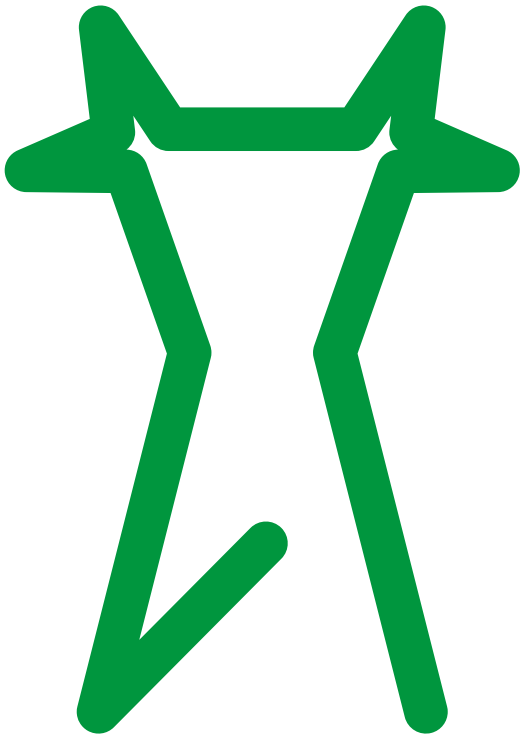
Medium Voltage Distribution
Catalogue 2015

Medium Voltage Switchgear & Products on the MV Network



Schneider Electric

Contents

Need more information?
→ www.schneider-electric.com/MV-distribution

A history of progress

Schneider Electric, with operations in over 100 countries, leverages its portfolio to make energy safe, reliable, efficient, productive and green.
While global energy demand is set to rise to support growing industrialization and urbanization, the scarcity of resources is becoming more pressing. Everyone needs to do more with less.
With available and mature technologies that can save up to 30 % of business-as-usual energy consumption, energy efficiency is a key component of this energy challenge.

This catalogue

We are proud to present to you Schneider Electric's first catalogue dedicated to its Medium Voltage offer. It represents the offering of the world's largest supplier of Medium Voltage equipment and encompasses all aspects of switchgear, transformers, package substations, protection and controlgear.

As a global specialist in energy management with operations in more than 100 countries, Schneider Electric offers integrated solutions across multiple market segments, including leadership positions in Utilities & Infrastructure, Industries & Machine Manufacturers, Non-residential Building, Data Centres & Networks and in Residential.

Focused on making energy safe, reliable, efficient, productive and green, the Group's 170,000 employees achieved revenues of 25 billion euros in 2014, through an active commitment to help individuals and organizations make the most of their energy.

A history of progress

From its creation in 1836 as a producer of iron and steel, we have evolved to become a global leader in energy management.
Along the way, we have contributed to the transformation of industries with an innovative, international and responsible mindset.

From 1836 to today, Schneider Electric has transformed itself into the global specialist in energy management. Starting from its roots in the iron and steel industry, heavy machinery, and ship building, it moved into electricity and automation management.
After 170 years of history, Schneider Electric has become today the solution provider that will help you make the most of your energy. Discover the transformation below.

19th century

1836: The Schneider brothers took over the Creusot foundries. Two years later, they created Schneider & Cie.

1891: Having become an armaments specialist, Schneider innovated by launching itself into the emerging electricity market.

First half of the 20th century

1919: Installation of Schneider in Germany and Eastern Europe via the European Industrial and Financial Union (EIFU). In the years that followed, Schneider associated with Westinghouse, a major international electrical group. The Group enlarged its activity to manufacturing electrical motors, electrical equipment for power stations and electric locomotives.

Post war: Schneider gradually abandoned armaments and turned to construction, iron and steel works and electricity. The company was completely reorganised in order to diversify and open up to new markets.

Late 20th century

1981-1997: Schneider Group continued to focus on the electrical industry by separating from its non-strategic activities. This policy was given concrete form through strategic acquisitions by Schneider Group: Telemecanique in 1988, Square D in 1991 and Merlin Gerin in 1992

1999: Development of Installation, Systems and Control with the acquisition of Lexel Europe's number two in electrical distribution. In May, the Group was renamed Schneider Electric, to more clearly emphasise its expertise in the electrical field. The Group engaged in a strategy of accelerated growth and competitiveness.

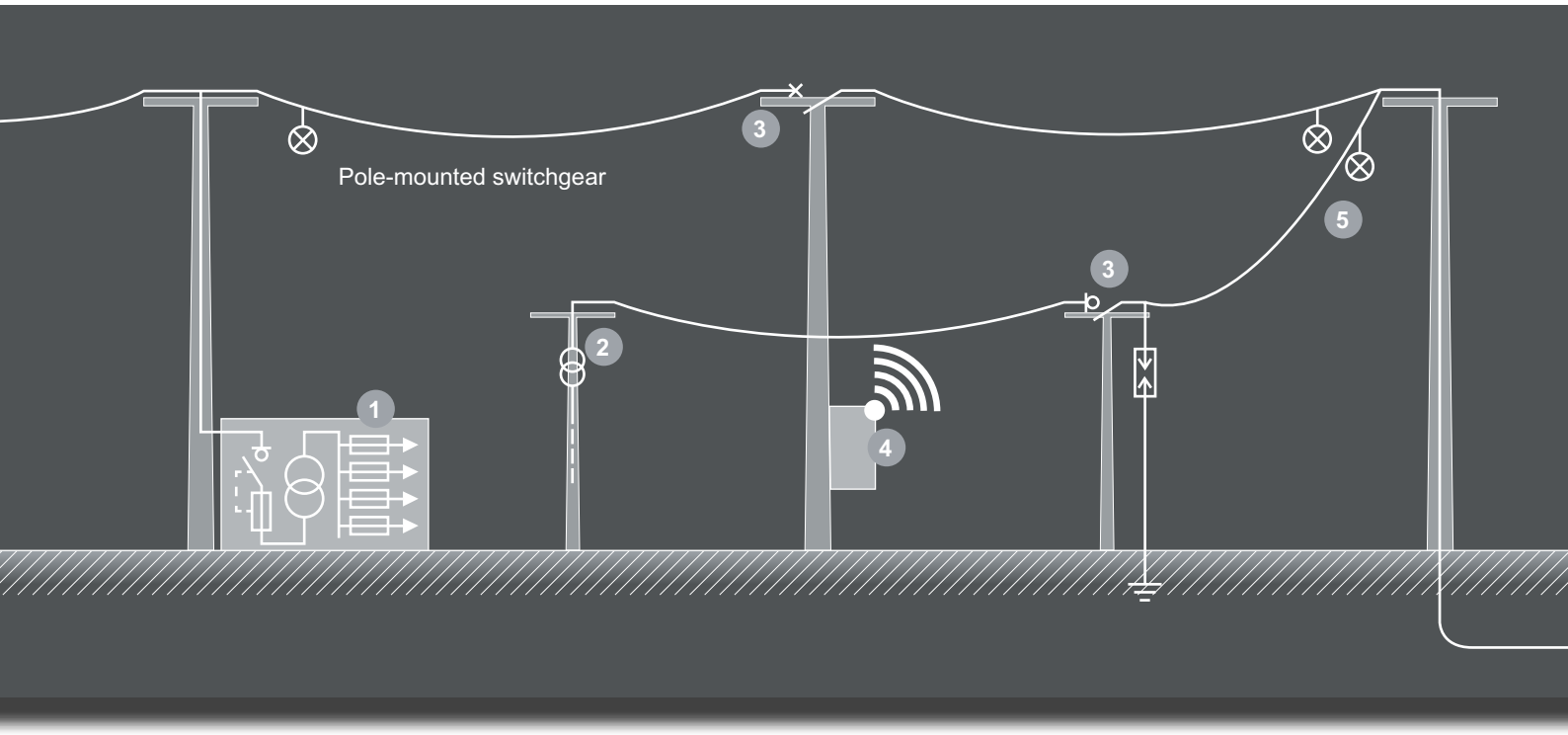
Early 21st century

2000-2009: Period of organic growth, positioning itself in new market segments: UPS (Uninterruptible Power Supply), movement control, building automation and security through acquisitions of APC, Clipsal, TAC, Pelco, Xantrex, becoming the global specialist in energy management.

2010: Schneider Electric strengthened its lead in the development of the Smart Grid, with the acquisition of the distribution activities of Areva D.

2011: The group reached the landmark of €20 billion sales, and continued its external growth with the acquisitions of Summit Energy (USA), Luminous (India), as well as Learder Harvest Power Technologies (China) and Telvent (Spain).

Complete offer ranging from 3 kV to 170 kV



1

Prefabricated MV/LV substation/E-House - *see page I-1*

2

Pole-mounted transformers - *see page G-1*

3

N Series / RL Series / U and W Series
Pole-mounted switchgear - *see page E-1*

and

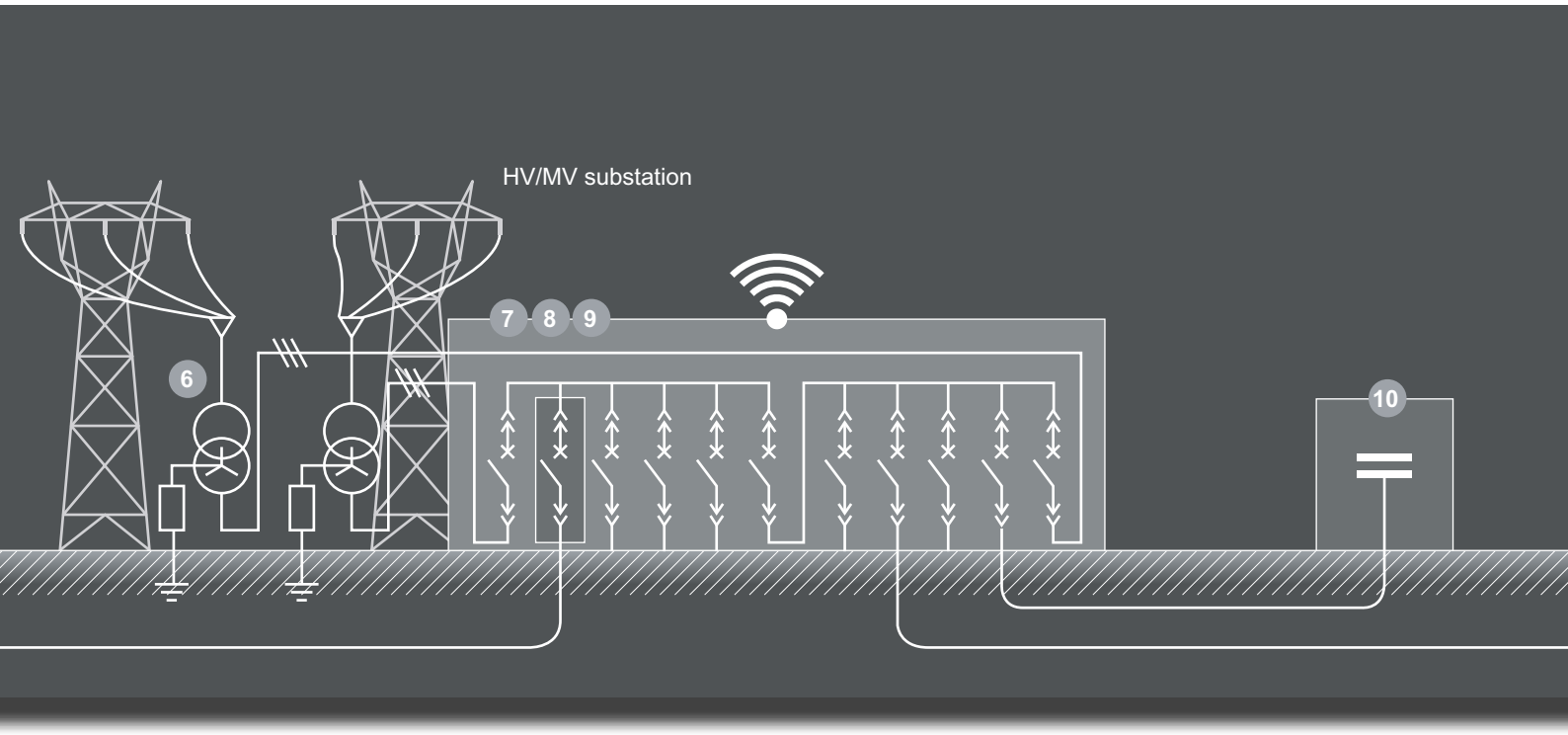
4

ADVC Controller - *see page E-1*
Overhead network control and monitoring

5

Easergy Flite, G200 - *see page F-1*

Complete offer ranging from 3 kV to 170 kV



6

Power transformer - *see page G-1*

7

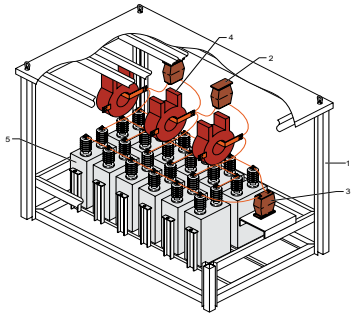
F400 MCset PIX GMA CBGS-0 Premset

Primary switchgear (AIS & GIS) - *see page A-1*
To know more about key components - *see page D-1*

8 9

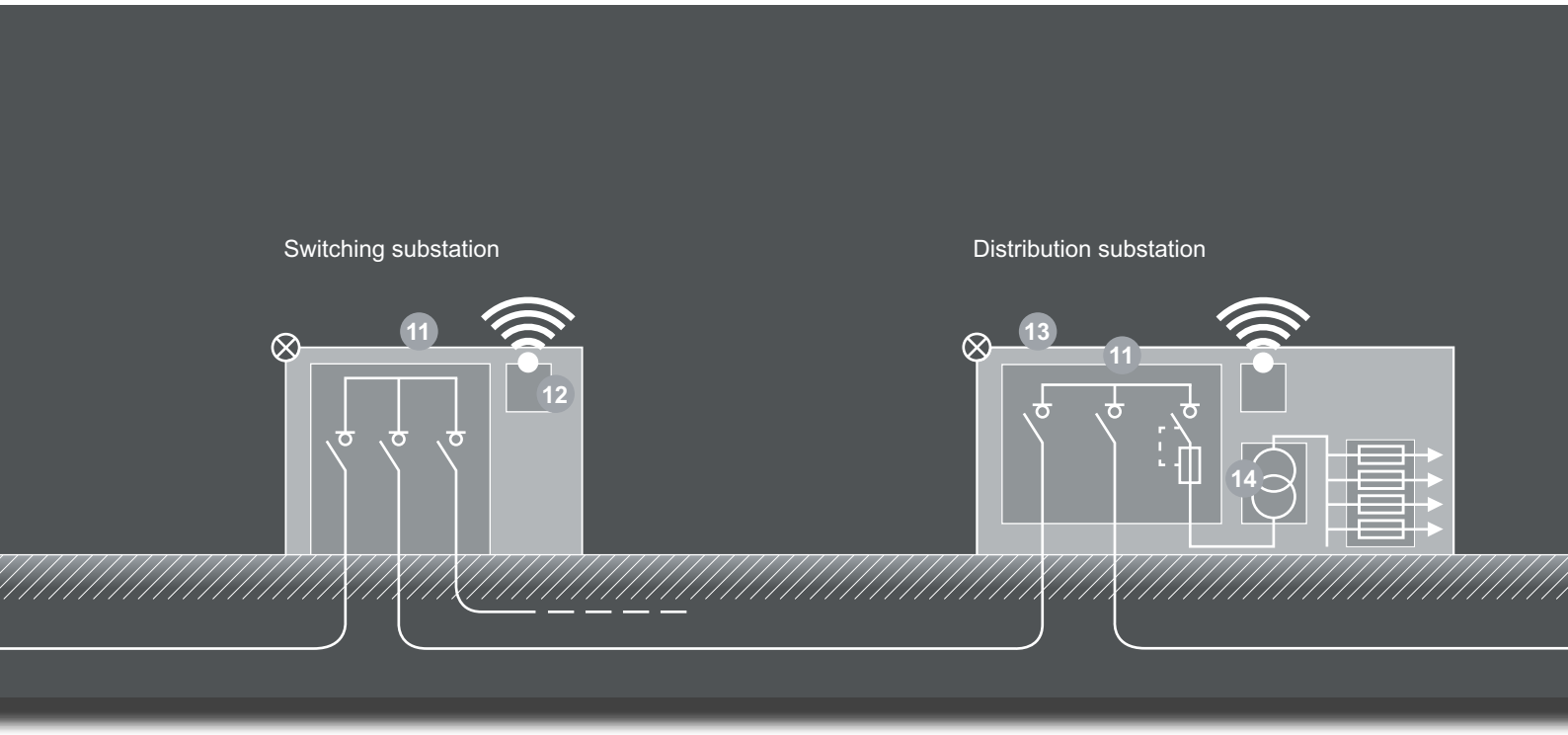
Digital protection relays and power metering - *see page F-1*

10



Automatic capacitor bank - CP range - *see page H-1*

Complete offer ranging from 3 kV to 170 kV



11

SM6 Flusarc FBX RM6

Air and Gas Insulated Switchgear - *see page C-1*
To know more about key components - *see page D-1*

12

Remote control and fault tracking - *see page F-1*

13

Prefabricated MV/LV substation - *see page I-1*

14

Trihal

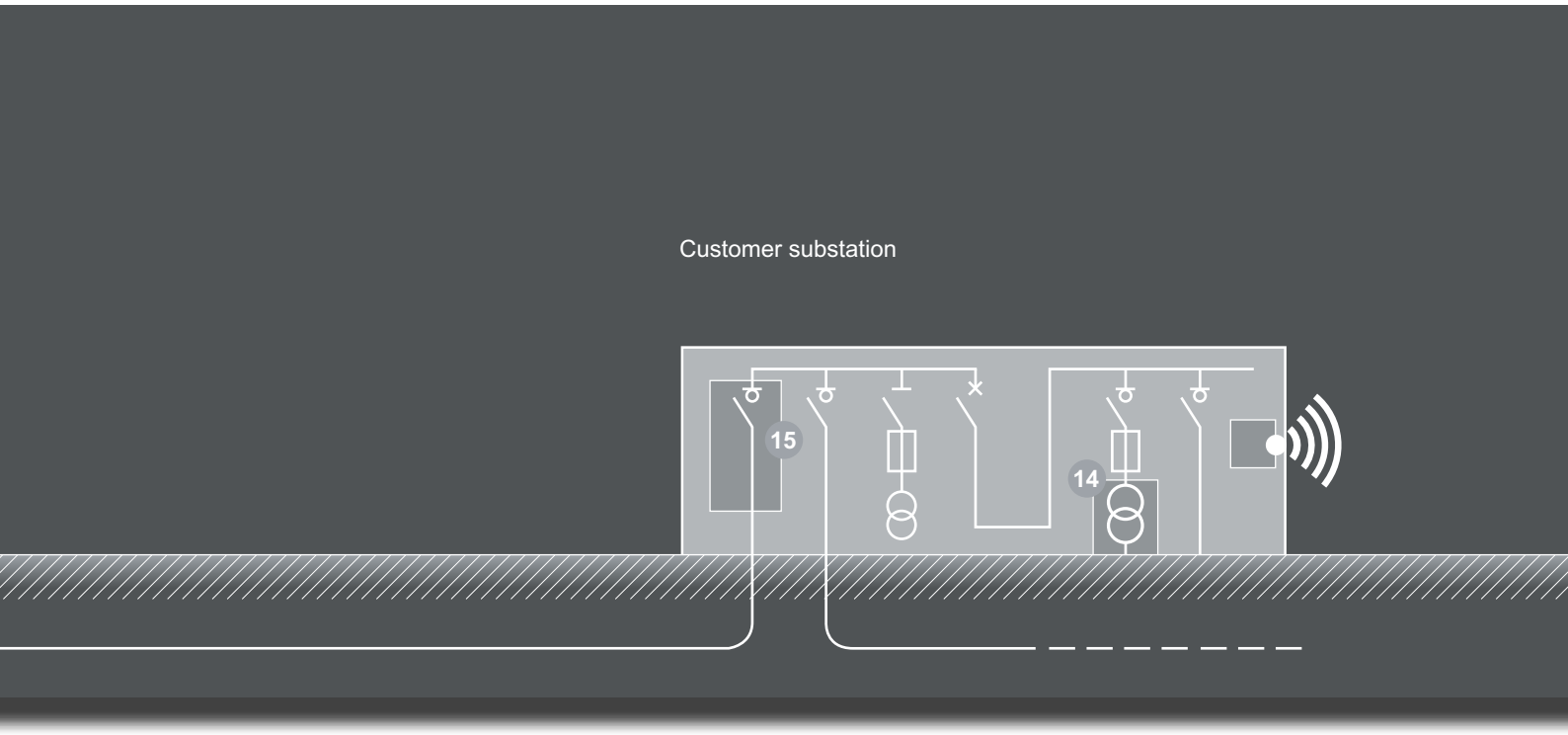
Distribution transformer - *see page G-1*

15

Premset

Modular switchboard - *see pages B-1 & C-1*
To know more about key components - *see page D-1*

Complete offer ranging from 3 kV to 170 kV



Building a smarter grid with reliable, efficient energy.
How Schneider Electric smart grid-ready products and solutions help balance your grid equation.

More and more people are learning to depend on energy as being integral to their daily lives. Meanwhile, the electricity market is changing. Every day, end users' expectations increase in terms of reliability and quality, and they gain greater awareness of energy's environmental impact. It's an evolution. But as our reliance on electricity grows globally, the ways in which we produce, distribute, and use energy must also evolve. The solution will not only involve smarter demand, but also smarter supply - and as such, a smarter grid is at the heart of the issue.

As The Global Specialist in Energy Management™, Schneider Electric is smart grid-ready, enabling the products and solutions that support and connect the five key domains of a smarter grid:
- Flexible distribution
- Smart generation
- Demand-side management
- Efficient homes (including electric vehicles)
- Efficient enterprise (buildings, industrial facilities, and Data Centres)

Our vision isn't just to connect our customers to the smart grid, but to also connect them with each other, facilitating smarter interactions and leading to increased energy management capabilities. Our smart grid solutions include:
- Smart Medium Voltage (MV) / Low Voltage (LV) equipment
- Substation automation
- Feeder automation
- Enhanced distribution management solutions
- Microgrid control
- Volt/var management
- Real-time condition monitoring

By fields of application

		Automotive	Building	Data Centre	Industry	Infrastructure	Oil & Gas	Marine	Mining, Minerals and Metals	Public lighting	Pulp & Paper	Power Generation	Railways	Solar farm	Utilities	Water	Wind power
Primary Distribution Switchgear	Air Insulated Switchgear																
	F400		✓		✓	✓	✓		✓		✓				✓		✓
	GenieEvo		✓	✓	✓	✓									✓		
	Masterclad		✓		✓	✓	✓								✓	✓	
	MCset	✓			✓	✓	✓	✓	✓			✓			✓	✓	
	NEX				✓	✓									✓		
	PIX Standard & PIX High	✓			✓	✓	✓	✓	✓			✓			✓	✓	
	PIX Double Busbar				✓	✓	✓	✓					✓		✓		✓
	Gas Insulated Switchgear																
	CBGS-0				✓	✓	✓						✓		✓		✓
	CBGS-2				✓	✓	✓						✓		✓		✓
	GHA				✓	✓	✓		✓				✓		✓		✓
	GMA				✓	✓	✓	✓	✓						✓	✓	✓
	WI				✓							✓	✓		✓		✓
	WS				✓		✓								✓		✓
	Shielded Solid Insulation System																
	Premset		✓	✓	✓	✓		✓	✓				✓		✓	✓	
	Motor Starter																
	Motorpact	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				✓	✓
	PIX MCC				✓		✓	✓	✓							✓	
Secondary Distr. Switch.	Air Insulated Switchgear																
	SM6		✓	✓	✓	✓									✓	✓	✓
	Gas Insulated Switchgear																
	DVCAS													✓			✓
	FBX		✓	✓	✓	✓	✓		✓				✓	✓	✓		✓
	Flusarc 36				✓	✓								✓	✓		✓
	Ringmaster		✓		✓	✓	✓		✓						✓		
	RM6		✓	✓	✓	✓	✓	✓	✓				✓	✓	✓		✓
	Shielded Solid Insulation System																
	Premset		✓	✓	✓	✓		✓	✓				✓		✓	✓	
MV Components	SF6 Circuit Breakers																
	SDR - CBR												✓				
	LF				✓	✓									✓		
	SF				✓	✓									✓		
	Vacuum Circuit Breakers																
	Evolis				✓	✓			✓						✓		
	HVX				✓	✓	✓	✓	✓						✓		
	VAH											✓					
	VOX					✓							✓				✓
	VXA-VXB												✓				
	VXC High				✓	✓		✓							✓		
	SF6 Contactor																
	Rollarc				✓			✓	✓								
	Vacuum Contactors																
	CPX - CLX - CBX - CVX				✓		✓		✓	✓							
	Fuses - Indoor and Outdoor Instrument Transformers - Low Power Current Transformers	To know more, please see chapter "MV components" / D1															

By fields of application

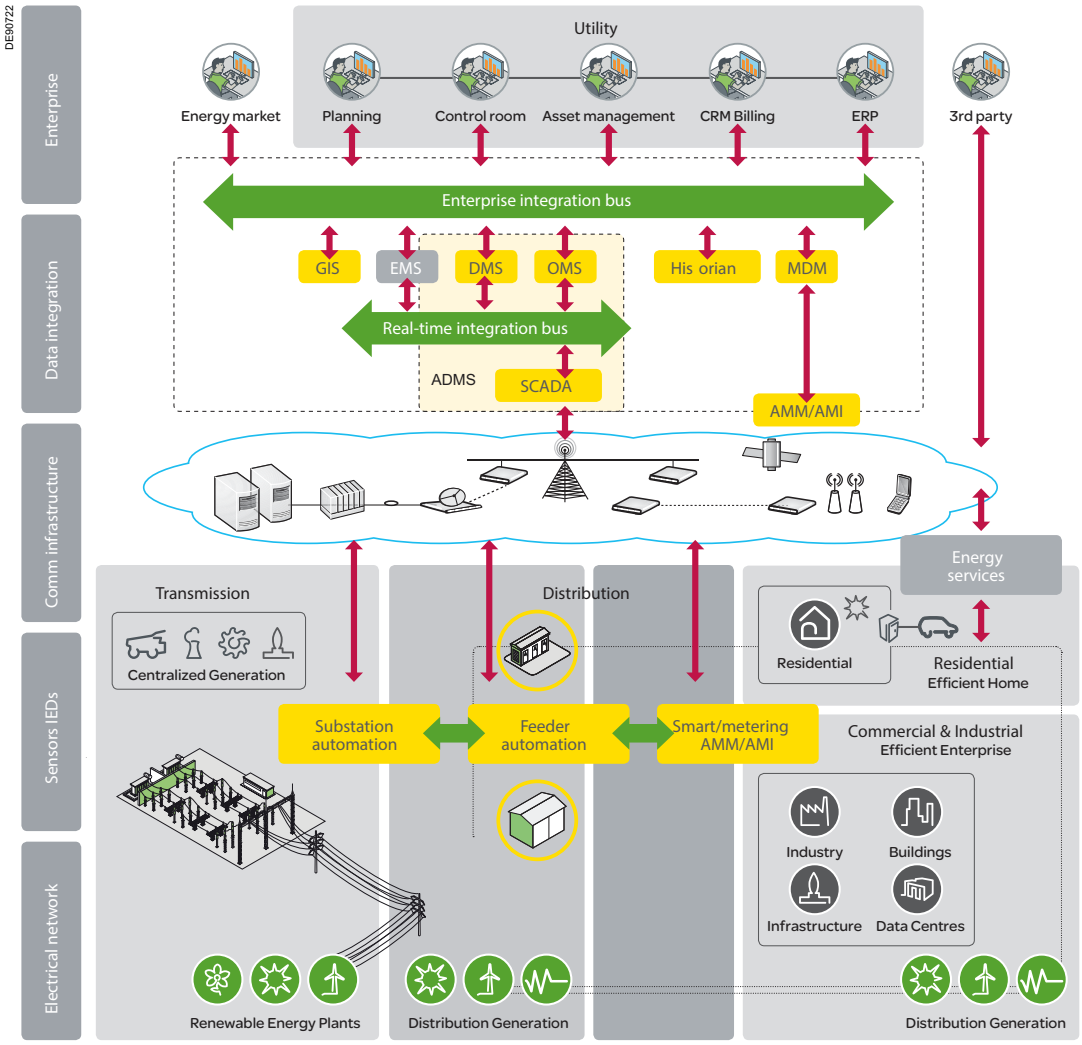
		Automotive	Building	Data Centre	Industry	Infrastructure	Oil & Gas	Marine	Mining, Minerals and Metals	Public lighting	Pulp & Paper	Power Generation	Railways	Solar farm	Utilities	Water	Wind power
Overhead Dist. S.	ADVC Controller														✓		
	Pole-mounted switchgear																
	N-series								✓						✓		✓
	PM6														✓		
	RL-series														✓		
	SBC														✓		
	U-series														✓		
	W-series														✓		
Transformers	Oil Distribution Transformers																
	Minera				✓		✓		✓			✓		✓	✓		✓
	Minera Pole-Mounted		✓			✓									✓		
	Minera HE+		✓	✓	✓	✓											
	Cast Resin Transformers																
	Trihal	✓	✓				✓		✓			✓					✓
	Tricast		✓		✓		✓	✓	✓				✓			✓	
	Resiglas		✓			✓	✓		✓				✓				✓
	Medium Power Transformers																
	Minera MP				✓		✓		✓			✓		✓	✓		✓
	Special Transformers																
	Minera SGrid		✓	✓	✓										✓		
	Minera EX						✓		✓								
	Minera R				✓			✓	✓			✓	✓	✓			✓
	Minera E		✓		✓	✓	✓		✓								
	Minera PV													✓			
	Siltrim						✓										✓
	Vegeta		✓		✓		✓	✓	✓								✓
	Imprego				✓	✓	✓	✓									
	Imprego AT		✓		✓		✓	✓	✓								✓
	R-Cool				✓	✓	✓	✓	✓			✓					
Power Factor Cor.	Banks for motor compensation				✓												
	Banks for industrial compensation				✓	✓											
	Banks for global compensation				✓												
	Banks for distr. and large sites networks				✓	✓											
	Banks for distribution networks				✓	✓											
	Banks for trans. and distr. networks				✓	✓											
	PFC and Harmonic Filtering				✓												
MV / LV Prefabricated Substations			✓		✓		✓		✓				✓	✓			✓
Services		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Network automation

Schneider Electric's range of switchgear can be remotely controlled or provide fully automatic supply restoration.
The switchgear can easily be embedded in a centralized scheme or can have automatic restoration logic embedded in the firmware of associated controllers. So, the switchgear can, intelligently and independently of other SCADA systems, restore supplies to all healthy sections of a circuit following a fault. This restoration can be achieved with or without the need for communication, depending on the network and customer preferences.
In either case, the switchgear is usually remotely controlled and it will automatically report the revised circuit and switchgear status to the central master station.

Schneider Electric also offers a highly sophisticated Advanced Distribution Management System (ADMS), which has an embedded Fault Detection Isolation and Restoration Algorithm (FDIR).
The centralised ADMS system has embedded status estimation to precisely define the network model, and process an unbalanced load flow algorithm based on that model together with telemetered real-time data recovered from the network. FDIR can operate in manual or automatic mode.
In manual mode, post fault, the system will recommend the switching steps required to isolate the minimum faulty line section and restore the supply to the healthy parts of the circuit. The system continually calculates the available capacity on each circuit and in the event that there is insufficient capacity to pick up the load that has been shed, the scheme will transfer some load from the proposed backfeed circuit to adjacent circuits. The scheme is fully dynamic and works regardless of how the network is organised. In automatic mode the system uses remotely controlled switchgear and automatically undertakes all of these isolation and supply restoration steps without any input from the operator.

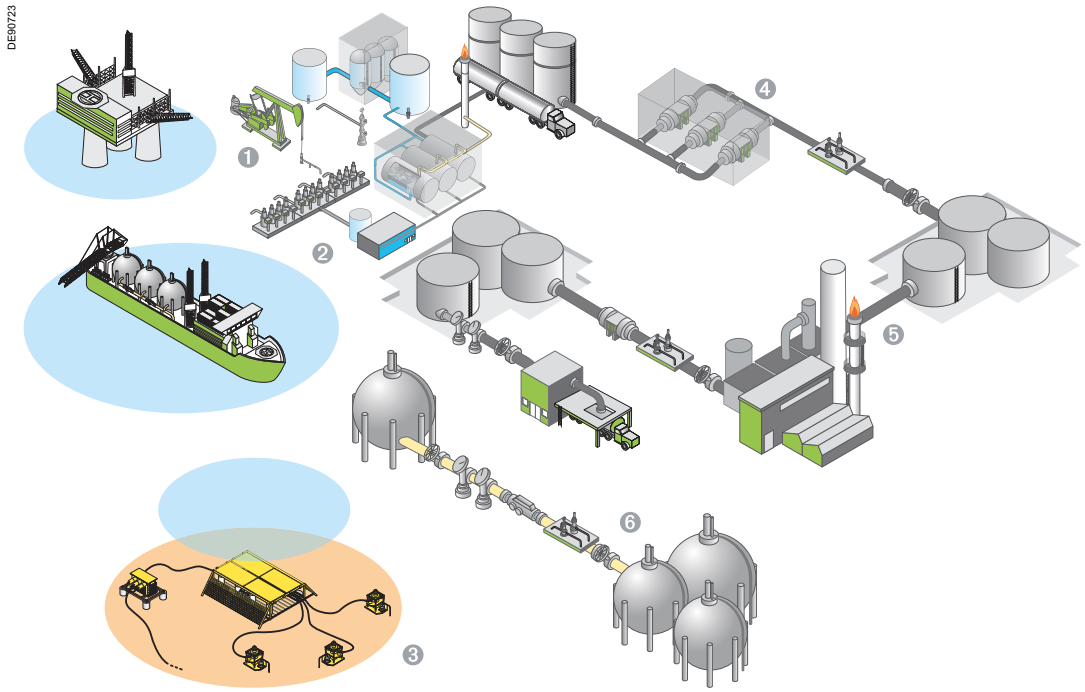
This system is optimized to work with Schneider Electric switchgear, but works with any switchgear that uses standard telemetry protocols.



Solutions for the Oil and Gas Industry

Schneider Electric's industry experience and focus on innovation can help you achieve your performance potential. Offering custom-engineered solutions with proven technology, Schneider Electric can ensure optimized levels of availability while protecting your processes and operations at every stage.

Resource Extraction
Manage oil and gas production from well to field with four integrated offers that increase efficiency and reduce mechanical failures and downtime.



1 E-Houses for offshore and onshore, Floating Production Storage and Offloading Units (FPSO)
Complete, modular E-House design delivering compact, efficient, and cost-effective power substations.

2 Seabed Electrical Distribution
A cost-effective, modular solution with high reliability for onshore to 60 MV subsea processing located up to 3000 m deep.

3 Pipeline Management
Complete pipeline distribution solutions that help increase safety, enhance reliability and improve operational performance and profitability.

4 Energy Management and Control Systems (EMCS)
Complete power distribution solutions for large oil & gas sites (refineries, petrochemical and LNG plants) based on the IEC 61850 standard.

5 Integrated Security Solutions
Supported by an open yet secure telecom backbone, with high-performance CCTV and efficient access control.

Solutions for Railways

Keeping you on track with intelligent solutions

At Schneider Electric, we understand the requirements that are essential to the modern-day railway network. With a long history of working in the rail industry, we provide a return on investment throughout the life of a rail installation.

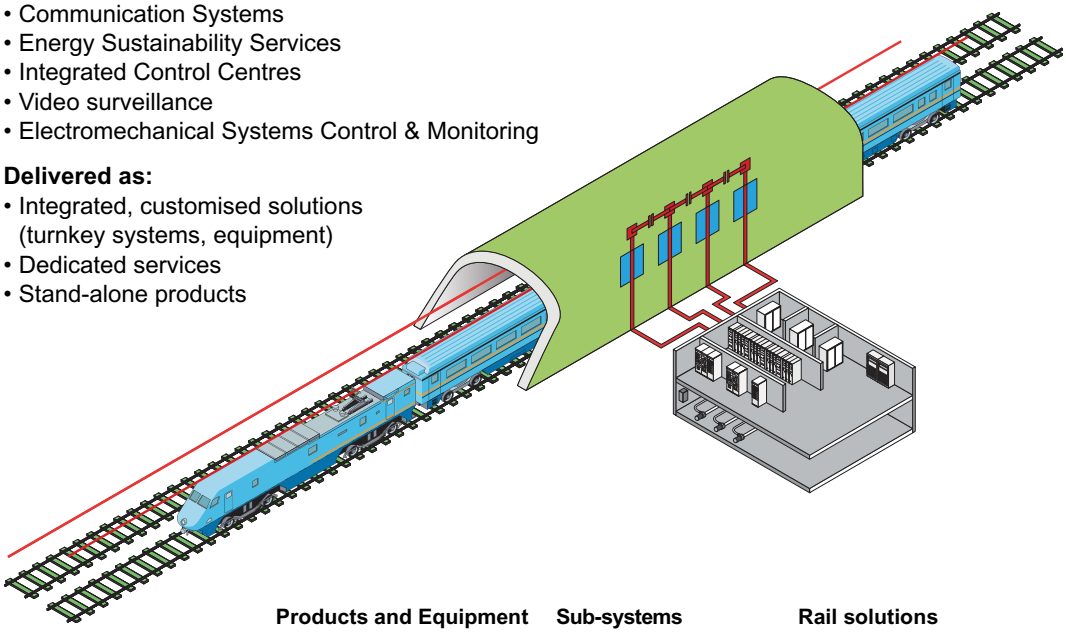
Our range of high-quality innovative and cost-effective electrical solutions ensure that your rail project is successfully completed. Our equipment and solutions have been selected by the most demanding rail and metro operators, and enable millions of passengers to safely reach their destinations every day.

Whether your interest lies in stations and depots, or on trackside power supplies and light rail, we can offer a tailored solution for all your communication, electrical distribution and automation requirements with efficient use of resources.

Complete offer comprising:
- Electrical Supply for traction power, signalling, stations
- Secure Power Solutions
- Substation Automation
- Energy Management Systems / SCADA
- Energy Management services
- Communication Systems
- Energy Sustainability Services
- Integrated Control Centres
- Video surveillance
- Electromechanical Systems Control & Monitoring

Delivered as:
- Integrated, customised solutions (turnkey systems, equipment)
- Dedicated services
- Stand-alone products

DE90725



	Products and Equipment	Sub-systems	Rail solutions
Mainline (25 kV AC) traction system	• 25 kV MV Switchgear • Transformers • MiCOM protection relay • RTU's, UPS • Filters / Capacitors	• Traction substations • Substation automation • Telecom • Video security	• Energy management (SCADA) • Integrated control centre • Asset & Operation management • Field services • Weather services
Urban (DC) traction system	• A/C MV Switchgear • Transformers • RTU's, UPS • Filters / Capacitors	• Traction substations • Substation automation • Telecom • Video security	• Energy SCADA • Integrated Control Centre • Asset & Operation management • Field services
Signalling	• RMU's, transformers, kiosks • LV panels, cabinets • PLC's, UPS • Insul. monitoring	• Automatic supply restoration • UPS systems	• Asset & Operation awareness • Power and Signalling status • Planning of Maintenance, Repairs, etc.
Tunnels & Stations	• MV, LV panels • Distribution Transformers • RTU's, UPS, PLC's • Canalis, LV components	• Distribution system • BM control • Lighting management • Video security • Building management	• Integrated Control Centre • Smart Energy Management • Asset & Operation management • Field services
Operations		• Access control • Video security • Cyber security	• Big data management • Integrated Asset & Operation management • Maintenance in operational condition • Energy Efficiency & Sustainability

Solutions for Railways

Powering Main Lines - Energy equipment for AC main lines

1 27.5 kV Indoor traction Switchgear

GHA-R	WI-R	CBGS2
■ (1x & 2x) 27.5 kV ■ 200 kV BIL ■ Up to 2000 A ■ 25 kA ■ Vacuum	■ 55kV - 2x27.5 kV ■ 250 kV BIL ■ Up to 2000 A ■ 31.5 kA ■ Vacuum	see page A-3

2 27.5 kV Outdoor traction Switchgear

SDR	CBR
■ 27.5 kV ■ 40 kA ■ Up to 2000A ■ Vacuum	■ 27.5 kV ■ 25 kA ■ Up to 2000A ■ Vacuum

3 Disconnectors

SG-52	RB-25
■ 55 kV - 2x27.5 kV ■ BIL 250 kV ■ Up to 2000A ■ 80 kA peak	■ 1x27 kV & 2x27kV ■ BIL 200 kV ■ Up to 2500A ■ 100 kA peak

4 Traction Transformers

Power and distribution transformers
- AC type, up to 110 kV
- Up to 50 MVA
- Dry or oil-immersed type
- Settings: Off-Circuit Tap Changer - On-Load Tap Changer

5 Autotransformers

Autotransformers
- Up to 52 kV
- Up to 20 MVA
- Oil-immersed type

6 Special Railways Transformers

Heating, Lighting or "Shifting/Shunting" transformers
- Up to 400 kVA - 26 kV. Insulation level 52 kV
- Mainly single-phase transformers
- Pole-, Pad- or Ground-mounted type
- Oil-immersed type

7 Power Quality Solutions

- Voltage Drop Compensation (Voltage support)
- Harmonics filtering
- Real time reactive power

8 Trackside Substation

- Plug & Play
- Prefabricated, fully assembled and tested in factory

9 Full IEC61850 Protection & Control

- MiCOM P range (P138 - P638 - P438 - P436)
- AC directional & distance catenary protection
- Communication Network and RTU's Distributed Control solution in traction substations

Powering Urban Rail

1. Medium Voltage Switchgear
2. Rectifier Transformers
3. Power Quality Solutions
4. Prefabricated traction Substation

Powering Signalling, Tunnels & Stations

1. Medium Voltage Switchgear
2. Distribution Transformers
3. Low Voltage Enclosures
4. Prefabricated Substations
5. Automatic Supply Restoration
6. Fault protection for IT networks
7. Integrated facilities management control Centre

1 Medium Voltage Switchgear

MCset 4	PIX	GHA - 3phase	GMA	CBGS-0	F400
■ 24 kV ■ 2500A ■ 31.5 kA ■ Vacuum or SF6 CB	■ 17.5 - 24 kV ■ 4500 - 2000A ■ 50 - 31.5 kA ■ Vacuum CB	■ Up to 40.5 kV ■ Up to 2500A ■ Up to 40 kA ■ Vacuum CB	■ Up to 24 kV ■ Up to 2500A ■ Up to 31.5 kA ■ Vacuum CB	■ Up to 36 kV ■ Up to 2000A ■ Up to 31.5 kA ■ SF6 CB	■ Up to 36 kV ■ Up to 2000A ■ Up to 31.5 kA ■ SF6 CB

Premset	RM6	SM6	Flusarc	FBX
■ 17.5 kV ■ Up to 1250A ■ 25 kA ■ Vacuum	■ 12 kV ■ Up to 630A ■ 25 kA ■ SF6	■ 17.5 - 24 - 36 kV ■ 1250A ■ 25 kA ■ SF6, Vacuum	■ 36 kV ■ Up to 630A ■ 20 - 25 kA ■ SF6	■ 12 - 24 kV ■ 630A ■ 25 - 20 kA ■ Vacuum, SF6

Solutions for the Mining Industry

Schneider Electric's global mining experience has led to the refinement of tools and systems that are adaptable to each individual mining application. Intelligent systems make it possible to maximise revenue generation by gathering and processing the information needed to optimize production performances and costs. In addition to pre-developed architectures greatly reducing system design costs, substantial operating savings can also be made through maintenance management services and energy efficient practices.

Architecture scalability permits installations to be expanded as and when demand trends shift. This flexibility, combined with process oriented design tools, allows for tightly knitted solutions, precisely integrating all mining processes, and simultaneously reducing resource wastage. Through integrating technologies across multiple domains of expertise, Schneider Electric is capable of delivering end-to-end solutions for the mining sector.

■ **Increase revenue**
Increase revenue and production capacity through information management, demand chain visualisation and remote operations.

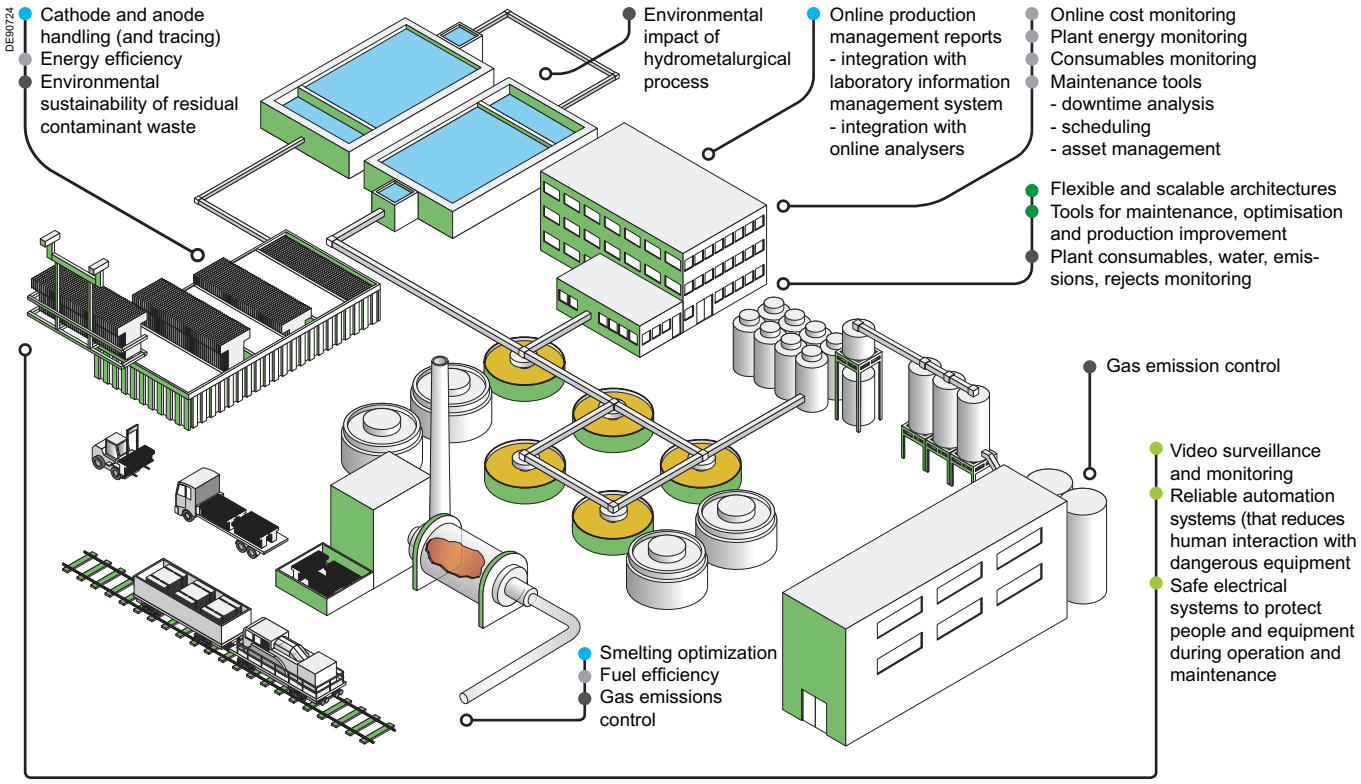
■ **Reduce costs**
Reduce design, implementation and operating costs by using proven and standard architectures and deploying them in a rapid and controlled manner.

■ **Total integration**
Integrated technology from the boardroom to the device means a standards approach can be taken to expansion projects, essentially "cookie cutting' the way to increased capacity.

■ **Turnkey project management**
Utilise Schneider Electric capability to turnkey your project and manage your procurement, design and installation risk through a single contract.

■ **Efficient deployment**
Delivering packaged electrical and automation solutions. Containerized Data Centre, control rooms and packaged substations means your entire electrical and automation infrastructure can be delivered and installed at site pre-tested and ready to commission.

■ **Contribute to sustainable development**
Improve health, safety and people development and reduce environmental impact.

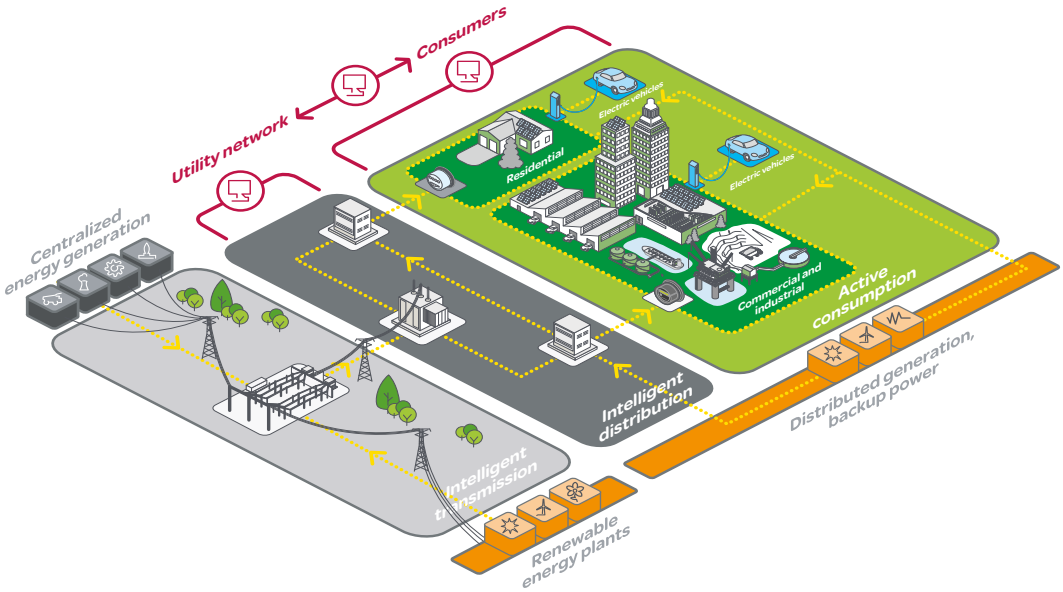


Solutions for Utilities

Enabling smart utilities
Schneider Electric is enabling the smart utilities with easy, efficient, and reliable products, services and solutions. Schneider Electric has been involved with Utilities for a number of years and is keen to support those that are embracing transition. Utilities or “smart Utilities” are the ones preparing for decarbonisation and renewable energy development.
Schneider Electric’s aim is to improve the efficiency of “smart Utilities”.

Challenges:
- Embracing self-generation and being proactive about it, in order to avoid an unstable and overloaded grid.
- Providing a better service to their customers with the use of data management.
- Reducing operating costs at a time when grids have to be upgraded and systems developed.
- Keeping tariffs low so as to attract large industrial customers into the country.

Innovative Services to deliver advanced solutions
- Advisory consulting
- Installation/Commissioning
- Turnkey projects
- Training
- Information & Infrastructure as a service



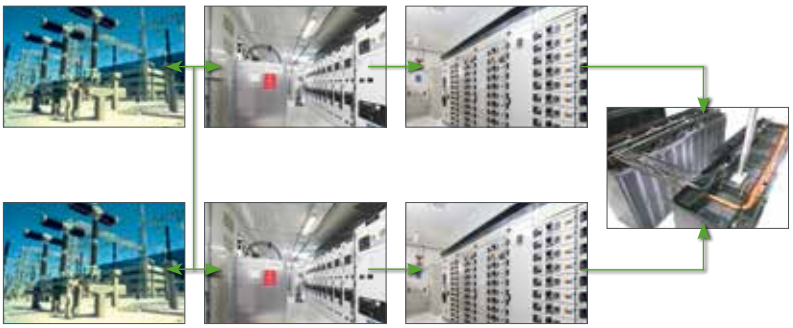
Smart Grid Operator	Smart Generator	Energy Services Provider	Wind & Solar Operator
Changing business processes for more efficient use of Assets & Workforce	Optimizing a portfolio of centralized and decentralized generation	Growing by selling energy management services to prosumers and consumers	Maximizing and monetizing energy output by leveraging policies and markets
Geospatial (GIS) Information Utility Analytics	*Analytics Asset Management*	*Analytics Sustainability*	*Analytics*
SCADA / ADMS Smart Metering DERMS	*Power Plant DCS*	*Demand Response Virtual Power Plant*	*Renewable Control Centre Power Plant Controller*
Feeder & Substation AutomationSmart Devices	*Nuclear & Thermal BoPUtility Microgrid / Storage*	*Microgrid / Storage Meters / Home Energy*	*On-Shore & Off-Shore BoPSolar BoP / Inverters*
“IT/OT integration from field to control centre to enterprise”	“Producing power efficiently"	"Bridging supply & demand"	"Making renewables dispatchable"

Solutions for Data Centres

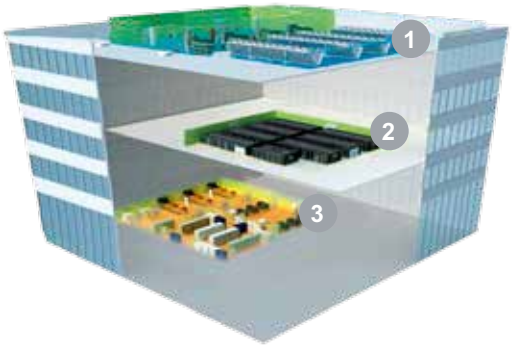
Supplying your preferred model: solutions, subsystems, components
Schneider Electric is striving to simplify the entire data centre life cycle from concept to commissioning: physical data centre infrastructure, full-service data centre solutions from rack to row to room to building.

Challenges:
- Keeping up with the explosive pace of cloud-based business and big data today. It needs to be reliable, efficient and scalable, while keeping data secure.
- Monitoring and controlling the entire physical infrastructure by automating and integrating data centre management to drive business performance.
- Simplifying and speeding up the process of planning, designing and building data centres.

A typical redundant (2N) architecture for Power Distribution Flow from MV to LV into IT room



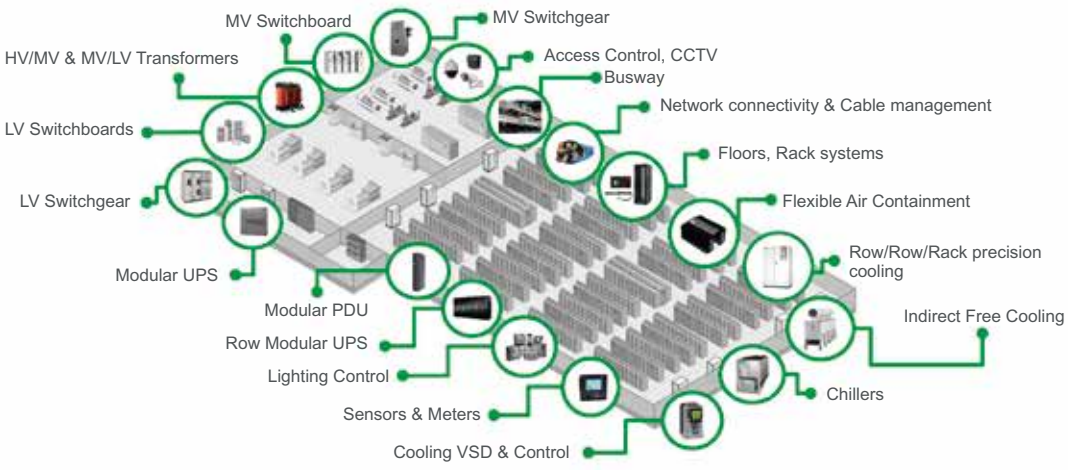
Functional building blocks of Data Centre



1. Cooling (Chillers - Economizers - Pump Packages - Monitoring and Control)
2. IT (IT racks - Security and Monitoring - CRAC - PDU's)
3. Power (UPS - Switchgear - Busway - Panel Boards - Monitoring)

We have a large portfolio of Data Centre components, software & services from rack to row to room to building

PE90857



Solutions	Subsystems	Components
Innovative combinations of technology, products, and services providing an integrated, high-value response to customer's Data Centre needs	Complex Data Centre systems that are key elements of Data Centre domains - IT Room, Facility Power, Facility Cooling, Security, DCIM	Catalogue of 100,000+ Data Centre components and individual software modules

Medium Voltage Distribution by Schneider Electric

Worldwide leader in Medium Voltage: discover our extensive offer for MV distribution networks.

Meeting your reliability expectations and efficiency are our goals.

Challenges
The world of energy is changing: rising demand, increased pressure on performance.
MV equipment is a critical component. In every situation you need the best solution for lower cost, ease of use and trouble-free service life for both operator and equipment.

Solutions
Your Medium Voltage requirements are evolving as efficiency improves. With our market-leading expertise, extensive knowledge and experience, Schneider Electric's team will have the cost-effective solution you need:

- A diverse portfolio, including all the latest technology (AIS, GIS and SSIS) and meeting all applicable international and local standards.
- Fully tested, smart digital solutions: flexible, compact, able to withstand harsh environments.
- Optimized total ownership costs throughout the installation life cycle.
- Industrial processes in compliance with Quality certifications ISO 9001, ISO 14001.
- Local support: specialists based all over the world with an active commitment to help you make the most of your energy.

E-House solution, a new trend of the market

The Electrical House (E-House) is a factory integrated, tested, validated, compact power distribution solution. The E-House contains Medium Voltage switchgear, motor control Centres, transformers, HVAC, UPS, and building management and control systems. It helps you reduce construction lead times, optimize the cost of transportation, installation and commissioning, and enhance uptime thanks to qualified and reliable design.

The E-House is the ideal solution for projects in all type of industries such as Oil & Gas, Mining & Minerals, Off-shore, Utilities, Electro-intensive industries or Railways.

Increase safety for people and equipment:
- Internal arc protection and thermal insulation.
- Equipment protection in harsh environments.
- Compliance with local standards.

Simplify:
- One partner for the complete distribution solution
- One project management team simplifies processes, time management, and control
- One engineering design team optimizes costs.

Reduce costs:
- CAPEX reduction thanks to reduced engineering, installation, and commissioning costs.
- The complete engineered solution is controlled, tested and pre-commissioned within the factory it enables to save time on-site.
- OPEX reduction via a highly serviceable design and local technical experts.
- Enhanced uptime due to qualified and reliable design.

MG_0730

SKSOL is a Joint Venture established in 2012 by SK Lubricants (70%) and Repsol Petroleo (30%) for the construction and operation of a Group 3 Base Oil Plant in Cartagena. Schneider Electric has provided an Electrical Substation (E-House) to ensure the quality and reliability of the electrical power supply of the new Lubricant Base Oils plant in Cartagena.

Some of the advantages of the solution include the optimization of the overall installation cost, reduced lead time and commissioning. This was possible thanks to the pre-assembled plug-and-play solution that helped to reduce on-site work.

E-House solution, a new trend of the market

The largest integrated offer for energy management

For painless execution of your industrial projects
Fully assembled and tested at the factory, an E-House contains a variety of integrated Schneider Electric equipment to meet the demanding requirements of your applications.

Best-in-class applications inside

Busways
MV, LV Equipment
MV, LV Drives
EMCS ICSS/ESD (1)
HVAC (2)
UPS (3)
Security (4)
BMS(5)

Engineering
Project Management
Integration & Testing
Asset Management
Lifetime Services


MV, LV Drives


Variable Speed Drive cabinets


MV, LV Equipment


Capacitor

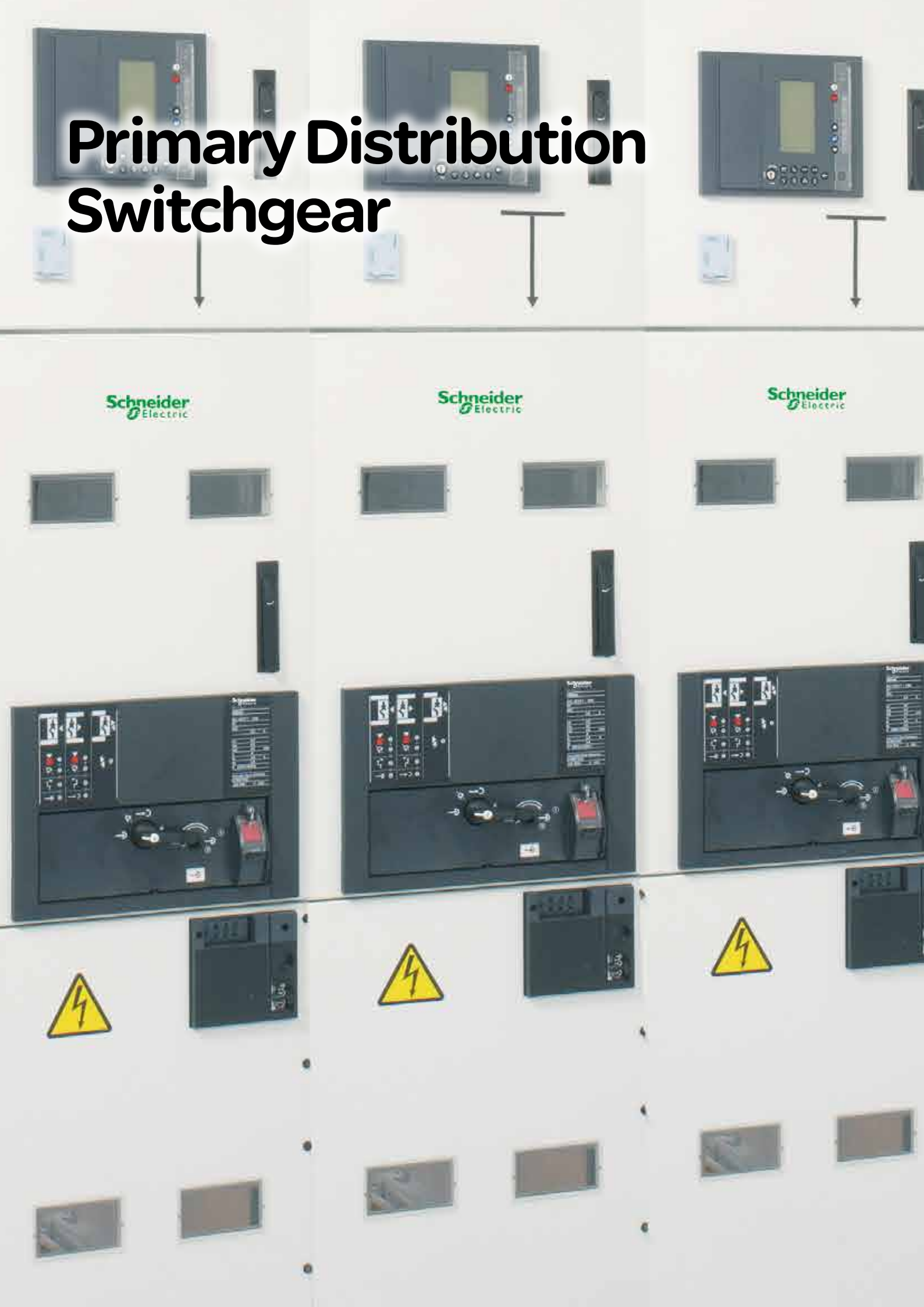

Energy Management and Control System - Integrated Control and Protection systems (Invensys)


HVAC (Uniflair)


Cable trays

(1) EMCS ICSS/ESD (Invensys) - Electrical, Monitoring & Control SystemsIntegrated & Control Safety Systems - Integrated Emergency Shut Down
(2) HVAC (Uniflair)
(3) UPS (APC/Gutor)
(4) Security (Pelco)
(5) BMS - Building Management Systems

Primary Distribution Switchgear



Contents

Selection Table

Air Insulated Switchgear								Motor Starter	
 PE90271	 PE90208	 PE90276	 PE57466	 PE57993	 DM102184	 PM103575		 PE90879	 PM103007
F400	**GenieEvo**	**Masterclad**	**MCset**	**NEX**	**PIX**	**PIX Double Busbar**		**Motorpact**	**PIX MCC**
IEC / GOST	IEC/BS	ANSI/IEEE	IEC	IEC	IEC/ GOST	IEC		IEC/NEMA/UL/ GOST/IACS	IEC
Rated voltage (kV)									
36 / 40.5	13.8	15 / 27	17.5 / 24	12 / 17.5 / 24	17.5 / 24	12 / 17.5		7.2	7.2
LSC2B-PM	LSC 2A-PM		LSC 2B PM	LSC 2B PM	LSC 2B PM	LSC 2B PM		LSC2A-PI	LSC 2B-PM
Max. rated current									
2500 A / 1250 A	2500 A	4000 A / 2750 A	4000 A / 2500 A	2500 A / 2500 A / 2000 A	5000 A** / 2500 A	3150 A		3150 A	3150 A (busbars)
Max. rated short circuit current									
31.5 kA Vacuum / 31.5 kA SF6 / 40 kA SF6	25 kA Vacuum	63 kA / 40 kA Vacuum	50 kA / 31.5 kA SF6*	31.5 kA / 31.5 kA / 25 kA Vacuum	50 kA / 31.5 kA Vacuum*	31.5 kA Vacuum		50 kA Vacuum	50 kA Vacuum
Single busbar system	Single busbar system Fixed type Rear cable access	Single busbar system	Single busbar system, Withdrawable Circuit Breaker * *Vacuum technology, please refer to PIX*	Single busbar system Withdrawable Circuit Breaker	Single busbar system, Withdrawable Circuit Breaker * *SF6 technology, please refer to MCset* ** *with fan*	Double busbar system, Withdrawable Circuit Breaker		Withdrawable double busbar for S3 DOL RVSS RVAT Reversing 2-speed	Withdrawable Direct line-up with PIX Front access cabling (rear option) DOL and feeder applications
Indoor	Indoor	Indoor & Outdoor	Indoor	Indoor	Indoor	Indoor		Indoor & Outdoor NEMA	Indoor

Selection Table

Gas Insulated Switchgear									2SIS
 PE90697	 PM102833	 PM103008	 PM103068	 PM102834	 PM102831	 PE90845			
CBGS-0*	**CBGS 2**	**CBGS-2 Rail**	**GHA**	**GHA Rail**	**GMA**	**WI**	**WI Rail**	**WS**	**Premset**
IEC/ANSI (ENA/UL)	IEC	IEC	IEC/GOST/ CNS/CSA/ENA	IEC/GB (China)	IEC/GOST/ CNS	IEC/CNS	IEC/EN	IEC / GOST / CNS	IEC/GOST/GB
Rated voltage (kV)									
24	36	38	52	1 x 27.5 / 2 x 27.5	40.5	1 x 27.5 / 2 x 27.5	24	52	2 x 27.5 / 55 / 36 / 12 / 17.5
									LSC 2A-PM
Max. rated current									
2000 A	2000 A	2000 A	2500 A 4000A (on request)	2000 A	2500 A	2500 A	2000 A	2500 A	1250 A
Max. rated short circuit current									
31.5 kA	25 kA	25 kA	40 kA	25 kA	31.5 kA	40 kA	31.5 kA	31.5 kA	25 kA
SF6	SF6	SF6	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum LBS, CB and transformer protection
Single busbar system Fixed type Mainly with C.B. but also switch-disconnector functions Compact design at 36 kV Flexible busbar system Outer cone cable connection No gas handling ** For Railways application also*	Single and double busbar system Fixed type CB applica-tions Separated gas compart-ments for CB and busbar Spacious cable connec-tion inner cone	For railway application 1 or 2 poles (250 kV BIL) Single busbar system Fixed type For traction application, 1 or 2 pole solution BIL 250 kV, suitable for traction side container Substation	Single and double busbar system Fixed type CB applications Separated gas compartments for CB and busbar Compact design, flexible cable connection for outer cone and inner cone, no gas handling	Single busbar system Fixed type For traction application 1 or 2 pole solution BIL 200 kV, suitable for traction side container Substation No gas handling	Single busbar system Fixed type Mainly with C.B. but also switch-disconnector functions Less Space-More Power Very compact design Flexible busbar system Outer cone cable connection No gas handling	Single and double busbar system Fixed type CB applications Separated gas compartments for CB and busbar Same small footprint for SBB and DBB, spacious cable connection inner cone	Single busbar system Fixed type For traction application, 1 or 2 pole solution BIL 250 kV, suitable for traction side container Substation	Single and double busbar system Fixed type CB applications Separated gas compartments for CB and busbar Same small footprint for SBB and DBB, spacious cable connection inner cone	Compact modular switchgear with 3-in-1 architecture for breaking disconnection and earthing
Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor & Outdoor

Air Insulated Switchgear

From experience to innovation
F400 is an indoor Medium Voltage switchgear assembly, specifically designed on the basis of extensive experience.
It complies with IEC standards.

PE90370

F400 with SF6 circuit breaker

Main characteristics

- 3 compartment design
- LSC2B-PM
- Rated voltage : up to 36 kV (Vacuum) / 40.5 kV (SF6)
- Single busbar (SBB)
- Withdrawable circuit breaker Roll on Floor: SF + Vacuum
- IP4X
- Internal arc classification up to AFLR: Vacuum (25 kA/1 s 31,5 kA/0,5 s) SF6 (25 kA/1s 31,5 kA/0,5 s and 40 kA/0,15 s)
- Protection and control devices: Sepam, GemControl

Key applications

Utilities - Industry - Infrastructure - Oil & Gas - Mining - Wind *(please see page 12 for more details)*

Field proven: 50000 units already installed
Reliable
Safety
Simplicity

Technical characteristics

				Vacuum Circuit Breaker		SF6 Circuit Breaker			
Rated voltage									
		Ur	(kV)	**36**	**36**	**36**	**36**	**36**	**40.5** (2)
Rated frequency									
		fr	(Hz)	50/60	50/60	50/60	50/60	50/60	50/60
Rated insulation level									
Power frequency withstand voltage 50 Hz - 1 min		**Ud**	(kV)	70	70	70	70	70	85 (4)
Lightning impulse withstand voltage 1.2/50 ms		**Up**	(kV peak)	170	170	170	170	170	185
Nominal current and maximum rated short-time withstand current									
Functional unit with circuit-breaker (1)									
Rated short-time withstand current	Ith. max	**Ik/tk**	(kA 3 s)	25	25	25 (3)	25	25	25
				31.5	31.5	31.5	31.5	31.5	31.5
				-	-	40	40	40	-
Rated normal current	In max busbars	**Ir**	(A)	1250	-	1250	1250	-	1250
				2500	2500	2500	2500	2500	-
	In Circuit Breaker	**Ir**	(A)	1250	-	1250	1250	-	1250
				-	2500	-	-	2500	-
Internal arc withstand									
			(kA/1 s)	25	25	25	25	25	25
			(kA/0.5 s)	31.5	31.5	31.5	31.5	31.5	31.5
			(kA/0.15 s)	-	-	40	40	40	-
Protection degree									
	Enclosure			IP3X/IP4X (5)		IP3X/IP4X (5)			
	LV control cabinet			IP4X		IP4X			
Dimensions / Weight									
	Width		mm	1100	1100	900	1100	1100	1100
	Height		mm	2255	2255	2255	2255	2255	2255
	Depth internal arc		mm	3074	3074	3074	3074	3074	3074
	Approximate weight		kg	1560/1949		1467/1929			1929

(1) For functional units equipped with circuit-breakers, the breaking capacity is equal to the rated short-time withstand current. In all cases, the peak making capacity is equal to 2.5 times the rated short-time withstand current for 50 Hz and 2.6 times for 60 Hz.
(2) For F400 version with functional current transformers. (3) Only 50 Hz for SF1. (4) Ud 95 kV 50 Hz 1 min possible.
(5) IP4X for type1 cubicle.

Air Insulated Switchgear

Bringing simplicity and high reliability to your applications
GenieEvo is a compact indoor Medium Voltage switchgear assembly. A fixed circuit breaker and 3-position disconnector, combined with solid insulation technology, makes it a simple and highly reliable solution.
It complies with IEC and BS standards.

PE90208

Main characteristics

- Compartmented design
- LSC2A-PM
- Rated voltage: 13.8 kV
- Solid insulated single busbar
- Fixed (demountable) circuit breaker: Evolis
- Resin encapsulated busbars and disconnector are virtually insensitive to ambient conditions
- Internal arc classification: AF(LR) up to 25 kA 1 s
- Protection and control devices: Sepam, MiCOM, VAMP arc flash or GemControl

Key applications

Utilities - Industry - Infrastructure - Building
(please see page 12 for more details)

Peace of mind
Energy availability
Safety

Technical characteristics

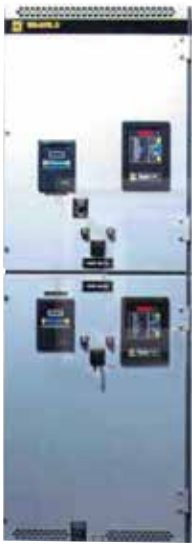
Rated voltage				
		Ur	(kV)	**13.8**
Rated insulation level				
Power frequency withstand voltage 50 Hz - 1 min		**Ud**	(kV rms)	38
Lightning impulse withstand voltage 1.2/50 µs		**Up**	(kV peak)	95
Rated normal current and maximum short time withstand current				
Rated peak current			(kA)	67.5
Short time withstand current	Ik max.	**Ik/tk**	(kA/3 s)	25
Rated current	Ir max. busbar	**Ir**	(A)	630
				1250
				2500 (1)
Rated current	Ir CB	**Ir**	(A)	200
				630
				1250
				2500 (1)
Internal arc classification (maximum value I_A and t_A)				
			(kA/1 s)	25
			IAC	AF - AFLR
Degree of protection				
External enclosure			Standard	IP3X
			Option	IP4X

(1) 2500 A available on request.

Air Insulated Switchgear

The reliability of a quality design
MasterClad is an ANSI-rated Medium Voltage switchgear assembly. It offers, as standard, a two-high drawout breaker arrangement that can be combined with a series of basic modular units, control packages and instrumentation to satisfy many user application requirements.
It complies with ANSI standards.

PE90276

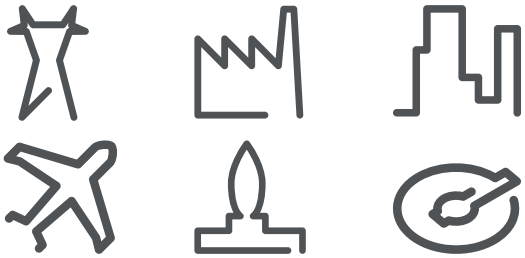


Main characteristics

- ■ Tested to ANSI/IEEE C37.20.2
- ■ Compartmented design
- ■ Rated voltage up to 27 kV
- ■ Busbar and circuit breaker ratings from 1200-4000 A
- ■ Withdrawable circuit breaker Roll on Floor: VR
- ■ Enclosure options:
- □ Indoor
- □ Outdoor walk-in and non-walk-in
- □ Arc Resistant Type 2B (ANSI/IEEE C37.20.7)
- ■ Optional Arc terminator
- ■ Protection and control devices: Powerlogic, ION

Key applications

Utilities - Industry - Building - Infrastructure - Oil & Gas - Water *(please see page 12 for more details)*



Rugged & durable
Long life
Flexible arrangements

Technical characteristics

Electrical characteristics					
Nominal Voltage	(kV)	**4.16**	**7.2**	**13.8**	**27**
Maximum Voltage	(kV)	4.76	8.25	15	27
BIL	(kV)	60	95	95	125
Continuous current	(A)	1200	1200	1200	1200
		2000	2000	2000	2000
		-	-	-	2750
		3000*	3000*	3000*	-
		4000*	4000*	4000*	-
Interrupting current	(kA)	40-50-63	40-50	25-40-50-63	16-25-40
Enclosure type					
External enclosure		NEMA 1, 3R, AR			NEMA 1, 3R

** One-high construction*

Air Insulated Switchgear

The strength of experience
MCset is an indoor switchgear assembly that provides maximum user safety. It is designed to meet all electrical distribution needs up to 24 kV and incorporates a set of innovative solutions.
It complies with the main IEC standards.

PE57466

Main characteristics

- High safety class thanks to 3 metallic compartments
- LSC2B-PM
- Wide range of rated voltage: 7.2, 12, 17.5, 24 kV
- Internal arc classification: AFL(R) up to 50 kA 1s
- Single busbar (SBB)
- Withdrawable circuit breaker: LF or SF (24 kV)
- Witdrawable Contactor: Rollarc
- Can be combined with Motorpact for contactor applications
- Protection and control devices: Sepam, MiCOM, GemControl, VAMP or thermal diagnosis

Key applications

Utilities - Industry - Infrastructure - Marine
(please see page 12 for more details)

Reliability
Safety
Simplicity

Technical characteristics

Rated voltage							
		Ur	(kV)	**7.2**	**12**	**17.5**	**24**
Rated insulation level							
Power frequency withstand voltage 50 Hz - 1 min		**Ud**	(rms kV)	20	28	38	50
Lightning impulse withstand voltage 1.2/50 µs		**Up**	(kV peak)	60	75	95	125
Rated normal current and maximum short time withstand current (1)							
Functional unit with circuit breaker							
Short time withstand current	Ik max.	**Ik/tk** (kA/3 s)		25	25	25	16
				31.5	31.5	31.5	25
				40	40	40	31.5
				50 (6)	50 (6)		
Rated current	Ir max. busbar	**Ir**	(A)	4000	4000	4000	2500 (7)
Rated current	Ir CB	**Ir**	(A)	1250	1250	1250	630
				2500	2500	2500	1250
				3150	3150	3150	2500
				4000 (2)	4000 (2)	4000 (2)	
Functional unit with fuse-contactor (3)							
Short time withstand current (prospective value) (9)	Ik max.		(kA)	50 (4)	50 (4) (5)		
Rated current	Ir max.		(A)	250	200 (5)		
Functional unit with switch-fuse combination (DI cubicle) (8)							
Rated current according to the fuses installed, see documentation							
Rated current	Ir max. ⩽		(A)	200	200	200	200
Internal arc classification (maximum value I_A and t_A)							
			(kA/1 s)	50	50	50	25
			(kA/0.15 s)	50	50	50	31.5
Degree of protection							
				IP3X - IP4X (7)- IPX2			IP3X IP4X IPX1 (7)

(1) For functional units equipped with circuit breakers or fuse-contactors, the breaking capacity is equal to the short time withstand current. In all cases, the device peak making capacity is equal to 2.5 times the short time withstand current.
(2) With fan.
(3) Lightning impulse dielectric withstand voltage = 60 kV peak.
(4) Limited by fuses (prospective value).
(5) With Rollarc contactor.
(6) Limited to 1 s for In circuit breaker: 1250 A.
(7) For higher performance, consult us.
(8) According to IEC 62271-105, combinations do not have a rated short time withstand current.
(9) In accordance with IEC 62271-106.

Air Insulated Switchgear

An optimized metal-enclosed cubicle concept
NEX is a modular type-tested cubicle, designed to meet local requirements and local standards, equipped with a vacuum circuit breaker.
It complies with IEC standards.

PE57993

Main characteristics

- Rated voltage: 17 / 24 kV
- Single Busbar
- Rated operational current vacuum technology: 3150 A / 2500 A
- Rated peak withstand current vacuum technology: 31.5 kA / 25 kA
- Internal Arc Classification: AFLR 25 kA 0.5 s/1 s
- Loss of Service Continuity: LSC 2B
- Partition class: PM
- Control & monitoring: Sepam, MiCOM

Key pplications

Utilities - Industry - Infrastructure
(please see page 12 for more details)

Reliability
Continuity of service
Safety

Technical characteristics

Rated voltage						
		Ur	(kV)	**12**	**17.5**	**24**
Rated insulation level						
Power frequency withstand voltage 50 Hz - 1 min		**Ud**	(kV rms)	28	38	50
Lightning impulse withstand voltage 1.2/50 µs		**Up**	(kV peak)	75	95	125
Rated normal current and maximum short time withstand current (1)						
Functional unit with circuit breaker						
Short time withstand current	Ik max.	**Ik/tk**	(kA/3 s)	25	25	16
				31.5	31.5	25
Rated current	Ir max. busbar	**Ir**	(A)	2500	2500	2000
Rated current	Ir CB	**Ir**	(A)	630	630	630
				1250	1250	1250
				2500	2500	2000
Functional unit with load break switch (LB cubicle)						
Short time withstand current	Ik max.	**Ik/tk**	(kA/3 s)	-	-	25
Rated current	In max. ⩽		(A)	-	-	630
Internal arc classification (maximum value I_A and t_A)						
			(kA/1 s)	25		25
			IAC	AFLR		AFLR
Degree of protection						
External enclosure				IP3X or IP4X	IP3X or IP4X	IP3X or IP4X
Internal - Between compartments				IP2X	IP2X	IP2X

(1) For functional units equipped with circuit-breakers or fuse-contactors, the breaking capacity is equal to the rated short-time withstand current.
In all cases, the peak making capacity is equal to 2.5 times the rated short-time withstand current.

PIX Standard & PIX High

Air Insulated Switchgear

Optimising reliability with Air Insulated Switchgear

The PIX range of indoor switchgear assemblies provides maximum user safety. It is designed to meet all electrical distribution needs up to 24 kV and incorporates a set of innovative solutions. It complies with main IEC standards.

PE57466

Main characteristics

- High safety class thanks to 3 metallic compartments
- LSC2B-PM
- Wide range of rated voltage: 7.2, 12, 17.5, 24 kV
- Internal arc classification: AFL(R) up to 50 kA 1 s
- Single busbar (SBB)
- Withdrawable circuit breaker: HVX
- Witdrawable Contactor: CVX
- Protection and control devices: Sepam, MiCOM, GemControl

Applications

Utilities - Industry - Infrastructure - Marine

(please see page 12 for more details)

Reliability
Safety
Simplicity

Technical characteristics

Rated voltage						
		Ur	(kV)	**12**	**17.5**	**24**
Rated insulation level						
Power frequency withstand voltage 50 Hz - 1 min		**Ud**	(kV rms)	28	38	50
Lightning impulse withstand voltage 1.2/50 µs		**Up**	(kV peak)	75	95	125
Rated normal current and maximum short time withstand current (1)						
Peak withstand current Ip (kA)			(kA rms)	63/80/100/130		50/63/80
Functional unit with circuit breaker						
Short time withstand current	Ik max.	**Ik/tk**	(kA/3 s)	25 - 31.5 - 40 - 50		20 - 25 - 31.5
Rated current	Ir max. busbar	**Ir**	(A)	up to 3150 up to 5000 (2)		up to 2500
Rated current	Ir CB	**Ir**	(A)	1250 - 2500 - 3150 - 4000 (2) - 5000 (2)		1250 - 2500
Functional unit with switch disconnector						
Rated current			(A)	630	630	630
Functional unit with switch-fuse combination (T1 cubicle) (3)						
Rated current			(A)	400	400	400
Functional unit with fuse contactor						
Rated current			(A)	200-400		
Internal arc classification (maximum value I_A and t_A)						
			(kA/1 s)	50	50	31.5
			IAC	AFLR	AFLR	AFL
Degree of protection						
External enclosure			Standard	IP3X		
			Option	IP4X		

(1) For functional units equipped with circuit breakers or fuse-contactors, the breaking capacity is equal to the short time withstand current. In all cases, the device peak making capacity is equal to 2.5 times the short time withstand current.

(2) With fan.

(3) According to IEC 62271-105, combinations do not have a rated short time withstand current.

GemControl

What is GemControl?

GemControl is a unique switchgear controller embedded within our Primary MV equipment. It is responsible for the complete control, monitoring and health diagnostics of the switchgear it controls.

By replacing most of the conventional components within the LV top box, it not only reduces costs but also significantly improves flexibility and delivery times.

GemControl allows Engineered-to-Order switchgear to be 90% configured to order and removes the need for complex project engineering. This also reduces delivery times significantly and enhances reliability. Full self documentation of all logic functions are provided together with automatic wiring diagrams, Bills of Material and data maps to the chosen protection relay. GemControl is independent of the protection relay and whilst it is best used with MiCOM, Sepam or VAMP relays alternate vendors can also be catered for.

The key benefits

- Simpler to operate and all ranges have an identical HMI.
- Motorised interlocks cannot be damaged or defeated.
- Emergency interlocks can be duplicated for additional safety.
- Can be instantly replaced without programming.
- Most future changes are achieved by configuration - not engineering and wiring changes.

The key technical features

- Available on primary AIS or GIS switchgear.
- No voltage restraints.
- No current restraints.
- Any protection relay.
- Modular construction - buy only what is needed.
- Documentation always up to date and stored.

PIX Double Busbar

Air Insulated Switchgear

Uninterruptible power supply up to 17.5 kV
PIX is an indoor MV switchgear assembly. Its modular design makes it suitable for many applications.
Two busbars provide the highest level of uninterruptible power supply which can be extended without disconnecting the busbars.
It complies with IEC standards.

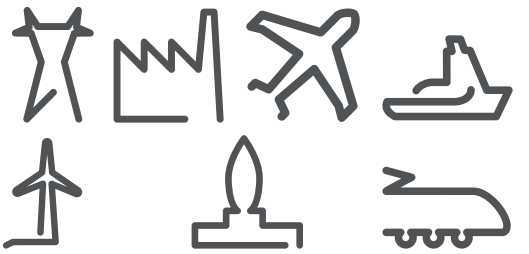
PM103575

Main characteristics

- High safety class thanks to 4 metallic compartments
- LSC2B-PM
- Wide range of rated voltage: 7.2, 12, 17.5 kV
- Internal arc classification: AFL(R) up to 31.5 kA 1s
- Double busbar (DBB)
- Withdrawable circuit breaker: HVX
- Protection and control devices: Sepam, MiCOM, GemControl, VAMP or thermal diagnosis

Key applications

Utilities - Industry - Infrastructure - Marine - Wind power - Oil & Gas - Railways
(please see page 12 for more details)



Service continuity
High Safety
Reliability

Technical characteristics

Rated voltage			
	(kV)	**12**	**17.5**
Power frequency withstand voltage 50 Hz - 1 min	(kV rms)	28	38
Lightning impulse withstand voltage 1.2/50 µs	(kV peak)	75	95
Rated frequency	(Hz)	50-60	50-60
Rated current	(A)	Up to 3150	Up to 3150
Rated short circuit current	(kA/3 s)	31.5	31.5
Rated peak current	(kA)	82	82
Internal arc fault (AFLR - 1s)	(kA/1 s)	31.5	31.5
	IAC	AFLR	AFLR
Loss of service continuity: LSC2B			
Degree of protection			
External enclosure	Standard	IP3X	IP3X
	Option	IP4X	IP4X

Gas Insulated Switchgear

Maximum safety in a reduced space
CBGS-0 is a Gas Insulated Switchgear assembly for indoor substations (HV/MV-MV/MV) that provides power in Utilities, Wind Farms, Railways, Data Centres, Oil & Gas, Mining, Mineral and Metals, Airports, etc.
It complies with the following standards: IEC, ANSI/IEEE. Certifications: ENA, UL Listed.

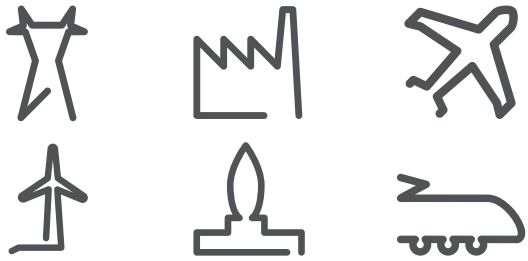
DE60488

Main characteristics

- Rated voltage: up to 36 / 38 kV
- Busbar system: single
- Rated current busbar & feeders: up to 2000 A
- Rated short time withstand current: up to 31.5 kA/3s
- Internal Arc Classification: AFL/AFLR: 31.5kA/1s
- Class : LSC2 PM
- No SF6 handling on site
- Protection and control devices: Sepam, MiCOM, VAMP or Thermal diagnosis

Applications

Utilities - Industry - Infrastructure - Wind Power - Oil & Gas - Railways
(please see page 12 for more details)



Continuity of service: unaffected by the environment, optimized maintenance on Medium Voltage version, sealed-for-life compartments, reduced gas pressure

Maximum safety: operating safety (interlocks), IAC-tested, no access to Medium Voltage parts

Investment optimization: optimized cost, life cycle > 30 years, space and maintenance savings, fully factory-tested

Technical characteristics

Rated voltage					
		Ur	(kV)	**24** (1)	**36** (1)
Rated insulation level					
Power frequency withstand voltage 50 Hz - 1 min		**Ud**	(kV rms)	50	70
Lightning impulse withstand voltage 1.2/50 µs		**Up**	(kV peak)	125	170
Rated normal current and maximum short time withstand current (1)					
Short circuit breaking current	Peak		(kA)	63 - 80	
Short circuit breaking current	Ik max.			25 - 31.5	
Rated current	Busbar system	**Ir**	(A)	1250 - 1600 - 2000	
Rated current	Incoming / Outgoing	**Ir**	(A)	630 - 1250 - 1600 - 2000	
Internal arc classification (maximum value I_A and t_A)					
			(kA/1 s)	25 - 31.5	
			IAC	AFL - AFLR	
Gas pressure at 20 °C					
			(bar)	0.30	
Degree of protection					
HV compartment				IP65	
LV compartment				IP3X - IP41	

(1) The values shown are for normal operating conditions according to IEC 62271-200 and 62271-1 standards.
Up to 27 kV / 38 kV (ANSI / IEEE).

Gas Insulated Switchgear

Maximum safety in a reduced space
CBGS-2 is a Gas Insulated Switchgear assembly for indoor substations (HV/MV-MV/MV) that provides power in Utilities, Railways, Wind Farms, Data Centres, Oil & Gas, Mining, Mineral and Metals, Airports, etc.
It complies with: IEC standards.

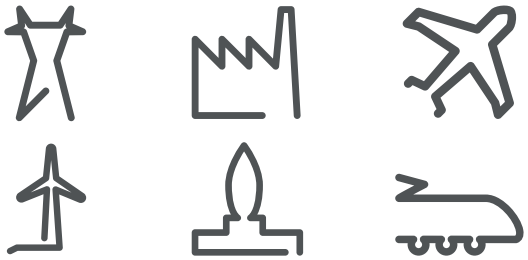
PE90849

Main characteristics

- Rated voltage: 52 kV (three-phase) - 2x27.5 kV (two-phase) - 1x27.5 kV (single-phase)
- Busbar system: Single / Double
- Rated current busbar & feeders: up to 2000 A
- Rated short time withstand current: 25 kA /1 s
- Internal Arc Classification: AFL/AFLR 25 kA/1 s
- Class : LSC2 PM
- Protection and control devices: Sepam, MiCOM, VAMP or Thermal diagnosis

Applications

Utilities - Industry - Infrastructure - Wind Power - Oil & Gas - Railways
(please see page 12 for more details)



Continuity of service: unaffected by the environment, optimized maintenance on Medium Voltage version, sealed-for-life compartments, reduced gas pressure

Maximum safety: operating safety (interlocks), IAC-tested, no access to Medium Voltage parts

Investment optimization: optimized cost, life cycle > 30 years, space savings, maintenance savings, fully factory-tested

Technical characteristics

Rated voltage				
		(kV)	**52**	
Rated insulation level				
Power frequency withstand voltage 50 Hz - 1 min		(kV rms)	95	
Lightning impulse withstand voltage 1.2/50 µs		(kV peak)	250	
Rated normal current and maximum short time withstand current				
Short circuit making current		(kA peak)	63	
Short circuit breaking current		(kA)	25	
Short time withstand current		(kA/s)	25	
Rated current	Busbar system	(A)	2000 max.	
Rated current	Incoming / Outgoing	(A)	1600 max. (1)	
Internal arc withstand				
		(kA/1 s)	25	
Gas pressure at 20° C				
		(bar)	0.40	
Degree of protection				
HV compartment			IP65	
LV compartment			IP3X	
Specific electrical data, monophase and two-phase versions				
			Monophase	**Two-phase**
Short circuit making current		(kV)	1 x 27.5	2 x 27.5
Short circuit making current		(kV)	250	250
Short circuit making current		(A)	Max. 2500	Max. 2000
Short circuit making current		(A)	Max. 2000	Max. 2000 (1)

(1) For other technical requirements, please contact Schneider Electric.

Gas Insulated Switchgear

Safe, Simple and Smart design
GHA is an indoor, metal enclosed SF6-insulated switchgear assembly with vacuum circuit breaker for primary distribution up to 40.5 kV with a clear, ergonomic design that ensures extremely straightforward handling during operation and installation.
Delivered ready to connect from the “crane hook”.
It complies with IEC, GOST, CSA, ENA, CNS, Railway and other national standards.
Preferred solution for E-houses due to its small dimensions and lighter weight.
Shell DEP-approved for Oil & Gas.

PE90858

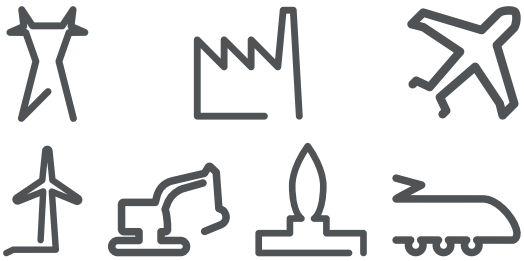
Main characteristics

- Rated up to 40.5 kV, 2500 A, 40 kA-3 s: Solution with busbar up to 4000 A
- Compact dimensions for SBB and DBB*
- No gas handling at site, due to innovative GHA busbar link (B-Link)
- Delivered ready to connect from the “crane hook”
- 1- and 2-pole version for Railway application up to 200 kV BIL
- Cable outer-cone connection or optional inner-cone
- Front cable access
- Intuitive user guidance with mechanical interlocks and all operations from front
- Rear top cable entry up to 2500 A
- Internal Arc Classification (IAC) in accordance with IEC 62271-200 AFL or AFLR up to 40 kA-1 s

** Single Bus Bar - Double Bus Bar*

Key applications

Utilities - Industry - Infrastructure - Mining - Oil & Gas - Railways - Wind Power
(please see page 12 for more details)



Eco-friendly design:
- No gas works on site during installation, replacement and end-of-life disposal
- Leakage test done in the factory
- High recycling rate (≥ 90%)

High factory-assembled quality. Feeders are delivered to sites fully assembled and routine-tested - simply connect!

Easy, safe installation: safe outer-cone cable solution; up to 40.5 kV and 2500 A and height ≥ 600 mm from the front

Technical characteristics

Electrical characteristics								
Rated voltage		(kV)	**12**	**17.5**	**24**	**36**	**38**	**40.5**
Rated lightning impulse withstand voltage		(kV)	75	95	125	170	170	185
Rated power frequency withstand voltage		(kV)	28	38/(42)	50	70	80	85/(95)
Rated peak withstand current		(kA)	100	100	100	100	100	100
Rated short time current		(kA)	40	40	40	40	40	40
Rated busbar currents		(A)	2500 (1)	2500 (1)	2500 (1)	2500 (1)	2500 (1)	2500 (1)
Rated current of branch circuits, naturally ventilated	max.	(A)	2500	2500	2500	2500	2500	2500
Internal Arc Classification (IAC) - IEC 62271-200		(kA/1 s)	40	40	40	40	40	40

(1) Higher values up to 4000 A on request.

Gas Insulated Switchgear

Takes up less space, supplies more power
GMA is an indoor, metal-enclosed, SF6-insulated switchgear assembly for primary distribution up to 24 kV. Its compact size allows switchboards to be installed in very small rooms with a ceiling height of less than 2.4 metres. Its clear, ergonomic design ensures extremely straightforward handling during installation and operation. Preferred solution for E-houses, due to its small dimensions and lighter weight. It complies with IEC, GOST and other national standards.

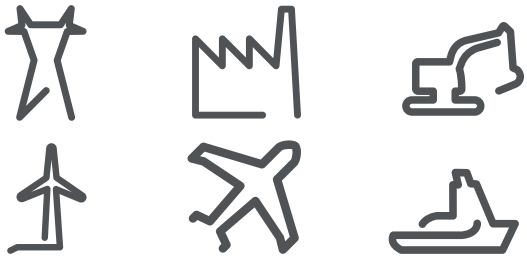
PE90341

Main characteristics

- Range optimized for rated voltage: 7.2, 12, 15/17.5, 24 kV
- Rated current up to 2500 A
- Thermal short-time withstand current up to 31.5 kA-3 s
- Vacuum circuit-breaker
- Single busbar (SBB) arrangement
- Outer cone cable connection
- No gas-handling at site
- Loss of Service Continuity LSC2
- Internal Arc Classification (IAC) in accordance with IEC 62271-200 AFL or AFLR up to 31.5 kA-1 s
- Double Busbar back to back with one circuit breaker
- Special option: rear top or bottom cable entry
- High recycling rate (≥ 90 %) by design (see Environmental Profile)

Key applications

Utilities - Industry - Mining - Wind Power - Airports - Marine *(please see page 12 for more details)*



Less space required: Small, very economical outgoing feeder, 450 mm wide version up to 800 A and 31.5 kA

More power: small incomer, 800 mm wide version for 2500 A with natural cooling

More power: maximum technical data with 24 kV-31.5 kA-2500 A

More compact & safer: internal arc type-tested for 2.4 metre ceiling height up to 31.5 kA-1s

Minimized shutdown time: Outgoing PT and busbar PT with disconnecting switch

Technical characteristics

Rated voltage			**12**	**15 - 17.5**	**24**
Rated frequency		(Hz)	**50 - 60**		
Rated insulation level					
Power frequency withstand voltage		(kV rms)	28	38 - 42	50
Lightning impulse withstand voltage (BIL)		(kV peak)	75	95	125
Rated normal current and maximum short time withstand current					
Rated peak withstand current	Ip	(kA)	40 - 50 - 63 - 80		
Rated short-circuit breaking current	Isc	(kA)	16 - 20 - 25 - 31.5		
Rated short-time withstand current	Ik/tk	(kA/3s)	16 - 20 - 25 - 31.5		
Rated current	Busbar system	(A)	1250 - 2000 - 2500		
Rated current	Incomer / Outgoing	(A)	630 - 800 - 1250 - 1600 - 2000 - 2500		
Internal arc withstand					
		(kA/1 s)	31.5		
		IAC	AFL - AFLR		
Gas pressure at 20 °C					
		(bar)	0.30		
Degree of protection					
HV compartment			IP65		
LV compartment			IP4X - IP5X		
Cable compartment			IP4X - IP5X		
Operation panel			IP2X - IP5X		

GemControl compatible
(see p. A-16)

Gas Insulated Switchgear

Compact - Modular - Robust

WI is a compact, modular, GIS switchgear for primary distribution. Panels are suitable for configuring single or double busbar switchgear. WI is an indoor SF6-insulated switchgear up to 60 kV with very modular and flexible design. 1- and 2-pole versions for Railway application up to 250 kV BIL suitable for traction side container substation.
It complies with IEC, Railway and other national standards.

PE90766

Main characteristics

- High rated lightning impulse withstand voltage (BIL) up to 250 kV
- Vacuum circuit-breaker
- Type WIA single busbar (SBB) or type WIB Double busbar (DBB)
- Compact design: feeder width 600 mm up to 60 kV
- SBB and DBB with same footprint
- Cable inner-cone connection
- For Railway type tested up to 2x27.5 kV and rated current 2000 A
- Intuitive user guidance operation with mechanical interrogation interlocks
- Internal arc tested

Key applications

Utilities - Industry - Railways - Wind Power
(please see page 12 for more details)

Long service life and low maintenance
Robust design
Small footprint
Operating safety
IAC tested

Technical characteristics

Electrical characteristics									
Rated voltage		(kV)	**12**	**17.5**	**24**	**36**	**38**	**40.5**	**52**(1)
Rated withstand peak lightning voltage in respect of earth (BIL)		(kV)	75	95	125	170	200	185 (200)	250
Rated power frequency test voltage		(kV)	28	38	50	70	80	85	95
Rated peak current	max.	(kA)	100	100	100	100	80	80	82
Rated short time current	max.	(kA/3 s)	40	40	40	40	31.5	31.5	31.5
Rated current	Ir max. busbar	(A)	2500	2500	2500	2500	2500	2500	2500
Rated current	Ir max. outgoing feeders	(A)	2500	2500	2500	2500	2500	2500	2500

(1) Higher values on request.

GemControl

What is GemControl?

GemControl is a unique switchgear controller embedded within our Primary MV equipment. It is responsible for the complete control, monitoring and health diagnostics of the switchgear it controls.
By replacing most of the conventional components within the LV top box, it not only reduces costs but also significantly improves flexibility and delivery times.
GemControl allows Engineered-to-Order switchgear to be 90% configured to order and removes the need for complex project engineering. This also reduces delivery times significantly and enhances reliability. Full self documentation of all logic functions are provided together with automatic wiring diagrams, Bills of Material and data maps to the chosen protection relay. GemControl is independent of the protection relay and whilst it is best used with MiCOM, Sepam or VAMP relays alternate vendors can also be catered for.

The key benefits

- Simpler to operate and all ranges have an identical HMI.
- Motorised interlocks cannot be damaged or defeated.
- Emergency interlocks can be duplicated for additional safety.
- Can be instantly replaced without programming.
- Most future changes are achieved by configuration - not engineering and wiring changes.

The key technical features

- Available on primary AIS or GIS switchgear.
- No voltage restraints.
- No current restraints.
- Any protection relay.
- Modular construction - buy only what is needed.
- Documentation always up to date and stored.

Gas Insulated Switchgear

Compact - Modular - Robust
WS is an indoor MV switchgear with vacuum circuit breaker, suitable for configuring single or double busbar switchgear with the same footprint.
Robust design throughout.
Mechanical indication and reliable mechanical interrogation interlocks.
Preferred solution for E-houses, due to small dimensions and less weight.
Shell DEP approved for Oil & Gas.
It complies with IEC, ENA and other national standards.

PM102831_A

WSA

PM102831

WSB

Main characteristics

- Rated up to 36 kV, 2500 A, 31.5 kA-3 s
- Vacuum circuit-breaker
- Type WSA Single BusBar (SBB) or type WSB Double BusBar (DBB)
- Compact design: feeder width 600 mm throughout
- Disconnectable circuit breaker
- Equal foot print requirement for single and double busbars
- Cable inner-cone connection
- Intuitive user guidance with mechanical interlocks and all operations from front
- M-encapsulation and enclosure
- Rear cable connection
- Internal arc classification (IAC) in accordance with IEC 62271-200, IAC AFL up to 31.5 kA-1 s

Key applications

Utilities - Industry - Oil & Gas - Wind Offshore
(please see page 12 for more details)

Long service life and optimized maintenance

Modular and robust design

Small footprint for Single BusBar and Double BusBar

Operating safety

IAC tested

Technical characteristics

Electrical characteristics						
Rated voltage		(kV)	**12**	**15/17.5**	**24**	**36**
Rated frequency		(Hz)	50/60	50/60	50/60	50/60
Rated power frequency withstand voltage		(kV)	28	38 (42)	50	70
Rated lightning impulse withstand voltage (BIL)		(kV)	75	95	125	170
Rated current	Ir max. busbar	up to (A)	2500 (1)	2500 (1)	2500 (1)	2500 (1)
Rated current	Ir max. feeder	up to (A)	2500	2500	2500	2500
Rated short time withstand current		(kA/3 s)	31.5	31.5	31.5	31.5
Rated peak withstand current		up to (kA)	80	80	80	80
Internal arc tested to IEC62271-200, AFL		up to (kA/1s)	31.5	31.5	31.5	31.5

(1) Higher ratings up to 3000 A on request.

Motor Starter

Solve your toughest motor control challenges
Motorpact is a global Medium Voltage Motor Control Centre for protection and control of motors up to 4000 kW.
A complete range of starting solutions:
- FVNR - Direct-on-Line
- RVSS - Reduced Voltage Soft Starter
- RVAT - Reduced Voltage Auto-Transformer
- S3 - Sequential starter for RVSS and VSD applications
- 2-speed starting for 1 and 2-winding motors

Can be configured with PIX, MCset, Masterclad, for a complete switchboard.
Complies with IEC, NEMA, UL, GOST, IACS standards.

PE90879_1

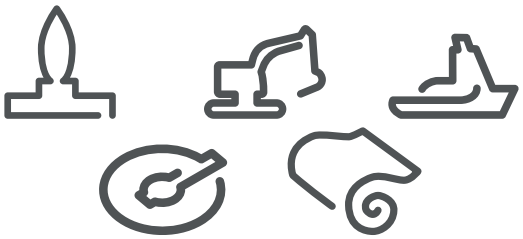
Main characteristics

- Loss of Service Continuity: LSC2A
- Partition class: PI
- Rated voltage: 7.2 kV
- Rated operational current: 200/400 A
- Rated busbar current: 3150 A
- Busbar system: single/double (S3)
- Rated short circuit capacity: 50 kA
- Rated short time current: 50 kA 3 s
- Internal Arc Classification: AFLR 25 kA/1 s - 40 kA/1 s – 50 kA/0.5 s

Compactness
Safety
Reliability
Reduced maintenance

Key applications

Oil & Gas - Mining - Marine - Water - Pulp & Paper
(please see page 12 for more details)



Technical characteristics

Rated voltage					
	Ur	(kV)	**3.3**	**5.5**	**6.6**
Rated insulation level					
Power frequency withstand voltage 50 Hz - 1 min	Ud	(kV rms)	20	20	20
Lightning impulse withstand voltage 1.2/50 µs	Up	(kV peak)	60	60	60
Rated current					
Rated busbar current	In	(A)	2500 - 3150	2500 - 3150	2500 - 3150
Short-time withstand current		(kA/3 s)	200 - 400	200 - 400	200 - 400
		(kA/2 s)	200 - 400	200 - 400	200 - 400
Rated operational current: 200 A					
Motor power with 315 A single fuse		(kW)	950	1500	1800
Transformer power with 315 A single fuse		(kVA)	1000	1600	2000
Rated operational current: 200 A					
Motor power with 315 A single fuse		(kW)	950	1600	1900
Motor power with 315 A double fuses		(kW)	1900	3000	3800
Transformer power with 315 A double fuses		(kVA)	1800	3000	3500
Rated operational current: 200 A					
Maximum capacitor		(kVar)	2000	2000	2000

Air Insulated Switchgear

Proven experience
PIX MCC - Motor Control Centre, is an indoor Medium Voltage switchgear assembly for protection and control of direct online motor starting applications.
Can be combined with PIX or PIX High if a circuit breaker is required.
It complies with IEC standards.

Main characteristics

- Ratings up to 7.2 kV / 270 A / 40/50 kA, 3150 A busbars
- Flexible installation: back to wall, front access, or rear cabling
- Designed to meet Oil & Gas Client Specifications i.e. Shell DEP
- Flexible Current Transformer configurations using encapsulated ring CT's for all ratings
- Suitable for Motor, Feeder and Capacitor switching
- Designed and tested to the latest standards - IEC 62271-200
- Loss of Service Continuity - LSC 2B
- Partition Class - PM
- Internal Arc Classification (IAC) AFLR duration 1 s

Applications

Oil & Gas - Mining - Marine - Water
(please see page 12 for more details)

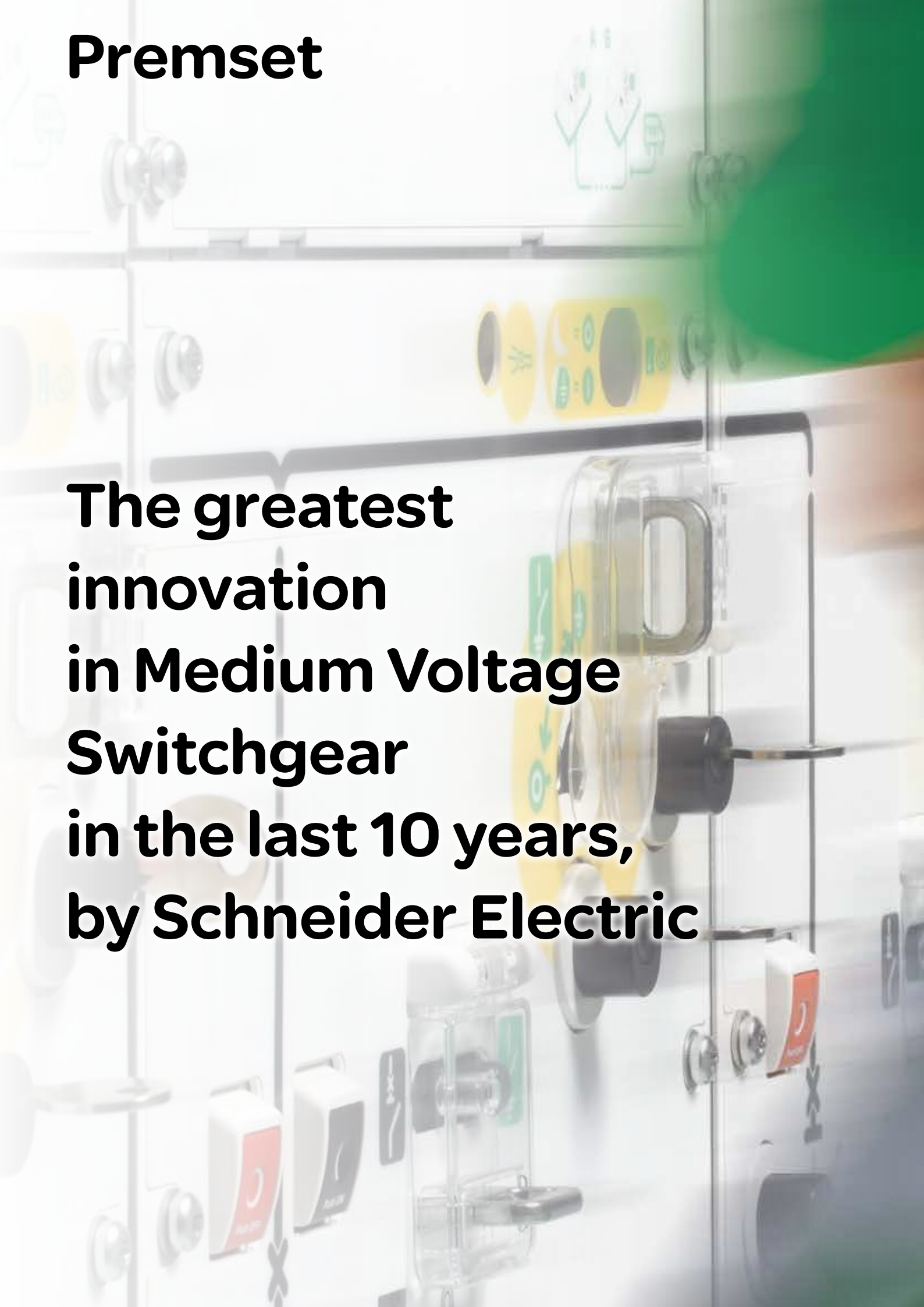
Flexible installation
Easy access
Clear and simple interface

Technical characteristics

Rated voltage				MCC7	MCC12*
		Ur	(kV)	**7.2**	**12**
Rated normal current and maximum short time withstand current					
Peak withstand current Ip (kA)			(kA rms)	40 - 50	40
Rated current	Ir max.	**Ir**	(A)	270	195

** For MCC 12, Current Transformers are DIN type, ring CT's are not applicable.*

Premset



The greatest innovation in Medium Voltage Switchgear in the last 10 years, by Schneider Electric

Focus on Premset

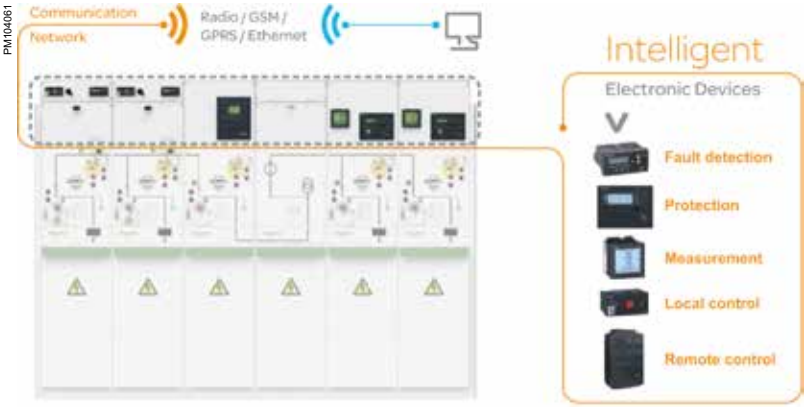
Born to be digital

Integrated intelligence

Smart and advanced management solutions across the network for **Control & Monitoring**

- Feeder automation
- Load management
- Asset management
- Automatic Transfer System

Architecture with distributed intelligence and **embedded protection chain**



All-in-one application

Premset invites itself into your devices

ANDROID APP ON Google play

Link for Google Play

Available on the App Store

Link for iTunes

Premset live! app.: a concentrate of Schneider Electric innovations

3D modelling, augmented reality and virtual reality: find out all about it from your Schneider Electric contact!

Primary & Secondary distribution

The new generation of MV Switchgear, Premset incorporates a wealth of innovations
The Premset Shielded Solid Insulation System (SSIS) drastically reduces the risk of internal arc faults, and makes it non sensitive to harsh environments.
A compact modular vacuum switchgear assembly, with a wide choice of functions, designed to fit all applications.

Primary & Secondary distribution

PE90845

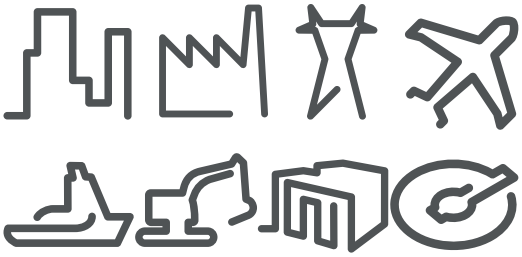
Main characteristics

- Up to 17.5 kV, 630-1250 A, Isc: 25 kA 3 s, internal arc withstand: A-FLR 25 kA 1 s
- Operation from -25 °C ~ +40 °C
- Altitude: no derating up to 3000 m
- Loss of service continuity: LSC2A
- Partition class of compartment accessible for maintenance: PM
- All external faces of the switchgear: IP3X (indoor version), IP 54 (outdoor version)
- Main circuit and all HV parts: IP67
- Flooding service continuity ensured for 96 h
- Complies with IEC, GOST and GB standards

Key applications

Building - Industry - Utilities - Infrastructure - Marine - Mining - Data Centre - Water

(please see page 12 for more details)



Safety: a wealth of innovations dedicated to customer safety

Efficiency: a smart solution entirely designed to optimize customer assets

Reliability: long-lasting performance ensuring continuity of service for the customer

Flexibility: a compact, modular design for all customer applications

Technical characteristics

Voltage						
Rated voltage	Ur	(kV)	**7.2**	**12**		**17.5** (1)
Rated frequency	fr	(Hz)	50 - 60			
Insulation level						
Rated short-duration power-frequency withstand voltage						
Phase to phase, phase to earth, open contact gap	Ud	(kV)	20	28	42	38
Across the isolating distance	Ud	(kV)	23	32	48	45
Rated short-duration power-frequency withstand voltage						
Phase to phase, phase to earth, open contact gap	Up	(kV)	60	75 (1)		95
Across the isolating distance	Up	(kV)	70	85 (1)		110
Current						
Rated normal current for the busbar	Ir	up to (A)	1250	1250		1250
Rated short-time withstand current						
for switchgear with tk=1s	Ik	up to (kA)	25	25		25
for switchgear with tk=3s	Ik	up to (kA)	25	25		25
for switchgear with tk=4s	Ik	up to (kA)	20	20		20
Rated short-circuit breaking current	Isc	up to (kA)	25	25		25
Internal arc withstand						
A-FLR		(kA/1s)	21	21		21
A-FLR		(kA/1s)	25 (2)	25 (2)		25 (2)
Degree of protection						
All external faces of switchgear			IP3X			
Main circuit and all HV parts (except M12A, M06A)			IP67			
Between compartments			IP2X			
Loss of service continuity category			LSC2A			
Partition class of compartment accessible for maintenance			PM			

(1) Higher values of the rated lightning impulse withstand voltage available with
- 95 kV for phase-to-phase, phase-to-earth, open contact gap as well as
- 110 kV across the isolating distance

(2) Except M06A, M12A, VTM-F and VTF.

Secondary Distribution Switchgear offer

Contents

Selection Table

Air Insulated Switchgear	Gas Insulated Switchgear					2SIS
 PE90700	 PE90704	 DM102666	 PE90703	 PE57770	 PE90702	 PE90845
SM6	**DVCAS**	**Flusarc**	**FBX**	**RM6**	**Ringmaster**	**Premset**
IEC	IEC/ANSI/UL	IEC	IEC	IEC	IEC	IEC/GOST/GB
Rated voltage (kV)						
12 / 24 / 36	36	36	12 / 24	12 / 24	13.8	12 / 17.5
Max. rated current						
630A & 1250A	630 A	630 A	630 A Option busbar 1250 A	630 A	630 A	1250 A
Max. rated short circuit current						
25 kA / 20 kA	20 kA	25 kA	25 kA / 21 kA	25 kA / 20 kA	21 kA	25 kA
SF6 Vacuum CB / SF6 CB	Vacuum CB SF6 LBS	Vacuum CB SF6 LBS	Vacuum CB SF6 LBS	SF6 CB - SF6 LBS	SF6 CB - SF6 LBS	Vacuum LBS, CB and transformer protection
Complete system of modular cubicles	Wind dedicated modular switchgear combining all MV functional units used in wind farms	Compact and modular switchgear combining all MV functional units				Compact modular switchgear with 3-in-1 architecture for breaking disconnection and earthing
Indoor	Indoor	Indoor & Outdoor / Indoor	Indoor	Indoor	Indoor and outdoor	Indoor & Outdoor

Air Insulated Switchgear

Modular units up to 36 KV

A modular switchgear assembly that guarantees high reliability for your underground secondary distribution applications. SM6-24 & 36 kV units are used for the medium voltage section in transformer substations in public distribution and commercial buildings.

PE90370

Main characteristics

- Air Insulated Switchgear
- Modular and extensible
- 24 kV, 630 A / 1250 A, 25 kA 1s
- 36 kV, 630 A 20 kA 1 s, 1250 A 25 kA 1 s
- IAC up to 20 kA 1 s, A-FL or A-FLR for 24 kV
- IAC 16 kA 1s AFL 36 kV
- Protection with fuse or SF6 & vacuum circuit breaker (Vacuum up to 24 kV)
- Disconnectable & withdrawable (up to 24 kV) circuit breaker
- Compliant to IEC 62271-200

Key applications

Utilities - Infrastructure - Industry - Data Centre - Buildings - Water - Wind power

(please see page 12 for more details)

PE90272

Upgradability
Compact size
Reduced maintenance
Ease of installation
Ease and safe to operate
Designed with control and monitoring in mind

Technical characteristics

Rated voltage								
	Ur	kV		**7.2**	**12**	**17.5**	**24**	**36**
Rated insulation level								
Insulation	**Ud**	50/60 Hz, 1 min (kV rms)		20	28	38	50	70
Isolation	**Ud**	50/60 Hz, 1 min (kV rms)		23	32	45	60	80
Insulation	**Up**	1.2/50 µs (kV peak)		60	75	95	125	170
Isolation	**Up**	1.2/50 µs (kV peak)		70	85	110	145	195
Breaking capacity								
Transformer off load		A		16				
Cables off load		A		31.5				50
Rated current	**Ir**	A		400 - 630 -1250				630 -1250
Short-time withstand current	**Ik/tk** (1)	kA/1 s	25	630 - 1250				1250
			20 (2)	630 - 1250				
			16	630 - 1250				
			12.5	400 - 630 - 1250				630-1250
Making capacity (50 Hz)	**Ima**	kA	62.5	630		NA		
			50	630				
			40	630				
			31.25	400 - 630				630
Maximum breaking capacity (Isc)								
Units IM, IMC, IMB		A		630 - 800 (3)				630
NSM-cables, NSM-busbars		A		630 - 800 (3)				NA
QM, QMC, QMB		kA		25		20		
PM		kA		25				20
CVM		kA		6.3	NA			
CVM with fuses		kA		25	NA			
SF6 circuit breaker range								
DM1-A, DM1-D, DM1-W (4)		kA	25	630 -1250				1250
			20	630 -1250				
DM1-S		kA	25	630				NA
DM1-Z			25	1250				NA
DM2		kA	20	630				
			25	630				1250
Vacuum circuit breaker range								
DMV-A, DMV-D, DMV-S		kA	25	630 -1250			NA	
DMVL-A		kA	20	630				NA
DMVL-D		kA	25	630				NA

*NA: Non Available - **(1)** 3 phases - **(2)** In 20 kA / 3 s, consult us - **(3)** In 800 A, consult us - **(4)** NA for SM6-36.*

Gas Insulated Switchgear

The DVCAS cubicle is a compact piece of equipment resulting from combining various modules for renewable segments (wind and solar farms).

PE90828

Main characteristics

- Gas Insulated Switchgear
- 36/38 kV, 630 A, 20 kA 3 s
- IAC : AFL-AFLR 20 kA 1 s
- Protection with vacuum circuit breaker
- Modular design in a compact architecture: simple and efficient
- Compliant to IEC, UL, ENA

Key applications

Wind power & Solar farms
(please see page 12 for more details)

Maximum safety for people and the installation
Maximum continuity of service with minimum maintenance
Smart Grid ready solution for greater efficiency
Customizable, cost-efficient equipment, with short lead times

Technical characteristics

Electrical characteristics		
Nominal voltage	(kV)	**36***
Frequency	(Hz)	50 - 60
Nominal current	(A)	630
Short-circuit current (rms value)	(kA/3s)	20
Short-circuit current (peak value)	(kA)	50 - 52
Insulation level		
At industrial frequency (50/60 Hz-1 min)	(kV)	70
Lightning impulse	(kV)	170
IAC AFL internal arc withstand(1)	(kA/1s)	20

Technical characteristics		
Insulation level		
MV compartment	(IP)	67
LV compartment and driving mechanisms**	(IP)	3X
SF6 insulating gas pressure at 20°C	(bar)	0.3
Operating temperature (2)	(°C)	-40 to +40
Storage temperature	(°C)	-40 to +50
Altitude (3)	(m)	2000
Connectors		
Geometry		T
Screening (recommended)		Earthing
Internal profile		C type
Screw connection		M16 x 22 mm

** For 38 kV voltages, please consult us.*
*** Except in the part corresponding to the cable passageway.*
(1) For IAC AFLR applications, please consult us.
(2) For applications in temperatures below -25°C or higher than +40°C, please consult Schneider Electric.
(3) For altitudes of more than 2000 m, please consult us.

Gas Insulated Switchgear

FBX is a Gas Insulated Switchgear assembly for secondary distribution networks up to 24 kV.
FBX benefits from the best-in-class footprint in the market. Innovative, its wide range of functions ensures the protection of people and equipment whilst maximizing power availability.
FBX comes equipped with all the necessary smart sensors to enable network and demand management.

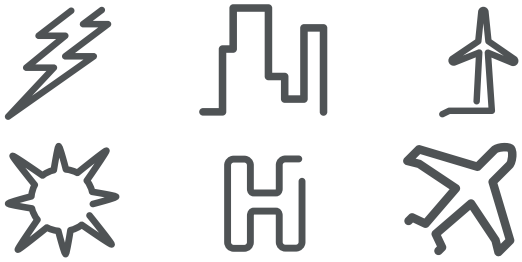
PE90829

Main characteristics

- Up to 24 kV/630 A/25 kA 1 s,
- IAC up to 25 kA 1 s
- Vacuum circuit breaker
- Up to 5 functions in one SF6 tank
- Either compact or extensible
- Auto-reclosing M2 vacuum circuit breaker
- IEC62271-200 standard compliant

Key applications

Utilities - Building - Wind - Solar - Hospital - Airport
(please see page 12 for more details)



Best-in-class footprint with a 1-metre width for 3 functions
Very easy to install with a deep cable compartment
Very easy to extend with minimal waste of space
Neither SF6 handling nor maintenance of live parts

Technical characteristics

Rated voltage	(kV rms)	**12**	**17.5**	**24**
Rated power frequency withstand voltage	(kV rms)	28	38	50
Rated lightning impulse withstand voltage	(kVp)	75	95	125
Rated frequence	(Hz)	50/60	50/60	50/60
Rated current in outgoing feeder of				
C, Sb, R, RE, CB	(A)	630	630	630
T1	(A)	200	200	200
T2	(A)	200-400-630	200-400-630	200-400-630
Rated current in busbar of				
Rated short time current 1 s or 3 s	(kA rms)	16-20-21-25*		
Rated short circuit breaker current	(kA rms)	16-20-21-25*		
Rated short circuit making current	(kAp)	40-50-52.5-62.5*		
Earthing switch making capacity (C, RE, T2)	(kAp)	40-50-52.5-62.5*		
Internal arc withstand (IAC)	(kA/1s)	AF/AFL 16-20-21-25*		

** 25 kA/1s under 12 kV*
(1)1250A with external busbar

Gas Insulated Switchgear

The design of Flusarc 36 is particularly well adapted for severe environments.
Its compact size allows quick, easy installation, and fits easily in prefabricated substations, kiosk substations or wind towers.

PE90834

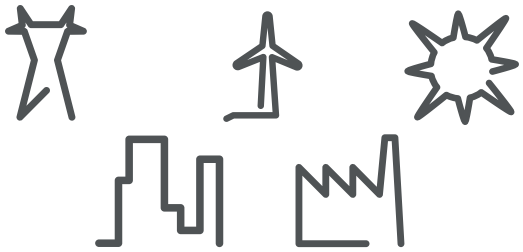
Main characteristics

- Gas Insulated Switchgear
- Block type or modular, extensible or not
- 36 kV, 630 A, 25 kA 1 s
- Fully IAC tested AFL 16/20 kA 1 s
- Protection with fuses or circuit breaker (Vacuum interruption technology)
- IEC 62271-200 compliant

Safety
Flexibility
Low cost of ownership
Easy installation and operation

Key applications

Utilities - Windfarm - Photovoltaic power stations - Infrastructure - Industry
(please see page 12 for more details)



Technical characteristics

Electrical characteristics				
Rated voltage		Ur	(kV rms)	**36**
Rated insulation level				
Power-frequency withstand voltage (50/60 Hz 1 min)	Insulation (1)	Ud	(kV rms)	70
	Isolation (2)	Ud	(kV rms)	80
Lightning impulse withstand voltage (1.2/50 ms impulse)	Insulation (1)	Up	(kVpeak)	170
	Isolation (2)	Up	(kVpeak)	195
Rated frequency		f	(Hz)	50 (for 60 Hz, please consult us)
Rated normal current				
Switchgear		Ir	(A rms)	630
Busbars			(A rms)	630 (compact range), 1250 (modular range)
Rated short-time withstand current				
Main circuit and earthing circuit	for tk = 1 s	Ik	(kA rms)	16 / 20 / 25
	for tk = 3 s	Ik	(kA rms)	20
Rated peak withstand current		Ip	(kA peak)	40 / 50 / 62.5
Internal arc classification	IAC for 1 s	IAC	(kA)	20/25 AFLR (as per IEC 62271-200)
Service continuity		LSC		LSC 2A (as per IEC 62271-200)
Filling pressure				
Rated filling level	absolute at 20 °C	Pre	(kPa)	130
Minimum functional level	absolute at 20 °C	Pme	(kPa)	120
Temperature				
Ambient air temperature	min. / max.	T	(°C)	- 25 /+ 40 (as per IEC 62271-1)
	24 h average (max.)	T	(°C)	35 (as per IEC 62271-1)
Temperature				
Ambient air temperature	for 1 minute		(kV)	70
	for 24 hours		(kV)	at Ur

(1) Across phase-to-phase and phase-to-earth clearances and across open contacts of switching devices.
(2) Across the isolating distance, i.e. the clearance beween open contacts meeting the safety requirements for disconnectors.

Gas Insulated Switchgear

Configured for indoor or outdoor Medium Voltage applications, the Ring Main Unit provides simple transformer protection and isolation with remote control of a multi-panel metered consumer switchboard.
Engineered for extreme climates, fully-certified internal arc design, providing flexibility for any location, up to 13.8 kV.

PE90835

Main characteristics

- Gas pressure indicator as standard
- Anti-reflex operating handle with facilities for electrical operation
- Interlocked Medium Voltage cable test access (no need to remove cable terminations or use loose earthing devices)
- Integral self-powered protection with TFL, adjustable curve & relay options using VIP or Sepam
- IP54 enclosure
- Available as extensible and non extensible functions
- Simple to follow mimic providing user-friendly operation
- Earth screened cast-resin gas module
- Range of dry type metering units
- Mechanical tripped on-fault indication
- Resin encapsulated busbars in air bus chamber for extensible version
- Direct coupling to transformers or cable connection
- Compliant to IEC 62271-100, IEC 60265, IEC 62271-200, BS EN 60265 and ENA TS 41-36

Key applications

Utilities - Industry - Infrastructure - Building - Mining - Oil & Gas *(please see page 12 for more details)*

Reliable
Efficient
Safe
Self powered protection

Technical characteristics

Rated voltage	Ur	(kV)	**12**	**13.8**
Rated frequency	f	(Hz)	50/60	50/60
Rated lightning impulse withstand voltage	Up	(kV)	75	95
Rated power frequency withstand voltage	Ud	(kV)	28	38
Rated normal current				
Ring switches	Ir	(A)	630	630
Circuit breaker	Ir	(A)	200/630	200/630
Ring switch rated short time withstand, 3 s	Ik	(kA)	16	21
Ring switch earth short time withstand, 3 s	Ik	(kA)	16	21
Ring switch peak making current	Ip	(kA)	40	53
Ring switch earth peak making current	Ip	(kA)	40	53
Circuit breaker short time withstand, 3 s	Ik	(kA)	16	21
Ciruit breaker earth short time withstand, 3 s	Ik	(kA)	16	21
Circuit breaker peak making current	Ip	(kA)	40	53
Circuit breaker earth peak making current	Ip	(kA)	40	53
Internal arc withstand		(kA)	16	21
Number of operating cycles (mechanical)				
Ring switch (main)			1000	1000
Ring switch (in option)			5000	5000
Ring switch (earth)			1000	1000
Circuit breaker (main)			2000	2000
Circuit breaker (earth)			1000	1000
Circuit breaker (at rated short circuit breaking current)			11	10
SF6 gas				
Pressure		(bar G)	0.35	0.55
Weight (RN2c/RN6c)		(g)	516	592
Weight (RE2c)		(g)	612	703

Gas Insulated Switchgear

RM6 is a Gas Insulated Switchgear assembly for secondary distribution networks up to 24 kV. It benefits from proven technology and is the number 1 world reference with over 1.5 million functions installed worldwide.
Built with safety in mind, its wide range of functions ensures the protection of people and equipment whilst maximizing power availability.
RM6 comes equipped with all the necessary smart sensors to enable network and demand management.

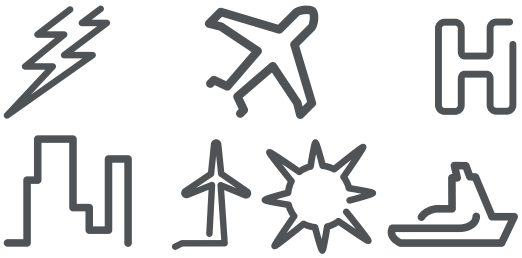
PE57770

Main characteristics

- Up to 24 kV/630 A/20 kA 1 s
- IAC up to 20 kA 1 s
- SF6 circuit breaker
- Up to 5 functions in one SF6 tank
- Either compact or extensible
- Compliant to IEC62271-200 standard

Key applications

Utilities - Airport - Hospital - Building - Wind - Solar - Marine *(please see page 12 for more details)*



Number 1 world reference
Proven reliability
Visible earthing contacts
Neither SF6 handling nor maintenance of live parts

Technical characteristics

Rated voltage	(kV rms)	**12**	**17.5**	**24**
Rated power frequency withstand voltage	(kV rms)	28	38	50
Rated lightning impulse withstand voltage	(kVp)	75	95	125
Rated frequence	(Hz)	50/60	50/60	50/60
Rated current in outgoing feeder				
B,IC,BC	(A)	630	630	630
D,Q	(A)	200	200	200
O	(A)	200-630	200-630	200-630
Rated current in busbar				
B,IC,BC, O	(A)	630	630	630
I, D, Q	(A)	400-630	400-630	400-630
Rated short time current 1s or 3 s	(kA rms)	25	21	20
Rated short circuit breaker current	(kA rms)	25	21	20
Rated short circuit making current	(kAp)	62.5	52.5	50
Earthing switch making capacity (I,B,D,Q)	(kAp)	62.5	52.5	50
Internal arc withstand (IAC)	(kA/1s)	20	20	20

MV Components

Contents

** SDR: Load Break Switch*

Selection Table

SF6 Circuit Breakers


PM102689


PE57191


PE57192


PE57194


PE56503

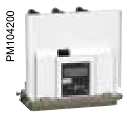
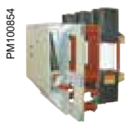

PE56504


PE56501

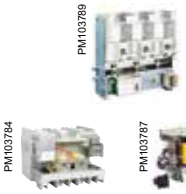
SDR	CBR	LF1	LF2	LF3	LFP	SF1	SFset	SF2
IEC	IEC	IEC	IEC	IEC	IEC	IEC	IEC	IEC
Rated voltage (kV)								
15	27.5	7.2 / 12	7.2 / 12 / 17.5	7.2 / 12 / 17.5	12 / 17.5	17.5 / 24 / 36	17.5 / 24	24 / 36 / 40.5
Max. rated current								
2000 A		1250 A	2000 A	3150 A	5000 A	1250 A	1250 A	3150 A / 2500 A
Max. rated short circuit current								
25 kA / 40 kA	8 kA / 25 kA / 27.5	31.5 kA	50 kA / 40 kA / 31.5 kA	50 kA / 50 kA / 40 kA	50 kA / 31.5 kA	25 kA	25 kA	40 kA / 40 kA / 31.5 kA
Vacuum		SF6	SF6	SF6	SF6	SF6	SF6	SF6
Fixed load break switch (SDR) or Circuit Breaker (CBR) for AC railway application		Fixed or withdrawable Circuit Breaker in MCset Cassette	Fixed or withdrawable Circuit Breaker in MCset Cassette	Fixed or withdrawable Circuit Breaker in MCset Cassette	Fixed Circuit Breaker	Fixed Circuit Breaker Front or side mounting Conventional spring	Fixed Circuit Breaker Front or side mounting Conventional spring Integrated VIP trip unit (without auxiliary power supply) in SFset up to 24 kV (for side mounted)	Fixed Circuit Breaker Front or side mounting Conventional spring
Outdoor								

Selection Table

Vacuum Circuit Breakers

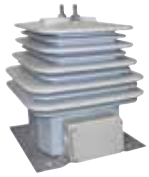
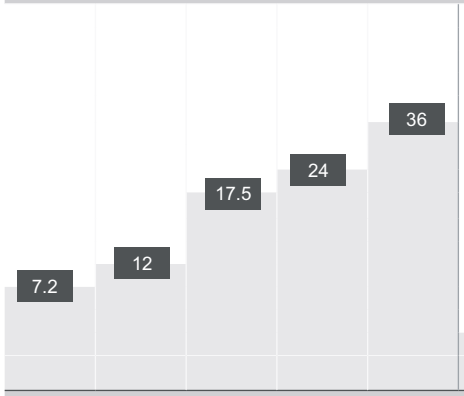
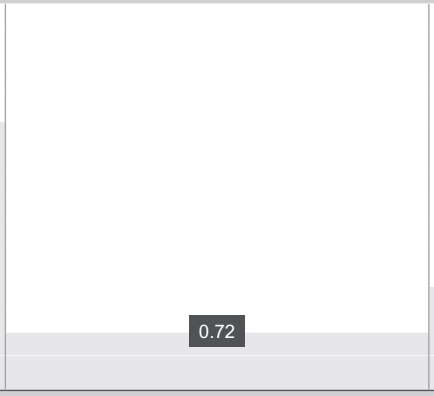
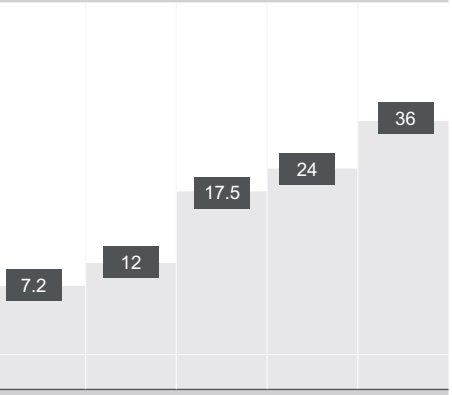
																			
Evolis				**HVX**				**VAH**			**VOX**			**VXA**			**VXB**	**VXC**	
IEC				IEC/GOST/DL/GB				IEC	IEC	IEC/ ANSI	IEC/ BS/AS	ANSI	GOST/ GB	IEC/EN				IEC	
7.2	12	17.5	24	7.2	12	17.5	24	12	13.8	17.5	36	38	40.5	1x12	1x17.5	1x27.5	2x27.5	36	38
2500 A				3150 A			2500 A	8000 A			2000 A			2500 A				2500 A	4000 A
31.5 kA				50 kA			40 kA	63 kA*			40 kA			50 kA	40 kA	31.5 kA	31.5 kA	40 kA	
Vacuum				Vacuum				Vacuum			Vacuum/SF6			Vacuum				Vacuum	
Fixed or withdrawable Circuit Breaker				Fixed or withdrawable Circuit Breaker				Fixed or withdrawable Circuit Breaker For generator applications up to 130 MVA ** ANSI / IEEE C37.013 Generator Switching 63 kA, 4000 & 5000 A*			Fixed outdoor dead tank Circuit Breaker			1 or 2-pole Circuit Breaker for railway application or as star point breaker for grounding application Fix installation or floor running truck - 16 2/3 Hz - 25 Hz - 50 Hz - 60 Hz				Fixed or withdrawable Circuit Breaker The arc furnace Circuit Breaker with high switching numbers, maintenance free up to 25000/30000 cycles	
														Indoor					

Selection Table

SF6 Contactor	Vacuum Contactors					
 PE60247	 PM103789 PM103784 PM103787				 PM103792	
Rollarc	**CPX**	**CLX**	**CBX**		**CVX**	
IEC	IEC	IEC	IEC			
Rated voltage (kV)						
7.2 / 12	3.6	7.2	7.2	12	7.2	12
Max. rated current						
400 A (AC4)	400 A (AC4)	400 A (AC4)	400 A (AC4)	315 A (AC4)	400 A (AC4)	315 A (AC4)
Max. rated short circuit current						
10 kA / 8 kA	6 kA	6 kA	6 kA	4 kA	6 kA*	4 kA
SF6	Vacuum					
Fixed or withdrawable contactor with magnetic holding or mechanical	Fixed vacuum contactors with magnetic holding or mechanical				Fixed vacuum contactor In version withdrawable fused vacuum contactor: CVX *(50 kA in conjunction with fuses) 1 or 3 poles With magnetic holding or mechanical	

MV Fuses			
 PE90706			
Fusarc CF	**Solefuse**	**Tepefuse, Fusarc CF**	**MGK**
DIN/IEC	IEC/UTE	IEC/DIN/UTE	AFNOR
Rated voltage (kV)			
36	36	36	7.2
Max. rated current			
250 A	5000 A (busbars) 400 A contactor		
Max. rated short circuit current			
63 kA	50 kA	63 kA	50 kA
Fuses for distribution transformer protection from 3.6 kV to 36 kV	Fuses for distribution transformer protection from 3.6 kV to 36 kV	Fuses for measurement transformer protection up to 24 kV (Tepefuse) and up to 36 kV (Fusarc CF) Back-up technology	Motor protection fuse range

Selection Table

Indoor Instrument Transformers	Low Power Current Transformers	Outdoor Instrument Transformers
 PE90296  PE28679	 PE58397  PE56703	 PE58461  PE58462
IEC	IEC	IEC
Rated voltage (kV)		
		
Max. rated current		
2500 A	5000 A	1500 A
Max. rated short circuit current		
50 kA	40 kA	40 kA
Dry	Dry	Dry
Medium Voltage Current Transformer, Voltage Transformer	Medium Voltage Low Power Current Transformer (LPCT)	Outdoor Current Transformer and Voltage Transformer

SF6 Load Break Switch (SDR) & Circuit Breaker (CBR)

SDR is an outdoor load break switch. CBR is an outdoor circuit breaker.
Available in single pole or two pole configuration.
Switchgear for railway networks.
Magnetic actuator.
SF6 gas insulation.

PM102689

Main characteristics

- Ambient temperature: -40 °C - +40 °C
- Standards - IEC 60265-1 classes E3, M2.
- SDR - Load Break Switch at 27.5 kV, 1250 A, 1600 A, 50/60 Hz
- CBR - Vacuum Circuit Breaker 27.5 kV, 2000 A, 25 kA, 50/60 Hz
- Sealed tank - IP67
- No static or Dynamic gaskets
- Optimized maintenance

Key applications

Railways *(please see page 12 for more details)*

No civil work - fast and easy installation
Suitable for refurbishment
Optimized maintenance switchgear
Insensitive to environmental influences
Long life vacuum switching
Vandal-proof insulating bushings

Technical characteristics

			SDR 15	SDR 25	CBR 25
Rated voltage	(kV)		**17.25**	**27.5**	**27.5**
Highest non-permanent voltage	(kV)		18	31.5	31.5
Frequency	(Hz)		50-60	50-60	50-60
Rated current	(A)	1250	■	■	■
		1600	■	■	■
		2000	-	-	■
Rated breaking current	(kA)		2	12.5	25
Short-time withstand current					
Rated value	(kA/1s)		25-40	12.5	25
Peak value	(kAp/1s)		63-100	31	63
Rated short-circuit making current	(kAp)		63-100	31	63
Power frequency withstand voltage	(kV/1min)		70	95	95
Lightning impulse withstand voltage (BIL)	(kV)		170	250	250
Insulation level for auxiliary contacts	(kV)		2	2	2
Control supply voltage					
	(V DC)		48 to 220	48 to 220	48 to 220
	(V AC)		110-230	110-230	110-230
Insulating gas			SF6 + N2	SF6	SF6
Relative filling pressure	(Bar)		0.5	0.5	0.5

SF6 Circuit Breaker

The assets of a tried-and-tested technology
LF is an **indoor** SF6 circuit breaker range for use in medium voltage network applications, in new installations or renovation projects, and provides protection for all types of application up to 17.5 kV and 5000 A.
It complies with IEC standard.

PE57191

***LF circuit breakers fixed version** from 7.2 kV to 17.5 kV*

PE57192

***LF circuit breakers withdrawable version** LF1 - LF2 - LF3 circuit breakers installed on a pole support*

PE57194

Main characteristics

- Range of three-pole circuit-breakers up to 17.5 kV
- Fixed or withdrawable switchgear with front operating mechanism
- Nominal current up to 3150 A.
- Short-circuit current up to 50 kA-3s.
- LF Fixed: up to 3150 A and 50 kA breaking current
- LFP Fixed: up to 5000 A and 50 kA breaking current
- LF Withdrawable: up to 3150 A and 50 kA breaking current
- Mechanical endurance: M2 (10000 operations)
- Electrical endurance: E2
- Capacitive current breaking: C2

Key applications

All segments *(please see page 12 for more details)*

Compact and reliable
Comprehensive range
Soft breaking without chopping currents
Free of re-strike and re-ignition
Poles sealed for life with SF6 pressure control set
Field-proven expertise

Technical characteristics

				LF1	LF2	LF3	LFP	LF1	LF2	LF3	LFP	LF1	LF2	LF3	LFP
Rated voltage	Ur	(kV)		**7.2**				**12**				**17.5**			
Rated insulation level															
Power frequency withstand	Ud	50 Hz, 1 min (kV rms)		20				28				38			
Lightning impulse withstand	Up	1.2/50 µs (kV peak)		60				75				95			
Rated current	In	(A)	630	■	■	-	-	■	■	-	-	-	■	-	-
			1250	■	■	-	-	■	■	■	-	-	■	■	-
			2000	-	■	■	-	-	■	■	-	-	■	■	-
			2500	-	-	■	-	-	-	■	-	-	-	■	-
			3150	-	-	■	-	-	-	■	-	-	-	■	-
			5000					-	-	-	■	-	-	-	■
Short-time withstand current	Ith	(kA/3s)	25	■	-	■	-	■	-	■	-	-	■	■	■
			31.5	■	-	■	-	■	-	■	-	-	■	■	■
			40	-	■	■	-	-	■	■	■	-	-	■	-
			50	-	■	■	-	-	-	■	■				

■ *Available.*
- Non available.

SF6 Circuit Breaker

The assets of a tried-and-tested technology
SF is an **indoor** SF6 circuit breaker range for use in medium voltage network applications, in new installations or renovation projects, and provides protection for all types of application up to 40.5 kV and 3150 A.
It complies with IEC standard.

PE56503

***SF1 circuit breakers fixed version** from 12 kV to 36 kV*

PE56501

***SF2 circuit breakers fixed version** from 24 kV to 40.5 kV*

PE56502

***SF2 F400 circuit breakers withdrawable version** from 24 kV to 40.5 kV*

Main characteristics

- Range of three-pole circuit-breakers up to 40.5 kV
- Fixed switchgear, left or right MV connection, side or front operating mechanism
- Nominal current from 400 to 3150 A
- Short-circuit current from 12.5 to 40 kA
- SF1 Fixed:
  up to 36 kV, 1250 A and 25 kA breaking current
- SFset Fixed:
  up to 24 kV, 1250 A and 25 kA breaking current
- SF2 Fixed:
  up to 40.5 kV, 3150 A and 40 kA breaking current
- SF F400 Withdrawable:
  up to 40.5 kV, 3150 A and 40 kA breaking current
- Mechanical endurance: M2 (10000 operations)
- Electrical endurance: E2
- Capacitive current breaking: C2

Key applications

Utilities - Industry - Infrastructure
(please see page 12 for more details)

Comprehensive range
Field-proven expertise
Compact and reliable
Peace of mind

Technical characteristics

				SF1	SFset	SF2	SF1	SFset	SF2	SF1	SFset	SF2	SF1	SFset	SF2	SF1	SFset	SF2
Rated voltage	Ur	(kV)		**12**			**17.5**			**24**			**36**			**40.5**		
Rated insulation level																		
Power frequency withstand	Ud	50 Hz, 1 min (kV rms)		28			38			50			70			95		
Lightning impulse withstand	Up	1.2/50 µs (kV peak)		75			95			125			170			185		
Rated current	In	(A)	400				■	■	-	■	■	-						
			630	■	■	-	■	■	■	■	■	-						
			1250				■	■	■	■	■	-	■	-	■	-	-	■
			2500										-	-	■			
			3150							-	-	■						
Short-time withstand current	Ith	(kA/3 s)	12.5				■	■	-	■	■	-	■	-	-			
			16							■	■	-	■	-	-			
			20				■	■	-	■	■	-	■	-	-			
			25	■	■	-	■	■	-	■	■	-	■	-	■			
			31.5										-	-	■	-	-	■
			40							-	-	■	-	-	■			

■ *Available.*
- Non available.

Vacuum Circuit Breaker

Evolis is a range of **indoor** vacuum circuit breakers for use in medium voltage network applications, in new installations or renovation projects, and provides protection for all types of application up to 24 kV and 2500 A.
It complies with IEC standard.

PE58083

Evolis 17.5 kV fixed, frontal version

Main characteristics

- ■ Mechanical endurance: M2 (10000 operations)
- ■ Electrical endurance: E2
- ■ Capacitive current breaking: C1
- ■ Evolis 17.5 kV:
- □ Fixed frontal version
- □ Withdrawable frontal version
- ■ Evolis 24 kV:
- □ Fixed: frontal or lateral versions
- □ Withdrawable frontal version

Key applications

Utilities - Industry - Infrastructure - Mining
(please see page 12 for more details)

PE58084

Evolis 24 kV fixed, frontal version

Compact dimensions
Easy to integrate
Large choice of options
Reliable spring mechanism
Wide international certifications

Technical characteristics

Rated voltage	Ur	(kV)		**7.2**	**12**	**17.5**	**24**
Rated insulation level							
Power frequency withstand	Ud	50 Hz, 1 min (kV rms)		20	28	38	50
Lightning impulse withstand	Up	1.2/50 µs (kV peak)		60	75	95	125
Rated current	In	(A)	630	■	■	■	■
			1250	■	■	■	■
			2500	■	■	■	■
Short-time withstand current	Ith	(kA/3s)	16	-	-	-	■
			25	■	■	■	■
			31.5	■	■	■	■

■ *Available.*
- Non available.

Vacuum Circuit Breaker

HVX combines state-of-the-art technologies for the most demanding applications.
This range of vacuum circuit breaker intended for use in medium voltage network applications, in new installations or renovation and provides protection for all types of applications up to 24 kV and 3150 A.
Resistant to severe environment due to embedded pole series range design.

PM104200_1

PM104200_2

Main characteristics

- Mechanical endurance: M2 (10000 operations)
- Electrical endurance: E2
- Capacitive current breaking: C1
- HVX 12 kV & 17.5 kV Fixed / Withdrawable frontal version
- HVX 24 kV Fixed / Withdrawable frontal version
- Fixed or Withdrawable (truck or Roll-on-Floor)
- Open & Embedded Pole range
- Common Spring driven mechanism
- Same LV features and options
- Certified according to IEC, Gost, DL & GB

Key applications

Utilities - Industry - Infrastructure - Mining - Oil & Gas - Marine *(please see page 12 for more details)*

Compact design suitable for retrofit
Specific range for OEM market
Optimized maintenance
Ergonomic handling
Long life robust design
Fixed or withdrawable units
State-of-the art vacuum interrupters and operating mechanism

Technical characteristics

Rated voltage	Ur	(kV)		**7.2**	**12**	**17.5**	**24**
Insulation level							
Power frequency withstand	Ud	50Hz, 1min (kV rms)		20	28	38	50
Lightning impulse withstand	Up	1.2/50 µs (kV peak)		60	75	95	125
Rated current	Ir	(A)	630	■	■	■	■
			1250	■	■	■	■
			2500	■	■	■	■
			3150	■	■	■	-
Short-time withstand current	Ith	(kA/3s)	25	■	■	■	■
			31.5	■	■	■	■
			40	■	■	■	■
			50	■	■	■	-

■ *Available.*
- Non available.

VAH

Vacuum Circuit Breaker

VAH is a high rating vacuum circuit breaker developed for the requirements of generator applications.
Power plants or generators up to 130 MVA.
Transformer Substations for Utilities or industrial applications.
Original Equipment Manufacturers (OEM) and Contractors.

PM100854

Main characteristics

- Ratings up to 17.5 kV, 63 kA, 8.000 A (with forced cooling)
- High continuous current level
- Easy access to all components
- Easy handling for operation and maintenance
- Meets the requirement of IEEE C37.013

Key applications

Power plants *(please see page 12 for more details)*

Extremely robust design
Ideal for high currents thanks to natural air-cooling
Special customized solutions available on request
Optimized maintenance

Technical characteristics

Rated voltage	(kV)	**12**	**13.8**	**17.5**
Rated lightning impulse withstand voltage	(kV)	75	95	110
Rated current	(A)	5000 - 8000	5000 - 8000	5000 - 8000
Rated short time current	(kA/3s)	63	63	63
Frequency	(Hz)	50 - 60	50 - 60	50 - 60
Short circuit switching cycles		100	100	50
Standard		IEC	IEC	IEC - ANSI

Vacuum Circuit Breaker

VOX is an outdoor dead tank circuit breaker
Switching in vacuum, insulation in a SF6-gas tank to provide gas-insulated environment totally immune from external ambient conditions.
Mounted in a stainless steel tank, sealed for life-time, optimized for reduced maintenance and life-cycle costs.

PE90250

Main characteristics

- Designed and tested to meet the standards of IEC, IEEE, BS, AS, GOST and GB
- The range is designed for voltages up to 40.5 kV, up to 40 kA and up to 2000 A
- Ambient temperature -40 °C / +40 °C
- High mechanical and dielectric performances

Key applications

All outdoor distribution applications
(please see page 12 for more details)

Reduced life time costs
Optimized maintenance
Out-of-phase switching for decentralized generation (wind farms)
Suitable for high speed auto-recloser switching
Suitable for capacitor bank switching

Technical characteristics

		IEC/BS/AS	ANSI	GOST/GB
Rated maximum voltage	(kV)	**36**	**38**	**40.5**
Rated impulse withstand voltage	(kVp)	170/200	200 (258 kVp chopped wave)	190
Power frequency withstand voltage	(kV)	70/80/95	80	95
Rated continuous current	(A)	1200 - 2000		
Rated withstand current	(kA/3s)	25 - 31.5 - 40		
Rated arc fault containment	(kA)	25-1s / 31.5-0.5s		
Rated short circuit breaking current	(kA)	25 - 31.5 - 40		
Closing and latching capability	(kAp)	65 - 82 - 100		
Operating sequence		OCO-15s-CO O-0.3s-CO-15s-CO		
Number of operations at rated current		10 000		
Number of operations at short circuit current		100		
Control supply voltage				
	(V DC)	24, 48, 125, 250		
	(V AC)	120, 240		
Gas fill pressure	(Bar)	0.5		
Environment				
Operating temperature range	(°C)	- 40 to + 40 (option - 60 to + 55)		
Relative humidity	(%)	0 - 100		
Altitude (maximum for quoted ratings)	(ft/m)	10 000 - 3 000		
Seismic withstand	(g)	0.5		
Optional equipments				

- Accommodation for additional current transformers
- Gas density monitoring
- Surge arresters
- Recloser configuration with auxiliary voltage transformer and protection relay
- Possibility of «Bay Module» installation with disconnectors, earthing switch, VT's, CT's, SA etc.

VXA - VXB

Vacuum Circuit Breakers

VXA - VXB **outdoor** vacuum circuit breakers have been specially designed to meet the specific requirements of AC traction power supply systems.
They comply with main IEC and EN standards.

PM100908

Main characteristics

- Ratings: 17 kV 16.7 Hz or 27.5 kV 50/60 Hz
- VXA:
  single pole configuration
- VXB:
  two pole configuration
- Can be fixed pole-mounted type or mounted on withdrawable trucks
- Can be configured with a rated lightning impulse withstand voltage (BIL) up to 250 kV

Key applications

Railways *(please see page 12 for more details)*

Proven experience
Cost-effective solution
Extremely robust construction
Compact design
Flexible integration into switchboards
High number of mechanical and electrical switching cycles

Technical characteristics

			VXA			VXB
Number of poles			**1**	**1**	**1**	**2**
Rated voltage	Ur	(kV)	**12**	**17 - 27.5**	**27.5**	**27.5**
Rated lightning impulse withstand voltage(BIL)		(kV)	150	170	250*	250*
Rated power frequency withstand voltage		(kV)	60	70	95	95
Rated current (up to)		(A)	2000	2500	2000	2000
Rated short-time current (3 s) (up to)		(kA/3s)	50	40	31.5	31.5
Rated short-circuit making current (up to)		(kA)	125	100	80	80
Rated short-circuit breaking current (up to)		(kA)	50	50	31.5	31.5
Rated frequency		(Hz)	25	16.7 - 25 - 50 - 60		
Operating characteristics						
Number of mechanical operating-cycles of drive mechanism			10000	10000	10000	10000
Number of electrical switching-cycles of drive mechanism			30000	30000	30000	30000

** 200 kV BIL on request, please contact us.*

VXC High

Vacuum Circuit Breakers

VXC High is a high rating **outdoor** vacuum circuit breaker developed for the requirements of industrial furnace circuit breaker applications. It also covers the needs for extreme high energy distribution in different production processes.
It complies with the main IEC standards.

PM100914

Main characteristics

- Ratings up to 40.5 kV (38.5 kV according to IEC standards), 40 kA, 4000 A
- 125,000 Operating Cycles (special maintenance service is required)
- High switching performance for inductive and capacitive currents
- Easy access to all components
- Easy handling for operation and maintenance

Key applications

Utilities - Industry - Infrastructure - Marine
(please see page 12 for more details)

Extremely robust and simple construction
Extra high mechanical and electrical switching capacity
Designed for high operating cycles
Minimum maintenance
Worldwide field-proven installations

Technical characteristics

Rated voltage Ur	(kV)	**36**	**38**	**38***
Rated lightning impulse withstand voltage(BIL)	(kV)	170	150	200
Rated power frequency withstand voltage	(kV)	70	70	95
Rated current (up to)	(A)	2500	4000	4000
Rated short-time current (3s) (up to)	(kA/3s)	31.5	40	40
Rated short-circuit making current (up to)	(kA)	100	100	100
Rated short-circuit breaking current (up to)	(kA)	40	40	40
Rated frequency	(Hz)	50-60	50-60	50-60
Operating characteristics				
ECO exchange program: Electrical and mechanical operating-cycles**		125000	125000	125000
Number of mechanical operating-cycles of drive mechanism		25000	25000	25000
Number of electrical switching-cycles of drive mechanism		30000	30000	30000

** On request 40.5 kV rated voltage.*
*** Special maintenance service is required.*

SF6 Contactor

Rollarc is a SF6 contactor for use in frequently operated medium voltage network applications, in new installations or renovation projects, for all types of application up to 12 kV/400 A.
Provides protection and control of the Medium Voltage motors, capacitor banks and power transformers.
It complies with IEC standards.

PE60247

Basic version
Contactor alone, without the cradle

PE56762

Fixed version
Contactor with control auxiliaries, mounted on a fixed cradle

PE56763

Withdrawable version
Contactor with control auxiliaries, mounted on a withdrawable cradle

Main characteristics

- Ratings up to 12 kV / 400 A
- Basic. Contactor alone, without the cradle
- Fixed. The contactor is mounted on a fixed cradle
- Withdrawable. The contactor is mounted on a withdrawable cradle
- Magnetic holding or mechanical
- Mechanical endurance (magnetic holding): 300,000 operations
- Mechanical endurance (mechanical latching): 100,000 operations
- Electrical endurance: 50 operating cycles at 10,000 A

Key applications

Mining - Industry - Marine
(please see page 12 for more details)

Compact and reliable

Comprehensive range

Soft breaking without chopping currents

Free of re-strike and re-ignition

Poles sealed for life with SF6 pressure control set

Field-proven expertise

Technical characteristics

Rated voltage	Ur (kV)	**3.3 to 4.76**	**7.2**	**12**
Rated insulation level				
Impulse(1) 1.2/50 µs	(kV peak)	60	60	60
1 min 50-60 Hz	(kV rms)	20	20	28
Breaking capacity at U				
	(kA)	10	10	8
With fuses(2)	(kA)	50	50	40
Rated current(3)	(A)	400	400	400
Making capacity				
	(kA peak)	25	25	20
With fuses (prospective current)	(kA)	125	125	100
Short-time current	(kA/3s)	10	10	8
Mechanical endurance	(operations)	300000 (magnetic holding)	100000 (mechanical latching)	

(1) Optional: 75 kV impulse/28 kV rms on basic version only.
(2) Fusarc CF fuses: see sheet AC0479 (fuses 3-36 kV).
(3) 400 A continuous (no overload possible).

CPX - CLX - CBX - CVX

Vacuum Contactors

These ranges of vacuum contactors are intended for use in frequently operated Medium Voltage network applications, in new installations or renovation projects, for all types of application up to 12 kV/400 A.
They perform switching and control of Medium Voltage motors, capacitor banks and power transformers.
They comply with IEC standards.

PM103787

CPX

Main characteristics

- Ratings up to 12 kV / 400 A
- CPX/CPX-C:
  most compact design for up to 3.6 kV applications
- CLX:
  for motor starters up to 7.2 kV, offering front access to terminals with its slim line
- CVX-C-F:
  fixed type of CBX for capacitive switching applications equipped with fuse holders (DIN or BS standard) up to 12 kV
- CVX-07/CVX-C-07:
  withdrawable type of CBX equipped with fuse holders (DIN or BS standard) up to 7.2 kV
  Inductive load or capacitive load categories
- CVX-C-12:
  withdrawable type of CBX for capacitive switching applications equipped with fuse holders (DIN or BS standard) up to 12 kV

Key applications

Industry - Mining - Oil & Gas - Public lighting
(please see page 12 for more details)

PM103789

CLX

PM103784

CBX

Fast switching rate
Long mechanical life
Selection of 3 compact arrangements
Wide range of auxiliary electronic power supply
Easy configuration

PM103792

CVX

Technical characteristics

		CPX	CLX	CBX		CVX	
Functions		Protection and control of networks					
Rated voltage	(kV)	**3.6**	**7.2**	**7.2**	**12**	**7.2**	**12**
Max. rated short-circuit current	(kA)	6	6	6	4	6*	4
Max. rated current	(A)	400 (AC4)	400 (AC4)	400 (AC4)	315 (AC4)	400 (AC4)	315 (AC4)
Versions		Fixed	Fixed	Fixed		Withdrawable CBX version equipped with DIN or BS fuses Optional on board auxiliary voltage transformer	Withdrawable CBX version equipped with DIN or BS fuses
Number of poles		3p	3p	1p - 3p		3p	
Mechanical switching cyc/es (ON/OFF)		300,000 (mechanical latch) and 1,000,000 (magnetically held)					

** 50 kA in conjunction with fuses.*

Fuses

Protection of Medium Voltage distribution devices & networks (from 3.6 to 36 kV) from both the dynamic and thermal effects of short-circuit currents. Suitable for both indoor and outdoor installation.
Numerous applications for motors, power transformers, capacitors, voltage transformer protection.

Main characteristics

- Rated voltage from 3.6 to 36 kV
- High breaking capacity
- Low breaking overvoltage
- Low I2t values
- With thermal striker
- It complies with IEC, DIN , VDE , UTE standards

No maintenance or ageing

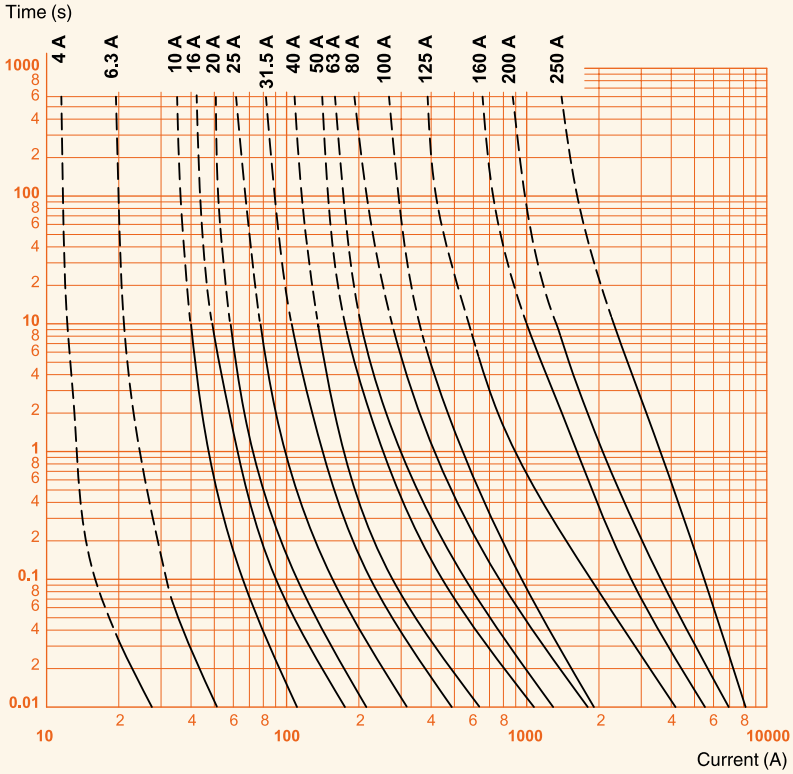
Thermal striker provides not only indication but also protection against short circuits and overcurrents

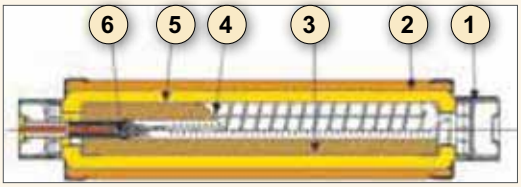
		Fusarc CF						Solefuse					Tepefuse		MGK
Rated voltage	(kV)	3.6	7.2	12	17.5	24	36	7.2	7.2-12	7.2-17.5	12-24	36	12	24	7.2
Operating voltage	(kV)	3-3.6	3-7.2	6-12	10-17.5	10-24	20-36	3-7.2	3-12	3-17.5	10-24	30-36	<12	13.8-24	≤7.2
Rated current	(A)	250	2.5-250	1-200	2.5-100	1-100	2.5-63	6.3-125	100	80	6.3-63	6.3-31.5	0.3	0.3	10-250

Fuse characteristics

In accordance with IEC 60282-1, it is advisable to replace all three fuses in a three-phase circuit when one of them has blown, unless there has definitely been no overcurrent in the fuses that have not blown.
It is important to take into account the fact that the striker only acts when the fuse element has blown. However, if the striker has not been activated, this does not mean that the fuse has not been subject to an overcurrent.

Time/current characteristics curves
3.6 - 7.2 - 12 - 17.5 - 24 - 36 kV





1. Contact caps
2. Enclosure
3. Core
4. Fuse element
5. Extinction powder
6. Thermal striker

Indoor Instrument Transformers

Instrument Current and Voltage Transformers have the following functions:
- To adapt the Medium Voltage current/voltage value at the primary to the characteristics of the metering or protection devices by supplying a proportionally reduced secondary current/voltage value
- To isolate the power circuits from the metering and/or protection circuits
- To supply the power for protection devices and data processing
- For indoor application: post-type, support type, functional and toroidal types

PE90296

PE28679

Main characteristics

- Instrument Transformers comply with IEC standards and can also be supplied according to specific country standards (IEE, NBR, NFC, GOST, etc.)
- The range is designed for voltages from 0.72 to 40.5 kV and currents from 5 to 4000 A
- Numerous different types depending on the specific cubicle installation and also the DIN standard available
- Quality guaranteed over time by the use of silica-filled epoxy resin
- Excellent mechanical and dielectric performance even at high temperature (insulation class A)
- No emission of any harmful substances in the event of fire

Reference standard, not standard customized solutions

High ageing resistance

Product quality maintained over lifetime even in difficult operating conditions

Certified by the main European countries

Current Transformers technical characteristics

Rated voltage	Ur	(kV)	**7.2**	**12**	**17.5**	**24**	**36**
Insulation level							
Power frequency withstand 1min		(kV)	20	28	38	50	70
Lightning impulse withstand		(kV peak)	60	75	95	125	170
Frequency		(Hz)	50-60				
Primary current		(A)	25-50-75-100-200-400-600				
Short-time thermal current (1 s)			12.5-16-20-25-31.5-40-50 kA or 40-80-100-200-300 x In				
Secondary current		(A)	1-5				
Accuracy power		(VA)	2.5-5-7.5-10-15				

Voltage Transformers technical characteristics

Insulating voltage	Ur	(kV)	**7.2**	**12**	**17.5**	**24**	**36**
Insulation level							
Power frequency withstand(1) 1min		(kV)	20	28	38	50	70
Lightning impulse withstand		(kV peak)	60	75	95	125	170
Frequency		(Hz)	50-60				
Primary voltage U1n (divided by √3 if single phase)		(kV)	3-3.3-5-5.5-6-6.6-10-11-13.8-15-20-22-30-33				
Secondary voltage U2n		(V)	100-110 or 100/√3-110/√3				
Accuracy power		(VA)	30-50-100				

(1) When there is a major difference between the highest voltage for the equipment (Um) and the rated primary voltage, the power frequency must be limited to five times the rated voltage.

Low Power Current Transformers

Low Power Current Transformers (LPCT) have the following functions:
- To adapt the Medium Voltage current value at the primary to the characteristics of the metering or protection devices by supplying a proportional reduced secondary voltage value
- To isolate the power circuits from the metering and/or protection circuits
- To supply the power needed to process the data or even for the protection devices to work
- For indoor application: post-type, support type, functional and toroidal types

PE58397

TLP 190

Main characteristics

- Both metering and protection functions
- Metering accurate up to the extended primary current, protection accurate up to the short-time current
- LPCTs can be connected directly to the Sepam relay via its RJ45 connector
- No danger in the event of accidental opening of the secondary circuit
- In MV LPCTs quality is guaranteed over time by the use of silica-filled epoxy resin (insulation class A)
- No emission of any harmful substances in the event of fire
- Low Power Current Transformers comply with the IEC standards

PE56703

TLP 160

Both metering and protection solutions in one product

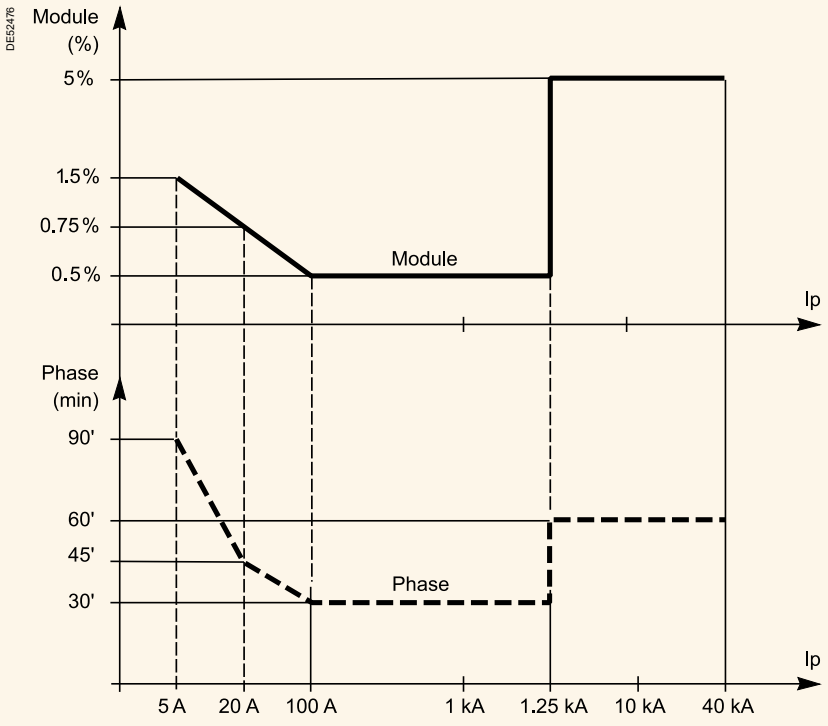
Safe, flexible, with optimized stock

Ease of interface connection

Takes up 50% less space than standard solutions

Primary current						
Rated	(A)	100	100	100	100	100
Extended	(A)	1250	1250	2500	2500	2500
Secondary voltage	(mV)	22.5	22.5	22.5	22.5	22.5
Accuracy class		0.5 - 5P	0.5 - 5P	0.5 - 5P	0.5 - 5P	0.5 - 5P
Accuracy limit factor FLP		500	400	400	400	400
Short-time thermal current		50 kA - 1s 40 kA - 3s	40 kA - 3s	40 kA - 3s	40 kA - 3s	40 kA - 3s
Rated insulation	(kV)	17.5	24	24	0.72	0.72
Secondary connector		RJ45 - 8 pts				
Internal diameter	(mm)	-	-	-	160	190

DE52476



Outdoor Instrument Transformers

Instrument Current and Voltage Transformers have the following functions:
- To adapt the Medium Voltage current/voltage value at the primary to the characteristics of the metering or protection devices by supplying a proportionally reduced secondary current/voltage value
- To isolate the power circuits from the metering and/or protection circuits
- To supply the power for protection devices and data processing
- For outdoor application: post-type

PE59461

PE59462

Main characteristics

- Instrument Transformers comply with IEC standards
- The range is designed for voltages from 7.2 to 40.5 kV and currents from 5 to 2500 A
- Quality guaranteed over time by the use of silicon on the sand-blasted surface of the epoxy resin
- Excellent mechanical and dielectric performance even at high temperature (Insulation Class A)
- No emission of any harmful substances in the event of fire

Reference standard, not standard customized solutions

High ageing resistance

Withstands the highest pollution level IV

Product quality maintained over life time even in difficult operating conditions

Current Transformers technical characteristics

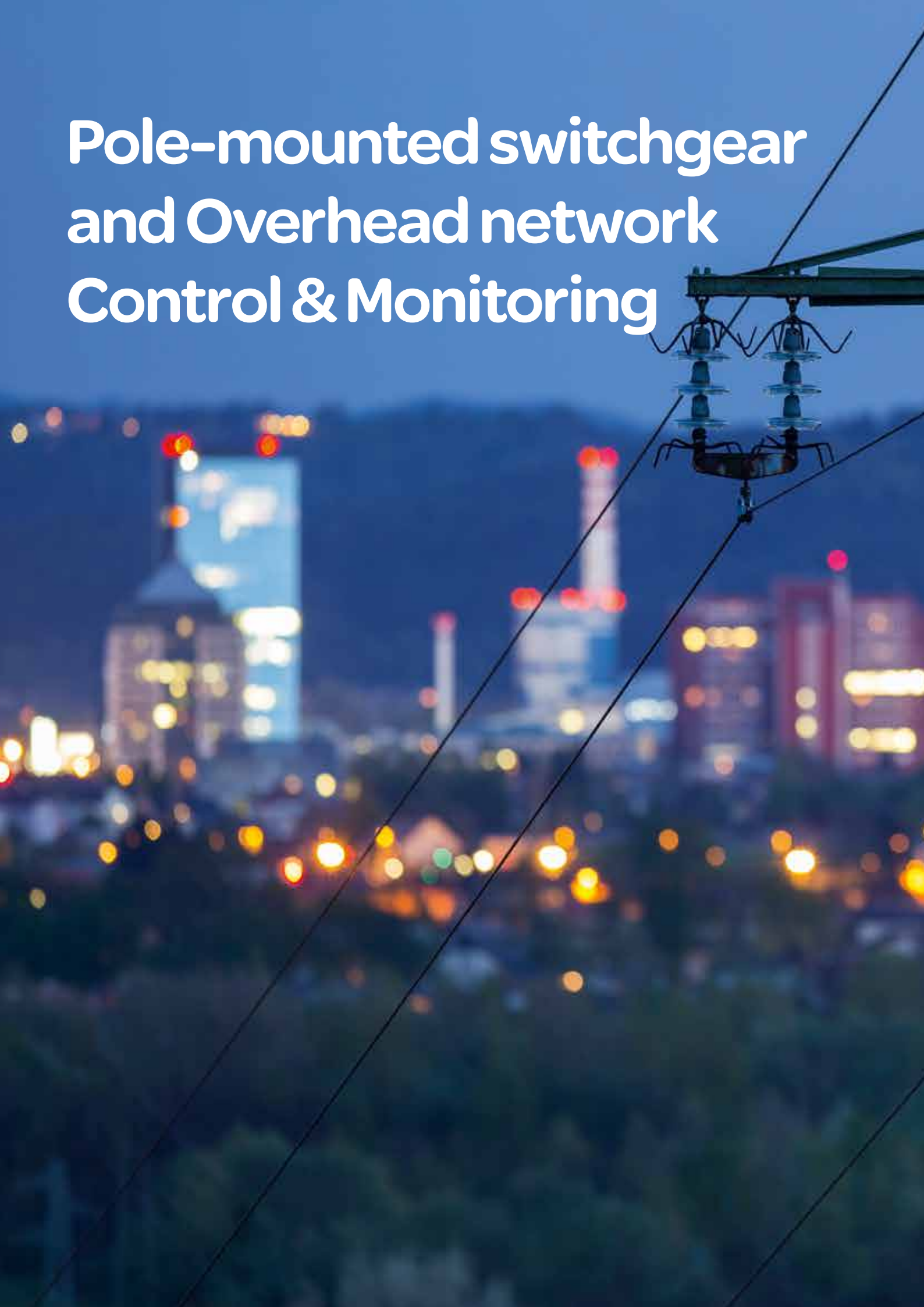
Rated voltage	Ur	(kV)	**7.2**	**12**	**17.5**	**24**	**36**
Insulation level							
Power frequency withstand 1min		(kV)	20	28	38	50	70
Lightning impulse withstand		(kV peak)	60	75	95	125	170
Frequency		(Hz)	50-60				
Primary current		(A)	25-50-75-100-200-400-600-1000-1200-1600-2000-2500				
Short-time thermal current (1s)			12.5-16-20-25-31.5-40-50 kA or 40-80-100-200-300 x In				
Secondary current		(A)	1-5				
Accuracy power		(VA)	2.5-5-7.5-10-15				

Voltage Transformers technical characteristics

Insulating voltage	Ur	(kV)	**7.2**	**12**	**17.5**	**24**	**36**
Insulation level							
Power frequency withstand(1) 1min		(kV)	20	28	38	50	70
Lightning impulse withstand		(kV peak)	60	75	95	125	170
Frequency		(Hz)	50-60				
Primary voltage U1n (divided by √3 if single phase)		(kV)	3-3.3-5-5.5-6-6.6-10-11-13.8-15-20-22-30-33				
Secondary voltage U2n		(V)	100-110 or 100/√3-110/√3				
Accuracy power		(VA)	30-50-100				

(1) When there is a major difference between the highest voltage for the equipment (Um) and the rated primary voltage, the power frequency must be limited to five times the rated voltage.

Pole-mounted switchgear and Overhead network Control & Monitoring



Contents

Selection Table

ADVC Controller

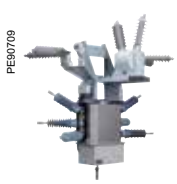
PE90836

PE55502

Ultra	Compact
IEC/ANSI	IEC/ANSI
Technical characteristics	
	Suited to straightforward applications such as typical overhead feeder installations WSOS5 (Windows Switchgear Operating System 5) is a software package that allows the configuration, control and monitoring of Schneider Electric's pole-mounted auto reclosers and sectionalizers
8 inputs, 8 outputs: optional	N/A
Battery: 7 Ah, or 12 Ah	Battery: 7 Ah
Auxiliary power supply: 115/230 VAC Dual AC power supply: optional VT supply via switchgear: optional DC power supply: optional	Auxiliary power supply: 115/230 VAC VT supply via switchgear: optional

Selection Table

Pole-Mounted Switchgear



N series	**PM6**	**RL series**	**SBC**	**U series**	**W series**
IEC/ANSI	IEC	IEC/ANSI	IEC	IEC/ANSI	IEC/ANSI
Rated voltage (kV)					
38	36	38	36	27	24
Max. rated current					
800 A	630 A	630 A	630 A	630 A	400 A
Max. rated short circuit current					
16 kA	12.5 kA	16 kA	20 kA	12.5 kA	6 kA
Vacuum / SF6 Dry air (optional)	SF6	SF6	Air	Vacuum / Epoxy	Vacuum / Epoxy
Recloser Remote controlled with ADVC controller Advanced protection, control and communication	Load break switch Remote controlled with Easergy T200 P control unit Manual or automatic load break switch Sectionalizer capabilities	Load break switch Remote controlled with ADVC controller or ADVC Lite Manual or automatic load break switch Sectionalizer capabilities on voltage and current	Air break switch and disconnector Manually operated	Recloser Remote controlled with ADVC controller Advanced protection, control and communication	Single Wire Earth Return (SWER) recloser Remote controlled with ADVC controller or ADVC Lite Advanced protection, control and communication

ADVC Controller

Advanced Recloser & Sectionalizer Controller

The ADVC Controller Range offers advanced protection, metering, diagnostic and communication features in a reliable package.

The use of a common controller platform (ADVC) provides our customers with valuable features such as:

- Continuity & ease of operation (same automation platform)
- Offers expertise & reliability (Schneider Electric brand, controller, 316 stainless steel, etc.)
- Offers continuity of service (backward compatibility), retrofit on installed base
- Continuous development of the latest Smart Grid features

It complies with IEC and ANSI standards.

PE90836

PE55502

Main characteristics

- Choice of two operator interfaces, flexVUE or setVUE:
  - flexVUE - interface with 20 configurable status lamps and 12 quick action keys.
  - setVUE - large 4 x 40 LCD with familiar menu-driven operation
- Choice of two cubicles, Compact or Ultra:
  - Compact - smaller 304SS controller
  - Ultra - large 316SS controller cubicle with two accessory mounting areas
- IP65 rated protection for electronics
- RS232, RS485, V23 and 10Base-T Ethernet communication ports
- Temperature range down to -40 °C
- DNP3, IEC 60870-5-101/104 & other protocols
- Stainless steel enclosure

Key applications

Utilities *(please see page 12 for more details)*

Best in class controller
Flexibility
Clear and easy interface
Ease of operation

Technical characteristics

	COMPACT	ULTRA
Enclosure	304 stainless steel	316 stainless steel
Door locking	Two-point	Three-point
Customer accessory tray	Side tray only	Side tray Upper tray
Input/output modules	N/A	8 inputs, 8 outputs Optional
Battery heater	N/A	Optional
Battery	7 Ah	7 Ah, or 12 Ah
Temperature range	-10 °C to 50 °C	-40 °C to 50 °C (with battery heater option)
Auxiliary power supply	115/230 VAC	115/230 VAC
Dual AC power supply	N/A	Optional
VT supply via switchgear	Optional	Optional
DC power supply	N/A	Optional

N-series

The N series is the best solution to improve reliability of power supply (through automatic supply restoration and isolation of faulty network section)
The N Series is a high-performance, three-phase, pole-mounted automatic recloser.
The rugged N series and advanced controller (ADVC) are renowned worldwide and have been used for more than 20 years by Major Utilities throughout the world. Its integrated voltage (x6) and current metering are specially designed for Smart Grid applications.
It complies with IEC and ANSI standards.

PE90712

PE55502

Linked to ADVC controller automation.

Main characteristics

- Rated voltages: 15, 27, or 38 kV
- Up to 16 kA Short Circuit withstand
- SF6 gas insulation medium / N-green dry air option
- 316 grade stainless steel tank
- Fully insulated bushing arrangement
- 800 A continuous rated current
- Integrated voltage and current measurement
- Up to 10,000 operations
- Preferred control unit: ADVC Controller range

Key applications

Utilities - Wind - Mining
(please see page 12 for more details)

Offer expertise & reliability
Continuity and ease of operation
Best-in-class Smart Grid switchgear (with ADVC controller)

Technical characteristics

		15 kV 12.5 kA	27 kV 12.5 kA	38 kV 12.5 kA	38 kV 16 kA
Rated maximum voltage	(kV)	**15**	**27**	**38**	**38**
Rated continuous current	(A)	800	800	800	800
Emergency current (8 hours)	(A)	850	850	850	850
Fault make capacity (RMS)	(kA)	12.5 or 16	12.5 or 16	12.5 or 16	16
Fault make capacity (Peak)	(kA)	31.5	31.5	31.5	40
Power operating time (Close / Open)	(s)	0.1 / 0.05	0.1 / 0.05	0.1 / 0.05	0.1 / 0.05
Mechanical operations		10 000	10 000	10 000	10 000
Rated full load operations		10 000	10 000	10 000	10 000
Short time current	(kA)	12.5 or 16	12.5 or 16	12.5 or 16	16

PM6

PM6 is the solution where power supply reliability needs to be improved (isolation of faulty network sections)
The PM6 is a 3-phase, pole-mounted SF6 load break switch.
It can be manually or remotely operated to energize or de-energize non-faulty line segments in Distribution Overhead Networks.
When used in combination with Easergy T200P RTU, the PM6 can reconfigure the network remotely, thus reducing the duration of outages. Additionally, it is able to discriminate between permanent faults and temporary faults automatically through its sectionalizer function.
It complies with IEC standards.

PE56860

Main characteristics

- Breaking and isolation in low pressure SF6
- Rated voltage: up to 36 kV
- Rated current: 400 to 630 A
- Isolating technology
- Sectionalizer capabilities
- Active parts are maintenance free
- Insensitive to the environment
- Preferred control unit: Easergy T200P

Key applications

Utilities *(please see page 12 for more details)*

PE56860_1

Linked to T200P

Improved power supply reliability
Reduced outage time
Designed for harsh environments
Remote operation

Technical characteristics

		S3-S2D	S4-S3D
Rated voltage	(kV)	**24**	**36**
Category according to IEC60265-1998		E3M2	E3M2
Rated current	(A)	400/630	630
Rated insulation level			
Power frequency voltage			
To earth and between poles	(kV)	50	70
Across the isolating distance	(kV)	60	80
Impulse lighting voltage			
To earth and between poles	(kV)	125	170
Across the isolating distance	(kV)	145	195
Rated frequency	(Hz)	50-60	50-60
Breaking capacity	(A)	400-630	630
Active load			
Loop load	(A)	400/630	630
Transformer with no load	(A)	10	20
Line with no load	(A)	10	10
Making capacity under short circuit	(kA)	31.5	31.5
Short time withstand current	(kA/1s)	12.5	12.5

RL-series

RL-series is the solution where power supply reliability needs to be improved (isolation of faulty network section)
The RL-series is a 3-phase, pole-mounted SF6 load break switch that can be manually or remotely operated to energize or de-energize non-faulty line segments in Overhead Networks.
When used in combination with ADVC or ADVC-Lite Controller Ranges, the RL series can reconfigure the network remotely, thus reducing the duration of outages. Additionally, it is able to discriminate between permanent faults and temporary faults automatically through its sectionalizer function.
It also has embedded self-healing functionality when used with an ADVC controller.
It complies with IEC & ANSI standards.

PE90711

PE55502

Linked to ADVC controller automation.

Main characteristics

- Up to 38 kV and 630 A rated current
- SF6 gas puffer interruption
- Can be used as a point of isolation
- Late automation / Retrofitable motorpack
- 316 Stainless Steel
- Low Gas Interlock (LGI)
- Sectionalizer capability
- Self healing embedded feature (ADVC)
- Same Engineering Tool & Controller as Schneider Electric Recloser range
- Preferred control unit: ADVC or ADVC Lite Controller Range

Key applications

Utilities *(please see page 12 for more details)*

Improved power supply reliability
Reduced outage time
Designed for harsh environments
Remote operation

Technical characteristics

		15 kV 12.5/16 kA	27 kV 12.5/16 kA	38 kV 12.5/16 kA
Rated maximum voltage	(kV)	**15.5**	**27**	**38**
Rated continuous current	(A)	630	630	630
Fault make capacity (RMS)	(kA)	12.5 / 16	12.5 / 16	12.5 / 16
Fault make capacity (Peak)	(kA)	31.5 / 40	31.5 / 40	31.5 / 40
Power operating time (Close / Open)	(s)	< 2	< 2	< 2
Mechanical operations		10 000	10 000	10 000
Rated full load operations		600	600	400
Short time current	(kA)	12.5 / 16	12.5 / 16	12.5 / 16

SBC

SBC is a cost-effective way to isolate faulty network sections
SBC is a vertical-break range of disconnectors and switch-disconnectors suitable for horizontal or vertical mounting on metal, concrete or wooden single or double poles.
It complies with IEC standards.

PE90715

Main characteristics

- Rated voltages: 24, 36 kV phase to ground
- Horizontal or vertical mounting
- High speed action of the auxiliary blade
- Visible breaking
- Porcelain or Polymeric insulator
- Up to 630 A rated current

Key applications

Utilities *(please see page 12 for more details)*

Limited arc creation, enhancing operator safety
Easy installation
Designed for outdoor use

Technical characteristics

		Porcelain insulator				Polymeric insulator			
Electrical characteristics		SBC-24/400 SBC-24/400 CB	SB-24/630 SBC-24/630 SBC-24/630 CB	SBC-36/400 SBC-36/400 CB	SB-36/630 SBC-36/630 SBC-36/630 CB	SBCP-24/400 SBCP-24/400 CB	SBP-24/630 SBCP-24/630 SBCP-24/630 CB	SBCP-36/400 SBCP-36/400 CB	SBP-36/2630 SBCP-36/630 SBCP-36/630 CB
Rated voltage	(kV)	**24**	**24**	**36**	**36**	**24**	**24**	**36**	**36**
Rated current	(A)	400	630	400	630	400	630	400	630
Creepage distance	mm	580	580	870	870	600	600	900	900
Withstand voltage									
Power frequency voltage									
To earth and between poles	(kV)	50	50	70	70	50	50	70	70
Across the isolating distance	(kV)	60	60	80	80	60	60	80	80
Impulse									
To earth and between poles	(kV)	125	125	170	170	125	125	170	170
Across the isolating distance	(kV)	145	145	195	195	145	145	195	195
Short time withstand current (rms)	(kA/1s)	16	20	16	20	16	20	16	20
Peak withstand current	(kA)	40	50	40	50	40	50	40	50
Short-circuit making capacity (*)	(kA)	20	20	20	20	20	20	20	20

(*) On request. CB only (see chart).

U-series

The U-series is the best solution where power supply reliability needs to be improved (through automatic supply restoration and isolation of faulty network section)
The U-series is a three-phase pole-mounted automatic recloser.
The U-series lightweight, advanced controller (ADVC) is renowned worldwide and has been used for more than 10 years by Major Utilities throughout the world.
Its integrated voltage (x3) and current metering are specially designed for Smart Grid applications.
It complies with IEC and ANSI standards.

PE90713

PE55502

Linked to ADVC controller automation.

Main characteristics

- Rated voltages: 15, 27 kV
- Up to 12.5 kA Short Circuit Withstand
- Solid Dielectric
- 316 grade stainless steel tank
- 630 A continuous rated current
- Integrated voltage on 3 I-side (horizontal) bushings, and current measurement on all 3 phases
- Up to 10,000 operations
- Preferred control unit: ADVC Controller Range

Key applications

Utilities *(please see page 12 for more details)*

Reduced installation and operating costs
Continuity and ease of operation
Best-in-class smart grid switchgear (with ADVC controller)

Technical characteristics

		15 kV 12.5 kA	**27 kV** 12.5 kA
Rated maximum voltage	(kV)	**15.5**	**27**
Rated continuous current	(A)	630	630
Fault make capacity (RMS)	(kA)	12.5	12.5
Fault make capacity (Peak)	(kA)	31.5	31.5
Power operating time (Close / Open)	(s)	0.1 / 0.05	0.1 / 0.05
Mechanical operations		10 000	10 000
Rated full load operations		10 000	10 000
Short time current	(kA)	12.5	12.5

W-series

The W-series is the ideal solution where power supply reliability needs to be improved on single-phase lines (through automatic supply restoration and isolation of faulty network section)
The W-series is a single-phase pole-mounted automatic recloser. The W-series lightweight ADVC Lite controller or advanced controller (ADVC) make it a best-in-class solution for single-phase applications.
Its integrated voltage and current metering are specially designed for Smart Grid applications.
It complies with IEC and ANSI standards.

PE90714

PE555502

Linked to ADVC controller automation.

Main characteristics

- Rated voltage: 24 kV phase to ground
- 316 grade stainless steel tank
- Latest technology in solid dielectric and vacuum arc interruption
- Single phase applications
- SWER (Single Wire Earth Return) applications
- 400 A continuous rated current
- Preferred control unit: ADVC Lite or ADVC Controller range

Key applications

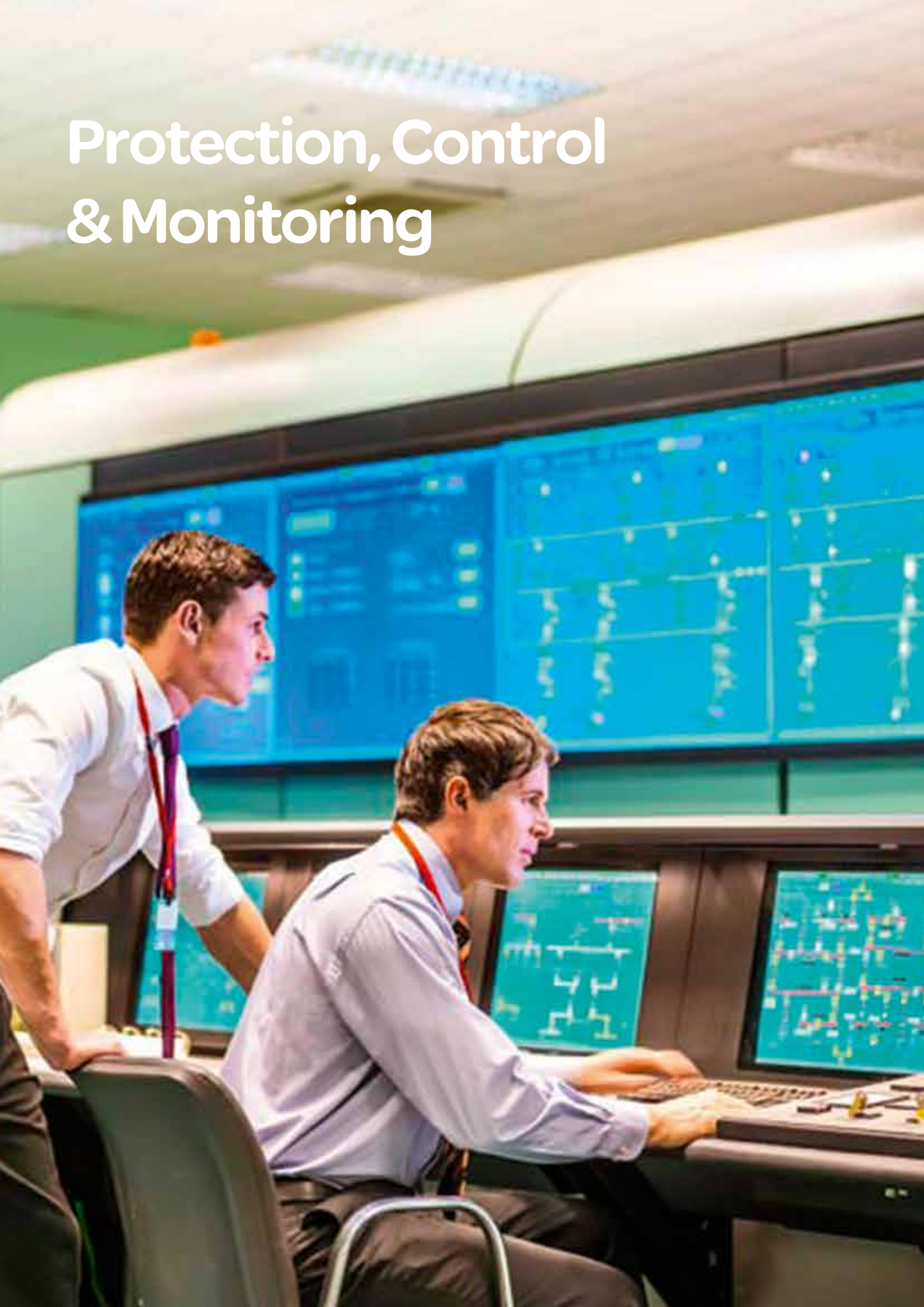
Utilities *(please see page 12 for more details)*

Reduced installation and operating costs
Continuity and ease of operation
Cost-effective solution (with ADVC Lite controller)

Technical characteristics

Rated maximum voltage	(kV)	**24**
Rated nominal voltage (Phase to ground)	(kV)	21
Rated continuous current	(A)	400
Fault make capacity (RMS)	(kA)	6
Fault make capacity (Peak)	(kA)	15
Power operating time (Close / Open)	(s)	0.1 / 0.05
Mechanical operations		10 000
Rated full load operations		10 000
Short time current	(kA)	6

Protection, Control & Monitoring



Contents

Feeder Automation

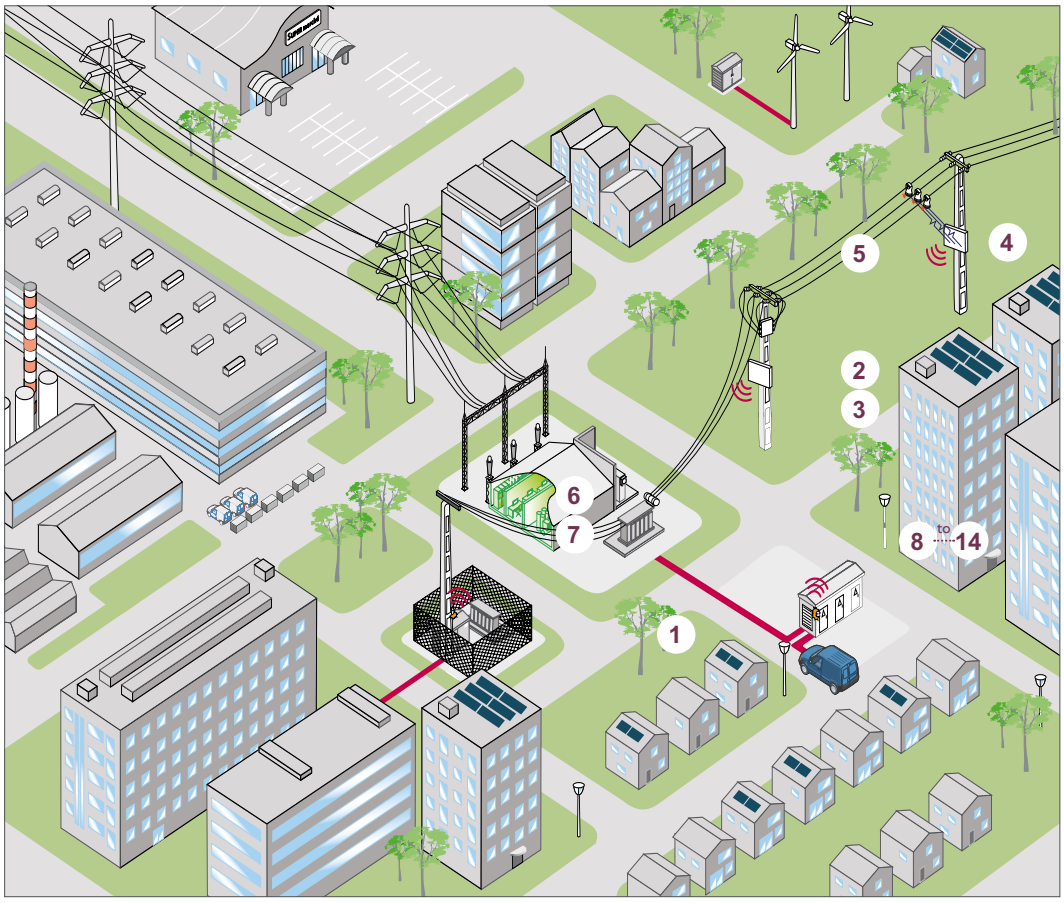
The strength of experience
Schneider Electric's Feeder automation offer provides affordable and scalable overhead and underground solutions including fault indication, monitoring units and remote monitoring and control.
Our offer ranges from the most basic Fault Passage indicators providing a visual indication to locate faults, up to the most complete Feeder Remote Terminal Units (FRTUs). They provide all fault diagnostic information remotely to the control centre and allow MV swich remote control, for both Underground and Overhead networks.

This comprehensive offer provides the most efficient and cost-effective way to reduce power outage duration (SAIDI index) as well as:
- Improve distributed power quality.
- Reduce operating costs.

Applications

Utilities

Feeder Automation solution at a glance



Feeder Automation

Reliability
Safety
Simplicity

Dedicated Supervision for Easergy range


PE56266

Easergy
L500

1

Easergy range dedicated to remote control system

Capacity for 400 Easergy type devices

Overhead Network

Recloser Controller	Remote Network Control	Remote Network Monitoring	Local Fault Indication		
 PM103550	 PE90722	 PE57923	 PE90724	 PE57927	 PE57929
ADVC 2	Easergy T200P	Easergy Flite 116-SA/G200	Easergy Flite 110-SA	Easergy Flite 210, 230	Easergy Flite 312, 315, 332, 335, 382
2	3	4	5	6	7
Dedicated controller for N, U, W reclosers, and RL sectionalizer	Overhead switch control unit	Communicating fault passage indicator for overhead networks	Fault passage indicator for overhead networks	Fault current detectors for overhead networks	Fault current detectors for overhead networks
Phase and earth current, directional, voltage, frequency, harmonics	Control of 1 or 2 switches, PM6 or other load break switches	Single-phase ammetric detector	Single-phase ammetric detector	Three-phase ammetric detectors	Three-phase directional detectors

Underground Network

Local Fault Indication		Remote Network Control			Remote Network Monitoring	MV/LV Substation Power Supply	Accessory
 PE57787	 PE57922	 PE90717	 PE57924	 DM103099 DM103098	 PE90718	 PM100592	 PE81141 PE86830
Easergy Flair 21D, 22D, 23D, 23DM	Easergy Flair 219, 279	Easergy T200I	Easergy T200E	Easergy R200, ATS100	Easergy Flair 200C	Easergy PS100	VPIS V2
8	9	10	11	12	13	14	
Fault passage indicator for MV substations. DIN format	Fault passage indicator for MV substation. Wall mounted	Control unit for MV and MV/LV substations		Premset cubicle monitoring and control unit	Communicating fault passage indicator for MV substation	Power supply and battery charger, 12 & 24 VDC or 12 & 48 VDC, for MV/LV substations	Self-powered voltage presence indicating system
Phase-to-phase and phase-to-earth Fault Passage Indicators with LCD display for settings and monitoring. Compatible with all types of neutral system and communication capability	Phase-to-phase and phase-to-earth Fault Passage Indicator settings configurable with dip-switches	Control of 1 to 16 switches, RM6, FBX, SM6 and other cubicle	Control of 4 switches, dedicated to Ringmaster		1 or 2 Fault Passage Indicators functions, compatible with all earthing systems		Including voltage output version (VPIS V0) for connection to a VD23 voltage presence relay
		Including FPI, backup power supply, local automation, IEC870-5-101/104, DNP3 or Modbus protocols, various communication media (GPRS, 3G, PSTN, radio, Ethernet etc.)					

Intelligent Electronic Devices

The strength of experience
MiCOM, Sepam and Vamp ranges offer scalable levels of functionality and hardware options to best suit your protection requirements, and allow you to choose the most optimal solution for your application.
These ranges of relays provide the capability for a wide variety of protection, control, measurement, monitoring, and communication. You get intuitive access to all system information in your chosen language, and can manage your electrical installation effectively. If a problem occurs, clear and complete information puts you in a position to make the right decisions immediately.
With the additional VAMP arc flash protection, relays also measure light via arc sensor channels, thereby monitoring the entire switchgear.

Fast response + **Maximum dependability** =

100% available energy

Key applications for MiCOM series

Utilities - Railway - Renewables -
(please see page 12 for more details)

Key applications for Sepam series

Industry - Building - Infrastructure -
(please see page 12 for more details)

Key applications for Vamp

Arc Protection - *(please see page 12 for more details)*

Intelligent Electronic Devices
MiCOM series P10, P20, P30, P40

Increase your capabilities

From cost-effective to high-end protection and control, the comprehensive MiCOM range allows complete optimisation of your solution. MiCOM protection relays were launched in 1999 using best-in-class protection techniques and are now combined with the latest technology to position MiCOM as a highly dependable range of devices. Their protection techniques are fine-tuned to give you the best possible protection for your assets. We also engineer quality into every device with best-in-class standards to match our protection performance.

MiCOM	Series P10			Series P20					Series P30					
	 PM100502			 PM100517					 PM100527		 PM100566			
Applications	Fulfils the basic requirements of buildings and small industry applications with a particular focus on overcurrent and motor protection. Two families are available: ■ Auxiliary powered ■ Self powered/dual powered			Fulfils the basic/medium requirements of industrial, utility and building applications, providing simplicity and ease-of-use in a wide range of installations. ■ Scalable solutions where type and quantity of protection features are model dependent ■ Flexible logic equations available on most models ■ Compact hardware options for easy installation ■ Multi-language HMI ■ Advanced protection functions					Fulfils the protection requirements of utility and industrial applications with a particular focus on integrated feeder control and provides dedicated railway protection devices. ■ Protection with bay level control options to facilitate feeder management ■ Input/output quantity selectable based on requirements ■ Protection functions available for isolated/Petersen coil earthed systems ■ Surface and flush mounted (including detachable HMI option) as well as compact case models are available ■ Full Programmable Scheme Logic (PSL) and function keys					
Protection														
Current	✔	✔		✔	✔	✔	✔		✔	✔	✔	✔	✔	✔
Voltage			✔		✔	✔		✔	✔	✔	✔	✔	✔	✔
Frequency			✔		✔			✔	✔	✔	✔		✔	✔
Specifics	Self power or dual power	Speed switch input	Over/ under voltage & frequency	Restricted earth fault	Directional earth fault and phase over-current	CT & trip circuit super-vision	Breaker failure	Under & over-voltage	Compact case	Startup moni-toring, protective signalling	Inter-locking logic	Negative sequence over-current	Negative sequence over-voltage	Railway application
Applications														
Overcurrent	P111 P115 P116			P122 P123	P127				P130C	P132 P139				P138
Motor		P211				P220 P225			P130C	P132 P139				
Line differential							P521		P530C			P532		
Distance									P430C		P433 P437 P439			P436 P438
Transformer							P721		P630C				P631 P632 P633 P634	P638
Busbar							P723							
Voltage & Frequency and ancillary protection			V11V				P821	P921 P922 P923						
Characteristics														
Logic Inputs	max 8			max 12					max 82					
Logic Outputs	max 8			max 9					max 48					
Boolean logic equation	no			flexible logic (model dependent)					fully programmable					
Communication Ports	USB front port and 1 rear port			RS232 front port / 1 rear port / 1 optional second rear port					RS232 front port / 1 rear port /1 optional second rear port					
IEC 61850 Protocol	No			No					Yes Edition 1					

Intelligent Electronic Devices
MiCOM series P10, P20, P30, P40

MiCOM	Series P40									
	 PM100523  PM100526									
Applications	Fulfils the protection requirements for a wide market of utility and industrial applications and offers a wide range of protection functions. ■ IEC 62439 redundancy protocols PRP (Parallel Redundancy Protocol) and HSR (High availability Seamless Redundancy) with dual IP addresses ■ Configurable communication protocol IEC 61850 Editions 1 or 2 ■ Full Programmable Scheme Logic available with graphic configuration tool for easy setting ■ Scalable input/output hardware depending on requirements ■ Operating voltage selectable via software for opto inputs									
Protection										
Current	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Voltage	✔	✔	✔	✔	✔	✔	✔	✔		✔
Frequency	✔	✔	✔	✔	✔	✔	✔	✔		
Specifics	Rate of change of frequency	Loss of field, out of step	100% stator earth fault (3rd)	100% stator earth fault (low freq.)	Phase directional & check sync.	Phase direc-tional	Negative sequence overcurrent	Negative sequence overvoltage	Decentra-lised busbar	Centralised busbar
Applications										
Overcurrent	P141 P142 P143 P145									
Motor		P241 P242 P243								
Generator			P342 P343 P344	P345						
Line differential							P45x			
Distance					P441 P442 P443 P444	P445 P446				
Transformer								P642 P643 P645		
Busbar									P740	P746
Voltage & Frequency and ancillary pro-tection	P341 P841									
Characteristics										
Logic Inputs	max 64									
Logic Outputs	max 60									
Boolean logic equation	fully programmable									
Communication Ports	RS232 front port / 1 rear port /1 optional second rear port									
IEC 61850 Protocol	Yes Edition 1 & 2									

Intelligent Electronic Devices
Sepam series 20, 40, 60, 80

Go for simplicity
With multi-functional Sepam protection relays, you can measure, manage, analyze, and produce diagnostics for all applications in an installation. Range modularity makes it easy to select the relay that exactly corresponds to your needs. The range is structured for typical applications (substations, transformers, generators, capacitors, busbars, and motors) and provides the necessary functions (protection, metering, control and monitoring, etc.).
Starting with a Sepam base unit, complete solutions can be built by adding input/output modules, sensors and communication modules.

Sepam	Series 20				Series 40				
	 PE88030				 PE88030				
Applications	For usual applications ■ Backlit LCD graphic bitmap display ■ 16 inverse time over-current characteristic curves ■ Easy software setup ■ Two 86-cycle fault records, last trip fault values and last 64 time-tagged alarms ■ Self-test diagnostics ■ Wide range of control power inputs (AC/DC) ■ Breaker/failure function for S24 and T24				For demanding applications ■ Compact case provides standardized dimensions (< 100 mm deep) ■ Directional over-current protection for dual incomers, couplings, and closed-loop feeders ■ Current and voltage inputs ■ Setting software with Boolean logic equation assistance ■ CT/VT and trip circuit supervision ■ Sixteen seconds of fault recording configurable for multiple captures, detailed history of last 5 trip reports, and retention of last 200 time-tagged alarms ■ 16 RTD inputs				
Protection									
Current	✔	✔			✔	✔	✔	✔	✔
Voltage			✔	✔	✔	✔	✔		✔
Frequency			✔	✔	✔	✔	✔		✔
Specifics		Breaker failure		Disconnection by rate of change of frequency		Directional earth fault	Directional earth fault and phase overcurrent	Directional earth fault	
Applications									
Substation	S20	S24			S40 S50	S41 S51	S41 S52	S43 S53	S44 S54
Busbar			B21	B22					
Transformer	T20	T24			T40 T50		T42 T52		
Motor	M20				M40	M41			
Generator					G40				
Capacitor									
Characteristics									
Logic Inputs	0 to 10				0 to 10				
Logic Outputs	4 to 8				4 to 8				
Communication Ports	1 to 2				1 to 2				
IEC 61850 Protocol	Yes				Yes				
Redundancy	No				Yes				
Goose message	No				No				

Intelligent Electronic Devices
Sepam series 20, 40, 60, 80

Sepam	Series 60			Series 80							
	 PE60305			 PE60304  PE60305							
Applications	For demanding applications ■ Directional over-current protection for dual incomers, couplings, and closed-loop feeders ■ Setting software with Boolean logic equation assistance ■ CT/VT and trip circuit supervision ■ Sixteen seconds of fault recording configurable for multiple captures, detailed history of last 5 trip reports, and retention of last 200 time-tagged alarms ■ Optional mimic-based display units are available to view a portion of single-line and phasor diagrams ■ Battery backup for historical and fault waveform data retention ■ Synchro-checks module available ■ 16 RTD inputs			For custom applications ■ Standardized dimensions for enhanced protection of incomers/feeders, transformer, motor, generator, busbar, and capacitor-bank applications ■ Differential protection of transformer or machine transformer units ■ Differential protection of motors and generators ■ Protection for incomers, couplings, and important feeders ■ Expanded logic-equation capabilities ■ Graphical assistance for setting software ■ Battery backup for historical and fault waveform data retention ■ Optional mimic-based display units are available to view a portion of single-line and phasor diagrams							
Protection											
Current	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Voltage	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Frequency	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Specifics		Directional earth fault	Directional earth fault and phase overcurrent		Directional earth fault	Directional earth fault and phase overcurrent	Disconnec-tion by rate of change of frequency	Transfor-mer & transformer-machine unit differential	Machine differential	Voltage & frequency protection for 2 sets of busbars	Capaci-tor-bank unbalance
Applications											
Substation	S60		S62	S80	S81	S82	S84				
Busbar				B80						B83	
Transformer	T60		T62		T81	T82		T87			
Motor		M61			M81			M87 M88			
Generator	G60		G62						G87 G88		
Capacitor	C60										C86
Characteristics											
Logic Inputs	0 to 28			0 to 42							
Logic Outputs	4 to 16			5 to 23							
Communication Ports	1 to 2			2 to 4							
IEC 61850 Protocol	Yes			Yes							
Redundancy	Yes			Yes							
Goose message	Yes			Yes							

PACiS: Solutions for Electrical Distribution

The strength of experience
PACiS is the latest generation of energy automation solutions for the Protection, Automation, and Control of electrical substations and microgrids.
PACiS solutions contribute to energy efficiency, protection of assets and improving grid availability with the inclusion of cybersecurity. They offer powerful and fast automation to reduce outages, management of electrical network balance, and optimization of energy availability in electrical distribution systems worldwide. Local services and support by Automation Experts help you to get the full benefit of your investment.

Key applications

Utilities - Oil & Gas - Mining & Metals - Industry - Hospital - Railways - *(please see page 12 for more details)*

Main characteristics

- Open, flexible and based on standards
- IEC 61850 substation modelling
- Dedicated automation for energy application
- Innovative cybersecurity approach

Reliability
Safety
Simplicity

More than 1,500 references worlwide

Technical characteristics

PACiS Solutions offer versatile arcitectures, energy dedicated automation and IEDs with cybersecurity.
Together with a full range of services to optimize project realization and provide long-term customer support.

PACiS Solutions include:
- ■ Key components leveraging IEC 61850
  - □ Engineering and administration tool suites including cybersecurity administration
  - □ SCADA/HMIs: EcoSUI, PSE
  - □ Bay Controller and automation (BCU): MiCOM C264
  - □ Gateway with multiple protocols (IEC61850, DNP3, T104/T101, Modbus, etc.)
  - □ Remote Terminal Units (RTU): Saitel, MiCOM C264
  - □ Ethernet switches with redundancy (SHP, RSTP, PRP, HSR): MiCOM Hxxx
- ■ Unrivalled IED Devices
  - □ Protection relays : MiCOM, Sepam and Vamp
  - □ Power and Measurement units: Powerlogic ION, PMxxx
  - □ Motor controllers : Tesys T

and multiple third party IEDs
- ■ Services
  - □ System specifications, project realization, installation retrofit, patch management, training, maintenance, after sales services, etc.

Transformers

Contents

Transformers selection table

	Oil Distribution Transformers		
	 Minera	 Minera Pole-Mounted	 Minera HE+
Max. rated power (MVA)	3.15	0.5	1.6
Max. rated voltage (kV)	36	36	36
Indoor/outdoor	Indoor and outdoor	Outdoor	Indoor and outdoor
Features and application	Ground-mounted and pole-mounted oil immersed transformer Three-phase units	Pole-mounted oil immersed transformer Phases: three-phase units (single-phase available on request)	High efficiency transformer with amorphous core technology available

	Cast Resin Transformers			Medium Power Transformers
	 Trihal	 Tricast	 Resiglas	 Minera MP
Max. rated power (MVA)	15	25	25	100
Max. rated voltage (kV)	36	52	36	170
Indoor/outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor
Features and application	Cast resin dry transformer Indoor: IP00, IP21 or IP31 Outdoor IP44 Highly rated to standards for environmental, climate and fire resistance	Cast resin dry transformer Indoor: IP00, IP21 or IP31 Outdoor IP44 Highly rated to standards for environmental, climate and fire resistance	Suitable for power supply of non-linear loads with high harmonic Contents (transformers with k-factor) Has a flexible design (adjustment of impedances)	Hermetically sealed or breathing with conservator. Low flammability dielectric liquids (Vegeta ranges) High capacity of cooling options such as ONAN, ONAF, ODAF, OFAF or OFWF

Transformers selection table

	Special Transformers				
					
	Minera SGrid	**Minera Ex**	**Minera R**	**Minera E**	**Minera PV**
Max. rated power (MVA)	1	60	80	15 kA (earth fault current)	3.2
Max. rated voltage (kV)	36	36	170	72	36
Indoor/outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor
Features and application	Transformer suitable for renewable power generation It features an on-load tap changer	Zone 1 and Zone 2 explosion proof transformer for mines and the oil and gas industries Hazardous zones (Atex Transformer range) Naturally cooled (ONAN) or air forced (ONAF)	Rectifier transformer for railways, metals and renewable Rectifier feeder (Rectifier Transformer range)	Designed to create the HV network neutral point and to limit the fault current in the phase-earth connection	Transformer for residential photovoltaic (PV) generation Natural cooled (ONAN) or air-forced (ONAF)

	Special Transformers				
					
	Siltrim	**Vegeta**	**Impregó**	**Impregó AT**	**R-Cool**
Max. rated power (MVA)	3.3	25	0.4	0.4	15
Max. rated voltage (kV)	36	72.5	1.1	1.1	36
Indoor/outdoor	Indoor and outdoor	Indoor and outdoor			Indoor and outdoor
Features and application	Very compact distribution transformer adapted to fit into reduced spaces such as wind towers and offshore oil & gas platforms	The safest transformer for the environment and people, using biodegradable vegetable oil as dielectric medium			Air-conditioned special dry-type transformer, which is designed to achieve high IP ratings and an efficient cooling solution that cannot be reached with conventional enclosures and cooling

Oil Distribution Transformers

Minera

Distribution Transformers up to 3.15 MVA and 36kV
The Minera oil-insulated voltage medium power transformer from Schneider Electric has been developed with proven, permanently optimized technology. The entire range is highly versatile, and offers high quality, reliability, and a long service life with minimum maintenance and easy recycling.

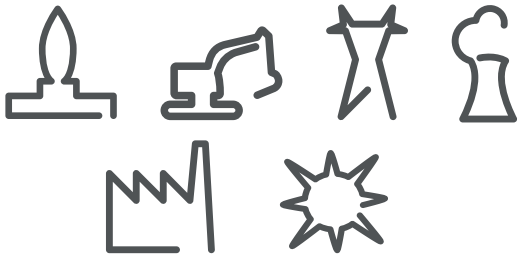
PE90841

Technical characteristics

- Rated power: from 50 kVA up to 2.5 MVA
- Rated voltage: up to 36 kV
- Phases: Three-phase unit
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: ONAN, (ONAF, OFAF, ODAF, OFWF or ODWF on request)
- Voltage regulation: off-circuit tap changer (OCTC) or on load tap changer (OLTC)
- Other (optional): breathing or sealed type, standard or low noise levels, a wide variety of accessories

Key applications

Oil and gas - Mining, Minerals and Metals - Utilities
Power generation - Industry - Renewable energies
(please see page 12 for more details)



Minera Pole-Mounted

Disribution Transformers up to 500 kVA and 36 kV
The Minera pole-mounted range is an outdoor range of pole-top oil-filled transformers. Rated from 10 kVA to 500 kVA, single or three-phase at 12 kV, 24 kV and 36 kV.
A wide range of oil-immersed transformers and transformer solutions designed to meet different specifications and applications.

PM102333

Technical characteristics

- Rated power: up to 500 kVA.
- Rated voltage: 12, 24 and 36 kV.
- Phases: three-phase and single-phase.
- Rated frequency: 50 Hz.
- Type of cooling: ONAN.
- Other (optional): oil temperature indicator.

Key applications

Utilities - Commercial and Industrial Buildings - Infrastructure *(please see page 12 for more details)*

Oil Distribution Transformers

Minera HE+ - High Efficiency transformer

Distribution Transformers up to 1600 kVA and 36 kV
Schneider Electric provides a full range of energy-efficient solutions to suit your exact needs. In addition to the existing high-efficiency Minera HE transformers, Schneider Electric offers a new technology product range; Minera HE+ amorphous core transformers, which provide even greater energy savings. Minera HE+ is an ultra high-efficiency amorphous transformer, which is more economical than “standard-efficiency” transformers, as it consumes 70% to 80% less energy than conventional silicon steel transformers.

PM102298

Technical characteristics

- Rated power: up to 1600 kVA
- Rated voltage: up to 36 kV
- Phases: three-phase
  (single-phase available upon request)
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: ONAN, KNAN
  (other on request)

Key applications

Industry - Infrastructure - Data Centres - Commercial and Industrial Buildings *(please see page 12 for more details)*

Cast Resin Transformers

Trihal - Cast resin transformer

Dry-Type Transformers up to 15 MVA and 36 kV
Trihal is a best-in-class high-quality transformer that performs reliably in a wide range of environments.
It is perfectly suited to a wide variety of industries, from densely populated buildings and critical infrastructure to heavy industry and renewable energy production, and is the perfect replacement for PCB transformers.

PE90780

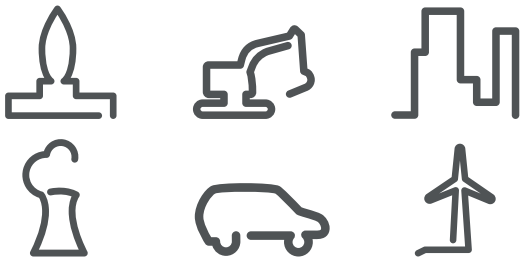
Technical characteristics

- Rated power: up to 15 MVA
- Rated voltage: up to 36 kV
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: AN, AF (other on request)
- Other: thermal protection system
- Enclosure, fans, anti-vibration pads, plug-in bushing, monobloc bushing, automatic voltage regulator panel, surge arrestors, etc.

Safety and Reliability

Key applications

Oil & Gas - Mining, Mineral and Metals - Commercial and Industrial Buildings - Nuclear - Automotive - Wind
(please see page 12 for more details)



Tricast - Cast resin transformer

Dry-Type Transformers up to 25 MVA and 52 kV
High quality and reliability make Tricast Cast Resin Dry Type Transformers the perfect solution for infrastructure projects such as transmission and distribution substations, public buildings and high-rise developments.
As Tricast is self-extinguishing, it is an effective solution for use in industrial installations susceptible to fire hazards.
In addition, it meets the needs of special applications such as wind farms.

PM102297

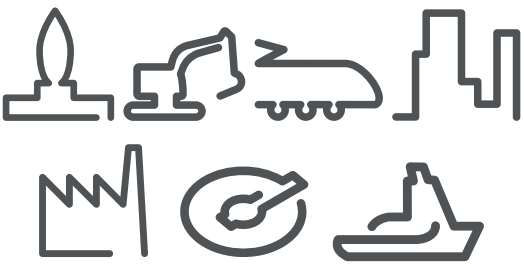
Technical characteristics

- Rated power: 25 MVA
- Rated voltage: 52 kV
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: AN, AF (other on request)
- Other: thermal protection system
- On-load tap changer, enclosure, fans, antivibration pads, plug-in bushing, monobloc bushing, automatic voltage regulator panel, surge arrestors, etc.

Safety and Reliability

Key applications

Oil & Gas - Mining, Minerals and Metals - Railways Commercial and Industrial Buildings - Industry - Water - Marine *(please see page 12 for more details)*



Cast Resin Transformers

Resiglas - Epoxy resin / Fibreglass transformer

Dry-Type Transformers up to 25 MVA and 36 kV
Resiglas transformers are equipped with MV coils reeled using “wet” technology; the product itself is made of non-flammable and fire-retardant materials.
It is therefore perfect for applications where the use of other types of transformers is impossible because of safety and difficult working conditions, e.g. in industrial installations susceptible to fire hazards. Additionally, it is suitable for internal use as a substitute for oil transformers.

PM102237

Technical characteristics

- Rated power: up to 25 MVA
- Rated voltage: up to 36 kV
- Phases: one or three-phase unit.
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: AN (other on request)
- Other: provided with protection levels up to IP55

Safety and Reliability

Key applications

Oil & Gas - Mining, Minerals and Metals - Railways Commercial and Industrial Buildings - Industry - Airports - Wind *(please see page 12 for more details)*

Medium Power Transformers

Minera MP

Medium Power Transformers up to 100 MVA and 170 kV
The Minera oil-immersed medium voltage power transformer is dedicated to all applications up to 170 kV and 100 MVA. Schneider Electric's technical expertise and know-how have been employed to create a wide variety of reliable transformers that satisfy customer requirements for both utility and industrial applications, even the most demanding such as Oil and Gas.

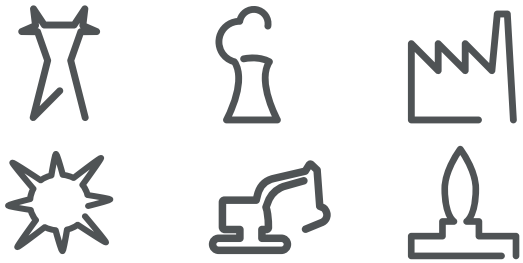
PE90735

Technical characteristics

- Rated power: from 3.15 up to 100 MVA
- Rated voltage: up to 170 kV
- Phases: one or three-phase unit
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: ONAN, (ONAF, OFAF, ODAF, OFWF or ODWF on request)
- Voltage regulation: off-circuit tap changer (OCTC) or on load tap changer (OLTC)
- Other (optional): breathing or sealed type, standard or low noise levels, a wide variety of accessories

Key applications

Utilities - Power Generation - Industry - Renewable Energies - Mining - Oil & Gas
(please see page 12 for more details)



Magnetic core
Tank construction
Surface protection

Special Transformers

Minera SGrid

Special Transformers up to 1 MVA and 36 kV
Minera SGrid is a regulated distribution transformer created to help distribution network owners eliminate the risk of voltage fluctuation. It is an innovative answer to voltage regulation, based on proven technology and designed for compliance with key modern regulations.
Whether intended for new substations or for retrofitting in existing locations, Minera SGrid helps you improve network quality without the need for other components.

PM102297

Technical characteristics

- Rated power: up to 1000 kVA
- Rated voltage: up to 36 kV
- Phases: three-phase unit
- Rated frequency: 50 Hz
- Type of cooling: ONAN

The intelligent answer to voltage fluctuation

Key applications

Commercial and industrial Buildings - Industries - Data Centres - Utilities
(please see page 12 for more details)

Minera EX - Explosive area transformer

Medium Power Transformers up to 60 MVA and 36 kV
Oil-immersed transformers can be installed in explosive atmospheres, particularly in the vicinity of hydrocarbon fluids.
In this case, explosion-proof transformers compliant with the relevant standards can be supplied.
Based on decades of field-tested experience in power generation and distribution for both offshore and onshore installations, Schneider Electric has adapted transformers to provide safety solutions for Zone 1 and Zone 2 applications in accordance with the latest ATEX and IECEx standards.

PE90775

Technical characteristics

- Rated power: up to 60 MVA
- Rated voltage: up to 36 kV
- Phases: three-phase units (single-phase available on request)
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: ONAN, (ONAF on request)
- Other (optional): hermetically sealed or conservator; ground-mounted with normal, low noise or very low noise levels

Key applications

Oil & Gas - Mining, Minerals and Metals
(please see page 12 for more details)

Special Transformers

Minera R - Rectifier transformer

Medium Power Transformers up to 80 MVA and 170 kV
The electrical and mechanical design of the Schneider Electric rectifier transformer is based on decades of experience in transformer design for both medium and high voltage ranges, expert calculation and CAD programming.
They are oil-type transformers filled with mineral, silicone or vegetable oil. They operate at the fundamental frequency of an alternating current system and are designed to have one or more output windings connected to the rectifier.
It is possible to make major changes in the output current and voltage by using the transformer with a different rectifier configuration.

PE90778

Technical characteristics

- Rated power: up to 80 MVA
- Rated voltage: various - *please consult us*
- Phases: three-phase unit
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: ONAN, ONAF (other on request)

Key applications

Railways - Mining, Minerals and Metals - Industry - Power Generation - Marine - Renewable Energies
(please see page 12 for more details)

Minera E - Earthing transformer

Special Transformers up to 15 kA and 72 kV
Minera E earthing transformers and coils are designed to protect your system against phase-earth fault currents for the given fault time duration. If an earth fault occurs on one line of an insulated system - usually one fed by a delta-connected main transformer winding with no return path available for the earth fault current and no current flow - the system will continue to operate, but the voltage on the other two lines will increase and both the transformer and the system will suffer from over-stressed insulation.

PM102709

Technical characteristics

- Rated power: up to 15 kVA (earth fault current)
- Rated voltage: up to 72 kV
- Phases: three-phase unit
- Rated frequency: 50 or 60 Hz
- Type of cooling: ONAN
- Other (optional): oil temperature indicator, integrated safety detector, pressure relief device, winding temperature indicator, marshalling box and wheels, limiting dimensions, fittings and paint systems, are available on request

Key applications

Oil & Gas - Mining, Mineral and Metals - Commercial and Industrial Buildings - Industry - Infrastructure
(please see page 12 for more details)

Special Transformers

Minera PV
Transformer for photovoltaic systems

Special Transformers up to 1600 kVA and 36 kV
Schneider Electric has developed transformers specially designed for grid-connected photovoltaic systems.
These transformers are designed to satisfy specific customer requirements regarding voltage, power, low losses, sound level, climate and more. Special attention is always paid to people and environmental safety issues. In large PV installations, multiple inverters paralleled on the PV arrays are directly connected to one or more medium-voltage transformers.
Schneider Electric's offer of three-winding transformers can reduce costs without compromising any of the transformer functions.
The transformer's primary voltage is on the low voltage side and the secondary is on the medium voltage side.

PE90784

Technical characteristics

- Rated power: up to 1600 kVA
- Rated voltage: up to 36 kV
- Phases: three-phase unit
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: ONAN or ONAF
- Other: protection relays on the filing plug, liquid retention tank

Key applications

Solar *(please see page 12 for more details)*

The ideal solution for photovoltaic systems

Siltrim - Compact size transformer

Special Transformers up to 3.3 MVA and 36 kV
Schneider Electric has designed a very compact distribution transformer to meet your technical requirements, adapted to fit into confined spaces.
Siltrim's patented design allows it to remain cool despite its extremely compact size. Siltrim is specifically built for our customers' complex mechanical and electrical environments and can be installed in the harshest environmental locations. It has been tested for an extremely high overvoltage level and is equipped with a pressure-relief device as an added safety measure against explosion. It offers lower winding hotspot temperatures, resulting in a longer working life with high availability and proven reliability.

PM102237

Technical characteristics

- Rated power: up to 3.3 MVA
- Rated voltage: up to 36 kV
- Phases: three-phase unit
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: ONAN
- Other (optional): on request

Key applications

Oil & Gas - Wind - Compact Substations
(please see page 12 for more details)

For extra power without extra heat

Special Transformers

Vegeta - Biodegradable vegetable oil transformer

Special Transformers up to 25 MVA and 72.5 kV
With natural ester-based biodegradable vegetable oil as the dielectric medium, Vegeta oil-immersed transformer is currently one of the most environmentally-friendly products available on the market.
This technology is biodegradable and non-toxic with a superior back-to-nature recycling rate of more than 99%.
Vegeta has been assigned a water hazard classification of zero, which means it is also eligible for use in areas where stringent environmental restrictions apply (water points, fields and forests).

PE90783

Technical characteristics

- Rated power: 50 kVA to 25 MVA
- Rated voltage: 72.5 kV
- Phases: one or three-phase unit
- Rated frequency: 50Hz or 60Hz.
- Type of cooling: ONAN, ONAF, ODAF, ODAN, ODWF

The ideal solution for photovoltaic systems

Key applications

Oil & Gas - Mining, Minerals and Metals - Commercial and Industrial Buildings - Wind - Marine - Utilities
(please see page 12 for more details)

Imprego

Special Transformer up to 400 kVA and 1.1 kV
The LV/LV transformer range is available in ratings up to 400 kVA. Imprego transformers are used to change the earthing system, isolate network disturbances, change the voltage and to supply power and ensure personal safety and equipment longevity.

PE90785

Technical characteristics

- Rated power: up to 400 kVA
  (for higher ratings, please consult us)
- Rated voltage: 400/400 V or 400/231 V and up to 1.1kV
- Phases: single phase, three-phase
- Rated frequency: 50 Hz or 60 Hz
- Other: electrostatic shield between the primary and the secondary connected to the earth, completely separate windings; covers may be purchased later as accessories

Key applications

Oil & Gas - Infrastructure - Industry - Marine - Security Network
(please see page 12 for more details)

Special Transformers

Impregno AT

Dry-Type Autotransformer up to 400 kVA and 1.1 kV
The autotransformers range is available in ratings up to 400 kVA.
They are used to adapt the network voltage without isolating the installation from electrical disturbances and they help increase its size compared to a transformer with the same power.

PE90786

Technical characteristics

- Rated power: up to 400 kVA
  (for higher ratings, please consult us)
- Rated voltage: 231/400 V or 400/231 V and up to 1.1 kV
- Phases: three-phase
- Rated frequency: 50 Hz or 60 Hz
- Other: star/star coupling with neutral

Key applications

Oil & Gas - Infrastructure - Health Care - Marine
(please see page 12 for more details)

R-Cool

Air conditioned special dry-type

Dry-Type Transformers up to 3150 kVA and 36 kV
The R-Cool dry-type transformer is an air-conditioned special dry-type transformer, designed to achieve high IP ratings and efficient cooling that are not achievable with conventional enclosures and cooling. It is now possible to use dry-type transformers in extreme temperatures and dusty environments; indoor or outdoor or 100% humidity without the need for filters or any other disposal materials.
No external air, water or other coolant is required on site since R-Cool is a complete standalone solution; it simply needs to be powered up in order to work.

PE90840

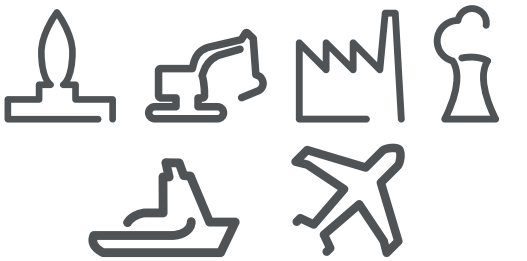
Technical characteristics

- Rated power: up to 3150 kVA
- Rated voltage: up to 36 kV
- Phases: three-phase unit
- Rated frequency: 50 Hz or 60 Hz
- Type of cooling: two independent cooling flows

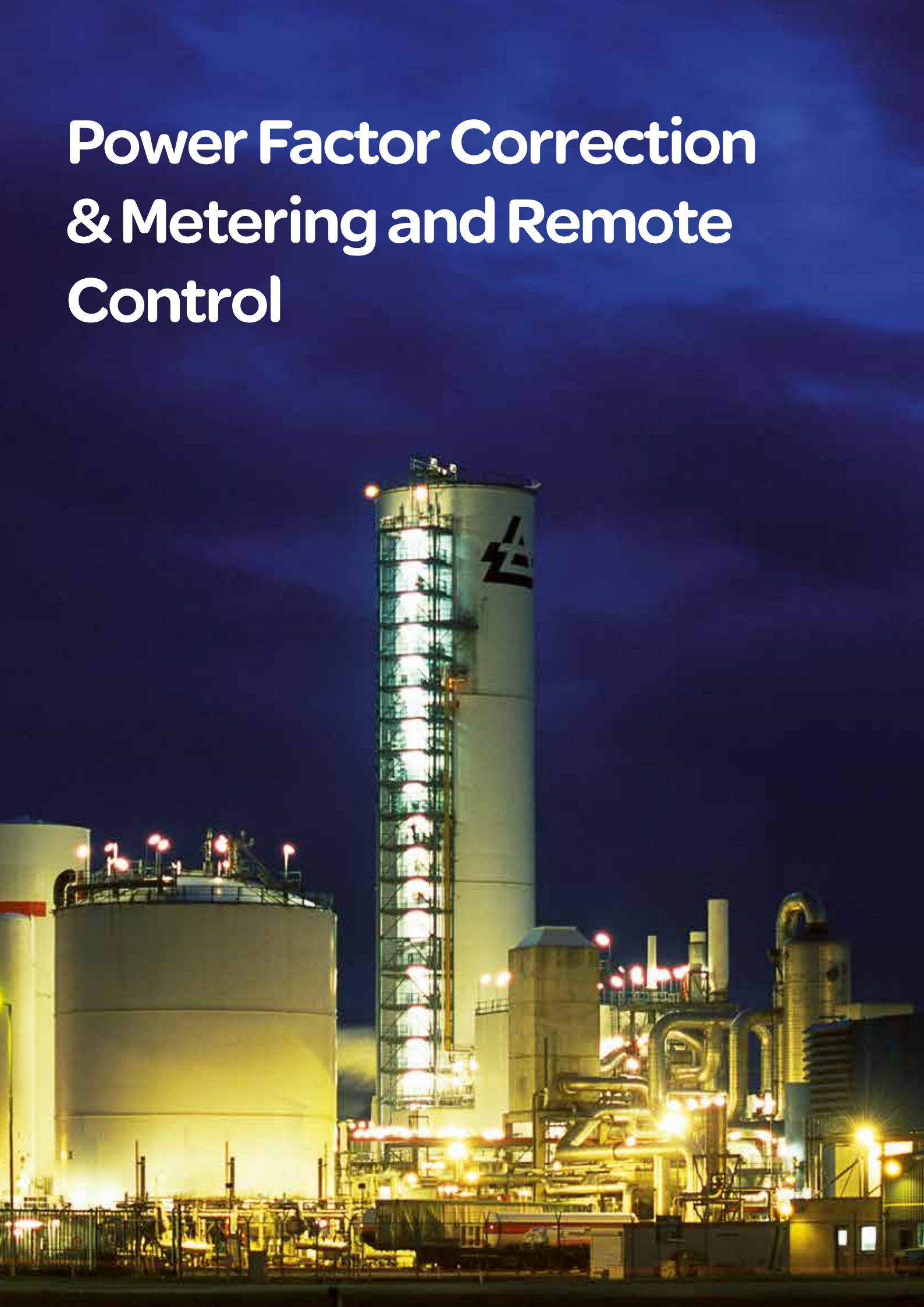
R-Cool Cooling System

Key applications

Oil & Gas - Mining, Minerals and Metals - Industry - Power Generation - Marine - Infrastructure - Tranportations
(please see page 12 for more details)



Power Factor Correction & Metering and Remote Control

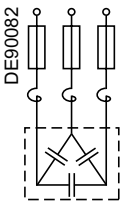
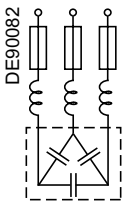
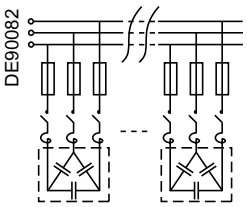


Contents

Why compensate reactive energy?

Every electrical system (cable, line, transformer, motor, lighting, etc) employs two forms of energy:
- Active energy consumed (kWh)
- Reactive energy consumed (kvarh)

The reactive energy demanded by the loads is supplied by the electrical network. This energy must be supplied in addition to the active energy. It is necessary to produce reactive energy as close as possible to the loads, to avoid demand for it on

	Industrial application		
Applications	Motor compensation Fixed bank		Industrial compensation Automatic bank
Reference	CP214	CP214SAH*	CP253
Three-line diagrams			
Maximum voltage	Up to 12 kV		Up to 12 kV
Connection mode	Three-phase capacitors with delta connection		Three-phase capacitors up to 900 kvar, single-phase capacitors with double star connection above
Type of protection	HRC fuses (**)		HRC fuses**
Maximum power****	2 x 450, i.e. 900 kvar		Up to 4500 kvar
Comments			

** SAH: Detuning Reactor*
*** HRC: High Rupturing Capacity*
**** CT: Current Transformer*
***** For larger power rating, please contact us*

CP 214

CP 227SAH

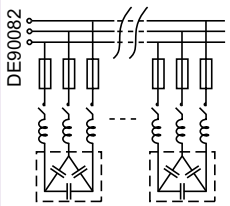
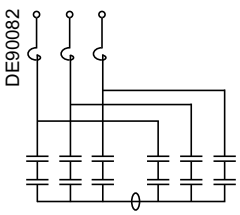
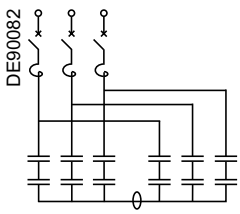
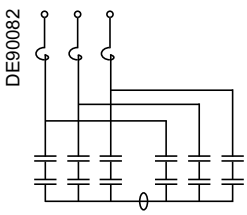
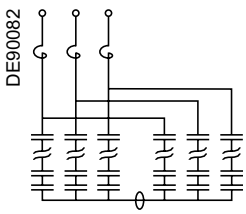
CP 253

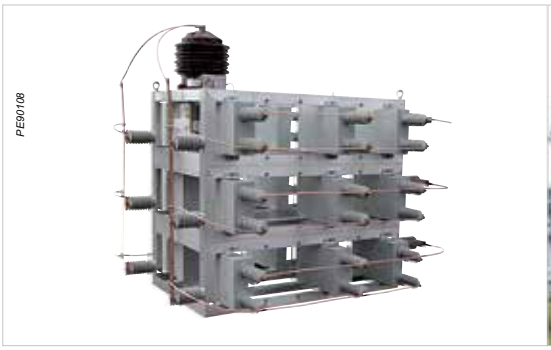
CP 254

Why compensate reactive energy?

the network, thereby increasing the installation's efficiency! This is what is called "reactive energy compensation" or "Power Factor Correction". The easiest and commonest way of generating reactive energy is to install capacitors on the network.

A "capacitor bank" generally consists of several single-phase or three-phase capacitor units assembled and interconnected to produce very powerful systems. The capacitor banks are branch-mounted on the network. They may be of fixed or automatic type.

	All applications		Energy application	
Industrial compensation Automatic bank	Global compensation Fixed bank	Distribution system Large sites Automatic bank	Distribution system Fixed bank	Distribution and Transport system Fixed bank
CP253SAH*	CP227	CP254	CP229	CP230
				
Up to 12 kV	Up to 36 kV	From 12 to 36 kV	Up to 36 kV	Above 36 kV
Three-phase capacitors up to 900 kvar, single-phase capacitors with double star connection above	Single-phase capacitors with double star connection			Single-phase capacitors with double star or H connection
HRC fuses**	Unbalance by CT*** and relay	Unbalance by CT*** and relay		
Up to 4000 kvar	12 x 600, i.e. 7200 kvar	12 x 480, i.e. 5760 kvar	Please contact us	Please contact us
	SAH* on request	SAH* on request	SAH* on request	SAH* on request



CP 229

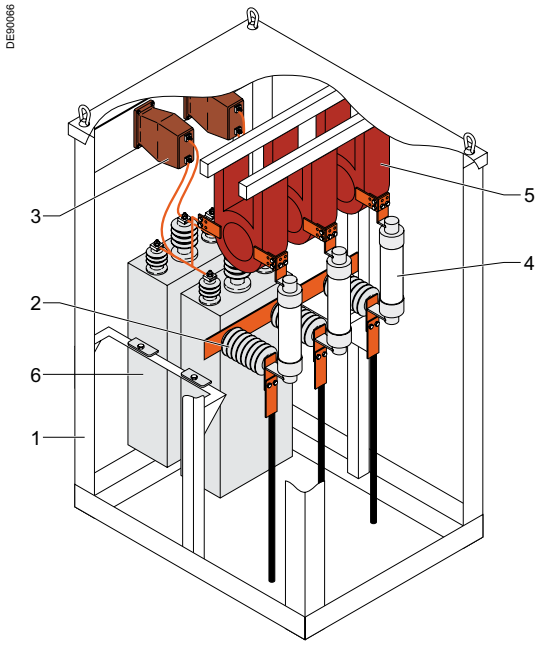
CP 230

Banks
for motor compensation

Insulation up to 12 kV - 50 Hz / 60 Hz - Fixed bank CP214

Applications

The CP214 banks are used for reactive energy compensation in medium-voltage networks. This solution is especially suitable for individual motor compensation. The banks are designed for use in electrical networks up to 12 kV.



Small size

Specially designed for motor compensation

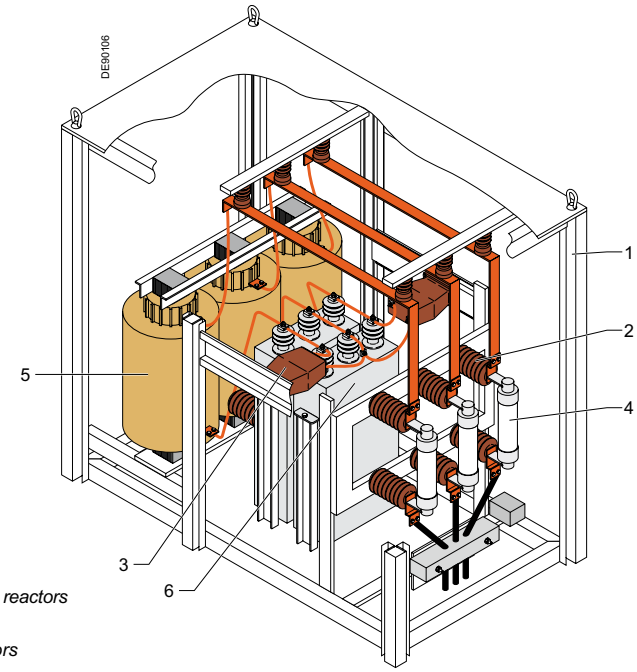
1: Frame
2: Insulators
3: Quick discharge reactors
4: Fuses
5: Inrush reactors
6: Capacitors

The banks are delta-connected (three-phase capacitors). HRC fuses provide protection against internal faults. The proposed CP214 compensation banks can be installed indoors or outdoors, mounted in aluminium or steel enclosures.

Insulation up to 12 kV - 50 Hz / 60 Hz - Fixed bank CP214SAH

Applications

The CP 214 SAH medium-voltage capacitor banks are designed for use in electrical networks up to 12 kV. The CP214 SAH banks are used for reactive energy compensation in medium-voltage networks containing harmonics. This range is especially suitable for individual MV motor compensation.



Small size

Specially designed for motor compensation

Suitable for networks with high harmonic levels

1: Frame
2: Insulators
3: Quick discharge reactors
4: Fuses
5: Detuning reactors
6: Capacitors

The banks are delta-connected (three-phase capacitors). HRC fuses provide protection against internal faults. The proposed CP214SAH compensation banks can be installed indoors or outdoors, mounted in aluminium or steel enclosures.

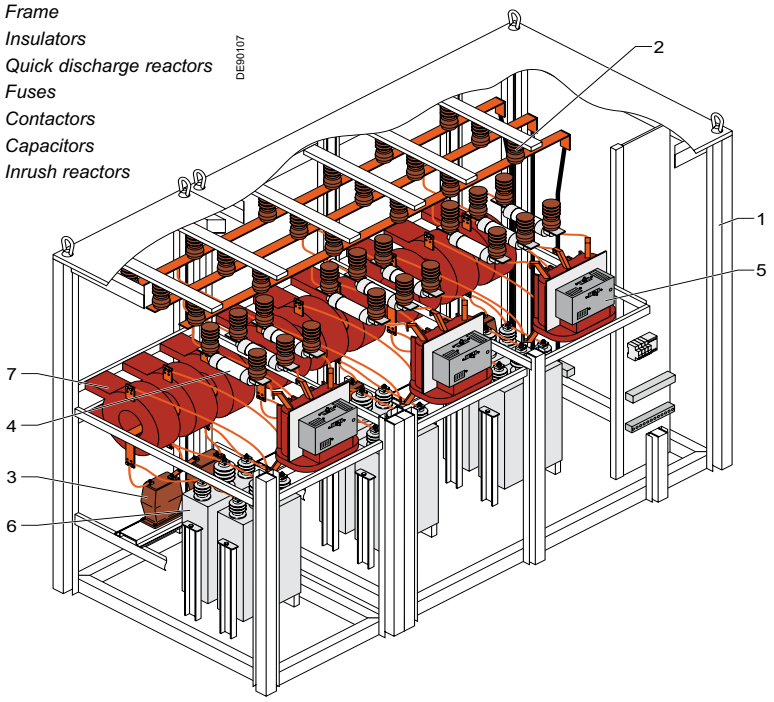
Banks
for industrial compensation

Insulation up to 12 kV - 50 Hz / 60 Hz - Automatic bank CP253

Applications

The CP253 medium-voltage capacitor banks are designed for use in electrical networks up to 12 kV. They are used for total installation compensation, when the load level is fluctuating. The “1 step” CP253 model is mainly designed for individual compensation of MV motors to avoid the risk of self-excitation.

1: Frame
2: Insulators
3: Quick discharge reactors
4: Fuses
5: Contactors
6: Capacitors
7: Inrush reactors



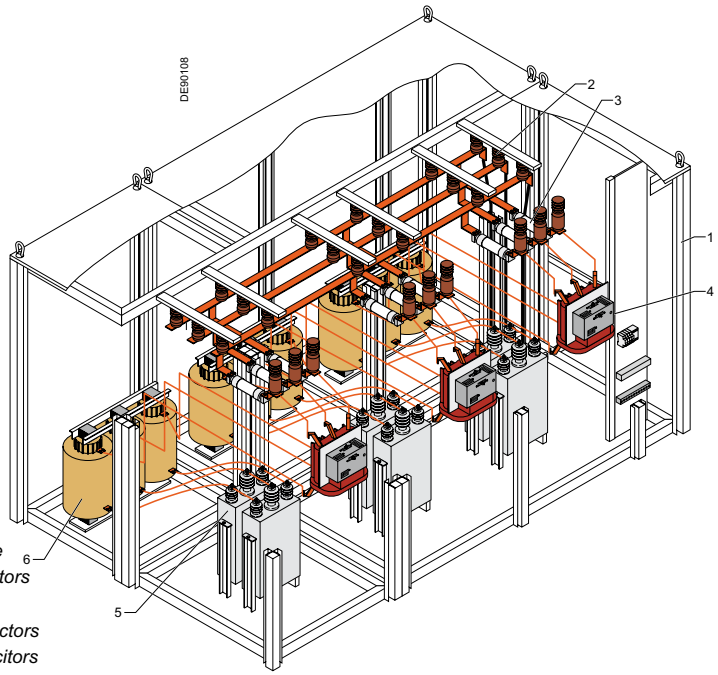
Total installation compensation
Fluctuating load level
Ease of access to components
Simplified maintenance
Easy installation

These banks are delta-connected (three-phase capacitors) and the HRC fuses provide protection against internal faults. An optional cubicle containing a power factor controller can be used to control the steps, thus forming an automatic compensation bank. For steps power values greater than 900 kvar, single-phase capacitors connected in double star will be used (maximum of 12 capacitors, maximum power 4500 kvar).

Insulation up to 12 kV - 50 Hz / 60 Hz - Automatic bank CP253 SAH

Applications

The CP253 SAH medium-voltage capacitor banks are designed for use in electrical networks up to 12 kV. The CP253 SAH banks are used for automatic reactive energy compensation in medium-voltage networks with a high harmonic level. This solution is particularly suitable for total installation compensation where the load level is fluctuating.



1: Frame
2: Insulators
3: Fuses
4: Contactors
5: Capacitors
6: Detuning reactors

Total installation compensation
Fluctuating load level
Ease of access to components
Simplified maintenance
Easy installation
Suitable for networks with a high harmonic level

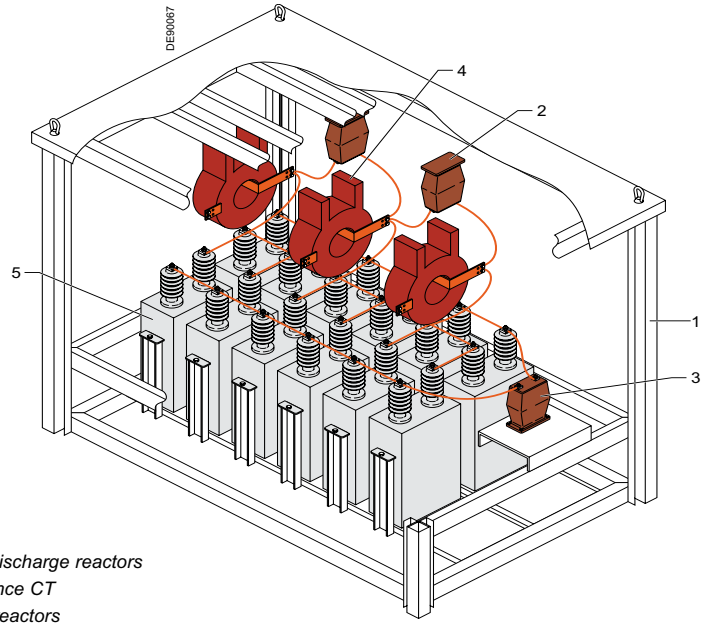
These banks are delta-connected (three-phase capacitors) and the HRC fuses provide protection against internal faults. An optional cubicle containing a power factor controller can be used to control the steps, thus forming an automatic compensation bank. For steps power values greater than 900 kvar, single-phase capacitors connected in double star will be used (maximum of 12 capacitors, maximum power 4500 kvar).

Banks
for global compensation

Insulation up to 36 kV - 50 Hz / 60 Hz - Fixed bank CP227

Applications

The CP227 medium-voltage capacitor banks are designed for use in electrical networks up to 36 kV. This range is mainly used for total installation compensation.



1: Frame
2: Quick discharge reactors
3: Unbalance CT
4: Inrush reactors
5: Capacitors

- **Total installation compensation**
- **Ease of access to components**
- **Simplified maintenance**
- **Easy installation**

These banks are connected in double star and the unbalance current detection system provides protection against internal faults.
The proposed CP227 compensation banks can be installed outdoors or indoors, mounted in aluminium or steel enclosures.
NB: CP 227 SAH fixed banks with detuning reactor are designed and proposed on request.

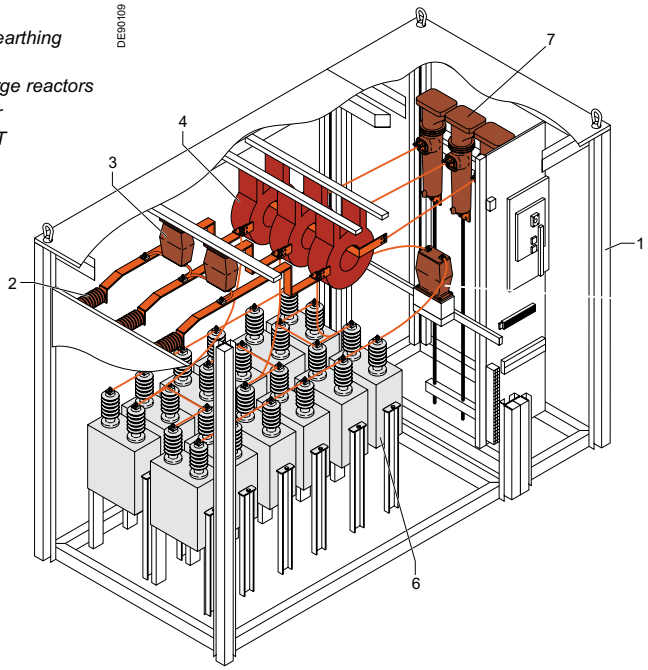
Banks for distribution and large sites networks

Insulation up to 36 kV - 50 Hz / 60 Hz - Automatic bank CP254

Applications

The CP254 medium-voltage capacitor banks are designed for use in electrical networks up to 36 kV. They are used for total installation compensation, when the load level is fluctuating.

1: Frame
2: Insulators of earthing switch
3: Quick discharge reactors
4: Inrush reactor
5: Unbalance CT
6: Capacitors
7: SF6 switch



- **Total installation compensation**
- **Fluctuating load level**
- **Ease of access to components**
- **Simplified maintenance**
- **Easy installation**

These banks are connected in double star and the unbalance current detection system provides protection against internal faults.
Several banks (in that case called “steps”) can be controlled by a power factor controller to form an automatic capacitor bank. The steps are connected in parallel with power cables (outside our scope of supply).
NB: CP 254 SAH fixed banks with detuning reactor are designed and proposed on request.

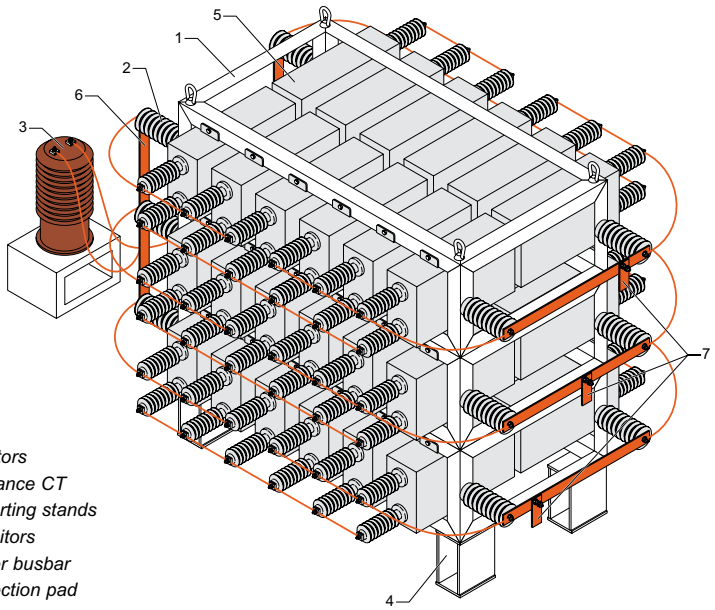
Banks
for distribution networks

Insulation up to 36 kV - 50 Hz / 60 Hz - Fixed bank CP229

Applications

The banks of the CP229 range are mounted in aluminium racks. They are used for reactive energy compensation in medium-voltage networks. This high power range is designed for total compensation of large industrial plants and power distribution systems.

DE90068



1: Frame
2: Insulators
3: Unbalance CT
4: Supporting stands
5: Capacitors
6: Copper busbar
7: Connection pad

Total plant compensation
Suitable for high power
Ease of access to components
Simplified maintenance
Easy installation

These banks are connected in double star (up to 36 capacitors) and the unbalance current detection system provides protection against internal faults.
NB: CP 229 SAH fixed banks with detuning reactor are designed and proposed on request.

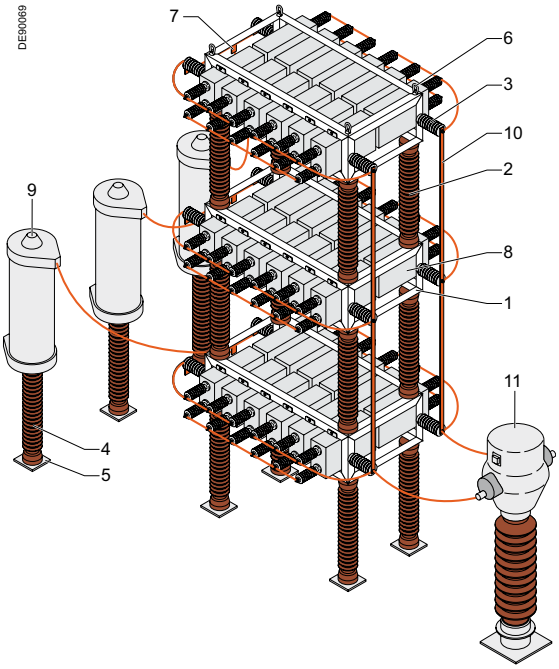
Banks for transport and distribution networks

Insulation up to 12 kV - 50 Hz / 60 Hz - Fixed bank CP230

Applications

These capacitor banks are custom designed, in accordance with customer specifications. Generally, they are used on high-voltage networks to increase the lines' transmission capacity and reduce voltage drops.

DE90069



1: Frame
2, 3 & 4: Insulators
5: Supports
6: Lifting rings
7: Connection pad
8: Capacitors
9: Inrush reactors
10: Neutral busbar
11: Unbalance CT

HV and EHV compensation
Special design adapted to customer specifications
Adaptation to site conditions
Simple, robust installation

The banks of the CP230 range are mounted in aluminium or galvanised steel frames. Schneider Electric can propose capacitor banks for networks up to 230 kV.

Power Factor Correction and Harmonic Filtering - ANSI/NEMA

Reactivar Medium Voltage fixed capacitors - Up to 600 kvar.4 kV, 900 kvar, 4.8 kV, 60 Hz

PE90847

Features

- Standard rating up to 600 kvar @ 2.4 kV, 900 kvar, 4.8 kV, 60 Hz (specials available)
- Available for indoor and outdoor installations

Reactive compensation of steady induction motor loads

Reduce energy costs by improving inefficiencies that reside in the motor loads

Reduce the need to oversize transformers, cables, switching, and protection devices

Medium Voltage Metal-Enclosed Reactive Compensation Systems

PE90848

Features

- Standard metal enclosures available up to 20 Mvar, up to 34.5 kV, 50/60 Hz
- Available for indoor and outdoor installations

Centralized reactive compensation of larger facilities

Reduce kVA demand and lower utility imposed charges for poor power factor

Provide voltage support and harmonic filtering

Medium Voltage Hybrid Ultra-Fast Reactive Compensation Solutions

Features

- Custom designed and built to specific load and objective requirements

Reduce flicker and improve voltage regulation

Real-time (dynamic) reactive compensation systems for rapidly fluctuating MV loads

Transient-free compensation

Medium and High Voltage Open-Rack-Style Reactive Compensation Systems

Features

- Custom designed for specific installation requirements and protection configurations
- Systems rated up to 230 kV, 50/60 Hz

Compensation systems for utility distribution and transmission grids

Various equipment topologies available to cover project-specific utility application and installation needs

Special topologies for reactive compensation of wind and solar farms

Hybrid Var Compensator (HVC)

HVC (Hybrid Var Compensator) equipment is designed to perform economical reactive energy compensation in real time. Its use can:

- improve the quality of public and industrial networks by reducing or eliminating voltage fluctuations, power fluctuations, etc.
- increase the capacity of existing networks by compensating losses due to reactive energy
- allow optimum coupling of renewable energies (wind-power, solar power) to the network through an appropriate response to normative constraints

Description

The equipment comprises a fixed MV bank of shunt capacitors with detuned reactor, and an AccuSine electronic device combined with an LV/MV step up transformer.
All this equipment can be installed in a shelter for outdoor installation.

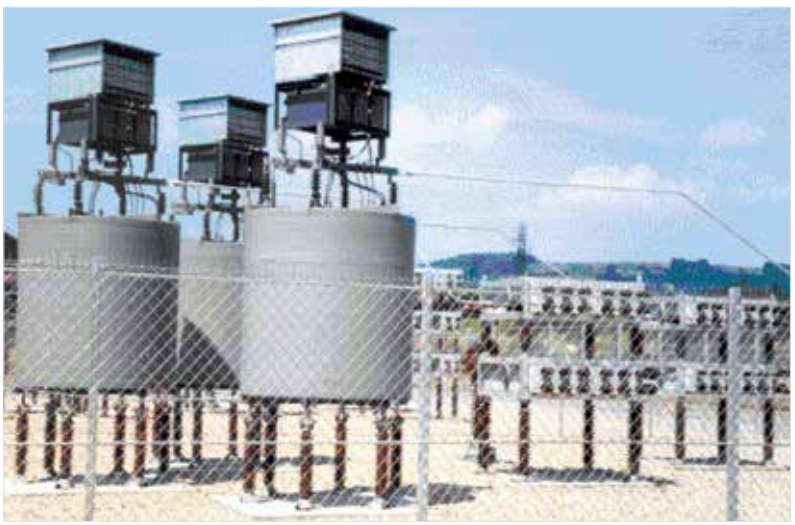
PE90074

AccuSine range

Passive harmonic filters

Schneider Electric can propose numerous passive harmonic filtering solutions in medium and high voltage, for 50 or 60 Hz networks. These solutions are custom designed on a case by case basis.
A preliminary site audit and a precise definition of needs (objectives to be achieved, etc.) are essential to guarantee the performance of this type of solution.

PE90097



Passive harmonic filters

MV/LV Prefabricated Substations

Contents

Medium Voltage / Low Voltage Prefabricated Substations (PSS)

Overview

The visible part of MV/LV underground networks, prefabricated substations are defined as a packaged solution with an enclosure that integrates all the MV/LV equipment (such as MV/LV transformers), Low Voltage and Medium Voltage switchgear, connections and auxiliary equipment required by the end user.
In order to meet customer needs, the kiosk designs can have different configurations depending on the equipment required and final site configuration.

Main characteristics - Safety

Prefabricated substations contain electrical equipment, often located in a public environment, and must therefore meet the highest safety standards.
The risk of equipment failure in a prefabricated substation is minimized through the design.
The design ensures that extremely hot gases generated during a fault are cooled via a patented filter, reducing the effects of overpressure and flame within the enclosure. The design limits the release of projectiles and flaming particles, which could potentially injure the public, or,operators, or start bushfires.
In the rare event of medium voltage equipment failure, an internal arc-rated kiosk design minimizes the risk of injury to the nearby public or an operator working with the kiosk door open.
Our substations are fully connected, tested in factory before to be delivered.
Schneider Electric has invested in safety studies over the years to provide the safest possible solutions for our customers and the general public.

Applications

Wind farm solutions

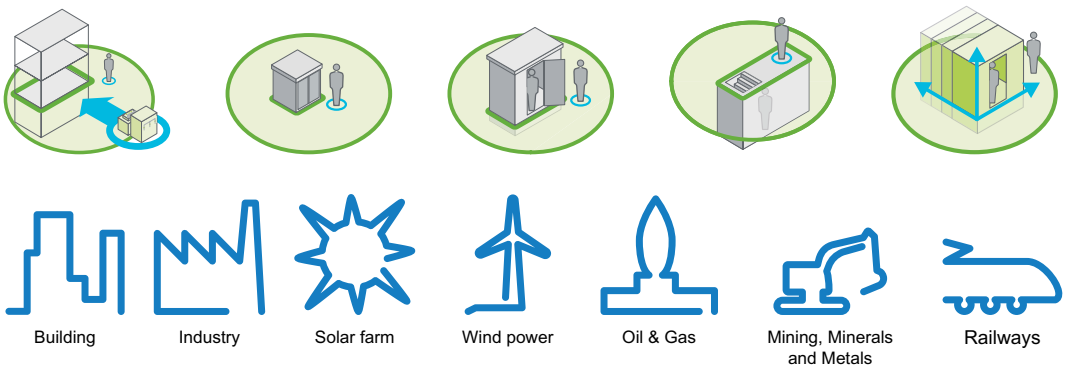
The initial design of a wind farm can have profound implications for its future profitability.
Once a site has been identified and a decision taken to invest in its development, the wind farm design process begins. The fundamental aim is to maximize energy production, minimize capital and operational costs and stay within the constraints imposed by the site. Kiosk substations for wind farms have to take account of many variables such as the environment (oil containment), exposure to windy weather and connection to the grid.

Electrical utility solutions

For electrical utilities, long blackout periods and voltage fluctuations are unacceptable.
Their primary needs include safety of supply and continuity of service, due to increasing pressure from the mandatory metering of customer service and customer expectations.

Industrial solutions

Reliability of supply for industrial customers is critical. A power outage can cost millions of Euros depending on the type of industry. Their primary needs include quality of supply, energy efficiency and continuity of service.



To find out more & to discover which MV/LV substations are available in your country, please contact your usual local Business team and/or browse your country's website.

Medium Voltage / Low Voltage Prefabricated Substations (PSS)

Overview

Prefabricated substations are defined as an enclosure containing transformers, Low Voltage and High Voltage switchgear, connections and the auxiliary equipment for supplying Low Voltage power from a High Voltage system or vice versa. Schneider Electric continues to design prefabricated substations with the highest level of safety for the operator and the public.

Environment

A substation should be designed to ensure the internal connections are protected from extreme environmental conditions, such as high temperatures, rainfall, dust and wind.
Schneider Electric's rigorous testing and graphic modelling ensures proper ventilation, protection against incoming water, sealed connections and secure locked doors.
At the end of the substation life cycle, our service offer ensures that all materials are handled with respect for the environment.

Smart substation

Combining our substations with remote monitoring and control from the Easergy range will help to reduce outage times and significantly improve service quality and continuity of the energy supply. A modern communication infrastructure ensures that a network management system can be implemented step-by-step according to your investment plan, reaping benefits from the start. Well-planned, well-designed loop automation systems ensure that the majority of your customers can be reconnected to the grid in the first minute after an outage occurs.

PE80814
PE80815

Customization

Although manufactured in an industrial process, as they are installed in public areas, our substations can be customized on demand. The substation colour can be adapted to suit the final site environment or the walls or roof decorated so as to blend in with its environment.

Transport

Ease of installation

The industrialized manufacturing process for our prefabricated substations allows fast, safe delivery of a complete product ready to be connected to the grid. Transport is possible on a standard truck. All that needs to be done is to connect it to the grid.

PE80816
PE80817

Site preparation

The installer must provide a suitable base surface which can support the configuration and weight of the substation to be installed.

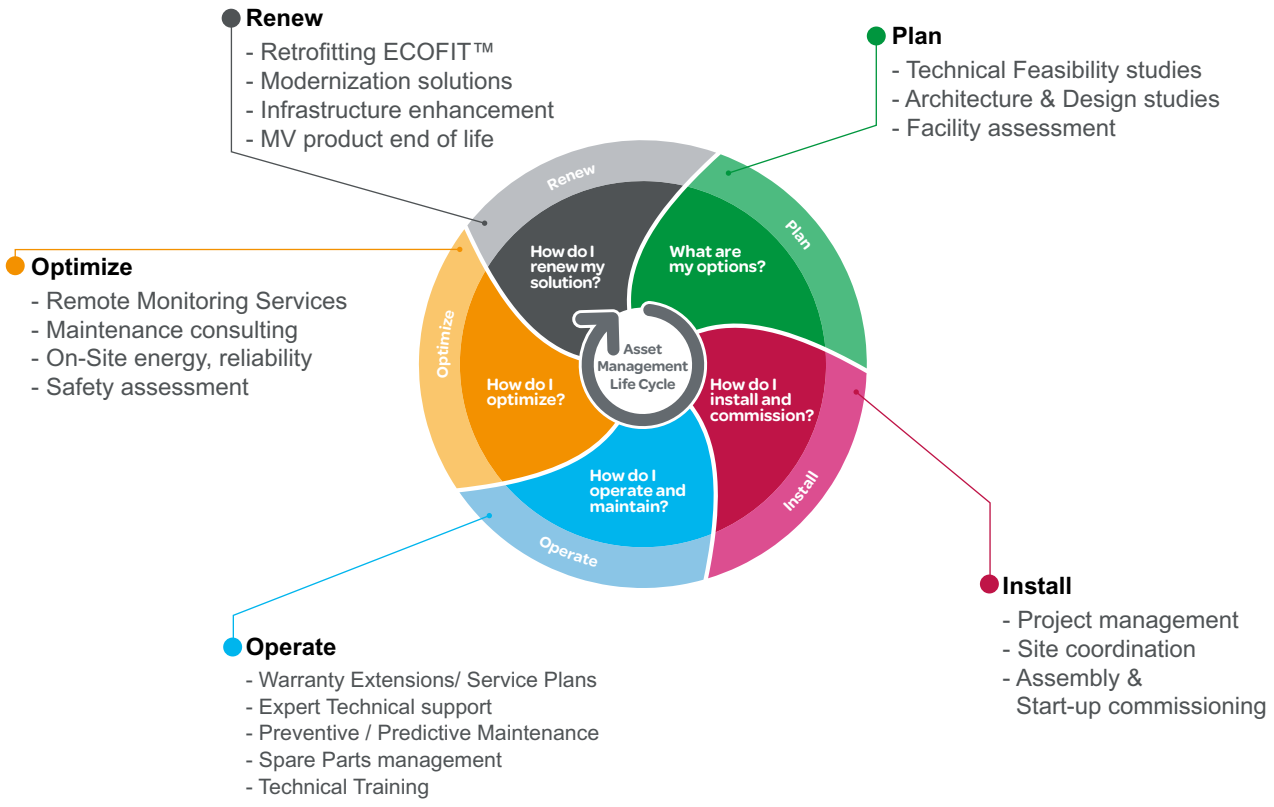
Electrical Distribution Services

Contents

Value throughout your system lifecycle

Schneider Electric Services offer you the benefits of true lifecycle support for your electrical distribution systems.
Our capabilities enable us to provide a wide range of services and solutions for your installations, from initial concept design through to end-of-life management and renewal programs.
Our highly trained services team work with you to understand your needs and offer individually tailored solutions, allowing you to focus on your core business. Schneider Electric has global and local project teams to manage your electrical distribution and energy management projects.
With a full range of services encompassing strategic consulting, design and engineering, maintenance contracts and training, Schneider Electric is the right partner for your projects and engineering challenges.
Schneider Electric Services provides specialist manufacturer's support for your electrical distribution equipment – delivering 'value throughout your system lifecycle'.

Schneider Electric Electrical Distribution Services, by your side throughout the life of your installation



Peace of mind for every stage of the lifecycle

Why Services are vital for your installed base

How can you cut costs and improve performance at the same time?
When it comes to your electrical distribution infrastructure, the answer is straightforward - get professional expertise.

Installed base services from Schneider Electric provide exactly that. Whether you're preparing to install brand new equipment, looking to extend the life of an existing installation, or planning to decommission an outdated facility, we have the experience and the service specialists to support you. Doing business in today's economic environment is challenging enough.
Let us handle your electrical distribution installation.

Schneider Electric Field Services

- 170 Years of expertise140,000+ Employees in more than 100 countries 6700+ Schneider Electric certified Field Service Representatives (FSR)
- Available around the world
- Discover more about Schneider Electric electrical distribution services.
  Log on to: www.schneider-electric.com/electricaldistributionservices

Increase productivity, reliability, and safety

Mitigate risk and **limit** downtime

Keep equipment up to date and **extend its lifespan**

Cut costs and **increase savings**

Improve return on investment

To know more click on: www.schneider-electric.com/electricaldistributionservices

Description

Plan & Install: Optimizes equipment from day one

- Reduced risk of delays
- Reduced risk of premature failure
- On-site recommendations of set-up, operation and maintenance
- Logging Schneider Electric interventions

PE90795

Operate:
On-demand maintenance achieves the highest level of performance

- Trouble shooting and repair in case of failure
- Improve your Total Cost of Ownership (TCO)
- Reduced downtime and restart time
- Compliance with safety regulations
- Expert recommendations

PE90796

Description

Operate: Advantage Service Plans - Optimize equipment safety and lower your total cost of ownership

- Reactivity commitment in case of failure
- Access to highly qualified personnel 24/7
- Control over budget
- Compliance with regulations
- Intervention warranty
- Real-time visibility of installation status with online asset management option

PE90797

Operate: Asset management - Optimizes asset lifecycle & reduce failure downtime costs, thanks to digital asset information

- CAPEX / OPEX optimization
- Increasing reliability of business process and reduced cost of downtimes
- Enhancing PEOPLE and installation safety
- Complying with regulations (including ISO 55000 on Asset Management)

PE90798

Description

Operate: Technical training - Turns knowledge into reliable power

- Optimisation of team competencies in terms of safety & technical skills
- Enhanced installation performance
- Technical program customised to your needs

PE90799

Optimize:
MP4 - Installation assessment offers best-in-class technical evaluation

- Prediction of failures and predictive action definitions
- Improvement of safety, availability, reliability and quality
- A roadmap for maintenance and modernisation, including ways to reduce OPEX and optimize CAPEX
- Reduction of energy bill
- Consistent method used worlwide

PE90800

Description

Renew: Modernisation – ECOFIT™ gives an extended installation lifetime

- 50% switchgear life extension
- Minimized shutdown time plus disruption of existing electrical installation and operational reliability
- Optimisation of service cost by +30 to 70%
- Improved safety for personnel and equipment
- Reduced maintenance costs
- Save time & money

PE90801

Renew: End of Life - Recycling of Medium Voltage equipment

- Medium Voltage equipment collection, dismantling and recycling
- Full environmental and legal compliance
- Legal documentation and traceability with destruction certificate
- SF6 gas recycling/destruction

PE90802

Technical information

Contents

MV
Metal-Enclosed Switchgear

Common international standards

IEC (International Electrotechnical Commission). Standards are adopted in Europe, Middle East, South East Asia, South America and are based on defined performances (technology independent). GOST standards are applied in Russia and former Soviet Republics ; many similarities with Chinese DL. GB/DL standard (applied in China). GB is based on IEC but ofter overruled by Utility specific DL standard. DL is prescriptive, leading to over specification. ANSI (American National Standards Institute). Applies mainly in the USA but influence Canada, Mexico and Oil & Gas (RSA, Venezuela). CSA (Canadian Standards Association) is accredited both in Canada and the USA. CSA published standards are recognized by ANSI and provide training and advisory services.

- IEC 60694: Common Clauses to High Voltage Switchgear
- IEC 62271-200: AC Metal-Enclosed Switchgear and Control Gear for rated voltage above 1 kV and up to and including 52 kV
- IEC 62271-100: High Voltage Alternating Current Circuit Breakers
- IEC 62271-102: Alternating Current Disconnectors and Earthing Switches
- IEC 60470: High Voltage Alternating Current Contactors
- IEC 60265-1: High Voltage Switches
- IEC 60282-2: High Voltage Fuses
- IEC 60255: Measurement Relay and Protection Unit
- IEC 60044-1: Current Transformers
- IEC 60044-2: Voltage Transformers
- IEC 60529: Degrees of Protection provided by Enclosures

Type tests according to IEC62271-200 / AS62271.200 - Mandatory tests

- n°1 - Dielectric tests
- n°2 - Measurement of the resistance of circuits
- n°3 - Temperature-rise tests
- n°4 - Short time withstand current tests
- n°5 - Verification of the protection
- n°6 - Verification of making and breaking capacities
- n°7 - Mechanical operation tests

Type tests according to IEC62271-200 / AS62271.200 - Option tests

- n°8 - Pressure withstand tests
- n°9 - Tests on non-metallic partitions and shutters
- n°10 - Tightness tests
- n°11 - Internal arcing test
- n°12 - EMC tests

To know more:

- IEC standards - web site: http://www.iec.ch/
- ANSI standards - web site : http://www.ansi.org/
- GOST standards - web site: http://sercons.ch/services/russian-market/gostr-and-technical-regulations/?gclid=CKDww4Xx98ECFQKWtAodbxoAoQ

1. Internal Arc Classification

PE90807

IAC switchgear:
Metal-enclosed switchgear which meets prescribed criteria for protection of persons in the event of internal arc as demonstrated by the appropriate type tests

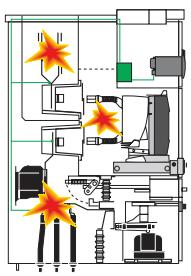
Accessibility type:
- **Type A** - restricted to authorised personnel only
- **Type B** - unrestricted accessibility, including that of the general public
- **Type C** - accessibility restricted by out of reach installation

Identification of protection:
- **F** - Front side
- **L** - Lateral side
- **Type C** - Rear side

Power and duration of fault:
Current/time
(example 25 kA/1 s)

Internal arc classification has to be proven with the relevant type test certificate

DE90729



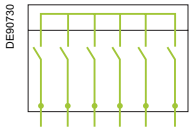
Each compartment with live MV equipment has to be tested
- Cable/connection compartment
- Circuit breaker compartment
- Busbar compartment

Installation conditions which have to be met
- Minimum ceiling height
- Minimum installation distance from wall

Installation conditions which have to be met
- Correctly secured doors and covers that do not open
- No fragmentation of the enclosure occurs
- Arcing does not cause holes in the accessible sides
- Indicators do not ignite due to the effect of hot gases
- The enclosure remains connected to its earthing point

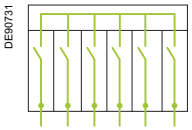
2. Loss of Service Continuity

LSC-1:
Type of switchgear is not intended to provide service continuity during maintenance and may require complete disconnection of the switchgear from the system before accessing the interior of the enclosure.

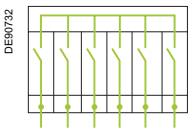


LSC-2:
Type of switchgear is intended to allow maximum continuity of service of the network during access to the compartments inside the switchgear.

LSC-2A:
When accessing components of one functional unit, the other functional units of the switchgear may be kept in service.



LSC-2B:
In addition to LSC-2A the incoming high voltage cables to the functional unit being accessed may be kept energised.



3. Partitioning

PM:
Metallic shutters and partitions between live parts and the open compartment

PI:
Insulation-covered discontinuity in the metallic partitions/ shutters between live parts and the open compartment

4. Degree of Protection (IP Ratings)

IP: 1st NUMERAL & 2nd NUMERAL

1st NUMERAL: conforming to AS60529 protection against ingress of solid bodies		**2nd NUMERAL:** conforming to AS60529 protection against ingress of water	
0	No protection.	0	No protection.
1	Full penetration of 50 mm diameter sphere not allowed. Contact with hazardous parts not permitted.	1	Protected against vertically falling drops of water. Limited ingress permitted.
2	Full penetration of 12.5 mm diameter sphere not allowed. The jointed test finger shall have adequate clearance from hazardous parts.	2	Protected against vertically falling drops of water with enclosure tilted 15° from the vertical. Limited ingress permitted.
3	The access probe of 2.5 mm diameter shall not penetrate.	3	Protected against sprays to 60° from the vertical. Limited ingress permitted
4	The access probe of 1.0 mm diameter shall not penetrate.	4	Protected against water splashed from all directions. Limited ingress permitted.
5	Limited ingress of dust permitted (no harmful deposit).	5	Protected against jets of water. Limited ingress permitted.
6	Totally protected against ingress of dust.	6	Protected against strong jets of water. Limited ingress permitted.
		7	Protected against the effects of immersion between 15 cm and 1 m.
		8	Protected against long periods of immersion under pressure.

Additional letter (optional): Protection of persons against contact with hazardous parts

- A: Protection against access with the back of the hand
- B: Protected against access with a finger (Ø 12 mm)
- C: Protected against access with a tool (Ø 2.5 mm)
- D: Protected against access with a wire (Ø 1.0 mm)

Examples

- **IP41:** Protection against vertically falling water drops and solid objects ≥ 1.0 mm Ø
- **IP2XC:** Protection against solid objects ≥ 12.5 mm Ø and live parts are not accessible by tools ≥ 2.5 mm Ø
- **X:** Where protection level is not specified, it shall be replaced by the letter "X".

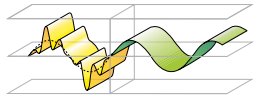
Power Factor Correction and Harmonic Filtering solutions

Energy quality with Power Factor Correction and harmonic filtering

Most utilities have specific policies for billing reactive energy. Price penalties are applied if the active power/apparent power ratio is not within the guidelines.

Solutions

DE90070



After Before

Power Factor Correction

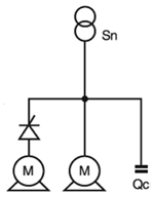
Every electric machine needs active and reactive power to operate. Power factor is used to identify the level of reactive energy. If the power factor drops below the limit set by the utility, then power factor correction equipment can be installed in order to avoid penalties. By correcting a poor power factor, these solutions also reduce kVA demand. The results are a 5 to 10% lower electricity bill, cooler equipment operation and longer equipment life. In addition, proper power factor correction helps optimize electrical network loading and improves reliability.

Harmonic filtering

Equipment such as drives, inverters , UPS, arc furnaces, transformers during energisation and discharge lamps generate harmonic currents and voltage distortion. These harmonics stress the network, overload cables and transformers, cause outages and disturb many types of equipment such as computers, telephones and rotating machines. The life of equipment can be greatly reduced.

MV Capacitor bank selection guide

PE90085



Step 1: basic data collection

Network characteristics:
- voltage U (V)
- network frequency (Hz)

Characteristics of installation:
- insulation voltage
- rated power of the transformer Sn (kVA)
- transformer short circuit voltage Usc (%)
- existing capacitor bank (Qc (kvar)

Operating conditions:
- energy bills
- measurements of power: P(kW) cos phi

Step 2: calculation of the reactive power Qc (kvar)

The reactive power is determined either:
- from the electricity bills, depending on the method of recording the consumption of kvar applied by the energy supplier
- from the electrical data of the installation

The aim is:
- not to pay for the consumption of reactive energy and to ensure optimum use of the transformers, cables and control and protection switchgear
- to satisfy the standards currently in force: compliance with a minimum cos phi, energy quality standards

Step 3: choice of type of capacitor bank according to the harmonics

The presence of non-linear loads creates harmonic currents and voltages. The compensation equipment is chosen according to the value of these harmonics.
The HV or MV filters that absorb the harmonic currents in the electrical installation consist mainly of capacitors associated with filtering reactors.
They are used to:
- bring the percentage of the distortion back to acceptable values recommended by the energy distributors
- compensate for the reactive power

Step 4: choice of type of compensation

Global compensation

The type of compensation should be chosen by taking into account the calculated reactive power Qc (kvar) and the apparent power Sn (MVA) of the upstream transformer.

Fixed compensation

Qc/Sn < 15% the reactive power of the capacitor banks is constant and they are started up or shut down when a predetermined kvar value is reached. It is an “on/off” type of operation.

Automatic compensation

Qc/Sn > 15% if automatic startup or shutdown for the capacitor bank (controlled by Varlogic varmetric relay) is specified, the reactive power of the capacitor banks is split into “steps” with the possibility of starting or stopping more or fewer steps. The reactive power corresponds to the change in load requirements.

Motor compensation

- if there is no risk of self-excitation

The capacitor bank will be connected in parallel with the motor.

- if there is a risk of self-excitation

It is only possible to connect to the motor terminals, the capacitor bank will be connected to the busbar independently of the motor.

Step 5: selection table

The recommended choice is based on the network insulation voltage, network harmonic pollution level and on the type of compensation.
- if the power of the capacitor bank to be installed is less than 600 kvar
- if the power of the capacitor bank to be installed ≥ 600 kvar ; see the table opposite

Insulation level		7.2kV	12kV	17.5kV	24kV	36kV
Slightly polluted network	Fixed	CP214	CP214			
		CP227	CP227	CP227	CP227	CP227
	Auto	CP253	CP253	CP254	CP254	CP254
Highly polluted network	Fixed	CP214 SAH	CP214 SAH			
	Auto	CP253 SAH	CP253 SAH			

Capacitor Bank sizing table

Based on the installation power (in kW) and power factor.
Given the installation power factor (cos φ) before compensation and the desired power factor after compensation, the table below can be used to obtain the coefficient which must be applied to the active power to determine the required capacitor bank output.

before compensation		capacitor kvar output required per kW load to obtain the following values of power factor cos φ (or tan φ)													
tan φ	cos φ	tg φ	0.75	0.59	0.48	0.46	0.43	0.40	0.36	0.33	0.29	0.25	0.20	0.14	0.0
		cos φ	0.80	0.86	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1
2.29	0.40		1.557	1.691	1.805	1.832	1.861	1.895	1.924	1.959	1.998	2.037	2.085	2.146	2.288
2.22	0.41		1.474	1.625	1.742	1.769	1.798	1.831	1.840	1.896	1.935	1.973	2.021	2.082	2.225
2.16	0.42		1.413	1.561	1.681	1.709	1.738	1.771	1.800	1.836	1.874	1.913	1.961	2.022	2.164
2.10	0.43		1.356	1.499	1.624	1.651	1.680	1.713	1.742	1.778	1.816	1.855	1.903	1.964	2.107
2.04	0.44		1.290	1.441	1.558	1.585	1.614	1.647	1.677	1.712	1.751	1.790	1.837	1.899	2.041
1.98	0.45		1.230	1.384	1.501	1.532	1.561	1.592	1.626	1.659	1.695	1.737	1.784	1.846	1.988
1.93	0.46		1.179	1.330	1.446	1.473	1.502	1.533	1.567	1.600	1.636	1.677	1.725	1.786	1.929
1.88	0.47		1.130	1.278	1.397	1.425	1.454	1.485	1.519	1.532	1.588	1.629	1.677	1.758	1.881
1.83	0.48		1.076	1.228	1.343	1.370	1.400	1.430	1.464	1.497	1.534	1.575	1.623	1.684	1.826
1.78	0.49		1.030	1.179	1.297	1.326	1.355	1.386	1.420	1.453	1.489	1.530	1.578	1.639	1.782
1.73	0.50		0.982	1.232	1.248	1.276	1.303	1.337	1.369	1.403	1.441	1.481	1.529	1.590	1.732
1.69	0.51		0.936	1.087	1.202	1.230	1.257	1.291	1.323	1.357	1.395	1.435	1.483	1.544	1.686
1.64	0.52		0.894	1.043	1.160	1.188	1.215	1.249	1.281	1.315	1.353	1.393	1.441	1.502	1.644
1.60	0.53		0.850	1.000	1.116	1.144	1.171	1.205	1.237	1.271	1.309	1.349	1.397	1.458	1.600
1.56	0.54		0.809	0.959	1.075	1.103	1.130	1.164	1.196	1.230	1.268	1.308	1.356	1.417	1.559
1.52	0.55		0.769	0.918	1.035	1.063	1.090	1.124	1.156	1.190	1.228	1.268	1.316	1.377	1.519
1.48	0.56		0.730	0.879	0.996	1.024	1.051	1.085	1.117	1.151	1.189	1.229	1.277	1.338	1.480
1.44	0.57		0.692	0.841	0.958	0.986	1.013	1.047	1.079	1.113	1.151	1.191	1.239	1.300	1.442
1.40	0.58		0.665	0.805	0.921	0.949	0.976	1.010	1.042	1.076	1.114	1.154	1.202	1.263	1.405
1.37	0.59		0.618	0.768	0.884	0.912	0.939	0.973	1.005	1.039	1.077	1.117	1.165	1.226	1.368
1.33	0.60		0.584	0.733	0.849	0.878	0.905	0.939	0.971	1.005	1.043	1.083	1.131	1.192	1.334
1.30	0.61		0.549	0.699	0.815	0.843	0.870	0.904	0.936	0.970	1.008	1.048	1.096	1.157	1.299
1.27	0.62		0.515	0.665	0.781	0.809	0.836	0.870	0.902	0.936	0.974	1.014	1.062	1.123	1.265
1.23	0.63		0.483	0.633	0.749	0.777	0.804	0.838	0.870	0.904	0.942	0.982	1.030	1.091	1.233
1.20	0.64		0.450	0.601	0.716	0.744	0.771	0.805	0.837	0.871	0.909	0.949	0.997	1.058	1.200
1.17	0.65		0.419	0.569	0.685	0.713	0.740	0.774	0.806	0.840	0.878	0.918	0.966	1.007	1.169
1.14	0.66		0.388	0.538	0.654	0.682	0.709	0.743	0.775	0.809	0.847	0.887	0.935	0.996	1.138
1.11	0.67		0.358	0.508	0.624	0.652	0.679	0.713	0.745	0.779	0.817	0.857	0.905	0.966	1.108
1.08	0.68		0.329	0.478	0.595	0.623	0.650	0.684	0.716	0.750	0.788	0.828	0.876	0.937	1.079
1.05	0.69		0.299	0.449	0.565	0.593	0.620	0.654	0.686	0.720	0.758	0.798	0.840	0.907	1.049
1.02	0.70		0.270	0.420	0.536	0.564	0.591	0.625	0.657	0.691	0.729	0.796	0.811	0.878	1.020
0.99	0.71		0.242	0.392	0.508	0.536	0.563	0.597	0.629	0.663	0.701	0.741	0.783	0.850	0.992
0.96	0.72		0.213	0.364	0.479	0.507	0.534	0.568	0.600	0.634	0.672	0.712	0.754	0.821	0.963
0.94	0.73		0.186	0.336	0.452	0.480	0.507	0.541	0.573	0.607	0.645	0.685	0.727	0.794	0.936
0.91	0.74		0.159	0.309	0.425	0.453	0.480	0.514	0.546	0.580	0.618	0.658	0.700	0.767	0.909
0.88	0.75		0.132	0.282	0.398	0.426	0.453	0.487	0.519	0.553	0.591	0.631	0.673	0.740	0.882
0.86	0.76		0.105	0.255	0.371	0.399	0.426	0.460	0.492	0.526	0.564	0.604	0.652	0.713	0.855
0.83	0.77		0.079	0.229	0.345	0.373	0.400	0.434	0.466	0.500	0.538	0.578	0.620	0.687	0.829
0.80	0.78		0.053	0.202	0.319	0.347	0.374	0.408	0.440	0.474	0.512	0.552	0.594	0.661	0.803
0.78	0.79		0.026	0.176	0.292	0.320	0.347	0.381	0.413	0.447	0.485	0.525	0.567	0.634	0.776
0.75	0.80			0.150	0.266	0.294	0.321	0.355	0.387	0.421	0.459	0.499	0.541	0.608	0.750
0.72	0.81			0.124	0.240	0.268	0.295	0.329	0.361	0.395	0.433	0.473	0.515	0.582	0.724
0.70	0.82			0.098	0.214	0.242	0.269	0.303	0.335	0.369	0.407	0.447	0.489	0.556	0.698
0.67	0.83			0.072	0.188	0.216	0.243	0.277	0.309	0.343	0.381	0.421	0.463	0.530	0.672
0.65	0.84			0.046	0.162	0.190	0.217	0.251	0.283	0.317	0.355	0.395	0.437	0.504	0.645
0.62	0.85			0.020	0.136	0.164	0.191	0.225	0.257	0.291	0.329	0.369	0.417	0.478	0.620
0.59	0.86				0.109	0.140	0.167	0.198	0.230	0.264	0.301	0.343	0.390	0.450	0.593
0.57	0.87				0.083	0.114	0.141	0.172	0.204	0.238	0.275	0.317	0.364	0.424	0.567
0.54	0.88				0.054	0.085	0.112	0.143	0.175	0.209	0.246	0.288	0.335	0.395	0.538
0.51	0.89				0.028	0.059	0.086	0.117	0.149	0.183	0.230	0.262	0.309	0.369	0.512
0.48	0.90					0.031	0.058	0.089	0.121	0.155	0.192	0.234	0.281	0.341	0.484

E.g. Calculate the required kvar output for a 500 kW installation to raise the power factor from cos φ = 0.75 (tan φ = 0.88) to cos φ = 0.93 (tan φ = 0.4)
Qc = 500 x 0.487 = 244 kvar, whatever the system rated voltage.

Useful Formulas:

$$\text{P.f.} = \cos\varphi = \frac{kW}{kVA} \qquad kW = \frac{\sqrt{3}\ VA \cos\varphi}{1000} \qquad kvar = \frac{\sqrt{3}\ VA \sin\varphi}{1000} \qquad kVA = \frac{\sqrt{3}\ VA}{1000} \qquad I = \frac{kVA \times 1000}{\sqrt{3}\ V} \qquad Ic = \frac{kvar \times 1000}{\sqrt{3}\ V}$$

Where:
P.f. = Power factor; kW = Active Power; kvar = Reactive Power; kVA = Apparent Power; V = Volts; A = Amps; I = line current; Ic = Rated capacitor current.

AS/NZS3000:2007 Clause 4.15.2.3 'Current carrying capacity of supply conductors' require circuit breakers to be rated at 1.35 times the rated capacitor current [to allow for capacitor and voltage tolerances and harmonic currents.]

Vibrations of cubicles in service

Vibrations in cubicles are neither unique nor uniform

They are characterized by:

- Their tone height (high-pitched = panel noises; low-pitched = bar or instrument transformer noises).
- Their fluctuations (according to the load or external phenomena) or else their uniformity.

In search of the causes

There are numerous search methods, this is only one of them.

It differs depending on the type of vibration:

- **Case 1,** the vibrations are without fluctuation.

There is a high chance that the source may be external to the cubicle; the vibrations are conveyed by the power cables or by the civil engineering structure.

In such cases, simply constrain the vibrating elements (as many elements as needed) until the noises cease; it is up to the operator to halt the vibrations by the most appropriate means, from a mechanic's approach.

- **Case 1,** the vibrations fluctuate according to the load.

Their cause(s) should be sought at the level of the cubicle or switchboard.

The search method is more difficult; one must:

□ search by ear for the humming cubicle(s);

□ establish whether this hum is low-pitched or high-pitched. In the latter case, one must first check whether this is not due to poorly tightened external panels, and then adjust the internal panels (screens, back panels, busbar inspection hatches, etc.).

The most effective means of identification is to grease the panel joints so as to see which parts are at fault (but shutdown possibilities do not always allow such a trial-and-error approach).

We can also, by passing under the switchboard, constrain each cubicle at the level of the rear jacks to identify the sources of hum. When they have been identified, then the jacks must be readjusted.

And as a last resort …

To conclude, it is generally fairly easy to locate the source of vibrations, but it is not always easy to eliminate them. If elimination is not possible, the only solution left is to break this resonance by adding elements appropriate for Medium Voltage (such as conducting rods bolted to the back panels, fastening of insulating bars to the shields, etc.). This addition should always be made with the approval of the designers' engineering offices.

Phenomenon of saturation of Voltage Transformers and its consequences

Saturation of voltage transformers in 3 diagrams

A voltage transformer (VT) is designed to operate at a defined voltage and frequency. If the voltage exceeds a maximum permissible value, the magnetic core is saturated and causes the occurrence of a high current in the primary winding, which creates problems.
For example, diagrams 1, 2 and 3 below represent the supply voltage and current in the primary winding of a transformer, with the secondary open.

Poorly controlled dielectric tests can lead to this phenomenon and accelerate product ageing

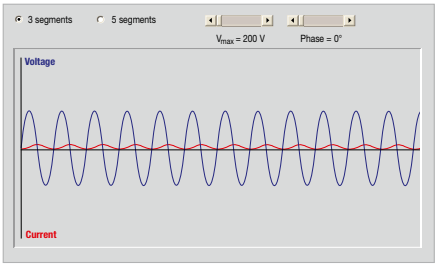
VTs designed for a primary voltage (Vp) of 6000 V or 10000 V and a voltage factor (Ft) of 1.9 Vp for 8 h have maximum operating voltages (Vmax = Vp x Ft), at 50 Hz, of 6582 V and 10971 V.
Accordingly, if a test voltage is applied to them (32 kV for the 6 kV VTs, 42 kV for the 10 kV VTs) at industrial frequency (50 Hz), they saturate.
The overcurrent generated results in a very high temperature rise and damage to the insulating materials. This damage causes discharge of the VT during the test or partial discharges at restarting, which are synonymous with premature ageing and low life expectancy.
The correct method for dielectric testing of a voltage transformer is therefore to do so at a high frequency to prevent such saturation of the magnetic core (in the case of the 6 kV and 10 kV VTs, the minimum test frequency is 250 Hz).

Designing VTs that could be subjected to tests at industrial frequency (50 Hz) would require:
- oversizing of the VT (which greatly reduces the accuracy and the assigned class);
- or an increase in the size of the VT, which may result in problems for installation in the cubicle.

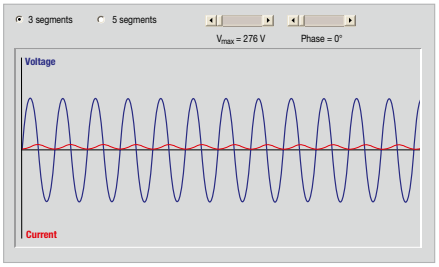
The industrial frequency dielectric test is an individual test provided for by IEC Standard 60044-2. Our VTs all undergo this test on leaving the line in our manufacturing plant.
We do not recommend you repeat it subsequently, since every dielectric test wears the tested components and reduces the equipment's life expectancy. However, if you want to repeat dielectric tests at 50 Hz, the maximum voltage value to be applied is the value at the voltage factor indicated above.

Conclusion for action

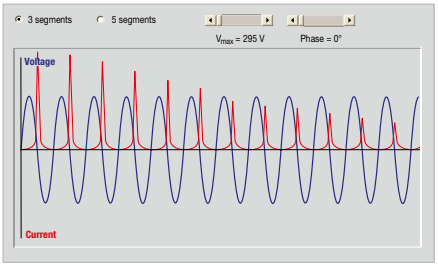
All installed equipment having undergone 50 Hz dielectric tests at voltages greater than those indicated above should be renewed.
The tests for recording of partial discharges on site cannot be considered viable in terms of the ultimate result, since their life expectancies are bound to be low.



(1) - 200 V, the current is very low.

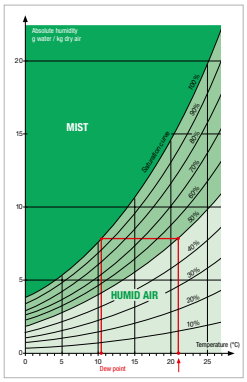


(2) - 276 V, the current is still low.



(3) - 295 V, the overcurrent has become flagrant. Very high at the start of saturation, it remains at a high level throughout the overvoltage.

Creation and effects of Corona in Medium Voltage cubicles



For example, in this diagram, if the ambient air is at 21 °C with 50% relative humidity, the temperature of the dew point will be 10.5 °C

Appendices, a few reminders

- Main gases present in air: nitrogen (N), oxygen and hydrogen.
- Electric field: every electric charge creates an electric field in the space surrounding it. When we approach a second charged particle, it will not interact directly with the first one, but rather react to the field in which it is located. In this way, the field acts as an intermediary between the charged particles.
  The unit of charge adopted by the Système International is the Coulomb (C), which represents a fairly high value, because the charge of an electron is -1.60219E-19 C.
- Resistivity: expresses the resistance of a material of length 1 m and of cross-section 1 m².

Pollution and Ionization of air

Corona effect in Medium Voltage cubicles is the result of ionization of the ambient air surrounding conductors. This ionization is generally due to the occurrence of natural pollution (dew), but it can also be due to chemical pollution, especially in industry.
The phenomenon is fairly easy to explain: any easily decomposable particle, placed in a high electric field, is ionized and creates an atmosphere that is not electrically neutral around the bare conductors.
This ionization generates capacitive discharges with the main voltage, called corona effect, often accompanied by small electric arcs called brush discharges.

Dew, the most common natural phenomenon

The appearance of dew in one or more compartments of MV cubicles is absolutely not due to the presence or proximity of water in the room but to a thermal shock between two masses (solid or gaseous); the percentage of relative humidity is merely one factor in the equation.
Of course, the phenomenon is favoured by moisture-saturated atmospheres; the presence of water in a room tends to cause the occurrence of condensation phenomena.

Unmistakable symptoms

- In the substation: an inaudible hum becoming audible, followed by the occurrence of an acrid smell;
- In the cubicles: at the level of triple points (three elements present, such as, for example, for a connection, copper + insulant + air), the local electric field is often high. Discoloration of one or more elements (chiefly insulants) occurs and a white powder (due to decomposition of the elements) is deposited. This is a chemical attack by the products of decomposition created by the electric discharge (chiefly ozone), whose dielectric properties evolve negatively, and which transforms matter.
  This blemish increases exponentially if nothing interrupts the phenomenon. One then observes cracks (treeing) necrotizing the insulant, usually accompanied by small honeycombs in which can be found black traces of carbon due to burns (calories released by the brush discharge).
  The path of this discoloration continues toward the core of the element; as the surface resistivity of the insulant decreases, the leakage currents are increasingly significant, with the associated thermal effects.
  The phenomenon (usually caused merely by transients at switching) then develops into an earth fault.
- On mechanical parts and greases: the molecules released, such as ozone (03), recombine with other elements present in the ambient air, generate nitric acid (NHO3) and ammonia (NH3), cause a deterioration of parts' surface coatings (cadmium plating, zinc plating, etc.) and paints and hence accelerated ageing of the greases. These exhalations of undesirable molecules contribute to deterioration of the cubicles; mechanisms become seized and mechanical parts rust.
- On cable terminations: insulant flashovers noted, especially on terminations using heat-shrinkable materials (referred to in this case as the wettability of matter).

A phenomenon to be corrected as soon as possible

If an electrical switchboard is occasionally subject to corona effect (e.g. in spring and autumn), the cause of the phenomenon should be sought and corrected as soon as possible. Otherwise the phenomenon increasingly affects the equipment's performance and over time the switchboard is subject to increasingly frequent corona problems as the insulants deteriorate.

Yes, but how?

In fact, there is no standard solution for guarding against this phenomenon.
One must pinpoint the cause and eliminate it. The mere reflex of installing heating in substations, although it is often beneficial, does not solve all cases. It should in no case be the only action taken.

The most frequent or most marked cases

- Fresh air intakes via cable trenches which sweep over the underside of electrical switchboards.
- Fresh air flows in substations between ventilation grilles and door meshes (effect increased depending on the prevailing winds).
- Cubicles in contact with an outside wall.
- Standby cubicles whose parts are energized but not charged with current (with no heat release).
- Cable compartments in which the terminals are angular and/or the clamping bolts (energized) are too long, generating peak effects.

Factors conducive to the non-occurrence of corona effect

- The presence of heat sources such as power transformers or effective heating.
- Cubicles charged with current.
- Substations that are ventilated or without excessive confinement but without air flows.
- Civil engineering structure relatively insensitive to sudden temperature variations.

Motor starting

Choosing a motor start depends on the application and on the network

- The load: application, constraints
- The type of motor: power, voltage, constraints
- The network: constraints.

FVNR Full Voltage (direct on line) motor starter

Applies the system line voltage to motor terminals to start a motor. The resulting inrush current can be high, ranging from 400% to 1000% of full load current. Figure 1 shows the typical inrush current of 600%.
Full voltage starting also provides high starting torque (about 150% of full load torque). Full voltage motor starters are the most widely used and meet most of applications. The Motorpact FVNR motor starter is particularly suitable, due to its simple and cost-effective design, compact footprint, easy operation and low maintenance.

Reduced Voltage motor starters

Starting with reduced voltage decreases the full load current (FLC) at the motor terminals in proportion to the voltage reduction while the full load torque (FLT) is reduced by the square of the voltage reduction.
Reductions are done with either an **autotransformer**, a primary reactor or a **SoftStart electronic device**.

RAVT auto-transformer motor starter

Provides maximum starting torque with minimal line current. Due to transformer action, the line current will be 25%, 42% or 64% of full voltage values for the 50%, 65% or 80% taps respectively. The two methods of transitioning from full voltage to reduced voltage are open and closed transitions:

- open transition disconnects the motor from the power source for a brief time, allowing the motor to act as a generator. However, when reconnected, transients are produced that can damage the motor.
- closed transition never disconnects the motor from the power source.

Motorpact RVAT auto-transformer motor starter uses the closed transition, or Korndorfer method.
The **transition from reduced voltage** to full voltage on Motorpact motor starters can be based on current or time. The overcurrent relay of the Sepam 41 monitors the motor current. When the motor current drops below the preset value, the relay signals the motor starter to full voltage. If the controller does not transition to full voltage in a preset time (acceleration time plus two seconds), an incomplete sequence relay signals the controller to stop. Fig. 1 and Fig. 2 show motor starting with auto-transformer, showing that the starting torque is slower than for full voltage.

RVSS SoftStart motor starter

A central processing unit (CPU) controls the reduced voltage applied to the motor, by phasing angle firing the SCR power module, and then slowly and gently increases torque through control of the voltage and current until the motor accelerates to full speed.
Motorpact RVSS SoftStart motor starter can have different starting settings:
Voltage ramp with current limit: the initial torque setting applies just enough voltage to the motor to cause the motor shaft to begin to turn. This voltage is gradually increased.
Constant current: the current is immediately increased to the Current Limit point and held there until the motor reaches full speed. The voltage is a function of the necessary torque.
Torque regulation: control of the acceleration; current and voltage are functions of the torque, see Fig. 4 and Fig. 5

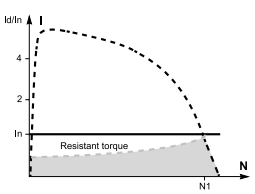


Fig.1

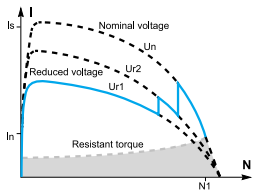


Fig.2

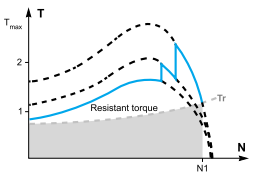


Fig.3

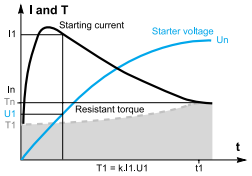


Fig.4

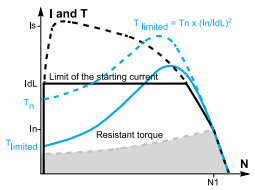
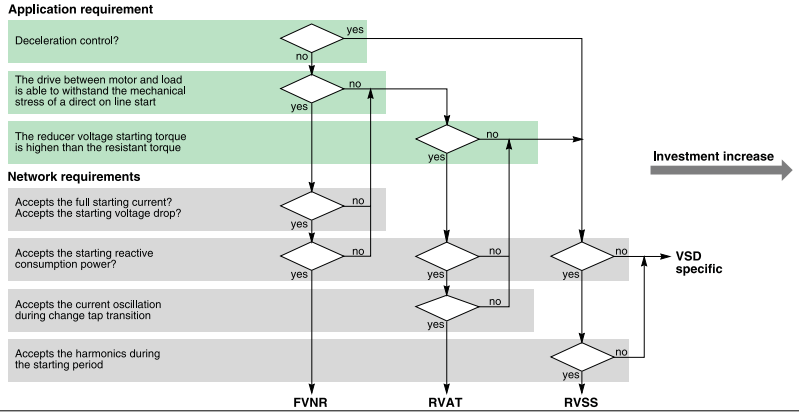


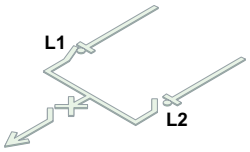
Fig.5



Ensuring power availability at any time

Automatic Transfer System (ATS)

Because a MV Power Supply interruption is unacceptable, especially in critical applications, an automatic system is required for MV source transfer.
For your peace of mind, RM6 enables automatic control and management of power sources in your Medium Voltage secondary distribution network with a short time (less than 10 seconds), guaranteeing high reliability of your installation.



ATS 1/2

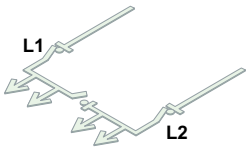
On loss of voltage on L1, the Automatic Transfer System automatically switches to L2.
Consider a network with two Medium Voltage network sources supplying a transformer.
With the automatic control feature provided by the T200, on loss of voltage on the main line L1, the Automatic Transfer System automatically switches to the backup line L2. The flexibility of the T200 allows for three different operating modes to dictate what will happen after switching to the backup line.

Case 1: As soon as voltage returns to L1, the ATS changes back to the main line.

Case 2: The ATS does not change back to the main line. Flow of power continues on L2 except in the event of a voltage loss on L2.

Case 3: ATS does not change back to the main line. Flow of power continues on L2 regardless of the voltage on the two lines.

For a network with a changeover between a distribution system line and a generator, the option for 3 different operating modes is also available; similar to the example above.
The ATS also provides the option for sending out a generator start up signal for this configuration.



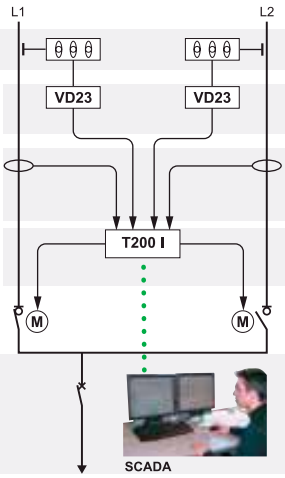
Bus coupler

ATS 2/3

On loss of voltage on one line, the ATS opens this line and closes the bus coupler.
The combination of the RM6 switchboard and Easergy T200 provides a highly reliable and pre-tested solution that ensures the availability of your energy.
Consider a source changeover between 2 incoming lines L1 and L2 and a busbar coupling switch. On loss of voltage on the main line L1, the ATS opens this line and closes the busbar coupler. This allows that load to be powered from the backup line L2. The flexibility of the T200 allows for 2 different operating modes to dictate what will happen next in this configuration.

Case 1: As soon as voltage returns to L1, the ATS changes back to the main line. (The switch for L1 closes and the busbar coupler is opened.)

Case 2: Voltage presence is monitored during a configurable period. If the voltage disappears during this period, the coupling switch is opened and the ATS is locked.



2 VPIS-VO	Voltage sensor: dedicated version of VPIS with voltage output signal.
2 VD3H	Voltage detector: a relay is activated when a loss of voltage is detected from the VPIS voltage output signal.
2 FPI	Fault passage indicator: if a fault current is detected, the Automatic Transfer System is locked in order to avoid closing the healthy line onto the fault.
1 T200 I + switch function motorised	From the digital input coming from the VD3H and the FPI information, T200 I takes the decision to switch from one line to another.
	Communication to SCADA: optionally, communication facilities may be added. Modems: PSTN, Radio, GSM/GPRS, Ethernet, etc. Protocols: Modbus, IEC 870-5-101, DNP3, etc. Functions: dual port, remote configuration, etc.

Feeder Automation Solutions

Reduce costly outages on your network with a range of solutions from Schneider Electric.

Schneider Electric's Medium Voltage network automation offer can provide affordable overhead and underground solutions; including fault indication, control units, remote monitoring and distribution products.

Schneider Electric can assist you to:

- Reduce network outage time
- Improve the quality of your distributed energy service
- Reduce operational costs
- Meet required industry standards e.g. SAIDI (System Average Interruption Duration Index)
- Minimise loss of revenue due to non-productive time

1. Remote control system: Easergy L500

2. SMS Alert

3. Switch monitoring and control unit for underground networks : Easergy T200I – T200E

4. Communicating fault passage indicator for underground networks: Easergy Flair 200C

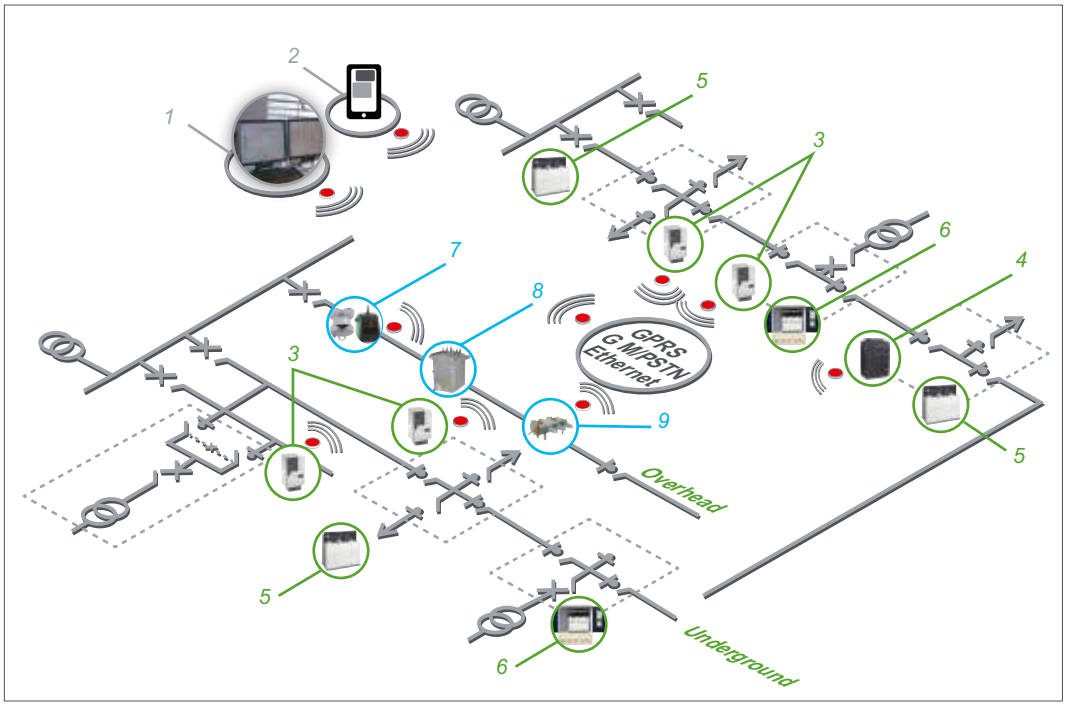
5. Medium voltage ring main unit RM6

6. Pre-fabricated MV/LV Substation

7. Communicating fault passage indicator for overhead networks: Easergy Flite 116SA/ G200

8. Recloser: N series remote controlled by ADVC

9. Sectionalizer: RL series load break switch remote controlled by ADVC



Conversion Factors and Tables

Temperature

- Kelvin = ˚C + 273.16
- Celsius = 5/9 (F-32)
- Fahrenheit = 9C/5 + 32

Distance

To Convert	Into	x by
Centimetres	Inches	0.394
	Feet	0.0328
	Metres	0.01
	Millimetres	10
Feet	Centimetres	30.48
	Inches	12
	Metres	0.3048
	Miles	0.0001894
	Yards	0.333
Gallons	Pints	8
	Litres	3.785 (US) 4.54 (IMP)
	Quarts	4
Grams	Ounces	0.035
	Pounds	0.002
	Kilograms	0.001
Inches	Centimetres	2.54
	Feet	0.0833
	Metres	0.0254
	Yards	0.0278
Kilograms	Grams	1,000
	Ounces	35.274
	Pounds	2.205
Kilometres	Feet	3281
	Metres	1000
	Miles	0.621
	Yards	1.093
Litres	Cups	4.226
	Pints	2.113 (US) 1.761 (IMP)
	Gallons	0.264 (US) 0.22 (IMP)
	Millilitres	1000
	Quarts	0.066 (US) 0.055 (IMP)

To Convert	Into	x by
Metres	Centimetres	100
	Feet	3.281
	Inches	39.3
	Kilometres	0.001
	Miles	0.0006214
	Millimetres	1000
	Yards	1.093
Miles	Feet	5.280
	Yards	1.760
	Kilometres	1.609
Ounces	Grams	28.35
	Pounds	0.0625
	Kilograms	0.028
Pints	Litres	0.473 (US) 0.568 (IMP)
	Quarts	0.5
	Gallons	0.125
Pounds	Grams	453.59
	Ounces	16
	Kilograms	0.454
Quarts	Pints	2
	Litres	0.946 (US) 1.136 (IMP)
	Gallons	0.25
Yards	Inches	36
	Feet	3
	Metres	0.914
	Miles	0.0005682

Pressure

Bar	PSI	kPa
1 bar = 14.5 PSI	1 PSI = 6.895 kPa	1 kPa = 7.5188 mm Hg
1 bar = 100 kPa	1 PSI = 51.71 mm Hg	1 kPa = 0.2953 in of mercury
1 bar = 750 mm Hg	1 PSI = 2.036 in of mercury	1 kPa = 0.01 bar
1 bar = 29.53 in of mercury	1 PSI = 0.069 bar	1 kPa = 0.145 PSI

Glossary & Library

Apparent power in MVA
Power in MVA drawn by the loads in a power system.

Blocking signal
Order sent to an upstream protection device by a device that has detected a fault.

Breaking capacity
Maximum current that a breaking device is capable of interrupting under prescribed conditions.

Coupling
Operation whereby a source or part of a power system is connected to a power system already in operation when the necessary conditions are fulfilled.

Current sensor
Device used to obtain a value related to the current.

Decoupling
Operation whereby a source or part of a power system is disconnected from a power system.

Feeder
Cables arriving from a set of busbars and supplying one or more loads or substations.

Harmonics
Series of sinusoidal signals whose frequencies are multiples of the fundamental frequency.

Incomer
A line supplying energy from a source to the busbars of a substation.

Making capacity
Maximum current that a breaking device is capable of making under prescribed conditions. It is at least equal to the breaking capacity.

Neutral earthing
Method by which the power system neutral is connected to earth.

Overload
Overcurrent lasting a long time and affecting one of the elements in the power system.

Power factor
Ratio between the active power and the apparent power. For sinusoidal signals, the power factor is equal to cos φ.

Power system
Set of electrical-power production and consumption centres interconnected by various types of conductors.

Protection settings
Protection function settings determined by the protection-system study.

Protection system
Set of devices and their settings used to protect power systems and their components against the main faults.

Protection-system study
Rational selection of all the protection devices for a power system, taking into account its structure and neutral earthing system.

Recloser
Automatic device that recloses a circuit breaker that has tripped on a fault.

Residual current
Sum of the instantaneous line currents in a polyphase power system.

Residual voltage
Sum of the instantaneous phase-to-earth voltages in a polyphase power system.

Short-circuit
Accidental contact between conductors or between a conductor and earth.

Short-circuit power
Theoretical power in MVA that a power system can supply. It is calculated on the basis of the rated power system voltage and the short-circuit current.

Voltage sensor
Device used to obtain a value related to the voltage.

Basics for MV cubicle design
This support is a technical guide of technical know-how intended for Medium Voltage equipment designers. This guide helps you to carry out the calculations required to define and determine equipment. Download the document to find out more.
http://www.iw-corp-preview.schneider-electric.com/sites/corporate/en/customers/designers/designers.page

MV Application guide
The purpose of this manual is to help product Medium Voltage switchgear assemblies and to help specify standards solutions. Download the document to find out more.
http://www.iw-corp-preview.schneider-electric.com/sites/corporate/en/customers/designers/designers.page

MV public distribution networks throughout the world
In a country, the Transmission and Public Distribution networks ensure the transfer of electrical energy from points of production to consumer units? Download the document to find out more.
http://www.schneider-electric.com/ww/en/download/document/ECT155

Overvoltages and insulation coordination in MV and HV
Insulation coordination is a discipline aiming at achieving the best possible technico-economic compromise for the protection of people and equipment against overvoltages and whether caused by the network. Download the document to find out more.
http://www.schneider-electric.com/ww/en/download/document/ECT151

Discovering our offer at a glance

Air Insulated Switchgear

Motor Starter


PE90271


PE90208


PE90276


PE57466


PE57993


DM102184


PM103575


PE90879


PM103007

F400	GenieEvo	Masterclad	MCset	NEX	PIX	PIX Double Busbar	Motorpact	PIX MCC
IEC / GOST	IEC/BS	ANSI/IEEE	IEC	IEC	IEC/ GOST	IEC	IEC/NEMA/UL/ GOST/IACS	IEC
Rated voltage (kV)								
36 / 40.5	13.8	15 / 27	17.5 / 24	12 / 17.5 / 24	17.5 / 24	12 / 17.5	7.2	7.2
LSC2B-PM	LSC 2A-PM		LSC 2B PM	LSC 2B PM	LSC 2B PM	LSC 2B PM	LSC2A-PI	LSC 2B-PM
Max. rated current								
2500 A / 1250 A	2500 A	4000 A / 2750 A	4000 A / 2500 A	2500 A / 2500 A / 2000 A	5000 A** / 2500 A	3150 A	3150 A	3150 A (busbars)
Max. rated short circuit current								
31.5 kA Vacuum / 31.5 kA SF6 / 40 kA SF6	25 kA Vacuum	63 kA / 40 kA Vacuum	50 kA / 31.5 kA SF6*	31.5 kA / 31.5 kA / 25 kA Vacuum	50 kA / 31.5 kA Vacuum*	31.5 kA Vacuum	50 kA Vacuum	50 kA Vacuum
Single busbar system	Single busbar system Fixed type Rear cable access	Single busbar system	Single busbar system, Withdrawable Circuit Breaker ** Vacuum technology, please refer to PIX*	Single busbar system Withdrawable Circuit Breaker	Single busbar system, Withdrawable Circuit Breaker ** SF6 technology, please refer to MCset* *** with fan*	Double busbar system, Withdrawable Circuit Breaker	Withdrawable double busbar for S3 DOL RVSS RVAT Reversing 2-speed	Withdrawable Direct line-up with PIX Front access cabling (rear option) DOL and feeder applications
Indoor	Indoor	Indoor & Outdoor	Indoor	Indoor	Indoor	Indoor	Indoor & Outdoor NEMA	Indoor

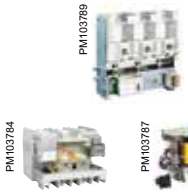
Gas Insulated Switchgear									2SIS
 PE90897	 PM102833		 PM103008		 PM103068	 PM102834		 PM102831	 PE90845
CBGS-0*	**CBGS 2**	**CBGS-2 Rail**	**GHA**	**GHA Rail**	**GMA**	**WI**	**WI Rail**	**WS**	**Premset**
IEC/ANSI (ENA/UL)	IEC	IEC	IEC/GOST/ CNS/CSA/ENA	IEC/GB (China)	IEC/GOST/ CNS	IEC/CNS	IEC/EN	IEC / GOST / CNS	IEC/GOST/GB
Rated voltage (kV)									
24 / 36 / 38 / 52	52	1 x 27.5 / 2 x 27.5	40.5	1 x 27.5 / 2 x 27.5	24	52	2 x 27.5 / 55	36	12 / 17.5
									LSC 2A-PM
Max. rated current									
2000 A	2000 A	2000 A	2500 A 4000 A (on request)	2000 A	2500 A	2500 A	2000 A	2500 A	1250 A
Max. rated short circuit current									
31.5 kA	25 kA	25 kA	40 kA	25 kA	31.5 kA	40 kA	31.5 kA	31.5 kA	25 kA
SF6	SF6	SF6	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum	Vacuum LBS, CB and transformer protection
Single busbar system Fixed type Mainly with C.B. but also switch-disconnector functions Compact design at 36 kV Flexible busbar system Outer cone cable connection No gas handling ** For Railways application also*	Single and double busbar system Fixed type CB applications Separated gas compartments for CB and busbar Spacious cable connection inner cone	For railway application 1 or 2 poles (250 kV BIL) Single busbar system Fixed type For traction application, 1 or 2 pole solution BIL 250 kV, suitable for traction side container Substation	Single and double busbar system Fixed type CB applications Separated gas compartments for CB and busbar Compact design, flexible cable connection for outer cone and inner cone, no gas handling	Single busbar system Fixed type For traction application 1 or 2 pole solution BIL 200 kV, suitable for traction side container Substation No gas handling	Single busbar system Fixed type Mainly with C.B. but also switch-disconnector functions Less Space- More Power Very compact design Flexible busbar system Outer cone cable connection No gas handling	Single and double busbar system Fixed type CB applications Separated gas compartments for CB and busbar Same small footprint for SBB and DBB, spacious cable connection inner cone	Single busbar system Fixed type For traction application, 1 or 2 pole solution BIL 250 kV, suitable for traction side container Substation	Single and double busbar system Fixed type CB applications Separated gas compartments for CB and busbar Same small footprint for SBB and DBB, spacious cable connection inner cone	Compact modular switchgear with 3-in-1 architecture for breaking disconnection and earthing
Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor & Outdoor

Air Insulated Switchgear	Gas Insulated Switchgear					2SIS
 PE90700	 PE90704	 DM102666	 PE90703	 PE57770	 PE90702	 PE90845
SM6	**DVCAS**	**Flusarc**	**FBX**	**RM6**	**Ringmaster**	**Premset**
IEC	IEC/ANSI/UL	IEC	IEC	IEC	IEC	IEC/GOST/GB
Rated voltage (kV)						
12 / 24 / 36	36	36	12 / 24	12 / 24	13.8	12 / 17.5
Max. rated current						
630A & 1250A	630 A	630 A	630 A Option busbar 1250 A	630 A	630 A	1250 A
Max. rated short circuit current						
25 kA / 20 kA	20 kA	25 kA	25 kA / 21 kA	25 kA / 20 kA	21 kA	25 kA
SF6 Vacuum CB / SF6 CB	Vacuum CB SF6 LBS	Vacuum CB SF6 LBS	Vacuum CB SF6 LBS	SF6 CB - SF6 LBS	SF6 CB - SF6 LBS	Vacuum LBS, CB and transformer protection
Complete system of modular cubicles	Wind dedicated modular switchgear combining all MV functional units used in wind farms	Compact and modular switchgear combining all MV functional units				Compact modular switchgear with 3-in-1 architecture for breaking disconnection and earthing
Indoor	Indoor	Indoor & Outdoor / Indoor	Indoor	Indoor	Indoor and outdoor	Indoor & Outdoor

MV Fuses

Fusarc CF	Solefuse	Tepefuse, Fusarc CF	MGK
DIN/IEC	IEC/UTE	IEC/DIN/UTE	AFNOR
Rated voltage (kV)			
36	36	36	7.2
Max. rated current			
250 A	5000 A (busbars)		
	400 A contactor		
Max. rated short circuit current			
63 kA	50 kA	63 kA	50 kA
Fuses for distribution transformer protection from 3.6 kV to 36 kV	Fuses for distribution transformer protection from 3.6 kV to 36 kV	Fuses for measurement transformer protection up to 24 kV (Tepefuse) and up to 36 kV (Fusarc CF) Back-up technology	Motor protection fuse range

SF6 Contactor — Vacuum Contactors



Rollarc	CPX	CLX	CBX		CVX	
IEC	IEC	IEC	IEC			
Rated voltage (kV)						
7.2	3.6	7.2	7.2	12	7.2	12
Max. rated current						
400 A (AC4)	400 A (AC4)	400 A (AC4)	400 A (AC4)	315 A (AC4)	400 A (AC4)	315 A (AC4)
Max. rated short circuit current						
10 kA / 8 kA	6 kA	6 kA	6 kA	4 kA	6 kA*	4 kA
SF6	Vacuum					
Fixed or withdrawable contactor with magnetic holding or mechanical	Fixed vacuum contactors with magnetic holding or mechanical				Fixed vacuum contactor In version withdrawable fused vacuum contactor: CVX *(50 kA in conjunction with fuses) 1 or 3 poles With magnetic holding or mechanical	

SF6 Circuit Breakers


PM102689


PE57191


PE57192


PE57194

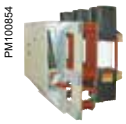

PE56503


PE56504

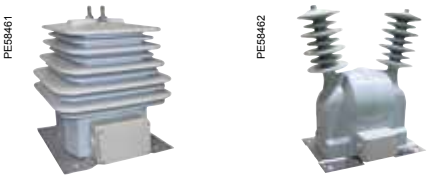
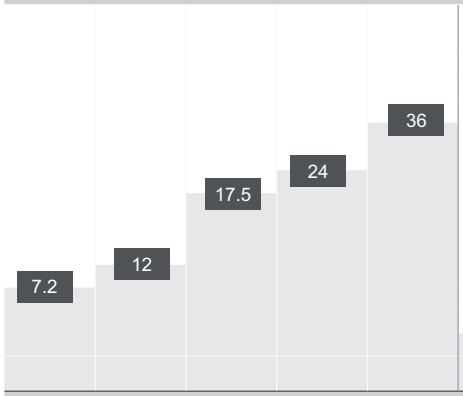
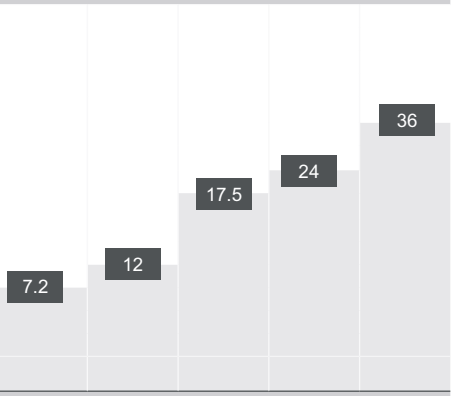

PE56501

SDR	CBR	LF1	LF2	LF3	LFP	SF1	SFset	SF2
IEC	IEC	IEC	IEC	IEC	IEC	IEC	IEC	IEC
Rated voltage (kV)								
15	27.5	7.2 / 12	7.2 / 12 / 17.5	7.2 / 12 / 17.5	12 / 17.5	17.5 / 24 / 36	17.5 / 24	24 / 36 / 40.5
Max. rated current								
2000 A		1250 A	2000 A	3150 A	5000 A	1250 A	1250 A	3150 A / 2500 A
Max. rated short circuit current								
25 kA / 40 kA	8 kA / 25 kA / 27.5	31.5 kA	50 kA / 40 kA / 31.5 kA	50 kA / 50 kA / 40 kA	50 kA / 31.5 kA	25 kA	25 kA	40 kA / 40 kA / 31.5 kA
Vacuum		SF6	SF6	SF6	SF6	SF6	SF6	SF6
Fixed load break switch (SDR) or Circuit Breaker (CBR) for AC railway application Outdoor		Fixed or withdrawable Circuit Breaker in MCset Cassette	Fixed or withdrawable Circuit Breaker in MCset Cassette	Fixed or withdrawable Circuit Breaker in MCset Cassette	Fixed Circuit Breaker	Fixed Circuit Breaker Front or side mounting Conventional spring	Fixed Circuit Breaker Front or side mounting Conventional spring Integrated VIP trip unit (without auxiliary power supply) in SFset up to 24 kV (for side mounted)	Fixed Circuit Breaker Front or side mounting Conventional spring

Vacuum Circuit Breakers



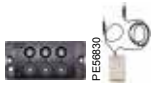
Evolis	**HVX**		**VAH**			**VOX**			**VXA**				**VXB**	**VXC**	
IEC	IEC/GOST/DL/GB		IEC	IEC	IEC/ ANSI	IEC/ BS/AS	ANSI	GOST/ GB	IEC/EN					IEC	
7.2	7.2		12	12		36	38	40.5	1x12	1x17.5	1x27.5	2x27.5		36	38
12	12		13.8	17.5											
17.5	17.5		17.5												
24	24														
2500 A	3150 A	2500 A	8000 A			2000 A			2500 A					2500 A	4000 A
31.5 kA	50 kA	40 kA	63 kA*			40 kA			50 kA	40 kA	31.5 kA	31.5 kA		40 kA	
Vacuum	Vacuum		Vacuum			Vacuum/SF6			Vacuum					Vacuum	
Fixed or withdrawable Circuit Breaker	Fixed or withdrawable Circuit Breaker		Fixed or withdrawable Circuit Breaker For generator applications up to 130 MVA ** ANSI / IEEE C37.013 Generator Switching 63 kA, 4000 & 5000 A*			Fixed outdoor dead tank Circuit Breaker			1 or 2-pole Circuit Breaker for railway application or as star point breaker for grounding application Fix installation or floor running truck - 16 2/3 Hz - 25 Hz - 50 Hz - 60 Hz Indoor					Fixed or withdrawable Circuit Breaker The arc furnace Circuit Breaker with high switching numbers, maintenance free up to 25000/30000 cycles	

Indoor Instrument Transformers	Low Power Current Transformers	Outdoor Instrument Transformers
		
IEC	IEC	IEC
Rated voltage (kV)		
		
Max. rated current		
2500 A	5000 A	1500 A
Max. rated short circuit current		
50 kA	40 kA	40 kA
Dry	Dry	Dry
Medium Voltage Current Transformer, Voltage Transformer	Medium Voltage Low Power Current Transformer (LPCT)	Outdoor Current Transformer and Voltage Transformer

ADVC Controller		Pole-Mounted Switchgear					
PE90836 	PE55502 	PE90712 	PE90709 	PE90711 	PE90715 	PE90713 	PE90714 
Ultra	**Compact**	**N series**	**PM6**	**RL series**	**SBC**	**U series**	**W series**
IEC/ANSI	IEC/ANSI	IEC/ANSI	IEC	IEC/ANSI	IEC	IEC/ANSI	IEC/ANSI
Technical characteristics		Rated voltage (kV)					
	Suited to straightforward applications such as typical overhead feeder installations WSOS5 (Windows Switchgear Operating System 5) is a software package that allows the configuration, control and monitoring of Schneider Electric's pole-mounted auto reclosers and sectionalizers	38	36	38	36	27	24
8 inputs, 8 outputs: optional	N/A						
Battery: 7 Ah, or 12 Ah	Battery: 7 Ah						
Auxiliary power supply: 115/230 VAC Dual AC power supply: optional VT supply via switchgear: optional DC power supply: optional	Auxiliary power supply: 115/230 VAC VT supply via switchgear: optional						
		Max. rated current					
		800 A	630 A	630 A	630 A	630 A	400 A
		Max. rated short circuit current					
		16 kA	12.5 kA	16 kA	20 kA	12.5 kA	6 kA
		Vacuum / SF6 Dry air (optional)	SF6	SF6	Air	Vacuum / Epoxy	Vacuum / Epoxy
		Recloser Remote controlled with ADVC controller Advanced protection, control and communication	Load break switch Remote controlled with Easergy T200 P control unit Manual or automatic load break switch Sectionalizer capabilities	Load break switch Remote controlled with ADVC controller or ADVC Lite Manual or automatic load break switch Sectionalizer capabilities on voltage and current	Air break switch and disconnector Manually operated	Recloser Remote controlled with ADVC controller Advanced protection, control and communication	Single Wire Earth Return (SWER) recloser Remote controlled with ADVC controller or ADVC Lite Advanced protection, control and communication

Dedicated Supervision for Easergy range	Overhead Network					
	Recloser Controller	**Remote Network Control**	**Remote Network Monitoring**	**Local Fault Indication**		
 PE56266	 PM103550	 PE90722	 PE57923	 PE90724	 PE57927	 PE57929
Easergy L500	ADVC 2	Easergy T200P	Easergy Flite 116-SA/ G200	Easergy Flite 110-SA	Easergy Flite 210, 230	Easergy Flite 312, 315, 332, 335, 382
Easergy range dedicated to remote control system	Dedicated controller for N, U, W reclosers, and RL sectionalizer	Overhead switch control unit	Communicating fault passage indicator for overhead networks	Fault passage indicator for overhead networks	Fault current detectors for overhead networks	Fault current detectors for overhead networks
Capacity for 400 Easergy type devices	Phase and earth current, directional, voltage, frequency, harmonics	Control of 1 or 2 switches, PM6 or other load break switches	Single-phase ammetric detector	Single-phase ammetric detector	Three-phase ammetric detectors	Three-phase directional detectors

Underground Network

Local Fault Indication		Remote Network Control			Remote Network Monitoring	MV/LV Substation Power Supply	Accessory
 PE57787	 PE57922	 PE90717	 PE57924	 DM103099 DM103098	 PE90718	 PM100592	 PE58141 PE58830
Easergy Flair 21D, 22D, 23D, 23DM	Easergy Flair 219, 279	Easergy T200I	Easergy T200E	Easergy R200, ATS100	Easergy Flair 200C	Easergy PS100	VPIS V2
Fault passage indicator for MV substations. DIN format	Fault passage indicator for MV substation. Wall mounted	Control unit for MV and MV/LV substations		Premset cubicle monitoring and control unit	Communicating fault passage indicator for MV substation	Power supply and battery charger, 12 & 24 VDC or 12 & 48 VDC, for MV/LV substations	Self-powered voltage presence indicating system
Phase-to-phase and phase-to-earh Fault Passage Indicators with LCD display for settings and monitoring. Compatible with all types of neutral system and communication capability	Phase-to-phase and phase-to-earh Fault Passage Indicator settings configurable with dip-switches	Control of 1 to 16 switches, RM6, FBX, SM6 and other cubicle	Control of 4 switches, dedicated to Ringmaster		1 or 2 Fault Passage Indicators functions, compatible with all earthing systems		Including voltage output version (VPIS V0) for connection to a VD23 voltage presence relay
		Including FPI, backup power supply, local automation, IEC870-5-101/104, DNP3 or Modbus protocols, various communication media (GPRS, 3G, PSTN, radio, Ethernet etc.)					

MiCOM	Series P10	Series P20	Series P30	Series P40
	 PM100502	 PM100517	 PM100527	 PM100526
Applications	Fulfils the basic requirements of buildings and small industry applications with a particular focus on overcurrent and motor protection. Two families are available: ■ Auxiliary powered ■ Self powered/dual powered	Fulfils the basic/medium requirements of industrial, utility and building applications, providing simplicity and ease-of-use in a wide range of installations. ■ Scalable solutions where type and quantity of protection features are model dependent ■ Flexible logic equations available on most models ■ Compact hardware options for easy installation ■ Multi-language HMI ■ Advanced protection functions	Fulfils the protection requirements of utility and industrial applications with a particular focus on integrated feeder control and provides dedicated railway protection devices. ■ Protection with bay level control options to facilitate feeder management ■ Input/output quantity selectable based on requirements ■ Protection functions available for isolated/Petersen coil earthed systems ■ Surface and flush mounted (including detachable HMI option) as well as compact case models are available ■ Full Programmable Scheme Logic (PSL) and function keys	Fulfils the protection requirements for a wide market of utility and industrial applications and offers a wide range of protection functions. ■ IEC 62439 redundancy protocols PRP (Parallel Redundancy Protocol) and HSR (High availability Seamless Redundancy) with dual IP addresses ■ Configurable communication protocol IEC 61850 Editions 1 or 2 ■ Full Programmable Scheme Logic available with graphic configuration tool for easy setting ■ Scalable input/output hardware depending on requirements ■ Operating voltage selectable via software for opto inputs.
Characteristics				
Logic Inputs	max 8	max 12	max 82	max 64
Logic Outputs	max 8	max 9	max 48	max 60
Boolean logic equation	no	flexible logic (model dependent)	fully programmable	fully programmable
Communication Ports	USB front port and 1 rear port	RS232 front port / 1 rear port / 1 optional second rear port	RS232 front port / 1 rear port / 1 optional second rear port	RS232 front port / 1 rear port / 1 optional second rear port
IEC 61850 Protocol	No	No	Yes Edition 1	Yes Edition 1 & 2

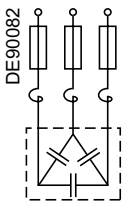
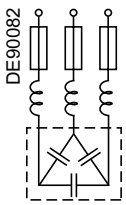
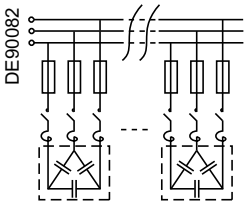
Sepam	Series 20	Series 40	Series 60	Series 80
	 PE88030	 PE88030	 PE60304	 PE60305
Applications	For usual applications ■ Backlit LCD graphic bitmap display ■ 16 inverse time over-current characteristic curves ■ Easy software setup ■ Two 86-cycle fault records, last trip fault values and last 64 time-tagged alarms ■ Self-test diagnostics ■ Wide range of control power inputs (AC/DC) ■ Breaker/failure function for S24 and T24	For demanding applications ■ Compact case provides standardized dimensions (< 100 mm deep) ■ Directional over-current protection for dual incomers, couplings, and closed-loop feeders ■ Current and voltage inputs ■ Setting software with Boolean logic equation assistance ■ CT/VT and trip circuit supervision ■ Sixteen seconds of fault recording configurable for multiple captures, detailed history of last 5 trip reports, and retention of last 200 time-tagged alarms ■ 16 RTD inputs	For demanding applications ■ Directional over-current protection for dual incomers, couplings, and closed-loop feeders ■ Setting software with Boolean logic equation assistance ■ CT/VT and trip circuit supervision ■ Sixteen seconds of fault recording configurable for multiple captures, detailed history of last 5 trip reports, and retention of last 200 time-tagged alarms ■ Optional mimic-based display units are available to view a portion of single-line and phasor diagrams ■ Battery backup for historical and fault waveform data retention ■ Synchro-checks module available ■ 16 RTD inputs	For custom applications ■ Standardized dimensions for enhanced protection of incomers/feeders, transformer, motor, generator, busbar, and capacitor-bank applications ■ Differential protection of transformer or machine transformer units ■ Differential protection of motors and generators ■ Protection for incomers, couplings, and important feeders ■ Expanded logic-equation capabilities ■ Graphical assistance for setting software ■ Battery backup for historical and fault waveform data retention ■ Optional mimic-based display units are available to view a portion of single-line and phasor diagrams
Characteristics				
Logic Inputs	0 to 10	0 to 10	0 to 28	0 to 42
Logic Outputs	4 to 8	4 to 8	4 to 16	5 to 23
Communication Ports	1 to 2	1 to 2	1 to 2	2 to 4
IEC 61850 Protocol	Yes	Yes	Yes	Yes
Redundancy	No	Yes	Yes	Yes
Goose message	No	No	Yes	Yes

	Oil Distribution Transformers		
	 **Minera**	 **Minera Pole-Mounted**	 **Minera HE+**
Max. rated power (MVA)	3.15	0.5	1.6
Max. rated voltage (kV)	36	36	36
Indoor/outdoor	Indoor and outdoor	Outdoor	Indoor and outdoor
Features and application	Ground-mounted and pole-mounted oil immersed transformer Three-phase units	Pole-mounted oil immersed transformer Phases: three-phase units (single-phase available on request)	High efficiency transformer with amorphous core technology available

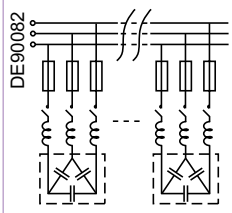
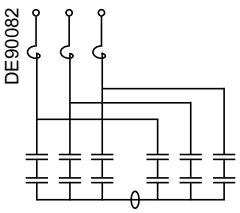
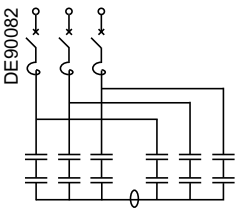
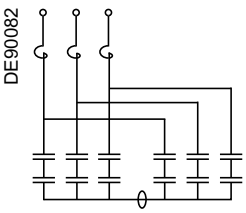
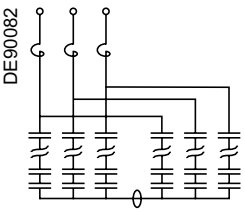
	Cast Resin Transformers			Medium Power Transformers
	 **Trihal**	 **Tricast**	 **Resiglas**	 **Minera MP**
Max. rated power (MVA)	15	25	25	100
Max. rated voltage (kV)	36	52	36	170
Indoor/outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor
Features and application	Cast resin dry transformer. Indoor: IP00, IP21 or IP31 Outdoor IP44 Highly rated to standards for environmental, climate and fire resistance	Cast resin dry transformer Indoor: IP00, IP21 or IP31 Outdoor IP44 Highly rated to standards for environmental, climate and fire resistance	Suitable for power supply of non-linear loads with high harmonic Contents (transformers with k-factor) Has a flexible design (adjustment of impedances)	Hermetically sealed or breathing with conservator Low flammability dielectric liquids (Vegeta ranges) High capacity of cooling options such as ONAN, ONAF, ODAF, OFAF or OFWF

	Special Transformers				
					
	Minera SGrid	**Minera Ex**	**Minera R**	**Minera E**	**Minera PV**
Max. rated power (MVA)	1	60	80	15 kA (earth fault current)	3.2
Max. rated voltage (kV)	36	36	170	72	36
Indoor/outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor
Features and application	Transformer suitable for renewable power generation It features an on-load tap changer	Zone 1 and Zone 2 explosion proof transformer for mines and the oil and gas industries. Hazardous zones (Atex Transformer range) Naturally cooled (ONAN) or air forced (ONAF)	Rectifier transformer for railways, metals and renewable Rectifier feeder (Rectifier Transformer range)	Designed to create the HV network neutral point and to limit the fault current in the phase-earth connection	Transformer for residential photovoltaic (PV) generation Natural cooled (ONAN) or air-forced (ONAF)

	Special Transformers				
					
	Siltrim	**Vegeta**	**Impregio**	**Impregio AT**	**R-Cool**
Max. rated power (MVA)	3.3	25	0.4	0.4	15
Max. rated voltage (kV)	36	72.5	1.1	1.1	36
Indoor/outdoor	Indoor and outdoor	Indoor and outdoor			Indoor and outdoor
Features and application	Very compact distribution transformer adapted to fit into reduced spaces such as wind towers and offshore oil & gas platforms	The safest transformer for the environment and people, using biodegradable vegetable oil as dielectric medium			Air-conditioned special dry-type transformer, which is designed to achieve high IP ratings and an efficient cooling solution that cannot be reached with conventional enclosures and cooling

	Industrial application		
Applications	Motor compensation Fixed bank		Industrial compensation Automatic bank
Reference	CP214	CP214SAH*	CP253
Three-line diagrams			
Maximum voltage	Up to 12 kV		Up to 12 kV
Connection mode	Three-phase capacitors with delta connection		Three-phase capacitors up to 900 kvar, single-phase capacitors with double star connection above
Type of protection	HRC fuses (**)		HRC fuses**
Maximum power****	2x450, i.e. 900 kvar		Up to 4500 kvar
Comments			

** SAH: Detuning Reactor*
*** HRC: High Rupturing Capacity*
**** CT: Current Transformer*
***** For larger power rating, please contact us*

	All applications		Energy application	
Industrial compensation Automatic bank	Global compensation Fixed bank	Distribution system Large sites Automatic bank	Distribution system Fixed bank	Distribution and Transport system Fixed bank
CP253SAH*	CP227	CP254	CP229	CP230
				
Up to 12 kV	Up to 36 kV	From 12 to 36 kV	Up to 36 kV	Above 36 kV
Three-phase capacitors up to 900 kvar, single-phase capacitors with double star connection above	Single-phase capacitors with double star connection			Single-phase capacitors with double star or H connection
HRC fuses**	Unbalance by CT*** and relay	Unbalance by CT*** and relay		
Up to 4000 kvar	12 x 600, i.e. 7200 kvar	12 x 480, i.e. 5760 kvar	Please contact us	Please contact us
	SAH* on request	SAH* on request	SAH* on request	SAH* on request

Notes

Notes

Need more information?

➜ www.schneider-electric.com/MV-distribution

Schneider Electric Industries SAS
35, rue Joseph Monier
CS30323
F-92505 Rueil-Malmaison cedex (France)

RCS Nanterre 954 503 439
Share capital: €928,298,512
www.schneider-electric.com

This document has been printed on ecological paper

Design: SYNTHESE ECA, Schneider Electric
Photos: Schneider Electric

NRJED314619EN

03-2015