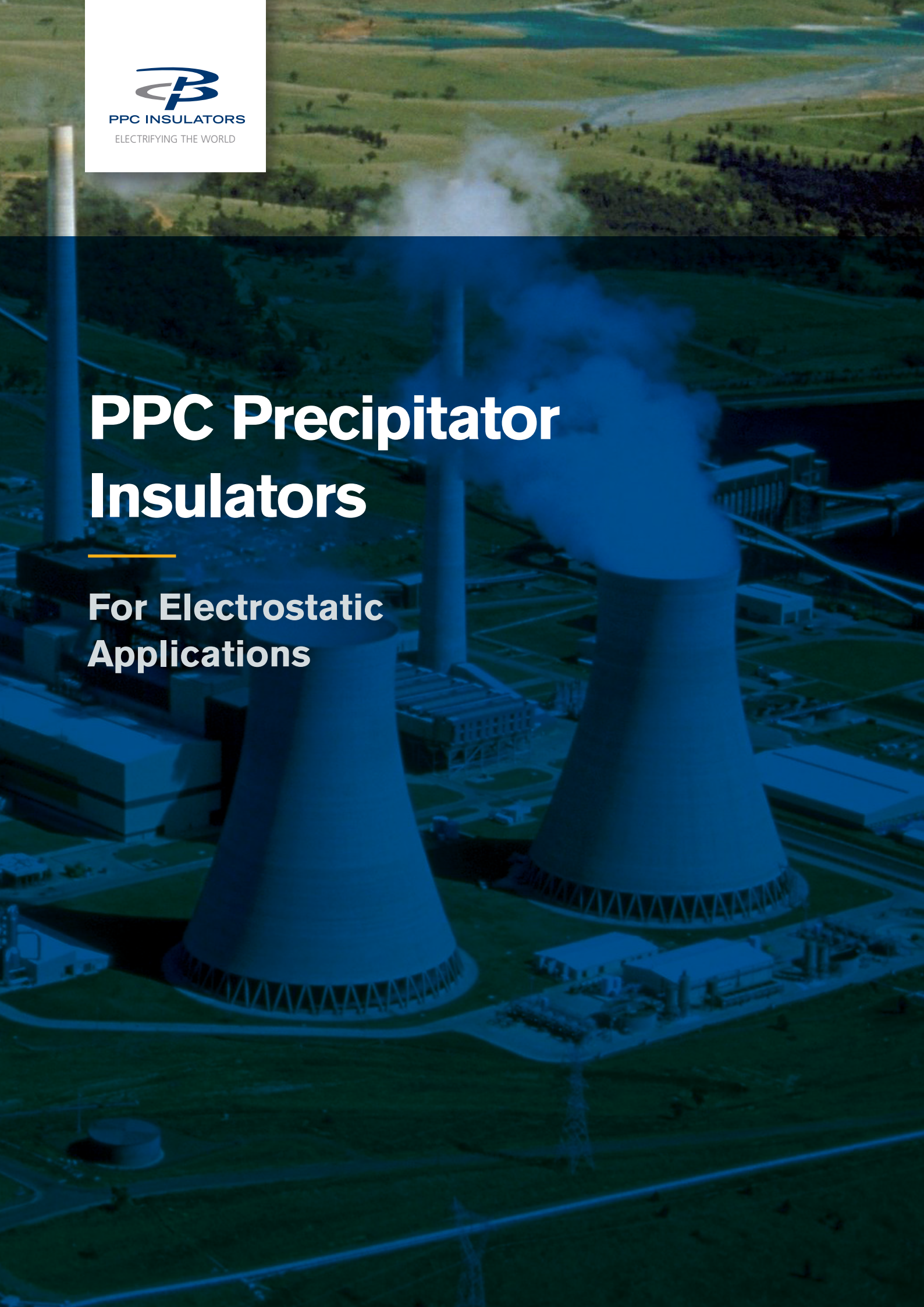
PPC INSULATORS

ELECTRIFYING THE WORLD

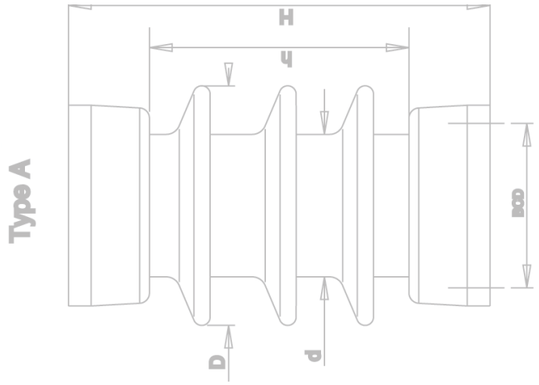


PPC Precipitator Insulators

For Electrostatic Applications

Precipitator Insulators

Never compromise on performance



PPC Insulators

More than 130 years of experience

PPC is a world leader and innovatorin the manufacture of precipitator insulators for use in electrostatic precipitation technology and applications. From our extensive manufacturing base in Germany, products are designed, engineered and manufactured to meet, and frequently surpass, exacting demands from OEM and industry customer in many applications and geographic areas. PPC has long experience in manufacturing a wide range of precipitator insulators. Our manufacturing tradition goes back more than a hundred years.

PPC develops, produces and delivers products worldwide and can provide the optimal solution for customers´ requirements. The specialists of PPCInsulators are dedicated to supplying clients with superior advice and global support.

PPC Insulators quality products and service provide time-tested. value to fulfill your needs!

PPC started with production of electrical precipitator insulators for electrostatic applications in the manufacturing plant PPC EKS Germany in 2019, but our manufacturing tradition goes back more than a hundred years.

Since 1918 high tension insulators have been produced at the PPC Bromölla plant in southern Sweden. It was at Bromölla that the cold isostatic production technique was developed and here, in 1988, the company commissioned the worlds first cold Isostatic line of its kind.

More than forty years ago, this plant developed a proprietary ceramic body. The LD-body was developed especially for heavy duty performance in demanding operating environments such as high temperature electrostatic precipitators.

Over the last two decades this design and materials formula, used in precipitator insulators, has given PPC distinct technical advantages when compared with alternative materials and products.

The evolutionary approach to product development, manufacture and design will help PPC maintain its long-term competitive position in the industry.

Precipitator Insulators
For Electrostatic Applications

Mechanical Strength Properties

based on different body material (comparison in MPa)

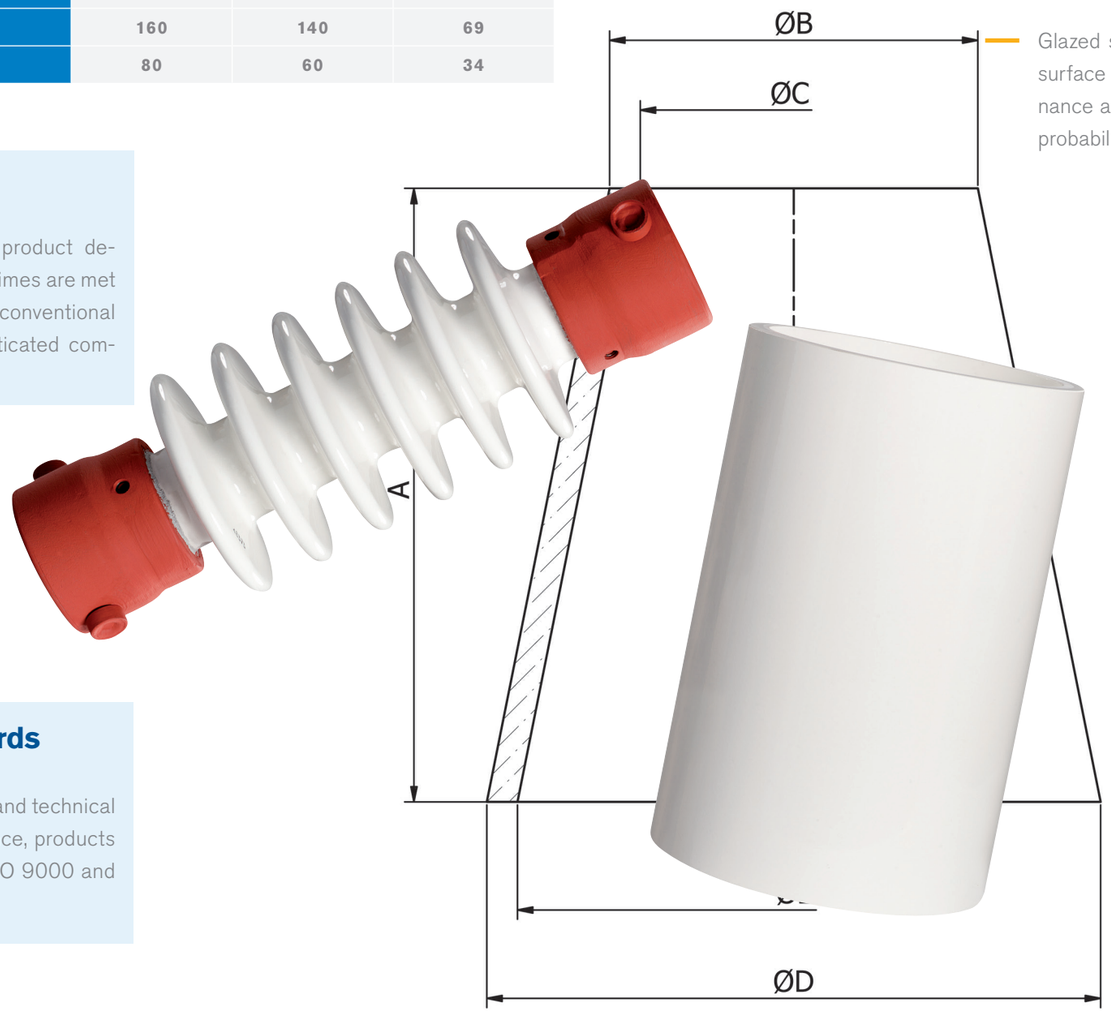
Mechanical Strength Area	LD Ceramics GLAZED	LD Ceramics UNGLAZED	Electrical Porcelain
Compressive Strength	650	650	458
Flexural Strength	160	140	69
Tensile Strength	80	60	34

Design

Customer demands regarding product design flexibility and delivery lead times are met primarily through utilizing the conventional method, with the aid of sophisticated computer technology.

International Standards

Recognizing that overall quality and technical performance is of vital importance, products are made in accordance with ISO 9000 and other relevant standards.

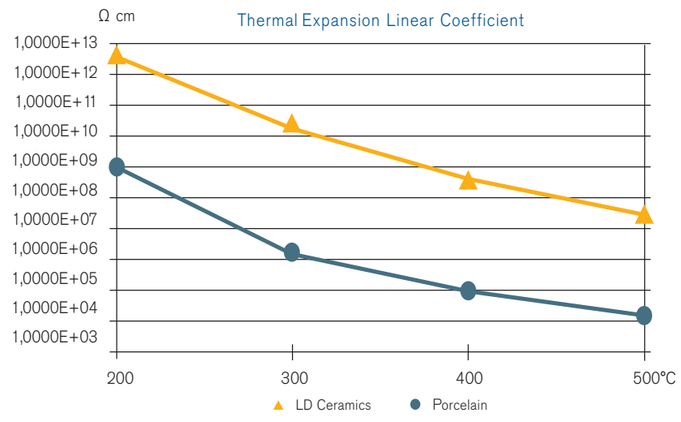


Technical Features

LD Ceramics precipitator insulators have a number of outstanding technical features including:

- High DC resistivity at elevated temperatures whereby electrial breakdown caused by high leakage current through the material is avoided.
- Excellent mechanical strength and impact resistance, signifcantly reducing failure due to mechanical stress.
- Very low thermal expansion due to increases in temperature or elevated temperature, allowing the insulator to resist cracking in case of thermal shock.
- Glazed surface facilitates visual inspection and cleaning. The glazed surface treatment has a dirt repellent function during plant maintenance and repair work. These properties also significantly reduce the probability of tracking across the material.

Volume Resistivity v.s. Temperature



Precipitator Insulators
LD Ceramics for Better Results

The benefits of LD Ceramics

The LD Ceramics body is a high-grade ceramic material with very good mechanical and electrical properties similar to that of aluminia-based electrical porcelain according to IEC 60672-3, Type C130.

Precipitator insulators from the LD Ceramics product family typically holds a glass face to approximately 50% of its content. The glass matrix consists of 25% mullitand 20% korund. The glass itself contains 13% of Al2O3, making the total content of Al2O3 in the body amount to approximately 50%.

They are sintered to adensity degree of 95% and haveno open porosity that allows water absorption. Unglazed insulators can thus be used completely safe invarious applications. The glazing of our precipitator insulators serves the dual enhancement purpose of providing the products with acombined dirt and dust-repelling surface to facilitate inspection, cleaning etc. and to avoid tracking and discharges along the insulator surface.

Traditional electrical porcelain can operate in environmentsclose to room temperature and should never be used intemperature environments above 100°C. The special and distinctive properties of LD Ceramics have been developed by adjusting the volume resistivity of the glass material. This is especially benefical at elevated temperatures. The glazing used for LD Ceramics also has the same high resistivity.

Products made from a high purity alumina have a comparatively rough surface following manufacturing. This surface easily adheres dirt and dust and could cause insulator malfunction. When products of this type are glazed the insulator will lose its otherwise favourable electrical properties

Precipitator Insulators
Key Data

Related to LD material properties

FLEXURAL STRENGTH - Glazed, MPa (psi)	160	(23200)
FLEXURAL STRENGTH - Unglazed, MPa (psi)	140	(20300)
COMPRESSION STRENGTH - Glazed, MPa (psi)	650	(94250)
COMPRESSION STRENGTH - Unglazed, MPa (psi)	650	(94250)
OPEN POROSITY	Nil	
DENSITY, kg/m^3 (lb/ft^3)	2.6	(0,062)
MODULUS OF ELASTICITY, GPa (ksi)	100	(14503)
COEFFICIENT OF LINEAR THERMAL EXPANSION @ 20-600°C , K^{-1} x 10^{-6} (°F^{-1} x 10^{-6})	5.3-5.5	(2.94-3.06)
THERMAL CONDUCTIVITY @ 20-100°C	2	(13.87)
THERMAL SHOCK RESISTANCE, K (°F)	150	(270)
DIELECTRIC STRENGTH, kV/mm (kV/in)	20	(508)
VOLUME RESISTIVITY at 100°C, ohm-cm (ohm-in)	10^{14}	(10^{13})
VOLUME RESISTIVITY at 200°C, ohm-cm (ohm-in)	10^{12}	(10^{11})
VOLUME RESISTIVITY at 400°C, ohm-cm (ohm-in)	10^{8}	(10^{7})
VOLUME RESISTIVITY at 500°C, ohm-cm (ohm-in)	10^{7}	(10^{6})

LD Ceramics initially has ahigh resistivity which is marginally lower than the resistivity of aluminia ceramics,however, it still meets the required performance levels of resistivity for the application in question.

- LD Ceramics shows asl ower decrease of resistivity during use due to reduced tendencies to build-up of conductive surface coatings in comparison with aluminia ceramics.

- The life-length expectancyfor LD ceramics is improved by the features mentioned above and also shows substainantially improved technical performancecharacteristics of the insulator by the end of its serviceperiod – whereby avoiding otherwise dramatic energy-consuming loss of resistivity that occurs in many situations.

Reducing failure and malfunction risks

There are three major causes for operating failure and malfunction of precipitator insulators as described below. By using precipitator insulators from the LD Ceramics product family you can significantly reduce your risk exposure accordingly.

1 Electrical breakdown

resulting from tracking or arcing across the insulator surface. Risks are particularly imminentin ESP start-up situations when the flue gas temperature maybe close to the acid dew point and when moisture and dust concentration in the air is high.

2 Electrical breakdown

resulting from high leakage current through the ceramic material itself or its glazing. This is partly due to the rapid-temperatue increase that is occuring when high voltage is continously applied over the insulator body.

Consequently, it is imperative to use insulator materials with high resistivity properties at elevated temperatures.

3. Mechanical failure

due to severe mechanical shockor uneven stress distributionthrough the ceramic material.

PPC Insulators has been a leading manufacturer of porcelain and hybrid insulators for over 130 years. Our extensive knowledge, expertise, and production technology enables us to produce the best insulator designs catering up to 1200 kV AC and 1100 kV DC system voltages. We supply over 40,000 standard insulators from our stock to meet the demands of our valued customers.

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