

SURGE CAPACITORS

Introduction

Electrical surges from various sources are common in power systems, such as lightning strikes, equipment failures, switching surges which have a high dv/dt ratio.

Hilkar Surge Capacitors are designed to prevent damage to the winding insulations of equipment such as generators, motors, reactors and transformers, where significant losses may occur if the necessary protection measures are not taken. Surge Capacitors are used to reduce or eliminate the effect of over-voltages on these devices, are frequently preferred as a cost-effective and versatile solution.

Surge Capacitors absorb energy from electrical surges and protect equipment. Therefore, implementation of Surge Capacitors as surge protection devices, significantly reduces the direct and indirect costs related to equipment repair and cessation of business activity. Surge Capacitors help to eliminate switching transients that can occur as a result of switchgear operation as well as significantly reduce the steep wave-front surges seen at load terminals. Also, Surge Capacitors are manufactured as wire-wrapped to have minimum inductance.

Advantages

- Save on costs, via reduced downtime and repair costs
- Improve operational performances, as a result of reduction in production downtime
- Superior protection against interturn insulation failures
- More effective protection against rapidly increasing voltages as the response time is shorter than surge arresters
- Extends lifetime of motors/transformers
- Reduce the likelihood of pre-strike, re-strike, and re-ignition observed at circuit breakers
- Reduce the magnitude and rate of rise of voltage (RRRV) transients
- Ease of installation
- Low loss dielectric,
- Long lifetime

Application Areas

- Power Generation
- Pulp and Paper Industry
- Petrochemical Industry
- Chemical Factories
- Surface and Underground Mining
- Water and Oil Pumping Stations
- Railway Applications
- Large Motors
- Arc furnaces
- and many other facilities using any kind of motors and/or transformers

Protections Provided

- Protection against all practical surge peaks and rise-times
- Withstands all the motor impulse voltage levels recommended by both CIGRE and IEEE
- Elimination and damping of multiple pre/re-strike transients that occur during switchgear operation
- Surge Capacitors are recommended to be used with surge arrester for more comprehensive protection

Product Range

- Operating Voltage: Up to 36kV
- Impulse Withstand Voltage: Up to 200 kV BIL
- Variety of surge capacitance ratings depending on the site requirements and application type (ie, 0.1-0.5 μ F)
- Fully assembled, tested, and ready for interconnection

General Technical Specifications

Type	-	Single Phase / Three Phase
Rated Voltage	kV	1 - 36
Rated Frequency	Hz	50/60
Capacitance Range	μ F	0.1 – 0.5
Capacitance Tolerance	-	-5 / +10%
Incoming Terminal (IEC 60137)	-	Top
Enclosure Protection Degree (IEC 60529)	-	IP00
Max Ambient Temperature	$^{\circ}$ C	\leq 55
Cooling	-	Air Natural
Dielectric System	-	All-film
Painting	-	Red (Consult to our factory for other colors)
Lightning Arrester	-	Optional

Basic Insulation Levels

Highest voltage for equipment	kV	2,4	3,6	7,2	12	17,5	24	36	52
Rated power-frequency short duration withstand voltage	kV	8	10	20	28	38	50	70	95
Rated lightning impulse withstand voltage (BIL)	kV	35	40	60	75	95	125	170	200

Benefits

In CASE-1 where the surge capacitor is used for transient voltage waveform steepness and peak reduction at the grid voltage side, the defined withstand voltage limit in the standards are not exceeded and the oscillations in the transient voltage waveform are significantly reduced but the defined withstand voltage limit in the standards are exceeded at the transformer side.

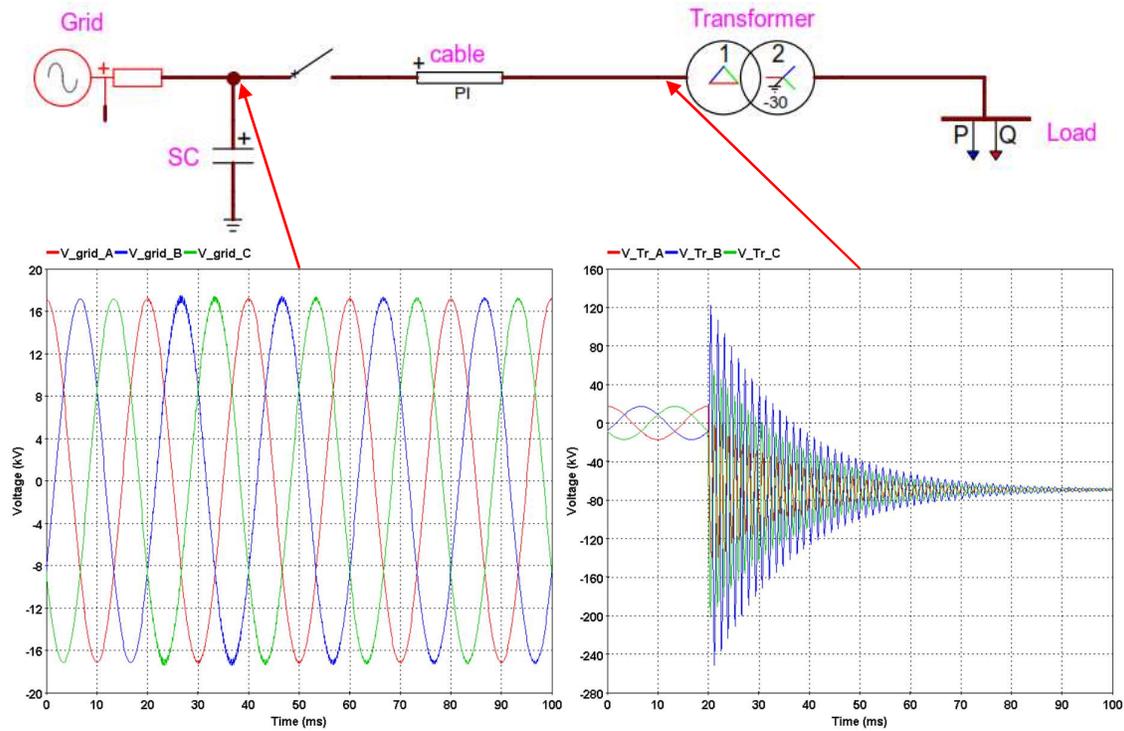


Figure 1 Case-1 @17.5 kV Grid Voltage

In CASE-2 where the surge capacitor is used for transient voltage waveform steepness and peak reduction on the transformer side, the defined withstand voltage limit in the standards are not exceeded and the oscillations in the transient voltage waveform are significantly reduced, but spikes occur on the grid voltage side.

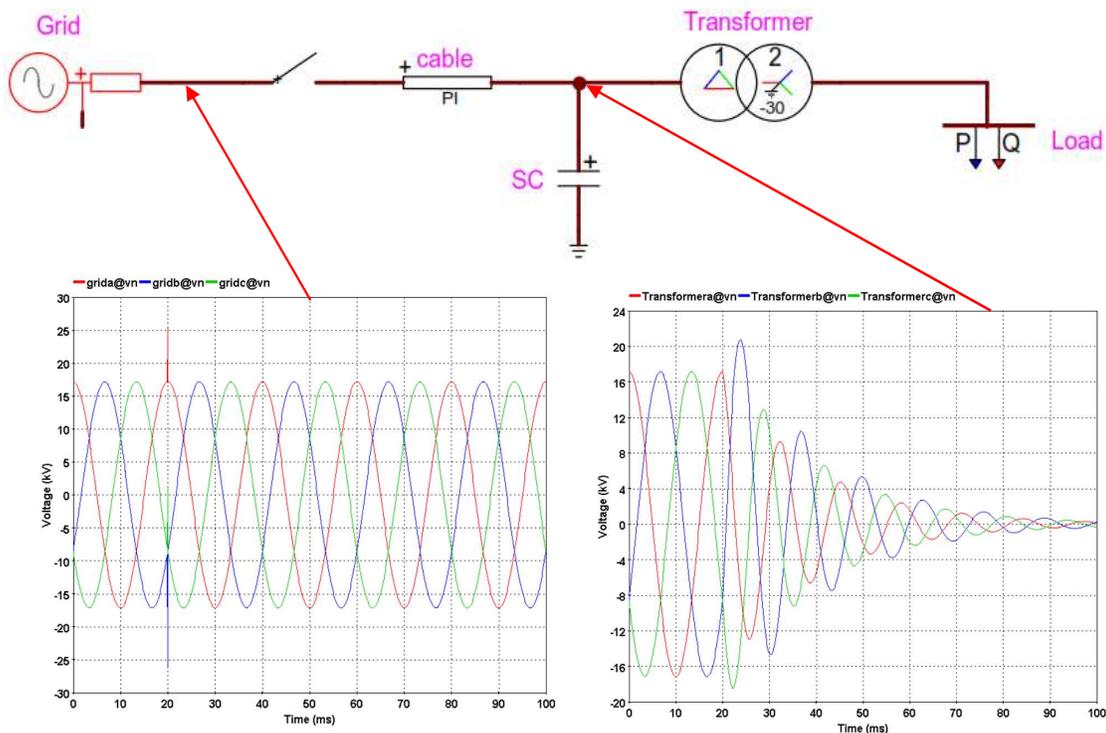


Figure 2 Case-2 @17.5 kV Grid Voltage

In CASE-3, where the surge capacitor is used for transient voltage waveform steepness and peak reduction at the both (Grid & Transformer) side, the defined withstand voltage limit in the standards are not exceeded and the oscillations in the transient voltage waveform are significantly reduced.

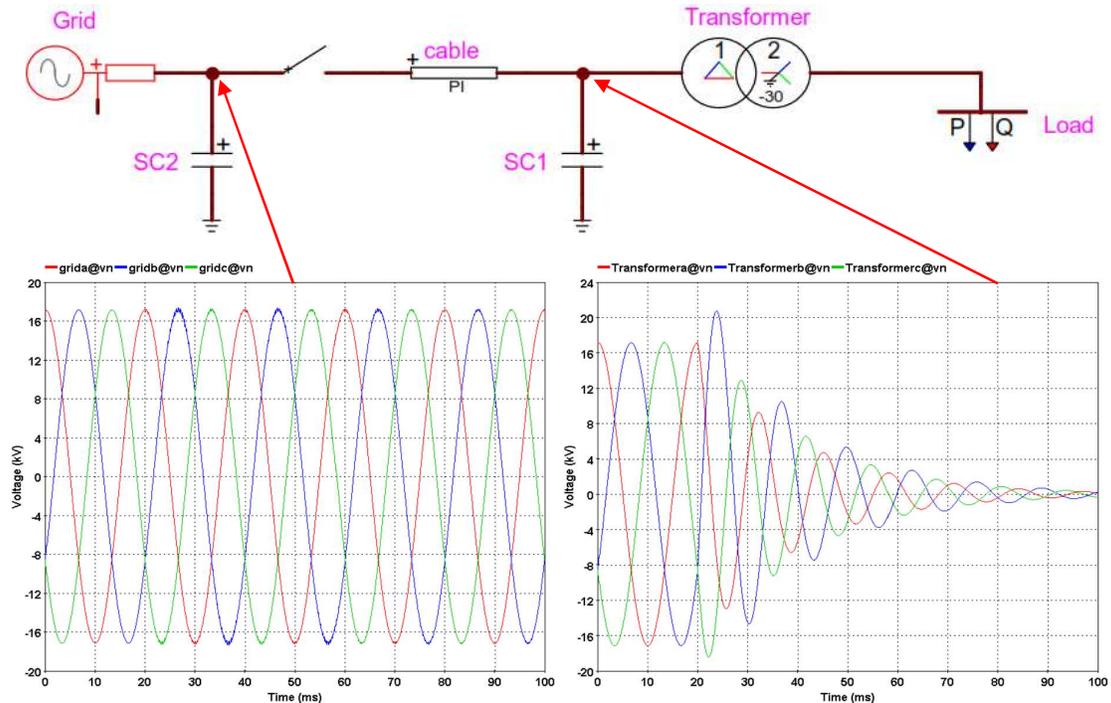


Figure 3 Case-3 @17.5 kV Grid Voltage

Types Available

Surge Capacitors are available as custom designs between 1 to 36 kV and 0.1 to 0.5 μF as single or three phase 50/60Hz systems. They are mainly supplied for industrial motor, transformer, reactor and generator protection applications. Single phase and three phase Surge Capacitors manufactured by HILKAR are custom built to meet your requirements. They are used to reduce the magnitude and frequency of transient voltages observed. For requests for lower or higher system voltages please contact factory.



Installation & Commissioning

Hilkar Surge Capacitors are suitable for (but not limited to) installation at the following connection points depending on the application:

- In the protected equipment's terminal box or associated switch panel, between each phase to ground.
- Connection to the equipment terminal box via a minimum of 3x25/16 mm² cable with the provided accessories.
- Surge Capacitors must be grounded to the motor/transformer ground or the breaker earth connection.
- When porcelain bushings are used, connections to the bushings must be through flexible connections so that any shock or vibration that may be transmitted to the bushing during transportation or in service, does not cause any damage.
- The fixing nuts shall not be tighter than 20 Nm.
- The flexible leads can be shortened but cannot be extended and must be directly connected to the protected equipment terminals.

Accessories

- Mounting brackets or clamps
- Connection cable and flexible leads (optional)