Low Voltage Metal Enclosed Drawout

Arc Resistant Switchgear

MNS-SG Guideform Specification

ABB

Specification Number: 2TDC490002 MNS-SG
Product Name: Low Voltage Metal Enclosed Drawout Switchgear

Section 26. 26 00.11
Low Voltage Metal-Enclosed Drawout Arc Resistant Switchgear (MNS-SG)

Part 1 GENERAL INFORMATION

1.01 SUMMARY

A This specification defines Type 2B arc resistant low voltage metal-enclosed switchgear assemblies utilizing ABB MNS-SG Low Voltage Metal-Enclosed Drawout Switchgear Assemblies constructed to ANSI C37.20.1 and ANSI C37.20.7 standards, UL 1558.

B Circuit breakers shall be draw-out type ABB Emax circuit breakers with ABB electronic trip units. Circuit breakers shall have interrupting ratings and withstand capabilities to meet system application. Circuit breakers shall be available in 800, 1200, 1600, 2000, 2500, 3200, 4000 and 5000 A frame sizes.

1.02 STANDARDS

A Switchgear shall be designed, manufactured and tested in accordance with the following:

1. ANSI C37.20.1 – Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear
2. ANSI C37.50 — Test Procedure for Low Voltage AC Power Circuit Breakers Used in Enclosures
3. ANSI C37.51 – Conformance Testing of Metal-Enclosed Low Voltage AC Power Circuit Breaker Switchgear Assemblies
4. UL 1558 – Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear
5. ANSI/IEEE C37.20.7 – Guide for Testing Metal-Enclosed Switchgear Rated up to 38kV for Internal Arcing Faults.

B Main and Feeder Circuit Breakers used in MaxSG shall be designed, manufactured and tested in accordance with the following:

1. ANSI C37.13 — Low Voltage AC Power Circuit Breakers Used in Enclosures
2. ANSI C37.16 — Preferred Ratings, Related Requirements, and Application for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors
3. ANSI C37.17 — Trip Devices for AC and General Purpose DC Low-Voltage Power Circuit Breakers
4. UL1066 – Low Voltage AC and DC Power Circuit Breakers Used in Enclosures

1.03 SUBMITTALS – FOR REVIEW AND APPROVAL

A The following information shall be submitted to the Engineer for review and approval:

1. Table of contents
2. Electrical bill of material
3. General arrangement drawings
4. Single line diagram
5. Nameplate information
6. Schematic diagrams and breaker control schematic diagrams.

1.04 SUBMITTALS – FOR CONSTRUCTION

A The following information shall be submitted for record purposes:

1. Final As-built drawings and information as described and listed in Section 1.03 incorporating
2. Complete point-to-point wiring drawings.
3. Certified Test Reports
4. Installation Information

1.05 QUALIFICATIONS

A The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B The manufacturer of this equipment shall be ISO 9001 or 9002 certified.

C The manufacturer shall provide Seismic certified equipment that complies with the following standards: IBC-2009, ASCE7-10

1.06 DELIVERY, STORAGE, AND HANDLING

A Equipment shall be properly packed for delivery, handled at site, and stored in accordance with the manufacturer's instructions. A set of these instructions will be included with the equipment at time of shipment.

1.07 OPERATION AND MAINTENANCE MANUAL

A Equipment operation and maintenance manuals shall be provided with each switchgear line up and shall include the following:

1. UL Authorization Page
2. General Information (Recommendations, Manual, and LV Switchgear Features)
3. Project Specs
4. As-Builts Drawings (electrical bill of material, general arrangement drawings, single line diagram, nameplate schematic diagrams, breaker control schematic diagrams, and interconnections and wiring diagrams)
5. Electrical Bill of Material
6. Test Reports
7. Measurement Equipment Calibrations
8. Low Voltage Switchgear Install and Maintenance Manual
9. Cut Sheets and Catalogs from each of the components used in the switchgear project

Part 2 PRODUCTS

2.01 MANUFACTURER

A Metal-Enclosed free-standing enclosure containing Low Voltage Power Circuit Breaker shall be ABB MNS-SG using Emax type Low Voltage Power Circuit Breakers.

2.02 RATINGS

A The System shall be rated for a maximum voltage rating of 480 Vac.

B The bus system ampacity of the Low Voltage Switchgear shall have the following ratings:

1. 2000A
2. 3200A
3. 4000A
4. 5000A

C The system shall be designed for use on 60 Hz electrical systems up to 480 Vac.

D The systems shall be able to be used in 3-Phase 3-Wire systems or 3-Phase 4-Wire electrical systems.

E The switchgear assembly shall be rated to withstand mechanical forces to extend during short-circuit conditions when connected to a direct power source having an available fault up to 85kA at 480V.

F The short circuit current rating of the system shall be determined by the available fault current at the Low Voltage Switchgear. All interrupting ratings shall be accomplished without the use of limiter fuses.

G The switchgear bus brace rating shall be 65ka or 100kA.

H All circuit breakers shall have a minimum short circuit interrupting capacity of:

1. [42 kA, 65 kA, 85 kA, and 100 kA]

I The switchgear assembly shall be certified by Underwriters Laboratories to be Arc Resistant Type 2B in accordance with testing guide ANSI/IEEE C.37.20.7. The minimum arcing duration used for testing shall be 500ms.

2.03 STRUCTURE

A General

1. The switchgear assembly shall consist of one or more enclosed vertical sections in an NEMA 1 indoor enclosure. The ends shall be designed to allow installation of future sections. Each vertical section shall contain up to four high individually enclosed Emax power breakers with uniformed height or instrument compartment and a full-height rear compartment housing the buses and outgoing cable connections.
2. The basic structure shall provide a rigid platform based on a C-channel design. The structure shall be comprised of 12 and 14 gauge galvanized steel.
3. Floor plates running from front to rear of the switchgear base to be supplied with removable conduit cutout for power and control wiring.

4. Rear venting flaps are provided for added air flow under normal operating conditions but automatically close during and arc event to prevent pressure and gasses from escaping.
5. Internal venting system allows ionized gas to flow into bus compartment from any location within the cabinet and out the top of the switchgear through hinged flaps safely exhausting the pressure and gasses out the top of the switchgear.
6. Front doors are strengthened with three-point door latches.
7. Optional Rear doors shall be provided with three point latch mechanism operated by a 180 degree handle.
8. Unobstructed switchgear floor-to-ceiling height is 3 m (10 ft) maximum.
9. The optional plenum channels exhaust pressure and gas to a designated safe area.
10. Four lifting eyes shall be provided on the roof of every shipping split.
11. The structure shall be listed and labeled under UL 1558.
12. The sides shall be covered with removable screwed on covers. The top shall be provided with roof flaps for pressure relief created by an internal arcing event. Ventilated covers over the breaker and bus compartment to ensure adequate ventilation within the enclosure shall automatically close in the event of pressure build up within the enclosure. The rear covers shall be fabricated of a (3) pieces and provided with lifting handles for ease of handling and installation. All covers shall be at a minimum 14 gauge steel.
13. Finish: Steel parts shall be prepared for painting by a four-stage wash system consisting of degreasing, fresh water rinse, zinc phosphate immersion, and fresh water rinse. Following the wash system, all steel parts shall be finished with a duplex finish system consisting of powder coat paint over hot dipped galvanized steel. The steel parts are coated with a minimum 2 mils dry film thickness of TGIC free polyester powder with electrostatic equipment. The finish of external steel parts shall be hammer tone texture. Internal painted metal parts shall have no texture. The steel parts shall be cured and baked properly. Paint finish color shall be ANSI # 61 light gray. Painted metal parts shall maintain the following minimum mechanical criteria:

Adhesion	ASTM D3359	100% (5B)
Hardness	ASTM D3363	H-3H
Abrasion	ASTM 4060-84	Minimum 3000 cycles to reach substrate
Impact	ASTM D2794	140-160 lb-in
Flexibility	ASTM D552	1/8"
Color	ASTM E308-05	DE <0.5
Corrosion	ASTM B-117	1500hrs, <1/8"
Humidity	ASTM D-2247	1500hrs, no blistering
Solvent Resistance	ASTM D5402-93	No loss of adheasion and bleaching

B Dimensions

1. Sections should be a minimum of 23.6” (600mm), 27.6” (700mm), 31.5” (800mm), or 39.4” (1000mm) wide, respectively, dependent on the circuit breaker frame size being installed.
2. Total switchgear depth shall not exceed 70.87” (1800mm).
3. Total switchgear height to top of chimney shall not exceed 96.06” (2440mm).
4. Total switchgear height with overhead lifting device shall not exceed 99.4” (2524mm).
5. Adequate cable space shall be provided to allow all conductors to exit the structure in the same direction.

C Handling

1. The line up shall be divided into shipping splits. The maximum shipping length shall not exceed 1800 mm (71 inches). Any lineup that is in excess of 1800mm (71 inches) shall be divided into shipping splits accordingly.
2. Switchgear shall be provided with adequate lifting eyes.
3. A removable shipping base (pallet) shall be provided with every shipping split.
4. Switchgear shall be capable of being rolled or moved into the installation location.
5. Switchgear shall have the capability to be bolted directly to the floor.

2.04 CIRCUIT BREAKER COMPARTMENT

A Circuit Breakers

1. Each circuit breaker shall be mounted in its own individual-barriered, grounded compartment.
2. Each compartment shall be complete with stationary circuit breaker contacts, mechanical interlocks, operating devices, and draw-out rails.
3. The circuit breaker draw-out system shall be such that it ensures accurate self-alignment of the circuit breaker primary and secondary disconnecting means.
4. Positive mechanical interlocks shall prevent racking the circuit breaker in or out unless the circuit breaker is in the open position.
5. Interlocks shall prevent the circuit breaker from being closed unless it is in the “connected” or “test” position.
6. The draw-out mechanism shall provide at least four distinct positions “connected”, “test”, “disconnected”, and “withdrawn”.
7. Complete operation of the circuit breaker and trip unit must be accessible without opening the circuit breaker door.
8. Padlocking provisions shall permit locking the circuit breaker in either the “test” or “disconnected” position.
9. Safety shutters shall be provided to cover the circuit breaker primary line and load disconnects.
10. Each circuit breaker compartment shall contain a rejection feature that allows only the insertion of an intended circuit breaker.

11. All circuit breakers of like size and ratings shall be completely interchangeable.
12. Future circuit breaker cubicles shall be totally complete including racking mechanisms, bussing and necessary secondary contacts so that insertion of a circuit breaker of correct frame size can be done without modification.

B Secondary Connections

1. All customer secondary control and communication connections shall be made from the front of the switchgear lineup.
2. Dedicated wiring areas shall allow easy access to all control or communication terminations.
3. All control wire wiring shall be type #14 gauge SIS wire. Current transformer wire shall be type #10 gauge SIS wire. All wire shall be secured to terminal blocks by ring-tongue type connectors. Control wiring for breakers shall be at a minimum type #22 gauge SIS wire.
4. Terminal blocks for interconnection shall allow ring-tongue type connectors.
5. Control wiring shall be capable of entering from the top or bottom of each section.
6. Interconnection of control wiring across shipping splits shall be done at terminal blocks located on top of the switchgear within the wire tray.
7. All secondary and communication wire shall be securely fastened to the switchgear without the use of adhesive backed wire anchors.

C Instrumentation / Devices

1. Barriered instrumentation compartments shall be provided for additional space when instrumentation such as: Power Transformers (PTs), Control Power Transformers (CPTs), Current Transformers (CTs), (Relays) metering, and etc. are required.
2. The switchgear shall include all protective devices and switchgear listed on drawings necessary for proper functionality and safe use of switchgear.

2.05 BUSSING AND CABLE COMPARTMENT

A Bussing

1. The horizontal bussing shall be rated to carry the full ampacity of the equipment.
2. The vertical distribution bus shall be rated up to 5000A.
3. All bussing shall be completely isolated from front compartments.
4. The bus material shall be fully plated [silver, tin] copper.
5. All bus joint connections shall be made with a minimum of two grade 5 bolts and secured by lock washers and washers to withstand mechanical forces exerted during short circuits.
6. Bus Bracing should be accomplished through polyamide reinforced glass insulators and be capable of withstanding the mechanical forces exerted during short circuits." The bus bracing shall be braced to withstand the instantaneous interrupting rating of the main breaker not to exceed 100ka.
7. Barriers should be provided to separate the bussing and cable compartments. The barriers shall be at a minimum 11 gauge galvanized steel glastic insulating material.

8. The bus arrangements shall be designed to allow for future additions at either end of the lineup when not used on close coupling connections to transformers.

B Cable Compartment

1. All incoming / outgoing power conductors shall be routed through a rear cable area.
2. Feeder circuit breakers shall have adequate wire bending space regardless of their ratings and orientations.
3. Metal Barriers should be provided to separate vertical sections of switchgear.

2.06 LOW VOLTAGE POWER CIRCUIT BREAKERS

A Circuit Breakers

1. The circuit breakers shall be individually mounted, draw-out, ABB Emax Low Voltage Power Circuit Breakers.
2. The circuit breakers shall meet the requirements of ANSI C37.13, 37.16, C37.17, C37.50 and shall be UL 1066 listed and labeled.
3. Circuit breakers shall be available with instantaneous short circuit ratings from 42 kA to 100 kA at 480Vac without the use of current limiting fuses.
4. Circuit breaker accessories shall be the same for all frame sizes
5. Circuit breaker accessories shall be able to be added / replaced in the field with the ability to maintain the UL listing.
6. All circuit breakers shall be pre-wired for quick and ready installation.
7. The mechanical life for all circuit breakers must be 8000 to 20,000 operations (depending on the size of the circuit breaker) with a frequency of 30 operations an hour without the need for maintenance of contacts or arcing chambers.
8. The electrical life for all circuit breakers must be between 3,000 to 10,000 operations (depending on the size of the circuit breaker) with a frequency of 30 operations an hour without the need for maintenance of contacts or arcing chambers.
9. The circuit breaker structure shall be made of sheet steel.
10. Padlock devices shall be provided in order to control opening/closing and racking in/out of the circuit breaker.
11. Optional Kirk Key interlocks to be provided as shown on the customer's single line diagram.
12. Circuit breaker main contacts should be separate from arcing contacts.
13. All manual control operators for the circuit breaker shall be accessible with the circuit breaker compartment door stationary and closed.
14. The circuit breakers must indicate the exact position of the main contacts, the circuit breaker position, and the status of the charging springs on the front of the circuit breaker with the door closed and stationary.
15. Circuit breakers must be equipped with an interlock to discharge the circuit breaker's stored energy spring before the circuit breaker can be withdrawn from its cell.

16. The entire line of circuit breakers must be equipped with interchangeable microprocessor based trip units.
17. Circuit breakers must include a manual spring charging handle that is completely operable with the circuit breaker compartment door closed. The handle shall be capable of performing complete charging of the circuit breaker.

B Trip Units

1. Circuit breaker trip system shall be ABB series electronic trip units.
2. The trip unit should consist of a solid-state trip actuator and current sensors. Rating plugs to be sized as needed to meet the drawings without the need to remove and change CTs.
3. The trip units shall incorporate “True RMS sensing”.
4. The trip unit should not require an external power supply for protection. Power should be supplied through CTs integral to the circuit breaker.
5. The trip unit protective functions shall not rely on or operate from internal batteries.
6. The minimum basic trip unit functions and settings should include:

    a. PR121 Series Trip Unit

        1). Overload Protection (L): Characteristic $t = k/I^2$ trip threshold settings ranging from I = (0.4 - 1) X In of the rated value and timing adjustable between 3 – 18 seconds.

        2). Short Time protection with adjustable delay (S): Characteristic t = k and $t = k/I^2$ trip threshold settings ranging from I = (1 - 10) X In of the rated value and timing adjustable between 0.05 – 0.4 seconds.

        3). Instantaneous Short Circuit Protection (I): Trip threshold I = (1, 5,….12) X In of rated CT value.

        4). Ground Fault Protection (G): Characteristic $t = k/I^2$ trip threshold settings ranging from I = (0.2 - 0.48) X In of the rated value and timing adjustable between 0.1 – 0.4 seconds.

        5). All protective functions except Overload (L) must be capable of being disabled while maintaining UL approval.

        6). Trip unit settings should be accomplished by means of dip switches on the front of the trip unit.

        7). The trip unit should include alarm LED signal for the “L” and “S” function.

    b. PR122 Series Trip Unit

        1). Overload Protection (L): Characteristic $t = k/I^2$ trip threshold settings ranging from I = (0.4 - 1)X In of the rated value and timing adjustable between 3 – 144 seconds.

        2). Short Time protection with adjustable delay (S): Characteristic t = k and $t = k/I^2$ trip threshold settings ranging from I = (0.6 - 10) X In of the rated value and timing adjustable between .05 – .4 seconds.

3). Instantaneous Short Circuit Protection (I): Trip threshold I = (1, 5,….15) X In of rated CT value.

4). Ground Fault Protection (G): Characteristic t = k and t = k/I^2 trip threshold settings ranging from I = (0.2 - .1) X In of the rated value and timing adjustable between 0.1 – 0.4 seconds.

5). All protective functions except Overload (L) must be capable of being disabled while maintaining UL approval.

6). The trip unit should include alarm LED signal for the “L” and “S” function.

7). Thermal memory must be present for “L” and “S” functions.

8). Protection against excessive temperature should be available.

9). The trip unit shall provide protection and indication for over temperature. The option to open the circuit breaker on over temperature shall also be available.

10). Protection against phase unbalance should be available.

11). The trip unit should be able to provide protection for 50% and 100% rated neutrals.

12). Zone selectivity function should be present for “S” and “G” functions.

13). Load protection and control should be present. It should be possible to monitor two loads or allow switching in/out of single loads to ensure minimal interruption of service.

14). The trip unit shall provide self-diagnosis for real time analysis of the microprocessor unit.

15). A trip unit test function should be available.

16). The trip unit shall allow programming and control by means of keys and an LCD.

17). Trip unit access and programming shall be capable of password protection.

18). Auxiliary power available LED shall be provided on the trip unit.

19). A permanent or temporary microprocessor fault LED shall be available on the trip unit.

20). A "Warning LED" signaling overload current at 0.83 of value, phase unbalance present, temperature threshold exceeded, contact wear greater than 80%, and harmonic distortion present shall be provided on the trip unit.

21). An "Emergency LED" signaling overload current greater than 100% of value, timing in progress for a protective trip, contact wear at 100%, CT disconnected, and shunt trip disconnected shall be provided on the trip unit.

22). Permanent indicators of L, S, I, G, and T (trip due to overheating) shall be present. Indicators must remain on for an indefinite time without the presence of an auxiliary supply or battery voltage present and be activated in case of reclosing on a fault. A local “RESET” button must be present to reset indicators.

23). The trip unit must possess the ability to meter and display phase, neutral and ground current with/without auxiliary power present.

24). The trip unit shall provide contacts for signaling of a protective trip and microprocessor fault. In addition, a user configurable contact shall be provided.

25). The trip unit should be capable of storing circuit breaker-opening data when an external power supply is available.

26). OPTIONAL – The trip unit shall be capable of supporting Modbus RTU standard communication protocol by means of EIA RS485-2- Wire Twisted Pair Bus topology at speeds up to 19,200bps. The communication will operate via an auxiliary 24V dc voltage supply.

27). OPTIONAL – The trip unit shall provide LED's for microprocessor fault due to communication and network activity due to communication.

c. PR123 Series Trip Unit

1). Overload Protection (L): Characteristic $t = k/I^2$ trip threshold settings ranging from I = (0.4 - 1)X In of the rated value and timing adjustable between 3 – 144 seconds.

2). Short Time protection with adjustable delay (S): Characteristic t = k and $t = k/I^2$ trip threshold settings ranging from Ic of the rated value and timing adjustable between 0.05 – 0.4 seconds.

3). Instantaneous Short Circuit Protection (I): Trip threshold I = (1, 5,….15) X In of rated CT value.

4). Ground Fault Protection (G): Characteristic t = k and $t = k/I^2$ trip threshold settings ranging from I = (0.2 - .1)X In of the rated value and timing adjustable between 0.1 – 0.4 seconds.

5). Directional short-circuit protection with adjustable delay (D): Characteristic t = k; trip threshold I = (0.6 - 10)X In with adjustable timing between 0.20 - 0.75 seconds.

6). Phase Unbalance Protection (U): Characteristic t = k; trip threshold 0.1 In <I <0.9 In with adjustable timing between 0.5 - 60 seconds.

7). Under Voltage Protection (UV): Characteristic t = k; trip threshold 0.6 Un <V <0.95 Un with adjustable timing between 0.1 - 5 seconds.

8). Over Voltage Protection (OV): Characteristic t = k; trip threshold 1.05 Un <V <1.2 Un with adjustable timing between 0.1-5 seconds.

9). Residual Voltage Protection (RV): Characteristic t = k; trip threshold 0.1 Un <V <0.4 Un with adjustable timing between 0.5-30 seconds.

10). Reverse Power Protection (RP): Characteristic t = k; trip threshold 0.3 Pn <P<-0.1 Pn with adjustable timing between 0.5-25 seconds.

11). All protective functions except Overload (L) must be capable of being disabled while maintaining UL approval.

12). The trip unit should provide a startup function allowing two sets of thresholds to be used for “S”, ”I”, ”G”, ”D” protections. The first set of thresholds should function through a time interval of 100ms - 1.5s adjustable in increments of 0.05s starting form the startup. The second set of thresholds should apply under normal conditions.

13). Thermal memory must be present for “L” and “S” functions.

14). Protection against excessive temperature should be available.

15). The trip unit shall provide protection and indication for over temperature. The option to open the circuit breaker on over temperature shall also be available.

16). Protection against phase unbalance should be available.

17). The trip unit should be able to provide protection for 50% and 100% rated neutrals.

18). Zone selectivity function should be present for “S” and “G” functions.

19). Load protection and control should be present. It should be possible to monitor two loads or allow switching in/out of single loads to ensure minimal interruption of service.

20). The trip unit shall provide self-diagnosis for real time analysis of the microprocessor unit.

21). A trip unit test function should be available.

22). The trip unit shall allow programming and control by means of keys and an LCD.

23). Trip unit access and programming shall be capable of password protection.

24). Auxiliary power available LED shall be provided on the trip unit.

25). A permanent or temporary microprocessor fault LED shall be available on the trip unit.

26). A Warning LED signaling overload current at 0.83 of value, phase unbalance present, distorted waveform present, contact wear greater than 80%, warning threshold exceeded, circuit breaker status error, and abnormal frequency shall be provided on the trip unit.

27). An Emergency LED signaling overload current greater than 100% of value, timing in progress for a protective trip, contact wear at 100%, CT disconnected and shunt trip disconnected shall be provided on the trip unit.

28). Permanent indicators of L, S, I, and G (tripped to protective relaying function) shall be present. Indicators must remain on for an indefinite time without the presence of an auxiliary supply or battery voltage present and be activated in case of reclosing on a fault. A local “RESET” button must be present to reset indicators.

29). The trip unit shall possess the capability to meter and display the following functions: current (phase, neutral, and ground), voltage, power, power factor, frequency, peak factor, energy, and historical data.

30). The trip unit must be capable of waveform display and harmonic calculation up to the 20th harmonic.

31). The trip unit shall provide contacts for signaling of a protective trip and microprocessor fault. In addition, two user configurable contacts shall be provided.

32). The trip unit should be capable of storing circuit breaker-opening data when an external power supply is available.

33). OPTIONAL – The trip unit shall be capable of supporting Modbus RTU standard communication protocol by means of EIA RS485-2- Wire Twisted Pair Bus topology at speeds up to 19,200bps. The communication will operate via an auxiliary 24V dc voltage supply.

34). OPTIONAL – The trip unit shall provide LED's for microprocessor fault due to communication and network activity due to communication.

2.07 NAMEPLATES AND LABELS

A All nameplates shall meet all standards listed in ANSI C37.20.1.

B Precautionary labels meet ANSI Z53.4. Standard nameplates for devices shall be white background with black lettering phenolic screwed on type with stainless steel screws. [Optional nameplate colors]

C The main system nameplate shall be stainless steel screwed on type with self tapping screws. All lettering is engraved. The following information is available on switchgear assembly nameplates:

1. Manufacturer's name and address

2. Manufacturer's type designations

3. Manufacturer's identification reference

4. Rated maximum voltage (where applicable)

5. Rated power frequency (where applicable)

6. Rated continuous current (main bus)

7. Rated short-circuit withstand current

8. Date of manufacture

9. Instruction manual number

2.08 COMPONENTS

A Instrument Transformers shall comply with IEEE C57.13.

1. Potential Transformers: Insulation Class of 600 volt dielectric, 10 kV full wave BIL. Accuracy Class is 0.6W and 1.2 X burdens at 60 Hz. Thermal ratings are 150 VA at 30°C ambient and 100 VA at 55°C ambient and secondary-voltage rating of 120 Vac.

2. Current Transformer: Ratios as indicated; burden and accuracy class suitable for connected relays, meters, and instruments.

3. Control Power Transformer: Insulation Class is 600 volt dielectric with a secondary-voltage of 120 Vac. Primary and secondary fuses mounted separately in an instrument compartment or on onboard fuse clips.

2.09 METERING, INSTRUMENTATION AND COMMUNICATION

A Main Metering and Instrumentation (if desired)

1. Metering shall exceed the capabilities of the circuit breaker trip unit.
2. Main metering shall be capable of displaying voltage, current, power, energy and THD. It shall be able to provide a suitable sampling rate and provide RS485 twisted pair communication port.

B Communication

1. Internal communications within the Low Voltage Switchgear shall be via Modbus.
2. Where stated on data sheets an ethernet gateway or main meter with ethernet capabilities shall be mounted in the low voltage switchgear.

2.10 ACCESSORIES

A An overhead lift device, track mounted at top of front of switchgear complete with a lifting hoist and lifting yokes. A portable floor-supported, roller-based, elevating lift truck for moving circuit breakers in and out of compartments as well as outside the switchgear.

B Portable test unit for testing all functions of circuit breaker, trip units without removal from switchgear.

C Breaker Test Cabinet: A wall mounted or free standing cabinet used for testing of electrically operated breakers and other breaker related functions.

Part 3 EXECUTION

3.01 INSTALLATION

A Install and anchor switchgear in accordance with manufacturer’s written guidelines and all applicable national and local codes.

B All necessary hardware required to secure the electrical equipment in place shall be provided by Contractor.

3.02 FIELD QUALITY CONTROL

A Adjustments

1. Adjust all operating mechanisms per manufacturer's requirements.
2. Adjust circuit breaker trip and time settings per values required per site engineer.
3. Tighten all bolted bus connections per manufacturer's specifications.

B Cleaning

1. Touch up damaged or scarred surfaces to match original finish.

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