Switchcraft Europe GmbH
Switchgear Product Overview

- iGIS – Gas Insulated Switchgear
- iSIS – Solid Insulated Switchgear
- iCB - Vacuum Circuit Breaker
- iAIR - Air insulated switchgear panel
Switchcraft is ERL’s Division for designing, developing and producing Medium voltage switchgear products from 10 to 40.5 KV, from 630A to 3150A

**Switchgear Product Family**

- **iGIS** – Gas Insulated Switchgear up to 24kV, up to 630A, 21.5kA (former GLX24!)
- **iSIS** – Solid Insulated Switchgear up to 40.5kV, up to 2500A, 31.5kA
- **iCB** – Vacuum Circuit Breaker for 12kV/24kV, up to 3150A, 40kA
- **iAIR** – Air Insulated Switchgear for 12kV/24kV, up to 3150A, 40kA
SWITCHCRAFT
Medium Voltage Switchgear Product Family

- iGIS - Gas Insulated MV Switchgear & Ring Main Units up to 24 kV, 25kA
- iSIS - Revolutionary Solid Insulated Switchgear up to 40.5 kV, 31,5kA
- iCB – Air insulated Circuit Breaker, 12/24kV, up to 40kA
- iAIR – Air insulated Switchgear 12kV/24kV, up to 40kA
- Special purposes MV Switchgear solution for utilities, industry, railways, and wind parks
Overview – RMU SF₆ Insulated Ring Main Unit
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iGIS - Main Features

✓ SF₆ Gas insulated Ring Main Unit
✓ Modular Design
✓ Metal Enclosed Factory Built Switchgear
✓ Fully Extensible & flexible
✓ Designed up to 12kV, 21.5kA, 630A & 24kV, 16kA, 630A
  ▪ Fully CESI Type Tested !
  ▪ w/Siemens Vacuum chambers
✓ Extreme Compact dimensions (350X800X1380mm)
✓ Single or Multiple gas tank solution
✓ Compatible to various outdoor enclosures
Easy operation & User friendly design

- ES Operating Handle Insertion Point
- LBS Operating Handle Insertion Point
- SF6 Pressure Gauge
- Lower front cover opening knob
- LBS/ES Mimic Indication
- Voltage Indication
- VCB Spring charging Point
- VCB ON/OFF Push Button
- VCB Mimic Indication
- Spring charge/discharge Indication
- Fuse Tripping Indication
Extremely safe

- Necessary Interlocks & protection against mal operation (as per latest IEC standards)
- Padlocking for all operations can be optionally provided
- Pressure release to rear or to bottom available
- Complete RMU panel is internal arc tested for 20kA / 1s as per latest IEC 62271-200
- Leak-proof gas tank enclosing all live primary parts of RMU ensuring a leakage rate of <0.02% per year
SF6 Gas Tanks

- Fully sealed SF6 gas tank
- Adoption of laser welding technology
- No small animals
- No entry to any foreign particles
- All live parts inside single tank
- Protection from salty atmospheres
- Protection from dusty and polluted environment
- Independent from humidity
- IP67 protection enabled
  - 6 → fully dust tight
  - 7 → temporary immersion
Patented Technology! – Designed and made in Germany

Fuse Holder (patented)

- Three phases in one body
- Extremely compact and exchangable
- Placement in any panel possible

Circuit Breaker (patented)

- Three poles in one body
- HV parts completely solid insulated
- Extremely compact and reliable
Process Technologies

- Laser Cutting and Punching
- Laser Welding
- Fully automatized helium leakage detection & SF6 gas filling system
- Fully automatized & digitally controlled epoxy resin mixing, hardening & filling
- Advanced silicon rubber vacuum pressure gelation
- Advanced test facilities
Product Accessories

Busbar End Plug (Optional)
Used for plugging extensible busbars for future extension

Busbar Plug (Optional)
Used for plug-in connections between two extensible RMU

Operating Handle
Used for manual operations of switches/breakers

Cable Connectors (Optional)
Separable Plug-in cable termination system
Why solid insulation?

The main advantages to use solid insulation are the following:

- Reduced dimensions (7,2 up to 40,5kV - 630 up to 2500A - 25/31,5kA)
  - Single bus bar: W=400mm, H=2000mm e D=1250mm
  - Double bus bar: W=400mm, H=2300mm e D=2050mm
- Same dimension independent of electrical characteristic;
- Not necessarily SF6 gas to insulate the live parts;
- Maintenance Free;
- High mechanical strength during a short-circuit;
- Long expected live;
- High protection degree;
- Secure operation;
- Has independent earthed compartments;
- Allows to use metallic partition between phases and compartments;
- Single phase metal-clad solid insulated switchgear.
- Ecologically correct
## Electrical Characteristics

<table>
<thead>
<tr>
<th>Standards</th>
<th>IEC (GB)</th>
<th>IEC (GB)</th>
<th>ANSI</th>
<th>IEC</th>
<th>IEC</th>
<th>ANSI</th>
<th>GB/CNS</th>
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<tbody>
<tr>
<td>Rated Voltage</td>
<td>kV</td>
<td>7,2</td>
<td>12</td>
<td>13,8</td>
<td>17,5</td>
<td>24</td>
<td>38</td>
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<tr>
<td>Power frequency withstand voltage</td>
<td>kV</td>
<td>20 (42)</td>
<td>28 (42)</td>
<td>38</td>
<td>38/50</td>
<td>50</td>
<td>80</td>
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<tr>
<td>Lightning Impulse withstand voltage</td>
<td>kV</td>
<td>60 (75)</td>
<td>75</td>
<td>95/110</td>
<td>95/110</td>
<td>125</td>
<td>150</td>
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<tr>
<td>Rated frequency</td>
<td>Hz</td>
<td>50</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
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<tr>
<td>Rated current</td>
<td>A</td>
<td>630-2500</td>
<td>630-2500</td>
<td>630-2500</td>
<td>630-2500</td>
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<tr>
<td>Rated short-time withstand current (IEC 3s, GB 4s)</td>
<td>kA</td>
<td>25/31,5</td>
<td>25/31,5</td>
<td>25/31,5</td>
<td>25/31,5</td>
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<td>25</td>
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<tr>
<td>Rated Peak value of short-time withstand current</td>
<td>kA</td>
<td>65/80</td>
<td>65/80</td>
<td>65/80</td>
<td>65/80</td>
<td>65</td>
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<tr>
<td>Making capacities</td>
<td>kA</td>
<td>65/80</td>
<td>65/80</td>
<td>65/80</td>
<td>65/80</td>
<td>65</td>
<td>65</td>
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<tr>
<td>Internal arc fault (1s)</td>
<td>kA</td>
<td>31,5</td>
<td>31,5</td>
<td>31,5</td>
<td>31,5</td>
<td>25</td>
<td>25</td>
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<tr>
<td>Operation sequence</td>
<td></td>
<td>O - 0,3s - CO - 180s - CO</td>
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<td></td>
<td></td>
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<tr>
<td>Breaking Time</td>
<td>ms</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
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<tr>
<td>Making Time</td>
<td>ms</td>
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<td>Ambient temperature</td>
<td>ºC</td>
<td>-25 ºC a +40 ºC</td>
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<td>Accessibility</td>
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<td>BFL</td>
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<td>Partition class</td>
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<td>PM</td>
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<td>Loss of service continuity category</td>
<td></td>
<td>LSC2A</td>
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</table>
With standard metal clad switchgear, the cables, VCB, busbars and secondary compartments had been separated from each other. Switchcraft takes this a step further; all components are metal clad, for each single phase, around their solid insulation. The iSIS is a true building block system, with all components fully insulated and encapsulated. This includes the current and voltage transformers, which can be plugged from various positions. And this holds true not only for single busbar systems, but also for double busbar systems.
Constructive details

- Busbar connection
- Busbar system
- 3/5 position switch
- Earthing device
- Circuit breaker
- Current transformer
- Cable connection
Solid Insulation

The application of solid insulation materials frees the components from the needs of insulating gases. SF6, with its ideal electrical properties, unfortunately is also a strong hot-house gas, and as gas tight as modern switchgear may be, during handling and over lifetime diffusion, great parts of the gas still escape into the atmosphere. The iSIS does not need any insulating gases for insulation and the epoxy resin is protect by metal clad from ageing, dust, moisture and small animals.
Circuit Breaker

Most circuit breakers offered today claim to be vacuum circuit breakers. This is only half true; while they use a vacuum chamber for arc quenching, the connections to the drives are still air insulated, giving the VCB a weak point and making them big. We has changed all that. We apply vacuum chambers that also fully use the insulating capacities of vacuum, making the chambers much smaller and the VCB much safer. This innovation is fully Patented.
SWITCHCRAFT
iCB – Air insulated Circuit Breaker

✓ Circuit breaker 24kV 1250A 25kA
  ✓ CESI Type tested!

✓ Circuit breaker 12kV 1250A 25kA
  ✓ CESI Type tested!

✓ Circuit breaker 12kV 2500A 40kA
  ✓ CESI Type tested!

❖ More to come soon ...
The main advantages to use this VCB are the following:

- the Silicon coating is not more necessary
- to fused with silica (Epoxy Typ)
- closed insulated Rod compartment
- better dielectric insulation by using the plastic parts
- better assembling way
- after casted the Pole is ready to use

✓ made in Germany
## SWITCHCRAFT

### iCB – Air insulated Circuit Breaker

<table>
<thead>
<tr>
<th>Circuit breaker fixed version</th>
<th>Circuit breaker withdrawable version</th>
</tr>
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<tbody>
<tr>
<td>ICB-F 241225</td>
<td>ICB-F 121225</td>
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<td>ICB-W 241225</td>
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>ICB-F 241225</th>
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<th>ICB-F 122540</th>
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<tbody>
<tr>
<td>Rated Voltage</td>
<td>24 kV</td>
<td>12 kV</td>
<td>12 kV</td>
</tr>
<tr>
<td>Rated current</td>
<td>1250 A</td>
<td>630 A</td>
<td>2500/3150A</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50 Hz</td>
<td>50 Hz</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Lightning impulse withstand voltage phase-earth/open contacts</td>
<td>125 kV</td>
<td>95 kV</td>
<td>85 kV</td>
</tr>
<tr>
<td>Power frequency withstand voltage phase-earth/open contacts</td>
<td>50 kV</td>
<td>36 kV</td>
<td>48 kV</td>
</tr>
<tr>
<td>Rated short-time withstand current 3s</td>
<td>25 A</td>
<td>25 A</td>
<td>40 A</td>
</tr>
<tr>
<td>Rated short-circuit making current (peak)</td>
<td>63 kA</td>
<td>63 kA</td>
<td>80 kA</td>
</tr>
<tr>
<td>Rated short-circuit breaking current</td>
<td>25 kA</td>
<td>25 kA</td>
<td>40 kA</td>
</tr>
<tr>
<td>DC component (referred to time constant =45ms)</td>
<td>50 %</td>
<td>36 %</td>
<td>50 %</td>
</tr>
<tr>
<td>Transient recovery voltage (TRV)</td>
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<td></td>
<td></td>
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<tr>
<td>First-pole-to-clear-factor</td>
<td>1,5</td>
<td>1,5</td>
<td>1,5</td>
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<tr>
<td>Peak value (Uc)</td>
<td>45,3 kV</td>
<td>20,6 kV</td>
<td>20,6 kV</td>
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<tr>
<td>Rate of rise</td>
<td>1,05 kV/μs</td>
<td>0,34 kV/μs</td>
<td>0,34 kV/μs</td>
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<tr>
<td>Operation sequence</td>
<td>O-0,3s-CO-3min-CO</td>
<td>O-0,3s-CO-3min-CO</td>
<td>O-0,3s-CO-3min-CO</td>
</tr>
<tr>
<td>Out-of-phase breaking current (voltage factor 2.5)</td>
<td>6,25 kA</td>
<td>6,25 kA</td>
<td>10 kA</td>
</tr>
<tr>
<td>Line charging breaking current</td>
<td>10 A</td>
<td>10 A</td>
<td>10 A</td>
</tr>
<tr>
<td>Cable charging breaking current</td>
<td>31,5 A</td>
<td>25 A</td>
<td>25 A</td>
</tr>
<tr>
<td>Single capacitor bank breaking current</td>
<td>400 A</td>
<td>400 A</td>
<td>400 A</td>
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<tr>
<td>Back-to-back capacitor bank breaking current</td>
<td>400 A</td>
<td>400 A</td>
<td>400 A</td>
</tr>
<tr>
<td>Vacuum interrupter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Siemens</td>
<td>Siemens</td>
<td>Siemens</td>
</tr>
<tr>
<td>Typ</td>
<td>VSS24-0-25</td>
<td>VSS12-0-25</td>
<td>VSS12-0-40-A</td>
</tr>
<tr>
<td>Opening gap</td>
<td>12±1 mm</td>
<td>6±1 mm</td>
<td>8±1 mm</td>
</tr>
<tr>
<td>Maximum permissible wear</td>
<td>3 mm</td>
<td>3 mm</td>
<td>3 mm</td>
</tr>
<tr>
<td>Mechanical endurance class</td>
<td>M2</td>
<td>M2</td>
<td>M2</td>
</tr>
<tr>
<td>Electrical endurance class</td>
<td>E2</td>
<td>E2</td>
<td>E2</td>
</tr>
<tr>
<td>Circuit breaker class</td>
<td>C2, S2</td>
<td>C2, S1</td>
<td>C2, S1</td>
</tr>
<tr>
<td>Protection degree</td>
<td>4X</td>
<td>4X</td>
<td>4X</td>
</tr>
<tr>
<td>Total weight</td>
<td>kg</td>
<td>kg</td>
<td>kg</td>
</tr>
<tr>
<td>Dimension (WxDxH)</td>
<td>350x800x1380 mm</td>
<td>350x800x1380 mm</td>
<td>350x800x1380 mm</td>
</tr>
</tbody>
</table>
iCB and iAIR – Today’s and Future VCB poles made by Switchcraft in Dinslaken, GER

Vacuum circuit breaker

VCB

12kV 40kA 2500A
24kV 25kA 2500A
17,5kV 31,5kA 2500A
17,5kV 40kA 3150A
17,5kV 40kA 2500A
12kV 25kA 1250A
17,5kV 31,5kA 1250A
24kV 25kA 1250A
Description

12 / 24 kV slide-in type switchgear for wall- or free standing as well as duplex assembly.

Design

Metal clad, air insulated, factory assembled and type tested. Compartmentalization is made between the cubicles as well as between busbar-, circuit breaker and cable compartment sections. The switchgear with short-time current up to 31,5 and 40kA are assembled with plasma reduction devices.

Application range

Circuit-breaker switchgear can be used for distribution substations in grid-, industrial- and power supply plants and are applicable for the switching of transformers, motors, generators, capacitors and transmission lines.

Cubicle styles

Load-break switches, circuit breaker and vacuum contactors in slide-in type design, fuse switch disconnectors in fixed mounted design, measuring cubicles in fixed mounted or slide-in type design.
✓ to be continued ...

Thank You !