



Korea Innovation Day 2010

Medium Voltage Switchgear

ABB MV switchgear

Gunnar Hall

Global Product and Marketing Manager

Primary air-insulated Switchgear

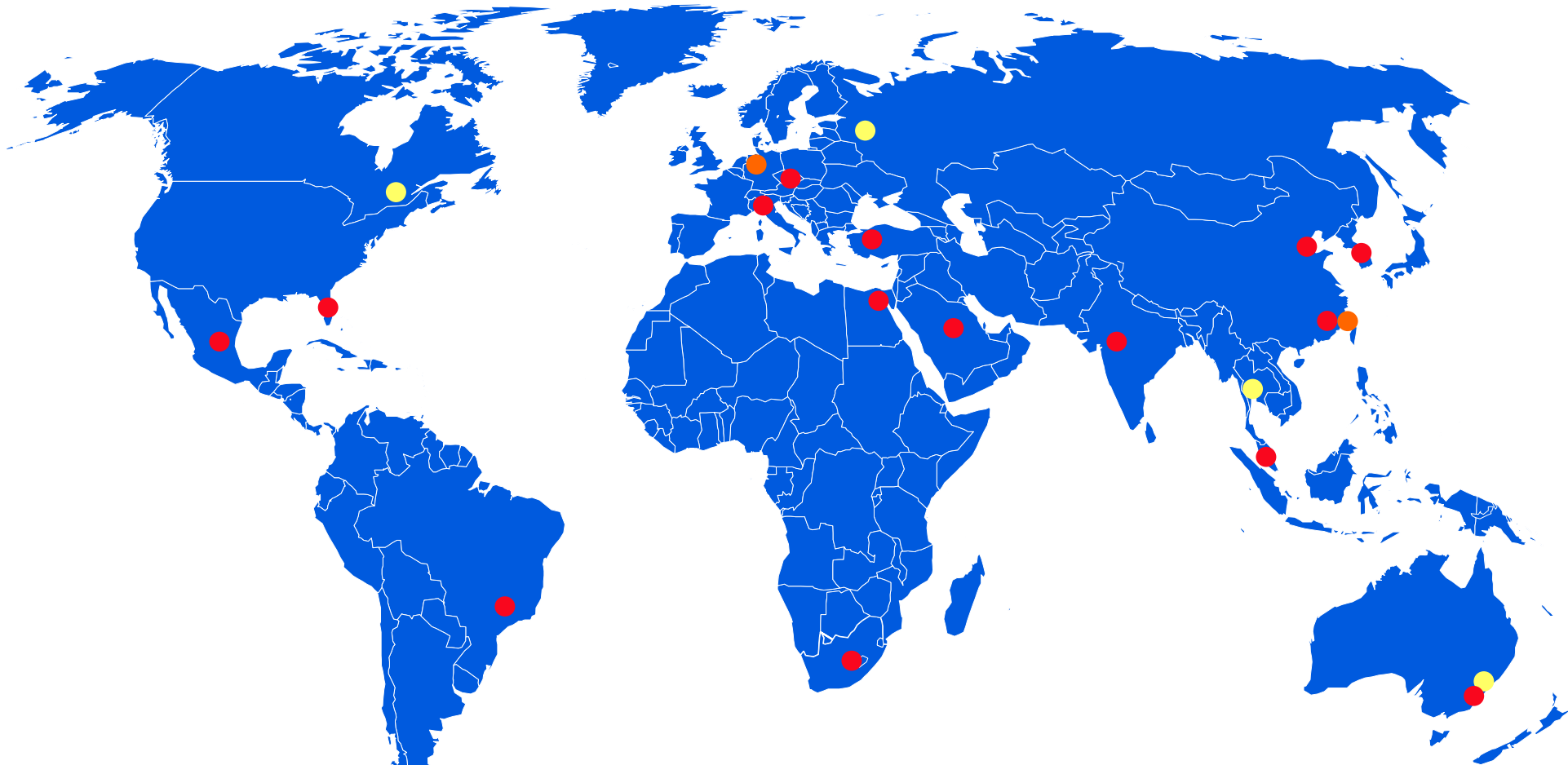
Medium Voltage Products

ABB MV switchgear presentation

Content

- MV Gas-insulated Switchgear type ZX
- MV Air-insulated Switchgear type UniGear
- The X-plug wiring innovation

Primary MV AIS & GIS footprint – 21 units worldwide



● RFFF: UniGear, Advance and SafeGear

AU, Moorebank
(UG ZVC)

BR, Guarulhos

CN, Xiamen (2)

CN, Tianjin

CZ, Brno

EG, 10th Ramadan

IN, Nashik

IT, Dalmine

KR, Chonan

MX, San Luis Potosí
(SafeGear & Advance)

MY, Kuala Lumpur

TR, Istanbul

US, Lake Mary (FL)
(SafeGear & Advance)

ZA, Longmeadow

SA, Riyadh

● RFFF: ZX GIS

DE, Ratingen

● LCU: Local Customizing Unit

AU, Moorebank

CA, Montreal

CN, Xiamen

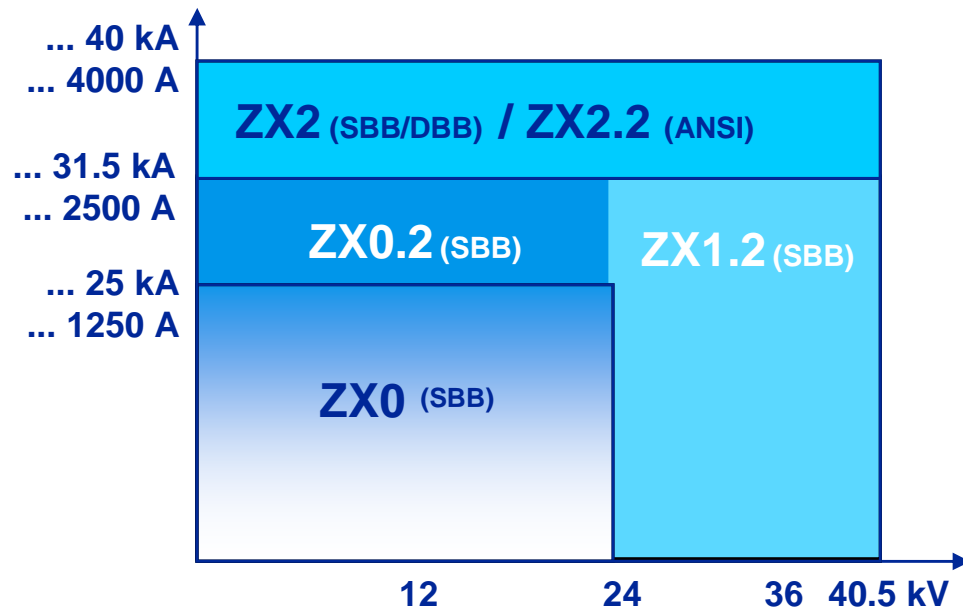
RU, Moscow

TH, Bangkok

ABB Medium Voltage GIS - ZX Family

One GIS product platform : **ZX**

- Complete portfolio covering all relevant requirements
- > 30,000 units in > 70 countries used in various EPC projects
- Local customization of panels in many locations, such as in Chonan, Korea



ZX0



ZX2

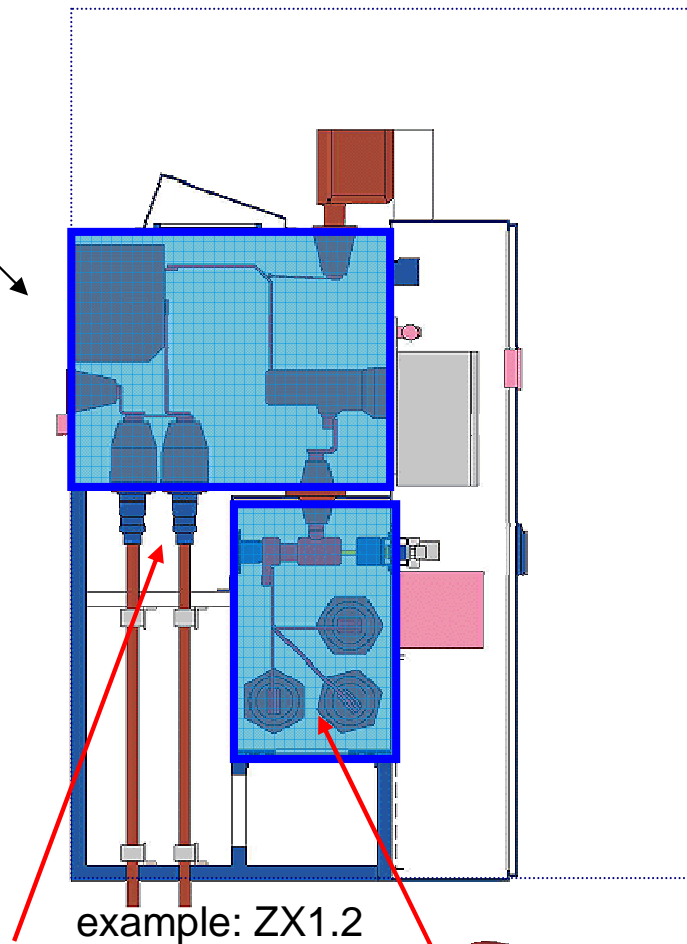


ZX1.2

ABB Medium Voltage GIS – ZX Features

Highest availability and safety

All MV parts are protected from external influence.
No maintenance of parts inside gas tank
Maximum safety for operators.

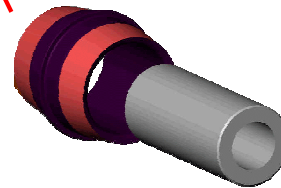


Reduced dimensions

Space saving compared to conventional solutions

Simple & safe installation

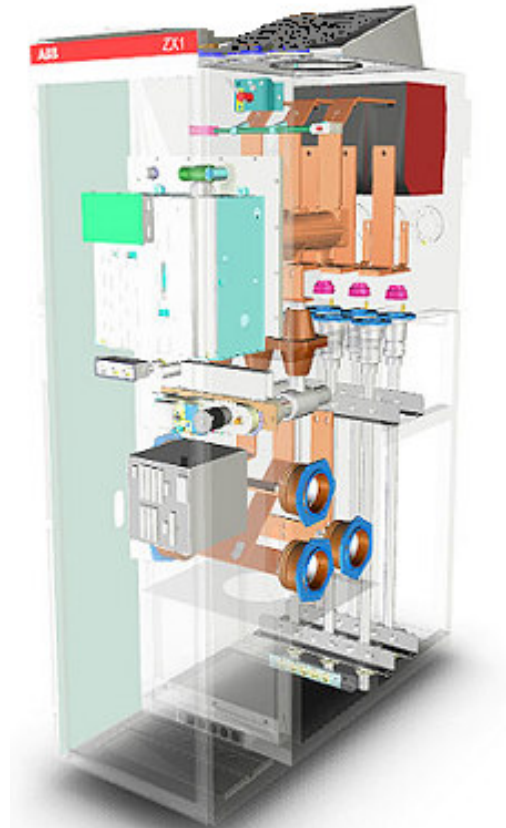
Plug-in technology for cable and busbar connections



**Small,
Safe & simple**

ABB Medium Voltage GIS – ZX benefits

- **Gas Insulated Switchboards stand for:**
 - **Small dimensions**
 - **Highest availability & increased lifetime**
 - dust, vermin, humidity do not impair insulation of MV parts
 - consequently reduced failure risk & ageing
 - maximum safety
 - **Low overall lifecycle cost**
 - no maintenance & cleaning of MV parts
 - minimum downtime
 - quick installation
 - smaller buildings



ZX1.2 - feeder

UniGear air-insulated switchgear

Portfolio overview 1-40,5kV



- Switchgear panels for primary switching applications.
 - 12-17,5kV panels up to 4000A and STC 50kA
 - 24kV panels available up to 3150A and STC 31,5kA
 - 36-40,5kV panels up to 3150A and STC 31.5kA
- Panels ready for complete remote control and monitoring as per IEC 61850.

UniGear air-insulated switchgear

Portfolio overview 1-40,5kV

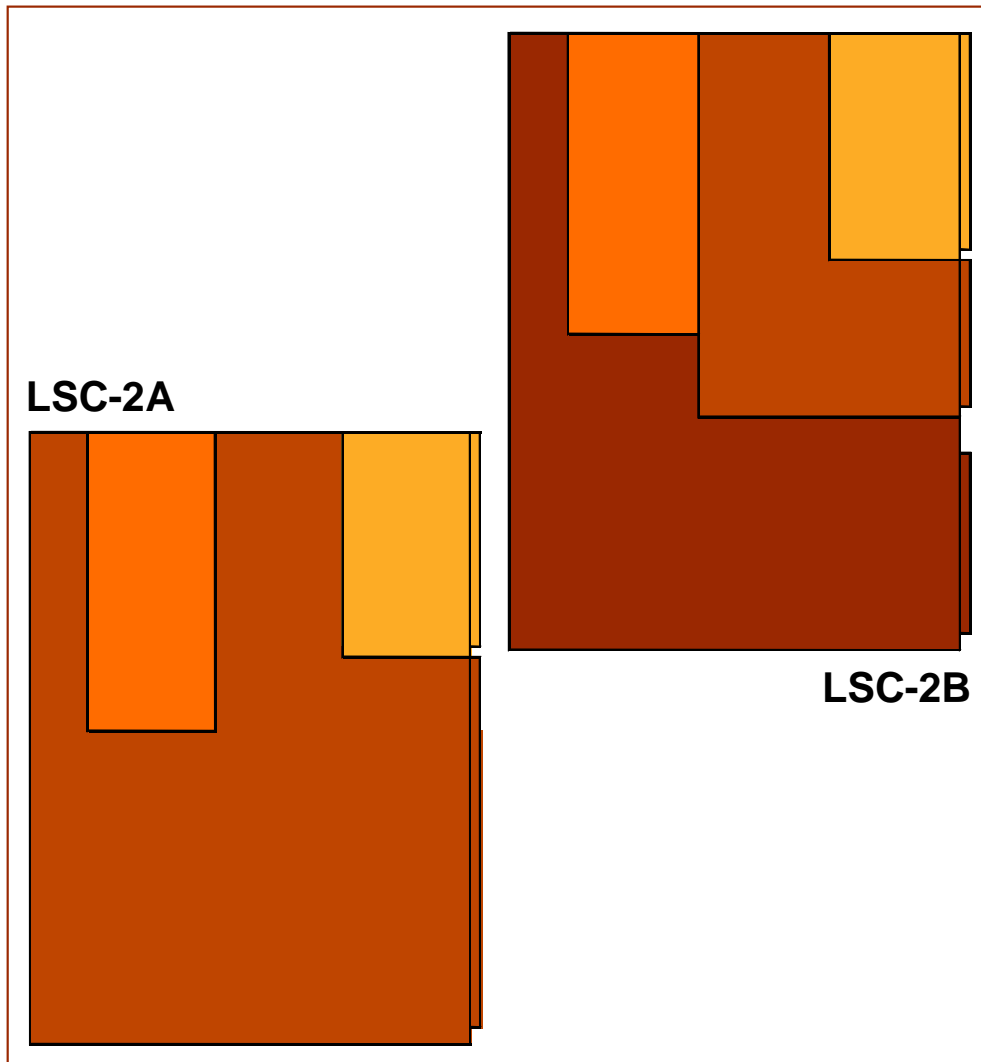
- UniGear ZS1 (12-17,5kV and 24kV)
 - Standard single busbar version
 - Duplex – double busbar version with two CBs
 - Double Busbar – one CB and two line disconnectors
- UniGear 550 (12-17,5kV)
 - Standard single busbar version
- UniGear 500R (12-17,5kV) – **NEW**
 - Reduced space panel, 2000A at 500mm width
 - Single busbar
- UniGear ZVC - slim motor control centre (7,2kV)
- UniGear MCC -- slim motor control centre (12kV) – **NEW**

UniGear air-insulated switchgear

Portfolio overview 1-40,5kV

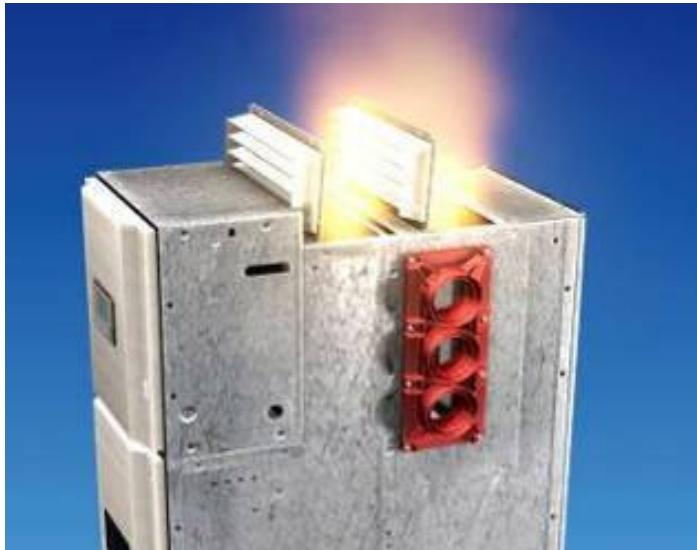
- UniGear ZS2 (36kV)
 - Standard single busbar version
 - Duplex – double busbar version with two CBs
- UniGear ZS3.2 (40,5kV)
 - High duty panel as per Chinese standards GB/DL
- Is-limiter (12-24 and 36kV)
- In addition, as per ANSI standards:
 - SafeGear arc resistant switchgear 1-15kV
 - SafeGear arc resistant MCC 1-7,2kV

IEC classification



- UniGear ZS1, ZS2, ZS3.2 and 550
 - LSC-2B (*Busbar, feeder and apparatus compartments physically and electrically segregated*)
- UniGear 500R & MCC
 - LSC-2A (*Busbar and feeder / apparatus compartments physically and electrically segregated*)
- PM (*partition metallic*) classified according the IEC 62271-200

UniGear is internally arc-proof



Internal arc classified IAC AFLR according to the IEC 62271-200 Annex A

UniGear is in full accordance to all the five criteria:

1. The doors of the switchboard must remain closed and no opening of the cover panels must occur;
2. Any part of the switchboard which may be hazardous for personnel must not be ejected;
3. No holes must appear in the external housing of the switchboard in any parts accessible to personnel;
4. The vertically and horizontally arranged fabric indicators placed outside the switchboard must not get burnt;
5. All the switchboard earthing connections must remain effective.

Front, rear and lateral arc resistance

Marine and seismic tests



Inclination test



Vibration test

- Fully type tested according to IEC standard
- Additional tests performed in compliance with shipping registers regulations
- Specifically tested to be in compliance with several local requirements (e.g. GOST and GB)
- Seismic tests performed according to IEC (IEC 68-2-6 / 68-2-57) and IEEE standards (IEE Std. 693-1977)

Back to wall installation – space saving

Excellent for prefabricated eHouses



- Maintenance and service operations performed from the front
- Front access to all the compartments (apparatus, busbars, cables)
- Comfortable front cable access

Fully interlocked – maximum safety



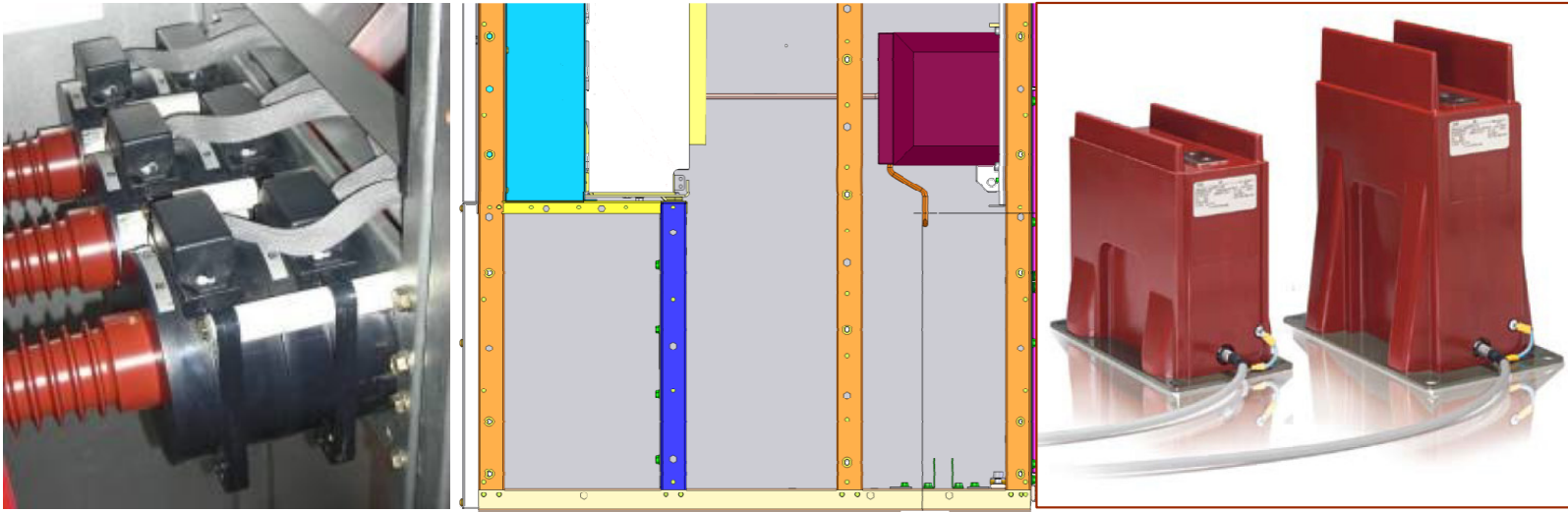
- Safety interlocks between all the switching devices and compartments doors
- Error-free interlocking system to prevent any incorrect operation
- Keylocks and padlocks facilities on all the devices, doors and shutters

Earthing switch – maximum safety



- With full making capacity
- Short time withstand current for 1 seconds
- Operated from the front
- Provided with secure position indicators
- Motor operated drive mechanism available

Current transformers – flexible range



Available solutions:

- Ring core CT's assembly
- Block type CT's assembly
- Sensor or combi sensor assembly

UniGear switchgear fixed on a skid – smooth logistics



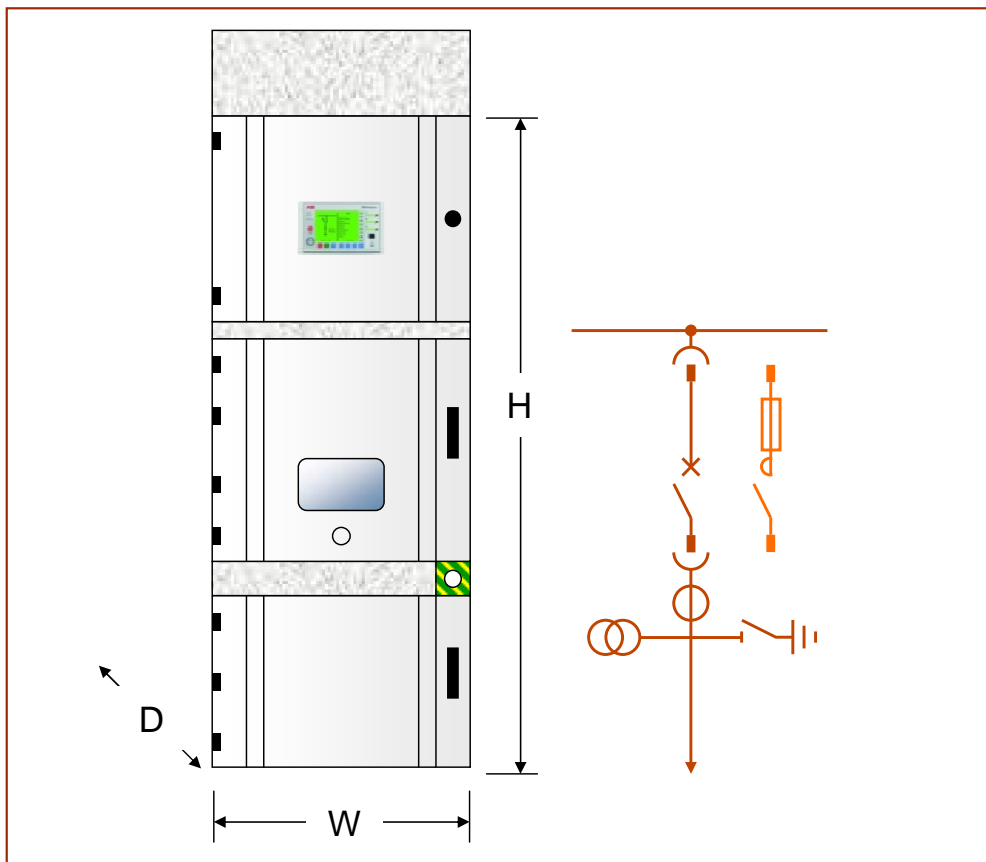
UniGear ZS1 - Single level / single busbar

Electrical characteristics

Rated voltage	[kV]		12	17,5	24
Test voltage (50-60 Hz/1 min)	[kV]		28	38	50
Impulse withstand voltage	[kV]		75	95	125
Rated frequency	[Hz]		50-60	50-60	50-60
Rated short-time withstand current	[kA 3s]	Up to	50	50	31,5
Peak withstand current	[kA]	Up to	125	125	80
Internal arc withstand current	[kA 1s]	Up to	50	50	31,5
Rated current of the main busbars	[A]	Up to	4000	4000	3150
Rated circuit-breaker thermal current	[A]	Up to	4000	4000	3150
Feeders rated current with natural ventilation	[A]		630	630	630
			1250	1250	1250
			1600	1600	1600
			2000	2000	2000
			2500	2500	
			3150	3150	
Feeders rated current with forced ventilation			3600	3600	2500
			4000	4000	3150

UniGear ZS1 - Single level / single busbar

Main information



Circuit breakers units

W=650mm	630-1250A	...31,5kA
W=800mm	1250-2000A	...50kA
W=1000mm	2500-4000A	...50kA

Fused vacuum contactor units up to 12kV

W=650mm	400A	...50kA
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All units

H=2200mm (2675mm with exhaust gas duct)	
D=1340/1390 ⁽¹⁾ -1700 ⁽²⁾ mm	Bottom entry
D=1650/1700 ⁽¹⁾ mm	Bottom ⁽³⁾ & top entry
D=2170mm	Bottom ⁽³⁾ & top entry

(1) 1390mm for 12/17,5kV at 3150-4000A

(2) 1700mm for 24kV

(3) With additional features

NEW UniGear MCC

Motor Control Centre 7.2-12kV



- Range of UniGear MCC
 - ...12 kV, ...400 A, ...50 kA
- Features of UniGear MCC
 - Slim contactor panel only 400 mm wide
 - Fused vacuum contactor with magnetic actuator (VSC/PN)
 - Internal arc classification IAC AFLR
 - Classified as LSC-2A, PM
 - Cable termination height up to 600 mm
 - Can be combined with UniGear ZS1, 550 and 500R
- First deliveries available from Q4/2010

NEW UniGear MCC

Electrical characteristics

Rated voltage	[kV]		7,2	12
Rated insulation voltage	[kV]		7,2	12
Rated power frequency withstand voltage	[kV]		20	28
Rated lightning impulse withstand voltage	[kV]		60	75
Rated frequency	[Hz]		50-60	50-60
Rated short-time withstand current ⁽¹⁾	[kA 3s]	Up to	50	50
Peak current	[kA]	Up to	125	125
Internal arc withstand current ⁽²⁾ (in accordance to IEC 62271-200 App A)	[kA 1s]	Up to	50	50
Branch connection rated current	[A]		400	400
Main busbar rated current ⁽³⁾	[A]	Up to	4000	4000

⁽¹⁾ Limited by the fuses.

⁽²⁾ The internal arc withstand values are guaranteed on the busbar compartment; the supply side. The fault in circuit-breaker and cable compartment is limited by the fuses.

⁽³⁾ 4000A is achieved with UniGear ZS1 combination.

NEW UniGear MCC

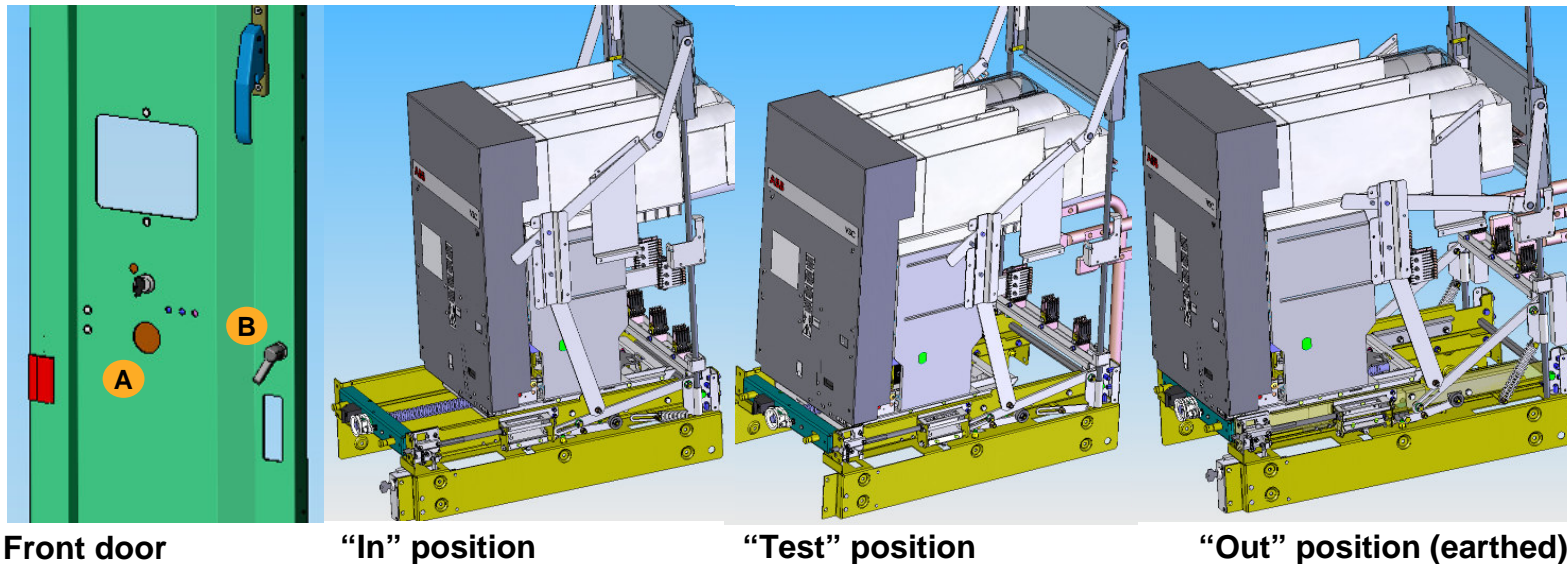
VSC vacuum contactor



- V-Contact VSC/PN ...12kV, 400A
- Designed in accordance with the IEC 60470 and 60694 (when applicable)
- With magnetic actuator
- Designed for use in “slimline” Motor Control Center switchgear
- Suitable for traditional type switchgear solutions
- Specifically designed for motor switching, granting an extremely limited chopping current

NEW UniGear MCC

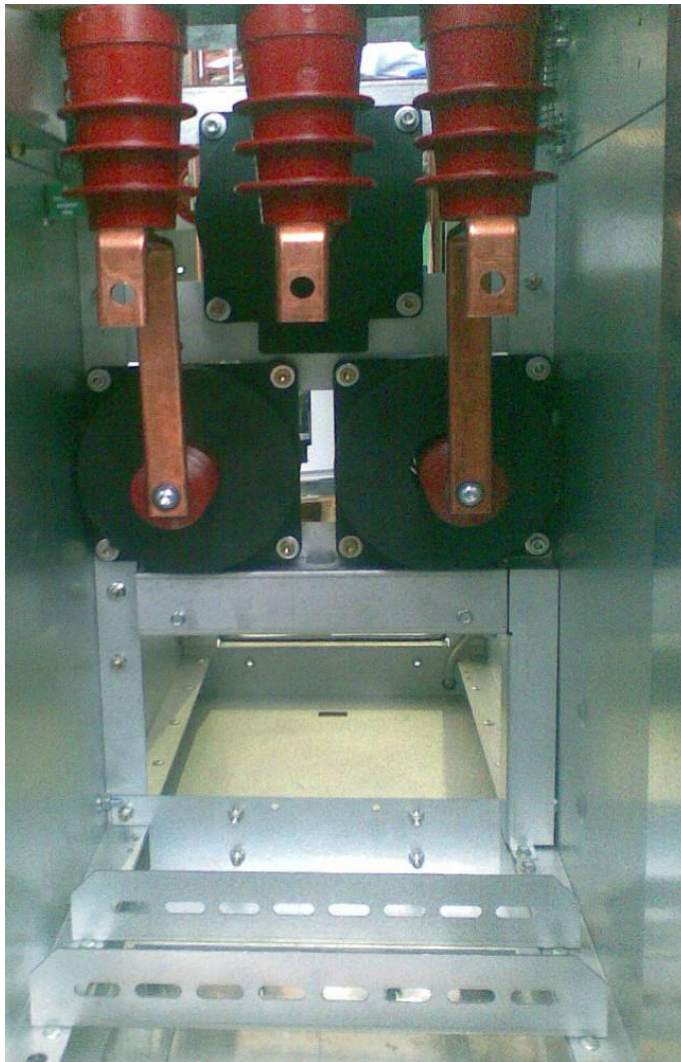
Operation on VSC vacuum contactor



- Insert the lever in the shutter A
- Rotate counter clockwise the lever up to "test" position (150mm of stroke)
- Rotate the handle B
- Rotate the lever up to "out" position (50mm of stroke) with the automatic closing of earthing switch

NEW UniGear MCC

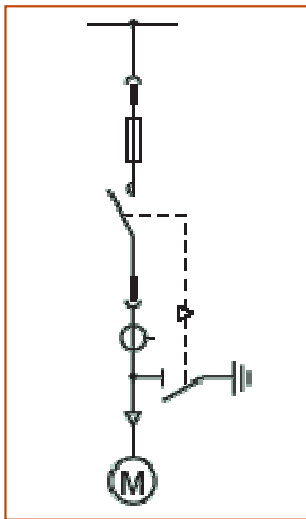
Cable connections



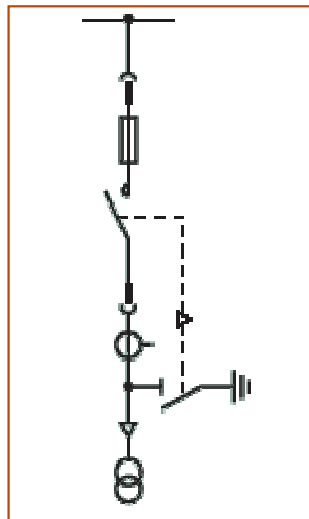
- 600mm height of cable connections
- Standard solution up to two cables each phase (up to 240mm²)

NEW UniGear MCC

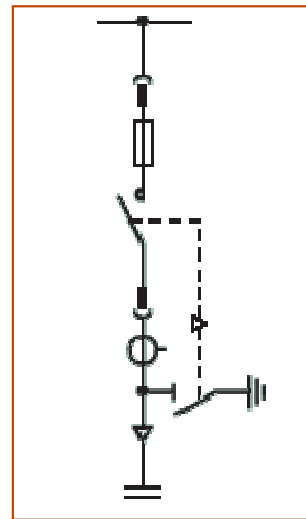
Available applications



Across the line motor starting



Transformer feeder

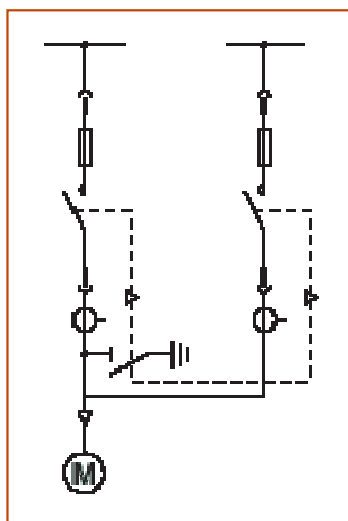


Capacitor bank feeder

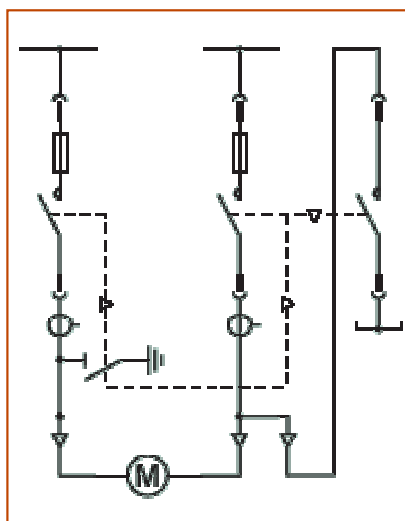
- Motor feeder
- Transformer feeder
- Capacitor bank feeder

NEW UniGear MCC

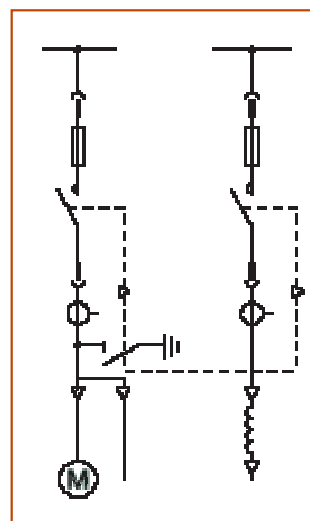
Motor starting applications



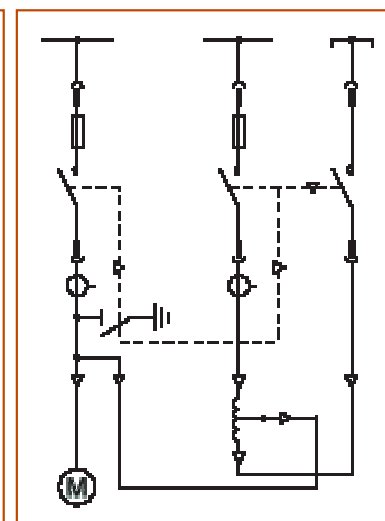
Reverse operation



Star-delta motor starting



Reactor motor starting



Auto-transformer motor starting

- Reverse operation
- Star-delta motor starting
- Reactor motor starting
- Auto-transformer motor starting

NEW UniGear 500R

2000A feeder in a 500 mm wide panel



NEW UniGear 500R

Directly connectible with UniGear ZS1 & 550



NEW UniGear 500R

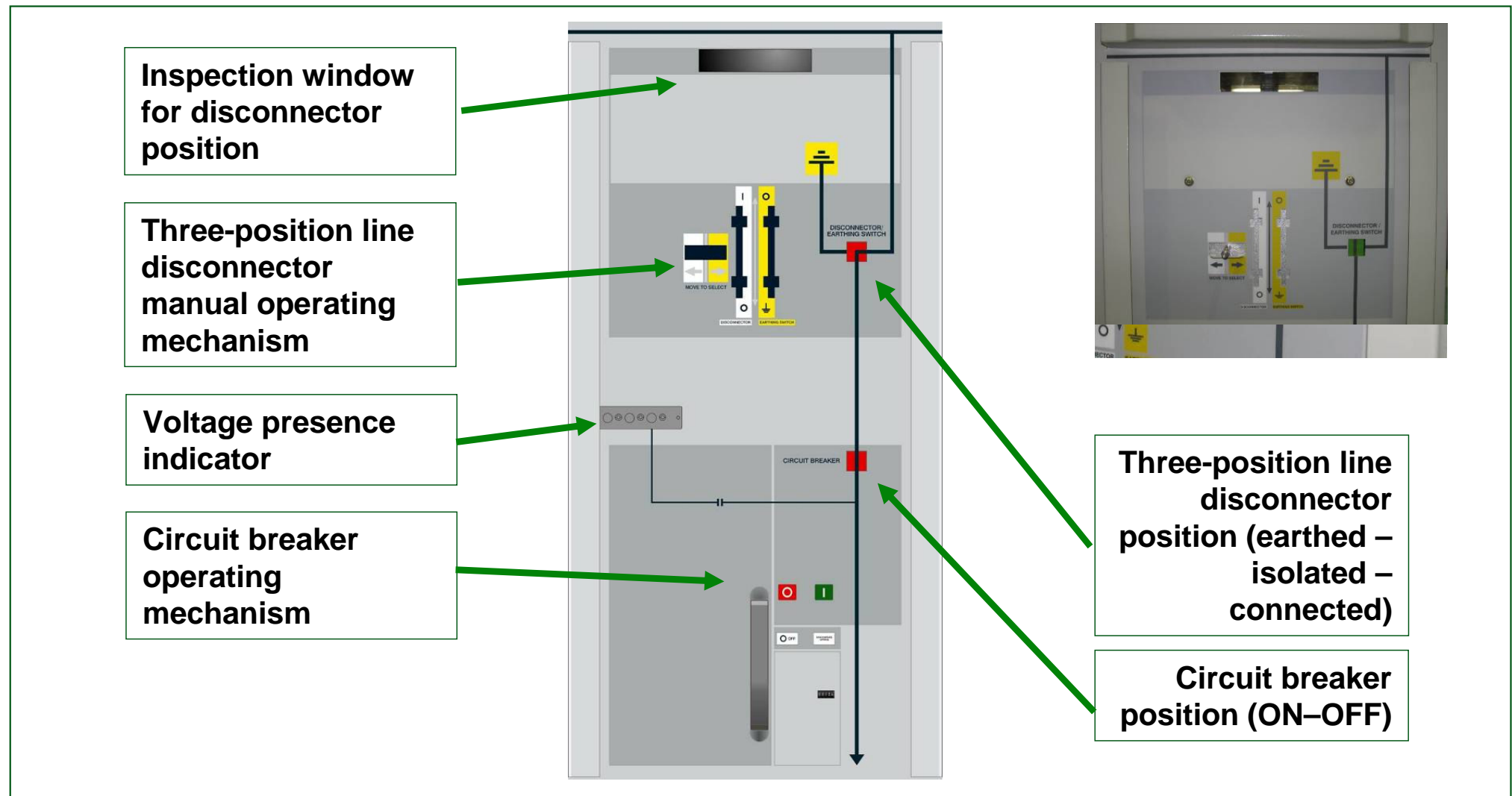
Electrical characteristics

Rated voltage	[kV]		12	17,5
Rated insulation voltage	[kV]		12	17,5
Rated power frequency withstand voltage	[kV]		28	38
Rated power frequency over the isolation distance	[kV]		32	45
Rated lightning impulse withstand voltage	[kV]		75	95
Rated lightning impulse withstand voltage over the isolation distance	[kV]		85	110
Rated frequency	[Hz]		50-60	50-60
Rated short-time withstand current	[kA 3s]	Up to	31,5	31,5
Peak current	[kA]	Up to	80	80
Internal arc withstand current (in accordance to IEC 62271-200 App A)	[kA 1s]	Up to	31,5	31,5
Feeder connection rated current	[A]		630	630
			1250	1250
			2000	2000
Main busbar rated current (*)	[A]	Up to	4000	4000

(*) up to 4000A incoming feeders available with standard UniGear ZS1

NEW UniGear 500R

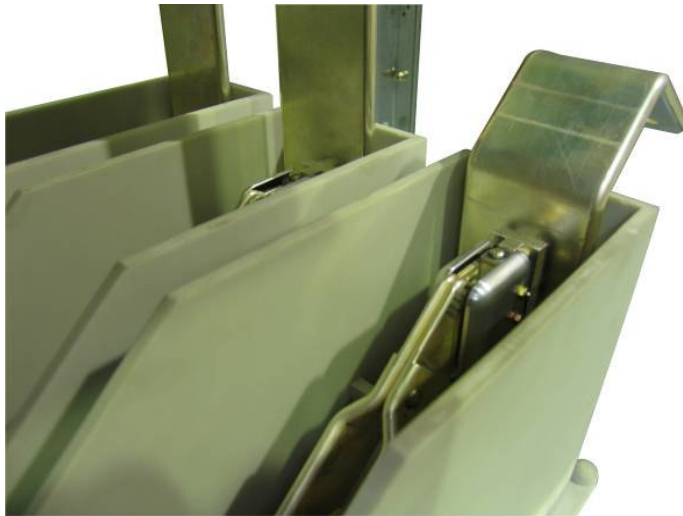
Front plate indications



NEW UniGear 500R

Three-position line disconnecter

Connected position



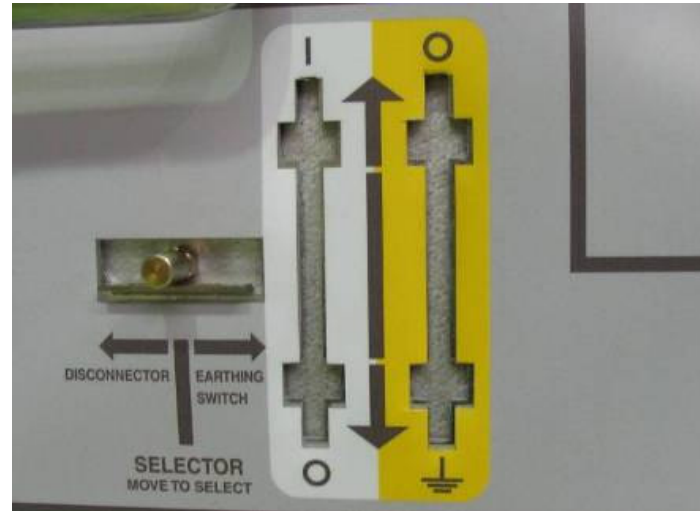
Isolated position



Earthed position



Operating mechanism



NEW UniGear 500R

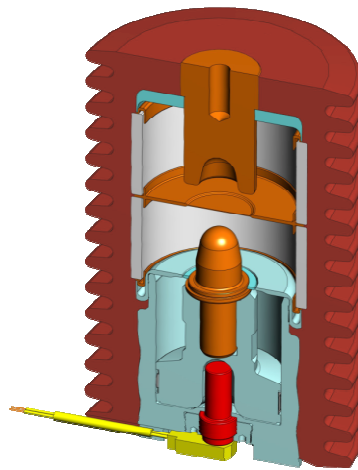
Vmax vacuum removable circuit breaker



- Ratings up to ...17,5kV, ...2000A, ...31,5kA
- Mechanical operating mechanism located on the front plate
- Same accessories as per withdrawable version and VD4/P
- Clear front indication of open – close position and spring status
- All components located in the front of the panel
- Replacing of CB from the front of the panel in one hour and a half

NEW UniGear

UniGear with UFES (Ultra Fast Earthing Switch)

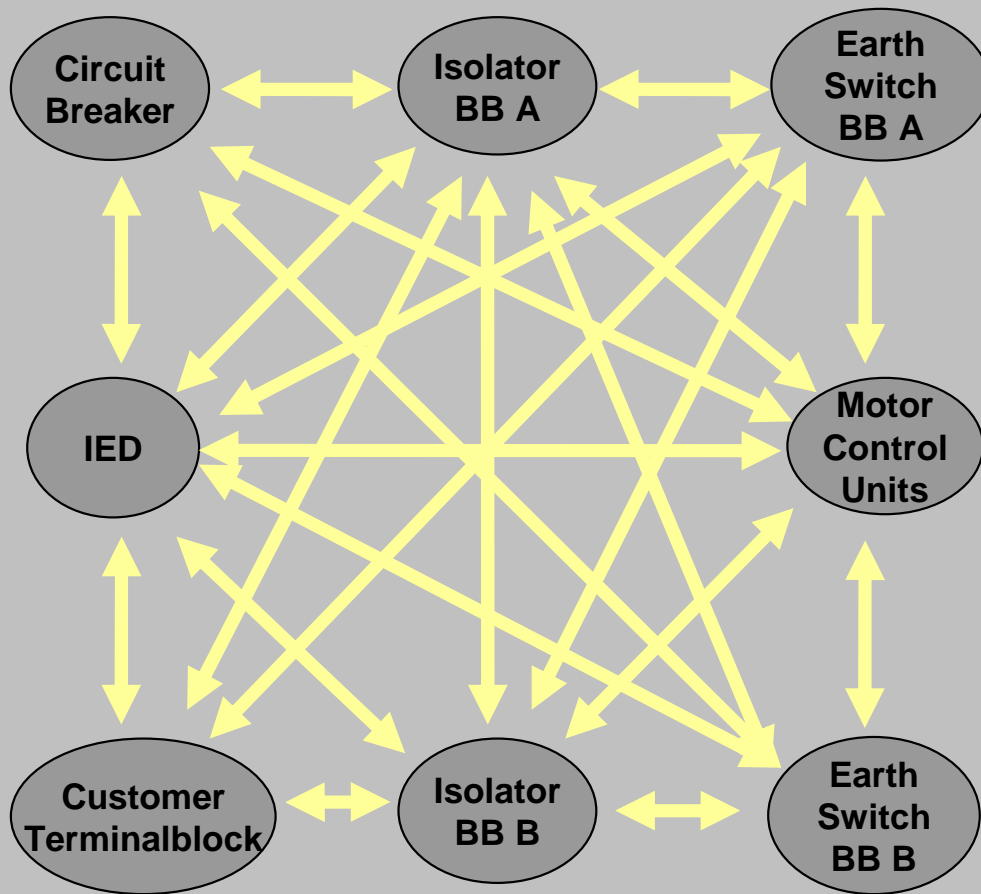


- Features of UFES
 - New arc protection concept for MV switchgears
 - Reliable detection of current and light of the internal arc
 - 3 current inputs
 - 9...54 optical inputs for arc detection
 - Special double vacuum interrupter
 - Arc fault duration ≤ 4 ms
 - Final clearing of the fault current by the upstream circuit-breaker
 - One shot device – to be replaced after operation.

NEW The X-Plug Innovation

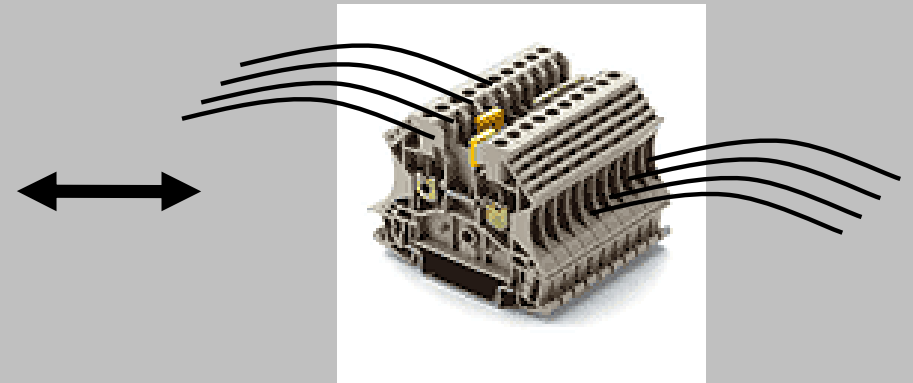
Traditional wiring concept

Traditional wiring



Each arrow represents 1 or n connections between two devices

⇒ i.e. 2 or $2 \cdot n$ wires connected via 1 or n feed-through terminals



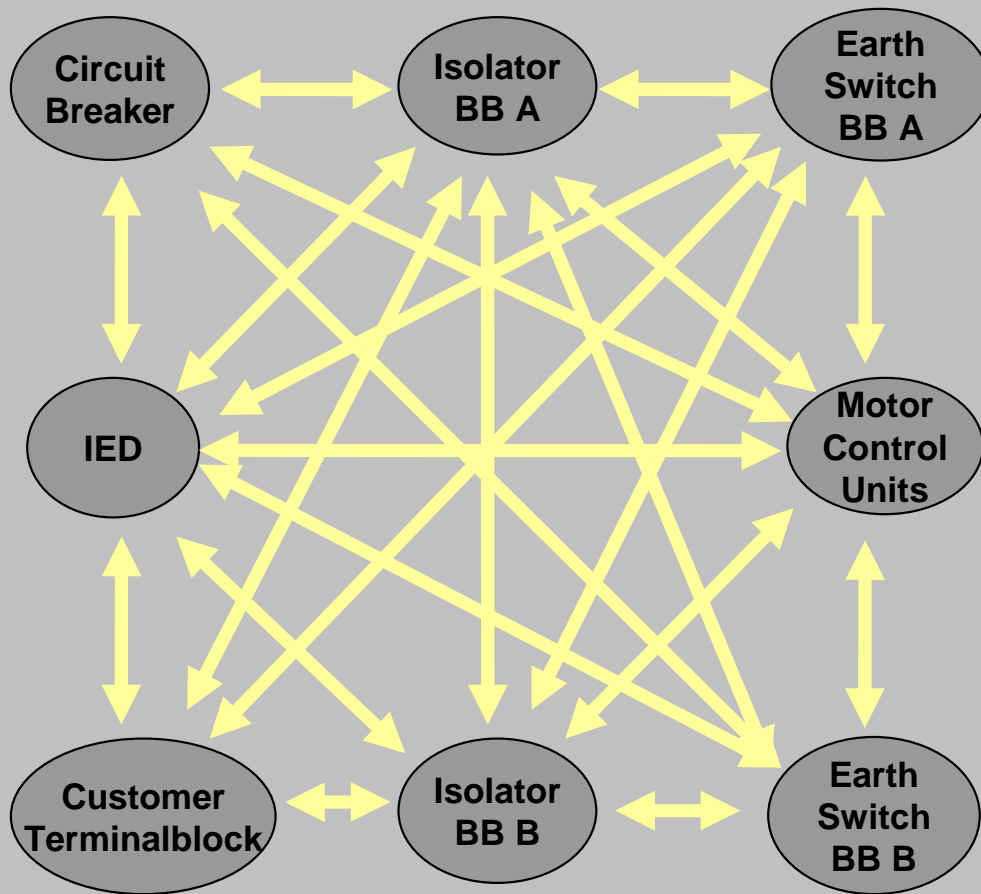
⇒ 4 or $4 \cdot n$ ferrules and crimping steps

⇒ The same number of screwing (or clamping) steps

NEW The X-Plug Innovation

Traditional wiring concept

Traditional wiring



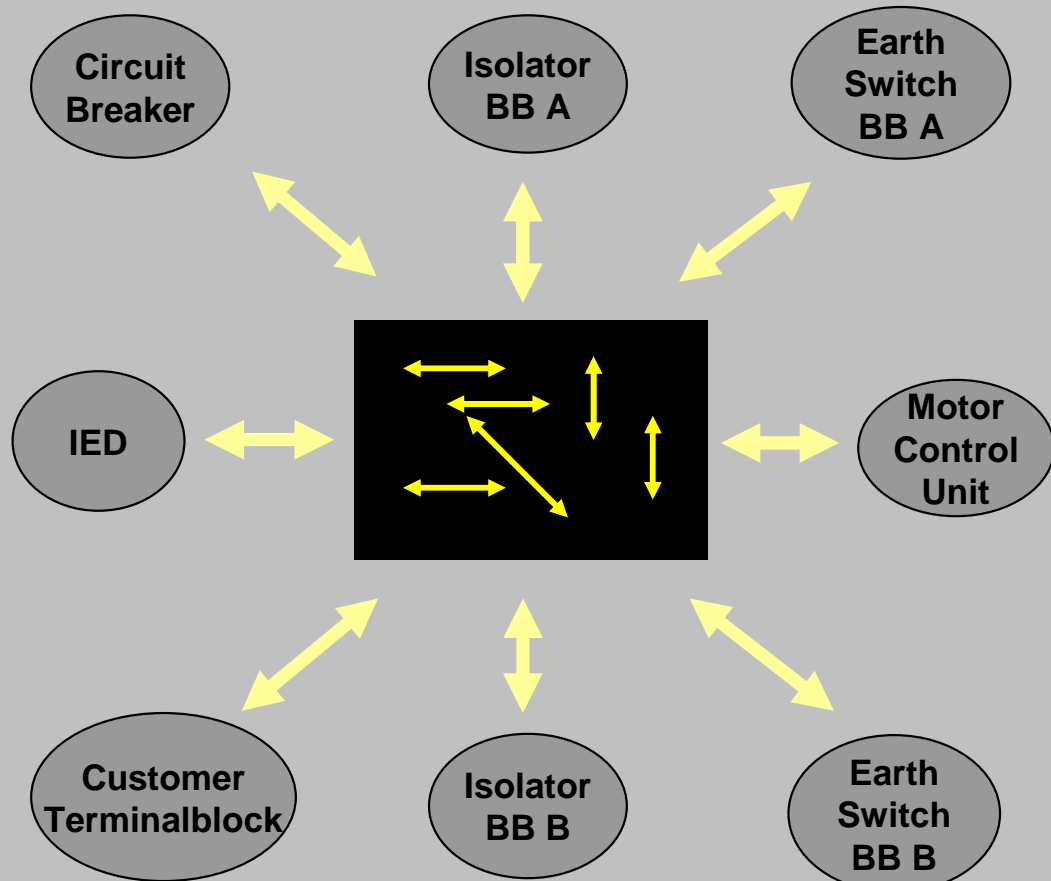
Disadvantages

- **Engineering**
 - Multiple standards for wiring diagrams needed and marginal harmonization of switchgear LVC wiring
 - Engineering of external relays leads to individual electrical wiring diagrams
- **Wiring**
 - No modular concept possible
 - Low level of standardization – no use of prefabricated and pretested cable harnesses
 - Throughput time not according to customer expectations
 - Huge expenses for labour and material in default of modern wiring concepts
- **Testing**
 - Increased testing effort
- **Commissioning**
 - Changes cause a lot of wiring effort
 - Wiring concept unclear and not traceable

NEW The X-Plug Innovation

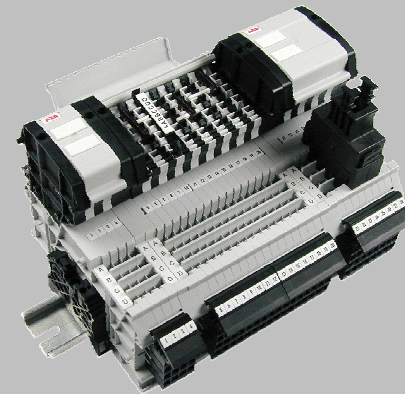
The intelligent wiring concept

X-Plug wiring concept



Less “arrows” representing 1 or n connections between a device and the central module

⇒ 1 or n wires connecting the device via the central module



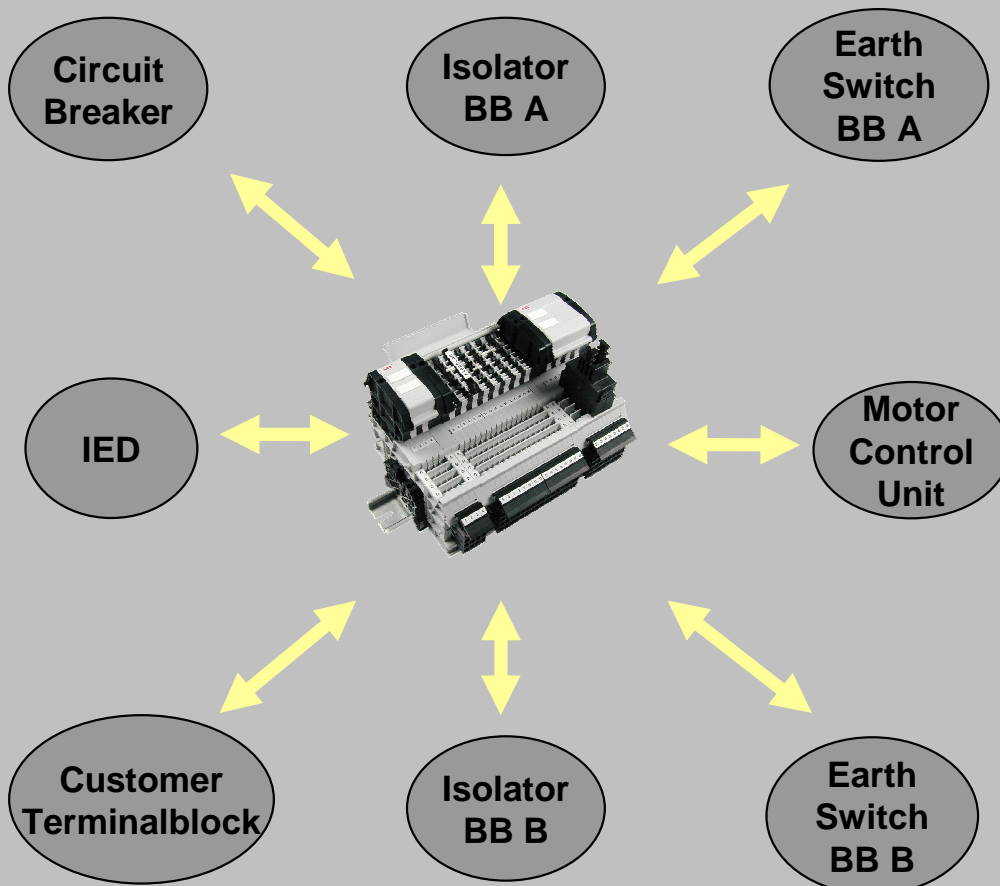
⇒ only 2 or 2xn ferrules and crimping steps

⇒ less than half the number of screwing (or clamping) steps

NEW The X-Plug Innovation

The intelligent wiring concept

Standardized wiring to X-Plug Interconnections realized with standard parts for bridge inside of X-Plug



Advantages

- Engineering
 - Harmonization of switchgear LVC wiring
 - Easy engineering of external relays by exchange of cable harness (modularity and harmonization)
 - Focus on customer requirements
 - 'Late customization' possible
- Wiring
 - Milestone for modular LVC concept
 - High Level of standardization caused by use of prefabricated and pretested cable harnesses
 - Consistent transformation to plug-in technology of wiring through to customer terminal board (Exception: CT and VT circuits)
 - Fast and clean wiring completion
- Testing
 - Optimized and reduced testing period
- Commissioning
 - Easy handling of changes by simply exchange of modified X-plugs
 - Wiring concept simple and for anyone traceable

Design of complete X-Plug module

Hinged hood cover can be opened and is removable.

A label with the cross connection set up can be put on the internal side of the Hood Cover.

Pluggable cross connections for lengthwise, crosswise and diagonal connections.

X-PLUGs can be fixed by screw on the end plate.

Space for pluggable test-adapters, additional X-PLUGs or further STGH Plugs.

STGH Plugs to be fixed by using locking elements VREL.

STGH Plugs as in the actual ZRV 2.5/2.

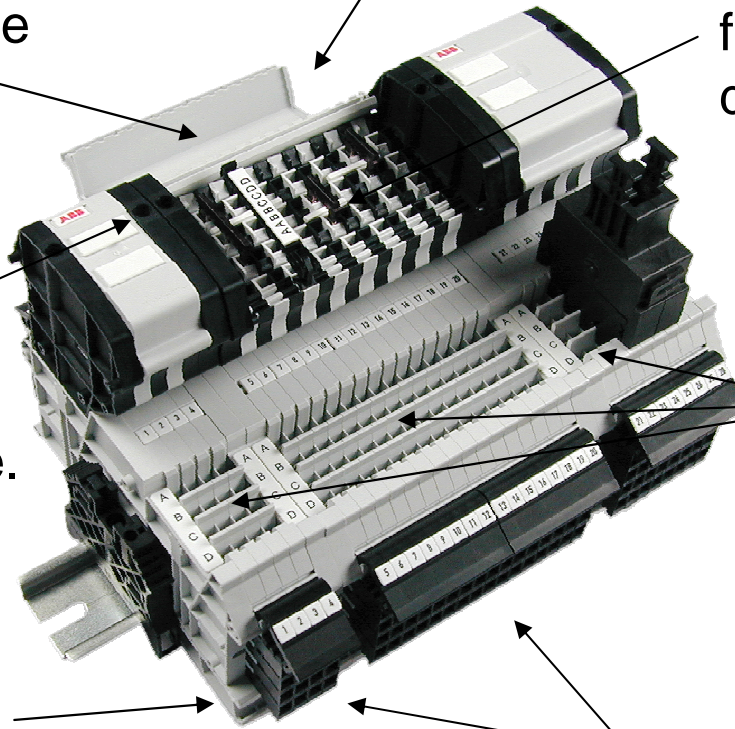


ABB Technology for all components



**ABB technology
for all core components**

Power and productivity
for a better world™

