Medium-voltage power distribution and control systems > XGIS >

Power Xpert XGIS

Contents

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General Description

Eaton's Power Xpert® XGIS gas-insulated metal-enclosed switchgear is an integrated assembly of SF6 pressurized tanks, bus and disconnect switches that are coordinated electrically and mechanically for medium-voltage circuit protection. Horizontal bussing uses a solid shielded insulation system.

Eaton's XGIS utilizes a compartmentalized design, in accordance with Loss of Service Continuity (LSC) standards within IEC 62271-200. All major primary circuit components are isolated from each other by grounded metal barriers. This type of construction minimizes the likelihood of arcing faults within the equipment and propagation of fault between the compartments containing major primary circuits. In addition, all XGIS designs are arc resistant and tested per the Internal Arc Classification (IAC) guidelines of IEC 62271-200.

Application Description

Eaton's XGIS metal-enclosed switchgear provides centralized control and protection of medium-voltage power equipment and circuits in industrial, commercial and utility installations involving generators, motors, feeder circuits, and transmission and distribution lines. All structures use single-high breaker arrangements.

Ratings

- Rated voltage (Ur): 5 kV, 15 kV, 27 kV, 38 kV
- Interrupting ratings (rated short-circuit breaking current): 25 kA or 31.5 kA
- Rated normal current—main bus: 1200 A, 2000 A or 2500 A
- Rated normal current—circuit breakers: 1200 A, 2000 A or 2500 A
- Rated frequency: 60 Hz
- Rated altitude: 4000 m

Standards and Certifications

- IEC 62271-1
- IEC 62271-100
- IEC 62271-102
- IEC 62271-200 (including loss of service continuity and internal arcing fault classifications)
- IEC 62271-201
- UL listed

Seismic Qualification

Refer to Power Distribution Systems Design Guide for information on seismic qualification for this and other Eaton products.

Features and Benefits

Eaton has been manufacturing medium-voltage switchgear for over 60 years, and Eaton's vacuum interrupters are second to none, with tens of thousands currently in operation.

With reliability as a fundamental goal, Eaton engineers have simplified the XGIS switchgear design to minimize problems and gain trouble-free performance. Special attention was given to material quality and maximum possible use was made of components proven over the years in Eaton switchgear.

Benefits of using gas-insulated switchgear:

- Overall footprint using GIS is significantly reduced compared to air-insulated switchgear (AIS)
- In addition to footprint, equipment room space is maximized by mounting the switchgear against the wall (no rear access is required)
- Maintenance requirements are minimized by the use of enclosed long-life vacuum interrupters sealed in a pressurized SF6 tank medium
- SF6 gas has high dielectric properties, making it the ideal insulation medium
- The parts inside the tank are maintenance-free for the life of the equipment
- XGIS utilizes compartmentalized structures

Loss of Service Continuity (LSC)

Eaton's XGIS medium-voltage switchgear meets all of the following categories of the LSC2 family, with LSC2B being the most stringent:

- **LSC2**—Functional unit having at least an accessible compartment for the high-voltage connection (called connection compartment), such that, when this compartment is open, at least one bus bar can remain energized and all other functional units of the switchgear can be operated normally
- **LSC2A**—Functional unit of category LSC2 such that, when any accessible compartment (other than the bus bar compartment of single bus bar switchgear) is open, at least one bus bar can remain energized and all other functional units of the switchgear can be operated normally
- **LSC2B**—Functional unit of category LSC2A, where the high-voltage connections (e.g., cable connections) to the functional unit can remain energized when any other accessible high-voltage compartment of the corresponding functional unit is open

The LSC category describes the extent to which the switchgear is intended to remain operational in case access to a high-voltage compartment is provided. For each functional unit of switchgear, the LSC category describes the extent to which other high-voltage compartments and/or functional units may remain energized when a main circuit compartment of this functional unit is opened.

Compartments deemed accessible within an XGIS functional unit are connection compartment and upper VT compartment; compartments deemed non-accessible within an XGIS functional unit are bus bar compartment and three-position switch/breaker compartment (gas tank).

See IEC Standard 62271-200 for additional information regarding LSC categories.

Degrees of Protection (IP)

Eaton's XGIS medium-voltage switchgear is available with IP rating IP4X.

IP classifications are intended to define the degrees of protection provided by switchgear enclosures of electrical equipment with regards to:

- Protection of persons against access to hazardous parts inside the enclosure
- Protection of the equipment inside the enclosure against ingress of solid foreign objects
- Protection of the equipment inside the enclosure against harmful effects due to the ingress of water

See IEC Standard 60529 for additional information regarding IP classifications.

Switchgear Assembly Ratings

Table 12.1-1. Switchgear Assembly Ratings

Rated Maximum Voltage kV rms	Rated Continuous Current Amperes	Lightning Impulse Withstand Voltage [LIWV] (BIL) kV Peak	Rated Short-Time Short-Circuit Current Withstand (2-Second) kA rms Sym	Power Frequency Withstand kV rms
5	1200 2000 2500	60 60 60	25, 31.5 25, 31.5 25, 31.5	19 19 19
15	1200 2000 2500	95 95 95	25, 31.5 25, 31.5 25, 31.5	36 36 36
27	1200 2000 2500	125 125 125	25, 31.5 25, 31.5 25, 31.5	60 60 60
38	1200 2000 2500	170 170 170	25, 31.5 25, 31.5 25, 31.5	80 80 80

Switchgear Construction

Overview

Eaton's XGIS medium-voltage switchgear platform is a front-accessible, single-high breaker construction that uses SF6 as the primary insulation medium. The switchgear is available with an arc-resistant certification. The XGIS platform does not require any on-site gas filling during commissioning and is built to allow replacement of center panels without deconstructing the entire lineup.

Each switchgear structure is built around a single robot laser welded tank that typically incorporates the circuit breaker, three-position disconnect switch, and optional VT earthing switch and connections. All of the primary parts are insulated using SF6. The circuit breakers are fully enclosed within the robot laser welded tank, therefore the circuit breakers are considered fixed.

The operating mechanisms for the circuit breaker and three-position disconnect switch are constructed as part of the tank and are located in the low-voltage compartment to allow for any needed maintenance.

Each low-voltage compartment is located at the front of the switchgear in the upper section and houses all necessary indicating lights, controls, meters and relays. Above the low-voltage compartment is a horizontal wireway where low-voltage conductors can enter the switchgear. There are two removable cover plates on top of each section to provide access. See second image to the right.

The cable compartment is located at the front of the switchgear in the lower section. A bolted door is used to access the cables that are connected using T-body connections. In addition to the cable compartment, each structure will need additional space underneath the equipment for cable entry, which can be done by including a vault in the site work, raising the electrical house above grade or installing the switchgear on a platform to raise it above the floor.

The main bus, constructed out of solid shielded insulated bus, is located on the top of the switchgear and is used to connect all of the panels. The bus is a combination of silicone rubber for insulation, a metal grounding barrier and copper bus.

Tank

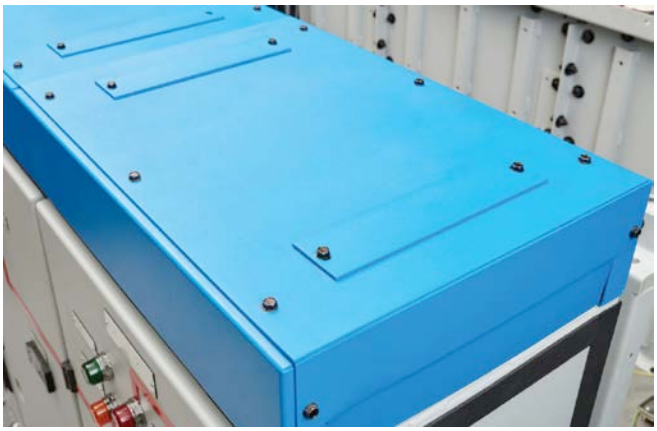
Each tank typically contains a circuit breaker, a three-position disconnect switch, sealed rear access cover, and an optional VT earthing switch with plug-in ports. If the lineup requires a main-tie-main configuration, tie breakers and riser sections are available.

Each tank has both pressure gauge and fill port if you need to sample gas for analysis or would need to remove the gas from the tank. A view port is also standard on each tank to verify position of the three position disconnect switch.

An over pressure safety burst disc is integral to each tank located on the rear. The burst disc allows for the venting of arc gases should an arc event occur inside the tank.

SF6 is used as the insulating medium inside the tank and allows the footprint to be reduced to a minimum. The SF6 is enclosed inside the tank by using machine welding to make the tank airtight. The construction of the tank allows for it to be sealed for life and removes the need for any on-site gas handling during commissioning.

XGIS LV Compartment Door Open



XGIS Control Cable Top Entry Locations

Tank View Port

Circuit Breaker

The circuit breaker mechanism as shown to the right is outside of the SF6 tank; the vacuum interrupters are located inside the SF6 tank. The spring charging mechanisms can be accessed by removing the cover plate.

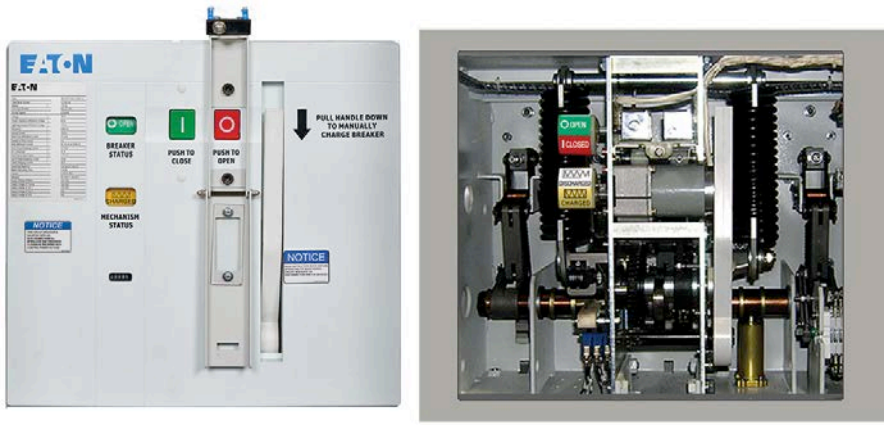
The Eaton XGIS vacuum circuit breaker incorporates electrical trip-free characteristics. That is, the contacts of the circuit breaker must return to the open position and remain there when an opening operation follows a closing operation, regardless of whether the closing signal is maintained. A circuit breaker with "Electrically Trip-Free" features must be able to receive and respond to an electrical opening signal regardless of whether an electrical closing signal is applied.

The circuit breaker and three-position disconnect switch are both mechanically and electrically interlocked. The three-position disconnect switch cannot be operated manually via the t-handle mechanism or electrically via local or remote operator controls while the circuit breaker is in the closed position.

Table 12.1-2. Circuit Breaker Ratings and Operations

Rated Maximum Voltage kV rms	Rated Continuous Current Amperes	Rated Short Circuit Current kA rms, sym	Momentary (Short-Time) Withstand Current Peak kA	Breaking Capacity kA	Mechanical Operations ①
5, 15, 27, 38	1200	25 and 31.5	82	50.4	10,000
5, 15, 27, 38	2000	25 and 31.5	82	50.4	2000
5, 15, 27, 38	2500	25 and 31.5	82	50.4	2000

① Each operation is comprised of one closing plus one opening.



Circuit Breaker Two View

Vacuum Circuit Breaker Assembly

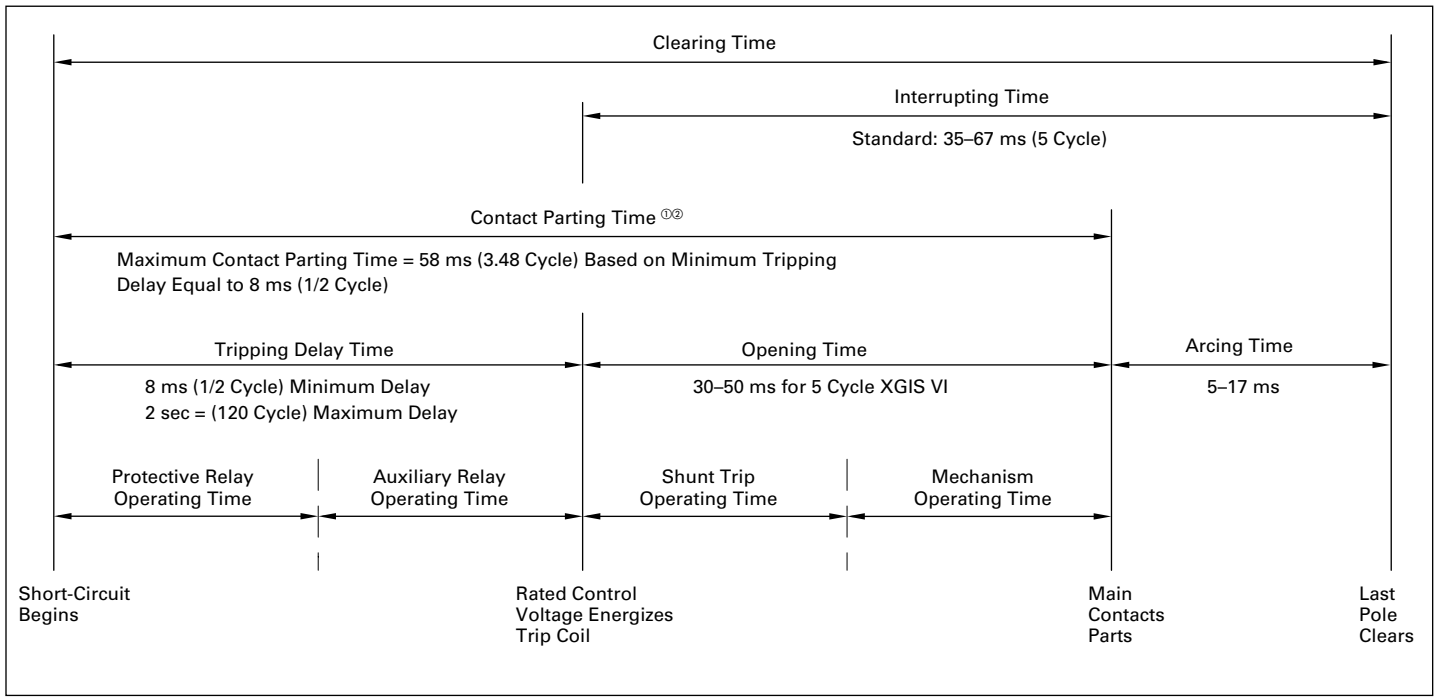


Figure 12.1-1. Sequence of Events and Circuit Breaker Operating Times

① Times shown are based on 60 Hz.

② % DC component capability (and asymmetry factor S) depend on the minimum contact parting time. The % DC component capability is M 50% (S factor M 1.2) for all circuit breakers.

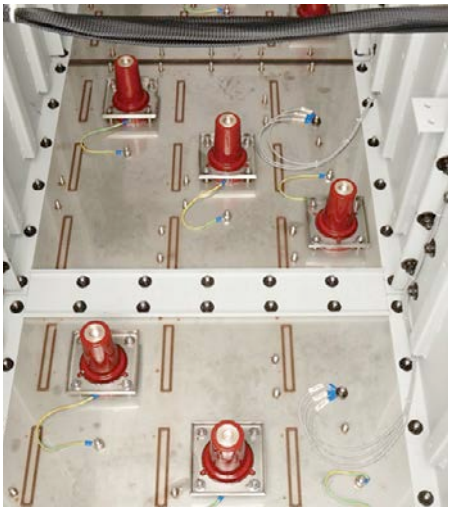
Bus Compartment

The bus compartment contains the main bus for the switchgear lineup and is located at top of the switchgear. The main bus is constructed in three separate isolated phases using a solid shielded insulated bus design.

The bus is a stocked item and is purchased by voltage, either 1250 A or 2500 A. Standard connections are located on the tank and used to attach the bus in the field, and are factory installed. Attaching or removing the bus does not require removal of panels or SF6 gas.

The construction of the bus consists of four separate layers. The center of the bus is copper bar. As the layers progress outward, the bus consists of a layer of insulating rubber, a metal grounding barrier and a final layer of insulating rubber on the exterior.

The bus construction allows for current transformers to be mounted directly on the bus.



XGIS Bus Compartment

Cable Compartment

The cable compartment is located at the front of the equipment in the bottom section. The operator is able to access the cable compartment by removing the bolted cover that is located on the front of the switchgear. The switchgear is considered front accessible.

Eaton's XGIS vacuum switchgear can be configured for cable or bus (SSIS for tie and sectionalizing sections) output connections. When cable connections are employed, Eaton's Cooper Power™ series DTS1242 bolted tee and DTB1242 bolted companion tee connectors are used with appropriately sized shielded power cable to connect the cable bushings to the vertical section's load.

Eaton's Cooper Power series DTS1242 and DTB1242 connectors are designed for single-conductor application. Eaton will supply the Cooper Power connectors as a standard, but other manufacturers equivalent connectors can be used as well. The bushing connect is IEC Type C.

Eaton's XGIS switchgear designs are furnished in two rating ranges: up to 1250 A output or up to 2500 A output. When cable connected, the cable bushings are configured as single bushings per phase for the 1250 A design, and dual bushings per phase for the 2500 A design.

The XGIS cable bushings can accommodate up to three connectors per phase bushing—as either one tee connector and two bolted companion tee connectors, or one tee connector and one bolted companion tee connector per phase if a surge arrester is also connected.

2000/2500 A Cable Compartment

1250 A Cable Compartments

Cable Connectors

Table 12.1-3. DTS1242 Bolted Tee Connector Catalog Numbering System

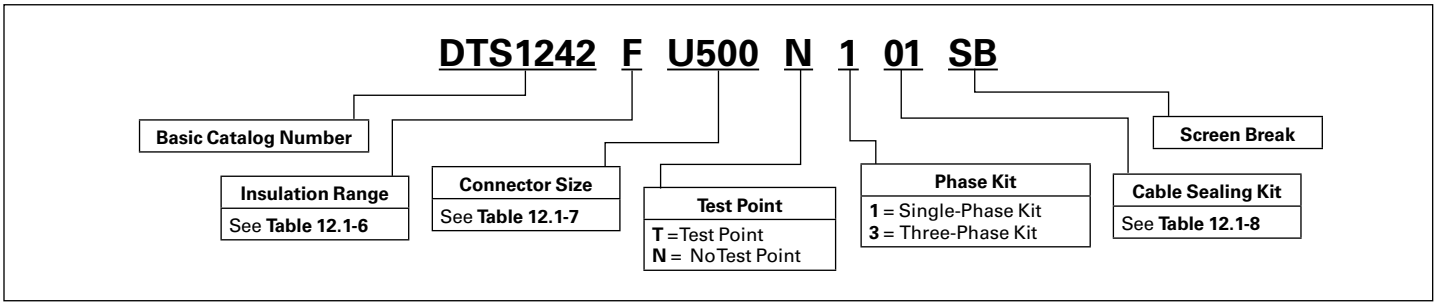
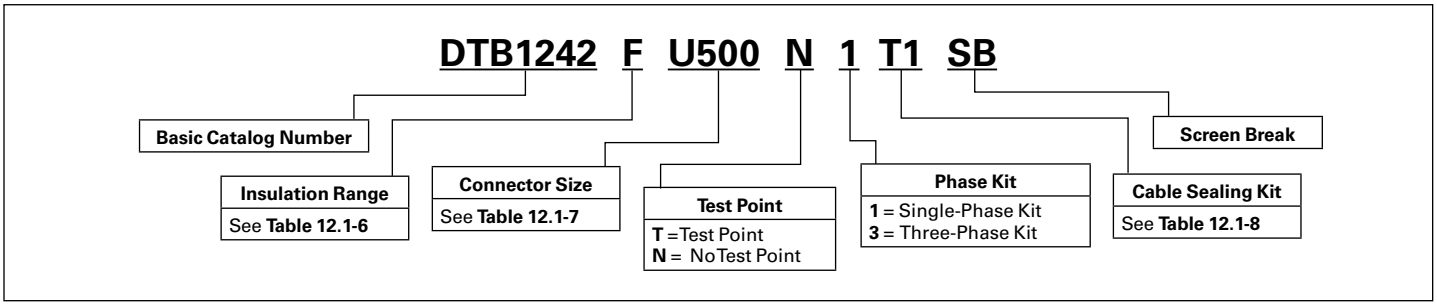


Table 12.1-4. DTB1242 Bolted Companion Tee Connector Catalog Numbering System



Cooper DTS1242 Bolted Tee and DTB1242 Companion Tee Connector Configuration

Table 12.1-5. Electrical Ratings

Description	Rating
Maximum Rated System Voltage	42 kV
Basic Impulse Level	200 kV
AC Voltage Withstand (5 min.)	93.5 kV
DC Voltage Withstand (15 min.)	125 kV
Continuous Current	1250 A
Thermal Short Circuit, 3 sec.	45 kA
Dynamic Short Circuit	100 kA

Table 12.1-6. Cable Range

Insulation Range Designation	Cable Insulation Range (mm)	
	Minimum	Maximum
A	28.2	32.3
B	31.1	35.7
C	35.0	39.1
D	37.2	41.6
E	40.1	44.8
F	42.9	47.9
G	46.5	51.9
H	50.0	56.0

Table 12.1-7. Conductor Size

Connector Size (mm^2)	DIN Types	Mechanical Type
95 120	U095 U120	S150 S150
150 185 240 300	U150 U185 U240 U300	S300 S300 S300 S300
400 500 630	U400 U500 U630	S400 S630 S630
800	—	S800

Table 12.1-8. Cable Sealing Kits

00	No sealing kit required
01	Basic tape kit with sealing mastic and tape for one single core cable with copper screen wires (3 tape kits included with three-phase kit)

Three-Position Disconnect Switch

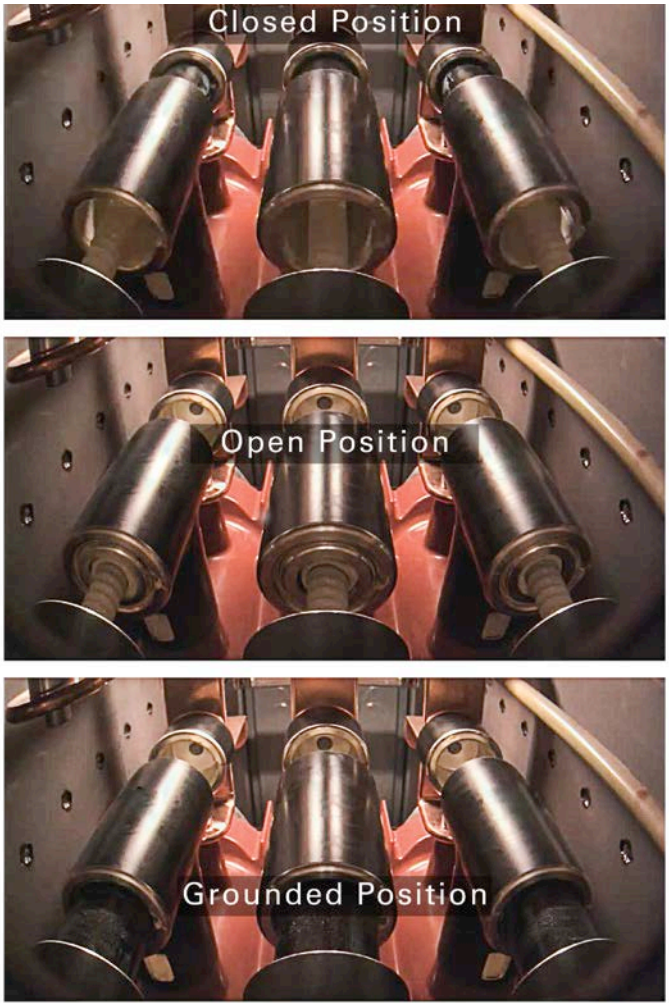
The three-position disconnect switch is located in the SF6 tank and the operating mechanism is located external to the tank. It is a non-load breaker device, only intended to connect downstream elements to the input source under no-load (open circuit) conditions. The switch can be operated electrically or manually via t-handle accessory provided with the switchgear.

The grounded and closed (connected) position contacts are sockets, electrically connected to their respective bus ground or incoming power. A center socket between the ground and main bus is connected to the circuit breaker. The screw driven connection moves to connect the circuit breaker to either ground, open or closed positions.

A viewing port is available to observe the three-position disconnect switch. This port is available for mounting a camera if desired. The camera can be used during maintenance and operation procedures to verify switch location (ground, open and closed) as shown below.

Table 12.1-9. Three-Position Disconnect Switch Operations

Rated Maximum Voltage kV rms	Mechanical Operations
5, 15, 27, 38 kV	2000



Three-Position Disconnector Switch Positions

Voltage Transformers

Voltage transformers for XGIS switchgear have been selected according to IEC standards, as referenced above: IEC 61869-1 (Instrument Transformers) and IEC 61869-3 (Inductive Voltage Transformers).

Chosen for application either inside or outside the vertical section, VTs are metal-clad single-pole transformers, insulated and cast with epoxy resin for indoor application. The resin body is covered with a welded grounded aluminum box. The VTs are suitable for installation inside or outside of the switchgear and meet all relevant international standards.

The primary coil and core together with the secondary winding(s) are completely resin embedded and cast in a single step process. The secondary terminals are integrated in the resin body and protected by the aluminum box.

XGIS VTs can be furnished as either fused or unfused units.

Fused VTs can be furnished for the vertical section main bus (located behind the main bus bushings compartment), or for the cable side connections, mounted outside the vertical section.

Unfused VTs can be furnished for the vertical section main bus (located behind the main bus bushings compartment), or for the cable side connections, mounted below and behind the vertical section tank.

Table 12.1-10. Voltage Specifications

Nominal System Voltage (kV, rms)	Maximum System Voltage (kV, rms)	Lightning Impulse Voltage (BIL) (kV, peak)		Power Frequency Withstand Voltage (kV, rms)	
		Full Wave	Chopped Wave	Dry	Wet
2.4 5.0 8.7 15.0	2.75 5.60 9.52 15.5	45 60 75 95	54 69 88 110	15 19 26 34	13 20 24 30
15.0 25.0 25.0 34.5	15.5 25.5 25.5 36.5	110 125 150 200	130 145 175 230	34 40 50 70	34 36 50 70

Current Transformers

XGIS current transformers are designed according to IEEE and IEC standards. Instrument transformers can be mounted on the cable bushings and the main bus. Each mounting location will require its own style of CT. Refer to **Table 12.1-11**—**Table 12.1-14** for high accuracy available cable bushing CTs.

Table 12.1-11. XGIS 1250 A Current Transformers (Cable Side)

Current Ratio	ANSI Relay Class	ANSI Metering Accuracy at 60 Hz					TRF at 30 °C	CT Depth Inches (mm)
		B0.1	B0.2	B0.5	B0.9	B1.8		
50/5	—	4.8	—	—	—	—	1.33	3.75 (95.3)
75/5	C10	2.4	2.4	—	—	—	1.33	3.75 (95.3)
100/5	C10	1.2	2.4	—	—	—	1.33	3.75 (95.3)
150/5	C20	0.6	1.2	2.4	—	—	1.33	3.75 (95.3)
200/5	C20	0.6	0.6	1.2	2.4	—	1.33	3.75 (95.3)
300/5	C20	0.3	0.3	0.6	1.2	2.4	1.33	3.75 (95.3)
400/5	C50	0.3	0.3	0.6	0.6	1.2	1.33	3.75 (95.3)
600/5	C50	0.3	0.3	0.3	0.3	0.6	1.33	3.75 (95.3)
800/5	C100	0.3	0.3	0.3	0.3	0.3	1.33	3.75 (95.3)
1200/5	C100	0.3	0.3	0.3	0.3	0.3	1.33	3.75 (95.3)
1500/5	C100	0.3	0.3	0.3	0.3	0.3	1.33	3.75 (95.3)
50/5	C10	2.4	—	—	—	—	1.33	6.00 (152.4)
75/5	C20	1.2	2.4	—	—	—	1.33	6.00 (152.4)
100/5	C20	0.6	1.2	2.4	—	—	1.33	6.00 (152.4)
150/5	C20	0.3	0.6	1.2	1.2	2.4	1.33	6.00 (152.4)
200/5	C50	0.3	0.3	0.6	1.2	2.4	1.33	6.00 (152.4)
300/5	C50	0.3	0.3	0.3	0.6	1.2	1.33	6.00 (152.4)
400/5	C100	0.3	0.3	0.3	0.3	0.6	1.33	6.00 (152.4)
600/5	C100	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)
800/5	C200	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)
1200/5	C200	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)
1500/5	C200	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)

Table 12.1-12. XGIS 2000/2500 A Current Transformers (Cable Side)

Current Ratio	ANSI Relay Class	ANSI Metering Accuracy					TRF at 30 °C	CT Depth Inches (mm)
		B0.1	B0.2	B0.5	B0.9	B1.8		
1500/5	C50	0.3	0.3	0.3	0.3	0.3	1.33	4.00 (101.6)
2000/5	C100	0.3	0.3	0.3	0.3	0.3	1.33	4.00 (101.6)
2500/2	C100	0.3	0.3	0.3	0.3	0.3	1.33	4.00 (101.6)
3000/5	C200	0.3	0.3	0.3	0.3	0.3	1.33	4.00 (101.6)
1500/5	C170	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)
2000/5	C200	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)
2500/2	C200	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)
3000/5	C300	0.3	0.3	0.3	0.3	0.3	1.33	6.00 (152.4)

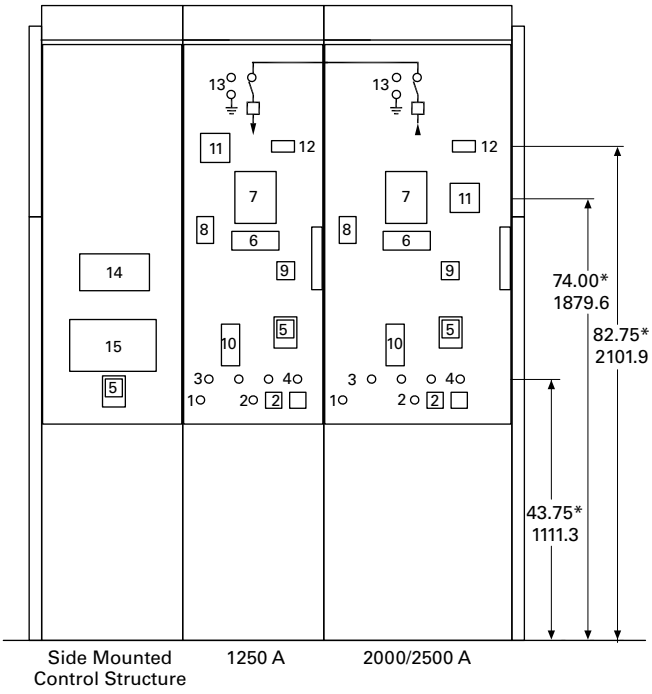
Table 12.1-13. XGIS 1250 A Current Transformers (Main Bus)

Current Ratio	ANSI Relay Class	ANSI Metering Class at 60 Hz					TRF at 30 °C	TRF at 55 °C	CT Depth Inches (mm)
		B0.1	B0.2	B0.5	B0.9	B1.8			
50/5	C10	2.4	4.8	—	—	—	2.0	2.0	3.25 (82.6)
75/5	C10	1.2	2.4	4.8	—	—	2.0	2.0	3.25 (82.6)
100/2	C10	1.2	1.2	2.4	4.8	—	2.0	2.0	3.25 (82.6)
150/5	C20	0.6	0.6	1.2	2.4	4.8	2.0	2.0	3.25 (82.6)
200/5	C20	0.3	0.3	0.6	1.2	2.4	2.0	2.0	3.25 (82.6)
250/5	C50	0.3	0.3	0.6	1.2	1.2	2.0	2.0	3.25 (82.6)
300/2	C50	0.3	0.3	0.6	0.6	1.2	2.0	2.0	3.25 (82.6)
400/5	C100	0.3	0.3	0.3	0.6	0.6	2.0	1.5	3.25 (82.6)
500/5	C100	0.3	0.3	0.3	0.3	0.6	2.0	1.5	3.25 (82.6)
600/5	C100	0.3	0.3	0.3	0.3	0.3	1.5	1.33	3.25 (82.6)
750/2	C100	0.3	0.3	0.3	0.3	0.3	1.5	1.0	3.25 (82.6)
800/5	C100	0.3	0.3	0.3	0.3	0.3	1.5	1.0	3.25 (82.6)
1000/5	C200	0.3	0.3	0.3	0.3	0.3	1.5	1.0	3.25 (82.6)
1200/5	C200	0.3	0.3	0.3	0.3	0.3	1.33	1.0	3.25 (82.6)
1500/2	C200	0.3	0.3	0.3	0.3	0.3	1.0	0.8	3.25 (82.6)
1600/5	C200	0.3	0.3	0.3	0.3	0.3	1.0	0.8	3.25 (82.6)

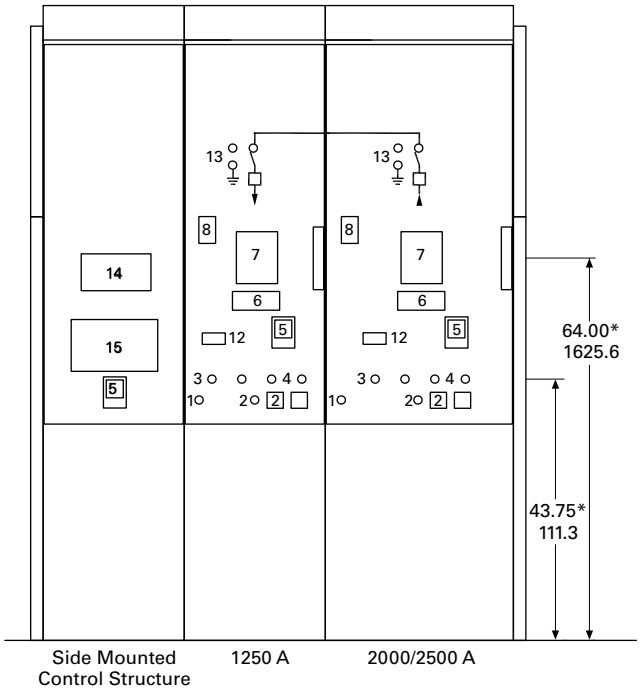
Table 12.1-14. XGIS 2000/2500 A Current Transformers (Main Bus)

Current Ratio	ANSI Relay Class	ANSI Metering Class at 60 Hz					TRF at 30 °C	TRF at 55 °C	CT Depth Inches (mm)
		B0.1	B0.2	B0.5	B0.9	B1.8			
50/5	—	2.4	4.8	—	—	—	2.0	2.0	4.00 (101.6)
75/5	C10	1.2	2.4	4.8	—	—	2.0	2.0	4.00 (101.6)
100/2	C10	1.2	1.2	2.4	4.8	—	2.0	2.0	4.00 (101.6)
150/5	C20	0.6	0.6	1.2	2.4	4.8	2.0	2.0	4.00 (101.6)
200/5	C20	0.3	0.6	1.2	1.2	2.4	2.0	2.0	4.00 (101.6)
250/5	C20	0.3	0.3	0.6	1.2	1.2	2.0	2.0	4.00 (101.6)
300/2	C50	0.3	0.3	0.6	0.6	1.2	2.0	2.0	4.00 (101.6)
400/5	C50	0.3	0.3	0.3	0.3	0.6	2.0	2.0	4.00 (101.6)
500/5	C50	0.3	0.3	0.3	0.3	0.3	2.0	1.5	4.00 (101.6)
600/5	C100	0.3	0.3	0.3	0.3	0.3	2.0	1.33	4.00 (101.6)
750/2	C100	0.3	0.3	0.3	0.3	0.3	1.5	1.0	4.00 (101.6)
800/5	C100	0.3	0.3	0.3	0.3	0.3	1.5	1.0	4.00 (101.6)
1000/5	C100	0.3	0.3	0.3	0.3	0.3	1.5	1.0	4.00 (101.6)
1200/5	C100	0.3	0.3	0.3	0.3	0.3	1.33	1.0	4.00 (101.6)
1500/2	C100	0.3	0.3	0.3	0.3	0.3	1.0	0.8	4.00 (101.6)
1600/5	C100	0.3	0.3	0.3	0.3	0.3	1.0	0.8	4.00 (101.6)
2000/5	C200	0.3	0.3	0.3	0.3	0.3	1.0	0.8	4.00 (101.6)
2500/5	C200	0.3	0.3	0.3	0.3	0.3	1.0	0.8	4.00 (101.6)
3000/2	C200	0.3	0.3	0.3	0.3	0.3	1.0	0.8	4.00 (101.6)
3200/5	C200	0.3	0.3	0.3	0.3	0.3	1.0	0.8	4.00 (101.6)

Sample Layouts



Structure Front Elevation View (Standard)
(* All Values Are Approximate)
Dimensions Do Not Include a Housekeeping Pad



Structure Front Elevation View with the
Optional 5-inch Compartment Extension
(* All Values Are Approximate)
Dimensions Do Not Include a Housekeeping Pad

1. Camera viewing port (optional)
2. Control switches (30.5 mm or electroswitch series 24)
3. Isolation switch position IL (30.5 mm)
4. Isolation switch control (30.5 mm)
5. Lockout relay (electroswitch)
6. Test switch
7. EDR protective relay
8. Gas pressure viewing port (standard)
9. Isolation switch viewing port (optional)
10. Breaker position viewing port (optional)
11. Power Xpert meter
12. Capacitive voltage sensing display
13. Isolation switch position IL (30.5 mm)
14. HMi (optional, used when required by project scope and specifications)
15. EBR bus differential relay (optional)

Figure 12.1-2. GIS Front View Control Space—Dimensions in Inches (mm)

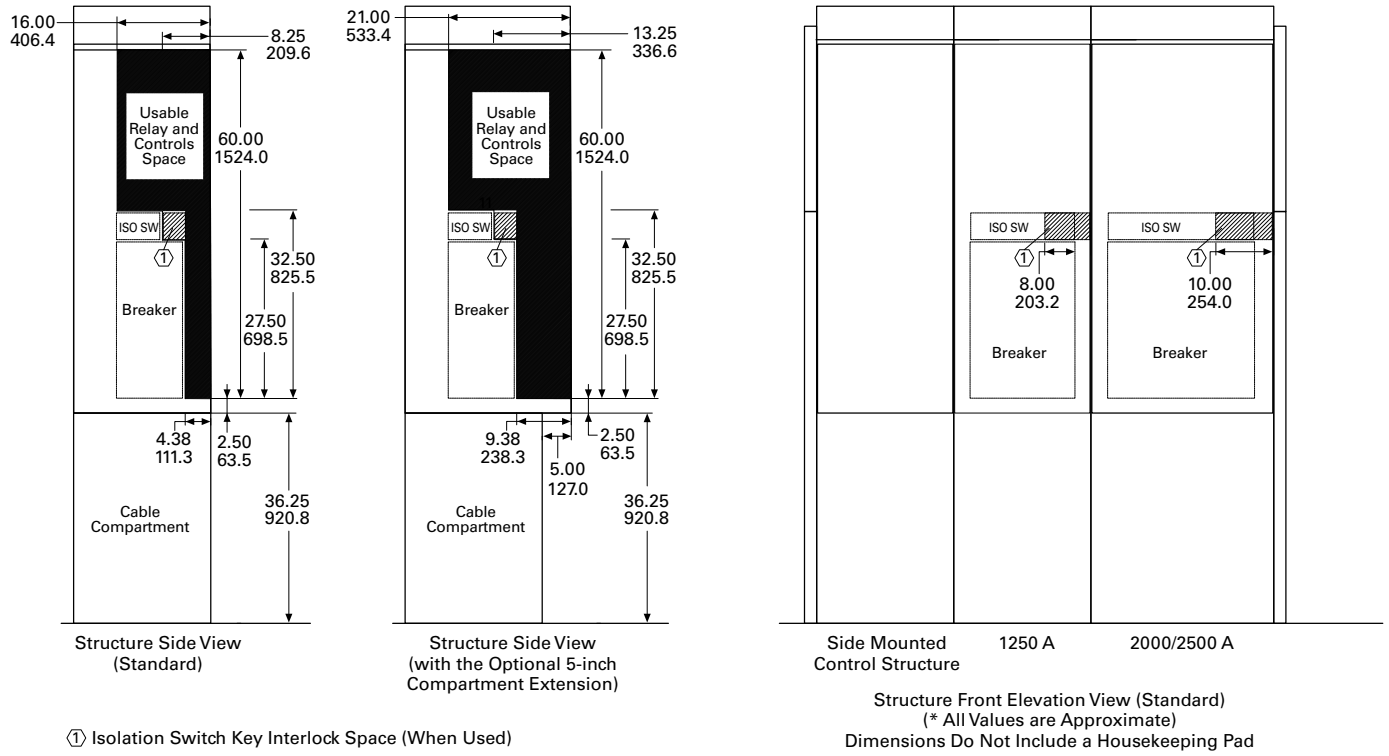


Figure 12.1-3. GIS Side View Control Space—Dimensions in Inches (mm)

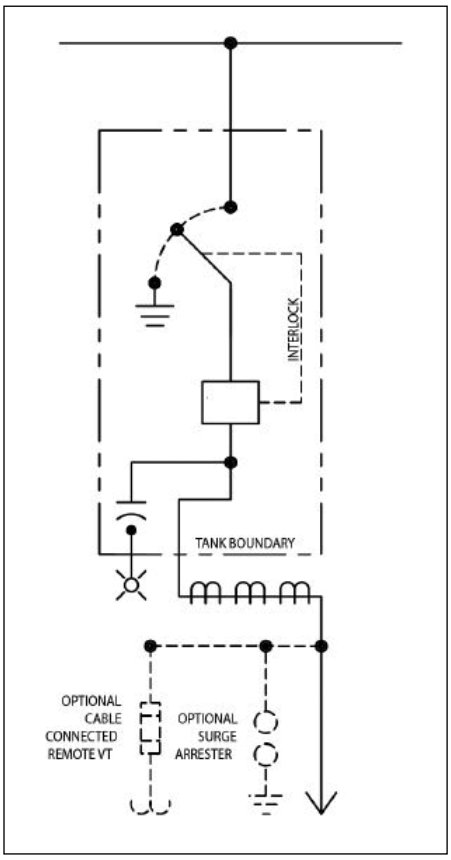


Figure 12.1-4. XGIS Main and Feeder Tank

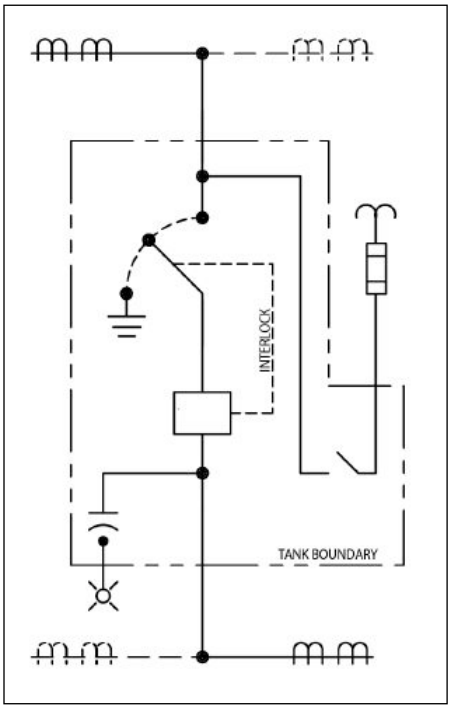


Figure 12-5. XGIS Bus Tie Tank

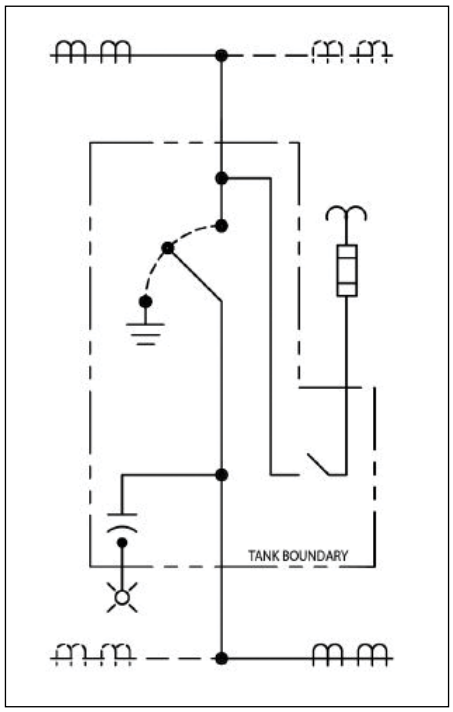


Figure 12.1-6. XGIS Bus Sectionalizer

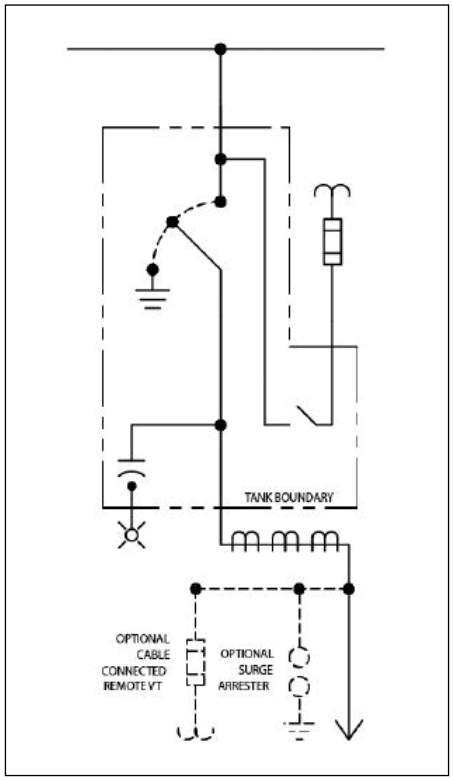


Figure 12.1-7. XGIS Bus Disconnector

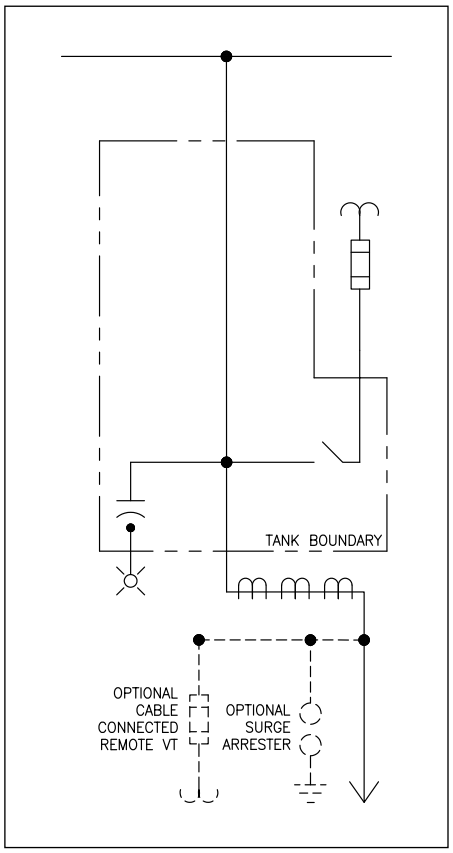


Figure 12.1-8. XGIS Cable Connector

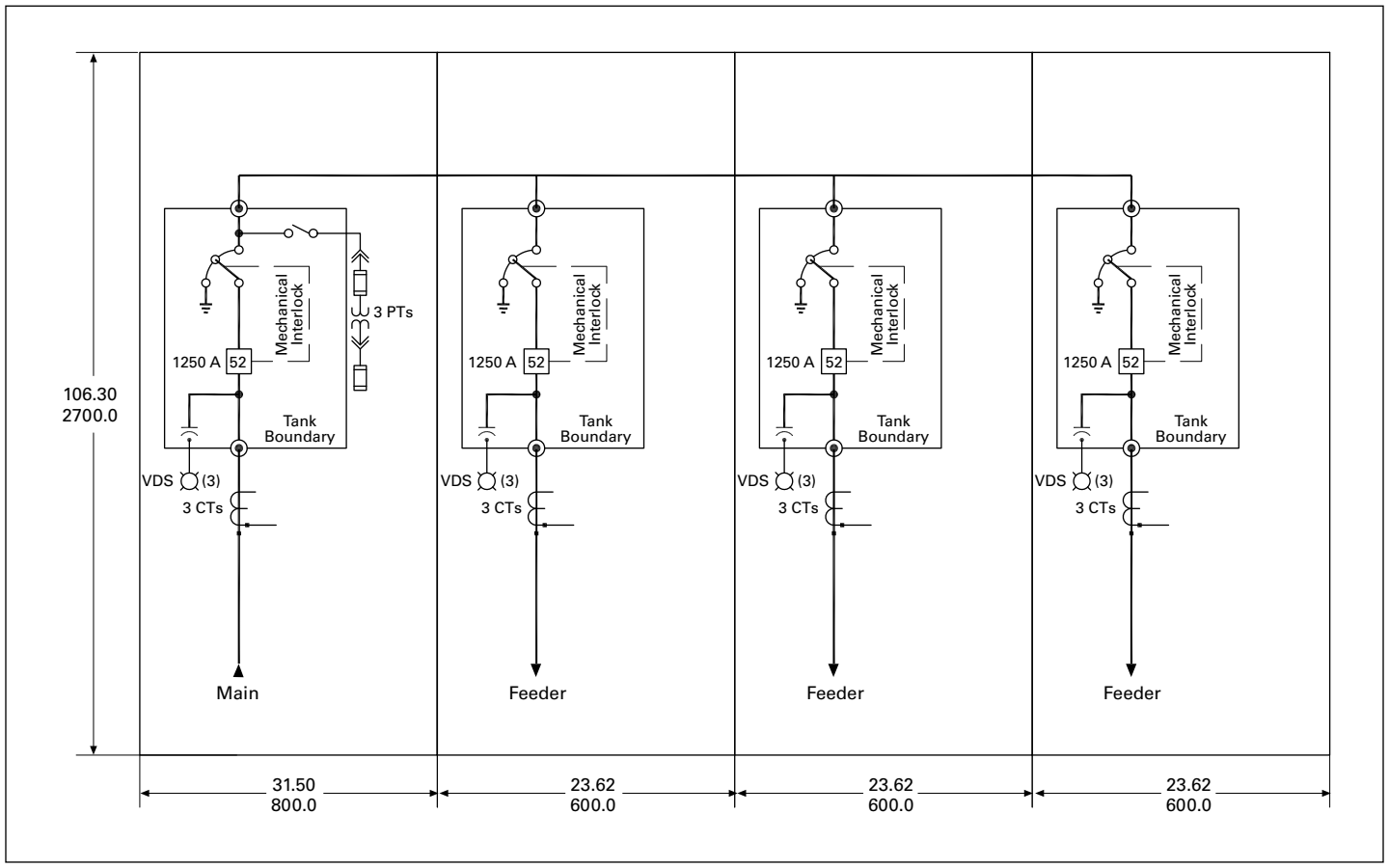


Figure 12.1-9. Main 2500 A—Feeders 1250 A—Dimensions in Inches (mm)

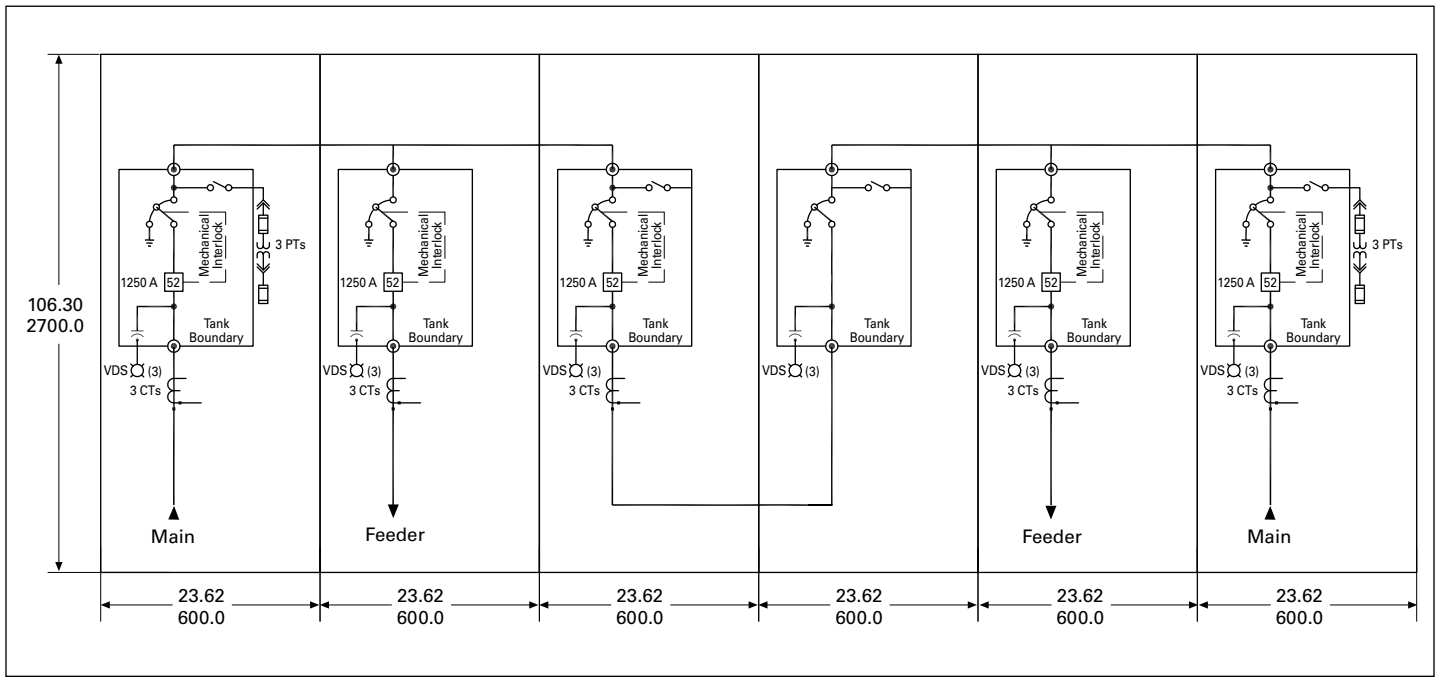


Figure 12.1-10. Main-Tie-Main 1200 A—Dimensions in Inches (mm)

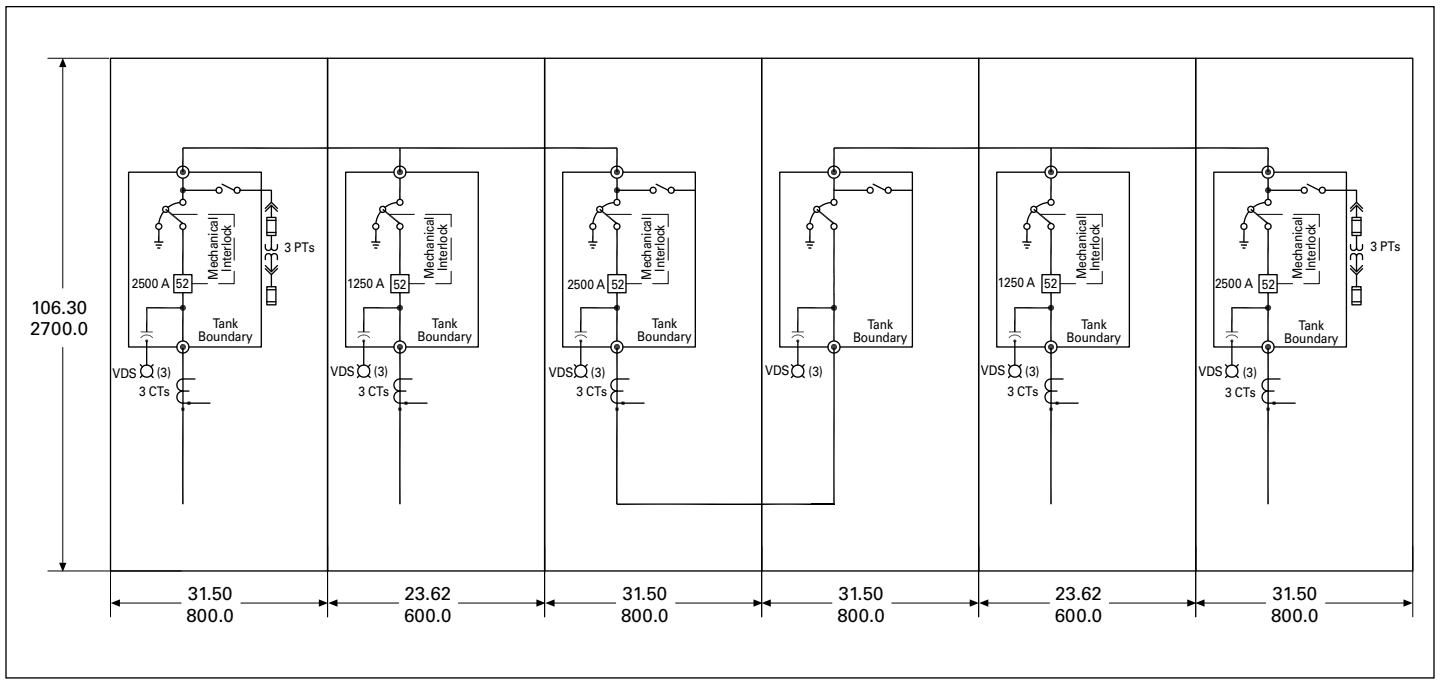


Figure 12.1-11. Main-Tie-Main 2500 A—Dimensions in Inches (mm)

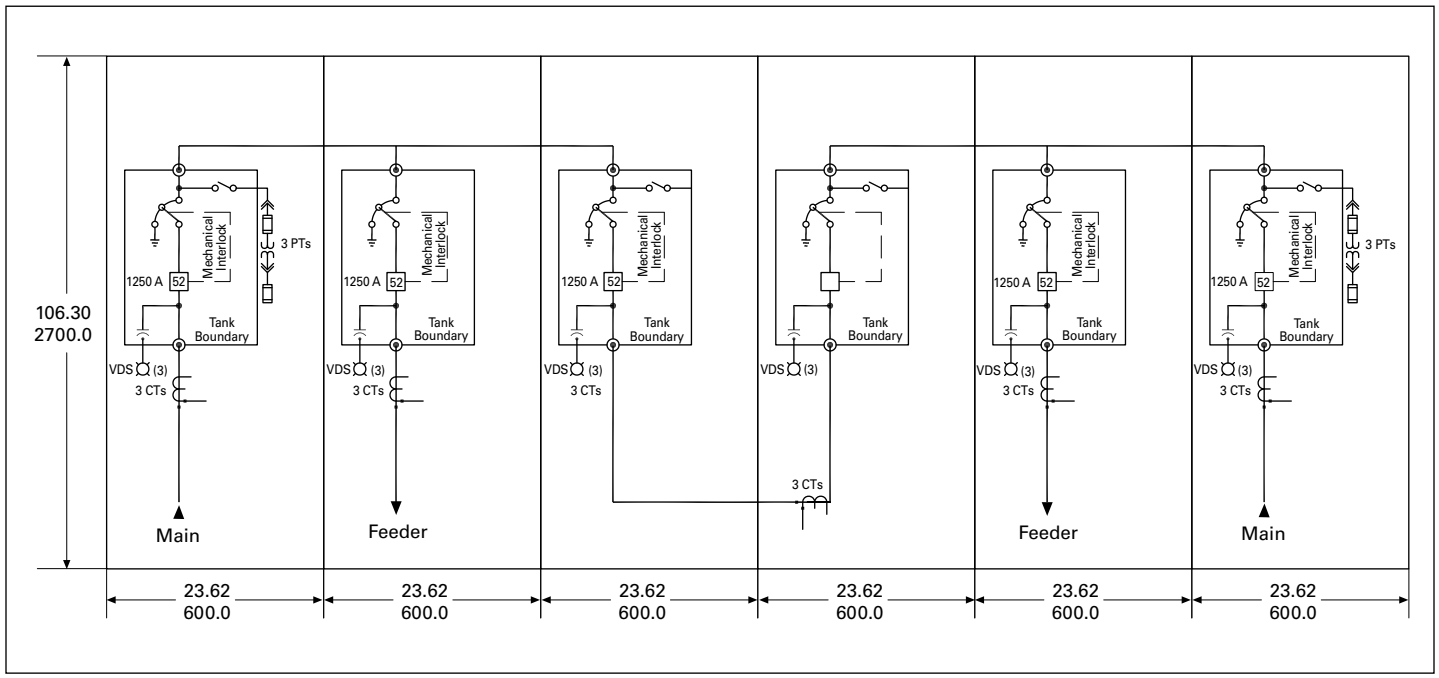


Figure 12.1-12. Main-Tie-Tie-Main 1250 A—Dimensions in Inches (mm)

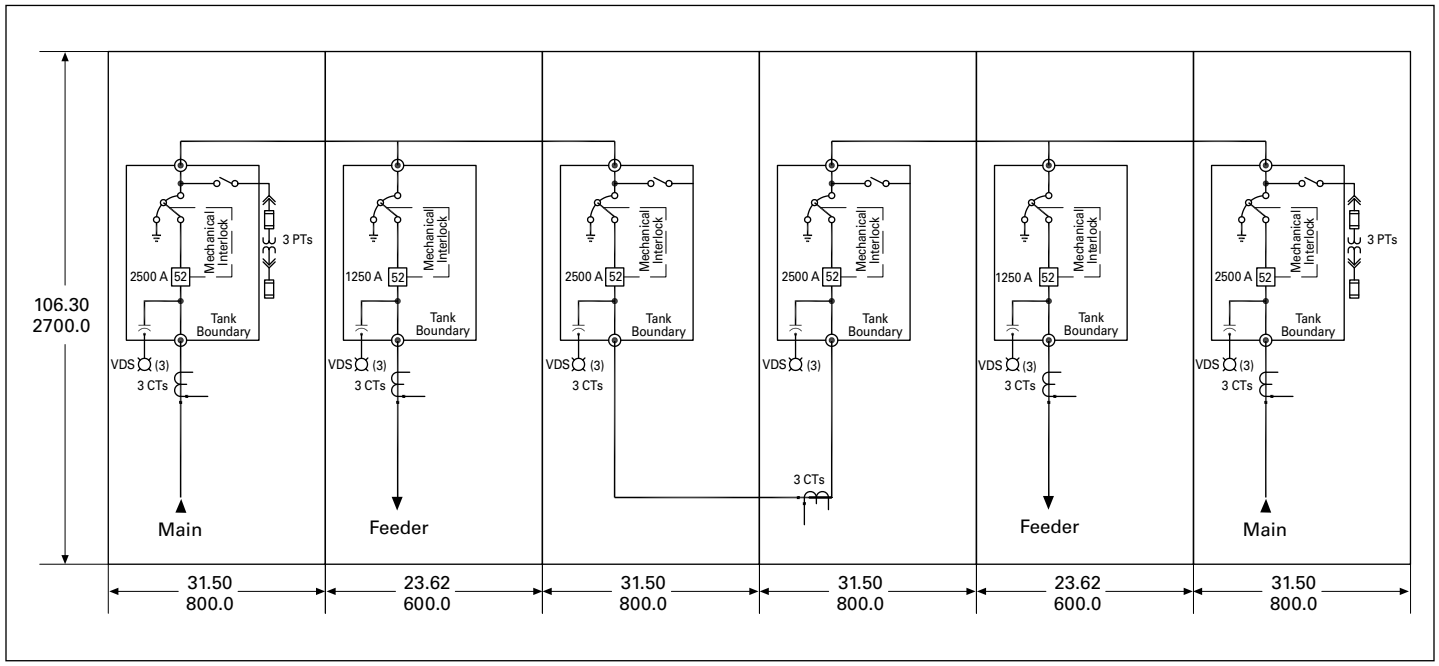
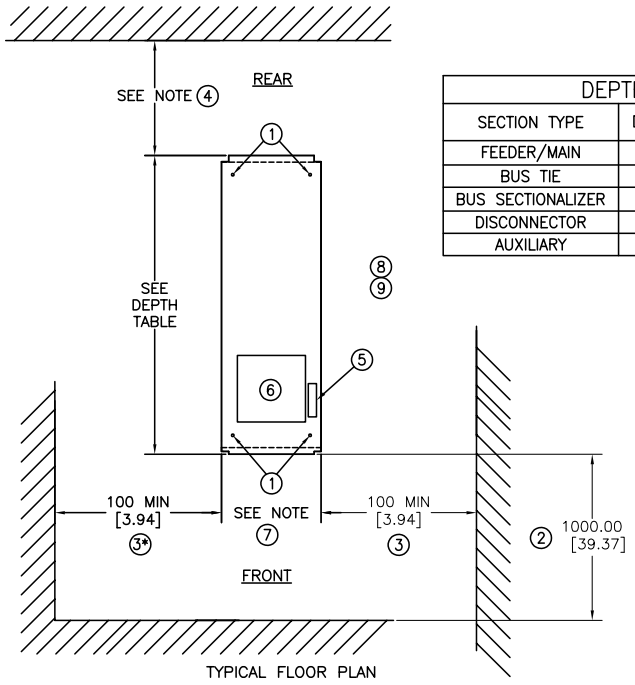


Figure 12.1-13. Main-Tie-Tie-Main 2500 A—Dimensions in Inches (mm)



TYPICAL FLOOR PLAN

DEPTH TABLE		
SECTION TYPE	DEPTH (MM)	DEPTH (IN)
FEEDER/MAIN	1800	70.87
BUS TIE	1800	70.87
BUS SECTIONALIZER	1800	70.87
DISCONNECTOR	1800	70.87
AUXILIARY	575	22.64

NOTE:

1. THESE ARE THE LOCATIONS OF 18 [0.71] DIAMETER MOUNTING HOLES FOR SECURING A POWER XPERT XGIS SWITCHGEAR ASSEMBLY VERTICAL SECTION TO A FINISHED FOUNDATION. USE OF 16 [0.625] DIAMETER SAE GRADE 5 HARDWARE TIGHTENED TO 183 N–M [135 FT–LB] IS RECOMMENDED. USE OF OTHER POST–INSTALLED MECHANICAL ANCHOR SYSTEMS, BONDED/ADHESIVE TYPE SYSTEMS, PRE–INSTALLED CAST–IN–PLACE SYSTEMS SUCH AS SHEAR LUGS, L–BOLTS, AND J–BOLTS OR PLUG WELDING THE XGIS SWITCHGEAR VERTICAL SECTION AT THE MOUNTING HOLE LOCATIONS TO CAST–IN–PLACE STRUCTURAL STEEL MATERIALS OR TO A STEEL HOUSE FOUNDATION IS SOLE RESPONSIBILITY OF OTHERS. ALTERNATIVE MOUNTING SYSTEMS MUST HAVE EQUAL OR GREATER AVERAGE ULTIMATE TENSILE AND SHEAR LOAD CAPABILITIES AS SAE GRADE 5 HARDWARE. IN ADDITION TO LOAD CAPABILITIES OF THE MOUNTING SYSTEM, THE BEARING STRENGTH AND BEARING SURFACE AT EACH XGIS SWITCHGEAR VERTICAL SECTION MOUNTING HOLE LOCATION MUST BE TAKEN INTO ACCOUNT. ALTERNATIVE MOUNTING SYSTEMS MUST PROVIDE EQUAL OR GREATER BEARING PROPERTIES AS A KEY BELLEVILLES, INC., K1125–E–125 WASHER OR OTHER MANUFACTURER'S EQUAL DEVICE USED WITH SAE GRADE 5 HARDWARE AT EACH POWER XPERT XGIS ANCHOR LOCATION. CONSULT A LICENSED STRUCTURAL OR CIVIL ENGINEER PRIOR TO SELECTING A MOUNTING SYSTEM IF A SYSTEM OTHER THAN THAT RECOMMENDED IS PREFERRED.

2. MINIMUM FRONT CLEARANCE SUGGESTED. THE LOCAL AUTHORITY HAVING JURISDICTION MAY ALSO REQUIRE A LARGER DISTANCE.

3. MINIMUM LEFT OR RIGHT CLEARANCE ALONG ENDS OF LINEUP. SEE THE POWER XPERT XGIS ASSEMBLY SPECIFIC FLOOR PLAN TO DETERMINE APPLICABLE DIMENSIONS. * LEFT SIDE MAY REQUIRE GREATER DISTANCE DEPENDING ON DOOR SWING REQUIREMENTS. THE LOCAL AUTHORITY HAVING JURISDICTION MAY REQUIRE A LARGER DISTANCE.

4. THE MINIMUM REAR CLEARANCE REQUIRED FOR NON–ACCESSABLE REAR IS 50.0 [2.0]. FOR REAR ACCESSABLE GEAR, THE MINIMUM CLEARANCE IS 800 [31.50]. THE LOCAL AUTHORITY HAVING JURISDICTION MAY REQUIRE A LARGER DISTANCE.

5. LOCATION OF LOW VOLTAGE CONTROL CONDUIT WIRING OPENING. CONDUITS ARE LIMITED TO A PROJECTION OF 25.4 [1.00] ABOVE THE FINISHED FLOOR OR INSIDE THE TOP COVER WHEN SUCH CONDUIT ENTRY IS FROM THE TOP. MAXIMUM CONDUIT SIZE IS 31.8 [1.25].

6. LOCATION OF HIGH VOLTAGE CABLE CONDUIT ENTRY. CONDUIT PROJECTION MUST NOT EXCEED 50.0 [2.0].

7. FOR 1250 AMP APPLICATIONS, SECTION WIDTH IS 600 [23.62].
FOR 2000 AMP APPLICATIONS, SECTION WIDTH IS 800 [31.50].

8. THE INTER–UNIT TIE FASTENERS TO JOIN THE SHIPPING GROUPS TOGETHER MUST BE INSTALLED AND PROPERLY TIGHTENED WHEN A POWER XPERT XGIS ASSEMBLY IS INSTALLED ON THE FOUNDATION. FAILURE TO JOIN THE SHIPPING GROUPS TOGETHER COULD RESULT IN DAMAGE TO THE EQUIPMENT DURING AN EARTHQUAKE. A MINIMUM OF TWO SWITCHGEAR SECTIONS OR ONE SECTION CONNECTED TO OTHER CLOSE COUPLED EQUIPMENT ARE REQUIRED TO MEET THE SEISMIC CAPABILITY.

9. THE FINISHED FOUNDATION SURFACE SHALL BE FLAT AND LEVEL WITHIN 3 MM [0.12 IN] 800 MM [31.5 IN] IN ANY DIRECTION, LEFT TO RIGHT, FRONT TO BACK, AND DIAGONALLY. ALTERNATIVELY A LOCAL FLATNESS VALUE OF 50 OR VALUE OF 37 TO 40 AS DEFINED IN INDUSTRY STANDARD ASTM–E1155–96 AND HIGHER AND AN ACCOMPANYING INDUSTRY STANDARD ACI 117–90 MAY BE USED TO ESTABLISH THE FLATNESS AND LEVELNESS OF THE FINISHED FOUNDATION . IT IS RECOMMENDED BUT NOT NECESSARY TO FINISH THE FOUNDATION TO THE SAME REQUIREMENTS IN FRONT OF THE XGIS SWITCHGEAR ASSEMBLY IN A TRAFFIC AREA DEFINED BY THE END USER. THE MINIMUM RECOMMENDED FOUNDATION AND ANCHORING SYSTEM REQUIREMENTS ARE SUFFICIENT TO WITHSTAND THE COMBINED TENSILE AND OVERTURNING REACTIVE FORCES IMPOSED ON THE FOUNDATION AT THE XGIS SWITCHGEAR ASSEMBLY MOUNTING POINTS DURING A SEISMIC EVENT. ANY DEVIATION FROM THESE RECOMMENDATIONS IS THE SOLE RESPONSIBILITY OF END USER. CONSULT WITH A LICENSED STRUCTURAL OR CIVIL ENGINEER IF SOME OTHER FOUNDATION METHODS ARE TO BE CONSIDERED.

Figure 12.1-14. XGIS Floor Plan—Dimensions in mm (inches)

Installation Requirements

The XGIS switchgear is designed for installation in the electrical room over cable vaults. It is very important that the installed lineup be level and mounted on the same plane. Eaton recommends that the electrical room design include steel rails embedded in the vault concrete for mounting the XGIS switchgear.

The finished foundation surface shall be flat and level within 0.12 in over 31.5 in any direction, left to right, front to back, and diagonally. Alternatively, a local flatness value of 50 or higher and an accompanying value of 37 to 40 as defined in industry standards ASTM-E1155-96 and ACI 117-90 may be used to establish the flatness and levelness of the finished foundation.

XGIS minimum ceiling height requirements vary with the application. For vertical section lineups that do not include top-mounted fused voltage transformers, there is a minimum ceiling height requirement of 11.81 inches (300 mm) from the top of the gear to the ceiling.

For vertical section lineups that include top-mounted fused voltage transformers, the minimum ceiling height requirement is 47.24 inches (1200 mm) from the top of the structure to the ceiling. This clearance is required to facilitate replacement access to the vertical section voltage transformer compartment.

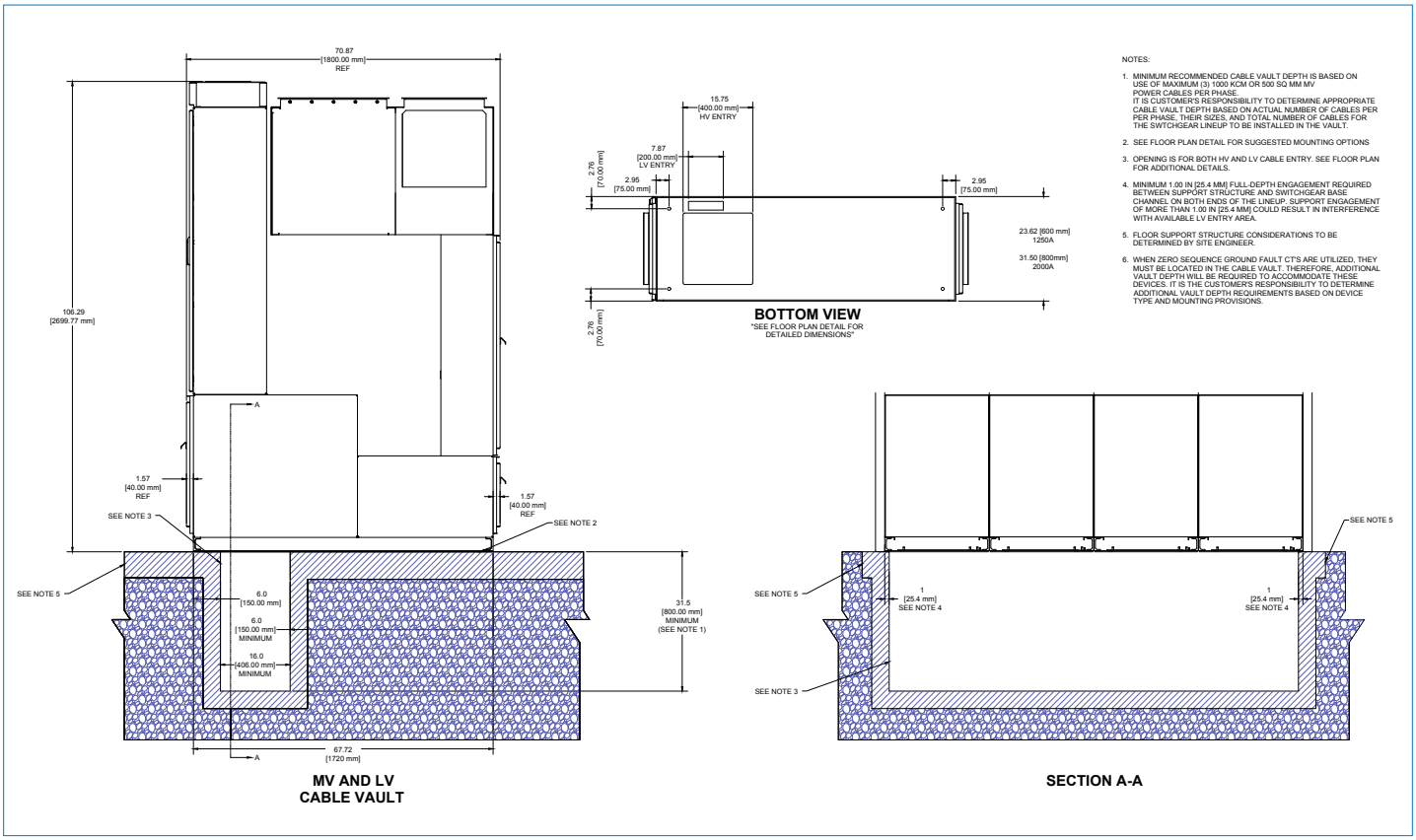


Figure 12.1-15. XGIS Cable Vault—Dimensions in Inches (mm)

Heat Loss

Table 12.1-15. Heat Loss Data

Heat Loss in Watts at Full Rating at 60 Hz				
Switchgear Assembly	**Breaker Rating**	**1250 A**	**2000 A**	**2500 A**
XGIS	5, 15, 27, 38 kV	700 W	925 W	1450 W
Other Components				
Each Cable CT 3.75 inches 1250 A Each Cable CT 6.5 inches 1250 A Each Bus CT 1250 A	50 W 100 W 50 W	— — —	— — —	— — —
Each Cable CT 4.00 inches 2000 A/2500 A Each Cable CT 6.00 inches 2000 A/2500 A Each Bus CT 2000 A/2500 A	50 W 100 W 50 W	— — —	— — —	— — —
Space Heater—Each	250 W	—	—	—

Weights

Table 12.1-16. Typical Weights ①

Vertical Section Type	Main Bus Rating Amperes	Structure with Tank	Add Voltage Transformer (Set of 3)	Add Current Transformer Cable Side (Set of 3)	Add Current Transformer Bus Side (Set of 3)
Breaker	1200 2000 2500	2900 3900 3900	400 400 400	120 180 180	120 150 150
Sectionalizer	1200 2000 2500	2600 3300 3300	400 400 400	120 180 180	120 150 150
Tie Breaker	1200 2000 2500	2900 3500 3500	400 400 400	120 180 180	120 150 150
Disconnector	1200 2000 2500	2600 3300 3300	400 400 400	120 180 180	120 150 150
Cable Connector	1200 2000 2500	2450 3150 3150	400 400 400	120 180 180	120 150 150

① All weights are in pounds.

Control Power Requirements

Table 12.1-17. Control Power Requirements

Control Power Options	Spring Charge Motor Power	Close Trip Power	UV Trip Power
120 Vac, 125 Vdc	90 W	242 W	108 W

XGIS Sample Schematics

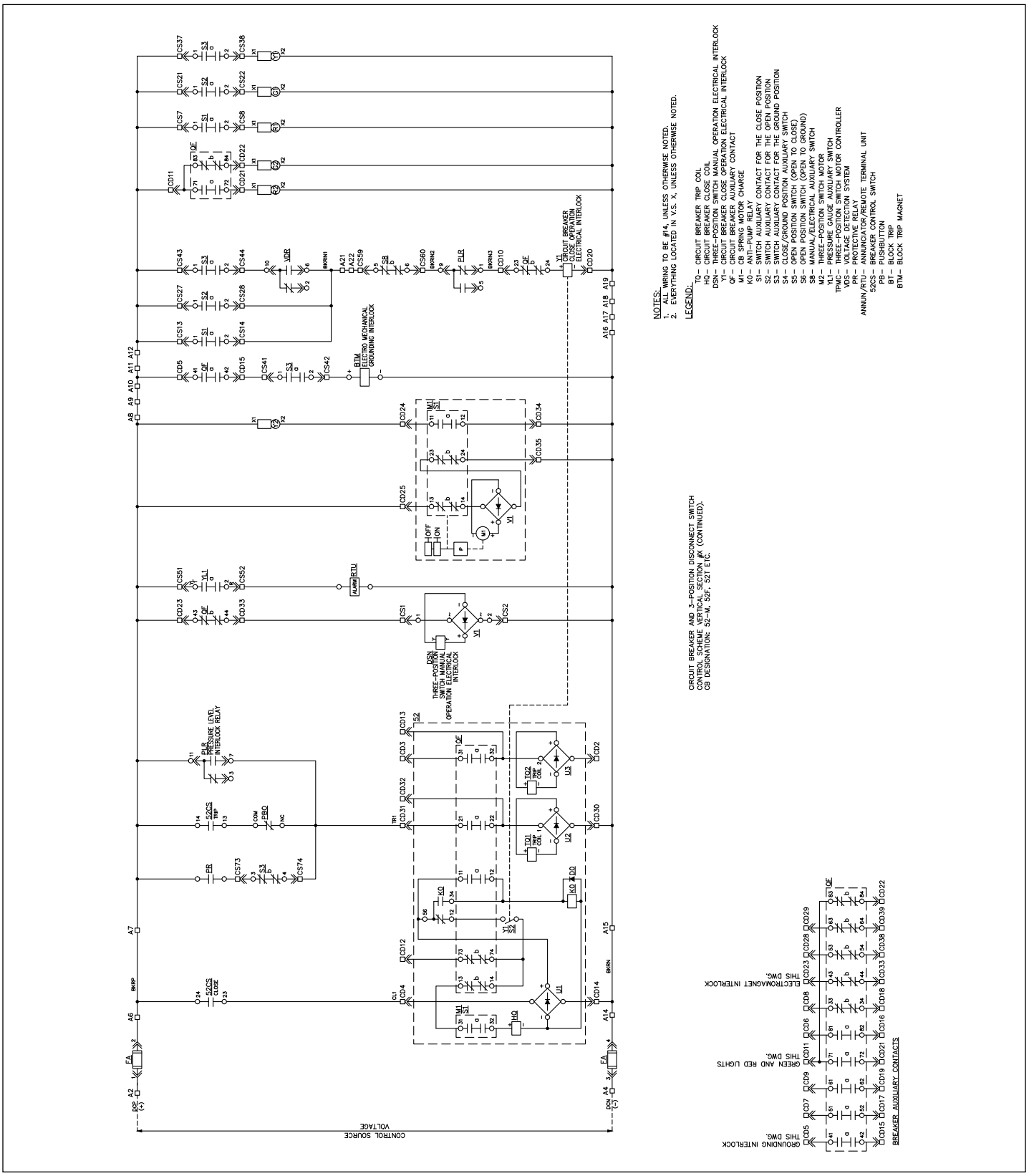


Figure 12.1-16. Sample Schematic

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