



5/15/27 kV, 25/31.5/50/63 kA
Manual Ground & Test Devices
Installation, Operations and
Maintenance Manual

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1. Important Safety Notes & Warnings

1.1 Safe Practices

It is mandatory that the instructions provided within this booklet be consulted to ensure safe interaction between the device and personnel and/or the facility and its equipment. The user has the responsibility of establishing a safety program that addresses the proper interaction with the equipment. This booklet is not intended to replace a safety program.

Only qualified persons, as defined in the National Electric Safety Code, who are familiar with the installation and maintenance of medium voltage circuits and equipment should be permitted to work with these Ground & Test Devices.

1.2 Safety Notations

Safety notations alert personnel to possible death, injury or property damage situations. The safety notations appear before the step in which the condition applies. The one safety notice and three hazard levels notations are:

 **NOTICE**

Indicates information considered important, but not hazard-related (e.g., messages relating to property damage).

 **CAUTION**

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

 **DANGER**

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

Personnel installing, operating, or maintaining this equipment must have thorough knowledge of all applicable local, regional, industry, government, and OSHA safety procedures as well as commonly accepted safe working practices. Personnel working in or around this equipment must also exhibit common sense and good judgment regarding the potential hazards for themselves and other personnel in the area. These instructions are intended for use by fully qualified personnel and are not a substitute for adequate training, experience and supervision.

Should clarification or additional information be required, refer the matter to your nearest ABB Sales office. When communicating with ABB regarding the product covered by this IOM Manual, always reference the ABB assigned Order number.

 **WARNING**

Indicates a hazardous situation that, if not avoided, could result in death or serious injury

2. Introduction & Safe Practices

2.1 Scope

The purpose of this manual is to provide instructions for unpacking, storage, installation, operation and maintenance for the Manual Ground & Test Devices. This manual should be carefully read and used as a guide during installation, commissioning, operation, and maintenance.

The specific ratings of each Manual Ground & Test Device are listed on the individual nameplates. Manual Ground & Test Devices are safety devices. As such, proper operation is required to satisfy the device's intended purpose. Specific safe operating procedures for the use of the device must be developed by the user to satisfy individual requirements. Additionally, Ground & Test Devices are maximum rated devices. Therefore, they should not under any circumstances be applied outside of their nameplate ratings.

This booklet provides information for the Manual G&T Device with ratings shown in Table 1. All information in this booklet was current at the time of printing.

2.2 Receiving, Handling, and Storage

Ground & Test devices are subject to complete factory production tests and inspection prior to packaging and shipment. The shipping package is designed to provide reasonable protection during shipment and to provide convenient handling.

CAUTION

Damage from improper handling of the G&T device may reduce the dielectric strength of the device.

Property	Rating			
Voltage Class	5-15kV	5-15kV	5-15 kV ReliaGear ND	27 kV
Continuous Current (A)	1200/2000 3000	1200/2000 3000	1200/2000	1200/2000
Short-time withstand current (kA, rms)	50	63	31.5	25
Momentary Current (kA, Peak)	130	164	82	65
Power frequency withstand voltage (kV)	36	36	36	60
Lightning impulse withstand voltage (kV)	95	95	95	125

Table 1: Ratings Table

2.2.1 Receiving

Immediately upon receipt of a G&T device, examine the cartons to determine if any damage or loss was sustained during transit. If damage or indication of rough handling is evident, file a damage claim at once with the carrier and promptly notify the nearest district office. ABB is not responsible for damage of goods after delivery to the carrier. Use care in unpacking to avoid damaging any G&T device parts.

Unpack the G&T device as soon as possible after receipt. If unpacking is delayed, difficulty may be experienced in making a claim for damages not evident upon receipt. Check the contents of each carton against the packing list before discarding any packing material. If any discrepancy is discovered, promptly notify your ABB sales representative. Information specifying the purchase order number, carton number and part numbers of damaged or missing parts should accompany the claim.

2.2.2 Handling

G&T device shipping containers are designed to be handled by a fork lift. Lifting equipment may be used to uncrate the device. Lifting provisions are provided. Once removed from the shipping container, the G&T may be transported using the lift truck. This is the preferred transport method.

2.2.3 Storage

Store all equipment indoors in a well-ventilated area. For G&T devices shipped in crates, store G&T devices upright in their original shipping carton oriented as indicated on the shipping crates. If the G&T devices are not placed in service for some time, it is advisable to provide adequate means of environmental protection. This may be done by keeping the G&T device in its original shipping container and storing in a warm, dry and uncontaminated atmosphere.

The G&T device should be stored to minimize condensation. Moisture can cause deterioration of metal parts and high voltage insulation. Cover with heavy wrapping paper or other moisture barrier. Use materials that will not trap moisture inside the unit. Do not cover louvered openings. The storage building should have a well-drained paved floor. The temperature should be above 60°F. The air should be dry (approximately 50% maximum humidity).

Pre-usage inspection and maintenance, if necessary, is recommended due to the intermittent nature of the usage of the device. See Section 4 "Maintenance" of this document for more information.

3. Usage and Operation for Advance, Advance 27, SafeGear, and SafeGear HD Manual G&T Devices

! WARNING

This equipment may contain voltages at a level which may cause death or serious injury. This equipment should only be operated by qualified personnel. Follow usage instructions and safety precautions. Only use this equipment for its nameplate rating.

3.1 Grounding

1. Disconnect the ground cables from all terminals.
2. Swing the door over the device terminal set that is not to be grounded (see Figures 1 and 2).



Figure 1: Bottom terminals to be grounded



Figure 2: Top terminals to be grounded

3. Padlock the door in position.
4. Insert the device in the switchgear breaker compartment using the instructions relevant to the switchgear found below:
 - a. SafeGear HD Installation, Operations and Maintenance Manual, document number: 1VAL108001-MB Section 5.11.1.
 - b. Advance Installation and Maintenance Manual, document number: IB3.2.6-7A Chapter 8.
 - c. SafeGear Installation and Maintenance Manual, document number: IB3.2.5-7C Chapter 8.
 - d. Advance 27 Installation, Operations, and Maintenance Manual, document number: 1VAL017002-MB Section 5.10.1.



Figure 3: Device installed in the switchgear breaker compartment



Figure 4: Device installed in the SafeGear compartment with bottom terminals to be tested.

- c. SafeGear Installation and Maintenance Manual, document number: IB3.2.5-7C Chapter 8.
- d. Advance 27 Installation, Operations, and Maintenance Manual, document number: 1VAL017002-MB Section 5.10.1.



Figure 5: The racking tool is used to move the device between the connect and disconnect positions

- 7. Open the switchgear breaker compartment door.
- 8. Test the exposed terminal ends to assure there is no voltage present on the terminal set to be grounded.



Figure 6: Bottom terminals exposed for testing

- 5. Close and secure the switchgear breaker compartment door.
- 6. Rack the device to the “Connect” position with the racking tool. The device must be completely in the “Connect” position. Reference the instructions for the relevant switchgear found below:
 - a. SafeGear HD Installation, Operations and Maintenance Manual, document number: 1VAL108001-MB Section 5.11.1.
 - b. Advance Installation and Maintenance Manual, document number: IB3.2.6-7A Chapter 8.



Figure 7: Top terminals exposed for testing

9. After establishing that the exposed terminal set is de-energized, close the switchgear breaker compartment door, and rack the device to the disconnected position (see Figure 5).
10. With the device in the disconnected position, open the switchgear breaker compartment door and attach the upper or lower ground cables to the exposed terminal set. Two cables per phase are required for the SafeGear HD 63 kA G&T device (see Figures 8 and 9). 5/15 kV 50 kA Advance/SafeGear and 27 kV Advance G&T devices only require one cable per phase (not shown).



Figure 8: Top terminals grounded



Figure 9: Bottom terminals grounded (padlock hasp not shown)

11. With the grounded cables attached, close and secure the switchgear breaker compartment door and rack the device into the “connect” position.
12. With the ground cables installed and the device racked into the “connect” position, the terminal set is connected to the switchgear ground bus.

3.2 Removing Ground/Withdrawing the Device

1. Rack the device to the disconnected position.
2. Open the switchgear breaker compartment door, disconnect and remove the grounding cables.
3. Remove the padlock.
4. Use the lift truck to remove the device. Reference the instructions for the relevant switchgear found below:
 - a) SafeGear HD Installation, Operations and Maintenance Manual, document number: 1VAL108001-MB Section 5.11.1.
 - b) Advance Installation and Maintenance Manual, document number IB3.2.6-7A Chapter 8.
 - c) SafeGear Installation and Maintenance Manual, document number IB3.2.5-7C Chapter 8.
 - d) Advance 27 Installation, Operations, and Maintenance Manual, document number 1VAL017002-MB Section 5.10.2.

3.3 Testing

Prior to each use, the following tests should be completed to assure the G&T device is in good condition.

3.3.1 AC Withstand Voltage Test

1. Remove all grounding cables
2. For each terminal complete the following test sequence:
 - a. Connect the high potential lead to one pole
 - b. Ground the remaining poles and G&T device frame
 - c. Start machine with output potential at 0 (zero) Vac/Vdc.
 - d. For a rated voltage of 15 kV, increase the potential to 27 kVac RMS. If using dc, the test potential should be 38 kVdc. For a rated voltage of 27 kV, increase the potential to 45 kVac RMS or 45 kVdc if performing a DC test.
 - e. Hold for one minute
 - f. Decrease potential to 0 (zero) Vac/Vdc and turn off machine
3. Repeat this testing for the remaining terminals

A successful withstand indicates satisfactory insulation strength of the primary circuit.

3.3.2 Current Path Resistance

1. Connect the grounding cables for the terminal set to be used (upper or lower)
2. Connect one lead from the test set to the ground shoes on the bottom of the G&T device.
3. Connect the other lead from the test set to the primary contact of the G&T device terminal to be tested.
4. Measure the end-to-end grounding path resistance through the primary disconnect, grounding cables and ground shoes using a digital low resistance ohmmeter (DLRO).

The measured resistance should not exceed 100 micro-ohms.

4. Usage and Operation for ReliaGear ND G&T Devices

⚠ WARNING

This equipment may contain voltages at a level which may cause death or serious injury. This equipment should only be operated by qualified personnel. Follow usage instructions and safety precautions. Only use this equipment for its nameplate rating.

4.1 Grounding

1. Disconnect the grounding bus from the terminal.
2. Remove grounding bus and clear the bus away from the G&T.
3. If the opposite terminal location (upper or lower) is needed, refer to section 4.3 for instructions.



Figure 10: Lower terminal configuration without ground bus installed



Figure 11: Upper terminal configuration without ground bus installed

4. Ensure proper procedures are followed for removing the breaker and opening the switchgear door.
5. Insert the device in the switchgear breaker compartment using ReliaGear ND Installation, Operations, & Maintenance Manual, document number: 1VAL107501-MB section 5.10.



Figure 12: Lower terminal configuration in disconnected position with field distributors installed



Figure 13: Upper terminal configuration in disconnected position with field distributors installed

6. Close and secure the switchgear breaker compartment door.
7. Rack the device to the “Connect” position with the racking tool (see Figure 14). The device must be completely in the “Connect” position. Reference ReliaGear ND Installation, Operations, & Maintenance Manual, document number: 1VAL107501-MB section 5.10.



Figure 14: Racking G&T device with door closed

8. Open the switchgear breaker compartment door.
9. Test the exposed terminal ends to assure there is no voltage present on the terminal set to be grounded.

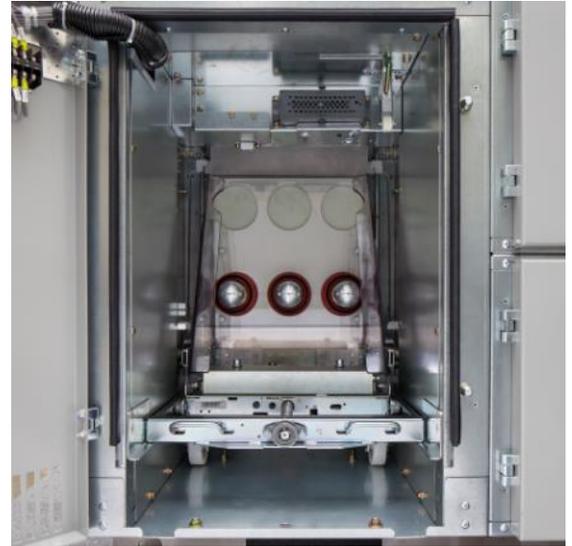


Figure 15: Lower terminal configuration in connected position with field distributors installed



Figure 16: Upper terminal configuration in connected position with field distributors installed

10. After establishing that the exposed terminal set is de-energized, close the switchgear breaker compartment door and rack the device to the disconnected position (see Figure 14).
11. With the device in the disconnected position, open the switchgear breaker compartment door and attach the grounding bus to the shorting bar.



Figure 17: Lower terminal configuration in disconnected position with ground bus installed



Figure 18: Upper terminal configuration in disconnected position with ground bus installed

12. With the ground bar attached, close and secure the switchgear breaker compartment door and rack the device into the “connect” position.
13. With the ground bar installed and the device racked into the “connect” position, the terminal set is connected to the switchgear ground bus.

4.2 Removing Ground/Withdrawing the Device

1. Rack the device to the disconnected position.
2. Open the switchgear breaker compartment door, disconnect and remove the ground bar.

4.3 Testing

Prior to each use, the following tests should be completed to assure the G&T device is in good condition.

4.3.1 AC Withstand Voltage Test

1. For each terminal, complete the following test sequence:
 - a. Connect the high potential lead to one pole.
 - b. Ground the remaining poles and G&T device frame.
 - c. Start machine with output potential at 0 (zero) Vac/Vdc.
 - d. Increase the potential to 27 kVac RMS. If using DC, the test potential should be 38 kVdc.
 - e. Hold for one minute.
 - f. Decrease the potential to 0 (zero) Vac/Vdc and turn off the machine.

2. Repeat this testing for the remaining terminals.

A successful withstand indicates satisfactory insulation strength of the primary circuit.

4.3.2 Current Path Resistance

1. Connect the ground bar for the terminal set to be used (upper or lower).
2. Connect one lead from the test set to the ground on the bottom of the G&T device.
3. Connect the other lead from the test set to the primary contact of the G&T device terminal set to be tested.
4. Measure the end-to-end grounding path resistance through the primary disconnect, grounding cable, and ground shoes using a digital low resistance ohmmeter (DLRO).

The measured resistance should not exceed 100 micro-ohms.

4.4 Changing the position of the terminals

1. Place the G&T outside of the switchgear compartment on a level work surface.
2. Remove the (6) M8X25 screws, (6) M8 nuts, and (12) M8 washers that hold the insulation board onto the supports. A 6 mm hex bit or allen wrench and a 13 mm open end wrench will be needed for this operation.
3. Rotate the insulation board to move the terminals to the opposite position.
4. Reinstall the hardware and torque to 10Nm (8 Ft-Lbs).

5. Maintenance

After removal from storage the following pre-usage inspection and maintenance should be performed. The contacts should be inspected for wear of the silver plating, and should be lubricated with NO-OX-ID Special Grade-A grease. The contact surfaces where the cables are mounted and the barrier module should be free from grease or debris. The recommended grease for the wheels and truck is ISOFLEX TOPAS NB 52 grease. Excess or old grease should be wiped off the wheels and truck of the device if present.

WARNING

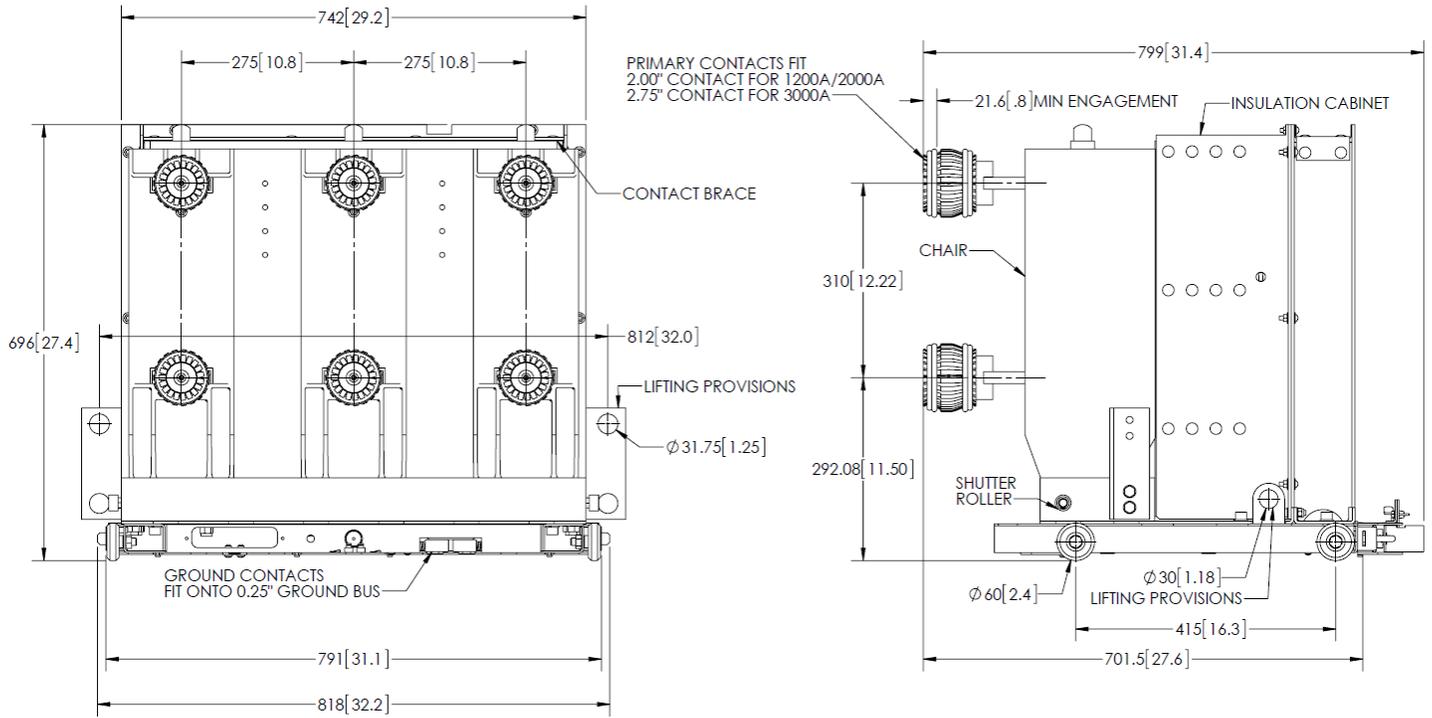
Maintenance should only be performed by qualified and knowledgeable personnel

Recommended Renewal and Maintenance Parts			
Description	Part No.		
	5-15 kV, 63 kA SafeGear HD	5-27 kV, 25-50 kA Advance/SafeGear	5-15 kV, 31.5 kA ReliaGear ND
Grounding Cable Kit (Upper)	2RGA018965A0001 (6 Pieces Required)	14526G00 (3 Pieces Required)	N/A
Grounding Cable Kit (Lower)	2RGA018727A0001 (6 Pieces Required)	14536G00 (3 Pieces Required)	N/A
Ground Shoe Assembly	2RGA017085A0003 (2 Pieces Required)	Contact Factory	N/A
Upper Primary Disconnect (1200/2000A)	2RGA018908A0001 (3 Pieces Required)	14522G00 (3 Pieces Required)	N/A
Upper Primary Disconnect (3000A)	2RGA018908A0002 (3 Pieces Required)	14544G00 (3 Pieces Required)	N/A
Lower Primary Disconnect (1200/2000A)	2RGA018915A0001 (3 Pieces Required)	14524G00 (3 Pieces Required)	N/A
Lower Primary Disconnect (3000A)	2RGA018915A0002 (3 Pieces Required)	14546G00 (3 Pieces Required)	N/A
Labels Kit	2RGA019075A0001	Contact Factory	2RGA021904A0001
Field Distributing Ball	N/A	N/A	2RGA021114P0001 (3 Pieces Required)
Primary Contact Plate Assembly (1200 A)	N/A	N/A	2RGA021098A0001
Primary Contact Plate Assembly (2000 A)	N/A	N/A	2RGA021098A0002

Note: contact your local ABB sales office for pricing and availability.

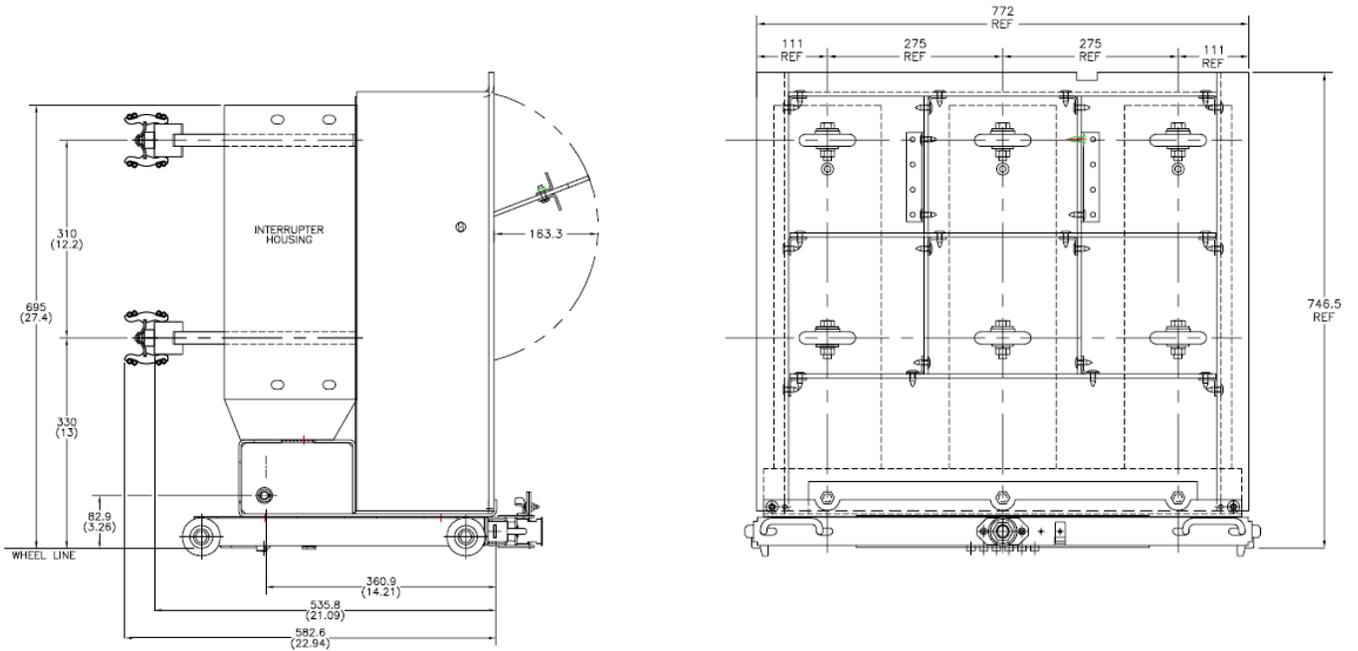
Appendix

5/15 kV, 63 kA Manual G&T (SafeGear HD) Layout Drawing



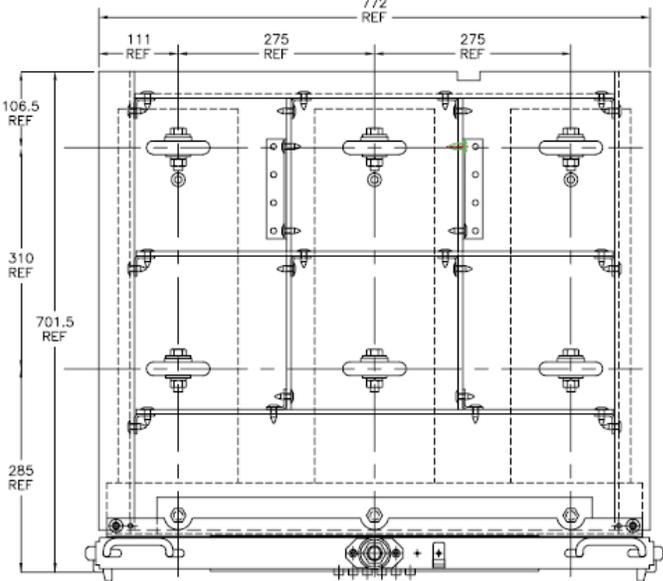
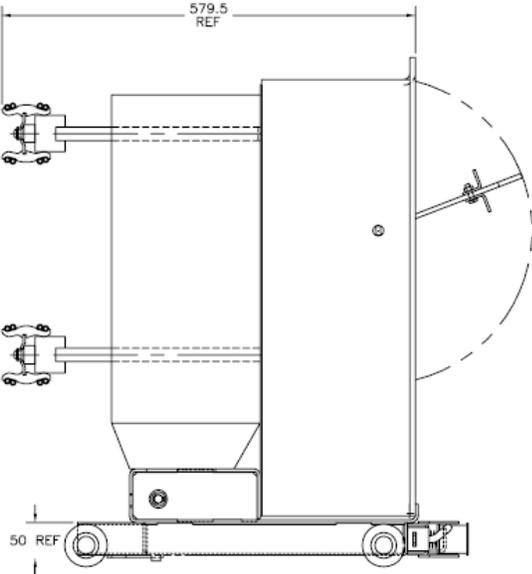
Note: dimensions in mm [in]

27 kV, 1200/2000 A, 25 kA Manual G&T Layout Drawing



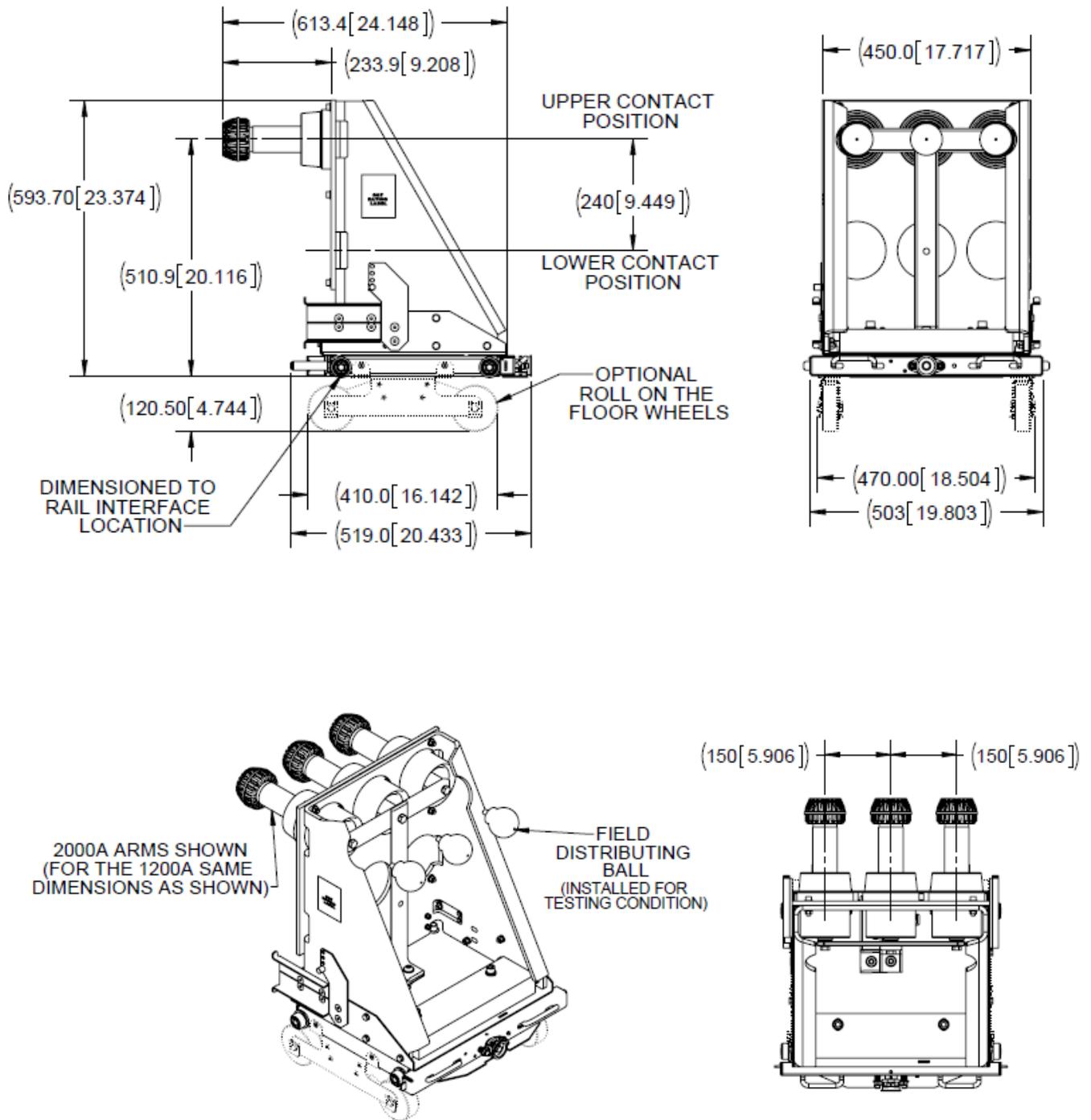
Note: dimensions in mm [in]

5/15 kV, 50 kA Manual G&T Layout Drawing



Note: dimensions in mm

5/15 kV, 31.5 kA ReliaGear ND Manual G&T Layout Drawing



End of life of Product

ABB products are manufactured to meet or exceed the standards of compliance for quality and environmental management systems in accordance with ISO 9001 and ISO 14001. All of these items can be supplied with a certificate of quality.

ABB is committed to complying with all legal and other relevant requirements for environmental protection in accordance with the ISO 14001 standards.

The responsibility of the company is to facilitate subsequent recycling or disposal at the end of the product's life. During disposal of the product, it is always necessary to act in accordance with all local and national legal requirements that are in effect at the time of disposal.

Methods of Disposal

Disposal can either be carried out in a manner of ways depending upon material of product. Below is the recommended method of disposal for various raw material.

ABB is committed to complying with the relevant legal and other requirements for environmental protection according to the ISO 14001 standard. The duty of the company is to facilitate subsequent recycling or disposal at the end of product life. During disposal of the product, it is always necessary to act in accordance with local legal requirements in force.

RAW MATERIAL	RECOMMENDED METHOD OF DISPOSAL
Metal material (Fe, Cu, Al, Ag, Zn, W, ect.)	Separation and recycling
Thermoplasts	Recycling or disposal
Epoxy resin	Separation of metal and disposal of remains
Rubber	Disposal
Oil (transformer oil)	Draining and recycling or proper disposal
SF6 gas	Discharging from equipment
Packing material	Recycling or disposal

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Notes

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