

Transformer Module Switchgear



1. General Description

The Transformer Module Switchgear (TMS) is a compact switchgear for applications in medium voltage distribution networks. TMS offers a sealed stainless steel tank, which contains all of the live components and switching functions. Routine tests are carried out on all units/modules before dispatch. No special tools are required for the installation of the equipment. Available modules are the cable switch and the vacuum circuit breaker.

1.1 Layout Diagram

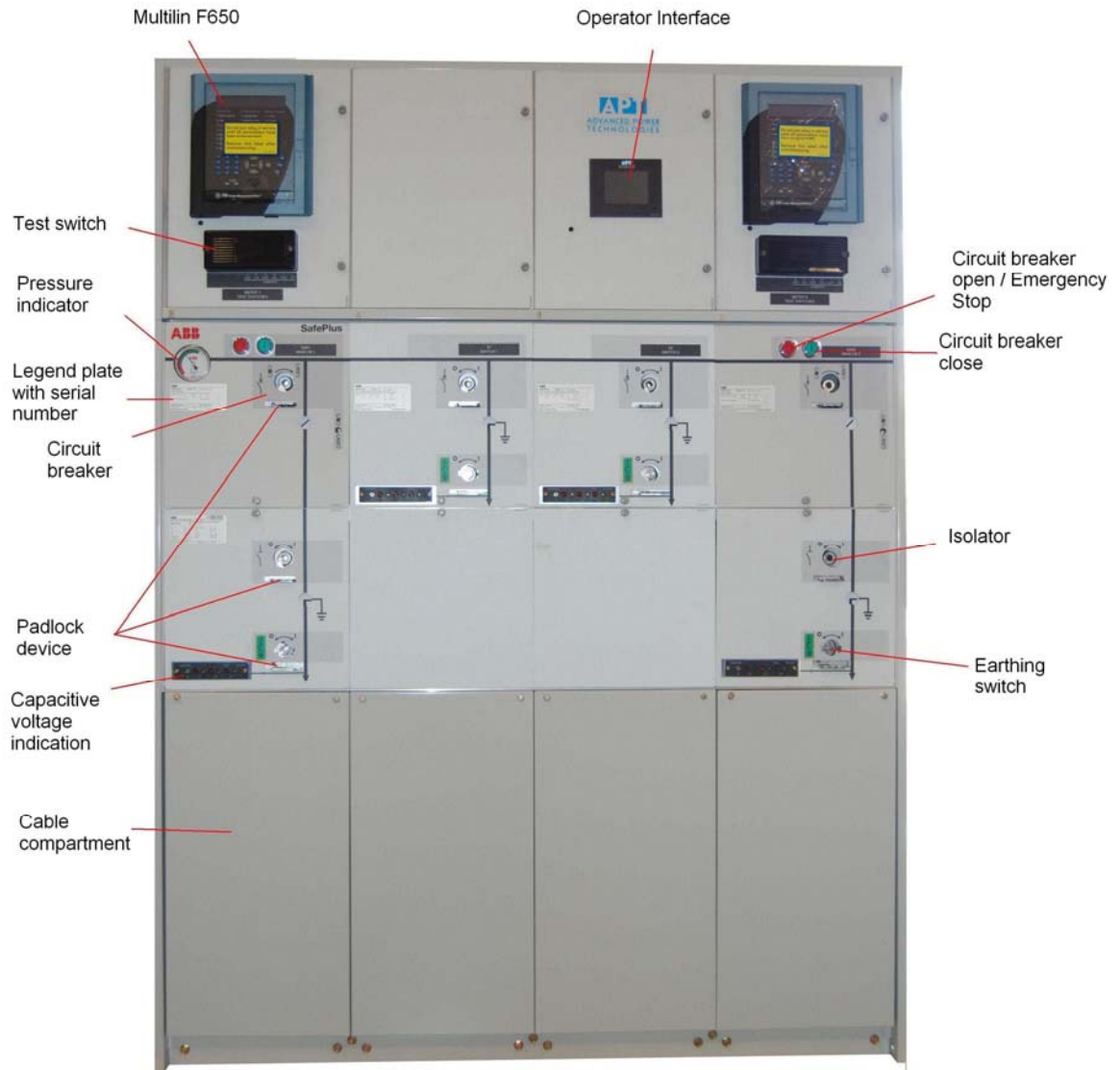


Figure 1.1: Layout Diagram

2. Electrical Data

Transformer Module Switchgear		C-Module		V-Module	
		Switch-disconnector	Earthing switch	Vacuum circuit breaker	Earthing switch
Rated voltage	kV	12/15/17,5/24	12/15/17,5/24	12/15/17,5/24	12/15/17,5/24
Power frequency withstand voltage	kV	28/38/38/50	28/38/38/50	28/38/38/50	28/38/38/50
Impulse withstand voltage	kV	95/95/95/125	95/95/95/125	95/95/95/125	95/95/95/125
Rated current	A	630/630/630/630		630/630/630/630	
Breaking capacities:					
active load	A	630/630/630/630			
closed loop	A	630/630/630/630			
off load cable charging	A	135/135/135/135			
off load transformer	A				
earth fault	A	200/150/150/150			
earth fault cable charging	A	115/87/87/87			
short circuit breaking current	kA			21/21/16/16	
Making capacity	kA	62,5/52,5/50/50	62,5/52,5/50/50	52,5/52,5/40/40	52,5/52,5/40/40
Short time current 0,5 sec.	kA			16/16/16/16	
Short time current 1 sec. **	kA	25/-/-	25/-/-	16/16/16/16	
Short time current 3 sec.	kA	21/21/21/21	21/21/21/21	21/21/16/16	21/21/16/16

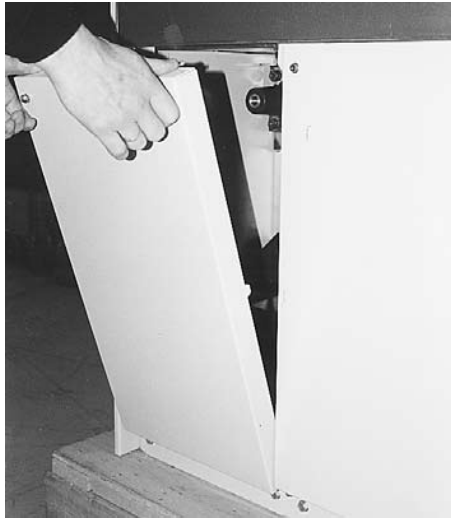
** Maximum rating for bushings Interface B (400 series plug-in)

Figure 2.1: Electrical Data

3. Installation

Installation of the TMS must be performed by a certified electrician. If you are unsure of any methodology during installation, please contact Advanced Power Technologies.

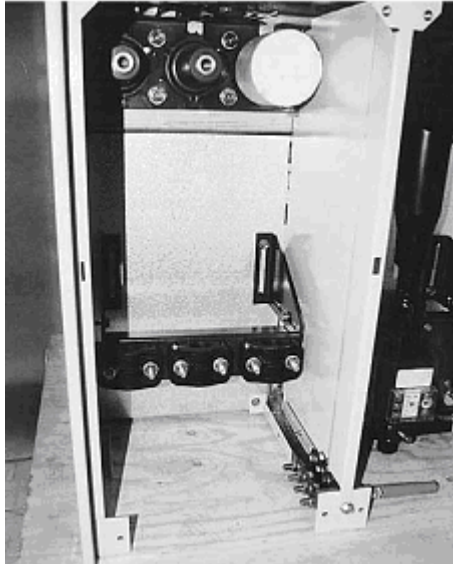
3.1 Removal of Cable Compartment



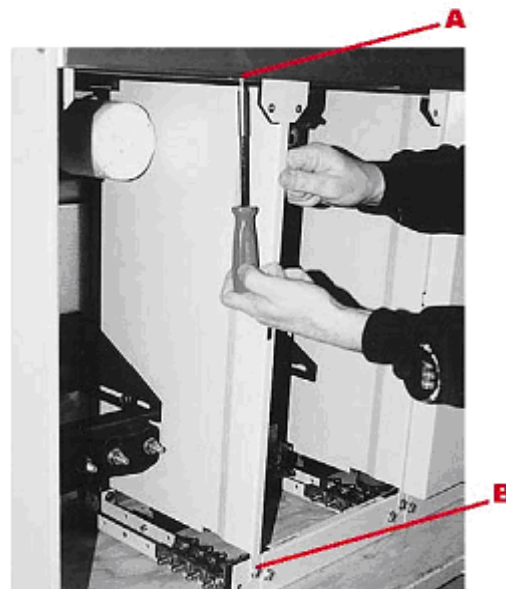
1. Loosen the screws on the cable cover, pull out and lift cover off.



2. Removal of front section.



3. Front section removed.



4. The panel can be removed by unscrewing A and B.

Figure 3.1: Removal of Cable Compartment

3.2 Cable Connection

The TMS is equipped with external bushings which comply with DIN47636T1 & T2/EDF HN 525-61 for termination of cables. All bushings are situated in the same height from the floor and are protected by the cable cover.

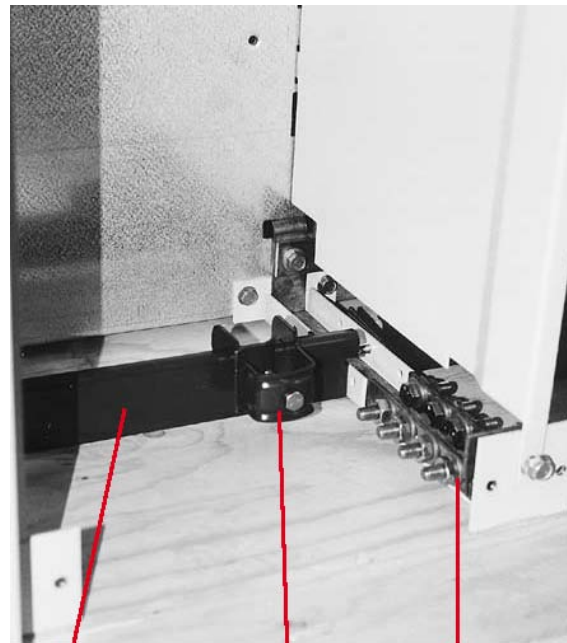
The TMS can be supplied with the following bushings for the various type of cubicle.

		Type of Module	
		Cable switch	Vacuum circuit breaker
Bushings	400 series bolted	X	X

Figure 3.2: Bushing Options

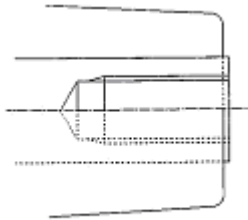


Adjustable cable support beam (additional equipment)



Cable support beam

Earthing bar
Cable clamp (additional equipment).



400 S Bolt

Figure 3.4: Bushing

The following types of cable adapters are recommended:

- ABB Kabeldon
- ABB Kabel und Draht
- Elastimold
- Raychem
- Cooper
- 3M

Please see supplier documentation for details. The manufacturer's installation instructions must be followed. Be sure to lubricate the bushings thoroughly with silicone.

Note: Where cables are not connected, the earthing switch must be locked in the closed position or the bushings must be fitted with dead-end recepticals before the unit is put into operation.

3.3 Relay Protection

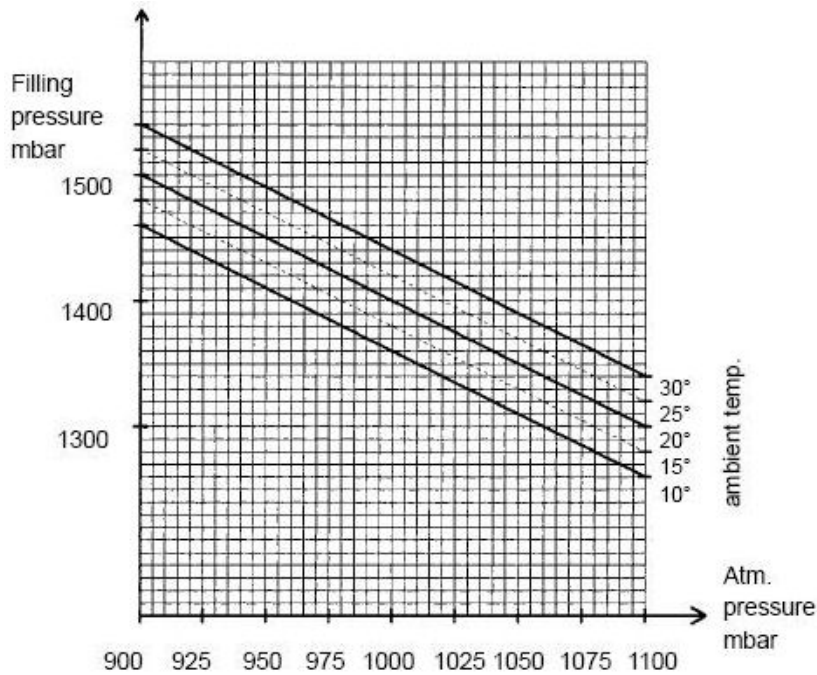
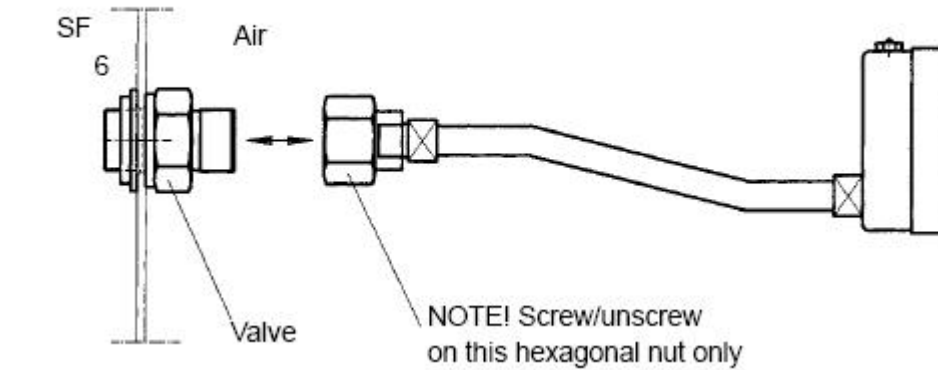


Figure 3.5: SR750 Protection Relay

An SR750 protection relay is installed in each vacuum circuit breaker module. The cables from the protection relay to the current transformers are placed in the cable compartment, ready for connection to the three current transformers supplied.

Separate manuals are available for each of these protection relays.

3.4 Gas Pressure



TMS contains SF₆ gas with a nominal pressure of **1.4** bar at 20° C. TMS is sealed and is fitted with a temperature-compensated pressure indicator. A temperature-compensated device that emits an electrical signal to indicate lower pressure can be supplied upon request.

Pointer in middle of green area - unit has correct pressure

Pointer in red area - pressure is too low

3.4.1 Refilling of SF₆ Gas

A gas bottle with a manometer and a reduction valve adapter pressure measuring device are both required to refill the gas.

1. Remove front cover and unscrew manometer as shown.
2. Screw (tightening the torque.45 Nm) the adapter to the valve.
3. Before connecting the hose from the gas bottle to the adapter, the air in the hose must be removed by running SF₆ gas through the hose.
4. When gas is flowing into the RMU/switchgear, the manometer on the gas bottle has to be observed. When it shows 0.4 bar at ambient temperature 20° Celsius, (1,4 bar absolute) the gas filling must be stopped. See table for filling pressure above.
5. Remove the filling hose and connect the pressure device to check the pressure inside the RMU/switchgear.
6. When the correct pressure of 0.4 bar (1,4 bar absolute) is obtained, remove the adapter and screw with tightening torque 45 Nm the manometer to the RMU/switchgear as shown above.

Observe that the sealing between the manometer and the valve is smooth and clean.

4. Operation

4.1 Operating Conditions

4.1.1 Normal Ambient Conditions

TMS is generally equipped for operation/service in normal indoor conditions in accordance with IEC 60694.

The following limitations apply:

Ambient temperature

Max. temperature +40°C

Max. temperature (24-hour average) +35°C

Min. temperature - 25°C

4.1.2 Humidity

Max. average relative humidity measured over 24 hours 95%

Max. average relative humidity measured over 1 month 90%

Max height above sea level for installation without reducing gas pressure 1,500 meters

4.1.3 Special conditions

In accordance with IEC 60694, the manufacturer and end-user must agree about special operating conditions which deviate from operation under normal conditions. The manufacturer/supplier must be consulted in advance if especially difficult operating conditions are involved. When electrical equipment is installed at more than 1,500 meters above sea level, for example, the atmospheric pressure will be lower and the overpressure in the tank will have to be reduced.

4.1.4 Airfreight

For units / modules delivered with reduced overpressure, see procedure for refilling.

4.2 Operation

All switches can be operated with the included operating handle.

Internal mechanical interlocking between the switch disconnector/isolator and the associated earthing switches prevents incorrect operation.

The isolator in the vacuum circuit breaker can only be opened after the circuit breaker is opened. Then the circuit breaker can be closed for testing purpose. The operation of the switch disconnector/circuit breaker and earthing switches can be further interlocked by means of a padlock. The earthing switches are operated by a snap action mechanism, which ensures fast closing.

The earthing switch is closed by turning the operation handle clockwise. Turning the operation handle counter-clockwise opens the switch.

In order to close the switch fuse disconnector/circuit breaker the spring mechanism must be charged. Turning the operation handle clockwise does this. Then the green “on” button must be pressed to close the switch/breaker.

An anti-reflex system, standard on all operating handles, prevents the immediate re-operation of switches.



Switch disconnector

Close: Turn the operating handle clockwise.
Open: Turn the operating handle anti-clockwise.



Earthing switch

Close: Turn the operating handle clockwise.
Open: Turn the operating handle anti-clockwise.



Isolator and Earthing switch both open

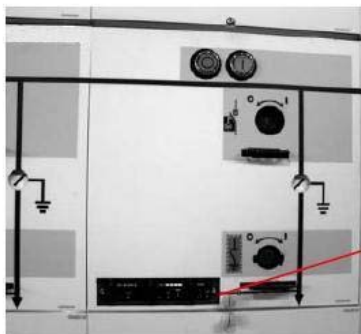
Vacuum circuit breaker

Figure 4.1: Operation

5. Additional Equipment

5.1 Capacitive Voltage Indication

Socket for capacitive voltage indication
HR-module IEC61243-5



Capacitive voltage
indicator type HR



Voltage indicator: Vim 1

6. Maintenance

All components in the SF₆ tank are maintenance-free for the declared life expectancy of the product. The tank is made of stainless steel.

If the panels sustain any scratches or damage, these must be repaired with paint to prevent corrosion.

Mechanical parts are positioned outside the tank and behind the front panel. This enables easy access and replacement if required.

Mechanical parts are surface-treated to prevent corrosion. Moving parts are lubricated at the factory for the product's life expectancy. In extreme conditions (dust, sand and pollution), inspection and maintenance will be imperative, and in some cases

replacements will be necessary. Check that the lubricant is not washed or wiped away from the mechanical moving parts.

6.1 Control and Monitoring the Gas

TMS is a pressure-sealed system that doesn't normally require special inspections. However, the gas pressure of the manometer should always be checked prior to operation.

