

The image features a background of an industrial facility with a blue corrugated metal wall and yellow safety railings. A large, multi-colored graphic consisting of overlapping circles in cyan, green, and purple is positioned on the left side. A bright, glowing white lightning bolt strikes a metal pipe in the center of the image. In the foreground, a thick, white, braided cable runs horizontally across the frame. The EDP Labelec logo is located in the top right corner.

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Labelec

Center of technical excellence

Electrical Energy Lab

Testing Labs

HV power cables

Test standards

- **IEC 60840**
 - Power cable with extruded insulation and their accessories for rated voltages above 30kV (Um = 36kV) to 150kV (Um = 170kV)

Type tests

- §12.4.4 Partial discharge test on cable systems
- §12.4.5 Tan delta measurement
- §12.4.6 Heating cycle voltage test *
- §12.4.7 Lightning impulse voltage test followed by a power frequency voltage test on cable systems

On-site tests

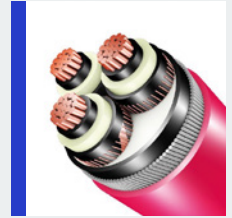
- Insulation Resistance and Capacitance Measurement *
- LIRA – Line Impedance Resonance Analysis *
- TDR – Time Domain Reflectroscopy *



MV power cables

Test standards

- **IEC 60502-2**
 - Power cable with extruded insulation and their accessories for rated voltages from 6kV ($U_m = 7,2kV$) up to 30kV ($U_m = 36kV$)



Type tests

- §18.2.5 Partial discharge test
- §18.2.6 Tan delta measurement
- §18.2.7 Heating cycle test *
- §18.2.8 Impulse test followed by a voltage test
- §18.2.9 Voltage test for 4 hours (screened)
- §18.3.2 Insulation resistance measurement at ambient temperature
- §18.3.3 Insulation resistance measurement at maximum conductor temperature
- §18.3.4 Voltage test for 4 hours (unscreened)
- §18.3.5 Impulse test

Routine tests

- §16.2 Electrical resistance of conductors
- §16.3 Partial discharge test
- §16.4 Voltage test

On-site tests

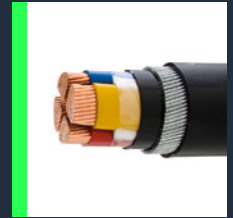
- Insulation Resistance and Capacitance Measurement *
- LIRA – Line Impedance Resonance Analysis *
- TDR – Time Domain Reflectroscopy *
- Tan delta, Capacitance and Partial Discharge Measurements (VLF – 0,1Hz) *

LV power cables



Test standards

- **IEC 60502-1**
 - Power cable with extruded insulation and their accessories for rated voltages from 1kV ($U_m = 1,2kV$) up to 3kV ($U_m = 3,6kV$)



Type tests

- §17.1 Insulation resistance measurement at ambient temperature
- §17.2 Insulation resistance measurement at maximum conductor temperature
- §17.3 Voltage test for 4 hours
- §17.4 Impulse test

Routine tests

- §15.2 Electrical resistance of conductors
- §15.3 Voltage test

On-site tests

- Insulation Resistance and Capacitance Measurement *
- LIRA – Line Impedance Resonance Analysis *
- TDR – Time Domain Reflectroscopy *

Cable accessories



Test standards

- **IEC 60502-4**
 - Power cable with extruded insulation and their accessories for rated voltages from 6kV ($U_m = 7,2kV$) up to 30kV ($U_m = 36kV$)
 - Part 4: Test Requirements on accessories for cables with rated voltages from 6kV ($U_m = 7,2kV$) up to 30kV ($U_m = 36kV$)
- **IEC 61442**
 - Test methods for accessories for power cables with rated voltages from 6kV ($U_m = 7,2kV$) up to 30kV ($U_m = 36kV$)



Type tests

- **IEC 61442**
 - §4 - AC voltage tests
- **IEC 61442**
 - §6 - Impulse tests
- **IEC 61442**
 - §7 - Partial discharge measurement
- **IEC 61442**
 - §8 - Tests at elevated temperature *
- **IEC 61442**
 - §9 - Heating cycles voltage test *

Post insulators

Test standards

- **IEC 60168**
 - Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000V
- **IEC 60660**
 - Insulators – Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1000V up to but not including 300kV
- **ANSI C29.1**
 - Test Methods for Electrical Power Insulators



IEC 60168 (ceramic) tests

- §4.5 Dry lightning-impulse withstand voltage test – Type test
- §4.6 Dry or wet switching-impulse withstand voltage tests – Type test
- §4.7 Dry power-frequency withstand voltage test – Type test
- §4.8 Wer power-frequency withstand voltage test – Type test
- §4.9 Puncture test
- §5.2 Mechanical failing load test

IEC 60660 (organic) tests

- §3.3 Dry lightning impulse withstand voltage test
- §3.4 Dry power-frequency withstand voltage test
- §3.5 Partial discharge extinction voltage test
- §3.6 Lightning impulse puncture test
- §3.7 Mechanical failing load test

ANSI C29.1 tests

- §4 Electrical Tests (RIV Test not accredited)

Overhead lines glass and ceramic insulators

Test standards

- **IEC 60383-1**
 - Insulators for overhead lines with a nominal voltage above 1000V
 - Part 1: Ceramic or glass insulator units for a.c. systems
 - Definitions, test methods and acceptance criteria
- **IEC 60383-2**
 - Insulators for overhead lines with a nominal voltage above 1000V
 - Part 2: Insulator strings and insulator sets for a.c. systems
 - Definitions, test methods and acceptance criteria
- **ANSI C29.1**
 - Test Methods for Electrical Power Insulators

IEC 60383-1 tests

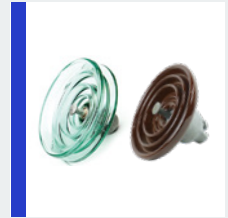
- §13 Lightning impulse voltage tests – Type test
- §14 Wet power-frequency voltage tests – Type test
- §15 Puncture withstand test
- §17 Verification of the dimensions – Type test

IEC 60383-2 tests

- §9 Lightning impulse voltage test
- §10 Wet power-frequency voltage tests
- §11 Wet switching impulse voltage tests

ANSI C29.1 tests

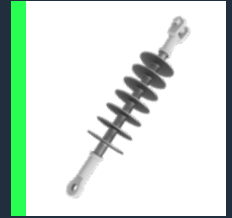
- §4 Electrical Tests (RIV Test not accredited)



Composite insulators

Test standards

- **IEC 61109**
 - Insulators for overhead lines
 - Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria
- **ANSI C29.1**
 - Test Methods for Electrical Power Insulators

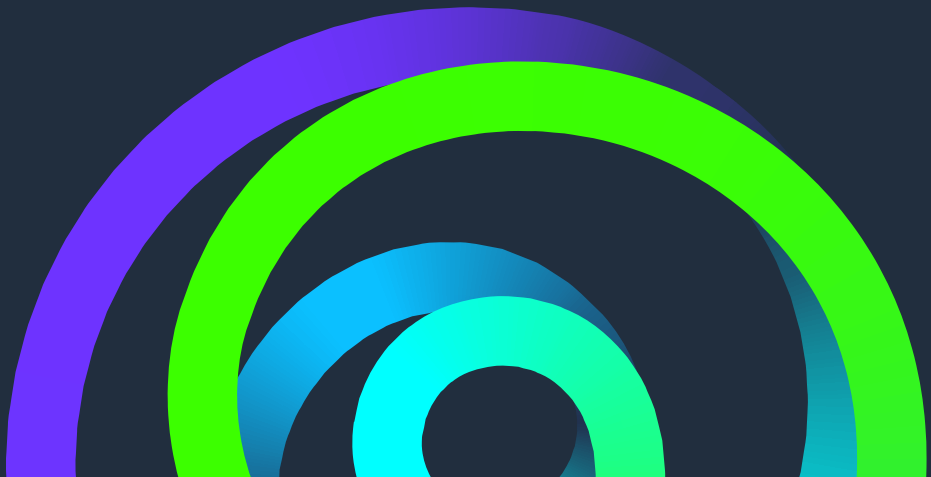


IEC type tests

- §11.1 Electrical Tests (following IEC 60383-2)

ANSI C29.1 tests

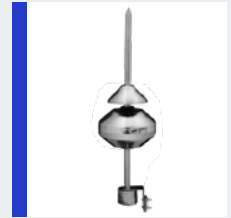
- §4 Electrical Tests (RIV Test not accredited)



Early streamer emission air terminal (ESEAT)

Test standards

- **NP 4426**
 - Proteção contra descargas atmosféricas
 - Sistemas com dispositivo de ionização não radioativo
- **UNE 21186**
 - Protección contra el rayo: Pararrayos com dispositivo de cebado
- **NF C 17-102**
 - Protection contre la foudre
 - Systèmes de protection contre la foudre à dispositif d'amorçage



Tests

- **NP 4426**
 - §C.3.5 - Ensaíos de avanço de ionização
- **UNE 21186**
 - §C.3.5 - Ensayos de avance en el cebado
- **NF C 17-102**
 - §C.3.5 - Essais d'avance à l'amorçage





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