

# STEF

## Gas-Insulated Voltage Transformers 123 kV to 550 kV

The STEF is a dead tank type voltage transformer with composite insulator for 245 kV up to 550 kV voltage. Primary coil is housed in the tank at the unit's base. For 123 kV up to 170 kV is top core design, with primary and secondary coil housed in the head, on the top of the insulator. Internal insulation is provided by SF<sub>6</sub>. The STEF is compliant with IEC and IEEE or equivalent standards.

Over 20 years of SF<sub>6</sub> experience, in addition to optimized, dust-free production techniques, make the STEF an excellent voltage transformer choice for needs up to 550 kV.

### Protection against Bursting

A metal rupture disk is located on top of the unit. In case of a powerful internal flashover, the sudden increase in pressure will release the rupture disk. Its release pressure is calculated according to IEEE 62271-203.

### Gas Control

All components are subjected to a routine tightness test performed with a helium leak detection device, followed by a routine pressure test. A special dual-type gasket system including single-piece moulded O-rings provides excellent gas-tightness.

The density of the gas is checked by a temperature compensated density meter giving a visual control on the status of the transformer. The density meter can be equipped with alarm contacts for centralized control.

### Housing

The STEF housing consists of a corrosion-proof aluminium alloy and is designed as dead tank housing for 245 kV and above and as live tank housing up to 170 kV. It is manufactured and tested in compliance with the required national pressure vessel standards. The external insulation is done thanks to a one piece post type insulator.



STEF 123 (left) with live tank housing and  
STEF 245 (right) with dead tank housing



## Technical Data

- Rated voltage up to 550 kV
- Frequency as 50 or 60 Hz
- Higher secondary output available
- Voltage factor 1.5/30s or 1.9/8h
- Up to 3 secondary windings

## Customer Benefits

- Production in dust-free room
- Line discharge capability
- Long term accuracy stability
- Long life insulation
- Decades of on-site experience
- g<sup>3</sup> capability - green gas for grid with very low global warming potential

## Proven Design

### Composite Insulator

The composite insulator is made of fiberglass reinforced resin with sheds of silicone rubber. The color is light grey C70 according to ANSI Z 55.1. Aluminum connection flanges are bonded to the insulator with a special thin-film glue.

### Winding and Ratings

The voltage transformer meets all measurement requirements and protection for up to three windings. A separate ground-fault winding is optional.

### Thermal Burden Rating

The thermal burden rating ranges from 500 to 5,000 VA at voltages of 123 kV up to 550 kV. Higher burden ratings are possible on request.

### Cores and Primary Winding

Counting on experienced suppliers for core manufacturing, insures the accurate laminations with high degree of precision up to 550 kV.

The fully automatic machine for primary winding insures the compact design of the voltage transformer. In the next step the unique drying process can give a good control of moisture inside the winding.

### Output and Accuracy

Each winding is custom designed and manufactured to meet specific customer requirements.

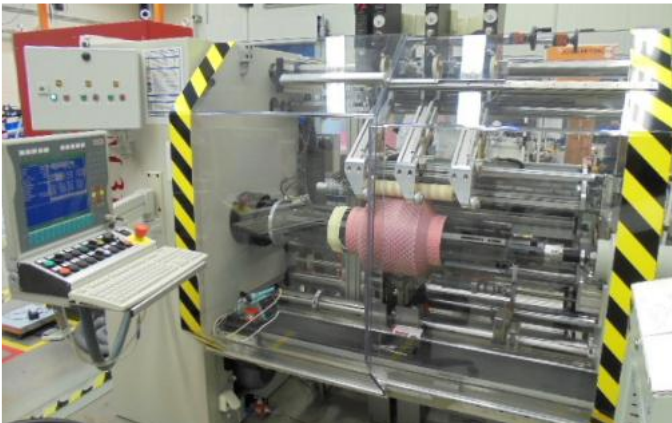
Accuracies in keeping with classes 0.1 to 3 are possible (as per IEC) for metering and measurement.



Close view of composite insulators



Gas density meter



Winding machine for primary winding



High voltage testing laboratory for instrument transformer

## Rated Voltage Factor

Rated voltage factors of 1.5/30s or up to 1.9/8h can be offered on customer request depending on the requirement of the different electrical systems.

## Commissioning, Operation and Maintenance

Units are delivered fully assembled with a transport pressure of 0.3 bars. STEF can be transported vertically for lower voltage unit (depending on permitted transportation height) or horizontally for higher voltages. Prior to energizing, the gas pressure must be increased to operation pressure. Filling can be done by a Grid Solutions service inspector or the client. Further commissioning tests are not required.

Gas pressure monitoring is significantly important for trouble-free operation. For this purpose, a temperature compensated density monitor at the base of the unit is provided which must be checked at regular intervals.

The density monitor can be used for remote control and is equipped with contacts for different pressures. It should be inspected for proper calibration at least every 6 years. The guaranteed leakage rate of 0.5 % per year is allowing the voltage transformer to be free of refilling for more than 20 years of service.

## Testing

All tests conform to national and international standards. Along with the power frequency test, the capacitance and the inner partial discharges are also measured as routine tests. Test certificates are issued and supplied.

## Inquiry Check List

- Applicable standards
- Rated frequency
- Highest system voltage
- Test voltages (power frequency, lightning impulse)
- Rated primary/secondary voltage
- Rated voltage factor
- Winding rating (burden, accuracy)
- Environmental conditions (altitude, temperatures, pollution...)
- Options: - Mini-circuit break on secondary winding - Ground cable connector - Specific seismic design
- Available accessories:
  - Lifting bar



STEF 420 during routine test

### Additional Information

#### Radio Influence Voltage (RIV):

Less than 2,500  $\mu\text{V}$  at 1,1  $U_m$

#### Internal partial discharge:

Less than 10 pC at 1.2  $U_m$

Less than 5 pC at 1.2  $U_m / \sqrt{3}$

#### Frequency:

50 Hz or 60 Hz or 16 2/3 Hz.

Other values on request.

#### Ambient temperature:

-35 °C...+40 °C on a 24h average with pure SF<sub>6</sub>.

- 60 °C with SF<sub>6</sub>/N<sub>2</sub> mixed gas.

#### Standard:

According to IEC 61869-1 and -3.

Other values on request.

#### Seismic withstand capability:

Seismic design possible on request.

## Dimensions

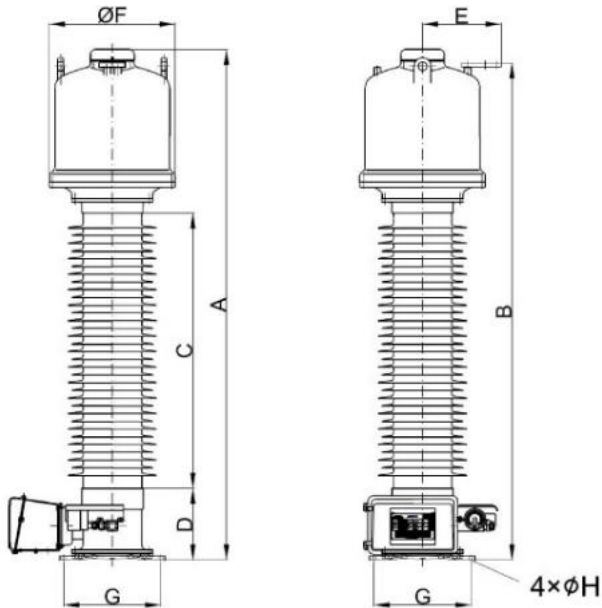
Type		STEF 123	STEF 145	STEF 170	STEF 245	STEF 362	STEF 420	STEF 550
Maximum system voltage (U <sub>m</sub> )	kV	123	145	170	245	362	420	550
Impulse test voltage (BIL)	kV	550	650	750	1,050	1,175	1,425	1,550
Minimum creepage distance (*)	mm	3,830	4,680	5,540	8,450	10,300	14,500	16,250
Dimensions mm	A	2,150	2,375	2600	3,882	4,532	5,385	5,785
	B	2,087	2,312	2,537	3,817	4,476	5,297	5,697
	C	1,055	1,280	1,505	2,470	3,120	3,680	4,080
	D	334	334	334	1,181	1,181	1,425	1,425
	E	365	365	365	342	342	390	390
	F	584	584	584	754	754	955	955
	G	450	450	450	600	600	900	900
	H	19	19	19	24	24	28	28
Total weight (approx.)	kg	225	230	240	580	670	1,350	1,400

Indicatives values only - all indicated dimensions must be confirmed with order. (\*) - standard creepage distance (mm) - other values on request.

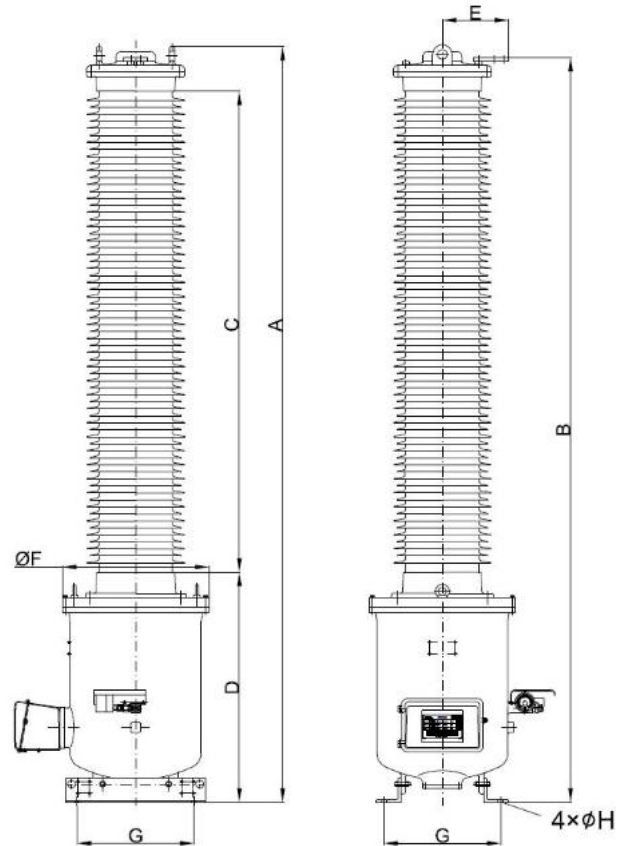
## Dimensions

The dimensions above refer to standard versions. Other U<sub>m</sub> values affect other dimensions.

The tank size can change, depending on number of secondary windings and burden. With regards to the creepage distance and clearance, the insulator can be adapted as needed.



STEF with live tank housing up to 170 kV



STEF with dead tank housing for 245 kV and above

For more information please contact  
GE Grid Solutions

### Worldwide Contact Center

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imagination at work