



Modular substation

Catalogue
2021

TGOOD

tgood.com

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TGOOD is the global leader in prefabricated electric power distribution solutions. It is the company that first comes to mind when cost-effective electric power solutions are required fast. TGOOD, as a passionate team of professionals, delights its customers with solutions that exceed expectations.

TGOOD listens to customers, and responds to their specific needs by providing innovative power solutions globally with exceptionally short lead times, high degree of flexibility, and great value for money.

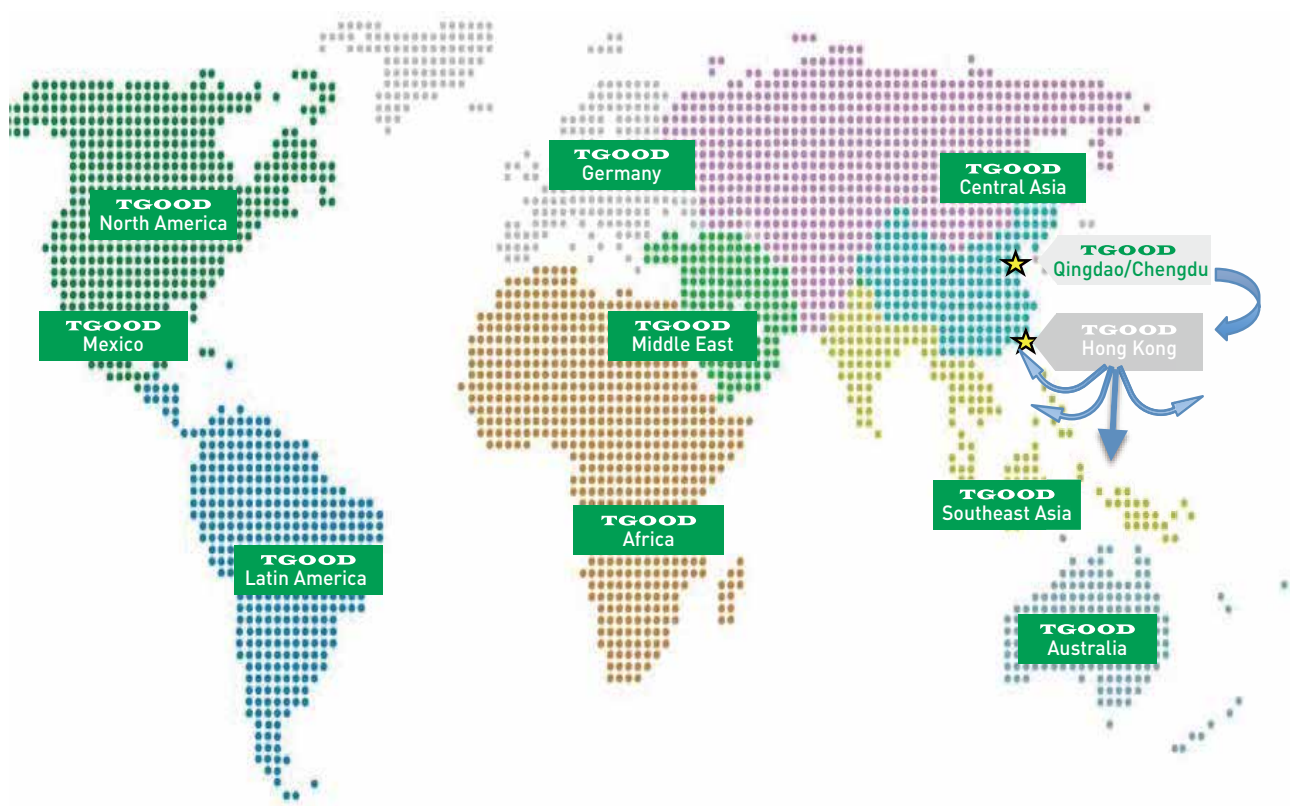
TGOOD specialises in providing vertically integrated substations solutions from power products through to and including modular buildings and structural fabrication. TGOOD stands alone on the global stage with such vertical integration and manufactures medium and high voltage power products up to 145kV. TGOOD's products can meet the requirements of various industries and have successfully executed installations in utility, transportation, mining, oil & gas, renewable energy and building sectors.

Since 2004, more than 100,000 TGOOD prefabricated substations installed worldwide!

Successful history of innovative solutions

- 2004 First railway remote substation
- 2004 First 40.5 kV compact prefabricated substation
- 2006 First offshore platform substation
- 2007 First intelligent railway remote substation
- 2007 First skid substation
- 2008 First 110 kV urban substation
- 2009 First coal dual power supply substation
- 2010 First trailer substation
- 2012 First 145 kV modular substation
- 2013 First PV integrated substation
- 2014 First E-vehicle group charging substation
- 2015 First 40.5kV and 12kV PV pad-mounted substation
- 2016 First 3x3 sections 110kV modular substation
- 2017 First 252kV modular substation
- 2018 First Micro-Grid solution
- 2019 First high power charging (HPC) solution
- 2020 First battery storage and charging station solution

Users worldwide



TGOOD have a proven modular design philosophy that has been standardised to achieve class leading project outcomes that are focused on meeting specification, commercial competitiveness and dramatically fast lead times. The TGOOD team can also work to ensure additional specifications can be achieved for specific customers and industries.

Modular substation design

Typical specifications

- Switchgear cabinets are welded to the cabin floor for structural integrity.
- Wall construction: 2.5 mm cold-rolled steel plate.
- Roof panel construction: 2 mm cold rolled steel plate.
- Mechanical impact protection rating: 1K10.
- Seismic intensity rating: horizontal and vertical acceleration of 0.5 g.

Dual layer panels

- Insulated panels are at least 50 mm thick to effectively maintain internal temperatures in all seasons and environmental conditions.

Thermal insulation

- Foam insulation is injected between panels to prevent heat conduction and eliminate condensation.

Sealed seams

- Rubber seals around doors are IP33D rated, and panel seams are not rated less than IP54.

Fire rating

- Optional three-hour fire rated designs available.

Windproof door

- Windproof door remains open at an angle of 90° to ensure personnel safety in high wind areas.

Anti-corrosion technology

- Layered anti-corrosion technology ensures thirty years of corrosion resistance before refinishing is required, and an overall lifespan of 30 years.
- Coating and spraying production lines are developed by the Nordson company in the United States.
- Hammertone finish incorporates an anti-UV coating that provides at least a decade of fade and oxidation resistance.

Fully integrated prefabricated substation and modular substation system

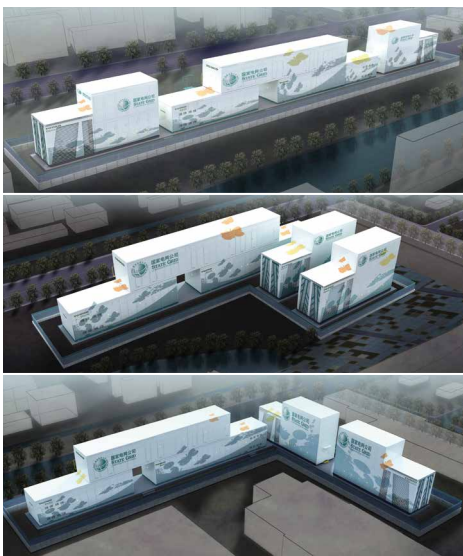
- Modular design for different functions such as housings for HV, MV, LV & control, transformer, and compensation.
- Integration of multi-systems including air conditioning, ventilation, sealing, lighting, earthing, communications system, and the alarm network.

Best-in-class lead time measured in weeks, not months

- Expertise of modular substation design
- Advanced and automatic production line
- Efficiency as prefabricated substation industrial base

Flexible design

- Layout design according to land available to customers
- Customised design optional
- A range of solutions available





Exceptional weatherproofing

- Constant temperature and humidity, with an internal air pressure greater than outside to avoid contamination (optional).
- Sealed design provides outstanding performance in harsh environments, including high altitude, heavy pollution, or coastal, desert, and arctic sites.

High voltage gas insulated switchgear available

- Mature technology and abundant references
- Compact to save space
- Flexible to meet customer needs

Substation expansions

- Capacity within existing footprint in crowded cities or congested industrial zones
- Compact and flexible solution
- Low audible noise (<45 dB) and electromagnetic shielding make the solution attractive (silent operation) for densely populated urban areas

Standard design complies with international building and specific regional codes

- TGOOD steel building system of prefabricated substation and E-house is certified according to CSA A660-10 and EN 1090-1:2009+A1:2011.
- Key switchgears such as HV GIS, MV GIS, and power AIS type tested in STL laboratories.





Impulse Generator 1800kV



Temperature rise test facility up to 7000 A

Fast

- Many substation delivery time in as little as six weeks after design approval
- Rigorous factory testing reduces commissioning times by an average of 50%
- For many applications, cast-in-place concrete are not needed
- Construction time reduced to between 3 and 6 months compared to traditional substations

Quality & safety

- Innovative designs protected by over 200 patents on modular substation, substation products, and production process
- Design Life up to 30 years
- High quality and reliable components manufactured in ISO 9001 certified facility
- High quality design of modular substation enclosures are safe to touch, and provide protection against vandalism

Benifits

- Compact substation modules reduce shipping and transportation cost
- Over 7000 prefabricated substation produced annually delivers significant economies of scale passed on to customers
- Pre-assembled and pre-commissioned substation reduces on site construction time and workload
- It helps to reduce project management time
- Compact substations reduce the land space required to as little as 420 m²
- This conserves valuable land, especially in congested urban and industrial areas

Service

- Complete engineering, procurement and construction (EPC) service available
- Customised layout to meet customer specifications and requirements
- Local TG00D regional company to service installed plant throughout the life cycle of your investment

Quality assurance certified quality: ISO 9001



TGOOD continues to partner with global independent organisations to ensure that it meets the local regional requirements around the world. TGOOD is certified by DNV-GL to ISO 9001:2015 in all manufacturing facilities and regional subsidiaries.

Strict and systematic checks

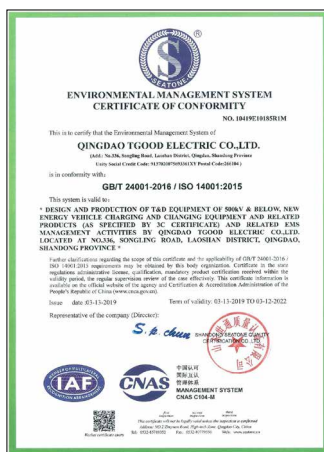
During manufacture, each modular substation is subject to systematic routine testing with the purpose of checking the quality and conformity to all of the relevant regional legislative standards both in electrical and structural adherence.

The results obtained are recorded, and equipment approved by the quality control department on each device's test certificate, guaranteeing product traceability.

Environmental protection

As part of the group's environmental policy, TGOOD encourages the recycling of high voltage switchgear in attempt to reduce the environmental impact of disposal.

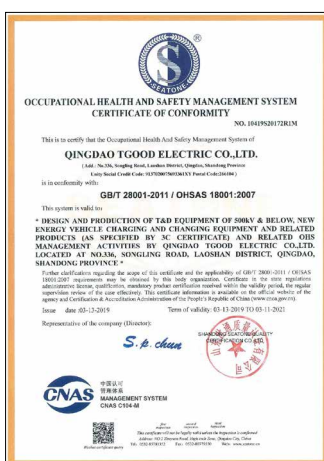
- All materials used, insulators and conductors for example, are identifiable, and easily dismantled and recycled.
- SF₆ usage is reduced in GIS, and SF₆ can be recovered at the end of the equipment's life, and reused after treatment.
- All TGOOD manufacturing facilities are certified to ISO 14001.



Occupational health and safety

Occupational Health and Safety (OH&S) bears the highest importance at TGOOD. Commitment towards control of the risks and improvement in performance of OH&S is demonstrated by complying with OHSAS 18001:2007, certified by China National Accreditation Service (CNAS). TGOOD management believes in a deliberate approach and its policy is based on PDCA methodology that focuses on elimination or minimising risks to personnel and other interested parties who could be exposed to hazards associated with its activities.

Strong mechanisms are in place to assure that TGOOD performance on OH&S not only meets, but also continues to meet legal and policy requirements.



TG00D offers flexible substation solutions throughout the whole voltage range from low voltage up to 252kV.



- | | |
|-----------------------|------------------------|
| 1. GIS module | 4. Control module |
| 2. MV module | 5. Compensation module |
| 3. Transformer module | |

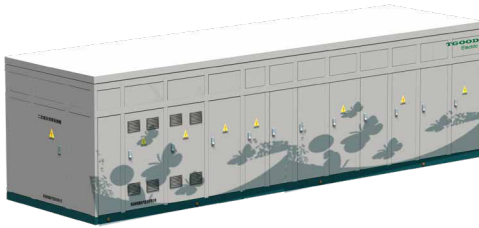


Key components

- Incoming and outgoing cable connections
- Air to overhead GIS bushings also available
- Lightning surge arrestors
- Site perimeter protection and video surveillance systems
- Internal, external lighting, and emergency lighting
- Positive pressure environmental control system (optional)
- Smoke detection and SF₆ monitoring system with alarms
- Balconies, stairways, and escape doors with push bars

Advantages of the structured modules

- Layout adaptable to space and topography requirements
- Electrical equipment kept at a constant temperature and humidity in a dust-free operation environment
- Largely maintenance-free and remotely operated
- Custom painting to improve appearance in neighbourhoods
- Advanced construction methods deliver an exceptional lifespan of 30 years



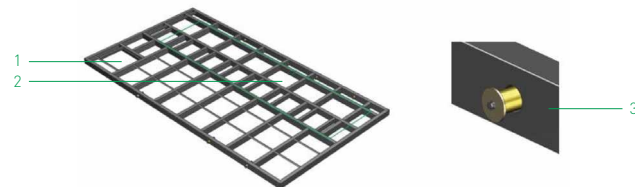
Key parts design

Walls and doors

- Doors & walls are a double-layer structure, plug welded with galvanized 1.2 mm inner sheet and 2.0 mm outer sheet, sandwiching 44.8 mm thick. This design features a validated structural integrity fire rating of 180 min. Total thickness for both doors and walls are 48 mm and both use the thermal bridge design which enhances thermal insulation performance.
- Doors can be equipped with appropriate locks, door closers, or push bars depending on customer's request.
- Doors are pre-assembled into a welded steel frame. Hinges shall be stainless steel, and the door shall be positioned in the frame with a gasket to provide an effective seal against wind-driven rain when closed.
- All doors shall swing a maximum of 100°, and open outward.

Base

Base is welded with profile steel, in which components such as I-beams are arranged and analysed to ensure adequate equipment support.



1. Man hole
2. Equipment to be installed
3. Lifting lug

Columns

Columns are bent with Q235 2.5 mm galvanized steel sheet and welded onto the base. Same solution is used for the lintels between columns. Stiffening columns are plug welded together with columns.

Roof

Roof is framed and welded by angle steel:

- Top sheet - 2.0 mm galvanized steel
- Base sheet - 0.5 mm PPGL sheet
- Sandwiching nonflammable foam in the middle.

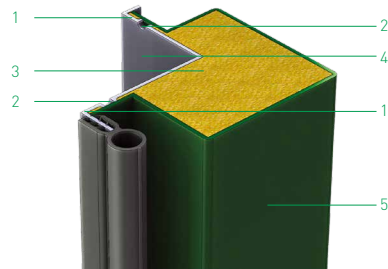
Another feature for the roof is the removability; its eyebolts connect the top sheet and structure together, which enables equipment to be lifted in or out of the modular substation with relative ease after the roof removed.



1. Water shedding, 3° slanted roof
2. Injected foam Insulation
3. Lifting rings
4. Steel frame

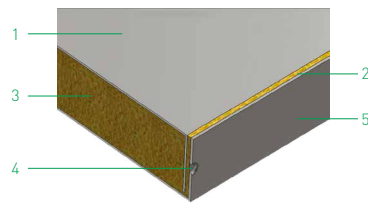
Thermal performance

Our insulation methods effectively eliminate thermal bridging across steel parts, providing the best overall thermal insulation performance in the modular substation industry



Insulation detail: corner column

1. Thermal barrier
2. Spot weld
3. Injected foam insulation
4. Internal metal surface
5. External metal surface

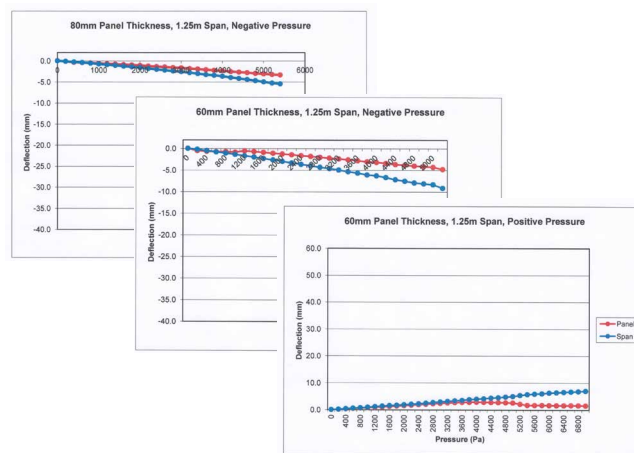
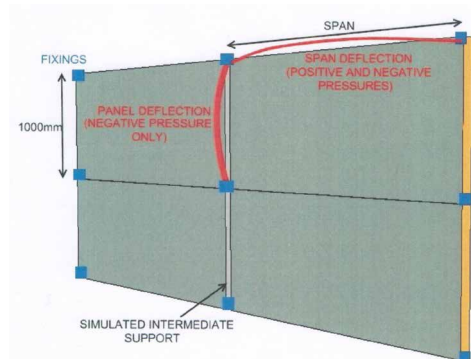


Insulation detail: panel

1. Internal metal surface
2. Thermal barrier
3. Injected foam insulation
4. Spot weld
5. External metal surface

Mechanical strength performance

Plain panel mechanical strength tests are performed according to Australian National Construction Code 2012 [NCC 2012]



Wind pressure simulations are performed on different panel sizes.

Evaluation of strength under test

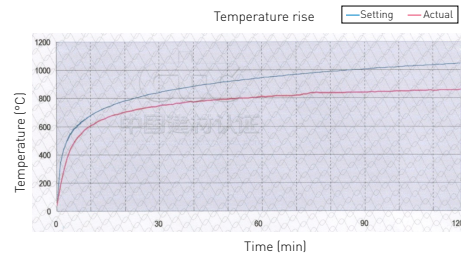
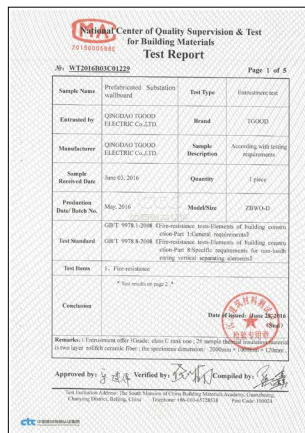
Strength limit static pressure ± 4000 Pa



Fire resistance performance

Fire resistance is designed and tested according to GB 9978, BS 476, AS 1350, and EN 13501.

Test report 20131C02391, issued by National Research Centre for Test Techniques for Building Materials.



Temperature inside the test room and wall temperature



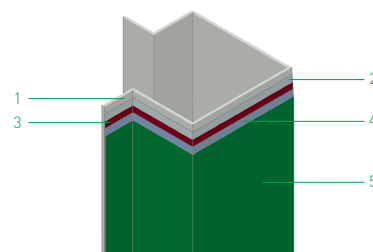
Object before test



Object after test

Corrosion protection performance

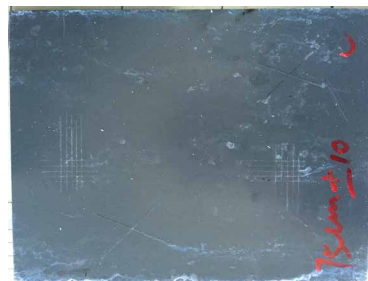
Layered anti-corrosion technology



1. Sandblasted steel frame
2. Hot zinc sprayed layer
3. Zinc + paint layer
4. Epoxy coating
5. Hammertone finish

Corrosion protection test

Performed according to ISO 9227, neutral salt spray, 5% NaCl



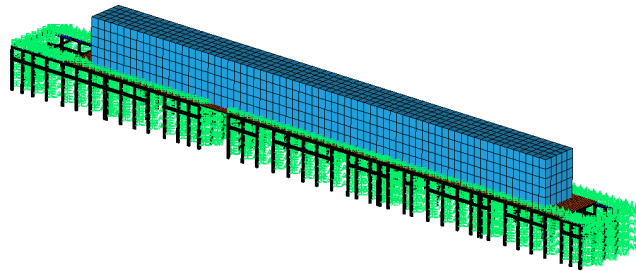
Zinc paint layer after 750 hrs salt fog test



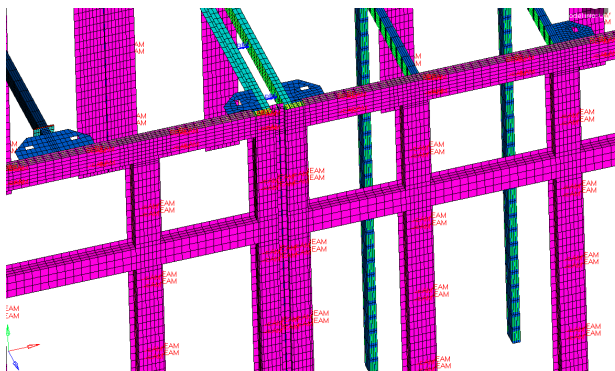
Final paint layer 750 hrs salt fog test

Seismic performance

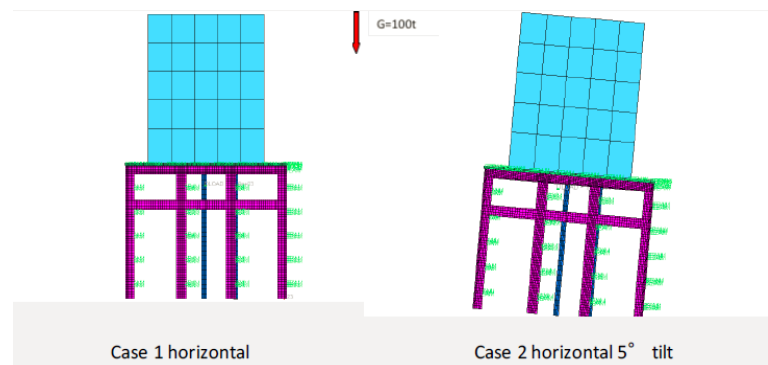
Numerical simulation of a support structure with a GIS module on the top



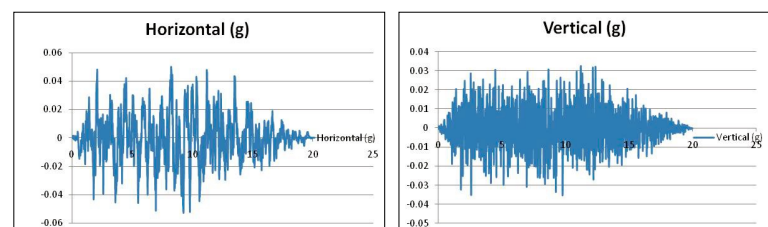
Transfer of the 3D data into a finite element mesh



Load assumption

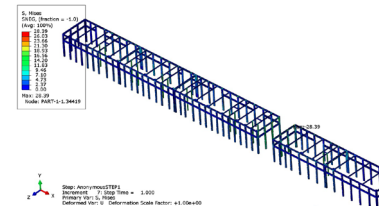


Load spectrum for magnitude 6 earthquake

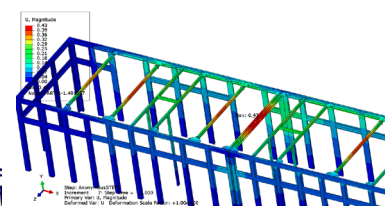


Results - static loads

	Case 1	Case 2
Maximum pressure	28.39 Mpa	92.49 Mpa
Maximum displacement	0.43 mm	6.71 mm
Safety factor	8.3	2.5

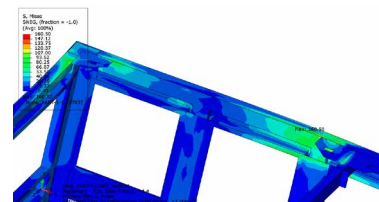


Case 1

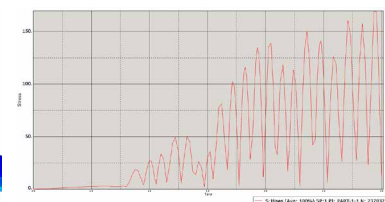


Case 2

Results - seismic (step 1, critical time)

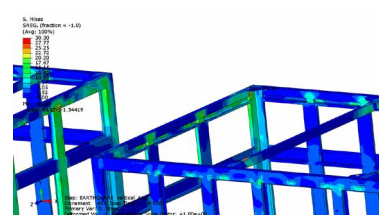


Corners and junctions at horizontal load



$t_{crit} = 4.4 \text{ s}$

Results - seismic (step 2, simulation up to 5 s)



Corners and junctions at vertical load



Overall result: Maximum stress is under horizontal load (160.5 MPa) with a safety factor of 1.5

Environment conditions

Variable	Unit	Description
Ambient air temperature	Maximum temperature	°C ≤45*
	Minimum temperature	°C ≥-35**
	Daily average temperature	°C ≤+35
Ambient humidity	Daily mean relative humidity	95% and below
	Monthly mean relative humidity	90% and below
Altitude of the installation site	m	1,000 and below (please specifically state if exceeding 1,000)
Wind pressure	Pa	≤700 (equivalent to a wind speed of 34 m/s)
Seismic intensity		Not exceeding magnitude 8
	Horizontal acceleration	g 0.5
	Vertical acceleration	g 0.5
	Safety factor	≥1.67 (simultaneous action)

Note: * more than 45°C is optional

**lower than -35°C is optional

Typical specification

Item	Unit	Description
Protection level		IP54 min.
Impact resistance	J	20 min.
Standard 3° sloped roof	N/m² load	2500 min.
Thermal conductivity	W/m °C	0.03 min.
Anti-corrosion Zinc protection		30 years (stainless steel optional)
Sound absorption technology	dB	<55 (day); <45 (night)

Standard compliance

IEC 62271-202 High-voltage/low-voltage prefabricated substation

ISO12944 Corrosion protection of steel structures by protective paint systems

IEC 60529-2004 Degrees of protection provided by enclosures (IP code)

IEC364-4-41 Protection of grounding, lightning protection and grounding standards

DIN EN ISO 3834-2 Quality requirements for fusion welding of metallic materials - Part 2: Comprehensive quality requirements

EN 1090-2:2008+A1:2011 Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures

ISO2768-1:1989 General tolerances for linear and angular dimensions without individual tolerance indications

GB/T 1231 Specification of high strength bolts with large hexagon head, large hexagon nuts, and plain washers for steel structures.

ISO 898-1:1999 Mechanical properties of fasteners made of carbon steel and alloy steel-- Part 1: Bolts, screws and studs

AS 4115-1993 Hand torque tools - general requirements.

CSA A660-10 Manufacturers certification of steel building systems

EN 1090 Assembly of steel structures

CWB 47.1 Canadian welding standards

ISO 3834 Welding fabrication certification

Please consult us concerning the standards applied for monitoring systems, UPS systems, automatic fire alarm system, and the design basis of the cabin auxiliary system.

HV GIS module

GIS module features

- Incoming and outgoing 145 kV lines: overhead line or cable.
- Low maintenance GIS modules.
- Compact inline arrangement.
- Operating voltage up to 145 kV, short time withstand current of 40 kA, and breaker rated current of 3150 A.
- Busbar rated current of 4000 A.
- Arc-quenching breaker design has a lifespan of 10,000 mechanical endurance and 22 times electrical endurance.
- Three-position switch integrates disconnecter and earthing switches into a single module, with viewing ports as option.
- Each three-phase GIS module is only 0.8 m wide.
- Aluminium alloy tanks provide corrosion resistance and eliminate eddy current losses.

Structural arrangement

- Standard, configurable prefabricated modules for fast assembly.
- Modules for fast transport.
- Inline layout with fixed maintenance corridor.
- SF₆ monitoring system with alarm and automatic ventilation system.
- Utilizes damping technology to reduce effects of seismic activity on GIS (optional).

TGP145 integrated

The TGP145 is compact, metal encapsulated, set of switchgear consisting of high voltage components such as circuit breakers and disconnectors.

TGP145 GIS complies with the international standard IEC 62271-203; all elements mounted inside the GIS conform to international standards as certified by STL laboratories.

Main technical parameters of TGP145

SN	Technical requirements	Unit	Data
1	Rated voltage	kV	145
2	Rated frequency	Hz	50/60
3	Rated current	A	2000, 2500, 3150
4	Rated short-time withstand current / time	kA/s	40/3
5	Rated peak withstand current	kA	104
6	Rated short-time power frequency withstand current [1 minute]	kV	275(to earth, between phases)
			315(across the isolating distance)
		kV	109
		kV	650(to earth, between phases)
7	Rated SF ₆ gas pressure / min. functional pressure (20°C)		750(across the isolating distance)
		mPa	VT / lightning arrester gas chamber 0.5/0.45
		μL/L	CB chamber ≤150 (during handover)
			Other gas chambers ≤250 (during handover)
9	Partial discharge	pC	≤5
10	Annual leakage ratio of SF ₆	%/year	≤0.1
11	Level of radio interference	μV	≤500
12	Bay width	m	0.8



3D view of HV GIS module

Typical Configuration of TGP145

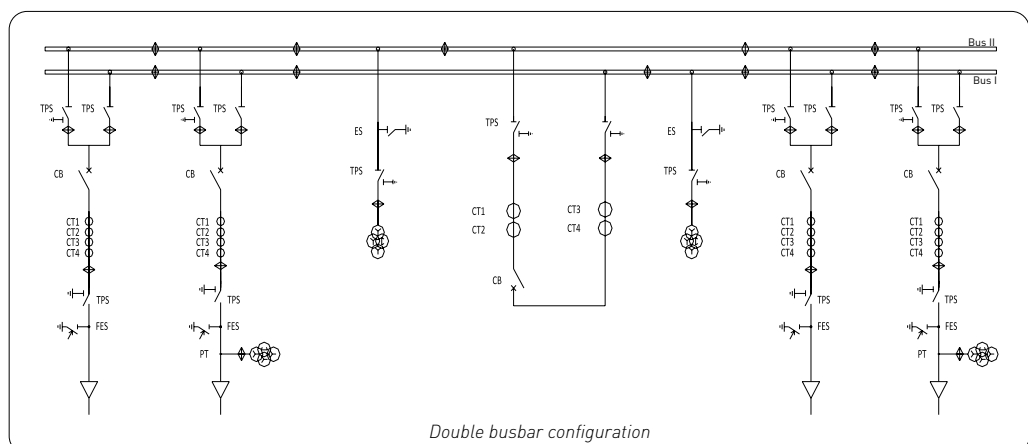
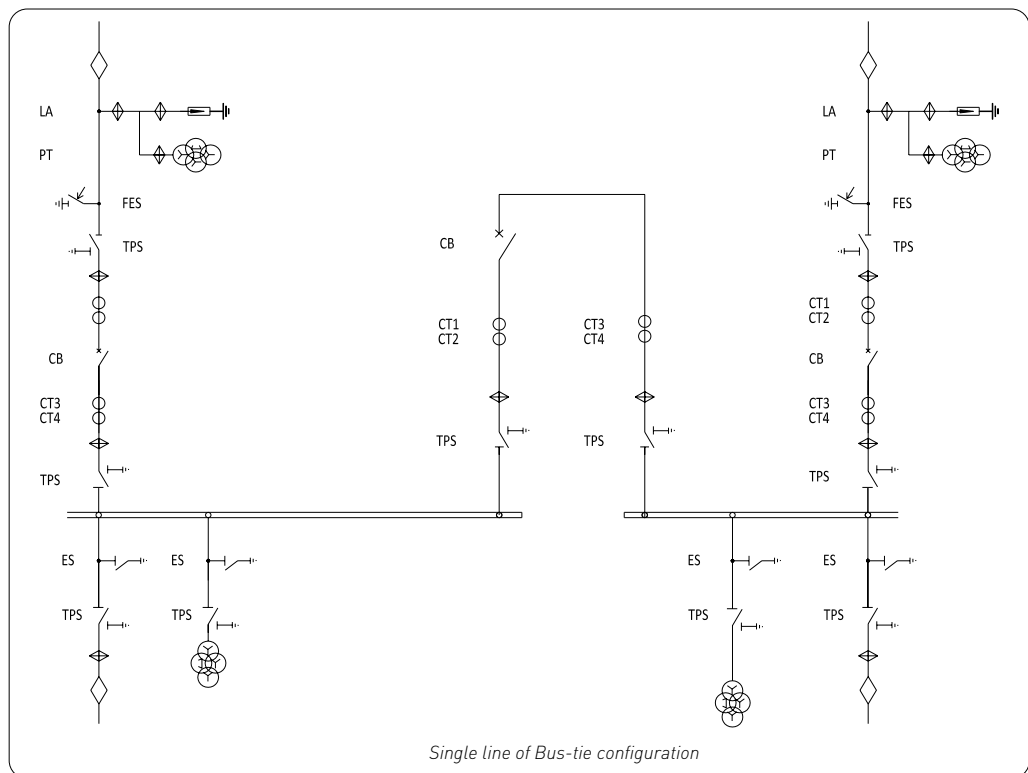
The modules of the TGP145 are integrated together into a sealed and grounded metal enclosure that, depending on requirements, can be set into various configurations to create bays that are then connected together via the busbar.

It is comprised of various partitions called bays that serve different functions, including:

- Incomer (feeder) bay
- Single-bus main transformer bay
- Single-bus line bay
- Busbar coupler bay
- Measurement and protection bay

Single line diagram of HV GIS module

Single busbar configuration





Medium voltage prefabricated switchgear modules

Feature & structural arrangement

17.5 kV AIS module features

- Incoming and outgoing 17.5 kV lines: outdoor busbar, cable.
- Maintenance-free vacuum circuit breakers.

36 kV GIS module features

- Incoming and outgoing 36 kV lines.
- Fully insulated and sealed gas insulated switchgear eliminates maintenance and ensures safe and reliable operation.
- Maintenance-free vacuum circuit breakers.
- Reduced footprint.

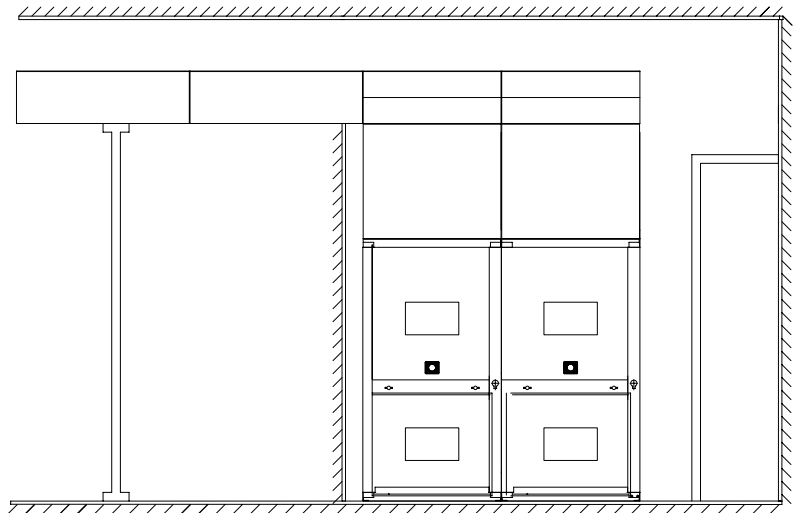
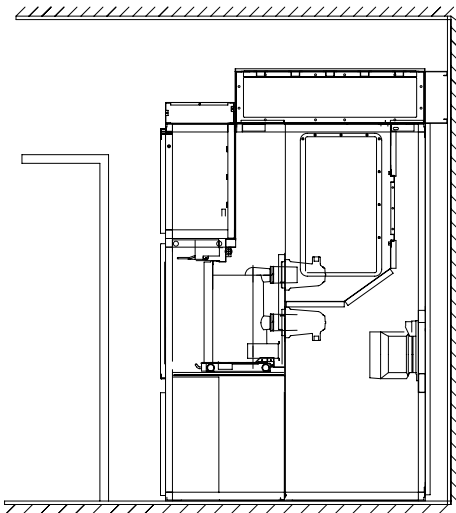
Structural arrangement

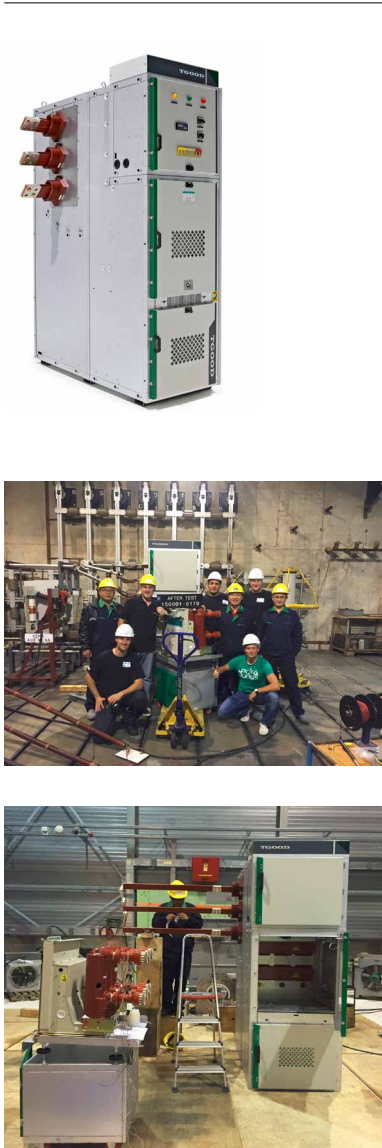
- Standard, configurable prefabricated modules for fast assembly.
- German-engineered arc-resistant switchgear design enhances highest level of personnel safety.
- Arc-resistant switchgear doors incorporate mechanical interlock labyrinth seals.
- Integrated switchgear allows for compact and transportable modules.
- Single-row layouts simplify maintenance access.

Arc fault consideration and TGOOD solution

IEC 62271-200 aims to have standard test conditions mainly to make the results comparable; at the end, the user is responsible for health and safety. The arc fault test considers most effects of the arc fault, but not any indirect damage on personnel (for example toxic gases), minimising the hazards to personnel is priority.

TGOOD tests are carried out under realistic conditions, to minimise the disturbances inside the room, all hot gases are vented out of the room, and cables are accessed from outside.





AIS TAP17

TAP17 is of LSC2B (Loss of Service Continuity category) type as defined by IEC standard 62271-200. The medium voltage parts are compartmented using metallic partitions and shutters which are connected to earth and which separate:

- The busbars
- The withdrawable parts (circuit-breakers, disconnector trucks, or earthing trucks)
- MV connections, earthing switches, current sensors and voltage transformers as required

Technical datasheet

Rated voltage (kV)				
			12	17.5
Rated frequency (HZ)				
			50	60
Rated insulation level				
Power frequency withstand voltage 50/60 Hz - 1 min	(rms kV)		28	38
Lightning impulse withstand voltage 1.2/50µs	(rms kV)		75	95
Nominal current and maximum short time with stand current				
Functionnal unit with circuit-breaker				
Short-time withstand current	lth. max	(kA/3 s)	25	25
			31.5	31.5
Reated current	In max busbars	(A)	3150	3150
	In CB	(A)	630	630
			1250	1250
			2000	2000
			2500	2500
			3150	3150
Intennal are withstand				
IAC-AFLR	(kA/1 s)		31.5	31.5

Six typical cubicles are offered:

- Incomer or feeder
- Incomer direct to busbar
- Bus coupler
- Bus riser
- Bus riser with withdrawable parts
- Busbar voltage transformer

Application examples

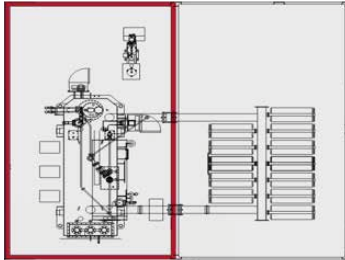
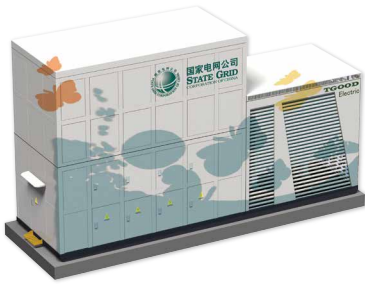
12 kV modular substation used for open pit coal mine



Another example of substation layout:



Project	Final Stage	Current Phases	Remarks
Primary transformer	2X50MVA	2X50MVA	
145kV outgoing line	2-outlet	2-outlet	1 backup 1-outlet
12kV outgoing line	8-outlet	8-outlet	



Transformer layout

Prefabricated transformer module

Compartment design and characteristics

The transformer body is placed in an enclosed cabinet, which adopts sound reducing and fire resistance technology to meet the requirements of noise reduction and fire protection. The radiator is separated from the body and placed in a protective box, which is self-ventilated to ensure normal transformer operations. The transformer has characteristics of low power consumption, low noise, low partial discharge, low temperature rise, leakage free, and not requiring a support structure.

Split type transformer chamber

The chamber of split type transformer consists of a transformer body cabinet and a radiator cabinet. The body cabinet adopts sound reduction and fire resistance technology. The radiator cabinet is made of an aluminium alloy and adopts natural and forced air cooling. The structure not only meets the requirements of ventilation and heat dissipation, but also of dust proofing.

Maintenance to main transformer

There is walkway with width of 1800 mm in the structure, which is for convenient daily maintenance. The top parts of the transformer can be removed for core repair.

Sound barrier technology

Noise reducing treatment applied to main transformer whilst noise killing shutters are used in ventilation outlets, which, in combination, meet the environmental noise control requirements.

Main Transformer features

- Capacity range of 20 MVA ~ 60 MVA without ventilation, depending on power load density.
- Main transformer windings may be two or three winds.
- On-load tap changers available.
- Transformer body is completely enclosed whilst radiator cabinet is perforated to facilitate cooling.
- Online analyser of dissolved gas in oil.
- Insulated cable bushings at 145 kV primary and 36/15 kV secondary.
- Standard, configurable prefabricated modules for fast assembly.
- Fire resistance technology: double steel casing allows the inner wall of the module to completely replace a traditional fire barrier.
- Electromagnetic shielding technology: full metal shielding reduces electromagnetic radiation.



Protection and control module

Protection systems

- State of the art protective relay systems designed to meet the highest of utility standards.

Automation and control

- Remotely accessible control systems allow for real-time operation of the substation with a wide range of SCADA systems for metering and data collection.

Station service power

- Highly reliable DC charger and battery systems provide uninterruptible power to all circuit breakers and control devices.

Absorbent glass mat battery technology eliminates the need for a separate, ventilated battery room.

Utility System

- Fire alarm systems, security systems, video surveillance, and environmental monitoring available.

Maintenance access

- Rear access doors allow for easy removal of secondary equipment modules.



Auxiliary systems (optional)

Reactive power compensation system (module)

- Substation power correction and/or harmonic filtering may be included as a module.
- Capacitor banks may be adjusted as required for the application.
- Fixed or variable stages of compensation available.

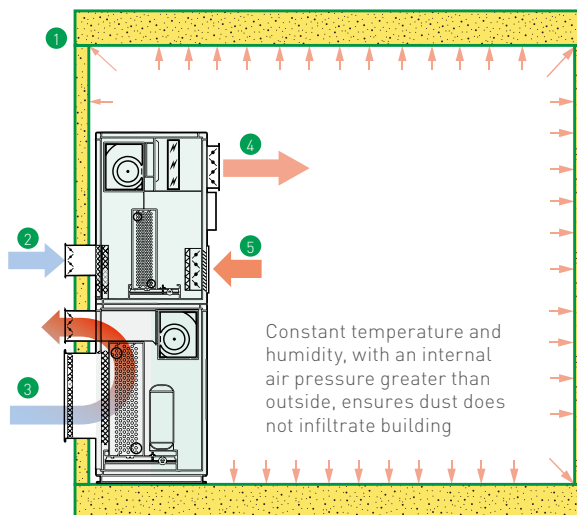
Neutral grounding system (module)

- Customers may choose between solid grounding, resistive grounding, reactor grounding, or resonant (Peterson coil) grounding.
- Zigzag transformer grounding also available.

Climate control and alarm systems

- System guarantees ideal environment for reliable operation and long lifespan of electrical components.
- Patented positive-pressure and air conditioning system provide a constant temperature and humidity in a dust free operating environment.
- Positive pressure environmental control system ensures that internal cabin pressure is always greater than external atmospheric pressure to repel dust. This technology has been tested and proven in the world's harshest operating environments, including the world's highest railway in Tibet.
- Alarm system detects deviations from standard operating tolerances to ensure safe and reliable operation.
- Early warning fire alarm is calibrated to detect a fire hours before visible smoke is produced, without the risk of false positives.
- Climate control system utilize a heat pump to precisely control the cabin temperature and humidity at all times.

Positive pressure environmental control system



1. Foam-Insulated panels (with optional bridge insulation technology)
2. Fresh air from outside
3. Outer recycling system
4. Return air (inside air combined with fresh air to maintain positive pressure environment)
5. Inside air

Typical references

Customer	Country	Operation time
Mozambique Electric	Mozambique	2013
Government of Laos	Laos	2012
State Grid China	China	2005-2016
China Southern Grid	China	2005-2016
Bugri	Russia	2017
Aleminsa S.A	Latin America	2018

Please refer to TGOOD reference lists for more details.

Specific references

Russia Bugri Substation



Ecuador 66kV Trailer Substation



Typical references

Customer	Country	Operation time
Pakistan PV	Pakistan	2014
Shandong Jiacheng	China	2016
Xinyi solar	China	2016
Tenhui PV	China	2016
SGCC Nari	China	2016
Tianjin Xindayu	China	2016
Longreach	Australia	2017
Haughton	Australia	2018
Cypart	Malaysia	2019
Nura	Russia	2020
Warwick	Australia	2020

Please refer to TGOOD reference lists for more details.

Specific references

Putian Offshore Wind Farm 220kV Substation



Malaysia 8MW Solar Farm 33kV Substation



Russia Solar Farm 110kV Two-Layer Substation



Kazakhstan 10MW Solar Farm Substation



Australia Solar Farm Substation



Typical references

Customer	Country	Operation time
Sicomines Sarl	Congo	2013
Sinobo Mining	Mongolia	2012
Kumtor	Kyrgyzstan	2013
Xinjiang Yili	China	2014
Gaoerqi	Inner Mongolia	2015
Yunnan Mining	China	2016
Martabe Gold Mine	Indonesia	2017
Iron Mine	Peru	2018
Copper Mine	Australia	2019

Please refer to TGOOD reference lists for more details.

Specific references

Kyrgyzstan Copper Mine 110 kV Substation



Indonesia Gold Mining 110kV Substation



Australia Copper Mining 33kV Substation



Peru Iron Mining 110kV Substation



Pakistan Coal Mining Substation



Typical references

Customer	Country	Operation time
KCP	Kazakhstan	2013
KCP	Kazakhstan	2014
Myanmar Energy	Myanmar	2012
Missan Oil	Iraq	2015
Petrochina	China	2015
115kV Trailer Substation	Colombia	2016
Maersk	Kazakhstan	2018
Linde	Singapore	2020

Please refer to TGOOD reference lists for more details.

Specific references

Kazakhstan Crude Oil Pipeline Project



Colombia 115kV 20MVA Trailer Substation



Kazakhstan 35kV Substation



Uzbekistan Lukoil Substation



Singapore 69kV Substation



Railway typical references

Customer	Country	Operation time
Government	Turkmenistan	2013
MTR	Hongkong	2014
China Railway	China	2013
Chendu Railway	China	2016

Railway
Qinhai-Tibet railway



Infrastructure typical references

Customer	Country	Operation time
Cabinda Government	Angola	2012
Kumtor Infrastructure	Kyrgyzstan	2012
Dalian Subway	China	2014
Zhenzhou Airport	China	2016

Infrastructure



Typical references

Customer	Country	Operation time
West Fraser Mills	Canada	2013
Handan Steel	China	2014
Hebei Steel	China	2013
Tenyu Ceramic	China	2014
Zhengzhou Airport	China	2017
Shenyang	China	2019
Ramenskaya	Russia	2019

Please refer to TG00D reference lists for more details.

Specific references

Zhenzhou Airport



Shenyang 69kV Substation



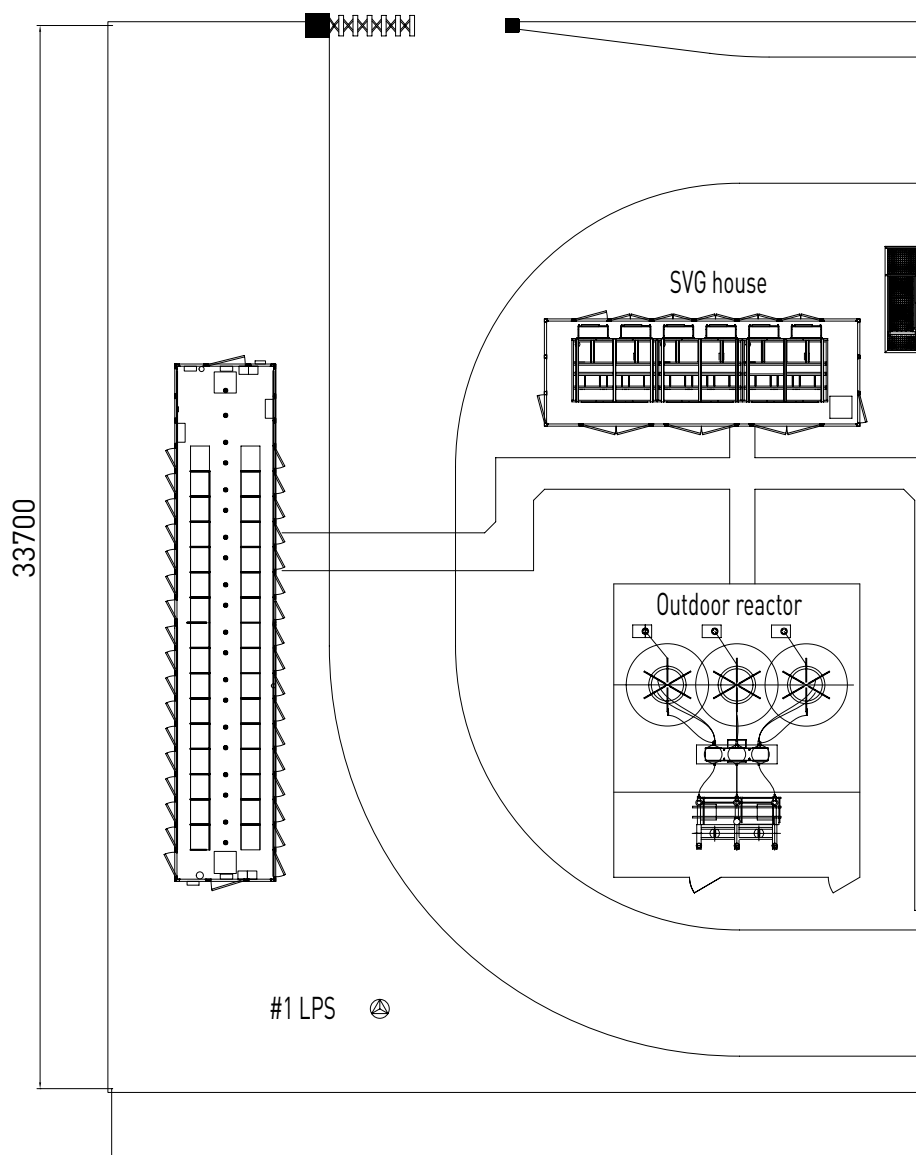
Russia 110kV Substation



110kV Xinyi Hongan solar project, Hubei province, China

Project scope

- Main transformer 1 x 50MVA
- Modular substation 110 kV x 4 units
- Modular substation 40.5 kV x 8 units
- EPC

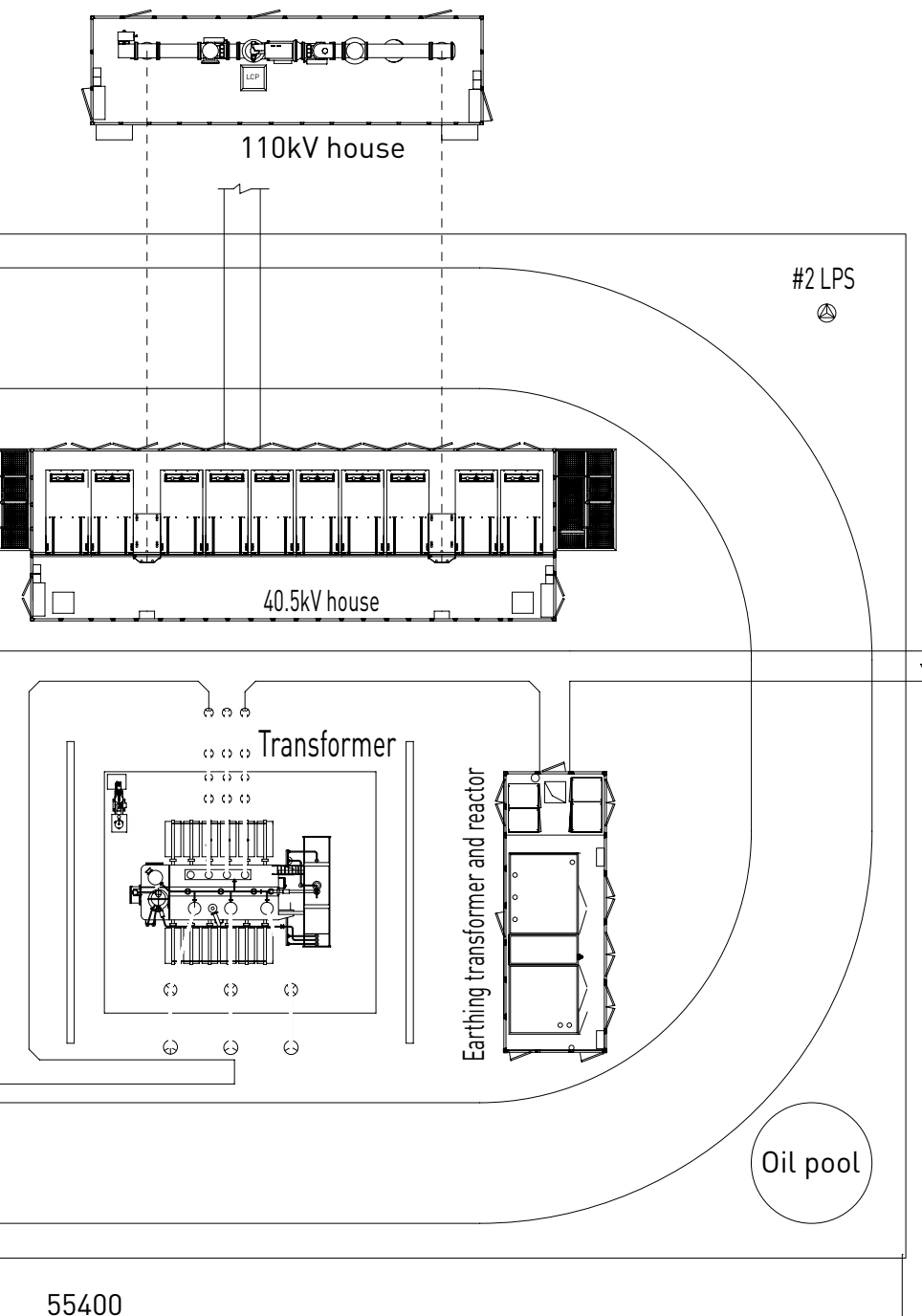


Value for the customer

- Customer needs substation in service within 3 months
- Compact space to deploy project
- Low work load on site
- Simple contact in projec management

Advantage of TGOOD solution

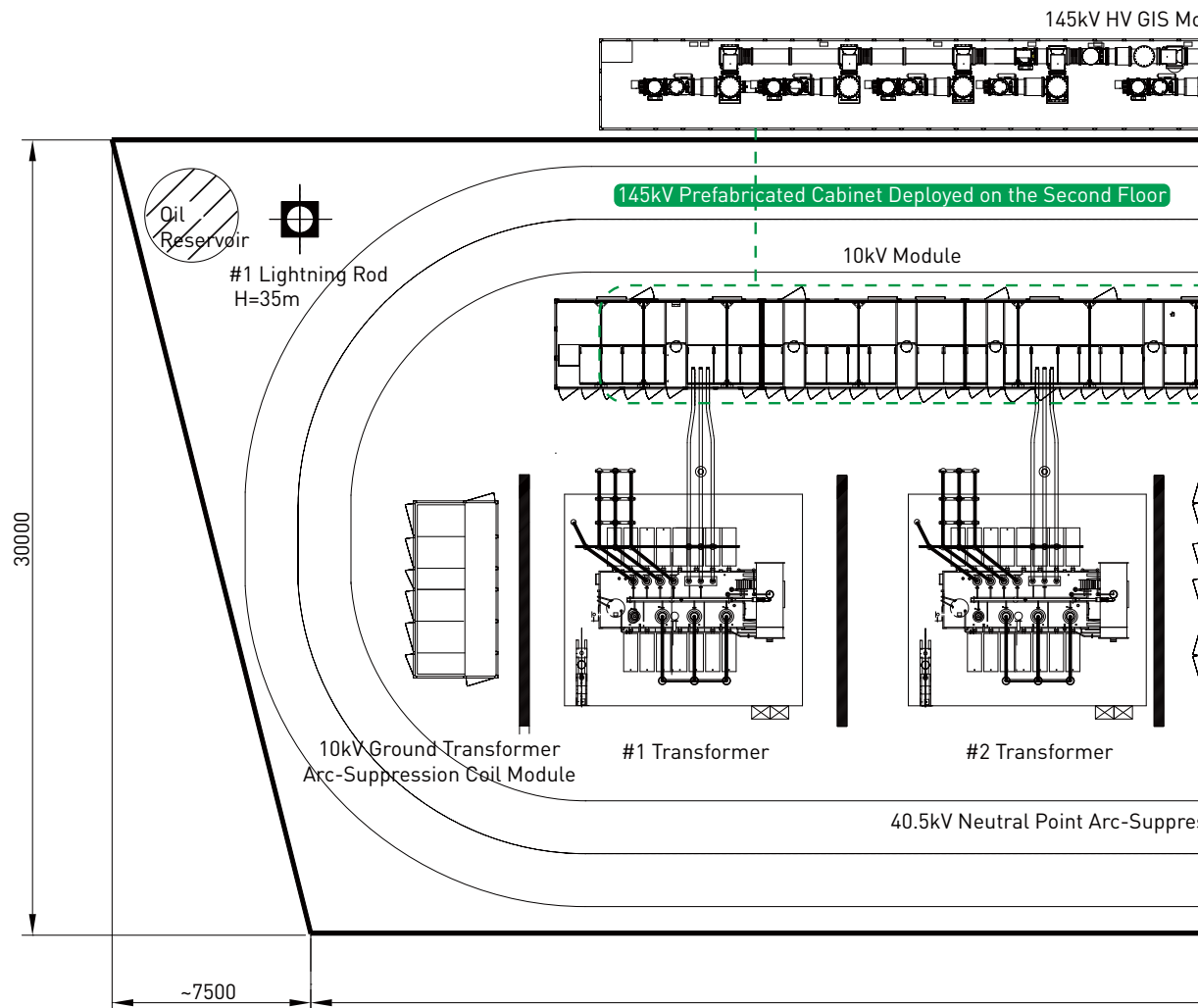
- Compact footprint to save land
- Production and delivery 2 months, installation 1 month
- Factory assembly and commissioning reduces on site working time



145kV Central Power Station in the City of Yulin, Shanxi Province, China

Project scope

- Primary transformer 2X50MVA
- 145kV outgoing line 6-outlet
- 40.5kV outgoing line 14-outlet
- 12kV outgoing line 10-outlet
- 12kV capacitor bank 1X4.8+1X3.6MVAR
- 12kV arc-suppression coil 2x230kVA

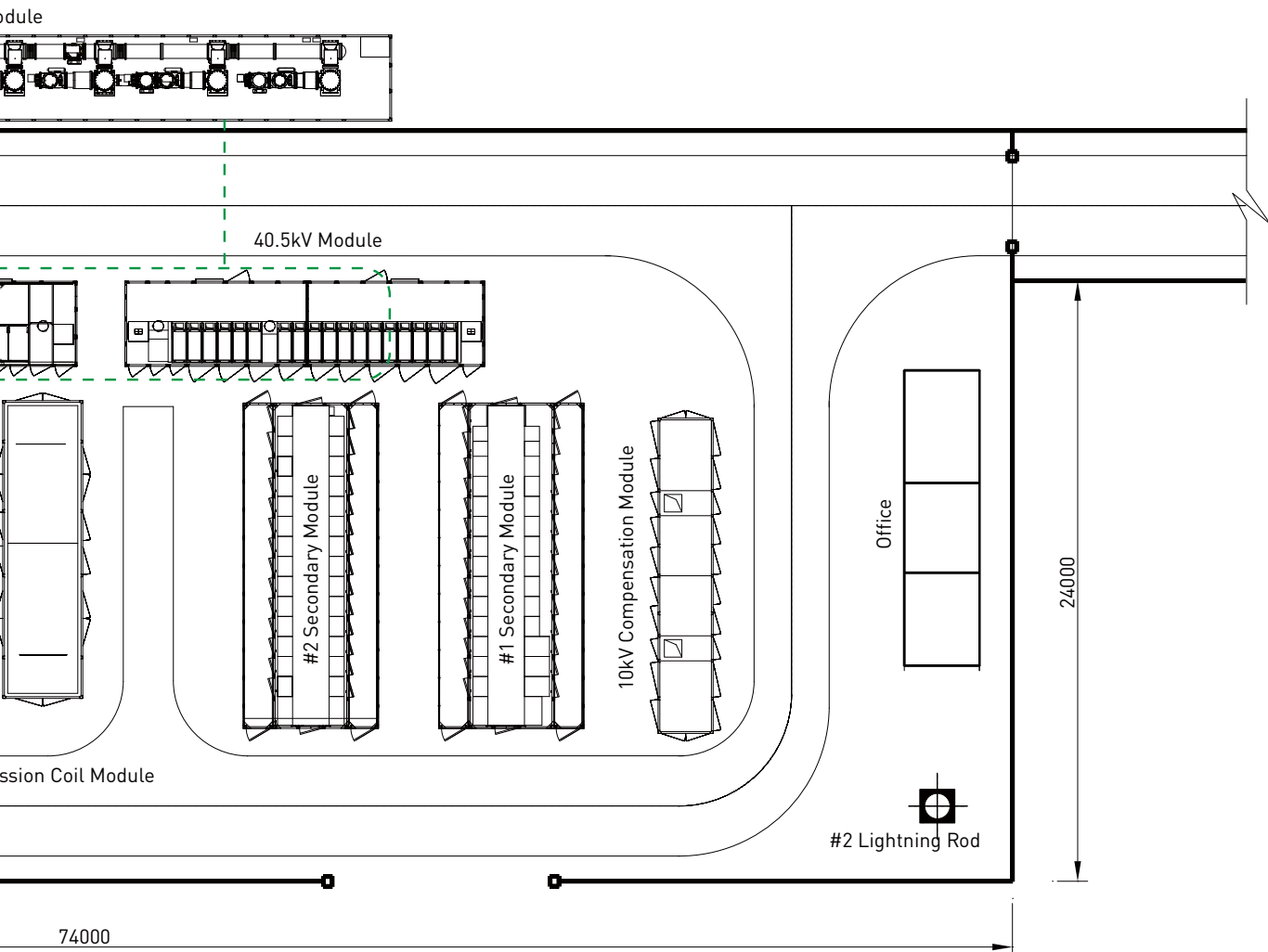


Value for customer

- Need to complete the project in 100 days from order placement
- Supplier considers the condition of land sinking due to mining area

Advantage of TGOOD solution

- Production and delivery 2 months, installation 1 month
- TGOOD provides prefabricated substation with rationalized base design
- Set up monitoring of complete substation to give signal to centre control room
- Busbar system adopts flexible design
- Design for substation transfer if land sinking happens



110kV Handan Steel and Iron Renovation project

Project scope

- Primary transformer 2X50MVA
- 110kV outgoing line 2 feeders
- 12kV outgoing line 8 feeders

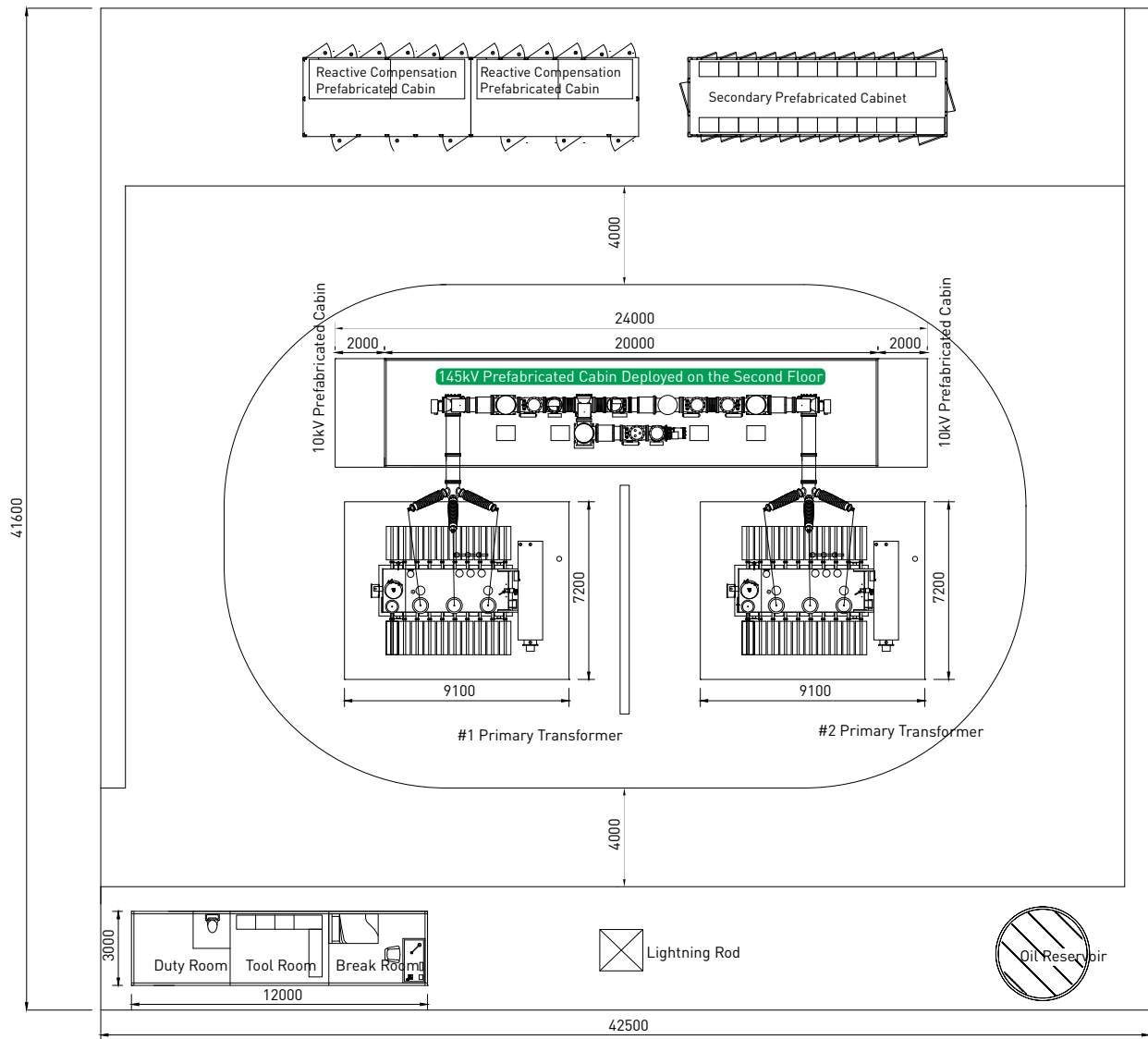


Customer values

- Fast construction
- Compact space
- Retrofit for partial substation

Advantage of TGOOD solution

- TGOOD offers modular substation to reduce land acqizition
- Factory assembly and commissioning reduces on site working time
- Rent trailer substation to provide emergency power supply



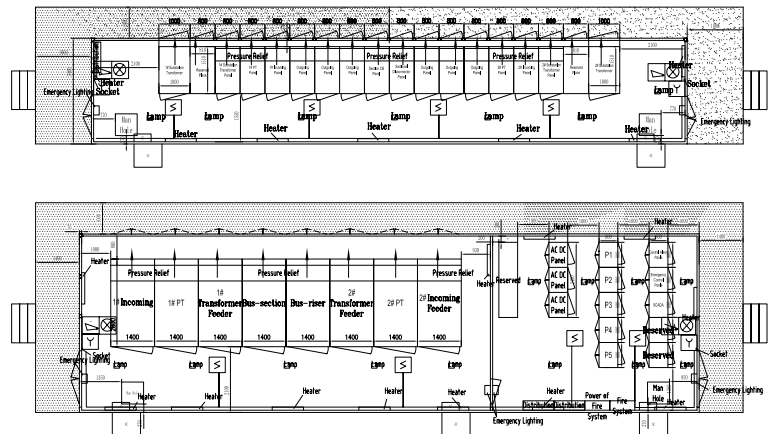
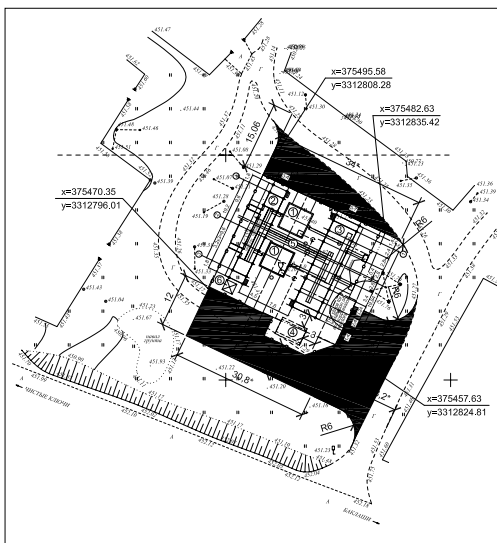


Extremely cold temperature: -58°C

TG00D provides modular substation solutions for extreme cold region applications, available down to the lowest temperature of minus 50 degrees (-50°C).

In order to deliver a safe and reliable modular substation to customer, TG00D tailors the design to meet the special conditions

- The all materials which are connected directly in the extreme cold are carefully selected and tested
- All components and switchgears are validated
- Sub-systems such as heating, monitoring & control, and fire warnings are tested under real operation environments
- The installation and commissioning process is re-defined compared to the conventional one



Russian Vedenschina project in arctic area

High ambient temperature: +55°C

TG00D also can offer modular substations for environments where the temperature rises up to +55°C without current derating. The thermal isolation technology of TG00D enables the modular substation design to meet the special requirements.



Fire rating solution

In order to enhance the operator's safety in case of a fire, the TG00D modular substation design puts different situations into consideration:

- Operator inside modular substation with double layers
- Operator inside modular substation with single layer
- Operator outside modular substation

For any of the above mentioned cases, TG00D modular substation can achieve:

- The wall, door and roof must keep integrity for three hours
- No poisonous gas accumulated to a degree which would endanger operator's life, for three hours

Snow or desert transportation

The special transportation will be considered if the project region is covered by snow or sand; TG00D can provide you a dedicated solution to solve any transportation issues.

A skid modular substation, or prefabricated substation is designed for mobility on sand or snow thanks to its ship inspired design; it can be pulled by driving forces available.

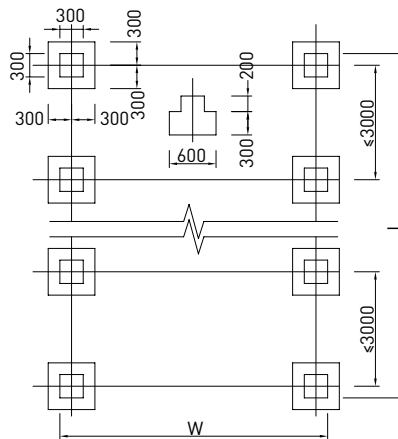
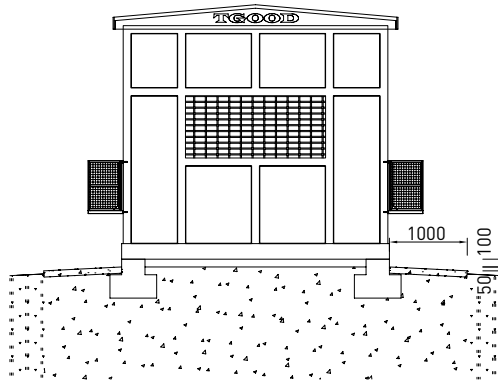
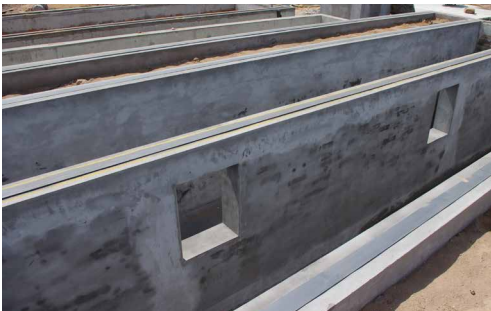


The modules of modular substation are heavy. Pay attention to the proper planning and constructing of the foundation according to soil conditions on sites, below three options for reference.

- On a solid sandy soil, gravel is usually enough
- On a normal soil (solid, non-sandy), construct two concrete support beams
- On a difficult soil (non-sandy, non-solid), construct concrete support raft under the substation

Foundation option 1 – Supporting the substation with gravel

Support the substation with a gravel foundation when placing it on a solid and sandy soil. Build the foundation and cast isolated foundation along long side of substation, max spacing of 3 m. The size of isolated foundation as follows. If the width of substation is more than 3500mm, please add a list of isolated foundation. The top of the foundation is higher than the surrounding by 100mm.

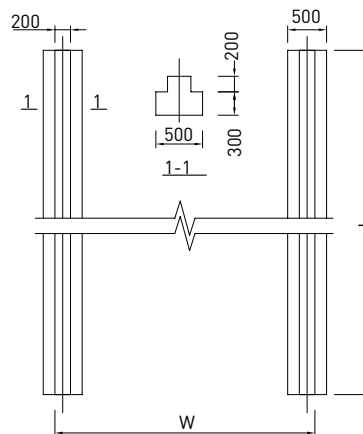
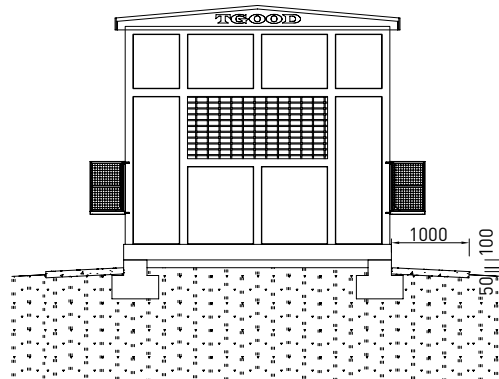


Note:

- Tilt the surface of the surrounding ground min. 50 mm per meter.
- Leave the concrete base 100 mm visible.
- Consider the local conditions such as frost, rain (humidity) and drought.
- W—width of substation, L—length of substation. Unit: mm.

Foundation option 2 – Supporting the substation with concrete beams

Support the substation with concrete beams when placing it on a normal soil (solid, no sandy) as follows: Build the foundation and cast two concrete support beams under the long sides of the substation with width of min. 200 mm and depth of min. 500 mm or into frost free depth. If the width of substation is more than 3500mm, please add a beam at the middle. The top of the foundation is higher than the surrounding by 100mm.

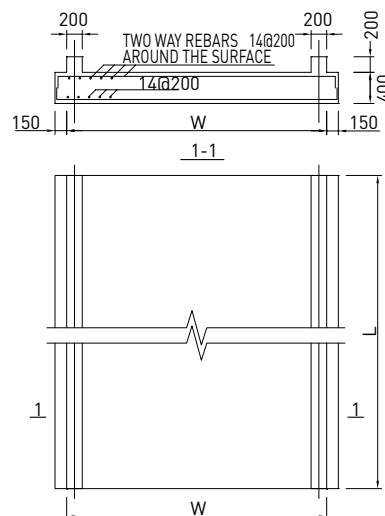
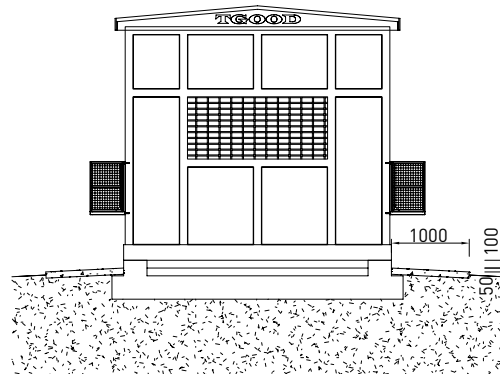


Note:

- Tilt the surface of the surrounding ground min. 50 mm per meter.
- Leave the concrete base 100 mm visible.
- Consider the local conditions such as frost, rain (humidity) and drought.
- W—width of substation, L—length of substation. Unit: mm.

Foundation option 3 – Supporting the substation with concrete raft foundation

Support the substation with concrete raft foundation when placing it on a difficult soil (non-sandy, non-solid): Build the foundation and cast one concrete raft foundation at the bottom, then cast two concrete support beams under the long sides of the substation. (width min. 200 mm, depth min. 500 mm or into frost free depth.) If the width of substation is more than 3500mm, please add a beam at the middle. The top of the foundation is higher than the surrounding by 100mm.



Note:

- Tilt the surface of the surrounding ground min. 50 mm per meter.
- Leave the concrete base 100 mm visible.
- Consider the local conditions such as frost, rain (humidity) and drought.
- All two-layer substations need to adopt the raft foundation.
- W—width of substation, L—length of substation. Unit: mm.
- More foundation options consult TGOOD organization worldwide.

Note

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