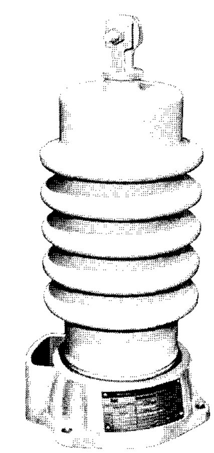
Westinghouse Electric Corporation
Distribution Apparatus Division
Bloomington, Indiana 47401

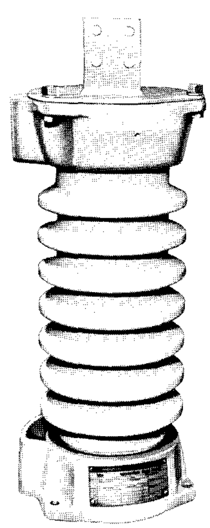
December, 1975
New Information and Supersedes
DB 38-221, pages 1-8, dated March 1970
E, D, C/1981/DB

Indoor-Outdoor
Altitude 0-10,000 Feet
3-120KV

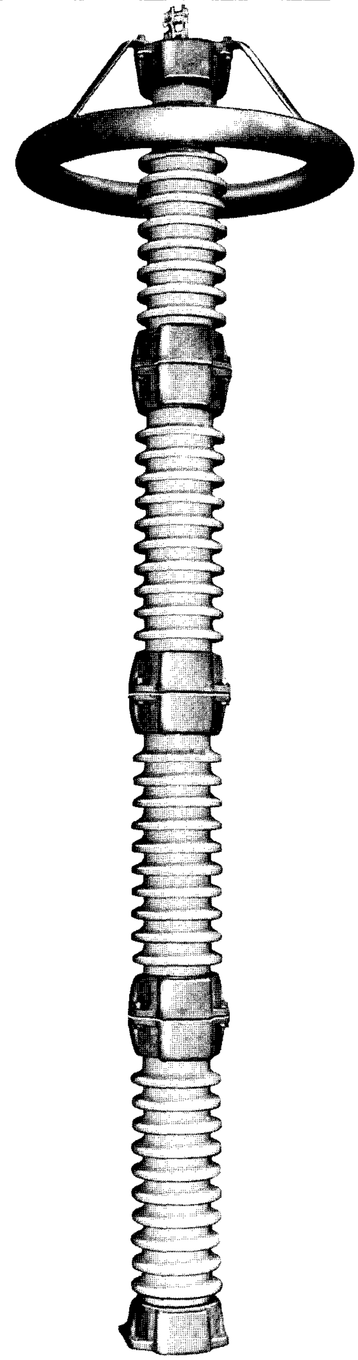
Intermediate Arrester Type IVL



IVL Porcelain Top 3—30KV



IVL Metal Top—18KV



IVL Metal Top—120KV

IVL Means Protection

A surge arrester is designed as a protective device. Its primary purpose is to protect the system insulation from damaging over-voltage surges.

The secondary protective function of the arrester is to protect itself from the surge currents it must discharge. The quality components and design of the IVL Intermediate Class allow it to perform both of these functions.

Matched Components Protect a Modern System

Due to matched components and expert design, the new generation of Westinghouse IVL Intermediate Class Arresters have low protective characteristics for standard ratings —3KV through 120KV. Voltage control of all sparkover and discharge voltages guarantee protective levels to safeguard electrical insulation from lightning surge transients.

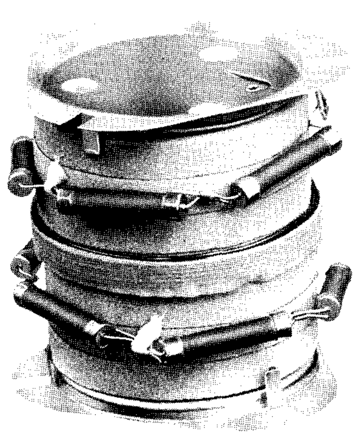
The major matched components of the IVL Intermediate Arrester are:

- Interrupter gap
- Grading resistors
- Valve elements

Interrupter Gap Assemblies

The IVL Intermediate Class Arrester utilizes current limiting interrupter gaps which perform the dual role of voltage sensing and current interruption. The current limiting interrupter gap coordinates with the valve element to assure that total arrester voltage does not exceed arrester protective levels even when producing back voltage to reduce 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 interrupter gap assembly also includes ceramic slab preionizers to insure consistent sparkover levels. The self-bonded magnetic drive coil stretches the arc between the ceramic gap plates, and the interruption of the power follow current is accomplished within a fraction of a half cycle. The interrupter gap assembly includes grading resistors as well as the gap sections and a magnetic blowout coil.



Interrupter Gap Assembly

Grading Resistor

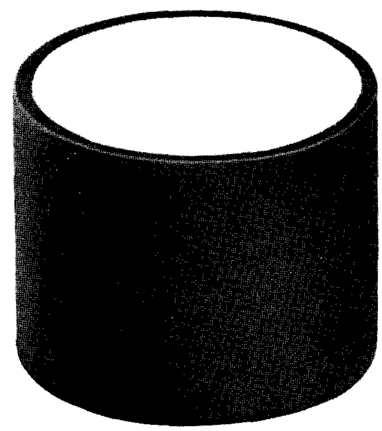
Grading Resistors

The voltage distribution of the IVL arrester is precisely controlled by the voltage responsive grading resistors.

The non-linear grading resistors are made of high quality silicon carbide and are assembled as part of the interrupter gap assembly.

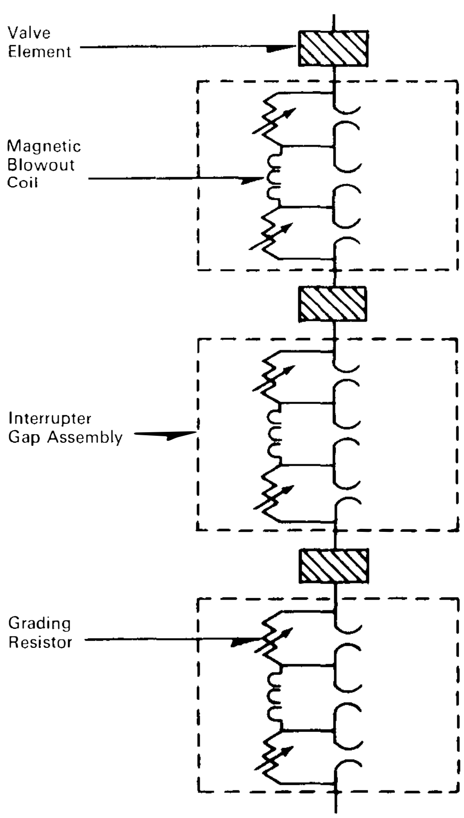
Valve Elements

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 discharge voltages and high thermal capability.



Valve Element

The Total Picture



Schematic Low Voltage CPL

Critically-Tested Construction Protects the IVL Arrester

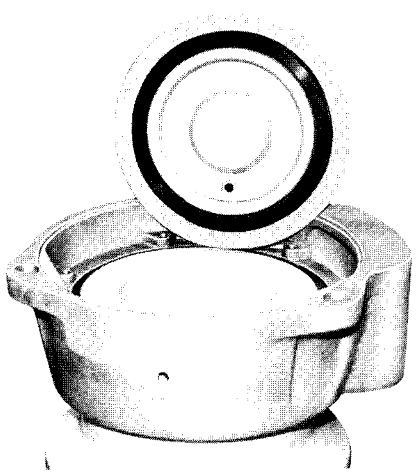
Special attention is given to the following major construction components of the IVL Intermediate Arrester:

- Sealing system
- Internal suspension system
- Porcelain housing
- Fault withstand capability

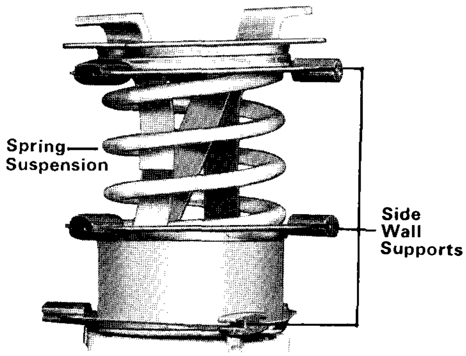
Sealing System

The IVL Arrester is the only intermediate 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.



Sealing System



Internal Suspension System

The IVL Arrester uses a coil spring suspension on the vertical axis of the arrester internal assembly to absorb shocks and vibrations caused by shipping and handling. The internal arrester structure is protected from side thrust by side wall supports positioned between every block and gap assembly to absorb shocks.

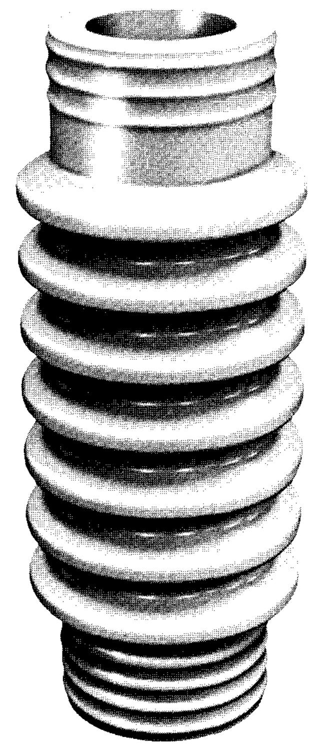
Pressure Relief Capabilities

IVL Arresters have been successfully tested in accordance with the pressure relief test requirements of ANSI C62.1. IVL's have published "safe fault current" pressure relief capabilities in excess of standards as shown below.

Arrester Rating① (KV)	ANSI C62.1—Class III High Current Test (RMS Symmetrical Amperes)	IVL Rating (RMS Symmetrical Amperes)
3-120	16,100	25,000

① Pressure relief ratings for porcelain top arresters are not standardized.

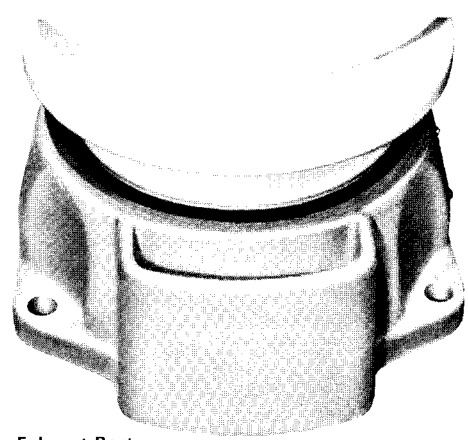
IVL Arresters have exhaust ports that provide directional venting in the remote event of a pressure relief operation. Directing the hot ionized gases away from the protected equipment minimizes the possibility of flashover.



Typical Porcelain

High Strength Wet Process Porcelain

All IVL Arresters are constructed using high strength wet process porcelain with a cantilever strength of 5,000 ft. lbs. The porcelain of the IVL Arrester passes all insulation withstand tests per ANSI C62.1. The coordination of the porcelain height and high standard creep distance with the internal grading scheme of the arrester provides excellent contamination resistance.



Exhaust Port

Built-in Quality Verified Through Production Testing

IVL Arresters are tested at various stages of manufacturing to insure that the final product offers protection for the modern system.

Seal Tests

The IVL 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. As gas is evacuated, it is passed through lines to sensitive helium detection equipment capable of recording a leak rate as small as 2×10^{-7} 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 fill hole to be plugged after the seal test is completed. The IVL is completely sealed prior to seal test—not afterwards.

Valve Element Testing

Valve elements are seasoned then tested for discharge voltage and thermal capability.

Grading Component Testing

High accuracy equipment is used to test each non-linear resistor. The tests are made in a controlled atmosphere environment.

Interrupter Gap Tests

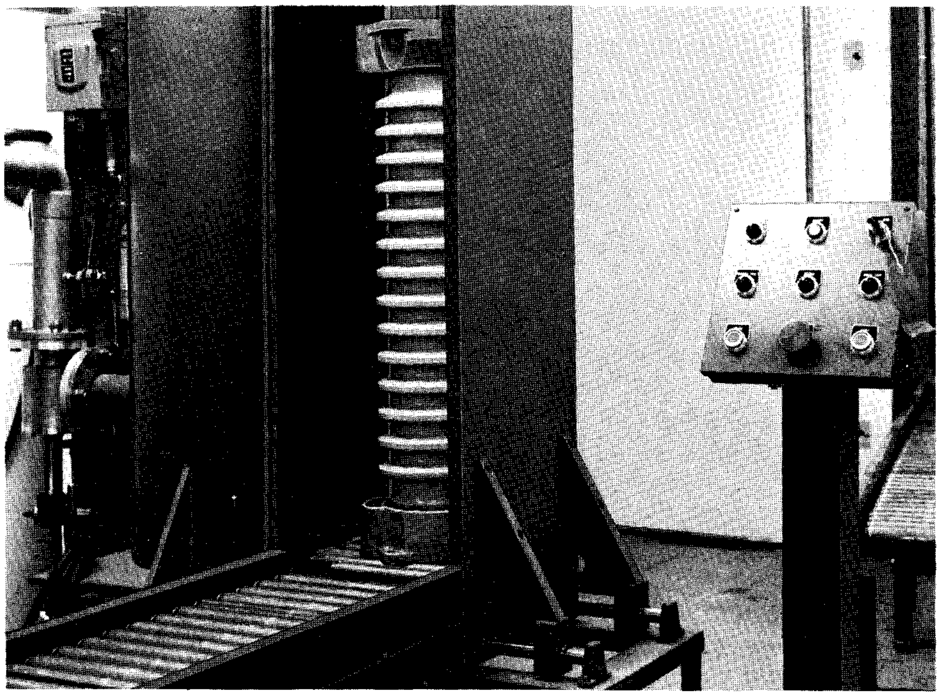
Each gap is placed in a test cell which is evacuated and then filled with arrester atmosphere. The gap must then successfully pass three electrical performance tests:

- 60 Hz
- Radio influence test
- Repetitive sparkover tests

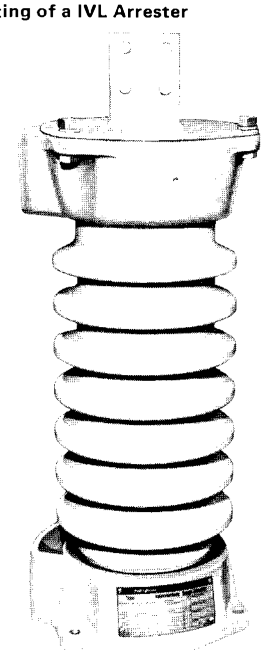
Performance Testing

To verify that IVL Arresters provide low and consistent protective characteristics, each unit is tested for the following electrical values:

- Radio influence voltage
- Grading current at 60 Hz rated voltage
- 60 Hz sparkover



Seal Testing of a IVL Arrester



Further Information

38-210 P WE A
38-212 F WE A
38-216 T WE A

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