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EZB AC-II 25 kV CUBICLE SWITCHGEAR

Elektrizace železnic
Praha a. s.



EZB AC-II 25 kV Cubicle Switchgear

Metal enclosed air insulated HV cubicle switchgear for indoor climate is produced and supplied by Elektrizace železnic Praha a.s. This switchgear is designed for electric traction system – 1 PEN 50 Hz 25 kV/ TN-C, and is designed to be installed in traction transformer and switching substations. Modular design of the EZB AC-II 25 kV allows to compose a switchgear of standardized functional units so that operator's requirements for a single-line diagram of a traction transformer substations and switching substations can be

fulfilled to the maximum degree. Any and all functional units have the same dimensions (width × depth × height): 1 000 mm × 1 850 mm × 2 250 mm, excluding the S functional unit having following dimensions: 900 mm × 1 850 mm × 2 250 mm, and Tor CV functional unit with 1 200 mm × 1 850 mm × 2 250 mm. Functional units consist of compartments, which vary depending on the equipment installed in them. By default, following types of functional units are produced and supplied:

Name of Functional Unit	Mark	Weight
Incoming feeder with circuit breaker	PV	450/280 kg
Outgoing feeder with circuit breaker	NV	450/280 kg
Outgoing feeder for power control unit of the decompensation branch of the filtering-compensating device with circuit breaker	FV	450/280 kg
Outgoing feeder for power control unit of the decompensation branch of the filtering-compensating device with circuit breaker	DV	450/280 kg
Functional unit for disconnection of auxiliary's transformer (in traction substation)	RV	400/150 kg
Functional unit for disconnection of auxiliary's transformer (in switching substation)	R	400 kg
Connective of main bus-bar with disconnecter (functional unit without circuit breaker with disconnecter)	S	300 kg
Functional unit with auxiliary's transformer	T	800 kg
Functional unit of filtering- compensating device with decompensation branch	CV	300/650 kg
Functional unit connecting main bus-bar and output	K, W	325 kg

The functional units with a vacuum circuit breaker (PV, NV, FV, DV, RV and R) consists of following compartments: motor-driven withdrawable part (chariot) with vacuum circuit breaker, cable compartment, compartment of the main bus-bar, and compartment with the control part. The functional unit without a circuit breaker but with a disconnecter (S, R) contains two compartments: compartment of the main bus-bar, and compartment with the control part. The T functional unit can be made in two designs, (1) it has only one compartment for -auxiliary transformer on the undercarriage, or (2) it has two compartments, where the second compartment is the compartment of the main bus-bar, which passes through the entire-switchgear including the T functional unit. The CV functional unit consists of the withdrawable part (converter block), and cable compartment. The compartment for the control circuits can be designed as a separate LV cabinet, or can be integrated into the compartment of the control part beside the standing functional unit. The converter block is a power control unit of the decompensation branch of the filtering-compensating device, which ensures the conversion of alternating current having industrial power-frequency to alternating current having a controlled level of frequency to compensate the PF of the entire traction transformer substation. Contains power circuits including circuits to convert electrical signals to optical signals and to distribute them. K, W functional units consist of one compartment, which includes connecting bus-bar with option of installation instrument voltage and current transformers or hand-drive disconnecter.

The incoming-feeder (PV) includes a vacuum circuit-breaker, which main function is (in connection with its respective protection) to protect the switchgear main bus-bar and equipment being connected to this bus-bar. In the outgoing-feeder (NV), the vacuum-circuit breaker is installed as an element protecting the supplied section of the overhead contact line. A similar function of equipment protection is specified for the circuit breaker being installed in the functional unit of the decompensation branch of the filtering-compensation device (DV). This circuit breaker will open the circuit, when preset values of individual protections (distance

protection, over-current protection, short-circuit protection, and balance protection, or under-voltage protection and voltage protection, etc.) are exceeded, or in case of loss of control voltage for this circuit breaker. Disconnection of circuit breakers will occur also, if any door of any functional unit would be opened in operating condition. The motor-driven disconnecter is installed only in connective functional units (S). In the NV, PV, FV, DV functional units, there are hand drive earthing switches. Motor- driven circuit breakers and disconnectors are, in terms of their structural design, equipped with mechanical systems enabling emergency operation using a hand crank, in case loss of control voltage or drive failure.

The switchgear is to be installed in the object so that its side covers are to be in a distance of 100 mm or more from the wall. A minimum headroom over the switchgear is to be 600 mm, in terms of maintenance, a headroom of 1 250 mm is recommended. The top cover contains pressure valves. Prior to the installation of the switchgear, it is required to ensure construction readiness in the form of a frame embedded in the floor structure, and preparation of cable bushings and ducts according to drawings submitted.

The basic protection against electric shock is secured in compliance with HD 60364-4-41 and EN 61140 ed.2, for HV equipment by means of insulation, positioning, enclosures, and/or it can be secured using supplementary insulation, and for LV equipment by means of insulation and enclosures. Fault protection is secured in compliance with HD 60364-4-41 and EN 61140 ed.2, for HV equipment by means of protective earthing with extra-short tripping times, and by means of equation to the same potential, and for LV equipment by means of automatic disconnection of supply, and protective-equipotential bonding. The switchgear earthing protection line is equipped with openings in end functional units enabling connection to the earthing system of the traction transformer substation or traction switching substation.

Design, production, type and routine tests of switchgear are performed in compliance with requirements of EN 62271-

200. In addition, within the frame of design and production, requirements of following standards were especially reflected: EN 50124-1, EN 50124-2, EN 60529, EN 61140 ed.2 and HD 60364-4-41. Innovations of this type of switchgear brought a new concept of incoming-feeder and supply functional units, where the vacuum circuit breaker is fixed in motor- driven withdrawable chariot. This innovative design allowed to remove the disconnecter in the incoming-feeder and outgoing-feeder functional units, enhanced the safety at work and simplified the maintenance of the entire switchgear. The distributed control system of individual functional units is provided by

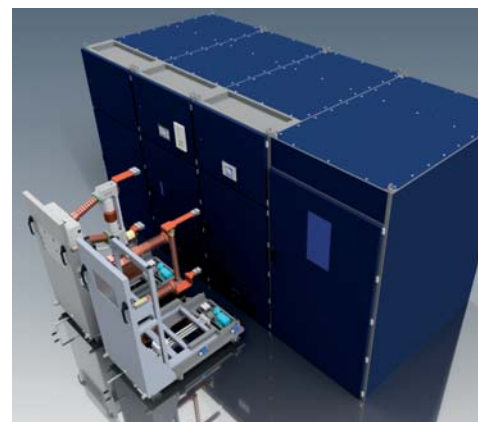
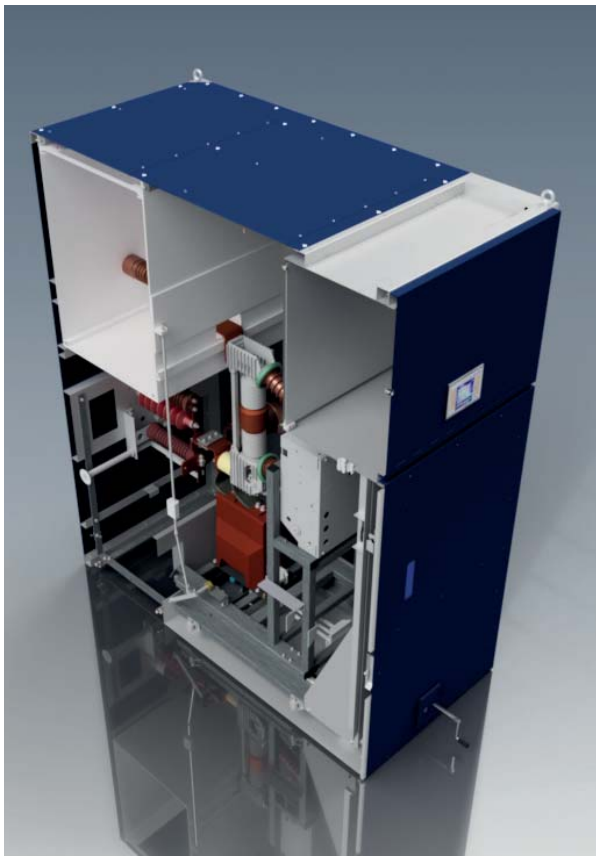
programmable logic controllers (PLC) in combination with touch panel, and in connection with digital protection installed in the functional units. This system, in its standard mode, secures the local control and visualization (displaying measured variables and status of instruments) using a touch panel, and data transmission (communication with a master PLC) for possibility to control the entire facility remotely and centrally as well. Parameterization of protection, PLC and touch panel programming is provided by our employees after installing the switchgear on-site.

Functional Units Characteristics

Func. unit	Description of HV Equipment	Description of LV Equipment
PV	Main bus-bar, withdrawable vacuum circuit breaker placed on chariot with motor drive operation, instrument current transformer, hand-drive earthing switch, surge arrester.	Overcurrent and short-circuit protection, return supply and under voltage relay, touch panel, PLC and auxiliary relay, circuit protection, terminal block.
NV	Main bus-bar, withdrawable vacuum circuit breaker placed on chariot with motor drive operation, instrument current and voltage transformers, hand-drive earthing switch, surge arrester.	Distance protection, reclose switching function, touch panel, PLC, and accessories.
FV	Main bus-bar, withdrawable vacuum circuit breaker placed on chariot with motor drive operation, instrument current and voltage transformers, hand-drive earthing switch, surge arrester.	Touch panel, PLC, and accessories.
DV	Main bus-bar, withdrawable vacuum circuit breaker placed on chariot with motor drive operation, instrument current and voltage transformers, hand-drive earthing switch, surge arrester.	Touch panel, PLC, and accessories
RV	Main bus-bar, power fuse.	Touch panel, PLC, and accessories.
R	Main bus-bar, power fuse, motor-drive disconnecter.	Touch panel, PLC, and accessories.
S	Main bus-bar, motor-drive disconnecter, voltage relay. Main bus-bar, motor-drive disconnecter, voltage relay.	Touch panel, PLC, and accessories.
T	Bus-bar or main bus-bar, auxiliary transformer.	---
CV	Converter block 25 kV to control decompensation branch of filtering- compensating device. Converter block 25 kV to control decompensation branch of filtering- compensating device.	Touch panel, PLC, and accessories.
K,W	Connecting main bus-bar and output, instrument current and voltage transformers, surge arrester or hand-drive earthing switch.	---

Switchgear Basic Electrical Parameters

Traction System	1 PEN 50 Hz 25 kV / TN-C
Nominal Voltage	25 000 V
Highest Permanent Voltage	27 500 V
Highest Non-permanent Voltage	29 000 V
Rated Impulse Voltage 1,2/50 μ s	180 000 V
1 min. power-frequency voltage	80 000 V
Nominal Frequency	50 Hz
Switchgear Nominal Current	1 250 A
Circuit breaker Nominal Current	1 250 A
Rated Short-time Withstand Current and Ground Fault Current	12 500 A
Rated peak withstand current (1 s)	38 000 A
Loss of service continuity category	LSC2A-P1
Internal arc classification	AFLR 12,5 kA / 0,5 s
Auxiliary power supply circuits Nominal Voltage	110 V DC nebo 230 V AC
Auxiliary control Circuits Nominal Voltage	110 V DC, 230 V AC a 24 V DC
Degree of protection provided by enclosure	IP 30/00



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