



unit
equip-
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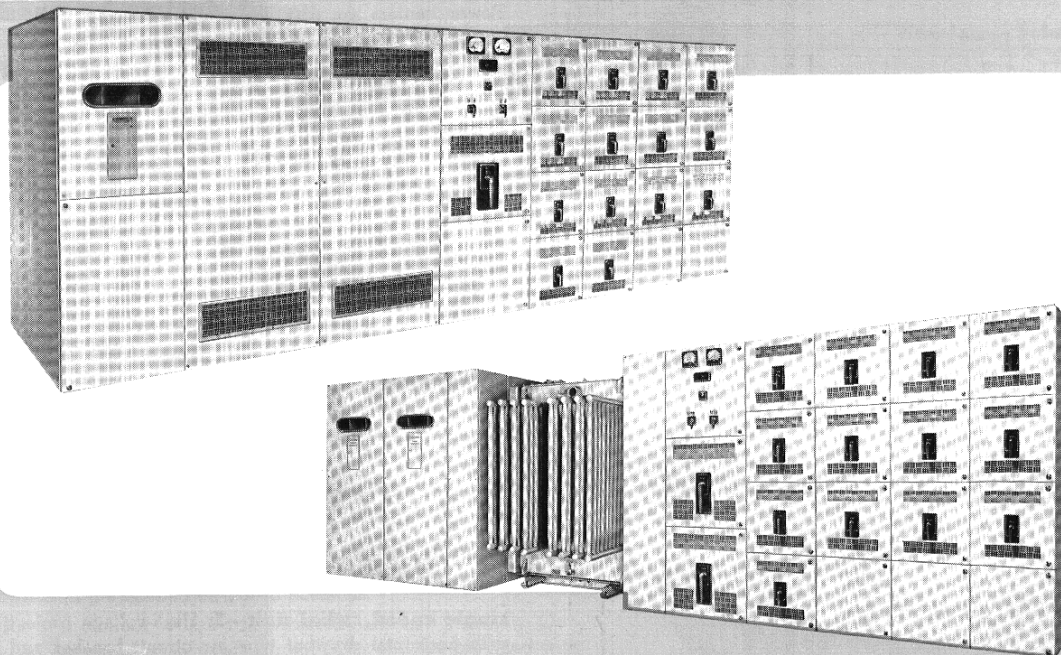
power centers • dry and liquid multi-circuit unitized type

descriptive
bulletin

34-150

page 1

112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle



ratings

kva

112½, 150, 225, 300, 500, 750,
1000, 1500, 2000

high voltage

2400, 4160, 4800, 6900, 7200,
12000, 13200, 13800 with stand-
ard ASA no load hv taps

low voltage

208 wye/120 ①, 240 ①, 480,
480 wye/277

① maximum kva is limited to
1000 kva

application

Westinghouse power centers are completely coordinated secondary unit substations for indoor and outdoor installations. They have a wide range of application for electric utilities, industrial plants, commercial buildings and institutions.

advantages

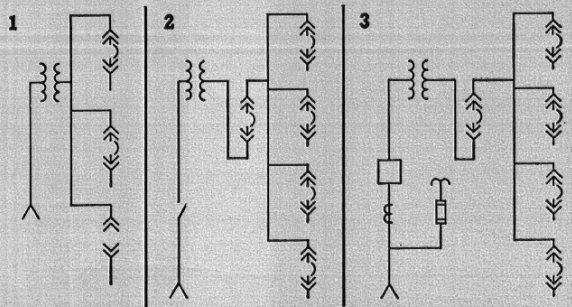
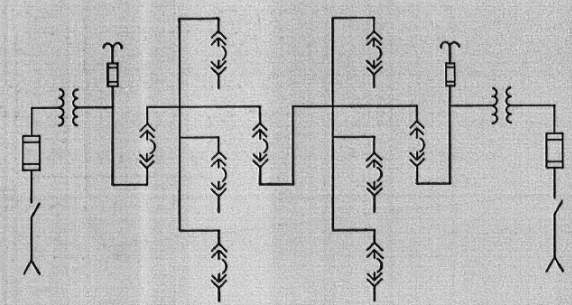
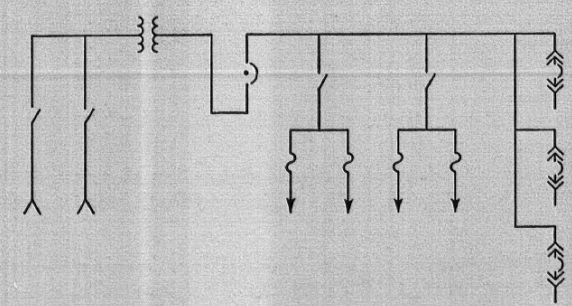
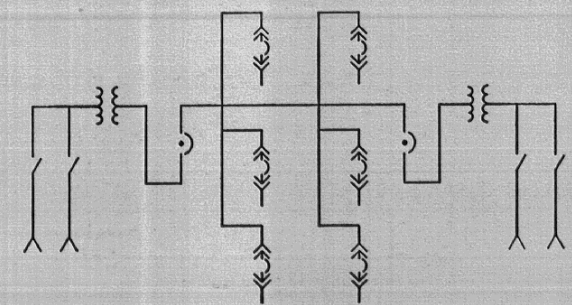
- **economical distribution of power:** Power centers permit distribution of power at the economical higher voltages and transform it to the desired utilization voltage near the center of load.
- **coordinated components:** Westinghouse power centers consist of three basic sections: the high voltage termination section, the transformer section and the low voltage metal-enclosed section, all coordinated in design and manufacture to provide an integrated unit.
- **modern design and construction:** Completely metal enclosed, self supporting structures are modern in appearance and construction throughout. Compact design occupies minimum space.
- **greater safety:** Completely metal enclosed construction reduces possibility of personnel coming in contact with live parts. Equipment is also protected against external hazards.
- **ease of installation:** Westinghouse power centers are factory-assembled, eliminating installation complications. They are shipped in standardized basic sections that require only bolting together and connection of incoming and outgoing lines.
- **Westinghouse unit responsibility:** The complete power center is Westinghouse throughout. Only one manufacturer is responsible for entire assembly through ordering, engineering, manufacturing, shipping and operation. This means savings in time and expense.

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August, 1960

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**selector guide** *diagrams in accordance with NEMA standards***single ended radial unit****secondary selective unit****distributed network unit****spot network unit**

Power centers are secondary unit substations which consist of one or more transformers mechanically and electrically connected to and coordinated in design with one or more switchgear assemblies. The type of load served and continuity of service required is as varied as the application. To meet these varied requirements six typical arrangements are suggested:

single ended radial unit—1: High-voltage entrance compartment; standard three-phase transformer; low-voltage drawout type DB feeder circuit breakers, either manually or electrically operated, with necessary control for electrically operated breakers, instrument panels, and cells equipped for future breakers. This unit is used where high-voltage switch or breaker is part of a separate installation.

single ended radial unit—2: High-voltage load or magnetizing current break disconnecting switch; standard three-phase transformer; low-voltage drawout type DB transformer secondary air circuit breaker, and type DB feeder air circuit breakers, either manually or electrically operated breakers. Interlock provided between high-voltage disconnect switch and transformer secondary breaker, if high-voltage switch is magnetizing break.

single ended radial unit—3: High-voltage protective section with horizontal drawout type air circuit breaker and necessary auxiliary compartment including control power transformer; standard three-phase transformer; low-voltage drawout type DB transformer secondary air circuit breaker and a combination of type DB feeder air circuit breakers, instrument panel, and cells equipped for future feeder breakers.

secondary selective unit: Two high-voltage fused disconnecting switches of the load or magnetizing current break type; two standard three-phase transformers; low-voltage type DB drawout type air circuit breakers, manually or electrically operated. The unit consists of transformer secondary breakers, feeder breakers, and tie breaker. This arrangement permits use of minimum size feeder breakers and provides an alternate emergency supply for the load in event of interruption due to outage of one of the transformers or its primary feeder. The transformer secondary and tie breakers are interlocked to prevent closing tie breaker unless one of the transformer secondary breakers is in the open position.

distributed network unit: High-voltage magnetizing or load current break selector switch used to select one of two high-voltage incoming feeders; standard three-phase transformer; low-voltage structure consisting of a network protector, loop disconnecting switches, limiter sections and load feeder breakers. The secondary network system offers the advantages of continuity of service, flexibility to meet changing and growing load conditions, and good voltage regulation.

spot network unit: Consists of two high-voltage load or magnetizing current break selector switches, used to select one of two incoming feeders; two standard three-phase transformers; low voltage structure consisting of two network protectors and type DB feeder air circuit breakers.

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high-voltage termination

switches and switch fuses

type LCB

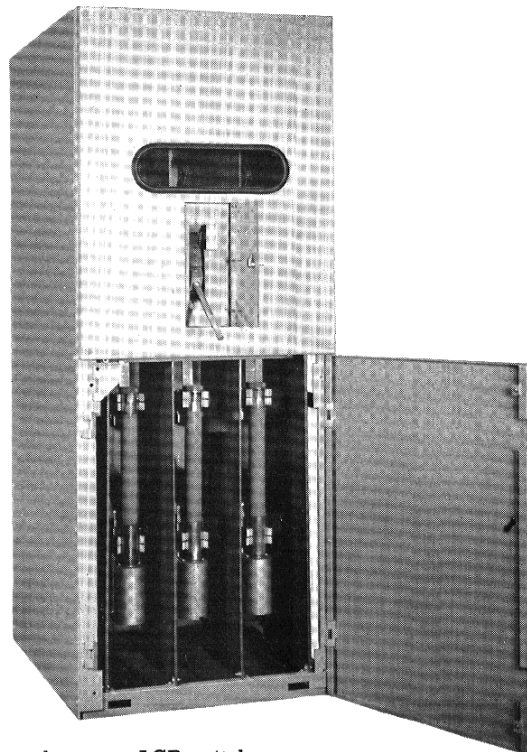
Air insulated load break switches with or without fuses are available for indoor and outdoor installations. The Westinghouse type LCB switch for power center transformers, is a three-pole, gang-operated, air-insulated, link-type, two-position switch. Selector service may be obtained by the use of two switches assembled as a duplex unit. The duplex selector switch is provided with a mechanical interlock which prevents energizing both switches at the same time. The LCB switch has a momentary short circuit rating of 40,000 amperes RMS asymmetrical and is available in two ratings, 60 kv BIL for circuits 5 kv and below, and 95 kv BIL for circuits above 5 kv. Refer to table on page 20 for complete ratings. The switch blades are mounted on post type insulators with a Redarta operating link and are of the divided jaw type with silver to silver contact surfaces. High pressure line contacts of the switch blade provide a wiping action which keeps the contact lines clean and reduces maintenance. The main and arcing contacts are bushing mounted with the arcing contacts in a De-ion arc chamber.

The switch operating mechanism includes a detachable handle mounted inside the operating door on the front of the switch case. The door latch has a cylinder lock to prevent unauthorized operation of the switch. A key interlock coordinated with the secondary breakers can be provided to lock the switch in the opened or closed positions.

Both indoor and outdoor switch compartments are free standing. Outdoor switches are supplied in weatherproof cases and are provided with space heaters. On indoor units the switch is bolted directly to the transformer case or transition flange. Outdoor switches are supplied with a throat for connection to the transformer tank.

fuses

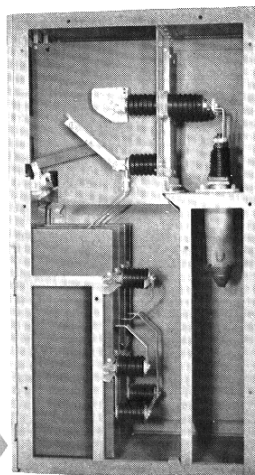
Fuses can be supplied with the above switches. The fuses are mounted in a separate compartment which is located immediately below the switch compartment. The fuse compartment is equipped with interphase barriers and the compartment access door is interlocked so that it cannot be opened unless the switch is in the open position, and the switch cannot be closed unless the fuse compartment door is closed. The fuses are applied within limits as specified in application table on page 20.



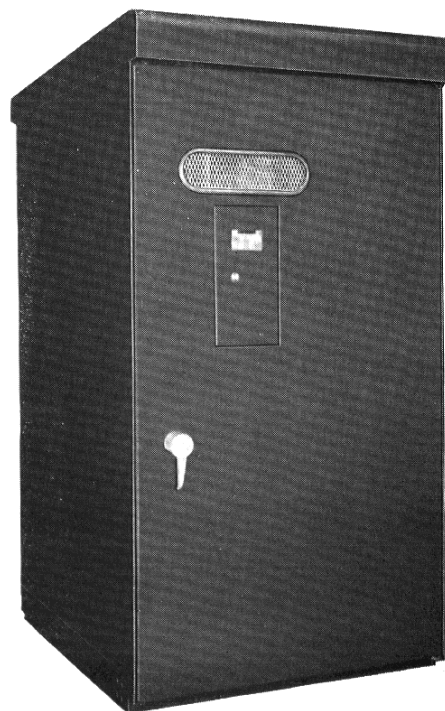
indoor type LCB switch



method of switch operation



indoor type LCB switch showing internal construction



outdoor type LCB switch

**high-voltage termination** *continued***terminal chamber—outdoor**

Liquid-insulated terminal chambers are available on all ratings of power center transformers. A terminal chamber is mounted on a vertical split throat to terminate the connections of incoming cables to the transformer.

Liquid-tight bushings project through the transformer tank wall into the terminal chamber throat. Potheads are required in liquid-filled terminal chambers to prevent the liquid from migrating through the customer's cables. The potheads are bolted into the terminal chamber with a gasketed liquid-tight joint and the customer's cables are terminated within the pothead. A connection is made in the terminal chamber with a flexible connector between the pothead bushings and the transformer bushings. The chamber is equipped with a liquid level gauge.

An air-insulated terminal chamber may be used for voltages up to 15 kv. This terminal chamber may be supplied with or without potheads. When potheads are not used, solderless clamp-type terminals are supplied to terminate the customer's cables directly to the transformer bushings. Various types of cable entrances are available, such as wiping sleeve, stuffing box, armor clamp, or conduit fittings. Combinations of these fittings, or a removable blank plate, can be supplied.

Adequate space is available for constructing stress cones on shielded cable when potheads are not supplied.

terminal compartment—indoor

On liquid-immersed power centers, ample space is supplied in a free-standing compartment for terminating customer's incoming cable.

On ventilated dry-type transformers, space is provided in the transformer case to terminate the incoming cables.

disconnect switch • liquid immersed

Liquid-immersed magnetizing current break, two position disconnect switches or three-position selector switches are available for all ratings of liquid-immersed power center transformers. The switch immersed in oil or Inerteen® is mounted on and becomes an integral part of the transformer. Transformer high-voltage leads are brought into the switch chamber through gasketed bushings in the tank wall. Magnetizing current break (mag. break) switches must be interlocked with secondary breakers either electrically or by means of key interlocks.

The switch is the rotary type and consists of a porcelain insulating tube keyed to the operating shaft. On this porcelain tube there is babbitted a segment of a disc and button type contact for each phase. The disk segment slides in a button-type contact mounted on the outlet or line bushing and makes contact through the entire range of travel of the drum.

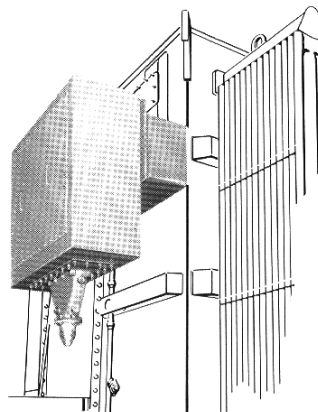
All main contacts consist of button type pressure elements engaging stationary blades. Ample contact pressure is maintained by strong springs. A set of auxiliary contacts is provided to break the transformer magnetizing current. The blades of these auxiliary contacts are spring-loaded to give a snap action regardless of the speed used in opening the switch.

operating mechanism

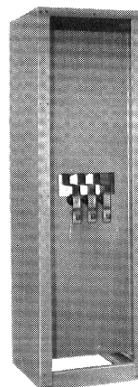
The moving contact arms are operated directly through the main shaft without the use of gears or links. The angular movement between positions is 45 degrees. In the "open" or "closed" position, the switch handle is kept from accidental movement by a spring-loaded latch which must be released by the operator before he can change positions. This latch also makes it possible to padlock the switch in any position.

terminal chamber

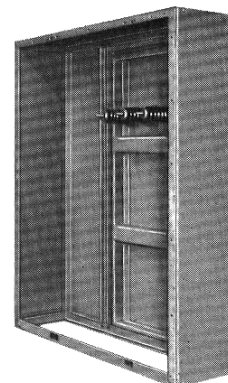
The incoming cable terminal chamber will accommodate single-or three-conductor cable. When installed, the terminal chamber must be filled with petrolatum or other suitable cable compound. The cable may enter either top or bottom. The terminal chamber is equipped with a filling plug at the top and a drain plug at the bottom.



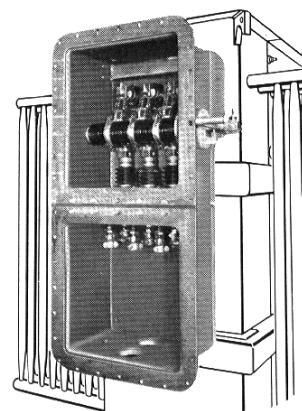
High-voltage terminal chamber with pothead for outdoor liquid-immersed transformer.



dry type unit



liquid type unit



High-voltage liquid switch

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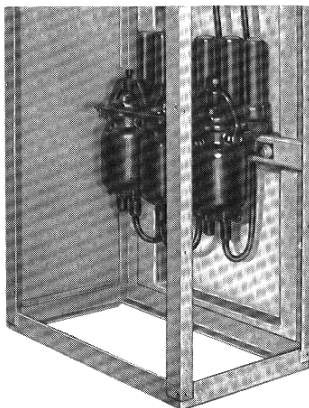
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*112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle*

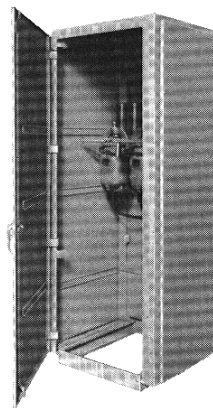
oil fuse cutouts

Oil fuse cutouts are available and can be supplied with fuses or with solid links. High-voltage, gang-operated oil-filled cutouts are supplied as shown for the various types of power centers. Provision is made for terminating one three-phase feeder cable or three single-phase feeder cables. These cutouts are suitable for breaking the transformer full load current. They are designed for indoor or outdoor operation.

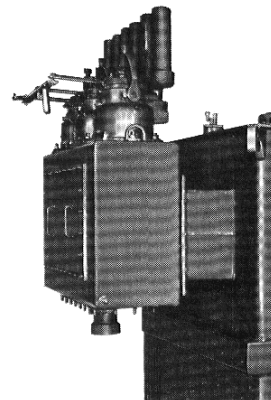
Oil fuse cutouts may be fused for kva sizes not exceeding 500 kva at 2400 volts, or 750 kva at 4160 and 4800 volts; unfused cutouts can be applied as a disconnect up to 750 kva at 2400 volts, 1000 kva at 4160 and 4800 volts.



cutout compartment for indoor liquid-immersed power center



cutout compartment for dry type power center



cutouts mounted on tank compartment on side of outdoor liquid-immersed power center

metal-clad switchgear

Power centers can be supplied with metal-clad switchgear on the incoming line. This may be required to meet power company specifications, or preference for automatic switching by the user.

Indoor metal-clad switchgear is built of structural steel members electrically welded to form a rigid unit assembly. The unit is encased with sheet steel sides, roof and bolted-on rear sheets, with the necessary interior steel barriers to form bus, cable and current transformer, and breaker compartments. The front is provided with a steel hinged panel for mounting instrument control switches and protective relays. The breaker compartment is provided with the necessary devices to give positive alignment of breaker, drive-in mechanism linkage, primary contact openings with automatic shutters, ground contact and automatic secondary control contacts.

finish

The finishing process for both indoor and outdoor metal-clad switchgear is similar. Both are thoroughly cleaned, phosphatized and a prime coat of paint applied immediately to preserve the full effect of phosphatizing. Indoor metal-clad is then finished in light gray both interior and exterior. Outdoor metal-clad switchgear is finished in light gray on the interior and dark blue-gray on the exterior. In addition the outdoor metal-clad switchgear is supplied with a heavy coat of rubberized sealing compound on the under-surface of the housing to protect against corrosion.

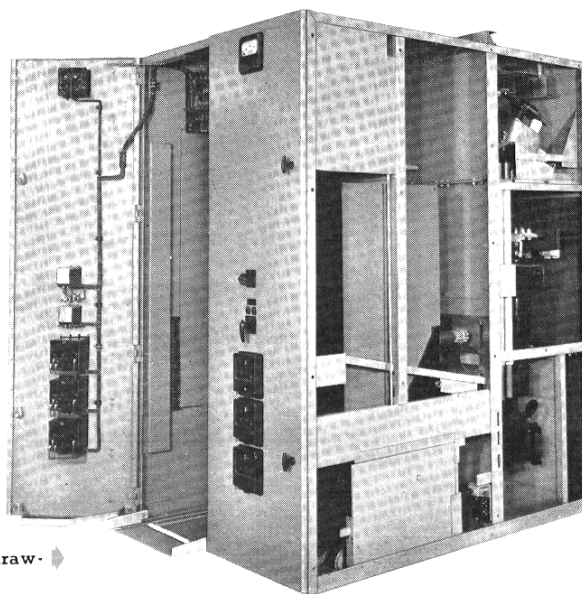
high-voltage metering

Metal-clad switchgear on the incoming line side of the power center permits high-voltage metering with the potential transformer mounted in an auxiliary unit. If power-company metering

is required, it is necessary to supply metal-clad construction even though other means of high voltage termination, such as a fused switch, is used.

connection to transformer

Indoor metal-clad switchgear is close coupled to ventilated dry type and is connected with a transition flange on liquid and sealed dry type indoor transformers. Outdoor metal clad switchgear is throat connected to liquid and sealed dry type outdoor transformers.



indoor metal-clad switchgear with type DH horizontal draw-out circuit breakers

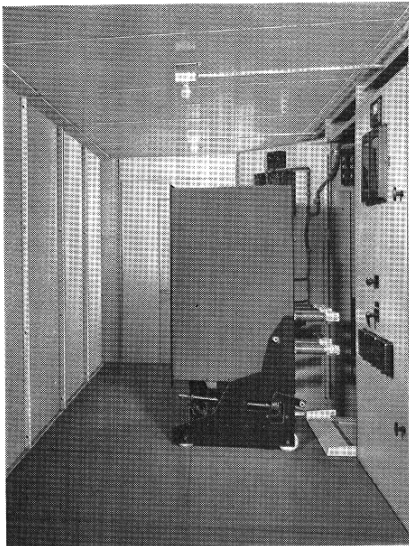


high-voltage termination *continued*

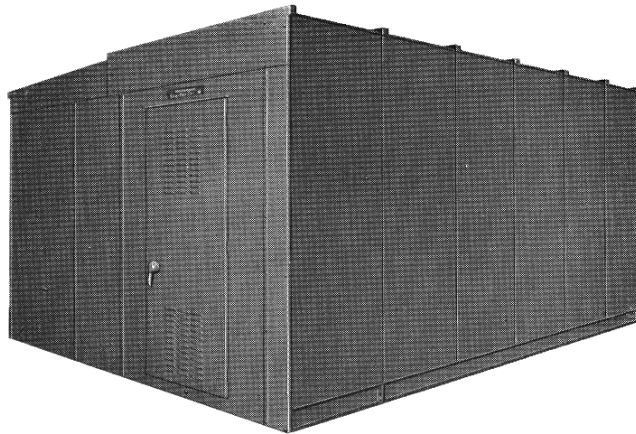
Shelterfor-M outdoor metal-clad switchgear

Shelterfor-M outdoor metal-clad switchgear is ideally suited for incoming line terminations. Shelterfor-M design eliminates front and rear doors and provides a protected aisle for maintenance and breaker interchange. With the built-in protected aisle, Shelterfor-M switchgear can be mounted on concrete footings, thus eliminating the need for concrete operating walks and breaker drawout pads.

This outdoor type of metal-clad switchgear was developed by Westinghouse to provide maximum protection of equipment and personnel while performing maintenance work under all weather conditions. The wide service aisle provides a roomy work area indoors.



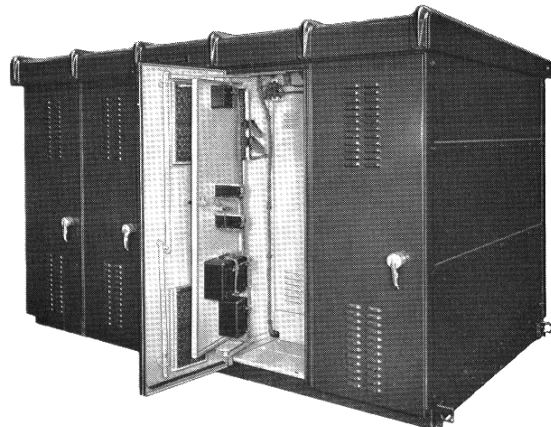
Sheltered aisle provides adequate space for inspection, maintenance and breaker interchange under all weather conditions.



Shelterfor-M outdoor metal-clad switchgear

Non-Shelterfor-M switchgear

Non-Shelterfor-M outdoor metal-clad switchgear utilizes the same assembled equipment as indoor metal-clad. In addition, water-proofing is accomplished through use of heavy gauge steel floor, finished on the exposed surfaces with all weather undercoating. Front and rear doors are double-flanged for rigidity and fitted into channel frames that assure weather resistance, with roof seams also adequately weather sealed. This outdoor type of switchgear does not include the protected aisle space for inspection and breaker interchange.



Non-Shelterfor-M outdoor metal-clad Switchgear

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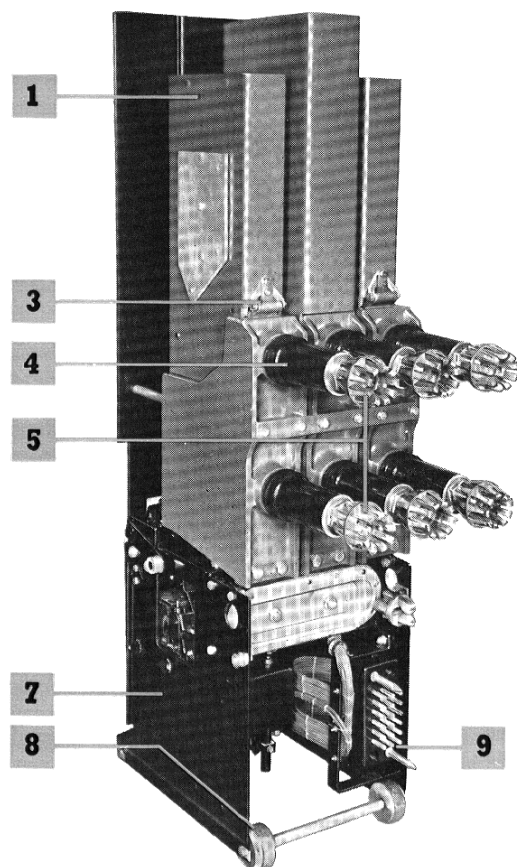
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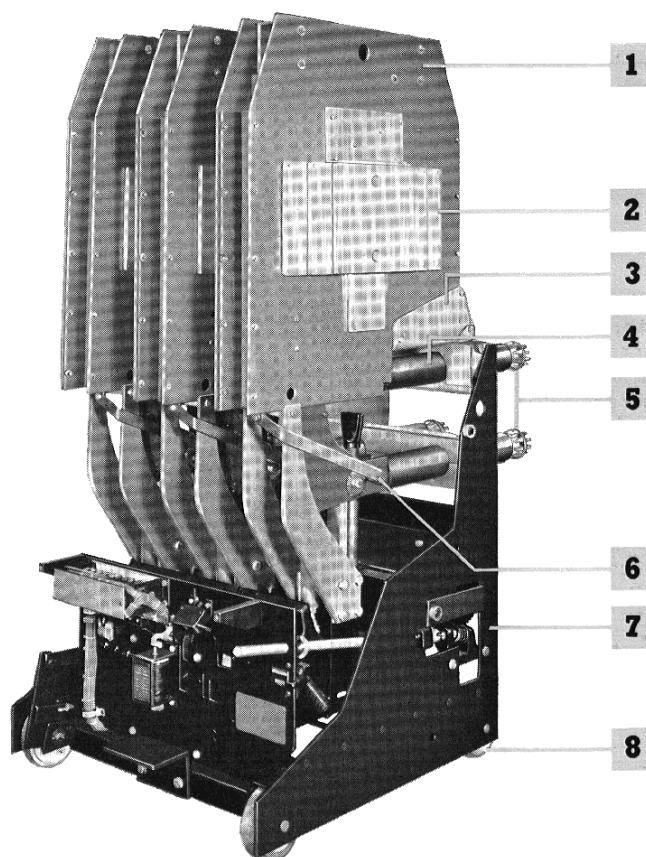
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high-voltage termination *continued*

rear view 5 kv type 50 DH 75 magnetic air circuit breaker



15 kv type 150 DH 500 magnetic air circuit breaker with barrier removed



1 arc chutes▲

2 iron pole pieces

3 tilt-back hinge

4 bushings

5 primary disconnect

6 arc horn connector

7 all-welded steel frame construction

8 two-surface wheels for mobility inside and outside structure

9 secondary contacts

▲ Limitrak® Insulation

magnetic De-ion air circuit breaker—type DH

The horizontal drawout breaker used in metal-clad switchgear is the type DH magnetic De-ion air circuit breaker. See tables on page 21 for ratings. Normally on power center application these breakers are a-c capacitor trip and a-c Rectox® closed from an a-c power source supplied from a control power transformer mounted in the switchgear.

The De-ion principle results in fast, positive arc interruption. The

true ceramic material used in constructing the arc chutes provides unusually high resistance to heat shock.

Type DH air circuit breakers are held to close dimensional tolerances to permit easy insertion and withdrawal from the housing and to allow easy interchangeability of breakers of like rating. Primary disconnects are full-floating, with high-pressure finger segments individually sprung in a single retaining ring.



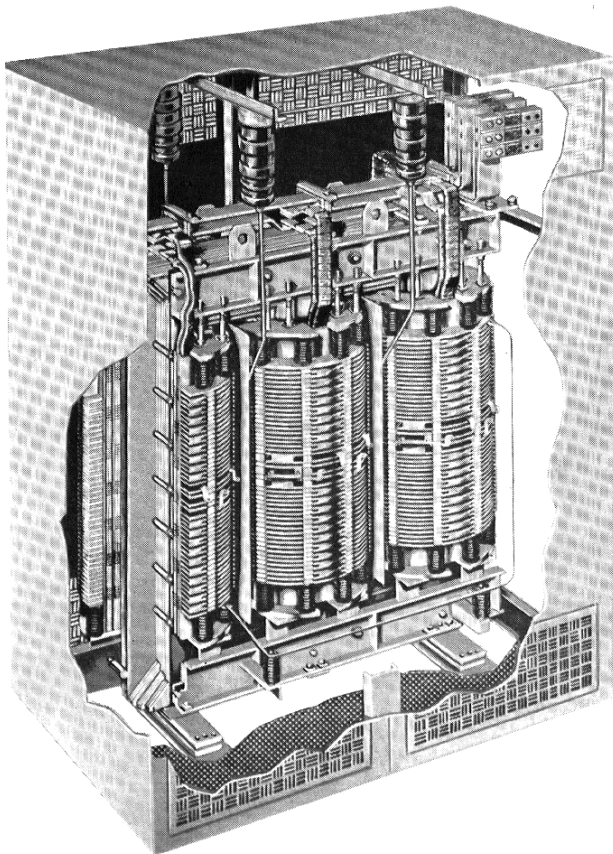
transformer

Power center transformers are available in both dry and liquid types. The dry type transformers are either ventilated or sealed and the liquid units are either oil or Inerteen-insulated. Ventilated dry type transformers are normally designed for installation indoors in dry locations. Sealed dry type transformers are designed for indoor or outdoor installation. Atmospheric conditions present no

problem since the core and coils are enclosed in a completely sealed tank. Oil-insulated transformers are suitable for installation outdoors or in vaults indoors. Inerteen-insulated transformers are used primarily for indoor installations. Inerteen, being a non-inflammable liquid, presents no fire hazard. Refer to application table on page 21 for standard ratings.

ventilated dry type

Westinghouse ventilated dry type power center transformers are supplied in two basic types, ASL and DT-3. Type ASL transformers are supplied 501 kva and above, and on all ratings, with a high voltage above 5 kv. Type DT-3 transformers are supplied 500 kva and below on units with a high voltage of 5 kv and below.



ventilated dry type power center transformer

enclosure

The entire unit is mounted in a fabricated steel framework enclosed by sheet panels and cover. Ventilation is provided through grilled openings at the bottom and top. A screen barrier is mounted behind the grilled openings to prevent damage from external objects. Removable side panels give access to the core and coils for inspection, changing of taps or removing core and coil assembly. The transformer case is thoroughly cleaned, primer coat applied and finished in light gray matching the switchgear.

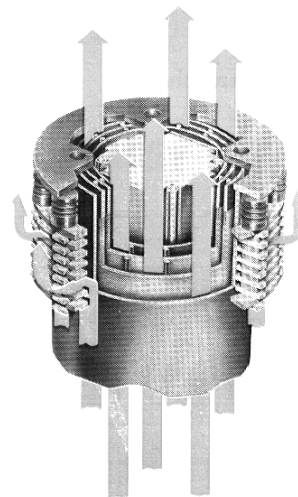
ASL power center transformer

Type ASL dry type transformers are of the conventional core form construction, and are built up of electrical steel laminations which are stepped in width to produce an approximate circular or cruciform section. Jack screws permit adjustment of each top pressure ring, which "uni-pressure" method of coil bracing insures uniform pressure distribution to all coils.

symmetrical coil arrangement

The high and low voltage windings are symmetrically arranged about the core with the low voltage cylindrical winding on the inside. Conductors are of glass insulated electrolytic copper made by a process that gives a sliverless copper of high ductility. The use of this special copper conductor eliminates surface imperfections in the conductor that cause insulation failures.

Both high-voltage and low-voltage coils are wound and assembled separately on insulating barriers. They are individually treated with a high temperature thermo-set varnish to add strength and to bond the conductor and coil insulation into place.



Large air ducts form vertical cylinders for natural draft ventilation, insulating low voltage from high voltage winding. Pancake coils provide maximum cooling surface per kva of load.

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ventilated dry type *continued*

pancake coils

The high voltage coils are of the pancake type of construction, continuous wound with no joints at section connections. The high voltage brazed taps are brought out from the center of the coil stack. With this arrangement the tapped portion of the winding is not exposed to line surges and the electrical centers are more nearly balanced on all connections.

The high voltage coil columns are supported at the top and bottom by large porcelain spacers. Transformer leads, terminals and other live parts are supported on porcelain insulators. Porcelain supports used at the major insulation points are glazed and so designed and located as to afford maximum resistance to the accumulation of moisture, dirt and dust.

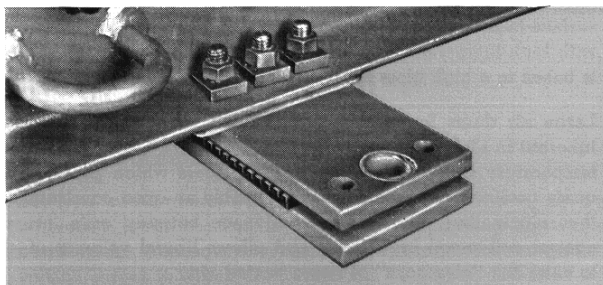
The assembled core and coils are finally treated with a high temperature, heat resistant varnish which imparts to the assembly a smooth, tough, glossy finish making it highly resistant to moisture and dirt.

insulation

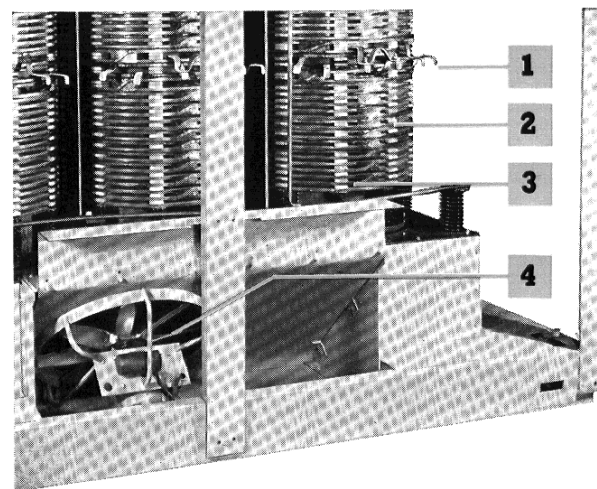
The insulation used on ventilated dry type transformers adequately meets the temperature requirements of NEMA Group II, (formerly class B) transformers. The temperature rise of ventilated dry type transformers is 80 degrees C average above a 30-degree C average ambient. Insulation used in NEMA Group II transformers consists of mica, glass, porcelain and inorganic materials in built-up form with organic binding substances. The insulation is selected and applied so as to withstand, without damage, the highest hot-spot temperatures encountered in service with natural draft ventilation.

vibration dampeners

Vibration dampeners are placed between the core and coil assembly and the base of the transformer case, reducing the transmission of vibration to the base, and possibility of external vibration noise. Flexible connections connect the transformer bus to the switchgear bus to minimize vibration transmission to the switchgear.



coil assembly features



1 high voltage tap leads

Are terminated at the coils and equipped with bolted links for changing tap position. Taps are accessible through a removable panel of the transformer case. Taps are standard ASA ratings.

2 porcelain spacers

Separate each coil section.

3 air space

Results in rapid heat dissipation, insures against coil to coil breakdown and permits liberal volumes of air to enter the inner duct for effective convection cooling augmented by the chimney effect of the rising heated air.

4 forced air ratings

Forced air cooled ratings are available on ventilated dry type transformers of 750 kva self-cooled rating and above. With the addition of air-blast equipment, the dry-type transformer has a supplemental rating of 133 percent of the self-cooled rating. This is accomplished by the addition of fans, winding temperature control relay, control panel and necessary mechanical arrangements to facilitate the increased rating. Provision for future addition of forced air cooling equipment is available on ratings 750 kva and above. This provision includes the necessary changes in mechanical arrangement, winding temperature relay (TRA), and provision only for the following; fans, control panel conduit and wiring, and current transformer.



transformer *continued*

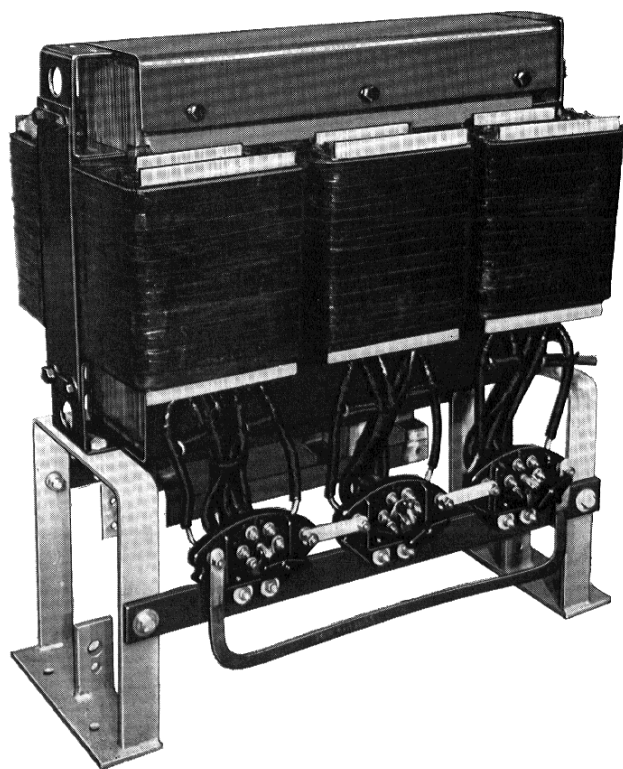
optional

type ASL thermal equipment

1. The type TRA relay (used in conjunction with a load current transformer) is a bimetal type relay having simulated self cooled winding temperature characteristics. This relay has two contacts:
 - a. To sound an alarm as the maximum safe temperature is approached.
 - b. To trip the secondary breaker if the maximum self cooled temperature is exceeded.
2. On forced air cooled transformer the TRA relay and control panel are used to control the fans. As the transformer limiting operating temperature is reached one set of contacts starts the fans. If the fans do not start and the temperature rises slightly higher the second contact closes an alarm or trip circuit.

type DT-3 power center transformer

Type DT-3 power center transformers have the conventional core construction, consisting of built-up Hipsil steel laminations, and DT-3 design high and low voltage coils.



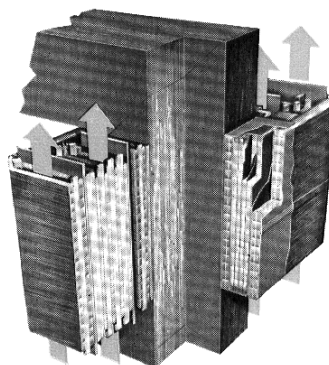
3. Hottest spot thermal indicators are of two types:

- a. Bi-metal thermometer inserted in a heater coil through which current is circulated proportional to the load current. The temperature is dial indicated. This device is equipped with three contacts which close at 133°, 140°, and 160°C and opens at 5°C less than the closing temperature. This device however, does not reflect accurate temperatures when fans are running on air blast ratings.
- b. Thermocouple type is brazed directly to the winding and connected to a millivoltmeter dial type temperature indicator. There are no contacts.

low-voltage connection

Connection to the switchgear is made by close coupling the transformer to switchgear.

core and coils



The core is constructed of "Hipsil" steel which is a cold rolled high permeability silicon steel that will carry one-third more flux than the best hot-rolled silicon steel. The use of "Hipsil" results in smaller cores, reducing weight and size appreciably. The magnetic circuit is rectangular in shape. The laminations are so designed that the flux path at corners is parallel with the grain of the steel in both yoke and leg punchings.

Coils are wound with oxygen-free copper conductor. Each individual copper conductor is insulated with glass fiber and treated with silicone varnish before it is wound into coils. The use of oxygen-free copper eliminates insulation failures resulting from surface imperfections in the conductor. The coils are impregnated with high temperature, moisture-resistant silicone varnish, which is baked to a high gloss finish.

Large air ducts for natural draft circulation through coils are inherent in all Westinghouse designs. Coils are spaced with high temperature silicone treated transite spacers which permit adequate cooling—giving the whole assembly an open construction, thus eliminating hot spots. Ample space between coils insures against coil-to-coil breakdown and allows liberal volumes of air to enter the "chimneys" of rising heated air.

power centers • dry and liquid multi-circuit unitized type

descriptive
bulletin

34-150

page 11

*112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle*

insulation

The new DT-3 transformer is designed with Group III insulation (Siliclad®) employing exclusively a silicone-base, inorganic insulation system for 150°C rise.

Silicone insulation offers greater resistance to heat, prevents charring and eventual breakdown, provides a greater margin of safety for overloads and higher operating temperature.

Case temperatures are well below Underwriters Standards maximum and approximately the same as for previous 80°C rise units.

high-voltage taps

Standard ASA rated kva de-energized taps are provided in the high voltage winding. Taps can be readily changed by hand-operated tap changer handles which are accessible through bolted-on panel.

enclosure

The entire unit is housed in a square-cornered steel case which encloses all live parts. The case has removable steel panels with louvres for cooling air circulation, and is supported on a structural steel frame suitable for lifting the complete transformer unit. All enclosures are drip-proof.

The case and structural frame are shot blasted using a fine shot to remove the scale and rust, prime coated and finished with two coats of high grade light grey paint.

Space is provided at each corner for jacking.

Four threaded holes are provided in the top of the enclosure by means of which lifting eyes are attached. The unit is shipped with the lifting eyes in place. After installation, the lifting eyes may be removed.

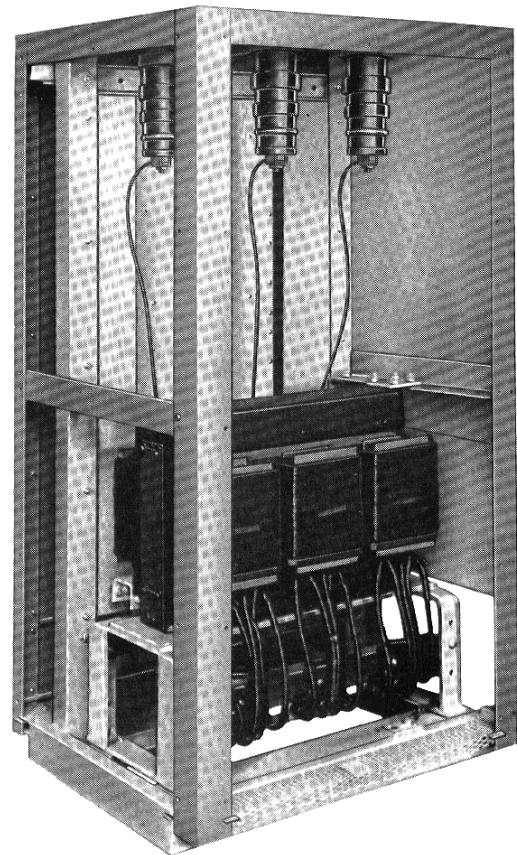
A metal barrier is provided to separate the high voltage switch from the core and coils of the transformer. This assures that, with the transformer de-energized, taps can be changed or coils inspected without the possibility of coming in contact with any live parts of the switch when in the "open" position.

vibration dampener

DT-3 core and coils float on Isomode rubber pads to reduce transmission of core noise, permitting connection of rigid conduit to case without danger of noise transmission throughout conduit and mounting equipment.

surge protection

Dry type transformers, with air as their basic insulation, have an inherently lower impulse level than corresponding liquid-filled transformers. Consequently, some consideration must be given to voltage surges to which the transformer may be exposed.



type DT-3 power center transformer

The use of dry type transformers on unexposed circuits has been proved by thousands of successful applications over a twenty-year span. Similarly, the protection of dry type transformers by low-ratio lightning arresters when applied to circuits exposed to surges has also been verified in service.

Recognizing the difficulty of predicting when arresters may be required on dry type transformers, Westinghouse is now applying type "RM" arresters to all "ASL" transformers and type "DT-3" power center transformers rated 1200 volts and above. This combination of dry-type transformers and special low protective ratio arresters is the equivalent of a liquid-immersed transformer in surge voltage application.

The arresters will normally be applied on the basis of the a-c voltage rating of the transformer and will vary, depending on whether the system is ungrounded or grounded. Where the grounding status of the system is not definitely known, it will be assumed that it is ungrounded and arresters applied accordingly.



type RM arrester



transformer *continued*

sealed dry type

Sealed dry-type ASL power center transformers are available at 300 kva, 500 kva, 750 kva, 1000 kva, 1500 kva and 2000 kva in all standard power center voltages except that on 208Y/120 volts secondary, the maximum kva is limited to 1000 kva.

enclosure

A bell-type case completely encloses the core and coils and is closed by welding the side wall to the bottom plate. The transformer case has integral top and side walls at least $\frac{1}{4}$ inch thick, with a bottom plate at least $\frac{5}{16}$ inch thick. The transformer case is hermetically sealed and is filled with nitrogen at the factory for shipment and operation. Two hand holes with welded-on covers are provided in the top of the case for making bushing connections. The transformer case is cleaned by shot-blast before the paint is applied. The finish is standard light-gray for indoor and dark blue-gray for outdoor units.

coil assembly

The design and characteristics of the core and coil are essentially the same as the ventilated type ASL, except the temperature rise is 150 degrees C average above a 30-degree C average ambient. The insulation will adequately meet the temperature requirements of NEMA Group III (formerly class H) transformers.

insulation

Solid insulation is inorganic material such as glass, porcelain, mica or asbestos in combination with a small quantity of silicone or similar binder to impart the necessary mechanical strength to the insulating structure.

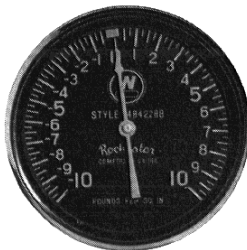
hv tap leads

High-voltage tap leads are terminated at the coils and equipped with bolted links for changing tap positions. Taps are accessible through side wall hand holes having welded-on covers. Standard ASA taps are supplied in the high voltage winding. The transformer core and coils will be mounted on a sub-base.

low voltage connection

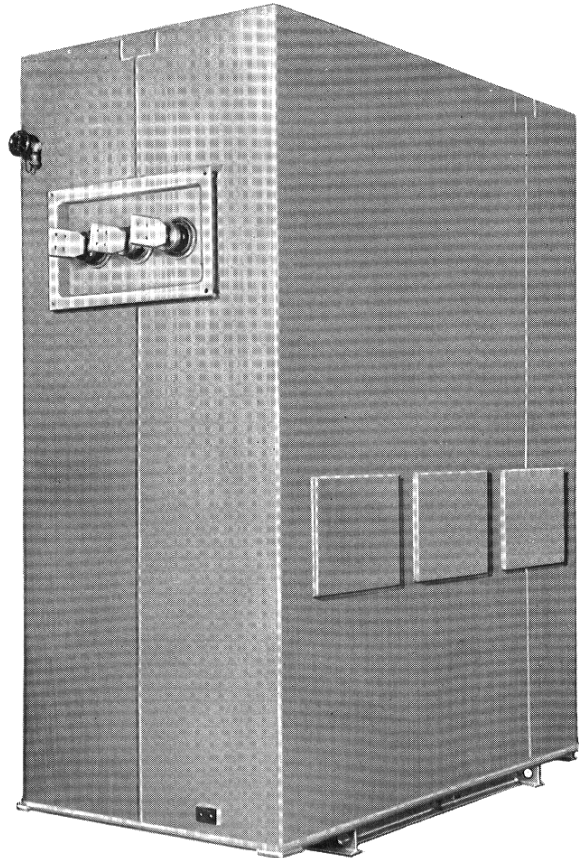
Connection to other components is made through a transition flange on indoor units and a throat on outdoor units.

pressure vacuum gauge

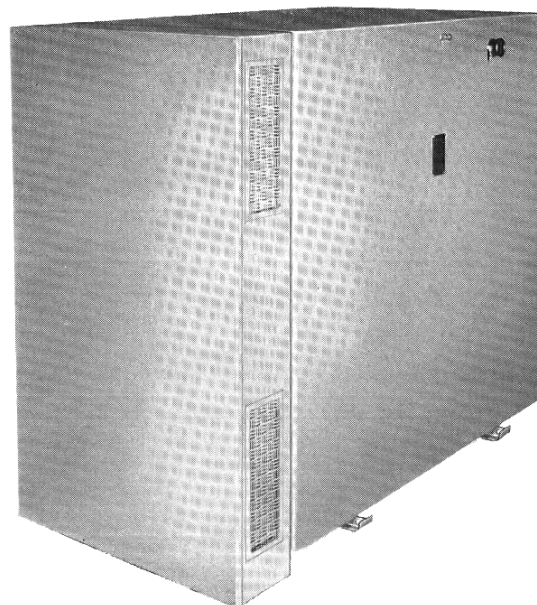


pressure vacuum gauge for sealed dry type transformer

This is a reliable weatherproof diaphragm type instrument with an easily read dial. The scale is calibrated in pounds per square inch pressure or vacuum in gas space.



outdoor sealed dry type ASL power center transformer



indoor sealed dry type ASL power center transformer

power centers • dry and liquid multi-circuit unitized type

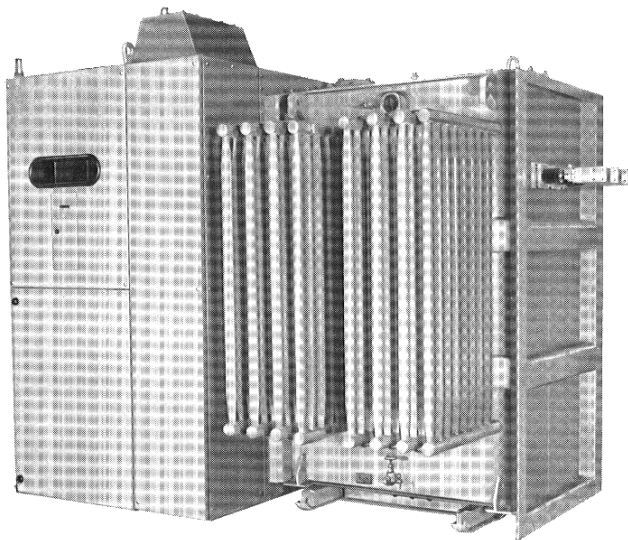
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*112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle*

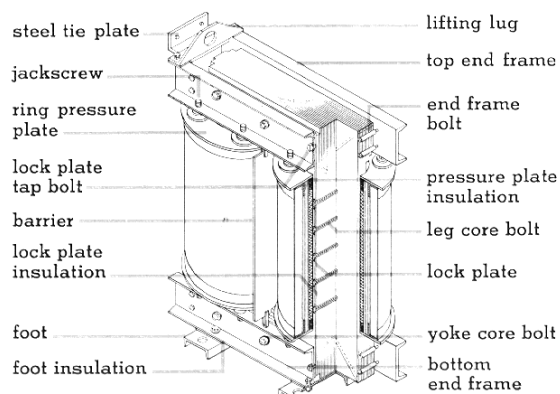
liquid-immersed type



Westinghouse liquid power center transformers utilize two basic types of core form construction. On ratings 225 kva through 2000 kva type SL construction is supplied and type S is supplied on 112½ and 150 kva transformer.

core

The core of the type SL transformer is built up of laminations of Hipersil® magnetic alloy steel, which is carefully annealed before stacking. These laminations are insulated with an inorganic material to withstand annealing temperatures. Legs are of uniform cross section with laminations held securely by insulated core bolts. Steel plates are used to give core legs rigidity.



Four way sled-runner base simplifies transformer movement.

coils

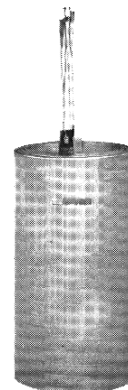
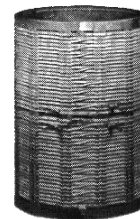
Two types of coils are supplied on liquid power center transformers: continuous-wound pancake coils and cylindrical-wound coils.

continuous-wound pancake

These coils consist of a column or stack of disk sections separated by horizontal oil ducts. The conductor consists of from one to five rectangular straps in parallel, wound continuously over vertical pressboard strips on a pressboard cylinder. Vertical oil ducts separate the conductor from the cylinder.

cylindrical-wound coils

Consist of one or more layers of insulated conductors on a heavy pressboard cylinder with liquid impregnated pressboard insulation, and vertical cooling ducts between adjacent layers. To provide additional mechanical strength, epoxy treated glass tape is wound around each coil and after heat treatment the tape has a strength comparable to steel.



insulating liquid

Liquid transformers are available with two types of insulating liquid, Wemco "C" oil and Inerteen. Inerteen is a non-inflammable liquid.

liquid preservation

To insure satisfactory operation of power center transformers, sealed-tank construction is used to exclude oxygen and moisture to prevent deterioration of insulating liquid and insulation.

With the sealed-tank construction, the transformer cover is welded to the tank wall. Adequate gas space is provided above the insulating liquid to limit internal pressure due to normal load-cycle operation.

A pressure relief device will be supplied on Inerteen transformers.

low-voltage connection

Connection to the low-voltage switchgear is made through a transition flange on indoor units and a throat on outdoor units.

Super Insuldur®

Now used in all new Westinghouse liquid-immersed power center transformers, the Super Insuldur system significantly retards the deterioration of transformer insulation. This system, a product of continuing research and development, utilizes insulation material that has been stabilized during manufacturing processes through use of chemicals which are insoluble in oil or inerteen. Transformers protected with Super Insuldur will carry 12% more kva load with an approximate 65°C temperature rise . . . with normal life expectancy.

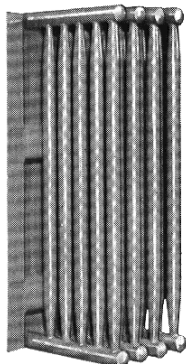
■ Westinghouse trade-mark

**transformer** *continued***liquid-immersed type****cooling**

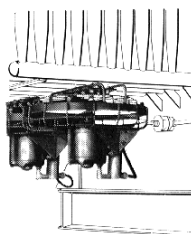
Cooling of liquid power center transformers is accomplished by circulating the insulating liquid through cooling tubes welded into headers that are in turn welded to the tank wall.

Proper bracing of coolers reduces vibration to a minimum. Each cooler is pressure tested at 75 pounds per square inch to assure freedom from leaks. They are located so that jacking clearances are not reduced.

forced air ratings are available 750 kva and above, with the addition of air blast equipment. The liquid transformer has a supplemental rating of 115 percent of the self-cooled rating. This is accomplished by mounting fans below the cooling tubes. The control for the fans is from top oil temperature with the fans started from a contact on a liquid temperature relay. Provision for future addition of forced-air cooling equipment is available on ratings 750 kva and above. This provision includes the necessary mechanical arrangement, additional material and provision only for the following: fans, conduit, wiring and mounting of control cabinet. Fans normally operate from a 230 volt, 60 cycle, single phase supply voltage.



tubular coolers



air blast fans mounted below tubular coolers on transformer tank.

tank construction

Tanks are rectangular with rounded corners, and are designed to withstand full vacuum and operating pressures. The tank walls are flanged outward at the top to form a platform for the cover plate which is welded on.

Welded to the base plate of the tank is a rectangular steel I-beam base. The unique sled-runner design of I-beams simplifies movement when pulling the transformer forward, backward or to either side. Holes in the ends are for cable attachment.

high voltage taps

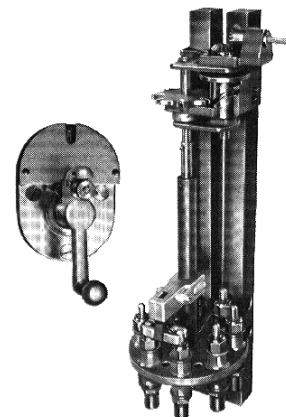
Standard rated kva taps are provided in the high voltage winding. The tap positions are changed at no load with the type WSB tap changer.

WSB tap changer

De-energized tap changers make matching of line voltage quick and convenient when the transformer is de-energized.

The operating crank is located on the top of the tank. One complete revolution of the crank is required for each tap change.

The tap-changer handle has provision for padlocking.

**standard accessories****description****kva ratings**

	45 through 2000	300 through 2000	112½ through 2000	
	ventilated dry type	sealed dry type	oil filled	Inerteen filled
de-energized tap changer on cover externally operated	...	...	x	x
no-load taps, internally connected	x	x	...	...
combination drain and filter valve and sampling device	...	...	x	x
pressure test connection	...	x	x	x
1-inch filling plug in cover	...	...	x	x
1-inch filter press connection in cover with pipe extended below liquid level	...	...	x	x
thermometer (dial type—without alarm contacts)	...	...	x	x
liquid-level gauge (without low level alarm contacts)	...	...	x	x
provision for lifting	x	x	x	x
jack pads	x	x	x	x
stubbed taps and connector (ASL)	x	x	...	...
pressure relief diaphragm	...	...	...	x
ground pad	x	x	x	x
top sampling device	...	...	...	x
instruction nameplate	x	x	x	x
de-energized tap changer, internally operated (DT-3 only) 112½-500 kva, 5 kv and below	...	...	...	...
pressure vacuum gauge	...	x	x	x
1-inch pipe plug at bottom and top	...	x	...	...
welded on main tank cover	...	x	x	x
type RM arresters, 1200 volts and above	x	x	...	...

power centers • dry and liquid multi-circuit unitized type

112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle

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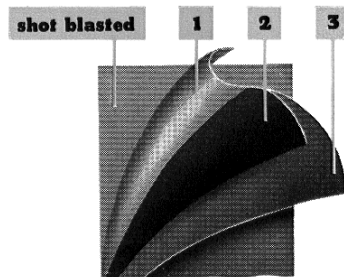
page 15

temperature indicators for type SL transformers (optional)

In addition to the top oil temperature indicator described above additional temperature indicators are available:

- a. Dial type hottest spot temperature indicator consists of an indicating dial thermometer, heating coil, and current transformer. This instrument indicates the hottest spot in the transformer winding.
- b. TRO-1 thermal load indicating relay is a combination overload protective device and thermal load indicator. This relay reflects winding temperature and is equipped with alarm contacts to control forced-air cooling fans and trip a circuit breaker if the safe overload rating of the unit is exceeded. Also equipped with a dial to indicate percent thermal load.

Coastal Finish®



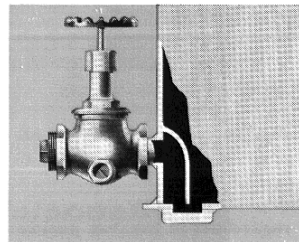
outdoor units ASA #24

The tanks are shot blasted to remove all traces of dirt, mill scale, rust and grease. Three coats of paint are applied by flow-coating: (1) a resilient prime coat of zinc chromate and iron oxide which inhibits spread of corrosion if the tank surface is scratched; (2) intermediate coat of phenolic and alkyd resins with suspended mica flakes that produces a tough shingle-roof effect capable of resisting moisture, oxygen, salts, acids and alkalis; (3) finish coat of weather-proof blue-gray enamel for neat appearance, and also to prevent the sun's damaging ultra-violet rays from reaching the primary and intermediate coats.

indoor units

Indoor transformers have a similar finish except that the third finish is a light grey ASA #61.

liquid drain valve, filter press connection



Valve arrangement, combined with tank sump, assures bottom sampling and complete oil drainage. Valve is placed above tank base for protection in shipping and handling and to avoid interference with tank welds.

combination indicator assembly

This assembly is supplied to give an indication of liquid level, liquid temperatures and gas space pressure. The indicator assembly consists of standard indicating elements grouped together in a common case.



The liquid level gauge is a float operated magnetic-coupled instrument with an easy to read scale marked to show the minimum, normal and maximum liquid level points.

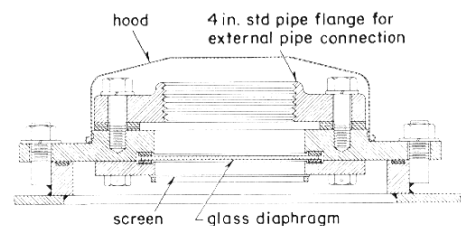
The liquid temperature thermometer is a bimetal, dial type. An auxiliary red pointer is provided for indicating the maximum obtained temperatures between readings.

The vacuum pressure gauge is a reliable diaphragm type instrument with an easily read dial.

The above assembly is supplied on all ratings of liquid transformers.

Alarm contacts are not available on the combination indicator, but a separately mounted liquid temperature relay with two sets of contacts used for fan control and alarm can be provided.

pressure relief device



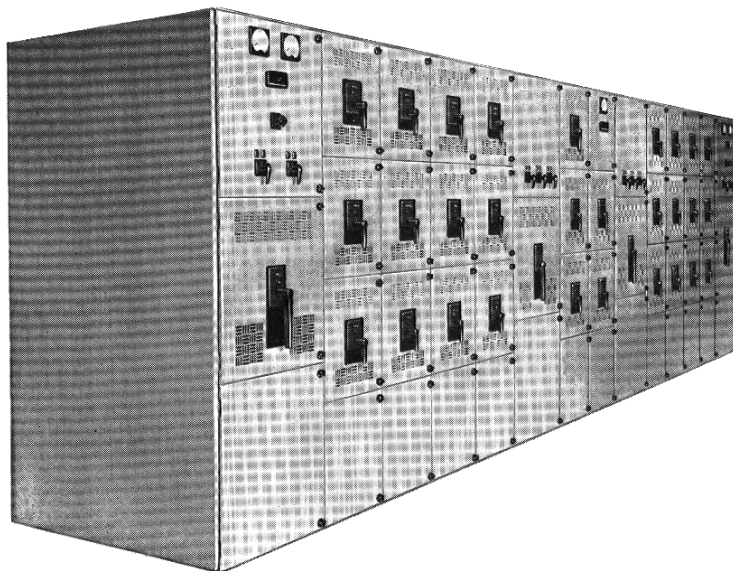
On Inerteen-immersed units a diaphragm relief device is furnished. The patented relief device consists of a sheet of glass mounted on a special manhole cover on the top of the transformer case with provisions for connection to customers outside venting system.



low-voltage termination

metal-enclosed switchgear

indoor



indoor: Indoor low-voltage metal-enclosed switchgear utilizes universal frame structure, which provides for great flexibility and adaptability to the installation requirements. The metal-enclosed switchgear is divided into compartments for safety and reliability. Each breaker is mounted in a separate compartment with studs extending to the rear bus compartment for connection to the main bus. The main bus, of high conductivity bare bars, is silver plated to assure a good contact surface at the joints.

The front breaker enclosure is constructed of heavy gauge steel. The top, rear and ends are enclosed with removable sheet steel. Indoor low-voltage switchgear finish consists of a cleaning, and phosphatizing treatment, followed immediately by a rust resisting primer coat. The interior and exterior are given a light gray ASA #61 finish coat of paint.

Indoor low-voltage switchgear is close coupled to ventilated dry type power center transformer and connected to liquid units through a transition flange.

3 position design DB air circuit breakers

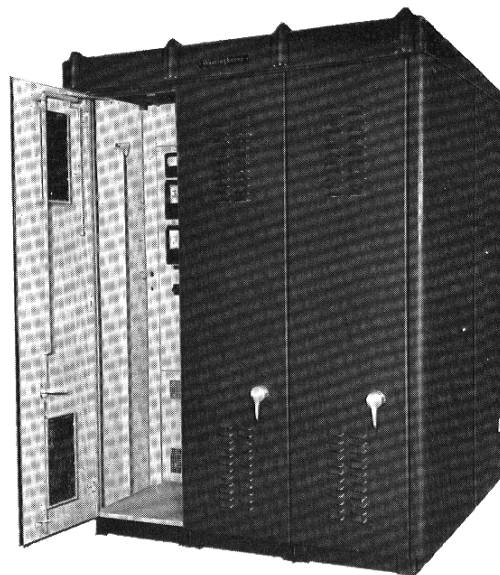
Power centers are available with a wide variety of low-voltage metal-enclosed switchgear arrangements. The low-voltage metal-enclosed switchgear is shipped separately from the transformer and is bolted to the transformer in the field.

Westinghouse low-voltage metal-enclosed switchgear of draw-out construction is furnished with 3-position DB air circuit breaker design—as a standard feature.

The 3-position breaker design permits the door of the breaker compartment to be closed with the type DB breaker in any three of its recognized positions—"connected", "test", "disconnected".

The 3-position feature offers important convenience and safety

outdoor



outdoor: Outdoor low-voltage switchgear consists essentially of standard indoor low-voltage metal-enclosed switchgear, enclosed in an integral-type weatherproof assembly.

Each standard frame section is mounted on a heavy-formed steel-plate base. The weatherproof enclosure is provided with hinged doors on the front and the rear for easy access to the bus compartment or to the breaker drawout side of the assembly. The weatherproof assembly is of the "walk-in" type. This provides an enclosed aisle space to permit drawing the breaker out without exposure to the weather. The outdoor switchgear is equipped with heaters, lights and convenience outlets.

The finish treatment for the outdoor structure is essentially the same as for the indoor switchgear except the color is dark blue-gray ASA #24 and a heavy rubberized sealing compound is sprayed on the under-surface of the housing to protect against corrosion.

Outdoor low-voltage metal-enclosed switchgear is throat-connected to the liquid or sealed dry type power center transformers.

to operating personnel, and greater protection to the circuit breaker, such as:

- closed door protection of the breaker at all times: The cell serves as a storage space for the breaker when it is in the fully connected position
- free aisle space regardless of breaker position
- easy recognition of breaker position
- breakers can be disconnected while maintenance is performed on equipment controlled

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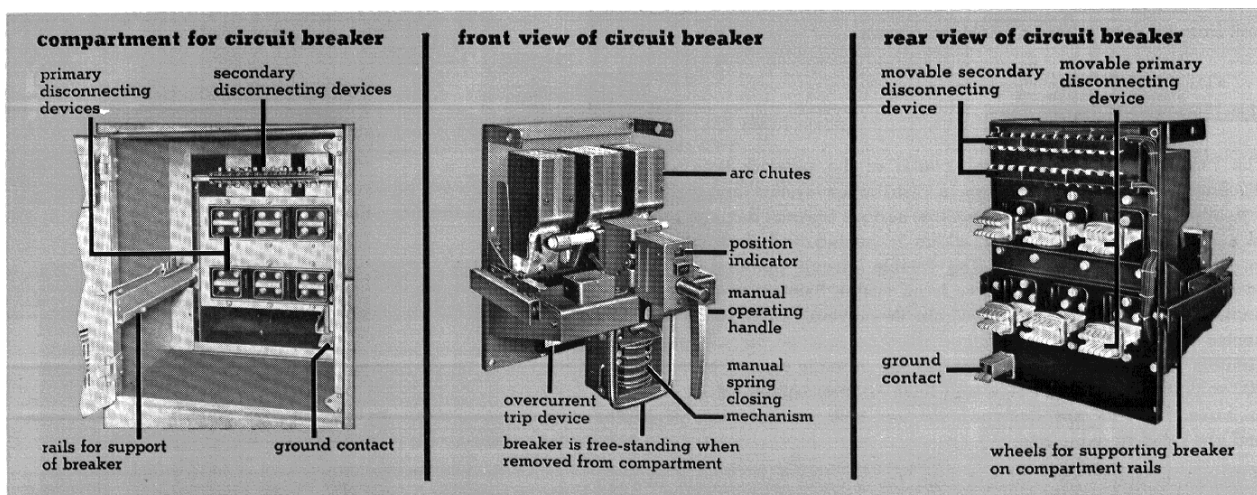
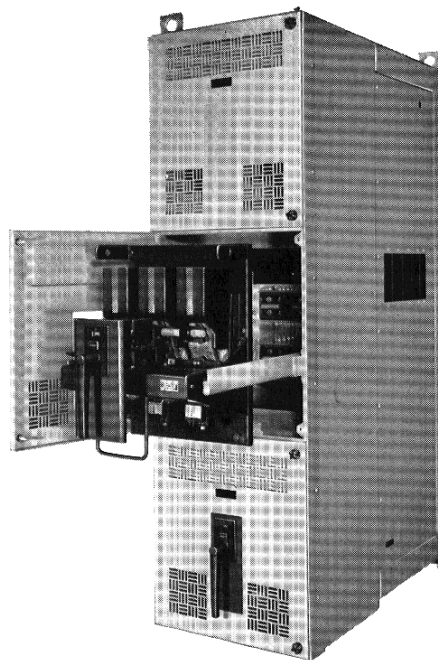
*112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle*

drawout DB air circuit breakers

Drawout type DB air circuit breakers are used in low-voltage metal-enclosed switchgear—available in short circuit ratings from 15,000 ampere rms to 150,000 ampere rms, depending on breaker size and voltage at which breaker is applied. These breakers can be manually, spring-manual or electric-solenoid operated for the types DB-15, DB-25 and DB-50; and electrically operated only for DB-75 and DB-100 air circuit breakers. Refer to application table k, pages 23 and 24, for ratings of various types and application data. The removable DB-15, DB-25 and DB-50 breakers are drawn out on extension rails and the DB-75 and DB-100 are floor-wheel mounted to roll out of the cell. All breakers can be easily moved from "connected" to "test" or "disconnect" positions.

automatic tripping device

Each pole of a DB breaker is equipped with a dual, overcurrent series tripping device. It provides automatic tripping of the circuit breaker, with delayed tripping on overcurrent of motor starting magnitudes and instantaneous tripping on high current faults. Trip elements with long and short time delay characteristics are available for selective trip applications. For complete ratings refer to table k, pages 23 and 24.



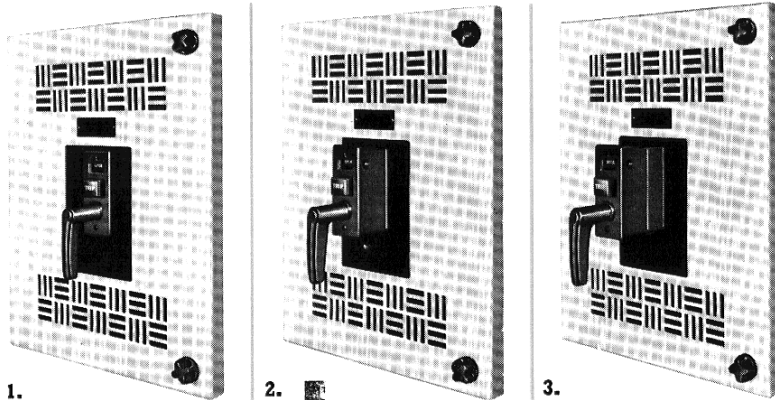
further information:

For more complete description of low-voltage metal-enclosed switchgear, see descriptive bulletin 32-150. Low-voltage air circuit breakers (DB-15, DB-25 and DB-50) provided in Westinghouse power centers are available with a choice of manual, spring-manual or electric solenoid closing mechanisms, see descriptive bulletin 33-850.



low-voltage termination *continued*

3-position DB breaker operation



1. connected position
2. test position
3. disconnected position

The composite photograph shows the breaker in all three positions—"connected", "test", "disconnected"—to illustrate how a portion of the breaker mechanism extends through the switchgear door when the breaker is placed in these three standard positions. The 3-position feature is provided by a movable trim plate on the breaker operating mechanism.

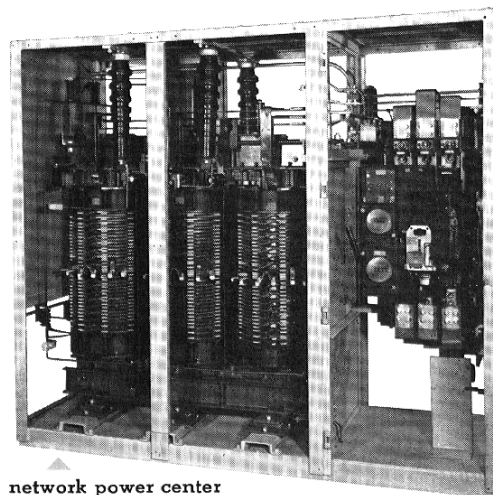
network protector

The network protector as used in power centers of the network type is a specially-designed a-c motor closed and a-c shunt tripped air circuit breaker controlled by network relays. The network relays function to close the protector automatically only when voltage conditions are such that its associated transformer will supply load to the secondary loop, and to open the protector automatically when power flows from the secondary loop to the network transformer. The purpose of the network protector is to protect the secondary loop and the loads fed from it against transformer and primary feeder faults by disconnecting the defective feeder—transformer unit from the loop where a backfeed occurs.

limiter section

The limiter section of a power center of the network type serves to disconnect a faulted cable from a distribution system and protect the unfaulted portion of that cable against serious thermal damage by means of a circuit opening member which is heated and destroyed by the circuit passing through it. The fusible circuit opening member is completely enclosed so that there is no visible flame or smoke when the limiter interrupts any current within its current rating and when connected in a circuit whose voltage does not exceed its voltage rating. Limiters for industrial plant networks are suitable for use on circuits of 600 volts, 60 cycles and below and have an interrupting rating of 50,000 amperes. Limiters are designed for use with various sizes of cables and are rated in cable size.

A limiter is not to be confused with the present day current limiting fuse. It is so named because its function is to limit secondary cable or bus damage which is caused by secondary faults.



network power center
transformer and network protector



power center limiter section

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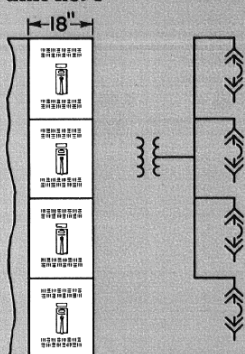
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112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle

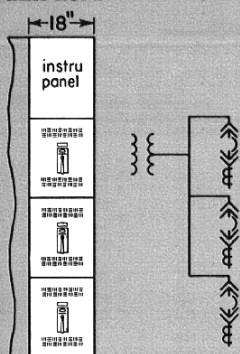
switchgear arrangements with standard 90 in. high sections—basic and optional

unit no. 1



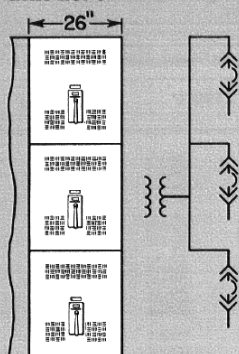
type DB-15 or DB-25 ACB
four high

unit no. 2



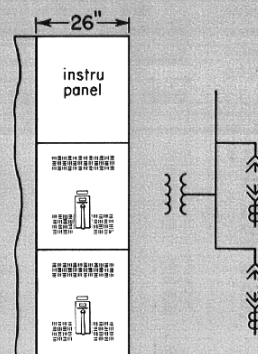
type DB-15 or DB-25 ACB
three high with 22½ in.
instrument panel

unit no. 3



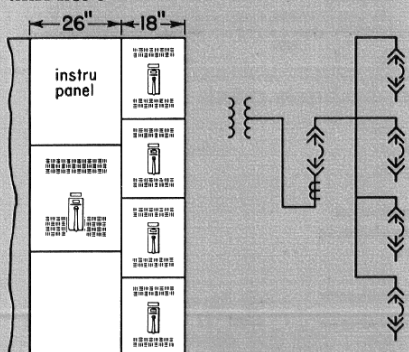
type DB-50 ACB
three high

unit no. 4



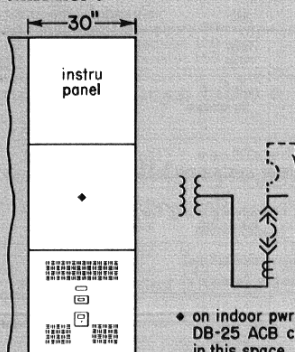
type DB-50 ACB
two high with 30 in.
instrument panel

unit no. 5



type DB-50 main breaker
and four DB-25
or DB-15 feeders

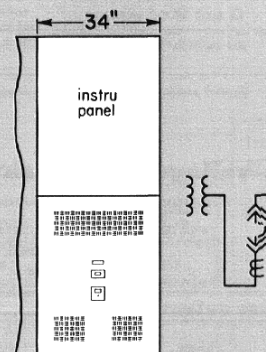
unit no. 6



type DB-75 ACB main breaker with 30 in.
or 60 in. instrument panel

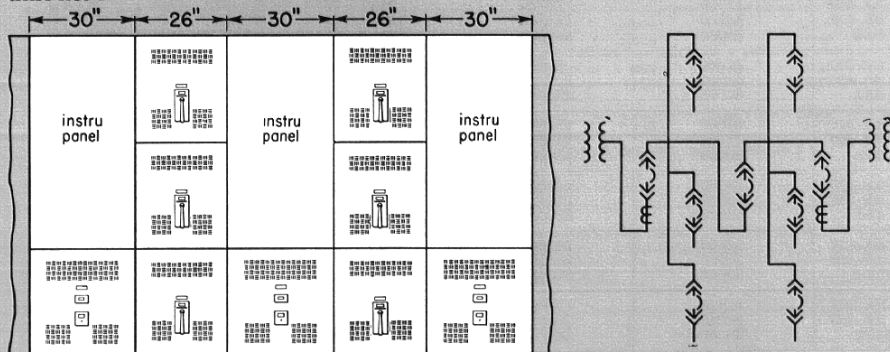
• on indoor pwr ctrs DB-50 or
DB-25 ACB can be mounted
in this space

unit no. 8



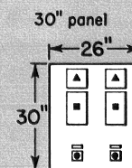
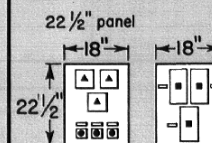
type DB-100 ACB
main breaker with 45 in.
instrument panel

unit no. 7



type DB-75 ACB main and tie with type DB-50 ACB feeders

instrument panel
arrangements



legend

- ▲ — ammeter
- — ammeter switch
- — watt-hour meter

**application data****high-voltage termination****disconnect switches (air and liquid): table a**

kva	G and W oil cutouts				Westinghouse mag. break switch oil-Inerteen, unfused		type LCB air load break		
	fused		unfused (load break)		2400 4160 v	8.66 and 15 kv	2400 v	4160 v	8.66 and 15 kv
	2400 v	4160 v	2400 v	4160 v					
112.5	x	x	x	x	x	x	x	x	x
150	x	x	x	x	x	x	x	x	x
225	x	x	x	x	x	x	x	x	x
300	x	x	x	x	x	x	x	x	x
500	x	x	x	x	x	x	x	x	x
750	no	x	x	x	x	x	x	x	x
1000	no	no	no	x	x	x	x	x	x
1500	no	no	no	no	x	x	x	x	x
2000	no	no	no	no	x	x	x	x	x

switch ratings: table b

type		contin- uous current (amps)	insula- tion medium	interrupts load current (500 operations)			interrupts load current (100 operations)		
				4.76 kv	8.66 kv	15 kv	4.76 kv	8.66 kv	15 kv
FC42	G and W oil cutouts	200	oil	200	...	...	200	...	...
LCB	air switch—load current break— 5 kv	600	air	600	...	...	600	...	...
	15 kv	600	air	...	200	100	...	600	600
	liquid switch magnetizing current break	400	oil Inerteen	...	...	...	...	...	...

high-voltage load break switch and fuse assemblies: table c

voltage class kv	nominal voltage	air insulated switch type	fuse type	① interrupting capacities— maximum		① maximum transformer kva
				asymmetrical amps (rms) ③	equivalent 3-phase kva	
oil fuse cutouts						
5	2400			12500	32000	500
	4160 ungrounded			9600	43000	500
	4160 grounded			12500	56000	750
air insulated switch and fuse						
5	2400	LCB	BA-200	17500	45400	300
			BA-400	30000	78000	750
			BAL	60000	150000	300
	4160	LCB	BA-200	17500	78700	750
			BA-400	30000	135000	1500
			BAL	60000	250000	750
4800	LCB	BA-200	17500	91000	750	
		BA-400	30000	156000	1500	
		BAL	60000	250000	750	
7.5	6900	LCB	BA-200	15000	112000	③1250
			BA-400	25000	186500	2000
			BAL	80000	500000	500
	7200	LCB	BA-200	15000	116600	1250
BA-400			25000	194400	③2000	
		BAL	80000	500000	500	
15	12000	LCB	BA-200	12500	162000	③2000
			BA-400	20000	259000	③2000
			BAL	50000	500000	1000
	13200	LCB	BA-200	12500	179000	③2000
			BA-400	20000	286000	③2000
			BAL	50000	500000	1000
13800	LCB	BA-200	12500	187000	③2000	
		BA-400	20000	300000	③2000	
		BAL	50000	500000	1000	

① For fuse interrupting capacities and transformer kva ratings (self-cooled or forced air-cooled) above the maximum listed with switch and fuse assembly. Refer to Unit Equipment Section, East Pittsburgh.

② May be applied up to 2500-kva maximum with air blast on the basis of breaking magnetizing current only.

③ Asymmetrical rms current (1.6 x symmetrical) at system voltage. The interrupting current rating is given as the rms instantaneous asymmetrical value which includes the d-c component. A fault occurring at or near the zero point on the voltage wave may reach, for the first half cycle, a value 1.6 times that of the symmetrical current wave.

Since system kva calculations are usually based on rms symmetrical current, the kva ratings in symmetrical kva can be obtained by dividing the asymmetrical current values by 1.6.

symmetrical (equivalent)
kva =

$$\frac{\text{voltage (kv)} \times \text{amperes (asymmetrical)} \times 1.73}{1.6}$$

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112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle

high-voltage air circuit breakers: ①available breaker types: table d

air circuit breaker type	3-phase inter- rupting rating mva	voltage ratings		current ratings in amperes				interrupting rating—amperes		60 cycle test for one minute kv	impulse rating open or closed gap kv
		rated kv	max. design kv	min kv for rated int mva	contin- uous 60 cy	short time momen- tary	4 second	at rated voltage	max. amperes		
50-DH-75	③75	4.16	4.76	3.5	1200	20000	12500	10400	12500	19	60
50-DH-150	②150	4.16	4.76	3.5	1200	40000	25000	21000	25000	19	60
50-DH-150	②150	4.16	4.76	3.5	2000	40000	25000	21000	25000	19	60
50-DH-250	②250	4.16	4.76	3.85	1200	60000	37500	35000	37500	19	60
50-DH-250	②250	4.16	4.76	3.85	2000	60000	37500	35000	37500	19	60
50-DH-350	350	4.16	4.76	4.0	1200	80000	50000	48600	50000	19	60
50-DH-350	350	4.16	4.76	4.0	3000	80000	50000	48600	50000	19	60
75-DH-250	250	7.2	8.25	4.6	1200	51000	32000	20000	32000	36	95
75-DH-250	250	7.2	8.25	4.6	2000	51000	32000	20000	32000	36	95
75-DH-500	500	7.2	8.25	6.6	1200	70000	44000	40000	44000	36	95
75-DH-500	500	7.2	8.25	6.6	2000	70000	44000	40000	44000	36	95
150-DH-150	②150	13.8	15.0	6.6	1200	20000	13000	6300	13000	36	95
150-DH-250	②250	13.8	15.0	6.6	1200	35000	22000	10600	22000	36	95
150-DH-250	②250	13.8	15.0	6.6	2000	35000	22000	10600	22000	36	95
150-DH-500	500	13.8	15.0	11.5	1200	40000	25000	21000	25000	36	95
150-DH-500	500	13.8	15.0	11.5	2000	40000	25000	21000	25000	36	95
150-DH-750	750	13.8	15.0	11.5	1200	60000	37500	31000	37500	36	95
150-DH-750	750	13.8	15.0	11.5	2000	60000	37500	31000	37500	36	95
150-DH-1000	1000	13.8	15.0	11.5	1200	80000	50000	42000	50000	36	95
150-DH-1000	1000	13.8	15.0	11.5	3000	80000	50000	42000	50000	36	95

① For technical data concerning application of power breakers, see technical data 33-060.

② 2400-volt application
50-DH-75 will interrupt 50 mva
50-DH-150 will interrupt 100 mva
50-DH-250 will interrupt 150 mva

③ 4800-volt application
150-DH-150 will interrupt 108 mva
150-DH-250 will interrupt 183 mva

transformer data: standard ratings and impedances: table e

hv rating (volts) delta	ASA standard taps	low voltage rating	kva ratings								① design imped- ance
			Inerteen or oil immersed type		ventilated dry type ASL		ventilated dry type DT-3		sealed dry type		
			self cooled	contin- uous forced air cooled	self cooled	contin- uous forced air cooled	self cooled	contin- uous forced air cooled	self cooled	contin- uous forced air cooled	
2400	2520-2460-2340-2280	208 wye/120	.....	.....	.....	.....	112.5	none	.....	.....	2.3
4160	4360-4260-4055-3950	240 delta	.....	.....	.....	.....	150	none	.....	.....	2.8
4800	5040-4920-4680-4560	480 wye/277	.....	.....	.....	.....	225	none	.....	.....	4.8
		480 delta	.....	.....	.....	.....	300	none	.....	.....	6.0
			.....	.....	.....	.....	500	none	.....	.....	6.0
2400 4160 4800 6900 7200 12000 13200 13800	2520- 2460- 2340- 2280 4360- 4260- 4055- 3950 5040- 4920- 4680- 4560 7245- 7070- 6730- 6555 7560- 7380- 7020- 6840 12600-12300-11700-11400 13860-13530-12870-12540 14490-14145-13455-13110	208 wye/120	.....	.....	②150	none	.....	.....	.....	.....	5.0
		240 delta	.....	.....	②225	none	.....	.....	.....	.....	5.0
		480 wye/277	112.5	none	.....	.....	.....	.....	.....	.....	4.0
		480 delta	150	none	.....	.....	.....	.....	.....	.....	4.0
			225	none	.....	.....	.....	.....	.....	.....	4.5
		208 wye/120	300	none	③300	none	.....	.....	300	none	5.0
		240 delta	500	none	③500	none	.....	.....	500	none	5.0
		480 wye/277	750	862	750	1000	.....	.....	750	none	5.75
		480 delta	1000	1150	1000	1333	.....	.....	1000	none	5.75
			480 wye/277	1500	1725	1500	2000	1500	none	5.75
		480 delta	2000	2300	2000	2666	.....	.....	2000	none	5.75

① Subject to standard tolerance of $\pm 7\frac{1}{2}\%$.

② Available only with primary voltage above 5 kv.

NEMA sound level: table f

equivalent 2 winding kva self-cooled	15 kv class and below average level in decibels			equivalent 2 winding kva forced air	15 kv class and below: average level in decibels		
	liquid (OA) 65° C rise	air (AA) 80° or 150° C rise	sealed dry (AA) 150° C rise		liquid (OA/FA) 55° C rise	air (AA/FA) 80° C rise†	sealed dry (AA/ FA) 150° C rise†
0 to 300	55 db	58 db	57	690 to 833	67 db	.....	.....
301 to 500	56 db	60 db	59	834 to 1167	67 db	.....	.....
501 to 750	57 db	62 db	63	1168 to 1667	67 db	.....	.....
751 to 1000	58 db	64 db	63	1668 to 2000	67 db	.....	.....
1001 to 1500	60 db	65 db	64	2001 to 2667	67 db	.....	.....
1501 to 2000	61 db	66 db	65	2668 to 4000	67 db	.....	.....
				2001 to 3333	.....	.....	.....

See NEMA standards Pub. TR-1-1954

No standards have been published to date for sealed ASL transformers.

Use same levels as listed for ventilated ASL.

† Refer to East Pittsburgh Headquarters.

**application data** *continued***transformer data: continued****basic impulse levels for power centers: table g**

voltage class	transformers		switches		switch-gear metal-clad
	liquid	dry	air type	liquid	
			LCB		
1.20	30	10			
2.50	45	20	60	45	60
5.00	60	25	60	①60	①60
8.66	75	35	95	75	95
15.00	95	50	95	95	95

① except 4800 v circuits—95 kv BIL

② except 4800 v circuits—75 kv BIL

③ Terminal chamber same BIL as transformer

lightning exposure: Transformers and related equipment may be subject to overvoltages resulting from lightning or switching surges, and should be suitably protected.

temperature guarantees: table h

altitudes must not exceed 1000 meters (3300 feet)

type of cooling	① ambient degrees	② rise degrees	hot spot rise degrees
liquid-immersed transformers	30 C	55 C	65 C
ventilated dry type	30 C	80 C	110 C
ventilated dry type (DT-3)	30 C	150 C	180 C
sealed dry type	30 C	150 C	180 C

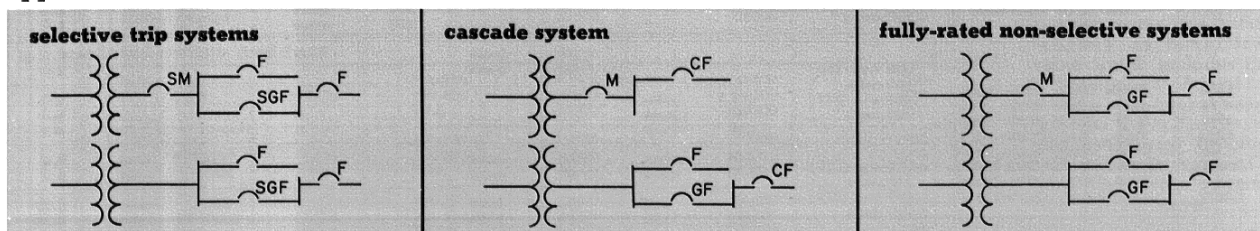
① The temperature of the cooling air (ambient temperature) must not exceed 40 degrees C and the average temperature of the cooling air for any 24-hour period must not exceed 30 degrees C.

② Degree rise is the average copper temperature rise by resistance. See ASA standard TR3-10.

limits of application for low voltage breakers**air circuit breakers: table i**

type of breaker	60 cycle a-c voltage	interrupting rating (RMS amperes)		range of continuous rating in amperes	maximum short circuit current at which breaker can be applied (RMS) amperes			
					cascade system		selective system	
		asym- metrical▲	symmetrical		asym- metrical▲	symmetrical	asym- metrical▲	symmetrical
DB-15	240 and below	30000	25000	30-225	60000	50000	15000	14000
DB-25	240 and below	50000	42000	150-600	100000	85000	25000	22000
DB-50	240 and below	75000	65000	600-1600	120000	100000	50000	42000
DB-75	240 and below	100000	85000	2000-3000	150000	130000	75000	65000
DB-100	240 and below	150000	130000	4000	150000	130000	100000	85000
DB-15	241-480	25000	22000	20-225	50000	42000	15000	14000
DB-25	241-480	35000	30000	100-600	70000	60000	25000	22000
DB-50	241-480	60000	50000	400-1600	100000	85000	50000	42000
DB-75	241-480	75000	65000	2000-3000	100000	85000	75000	65000
DB-100	241-480	100000	85000	4000	100000	85000	100000	85000
DB-15	481-600	15000	14000	15-225	30000	25000	15000	14000
DB-25	481-600	25000	22000	40-600	50000	42000	25000	22000
DB-50	481-600	50000	42000	200-1600	100000	85000	50000	42000
DB-75	481-600	75000	65000	2000-3000	100000	85000	75000	65000
DB-100	481-600	100000	85000	4000	100000	85000	100000	85000

▲ average of 3 phases

application of low-voltage air circuit breakers in power centers

Selective tripping based on time discrimination can easily be arranged to isolate faulted circuits without interruption of power to unfaulted branches. This would require all breakers (SM, SGF, F) to be applied on the basis of having full interrupting capacity for system involved. By properly selecting the time-current characteristics for each breaker in the system, the breaker nearest the fault will automatically open first to remove overcurrent condition. The breakers nearer the source will remain closed and continue to supply the unfaulted circuits.

In some installations where a large number of feeder breakers are on the secondary of the power center, it may be economically justified to install cascaded air circuit breakers. In this type of arrangement the cascaded breakers (CF) may be applied beyond their published interrupting ratings. In this scheme the main breaker (M) or group feeder breaker (GF) is set to trip at 80 percent of the interrupting rating of the cascaded breakers. The cascaded breakers (CF) should be electrically operated when applied beyond their interrupting ratings.

Circuit breakers applied to the (F) or (GF) position without a main breaker must have an interrupting rating equal to or greater than the calculated available short circuit current.

A main breaker should be supplied in position (M) when either: (1) interlocking is required with a high-voltage disconnect switch or (2) the primary breaker is located a considerable distance from the power center or (3) the low voltage system is connected to other sources of supply such as in double ended power centers.

the above systems apply to the following tables

power centers • dry and liquid multi-circuit unitized type

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112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle

table k+

voltage	transf rating 3 phase kva and impedance percent	max. short circuit kva available from primary system	rated load contin- uous current amps	short circuit-current rms symmetrical amps			recommended type DB air circuit breaker▲							
				transf alone	motor load†	com- bined	selective trip systems□			cascade systems□			fully-rated non-selective systems□	
							SM	SGF	F	M	F or GF	CF	M	F or GF
208 volts • 50% motor load	112.5 2%	50000	312	14800	700	15500	DB-25	DB-25	DB-15	DB-25	DB-15	DB-15	DB-25	DB-15
		100000		14900		15600								
		150000		15100		15800								
		250000		15300		16000								
	150 2%	500000	416	15500	900	16200	DB-25	DB-25	DB-15	DB-25	DB-15	DB-15	DB-25	DB-15
		unlimited		15700		16400								
		50000		18000		18900								
		100000		19400		20300								
	225 4.5%	50000	625	19800	1300	20700	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		100000		20200		21100								
		150000		20300		21200								
		250000		20800		21700								
	300 5%	50000	834	12600	1700	13900	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		100000		13200		14500								
		150000		13400		14700								
		250000		13600		14900								
	500 5%	500000	1388	13700	2800	15000	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		unlimited		13900		15200								
		50000		14900		16600								
		100000		15700		17400								
240 volts • 100% motor load	112.5 2%	50000	270	14800	1100	15500	DB-25	DB-25	DB-15	DB-25	DB-15	DB-15	DB-25	DB-15
		100000		14900		15600								
		150000		15100		15800								
		250000		15300		16000								
	150 2%	500000	361	15500	1500	16200	DB-25	DB-25	DB-15	DB-25	DB-15	DB-15	DB-25	DB-15
		unlimited		15700		16400								
		50000		16800		18300								
		100000		17200		18700								
	225 4.5%	50000	541	17500	2200	19000	DB-25	DB-25	DB-15	DB-25	DB-15	DB-15	DB-25	DB-15
		100000		17800		19300								
		150000		18000		19500								
		250000		19300		20700								
	300 5%	500000	722	20000	2900	21900	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		unlimited		20300		21200								
		50000		12900		13600								
		100000		13900		14100								
240 volts • 100% motor load	500 5%	150000	1203	14300	4800	17200	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		250000		14400		17300								
		500000		20000		21900								
		unlimited		21900		23100								
	500 5%	50000	1203	23600	4800	24800	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		100000		24100		25900								
		150000		25300		27900								
		250000		26700		29900								

† All selections in tables are based on voltages, transformer impedances, and motor loads, as indicated. For conditions differing from those given in these tables, the selections therein do not apply. Under different conditions, the short-circuit currents should be calculated and selections made accordingly.

† The motor's short-circuit contributions are computed on the basis of motor characteristics that will give four times normal current. For the 208-volt table, 50 percent motor load is assumed. For the 240 and 480-volt tables, 100 percent motor loads are assumed. For other percentages of load, the motor short-circuit current will be in direct proportion.

▲ Standard ranges of trip-coil ratings are listed in table i on page 22.

□ legend:
SM—selective main breaker
SGF—selective group feeder breaker
F—feeder breaker
M—main breaker
CF—cascaded feeder breaker
GF—group feeder breaker

**application data** *continued***table k+** *continued • see notes page 23*

voltage	transf rating 3 phase kva and imped- ance percent	max. short circuit kva available from primary system	rated load contin- uous current amps	short circuit-current rms symmetrical amps			recommended type DB air circuit breaker▲							
				transf alone	motor load†	com- bined	selective trip systems□			cascade systems□			fully-rated non-selective systems□	
							SM	SGF	F	M	F or GF	CF	M	F or GF
240 volts • 100% motor load (cont)	750 5.75%	50000	1804	24900	7200	32100	DB-75	DB-50	DB-25	DB-75	DB-25	DB-15	DB-75	DB-25
		100000		27800		35000		DB-50	DB-25		DB-25	DB-15		DB-25
		150000		28900		36100		DB-50	DB-25		DB-25	DB-15		DB-25
		250000		29800		37000		DB-50	DB-25		DB-25	DB-15		DB-25
	1000 5.75%	50000	2406	30600	9600	37800	DB-75	DB-50	DB-25	DB-50	DB-25	DB-15	DB-75	DB-25
		100000		31400		38600		DB-50	DB-25		DB-25	DB-15		DB-25
		150000		31000		40600		DB-75	DB-50		DB-50	DB-15		DB-50
		250000		37500		43200		DB-75	DB-50		DB-50	DB-15		DB-50
	1500 5.75%	50000	3609	41200	14400	47100	DB-100	DB-75	DB-50	DB-100	DB-50	DB-25	DB-100	DB-50
		100000		39100		48700		DB-75	DB-50		DB-50	DB-15		DB-50
		150000		40400		50000		DB-75	DB-50		DB-50	DB-15		DB-50
		250000		41800		51400		DB-75	DB-50		DB-50	DB-25		DB-50
480 volts • 100% motor load	112.5 2%	50000	135	6050	550	6600	DB-15	DB-15	DB-15	DB-15	DB-15	DB-15	DB-15	DB-15
		100000		6400		6950		DB-15	DB-15		DB-15	DB-15		DB-15
		150000		6500		7050		DB-15	DB-15		DB-15	DB-15		DB-15
		250000		6600		7150		DB-15	DB-15		DB-15	DB-15		DB-15
	150 2%	50000	180	6700	750	7250	DB-15	DB-15	DB-15	DB-15	DB-15	DB-15	DB-15	DB-15
		100000		6750		7300		DB-15	DB-15		DB-15	DB-15		DB-15
		150000		7850		8600		DB-15	DB-15		DB-15	DB-15		DB-15
		250000		8400		9150		DB-15	DB-15		DB-15	DB-15		DB-15
	225 4.5%	50000	271	8600	1100	9350	DB-25	DB-15	DB-15	DB-25	DB-15	DB-15	DB-25	DB-15
		100000		8750		9500		DB-15	DB-15		DB-15	DB-15		DB-15
		150000		8950		9700		DB-15	DB-15		DB-15	DB-15		DB-15
		250000		9000		9750		DB-15	DB-15		DB-15	DB-15		DB-15
	300 5%	50000	361	9850	1400	10600	DB-25	DB-15	DB-15	DB-25	DB-15	DB-15	DB-25	DB-15
		100000		9750		10500		DB-15	DB-15		DB-15	DB-15		DB-15
		150000		9850		10600		DB-15	DB-15		DB-15	DB-15		DB-15
		250000		9900		10700		DB-15	DB-15		DB-15	DB-15		DB-15
	500 5%	50000	601	10000	2400	10900	DB-50	DB-15	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		100000		10900		12400		DB-15	DB-15		DB-15	DB-15		DB-15
		150000		11300		13700		DB-15	DB-15		DB-15	DB-15		DB-15
		250000		11600		14000		DB-15	DB-15		DB-15	DB-15		DB-15
	750 5.75%	50000	902	11800	3600	12400	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		100000		12000		14400		DB-25	DB-15		DB-15	DB-15		DB-15
		150000		12400		16000		DB-25	DB-15		DB-15	DB-15		DB-15
		250000		13900		17500		DB-25	DB-15		DB-15	DB-15		DB-15
	1000 5.75%	50000	1203	14400	4800	18000	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-50	DB-15
		100000		14900		18500		DB-25	DB-15		DB-15	DB-15		DB-15
		150000		15300		18900		DB-25	DB-15		DB-15	DB-15		DB-15
		250000		15700		19300		DB-25	DB-15		DB-15	DB-15		DB-15
	1500 5.75%	50000	1804	15900	7200	20300	DB-75	DB-50	DB-25	DB-75	DB-25	DB-15	DB-75	DB-25
		100000		17800		22600		DB-50	DB-25		DB-50	DB-15		DB-50
		150000		18700		23500		DB-50	DB-25		DB-50	DB-15		DB-50
		250000		19600		24400		DB-50	DB-25		DB-50	DB-15		DB-50
	2000 5.75%	50000	2406	20200	9600	25000	DB-75	DB-50	DB-25	DB-75	DB-50	DB-15	DB-75	DB-50
		100000		20900		25700		DB-50	DB-25		DB-50	DB-15		DB-50
		150000		20600		27800		DB-50	DB-25		DB-50	DB-15		DB-50
		250000		24900		32100		DB-50	DB-25		DB-50	DB-15		DB-50
	2500 5.75%	50000	3008	26700	12000	33900	DB-100	DB-50	DB-50	DB-100	DB-50	DB-25	DB-100	DB-50
		100000		28400		35600		DB-50	DB-50		DB-50	DB-25		DB-50
		150000		29800		37000		DB-50	DB-50		DB-50	DB-25		DB-50
		250000		31400		38600		DB-50	DB-50		DB-50	DB-25		DB-50

§ For liquid and ventilated dry type transformers only. For sealed dry type transformers use next larger breaker.
 ▲ For liquid type transformers only. For dry types (ventilated and sealed) use next larger breaker.

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112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle

dimensions and weights ① power center transformers

indoor ventilated dry type: table 1

except for hv close coupling to metal-clad switchgear

kva	A	B—overall width with various hv arrangements②					B add		C	weights transformer only⑥
	overall height transf only③	hv terminal chamber single or loop	hv air switch 2-pos type LCB	2-hv air switch 2-pos type LCB selector arr.	hv oil cutouts fused or unfused	network protector in lv transf case		depth transf only③		
						2000A	3000A			
hv 2400-4160-4800 • lv 208/120Y-240-480-480/277Y • 600 volts										
112.5	90%	55	67 ⑤	94 ④	68	38	42	48	1900	
150	90%	55	67 ⑤	94 ⑤	68	38	42	48	2100	
225	90%	55	67 ⑤	94 ⑥	68	38	42	48	2600	
300	90%	55	67 ⑥	94 ⑥	68	38	42	48	3200	
500	90%	55	67 ⑥	134 ⑤	68	38	42	48	3900	
750	90%	95	107 ⑤	134 ⑥	108	38	42	48 ⑦	7500	
1000	90%	105	117 ⑥	144 ⑥	118	38	42	48 ⑦	8650	
④1500	100	115	127 ⑥	154 ⑥	...	38	42	54	11700	
④2000	100	115	127 ⑥	154 ⑥	...	38	42	54	14200	
hv 6900-7200 volts										
150	90%	85	104	138	...	38	42	48	3450	
225	90%	85	104	138	...	38	42	48	3900	
300	90%	85	104	138	...	38	42	48	4650	
500	90%	95	114	148	...	38	42	48	6800	
750	90%	105	124	158	...	38	42	48 ⑦	7950	
1000	90%	105	124	158	...	38	42	48 ⑦	8950	
④1500	100	115	134	168	...	38	42	54	12000	
④2000	100	115	134	168	...	38	42	54	14500	
hv 12000-13200-13800 volts										
150	90%	85	114	148	...	38	42	48	3550	
225	90%	85	114	148	...	38	42	48	4050	
300	90%	95	114	148	...	38	42	48	5100	
500	90%	95	124	158	...	38	42	48	7000	
750	90%	105	124	158	...	38	42	48 ⑦	8150	
1000	90%	105	124	158	...	38	42	48 ⑦	9150	
④1500	100	115	144	178	...	38	42	54	12200	
④2000	110	115	144	178	...	38	42	54	14750	
⑨hv modification weight to be added to transf weight		5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv		
		500	500	1500	2600	3700	1380	1150	1500	

① dimensions in inches, weights in pounds • approximate, not for construction purposes.

② B dimension includes low voltage transition sections.

③ not complete without hv modification additions, refer to table n, page 26, for air switch height and depth.

④ not standard. Refer to East Pittsburgh Unit Equipments.

⑤ 60 kv BIL switch furnished below 5 kv unless otherwise specified.

⑥ See high voltage modification weight to be added to transformer weight.

⑦ This dimension will be 54 inches for low voltage ratings 240 v delta or 208 wye/120.


dimensions and weights power center transformers • continued

indoor ventilated dry type: table m
close coupled to hv and lv switchgear

kva	A overall height transformer only ①	B overall width transformer only	C depth transformer only	weight transformer only
hv 2400-4160 volts				
112½	90%	40	64	2075
150	90%	40	64	2250
225	90%	40	64	2850
300	90%	40	64	3350
500	90%	40	64	4100
750	90%	60	74	7700
1000	90%	60	74	8700
1500 ④	110	100	54	11800
2000 ④	110	100	54	14300

hv 4800-6900-7200-12000-13200-13800 volts

112½	90%	50	86	3650
150	90%	50	86	4150
225	90%	50	86	4950
300	90%	50	86	6850
500	90%	60	86	8250
750	90%	60	86	9250
1000	90%	60	86	12300
1500 ④	110	100	54	14800
2000 ④	110	100	54	

air switch dimensions: table n

	BIL	height		depth single feed		depth loop feed		③width—switch compartment only	
		indoor	outdoor	indoor	outdoor	indoor	outdoor	indoor	②outdoor
type LCB air switch 5 kv	60 kv	90%	90	48	59	54 ⑤	59	27	42
type LCB air switch 15 kv	95 kv	①90%	① 97	48	56	54	65	34	54

① For top cable entrance on LCB add 21 inches.

② Dimension includes stub flange on switch compartment.

③ Width dimension given for reference only. This dimension has already been included in all tables where air switches are involved.

④ Not standard. Refer to East Pittsburgh Unit Equipment.

⑤ For liquid transformers 48 inches.

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*112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle*

table o and table p^①

kva	A	B—overall width with various hv arrangements ^②					C	weights transf only ^⑥
	③overall height transf only	hv terminal chamber	hv air switch 2-pos type LCB	2 hv air switch 2-pos type LCB selector arr.	hv oil cutouts fused or unfused	hv transition connection to metal-clad swgr	③depth transf only	
		single feed	loop feed					

indoor sealed dry type: table o

hv 2400-4160-4800 volts • lv 208/120Y-240-480-480/277Y-600 volts

300	71	81	90	109 ⑤	136 ⑤	88	87	36	6100
500	81	92	101	120 ⑤	147 ⑤	99	98	39	10000
750	93	96	105	124 ⑤	151 ⑤	103	102	41	12550
1000	101	102	111	130 ⑤	157 ⑤	109	108	44	15600
④1500	117	114	123	142 ⑤	169 ⑤	...	120	48	20900
④2000	125	116	125	144 ⑤	171 ⑤	...	122	52	23900

hv 12000-13200-13800 volts

300	83	91	100	127	161	...	95	40	8100
500	88	96	105	132	166	...	100	41	11000
750	98	100	109	136	170	...	104	43	13500
1000	102	106	115	142	176	...	110	47	17600
④1500	120	116	125	152	186	...	120	50	22600
④2000	128	122	131	158	192	...	126	54	26800

hv modification
weight to be added
to transf weight

5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv
140	400	240	600	1800	2100	2900	3950	750	450	500	

outdoor sealed dry type: table p^①

hv 2400-4160-4800 volts • lv 208/120Y-240-480-480/277Y-600 volts

300	71	89	98	125 ⑤	153 ⑤	96	83	36	6100
500	81	100	109	136 ⑤	164 ⑤	107	94	39	10000
750	93	104	113	140 ⑤	168 ⑤	111	98	41	12550
1000	101	110	119	146 ⑤	174 ⑤	117	104	44	15600
④1500	117	122	131	158 ⑤	186 ⑤	...	116	48	20900
④2000	125	126	135	162 ⑤	190 ⑤	...	120	52	23900

hv 12000-13200-13800 volts

300	83	99	108	145	178	...	91	40	8100
500	88	103	112	149	182	...	95	41	11000
750	98	108	117	154	187	...	100	43	13500
1000	102	114	123	160	193	...	106	47	17600
④1500	120	124	133	170	203	...	116	50	22600
④2000	128	130	139	176	209	...	122	54	26800

hv modification
weight to be added
to transf weight

5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv
140	400	240	600	2200	2500	3500	4100	750	75	75	

- ① dimensions in inches, weights in pounds • approximate, not for construction purposes.
② B dimension includes flange for connection to lv transition—does not include lv transition or projecting bushings.
③ not complete without hv modification additions, refer to table n, page 26, for air switch height and depth.
④ not standard. Refer to East Pittsburgh Unit Equipment Section.
⑤ 60 kv BIL switch furnished below 5 kv unless otherwise specified.
⑥ See high voltage modification weights to be added to transformer weight.

**dimensions and weights****① power center transformers • continued****indoor liquid type: table q**

kva	A	②B—overall width with various hv arrangements							C	gals. liquid	weights⑥	
	③ overall height transf only	hv terminal compartment	hv air switch 2-pos type LCB ⑤⑥	2 hv air switch 2-pos type LCB selector arr. ⑥⑦	hv liquid switch 2-pos single or loop	hv liquid switch 3-pos selector	hv oil cut-outs fused or unfused	hv transition connection to metal-clad swgr	③ depth transf only		transf only	
		single feed	loop feed								Iner- oil teen	
hv 2400-4160-4800 volts • lv 208/120Y-240-480-480/277Y-600 volts												
112½	66	40	45	68	95	44	58	53	44	60	115	3700 3100
150	66	40	45	68	95	44	58	53	44	60	115	3700 3100
225	78	48	53	76	103	52	66	54	53	68	260	5500 5800
300	78	48	53	76	103	52	66	54	53	68	260	7200 5800
500	82	72	72	95	122	71	85	73	72	63	290	8900 7300
750	85	77	77	100	127	71	85	78	77	75	355	10750 8850
1000	91	78	78	101	128	77	91	79	78	83	430	13050 10700
①1500	101	90	90	112	139	86	100	..	89	91	620	18600 15200
②2000	108	90	90	112	139	86	100	..	89	93	735	21850 17800

hv 6900-7200-12000-13200-13800 volts

112½	66	43	48	78	112	44	58	..	44	60	115	3700 3100
150	66	43	48	78	112	44	58	..	44	60	115	3700 3100
225	78	51	56	86	120	52	66	..	53	68	260	6000 5800
300	78	51	56	86	120	52	66	..	53	68	260	7200 5800
500	82	84	84	112	146	78	92	..	79	64	360	9750 7750
750	85	88	88	116	150	82	96	..	83	76	380	11400 9350
1000	88	89	88	116	150	82	96	..	83	82	425	13400 11050
①1500	98	95	95	122	156	88	102	..	89	91	585	18400 15200
②2000	105	98	98	125	159	91	105	..	92	94	750	22700 18550

hv modification weight to be added to transf weight	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv
	550	650	550	650	2300	2700	3400	4300	700	700	1200	1200	800	500 600
gals. liquid to be added to transf									23	23	80	80	6	

① Dimensions in inches, weights in pounds • approximate, not for construction purposes.

② B dimensions include flange for connection to lv transition—does not include lv transition or projecting bushings.

③ Not complete without hv modification additions, refer to table n, page 26, for air switch height and depth.

④ Not standard. Refer to East Pittsburgh Unit Equipment.

⑤ 60 kv BILL switch furnished below 5 kv unless otherwise specified.

⑥ See high voltage modification weight to be added to transformer weight.

⑦ Includes switch transition weight plus switch weight.

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112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle

① outdoor liquid type: table r

kva	A		②B—overall width with various hv arrangements								C		gals. liquid	weights transf only⑥	
	③ overall height transf only	hv terminal compartment	hv air switch 2-pos type LCB	2-hv air switch 2-pos type LCB selector arr.⑤	hv liquid switch 2-pos single or loop	hv liquid switch 3-pos selector	hv⑦ oil cut- outs fused or un- fused	hv throat con- nection to metal- clad swgr	③ depth transf only						
		single feed	loop feed	⑤							Iner- teen	oil			
hv 2400-4160-4800 volts • lv 208/120Y-240-480-480/277Y-600 volts															
112½	66	49	49	76	105	47	61	53	34	60	115	3700	3100		
150	66	49	49	76	105	47	61	53	34	60	115	3700	3100		
225	78	57	57	83	111	56	70	60	41	68	260	7200	5800		
300	78	57	57	83	111	56	70	60	41	68	260	7200	5800		
500	82	82	82	108	136	81	95	85	66	63	290	8900	7300		
750	85	88	88	114	142	81	95	91	72	75	355	10750	8850		
1000	91	89	89	115	143	82	96	92	73	83	430	13050	10700		
①1500	101	100	100	126	154	93	107	..	84	91	620	18600	15200		
②2000	108	100	100	126	154	93	107	..	84	93	735	21850	17800		
hv 6900-7200-12000-13200-13800 volts															
112½	66	56	56	92	126	47	61	..	38	60	115	3700	3100		
150	66	56	56	92	126	47	61	..	38	60	115	3700	3100		
225	78	65	65	94	133	56	70	..	46	68	260	7200	5800		
300	78	65	65	94	133	56	70	..	46	68	260	7200	5800		
500	82	94	94	128	162	83	97	..	75	64	360	9725	7750		
750	85	99	99	133	167	87	101	..	80	76	380	10800	9325		
1000	88	99	99	133	167	87	101	..	80	82	425	13400	11050		
①1500	98	105	105	139	173	92	106	..	86	91	585	18400	15200		
②2000	105	107	107	141	175	95	109	..	89	94	750	22700	18550		
hv modification weight to be added to transf weight	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	5 kv	15 kv	
	300	450	350	500	2200	2900	3500	4000	700	700	1200	1200	600	25 50	
gals. liquid to be added to transf							23	23	80	80	6				

① Dimensions in inches, weights in pounds • approximate, not for construction purposes.

② B dimensions include lv throat section.

③ Not complete without hv modification additions, refer to table n, page 26, for air switch height and depth.

④ Not standard. Refer to East Pittsburgh Unit Equipment.

⑤ 60 kv BIL switch furnished below 5 kv unless otherwise specified.

⑥ See high voltage modification weight to be added to transformer weight.

⑦ Dimension over operating handle.

high-voltage metal-clad switchgear: table s

indoor units

type	continuous current rating amps	dimensions in inches				approx net weight in lbs	dimensions in inches						approx net weight in lbs
		A _H	B _H	C _H	minimum aisle space		A _H NS	A _H S	B _H NS	B _H ♦ S	C _H NS	C _H S	
50-DH-75	1200	90	20	64	36	2000	90	105	28	20	90	122	3300
auxiliary	.....	90	26/36	64	36	1800	90	106	30	26/36	90	122	3300
50-DH-150	1200	90	26	74	36	2800	90	105	28	26	90	162	3900
50-DH-150	2000	90	36	74	43	3300	90	106	38	36	90	162	4300
50-DH-250	1200	90	26	74	36	2800	90	106	28	26	90	162	3900
50-DH-250	2000	90	36	74	43	3300	90	106	38	36	90	162	4300
auxiliary	.....	90	26/36	74	36	2800	90	106	30	26/36	90	162	3800
50-DH-350	1200♦	90	26	92	47	5900	...	106	..	36♦	...	168	6600
auxiliary	.....	90	26/36	92	..	3000	...	106	..	26/36	...	168	3900
150-DH-150	1200	90	36	86	49	4200	104	106	38	36	102	174	4800
▲150-DH-250	1200	90	36	86	49	4200	104	106	38	36	102	174	4800
▲150-DH-250	2000	90	36	86	49	4600	104	106	38	36	102	174	5100
▲150-DH-500	1200	90	36	86	49	4200	104	106	38	36	102	174	5100
▲150-DH-500	2000	90	36	86	49	4600	104	106	38	36	102	174	5400
▲auxiliary	.....	90	36	86	49	3300	104	106	38	36	102	174	4200
150-DH-750	1200	90	36	86	49	5000	104	106	38	36	102	174	6000
150-DH-750	2000	90	36	86	49	5400	104	106	38	36	102	174	6300
auxiliary	.....	90	36	86	49	3600	104	106	38	36	102	174	4500
150-DH-1000	1200♦	104	36	116	60	5400	...	120	..	36♦	...	194	7400
auxiliary	.....	104	36	116	60	3900	...	120	..	36	...	194	4900

◆ At least one auxiliary section must be supplied for each assembly, and dimensioned accordingly.

width

width									depth				height		
breaker type of connection	type of operation	indoor				outdoor			kva	power center type	indoor		outdoor	indoor	outdoor
		dimensions		weights		dim.	weights				C _L 208 240 volts	C _L 480 600 volts	C _L 208, 240 480, 600 volts		
		B _L	①min aisle space	vert sec	each breaker	B _L	vert sec	each breaker							
①transition connection		18		500		..	....		112½ thru 500	vent. dry sealed dry liquid	54 54 54	54 54 54	92 92 92	90% 90% 90%	115 115 115
③throat connection & end trim		..		....		26	500		750 thru 1000	vent. dry sealed dry liquid	54 60 60	54 54 54	92 92 92	90% 90% 90%	115 115 115
DB-15	manual	18	36	700	70	18	1800	70	1500	vent. dry	④	54	92	90%	115
DB-15	electrical	18	36	700	85	18	1800	85	thru	sealed dry	④	60	92	90%	115
DB-25	manual	18	36	800	90	18	1800	90	2000	liquid	④	60	92	90%	115
DB-25	electrical	18	36	800	110	18	1800	110							
DB-50	manual	26	36	1000	280	26	2500	280							
DB-50	electrical	26	36	1000	355	26	2500	355							
DB-75	electrical	30	44	1500	500	30	3500	500							
DB-100	electrical	34	44	1800	700	38	4400	700							

③ Must be included in all outdoor liquid filled and sealed dry type power centers
④ Refer to Westinghouse.

① **low-voltage network units: table u**

kva	low voltage (volts)	protector rating in amps	indoor							
			protector mounted in ventilated dry transformer case				protector in switchgear			
			dimensions			weight	dimensions		weight	
			A _N	B _N	C _N		A _N	②B _N	C _N	
300	216	1500	90	70	48	2500	90	104	48	5500
500	216	2500	90	70	48	2500	90	108	48	5600
500	480	1200	90	70	48	2500	90	104	48	5500
750	216	3000	90	70	48	3000	90	108	48	9100
750	480	1600	90	70	48	3000	90	104	48	5500
1000	480	2000	90	70	48	3000	90	104	48	5600

② Includes 18 inch transition for liquid filled and sealed dry type units.

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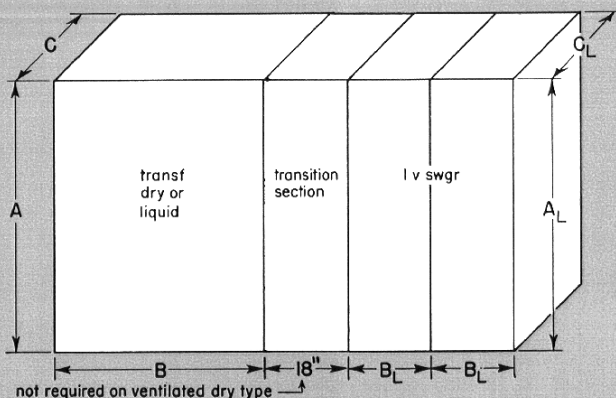
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112½ to 2000 kva • hv—2400 to 13800 volts
lv—208 wye/120 to 480 volts • 3 phase • 60 cycle

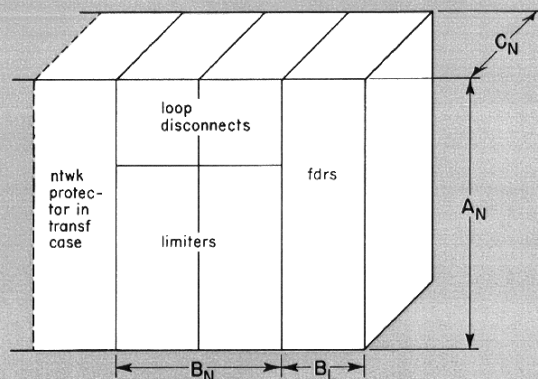
block diagrams • power centers

indoor units

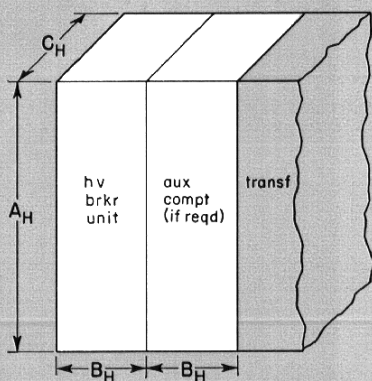
power center



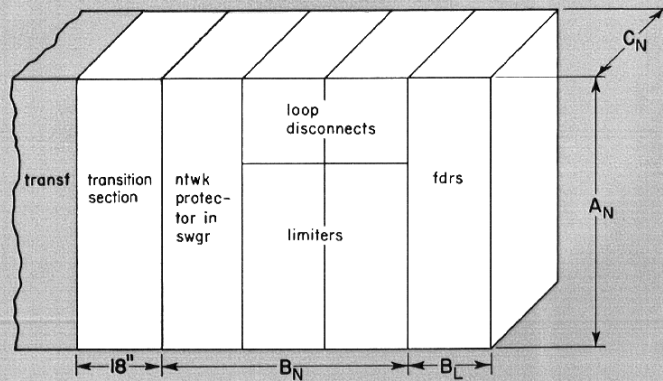
network switchgear protector in transformer case—ventilated dry type only



hv metal-clad switchgear for power centers

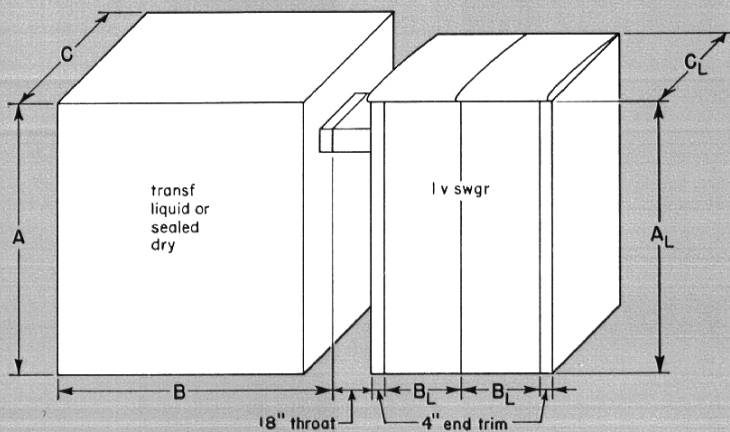


network protector in switchgear

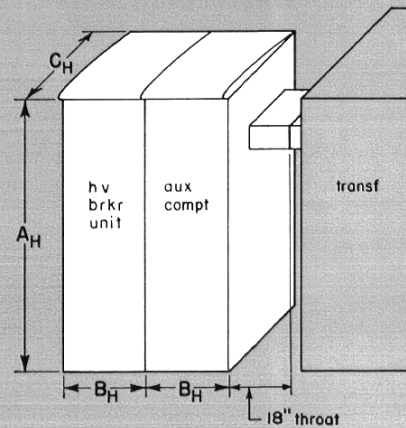


outdoor units

power centers

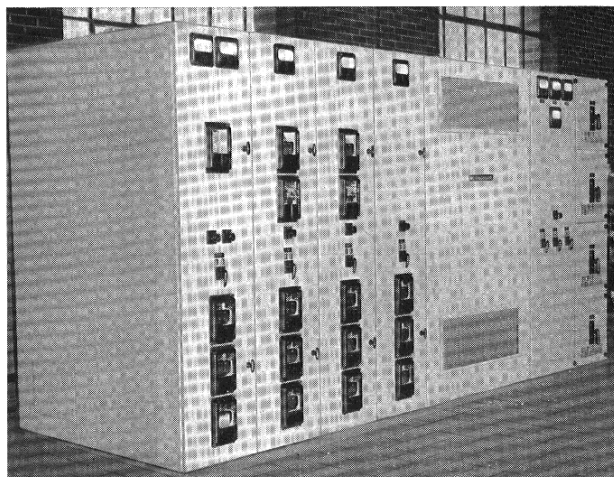


hv metal-clad switchgear for power centers

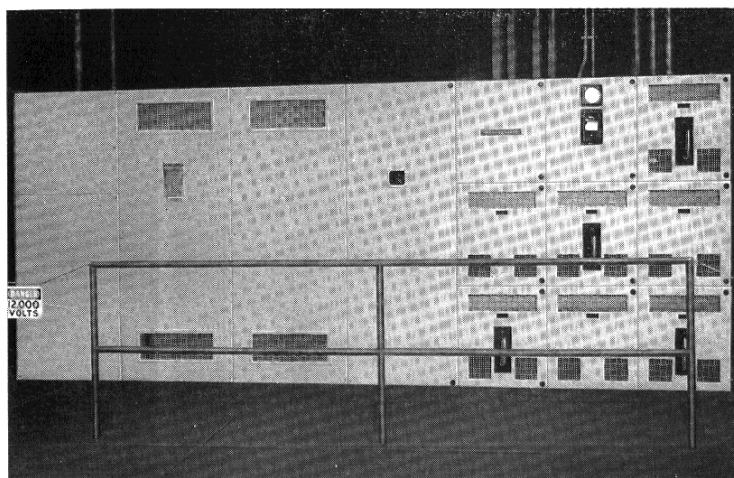




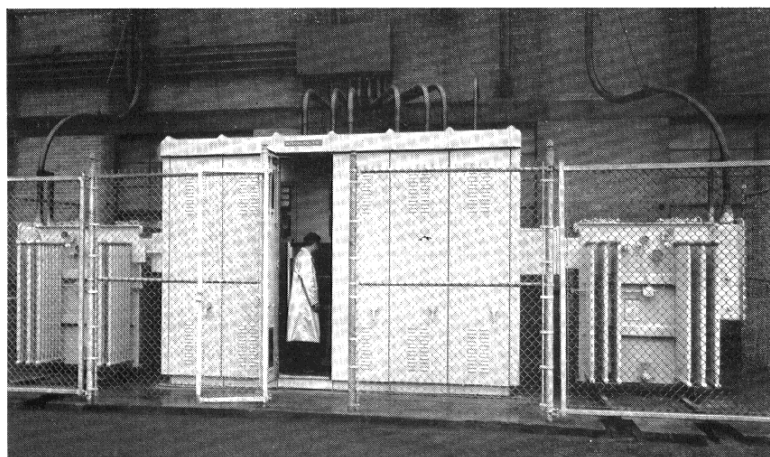
**power centers • dry and liquid
multi-circuit unitized type**



1000 kva indoor dry type power center with
high voltage indoor metal-clad switchgear



750 kva indoor dry type
network power center



2000 kva double ended outdoor power
center with "walk-in" type
metal-enclosed switchgear

further information: refer to Westinghouse

Westinghouse Electric Corporation
Assembled Switchgear and Devices Division • East Pittsburgh, Pa.
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