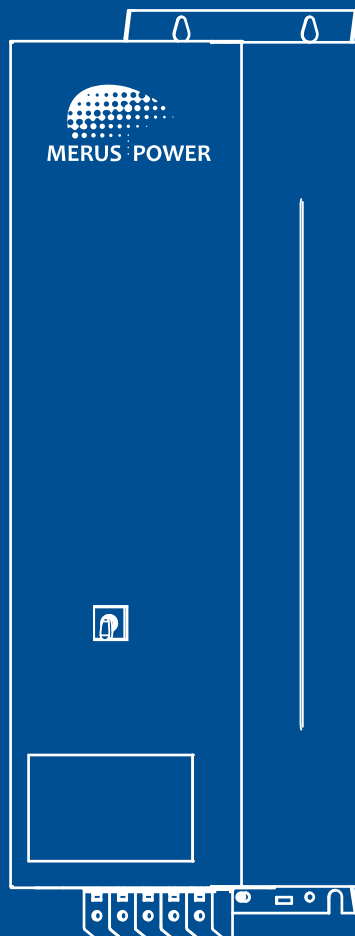


ACTIVE HARMONIC FILTERS



A2 Series

Modern, modular and super compact active harmonic filtering and dynamic reactive power compensation solution



IMPORTANCE

OF GOOD POWER QUALITY

Power quality can affect the overall company performance, which is a fact easily overlooked by the management. Merus Active Harmonic Filters provide a fast return on your investment. The quick and effective response of Merus Active Harmonic Filters to power system variations enables higher process reliability, longer equipment life, reduced energy losses and better productivity. It also makes it easy to comply with global power quality standards and demanding grid codes.

Rises in non-linear and other challenging loads in modern electrical networks present unique power quality challenges. Sensitive operations, irregular loads and isolated or weaker grids demand stricter grid codes and power quality standards to safeguard the reliability of an electrical system for smooth industrial and commercial processes. Harmonics distortions, voltage variations, poor power factor and load unbalance are among the key elements that not only test the reliability of modern electrical systems but also induce overall greater system losses.



CUSTOMER BENEFITS

- **Energy savings**
- **Higher productivity**
- **Reliable plant operation at reduced maintenance costs**
- **Longer lifetime of electrical and process equipment**
- **Additional capacity in existing electrical network**
- **Compliance with IEEE 519, G5/4, IEC 61000 3-2, 3-4 or any other power quality standards and recommendations**
- **Quick return on investment**

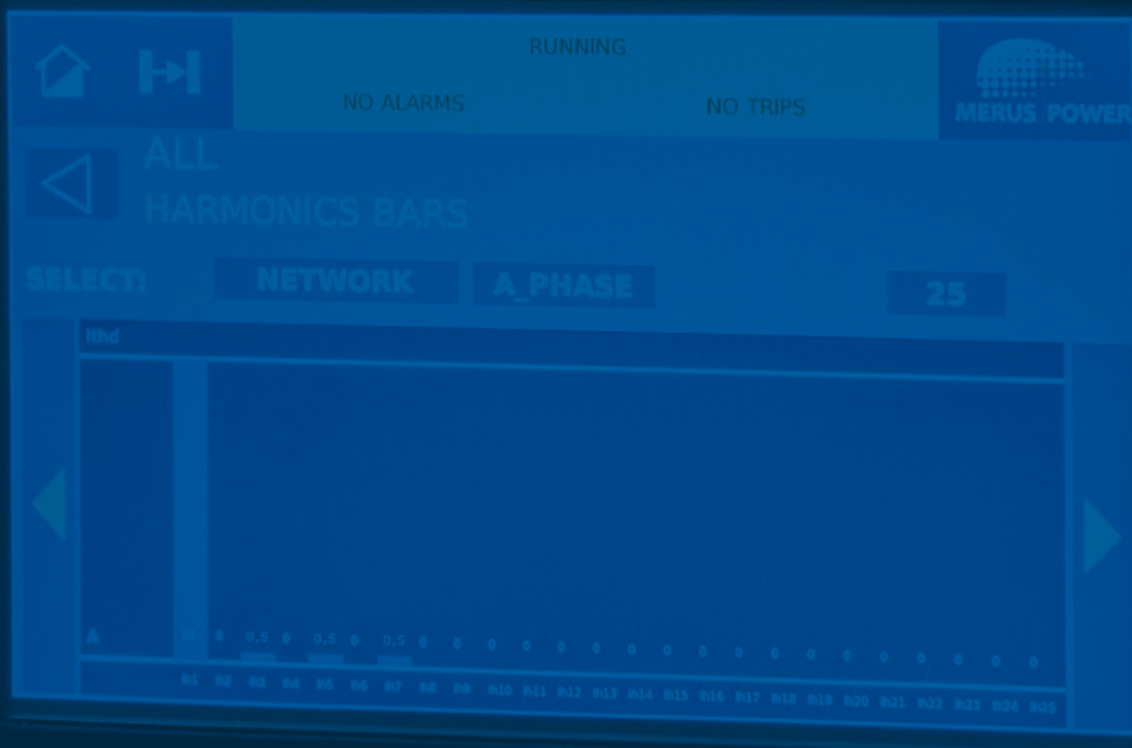
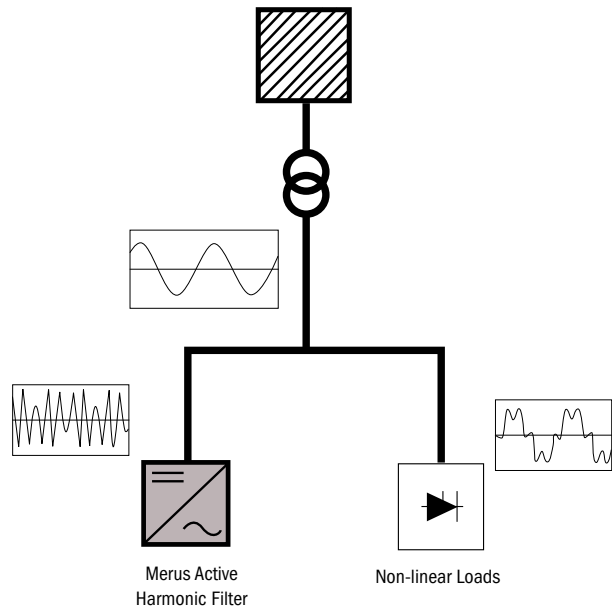
MERUS A2-SERIES

ACTIVE HARMONIC FILTERS

Merus A2-Series Active Harmonic Filters save money by improving power quality, increasing process reliability and productivity while helping to comply with power quality standards.

Merus A2-Series Active Harmonic Filters are designed for dynamic reactive power compensation and harmonic filtering. They provide an efficient solution for power quality applications in commercial and industrial facilities as well as in infrastructure.

Merus A2-series combines state-of-the-art controller built on modern 3-level topology, 7" touch-screen user interface and modular technical design. This results in a fast, reliable and compact device that is easy to operate and complies with all standard communication protocols.



FUNCTIONS

OF MERUS ACTIVE HARMONIC FILTERS

Along with effectively cancelling harmonic distortions, Merus Active Harmonic Filters are capable of solving several other power quality challenges. The selective operation mode allows tailoring of the functionality of Merus Active Harmonic Filter to meet the required performance level. Merus Active Harmonic Filters are easily configurable through the HMI to improve the power factor by injecting fundamental reactive power. Unlike conventional technologies, real time response ensures that reactive power is fed efficiently to the fast fluctuating loads such as welding machines and cranes, among others. It guarantees the mitigation of voltage variations and flicker. Load unbalancing in a 3-phase system, such as spot welding, can also be addressed with the help of Merus Active Harmonic Filters.

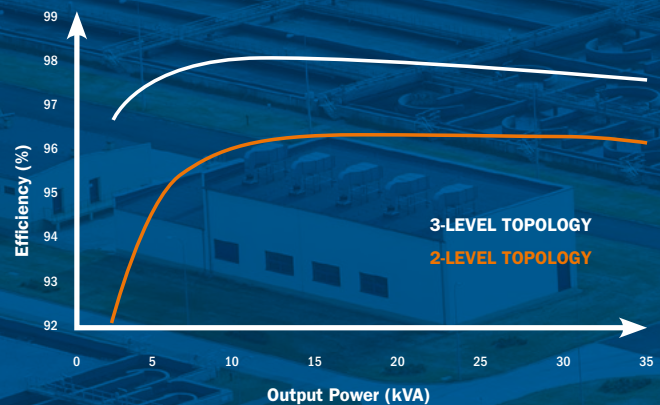
KEY FUNCTIONS

- **Active harmonic filtering**
- **Power factor correction**
- **Voltage variation control and flicker mitigation**
- **Load balancing in three-phase systems**



3-LEVEL TOPOLOGY

Merus A2-series Active Harmonic Filters are built on modern 3-level topology which brings several benefits compared to other active filters built on the conventional 2-level topology. In 3-level topology, the switching frequency and voltage stress are distributed among the two IGBTs. Reduced stress extends the lifetime of the power electronics. The efficiency achieved with 3-level topology is excellent and with lower losses. It makes the overall cost of ownership much lower compared to conventional solutions.



COMPACT DESIGN

AND EASE OF INTERGRATION

The Standard A2-series Active Harmonic Filter is in IP20 protection class module. Its extremely compact size allows easy integration into variable speed drives (VFDs) or capacitor bank cubicles. Merus Power can also deliver active harmonic filters in IP21, IP54 or others degrees of protection upon request. Furthermore, A2-series Active Harmonic Filters are also available in wall-mounted design

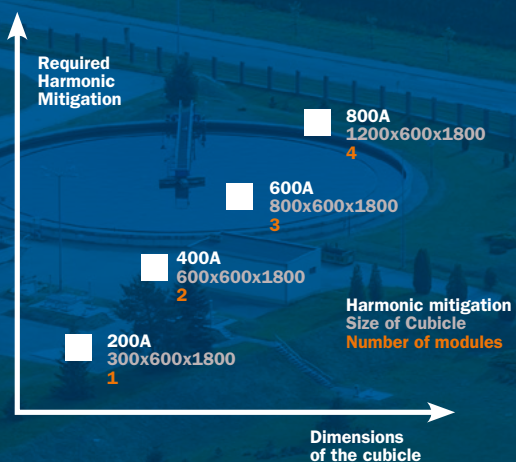
AUTOMATIC VOLTAGE & FREQUENCY SENSING WITH SMART OPERATION MODE

Merus Active Harmonic Filters come with several advanced features. When connected to the network, they automatically sense the voltage and frequency, simplifying the order and delivery processes. A2-series Active Harmonic Filters are also equipped with the built-in smart operation mode. Under low load conditions, the smart operation mode automatically turns off the IGBTs and fans reducing the operational losses and extending the lifetime of the active harmonic filters.



UNLIMITED SCALABILITY

Unlimited scalability can easily be achieved with Merus A2-series Active Harmonic Filters in both; open-loop as well as closed-loop connections. Higher harmonic compensation capacity can be achieved by adding A2-series Active Harmonic Filters modules in parallel without any technical limitations. This gives flexibility to facility engineers when more loads are added in the facilities



EASY COMMISSIONING ENABLED

WITH MODERN HMI

Merus A2-series Active Harmonic Filters are equipped with sophisticated 7" Human Machine Interface (HMI). The commissioning of the device is simple and hassle free with the help of the built-in Commissioning Wizard.

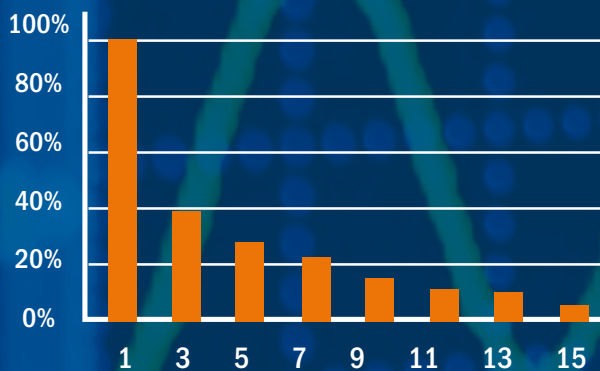
When connecting the device to the network, the active harmonic filter automatically senses the voltage and the frequency of the system. After acknowledging the voltage and the frequency of the system, the Commissioning Wizard guides the user one step at a time to parametrize the device leading to successful commissioning.



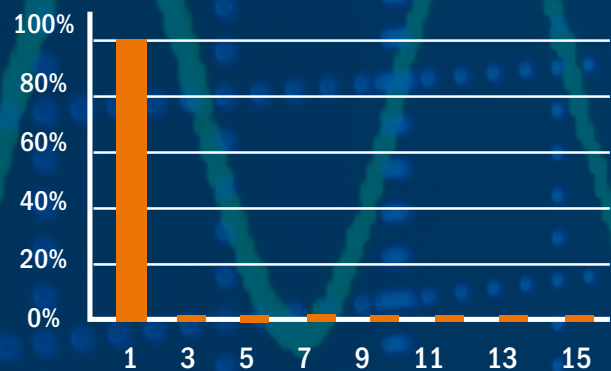
COMPREHENSIVE MONITORING AND REPORTING

Merus A2-series Active Harmonic Filters come with advanced and comprehensive monitoring & reporting features. They not only efficiently filter harmonic distortions from your electrical network but also provide you with a comprehensive power quality report from the last 30 days. It enables before and after analysis with data of harmonic distortions from both supply and load side. The device can be monitored and controlled remotely. SCADA systems can be connected to the device via Modbus TCP. The remote monitoring and controlling services open up possibilities for Internet of Things (IoT) applications.

**HARMONIC SPECTRUM BEFORE
MERUS ACTIVE FILTER**



**HARMONIC SPECTRUM AFTER
MERUS ACTIVE FILTER**



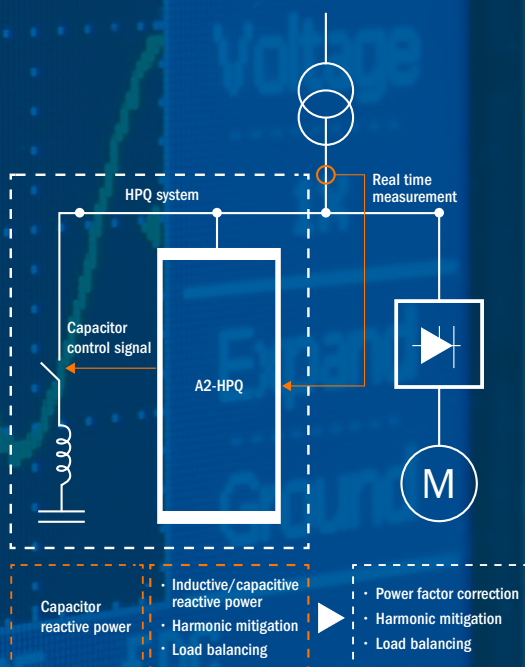
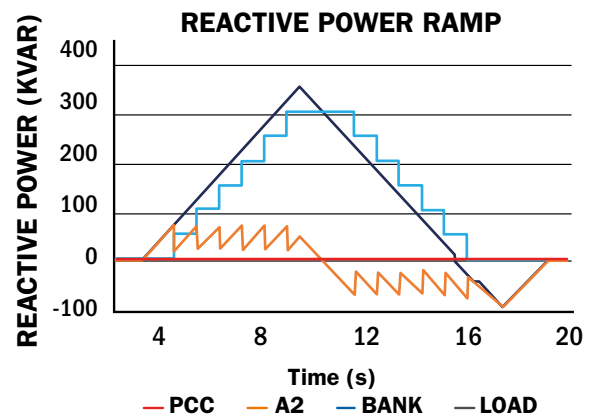
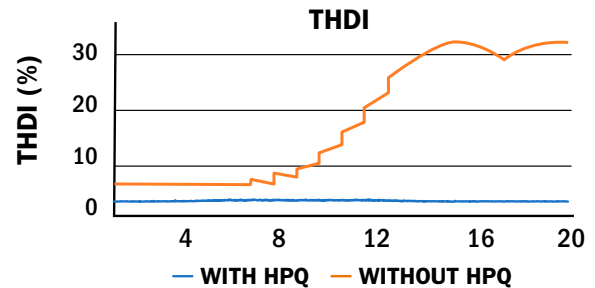
STEPLESS DYNAMIC REACTIVE POWER COMPENSATION

AT REASONABLE COST

All Merus A2 Active Harmonic Filters can be upgraded with a unique feature. An optional software extension unlocks the Hybrid Power Quality (HPQ) feature, which combines an active filter and a capacitor bank controller. The combination provides a complete power quality solution.

The HPQ controls the detuned capacitor steps to provide most of the capacitive reactive power needs, while the A2-HPQ module(s) are used to fine tune the reactive power or leading power factor compensation. At the same time the module filters out harmonic currents and symmetrize any unbalanced loads in the system.

Each HPQ-upgraded module can control up to 6 individual capacitor steps. By adding modules, the HPQ system can always maintain the target power factor through the achieved stepless reactive power control.



With stepless reactive power control and thyristor switched capacitors the HPQ can always maintain the target power factor and is an ideal solution to compensate loads, which require both dynamic reactive power and harmonics compensation, such as DC drives in heavy lifting equipment or rolling mills.

HPQ is the ultimate all-in-one solution that provides:

- **Stepless power factor correction**
- **Harmonic mitigation**
- **Unbalance correction**
- **Leading power factor compensation**
- **1:1 step ratio**
- **6 steps/module**

LOW NOISE HARMONIC FILTERING SOLUTION

Pollution comes in many forms: harmonics pollute the electrical power system, and high audible noise pollutes and disturbs people working in close proximity. Merus A2-series Active Harmonic Filters, enabled by 3-level topology, release the lowest possible audible noise among all active filters. Designed with high switching frequency and special inductor core material, Merus A2-series Active Harmonic Filters can be installed into spaces where silence is vital.

WIDE RANGE OF HARMONIC MITIGATION SOLUTION

Merus Power offers you a wide range of active harmonic filtering solutions to meet your exact needs. Merus A2-series Active Harmonic Filters are available from 200V up to 690V. Merus M-series Active Harmonic Filters are available in nominal voltage of 690V and 960V. M-series Active Harmonic Filters are powerful devices which can be used in heavy industrial applications for dynamic reactive power compensation and active harmonic filtering.



COMMERCIAL BUILDINGS

Modern commercial buildings use equipment built with Switch Mode Power Supplies (SMPS) and Uninterrupted Power Supply (UPS) systems which are sources of harmonic distortions.

In commercial buildings, single-phase loads cause triplen harmonics which are accumulated in the neutral wire. A2-series Active Harmonic Filters are available in 4W so not only do they cancel harmonics in 3 phases but also in neutral.

- Financial institutions
- Data centers
- Scientific laboratories
- Hospitals
- Telecommunication centers
- Airports
- Remote radar locations
- Amusement parks
- Shopping centers
- Ski resorts
- Residential buildings

APPLICATIONS

IN INDUSTRIES

In the manufacturing plants, the Variable Frequency Drives (VFDs) have extensively been used for the motor control purposes to save energy. However, they are one of the major sources of harmonic distortions in the network. Merus A2-series Active Harmonic Filters can effectively cancel the harmonic distortions created by variable speed drives in industrial applications. Merus A2-series Active Harmonic Filters bring power quality benefits to variety of industries including the following:

- **Paper industry**
- **Food & beverage industry**
- **Automotive industry**
- **Oil & gas industry**
- **Chemical industry**
- **Pharmaceutical industry**
- **Textile & clothing industry**
- **Steel industry**
- **Cement industry**
- **Microelectronic manufacturers**
- **Other industrial processes with AC or DC drives**



INFRASTRUCTURE

Fans, pumps, compressors and other heavy loads in modern infrastructure are often fed with variable speed drives to control the motors to save energy. Harmonic distortions are significantly higher in the presence of variable speed drives and often exceed the limits defined in global power quality standards and recommendations. Merus A2-series Active Harmonic Filters can effectively bring the harmonic distortions to the desired limits and help comply with the standards.

- **Water and waste water treatment plants**
- **District cooling plants**
- **Tunnels**
- **Metro stations**
- **Traction**
- **Wind & Solar farms**



VOLTAGE VARIATIONS CONTROL CAUSED BY DYNAMIC LOADS

Dynamic loads such as welding machines and cranes demand real time reactive power compensation to avoid voltage destabilization. Conventional power factor correction solutions are unable to answer to this demand in real-time.

Merus A2-series Active Harmonic Filters are versatile solutions capable of providing several functionalities. They can inject fundamental reactive power in the network in real time, ensuring stable voltage. They can also be used to remove voltage unbalance in the network.

- **Welding machines**
- **Cranes**
- **Crushers**
- **Winders**
- **Shredders**
- **Lifts**
- **Other dynamic loads**

TECHNICAL SPECIFICATIONS A2-SERIES

TYPE	A2-50-480	A2-100-480	A2-150-480	A2-200-480	A2-50-690	A2-100-690
Nominal current capacity	50 A	100 A	150 A	200 A	50 A	100 A
ELECTRICAL RATINGS						
Nominal voltage	3W: 200 VAC – 480 VAC , 4W: 200 – 440 VAC				3W: 500 VAC – 690 VAC 4W: 480 – 525 VAC	
Rated frequency	50/60 Hz (Auto frequency sensing)					
Max neutral wire current	150 A	300 A	450 A	600 A	150 A	300 A
Network (3-wire/4-wire)	3W/4W					
SYSTEM FEATURES						
Response time	Reaction time <50 us / Response time <100us (1x network cycle in selectable mode)					
Inverter topology	3-level NPC topology					
Switching frequency	20 kHz					
Controller	Real time digital control with FFT + Each module has independent controller. In case of parallel modules installation, the failure of one module would not interrupt the operation of remain modules.					
Harmonics filtering	2th to 50th harmonics. Fully selectable and programmable up to 25th harmonic order in “selectable” mode (standard deliveries).					
Filtering performance	Typically, <5% THDi even with most complex loads.					
Load balancing capacity	Programmable 0...100 % * IN of the module					
PF correction capacity	Programmable 0...100 % * IN of the module(lagging/leading)					
Operation modes	All harmonics/All harmonics but not fundamental/Selectable harmonics					
Smart operation modes	AutoStart, AutoAck, Stand-By					
Parallel modules	Unlimited scalability. Load is shared evenly between parallel modules					
Certificates	CE, UL 508, RoHS 2				CE, RoHs2, UL pending	
CONNECTIONS						
CT-locations	Network/load side					
Number of CT's	3 pcs / 6 pcs (see chapter 5.4)					
Minimum CT accuracy class	1.0 or better					
CT-primary/secondary	Primary: no limitations. Secondary: load currents: 1A/5A, auxiliary currents: 5A.					
Digital inputs	5 pcs potential free programmable ports. 3 pcs operational inputs selectable from the HMI in standard deliveries.					
Digital outputs	6 pcs potential free programmable ports. 4 pcs operational outputs selectable from the HMI in standard deliveries.					
INTERFACES AND HMI						
HMI / display	7” touch screen with multilingual graphical HMI					
Connections for HMI	1...7 module connections in one HMI. Unlimited number of HMIs					
Communication capability	Ethernet, USB, Modbus TCP/IP					
Software update	Ethernet/USB-drive					
Monitoring and reporting	On-site and remote monitoring capabilities. Waveforms and spectrums from both load and network sides. Diagnostics services					
MECHANICAL FEATURES						
Protection degree	IP 20 / Pollution degree 2 / Conformal coating on all PCBAs					
Enclosure material	Galvanised steel					
Cooling method	Forced air by temperature-controlled fans					
Losses	<2.3 %			<2.5%		
Typical noise at full load	60 db	64 db	67 db	68 db	67 db	68 db
Dimension (WxDxH)	225x500x850 mm³		225x500x1150 mm³			
Weight	70 kg	70 kg	110 kg	110 kg	120 kg	120 kg
INSTALLATION AND OPERATION						
Temperature	5-40 °C, without derating. Max ambient temperature 50 °C					
Altitude without derating	<1000 m, without derating					
Humidity	Maximum 85 % RH, non-condensing (operation) + Maximum 95 % RH, non-condensing (storage)					
Main cable entry	Top / Bottom					

WINNING BUSINESS WITH POWER QUALITY

Merus Power offers world-leading clean technology to improve power quality, energy efficiency and environmental performance. Our dynamic compensation solutions – active harmonic filters, UPQs, STATCOMs and SVCs – solve your power quality problems in no time. You will enjoy a swift payback on your investment: our solutions save energy, increase productivity and lifetime written together.

We also offer a service portfolio which spans the whole product lifecycle from power quality surveys to after sales services. We provide our clients with world-class products, reliable Finnish technology, dependable and flexible service and true co-operation.

*Merus Power is a member of
Cleantech Finland.*

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