



ABB Australia Pty Limited.

PO Box 574
88 Beresford Road
Lilydale Victoria 3140
Australia

ABB Contact centre

1800 222 435
Facsimile + 61 (0)3 9735 3863

Metal enclosed capacitor banks: ABBACUS family

Enhancing power quality and energy efficiency of your network.



- Enhanced life of electrical installations
- Reduced maintenance needs
- Easier installations, commissioning and operation

ABB is a pioneering technology leader in electrification products, robotics and motion, industrial automation and power grids, serving customers in utilities, industry and transport & infrastructure globally. Continuing a history of innovation spanning more than 130 years, ABB today is writing the future of industrial digitalization with two clear value propositions: bringing electricity from any power plant to any plug and automating industries from natural resources to finished products. As title partner of Formula E, the fully electric international FIA motorsport class, ABB is pushing the boundaries of e-mobility to contribute to a sustainable future. ABB operates in more than 100 countries with about 135,000 employees.

ABB offers a wide range of products from 208 V up to 1200 kV that help enhance the reliability, efficiency and quality of power in transmission and distribution grids, power plants and industries while minimizing environmental impact. The wide product range is complemented by a comprehensive service offering.



Ensuring stronger, smarter and greener grids

Metal enclosed capacitor banks from ABB

Power quality is a major concern for transmission and distribution utilities, industries, and transport and infrastructure sectors. Poor power quality affects grid reliability, productivity, leads to higher operating costs and penalties for non-compliance with grid codes. ABB is a technology leader with a wide range of products, systems and services that improve power quality including capacitors and filters, power electronics-based compensators and software solutions, across the power value chain for low, medium and high-voltage applications, helping to shape a stronger, smarter and greener grid.

ABB's ABBACUS family of metal enclosed capacitor banks (MECB) are a 'one stop' solution for maintaining power quality in medium voltage networks and comprise of premium range of primary and secondary components, including world-

class, highly reliable capacitors from ABB. The ABBACUS family improves power quality by compensating reactive power, improving power factor or passively mitigating harmonics. The design consists of a compact modular enclosure that combines primary components with secondary control and protection equipment. The system can be either configured as fixed or switched, with the switched bank consisting of single or multiple steps, automatically controlled to improve power factor.

ABBACUS family is available in a range of models: ABBACUS A-Series, ABBACUS B-Series, ABBACUS C-Series, ABBACUS D-Series and ABBACUS E-Series MECB.

It is suitable for voltages up to 38 kV. All models come fully assembled and factory tested in an ISO 9001 and ISO 14001 environment.

ABBACUS A-Series MECB



ABBACUS B-Series MECB



ABBACUS C-Series MECB



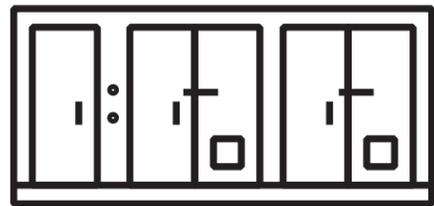
ABBACUS D-Series MECB



ABBACUS E-Series MECB



Over 20 years of experience in metal enclosed capacitor bank ABBACUS

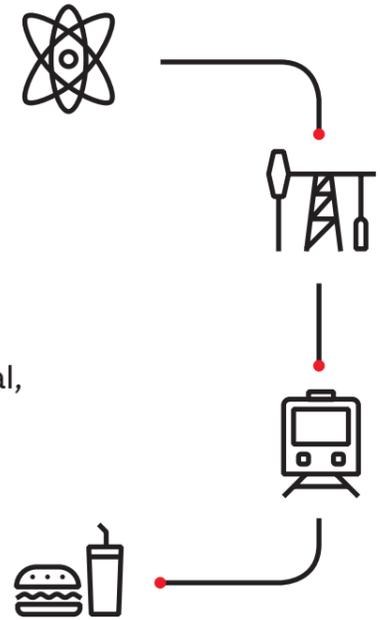


More than **1500 ABBACUS** delivered in over **80 countries**



Across many **segments**

Including distribution utilities, mining, oil & gas, petrochemical, pulp & paper, food & beverage and rail



10 regional Power Quality Centers (PQC)

Across the world focusing on metal enclosed capacitor banks solutions



Efficiency in delivery

PQCs stay close to the customer and ensure efficiency in delivery lead time



Manufacturing capabilities

PQCs have manufacturing capability and use common technology and processes



Customer support

PQCs support customers with solutions specific to local needs and service requirements



Safety features

Type tested busbar systems, Arc Fault protection solution on customer request

Enhancing power quality

Applications in several areas of power value chain

The ABBACUS family provides solutions suitable for any MV application requiring compact, easy to install and safe reactive power compensation or filtering. Segments and customers include electrical distribution utilities, integrators of renewable power e.g. wind or solar farm integrators, large industrial power users including mining, pulp and paper, oil and gas, chemical, petrochemical, plastics, food and beverage and cement.

See below examples of various power quality challenges faced by customer and how ABB's metal enclosed capacitor bank ABBACUS helps resolves this.



Segment - Petrochemical

Power quality challenge:

Power factor correction and harmonic filtering requirement. Since it was a diesel powered site, it was important to ensure efficiency of equipment and fuel, as well as reducing cost of power supply without the risk of over-compensation.

How ABBACUS addresses this challenge:

Multistep detuned solution was connected to the network to maintain a high power factor (0.9) and perform limited harmonic filtering ensuring generators can run without problems.

Key feature of ABBACUS:

An air-conditioned IP65 enclosure was used to house the ABBACUS in a desert environment with operating temperatures around +55°C.



Segment - Wind

Power quality challenge:

Var support and grid code compliance of wind farm

How ABBACUS addresses this challenge:

Multistage, automated remote control of bulk var compensation was connected to the network to allow flexible compensation during operation of the windfarm

Key feature of ABBACUS:

Compact 21 Mvar solution housed in an IP55 aluminum enclosure in a demanding seaside environment. ABBACUS allows the use of ABB's DS1 switches to provide transient free switching on the weak grid near the sensitive wind farm loads.



Segment - Utility

Power quality challenge:

Power factor correction in a dense city area- safe and compact solution was the key requirement. Customer needed a standardized easy-to-manufacture solution.

How ABBACUS addresses this challenge:

Automated, multistep detuned solution that was repeatable and allowed the customer to standardize their solution for all inner city substations.

Key feature of ABBACUS:

Compact fully enclosed design that could be installed in an indoor or an outdoor substation in a dense inner city environment.



Segment - Mining

Power quality challenge in target segment:

Excessive harmonic pollution at MV level. A metal enclosed solution was required due to the highly polluted and dangerous environment.

How ABBACUS addresses this challenge:

A passive 5th and 7th harmonic filter was designed and incorporated into the solution.

Key feature of ABBACUS:

The IP65 enclosure of the ABBACUS allowed it to be installed in a highly polluted environment with personnel constantly working at close quarters. The ABBACUS comprises ABB's Q-ACT (arc fault mitigation) protection to not only protect the equipment but more importantly people on site.

ABBACUS A-E Series MECB family

Features and benefits

Improved power quality in a wide voltage range

Power factor is the measurement of how effectively AC electrical power is being used. When the power factor is high and close to unity, high system efficiency can be achieved. Therefore, an improvement in power factor or a reduction in harmonics can lead to enhanced power quality, and energy efficiency, contribute to industrial productivity and lower carbon emissions. The ABBACUS family improves energy efficiency and reduces system losses by improving the power factor. It is available in a wide range of voltages that allows for it to be flexibly connected to any MV network.

Ensuring compliance with utility regulations

The ABBACUS family enable compliance with power quality regulations on power factor and harmonics. This helps customers avoid penalties imposed by utilities and/or refusal to connect installations to the grid.

Passive mitigation of harmonics

Due to growing use of power electronic based equipments, harmonics are a growing issue in the electrical grids. If excessive, they are detrimental for the good operation of electrical systems and may even lead to equipment failure. While lower levels of harmonics will not lead to failures, they reduce the system efficiency and can lead to reduced lifetime of electrical equipment. ABBACUS family is available in inrush, detuning and passive filter options, enabling to pick the right solution for addressing harmonics efficiently.

Improved system usage

As the ABBACUS family can be used to offload the network by removing the demand for reactive power, more active power can be transferred. This potentially allows for cost savings, as the investment for infrastructure equipment like transformers, switchgear and cable to serve additional loads is low to negligible.

Reduced maintenance needs and enhanced life of electrical installations

Poor power quality leads to inefficient running of installations, system down time and reduced equipment life and consequently high installation running costs. With the ABBACUS family, the power quality of electrical installations is maintained and the installation lifetime can be optimized.

Increased flexibility

Internal arrangement of components is more flexible allowing for increased kvar ratings, switching types and configurations, more compact footprints and more protection and control options in a wider voltage range. With more “double modules”, the ABBACUS family can mix and match module types to ensure we supply the best fit solution for our customer’s needs. Enclosure material is also available in a wider range for the standard designs to ensure we can match varied site conditions.

New benefits with extended ABBACUS family

Extended range

The ABBACUS family has been complimented with new models so that customers have more choice to pick an optimized solution for their applications.

Lower footprint

Increased kvar capacity per module across the range means an increased output with a reduced footprint. The number of designs using “double modules” has increased drastically reducing the footprint without compromising output. The flexible internal arrangements drastically reduces the size of the banks across all voltage ranges. Up to 40% reduction in size for 36kV designs is obtained.

Easier installation, commissioning and operation

The new ABBACUS family allows for reduced site installation time through smaller designs, quicker module interconnections and reduced hardware and fixings. This means that reduced site work leading to reduction in costs and safety risks. Lifting pads double as anchor points meaning less time has to be spent positioning and securing the capacitor bank. Integrated cooling fans result in maintenance that can be performed safer and faster!



ABBACUS family of metal enclosed capacitor banks

— 01 Circuit diagram for individual compensation

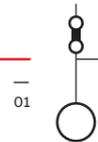
— 02 Circuit diagram for Central compensation on MV side

— 03 Circuit diagram for Central compensation on MV/LV side

— 04 Circuit diagram for Individual compensation

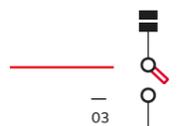
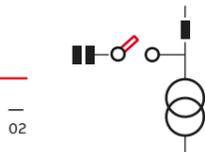
Individual compensation

With this compensation type, individual loads (e.g. motors) are compensated. The special advantage with individual compensation is that existing switching and external protective devices for the machine to be compensated can also be utilized, in addition to the standard internal MECB protection. Also, the upstream cables or transformers are offloaded optimally, resulting in maximum reduction in network losses.



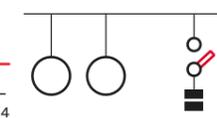
Central compensation

The new ABBACUS family offers flexibility to meet the varying requirements of utility and industrial users due to its unique modular design. The design allows compensation to be connected at different points in the network and offers different configurations for reactive power compensation and harmonic mitigation:



Group compensation

Group compensation can be applied when a concentrated group of loads needs to be or can be compensated. This compensation type reduces load on the upstream cables or transformers thereby decreasing energy losses.



Wider range for higher flexibility

The new ABBACUS family offers flexibility to meet the varying requirements of utility and industrial users due to its unique modular design. The design allows compensation to be connected at different points in the network and offers different configurations for reactive power compensation and harmonic mitigation.



ABBACUS family of metal enclosed capacitor banks

Series overview

| Series | Overview | Market segment | Product description |
|--|--|--|--|
| A-Series  | Basic reactive power compensation for fixed loads | Light industrial | Compact Fixed solution up to 0.7 Mvar at 12 kV |
| B-Series  | Basic automatic reactive power compensation for dynamic or fixed loads | Heavy Industrial, Light Industrial | Small modular switched solution with basic protection options up to 1 Mvar at 12 kV |
| C-Series  | Basic automatic reactive power compensation for dynamic or fixed loads on polluted networks | Heavy Industrial, Light Industrial, Infrastructure | Mid-sized modular detuned / filter switched solution with basic protection options up to 1.5 Mvar per module at 12 kV |
| D-Series  | Intermediate automatic reactive power compensation for dynamic or fixed loads on polluted networks | Utility, Heavy Industrial, Light Industrial, Infrastructure, Renewable | Modular full-sized inrush / detuned / filter switched / fixed solution with advanced protection options up to 2.5 Mvar per module at 12 kV |
| E-Series  | Advanced reactive power compensation for dynamic or fixed loads on polluted networks | Utility, Heavy Industrial, Light Industrial, Infrastructure, Renewable | Modular full-sized inrush / detuned / filter switched / fixed solution with advanced protection options up to 2.5 Mvar per module at 12 kV to 6 Mvar per module at 36 kV |



Ensuring reliability, availability and safety of the electrical network

DS1 capacitor switch

In operations where sensitive loads are present, ABB's DS1 capacitor switch can be included to allow for transient free switching. Utilizing diode based switching technology, the DS1 can perform bank opening and closing operations without any transient current or voltage, and completely eliminates any possibility of restrike.

Arc fault mitigation technology Q-ACT

Certain models of the ABBACUS family are available with the latest innovation in arc fault mitigation technology Q-ACT.

The type tested protection system utilizes advanced sensing and tripping relays in conjunction with a fiber optic network to detect and extinguish an arc before any damage can occur. Using ABB's Ultra-Fast Earthing Switch (UFES) device, arc extinction occurs in less than four milliseconds leaving the metal enclosed capacitor bank and its components completely undamaged and operational after an arc fault.

ABB's commitment

Quality assurance

At ABB, we are committed to providing the best products and services. Our products comply with or exceed the latest international standards. In addition to type tests in independent laboratories, our certified design and manufacturing processes guarantee the highest quality. We are certified according to the latest relevant ISO quality standards.

Sustainability

For ABB, sustainability is about balancing economic success, environmental stewardship and social progress to benefit all our stakeholders.

Sustainability considerations cover how we design and manufacture products, what we offer customers, how we engage suppliers, how we assess risks and opportunities, and how we behave in communities where we operate and towards one another, while striving to ensure the health, security and safety of our employees, contractors and others affected by our activities. We are certified according to the latest relevant ISO quality standards.



ABB's ABBACUS family of metal enclosed capacitor banks are a 'one stop' solution for maintaining power quality. With over 20 years of experience in metal enclosed capacitor banks across geographies and customer segments, ABB can deliver an efficient and cost effective solution to all types of customer requirements.

