General Specification for Indoor Medium Voltage Air-insulated Switchgear

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1. General

1.1 Section includes

1.1.1 The Contractor shall supply the medium voltage switchgear as specified herein.
1.1.2 Switchgear application describes air-insulated metal-enclosed medium voltage switchgear.
1.1.3 Medium voltage switchgear is designed to equip high power indoor {Option :} [HV/MV], [MV/MV] switchboards.

1.2 Standards

Medium voltage switchgear shall be designed, manufactured, assembled and tested in accordance with the following standards:

1.2.1	IEC 62271-1	Common specifications for high-voltage switchgear
1.2.2	IEC 62271-200	AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
1.2.3	IEC 62271-100	High-voltage alternating-current circuit-breakers
1.2.4	IEC 62271-102	AC high-voltage disconnectors and earthing switches.
1.2.5	IEC 60470	High-voltage alternating current contactors
1.2.6	IEC 60265-1	Switches for rated voltages above 1 kV and less than 52 kV
1.2.7	IEC 60255	Measurement relay and protection unit
1.2.8	IEC 61850	Communication networks and systems in substations
1.2.9	IEC 60044-1	Current transformers
1.2.10	IEC 60044-8	Electronic current transformers
1.2.11	IEC 60044-2	Voltage transformers

1.3 Quality Assurance

1.3.1 Manufacturer: Company specializing in medium voltage metal-enclosed switchgear with at least 30 years documented experience.
1.3.2 Conformity assessment: Manufacturers of MV switchgear shall be able to manage a first party conformity assessment procedure, as defined by ISO 17000, and provide the associated deliverable “Declaration of Conformity”. The supplier shall ensure the validity of the declaration over the time.

2. Equipment

2.1 Medium Voltage Switchgear Assembly

2.1.1 The switchboards shall be modular and extensible at site. They shall comprise functional units as defined by IEC 62271-200: “part of metal-enclosed switchgear including all the main circuit and auxiliary circuit equipment that contributes to the performance of the same function”.
A functional unit will be, for example, a transformer incomer unit, a motor feeder unit, etc .
The factory-made functional units shall be bolted together at the place of use.
The functional unit power circuits shall be interconnected by a busbar rated to carry the maximum rated current that may flow through the switchboard.
The functional unit earthing circuits shall be interconnected by a main earth collector made of copper, the cross-section of which shall allow the flows of the rated short-circuit current.

2.1.2 Switchboard dimensions:
2.1.2.1 **{Option :} [the width of standard switchgear up to 12kV/25kA/1250A shall be no more than 650mm or 800mm for up to 17.5kV/31.5kA/1250A] [For all other ratings of standard switchgear, the panel width shall be no wider than 900mm]**
2.1.2.2 All standard cubicles of the switchboard shall have the same height and depth, which shall be no more than 2320mm and 1595mm (or 1780mm for internal arc).
2.1.3 The cubicle outer enclosure shall have a degree of protection of {option :} [IP3X] [IP4X] The partitions between compartments of the same cubicle shall have IP2X.
2.1.4 The cubicle shall be of LSC 2B (Loss of Service Continuity) and PI (Partition Class) classes as defined by IEC standard 62271-200. And it shall comprise three electrically independent compartments and one LV cabinet:
- Busbar compartment
- Circuit breaker compartment
- Cable compartment
- Low voltage cabinet

2.1.5 Cable and bar connections: Power connection in standard for “incomer” and “feeder” cubicles shall be {option :} [bottom-entry cable connection] [top-entry cable connection] [top-entry bars connection].
2.1.6 {Option :}Internal Arc Class (IAC)
2.1.6.1 The cubicles shall be internal arc classified by IEC 62271-200 of {option :}[25kA 0,5s], AFLR.
2.1.7 The plates used as the visible parts of the switchboard shall be painted light grey in colour (RAL 9002). All non-painted steel parts shall be zinc-plated or galvanized.

2.2 Ratings Gordon please check this table
2.2.1 Medium Voltage Switchgear shall have the following ratings:

MV switchgear Ratings		
rated voltage	kV	[7.2] [12] [15] [17.5]
rated insulation level	kV	[20/60] [28/75] [38(42)/95]
rated current of the busbar	A	[630] [1250] [2500]
rated current of CB (incoming, feeders…)	A	[630] [1250] [2500]
rated short-time withstand current and duration	kA/s	[25][31.5] / 3s
Internal arc withstand (AFLR)		[25kA 0,5s]

2.2.2 The cubicles shall not require forced ventilation when the rated current is equal to or less than 2500A.

2.3 Switching Devices
2.3.1 Functional units shall be available with following withdrawable devices:
- Withdrawable circuit breaker,
- Withdrawable earthing truck,

2.3.2 Racking in and racking out operations shall be carried out only with the door closed and, for a circuit breaker, when the circuit breaker operating auxiliaries are connected. It shall only be possible to open the door when the switchgear device is in the “racked out” position.
2.3.3 Circuit breaker:
2.3.3.1 The breaking medium of circuit breaker shall be vacuum.
2.3.3.2 The circuit breaker shall be designed so as to have class E2 (circuit breaker with extended electrical endurance) of electrical endurance, and class M2 (circuit breaker with extended mechanical endurance, mechanically type tested for 10 000 operations) of mechanical endurance, as defined by IEC 62271-100.
2.3.4 Cable earthing switch:
2.3.4.1 The earthing switch shall have full making capacity in accordance with IEC standard 62271-102.
2.3.4.2 It shall be mechanically interlocked with the main switching device. Solutions involving key-locking, padlocking or electrical locking won’t be authorised to perform this function.

2.3.4.3 A {option :} [key-locking] [padlocking] system shall allow the earthing switch to be locked in the {option :} [open] [closed] position.
2.3.4.4 The operation devices of earthing switch, as well as {option :} [electromagnetic locking] [key-locking] [padlocking] devices and voltage present indicators, shall be grouped in dedicated area.
2.3.5 Operation of switching devices
2.3.5.1 **Only one handle shall be used for all operations (racking in/racking out withdrawable devices, open/close earthing switch, racking in/racking out of VTs (if applicable)). This operation handle shall be "anti-reflex" type to ensure operators safety, and the storage of the handle shall be inside the switchboard and accessible without opening a door.**
2.3.5.2 The various operations of circuit breaker and earthing switch must be done in front of the switchboard. When the racking operations are completed, they shall be confirmed by means of a dedicated selector.
2.3.5.3 Operations of circuit breakers and earthing switches shall be described solely in the form of explicit symbols and colour codes. Instruction using texts will not be accepted. There shall be indicators to show the position of switching device truck racking and earthing switch and of VTs (if applicable).

2.4 Current and Voltage Sensors

2.4.1 Current sensors:
2.4.1.1 Phase-phase sensors {option :}
- [electronic current sensor (LPCT)]
- [conventional current transformer {option :} [with primary winding] [without primary winding]]
2.4.1.2 Zero sequence current sensors
- Zero sequence core balance current transformers (CSH type)
2.4.2 Voltage sensors:
2.4.2.1 The voltage sensors shall be installed at the bottom of functional units, in front of the cables.
2.4.2.2 The voltage sensors shall be {option :} [phase-earth] [phase-phase] type, {option :} [with fuse] [without fuse]. The fused VTs (if applicable) shall be withdrawable type.

2.5 Power Busbars and Earthing Circuit

2.5.1 Power busbars:
2.5.1.1 A copper busbar of flat formation type shall ensure the flow of power within the switchboard. The busbars shall be flat, parallel, and identical within each cubicle.
2.5.1.2 {Option:}[For cubicles below 17.5kV, the busbars shall be {option:} [bare] [insulated]]. [For 17.5 kV cubicles, the busbars shall be insulated by sleeving].
2.5.1.3 {Option:}[the busbars should be tinned in the event of a risk of corrosion.]
2.5.2 Earthing circuit:
2.5.2.1 There shall be earth conductors which are made of copper, and earthing circuit must have verified the rated short-circuit current withstand of the main circuit, in accordance with IEC 62271-200.
2.5.2.2 The earth conductors of all cubicles shall be connected to one another as well as connected to the main earth conductor. The main earth conductor shall be installed in the connection compartment.

2.6 Protection and Control System

2.6.1 The functional units shall be equipped with integrated digital protection and control units, which include the protection, automation, measurement, counting, monitoring, diagnosis, and communication functions.
2.6.2 {Option :}Protection system shall be able to assemble electronic current transformer
2.6.3 The switchboard shall integrate Web technologies, so that information about electrical installation can be found out by opening a Web page.