

suspension insulator definition



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Chapter 1

Suspension Insulator Definition

1.1 Suspension insulator definition

By Orient Power

Suspension insulator definition



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Definition of suspension insulator:

A suspension insulator is an insulator which can assemble with other metal parts and provides the means for non-rigidly supporting electric conductors.

Suspension insulator voltage range can be from 10KV to 1000KV, is widely used in the transmission and distribution line.

Suspension insulator can be divided into porcelain suspension insulator and silicon rubber suspension insulator according to the material.

Porcelain suspension insulator:

Porcelain suspension insulator can also be called disc insulator. By the way of insulator string, suspension insulator can adapt to different voltages. Disc suspension insulator is used to carry a line conductor at its lower end, and the top is fixed to the cross arm of the tower.

Classification of ceramic suspension insulator according to the shed-type:

- ✧ Nominal type
- ✧ Bell shaped type
- ✧ Double sheds or tri-sheds types
- ✧ Aerodynamic type

Silicon rubber suspension insulator:

Composite suspension insulator has big creepage distance and this can be got through alternative sheds.

Standard for suspension insulator:

ANSIC29.1, ANSIC29.2, IEC60383, IEC 61109...

Mechanical strength for suspension insulator:

40KN,70KN,80KN,90KN,100KN,120KN,160KN,210 KN,300KN, 530KN

Suspension Insulator classification



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✚ According to the material:

- Porcelain suspension insulator
- Silicone rubber suspension insulator
- Glass suspension insulator

Porcelain suspension insulator:

- ANSI 52 series
- IEC U70BL series
- Anti-pollution series

Silicone rubber suspension insulator

- 10kv-36kv on distribution line
- 66kv-1000kv on transmission line
- 15kv-69kv dead-end suspension insulator

✚ According to the end hardware connection way:

- Ball & socket type suspension insulator
- Clevis & tongue type suspension insulator

✚ According to the pollution status of the environment:

- Common type suspension insulator
- Anti-pollution suspension insulator

The suspension insulators play an important part in the transmission and distribution line.

IEC disc suspension insulator



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IEC disc suspension insulator usually means the ceramic suspension insulator.

IEC disc suspension insulator is an assembly of one or more shells with metallic fittings.

Disc suspension insulator is nonrigid supporting type because of their connection of fitting.

Metallic fittings for IEC suspension insulator:

- ✧ Socket and ball
- ✧ Clevis and tongue

The left picture can show you this two types.

This structure enables them form the insulator string by fitting into themselves one another as per voltage requirement.

Main type of IEC disc suspension insulator:

- ✧ U70BS U70BL U70C
- ✧ U100BL U120B U160BS
- ✧ U210B U300B U530B
- ✧ XHP-70 XHP-120 (this is for China name)

The meaning of the model type:

For example, U70BL, “U” means a cap and pin insulator, “70” is the mechanical failing load, “B” is the ball and socket type insulator, “L” is long spacing.

So we can judge some parameters through the disc suspension insulator name.

IEC disc suspension insulator is according to the IEC60383, Orient power can also provide the design as per customer's requirements.

Suspension Insulator Tests



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✚ **Suspension insulator tests:**

Orient Power does tests on all the suspension insulators, because the tests for the insulators can affect the quality of the suspension insulator.

✚ **Porcelain suspension insulator tests:**

- Design tests: Low-frequency dry/wet flashover test, Critical impulse flashover tests-positive and negative, Radio-influence voltage test, Thermal-mechanical load cycle test, Thermal shock test, Residual-strength test...
- Quality conformance tests: Visual and dimensional tests, Porosity test, Galvanizing test, Combined mechanical and electrical-strength tests, Puncture tests
- Routine tests: Cold-to-hot/hot-cold thermal shock test, Tension proof test, Flashover test.

✚ **Silicone rubber suspension insulator tests:**

- Design tests: Tests on interfaces and connections of end fittings, Tests on core material, Tracking and erosion test...
- Type tests: Electrical tests...
- Sample tests: Verification of dimensions, mechanical test, dye penetration test, gauging test...
- Routine tests: Mechanical routine test, Visual examination

Suspension Insulator Specification



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🚩 Porcelain suspension insulator specification:

- **ANSI 52 series:**

Leakage distance: 171mm, 178mm,
210mm, 280mm, 292mm

Rated E&M failing load: 44KN, 70KN, 111LN,
160KN

Tension proof load: 22KN, 35KN, 55.5KN,
80KN

- **IEC U70BL series:**

Leakage distance: 295mm, 320mm, 370mm, ,
600mm

Rated E&M failing load: 70KN, 100KN, 120LN,
160KN, 210KN, 300KN, 530KN

Routine tension load: 35KN, 50KN, 60KN,
80KN, 105KN, 150KN, 265KN

- **Anti-pollution series:**

Leakage distance: 432mm

Rated E&M failing load: 70KN, 80KN, 120KN,
160KN, 210KN

Routine tension load: 35KN, 60KN

🚩 Silicone rubber suspension insulator specification:

Rated voltage: 10KV, 11-15KV, 12KV, 33/36KV,
22/24KV, 33/36KV, 35KV, 15KV, 69KV, 52KV,
46KV, 132KV, 145KV, 161KV, 220/245KV, 330KV,
400KV, 500KV, 66/69KV, 110KV

Specified mechanical load: 70KN, 40KN, 80KN,
90KN, 100KN, 120KN, 160KN, 210KN, 300KN

Suspension insulator voltage



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Suspension insulator is widely used in the transmission and distribution line, the voltage range can be from 10kv to 1000kv.

Distribution line: 10kv~36kv

Transmission line: 66kv~1000kv

Suspension insulator voltage class:

- ✧ 10kv, 11kv, 12kv, 15kv
- ✧ 22kv, 24kv, 25kv
- ✧ 33kv, 35kv, 36kv
- ✧ 66kv, 69kv, 110kv
- ✧ 132kv, 245kv, 161kv
- ✧ 220kv, 275kv, 330kv
- ✧ 400kv, 500kv, 750kv, 800kv, 1000kv

Voltage type of suspension insulator:

- ✧ Rated voltage
- ✧ Highest system voltage
- ✧ Low frequency dry flashover voltage
- ✧ Low frequency wet flashover voltage
- ✧ Impulse flashover voltage
- ✧ Radio-influence voltage
- ✧ Puncture voltage

Suspension insulator voltage is also very important parameters when design the insulator. For the porcelain insulator, usually through the insulator string connect, we can judge the voltage according to the quantity of string.

Composite suspension insulator voltage can be known from the insulator length.

More insulator information, welcome to visit orient power website.

ANSI suspension insulator



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Usually, the insulator material has the ceramic and composite, so the ANSI suspension insulator can be divided into porcelain suspension insulator and polymer insulator:

ANSI standard suspension insulator is: ANSIC29.2, ANSIC29.11-89.

Color for ANSI suspension insulator:

Porcelain: grey, gray, brown, white

Composite: red, grey, gray

Types of ANSI suspension insulator:

Porcelain: ANSI52-1, ANSI52-2, ANSI52-3, ANSI52-4, ANSI52-5, ANSI52-6, ANSI52-7, ANSI52-8, ANSI52-9A

Composite: there is no specific model, should design according to customer's request.

Design test for ANSI suspension insulator:

Porcelain:

- ✧ Low frequency dry/wet flashover test
- ✧ Critical impulse flashover test(positive and negative)
- ✧ Radio-influence voltage test
- ✧ Thermal-mechanical load cycle test
- ✧ Thermal shock test
- ✧ Residual strength test
- ✧ Impact test
- ✧ Cotter key test
- ✧ Cement expansion

Composite:

- ✧ Lighting critical-impulse flashover test
- ✧ Alternating-voltage rated dry flashover test
- ✧ Switching critical-impulse flashover test

Suspension Insulator Material



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✚ Suspension insulator material:

Normally there are three kinds of materials for suspension insulator: silicone rubber and porcelain or ceramic, and glass.

✚ Porcelain suspension insulator:

Generally, the porcelain suspension insulator is made of good commercial grade wet-process porcelain C110, C120, C130.

- Porcelain suspension insulator advantage:
 - The strong ionic bonding and close packing of atoms constitute porcelain, which makes sure the stability of the suspension insulator.
 - Low raw material cost
- Porcelain suspension insulator disadvantages:
 - Breakage, ceramics are very brittle
 - The porcelain bodies are very heavy

✚ Silicone rubber suspension insulator:

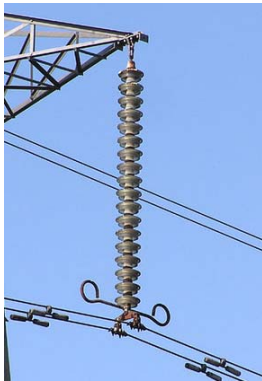
- The raw material of the silicone rubber suspension insulator includes white carbon black, aluminum hydroxide and gum.
- Advantages: light weight, good pollution performance, the manufacturing process is shorter than porcelain.

✚ Glass suspension insulator:

- Raw material is toughened glass.
- Advantage: no need to check zero value.

✚ **Conclusion:** As the silicone rubber has more advantage over the porcelain, so more and more country choose the silicone rubber suspension insulator instead of porcelain suspension insulator.

Suspension Insulator String



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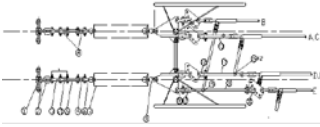
The suspension insulator string:

- The suspension insulator string is used in the vertical direction.
- The suspension insulator can be classified as single suspension insulator string and double suspension insulator string.
- The single suspension insulator string can be used together with the other type of insulators on some certain conditions.

✚ Suspension insulator string properties:

- Each suspension disc is designed for normal voltage rating 11KV (Higher voltage rating 15KV), so by using different numbers of discs, a suspension string can be made suitable for any voltage level.
- If any one of the disc insulators in a suspension string is damaged, it can be replaced much easily.
- Mechanical stress on the suspension insulator is less since the line hanged on a flexible suspension string.
- As the current carrying conductors are suspended from supporting structure by suspension string, the height of the conductor position is always less than the total height of the supporting structure. Therefore, the conductors may be safe from lightning.

Electrical Fittings for Insulator String



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Types of insulator string:

Suspension insulator string

Tension / strain insulator string

Jumper insulator string

Electrical fittings for insulator string:

Insulator string or composite insulators need to be connected with electrical fittings and then connect them with the power towers at ground end and conductors at live end.

Types of electrical fittings:

- Electrical link fittings

Ball eye, ball clevis, socket eye, socket tongue, socket clevis, socket thimble, anchor shackle, twisted shackle, twisted strap, clevis eye, twisted strap, eye chain link, chain link, clevis tongue, extension link, U-bolt, adjusting plate, yoke plate, turnbuckle

- Suspension clamps

Suspension clamp U bolt type

Preformed armour grip suspension clamp

- Strain clamps

Strain clamp for ACSR, AAAC, steel wire

Hydraulic compression type

Deadend bolted type

Material for electrical fittings:

- Aluminium alloy
- Hot dip galvanized, HDG iron
- Steel
- Stainless steel
- Copper

Coupling size of electrical fittings:

16mm, 20mm, 24mm

Mechanical failing load strength:

70KN, 100KN, 120KN, 160KN, 210KN, 250KN, 300KN, 420KN, 500KN