



# TDK

## MV Prefabricated Substation

Catalogue

2017

**TGOOD**

[tgood.com](http://tgood.com)

# TDK series

MV prefabricated substation

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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.

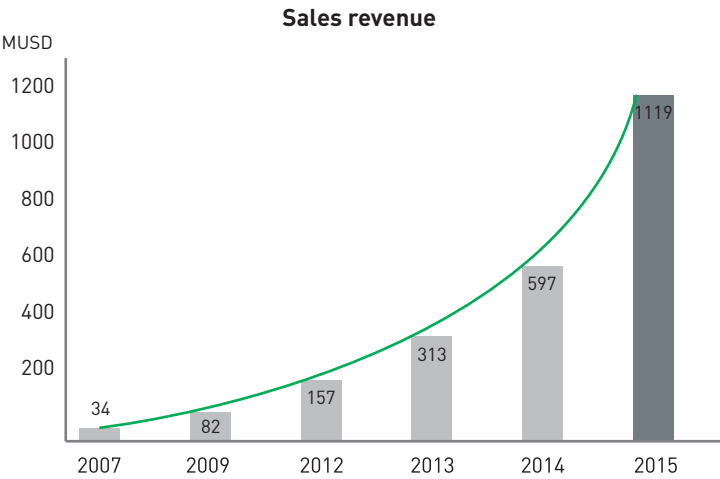
Since 2004, more than 100,000 TGOOD prefabricated substations installed worldwide!

### Successful history of innovative solutions

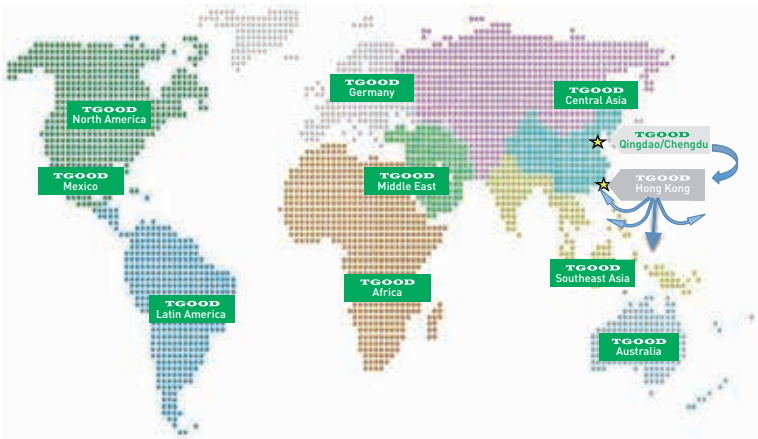
- 2004 First railway remote substation
- 2004 First 40.5 kV compact prefabricated substation
- 2006 First offshore platform substation
- 2007 First intelligent railway remote substation
- 2007 First skid substation
- 2008 First 110 kV urban substation
- 2009 First coal dual power supply substation
- 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

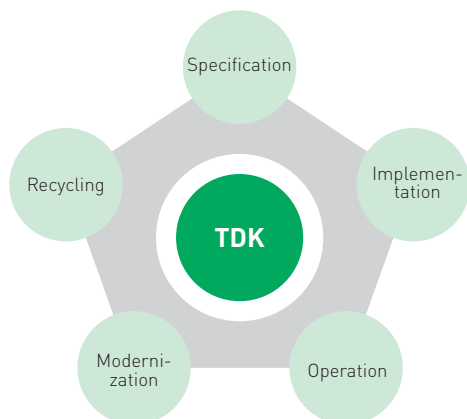


Fast growth since 2004



Users worldwide





### **TGOOD Services, by your side throughout the life of your installation**

#### **Specification**

We help you to define your solutions: by providing a complete selection guide technical assistance and advice

#### **Implementation**

We oversee the completion and commissioning of your installation: design, cost optimization, guaranteed performances and commissioning tests.

#### **Operation**

We help run your daily operations in real time: with agreed maintenance contracts. This will include technical assistance, supply of replacement parts, corrective and preventive maintenance, operation and maintenance training.

#### **Modernization**

We can bring the performance of your installation up to date by providing installation audits, switchgear diagnosis, adaptation and modification and end of life recycling.

#### **Recycling**

We can offer to dismantle your complete switchgear at the end of its service life: to include disassembly, supply material data sheets with environmentally-compatible recycling.



## 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 any independent organization:

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



## Strict and systematic checks

During manufacture, each TDK substation 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. Each gas tank, sealed and airtight, is checked for the quality of the gas pressure obtained.



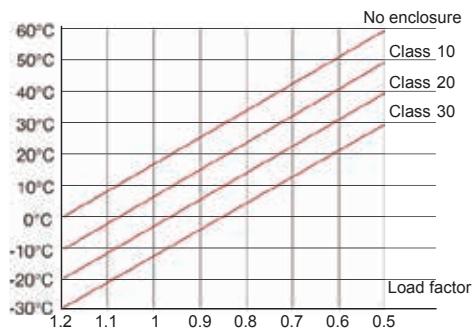
## Environment protection

As part of the group's environmental policy, TGOOD offers you 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. TDK substation has been designed with environmental protection in mind:

- All materials used, for instance insulators and conductors, are identified, and easily separable and recyclable.
- SF<sub>6</sub> usage is reduced in TDK substation, and SF<sub>6</sub> can be recovered at the end of the equipment's life and reused after treatment.
- Oil containment bund is designed to prevent transformer oil leakage.
- Production sites are certified to ISO 14001.

## Occupational health and safety

Occupational Health and Safety (OH&S) bears the highest importance at TGOOD. TGOOD demonstrates its commitment towards the 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 a 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 continue to meet, its legal and policy requirements.



Ambient temperature

## Rated class of enclosure

The test demonstrate that the temperature rise of the transformer inside the enclosure do not exceed those measured on the same transformer outside the enclosure by more than the value which defines the class of enclosure, for example, 5K, 10K, 15K, 20K, 25K or 30K.



## TDK Series Introduction

### General

TGOOD is leading prefabricated substation development in the world through its 10 years' of experience in design, installation and operation. The TDK series prefabricated substation is the compact solution for customers worldwide in power industry, infrastructure, renewable energy, commercial buildings, residential areas and factories. The new designed substation, which is based on abundant test data accumulated in technological research of aerothermodynamics performed in Germany, it is engineered and type-tested according to IEC62271-202.

### Features

TDK prefabricated substation features:

#### Advanced ventilation technology

- Excellent performance originates from unique aerothermodynamics simulation
- Advanced natural ventilation technologies with class 10 enclosure
- Distinctive CAD for mechanical and thermal computation
- Research of ventilation technologies for harsh environments

#### Flexible solution

- 1 to 4 medium voltage feeders
- The same footprint for different feeders such as cable feeder, transformer feeder
- Customized design available for medium & low voltage
- Up to 750kVA transformer fits the same enclosure
- More functions such as automation and communication systems as option

#### Environment friendly

- Low height
- Oil containment bund
- Low noise

#### Optimized structure

- Design against condensation, dust and splashing
- Engineered lifting points
- Optimal design for standardized manufacture
- Ventilation windows and doors
- Neat and aesthetic
- Internal hinges
- Centralized ventilation openings
- Optimized dimensions

#### Convenience

- Simple foundation
- One-stop equipment assembly
- Convenient connection of MV and LV cables
- Easy removable enclosure to access all components



### Structure

- TDK series of prefabricated substation is characterized by diversified functions and flexible configurations. It is assembled through rivet and bolted connection. The industrialized production enhances the production efficiency remarkably.
- Through special paint spraying process, TDK is featured with excellent corrosion-resistance performance, to ensure corrosion-free for 30 years.
- The optimized structure, including natural ventilation system will ensure a class 10 enclosure of the substation.
- Removable enclosure to ensure flexible and convenient upgrade of product.
- The optional built-in oil containment bund will avoid possible contamination.

### MV RMU

- TGOOD TGS series RMU is used for medium voltage switching. The internal arcing performance complies with IEC62271-200. High protection level (IP67) of gas tank enhances personal safety of users. This product is featured with superb environment compatibility, reliable quality, easy & fast installation, as well as a 30 years' life cycle.
- RMU TGS is IAC classified at AFLR 20kA 1s.
- Remote terminal unit (RTU) can be used on MV side to control remotely and inspect the MV switches (optional).

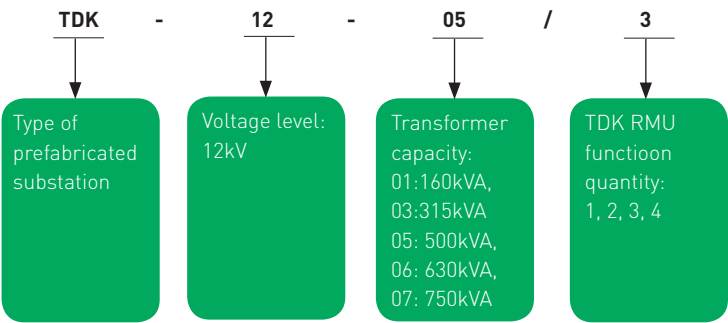
### Transformer unit

TGOOD TDT-I series oil-immersed transformer can be used, which is characterized by fast delivery and optimized design.

### Low voltage unit

Air circuit breaker or MCCB can be used in LV switchgear for protection of incoming / outgoing circuits. The breakers can be mounted side by side, which can save space.

Type description



Types and layout

| Type                                | Layout | Transformer capacity       | RMU type             |
|-------------------------------------|--------|----------------------------|----------------------|
| TDK-12-01<br>TDK-12-02<br>TDK-12-03 |        | 160kVA<br>250kVA<br>315kVA | TGS<br>1 ~ 4 feeders |
| TDK-12-04<br>TDK-12-05              |        | 400kVA<br>500kVA           |                      |
| TDK-12-06<br>TDK-12-07              |        | 630kVA<br>750kVA           |                      |

Application condition

- Altitude: < 1000m
- Ambient temperature: -25°C ~ 40°C (higher or lower temperature optional)
- Inclination degree: not exceed 3°

**Note:**  
No violent vibration in the installation position, no corrosive / inflammable gas or vapor in the ambient air.

## Technical data

## Parameters

|                  | Tems                                      | Unit           | Parameter                |
|------------------|---|----------------|--------------------------|
| Enclosure & base | Temperature rise level                    | Class          | 10                       |
|                  | Noise level                               | dB             | ≤44                      |
|                  | Walls, doors and roof thickness           | mm             | 2 (galvanized sheet      |
|                  | Hinges diameter                           | mm             | ≥10 (IS stainless steel) |
|                  | Structural steel of the base              | mm             | 5 (GBQ235 )              |
| MV unit          | Rated frequency                           | Hz             | 50, 60                   |
|                  | Rated voltage                             | kV             | 12                       |
|                  | Rated power frequency withstand voltage   | kV             | 28                       |
|                  | Rated lightning impulse withstand voltage | kV             | 95                       |
|                  | Rated current                             | A              | 630                      |
|                  | Rated short - time withstand current      | kA             | 20/3s or 25/1s           |
|                  | Rated peak withstand current (60Hz)       | kA             | 50 or 63                 |
|                  | Protection level                          | IP33D or IP43D |                          |
|                  | IAC                                       | IAC-AB-20kA-1s |                          |
| LV unit          | Rated voltage                             | V              | 400, 415, 690            |
|                  | Main circuit rated current                | A              | 100~1600                 |
|                  | Rated thermal stability current           | kA             | 30/1s                    |
|                  | Rated dynamic stability current           | kA             | 63                       |
|                  | Quantity of feeder lines                  | 1~8            |                          |
|                  | Protection level                          | IP33 or IP43   |                          |
|                  | Compensation capacity                     | kVAR           | 0~300                    |
| Transformer unit | Rated capacity                            | kVA            | 100~750                  |
|                  | Protection level                          | IP23D          |                          |

## TDK Selection

| Transformer capacity | Transformer primary current (A) | MV cable size (recommend) (60Hz) | Transformer protection fuse (A) | Transformer protection breaker/Current setting(A) | Transformer LV side rated current(A) | LV incoming breaker (recommend)(A) | Compensation current (A) |
|----------------------|---------------------------------|----------------------------------|---------------------------------|---|--------------------------------------|------------------------------------|--------------------------|
| 125kVA               | 7.22                            | 50                               | 20                              |   | 180.43                               | 250                                | 27~54                    |
| 160kVA               | 9.24                            | 50                               | 25                              |   | 230.95                               | 400                                | 35~69                    |
| 200kVA               | 11.55                           | 50                               | 25                              |   | 288.68                               | 630                                | 43~87                    |
| 250kVA               | 14.43                           | 50                               | 31.5                            |   | 360.84                               | 630                                | 54~108                   |
| 315kVA               | 18.19                           | 50                               | 40                              |   | 454.66                               | 800                                | 68~136                   |
| 400kVA               | 23.09                           | 50                               | 50                              |   | 577.37                               | 800                                | 87~173                   |
| 500kVA               | 28.87                           | 50                               | 50                              | 30  | 721.71                               | 1000                               | 108~217                  |
| 630kVA               | 36.37                           | 50                               | 63                              | 37  | 909.35                               | 1250                               | 136~273                  |
| 750kVA               | 46.19                           | 70                               | 80                              | 55  | 1154.73                              | 1600                               | 173~346                  |

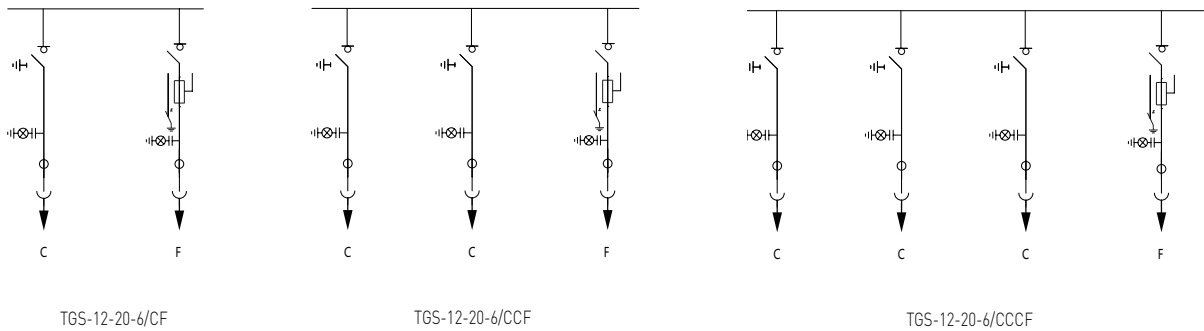
Note:

(1) Compensation capacity: 15%~30% of transformer capacity

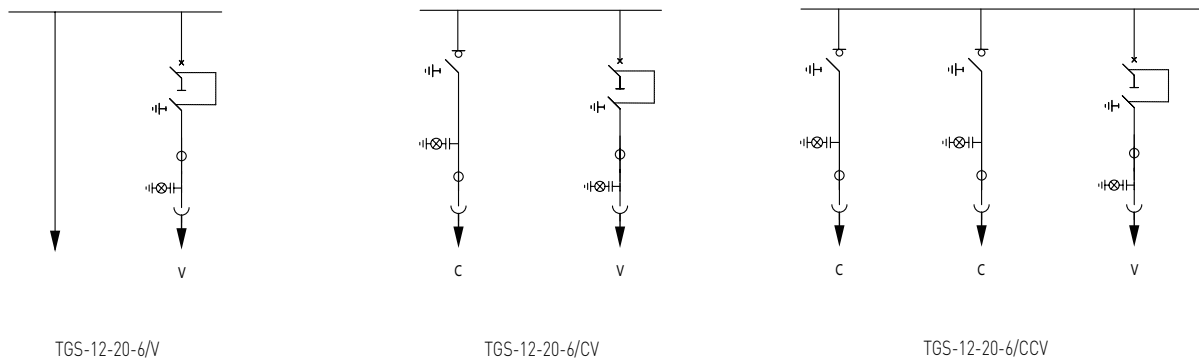
(2) Capacitor: Choose combination of capacitors to achieve required capacity

- Note:**
- F Load switch and fuse functional unit
  - V Circuit breaker functional unit
  - C Load switch function unit

**Transformer protection: Load-switch and fuse**

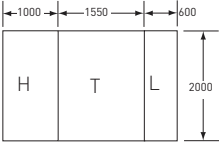
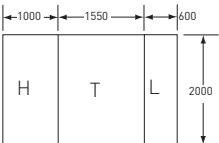
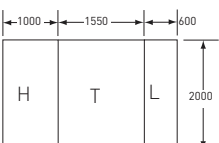


**Transformer protection: 630A circuit breaker**



Dimension & installation

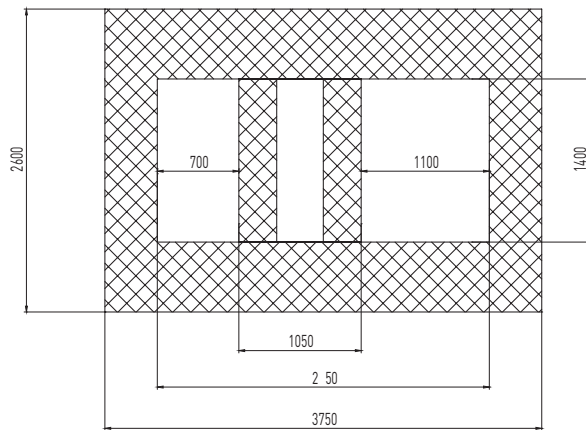
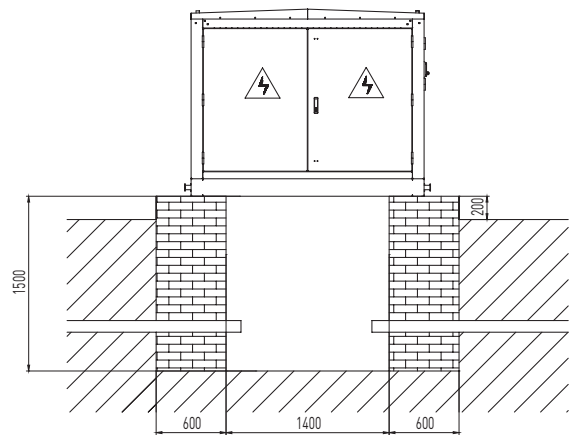
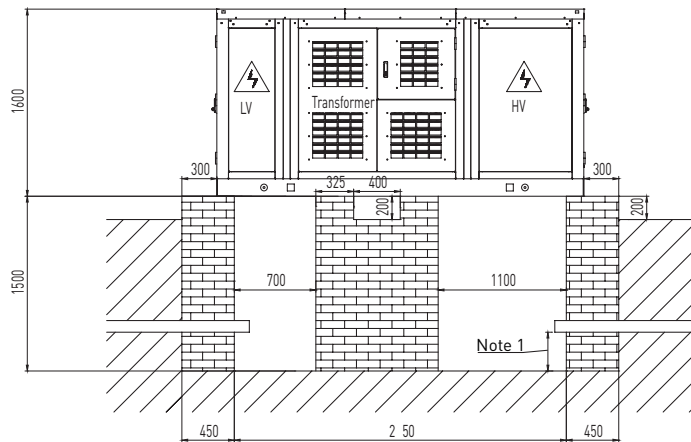
Dimensions

| Type      | Layout Dimension  | Out size (L*W*H) | Equipments  |
|-----------|---|------------------|---|
| TDK-12-03 |  | 3150*2000*1600   | TDT-I series oil transformer<br>Transformer capacity: 315kVA<br>MV TGS: 1~4 ways<br>Weight: 5500kg          |
| TDK-12-05 |  | 3150*2000*1600   | TDT-I series oil immersed transformer<br>Transformer capacity: 500kVA<br>MV TGS: 1~4 ways<br>Weight: 5800kg |
| TDK-12-07 |  | 3150*2000*1600   | TDT-I series oil immersed transformer<br>Transformer capacity: 750kVA<br>MV TGS: 1~4 ways<br>Weight: 6800kg |

Note:

Here is the examples of partial dimensions, the layout dimension of TDK-12-01(02,04,06) is the same as TDK-12-03 (05,07), the main change is the transformer.

## Foundation 1



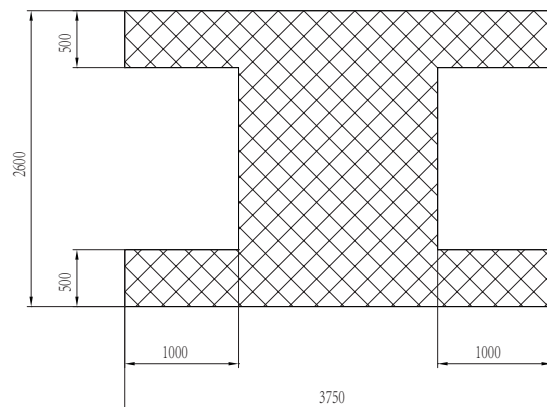
### Note

- 1: The dimension depends on numbers of feeder.
- 2: Outsize (L x W x H): 3150mmx2000mmx1600mm

### Foundation requirements:

1. The surface of foundation should be leveled.
2. The distance between TDK and other objects must be more than 1m to facilitate opening the door.
3. The internal surface must be sealed by 1:3 cement mortar, water proof treatment should be done.
4. Cable pipe should be embeded in foundation, the size, quantity and location refer to the drawing.
5. All the embeded metal parts and support accessories in foundation must be earthed, the earthing resistance must be less than  $4\Omega$ .
6. The location of gully drain is decided by on site condition, set it at lower position.

## Foundation 2



TGS-12-20-6/CCV



TGS-12-20-6/CCF



TG00D TGS is an integrated and modularized SF<sub>6</sub> RMU to protect transformer inside TDK substation. The switches and busbas are mounted in a fully sealed enclosure full of SF<sub>6</sub> gas. The switches are immune from external influences. TG00D can provide the following transformer protections:

- Load switch+ fuse
- Circuit breaker

TGS production conforms to strict quality standards. Its advanced design and technology enhance safety of operators and equipment. Main technical parameters are as follows.

| Content  | Unit                   | Parameter |      |
|--|------------------------|-----------|------|
| Normal characteristics   |                        |           |      |
| Rated voltage  | kV rms                 | 12        |      |
| Rated frequency  | Hz                     | 50, 60    |      |
| Insulation levels  |                        |           |      |
| Rated power frequency voltage withstand                                | kV rms (50 HZ / 1 min) | 42        |      |
| Rated impulse voltage withstand (peak)                                 | kV                     | 95        |      |
| Main circuit and busbar  |                        |           |      |
| Rated current  | A                      | 630       |      |
| Rated short-circuit current  | kA rms/s               | 20/3      | 25/1 |
| Load switch / disconnect<br>/ Earthing switch making current<br>(peak) | kA                     | 50        | 62.5 |
| Breaking of transformer  |                        |           |      |
| Rated current  | A                      | 200       |      |
| Fuse load switch   |                        |           |      |
| Breaking capability of fuse load switch                                | kA rms                 | 20/3      | 25/1 |
| Making capacity (peak)   | kA peak                | 50        | 62.5 |

Each switch of TGS has three positions: open, close, earth; each position is ensured by interlock device to avoid misoperation. Earthing switch has complete making capability.

Operation mechanism is independent to ensure the irrelevance between the main contactor movement and operating speed of the operator. The position indicator is driven by main shaft to ensure indication accuracy.

### TGS advantages:

- Low maintenance workload
- Electrically operated
- High reliability
- Standardized connection
- Immune to environmental influence
- Light in weight
- Compact structure
- Easy operation
- With locking device



## General introduction

TGOOD TDT-I type oil immersed transformer is installed in TDK prefabricated substation.

- Sealed tank type construction is used, all seams are welded and oil tight. On the external areas of the tank, welding of horizontal and vertical joints is on both sides of the joint.
- The lid of the transformer is capable of being removed without having to take off another components first
- The method of cooling transformer is ONAN as standard
- Transformer insulating oil is certified as (PCB- free)
- Oil level indication is provided by a permanent marking on the inside of the tank. An external oil level indicator is also provided.
- An oil drain valve is provided and located in a position easily accessible through an open door
- Transformers are fitted with a filler cap which is easily accessible.
- Low voltage terminal palms are made of copper with their contact surfaces tinned or silver plated.
- Each low voltage bushing part within the tank is completely covered with oil when the transformer is cold and can be readily accessible with the tank cover removed.

## Technical data

| Item                    | Unit            | Data                  |
|-------------------------|-----------------|-----------------------|
| Standard                |                 | IEC60296              |
| Frequency               | Hz              | 50, 60                |
| No. of windings         |                 | 2                     |
| Rated voltage ratio     | V               | 11000/ 415, 433, 690  |
| Rated power             | kVA             | 160,315, 500,630, 750 |
| Vector group            |                 | Dyn11                 |
| Type of cooling         |                 | ONAN                  |
| Winding material        | Cu or Al        | Cu or Al              |
| Impedance voltage       | %               | 4, 4, 5, 5, 6.25      |
| Oil conservation system |                 | Sealed                |
| Sound level             | dB (A)          | 58, 61, 64, 66, 68.5  |
| Operation flux density  | Tesla           | Less than 1.6         |
| Tap changer location    | HV/ LV side     | HV side               |
| Tapping range           |                 | -5% to +10%           |
| Tapping positions       |                 | 7                     |
| Tapping method          | Offload/ onload | Off load              |





### Remote Terminal Unit (optional)

- Remote terminal unit (RTU) will realize all necessary functions of TGS switchgear at MV side of TDK substation, such as remote control and monitoring.
- Working condition information can be collected, including switch status, load current and failure points, etc.
- Communicate open / close commands of switchgear
- Communication with central control room
- Practicability and reliability of RTU have been proved, which will ensure real-time remote control of switchgear from control room. Assembly and operation of interface are simplified.
- The remotely-controlled interface is applicable to MV power grid.
- Operation of the local / remote control switch on the front face is simplified, information of switching status can be indicated.
- During failure of auxiliary power supply, standby power supply will ensure several hours' of normal work.
- Plug-in type of connection is realized through connectors.
- RTU has special tools, which can be connected to electrical operation system easily.
- During installation or measurement, the connectors with polarities are used to ensure correct connection.
- Split-type current transformer is used, which is featured with easy installation.



## Low voltage ACB

TGOOD selects high performance compact circuit breakers in the world. Besides the characteristics of traditional circuit breakers (withdrawable, selective and low maintenance workload), this product is also characterized by compact size, internal communication & measurement functions, which enhance the performance and safety of the product. This product is also featured with simple installation, friendly user interface and easy operation. Main incoming circuit breaker used in TDK substation will save space in LV side.

### Technical data:

|   |          |           |      |
|---|----------|-----------|------|
| Number of poles                           | 3/4      |           |      |
| Rated insulation voltage (V)              | 1000     |           |      |
| Rated frequency (Hz)                      | 50,60    |           |      |
| Rated operational voltage (V AC 50/60Hz)  | 690      |           |      |
| Rated current (A)                         | 630~1000 | 1250~1600 | 2000 |
| Ultimate breaking capability (kA rms)     | 42       | 42        | 50   |
| Service breaking capability (kA rms)      | 35       | 35        | 40   |
| Short- time withstand current (kA rms 1s) | 35       | 35        | 40   |

Note: Higher performance optional, consult us for more information.



## Low voltage MCCB

The MCCB is in modularized structure, and featured with wide usage, reliability and safety.

The MCCB chosen by TGOOD for LV power distribution is used for AC 50/60Hz (<500V), which prevents overload and short circuit damage to circuit , and enhances the reliability and continuity of power supply.

### Technical data:

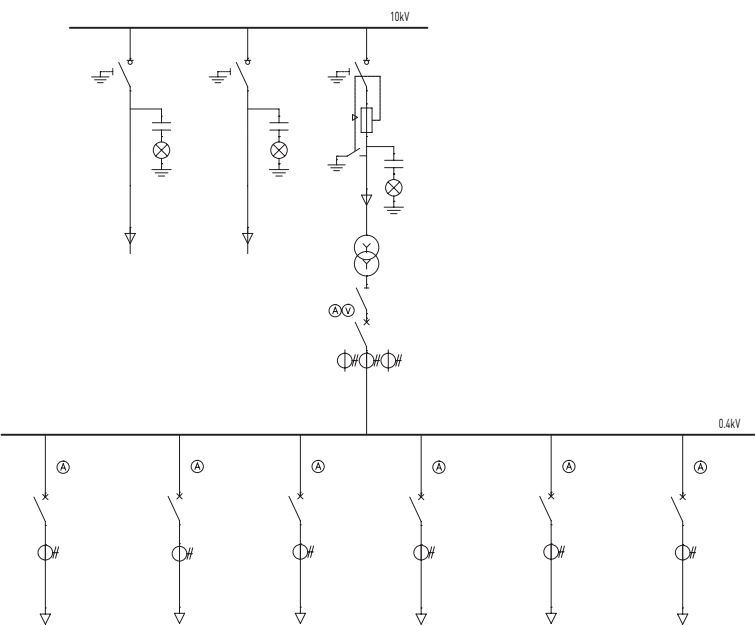
|                                  |                     |              |    |
|----------------------------------|---------------------|--------------|----|
| Rated current (A)                | 100/160/250/400/630 |              |    |
| Rated insulation voltage (V)     | 800                 |              |    |
| Rated impulse voltage (kA, Peak) | 8                   |              |    |
| Rated operational voltage (V)    | 690                 |              |    |
| Ultimate breaking capability     | Icu (kA)            | 220V/230V    | 85 |
|                                  |                     | 380V/400V    | 35 |
| Service breaking capability      | Ics                 | 75%~100% Icu |    |

Note: Higher performance optional, consult us for more information.

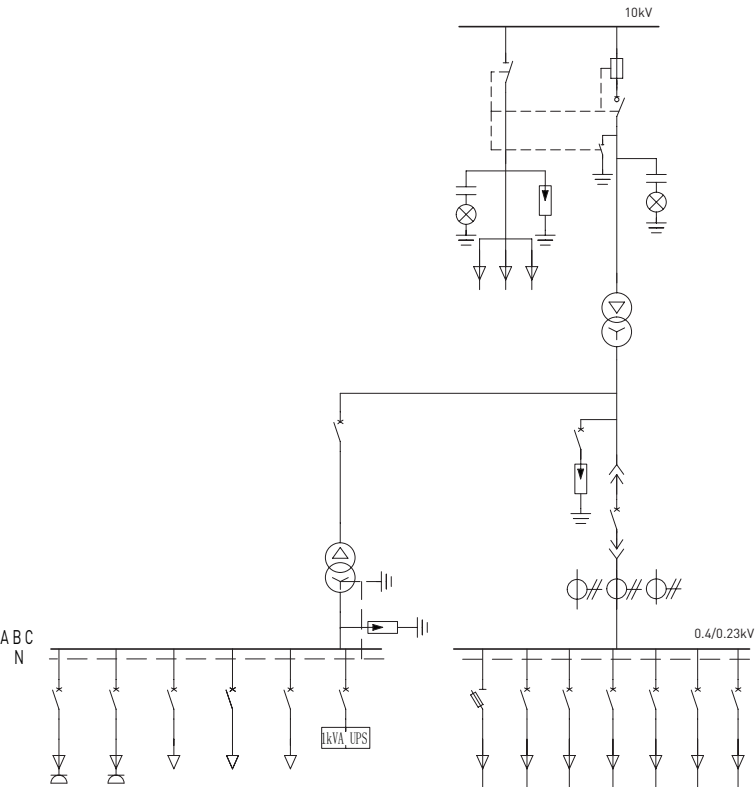
Application examples of prefabricated substation in power distribution



Utility

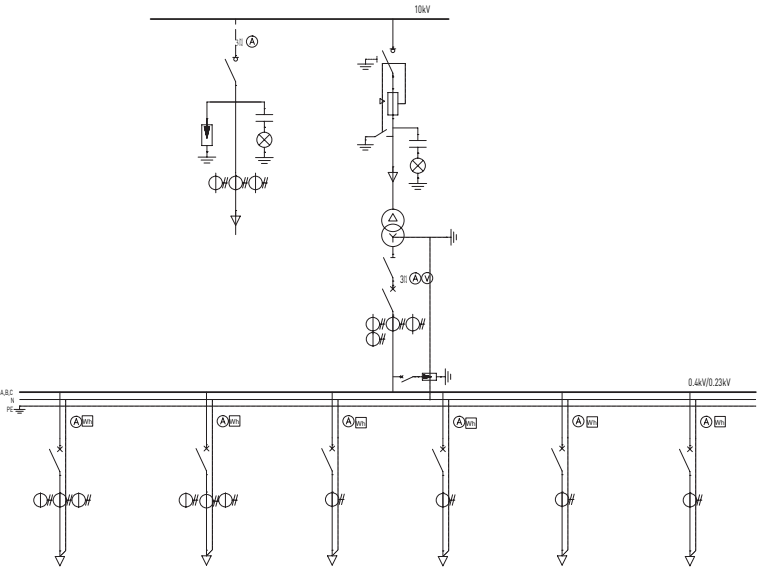


Renewable





Transportation



### TGS cable connection

Two kinds of cable connection are available – terminal with shielding (touchable) is applicable to single core XLPE cable; while terminals without shielding is applicable to all cables.

Cable box shall be added to ensure personal safety.

| TGS RMU                   | Bushings  | Cable        | Elastimold                             | Heat shrink<br>dismountable |          | Dismountable |
|---------------------------|-----------|--------------|--|-----------------------------|----------|--------------|
| 12kV 400A<br>20kA / 1 sec | Universal | XLPE<br>MIND | 400LR<br>N.A                           | EE<br>EE                    | RE<br>RE | TCH<br>TCH   |
| 12kV 630A<br>20kA / 3 sec | M16 bolt  | XLPE<br>MIND | 400TB<br>N.A                           | EE<br>EE                    | RE<br>RE | TCH<br>TCH   |
| 12kV 630A<br>25kA / 1 sec | M16 bolt  | XLPE<br>MIND | 400TB<br>N.A                           | EE<br>EE                    | RE<br>RE | TCH<br>TCH   |
| 24kV 400A<br>20kA / 1 sec | universal | XLPE<br>MIND | K400LR<br>N.A NO cable<br>box required | RE*<br>RE*                  |          |              |
|                           |           |              |  | Require cable box           |          |              |

Symbols:

XLPE: cross-linked PUR MIND: Oil-immersed paper insulation (without dripping);

Universal type: M14 insert type / M12 bolt

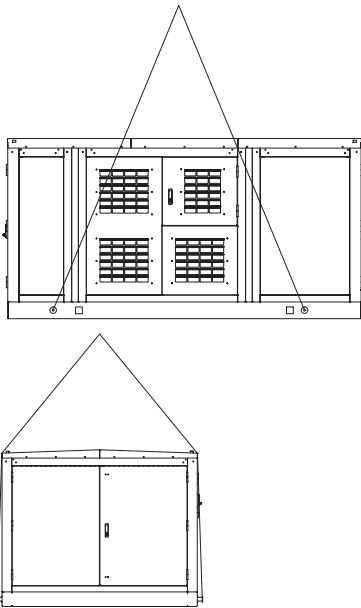
EE: EPKT + EAKT RE: RICS + EPKT

RE\*: RICS + EPKT + additional cable box

TCH: T4PC + CC1 + heat shrinkable cable head

### LV cable connection

The low voltage cable are connected directly to the breaker.



Hoisting



Enter transformer chamber



Replacement

### TDK transportation

- Appropriate forklift can be used for short-distance transportation of TDK prefabricated substation.
- Weight of prefabricated substation shall not exceed the load carrying capacity of forklift.
- Take out the hoisting rod before hoisting
- Under normal circumstance, 4 hoisting rods are hidden in the groove of base, which can be taken out directly before hoisting.

### TDK enclosure hoisting

- The prefabricated substation can be hoisted through hoisting tools made according to TGOOD drawings.
- TGOOD made the hoisting tools of TDK substation, which can effectively avoid surface damages, like paint scratch.
- For long distance transportation, take out the hoisting rod, then secure the substation to the truck through tie downs and securing ring (made by customer)
- After finishing the hoisting, push the hoisting rods back into the substation base

### Entry

- Enter MV / LV chamber: customers access into the MV and LV chamber through double-opening door for equipment operation or adjustment; when door is opened, fix the 2 door leaves with door supporting mechanism.
- Enter transformer chamber: both sides of transformer chamber are equipped with outwardly-opened doors, through which customers could go into transformer chamber for adjustment and inspection; the door can be fixed through door supporting mechanism.

### Replacement or upgrading

- If large components (transformer, MV switchgear, LV cubicle, etc.) are to be replaced or upgraded, customer can remove the enclosure of substation to perform replacement or upgrading, and re-assemble the enclosure. The operation is very simple – the on-site replacement or upgrading can be finished within 30 minutes.

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