SEVES

sediver

Sediver composite suspension insulators

ANSI USA/Canada

2008

This catalog presents a selection of the Sediver composite insulators suspension type for AC applications answering the needs of North-American customers in term of standards (ANSI), current practices and environmental conditions. ANSI standards C29.11 and C29.12 set the basic and minimum requirements for this type of insulators. Sediver composite insulators meet and exceed the performance requirements of ANSI standards. Sediver insulator designs for DC applications are also available upon request.

Sediver composite insulators in North America

Sediver introduced composite insulators in 1975, after a 10-year research and development program. The dependability of the Sediver design has been demonstrated by the excellent performance of nearly 5 million polymer insulators now installed worldwide at voltages from 15 kV to 735 kV.

Experience records in the U.S. and world-wide confirm that Sediver composite insulators have proven to perform extremely well over the last 30 years.

Some customers* of Sediver composite insulators in the U.S.A and Canada

Alabama Electric Coop, Andalusia, AL - Alabama Power Co, Birmingham, AL - - Appalachian Power Co, - Arizona Public Service Co, AZ - Atlantic Electric, Charleston, SC - Austin (City of), Austin, TX - Baltimore Gas & Electric, Baltimore, MD - Big Rivers Electric, Henderson, KY - Bonneville Power Administration, Portland, OR - Carolina Power & Light, Raleigh, NC - Central Illinois Public Service, Springfield, IL - Central Power & Light, Corpus Christi, TX - Commonwealth Edison Co, IL - Connecticut Light & Power, CT - Delmarva Power & Light, Wilmington, DE - Delmarva Power Co, MD - Detroit Edison, Detroit, MI - Douglas Country P,U,D, Washington, WA - Empire District Electric, Joplin, MO - Florida Power & Light, St. Petersburg, FL - Georgia Power, Atlanta, GA - Grant County P,U,D, - Houston Light & Power, Houston, TX - Idaho Power, Morristown, NJ - Imperial Irrigation District Iowa-Illinois Gas & Electric, IL - Jersey Central, Power & Light Morriston, NJ - Kansas City Power & Light, KS - Kansas City Public Utility Board, KS - Kansas Gas & Electricity, KS - Kansas Power & Light, KS - Knoxville Utilities Board, Tennessee, TN - Los Angeles Dept of Water & Power, Los Angeles, CA - Midway Sunset Co-Generation, CA - Minnkota Power Coop, Mississippi Power & Light, MO - Mississippi Power Co, MO - Nebraska Public Power District, Colombus, NB - Nevada Power Co, NV - New England Power Co, New York State Electric & Gas, NY - Niagara Mohawk Power Co, North Virginia Electric Coop, VA - Northern Indiana Public Service, IN - Northern States Power Co, Ohio Edison Company, OH Otter Tail Power Company, Pacific Gas & Electric, Pacific Power & Light, Portland, OR - Pensylvannia Power Co, Allentown, PA - Philadelphia Electric, Public Service Electric & Gas, Newark, NJ - Public Service of Colorado, Denver, CO - Public Service of Indiana, IN - Public Service of New Hampshire, NH - Public Service of New Mexico, NM - Public Service of Oklahoma, OK - Puget Sound Power & Light, San Antonio {City of}, Public Serv, Bd, Tx San Diego Gas & Electric, Sierra Pacific Power Company, South Carolina Electric & Gas, SC - South Mississippi ElecPower Assoc, MS - Southern California Edison, CA - Southwestern Electric Power Co, Southwestern Public Service, Tacoma {City of}, Washington, WA - Tampa Electric, Tarheel Electric Membership Association, Tennesse Valley Authority, Chattanooga, TN - Tri-State Generation & Trans, Ass, Union Electric Co, St Louis, MO - United Power Association, Elk River, Utah Power & Light, Salt Lake city, UT - West Penn Power, Western Area Power Adminis, Winfield {City of}, Kansas, KS - Wisconsin Electric Power, WI - Wisconsin Power & Light, WI - Wisconsin Public Service, WI - **USA**

Alberta Power, BC Hydro, Enmax, Hydro Québec, Hydro One, Manitoba Hydro, Newfoundland Hydro, NB Power, Sask Power - **Canada**

* Some of the companies above are now part of new entities

Sediver today

SEVES sediver

The SEVES group is a world leader in the power insulator industry, specialized in composite, glass and porcelain insulators for high voltage transmission lines and substations.

Sediver is part of the Seves group and has been specialized for the last 60 years in the field of high voltage glass and polymer insulation. More recently, composite surge arresters have been added to our product range.

Today Sediver's global presence is assured by:

- manufacturing facilities located in South America (Brazil), Europe (Italy) and the Far East (China). Each facility is ISO 9001-2000 certified and is ruled by the same quality assurance programs and organization. This ensures that all Sediver insulators are manufactured with the same design, following the same methods and procedures, in order to supply insulators to our clients, worldwide, with the same level of high quality.
- centralized technical resources located in France, including Research and Development and Customer Technical Support as well as high voltage laboratories.
- a large and widespread commercial network ensuring timely assistance to customers in the execution of their projects. The sales offices for North America are based in Tiffin (OH), USA and Montreal, Canada, with regional representatives covering all of the North American territory.

Quality driven organisation and staff

Ideally, an insulator once installed, should be maintenance-free and forgotten by the operator of the line for several decades. Sediver contributes to achieving this goal by placing quality at all levels of the organization and at the forefront of the actions undertaken by all personnel, from the design, manufacturing, testing and supply, up to after-sales service of any Sediver products to its customers.

Quality of products

Each factory quality organization is coordinated through a centralized Quality Department who acts as the client's representative in determining and assuring full compliance of the manufactured insulators with the highest standards. Each quality department has absolute authority to ensure that the overall quality policy is enforced and respected at all levels of operations.

Quality of technical support

A team of skilled engineers operating in our Product Engineering Dept are dedicated to providing solutions to customers in the field of high-voltage insulation and protection. Their know-how is based on 60 years of experience, testing and research carried out in State-of-the-Art laboratories using cutting edge technology in the fields of material science, mechanical and HV testing including pollution testing and 3D electrical and mechanical simulations.

Sediver unique combination between design features ...

Sediver « Impenetrable » design proven dependability

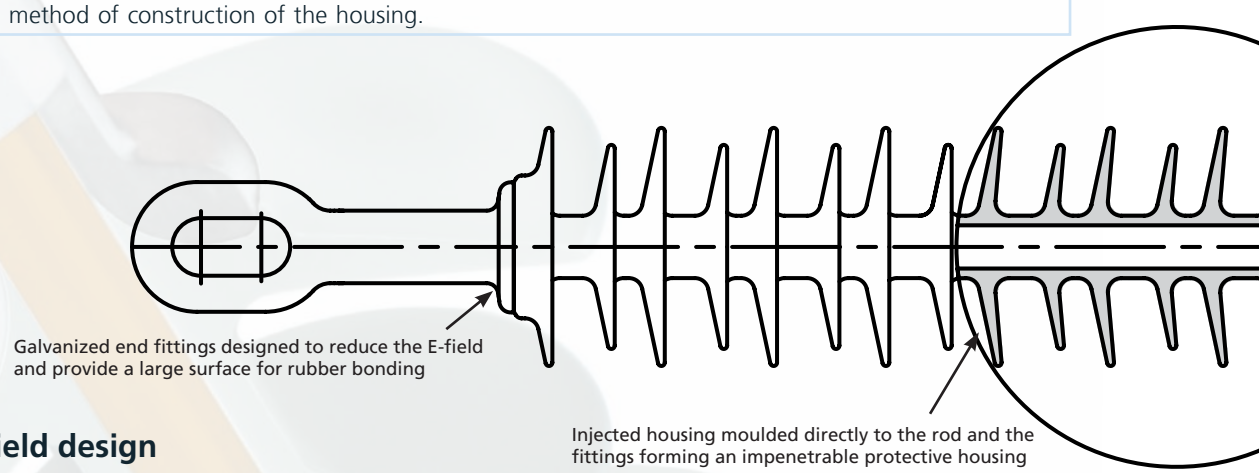
All Sediver composite insulators are manufactured at high pressure and high temperature thanks to direct injection molding technology. This unique "**impenetrable"** housing design safely protects the fiberglass rod against water or contaminant penetration without the need of any "seals". Injection molding technology has been adopted and continuously perfected by Sediver since 1985.

The Sediver state-of-the-art insulator is made with the most advanced materials, resulting from extensive research testing and field experience gained over more than 50 years of expertise in overhead line insulation.

Field experience has clearly demonstrated that composite insulators performance and degradation was directly related to some key design features. One of them, (provided material selection is adequate), is defined by the method of construction of the housing.

In this regard, internal tracking and moisture penetration are known to be the main actors for failures in service. To prevent such risks, Sediver housing is directly injected and bonded at high temperature and high pressure on the fiberglass rod and the fittings, assuring a complete adherence of the rubber.

The perfect interface between rod and housing will not allow any development of internal tracking under the housing. The complete adherence of the rubber onto the end fittings enlarged collar eliminates the need for inherently weak sealing devices responsible for moisture ingress, and subsequently brittle fractures. The housing being totally **"impenetrable"** will also prevent possible moisture penetration along the core.



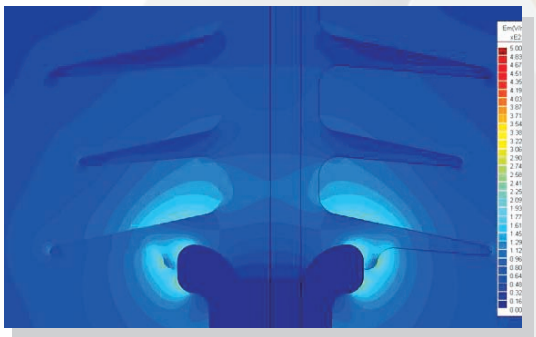
Reduced E-field design

The extremity of the insulator is the most severely stressed section of the insulator.

Thanks to the direct injection moulding process, the Sediver design requires no seal at the end fitting which is totally bonded to the first shed eliminating any risk of ageing of seals.
Beyond being fully impenetrable, this design where the first shed is moulded over an enlarged collar at the extremity of the end fitting reduces greatly the E-field, decreasing simultaneously the current density on the shank.
These unique features have shown to be essential for the long term performance of composite materials.

Long term performance

The direct injection moulding process used by Sediver offers a unique quality of interface between the rod and the housing as well as between the end fitting and the housing.
Making the insulator fully **"impenetrable"**, this feature also offers unparallel quality of bonding along the rod preventing any risk of internal tracking along the longitudinal interface of the composite insulator.



and manufacturing process

Mechanical reliability

The quality of the rod is key for the long term mechanical reliability of a composite insulator.

Sediver customized fiberglass reinforced epoxy resin rod formulation provides outstanding performance under the most severe field conditions.

This high strength core is not only protected by a fully impenetrable housing but is by nature formulated against acid generation that might exist with low grade resins.

This combination is a major step against brittle fracture.

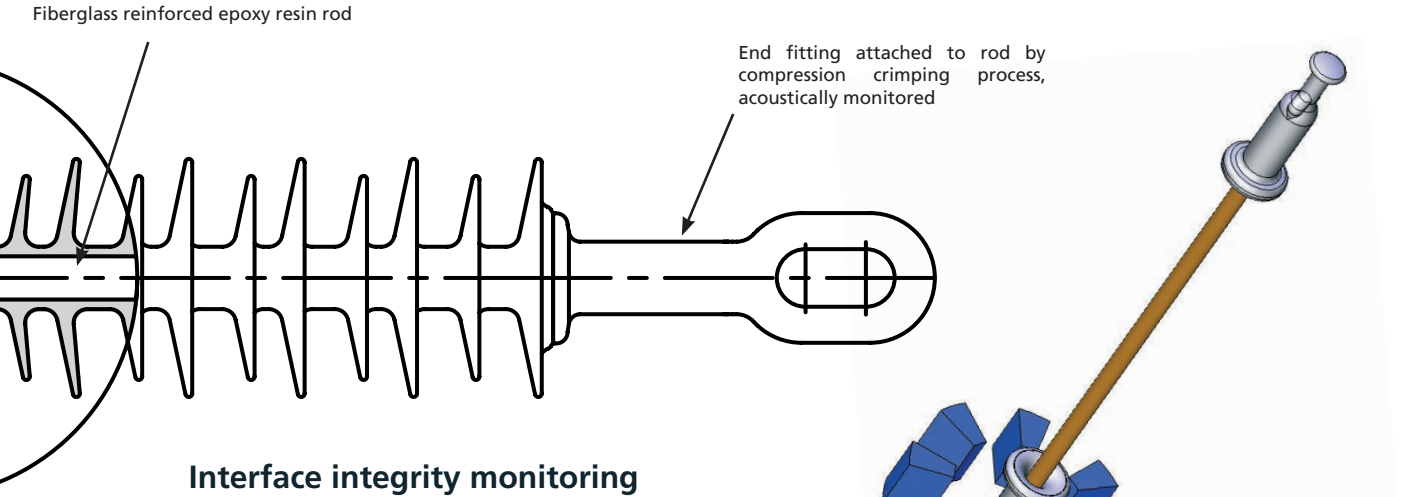
Compression crimping monitoring

End fittings for composite insulators need sufficient gripping force to achieve the required tensile strength without damaging the rod.

Cutting edge technology is present in the Sediver composite insulator process including the monitoring of crimping under compression of the end fitting on the fiberglass rod.

The latest evolution of more than 20 year development of acoustic monitoring technique is fully integrated to our process, removing the unknown of non visible damage in the rod under the metal end fitting.

This is one more major contribution to the dependability of the Sediver composite insulators.



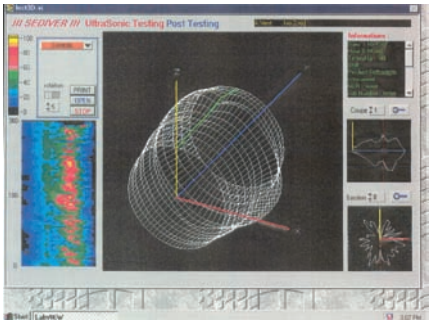
Interface integrity monitoring

The longitudinal interface along the fiberglass rod and the rubber housing is highly critical in regard to risks of internal tracking if this interface is not perfect.

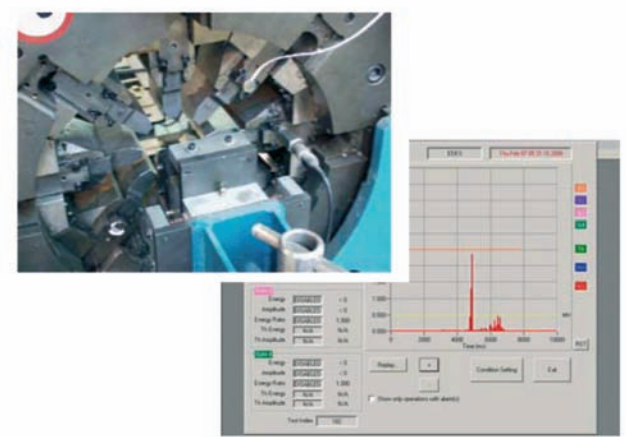
Thanks to the injection moulding process, the Sediver design offers the strongest possible bonding and adherence between these two components.

Additionally, Sediver designed an exclusive non destructive testing method based on ultrasonic technique to validate, on a sampling basis, the quality of this interface.

This control performed on finished products offers one more step in the advanced dependability of our products.



Ultrasonic monitoring system



Crimping acoustic monitoring system

How to select your Sediver composite insulator

Housing material

Sediver suspension insulators are available either with EPDM or with silicone rubber.

> EPDM compound has been specially formulated to provide optimum weathering and electrical properties for all operating conditions.
Sediver has more than 30 years of excellent field experience with EPDM insulators.

> Silicone compound provides excellent hydrophobic and recovery characteristics which limit leakage current and arcing in polluted or seacoast environments.

Both formulations are the result of extensive research and testing programs.

Performance of shed profile under contaminated conditions

The high leakage distance and relatively small surface area of Sediver insulators provide improved contamination performance as compared with strings of standard design ceramic insulators. Selection of the correct type and length of Sediver insulators depends on the nature of the pollutants involved, local weather patterns and washing practices. These conditions should therefore be described when requesting recommendations for contaminated area applications.

Sediver insulators with a higher leakage distance in a given standard section length are available for this purpose, when needed. Dimensions and ratings of a typical high leakage Sediver insulator, as compared with the standard leakage type, are shown below:

25 kips	Profile	Section Length type EB	Leakage Distance	Flashover ratings Low frequency		Critical Impulse	
		Inches (mm)	Inches (mm)	Dry kV	Wet kV	Pos. kV	Neg. kV
Standard Leakage	XF	50,7	111,6	400	355	710	740
High Leakage	XM	50,7	126,4	405	360	720	750
Very high Leakage	XL	50,7	166,2	415	370	740	770

Mechanical ratings

Sediver suspension insulators are available with mechanical ratings from 10 to 132 kip.
The mechanical characteristics are defined by two parameters:

Specified mechanical load (SML)- the tensile test load which the Sediver insulator can withstand for 30 to 90 seconds without failure.

Routine test load - the tensile load applied for 10 seconds at ambient temperature to every Sediver suspension insulator at the end of the manufacturing process.

Grading rings

At higher operating voltages, grading rings are necessary to reduce the voltage gradient on and within the insulator, and to reduce radio noise to acceptable levels. As on ceramic strings, the need for grading rings also depends on admissible hardware design, conductor bundle position, altitude and contamination conditions. General recommendations for Sediver suspension insulators used in non-contaminated and low altitude (<3000') areas are:

Line Voltage	Recommendations
Below 160 kV	Grading rings not required
160 kV	Grading ring 11" required at line end of 25, 30 and 40 kip (SML)
	Not required for 50 kip (SML)and above
230-345 kV	Grading ring 11" required at line end of all types
500 kV & above	Grading ring 15.4" required at line end and 11" ring at ground end of all types

The presence of the ring(s) is identified by the last digit of the catalog designation:

0 no grading ring
1 one ring 11" at line end
5 one ring 15.4" at line end and one ring 11" at ground end

How to select your Sediver composite suspension insulator

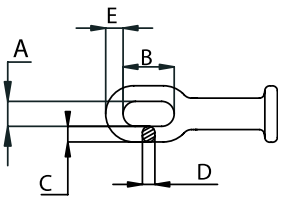
Fitting configuration

Sediver Suspension insulators are available with six end fitting configurations shown on this page and therefore, adapt easily to any method of attachment to structures and conductor clamps.

The user's selection of the required end fitting combination will depend upon construction situation (new or retrofitted line) specific application (I, V, deadend) and maintenance practice.

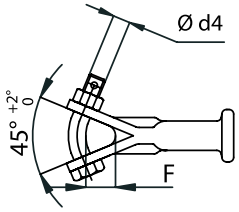
Each end fitting configuration is identified by a type letter (E, B, Y, etc.).
To specify the end fitting combination required, two type letters are added to the basic catalog number designation for a given insulator. The first type letter indicates the cold (or structure) end fitting configuration, while the second letter indicates the hot (or conductor end) configuration.

Oval eye (type E)



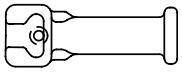
speciefied mechanical load lbs	dimensions inches A (min)	B (min)	C (max)	D (max)	E (max)	ANSI
25.000	1"	2"	0.63"	0.53"	0.75"	C29.12
30.000	1"	2"	0.63"	0.53"	0.75"	C29.12
40.000	1"	2"	0.75"	0.75"	0.9"	C29.12
50.000	1"	2"	0.9"	0.9"	1.3"	
80.000	1.1"	2.9"	0.9"	0.9"	1.3"	

Y-clevis (type Y)



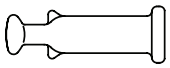
speciefied mechanical load lbs	dimensions inches F (min)	d4 (min)	ANSI
25.000	1.25"	0.75"	C29.12
30.000	1.25"	0.75"	C29.12
40.000	1.57"	0.875"	C29.12
50.000	1.57"	0.875"	

Socket (type S)



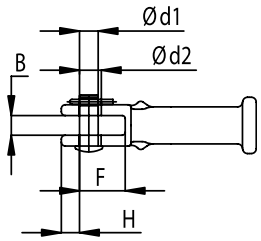
speciefied mechanical load lbs	ANSI class
25.000	52.5
30.000	52.5
40.000	52.8
50.000	52.11

Ball (type B)



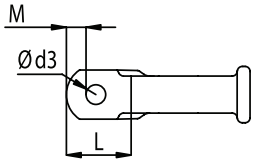
speciefied mechanical load lbs	ANSI class
25.000	52.5
30.000	52.5
40.000	52.8
50.000	52.11

Clevis (type C)



speciefied mechanical load lbs	dimensions inches B (min)	F (min)	H (max)	d1 (max)	d2 (min)	ANSI class
25.000	0.69"	1.33"	0.71"	0.625"	0.66"	52.6
30.000	0.69"	1.33"	0.71"	0.625"	0.66"	52.6
40.000	0.94"	1.77"	0.83"	0.76"	0.78"	52.10
50.000	1"	1.64"	0.91"	0.89"	0.90"	52.12

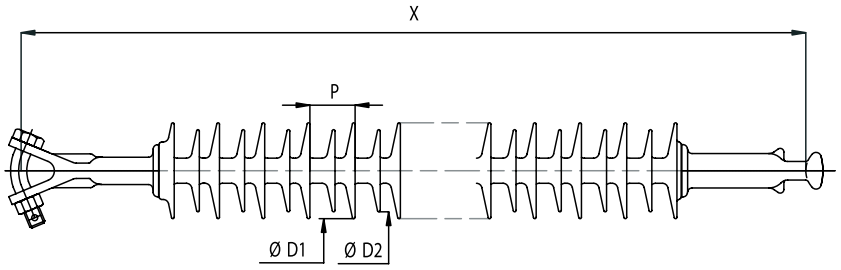
Tongue (type T)



speciefied mechanical load lbs	dimensions inches Thickness (max)	L (min)	M (max)	d3 (min)	ANSI class
25.000	0.56"	1.89"	0.56"	0.66"	52.6
30.000	0.56"	1.89"	0.56"	0.66"	52.6
40.000	0.7"	2.55"	0.87"	0.78"	52.10
50.000	0.94"	2.18"	0.56"	0.90"	52.12

Sediver composite suspension insulators

25 kip - (120 kN)
30 kip - (130 kN)



	Shed Profile		
	XF	XM	XL
Ø D1	3.7	4.1	5.4
	93 mm	105 mm	137 mm
Ø D2	3.1	3.5	4.7
	78 mm	90 mm	119 mm

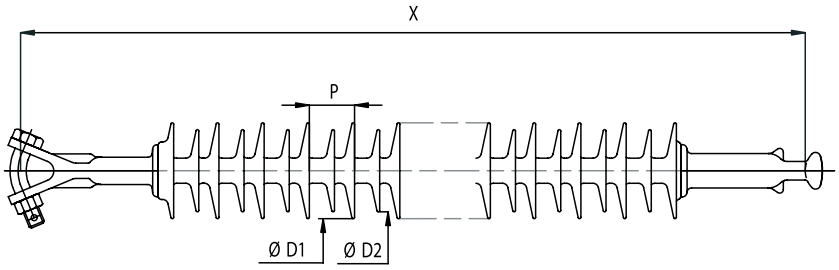
Typical Line Voltage	Sediver Catalog Designation	Number of Sheds	Section Length Inches (mm)	Leakage Distance Inches (mm)	Dry Arcing * Distance Inches (mm)	Low Frequency* Flashover - ANSI Dry kV	Low Frequency* Flashover - ANSI Wet kV	Critical Impulse* Flashover - ANSI Pos. kV	Critical Impulse* Flashover - ANSI Neg. kV	Approx. Net Wt Lbs. (kg)
69 kV	SEDNYB120XF21S0	21	34.1 *866*	62.8 *1595*	23.1 *587*	240	200	425	450	8.1 *3.7*
	SEDNYB120XM21S0			71.2 *1810*	23.6 *601*	245	205	430	460	8.8 *4*
	SEDNYB120XL21S0			93.9 *2385*	25 *635*	255	215	455	480	11.4 *5.2*
	SEDNYB120XF25S0	25	38.4 *976*	75 *1905*	27.4 *697*	280	240	495	525	8.7 *3.9*
	SEDNYB120XM25S0			85 *2160*	28 *711*	285	245	505	535	9.5 *4.3*
	SEDNYB120XL25S0			112 *2844*	29.3 *745*	295	255	525	555	12.7 *5.7*
115 kV	SEDNYB120XF29S0	29	42.8 *1086*	87.2 *2215*	31.8 *807*	320	280	570	595	9.2 *4.2*
	SEDNYB120XM29S0			98.8 *2510*	32.3 *821*	325	285	575	605	10.2 *4.6*
	SEDNYB120XL29S0			130 *3303*	33.6 *855*	340	295	600	630	13.9 *6.3*
	SEDNYB120XF33S0	33	47.1 *1196*	99.4 *2525*	36.1 *917*	360	315	640	670	9.8 *4.5*
	SEDNYB120XM33S0			112.6 *2860*	36.6 *931*	365	320	650	675	11 *5*
	SEDNYB120XL33S0			148.1 *3762*	38 *965*	375	335	670	700	15.1 *6.9*
138 kV	SEDNYB120XF37S0	37	51.4 *1306*	111.6 *2835*	40.4 *1027*	400	355	710	740	10.4 *4.7*
	SEDNYB120XM37S0			126.4 *3210*	41 *1041*	405	360	720	750	11.7 *5.3*
	SEDNYB120XL37S0			166.2 *4221*	42.3 *1075*	415	370	740	770	16.4 *7.4*
	SEDNYB120XF39S0	39	53.6 *1361*	117.7 *2990*	42.6 *1082*	420	375	745	775	10.7 *4.9*
	SEDNYB120XM39S0			133.2 *3385*	43.1 *1096*	425	380	755	785	12.1 *5.5*
	SEDNYB120XL39S0			175.2 *4451*	44.5 *1130*	435	390	775	805	17 *7.7*
	SEDNYB120XF43S0	43	57.9 *1471*	129.9 *3300*	46.9 *1192*	460	410	815	845	11.3 *5.1*
	SEDNYB120XM43S0			147 *3735*	47.5 *1206*	465	415	825	855	12.8 *5.8*
	SEDNYB120XL43S0			193.3 *4910*	48.8 *1240*	475	425	845	875	18.2 *8.3*
	SEDNYB120XF47S0	47	62.2 *1581*	142.1 *3610*	51.3 *1302*	495	445	885	915	11.9 *5.4*
	SEDNYB120XM47S0			160.8 *4085*	51.8 *1316*	500	450	890	920	13.5 *6.1*
	SEDNYB120XL47S0			211.4 *5369*	53.1 *1350*	515	465	915	945	19.4 *8.8*

Table shows typical models. Higher voltages and other dimensions or fittings combinations are available on request. Tests complying with ANSI C29.11

*When grading rings are included in the designation, the electrical values and dry arcing distance are given accordingly

Sediver composite suspension insulators

25 kip - (120 kN)
30 kip - (130 kN)



Section length adjustments

Ground fitting	Line fitting	Type letters	Adjustments inches	Adjustments mm
Socket	Ball	SB	-1.4	-36
Eye	Ball	EB	-0.7	-18
Y-clevis	Tongue	YT	+0.9	+22
Clevis	Tongue	CT	+0.1	+2
Eye	Eye	EE	+0.4	+10

Typical Line Voltage	Sediver Catalog Designation	Number of Sheds	Section Length Inches (mm)	Leakage Distance Inches (mm)	Dry Arcing* Distance Inches (mm)	Low Frequency* Flashover - ANSI Dry kV	Low Frequency* Flashover - ANSI Wet kV	Critical Impulse* Flashover - ANSI Pos. kV	Critical Impulse* Flashover - ANSI Neg. kV	Approx. Net Wt Lbs. (kg)
161 kV with grading ring*	SEDNYB120XF51S1	51	66.6 *1691*	154.3 *3920*	53.1 *1348*	515	460	910	940	18.4 *8.4*
	SEDNYB120XM51S1			174.6 *4435*	53.3 *1355*	515	465	915	945	20.2 *9.2*
	SEDNYB120XL51S1			229.4 *5828*	54 *1372*	520	470	925	955	26.6 *12.1*
	SEDNYB120XF55S1	55	70.9 *1801*	166.5 *4230*	57.4 *1458*	550	500	980	1010	19 *8.6*
	SEDNYB120XM55S1			188.4 *4785*	57.7 *1465*	555	500	985	1015	20.9 *9.5*
	SEDNYB120XL55S1			247.5 *6287*	58.3 *1482*	560	505	995	1025	27.8 *12.6*
	SEDNYB120XF59S1	59	75.2 *1911*	178.7 *4540*	61.7 *1568*	590	535	1050	1075	19.6 *8.9*
	SEDNYB120XM59S1			202.1 *5135*	62 *1575*	590	535	1055	1080	21.6 *9.8*
	SEDNYB120XL59S1			265.6 *6746*	62.7 *1592*	600	540	1065	1090	29.1 *13.2*
230 kV with grading ring*	SEDNYB120XF65S1	65	81.7 *2076*	197 *5005*	68.2 *1773*	645	585	1150	1180	20.5 *9.3*
	SEDNYB120XM65S1			222.8 *5660*	68.5 *1740*	650	590	1155	1180	22.7 *10.3*
	SEDNYB120XL65S1			292.7 *7434*	69.2 *1757*	655	595	1165	1190	30.9 *14*
	SEDNYB120XF71S1	71	88.2 *2241*	215.4 *5470*	74.7 *1898*	705	635	1250	1275	21.4 *9.7*
	SEDNYB120XM71S1			243.5 *6185*	75 *1905*	705	640	1255	1280	23.8 *10.8*
	SEDNYB120XL71S1			319.8 *8123*	75.7 *1922*	710	645	1265	1290	32.8 *14.9*
	SEDNYB120XF75S1	75	92.6 *2351*	227.6 *5780*	79.1 *2008*	740	670	1320	1340	21.9 *10*
	SEDNYB120XM75S1			257.3 *6535*	79.3 *2015*	740	675	1320	1345	24.5 *11.1*
	SEDNYB120XL75S1			337.9 *8582*	80 *2032*	750	680	1335	1355	34 *15.4*
345 kV with grading ring*	SEDNYB120XF81S1	81	99.1 *2516*	245.9 *6245*	85.6 *2173*	795	720	1420	1440	22.8 *10.4*
	SEDNYB120XM81S1			277.9 *7060*	85.8 *2180*	795	720	1420	1445	25.6 *11.6*
	SEDNYB120XL81S1			365 *9270*	86.5 *2197*	805	725	1430	1455	35.8 *16.3*
	SEDNYB120XF87S1	87	105.6 *2681*	264.2 *6710*	92 *2338*	850	770	1515	1535	23.7 *10.8*
	SEDNYB120XM87S1			298.6 *7585*	92.3 *2345*	850	770	1520	1540	26.7 *12.1*
	SEDNYB120XL87S1			392.1 *9959*	93 *2362*	860	775	1530	1550	37.7 *17.1*

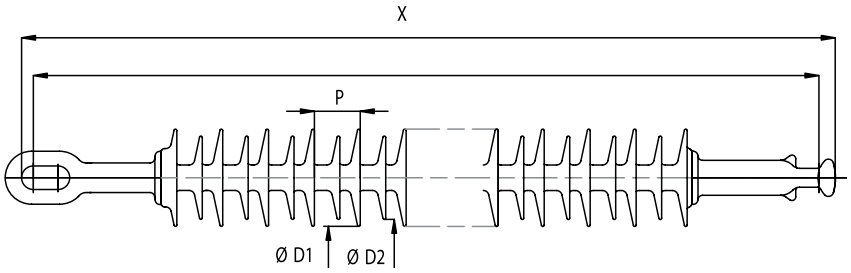
Table shows typical models. Higher voltages and other dimensions or fittings combinations are available on request. Tests complying with ANSI C29.11

*When grading rings are included in the designation, the electrical values and dry arcing distance are given accordingly

SED	N	Y B	120	XM	25	S	0
	ANSI Standard	End fitting type	SML in kN	Shed profile	Number of sheds	Material S for Silicon E for EPDM	Number/type of grading rings

Sediver composite suspension insulators

40 kip - (180 kN)



	Shed Profile		
	XF	XM	XL
Ø D1	3.7	4.1	5.4
	93 mm	105 mm	138 mm
Ø D2	3.1	3.5	4.6
	78 mm	90 mm	118 mm

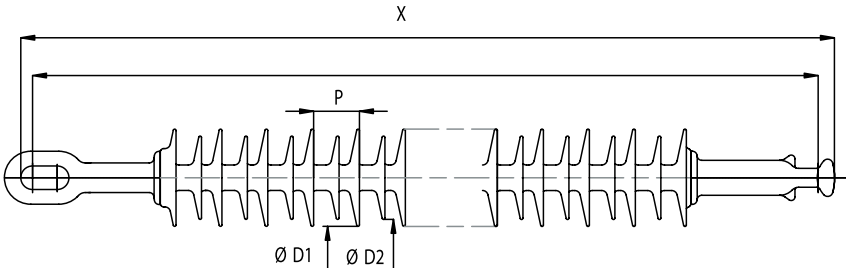
Typical Line Voltage	Sediver Catalog Designation	Number of Sheds	Section Length Inches (mm)	Leakage Distance Inches (mm)	Dry Arcing * Distance Inches (mm)	Low Frequency* Flashover - ANSI Dry kV	Low Frequency* Flashover - ANSI Wet kV	Critical Impulse* Flashover - ANSI Pos. kV	Critical Impulse* Flashover - ANSI Neg. kV	Approx. Net Wt Lbs. (kg)
115 kV	SEDNEB180XF29S0	29	43.1 *1094*	87.3 *2219*	31.9 *810*	320	280	570	600	9.8 *4.4*
	SEDNEB180XM29S0			98.8 *2510*	32.3 *821*	325	285	575	605	10.7 *4.8*
	SEDNEB180XL29S0			130 *3303*	33.6 *855*	340	295	600	630	14.5 *6.6*
	SEDNEB180XF33S0	33	47.4 *1204*	99.5 *2529*	36.2 *920*	360	320	640	670	10.4 *4.7*
	SEDNEB180XM33S0			112.6 *2860*	36.6 *931*	365	320	650	675	11.4 *5.2*
	SEDNEB180XL33S0			148.1 *3762*	38 *965*	375	335	670	700	15.7 *7.1*
138 kV	SEDNEB180XF35S0	35	49.6 *1259*	105.6 *2684*	38.4 *975*	380	335	675	705	10.6 *4.8*
	SEDNEB180XM35S0			119.5 *3035*	38.8 *986*	385	340	685	715	11.7 *5.3*
	SEDNEB180XL35S0			157.1 *3992*	40.1 *1020*	395	350	705	735	16.3 *7.4*
	SEDNEB180XF39S0	39	53.9 *1369*	117.9 *2994*	42.7 *1085*	420	375	745	775	11.2 *5.1*
	SEDNEB180XM39S0			133.2 *3385*	43.1 *1096*	425	380	755	785	12.4 *5.6*
	SEDNEB180XL39S0			175.2 *4451*	44.5 *1130*	435	390	775	805	17.6 *8*
161 kV	SEDNEB180XF45S0	45	60.4 *1534*	136.2 *3459*	49.2 *1250*	480	430	850	880	12.1 *5.5*
	SEDNEB180XM45S0			153.9 *3910*	49.6 *1261*	485	435	855	885	13.5 *6.1*
	SEDNEB180XL45S0			202.3 *5139*	51 *1295*	495	445	880	910	19.4 *8.8*
	SEDNEB180XF53S0	53	69.1 *1754*	160.6 *4079*	57.9 *1470*	555	500	990	1015	13.3 *6*
	SEDNEB180XM53S0			181.5 *4610*	58.3 *1481*	560	505	995	1025	14.9 *6.8*
	SEDNEB180XL53S0			238.5 *6057*	59.6 *1515*	570	515	1015	1045	21.9 *9.9*
230 kV with grading ring*	SEDNEB180XF61S1	61	77.7 *1974*	185 *4699*	64 *1625*	610	550	1085	1110	20.4 *9.3*
	SEDNEB180XM61S1			209 *5310*	64.2 *1630*	610	555	1085	1115	22.3 *10.1*
	SEDNEB180XL61S1			274.6 *6975*	68.3 *1735*	615	560	1095	1125	30.3 *13.8*
	SEDNEB180XF67S1	67	84.2 *2139*	203.3 *5164*	70.5 *1790*	665	605	1185	1210	21.3 *9.7*
	SEDNEB180XM67S1			229.7 *5835*	70.7 *1795*	670	605	1190	1215	23.4 *10.6*
	SEDNEB180XL67S1			301.7 *7664*	71.3 *1812*	675	610	1200	1225	32.2 *14.6*
	SEDNEB180XF71S1	71	88.5 *2249*	215.5 *5474*	74.8 *1900*	705	635	1250	1280	21.9 *9.9*
	SEDNEB180XM71S1			243.5 *6185*	75 *1905*	705	640	1255	1280	24.1 *10.9*
	SEDNEB180XL71S1			319.8 *8123*	75.7 *1922*	710	645	1265	1290	33.4 *15.2*

Table shows typical models. Higher voltages and other dimensions or fittings combinations are available on request. Tests complying with ANSI C29.11

*When grading rings are included in the designation, the electrical values and dry arcing distance are given accordingly

Sediver composite suspension insulators

40 kip - (180 kN)



Section length adjustments				
Ground fitting	Line fitting	Type letters	Adjustments inches	Adjustments mm
Socket	Ball	SB	-0.2	-5
Y-clevis	Ball	YB	+0.7	+19
Y-clevis	Tongue	YT	+1.7	+43
Clevis	Tongue	CT	+1.3	+34
Eye	Eye	EE	+1.1	+29

Typical Line Voltage	Sediver Catalog Designation	Number of Sheds	Section Length Inches (mm)	Leakage Distance Inches (mm)	Dry Arcing* Distance Inches (mm)	Low Frequency* Flashover - ANSI Dry kV	Low Frequency* Flashover - ANSI Wet kV	Critical Impulse* Flashover - ANSI Pos. kV	Critical Impulse* Flashover - ANSI Neg. kV	Approx. Net Wt Lbs. (kg)
345 kV with grading ring*	SEDNEB180XF81S1	81	99.4 *2524*	246 *6249*	85.6 *2175*	795	720	1420	1440	23.4 *10.6*
	SEDNEB180XM81S1			277.9 *7060*	85.8 *2180*	795	720	1420	1445	25.9 *11.7*
	SEDNEB180XL81S1			365 *9270*	86.5 *2197*	805	725	1430	1455	36.5 *16.6*
	SEDNEB180XF87S1	87	105.9 *2689*	264.3 *6714*	92.1 *2340*	850	770	1520	1540	24.3 *11*
	SEDNEB180XM87S1			298.6 *7585*	92.3 *2345*	850	770	1520	1540	27 *12.2*
	SEDNEB180XL87S1			392.1 *9959*	93 *2362*	860	775	15305	1550	38.4 *17.4*
	SEDNEB180XF93S1	93	112.4 *2854*	282.6 *7179*	98.6 *2505*	905	820	1615	1635	25.1 *11.4*
	SEDNEB180XM93S1			319.3 *8110*	98.8 *2510*	905	820	1620	1635	28 *12.7*
	SEDNEB180XL93S1			419.2 *10647*	99.5 *2527*	915	825	1630	1645	40.2 *18.2*
	SEDNEB180XF99S1	99	118.9 *3019*	300.9 *7644*	105.1 *2670*	960	865	1715	1730	26 *11.8*
	SEDNEB180XM99S1			339.9 *8635*	105.3 *2675*	960	870	1720	1730	29.1 *13.2*
	SEDNEB180XL99S1			446.3 *11336*	106 *2692*	965	870	1730	1740	42.1 *19.1*
500 kV with grading rings*	SEDNEB180XF119S5	119	140.5 *3569*	361.9 *9194*	123.2 *3129*	1110	995	1985	1990	42 *19*
	SEDNEB180XM119S5			408.8 *10385*	123.2 *3129*	1110	995	1985	1990	45.7 *20.7*
	SEDNEB180XL119S5			536.6 *13631*	123.2 *3129*	1110	995	1985	1990	61.3 *27.8*
	SEDNEB180XF129S5	129	151.3 *3844*	392.5 *9969*	134 *3404*	1200	1070	2145	2145	43.4 *19.7*
	SEDNEB180XM129S5			443.3 *11260*	134 *3404*	1200	1070	2145	2145	47.4 *21.5*
	SEDNEB180XL129S5			581.8 *14778*	134 *3404*	1200	1070	2145	2145	64.4 *29.2*

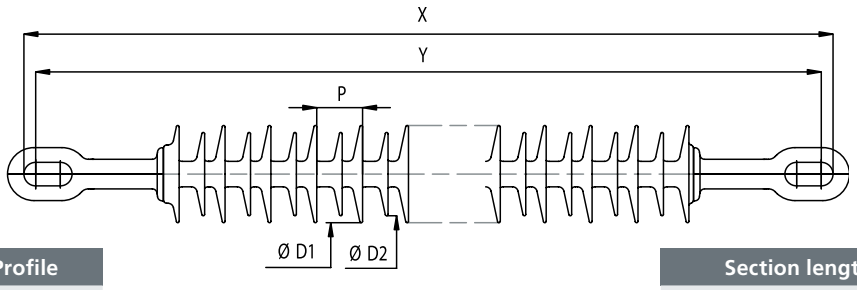
Table shows typical models. Higher voltages and other dimensions or fittings combinations are available on request. Tests complying with ANSI C29.11

*When grading rings are included in the designation, the electrical values and dry arcing distance are given accordingly

SED	N	Y B	120	XM	25	S	0
	ANSI Standard	End fitting type	SML in kN	Shed profile	Number of sheds	Material S for Silicon E for EPDM	Number/type of grading rings

Sediver composite suspension insulators

50 kip - (220 kN)



	Shed Profile	
	XF	XL
Ø D1	4.1	5.9
	105 mm	150 mm
Ø D2	3.5	5.1
	90 mm	130 mm

Section length adjustments				
Ground fitting	Line fitting	Type letters	Adjustments inches	Adjustments mm
Socket	Ball	SB	-1.2	-32
Eye	Ball	EB	-1.3	-33
Y-clevis	Tongue	YT	+1.0	+25
Clevis	Tongue	CT	-0.1	-3
Y-clevis	Ball	YB	-0.1	-4

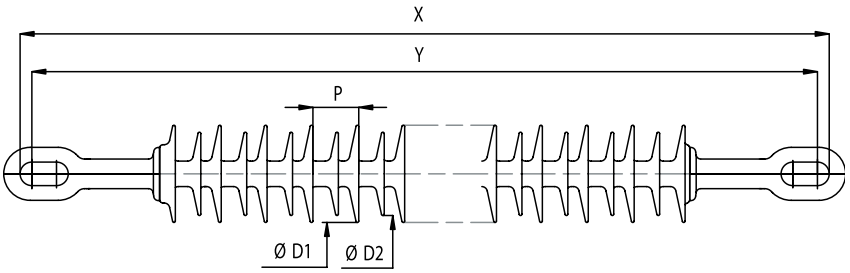
Typical Line Voltage	Sediver Catalog Designation	Number of Sheds	Section Length Inches (mm)	Leakage Distance Inches (mm)	Dry Arcing* Distance Inches (mm)	Low Frequency* Flashover - ANSI Dry kV	Low Frequency* Flashover - ANSI Wet kV	Critical Impulse* Flashover - ANSI Pos. kV	Critical Impulse* Flashover - ANSI Neg. kV	Approx. Net Wt Lbs. (kg)
230 kV with grading ring*	SEDNEE220XF61S1	61	81.5 *2070*	186.2 *4729*	64.1 *1627*	610	550	1085	1115	30.6 *13.9*
	SEDNEE220XL61S1			283.3 *7195*	64.9 *1648*	615	560	1100	1125	41.4 *18.8*
	SEDNEE220XF65S1	65	85.8 *2180*	198.5 *5041*	68.4 *1737*	650	585	1155	1180	31.6 *14.3*
	SEDNEE220XL65S1			301.9 *7669*	69.2 *1758*	655	595	1165	1190	43 *19.5*
	SEDNEE220XF71S1	71	92.3 *2345*	216.9 *5509*	74.9 *1902*	705	640	1255	1280	32.9 *14.9*
	SEDNEE220XL71S1			329.9 *8380*	75.7 *1923*	710	645	1265	1290	45.4 *20.6*
	SEDNEE220XF75S1	75	96.7 *2455*	229.2 *5821*	79.2 *2012*	740	670	1320	1345	33.9 *15.4*
	SEDNEE220XL75S1			348.6 *8854*	80 *2033*	750	680	1335	1355	47.1 *21.3*
	SEDNEE220XF81S1	81	103.1 *2620*	247.6 *6289*	85.7 *2177*	795	720	1420	1445	35.2 *16*
	SEDNEE220XL81S1			376.6 *9565*	86.5 *2198*	805	730	1435	1455	49.5 *22.4*
345 kV with grading ring*	SEDNEE220XF87S1	87	109.6 *2785*	266 *6757*	92.2 *2342*	850	770	1520	1540	36.6 *16.6*
	SEDNEE220XL87S1			404.6 *10276*	93 *2363*	860	775	1530	1550	51.9 *23.6*
	SEDNEE220XF95S1	95	118.3 *3005*	290.6 *7381*	100.9 *2562*	925	835	1650	1665	38.5 *17.4*
	SEDNEE220XL95S1			441.9 *11224*	101.7 *2583*	930	840	1665	1680	55.2 *25*
	SEDNEE220XF105S1	105	129.1 *3280*	321.3 *8161*	111.7 *2837*	1015	915	1815	1825	40.8 *18.5*
	SEDNEE220XL105S1			488.5 *12409*	112.5 *2858*	1020	920	1825	1835	59.3 *26.9*
500 kV with grading rings*	SEDNEE220XF115S5	115	140 *3555*	352 *8941*	119 *3023*	1075	965	1925	1930	56.5 *25.6*
	SEDNEE220XL115S5			535.2 *13594*	119 *3023*	1075	965	1925	1930	76.8 *34.8*
	SEDNEE220XF125S5	125	150.8 *3830*	382.7 *9721*	129.8 *3297*	1165	1040	2085	2085	58.8 *26.7*
	SEDNEE220XL125S5			581.9 *14779*	129.8 *3297*	1165	1040	2085	2085	80.8 *36.7*
	SEDNEE220XF135S5	135	161.6 *4105*	413.4 *10501*	140.6 *3571*	1250	1115	2245	2240	61.1 *27.7*
	SEDNEE220XL135S5			628.5 *15964*	140.6 *3571*	1250	1115	2245	2240	84.9 *38.5*
	SEDNEE220XF145S5	145	172.4 *4380*	444.1 *11281*	151.5 *3848*	1340	1190	2405	2395	63.4 *28.8*
	SEDNEE220XL145S5			675.2 *17149*	151.5 *3848*	1340	1190	2405	23950	89 *40.4*

Table shows typical models. Higher voltages and other dimensions or fittings combinations are available on request. Tests complying with ANSI C29.11

*When grading rings are included in the designation, the electrical values and dry arcing distance are given accordingly

Sediver composite suspension insulators

80 kip - (360 kN)



	Shed Profile	
	XF	XL
Ø D1	4.1	5.9
	105 mm	150 mm
Ø D2	3.5	5.1
	90 mm	130 mm

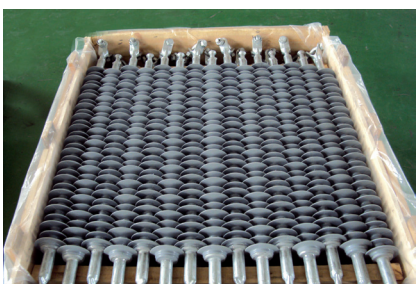
Typical Line Voltage	Sediver Catalog Designation	Number of Sheds	Section Length Inches (mm)	Leakage Distance Inches (mm)	Dry Arcing * Distance Inches (mm)	Low Frequency* Flashover - ANSI Dry kV	Low Frequency* Flashover - ANSI Wet kV	Critical Impulse* Flashover - ANSI Pos. kV	Critical Impulse* Flashover - ANSI Neg. kV	Approx. Net Wt Lbs. (kg)
500 kV with grading rings*	SEDNEE360XF123S5	123	151.8 *3856*	376.6 *9565*	127.6 *3241*	1145	1025	2050	2055	63.8 *28.9*
	SEDNEE360XL123S5			572.5 *14542*	127.6 *3241*	1145	1025	2050	2055	85.3 *38.7*
	SEDNEE360XF139S5	139	169.1 *4296*	413 *10489*	145.6 *3698*	1285	1145	2310	2300	67.3 *30.6*
	SEDNEE360XL139S5			647.2 *16438*	145.6 *3698*	1285	1145	2310	2300	91.9 *41.7*
	SEDNEE360XF143S5	143	173.5 *4406*	438 *11125*	149.3 *3792*	1320	1175	2370	2365	68.4 *31*
	SEDNEE360XL143S5			665.8 *16912*	149.3 *3792*	1320	1175	2370	2365	93.5 *42.4*
	SEDNEE360XF157S5	157	189 *4800*	466 *11850*	164.5 *4177*	1445	1280	2595	2575	71.5 *32.5*
	SEDNEE360XL157S5			731.1 *18571*	164.5 *4177*	1445	1280	2595	2575	99.2 *45*

Table shows typical models. Other dimensions are available on request. Tests complying with ANSI C29.11.
*Electrical values and dry arcing distance take into account the rings.

SED	N	Y B	120	XM	25	S	0
	ANSI Standard	End fitting type	SML in kN	Shed profile	Number of sheds	Material S for Silicon E for EPDM	Number/type of grading rings

Packing

The methods employed to pack Sediver composite insulators are the result of experience gained from shipping millions of insulators to user warehouses and construction sites in a large number of countries worldwide.
The packing method illustrated below have been developed to minimize possible damage during shipment and storage as well as to reduce space and freight cost. The separators are made by wood.



Sediver laboratory and research facilities

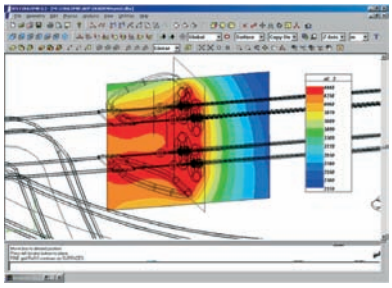
Material science is present at every angle of composite insulator technology. Beyond more traditional mechanical and electrical testing facilities for which Sediver has full testing equipment available either in the factory laboratories or, at a larger scale, in our Research Centre in France, Sediver has also implemented state of the art material testing capabilities. With more than 30 years of experience in this field, we offer the most advanced and comprehensive tools and expertise for rod, rubber housing or complete design testing and evaluation from our Research centre based in Saint Yorre, France.

Constant research in material science is a guarantee for Sediver product end users to always benefit of the most advanced know how in this field.

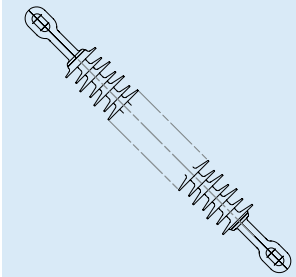
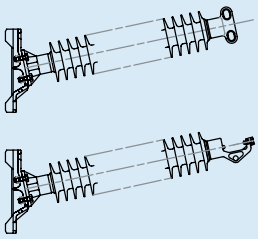
Sediver R&D and EHV laboratory main testing equipments

Electrical testing equipment	Characteristics
Impulse generator	1.2 MV 60 kJ
Impulse generator	5.5 MV 60 kJ
Current impulse generator	100 kA
Power frequency transformer (dry/wet test)	500 kV
Power frequency transformer (dry/wet test)	1.3 MV
RIV testing equipment	100 KV
RIV testing equipment	700 KV
DC +/- power source	100 KV +/-
DC +/- power source	200 KV +/-
AC pollution room	150 KV salt fog as per IEC 507
AC/DC clean fog test	250 KV AC
Tracking wheel test (4 wheels)	as per CSA and IEC
1000 h salt fog test (2 rooms)	as per IEC 61109
5000 h ageing test	as per IEC 61109
Inclined plan test	as per IEC 60587 and ASTM D2303
Oil puncture test	200 kV
Ionic migration test HVDC	IEC 61325
Partial discharges	700 kV
Partial discharges	100 kV
Mechanical testing equipment	
Tensile load test machine	400 kN - 500 kN – 1000 kN
Thermo-mechanical machine	1000 kN -50°C/+80°C
Thermo-mechanical machine	500 kN -60°C/+80°C
Torsion test	20000 mdaN
Cantilever/ compression combined load	200 kN
Cyclic bending machine	50 kN
Cantilever thermo-mechanical test	20 kN -45°C/+70°C
Vibration test station	2 Hz to 3000 Hz 50 kN 43 m span

3D Electric field calculation of a complete structure using composite insulators or computerized mechanical simulations can be offered for specific needs.



Sediver composite insulators for HV transmission lines applications

Insulator type	Definitions and applications	
> Suspension > Dead-end > Brace	Standard insulator designed for applications where the applied mechanical load is always in pure tension. It can be used vertically, in suspension: I or V string configuration or horizontally as a dead-end, (strain tension) single or multiple insulator assembly and as a brace for braced line posts. Composite materials provide a good solution in highly contaminated areas where frequent washing of toughened glass and porcelain cap and pin insulators is required or in case of helicopter erection in remote or difficult areas requiring minimal weight.	
> Line post	Insulator designed mainly for flexural loads (bending) but also tension and compression, thus having combined loading capability. Normally utilized as a single unit can also be a double insulator assembly. Composite materials are most suitable for the application on compact lines and retrofitting due to their flexibility, overloads absorption capacity and reduced weight.	
> Braced line post	Designed for applications similar to a line post but with an added suspension insulator or "brace" to increase the vertical load capacity of the assembly. The base is rigid thus allowing also longitudinal load capability (in the direction of phase conductor). This assembly is used where high vertical load capability is required. It can also be utilized to help stabilize longitudinally sequences of pivoting horizontal vees. Typically supplied as a complete assembly.	
> Horizontal vee > Pivoting braced post	Similar to a braced line post except that instead of a fixed base, it is equipped with a hinged (or pinned or pivoting) base thus preventing bending of the post insulator, thereby increasing its axial compression load capacity. This provides the horizontal vee assembly with a large vertical load capacity. The hinged connections allow it to efficiently redistribute unbalanced longitudinal loads in the conductor (such as due to non-uniform ice accumulation) and minimize torsional loads on the support structure. Normally supplied as a complete assembly including hinged base.	
> Insulated cross-arm	Unlike a braced line post or a horizontal vee which are two-dimensional structures, an insulated cross-arm is made up of a minimum of 3 insulators disposed in a triangulated position so as to provide to the assembly vertical, transverse and longitudinal loads capability. These assemblies are generally used to stabilize longitudinally long sequences of horizontal vees. They can also be used to dead-end phase conductors and replace parts of steel cross-arms on existing towers for voltage upgrades and compaction. Normally supplied as a complete assembly including hinged or fixed bases.	

Contribution to international committees

Since the very beginning of international technical cooperation, Sediver has always been an active member in fields of research and standardization in international committees and working groups dealing with all aspects of high voltage insulation; for example Sediver experts are Project Leaders in IEC working groups 36WG11, 36BMT10...

IEEE

Institute of Electrical and Electronics Engineers

Sediver's experts are active in

- T&D Committee
- WG Insulator contamination
- WG Insulator strength
- WG Application of non ceramic insulators
- ESMOL

List of some IEEE and international publications on composite:

"IEEE Guide for Braced Insulator Assemblies for Overhead Transmission Lines 60 kV and greater" **IEEE TF15.09.09.07 (E. DEL BELLO...)** IEEE Transactions on Power Delivery, Vol.23 N°2, April 2008 p.785-791

«Determination of the brittle fracture process of field failed HV insulators» **C. de TOURREIL ; G. THEVENET ; E. BROCARD ; N. SIAMPIRINGUE ; N. PICHON** – *XIVth ISH , 2005* Paper D-28

«Use of corona rings to control the electrical field along transmission line composite insulators» **CIGRE WG B2-03 (E. BROCARD ...)** *CIGRE TECHNICAL BROCHURE, 2005* N° 284

«Guide for the evaluation of composite line post insulators subjected to combined mechanical load / Guide pour l'évaluation des consoles isolantes composites soumises à une combinaison de charges mécaniques « **CIGRE WG 22-03 (E. BROCARD...)** *ELECTRA, 2002,* N° 203

«Composite Insulator Handling guide» **CIGRE WG 22-03 (E. BROCARD ...)** *CIGRE TECHNICAL BROCHURE, April 2001,* N° 184

«Brittle fracture» of composite insulators : the new explanation and a field case study» **C. DE TOURREIL, L. PARGAMIN, G.THEVENET, S. PRAT, N. SIAMPIRINGUE** , *ISH, 2001,* Paper 5-25

«New compact composite insulation for environmental economic and safety considerations» **D. DUMORA,** *2001 WORLD INSULATOR CONGRESS AND EXHIBITION,* Shanghai Nov. 18-21, 2001

«Non destructive techniques for the evaluation of the integrity of composite insulators» **J.M. GEORGE,** *INTERNATIONAL SYMPOSIUM ON MODERN INSULATOR TECHNOLOGIES,* Coral Gables Florida, Nov. 16-19, 1997

«Studies of the long term performance of composite insulators and of the representativity of ageing tests» **G. RIQUEL, JM FOURMIGUE, D. DE DECKER, R. JOULIE, R. PARRAUD,** *CIGRE 1996,* Paper 33-304

«Review of in service diagnostic testing of composite insulators / Revue des techniques de diagnostic en service pour isolateurs composites» **CIGRE WG 22-03,** *ELECTRA,* 1996, N° 169

«Rating of composite suspension insulators related to the long term mechanical strength of rods» **L. PARIS, L. PARGAMIN, D. DUMORA, R. PARRAUD,** *IEEE Transactions on Power Delivery,* Vol.9 n°4 October 1994 p.2055-2063

«Mechanical behavior of flexurally stressed composite insulators» **D. DUMORA, D. FELDMANN, M. GAUDRY,** *IEEE POWER DELIVERY,* 1990 Vol. 5 n°2 p.1066-1073

«Natural and artificial weathering of EPDM compounds used in outdoor high voltage insulation» **C. AUBIN, C. HOUDRET, R. MAILFERT, L. PARGAMIN,** *IEEE ELECTRICAL INSULATION,* 1981, N° 4

«Composite insulators for lines 220 kV and above» **L. PARGAMIN, J. HUC,** *IEE CONFERENCE PUBLICATION,* 1979, N° 176

«Effects of the superposition of electric, mechanical and environmental stresses on the fatigue behavior of composite insulating materials» **R. MAILFERT, J. THORIS, D. RIVIERE, L. PARGAMIN,** *CIGRE,* 1978, Paper 15-10

«Behaviour of fiber reinforced plastics in HV insulators and fiber matrix bonding in composites: testing and measurements by a pointe-plan needle test» **L. PARGAMIN, R. MAILFERT,** *IEEE,* 1976, Paper A 77 025-0

ISO 9001-2000 certifications

Catalogs

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