



Dead Tank Circuit Breakers

72.5–800kV — Advanced Technology in a Compact, Reliable Design



with **Primary Plus™**

Pre-engineered solution set that digitizes XD|GE primary equipment and provides factory installed and configured protection, monitoring, diagnostics and communications.



GE
Digital Energy



363kV Dead Tank SF₆ Circuit Breaker



800kV Dead Tank SF₆ Circuit Breaker

Robust, High Quality and Reliable Breaker Technology

For over a century, utilities around the world have relied on GE products and services to increase power system reliability and improve grid resiliency and responsiveness. As a global leader in grid infrastructure products and services, GE supports a broad set of utility applications ranging from transmission and substation automation to distribution networks and smart metering, enabling greater safety, connectivity and increased security.

Through an alliance with XD Electric®, GE has extended its portfolio to include high and ultra high-voltage power equipment supporting the highest transmission voltage levels in the world. XD Electric is one of China's largest primary equipment manufacturers dedicated to the research, application and development of high and ultra high-voltage power transmission equipment. XD Electric has a broad range of products to transform and direct the flow of power for industrial, commercial and residential users.

The XD|GE alliance provides end-to-end transmission solutions to meet the growing demand for electricity globally. The combined portfolios of GE and XD provide a comprehensive range of technology solutions for customers in the utility sector and energy intensive industries.

The XD|GE breaker offerings are robust in design and are based on proven technology, yielding high quality products suitable for an extensive range of applications. XD|GE's breakers are compact in design and construction with advanced puffer type arc extinguishing technology which significantly reduces product size and improves reliability.

Designed with a modular spring operated mechanism and an integrated hydromechanical operating mechanism, these circuit breakers improve product reliability, reduce costs, and minimize maintenance requirements.



Key Features & Benefits

Reduced Footprint

Current transformers equipped in the bushing insulators allow for reduced space and foundations required for installation.

Compact Design and Construction

Advanced arc extinguishing technology significantly reduces product size and improves reliability.

Excellent Seismic Performance and Pollution-Resistant Capability

The dead tank circuit breaker is well-suited for areas with frequent earthquakes, high elevation or severe pollution.

Maintenance Free Design

Modular spring operated mechanism and integrated hydromechanical operating mechanism improve product reliability, reduce costs, and minimize maintenance requirements.

Primary Plus



XD|GE offers Primary Plus™ for all its critical power delivery equipment. Primary Plus is a pre-engineered solution set that provides utilities and large industrial facilities with a means to reduce the time and labor associated with substation construction, expansion, and maintenance, while utilizing technologies and methodologies familiar to existing engineering resources.

XD|GE's factory installed and configured solutions include:

- Digitized primary equipment by replacing labor-intensive, individually terminated copper wires with standardized physical interfaces and open communications protocols (IEC 61850)
- Electrical protection systems optimized for each primary asset and application to monitor and react to fault conditions
- Highly secure and ruggedized communication network equipment including industrial strength wireless, fiber optic multiplexers, and Ethernet switches for an advanced and reliable communications infrastructure



72.5kV Dead Tank SF₆ Circuit Breaker

72.5kV SF₆ Insulated Breaker

The LW24-72.5 is an outdoor dead tank SF₆ circuit breaker with puffer type interrupter technology and a spring operating mechanism.

Puffer type interrupting technology has been applied for many years, is well proven and is accepted as the industry standard. Performance & reliability is enhanced with this technology.

The operating mechanism used in this breaker, the CT20-II, is a spring driven mechanism. The advantages of this spring operated mechanism include improved stability and reliability, increased stability with ambient temperature changes, and minimal to zero maintenance given the lack of oil or gas component.

The LW24-72.5 product has received independent KEMA certification for shunt capacitor bank switching tests.

This dead-tank breaker design is the most widely produced by XD|GE with over 2,000 units shipped and in service over the last few years.

Normal Service Conditions

- 2.1. Altitude 3000m
- 2.2. Humidity monthly 90%
- 2.3. Max. wind velocity 35m/s
- 2.4. Pollution class: IV class
- 2.5. Typical ambient temperature: -35°C to +40°C
- 2.6. Max. temperature difference daily: 25°C
- 2.7. Seismic withstand capability 0.5g
- 2.8. Ice coating: ≤ 10mm
- 2.9. Max. radiance from sun: 1000 W/m²



126/145/252kV SF₆ Insulated Breaker

Type LW24-126/145/252/T outdoor dead tank SF₆ circuit breaker product line incorporates world class advanced technology at these kV ratings.

Single pressure puffer type interrupting technology is employed. This industry standard technology simplifies the design and assembly, improves reliability and provides superior arc interruption capabilities for successful interruption of all industry standards' interruption requirements.

The operating mechanism is a spring design, which makes the product simple in construction and light in weight with higher reliability and less noise in operation.

This family of dead tank circuit breakers will have independent certifications from XIHARI, MHI, or KEMA depending on the rating class and design.

Normal Service Conditions

- 2.1. Altitude: ≤ 1000m (not more than 3000m in special condition)
- 2.2. Humidity monthly 90%
- 2.3. Max. wind velocity 35m/s
- 2.4. Pollution class: III, IV class
- 2.5. Typical ambient temperature: -35°C to +40°C
- 2.6. Max. temperature difference daily: 25°C
- 2.7. Seismic withstand capability 0.5g
- 2.8. Ice coating: ≤ 10mm
- 2.9. Max. radiance from sun: 1000 W/m²



363/550/800kV SF₆ Insulated Breaker

The LW13A/23-363, LW13A-550, and LW13-800 family of products represent the technology platform for the highest kV rated XD|GE dead tank breakers. Single interrupting units per pole are utilized on breaker products from 363kV to 550kV without parallel capacitors and pre-insertion resistors. In addition, double interrupting unit designs are used for products from 363kV up to 800kV. Parallel capacitors and pre-insertion resistors are incorporated when double interrupting units per pole are used.

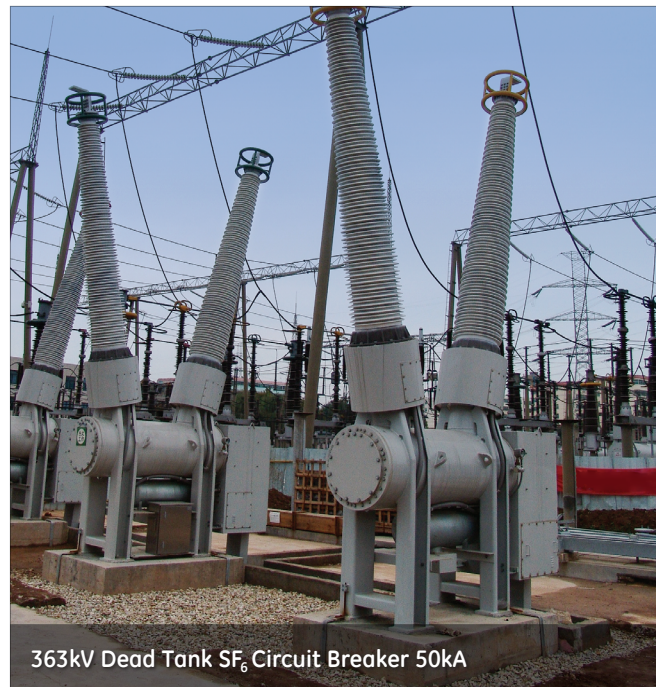
Breakers from 363kV to 800kV can carry continuous current up to 5000A and have interrupting capability for short circuit at either 50kV or 63kV, per customer specification.

Breakers above 363kV are equipped with the CYA8 hydromechanical mechanism. The fully integrated hydro-mechanical operating mechanisms are maintenance-free designs with long-term stability and reliability.

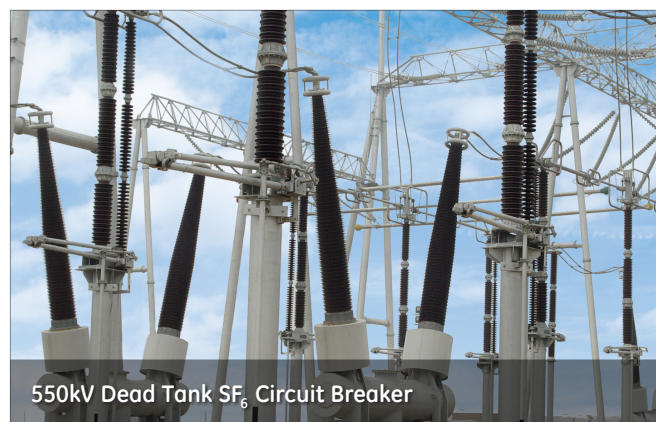
363kV - 800kV series dead tank breakers are tested and certified per IEC® standards by XIHARI®, the national HV lab in China.

Normal Service Conditions

- 2.1. Altitude: ≤ 1000m (not more than 3000m in special condition)
- 2.2. Humidity monthly 90%
- 2.3. Max. wind velocity 35m/s
- 2.4. Pollution class: III, IV class
- 2.5. Typical ambient temperature: -35°C to +40°C
- 2.6. Max. temperature difference daily: 25°C
- 2.7. Seismic withstand capability 0.5g
- 2.8. Ice coating: ≤ 10mm
- 2.9. Max. radiance from sun: 1000 W/m²



363kV Dead Tank SF₆ Circuit Breaker 50kA



550kV Dead Tank SF₆ Circuit Breaker



550kV Dead Tank SF₆ Circuit Breaker



800kV Dead Tank Circuit Breaker

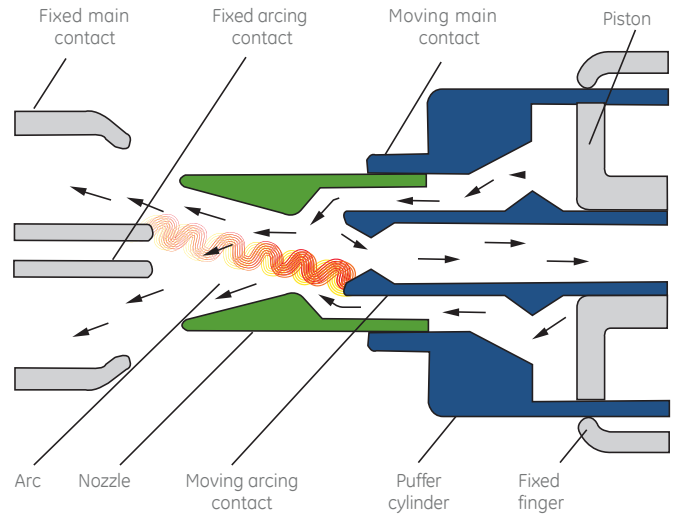
Technology

1. Interrupter

The figure below shows the principle construction of the interrupter. The pressure of the gas in the puffer cylinder goes up when the gas is compressed by opening movement of the puffer cylinder.

This pressurized and compressed gas goes to the arc between the stationary contact and moving contact. The nozzle concentrates the gas flow to the arc for efficient cooling.

Inner Construction of Interrupter



2. Spring Operating Mechanism

The design of the spring operated mechanism provides the high performance required for reliable operation. The lever engaged with the locking device, which is released when the trip coil is energized, is rotated counterclockwise by the trip spring (Fig.1).

The cam and the ratchet wheel engaged with the locking device, which is released when the closing coil is energized, are rotated counterclockwise by

the closing spring. The lever is rotated clockwise, compressing the trip spring by torque from the cam (Fig.2).

As soon as the closing sequence is completed, the closing spring is charged by the ratchet linked to the motor (Fig.3).

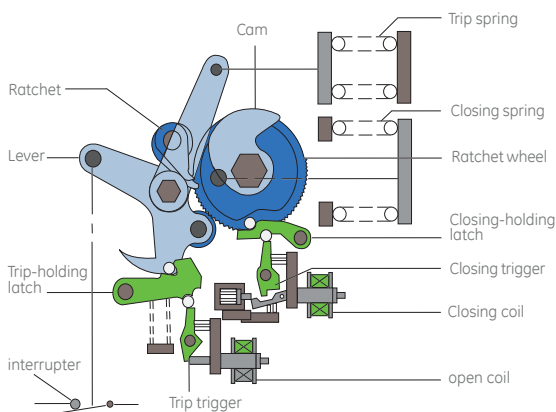


Fig1. Closed position (closing spring charged)

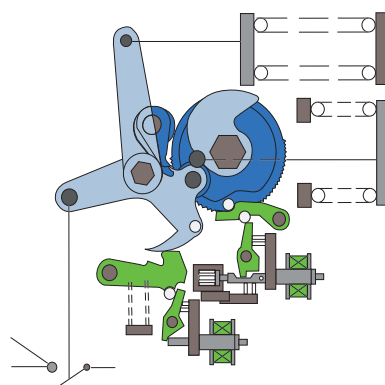


Fig2. Open position (closing spring charged)

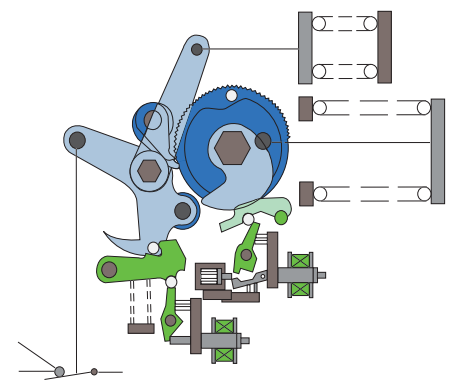
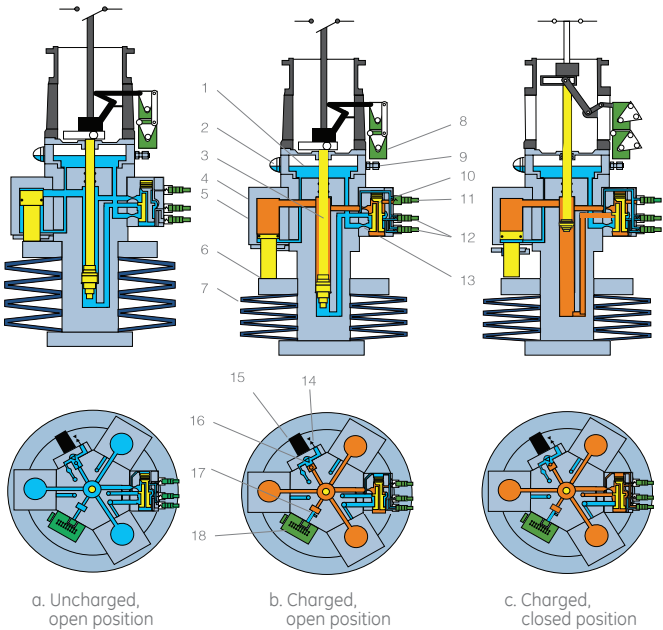


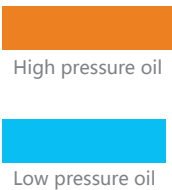
Fig3. Closed position (closing spring discharged)

3. Hydromechanical Operating Mechanism for Circuit Breakers

The hydromechanical mechanism is built with its functional parts linked by integrated modules. To keep the operation as reliable as possible, "O"-rings are used at sealing points, disc-type springs are used to store energy, and two sets of respectively independent opening control valves are incorporated into the design. This mechanism can be operated either in single phase or in three phase electrically, and can be gang-operated in three phase mechanically.



- 1. Low pressure oil tank
- 2. Oil lever indicator
- 3. Operating piston rod
- 4. High pressure oil tank
- 5. Piston for charge
- 6. Support ring
- 7. Disk spring
- 8. Auxiliary switch
- 9. Oil-filling hole
- 10. Throttle of close
- 11. Electro-magnetic valve for close
- 12. Electro-magnetic valve for open
- 13. Throttle of open
- 14. Oil drainage valve
- 15. Energy-store motor
- 16. Oil pump
- 17. Pressure release valve
- 18. Spring position switch



550kV Dead Tank SF₆ Circuit Breaker

Innovative Facilities and Rigorous Quality Processes

XD|GE's technology portfolio is built in state-of-the-art manufacturing and testing facilities with robust quality processes which provide customers with products that meet the critical and demanding reliability and environmental challenges of transmission applications.

Manufacturing Excellence

XD|GE designs a broad range of switchgear in five specialized production facilities including machining, surface treatment, insulating, housing and casting.

Additionally, there are two specialized facilities that produce both the spring and hydromechanical operating mechanisms.

Final production is completed in three workshop assembly lines that total more than 50,000 square meters. Components such as aluminum enclosures, cast resin insulators, current and voltage transformers, and operating mechanisms are manufactured by XD|GE through a completely integrated manufacturing model.

The switchgear facilities are ISO® 9001 certified, ISO 14001 certified for environmental management systems, as well as OSHA® 18001 certified for health and safety management systems.

Exceptional Quality

A focus on quality is an ongoing strategic initiative for XD|GE and that is evident throughout the manufacturing environment. The quality process begins with an incoming inspection of all materials to ensure the best possible inputs before manufacturing begins.

Throughout the production and assembly process, there are multiple checkpoints in the documented test plan, including both visual and “stop flow” inspections. The production facilities follow strict non-conforming procedures to identify, control and avoid the use and delivery of non-conforming products. Each production facility has developed strict environmental standards, including controls of cleanliness, temperature and humidity, and has controls in place to monitor and manage to the established standards.

In addition, XD|GE has a dedicated measuring and inspection department with certified, full-time inspectors in each of its manufacturing sites. The measuring and inspection department provides a secondary cross-inspection for all work in process, as well as finished products, ensuring a high level of quality is achieved throughout the manufacturing process. First Pass Yield and Cost of Quality data is maintained and analyzed, per product family, in order to drive continual product and process improvements and higher product reliability.

From raw materials acquisition and inspection to finished product, XD|GE's breakers are designed to meet rigid quality processes so the installed product provides the highest level of reliability.

Advanced Test Facilities

XIHARI®, the Xi'an High Voltage Apparatus Research Institute, is an integral part of the XD|GE alliance. XIHARI has extensive testing capabilities at its facility sites, which include a: High Power Laboratory, High Voltage Laboratory, Artificial Climate Laboratory, EMC Laboratory, and an Operational Test Circuit for HVDC Thyristor Valves.

The testing hall meets all of the requirements of ISO/IEC® 17025 and houses some of the largest test equipment in the world, providing the capacity to test primary equipment as large as 1,100kV AC. The High Voltage Apparatus Laboratory in XIHARI is a government authorized national high-voltage apparatus quality supervision and inspection test center. It is an independent third-party laboratory for type tests, routine tests, performance tests and certificate tests for high-voltage apparatus. The testing facilities at XIHARI also include an extension environmental laboratory. Testing capabilities here include high altitude testing, high humidity testing, and temperature testing from -70° C up to +150° C.



Support and Service

Global Project Engineering Services

XD|GE is dedicated to helping its customers reach their system objectives and provides a suite of professional services to assist the successful deployment and maintenance of XD|GE products and solutions globally. From design to implementation to post-sales support, a team of technical and business experts are available to help customers effectively use the capabilities and product domain knowledge that are available from XD|GE.

This support infrastructure covers the entire life cycle of the product. From the coordination of transportation logistics to the completion of site acceptance testing and warranty service, the highly qualified XD|GE team is available throughout the implementation.

To ensure a high quality of service to meet the needs of each unique application, XD|GE has a global field service team of highly experienced and dedicated individuals. Coupled with a vast network of high voltage power equipment domain experts, XD|GE is able to support a broad range of applications in various environments.

Finally, XD|GE offers a 24x7 global support service to address and direct any customer application and field questions.

Specialized Installation and Commissioning

- Logistics including coordination of ocean and inland transportation
- Installation services include receiving, rigging, unloading and labor (mechanical and electrical)
- Test commissioning
- Site acceptance testing

Post-Sales and Installation Support

- 24x7 global customer service
- Emergency response hotline
- Several customer support access points available to ensure timely support (telephone, e-mail, fax, or web)
- Global spare parts reserve
- A global network of maintenance and repair facilities



4800kV/720 kJ Impulse Voltage Generator & ±2000kV 30mA DC Voltage Generator

Primary Plus



Pre-Engineered Secondary Equipment

Primary Plus, XD|GE's supplemental offering to its primary equipment, is a pre-engineered, factory installed solution set that allows utilities to reduce the time and labor associated with substation construction and commissioning. Primary Plus uses technologies and methodologies familiar to existing resources and skill sets.

- Digitized primary equipment for replacing labor-intensive, individually terminated copper wires
- Electrical protection solutions to monitor and react to fault conditions
- Secure and ruggedized communications infrastructure devices including wireless radios, fiber optic multiplexers and Ethernet switches



Digitized Substation

Multilin™ HardFiber System

- Using the Multilin HardFiber system, XD|GE can deliver primary equipment with digital communications. The Multilin HardFiber system digitizes analog signals from primary assets utilizing IEC 61850 communications, reducing total life costs of protection and control through labor and resource optimization.
- This factory-installed solution reduces the amount of labor-intensive, individually terminated copper wire connections with pre-terminated copper and fiber optic cables with standard physical interfaces and open digital communications.

Key Benefits

- Saves up to 50% of Protection & Control labor costs
- Eliminates the majority of copper wiring to better utilize resources for the design, building, commissioning, and maintenance of power system protection and control
- Robust and simple architecture for deploying IEC 61850 process bus
- Improves employee safety by leaving potentially dangerous high-energy signals in the switchyard
- Reduces the chances for operational mistakes made during isolation and restoration after routine maintenance
- Built as an extension of the Multilin Universal Relay (UR) family of products, suitable for a wide array of protection applications
- Rugged, hardened, and secure switchyard interface enabling NERC/CIP compliance



Electrical Protection & Control

Advanced Relays for Primary Substation Equipment

Primary Plus utilizes the Multilin C60 Breaker Protection system or Multilin F60 Feeder Protection system to provide primary protection of critical substation equipment. Multilin relays are substation hardened devices that provide comprehensive protection, control, automation, and monitoring of high voltage substation circuit breakers. With fast, deterministic execution of programmable automation logic, extensive I/O options, and integrated high-speed peer-to-peer communications, Multilin protection devices can receive and execute commands and at a fraction of the cost when compared to a traditional hard-wired configuration.

Key Benefits

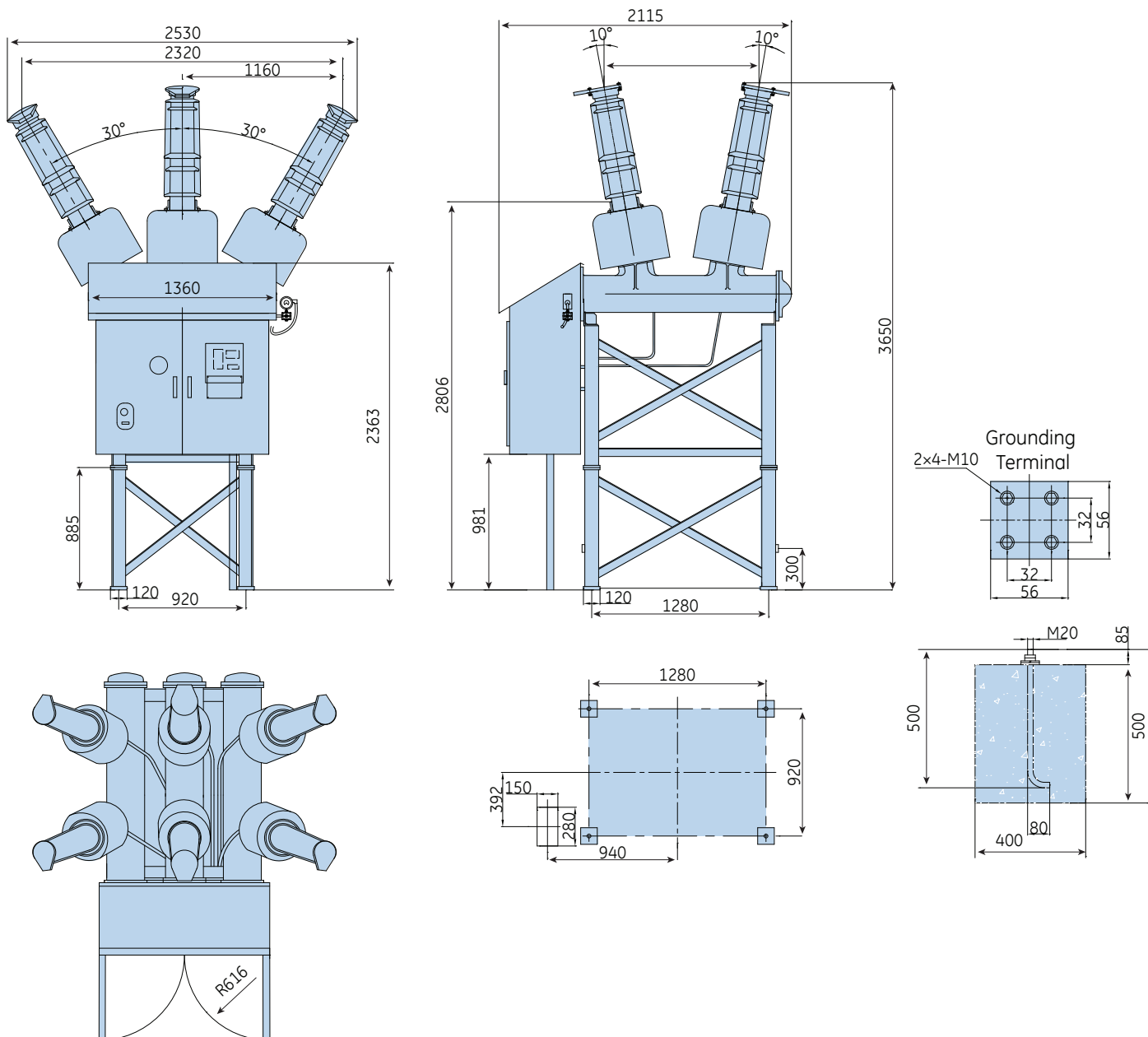
- Advanced circuit breaker monitoring and control in a single platform
- Complete IEC 61850 Process Bus solution providing resource optimization and minimizing total protection & control lifecycle costs
- Modular hardware architecture allow for device configuration flexibility, meeting the needs of most circuit breaker applications
- Advanced fault and disturbance recording, including internal device health monitoring, eliminating the need for external devices and maximizing asset life
- Robust network security enabling critical infrastructure Protection and NERC/CIP compliance
- Advanced automation capabilities for customized protection and control systems
- Simplified system integration and access to information through the use of multiple communication options and protocols, including native support for IEC 61850



Dimensions and Foundation

72.5kV SF₆ Breaker

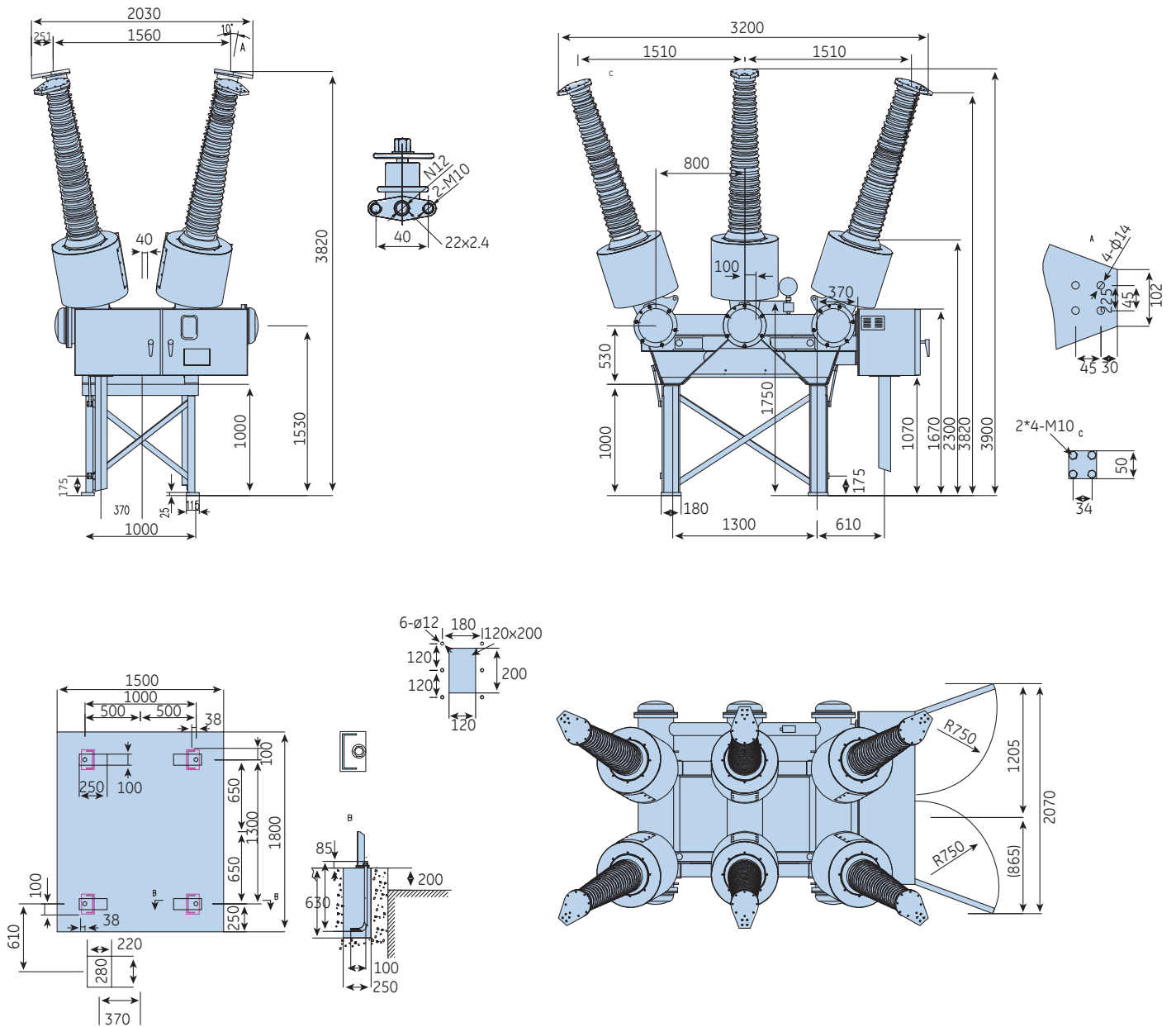
LW24-72.5



All measurements are in millimeters (mm)

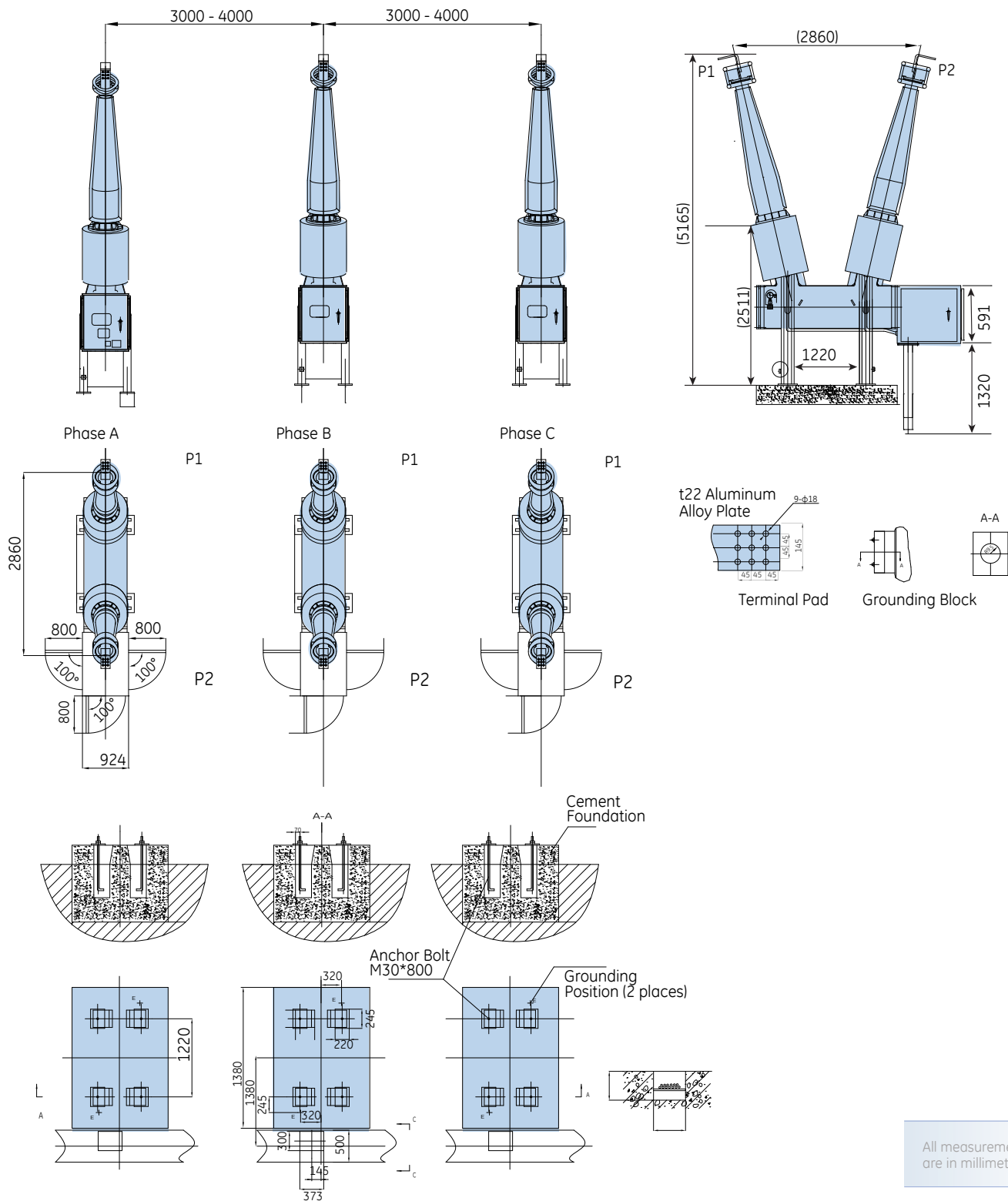
126-145kV SF₆ Breaker

LW24-126/LW24-145



252kV SF₆ Breaker

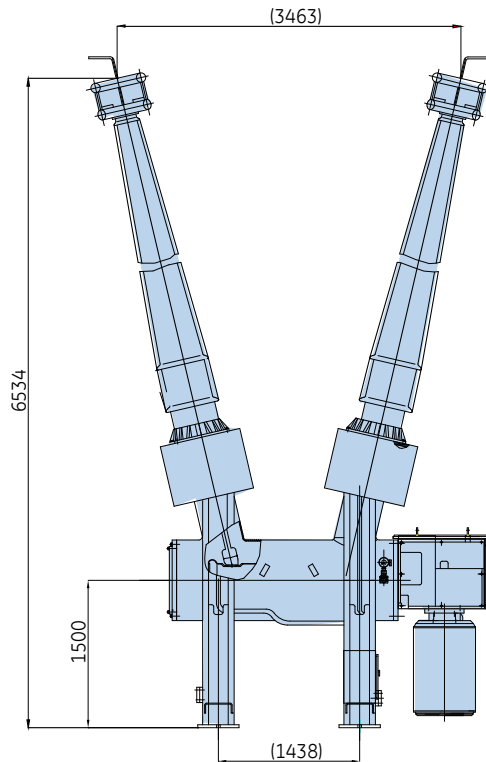
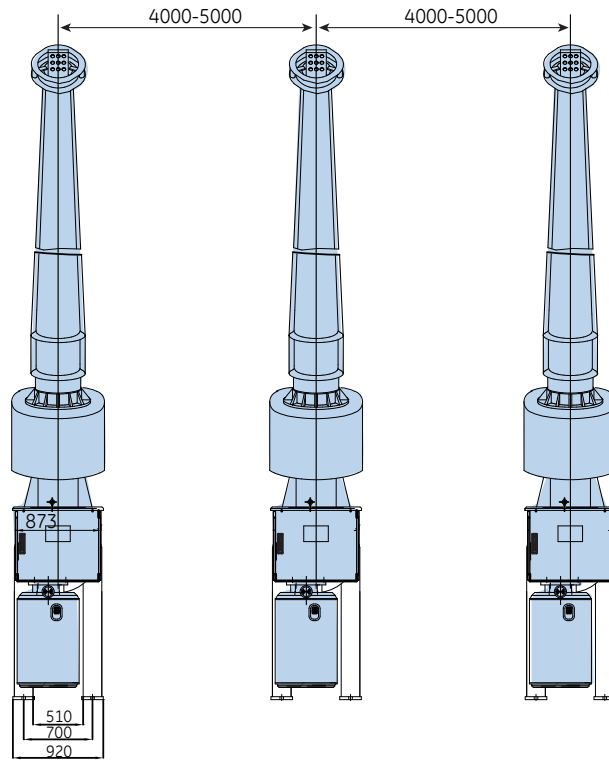
LW24-252



All measurements are in millimeters (mm)

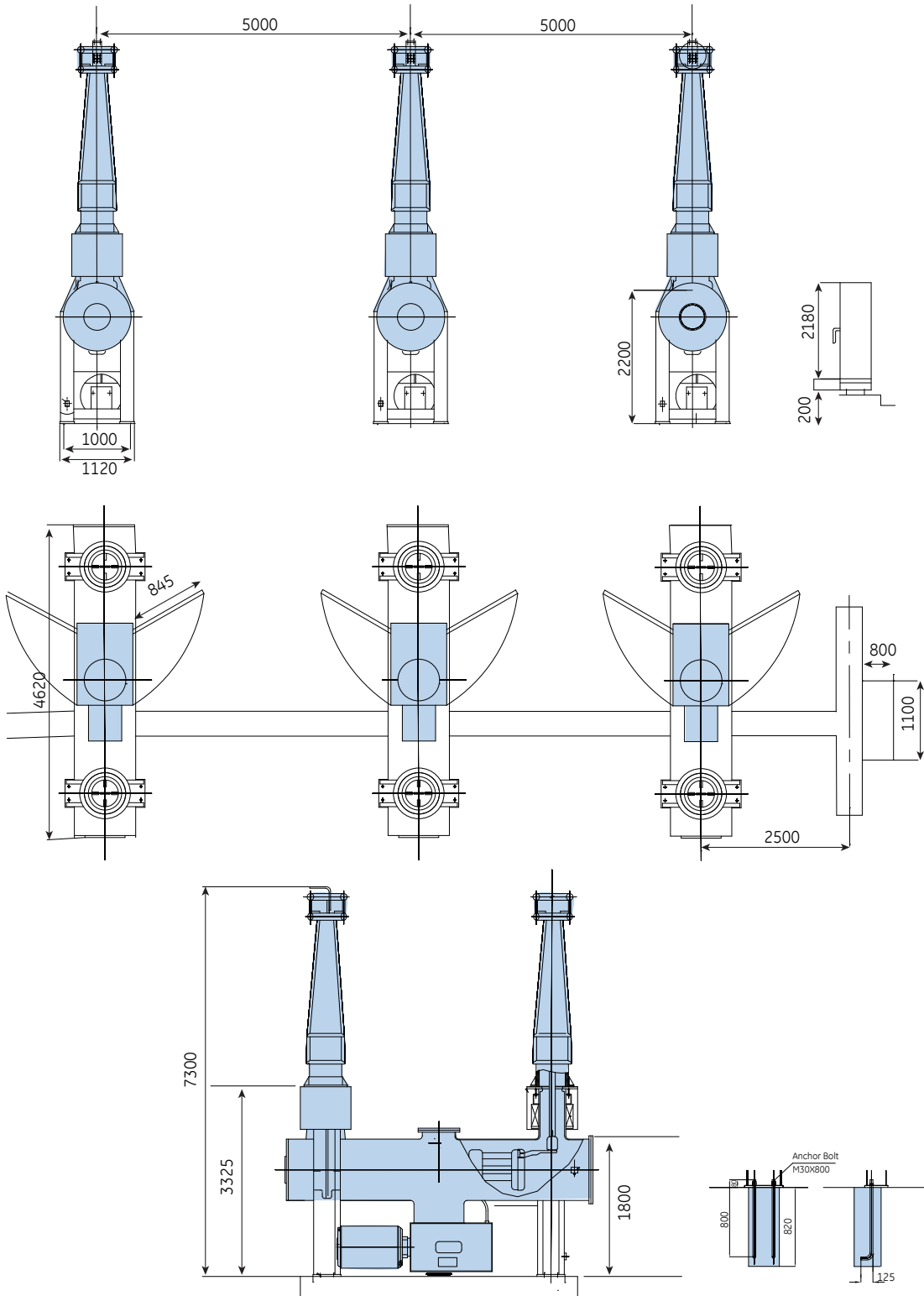
363kV SF₆ Breaker

LW23-363



363kV SF₆ Breaker

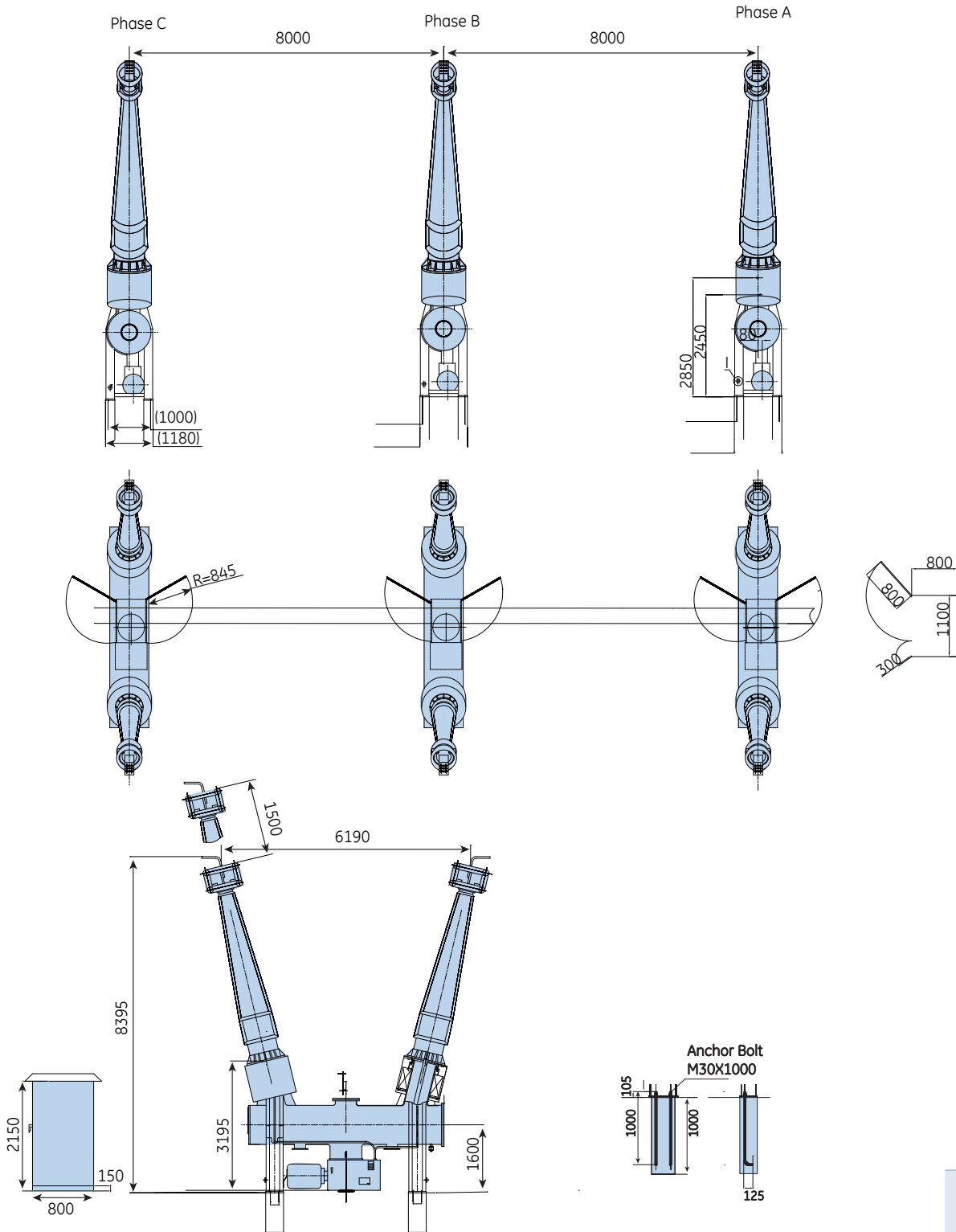
LW13A-363



All measurements are in millimeters (mm)

550kV SF₆ Breaker

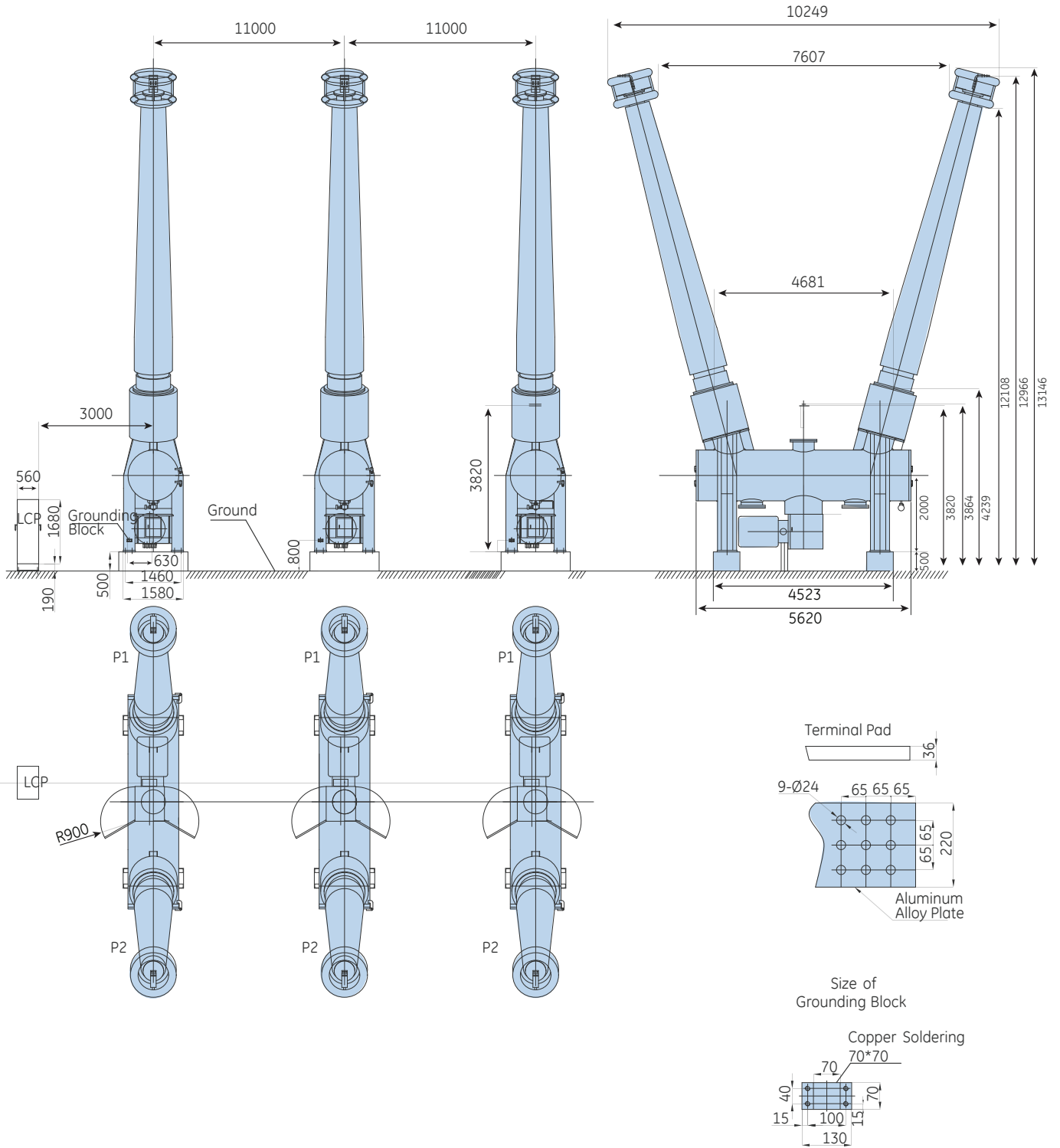
LW13A-420 / LW13A-550



All measurements are in millimeters (mm)

800kV SF₆ Breaker

LW13-800



Technical Specifications

Main Technical Data of 72.5kV-800kV Dead Tank Circuit Breaker*

PRODUCT TYPE	LW24-72.5	LW24-126	LW24- 145	LW24-252	LW23-363	LW13A-363	LW13A-420	LW13A-550	LW13-800
1. Electrical Parameters									
1. 1 Rated voltage (kV)	72.5	126	145	252	363	363	420	550	800
1. 2 Rated frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60	50	50	50/60
1. 3 Rated continuous current (A)	3150	3150	3150	4000	3150/4000	3150/4000/ 5000	5000	5000	5000
1. 4 Rated short circuit breaking current (kA)	40	40	31.5/40	50/63	50	50/63	50/63	50/63	50/63
1. 5 Making current (kA)	104	104	80/104	130/164	130	130/164	135/171	135/171	135/171
1. 6 Rated peak withstand current (kA)	104	104	80/104	130/164	130	130/164	135/171	135/171	135/171
1. 7 Specific creepage distance (mm/kV)	25/31	25/31	25/31	25/31	25/31	25/31	25	25	25
1. 8 Short line fault breaking current (kA)	36/30	36/30	28.35/23.63	45/37.5	45/37.5(50kA); 56.7/47.25(63kA)				
1. 9 Out of phase breaking current (kA)	10	10	7.875	12.5	12.5(50kA); 15.75(63kA)				
1. 10 Rated short-time power-frequency withstand voltage (kV): To earth	160	230	275	460	510	510	650	740	960
1. 11 Rated lightning impulse withstand voltage (kV): To earth	350	550	650	1050	1300	1300	1425	1675	2100
1.12 First pole to clear factor	1.5	1.5	1.5	1.3	1.3	1.3	1.3	1.3	1.3
1.13 Rated short-time withstand duration(s)	4	4	3	3	3	3	3	3	3

PRODUCT TYPE	LW24-72.5	LW24-126	LW24- 145	LW24-252	LW23-363	LW13A-363	LW13A-420	LW13A-550	LW13-800
2. Mechanical Parameters									
2. 1 Type of mechanism	Spring	Spring	Spring	Spring/ Hydro-mechanical	Spring/ Hydro-mechanical	Spring/ Hydro-mechanical	Hydro-mechanical		
2. 2 Mechanical endurance (times)	≥5000	≥5000	≥5000	≥5000	≥5000	≥5000	≥5000	≥5000	≥5000
2. 3 Rated operating sequence	O-0.3s-CO-180s-CO								
2. 4 Close time (ms)	≤100	≤100	≤100	≤110	≤100	≤100	≤100	≤100	≤100
2. 5 Open time (ms)	≤30	≤30	≤30	≤30	≤20	≤20	≤20	≤20	≤20
2. 6 Breaking time (ms)	≤60	≤60	≤60	≤60	≤40	≤40	≤40	≤40	≤40
2. 7 Close-open time (ms)	40-50	40-50	40-50	50-70	40-50	40-50	40-50	40-50	40-50
2. 8 Operating asynchronism (ms) Between poles Open Close	≤2 ≤4			≤3 ≤4	≤3 ≤5	≤3 ≤4	≤3 ≤4	≤3 ≤4	≤3 ≤5
2. 9 Operating asynchronism (ms) Across break Open Close					≤2 ≤3	≤2 ≤3	≤2 ≤3	≤2 ≤3	≤2 ≤3
2. 10 Number of breaks per pole	1	1	1	1	1	2	2	2	2
2. 11 Three phase operation/ single phase	3p	3p	3p	3p/1p	1p	1p	1p	1p	1p
2. 12 Rated SF ₆ gas pressure (Mpa)	0.4/0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.6
2. 13 Leakage of SF ₆ gas per year (%)	≤0.5	≤0.5	≤0.5	≤0.5	≤0.5	≤0.5	≤0.5	≤0.5	≤0.5
2. 14 Weight (kg)	1550	3400	3400	9000	10000	18000	18000	18000	60000

* Additional products available - see product ordering page for complete listing.

Ordering

	LW	*	-	*	/	*	*	-	*
SF ₆ Circuit Breaker Outdoor	LW								
Design Sequence No.		24 13/13A 23							
Rated Voltage				72.5 126 145 252 363 420 550 800					
Operating System: T: Spring Mechanism Y: Hydro-mechanical Mechanism						T Y			
Rated Current (A)							1250 2000 3150 4000 5000		
Rated Interrupting Current (kA)									31.5 40 50 63

Dead Tank Circuit Breaker Product Line With Spring Mechanism:	Dead Tank Circuit Breaker Product Line With Hydro-mechanical Mechanism:
LW24-72.5/T1250-31.5	LW24-252/Y4000-63
LW24-72.5/T2000-31.5	LW23-363/Y3150-50
LW24-72.5/T2500-31.5	LW23-363/Y4000-50
LW24-72.5/T3150-40	LW13A-363/Y3150-50
LW24-126/T3150-40	LW13A-363/Y4000-50
LW24-145/T3150-31.5	LW13A-363/Y5000-50
LW24-145/T3150-40	LW13A-363/Y3150-63
LW24-252/T4000-50	LW13A-363/Y4000-63
	LW13A-363/Y5000-63
	LW13A-420/Y5000-63
	LW13A-550/Y5000-63
	LW13-800/Y5000-63

Ordering Notes: Please provide the following information when ordering:

1. Type, description of product, and type of mechanism.
2. Rated voltage, rated current, short circuit breaking current.
3. Current ratio, accuracy class and quantity, rated output capacity.
4. Pollution class: class III or class IV.
5. Control voltage of mechanism: DC220V or DC110V.
6. Voltage of energy-store motor: AC380V or AC/DC 220V or AC/DC 110V.

GEDigitalEnergy.com



Digital Energy

Toll Free: +1 877-605-6777

Direct: +1 678-844-6777

gedigitalenergy@ge.com

GE, the GE monogram, Primary Plus and Multilin are trademarks of the General Electric Company.

XD Electric is a registered trademark of China XD Electric Group. XIHARI is a registered trademark of the Xi'an High Voltage Apparatus Research Institute Co., Ltd. IEC is a registered trademark of Commission Electrotechnique Internationale. IEEE is a registered trademark of the Institute of Electrical Electronics Engineers, Inc. ISO is a registered trademark of the International Organization for Standardization. OSHA is a registered trademark of the U.S. Department of Labor. KEMA is a registered trademark of DNV.

GE Digital Energy reserves the right to make changes to specifications of products described at any time without notice and without obligation to notify any person of such changes.

Copyright 2015, General Electric Company.



GEA-12723D(E)
English
150317