



TGS

Gas insulated switchgear up to 24 kV

Catalogue

2022

TGOOD



tgood.com

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Example of TGS Extensible in industry
(with tool-free cable testing facility)



TGS in a MV/LV substation – chosen for its compact size



TGS in the mast of a wind tower, can be installed through a narrow door thanks to its compact size



TGS is designed by TG00D R&D in Germany

TGS, a versatile switchboard

TGS is a medium voltage gas insulated switchboard up to 24kV, 630A, 20kA 3s, used in secondary distribution applications. It can be fitted with the following protection devices:

- Transformer protection by fuse (F function)
- Transformer and line protection by vacuum circuit-breaker (V function)

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

Electrically insulated using SF₆ gas

The high voltage conductive parts of the TGS 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 304 stainless steel tank. TGS 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 TGS, makes it one of the most compact MV switchboards on the market (for instance, a cubicle with 3 functional units is 1 meter wide).

Simple operation and maintenance

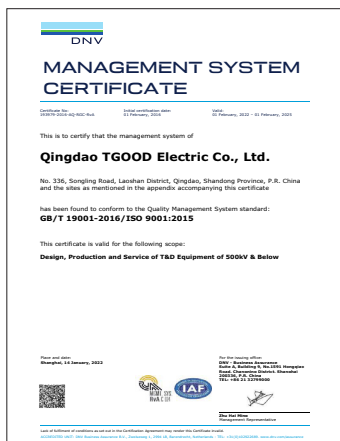
With a service life of 30 years for the main circuit without maintenance, the overall design of the range of TGS switchboards guarantees simple and reliable use:

- 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 TGS
- 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.

Safety and innovation

TGS 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)



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 TGS is certified to be in conformity with the requirements of ISO 9001: 2015 quality assurance standard.

Strict and systematic checks

During manufacture, each TGS 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.



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. TGS 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 TGS, 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 ISO 45001:2018 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.

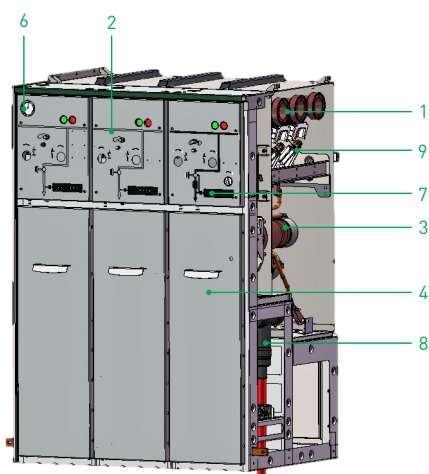


Illustration of an TGS
CCF function, protection by fuses

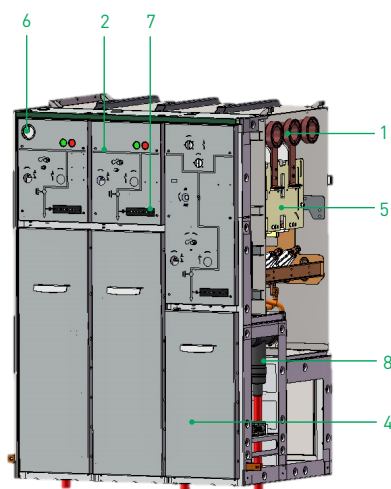


Illustration of an TGS
CCV function, protection by vacuum circuit-breaker

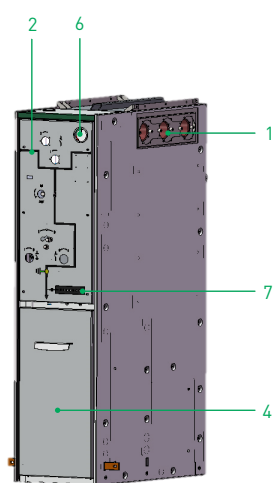


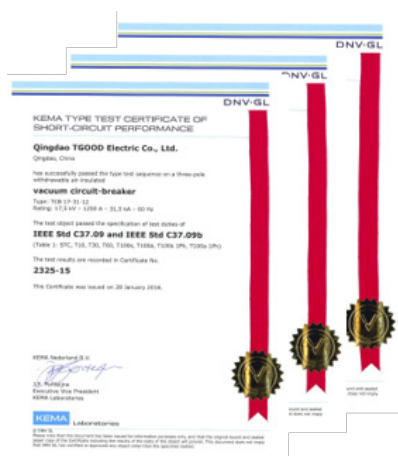
Illustration of an TGS vacuum
circuit-breaker function

- 1 Hermetically-sealed S304 tank filled with gas to insulate the main circuit
- 2 Operating mechanism compartment and mimic diagram
- 3 Fuse compartment
- 4 Cables compartment door
- 5 Vacuum circuit-breaker
- 6 Tank pressure manometer
- 7 Voltage presence detection system and low voltage part
- 8 Cable plug-in connections
- 9 3-position switch-disconnector

Identification plate

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

Example	TGS	24	-	20	-	6	/	eCCF
Switchboard								
Rated voltage: 24 kV								
Short-circuit current: 20 kA (3s)								
Rated current: 630A								
Functions order: from left to right e = extensible								



Operating conditions

- Temperature classification: -5°C indoors (option: -25°C).
- Ambient temperature: from -5°C to +40°C (option: -25°C ~ +55°C, rated normal current of 630A applies to ambient air temperature of max. 40°C).
- Average value over 24 hours (max.): +35°C
- Typical maximum altitude for installation above sea level is 1,000 m. However, much higher altitudes are possible on request but with limitations when Metering or HV fuse-holders functions are requested.
- Type of insulating gas: sulphur hexafluoride (SF₆)
- Rated pressure at +20°C: 0.14 MPa
- Flood proof (option): successfully tested under water for 24 hours at 24 kV 50 Hz.

Protection index (IP)

- Main electrical circuits: IP67
- Fuse compartment: IP65 (option: IP67)
- Operating mechanisms: IP3X
- Cable connection compartment: IP2XC
- Switchgear: IK07

Partition class and loss of service continuity category

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

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.

Internal Arc Classification

TGS 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.

TGS 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, TGS is classified as LSC2B.

The TGS 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 (in C, F, V, DE, I)	IEC 62271-102	E2
Disconnecter (in V, I)	IEC 62271-102	M1
General use switch (C)	IEC 62271-103	M1, E3, C2
Switch-disconnector fuse combination (F)	IEC 62271-105	M1, E3 (switch)
Circuit-breaker (in V, I)	IEC 62271-100	M1, 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	

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TGS: non- extensible version



TGS: extensible version

TGS: non- extensible version

This version can be easily integrated into a substation thanks to its compact size and small footprint. Up to 6 functional units can be assembled in a single tank insulated by SF₆ gas.

TGS: extensible version

The extensible version of TGS is used to enable the extension of a switchboard with additional functional unit.

- TGS: Double extensible version

TGS switchboard can be extended on either or both left and right sides.

- TGS: Single extensible version

TGS switchboard can only be extended on the right side.

These versions offer the following advantages:

- A highly economic solution for secondary distribution applications
- Installation in very limited space locations such as through a narrow opening or hatch is possible
- The additional TGS extensible functional units can be arranged in any order you like
- A subsequent extension is possible through connecting device at the bushing level
- The flexibility and modularity of TGS extensible make TGS an ideal MV switchboard for applications in the industrial sector, or for those liable to change in time such as public distribution network.

Main functional units:

- C** Cable incoming or outgoing feeder with switch-disconnector and earthing switch
- F** Transformer protection with switch-disconnector fuse combination
- V** Transformer/line protection with vacuum circuit-breaker
- D** Direct incoming feeder without earthing switch
- DE** Direct incoming feeder with earthing switch
- S** Bus coupler with switch-disconnector
- I** Bus coupler with vacuum circuit breaker
- M** Metering panel

Main functional units

Names	C	F	V	D	DE	S	I	M
Functions	Cable incoming or outgoing feeder with switch-disconnector	Transformer protection with switch-disconnector fuse combination	Transformer/line protection with vacuum circuit breaker	Direct incoming feeder without earthing switch	Direct incoming feeder with earthing switch	Busbar switch-disconnector	Busbar protection with vacuum circuit-breaker*	Metering
Single line diagrams								

*Note: designed for regular CT parameter 10P10, 2.5VA. For other CT parameters please consult TGOOD.

C function

- The interrupting mechanisms are located in the sealed-for-life tank filled with gas
- The three-position switch is equipped with a spring-loaded closing mechanism for the switch-disconnector function and the earthing switch function

F function

- To make the replacement of HV fuses secure, earthing switches are placed both upstream and downstream from the fuses
- Both earthing switches are connected mechanically and are activated with a single operating mechanism
- The switch-disconnector is equipped with a spring-loaded mechanism for the closing operations and a stored energy mechanism for breaking operations which is mechanically pre-loaded
- When the striker pin trips on the blowing of one of the HV fuses, the switch disconnector is opened mechanically on all three phases
- An indicator on the front panel of the TGS visually signals the interruption due to a fuse blowing
- A push button for tripping the opening of the switch is available as an option.
- An opening by tripping coil is also possible
- The earthing function is operated with a separate spring mechanism

D function

- This function allows for the direct connection of a cable incoming feeder to the busbar of the TGS switchboard

DE function

- This function, which is equipped with an earthing switch, allows for the direct earthing

S function

- This function is used for the opening and disconnection of the busbar to separate the end-user from the energy provider

V function

- The CB function includes a vacuum circuit-breaker and a three-position disconnect switch
- Fast auto-reclosing operating cycle: O - 0.3 s - CO - 180 s - CO
- The earthing switch with making capacity is activated by a spring-loaded mechanism
- The vacuum circuit-breaker is equipped with a double-latch energy accumulation spring-loaded mechanism and can be pre-loaded manually or electrically for a complete OCO cycle
- An integrated protection relay is linked to the circuit-breaker
 - One of the following two autonomous relays can be integrated behind the front over with the current transformers fitted on cable plug-in connections: DPX-1 and WIC
 - Other non-autonomous relays can be used by fitting a low voltage cabinet with the current transformers fitted either to the withdrawable terminals or onto the outgoing feeder cables
- In option: metering with current transformers fitted to the cables in the cubicle's compartment
- When connected to an overhead line network, the CB function can protect from temporary line faults. It can also provide private network protection

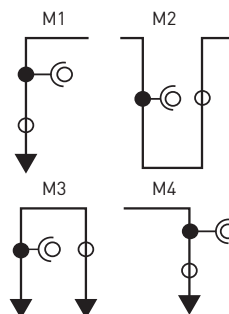
I function

- The I function is used to protect the switchgear busbar (on the left- or righthand side). Example of use: medium voltage metering switchboard
- This function uses the same vacuum circuit breaker and mechanism as the CB function

M function

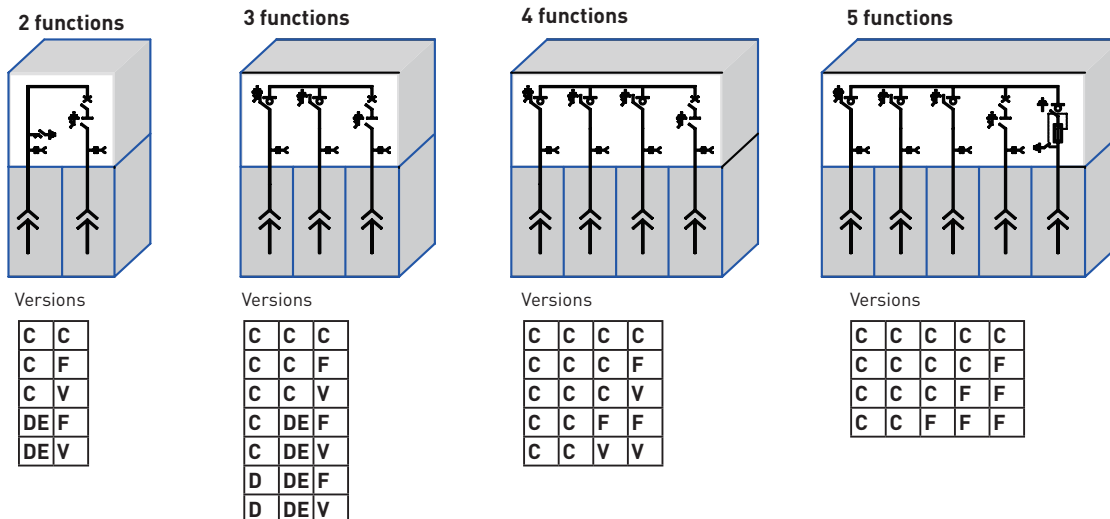
TG00D provides metering functional panel with conventional CTs and VTs, whose position can be switched between each other, it is a factory assembled, tested, air insulated and available in 4 versions:

- M1: M on left side of switchboard, top busbar connection, bottom cable in
- M2: Top busbar in/out
- M3: Bottom cable in/out
- M4: M on right side of switchboard, top busbar connection, bottom cable in



Contact TG00D local regional office to find more metering solution.

TGS, non-extensible



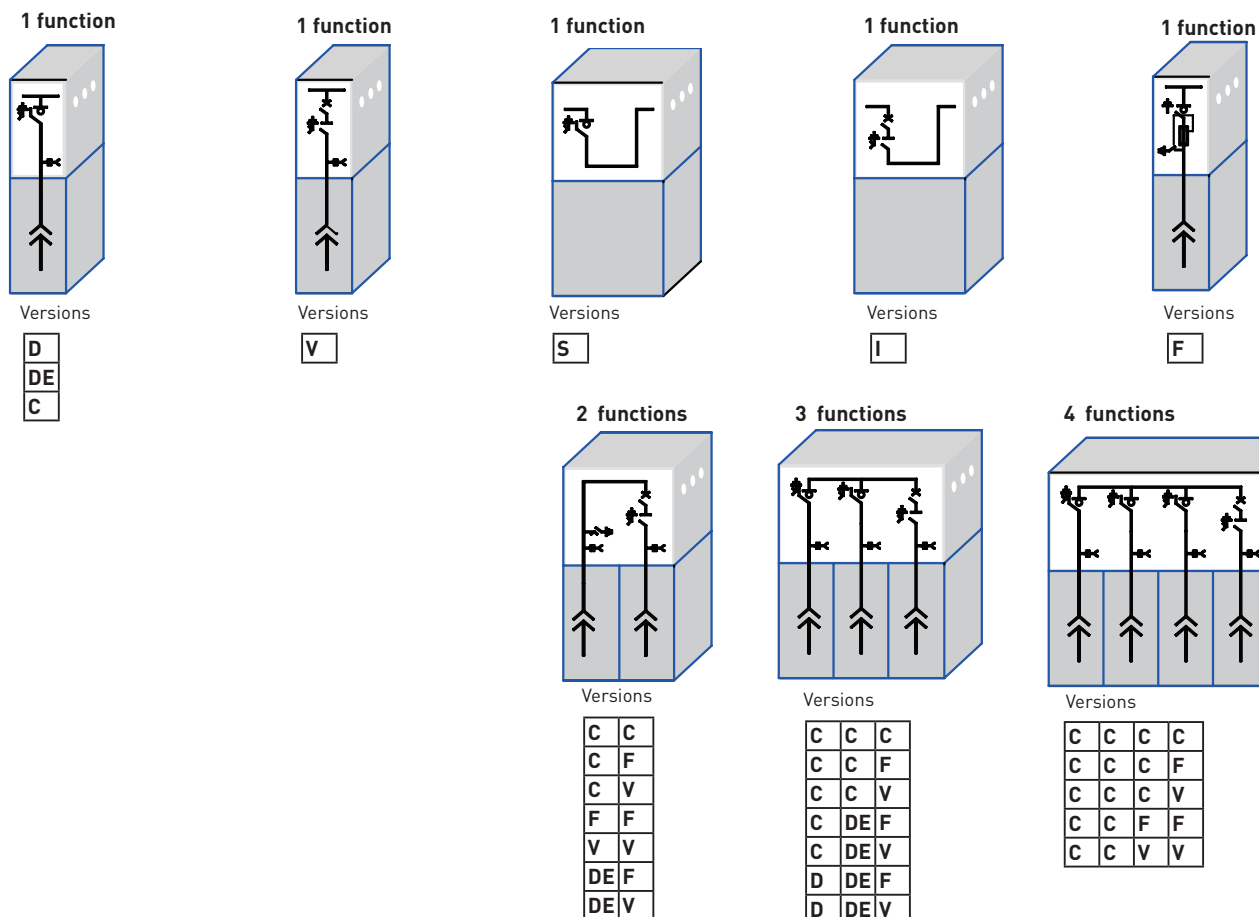
TGS, extensible version

TGS: double-side extensible version

TGS switchboard can be extended on either or both left and right sides.

TGS: single-side extensible version

TGS switchboard can only be extended on the right side.



Dimensions and weights of the TGS non-extensible

Function	Number of functional units	Height (mm)	Depth (mm)	Width (mm)	Approximative weight (kg)	
					1502 mm	1200 mm
CC	2	1502 / 1200	800	708	200	190
CF		1502 / 1200			200	190
CV		1502 / 1200			240	230
FF		1502 / 1200			210	200
WV		1502 / 1200			240	230
CCC	3	1502 / 1200	800	1048	320	305
CCF		1502 / 1200			330	315
CCV		1502 / 1200			360	345
CFF		1502 / 1200			320	305
CVV		1502 / 1200			360	345
FFF		1502 / 1200			320	305
WVW		1502 / 1200			350	335
CCCC	4	1502 / 1200	800	1388	440	420
CCCF		1502 / 1200			450	430
CCCV		1502 / 1200			480	460
CCFF		1502 / 1200			470	450
CCWV		1502 / 1200			530	510
CCCCC	5	1502 / 1200	800	1728	550	530
CCCCF		1502 / 1200			550	530
CCCFF		1502 / 1200			550	530
CCFFF		1502 / 1200		1728	570	550

Dimensions and weights of the TGS extensible

Function	Number of functional units	Height (mm)	Depth (mm)	Width ⁽¹⁾ ⁽²⁾ (mm)	Approximative weight (kg)	
					1502 mm	1200 mm
C	1	1502 / 1200	800	368	135	130
F		1502 / 1200			125	120
V		1502 / 1200			135	130
D		1502 / 1200		500	200	195
DE		1502 / 1200			200	195
I		1502 / 1200			250	245
S		1502 / 1200			200	195
M		1502 / 1200			750 / 900	— ^[3]
CC	2	1502 / 1200	800	708	210	200
CF		1502 / 1200			210	200
CV		1502 / 1200			240	230
FF		1502 / 1200		708	310	300
W		1502 / 1200			370	360
[DE]F		1502 / 1200		868	220	210
[DE]V		1502 / 1200			250	240
CCC	3	1502 / 1200	800	1048	330	315
CCF		1502 / 1200			340	325
CCV		1502 / 1200			370	355
C[DE]F		1502 / 1200		1208	330	315
C[DE]V		1502 / 1200			360	345
D[DE]F		1502 / 1200			330	315
D[DE]V		1502 / 1200			360	345
CCCC	4	1502 / 1200	800	1388	450	430
CCCF		1502 / 1200			460	440
CCCV		1502 / 1200			490	470
CCFF		1502 / 1200			480	460
CCVW		1502 / 1200			540	520

(1) Add 14 mm for the busbar protective covers (right or left) at the extremity of the switchboard.

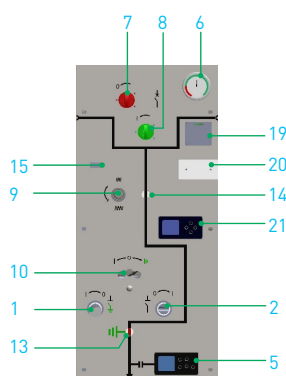
(2) It is impacted by CT and VT.

User interface	15
Interlocks	17
Extensibility	18
Cable compartment	19
Fuse compartment	20

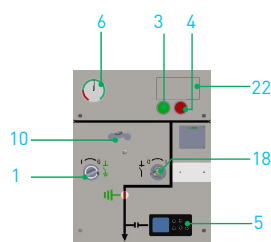
User interface description

Thanks to its clear mimic diagram, the user interface makes it easy and safe to operate TGS. Each switching device is equipped with an access point for the control lever and an indicator of the mechanical position.

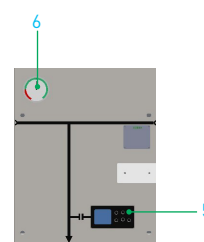
The two earthing switches, both upstream and downstream from the MV fuse holders on the T1 switch-disconnector fuse combination, are activated simultaneously by a common mechanism. The switch-disconnectors and vacuum circuit-breakers can be equipped, as an option, by a motorised control mechanism.



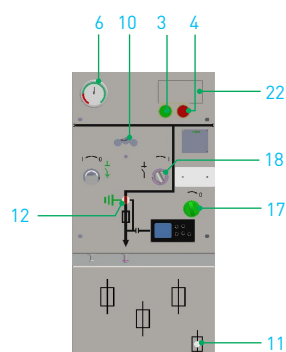
Transformer protection with vacuum circuit-breaker (V)



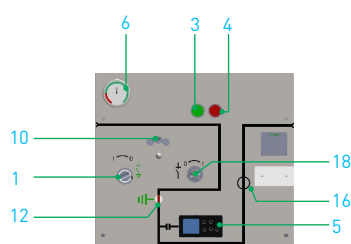
Incoming/outgoing feeder with switch-disconnector (C)



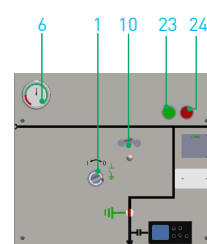
Direct incoming feeder without earthing switch (D)



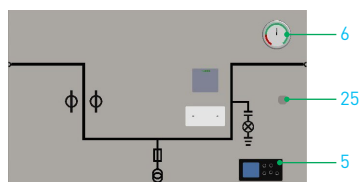
Outgoing feeder with switch-disconnector fuse combination (F)



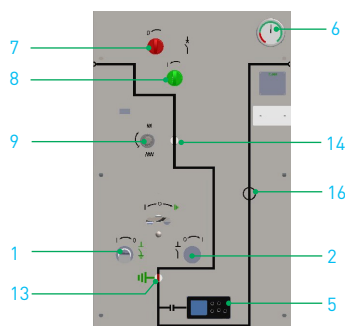
Bus coupler with switch-disconnector (S)



Direct incoming feeder with earthing switch (DE)



Metering (M)

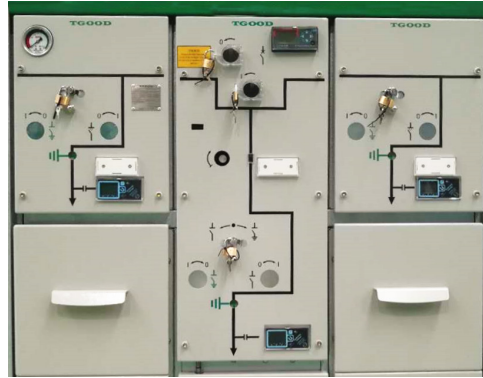


Bus coupler with circuit-breaker (II)

1. Lever hub socket for the earthing switch
2. Lever hub socket for the disconnector
3. Load switch closing button
4. Load switch opening button
5. Voltage presence indicating system
6. Gas manometer
7. CB opening rotary button
8. CB closing rotary button
9. Lever hub for circuit-breaker spring charging
10. Locking device for three-position switch
11. Fuse tripping indicator
12. Position indicator load switch / earthing switch
13. Position indicator disconnector / earthing switch
14. CB position indicator
15. Spring charging indicator
16. Current transformer
17. Load switch opening switch (manual tripping)
18. Lever hub socket for LBS (load switch)
19. Nameplate
20. Label for functional unit
21. Protection relay
22. Reserved position for fault indicator
23. Earthing switch closing button
24. Earthing switch opening button
25. Control plate door lock

Padlocking

The actuator's operating hub, circuit-breaker opening and closing rotary buttons can be controlled by padlock (optional).



Obstruction of the lever hub socket by padlock

Interlocking of the functional units

During the development of TGS switchboard, the accent was placed on personnel safety and the reliability of the operation.

An interlocking system prevents any incorrect use.

Thus, the operating levers can only be inserted if the service status permits it.

Access to the cables compartment and to the fuses is only possible if the appropriate outgoing feeder is connected to earth.

The switchboards are equipped in production series with the following interlocks:

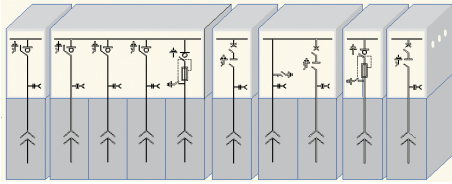
Functional unit with switch-disconnector and earthing switch, switch-disconnector fuse combination (C, F and S functions)

Interrupting mechanism	Position	Interlock status... Switch-disconnector	Earthing switch	Cables compartment panel or fuses
Switch-disconnector	Closed	–	Locked	Locked
	Open	–	Unlocked	Locked, if earthing switch is open
Earthing switch (ES)	Closed	Locked	–	Unlocked
	Open	Unlocked	–	Locked
Cable or fuses compartment panel (S function not concerned)	Removed	Locked	Locked	–
	Fitted	<ul style="list-style-type: none"> ■ Unlocked, if earthing switch is open ■ Locked, if earthing switch is closed 	Unlocked	–

Option: switch-disconnector – locking of the cables compartment panel, for example, for the cable tests.

Functional unit with vacuum circuit-breaker, disconnector and earthing switch (V, and I function)

Interrupting mechanism	Position	Interlock status...		Earthing switch		Circuit-breaker		Cable compartment panel (not I)
		Open	Closed	Open	Closed	Open	Closed	
Disconnecter (Disc.)	Open	–	–	Unlocked	Unlocked	Unlocked	Unlocked	–
	Closed	–	–	Locked	–	Unlocked	Unlocked	–
Earthing switch (ES)	Open	Unlocked	Unlocked	–	–	Unlocked	Unlocked	Locked
	Closed	Locked	–	–	–	Unlocked	Unlocked	Unlocked
Circuit-breaker	Open	<ul style="list-style-type: none"> ■ Unlocked if ES open ■ Locked if ES closed 	Unlocked	<ul style="list-style-type: none"> ■ Unlocked if DISC open ■ Locked if DISC closed 	Unlocked	–	–	–
	Closed	Locked	Locked	<ul style="list-style-type: none"> ■ Unlocked if DISC open ■ Locked if DISC closed 	Unlocked	–	–	–



Extensibility of TGS

- TGS offers extensible configurations for secondary distribution applications.
- The connection of each functional unit allows for multiple combinations depending on the installation requirements
- TGS extensible permits the connection of additional units on the left or right-hand side, thereby offering greater flexibility in the choice and positioning of the medium voltage switchboard functions
- The installation and in-line connection of TGS extensible does not require any handling of gas
- Maximum current: 630A

Erection and assembly

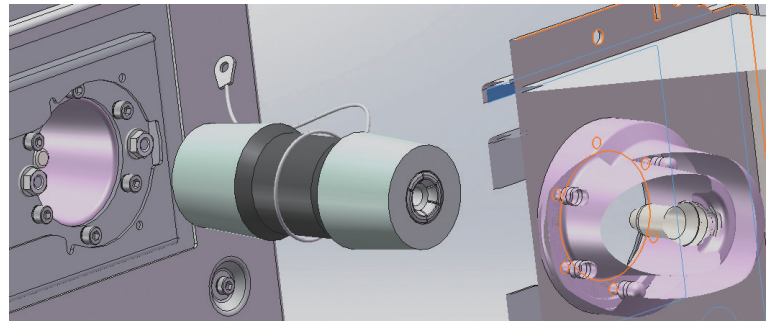
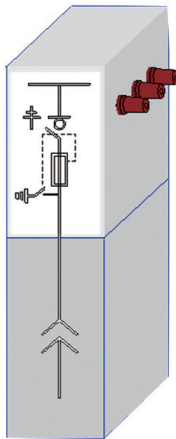
The extension is a very simple process thanks to:

- The extension device used to connect the busbars of two cubicles. Variations in positioning are compensated by fixed, spherical contacts and mobile couplings that can be adjusted axially and radially
- Highly secure dielectric seals made with silicone insulating conical connectors adapted to the electrical voltage

The assembly of the insulating connectors is maintained by a mechanical force generated by:

- Integrated guiding pins for the correct alignment of the cubicles
- An assembly by bolts secured by mechanical stops

During the assembly of an extension cubicle, an additional space of at least 450 mm is necessary to allow for handling



Extension device for the in-line connection of the TGS extensible

TGS switchboard is equipped with plug-in bushings:



C / F / V : plug-in bushing
NF EN 50181, with C type connection (I_r:
630 A; Ø M16 mm)



F (as standard): plug-in bushing
NF EN 50181, with A type connection (I_r:
250 A; contact finger Ø M7.9
+0.02/-0.05 mm)

Cable compartment

The cables connection compartment has been designed to accept connection systems that are:

- Completely insulated
- In metallic housing
- Partially insulated

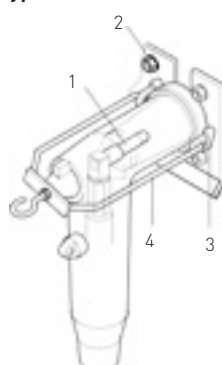
Cable support mountings are adjustable horizontally and vertically to enable installation of various cable systems. The cable mountings are equipped with either round or long holes for standard cable terminals.

Additional support structures can be supplied (available only in the 1,502mm height version) for the installation of two cables per phase cable plug-in connections or surge arresters.

Bushing connector cones in accordance with NF-EN-50181 :

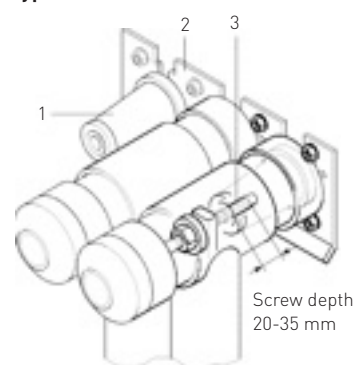
Switchboard function	D / DE	C	F	V
Connector cone Type A (250 A)	–	–	■	–
Connector cone Type C (630 A)	■	■	□	■

Type A (250 A)



- 1 - Sliding contact pin
- 2 - Support plate
- 3 - Mounting flange
- 4 - Mounting device

Type C (630 A)



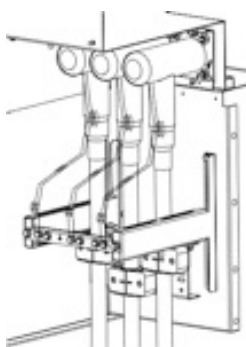
- 1 - Cross member - Male
- 2 - Support plate
- 3 - Screw contact

Screw depth
20-35 mm

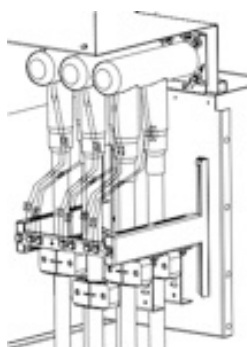
Type of connection

TGS cable compartment is spacious and allows for various connections (cf. § Selection of cables):

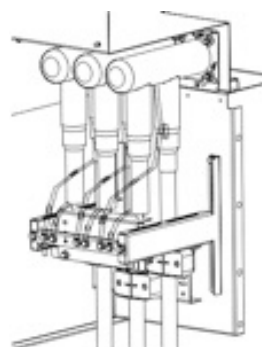
- Single cable per phase
- Two cables per phase
- Single cable per phase + surge arresters
- A triple cable per phase connection is also available (please consult us)
- No cable - bushing protected by insulating plug



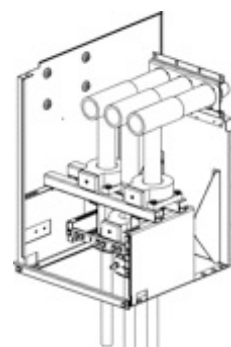
Single cable per phase
connection



Two cables per phase (only
available in the TGS 1,502 mm
height version)



Cables & surge arresters (only
available in the TGS 1,502 mm
height version)



CB cable compartment with
metering CT cores

Tool-free cable testing facility

TG00D provides integral cable testing facility which is independent of the cable boxes and accessible from the front of switchboard.

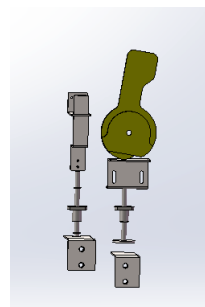
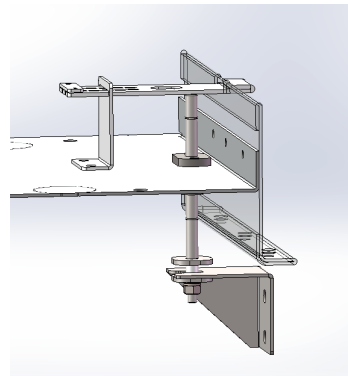
For operator safety, the cable testing procedures shall be carried out at the front and inside of the cable testing facility covers.

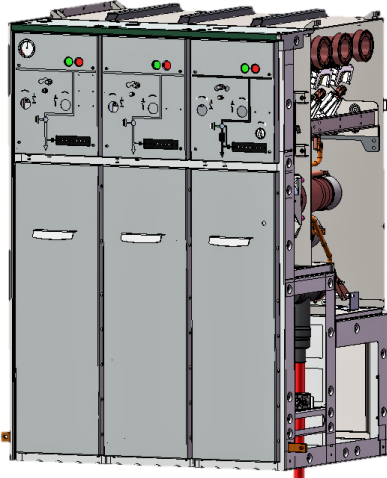


Mechanical interlock

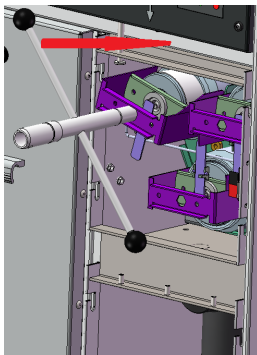
For safety issue, mechanical interlock is used between earthing switch and the tool-free cable testing facility.

The metal covers for earthing bars are independently interlocked with the earth switch of the switching device that the cable test is being performed on. Once those metal covers have been opened, it's then possible to remove the earth bars to test cables.

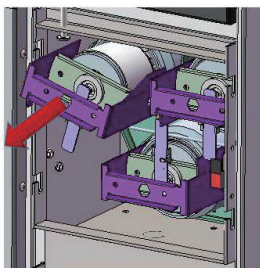




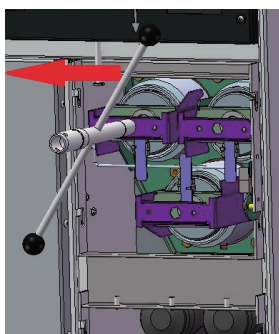
TGS with fuse protection



Open the fuse canisters



Removal of the fuse



Close the fuse canisters

Fuse compartment

The fuses are located within plugged and insulated fuse-holders. These fuse holders are integrated into the gas tank and offer the following advantages:

- The electrical field is placed in the SF₆ gas
- The fuse-holder plugs are placed outside the electrical field which is contained in the tank filled with SF₆ gas
- The fuse-holder is located in the tank and cannot be affected by outside elements
- The dielectric strength of the plug is thus not ensured by the compression of a seal but by an insulating distance.

Available option: watertight plugs.

Fuse tripping

The stored energy mechanism and the tripping striker open all three phases thanks to the switch-disconnector. If the striker on a single HV fuse is actuated, all three phases are disconnected.

Fuse replacement

The interlocking guarantees maximum safety for the personnel during the replacement of fuses. The fuse compartment panel can only be opened if it has been earthed correctly. Inversely, the earthing can only be removed once the fuse compartment panel is closed and locked.

Two earthing switches with making capacity (both upstream and downstream from the fuses) allow the fuses to be replaced without using auxiliary equipment. The two earthing switches with making capacity are operated by a common spring loaded mechanism.

C, S, D, DE functions	23
F function	24
V function	25
I function	26
M function	27
Choice of mechanisms and equipment	28
Operating mechanisms	29
Current and voltage transformers	30

Characteristics of the C, S, D, DE functions (switch-disconnector) ⁽¹⁾						
Rated voltage	kV	12			24	
Rated frequency	Hz	50/60			50/60	
Rated lightning impulse withstand voltage						
Directly earthed	kV	95			125	
On the sectionalized distance	kV	110			145	
Rated power frequency withstand voltage						
On the sectionalized distance	kV	32			60	
Level of insulation for the SF₆ pressure - Pre = 0.00 MPa						
Rated power frequency withstand voltage	kV	28			50	
Level of insulation of the sectionalized distance for the cable test						
Maximum AC feeder test voltage (30 min)	kV 0.1 Hz	18			35	
Rated current						
Busbar, S function	A	630			630	
Outgoing feeder	A	630			630	
Rated peak current	kA	40	50	63	40	50
Rated short-circuit making capacity	kA	40	50	63	40	50
Rated short-time current, main electrical circuit	1 s kA	16	20	25	16	20
	3 s kA	16	20	–	16	20
Rated short-time current of earthing circuit	1 s kA	16	20	25	16	20
	3 s kA	16	20	–	16	20
Rated network load and closed-loop breaking current	A	630			630	
Rated no-load cable-breaking current	C2 A	110A			110A	
Rated breaking current under earth fault conditions	A	30			30	
Rated no-load cable breaking current under earth fault conditions	A	17.3			17.3	
Number of operating cycles without inspection						
Mechanical: Load switch/ Earthing switch	M2/M1	5000/2000			5000/2000	
Electrical: Rated current	E3	100			100	
Short-circuit making Switch-disconnector	E3	5			5	
Earthing switch	E2	2			2	
Internal Arc Classification (IAC)						
	AFLR	20kA/1s				

[1] General use switch. The characteristics of the switch-disconnector are not applicable to the D and DE functions.

Characteristics of the F function (switch-disconnector fuse combination)			
Rated voltage	kV	12	24
Rated frequency	Hz	50/60	50/60
Rated current for continual service	A	200	200
Rated short-circuit making current, downstream of fuse protection circuit	kA	52/65	52/65
Rated short-time current of main & earthing circuit	1 s kA	25	25
	3 s kA	20	20
Rated no-load cable-breaking current	A	110	110
Rated breaking current under earth fault conditions	A	50	50
Rated no-load cable breaking current under earth fault conditions	A	30	30
Rated transfer current in accordance with IEC 62271-105	A	1500	1300
Opening time in the case of fuse striker tripping T0	ms	34	34
Number of operating cycles without inspection			
Mechanical: Load switch/ Earthing switch	M2/M1	5000/2000	5000/2000
Electrical: Rated current	E2 ⁽¹⁾	10	10
Short-circuit making	Load switch E3	5	5
	Earthing switch E2	2	2
Internal Arc Classification (IAC)			
AFLR		20kA/1s	

(1) E3 (100 x rated current) on request.

Characteristics of the V function (vacuum circuit-breaker)							
Rated voltage		kV	12			24	
Rated frequency		Hz	50/60			50/60	
Rated lightning impulse withstand voltage							
Directly earthed		kV	95			125	
On the sectionalized distance		kV	110			145	
Rated power frequency withstand voltage							
On the sectionalized distance		kV	32			60	
Level of insulation for the SF ₆ pressure - Pre = 0.00 MPa							
Rated power frequency withstand voltage		kV	28			50	
Level of insulation of the sectionalized distance for the cable test							
Maximum AC feeder test voltage (30 min)		kV	0.1 Hz	18			35
Rated current							
Outgoing feeder		A	400 / 630			400 / 630	
Rated peak current		kA	42	52	65	42	52
Rated short-circuit making capacity		kA	42	52	65	42	52
Rated short-time current, main electrical circuit	1 s	kA	16	20	25	16	20
	3 s	kA	16	20	20	16	20
Rated short-time current of earthing circuit	1 s	kA	16	20	25	16	20
	3 s	kA	16	20	20	16	20
Rated short-circuit breaking current		kA	16	20	20	16	20
Percentage of the direct current component		%	20			20	
Rated operating sequence ⁽¹⁾			O -0.3s - CO - 180s - CO				
Rated no-load cable-breaking current		A	25			31.5	
Rated operating time							
Opening with tripping release		ms	18 to 60			18 to 60	
Breaking with tripping release		ms	18 to 50			18 to 50	
Arcing		ms	< 15			< 15	
Closing		ms	30			30	
Number of operating cycles without inspection							
Mechanical:	Vacuum circuit-breaker		M2	10000			10000
	Disconnecter/ Earthing switch		M1	2000			2000
Electrical:	Short-circuit making	Disconnecter	E2	5			5
		Earthing switch	E2	5			5
	Vacuum circuit-breaker		At E2 rated current	2000			2000
	At rated short circuit breaking current			50			50
Internal Arc Classification (IAC)							
AFLR			20kA/1s				

(1) Spring-loaded current making and breaking mechanism with stored energy and motor.
(2) For the first cable test on a new unit. Later tests can be carried out at 67 kV.

Characteristics of the I functions (bus coupler with vacuum circuit-breaker)

Rated voltage		kV	12			24		
Rated frequency		Hz	50/60			50/60		
Rated lightning impulse withstand voltage								
Directly earthed		kV	95			125		
On the sectionalized distance		kV	110			145		
Rated power frequency withstand voltage								
On the sectionalized distance		kV	32			60		
Level of insulation for the SF ₆ pressure - Pre = 0.00 MPa								
Rated power frequency withstand voltage		kV	28			50		
Level of insulation of the sectionalized distance for the cable test								
Maximum AC feeder test voltage (30 min)		kV	0.1 Hz	18			35	
Rated current for continual service								
Busbar, I function		A	630			630		
Circuit-breaker		A	630			630		
Rated peak current		kA	40	50	63	40	50	
Rated short-circuit making capacity		kA	40	50	63	40	50	
Rated short-time current, main electrical circuit		1 s	kA	16	20	25	16	20
		3 s	kA	16	20	–	16	20
Rated short-time current of earthing circuit		1 s	kA	16	20	25	16	20
		3 s	kA	16	20	–	16	20
Rated short-circuit breaking current		kA	16	20	25	16	20	
Percentage of the direct current component		%	52			52		
Rated operating sequence ⁽¹⁾			O - 0.3s - CO - 180s - CO					
Rated no-load cable-breaking current		A	25			31.5		
Rated operating time								
Opening with tripping release		ms	18 to 60			18 to 60		
Breaking with tripping release		ms	18 to 50			18 to 50		
Arcing		ms	< 15			< 15		
Closing		ms	30			30		
Number of operating cycles without inspection								
Mechanical:	Vacuum circuit-breaker		M2	10000			10000	
	Disconnecter/ Earthing switch		M1	2000			2000	
Electrical:	Short-circuit making	Disconnecter	E2	5			5	
		Earthing switch	E2	5			5	
	Vacuum circuit-breaker		At rated current		2000			2000
	At rated short circuit breaking current		50			50		
Internal Arc Classification (IAC)								
AFLR			20kA/1s					

(1) Spring-loaded current making and breaking mechanism with stored energy and motor.

(2) For the first cable test on a new unit. Later tests can be carried out at 67 kV.

Characteristics of the M1, M2, M3, M4 functions							
Rated voltage		kV	12			24	
Rated frequency		Hz	50/60			50/60	
Rated lightning impulse withstand voltage							
Directly earthed		kV	95			125	
On the sectionalized distance		kV	110			145	
Rated power frequency withstand voltage							
On the sectionalized distance		kV	32			60	
Rated current							
Outgoing feeder		A	400 / 630			400 / 630	
Rated peak current		kA	42	52	65	42	52
Rated short-time current, main electrical circuit	1 s	kA	16	20	25	16	20
	3 s	kA	16	20	20	16	20
Rated short-time current of earthing circuit	1 s	kA	16	20	25	16	20
	3 s	kA	16	20	20	16	20
Internal Arc Classification (IAC)							
AFLR			20kA/1s				

Mechanism operating principles	
Spring mechanism (C function)	<p>It is a tumbler mechanism with a dead point passage. The energy is stored by tumbler mechanism.</p> <ul style="list-style-type: none"> Manual: the opening or closing operation is manual and independent of the operator. The operation is performed without any duration or time constraint Motorized: the opening or closing operations are performed by a motor without duration or time constraint
Spring with energy storage (F function)	<p>It is a tumbler mechanism for closing, with a latch-in feature for opening. The energy needed for opening is stored while closing.</p> <ul style="list-style-type: none"> Manual: the operator manually closes the switch-disconnector in one single operation, and in the same time loads a spring for next opening. The mechanism is thus ready for a snap opening operation. Tripping can be performed with a coil, a fuse striker or a push-button Motorized: the closing operation is performed by a motor. The opening operation can be done with the motor or with a shutter release
Spring mechanism for DS/ES	<p>It is a tumbler mechanism for closing operation.</p> <p>The opening is manual and dependent of the operator, a spring is loaded and stores energy for next closing. The closing is independent of the operator, the energy is released from the spring and closes the earthing switch in a snap operation.</p>
Circuit-breaker mechanism (V function)	<p>These operating mechanisms use the energy stored by springs to close and open the circuit-breaker on the V and I functions. There are two types:</p> <ul style="list-style-type: none"> Manual: the operator manually operates to load the control mechanism's spring. The spring is held in place by a latch, freed manually by a mechanical button, causing: <ul style="list-style-type: none"> the release of the spring the closing of the CB the arming of the trip spring, now held in place by a latch <p>It is thus possible to open the circuit-breaker by freeing the trip spring latch manually (mechanical button) or electrically (electro-magnet)</p> <p><u>Note:</u> with the circuit-breaker closed, it is possible to rearm the closing spring, which authorizes a rapid re-closure cycle</p> <ul style="list-style-type: none"> Motorized: the closing spring is armed by a motor (arming time < 7 s). Opening and closure operations are carried out electrically (magnets) <p><u>Note:</u> It is possible to manually arm, close and trip the circuit-breakers</p>

Functions								
Type of operating mechanism		C	F	V	D	DE	I	S
Switch-disconnector	Spring mechanism	■	–	■	–	–	■	■
	Spring with energy storage	□	■	–	–	–	–	□
Earthing switch	Spring mechanism for DS/ES		■	■	–	■	■	■
Circuit-breaker	Spring with energy storage	–	–	■	–	–	■	–
	Circuit - breaker mechanism	–	–	–	–	–	–	–
Equipment		C	F	V	D	DE	I	S
Manual opening and closing		■	■	■	–	■	■	■
Mechanical position indicator		■	■	■	–	■	■	■
Motorization		□	□	□	–	–	□	□
Trip coil		□	□	■	–	–	■	–
2nd trip coil		–	–	□	–	–	□	–
Autonomous tripping device without any auxiliary source (striker)		–	–	–	–	–	□	–
Undervoltage tripping coil		–	–	□ ⁽¹⁾	–	–	□	–
Closing coil		–	–	■	–	–	■	–
Operating counter		–	–	□	–	–	□	–
Auxiliary contacts		C	F	V	D	DE	I	S
Switch-disconnector position	Manual: 2 NO + 2 NC	□	□	□	–	–	□	□
	Motorized: 2 NO + 2 NC							
Earthing switch position	1 NO and 1 NF	□	□	□	–	□	□	□
	Motorized: 2 NO + 2 NC							

Legend: ■ Standard □ Option

[1] The connection and wiring diagrams for the motorized mechanism, the magnetic tripping devices and auxiliary contacts are supplied in the event of an order.

Electrical characteristics of the C, F, DS/ES operating mechanisms											
Reference standards		IEC									
Type of current		DC						AC			
Rated supply voltage		V	24	30	48	110	125	220	100/110	120/125	230
Frequency		Hz							50/60		
Rearming motor											
Voltage range		% of Un	85 to 110						85 to 110		
Max. absorbed power			120 W						120 VA		
Starting current		A	12.1	4.7		4.1	2.5		6.9	6.8	3.7
Rearm time		s	< 6								
Trip coil											
Coil current		A	3	1		1	0.5		1	0.9	0.5
Undervoltage trip coil		V	24/60						230		
Auxiliary contacts											
Rated voltage		V	24	30	48	110	125	220	100/110	120/125	230
Rated current		A	10						10		
Short circuit current, 30 ms		A	100						100		
Breaking capacity (L/R ≤ 20 ms)		A	4	2		1	0.5				
Breaking capacity (U ≤ 230 Vac (resistive))		A							10		

Electrical characteristics of the CB operating mechanisms											
Reference standards		IEC									
Type of current		DC						AC			
Rated supply voltage		V	24 - 30 - 48 - 110 - 125 - 220						120 - 230		
Frequency		Hz	-						50/60		
Rearming motor											
	Voltage range	% of Un	85 to 110						85 to 110		
	Rearm time	s	< 6.5						< 6.5		
Tripping device											
Tripping coil											
	Voltage range	% of Un	70 to 110						85 to 110		
Undervoltage coil											
	Closing voltage range	% of Un	> 35						> 35		
	Tripping voltage	% of Un	70 to 35						70 to 35		
Autonomous tripping device without any auxiliary source (striker)											
		The low energy release type MITOP, trips at 200 µF / 12 V Trip energy ≤18 mJ									
Closing device											
	Voltage range	% of Un	85 to 110						85 to 110		
Auxiliary contacts											
Rated current		A	10						10		
Breaking capacity 110 Vdc (L/R = 10 ms)		A	1						-		
Breaking capacity 230 Vac Cos φ = 0.4		A	-						10		

(*) Please consult us for current value

(*) Please consult us for current value

Characteristics of the current and voltage transformers

- According to IEC61869-1 and -2
- Designed as ring type CTs for V function, block type CT and VT for M function
- Inductive type
- Insulation class E
- Secondary connection by means of a terminal strip for ring type and by screwed type terminal for block type

Installation

- The mounting location is outside the panel gas tank, around the HV cables in the cable compartment
- Installation of current and voltage metering devices is possible with or without a selector switch
- Option: a voltage indicator can be added

Technical data

TGS panel		For V function	For M function			
Ritz type		CT: KSOH1555C	CT: GIS12d	CT: GIS24	VT: GE12RS	VT: GE24RS
Primary data						
Highest voltage for equipment U_m		0.72kV	12kV	24kV	$1.9 \times U_n$	$1.2 \times U_n$
Rated current I_N		200A ~ 600A	60A ~ 600A	60A ~ 600A		
Rated voltage U_r					6kV, 10kV	24kV
Rated short-duration power-frequency withstand voltage U_d		3kV	28kV	65kV	28kV	65kV
Rated lightning impulse withstand voltage U_p			95kV	125kV	95kV	125kV
Rated short-time thermal current I_{th}		25kA/1s or 25kA/3s	20kA/1s	20kA/1s		
Rated continuous thermal current I_D		$1.2 \times I_N$	$1.2 \times I_N$	$1.2 \times I_N$		
Rated dynamic current I_{dyn}		$2.5 \times I_{th}$	max. $2.5 \times I_{th}$	max. $2.5 \times I_{th}$		
Secondary data						
Rated current/voltage		1A or 5A	1A or 5A	1A or 5A	100/V3, 110/V3	100/V3, 110/V3
Measuring core	Class	0.2, 0.5	0.2, 0.5	0.2, 0.5	0.2, 0.5	0.2, 0.5
	Overcurrent factor	FS10	FS5, FS10	FS5		
	Burden	2.5VA ~ 10VA	5VA ~ 30VA	5VA ~ 30VA	10VA, 15VA, 25VA	40VA, 60VA
Protection core	Class	5P or 10P	5P or 10P	5P or 10P	3P	3P
	Overcurrent factor	10, 15, 20	10, 15, 20	0, 15, 20		
	Burden	2.5VA ~ 10VA	5VA ~ 30VA	5VA ~ 30VA	100VA	100VA
Dimensions						
Overall height H [according to core data]		max. 100mm				
Outside diameter		150mm				
Inside diameter		55mm				
For cable diameter		50mm				
W*D*H in mm			148*349*220	180*370*280	148*358*220	180*370*280
Figure						

For further values and solutions, please consult TGOOD Marketing.

Protection relay	32
<hr/>	
Fault passage indicators	34
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Voltage indicator and relay	35
<hr/>	
Control	36
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Overall Operation

The digital multi-functional protection relay is equipped with a high-performance microprocessor. This provides fully numerical processing of all functions in the device, from the acquisition of the measured values up to the output of commands to the circuit-breakers.

Application Scope

Microcomputer Comprehensive Protection and Monitoring Device is a versatile devices designed for protection, control and monitoring of busbar feeders. For line protection, the device can be used in networks with grounded, low resistance grounded, isolated or compensated neutral point. It is suited for radial systems with single end infeed, for open or closed ring systems and for networks that are radial or looped, and for lines with double-end infeed. The device is equipped with motor protection for asynchronous machines of all sizes.

The device includes the functions that are necessary to protect and monitor circuit-breaker positions and control the switchgear elements in single or double busbars providing universally applicable protection schemes. The devices also provide excellent backup facilities of differential protective schemes of lines, transformers, generators, motors, and busbars of all voltage levels.

Functions Overview

The relay features protective functions and additional functions. The hardware and firmware is tailored to these functions. Moreover, the command functions can be adjusted to the system conditions. Users can also enable or disable individual functions during configuration or modify how the functions interact.

- Protective Functions
- Control Functions
- Messages and Measured Values; Recording of Event and Fault Data
- Communication



Protection relay: STROM, ST260E

Intellectual self-powered relay

STROM relay

The intellectual protect device adopts high integrating micro processor with bus in the chip to process the signals from the current transformers, and then output the signals through digital logical operation control device. The device is with compact structure, airproof chassis, maintenance free design, sound anti-interference performance, and it specially suits for ring network system running in worse environment and with limited installation position.

- Low power consumption design technology is adopted for the whole machine, to ensure the protection functions can start quickly and is reliably at any condition.
- The structure of the device is simple and smart, easy and flexible to install, suiting for the compact installation conditions of ring network system.
- Power self-supply function (powered by current transformer) is available, which can avoid extra cost caused by installation of DC screen or UPS.
- Protection configuration is flexible and complete, and all protection functions can be switched on and off freely through control figures.
- Many kinds of IEC standard inverse time curves are available. The device has high current latch-up protection function and can be used together with various fuse protector, solving the problems commonly seen in power distribution system.
- LED display interface and multi-layer menu display is adopted, with sound human-machine interface.
- The large capacity nonvolatility memorizer of the device can record at least 200 times of historical events with complete content, and no data will lose even the power is off.
- The device has complete dynamic and static self-inspection function to in-service monitor the working conditions of various parts of the device, ensuring the reliability of the device.
- High precision components and working flows ensure the precision, reliability and longer service life of the device.
- The device provides RS-232 communication bus interface (back side terminal RS-485 communication bus interface is selectable) and provides open communication protocols to clients, so as to realize SCADA function.



Protection relay: Kries, IKI-35

Kries relay

Self-powered overcurrent protection relay

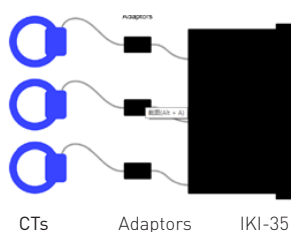
- Application for transformer or feeder protection
- Suitable for transformer nominal currents $I_n = 10 \text{ A} \dots 250 \text{ A}$ with wide-range CTs
- Overcurrent, short-circuit and optional earth fault stage
- Event recorder, up to 16 events, download by interface-cable to PC
- Self-test function
- Maintenance minimized due to self powering by CTs
- Low power tripping coil $3\text{V}/0.02\text{Ws}$ (self-reset), no external supply

Tripping due to:

- Short-circuit detection on MV- or LV-side of transformer
- Overload detection
- Earth fault detection
- Emergency-command or remote-command at external fast trip input

Protection relay system consists of:

- Base unit IKI-35
- 3 split-core CTs (optional: 1 balanced core CT for earth fault detection)
- Low power tripping coil or standard coil with capacitor buffer, e.g. PSU
- An adaptor for adapting permanent current up to 600A



For more detailed information please refer to product catalogue/manual.



Fault passage indicator

Fault passage indicators

To improve your power availability and manage your network load, TGS can be fitted with a variety of fault passage indicators integrated in TGS Low Voltage front panel.

Main characteristics of fault passage indicators:

It provides a high visibility flashing led and gives detailed information via the digital display. An outdoor lamp on option can give the fault passage indication without entering the substation.

Overcurrent detection

- Automatic mode for automatic adjustment-free calibration of detection thresholds
- Manual mode possible to perform special override settings
- Fault acknowledged time

Earth fault detection

Principle: the detector checks on the 3 phases the current variations (di/dt). A time delay of 70 s is applied for fault confirmation by the upstream protective device.

- Automatic mode for automatic, adjustment-free calibration of detection thresholds
- Manual mode possible to perform special override settings
- Inrush function: to prevent unwanted detection in the event of load switch-on. Incorporates a 3 s time delay for fault filtering at network power up



Fault indicator: Kries, IKI-20

Fault indication

- Signalling

As soon as a fault is confirmed, the indication device is activated.

- Fault indication via a red LED on the front panel
- Indication of the faulty phase (earth fault) on LCD display
- Optional remoting of indication to external flashing lamp
- Activation of a contact for retransmission to the SCADA system
- Indication reset
 - Automatic reset upon load current recovery
 - Manual reset via front panel button
 - Reset via external Reset input
 - Reset by time delay:
- Communication
 - It provides Modbus communication whilst also acting as a Voltage Detector

To accompany the rise of distributed power generation on distribution networks, TGS can be equipped with directional fault indicators.



VDS HR and its removable luminous indicator



VPIS, Voltage Presence Indicating System



VPIS-V0



VDS: Kries, CAPDIS-S1/2+R4.5

Voltage detection systems

The absence, or presence, of voltage at outgoing feeders level can be checked using 3 types of device:

- VDS-HR
- VDS-LR
- VPIS

Voltage indicators and any connectors for warning lights can be found to the top of the TGS front panel.

VPIS : voltage presence indicating system

Description:

- The VPIS is a self-powered voltage presence indicating system, in compliance with the IEC 62271-206 standard
- Connectors on the front panel allow the use of a phase comparator
- Extended lifetime of LEDs on the front panel
- Compatibility with existing MV network devices for replacement. VPIS-V0
- VPIS can be fitted with a voltage output cable to interface with passage indicator range or VD23 voltage detection relay, and in particular for power source changeover.

IVIS : voltage detection system

TGS can be fitted with the VDS-LR IVIS device:

- The integrated IVIS system (Integrated Voltage Detection System) checks for the absence of a voltage
- Flashing arrow symbols light up on the indicators in case of the presence of a voltage within defined threshold response limits

The IVIS is equipped with a self-test in order to avoid any electrical tests. The IVIS system also provides a phase comparison function.

It is equipped with integrated electronics, protected against bad weather conditions and requires no maintenance. It is auto-supplied. An auxiliary contact is available for remote monitoring (optional).

CAPDIS-S1/2+R4.5: fail-safe integrated voltage detecting system

Kries VDS provides integrated continuous three-phase voltage indication in high voltage equipment according to IEC61243-5.

It's composed with following features:

- **Inherent safety**, it includes a self test which offers inherent safety; no external test device is required.
- **No battery & maintenance free**, for voltage detecting and self test, no external power supply or battery is required.
- **Relay and LED outputs**, for remote monitoring of voltage condition, two relay contacts are integrated. The relays are driven by auxiliary voltage. Two LEDs show the actual relay state.

LPVT options

TGS can now be specified with compact high accuracy Low Power Voltage Transformers (LPVT). These innovative sensors are ideal for the new generation of electronic protection devices and are the only way to measure energy in secondary MV loops.

- Up to Class 0.5 accuracy levels for metering
- Linear wide spectrum voltage range with no ferro resonance characteristics.
- Low power consumption and reduced size - ideal for new or retrofit solutions



Automated substation



Remote Terminal Unit

- Excellent harmonic performance for Power Quality monitoring
- Increased quality and safety under over-voltage, open circuit, or short circuit conditions
- Easy to install, operate and test - no need to disconnect for cable testing 42kV / 15min
- Comply to international standard : IEC 60044-7

Remote control & monitoring

TGS can be motorized by functional units allowing for the remote control and monitoring of the components of TGS.

Complete automation of the network is therefore possible and avoids costly human interventions on the site.

To enable communication with the network control centers, TGS integrates communication systems such as:

- Modem solutions for telephone lines
- Radio
- The GSM network.

Possible equipment levels for remote control and monitoring are detailed in the table below.

The levels correspond to the basic variants. Level 3 includes the control relays, local/remote selector switches and microswitches.

Other documents covering the level of equipment for monitoring (Lvl 1) and integrated remote control & monitoring (Lvl 3) are available on request.

Remote Terminal Unit

TGS is suitable to equip a remote terminal unit that integrates all the functional units necessary for remote supervision and control:

- acquisition of the different types of information: switch position, fault detectors, current values...
- transmission of switch open/close orders
- exchanges with the control center

Required particularly during outages in the network, the RTU is of proven reliability and availability, being able to ensure switchgear operation at any moment. It is simple to set up and to operate.

Functional unit designed for the Medium Voltage network

- It is designed to be connected directly to the MV switchgear, without requiring a special converter
- It has an integrated MV network fault current detection system (overcurrent and zero sequence) with detection set points that can be configured channel by channel (current value and fault current duration)
- Open communications thanks to appropriate protocols (IEC101/104, DNP3 or Modbus) and large choice of media (GSM/GPRS, radio, telephone, etc.)
- Automation function with an optional Auto-transfer-switch capability for power source permutation

Medium Voltage switchgear operating guarantee

- It is a backed up power supply which guarantees continuity of service for several hours in case of loss of the auxiliary source, and supplies power to the RTU and the MV switchgear motor mechanisms

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Selection of HV fuses	
<hr/>	
Accessories	40
<hr/>	



Types of HV fuse

To protect distribution transformers, we recommend to use HV fuses that have an integrated thermal striker, which is activated at a certain temperature threshold, in compliance with the selection tables. The fuse with thermal striker operates:

- In case of overcurrent
- In case of accidental damage.

It then switches off the switch-disconnector which avoids a thermal overload in the fuse holder.

Necessary data when placing an order

The following data must be specified:

- Transformer power
- Transformer service voltage

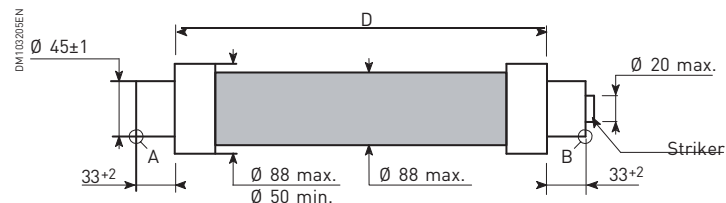
Rated current of suitable HV fuses is then given by the selection tables.

Technical characteristics

The fuses meet the following standards:

- Protection of the distribution transformers in compliance with the IEC 60787 standard
- Fuses in compliance with the IEC 60282-1 standard
- Specifications of the IEC 62271-105 standard
- Maximum ambient temperature for the switchboards: 40°C in accordance with standards IEC 62271-1. Temperature must be considered when calculating fuse power losses. For higher temperature conditions, please consult us
- HV fuses can bear 1.3 times the transformer's rated current for a minimum of ten hours
- The interruption is made at 1.5 times the transformer's rated current for two hours

HV fuse



Voltage	D (mm)
Up to 12 kV	292
(with adaptor to extend to 442 mm)	
Up to 24 kV	442
17.5 kV	442

Spare fuses

Spare fuses must meet the following requirements:

- Dimensions in compliance with technical data sheet 1 (type 1, line 1), IEC 60282-1 publication, radius A and B < 3 mm
- "Medium" type of striker with a maximum initial tripping force of 80 N
- When using spare fuses without tripping with a thermal limitation integrated striker, the following requirements must be fulfilled
 - in case of overcurrents, the interruption must be carried out by LV fuses
 - if the switchboard is installed in an exposed area, in which the fuse links may be submitted to damage due to transient events (e.g. lightning), all the fuses must be replaced in accordance with the appropriate maintenance intervals

If these requirements are not fulfilled, only the backup HV fuses with integrated tripping of the striker and thermal limitation must be used in the TGS switchboard to protect from a thermal overload.

Selection of HV fuses

HV fuses selection table																			
Fuse type as per IEC		Power of transformer (kVA)																	
		25	50	63	80	100	125	160	200	250	315	400	400	500	630	800	1000	1250	1500
Fuse rated voltage (kV)	Transformer service voltage (kV)	Uk = 4%											Uk = 6%						
		Rated current for fuses (A)																	
7.2	3	10	25	25	31.5	40	50	50	80	100	100(2)	–	–	–	–	–	–	–	–
7.2	3.3	10	25	25	31.5	40	40	50	63	80	100(2)	–	–	–	–	–	–	–	–
7.2	5.5	6.3	16	16	20	25	31.5	31.5	40	50	63	80	80(1)	100(1)(2)	–	–	–	–	–
7.2	6	6.3	10	16	20	25	25	40	40	50	63	80	63	80(1)	100(1)(2)	–	–	–	–
7.2	6.6	6.3	10	16	16	25	25	31.5	40	50	63	63	63(1)	80(1)	80(2)	–	–	–	–
12	10	–	–	10	10	16	20	25	25	31.5	40	50	40	50	63(2)	80(1)(2)	–	–	–
12	11	–	6.3	10	10	16	16	25	25	31.5	40	40	40	63(1)	63(1)	80(1)(2)	–	–	–
24	13.8	4	6.3	6.3	10	10	16	16	20	25	31.5	31.5	31.5	40	50(1)(2)	63(1)(2)	–	–	–
24	15	4	6.3	6.3	10	10	16	20	20	25	31.5	31.5	31.5	40(1)	50(1)(2)	63(1)(2)	–	–	–
24	20	–	–	6.3	6.3	10(1)	10	16	16	20	25	25	25	31.5(1)	40(1)	40(1)(2)	63(1)(2)	–	–
24	22	–	–	6.3	6.3	6.3	10	10	16	16	25	25	25(1)	31.5(1)	40(1)	40(2)	50(1)(2)	63(1)(2)	–

(1) With mechanical time-delay device 70 ms.

(2) Without transformer overload.

HV fuses selection table																				
Fuse type as per DINVDE		Power of transformer (kVA)																		
		25	50	63	80	100	125	160	200	250	315	400	500	630	630	800	1000	1250	1500	1600
Fuse rated voltage (kV)	Transformer service voltage (kV)	Uk = 4%												Uk = 6%						
		Rated current for fuses (A)																		
7.2	6	6.3	10	16	20	25	25	40	40	50	63	80	100	100(2)	100 (1)(2)	–	–	–	–	–
12	10	–	–	10	10	16	20	25	25	31.5	40	50	63	80	63(2)	80 (1)(2)	–	–	–	–
24	15	4	6.3	6.3	10	10	16	20	20	25	31.5	31.5	50	63	50 (1)(2)	63 (1)(2)	–	–	–	–
24	20	–	–	6.3	6.3	10(1)	10	16	16	20	25	25	40	40	40(1)	40 (1)(2)	63 (1)(2)	–	–	–

(1) With mechanical time-delay device 70 ms.

(2) Without transformer overload.

HV fuses selection table																					
Fuse type as per DINVDE		Power of transformer [kVA]																			
		25	50	63	80	100	125	160	200	250	315	400	500	630	630	800	1000	1250	1500	1600	2000
Rated voltage [kV]	Service voltage (kV)	Uk = 4%												Uk = 6%							
		Rated current for fuses [A]																			
7.2	6	–	–	–	–	25	–	40	–	50	63	80	100	125	100	125	160(1)	–	–	–	–
12	10	–	–	–	–	16	–	25	–	32	40	50	63	80	63	80	100	100	–	160(1)	160(1)
17.5	15	–	–	–	–	16	–	20	–	32	32	40	50	63(1)	50	63(1)	63(1)	80(1)	–	–	–
24	20	–	–	–	–	10	–	16	–	20	25	32	40	40	40	40	50	80(3)	–	100(1)(3)	125(1)(3)

(1) With mechanical time-delay device.

(3) Specific SSK type fuses.

Other HV fuses also available with TGS such as Ferraz fuses or Jean Müller IKUS type fuses.

Accessories and options



Relative pressure gauge



Portable gas refilling tool



Operating lever



Halogen Qualitative Leak Detector



Universal tester set: Kries_CAP-Phase

Manometer

- The interrupting mechanisms are installed in S304 tanks filled with gas. During the service life of the switchboard, the addition of SF₆ gas is not necessary
- The gas pressure in the hermetically sealed tank is indicated, as an option, by a relative or absolute pressure manometer for uses at high altitude
- An auxiliary contact can be fitted to the manometers (optional)
- A portable gas refilling tool is optional for onsite refilling case (SF₆ gas bottle is recommended to be purchased locally)

Accessories

Standard accessories supplied with TGS switchboard are:

- A set of operating levers (longer lever is optional)
- A set of keys to lock fuse compartment
- A hardcopy of operation manual

Ask for details of other supplies. Only TGOOD accessories are authorised for use with TGS.

Halogen Qualitative Leak Detector

XP-1A detector is as an optional accessory for detecting the leakage of SF₆ gas.

Universal tester

- Combined phase comparator and voltage detector: for voltage detection, phase comparison and phase sequence test at capacitive HR- and LRM interfaces according to IEC 61243-5
- Self-powered microprocessor technology, no battery required
- Integrated self test: covering universal tester and test leads
- Scope of supply: Universal-tester, two test leads (length 2m), two HR/LRM adaptors, carrying case

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Cable with synthetic insulation – Single connection per phase for C, V, D and DE functions

630 A connector, external cone as per EN 50181, C type connector, screw type contact with M16 x 2 internal threading

			12 kV		24 kV	
Type of cable	Manufacturer	Rated current	Type of connector	For sections in mm ²	Type of connector	For sections in mm ²
Complete insulation	EUROMOLD	630	430TB/G	35 - 300	K400LB/G	25 - 300
	EUROMOLD	630	430TB	35 - 300	430TB	35 - 300
	EUROMOLD	630	434TB/G	35 - 300	K400TB/G	35 - 300
	EUROMOLD	630	440TB/G	185 - 630	K440TB/G	185 - 630
	nkt	630	CB 12/630	25 - 300 (1)	CB 24/630	25 - 300 (1)
	Südkabel	630	SET 12	50 - 300	SET 24	25 - 240
	Südkabel	630	SEHDT 13	300 - 500	SEHDT 23	300 - 630
	Tyco	400	RSES-54xx	25 - 240	RSES-54xx	25 - 240
Partially insulated	Tyco	800	RSTI-58xx	25 - 300	RSTI-58xx	25 - 300
	Tyco	800	RSTI-395x	400 - 800	RSTI-595x	400-800
	nkt	630	AB 12/630	25 - 300	AB24/630	25 - 300
	Tyco	400/630	RICS-51xx with sealing end IXSU-F for one wire cables	25 - 300	RICS-51xx with sealing end IXSU-F for one wire cables	25 - 300
	Tyco	400/630	RICS-51xx with sealing end IXSU-F for three wires cables	25 - 300	RICS-51xx with sealing end IXSU-F for three wires cables	25 - 300
Earthing cable						
Complete insulation	Tyco	400/630	RICS-51xx with sealing end UHGK for belted cables	16 - 300	–	–
	Tyco	400/630	RICS-51xx with sealing end IDST-51xx for cables with one or three paper insulated wires	50 - 300	RICS-51xx with sealing end IDST-51xx for cables with one or three paper insulated wires	35 - 240

(1) Sections 300 – 500 mm² on request.

Conforming with the manufacturer's technical data and mounting instructions.

Cable with synthetic insulation - Single connection per phase for F transformer protection (250 A)

250 A connector, external cone as per EN 50181, A type connector, with male contact Ø 7.9 mm

		12 kV		24 kV	
Type of cable	Manufacturer	Type of connector	For sections in mm²	Type of connector	For sections in mm²
Complete insulation	EUROMOLD	158LR	16 - 120 (1)	K158LR	16 - 120 (1)
	EUROMOLD	158LR+MC3-158LR-R02	16 - 120 (1)	K158LR+MC3-158LR-R02	16 - 120 (1)
	EUROMOLD	AGW 10/250	25 - 95	AGW 20/250	25 - 95
	EUROMOLD	AGWL 10/250	25 - 95	AGWL 20/250	25 - 95
	nkt	CE 24-50	25 - 95	CE 24-50	25 - 95
	Südkabel	SEW 12	25 - 150	SEW 24	25 - 95
	Südkabel	–	–	SEHDW 21	120 - 150
	Tyco	RSES-52xx-R	25 - 120	RSES-52xx-R	16 - 120

(1) 150 mm² on request.

Conforming with the manufacturer's technical data and mounting instructions.

Note: All the above connector selection are based on the standard TGS (Height:1500mm). Please consult us for the selection for TGS with low cable compartment (Height:1230mm)

Cables with synthetic insulation - Double connection per phase for C, D, DE functions

630 A connector, external cone as per EN 50181, C type connector, screw type contact with M16 x 2 internal threading

			12 kV		24 kV	
Type of cable	Manufacturer	Rated current	Type of connector	For sections in mm ²	Type of connector	For sections in mm ²
Complete insulation	EUROMOLD	630	434 TB/G + 300 PB	300 - 630	434 TB/G + 300 PB	300 - 630
	EUROMOLD	630	430 TB + 300 PB	35 - 300	430 TB + 300 PB	35 - 300
	nkt (1)	630	CB 12/630 + CC 12/630	25 - 300	CB 24/630 + CC 24/630	25 - 300
	Südkabel	630	SET 12 + SEHDK 13.1	70 - 300	SET 24 + SEHDK 23.1	35 - 240
	Tyco	800	RSTI-58xx + RSTI-CC-58xx	25 - 300	RSTI-58xx + RSTI-CC 58xx	25 - 300
Partially insulated	nkt	630	AB 12/630 + AC 12/630	25 - 300	AB 24/630 + AC 24/630	25 - 300
	Tyco	400/630	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51xx with sealing end IXSU-F for one wire cables	25 - 300	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51xx with sealing end IXSU-F for one wire cables	25 - 300
	Tyco	400/630	RICS-57xx with sealing end IXSU-F for three wires cables + RICS-51xx with sealing end IXSU-F for three wires cables	25 - 300	RICS-51xx with sealing end IXSU-F for three wires cables	25 - 300
Earthing cable						
Partially insulated	Tyco	400/630	RICS-57xx with sealing end IDST-57xx for cables with one or three paper insulated wires	16 - 300	–	–

(1) Obligatory for the IAC 25 kA option

The second cables mounting support must be specified when ordering the TGS.

A surge arrester may be installed instead of a second cable connection. These mounting supports are available on request. Conforming with the manufacturer's technical data and mounting instructions.

Cables with synthetic insulation - Triple connection per phase for C, D and DE functions

630 A connector, external cone as per EN 50181, C type connector, screw type contact with M16 x 2 internal threading

			12 kV		24 kV	
Type of cable	Manufacturer	Rated current	Type of connector	For sections in mm ²	Type of connector	For sections in mm ²
Complete insulation	nkt	630	CB 12/630 + CC 12/630	25 - 300	CB 24/630 + CC 24/630	25 - 300

Note: the IAC 25 kA option is not available if 3 cables are used per phase. The cables mounting support must be specified when ordering the TGS.

A surge arrester may be installed instead of a third cable connection. These mounting supports are available on request. Conforming with the manufacturer's technical data and mounting instructions.

Cable with synthetic insulation - Single connection per phase with surge arrester for C, V

630 A connector, external cone as per EN 50181, C type connector, screw type contact with M16 x 2 internal threading

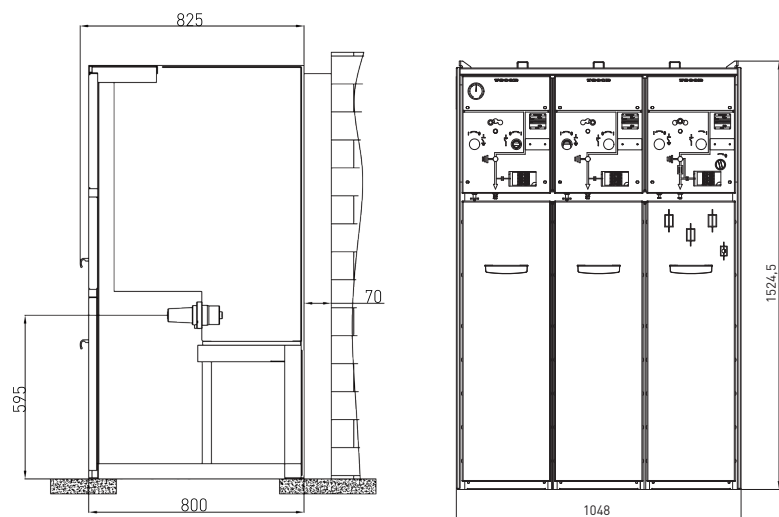
			12 kV		24 kV	
Type of cable	Manufacturer	Rated current	Type of connector	For sections in mm²	Type of connector	For sections in mm²
Complete insulation	nkt	630	CB 12/630 + CC 12/630	25 - 300	CB 24/630 + CC 24/630	25 - 300
	EUROMOLD	630	430 TB + 300 SA	35 - 300	430 TB + 300 SA	35 - 300
	Südkabel	630	SET 12 + MUT 23	50 - 300	SET 24 + MUT 23	25 - 240
	Südkabel	630	SEHDT 13.1 + MUT 23	70 - 300	SEHDT 23.1 + MUT 23	35 - 240
	Tyco	800	RSTI-58xx + RSTI-CC-58SAxx05 (5 kA) RSTI-58xx + RSTI-CC-66SAxx10 (10 kA)	25 - 300	RSTI-58xx + RSTI-CC-58SAxx05 (5 kA) RSTI-58xx + RSTI-CC-66SAxx10 (10 kA)	25 - 300
			RSTI-395x + RSTI-CC-58SAxx05 (5 kA) (10 kA) RSTI-395x + RSTI-CC-66SAxx10 (10 kA)		RSTI-595x + RSTI-CC-58SAxx05 (5 kA) RSTI-595x + RSTI-CC-66SAxx10 (10 kA)	
Partially insulated	Tyco	400/630	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51x9 plus RDA-xx	25 - 300	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51x9 plus RDA-xx	25 - 300
	Tyco	400/630	RICS-57xx with sealing end IXSU-F for three wires cables + RICS-51x9 plus RDA-xx	25 - 300	-	-
Earthing cable						
Partially insulated	Tyco	400/630	RICS-51xx with sealing end IDST-51xx for cables with one or three paper insulated wires	50 - 300	-	-

Cable with synthetic insulation – Double connection per phase for V functions

630 A connector, external cone as per EN 50181, C type connector, screw type contact with M16 x 2 internal threading

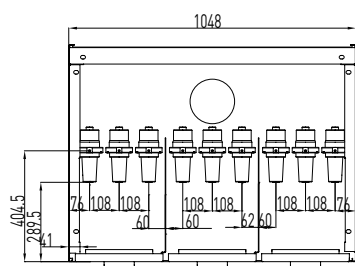
			12 kV		24 kV	
Type of cable	Manufacturer	Rated	Type of connector	For sections in mm²	Type of connector	For sections in mm²
Complete insulation	nkt	630	CB 12/630 + CC 12/630	25 - 300	CB 24/630 + CC 24/630	25 - 300
	Tyco	800	RSTI-58xxx + RSTI-CC-58xx	25 - 300	RSTI-58xx + RSTI-CC-58xx	25 - 300
	Südkabel	630	SEHDT 13	300 - 500	SEHDT 23	300 - 630
	nkt	630	AB 12/630 + AC 12/630	25 - 300	AB 24/630 + AC 24/630	25 - 300
	Tyco	400/630	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51xx with sealing end IXSU-F for one wire cables	300 - 500	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51xx with sealing end IXSU-F for one wire cables	25 - 300
	Tyco	400/630	RICS-57xx with sealing end IXSU-F for three wires cables + RICS-51xx with sealing end IIXSU-F for three wires cables	300 - 500	–	–
Earthing cable						
Partially insulated	Tyco	400/630	RICS-57xx with sealing end IDST-57xx for cables with one or three paper insulated wires	50 - 300	–	–

TGS, 3 functions switchboard CCF configuration

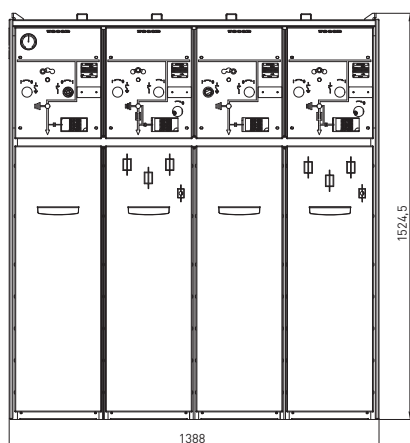


Note: cable connection height of 595mm is for standard TGS with the height of 1500mm.

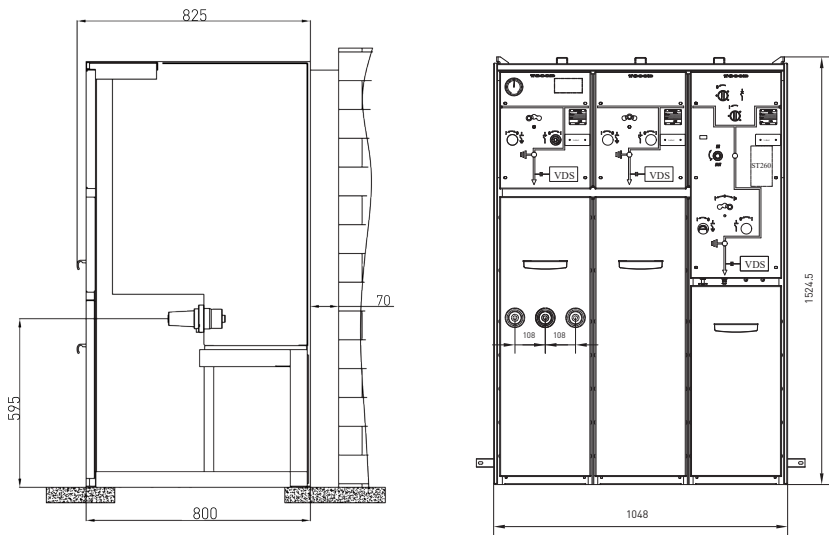
Cable compartment dimensions



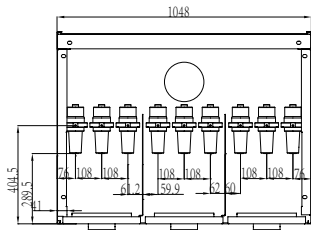
TGS-N, 4 functions switchboard CFCF configuration



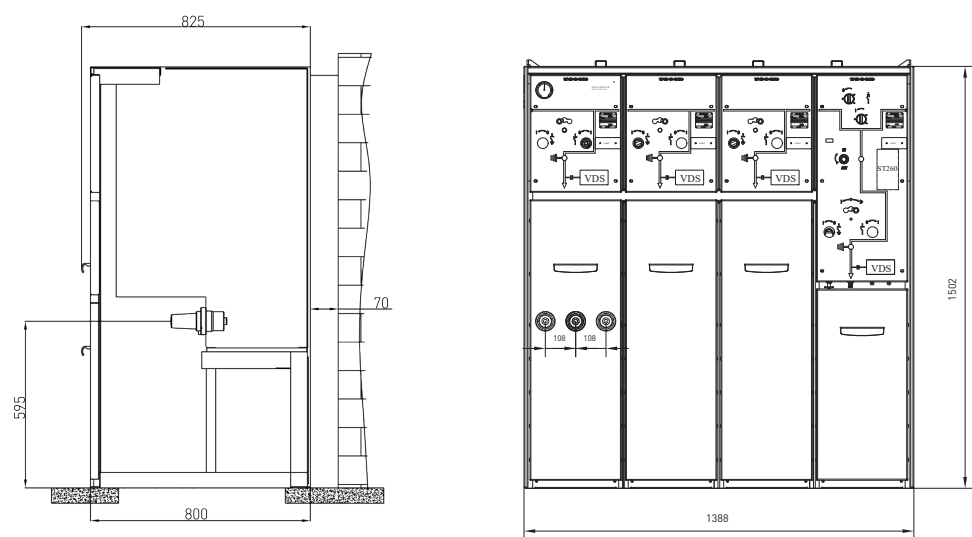
TGS, 3 functions switchboard CCV configuration



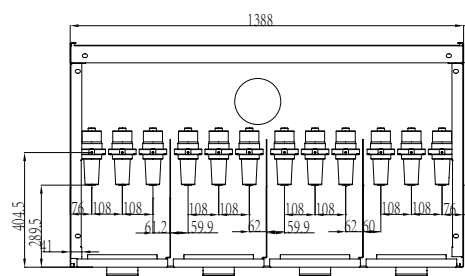
Cable compartment dimensions



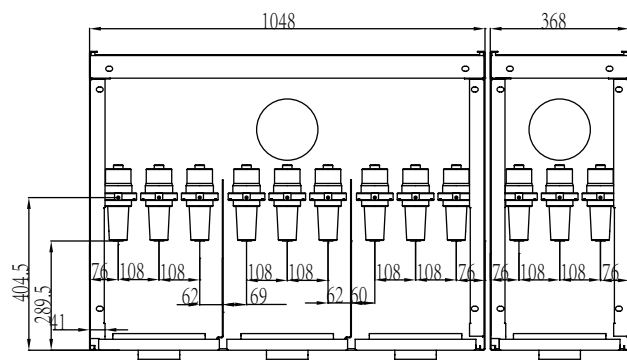
TGS-N, 4 functions switchboard CCCV configuration



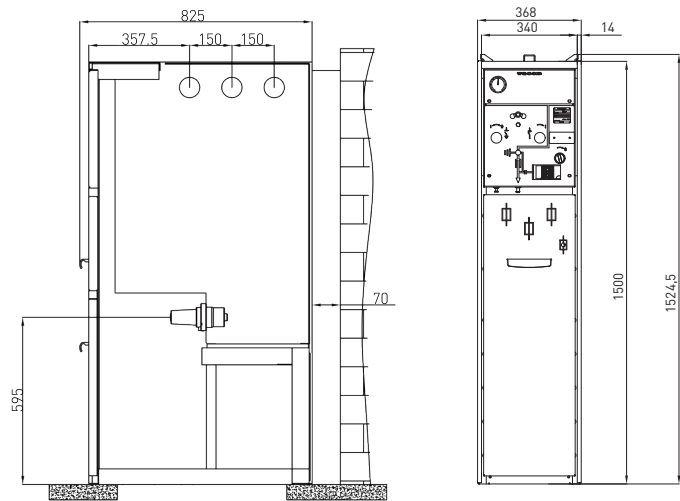
Cable compartment dimensions



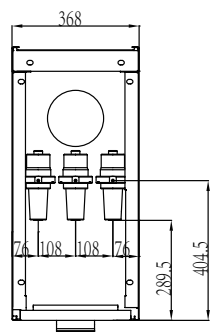
Cable compartment dimensions



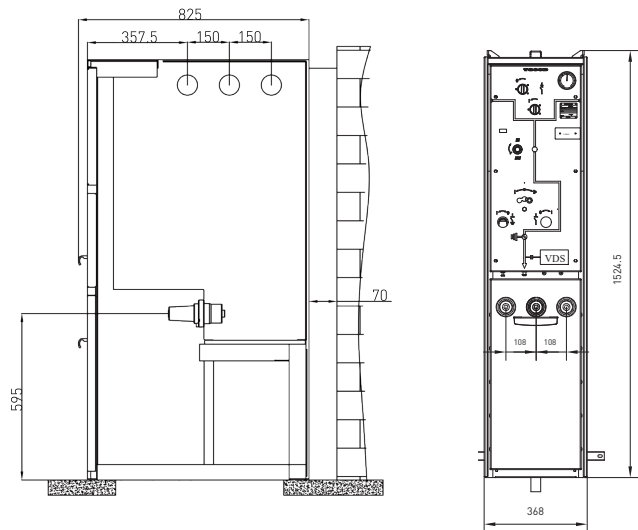
TGS, 1 function switchboard
eF configuration



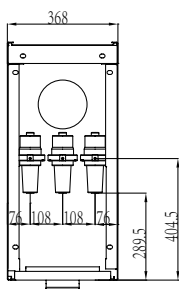
Cable compartment dimensions



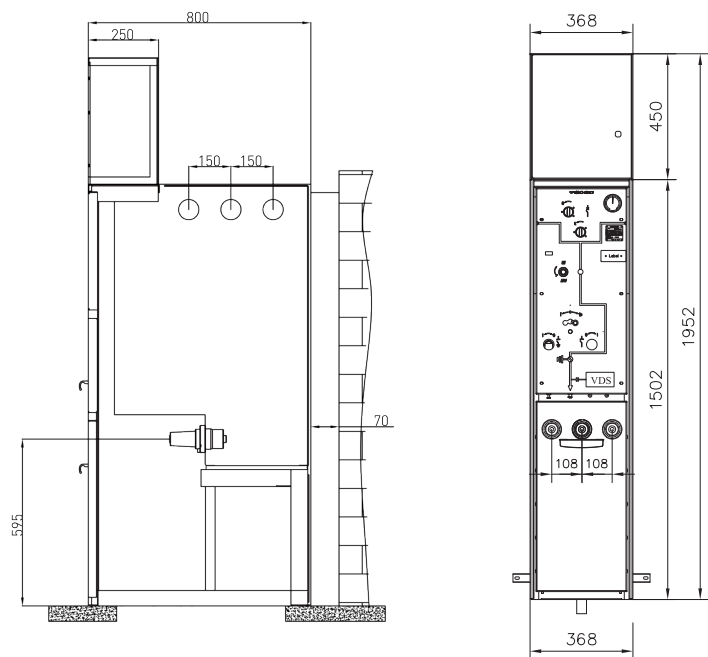
TGS, 1 function switchboard
eV configuration



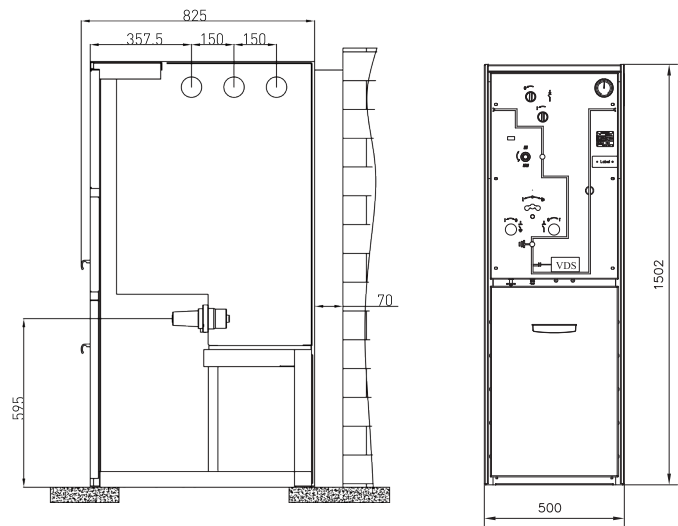
Cable compartment dimensions



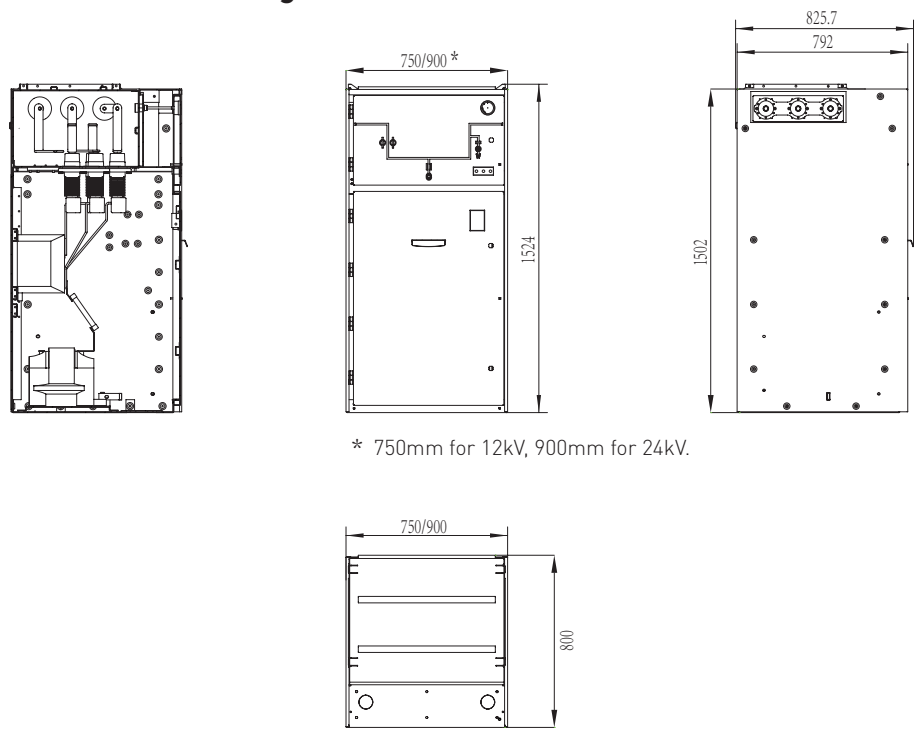
TGS, 1 function switchboard
eV + LV cabinet (600 mm) configuration



TGS, 1 function switchboard
el configuration



eM configuration



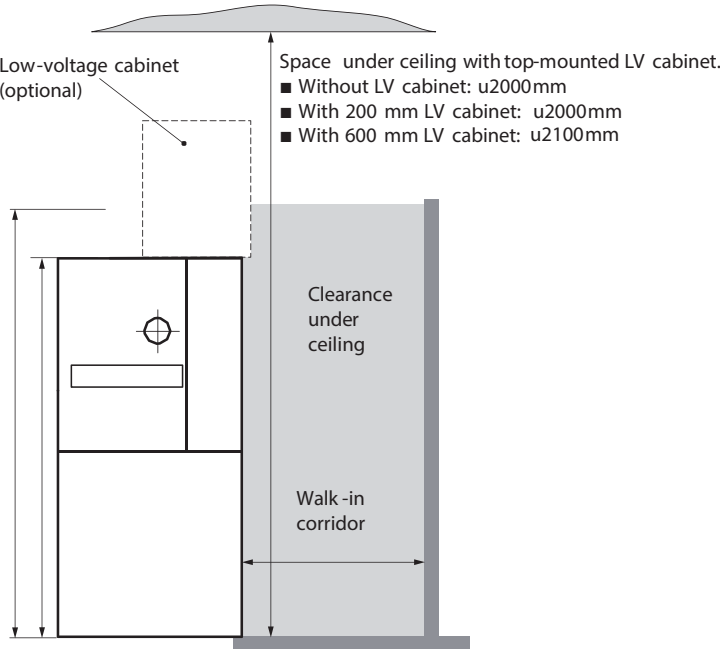
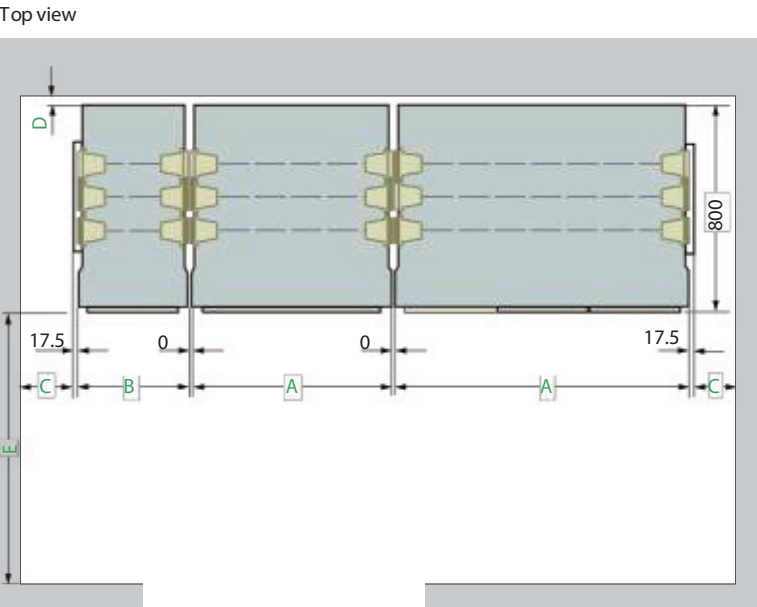
* 750mm for 12kV, 900mm for 24kV.

Minimum distances between the TGS extensible and the building's walls

Top view

Functions and distances		Space (mm)
A	Unit 2 functions	708
	Unit 3 functions	1048
	Unit 4 functions	1388
B	Unit 1 function C, D, DE	368
	Unit 1 function F, V	368
	Unit 1 function I	500
C	Distance with the side wall of the building for TGS-C*	70
	for TGS-E**	450
D	Distance between the rear of the switchboard and the building's wall	Release of overpressures only towards the bottom
		70 (for easy handling)
E Minimum width of passage in front of the TGS-E switchboard: the national standards/ instructions must be respected! For a subsequent extension to the existing TGS-E: access for assembly E > 950; TGS-C: > 800		

Notes:
* C for Compact
** E for Extensible



Indoor installation & evacuation of overpressures

We are presenting several examples of installation for transformer substations (IAC classification as per IEC 62271-200).

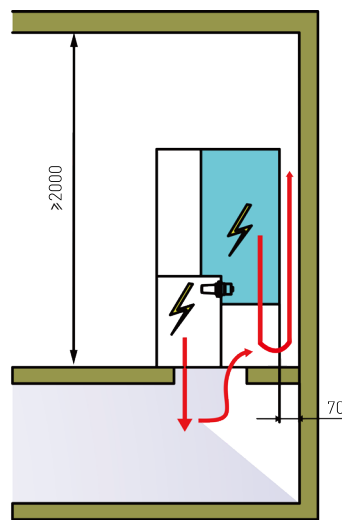
For further information, consult the civil engineering guide.

Example of an TGS-N CCF installation:

Height of the room $\geq 2,000$ mm with possible solutions for the evacuation of gases in case of overpressure.

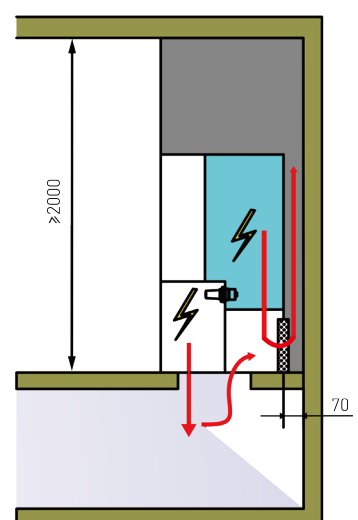
• IAC class AFLR 16/20 kA 1s

With deflector



• IAC class AFLR 16/20 kA 1s

With gass cooler



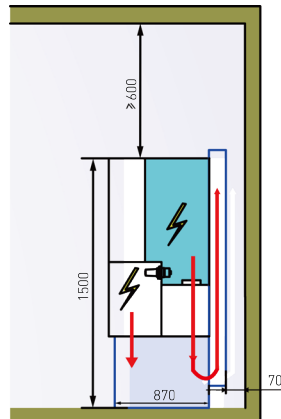
→ Evacuation of gas in the event of overpressure

Example of an installation for transformer substations without cable trough or double panel (IAC classification as per IEC 62271-200).

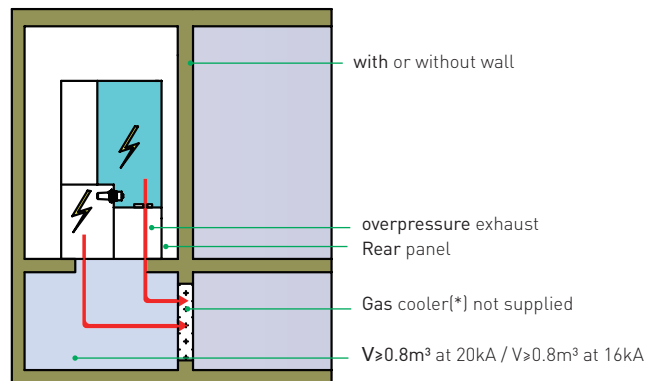
Example of TGS installation where the exhaust of gas goes into cable duct and through a gas cooler made of 5 layers of metal.

- **IAC class AFLR 16/20kA 1s**
with chimney and base

- **IAC class AFLR 16/20kA 1s**
without side panel



→ Evacuation of gas in the event of overpressure



→ Evacuation of gas in the event of overpressure



Packaging

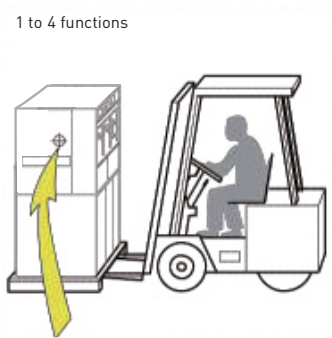
For road and rail transport:
TGS switchboard is packaged under protective sheeting. It is delivered fixed on to a wooden pallet by two plastic tapes.

- For maritime transport:
TGS 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:
TGS switchboard is packaged in a wooden boxes (crates) with solid walls and a protective cover (dust cover).

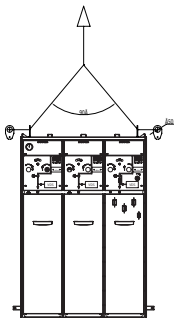
Handling

The TGS 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 a switchboard:
Maximum width of transport unit: 1388 mm



When transporting on pallet don't tilt the switchboard. Respect the centre of gravity markings.

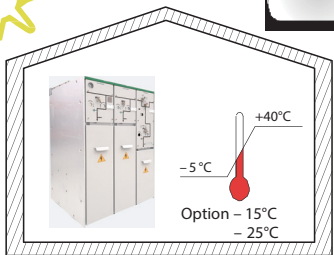


When transporting with slings, use the two lifting rings.

Switchboard with LV cabinet	Number of functions	Composition of the switchboard	Width X (mm) from the swing arm
	1	C/DE/D	368
	2	F/V	368
	3	All types, except FF/VV	708
	4	All types	1048
	5	All types	1388
	5	CCCC/CCCCF/CCCFF	1728
		CFCFF	1728



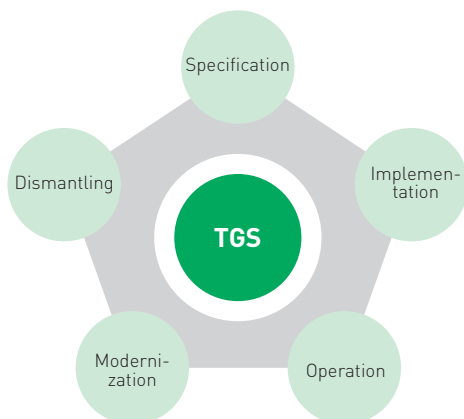
DES9997



Storage

TGS must be packaged depending on the requirements for its planned storage duration. TGS 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.

TGOOD Services	57
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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 his given environment
- **Preliminary design:** Accelerate turn around time to come to a final solution design

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 and within 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

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

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		
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 be increased according to: a) the level of criticality (low, major, critical) b) the severity of environmental conditions (i.e. corrosive, naval, offshore) following recommendations of Manufacturer.

Sustainable development	59
End of service life processing	60



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

Eco-design and impact on the environment

TGOOD contributes efficiently to worldwide savings in terms of energy resources. TGS 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 (CCF type) 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.



At the end of the TGS service life

The dismantling and disassembly of TGS 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 TGS end of service life processing approach.

SF₆ gas recovery

The volume of the insulating gas used in TGS 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
SF ₆ 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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