



TRUST. WELL EARNED.

Switchgear Services

Total Support for Continued High Performance





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Switchgear Services



BRUSH Switchgear engineers are fully factory trained and conversant with all aspects of our products.

The BRUSH Switchgear product range is extensive and our experienced and highly skilled Services Team provide a comprehensive package of activities that are designed to ensure the maximum benefits are delivered for your Switchgear products.

With global coverage for our current and heritage products, Switchgear Services include Servicing and Repairs, Retrofit Solutions, Asset Management, Spares, Training and the support for our Heritage

products, including Hawker Siddeley Switchgear, BRUSH Switchgear, South Wales Switchgear or Whipp & Bourne Switchgear.

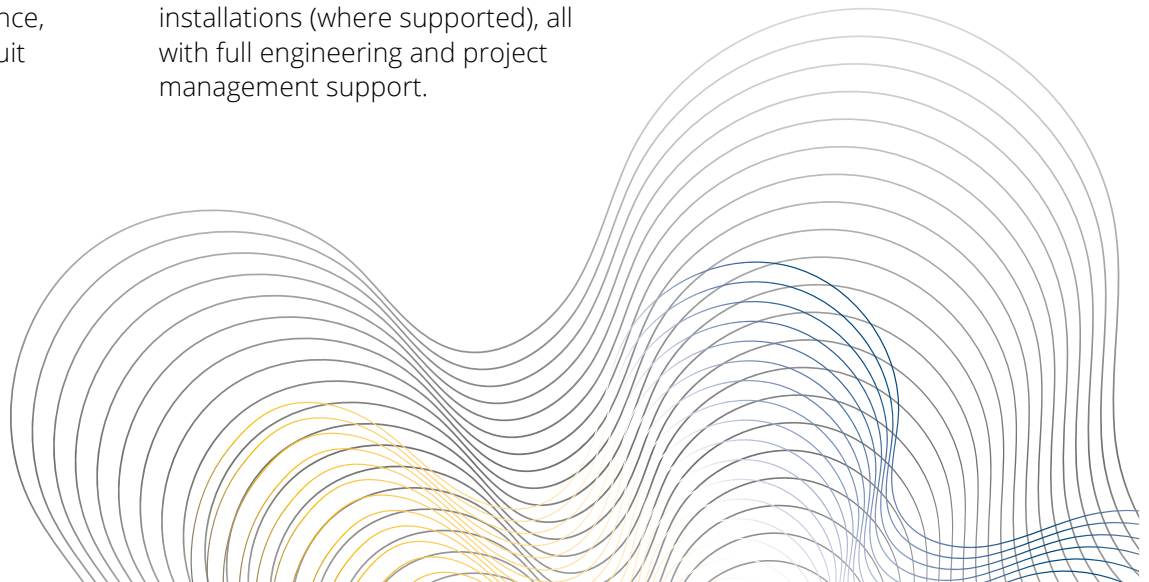
BRUSH Switchgear places great importance on providing our valued customers with a professional service, meeting their requirements in a timely and efficient manner.

- Fast and reliable response
- Many spare parts are available from stock
- A dedicated team of specialist field engineers with full in-depth product knowledge
- Global sales, service and technical support
- Service agreements tailored to our customers' specific requirement

Our global comprehensive service package includes full on-site installation and commissioning, refurbishment and repairs for older products, routine maintenance, retrofit new technology circuit

breakers into both BRUSH Switchgear and non BRUSH switchgear upgrades, modifications and extensions to existing installations (where supported), all with full engineering and project management support.

BRUSH is an ISO9001 compliant company, assuring you of quality service every time.





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Service and Repairs Supply, Deliver, Install, Test & Commission



As an Original Equipment Manufacturer (OEM), BRUSH have been installing and commissioning switchboards produced in our factories for decades.

All our engineers are fully factory trained and are fully conversant with all aspects of the equipment.

We offer a complete installation service or alternatively the supply of a supervisor to “oversee” and guide the installation, testing and commissioning of your equipment.

BRUSH will undertake upgrades, modifications and extensions to existing installations and fully engineer this work in every aspect if required.

BRUSH operate throughout the world and offer a comprehensive service including routine maintenance, repair, installation and modification, followed by pre-commissioning, test and final commissioning as required.

We offer complete Method Statements and Risk Assessments in accordance with our ISO9001 accreditation. Dedicated Site Quality Plans are compiled for every site contract.

BRUSH Switchgear Services, as part of a major OEM, have the full support of the Production and Design elements of the factory as well as the Spares Department, Drawing Office and Contracts Engineers.

This allows us to correctly and effectively advise you of any other items of work you may require on site or at the factory during manufacture.





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Maintenance of Primary Plant

As a major Original Equipment Manufacturer (OEM) of MV switchgear, BRUSH offers a comprehensive global service for the maintenance of switchboards, protection and circuit breakers. This also includes all ancillary equipment.

All types of testing is undertaken either to BRUSH documented specifications or any other specific requirements.

BRUSH Switchgear service covers 3.3kV, 6.6kV, 11kV & 33kV switchgear, generation and land-based equipment as well as overhead line (33kV, 132kV, 275kV & 400kV).

As an OEM, our Service Team are fully experienced with all our products both past and present whether this is Hawker Siddeley Switchgear, BRUSH Switchgear, South Wales Switchgear or Whipp & Bourne Switchgear.

BRUSH Switchgear offer a comprehensive global service whether routine maintenance, repair, installation, commissioning or modification of existing or equipment.

We offer complete method statements, risk assessments and safety plans on request, while our site Team work to dedicated Site Quality Plans as part of our ISO 9001 accreditation.

BRUSH Switchgear Services, as the OEM, are fully supported by the Production and Design departments of the factory as well as the Spares Department, Drawing Office and Contracts Engineers.

This allows us to give fast and effective technical advice for all aspects of switchgear maintenance work.

BRUSH Switchgear offers peace of mind that your equipment will be correctly maintained by a major OEM.

As an OEM, our Switchgear Service Team are fully experienced with all our products both past and present...





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Protection and Control Equipment

Maintenance

Protective relays and devices must be tested and functionality proven at certain intervals during the life of the equipment. However, when planning or carrying out primary plant maintenance the protection element is easily overlooked.

As a major Original Equipment Manufacturer (OEM) of MV switchgear BRUSH Switchgear offer a comprehensive service of protection and control equipment testing irrespective of whether the equipment is electro-mechanical, electronic or micro-processor based (programmable) type.

Whatever the system parameters BRUSH Switchgear can test your protection and control schemes.

The BRUSH Switchgear Service Team work globally and as part of an OEM, have the full support of our experienced Technical, Production and Test Departments in the factory.

Our Field Engineers will resolve problems at site or report any unusual findings to the supporting staff back at the factory who are available on request to rectify any problematic situations with technical solutions.

As an OEM, the factory has specialist testing facilities; ensuring that protection and control relays are fully operational and compliant with calibration criteria and specifications.

Primary/Secondary current injection of protection relays (and associated CTs) ensure that relays are compliant with calibration criteria and specifications.

Upgrading

BRUSH Switchgear will advise you of faulty equipment and offer a choice of options to correct the situation.

As a result of this we offer the additional service of retrofitting new protection relays and control schemes to older types of switchgear irrespective of who manufactured the original equipment.

BRUSH Switchgear can, if an installation has been re-engineered by BRUSH Switchgear (or others), provide a site service which can vary from upgrading CT's to changing the functionality of the circuit from a simple feeder to a fully automated motor or generator circuit.

BRUSH Switchgear is an ISO9001 compliant company, assuring you of quality service every time.

All of our site work is controlled by dedicated Site Quality Plans. Detailed reports are issued on completion using BRUSH Switchgear pro-forma test sheets or any customer specified test sheets.





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Gas Handling, Decontamination, Maintenance or Disposal of SF₆ Switchgear

BRUSH Switchgear as an Original Equipment Manufacturer (OEM) and on-site service provider is very experienced in the handling and use of SF₆ gas as an arc control and insulating medium in switchgear.

SF₆ gas, being a green house gas, has strict emission control requirements, with all personnel involved in its use, i.e., disposal, processing, gassing, de-gassing & topping up activity, being required to be trained and certified in accordance with F Gas regulations.

SF₆ gas is odourless, tasteless and non-poisonous in its purest state. It is however heavier than air and as such will become an asphyxiant.

In addition, when subjected to electrical arcing, SF gas produces by-product contaminants which are carcinogenic.

To comply with current legislation and to minimise these hazards down to effective zero, all BRUSH Switchgear Services team members involved with SF₆ gas handling are trained/certified in accordance with F Gas Regulations, issued with appropriate PPE, and work to strict procedures developed for the handling of potentially contaminated SF₆ gas filled switchgear.

The processing of switchgear, for either maintenance or disposal purposes, can be carried out either in a "clean" room at our Service Centre in Blackwood, or, as our specialist gas handling equipment is portable, at the customers site.

Potentially contaminated switchgear is only opened under strictly controlled conditions by operators correctly protected and using breathing apparatus.

Any carcinogenic by-products produced by electrical arcing are neutralised before the switchgear is released for maintenance work or disposal.

Once maintenance work is complete the switchgear is re-sealed and re-gassed to OEM specifications.

BRUSH Switchgear offers peace of mind that SF₆ gas will be handled and processed in accordance with current legislation, potentially carcinogenic by-products will be neutralised and that your switchgear will be correctly maintained or disposed of by a major OEM, whether in our Switchgear Service Centre or at site by trained, competent and certified personnel.



Any carcinogenic by-products produced by electrical arcing are neutralised before the switchgear is released...



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Condition Monitoring

Increasingly the demand for cost reduction has to be balanced with the need to complete essential maintenance work.

Based on proven techniques and data, the elapsed time span between maintenance cycles has increased for some users of MV switchgear.

Maintenance is by definition an intrusive activity. The cost of the actual maintenance has to be coupled to the cost of the down time of switchgear to get a true picture of what maintenance costs mean to some users.

However failure to complete maintenance can lead to expensive disruptive failures.

BRUSH Switchgear offer a non-intrusive condition monitoring service that provides an insight into the status of the switchgear without equipment being removed from service.

Detailed reports then give the switchgear user the opportunity to make an assessment based on the findings and either give the switchgear a clean bill of health or plan for an unforced intrusive intervention.

What does BRUSH Switchgear offer?

Partial Discharge Mapping

Evidence suggests that most disruptive failures occur due to discharge activity of solid insulating materials. This activity can be detected using specifically designed instrumentation.

Indicative outlines of the switchgear are produced on dedicated test sheets and partial discharge is recorded in decibels for the mapping points identified on the test sheets.

Thermal Imaging

As a compliment to Partial Discharge Mapping a Thermal Image of the switchgear is taken using state of the art infrared cameras. Such imagery will readily identify any hot spots within switchgear chambers. The digital print out from the camera forms an integral part of the final report.

Battery Condition Check

As switchgear protection is dependant on a battery to provide the power source for tripping purposes it is vital that the battery is capable of performing to its specification when called upon to do so.

Observing that there is voltage on the battery voltmeter is only confirmation that there is a charger output and not that the battery is charged and capable of delivering load-current when called upon to do so.

As part of the Condition Monitoring Service the Battery Impedance will be checked. Such a check is capable of identifying single defective cells with the battery on-line.

Environmental

General observation of the sub-station environment is an integral part of the Condition Monitoring Service. Photographs are taken of the general status of the substation. Temperature and Humidity are recorded for the specific date and time of the inspection.

Observations are made as to the status of cable trenches to ascertain if there is any standing water.

Any non functioning lighting will be recorded. Any circumstance observed that is deemed to be detrimental will be recorded such as broken windows, failed locks, general building damage etc.



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Functions of Condition Monitoring

Modern approaches to maintenance requires non-intrusive testing to identify any developing problems that could, if left undetected, lead to expensive disruptive failures. BRUSH offers the following as part of a non-intrusive Condition Monitoring Service.

Partial Discharge

Partial discharge occurs when solid insulation begins to break down either through age deterioration or application problems.

This deterioration can be detected and mapped to dedicated record sheets with specially designed sensitive (TEV) instrumentation while the switchgear asset is still electrically live.

This type of first pass testing enables decisions as to whether any intrusive intervention will be required.

Infrared Imaging

Used in conjunction with partial discharge detection, sophisticated cameras operating in the infrared range are capable of detecting heat sources within switchgear compartments.

Printouts of the heat pattern can be down-loaded and included as part of the overall reporting.

Battery Impedance Testing Batteries are an essential and important part of the switchgear protection application.

Faulty or defective cells can be detected with the battery still on line. This is especially useful for simple battery systems that only have an output voltmeter, as voltmeter may be more indicative of the charger output than the battery status.

Environmental Conditions

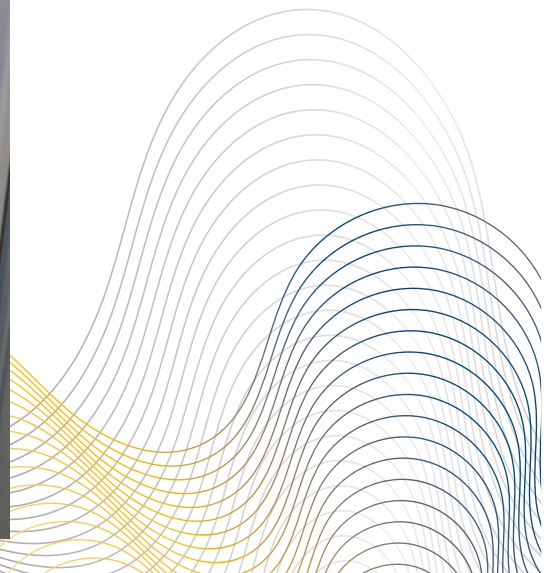
As part of the application of Condition Monitoring the general condition of the substation is included as part of any final report. Typical of the data recorded is humidity and temperature at the time and date of the non-intrusive testing.

Other important recorded factors will be presence of any standing water in cable trenches, defective lighting, defective locks and any general building damage.

This would all be supported by photographic evidence.

Standards and Application All tests offered by BRUSH Switchgear as part of a Condition Monitoring package are to British Standards.

They can be applied as a one off occurrence or can form part of an overall ongoing programme of activities to all types and makes of switchgear, irrespective of asset age.





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Retrofit Solutions

BRUSH Switchgear offer OEM retrofits for our Heritage products.



Where housings are in good working condition, we are able to upgrade the circuit breaker from oil or SF₆ gas to a vacuum circuit breaker.

With little or no modifications to the panel required, our products can greatly extend the life of your switchgear, giving you peace of mind and outstanding quality.

Retrofitting is particularly attractive to organisations with a large volume of ageing installed equipment and where asset replacement budgets are limited.

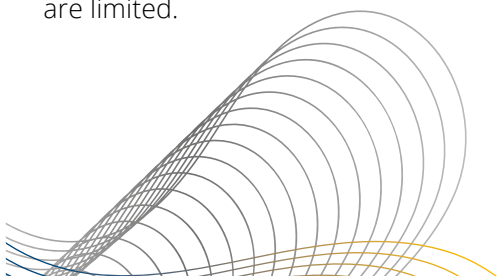
A major attraction of retrofitting is the elimination of the need for disruptive re-cabling and no requirement for civils, transformer or cabling works.

Retrofitting switchgear can extend the life expectancy of current assets by 30 years, dependent on the switchgear panel's condition, whilst offering minimal disruption.

For a straightforward retrofit circuit breaker option, site times can be very short, perhaps even less than one day per circuit.

A typical retrofit solution involves the replacement of old circuit breakers with modern vacuum circuit breakers.

Retrofitting switchgear can extend the life expectancy of current assets by 30 years...





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The benefits of retrofitting switchgear are:

- Maintains the fully certified rating of the combined replacement circuit breaker /existing switchgear
- Considerable life extension to your original switchgear
- Provision of a very low maintenance circuit breaker with few consumable spares
- Long term minimum cost of ownership
- Proven reliability of replacement circuit breaker
- Provision of a cost-effective method for the removal of bulk oil products
- No expensive civil works or HV cable disruptions required
- Removes the need for high capacity/high maintenance auxiliary power supplies
- Provision of circuit breakers with electrical trip/close facility
- Improvement of Health & Safety by removal of oil or SF₆ gas
- Lower owner costs through virtually no maintenance requirements
- Uses existing design of primary and automatic secondary contacts

As OEM of BRUSH Switchgear and South Wales Switchgear, BRUSH Switchgear offer retrofit solutions for VSI and VMV range of BRUSH Switchgear and C & D Range and HawkGas12 South Wales Switchgear circuit breakers.

All our retrofit solutions are fitted with our award-winning magnetic actuator technology. Our Retrofit Circuit Breakers are designed for 10,000 operations.

Our single coil magnetic actuator technology and electromagnetic spring innovations have been widely acclaimed, ground-breaking developments, which provide BRUSH Switchgear with a world leading edge in circuit breaker technology.

The actuator coil is energised in one direction to 'power close' the circuit breaker and in the opposite direction to open it by de-latching the holding force.

This unique feature of the actuator design is used in our relevant products and ensures reliable tripping operation under all battery conditions and even for manual trip.

The benefits of this are:

- Patented single coil design;
- Minimal moving parts;
- Bi-stable with pulsed coil to operate;
- High strength rare earth magnets;
- Opening energy stored during closing;
- Tripping performance independent of supply voltage;
- Over 30,000 in service



Our single coil magnetic actuator technology and electromagnetic spring innovations have been widely acclaimed...



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SWR12 The Retrofit Solution

The SWR12 is an OEM designed retrofit circuit breaker for both the South Wales Switchgear C & D range Oil Circuit Breaker and the HG12 Gas Circuit Breaker, to IEC 62271-100.

BRUSH Switchgear is proud of its heritage in the C and D range of switchgear, which continue to work at the highest standards.



Technological advances have allowed us to improve further and offer our customers a circuit breaker that boasts the award-winning magnetic actuator technology along with removing the need for SF₆ gas.

The SWR12 circuit breaker, offers a new lease of life for existing switchgear, with this effective retrofit solution.

Employing award-winning magnetic actuator technology with vacuum interrupters, the SWR12 is designed for 10,000 operations and a life expectancy of 30 years. It is designed for retrofitting into existing switchboards without the need for panel modification.

BSR The Retrofit Solution

The BSR is an OEM designed retrofit circuit breaker for both the BRUSH Switchgear VSI range of Oil Circuit Breakers and the VMV vacuum Circuit Breaker, to IEC 62271-100.

BRUSH Switchgear is proud of its heritage in the VSI, VTD & VMV range of switchgear, which continue to work at the highest standards today.

Technological advances have allowed us to improve further and offer our customers a circuit breaker that boasts the award-winning magnetic actuator technology.

The BSR circuit breaker, offers a new lease of life for existing switchgear, with this effective retrofit solution.

Employing award-winning magnetic actuator technology with vacuum interrupters, the BSR is designed for 10,000 operations and a life expectancy of 30 years.

It is designed for retrofitting into existing switchboards without the need for panel modification.

VMV – Retrofit Circuit Breakers

To enable you to safely extend the life of your existing VSI switchgear, BRUSH Switchgear can provide direct replacement retrofit vacuum circuit breakers.

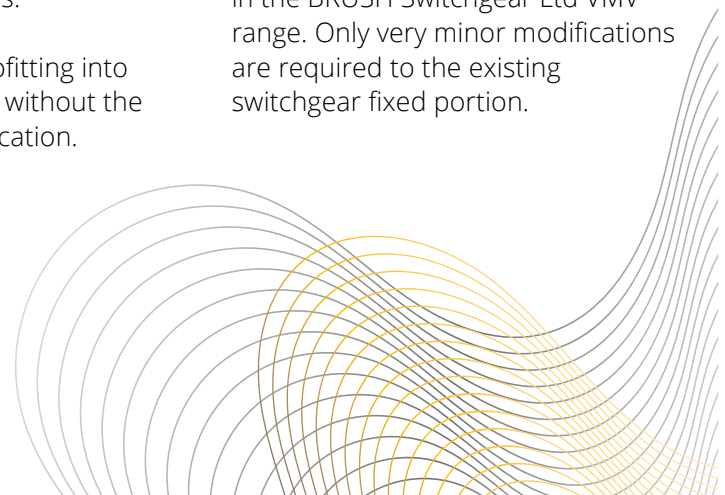
Within the MV switchgear sector, there is now increasing interest in the options for the economic replacement of ageing oil based switchgear with a product that utilises Vacuum as the breaking medium. One such option is to retain the fixed portion of the switchgear and replace the oil circuit breaker with a modern technology circuit breaker.

Oil circuit breakers manufactured by BRUSH Switchgear since 1963 formed an integral part of the VSI (single busbar) and VTD (double busbar) range of switchgear.

Many of these circuit breakers are approaching or have exceeded twenty five years operational service life.

We can supply a type tested vacuum circuit breaker as a direct retrofit for the oil circuit breakers in the VSI and VTD switchgear.

This vacuum circuit breaker has more than two decades of reliable and proven operational service experience throughout the world in the BRUSH Switchgear Ltd VMV range. Only very minor modifications are required to the existing switchgear fixed portion.





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Asset Management Maintenance Contracts & Extended Warranties



BRUSH Switchgear as a major Original Equipment Manufacturer (OEM), offer different versions of maintenance contracts and extended warranties to suit all particular requirements.

Maintenance contracts can be established via a "call off" system i.e. BRUSH Switchgear attends to your maintenance requirements only at your request. Alternatively, BRUSH Switchgear can set up a mutually agreeable contract whereby we visit your site at fixed intervals to carry out maintenance.

The BRUSH Switchgear offering includes:

- Participating in and help set up Reliability Centred Maintenance (RCM)
- A Non-Intrusive Condition Monitoring service, to identify any developing problems that could, if left undetected, lead to expensive disruptive failures.
- A 24 hour, 365 day callout service for all urgent switchgear incidents or needs.
- Extended Warranties. These are set up either at the point of sale or after intensive corrective maintenance have been carried out on your equipment.
- Peace of mind that your equipment will be correctly maintained by a major OEM

Method Statements and Risk Assessments

We offer Method Statements and Risk Assessments in accordance with our ISO9001 accreditation. Dedicated Site Quality Plans are compiled for every site contract. BRUSH Switchgear Limited comply with the latest F Gas Regulations.



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Spares

Complete range of component and engineering spares

As an Original Equipment Manufacturer (OEM), BRUSH markets a complete range of components and engineering spares for current production types of switchgear as well as for non-current products previously manufactured by Hawker Siddeley Switchgear, BRUSH Switchgear, Whipp & Bourne Switchgear and South Wales Switchgear, supported either directly by ourselves or indirectly through an approved third party.

Component Spares.

Component type consumable spares such as fixed and moving contacts, arcing chambers, breathers, etc are available for all ranges of switchgear spanning 40 years of production.

Spares are available for operating mechanisms and associated isolators.

These range from trip coils and assemblies, closing solenoids, spring mechanism actuators through to individual components such as mechanism links, spacers, cranks etc.

Gaskets and tank liners are available for most oil circuit breaker types.

Engineered Spares

BRUSH recognises that switchgear is manufactured for a safe and long life and that during that life-cycle the switchgear may be called upon to fulfil many different functions.

This may involve simply upgrading a feeder with higher ratio CT's, upgrading protection, changing the rating of the circuit (e.g. from 400A to 630A or 1250A), or a complete function change such as from a plain feeder to generation duty incorporating all G59 requirements.

Modifications may entail the supply of upgraded circuit breakers, complete mechanisms, voltage transformers, current transformers, cable boxes, bushings, monoblocs, auxiliary switches, replacement or upgraded bus-bars.

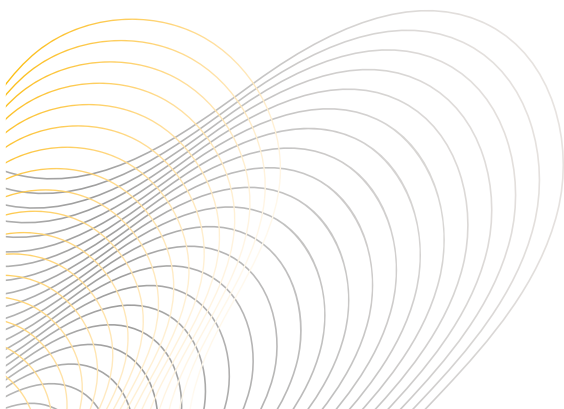
Why buy genuine original spare parts?

- All spare parts are guaranteed to fit
- All spare parts come with an Original Equipment Manufacturer warranty
- Equipment can fail as a direct result of using non-original spare parts
- The use of non-original spare parts can result in machine damage and potentially cause personal injury

BRUSH Switchgear offers a fast and reliable response, many spare parts are available from stock and a dedicated team of specialist field engineers with full in-depth product knowledge.

All spares supplied, whether Component or Engineered, can if required, be fitted and functionally tested by RUSH Switchgear site personnel.

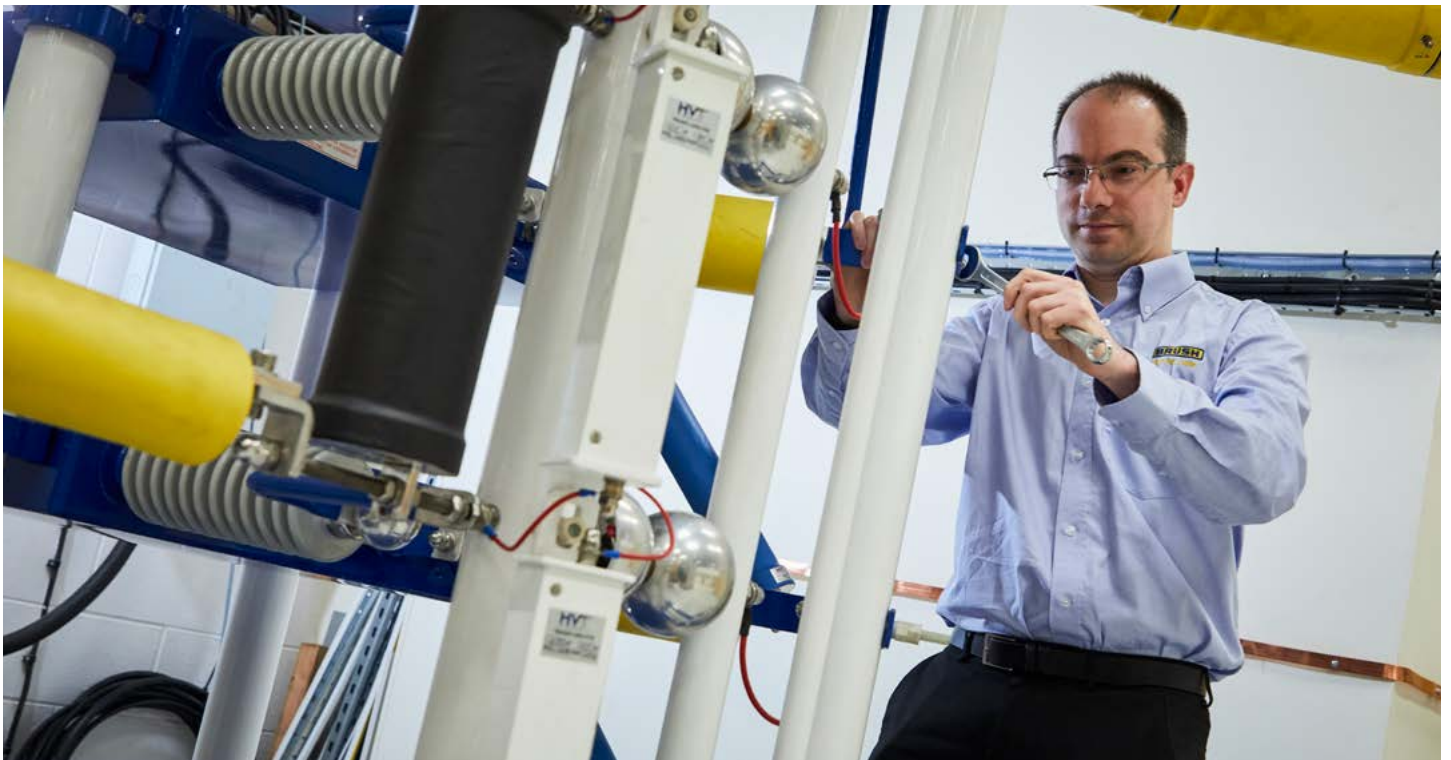
BRUSH offers a fast and reliable response, many spare parts are available from stock...





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Training Operation and Maintenance Training



BRUSH Switchgear can offer bespoke training courses to help your staff operate and maintain your switchgear safely, correctly and efficiently.

Our training courses vary in length depending on the intensity of the training, the level of competence of the trainees and the type of switchgear or protection systems being trained on.

The course content can be varied dependent upon which topics are most important for your company and staff.

BRUSH Switchgear can offer training at your premises or at the Training facilities at our production factory. The former being preferable when training is required on non-production switchgear types.

Certificates as proof of training can be issued if requested.

Post Training Course Examinations can also be organised, both theoretical as well as practical.

Our training courses vary in length depending on the intensity of the training...



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Heritage Brands

BRUSH Switchgear incorporates the following Heritage Brands:



BRUSH Switchgear

Charles Francis BRUSH established the BRUSH Electrical Engineering Company in 1888 and were the pioneers behind the development of Vacuum Switchgear.

In the last 30 years, successes have included the first Vacuum Switchgear Circuit Breaker (FV and OFV) in Europe and India, and the world's first Ring Main Unit (Falcon Beta).



Whipp & Bourne

Established in 1903, Whipp & Bourne has long been a leader in heavy-duty electrical switchgear, introducing arc and oil circuit breakers in 1908 and 1909 respectively.

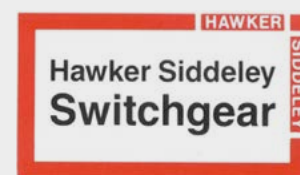
In 1975 the company launched its vacuum insulated switchgear and was acquired by Babcock International Limited. In 1987, Whipp & Bourne became part of FKI plc then merged with Hawker Siddeley in 1996.



South Wales Switchgear

Formed in 1941 in Treforest, South Wales, South Wales Switchgear (SWS) led the way in exploiting SF₆ gas as a medium of interruption and insulation.

Traditionally, South Wales Switchgear were involved in the design and manufacture of 11kV – 33kV switchgear and DC type switchgear for naval projects.



Hawker Siddeley Switchgear

In 1991, South Wales Switchgear merged with BRUSH Switchgear to form Hawker Siddeley Switchgear Ltd. Hawker Siddeley Switchgear Ltd was then acquired by FKI plc in November 1996.

The company relocated to the present Blackwood site in South Wales and created a Centre of Excellence for the manufacture of MV Distribution Switchgear. In 2008 Melrose Plc acquired FKI Switchgear where it returned to its former brand of Hawker Siddeley Switchgear.



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