Westinghouse

Surge Arresters

Distribution Class, Type LV

0 to 10,000 Feet Altitude
Indoor or Outdoor, Single Pole
3 to 18 Kv

Design Features:

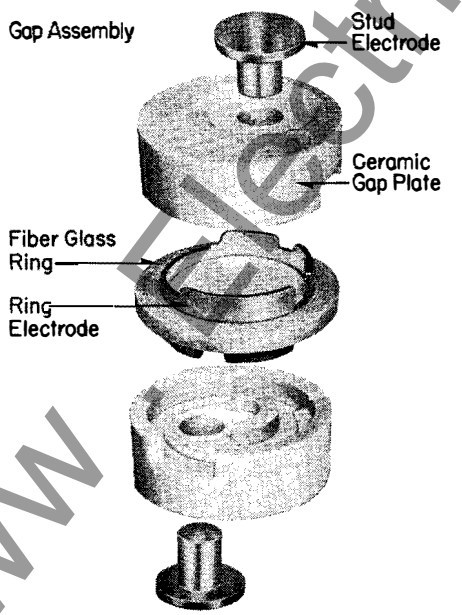
To protect distribution systems from lightning, a valve type arrester depends on a balanced design between gap and valve block.

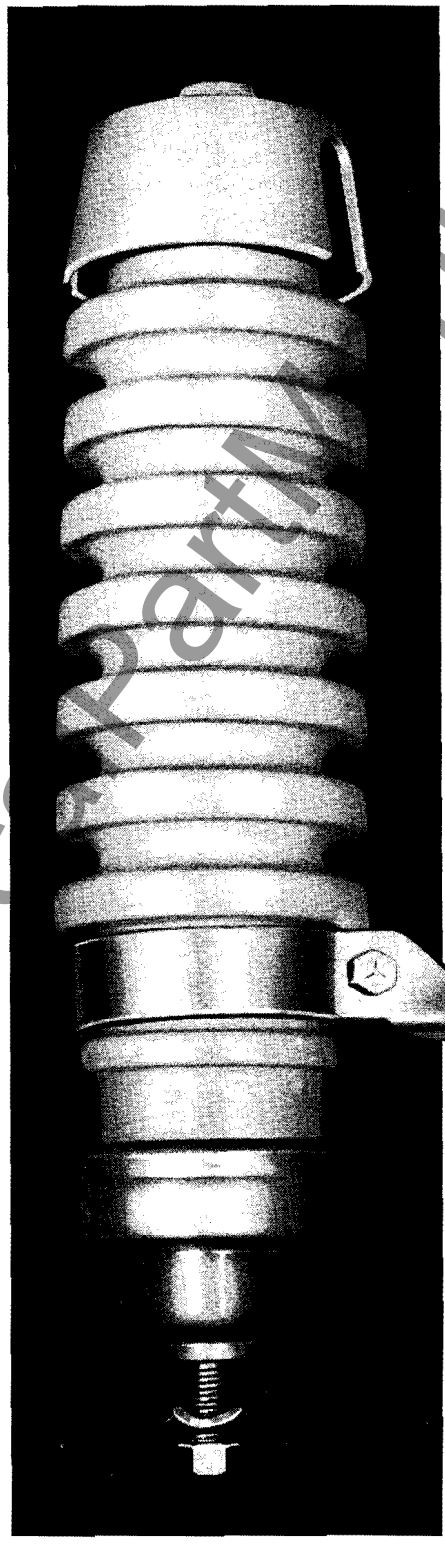
The gap limits the voltage on the system to its sparkover value. Once the gap sparks over, the blocks must take over the job of limiting the "discharge voltage" that the system sees, and limiting the flow of power-follow current to a value that the gap can interrupt.

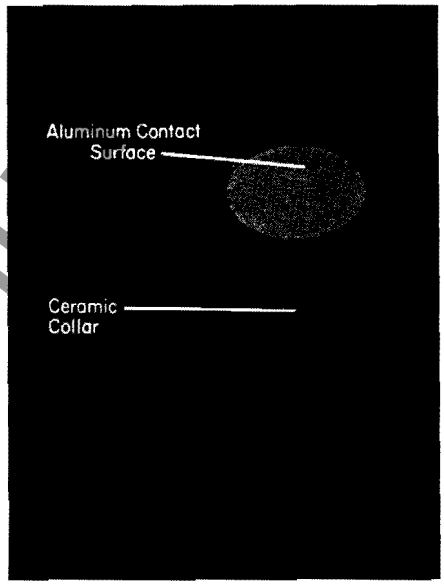
Gap Operation

The Westinghouse LV arrester uses a unique self-driving gap consisting of a series of brass electrodes separated by ceramic plates. When the gap sparks over, the "current loop" formed by the flow of power-follow current provides a magnetic flux build-up within the loop that forces the arc from the point of initial sparkover.

The arc is stretched over the cool ceramic gap plates, enabling the arrester to more easily reseal against system voltage after passing power follow current. In addition, movement of the arc prevents electrode pitting and burning that would normally result in radio noise, erratic sparkover characteristics, and reduced arrester life.







Autovalve® Block

The valve blocks, made of ceramic bonded silicon carbide, display the peculiar characteristic of posing a very low resistance to lightning surges, but offering a very high resistance to 60 Hertz system voltage.

Silicon carbide crystals are mixed with a ceramic binder and molded under tons of pressure into cylindrical blocks. Each block has a ceramic collar, to protect against external flashover, and is fired in high temperature kilns.

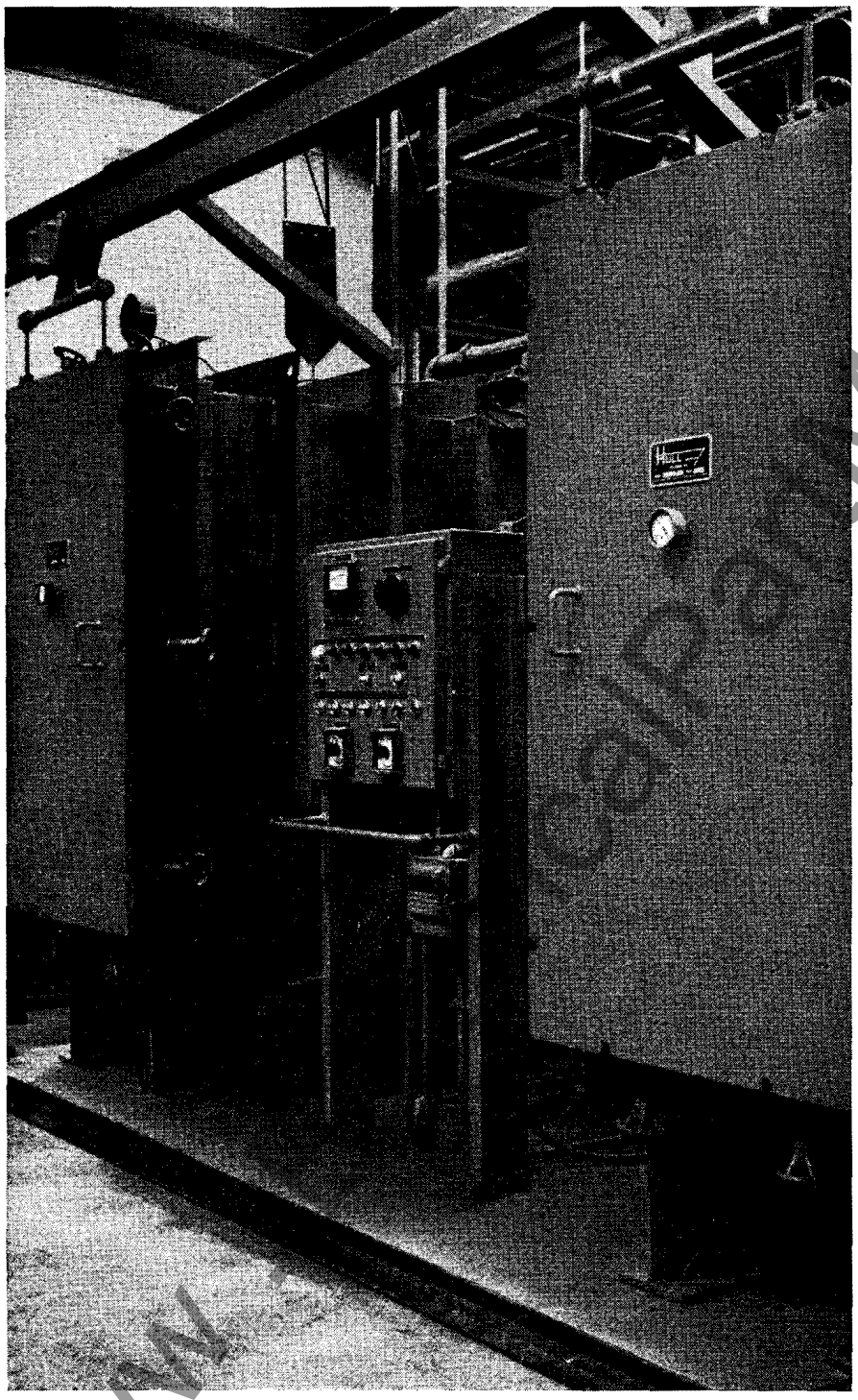
After firing, the ends of the cylindrical blocks are sprayed with molten aluminum to assure good electrical contact.

Neoprene Gasket Seals

Both ends of the LV arrester are sealed with neoprene rubber rings designed to effectively and permanently seal the arrester against the entrance of moisture, the single largest cause of arrester failure. These neoprene seals are of the highest quality material and have been used successfully for years on high voltage circuit breakers and station arresters. Through extensive studies of sealing techniques, Westinghouse has found that controlled compression insures a uniform high quality seal at time of manufacture.

February 25, 1975
Supersedes Descriptive Bulletin 38-321, pages 1-4, dated November, 1972
E, D, C/1982/DB

Westinghouse



Insulating Gas Seal Test Equipment

Why So Much Concern About Seals?

An arrester is a protective device . . . it must protect distribution systems from lightning, and it must do it consistently.

The protective characteristics of the arrester cannot be maintained if moisture is allowed to enter. The arrester will fail . . . but more important, the system will be unprotected.

A permanent seal is a *must!*

Testing The Seal

The seal is the most important part of any distribution arrester. If moisture laden air is allowed to enter the arrester through a defective seal, deterioration of the internal components will result in arrester failure.

It is essential that the integrity of *every* seal be assured. Westinghouse has developed a unique insulating gas seal test to provide this assurance.

The photograph shows the production test equipment used to test every distribution arrester.

The completely sealed arresters are placed in test chambers. The chambers are sealed and evacuated to a pressure of less than 1 mm of Mercury. The arresters are held under vacuum for a specified period and then the chambers are backfilled to a positive pressure with insulating gas. After the required "soaking" time, the arresters are removed and tested for 60 Hertz sparkover voltage.

What Does The Test Mean?

If an arrester is defectively sealed, the air inside the unit is evacuated during the vacuum cycle and replaced with insulating gas during the positive pressure cycle. A *substantial* increase in 60 Hertz sparkover voltage provides a positive identification of a "leaker."

The result: every arrester is tested to assure 100% reliability of the seal.

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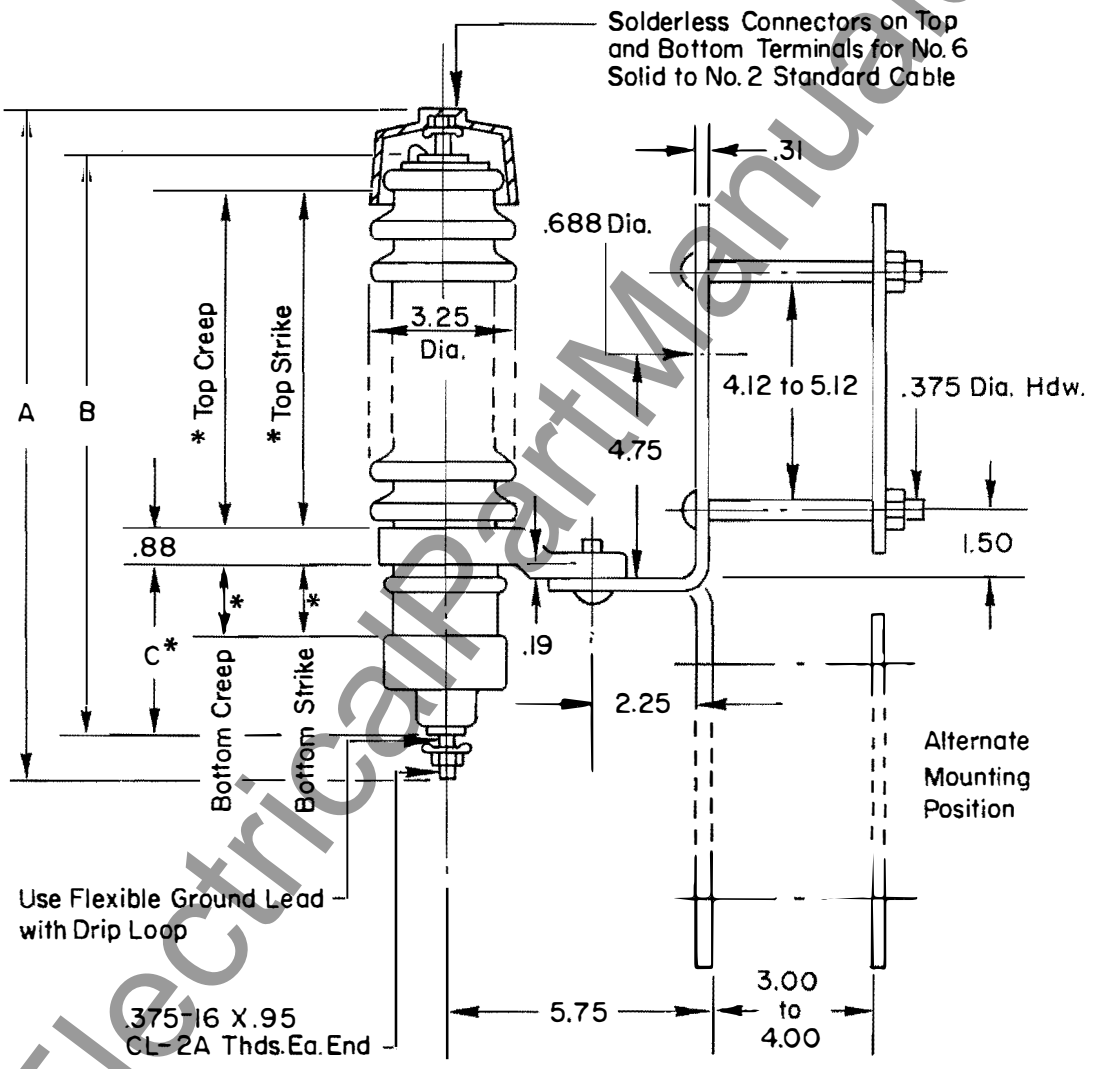

* Creep, Strike and "C" Dimensions are Measured with Mtg. Clamp in Upper Position.

* Use the Alternate Mounting Position for Application of 6000 to 12000 Feet for all Ratings Except 3 KV and 6 KV. Refer to Westinghouse for Information on These Two Ratings.

Style Number	KV Rating	Dimensions (Nominal) A	B	C	Top Creep	Top Strike	Bottom Creep	Bottom Strike
634A100A03	3	9.08	7.03	3.32	3.38	2.06	1.27	1.16
634A100A06	6	11.42	9.37	3.64	6.72	4.00	1.57	1.48
634A100A09	9	14.16	12.11	3.20	11.86	7.05	1.22	1.04
634A100A10	10	14.16	12.11	3.20	11.86	7.05	1.22	1.04
634A100A12	12	17.92	15.87	4.33	16.46	10.10	2.75	2.17
634A100A15	15	19.04	17.99	6.65	16.47	9.81	5.34	4.49
634A100A18	18	23.04	20.99	7.74	19.72	12.19	6.38	5.58

Surge Arresters

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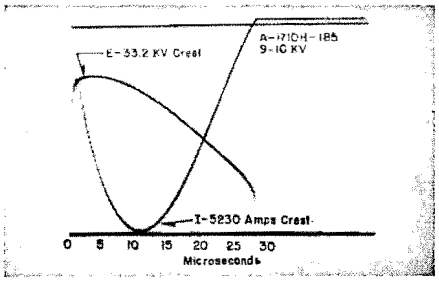
Performance Specifications①

The following oscillograms and test results verify that LV lightning arresters conform to all applicable American standards as described in ANSI Standard C62.1-1972 and NEMA publication No. LA1-1968.

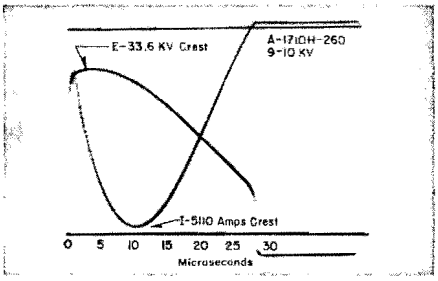
① All values apply to both the positive and negative polarity surges.

Typical Duty Cycle 10 Kv Arrester

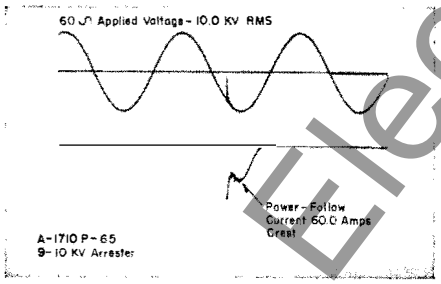
Discharge voltage using 5,000 ampere surge.



Before Duty Cycle



After Duty Cycle (20 Shots)

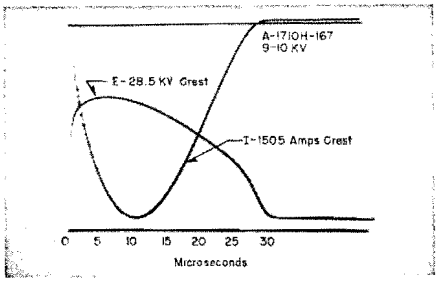


Typical Operating Cycle Using 5,000 Ampere Surge

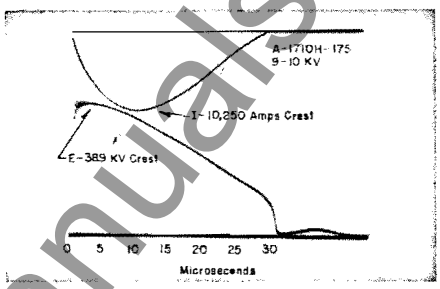
Further Information

Prices: PL 46-520

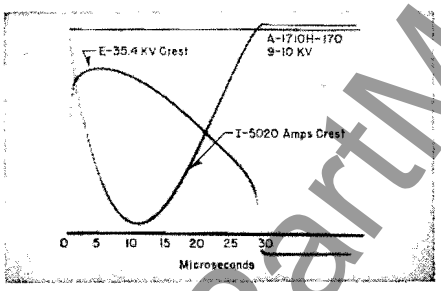
Typical Discharge Voltage Oscillograms 10 Kv Arrester



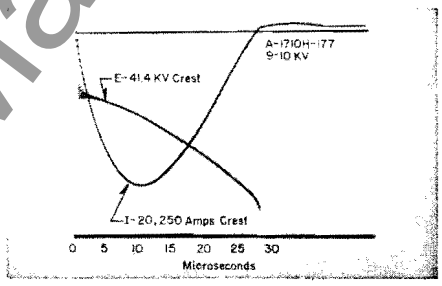
1500 Amperes



10,000 Amperes



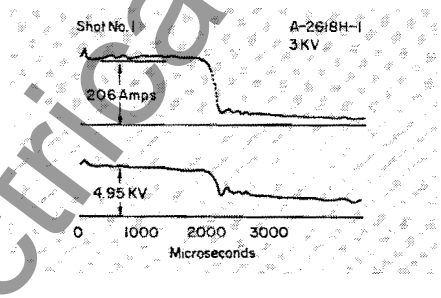
5000 Amperes

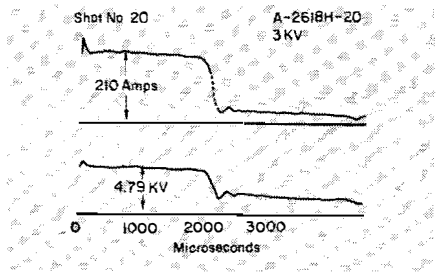


20,000 Amperes

Typical Low Current, Long Duration Surges 3 Kv Arrester

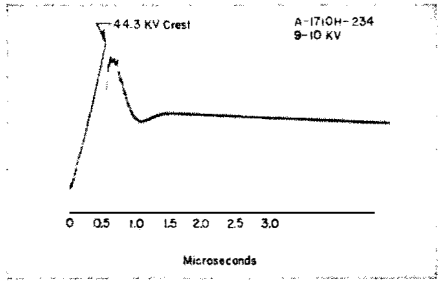
Total time required for test: 20 minutes.





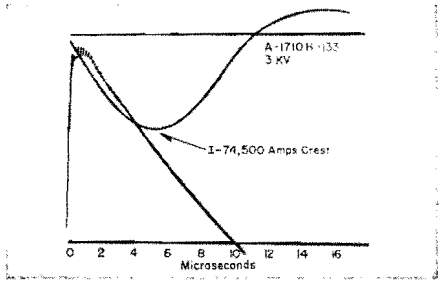
Typical Impulse Sparkover, Front of Wave 10 Kv Arrester

Rate of rise of test voltage: 100 kv per microsecond for each 12 kv of arrester rating.



Discharging Two High Current Surges 3 Kv Arrester

Sixty cycle sparkover before and after two high current surges was 8,000 volts.

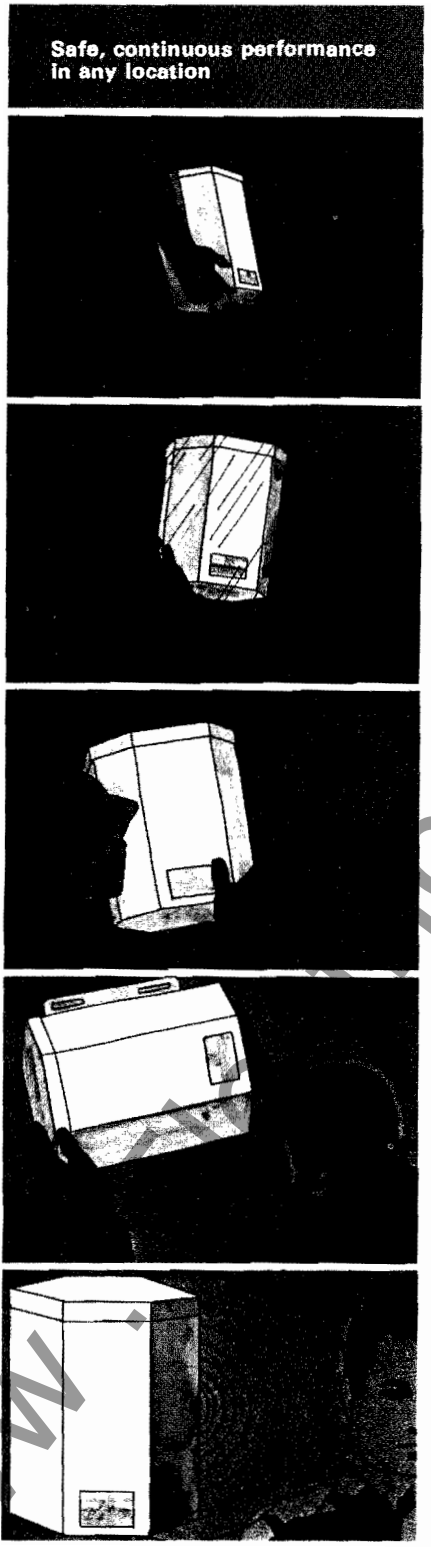


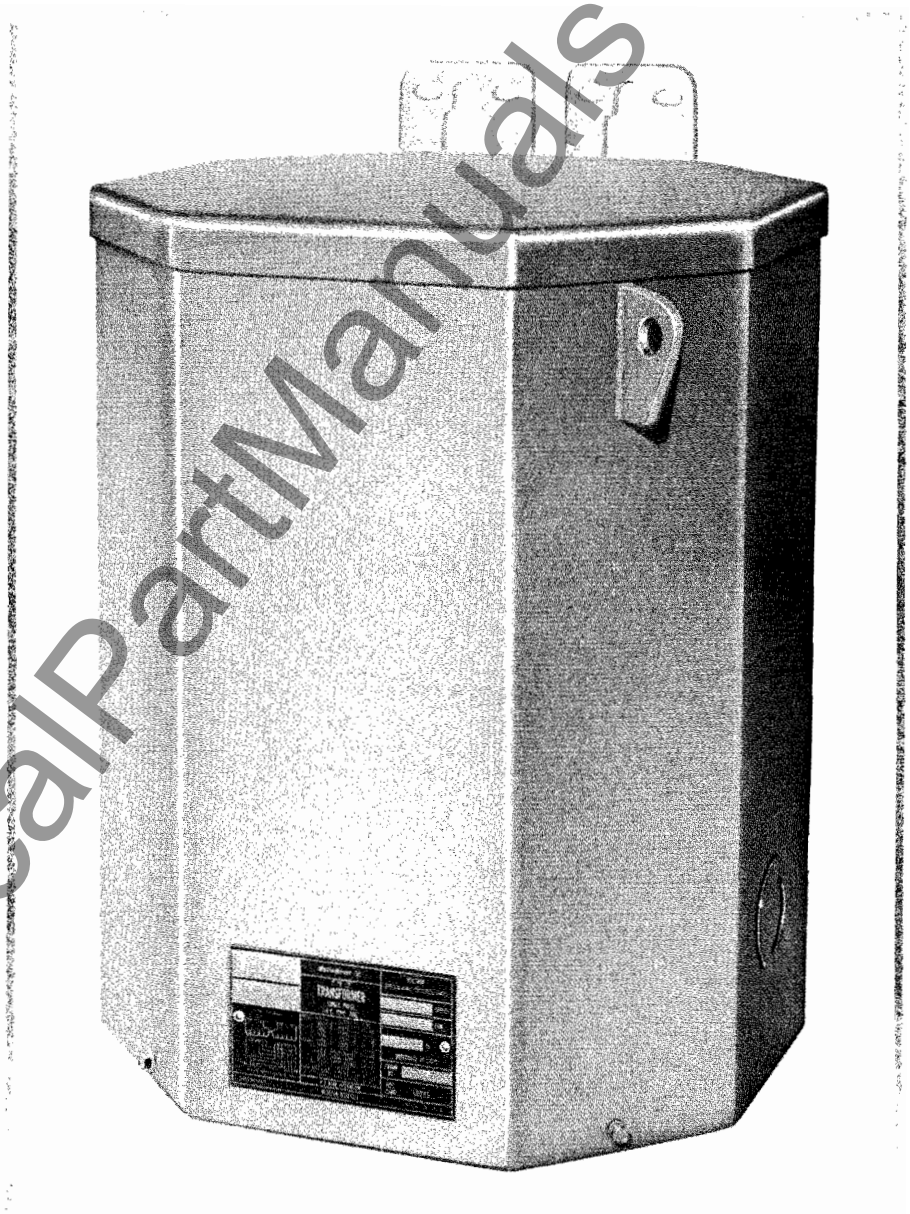
Westinghouse Electric Corporation
Distribution Transformer Division: Athens, Georgia 30601 USA
Printed in USA

Westinghouse

Specialty Dry Type Distribution Transformers

"Green Line" Types EP and EPT
5000 Volts and Below





Advantages

Safer – Fire resistant and completely free from toxic fumes – safe for personnel and equipment.

Indestructible – Core and coil embedded in epoxy-potted compound, impregnable to dust, moisture and corrosive fumes – ideal for rugged applications

Mounting Flexibility – Radiation cooled, permits mounting underground, sideways, upside-down and exposed to weather – mount anywhere, in any position

Smaller Size – 40% smaller in cubic volume than other dry type designs – install in any location

Quieter – Sound levels below ANSI standard – perfect for hospitals, schools, apartments or any location involving people

Kva	Sound Level in DB	
	Westinghouse	NEMA-ASA
0-9	36	40
10-50	40	45

April, 1971
Supersedes DB 46-850, pages 1-8, dated May, 1967
E. D. C/2071/DB

Westinghouse

Application

Westinghouse Types EP and EPT "Green Line" Transformers are totally enclosed dry type transformers ideal for use in high rise apartments, industrial plants, hospitals, office buildings, shopping centers, schools, and other locations involving crowds of people or hazardous atmospheres where safety and uninterrupted performance are essential.

Applications include: Indoor or outdoor lighting, heating, ranges, air conditioners, exhaust fans, control circuits, appliances; Switchgear and motor starters; isolating circuitry in hospitals; sewage treatment and waterworks facilities; mining and shipboard systems; machinery drag lines and power shovels.

UL Specifications

These "Green Line" transformers meet all Underwriters' Laboratories, Inc. specifications where applicable and are labelled.

Construction Features

Embedding Compound

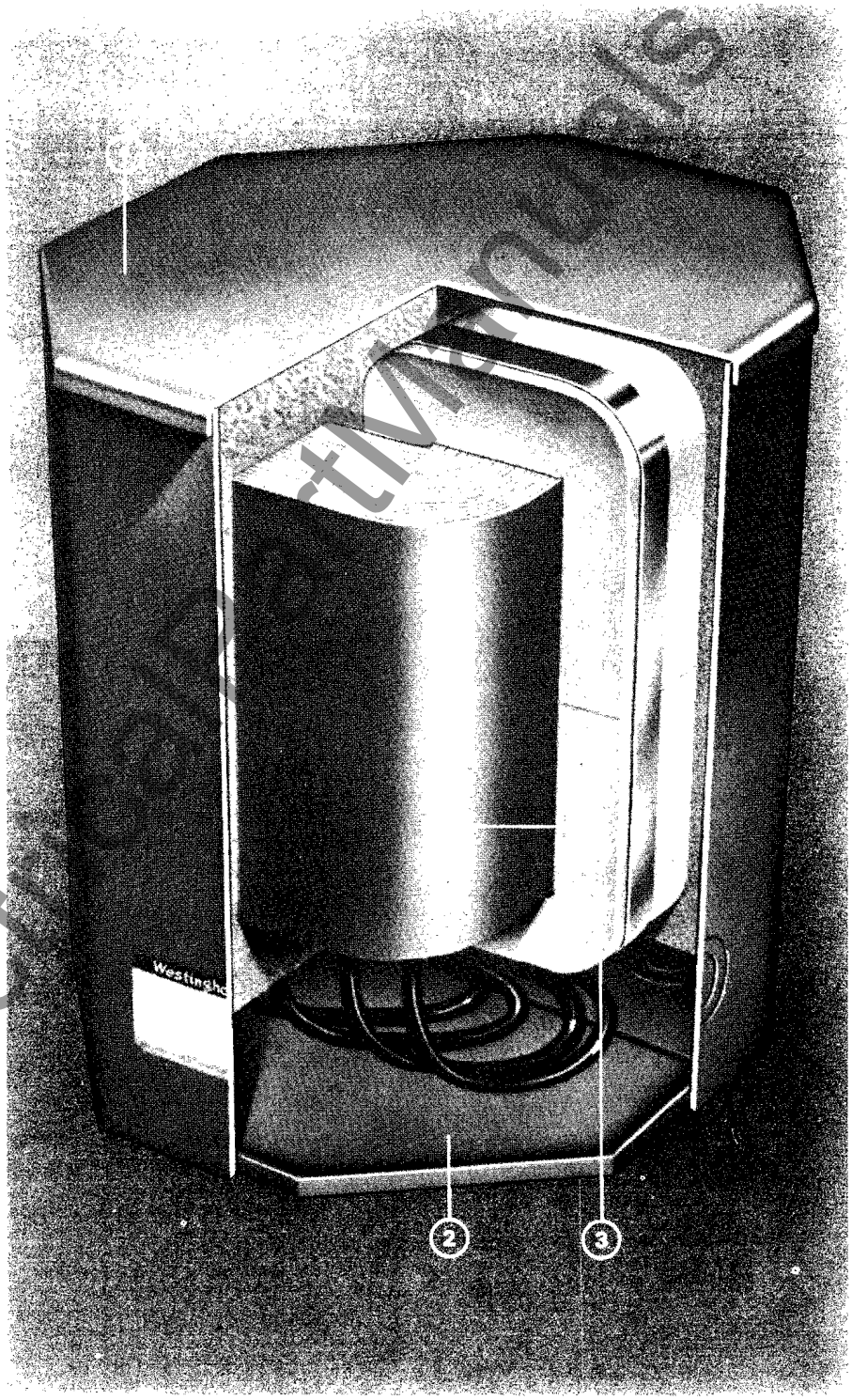
Westinghouse Rezildur embedding technique provides a rock-hard, durable, airtight, shock-free seal, and facilitates rapid transfer of heat from core and coil to the radiating surface, minimizing size and weight of unit.

Steel Case

Sturdy steel case adds to structural strength of embedded construction for use in rugged applications.

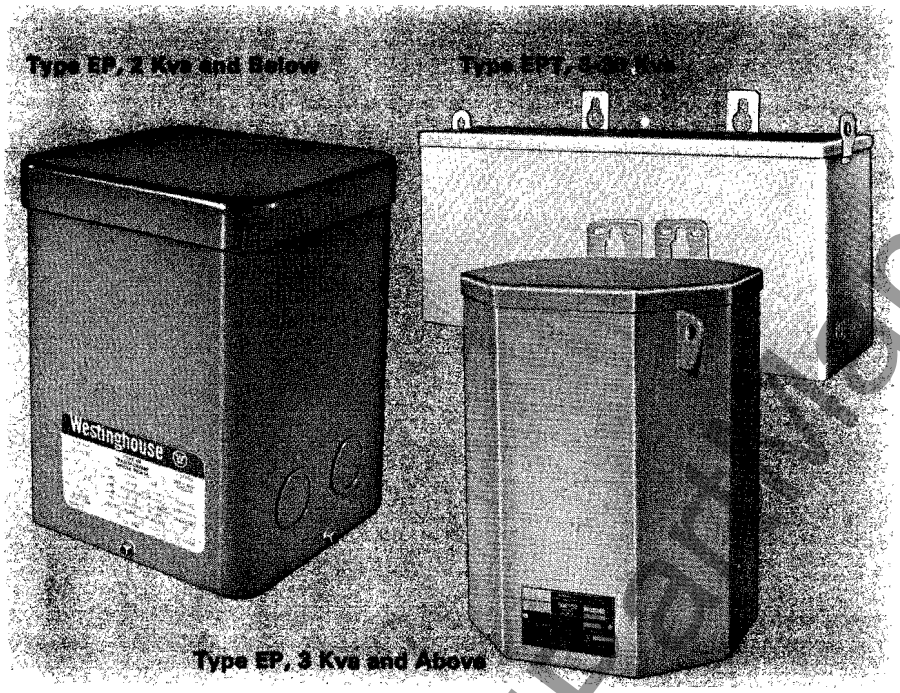
Core and Coil Assembly

Low current loss core and coil configuration with proper iron to copper ratios produces good regulation and high efficiency. Hypersil type C cores are used for their magnetic qualities.



Specialty Dry Type Distribution Transformers

"Green Line" Types EP and EPT
5000 Volts and Below



Models Available

Single Phase

Type EP, 2 Kva and below, 600 volts and below, 60 Hz, indoor or outdoor, totally enclosed, non-ventilated.

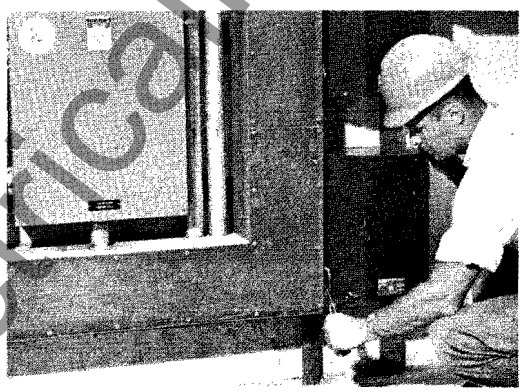
Type EP, 3 Kva and above, 600 volts and below, 60 Hz, indoor or outdoor, totally enclosed, non-ventilated.

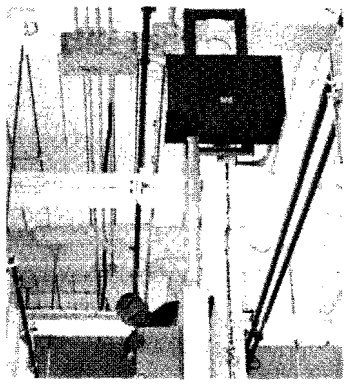
Three Phase

Type EPT, 3-30 Kva, 600 volts and below, 60 Hz, indoor or outdoor, totally enclosed, non-ventilated.

Single and Three Phase

Types EP and EPT, 2400 and 4160 volt primaries, 3-30 Kva.





Typical Installations

Montefiore Hospital, Pittsburgh, Pa.
Twenty Westinghouse EP and EPT Transformers feed power to 10 operating rooms, and to X-ray and therapy rooms. Prime requirements are safety and quiet operation. The installation is maintenance free. All the transformers were mounted on a 12 x 12 ft. wall and project only 12 in. from surface.

Sinclair-Koppers Co. Kobuta Plant
Monaca, Pa.
Westinghouse EP Green Line Transformers, installed in limited space in motor control room, furnish power for lighting in a plant that handles some explosive raw materials.

Bal Harbour Shopping Center
Miami Beach, Fla.
Installed in vaults under lighting standards, Westinghouse Type EP Transformers must resist salt water during flooding conditions, corrosive atmosphere, dirt, insects and must be maintenance free for economical operation.

Reeves Bros., Inc., Chesnee, S. C.
Westinghouse Type EPT Transformers used in this textile plant are subject to intense humidity and dust. Conventional transformers could neither handle these difficult conditions, nor meet the safety standards which are critical because of fire hazard created by floating wisps of cotton.

Specialty Dry Type Distribution Transformers

"Green" Line Types EP and EPT
5000 Volts and Below

Specification Guide for Dry Type Transformers

The following specification information should be used as a guide when negotiating or preparing specifications for procurement.

Manufacturers Standards

Transformers must be built in accordance with the latest revision of ASA C89 and NEMA ST1-4 standard for general purpose specialty transformers. Kva, voltage, and tap ratings should conform to standards for economical buying, handling load increments, and replacement.

Insulation Temperature or Class

Transformers should be insulated with either 80°C rise or 115°C rise insulation systems.

Temp. Rating	Cl.	Gr.	Hot Spot Allowance	Hot Spot Limiting Rise	Hot Spot Temp.	NEMA Reference Temp.
80°C rise	B	II	30°C	110°C	150°C	100°C
115°C rise	F	III	30°C	145°C	185°C	135°C

Either system performs equally well but some users may prefer the 115°C system because of the smaller size.

Construction

1 Transformers must be constructed with grain oriented magnetic circuit such as Hipersil to minimize no load losses and exciting current.

2 Coils to be wound of highest quality conductor material, rigidly controlled by specifications to prevent burrs and slivers. Proper design attention given to the interleaving of primary and secondary to give a leakage reactance for minimizing voltage regulation.

3 The core and coil to be rigidly held to withstand short circuit stresses resulting from 25 times normal load current for a period of two seconds.

4 Core and coil treatment to be total immersion in an insulating resin of the class equal to the temperature rise and to be cured at temperatures to result in complete cure and stable condition of the resin.

5 The core and coils to be embedded in a resin with suitable filler to attenuate the sound level.

6 The case to have thickness in line with U.L. specification and to be weatherproof and non-ventilating. Lifting holes to be obtainable without the removal of any case parts. Conduit knock-outs should be provided, directly in line with terminals, and be of sufficient size and number to accommodate N.E.C. cable and conduit sizes.

7 Transformers to be Underwriters Laboratories listed, where listing applies.

Performance Data

Performance data should be provided prior to acceptance and submittal of prices. Performance data must contain information stating whether figures shown are average, typical, or guaranteed and must be corrected to the corresponding NEMA reference temperatures.

Sound Levels

Sound levels must fall within ASA-NEMA Standard levels according to kva size.

Other "Green Line" products

Buck and Boost transformers
Explosion Proof transformers
Isolating transformers
Mini-Power centers
Auto transformers
Marine Dry Type transformers
In-Wall transformers
Submersible transformers

Further Information

Prices: Price List 46-820
Technical Data: Technical Data 46-860
Dimensions: Technical Certification Section 46-870.
Control Transformers: Price List 46-830.

Westinghouse Electric Corporation
Specialty Transformer Division: Greenville, Pa. 16125
Printed in USA