hz or 60 Hz frequencies, are available for the following voltages: 220, 230, 240, 380, 400, 415, 440, 480, 525, 600, 660 and 690 V.

Other voltages up to 1,000 V are available on request.

Applications

All kinds of capacitor banks

Typical Customers

- Panel builders
- LV switchboard manufacturers

Key Advantages

- Low losses
- Compact size
- Light in weight
- Self-healing
- Easy-to-install components

Technical Data

NOKIAN CAPACITORS LOW VOLTAGE CAPACITOR UNITS	
Technical data	N-Series
Rated voltage	200 V to 1,000 V
Rated frequency	50 Hz or 60 Hz
Rated power	2.5 kvar ... 25 kvar
Output	3-phase applications
Capacitance tolerance	-5 to +10%
Insulation level	4 kV / 12 kV crest
Continuous overvoltage	1.1 x U_N
Continuous overcurrent	1.3 x U_N
Power losses	≤ 0.5 W/kvar (with discharge resistors)
Mounting arrangement	indoor
Enclosure IP class	IP42
Temperature class Average 24h Average 1 year	-40/D +45° C +35° C
Container	Painted steel container
Weight	2.6 to 4.9 kg
Color	RAL 7032 (light grey)
Standards	IEC 60831 - 1&2

L1 and L2-Series Low Voltage Capacitor Units

Product Features

Capacitor elements made of metallised polypropylene film are self-healing and dry without impregnation liquid. Each capacitor element is individually protected with patented internal fuse protection.

Capacitors come with internal discharge resistors up to 690 V (3 min. 75 V) and terminal boxes (IP42) or without terminal box (IP00). Electronic discharge devices up to 550 V are available.

Standard series, for 50 Hz or 60 Hz frequencies, are available for the following voltages: 220, 230, 240, 380, 400, 415, 440, 480, 525, 600, 660 and 690 V. Other voltages up to 1000 V are available on request.

Applications

All kinds of capacitor banks

Typical Customers

- Panel builders
- LV switchboard manufacturers

Key Advantages

- Easy and robust cable termination
- Internal discharge resistors
- Simple, safe and solid construction
- Self-healing
- Easy-to-install components

Technical Data

NOKIAN CAPACITORS LOW VOLTAGE CAPACITOR UNITS	
Technical data	L-Series
Rated voltage	200 V to 1,000 V
Rated frequency	50 Hz or 60 Hz
Rated power	2.5 kvar ... 125 kvar
Output	3 or 1-phase applications
Capacitance tolerance	-5 to +10%
Insulation level	4 kV / 12 kV crest
Continuous overvoltage	1.1 x U_N
Continuous overcurrent	1.3 x U_N
Power losses	≤ 0.5 W/kvar (with discharge resistors)
Mounting arrangement	indoor
Enclosure IP class	IP00 or IP42
Temperature class Average 24h Average 1 year	-40/D as standard (-5/D on request) +40°C +30°C
Container	Painted steel container
Weight	3.1 to 26.6 kg
Color	RAL 7032 (light grey)
Standards	IEC 60831 - 1&2

MaxSine™ Compact Active Harmonic Filters

Product Features

- Small size enables customized modular cabinet construction
- Three level hardware topology
- Two sets of current sampling hardware port design suitable for complex field harmonic filtering applications
- Multiple protection functions
- Standard component RS485, Available accessories GPRS(4G) Bluetooth wireless and mobile APP
- Clock

Applications

- Improving power quality and power factor correction in real time

Typical Grid Customers

- Datacenter
- Telecom
- Airports
- Metro lines
- Hospitals
- Commercial buildings
- Fast-changing loads (welding machines, lifts)

Key Advantages

- Real time filtering and power compensation
- Compact construction
- Improved usability
- Money savings
- Improved power quality

Technical Data

RATED OUTPUT	MaxSine™ CENTAURUS 50A 50 Arms	MaxSine™ CENTAURUS 100A 100 Arms
Main's voltages	208/400V_{AC} (200V~440V) 660/690V_{AC} (480V~750V)	
Network configuration	3-Phase 3-Wire 3-Phase 4-Wire	
Frequency	50Hz / 60Hz (±5%)	
Degree of protection	IP20 (Higher protection requirements can be customized)	
Dimensions (w.d.h) Weight	520×778×172 mm(WxDxH) 50 kg	520×778×172 mm(WxDxH) 50 kg
Network configuration	3-Phase 3-Wire; 3-Phase 4-Wire	
Electrical safety	IEC 61800-5-1	

Power Factor Controllers N-6, N-12 and NC-12

Product Features

GE Vernova's power factor controllers provide your network with efficient reactive power compensation, measurement and supervision.

User-friendliness and Condition Monitoring

User-friendliness due to multilingual user interface, clear text and symbol messages, graphics, alarm log and communication. GE Vernova's power factor controller offers advanced condition monitoring for your network as well as for the capacitor bank. The supervision and condition monitoring functions add to the simplified programming with intelligent self-set-up to ensure optimal use of the reactive power compensation system.

Applications

- Automatic reactive power control of low and medium voltage capacitor banks (tuned, detuned and conventional)

Typical Customers

- Panel builders
- LV switchboard manufacturers

Key Advantages

- Optimized user interface for easy operation
- Intelligent stepping algorithm for optimum step utilization and fast response
- All traditional stepping sequences also available
- Quick and simple mounting and wiring
- Insensitive to current transformer polarity
- Monitoring and protection
- User-friendly
- Several language versions
- Robust construction
- Various step programs

N-6 & N-12

Maximum 6 or 12 capacitor steps
Microprosessor-based technology
C/K auto search
Accuracy class 5%
Ambient temperature 0 to + 60°C
Protection class IP41 at panel and IP20 DIN-rail installation
Measurements; cosφ P, Q, S, THD(U), U,I, temperature

NC-12

Maximum 12 capacitor steps
Microprocessor-based technology
C/K auto search
Separate C/K setting for inductive and capacitive side
Accuracy class 2%
Ambient temperature 0 to + 60°C
Protection class IP41 at panel and IP20 DIN-rail installation
Measurements; cosφ, Ip, Iq, Irms/I1, P, Q, S,THD(U), U, THD(I), Is, harmonics
Communication RS48S/modbus via optional auxiliaries

For more information, visit
gevernova.com/grid-solutions

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