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PRODUCT INFORMATION

KEY FEATURES

- Air insulated metal enclosed switchgear panel with metal partitions suitable for medium voltage power distribution
- Custom made product designed according to our customer's preferences
- Indoor installation
- Available with fixed or withdrawable switching devices
- Possibility of installation of electrical equipment from different manufacturers
- Arc proof and pressure resistant design
- Mechanical and electro-mechanical safety interlocks
- Earthing switch with full fault making capacity
- Loss of service continuity category – LSC 2B
- Partition class PM
- Suitable for both local and remote control
- Metal earthed shutters

CUSTOMER BENEFITS

- Logical interlocking system
- Easy installation
- Minimal maintenance, all parts easily accessible
- All operation performed with the door closed
- As an insulating media, air is absolutely neutral to the environment, always available and requires no special monitoring
- Smooth operation and maximum personnel safety
- Minimal space requirements

SCOPE OF APPLICATION

- Electrical power distribution
- Power generation substations
- Transformer substations
- Testing laboratories
- Industrial factories
- Co-generation power plants
- Oil and gas industry
- Large infrastructures (roads, tunnels, supermarkets, hospitals, railway stations)



TYPE TEST CERTIFICATES

MV AIS type BVK is type tested in accordance with the most recent IEC standards at the independent, internationally recognized and accredited laboratories.

Performed tests:

- Dielectric tests on main circuits
- Dielectric tests on auxiliary and control circuits
- Measurement of the resistance of circuits
- Temperature rise tests
- Short-time withstand and peak withstand current tests on the main circuits
- Short-time withstand and peak withstand current tests on the earthing circuits
- Making and breaking tests of the circuit breaker
- Basic short-circuit test duties
- Single-phase and double-earth fault tests of the circuit breaker
- Three-phase short-circuit making tests on the earthing switch
- Internal arcing tests
- Verification of the degree of protection
- Mechanical operation tests
- Partial discharge tests

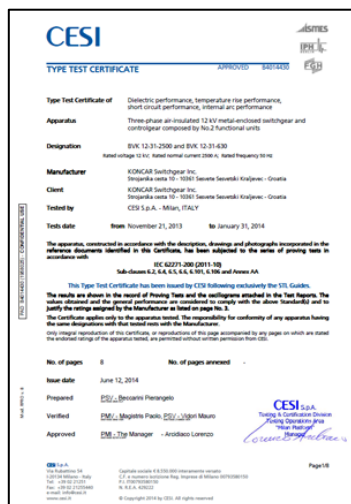


Figure 1. CESI Italy type test certificate

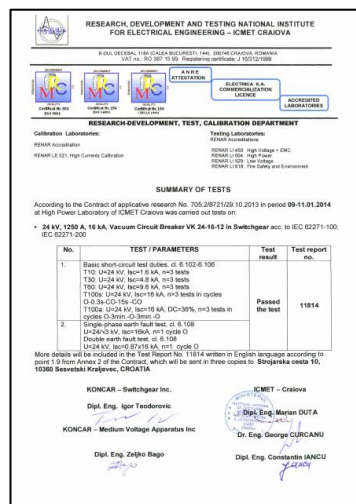


Figure 2. ICMET Romania test report



Figure 3. Končar Institute Croatia certificate on type test

BVK air insulated switchgear is manufactured complying the requirements of following standards

- ISO 9001:2015
- ISO 14001:2015
- ISO 45001:2018

Figure 5. ISO 14001 certificate

Figure 6. ISO 45001 certificate



According to our internal policy and IEC standard, switchgear panels can be shipped only after completion of the following routine tests:

- Dielectric test on the main circuit (IEC 62271-200 subclause 7.1)
- Tests on auxiliary and control circuits (IEC 62271-200 subclause 7.2)
- Measurement of the resistance of the main circuit (IEC 62271-200 subclause 7.3)
- Design and visual checks (IEC 62271-200 subclause 7.5)
- Mechanical operation tests (IEC 62271-200 subclause 7.102)

Routine tests are performed on every functional unit and a routine test report is issued. Routine tests can be witnessed by customer during FAT.

TECHNICAL DETAILS



Figure 7. MV switchgear type BVK12, BVK24 and BVK36

COMMON DATA

Manufacturer	Končar - Switchgear Ltd.
Model designation	BVK
Country of origin	Croatia
Installation	Indoor
Standard	IEC 62271-200
Quality	ISO 9001:2015
Number of phases	3
Busbar system	Single busbar system
Busbar insulation	Heat shrinkable insulation
Method of earthing	Earthing switch
Degree of protection enclosure	IP 41
Loss of service continuity category	LSC 2B
IAC classification*	AFLR
Max. ambient temperature	55 °C
Min. ambient temperature	5 °C
Standard painting colour**	RAL 7032

* Other IAC classifications available on request

**Other colours available on request

ELECTRICAL DATA

		BVK12	BVK24	BVK36
<i>Rated voltage</i>	kV	12	24	36
<i>Rated frequency</i>	Hz	50	50	50
<i>Rated power frequency withstand voltage</i>	kV / 1min	28	50	70
<i>Rated lightning impulse withstand voltage</i>	kV	75	125	170
<i>Rated short time withstand current</i>	kA / 3s	16	16	16
		25	25	25
		31,5	31,5	31,5
		40	40*	40*
<i>Rated peak withstand current</i>	kA	40	40	40
		63	63	63
		80	80	80
		100	100*	100*
<i>Rated current of main busbars</i>	A	630	630	630
		800	800	800
		1250	1250	1250
		1600	1600	1600
		2000	2000	2000
		2500	2500	2500
		3150	3150*	3150*
		3600*		
<i>Rated current of connection branches</i>	A	630	630	630
		800	800	800
		1250	1250	1250
		1600	1600	1600
		2000	2000	2000
		2500	2500	2500
		3150	3150*	3150*
<i>Internal arc withstand current**</i>		3600*		
		31,5kA / 1s	25kA / 1s	25kA / 0.5s

*Available on customer request

**Possibility of higher currents

APPLICABLE STANDARDS

Metal enclosed medium voltage switchgear BVK is entirely designed according to all relevant IEC standards.

Metal enclosed switchgear	IEC	62271-200
HV switchgear - Common specifications	IEC	62271-1
Circuit breakers	IEC	62271-100
Earthing switches	IEC	62271-102
Instrument transformers	IEC	61869-1
Current transformers	IEC	61869-2
Voltage transformers	IEC	61869-3
Degree of protection	IEC	60529



Figure 8. BVK12 with protection degree IP41

FUNCTIONAL UNIT

Panel parts are made of high-quality steel sheets, cut and folded on numerically controlled machines, RAL 7032 painted and protected against corrosion. Final parts are welded and bolted together to form a rigid robust enclosure with completely segregated compartments – busbar compartment, circuit breaker compartment, cable connection compartment, low voltage compartment and voltage transformer compartment (where applicable). Functional unit is designed for minimum effective space usage while providing maximum safety for the technical staff and environment (SF6 free).

DEGREE OF PROTECTION

Functional unit along with all its components complies the IEC 60529 standard. According to our customer's desires, different IP protection can be applied to switchgear panels. Standard values are given in the table below.

Enclosure*	IP 41
Between compartments	IP 3X
Circuit breaker (door closed)	IP 41
LV Compartment	IP 52
Shutters and spouts	IP 3X
Pressure relief flaps	IP 41
VT compartment	IP 41
* Other IP requirements available on request	

TYPICAL DIMENSIONS OF SWITCHGEAR UNITS

MODEL DESIGNATION		BVK 12		BVK 24		BVK 38	
Rated voltage	kV	12		24		38	
Rated power frequency withstand voltage (1min)	kV	28		50		70/80	
Rated lighting impulse withstand voltage	kV	75		125		170	
Rated feeder current	A	630 / 1250 / 2500 / 3150		630 / 1250 / 2500		630 / 1250 / 2500	
Rated short-time withstand current	kA	25 / 31,5 / 40		25 / 31,5		16 / 25 / 31,5	
Protection class		IP4X					
Dimensions	W	600 / 700 / 900 / 1000		800	1100	1200 / 1400 / 1500	
	D	1420		1680	1840	2300	2400
	H	2040		2040	2140	2290	2385

GENERAL NOTE: The presented table is informational only. Actual dimensions for specific projects will be provided during the detailed engineering stage.



Figure 9. Busbar compartment

BUSBAR COMPARTMENT

The busbar compartment is located in the upper rear part of the functional unit and consists of 3 phase horizontal busbars, supported with post insulators, connected through insulation bushings to upper circuit breaker connection terminals.

Busbars are extensible on both sides and have silvered contact surface to minimize the transient resistance. The number of parallel bars in each phase and its cross-section are determined by the value of rated current. Each bar is separately insulated with heat shrinkable insulation.

Busbar compartment is accessible either through the top of the panel or rear of the panel, depending on the design and type of the cubicle. Busbar joints are insulated with removable covers enabling the joint tightness inspection.

APPARATUS COMPARTMENT

Apparatus compartment houses one of the switching devices – circuit breaker, load break switch or disconnecter. For purpose of further description, CB will be considered as a switching device.

All operations are performed with the door closed.

CB is electro-mechanically interlocked with the earthing switch, preventing the earthing switch to be operated when the CB is not in test position. For more details about the interlocking see “Interlocking system” paragraph.

Metal shutters prevent access to live parts when CB is in test/disconnected or removed position. Shutters are earthed and automatically cover the fixed contacts inside the bushings when the CB is being racked to test position. Once the CB is removed from the functional unit, shutters can be moved and padlocked independently.

Low voltage wiring between CB and a fixed part of the panel is connected with 24/32/64 pin plug through a wiring duct on the side of the panel.

Inspection window is provided on the front door, which allows the CB position to be directly seen.

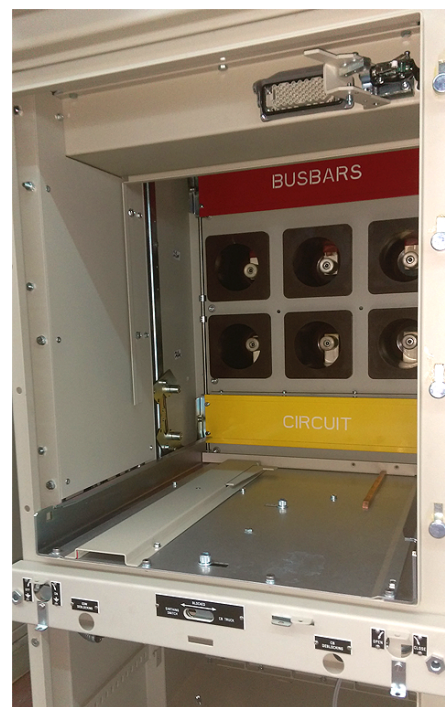


Figure 10. Apparatus compartment

CABLE CONNECTION COMPARTMENT

Cable compartment contains:

- Cable connection spots and points designed for connection of cables various size
- Earthing switch
- Current transformers
- Capacitive voltage dividers for voltage indication
- Earthing conductor
- Compartment heater regulated by humidistat



Figure 61. Cable connection compartment

Compartment is accessible from front (if there are no withdrawable VTs in the functional unit) and rear side. Cable termination height is set well above the floor level, which provides plenty of space for power cable termination and makes handling easier. This feature reduces the tension on the cable terminations.

VOLTAGE TRANSFORMER COMPARTMENT

Located on the front side bottom part of the panel, VT compartment houses 3 single phase voltage transformers.

VTs are protected with fuses on the primary side and connected to the live circuit through bushings, ensuring complete insulation from the cable compartment. Safety shutter is also provided.

Compartment is accessible from the front side. VTs are mounted on the withdrawable truck. Wedge platform is used for VTs withdrawal (see paragraph "Accessories").



Figure 7. VTs with primary fuses on a withdrawable truck

LOW VOLTAGE COMPARTMENT

The LV compartment is used for accommodation of secondary circuit equipment which provide functions of measurement, control, signalling, protection, monitoring and communication.

- Flush mounted protection relays, energy meters, test blocks, ammeters/voltmeters, control and selector switches, led indicating lamps, trip relays etc.
- Illumination lamp with door operated limit switch
- Front door imprinted mimic diagram
- Lockable door
- Inside accommodation of
 - Miniature circuit breakers
 - Terminal blocks
 - Humidistat
 - Wiring
 - Auxiliary relays
 - Shorting links (jumpers)
 - Metrosil and variable resistors
 - Ethernet switches etc.



Figure 83. Inside of the LV compartment



Figure 94. LV compartment door (IP 52)

INTERLOCKING SYSTEM

BVK switchgear provides mechanical and electro-mechanical interlocking system designed in full accordance with the latest IEC standard. According to our customer's requirements any other interlock can be provided aside the standard interlocks.

Standard interlocks:

- All operations can be performed only with the door closed.
- Circuit breaker cannot be racked or withdrawn unless it is in an open position.
- CB can be closed only when in service/test position. CB can be opened in any position.
- CB cannot be closed in service position unless the auxiliary circuit (LV connector) is connected. LV connector cannot be removed if the CB is closed in the service position.
- Earthing switch cannot be closed when the CB is not in test/disconnected/removed position and vice versa.

INSTALLED EQUIPMENT

CIRCUIT BREAKER

Developed in accordance with most recent generation of vacuum interrupters, with minimal dimensions and weight, circuit breaker is a heart of every switchgear panel. Its modern operational mechanism ensures smooth operation and long lasting lifetime. Hand and/or motor charged spring, stored energy mechanism with manual and electrical release makes CB operation safe, reliable and efficient. CB is fixed on a withdrawable truck and equipped with contacts arms.

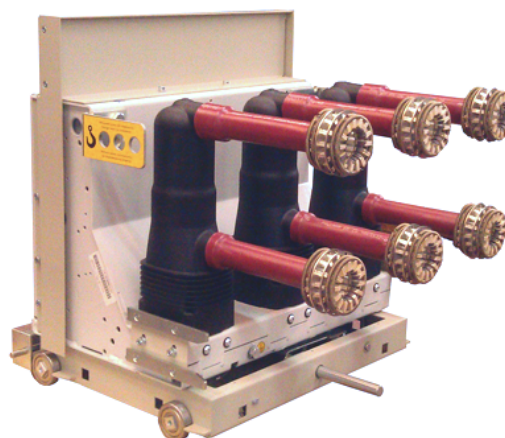


Figure 105. Vacuum circuit breaker

Various circuit breakers from different manufacturers can be fitted inside the BVK switchgear panel. This refers both to vacuum and SF6 circuit breakers. Circuit breakers are designed in accordance with the latest IEC 62271-100 standard and comply other standards as well.

<i>Rated voltage level</i>	kV	12	24	36
<i>Rated frequency</i>	Hz		50	
<i>Power frequency withstand voltage</i>	kV / 1min	28	50	70
<i>Lightning impulse withstand voltage</i>	kV	75	125	170
<i>Rated short time withstand current</i>	kA / 3s	16	16	16
		25	25	25
		31,5	31,5	31,5
		40		
<i>Rated peak withstand current</i>	kA	40	40	40
		63	63	63
		80	80	80
		100		
<i>Rated current</i>	A	630	630	630
		800	800	800
		1250	1250	1250
		1600	1600	1600
		2000	2000	2000
		2500	2500	2500
		3150	3150	3150
		3600		
<i>Endurance class</i>			E2	
			M2	
			C2	
<i>Opening time</i>	ms		< 60	
<i>Closing time</i>	ms		< 80	
<i>Arcing time</i>	ms		< 15	
<i>Break time</i>	ms		< 75	
<i>Operation sequence</i>		O - 0.3s - CO - 15s - CO		
		O - 0.3s - CO - 3min - CO		

INSTRUMENT TRANSFORMERS

Instrument transformers are manufactured in compliance with IEC, VDE, ANSI, BS and other standards.

CURRENT TRANSFORMERS (up to 36kV)

- Epoxy resin compound cast in high vacuum, with superior dielectric and mechanical properties
- Cores made of quality cold-rolled grain-oriented magnetic steel sheets or a high-quality soft magnetic material (mumetal), depending on the required accuracy class
- Designed in accordance with IEC 60044-1



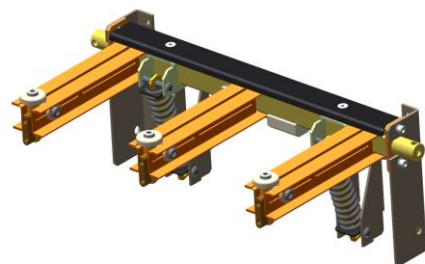
VOLTAGE TRANSFORMERS (up to 36kV)

- Epoxy resin cast
- Opened delta winding with dumping resistor for ferro-resonance
- Designed in accordance with IEC 60044-2
- Low and high voltage windings designed as multilayer windings
- Thermally treated cores

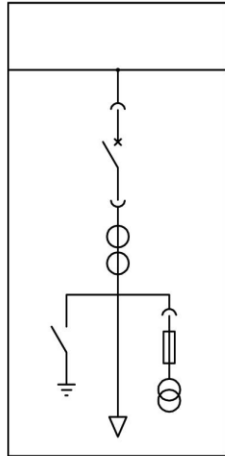


EARTHING SWITCH

- 3 phase earthing switch up to 36kV, designed in compliance with IEC 62271-102
- Operated from the front of the panel behind closed doors
- Full fault making capability during closing operation
- Spring operated

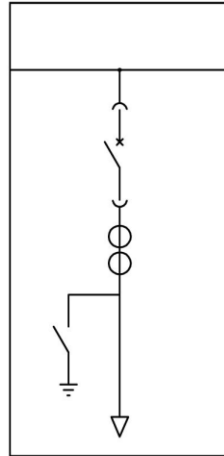


PRODUCT RANGE



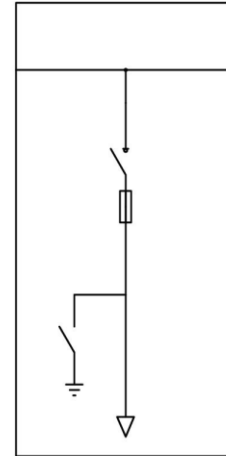
INCOMING TRANSFORMER FEEDER

- Withdrawable circuit breaker rated up to busbar current
- Current transformers
- Full fault making earthing switch
- Withdrawable voltage transformers with primary fuses
- Capacitive voltage dividers



OUTGOING CABLE FEEDER

- Withdrawable circuit breaker rated up to busbar current
- Current transformers
- Full fault making earthing switch
- Capacitive voltage dividers

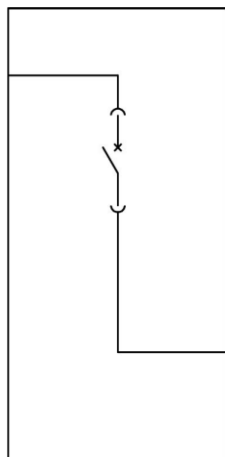


FEEDER WITH SWITCH-FUSE COMBINATION

- Switch-fuse combination
- Full fault making earthing switch

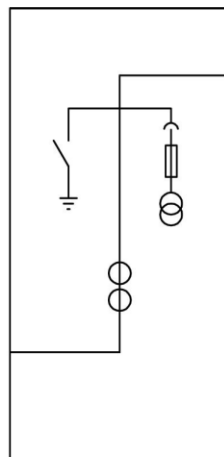
OPTION:

- Withdrawable switch-fuse combination



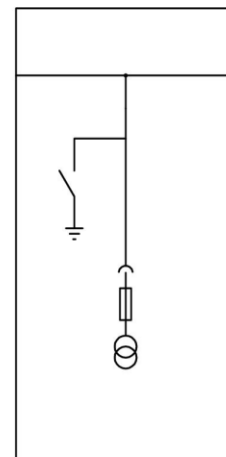
BUS COUPLER

- Withdrawable circuit breaker rated up to busbar current
- OPTION:
- Current transformers
 - Full fault making earthing switch
 - Capacitive voltage dividers



BUS RISER

- Withdrawable voltage transformers with primary fuses
- Current transformers
- Full fault making earthing switch
- Capacitive voltage dividers



VT PANEL

- Withdrawable voltage transformers with primary fuses
- Full fault making earthing switch
- Capacitive voltage dividers

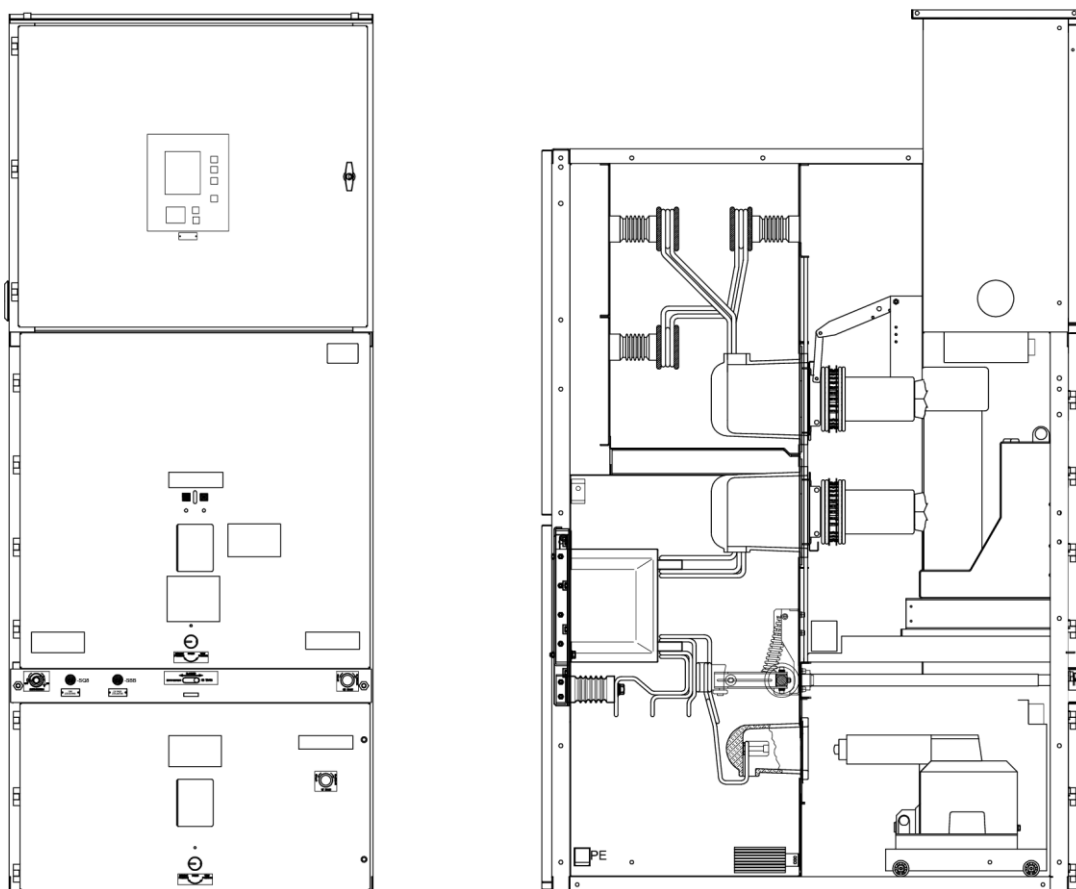


Figure 11. Typical panel cross-section (Incoming transformer feeder 12kV, 3150A, 31.5kA/3s)

ACCESSORIES

Tool cabinet

Includes all other necessary tools for operation and handling of the switchgear



Service truck

For insertion and extraction of the circuit breaker



Measuring group service platform

For insertion and extraction of the VTs



Primary test probes

For primary current and voltage testing



Two step ladders

Suitable for working on LV compartment



Note: Service truck, measuring group platform and operational toolbox are standard accessories (delivered with each substation) while the rest are to be ordered separately.

REFERENCES

Since the foundation of the company, Končar – Switchgear Inc. has delivered many of its products worldwide, including countries:

- | | | |
|--------------------------|--------------|------------------------|
| ▪ Albania | ▪ Germany | ▪ Netherlands |
| ▪ Algeria | ▪ Greece | ▪ Philippines |
| ▪ Armenia | ▪ India | ▪ Russia |
| ▪ Bosnia and Herzegovina | ▪ Iran | ▪ Saudi Arabia |
| ▪ Brazil | ▪ Iraq | ▪ Serbia |
| ▪ Canada | ▪ Jordan | ▪ Slovenia |
| ▪ Costa Rica | ▪ Kenya | ▪ Thailand |
| ▪ Egypt | ▪ Montenegro | ▪ United Arab Emirates |





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