



ZX2.2

Gas-insulated medium voltage switchgear

Power engineering from ABB

Solutions for the future

As a technology group with global operations, ABB supplies the solutions of the future for the core areas of our economy: public and industrial electricity, heat, gas and water supply. In that context, our clients benefit from a comprehensive product, system and service range in power engineering. With a combination of experience and innovative power, we offer them turnkey implementation of projects of all sizes, from planning to commissioning, from low voltage to high voltage and from process control to corporate management.

Our innovative and holistic concepts for modular structure systems enable you to make optimum, economical use of the equipment deployed and thus ensure the necessary security of investment in today's markets.

Gas-insulated switchgear from ABB

Flexible combination, reliability, availability and economy are the attributes that make it easy for our clients in industry and the public sector to decide in favor of this product series. The modular structure ensures that even unusual configurations can be economically implemented. The use of digital protection and control technology, and plug-in connections makes the products in the ZX2.2 family unrestrictedly fit for the future, and the primary function of reliable power distribution is fulfilled with no ifs and buts.

This is ensured by ABB's uncompromising approach to quality, which leaves no customer's wishes unfulfilled.



Safe for a lifetime

Sulphur hexafluoride (SF₆) is used as the insulating medium

The high voltage compartments are designed as hermetically sealed pressure systems. As they are filled with sulphur hexafluoride (chemical symbol SF₆), constant ambient conditions are permanently ensured for the entire high voltage area of the panel. SF₆ is maintenance-free, non-toxic, non-combustible. The chemically inactive gas has three times the dielectric strength of air at atmospheric pressure. SF₆ consists of very large molecules and can be enclosed without notable losses for the complete service life of the switchgear.

Greater Safety and savings in space and materials

Its unique electrical and thermal properties have made the design

of new, more efficient switchgear possible. The change from conventional insulation to the non-flammable, chemically inactive and non-toxic heavy gas SF₆ has led to significant savings in space and materials, and to greater safety of the installations. Switchgear systems insulated with SF₆ have become highly successful especially in applications where space is constricted and compact design is required. On account of their insensitivity to air-pollution, enclosed SF₆ systems are also used in the chemicals industry, in desert areas and at coastal locations.

SF₆ has been used in HV-switchgear since 1960.

Your benefit

Maximum operator safety

- All live components are enclosed to prevent accidental contact.
- As the high voltage compartments are independent of external influences (degree of protection IP65), the probability of a fault during operation is extremely low.
- As evidenced by arc fault testing, our switchgear systems are notable for maximum operator safety.
- A further increase in operator safety can be achieved by providing pressure relief to outside the switchgear room.

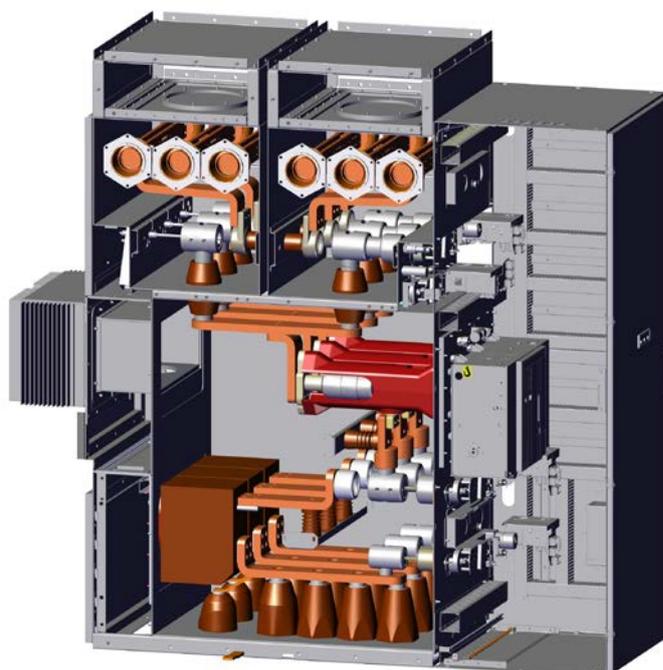
Minimum overall costs

- The compact design of the panels reduces the space required and therefore the size of the station. The result is a lower investment requirement.
- Freedom from maintenance is achieved by constant conditions in the high voltage compartments in conjunction with the selection of suitable materials. The injurious influences of dust, vermin, moisture, oxidation and contaminated air in the high voltage compartments are precluded, as the gas-tight compartments are filled with inert gas. As a rule, therefore, isolation of the switchgear to perform maintenance work is not required.

- The systematic selection during the development process of the materials used provides for complete recycling or reuse of those materials at the end of the service life.
- The panels only leave our production facilities after documented routine testing. Thanks to the plug-in technology applied in the areas of the busbars, cables and secondary systems, extremely short installation times are possible.
- No gas work is required as a rule at site. There is thus no need to evacuate and fill the high voltage compartments, test them for leakage and measure the dewpoint of the insulating gas at site.

Maximum availability

- The plug-in busbar technology without screw couplings permits simple and therefore safe assembly.
- In spite of the extremely low failure probability of the ZX switchgear systems, replacement of components in the gas compartments and therefore a rapid return to service after repairs is possible.
- In gas-insulated switchgear, earthing of switchgear sections is performed by a high quality vacuum circuit-breaker. The circuit-breaker can close onto a short-circuit significantly more frequently and reliably than a positively making earthing switch.



ZX2.2 Feeder Panel,
Double Busbar

Technical data

			Ratings
Rated voltage	U_r	kV	42
Maximum operating voltage		kV	42
Rated power frequency withstand voltage	U_d	kV	80
Rated lightning impulse withstand voltage	U_p	kV	200
Rated frequency	f_r	kV	60
Rated busbar current	I_r	A	... 2500
Rated feeder current	I_r	kA	... 2500
Rated peak withstand current	I_p	kA	...104
Rated short-time withstand current	I_k	kA	...40
Rated duration of short-circuit	t_k	s	...3
Rated peak withstand current of circuit-breaker	I_{MC}	kA	...104
Rated short-time withstand current of circuit-breaker	I_{SC}	kA	...40
Rated operating sequence			O - 0.3 s - CO - 3 min - CO
Total break-time		ms	approx. 60
Make-time		ms	approx. 80
Insulating gas system			
Insulating gas			SF ₆
Rated filling level for insulation	p_{re}	PSI	18.85
Alarm level for insulation	p_{ae}	PSI	17.40
Minimum functional level for insulation	p_{me}	PSI	17.40
Degree of protection			
Degree of protection for gas filled compartments			IP65
Degree of protection of low voltage compartment ⁶⁾			IP4X
Ambient temperatures			
Ambient air temperature, maximum		°F / °C	104 / 40
Ambient air temperature, maximum 24 hour averages		°F / °C	95 / 35
Ambient air temperature, minimum		°F / °C	23 / -5
Altitude for erection above sea level		ft	...3281
Basic Dimensions			
Height		in	91
Depth		in	81
Width		in	31.5
Approximate weight			
Panel, single busbar type, rated feeder current < 2000 A		lb	3500
Panel, single busbar type, rated feeder current 2500 A		lb	3700
Panel, double busbar type, rated feeder current < 2000 A		lb	4000
Panel, double busbar type, rated feeder current 2500 A		lb	4300

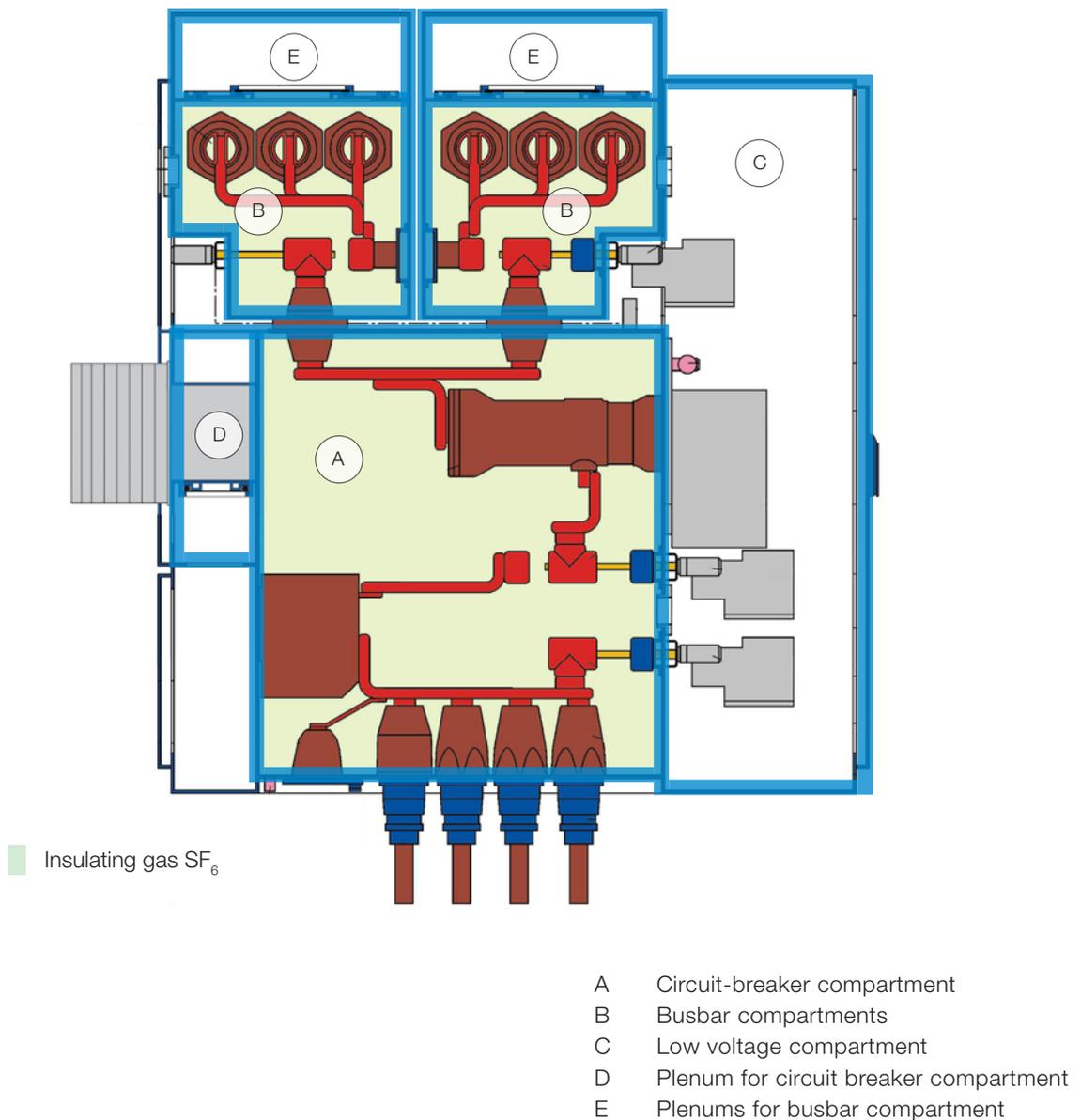
Fundamental structure of the panels

Modular structure

Each feeder panel consists of the circuit-breaker compartment (A), one or two busbar compartments (B), the low voltage compartment (C), the plenum for the circuit breaker compartment (D) and one or two plenums for the busbar compartments (E).

The circuit-breaker compartment and the busbar compartments are filled with SF₆.

There are no gas connections between the compartments of a panel or to gas compartments in adjacent panels.



Focus on the details

Design

- Vacuum circuit breaker
- Single and double busbar systems
- CMT welded stainless steel enclosures for
- Modular design
- Panels coupled by plug-in busbar connectors
- Without SF₆ gas work on site
- Inner cone cable plug system with sizes 3
- Bus duct connection solidly insulated
- Three position disconnect on both sides of the circuit breaker
- Integrated grounding switch
- View ports to check switch positions
- View ports can be covered when not in use

Advantages

Maximum safety

- Inherently arc-resistant design
- Partitioning of functional compartments
- Encapsulation completely protected against access to hazardous parts
- No effect of site altitude on dielectric strength

Minimum space required

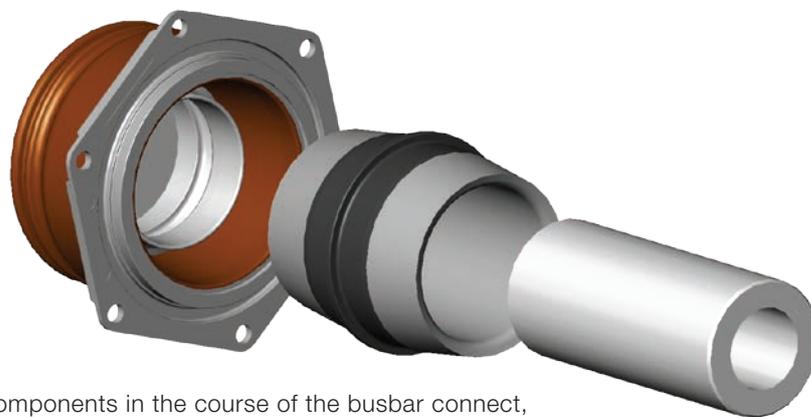
- Minimum switchgear dimensions due to SF₆ insulation
- Savings in real estate and transportation cost

Economy

- Maximum availability for the operator
- Maximum system service life as independent of the environment
- Minimum maintenance requirement means significant savings in operating costs

Metal-partitioned and gas-tight

- SF₆ gas-insulated
- Low pressure SF₆ gas system
- Main busbar compartment is segregated from adjacent compartments
- 12 to 42 kV
- Up to 2500 A and 40 kA
- Up to 200 kV BIL



Plug-in components in the course of the busbar connect, insulate and conduct the current.

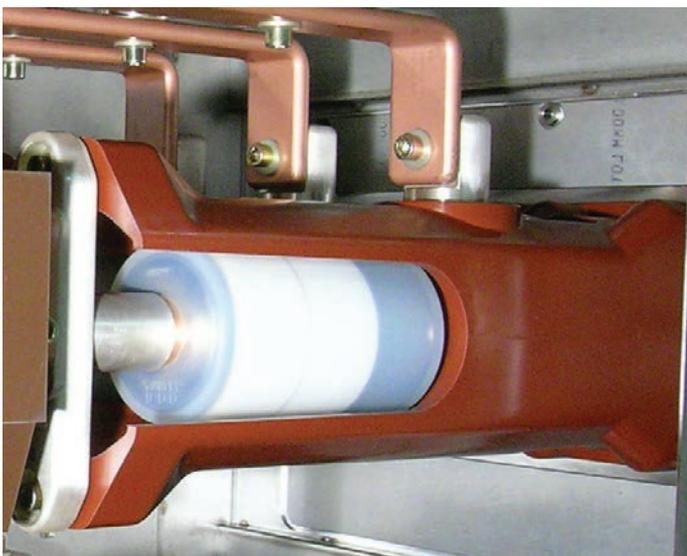
In Service wherever Electrical Energy is generated, distributed and utilized.

Circuit-breaker VD4 X

- Fixed mounted design with vacuum interrupter
- Horizontal arrangement of circuit-breaker poles
- Operating mechanism outside the gas compartment
- Poles and mechanism connected via gas-tight thrust bushing
- Additional earthing function in combination with three position disconnect

Advantages of grounding through circuit breaker

- Circuit-breaker of higher quality than a grounding switch
- Higher number of switching cycles onto faults
- Causes no pollution of the SF₆ during switching operations



Three position disconnect

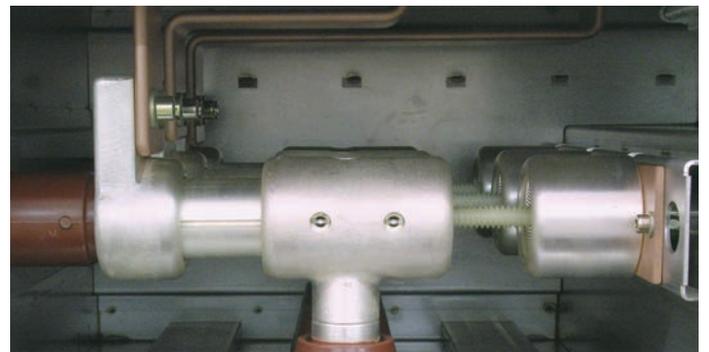
- Motor-operated rod-type switch with three functions: Connecting, isolating and grounding
- Disconnected position at center
- Limit positions: Disconnecter ON or grounding switch ON

Grounding switch

- Motor-operated rod type switch to ground cables

Switch features

- No-load operation, interlocked with circuit breakers: Switching is performed exclusively by the circuit-breaker
- Operating mechanism outside the gas compartment
- Motor operated insulating spindle drives the moveable contact
- Emergency manual operation available with mechanical interlocking
- Mechanical position indicators



View ports

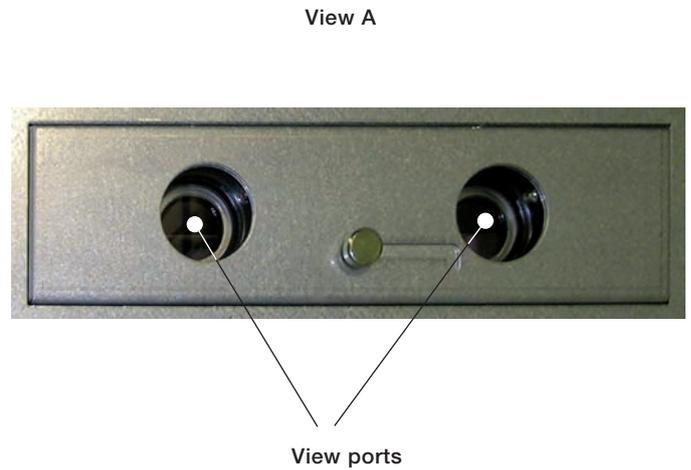
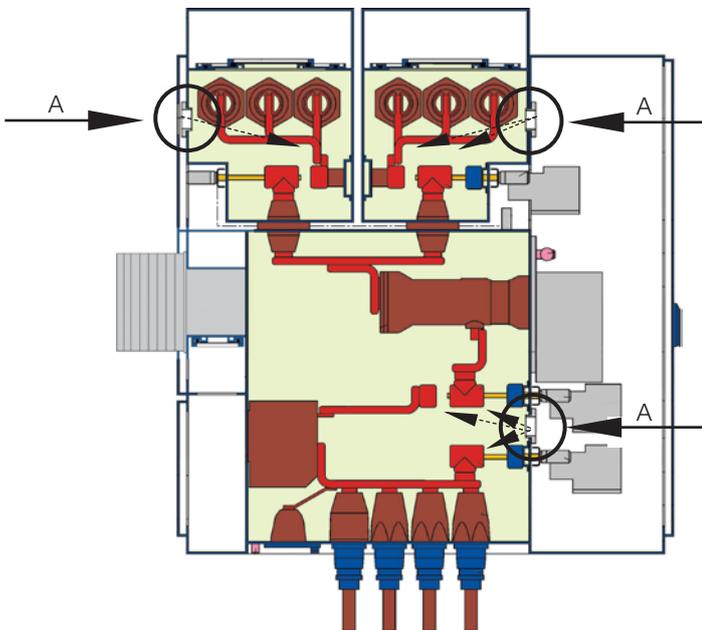
The compartments are equipped with view ports to allow operators to verify the switching positions of the three position disconnects, the disconnects and the grounding switch visually.

The view ports are located close to the relevant switches in the low voltage compartment or at the rear of the panel.

Using a flashlight to peer through the view ports, the operator can visually verify that the relevant switch is disconnected, connected or in the grounded position.

The view ports will be covered by a slide mechanism.

Provided as an optional accessory, the camera system makes visual verification of the switches quick, simple and ergonomic. The camera system mounts directly to the view ports and the operator monitors the position of the disconnect via LCD screen. The camera system will be placed outside the gas compartment when it is needed. This way if a failure occurs with the camera it can be easily replaced without compromising safe operation of the gear or verification of the disconnect switch.



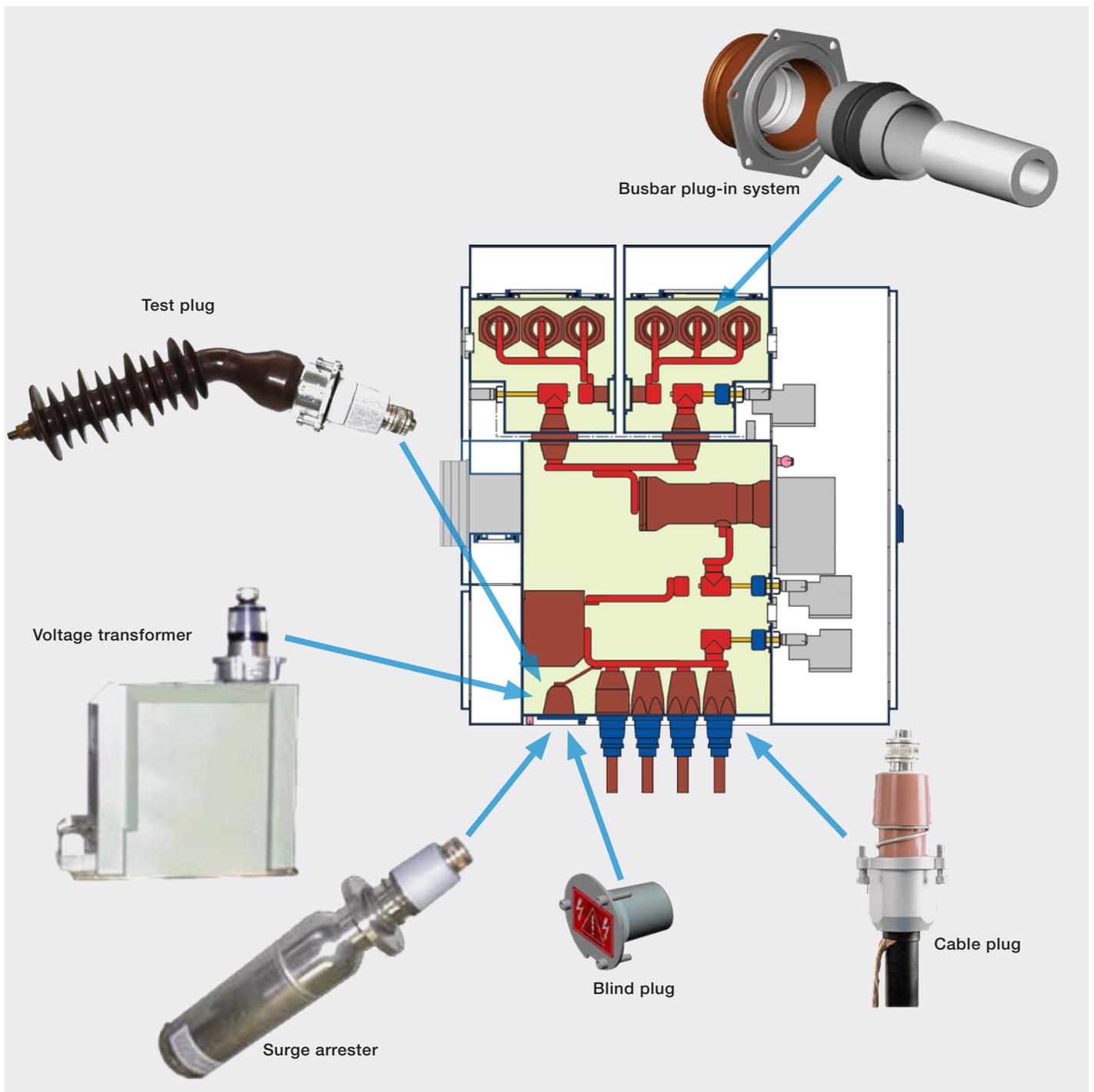
Camera system case



Plug-in System

ZX2.2 offers a convenient plug-in system for busbars, cables, PT's, surge arresters and other common switchgear components. Installation time for plug-in components is considerably shorter when compared to bolted connections. Additionally, the plug connector system allows for testing of panels for leakage and dielectric strength at the factory, ensuring that the switchgear will be in working conditions when it is shipped.

When using plug-in systems, it is possible to avoid handling SF₆ gas during installation since the units can be shipped filled with gas and there is no need to open the primary compartments on site, allowing the switchgear to be ready for operation in no time



Maximum operator safety

Maximum operator safety for the total live time

All live components are enclosed to prevent accidental contact. Probability of internal arc is greatly reduced thanks to ZX Family's stainless steel sealed (for life) pressure systems - medium voltage components isolated from external influences for 40 years.

Segregated gas compartments

Segregated stainless steel gas compartments greatly reduce the probability that damage from internal arcing may propagate inside the switchgear.

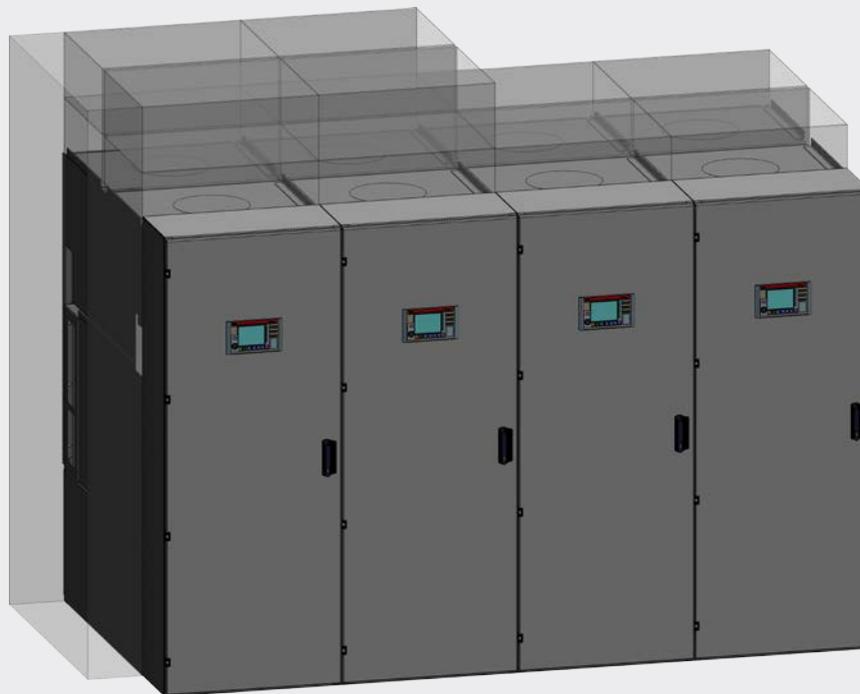
Plenums

Integral plenums to redirecting any plasma and hot toxic gases, generated in the extremely unlikely event of internal arcing, away from personnel.

Three phase design

The ZX2.2's three phase design does not allow for propagation of internal arcs to adjacent panels. In the unlikely case of an arc flash event, only the compartment where the arc occurred is affected, leaving the rest of the switchgear line-up unscathed. The operator's safety is maintained since the arc is contained to one compartment of one frame. There is less downtime associated with the outage, as only 1 frame would require maintenance.

Plenums in transparent view



Exemplary illustration: Plenum discharges into the switchroom

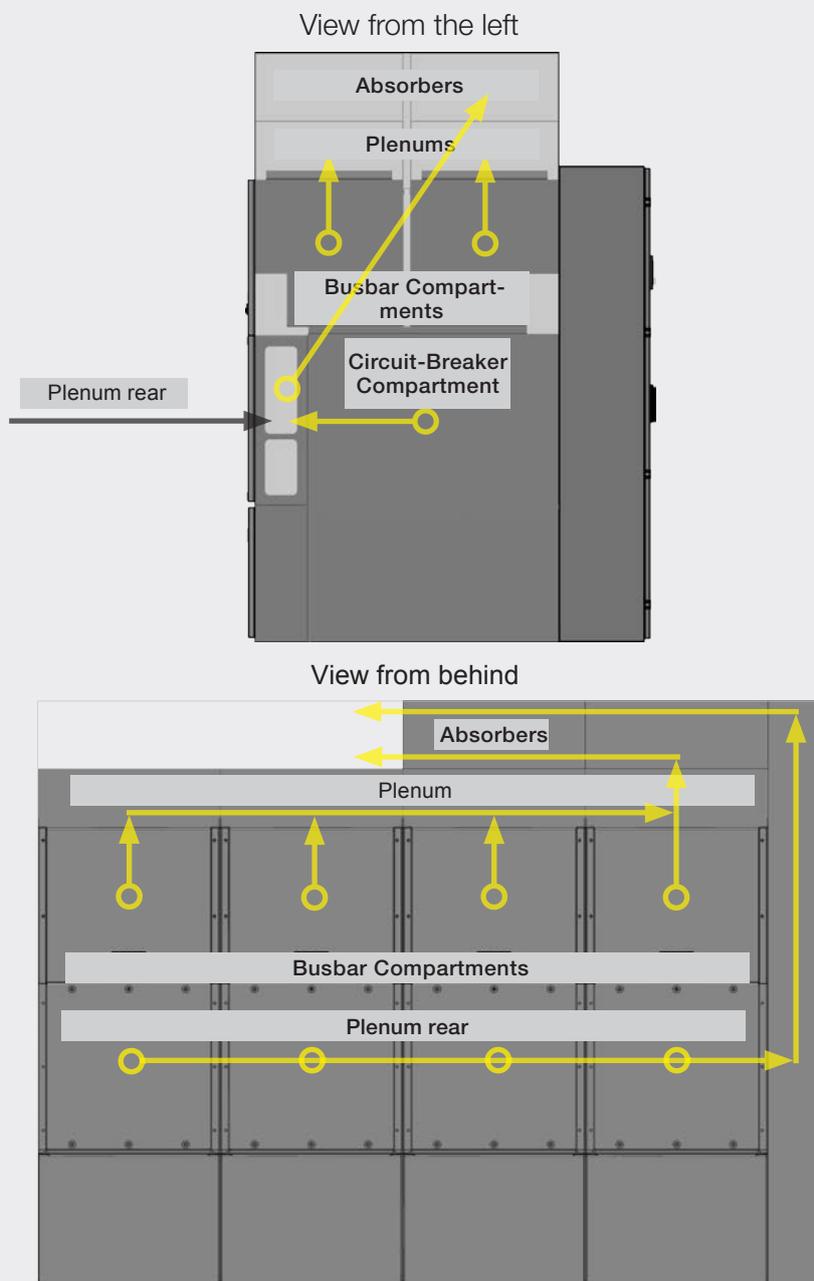
Improved safety

Improved safety for personal

Figures show the redirecting of hot gases, generated in the extremely unlikely event of internal arcing from the location of constitution through the plenums to the outside on the top of the switchgear.

Discharge of pressure from the circuit-breaker compartments compartments is effected via the rear plenum, and

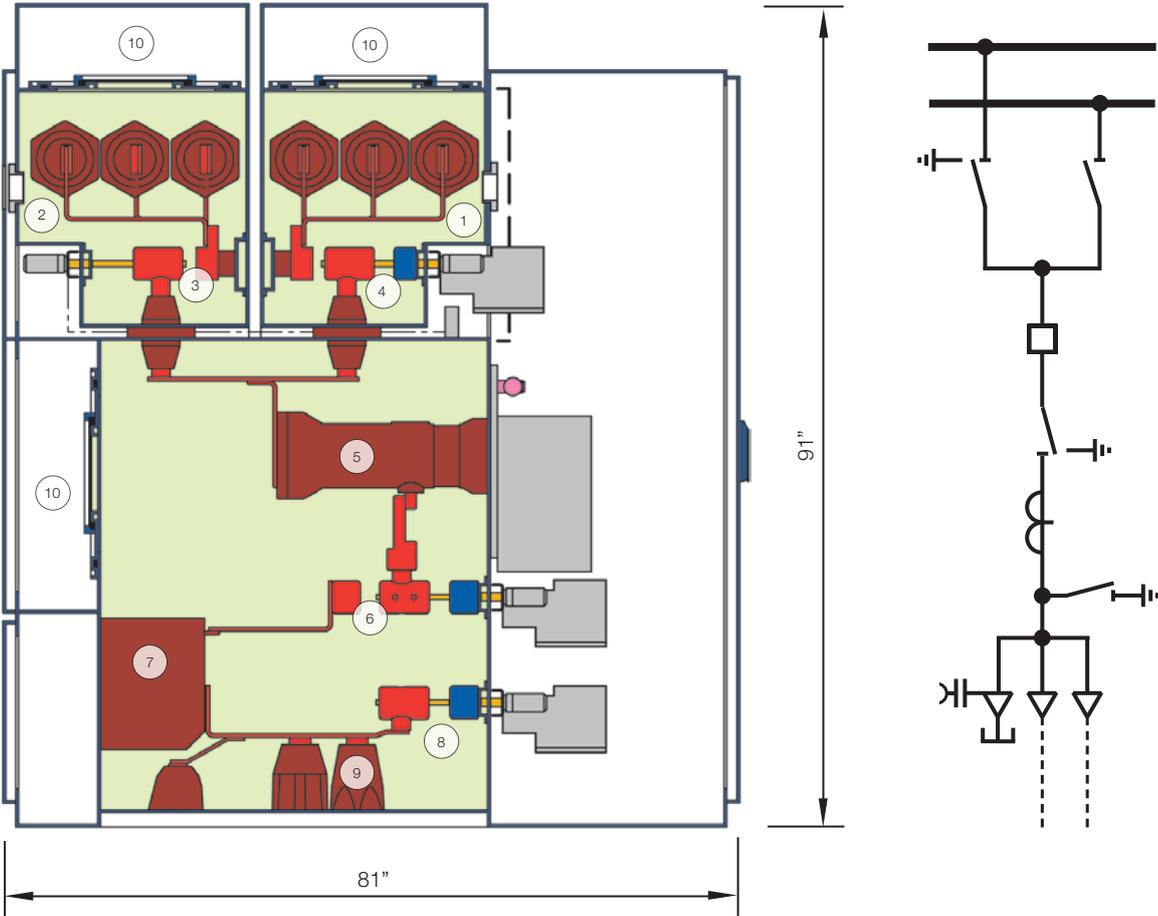
then through a plenum designed as a broad end cover at the side of the switchgear block into the front absorber. Discharge of pressure from the busbar compartments is directed into the upper plenums. The pressure surge is cooled in the (plasma) absorber located above the upper plenum and released into the switchgear room.



Exemplary illustration: Plenum discharges into the switchroom

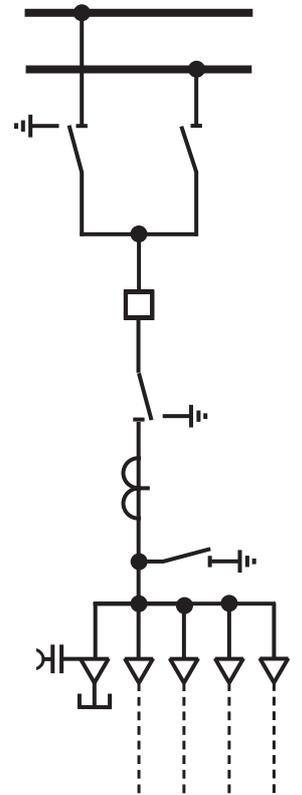
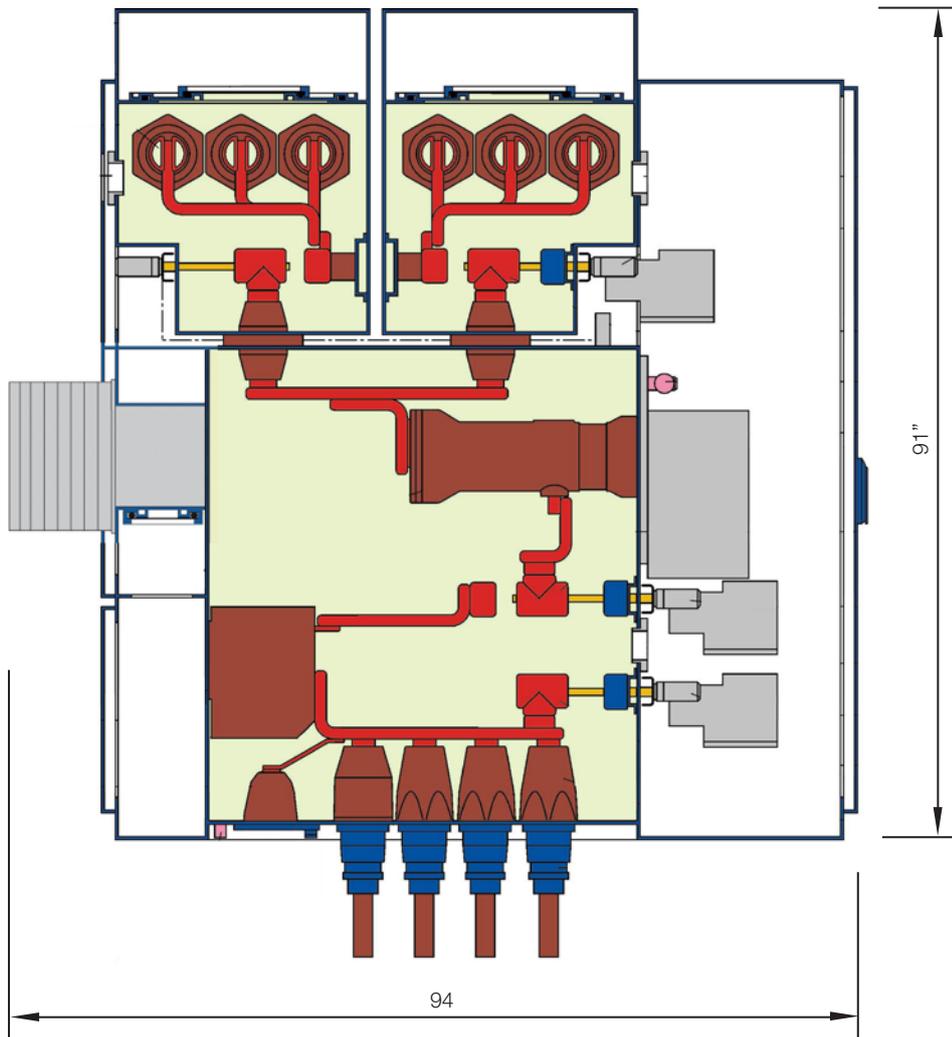
Panel Variants

1250 A Feeder on a Double Busbar Arrangement

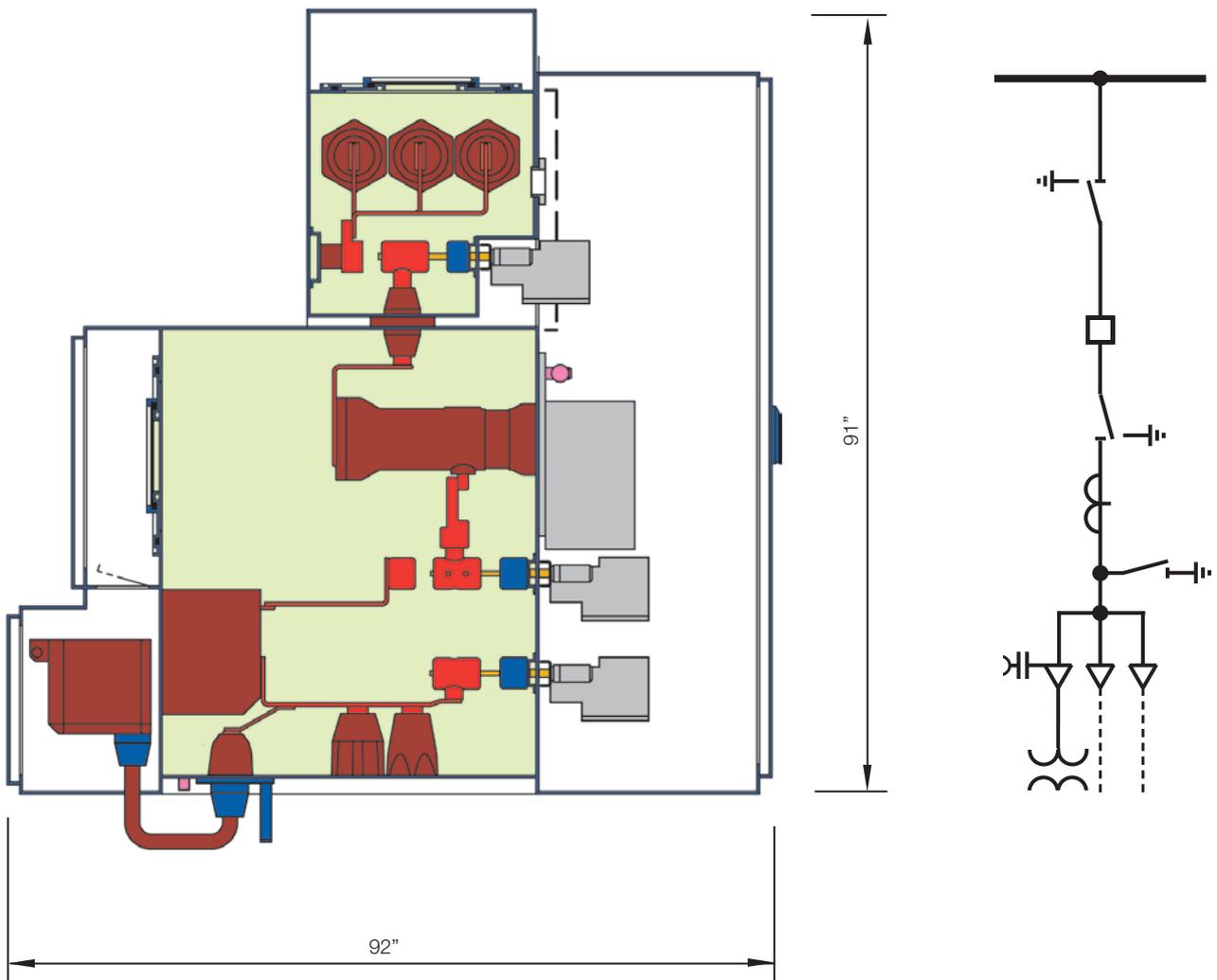


- 1 Busbar 1
- 2 Busbar 2
- 3 Two-position disconnect
- 4 Three-position disconnect
- 5 Circuit breaker
- 6 Three-position disconnect
- 7 Current transformer
- 8 Grounding switch
- 9 Plug-in connectors
- 10 Integrated safety plenum

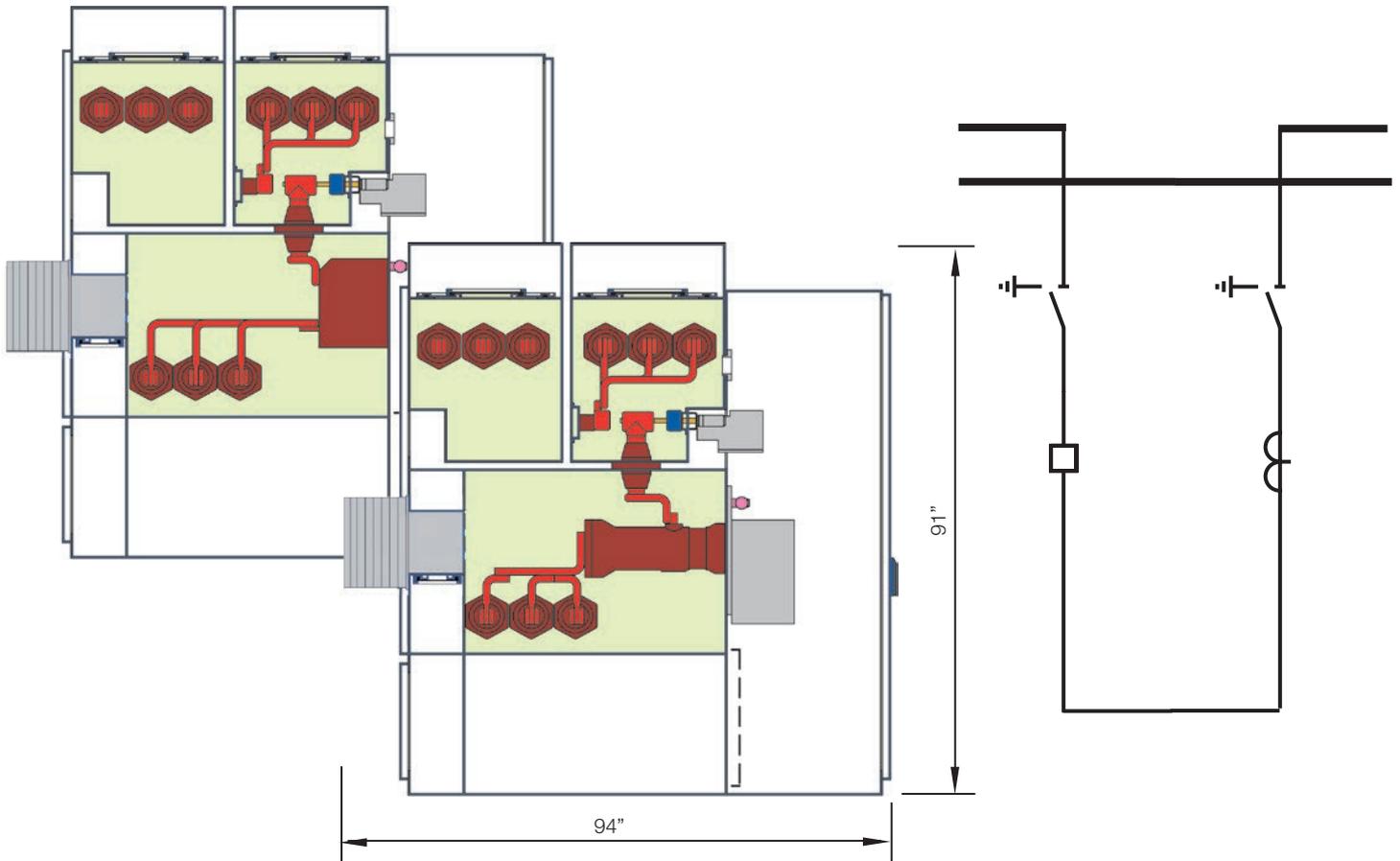
2000 A Feeder on a Double Busbar Arrangement



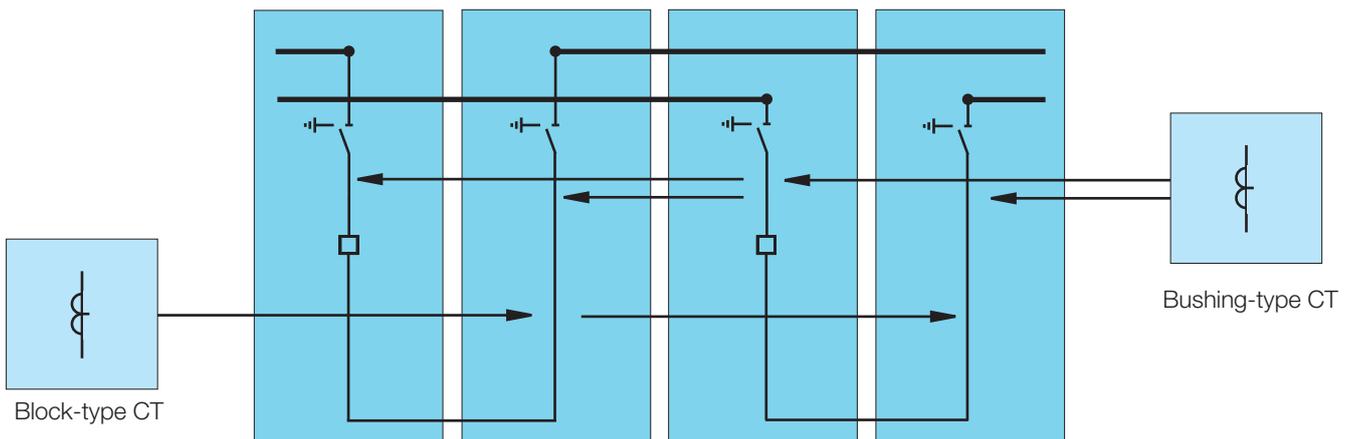
1250 A Feeder on a Single Busbar Arrangement



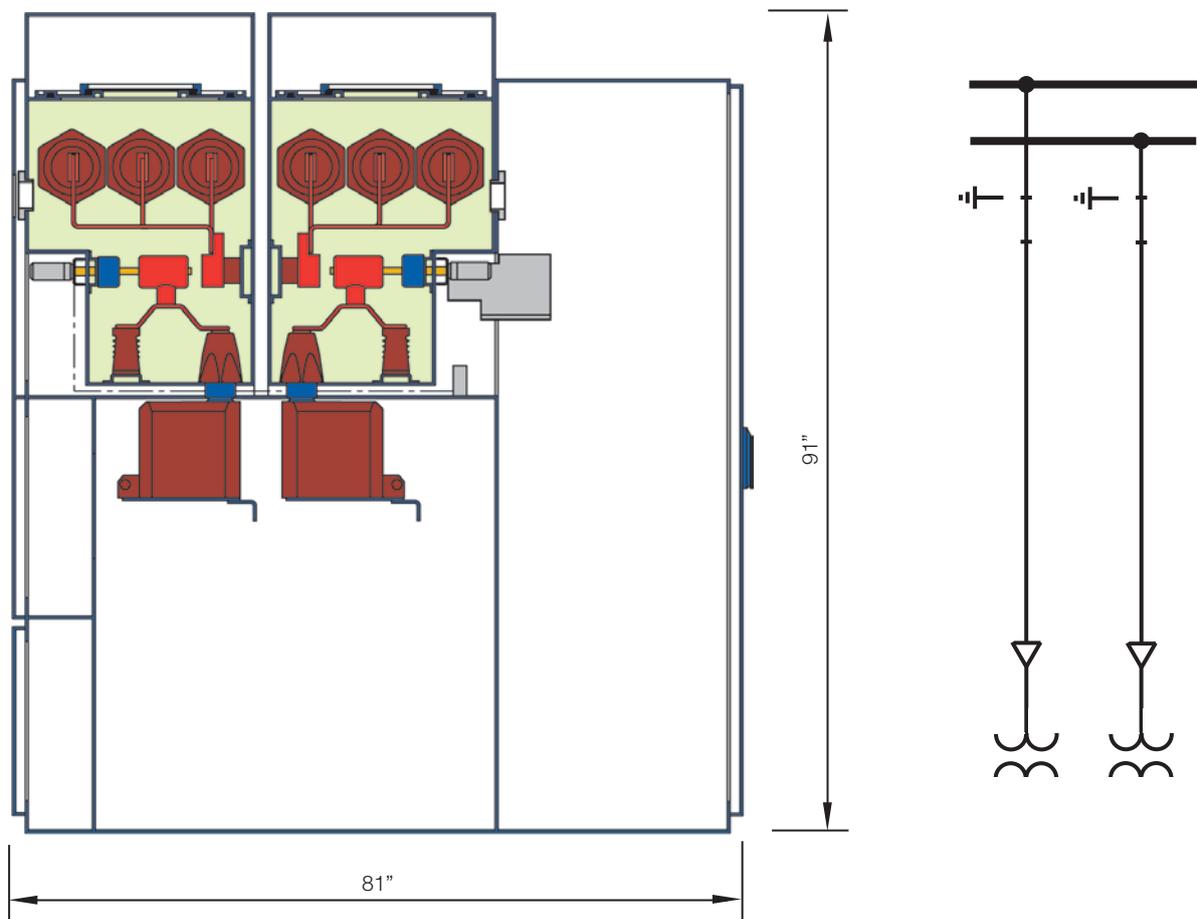
2000 A Bus Riser and Bus Sectionalizer for Double Busbar System



Also available for rated currents up to 2500 A (Panel height: 113")



Metering panel



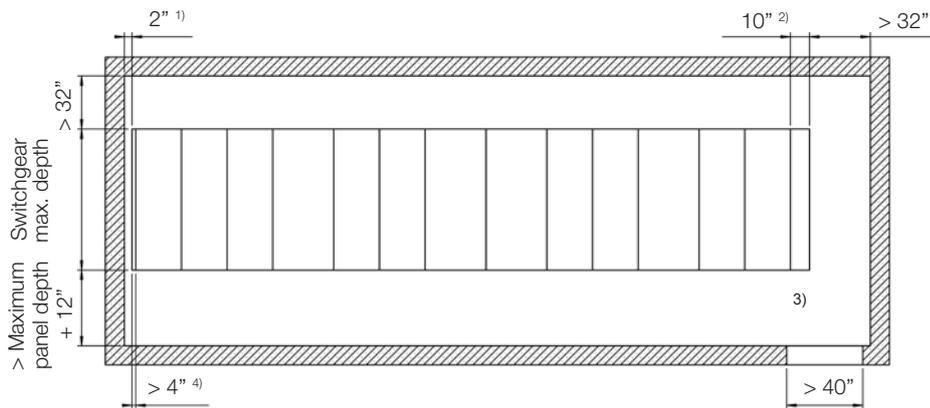
Also available for Single busbar systems

Minimum Recommended Clearances

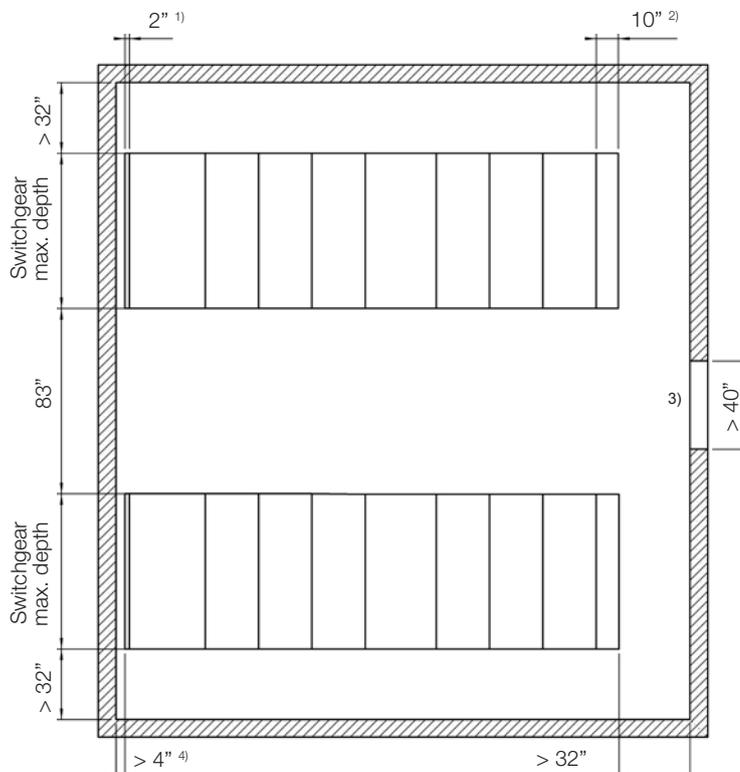
Planning of the space required for the switchgear must take account of the

- escape routes,
- the possibility of inserting panels into an existing row,
- the boundary conditions for IAC qualification, and
- space required for dismantling and assembly of voltage transformers.

Example of a single row installation (Top view)



Example of a double row installation (Top view, dimensions in inches)



- ¹⁾ End cover
- ²⁾ Lateral plenum
- ³⁾ Door height: > 91" (with integrated measurement: > 98.5")
- ⁴⁾ Recommendable: 20"

Note: Depending on the particular configuration of each switchgear line up, the minimum recommended clearance on top of the switchgear will typically vary between 8" and 13". Consult the factory for more details.

Delivery, Installation, Commissioning and Maintenance

Delivery

- Complete panels
- Factory tested
- With SF₆ at rated filling pressure
- Suitable for handling by crane or fork lift truck

Installation

- Erection over a vault or raised false floor
- Easy and fast installation due to plug-in technology
- Simple connection of panels via plug-in connectors
- Cable termination compartments with plug-in technology

Commissioning

- US-based trained technicians
- Direct access to the conductors through a test socket is available for current and voltage tests on site
 - without removing the cable connection
 - without gas work

Inspection and Maintenance

- Test socket can be used for cable tests or maintenance grounding
- No refill of insulating gas required under normal conditions due to sealed pressure system
- Gas compartments are maintenance-free under normal conditions
- Inspection predominantly comprises visual inspection and functional testing



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