TGP-40.5

Gas-insulated switchgear with vacuum circuit-breaker up to 40.5 kV

Catalogue

2022

TGOOD

tgood.com

General

Content

Introduction

Example of TGP-40.5

TGP-40.5, a versatile switchboard

TGP-40.5 is a medium voltage gas insulated switchboard up to 40.5kV, used in primary distribution applications. It can be fitted with the following protection devices:

- Transformer protection
- Line protection

Its compactness, wide range of functions and ease of installation and extensibility, make it a versatile switchboard to fit many distribution applications such as: public distribution, industry, infrastructure or renewables.

TGP-40.5 in a MV/LV substation – chosen for its compact size

Electrically insulated using SF6 gas

The high voltage conductive parts of the TGP-40.5 switchboard are placed in an insulating inert gas (Sulphur Hexafluoride - SF6) which is neither reactive nor toxic.

The gas is confined in a hermetically sealed stainless steel tank. TGP-40.5 is insensitive to the outside environment and to any possible aggressions such as:

- Humidity
- Dust
- Pollution
- Dirt
- Harmful rodents.

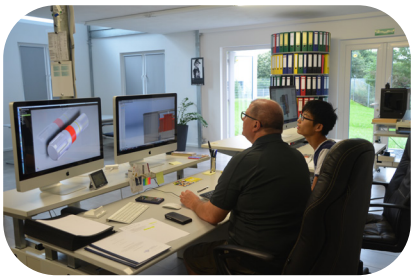
The use of SF6 as an insulating gas, and the design of TGP-40.5, makes it one of the most compact MV switchboards on the market.

TGP-40.5 in the subway application

Simple operation and maintenance

With a service life of 30 years for the main circuit without maintenance, the overall design of the range of TGP-40.5 switchboards guarantees simple and reliable use:

- Simplified maintenance of the functional units and with continuity of service for the other units (LSC2 class)
- No gas filling is required on site at installation nor during the service life of TGP-40.5
- Under normal operating conditions
- Long service life
- Interlocking to ensure the correct sequences of operations
- Can be used in substations with or without walk-in operation corridors
- Voltage presence indicator light
- Wide cable compartment to allow the installation of various types of cable, etc.



TGOOD R&D center in Germany

Safety and innovation

TGP-40.5 has been designed for maximum safety of the operators and equipment in particular in case of internal arcing in the equipment:

- Safety valves at the rear yield and thus avoid gas overpressure
- An exhaust duct cools down and evacuates the gases towards the top (optional) and/or a deflector at the rear channels and cools the hot gases
- Front protection for the operator (lateral also as an option)

Standards & quality

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

Qingdao TGOOD Electric Co., Ltd.

No.336 Songling Road, Laoshan District, Qingdao, Shandong Province, China and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
ISO 9001:2015/GB/T 19001-2016

This certificate is valid for the following scope:

Design, Production and Service of T&D Equipment of 500kV & Below; Design and Production of Vehicle Charging System and Equipment

Quality assurance

Certified quality: ISO 9001

A major asset

TGOOD integrates a functional organization whose main role is to check quality and monitor compliance with standards. This procedure is:

- uniform throughout all departments
- recognized by many customers and approved organizations. But above all, it is its strict application that has allowed us to obtain the recognition of an independent organization:

The International Accreditation Forum (IAF). The quality system for the design and manufacture of TGP-40.5 is certified to be in conformity with the requirements of ISO 9001: 2015 quality assurance standard.

ENVIRONMENTAL MANAGEMENT SYSTEM CERTIFICATE OF CONFORMITY

NO. 10416E10136R0M

This is to certify that the Environmental Management System of

QINGDAO TGOOD ELECTRIC CO.,LTD.

is in conformity with:

GB/T 24001-2004 idt ISO 14001:2004

This system is valid for:

" DESIGN AND PRODUCTION OF T&D EQUIPMENT OF 220kV & BELOW (AS SPECIFIED BY 3C CERTIFICATE) AND BELOW AND RELATED EMS MANAGEMENT ACTIVITIES BY QINGDAO TGOOD ELECTRIC CO.,LTD. LOCATED AT NO.336, SONGLING ROAD, LAOSHAN DISTRICT, QINGDAO, SHANDONG PROVINCE "

Issue date :03-13-2016 Term of validity: 03-13-2016 TO 03-12-2019

Strict and systematic checks

During manufacture, each TGP-40.5 functional unit is subject to systematic routine testing with the aim of checking the quality and conformity of the following features:

- measuring of opening and closing speeds
- dielectric test
- testing of safety systems and interlocks
- testing of low voltage components
- conformity with drawings and diagrams.

The results obtained are recorded and approved by the quality control department on each device's test certificate. This therefore guarantees product traceability. Control of vacuum interrupters Each vacuum interrupter, sealed and airtight, is checked for the quality of the vacuum obtained. This pressure measurement is based on the proven "magnetron discharge" method. Using this sophisticated procedure, measurement is very precise and does not require access to the inside of the bulb, thus not affecting the airtight seal.

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM CERTIFICATE OF CONFORMITY

NO. 10416S20113R0M

This is to certify that the Occupational Health And Safety Management System of

QINGDAO TGOOD ELECTRIC CO.,LTD.

is in conformity with:

GB/T 28001-2011/OHSAS 18001:2007

This system is valid for:

" DESIGN AND PRODUCTION OF T&D EQUIPMENT OF 220kV & BELOW (AS SPECIFIED BY 3C CERTIFICATE) AND BELOW AND RELATED OHS MANAGEMENT ACTIVITIES BY QINGDAO TGOOD ELECTRIC CO.,LTD. LOCATED AT NO.336, SONGLING ROAD, LAOSHAN DISTRICT, QINGDAO, SHANDONG PROVINCE "

Issue date :03-13-2016 Term of validity: 03-13-2016 TO 03-12-2019

Environment protection

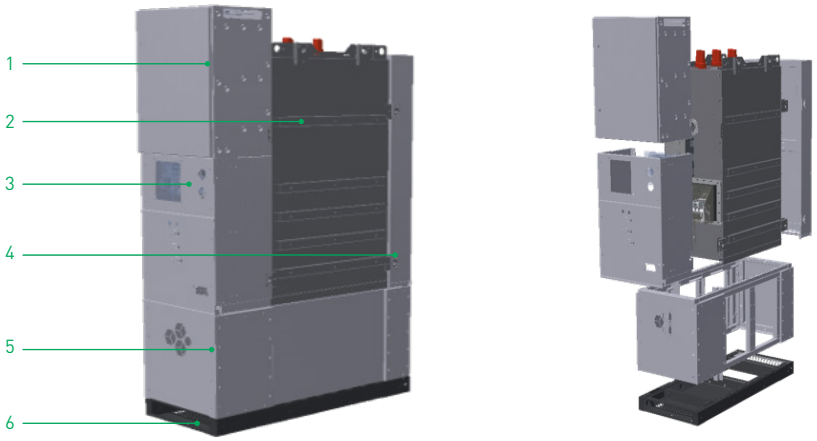
As part of the group's environmental policy, TGOOD provides you an option to recover high voltage switchgear and thus eliminate any discharge to atmosphere. In order to help you protect the environment and to relieve you of any concerns in terms of stock or dismantling, TGOOD service offers to take back your equipment at the end of its life. TGP-40.5 has been designed with environmental protection in mind:

- all materials used, for instance insulators and conductors, are identified, and easily separable for recyclable.
- SF6 usage is reduced in TGP-40.5, and SF6 can be recovered at the end of the equipment's life and reused after treatment.
- production sites are certified to ISO 14001.

Occupational Health and Safety

Occupational Health and Safety (OH&S) bears highest importance at TGOOD. TGOOD demonstrates its commitment towards control of the risks and improvement in performance of OH&S by complying to OHSAS 18001:2007 certified by China National Accreditation Service (CNAS). TGOOD management believes in process approach and its policy is based on PDCA methodology that focuses on elimination or minimizing risks to personnel and other interested parties who could be exposed to OH&S hazards associated with its activities. Strong mechanisms are in place to assure that TGOOD performance on OH&S not only meets, but will exceed its legal and policy requirements.

Product

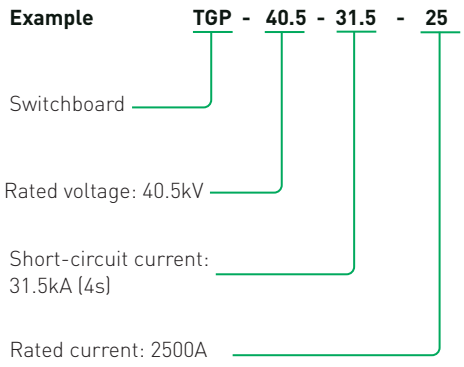


TGP-40.5 composition

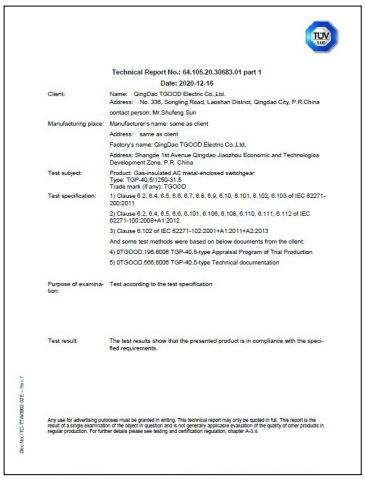
1 The secondary control compartment
2 Gas tank (The primary circuit)
3 Operating mechanism compartment
4 Pressure relief channel
5 Cable compartment
6 Ventilation base

Identification plate

The rating plate supplies information on the version, rated voltage, short-circuit current, rated current and components.



Product



Technical Report No.: 64.105.20.30683.01 part 1
Date: 2020-12-16

Client: Name: QingDao TGOOD Electric Co.,Ltd.
Address: No. 336, Songling Road, Laoshan District, Qingdao City, P.R.China
contact person: Mr.Shufeng Sun

Manufacturing place: Manufacturer's name: same as client
Address: same as client
Factory's name: QingDao TGOOD Electric Co.,Ltd.
Address: Shangde 1st Avenue Qingdao Jiaozhou Economic and Technological Development Zone, P.R. China

Test subject: Product: Gas-insulated AC metal-enclosed switchgear
Type: TGP-40.5/1250-31.5
Trade mark (if any): TGOOD

Test specification: 1) Clause 6.2, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.101, 6.102, 6.103 of IEC 62271-200:2011
2) Clause 6.2, 6.4, 6.5, 6.6, 6.101, 6.106, 6.108, 6.110, 6.111, 6.112 of IEC 62271-100:2008+A1:2012
3) Clause 6.102 of IEC 62271-102:2001+A1:2011+A2:2013
And some test methods were based on below documents from the client:
4) DTGOOD.196.6006 TGP-40.5-type Appraisal Program of Trial Production
5) DTGOOD.556.6006 TGP-40.5-type Technical documentation

Purpose of examination: Test according to the test specification

Test result: The test results show that the presented product is in compliance with the specified requirements.

Any use for advertising purposes must be granted in writing. This technical report may only be quoted in full. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production. For further details please see testing and certification regulation, chapter A-3.4.

Operating conditions

- Ambient temperature: from –25°C to +45°C
- Average value over 24 hours (max.): +35°C
- Typical maximum altitude for installation above sea level is 2,000 m. However, much higher altitudes are possible on request.
- Type of insulating gas: sulphur hexafluoride (SF6)
- Rated pressure at +20°C: 0.04 MPa
- Flood proof (option): successfully tested under water for 24 hours at 24 kV 50 Hz.

Protection index (IP)

- Main electrical circuits (gas tank): IP67
- Enclosure: IP4X
- Between compartments: IP2X
- Switchgear: IK10

Partition class and loss of service continuity category

- Partition Class: PM (1)
- Loss of Service Continuity Category: LSC2B for single functional unit (2)

Internal Arc Classification

TGP-40.5 is a pressurized sealed-unit system that complies with IEC 62271-1. Its tank is filled with SF6 gas that is used as an insulating and breaking medium. TGP-40.5 internal arc classification as per IEC 62271-200 is detailed in the table below. In the unlikely event of gas overpressure, the gas is discharged via safety valves away from the operator.

(1) PM class according to IEC 62271-200 edition 2: metallic partitioning between compartments.
(2) Based on IEC62271-200 edition 2, TGP-40.5 is classified as LSC2B.

IAC (internal arc classification):
The metal enclosed switchgear may have different types of accessibility on the various sides of its enclosure.
For identify purpose of different sides of the enclosure, the following code shall be used (according to IEC 62271-200 standard).
A: restricted access to authorized personnel only
F: access to the front side
L: access to the lateral side
R: access to the rear side.

LSC2A (Loss of service continuity):
this category defines the possibility to keep other compartments energized when opening a main circuit compartment.

LSC2B: switchgear and controlgear of category LSC2 where the cable compartment is also intended to remain energized when any other accessible compartment of the corresponding functional unit is open.

The TGP-40.5 switchboards comply with the standards

Description	IEC standard	IEC classes
Switchboard	IEC 62271-200 IEC 62271-1	
Behaviour in the event of internal faults	IEC 62271-200	
Earthing switch	IEC 62271-102	E2
Disconnector	IEC 62271-102	M2
Circuit-breaker	IEC 62271-100	C2, M2, E2
Current transformer	IEC 61869-2	
Voltage transformer	IEC 61869-3	
Voltage presence indicators	IEC 62271-206	
Voltage detection systems	IEC 61243-5	
Protection against accidental contact, foreign bodies and ingress of water	IEC 60529	

Contents

Introduction

TGP-40.5

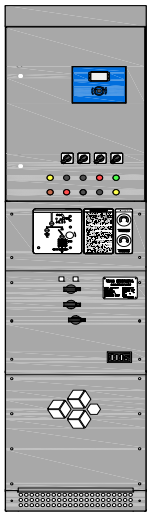
General introduction

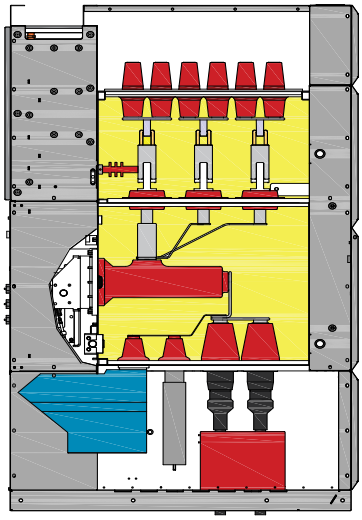
- TGP-40.5 gas insulated switchgear (hereinafter referred to as C-GIS) is an SF6 gas insulated, metal shell, fixed switchgear, and is an indoor complete set of three-phase AC 50Hz single bus and bus segmentation. Mainly used in power distribution systems such as power plants, small and medium generators, substations, high-rise buildings, industrial and mining enterprises, subways and electrified railways, to implement the control, protection and detection of power supply systems and loads. It is especially suitable for underground, high altitude, frozen soil, coastal, humid and other environments, densely populated areas and places with expensive construction area.
- The products are jointly developed with German technical experts, the products have independent intellectual property rights, and 56 national authorized patents (including 4 patents for invention) have been applied for.
- The key technologies of product development and design, such as insulation, temperature rise, mechanical strength, sealing, arcing, etc., are all calculated by computer simulation to ensure the quality and reliability of product development.
- In order to ensure the stability and reliability of product manufacturing quality, the company has introduced imported three-dimensional five-axis robot welding equipment, helium quality general leak detector, lightning impact, X-ray detection, partial discharge tester, temperature rise, high and low temperature testing And other equipment.
- The company strictly organizes production according to ISO9000 documents and 6S management to ensure that the quality of the entire cabinet is monitored throughout the process.
- The product has a compact structure and small volume. The volume of the TGP-40.5 product is only 16% of the volume of the conventional AIS product.
- The high-voltage primary components of the product are enclosed in a stainless steel gas chamber, and the main circuit is fully enclosed, fully insulated and maintenance-free.
- The product adopts SF6 gas insulation and vacuum arc extinguishing breaking technology, and the service life of the vacuum circuit breaker is up to 20,000 times.
- The product is designed with an independent arcing channel, and the arcing capacity of the whole cabinet: IAC-31.5kA/1s.

Features

- SF6 gas insulation, vacuum interruption;
- No need to fill in SF6 when on-site installation;
- Rated pressure for gas filled is lower to 0.04MPA;
- With unique natural air cooling duct;
- Modular design, removeable gas tank and compartment;
- The main circuit is fully enclosed and insulated with IP67;
- The circuit-breaker is up to 2500A, main busbar up to 4000A;
- Rated breaking current 31.5kA;
- Independent centralized pressure relief channel;
- Main bus VT and arrester with isolation switch, easy for operation and maintenance;
- Compact size.

Range of functions





Advantages

Diversified solutions

- Satisfy the global market demands by providing various solutions;
- Bus and line VT solution;

Capability of development

- Self-developed the core components (CB and TPS);
- Up to now, a total of 30 patents have been awarded;

Compact size

- The height with busbar and line VT: 2450mm;
- Width: 600mm/800mm;
- Depth: 1500mm.

Positioning

Technically

- 40.5kV SF6 gas insulated switchgear series;

Market

- Railway, photovoltaics, oil & gas, mining, etc;
- China and out of China;

Quality & cost

- IEC compliance and cost effective;

High-end

- Safe and high reliable, maintenance-free.

Technical data

TGP-40.5						
Rated voltage		kV	12	24	36	40.5
1min power frequency insulation		A	42/48	65/75	70/80	95/118
Lightning impulse withstand voltage (peak)		kV	75/85	125/145	170/195	185/215
Rated frequency		Hz	50	50	50	50
Rated short-circuit breaking current (RMS)		kA	25/31.5			
Rated peak withstand current		kA	63/80			
Rated short-time withstand current (RMS)		kA	25/31.5			
Duration of rated short-time withstand current		s	4			
Rated current of busbar		A	3150	2500	2500	2500
Rated current of branch busbar		A	630/1250/1600/2000/2500			
Internal arc classification		kA/s	A FLR 25/1; 31.5/1			
Mechanical endurance of VCB		times	20000			
Mechanical endurance of three-position disconnector		times	5000			
Rated ex-factory charging pressure (relative)		MPa	0.03			
Alarm pressure (relative)		MPa	0.02			
Blasting pressure of explosion-proof membrane (relative)		MPa	0.12			
Type of insulating gas			N2	SF6+N2	SF6	SF6
SF6 moisture content (20°C)		ppm	⩽300	⩽300	⩽300	⩽300
Annual leakage rate		%	⩽0.01			
1min power frequency insulation at zero gauge pressure		kV	40	45	85	85
Volume (W*D*H)		mm	600 (700) ×1500 ×2450		600 (800) ×1500 × 2450	
IP class	Gas tank (the primary circuit)		IP67			
	Enclosure		IP4X			
	Between compartments		IP2X			

Notes:

1. For TGP-12/24: when the rated current is less than or equal to 1250A, the standard is 600mm cabinet width; when the rated current is 1250A, the cabinet width is 600mm; when the rated current is >1600A, the cabinet width is 800mm;

2. For TGP-36/40.5: when the rated current is less than or equal to 1600A, the cabinet width is 600mm; when the rated current is more than 1600A, the cabinet width is 800mm;

3. For TGP-36/40.5: the height of the conventional incoming/outgoing cabinet is 2450mm (including the head size) when the busbar is equipped with VT and lightning arresters, and both VT and arresters can be equipped with independent isolation switches, and the cabinet height is 2500mm (including the top brow size).

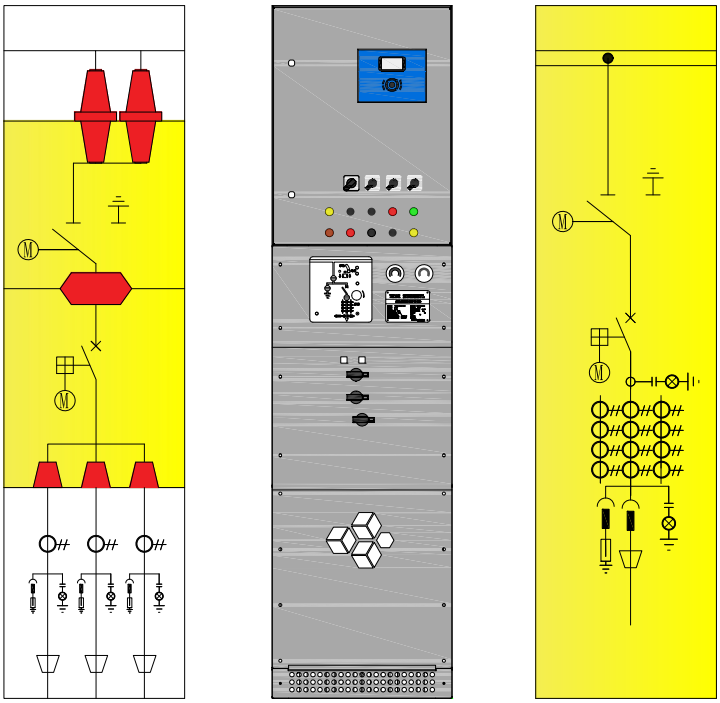
4. The standard height of the LV box is 850mm. If more instruments, the height of the secondary room can be increased appropriately through technical clarification.

Technical data

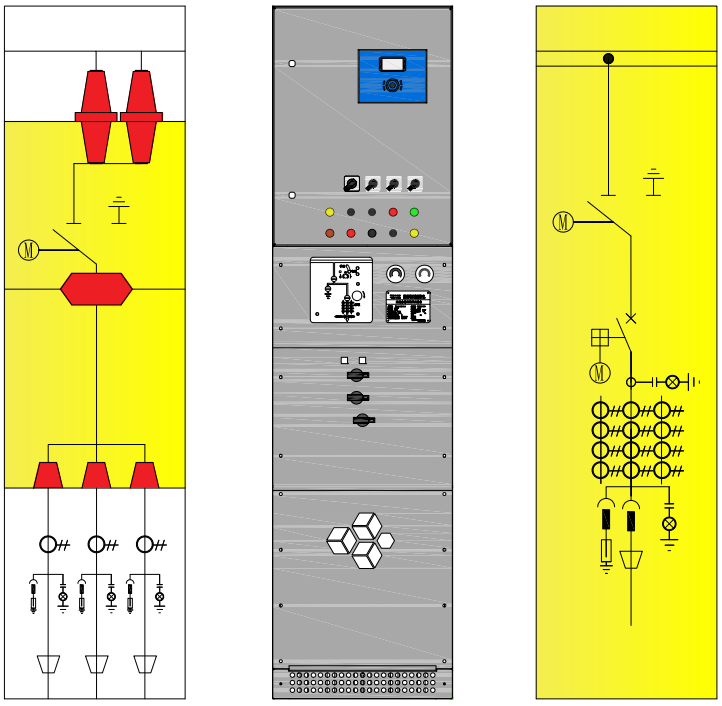
TGP-40.5 Vacuum circuit-breaker					
Rated voltage	kV	12	24	36	40.5
1min power frequency insulation	A	42/48	65/75	70/80	95/118
Lightning impulse withstand voltage (peak)	kV	75/85	125/145	170/195	185/215
Rated frequency	Hz	50	50	50	50
Rated short-circuit breaking current (RMS)	kA	25/31.5			
Rated peak withstand current	kA	63/80			
Rated short-time withstand current (RMS)	kA	25/31.5			
Duration of rated short-time withstand current	s	4			
100% short-circuit breaking times	times	30			
Rated single capacitor bank switching current	A	630	630	630	630
Rated cable-charging switching current	A	50	50	50	50
CB mechanical endurance	times	20000			
Closing and opening time	ms	< 80			
Rated ex-factory charging pressure (relative)	MPa	0.03			
Contact opening distance	mm	11±1	15±1	18±1	18±1
Over travel	mm	4±1	4±1	4±1	4±1
Rated operating sequence		O-0.3s-CO-180s-CO			

Typical solutions

Solution I: Circuit-breaker panel

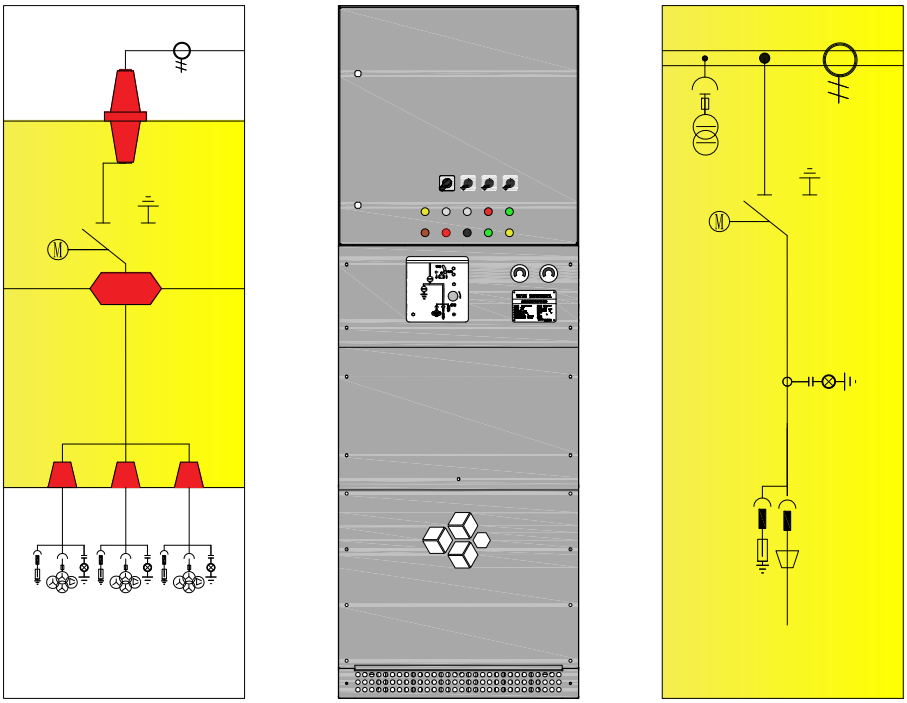


Solution II: Disconnector panel

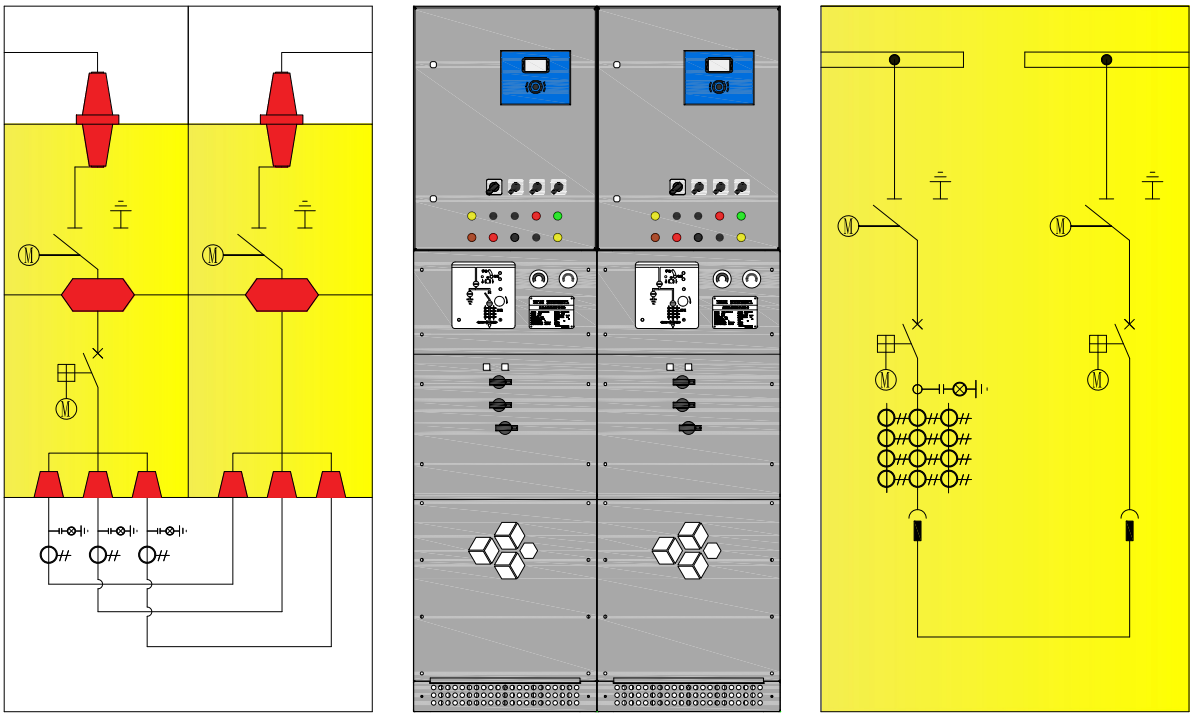


Typical solutions

Solution III: Disconnector with metering

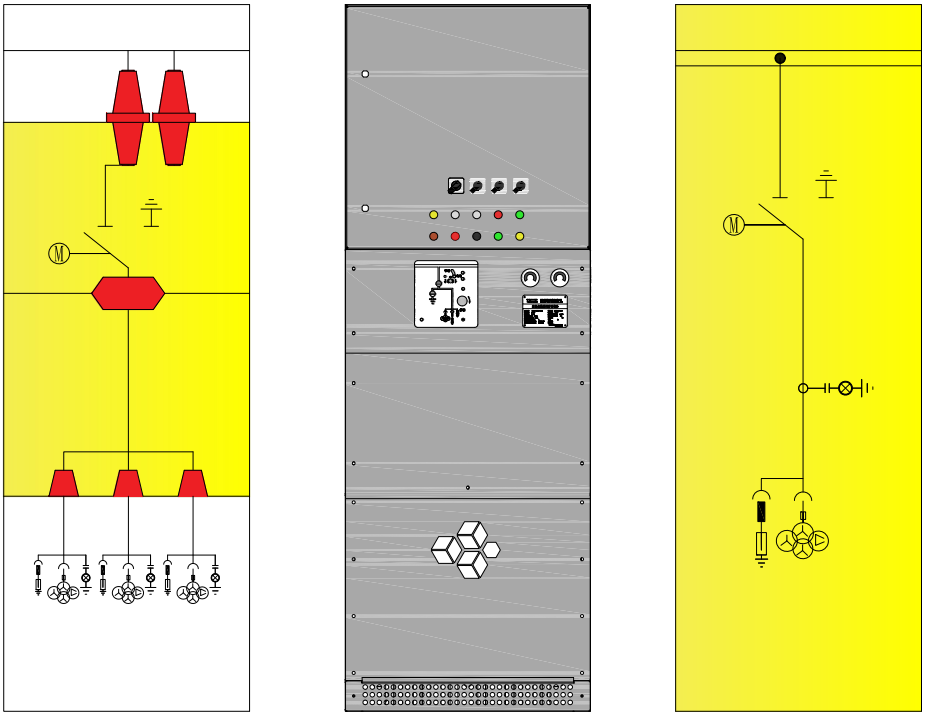


Solution IV: Bus coupler panel

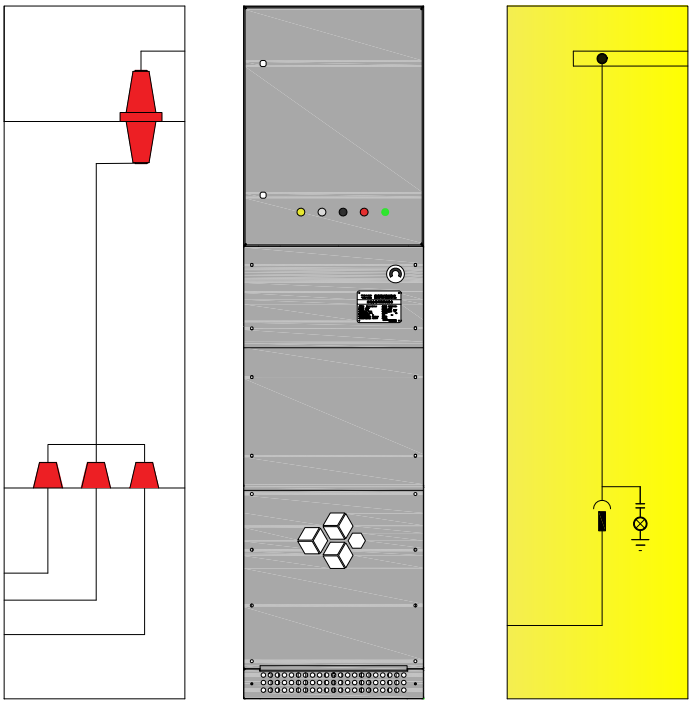


Typical solutions

Solution V: VT panel (main bus VT+SA)



Solution VI: Direct panel



Content

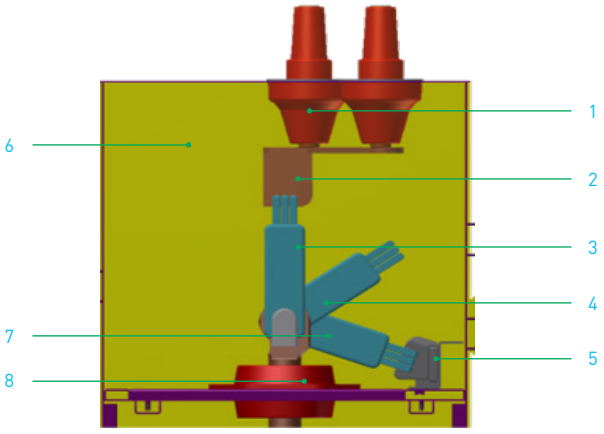
LV cubicle

LV cubicle

Height: 850mm/1000mm/1200mm (optional)
It is modular and withdrawable, the height is 850mm, 1000mm and 1200mm (optional), plug-in control busbars (through 6-10 pin plug-in terminals), equiped with traditional and digital relays. The secondary equipment is designed according to customer requirements.

Three-position disconnector

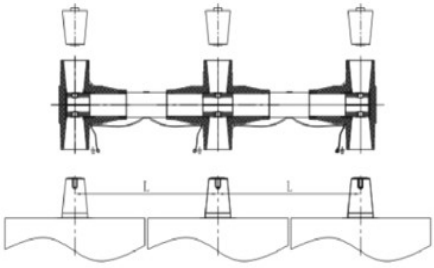
The three-position disconnector on the TGP-40.5 combines the functions of an isolating switch and a grounding switch. It does not have the ability to make and close, and the maximum rated circuit is 2500A. It can only perform "close and open" operations when there is no current. The specific structure can be shown as below.



Three-position switch with bus bushing

1. Bus bushing
2. Fixed contact of disconnector
3. Moving contact of disconnector at connected position
4. Moving contact of disconnector at disconnecting position
5. Fixed contact of earthing switch
6. Gas tank enclosure
7. Moving contact of earthing switch
8. Cross wall bushing

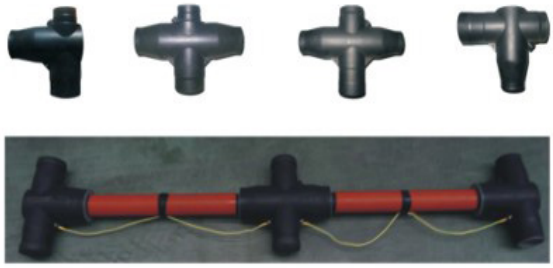
Bus connector



The assembly of bus connector

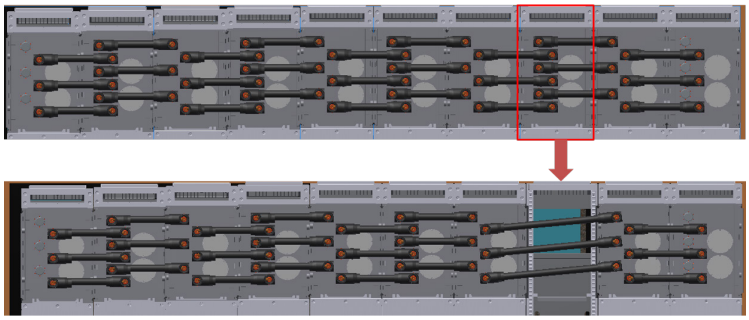
Bus connector

The plug-in solid insulated bus connector is used between the cabinet of TGP-40.5 and the main busbar, which is outer cone solid plug insulated structure. SF6 gas operation is not involved in the assembly of the switch cabinet, which is not affected by dust and condensation, so the installation is more convenient, and it has low requirement on foundation flatness. The partial discharge of each solid bus an be controlled within the range of 5pC under 45kV experimental voltage. The maximum rated current of TGP-12kV bus is 3150A, and that of TGP-24, 36 and 40.5kV is 2500A.



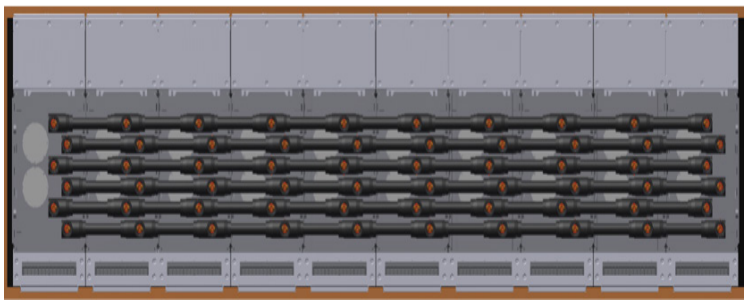
Solution I: Bus layout for 2500A

Single row: The main busbars up to 2500A are arranged in a single row, the adjacent cabinets are designed with a segmented structure. Each one can be withdrawn without the entire busbar "disassembly and assembly". Remove the interval labelled below can quickly supply power to the others.



Solution II: Bus layout for 4000A

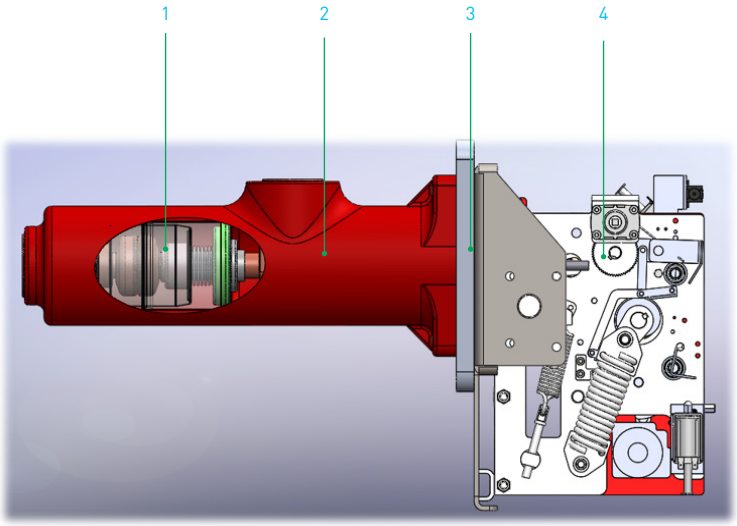
Double row: Each phase adopts double-row layout, the main busbar up to 4000A between adjacent cabinets adopts the whole section structure design.



Vacuum circuit-breaker

Vacuum circuit-breaker

Vacuum breaking technology is adopted for the circuit-breaker on TGP-40.5. The maximum rated current is 2500A, the rated short-circuit breaking current is 31.5KA (4s), the electrical life is E3 (30 times), the mechanical life is M2 (20000 times). The three phases of A/B/C are horizontally arranged from left to right. After the installation and debugging outside the cabinet, it is fixed in the "cabinet" after the overall installation. The specific structure is shown as below.



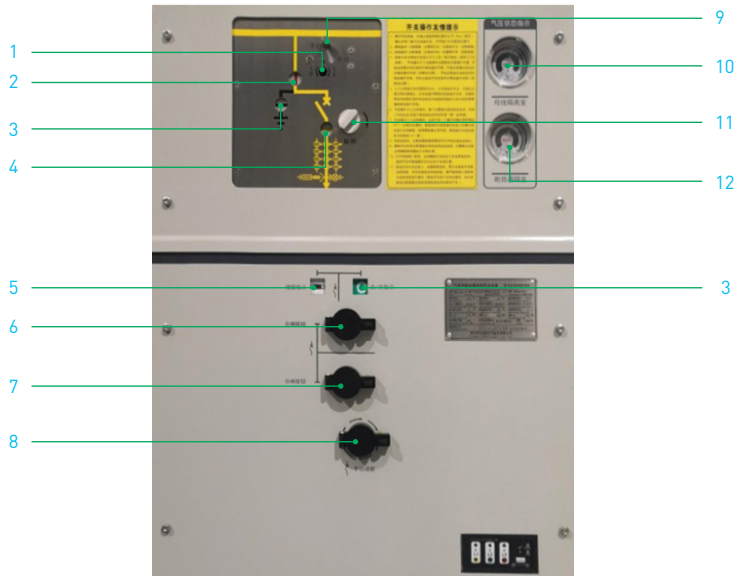
The structure of vacuum circuit-breaker

1. Vacuum circuit-breaker
2. Circuit-breaker pole
3. Sealing plate
4. Operating mechanism (spring)

Operating mechanism

Operating mechanism (three-position disconnector and circuit-breaker)

The operation buttons and position indication of circuit breaker, three-position disconnector and SF6 manometer involved in TGP-40.5 are all embodied on the panel. The operation and indication are user friendly. The specific structure is shown as below.



The panel of operating mechanism

1. Manual operating hole of three-position switch
2. Indication of disconnector O/C (opening & closing)
3. Indication of grounding O/C
4. Indication of CB O/C
5. Indication of CB energy storage /non-energy storage
6. CB closing selector position
7. CB opening selector position
8. CB manual energy storage operating position
9. Three-position switch manual/electric switch handle
10. Manometer of bus bar compartment
11. Three-position switch manual unlock handle
12. Manometer of CB compartment

Current transformer

Three-phase integrated CT

Current transformer

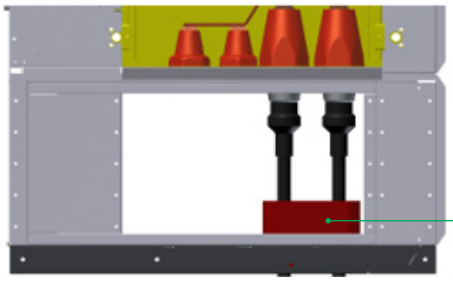
TGP-40.5 adopts straight-through type CTs, which can go through incoming/ outgoing cables and the main busbar. When the incoming / outgoing cables are single cable, round CT is adopted, and when the incoming / outgoing cables are multiple, the ring CT is adopted. The external cone cable is used to connect the CT on the TGP-40.5. The three-phase integrated CT can be directly fixed on the outer cone sleeve. The primary current of current transformer is 100 to 2500A, and the secondary current is 1A or 5A. The specific secondary coil quantity, accuracy and capacity of CT shall be determined when ordering.

Round CT (for single cable)

Ring CT (for double cable)

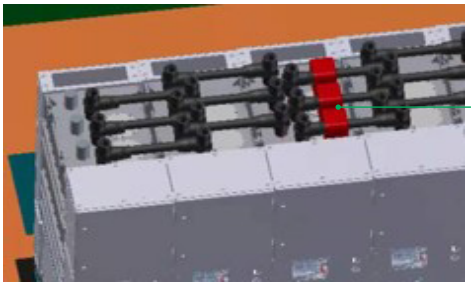
CT installation in the cable side

The cable-side circuit transformer passes through the incoming/outgoing cable and is fixed on the beam on the cable compartment, as shown as below.



CT installation in the main busbar side

The current transformer on the main bus side of TGP-40.5 passes through the main bus and is fixed to the top of the cubicle.



Voltage transformer

Voltage transformer

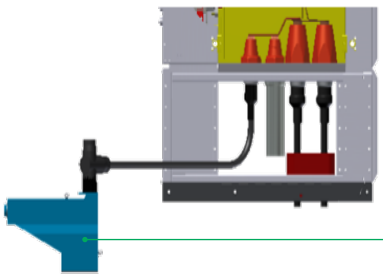
The voltage transformer (VT for short) involved in the TGP-40.5 is designed with an insulated medium voltage terminal with a plug-in connector, and the VT is directly plugged into the special socket on the bottom side of the product's air box shell. The VT core and the winding are integrated, and can be protected by a fuse once. The fuse is installed inside the transformer. The fuse current of the fuse matches the short-circuit current withstand capacity of the transformer, which can effectively protect the VT when the power grid has harmonics. It is burned out (see the below fugure for VT with fuse/without fuse).

The VT secondary voltage is 100V, and the secondary coil can provide a measurement level, a measurement level, and a protection level, for example: 35/√3/0.1/√3/0.1√3/0.1/3, VT specific secondary coil quantity, accuracy, capacity and other characteristics are determined when ordering.

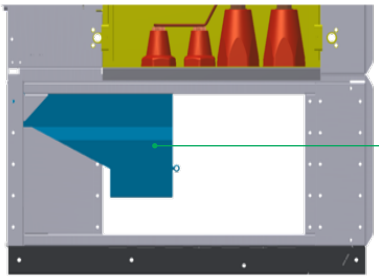
VT with fuse

VT without fuse

The main bus VT and the line side VT are physically arranged at the bottom of the cabinet, and can be directly plugged and fixed at the bottom of the cubicle gas tank, or fixed on the base of the cubicle's cable room or outside through cable connection.

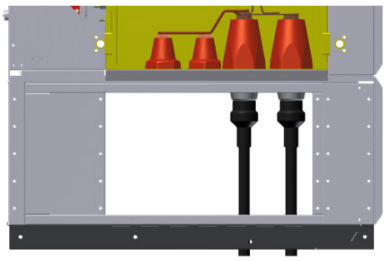


VT outside the cubicle



VT inside the cubicle

Bushings and connectors



Bushings

The primary main circuit of TGP-40.5 is fully enclosed and fully insulated. All incoming and outgoing cables are equipped with plug-in cable terminals. The connection between the connectoe and the product cabinet is coordinated and fixed by bushings. There are two catogories of bushings in TGP-40.5, inner cone bushing and outer cone bushing. Refer to the below table for relevant information of cable types, rated current and applicable TGP-40.5 cubicle types.

Item	Inner cone bushing	
	2#	3#
Type		
Rated current	1000A	1250A
Applicable cubicle	TGP-36 TGP-40.5	TGP-36 TGP-40.5
Applicable position	VT/SA/Cable	VT/SA/Cable

Connectors

The connection between cable and cabinet of TGP-40.5 is fully enclosed and fully insulated, which is mainly realized by cable terminal. According to the structure, the connectors are divided into inner cone connector and outer cone connector. The connectors' structure and applicable cabinet type involved in TGP-40.5 are shown below.

Item	Inne cone connector
Type	
Applicable cable	50mm^2~630mm^2
Applicable cubicle	TGP-36 TGP-40.5

Surge arrester

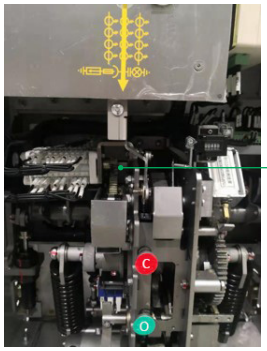
Surge arrester

TGP-40.5 surge arrester can be divided into two types according to the cable sockets, one with outer cone sleeve and the other with inner cone cable socket, plug in connection with the cubicle, and match with the 2# inner cone socket;
The surge arresters of main busbar and line side are placed on the bottom of the cubicle.
The specific technical parameters of arresters shall be determined when ordering.

Item	Inner cone cable terminal
Type	
Rated voltage (kV)	41/42/51/52.7/54
Applicable cubicle	TGP-36 TGP-40.5

Interlock (optional)

The interlock design is satisfied, it is placed between three-position switch and CB mechanism, and between disconnector and earthing switch (in three-position switch)-mechanical. CB and three-position switch can be padlocked.
Disconnector and earthing switch can be electromagnetic interlocks.
Earthing switch can be electromagnetic interlock.

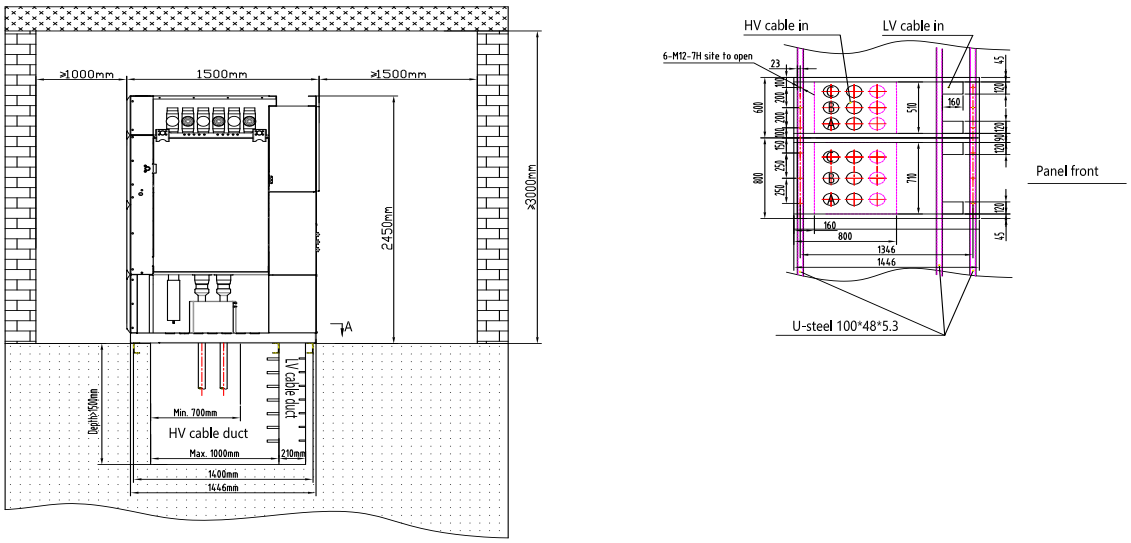


Interlock between disconnector and earthing switch

Content

Foundation

Drawing of TGP-40.5 foundation



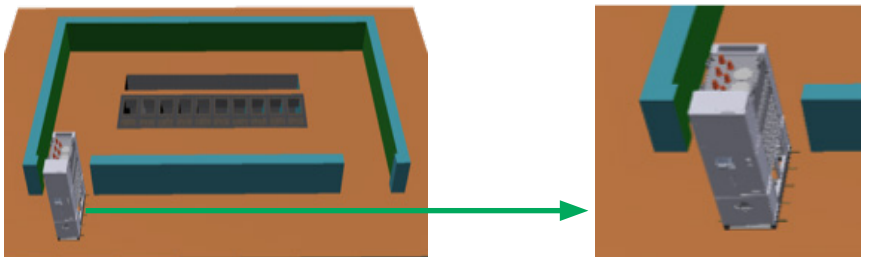
The basic technical requirements as follows:

- The upper surface of foundation section steel shall be 5-10 mm higher than the finished distribution room or substation's ground;
- The flatness tolerance of foundation section steel is ± 3mm/m;
- The allowable straightness tolerance of foundation section steel is ± 1mm/m;
- The height difference between two adjacent sections is ± 1mm;
- The depth of cable trench must meet the requirement of minimum bending radius of primary cable at one time. When laying cables, reserve one fixed cable length and 1.5m higher than the ground of distribution room or box transformer;
- The product is fixed on the profile steel and connected with bolts after adjusting the level.

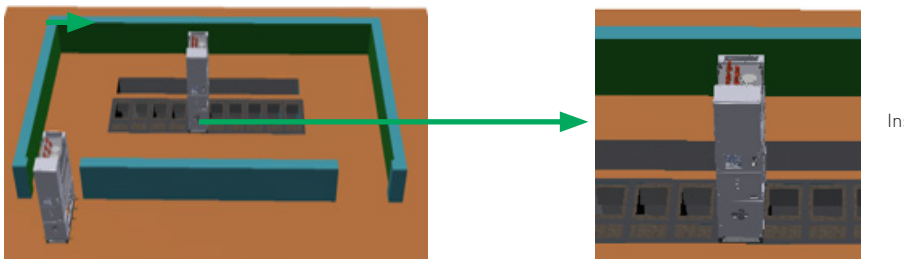
Installation

Installation

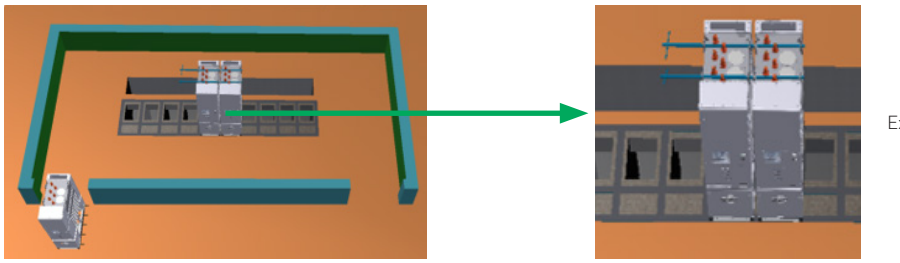
Easy installation: Adopt the outer cone solid bus structure, and the on-site extension does not require "vacuuming-filling SF6-leakage test" and other links, and the installation efficiency is high.



Before installation



Installed in the substation

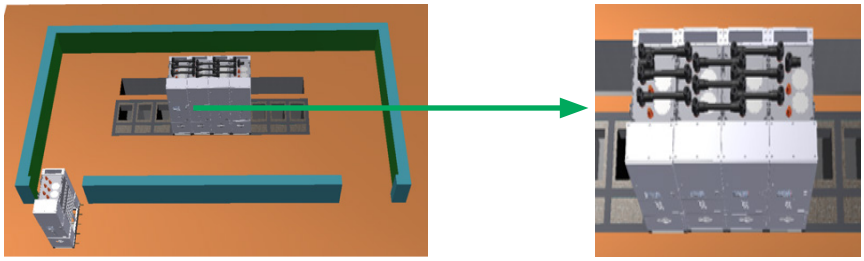


Extension

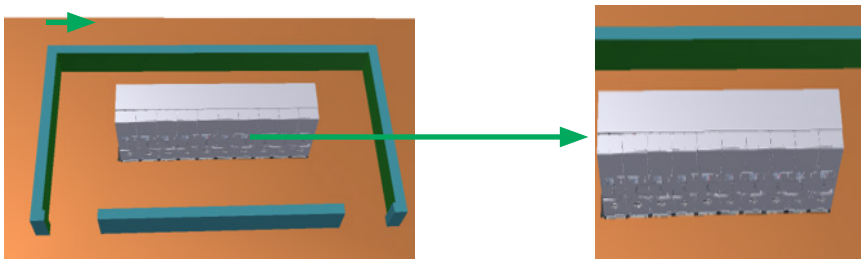
Extension

Extension

Easy extension: Low requirements on the foundation flatness (2mm/m).



Install bus

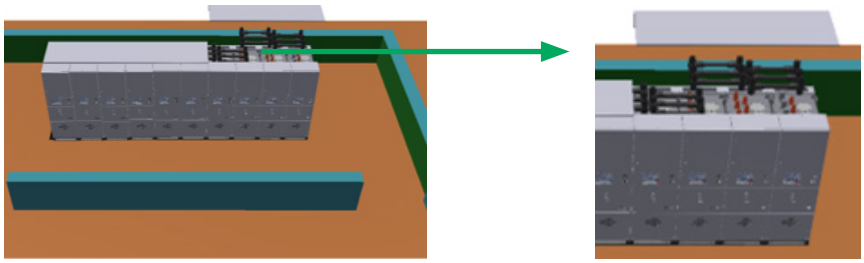


Complete extension

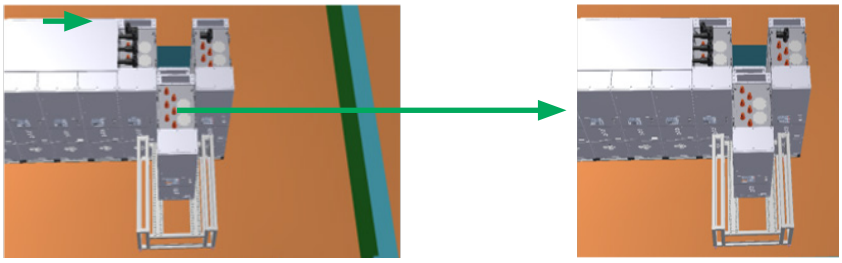
Maintenance

Maintenance

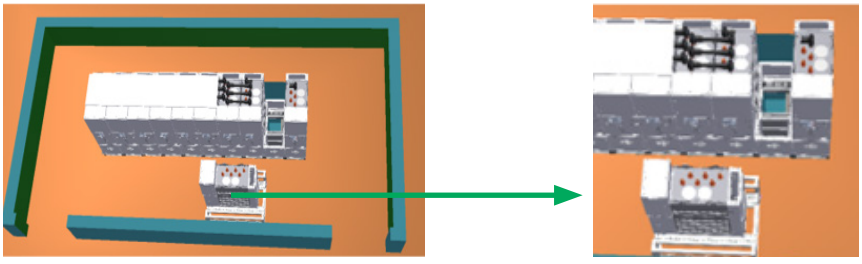
Efficient maintenance: When an "unrecoverable" fault occurs in any compartment, the "primary circuit" module can be replaced (gas tank is sliding connected with the base).



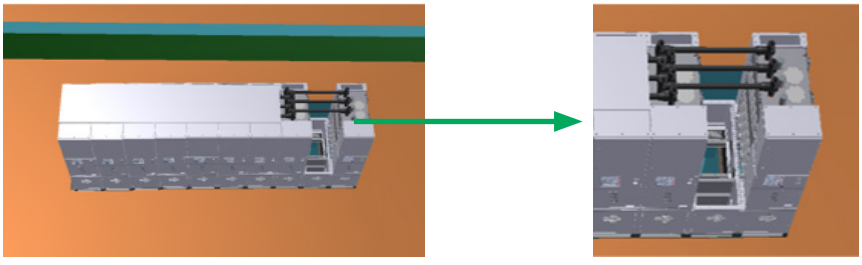
When fault occurs, power off and disassemble the roof



Remove the faulty compartment



The faulty compartment has been taken out



Temporary recover the power supply

Packaging and transport

Packaging

For road and rail transport:
TGP-40.5 switchboard is packaged under protective sheeting. It is delivered fixed on to
a wooden pallet by two plastic tapes.

- For maritime transport:

TGP-40.5 is packaged in a heat-sealed cover with bags of desiccant, then enclosed
in a wooden case with a solid leak tight bottom (including transport by container).

- For air transport:

TGP-40.5 switchboard is packaged in a wooden boxes (crates) with solid walls and a protective cover (dust cover).

Handling

The TGP-40.5 must be transported vertically:

- When moving using a forklift:

Only move the device on a pallet.

- When moving without a pallet:

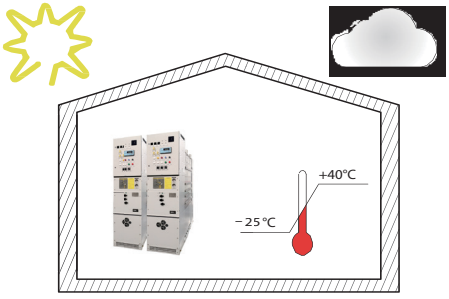
A lifting sling must be hooked on to the switchboard's lifting rings. The angle with the lifting sling must be at least 45°.

- When transporting on pallet:

Don't tilt the switchboard. Respect the centre of gravity markings.

- When transporting with slings:

Use the two lifting rings.



Storage

TGP-40.5 must be packaged depending on the requirements for its planned storage duration. TGP-40.5 must be preserved intact in its factory origin packaging.
The storage area must not have any sharp and important changes in temperature.
Consult us for any particular storage condition.

Contents

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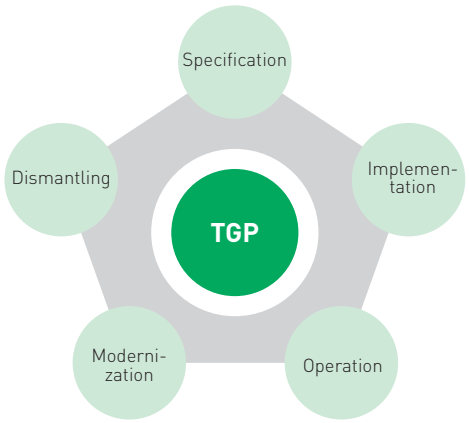

Plan

TGOOD helps you to plan the full design and execution of your solution, looking at securing your process and optimising your time:

- **Technical feasibility studies:** Accompany customer to design solution in hisgiven environment
- **Preliminary design:** Accelerate turn around time to come to a final solutiondesign

Install

TGOOD will help you to install efficient, reliable and safe solutions based on your plans.

- **Project Management:** Designed to help you complete your projects on time andwithin budget
- **Commissioning:** Ensures your actual performance versus design, through onsite testing & commissioning, tools & procedures

Operate

TGOOD helps you maximise your installation uptime and control your capital expenditures through its services offering.

- **Asset Operation Solutions:** The information you need to increase safety, enhance installation training performance, and optimise asset maintenance and investment
- **Advantage Service Plans:** Customised services plans which cover preventive, predictive and corrective maintenance
- **On site Maintenance services:** Extensive knowledge and experience in electrical distribution maintenance
- **Spare Parts Management:** Ensure spare parts availability and optimised maintenance budget of your spare parts
- **Technical Training:** To build up necessary skills and competencies. in order to properly operate your installations in safety

Optimise

TGOOD propose recommendations for improved safety, availability, reliability & quality.

- **Electrical Assessment:** Define improvement & risk management program

Renew

TGOOD extends the life of your system while providing upgrades. TGOOD offers to take full responsibility for the end-of-life processing of old electrical equipments.

- Keep up to date & improve performances of your electrical installations (LV,MV, Protection Relays...)
- MV product End of life: recycle & recover outdated equipment with end of life services

Frequency of maintenance intervention

TGOOD equipment manufacturers recommend a schedule for maintenance activities to extend Electrical Distribution equipment performance over time. Frequencies under normal/healthy operation (minor equipment criticality and optimal environmental conditions) can be generally defined as follows:

Maintenance	Minimal frequency [1] (every)	Who		
		Manufacturer	Certified partner	End user
Exclusive	4 years	b		
Advanced	2 years	b	b	
Light	1 year	b	b	b

(1) Recommended under normal operating conditions (minor equipment criticality and optimal environmental conditions).However, this recommended frequency should increased according to: a) the level of criticality (low, major, critical) b) the severity of environment conditions (i.e. corrosive, naval, offshore) following recommendations of Manufacturer.

When it comes to your electrical distribution installation, we can help you:

- Increase productivity, reliability, and safety
- Mitigate risk and limit downtime
- Keep equipment up to date and extend lifespan
- Cut cost and increase savings
- Improve your return on investment

Contact us!

www.service@tgood.com

Contents

Sustainable development

TGOOD has resolved to engage itself in a dynamic process of sustainable development through 6 commitments:

- To develop eco-design to reduce environmental impact of the products during their lifetime
- To reduce greenhouse effect gases related to SF6
- To develop environmental management and safety
- To participate in the local economy
- To develop a responsible purchasing policy
- To minimise impact on the environment by offering solutions allowing for renewable energies to be connected to electrical networks

ENVIRONMENTAL MANAGEMENT SYSTEM
CERTIFICATE OF CONFORMITY

NO. 10416E10130R0M

This is to certify that the Environmental Management System of

QINGDAO TGOOD ELECTRIC CO.,LTD.

is in conformity with:

GB/T 24001-2016/ISO 14001:2015

This system is valid to:

* DESIGN AND PRODUCTION OF T&D EQUIPMENT OF 220kV & BELOW (AS SPECIFIED BY 3C CERTIFICATE) AND BELOW AND RELATED EMS MANAGEMENT ACTIVITIES BY QINGDAO TGOOD ELECTRIC CO.,LTD. LOCATED AT NO.336, SONGLING ROAD, LAOSHAN DISTRICT, QINGDAO, SHANDONG PROVINCE *

Issue date :03-13-2016 Term of validity: 03-13-2016 TO 03-12-2019

Change date: 03-23-2018

Representative of the company (Director):

Eco-design and impact on the environment

TGOOD contributes efficiently to worldwide savings in terms of energy resources. TGP-40.5 replies to a high degree of ecological requirements related to environmental
protection thanks to:

- The optimisation of consumption of materials and energy during manufacture The compliance with all ecological requirements during the service life of the product
- The use of materials that can be recycled for an efficient valorisation

A responsible design

Our construction directives relating to an ecological design specify the use of materials that are easy to recycle and dismantle:

- 90% of the metals of a switchboard can be recycled, as well as
- All thermosetting plastics and thermoplastics

All the materials have been selected and developed in such a way that, for instance, a switchboard affected by a fire in a building has a minimal impact on the load of the fire (development of heat and toxic substances in the emissions). Eco-declarations are available on request

Environmental impact

The end of service life phase is considered a very important part of the life cycle of TGOOD products. The environmental impact inherent to the disposal of equipment is sometimes more polluting than the manufacturing, delivery or use. European directives, such as WEEE, ELV and RoHS, have confirmed this point and all insist upon the recovery of waste products and their valorisation at the end of the equipment's service life.
Even though our switchgear is not covered by this legislation, TGOOD is willingly attempting to optimise the recycling, the processing of waste and, as a consequence, the end of service life phase of our products, which is an integral part of the operating costs.

End of service life processing

At the end of the TGP-40.5 service life

The dismantling and disassembly of TGP-40.5 is possible at the end of its service life. The separation of the elements making up the switchgear will be made:

- Either by disconnecting the mechanical connections
- Or, by dismantling, that is to say, by breaking or shearing the connections. To guarantee efficient and ecological sorting and destruction of the materials, all plastic components have been identified
- A description of the materials is supplied to customers
- Information on the valorisation process that are supplied to companies in charge of the recycling

End of service life processing

TGOOD can support you in your TGP-40.5 end of service life processing approach.

SF6 gas recovery

The volume of the insulating gas used in TGP-40.5 is equivalent to 0.5% of the total weight of the switchboard. At the end of the switchboard's service life, gas can be evacuated via the valve to be recycled thanks to a process developed by gas suppliers.

Composition of materials and valorisation at end of service life

After disassembly (or dismantling), the recovered elements must be forwarded for treatment in the following manner:

Waste processing

Type of waste	Destination	Recommended processing
SF6 gas	Supplier	Recovery, storage and regeneration
Steel & stainless steel	Local recovery agent	Shredding, sorting and recycling
Non-ferrous metals	Local recovery agent	Shredding, sorting and recycling
Epoxy resin	Cement plant	Revalorisation at a lower added value
Thermoplastics	Local recovery agent	Incineration
Molecular sieve	Authorised network	Elimination
Soiled protective equipment	Authorised network	Incineration
Cables	Local recovery agent	Separation of sheathing and conductors

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