Substation Transformers

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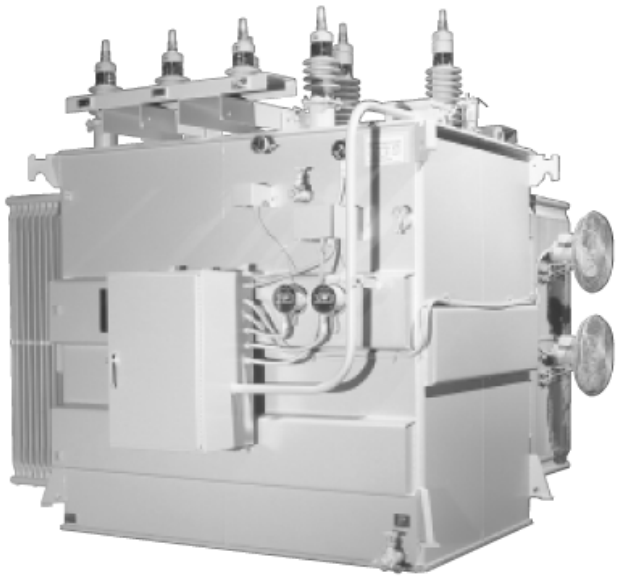


Substation Transformer—Liquid-Filled

Substation Transformers

Substation Transformers Feature Cover-Mounted Primary and Secondary Bushings and Can Be Provided with Load (LTC) Changers

Definition

A substation transformer is typically a standalone unit located at the front end of a campus, industrial site or large commercial project. The substation transformer is used to step down the utility service voltage.

Eaton's substation transformers use a rectangular core and coil design that is a distinguishing characteristic of Eaton small power liquid-filled transformers. This proven design provides excellent mechanical strength, dependability and space-saving economy needed for utility, industrial and commercial applications.

With most ratings, a choice of fluids including mineral oil (typically specified for outdoor applications), silicone (flammability concerns) and environmentally friendly fluids (flammability concerns, anywhere that an insulating fluid spill could require expensive cleanup procedures or where extended insulation life is desired) are all optional fluids.

Note: For additional information about transformer applications and types of insulating fluids, see **Tab 14**.

Product Scope

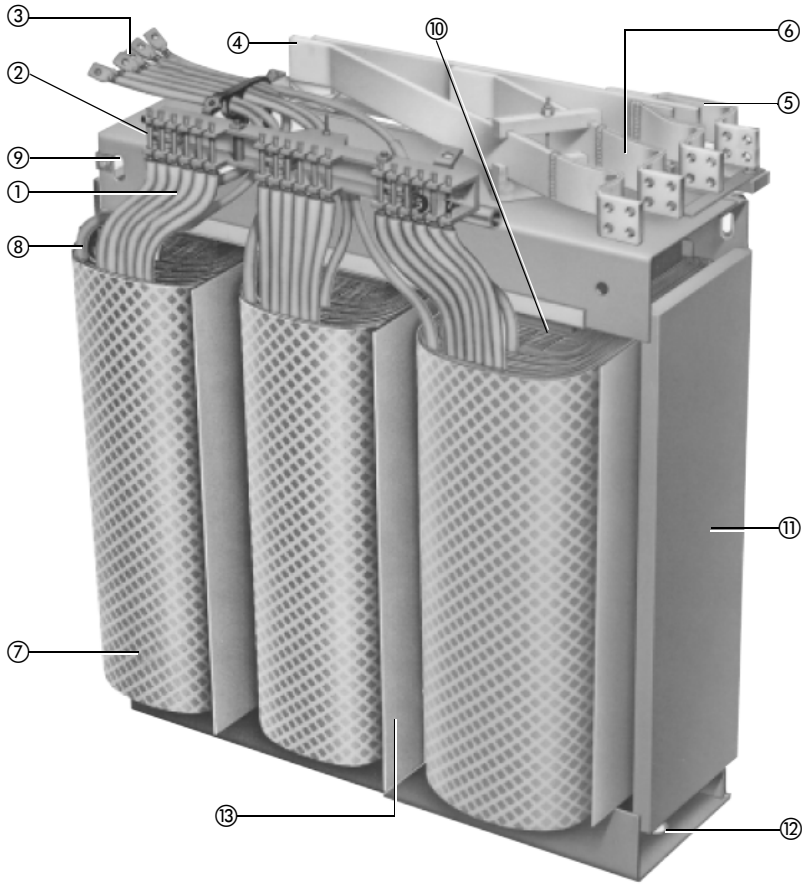
- 750–30,000 kVA
- Primary voltages: through 69 kV
- Secondary voltages: through 34.5 kV

Available Fluids

- Mineral oil
- Silicone
- Environmentally friendly fluids

Substation Benefits/Advantages

- Rectangular core/coil design:
  - Minimal size: space saving
  - Minimal weight: energy saving
- Insulation system for thermal upgrade and mechanical strength
- Turn insulation—superior adhesion, abrasion resistance and thermal stability
- High efficiency with the best combination of initial cost and low operating cost
- Preservation system—sealed gas blanket over fluid in tank



Core and Coil Assembly

Core and Coil Items

① Tap leads
② Tap changer
③ High voltage leads
④ Low voltage bus
⑤ Low voltage bushing connection
⑥ Flexible bus
⑦ Phase coil
⑧ High voltage lead
⑨ Core ground (removable)
⑩ Step-lap core
⑪ Side braces and support tie
⑫ Bottom support
⑬ Inner phase barrier insulation

Rectangular Core and Coil Process Design

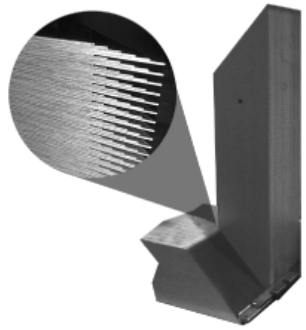
The rectangular design offers excellent mechanical strength that has been proven through years of service and in special testing.

Mechanical strength is achieved in multiple ways. One such process includes the use of a unique six-piece supporting structure. This supporting structure is assembled in a pressure jig around the core and coils, and arc welded to form a rigid structure.

The top and bottom pieces exert a clamping action on the yokes of the core to hold the laminations firmly in place and more importantly, to achieve optimum sound attenuation by using a precalculated pressure. Welding holds this preload for a permanently quiet core.

Steel end plates are pressed into position and welded to the top and bottom pieces to form a permanent framing. The thickness of the end plate is calculated for each design. The end plate's calculated thickness provides the beam strength required to minimize the tendency of the wide, flat part of the outside coils to "round out" during fault conditions.

Core



Step-Lap Mitered Core Joints are Used for Efficiency and Noise Reduction

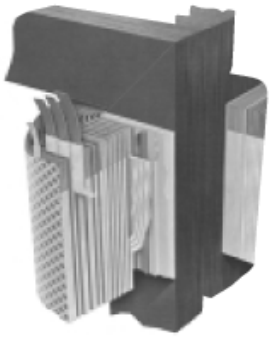
The rectangular core is a series of laminations made from high-quality, grain-oriented silicon steel.

The stacked core provides a superior flux path by using a step-lap mitered core joint. The effective way in which the core is supported, as well as the efficient step-lap joint, have resulted in:

- Decreases in exciting current up to 40%
- Reductions in sound levels up to 3 dB
- Reductions in no load loss up to 10%

The rectangular-shaped core efficiently fills the correspondingly shaped opening in the coil with a minimum of unused space. The short yoke between the core legs reduces the external path of the flux between active core leg material, resulting in an increase in efficiency. The rectangular shape of the core allows for more uniform and rigid support that prevents the shift of laminations and improves sound level characteristics.

Coil



The Core Efficiently Fills the Similar Shape Opening in the Coil to Minimize Unused Space

Eaton coils feature aluminum or copper conductors in both high and low voltage windings. The low voltage winding is accomplished on a constant tension machine and consists of a full-width or part-coil sheet conductor extending the full height of the coil.

The advantage of the low voltage sheet is a continuous cross-section of conductor that allows the electrical centers of high and low voltage windings to easily align themselves, virtually eliminating the vertical component of short-circuit force.

The high voltage windings use wire conductors and are wound directly over the low voltage winding on a constant tension traversing machine. The high voltage conductors are typically insulated with the DuraBIL turn insulation.

Turn Insulation

DuraBIL Turn Insulation

Traditional crepe paper or Nomex® tape is used in some design considerations. However, DuraBIL, which is a tough, flexible and inert turn insulation, is used in most designs. It reduces the most prevalent cause of transformer failure: deterioration of turn insulation.

DuraBIL is a single layer of epoxy powder deposited electrostatically and baked on the wire conductor. The process is closely controlled and monitored to ensure a continuous, uniform coating. The result is a compact turn insulation with superior characteristics, including adhesion, flexibility, abrasion resistance, and thermal and chemical stability.

DuraBIL will not degrade and contaminate the transformer fluid with moisture. Beyond the chemical attributes, DuraBIL maintains dimensional stability and the coil's structural integrity.

Insuldur Insulation

Insuldur insulation thermally upgraded craft paper is typically used for layer and high to low insulation.

The Insuldur system of chemical stabilizers thermally upgrades cellulose insulating materials to permit a 12% higher load capacity. Insuldur can be used with all fluids offered with Eaton small power transformers.

Chemical stabilizers retard insulation breakdown under elevated temperature conditions. Additionally, dimensional changes in the insulating materials are minimized to ensure a tighter structure. The result is greater strength and coil integrity throughout the life of the transformer.

The Insuldur system allows a unit rated at 55 °C rise to be operated at a 10 °C higher temperature, with a 12% increase in kVA capacity. Generous oil ducts extend the height of the coil to provide cooling in the winding. The staggered, diamond epoxy bonds help to ensure free oil flow through the winding.

Tank Construction

The transformer tank is designed to withstand a pressure 25% greater than the maximum operating pressure. The carbon-steel plate used to form the tank is reinforced with external side wall braces, and tank seams are continuously welded.

Each cooler assembly is individually welded and receives a pressurized check for leaks prior to assembly on the tank. After the coolers are attached to the tank, the completed tank assembly is leak-tested before shipment.

Micafil™ Low Frequency Heating Insulation Drying Process

- The insulation is dried in its own tank and is never exposed to the atmosphere once it dries
- The windings are heated uniformly, so the insulation deep in the coils reaches a temperature that promotes moisture removal during the vacuum cycle
- The moisture level of the air in the vacuum exhaust is monitored constantly to ensure that the insulation is dry when the process is completed

Fluid Preservation Systems

Sealedaire Standard on Units >2500 kVA or ≥250 kV BIL

The Sealedaire preservation system uses a sealed gas space above the fluid that prevents breathing under normal conditions. An automatic pressure-vacuum relief valve assembly is factory-set to keep internal pressure within the limits of 6.5 pounds per square inch pressure or vacuum.

Intertaire Optional

The Intertaire Fluid Preservation System prevents oxygen and moisture from being drawn into the transformer tank when vacuum conditions exist. This system consists of a nitrogen cylinder and necessary controls to maintain positive nitrogen pressure in the gas space.

Conservator Optional

The Conservator, or Expansion-Tank System, seals the fluid from the atmosphere in the main tank by using an auxiliary tank partially filled with transformer fluid and connected to the main tank by piping. The system allows the transformer tank to remain full, despite expansion or contraction of the fluid due to temperature changes.

Transformer Fluids

Mineral Oil

Mineral oil is primarily used in outdoor applications.

Eaton offers transformers designed with less flammable fluids—silicone, Envirotemp FR3—that can be used to meet the National Electrical Code® 450.23 for indoor applications, environmental superiority and extended transformer insulation performance and life. Tests have shown Envirotemp FR3 will extend transformer insulation life 5–8 times longer than insulation in mineral oil.

Silicone

Silicone is a less flammable dielectric coolant for transformer applications and features heat stability, material compatibility, low flammability and low toxicity. Silicone's high fire point of 340 °C qualifies it as a less flammable fluid, which is UL® listed and factory mutual approved for indoor and outdoor use. It's a good choice in areas where potential fire hazards exist and special fire-suppressant systems are installed.

Envirotemp FR3

Envirotemp FR3 is a new, fully biodegradable, environmentally friendly dielectric fluid. In a 21-day period, Envirotemp FR3 has been tested to be 99% biodegradable.

Envirotemp FR3 is Factory Mutual approved and UL certified when installed in a transformer per the listing restrictions of the fluid to meet NEC 450.23. Envirotemp FR3 is suitable for application indoors and in areas of heightened environmental sensitivity where any insulating fluid spill could require expensive clean-up procedures.

Note: FR3™ and Envirotemp™ are licensed trademarks of Cargill, Incorporated.

Quality Assurance Testing

The following tests are made on all transformers unless noted as an exception. The numbers shown do not necessarily indicate the sequence in which the tests will be made. All tests will be made in accordance with the latest revision of IEEE C57.12.90 Test Code for Transformers.

1. Resistance measurements of all windings on the rated tap and on the tap extremes on one unit of a given rating on a multiple unit order.
2. Ratio Tests on the rated voltage connection and all tap connections.
3. Polarity and Phase-relation Tests.
4. No-load loss at rated voltage.
5. Excitation current at rated voltage.
6. Impedance and load loss at rated current on the rated voltage connection of each unit and on the tap extremes on one unit of a given rating on a multiple unit order.
7. Applied Potential Tests.
8. Induced Potential Test.
9. Mechanical Leak Test.

Optional Tests

The following additional tests can be made on any substation transformer. All tests are made in accordance with the latest revision of IEEE Standard Test Code C57.12.90.

1. IEEE Impulse Test.
2. Quality Control Impulse Test.
3. IEEE Front-of-Wave Impulse Test.
4. Temperature Test.
5. Sound Test.
6. Octave Band Sound Test.
7. Insulation Resistance (Meggar) Test.
8. Corona (Partial Discharge) or Radio Influence Voltage (RIV) Tests.
9. Short-Circuit Capability Calculations in lieu of Short-Circuit Test.
10. Insulation Power Factor Test.
11. Zero-Phase Sequence Impedance Test.
12. Seismic Certificate available.
13. Quality Assurance Documentation.
14. Witness or Inspection.

Standards Compliance

- IEEE C57.12.00
- IEEE C57.12.10 C57.12.36 (≤10 MVA)
- IEEE C57.12.90
- ISO® 9001
- CSA®-C88
- Substation transformers have successfully passed IEEE short-circuit tests
- Substation transformers are manufactured in an ISO 9001 certified factory

Seismic Qualification

Refer to **Tab 1** for information on seismic qualification for this and other Eaton products.

General Description

- Self-cooled power rating (kVA): 750–20,000
- Primary voltage (kV): Up through 69 Secondary voltage (kV): Up to 34.5
- Available fluids: Oil, silicone and Envirotemp FR3
- Load tap changers: 2500 kVA and larger

Standard Electrical Features

- Two windings, without reconnectable windings
- Four high voltage winding full-capacity taps with a total tap range of 10%
- Standard impedance as shown in **Table 16.0-3**
- Frequency of 60 Hz
- Sound levels as shown in **Table 16.0-1**
- Standard BIL levels as shown in **Table 16.0-2**
- Excitation limits defined by IEEE C57.12.00:
  - Unit will deliver rated kVA at 5% above rated secondary voltage without exceeding the limiting temperature rise provided the load power factor is 80% or higher and the frequency is at least 95% of rated value
  - Unit can be energized at 10% above rated secondary voltage at no-load without exceeding the limiting temperature rise
- 65 °C average temperature rise

Optional Electrical Features

- Series multiple windings
- Delta-wye connection—changing the internal connections on the HV or LV windings (three-phase only)
- Nonstandard HV taps and tap range
- Nonstandard phase relationship
- Low-loss, high-efficiency designs
- Frequency other than 60 Hz
- Special impedances
- Design to withstand IEEE front-of-wave impulse test
- Special sound level
- Special BIL level
- Over excitation
- 55 °C / 65 °C average temperature rise
- 55 °C / 75 °C average winding rise
- Special ambient temperatures
- Operation at altitudes above 3300 ft (1000 m)
- Motor-starting duty or dedicated motor loads

Standard Electromechanical Features

- Aluminum windings
- Tap changer for de-energized operation with the handle brought out through the tank wall
- Rubber-jacketed multi-conductor control wiring

Optional Electromechanical Features

- Copper windings
- Tap changer mechanical key interlock
- Provisions only for tap changer mechanical key interlock
- Flexible conduit for control wiring
- Rigid conduit for control wiring
- Special control wiring size or insulation
- Core ground lead brought to test point located inside tank adjacent to bolted handhole
- Electrostatic shields
- Internally-mounted bushing current transformer

Standard Tank Features

- Corrosion-resistant steel hardware
- Lifting hooks for complete unit
- Lifting loops for tank cover
- Welded main tank cover
- Welded handhole on cover, or bolted handhole when access to tank interior is required
- Tank grounding provisions
- Transformer base that permits rolling in directions parallel to the base center line
- Provisions for jacking

Optional Tank Features

- Special hardware
- Bolted handhole
- Bolted manhole
- Ground connector and pad
- Skid mounting

Standard Gauges and Fittings

- Dial-type thermometer with alarm contacts
- Pressure-vacuum gauge:
  - Units rated 200 kV BIL and below
  - Units rated 2500 kVA and below
- Pressure-relief device (no alarm contacts):
  - Silicone filled
  - Oil filled

Optional Gauges and Fittings

- Magnetic liquid-level gauge with alarm contacts
- Dial-type thermometer with alarm contacts
- Pressure-vacuum gauge (no alarm contacts—primary units +/<2500 only)
- Pressure-vacuum gauge with alarm contacts
- Pressure-relief device (no alarm contacts):
  - Silicone filled (excluding primary units >2500)
  - Oil filled (excluding primary units >2500)
- Top filter-press connection-valve
- RTD coil for use with remote temperature indicator

Optional Cooling System

- Tank design pressure: 15 psig without rupturing
- Fluid preservation system:
  - Sealedaire on units ≤2500 kVA
  - Intertaire
  - Conservator
- Removable coolers
- Provisions only for future fans (FFA) excluding secondary units >500 kVA
- Complete forced air cooling systems (FA):
  - 15% added capacity units rated ≤2500 kVA
  - 25% added capacity units rated >2500 kVA
  - 33%>10 MVA

Standard Tank Finish

- Special paint color
- Paint system process:
  - Standard system: 5 mils total thickness
  - Optional: zinc chromate epoxy primer and intermediate coat, oven cure, air spray aliaphatic polyurethane, ambient cure, 5–7 mils
  - Optional: zinc-rich primer, epoxy coat, oven cure and air dry, 7 mils minimum (only available with panel coolers)

Optional Tank Finish

- Special paint color
- Paint system process:
  - Standard system: 5 mils total thickness
  - System I: zinc chromate epoxy primer and intermediate coat, oven cure, air spray aliaphatic polyurethane, ambient cure, 5–7 mils
  - System II: zinc-rich primer, epoxy coat, oven cure and air dry, 7 mils minimum (only available with panel coolers)
- Tank undercoating

Standard High and Low Voltage Components

- Bushings: cover-mounted porcelain with copper conductor

Optional High and Low Voltage Components

- Bushings:
  - Special cover-mounted porcelain bushings
  - Extra creep bushings
  - Transformer-breaker-interchangeable (TBI) bushings
- Bushing terminal connectors
- Cover-mounted bus duct throat
- HV and LV surge arresters
- External fuses (HV only)

Special Options

- Operation in hazardous locations (qualification of externally attached equipment such as wiring, conduit, fans, cabinets, alarm contacts and relays)
- Receptacle or light in control cabinet
- Space heater with thermostat in control cabinet
- Reusable gaskets on bushings, handhole and devices
- Special dimensions

Standard Features—Liquid-Filled Transformer

① Cover—welded to tank

② Cooling tubes (radiators)

Note: Radiator position and number of radiators will vary based upon design.

③ Bolted handhole on cover

④ Automatic resealing mechanical pressure relief device

⑤ HV bushing, three total, located in ANSI Segment 2

⑥ LV bushing, four total (wye connected), located in ANSI Segment 4

Note: HV and LV bushings may be cover mounted or left/right orientation may be reversed.

⑦ Lifting loops—two for lifting cover only

⑧ Lifting hooks—four for lifting complete unit

⑨ Jacking provisions on tank or base

⑩ Ground pad—two total

⑪ Drain valve—for combination lower filter press connection and complete drain with sampler

⑫ Base (may be flat or formed)

⑬ Control cabinet for alarm lead termination

⑭ Diagram instruction nameplate with warning nameplate

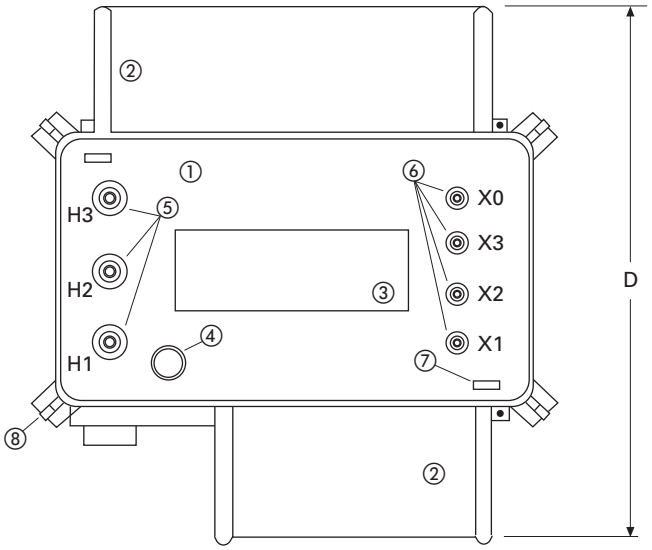
⑮ De-energized tap changer with padlock provisions

⑯ Liquid temperature indicator with maximum indicating hand

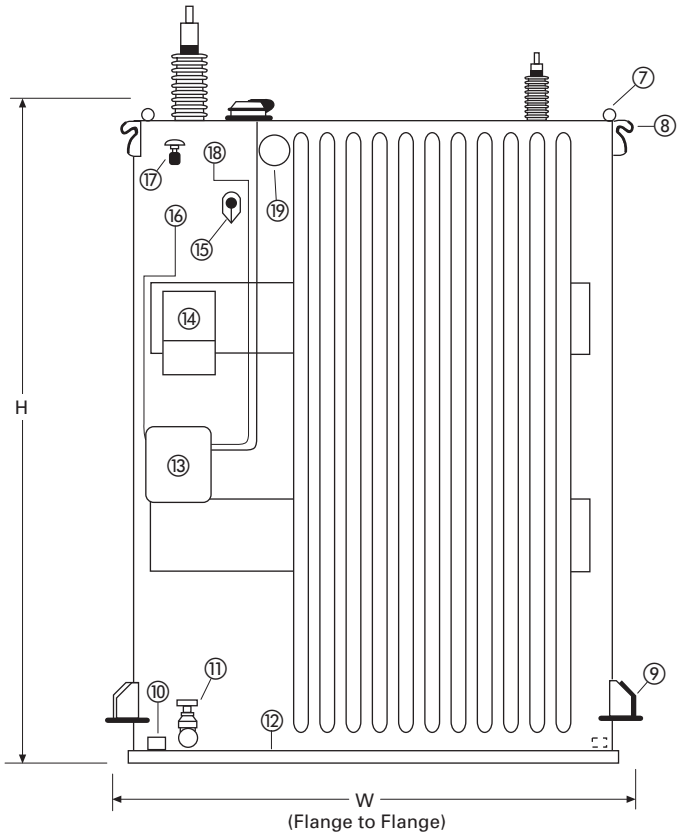
⑰ Upper valve for upper filter press connection

⑱ Magnetic liquid level gauge

⑲ Vacuum pressure gauge with air test and Sealedaire valve



Top View



Front View

Figure 16.0-1. Liquid-Filled Primary Unit Substation Transformer with Wall-Mounted High Voltage and Low Voltage Bushings

Note: See **Pages 16.0-12** through **16.0-14** for dimensions and weights.

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Table 16.0-1. Standard Sound Levels

Self-Cooled (OA) Equivalent Two-Winding (kVA)	NEMA® Average DB-OA	NEMA Average DB-FA
6001–7500	67	69
7501–10,000	68	70
10,001–12,000	69	71
12,001–15,000	70	72
15,001–20,000	71	73

Table 16.0-2. Standard Basic Impulse Levels

kV Class	Induced Test 180 Hz–7200 Cycles	kV BIL	Applied Test 60 Hz-kV
1.2	Twice	45	10
2.5	Normal	60	15
5.0	Voltage	75	19
8.7		95	26
15.0		110	34
25.0 (Ground Y only)		125	40
25.0		150	50
34.5 (Ground Y only)		150	50
34.5		200	70
46.0		350	95
69.0		250	140

Table 16.0-3. Percent Impedance at Self-Cooled Ratings (ONAN / KNAN) (IEEE C57.12.10)

High-Voltage BIL (kV)	Without LTC	With LTC
≤110	5.5	—
150	6.5	7.0
200	7.0	7.5
250	7.5	8.0
350	8.0	8.5
450	8.5	9.0
550	9.0	9.5
650	9.5	10.0
750	10.0	10.5

ANSI Segment Identification for HV and LV Bushings

The plan view, below, shows the ANSI segments used to identify the location of both the HV and LV bushings.

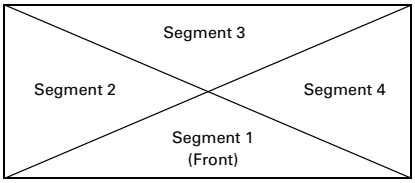

Figure 16.0-2. Front (Nameplate, Gauges, etc.)

HV: Segment 2 is standard for wall-mounted bushings (optional Segment 4). Segment 3 is standard for cover-mounted bushings.

LV: Segment 4 wall-mounted is standard (optional Segment 2).

Table 16.0-4. Liquid Filled 5 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	60 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1777	9984	11,761	4270
1000	2254	12,613	14,867	5410
1500	3161	17,178	20,339	7460
2000	4004	20,820	24,824	9210
2500	4784	23,538	28,322	10,670
3000	4310	23,584	27,894	10,210
3750	6359	27,990	34,349	13,360
5000	8070	34,991	43,061	16,820
7500	11,343	47,722	59,065	23,270
10,000	14,419	58,758	73,177	29,110

Table 16.0-5. Liquid Filled 15 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	95 kV HV BIL Total Losses at 50% Load and 55°C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1795	10,085	11,880	4320
1000	2277	12,741	15,018	5460
1500	3193	17,352	20,545	7530
2000	4045	21,031	25,076	9300
2500	4833	23,776	28,609	10,780
3000	5364	23,823	29,187	11,320
3750	6424	28,273	34,697	13,490
5000	8152	35,345	43,497	16,990
7500	11,458	48,205	59,663	23,510
10,000	14,565	59,352	73,917	29,400

Table 16.0-6. Liquid Filled 25 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	150 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1812	10,183	11,995	4360
1000	2299	12,865	15,164	5520
1500	3224	17,521	20,745	7600
2000	4084	21,236	25,320	9390
2500	4879	24,008	28,887	10,880
3000	4396	24,055	28,451	10,410
3750	6486	28,549	35,035	13,620
5000	8231	35,690	43,921	17,150
7500	11,569	48,676	60,245	23,740
10,000	14,707	59,933	74,640	29,690

Table 16.0-7. Liquid Filled 35 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	200 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1902	10,692	12,594	4580
1000	2413	13,508	15,921	5790
1500	3385	18,397	21,782	7980
2000	4288	22,298	26,586	9860
2500	5122	25,208	30,330	11,420
3000	4615	25,257	29,872	10,930
3750	6810	29,976	36,786	14,300
5000	8642	37,474	46,116	18,010
7500	12,147	51,109	63,256	24,920
10,000	15,442	62,929	78,371	31,170

Table 16.0-8. Liquid Filled 5 kV Primary 65 °C Temp. Rise

kVA	No Load at 85 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	60 kV HV BIL Total Losses at 50% Load and 55°C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1928	10,832	12,760	4640
1000	2445	13,685	16,130	5870
1500	3429	18,638	22,067	8090
2000	4344	22,589	26,933	9990
2500	5190	25,538	30,728	11,570
3000	4676	25,584	30,260	11,070
3750	6899	30,369	37,268	14,490
5000	8755	37,965	46,720	18,250
7500	12,307	51,778	64,085	25,250
10,000	15,644	63,752	79,396	31,580

Table 16.0-9. Liquid Filled 15 kV Primary 65 °C Temp. Rise

kVA	No Load at 85 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	95 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1947	10,942	12,889	4680
1000	2470	13,823	16,293	5930
1500	3464	18,826	22,290	8170
2000	4388	22,818	27,206	10,090
2500	5243	25,796	31,039	11,690
3000	5819	25,847	31,666	12,280
3750	6970	30,676	37,646	14,640
5000	8844	38,349	47,193	18,430
7500	12,431	52,302	64,733	25,510
10,000	15,803	64,396	80,199	31,900

Note: Losses offered are typical only, not guaranteed. Losses based on aluminum windings. Losses based on LV rating of 2–5 kV.

Table 16.0-10. Liquid Filled 25 kV Primary 65 °C Temp. Rise

kVA	No Load at 85 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	150 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1966	11,048	13,014	4730
1000	2494	13,958	16,452	5980
1500	3498	19,010	22,508	8250
2000	4431	23,041	27,472	10,190
2500	5293	26,048	31,341	11,810
3000	4769	26,099	30,868	11,290
3750	7037	30,875	37,912	14,760
5000	8930	38,735	47,665	18,610
7500	12,552	52,813	65,365	25,760
10,000	15,957	65,027	80,984	32,210

Table 16.0-11. Liquid Filled 35 kV Primary 65 °C Temp. Rise

kVA	No Load at 85 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	200 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	2063	11,600	13,663	4960
1000	2618	14,656	17,274	6280
1500	3672	19,960	23,632	8660
2000	4652	24,193	28,845	10,700
2500	5557	27,350	32,907	12,390
3000	5007	27,403	32,410	11,860
3750	7388	32,523	39,911	15,520
5000	9376	40,659	50,035	19,540
7500	13,179	55,453	68,632	27,040
10,000	16,754	68,277	85,031	33,820

Table 16.0-12. Environmentally Friendly Fluid 5 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	60 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1756	9491	11,247	4130
1000	2235	11,822	14,057	5190
1500	3156	15,576	18,732	7050
2000	4028	18,115	22,143	8560
2500	4851	19,441	24,292	9710
3000	5246	21,540	26,786	10,630
3750	6286	24,712	30,998	12,460
5000	8004	29,717	37,721	15,430
7500	11,380	38,675	50,055	21,050
10,000	14,675	46,227	60,902	26,230

Table 16.0-13. Environmentally Friendly Fluid 15 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	95 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1774	9587	11,361	4170
1000	2258	11,942	14,200	5240
1500	3188	15,734	18,922	7120
2000	4069	18,298	22,367	8640
2500	4900	19,638	24,538	9810
3000	5299	21,758	27,057	10,740
3750	6350	24,962	31,312	12,590
5000	8085	30,018	38,103	15,590
7500	11,495	39,066	50,561	21,260
10,000	14,824	46,694	61,518	26,500

Table 16.0-14. Environmentally Friendly Fluid 25 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	150 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1791	9680	11,471	4210
1000	2279	12,058	14,337	5290
1500	3219	15,887	19,106	7190
2000	4108	18,477	22,585	8730
2500	4948	19,829	24,777	9910
3000	5350	21,970	27,320	10,840
3750	6411	25,206	31,617	12,710
5000	8164	30,311	38,475	15,740
7500	11,607	39,448	51,055	21,470
10,000	14,968	47,150	62,118	26,760

Table 16.0-15. Environmentally Friendly Fluid 35 kV Primary 55 °C Temp. Rise

kVA	No Load at 75 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 75 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	200 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1880	10,164	12,044	4420
1000	2392	12,660	15,052	5560
1500	3379	16,681	20,060	7550
2000	4313	19,400	23,713	9160
2500	5195	20,820	26,015	10,400
3000	5617	23,068	28,685	11,380
3750	6731	26,466	33,197	13,350
5000	8572	31,826	40,398	16,530
7500	12,187	41,420	53,607	22,450
10,000	15,716	49,507	65,223	28,090

Note: Losses offered are typical only, not guaranteed. Losses based on aluminum windings. Losses based on LV rating of 2–5 kV.

Table 16.0-16. Environmentally Friendly Fluid 5 kV Primary 65 °C Temp. Rise

kVA	No Load at 85°C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	60 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1905	10,297	12,202	4480
1000	2424	12,826	15,250	5630
1500	3424	16,899	20,323	7650
2000	4370	19,654	24,024	9280
2500	5263	21,093	26,356	10,540
3000	5691	23,370	29,061	11,530
3750	6820	26,812	33,632	13,520
5000	8684	32,242	40,926	16,740
7500	12,347	41,962	54,309	22,840
10,000	15,922	50,156	66,078	28,460

Table 16.0-17. Environmentally Friendly Fluid 15 kV Primary 65 °C Temp. Rise

kVA	No Load at 85 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	95 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1924	10,401	12,325	4520
1000	2449	12,957	15,406	5690
1500	3458	17,071	20,529	7730
2000	4414	19,853	24,267	9380
2500	5316	21,307	26,623	10,970
3000	5749	23,607	29,356	11,650
3750	6889	27,083	33,972	13,660
5000	8772	32,569	41,341	16,910
7500	12,472	42,386	54,858	23,070
10,000	16,084	50,662	66,746	28,750

Table 16.0-18. Environmentally Friendly Fluid 25 kV Primary 65 °C Temp. Rise

kVA	No Load at 85 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	150 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	1943	10,502	12,445	4570
1000	2472	13,082	15,554	5740
1500	3492	17,237	20,729	7800
2000	4457	20,047	24,504	9470
2500	5368	21,514	26,882	10,750
3000	5804	23,837	29,641	11,760
3750	6955	27,348	34,303	13,790
5000	8857	32,887	41,744	17,080
7500	12,593	42,801	55,394	23,290
10,000	16,240	51,157	67,397	29,030

Table 16.0-19. Environmentally Friendly Fluid 35 kV Primary 65 °C Temp. Rise

kVA	No Load at 85 °C Ref. Temp. (Watts)	Load Loss at 100% Load and 85 °C Ref. Temp. (Watts)	Total Losses at 100% Load and 85 °C (Watts)	200 kV HV BIL Total Losses at 50% Load and 55 °C LL Ref. Temp. and 20 °C NL Ref. Temp. per DOE (Watts)
750	2039	11,027	13,066	4800
1000	2595	13,736	16,331	6030
1500	3666	18,098	21,764	8190
2000	4679	21,049	25,728	9940
2500	5636	22,589	28,225	11,280
3000	6094	25,028	31,122	12,350
3750	7303	28,715	36,018	14,480
5000	9300	34,531	43,831	17,930
7500	13,222	44,940	58,162	24,460
10,000	17,051	53,715	70,766	30,480

Note: Losses offered are typical only, not guaranteed. Losses based on aluminum windings. Losses based on LV rating of 2–5 kV.

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For special 55 °C rise units, bus duct throats and air terminal chambers, see **Notes** at bottom of page for dimensions that should be added to the table dimensions.

Table 16.0-20. 65 °C Rise, Oil-Filled
HV 6900D, 75 BIL
LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
500	4520 (2050)	120 (454)	92 (2337)	56 (1422)	56 (1422)
750	4750 (2155)	150 (568)	92 (2337)	56 (1422)	56 (1422)
1000	5590 (2536)	170 (644)	92 (2337)	59 (1499)	59 (1499)
1500	7380 (3348)	210 (795)	92 (2337)	67 (1702)	67 (1702)
2000	8890 (4032)	240 (908)	92 (2337)	70 (1778)	70 (1778)
2500	10,060 (4563)	260 (984)	92 (2337)	70 (1778)	70 (1778)
3000	11,110 (5039)	290 (1098)	95 (2413)	70 (1778)	70 (1778)
3750	13,200 (5987)	340 (1287)	95 (2413)	73 (1854)	73 (1854)
5000	18,020 (8174)	620 (2347)	113 (2870)	74 (1880)	74 (1880)

Table 16.0-21. 65 °C Rise, Oil-Filled
HV 13800D, 95 BIL
LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	4840 (2195)	160 (606)	92 (2337)	56 (1422)	79 (2007)
1000	5720 (2595)	180 (681)	92 (2337)	59 (1499)	78 (1981)
1500	7370 (3343)	210 (795)	92 (2337)	65 (1651)	92 (2337)
2000	8760 (3973)	230 (871)	92 (2337)	68 (1727)	114 (2896)
2500	9940 (4509)	260 (984)	92 (2337)	68 (1727)	125 (3175)
3000	11,650 (5284)	350 (1325)	95 (2413)	70 (1778)	127 (3226)
3750	13,330 (6046)	390 (1476)	95 (2413)	72 (1829)	127 (3226)
5000	16,640 (7548)	480 (1817)	95 (2413)	75 (1905)	131 (3327)
7500	30,300 (13,744)	1220 (4618)	114 (2896)	113 (2870)	138 (3505)
10,000	34,830 (15,799)	1230 (4656)	114 (2896)	118 (2997)	139 (3531)

Table 16.0-22. 65 °C Rise, Oil-Filled
HV 13800D, 95 BIL
LV 4160Y, 60 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	5120 (2322)	170 (644)	92 (2337)	57 (1448)	79 (2007)
1000	5980 (2712)	180 (681)	92 (2337)	62 (1575)	81 (2057)
1500	7280 (3302)	210 (795)	92 (2337)	63 (1600)	100 (2540)
2000	8700 (3946)	230 (871)	92 (2337)	65 (1651)	108 (2743)
2500	10,290 (4667)	270 (1022)	92 (2337)	70 (1778)	114 (2896)
3000	11,860 (5380)	320 (1211)	95 (2413)	73 (1854)	127 (3226)
3750	13,410 (6083)	360 (1363)	95 (2413)	73 (1854)	129 (3277)
5000	17,030 (7725)	520 (1968)	99 (2515)	75 (1905)	131 (3327)
7500	29,720 (13,481)	1140 (4315)	109 (2769)	113 (2870)	140 (3556)
10,000	35,790 (16,234)	1310 (4959)	116 (2946)	117 (2972)	143 (3632)

Notes:
1. Dimensions are APPROXIMATE. Refer to the transformer's outline drawing for actual dimensions for construction.
2. For 55 °C units, add 5.00 inches (127.0 mm) to "W" dimension and 10.00 inches (254.0 mm) to "D" dimension.
3. Add 9.00 inches (228.6 mm) to "W" dimension for each bus duct throat.
4. Add 22.00 inches (558.8 mm) to "W" dimension for each 15 kV air terminal chamber.
5. Add 25.00 inches (635.0 mm) to "W" dimension for each 27 kV air terminal chamber.
6. Add 35.00 inches (889.0 mm) to "W" dimension for each 34.5 kV air terminal chamber.

Table 16.0-23. 65 °C Rise, Oil-Filled
HV 22900D, 150 BIL
LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	5650 (2563)	220 (833)	92 (2337)	59 (1499)	81 (2057)
1000	6400 (2903)	220 (833)	92 (2337)	61 (1549)	87 (2210)
1500	8020 (3638)	250 (946)	92 (2337)	64 (1626)	101 (2565)
2000	9500 (4309)	280 (1060)	92 (2337)	68 (1727)	101 (2565)
2500	10,550 (4785)	300 (1136)	92 (2337)	70 (1778)	107 (2718)
3000	12,000 (5443)	330 (1249)	95 (2413)	73 (1854)	127 (3226)
3750	14,350 (6509)	450 (1703)	95 (2413)	73 (1854)	128 (3251)
5000	19,110 (8668)	700 (2650)	117 (2972)	74 (1880)	129 (3277)
7500	30,880 (14,007)	1210 (4580)	117 (2972)	102 (2591)	140 (3556)
10,000	39,080 (17,726)	1600 (6057)	124 (3150)	106 (2692)	145 (3683)

Table 16.0-24. 65 °C Rise, Oil-Filled
HV 22900D, 150 BIL
LV 4160Y, 60 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	5660 (2567)	210 (795)	92 (2337)	58 (1473)	83 (2108)
1000	6640 (3012)	230 (871)	92 (2337)	62 (1575)	87 (2210)
1500	8000 (3629)	250 (946)	92 (2337)	64 (1626)	107 (2718)
2000	9350 (4241)	290 (1098)	92 (2337)	66 (1676)	107 (2718)
2500	10,860 (4926)	310 (1173)	92 (2337)	71 (1803)	107 (2718)
3000	12,400 (5625)	340 (1287)	95 (2413)	73 (1854)	130 (3302)
3750	14,500 (6577)	430 (1628)	95 (2413)	74 (1880)	130 (3302)
5000	19,510 (8850)	720 (2725)	118 (2997)	74 (1880)	132 (3353)
7500	30,270 (13,730)	1120 (4240)	118 (2997)	101 (2565)	143 (3632)
10,000	38,140 (17,300)	1500 (5679)	124 (3150)	105 (2667)	146 (3708)

Table 16.0-25. 65 °C Rise, Oil-Filled
HV 22900D, 150 BIL
LV 12470Y, 95 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	6630 (3007)	250 (946)	92 (2337)	65 (1651)	64 (1626)
1000	7510 (3406)	280 (1060)	92 (2337)	66 (1676)	78 (1981)
1500	9040 (4100)	290 (1098)	92 (2337)	69 (1753)	88 (2235)
2000	10,110 (4586)	290 (1098)	92 (2337)	70 (1778)	96 (2438)
2500	11,670 (5293)	330 (1249)	92 (2337)	73 (1854)	106 (2692)
3000	12,760 (5788)	350 (1325)	95 (2413)	74 (1880)	130 (3302)
3750	15,280 (6931)	440 (1666)	95 (2413)	75 (1905)	133 (3378)
5000	19,370 (8786)	650 (2461)	107 (2718)	76 (1930)	136 (3454)
7500	30,850 (13,993)	1180 (4467)	114 (2896)	100 (2540)	139 (3531)
10,000	38,320 (17,382)	1450 (5489)	122 (3099)	104 (2642)	143 (3632)

For special 55 °C rise units, bus duct throats and air terminal chambers, see **Notes** at bottom of page for dimensions that should be added to the table dimensions.

Table 16.0-26. 65 °C Rise, Oil-Filled
HV 34400D, 200 BIL
LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	7000 (3175)	330 (1249)	115 (2921)	67 (1702)	66 (1676)
1000	7720 (3502)	350 (1325)	115 (2921)	67 (1702)	79 (2007)
1500	9880 (4481)	380 (1438)	115 (2921)	69 (1753)	98 (2489)
2000	11,300 (5126)	410 (1552)	115 (2921)	71 (1803)	112 (2845)
2500	12,880 (5842)	450 (1703)	115 (2921)	71 (1803)	122 (3099)
3000	13,760 (6241)	460 (1741)	115 (2921)	72 (1829)	130 (3302)
3750	16,030 (7271)	520 (1968)	115 (2921)	85 (2159)	136 (3454)
5000	19,780 (8972)	660 (2498)	117 (2972)	100 (2540)	138 (3505)
7500	30,270 (13,730)	1070 (4050)	129 (3277)	124 (3150)	138 (3505)
10,000	39,290 (17,822)	1480 (5602)	136 (3454)	127 (3226)	140 (3556)

Table 16.0-27. 65 °C Rise, Oil-Filled
HV 34400D, 200 BIL
LV 4160Y, 60 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	7230 (3279)	340 (1287)	115 (2921)	68 (1727)	67 (1702)
1000	8040 (3647)	360 (1363)	115 (2921)	68 (1727)	80 (2032)
1500	9920 (4500)	390 (1476)	115 (2921)	69 (1753)	94 (2388)
2000	11,700 (5307)	430 (1628)	115 (2921)	71 (1803)	116 (2946)
2500	13,120 (5951)	460 (1741)	115 (2921)	73 (1854)	124 (3150)
3000	14,400 (6532)	500 (1893)	115 (2921)	76 (1930)	128 (3251)
3750	16,210 (7353)	540 (2044)	115 (2921)	77 (1956)	136 (3454)
5000	20,490 (9294)	740 (2801)	124 (3150)	95 (2413)	139 (3531)
7500	31,470 (14,275)	1190 (4505)	133 (3378)	122 (3099)	140 (3556)
10,000	36,390 (16,506)	1190 (4505)	132 (3353)	125 (3175)	145 (3683)

Table 16.0-28. 65 °C Rise, Oil-Filled
HV 34400D, 200 BIL
LV 13800Y, 95 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	9110 (4132)	410 (1552)	115 (2921)	72 (1829)	63 (1600)
1000	9370 (4250)	390 (1476)	115 (2921)	72 (1829)	70 (1778)
1500	10,760 (4881)	410 (1552)	115 (2921)	72 (1829)	93 (2362)
2000	12,210 (5538)	450 (1703)	115 (2921)	72 (1829)	108 (2743)
2500	13,600 (6169)	470 (1779)	115 (2921)	74 (1880)	109 (2769)
3000	14,990 (6799)	510 (1931)	115 (2921)	77 (1956)	125 (3175)
3750	16,590 (7525)	540 (2044)	115 (2921)	77 (1956)	137 (3480)
5000	20,480 (9290)	710 (2688)	122 (3099)	94 (2388)	138 (3505)
7500	32,220 (14,615)	1050 (3975)	125 (3175)	123 (3124)	139 (3531)
10,000	38,460 (17,445)	1350 (5110)	135 (3429)	124 (3150)	148 (3759)

Notes:
1. Dimensions are APPROXIMATE. Refer to the transformer's outline drawing for actual dimensions for construction.
2. For 55 °C units, add 5.00 inches (127.0 mm) to "W" dimension and 10.00 inches (254.0 mm) to "D" dimension.
3. Add 9.00 inches (228.6 mm) to "W" dimension for each bus duct throat.
4. Add 22.00 inches (558.8 mm) to "W" dimension for each 15 kV air terminal chamber.
5. Add 25.00 inches (635.0 mm) to "W" dimension for each 27 kV air terminal chamber.
6. Add 35.00 inches (889.0 mm) to "W" dimension for each 34.5 kV air terminal chamber.

Table 16.0-29. 65 °C Rise,
Silicone/Environmentally Friendly Fluid
HV 6900D, 75 BIL
LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	4930 (2236)	160 (606)	87 (2210)	48 (1219)	76 (1930)
1000	5940 (2694)	180 (681)	87 (2210)	52 (1321)	92 (2337)
1500	7690 (3488)	220 (833)	87 (2210)	59 (1499)	95 (2413)
2000	9270 (4205)	250 (946)	87 (2210)	62 (1575)	107 (2718)
2500	10,630 (4822)	280 (1060)	87 (2210)	62 (1575)	112 (2845)
3000	12,280 (5570)	340 (1287)	87 (2210)	63 (1600)	121 (3073)
3750	14,540 (6595)	380 (1438)	87 (2210)	67 (1702)	122 (3099)
5000	18,620 (8446)	580 (2196)	98 (2489)	68 (1727)	123 (3124)

Table 16.0-30. 65 °C Rise,
Silicone/Environmentally Friendly Fluid
HV 13800D, 95 BIL
LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	5010 (2272)	160 (606)	87 (2210)	48 (1219)	79 (2007)
1000	6090 (2762)	180 (681)	87 (2210)	53 (1346)	82 (2083)
1500	7730 (3506)	220 (833)	87 (2210)	55 (1397)	116 (2946)
2000	9270 (4205)	250 (946)	87 (2210)	59 (1499)	118 (2997)
2500	10,510 (4767)	270 (1022)	87 (2210)	61 (1549)	119 (3023)
3000	12,100 (5488)	310 (1173)	87 (2210)	65 (1651)	119 (3023)
3750	14,380 (6523)	390 (1476)	87 (2210)	65 (1651)	121 (3073)
5000	18,490 (8387)	560 (2120)	97 (2464)	68 (1727)	122 (3099)
7500	32,180 (14,597)	1020 (3861)	98 (2489)	112 (2845)	131 (3327)
10,000	46,580 (21,128)	1760 (6662)	119 (3023)	120 (3048)	131 (3327)

Table 16.0-31. 65 °C Rise,
Silicone/Environmentally Friendly Fluid
HV 13800D, 95 BIL
LV 4160Y, 60 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	5340 (2422)	180 (681)	87 (2210)	49 (1245)	79 (2007)
1000	6120 (2776)	190 (719)	87 (2210)	51 (1295)	82 (2083)
1500	7660 (3475)	220 (833)	87 (2210)	56 (1422)	116 (2946)
2000	9080 (4119)	250 (946)	87 (2210)	59 (1499)	118 (2997)
2500	11,180 (5071)	290 (1098	87 (2210)	64 (1626)	119 (3023)
3000	12,470 (5656)	310 (1173)	87 (2210)	66 (1676)	115 (2921)
3750	14,590 (6618)	360 (1363)	87 (2210)	68 (1727)	121 (3073)
5000	18,330 (8314)	540 (2044)	93 (2362)	68 (1727)	122 (3099)
7500	31,330 (14,211)	970 (3672)	98 (2489)	111 (2819)	131 (3327)
10,000	39,050 (17,713)	1230 (4656)	101 (2565)	114 (2896)	131 (3327)

For special 55 °C rise units, bus duct throats and air terminal chambers, see **Notes** at bottom of page for dimensions that should be added to the table dimensions.

Table 16.0-32. 65 °C Rise, Silicone/Environmentally Friendly Fluid HV 22900D, 150 BIL LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	5970 (2708)	230 (871)	87 (2210)	52 (1321)	73 (1854)
1000	6820 (3093)	240 (908)	87 (2210)	54 (1372)	91 (2311)
1500	8710 (3951)	280 (1060)	87 (2210)	57 (1448)	95 (2413)
2000	10,140 (4599)	310 (1173)	87 (2210)	58 (1473)	110 (2794)
2500	11,890 (5393)	338 (1279)	87 (2210)	62 (1575)	121 (3073)
3000	13,480 (6114)	380 (1438)	87 (2210)	66 (1676)	124 (3150)
3750	15,820 (7176)	440 (1666)	87 (2210)	68 (1727)	125 (3175)
5000	19,250 (8732)	540 (2044)	87 (2210)	70 (1778)	129 (3277)
7500	32,700 (14,832)	1090 (4126)	100 (2540)	99 (2515)	133 (3378)
10,000	50,160 (22,752)	2200 (8328)	120 (3048)	118 (2997)	133 (3378)

Table 16.0-33. 65 °C Rise, Silicone/Environmentally Friendly Fluid HV 22900D, 150 BIL LV 4160Y, 60 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	6090 (2762)	230 (871)	87 (2210)	52 (1321)	75 (1905)
1000	7110 (3225)	250 (946)	87 (2210)	55 (1397)	91 (2311)
1500	8630 (3915)	280 (1060)	87 (2210)	56 (1422)	102 (2591)
2000	10,050 (4559)	310 (1173)	87 (2210)	58 (1473)	107 (2718)
2500	12,170 (5520)	350 (1325)	87 (2210)	63 (1600)	114 (2896)
3000	13,600 (6169)	380 (1438)	87 (2210)	66 (1676)	116 (2946)
3750	15,300 (6940)	420 (1590)	87 (2210)	68 (1727)	126 (3200)
5000	19,350 (8777)	580 (2196)	89 (2261)	70 (1778)	129 (3277)
7500	32,590 (14,783)	1040 (3937)	94 (2388)	98 (2489)	134 (3404)
10,000	40,250 (18,257)	1370 (5186)	109 (2769)	102 (2591)	137 (3480)

Table 16.0-34. 65 °C Rise, Silicone/Environmentally Friendly Fluid HV 22900D, 150 BIL LV 12470Y, 95 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	6930 (3143)	360 (1363)	87 (2210)	56 (1422)	66 (1676)
1000	7920 (3592)	300 (1136)	87 (2210)	58 (1473)	72 (1829)
1500	9370 (4250)	310 (1173)	87 (2210)	59 (1499)	90 (2286)
2000	11,240 (5098)	330 (1249)	87 (2210)	62 (1575)	104 (2642)
2500	12,760 (5788)	370 (1401)	87 (2210)	66 (1676)	110 (2794)
3000	14,260 (6468)	390 (1476)	87 (2210)	69 (1753)	111 (2819)
3750	15,910 (7217)	420 (1590)	87 (2210)	69 (1753)	122 (3099)
5000	19,830 (8995)	530 (2006)	89 (2261)	71 (1803)	130 (3302)
7500	33,990 (15,418)	1100 (4164)	94 (2388)	97 (2464)	139 (3531)
10,000	39,610 (17,967)	1280 (4845)	109 (2769)	99 (2515)	139 (3531)

Notes:
1. Dimensions are APPROXIMATE. Refer to the transformer's outline drawing for actual dimensions for construction.
2. For 55 °C units, add 5.00 inches (127.0 mm) to "W" dimension and 10.00 inches (254.0 mm) to "D" dimension.
3. Add 9.00 inches (228.6 mm) to "W" dimension for each bus duct throat.
4. Add 22.00 inches (558.8 mm) to "W" dimension for each 15 kV air terminal chamber.
5. Add 25.00 inches (635.0 mm) to "W" dimension for each 27 kV air terminal chamber.
6. Add 35.00 inches (889.0 mm) to "W" dimension for each 34.5 kV air terminal chamber.

Table 16.0-35. 65 °C Rise, Silicone/Environmentally Friendly Fluid HV 34400D, 200 BIL LV 2400Y, 45 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	7600 (3447)	370 (1401)	107 (2718)	60 (1524)	68 (1727)
1000	8460 (3837)	390 (1476)	107 (2718)	60 (1524)	84 (2134)
1500	10,740 (4872)	420 (1590)	107 (2718)	62 (1575)	107 (2718)
2000	12,260 (5561)	460 (1741)	107 (2718)	64 (1626)	115 (2921)
2500	13,760 (6241)	490 (1855)	107 (2718)	64 (1626)	121 (3073)
3000	15,020 (6813)	520 (1968)	107 (2718)	66 (1676)	121 (3073)
3750	16,950 (7688)	570 (2158)	107 (2718)	78 (1981)	129 (3277)
5000	20,270 (9194)	650 (2461)	109 (2769)	92 (2337)	132 (3353)
7500	33,980 (15,413)	1200 (4542)	120 (3048)	117 (2972)	136 (3454)
10,000	42,340 (19,205)	1440 (5451)	129 (3277)	150 (3810)	136 (3454)

Table 16.0-36. 65 °C Rise, Silicone/Environmentally Friendly Fluid HV 34400D, 200 BIL LV 4160Y, 60 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	7930 3597)	380 (1438)	107 (2718)	61 (1549)	68 (1727)
1000	8840 (4010)	400 (1514)	107 (2718)	61 (1549)	81 (2057)
1500	10,710 (4858)	440 (1666)	107 (2718)	62 (1575)	95 (2413)
2000	12,530 (5684)	470 (1779)	107 (2718)	64 (1626)	117 (2972)
2500	13,920 (6314)	500 (1893)	107 (2718)	66 (1676)	117 (2972)
3000	15,620 (7085)	560 (2120)	107 (2718)	69 (1753)	127 (3226)
3750	17,580 (7974)	610 (2309)	107 (2718)	71 (1803)	127 (3226)
5000	20,980 (9516)	680 (2574)	108 (2743)	84 (2134)	132 (3353)
7500	32,460 (14,724)	1080 (4088)	119 (3023)	116 (2946)	135 (3429)
10,000	40,320 (18,289)	1360 (5148)	129 (3277)	119 (3023)	135 (3429)

Table 16.0-37. 65 °C Rise, Silicone/Environmentally Friendly Fluid HV 34400D, 200 BIL LV 13800Y, 95 BIL

kVA Rating	Weight Lb (kg)	Gallons (Liters) Liquid	Dimensions in Inches (mm)		
			Height	Width	Depth
750	9270 (4205)	400 (1514)	107 (2718)	65 (1651)	55 (1397)
1000	9900 (4491)	420 (1590)	107 (2718)	65 (1651)	67 (1702)
1500	11,620 (5271)	460 (1741)	107 (2718)	65 (1651)	96 (2438)
2000	13,160 (5969)	500 (1893)	107 (2718)	65 (1651)	117 (2972)
2500	14,580 (6613)	530 (2006)	107 (2718)	67 (1702)	117 (2972)
3000	16,090 (7298)	560 (2120)	107 (2718)	69 (1753)	123 (3124)
3750	17,930 (8133)	600 (2271)	108 (2743)	77 (1956)	130 (3302)
5000	21,410 (9711)	680 (2574)	110 (2794)	77 (1956)	131 (3327)
7500	32,060 (14,542)	1010 (3823)	114 (2896)	116 (2946)	132 (3353)
10,000	41,850 (18,983)	1330 (5035)	122 (3099)	148 (3759)	116 (2946)