



# TGS 40.5

Ring Main Unit up to 40.5 kV 1250 A 31.5 kA

Catalogue

2026

**TGOOD**



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A TGOOD integrated kiosk substation  
containing TGS 40.5



## TGS 40.5

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# Presentation



TGS 40.5

## TGS 40.5, a versatile switchboard

TGS 40.5 is a medium voltage gas insulated switchboard up to 40.5 kV, 1250 A, 31.5 kA, 4 s, used in secondary distribution. It is designed for customised application of switchgear in:

- Compact secondary substations
- Small industries
- Wind power plants
- Hotels, shopping centres, office buildings, business centres etc.

## Electrically insulated using SF<sub>6</sub> gas

The high voltage conductive parts of the RMU are placed in an insulating inert gas (Sulphur Hexafluoride—SF<sub>6</sub>) which is neither reactive nor toxic.

The gas is confined in a hermetically sealed stainless steel tank. TGS 40.5 is insensitive to the outside environment and to aggressors like humidity, dust, pollution, dirt and animals.

The use of SF<sub>6</sub> as an insulating gas, and the design of TGS 40.5, makes it one of the most compact MV switchboards on the market (for instance, a cubicle with three functional units is only 1.5 metres wide).

SF<sub>6</sub>-free  
version  
available



TGS 40.5 in a TGOOD MV/LV substation



TGS 40.5 in the mast of a wind tower

## Simple operation and maintenance

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

- Simplified maintenance of the functional units and with continuity of service for the other units (LSC1 class)
- No gas filling is required on site at installation nor during the service life of TGS 40.5 under normal operating conditions
- Long service life
- Interlocking to ensure the correct sequences of operations
- Can be used in substations with or without walk-in operation corridors
- Voltage presence indicator light
- Wide cable compartment to allow the installation of various types of cable, etc.

## Safety and innovation

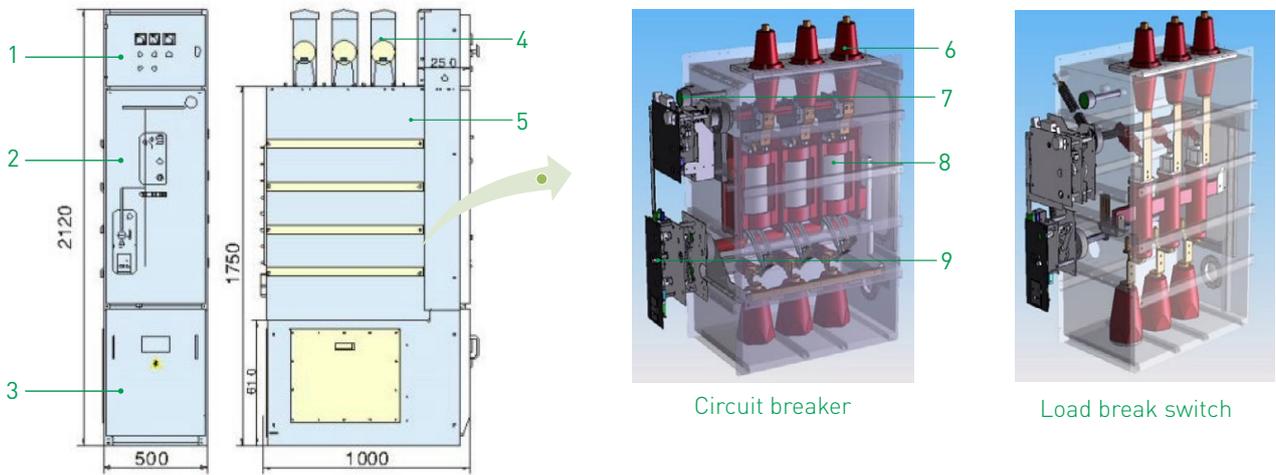
TGS 40.5 has been designed for maximum safety of the operators and to protect equipment, in particular in case of internal arcing:

- Safety valves at the rear yield reduce the change of 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)



Technical centre of TGOOD Global

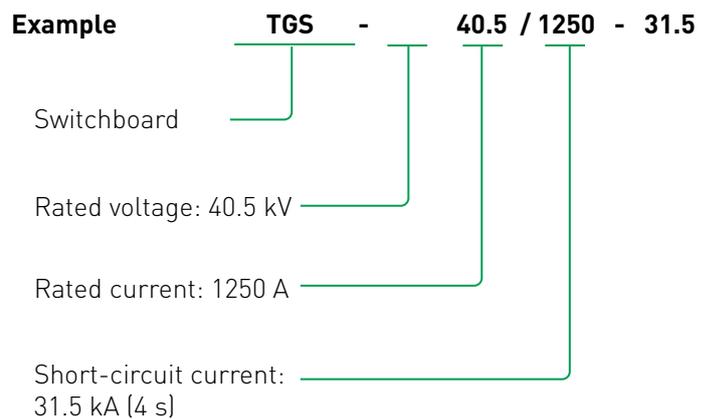
# Presentation



- 1 LV compartment
- 2 Operating mechanism compartment and mimic diagram
- 3 Cable compartment
- 4 Solid busbar connector
- 5 Hermetically-sealed stainless steel tank filled with gas to insulate the main circuit
- 6 Bushings for busbar connection
- 7 Tank pressure manometer
- 8 Vacuum circuit breaker
- 9 Operation mechanism

## Identification plate

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



## IAC (internal arc classification):

The metal enclosed switchgear may have different types of accessibility on the various sides of its enclosure.

To identify the different sides of the enclosure, the following codes are used (according to IEC 62271-200 standard):

- A: Restricted access to authorised personnel only
- F: Access to the front side
- L: Access to the lateral side
- R: Access to the rear side.

LSC1 Loss of service continuity

## Operating conditions

- Altitude: ≤3000 m
- Ambient temperature: -40 °C ~ + 40 °C
- Relative humidity: ≤95% (daily), ≤90% (monthly)
- Seismic intensity: ≤grade 8

Note: if deviation of normal service conditions occurs, the customer can discuss what should be done with the TGOOD regional subsidiary they purchased it from.

## Protection index (IP)

- Main electrical circuits: IP67
- Operating mechanisms: IP4X
- Cable connection compartment: IP2XC
- Switchgear: IK07

## Partition class and loss of service continuity category

- Partition Class: PM (1)
- Loss of Service Continuity Category: LSC1

## Internal arc classification

TGS 40.5 is a pressurised sealed-unit system that complies with IEC 62271-1. Its tank is filled with SF<sub>6</sub> gas that is used as an insulating and breaking medium. 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.

## TGOOD's TGS 40.5 RMU switchboards comply with the following 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, V, P, Pb)	IEC 62271-102	E2, E3
Disconnecter (in VL, P, Pb)	IEC 62271-102	
General use switch [C]	IEC 62271-103	M2, E3
Circuit breaker (in V, VL)	IEC 62271-100	M2, E2, C2
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	

## TGS 40.5 range



TGS 40.5

### General introduction

TGOOD's TGS 40.5 switchgear is a composite apparatus which encloses the main circuits and switches in a sealed metal housing and uses SF<sub>6</sub> gas for arc-extinguishing and insulation.

The unit is suitable for RMU applications and dual-power-supply operation in 40.5 kV networks, allowing conversion from an original single-supply arrangement. It is particularly suited to industrial and commercial zones, as well as rural areas with high-density loads and cable-fed networks.

Our TGS 40.5 RMU offers safe operation, immunity to weather conditions, easy installation, minimal maintenance and a compact footprint, making it suitable for prefabricated substations and wind-driven generators. The RMU can also be flexibly configured through busbar extensions

### TGS 40.5 is supplied with the following standard equipment

- Vacuum circuit breaker with two-position mechanism and auto-reclosing duty
- Two-position load-break puffer switch
- Earthing switch with single-spring operating mechanism
- Single-spring operating mechanism on cable switches
- Position indication for load-break and earthing switches
- Cable bushings—horizontal (front) or vertical (bottom), with integrated voltage divider for voltage indication
- Busbars, 630 A/1250 A
- Earthing bar
- Operating handle
- Lifting lugs for handling
- Adjustable cable support bars
- SF<sub>6</sub> pressure manometer

### Service conditions

- Altitude: ≤3000 m
- Ambient temperature: -40 °C ~ + 40 °C
- Relative humidity: ≤95% (daily), ≤90% (monthly)
- Seismic intensity: ≤8°

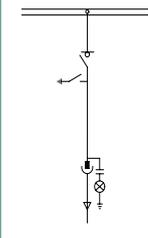
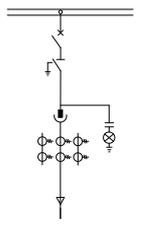
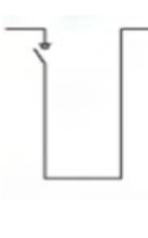
Note: if deviation of normal service conditions occurs, the customer can negotiate with TGOOD.

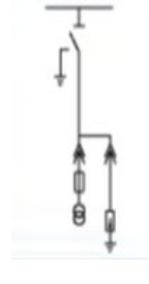
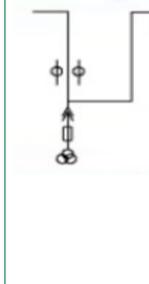
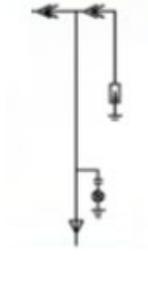
### Technical characteristics

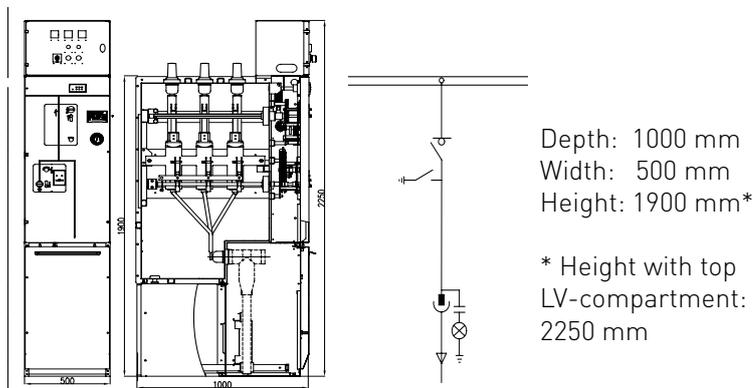
- Equipped with load-switch and circuit-breaker functional units
- Compact and lightweight; the smallest unit measures 500×1000×1800 mm, making it suitable for wind-driven generators and solar farms
- Designed for easy operation, safe use and convenient access; the switchgear can operate for up to 30 years without maintenance
- The TGS-40.5 RMU is fully sealed, with no exposed live parts, and is suitable for long-term operation in adverse environments
- If required, the gas tank can be manufactured to IP67, suitable for high-salt-fog environments such as coastal areas and wind farms

**Main functional units:**

- C Load switchgear
- V Vacuum circuit breaker switchgear
- CL Bus-coupler switchgear
- VL Bus-coupler switchgear
- P VT switchgear
- Pb VT with SA switchgear
- M Measurement switchgear
- D Direct to bus switchgear
- Db Direct with SA switchgear

Names	C	V	CL	VL
Size	500*1000*1800	500*1000*1800	600*1000*1800	600*1000*1800
Functions	Load switchgear	VCB switchgear	Bus coupler switchgear	Bus coupler switchgear
				

Names	P	Pb	M	D	Db
Size	800*1000*1800	800*1000*1800	800*1000*1800	300*1000*1800	400*1000*1800
Functions	VT switchgear	VT, SA switchgear	Metering switchgear	Direct to bus switchgear	Direct with SA switchgear
					



**Technical data**

Load switch		
Rated voltage	kV	40.5
Rated power frequency withstand voltage	kV	95
-across isolating distance	kV	110
Lightning impulse withstand voltage	kV	185
-across isolating distance	kV	215
Rated current	A	630
Breaking capacities		
-active load	A	630
-closed loop	A	630
-off load cable charging	A	21
-earth fault	A	63
-earth fault cable charging	A	36
Making capacity	kA	50 (3 times)
Class (electrical endurance)		E3
Rated short-time current of earthing circuit 4s	kA	20
Rated short-time current of earthing circuit 2s	kA	25
Internal arc classification IAC		AFLR-20kA-1s
Number of mechanical operations	times	5,000
Earthing switch		
Rated voltage	kV	40.5
Rated power frequency withstand voltage	kV	95
Lightning impulse withstand voltage	kV	185
Making capacity	kA	50 (2 times)
Rated short-time current of earthing circuit 4s	kA	20
Rated short-time current of earthing circuit 2s	kA	25
Class (electrical endurance)		E2
Number of mechanical operations	times	3,000

## Standard features

- Two-position load break puffer switch and separate earthing switch
- Two-position single spring operating mechanisms with two separate operating shafts for load break function and earthing function
- Switch position indication for load break switch and earthing switch
- Cable bushings horizontal in front or vertical at bottom, with integrated voltage divider for voltage indication
- Cable compartment cover allowing double cable connection cable adapters by using cables adapters
- Busbars, 630 A
- Earthing bar

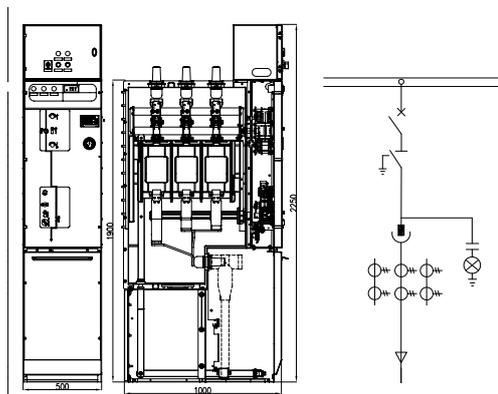
## Factory assembled options

- Interlocking
  - Cable compartment front cover interlocked with earthing switch

## Additional equipment also available as retrofit

- Motor operation for load break switch
- Auxiliary switches
- Load break switch position 2NO+2NC
- Earthing switch position 2NO+2NC
- Capacitive voltage indicator
  - VPIS acc. to IEC 61958 with integrated indicator lamps (LED)
  - VDS acc. to IEC 61243-5
- Short circuit indicators
- Short circuit and earth fault indicator
- Cable cover for parallel cables
- External current transformers (CT)
- Key interlock





Depth: 1000 mm  
Width: 500 mm  
Height: 1900 mm\*

\* Height with high LV-compartment: 2250 mm

### Technical data

Vacuum circuit breaker		
Rated voltage	kV	40.5
Rated power frequency withstand voltage	kV	95
Lightning impulse withstand voltage	kV	185
Rated current	A	630, 1250
Breaking capacities		
-short circuit breaking current	kA	31.5
-D.C. component	%	<52
-cable charging switching current	A	50
Making capacity	kA	80
Short time withstand current	kA	31.5
Internal arc classification IAC		AFLR-31.5 kA-1s
Rated operating sequence		O-0.3s-CO-180s-CO
Number of mechanical operations	times	20,000 (Class M2)
Downstream disconnecter and earthing switch		
Rated voltage	kV	40.5
Rated power frequency withstand voltage	kV	95
-across isolating distance	kV	110
Lightning impulse withstand voltage	kV	185
-across isolating distance	kV	215
Making capacity	kA	80
Class (electrical endurance)		E2
Short time withstand current 4s	kA	31.5
Internal arc classification IAC		AFLR-31.5 kA-1s
Number of mechanical operations	times	3,000

## Standard features

- 1250 A vacuum circuit breaker
- Two position mechanism with auto-reclosing duty for vacuum circuit breaker
- Two position operating mechanisms for the downstream disconnecter and earthing switch
- Interlocking between vacuum circuit breaker and disconnecter
- Switch position indication for vacuum circuit breaker, disconnecter and earthing switch
- Self-powered electronic protection relay with ring core CTs on cables
- Trip coil (for relay tripping)
- Cable bushings horizontal in front or vertical at bottom, with integrated capacitor for voltage indication
- Cable compartment cover allowing double cable connection
- Main busbar 630 A, or 1250 A
- Earthing bar

## Factory assembled options

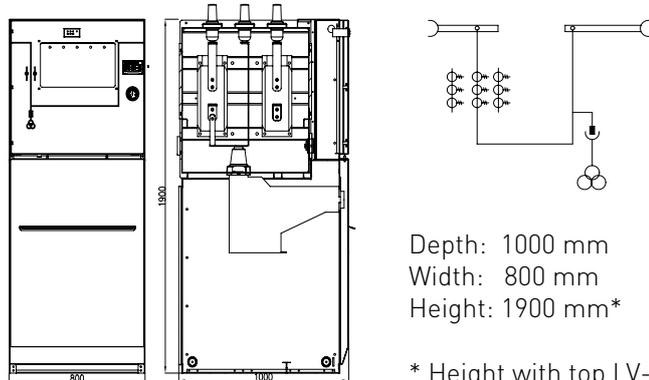
- Cable bushings
- Bushings for connection of external busbars or cable on
  - Interface 2 (inside cone)
  - Interface B (plug-in)
  - Interface C (bolted)
- Interlocking
- Cable compartment front cover interlocked with earthing switch
- Signal (1NO) from internal pressure indicator wired to terminals (only one each SF6 tank)

## Additional equipment also available as retrofit

- Manometer
- Motor operation for vacuum circuit breaker
- Top LV-compartment with hinged door
- Short circuit indicator
- Auxiliary contacts
  - Vacuum circuit breaker position 2NO+2NC
  - Disconnecter position 2NO+2NC
  - Earthing switch position 2NO+2NC
  - Vacuum circuit breaker tripped signal 1NO
- Capacitive voltage indicating systems
  - VPIS acc. to IEC 61958 with integrated indicator lamps (LED)
  - VDS acc. to IEC 61243-5
- Indicator lamp
- Trip coil
- Closing coil
- Undervoltage release (optional electronic time delay device)
- Cable compartment cover
  - With extra depth (surge arrester)
  - Arc proof (if existing modules have interlocked covers)
- Cable support bars, non-magnetic
- Key interlock on disconnecter/earthing switch

## Relays with auxiliary voltage

Located in LV-compartment with hinged door.



Depth: 1000 mm  
Width: 800 mm  
Height: 1900 mm\*

\* Height with top LV-compartment: 2250 mm

### Technical data

Metering module		
Rated voltage	kV	40.5
Rated power frequency withstand voltage	kV	95
Impulse withstand voltage	kV	185
Rated normal current	A	630, 1250
Short time withstand current 4s	kA	20, 31.5

The M-module is a factory assembled type tested air insulated measurement cubicle with conventional CTs and VTs. The M-module is designed for CTs and VTs with dimensions according to DIN 42600 narrow type and for installation of transformers locally.

The M-module is manufactured and tested according to IEC 62271-200. It is available in 4 versions:

- Bottom cable in/out
- Left side top connection to the modules, bottom cable in
- Right side top connection to the modules, bottom cable in
- Left and right side connection to the modules

### Standard features

- 3 pcs DIN 42600 narrow type current transformers with ribs
- 3 pcs DIN narrow type single pole voltage transformers
- Padlock interlocking to prevent access to live parts
- MV cable connection to the cubicle using connectors
- MV cable connection inside M-module by conventional cable lugs

### Voltage transformers

- Single pole insulated with measuring and earth fault windings
- Primary voltage has to be specified
- Secondary windings -- / 110:  $\sqrt{3}$  / 110:  $\sqrt{3}$  or / 100: $\sqrt{3}$  / 100: $\sqrt{3}$  has to be specified

Note:

- VTs can also be delivered without open Delta Earth fault windings
- Burden / class has to be specified

**Current transformers**

- Single-core or double-core design
- Secondary side reconnectable possible
- Primary current max 600 Amp, has to be specified
- Secondary current 5 Amp or 1 Amp has to be specified

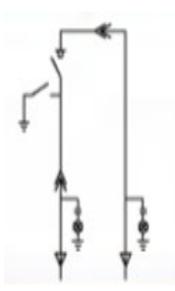
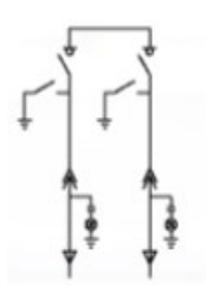
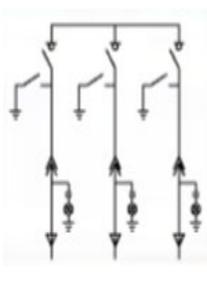
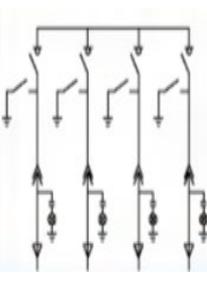
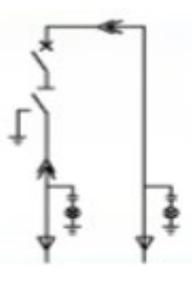
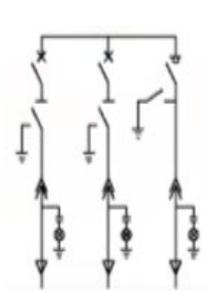
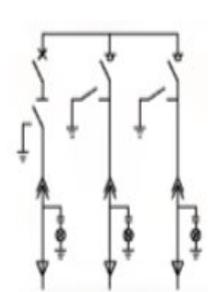
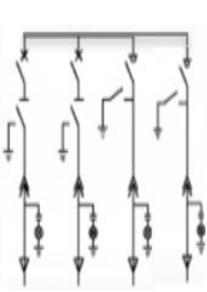
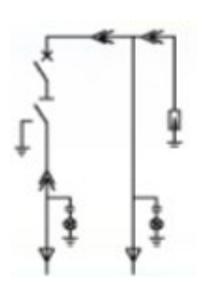
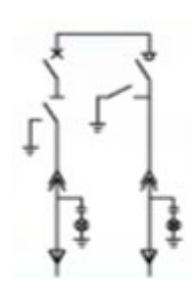
**Low voltage compartment**

- Terminals for voltage transformers secondary connection
- 3-pole MCB for measuring voltage
- 1-pole MCB for earth fault voltage
- Damping resistor for voltage transformers open delta earth fault windings, to avoid ferro resonance
- Separating terminals for current transformers secondary windings
- Space for electronic kWh-meter

**Optional features**

- Voltmeter with selector
- A-meter with selector

**Typical configurations**

Names	C+D	CC	CCC	CCCC	V+D
Size	800*1000*1800	1000*1000*1800	1500*1000*1800	2000*1000*1800	800*1000*1800
Primary Wiring scheme					
Names	VVC	VCC	VVCC	V+Db	VC
Size	1500*1000*1800	1500*1000*1800	2000*1000*1800	900*1000*1800	1000*1000*1800
Primary Wiring scheme					

### Load switch unit

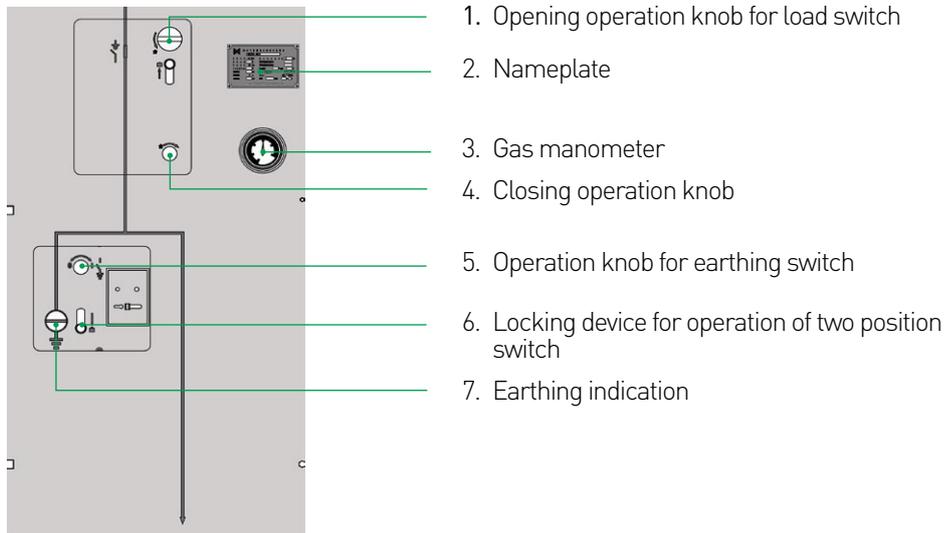
#### Power-on operation:

- Close cable room door, insert the operating handle into the handle hole of the earthing switch, turn the handle in an anticlockwise direction to open the earthing switch
- The taper of the barrier should be set on the position 2, insert the operating handle into the handle hole of the load switch, turn the handle in a clockwise direction to close the load switch

#### Power-off operation:

- Turn the opening knob of the load switch in an anticlockwise direction to open the load switch
- Make sure that the cable side is neutral, put the lock pin of the electromagnetic lock in the unlock position
- The taper of the barrier should be set on the position 1. Insert the operating handle into the handle hole of the earthing switch, turn the handle in an anticlockwise direction to close the earthing switch, then the cable room door can be opened.

The taper of the barrier allows a padlock to be installed to lock position 2. This can prevent accidental closing of the earthing switch. The load switch operating mechanism's grounding baffle pin can also be equipped with padlocks to prevent misclassification of the load switch.



Operation board on load switch unit  
(C module)

### Circuit breaker unit

#### Power-on operation:

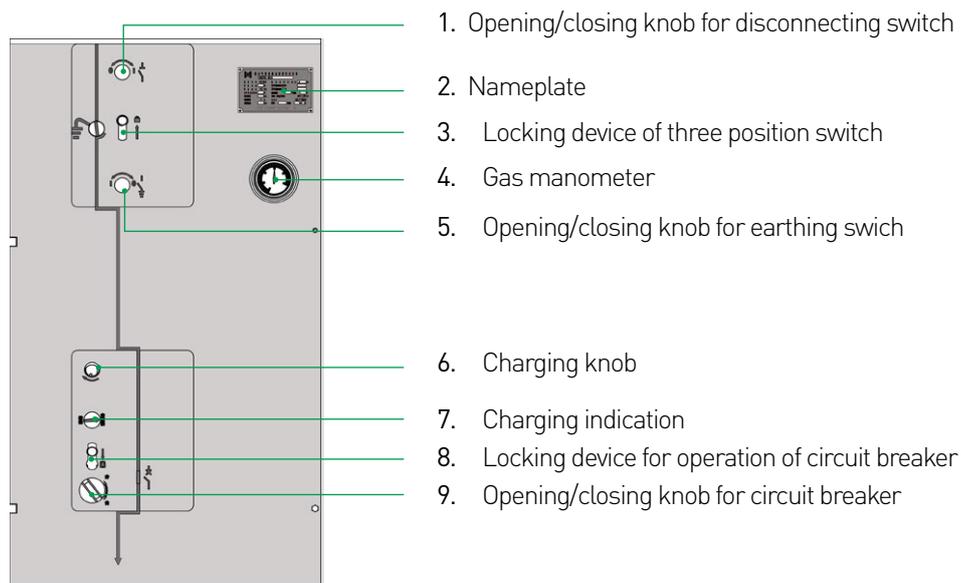
- Close cable room door. The taper of the barrier should be set on position 3. Insert the operating handle into the earth handle hole, then turn the handle in a clockwise direction to open the earthing switch
- The taper of the barrier should be set on position 1. Insert the operating handle into the isolating handle hole, then turn the handle in a clockwise direction to close the disconnecter
- The taper of the barrier should be set on position 2. Insert the operating handle into the charging hole of the circuit breaker, then turn the handle in a clockwise direction to close the circuit breaker and make the spring charge
- Turn the opening-closing knob in a clockwise direction to close the circuit breaker

#### Power-off operation:

- Turn the opening-closing knob in an anticlockwise direction to open the circuit breaker
- The taper of the barrier should be set on position 1. Insert the operating handle into the isolating handle hole, then turn the handle in an anticlockwise direction to open the disconnecter
- Make sure that the cable side is neutral. Put the lock pin of the electromagnetic lock in the unlock position
- The taper of the barrier should be set on position 3, then insert the operating handle into the earth handle hole. Turn the handle in an anticlockwise direction to close the earthing switch, then the cable room door can be opened.

The taper of the barrier allows a padlock to be installed to lock positions 2 and 3 to prevent closing the disconnecter and earthing switch accidentally.

The circuit breaker baffle of the operating mechanism can also be equipped with padlocks to prevent misclassification of the circuit breaker.



Operation board on circuit breaker unit (V module)

## Interlocking of the functional units

During the development of TGS 40.5, TGOOD emphasised personnel safety and the reliability of the switchgear in operation. An interlocking system prevents incorrect use. Thus, the operating levers can only be inserted if the service status permits it.

Access to the cable compartment is only possible if the appropriate outgoing feeder is connected to earth. These RMUs are equipped in production series with the following interlocks:

## Functional unit with load switch, earthing switch and cable compartment panel (C and CL functions)

Interrupting mechanism	Position	Interlock status...				Cable compartment panel
		LS		ES		
		Open	Closed	Open	Closed	
Load switch (LS)	Open	-	-	Unlocked	Unlocked	-
	Closed	-	-	Locked	-	-
Earthing switch (ES)	Open	Unlocked	Unlocked	-	-	Locked
	Closed	Locked	-	-	-	Unlocked

Option: Load switch locking of the cable compartment panel, for example, for cable tests.

## Functional unit with vacuum circuit breaker, disconnecter and earthing switch (V, and VL functions)

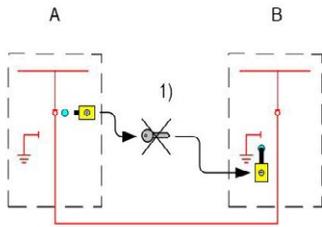
Interrupting mechanism	Position	Interlock status...						Cable compartment panel
		DS		ES		CB		
		Open	Closed	Open	Closed	Open	Closed	
Disconnecter (DS)	Open	-	-	Unlocked	Unlocked	Unlocked	Unlocked	-
	Closed	-	-	Locked	-	Unlocked	Unlocked	-
Earthing switch (ES)	Open	Unlocked	Unlocked	-	-	Unlocked	Unlocked	Locked
	Closed	Locked	-	-	-	Locked	-	Unlocked
Circuit breaker (CB)	Open	<ul style="list-style-type: none"> <li>■ Unlocked if ES open</li> <li>■ Locked if ES closed</li> </ul>	Unlocked	<ul style="list-style-type: none"> <li>■ Unlocked if DS open</li> <li>■ Locked if DS closed</li> </ul>	Unlocked	-	-	-
	Closed	Locked	Locked	Locked	Locked	-	-	-



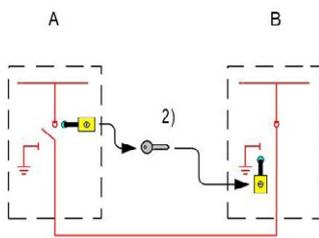
# Key interlock

As an option all load break switches and earthing switches may be equipped with key interlocks. Key interlocks may be mounted according to the customer's specification; either to prevent closing or opening of the switch.

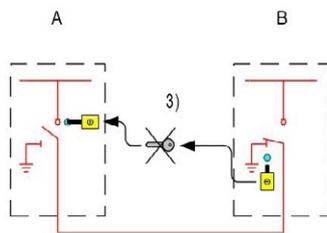
Key interlocks can be used as follows: two switchgear (A and B) are connected to each other by cables. The purpose of interlocks is to prevent closing of the earthing switch unless the load break switch on the other switchgear is locked in the open position.



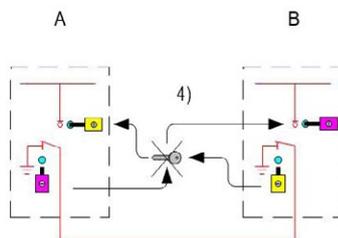
**1)** One key interlock will be mounted close to the operating shaft of the load break switch in switchgear A. An identical key interlock will be mounted close to the operating shaft of the earthing switch in switchgear B. As long as the load break switch in switchgear A is in the closed position, it will be impossible to remove or operate the key in the key interlock.



**2)** First you have to operate this load break switch in switchgear A to the open position. Then it will be possible to operate this key interlock and turn the key which extends the locking bolt. This will prevent access to the operating shaft of this load break switch. The next thing to do is to withdraw the key and insert it into the identical key interlock on the earthing switch of switchgear B.

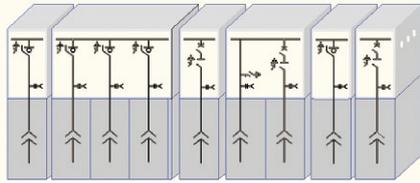


**3)** When the key is inserted, you will be able to operate the key interlock and turn the key which will withdraw the extended locking bolt. Then you will have access to operate this earthing switch to the closed position. As long as this earthing switch is in the closed position, the key will be captured and this makes it impossible to close the load break switch in switchgear A.



**4)** If the load break switch in switchgear B and the earthing switch in switchgear A are equipped with another identical key interlock which has a different key combination than described above, it will be impossible to make an earth connection of an incoming energised cable from switchgear A or B.

Another example for the use of key interlocks is to prevent access to the distribution transformer before the primary side of the transformer is connected to earth. This can be solved by using two identical key interlocks; one mounted on the earthing switch for the distribution transformer feeder and the other one on the door in front of the transformer.

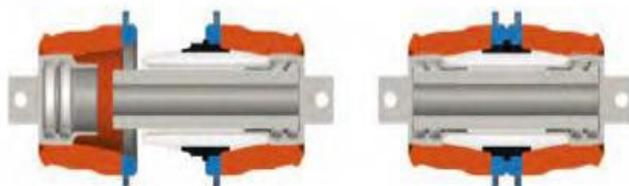
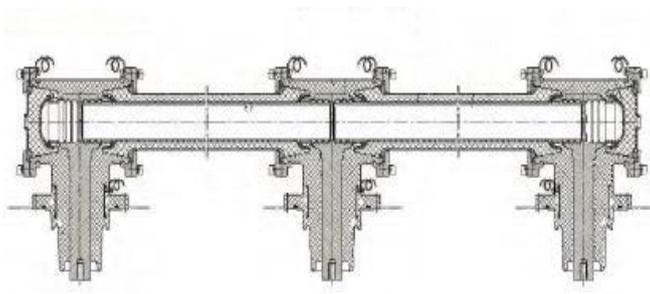
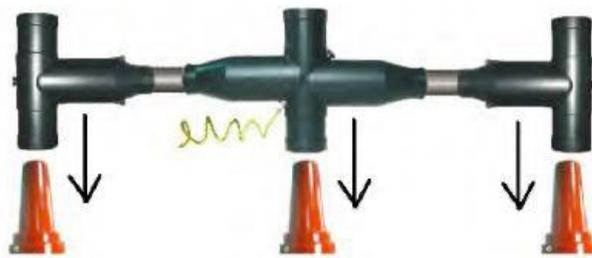


### Extensibility of TGS 40.5

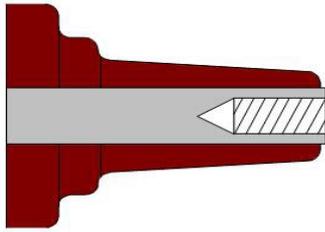
- The RMU offers extensible configurations for secondary distribution applications
- The connection of each functional unit allows for multiple combinations depending on the installation requirements
- The RMU extensible permits the connection of additional units on the left or right-hand side, thereby offering greater flexibility in the choice and positioning of the medium voltage switchboard functions
- The installation and in-line connection of RMU extensible does not require any handling of gas
- Maximum current: 630 (C/F); 1250 A (V)

### Assembly

The extension bus can choose following types:



# Cable bushing



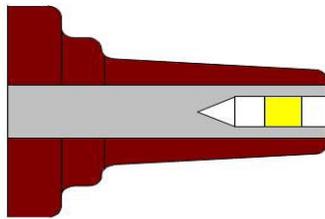
TGS 40.5 is equipped with cable bushings which comply with EN 50181 and IEC 60137 for termination of cables. The bushings fulfil the requirements of DIN47636T1.

The following cable bushings are used:

Interface C with M16 x 2 metric threads 400 series, In = 630 A  
Standard on all modules and for side connection

Interface B with plug 400 series, In = 400 A  
Optional for all modules.

The yellow area indicates the silver coated contact spring.



The installation instructions from the manufacturer of cable terminations must be followed. Be sure to lubricate the bushings thoroughly with the silicone supplied.

**Important:**

Where cables are not connected, the earthing switch must be locked in closed position or the bushings must be fitted with dead end receptacles before the unit is energised.

## Cable terminations

All bushings are protected by cable compartment cover. The drawings below show typical arrangements with cable connectors.

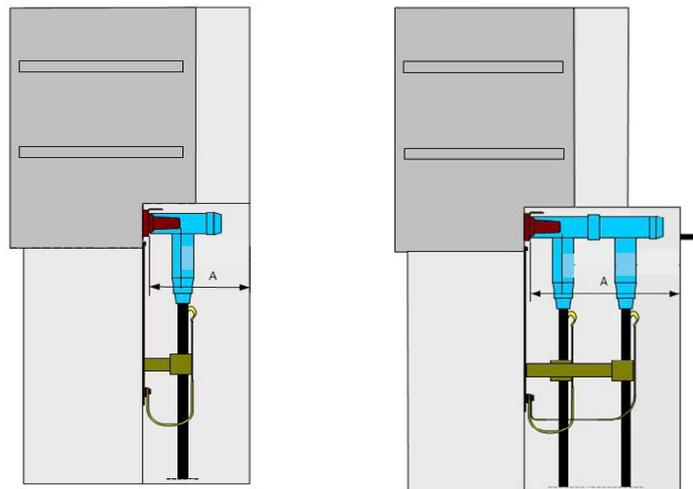
The table below the drawings shows the distance A in millimeter from cable bushing to the inner part of cable compartment cover.



Inner cone cable connector



Outer cone cable connector



	Distance A
Standard	350 mm
Double cables	570 mm
Arc proof cable covers	331 mm

40.5 kV: Seperable connectors interface B with earthing shield, I=400A						Cable compartment with												
Manufacturer	Designation	Conductor (mm <sup>2</sup> )	XLPE / EPR Ø [mm]	Additional equipment for dual cable arrangement	Surge Arrester with	Single cable + SA				Dual cables				Dual cables + SA				
						Standard Dis. A = 361 mm	Arc proof Dis. A = 344 mm	Double cables Dis. A = 581 mm	Direct connection Dis. A = 316 mm	Standard Dis. A = 361 mm	Arc proof Dis. A = 344 mm	Double cables Dis. A = 581 mm	Direct connection Dis. A = 316 mm	Standard Dis. A = 361 mm	Arc proof Dis. A = 344 mm	Double cables Dis. A = 581 mm	Direct connection Dis. A = 316 mm	
3M	94-EE 605-4	35-300	22.8-39.6	KU 33+94-EE 605-4	MUT 23													
Euromold	M400LR/G	35-185	12.0-37.5	None	None													
Euromold	M400TE/G	35-185	12.0-37.5	M400CP-SC+M400TE/G	None							X						
nkt cables	CB 36-400	25-300	17.0-40.0	CC 36-630	CSA 36	X	X	X	X	X	X	X	X				X	
Prysmian	FMCE-400	25-240	21.4-38.8	None	None													
Prysmian	FMCT-400	25-240	21.4-38.8	None	None													
Südkabel	SEHDT 32	35-300	22.8-39.6	None	None													
Tyco Electronics	RSTP	50-300	22.4-40.0	None	None													

40.5 kV: Seperable connectors interface C with earthing shield, I=630 A						Cable compartment with												
Manufacturer	Designation	Conductor (mm <sup>2</sup> )	XLPE / EPR Ø [mm]	Additional equipment for dual cable arrangement	Surge Arrester with	Single cable + SA				Dual cables				Dual cables + SA				
						Standard Dis. A = 360 mm	Arc proof Dis. A = 343 mm	Double cables Dis. A = 580 mm	Direct connection Dis. A = 315 mm	Standard Dis. A = 360 mm	Arc proof Dis. A = 343 mm	Double cables Dis. A = 580 mm	Direct connection Dis. A = 315 mm	Standard Dis. A = 360 mm	Arc proof Dis. A = 343 mm	Double cables Dis. A = 580 mm	Direct connection Dis. A = 315 mm	
3M	94-EE 705-6	70-400	25.1-42.8	KU 33+94-EE 705-6	MUT 23			X				X						
Euromold	M400TB/G	35-240	12.0-37.5	M400CP-SC+M400TB/G	400PB-XSA			X				X						
Euromold	P400TB/G1	35-240	12.0-37.5	M400CP-SC+P400TB/G	400PB-XSA			X				X						
Euromold	M440TB/G	185-630	23.5-56.0	M440CP+M440TB/G	400PB-XSA			X				X						
nkt cables	CB 36-630	25-300	17.0-34.6	CC 36-630	CSA 36	X	X	X	X	X	X	X	X				X	
nkt cables	CB 36-630 (1250)	400-630	34.0-51.0	CC 36-630(1250) or CC 36-630	CSA 36	X	X	X	X	X	X	X	X				X	
nkt cables	CB 36-6301	50-185	28.9-40.0	None	None													X
nkt cables	CB 36-630	50-300	22.4-40.0	None	None													
Prysmian	FMCTs-400	25-240	21.4-38.3	FMPCS-400-36+	Yes2)			X				X						
Südkabel	SEHDT 33	35-500	22.8-45.6	KU 33+SEHDT 33	KU 33+MUT33			X				X						
Tyco Electronics	RSTI-66xx1)	50-300	22.4-40.0	None	None													
Tyco Electronics	RSTI- 66Lxx1)	400-630	34.0-51.0	RSTI-66CP-M16+RSTI-66LXX	None							X						

### Overall operation

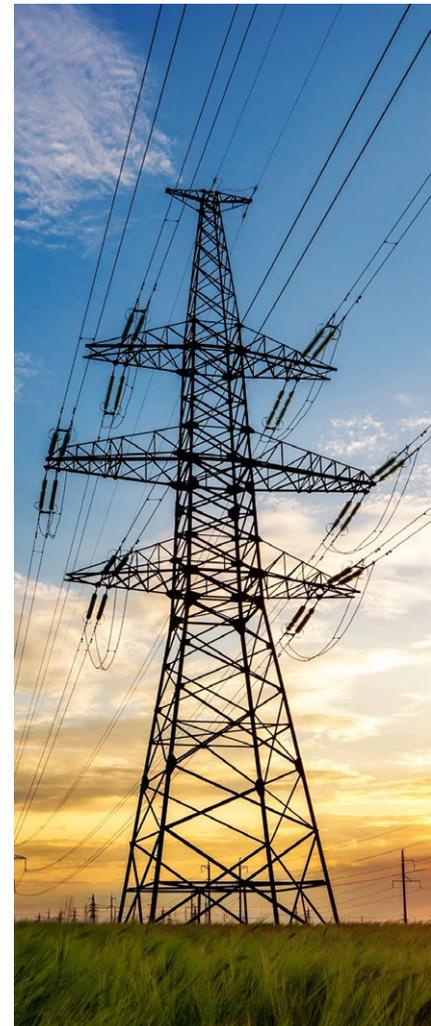
The digital multi-functional protection relay is equipped with a high-performance microprocessor. This provides fully numerical processing of all functions in the device, from the acquisition of the measured values up to the output of commands to the circuit breakers.

### Application scope

The versatile microcomputer comprehensive protection and monitoring device used in TGS 40.5 is designed for protection, control and monitoring of bus-bar feeders. For line protection the device can be used in networks with a grounded, low resistance grounded, isolated or compensated neutral point.

It is suitable 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 bus-bars providing universally applicable protection schemes. The devices also provide excellent backup facilities of differential protective schemes of lines, transformers, generators, motors and bus-bars of all voltage levels.





Protection relay: STROM, ST260E



Protection relay: Kries, IKI-35

## 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. The user 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

## Self-powered intelligent relay

The protection device in TGS 40.5. uses a high-integration microprocessor with an internal bus to process signals from the current transformers and output them through a digital logic control module. It features a compact structure, sealed enclosure, maintenance-free design and strong anti-interference performance, making it suitable for ring-main systems operating in harsh environments or with limited installation space.

- The relay adopts a low-power-consumption design to ensure that protection functions start quickly and reliably under all conditions.
- Its simple, compact structure allows flexible installation, ideal for the confined layouts typical of ring-main systems.
- A self-powering function (CT-powered) is available, eliminating the need for a DC supply, DC panel or UPS and reducing installation cost.
- Protection functions are comprehensive and configurable, and each function can be enabled or disabled through the control settings.
- Multiple IEC inverse-time curves are provided. The device includes high-current latch-up protection and can coordinate with a range of fuse-based protection devices, addressing common issues in distribution networks.
- An LED display with multi-layer menu navigation provides a clear human-machine interface.
- A large-capacity non-volatile memory stores at least 200 historical events with full detail, with no data loss during power outages.
- The device includes complete dynamic and static self-diagnostic functions to continuously monitor internal operating conditions and ensure reliability.
- High-precision components and controlled manufacturing processes provide accuracy, stability and long service life.
- The device provides an RS-232 communication interface (with optional RS-485 rear-terminal interface) and supports open communication protocols for SCADA integration.



Fault passage indicator

## Fault passage indicators

To improve power availability and support network-load management, the TGS-40.5 can be fitted with a range of fault-passage indicators integrated into the low-voltage front panel.

### Main characteristics of fault passage indicators:

Fault-passage indicators provide a high-visibility flashing LED and detailed information via the digital display. An optional outdoor lamp can also provide fault indication without the need to enter the substation.

### Overcurrent detection

- Automatic mode with adjustment-free calibration of detection thresholds
- Manual mode available for special override settings
- Fault-acknowledge time setting

### Earth fault detection

**Principle:** the detector monitors current variation ( $di/dt$ ) on all three phases.

A 70 s time delay is applied to allow fault confirmation by the upstream protective device.

- Automatic mode provides adjustment-free calibration of detection thresholds.
- Manual mode allows special override settings.
- Inrush restraint: prevents unwanted detection during load energisation; includes a 3 s delay to filter transient conditions during network power-up.



Fault indicator: Kries, IKI-20

### Fault indication and signalling

- Once a fault is confirmed, the indication device is activated.
- Red LED fault indication on the front panel.
- LCD display shows the faulty phase for earth-fault events.
- Optional remote indication via external flashing lamp.
- Output contact available for retransmission to the SCADA system.
- Indication reset options:
  - Automatic reset upon load-current recovery
  - Manual reset via front-panel button
  - Reset via external input
  - Reset by time delay
- Communication
  - Provides Modbus communication and also functions as a voltage detector.
- Directional fault indicators
  - To support the increasing penetration of distributed generation on distribution networks, the switchgear can be equipped with directional fault indicators.



VDS HR and its removable luminous indicator

### Voltage detection systems

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

- VDS-HR
- VDS-LR
- VPIS

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



VPIS, voltage presence indicating system

### VPIS: voltage presence indicating system

- 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.



VPIS-V0

### IVIS : voltage detection system

TGS 40.5 can be fitted with a VDS-LR IVIS device:

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

The IVIS is equipped with a self-test function, eliminating the need for electrical testing. It also provides a phase-comparison function.

The system uses integrated electronics housed in a weather-protected, maintenance-free enclosure and is self-powered. An auxiliary contact is available for optional remote monitoring.

### 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.

- **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.



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

### LPVT options

TGS 40.5 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
- 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
- Comply to international standard : IEC 60044-7



Automated substation

## Remote control & monitoring

TGS 40.5 can be motorised by functional units allowing for the remote control and monitoring of the components. Complete automation of the network is therefore possible and avoids costly human interventions on the site.

To enable communication with the network control centres, the switchgear integrates communication systems such as:

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

Further information covering the level of equipment for monitoring and integrated remote control and monitoring are available on request.

## Remote terminal unit

The switchgear 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 centre

This technology is 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.



Remote terminal unit

## 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

**Characteristics of the current and voltage transformers**

Current and voltage transformers in compliance with the DIN 42600 standard (narrow version) must be used in metering cubicles.

- Installation of current and voltage metering devices is possible with or without a selector
- Option: a voltage indicator can be added
- Pre-assembled cable connections can be purchased as an option.

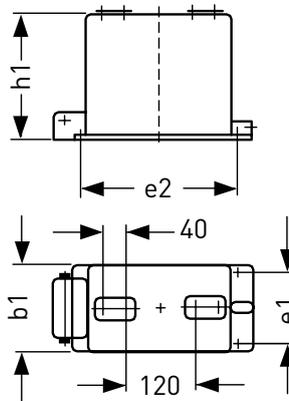


**Electrical parameters of current transformers**

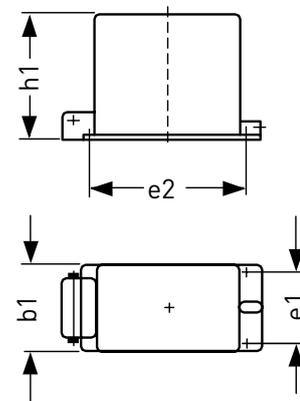
Type	Rated primary current	Rated secondary current	CSR1-40.5					
			Accuracy class and rated secondary output (VA)			Accuracy class and rated secondary output (VA)		
			0.2S	0.2	0.5	10P20	10P15	10P10
High-precision current transformer	75	5			2.5			
	100				5			
	200		2.5	7.5	10	2.5	3.75	5
	400		5	12.5	15	5	7.5	12.5
	600		10	20	25	7.5	12.5	12.5

Type	Rated primary current	Rated secondary current	CBC-40.5					
			Accuracy class and rated secondary output (VA)			Accuracy class and rated secondary output (VA)		
			0.2	0.5	1	10P15	10P10	10P5
Open-type current transformer	75	5		2	2.5			2.5
	100			3.75	5			2.5
	200			7.5		2.5	5	
	400		5	12.5		7.5	10	
	600		10	20		10	15	



Current transformer (C) (DIN 42600, Section 8)



Single phase voltage transformer (V) (DIN 42600, Section 9)



VT: VSSIF4-40.5/195  
(only as reference, real product could vary)

### VT solution

TGOOD provides the following VT solution:

- A block VT (36/40.5 kV)
- Plug for VT

#### Electrical parameters of voltage transformer

Type	VSSIF4-40.5/195
Rated voltage ratio	$33/\sqrt{3}/0.1/\sqrt{3}/0.1/3$
Accuracy class combination	0.2/3P, 0.5/3P, 1/3P, 3/3P
Rated secondary output (VA)	15/15, 25/100
Limit (VA)	300



**Motor operation and coils**

Closing and opening operations of load-break switches and charging of the springs of the mechanism for the circuit breaker can be performed with a motor operation. Earthing switches do not have this possibility.

All motor devices require DC voltage. If control voltage is either 110 or 220 VAC, a rectifier is integrated in the control unit. The operating cycle for the motor operation of the C module is CO-3 min (i.e. it can be operated with a frequency of up to one close and one open operation every third minute). The operating sequence for the V-module is O-0,3s-CO-180s-CO.

The test voltage for the tables below is + 10/-15% for motor operations and closing coils and +10/-30% for trip coils and opening coils. Motor and coils can easily be mounted on the mechanisms after delivery (retrofit).

Characteristics of motor operation for C-module				
Rated voltage (V)	Power consumption (W)	Closing time (s)	Peak start current (A)	Fuse current (A)
24	70	13±2	5	10
48	70	13±2	4	8
60	70	13±2	3	6
110	70	13±2	2	4
220	70	13±2	1	2

Characteristics of motor operation for V-module					
Rated voltage (V)	Power consumption (W)	Closing time (s)	Current (A)	Peak start current (A)	Fuse current (A)
24	70	13±2	6.5	6.8	10
48	70	13±2	3.2	3.6	6
60	70	13±2	2.5	2.8	4
110	70	13±2	1.4	1.6	4
220	70	13±2	0.7	1	2

Characteristics of shunt trip coils, closing coils and opening coils V-module					
Rated voltage (V)	Power consumption (W)	Operating times		Current (A)	Fuse current (A)
		Closing time (ms)	Opening time (ms)		
24 DC	200	40±10	30±10	8	10
48 DC	200	40±10	30±10	4	6
60 DC	200	40±10	30±10	3	4
110 DC	200	40±10	30±10	2	4
220 DC	200	40±10	30±10	1	2
110 AC	200	40±10	30±10	2	4
220 AC	200	40±10	30±10	1	2



Relative pressure gauge



Operating lever



Halogen qualitative leak detector

### Manometer

- The interrupting mechanisms are installed in stainless steel tanks filled with gas. During the service life of the switchboard, the addition of SF<sub>6</sub> 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)

### Accessories

Standard accessories supplied with the switchboard are:

- A set of operating levers (longer lever is optional)
- A hardcopy of the TGS 40.5 operation manual

Only TGOOD-approved accessories are authorised for use. Please discuss any other supplier equipment you wish to use with your local TGOOD subsidiary.

### Halogen qualitative leak detector

XP-1A detector is as an optional accessory for detecting the leakage of SF<sub>6</sub> gas.



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