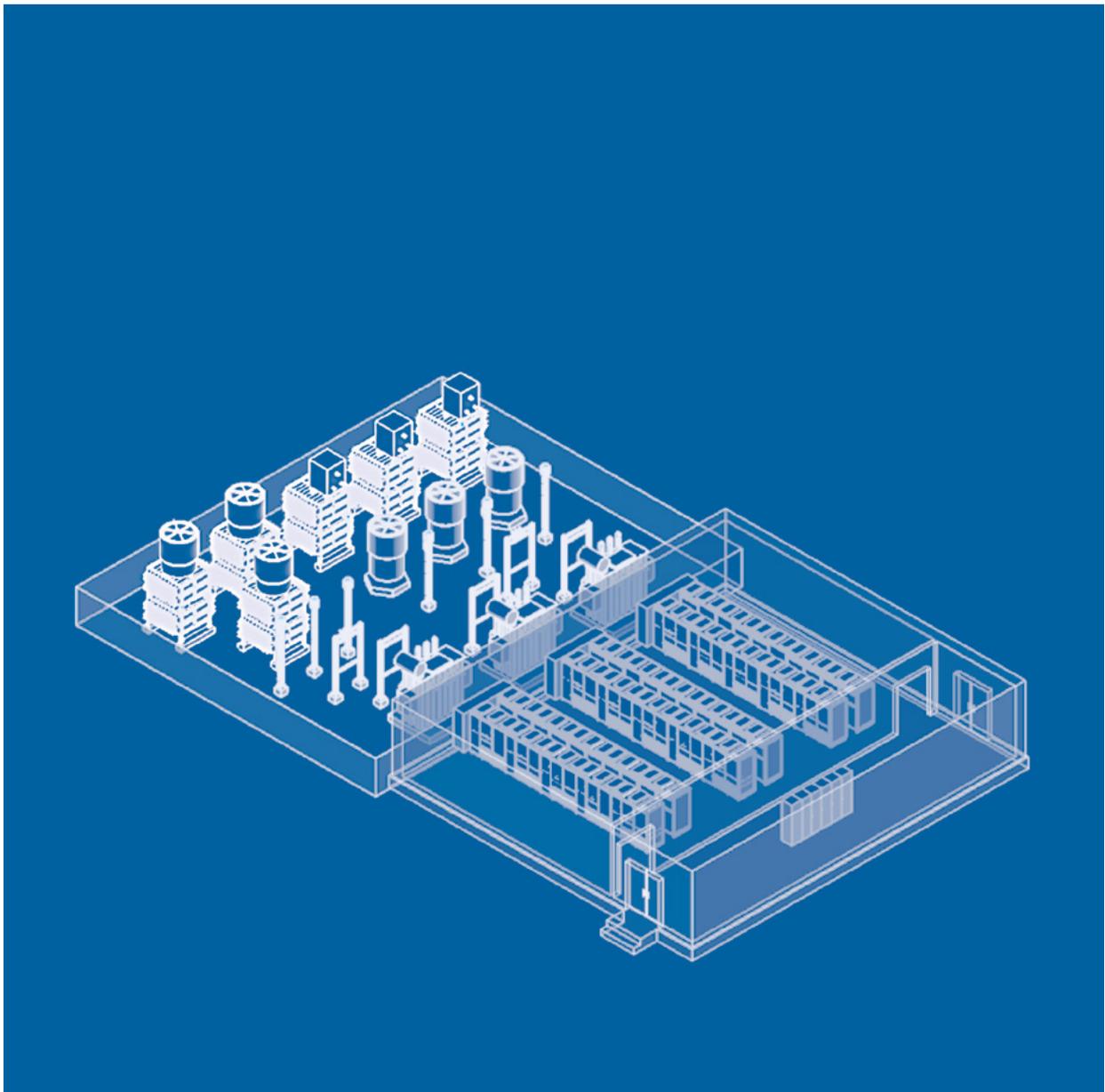




STATCOM

MERUS – STATCOM

A modern power quality solution for heavy industry and utilities.



MODERN POWER QUALITY SOLUTION

FOR HEAVY INDUSTRIES

In modern power systems, the supply and demand of active and reactive power have to be balanced in order to ensure good power quality. Presence of heavy and fast fluctuating loads can disturb the balance. Such disturbance creates power quality challenges to both supply grids and end customers with demanding loads. Voltage variations, flicker, harmonic distortions and poor power factor are commonly experienced power quality problem.

Good power quality brings substantial benefits to supply grid and end customers alike. It increases the plant productivity, energy efficiency, lifetime and reliability as well as reduces the maintenance costs of the plant. Utilities enjoy additional transmission and distribution capacities from existing networks without any additional investments.

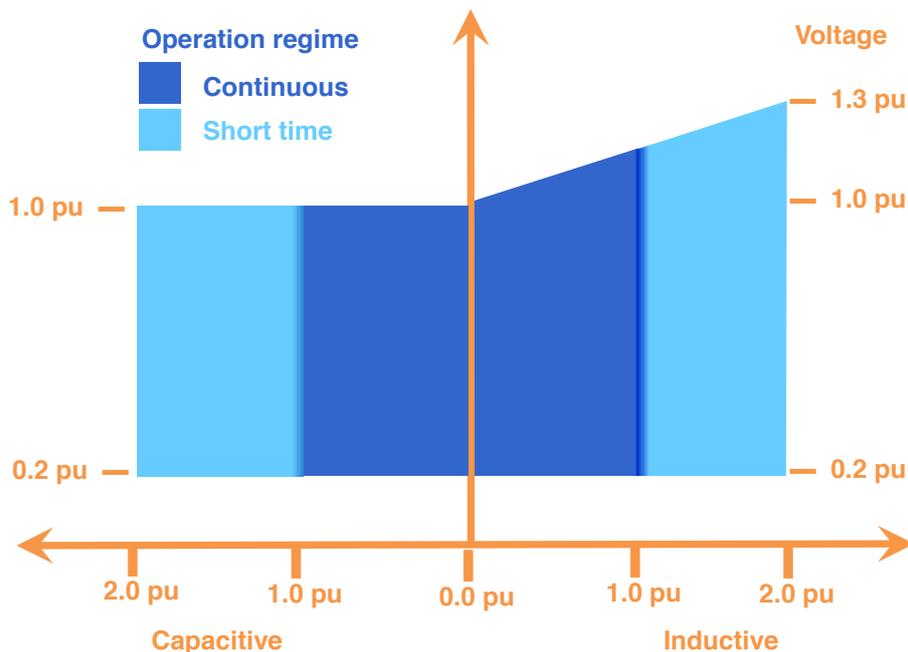


To the end customer, poor power quality means reduced productivity, low reliability and higher operating costs. The supply system, on the other hand, suffers from compromised reliability and low transmission capacity.

Conventional technologies are too slow to control capacitive or inductive powers. They are often not sufficient to ensure stable power system.



Merus Static Synchronous Compensator (STATCOM) is an extremely fast and reliable solution for power quality challenges. Merus STATCOM can guarantee the stability of a power system with response time less than a millisecond. In a single device, Merus STATCOM combines dynamic reactive power compensation and active harmonic filtering functionalities, which can solve variety of customer challenges.



Merus Statcom operation regime

EXCELLENT PERFORMANCE

PROVIDED BY TOP-NOTCH TECHNOLOGY



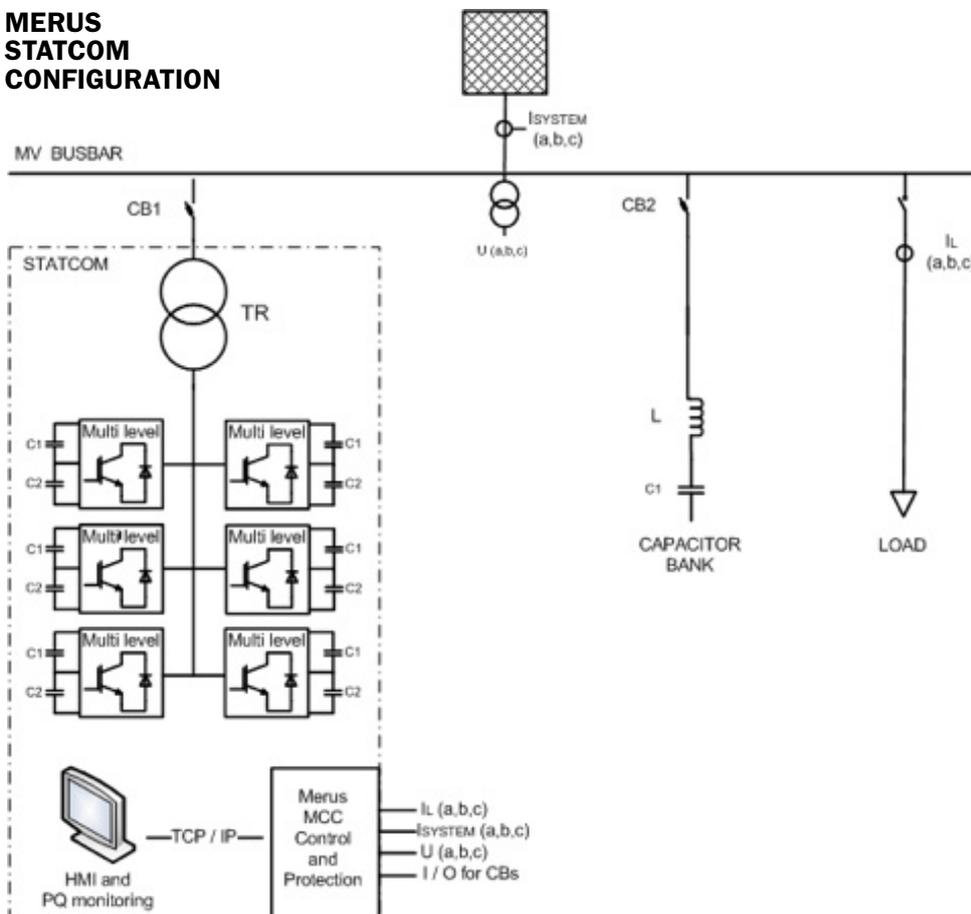
M-Series STATCOM, a Voltage source converter (VSC) based modern compensation system, can act as a source or sink for reactive power.

It consists of a controllable part that can operate as capacitive and inductive power and keeps the reactive power flow constant in the system. If there is a need for reactive power in the supply grid, Merus STATCOM can provide instant reactive power support to stabilize the grid. On contrary situation, it absorbs the additional VARs to ensure the stability of the grid.

With pulse-width modulation (PWM), voltage source converter provides faster converter control, which is pre-requisite for excellent flicker reduction. The fixed capacitor banks can be implemented in the system when inductive reactive power demand is less than capacitive.

Merus STATCOM solution comes with advanced Merus Control and Protection (C&P) system. Equipped with 19" modern touch screen user-interface, Merus Control and Protection system provides excellent performance for voltage stabilization, flicker reduction, reactive power control, harmonics mitigation and power factor control.

MERUS STATCOM CONFIGURATION



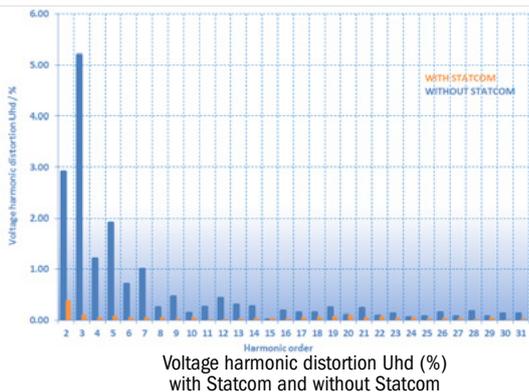
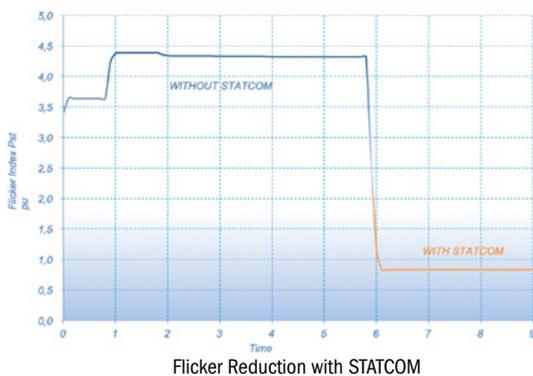
Merus STATCOM is built on Insulated Gate Bipolar Transistor (IGBT) based power electronics technology. Use of modern technology brings benefits of fast switching, low overall system losses, smaller footprint and superior performance.

FAST AND DYNAMIC REACTIVE POWER COMPENSATION

FOR DEMANDING APPLICATIONS

Merus STATCOM is the right solution to solve following power quality challenges:

- Voltage variation and flicker
- Poor power factor
- Harmonics distortions
- Voltage sags
- Entrapped capacities of transmission and distribution network



Different power quality problems faced by customers in heavy industry and utilities can effectively be solved with Merus STATCOM.

ELECTRIC ARC FURNACES

Electric arc furnaces may create severe power quality challenges to a supply grid. Their operation causes voltage variations, which are then experienced as flicker by adjacent customers. Merus STATCOM delivers excellent flicker reduction which conventional technologies are unable to offer. The result is stable grid operation with minimum voltage variations.

**** Customer Benefits:** Voltage stabilization brings a number of benefits to the end-customer. It increases plant productivity by reducing tap-to-tap time and lowers electrode consumption and carbon charges.

ROLLING MILLS

Higher power variable speed drives (VFDs) are key components of rolling mills operating systems. The drives, however, lower the power factor and cause voltage sags and harmonic distortions. Merus STATCOM provides active harmonic filtering in real time, improving power factor and eliminating voltage sags. Fast and effective response to harmonic distortions allows meeting power quality standards.

**** Customer Benefits:** Elimination of voltage and harmonic distortions with Merus STATCOM brings several benefits to rolling mills. Power factor control reduces system losses and reactive power demand, releases trapped capacity of electrical system, and in many cases increases production.

MINING AND HEAVY LOADS

In mining and other heavy industrial segments there are typically large and sensitive loads such as mining hoist, mining shovels, pumps, harbour cranes, wood chippers, conveyor belts and crushers. Large motors require significant reactive power especially in the start-up phase.

When connected with the weak grids, high reactive power demand can induce voltage sags and fluctuations on the

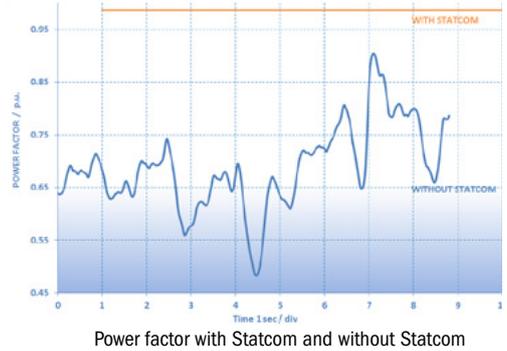
supply grid. The voltage sags not only disturb the other customers on the same feeders but also reduce the reliability of the whole power system. Dynamic reactive power compensation is a key requirement to ensure smooth operation of the motors and to stabilize the power system. Merus STATCOM provides needed Vars when needed.

**** Customer Benefits:** Improved power quality brings several benefits to the end customers. The payload on the hoist applications increases and jams are avoided in crushers and shredders applications. The production capacity and capital equipment lifetime are enhanced and smooth plant operations are secured.

WIND AND SOLAR FARMS

Wind farms need to comply with grid connection criteria in order to be connected with the supply grid. In varying voltage conditions, ability to dynamically provide or absorb reactive power is an essential requirement imposed by many utilities. Merus STATCOM is an excellent solution that provides dynamic voltage control under different fault conditions and allows wind and solar farms to easily meet strict grid codes criteria.

**** Customer Benefits:** Excellent performance of Merus STATCOM guarantees to meet the grid-codes effectively, no matter how strict they are. Voltage stabilization at the point of common coupling (PCC) increases the energy production.



UTILITIES:

- Typically, power generation and power consumption take place hundreds of kilometres away from each other. If the electrical networks lack dynamic reactive power compensation systems it can result in voltage variations and eventually can block certain transmission and distribution capacity of supply grids.

- Merus STATCOM is an excellent source of dynamic reactive power compensation due to its extremely fast response time of less than one millisecond. Such fast and effective dynamic reactive power compensation releases the blocked capacity in transmission or distribution network. It is a very cost effective solution to gain additional capacity from existing infrastructure whereas building a new infrastructure is expensive and often complicated.



INNOVATIVE FEATURES

OF MERUS STATCOM



Flicker reduction performance

Thanks to modern high speed IGBT technology and real time control strategy, Merus STATCOM provides excellent flicker reduction. In electric arc furnace (EAF) applications, flicker can be reduced as low as to factor of 5.5.

Overloading capabilities

Merus STATCOM can be over-loaded for short periods of time e.g. couple of seconds per one minute. Overloading feature of Merus STATCOM offers high performance in the applications where instant short period reactive power compensation is needed. Overloading capacity has been defined by the size of energy storage and the thermal limits of the semiconductors.

Redundancy and Modularity

Merus STATCOMs are extremely redundant and modular systems. The systems are designed to operate as stand alone units. Higher power can be achieved by adding more systems. Each module has its own cooling system and an independent control and protection system that communicates with the HMI. In case a module has an internal failure, it will be disconnected from the system and the remaining modules continue their operation without any interruption.

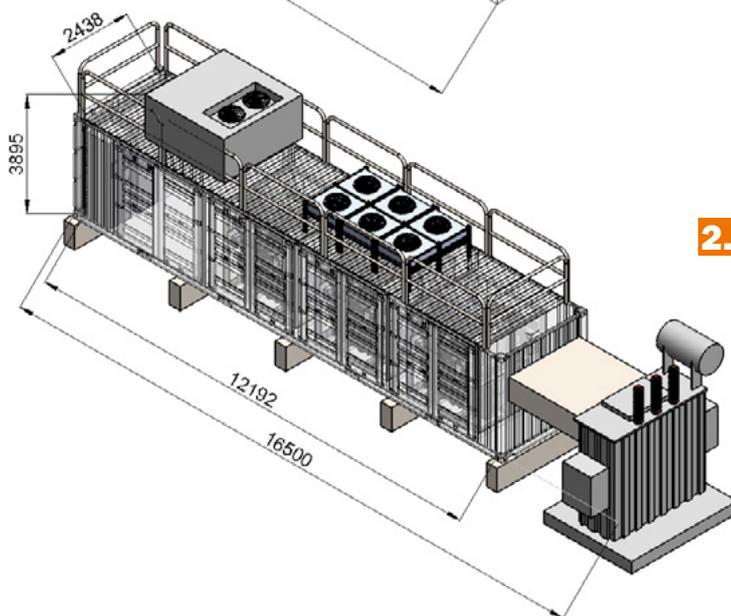
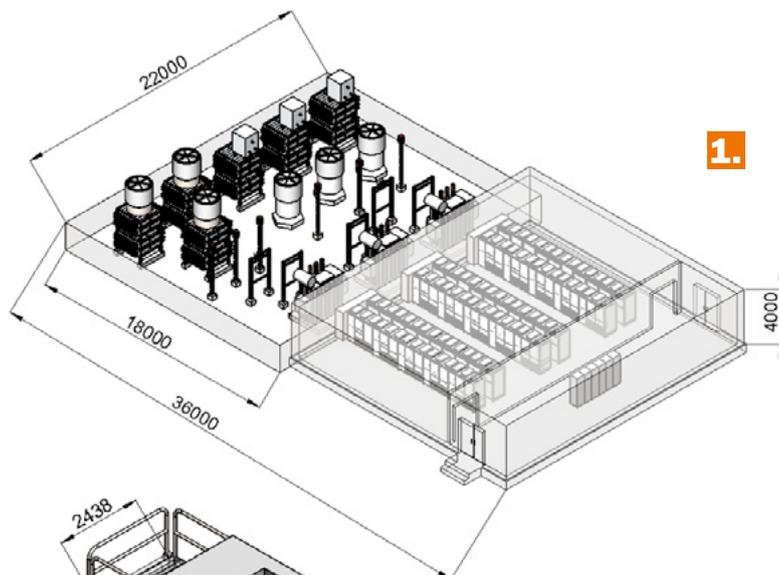
C&P system

The Control and Protection system of Merus STATCOM is equipped with advanced user interface and 19" easy-to-use touch-screen panel. Proven control algorithms and close and open loop strategies enable effective and fast flicker mitigation, reactive power and power factor control and harmonic mitigation.

TURNKEY PROJECT DELIVERY

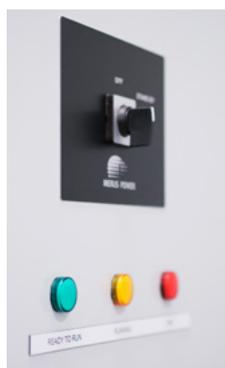
Our experienced project team has successfully completed a number of power quality projects right from initial phase of problem recognition to onsite delivery including installation, commissioning and training of customer personnel.

- System studies and in-depth analysis
- Engineering, simulation and design
- Factory tests for validation of required criteria
- On-site delivery, installation and commissioning
- Training and after-sales support
- Modernization and system upgrades



Typical STATCOM layouts

1. 33kV, 144MVar
2. 6kV, 8MVar - Containerized Solution



Choosing between Merus STATCOM and Merus SVC:

Merus STATCOM and Merus SVC both are proven and reliable solutions to solve power quality challenges. To select the right solution for your specific power quality challenge and application, please feel free to contact us. Our experts will be happy to analyse your power quality challenge and suggest the right solution.

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 filters, STATCOMs and SVC's – solve your power quality problems in no time. You will enjoy a swift payback on your investment: our solutions save energy,

increase productivity and capacity and reduce energy costs. We provide our clients with world-class products, reliable Finnish technology, agile and flexible service, tailored solutions and true co-operation.



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