

SEDIVER



Sediver® toughened glass
insulators for HVAC applications

Experts & Pioneers

Sediver, Experts and pioneers in insulation technology

With 70 years of experience and investment in R&D, Sediver has gained uncontested expertise in research, design, manufacturing and testing of insulators for power networks up to very high voltages and for railway catenary systems. Sediver is the partner of choice for all insulation applications.

Our expertise

- > 500 million toughened glass insulators installed in more than 150 countries on lines up to 1,100 kV AC,
- > 6.5 million toughened glass DC insulators installed up to 800 kV,
- > 5 million composite insulators on lines up to 735 kV,
- > 2 million Sedicoat insulators, silicone coated toughened glass insulators for both AC and DC applications.

Research & Development, a permanent and continuous investment

Always on the lookout for continuous technological improvements, Sediver heavily invests in Research and Development. Our research and testing facilities as well as our high voltage CEB laboratory both located in France boast state-of-the-art equipment that allows extensive research programs as well as testing of complete strings for systems up to 800 kV.

Worldwide presence – reinforced proximity



Unique manufacturing processes

Sediver manufacturing processes are unique in the world.

These processes have been developed and improved thanks to the experience Sediver has gained over the years following-up and assessing the performance of millions of insulators in service as well as through the integration of the latest technological advances.

Our goal: your satisfaction through the reliability of our products on your lines.

Sediver, our experts at your service

In-depth technical expertise

Our team of multidisciplinary and highly skilled engineers is dedicated to the research and development of optimum solutions in the field of high-voltage insulation and protection.

Innovative products

Our engineers and scientists are always searching for new materials, products, designs and technologies that will contribute to improve the performance and the reliability of your systems while reducing the environmental impact.

Sediver technical assistance

Our technical assistance teams help you throughout all the stages of the insulation related matters from the selection of the optimum insulation solution to the monitoring of performance in service.

We offer specifically:

- Testing and evaluation programs
- Joint research programs related to solving insulation issues
- Training programs dedicated to design, handling and maintenance teams
- End-of-life and failure diagnostics

Dedicated research and testing facilities



The equipment and facilities of our 7 research and testing centers ensure the development of insulators with excellent long term behavior and performance.

- **Investigation of materials and their behavior in service:**
Vital to ensure a high level of performance and reliability of our insulators
- **Mechanical endurance testing:**
Essential to designing insulators with excellent long term behavior under extreme service conditions
- **Evaluation of the insulators' electrical performance:**
Fundamental to assess the performance of any type of insulator string configuration
- **Determination of the pollution performance of insulators and strings:**
Critical for the choice of the right insulator adapted to each specific environmental condition

Overview of main testing equipment per country

	Brazil	China	France	Italy	USA
Dielectric tests on insulator units	✓	✓	✓	✓	✓
Dielectric tests on complete strings			up to 800 kV		
AC Salt-fog Pollution tests			150 kV		
AC Solid layer Pollution tests			250 kV		
DC Pollution tests (salt fog/solid layer)			120 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			up to 800 kV		
Standard sample tests according to national and international standards	✓	✓	✓	✓	✓

Sediver® laboratories are all ISO 9001 or ISO 17025 certified

Sediver®'s unique manufacturing processes

The Sediver design and manufacturing processes have been developed over the past 70 years, taking advantage of millions of insulators supplied and the evolution of new technology, with always the same goal in mind: **your satisfaction.**

Sediver®'s unique processes

Glass composition and melting

Sediver® glass is obtained through a unique melting process based on the use of a specific furnace technology and proprietary Sediver manufacturing process control and parameters.

The technology developed by Sediver:

- Ensures an outstanding homogeneity in the chemical composition of the glass
- Provides high purity glass without heterogeneity.

Moulding

Our unique know-how enables us to create complex glass shapes and products up to 420 mm in diameter and weighing more than 10 kg.

Toughening

The toughening process developed by Sediver generates a permanent compressive pre-stress on the surface of the glass shells which confers to the glass:

- high mechanical strength
- high resistance to thermal shocks and mechanical impacts
- immunity to the effects of aging.

Thanks to the toughening, the behavior of the dielectric shell becomes binary:

- 1) either the glass is intact: no possible internal cracks nor puncture
- 2) or the glass is shattered: the glass is no longer visible outside the metal cap (stub).

Assembly of the glass shell with metal fittings

The assembly of Sediver® glass insulators is done by a specific hot curing process, using a chemically inert cement (high strength aluminous cement).

Thanks to this process our insulators offer:

- outstanding mechanical stability over time
- residual mechanical strength close to that of a complete insulator if dielectric shell happens to be broken.

Systematic control and inspection of the insulators during manufacturing

Guaranteed quality thanks to continuous inspection and control of the production lines

- All glass shells undergo specific and repeated thermal shocks and successive quality controls so as to eliminate pieces that could present defects
- All insulators are subjected to stringent quality inspection by automated systems.

The entire process is constantly monitored by highly qualified inspectors.

Users' benefits

Appropriate solutions

Thanks to the different shapes of the glass shells and to mechanical strengths ranging up to 840 kN, Sediver offers solutions adapted to all applications and the most varied environmental conditions.

Easy installation, inspection and detection

As Sediver® glass insulators are very resistant to mechanical shocks, the stringing and line construction is much easier while the number of accidentally damaged insulators is significantly lower than with porcelain insulators.

As the detection of any damages during installation is evident and immediate, the risk of installing a damaged unit is non-existent.

Reduced inspection and maintenance costs

- Unlike other materials, such as porcelain or composites, a quick and easy visual inspection is enough to identify the state of the toughened glass insulators and this without any possible mistake. The inspection costs are thus reduced to a minimum throughout the life cycle of the line.
- Sediver® toughened glass insulators are unpuncturable and resistant to overvoltage stresses thanks to a defect-free dielectric body and the homogeneity of the glass shell.
- The shattering rate of glass shells in service is negligible thanks to the high purity of Sediver® glass.
- The residual mechanical strength of Sediver® glass insulators remains almost unchanged compared to an intact insulator thanks to unique hot cured aluminous cement assembly process. Therefore, there is no urgency to replace an insulator with a broken glass shell.
- Optimum safety for live line working.

Extended life

The life time of Sediver® glass insulators exceeds the life time of the conductors, hardware and structure. Since they do not age, there is no need to replace the insulators during the life of the line.

Reliability, traceability

As Sediver® technology and quality are homogenous throughout all its production sites, we can therefore guarantee full consistency of performance worldwide. Each insulator is marked with the manufacturing plant's identification code and the production batch.

The marking allows total traceability.

Sediver® insulators: more than a standardized insulator

The design of Sediver® insulators is not limited to complying with the minimum requirements of the applicable standards, but is based on requirements for a higher level of performance in service which in turn, reduces the operating cost of the line.

Users' benefits in choosing Sediver® glass insulators

Type of test	Test description	Criteria IEC 60383-1	Sediver® criteria	Benefits for the user
Type test	Mechanical failing load test	$X \geq SFL + 0.72 S$ Individual value could be < SFL	$X \geq SFL + 3 S$ Individual value $\geq SFL$	Reinforced reliability and safety <ul style="list-style-type: none"> Individual value $\geq SFL$ Low deviation of the results
	Thermal-mechanical performance test	Temperature cycles -30°/+40° C Tensile load 0.60 SFL $X \geq SFL + 0.72 S$ Individual value could be < SFL	Temperature cycles -50°/+50° C Tensile load 0.70 SFL $X \geq SFL + 3 S$ Individual value $\geq SFL$	High reliability along service life <ul style="list-style-type: none"> No aging High mechanical strength even in case of extreme service conditions
	Residual strength test	$X \geq 0.65 SFL + 1.645 S$	$X \geq 0.80 SFL + 1.645 S$	Reduced maintenance cost <ul style="list-style-type: none"> High residual mechanical strength maintained in stub state No urgency in replacing the insulator
Sample test	Mechanical failing load test	$X \geq SFL + 1.7 S$ (*), or Individual value could be < SFL	$X \geq SFL + 3 S$ Individual value $\geq SFL$	Reinforced reliability <ul style="list-style-type: none"> Even in case of natural disasters Individual value $\geq SFL$ Low deviation of the results
	Puncture withstand test	Puncture in oil	Impulse puncture testing in air (IEC 61211)	No risk of puncture <ul style="list-style-type: none"> Even in case of lightning
Routine test	Visual inspection	Inspection whether there are no visual defects that would be prejudicial to satisfactory performance in service	<ul style="list-style-type: none"> Inspection whether there are no visual defects such as in IEC Marking verification 	Complete traceability <ul style="list-style-type: none"> Complete identification of each insulator Quality Control full traceability
	Mechanical test	50 % SFL	<ul style="list-style-type: none"> 50 % SFL Marking proving that each insulator passed the routine test 	Guarantee that each insulator passed the mechanical test
	Dimensional verification	None	Spacing verification of each unit	Dimensional conformity <ul style="list-style-type: none"> Guarantee of the string spacing Easy installation
	Thermal test	None	Thermal treatments specific to Sediver® on each glass shell	Reduced operating cost <ul style="list-style-type: none"> Extremely low in service shattering rate thanks to a very high quality glass

X = Average value of results
SFL = Specified Mechanical Failing Load
S = Standard deviation
(*) 12 samples



Sediver® toughened glass suspension insulators

Dielectric shell profiles

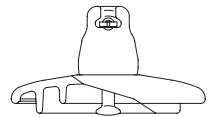
Throughout decades, Sediver® engineers have developed and designed different types of insulators adapted to all kinds of climates and environments, such as described in the IEC 60815-1 standard.

Standard profile:

The standard profile is characterized by a leakage distance* higher than the values indicated in the IEC 60305 for standard insulators and by shallow and well-spaced under-ribs that allow an effective self-cleaning action by wind or rain. It features a "leakage distance/spacing" ratio of around 2.2 and is particularly effective in suspension and tension applications in very light to medium polluted areas where typically the pollution level (ESDD) is lower than 0.1 mg/cm².

(Examples: zones E1 to E4).

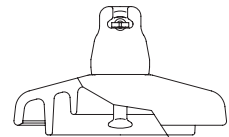
* or creepage distance



Fog type profile:

The fog type profile is characterized by long and widely-spaced under-ribs so as to avoid arc bridging between adjacent ribs. It features a « leakage distance/spacing » ratio of around 3.2 and is particularly effective in coastal areas (Salt fog) as well as in polluted areas where a higher specific leakage distance is required.

(Examples: areas E5 to E7).

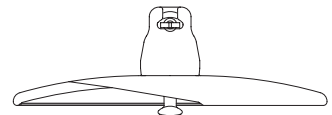


Open profile:

The open type profile features a « leakage distance/spacing » ratio of around 2.4, with no under-ribs so as to avoid the accumulation of solid pollution deposits (dust, sand) on its lower surface. It is particularly adapted to suspension and tension applications in desert areas where wind is predominant and rain infrequent.

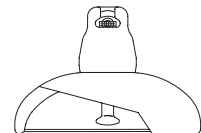
(Example: areas E1 to E4).

It is also effective for dead-end strings in cases of extreme industrial pollution and can solve ice-bridging problems when it is alternated with other profiles in the string.



Spherical profile:

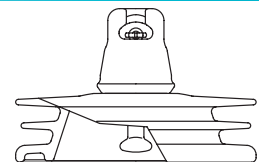
The spherical shape offers a leakage distance equivalent to that of standard profile type. With a spherical profile, manual cleaning is easy and effective.



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.



Corrosion prevention solutions

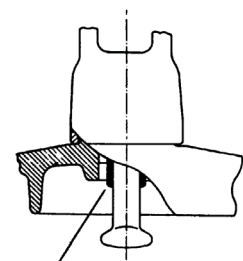
Corrosion prevention sleeve

In severely corrosive marine and industrial atmospheres, the galvanized coating on suspension insulator pins may deteriorate over time and be followed by 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. The insulators are then designated by "DC" (F100P/146 with zinc sleeve becomes F100P/146DC).

Heavy galvanization

All Sediver® ferrous metal fittings are hot-dip galvanized. 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 protection of the cap and the pin by increasing the thickness of zinc to 110 µm, or up to 125 µm.

For specific insulators not presented in this catalogue, or for specific applications such as extreme pollution areas or direct current, please contact us.



Corrosion prevention sleeve

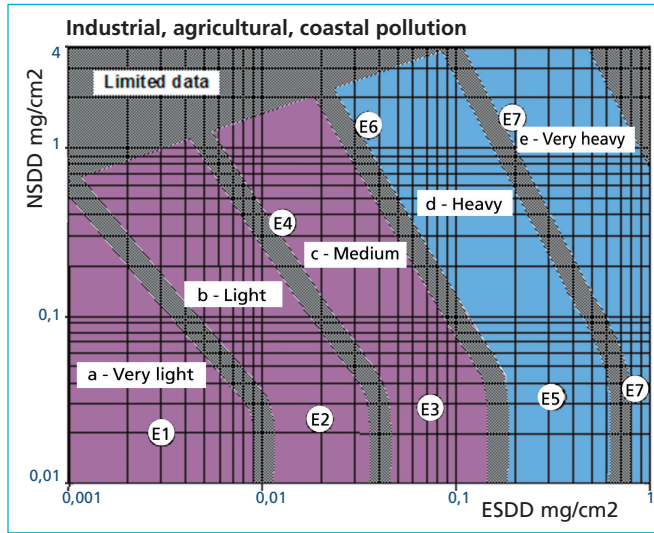
Selection criterion

Choice of the insulator profile

The IEC 60815-1 standard defines 5 levels of pollution according to the pollution severity:

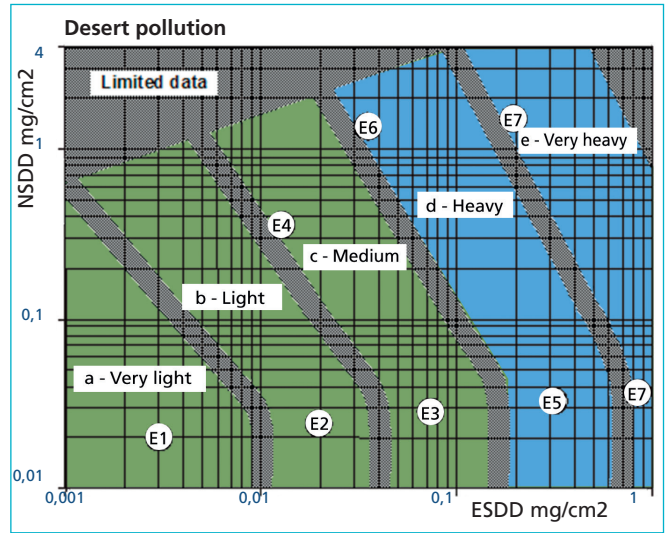
very light, light, medium, heavy and very heavy.

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



Standard type Fog type

In the case of industrial, agricultural and coastal pollution: Sediver® recommends the 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.



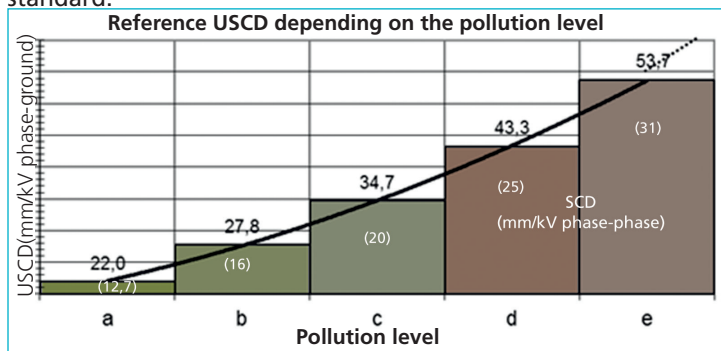
Open type Fog type

In the case of desert pollution: Sediver® recommends the 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.

Choice of insulation

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* or SCD**) 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).

(**) SCD = USCD / √3

String dimensioning example:

For a 230 kV line,
 (Max. phase-ground voltage: $245 / \sqrt{3}$)
 located on the coast in a heavy pollution level
 (ESDD > 0.1 mg/cm², pollution level = d)
 Selected insulator: F120P / 146
 (fog type profile with 445 mm leakage distance)

Total leakage distance needed:

■ $43.3 \times 2 \times 45 / \sqrt{3} = 6125 \text{ mm.}$

Number of insulators in the string:

■ $6125 / 445 = 14 \text{ insulators.}$

In cases of extreme pollution when regular washing of the insulator strings becomes necessary, Sediver® offers Sedicoat®: Sediver® silicone coated toughened glass insulator (see page 23)



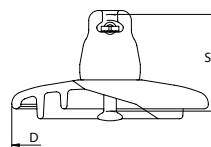
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Sediver® toughened glass suspension insulators

IEC

Ball & Socket type

70 kN
100 kN



CATALOG N°	Standard Profile				
	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
N° of insulators per crate		6	6	6	6
Volume per crate	m ³	0.05	0.05	0.05	0.05
Gross weight per crate	kg	24	24	26	26
N° of insulators per pallet		96	96	96	96
Volume per pallet	m ³	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)

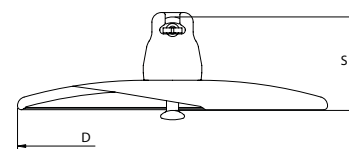
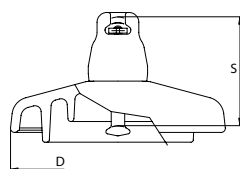
For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators



Ball & Socket type

70 kN
100 kN



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

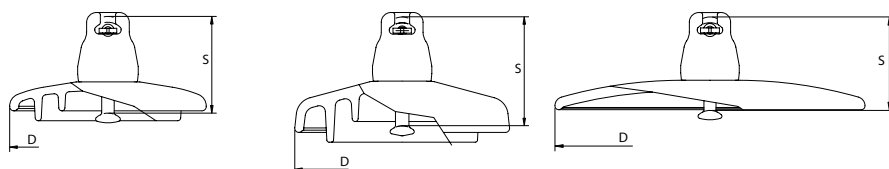
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Sediver® toughened glass suspension insulators

IEC

Ball & Socket type

120 kN



CATALOG N°	Standard Profile		Fog Type Profile		Open Type Profile	
	F12/127	F12/146	F12P-A/146	F120P/146	F12D/127	
IEC class ⁽¹⁾	U120B		U120BP			
MECHANICAL CHARACTERISTICS						
Minimum mechanical failing load	kN	120	120	120	120	
DIMENSIONS						
Diameter (D)	mm	255	255	280	380	
Spacing (S)	mm	127	146	146	127	
Creepage distance	mm	320	320	390	445	
Metal fitting size ⁽²⁾		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
N° of insulators per crate		6	6	6	6	6
Volume per crate	m ³	0.05	0.05	0.06	0.07	0.11
Gross weight per crate	kg	27	27	30	39	41
N° of insulators per pallet		96	96	96	72	90
Volume per pallet	m ³	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)

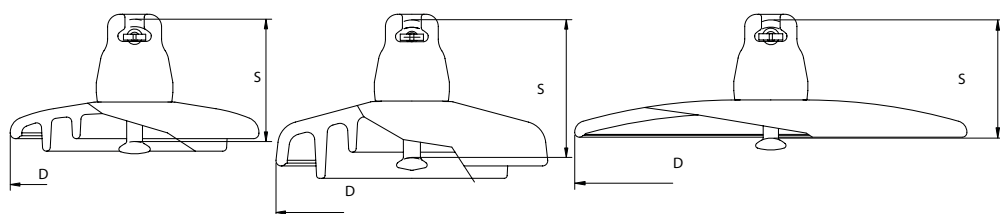
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Sediver® toughened glass suspension insulators



Ball & Socket type

160 kN



CATALOG N°	Standard Profile		Fog Type Profile		Open Type Profile	
	F160/146	F160/170	F160P/146	F160P/170	F160D/146	
IEC class ⁽¹⁾	U160BS	U160BL	U160BSP	U160BLP		
MECHANICAL CHARACTERISTICS						
Minimum mechanical failing load	kN	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
N° of insulators per crate		6	6	6	6	6
Volume per crate	m ³	0.07	0.08	0.10	0.11	0.15
Gross weight per crate	kg	39	39	56	57	52
N° of insulators per pallet		72	72	54	54	36 54
Volume per pallet	m ³	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)

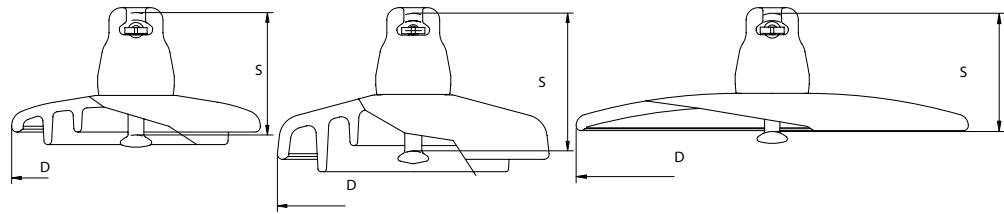
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Sediver® toughened glass suspension insulators

IEC

Ball & Socket type

210 kN



		Standard Profile	Fog Type Profile	Open Type Profile
CATALOG N°		F21/170	F210P/170	F21D/170
IEC class ⁽¹⁾		U210B	U210BP	
MECHANICAL CHARACTERISTICS				
Minimum mechanical failing load	kN	210	210	210
DIMENSIONS				
Diameter (D)	mm	280	330	420
Spacing (S)	mm	170	170	170
Creepage distance	mm	380	550	370
Metal fitting size ⁽²⁾		20	20	20
ELECTRICAL CHARACTERISTICS ⁽³⁾				
Power frequency withstand voltage				
- Dry one minute	kV	75	90	60
- Wet one minute	kV	45	55	50
Dry lightning impulse withstand volt.	kV	110	140	90
Puncture withstand voltage	kV	130	130	130
PACKING AND SHIPPING DATA				
Approx. net weight	kg	6.6	9.5	8
N° of insulators per crate		6	6	6
Volume per crate	m ³	0.08	0.11	0.17
Gross weight per crate	kg	46	64	59
N° of insulators per pallet		72	54	36 54
Volume per pallet	m ³	1.3	1.3	1.5 2.1
Gross weight per pallet	kg	563	590	376 553

(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)

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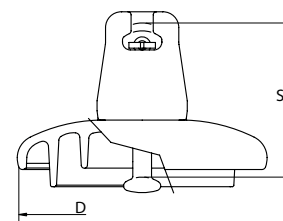
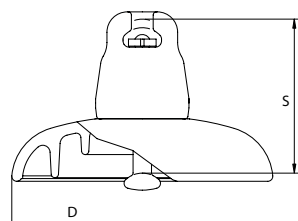
Sediver® toughened glass suspension insulators

IEC

Ball & Socket type

240 kN

300 kN



Standard Profile

Fog Type Profile

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	300
DIMENSIONS					
Diameter (D)	mm	280	320	380	320
Spacing (S)	mm	170	195	195	195
Creepage distance	mm	380	480	690	595
Metal fitting size ⁽²⁾		24	24	24	24
ELECTRICAL CHARACTERISTICS ⁽³⁾					
Power frequency withstand voltage					
- Dry one minute	kV	75	85	100	90
- Wet one minute	kV	45	50	55	50
Dry lightning impulse withstand volt.	kV	110	130	150	135
Puncture withstand voltage	kV	130	130	130	130
PACKING AND SHIPPING DATA					
Approx. net weight	kg	6.8	9.8	13.6	10.7
N° of insulators per crate		6	5	4	5
Volume per crate	m ³	0.08	0.10	0.11	0.10
Gross weight per crate	kg	47	56	62	60
N° of insulators per pallet		72	45	24 36	45
Volume per pallet	m ³	1.3	1.4	1.0 1.5	1.4
Gross weight per pallet	kg	578	516	386 572	558

(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.

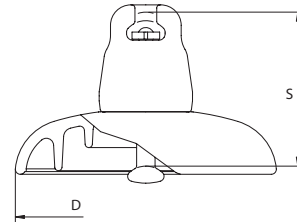
Sediver® toughened glass suspension insulators

IEC

Ball & Socket type

400 kN

840 kN



Standard Profile

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	m ³	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	m ³	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)

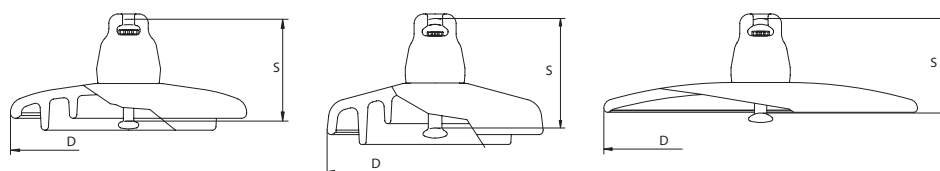
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Sediver® toughened glass suspension insulators

BS

Ball & Socket type

80 kN
120 kN



CATALOG N°	Standard Profile		Fog Type Profile		Open Type Profile	
	B8/140	B12/146	B8P-A/146	B80P/140	B80D/146	
MECHANICAL CHARACTERISTICS						
Minimum mechanical failing load	kN	80	120	80	80	80
DIMENSIONS						
Diameter (D)	mm	255	255	255	280	380
Spacing (S)	mm	140	146	146	140	146
Creepage distance	mm	320	320	390	445	365
Metal fitting size ⁽¹⁾		16B	16B	16B	16B	16B
Locking device designation		W	W	W	W	W
ELECTRICAL CHARACTERISTICS ⁽²⁾						
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	4	4	5	5.8	5.6
N° of insulators per crate		6	6	6	6	6
Volume per crate	m ³	0.05	0.05	0.05	0.07	0.11
Gross weight per crate	kg	28	28	35	40	41
N° of insulators per pallet		96	96	96	72	90
Volume per pallet	m ³	1.3	1.3	1.3	1.2	2.2
Gross weight per pallet	kg	461	461	565	497	630

(1) in accordance with IEC 60120 & BS 3288

(2) in accordance with IEC 60383-1 & BS 60383-1

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

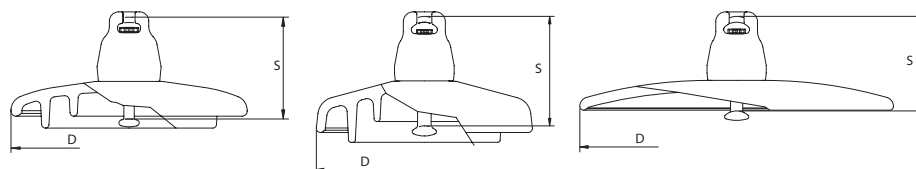
For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

BS

Ball & Socket type

125 kN



		Standard Profile	Fog Type Profile	Open Type Profile
CATALOG N°		B13/140	B130P/146	B13D/140
MECHANICAL CHARACTERISTICS				
Minimum mechanical failing load	kN	125	125	125
DIMENSIONS				
Diameter (D)	mm	255	280	380
Spacing (S)	mm	140	146	140
Creepage distance	mm	320	445	365
Metal fitting size ⁽¹⁾		20	20	20
Locking device designation		W	W	W
ELECTRICAL CHARACTERISTICS ⁽²⁾				
Power frequency withstand voltage				
- Dry one minute	kV	70	80	60
- Wet one minute	kV	40	50	50
Dry lightning impulse withstand volt.	kV	100	125	90
Puncture withstand voltage	kV	130	130	130
PACKING AND SHIPPING DATA				
Approx. net weight	kg	4.4	5.8	5.6
N° of insulators per crate		6	6	6
Volume per crate	m ³	0.05	0.07	0.12
Gross weight per crate	kg	30	40	44.6
N° of insulators per pallet		96	72	90
Volume per pallet	m ³	1.3	1.2	2.6
Gross weight per pallet	kg	499	497	624

(1) in accordance with IEC 60120 & BS 3288

(2) in accordance with IEC 60383-1 & BS 60383-1

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

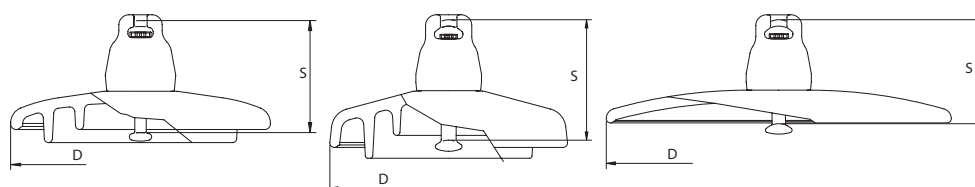
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Sediver® toughened glass suspension insulators

BS

Ball & Socket type

160 kN



Standard Profile

Fog Type Profile

Open Type Profile

CATALOG N°

B160/146

B160P/170

B160D/146

MECHANICAL CHARACTERISTICS

Minimum mechanical failing load	kN	160	160	160
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DIMENSIONS

Diameter (D)	mm	280	330	420
Spacing (S)	mm	146	170	146
Creepage distance	mm	400	545	375
Metal fitting size ⁽¹⁾		20	20	20
Locking device designation		W	W	W

ELECTRICAL CHARACTERISTICS ⁽²⁾

Power frequency withstand voltage				
- Dry one minute	kV	75	90	60
- Wet one minute	kV	45	55	50
Dry lightning impulse withstand volt.	kV	110	140	90
Puncture withstand voltage	kV	130	130	130

PACKING AND SHIPPING DATA

Approx. net weight	kg	6	8.8	8
N° of insulators per crate		6	6	6
Volume per crate	m ³	0.07	0.11	0.15
Gross weight per crate	kg	42	60	57
N° of insulators per pallet		72	54	36 54
Volume per pallet	m ³	1.2	1.4	1.3 1.8
Gross weight per pallet	kg	518	551	367 538

(1) in accordance with IEC 60120 & BS 3288

(2) in accordance with IEC 60383-1 & BS 60383-1

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

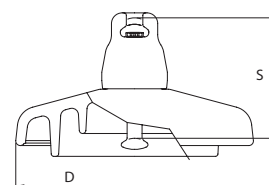
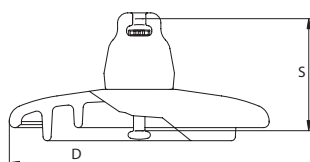
For specific markets we also supply a range of customized products which are not shown here. Please contact our sales department for more details.

Sediver® toughened glass suspension insulators

BS

Ball & Socket type

190 kN



Standard Profile

Fog Type Profile

CATALOG N°

B190/200

B190P02/170

MECHANICAL CHARACTERISTICS

Minimum mechanical failing load	kN	190	190
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DIMENSIONS

Diameter (D)	mm	280	330
Spacing (S)	mm	200	170
Creepage distance	mm	380	550
Metal fitting size ⁽¹⁾		24	24
Locking device designation		W	W

ELECTRICAL CHARACTERISTICS ⁽²⁾

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	7.2	10.2
N° of insulators per crate		2	6
Volume per crate	m ³	0.03	0.11
Gross weight per crate	kg	24	68
N° of insulators per pallet		24	54
Volume per pallet	m ³	0.9	1.3
Gross weight per pallet	kg	300	628

(1) in accordance with IEC 60120 & BS 3288

(2) in accordance with IEC 60383-1 & BS 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

ANSI

Ball & Socket type

70 kN



Standard Profile

CATALOG N°		CT70/146	N70/146
ANSI class ⁽¹⁾		52-4-L	52-3-L
MECHANICAL CHARACTERISTICS			
Combined M&E Strength	kN	70	70
	lbs	15,000	15,000
Impact strength	m.N	45	45
	in-pds	400	400
Tension proof	kN	35	35
	lbs	7,500	7,500
DIMENSIONS			
Diameter (D)	mm	255	255
	inch	10	10
Spacing (S)	mm	146	146
	inch	5 ^{3/4}	5 ^{3/4}
Creepage distance	mm	320	320
	inch	12 ^{5/8}	12 ^{5/8}
Metal fitting coupling ⁽¹⁾		Clevis type	B & S type B
ELECTRICAL CHARACTERISTICS ⁽²⁾			
Low frequency dry flashover	kV	80	80
Low frequency wet flashover	kV	50	50
Critical impulse flashover +	kV	125	125
Critical impulse flashover -	kV	130	130
Low frequency puncture voltage	kV	130	130
R.I.V Low frequency test voltage	kV	10	10
Max. RIV at 1 MHz	µV	50	50
PACKING AND SHIPPING DATA			
Approx. net weight	kg	3.6	3.8
N° of insulators per crate		6	6
Volume per crate	m ³	0.06	0.06
Gross weight per crate	kg	26	27
N° of insulators per pallet		96	96
Volume per pallet	m ³	1.36	1.40
Gross weight per pallet	kg	443	463

(1) in accordance with ANSI C29.2

(2) in accordance with ANSI C29.1

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

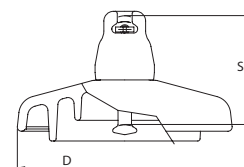
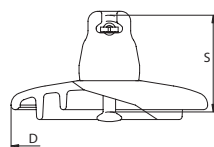
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Sediver® toughened glass suspension insulators

ANSI

Ball & Socket type

100 kN



		Standard Profile	Fog Type Profile
CATALOG N°		N100/146	N100P/146
ANSI class ⁽¹⁾		52-3-H	
MECHANICAL CHARACTERISTICS			
Combined M&E Strength	kN	100	100
	lbs	22,000	22,000
Impact strength	m.N	45	45
	in-pds	400	400
	Tension proof	kN	50
	lbs	11,000	11,000
DIMENSIONS			
Diameter (D)	mm	255	280
	inch	10	11
Spacing (S)	mm	146	146
	inch	5 3/4	5 3/4
Creepage distance	mm	320	445
	inch	12 5/8	17 1/2
Metal fitting coupling ⁽¹⁾		B&S type B	B&S type B
ELECTRICAL CHARACTERISTICS ⁽²⁾			
Low frequency dry flashover	kV	80	100
Low frequency wet flashover	kV	50	60
Critical impulse flashover +	kV	125	140
Critical impulse flashover -	kV	130	140
Low frequency puncture voltage	kV	130	130
R.I.V Low frequency test voltage	kV	10	10
Max. RIV at 1 MHz	µV	50	50
PACKING AND SHIPPING DATA			
Approx. net weight	kg	4	5.5
N° of insulators per crate		6	6
Volume per crate	m ³	0.06	0.08
Gross weight per crate	kg	29	39
N° of insulators per pallet		96	54
Volume per pallet	m ³	1.40	1.20
Gross weight per pallet	kg	482	378

(1) in accordance with ANSI C29.2

(2) in accordance with ANSI C29.1

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

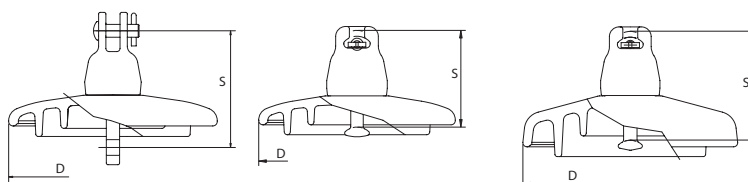
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Sediver® toughened glass suspension insulators

ANSI

Ball & Socket type

120 kN



		Standard Profile		Fog type Profile
CATALOG N°		CT12/146	N12/146	N120P/146
ANSI class ⁽¹⁾		52-6-L	52-5-L	
MECHANICAL CHARACTERISTICS				
Combined M&E Strength	kN	120	120	120
	lbs	25,000	25,000	25,000
Impact strength	m.N	45	45	45
	in-pds	400	400	400
Tension proof	kN	60	60	60
	lbs	12,500	12,500	12,500
DIMENSIONS				
Diameter (D)	mm	255	255	280
	inch	10	10	11
Spacing (S)	mm	146	146	146
	inch	5 ^{3/4}	5 ^{3/4}	5 ^{3/4}
Creepage distance	mm	320	320	445
	inch	12 ^{5/8}	12 ^{5/8}	17 ^{1/2}
Metal fitting coupling ⁽¹⁾		Clevis type	B&S type J	B&S type J
ELECTRICAL CHARACTERISTICS ⁽²⁾				
Low frequency dry flashover	kV	80	80	100
Low frequency wet flashover	kV	50	50	60
Critical impulse flashover +	kV	125	125	140
Critical impulse flashover -	kV	130	130	140
Low frequency puncture voltage	kV	130	130	130
R.I.V Low frequency test voltage	kV	10	10	10
Max. RIV at 1 MHz	µV	50	50	50
PACKING AND SHIPPING DATA				
Approx. net weight	kg	4	4	5.5
N° of insulators per crate		6	6	6
Volume per crate	m ³	0.06	0.06	0.078
Gross weight per crate	kg	29	29	39
N° of insulators per pallet		96	96	72
Volume per pallet	m ³	1.36	1.40	1.20
Gross weight per pallet	kg	482	482	475

(1) in accordance with ANSI C29.2

(2) in accordance with ANSI C29.1

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

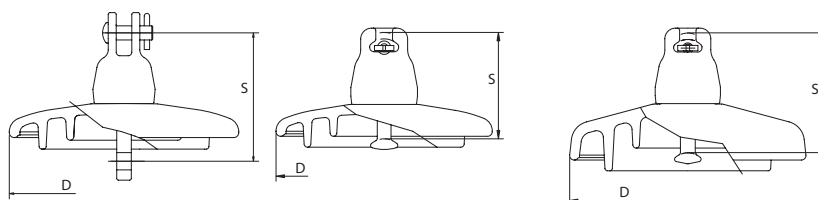
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Sediver® toughened glass suspension insulators

ANSI

Ball & Socket type

160 kN
220 kN



CATALOG N°	Standard Profile			Fog type Profile		
	CT160/165	N160/146	N21/156	N160P/146	N222P/171	
ANSI class ⁽¹⁾	52-10-L	52-8-L	52-11			
MECHANICAL CHARACTERISTICS						
Combined M&E Strength	kN	160	160	222	160	222
	lbs	36,000	36,000	50,000	36,000	50,000
Impact strength	m.N	45	45	45	45	45
	in-pds	400	400	400	400	400
Tension proof	kN	80	80	111	80	111
	lbs	18,000	18,000	25,000	18,000	25,000
DIMENSIONS						
Diameter (D)	mm	280	280	280	330	330
	inch	11	11	11	13	13
Spacing (S)	mm	165	146	156	146	171
	inch	6 1/2	5 3/4	6 1/8	5 3/4	6 3/4
Creepage distance	mm	400	400	380	545	550
	inch	15 3/4	15 3/4	15	21 1/2	21 5/8
Metal fitting coupling ⁽¹⁾		Clevis type	B&S type K	B&S type K	B&S type K	B&S type K
ELECTRICAL CHARACTERISTICS ⁽²⁾						
Low frequency dry flashover	kV	80	80	80	105	105
Low frequency wet flashover	kV	50	50	50	65	65
Critical impulse flashover +	kV	125	125	140	170	170
Critical impulse flashover -	kV	130	130	140	160	160
Low frequency puncture voltage	kV	130	130	130	130	130
R.I.V Low frequency test voltage	kV	10	10	10	10	10
Max. RIV at 1 MHz	µV	50	50	50	50	50
PACKING AND SHIPPING DATA						
Approx. net weight	kg	6.1	6.2	7.2	8.8	9.5
N° of insulators per crate		6	6	6	6	6
Volume per crate	m ³	0.09	0.09	0.08	0.12	0.11
Gross weight per crate	kg	43	43	50	59	64
N° of insulators per pallet		54	54	54	54	54
Volume per pallet	m ³	1.20	1.20	1.20	1.38	1.3
Gross weight per pallet	kg	415	415	471	560	590

(1) in accordance with ANSI C29.2

(2) in accordance with ANSI C29.1

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.

For extreme pollution: Sedicoat® solution

In case of extreme or exceptional pollution, it may become necessary to wash the glass and porcelain insulators so as to reduce the risk of flashover due to the critical deposit of pollution. Composite insulators can be used in these conditions, nonetheless the benefits linked to the hydrophobicity and profile of this kind of insulators are outweighed by the difficulties of inspection and diagnosis of the aging as well as the difficulty of live line working.

Sedicoat®: no washing is needed anymore

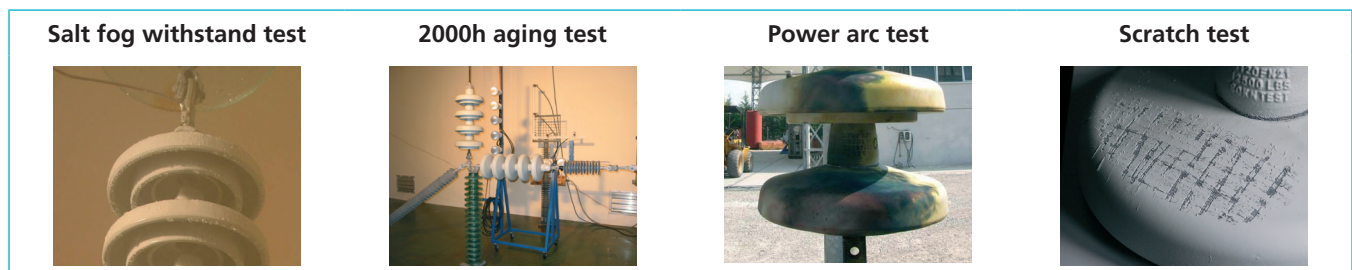
Sedicoat® insulators are Sediver® toughened glass insulators coated with silicone. The silicone coating procures hydrophobic properties to the surface of the glass shell and thus significantly enhances its electrical performance under extreme pollution. The hydrophobic behavior of the surface helps mitigating extreme pollution problems by reducing wetting and leakage currents.

Sedicoat® insulators offer a solution that eliminates the need for regular washing in extreme pollution conditions.

A Sediver R&D qualification program

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

To obtain optimum performance, Sediver® has set in place a stringent R&D program. The silicones qualified by Sediver® have been specifically selected to resist quite severe electrical constraints undergone by cap and pin insulators on overhead lines in polluted environments.



The application of the coating is done at the factory according to a specific industrial process qualified by Sediver.

A solution confirmed by 2 decades of satisfactory service

Applications

- Coastal areas
- Industrial pollution areas
- Desert areas
- Mixed pollution areas
- Applications in HVAC and HVDC

Main advantages:

- Reduce the maintenance cost as there is no need for washing
- Keep the inherent properties of the toughened glass in terms of:
 - easiness and reliability of visual inspection
 - safe live-line working
 - long term electrical and mechanical reliability
 - no aging
- No need to modify line design
- Can be applied on all glass profiles



Sedicoat® is the solution that maintains the unique properties of Sediver® toughened glass insulators while eliminating the need for washing under extreme pollution conditions thanks to the silicone coating.

IEC/BS string electrical ratings

Sediver® toughened glass suspension insulators

Standard profile

Standard profile suspension insulator string withstand voltages based on the test procedure of the International Standard IEC 60383-93 and British Standard BS 60383.

Catalog N°	Diameter / Spacing Ø 255/127			Diameter / Spacing Ø 255/146 - Ø 280/146		
	F70/127 - F100/127 - F12/127			F70/146 - F100/146 - F12/146 - F160/146		
	Number of units	Power frequency withstand voltage (kV)		Lightning impulse withstand voltage (kV)	Power frequency withstand voltage (kV)	
DRY		WET	DRY		WET	
2	113	65	175	130	75	195
3	157	100	245	180	115	275
4	204	135	320	235	155	360
5	244	170	395	280	195	430
6	283	200	460	325	230	505
7	326	231	525	375	265	580
8	365	261	585	420	300	660
9	404	283	660	465	325	730
10	444	326	720	510	375	800
11	478	357	785	550	410	880
12	518	383	850	595	440	955
13	552	413	920	635	475	1025
14	587	444	985	675	510	1095
15	622	470	1050	715	540	1160
16	657	496	1115	755	570	1230
17	696	522	1180	800	600	1300
18	744	552	1240	855	635	1370
19	761	578	1310	875	665	1440
20	796	609	1365	915	700	1510
21	826	635	1425	950	730	1575
22	861	661	1490	990	760	1640
23	896	687	1550	1030	790	1710
24	926	713	1610	1065	820	1775
25	957	744	1670	1100	855	1850
26	992	765	1735	1140	880	1920
27	1022	792	1800	1175	910	1990
28	1057	813	1860	1215	935	2060
29	1092	839	1920	1255	965	2130
30	1122	861	1980	1290	990	2200

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

IEC/BS string electrical ratings

Sediver® toughened glass suspension insulators

Standard profile

Standard profile suspension insulator string withstand voltages based on the test procedure of the International Standard IEC 60383-93 and British Standard BS 60383.

Catalog N°	Diameter / Spacing Ø 280/170			Diameter / Spacing Ø 320/195 - Ø 360/205		
	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)	
DRY		WET	DRY		WET	
2	140	80	215	155	90	230
3	200	120	305	220	140	340
4	250	160	385	290	180	430
5	300	200	470	350	220	530
6	350	240	560	405	260	620
7	400	280	640	465	300	700
8	450	320	720	515	350	790
9	500	350	810	570	390	880
10	545	380	900	620	440	970
11	590	420	980	675	490	1060
12	635	455	1070	725	540	1150
13	675	490	1140	775	580	1240
14	720	520	1220	825	620	1330
15	760	550	1300	870	660	1425
16	810	585	1380	920	700	1520
17	850	615	1460	970	740	1610
18	895	650	1550	1020	780	1700
19	930	680	1620	1070	820	1790
20	970	710	1690	1110	860	1880
21	1000	740	1770	1160	900	1970
22	1050	775	1840	1210	940	2050
23	1090	805	1920	1260	980	2140
24	1130	835	2000	1310	1015	2230
25	1170	870	2080	1360	1050	2320
26	1210	900	2160	1410	1085	2410
27	1250	930	2240	1460	1120	2500
28	1290	960	2320	1510	1155	2600
29	1330	990	2400	1550	1190	2700
30	1370	1030	2480	1600	1225	2800

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

IIEC/BS string electrical ratings

Sediver® toughened glass suspension insulators

Fog type profile

Fog type profile suspension insulator string withstand voltages based on the test procedure of the International Standard IEC 60383-93 and British Standard BS 60383.

Catalog N°	Diameter / Spacing Ø 280/146 - Ø 330/146			Diameter / Spacing Ø 330/170		
	F100P/146 - F120P/146 F160P/146 - 100PF/146		Lightning impulse withstand voltage (kV)	F160P/170 - F210P/170		Lightning impulse withstand voltage (kV)
	Power frequency withstand voltage (kV)			Power frequency withstand voltage (kV)		
Number of units	DRY	WET		DRY	WET	
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

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

IIEC/BS string electrical ratings

Sediver® toughened glass suspension insulators

Open type profile

Open type profile suspension insulator string withstand voltages based on the test procedure of the International Standard IEC 60383-93 and British Standard BS 60383.

Catalog N°	Diameter / Spacing Ø 380/127			Diameter / Spacing Ø 380/146 - Ø 420/146		
	F12D/127		Lightning impulse withstand voltage (kV)	F12D/146 - F160D/146 - B160D/146		Lightning impulse withstand voltage (kV)
	Power frequency withstand voltage (kV)			Power frequency withstand voltage (kV)		
Number of units	DRY	WET		DRY	WET	
2	95	75	160	110	85	165
3	135	110	225	160	125	235
4	175	145	290	205	165	310
5	215	180	355	255	205	380
6	255	210	420	305	240	450
7	290	245	490	355	280	525
8	330	280	555	405	320	595
9	370	310	620	455	360	670
10	410	345	685	505	395	740
11	450	380	750	555	435	810
12	490	410	815	605	470	885
13	530	445	885	655	510	955
14	570	480	950	705	550	1030
15	610	515	1015	755	590	1100
16	650	545	1080	800	625	1175
17	690	580	1145	850	665	1245
18	730	615	1210	900	705	1315
19	770	645	1280	950	745	1390
20	810	680	1345	1000	780	1460
21	850	715	1410	1050	820	1535
22	890	750	1475	1100	860	1605
23	930	780	1540	1150	895	1675
24	970	815	1605	1200	935	1750
25	1010	850	1675	1250	975	1825
26	1050	880	1740	1290	1010	1895
27	1090	915	1805	1350	1050	1965
28	1130	950	1870	1400	1090	2035
29	1170	980	1935	1450	1125	2110
30	1210	1015	2000	1495	1165	2180

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

ANSI string electrical ratings

Sediver® toughened glass suspension insulators

Standard profile

Standard profile suspension insulator string flashover voltages based on the test procedure of the American Standard ANSI C 29.1.

Catalog N°	Diameter / Spacing Ø 255/146 - Ø 280/146				Diameter / Spacing Ø 280/156			
	N70/146 - N100/146 - N12/146 - N160/146 CT70/146 - CT12/146				N21/156			
	Number of units	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	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

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.

ANSI string electrical ratings

Sediver® toughened glass suspension insulators

Fog type profile

Fog type profile suspension insulator string flashover voltages based on the test procedure of the American Standard ANSI C 29.1.

Catalog N°	Diameter / Spacing Ø 280/146 - Ø 330/146				Diameter / Spacing Ø 330/171			
	N100P/146 - N120P/146 - N160P/146				N160P/171 - N222P/171			
	Number of units	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	13	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

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.

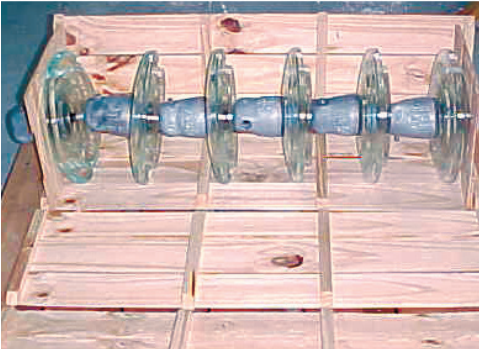
Packing and palletization

Reinforced and optimized packing

The packing and palletizing methods used by Sediver® result from the experience gained from the shipment of hundreds of millions of toughened glass insulators to users' warehouses and construction sites in 150 countries as well as from extensive tests performed by packing research organizations.

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

The wood used for packing is either standard or treated according to country regulations or/and customer specification.



Strengthened packing

Factory-assembled strings of Sediver® insulators are packed in wooden crates, which are reinforced and held closed by external wire bindings. A crate is shown here 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 a sturdy four-way wooden pallet. This assembly is held tightly in place with either steel or plastic bands and is protected against moisture by a complete covering of polyethylene film.

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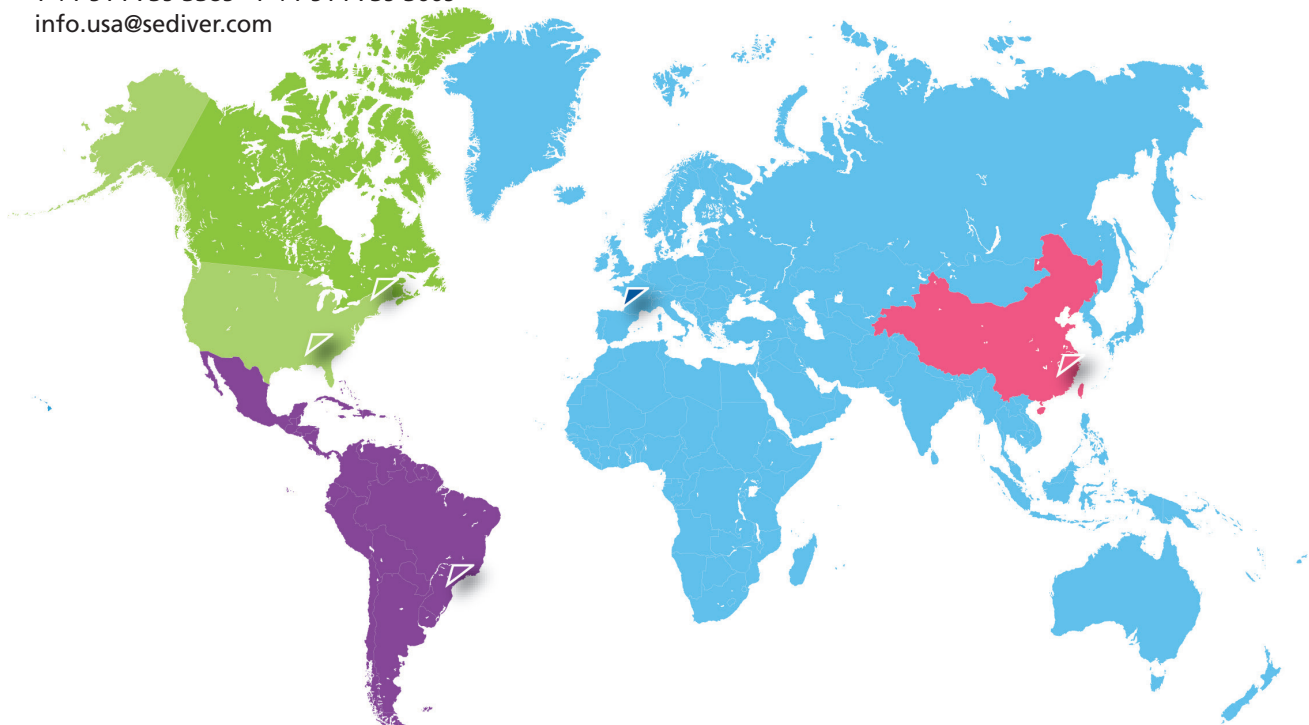
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