



GE Surge Arresters, Surge Capacitors & IHM Capacitors

Power Quality Products

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Agenda

Arresters Concepts
Arresters Selection
Surge Capacitors
IHM Capacitors
Library



Arresters Concepts



Surge Arresters - Concepts

Surge arrester is to protect insulation/components from high DV/DT that peak at instantaneous values that are in excess of the breakdown of the insulation or component.

- Surge causes, traveling voltage wave from Lightning (least common) or Switching (most common)
- Voltage spike would be enough to damage insulation of equipment
- Surge arrester high resistance at L-G voltage
- Surge arrester changes to low resistance at surge voltage
- Surge is diverted to ground, unit reverts back to high resistance
- Arresters limit overvoltage to acceptable levels, to below BIL (Basic Insulation Level) of the equipment being protected



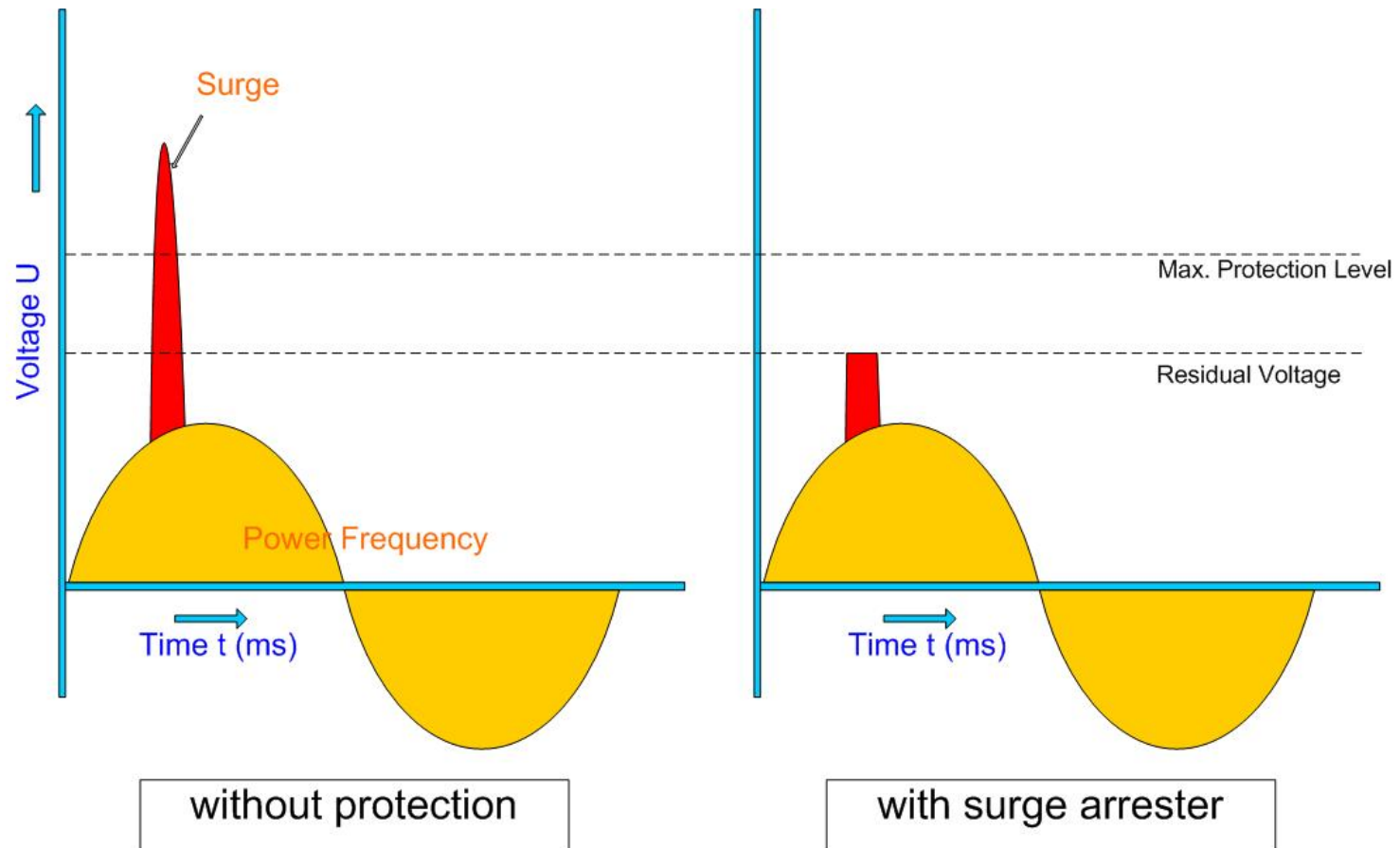
Causes for Surges

- Temporary Over Voltages (TOV), seconds
- Transients
 - Lightning, least common, microseconds;
 - Switching surge, more common, milliseconds;

Arresters limit overvoltage to acceptable levels, to below BIL of the equipment being protected.



Arresters Function



Where are Arresters Used?

- Switchgear, Outdoor substation
- Breakers need arresters.
- Transformers will have arresters.
- Surge protection is often found on AC rotating machines, both surge capacitors and arresters. We offer both.
- EPCs, Utilities & industrial customers use arresters on capacitor banks.
- Voltage regulators either come with arresters or they are added at install.



Arresters Selection



Information Needed to Select Arrester

- Rated voltage or Max Continuous Operating Voltage (MCOV)
- Grounding information
- Class of arrester
- Housing material (porcelain/polymer)
- Creepage requirement
 - Pollution Level / Altitude
- Seismic requirement



Rated voltage or MCOV

- Rated voltage or Max Continuous Operating Voltage (MCOV)

The arrester rating is selected so that the maximum continuous power system voltage applied to the arrester is less than, or equal to, the arrester's MCOV rating.

- In most cases the arresters are connected line-to-ground.

- If arresters are connected line-to-line, then phase-to-phase voltage must be considered



Grounding information

- Grounding information

Knowing the system configuration (wye/delta, grounded or ungrounded) is a key factor in selecting an arrester rating.

Example 1: 13.8kV Solidly Grounded System

The continuous operating voltage is 13.8kV divided by root 3, or 7.97kV.

- Arrester rated 9 kV with MCOV of 7.65kV < 7.97kV
- Select 10 kV arrester with an MCOV of 8.4 kV or a 12kV arrester with MCOV of 10.2kV.

Example 2: 13.8kV Ungrounded System

Then 12kV arrester with MCOV of 10.2kV is not adequate for a nominal voltage of 13.8kV. Use an 18 kV arrester with an MCOV of 15.3 kV.

If the system grounding configuration is unknown, assume the system is ungrounded. This will result in choosing an arrester with a higher continuous system voltage and/or MCOV rating.



Class of Arrester

The class of lightning arrester to be applied depends upon the importance and value of the protected equipment, its impulse insulation level and the expected discharge currents the arrester must withstand.

Station class arresters are designed for protection of equipment that may be exposed to significant energy due to line switching surges and at locations where significant fault current is available. They have superior electrical performance because their energy absorption capabilities are greater. **Station class arresters are the top choice for protecting valuable equipment where high reliability operation is required.**

Intermediate class arresters are designed to provide economic and reliable protection of medium voltage class electrical power equipment. Intermediate arresters are commonly used for the protection of dry-type transformers, for use in switching and sectionalizing equipment.

Distribution class arresters can be found on smaller liquid-filled and dry-type transformers 1000 kVA and less. These arresters can also be used for application at the terminals of rotating machines below 1000 kVA, if available in the proper voltage rating. The distribution arrester is often used out on exposed lines that are directly connected to rotating machines.



Arresters Selection Classes (2.4 to 500kV)

IEEE C62.11 Standard

Distribution - Riser – Intermediate – Station

IEC 60099.4 Standard

Classes 1, 2, 3, 4, 5

Protective Level, Energy Handling & Price
Low  High



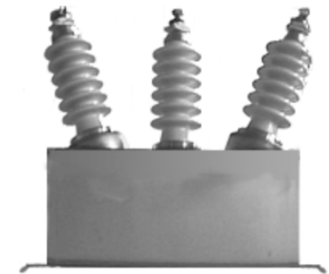
Surge Capacitors

Protection of windings in large motors

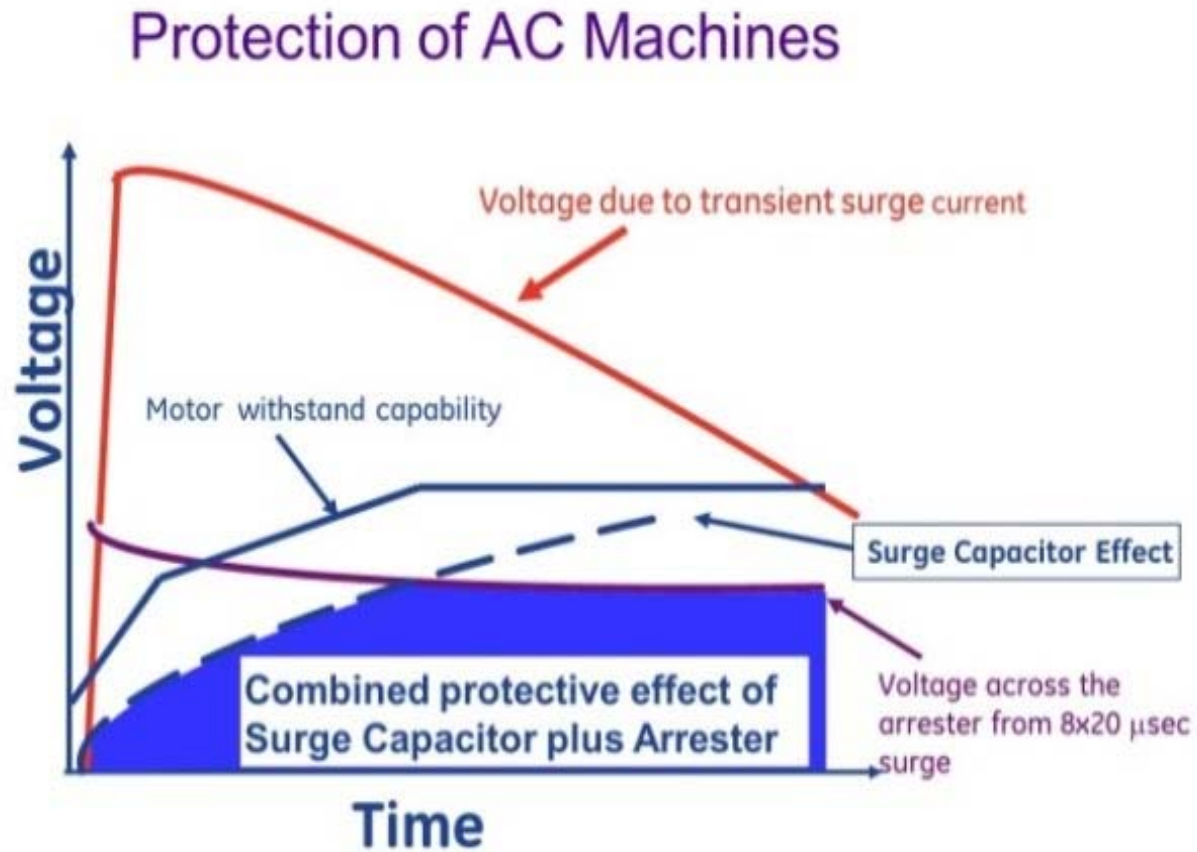


Surge Capacitors (2.4 to 25kV)

- Surge Protection for AC Generators, Synchronous Condensers and Large Motors
- Remember the greatest number of transient voltages are caused by switching.
- Provides Turn-to-Turn insulation protection by reducing steepness of wave fronts applied to or reflected within the machine
- Used in combination with TRANQUELL Station Arresters for Optimum Protection



Surge arrester & capacitor protection



Peak current 8 μ S, 50% 20 μ S

Induction, Heating, Melting (IHM) Capacitors

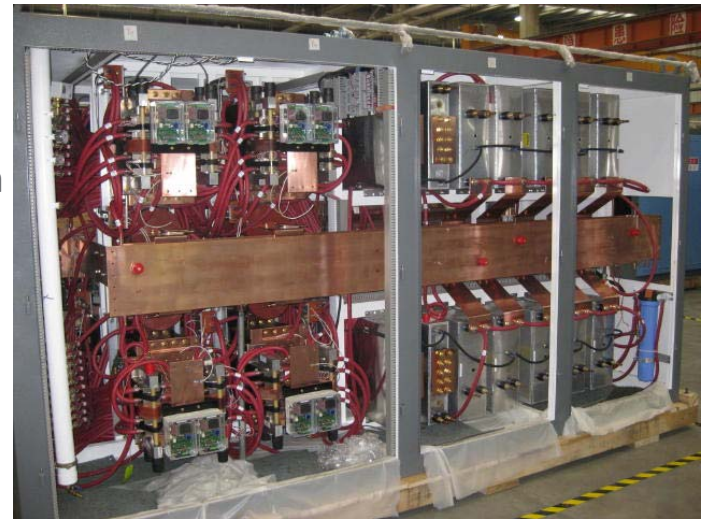


Induction Heating and Melting Capacitors

GE is a global supplier of air and water cooled capacitors to the Induction Heating and Melting Industry with an extensive range of capacitor ratings up to 4000 Volts and up to 50 kHz

Product Scope

- Air cooled capacitors for Induction Heating & Melting Applications
 - Single phase air cooled capacitors, 50 & 60 Hz, through 500 kVAR
- Water cooled capacitors for Induction Heating & Melting Applications
 - Water cooled capacitors, 50Hz - 50 kHz, 100 - 4000 V through 12,000 kvar



Induction Melting Power Supply

Major Customers Include

- IM power supply manufacturers
- OEMs
- EPCs / Solution provider

Features and Benefits

- High quality & low loss dielectric system.
- Air cooled and water cooled tank circuit and filter capacitors.



Induction Heating and Melting Capacitors



Alloy manufacturing



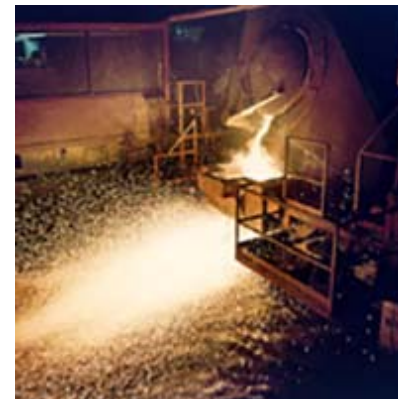
Aluminum melting



Rolling mills



Iron melting



Steel & Stainless Steel melting



Induction Heating and Melting Capacitors

Description/Specification/Construction:

- Designed for use in AC tank circuits or specialty DC filter circuits
- All-film or metallized film dielectric
- Tin-plated, copper terminals rated for up to 300 Amps continuous
- Electrical grade phenolic bushings for indoor application
- Long life, 20 year nominal life
- Low loss, less than 0.3 watts per kVAR up to 5 kHz; less than 0.5 watts per kVAR up to 50 kHz
- Special dielectric system designs for high efficiency
- GE dielectric fluids; Dielektrol VI for metallized dielectrics, Dielektrol VIIa for all-film dielectrics
- Designs that employ a pressure switch are supplied with a N/C, 12 PSI, non-resetting switch. All metallized dielectric designs require a pressure switch
- Case design: textured aluminum using 0.60 in. (15.25mm) to 0.90 in. (22.85mm) aluminum, with 0.125 in. (3.18mm) base and cover
- Brackets when included have .50 in. (12.7mm) and 0.625 in. (15.9mm) mounting slots
- GE requires that equipment manufacturers use the recommendations specified in bulletin GEH-2733 concerning outlet water temperature, water flow rate and water cleanliness in design and operation of their equipment



Water Cooled Designs



Induction Heating and Melting Capacitors

Description/Specification/Construction:

- Designed for line frequency application
- All-film or metallized film dielectric
- Tin-plated, copper terminals rated for up to 300 Amps continuous
- Electrical grade phenolic bushings for indoor application
- Long life, 20 year nominal life
- Low loss, less than 0.3 watts per kVAR
- Special dielectric system designs for high efficiency
- GE dielectric fluids; Dielektrol V (DK-VI) for metallized dielectrics; Dielektrol VII (DK-VIIa) for all-film dielectrics
- Designs that employ a pressure switch are supplied with a N/C, 12 PSI, non-resetting switch. All metallized dielectric designs require a pressure switch
- Standard case material for 50/60 Hz designs is painted stainless steel



Air Cooled Designs



Library



Library

GE arrester brochures:

- IEEE Distribution Class along with Intermediate & Station Class
- IEC Porcelain (Class 3, 4 & 5) along with Polymer (Class 2, 3, & 4)

https://www.gegridsolutions.com/app/Resources.aspx?prod=surge_arresters&type=1

- GE OnLine Store
 - Outlines have physical and protective characteristics
 - Arrester configurator, arrester selection tool

GE surge capacitor brochures:

https://www.gegridsolutions.com/app/Resources.aspx?prod=high_volt_capacitor&type=1

GE IHM capacitor brochures:

https://www.gegridsolutions.com/app/Resources.aspx?prod=i hm_capacitor&type=1

