ABB – ELDS, 2019

MV Primary Gas-insulated Switchgear

ZX Family

Speaker, position

ZX Family

MV Primary Gas-insulated Switchgear – ZX Family

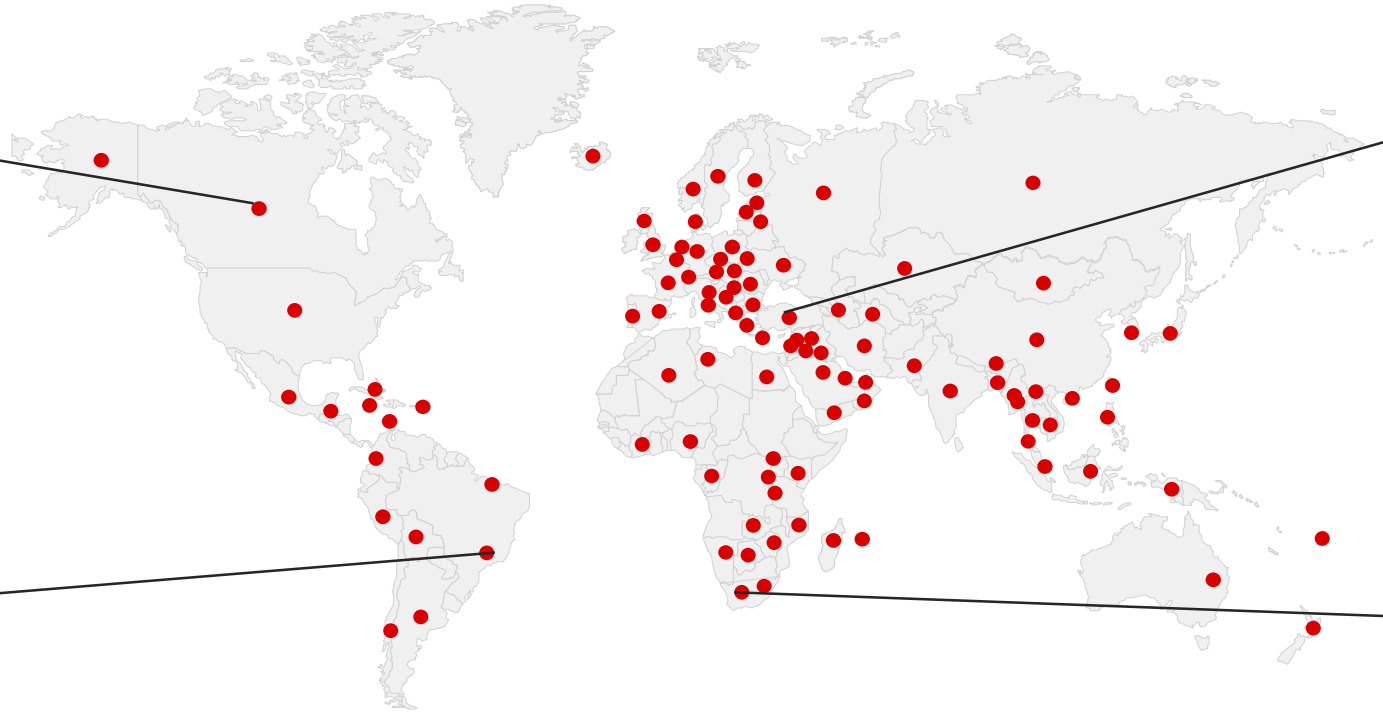
References

Canada

Crosslinx Transit Solution Constructors
122 x ZX2 Panels for Toronto Metro

Brazil

Arena Fonte Nova
18 x ZX0.2 Panels for the stadium



Turkey

Istanbul Metropolitan Municipality
198 x ZX0.2 panels for the Istanbul Metro

South Africa

City of Cape town
More than 100 x ZX0.2 Panels for the Cape Town

Over 75.000 panels installed in more than 100 countries!

MV Primary Gas-insulated Switchgear – ZX Family

Reliable, safe, cost-effective and operator-friendly

Our solution

Reliable

- Performance and aging behavior independent of site conditions
- **Proven**, durable circuit breaker design with extended lifetime
- Increased avaiulability

Safe

- Reduced fault rate
- Increased operator safety due to **arc-resistant** design
- No access to MV parts

Cost-effective

- **Compact** switchgear design and optimized substation layout
- **Maintenance-free** MV parts
- Reduced demand for spare parts

Operator-friendly

- **Safe, fast and easy installation** without gas works and the need for special tools
- Intuitive panel control
- **Flexible, customized design**

Portfolio

Portfolio overview ZX2, ZX0.2 and ZX1.2

Why choose ABB?

Contacts

MV Primary Gas-insulated Switchgear – ZX Family

ABB's MV GIS offering

IEC primary switchgear

Gas-insulated switchgear (GIS Primary):

– Global: ZX0, **ZX0.2, ZX1.2, ZX2**, ZX1.5R (for rail applications)

Recent innovations: **Digital switchgear, eco-efficient GIS**

For ANSI markets

Gas-insulated switchgear (GIS Primary): **ZX2, ZX2.2, ZX0.2**

IEC secondary switchgear

Gas-insulated switchgear (GIS RMU): **SafeRing, SafePlus, SafeLink** families

Recent innovations: **Eco-efficient GIS, smart grid enabled switchgear**

MV Primary Gas-insulated Switchgear – ZX Family

Where is MV GIS technology used?

Applications

Utilities (ZX0.2, ZX2)

- **Electricity Distribution**
- **Substations**
- Power Generation
  - Conventional
  - **Renewables**

Industry (ZX2, ZX1.2)

- Oil and Gas
- **Mining and Minerals**
- **Pulp and Paper**
- Petrochemicals
- Steel

Transportation (ZX0.2, ZX2, ZX1.5R)

- **Rail**
- Airports
- Marine
  - Offshore Applications
  - Vessels

Building (ZX0.2, ZX2)

- **Data Center**
- Hospitals
- Infrastructure

MV Primary Gas-insulated Switchgear – ZX Family

Well-positioned in attractive markets

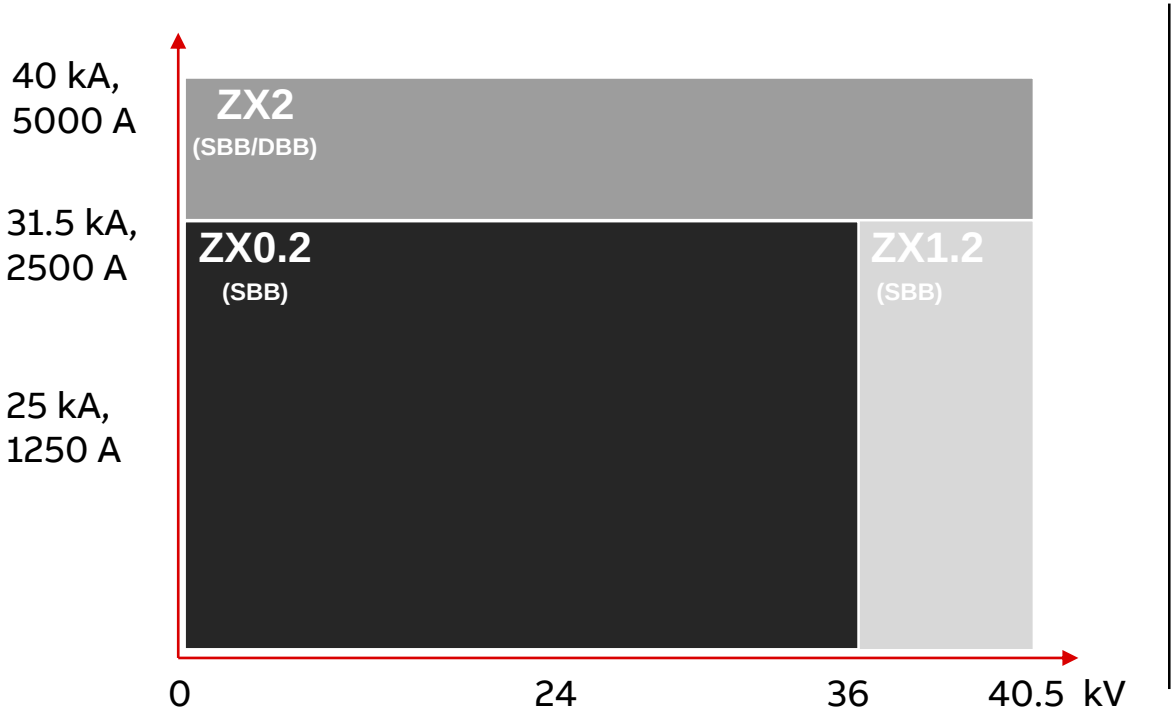
Well-positioned ZX portfolio

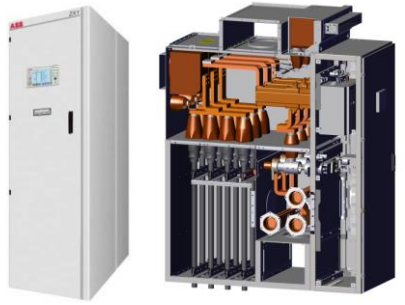
- Most **complete switchgear** portfolio
- Global coverage of requirements – **locally supplied and supported**
- **Flexible** design, **reliable and** and **cost-efficient**
- Global presence with **local service and support**

Most complete portfolio, global coverage

MV Primary Gas-insulated Switchgear – ZX Family

ZX Family





ZX1.2

ZX0.2

ZX2

MV Primary Gas-insulated Switchgear – ZX2

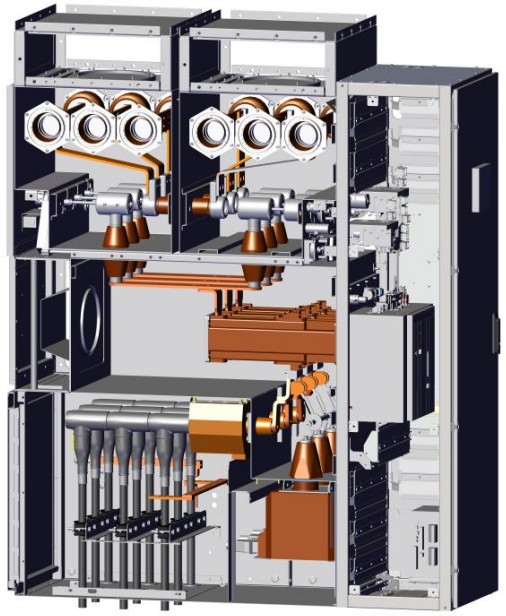
Flexible, high-quality design to meet all customer requirements

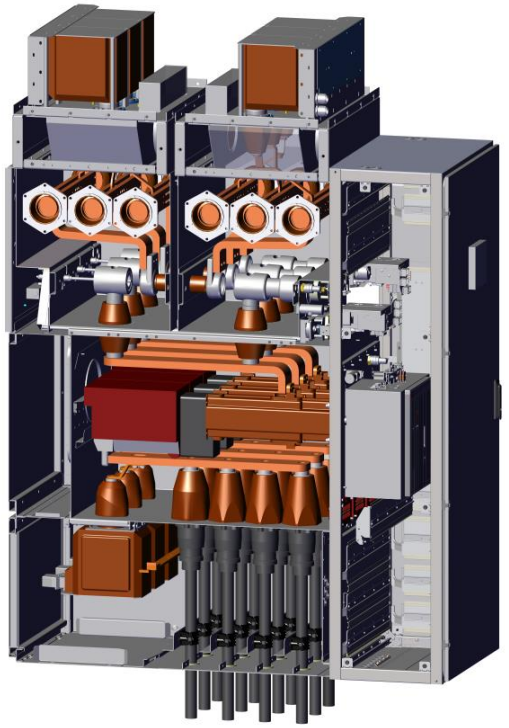
MV Primary Gas-insulated Switchgear – ZX2

Are you looking for a safe, reliable and compact switchgear design?

Flexible, high-quality design to meet all customer requirements

- Up to **40.5kV and 200kV BIL**
- Up to **5000A (SBB) or 3150A (DBB)**
- Up to **40kA, 3 sec**
- **3-phase encapsulated, modular arc-resistant design**
- All gas compartments are fully segregated, no gas connection between adjacent panels
- Factory-assembled, -filled and –tested panels
- IEC 62271-200
- Several local certifications available on request





MV Primary Gas-insulated Switchgear – ZX2

Are you concerned about gas handling?

Gas compartments

- Each **feeder consists of 2 (SBB) or 3 (DBB) gas** compartments made from laser-cut **stainless steel**
- Each gas compartment is equipped with a on-return filling valve (with protective cap) and **repair openings**
- Operation at slight overpressure - rated **operating pressure 130kPa** (alarm level 120kPa) for rated voltage > 36kV
- **Low amount of SF6** used per panel: 5 - 10 kg
- **Gas leakage < 0,1% per year**
- **No checks on the insulating gas are necessary and maintenance-free**

No gas handling during 40-year lifetime of the switchgear required

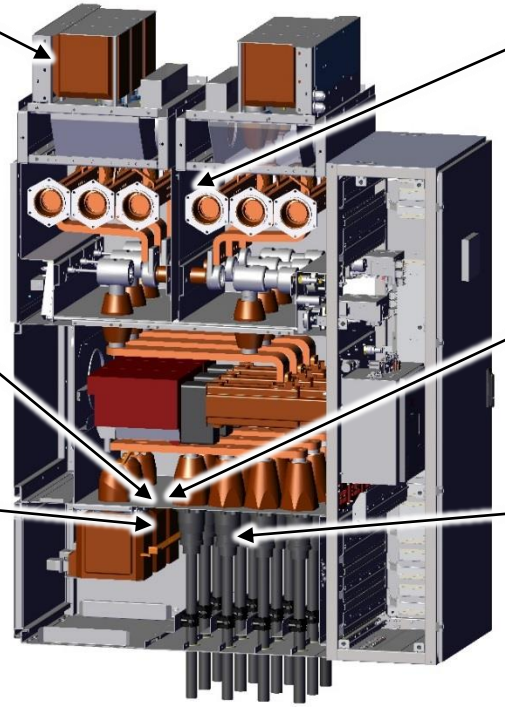
MV Primary Gas-insulated Switchgear – ZX2

Technology: safe, fast and easy installation

Voltage transformer / Sensor

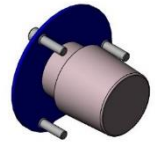
Surge arrestor

Test plug

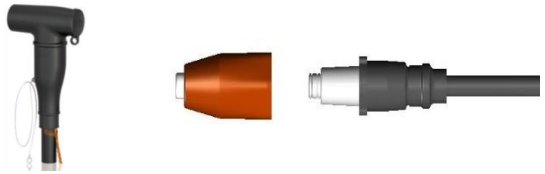


Busbar (plug-in)

Dummy plug



Cable plug

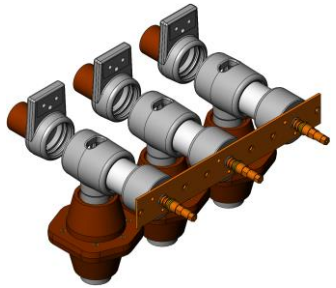


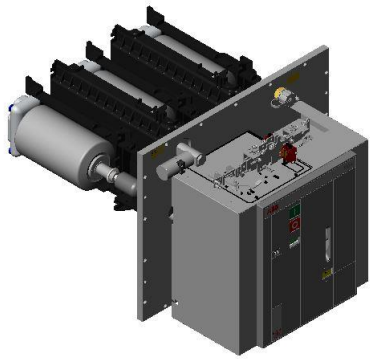
MV Primary Gas-insulated Switchgear – ZX2

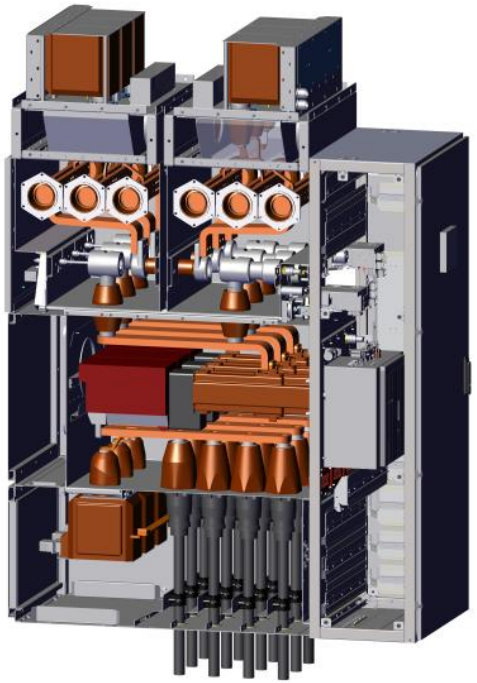
Key components

Operation

- Motorized operating mechanisms for switching devices located easily accesible inside LVC
- Manual emergency operation possible
- Advantages of **earthing via circuit breaker and three position switch** in series:
  - Circuit breaker is of higher quality than any earthing switch
  - Higher number of make-proof earthing operations
  - No contamination of SF6 through switching operations
- Optional view ports for visual verification
- High performance CB



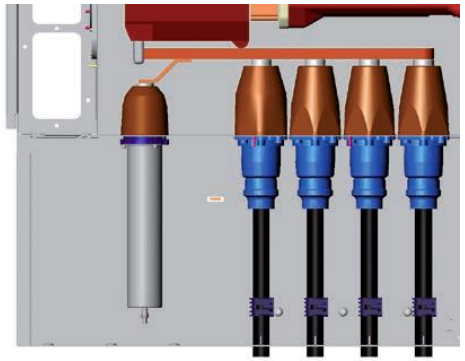




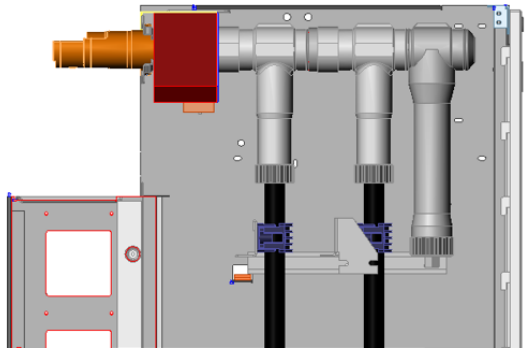
MV Primary Gas-insulated Switchgear – ZX2

How would you like to make your cable connection?

Inner cone termination

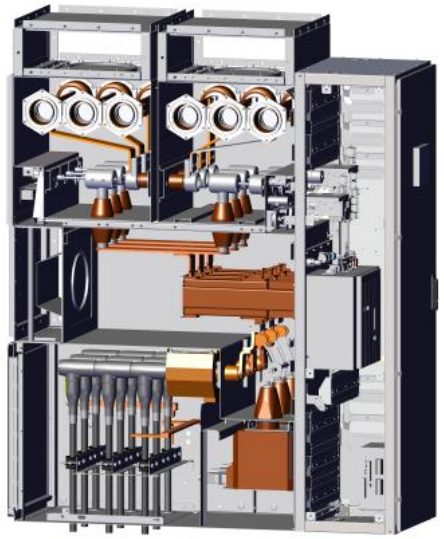


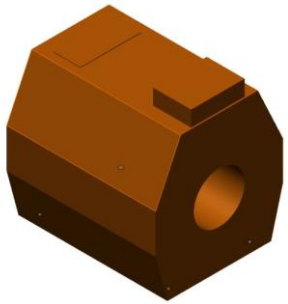
Outer cone termination



MV Primary Gas-insulated Switchgear – ZX2

Current transformer / Ring type

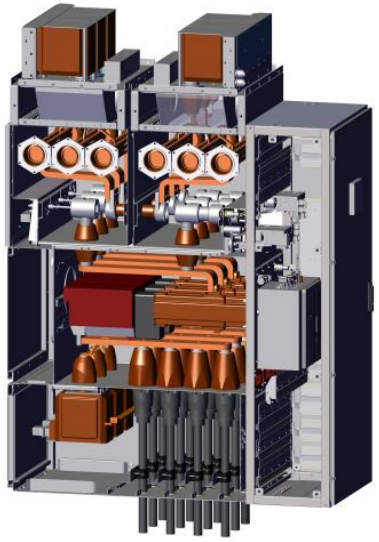


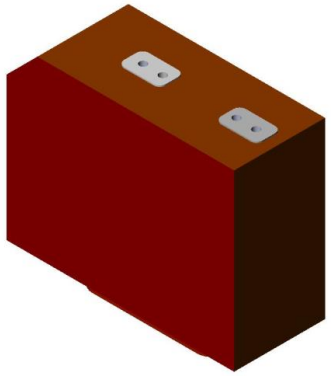


Technical data of the ring core current transformers (primary data)					
Type og current transformer				1	2
Rated voltage		U_r	kV	0.72	
Rated short duration power-frequenzy withstand voltage		U_d	kV	3	
Rated frequenzy		f_f	Hz	50/60	
Rated thermal short-time current		I_{therm}	kA	25	40
Rated impulse current		I_p	kA	62.5	100
Core data					
Panel width			mm	2 x 400	600
Rated primary current		I_r	A	…630	…1250
Rated secondary current				1 or 5	
Max. number of cores				2	3
Measuring cores	Capacity Class		VA	2.5 to 15 0.2 / 0.5 / 1	…20 0.2 / 0.5 / 1
Protection cores	Capacity Class Overcurrent factor		VA	2.5 to 15 5P to 10P 10 to 20	…20 5P 20

MV Primary Gas-insulated Switchgear – ZX2

Current transformer / Block type

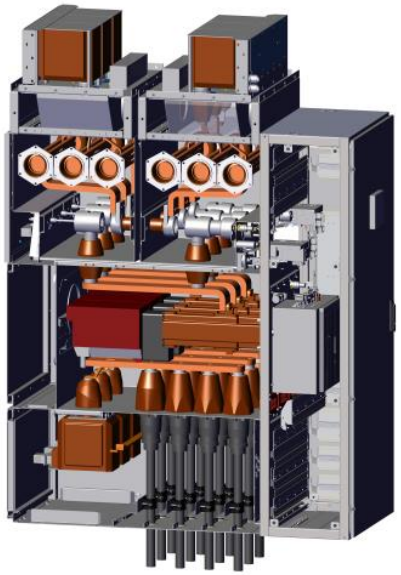


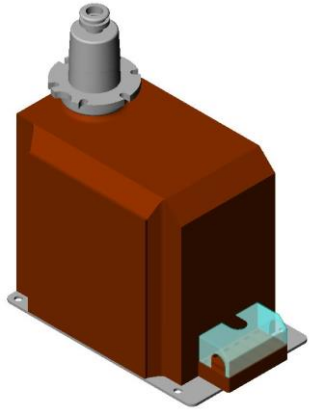


Technical data of the current transformers (primary data), device B and C					
Rated voltage		U_r	kV	…24	…36
Max. operating voltage			kV	24	40.5
Rated short duration power-frequency withstand voltage		U_d	kV	50	70 (85)
Rated lightning impulse withstand voltage		U_p	kV	125	170 (185)
Rated frequenzy		f_r	Hz	50/60	50/60
Rated thermal short-time current		I_{therm}		100 /250 x I, max. 40kA – 3 s	100 /250 x I, max. 40kA – 3 s
Core data					
Panel width			mm	600	800, 840
Rated primary current		I_r	A	…1250	…2500
Rated secondary current			A	1 to 5	1 to 5
Max. number of cores				3	5
Measuring cores	Capacity Class		VA	2.5 to 15 0.2 / 0.5 / 1	
Protection cores	Capacity Class Overcurrent factor		VA	2.5 to 30 5P to 10P 10 to 20	

MV Primary Gas-insulated Switchgear – ZX2

Voltage transformer





Rated power frequenzy withstand voltage of voltage transformers

Rated voltage [kV]	Rated power frequenzy withstand voltage (1 min) [kV]
> 12 to 24	50
> 24 to 36	70
> 36 to 40.5	85

Technical data of voltage transformers

	Max. capacity [VA]	Class	Rated secondary voltafe of the metering winding [V]	Rated secondary voltage of the earth fault winding [V]	Rated thermal current limit of the metering winding with rated voltage factor 1.2 / continuous [A]	Rated thermal long duration current of the earth fault winding with rated voltage factor 1.9 / 8 h[A]
Voltage transformers for 1250 A panel, 3 x cable sockets per phase	15 45 100	0.2 0.5 1	100 / √3 110 / √3	100 / 3 110 / 3	4	4
All other voltage transformers	30 75 150	0.2 0.5 1	100 / √3 110 / √3	100 / 3 110 / 3	6	6

MV Primary Gas-insulated Switchgear – ZX2

What is your control and protection philosophy?

Protection, metering and control

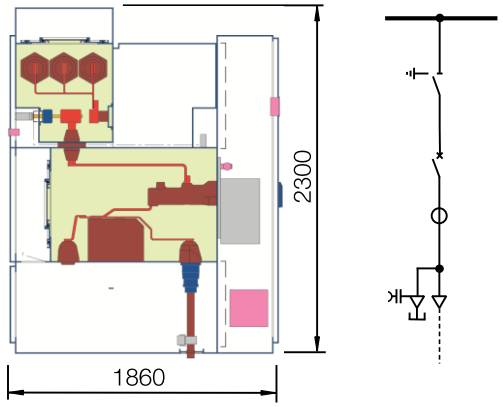
PCU

REX 640

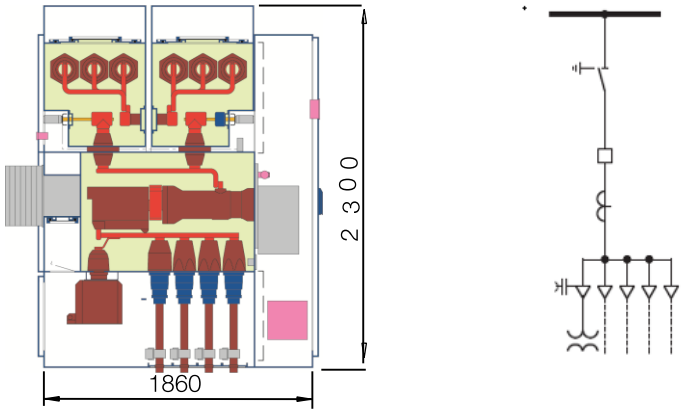
MV Primary Gas-insulated Switchgear – ZX2

Section views

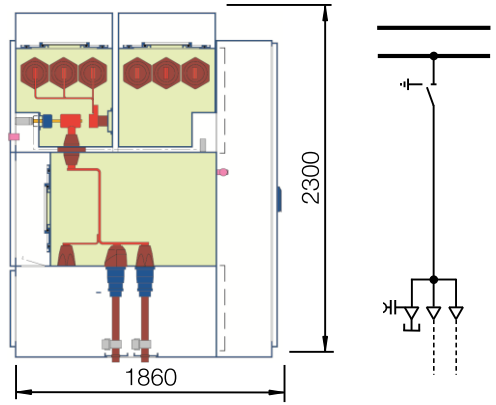
Typical panel variants ZX2



Outgoing feeder panel



Incoming feeder panel

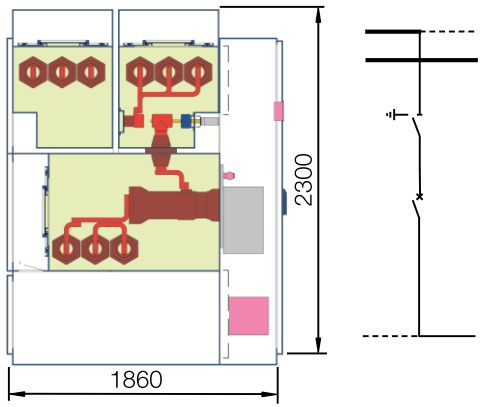


Cable termination panel

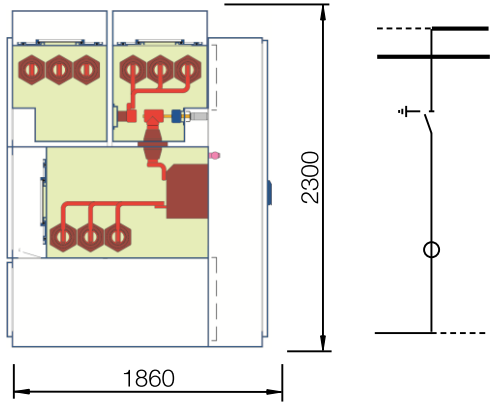
MV Primary Gas-insulated Switchgear – ZX2

Section views

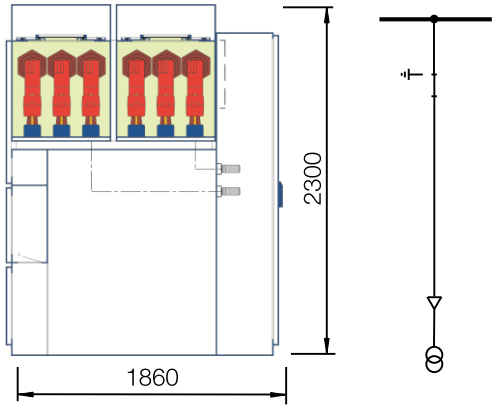
Typical panel variants ZX2



Sectionalizer panel



Riser panel



Metering panel

MV Primary Gas-insulated Switchgear – ZX2

How easy can a switchgear installation be?

Busbar connection

Safe, fast and easy installation, no gas works at site, no special tolls required !





MV Primary Gas-insulated Switchgear – ZX2

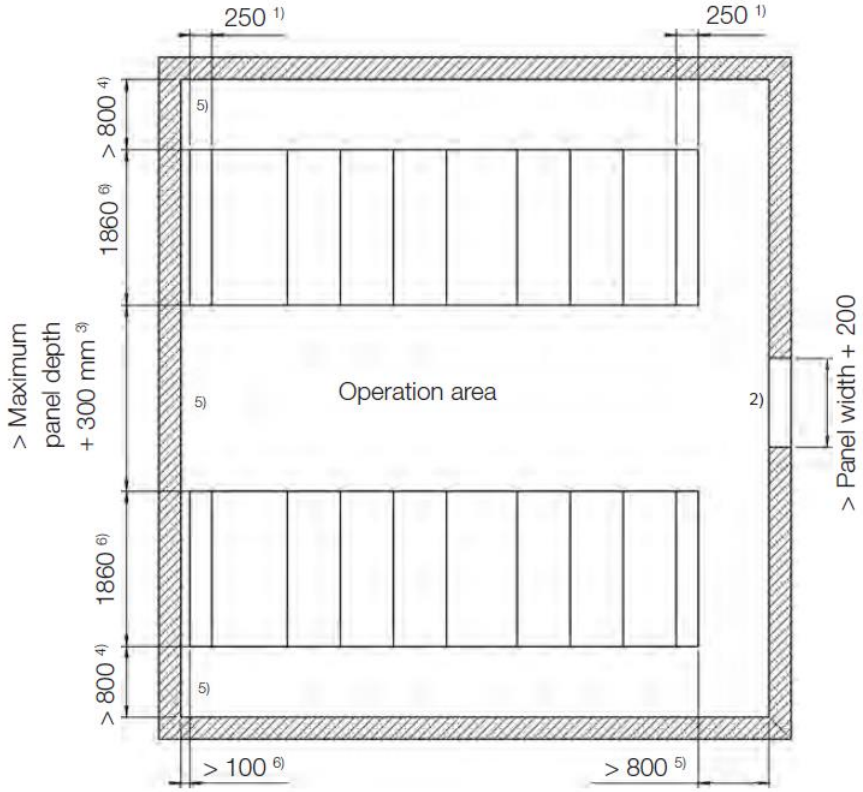
Saving space helps to reduce cost

Installation

- Delivery of **factory filled and tested panels**
- Installation without gas works at site
- Transverse installation is possible
- Installation on standard floor frames embedded in concrete floor, on intermediate frame or on raised false floor
- Installation and commissioning shall be done by **trained and certified service personnel**

Panel weights

Panel type	Panel width [mm]	Weight, max. [kg]
Single busbar	2x400 600 800	1500 1400 2000
Double busbar	2 x 400 600 800	1800 1600 2400
Side pressure relief duct (increase in weight of the relevant end panel)		250



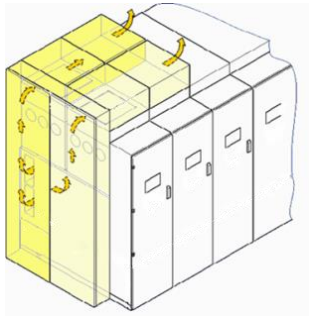
MV Primary Gas-insulated Switchgear – ZX2

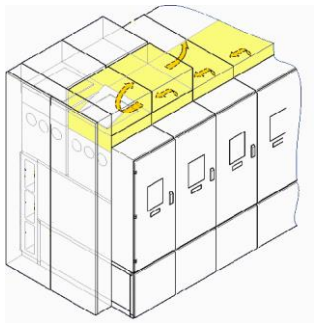
How does your switchgear room look like?

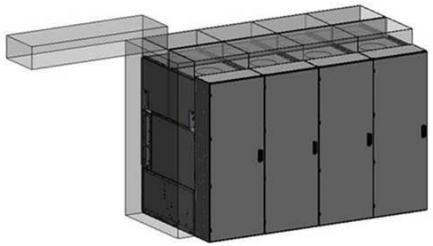
Installation – Minimum room heights

Minimum room heigths

Pressure relief into the switchgear room (absorber) [mm]	Pressure relief into the switchgear room with a fan on the absorber [mm]	Pressure relief to the outside [mm]	Integrated metering on at least one panel [mm]	Integrated metering with plug-in, isolatable voltage transformers on at least one panel [mm]	Heat sink on at least one panel [mm]
> 2800	> 3000			> 3500	> 3200







MV Primary Gas-insulated Switchgear – ZX0.2

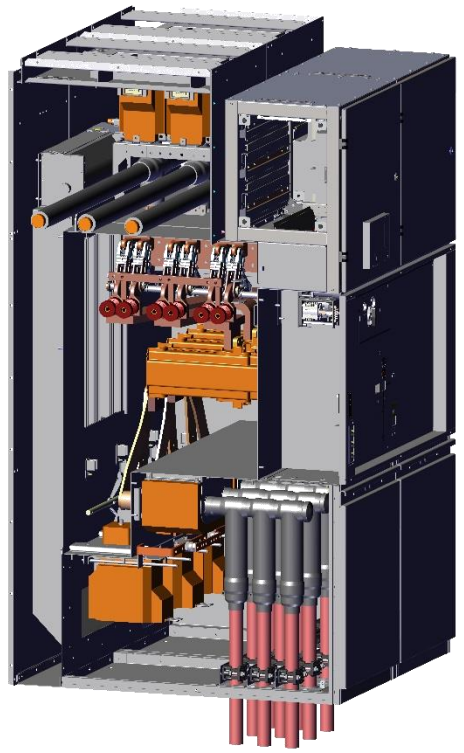
Cost-effective design for applications with little real estate

MV Primary Gas-insulated Switchgear – ZX0.2

Are you looking for a safe, reliable and compact switchgear design?

Flexible, high-quality design to meet all customer requirements type ZX0.2

- Up to **36kV**
- Up to **2500A**
- Up to **31.5kA, 3 sec**
- **3-phase encapsulated, modular arc-resistant design**
- Factory-assembled, -filled and –tested panels
- IEC62271-200
- Several local certifications available on request



MV Primary Gas-insulated Switchgear – ZX0.2

Are you concerned about gas handling?

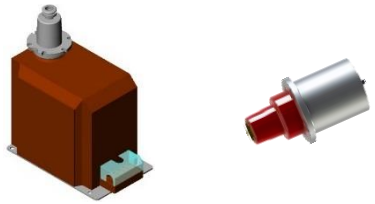
Gas compartments

- Gas compartments made from laser-cut stainless steel
- Gas compartment is equipped with a on-return filling valve (with protective cap) and repair openings
- Rated operating pressure 130kPa up to 24kV, 150kPA @36kV
- **Low amount of SF6** used per panel: 5 - 10kg
- **Gas leakage < 0,1% per year**
- **No checks on the insulating gas are necessary and maintenance-free**

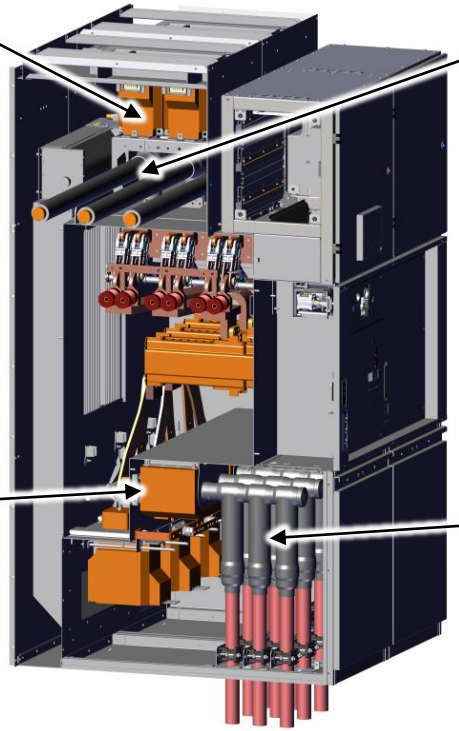
MV Primary Gas-insulated Switchgear – ZX0.2

Technology: safe, fast and easy installation

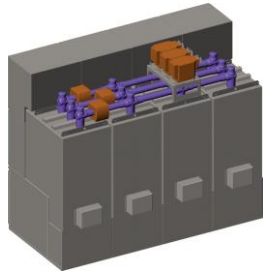
Voltage transformer / Sensor



Ring core type / Sensor



Busbar



Cable plug

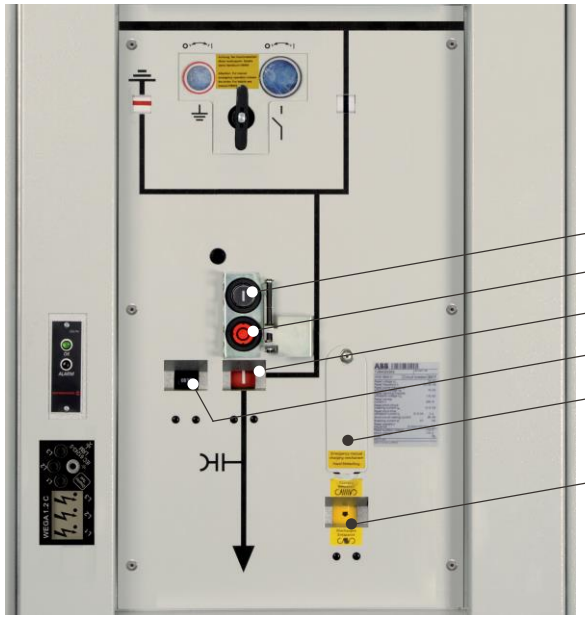
MV Primary Gas-insulated Switchgear – ZX0.2

Key components

Operations

- Motorized operating mechanisms for switching devices located easily accesible inside LVC
- Optional view ports for visual verification
- Operator control area, controls and indicators for the CB
- CB operation mechanism is located in the mechamism bay of the panel. The indicators and control for CB are located in the operator control area of the panel

Operator control area, controls and indicators for CB



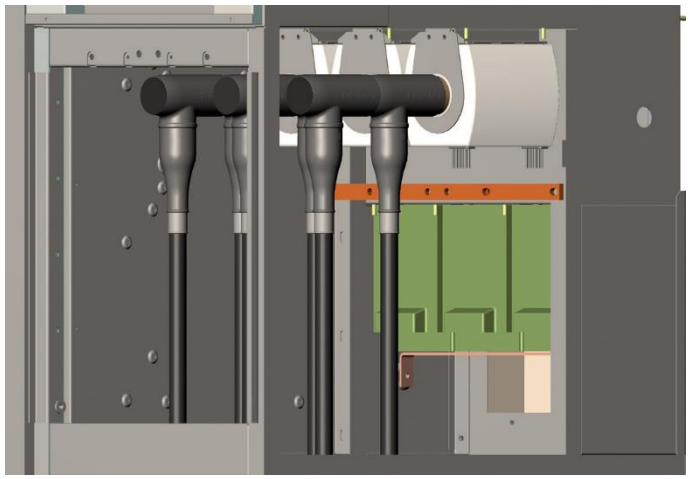
1	Mechanical N pushbutton ci cuit-breaker
2	Mechanical OFF pushbutton circuit-breaker
3	Cover on the receptacle for manual charg-ing of the stored-energy spring
4	Mechanical indi ator for “Circuit-breaker ON” “Circuit-breaker OFF”
5	Mechanical indicator “Stored-energy spring charged” “Stored-energy spring dis-charged”
6	Operating cycle counter

MV Primary Gas-insulated Switchgear – ZX0.2

How would you like to make your cable connection?

Outer cone termination system

Cable termination compartment



Cable termination area

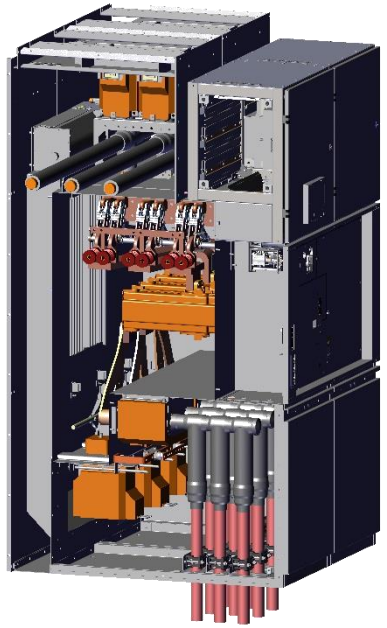
Connector

Cable termination

Panel with three position disconnector and fuse

MV Primary Gas-insulated Switchgear – ZX0.2

Current transformer

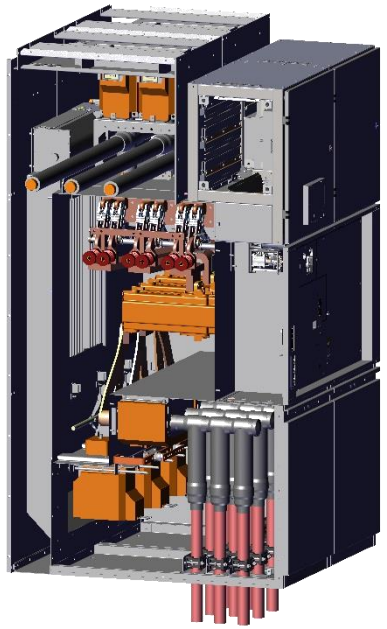


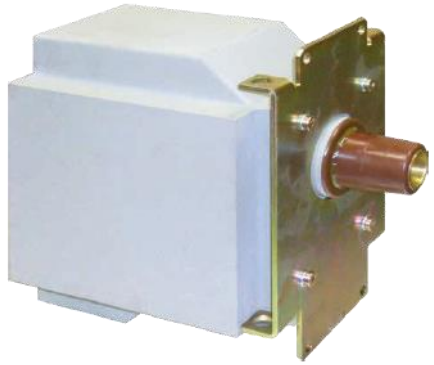
Technical data of the ring core current transformers

Current transformer type			1	2	3
Rated voltage	U_r	kV		0.72	
Panel width		mm	450	600	1200
Rated primary current	I_r	A	…630	…1250	…2500
Rated secondary current		A		1 or 5	
Max number of cores			2	3	5
Core data					
Measuring cores	Capacity Class	VA	2.5 to 15 0.2/0.5/1	…20 0.2/0.5/1	…20 0.2/0.5/1
Protection cores	Capacity Class Overcurrent factor	VA	2.5 to 15 5P to 10P 10 to 20	…20 5P 20	…20 5P 20

MV Primary Gas-insulated Switchgear – ZX0.2

Voltage transformer





Technical data of voltage transformers

Type of voltage transformer	Rated voltage [kV]	Max. capacity [VA]	Class	Rated secondary voltage of the metering winding [V]	Rated secondary voltage of the earth fault winding [V]	Rated thermal current limit of the metering winding with rated voltage factor 1.2 / continuous [A]	Rated thermal long duration current of the earth fault winding with rated voltage factor 1.9 / 8 h [A]
fixed mounted	up to 24	20 50 100	0.2 0.5 1	100 / √3 110 / √3	100 / √3 110 / √3	6	6
plug-in type	up to 36	25 60 120	0,2 0.5 1	100 / √3 110 / √3	100 / √3 110 / √3	6	6

Rated power frequency withstand voltage of voltage transformers

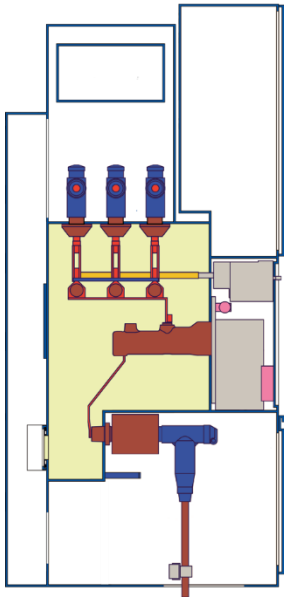
Ratd voltage [kV]	Rated power frequency withstand voltage (1 min)
> 12 – 24	50
> 24 – 36	70

MV Primary Gas-insulated Switchgear – ZX0.2

What is your control and protection philosophy?

LVC and Protection, metering and control

Panel with tall LVC



REF 620

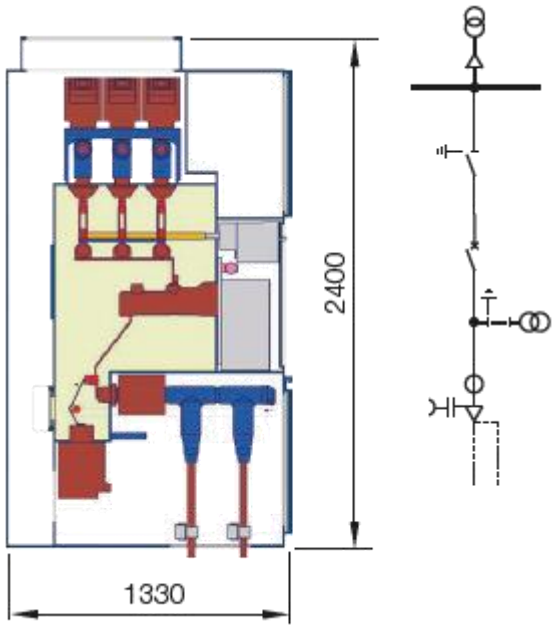
REF620 is a member of ABB's Relion® product family and part of its 620 protection and control product series.

The 620 series relays are characterized by their functional scalability, compactness and withdrawable plug-in unit design.

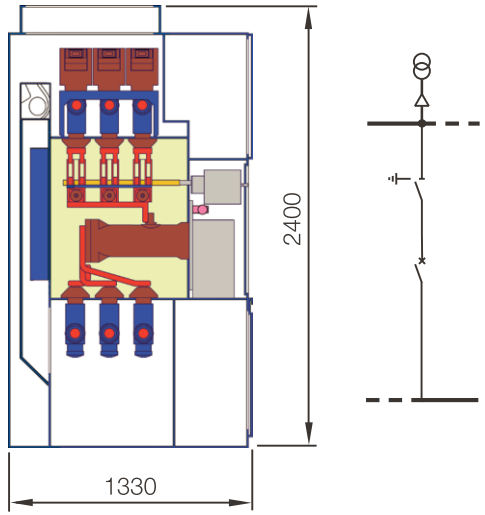
MV Primary Gas-insulated Switchgear – ZX0.2

Section views

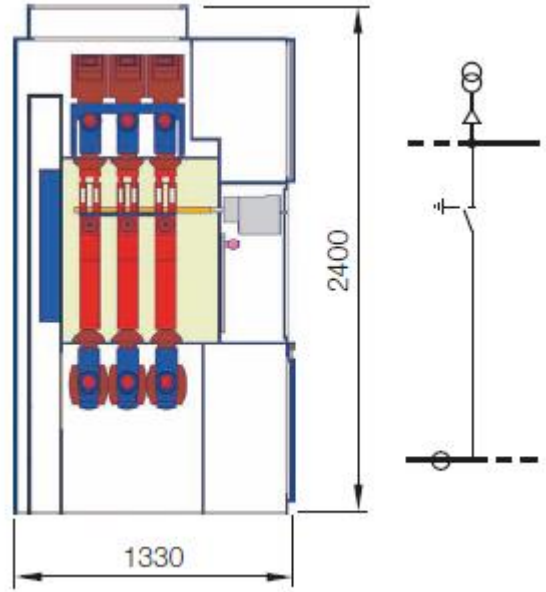
Typical panel variants ZX0.2



Feeder panel



Sectionaliser panel



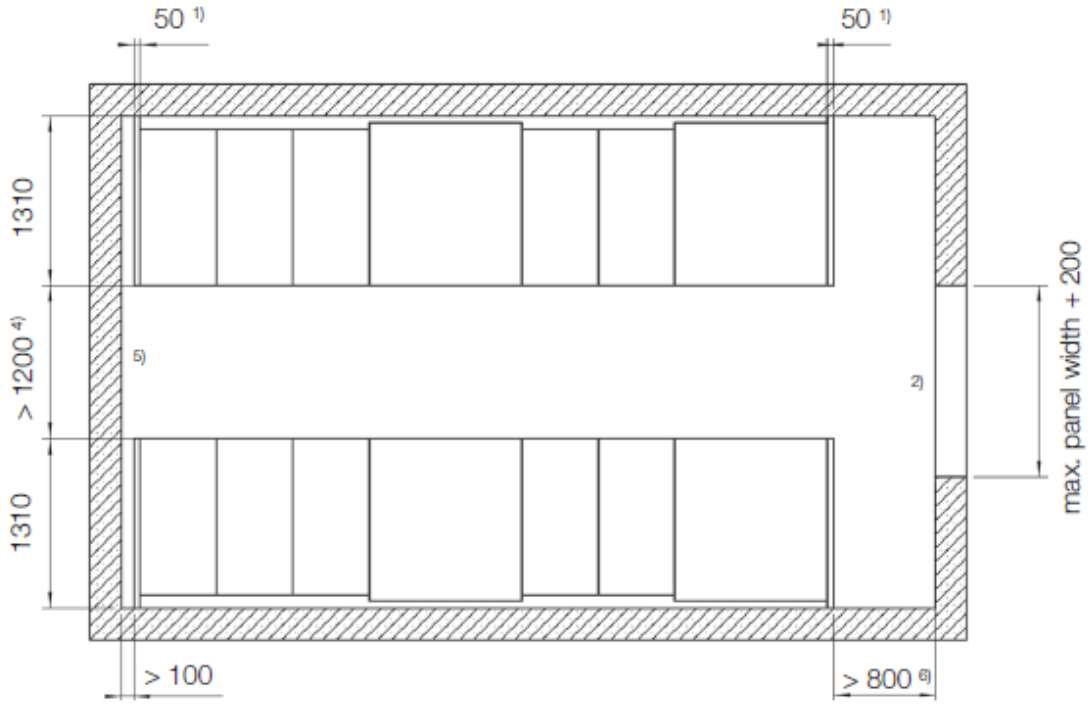
Riser panel

MV Primary Gas-insulated Switchgear – ZX0.2

Saving space helps to reduce cost

Installation

- Delivery of **factory filled and tested panels**
- Installation without gas works at site
- Wall mounting installation
- Transverse installation is possible
- Installation on standard floor frames embedded in concrete floor, on intermediate frame or on raised false floor
- Installation and commissioning shall be done by **trained and certified service personnel**



MV Primary Gas-insulated Switchgear – ZX0.2

Saving space helps to reduce cost

Installation

- Delivery of **factory filled and tested panels**
- Installation without gas works at site
- Wall mounting installation
- Transverse installation is possible
- Installation on standard floor frames embedded in concrete floor, on intermediate frame or on raised false floor
- Installation and commissioning shall be done by **trained and certified service personnel**

Panel weights

Panel variants	Panel width [mm]	Rated normal current [A]	Weight, max [kg]
Feeder panel with three position switch disconnector and fuses	600	Dependet on the fuses	600
Feeder panel	450 600	…630 …1250	450 900
Sectionaliser panel	600	…1250	900
Riser panel	600	…1250	700
Transfer panel	600	…1000 (…1250)	800
Incomer panel	1200	…2500	2200
Sectionaliser panel	900	…2500	1600
Riser panel	900	…2500	1200

MV Primary Gas-insulated Switchgear – ZX1.2

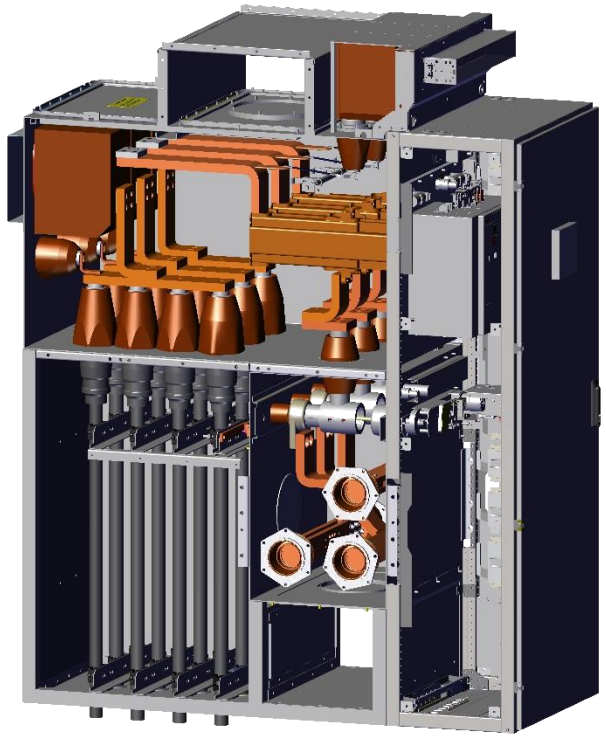
Safe and reliable design for special applications

MV Primary Gas-insulated Switchgear – ZX1.2

Are you looking for a safe, reliable and compact switchgear design?

Flexible, high-quality design to meet all customer requirements type ZX1.2

- Up to **40.5kV**
- Up to **2500A**
- Up to **31.5kA, 3 sec**
- **3-phase encapsulated, modular arc-resistant design**
- All gas compartments are fully segregated, no gas connection between adjacent panels
- Factory-assembled, -filled and –tested panels
- IEC62271-200
- Several local certifications available on request



MV Primary Gas-insulated Switchgear – ZX1.2

Are you concerned about gas handling?

Gas compartments

- Each feeder consists of 2 gas compartments made from laser-cut stainless steel
- Each gas compartment is equipped with a on-return filling valve (with protective cap) and repair openings
- Operation at slight overpressure - rated **operating pressure 130kPa** (alarm level 120kPa) > 36 kV
- **Low amount of SF6** used per panel: 5 - 10kg
- **Gas leakage < 0,1% per year**
- Permanently ensured for entire high voltage area of panels
- **No checks on the insulating gas are necessary and maintenance-free**

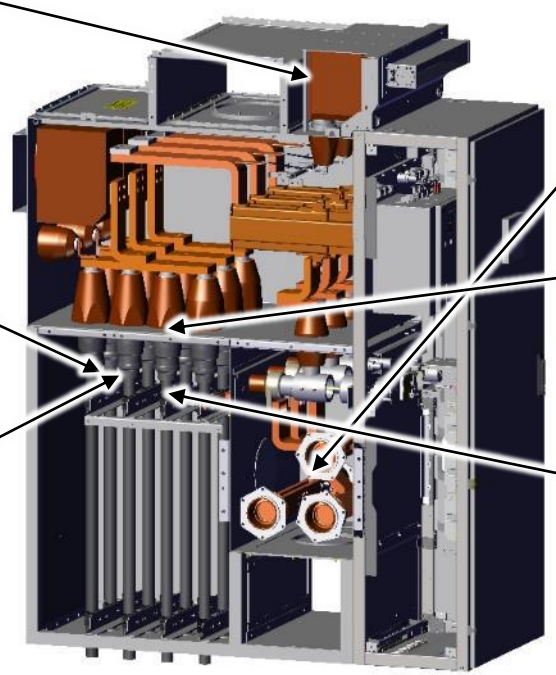
MV Primary Gas-insulated Switchgear – ZX1.2

Technology: safe, fast and easy installation

Voltage transformer

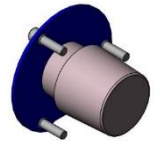
Surge arrestor

Test plug



Busbar (plug-in)

Dummy plug



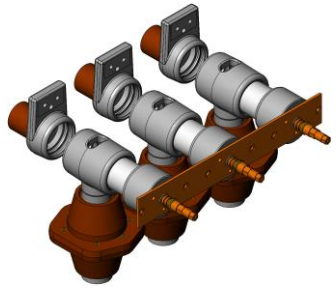
Cable plug

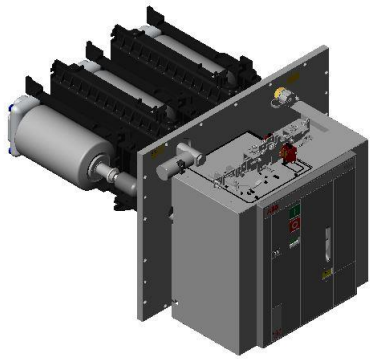
MV Primary Gas-insulated Switchgear – ZX1.2

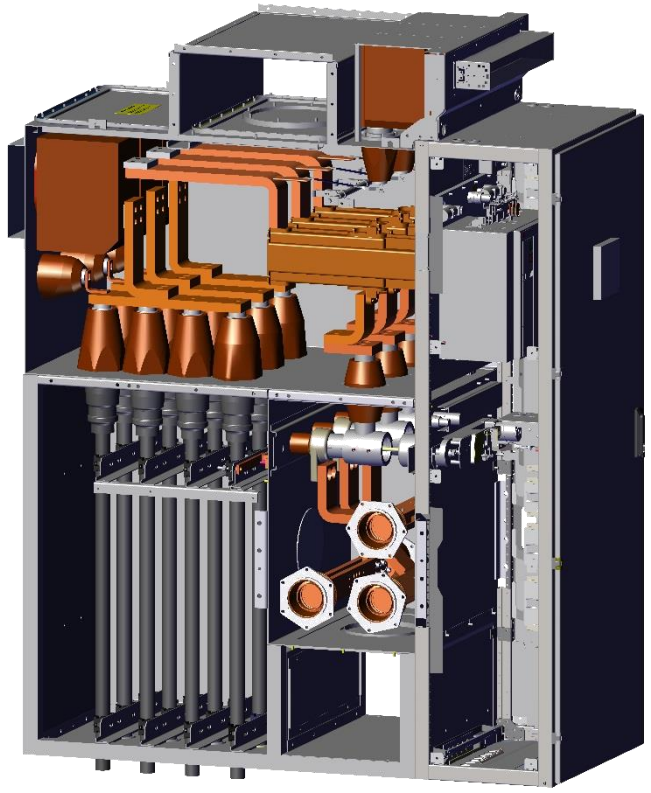
Key components

Operations

- Motorized operating mechanisms for switching devices located easily accesible inside LVC
- Manual emergency operation possible
- Advantages of **earthing via circuit breaker and three position switch** in series:
  - Circuit breaker is of higher quality than any earthing switch
  - Higher number of make-proof earthing operations
  - No contamination of SF6 through switching operations
- Optional view ports for visual verification







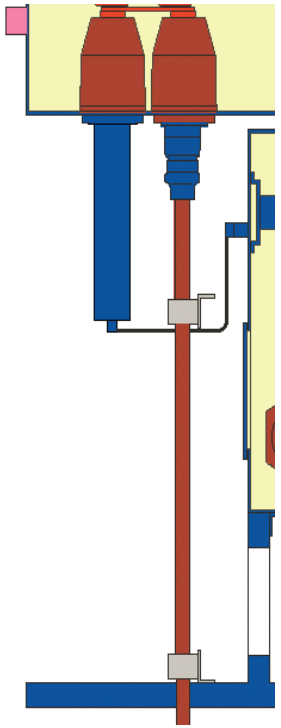
MV Primary Gas-insulated Switchgear – ZX1.2

How would you like to make your cable connection?

Inner cone termination

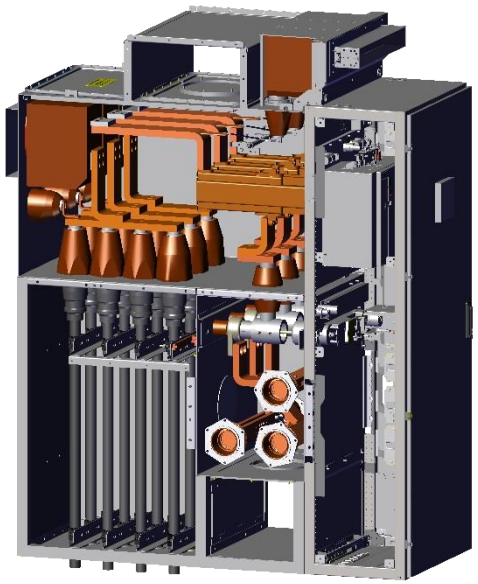
Inner cone termination

Connection of cables



MV Primary Gas-insulated Switchgear – ZX1.2

Current transformer

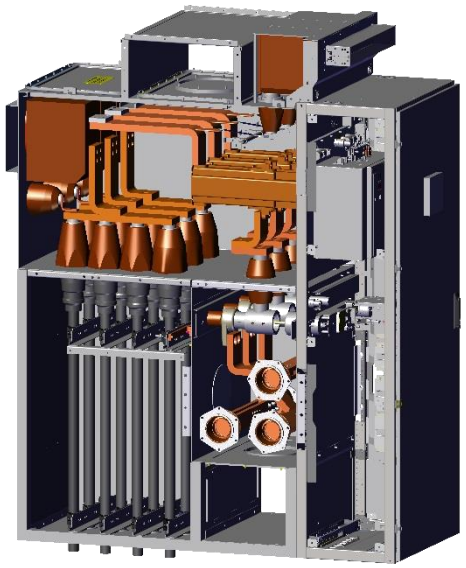


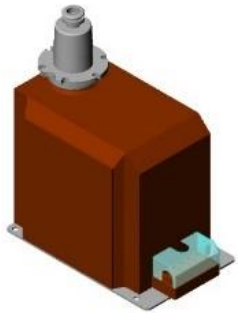
Core data (Device A)

Panel width			mm	600	800	
Rated primary current		I_r	A	…1250	…1250	…2500
Rated secondary current			A		1 or 5	
Max. number of cores				3	5	5
Measuring cores	Capacity Class		VA		2.5 to 15 0.2 / 0.5 / 1	
Protection cores	Capacity Class Overcurrent factor		VA		2.5 to 30 5P to 10P 10 to 20	

MV Primary Gas-insulated Switchgear – ZX1.2

Voltage transformer





Technical data of voltage transformers

Rated voltage [kV]	Panel width [mm]	Max. capacity [VA]	Class	Rated secondary voltage of the metering winding [V]	Rated secondary voltage of the earth fault winding [V]	Rated thermal current limit of the metering winding with rated voltage factor 1.2 / continuous [A]	Rated thermal long duration current of the earth fault winding with rated voltage factor 1.9 / 8 h [A]
Up to 24 kV	600	15 45 100	0.2 0.5 1	100 / √3 110 / √3	100 / √3 110 / √3	4	4
	800	30 75 150	1 0.2 1	100 / √3 110 / √3	100 / √3 110 / √3	6	6
> 24 to 36 kV	800	30 75 150	0.2 0.5 1	100 / √3 110 / √3	100 / √3 110 / √3	6	6

MV Primary Gas-insulated Switchgear – ZX1.2

What is your control and protection philosophy?

Protection, metering and control

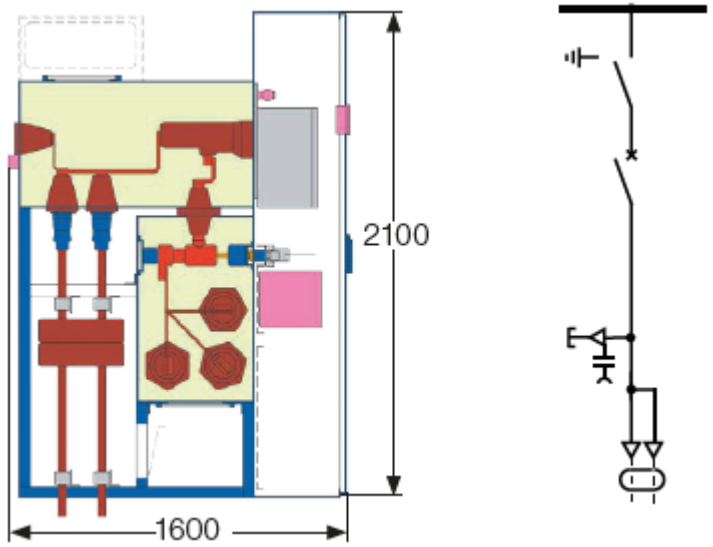
PCU

REX 640

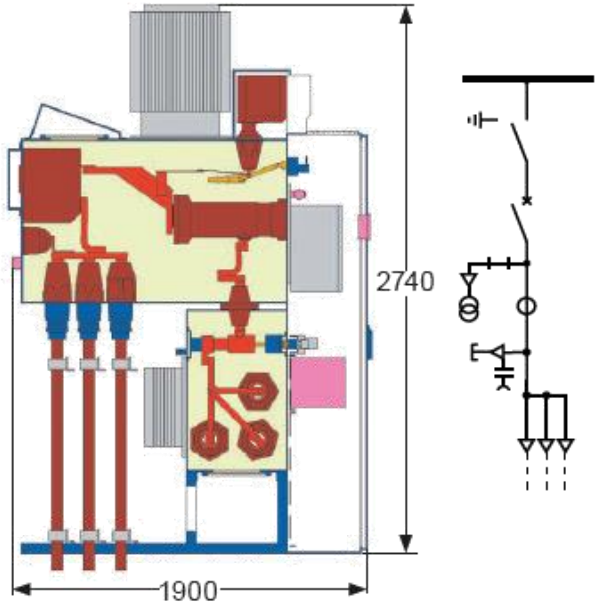
MV Primary Gas-insulated Switchgear – ZX1.2

Section views

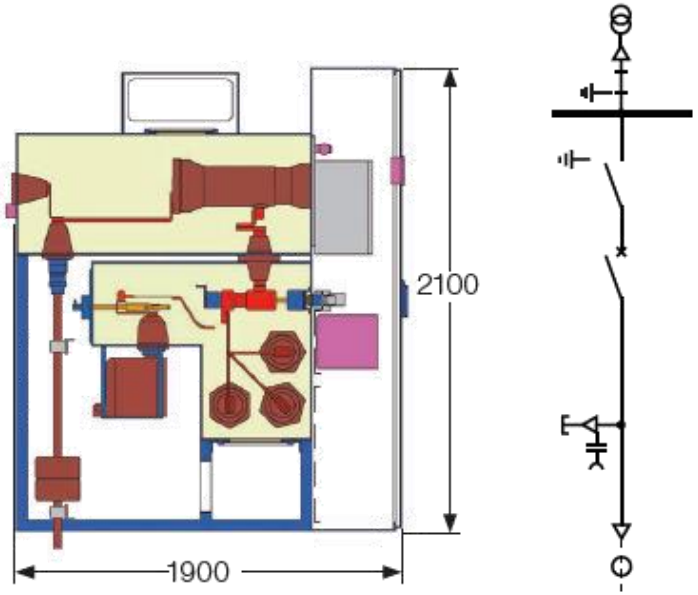
Typical panel variants ZX1.2



Outgoing feeder panel



Incoming feeder panel



Feeder panel

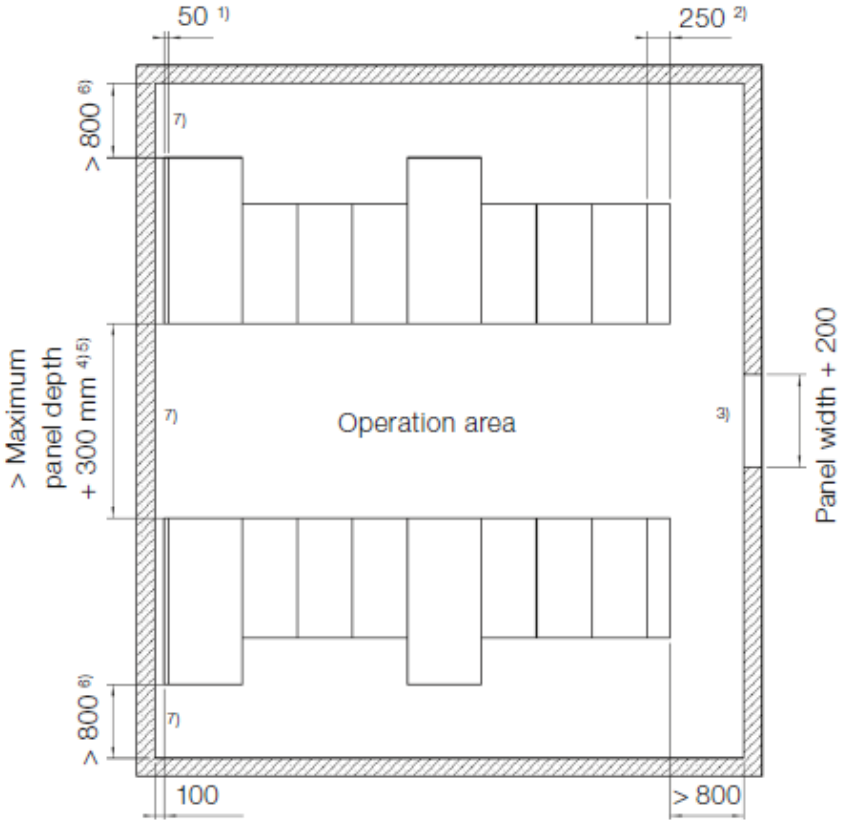
MV Primary Gas-insulated Switchgear – ZX1.2

Saving space helps to reduce cost

Installation

- Delivery of **factory filled and tested panels**
- Installation without gas works at site
- Transverse installation is possible
- Installation on standard floor frames embedded in concrete floor, on intermediate frame or on raised false floor
- Installation and commissioning shall be done by **trained and certified service personnel**

Panel weights	
800 – 1250 A panel variants	From approx. 550 kg to approx. 1000 kg
2500 A – panel variants	Up to 1650 kg

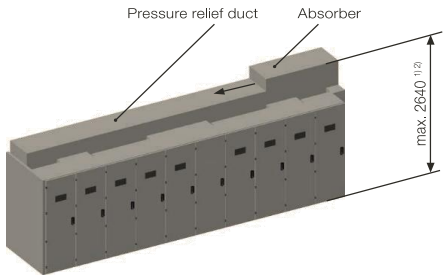


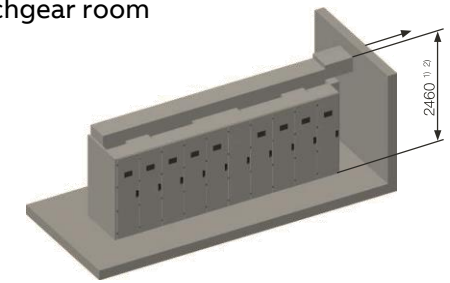
MV Primary Gas-insulated Switchgear – ZX1.2

How does your switchgear room look like?

Installation – Minimum room heights

Minimum room heights		
System with tall heat sinks on at least one circuit-breaker compartment		3250 mm
System without ZX1.2 – C (with or without voltage transformers on the circuit-breaker compartment)	Pressure relief duct with discharge to the outside	2700 mm
	System with plasma diverters	2800 mm
	Pressure relief duct with discharge into the switchgear room	2950 mm
System with ZX1.2 – C (with or with voltage transformers on the circuit-breaker compartment)	System plasma diverters	3000 mm
	Pressure relief duct with discharge to the outside (ZX1.2 – C not at the end of the system)	
	Pressure relief duct with discharge to the outside (ZX1.2 – C at the end of the system)	3200 mm
	Pressure relief duct with discharge into the switchgear room	





Sales Product Presentation - ZX Family

Why choose ABB?

Highlights

- ABB is the pioneer in MV GIS
- Continuous improvement
- Products tailored to meet your local requirements and standards
- Highly reliable, smart, compact and economic solution
- Full engineering and technical support
- Worldwide footprint and service network

Sales Product Presentation - ZX Family

Links

http://abb.com/

http://abb.com/medium-voltage

https://new.abb.com/medium-voltage/switchgear/gas-insulated-switchgear

Let’s write the future of safe, smart, and sustainable electrification


ABB