



Transmission line

Damping System Products

sicame
GROUP



About us

sicame
GROUP

Sicame Group is one of the key players in the electrical equipment business worldwide. It has been able to adapt and develop to support the continuous evolution of electricity infrastructure in France and around the world, and become the largest independent entity in its sector.

A true player in the energy transition, it offers its customers new products and services to improve energy efficiency, deal with environmental risks and support the development of electric vehicle and solar power plant markets.

+65

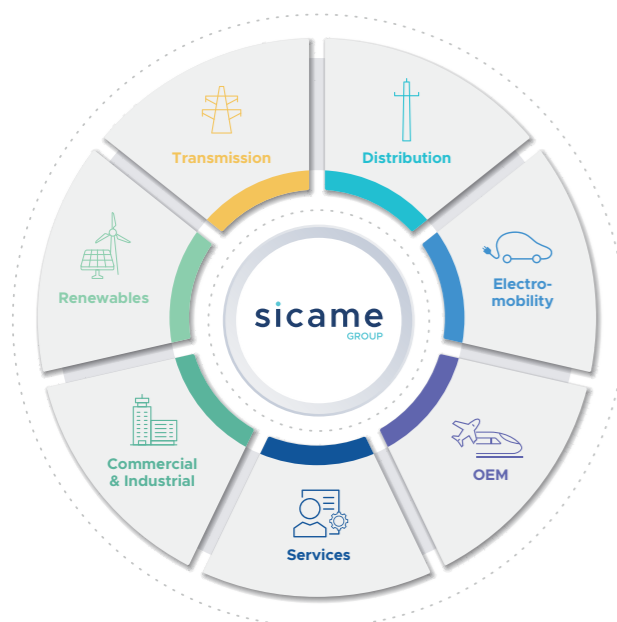
years of worldwide success

567 M€

2023 turnover

3,600

employees



Our fields of activity

Sicame Group is specialised in **products and services** related to transmission and distribution of **electrical energy**, renewables, electro-mobility, safety equipment and industrial applications.

With decades of history and recognized expertise, our Transmission division is specialized in designing, manufacturing and producing comprehensive ranges of transmission lines and systems connectors, damping systems, hardware and most advanced substation fitting solutions, adapted to the most technical configurations such as 8-bundle spacer dampers, UHV HVDC connectors and innovative high temperature conductor's accessories.

5 continents

26 countries

50 companies
around the world

Products distributed
in **157** countries



Different clamping solutions

Require different requirements based upon:

- International recommendations
- Utilities standards

Salvi can supply solutions with all possible combinations:

- **Locking Systems**
 - A - Bolted clamping design
 - B - Preformed clamping design
 - C - Boltless clamping design
- **Clamp Types**
 - A - Cantilever clamp
 - D - Inverted clamp
- **Coupling Types**
 - A, C, D - Metal – Metal
 - B, E - Rubber Liner



Two to eight bundle spacer dampers

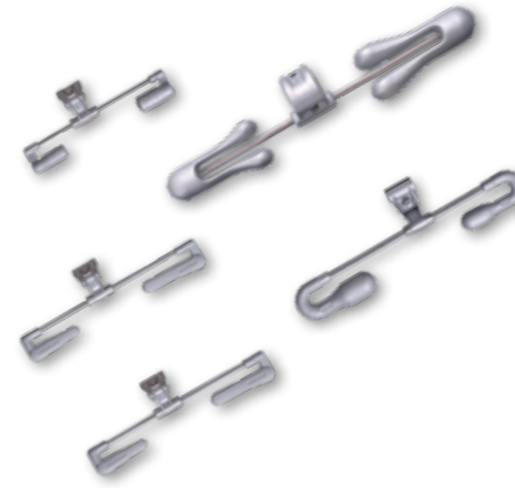
The range of Salvi SD covers all possible applications: Voltage up to 1.200kV Bundle Spacing up to 1.200mm – Any conductor types (ACSR, AAC, AAAC, ACAR) and clamping solutions.

Salvi expertise in R&D, design & test has and continues to assist Engineers, Consultants and Utilities globally, with new types of spacer dampers for all type of configurations.



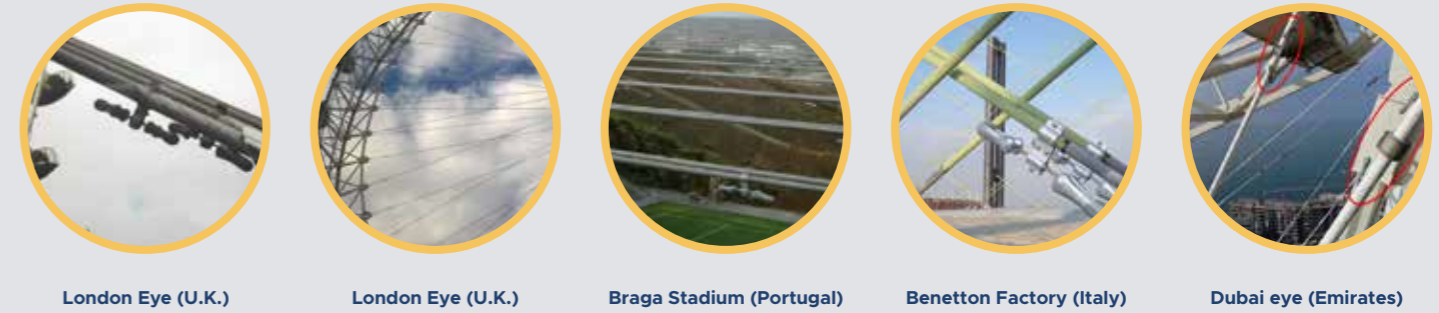
Vibration dampers (VD)

In order to satisfy several demands of the market, our range of VD is very wide. It includes models with galvanized steel or melted Zamac masses and models with galvanized steel or stainless steel messenger cable.



Special products

Salvi is also specialized in executing projects which have a high technological content which requires a highly qualified internal organization, cutting edge laboratory equipment and a strict collaboration with Research Centres and Universities. Few examples are shown hereunder.



Manufacturing tests

The following tests performed on Spacer Dampers and Vibration Dampers are carried out in our laboratory:

- Fatigue test
- Simulation of short circuit
- Slippage of clamps
- Verification of damping performances

Complete assembly of spacer dampers and Vibration Dampers is carried out by Salvi with automatic assembly lines.

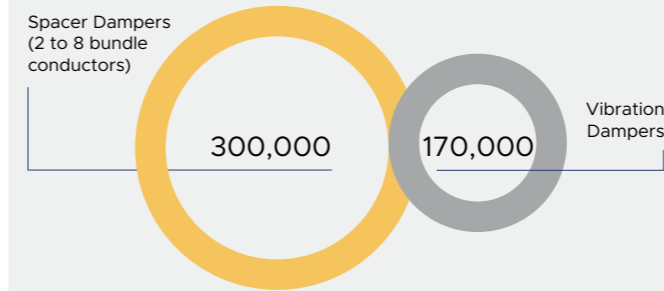
Spacer dampers automatic assembly line



Vibration dampers automatic assembly line



Annual production capacity.



Damping systems



Aeolian vibrations and sub-span oscillations are the adverse phenomena induced by wind action that shall be controlled in order to safeguard the life of the transmission lines. This is always the target of Salvi design of Damping Systems.

An overview on Salvi damping systems

Vibrations induced by the wind on single and bundled conductors generate undesirable and dangerous phenomena on the OHTL:

- Aeolian Vibration (Vortex Shedding)
- Wake Induced Oscillation (Sub-Span Oscillation)

They will be kept under control using a proper Damping Systems made by Spacer Dampers and Vibration Dampers.

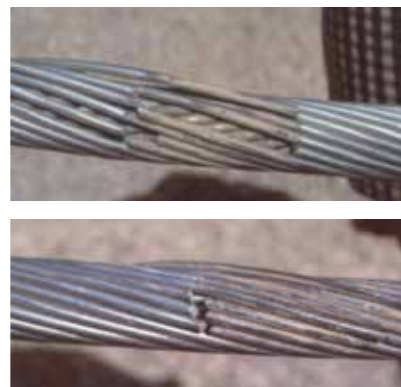
Aeolian vibration

Aeolian Vibration's effect is conductor fatigue. Fatigue is the result of a combined effect of alternate bending strain and of fretting among the single wires of the conductor (in HVTL stranded cables).

Fretting causes the generation of micro-cracks which, depending on the strain level, may cause failure of the single wires and finally of the conductor.

Aeolian Vibration can occur on single and bundle conductor configuration.

When	Single & Bundle
Caused by	Vortex shedding
Winds	Moderates
Amplitudes	Small (up to one cable diameter)
Frequencies	5 – 100 Hz
Effect	Fatigue (bending + fretting)
Controlled by	Vibration Damper – Spacer Damper



Analytical evaluation

Damping Systems design

An optimum Damping Systems is designed evaluating the two vibration phenomena (Aeolian and Sub-Conductor vibration) on the OHTL, by means a damping study, carried out with a validated software.

Input data

Type of conductor (stranding, diameter, mass per unit length)

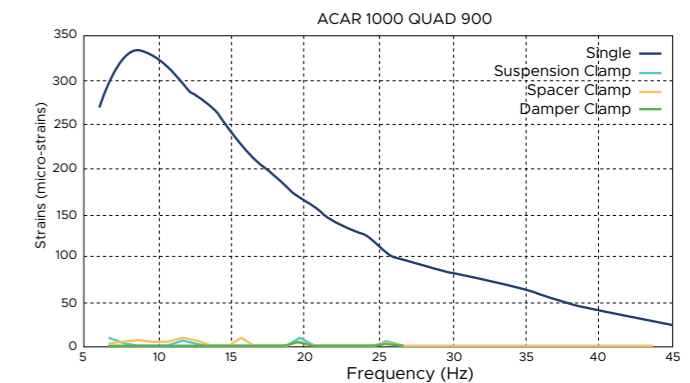
- Bundle spacing in inches or mm
- Tensile load at the coldest period of the year
- EDS
- Span lengths (presence of long spans)
- Type of terrain
- Maximum wind speed
- Type of spacer dampers
- Number of spacer dampers
- Staggering of spacer dampers



Damping systems validation

The validation of a Damping System is carried out with measurements performed by Salvi equipment and personnel on the site ie (FIELD TEST).

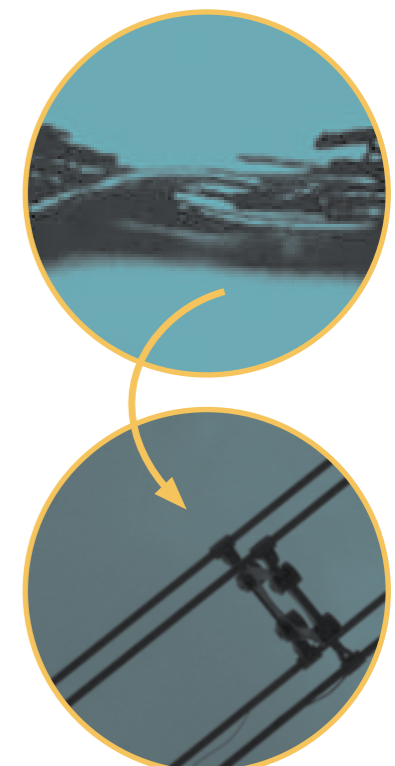
Such tests verify the real level of vibrations compared with evaluation at the design stage with the analytical method ie (DAMPING STUDY).



Sub-span oscillations

- Occur only on bundle conductors with at least one couple of sub-conductors with one in the wake of the other
- It is an instability phenomenon due to the coupling of bundle vertical and horizontal modes of vibration
- Sub-span oscillations may cause sub-conductor clashing with possible conductor breakage

When	Bundle
Caused by	Wake effect
Winds	Medium / High speed (V > 10 m/s)
Amplitudes	High (up to conductor spacing)
Frequencies	0,7 – 2 Hz
Effect	Clashing – Clamp bolts loosening
Controlled by	Spacer Dampers staggering

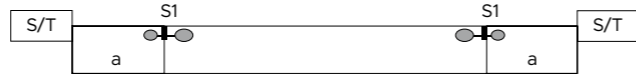


Vibration damper

Clamp & keeper



Definition of the proper vibration damper, relevant spacing and needed quantities are defined by a Damping Study, either by contacting us or through the web software platform.



Vibration damper Catalog Number code: VD 23 32 CD B X	
"VD"	If Vibration Damper (Stockbridge four resonances)
"23"	If Minimum clamp range diameter in mm
"32"	If Maximum clamp range diameter in mm
"CD"	If damper masses type
"B"	If present, means the option with stainless steel breakaway nut
"X"	If present, means the option with stainless steel messenger cable
"U"	If present, means the option with imperial fasteners

Code of the complete Vibration Damper	Range of clamp diameter				Range of applicable cable diameter				Bolt size		Torque value		Total length		Approximative Weight	
	max		max		max		max									
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Nm	ft lb	mm	inch	kg	pounds
VD0712JB	7	0,28	12	0,47	7	0,28	12	0,47	M10	3/8"	40	29.5	348	13,70	1,54	3,40
VD1223JB	12	0,47	23	0,91	12	0,47	16	0,63	M10	3/8"	40	29.5	348	13,70	2,42	5,34
VD1223CD	12	0,47	23	0,91	16	0,63	23	0,91	M10	3/8"	40	29.5	571,5	22,50	2,27	5,00
VD2332CD	23	0,91	32	1,26	23	0,91	27	1,06	M12	1/2"	40	29.5	571,5	22,50	2,42	5,34
VD2332CD (*)	23	0,91	32	1,26	27	1,06	32	1,26	M12	1/2"	40	29.5	571,5	22,50	2,42	5,34
VD3242CD (*)	32	1,26	42	1,65	32	1,26	42	1,65	M14	9/16"	40	29.5	571,5	22,50	2,66	5,86
VD2332N	23	0,91	32	1,26	23	0,91	32	1,26	M12	1/2"	40	29.5	510	20,08	3,29	7,25
VD3242N (*)	32	1,26	42	1,65	32	1,26	42	1,65	M14	9/16"	40	29.5	510	20,08	3,53	7,78
VD4252N (*)	42	1,65	52	2,05	42	1,65	52	2,05	M14	9/16"	60	44.25	510	20,08	3,76	8,29
VD2332P	23	0,91	32	1,26	31	1,22	32	1,26	M12	1/2"	40	29.5	548	21,57	4,45	9,81
VD3242P	32	1,26	42	1,65	32	1,26	42	1,65	M14	9/16"	40	29.5	548	21,57	4,69	10,34
VD4252P	42	1,65	52	2,05	42	1,65	45	1,77	M14	9/16"	60	44.25	548	21,57	4,75	10,47
VD4252P (*)	42	1,65	52	2,05	45	1,77	52	2,05	M14	9/16"	60	44.25	548	21,57	4,75	10,47
VD3242VZ	32	1,26	42	1,65	40	1,57	42	1,65	M14	9/16"	40	29.5	778,5	30,65	14,22	31,35
VD4252VZ	42	1,65	52	2,05	42	1,65	52	2,05	M14	9/16"	60	44.25	778,5	30,65	14,45	31,86

(*) Ranges for conductor plus armor-rods

Cable diameter	Clamp range and damper type														
	inch	mm	"7-12"	"12-23"	"12-23"	"23-32"	"32-42"	"23-32"	"32-42"	"42-52"	"23-32"	"32-42"	"42-52"	"32-42"	"42-52"
0,28	7														
0,31	8														
0,35	9	JB													
0,39	10	JB													
0,43	11	JB													
0,47	12		JB												
0,51	13		JB												
0,55	14		JB												
0,59	15		JB												
0,63	16														
0,67	17														
0,71	18														
0,75	19														
0,79	20														
0,83	21														
0,87	22														
0,91	23														
0,94	24														
0,98	25														
1,02	26														
1,06	27														
1,10	28														
1,14	29														
1,18	30														
1,22	31														
1,26	32														
1,30	33														
1,34	34														
1,38	35														
1,42	36														
1,46	37														
1,50	38														
1,54	39														
1,57	40														
1,61	41														
1,65	42														
1,69	43														
1,73	44														
1,77	45														
1,81	46														
1,85	47														
1,89	48														
1,93	49														
1,97	50														
2,01	51														
2,05	52														

Plastic spiral vibration damper



Plastic spiral vibration dampers are designed to minimize damage to conductor and strand from vibration due to wind and reduce overall vibration on cables.

Description

Spiral Vibration Dampers (SVD) effectively control Aeolian vibration on small diameter cables and conductors and avoids cable fatigue, and hardware failure.

Features

- For cables smaller than 1.35" (34.30mm) in diameter
- Provides control and protection against aeolian vibrations induced by wind action in order to safeguard the life of the transmission lines
- Free hand installation. No tools are required
- Spiral vibration dampers along with spacer dampers and stockbridge vibration dampers complete the full range of motion devices available for vibration damping in cables & conductors

Construction & installation

- Made of weather and corrosion resistant thermoplastic material
- The helically formed rod has a smaller diameter area for gripping the cable/conductor and a larger diameter area for the damping section
- Ideal for use on:
 - Bare conductor
 - Covered conductor
 - Overhead shield wire
 - Optical Ground Wire (OPGW)
 - Optical Fiber Cable (OFC)



UV Stabilized PVC

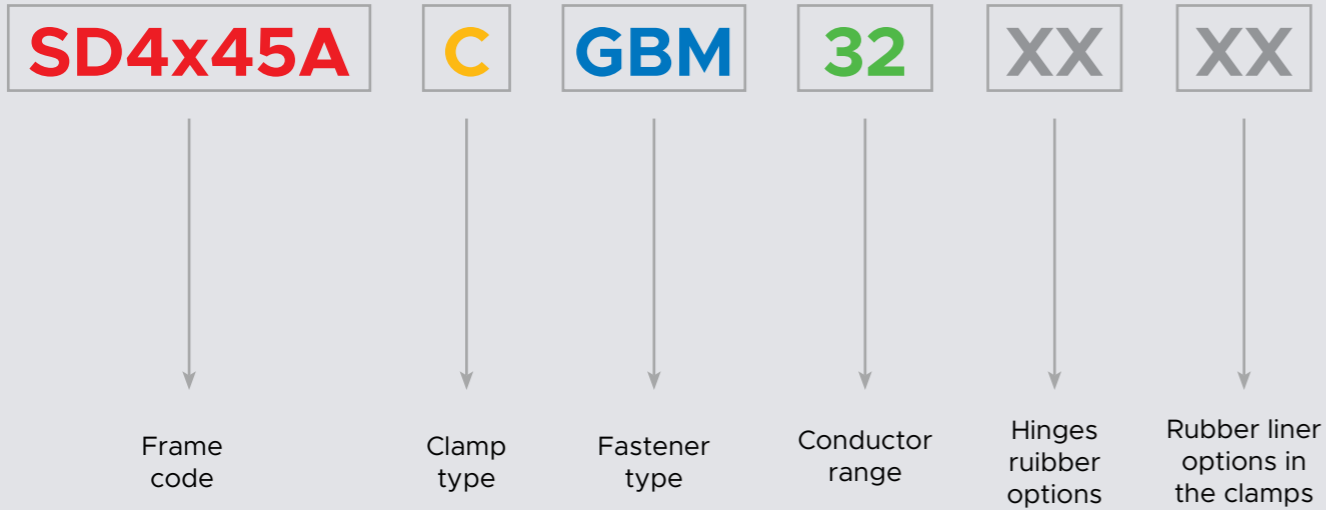
Reference	Cable range		Length (mm)	Weight (kg)	Packing
	(Ø mm)	(Ø inch)			
PSVD 063	6.35 - 8.30	0.25 - 0.33	1245	0.260	1
PSVD 083	8.31 - 11.69	0.33 - 0.46	1295	0.320	1
PSVD 117	11.70 - 14.31	0.46 - 0.56	1360	0.320	1
PSVD-143	14.32 - 19.40	0.56 - 0.76	1570	0.390	1

Spacer damper

Salvi spacer damper designs consist of modular components, which allow to combine all the frames shapes and dimensions with the various clamping systems. In such a way we achieve the largest range of options available in the market, able to satisfy the various customer's demands and technical specifications.

As explained above the definition of the optimum system (quantities and relevant installation distances per span), depends on an accurate damping study performed using the input data received.

Spacer damper code identification



Frame code

The suffix "SD" meaning "Spacer Damper" to which add

- Number for Bundle (2x = Double, 3x = Triple, 4x = Quadruple, 6x = Sextuple)
- Spacing in cm (40, 45, 50, 60 etc..)
- Frame shape (S = Symmetric, A = Asymmetric, V = Vertical, D = Diamond)

Clamp type

C	Cantilever clamp metal to metal with fastener
H	Inverted hinge clamp metal to metal with fasteners
N	Nutcracker clamp with rubber liner, boltless (<= 500 kV)
NL	Nutcracker clamp with rubber liner, boltless with larger width (> 500 kV)
P	Pre-formed clamp with retaining rods, boltless
PL	Pre-formed clamp with retaining rods, boltless with larger widths (special applications)
A	Automatic clamp metal to metal, boltless

Fastener type

(excluded boltless clamp types)

G	Galvanized bolt + Galva grower + Galva plain washer
X	Stainless steel bolt + Stainless grower + Stainless plain washer
B	Breakaway (Stainless steel) + Stainless grower + Stainless plain washer
B	Option for Belleville washer (instead of grower) to be added to the above three letters if needed Each of the above faster options can be provided with
M	Metric/iso threads and standards
U	Imperial UNC threads standards

Conductor range

Final two digits for cantilever, inverted hinge & nutcracker for defining the maximum range.
Final three digits for pre-formed and auto clamp for defining the conductor diameter.

Hinges rubber options

(if applicable add those letters)

HR	High Resistance hinge rubber
LT	Low Temperature hinge rubber

Rubber liner options in the clamps

(applicable only for pre-fomed clamp, as nutcracker is always for high temp)

HT	High Temperature clamp liner
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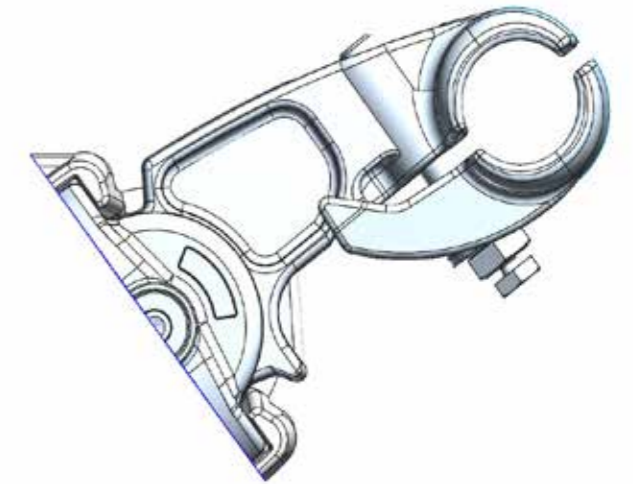
Frame & bundle available

New Frame Code (1)	Old Frame Code (1)	Bundle	Bundle Spacing	
			MM	Inch
SD2x40R	3931B40	Double	400	15,7
SD2x45R	3931B45		450	17,7
SD2x45R	3931B45		457	18,0
SD2x50R	3931B50		500	19,7
SD2x50V	3934B50		500	17,7
SD3x40R	3931T40	Triple	400	15,7
SD3x45R	3931T45		450	17,7
SD3x45R	3931T45		457	18,0
SD3x50R	3930T50		500	19,7
SD3x64A	3930T64		635 x450	25x18
SD4x40A	3931QS40	Quadruple	400	15,7
SD4x45A	3931QS45		450	17,7
SD4x45A	3931QS45		457	18,0
SD4x45D	3931QD45		450	17,7
SD4x50R	3931Q50		500	19,7
SD4x60R	3930Q60		600	23,6
SD6x32R	3930E32	Sextuple	320	12,6
SD6x38R	3931E38		380	15,0



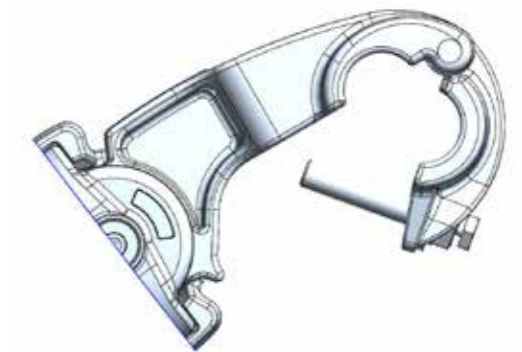
Cantilever bolted clamp metal to metal (C)

Conductor Clamp Range digits (2)	Range			
	Min	Max	Min	Max
22	20	0,787	22	0,866
24	22	0,866	24	0,945
26	24	0,945	26	1,024
28	26	1,024	28	1,102
30	28	1,102	30	1,181
32	30	1,181	32	1,260
34	32	1,260	34	1,339
36	34	1,339	36	1,417
38	36	1,417	38	1,496
40	38	1,496	40	1,575
42	40	1,575	42	1,654

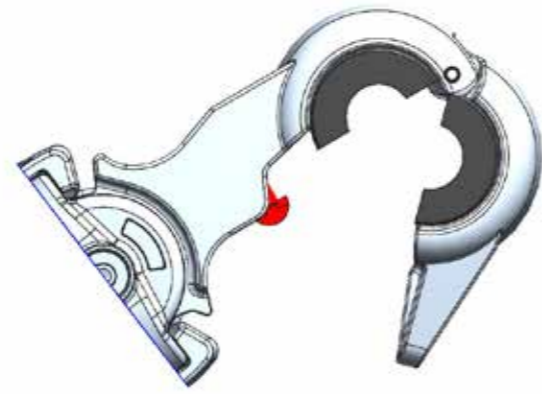


Inverted hinge bolted clamp metal to metal (H)

Conductor Clamp Range digits (2)	Range			
	Min	Max	Min	Max
32	30	1,181	32	1,260
34	32	1,260	34	1,339
36	34	1,339	36	1,417
38	36	1,417	38	1,496
40	38	1,496	40	1,575
42	40	1,575	42	1,654



Nutcracker boltless clamp with liner (N or NL)



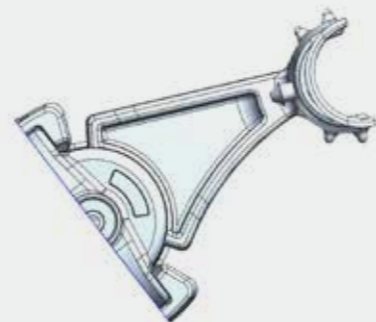
Conductor Clamp Range digits (2)	Range			
	Min	Max	Min	Max
21	20	0,787	21	0,827
22	21	0,827	22	0,866
23	22	0,866	23	0,906
24	23	0,906	24	0,945
25	24	0,945	25	0,984
26	25	0,984	26	1,024
27	26	1,024	27	1,063
28	27	1,063	28	1,102
29	28	1,102	29	1,142
30	29	1,142	30	1,181
31	30	1,181	31	1,220
32	31	1,220	32	1,260
33	32	1,260	33	1,299
34	33	1,299	34	1,339
35	34	1,339	35	1,378

Conductor Clamp Range digits (2)	Range			
	Min	Max	Min	Max
36	35	1,378	36	1,417
37	36	1,417	37	1,457
38	37	1,457	38	1,496
39	38	1,496	39	1,535
40	39	1,535	40	1,575
41	40	1,575	41	1,614
42	41	1,614	42	1,654
43	42	1,654	43	1,693
44	43	1,693	44	1,732
45	44	1,732	45	1,772
46	45	1,772	46	1,811
47	46	1,811	47	1,850
48	47	1,850	48	1,890
49	48	1,890	49	1,929
50	49	1,929	50	1,969

Pre-formed (P or PL)

For specific pre-formed boltless clamp we have a range of capacity from 22 to 45 mm (0.866" to 1,771") conductor diameter. They are equipped with rubber liners for working with conventional cable, and optionally for high temperature operation. The clamp can be used on all frame configurations.

Please ask us for your specific needs.

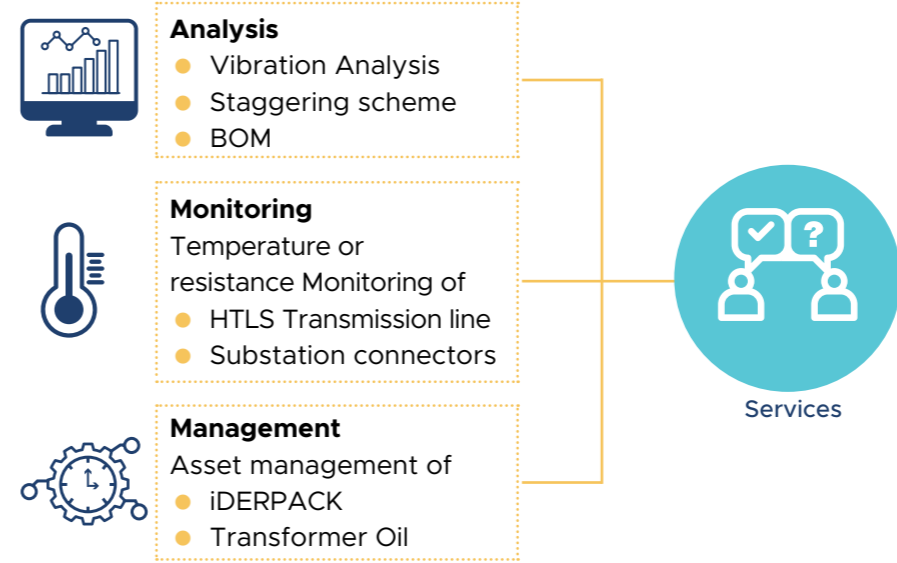


Services and IoT solutions

With a dedicated IoT team, Sicame Group is willing to impulse new generation of SmartGrid products communicating to a global IoT platform

Today our Transmission benefits from this technological advance and proposes connected solutions dedicated to transmission lines specific issues. Our partners will save time and gain peace of mind knowing that our IoT solutions will facilitate daily monitoring and maintenance actions, and guarantee a high quality electrical service for the final user.

- Monitoring, Analysis and Data Management
- Software / Mobile Application
- Multiple features



Sicame IoT platform

for complete Energy Business

Communicate with your Transmission Line

- Reliability
- Availability
- Maintainability
- Safety

Features



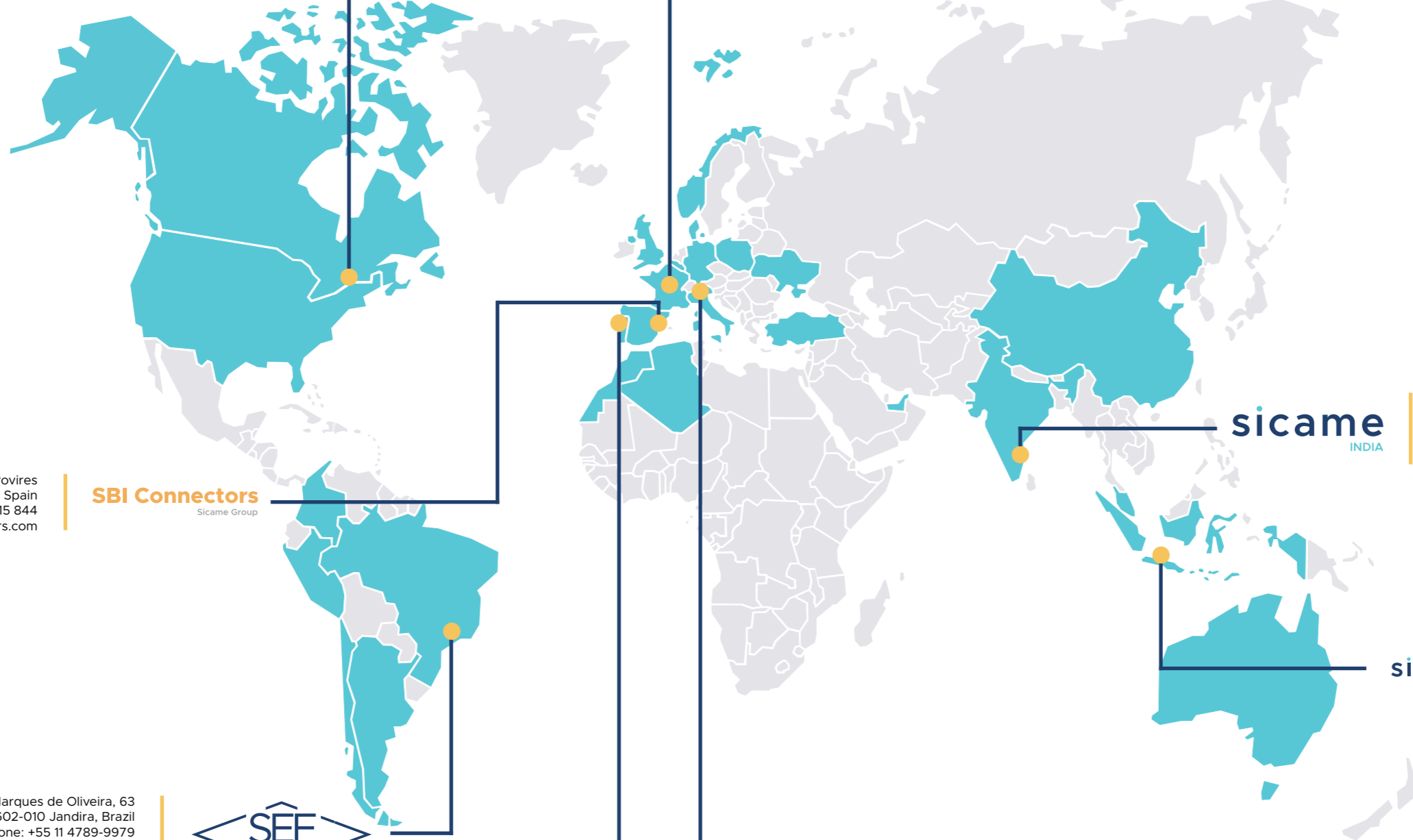
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