Vacuum Circuit Breaker

ISOVAC series

Vacuum Circuit Breakers

IV2000 Metal-enclosed Switchgear

energy alliance

LKE Medium Voltage Systems

BSI REGISTERED FM 73638

UKAS QUALITY MANAGEMENT 003

12/17.5kV ISOVAC M/S VCB

12/17.5kV ISOVAC VCB

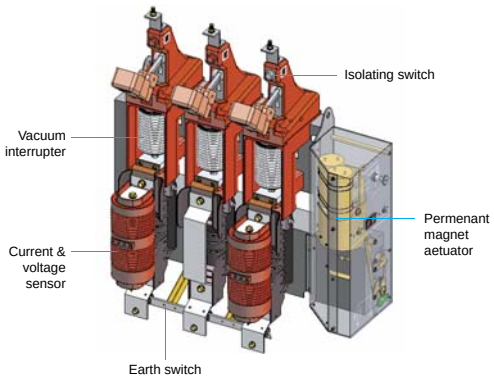
The **ISOVAC** (Integrated, Spatially Optimised Vacuum Circuit Breaker) is a fixed-type 12/17.5kV Vacuum Circuit Breaker designed to be mounted within LKE's **IV2000** Air-Insulated M.V switchboards.

The **ISOVAC** is a compactly designed product which integrates an isolating-switch module (Optional), a vacuum interrupter module, a current and voltage sensor module(Optional), an earth-switch module (Optional) and an interlocked operating mechanism module into one single system.

The **ISOVAC-M** is driven by a low energy single-coil permenant-magnet actuator system capable of more than 50,000 mechanical operations.

The **ISOVAC-S** is driven by conventional spring-charged mechanism capable of more than 20,000 mechanical operations.

As such, the final panel dimensions may be as compact as 520mm X 1700mm X 900mm (WXHXD) for 12kV systems and 550mm X 1900mm X 1200mm (WXHXD) for 17.5kV systems for a single IV2000 panel.



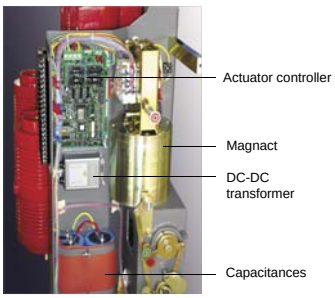
The main modules of the ISOVAC

ISOVAC-M32/12-1250

ISOVAC-S32/18-1250

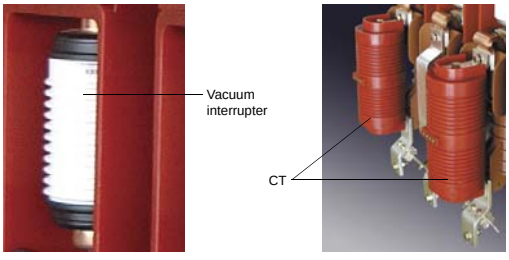
ISOVAC VCB type tested in compliance with the following standards:

- IEC 60056
- IEC 129



Ambient conditions

- Ambient temperature: -25 ^{o}C to +40 ^{o}C.
- Relative humidity: daily average of less than 95% and monthly average of less than 90%.
- Height above sea level of less than 1000 m.
- Earthquake intensity less than 8 degree.
- Environment: no frequent and violent vibrations.



IV2000 Metal-enclosed switchgear

The **IV2000** switchboard an air-insulated switchgear (AIS) system.

It is a modular system consisting of extensible panels,designed to incorporate the **ISOVAC-M** or **ISOVAC-S** circuit breaker.

The **IV2000** is a self-sufficient system which includes an optional internal auxilliary power supply module for powering the secondary/control system. This module is energised via internal potential transformers and it is used with the **ISOVAC-M** VCB. With the **ISOVAC-S** VCB, on the other hand, the system includes a microprocessor-based digital protection relay powered by energy from the current transformer and a low-energy solenoid as a tripping device.

Its compact dimension, independence from external power supply, and its safe and reliable design allows for a wide range of applications:

- Prefabricated outdoor substations and RMUs
- Industrial switchboard systems
- Urban and rural power distribution systems

Operating Conditions

- Ambient temperature: -20 ^{o}C to +40 ^{o}C
- Height above sea level of less than 1000m, for greater altitudes, refer to the next section.
- Relative humidity: Daily average of less than 95% and monthly average of less than 90% .
- Outdoor operations in enclosures only.
- Environment: no fire, explosive hazard, chemical corrosion and no frequent violent vibration.

The IV2000 was type-tested in compliance with the following standards:

- IEC 298

2XIV2000
(with ISOVAC within)

LKE-APS
Intend auxiliary power supply module

LKE-DPR
digital protection relay

Low voltage compartment

IV2000 Modular Swithgear (with ISOVAC within)

IV2000 Metal-enclosed switchgear

Frame

The design of the panel complies with IEC 298. The materials used are Al-Zn-coated or epoxy powder coated sheet steels, with a thickness of 2.5mm~3.0mm. The steel frame section is assembled into a strong unit with bolts. The low-voltage compartment, switch compartment, busbar compartment and cable compartment are totally enclosed by sheet steel.

Each module has its own independent over-pressure relief vents. A special clamping jig is used during assembly to ensure a high degree of precision. Each functional unit has its own separate door with lock and hinges on it (the distance between hinges doesn't exceed 400mm).

The frames present a robust appearance. The protection degree of the enclosure with closed door is IP4X.

Surface Treatment

The doors and end covers are epoxy powder coated to ensure a high degree of corrosion resistance.

Bus - bar compartment

The bus-bar compartment is located in the upper rear section of the panel. The busbar system consists of high-quality electrolytic copper which meets IEC694 standard. The material of the busbars conforms to IEC431.

The busbars (copper bars of upto 10x60mm) are mounted on each phase, and are capable of carrying a load current of 1250A. During short-circuit, the busbar system can withstand peak currents of upto 80kA, short-time currents of up to 31.5kA/4s. It is suitable for applications under severe conditions.

The busbars have round edges (R=2mm). Holes in the busbar are punched before leaving the factory. The joints are silver-plated. The bolts of the busbar are made of high tensile strength stainless steel. The system of mounting the busbars conforms to IEC298.

The earthing busbar is 30x5mm^2, which can carry a fault current of 25kA/2s. Holes on the earthing busbar are punched before leaving the factory.

Circuit breaker Compartment

The circuit breaker is located beneath the bus-bar compartment. This compartment also contains the isolating switch module, the earth switch module and the current transformer module. A door at the panel front allows access to the circuit breaker's drive mechanism but not access to live parts within the compartment.

Operating mechanisms and interlock

The operating mechanism with interlock mechanism is located at the front of the panel for ease of service.

Service compartment

About 40% of the space in the cubicle of IV2000 circuit breaker panel is taken up by the service compartment, within which cable connections are located.The surge/lighting arrestors, are also located within this compartment. The standard design includes an inspection window.

Low voltage compartment

The low voltage compartment is located at the upper front section of the panel. This houses the digital overload and fault protection relay with a communication interface.

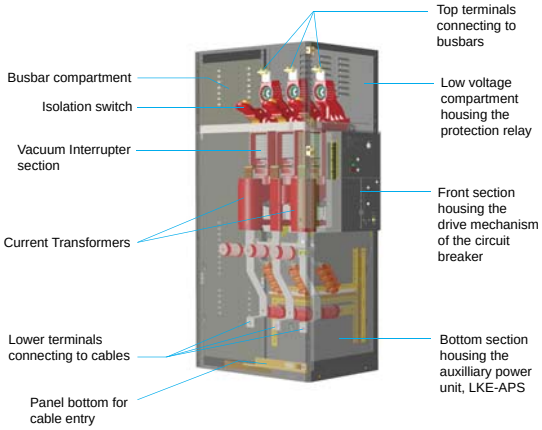
The protection relay also displays and records data as well as sends alarm from the sub-station to the main control center. It has a backup RS232 or RS485 serial interface for communication purposes.

The following indicating and control devices are provided on the front panel of the low-voltage compartment:

- Functional unit control switch
- Local/remote operation selection switch
- Test terminals of relay circuits used to check the protection relay.
- Signal indication: breaking or making, operation position and test position of the VCB, closed status of earthing switch.
- Voltage indicator. These indicators are connected with a capacitive layer in the cable compartment.
- Different types of measurement meters

Auxiliary wiring

Cross-section: current circuit >2.5mm^2 ;
voltage circuit >1.5mm^2
Insulation grade of the L.V. section : 2000V
Connection method: fixed at the block terminal
Enough terminals are prepared; 25% terminals and some connection strips are reserved.



Technical parameters

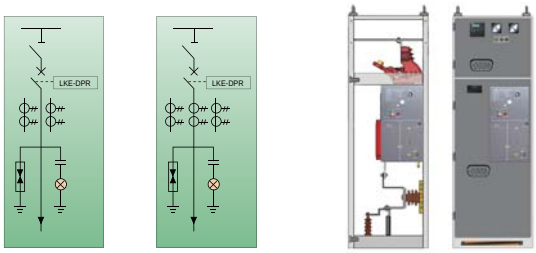
The ISOVAC-M has the following parameters:

Electrical Characteristics	Unit	M20/12	M25/12	M32/12	M20/18	M25/18	M32/18
Rated Voltage	kV	12	12	12	17.5	17.5	17.5
Rated current	A	630/1250	630/1250	630/1250	630/1250	630/1250	630/1250
Short-time(1min) power frequecy withstand voltage Between phases, from phase to earth, and vacuum interrupter	kV	42	42	42	48	48	48
Short-time(1min) power frequecy withstand voltage for Disconnector switch	kV	48	48	48	50	50	50
Lightning lmpulse test voltage	kV	85	85	85	95	95	95
Rated maximum short-circuit breaking capacity	kA	20	25	31.5	20	25	31.5
Rated number of operations at maximum breaking capacity	no.	50	30	30	50	30	30
Rated short-time current (kA / sec)	kA/s	20/4	25/4	31.5/4	20/4	25/4	31.5/4
Rated peak withstand current	kA	50	50	50	50	50	50
Rated single capacitor bank breaking current	A	630	630	630	630	630	630
Rated back-to-back capacitor bank breaking current	A	400	400	400	400	400	400

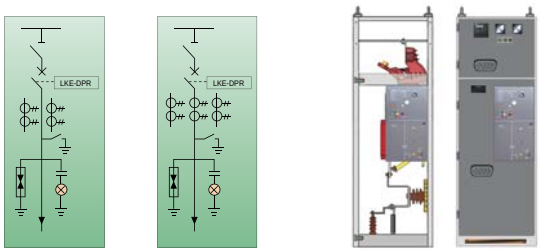
The ISOVAC-S has the following parameters:

Electrical Characteristics	Unit	S20/12	S25/12	S32/12	S20/18	S25/18	S32/18
Rated Voltage	kV	12	12	12	17.5	17.5	17.5
Rated current	A	630/1250	630/1250	630/1250	630/1250	630/1250	630/1250
Short-time(1min) power frequecy withstand voltage Between phases, from phase to earth, and vacuum interrupter	kV	42	42	42	48	48	48
Short-time(1min) power frequecy withstand voltage for Disconnector switch	kV	48	48	48	50	50	50
Lightning lmpulse test voltage	kV	85	85	85	95	95	95
Rated maximum short-circuit breaking capacity	kA	20	25	31.5	20	25	31.5
Rated number of operations at maximum breaking capacity	no.	50	30	30	50	30	30
Rated short-time current (kA / sec)	kA/s	20/4	25/4	31.5/4	20/4	25/4	31.5/4
Rated peak withstand current	kA	50	50	50	50	50	50
Rated single capacitor bank breaking current	A	630	630	630	630	630	630
Rated back-to-back capacitor bank breaking current	A	400	400	400	400	400	400

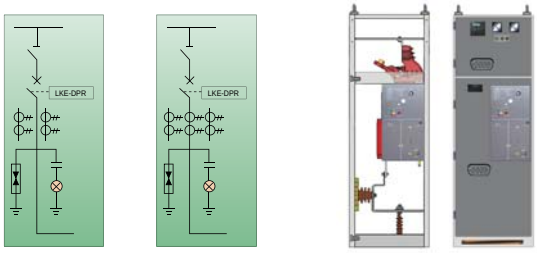
Layout of standard panels



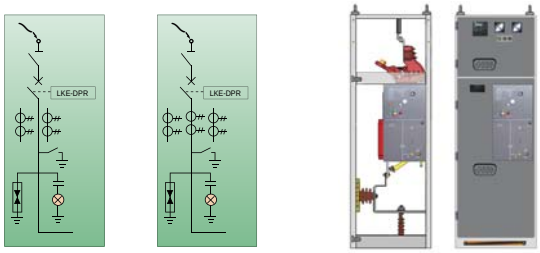
Circuit breaker panel IV2000-01			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X550X1200



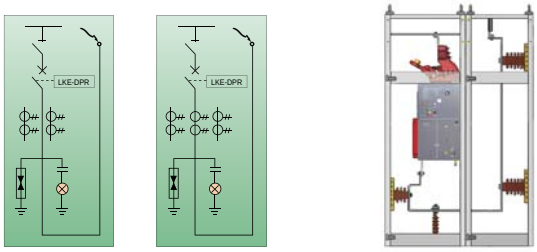
Circuit breaker + earthing switch panel IV2000-02			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X550X1200



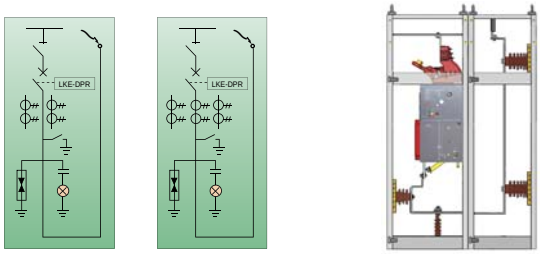
Connection / Section isolation with VCB IV2000-03			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X550X1200



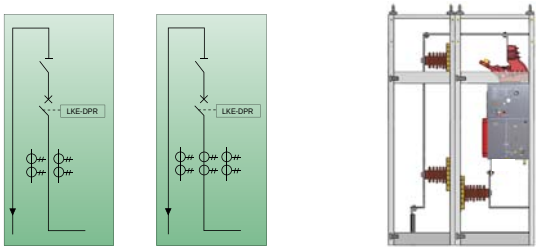
Circuit breaker panel with incoming from above IV2000-04			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X550X1200



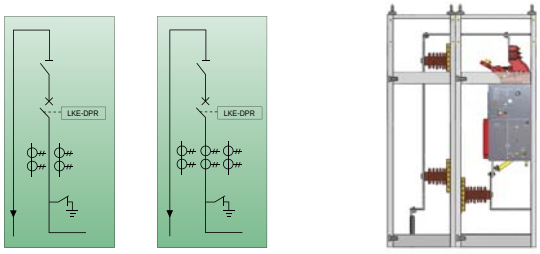
Circuit Breaker panel + upward feeder section IV2000-05			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X(550+400)X1200



Circuit breaker panel + earthing switch + upward feeder IV2000-06			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X(550+400)X1200



Riser section + Circuit breaker panel IV2000-07			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X(550+400)X1200



Riser section + Circuit breaker panel with earthing switch IV2000-08			
Rated Voltage (kV)	Rated Current (A)	Breaking Capacity (kA)	HXWXD (mm)
12	630~1250	20/25/31.5	1700X520X900
17.5	630~1250	20/25/31.5	1900X(550+400)X1200

Energy Alliance AG
Neuenbergstrasse 26
D-91301 Forchheim
Germany
Tel: +49 (0) 9191 67 04 24
Fax: +49 (0) 9191 67 04 25
E-mail: info@energy-alliance-ag.de
Web: www.energy-alliance-ag.de