

List of tests that must be performed before energizing the facilities that make it possible the connection to the transmission network are as follows:

I. Primary equipments

1. List of factory acceptance Test (FAT)

a) *Circuit Breaker*

- Visual inspection
- Measurement of main circuit resistance
- Mechanical operation test
- Testing of main circuits
- Testing of secondary and control circuits
- Hermeticity test
- Gas pressure measurement test and functional control of its circuits
- Stability tests for impulse voltage
- Stability tests for industrial frequency voltage

b) *Switch*

- Visual control
- Main circuit testing
- Testing of auxiliary and control circuits
- Measurement of main circuit resistance
- Mechanical operation test
- Stability tests for impulse voltage
- Endurance tests for industrial frequency voltage

c) *Voltage Transformer*

- General control
- Measurement of capacities and losses in dielectric
- Measurement of partial discharges
- Target verification and terminal naming
- Measurement of industrial frequency stability, between primary and secondary winding sections and in the secondary winding
- Stability test for overvoltage between coils
- Endurance tests for impulse voltage
- Endurance tests for industrial frequency voltage
- Determination of errors by 10%; 100% and 120% of the load
- Temperature rise test
- Chopped tests with impulses
- Impulse voltage test at primary terminals
- Humidity test for transformers in outdoor environments
- Verification of the degree of protection from the constructive side (eg IP 55)
- Enclosure tightness test
- Closing pressure
- Capacity measurement and $\tan \delta$
- Ferro-resonance measurement test
- Transient response test

d) *Current Transformer*

- General control
- Measurement of partial discharges
- Target verification and terminal naming
- Measurement of industrial frequency stability in the primary winding
- Measurement of industrial frequency stability between the primary and secondary winding sections and the secondary winding
- Stability testing for overvoltage between coils
- Short-term current stability tests.
- Temperature rise tests
- Endurance tests for impulse voltage
- Endurance tests for industrial frequency voltage
- Determination of errors for 1% to 100% and 120% of the load
- Wet test for outdoor transformers
- Accuracy test and error determination
- Verification of the degree of protection from the constructive side (eg IP 55)
- Enclosure tightness test
- Closing pressure
- Measurement of $\tan \delta$
- Short circuit withstand capability test

e) *Surge arrester*

- General control
- Proof of partial discharges
- Insulation material test
- Endurance tests for impulse voltage
- Endurance tests for industrial frequency voltage

2. List of site acceptance test (SAT)

a) *Circuit breakers*

- General control
- Operation tests
- Contact resistance measurement test
- Connection and disconnection time
- Hermeticity test
- Visual control
- Hermeticity test
- Industrial frequency voltage endurance test
- Sustainability tests for auxiliary and control circuits
- Measurement of main circuit resistance
- Mechanical operation test
- Tests on auxiliary and command circuits
- Trial of disconnection times
- $0.8 \times I_n$ and $1.2 \times I_n$ voltage control tests

b) *Switches*

- General control
- Operation tests
- Contact resistance measurement test
- Connection and disconnection time
- Insulation resistance measurement test
- Visual verifications

- Hermetic control
 - Industrial frequency voltage endurance test
 - Sustainability tests for auxiliary and control circuits
 - Measurement of main circuit resistance
 - Mechanical operation test
 - Tests on auxiliary and command circuits
- c) *Current transformer*
- General control
 - Contact resistance measurement test
 - Insulation resistance measurement test
 - Transformation coefficient test (ratio check)
 - Proof of constructive features
 - Proof of hermeticity
 - Verification of terminal names
 - Secondary coil magnetization curve
 - Secondary versus primary polarity polarity test
 - Coefficient error testing.
 - Measurement of ohmic resistance of secondary winding
 - Volt-voltampere characteristics of secondary windings
- d) *Voltage transformer*
- General control
 - Insulation resistance measurement test
 - Transformation coefficient test (ratio check)
 - Magnetization curve test (knee point)
 - Measurement of winding resistance
 - Proof of hermeticity
 - Verification of terminal names
 - Industrial Frequency Stability Test at
 - primary windings and measurement of partial discharges
 - Coefficient error testing
 - Secondary versus primary polarity polarity test
 - Measurement of the ohmic resistance of the secondary winding
- e) *Surge arrester*
- General control
 - Insulation resistance measurement test
 - Cleaning the insulator surface
 - Check the connection of the discharger to the counter and then to the earthing network
 - Proof of partial discharges
 - Proof of hermeticity

II. **Energy Measurement**

1. **Factory acceptance test (FAT)**

- a) *Test the complete reports of current transformers according to the IEC standard in the factory*
- Short-term current stability tests
 - Temperature rise tests
 - Endurance tests for impulse voltage
 - Endurance tests for industrial frequency voltage

- Determination of errors for 1% to 100% and 120% of the load
 - Wet test for outdoor transformers
 - Accuracy test and error determination
 - Verification of the degree of protection from the constructive side (eg IP 55)
 - Enclosure tightness test
 - Closing pressure
 - Measurement of $\tan \delta$
 - Short circuit withstand capability test
- b) *Test complete reports of Voltage Transformers according to IEC standard in the factory*
- Endurance tests for impulse voltage
 - Endurance tests for industrial frequency voltage
 - Determination of errors by 10%; 100% and 120% of the load
 - Temperature rise test
 - Chopped tests with impulses
 - Impulse voltage test at primary terminals
 - Humidity test for outdoor transformers
 - Accuracy test
 - Verification of the degree of protection from the constructive side (eg IP 55)
 - Enclosure tightness test
 - Closing pressure
 - Capacity measurement and $\tan \delta$
 - Ferro-resonance measurement test
 - Transient response test
- c) *Electricity meter calibration certificate according to the factory standard IEC 62053-22 and IEC 62053-23.*

2. Site acceptance test (SAT)

- a) *Test reports of current transformers according to IEC standard. (to identify the test equipment, accompanied by its calibration certificates).*
- Secondary coil magnetization curve
 - Secondary winding polarity test versus primary winding
 - Coefficient error testing
 - Measurement of ohmic resistance of secondary winding
 - Volt-voltampere characteristics of secondary windings
 - Insulation measurement
- b) *Complete test reports of voltage transformers according to the IEC standard (to identify the test equipment, accompanied by its calibration certificates).*
- Coefficient error testing
 - Secondary versus primary polarity test
 - Measurement of the ohmic resistance of the secondary winding
 - Insulation measurement
- d) *Test on energy meters.*
- Complete SET-UP configuration list of the meter

- Test reports of the meter communication with the monitoring platform of OST sh.a.

III. **Protection relay**

Tests to be performed for Relay Protection Equipment before energization

1. *110 kV, 220 kV dhe 400 kV Line Bay*

- a) Functional bay tests - interlocutors, commands, signals,,
- b) Main protection tests (Mbrojtja Distanzionale)
 - Characteristic tests of remote protection areas according to the tariffs
 - SOTF function test within remote protection (F21)
 - Synchronization function test (F25)
 - Ground-based protection test (F67N) according to tariffs
 - PAK test (F79)
- c) Main protection 2 (for lines 220 kV and 400 kV)
 - Characteristic tests of remote protection areas according to the tariffs
 - SOTF function test within remote protection (F21)
 - Synchronization function test (F25)
 - Ground-based protection test (F67N) according to tariffs
 - PAK test (F79)
 - Test of the function of maximum protection with automatic drop of voltage transformer
- d) Backup protection (for 110 kV lines)
 - Maximum protection function test (F51)
 - Unfavorable soil protection test (F50N), (F51N)
 - Directed ground protection function test (F67N)
 - Surge protection function (F59)
 - Phase asymmetry protection function (F46)

2. *Transformer Bay 110 kV, 220 kV dhe 400 kV*

- a) Main Protection 1
 - Differential protection test (F87)
 - Maximum protection test (F51)
- b) Back Up Protection
 - Maximum protection tests (F51)
 - Nuclear protection tests (F51N), (F50N)
 - Overvoltage protection tests (F59)

