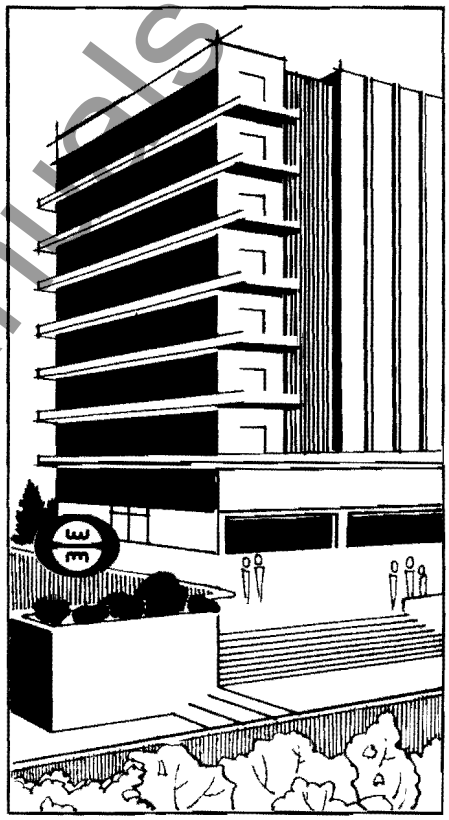
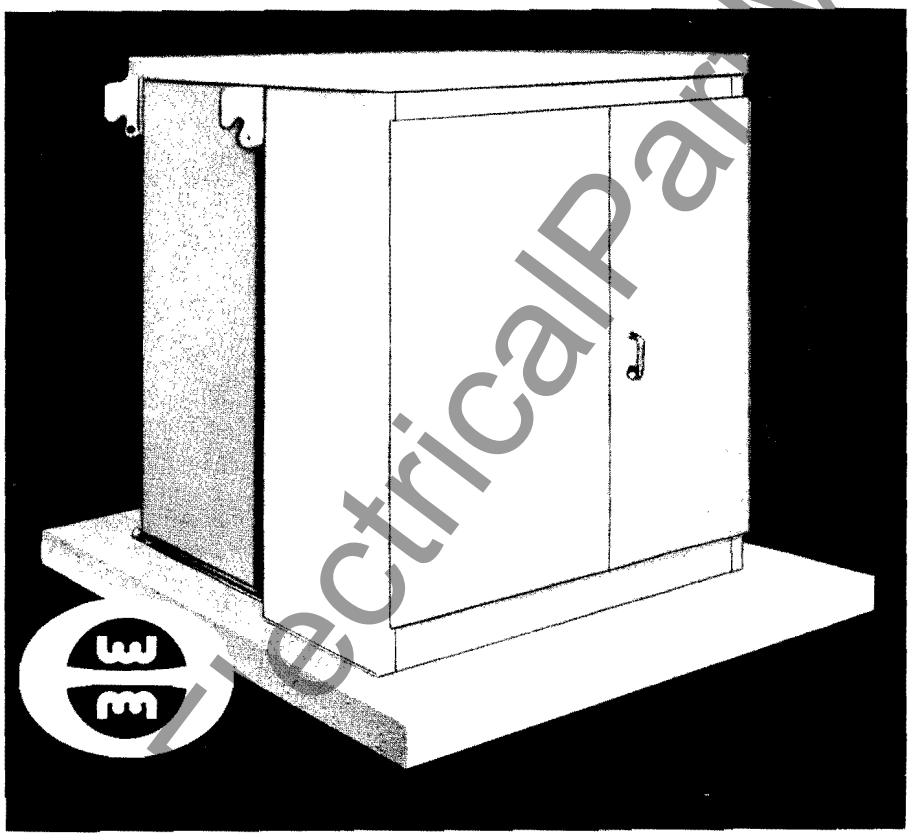
Westinghouse

Pad Mounted Dry Type Transformers

37.5–10000 Kva
Thru 34.5 Kv





Features

- Maximum Safety
- Minimum Maintenance
- Transformer Cannot Explode–Ventilated–Not Sealed Vessel
- Fire-Proof–No Combustible Materials
- Ecology Designed–No Contaminating Emissions
- Proven Short Circuit Capabilities–Tests Available
- Proven Surge Capabilities–Hisercap® Design Tests Available

Ratings–3 Phase
37.5 Kva to 10,000 Kva–AA
600 Volt Class to 34.5 Kv Class ①
BIL ratings–150 Kv and Below
150°C Rise–120°C Rise–80°C Rise
Y–Y–Three Phase
Δ–Y–Three Phase
Δ–Δ–Three Phase

Ratings–Single Phase
37.5 Kva to 3,333 Kva–AA
600 Volt Class to 34.5 Kv Class①

① To 2500 Amperes per phase winding—LV
To 600 Amperes per phase winding—HV
Contact Division for Special Requirements

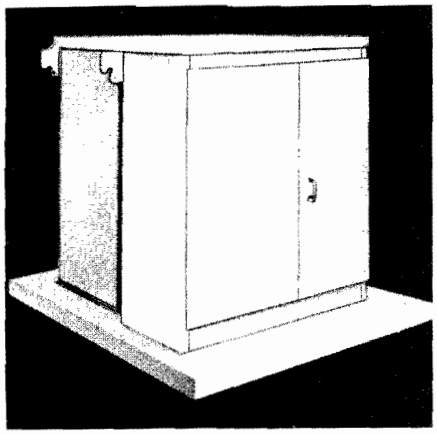
December, 1972
New Information
E.D.C/2076, 2095/DB

Westinghouse

Application

The Westinghouse dry type padmounted transformer is ideally suited for underground power distribution to shopping centers, apartment and office buildings, schools, industrial locations and the like without need for unsightly fences or other external protection. Outdoor tamperproof construction with no accessible external bolts, hinges, screws or fasteners provides a safe self-contained unit which prevents entry by unauthorized personnel. Available in ratings 37.5–10.000 Kva with delta or wye primary voltages through 34.5 Kv. Terminal compartments are built in accordance with ANSI Standard C57.12.22.

Construction



The Westinghouse dry type padmounted transformer is completely factory assembled and is designed to be shipped as one piece to reduce installation and handling costs. The transformer is built up from the following major components:

Transformer Case–containing the core and coils

Terminal Compartments–incorporates the high voltage and low voltage compartments and doors

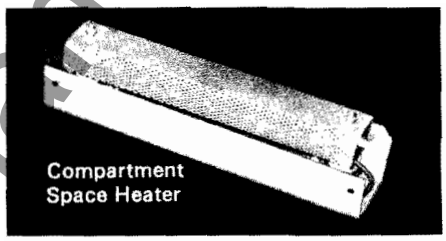
Ventilating Grilles–special grilles allow ventilation of fresh air but inhibit the entrance of rain, snow, wire and metal objects

Transformer Case

The transformer case is constructed of seven gauge steel for units 1000 Kva and larger and of eleven gauge steel for units below 1000 Kva. The terminal compartments which are bolted to transformer case utilize thirteen gauge steel to provide a rugged, durable structure. The paint system used is first grit blasting the metal surfaces and then applying a heavy spray coat of 5-7 mils thickness of Polestron paint and upon completion of unit a finish coat of the same paint. With this paint system color change is inhibited because the same paint is used all the way through the cycle. This use of rugged Polestron paint throughout the paint system may save several repainting jobs over the life of the transformer. Standard paint is Bell Telephone Green Munsell No. 7GY3.29/1.5 with other ANSI standard finishes and special finishes available upon request.

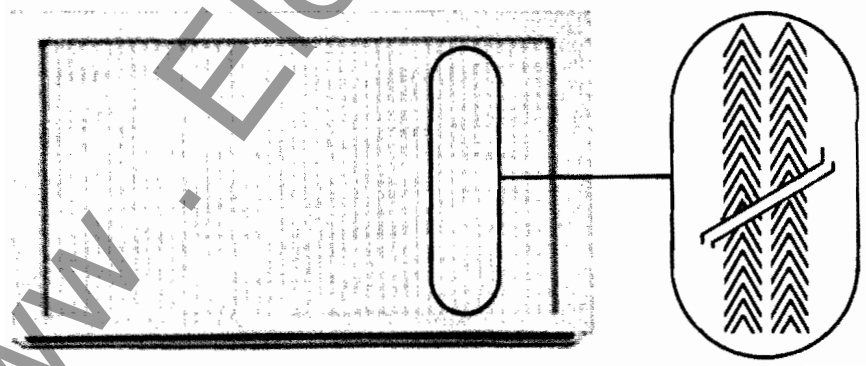
To make the transformer case safe from unauthorized entry or tampering and have the strength for lifting the complete unit, the case is the same basic construction as used on fluid filled padmounts. High voltage leads are brought into terminal compartment through an insulated board and are terminated on stand-off insulators. The low voltage bus bars are brought into the low voltage compartment through a supporting insulating board and are provided with standard NEMA drillings.

Other standard accessories on the transformer enclosure are lifting hooks for lifting complete unit near the top of the case; provisions for packing the unit; base is suitable for rolling or skidding in any direction. Also space heaters are used inside the transformer case to reduce the amount of moisture in the core and coil during periods of limited use.



Terminal Compartments

Bolted to the front of the transformer case is a weatherproof housing consisting of the high and low voltage terminal compartments. The compartments are separated by a sturdy steel barrier bolted into place, the high voltage compartment being accessible only after the low voltage compartment has been opened. A single handle with padlocking provisions on the low voltage compartment door operates a three point latching arrangement on the inside. This latch system prevents prying the door open from any angle. The compartment doors are provided with stainless steel hinges to prevent rusted, frozen doors and have 90 degree door stops to limit the swinging of the doors from a strong wind. A swinging door could cause injury to personnel and damage to the door and compartment. The compartment doors, compartment cover and door sills are easily removable to facilitate cable connections.



Front View of Grill

Cross-section of Grill

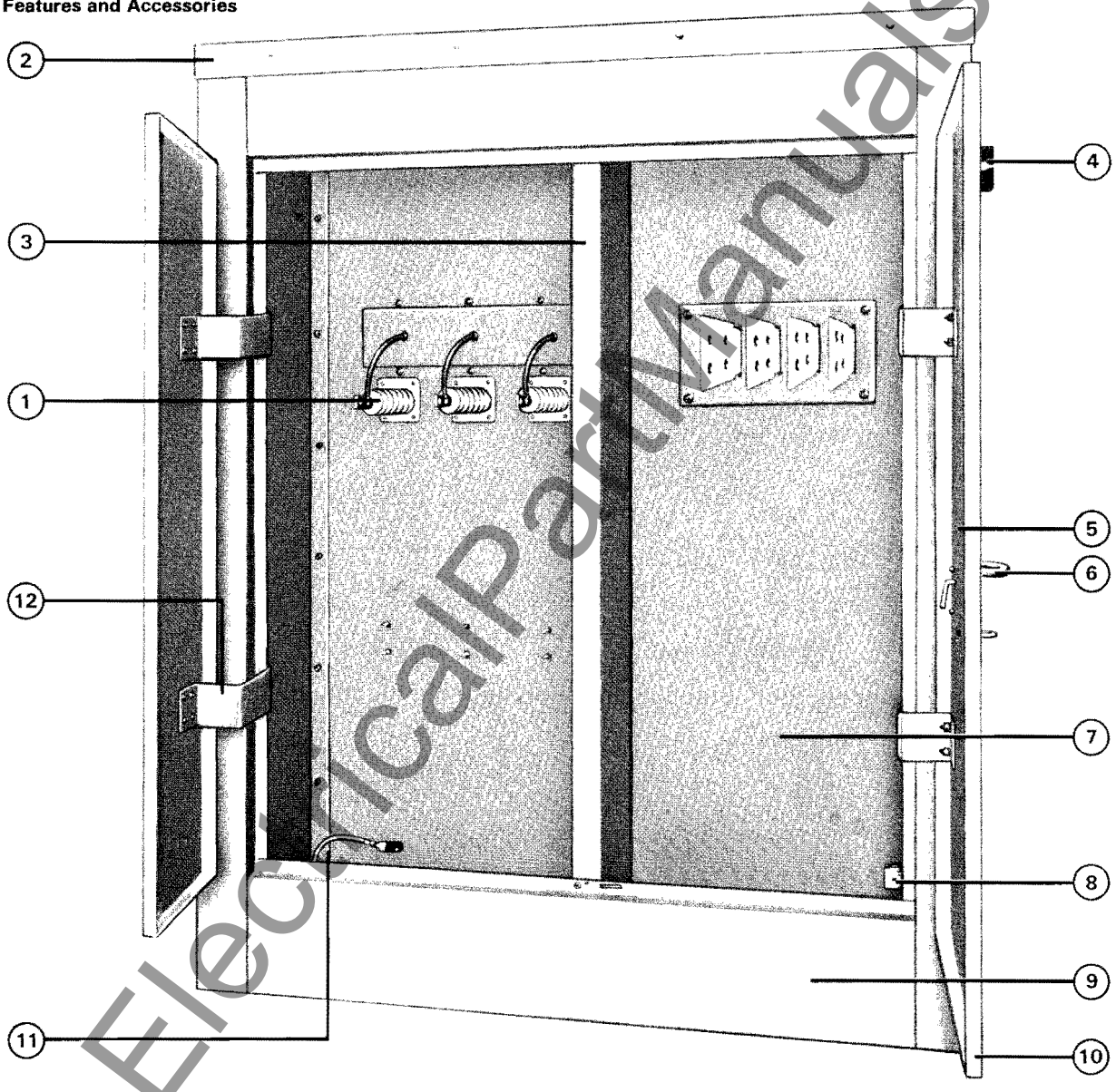
Ventilating Grilles

The ventilation grilles used are of the transfer type using a V sight-tight core. The grille system used consists of two sections of transfer grille, one in front of the other and thus with this method, rain and snow is hindered from entrance into the transformer as shown on the cross-section of the ventilating grille. Also with this type of grille arrangement wires and objects cannot be inserted into the transformer, thus avoiding possible injury.

Pad Mounted
Dry Type Transformers

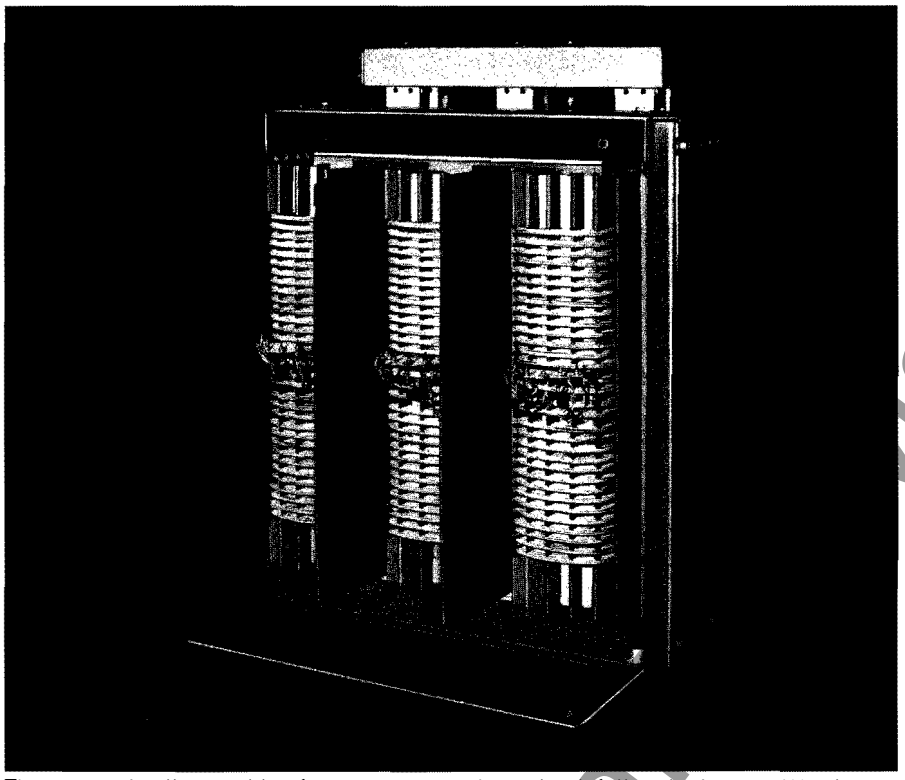
37.5–10000 Kva
Thru 34.5 Kv

Features and Accessories



1	5	9
2	6	10
3	7	11
4	8	12

Westinghouse



The core and coil assembly of every Westinghouse dry type transformer is ruggedly constructed to withstand shock and vibration—whether during shipment, motor starting, line faults, or multiple short circuits. Each unit is subjected to a computer simulated short circuit to calculate short circuit forces. Coils therefore are designed with the inherent strength to resist all forces generated during faults. This process virtually eliminates the possibility of short-circuit failure. In fact, there has been no known instance of short-circuit failure in dry type Westinghouse core and coil assemblies since 1936.

Core and coil structure forms a compact, rigidly braced unit. The coils, wound concentrically around the core legs, are firmly positioned laterally between the innermost insulating cylinder and the core.

Core

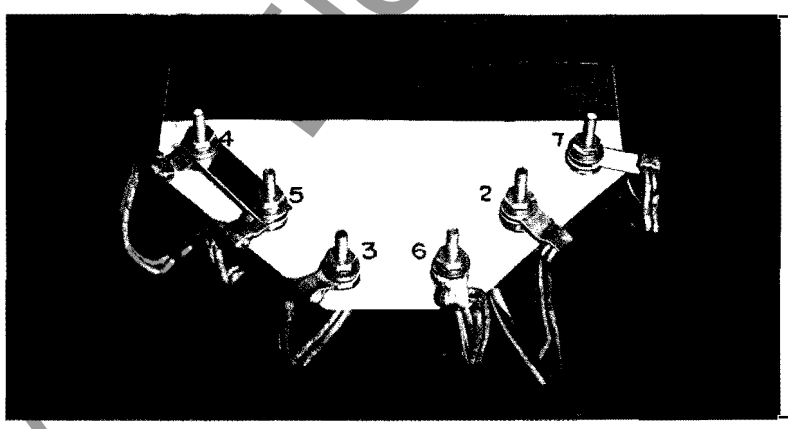
Core material is non-aging, highly permeable, cold-rolled silicon steel. Specially hardened and ground tools are used for cutting bulk material to width and shearing it to length. These special cutters not only prevent edge damage, they also eliminate burrs that could short between laminations and thus reduce core efficiency.

Coils

Standard conductor material for both low and high voltage windings is aluminum (used by Westinghouse in dry type transformers and air core reactors since 1952). Perfected over the last twenty years, Westinghouse joining methods and winding techniques have proven completely reliable in the thousands of units now in service. High voltage coils are wound directly over the low voltage coils, forming a rigid structure that can easily withstand the hammering of multiple short circuits.

Optimized computer design programs are used by Westinghouse to eliminate design errors. Voltage stress calculations for each coil verify the ability of that coil to meet the BIL requirements, thereby eliminating the need to impulse test each unit —a $300 to $400 savings. The multivariable iterative optimization process, while providing a 5 to 10 % reduction in size and weights, also determines the most economical and reliable design to meet all individual customer requirements.

Voltage requirements determine the type of coils to be used. Low voltage coils in the 1.2 KV class are sheet wound, while those in the 5 KV class are barrel/cylindrical windings. High voltage coils are either pancake/random wound (15 KV class) or Hisercap®—high series capacitance—construction. Used for the 15 KV through 34.5 KV class, the compact, lightweight Hisercap coils are a Westinghouse exclusive. Hisercap windings assure maximum possible reliability during very high voltage surges.



Tap Terminal Board

The taps can be reached from the front or back by removing a panel which also protects the taps from tampering.
The taps are rigidly supported on a terminal board, centrally located on the coils. Taps are changed by moving the terminal strips from one connecting point to the other. To simplify these changes, the connections are clearly identified.

Pad Mounted Dry Type Transformers

37.5–10000 Kva
Thru 34.5 Kv

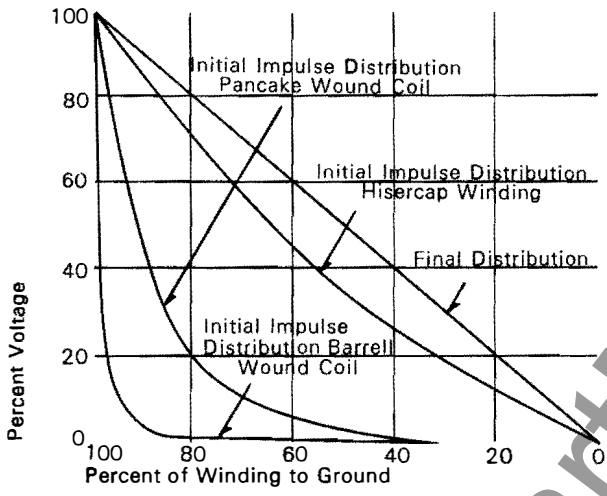


Figure 1

Figure 1 illustrates the superior performance of Hisercap windings. These curves depict voltage build-up on the line ends of the various types of coils (during a voltage surge). The straight line indicates completely even voltage distribution throughout the coil—in other words, no voltage build-up.

In comparison to either Hisercap or pancake windings, the barrel/cylindrical coil has a high voltage build-up during surges. However, this type of winding is perfectly reliable for the 5 KV class and below. Westinghouse barrel/cylindrical windings are designed to withstand 20-25 KV impulses.

Insulation

For superior strength and durability at sustained elevated temperatures, coil windings are insulated by du Pont Nomex● class H insulation and protected by Doryl● high-temperature varnish. Tough, long-life Nomex is especially resistant to humidity and thermal cycling. Doryl, as shown in Figure 2 and 3, combines superior bond strength and high dielectric strength with good performance at high temperatures.

These materials allow Westinghouse to offer a true 220°C insulation system, fully 40°C more than the commonly used insulations. Standard Westinghouse 150°C rise units are designed to be operated (in a 40°C ambient temperature), at full load continuously—24 hours a day, 365 days a year—for twenty years. Our experienced mean time between failure rate of 2.27×10^6 assures uninterrupted service for many years.

In addition to the Nomex conductor and layer insulation, Westinghouse dry type transformers have large air ducts that provide insulation between windings. The ducts form vertical cylinders for natural ventilation, thus reducing heat build-up.

Westinghouse insulation structures are both flame retardant and self-extinguishing, for increased safety and lower repair costs in case of fire. Flame retardant testing is performed under ASTMD635.

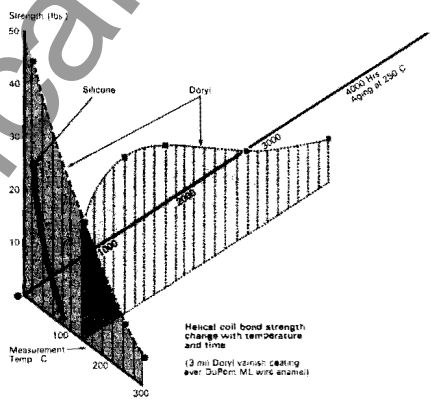


Figure 2

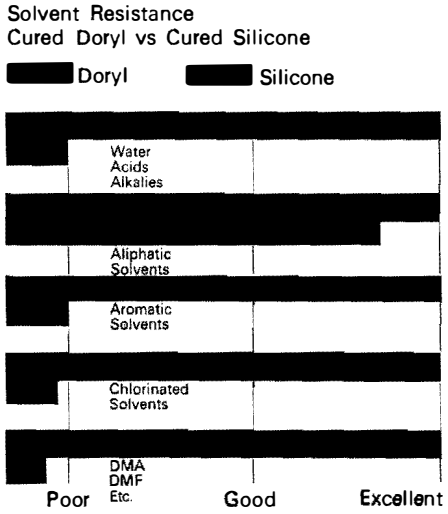


Figure 3

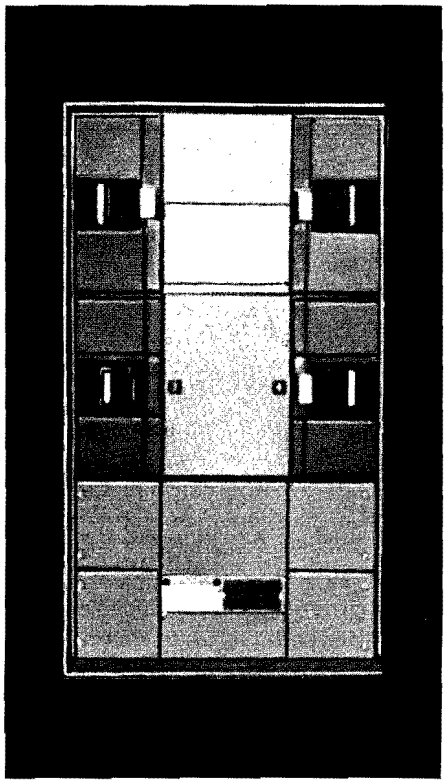
As shown below, both 115°C and 80°C units are also available, for added KVA capacity on all taps:

Insulation System	Ambient Temperature	Maximum Temperature Rise	Hottest Spot Winding Temperature Rise	KVA Capacity at 150°C Rise
220°C	40°C	150°C	180°C	100%
220°C	40°C	115°C	145°C	115%
220°C	40°C	80°C	110°C	135%

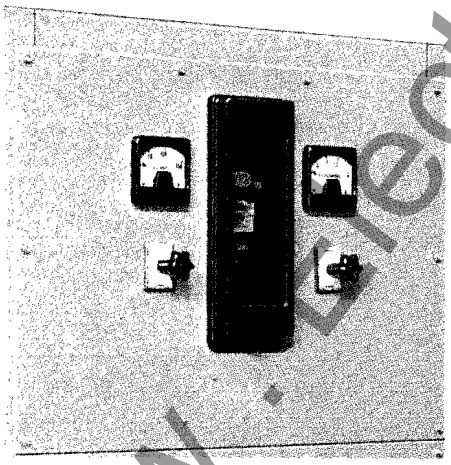
Westinghouse

Optional Accessories

LV Metering and Panelboard



A CDP panelboard or a single breaker is available in the LV compartment.

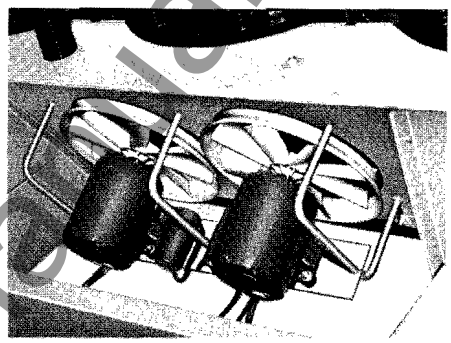


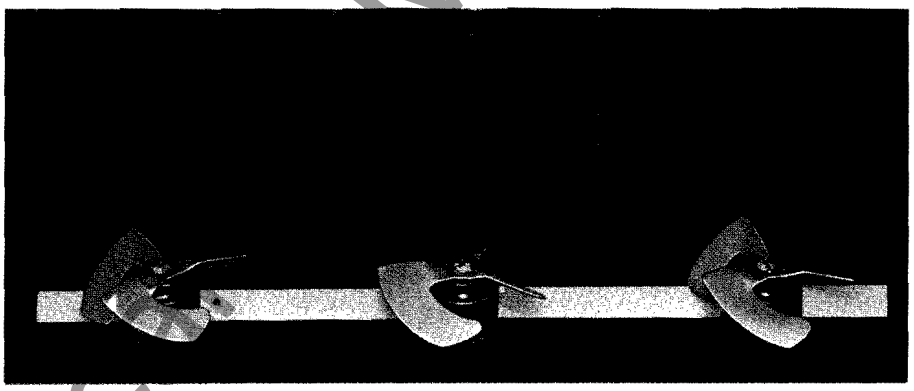
Westinghouse simple metering available with:

- Ammeter
- Voltmeter
- Transfer Switches
- Watthour Meter
- Instrument Transformers

Forced Air Cooling

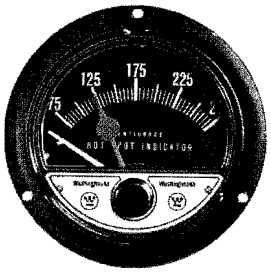
Forced air cooling is available on all units. Network transformers 1000 KVA and below use 6 small fans, 3 on each side of the coils. With air blast equipment in operation the units have forced cooled ratings of 133 percent of the self-cooled rating continuously without exceeding 150 degree C. rise and 180 degree C. hot spot rise. On units rated above 1000 KVA fans mount near the bottom of the case and their output is uniformly distributed by an air chamber, upward through each phase group. Single phase 230 volt, capacitor start, Thermoguard® protected fan motors are turned on or off by a winding temperature relay. The 230 volt power supply is not included with the forced air package. If a 230 volt supply is not available, an optional control power transformer should be specified.





Forced Air Control Panel

The forced air control panel is included on all forced air cooled (AA/FA) transformers and is available as an optional item on all transformers provided with everything except the fans. The control panel in conjunction with the winding temperature relay alarm contacts turns the fans on and off. The control panel is protected at the incoming line with a circuit breaker. Also, three lights—green, amber and red—detect normal (AA), fans on, and excessive temperature.



Winding Temperature Relay

Included on all AA/FA units and available as an optional accessory on AA units, the winding temperature relay indicates winding hot spot temperature.

The hot spot temperature is an indication of the load being carried by the transformer. Alarm contacts are furnished to signal overload conditions. On fan cooled units, a separate set of contacts turn the fans on when the AA rating is exceeded.

Pad Mounted Dry Type Transformers

37.5–10000 Kva
Thru 34.5 Kv

High Voltage Switching and Fusing
The Westinghouse Dry Type Padmounted transformer is available with a wide selection of primary switching and fusing arrangements to meet every application.

1. Westinghouse RBA disconnect or stationary fuse assembly

2. Westinghouse 200A EFD air switch, radial or loop feed
200A continuous and loadbreak
5000A symmetrical
10,000A asymmetrical
CLT fuses
RBA fuses

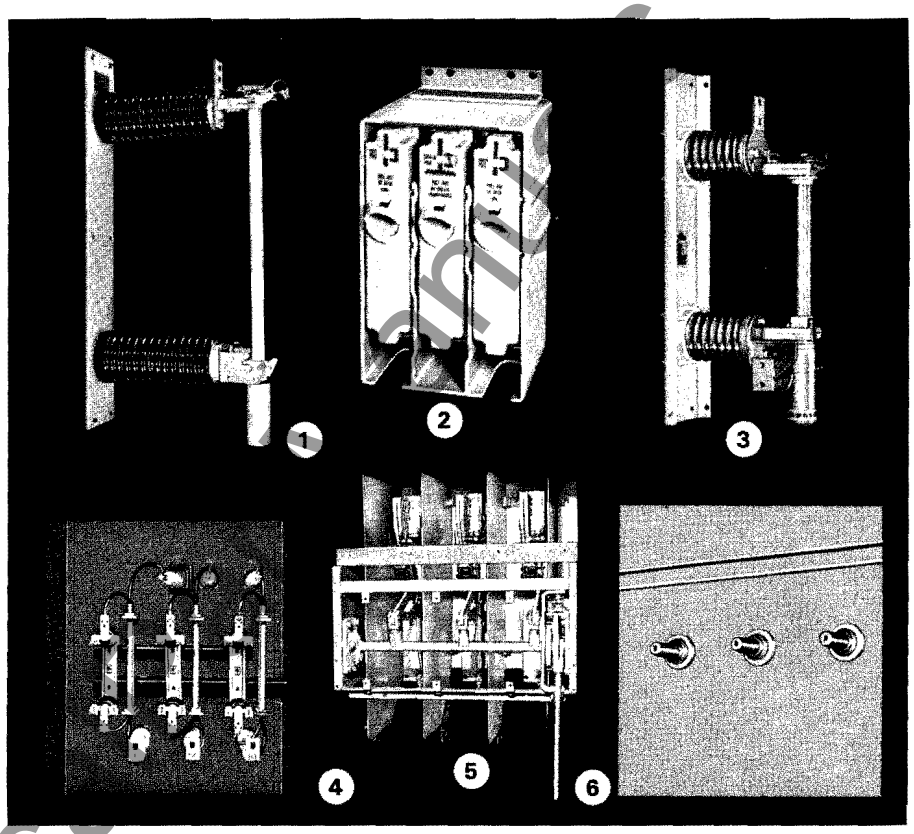
3. S&C hookstick operated disconnect switches
200A standard duty, unfused
600A heavy duty, unfused
50A fused disconnect, SM fuses
200A fused disconnect, SM fuses

4. McGraw Edison Line Material disconnect switches
Arc Strangler disconnect
40A fused disconnect, NX fuses
80A fused disconnect, NX fuses

5. Westinghouse 600A LBF gang operated air switch
600A continuous and loadbreak
61,000A asymmetrical at 5 KV
40,000A asymmetrical at 15 KV
RBA fuses
CLE fuses

6. Westinghouse Loadbreak Bushings
200A continuous
100A loadbreak
5, 15, 25 and 34.5 KV

Also available (Not shown).
- 100A, 200A and 300A (5 KV and 15 KV) oil fused cutouts



Insulation Levels

KV	Induced Test 120 Hertz	Applied Test 60 Hertz	BIL
1.2	Two	14	10
2.5	Times	10	20
5.0	Normal	12	25
8.66		19	35
15.0		31	50
25.0		40	95
35.0		40	125

Audible Sound Level (in decibles)

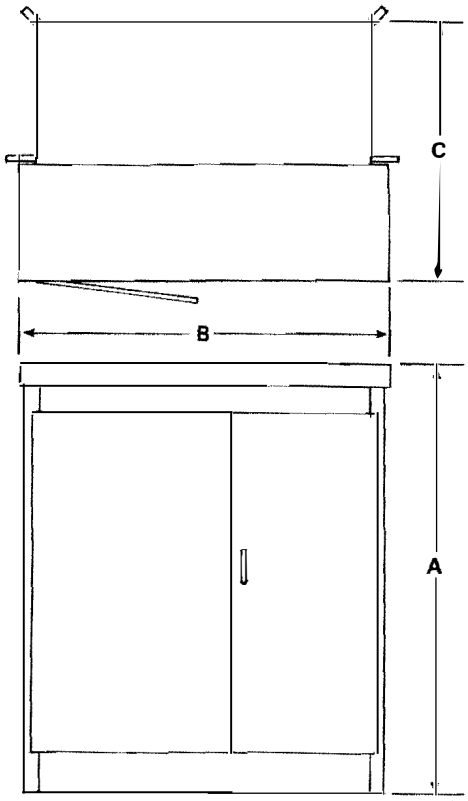
KVA	Guaranteed (NEMA)		Normal Average	
	600 V Class	Above 600 V Class	600 V Class	Above 600 V Class
37.5-50	45	58	42	53
51-150	50	58	42	53
151-300	55	58	46	54
301-500	60	60	50	56
750-1000	64	64	59	60
1001-1500	65	65	60	61
1501-2000		66		62
2001-3000		68		64
3001-4000		70		66
4001-5000		71		67
5001-6000		72		68
6001-7500		73		69
7501-10,000		75		71

Impedance

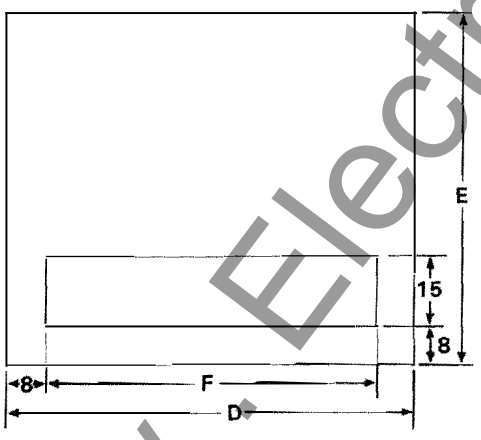
KVA	600 V Class	5 KV Class	8.7 & 15 KV Class	25 & 35 KV Class
37.5-1500	Contact Westinghouse		5.75	6.5
2000-2500		5.75	5.75	6.5
2501-5000			7.0	7.5
5001-7500			7.0	7.5
7501-10,000			7.0	7.5

Pad Mounted
Dry Type Transformers

37.5–10000 KVA
Thru 34.5 KV



Recommended Pad Size



Dimensions and Weights for Units with 150°C Rise Delta-Connected (Approximate)

KVA	HV 600 V Class LV 600 V Class ②			HV 5 KV Class LV 600 V Class ②			8.7 KV Class or HV 15 KV Class LV 600 V Class ② or 5 KV Class			HV 25 or 35.0 KV Class ① LV 600 or 5 KV Class ②		
	A	B	C ③	A	B	C ③	A	B	C ③	A	B	C ③
37.5	30 700 lbs.	40	34	30 800 lbs.	40	34						
45	30 700 lbs.	40	34	30 800 lbs.	40	34						
75	40 850 lbs.	44	42	40 950 lbs.	44	42	55 2,000 lbs.	53	55			
112.5	40 1100 lbs.	44	42	40 1200 lbs.	44	42	55 2,100 lbs.	53	55			
150	40 1200 lbs.	44	42	40 1500 lbs.	44	42	60 2,200 lbs.	53	60			
225	50 1500 lbs.	44	46	50 1750 lbs.	44	46	60 3,300 lbs.	53	60			
300	50 1750 lbs.	44	46	50 2000 lbs.	44	46	65 3,400 lbs.	60	60			
500	75 2350 lbs.	44	56	75 2900 lbs.	44	46	65 3,600 lbs.	60	60	95 6,000 lbs.	95	90
750	75 3400 lbs.	54	56	75 3900 lbs.	54	56	65 4,100 lbs.	60	60	95 6,500 lbs.	95	90
1,000	90 5200 lbs.	54	56	90 5300 lbs.	54	56	85 7,000 lbs.	85	65	100 7,400 lbs.	100	90
1,500	90 6600 lbs.	58	64	90 6800 lbs.	58	64	100 9,500 lbs.	95	75	100 10,100 lbs.	100	90
2,000				100 9,800 lbs.	95	75	100 10,800 lbs.	95	75	100 11,400 lbs.	100	90
2,500				100 11,200 lbs.	95	75	105 12,200 lbs.	95	75	105 13,200 lbs.	100	95
3,000				105 12,000 lbs.	95	75	110 13,000 lbs.	95	75	110 14,300 lbs.	110	95
3,750							110 19,200 lbs.	115	75	110 20,700 lbs.	120	95
5,000							120 23,300 lbs.	125	75	120 25,000 lbs.	130	100
7,500							130 33,000 lbs.	130	90	135 34,000 lbs.	140	110
10,000							130 34,000 lbs.	130	90	135 37,000 lbs.	140	110

① Dimensions are for units with 3 legged core. Contact Westinghouse for dimensions of Y-Y 4 and 5 legged core (length increases from 7" for 112.5 KVA to 20" for 10,000 KVA for 4 legged core and from 14" for 112.5 KVA to 40" for 10,000 KVA) 4 and 5 legged core not available on transformers with HV 5 KV and below, 750 KVA and below.

② LV of 208Y/120 available up to 1500 KVA. LV of 480Y/277 or 480 △ available up to 3000 KVA. Terminal compartment will be for cable termination only. Check Westinghouse for HV switches or LV panelboard, etc.

③ Depth of terminal compartment is approximately 18-22 inches for units through 15 KV and is 30 inches for 25 and 35 KV.

Further Information

Prices: Price List 47-330

Dimensions: Dimension Sheets 47-370

The Westinghouse policy of continuous improvement of its products may result in changes of these specifications without notice.

Westinghouse Electric Corporation
Sharon Transformer Division, Sharon, Pa. 16146
Printed in USA