



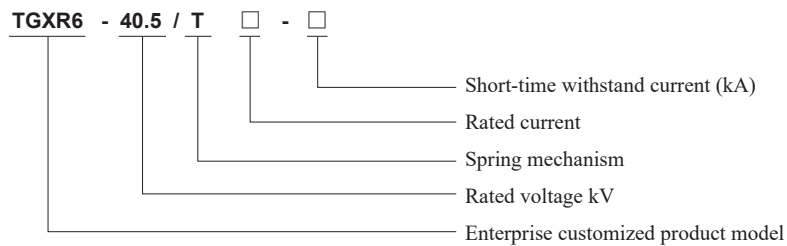
TGXR6-40.5 Series SF₆ Fully-Insulated and Fully-Sealed Metal-Enclosed Ring Network Switchgear

1 Overview

TGXR6-40.5 gas-insulated AC metal-enclosed ring main unit and controlgear (hereinafter referred to as Ring Main Unit) is a new generation of switch products developed by Tengen Electric with independent intellectual property rights, and its technical performances satisfy GB/T3906 "Alternating-current metal-enclosed ring main unit and controlgear for rated voltages above 3.6kV and up to and including 40.5kV and IEC62271 AC metal-enclosed ring main unit and controlgear for rated voltages above 1kV and up to and including 52kV" standards. The product features with high reliability, maintenance-free, small land occupation.

TGXR6-40.5 series ring main unit is a complete set of power distribution device for 40.5kV three-phase AC 50Hz single busbar and single busbar sectional system, primarily suitable for power transmission in power generation companies and small and medium-sized generators, power distribution in industrial and mining enterprises, power receiving and power transmission in power system substations, and startup of large-scale high-voltage motor for control, protection, and monitoring.

2 Type Designation



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3 Technical Parameters

No.	Name		Unit	Parameter	
1	Rated voltage		kV	40.5	
2	Rated current		A	1250, 2500	
3	Rated freq.		Hz	50	
4	Rated short-time withstand current		kA	25(21.8), 31.5(27.4)	
5	Rated peak withstand current		kA	63(54.8), 80 (69.6)	
6	Rated short-circuit current duration		s	4	
7	Rated short-circuit breaking current		kA	25, 31.5	
8	Rated short-circuit making current		kA	63, 80	
9	Arcing duration		s	1	
10	Mechanical life	Circuit breaker	Times	10000	
		Isolating switch		3000	
		Grounding switch		3000	
11	Electrical life of circuit breaker		Times	30 times	
12	Rated charge pressure (gauge pressure at 20℃)		MPa	0.02	
13	Min. functional pressure (gauge pressure at 20℃)			0	
14	Annual leakage rate of SF6 gas		-	≤0.01%	
15	Rated insulation level	Rated power frequency 1min withstand voltage (effective value)	Phase-to-phase, phase-to-ground	kV	95
			Isolation fracture, vacuum fracture		118
		Rated lightning impulse withstand voltage peak (peak)	Phase-to-phase, phase-to-ground	kV	185
			Isolation fracture, vacuum fracture		215
16	Aux. control circuit	Rated voltage		V	DC:110, 220 AC:110, 220
		1min power frequency withstand voltage			2000
17	Protection grade	Housing		-	IP41
		Gas chamber		-	IP67
18	Operation loss continuity category		-	LSC2B	
19	Temperature rise test		A	1.1Ir	
20	Loop resistance	1250A			≤120
		2500A			≤80
21	Partial discharge	Test voltage		kV	1.1×40.5
		Single insulator		pC	≤3
		Machine			≤20
22	Service life		Year	≥30	

Notes:

- The rated peak withstand current parameters and rated short-time withstand current of the current transformer are evaluated separately;
- The loop resistance refers to the measured resistance from the outgoing line of the busbar tie breaker socket (including busbar tie breaker) to the outgoing line of the cable socket (including the current device), with 20 subtracted when there are no busbar tie breaker and current device.
- The value in parentheses is the parameter value of the grounded circuit.

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4 Operating Conditions

- 4.1 Ambient temperature: Max. temperature: +40°C; Min. temperature: -25°C; mean temperature in 24h does not exceed 35°C.
- 4.2 Ambient humidity:
- 4.2.1 The mean relative humidity measured in 24h does not exceed 95%;
- 4.2.2 The mean monthly relative humidity does not exceed 90%.
- 4.2.3 Condensation may occur when the temperature changes sharply during the high-humidity period.
- 4.2.4 The average value of water vapor pressure measured within 24h shall not exceed 2.2kPa;
- 4.2.5 The average value of the monthly water vapor pressure does not exceed 1.8kPa;
- 4.3 Altitude: The altitude at the equipment installation site shall not exceed 1000m. technical confirmation is required for product application at higher altitude.
- 4.4 The seismic intensity shall not exceed 8 degrees.
- 4.5 The amplitude of electromagnetic interference induced in the secondary system shall not exceed 1.6kV.
- 4.6 The ambient air is not significantly polluted by dust, smoke, corrosive and flammable gases, vapors or salt mist.
- Note: When the working conditions is out of the above range, please contact the user to determine the solution.

5 Product Structure and Installation

5.1 Overview of product structure

As an assembled metal-enclosed ring main unit, the ring main unit adopts low-pressure SF₆ gas insulation in its main circuit and uses a vacuum circuit breaker as main switch. The gas filled compartment is divided into two parts, namely circuit breaker compartment and main busbar compartment. All main circuit components (vacuum circuit breaker, three-position isolating switch) as well as main busbar and branch busbar are all installed inside the gas filled compartment. The ring main unit structure can be divided into circuit breaker gas filled compartment, main busbar gas filled compartment, cable chamber, operating mechanism chamber, instrument chamber, and small busbar chamber. There are independent pressure relief channels in gas filled compartment and cable chamber to ensure personal safety and equipment operation maximally.

The circuit breaker gas filled compartment and circuit breaker gas filled compartment of the ring main unit are welded with stainless steel plates, and the ring main unit shell is assembled by the bent high-quality steel plates.

The dimensions and structure diagram for typical scheme see Fig. 1, and the weight of a single unit is ranged 1500 to 2000kg. the main cabinets include cable inlet/outlet cabinets, PT cabinets, busbar sections / lift cabinets, isolation cabinets, overhead wire inlet cabinet, and metering cabinets.

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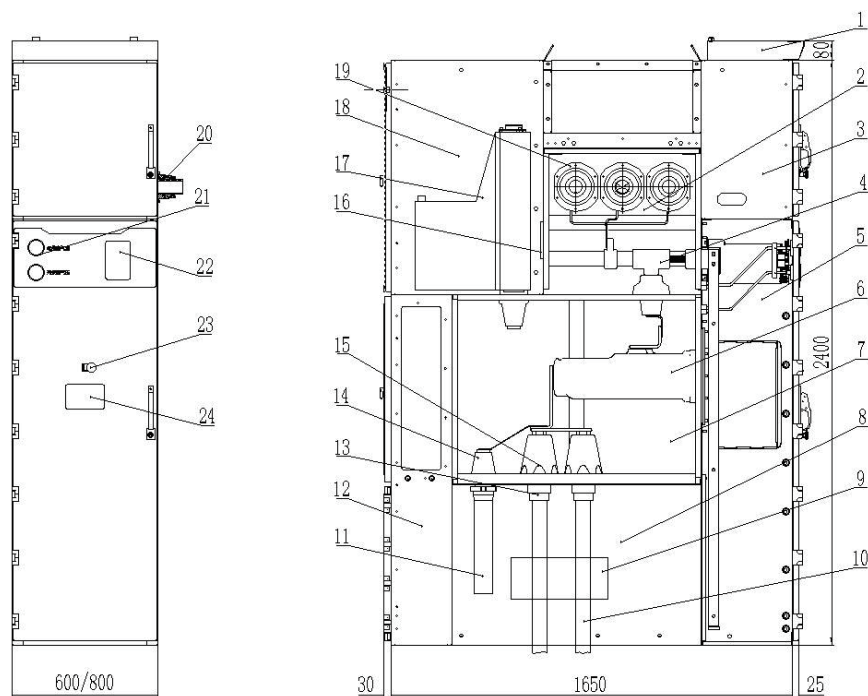


Fig. 1 Dimensions and structure diagram for typical scheme

- | | | |
|---|---|-------------------------------------|
| 1. Small busbar chamber | 2. Main busbar gas filled compartment | 3. Instrument chamber |
| 4. Three-position isolating switch | 5. Operating mechanism chamber | 6. Circuit breaker |
| 7. Circuit breaker gas filled compartment | 8. Cable chamber | 9. Current transformer |
| 10. Cable | 11. CM-35 arrester | 12. Pressure relief channel |
| 13. Cable plug | 14. Test/arrester socket | 15. Cable/test socket |
| 16. Pressure relief device | 17. Voltage transformer | 18. Voltage transformer compartment |
| 19. Busbar connector socket | 20. Busbar connector | |
| 21. Barometer | 22. Sight window of three-position isolating switch | |
| 23. Emergency OFF button | 24. Glass window of circuit breaker | |

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5.2 Small busbar chamber

15-circuit or 20-circuit small busbars are laid in the small busbar chamber to provide the power required by the control circuit or auxiliary circuit for ring main unit. The small busbar is made of $\phi 6$ copper rod or multi-strand flexible cords, and is connected to the adjacent cabinet through the terminal. For the number of small busbars provided, please see the schematic diagram provided by the user. The small busbars are provided by the company according to the specified quantity, and are prepared and installed by the user after the cabinets are combined on site.

5.3 Main busbar gas filled compartment

The main busbar gas filled compartment is a sealed compartment with low-pressure SF₆ gas insulation; the gas chamber is welded and formed with 3mm stainless steel plate, and its protection grade is IP67; there is a pressure release burst disk at the rear of the compartment, and an inspection cover at the top.

There are main busbars, branch busbars, busbar connector sockets and connecting bushings, and main circuits of three-position isolating switch in this compartment. The operating mechanism of the three-position isolating switch is located outside the compartment to realize the operation, isolation and grounding functions, and all functions are interlocked; the electrical connection between the main busbars located between the cabinets can be realized through the busbar connector and the busbar connector socket; the connecting bushing not only realize the electrical connection between the main busbar gas filled compartment and the circuit breaker gas filled compartment, but also is used as a support for main circuit of the three-position isolating switch, simplifying the structure. The dynamic sealing connection inside and outside the three-position isolating switch compartment is realized by the rotary shaft lip seals.

5.4 Instrument chamber

Two instrument chambers of this ring main unit can be provided as required to accommodate the relay protection components, instruments, live monitoring indicators and various secondary equipment. The control line is laid in the trunking with enough space, and has a metal cover for isolation from the high-voltage chamber and the operating mechanism. There are small busbar passing-through holes on the top plate of the relay instrument chamber. When wiring, the top cover of the small busbar chamber can be removed for installation.

5.5 Operating mechanism chamber

There are three-position isolating switch, vacuum circuit breaker operating mechanism and its interlock mechanism, and SF₆ gas pressure gauge in the mechanism operating chamber. The front door shall be opened for manual operation of mechanism.

5.6 Circuit breaker gas filled compartment

The circuit breaker compartment is a sealed compartment with low-pressure SF₆ gas insulation; the gas chamber is welded and formed by 3mm thick stainless steel plate, and the protection grade of gas chamber is IP67; there is a pressure relief burst disk at the rear of the compartment, and an inspection cover at the rear.

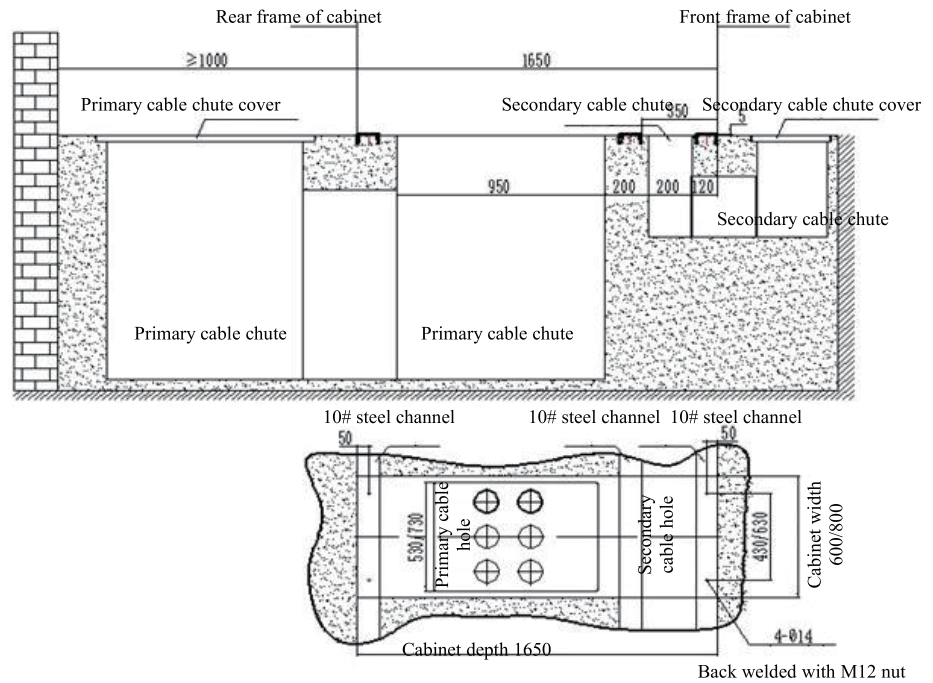
There are main circuit, branch busbar and inner cone type cable socket of the vacuum circuit breaker in this compartment. The integrated spring operating mechanism equipped for the circuit breaker is provided outside the compartment to realize the dynamic sealing connection between the inside and the outside of the circuit breaker compartment through the direct-acting sealing device. The inner cone type cable socket is mounted at the bottom of the compartment as a busbar support in the compartment, and can realize the connection between the external cable, the lightning arresters, and the voltage transformer outside the cabinet.

5.7 Cable chamber

The cable chamber is an air-insulated compartment having a large cable installation space, with a height of 660mm for convenient installation, inspection and maintenance. The primary cable is installed using the inner cone plug-in method, and each phase can be connected with 1 to 3 single-core cables with reliable insulation performance, and is not affected by environmental factors such as salt spray and altitude and is easily installed; the busbar through current transformer is located in the lower part of the compartment, and the cable passes through it. The voltage transformer and arrester are installed in the inner cone plug-in way in the rear upper part of the cable chamber and circuit breaker gas filled compartment. The construction personnel can enter the cabinet from the back of the ring main unit to carry out construction and maintenance of the cable chamber. There is a detachable sealing plate at the bottom of the cable chamber for convenient construction of cable entering the cabinet.

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5.8 Install ring main unit



Notes: Installation instructions

1. The ring main unit can be connected to the steel channel of the base or welded to the steel channel of the base;
2. The steel channel of the base shall be laid flatly, and the non-flatness per meter shall not be greater than 1mm;
3. The base can bear the maximum static load 2000kg of ring main unit, and the maximum impact load 3000kg.
4. The steel channel shall not be used if there is no back cabinet.

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6 Ordering Technical Confirmation Form

Technical confirmation form for ordering TGXR6-40.5 series SF₆ ring main unit

Confirm your requirements according to the items listed in table below:

Switch type	C: Load switch cabinet V: Vacuum circuit breaker cabinet F: Combined apparatus cabinet D: Through cabinet G: Isolation tank CL: Load switch busbar lift cabinet VL: Circuit breaker busbar lift cabinet Me: Metering cabinet ☐ CCF ☐ CCCF ☐ CCV ☐ CCCV ☐ Others _____		
Cabinet layout	_____ (Arranged from the left to the right at the front of the operating panel)		
Order Qty. (unit)	Rated voltage (kV)	☐ 40.5	
	Rated current (A)	☐ 1250 ☐ Others _____	
Connector and cable accessories	☐ No (standard configuration) ☐ Yes (☐ heat shrink ☐ cold shrink) _____ mm ² Qty.: _____	Rated short-circuit breaking current (kA)	☐ 25 ☐ 31.5 (except for fuse)
Barometer signal contact	☐ No (standard) ☐ Yes ☐ Others	Door panel color	☐ RAL7035 ☐ Others _____
Gas box type	Gas box type ☐ Common gas box ☐ Independent gas box (extended mode: ☐ Top extended ☐ Side extended) Others: _____		
Shell and thickness	Gas box: ☐ SU201 stainless steel (standard) ☐ SU304 stainless steel(standard)		
	Cabinet frame: ☐ Carbon steel, plastic sprayed (standard) ☐ Al and zinc coated plate Thickness: ☐ 1.5mm (standard) ☐ 2.0mm		
C load ring main unit	Load switch operating mode: Electric (☐ DC24(standard) ☐ DC48 Others _____) Aux. contact: 4-ON and 4-OFF (standard), Others _____ Isolating switch: ☐ Yes (standard) Aux. contact: 2-ON and 2-OFF (standard), Others _____ Ground switch: ☐ No (standard) ☐ Yes Aux. contact: 2-ON and 2-OFF (standard), Others _____ Current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ Accuracy: _____ (Cable through-core type) Zero-sequence current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ (Cable through-core type) Voltage transformer: ☐ No (standard) ☐ V/V wiring ☐ Y0/Y0 wiring Others _____ Protective device: ☐ No (standard) ☐ Yes (☐ Zero sequence protection (Watch dog) Others _____) Ammeter: ☐ No (standard) Yes (☐ Pointer type ☐ Electronic type) Voltmeter: ☐ No (standard) Yes (☐ Pointer type ☐ Electronic type) Temperature and humidity controller: ☐ No (standard) ☐ Yes Other options: ☐ Cable head ☐ Short circuit and ground fault indicator ☐ Arrester ☐ Cable with an electric locking device		
V vacuum circuit breaker cabinet	Circuit breaker operating mode: Electric (☐ DC24 (standard) ☐ DC48 Others _____) Aux. contact: 4-ON and 4-OFF (standard), Others _____ Isolating switch: ☐ Yes (standard) Aux. contact: 2-ON and 2-OFF (standard), Other _____ Ground switch: ☐ No (standard) ☐ Yes Aux. contact: 2-ON and 2-OFF (standard), Others _____ Current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ Accuracy: _____ (Cable through-core type) Zero-sequence current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ (Cable through-core type) Voltage transformer: ☐ No (standard) ☐ V/V wiring ☐ Y0/Y0 wiring Others _____ Protective device: ☐ Line protection (standard) (☐ Transformer protection ☐ Passive protection ☐ Back automatic switching protection ☐ Buscouple protection Others _____) Ammeter: ☐ No (standard) ☐ Pointer type standard) ☐ Electronic type Voltmeter: ☐ No (standard) ☐ Pointer type standard) ☐ Electronic type Temperature and humidity controller: ☐ Yes ☐ No (standard) Other options: ☐ Cable head ☐ Short circuit and ground fault indicator ☐ Arrester ☐ Cable with an electric locking device		

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F Combined apparatus cabinet	Load switch operating mode: Electric (☐ DC24(standard) ☐ DC48 Others _____) Aux. contact: 4-ON and 4-OFF (standard), Others _____ Isolating switch: ☐ Yes (standard) Aux. contact: 2-ON and 2-OFF (standard), Others _____ Ground switch: ☐ No (standard) ☐ Yes Aux. contact: 2-ON and 2-OFF (standard), Others _____ Rated current of fuse: _____ A Current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ Accuracy: _____ (Cable through-core type) Zero-sequence current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ (Cable through-core type) Protective device: ☐ Transformer protection Fuse protection (standard) Ammeter: ☐ No (standard) Yes (☐ Pointer type ☐ Electronic type) Voltmeter: ☐ No (standard) Yes (☐ Pointer type ☐ Electronic type) Temperature and humidity controller: ☐ No (standard) ☐ Yes Other options: ☐ Cable head ☐ Short circuit and ground fault indicator ☐ Arrester ☐ Cable with an electric locking device	
D Through cabinet	Current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ Accuracy: _____ (Cable through-core type) Zero-sequence current transformer: ☐ No (standard) ☐ Yes, transformation ratio _____: _____ Capacity: _____ (Cable through-core type) Voltage transformer: ☐ No (standard) ☐ V/V wiring ☐ Y0/Y0 wiring Others _____ Ammeter: ☐ No (standard) ☐ Pointer type standard) ☐ Electronic type Voltmeter: ☐ No (standard) ☐ Pointer type standard) ☐ Electronic type Temperature and humidity controller: ☐ Yes ☐ No (standard) Other options: ☐ Cable head ☐ Short circuit and ground fault indicator ☐ Arrester ☐ Cable with an electric locking device	
Dimensions	☐ Standard shape (see catalog) ☐ Non-standard shape (figure attached)	
Other special requirements		Ordering unit (Seal) Sign: _____ Date: _____ Tel: _____

Note: Only the basic cabinet type scheme is listed above, and those options not checked shall be produced according to the Tengen's standard requirements!