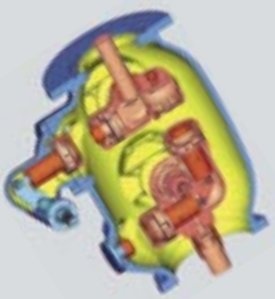


High-Voltage Compact Switchgear 3AP1 DTC for 145 kV

Power Transmission and Distribution

SIEMENS

Experience you can rely on - at anytime, anywhere

The 3AP1 DTC Complying with our Customers‘ demands

Decades of experience in high-voltage switching technology are the basis for the design and production of high-voltage circuit-breakers and disconnectors which are setting international trends. We are one of the leading suppliers of products and solutions with the highest standards in quality at competitive prices.
A further story of success has now been written with the new DTC Compact Switchgear from Siemens.

The DTC (**D**ead **T**ank **C**ompact) Switchgear family is available for rated voltages up to 145 kV.

DTC is a compact arrangement of several functions needed in a substation. The elements of this new Siemens Compact Switchgear is a dead-tank circuit-breaker, fitted with one or two current transformers, one or more disconnectors, earthing switches and bushings as applicable for connection to the bus bar system.

Based on the well proven modular design, the core components of the main units have been adopted from our well established high-voltage circuit-breakers, disconnectors and GIS product family. These components are:

- Self-compression arc-quenching interrupter unit of the AIS 3AP-circuit-breaker
- Stored-energy spring drive mechanism
- SF_6-insulated disconnector/earthing switch from the GIS type 8DN9
- Outdoor earthing switch from the Ruhrtal range of disconnectors

Deliveries of more than 100,000 components to over 100 countries provide our customers with safety and competitive advantages worldwide, which equates to greater success for their own businesses.

Due to the compact design and the flexible use of predefined modules, different layouts can be realized with a minimum of engineering effort. The concept of DTC is to provide an economical compact design and create further options for our customers.

The Concept

The concept of the DTC offers the following selected arrangements:

- In-/Out - Variant
- Single Bus Bar - Variant
- Double Bus Bar - Variant
- Circuit-Breaker with combined function and outdoor earthing switch

All parts, excluding the primary terminations are encapsulated in grounded cast aluminium housings. The circuit-breaker is based on our well established dead-tank design. The pole assemblies are filled with pressurised SF_6 and fixed on a common base frame.

Modular Design
The figures show typical arrangements with bushings on the incoming and outgoing side, the circuit-breaker and the three position switches for disconnection and earthing functions.

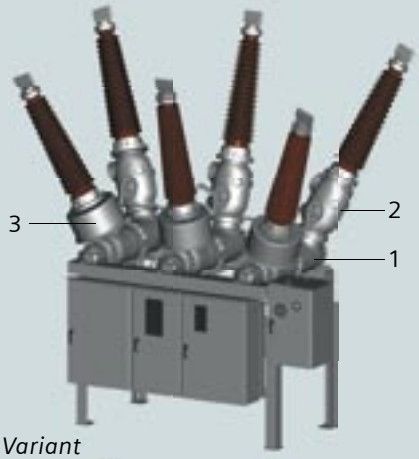
The circuit-breaker has a common stored-energy spring drive mechanism. The control cabinet for the circuit-breaker, the three position switch and the terminals of the current transformers are located in front of the switchgear module. A linkage fitted between the poles connects the three position switches to the drive mechanism.

Circuit-Breaker
The self-compression arc-quenching principle is applied in the DTC circuit-breakers. The arc energy is used to interrupt the fault circuit breaking current. The required energy does not need to be provided by the operating mechanism. The components of the interrupter unit and the stored-energy spring drive mechanism are adopted from the well established 3AP circuit-breaker family.

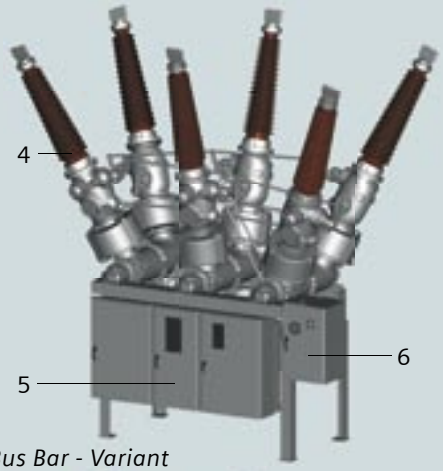
Disconnector/Earthing Switch
The DTC disconnector/earthing switch is based on the design of GIS components with the same function. The main parts contain movable contacts, shafts and levers from GIS components. They have proved their reliability in operation over many years. The motor drive is an established reliable component from the GIS disconnector/earthing switches range of products.

Current Transformer
Current transformers for DTC are conventional types. The existing CT housing enables the placement of ring type cores in many combinations with different ratings. Cores for measuring and protection are available. The current transformer is located between the circuit-breaker and the disconnector/earthing switch. This is equivalent to the location of current transformers in Air Insulated Switchgear (AIS).

Air/SF_6-Bushings
DTC switchgear is connected to the overhead lines and bus bars by SF_6 insulated air bushings. A conductor and a shield electrode are fixed inside the bushing. The insulator is available in either porcelain or composite (epoxy impregnated fibreglass tube with silicon rubber sheds) materials. The variants with outdoor earthing switches are equipped with porcelain bushings.

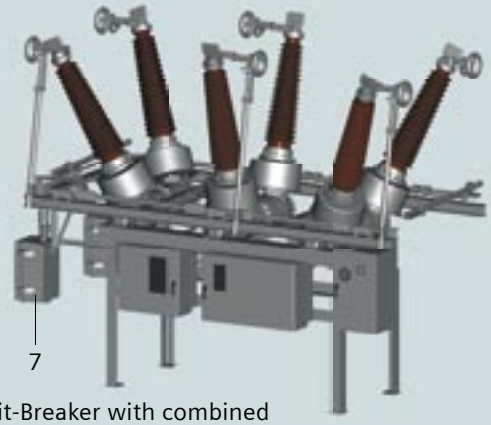


In-/Out - Variant



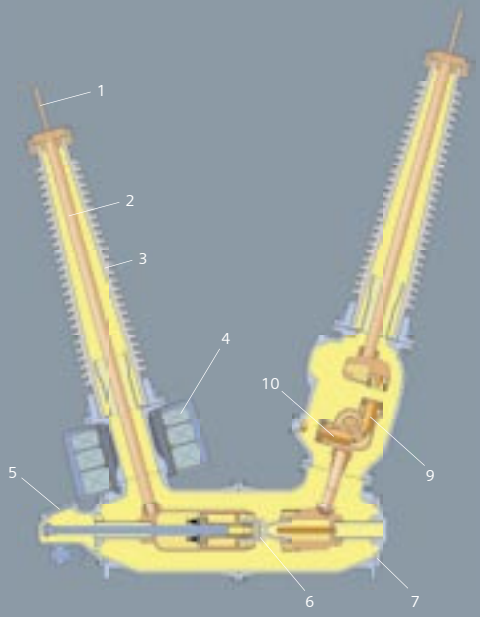
Single Bus Bar - Variant

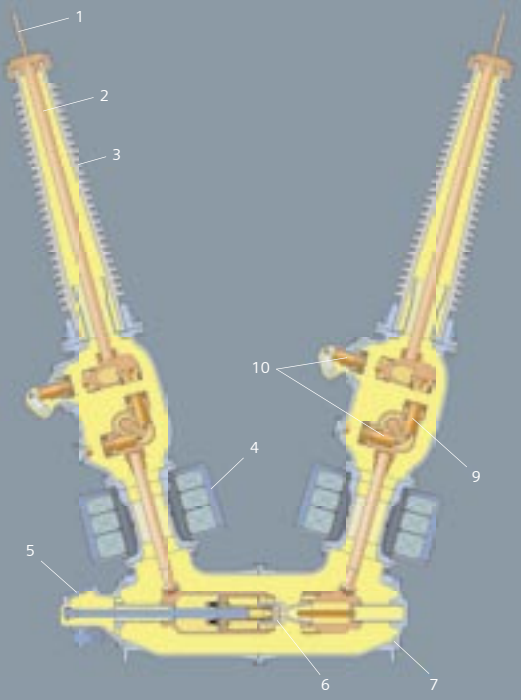

Double Bus Bar - Variant



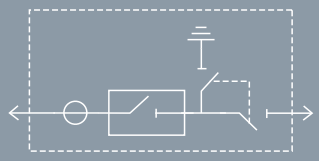
Circuit-Breaker with combined function and outdoor earthing switch

1 Circuit-breaker
2 Disconnector/earthing switch
3 Current transformer
4 Air/SF_6-Bushings
5 Controll cabinets
6 Spring drive mechanism circuit-breaker
7 Drive mechanism for outdoor earthing switch

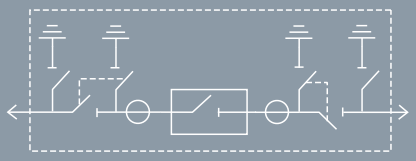




1 *Terminal plate*
2 *Conductor*
3 *Bushing*
4 *Current transformer*
5 *Rupture disc*
6 *Interrupter unit*
7 *Metal housing*
8 *Insulating partition*
9 *Disconnector*
10 *Earthing switch*
11 *Angle housing*
12 *Outdoor earthing switch*



In-/Out - Variant



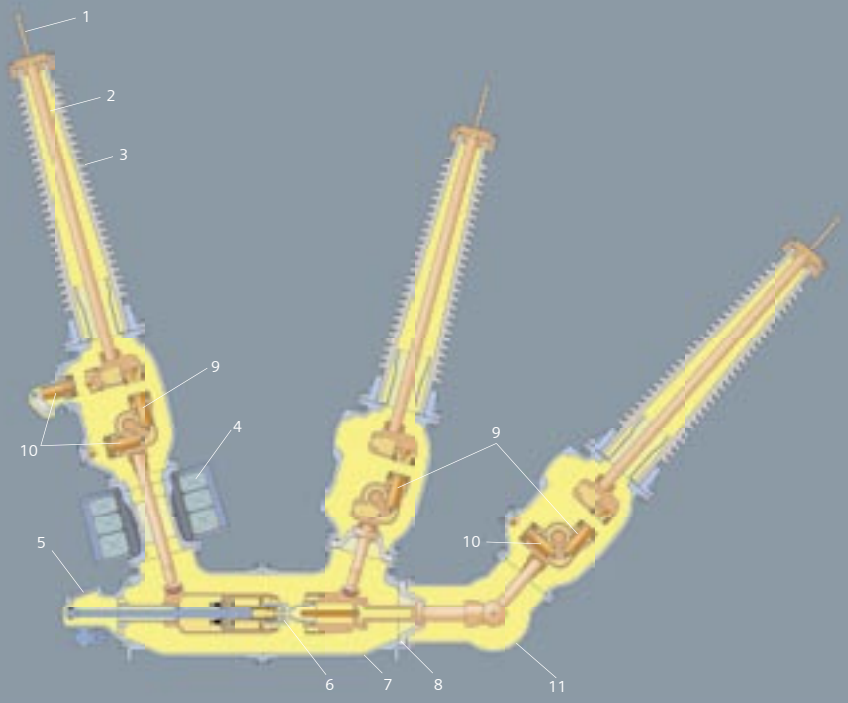
Single Bus Bar - Variant

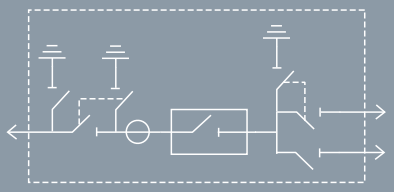
In-/Out - Variant
The DTC concept enables a flexible use for any substation layout.
With its current transformers and disconnector/earthing switches on the incoming and outgoing side, the new Compact Switchgear from Siemens features innovative technology and ensures efficient operation.

Single Bus Bar - Variant
If further disconnector/earthing switches on the line-side or bus bar-side are required, this variant offers the right solution.

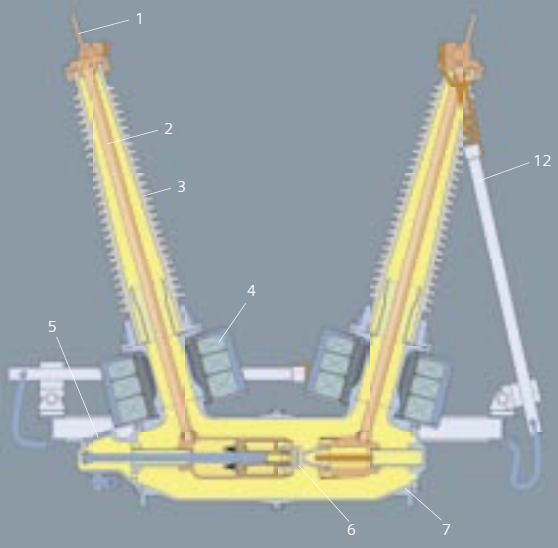
A combination of earthing switch/disconnecting and earthing switch is also available. They are located in one common housing.

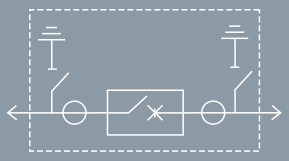
Double Bus Bar - Variant
The DTC can also be used for a double bus bar layout. Gas-tight insulating partitions are available on request. They divide each device into functionally distinct gas compartments (circuit-breaker, disconnector). The gas compartments are under constant monitoring by means of density monitors with an integrated indicator; any nonconformity is immediately





Double Bus Bar - Variant





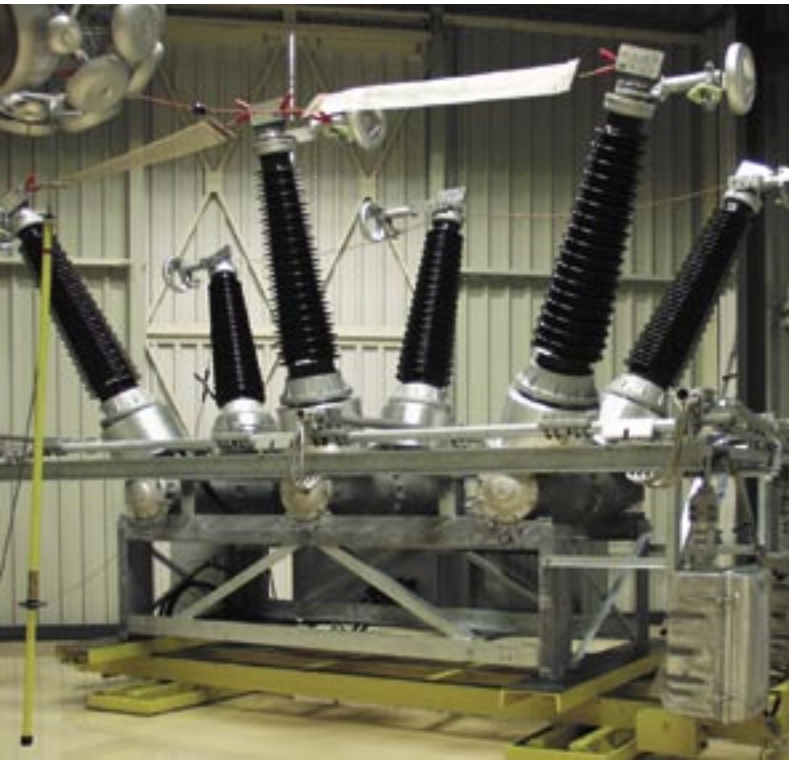
Circuit-Breaker with combined function and outdoor earthing switch

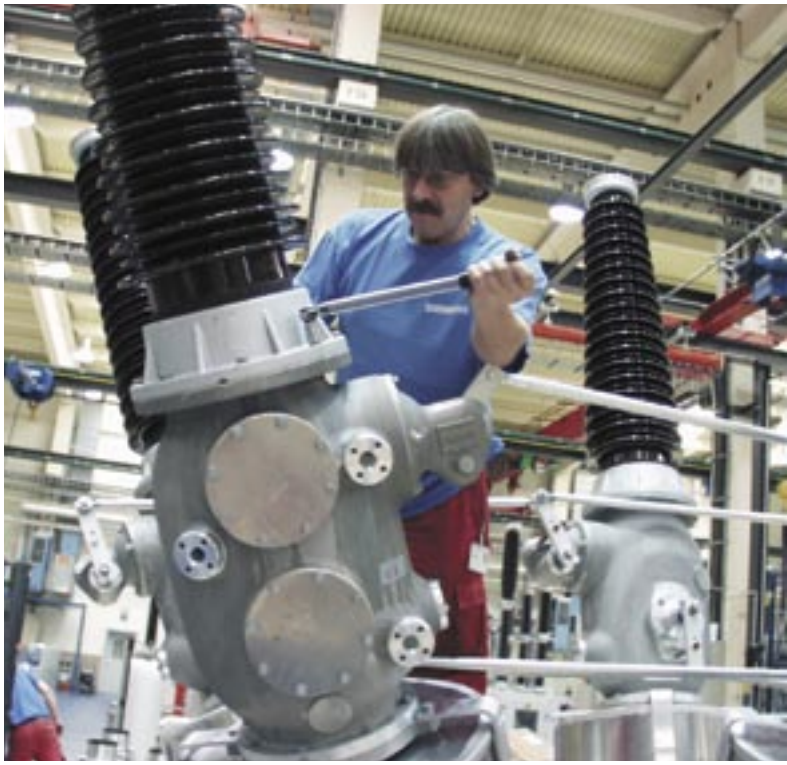
signalled. In case of a fault inside one disconnector, the other disconnector will not be affected. The SF_6 bushing can be delivered in porcelain or epoxy design, which is the same as used in other GIS devices.

Circuit-Breaker with combined function and outdoor earthing switch
This version of the DTC offers the function of a combined disconnecting circuit-breaker. Additional elements in this arrangement are current transformers and earthing switches attached to both sides of the module.

The features are:
- A simple and compact substation layout
- A visible indication of the earthing contact position
- No creepage currents across the open device
- The use of conventional current transformers

Earthing Switch
The module can be equipped on both sides of the DTC with earthing switches which are adopted from well proven Siemens disconnector products. They can be operated either by motor or by hand. The earthing switches and drives are mounted on a common base frame.





Routine Testing

The main components of the Compact Switchgear are subject to complete pre-acceptance pressure testing before assembly. Based on this high quality level, it is possible to guarantee a leakage rate of less then 0.5 % per year for the switchgear modules.
Routine testing is performed in accordance with the latest IEC- or ANSI-standards which includes at least the following operations and measurements:

- Series of 100 mechanical switching cycles
- Switching time determination
- Tripping and motor currents
- Gas monitoring
- Testing of control circuits in accordance with the circuit diagram
- Voltage drop of the main conducting path
- High-voltage tests

Technical Data

High-Voltage Compact Switchgear	3AP1 DTC	
Rated voltage	123 kV	145 kV
Rated normal current	2500 A	2500 A
Rated frequency	50/60 Hz	50/60 Hz
Rated lightning impulse withstand voltage	550 kV	650 kV
Rated power frequency withstand voltage	230 kV	275 kV
Rated power frequency current (3 s)	40 kA	40 kA
Rated peak withstand current	108 kA	108 kA
Ambient temperature range	-30 ... +40°C	-30 ... +40°C

Values in accordance to IEC,
other values on request

For further Information

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Please send me more information on the following topics:

- ☐ High-voltage circuit-breakers for outdoor installation
- ☐ Live-tank and dead-tank high-voltage circuit-breakers technology
- ☐ High-voltage circuit-breakers: Type 3AT2/3, 245 kV to 550 kV
- ☐ Hydraulic operating mechanisms for high-voltage circuit-breakers
- ☐ Eliminate stress: Controlled switching of high-voltage circuit-breakers
- ☐ SF_6 in power engineering - acting responsibly
- ☐ Ruhrtal - Disconnectors and Earthing Switches
- ☐ Further copies of this brochure

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Order No. E50001-U113-A343-7600
Printed in Germany
Dispo-Stelle 30000
By. PA 07065.0

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