Single Phase Padmounted Transformers

10-250 kVA

Introduction to ABB

ABB is a global leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering their environmental impact.

Distribution Transformers

ABB Distribution Transformers provide the most complete line of padmounted transformers to meet the applications of any distribution system. We are a dominant force in the industry. We lead the way with the introduction of new products and services for the ever-changing distribution transformer industry.

We can offer cost-effective solutions for power distribution. We support our industry with a commitment to product development. We utilize the latest manufacturing technology to maintain state-of-the-art quality and productivity. Large vertical integration allows us to ship high quality products in the shortest possible production cycle. We are in alliances with major utilities and businesses around the world providing products and services to meet all their needs.

ABB will continue to build on a heritage of quality, customer satisfaction and technology, and capitalize on its resources, to maintain its position as the number one supplier of transformers in the industry.

Our Quality Policy

Total customer satisfaction through continual process improvement.

Our Values

Our values guide us in how we go about meeting our vision and mission.

Customer Success – We seek to provide solutions for mutual competitive advantage. We set the highest standards for quality, meet delivery commitments and provide high value.

Quality Excellence – We want to be recognized as a company that exceeds our customers' expectations.

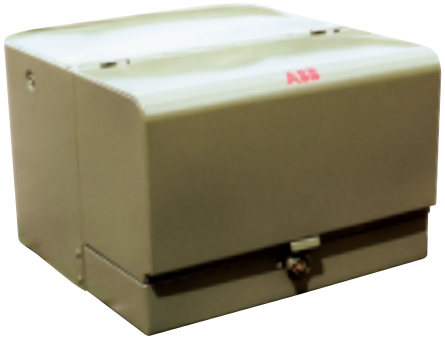


ABB Quality Strategy

Start with a focus on the customer.

Measure what is important.

Define a benchmark for "highest standard for quality."

Have a means to dramatically improve performance against the benchmark.

MTR Mini-Pak Single Phase Padmounted Transformer

A single phase, multi-service, low profile padmounted transformer.

The Mini-Pak is designed for cross feed (Type 2) loop feed or radial feed on a grounded wye, underground distribution system. It can be furnished in a complete line of ratings and in a wide range of configurations to meet the reliability, safety and operating requirements of any distribution system.

The Mini-Pak meets the following industry standards:

IEEE C57.12.00	NEMA TR-1
ANSI C57.12.25	WUG 2.13, Rev. 4
ANSI C57.12.28	ANSI C57.12.29
IEEE C57.12.70	IEEE C57.12.80
IEEE C57.12.90	IEEE C57.91

Ratings @ 65º C Rise:

kVA: 10, 15, 25, 37-1/2, 50, 75, 100, 167
HV: 4160GY/2400 through 34500GY/19920V
BIL: 60, 75, 95, 125 kV
LV: 240/120, 480/240, 277 V
60 hertz standard, 50 hertz optional

Standard Features:

1. Equipped with two universal high voltage bushing wells for loop feed. (Only one bushing well is provided for radial feed.)
2. A flip-top hood and heavy duty 3/8", removable stainless steel hinge pins provide safe and durable service.
3. A recessed locking assembly with padlock provisions and a penta-head locking bolt is standard for tamper-resistant operation. A hex-head locking bolt is available.
4. All tanks are constructed of heavy gauge steel. Tank seams are welded and each unit is pressure tested and inspected for leaks prior to shipment. In addition, all single phase transformers are supplied with:
   a) 5/8" -11 stainless steel lifting bosses
   b) Oil level/fill plug
   c) Oil drain plug
   d) Self-actuating pressure relief device
   e) Two ground bosses,1/2" -13 NC tapped hole, 7/16" deep
5. The front sill latches with the flip-top hood, is attached on the side of the tank and is removable.
6. The high voltage universal bushing wells are externally clamped and removable. A parking stand between the bushing wells is provided for attachment of bushing accessories.
7. Externally clamped low voltage bushings with contact nuts.
8. Tamper-resistant design that exceeds ANSI C57.12.28.
9. NEMA safety labels.
10. Nameplate.
11. The paint finish process applies a durable, corrosion resistant finish to the product. The multi-step process includes an epoxy primer uniformly applied by cationic electrodeposition and a urethane top coat.

Optional Accessories:

Overcurrent Protection
- An internal primary protective link to remove the transformer from the system in the event of an internal fault.
- A secondary breaker provides protection against secondary overloads and short circuits.
- An oil-immersed bayonet-type fuse link to remove the transformer from the system in case of an internal fault (fault sensing) or secondary short or overload (overload sensing). This fuse is a drawout design and is supplied in series with an isolation link. A drip plate is provided to prevent oil from dripping onto the bushing or elbow.
- A current limiting fuse mounted in a dry well loadbreak canister.
  - The high interrupting rating of the CL fuse permits its use on systems where the available fault current exceeds the ratings of normal expulsion fuses.
- A partial range current limiting fuse mounted under oil with the transformer tank.
  - An explusion fuse is supplied in series with the partial range CL fuse.
  - Available at 95 and 125 kV BIL.

Switching
- Externally-operated tap changer.
- Externally-operated dual voltage switch.
- Externally-operated loadbreak oil rotary (LBOR) switch.

Primary Connection
- Universal bushing wells (standard) and loadbreak inserts.
- Integral (one piece) loadbreak bushings.

Secondary Connections
- Copper studs with contact nuts (standard).
- Copper studs with rotatable spades.
  - Four-hole, NEMA type, tin-plated copper alloy spade.
  - Four-hole, in line, tin-plated copper alloy spade.

Miscellaneous
- Cleats for anchoring sill to pad.
- Stainless steel transformer (304 or 400 CB).
- Stainless steel ("Mini-Skirt") at base of carbon steel tank.
- Conduit hole (not available with composite hood).
- Provisions for fault indicator.

Minimum/Maximum Design Dimensions

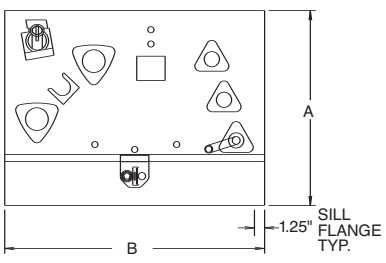
(Actual dimensions will vary according to voltage, loss evaluation, and accessories.)

MTR	A	B	C	D
Min.	24	32	30.5	14.25
Max.	42	44	46.5	19.25

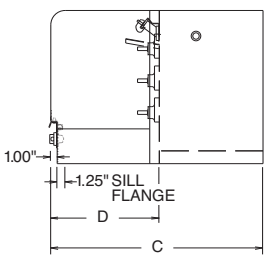
Design Dimensions:

Approximate dimensions. Dimensions are in inches.

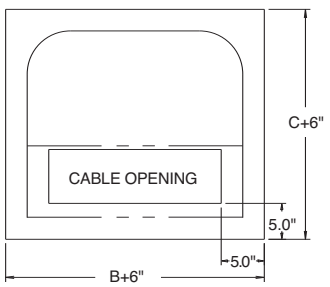
Front View



Side View



Recommended Pad Dimensions



MTR Maxi-Pak Single Phase Padmounted Transformer

A single phase, multi-service, low profile padmounted transformer.

The Maxi-Pak is designed for loop or radial feed on a grounded wye, underground distribution system. It is designed specifically for customers requiring straight-up feed (Type 1) rather than cross feed (Type 2).

The Maxi-Pak meets the following industry standards:

IEEE C57.12.00
ANSI C57.12.21 - Live front
ANSI C57.12.25 - Dead front
ANSI C57.12.28
ANSI C57.12.29
IEEE C57.12.70
IEEE C57.12.80
IEEE C57.12.90
NEMA TR-1
WUG 2.13, Rev. 4
IEEE C57.91

Ratings @ 65º C Rise:

kVA: 10, 15, 25, 37-1/2, 50, 75, 100,167, 250
HV: 4160GY/2400 through 34500GY/19920V
BIL: 60, 75, 95, 125, 150 kV
LV: 240/120, 120/240, 480/240,240/480, 277 V
60 hertz standard, 50 hertz optional

Standard Features:

1. Equipped with two universal high voltage bushing wells for loop feed. (Only one bushing well is provided for radial feed.)
2. A flip-top hood and heavy duty 3/8", removable stainless steel hinge pins provide safe and durable service.
3. A recessed locking assembly with padlock provisions and a penta-head locking bolt is standard for tamper-resistant operation. A hex-head locking bolt is available.
4. All tanks are constructed of heavy gauge steel. Tank seams are welded and each unit is pressure tested and inspected for leaks prior to shipment. In addition, all single phase trans-formers are supplied with:
   a) 5/8" -11 stainless steel lifting bosses
   b) Oil level/fill plug
   c) Oil drain plug
   d) Self-actuating pressure relief device
   e) Two ground bosses, 1/2" -13 NC tapped hole, 7/16" deep
5. The front sill latches with the flip-top hood, is attached on the side of the tank and is removable.
6. The high voltage universal bushing wells are externally clamped and removable. A parking stand between the bushing wells is provided for attachment of bushing accessories.
7. Externally clamped low voltage bushings with contact nuts.
8. Tamper-resistant design that exceeds ANSI C57.12.28.
9. NEMA safety labels.
10. Nameplate.
11. The paint finish process applies a durable, corrosion resistant finish to the product. The multi-step process includes an epoxy primer uniformly applied by cationic electrodeposition and a urethane top coat.

Optional Accessories:

Overcurrent Protection
- An internal primary protective link to remove the transformer from the system in the event of an internal fault.
- A secondary breaker provides protection against secondary overloads and short circuits.
- An oil-immersed bayonet-type fuse link to remove the transformer from the system in case of an internal fault (fault sensing) or secondary short or overload (overload sensing). This fuse is a drawout design and is supplied in series with an isolation link. A drip plate is provided to prevent oil from dripping onto the bushing or elbow.
- A current limiting fuse mounted in a dry well loadbreak canister.
  - The high interrupting rating of the CL fuse permits its use on systems where the available fault current exceeds the ratings of normal expulsion fuses.
- A partial range current limiting fuse mounted under oil with the transformer tank.
  - An explusion fuse is supplied in series with the partial range CL fuse.
  - Available at 95, 125 and 150 kV BIL.

Switching
- Externally-operated tap changer.
- Externally-operated dual voltage switch.
- Externally-operated loadbreak oil rotary (LBOR) switch.

Primary Connection
- Universal bushing wells (standard) and loadbreak inserts.
- Integral (one piece) loadbreak bushings.

Secondary Connections
- Copper studs with contact nuts (standard).
- Copper studs with rotatable spades.
  - Four-hole, NEMA type, tin-plated copper alloy spade.
  - Four-hole, in line, tin-plated copper alloy spade.
- Cable lead secondary.

Miscellaneous
- Cleats for anchoring sill to pad.
- Stainless steel transformer (304 or 400 CB).
- Stainless steel ("Mini-Skirt") at base of carbon steel tank.
- Conduit hole.
- Provisions for fault indicator.

Minimum/Maximum Design Dimensions

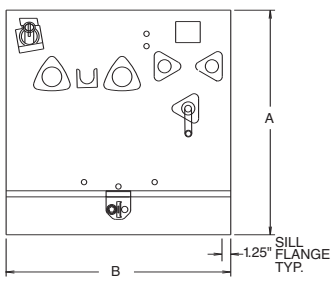
(Actual dimensions will vary according to voltage, loss evaluation, and accessories.)

MTR	A	B	C	D
Min.	32	32	30.5	14.25
Max.	42	44	46.5	19.25

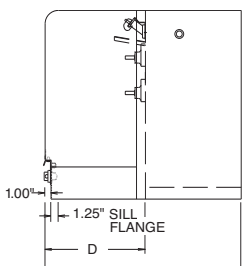
Design Dimensions:

Approximate dimensions. Dimensions are in inches.

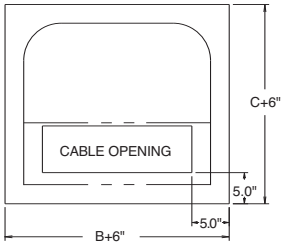
Front View



Side View



Recommended Pad Dimensions



MTR Micro-Pak Single Phase Padmounted Transformer

A single phase, single service, low profile distribution padmount transformer available in loop or radial feed.

Designed to aesthetically, safely and economically provide underground electrical service to single loads, particularly, rural residences, farms and ranches.

The Micro-pak meets the following industry standards:

ABB padmounted distribution transformers meet the following industry standards:

IEEE C57.12.00	IEEE C57.12.80
ANSI C57.12.25	NEMA TR-1
ANSI C57.12.28	WUG 2.13, Rev. 4
ANSI C57.12.29	IEEE C57.91
IEEE C57.12.70	IEEE C57.12.90

Ratings @ 65° C Rise:

kVA: 10, 15, 25, 37-1/2, 50
HV: 4160GY/2400 through 24940GY/14400V
BIL: 60, 75, 95, 125 kV
LV: 240/120, 480/240, 277 V, 120/240①,240/480①
60 hertz standard, 50 hertz optional

Standard Features:

1. Equipped with two universal high voltage bushing wells for loop feed. (Only one bushing well is provided for radial feed.)
2. A flip-top hood and heavy duty 3/8", removable stainless steel hinge pins provide safe and durable service.
3. A recessed locking assembly with padlock provisions and a penta-head locking bolt is standard for tamper-resistant operation. A hex-head locking bolt is available.
4. All tanks are constructed of heavy gauge steel. Tank seams are welded and each unit is pressure tested and inspected for leaks prior to shipment. In addition, all single phase transformers are supplied with:
   a) 5/8" -11 stainless steel lifting bosses
   b) Oil level/fill plug
   c) Oil drain plug
   d) Self-actuating pressure relief device
   e) Two ground bosses, 1/2" -13 NC tapped hole, 7/16" deep
5. The front sill latches with the flip-top hood, is attached on the side of the tank and is removable.
6. The high voltage universal bushing wells are externally clamped and removable. A parking stand between the bushing wells is provided for attachment of bushing accessories.
7. Externally clamped low voltage bushings with contact nuts.
8. Tamper-resistant design that exceeds ANSI C57.12.28.
9. NEMA safety labels.
10. Nameplate.
11. The paint finish process applies a durable, corrosion resistant finish to the product. The multi-step process includes an epoxy primer uniformly applied by cationic electrode position and a urethane top coat.

Optional Accessories:

Overcurrent Protection
- An internal primary protective link to remove the transformer from the system in the event of an internal fault.
- An oil-immersed bayonet-type fuse link to remove the transformer from the system in case of an internal fault (fault sensing) or secondary short or overload (overload sensing). This fuse is a drawout design and is supplied in series with an isolation link. An optional drip plate is provided to prevent oil from dripping onto the bushing or elbow.

Primary Connection
- Universal bushing wells (standard) and loadbreak inserts.
- Integral (one-piece) loadbreak bushings.

Secondary Connections
- Copper studs with contact nuts (standard).
- Copper studs with rotatable spades.
- Four-hole, NEMA type, tin-plated copper alloy spade.
- Four-hole, in line, tin-plated copper alloy spade.
- Cable lead secondary.

Miscellaneous
- Cleats for anchoring sill to pad.
- Polypad mounting base.
- Stainless steel transformer (304 or 400 CB).
- Stainless steel ("Mini-Skirt") at base of carbon steel tank.
- Conduit hole.
- Provisions for fault indicator.

Minimum/Maximum Design Dimensions

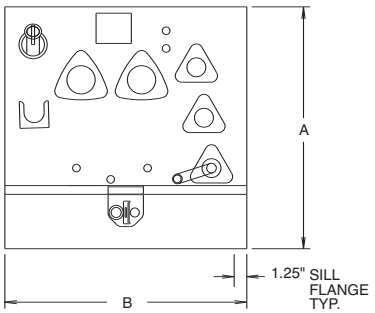
(Actual dimensions will vary according to voltage, loss evaluation, and accessories.)

MTR	A	B	C	D
Min.	24	24	30.5	14.25
Max.	26	24	35.5	16.25

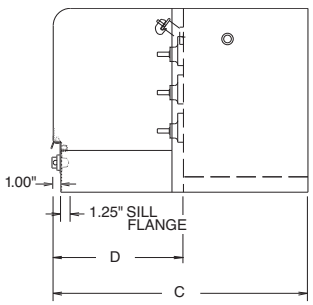
Design Dimensions:

Approximate dimensions. Dimensions are in inches.

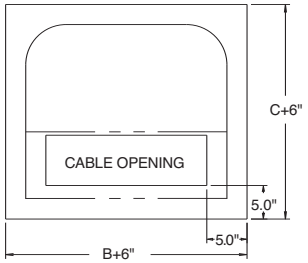
Front View



Side View



Recommended Pad Dimensions



①Available only with cable lead secondary

Single Phase, Padmounted Transformer Underground

The single phase underground transformer is designed for use on residential underground systems. It is built to withstand environmental conditions common to below-grade and vault-type installations. The transformer utilizes a stainless steel tank and cover.
ISO 9001 Certified

Standard Features:

- A 400 CB stainless steel tank with all seams welded. Each unit is pressure-tested and inspected for leaks prior to shipment.
- Equipped with two (2) universal, high-voltage bushing wells for loop feed
- Parking stand between the two (2) primary bushings for attachment of bushing accessories
- Welded-in stud, low-voltage bushings with threaded studs for use with copper or aluminum connectors
- Stainless steel ground pads near each bushing
- All single phase transformers are supplied with:
  - Two (2) lifting lugs
  - Oil level/fill plug
  - Oil drain plug
  - Oil level sight gauge
  - Self-actuating, pressure-relief device
- Sealed tank construction
- Welded-on cover
- Nameplate
- Durable, corrosion-resistant paint finish

Options and Accessories:

- An oil-immersed, bayonet-type fuse link removes the transformer from the system in case of an internal fault, secondary short, or overload.
- Secondary connections:
  - Copper studs with contact nuts (standard)
  - Copper studs with rotatable spades
- Copper windings
- Miscellaneous
  - External tap changer
  - 304 stainless steel tank

Single Phase, Padmounted Transformer Underground

Specifications:

- Ratings @ 55° C Rise
  Although the insulation is 65° C temperature rise, an actual full-load temperature rise of 55° C maximum allows additional capacity for temperature differentials between vault-type and above-ground installations per ANSI standards.
- 60 Hz standard, 50 Hz optional

kVA	HV	BIL	LV
25, 37.5, 50, 75, 100, 167	4160GY/2400 – 24,940GY/14,400 V	60, 75, 95, 125 kV	240/120, 480/240, 277 V

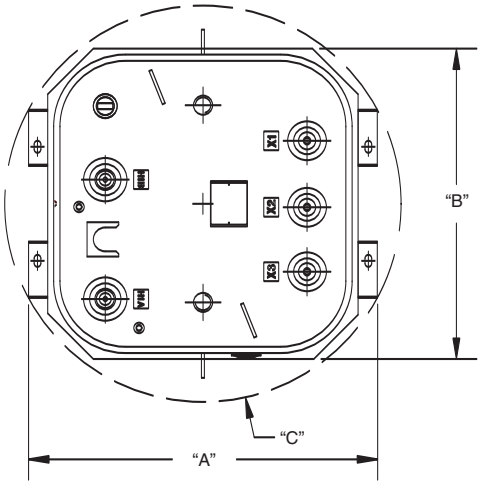
Standard Design Dimensions

(Actual dimensions will vary according to voltage, loss evaluation, and accessories.)

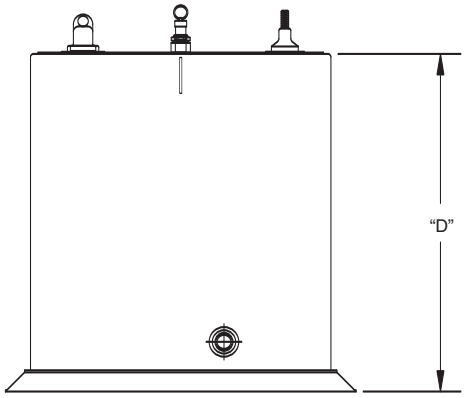
	A	B	C*	D
kVA	Inches (mm)	Inches (mm)	Inches (mm)	Inches (mm)
25	29 (745)	26 (661)	33 (845)	28 (720)
37.5	29 (745)	26 (661)	33 (845)	28 (720)
50	29 (745)	26 (661)	33 (845)	30 (771)
75	31 (791)	28 (705)	36 (907)	33 (847)
100	31 (791)	28 (705)	36 (907)	38 (974)
167	32 (824)	29 (738)	37 (935)	42 (1076)

*C Dimension = Diameter

NOTE:
Dimensions are in inches (millimeters) and are approximate based on single-voltage units with or without taps. Dimensions may change to meet specific customer requirements.



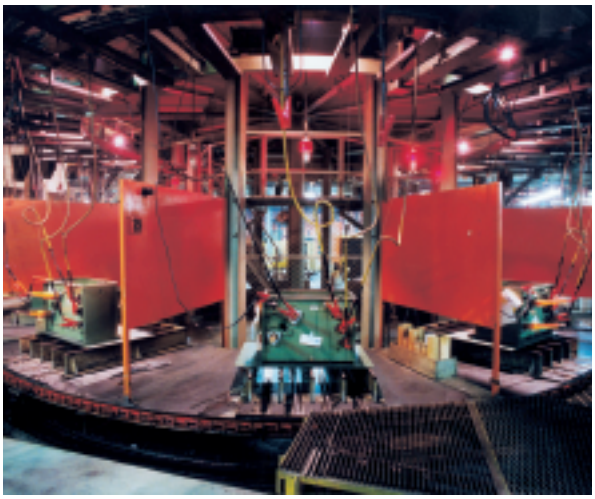
Front View



Side View

Distribution Transformer Testing

The ABB commitment to manufacture quality distribution transformers is backed by a series of transformer tests used to verify conformance to performance characteristics outlined in the latest revisions of IEEE C57.12.00 and IEEE C57.12.90. These identified tests are also part of the Quality System which is audited semi-annually by DET NOSKE VERITAS (DNV) to the ISO Standards.



Testing Program

Factory tests are performed on a transformer to confirm that it is properly designed and constructed to carry rated load and that it will withstand the conditions it will be exposed to in service.

Each transformer manufactured by ABB must undergo a series of tests.

1. Polarity, Phase-Relation, and Ratio
2. Demag Test
3. Applied Voltage Test of the HV
4. Applied Voltage Test of the LV
5. Induced Voltage Test
6. No-Load (Excitation) Loss and Excitation Current
7. Impedance Voltage and Load Loss
8. Full Wave Impulse
9. Continuity Check

Test Facilities

The multi-station, automated test facilities are operated by process control computers. Required interaction with test floor personnel is minimal with the computers initiating and monitoring each test, and then analyzing the test results feedback. The computers are programmed to conduct tests according to ANSI standards, and according to the ratings of each transformer style, the test floor computers will initiate appropriate test setups, compare results with established ANSI standard limits, and determine acceptance for each tested unit.

The test results for each unit are recorded and stored on computer files for access and analysis.

Polarity, Phase-Relation, and Ratio Tests

These tests verify proper phase-relation (three phase), ratio, and polarity (single phase) of the transformer under test. To pass, a unit must demonstrate the proper polarity or phase-relation and have a turns ratio within one-half of one percent of the nominal voltage ratio.

Demag Test

Some transformers require the Demag Test to remove any residual magnetism in preparation for an impulse test. It also serves as a no-load exciting current test. A transformer passes this test if the exciting current does not exceed the limit specified for the design of the transformer.

Applied Voltage Test of the HV

This test checks the dielectric integrity of insulation structures between the high voltage and low voltage, and between the high voltage and ground. A pass/fail decision is made by monitoring the test current intensity. If the resulting current is larger than specified normal leakage and capacitive currents, the unit is rejected. This test is omitted for transformers with a permanently grounded high voltage winding.

Applied Voltage Test of LV

This dielectric test is similar to the Applied Voltage test of the high voltage circuitry except that the integrity of insulation structures between the low voltage and the high voltage, and between the low voltage and ground is checked. A pass-fail decision is made by monitoring the test current intensity. If the resulting current is larger than specified normal leakage and capacitive current, the unit is rejected.

Induced Voltage Test

The principal purpose of this test is to verify the dielectric strength of turn to turn, layer to layer, phase to phase, and other insulation structures within the transformer windings by inducing an overvoltage condition (at higher than normal frequency to avoid saturation of the core). The test current is monitored, and if it exceeds limits specified for each transformer, the unit is rejected.

No-Load Loss and Excitation Current

This test measures the no-load (excitation) loss and the transformer exciting current with rated voltage applied. If the exciting current and/or the no-load loss exceed the limits specified, the transformer is rejected.

Impedance Voltage and Load Loss

This test measures the load loss and the impedance voltage at rated current. The load loss and the impedance voltage must be within specified limits.

Full Wave Impulse

The impulse test is one of several tests designed to verify the dielectric strength of the many insulation structures within the distribution transformer against line voltage surges. It is performed to comply with ANSI standards and for quality assurance. The change in the ANSI standard in 1993 required all manufacturers to install fault detection sensitive enough to detect a single turn short.

Continuity Check

This test is performed on all transformers to verify transformer circuit and component integrity. This test is performed with an ohmmeter to verify that the internal wiring is correct.

The transformer's nameplate is compared to manufacturing information for style, serial number, kVA, HV rating, LV rating, tap voltages, impedance, conductor materials and coil BIL rating. The bushings, electrical accessories, and fuses are verified.

Special Tests

Some tests are performed at the option of the customer.

Sound Testing

ANSI standards define the required sound levels for transformer but some customers specify reduced sound levels. The sound generated by a transformer is affected by the core geometry, flux density, tank design, and the quality of assembly of all the transformer components into a completed unit. Sound tests are made with the unit powered at 100% and 110% of rated voltage under no-load conditions.

Temperature Tests

Core losses and coil losses are the primary sources of heating within the transformer. Our transformers are guaranteed to have an average coil winding temperature of no more than 65° C rise over ambient air temperature when operated at rated voltage and load conditions.

The temperature test is performed to determine the thermal characteristics of the transformer and to verify that they are within design limits.

Calibration

Test equipment is calibrated on a scheduled basis by trained technicians. Calibration records are maintained in accordance with the Quality System procedures. These are audited semi-annually by DNV in accordance with ISO Standards.

Short Circuit Withstand Capabilities

Distribution transformers are subjected to external short circuits on the secondary side. Such external faults can develop on the service line, in the house wiring or in connected loads due to numerous environmental reasons. These faults can be line-to-ground, double line-to-ground or line-to-line.

To meet these operating conditions, the American National Standard Institute (ANSI) has set standards concerning short circuit withstand capability. These standards require that distribution transformers shall be designed and constructed to withstand the mechanical and thermal stresses produced by these external short circuits.

The current standards relating to short circuit strength are IEEE C57.12.00 which sets the short circuit withstand requirements for distribution transformers and IEEE C57.12.90 which provides procedures for short circuit testing.

For distribution transformers, the magnitude of the short circuit current, the numbers of short-circuit tests and the duration of each short circuit test are defined by ANSI standards as follows.

A. Magnitude

Category	Single Phase kVA	Three Phase kVA	Withstand Capability*
I	5-25	15-75	40
	37.5-100	112.5-300	35
	167-500	500	25
II		750-2500	$1/Z_{T**}$

*Base current (Symmetrical) per unit for all distribution transformers with secondary rated 600 V and below.

**The short circuit current will be limited by the transformer impedance only.

B. Number of Tests

Each phase of the transformer shall be subjected to a total of six tests, four with symmetrical fault currents and two with asymmetrical fault currents.

C. Duration of Short Circuit Tests

When short circuit tests are performed the duration of each test shall be 0.25 s except that one test satisfying the symmetrical current requirement shall be made for a longer duration on distribution transformers. The duration of the long test in each case shall be as follows:

Category I:

$$T=1250/I^2$$

Where T is the duration in seconds,

And $I=I_{sc}/I_R$=symmetrical short circuit current, in multiples of normal base current except I shall not exceed the maximum symmetrical current magnitudes listed in A.

Where $I_{sc}=I_R/Z_T$=symmetrical short circuit current, in rms amperes

I_R=rated current on the given tap connection, in rms amperes

Z_T=transformer impedance on the given tap connection in per unit on the same apparent power base as I_R

Category II:

$$T=1.0 \text{ second}$$

Criteria of Satisfactory Performance

According to ANSI Standards a unit is considered to have passed the test if it passes a visual inspection and dielectric tests. Recommended additional checks include examination of wave shape of terminal voltage and current, leakage impedance measurement and excitation current test. (Refer to IEEE C57.12.90.)

The standard allows the following variations in the leakage impedance:

Z_T (Per Units)	Percentage Variation
0.0299 or less	22.5-500 (Z_T)
0.0300 or more	7.5

Z_T=per unit impedance of the transformer

Paint Finish Process

ABB utilizes a multi-step process to apply a corrosion resistant finish to transformers. The materials and processes used are designed to protect against the effects of abrasion, sunlight, rural and industrial atmospheres, and humidity. Each carefully controlled process step has a specific purpose, and each step builds on the previous steps to form the complete protection system that ensures that our transformers meet ANSI functional paint specification guidelines.

Paint Process Procedure

Transformer parts receive the following steps of surface preparation prior to painting.

1. Abrasive cleaning: All parts are cleaned or prepped to remove welding by-products and provide more consistent adhesion and corrosion protection.
2. Alkaline wash cleaner: Removes mill oils, drawing oils, and shop soils that could interfere with good adhesion.
3. Water rinse.
4. Zinc phosphate coating: Provides a firm anchor for good paint adhesion and provides resistance to underfilm corrosion should the paint film be damaged, exposing bare metal.
5. Water rinse.
6. Deionized water rinse: Removes any ionic contamination to prepare for first application of paint.

The entire cleaning and pretreating process is automatic and conveyorized with all chemicals applied by spray. The pretreatment system combines the latest in cleaning technology such as DI rinses and zinc phosphate over abrasive cleaning in a tried and true format to provide the best possible pretreatment before paint is applied.

One of the keys to effectiveness of the ABB paint finish system is the primer. The green epoxy primer is applied by cationic electrodeposition – a dip process in which positively charged primer particles are attracted to grounded parts (cathodes). This method applies a very uniform, pinhole-free coating which penetrates and thoroughly coats all parts. This is a highly effective process for coating parts with difficult geometry. The process utilizes practically 100% of the primer paint, and since the primer is water borne OSHA and EPA emission standards are met. The primer is free of lead and chrome. After rinsing, parts are cured in an oven in preparation for the next step.

After the transformer is assembled, a final coating of two-component urethane paint is spray applied for color and additional film build. The final coat provides the weatherability necessary to protect the unit from sunlight and maintain its appearance.

Summary

The ABB paint system utilizes advanced techniques and materials to provide a superior finish system on pad-mounted distribution transformers. Each step in the process is specifically designed to maximize finish performance while minimizing waste to provide the best possible combination of performance and cost.

Paint Finish Specifications and Test Results

Parameter	Test Method	Specification	Typical ABB Value
Total exterior film build	Elcometer 456 Basic F	Not specified by ANSI	2.5 - 3.5 mils
Salt fog 1500 hrs.	ASTM B117	6 rating per ASTM D1654, no blisters	7 rating per ASTM D1654, no blisters
Adhesion	ASTM D3359 Method A or B	100%	100%
Humidity 1000 hrs.	ASTM D4585 @45c	No blisters, up to 1 pencil hardness change per ASTM D3363	No blisters, no softening
Impact, 80 InLb	ASTM D2794/ ASTM B117	No red rust after 24 hrs.	No red rust after 24 hrs.
Oil resistance	Immerse in 100c Oil for 72 hrs.	No loss of adhesion per ASTM 3359, no blisters, no streaking, up to 1 pencil hardness change per ASTM D3363	No loss of adhesion, no blisters, no streaking, no change in hardness, color or gloss
QUV, 500 hrs.	ASTM G53/D523	50% loss of gloss, no cracks, no crazing	40% loss of gloss, no cracks, no crazing
Abrasion, 3000 cycles	ASTM D4060 24 hrs.	No red rust after 24 hrs.	No red rust after 24 hrs.
Gravelometer, 60 PSI	ASTM 3170/ SAE J400	After 24 hrs. red rust in chips to not exceed 4B rating	4A (better than 4B)
QUV/SCAB, 15 cycles	ASTM G53	6 rating per ASTM D1654, no blisters	6 rating per ASTM D1654, no blisters

Paint meets or exceeds ANSI C57.12.28, C57.12.29 and EEMAC Y1-2, Canadian Standard.

ABB Inc.
Distribution Transformers
500 West Highway 94
Jefferson City, MO 65101
Phone 573-634-2111
Fax 573-659-6275
e-mail:
www.abb.com/distributiontransformers

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ISO Certified
September, 2005