

Catalogue 2015



DVCAS

GIS cubicles
for renewable transformer substations
Up to 36/38 kV

Medium Voltage Distribution

Your requirements

Quality



Safety



Efficiency



Our solution

High QUALITY to optimize continuity of service with minimum maintenance

- Customizable, modular design in a compact architecture: simple and efficient
- 100% factory-tested without the need for further tests
- The quality management system is certified ISO 9000

Enhanced SAFETY for people and installations

- Mechanical and electrical interlocks, to prevent incorrect operations
- 100% factory-tested without the need for further tests on site
- Simple design that is easy to operate, with front access to all operations
- Tested against internal arcs IEC 62271-200 IAC AFL/ AFLR

Technical and economics EFFICIENCY

- Cost-efficient equipment, with short lead times
- Space optimization
- Flexible products that are optimised for customer requirements
- Offering innovative & automated solutions for Smart grids
- Compact architecture ready for commissioning (Plug & Play)
- Integrated protection and control
- Reduced maintenance

PM104555

DVCAS

Meeting
customer needs



Schneider Electric has 180 years' experience and operations in more than 130 countries, offering products and solutions for the main electrical companies. We are pioneers in the renewable market, working in tandem with the main players in the global renewable market.

Quality

We are convinced that only maximum quality in the manufacturing of our equipment can ensure its high reliability.

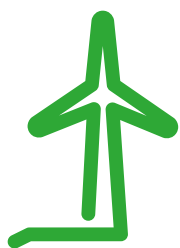
Schneider Electric introduced its quality policy over 30 years ago, creating the company's first quality manual, and since then it has been continually developed and updated to achieve total quality. The quality management system is certified in accordance with the ISO 9000 standard and we continue to work every day to improve constantly every process, from designing the equipment we manufacture to our after-sales service, to ensure maximum customer satisfaction.

Innovation

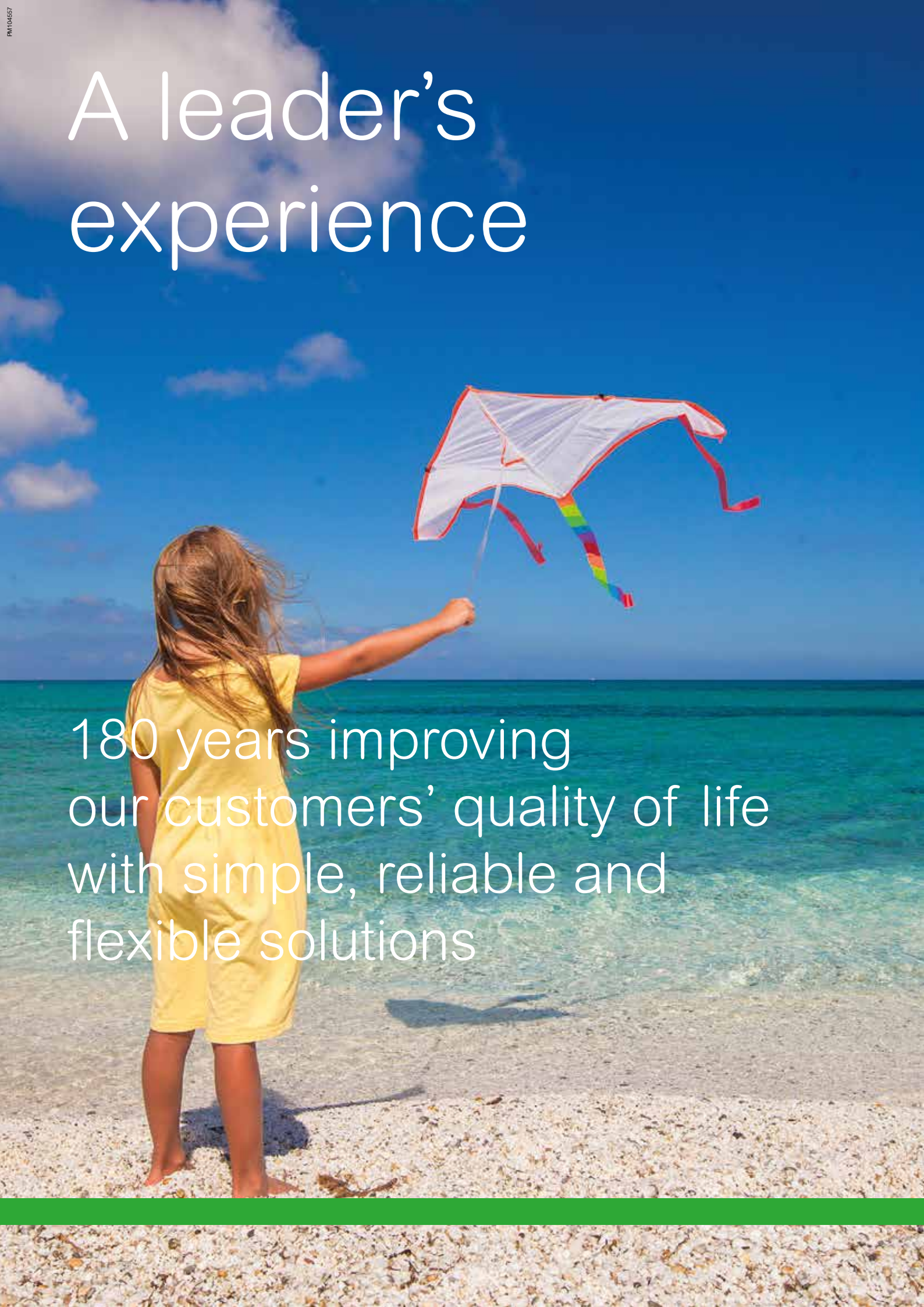
At Schneider Electric we believe that only by being at the vanguard of technology we can offer our customers the most innovative and smart solutions that respond to the challenges faced on every project.

R&D&i has been part of Schneider Electric's DNA since it began, and this has led to us being leaders by setting the pace for designing Medium Voltage equipment for the renewable market that others have later followed. We have travelled a long road alongside the main electricity companies and players in the electricity sector, seeking out solutions that best suit their requirements.

The high voltage laboratory at the R&D&i department has allowed us to perform the electrical, mechanical and climate tests needed to guarantee the quality and reliability that our customers expect from the equipment we design.



+ 30,000 MW worldwide with
Schneider Electric Energy Solutions

A young girl with long brown hair, wearing a yellow dress, stands on a sandy beach. She is holding a string attached to a white kite with red trim and a long, colorful rainbow tail. The kite is flying in a clear blue sky with a few white clouds. The ocean is visible in the background, with clear turquoise water near the shore. The overall scene is bright and sunny, conveying a sense of freedom and joy.

A leader's experience

180 years improving
our customers' quality of life
with simple, reliable and
flexible solutions

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General Presentation

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The advantages of proven technology

Quality

Right from the outset, excellence and quality have always been our highest priority.

To this end, at Schneider Electric we have implemented a quality policy which encompasses design, customization and manufacture of our equipment right through to our after-sales service.

Design quality and customization

Modular design and compact architecture

For their standard wind farm application, DVCAS cubicles can be made up of as many as 4 interconnected modular cubicle units, thus forming the most commonly used renewable power functional groups.

DVCAS cubicles are supplied as complete functional groups, the various modular functions having been assembled in the factory.

This configuration provides the user with the advantages of both compact architecture and modularity.

Operation at very low temperatures

The DVCAS has been tested to ensure that it can operate in extreme temperatures with maximum efficiency.

Fully automatable design

The DVCAS cubicle offers a flexible, fully automatable design that can be configured either in the factory or on site.

Manufacturing quality

At Schneider Electric, we are convinced that only maximum quality in manufacturing our equipment will guarantee a high level of equipment reliability. At Schneider Electric, we work day-in, day-out to continuously improve production quality, with the goal of optimizing each process to the maximum.

All our production lines operate according to Lean manufacturing methodology and the tools associated with this management model: Kaizen, Kanban, VSM, etc. All our welding processes are certified ISO 3834-2, ensuring a high-quality finished product.

Our quality department is able to rely on low and high-voltage laboratories that ensure the quality of the checks and tests conducted during manufacturing.

After-sales quality

From our earliest beginnings, we have stood out due to the high quality of service we offer. Our priority is meeting customers' needs and we strive daily to offer them a better service.

■ 24-hour service

We offer a technical support service 24 hours a day.

■ Training

We also have a fully-functioning training department that can offer training courses tailored to each customer; on our premises, at those of the customer or on site.

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Exceptional quality service sets us apart

The advantages of proven technology (cont.)

Safety

DVCAS cubicles guarantee maximum safety for both the operator and the installation.

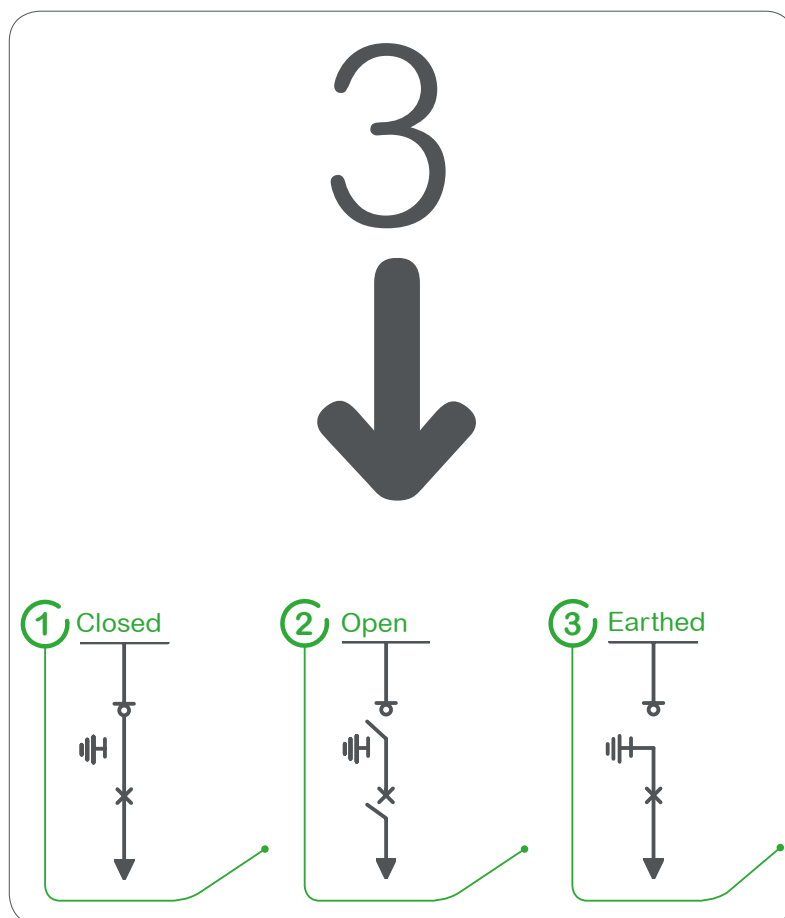
The DVCAS is designed to hold a stainless steel tank, containing all the electrical switchgear, sealed for life (30 years), that prevents the operator from coming into contact with MV live parts.

High level of operational safety

As standard, the DVCAS has the following characteristics that guarantee a high level of operational safety:

- Mechanical and electrical interlocks, to prevent incorrect operations.
- 100% factory-tested without the need for further tests on site.
- Simple design that is easy to operate, with front access to all operations.
- Tested against internal arcs IEC 62271-200 IAC AFL/AFLR.

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Maximum safety for people and installations

The advantages of proven technology (cont.)

Technical and economic efficiency

The DVCAS cubicle is the only commercially-available cubicle specifically designed to be installed on wind farms.

Its design takes account of the particular features and needs of wind farm operation.

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PW104562



We guarantee you a return on your investment

Fast assembly and commissioning time

- 100% factory-tested without the need for further tests
- Compact architecture ready for commissioning (Plug & Play)
- Integrated protection and control

Reduced maintenance

- Maintenance-free for the MV live parts
- Minimum maintenance of the driving mechanisms

Compact installation inside and outside the wind turbine

Its compact configuration, which can be split into modules, allows it to be installed both inside and outside the wind turbine.

Automation on site possible

The DVCAS can be configured for manual, local or remote control actuation. It can be configured during the manufacturing process or on site.



The DVCAS cubicle is the solution to the main demands of operation and optimizing investments

The advantages of proven technology (cont.)

Smart Grid ready

Once considered a futuristic concept, Smart Grid has now become a reality, whose energy efficiency and smart energy management are the two main prized objectives, especially in these times of economic uncertainty.

For the time being, the greatest efforts towards greater efficiency and productivity have been focused on larger turbines, wind turbine generators with better efficiency in any wind conditions and storage systems which provide flexibility in injecting energy into the system, for example.

We are convinced that we also have some way to go with our wind farm medium-voltage networks to make them "Smart" too.

Smart Wind Grid

The latest "Smart" developments in the DVCAS range offer:

- More accurate, faster troubleshooting
- Automated management of the farm's connection to the grid
- Integration of communication equipment
- A standalone power supply for the aforementioned systems
- All these features lead directly to a reduction in losses/stops, increasing the quality and safety of supply and making management of the medium-voltage network much more dynamic and smart.



The energy of the future: information, communication and online MV network management

Schneider Electric Services

Peace of mind throughout your installation life cycle

How can you cut costs and improve performance at the same time?

When it comes to your electrical distribution infrastructure, the answer is straight forward - get professional expertise.

DM10325



When it comes to your electrical distribution installation, we can help you:

- Increase productivity, reliability, and safety
- Mitigate risk and limit downtime
- Keep equipment up to date and extend lifespan
- Cut cost and increase savings
- Improve your return on investment

CONTACT US!

[www.schneider-electric/
electricaldistributionservices](http://www.schneider-electric/electricaldistributionservices)

Plan

Schneider Electric helps you to plan the full design and execution of your solution, looking at securing your process and optimising your time:

- **Technical feasibility studies:** Accompany customer to design solution in his given environment.
- **Preliminary design:** Accelerate turn around time to come to a final solution design.

Install

Schneider Electric will help you to install efficient, reliable and safe solutions based on your plans.

- **Project Management:** Designed to help you complete your projects on time and within budget.
- **Commissioning:** Ensures your actual performance versus design, through on site testing & commissioning, tools & procedures.

Operate

Schneider Electric helps you maximise your installation uptime and control your capital expenditures through its services offering.

- **Asset Operation Solutions:** The information you need to increase safety, enhance installation training performance, and optimise asset maintenance and investment.
- **Advantage Service Plans:** Customised services plans which cover preventive, predictive and corrective maintenance.
- **On site Maintenance services:** Extensive knowledge and experience in electrical distribution maintenance.
- **Spare parts management:** Ensure spare parts availability and optimised maintenance budget of your spare parts.
- **Technical Training:** To build up necessary skills and competencies in order to properly operate your installations in safety.

Optimise

Schneider Electric propose recommendations for improved safety, availability, reliability & quality.

- **MP4 Electrical Assessment:** Define improvement & risk management program.

Renew

Schneider Electric extends the life of your system while providing upgrades. Schneider Electric offers to take full responsibility for the end-of-life processing of old electrical equipments.

- **ECOFIT™:** Keep up to date & improve performances of your electrical installations (LV/MV, Protection Relays...).
- **MV product End of life:** Recycle & recover outdated equipment with end of life services.

Frequency of maintenance intervention

Schneider Electric equipment manufacturers recommend a schedule for maintenance activities to extend Electrical Distribution equipment performance over time. Frequencies under normal/healthy operation (minor equipment criticality and optimal environmental conditions) can be generally defined as follows:

Maintenance	Min. freq.(1)	Who		
		Manufacturer	Certified Partner	End user
Exclusive	every 4 years	■		
Advanced	every 2 years	■	■	
Light	every 1 year	■	■	■

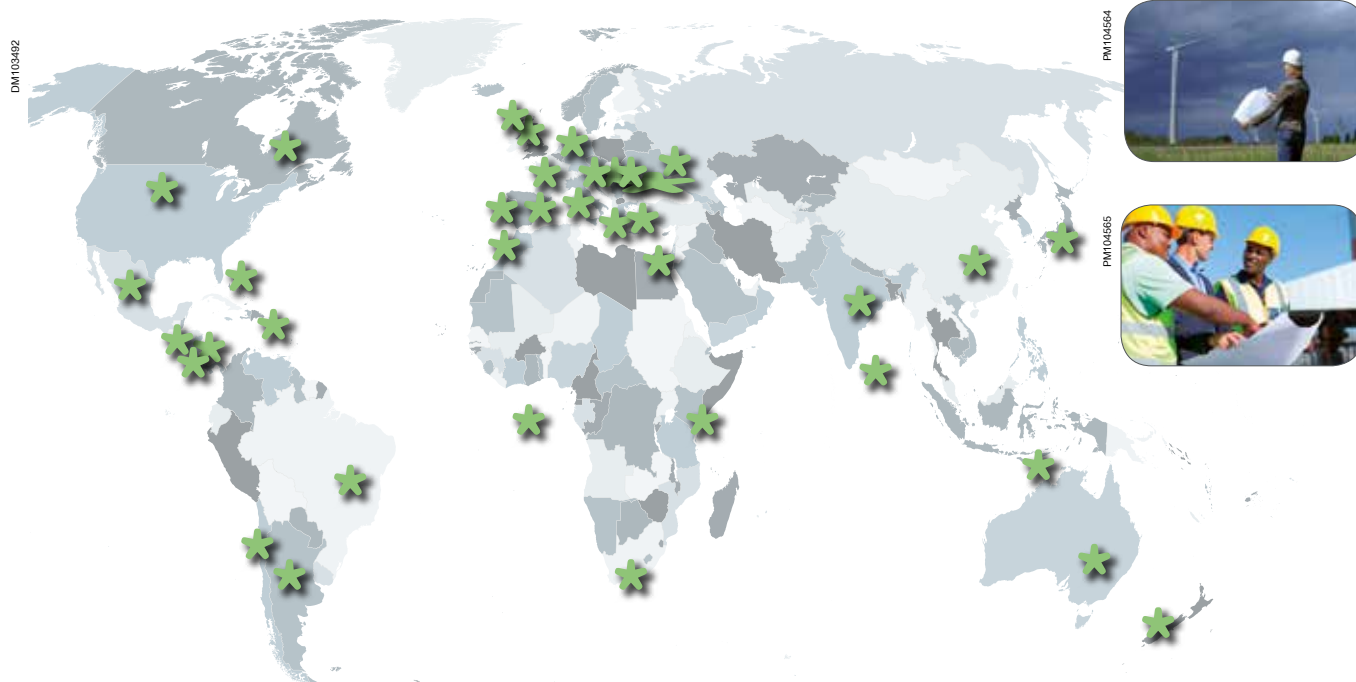
(1) Recommended under normal operating conditions (minor equipment criticality and optimal environmental conditions). However, this recommended frequency should be increased according to:
a) the level of criticality (low, major, critical) / b) the severity of environment conditions (i.e. corrosive, naval, offshore) following recommendations of Manufacturer's services.

Schneider Electric has transformed itself into the global specialist in energy management, starting in the 1990s in collaboration with the main wind turbine manufacturers and developers to provide the most efficient solutions tailored to their needs.

Leading the field all over the world

To prove the company's international leadership in the renewable power sector, Schneider Electric has pioneered the development of configurations suitable for renewable power radial architectures and was the first European manufacturer to develop MV cubicles for wind farms that comply with American standards.

Gamesa, Iberdrola Renovables, GE Wind, Alstom Wind, Vestas, Suzlon, Nordex, Enercon, IMPSA, Repower, Acciona, EDPR, Enel Green Power, etc. are some of the key players in the wind power sector who have already equipped their farms with Schneider Electric cubicles.



More than 30,000 MW installed in 45 countries over 5 continents

AMERICA

Arauco	ARGENTINA
Casa dos Ventos	BRAZIL
Montolin	CANADA
Los Cururos	CHILI
Orosi	COSTA RICA
Gibara II	CUBA
Juancho los Cocos	DOMINICAN REPUBLIC
San Antonio	GUATEMALA
Choluteca Solar Power Plant	HONDURAS
Dominica	MEXICO
Canoa	NETHERLANDS ANTILLES
Eolo	NICARAGUA
Coco	PANAMA
Tres Hermanas	PERU
Pintado	URUGUAY
Shepherds Flat Wind Farm Flat	USA

AFRICA

Monte São Filipe	CAPE VERDE
Gabal El Zayt	EGYPT
Kinangop	KENYA
Tanger	MOROCCO
Jasper	SOUTH AFRICA

ASIA - OCEANIA

Capital Hill	AUSTRALIA
Houhai Project A	CHINA
Patan	INDIA
Kashima Port	JAPAN
Al Tafila	JORDAN
Mount Stuart	NEW ZEALAND
Nabas	PHILIPPINES
Nirmalapura	SRI LANKA
Soma	TURKEY

EUROPE

Karapelite	BULGARIA
Krtolin	CROATIA
Anna	CYPRUS
Pézilla-La-Rivière	FRANCE
Trebbichau	GERMANY
Viotia	GREECE
Ikervar	HUNGARY
Corkmore	IRELAND
Sambuco	ITALY
Tholen	NETHERLANDS
Zgorzelec	POLAND
Lousa	PORTUGAL
Pantelimon	RUMANIA
El Segredal	SPAIN
Höge Väg Wind Farm	SWEDEN
Harestanes	UK

PE98521



Operating conditions

Normal operating conditions, according to the IEC International Standards listed below, for indoor switchgear.

- Ambient air temperature:
 - less than or equal to 40°C
 - less than or equal to 35°C on average over 24 hours
 - greater than or equal to – 25 °C *
- Altitude:
 - less than or equal to 2000 m;
 - above 2000 m, a derating coefficient is applied (please consult us)
- Atmosphere: no dust, smoke or corrosive or inflammable gas and vapor, or salt
- Humidity:
 - average relative humidity over a 24 hour period $\leq 95\%$
 - average relative humidity over a 1 month period $\leq 90\%$
 - average vapor pressure over a 24 hour period ≤ 2.2 kPa
 - average vapor pressure over a 1 month period ≤ 1.8 kPa

Storage conditions

In order to retain all of the functional unit's qualities when stored for prolonged periods, we recommend that the equipment is stored in its original packaging, in dry conditions, and sheltered from the sun and rain at a temperature ranging from - 40°C up to + 70°C.

** Below - 25 °C, please consult us*



IEC standards

DVCAS cubicles have been designed and certified as compliant with the following standards:

Standard	Specification
IEC 62271-1	High-voltage switchgear and controlgear
IEC 62271-100	High-voltage switchgear and controlgear Part 100: High-voltage alternating-current circuit-breakers
IEC 62271-102	High-voltage switchgear and controlgear Part 102: High-voltage alternating current disconnectors and earthing switches
IEC 62271-200	High-voltage switchgear and controlgear Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltage above 1 kV and up to and including 52 kV
IEC 60265-1	High-voltage switches Part 1: Switches for rated voltages above 1 kV and less than 52 kV
IEC 60529	Degrees of protection provided by enclosures (IP Code)



American standards

DVCAS cubicles comply with the following American standards, certified by UL (Underwriters Laboratories):

Standard	Specification
IEEE C37.06-2000	Guide for High-Voltage Circuit Breakers Rated on Symmetrical Current Basis Designated "Definite Purpose for Fast Transient Recovery Voltage Rise Times.
IEEE C37.09-1999	Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
IEEE C37.010-1999	(R 2005), IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
ANSI C37.54-2002	Indoor Alternating Current High-Voltage Circuit Breakers Applied as Removable Elements in Metal-enclosed Switchgear – Conformance Test Procedures
IEEE C37.20.3-2001	Metal-Enclosed Interrupter Switchgear
IEEE C37.200.4-2001	Indoor AC Switches (1 kV–38 kV) for Use in Metal - Enclosed Switchgear.
C37.57-2003 NEMA	Switchgear—Metal-Enclosed Interrupter Switchgear Assemblies—Conformance Testing.
C37.58-2003 NEMA	Switchgear—Indoor AC. Medium Voltage Switches for Use in Metal-Enclosed Switchgear—Conformance Test Procedures
IEEE 1247-1998	Interrupter Switches for Alternating Current, Rated Above 1000 V
NFPA 70-2005	National Electrical Code (NEC)

Canadian standards

Standard	Specification
C22.2 No. 31-04	Switchgear assemblies
C22.2 NO. 58-M1989	High-Voltage Isolating Switches
C22.2 No. 193-M1983 Reaffirmed 2004	High Voltage Full-Load Interrupter Switches

PM104571



Environment

A rigorous material management system, at the heart of the whole productive process, ensures product traceability and prevents emission of pollutants.

Emission-free

Since its foundation, Schneider Electric has been strongly committed to the environment. Schneider Electric was one of the first companies to stake its future on renewable energies and design MV equipment for protecting wind farms. Schneider Electric integrates the top 10 of the 2015 Global 100 Most Sustainable Corporations in the World.

The materials used are identified, and are easy to separate and recycle.

DVCAS cubicles have been designed with protection of the environment in mind:

- "RoHS Compliant".
- Obsolete DVCAS cubicles can be processed, recycled and their materials recovered in accordance with the requirements of European legislation for end of life of electrical and electronic products.
- The tanks are leaktight, thus allowing DVCAS cubicles to be classified as "sealed pressure systems". The SF₆ gas can therefore be recovered and, after appropriate treatment, be reused.
- The environmental management system adopted by Schneider Electric is certified in accordance with the requirements set out in standard ISO 14001.

Schneider Electric has a number of energy-efficient installations using pioneering production methodologies that guarantee maximum respect for the environment throughout the manufacturing process and in the final product.

PM104584



Quality

*Ongoing commitment to quality.
High-quality products, care and support.*

PM104588



ISO 14001

PM104589



ISO 9001

Manufacture: Rigorous systematic checking

Quality is our top priority. To this end, at Schneider Electric we have implemented a quality policy which encompasses design and customized manufacture right through to the after-sales service.

This quality system is certified in accordance with the requirements of standard ISO 9001.

As part of this established policy of maximum manufacturing quality, the stainless steel welding processes are certified in accordance with international standard ISO 3834-2.

During the manufacturing process, in order to check the quality, each DVCAS cubicle is subjected to routine systematic checks: leaktightness, dielectric test, contact resistance, etc. The results of all these checks are recorded and form part of the test certificate available for each cubicle.

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Mungia, Spain

Product Description

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Description of DVCAS

The DVCAS cubicle is a compact piece of equipment resulting from the combination of various modules for renewable transformer substations.

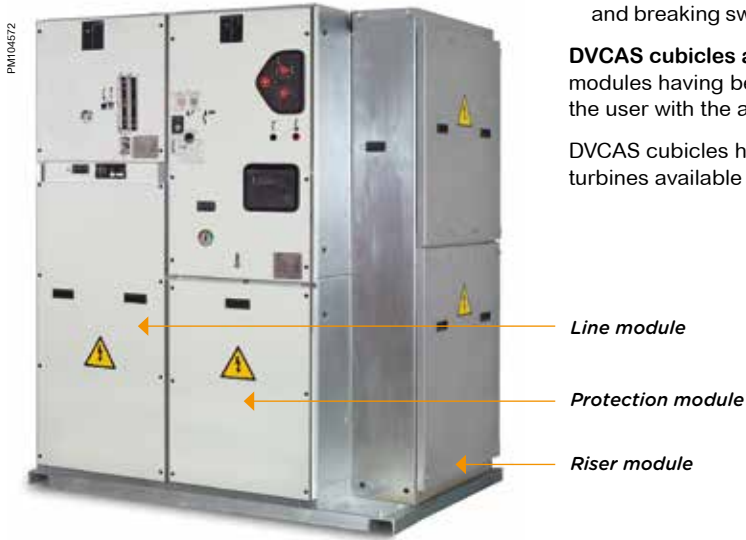
For their standard wind farm application, the cubicles can be made up of as many as 4 interconnected modules, thus forming the most commonly used renewable power functional groups.

Each of the modules consists of:

- Metal base frame
- Driving mechanism and relay compartment
- MV cable compartment
- Stainless steel, gas-tight cubicle, insulated with SF₆, busbars and switching and breaking switchgear

DVCAS cubicles are supplied as complete functional groups, the various modules having been assembled in the factory. This configuration provides the user with the advantages of both compact architecture and modularity.

DVCAS cubicles have been developed for installation on the various wind turbines available on the global wind market and are constantly evolving.



DVCAS inside the wind turbine

DVCAS inside a kiosk



Continued development of the DVCAS means that Schneider Electric is the first European company to develop a medium-voltage GIS solution for wind turbines installed in the United States and Canada, compliant with UL standards.

36 kV DVCAS characteristics

Electrical characteristics		
Nominal voltage *	(kV)	36*
Frequency	(Hz)	50/60
Nominal current	(A)	630
Short-circuit current (rms value) **	(kA/s)	20/3
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/1 s)	20

Technical characteristics		
Degree of protection		
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)	-25 to +40
Storage temperature	(°C)	-40 to +70
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.

** 25kA available under request.

*** Except in the part corresponding to the cable passageway.

⁽¹⁾ For IAC AFLR applications, available under request.

⁽²⁾ For applications in temperatures below -25°C or higher than +40°C, please consult us. (Available solutions for -40°C)

⁽³⁾ For altitudes of more than 2000 m, please consult us.

PM104575



El Pical wind farm - Palencia (1500 m)

PM104576



Wind Power Box - Transformer Substation

PM104577



Marine wind farm in Øresund, Denmark

PM104578



The amount of energy we consume daily in manufacturing is immense. This fact is hugely at odds with the reality of the situation: energy resources are running out and before long it will no longer be possible to continue living as we do.

That's why national and local governments are starting to see the importance of making extensive use of alternative energy sources: wind, solar, geothermal, hydroelectric and biomass. All social, technological and industrial players have recognized the importance of promoting sustainable, balanced global development, which is why they need to expand the use of renewable energies.

The advantages of using renewable energy are enormous: it can help reduce countries' dependence on energy imports and thus ensure a supply that contributes to improving the global competitiveness of European industry, it has positive effects on regional development and employment, and fits in with Europe's global sustainable development strategy.

The future of renewable energies

The renewable sector is experiencing huge growth worldwide. Nonetheless, in order to put together a global solution it would be necessary to devise storage systems and an efficient transport network.

Technological developments on wind farms in recent years present new challenges:

- 1. 36-38 kV networks are now required:** DVCAS cubicles comply with all the requirements posed by networks up to 38 kV in wind farms.
- 2. The nominal wind turbine power is increasing all the time**
- 3. Offshore wind is a booming market,** with considerable development prospects and is shaping up to be one of the renewable technologies with most growth potential in Europe in the coming years.
- 4. The growth of Photovoltaics:** The PV market has been deployed faster than anticipated and by 2020 will probably reach twice the level previously expected.

Primary distribution - CBGS cubicle range

CBGS primary distribution cubicles insulated with SF₆ gas are the perfect complement to DVCAS for renewable MV/HV substations.

The use of CBGS-0 cubicles makes the best use of the space available since they take up between 50% (24 kV) and 70% (36 kV) less space than conventional air-insulated solutions.

+25,000 CBGS cubicles installed worldwide

With our offer you can benefit from:

■ Optimized investment

- Lower engineering costs
- Lower management costs
- Lower time costs (Plug & Play)
- 30% and 60% less bulk

■ Safety and Reliability

- Safety for people and equipment
- Reinforced substations
- Able to withstand adverse weather conditions
- Compliant with international and local standards
- Easy to transport by road and sea

Solution for Wind Farms

DVCAS is a compact cubicle, resulting from the configuration of different modules joined together.

Inside, each modular cubicle contains all the switchgear needed to protect and connect each wind turbine transformer to the wind farm medium-voltage network.

Since DVCAS cubicles have been designed specifically to go inside wind turbines, no site configuration is required, cutting the cost and simplifying installation as well as reducing the environmental impact.

Solution for Photovoltaic Plants

For large photovoltaic farms, MESA has cubicles adapted to the requirements of PV Box transformer substations. PV Box is an integrated transformer substation that includes solar inverters and electrical equipment. Included in the MV electrical equipment are DVCAS cubicles that guarantee the highest protection and reliability of the entire solar plant and maximum safety for people and equipment.

MESA offers cost-effective, flexible PV solutions for installations of all sizes, all combined with the reliability and confidence MESA can offer, as a global company with more than 65 years' experience.

Solutions for Offshore Wind Farms

The potential of seas and oceans has driven the expansion of offshore wind farms, and the growth forecasts for these farms in the near future are very optimistic. The Marine Energy industry is growing at a rapid rate in Europe.

At Schneider Electric we have drawn on our experience and applied it to the technology and management of offshore installations and we have adapted the DVCAS cubicle to cover all requirements for medium voltage protection of Offshore farms and platforms. The DVCAS cubicle offers a high level of safety, reliability and continuity of service in harsh conditions.

We have developed a new design in order to improve the response of the switchgear to harsh environmental conditions, high salinity, humidity and temperature that could affect the performance of the equipment.

These new improvements will avoid:

- Leakage due to pitting corrosion of the stainless steel tank
- Failures or operating anomalies due to corrosion mechanisms
- Structural, malfunction and aesthetic problems due to corrosion of the outer surface of the switchgears

Offshore technology :
Hope for the future



The choice of network configuration used in wind farms will affect the services required by the MV switchgear. The majority of onshore wind farms are arranged in a radial configuration, but offshore farms use a ring configuration. The radial configuration is characterized by its simplicity, lower investment required and ease of commissioning. However it provides less continuity of service in the event of a fault.

33 kV - 1250 A - 31.5 kA/3 s



Application

Typical Example of a photovoltaic substation

Photovoltaic power stations are groups of equipment with huge generating capacity, usually connected to the medium voltage (MV) electrical distribution network.

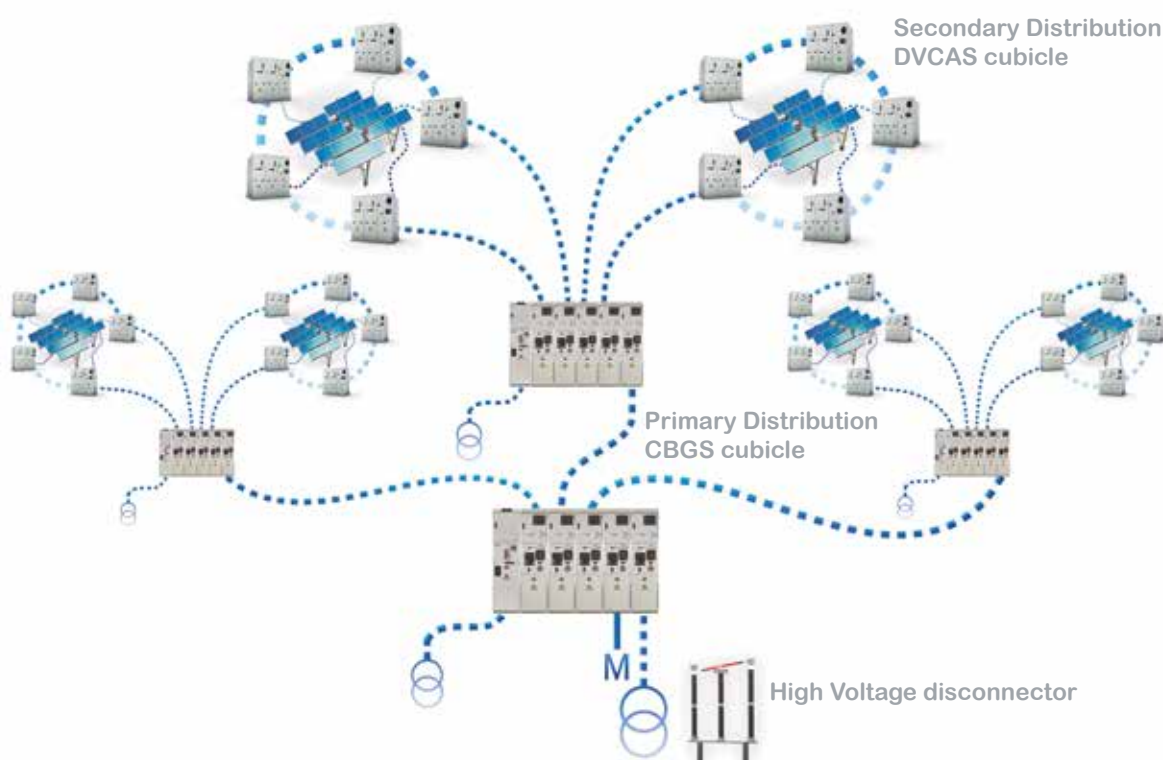
They can consist of a large number of individual PV generators with different power ratings (50, 100, 630 kW, etc.).

MV distribution in solar parks

MV electrical distribution on a solar park consists of a certain number of LV/MV transformer substations in PV generating units connected in a loop (ring), so the typical diagram for this type of substation has two line functions and one protection function with a transformer with fuse-switch or circuit-breaker, depending on the size of the transformer itself.

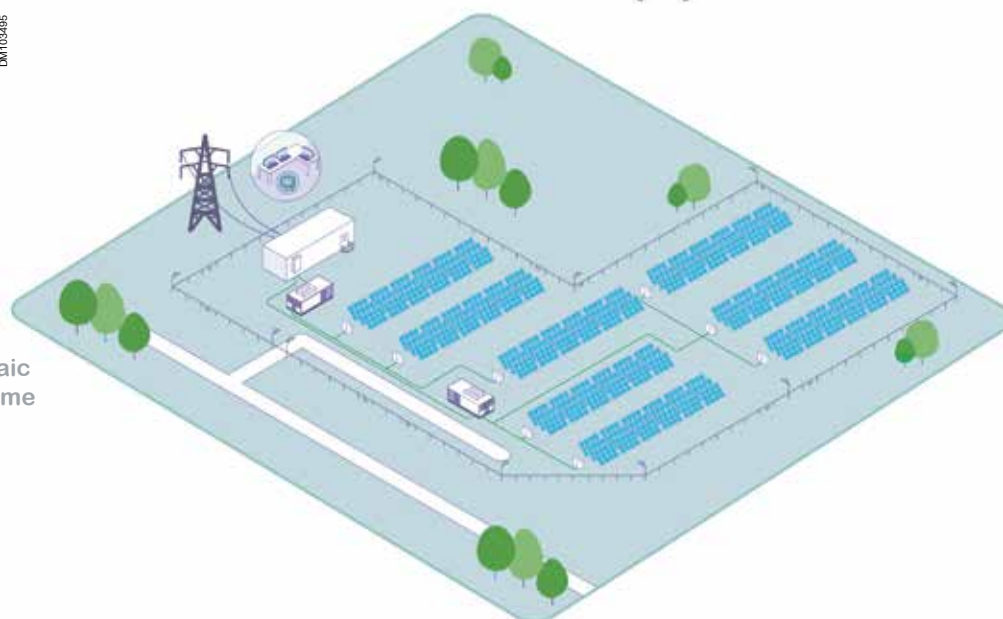
Nevertheless, it is also possible to have bypass diagrams that do not form part of the loop, and also two transformers contained in the same transformer substation.

DM103484



DM103495

Photovoltaic park scheme



Application

Installation inside the wind turbines

The special installation conditions on wind farms make the size of the access doors to the wind turbines a critical aspect of the design.

As this equipment is usually installed inside the wind turbines, it must be designed to go through the door in case replacement is ever necessary.

Although the DVCAS cubicle is supplied in its final configuration as a compact cubicle that has been assembled and tested on a bench in the factory, it can be split into different modules to allow removal through the door.

All the modules fit through the wind turbine doors, including in multi-megawatt turbines with access doors just 600 mm wide.

The modules can easily be inserted and removed through the door with the help of a roller conveyor which can be supplied by Schneider Electric on request.

If necessary, we have an interactive multimedia DVD which shows the process of putting the cubicle inside the wind turbine; separating the modules, assembling them inside the wind turbine and the subsequent dielectric and voltage drop tests.

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PM104591



PM104592



PM104593



Wind turbine technology is continually evolving, with ever larger power generators, leading to new turbine solutions.

Depending on the transformer power, there are two different modular functions for protecting the turbines.

■ Q function:

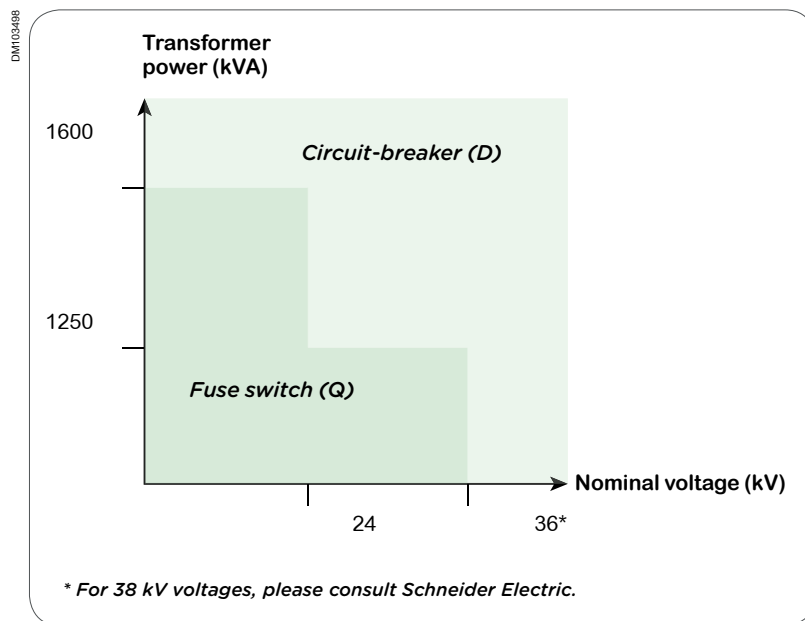
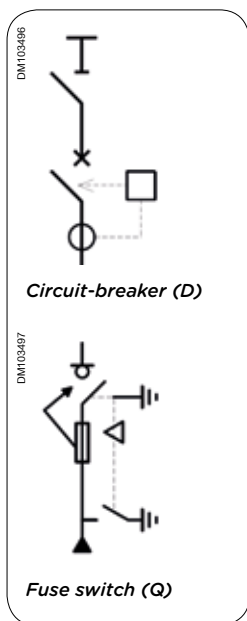
Protection with combined fuse switch, in which the switch-disconnector, combined with fuses, is capable of protecting transformers up to 1250 kVA (36 kV version) or 1600 kVA (24 kV version). This limit has been established to comply with the requirements of standard IEC 62271-105 for combined fuse switches.

■ D function:

Protection with circuit-breaker for higher power ratings than 1250 kVA (36 kV version) or 1600 kVA (24 kV version).



Selecting protection for transformers



DVCAS is a configurable piece of equipment that aims to satisfy the many and varied demands of the global renewable power market.

In an attempt to provide the solutions that most closely meet the needs of our customers and the different installation models, we have a wide range of customization options, in order to maximize the value and ultimate satisfaction for our users.

Special adaptations particularly worthy of mention are:

- **Adaptation to UL (Underwriters Laboratories) requirements** for wind farm applications in USA and Canada operating at 34.5 kV.
- **Adaptation to ENA requirements** for wind farm applications in the UK.
- **Adaptation of the cubicle to the internal configuration** of different wind turbines.
- **Smart Wind Solution** for intelligent, automated wind farm management.

Customization centers

We have set up customization centers in key countries, including Brazil, USA, England and Germany that, due to the requirements of local regulations or certifications, or because of particular features, mean our solution offers greater added value.



Design and manufacturing centers

Our plant at Mungia (Spain), one of the most modern design and manufacturing centers of MV equipment in Europe, is capable of implementing the particular features each project requires both quickly and reliably.



DVCAS modules

Recommended configurations	34
Transformer protection (D)	36
Incoming line (I)	41
Riser function (0)	43
MV cable compartment	44
Weights and dimensions	45

The DVCAS cubicle is made up by joining together up to four modules.

There is a possibility of combining more than two circuit breaker protection modules.

DVCAS leaves the factory as a compact cubicle, that has been tested, assembled and mounted on the bench. Depending on the number of incoming - outgoing lines needed for each wind turbine, different functional groups will be needed.

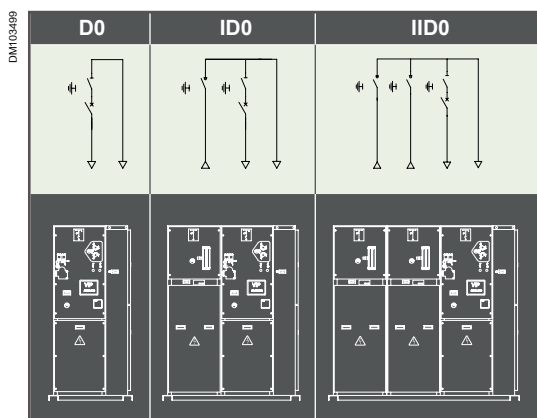
We recommend using a rigid incoming busbar riser (0) for the incoming line to the following wind turbine.

We recommend using a three-position switch-disconnector (I) for the outgoing line from the preceding wind turbine(s), which makes the wind farm much easier to operate and maintain (see page 26 for a typical diagram of a wind farm).

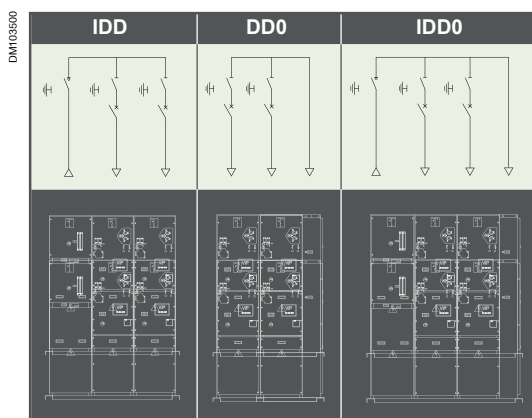
- **0 module:** Busbar riser function.
- **I module:** Switching function with switch-disconnector.
- **D module:** Protection function with circuit-breaker.

The configurations recommended by Schneider Electric have been chosen primarily for their safety, optimized cost and space saving.

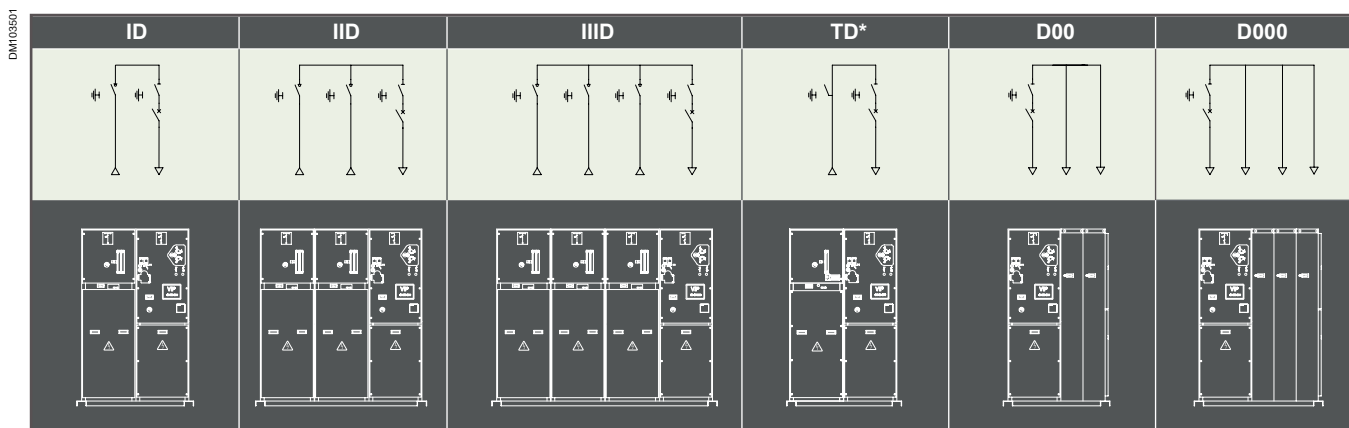
Recommended configurations



Configurations for more than one protection functions



Other possible configurations



For other configurations, please consult Schneider Electric.

* T: outgoing line

Combinations with 0 riser function are units specifically designed for wind farms with a radial configuration and they have numerous advantages over combinations without the busbar riser function.

Safety

- In the event of a short-circuit between two wind turbines, the affected area is isolated and there is no risk of earthing the substation when the power returns.
- No operating procedures or interlocks are needed.

ID0 is the best solution for maximum safety

Optimized cost

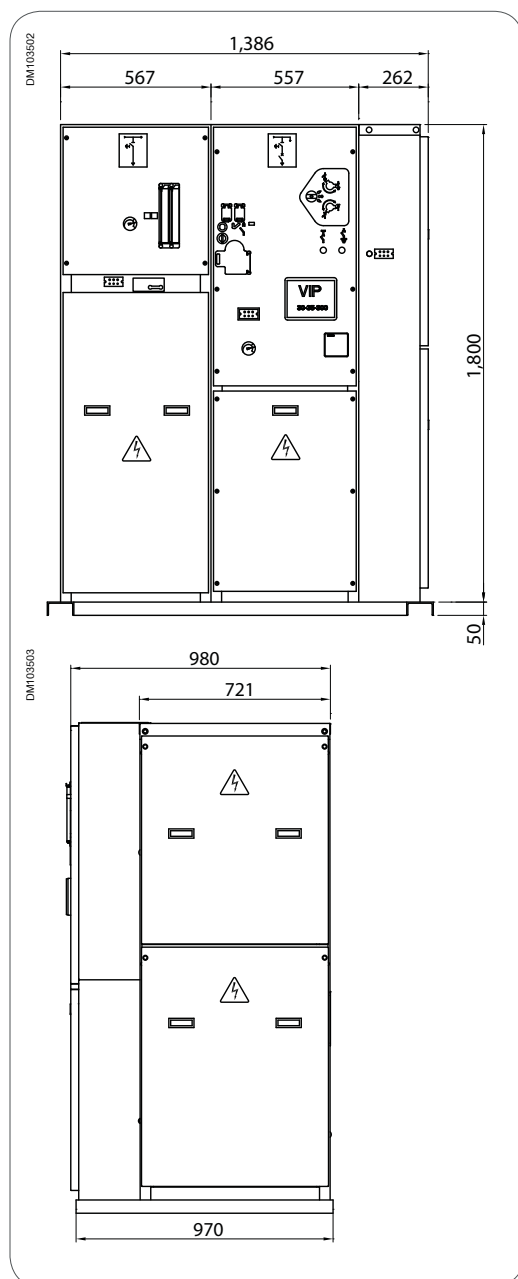
- No interlocks are needed to prevent the substation being earthed.
- The riser function (0) costs less than the three-position switch disconnecter (I).

ID0 is the best solution for maximum cost optimization

Space saving

The function (0) is much narrower than I and D cubicles.

ID0 is the best solution for maximum space optimization



Transformer protection (D)

D transformer protection module

Includes the vacuum circuit-breaker and the three-position disconnect. It can include a rigid incoming busbar riser.

Sealed-for-life SF6 tank

- Busbar
- 3-position disconnect
- Vacuum circuit-breaker

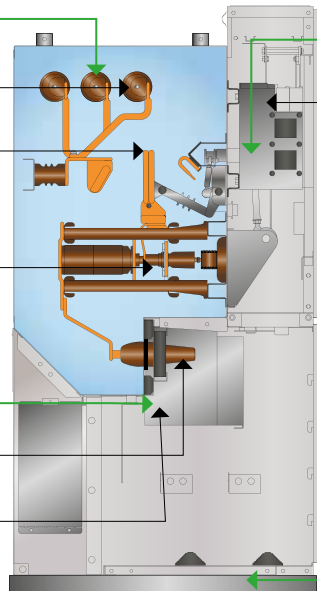
Driving mechanism and relay compartment

- Disconnect driving mechanism
- Circuit-breaker driving mechanism * motor for the driving mechanism (optional)
- VIP protection relay

MV cable compartment

- Cable bushings for connecting cables
- Three CRc phase current sensors
* Two cables per phase but still with the same dimensions (optional)

Metallic frame



Cable earthing interlock (optional)

Mimic diagram

Circuit-breaker driving mechanism

- Closing pushbutton
- Opening pushbutton
- Actuating points for manual spring loading lever
- Mechanical position and spring loading indicators

Disconnect driving mechanism

- Disconnect: open-closed
- Earthing switch: open-closed
- Position indicators

Voltage presence indicator

SF6 pressure inside the tank indicator

Cable bushings for connecting cables

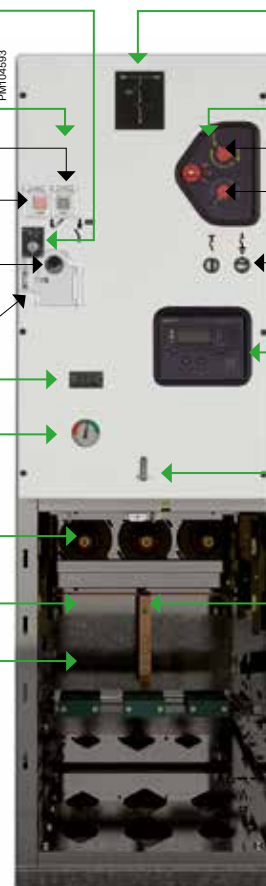
MV cable compartment

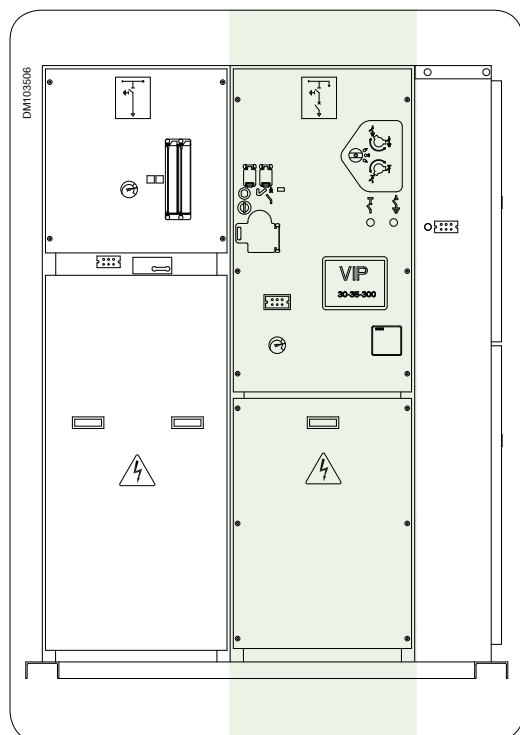
Cable ties

Protection relay (VIP series)

Power cable compartment door opening-closing latch

Earthing bar





Vacuum circuit-breaker

The transformer is protected by the circuit-breaker. The CB extinguishes the arc safely.

The vacuum circuit-breaker is sealed inside the tank.

The actuating mechanism is outside the SF₆ cubicle and is easily accessible for maintenance and preventive maintenance by removing the front panel of the cubicle.

The circuit-breaker is category E2 M1 in accordance with standard IEC 62271-100, with an operating cycle O-0.3s-CO-15s-CO.

There are two models, depending on whether it incorporates a busbar riser through the cable bushing at the top right or not.

There is a possibility of combining more than two protection circuit breaker modules.

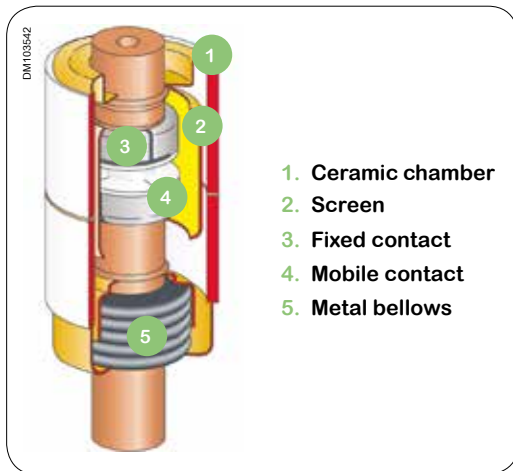
Any functional units are always connected on the left. If no other module needs to be connected on the left of function D, the connection sockets are equipped with insulating plugs.

The vacuum circuit-breaker incorporated in DVCAS cubicles complies with the requirements of standard IEC 62271-100.

Technical and electrical characteristics

Nominal voltage	(kV)	36*
Frequency	(Hz)	50/60
Nominal current	(A)	630
Short-circuit current (rms value)	(kA/s)	20/3 - 25/2
Short-circuit current (peak value)	(kA)	50/52 - 63/65
Insulation level		
At industrial frequency (50/60 Hz-1 min)	(kV)	70
Lightning impulse	(kV)	170
Circuit-breaker		
Electrical endurance	(Class)	E2
Mechanical endurance	(Class)	M1
Short-circuit breaking capacity (rms value)	(kA)	20 - 25
Three-position disconnect		
Electrical endurance	(Class)	E0
Mechanical endurance	(Class)	M0

* For 38 kV voltages, please consult Schneider Electric.



Vacuum circuit breaker components

Circuit-breaker operating mechanism

The vacuum circuit-breaker is actuated by means of operating mechanisms that guarantee an opening and closing rate for the switching device independent of the operator. This mechanism performs fast remote closing cycles. The speed at which the contacts on the circuit-breaker used for the DVCAS switchgear open and close is independent of the operator's actions. This electrical mechanism, which is always motorized to carry out remote control functions, is used for fast reclosing cycles.

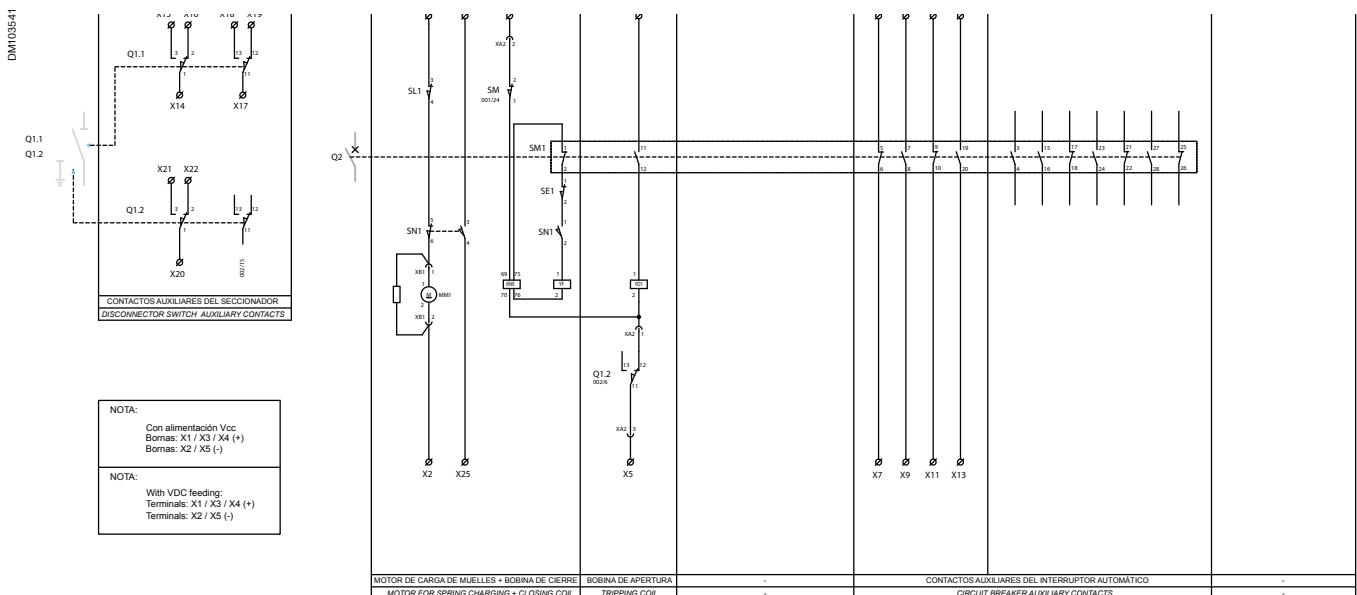
All the operating mechanisms on the switchgear installed in DVCAS cubicles are arranged on the outside of the SF₆ tank.

The maintenance required by this type of operating mechanism is significantly reduced since they use self-lubricating components.

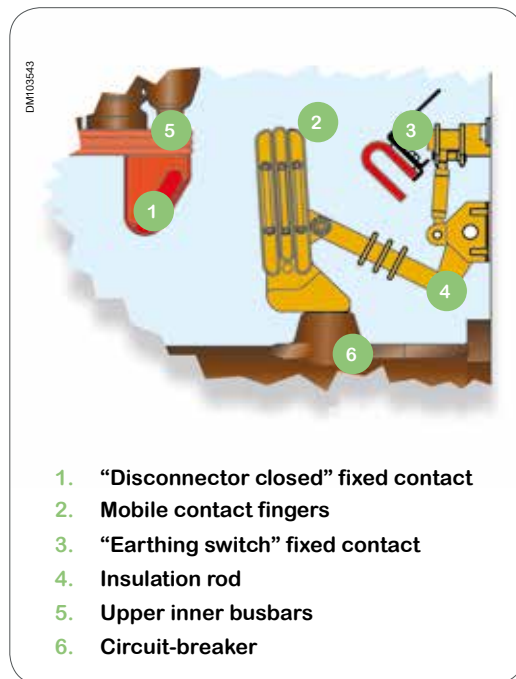
The operating mechanism includes:

- A spring system that stores the power needed to open and close the circuit-breaker.
- A manual spring-loading system.
- An electric motor loading device which automatically reloads the springs less than 5 seconds after closing of the main contacts.
- A mechanical opening pushbutton with cover for the interlock (optional).
- A mechanical closing pushbutton with cover (optional).
- An electrical closing system that includes a closing coil for remote control and an anti-pumping relay.
- An electrical opening system that includes a single or double trip coil (optional).
- Operation counter.
- A spring-loading indicator contact.
- A loading complete indicator contact.
- A mechanical switch position indicator: open-closed.
- A mechanical spring status indicator: loaded-unloaded.
- An interlock using a key for locking the circuit-breaker in open position (optional).

Operating mechanism auxiliary diagram



- M** Spring loading motor.
YF Closing coil.
KN Anti-pumping relay.
Y01 Trip coil.
Y02 Second trip coil (optional).



3-position disconnector

The 3-position disconnector incorporated in DVCAS cubicles complies with the requirements of standard IEC 62271-102 for disconnectors and earthing switches.

The actuation speed in all the opening and closing operations depends on actuation by the operator. The short-circuit breaking capacity, on both the disconnector and earthing switch, ensures they act as a circuit-breaker.

Operation and control

The 3-position disconnector is always manually operated using an actuating lever.

The function is selected (operation permissible on the disconnector) using an indicator type selector switch.

Interlocks

In the design of both the circuit-breaker and the disconnector, all operating conditions have been taken into consideration, guaranteeing maximum safety of operators and the installation through the use of appropriate interlocks, thus eliminating the possibility of incorrect operations.

Standard disconnector operation is manual, using an actuating lever.

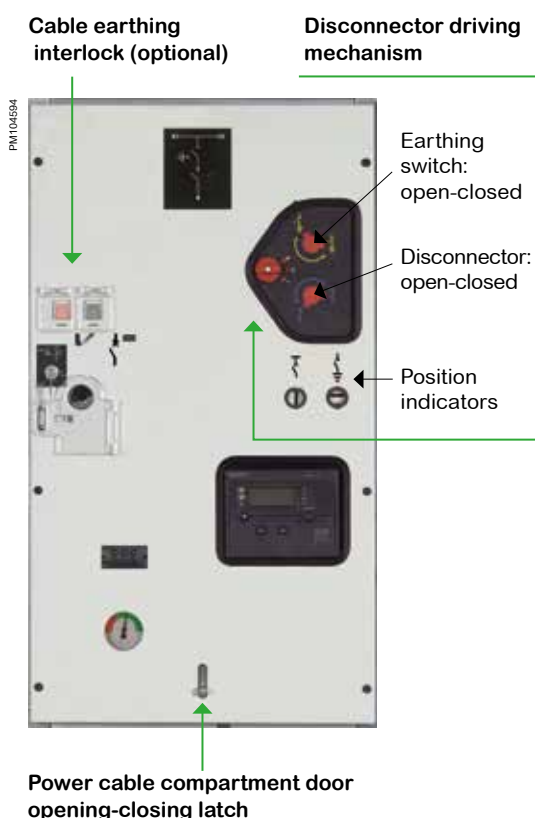
The function is selected (permissible operation) using a selector switch.

The indicator type selector switch design only allows the actuating lever to be inserted in the actuating point corresponding to the selected function.

The actuating lever cannot be removed until the disconnector operation is fully complete.

The circuit-breaker cannot be closed until the function selector switch has been put in the neutral position, which ensures that the disconnector completes its operation.

The 3-position disconnector can only be actuated when the circuit-breaker is in the open position.



Combination of circuit-breaker and disconnector

All mechanical and electrical operations on the circuit-breaker are prevented until the function selector switch is in the neutral position.

In addition, the connecting the disconnector to earth cancels all electrical operations on the switch. For its part, no operation will be possible on the 3-position disconnector while the circuit-breaker is closed.

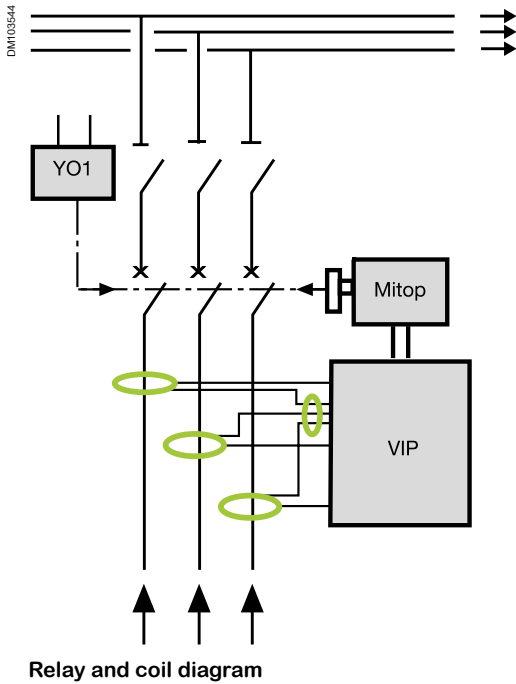
Access to MV cables and the transformer enclosure

As an option, the protection function has a key that remains free when this function is earthed.

Similarly, it is not possible to access the MV cable compartment unless this functional unit is earthed.

Secondly, there are specific internal interlocks that ensure that operations on the switch and earthing switch are prevented when the panel has been removed or the key withdrawn.

There are other special interlocks using a lock that can also be included as an option.



Protection chain

Protection system characteristics

For their usual wind power application, DVCAS cubicles have a protection system which allows them to operate without needing an external power supply.

The system comprises:

- 3 x CRc current sensors, toroidal type
- CSH-30 homopolar current sensor, toroidal type and they should be placed at the rear of the VIP relay.
- VIP electronic relay
 - Located on the front panel of the mechanisms, this is protected by a transparent cover that gives the assembly an IP 54 protection rating.
 - Its basic electrical characteristics are:
 - Phase-to-phase fault protection
 - Phase-to-earth fault protection
 - No need for an external power supply
- Trip coils : DVCAS cubicles provided with a circuit-breaker incorporate (as standard) 2 trip coils:
 - Mitop coil: self-powered by means of a relay
 - YO1 coil for external trip

Indications: reliability

The system indicating the disconnector position complies with standard IEC 62271-102, avoiding the need to incorporate windows or any other device for visually checking the switchgear position.



Remotely operated
circuit breakers

Incoming line (I)

Feeder cubicle (I)

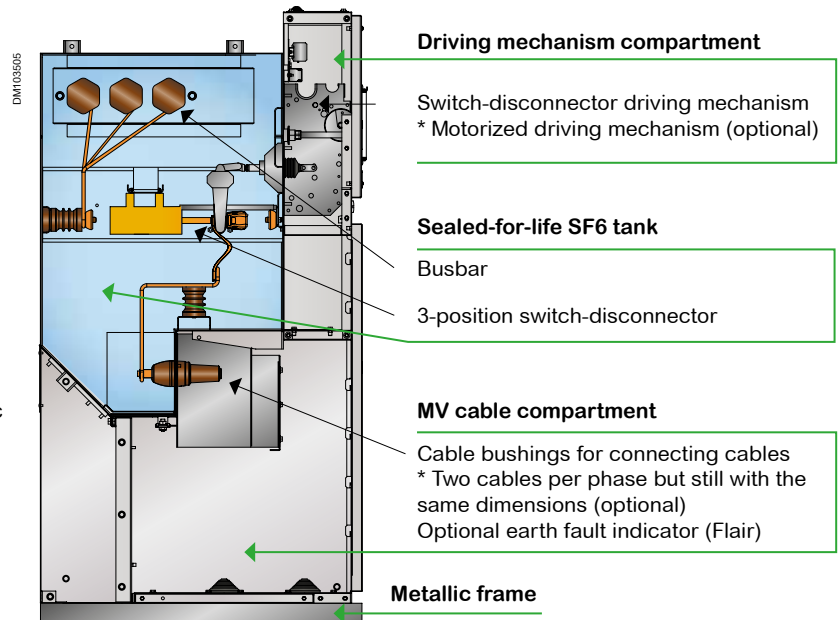
Includes the three-position disconnecter. It can include a rigid incoming busbar riser.

We recommend that the incoming line function from the preceding wind generator, on wind farm MV networks, is created by using a modular DVCAS cubicle equipped with a I 3-position switch-disconnector, for a variety of reasons:

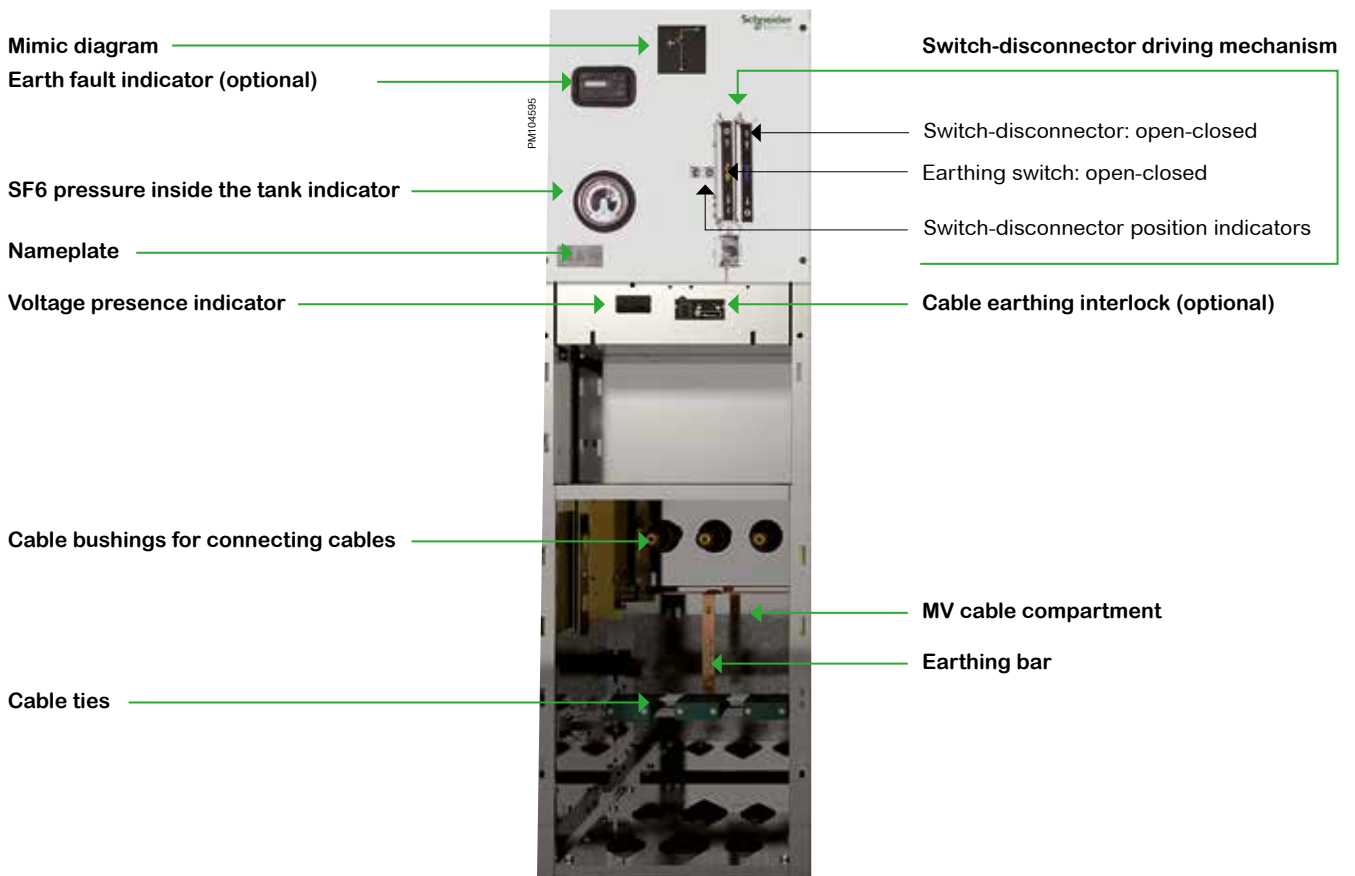
- Minimizes downtime in the event of malfunctions
- Assists troubleshooting
- Reduces downtime for maintenance work
- Optimizes energization work

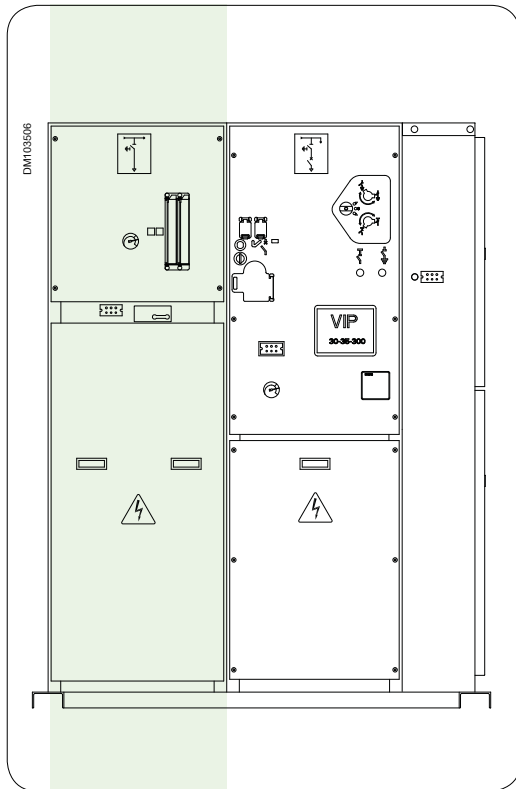
The I function is always connected to the D protection function on the right, by means of single-phase coupling bushings with screened elastomeric insulation.

** Contact Schneider Electric for different configurations*



Switch-disconnector mechanisms





Switch-disconnector

The switch-disconnectors are three-position autopneumatic type: connected, disconnected and earthed, and hence intrinsically safe (preventing incorrect operation).

They are general usage category, for frequent use (100 operations), in accordance with IEC 60265-1. They have short-circuit breaking capacity, on both the switch-disconnector closing and cable earthing operations. The breaking technique used is autopneumatic blowing of SF₆ towards the contact separation zone.

Operation and control

The actuation speed in all opening and closing operations (except opening the earthing switch) is independent of actuation by the operator. The 3-position disconnector can always be manually operated using an actuating lever.

As an option, the switch function driving mechanism can be motorized and the actuating lever can be the non-return type. This function, combined with Flair type earth fault detectors and protection devices in the substation allows remote fault isolation and gradual service restoration.

Interlocks

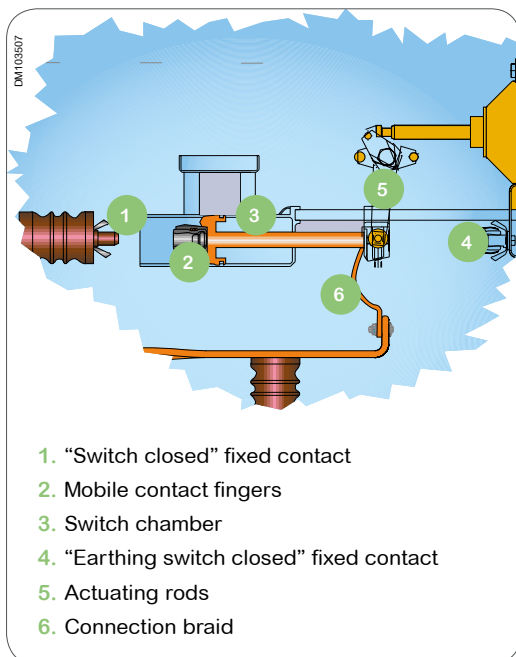
In the design of the switch-disconnector, all operating conditions have been taken into consideration, guaranteeing maximum safety of operators and the installation through the use of appropriate interlocks.

Access to MV cables

The interlock allowing access to the MV cable compartment is only released once the circuit has been earthed. As an option, an interlock with a lock can be incorporated, in such a way that its key is only released with the earthing switch in the closed position and the panel unlocked.

Characteristics

The 3-position disconnector incorporated in DVCAS cubicles complies with the requirements of standards IEC 60265-1 (IEC 62271-103) for switches and IEC 62271-102 for disconnectors and earthing switches.



Technical and electrical characteristics

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

Switch-disconnector

Electrical endurance	(Class)	E3
Mechanical endurance	(Class)	M1

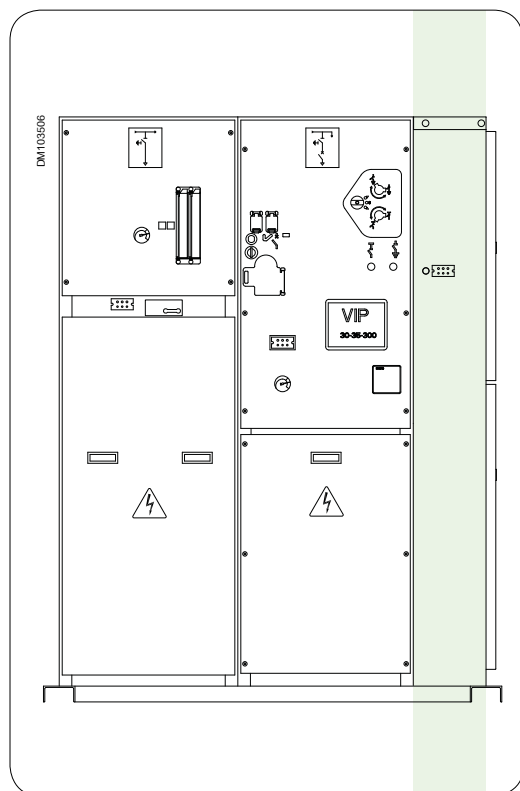
Earthing switch

Electrical endurance	(Class)	E2
Mechanical endurance	(Class)	M0

* For 38 kV, please consult Schneider Electric.

Riser function (0)

We recommend using a rigid incoming busbar riser (0) for the incoming line to the following wind turbine.
The 0 modular cubicle can also be used to create the outgoing line, using a second group of three cables.



Interlocks

Special attention should be paid to the appropriate use of interlocks that prevent accidental earthing of the whole MV circuit with the power on.

When accessing the riser function connectors, always check that no voltage exists at this point of the circuit. After checking no voltage is present, remove the panel.

Earthing interlocks with a key are also available as an option.

Voltage presence indicator

Incorporated on the front of the equipment are voltage presence indicator systems in accordance with standard IEC 61958. A flashing LED indicates voltage presence in the cable corresponding to the phase indicated (L1-L2-L3).

Riser module with earthing switch T

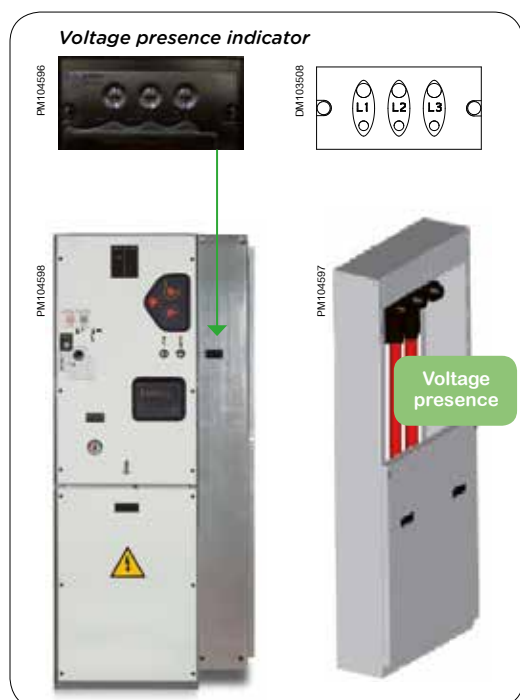
Only an earthing switch for the incoming line may be required and exceptionally for both the incoming and outgoing line on a wind turbine. For this a DVCAS T functional module can be used, which allows connection of up to 2 cables per phase (3 small connectors) to create the incoming and outgoing lines.

This module has the same components as the I incoming line module, except that it does not incorporate the line switch function nor its associated elements.

Technical and electrical characteristics

Nominal voltage	(kV)	36*
Frequency	(Hz)	50/60
Nominal current	(A)	630
Short-circuit current (rms value)	(kA/s)	20/3 - 25/2
Short-circuit current (peak value)	(kA)	50/52 - 63/65
Insulation level		
At industrial frequency (50/60 Hz-1 min)	(kV)	70
Lightning impulse	(kV)	170
Earthing switch category (0LT)		
Electrical endurance	(Class)	E2
Mechanical endurance	(Class)	M0

* For 38 kV voltages, please consult Schneider Electric.



The Medium Voltage incoming/outgoing cable connection compartment is located at the bottom of the cubicle and can be accessed from the front.

It contains:

- Compartment access door
- Electrical warning triangle
- 3 cable bushings for connecting the MV cable terminals
- MV cable tie system
- Earthing bars

PM104599



Side cable compartment

PM104600



Cable bushing

Earthing bar

MV cable compartment

Cable ties

In addition to the visual safety elements (voltage presence indicators and electrical warning triangle), the cable compartment access door has the necessary interlocks to guarantee safety. On all modular cubicles, the door can only be opened when the line is earthed (D, I, O, T).

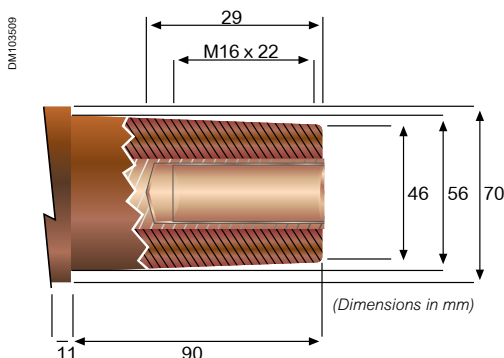
Each cubicle has plenty of cable compartments, with enough room to install a double connection where necessary, which can be accessed from the front.

The transformer protection cubicles incorporate (depending on their type) a side cable compartment, which can be used to create the rigid incoming busbar riser.

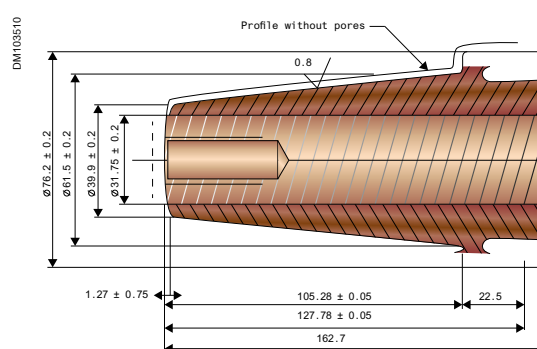
All the equipment has a general earth collector at the bottom consisting of a 40 x 5 mm copper bar (marked 15), provided with connection terminals, in order to connect the equipment to the transformer substation general earthing circuit. This is essential for protecting people against dangerous electrical discharges.

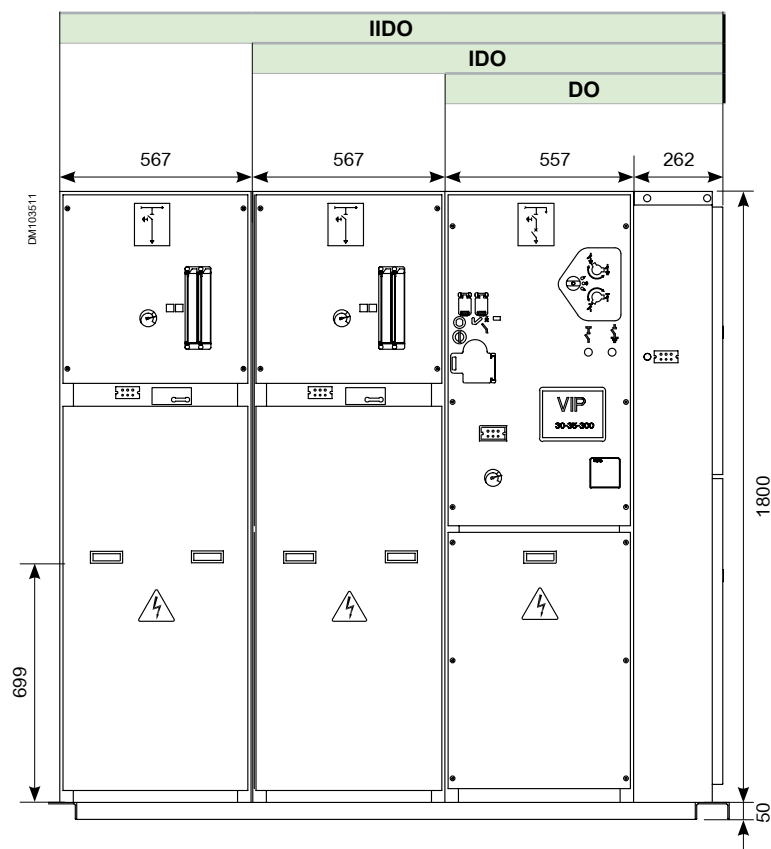
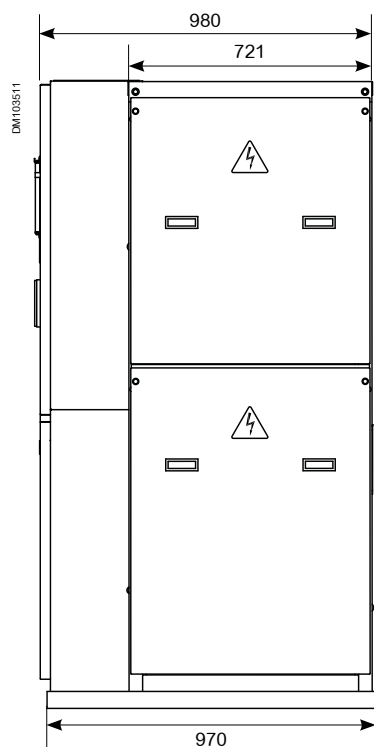
The cubicle MV cable earths should be connected to these bars.

IEC Cable bushing



IEEE cable bushing





Technical and electrical characteristics

	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
D0	1,800	819	980	375
ID0	1,800	1,386	980	650
IID0	1,800	1,953	980	925
TD	1,800	1,124	980	625
ID	1,800	1,124	980	625
IID	1,800	1,691	980	900
IIID	1,800	2,258	980	1175
D00	1,800	1,051	980	400
D000	1,800	1,283	980	425
ID00	1,800	1,618	980	675
IDD	1800	1681	980	975
DD0	1800	1396	980	725
IDD0	1800	1943	980	1000

* The packaging is not included in the weights or dimensions.

** The base frame stands 50 mm high and projects around 35 mm from each side of the cubicle.

Options

Content

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Interlocks	49
Protection relay	50
Earth fault detector	51
Voltage presence detector	52
Battery charger	53
Connectors	54

DVCAS has been designed to be resistant and protect operators in the event of internal arcs caused by excess pressure, mechanical and thermal stress, etc. Its withstand to internal arcs has been tested and complies with standard IEC 62271-200.

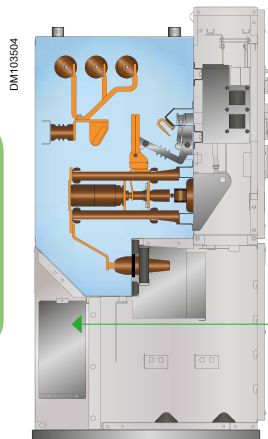
DVCAS offers internal arc withstand (IAC AFL-AFLR) of 20 kA/1s.

If an internal arc occurs due to accidental excess pressure, the overpressure relief at the bottom of the tank will open, well out of reach of personnel. The gas is released from the rear of the DVCAS without affecting conditions at the front, guaranteeing the operator's safety.

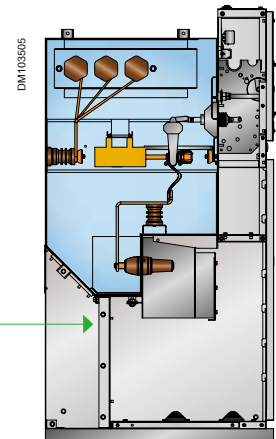


Maximum safety for people and equipment

Protection function D



Line function I



Overpressure relief



IAC AFL protection



IAC AFLR protection

AFL-AFLR protection

In some situations the cubicle requires protection, in addition to that at the front and side, at the rear. The DVCAS has been tested and offers this option.

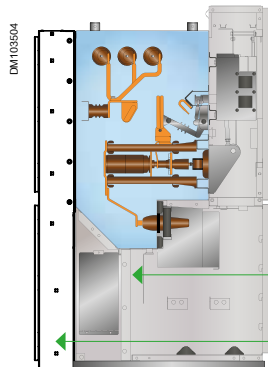
IAC AFL internal arc protection on 3 sides: DVCAS installed against the wall.

IAC AFL internal arc protection on 4 sides: DVCAS installed in the middle of the wind turbine interior where circulation at the rear is required.

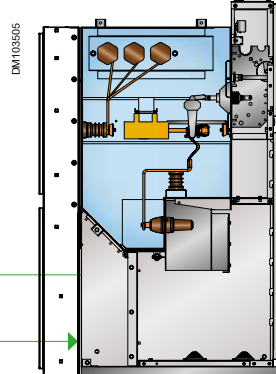
■ A: Access restricted to authorized people
Accessibility Class: States to which side of the cubicle people can safely go when an internal arc occurs.

- F - Front
- L - Side
- R - Rear

Protection function D



Line function I



Overpressure relief

Overpressure duct

The DVCAS cubicle is designed to guarantee maximum safety for the operator, cubicle operation and the installation.

Depending on the DVCAS configuration we will need different interlocks to prevent incorrect operations.

Interlocks can be functional, or in the form of locks and keys.

Interlocks using locks and keys

The most common interlocks using locks and keys in cubicles are listed below:

Riser module (0)

The riser module can be locked using a lock and key. (3)

It locks access to the 0L cables and earths the following wind turbine line function.

Line module (I)

■ Earthing interlock

This locks the line function earthing with access to the 0 cables on the preceding wind turbine. (4)

■ Switch-disconnector interlock

This locks the line function earthing with access to the 0 cables on the following wind turbine. (5)

■ Double interlock

When there is no riser function and the line function is connected to the line function of the following wind turbine, the earthing switch and the switch-disconnector can be locked with a double key. (6)

Protection module (D)

■ Circuit-breaker interlock

This is used to earth the protection function cables. (7)

Optionally a padlock can be placed on the caps of the pushbuttons for opening and closing the circuit-breaker and in the spring loading slot. (8)

Internal functional interlocks

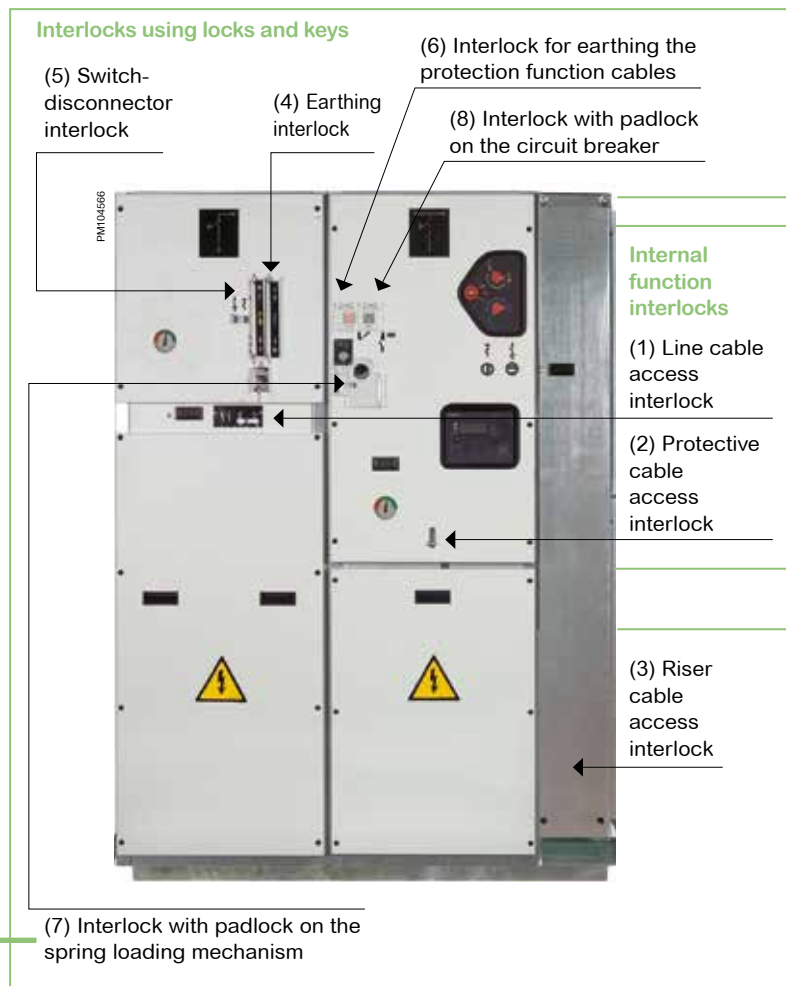
These comply with the UNE-EN 60298 standard and international standard IEC 60298.

Switch-disconnector module (I)

- It is only possible to close the switch if the earthing switch is open and the access panel closed.
- It is only possible to close the earthing switch if the switch is open.
- It is only possible to open the cable compartment access panel if the earthing switch is closed. (1)
- Cable insulation test: With the access panel closed and the switch-disconnector earthed, this can be opened to perform the test.

Circuit-breaker module (D)

- Any operation with the disconnector is only possible if the circuit-breaker is open and the access panel closed.
- It is only possible to open the cable compartment access panel with the earthing outgoing line after connecting the 3-position disconnector to earth and closing the circuit-breaker. (2)



Protection relay

In the great majority of installations that protect the wind turbine step-up transformer, no auxiliary voltage is available to supply the MV cubicle protection.

Self-powered protection relays are therefore used to do this.

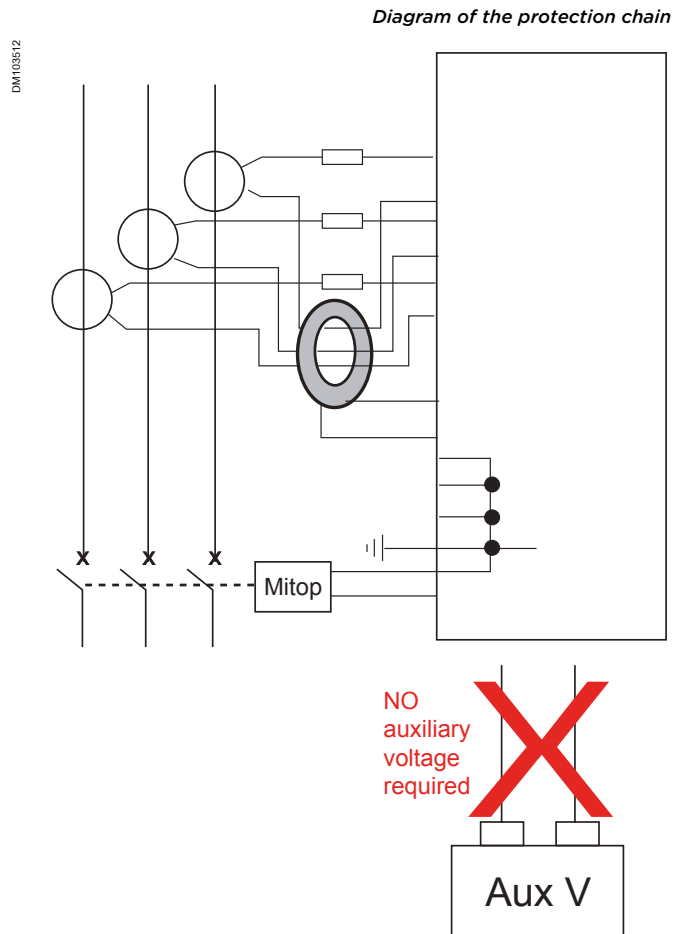
The VIP relay design makes them ideal for protecting the transformer in wind farm transformer substations, by means of phase (50-51) and earth (50N-51N) protection functions.

They are standalone relays (not requiring an auxiliary power supply), that are supplied by means of CRC type toroidal current sensors mounted on the outgoing MV cable bushings to the transformer.

The VIP relay is actuated on the circuit-breaker by means of a Mitop release (coil).

The relay should normally be located on the front panel of the MV cubicle mechanisms, protected by a transparent cover that gives the assembly an IP 54 protection rating.

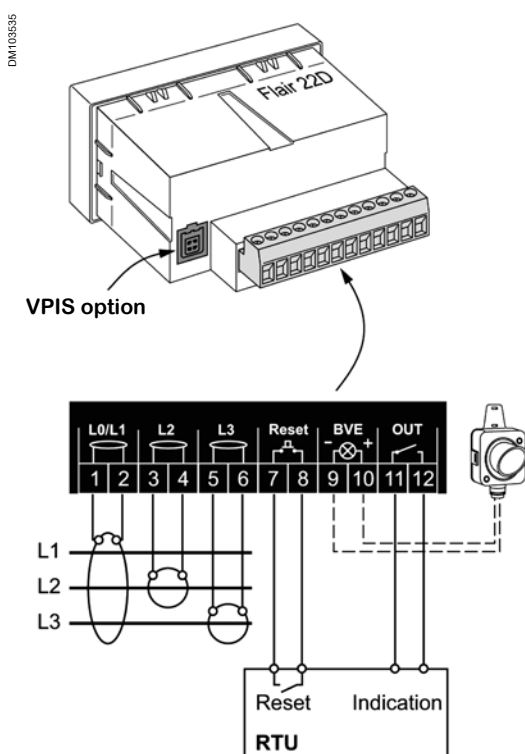
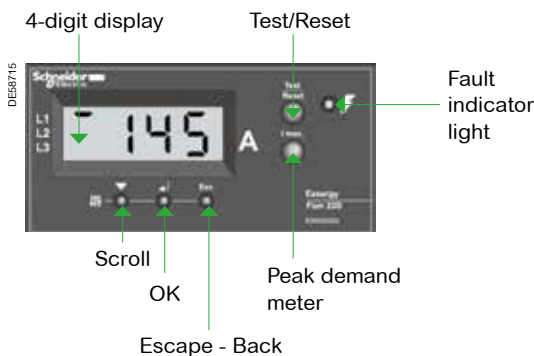
** For other relays, please consult Schneider Electric*



- High-efficiency indicator
- Easy to use
- Clear comprehensive display
- No maintenance required
- Simple installation



Flair 22D



Flair earth fault indicators are used to provide advanced management of MV networks in wind farms.

Flair indicators, by enabling quick detection and troubleshooting of MV network faults, minimize the availability losses that occur during troubleshooting and subsequent repair of these defects in the MV network.

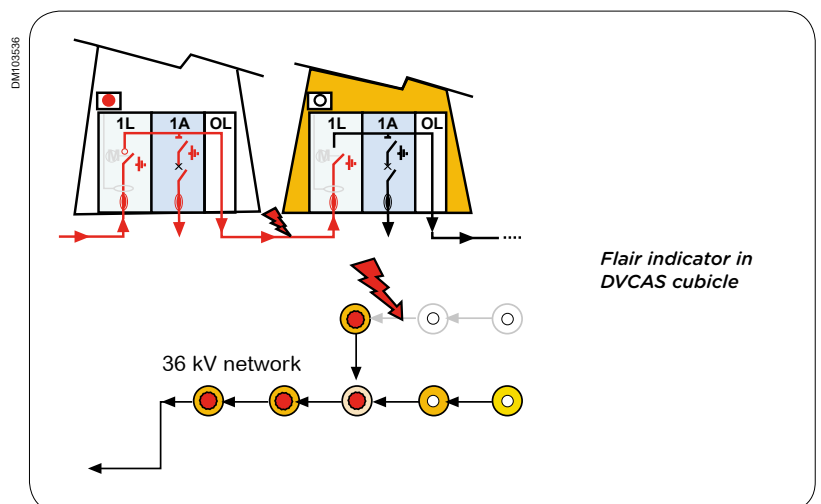
Flair earth fault indicators, used in I switch-disconnectors on incoming lines, are used to quickly isolate the faulty section of the network, thus maximizing the wind farm's availability.

Maximum efficiency is achieved with Flair indicators when the I outgoing line switch-disconnectors are motorized and provided with a rectifier-battery charger. In this way service can be restored immediately from the control station.

This option improves continuity of service and minimizes the payback period.

Technical and electrical characteristics

Fault detector	
Earth fault	20 to 160 A
Phase-to-phase fault	200 to 800 A
Voltage fault identifier with voltage indicator (VPIS-VO)	■
Voltage detector	
Voltage presence/absence	-
Settings	
Automatic settings	■
Manual settings	■
Display	
Display	4 digits
Charging current	■
Peak current	■
Frequency	■
Phase fault	■
Current resolution	1A
Accuracy	±1%
Power supply	
Self-contained power supply	■
Double power supply	■ (lithium battery)
Other	
Minimum charging current for operation	2A
External light	■
Reset	■
SCADA output	■



Voltage presence detector

- Continuity of Service + Safety
- Voltage presence detector
- Voltage absence detector
- Automatic calibration
- Flexibility
- Logic programming
- Sequential wind farm switch on/off

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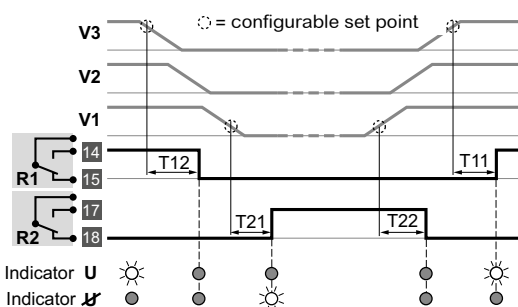


- 4-digit display
- Voltage presence indicator
- Scroll
- OK
- Escape - Back
- Voltage absence indicator

PM104610



DM103837



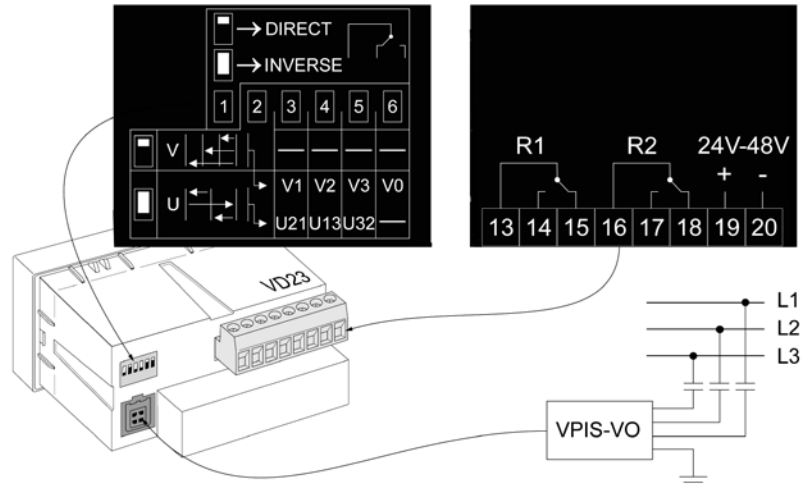
VD23 is a voltage presence detector that adapts to all MV networks from 3 kV to 36 kV 50/60 Hz.

The VD23 relay detects the presence of voltage via the signals emitted by the VPIS.

Easy to install in Medium Voltage cubicles, it is mounted in a fixed housing on a DIN rail or embedded.

- At the forefront of technology, it provides information as to whether voltage is present or absent.
- It can adapt to any network voltage and is ready to use.
- With its smart design, the VD 23 displays the voltage as a % of the calibrated voltage. 4 digits
- Adaptable to a variety of situations, the VD 23 can be used to work in different combinations of unbalanced phases and voltages
- Easy to install in Medium Voltage cubicles
- Compact on a DIN rail, it adapts to any Medium Voltage cubicle

DM103838



Applications

Applications based on voltage presence

- Loss of voltage causes the R1 relay to change state
- Automatic transfer systems
- Alarms with loss of voltage
- Automation in the event of loss of voltage
- Applications based on voltage absence
- Earthing interlock when voltage present
- Alarms with voltage present

Detection sequence

Configuration: V1, V2, V3 voltage, direct mode

- R1: outgoing 15 = relay rest position: loss of voltage in at least one of the three phases
- R2: outgoing 18 = relay rest position: voltage present in at least one of the three phases

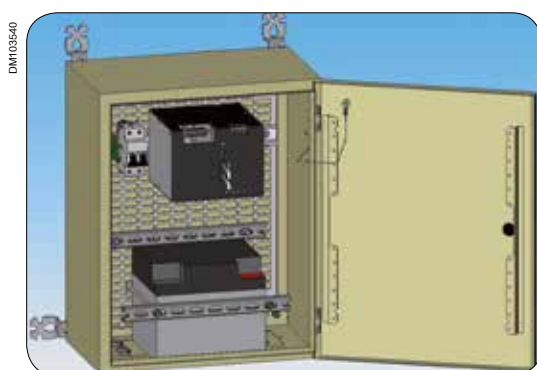
Programmable delay time for control of relays R1 and R2:

- T12 = delay time for R1 change to loss of voltage
- T11 = delay time for R1 change to voltage present
- T21 = delay time for R2 change to loss of voltage
- T22 = delay time for R2 change to voltage present

- Easy to maintain, just one battery
- Battery remote control
- High insulation level to protect electrical devices in
- MV harsh environments
- Certified in accordance with standard IEC 60255-5 (10 kV)



PS100



Battery and PS100



The PS100 ensures the continuity of operation in the event of a fault

PS100 is a high-quality external power supply containing a battery charger for MV switchgear that ensures continuity of operation in the event of a fault.

It provides alternative power to MV equipment. It can be incorporated in transmission, protection and control devices in MV equipment. Protection relays and earth fault detectors can both take a PS100.

The PS100 charger complies with standard IEC 60255-5 (10 kV).

Low voltage and overvoltage protection.

Characteristics

It includes a charger with a temperature sensor that is used to adjust the charging voltage.

The power supply unit measures the battery resistance every 12 hours.

It sends information monitored via a communication port (RJ45 Modbus) and a relay output that detects a fault in the charger power supply, battery or voltage.

Benefits

Conventional power supplies need 2 or 4 batteries to supply 24 or 48 V, with complicated battery replacement and adjustment procedures. PS100 simply needs a battery, making replacement considerably easier. The lead and acid battery unit supplies 24 or 48 V simultaneously for system components that use exclusively 24 or 48 V.

PS100 is designed to supply power for 48 hrs without interruption. The unit keeps additional power in reserve so that it can start up the installation after a long shutdown.

This “reserve power” can be activated by pressing the pushbutton, which will give power to the protection relays, allowing the DVCAS to be able to operate. High insulation level to protect electrical devices in harsh environments.

Other characteristics

- 2 outputs:
 - 12 VDC - 50 W (for modem, radio, RTU, etc.)
 - 48 VDC or 24 VDC - 300 W/1 minute (for driving mechanisms in MV cubicles) and 90 W/permanent for protection relays, electrical devices etc.
- RJ45 Modbus – Communication port.
- 2 relay outputs (AC supply ON, Battery ON).
- LED indication.
- One 12 V lead and acid battery charge, 10-year life (from 7 Ah to 40 Ah).
- Alternative power supply with a second PS100 to increase availability or provide additional power.
- -40°C to +70°C (operating temperature).
- Dimensions: 125 x 165 x 160 (Height x Width x Depth in mm).
- Weight: 2.6 kg approx.
- Easy to maintain.

Easy to install

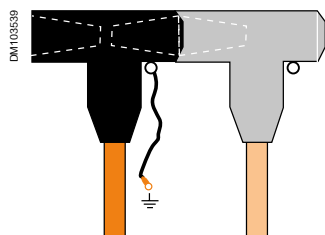
- No special tools required
- Easy to slide in and out
- Totally safe in the event of an accident
- Can be energized immediately



With IAC AFL internal arc classification, the cubicle has reinforcement to protect the area around the connectors.



Connectors.MV Cable compartment



Small Connectors

The connectors are fitted to the DVCAS cubicle bushings. The bushings are located in the MV cable compartment.

The access door to the cable compartment has the necessary interlocks to guarantee safety. On all modular cubicles, the door can only be opened when the line is earthed.

The bushings are type C threaded and are molded from epoxy resin with a threaded metal insert to house the clamping screw. They are routinely subjected to dielectric tests at power frequency and to partial discharge tests.

DVCAS cubicles use "T" shape screw connectors from the 36 kV/630 A/20 kA range. The connectors are screened and the screen is earthed (Safe to touch).

These connectors are type C, manufactured in accordance with EN 50180, EN 50181. The bushing model used in all the DVCAS cubicle functions also complies with standard EN 50181.

Although in their more common wind farm application, DVCAS cubicles are equipped with a single MV cable for each phase, the cubicles always allow connection of two cables per phase.

The connector is made from a single piece of high-quality EPDM rubber. The connector guarantees a hermetically-sealed connection and a long service life for the cable ends.

For a more concrete definition of the MV connector to be used in each case, the cable to be connected must be defined precisely, so the following data may be requested:

- Conductor type: aluminum or copper.
- Conductor cross-section in mm².
- Diameter over cable insulation.
- Cable composition: single-core or three-core.
- Insulation type: dry or impregnated paper.
- Screen type.
- Armature, etc.

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- Screen type.
- Armature, etc.

General characteristics

Geometry	"T" shape
Screening	Earthed
Internal profile	C type
Screw connection	M16 x 22 mm
Nominal and test voltage	36/70/170 kV
Nominal current	630A
Short-time current	20 kA/3 s

* Two cables per phase but still with the same dimensions (optional)
IEEE Bushings available under request

Manufacturers - General characteristics - IEC 60137 - EN 50181

Brand	Screw connect.	Type	Insulation	Model	Cross-section (mm ²)
PRYSMIAN	Yes	C	EPDM	MSCT-630A-XX-XX/36	50-400
TYCO	Yes	C	Silicon	RSTI-68	35-300
NKT	Yes	C	Silicon	CB 36-630	25-300
NKT	Yes	C	Silicon	CB 36-630 (1250)	400-630
EUROMOLD	Yes	C	EPDM	400TB	35-300
EUROMOLD	Yes	C	EPDM	440TB	185-630

DVCAS Training

Training	58
Interactive 3D manuals	59

Standard courses available for DVCAS cubicles:

- General principles:
1 day
- Operation and maintenance:
1 day
- Installation, commissioning and maintenance:
2 days

PN104616



The continually changing scenario we are experiencing on the current energy landscape makes training one of the cornerstones of this constant struggle to adapt to change.

At Schneider Electric, we are convinced that the greater knowledge a professional has about the electrical switchgear he is managing, the more efficient he can make it, ensuring its working life is safer, more reliable and longer-lasting.

Through our training department, we therefore offer our customers a variety of courses, designed so that each and every customer can gain the necessary skills to get the most out of our equipment.

The same applies to people dedicated to project management, procurement, project engineering, operating and maintenance personnel or installers, we have the right course for any professional. And if you are looking for something else, we can adapt to your needs.

In our plants at Mungia (Vizcaya, Spain), we have dedicated training rooms, as well as “demo” units where hands-on experience can be gained. And if you can't travel to us, we will come to you.

For more information, please visit the training section on our website.



+2000 people
have been trained by
Schneider Electric

PM104617



We have developed a set of multimedia interactive manuals that simplify the process of teaching and learning about the DVCAS cubicle and its functions.

PM104619



PM104618



In a simple format using text, animations, graphic material, voice-over, instructions and guided explanations to increase your product knowledge.

You can choose to access sections of the instruction manual, in sequences showing how to store, transport and assemble the cubicles inside the wind turbine, different operations on the line and cubicle protection functions, and wind turbine energization.

We also have a multimedia manual on how to place the cubicles inside the wind turbine through the door, assemble them and perform the dielectric and voltage drop tests.

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