EPCOS Product Brief 2018

Power Quality Solutions

Active Harmonic Filters and Power Optimizers PQSine S Series

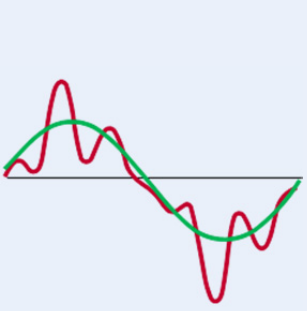
EPCOS has been offering a comprehensive range of key components for power factor correction (PFC) and power quality solutions (PQS) for many years.

In the past, most consumer loads were linear, i.e. when they were connected to a sinusoidal voltage, the current was also sinusoidal. In the meantime, the use of power electronics has significantly increased. These devices are usually non-linear, i.e. when connected to a sinusoidal voltage they produce non-sinusoidal currents which may create problems for other devices.

Besides passive filters, more and more active harmonic filters are now used, especially where the PF is close to 1 and harmonic disturbances change frequently.

The PQSine S Series active filter and power optimizer from EPCOS

- Eliminate harmonics up to the 50th order
- Offer dynamic VAR compensation
- Balance the load actively to all phases
- Offer high performance
- Have three level topology
- Ensure integrated overload, overvoltage and undervoltage protection
- Ensure low life-cycle costs thanks to a modular concept and low losses



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Active Harmonic Filters and Power Optimizers PQSine S Series

The cleaner your grid, the higher your benefit

EPCOS active harmonic filters and power optimizers help to eliminate harmonic pollution from the grid, reduce power quality problems and use energy more efficiently and reliably.

Harmonic pollution is a growing problem with the increasing use of power electronics and non-linear loads (such as variable speed drives, UPS, computers, servers, TV sets, etc.).

The presence of harmonics increases the RMS current in power networks. The circulation of harmonic currents through the system impedance creates voltage harmonics which produce voltage distortions and thus deteriorate the quality of the supply voltage. This leads to higher operating and energy costs, production/process downtimes, over-heating and malfunction of equipment.

The active harmonic filters PQSine S Series from EPCOS are based on the latest state of the art in power electronics technology. They are installed in parallel to the polluting loads. The active filter analyzes the line current and its associated harmonics and generates a compensation current which neutralizes the harmonic currents and creates an almost sinusoidal waveform (see Figure 1).

Figure 2 shows the total current harmonic distortion without AHF PQSine S Series. Figure 3 shows the result with activated AHF PQSine S Series, namely a cleaner grid.

In addition to eliminating the harmonics, the AHF PQSine S Series active filter and power optimizer also actively balances the loads to all three phases, performs dynamic VAR compensation and even some transient compensation. These features avoid line resonance and ensure high performance and reliability.

Active harmonic filter

Figure 1: Principle of active filter

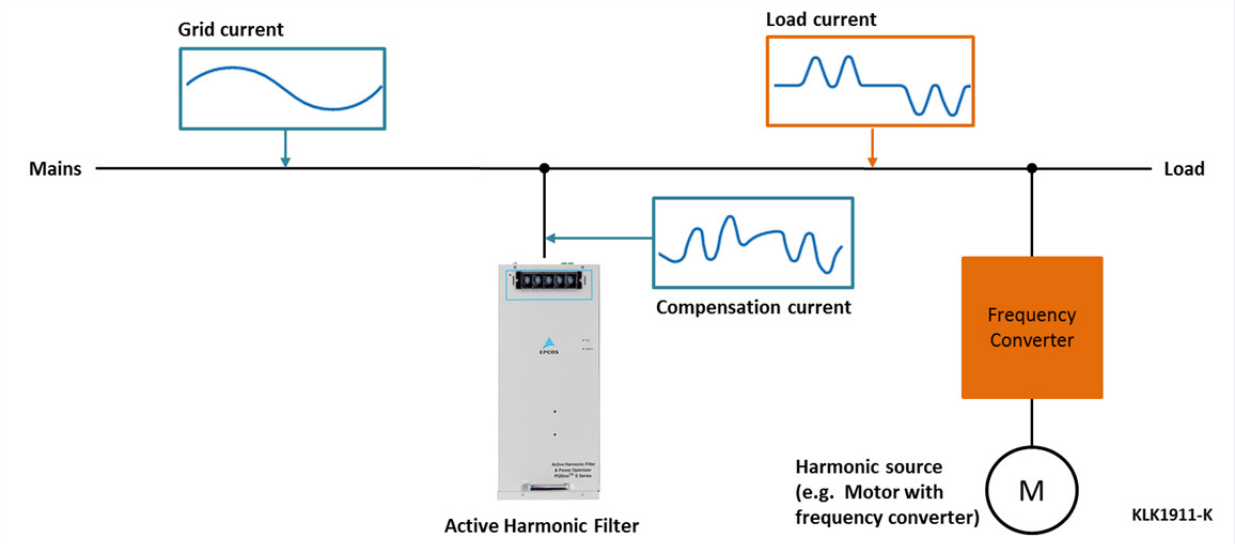


Figure 2: Total harmonic current distortion without active filter

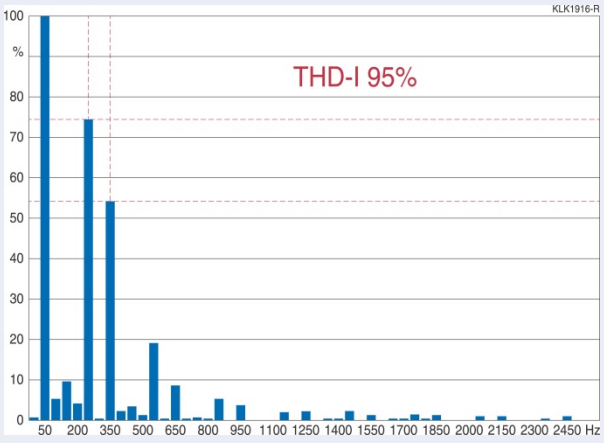
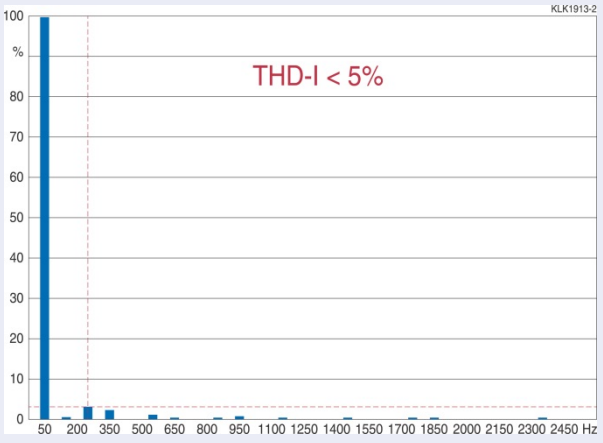


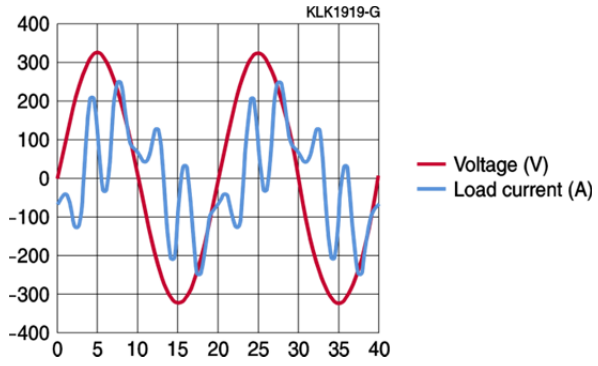
Figure 3: Total harmonic current distortion with active filter



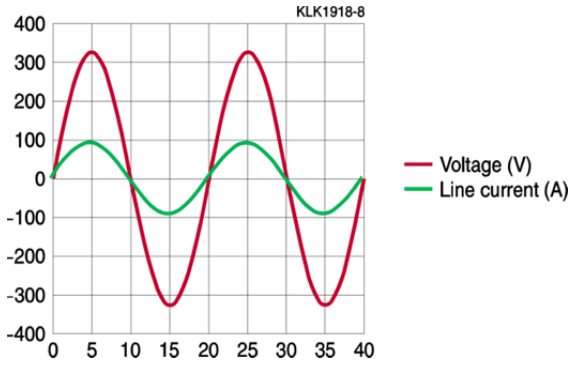
Active Harmonic Filters and Power Optimizers PQSine S Series

Active harmonic filter

Without AHF PQSine S Series
Harmonic disturbances caused by e.g. actively non-linear loads



With AHF PQSine S Series
Reactive power harmonic oscillations are compensated



General information

The PQSine S Series is an active harmonic filter system designed to eliminate harmonic oscillations and consequently reduce costs. AHF PQSine S Series monitors the current signal and compensates the unwanted elements of the measured current. Thus, the filter ensures harmonic suppression independently of the number of loads. It also corrects the power factor, improving the system efficiency while reducing harmonic pollution.

Features

- Harmonic compensation up to 50th harmonic (individually selectable)
- Ultra-fast reactive power compensation (inductive and capacitive)
- Load balancing between phases and unloaded neutral wire
- Compact design, 3 level topology
- Modular system extendable
- Grid resonance detection
- Digital Control of FFT algorithm, intelligent FFT algorithm, instantaneous reactive algorithm
- Ethernet and Ethercat system for interconnection
- User-friendly menu operation
- High performance and reliability
- Insensitive to network conditions

Typical applications

Fast current harmonics and reactive power suppression e.g. for:

- Data centers
- UPS systems
- 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)
- Office buildings and shopping centers (3rd and triple harmonic cancellation and neutral conductor unloading)

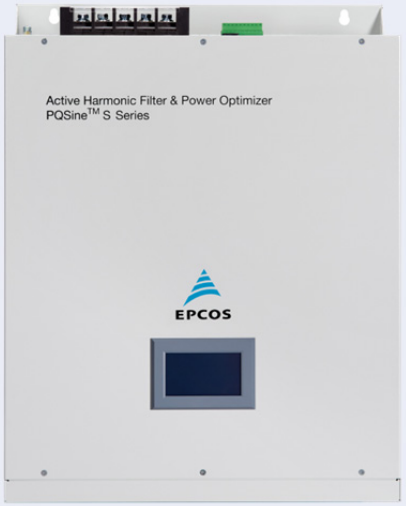
Safety features

- Highest safety and reliability
- Overload protection
- Internal short-circuit protection
- Overheating protection
- Overvoltage and undervoltage protection
- Inverter bridge protection
- Resonance protection
- Fan fault alarm

Active Harmonic Filters and Power Optimizers PQSine S Series

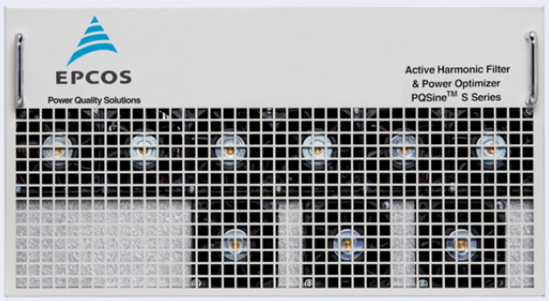
Depending on your needs, EPCOS offers either complete panels, wall mounted cabinets or modules. The state of the art modular design of PQSine S Series offering the advantage that in case of service, the downtime keeps at a minimum.

Wall-mounted panel

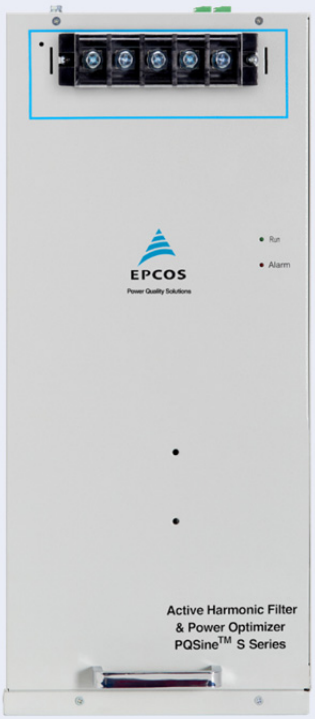


Floor-mounted panel

Horizontal module



Vertical module



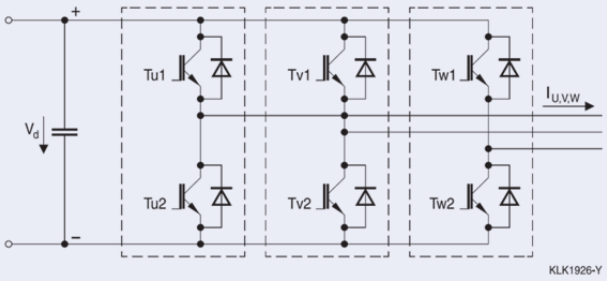
Active Harmonic Filters and Power Optimizers PQSine S Series

Advantages of AHF PQSine S Series three-level NPC topology

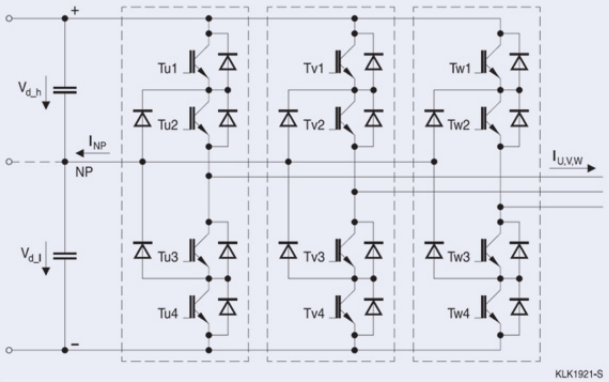
The AHF PQSine S Series range operates on the basis of a three-level Neutral-Point-Clamped (NPC) topology circuit. As can be seen from the diagrams below, the conventional two-level circuit configuration consists of 6 IGBTs (two IGBT power devices in each phase leg and current path). In case of a three-level topology, the circuit configuration consists of 12 IGBTs (four IGBT power devices in each phase leg and current path).

The three-level NPC circuit can produce three voltage levels at the output: the DC bus plus voltage, zero voltage and DC bus negative voltage. The two-level topology can only connect the output to either the plus bus or the negative bus. It also ensures higher quality and better harmonics of the line-to-line output voltage, thus reducing the output filter requirement and the associated costs.

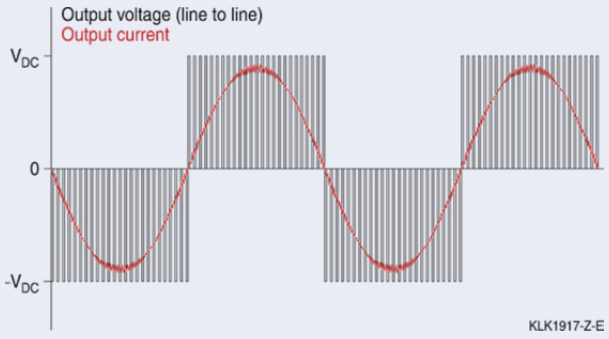
Two-level topology circuit:



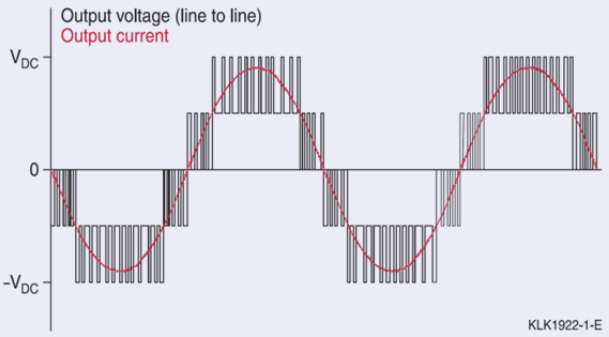
Three-level NPC topology circuit:



Current and switched output voltage for a two-level topology:



Current and switched output voltage for a three-level NPC topology:



Main advantages of the three-level NPC topology are:

- Lower losses: only half of the voltage has to be switched, thus reducing the switching losses in the transistor. Three-level solutions are characterized by reduced circuit losses and higher efficiency, thus supporting energy-saving concepts.
- Smaller output current ripple: the NPC three-level topology has a lower ripple in the output current and half of the output voltage transient thanks to a higher quality output voltage. This improves performance and reduces the internal filter requirement.

Active Harmonic Filters and Power Optimizers PQSine S Series

Technical data and specifications			
Rated voltage	380 V (228 … 456 V)	480 V (384 … 552 V)	690 V (480 … 790 V)
Mains frequency	43…62Hz		
Filter current	25, 35, 50, 60, 100, 150 A	75, 90 A	75, 90 A
Neutral filtering capability	3 times the rated filter current (in case of 4 wire device)		
Harmonic current compensation range	2^{nd} to 50^{th} harmonic order, or specified harmonics 0 to110%		
Rate of harmonic reduction	> 97% *)		
Typical power losses	<3% (depending of the load)		
Target power factor	Adjustable from -1 to 1		
Switching / Control frequency	20 kHz/20 kHz		
Reaction time	Approx. 20 µs		
Overall response time	< 5 ms		
Harmonic compensation	Available		
Reactive power compensation	Available		
Unbalance compensation	Available		
Display	All systems include a 7" TFT color control / display unit (touch screen)		
Communication ports	RS485 and network port (RJ45)		
Communication protocols	Modbus (RTU), TCP/IP(Ethernet)		
Fault alarm	Available, max. 500 alarm records		
Noise level	< 56dB (depending on the model)	< 65dB(depending on the model)	
Protection functions	Overvoltage, undervoltage, short-circuit, inverter bridge inverse, overcompensation		
Operating temperature	-10 to +40 °C without derating		
Relative humidity	5 to 95%, non-condensation		
Cooling	75,151,300,405 L/sec (25-35,50-60,75-100, 150 A)	359 L/sec	
Protection class	IP 20 according to IEC 529 (customizable)		
Panel color	RAL7035 light grey		
Altitude	1500; 1% up 1500 m. Between 1500 m to 4000 m, according to GB/T3859.2, the power decreases by 1% for every additional 100 m		
Qualifications	CE, IEEE 61000	CE, ETL (UL 508 and CSA C22.2 # 2014), IEEE 61000	
Compliance with standards	IEEE 519, ER G5/4		

*) For typical harmonic order distortions

Active Harmonic Filters and Power Optimizers PQSine S Series

400 V PQSine S Series – 3P4W systems*)							
Type	Rated filter current A	System min. /max. voltage V		Mounting variant	Approx. weight kg	Approx. dimensions (WxDxH) mm	Ordering code
PQSW4025S344	25	228	456	Wall-mounted	18	440x150x470	B44066F4025S344
PQSW4035S344	35	228	456	Wall-mounted	18	440x150x470	B44066F4035S344
PQSW4050S344	50	228	456	Wall-mounted	35	440x190x610	B44066F4050S344
PQSW4060S344	60	228	456	Wall-mounted	35	440x190x610	B44066F4060S344
PQSW4100S344	100	228	456	Wall-mounted	46	440x232x625	B44066F4100S344
PQSW4150S344	150	228	456	Wall-mounted	48	500x270x585	B44066F4150S344
Vertical mounting variant							
PQSF4100S310	100	228	456	Floor-mounted	270	1000x600x2200	B44066F4100S310
PQSF4150S310	150	228	456	Floor-mounted	305	1000x600x2200	B44066F4150S310
PQSF4200S310	200	228	456	Floor-mounted	310	1000x600x2200	B44066F4200S310
PQSF4250S310	250	228	456	Floor-mounted	345	1000x600x2200	B44066F4250S310
PQSF4300S310	300	228	456	Floor-mounted	350	1000x600x2200	B44066F4300S310
Horizontal mounting variant							
PQSF4100S315	100	228	456	Floor-mounted	276	600x1000x2200	B44066F4100S315
PQSF4150S315	150	228	456	Floor-mounted	278	600x1000x2200	B44066F4150S315
PQSF4200S315	200	228	456	Floor-mounted	313	600x1000x2200	B44066F4200S315
PQSF4250S315	250	228	456	Floor-mounted	324	600x1000x2200	B44066F4250S315
PQSF4300S315	300	228	456	Floor-mounted	326	600x1000x2200	B44066F4300S315
PQSF4350S315	350	228	456	Floor-mounted	361	600x1000x2200	B44066F4350S315
PQSF4400S315	400	228	456	Floor-mounted	372	600x1000x2200	B44066F4400S315
PQSF4450S315	450	228	456	Floor-mounted	374	600x1000x2200	B44066F4450S315
PQSF4500S315	500	228	456	Floor-mounted	392	600x1000x2200	B44066F4500S315
PQSF4550S315	550	228	456	Floor-mounted	420	600x1000x2200	B44066F4550S315
PQSF4600S315	600	228	456	Floor-mounted	422	600x1000x2200	B44066F4600S315

*) All systems include a 7" TFT color control / display unit (touch screen). External current transformers are not included.

Active Harmonic Filters and Power Optimizers PQSine S Series

400 V PQSine S Series - 3P3W systems*)							
Type	Rated filter current A	System min. /max. voltage V		Mounting variant	Approx. weight kg	Approx. dimensions (WxDxH) mm	Ordering code
PQSW3025S344	25	228	456	Wall-mounted	18	440x150x470	B44066F3025S344
PQSW3035S344	35	228	456	Wall-mounted	18	440x150x470	B44066F3035S344
PQSW3050S344	50	228	456	Wall-mounted	35	440x190x610	B44066F3050S344
PQSW3060S344	60	228	456	Wall-mounted	35	440x190x610	B44066F3060S344
PQSW3100S344	100	228	456	Wall-mounted	46	440x232x625	B44066F3100S344
PQSW3150S344	150	228	456	Wall-mounted	48	500x270x585	B44066F3150S344
Vertical mounting variant							
PQSF3100S310	100	228	456	Floor-mounted	270	1000x600x2200	B44066F3100S310
PQSF3150S310	150	228	456	Floor-mounted	305	1000x600x2200	B44066F3150S310
PQSF3200S310	200	228	456	Floor-mounted	310	1000x600x2200	B44066F3200S310
PQSF3250S310	250	228	456	Floor-mounted	345	1000x600x2200	B44066F3250S310
PQSF3300S310	300	228	456	Floor-mounted	350	1000x600x2200	B44066F3300S310
Horizontal mounting variant							
PQSF3100S315	100	228	456	Floor-mounted	276	600x1000x2200	B44066F3100S315
PQSF3150S315	150	228	456	Floor-mounted	278	600x1000x2200	B44066F3250S315
PQSF3200S315	200	228	456	Floor-mounted	313	600x1000x2200	B44066F3200S315
PQSF3250S315	250	228	456	Floor-mounted	324	600x1000x2200	B44066F3250S315
PQSF3300S315	300	228	456	Floor-mounted	326	600x1000x2200	B44066F3300S315
PQSF3350S315	350	228	456	Floor-mounted	361	600x1000x2200	B44066F3350S315
PQSF3400S315	400	228	456	Floor-mounted	372	600x1000x2200	B44066F3400S315
PQSF3450S315	450	228	456	Floor-mounted	374	600x1000x2200	B44066F3450S315
PQSF3500S315	500	228	456	Floor-mounted	392	600x1000x2200	B44066F3500S315
PQSF3550S315	550	228	456	Floor-mounted	420	600x1000x2200	B44066F3550S315
PQSF3600S315	600	228	456	Floor-mounted	422	600x1000x2200	B44066F3600S315

*) All systems include a 7" TFT color control / display unit (touch screen). External current transformers are not included.

690 V PQSine S Series - 3P3W systems*)							
Type	Rated filter current A	System min. /max. voltage V		Connection variant	Approx. weight kg	Approx. dimensions (WxDxH) mm	Ordering code
PQSF3150S615	150	480	790	Floor-mounted	325	600x1000x2200	B44066F3150S615
PQSF3225S615	225	480	790	Floor-mounted	425	600x1000x2200	B44066F3225S615
PQSF3300S615	300	480	790	Floor-mounted	500	600x1000x2200	B44066F3300S615

*) All systems include a 7" TFT color control / display unit (touch screen). External current transformers are not included.

Active Harmonic Filters and Power Optimizers PQSine S Series

400 V PQSine S Series – modules							
Type	Rated filter current A	System min. /max. voltage V		Connection variant	Approx. weight kg	Approx. dimensions (WxDxH) mm	Ordering code
Vertical mounting variant							
PQSM4025S303	25	228	456	3P4W	18	150x440x450	B44066F4025S303
PQSM4035S303	35	228	456	3P4W	18	150x440x450	B44066F4035S303
PQSM4050S303	50	228	456	3P4W	35	190x440x540	B44066F4050S303
PQSM4060S303	60	228	456	3P4W	35	190x440x540	B44066F4060S303
PQSM4100S303	100	228	456	3P4W	46	230x440x550	B44066F4100S303
PQSM4150S303	150	228	456	3P4W	48	270x500x510	B44066F4150S303
Horizontal mounting variant							
PQSM4025S300	25	228	456	3P4W	18	484x490x150	B44066F4025S300
PQSM4035S300	35	228	456	3P4W	18	484x490x150	B44066F4035S300
PQSM4050S300	50	228	456	3P4W	35	484x590x190	B44066F4050S300
PQSM4060S300	60	228	456	3P4W	35	484x590x190	B44066F4060S300
PQSM4100S300	100	228	456	3P4W	46	484x600x230	B44066F4100S300
PQSM4150S300	150	228	456	3P4W	48	540x560x270	B44066F4150S300
Vertical mounting variant							
PQSM3025S303	25	228	456	3P3W	18	150x440x450	B44066F3025S303
PQSM3035S303	35	228	456	3P3W	18	150x440x450	B44066F3035S303
PQSM3050S303	50	228	456	3P3W	35	190x440x540	B44066F3050S303
PQSM3060S303	60	228	456	3P3W	35	190x440x540	B44066F3060S303
PQSM3100S303	100	228	456	3P3W	46	230x440x550	B44066F3100S303
PQSM3150S303	150	228	456	3P3W	48	270x500x510	B44066F3150S303
Horizontal mounting variant							
PQSM3025S300	25	228	456	3P3W	18	484x490x150	B44066F3025S300
PQSM3035S300	35	228	456	3P3W	18	484x490x150	B44066F3035S300
PQSM3050S300	50	228	456	3P3W	35	484x590x190	B44066F3050S300
PQSM3060S300	60	228	456	3P3W	35	484x590x190	B44066F3060S300
PQSM3100S300	100	228	456	3P3W	46	484x600x230	B44066F3100S300
PQSM3150S300	150	228	456	3P3W	48	540x560x270	B44066F3150S300

Active Harmonic Filters and Power Optimizers PQSine S Series

480 V PQSine S Series ETL approved modules *)							
Type	Rated filter current A	System min. /max. voltage V		Connection variant	Approx. weight kg	Approx. dimensions (WxDxH) mm	Ordering code
Horizontal mounting variant							
PQSM4075S408	75	384	552	3P4W	66	544x640x250	B44066F4075S408
PQSM4090S408	90	384	552	3P4W	66	544x640x250	B44066F4090S408
PQSM3075S408	75	348	552	3P3W	66	544x640x250	B44066F3075S408
PQSM3090S408	90	348	552	3P3W	66	544x640x250	B44066F3090S408
Wall-mounted variant							
PQSM4075S448	75	384	552	3P4W	66	504x250x665	B44066F4075S448
PQSM4090S448	90	384	552	3P4W	66	504x250x665	B44066F4090S448
PQSM3075S448	75	348	552	3P3W	66	504x250x665	B44066F3075S448
PQSM3090S448	90	348	552	3P3W	66	504x250x665	B44066F3090S448

600 V PQSine S Series ETL approved modules *)							
Type	Rated filter current A	System min. /max. voltage V		Connection variant	Approx. weight kg	Approx. dimensions (WxDxH) mm	Ordering code
Horizontal mounting variant							
PQSM4075S608	75	420	690	3P4W	66	544x640x250	B44066F4075S608
PQSM4090S608	90	420	690	3P4W	66	544x640x250	B44066F4090S608
PQSM3075S608	75	420	690	3P3W	66	544x640x250	B44066F3075S608
PQSM3090S608	90	420	690	3P3W	66	544x640x250	B44066F3090S608
Wall-mounted variant							
PQSM4075S648	75	420	690	3P4W	66	504x250x665	B44066F4075S648
PQSM4090S648	90	420	690	3P4W	66	504x250x665	B44066F4090S648
PQSM3075S648	75	420	690	3P3W	66	504x250x665	B44066F3075S648
PQSM3090S648	90	420	690	3P3W	66	504x250x665	B44066F3090S648

*) The products have been tested by ETL according to UL 508 and CSA C22.2 # 2014.

Active Harmonic Filters and Power Optimizers PQSine S Series

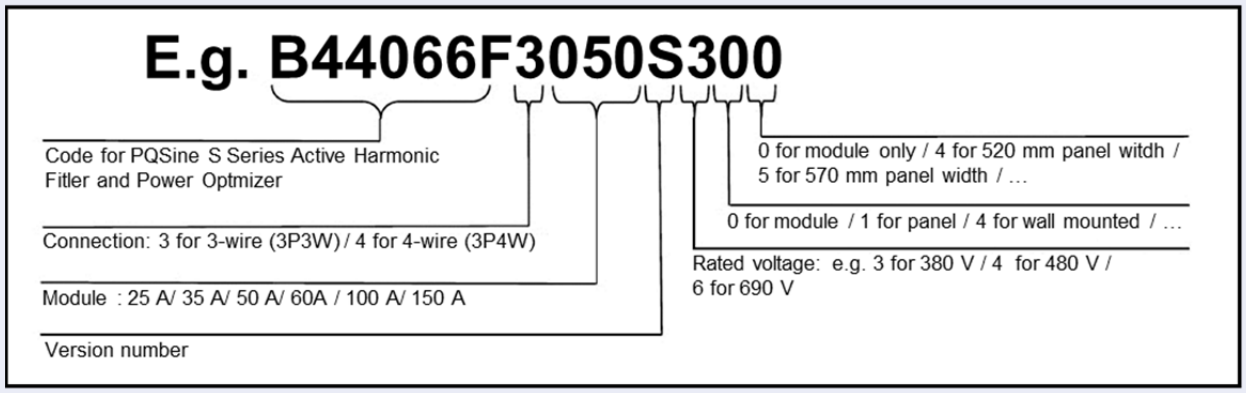
690 V PQSine S Series ETL approved modules *)							
Type	Rated filter current A	System min. / max. voltage V		Connection variant	Approx. weight kg	Approx. dimensions (WxDxH) mm	Ordering code
Horizontal mounting variant							
PQSM4075S708	75	483	793	3P4W	66	544x640x250	B44066F4075S708
PQSM4090S708	90	483	793	3P4W	66	544x640x250	B44066F4090S708
PQSM3075S708	75	483	793	3P3W	66	544x640x250	B44066F3075S708
PQSM3090S708	90	483	793	3P3W	66	544x640x250	B44066F3090S708
Wall-mounted variant							
PQSM4075S748	75	483	793	3P4W	66	504x250x665	B44066F4075S748
PQSM4090S748	90	483	793	3P4W	66	504x250x665	B44066F4090S748
PQSM3075S748	75	483	793	3P3W	66	504x250x665	B44066F3075S748
PQSM3090S748	90	483	793	3P3W	66	504x250x665	B44066F3090S748

Accessories ordering codes	
Product description	Ordering code
7” TFT HMI Color Control/Display unit, touch screen	B44066F9999S230

*) The products have been tested by ETL according to UL 508 and CSA C22.2 # 2014.

Active Harmonic Filters and Power Optimizers PQSine S Series

Ordering code nomenclature

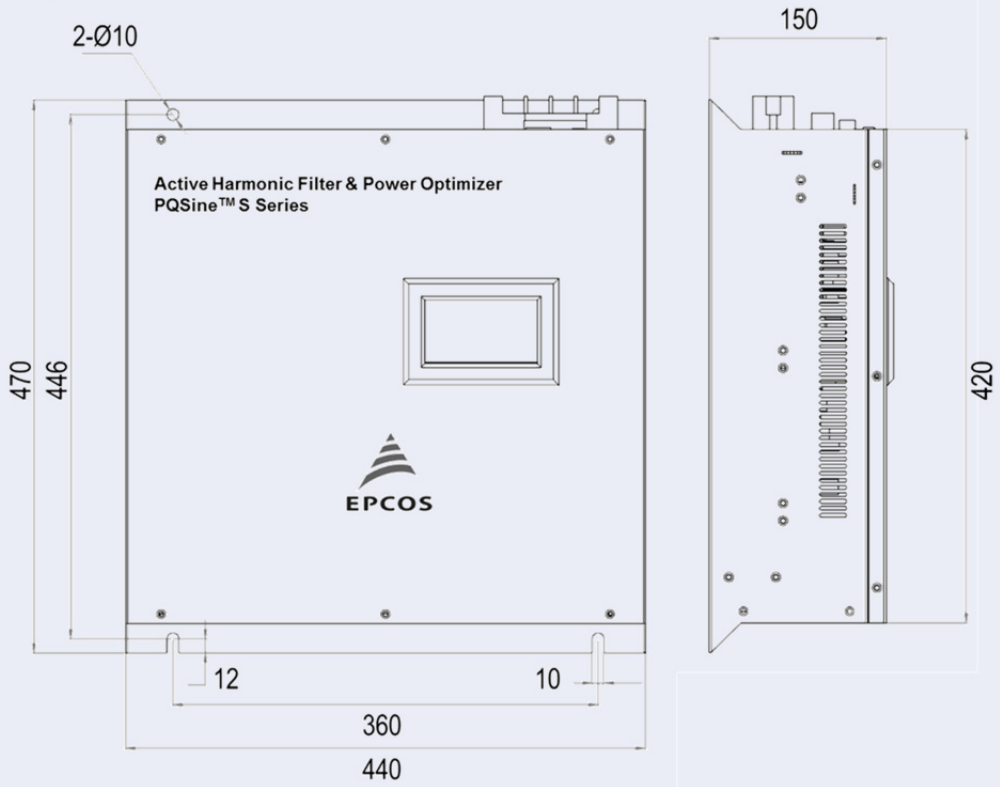


Display of ordering codes for EPCOS products
The ordering code for one and the same product can be represented differently in data sheets, data books, other publications and the website of EPCOS, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products.** Detailed information can be found on the Internet under www.epcos.com/orderingcodes

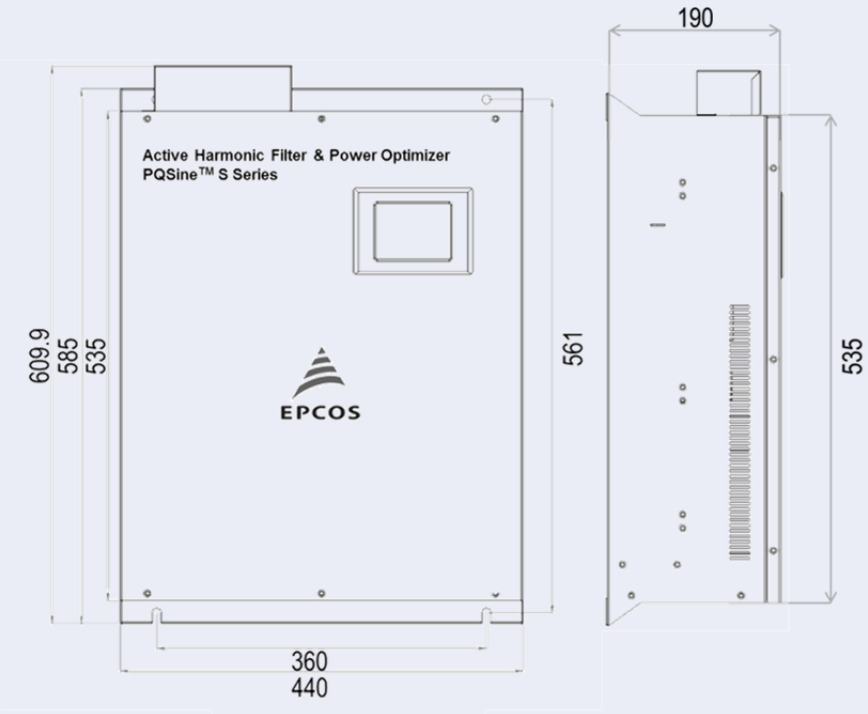
7” TFT HMI Color Control / Display unit, touch screen

Active Harmonic Filters and Power Optimizers PQSine S Series

Wall-mounted panel 25 to 35 A

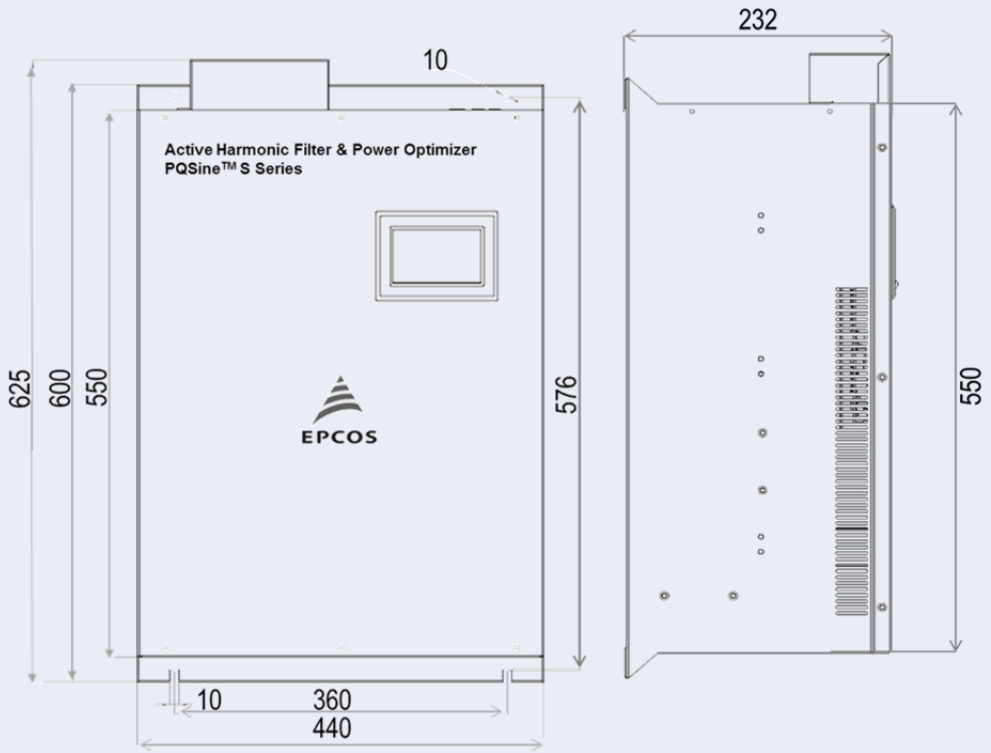


Wall-mounted panel 50 to 60 A

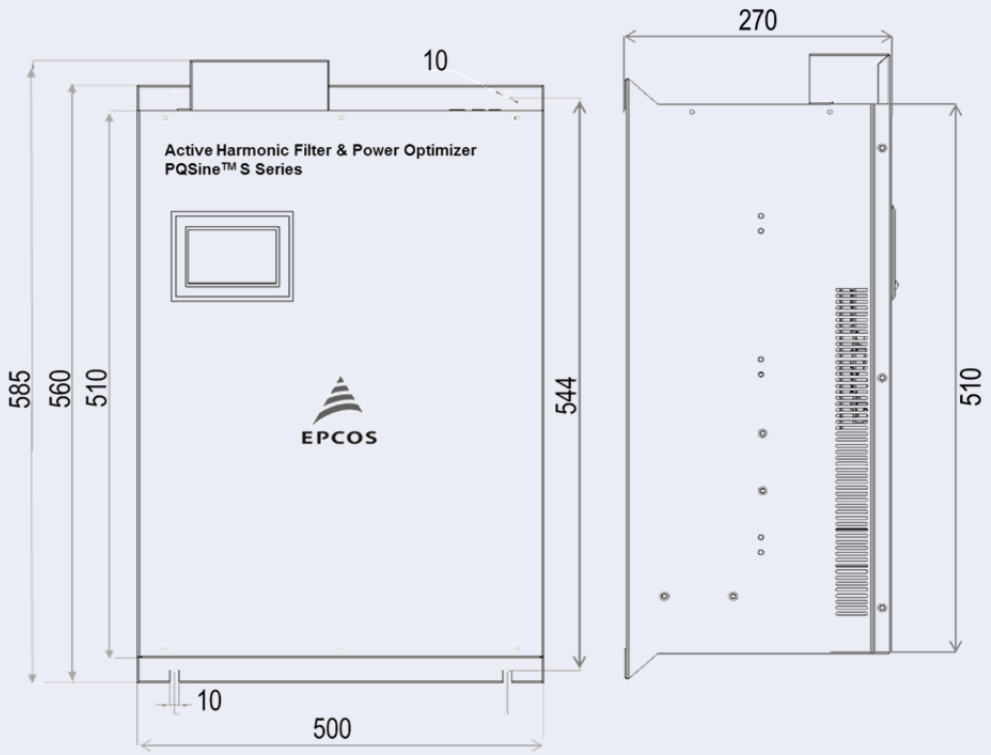


Active Harmonic Filters and Power Optimizers PQSine S Series

Wall-mounted panel 100 A

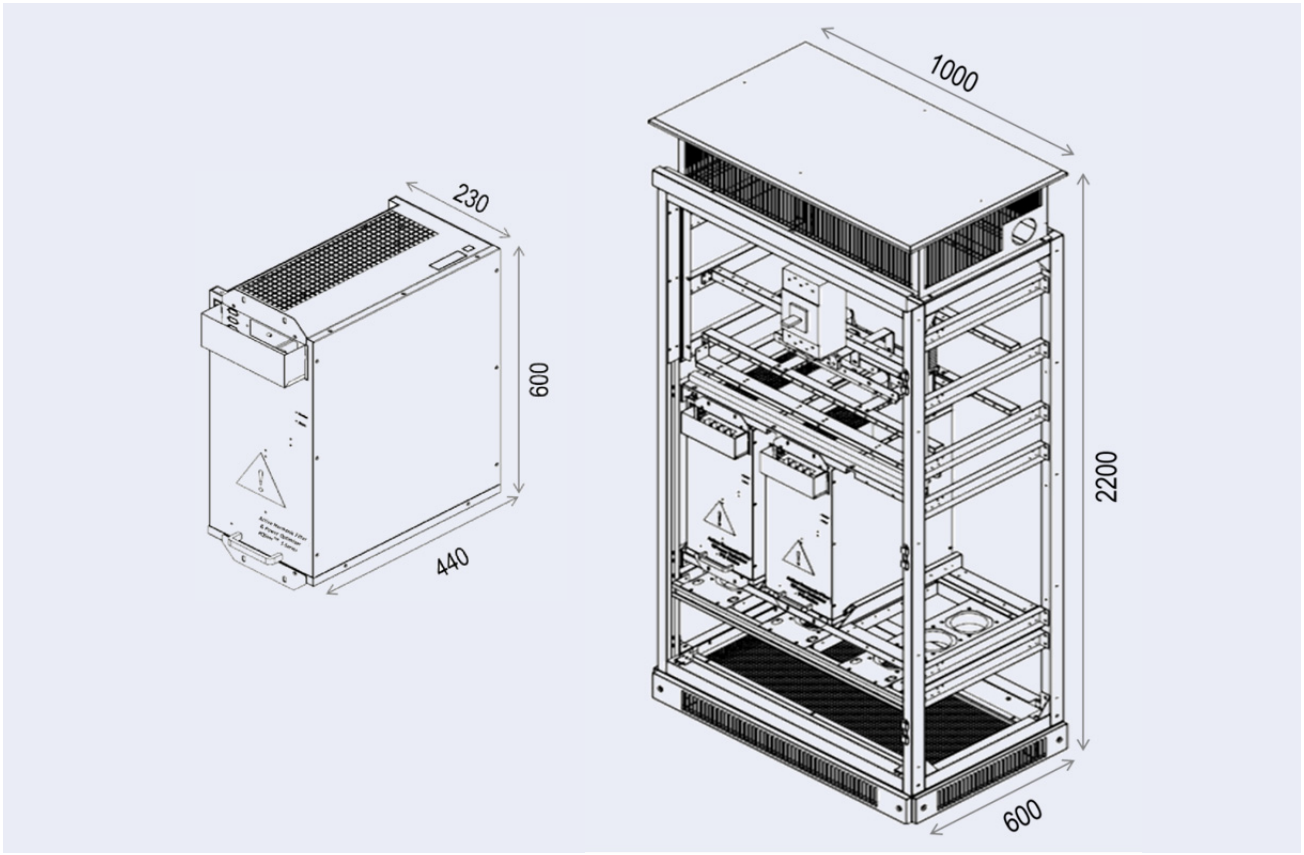


Wall-mounted panel 150 A



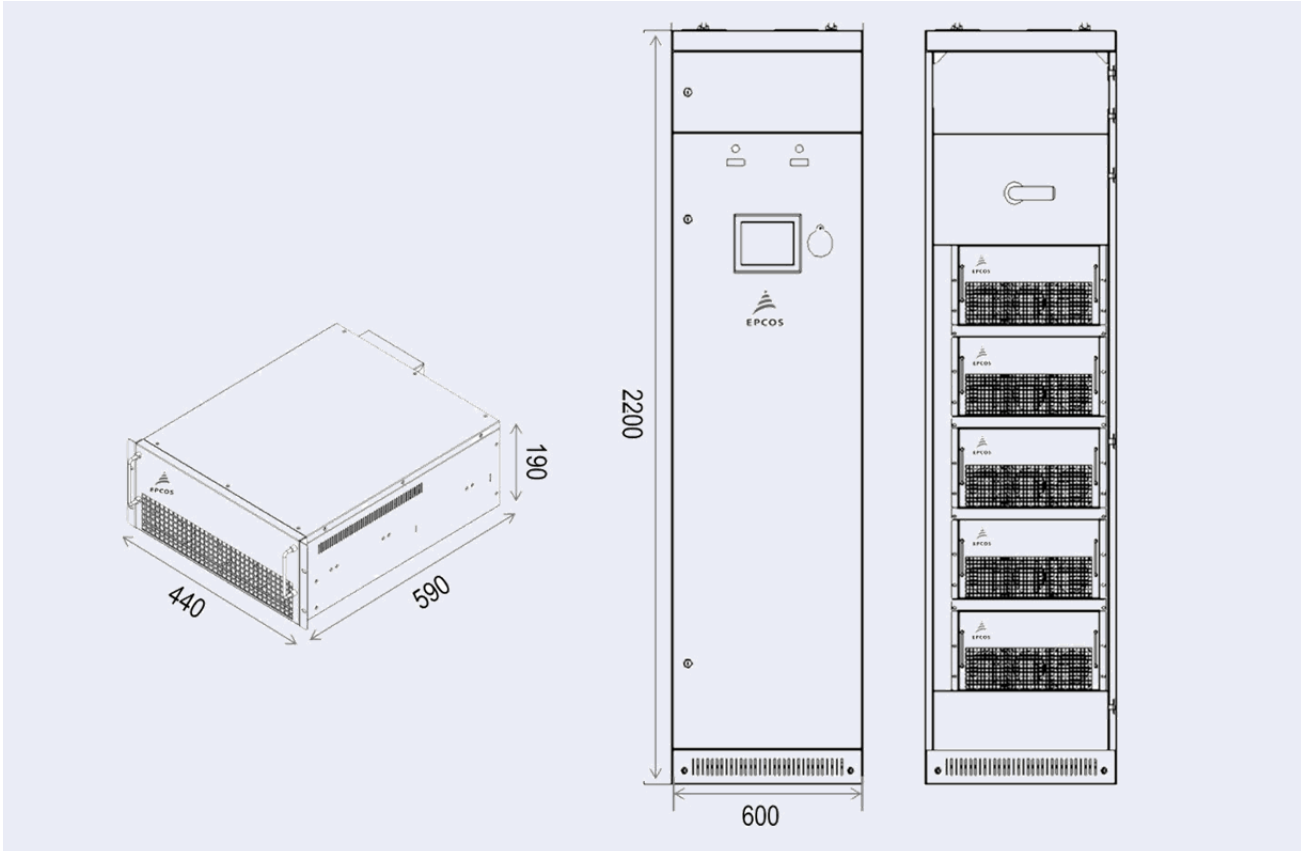
Active Harmonic Filters and Power Optimizers PQSine S Series

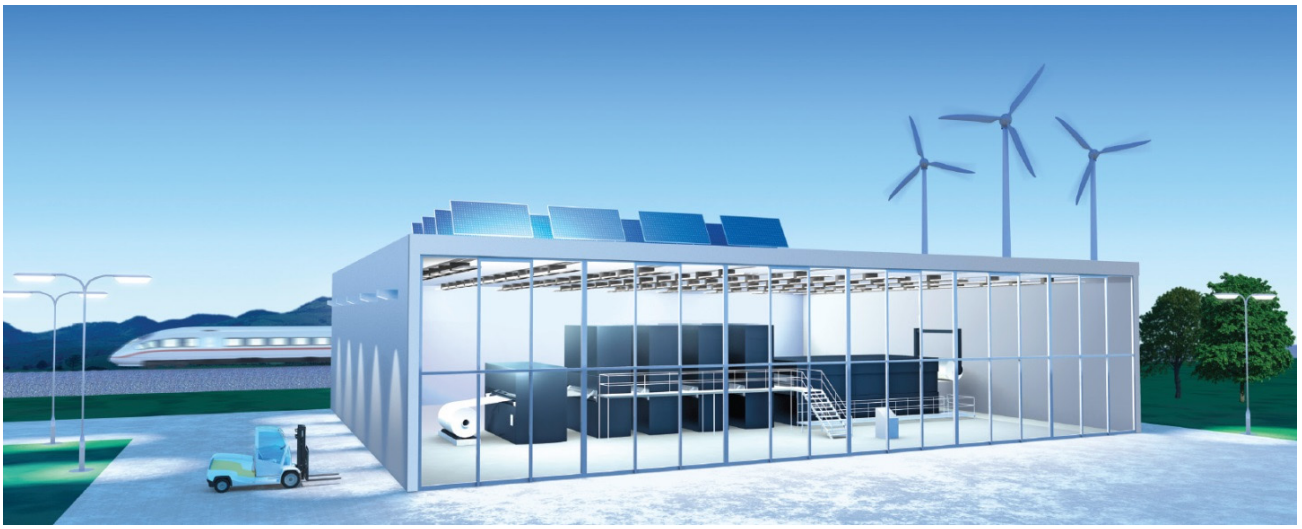
Drawings vertical mounting variant (Module 100 A / Floor-mounted panel 300 A)



Active Harmonic Filters and Power Optimizers PQSine S Series

Drawings horizontal mounting variant (Module 60 A / Floor-mounted panel 300 A)





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