



ZX2.2

Medium voltage gas-insulated switchgear

Power and productivity  
for a better world™



# Power engineering from ABB

## Solutions for the future.



### A strong family for all seasons.

Equipped to master all requirements, the members of the ZX family provide solutions to every challenge. Clients in over 70 countries rely on gas-insulated switchgear from ABB. The selected references speak for themselves...



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

### Plug-in technology at all ends.

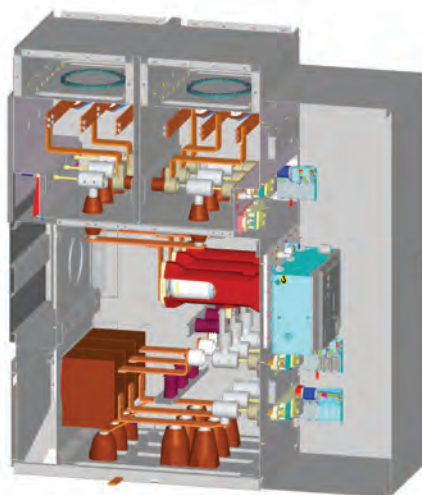
#### Every enclosure is hermetically sealed.

The factory-assembled, routine tested gas-insulated switchgear accommodates all the live components in a gas-tight stainless steel enclosure containing  $\text{SF}_6$  gas.  $\text{SF}_6$  stands for sulfur hexafluoride, an artificially manufactured gas molecule in which six fluorine atoms are arranged around one sulfur atom.

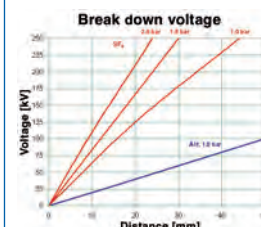
With its good chemical and physical properties (excellent insulating capacity)  $\text{SF}_6$  provides optimum conditions for the handling of voltages over 1000V.

Not only power cables, but also busbars and voltage transformers are connected to the panels using our tried and tested plug-in technology.

The result is a hermetically sealed panel which requires no handling of  $\text{SF}_6$  gas at site in most cases.



$\text{SF}_6$  is an inert, non-flammable, non-toxic and non-ozone depleting insulating medium.



$\text{SF}_6$  has three times the dielectric strength of air at atmospheric pressure. This can be further increased by increasing the pressure.

$\text{SF}_6$  consists of very large molecules and can be enclosed without notable losses for the complete service life of a switchgear installation (approx. 40 years).

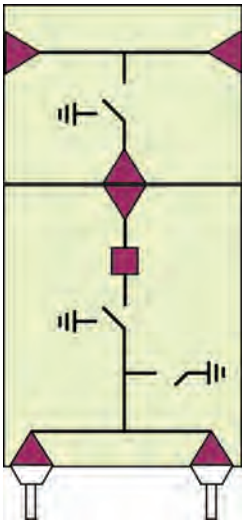
### The advantages at a glance.

- Dielectrically safe, even at  $\text{SF}_6$  gas atmospheric pressure
- Sealed for life
- Space-saving
- Touch proof
- Arc-resistant, even when the breaker door is open

## Focus on the details



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



Functional compartments are partitioned off from each other. The high voltage compartments are designed as hermetically sealed pressure systems. These are areas which require no further gas or vacuum treatment during the expected service life.

### Design

- Vacuum circuit breaker
- Single and double busbar systems
- Laser welded stainless steel enclosures for increased reliability
- Modular design
- Panels coupled by plug-in busbar connectors without SF<sub>6</sub> gas work on site
- Inner cone cable plug system with sizes 2 and 3
- Bus duct connection solidly insulated
- 3-position switch 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 SF<sub>6</sub> insulation
- Savings in real estate and transportation cost

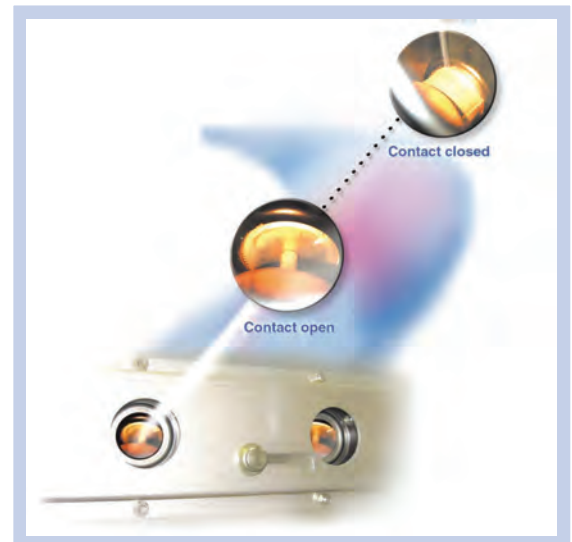
#### Economy

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

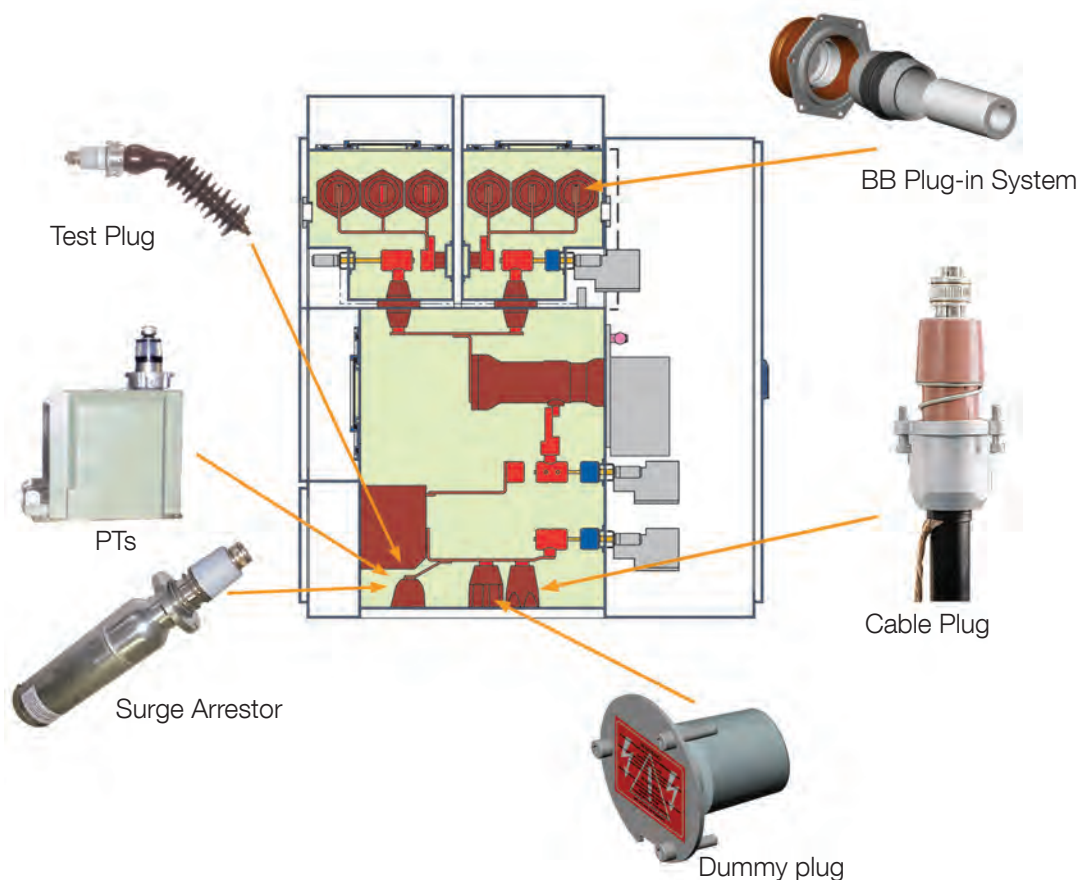
### Metal-partitioned and gas-tight

- SF<sub>6</sub> gas-insulated
- Low pressure SF<sub>6</sub> gas system
- Main bus bar compartment is segregated from adjacent compartments
- 12 to 42 kV
- Up to 2500 A\* and 40 kA
- Up to 200 kV BIL

\* Contact factory for higher ratings



## Plug-in System



ZX2.2 offers a convenient plug-in system for bus bars, 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.

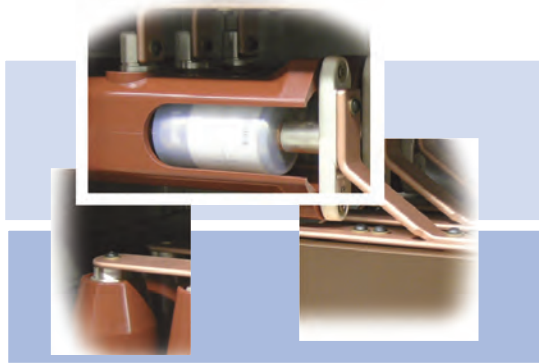


When using plug-in systems, it is possible to avoid handling SF<sub>6</sub> gas during installation since the units can be shipped filled with gas and there is no need to open the primary compartments on site, allowing the switchgear to be ready for operation in no time.



## 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 3-position switch

### 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

### 3-position switch

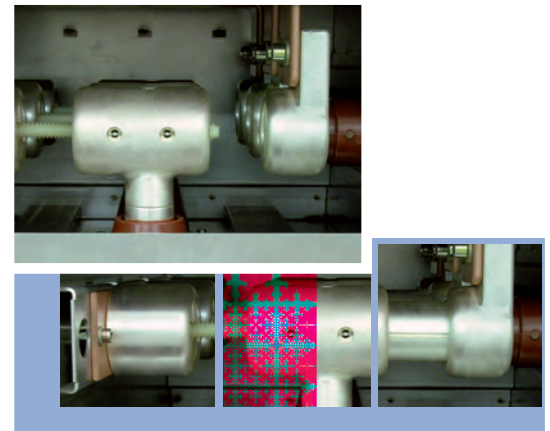
- Motor-operated rod-type switch with three functions
  - Connecting, isolating and grounding
  - Disconnected position at center
  - Limit positions: Disconnecter ON or grounding switch ON

### Grounding switch

- Motor-operated rod type switch to ground cables

### 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 SF<sub>6</sub> during switching operations



By merging 2 devices in a 3-position switch, mutual interlocking of the functions is integrated as part of the system and requires no further work.

## Customized ANSI Control and Protection Systems

- Compatible with ANSI protection relays
- Approval drawings in ANSI format
- Customized multifunctional device
- Mimic bus on front door



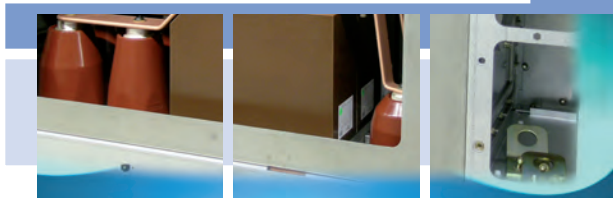
### Potential transformers

The potential transformers are always located outside the gas compartments. They are of the plug-in type (plug size 2 to DIN 47637 and EN 50181). The voltage transformers can be dismantled for test purposes.

In metering panels, isolating systems in combination with a grounding function are connected in series with the potential transformers.

### Current/voltage detection by

- Line current transformers in the breaker compartment
- Bus connected current transformers
- Potential transformers
  - Plugged-in, air-insulated
  - Touch proof



## Delivery

Complete panels

- Factory tested
- With SF<sub>6</sub> at rated filling pressure
- Suitable for handling by crane or fork lift truck

## Installation

- Easy and fast installation
- Erection over a vault or raised false floor
- 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
- Test socket can be used for cable tests or maintenance grounding

- No refill 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

## Inspection and maintenance

In 40 years, ABB has acquired outstanding expertise in the design and construction of gas-insulated switchgear. ZX panels have been positioned successfully and reliably on the world market since 1995.



## Technical Data

			Ratings
Rated voltage	$U_r$	kV	
Maximum operating voltage		kV	42
Rated power frequency withstand voltage	$U_d$	kV	80 <sup>1)</sup>
Rated lightning impulse withstand voltage	$U_p$	kV	200
Rated frequency	$f_r$	Hz	50/60
Rated busbars current	$I_r$	A	...2500 <sup>2)</sup>
Rated feeder current	$I_r$	A	...2500
Rated peak withstand current	$I_p$	kA	...104
Rated short-time current, 3s	$I_k$	kA	...40
Rated short-circuit breaking current of circuit-breaker	$I_{SC}$	kA	...40
Rated short-circuit making current of circuit-breaker	$I_{MC}$	kA	...104
Rated operating sequence			O - 0.3 s - CO - 3 min - CO <sup>3)</sup>
Total break-time		ms	approx. 60
Make-time		ms	approx. 80
Insulating gas			SF <sub>6</sub> <sup>4)</sup>
Rated filling level for insulation <sup>5)</sup>	$P_{re}$	kPa/PSI	130/18.85
Alarm level for insulation <sup>5)</sup>	$P_{ae}$	kPa/PSI	120/17.40
Minimum functional level for insulation <sup>5)</sup>	$P_{me}$	kPa/PSI	120/17.40
Rated data:			
Charging motor		VA(W)	240
Closing coil		VA(W)	250
Opening coil		VA(W)	250
Auxiliary voltage		V	60, 110, 125, 220 DC <sup>6)</sup>
Degree of protection - HV live parts			IP65
Ambient temperature:			
Maximum value		°C/°F	40/104
Maximum value of 24 hour mean		°C/°F	35/95
Minimum value		°C/°F	- 5/23
Altitude for erection above sea level <sup>7)</sup>		m/ft	...1000/3300
Basic Dimensions:			
Height		inches	91
Depth		inches	81
Width		inches	31.5

<sup>1)</sup> Higher values as per international standards on request

<sup>2)</sup> Single busbar arrangements up to 4000 A on request

<sup>3)</sup> Other sequences on request

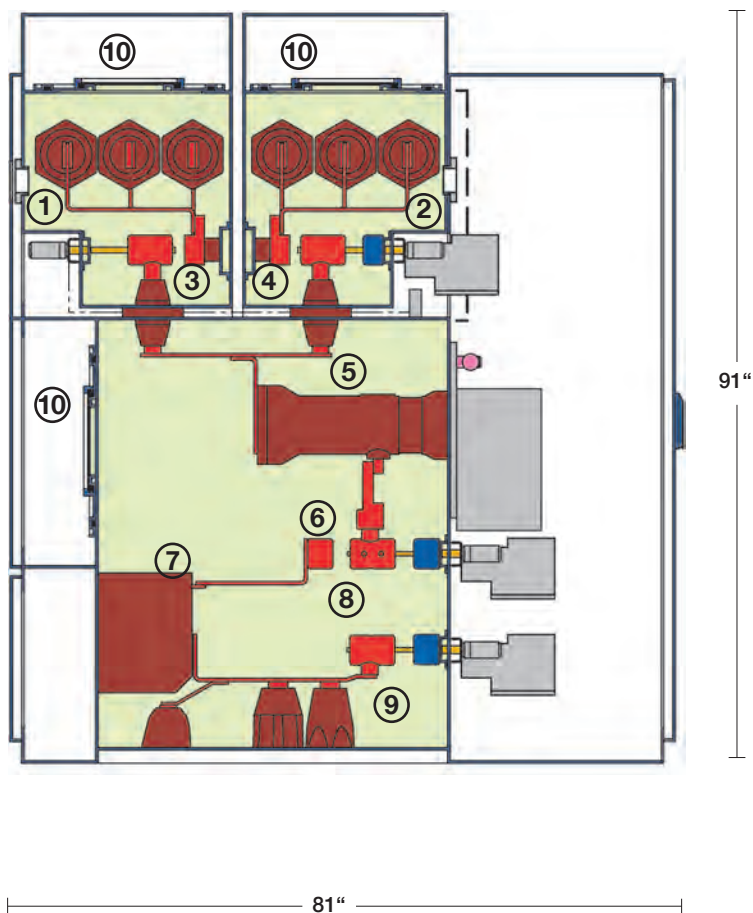
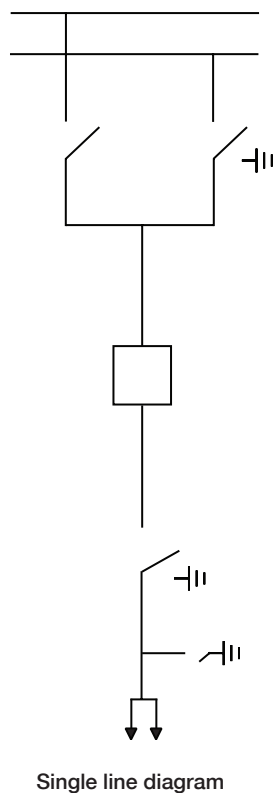
<sup>4)</sup> Insulating gas: sulphur hexafluoride

<sup>5)</sup> All pressures stated are absolute pressures at 20°C; 100kPa = 1 bar

<sup>6)</sup> Other auxiliary voltages on request

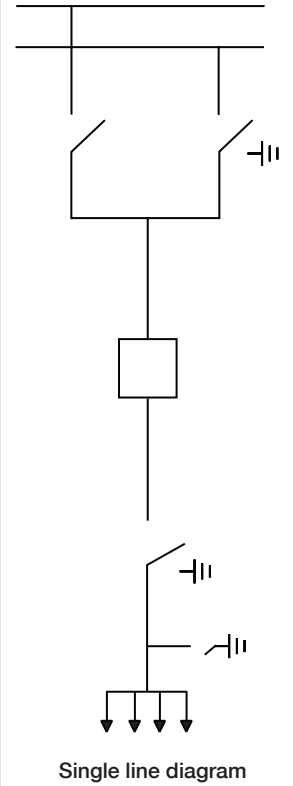
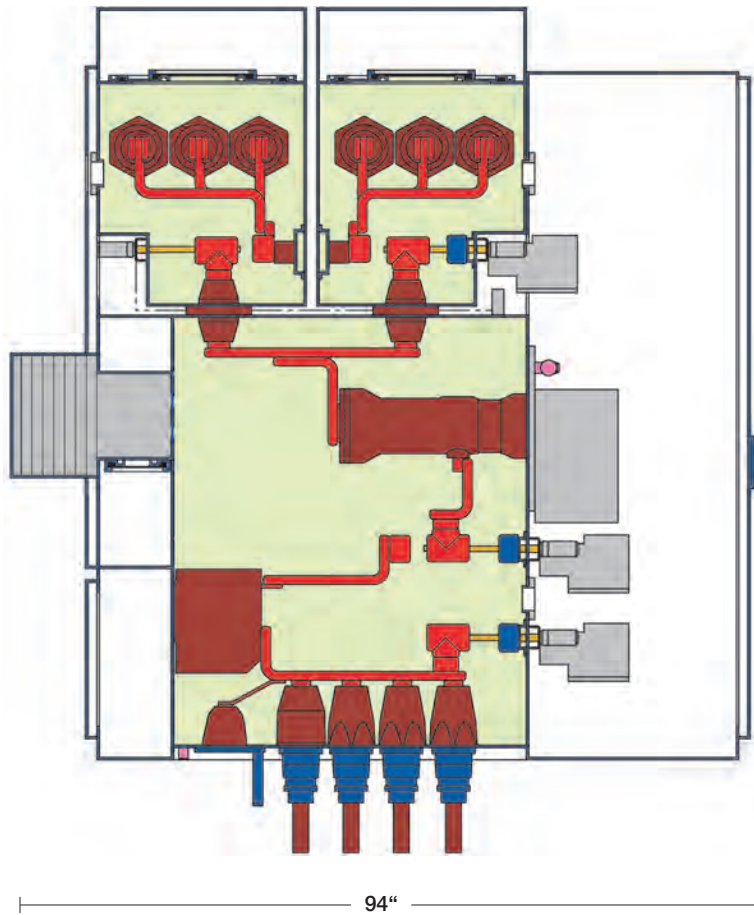
<sup>7)</sup> Higher altitudes above sea level on request

## 1250 A Feeder on a Double Bus Bar Arrangement (Section View)

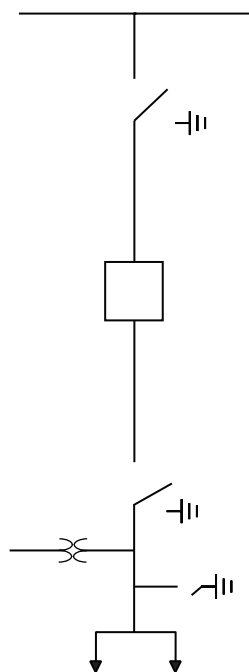


- 1 Bus bar 1
- 2 Bus bar 2
- 3 Two-position switch
- 4 Three-position switch
- 5 Circuit breaker
- 6 Three-position switch
- 7 Current transformer
- 8 Grounding switch
- 9 Plug-in connectors
- 10 Integrated safety plenum

## 2000 A Feeder Double Bus Bar Arrangement (Section View)



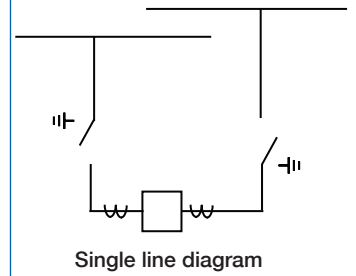
## 1250 A Feeder Single Bus Bar Arrangement with Line-connected Potential Transformers



Single line diagram

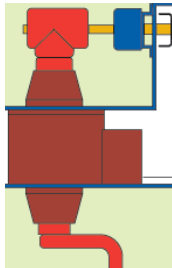


## Bus coupler 2500 A with CTs on Both Breaker Sides

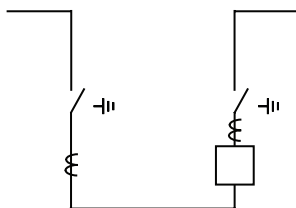




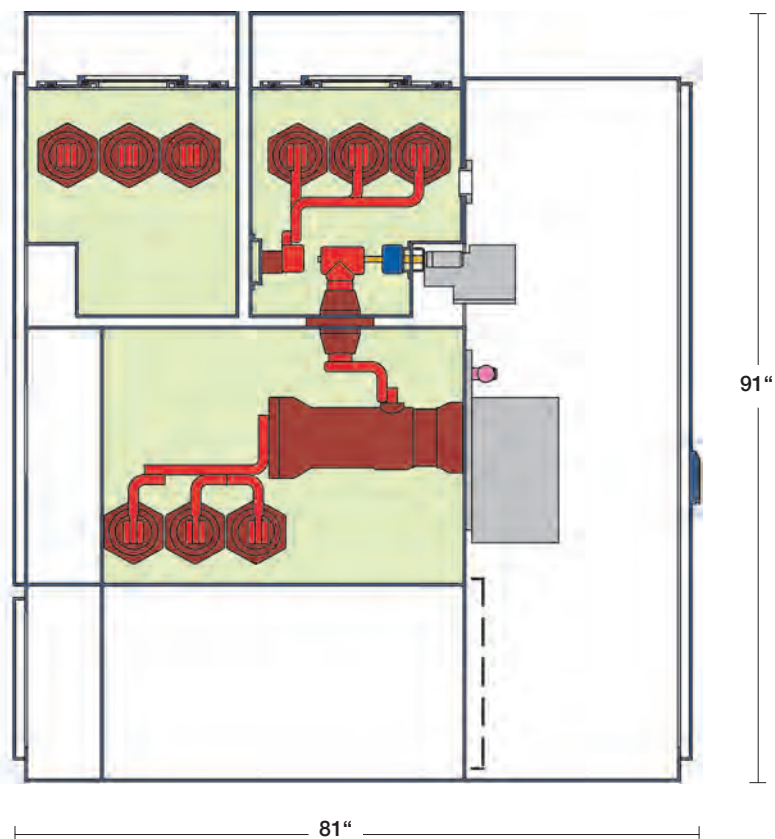
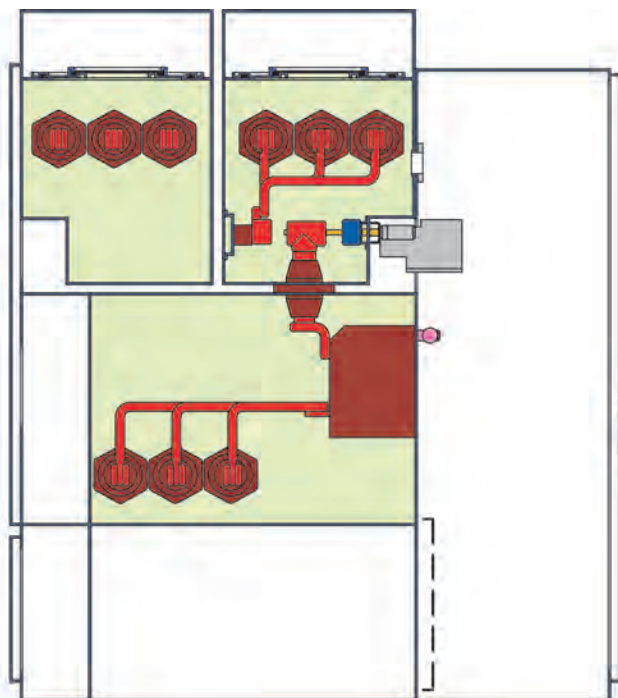
## 1250 A Bus Riser and Bus Sectionalizer for Single Bus bar System (Section View)



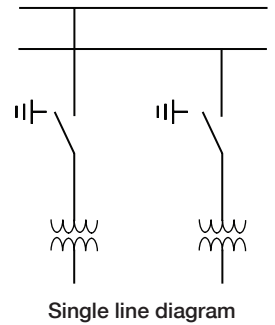
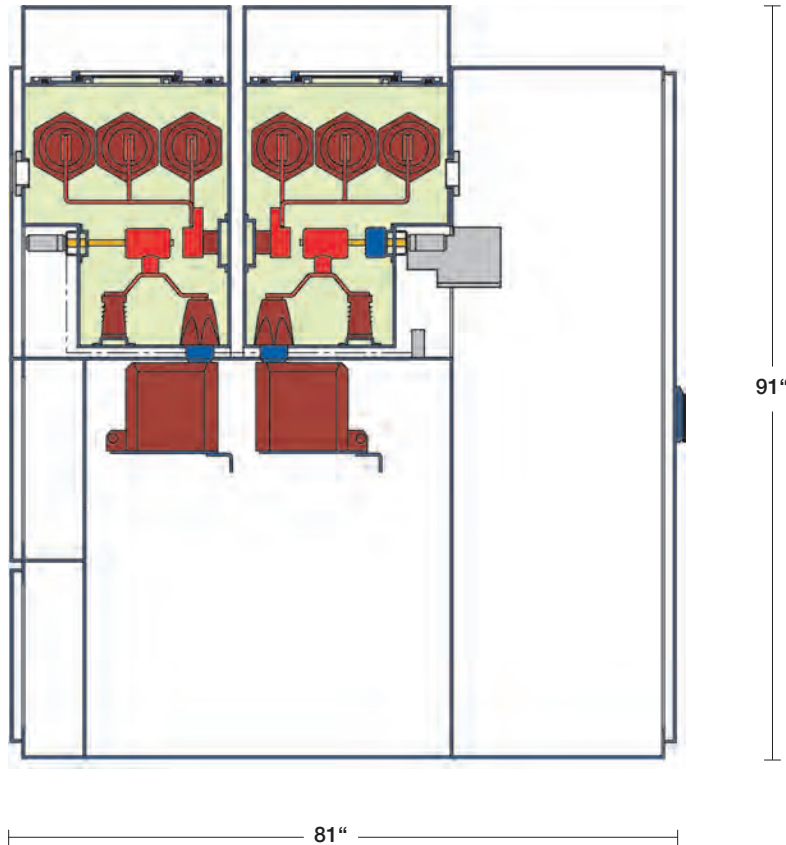
Optional bushing-type current transformers can be placed in front of and behind the circuit-breaker.



Single line diagram



## Bus Bar Metering - Double, Single Bus



# Implementing Customers' Wishes

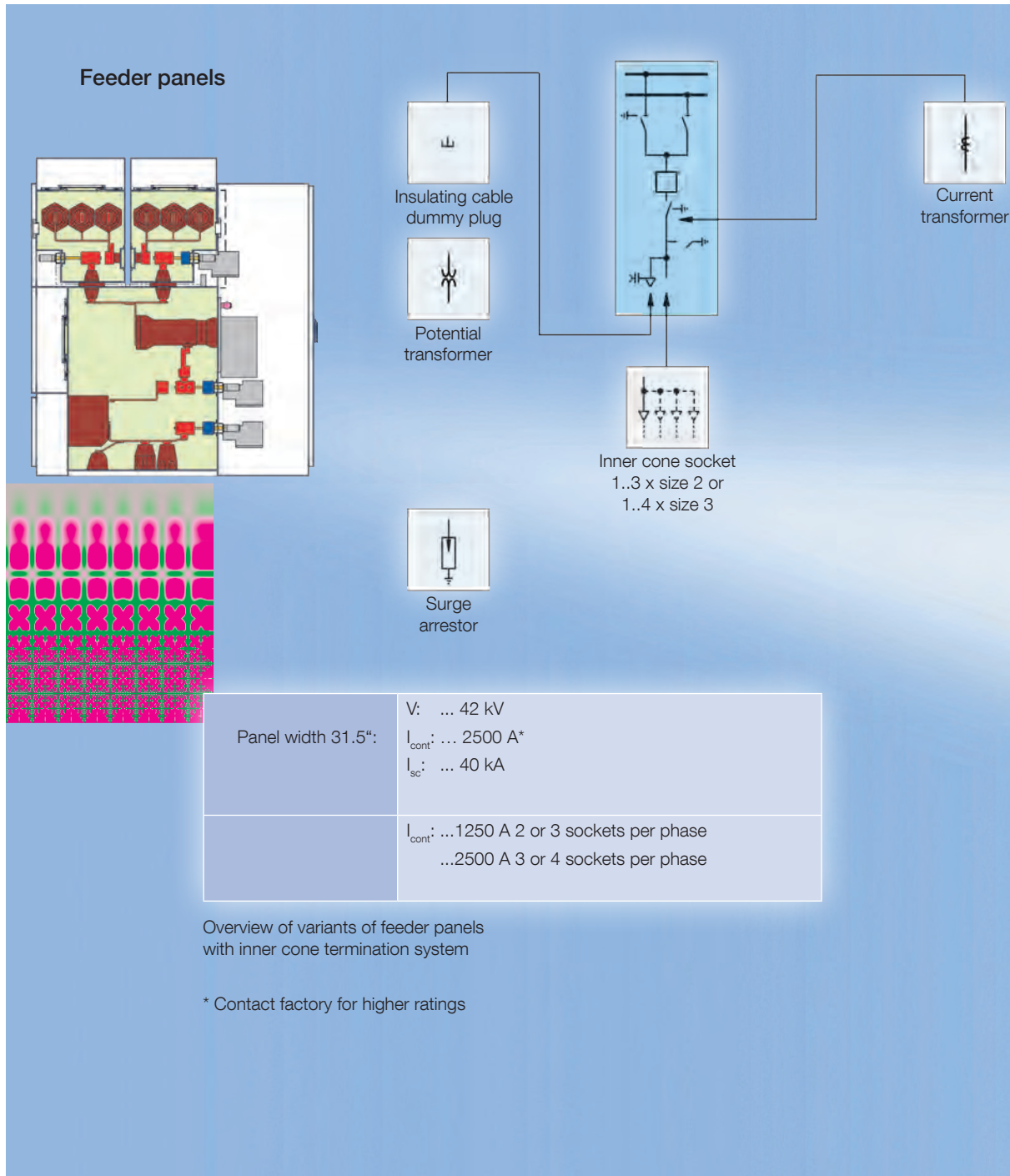


## ZX2 family, successful in service with our customers:

- ADWEA
- Barclays Bank
- BASF
- Bayer AG
- Burbank Water & Power
- Celanese Chemicals
- Ceylon Electricity Board
- Columbus Steel
- Deutsche Steinkohle
- DOW Chemical
- Edelstahlwerke Buderus
- Electricidade Mosambique
- Eneco
- Fina Refinery
- Fortune Electric
- GE Industrial Systems
- Howaldtswerke-Deutsche Werft
- Hyundai Engineering
- InfraLeuna
- International Airport Athens
- Kodala
- ThyssenKrupp Nirosta
- Larsen & Toubro
- London Underground
- Meralco
- Nan Ya Plastics
- NEC
- New Bangkok Int. Airport
- Norsk Hydro
- PEMEX
- Petronas
- PREPA
- Ruhrkohle AG
- RWE
- Shell Nederland Chemie B.V.
- Shell
- StoraEnso
- SÜC
- SÜWAG
- Toronto Hydro
- Toshiba Corporation
- Ras Gas
- Sabic
- Qatar Gas
- Endesa Group
- Iberdrola
- Petrobras
- BMS
- Vaughan Hydro
- VALE
- Beta Steel

With the ZX2.2, all the variants of single and double busbar systems can be implemented.

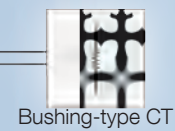
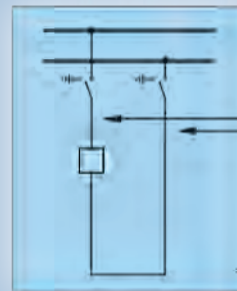
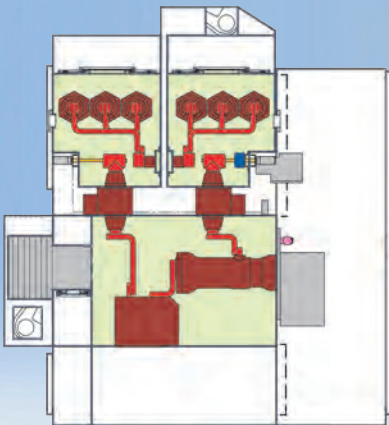
ZX2.2 reflects the wishes of customers worldwide and ZX2 always provides the right solution.



## Versatile and Adaptable

- Compact
- Flexible
- Universally usable
- Expandable
- Economical

Bus coupler /  
Bus sectionalizer SSB



Bushing-type CT

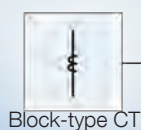
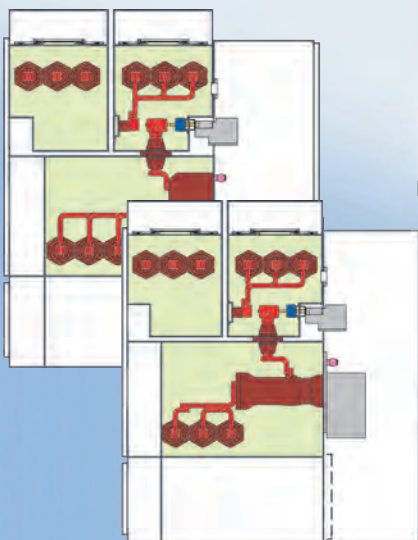
Panel width 31.5":

V: ... 42 kV  
 $I_{cont}$ : ... 2500 A  
 $I_{sc}$ : ... 40 kA

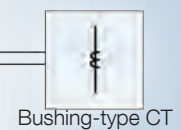
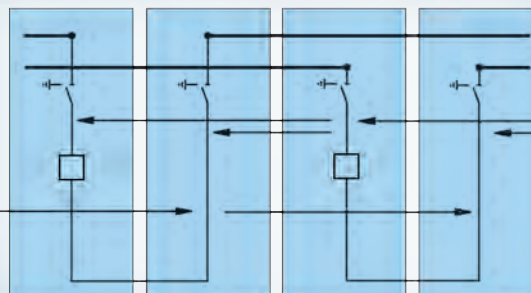
4 variants:

- without transformers
- Block-type CT
- Bushing-type CT
- Block-type CT + bushing-type CT

Bus riser /  
Bus sectionalizer



Block-type CT



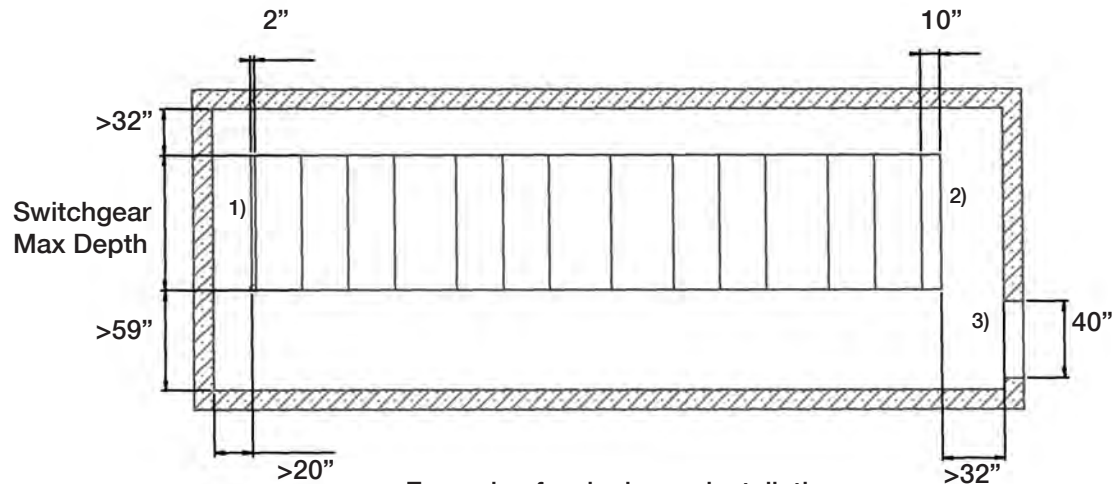
Bushing-type CT

Panel width 31.5":

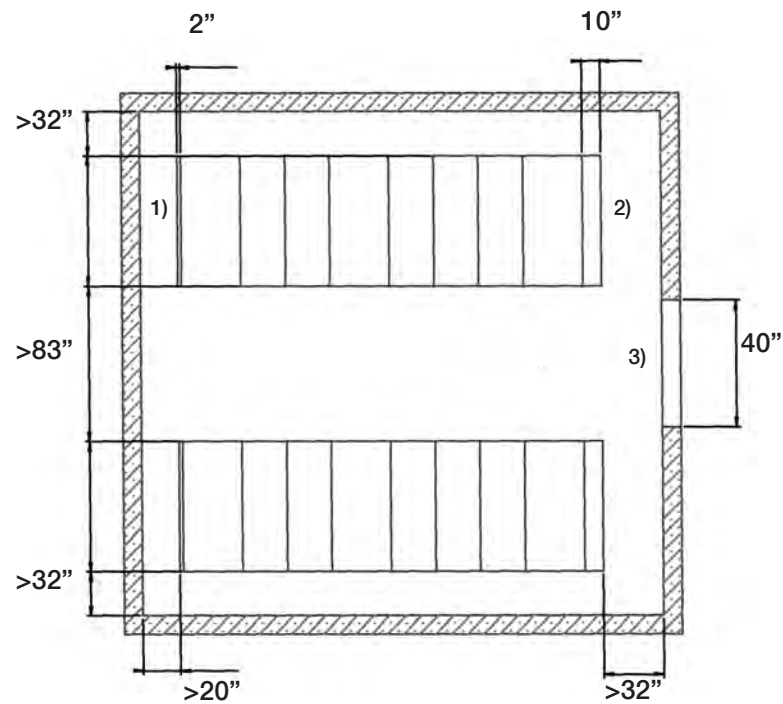
V: ... 42 kV  
 $I_{cont}$ : ... 2500 A  
 $I_{sc}$ : ... 40 kA

Bus sectionalizer without transformers  
 or with bushing-type CT  
 Bus riser with block-type CT

## Minimum Recommended Clearances



Example of a single row installation



Example of a double row installation

- 1) End cover
- 2) Lateral pressure relief duct
- 3) Door height: >91" (with integrated measurement: >98")

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.



## Approximate Weights

Panel Type	Panel width (inches)	Rated current (A)	Approximate weight (LB)
Single busbar	31.5	$\leq 2000$	3500
Single busbar	31.5	2500	3700
Double busbar	31.5	$\leq 2000$	4000
Double busbar	31.5	2500	4300

# Contact us

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1VAL1001-DB Rev. C May 2010