SECTION 26 13 13 – MEDIUM VOLTAGE SWITCHGEAR

PART 1 GENERAL

1.1 SCOPE

A. This specification covers the minimum requirements for indoor medium voltage, 12.47kV metal clad and metal enclosed switchgear.

1.2 DEFINITIONS

A. "Seller" – The party or parties supplying the equipment described in the purchase order and or specifications.

B. "Bilstein Cold Rolled Steel (BCRS)" – Owner of facilities located in Bowling Green, Kentucky, USA.

C. "Engineering Contractor" – The person or company responsible for the overall design of the project. In this case; Gulf States Engineering (GSE) of Mobile, Alabama, USA

1.3 GENERAL REQUIREMENTS

A. Acceptable manufacturers include: Siemens, ABB, Square D, Rockwell, GE or owner approved substitute

B. The switchgear assembly shall be approved to UL standards and bear an appropriate label. All equipment shall be newly manufactured.

C. To fully specify electrical equipment, this specification is intended to be supplemented with Equipment Data sheets, prepared by the Engineering Contractor for inclusion in a purchase order.

1.4 APPLICABLE TECHNICAL SPECIFICATIONS AND STANDARDS

A. ANSI / IEEE C37.04 - Standard Rating Structure for AC High Voltage Circuit Breakers

B. ANSI / IEEE C37.06 - AC High-Voltage Circuit Breakers Rated on Symmetrical Current Basis-Preferred Ratings and Related Required Capabilities

C. ANSI / IEEE C37.09 - Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

D. ANSI / IEEE C37.11 - Requirements for electrical control for AC high voltage circuit breakers rated on a symmetrical current basis or a total current basis

E. NEMA SG4 – Alternating current high voltage circuit breakers

F. NEMA SG5 – Power switchgear assemblies

G. ANSI / IEEE C37.20.2 – Standard for Metal-Clad Switchgear

H. ANSI / IEEE C37.20.3 – Standard for metal enclosed interrupter switchgear

I. ANSI / IEEE C37.20.4 – Standard for indoor AC medium voltage switches

J. ANSI / IEEE 48 – Test procedures and requirements for high voltage AC cable termination

K. ANSI C37.20.7 Guideline for testing metal enclosed switchgear for internal arc faults

L. EEMAC G14.1 Procedure for testing the resistance of metal clad switchgear under conditions of an internal fault

M. National Electrical Code (NEC) 2014

1.5 CONFLICTS

A. Where there are conflicts between GSE drawings, data sheets, specifications and the specified code or government requirements, such conflicts shall be referred to GSE in writing for resolution.

B. GSE must approve any deviations from this specification in writing.

PART 2 DESIGN AND CONSTRUCTION

2.1 ARRANGEMENT

A. Arrangement of equipment and structural details shall be as specified on the Single Line Diagram (SLD) and General Arrangement Drawing (GA) with the exception that minor rearrangement of components to suit physical assembly requirements may be proposed by the Seller in writing.

B. Space shall be provided for future expansion as indicated on the drawings. All spaces marked "future" shall be complete with stationary elements, doors and shall be wired for future breakers. Units marked "space only" shall not be provided with equipment for future breakers. These units shall not be used for mounting control switches or other auxiliary equipment. Final Seller drawings shall indicate which of these "space only" areas may be used (with appropriate modifications) for future breakers. High voltage stabs in future spaces shall be covered to prevent accidental contact with live parts if door is fully opened

C. Space shall be provided for the sync transformers required for the SM-150 MV drive equipment. These transformers will be "free issued" to the GC / Switchgear vendor for mounting and wiring at the switchgear vendor's factory prior to shipment of the switchgear. See attached drawings for dimensional and mounting information.

2.2 ASSEMBLY

A. This specifications shall be used together with the following drawings:
   1. Single Line Drawings:
      a. 020-03-801
      b. 020-03-802
      c. 020-03-803

B. The metal clad switchgear will consist of an enclosure containing main circuit breaker, main bus bars, feeder breakers and the necessary accessory components all factory assembled and tested. The complete assembly shall be constructed to NEMA1 standards, be self-supporting and suitable for floor mounting. The various doors and removable panels shall have a minimum thickness of 11 gauge and be finished with ANSI 61 color paint. Each door and removable panel shall have self-adhesive labels warning of "danger hazardous voltage" and "danger electric arc flash hazard."

C. The main bus will be rated 1200 amps and be fully insulated over its total length. The bus will be tin plated copper and be of a bolted design and be predrilled to allow extension of the switchgear at either ends. A continuous 2" x 0.25" copper ground bus will run through the bottom of the complete enclosure.

D. Indoor metal enclosed switchgear assembly shall be provided with adequate lifting means and shall be capable of being rolled or lifted into installation position and bolted down.

E. The enclosure of each bay/cell of outdoor metal enclosed switchgear assembly shall be constructed of the universal frame type using die-formed welded construction only. Each bay containing high voltage components shall be a complete unit in itself. The assembly shall be fabricated from not less than 11 ANSI gauge steel.

F. Indoor metal enclosed switchgear assembly shall be provided with a base consisting of continuous four inch galvanized steel channel extending completely around all four sides of each bay and welded or bolted at each corner.

G. Access to indoor metal enclosed switchgear assembly shall be from the front and rear only. To guard against unauthorized or inadvertent entry, there shall be no access to high voltage by means of externally removable panels.

H. Externally accessible hardware shall not be used for support of high voltage components or switch operating mechanisms with the switchgear.

I. Indoor metal enclosed switchgear assembly shall have provision for bottom cable entry / exit. All ventilation openings shall be screened to prevent the entrance of small animals and barriered to inhibit the entrance of dirt. Non-hardening gasket seals shall be provided at the top and side edges of adjoining bays to prevent water entry between double walls and roof.

J. Individual doors shall be supplied for each switch compartment and fuse compartment.

K. Doors over 40 inches in height shall have a minimum of three stainless steel hinges with bronze hinge pins. Doors 40 inches in height or less shall have a minimum of two such hinges.

L. Each d1247oor will be equipped with a door handle. The door handle shall be padlock able.

M. In consideration of controlled access, tamper resistance and arcing faults, each door over 40 inches in height shall have a minimum of three concealed, interlocking cam-type, high strength latches. Doors 40 inches in height or less shall have a minimum of two such latches.

N. Doors providing access to interrupter switches or interrupter switches with power fuses shall be provided with a wide view window, constructed of impact resistant material, to facilitate checking of switch position without opening the door.

O. Doors providing access to fuses shall have provisions to store spare fuse units or refill units.

P. All doors shall be capable of being opened to a 90 degree position and held in that position with sturdy, positive latching door holders, which shall be zinc plated and chromate, dipped.

Q. Access control shall be provided as follows:
   1. Doors providing access to interrupter switches with power fuses shall be mechanically or key interlocked to guard against:
      a. Opening the door if the interrupter switch on the source side of the power fuse is closed
      b. Closing the interrupter switch if the door is open.
   2. Doors providing access to interrupter switches only, which are operated by stored-energy type switch operators, shall be mechanically or key interlocked to guard against operating the interrupter switch if the door is open.
   3. Breakers cannot be racked in or out unless in the open or tripped position.

R. Screen Doors
   1. Each load break switch compartment thereof containing high voltage components shall be provided with a protective screen door, bolted closed to guard against inadvertent entry to bays containing these components when the enclosure door is open.

2.3 SAFETY BY DESIGN

A. The switchgear shall be designed to contain an arc flash/blast event as per EEMAC G14-1-1987 Category ‘B’ and ANSI standard C37-20-2001 (designed for front, side and rear arc flash and arc blast protection).

B. Doors providing access to breakers shall be mechanically or key interlocked to breaker position so that they can only be opened when the power circuit breaker is in the “TEST” or “RACKED OUT” position.

C. Breakers cannot be racked in unless the door is closed and latched. An external racking mechanism and slot shall be provided for closed door racking in/ out of breakers.

D. All switchgear shall have IR windows in the rear of the panels to conduct IR scans.

E. Grounding studs shall be mounted on the High Voltage bus in each cable entrance bay/cell.

F. All switchgear cells shall have surge arrestors installed as defined by the Engineering contractor.

2.4 SWITCHGEAR BUS WORK

A. Ratings:
   1. Voltage: Nominal 12.47 kV, Maximum 15 kV
   2. Three Phase, with Ground Bus
   3. Rated Continuous Current: 1200 Amps
   4. Basic Impulse Level: 95 kV
   5. Short Circuit Current (I): 23kA
   6. Interrupting Time: 5 cycles
   7. Max. Sym. Interrupting (I): 23kA
   8. Close & latching (Momentary) Asymm.: 37kA RMS
   9. Close & latching (Momentary) Peak: 62kA

B. The main bus shall be tin plated copper mounted on NEMA rated porcelain insulators or epoxy formation and rated as indicated in drawings. Bus bars shall have a continuous current rating based on temperature rise and documented by design tests, as required by ANSI Standard C37.23. All joints will be tin plated with at least 2 bolts per joint. Bus bars will be braced to withstand magnetic stresses developed by currents equal to main power circuit breaker close, carry, and interrupt ratings. Access to bus bars shall be through removable front and rear panels. Bus bars shall have fluidized bed epoxy flame retardant and non-hydroscopic insulation with a continuous current rating.

C. REMOVED See section A above for ratings.

D. All hardware used on conductors shall have a high tensile strength and anti-corrosive plating. Bolted copper-to-copper connections shall be made with conical washer bolts.

E. Provisions for future bus extension shall be closed with an internally secured exterior barrier at each end of the switchgear lineup.

F. A ground bus shall be furnished to extend the entire length of the metal enclosed switchgear assembly. The ground bus shall be copper (1/4” x 2”) and shall be provided at the bottom of the metal enclosed switchgear assembly. In each bay the ground bus shall be bolted to a copper clad steel bracket which shall be welded to the steel enclosure. Copper lugs suitable for 250 MCM bare copper cables shall be provided at each end of the ground bus.

G. Manufacturer shall supply additional 2 (two) 250 MCM copper ground lugs for each switch compartment.

H. For bus duct connections grade 5, high tensile strength, stainless steel hardware shall be used. All bolted bus joints shall be provided with lock washers.

2.5 CABLE PROVISIONS

A. To facilitate cable pulling and installation of cable terminating devices, provisions shall be made for:
   1. Full rear access for easy positioning and removal of cable pulling sheaves.
   2. Free access without interference from structural members
   3. Cable termination chamber access control shall be the same as switch access control.

4. Space for stress cones where applicable
5. Compression type two (2) hole lugs sized as per the bus rating.

2.6 CIRCUIT BREAKERS

A. Power circuit breakers shall be "Draw-out" type with a "CONNECTED," "TEST" and "LOCK-OUT" position.

B. Circuit breakers shall be electrically operated with a local manual operating handle with Closed and TRIP visual indications.

C. Circuit Breakers shall have a minimum of 4 (four) spare 52a and 4 (four) spare 52b auxiliary contacts as well as MOC and TOC contacts available for status of the breaker (OPEN/CLOSE/ TEST/RACK position).

D. Power circuit breakers shall be applied in accordance with IEEE std C37.010 and rated on a symmetrical current basis according to IEEE std C37.04.

E. Circuit breakers shall have an electrically controlled, stored energy type (motor charging spring) operating mechanism for close and trip functions.

F. Circuit Breakers shall be equipped with a trip coil supervision relay or visual indication.

G. Circuit breakers used as motor starters shall have provisions at the switchgear for locally:
   1. Opening and closing the breaker in the test position (locally only)
   2. Opening and closing the breaker when in the CONNECTED position (local electrical, local manual and remote electrical).

H. Circuit breakers of the same rating shall be interchangeable. A feature shall be provided in the breaker compartment to prevent insertion of an incompatible breaker.

I. Circuit breakers shall be provided with a device to manually charge the stored energy operating mechanism.

J. The feeder circuit breaker for the Siemens SM-150 medium voltage drive has unique requirements and the following specifications from Siemens must be met by the supplier of the medium voltage switchgear:
   1. The supplier of the MV switchgear will include 3 phase AC synchronizing instrument transformers connected to the 12.47kV busbars and meeting the following specifications:
      a. Primary voltage 12470V/√3 Secondary voltage 100V/√3
      b. Accuracy class 1.0 or better
      c. Rated frequency 60Hz
      d. Current consumption approx. 0.1A
   2. The MV circuit breaker feeding the Sinamics SM-150 drive system is part of the drive's protection system and has to fulfill the following requirements:

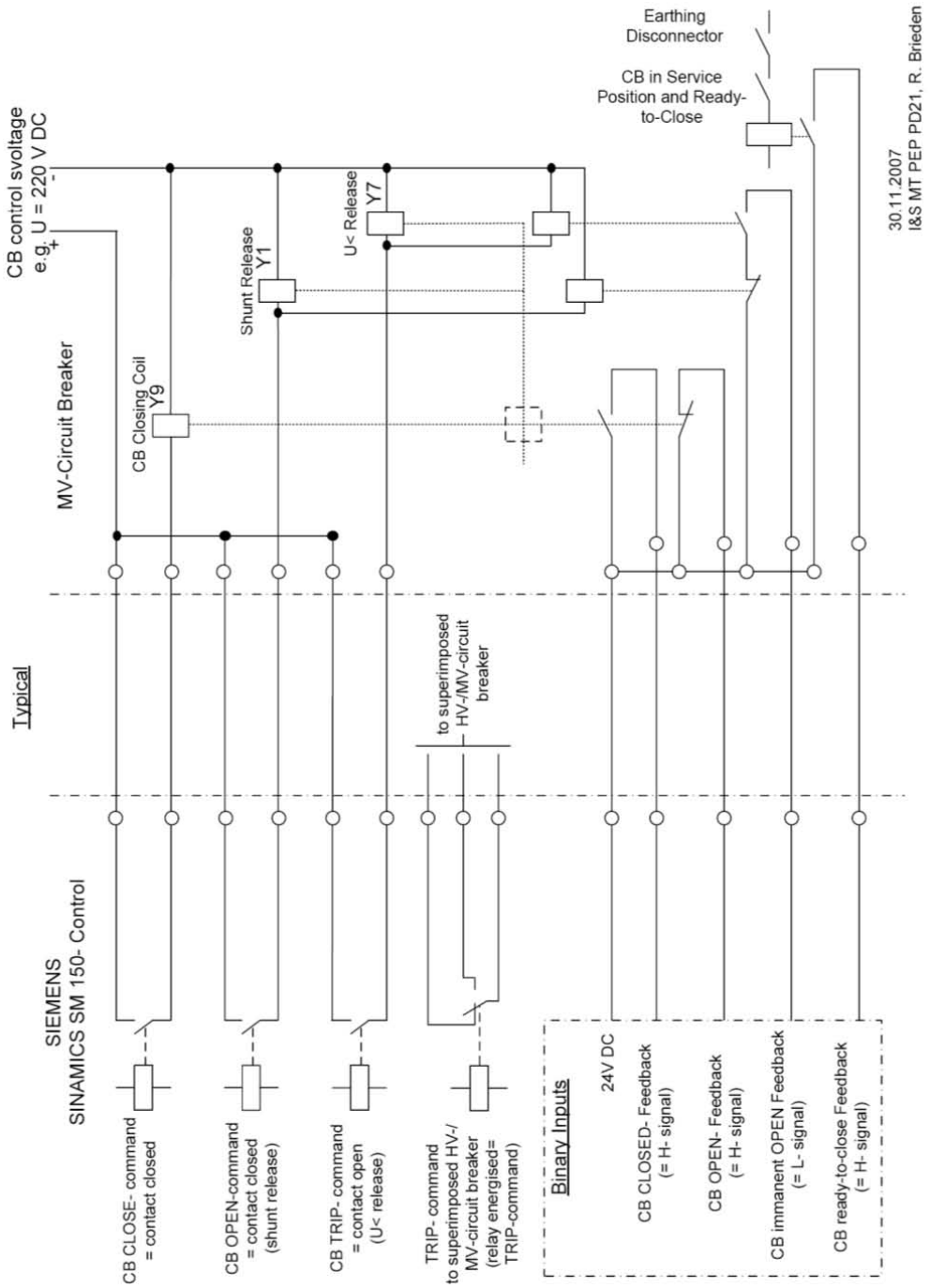
Designation	MV-Circuit Breakers for SINAMICS SM150-Drive system
Quantity	1
Type	3- pole vacuum or SF6 circuit breaker
Rated voltage	12.47 kV
Rated Circuit Breaker Current	Acc. to MV- switchgear specification
Short circuit current	acc. to system fault level
Release action time	≤ 40 ms
Arc extinguish time	≤ 40 ms
Total switching time	≤ 80 ms
Undervoltage release	U < release required for SINAMICS SM150-converter system!

3. Signal Interface between MV Circuit Breaker and Drive Control
   a. Below listed feedback signals will be connected from each MV circuit breaker to the related drive control.

Signal	Signal level	required contact load
Circuit breaker CLOSED-feedback	1 x dry contact, CB CLOSED = contact closed	24V DC / 0,5A
Circuit breaker OPEN-feedback	1 dry contact, CB OPEN = contact closed	24V DC / 0,5A
Circuit breaker ready to close	1 x dry contact, CB ready to close = contact closed	24V DC / 0,5A
CB imminent (external) OPEN / TRIP- feedback	1 x dry contact, this contact opens if the MV- circuit breaker is tripped from any other protection device than the drive control itself (e.g. overcurrent protection)	24V DC / 0,5A

Signal	Signal level	Permissible contact load
Circuit breaker CLOSE-command (Pulse signal)	1 x dry contact, CLOSE- command = contact closed	DC-13, 110V DC / 10,0A DC-13, 220V DC / 2,0A AC-15, 230V AC / 10,0A
Circuit breaker OPEN- command (to shunt CB release)	1 x dry contact, OPEN- command= contact closed	DC-13, 110V DC / 10,0A DC-13, 220V DC / 2,0A AC-15, 230V AC / 10,0A
Circuit breaker TRIP- command (to CB undervoltage release)	1 x dry contact, TRIP- command = contact open	DC-13, 110V DC / 10,0A DC-13, 220V DC / 2,0A AC-15, 230V AC / 10,0A
OPEN – command to the superimposed HV or MV circuit breaker in case the drive related circuit breaker does not open after a trip command has been initiated by the drive control	1 x dry CO- contact, (relay energized = trip command)	DC-13, 24V DC / 10,0A

K. General Notes for SINAMICS SM150 Converter systems:
   1. MV-circuit breakers used for the fuseless SINAMICS SM150- converter system require in addition to the shunt release also an undervoltage release. This is necessary to prevent the converter system from severe damages caused by failures of the circuit breakers' control voltage when it is not possible to open / trip the breaker by the shunt release.
   2. For safe operation of the drive system it is required that only the drive control is allowed to close the related MV- circuit breaker. Local closing of the circuit breaker or closing from anywhere else shall not be possible!
   3. Local closing should only be possible for maintenance purposes with the circuit breaker in test position.
   4. As drive protection at least an overcurrent time protection relay should be installed in the related 12.47kV circuit breaker panel. A protection relay with transformer inrush current detection is recommended.
   5. The following typical shows the interface between a SINAMICS SM 150- converter system and the related 12.47 kV- circuit breaker.
   6. A manually operated ground and test device shall be included with the switchgear. Optionally an electrically operated ground and test device shall be quoted as an option.


Earthing Disconnector
CB in Service Position and Ready-to-Close
30.11.2007
I&S MT PEP PD21, R. Brieden
CB control svoltage
e.g. U = 220 V DC
U< Release Y7
Shunt Release Y1
CB Closing Coil Y9
MV-Circuit Breaker
Typical
to superimposed HV-/MV-circuit breaker
SIEMENS
SINAMICS SM 150- Control
CB CLOSE- command = contact closed
CB OPEN-command = contact closed (shunt release)
CB TRIP- command = contact open (U< release)
TRIP- command to superimposed HV-/ MV-circuit breaker (relay energised= TRIP-command)
Binary Inputs
24V DC
CB CLOSED- Feedback (= H- signal)
CB OPEN- Feedback (= H- signal)
CB immanent OPEN Feedback (= L- signal)
CB ready-to-close Feedback (= H- signal)

2.7 CONTROL & SECONDARY WIRING

A. Terminal boards will be provided for all control wiring, potential and current circuits. Each terminal block will be identified by a nameplate and each terminal point clearly identified. Current circuits will be wired through a heavy-duty short-circuiting terminal block. Terminals for 25% spares in excess of the requirements will be furnished. The terminal boards will be accessible from the front of the switchgear without exposure to energized power voltage compartments.

B. Control and protection auxiliary voltage shall be 125VDC and shall be supported by a battery backup system for emergency operations. This battery backup system is included in the GC's scope of supply and installation.

2.8 INSTRUMENT TRANSFORMERS

A. Current transformers can be primary wound or of toroidal type E with current ratios in accordance with those shown on the drawings and ESD. Secondary's shall have a 5 amp rating. They shall be capable of continuously carrying 150 % of the rated current at 55° C ambient and will be of applicable ANSI relaying accuracy class as specified in the ESD. By itself the CT can be rated 600 volt class 10 kv BIL.

B. Voltage or Potential Transformers, if required, shall be single phase 19.95 kV-69.5V (Y-Yg connection). They shall be insulated for the line-line voltages of 12.47kV and 120v.They shall be of applicable ANSI relaying accuracy class and be provided with primary and secondary fusing. The accuracy class and burden of the PT shall be specified by the Engineering Contractor.

C. Instrument transformer secondary's shall be provided with a safe means to isolate them from the relay inputs for relay testing and calibration.

2.9 PROTECTION

A. Protective relays shall as a minimum comply with service conditions, ratings and testing requirements specified in IEEE Std. C37.90.

B. Relays shall be mounted at locations convenient for maintenance, service, inspection, target resetting and testing.

C. Relays shall have visual trip indications and shall be associated with manual rest lock-out relays (ANSI 86 function).

D. Protective relays shall be provided as shown on the single line diagram and shall be solid state (microprocessor) controlled and provide the specified IEEE protective functions including but not limited to:
   1. Directional and non-directional overcurrent protection
   2. ground fault protection
   3. Arc protection
   4. Over and Under voltage protection
   5. Frequency protection and change protection
   6. Power protection, active and reactive

7. Circuit breaker failure

E. Relays shall have provision for testing and calibration using an external power source and access to instrument transformer inputs via terminal blocks and 'FT' type test blocks.

F. Multi-function relays shall have indications of the type of fault and a memory to indicate the type and time of the event. Refer to the single line diagram for the location and type of fault detection for each feeder.

2.10 METERING & CONTROL

A. Metering (Digital) and control shall be provided as shown on the single line diagrams and include the following:
1. Voltage
2. Current
3. Frequency
4. Power Factor
5. Demand
6. Energy
7. Time of Use metering
8. Harmonics up to 49th
9. Analog and digital I/O
10. Communications: Ethernet, RS-485

B. Control switches shall be the pistol grip type for circuit breaker control and the round handle type for instruments and metering. Control switches shall not be mounted adjacent to instrument control switches.

C. Indicating lights shall be for close (red) and open status (green) and be LED type. Circuit breaker control, the close indicating light shall continuously monitor the trip coil continuity.

2.11 NAMEPLATES, LABELS AND FINISH

A. Nameplates, function and location designation shall be in accordance with BCRS Annex D attached.

B. To guard against corrosion, all hardware (including door fittings, fasteners etc), all operating mechanism parts, and all other parts subject to abrasive action from mechanical motion shall be of either nonferrous materials or galvanized or zinc-plated ferrous materials. Cadmium plated ferrous parts shall not be used.

C. Full coverage at joints and blind areas shall be achieved by processing enclosures independently of components such as doors before assembly into the unitized structures. All exterior seams shall be filled and sanded smooth for neat appearance.

D. To remove oils and dirt, and to form a chemically and finish – to metal bond, and to retard under film propagation of corrosion, all surfaces shall undergo a thorough pretreatment process before any protective coatings are applied.

E. After the enclosures are completely assembled and the components (switches, fuses, bus etc.) are installed, the finish shall be inspected for scuffs and scratches. Blemishes shall be carefully touched up by hand to restore the protective integrity of the finish.

F. A packaged kit of refinishing materials – with complete instructions – shall be included with each shipment of metal enclosed switchgear for touch up in the field.

G. All steel surfaces shall be chemically cleaned and given an iron phosphate corrosion resistant treatment providing a strong bond for paint adhesion. All parts shall be immersed in paint applying 0.7 - 0.8 mils of cathodic epoxy paint electrically bonded to all surfaces for maximum adhesion. The finish shall be cured in an oven at to insure maximum toughness and prolong service in severe environments.

H. The paint finish shall be RAL 7032 light gray color.

I. Labels:
   1. All external doors and hinged bolted panels providing access to energized equipment will be provided with flowing signs "Caution -- High Voltage 12,470 Volts -- Keep Out" – “Danger-Electric Arc Flash Hazard.”
   2. All internal doors and screen doors providing access to high voltage will be provided with "Danger -- High Voltage 12,470 Volts -- Keep Out - Qualified Persons Only" signs.
   3. All internal doors and screen doors providing access to interrupter switches will be provided with warning signs indicating that "Switch Blades May Be Energized in Any Position".
   4. All internal doors and screen doors providing access to power fuses will be provided with warning signs indicating that "Fuses May Be Energized in Any Position".

J. Rating Nameplates
   1. The integrated switchgear assembly will be provided with an external nameplate indicating the manufacturer's drawing number and the following: Voltage Rating (KV, Nominal; KV, Maximum Design; KV, BIL); Main Bus Continuous Rating (Amperes); Short Circuit Ratings (Amperes, RMS Symmetrical and MVA Three-Phase Symmetrical at Rated Nominal Voltage); and the Momentary and Fault-Closing Ratings (Amperes, RMS Asymmetrical).
   2. Each individual bay will bear a nameplate indicating the ratings of the interrupter switch (Amperes continuous and interrupting); the maximum rating of the power fuse.

PART 3 DOCUMENTATION REQUIREMENTS

3.1 DRAWINGS

A. Drawings supplied by the Engineering Contractor (GSE) to the “Seller”;
   1. Single Line Diagrams
   2. Three Line Diagrams
   3. Equipment Data Sheets

B. Drawings to be furnished by the “Seller” shall include the following as applicable;
   1. General Arrangement
   2. General Layout

3. Switchgear Layout
4. Power & Control Layout
5. Distribution Panel
6. Schematic Diagrams
7. Control Schematic
8. I/O Schematic
9. Block Diagram
10. Wiring Diagram
11. Wiring Interconnection Diagram
12. Communications
13. Details
14. Electrical Installation Details
15. Motor and Component List

C. All documents submitted by seller must be in editable electronic format as described in BCRS Annex J attached.

3.2 QUOTATION SUBMITTALS FOR REVIEW

A. Manufacturer shall provide [3] copies of the following documents to owner for review and evaluation.
1. Front view and floor plan of switchboard
2. Switchboard anchoring locations
3. Conduit and busway entry / exit locations
4. Location of shipping splits
5. One-line diagram of switchboard bus and protective devices
6. Switchboard ratings including:
   a. Short circuit rating
   b. System voltage rating
   c. Continuous current rating
7. Protective device schedule including:
   a. Device type
   b. Sensor and trip rating
   c. Location within the switchboard
8. Cable quantity and size capabilities for each device Panel drawing showing all major protection, instrumentation, and control devices mounted within the switchboard
9. Schematic (elementary) diagram showing power, metering, and control circuits for the switchboard and circuit breakers
10. Bill of Material listing (including quantity, location, catalog number, and ratings) of all major protection, instrumentation and control devices
11. Switchboard nameplate schedule
12. Contractor furnished seismic calculations and anchoring recommendations for equipment and seismic requirements defined in these specifications. Report shall be signed by a structural or civil engineer registered in the state were the equipment is to be installed
13. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner.

3.3 PROJECT RECORD DOCUMENTS

A. Maintain an up-to-date set of Contract documents. Note any and all revisions and deviations that are made during the course of the project.

B. Record drawings and information shall be furnished providing the following information:
   1. All of the information listed in the "SUBMITTALS FOR REVIEW "section.
   2. Wiring diagrams for each switchboard section showing component location and tabulated wire listing for each component
   3. Installation information for the switchboard
   4. Certified test reports for switchboard production tests
   5. Submit (3) copies of the above information for record

3.4 QUALITY ASSURANCE

A. Manufacturer shall have specialized in the manufacture and assembly of high voltage switchgear for 10 years

B. High voltage switchboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in section 1.4.

3.5 UNITS OF MEASUREMENT

A. All dimensions shall be in the SI metric and ANSI system of units.

PART 4 TESTING AND INSPECTION

4.1 DESIGN TESTS

A. Design tests shall meet the applicable standards as set out in section 1.4 above.

4.2 FACTORY TESTS

A. The switchgear equipment shall receive factory production tests as listed below and meet EEMAC Std G8-2:
   1. Visual and Mechanical Checks:
      a. Grounding of instrument cases
      b. Device Check – Visual inspection of device catalog number to verify compliance to specification
      c. Bus Check – Visual Check of buses
      d. Clearance Check – Inspect buses for proper electrical clearances
      e. Connection Check– Torque all bolted connections to NEC standards
      f. Nameplate Check – Verify Nameplate engraving and location per drawings
   2. Electrical Tests:
      a. Control Power Check – Apply power to all control circuits
      b. Wiring Check – Continuity test to ensure correctness of wiring as per design.
      c. Instrument Transformers – Ratios of CTs and PTs, Insulation resistance to ground. CT saturation test.

d. Meter and Relay Checks – Induced current and voltages to verify devices
e. Circuit Breaker Check – Verify tripping, and closing operation, electrically and mechanically. Check contact resistance, and High Voltage insulation resistance.
f. Bus – High potential test for one minute on bus

B. Manufacturer shall provide to the Engineer documents verifying completion of factory production tests.

C. Provision shall be made to allow for client witness testing at the factory prior to acceptance.

PART 5 SHIPPING

5.1 GENERAL

A. Each shipping section shall be furnished in accordance with removable lifting angles and/or plates suitable for crane hooks or slings.

B. Each indoor 'shipping section" shall be furnished with removable wooden shipping and rolling skids

C. If shipped separately, each structure shall be individually crated and tagged with its proper unit number and the equipment number of the assembly to which it belongs.

D. Relays shall be installed and suitable braced for shipment.

E. Each shipping section shall be provided with a permanently attached, readily visible identification tag bearing the equipment number of the assembly of which it is a part.

5.2 PREPARATION FOR SHIPMENT

A. Preparation for shipment shall be in accordance with manufacturer's standards unless otherwise noted in the purchase order. The manufacturer/seller shall be solely responsible for adequacy of the preparation for shipment provisions employed to ensure that the materials reach their destination in perfect working condition when handled by a commercial carrier.

PART 6 GUARANTEE

6.1 GENERAL

A. Seller shall guarantee the equipment against defective materials, poor workmanship, and improper design for a period of 12 months after start-up or 18 months from date of receipt of goods, whichever is sooner.

B. The Engineering Contractor or end user BCRS may conduct performance tests under the specified conditions of service within 12 months after start-up, the total period not to exceed 18

months from receipt of goods. Other test conditions and procedures may be selected by agreement between GSE, representing the end user BCRS and the Seller.

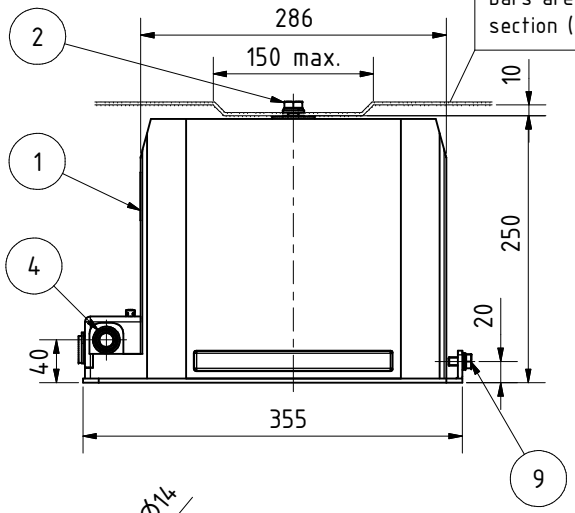
C. Seller shall make good or repair at his own expense any defects or non-conformities noted during the guarantee period.

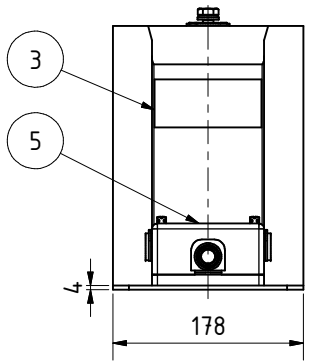
D. These conditions shall not be precluded by any Seller warranty.

END OF SECTION

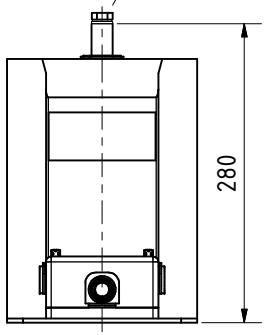
Anschlusshöhe 260 erforderlich, wenn Schienen parallel zur Wandleroberfläche geführt (z.B. gekröpfte Schiene oder 10 hohes Distanzstück)

Connection height 260 necessary, if the primary bars are led in parallel to the tranformer head section (e.g. cranked bar or spacer, height 10)



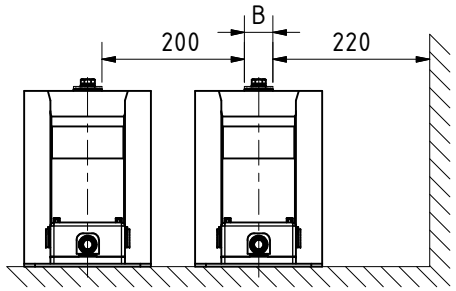


Adapter lieferbar, Spacer deliverable



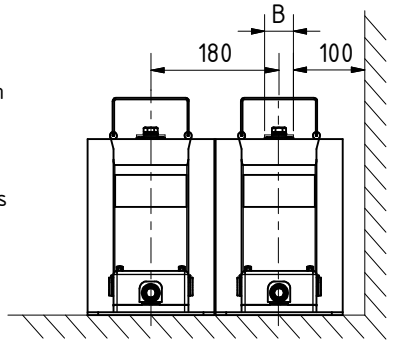
Maß B für Anschlüsse bzw. Schienen. Schienenabmessungen im Auftragsfall angeben.

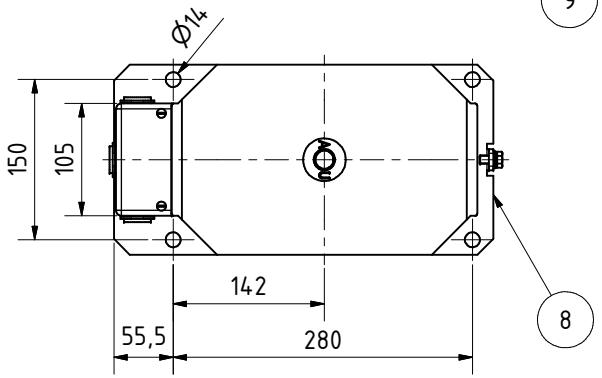
Measure B for primary connection or busbars. Measurement of busbars to be declared in customers order.



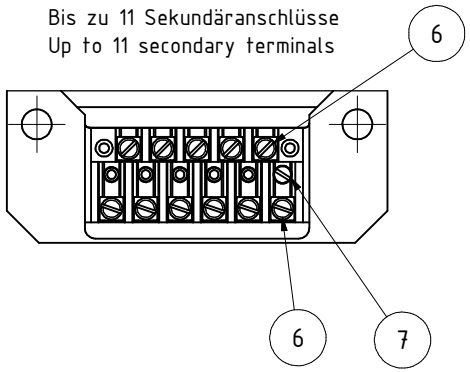
Mit Abdeckkappe und isolierten Anschlüssen bzw. Schienen

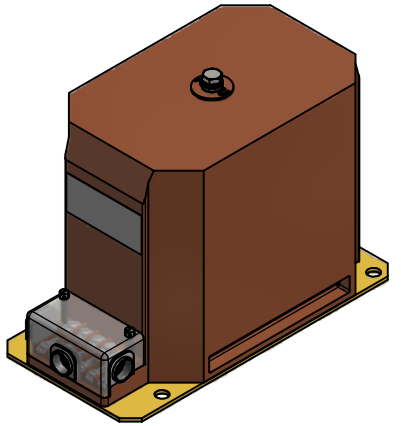
With cover and insulated primary connections or busbars





Bis zu 11 Sekundäranschlüsse
Up to 11 secondary terminals





1 Gießharz
2 Primäranschluss M10, 14 tief, mit Schraube M10x16
3 Leistungsschild
4 Kabelverschraubung Pg16
5 Klemmenkastendeckel transparent mit Plombierschraube
6 Sekundärklemmen M5
7 Erdungsschraube M5
8 Fußplatte
9 Erdungsanschluss M8

1 Cast resin
2 Primary connection M10, 14 deep, with screw M10x16
3 Rating plate
4 Cable gland Pg16
5 Cover of terminal box transparent with sealing screw
6 Secondary terminals M5
7 Earthing screw M5
8 Base plate
9 Earthing connection M8

EKM	EBS	VMI	RGD											
6	090015	26.02.10	Wo		Datum/date	Name/name	Benennung/designation							
9	140021	12.12.14	Dig	Bear. drawn	19.12.1989	Ri	GSES24							
8	120026	01.11.12	Dig	Gepr. checked			Innenraum-Gießharz-Spannungswandler Indoor cast resin voltage transformer							
7	090033	02.12.10	Dig	Maße in mm / All dimensions in mm Geringe Maß- und Gewichtsabweichungen vorbehalten Small deviations in dimensions and weight are possible										
Index	Änderung revision	Datum date	Name name											
Urheberschutz nach copyright acc. to DIN ISO 16016				RITZ Instrument Transformers			Zeichnungsnummer/drawing number							Index
Gewicht ca. weight approx.	31 kg						MB3.3794							9
Maßstab/scale bei / ref. to DIN A3	1:5	4583		Dateiname data file name	M00379419.idw		(Ers.f.)/(sub.for)			Blatt / page		von / of		