



Protegemos y Garantizamos la continuidad del Suministro de Energía

FACTS; Sistemas de Transmisión Flexibles de Corriente Alterna

PQvar™ Var Generator (DVG o SVG)

TDK at a glance

TDK Corporation is a leading electronics company. Our portfolio includes electronic components, modules and systems, power supplies, magnetic application products as well as energy devices, flash memory application devices, and others. TDK focuses on demanding markets in the areas of information and communication technology and consumer, automotive and industrial electronics. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, North and South America.

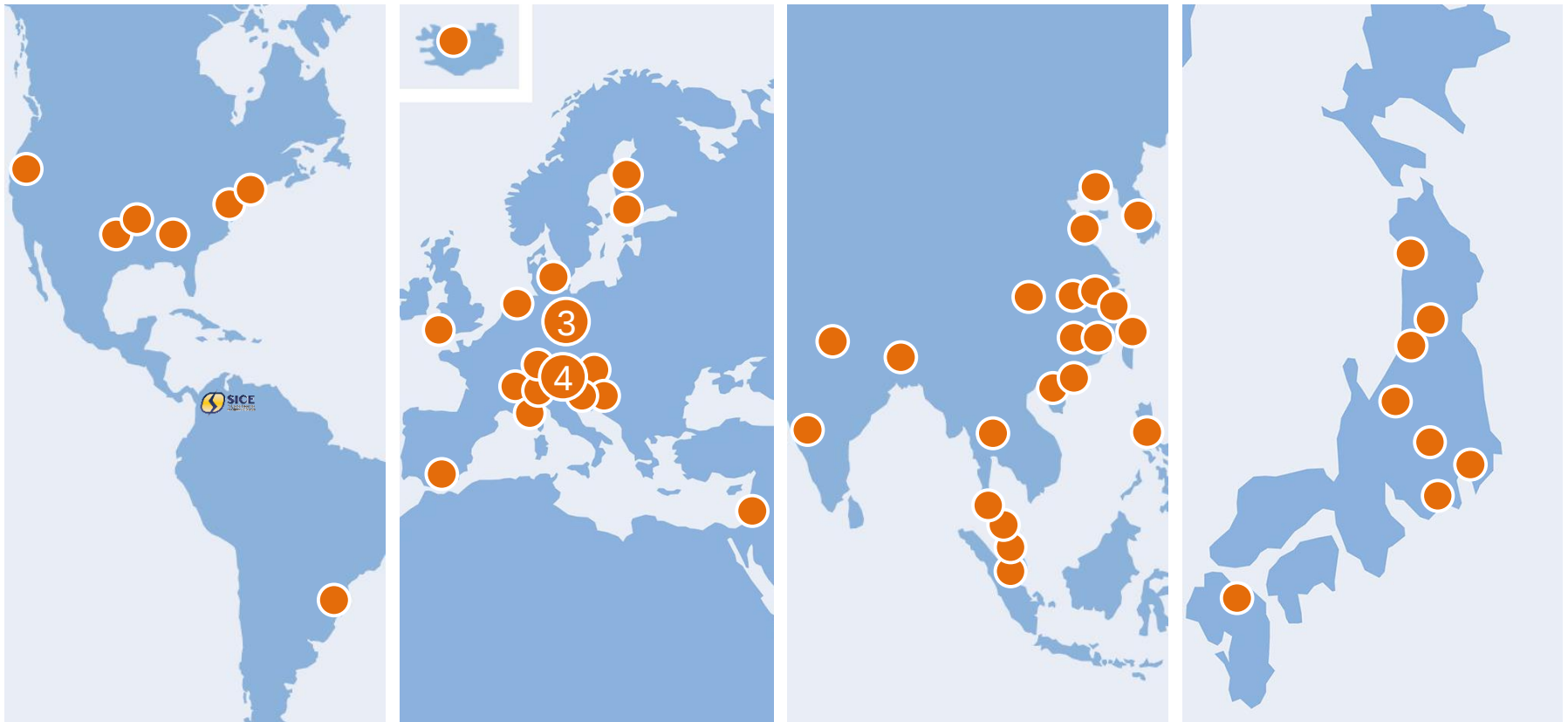
Key info (Fiscal 2016, ending March 31)		Evolution	
Business	• Passive components • Magnetic application products • Film application products • Others	1935	TDK (Tokyo Denki Kagaku Kogyo = Tokyo Electric & Chemical Industries) established in Japan to manufacture and commercialize ferrites
Headquarters	Tokyo, Japan	1986	SAE Magnetics acquired
Sales	JPY 1,152 billion	2005	Amperex Technology Limited (ATL) acquired
Sites	More than 110 factories, R&D and sales offices in more than 30 countries	2005	Lambda Power Group acquired
Employees	92,000	2007	Recording Media Business sold
		2008	EPCOS AG acquired
		2016	Micronas Semiconductor Holding AG acquired

Worldwide manufacturing and R&D presence

We are near to the customer



● TDK manufacturing and R&D sites



PQS for Applications of all Sizes and Types



■ Ventajas:

- Frecuencia Constante (50Hz, 60Hz)
- Capaces de funcionar con cargas de alto contenido armónico.
- Rangos de tensiones; 163 – 793 Voltios.
- Ideal para cargas desbalanceadas.
- No se afectan por sags o sobre tensiones.
- Controlan la energía reactiva inductiva y capacitiva.

■ Cargas Típicas:

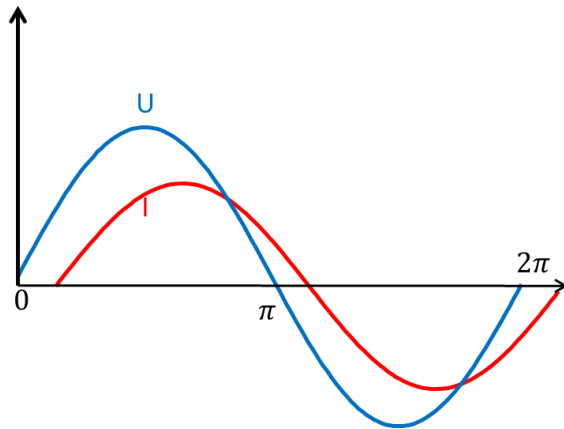
- Rectificadores.
- Variadores de Velocidad.
- UPS (uninterruptable power supplies)
- Iluminacion Electronica.
- SMPS (switched mode power supplies)
- Hornos de inducción.
- Equipos de soldadura.



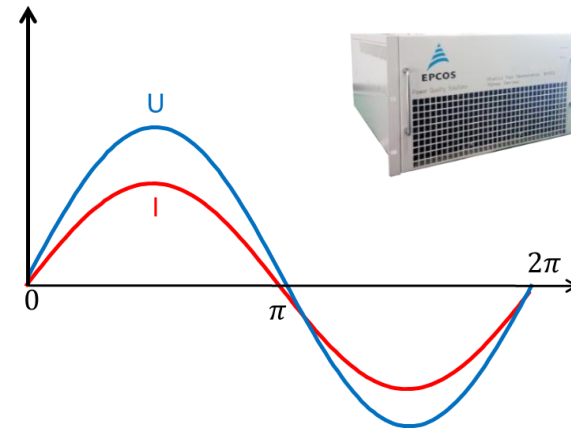
PQvar™ SVG – Static Variator Generator (SVG)

El SVG o DVG PQvar, es capaz de seguir la señales de corriente y compensar tanto la energía reactiva inductiva como la capacitiva.

Without PQvar™ SVG



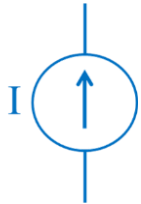
With PQvar™ SVG



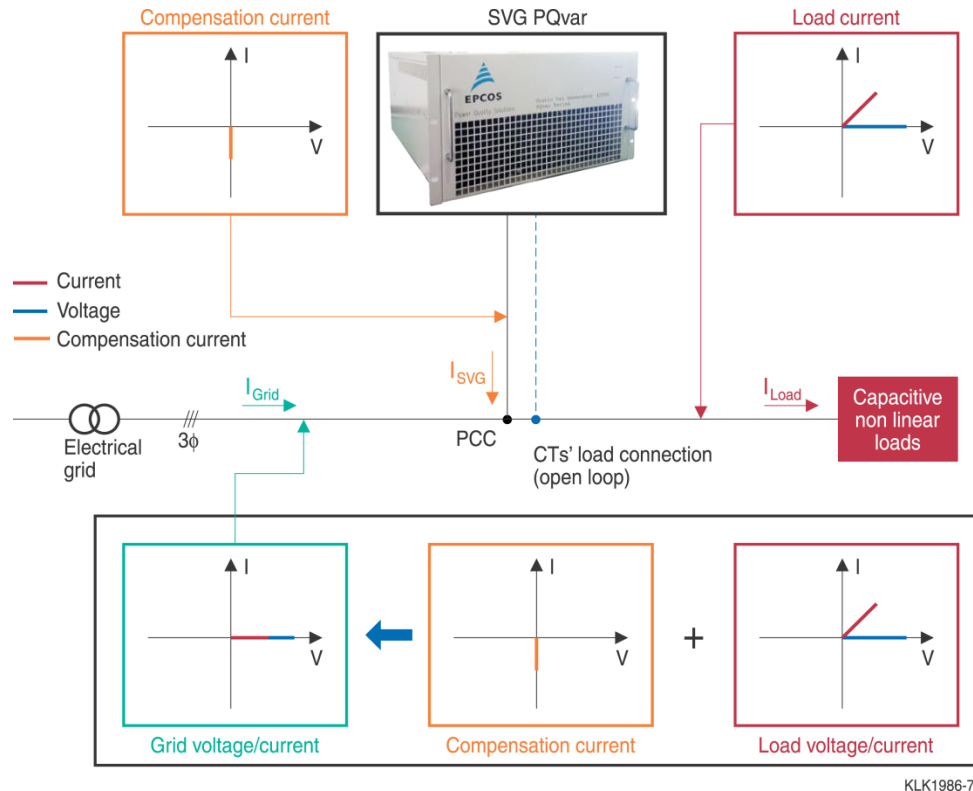
Features of PQvar™ (SVG/DVG)

- ✓ PQvar SVG can be considered as controllable reactive current source, power factor value can be achieved more **than > 0.99**, meanwhile, no over and under-compensation happens.
- ✓ **Extremely rapid dynamic compensation**, reaction time is less than 50 μ s, state response time is less than 15 ms.
- ✓ PQvar SVG output reactive power, no need the traditional capacitor bank, no change of system impedance; it means that no resonant could happen. SVG is an active compensation device; this **reactive current generator can avoid resonance**.
- ✓ PQvar SVG can **compensate both inductive reactive power and capacitive reactive** power, when installed with traditional capacitor banks, it can compensate reactive power in any scope.
- ✓ PQvar SVG is an active power compensation device in which its compensation is almost not affected by the grid. Thus, **if the system voltage drops down, PQSine SVG can compensate the required reactive power tracking power quality requirements**.
- ✓ PQvar SVG real compensation capacity is equal to the installed capacity, and reaches the same compensation result, **SVG installed capacity can be 20% to 30% lower compare to capacitor banks**.

Principle of operation of PQvar™ SVG(DVG)

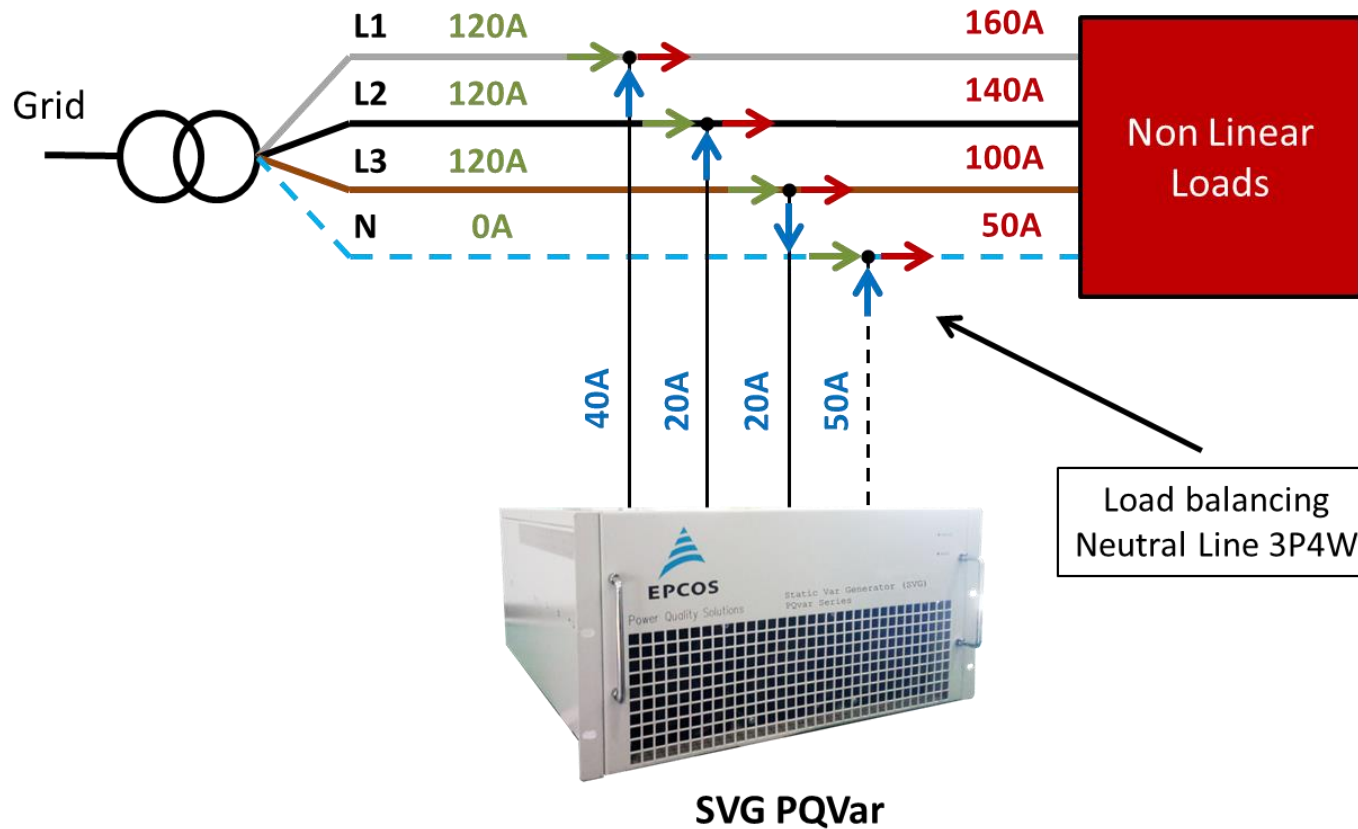


SVG generates a compensation current working as a dynamic current source, monitoring the Power Factor value of power system, and generate real- time compensation current in order to ensure to reach the set target $\cos \phi$.



PQvar™ SVG load balancing for 3P3W and 3P4W

SVG PQvar can balance load between phases and unloaded neutral wire for input voltage connection systems such as three phase wires (3P3W) and three phase four wires (3P4W). Therefore, it is suitable for applications with unbalanced loads and reactive power as present in industry, electricity distribution in rural areas and much more.

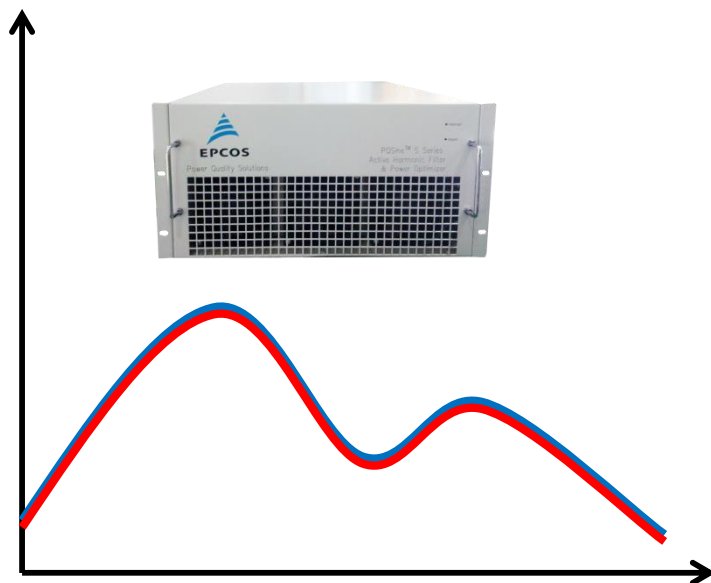


PQvar™ SVG - active power factor correction

Step less active power factor correction with very fast response time

Active PFC with PQvar

- Step less power factor correction
- Ultra Fast reaction within microseconds

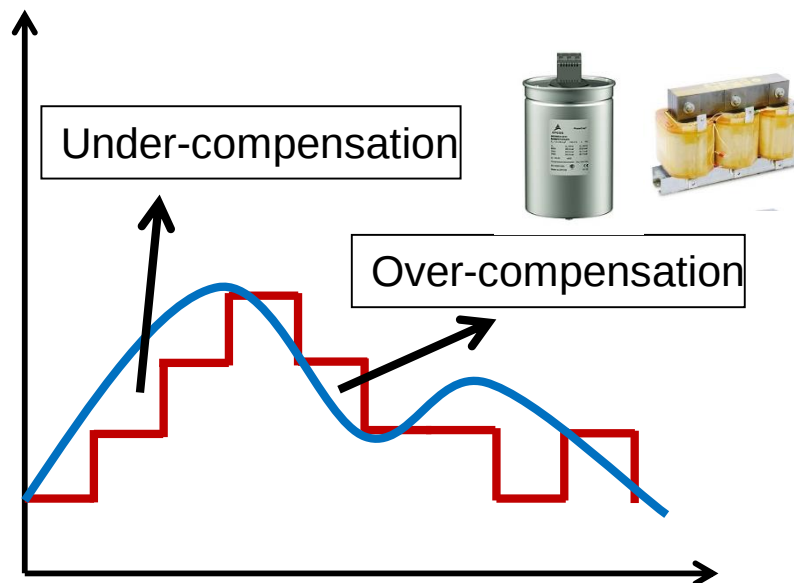


Load reactive demand in the application

PQSine compensation capacity

Traditional reactive compensation with capacitor steps:

- Because of stepwise switching may cause over-compensation and/or under-compensation.



Load reactive demand in the application

Capacitor step compensation capacity

Technical parameters for LV - PQvar™ SVG

Technical data and specifications of Low Voltage SVG PQvar series

Rated voltage	220, 440, 460, 480, 690V	
Mains frequency	50/60 Hz (range: 45~63 Hz)	
Input phase voltage range	-40%~+20%	
Parallel operation	Unlimited	
Overall efficiency	> 97%	
Power Grid structure	3P3W / 3P4W	
Current Transformers	150/5 ~ 10000/5	
Circuit topology	3-level	
Single-module compensation capacity	30/50 Kvar	100, 120, 200, 250 Kvar
Response time	< 15ms	
Target power factor	Adjustable from -1 to 1	
Cabinet Mounting	Floor-mounted, wall-mounted, and container	
Module net weight	35kg	48kg
Dimensions (wxdxh mm)	30kvar: 440x445x150 (module) 50kvar: 500x510x190 (module)	100kvar: 500x470x270 (module)
Cooling mode	Smart air cooling: 220L/sec	Smart air cooling: 405L/sec
Communication ports	RS485, CAN, and network port	
Communication protocols	Modbus and PMBus	
Noise level	< 65dB (depending on the model)	
Protection functions	Over-voltage, under-voltage, short-circuit, inverter bridge inverse, over-compensation, and so on	
Operating temperature	-10 to +40° C; temperature típica de operación?	
Relative humidity	5%~95%, non-condensing	
Protection class	IP20 (other IP classes are customizable)	
Panel color	RAL7035 light grey	
Altitude	1500 m. Between 1500 m to 4000 m, according to GB/T3859.2, the power decreases by 1% for every additional 100 m.	
General safety requirements for SVG use and operation area	EN 50178:1997/IEC 50178:1997	
SVG EMC requirements	EN 61000_6_2(2005)/EN55011, GROUP1, CLASS A; IEC 61000_6_2(1999)/CISPR11, GROUP1, CLASS A	
SVG performance requirements	EN 50091-3/IEC 62040-3/AS 62040-3(VFI SS 111)	

Display of ordering codes for LV - PQvar™ SVG

SVG Module



Wall-mounted panel



Floor-mounted panel



100kvar: 500x470x270 (module)

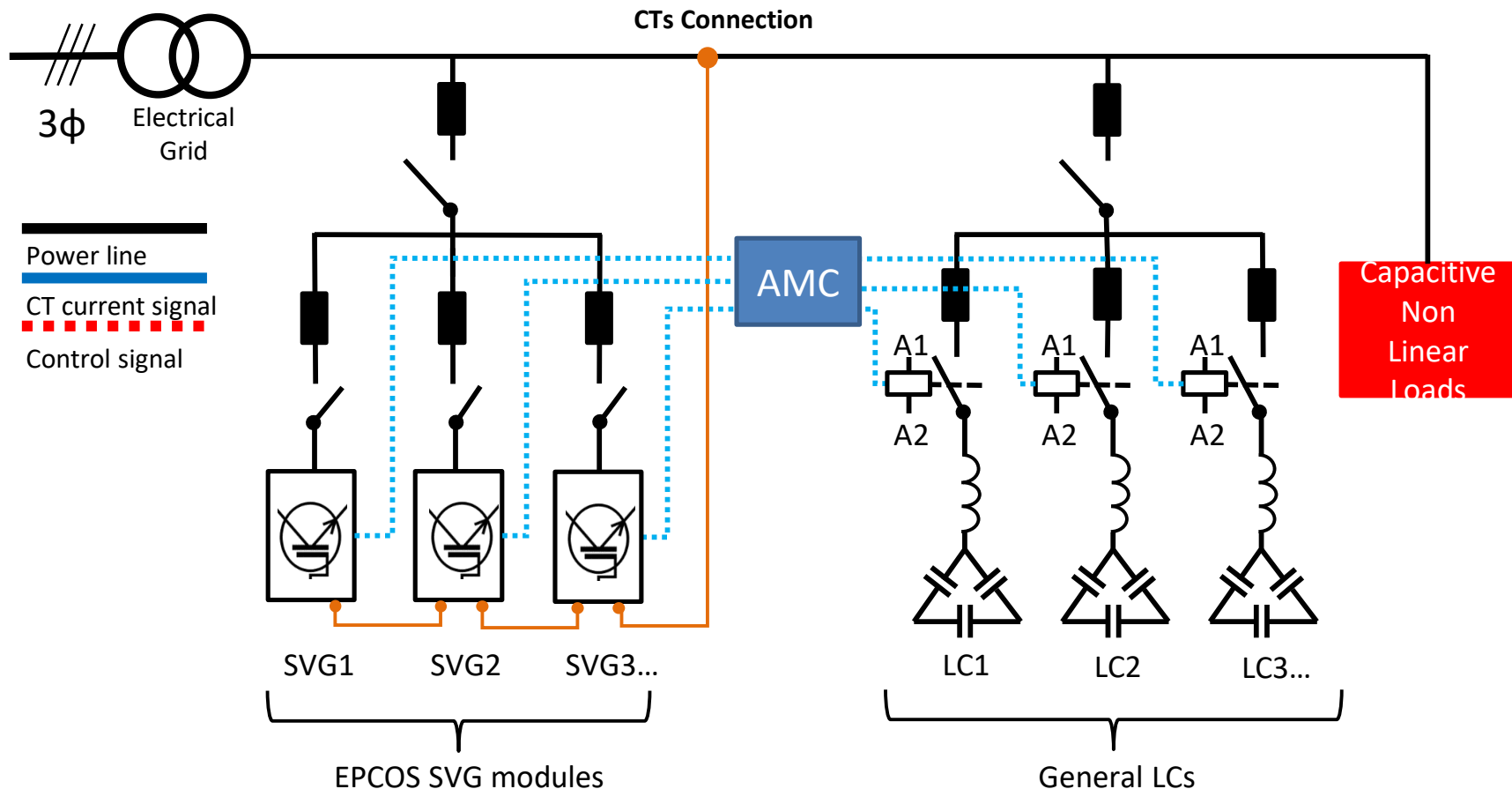
Advanced Multi Controller (AMC) Unit



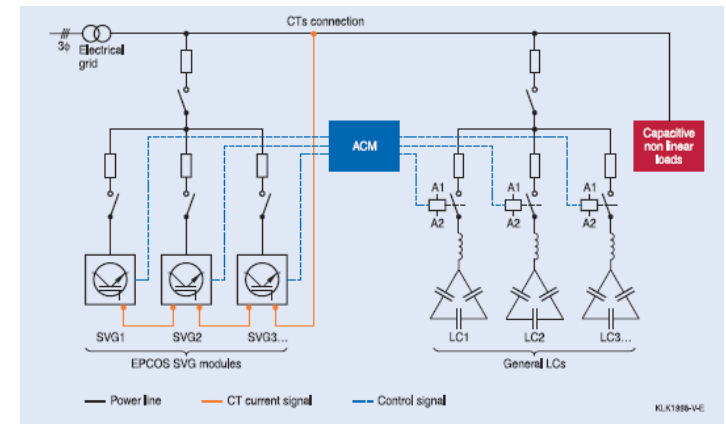
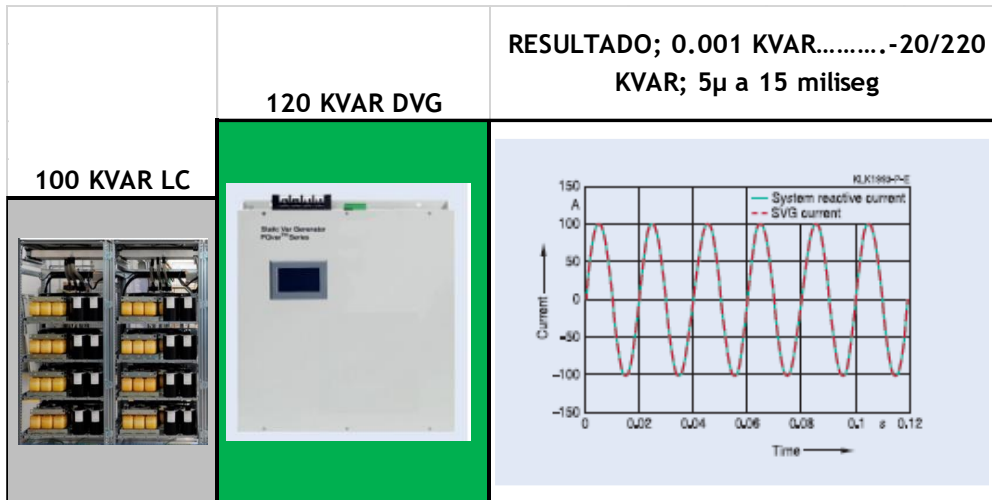
Technical data and specifications of Advanced Multi Controller (AMC) Unit

Operating voltage	24VDC
Target PF	-1 to 1
Reactive power compensation rate	>99% (target PF is 1)
Response time	<15ms
Reaction time	<50 μ s
Compensation method	Three-phase/split/mixed compensation
Capacitor switching method	Stack/normal/cycle/intellectual
Switching manner	Auto/manual
Temperature detection	Measuring system's operating temperature or ambient temperature
Fan controlling dry contact	Controlling SVC cooling fan
Alarm indicator dry contact	For reserved external alarm indicator
Control output contact	Control outputs, up to 18 at most; Contact support: 120VAC/10A, 220VAC/8A, 400VAC/3A, 110VDC/0.2A, 60VDC/0.6A, 24VDC/5A; Level signal: 12VDC/30ma
Communication protocol	MODBUS
Display	7-inch touch screen

Operating principle of SVG with LC banks and AMC



Operating principle of SVG with LC banks

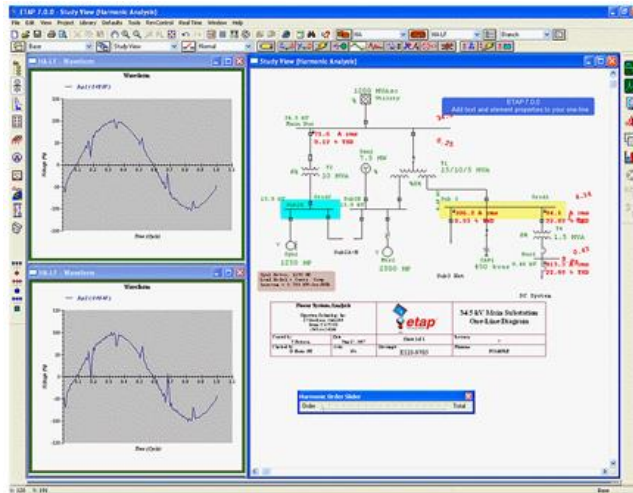


Logramos soluciones Híbridas conservamos las ventajas de velocidad y compensación a un menor costo.

Requerimientos para el diseño de la solución

Hay dos requerimientos:

1. Medición de parametros electricos usando un analizador de calidad de energia, clase A, certificado con IEC 61000-4-30.
2. Simulacion software ETAP for power quality systems is used at EPCOS/TDK/ SICE



Typical applications for PQvar™ SVG



Fast reactive power suppression e.g. for:

- Data centers
- UPS systems
- Electric induction furnaces.
- Green power generation (e.g. photovoltaics and wind turbines)
- Sensitive equipment manufacturing (e.g. silicon wafer production, semiconductor production)
- Industrial production machines
- Electrical welding systems
- Plastic industry machinery (extruders, injection molders)



Reference projects & applications of FACTS PQS



Datacenters



Oil & Gas



Hospitals



Solar Farms



Airports



Automotive factories



Furnaces



High rise towers

PQvar™ SVG Advantages



Low Power losses



Very fast response time and very fast steady state time



Modular design, independently operation, easy installation & commissioning



Automatic Derating Temperature



No resonances



Best Payback in comparison with competitors with high saving cost in electricity bill



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Inquietudes?

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Muchas Gracias !