



TRIDELTA

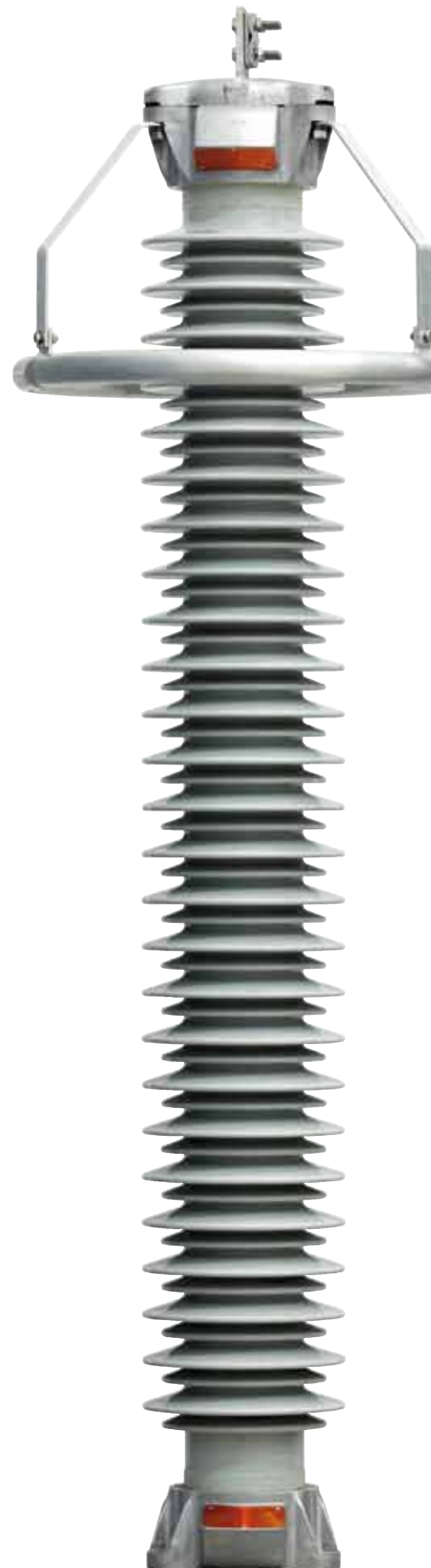
Surge Arrester Business  
A member of TRIDELTA Group



## Surge Arresters *Product Portfolio*



Best solutions and best quality  
*for every requirement*



## TRIDELTA SURGE ARRESTERS

### Best solutions and best quality – for every requirement

- Comprehensive product portfolio
- Stable continuous duty and lowest failure rates ensuring a long service life
- Best protection levels and loading capacity
- Efficiency and the highest quality in manufacturing

TRIDELTA provides arresters for every requirement. Our products are especially developed for service in all environmental conditions around the world. They are successfully installed in coastal and desert regions, in areas with high industrial air pollution, heavy windload and extreme climatic conditions, in seismic zones and other areas that require special protection.

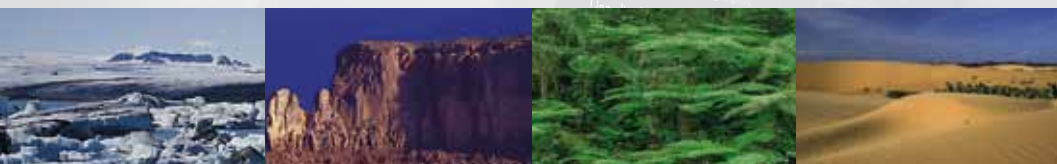
TRIDELTA arresters protect outdoor equipment such as transformers, motors, generators, traction vehicles or other equipment from atmospheric and switching overvoltages.

Furthermore, TRIDELTA provides surge arresters for special applications:

- arresters for capacitor banks in static compensators
- AC and DC railway arresters
- arresters for indoor applications in MV cubicles
- cable sheath protection arresters

In addition TRIDELTA offers an extensive range of transmission line arresters – a cost-effective solution to protect overhead transmission lines, reduce potential line outages and enhance system reliability.

A wide range of porcelain and polymer housings in various designs and versions is the basis to provide the optimum surge arrester for every application.



## SURGE ARRESTERS by TRIDELTA Fast, flexible and customer-oriented

The TRIDELTA venture is a traditional family owned company that is specialized in manufacturing high quality products. TRIDELTA is independent and therefore an ideal partner not only for utilities but also for contractors and EPC's looking for products from an independent source.

TRIDELTA stands for fast, flexible and customer-oriented solutions. As a result of the stable continuous duty, the long lifetime, the low loss rate and a very good price performance ratio of our surge arresters, TRIDELTA is one of the leading surge arrester manufacturers worldwide.

The TRIDELTA surge arrester portfolio covers all areas of application, no matter which environmental conditions the surge arresters need to withstand. Due to high technical knowledge, new innovative products are added constantly to the portfolio. Examples for this are our high voltage arresters with silicone housing: three specific designs from one supplier.

## MOV blocks by TRIDELTA – The heart of reliability

Metal Oxide Varistors (MOV's) are the heart of surge arresters. They define the electrical properties and the protective function of a surge arrester. Our tradition and know-how in developing and manufacturing MOV's leads to high quality arresters with excellent energy absorption capability and best protective levels. MOV's by TRIDELTA ensure a long economic lifetime of our surge arresters.

TRIDELTA produces MOV's in our own plant in France according to highest quality standards. Access and control are guaranteed throughout the whole manufacturing process. We develop our surge arresters with optimal adjustment between our MOV's, housings and connections.





## High Voltage Surge Arresters with Silicone Housing – TRIDELTA's Masterpieces

- Three different designs for applications with standard, advanced or highest technical requirements
- Outstanding pollution performance
- Resistance to tracking erosion and UV radiation
- Fire retardant and self extinguishing
- Lifetime hydrophobicity

TRIDELTA offers three different arrester designs for high voltage applications with silicone housing for standard, advanced and highest technical requirements:

**Solid Core, Cage and Tube Design.** They all use high quality silicone as insulation material with outstanding pollution performance. All three of the designs benefit from important silicone properties such as resistance to tracking erosion and UV radiation, being fire retardant and self extinguishing plus being water-repellent. Genuine silicone rubber housings, compared to other polymeric materials, retain their hydrophobicity during the lifetime of the arrester. This results in a long service life of all TRIDELTA arresters with silicone housings.

All three of the designs use the same high quality MOV blocks ensuring excellent electrical performance. They benefit from easy transportation and installation thanks to their reduced weight compared to porcelain arresters. The differences between these three product lines are their internal design and the method of fixing the column of MOV blocks into the housing of arrester. Please refer to the next page for more details.

### Solid Core design:

Mechanical stability is given by a solid core of prefabricated modules of fiberglass reinforced woven structure ensuring mechanical stability of the arrester for standard requirements.

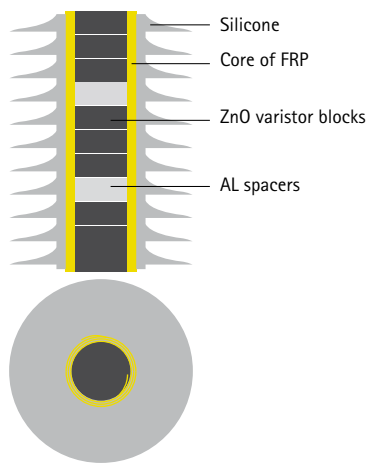
### Cage design:

A cage of FRP rods around the stack of MOV block, fixed into the terminals by a patented wedge clamping system, ensures higher mechanical strength for advanced requirements.

### Tube design:

A FRP tube with enclosed gas volume, including a pressure relief device, ensures greatest possible mechanical strength, for highest mechanical requirements, i. e. for areas with high seismic activity, heavy windload, extreme climatic conditions or additional mechanical loads.

## Solid Core design



### Description:

MOV blocks are pre-arranged in „Solid Design Modules“, prefabricated modules of a fiberglass reinforced woven structure with silicone sheds ensure high flexibility regarding customer demands

**Network Voltage  $U_m$ :** up to 245 kV\*

**Weight:** very low weight

**Mechanical strength (SSL):** 1 kNm

### Key Parameters:

- short delivery time
- easy transport (also in horizontal position) reduced transportation costs
- easy and fast installation without special equipment

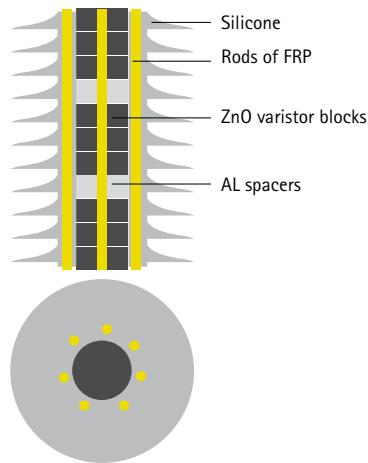
### Applications:

for standard mechanical requirements  
**excellent for line arrester applications** (NGLA and EGLA type)

### Summary:

competitive arrester for applications with standard/basic mechanical requirements for applications up to 245 kV networks

## Cage design



Cage of FRP rods around MOV blocks, FRP rods fixed into the end terminals by a patented wedge clamping; silicone sheds directly molded onto MOV blocks/cage, no enclosed gas volume, no sealing/pressure relief device needed

up to 420 kV\*

lower weight than tube design

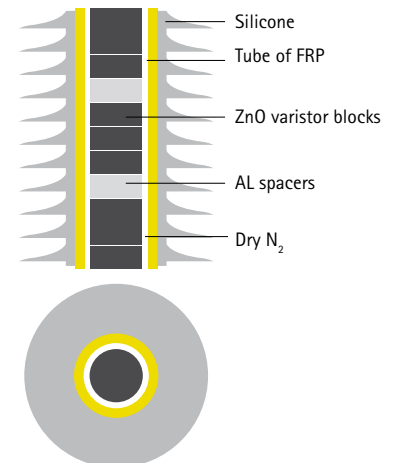
4 kNm

- high safety margin regarding electrical and mechanical overloads
- no violent destruction after overload or short circuit events
- shorter than tube design
- easy transport (also in horizontal position) reduced transportation costs
- easy and fast installation without special equipment

for standard and advanced mechanical requirements  
**excellent for line arrester applications** (NGLA and EGLA type)

arrester with best price/performance ratio for applications with advanced mechanical requirements for applications up to 420 kV networks

## Tube design



FRP tube with enclosed gas volume (hollow insulator), silicone sheds directly molded onto FRP tube

up to 550 kV

lower weight than comparable porcelain design

up to 75 kNm

- excellent pollution behaviour due to highly hydrophobic behaviour of silicone
- highest safety margin regarding electrical and mechanical overloads, no ejection of internal parts in case of short circuit
- even after short circuit/pressure relief remains 75% of mechanical stability
- delivery time similar to porcelain arresters
- easier transport than porcelain arresters (less risk of damage)
- installation similar to porcelain arresters but lower weight

for highest mechanical and safety requirements for arrester applications as support/post insulator for applications with seismic requirements

arrester for applications with highest requirements to mechanical strength and safety

\* higher ratings available for transmission line applications

# High Voltage Surge Arresters up to 800 kV



	Porcelain Housing		
Product	SB size 0	SB size I	SB size II
Design	Hollow Insulator, type A as per IEC 60099-4		
Application	Protection of Outdoor Medium voltage and High Voltage equipment	Protection of Outdoor High Voltage equipment	Protection of Outdoor High Voltage equipment, HVDC, SC and SVC applications
Housing Material	porcelain	porcelain	porcelain
Specification	IEC 60099-4	IEC 60099-4	IEC 60099-4
max. Nominal System Voltage $U_n$ kV	275	500	765
max. Highest Voltage for Equipment $U_m$ kV	362	550	800
max. Rated Voltage $U_r$ kV	300	444	612
max. Nominal Discharge Current $I_n$ (at 8/20 $\mu$ s waveshape) kA	20	20	20
Energy Capability			
- max. Thermal Energy Capability (2 impulses) kJ per kV or $U_r$	9,2	13	15
- max. Line Discharge Class	4	5	5
Discharge Current Withstand Strength			
- High Current 4/10 $\mu$ s kA	100	100	100
- Low Current 2 ms A	1.500	1.700	2.200
max. Short Circuit / Pressure Relief Capability kA	50	63	63
Mechanical Strength			
- Specific long-term load SLL Nm	2.600	9.200	14.000
- Specific short-term load SSL Nm	6.500	23.000	35.000
Service Conditions			
- Ambient Temperature	-60°C ... +55°C	-60°C ... +55°C	-60°C ... +55°C
- Frequency	16 Hz ... 62 Hz	16 Hz ... 62 Hz	16 Hz ... 62 Hz



## Silicone Housing

Varisil™ HI

Varisil™ HTS

SBKC 3

SBKC 4

SBKT size I

SBKT size II

### Solid Core Design

type B1 as per IEC 60099-4  
fiberglass reinforced woven  
structure with silicone sheds

### Cage Design

type B2 as per IEC 60099-4  
silicone directly moulded  
onto MOV blocks

### Tube Design

Hollow Insulator, type A as per IEC 60099-4  
silicone directly moulded  
onto FRP tube

Protection of Outdoor Medium Voltage and High  
Voltage equipment, protection of  
Transmission lines

Protection of Outdoor Medium Voltage and High  
Voltage equipment, protection of  
Transmission lines

Protection of Outdoor  
High Voltage equipment, HVDC,  
SC and SVC applications

silicone rubber

silicone rubber

silicone rubber

IEC 60099-4

IEC 60099-4

IEC 60099-4

170

220

400\*

400\*

500

500

170

245

420\*

420\*

550

550

144

204

360\*

360\*

420

444

10

10

10

20

20

20

5

7

8

9,2

10

15

2

3

3

4

4

5

100

100

100

100

100

100

500

800

1.500

1.500

1.700

2.200

63

63

63

63

63

63

800

800

2.800

2.800

6.000

12.000

1.000

1.000

4.000

4.000

12.000

23.000

-60°C ... +55°C

-60°C ... + 55°C

-60°C ... +55°C

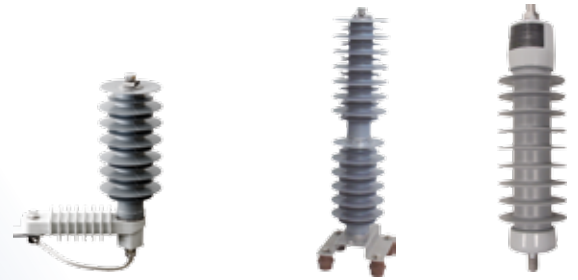
16 Hz ... 62 Hz

16 Hz ... 62 Hz

16 Hz ... 62 Hz

\* higher ratings for line arrester applications available on request

# Medium Voltage Metal Oxide Surge Arresters and Limiters up to 51 kV



	Distribution Type Arresters			
Product	Varisil™ HE	Varisil™ HE-S	Varisil™ HE-I	Varisil™ H24 / H36
Application	protection of outdoor and indoor distribution networks			
Housing Material	silicone rubber	silicone rubber	silicone rubber	silicone rubber
Specification	IEC 60099-4	IEC 60099-4	IEC 60099-4	EDF HN 65-S-40
max. Phase to Phase voltage under normal conditions $U_s$ , kV	45	52	52	24/36
max. Rated Voltage $U_r$ , kV	36	54	54	24/36
Nominal Discharge Current $I_n$ (8/20 waveshape) kA	10	10	10	5 (actual 19)
Energy Absorption Capability				
- max. Thermal Energy Absorption Capability $W_{th}$ (2 impulses) kJ per kV or $U_r$	3	3	4,5	3
- max. Line Discharge Class	1	1	2	1
Current Impulse Withstand				
- High Current 4/10 kA	100	100	100	65 (actual 100)
- Low Current 2000 $\mu$ s A	300	300	500	150 (actual 300)
max. Short Circuit / Pressure Relief Capability kA – 0,2s	20	20	20	31,5
Mechanical Strength				
- Specific long-term load SLL Nm	100	200	200	300
- Specific short-term load SSL Nm	125	250	250	400
Service Conditions				
- Ambient Temperature	-40°C .. +50°C	-50°C .. +50°C	-50°C .. +40°C	-50°C .. +60°C
- Frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz





	AC and DC Railway Arresters					Low Voltage Limiters	Sheath Voltage Limiters		
SBK-0	Varisil™ HD/T	Varisil™ HDC	SBKB	SBB	B8506	CLS	Varisil™ HC	RNL HC	
protection of indoor distribution networks	protection of railway AC equipment	protection of railway DC equipment					protection of people	protection of cable sheath	
silicone rubber	silicone rubber	silicone rubber	silicone rubber	porcelain	painted steel	painted brass	silicone rubber	Saturated polyester	
IEC 60099-4	IEC 60099-4	EN 50123-5	EN 50123-5	EN 50123-5	---	EN-50123-5	IEC 60099-4		
	27,5 AC single-phase	4 DC	4 DC	4 DC	1,5 x 3 DC	N/A	N/A	N/A	
51	42	4,8	4,8	4,8	4	0.15	18	6	
10	10	10	10	10	10	N/A	10	10	
2,8	3	5	6,7	6,7	8	N/A	3	2	
1	1	2	4	4	3	N/A	1	N/A	
100	100	100	100	100	100	N/A	65 (actual 100)	65	
250	300	500	1.000	1.000	800	N/A	150 (actual 300)	150	
20	31,5	20	40	40	10	8	31,5	N/A	
160	300	200	N/A	N/A	N/A	N/A	300	N/A	
230	400	250	N/A	N/A	N/A	N/A	400	N/A	
-40°C .. +55°C	-50°C .. +50°C	-50°C .. +50°C	-40°C .. +55°C	-40°C .. +55°C	-50°C .. +50°C	-50°C .. +60°C	-50°C .. +60°C	-40°C .. +60°C	
16 - 62 Hz	16 - 60 Hz	DC	DC	DC	DC	AC & DC	50 - 60 Hz	50 - 60 Hz	



# Monitoring Equipment

In addition to our wide range of surge arresters we offer devices for monitoring and recording of the discharge process and the condition of the arrester.



## TRIDELTA R&D and HV Test Laboratory – Investment in the future!

The combination of continuous development for our products and investment into modern high voltage test facilities specialized for surge arresters is one key factor for the success of TRIDELTA. Based on constant interaction between development and production we are continuously improving our manufacturing lines ensuring high standard of our arresters. Our development processes are certified according to ISO 9001. Each MOV block and surge arrester is individually tested during and at the end of the manufacturing process.

Our modern and powerful high voltage laboratory is equipped with:

- Impulse Generator up to 1.200 kV
- Power Frequency Transformer 600 kV
- High Current Impulse Generator 150 kA
- Long Duration Current Impulse Generator for line discharge classes 1 to 5
- Test Facilities for 5000h whether ageing test
- Climate testing laboratory with capability of -40°C ... +100°C
- Mechanical Bending and Tensile Test machine with capability of up to 30.000 Nm for bending moment and up to 50.000 N for tensile strength tests

TRIDELTA is able to conduct most of the usual type tests as well as acceptance tests and tests for R&D activities.

Our surge counters DCC, DCC-M and MDC3 as well as our Monitoring Spark Gap KOFU provide information about the number of recorded discharge events as well as total leakage current.



Our innovative diagnostic device DIAG provides leakage current analysis under normal arrester operation based on 3<sup>rd</sup> harmonic analysis of leakage current.



Mechanical bending test equipment

5000 h weather ageing test

testing facility for varistors



## TRIDELTA Quality Products Made in Germany Made in France

Our arresters are manufactured in Hermsdorf, Germany and Bagnères de Bigorre, France. German and French art of engineering, best materials and approved testing technologies make TRIDELTA arresters a synonym for quality. Our tradition and knowledge over decades, the innovative potential of our engineers and employees and our uncompromising quality demands lead to outstanding products and best solutions.

TRIDELTA has implemented a process oriented quality management system according DIN ISO EN 9001. The system, all processes, technologies, procedures and activities are described in our QA manual, process instructions and related operating instructions. These documents define the requirements of all business processes, in particular quality planning and the development, manufacturing and testing of high-quality products. To ensure that every customer can rely on the high quality of our products, all MOV blocks and arresters are manufactured and extensively routine-tested during and at the end of the manufacturing process in compliance with IEC 60099-4.

By manufacturing up to 1.5 million MOV blocks per year in our French factory, TRIDELTA has direct control over the quality of this key component. The manufacturing process comprises the complete range from mixing the zinc oxide with other metal oxides, pressing, sintering, grinding, individual testing and classification – all under full traceability from raw material to MOV block and final surge arrester.

The very low failure rates of our arresters resulting in their long service life are confirmation to us of our efforts to constantly maintain highest quality standards for our products.



Reg.Nr. 3453 - 01





TRIDELTA Überspannungsableiter | Hermsdorf / GERMANY



TRIDELTA Parafoudres S.A. | Bagnères de Bigorre / FRANCE

## TRIDELTA's global presence

More than 5 million of TRIDELTA surge arresters are currently in reliable service in more than 120 countries all over the world.

TRIDELTA's agents and distributors provide local technical and commercial service for our products in most countries worldwide.

TRIDELTA's agents and distributors are supported by our sales engineers located in our headquarters in France and Germany who will prepare technical and commercial proposals based on your requirements.

TRIDELTA is Your supplier for high quality surge arrester products focused on any specific technical and commercial requirement.

Thank you for your interest in our products. Please contact your local TRIDELTA agent or distributor or our headquarters at:



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