

Suspension Insulator Selection Guide: Disc Count, SML, and Creepage Distance

Select a cap-and-pin string from the actual electrical, pollution, mechanical, and coupling requirements; do not infer disc count from voltage alone.

Offline reading copy of the web article. This is not a product datasheet, type-test certificate, quotation, or installation instruction. Confirm the exact project requirements and supplier evidence before procurement.

A cap-and-pin suspension string is an assembly, not a voltage rating attached to a single disc. Selection combines system insulation coordination, site pollution, conductor and environmental loads, coupling geometry, and the utility's approved construction. This guide identifies the information needed for a defensible specification; it does not prescribe a universal disc count or field maintenance interval.

Determine Voltage Class and Baseline Disc Count

Record nominal and highest system voltage, applicable withstand levels, altitude, line configuration, and utility insulation-coordination rules. Shortlist the exact disc model and obtain its tested electrical values and unit spacing. Calculate a preliminary string from the project requirements, then verify the assembled string against clearances and all applicable performance criteria. The same system voltage can require different counts under different designs and environments.

Inputs for an initial string calculation

Input	Source	Why it matters
System insulation requirement	Utility and project specification	Sets electrical performance target
Disc electrical values	Exact model datasheet and test records	Checks the proposed unit
Unit spacing and total length	Approved drawing	Checks geometry and clearance
Altitude and site conditions	Project data	Identifies required corrections

Apply IEC 60815 Pollution Correction

[IEC TS 60815-1:2025](#) outlines how site pollution severity and the chosen insulator's properties feed a dimensioning decision. Ceramic and glass units are addressed in the corresponding part of the series. Determine the required creepage from the adopted edition and local utility method, then compare it with the actual per-unit creepage and complete string geometry. Do not reuse an old fixed millimetres-per-kilovolt figure without checking its definition, voltage basis, site class, and correction factors.

Pollution review checklist

Question	Required evidence
What is the site severity?	Site assessment and utility classification
What is the proposed profile?	Exact unit drawing and creepage distance
What string is proposed?	Disc count, assembled length, and electrical calculation
What is the operating plan?	Approved inspection and maintenance procedure

Specify Mechanical Load Class (SML)

Obtain everyday and extreme conductor tensions, wind, ice, stringing, and other load cases from the line designer. State the required mechanical rating using the terminology and tests of the adopted product standard, and verify that the actual disc and complete string components meet the calculated duty. A destructive failing-load result or catalogue number must not be treated as an automatic allowable continuous working load. Do not convert one rating to another using a universal factor from an article.

Mechanical documents to request

Document	Purpose
Line loading calculation	Defines the design loads and safety margin
Disc rating and test report	Verifies the specified mechanical class
String and fitting drawings	Checks the weakest assembly component and geometry

Verify Ball-Socket Hardware Compatibility

[IEC 60120:2020](#) defines standard ball-and-socket coupling dimensions for string units and associated fittings. Specify the coupling series, locking device, and all mating hardware on the assembly drawing. Do not infer coupling size from mechanical class alone, or assume mixed-manufacturer parts fit merely because both descriptions mention IEC 60120; inspect the actual dimensional and locking evidence.

Choose Disc Material: Porcelain vs. Toughened Glass

[IEC 60305:2021](#) addresses characteristics of ceramic or glass cap-and-pin units; [IEC 60383-1:2023](#) addresses relevant tests and acceptance criteria. Compare exact models for mechanical and electrical performance, pollution profile, inspection approach, availability, and project cost. A broken toughened-glass shell may be visually identifiable, but glass does not self-heal; neither material has a universal annual failure rate or cleaning schedule.

Material comparison at the product level

Factor	Porcelain proposal	Glass proposal
Electrical and mechanical ratings	Check exact model and reports	Check exact model and reports
Pollution profile	Check actual creepage and shed geometry	Check actual creepage and shed geometry
Inspection	Follow utility defect criteria	Follow utility defect criteria, including shattered-shell identification
Cost	Compare complete project quotation	Compare complete project quotation

Common Installation and Commissioning Issues

Before stringing, verify unit markings, damaged shells, end fittings, locking devices, and drawing conformity. Use the utility-approved lifting, stringing-tension, cleaning, and commissioning procedures for the specific line. Do not apply a generic “percentage of mechanical class” as a safe stringing tension or prescribe high-pressure washing from an online guide. Any electrical testing of an energized or installed string must be performed only under a qualified safety procedure.

Six Common Suspension Insulator Specification Errors

1. Selecting disc count from nominal kV without insulation-coordination and pollution data.
2. Quoting a mechanical failing-load number as the allowable service load.
3. Using creepage from a different disc profile or model.

4. Omitting coupling series, locking device, or matching fitting drawings.
5. Assuming a type report for one design covers every offered variant.
6. Promising a complete report set or delivery date before the actual manufacturer confirms it.

Related Technical Topics

For a formal RFQ, provide the line voltage and insulation requirements, site pollution assessment, conductor tension and span data, preferred material or accepted alternatives, unit and fitting drawings, quantity, delivery destination, tender deadline, and mandatory-document list. We can then review product and evidence availability before confirming whether a technical proposal is feasible.

Standards scope: [IEC 60305:2021](#), [IEC 60383-1:2023](#), [IEC 60120:2020](#), and [IEC TS 60815-1:2025](#). Verify the full adopted editions and project-specific calculations.

Frequently Asked Questions

How many suspension insulator discs are needed for a 132 kV line?

There is no universal disc count for that nominal voltage. The line designer must check insulation coordination, site pollution, the exact disc's electrical and creepage values, altitude, string geometry, and utility requirements.

What is the difference between SML and MFL in suspension insulators?

Specified and measured failing-load terms serve different purposes. Use the exact adopted standard and manufacturer report to identify each rating; do not convert a test result into an allowable working load using a generic multiplier.

When should I choose a long-rod instead of a cap-and-pin string?

Compare the complete designs for electrical duty, mechanical load, pollution, installation, inspection, and utility qualification. IEC 60433 covers ceramic long-rod units; IEC 62155 covers hollow ceramic or glass insulators for electrical equipment and is not the ceramic long-rod product standard.

What hardware socket size should I specify with IEC 60305 suspension discs?

Use the coupling series and dimensions on the exact disc and fitting drawings, with the appropriate locking device. IEC 60120 defines standard ball-and-socket dimensions, but a mechanical class alone does not establish the mating size.

Can porcelain and toughened glass suspension discs be used in the same string?

Do not assume interchangeability from material or coupling designation alone. Any mixed string needs utility and line-designer approval after checking the complete assembly's electrical, mechanical, dimensional, and maintenance requirements.

How do I control tension during suspension insulator installation?

Use the approved stringing plan, load calculations, equipment, and monitoring procedure. Do not use a fixed percentage of a catalogue rating from an article as a safe installation limit.

How often should suspension insulator strings be cleaned in polluted areas?

Follow the utility's maintenance plan based on site pollution severity, condition monitoring, equipment type, and safe-work rules. IEC 60815 is a selection and dimensioning series, not a universal calendar for washing live lines.