

SEDIVER

TOUGHENED GLASS INSULATORS FOR HVAC APPLICATIONS



Experts & Pioneers

WORLDWIDE - 2024

Sediver®, experts and pioneers in insulation technology

Sediver® was established in 1898 in Saint-Yorre, France. Its history is shaped by a series of innovations and successes that have made Sediver® what it is today: the partner of choice for utilities worldwide.

We bring deep knowledge and on-the-ground experience in designing power lines and equipping them with high quality toughened glass insulators suitable for all environments.

Our significant recurring R&D investments have resulted in a level of technical know-how that is unique on the market. We are proud of the relationships we have built with our customers around the world. Our mission is to give everyone access to electricity while minimising environmental impacts.

Supported by a global network of business partners, we maintain the closest of relations with all our customers in over 150 countries.

This catalogue presents a selection of our Sediver® toughened glass insulator products, meeting customers' needs worldwide in terms of technical standards (ANSI/IEC/BS), best practices and environmental conditions. Sediver® toughened glass insulators satisfy and exceed the performance requirements of all standards.

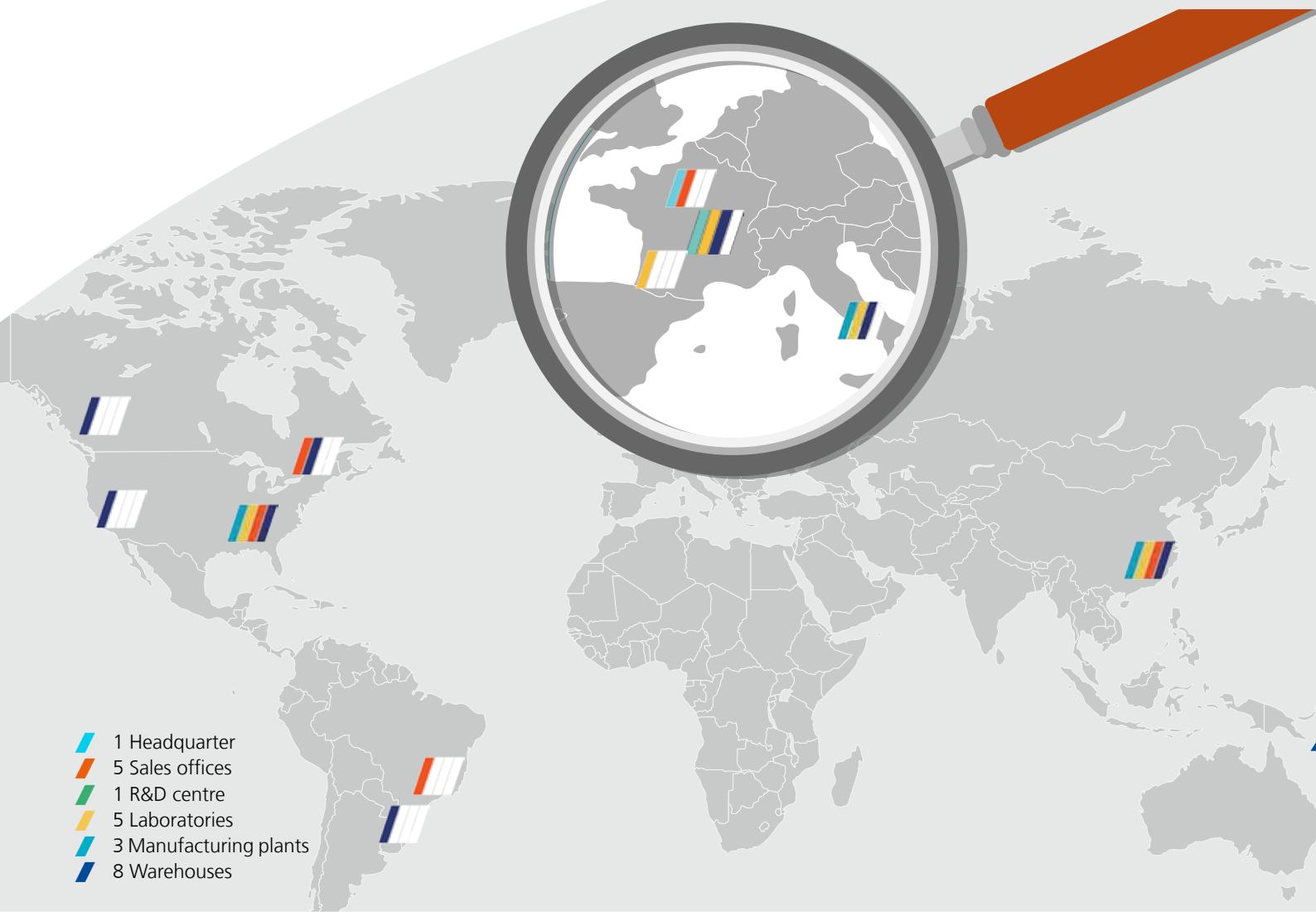


Over 600 toughened glass insulators installed in more than 150 countries on lines up to 1,100 kV AC,

Over 11 toughened glass DC insulators installed on lines up to 800 kV,
15 million insulators installed on lines ≥ 735 kV AC/DC UHV.

Over 4.5 million Sedicoat insulators, silicone-coated toughened glass insulators for both AC and DC applications.

Worldwide presence



- 1 Headquarter
- 5 Sales offices
- 1 R&D centre
- 5 Laboratories
- 3 Manufacturing plants
- 8 Warehouses

We support the energy transition by enabling a reliable and sustainable electricity supply

Our decades of experience have given us ample opportunities to experiment with and test different insulator technologies. Since 1947, we have maintained a sharp focus on the one technology capable of giving our customers the confidence and assurance they demand: toughened glass.

Since then, we have consistently innovated to improve our products for:

- greater efficiency in all operating conditions
- longer lifespans in all environments
- easier installation
- simpler line maintenance
- lower total cost of ownership.

And, as suppliers of one of the most extensive product lines on the market, we are positioned to support all types of project worldwide.



We manufacture high quality toughened glass insulators

Why glass?

Glass is fully amorphous, it is a frozen liquid. This means it has no crystallographic structure responsible for ageing. Our unique manufacturing process makes glass even more reliable, stable and strong. We have decades of knowledge of this material, enabling us to provide our customers with unique benefits throughout the life cycle of their transmission line.



Our own distinctive manufacturing process

- A **high-purity** glass with an **outstandingly homogeneous chemical composition**.
- A unique know-how enabling us to create **complex glass shapes** and products up to 420 mm (16½") in diameter and weighing more than 10 kg (22 lbs).
- A toughening process developed by Sediver® that generates a compressive pre-stress on the surface of the glass shells, giving the glass a high mechanical strength and increasing its resistance to thermal shocks and mechanical impacts and its immunity to the effects of ageing.
- A highly automated manufacturing process perfected over the years by Sediver®, guaranteeing consistently high levels of quality in terms of materials and final product assembly.
- Assembly using a **specific hot curing process** and a chemically inert cement (high strength aluminous cement) immune to the cement growth phenomena, promising outstanding mechanical stability over time and very high mechanical strength.
- **Galvanisation and zinc sleeves that prevent corrosion of metal fittings** and help extend the service life of insulators.
 - A **stringent quality system** comprising systematic controls and inspection of insulators during manufacturing, all **constantly and automatically monitored** and supervised by qualified inspectors.
 - A **standardised process across all production facilities, guaranteeing consistent product performance worldwide**.
 - A **quality assurance system** and individually marked units that ensure full traceability of all insulators.
 - A **low shattering rate**, guaranteed <1/10,000 per year due to the high purity of our Sediver® glass and outstanding process.



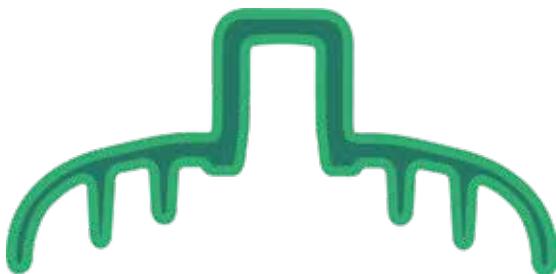
GLASS LINE



ASSEMBLY LINE

The toughening process

The toughening process **exposes the glass shell to pre-stress** through rapid and precisely controlled cooling. This creates **compressive forces** on the outer surface layer, counterbalanced by extension forces operating within the body of the glass shell.



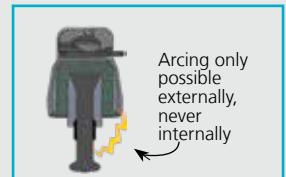
Toughening improves our insulators:

- High mechanical strength
- High resistance to thermal shocks
- No ageing
- High resistance to the most extreme surges, including switching surges, steep front lightning strikes and power arcs
- Unique property of **breaking in a predictable pattern** in case of mechanical or electrical overstress: crumbling of the glass shell results always in fragments of safety glass with no razor-sharp shards
- **Binary nature:** exists in one of two well-defined states, either fully intact or as a mechanically and electrically safe stub. Visual inspection provides 100% infallible data at glance: no possible hidden cracks, easy inspection, no instruments needed

With glass, no line drops



Intact shell



Damaged shell

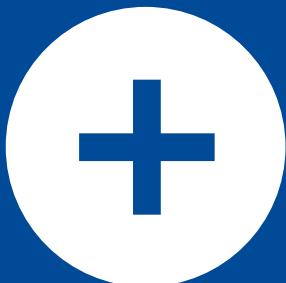
- Guaranteed absence of internal cracks and electrical punctures
- 100% mechanical rating guaranteed over prolonged periods, even in very harsh conditions
- 100% electrical strength

Therefore

- Easier inspection: no need to climb structures or use sophisticated instruments
- Greater worker safety in live-line operations
- Very low-cost inspection throughout the service life of the line
- No risk of separation or line drops
- No urgency in replacing a unit with a broken shell
- Long-term savings in maintenance operations

Global user benefits

- Superior mechanical, electrical and safety performance.
- Very **resistant** to rough handling.
- **Easy transportation** and installation at site.
- **No risk of installing a damaged unit.**
- Residual mechanical strength: **no immediate need to replace an insulator with a broken glass shell.**
- •**A Sediver® glass insulator lifetime equal to or greater than that of conductors, hardware and structures.**
- Sediver® toughened glass insulators = **lowest life cycle cost of all insulating solutions.**



Our worldwide network of experts at your service

Innovating to bring our customers greater added value every day

At Sediver®, we invest heavily in R&D. The drive to innovate is one of our biggest motivators. For a mission-critical product like high voltage transmission line insulators, innovation is not just possible, it's vital!

Our R&D department is actively committed to improving the performance, sustainability and reliability of our products and services.

- By **working closely with our customers** to help design the most efficient lines possible and developing custom solutions for their projects.
- By **developing products** for the environments in which they will be used. We deliver researched and tested solutions for efficient use, operation, maintenance and resistance to harsh environments.
- By **offering training classes** to help our customers keep abreast of the latest regulatory and technical requirements.
- By **sharing our results** with the international technical community and with grid operators worldwide through regular technical publications.

Technical support, from the outset

Our team offers:

- research and testing through our global network of laboratories, including electric field simulations and analysis
- development of string designs and custom solutions with dedicated quality and testing programmes
- in-field assessments of in-service insulators and on-site pollution measurements
- technical consultation for selecting insulation solutions and specifications
- solutions for technical issues relating to line operating conditions
- evaluation of end-of-life timelines for in-service insulators



Our laboratory network

The equipment and facilities at our five research and testing centres guarantee excellent long-term insulator behaviour and performance. Sediver® laboratories are all ISO 9001 or ISO 17025 certified. We perform dielectric tests on single units and complete strings of insulators for glass, porcelain and composites according to the relevant IEC, ANSI and CSA standards.



- Investigation and research in **material science**: vital to ensure a high level of insulator performance and reliability.
- **Mechanical** endurance testing: essential to design insulators offering excellent long-term behaviour under extreme service conditions.
- Evaluation of the insulators' **electrical** performance: fundamental to assess the performance of any type of insulator string configuration.
- Evaluation of the **pollution** performance of insulators and complete strings: critical for choosing the right insulator for a specific environmental condition.

Main testing equipment per country	China	France	Italy	USA
Dielectric tests on insulator units	✓	✓	✓	✓
Dielectric tests on complete strings		up to 800 kV*		
AC salt-fog pollution tests		250 kV		
AC Solid layer Pollution tests		250 kV		
DC pollution tests (salt fog/solid layer)		350 kV		
DC sample tests according to IEC 61325	✓	✓	✓	✓
DC type tests according to IEC 61325		✓		
Mechanical tests on insulator units	✓	✓	✓	✓
Thermal-mechanical tests	✓	✓	✓	✓
Long duration vibration tests on complete strings		2 Hz to 30 Hz*		
Standard sample tests according to national and international standards	✓	✓	✓	✓
Fatigue test station		✓		

* line equipment

*¹ 2 Hz to 30 Hz, 60 kN per conductor, 6 conductors - 40 m span



Toughened glass insulators technology

The basics

Definitions

Selecting the right insulator profile for the line environment is essential to achieve the arcing and leakage distances required to avoid flashover.

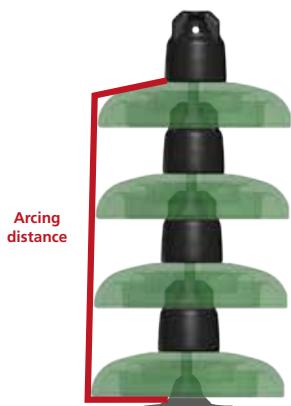


Figure 1

- **Arcing distance:** the shortest air distance between metal parts that can be used by an external arc (shown in red in Figure 1).
- **Leakage distance:** the distance along the glass shell surface of the insulator (shown in yellow in Figure 2).



Figure 2

Unlike the arcing distance, which is the distance an electric arc has to bridge during lightning or other events, the **leakage distance is THE most important parameter in polluted environments.**

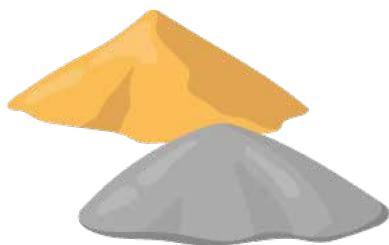
- **USCD:** the **Unified Specific Creepage Distance** for an application given in mm/kV, where the leakage distance of a string of insulators is divided by the line's maximum phase-to-ground voltage.

Solid pollution

Any contaminants deposited over the surface of the insulator impacting the performance of the string.



INDUSTRIAL



SAND/DUST



COASTAL



ROAD SALT/SNOW & ICE



WILDLIFE

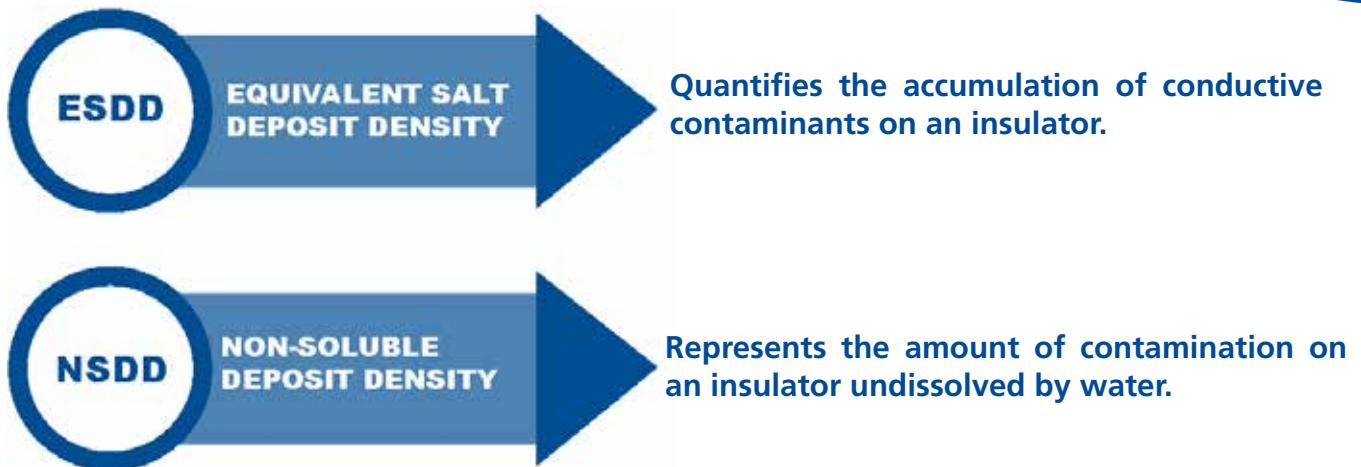


AGRICULTURAL

Types/sources of solid pollution

Measuring pollution levels

Evaluation of pollution levels involves washing an insulator's surface with deionised water and measuring the ESDD and the NSDD.



Pollution accumulation: What are the risks? How does flashover occur?

1- Pollution deposits, day after day, over the time, time driven process depending on environmental conditions, until it reaches a critical level

2- Wetting of the solid layer pollution by rain, dew, fog etc.

3- Development of surface leakage current in the conductive layer (pollution+water). This surface leakage current along the polluted surface generates dry bands.

4- Localised drying causes partial flashover of dry bands.

5- If the resistance of the remaining layer is low enough, arcs can extend along the insulator.

6- Flashover.



High voltage transmission lines

Choosing the right profile

For decades, Sediver® engineers have developed and designed different types of insulator for different types of climate and environment, as described in technical standard IEC 60815-1.



Standard profile

The standard profile is characterised by a leakage distance* higher than the values indicated in the ANSI C29.2B and by well-spaced under-ribs that allow an effective self-cleaning action by wind or rain. It is particularly effective in suspension and tension applications in very light to medium polluted areas (e.g. areas E1 to E4). It is the most commonly used profile for inland projects.



Fog type profile

The fog type profile is characterised by long and widely-spaced under-ribs, which prevent arc bridging between adjacent ribs. It is particularly effective in coastal areas (salt-fog environment) as well as in locally polluted areas where a higher specific leakage distance* is required (e.g. areas E5 to E7).



Open profile

The open type profile features no under-ribs to avoid the accumulation of solid pollution deposits (dust, sand) on its lower surface. It is particularly adapted to suspension and tension applications in dry desertic areas where wind is predominant and rain infrequent (e.g. areas E1 to E4).



External shed profile

This profile offers a leakage distance* equivalent to the anti-pollution profile and is adapted to the most extreme cases of solid pollution. The elimination of the under-ribs reduces pollution build-up, promotes self-cleaning and facilitates manual cleaning when necessary (e.g. areas E5 to E7 in desert pollution)

* or creepage distance

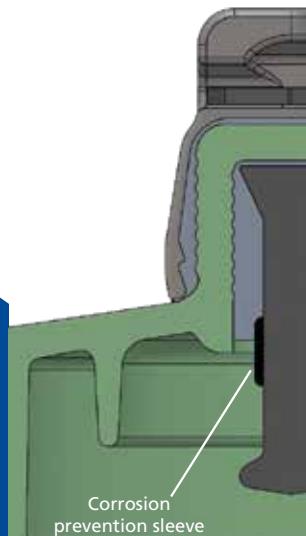
Corrosion prevention solutions

Corrosion prevention sleeve

In severely corrosive marine and industrial atmospheres, the galvanised coating on suspension insulator pins can deteriorate over time and result in corrosion of the pin itself. To prevent this form of pin damage, Sediver® can supply insulators equipped with a corrosion retardation sleeve made of high-purity zinc. These insulators are designated by a "Z" (F100PB/146 with zinc sleeve becomes F100PB/146Z).

Heavy galvanization

All Sediver® ferrous metal fittings are hot-dip galvanised. IEC 60383-1 and ASTM A153-82 require a zinc coating mass of 600/610 g/m² corresponding to a thickness of 85/86 µm. In severe conditions, where this standard protection is known to be insufficient, Sediver® offers enhanced cap and pin protection by increasing the zinc thickness to 120 µm, or up to 130 µm.

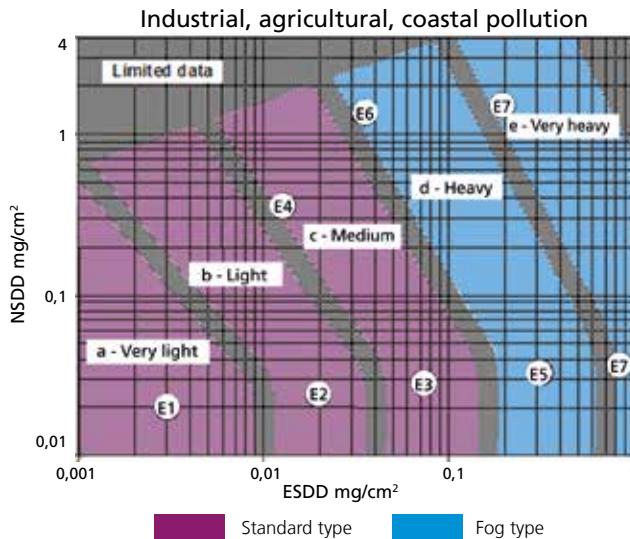


Selection criteria for pollution management

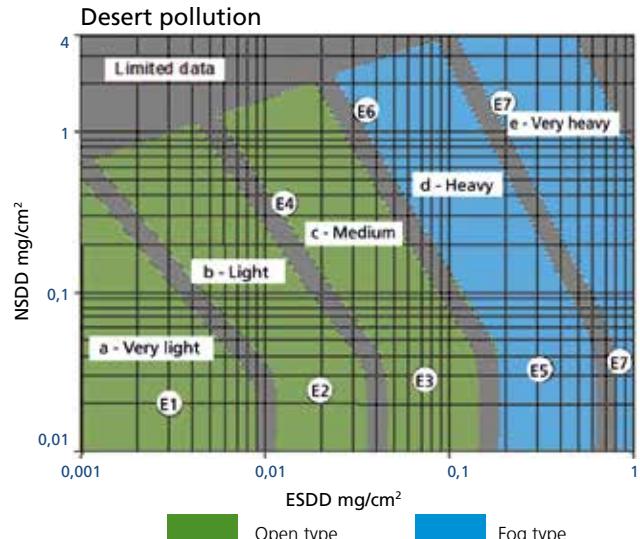
Choosing an insulator profile

Technical standard IEC 60815-1 defines five levels of pollution according to pollution severity: very light, light, medium, heavy and very heavy.

The levels of pollution are defined according to Equivalent Salt Deposit Density (ESDD) and Non-Soluble Deposit Density (NSDD) on the surface of the insulator.



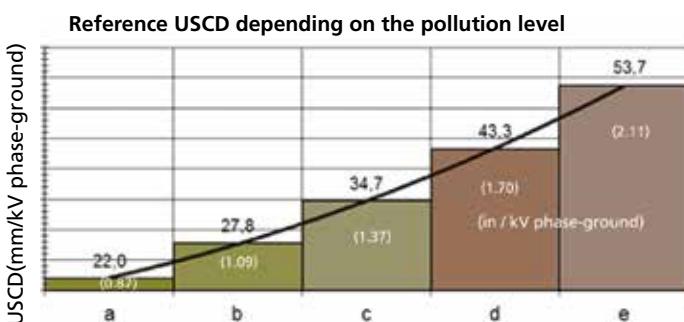
In the case of industrial, agricultural and coastal pollution, Sediver® recommends use of the standard profile in very light, light and medium polluted areas and the fog type profile in heavy and very heavy polluted areas.



In the case of desert pollution, Sediver® recommends use of the open profile in very light, light and medium polluted areas and the fog type profile in heavy and very heavy polluted areas.

Insulation level

The number of insulators per string depends on the maximum voltage of the transmission line and the pollution severity of the region. It should be calculated in accordance with the specific creepage distance (USCD*) as defined by the IEC 60815-2 standard.



(*) USCD = Leakage distance of the string of insulators divided by the RMS value of the highest power frequency voltage seen by the string (phase-ground).

String dimensioning example:

For a 230 kV line, located on the coast in a heavy pollution area (max. phase-ground voltage: $245 / \sqrt{3}$)

Selected insulator: F120PB/146Z

(fog type profile with 445 mm leakage distance)

Total leakage distance needed: $43.3 \times 245 / \sqrt{3} = 6125 \text{ mm}$

Number of insulators in the string: $6125 / 445 = 14 \text{ insulators}$

Sediver® thanks the International Electrotechnical Commission (IEC) for allowing the use in this catalogue of figure 1 page 18 of the Technical Specification 60815-1:2008 and figure 1 page 9 of the Technical Specification 60815-2:2008. These extracts are subjected to the IEC, Geneva, Switzerland copyright (www.iec.ch). The IEC is not liable for the use of extracts reproduced by Sediver® and cannot be held responsible for their content and exactness.

Sedicoat - RTV coated insulators

Solution for pollution mitigation

A proven solution with over 4.5 million insulators in service and over 25 years of satisfactory service



Sedicoat RTV coated glass insulators

Sediver® offers high quality factory coated glass insulators as part of its standard product range, created from extensive testing and vast field experience, with more than 4.5 million RTV coated glass insulators (Sedicoat) supplied over a period of more than 25 years worldwide.

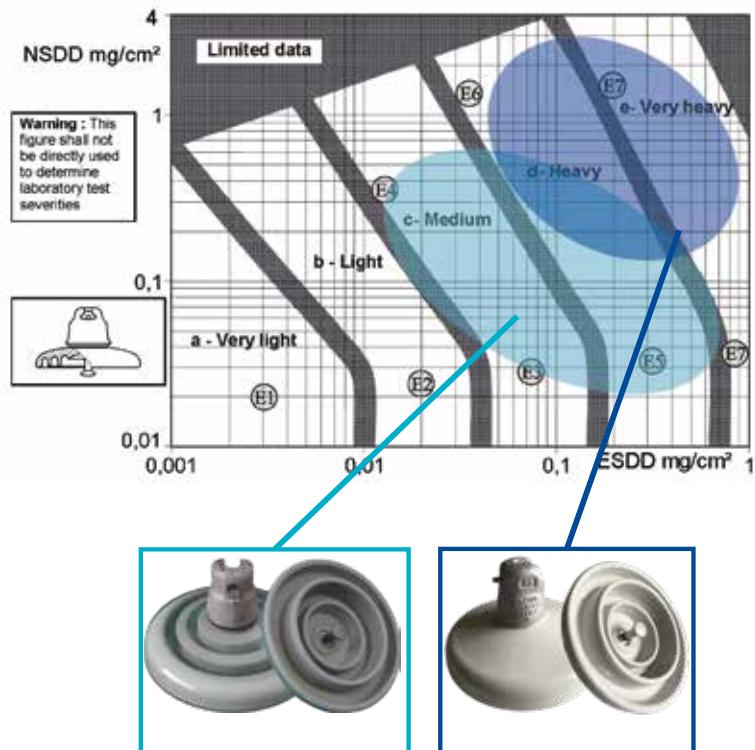
Sedicoat combines a high-performance material with a fully-controlled, industrial application process.

Sedicoat was developed to eliminate or dramatically reduce the need for washing insulator strings in areas of heavy and very heavy contamination. It also helps to improve insulator performance in areas of medium contamination, while retaining the inherent self-detecting features and longevity of toughened glass.

Initially, pollution was mitigated by fully coated insulators. Sediver® introduced under coated insulators for the first time in 2010 as an optional feature.

All Sediver® toughened glass insulator models can be coated

Insulator strings in very heavy (IEC) pollution classes generally require fully coated insulators. Under coated insulators are suitable for medium and heavy pollution areas (IEC), as shown below. In specific cases, where high NSDD levels are registered, Sediver® technical support can assist engineers to evaluate the best fit on a case-by-case basis.

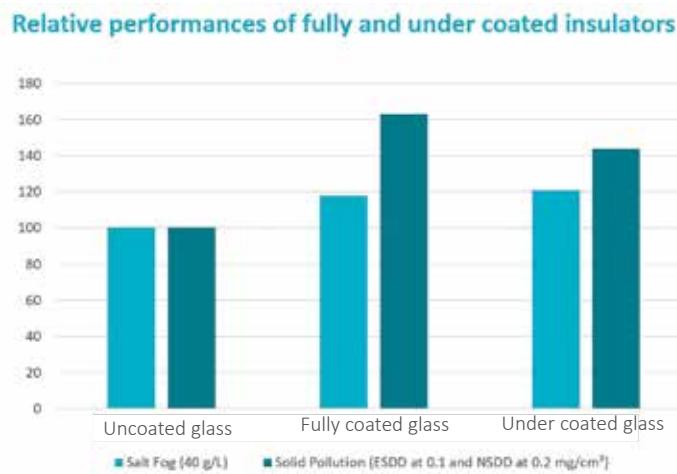


Sediver thanks the International Electrotechnical Commission (IEC) for allowing the use in this catalog of figure 3 page 18 of the Technical Specification 60815-1:2008. These extracts are subjected to the IEC, Geneva, Switzerland copyright (www.iec.ch). The IEC is not liable of the use in which these extracts have been reproduced by Sediver nor can be held responsible for its content and exactness.

Sediver's Sedicoat maintains the unique properties of our toughened glass insulators while eliminating the risk of flashover

Under coated insulators

In many cases, under coating is an optimal solution, as it performs almost as well as a fully coated insulator with the added benefit of packing and handling conditions similar to those of uncoated insulators. A comparison between fully and under coated insulators is shown below.



Sedicoat insulators for enhanced pollution performance

RTV coated insulators can be used to either optimise a string length at the design stage or improve the performance of insulators in existing lines in highly polluted environments, by increasing the effectiveness of the leakage distance compared to uncoated insulators.

For short line sections where the pollution deposit is homogeneous, use of coated glass may be justified for the entire line.

For longer lines with multiple pollution levels along the route, a flexible approach may be adopted by coating some sections only, increasing the effectiveness of the USCD (Unified Specific Creepage distance) wherever needed. In many cases this will help achieve a line design where similar string and tower designs can be used while adapting the string performance to each specific environment.

Long-term performance of coated glass insulators

The performance and lifetime of a silicone coating depends on the type of silicone, the adherence of the silicone layer to the glass shell, and the thickness and homogeneity of the coating.

Sediver® has set up a stringent R&D programme to ensure optimum performance. The silicones qualified by Sediver® are chosen specifically to resist the severe electrical conditions that cap and pin insulators face on overhead lines in polluted environments.

The coating is applied at the factory according to a specific industrial process qualified by Sediver®.

Sediver® performed extensive testing before offering this solution while monitoring closely, from the outset, how these insulators perform and age. To help end users make the right choice, Sediver® also recommends a selection method which includes 2,000-hour long-term ageing, multi-stress tests, shown below:



Left: test setup.

Middle and right: at the end of the test, the strong hydrophobicity and overall condition demonstrates the strong performance and lack of erosion on Sedicoat coated insulators after a 2,000-hour multi-stress test.

Safety reliability and peace of mind with Sediver® toughened glass insulators

Safe handling and construction

Sediver® glass insulators resist mechanical impacts well, which makes stringing and line construction much easier and significantly reduces the number of accidentally damaged insulators compared with porcelain insulators.

In the unlikely event of a shell being damaged, any small fragments are harmless to personnel and equipment.

Lastly, damage during installation is clearly and immediately detected, so there is no risk of installing a damaged unit.



Easy inspection

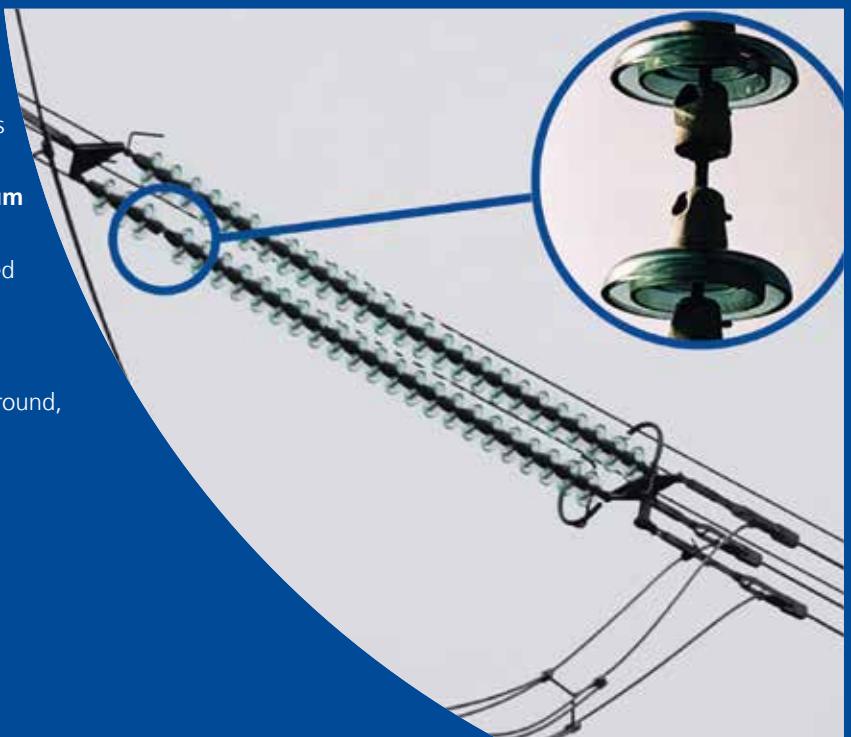
A quick visual inspection will provide 100% infallible data on the condition of a Sediver® toughened glass insulator.

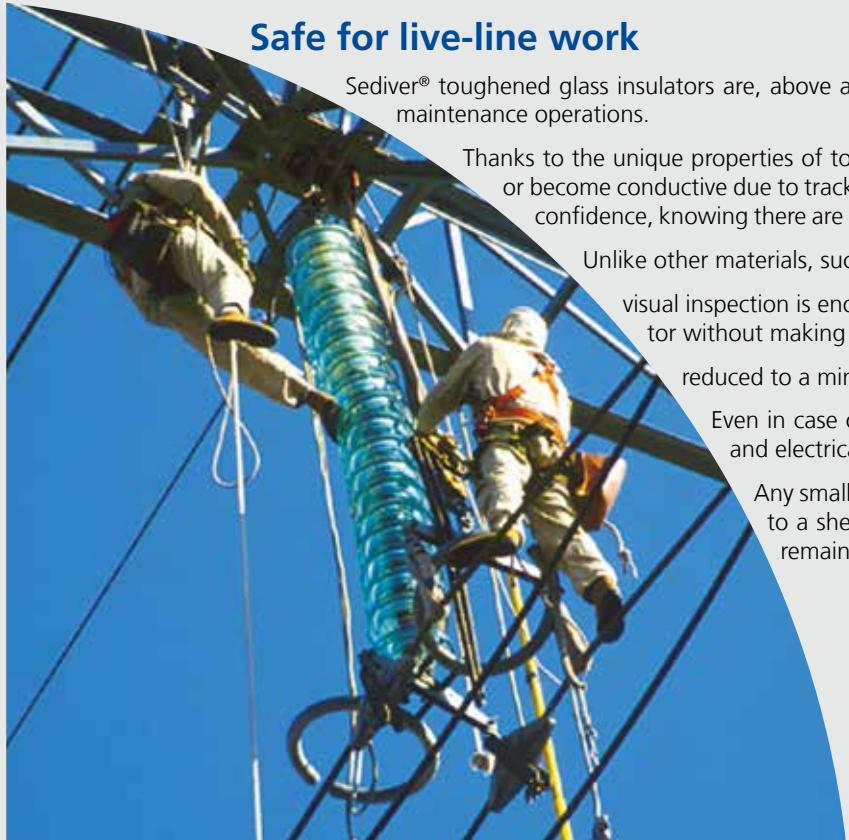
Inspection costs are therefore kept to a minimum throughout the line life cycle.

- No climbing, no bucket truck, no training needed
- No instruments required
- Maximum safety for live-line work
- Can be done by helicopter, drone or from the ground, covering many miles of line per day

No cracks or punctures

- Binary behaviour (intact or stub)
- Mechanically and electrically safe stub





Safe for live-line work

Sediver® toughened glass insulators are, above any other technology, highly suitable for safe live-line maintenance operations.

Thanks to the unique properties of toughened glass, which cannot have hidden punctures or become conductive due to tracking, maintenance crews can carry out live-line work in confidence, knowing there are no concealed risks from internally damaged insulators.

Unlike other materials, such as porcelain and composites, a quick and easy visual inspection is enough to identify the state of a toughened glass insulator without making any possible mistakes. Inspection costs are therefore reduced to a minimum throughout the line's life cycle.

Even in case of a missing shell, the remaining stub is mechanically and electrically safe, with a guaranteed 80% residual strength.

Any small fragments generated in the unlikely event of damage to a shell will not harm the personnel, the equipment or the remaining stub.



Peace of mind

Insulators must withstand both extreme environmental conditions and in-service stresses for over 50 years, without failures or service interruptions.

For example, insulator reliability during or after a fire is a key consideration for T&D line design or refurbishment.

Transmission line operators must evaluate the risk of a line drop in proximity to a fire, and the subsequent possibility of a catastrophic failure resulting from a degraded insulator.

The performance of a toughened glass insulator is not impaired after a fire*

- Non-combustible glass insulators
- Toughened glass: no crack propagation or puncture
- Easy visual inspection after fire
- Mechanically safe at high temperatures, even with a damaged shell

* Based on "Overhead Lines Under Extreme Heat Resulting from Wildfires" by Jean-Marie George (Scientific Director) and Sandrine Prat (PhD Research Manager) - T&D World library - Wildfire risk mitigation for electric utilities.

Specific applications

Choosing the right toughened glass insulator



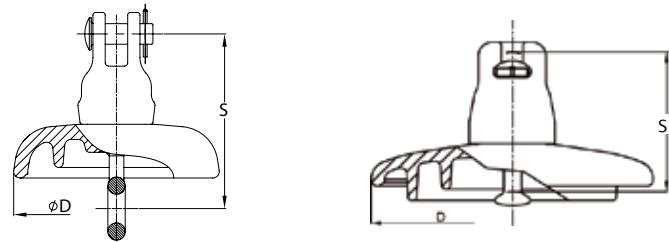
Distribution lines

Sediver® toughened glass insulators are designed for distribution, so they are strong, hard-wearing and easy to inspect.

The toughened glass dielectric shell offers superior resistance to damage during shipment, storage, installation and service.

They are ideal for hotline work and pose no risk of line drops.

Damaged units can be easily detected by visual inspection. In the unlikely event of a damaged shell, any small fragments will not harm personnel or equipment.



Bird issue mitigation

Inclusion of an open profile insulator at the top of the string will (no need for additional hardware):

- protect the insulator string below
- maintain the existing string length
- maintain safe live-line working conditions
- reduce or eliminate the need for washing
- reduce or eliminate flashover due to bird mute



Ice bridging solutions in contaminated areas

The large diameter of the open profile glass shell is advantageous for alleviating ice bridging problems.

Flashover due to ice bridging can occur under specific climatic conditions where the ambient temperature is close to the melting point of ice. Urban areas where there are atmospheric particles and contaminants are most prone to ice bridging problems.

Using alternate shed profile insulators reduces the risk of flashover due to ice bridging, since it effectively doubles the length of the icicles required to bridge in between insulators.

This solution has been adopted by several Canadian utilities, and more than 25 years of service experience has shown it to be effective.



Other applications on demand

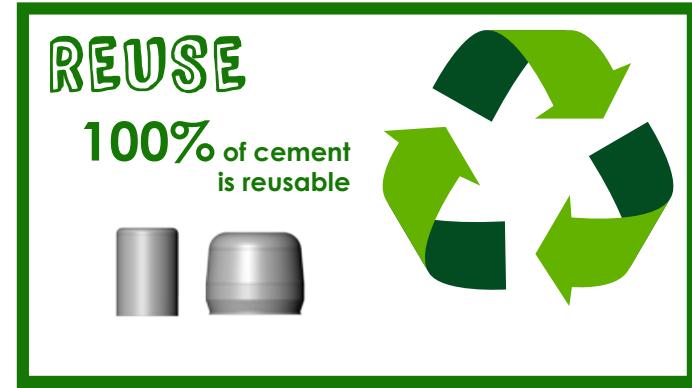
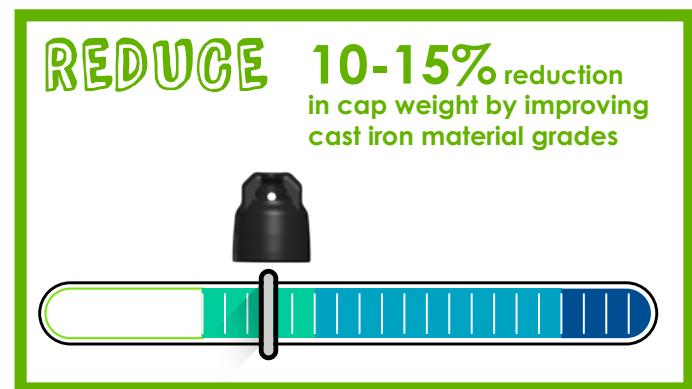
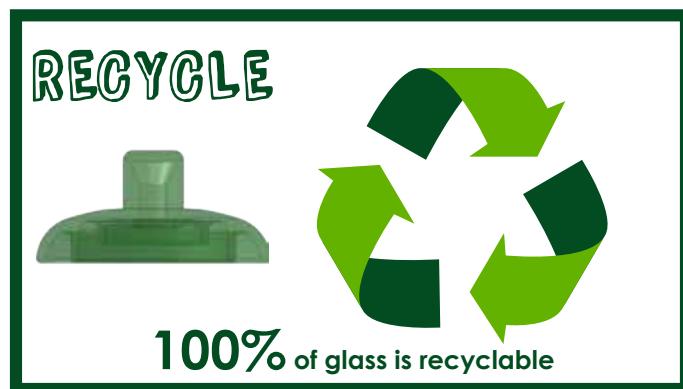
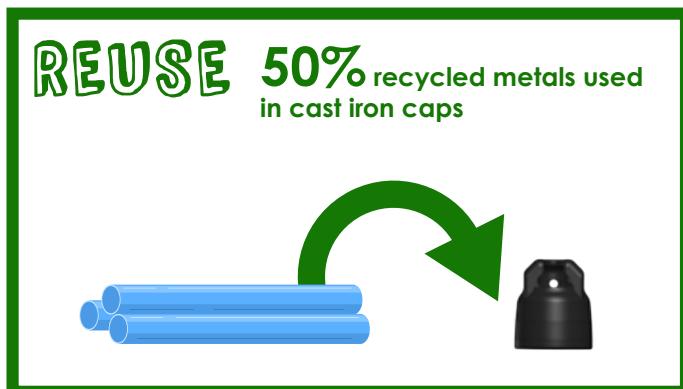
Our products are inherently more resilient and sustainable

Sediver® toughened glass insulators in renewable applications

By supporting grid infrastructure expansion and decarbonisation, our core activity improves access to energy, facilitates integration of renewable energy and accelerates electrification:

- Our high-quality products have a service life which meets or exceeds that of all other components on the line: high-performance insulators translate into superior line reliability and fewer replacement needs.
- Our insulators have the unique ability to withstand mechanical, thermal and electrical stresses with no ageing or degradation of dielectric performance.
- Glass insulators are 100% recyclable.

Sustainability: we are committed to improving our environmental performance



Reinforced and optimised packaging



The packing and palletising methods used by Sediver® result from experience gained from shipping hundreds of millions of toughened glass insulators to users' warehouses and construction sites in 150 countries and from extensive tests performed by packing research organisations.

The packing methods described and illustrated below have been developed specifically to minimise any possible damage during shipment and storage.

Stronger packaging

Factory-assembled strings of Sediver® insulators are packed in wooden crates, which are reinforced and held closed by external wire bindings. The crate shown here is in the open position and is internally braced to permit stacking.

Easy to open

External wire bindings are designed to keep crates firmly closed, and to allow easy and quick opening at time of installation with no need for special tools.

Maximum protection

Crates are evenly stacked on sturdy four-way wooden pallets. The assembly is held tightly in place with banding and is protected against moisture by a complete covering of polyethylene film.

Clear labelling

Each wooden pallet is clearly labelled with all quality control and traceability information.

Custom packaging

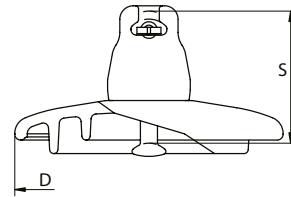
We can create and supply custom packaging on demand.



Sediver® toughened glass suspension insulators

Ball & Socket type - 70 kN & 100 kN

IEC



		Standard Profile			
NEW CATALOG N°		F70CJ/127	F70CJ/146	F100CB/127	F100CB/146
OLD CATALOG N°		F70/127	F70/146	F100/127	F100/146
IEC class ⁽¹⁾		U70BS	U70BL	U100BS	U100BL
MECHANICAL CHARACTERISTICS					
Minimum mechanical failing load	kN	70	70	100	100
DIMENSIONS					
Diameter (D)	mm	255	255	255	255
Spacing (S)	mm	127	146	127	146
Creepage distance	mm	320	320	320	320
Metal fitting size ⁽²⁾		16A	16A	16A	16A
ELECTRICAL CHARACTERISTICS ⁽³⁾					
Power frequency withstand voltage					
- Dry one minute	kV	70	70	70	70
- Wet one minute	kV	40	40	40	40
Dry lightning impulse withstand volt.	kV	100	100	100	100
Puncture withstand voltage	kV	130	130	130	130
PACKING AND SHIPPING DATA					
Approx. net weight	kg	3.4	3.4	3.7	3.7
Nº of insulators per crate		6	6	6	6
Volume per crate	m³	0.05	0.05	0.05	0.05
Gross weight per crate	kg	24	24	26	26
Nº of insulators per pallet		96	96	96	96
Volume per pallet	m³	1.3	1.3	1.3	1.3
Gross weight per pallet	kg	403	403	432	432

(1) in accordance with IEC publication 60305

(2) in accordance with IEC publication 60120

(3) in accordance with IEC publication 60383-1

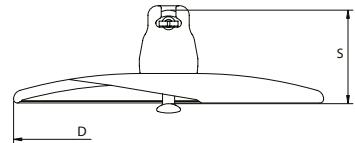
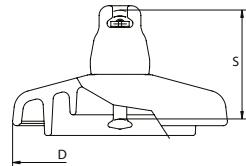
Corrosion prevention solution: Insulators with specific protection against corrosion are also available (see page 6)

For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

Ball & Socket type - 70 kN & 100 kN

IEC



	Fog Type Profile				Open Type Profile
NEW CATALOG N°	F100PG/146	F70PB/146	F100PB/146	F100PF/146	F100AB/127
OLD CATALOG N°	F9P-A/146	F70P/146	F100P/146	F100PF/146	F100D/127
IEC class ⁽¹⁾	U70BLP U100BLP				
MECHANICAL CHARACTERISTICS					
Minimum mechanical failing load	kN	100	70	100	100
DIMENSIONS					
Diameter (D)	mm	255	280	280	330
Spacing (S)	mm	146	146	146	127
Creepage distance	mm	390	445	445	545
Metal fitting size ⁽²⁾		16A	16A	16A	16A
ELECTRICAL CHARACTERISTICS ⁽³⁾					
Power frequency withstand voltage					
- Dry one minute	kV	72	80	80	90
- Wet one minute	kV	42	50	50	55
Dry lightning impulse withstand volt.	kV	110	125	125	140
Puncture withstand voltage	kV	130	130	130	130
PACKING AND SHIPPING DATA					
Approx. net weight	kg	4.2	5.4	5.4	8.1
N° of insulators per crate		6	6	6	6
Volume per crate	m³	0.06	0.07	0.07	0.10
Gross weight per crate	kg	30	38	38	55
N° of insulators per pallet		96	72	72	54
Volume per pallet	m³	1.3	1.2	1.2	1.3
Gross weight per pallet	kg	488	468	468	512

(1) in accordance with IEC publication 60305

(2) in accordance with IEC publication 60120

(3) in accordance with IEC publication 60383-1

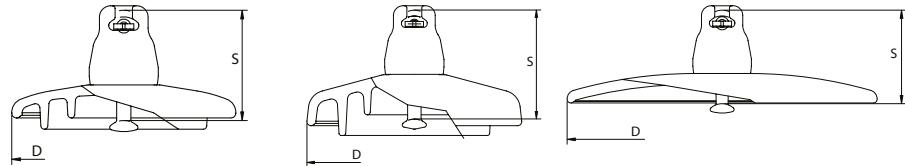
Corrosion prevention solution: Insulators with specific protection against corrosion are also available (see page 6)

For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

Ball & Socket type - 120 kN

IEC



	Standard Profile		Fog Type Profile		Open Type Profile	
NEW CATALOG N°	F120CB/127		F120CB/146		F120AB/127	
OLD CATALOG N°	F12/127		F12/146		F12D/127	
IEC class ⁽¹⁾	U120B		U120BP			
MECHANICAL CHARACTERISTICS						
Minimum mechanical failing load	kN	120	120	120	120	120
DIMENSIONS						
Diameter (D)	mm	255	255	255	280	380
Spacing (S)	mm	127	146	146	146	127
Creepage distance	mm	320	320	390	445	365
Metal fitting size ⁽²⁾		16A	16A	16A	16A	16A
ELECTRICAL CHARACTERISTICS ⁽³⁾						
Power frequency withstand voltage						
- Dry one minute	kV	70	70	72	80	60
- Wet one minute	kV	40	40	42	50	50
Dry lightning impulse withstand volt.	kV	100	100	110	125	90
Puncture withstand voltage	kV	130	130	130	130	130
PACKING AND SHIPPING DATA						
Approx. net weight	kg	3.8	3.8	4.3	5.5	5.6
Nº of insulators per crate		6	6	6	6	6
Volume per crate	m³	0.05	0.05	0.06	0.07	0.11
Gross weight per crate	kg	27	27	30	39	41
Nº of insulators per pallet		96	96	96	72	90
Volume per pallet	m³	1.3	1.3	1.3	1.2	2.2
Gross weight per pallet	kg	442	442	498	475	630

(1) in accordance with IEC publication 60305

(2) in accordance with IEC publication 60120

(3) in accordance with IEC publication 60383-1

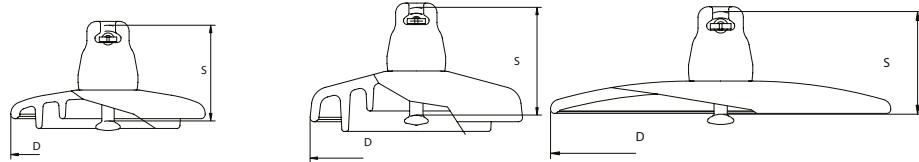
Corrosion prevention solution: Insulators with specific protection against corrosion are also available (see page 6)

For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

Ball & Socket type - 160 kN

IEC



	Standard Profile		Fog Type Profile		Open Type Profile	
NEW CATALOG N°	F160CK/146		F160PF/146		F160AD/146	
OLD CATALOG N°	F160/146		F160P/146		F160D/146	
IEC class ⁽¹⁾	U160BS	U160BL	U160BSP	U160BLP		
MECHANICAL CHARACTERISTICS						
Minimum mechanical failing load	kN	160	160	160	160	160
DIMENSIONS						
Diameter (D)	mm	280	280	330	330	420
Spacing (S)	mm	146	170	146	170	146
Creepage distance	mm	400	400	545	545	375
Metal fitting size ⁽²⁾		20	20	20	20	20
ELECTRICAL CHARACTERISTICS ⁽³⁾						
Power frequency withstand voltage						
- Dry one minute	kV	75	75	90	90	60
- Wet one minute	kV	45	45	55	55	50
Dry lightning impulse withstand volt.	kV	110	110	140	140	90
Puncture withstand voltage	kV	130	130	130	130	130
PACKING AND SHIPPING DATA						
Approx. net weight	kg	5.4	5.5	8.2	8.3	7.2
Nº of insulators per crate		6	6	6	6	6
Volume per crate	m³	0.07	0.08	0.10	0.11	0.15
Gross weight per crate	kg	39	39	56	57	52
Nº of insulators per pallet		72	72	54	54	36 54
Volume per pallet	m³	1.2	1.3	1.3	1.4	1.3 1.8
Gross weight per pallet	kg	475	484	517	524	338 495

(1) in accordance with IEC publication 60305

(2) in accordance with IEC publication 60120

(3) in accordance with IEC publication 60383-1

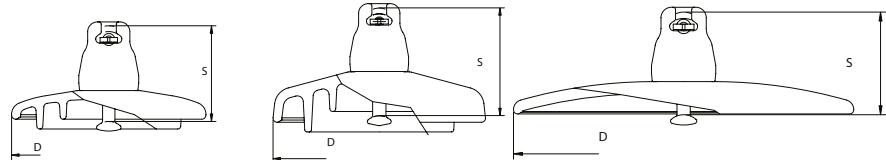
Corrosion prevention solution: Insulators with specific protection against corrosion are also available (see page 6)

For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

Ball & Socket type - 210 kN

IEC



	Standard Profile	Fog Type Profile	Open Type Profile
NEW CATALOG N°	F210CZ/170	F210PP/170	F210AI/170
OLD CATALOG N°	F21/170	F210P/170	F21D/170
IEC class ⁽¹⁾	U210B	U210BP	
MECHANICAL CHARACTERISTICS			
Minimum mechanical failing load	kN	210	210
DIMENSIONS			
Diameter (D)	mm	280	330
Spacing (S)	mm	170	170
Creepage distance	mm	390	550
Metal fitting size ⁽²⁾		20	20
ELECTRICAL CHARACTERISTICS ⁽³⁾			
Power frequency withstand voltage			
- Dry one minute	kV	75	90
- Wet one minute	kV	45	55
Dry lightning impulse withstand volt.	kV	110	140
Puncture withstand voltage	kV	130	130
PACKING AND SHIPPING DATA			
Approx. net weight	kg	6.6	9.5
N° of insulators per crate		6	6
Volume per crate	m³	0.08	0.11
Gross weight per crate	kg	46	64
N° of insulators per pallet		72	54
Volume per pallet	m³	1.3	1.3
Gross weight per pallet	kg	563	590

(1) in accordance with IEC publication 60305

(2) in accordance with IEC publication 60120

(3) in accordance with IEC publication 60383-1

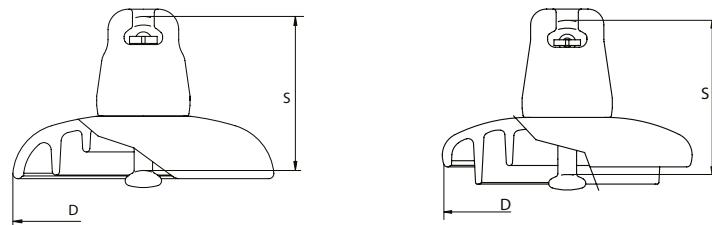
Corrosion prevention solution: Insulators with specific protection against corrosion are also available (see page 6)

For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

Ball & Socket type - 240 kN & 300 kN

IEC



	Standard Profile		Fog Type Profile	
NEW CATALOG N°	F240CZ/170	F300CH/195	F300PK/195	F300PJ/195
OLD CATALOG N°	F24/170	F300/195	F300P/195	F30P/195
IEC class ⁽¹⁾	U300B			U300BP
MECHANICAL CHARACTERISTICS				
Minimum mechanical failing load	kN	240	300	300
DIMENSIONS				
Diameter (D)	mm	280	320	380
Spacing (S)	mm	170	195	195
Creepage distance	mm	390	480	690
Metal fitting size ⁽²⁾		24	24	24
ELECTRICAL CHARACTERISTICS ⁽³⁾				
Power frequency withstand voltage				
- Dry one minute	kV	75	85	100
- Wet one minute	kV	45	50	55
Dry lightning impulse withstand volt.	kV	110	130	150
Puncture withstand voltage	kV	130	130	130
PACKING AND SHIPPING DATA				
Approx. net weight	kg	6.8	9.8	13.6
Nº of insulators per crate		6	5	4
Volume per crate	m³	0.08	0.10	0.11
Gross weight per crate	kg	47	56	62
Nº of insulators per pallet		72	45	24 36
Volume per pallet	m³	1.3	1.4	1.0 1.5
Gross weight per pallet	kg	578	516	386 572

(1) in accordance with IEC publication 60305

(2) in accordance with IEC publication 60120

(3) in accordance with IEC publication 60383-1

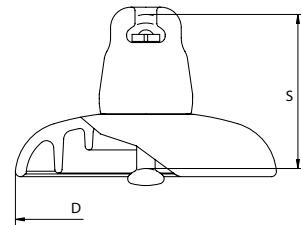
Corrosion prevention solution: Insulators with specific protection against corrosion are also available (see page 6)

For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

Ball & Socket type - 400 kN & 840 kN

IEC



		Standard Profile		
NEW CATALOG N°		F400CX/205	F530CT/240	F840NY/300
OLD CATALOG N°		F400/205	F530/240	F840/300
IEC class ⁽¹⁾		U400B	U530B	
MECHANICAL CHARACTERISTICS				
Minimum mechanical failing load	kN	400	530	840
DIMENSIONS				
Diameter (D)	mm	360	360	400
Spacing (S)	mm	205	240	300
Creepage distance	mm	550	635	700
Metal fitting size ⁽²⁾		28	32	40
ELECTRICAL CHARACTERISTICS ⁽³⁾				
Power frequency withstand voltage				
- Dry one minute	kV	90	90	100
- Wet one minute	kV	55	55	55
Dry lightning impulse withstand volt.	kV	140	140	140
Puncture withstand voltage	kV	130	130	130
PACKING AND SHIPPING DATA				
Approx. net weight	kg	13.6	18	29
N° of insulators per crate		4	4	2
Volume per crate	m³	0.10	0.12	0.11
Gross weight per crate	kg	62	80	63
N° of insulators per pallet		36	36	12 18
Volume per pallet	m³	1.3	1.6	0.9 1.3
Gross weight per pallet	kg	572	731	397 585

(1) in accordance with IEC publication 60305

(2) in accordance with IEC publication 60120

(3) in accordance with IEC publication 60383-1

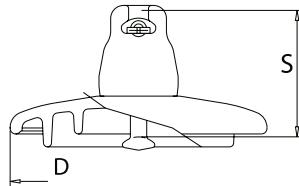
Corrosion prevention solution: Insulators with specific protection against corrosion are also available (see page 6)

For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

Ball & Socket type

ANSI



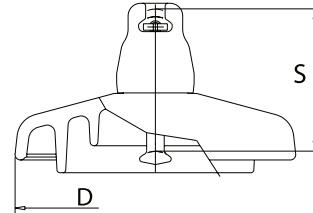
CATALOG No	Standard Profile				
	N100/146DC	N14/146DC	N180/146DC	N21/156DC	
ANSI class	52-3-H	52-5-H	52-8-H	52-11	
Ball and socket coupling	Type J	Type J	Type K	Type K	
MECHANICAL CHARACTERISTICS					
Combined M&E strength	lbs kN	22,000 100	30,000 136	40,000 180	50,000 222
Impact strength	in-lbs N-m	400 45	400 45	400 45	400 45
Tension proof	lbs kN	11,000 50	15,000 68	20,000 90	25,000 111
DIMENSIONS					
Diameter (D)	in mm	10 255	10 255	11 280	11 280
Spacing (S)	in mm	5 3/4 146	5 3/4 146	5 3/4 146	6 1/8 156
Leakage distance	in mm	12 5/8 320	12 5/8 320	15 380	15 380
ELECTRICAL CHARACTERISTICS					
Low frequency dry flashover	kV	80	80	80	80
Low frequency wet flashover	kV	50	50	50	50
Critical impulse flashover +	kV	125	125	125	140
Critical impulse flashover -	kV	130	130	130	140
Low frequency puncture voltage	kV	130	130	130	130
R.I.V low frequency test voltage	kV	10	10	10	10
Max. RIV at 1 MHz	μV	50	50	50	50
PACKING AND SHIPPING DATA					
Approx. net weight per unit	lbs	8.1	10.1	12.8	13.9
No of insulators per crate		6	6	6	6
Volume per crate	ft³	1.977	1.977	2.472	2.472
Gross weight per crate	lbs	59.5	66.7	92.7	100.5
No. of insulators per pallet		72	72	54	54
Volume per pallet	ft³	35.3	35.3	42.3	42.3
Gross weight per pallet	lbs	790	880	934	1005

ANSI designations 52-3-L, 52-5-L, 52-8-L and custom products are also available

Sediver® toughened glass suspension insulators

Ball & Socket type

ANSI



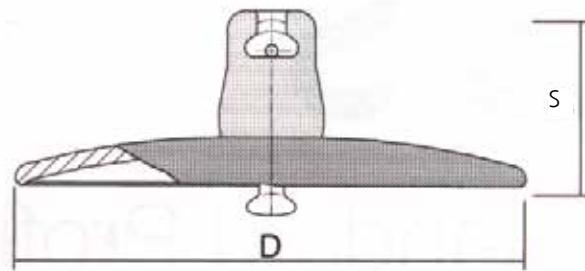
CATALOG No	Fog Profile				
	N100P/146DC	N14P/146DC	N180P/160DC	N21P/171DC	F300P/195DC
ANSI class					
Ball and socket coupling	Type J	Type J	Type K	Type K	IEC 24
MECHANICAL CHARACTERISTICS					
Combined M&E strength	lbs kN	22,000 100	30,000 136	40,000 180	50,000 222
Impact strength	in-lbs N-m	400 45	400 45	400 45	400 45
Tension proof	lbs kN	11,000 50	15,000 68	20,000 90	25,000 111
DIMENSIONS					
Diameter (D)	in mm	11 280	11 280	13 330	13 330
Spacing (S)	in mm	5 3/4 146	5 3/4 146	6 5/16 160	6 3/4 171
Leakage distance	in mm	17 1/2 445	17 1/2 445	21 5/8 550	21 5/8 550
ELECTRICAL CHARACTERISTICS					
Low frequency dry flashover	kV	100	100	105	100
Low frequency wet flashover	kV	60	60	65	60
Critical impulse flashover +	kV	140	140	145	150
Critical impulse flashover -	kV	140	140	145	150
Low frequency puncture voltage	kV	130	130	130	130
R.I.V low frequency test voltage	kV	10	10	10	10
Max. RIV at 1 MHz	μV	50	50	50	50
PACKING AND SHIPPING DATA					
Approx. net weight per unit	lbs	12.1	13.4	19.6	20.7
No of insulators per crate		6	6	6	6
Volume per crate	ft³	2.47	2.47	2.82	3.04
Gross weight per crate	lbs	84.9	87.3	126.4	140.4
No. of insulators per pallet		54	54	54	54
Volume per pallet	ft³	42.3	42.3	46	48
Gross weight per pallet	lbs	862	886	1245	1360

ANSI designations 52-3-L, 52-5-L, 52-8-L and custom products are also available

Sediver® toughened glass suspension insulators

Ball & Socket type

ANSI



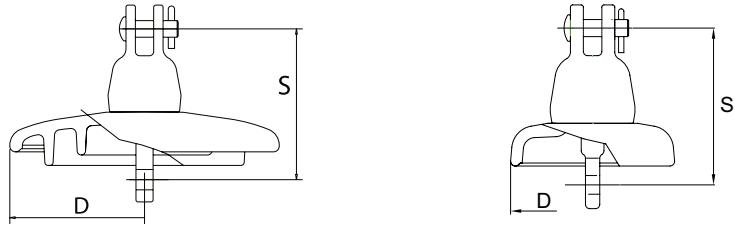
CATALOG No	Open Profile				
	N100D/146DC	N14D/146DC	N160D/146DC	N21D/156DC	
ANSI class					
Ball and socket coupling					
MECHANICAL CHARACTERISTICS					
Combined M&E strength	lbs kN	22,000 100	30000 140	35000 160	50000 222
Impact strength	in-lbs N-m	400 45	400 45	400 45	400 45
Tension proof	lbs kN	11,000 50	15000 70	17500 80	25000 111
DIMENSIONS					
Diameter (D)	in mm	15 380	15 380	16 ^{1/2} 420	16 ^{1/2} 420
Spacing (S)	in mm	5 ^{3/4} 146	5 ^{3/4} 146	5 ^{3/4} 146	6 ^{1/8} 156
Leakage distance	in mm	14 ^{3/8} 365	14 ^{3/8} 365	15 375	14 ^{1/2} 370
ELECTRICAL CHARACTERISTICS					
Low frequency dry flashover	kV	65	65	70	70
Low frequency wet flashover	kV	50	50	55	55
Critical impulse flashover +	kV	100	100	105	105
Critical impulse flashover -	kV	100	100	105	105
Low frequency puncture voltage	kV	195	195	195	195
R.I.V low frequency test voltage	kV	10	10	10	10
Max. RIV at 1 MHz	μV	50	50	50	50
PACKING AND SHIPPING DATA					
Approx. net weight per unit	lbs	12,35	13,67	15,88	17,86
No of insulators per crate		6	6	6	6
Volume per crate	ft ³	4,59	4,59	6,36	6,36
Gross weight per crate	lbs	92,61	98,12	119,07	127,89
No. of insulators per pallet		36/54	36/54	36/54	36/54
Volume per pallet	ft ³	37,43/52,97	37,43/52,97	49,44/70,63	49,44/70,63
Gross weight per pallet	lbs	617,4/893,02	650,47/937,12	771,75/1126,75	826,87/1212,75

Custom products are also available

Sediver® toughened glass suspension insulators

Clevis coupling CT

ANSI



CATALOG N°	Standard Profile					Ground wire insulator
	CT100/146DC	CT14/146DC	CT50/159	CT4/140	CT160/165	
ANSI class	52-4-H	52-6-H	52-9	52-1		CT14-6/146DC
MECHANICAL CHARACTERISTICS						
Combined M&E strength	lbs kN	22,000 100	30,000 136	10,000 45	10,000 50	30,000 136
Impact strength	in-lbs N·m	400 45	400 45	400 45	400 45	400 45
Tension proof	lbs kN	11,000 50	15,000 68	5,000 22.5	5,000 25	15,000 68
DIMENSIONS						
Diameter (D)	In mm	10 255	10 255	6 5/16 160	6 5/16 160	6 155
Spacing (S)	In mm	5 3/4 146	5 3/4 146	6 1/4 159	5 1/2 140	5 3/4 146
Leakage distance	In mm	12 5/8 320	12 5/8 320	7 1/2 190	7 1/2 190	5 1/3 135
ELECTRICAL CHARACTERISTICS						
Low frequency dry flashover	kV	80	80	60	60	40
Low frequency wet flashover	kV	50	50	30	30	20
Critical impulse flashover pos.	kV	125	125	90	90	70
Critical impulse flashover neg.	kV	130	130	95	95	70
Low frequency puncture voltage	kV	130	130	110	110	90
R.I.V low frequency test voltage	kV	10	10	7.5	7.5	7.5
Max. RIV at 1 MHz	µV	50	50	50	50	50
PACKING AND SHIPPING DATA						
Approx. net weight per unit	lbs	9	9			5.5
Nº of insulators per crate		6	6			6
Volume per crate	ft³	1.977	1.977			0.70
Gross weight per crate	lbs	59.5	66.7			32.2
No. of insulators per pallet		72 96	72 96			150
Volume per pallet	ft³	35.3 49.4	35.3 49.4			28.8
Gross weight per pallet	lbs	790 1050	880 1165			833

Custom products are also available

Sediver® toughened glass suspension insulators

IEC string electrical ratings - Standard profile

		Diameter / Spacing Ø 255/127		Diameter / Spacing Ø 255/146 - Ø 280/146			
NEW Catalog N°	F70CJ/127 - F100CB/127 - F120CB/127	F70CJ/146 - F100CB/146 - F100PG/146 - F120CB/146 F120PG/146 - F160CK/146 - B80PG/146 - B120CB/146 - B160CK/146					
OLD Catalog N°	F70/127 - F100/127 - F12/127	F70/146 - F100/146 - F9P-A/146 - F12/146 - F12P-A/146 - F160/146 - B8P-A/146 - B12/146 - B160/146					
Number of units		Power frequency withstand voltage (kV)	Lightning impulse withstand voltage (kV)	Power frequency withstand voltage (kV)	Lightning impulse withstand voltage (kV)		
		DRY	WET	DRY	WET		
2	113	65	175	130	75		
3	157	100	245	180	115		
4	204	135	320	235	155		
5	244	170	395	280	195		
6	283	200	460	325	230		
7	326	231	525	375	265		
8	365	261	585	420	300		
9	404	283	660	465	325		
10	444	326	720	510	375		
11	478	357	785	550	410		
12	518	383	850	595	440		
13	552	413	920	635	475		
14	587	444	985	675	510		
15	622	470	1050	715	540		
16	657	496	1115	755	570		
17	696	522	1180	800	600		
18	744	552	1240	855	635		
19	761	578	1310	875	665		
20	796	609	1365	915	700		
21	826	635	1425	950	730		
22	861	661	1490	990	760		
23	896	687	1550	1030	790		
24	926	713	1610	1065	820		
25	957	744	1670	1100	855		
26	992	765	1735	1140	880		
27	1022	792	1800	1175	910		
28	1057	813	1860	1215	935		
29	1092	839	1920	1255	965		
30	1122	861	1980	1290	990		

For other values, please contact the Sediver® technical department.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings

Sediver® toughened glass suspension insulators

IEC string electrical ratings - Standard profile

		Diameter / Spacing Ø 280/170		Diameter / Spacing Ø 320/195 - Ø 360/205	
NEW Catalog N°	F160CK/170 - F210CZ/170 - F240CZ/170			F300CH/195 - F400CX/205	
OLD Catalog N°	F160/170 - F21/170 - F24/170			F300/195 - F400/205	
Number of units	Power frequency withstand voltage (kV)	Lightning impulse withstand voltage (kV)	Power frequency withstand voltage (kV)	Lightning impulse withstand voltage (kV)	
	DRY	WET	DRY	WET	
2	140	80	215	155	230
3	200	120	305	220	340
4	250	160	385	290	430
5	300	200	470	350	530
6	350	240	560	405	620
7	400	280	640	465	700
8	450	320	720	515	790
9	500	350	810	570	880
10	545	380	900	620	970
11	590	420	980	675	1060
12	635	455	1070	725	1150
13	675	490	1140	775	1240
14	720	520	1220	825	1330
15	760	550	1300	870	1425
16	810	585	1380	920	1520
17	850	615	1460	970	1610
18	895	650	1550	1020	1700
19	930	680	1620	1070	1790
20	970	710	1690	1110	1880
21	1000	740	1770	1160	1970
22	1050	775	1840	1210	2050
23	1090	805	1920	1260	2140
24	1130	835	2000	1310	2230
25	1170	870	2080	1360	2320
26	1210	900	2160	1410	2410
27	1250	930	2240	1460	2500
28	1290	960	2320	1510	2600
29	1330	990	2400	1550	2700
30	1370	1030	2480	1600	2800

For other values, please contact the Sediver® technical department.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings.

Sediver® toughened glass suspension insulators

IEC string electrical ratings - Fog profile

	Diameter / Spacing Ø 280/146 - Ø 330/146		Diameter / Spacing Ø 330/170	
NEW Catalog N°	F70PB/146 - F100PB/146 - F120PB/146 F160PF/146 - F100PF/146		F160PF/170 - B160PF/170 - F210PP/170	
OLD Catalog N°	F70P/146 - F100P/146 - F120P/146 F160P/146 - 100PF/146		F160P/170 - B160P/170 - F210P/170	
Number of units	Power frequency withstand voltage (kV) DRY WET	Lightning impulse withstand voltage (kV)	Power frequency withstand voltage (kV) DRY WET	Lightning impulse withstand voltage (kV)
2	140 85	210	150 105	235
3	195 115	295	210 150	335
4	240 150	380	265 190	435
5	290 180	465	320 230	535
6	335 210	530	370 270	625
7	380 240	600	420 300	710
8	425 270	680	470 335	800
9	465 300	760	515 365	890
10	510 330	840	570 395	980
11	550 360	920	610 430	1070
12	585 390	1000	660 460	1170
13	630 410	1080	700 490	1260
14	670 430	1160	745 520	1355
15	710 460	1240	785 550	1450
16	750 490	1320	830 575	1540
17	785 510	1410	870 605	1640
18	825 530	1500	910 630	1730
19	860 550	1580	950 655	1810
20	895 570	1655	990 680	1900
21	925 590	1730	1030 700	1990
22	960 610	1810	1060 720	2080
23	995 630	1885	1090 740	2160
24	1025 650	1950	1130 755	2245
25	1060 670	2025	1170 780	2325
26	109 690	2100	1200 800	2410
27	1120 710	2180	1250 825	2490
28	1155 730	2260	1290 850	2575
29	1185 750	2340	1330 885	2650
30	1215 770	2420	1360 910	2720

For other values, please contact the Sediver® technical department.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings.

Sediver® toughened glass suspension insulators

IEC string electrical ratings - Open profile

		Diameter / Spacing Ø 380/127		Diameter / Spacing Ø 380/146 - Ø 420/146	
NEW Catalog N°		F100AB/127 - F120AB/127		F160AD/146 - B160AD/146	
OLD Catalog N°		F100D/127 - F12D/127		F160D/146 - B160D/146	
Number of units		Power frequency withstand voltage (kV)	Lightning impulse withstand voltage (kV)	Power frequency withstand voltage (kV)	Lightning impulse withstand voltage (kV)
		DRY	WET	DRY	WET
2		95	75	160	110
3		135	110	225	160
4		175	145	290	205
5		215	180	355	255
6		255	210	420	305
7		290	245	490	355
8		330	280	555	405
9		370	310	620	455
10		410	345	685	505
11		450	380	750	555
12		490	410	815	605
13		530	445	885	655
14		570	480	950	705
15		610	515	1015	755
16		650	545	1080	800
17		690	580	1145	850
18		730	615	1210	900
19		770	645	1280	950
20		810	680	1345	1000
21		850	715	1410	1050
22		890	750	1475	1100
23		930	780	1540	1150
24		970	815	1605	1200
25		1010	850	1675	1250
26		1050	880	1740	1290
27		1090	915	1805	1350
28		1130	950	1870	1400
29		1170	980	1935	1450
30		1210	1015	2000	1495

For other values, please contact the Sediver® technical department.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings.

Sediver® toughened glass suspension insulators

ANSI string electrical ratings - Standard profile

Standard profile suspension insulator string flashover voltages based on the test procedure of the American Standard ANSI C 29.2B.

CATALOG N°	Diameter / Spacing Ø 10 / 5 ^{3/4} - Ø 11 / 5 ^{3/4}				Diameter / Spacing Ø 11 / 6 ^{1/8}			
	N100/146DC - N14/146DC - N180/146DC CT100/146DC - CT14/146DC				N21/156DC			
	Low frequency flashover voltage (kV)		Critical impulse flashover voltage (kV)		Low frequency flashover voltage (kV)		Critical impulse flashover voltage (kV)	
Number of units	DRY	WET	+	-	DRY	WET	+	-
2	145	90	220	225	145	90	230	230
3	205	130	315	320	210	130	325	330
4	270	170	410	420	275	170	425	440
5	325	215	500	510	330	215	515	540
6	380	255	595	605	385	255	610	630
7	435	295	670	695	435	295	700	720
8	485	335	760	780	490	335	790	810
9	540	375	845	860	540	375	880	900
10	590	415	930	945	595	415	970	990
11	640	455	1015	1025	645	455	1060	1075
12	690	490	1105	1115	695	490	1150	1160
13	735	525	1185	1195	745	525	1240	1245
14	785	565	1265	1275	790	565	1330	1330
15	830	600	1345	1360	840	600	1415	1420
16	875	635	1425	1440	890	635	1500	1510
17	920	670	1505	1530	935	670	1585	1605
18	965	705	1585	1615	980	705	1670	1700
19	1010	740	1665	1700	1025	740	1755	1795
20	1050	775	1745	1785	1070	775	1840	1890
21	1100	810	1825	1870	1115	810	1925	1985
22	1135	845	1905	1955	1160	845	2010	2080
23	1180	880	1985	2040	1205	880	2095	2175
24	1220	915	2065	2125	1250	915	2180	2270
25	1260	950	2145	2210	1290	950	2260	2365
26	1300	985	2220	2295	1330	958	2390	2465
27	1340	1015	2300	2380	1370	1015	2470	2555
28	1380	1045	2375	2465	1410	1045	2570	2650
29	1425	1080	2455	2550	1455	1080	2650	2740
30	1460	1110	2530	2635	1490	1110	2740	2830

For other values, please contact the Sediver® technical department.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings.

According to the American Standard the average value of three tested strings shall equal or exceed:

95% of the guaranteed values as given in the data sheet, for low frequency dry flashover,

90% of the guaranteed values as given in the data sheet, for low frequency wet flashover,

92% of the guaranteed values as given in the data sheet, for critical impulse flashover.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings

Sediver® toughened glass suspension insulators

ANSI string electrical ratings - Fog profile

Fog type profile suspension insulator string flashover voltages based on the test procedure of the American Standard ANSI C 29.2B.

Catalog N°	Diameter / Spacing Ø 11 / 5 ^{3/4}				Diameter / Spacing Ø 13 / 6 ^{3/4}			
	N100P/146DC - N14P/146DC				N21P/171DC			
	Low frequency flashover voltage (kV)		Critical impulse flashover voltage (kV)		Low frequency flashover voltage (kV)		Critical impulse flashover voltage (kV)	
	DRY	WET	+	-	DRY	WET	+	-
2	155	95	270	260	160	110	315	300
3	215	130	380	355	230	145	440	410
4	270	165	475	435	290	155	550	505
5	325	200	570	520	350	225	660	605
6	380	240	665	605	405	265	775	705
7	435	275	750	690	460	310	870	800
8	485	315	835	775	515	355	970	900
9	540	350	920	860	570	390	1070	1000
10	590	375	1005	950	625	430	1170	1105
11	640	410	1090	1040	680	460	1270	1210
12	690	440	1175	1130	735	495	1370	1315
13	735	470	1260	1220	790	530	1465	1420
14	785	500	1345	1310	840	565	1565	1525
15	830	525	1430	1400	885	595	1665	1630
16	875	555	1515	1490	935	630	1765	1735
17	920	580	1600	1595	980	660	1860	1845
18	965	615	1685	1670	1030	690	1960	1945
19	1010	640	1770	1755	1075	725	2060	2040
20	1055	670	1850	1840	1120	755	2155	2140
21	1100	695	1930	1925	1165	785	2245	2240
22	1145	725	2010	2010	1210	820	2340	2340
23	1190	750	2090	2095	1255	850	2430	2440
24	1235	780	2170	2180	1300	885	2525	2540
25	1280	810	2250	2265	1345	910	2620	2635
26	1325	835	2330	2350	1385	945	2710	2735
27	1370	860	2410	2435	1430	975	2805	2835
28	1410	890	2490	2520	1470	1005	2900	2935
29	1455	915	2560	2600	1515	1035	2980	3025
30	1495	940	2630	2680	1555	1065	3060	3120

For other values, please contact the Sediver® technical department.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings.

According to the American Standard the average value of three tested strings shall equal or exceed:

95% of the guaranteed values as given in the data sheet, for low frequency dry flashover,

90% of the guaranteed values as given in the data sheet, for low frequency wet flashover,

92% of the guaranteed values as given in the data sheet, for critical impulse flashover.

These electrical ratings are applicable to Sediver® suspension insulator strings not equipped with arcing devices or grading rings.

Active contributions to international committees

Since beginning its international technical cooperation, Sediver® has been an active contributor to research and standardisation work in international committees and working groups dealing with all aspects of high voltage insulation. For example, Sediver® experts are involved in IEC working groups TC36B, CIGRE: B2, D1, C4 and contribute to the activities of the ANSI NEMA C29, IEEE OHL SC and CSA 411 standards committees.

Sediver® articles on glass in international publications:

- George JM, Lepley D, "AC and DC pollution testing methods: accuracy and limitations", 2022 INMR World Congress, 16-19 Oct. 2022, Berlin, Germany
- Delhumeau F, Dumas C, George JM, "Simulation of electric field: what and what not to expect", 2022 INMR World Congress, 16-19 Oct. 2022, Berlin, Germany
- Espinosa C, Vo D, George JM, "Overhead line insulators in operating constraints under severely polluted conditions: the benefits of silicone coated glass insulators and their application at the PG&E diablo canyon nuclear power plant", 2022 CIGRE PARIS, 28 Aug.-2 Sep. 2022, Paris
- George JM, Pons C, Vosloo WL, "Assessment of performance of insulators through leakage current monitoring under contaminated conditions", CIGRE 2020 Paris, CIGRE e-session 48, 24 Aug.-3 Sep. 2020
- George JM, Prat S, "Insulators under fire", EDM 2019, International Conference on Overhead Lines, Design, Construction, Inspection and Maintenance, 25-28 Mar. 2019, Ft Collins, Colorado, USA
- Virlogeux F, Prat S, George JM, "Review of 20 years of silicone coated insulators in the field", INMR 2017 World Congress, 5-8 Nov. 2017, Barcelona, Spain
- George JM, Brocard E, Prat S, Virlogeux F, Lepley D, "Necessary Check Points & Testing for Screening the Quality of Insulators", INMR 2017 World Congress, 5-8 Nov. 2017, Barcelona, Spain
- Alles J, Beroual A, Brocard E, George JM, "Evaluation of Electrical Performance on High Voltage Glass Suspended Insulators", EIC 2017, Electrical Insulation Conference IEEE, 11-14 Jun. 2017, Baltimore, USA
- George JM, "Mitigation of severe contamination problems on overhead lines without the need for composite insulators", EDM International Conference on Overhead Lines, Fort Collins, Colorado, USA, April 2016
- Klassen D, Zoghby E, Kieloch Z, "Assessment of toughened glass insulators removed from HVDC lines after more than 40 years in service", CIGRE Canada Conference 2015
- George JM, Prat S, Virlogeux F, "Silicone coating on toughened glass insulator: Review of laboratory and field performance", INMR World Congress 2015, Munich, Germany, 2015
- Virlogeux F, Prat S, George JM, "Ageing and degradation mechanisms of silicone polymers used for outdoor electrical insulation", ISH 2015, Pilsen, Czech Republic
- Klassen D, Zoghby E, Kieloch Z, "Assessment of toughened glass insulators removed from HVDC lines after more than 40 years in service", CIGRE Canada Conference, 2015
- George JM, Prat S, Virlogeux F, "Coating Glass Insulators for Service in Severe Environments", INMR Quarter 4, 2014
- George JM, Lodi Z, "Mechanical and electrical behaviour of a damaged toughened glass insulator", EDM, Fort Collins, USA, 2014
- George JM, Prat S, Tartier S, Lodi Z, "Electrical characteristics and properties of a Stub", ISH 2013 Seoul, Korea
- George JM, Del Bello E, "Assessment of electrical and mechanical performance of toughened glass insulators removed from existing HV lines", CIGRE Regional Meeting, Calgary, Canada, August 2007
- Paiva O, Suassuna R, Dumora D, Parraud R, Ferreira L, Namora M, "Recommendations to solve corrosion problem on HV insulator strings in tropical environment", CIGRE Symposium Cairns, 2001, Paper 300-05
- Dumora D, Parraud R, "Corrosion mechanism of insulators in tropical environment", CIGRE Symposium Cairns, 2001, Paper 300-04
- Parraud R, Pecl H, "Long-term performance of toughened glass insulators on AC and DC transmission lines: improvement, field experience and recommendations", CIGRE International Workshop on Insulators, Rio De Janeiro, Brazil, June 1998
- Crouch A, Swift D, Parraud R, De Decker D, "Aging mechanisms of AC energised insulators", CIGRE 1990, Paper 22-203
- Parraud R, Lumb C, Sardin JP, "Reflexions on the evaluation of the long-term reliability of ceramic insulators", IEEE WG INSUL. STRENGTH RATING 1987
- Parraud R, Lumb C, "Lightning stresses on overhead lines", IEEE Bangkok, 1985
- Mailfert R, Pargamin L, Riviere D, "Electrical Reliability of DC Line Insulators", IEEE Electrical Insulation 1981 No. 3
- Couquelet F, Riviere D, Willem M, "Experimental assessment of suspension insulator reliability", IEEE Conference Paper 1972, Paper 173-8