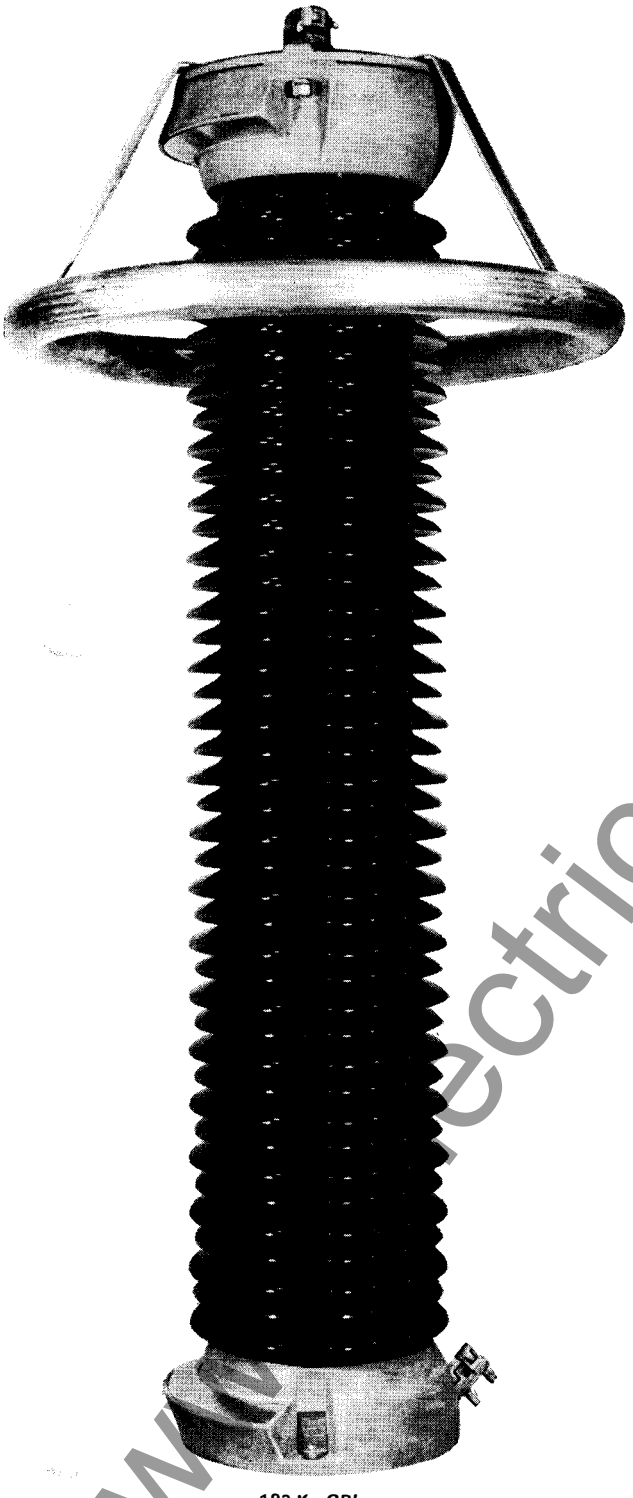
Westinghouse

Station Arrester
CPL
Controlled Protective Level

Indoor-Outdoor
Altitude 0-10,000 feet
60-312 KV



192 Kv CPL

CPL
Controlled Protective Level

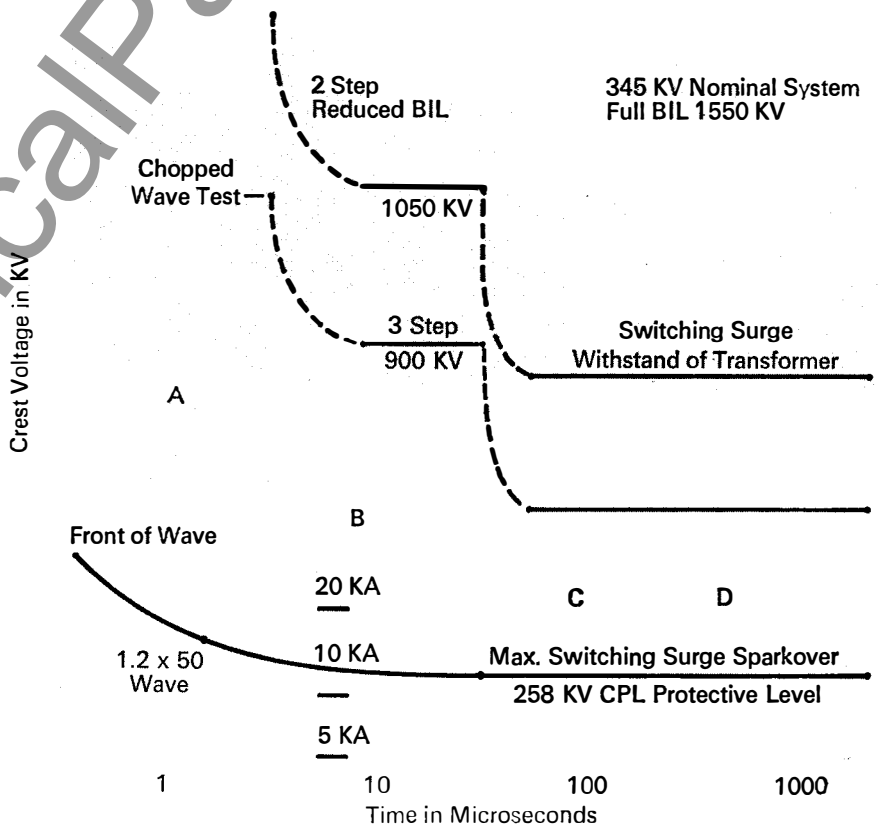
The new generation of Westinghouse CPL Station Valve Arresters have the lowest protective characteristics ever offered for standard ratings 60 kv through 312 kv. (See P.D. 38-136).

Total voltage control of all sparkover and discharge voltages guarantees Controlled Protective Levels to safeguard electrical insulation from lightning surge and switching surge transients while at the same time assuring that the switching surge discharge voltage does not exceed the switching surge sparkover voltage.

Controlled Protective Levels make significant savings possible by reductions in transformer basic impulse insulation levels up to 3 steps reduced for 161 kv, 230 kv, or 345 kv systems with an effectively shielded substation and low coefficient of groundings shown in Fig. 1.

Typical Voltage – Time Curve:

Figure 1



Protective Margins:

(A) Lightning Impulse Sparkover
(B) Lightning Impulse Discharge Voltage
(C) Switching Surge Sparkover
(D) Switching Surge Discharge Voltage

Reduced BIL with CPL Arrester

Insulation coordination consists primarily of the application of arresters to control surge voltages to a level below the equipment insulation withstand strength. When comparing transformer or other equipment BIL's with the arrester protective characteristics, the four areas or protective margins shown graphically in Fig. 1 should be examined.

The most critical area for higher voltage systems is in the switching surge range. The switching surge sparkover and the switching surge discharge voltage protective margins should be determined.

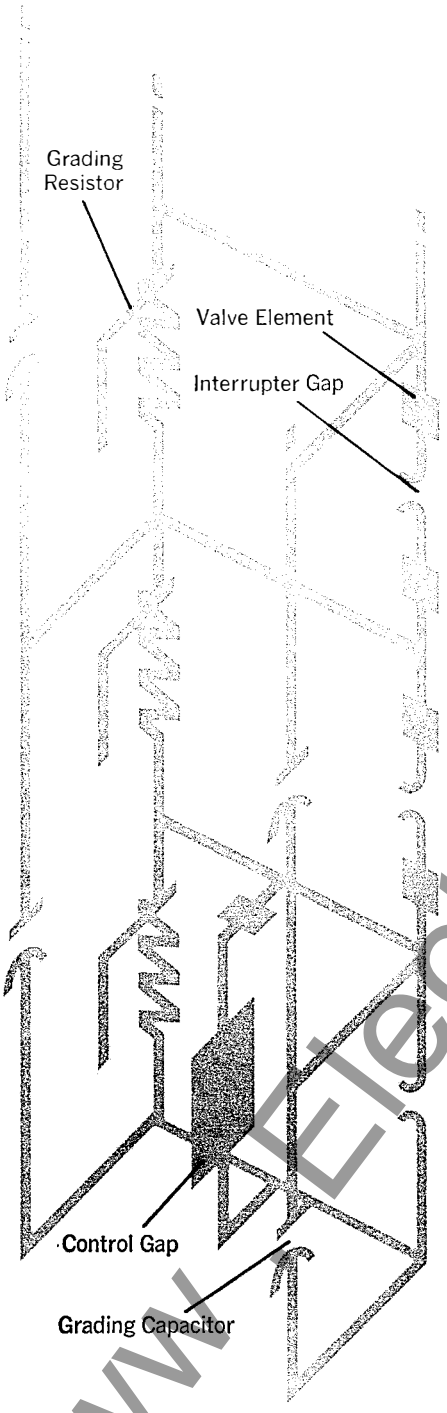
The CPL arrester is adaptable to critical insulation coordination applications since it has the industry's lowest published switching surge sparkover and discharge characteristics.

The CPL diverts switching surges harmlessly to ground while limiting switching surge sparkover and discharge voltages so that the protective ratio is greater than the minimum recommended protective ratio of 1.15.

May, 1972
New Information
E, D, C/1981/DB

Westinghouse

Matched Components for a Modern System



Exclusive Control Gap

The CPL arrester employs revolutionary parallel path gaps and separates the voltage sensing and current interruption functions of an arrester's gaps. This new technology results in a level of arrester sparkover and reliability formerly unattainable.

Present arresters have gaps which perform the dual role of voltage sensing and current interruption while the CPL uses separate control gaps and interrupter gaps. The control gap serves as the voltage sensing, measuring, and triggering device and is located out of the power interruption path. It is connected in parallel with an interrupter gap and is not involved in the energy dissipating and current extinguishing duty.

The interrupter gap serves as the energy dissipation and power follow current interruption device.

The control gap is the key element in controlling switching surge sparkover.

The exclusive parallel path circuitry of the CPL assures that the control gap will retain its precise sparkover characteristics.

The control gap is made with planar electrodes hermetically sealed to the ends of an alumina ceramic tube. The large electrodes produce a uniform electric field that is not polarity sensitive.

The electrode to ceramic hermetic seal assures a precision control gap for the life of the arrester.

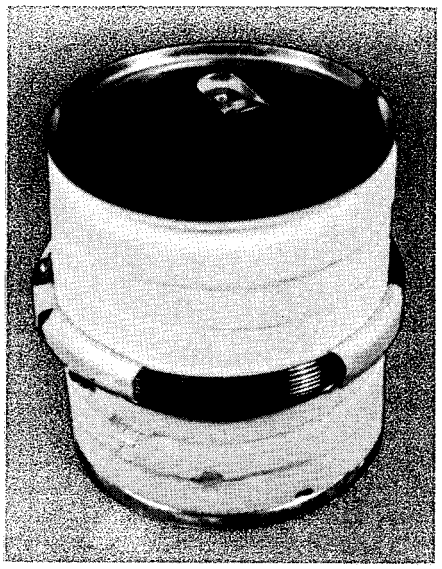
The control gap is placed inside a steatite protective tube and held firmly under spring compression.

Interrupter Gap

The current-limiting interrupter gap coordinates with the valve element to assure that total arrester voltage does not exceed the maximum switching surge sparkover voltage by producing a back voltage and thereby reducing the amount of energy that the arrester is required to absorb.

The interrupter gap assembly consists of permeable ceramic gap plates that cool and assist in the interruption of the arc which is extended between horn shaped copper electrodes.

The self-bonded magnetic drive coil stretches the arc between the ceramic gap plates, and interruption of the power follow current is accomplished within a fraction of a half cycle.



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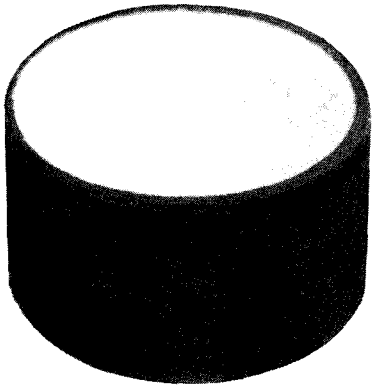
Matched Components for a Modern System

Valve Element

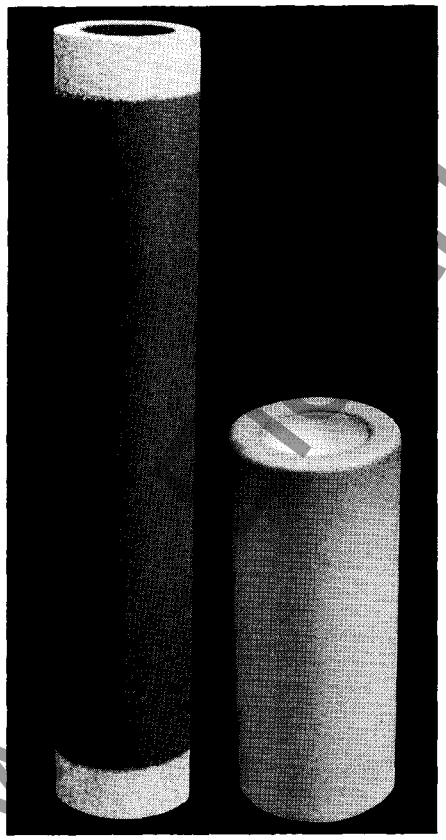
The non-linear resistance elements (blocks) are made of high quality silicon carbide which is a semi-conductor exhibiting a non-linear voltage current relationship. The resistance elements are ceramic bonded with special composition to obtain low valve element voltages and high thermal capability.



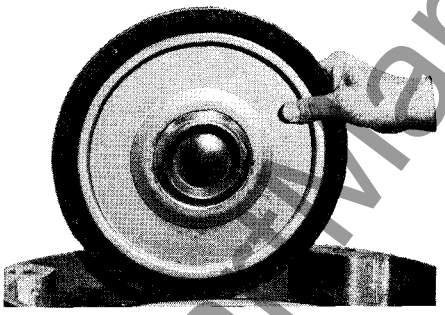
Grading Components

The voltage distribution of the CPL is precisely controlled by the frequency responsive and voltage responsive grading elements.

The non-linear grading resistors are made of high quality silicon carbide and the grading capacitors are solid ceramic body fixed capacitors.



Double Sealing System



The CPL arrester is the only station arrester with double sealing: a primary sealing gasket and the backup protection of a weather seal gasket.

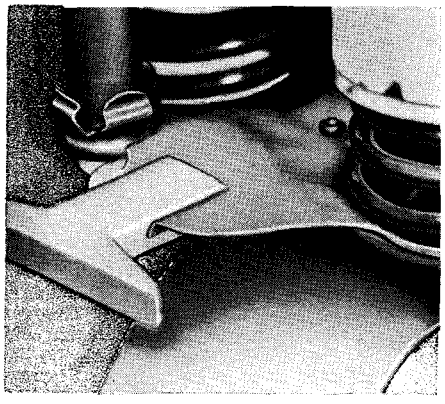
The end plates are sealed to the arrester porcelain with a neoprene gasket confined in restraining channels and held under pressure to maintain the effectiveness of the seal.

To protect the primary sealing gasket from effects of the environment a weather seal of asbestos neoprene is used. This seal is actually the front line defense against potentially damaging effects of the atmosphere on the arrester's primary sealing gasket.

All gaskets and mating areas are coated with a special cement to bond the sealing surfaces.

Rugged Spring Suspension

The leaf and coil spring suspension absorbs shocks and vibration caused by shipping and handling. Bumpers positioned around the module absorb shock from side thrust.



Quality Assurance Programs

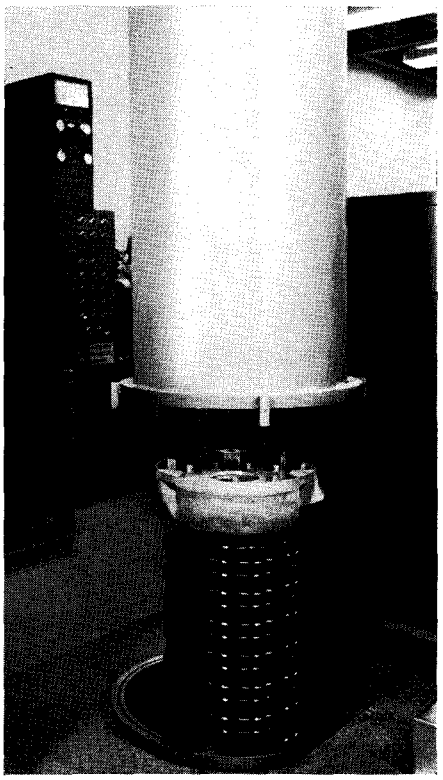
Seal Tests

The CPL sealing system is stressed and leak tested after the arrester is completely sealed and ready for shipment.

Each arrester unit is evacuated and back filled with dry nitrogen and trace quantities of helium. The filling tube is then pinched off (cold weld) completing the sealing of the arrester unit.

The arrester unit is then placed in a vacuum chamber which is evacuated through lines to sensitive helium detection equipment capable of recording a leak rate as small as 5×10^{-12} atmosphere-cc/second.

The leak detection system tests the complete arrester – end plates, seals, castings, and porcelain unlike all other testing methods that require the sealing hole to be plugged after the seal test is completed. The CPL is completely sealed prior to seal test – not afterwards – and assures a leak free arrester.



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Quality Assurance Programs

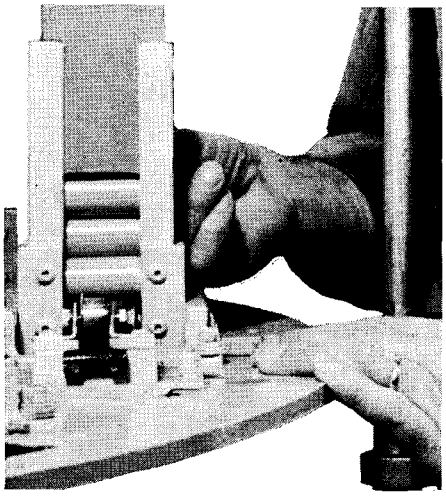
Valve Element Testing

All valve elements are tested seven times:

- Two positive and two negative polarity surges at 25,000 amperes.
- Discharge voltage test application of 10,000 ampere surge.
- Two thermal duty tests with rectangular wave of high current and long duration.

Grading Components Testing

High accuracy equipment automatically tests each ceramic capacitor and non-linear resistor. The tests are made in a controlled atmosphere room.



Pressure Relief Test

CPL arresters were successfully tested in accordance with the pressure relief test requirements, Section 1-7.7, USAS C62.1, 1967.

CPL arresters have the highest published "safe fault current" pressure relief values as shown in the table below.

High Current Test

Arrester Rating	USAS 1-7.7	Type CPL
60-192 kv	62,000 amperes rms asym	69,200 amperes rms asym
240-294 kv	40,000 amperes rms asym	69,200 amperes rms asym
300-312 kv	Not Listed	69,200 amperes rms asym

All CPL arresters have exhaust ports that provide directional venting in the remote event of a pressure relief operation. Directing the hot ionized gases away from the protected equipment minimizes the possibility of flashover of close by arresters, bushings, or bus supports.

Interrupter Gap Tests

Each gap is placed in a test cell which is evacuated and then filled with dry nitrogen. The gap must then successfully pass three electrical performance tests:

- Overvoltage withstand test
- Radio influence test
- Repetitive sparkover tests

Control Gap Testing

Each control gap is subjected to ten sparkover applications of a ramp voltage and then categorized for use with other arrester components.

Each control gap is energized above rating and given a radio influence voltage test.

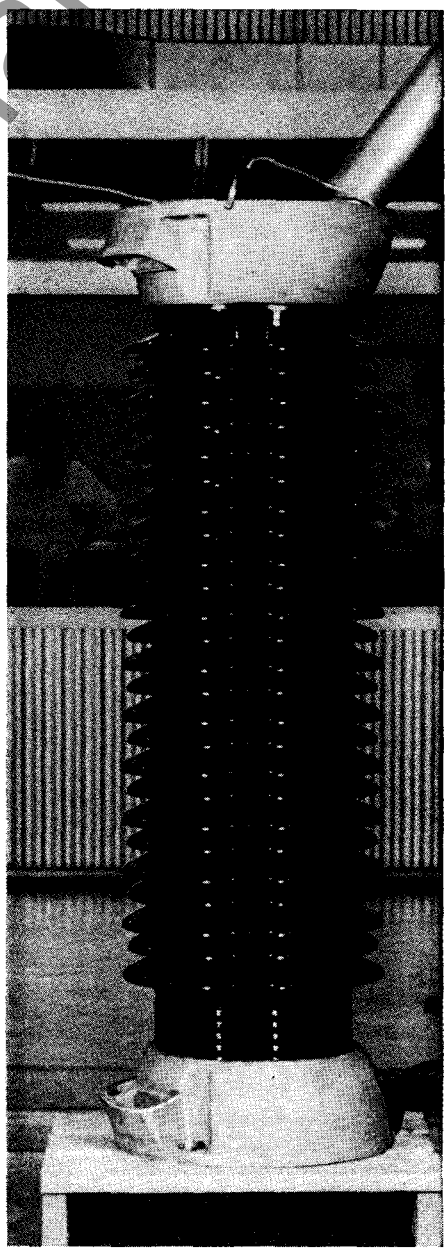
Further Information:

Price List 38-130
Dimension Sheet 38-132
Design Test Report File 38-134
Performance Data 38-136
Instruction Leaflet 38-131-1A
Blitzwatcher™ Monitoring Device PL 38-160 and DB 38-160

Performance Testing

To verify that CPL arresters provide low and consistent protective characteristics, each unit is tested for:

- Radio influence voltage.
- Grading current at 60 Hz rated voltage.
- 60 Hz sparkover.
- Switching surge sparkover.



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