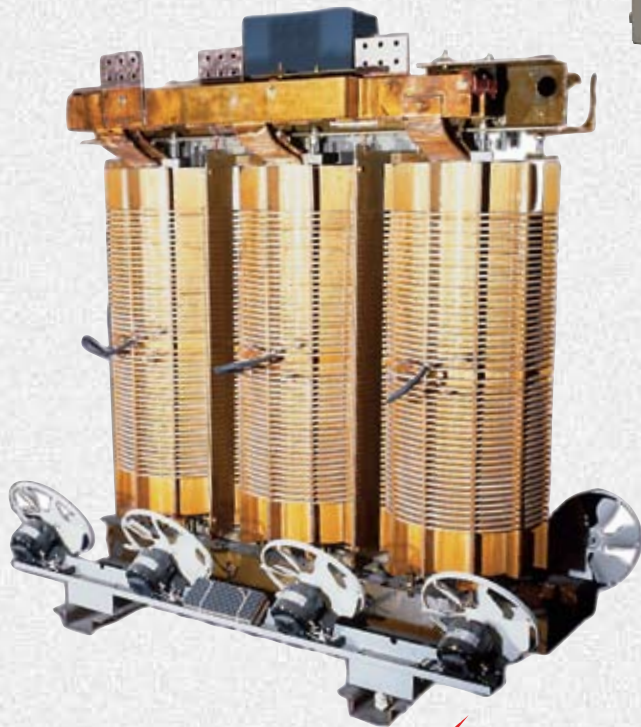


# *VPI & Epoxy Shielded Dry-Type Transformers*



VPI & Epoxy Shielded

**FEDERAL**  **PACIFIC**<sup>TM</sup>

**ISO 9001:2000  
REGISTERED**

## VPI and Epoxy Shielded

Federal Pacific vacuum pressure impregnated (VPI) transformers combine a performance proven dry-type transformer design with the environmental protection of a polyester coil encapsulation process. This combination ensures reliable transformer operation in hostile environments containing moisture, dust, dirt, chemicals and other contaminants.

The VPI process fully penetrates and seals the coils into a high strength composite unit for complete environmental protection. Since the coil protection is created using vacuum pressure impregnation rather than molding, maximum design flexibility is achieved to allow conformance to the most stringent application requirements.

The vacuum impregnation of the varnish eliminates winding voids to reduce essentially to zero any corona generation due to insulation voids. Corona, particularly in conjunction with corrosive environments, accelerates the degradation of the insulation materials and will cause the transformer to fail prematurely.

Federal Pacific VPI and Epoxy Shielded transformers are available in sizes from 7.5 KVA to 10,000 KVA and voltages from 600 through 34,500 volts. The most popular standard KVA and voltages are available, as well as custom sizes.

### Benefits

Federal Pacific Epoxy Shielded vs. Cast Coil:

- Lower initial cost
- Flexibility of design

- Elimination of cracking epoxy
- Higher thermal overload  
Cast = 17% @ 80/115° C rise  
VPI = 30% @ 80/150° C rise
- Less weight for easier handling and installation
- Smaller dimensions to save valuable floor space
- Outstanding environmental protection

### The Product

A high quality electrical transformer with excellent resistance to dust, fumes and moisture. Superior resistance to cracking from thermal cycling. Maximum design flexibility. All at less cost than cast coil transformers.

### The Material

Federal Pacific uses high performance 100% solid, precatalized, solventless varnish. This varnish, when applied, imparts a clear, tough, high bond strength coating to the coil assembly. It also adds high dielectric strength as well as mechanical bond strength and unparalleled thermal endurance.

### Coil Construction

Circular coil construction is used to assure proper ventilation and maximum short circuit strength. Coils are constructed using a 220° C Nomex<sup>®</sup> insulation system that for many years has had proven performance in dielectric strength, temperature stability and long life. The high voltage coils are wound directly over the low voltage coils to form a complete assembly. The coil assembly is completely insulated and mechanically braced to pass all ANSI standard test prior to encapsulation. The coil does not depend on the encapsulation process and its material to provide electrical and mechanical strength. The VPI process provides an additional margin of insulation and strength.

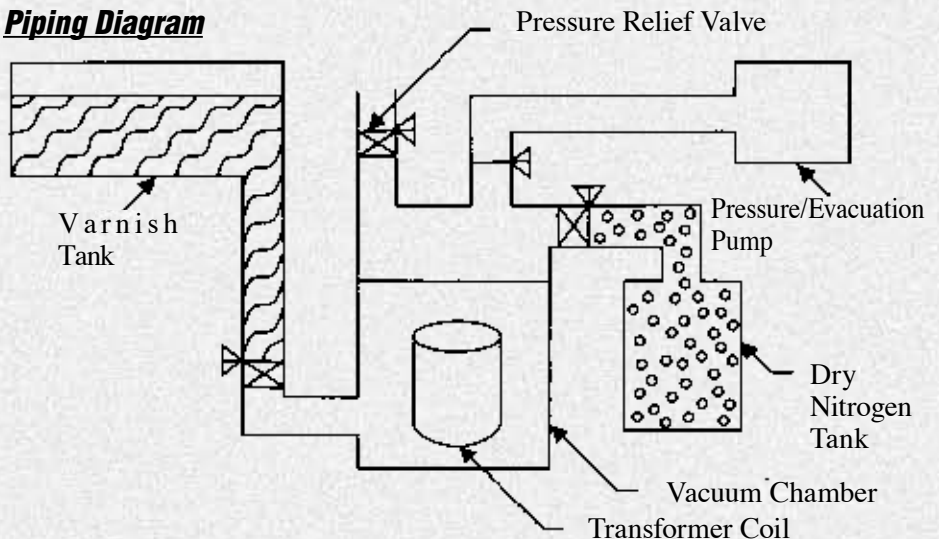


## The Process

- Coil assembly baked 2 hours at 375° C to remove moisture.
- Pre-heated coil assembly placed in sealed VPI tank.
- Vacuum applied (27" Hg) and held for 45 minutes.
- Dry nitrogen blanket injected to lower vacuum to 21" Hg.
- Vacuum broken and pressure (75psi) applied for 45 minutes.
- Varnish evacuated and returned to the reservoir.
- Coil assembly drained, then baked for 4 hours at 375° F. (190° C.).

**Total process time = 8 hours, 15 minutes.**

## Piping Diagram



## Epoxy Shielded Transformer

Federal Pacific offers, in addition to VPI, the Epoxy Shielded Transformer, a product superior to the more expensive and larger cast coil transformer.

Federal Pacific's Epoxy Shielded design has the same benefits of unequalled environmental protection, high Basic Impulse Levels, low sound, and superior short circuit strength, as cast coil transformers. But the Epoxy Shielded transformers has the added benefits of lower cost, greater design flexibility, elimination of cracking, higher thermal overloads, smaller dimensions and less weight.

The Federal Pacific design begins with a quality VPI transformer. To this we add 2 mils minimum of modified epoxy varnish and the result is a premium transformer ready to handle the really tough environments. The Federal Pacific Epoxy Shielded Transformer is ideal for environments polluted with chlorides, acids, alkalies, salt water and high humidity.

Federal Pacific uses high viscosity (40-60 sec. #4 Fordcup) formulated epoxy. This specially formulated epoxy is designed for greater film dry thickness than most epoxies in use today. The epoxy used has a high percentage of solids, yet has a relatively low cure weight. This unique combination allows high mechanical bond strength and a low overall unit weight.

Where your environmental concerns are the greatest, specify the best epoxy transformer on the market today - Federal Pacific's Epoxy Shielded transformer.

## Specification Guide

The transformer(s) shall be open dry-type with both primary and secondary coils encapsulated with polyester resin using a vacuum pressure impregnation (VPI) process (optional VPI with Epoxy Shield). The transformer shall be fire resistant, and cooled by the natural circulation of air through the windings.

The unit shall be mounted in an indoor (optional outdoor/NEMA 3R) ventilated enclosure, finished in the manufacturer's standard light gray paint.

The transformer will be designed, manufactured and tested in accordance with applicable ANSI, NEMA and IEEE standards.

## Conductor Material

The conductor shall be electrical grade aluminum (copper)

## Insulation Material

All insulation materials for the primary and secondary coils shall be rated for continuous 220° C operation.

## Optional Forced Air Cooling

A complete forced air cooling system shall be provided for automatically increasing the self cooled rating by 33-1/3%. The system shall contain 120 VAC single phase fans and a control panel with indicating lights, temperature indicator, fan position test switch and alarm mode selector switch.

## Ratings

The transformer shall be rated as follows:

KVA \_\_\_\_\_ self-cooled AA  
\_\_\_\_\_ (optional FA or FFA)

Phase \_\_\_\_\_

Hertz \_\_\_\_\_

Primary Voltage \_\_\_\_\_

Delta (Wye) \_\_\_\_\_

Secondary Voltage \_\_\_\_\_

Wye (Delta)

Primary Taps  $2 \pm 2-1/2\%$  full capacity

Primary Basic Impulse Level  
KV

Maximum Temperature Rise:

80° C     115° C     150° C

## Coil Assembly

The high and low voltage coils shall be round, concentrically wound as an integral assembly. The insulated coil assembly shall be capable of passing all standard ANSI and NEMA tests, including impulse test before the coils are encapsulated.

## High Voltage Taps

Taps shall be terminated at the coils and equipped with provisions for changing taps under de-energized conditions.

## Encapsulation System

The coil assembly shall be encapsulated using a VPI process. This process shall utilize heat, vacuum and pressure to completely seal and bind the windings. The VPI encapsulating material shall be solventless polyester. (An additional shielding of high viscosity insulating epoxy may be applied after the VPI process for protection against environments containing corrosive elements).

## Core Structure

The core structure shall be of non-aging, cold rolled, grain oriented, high permeability silicon steel. All core laminations shall be free of burrs and stacked without gaps. The core

framing structure shall be of rigid construction to provide full clamping pressure upon the core and provide support points for the coils.

Cores to be constructed in a butt-lap construction, or as an option, a miter type construction.

Vibration dampening pads shall be provided to isolate the core and coil assembly from the base structure.

The outside surfaces of the core shall be varnish dipped to protect against corrosion.

## Enclosure

The enclosure shall be constructed of 12 gauge sheet steel equipped with removable panels for access to the core and coils on the front and rear. Ventilated openings shall meet NEMA and IEEE standards. The enclosure shall include provisions for rolling, skidding, jacking and lifting.

Finish to be an electrostatic powder coating using a U.L. approved outdoor polyurethane paint.

## Sound Level

The transformer shall be designed to meet or exceed the standards for dry-type transformers per ANSI and NEMA standards.

## Tests

Each transformer shall be tested in accordance with IEEE C57.12.91.

The VPI or Epoxy Shielded transformer shall be as manufactured by Federal Pacific.

## Other Products Available

### TRANSFORMERS

#### 600 Volt and Below Dry-Type Transformers

- Encapsulated/compound filled transformers
- Industrial control transformers
- Buck-Boost transformers
- General purpose, lighting and control power transformers
- Open core and coil transformers
- Electrostatically shielded transformers
- Motor drive isolation transformers
- Energy saving 115° C and 80° C designs
- K-Factor transformers
- Wall mounting, dripshield and terminal lug accessories

#### Specialty Transformers

FP will custom engineer your specialty transformer requirements.

#### High Voltage Dry-Type Transformers

- Core and coil transformers
- General purpose transformers
- Outdoor designs
- Unit substation transformers
- Motor drive isolation transformers
- K-Factor transformers
- Padmounted transformers
- Vacuum pressure impregnation (VPI) transformers
- VPI/epoxy shielded transformers
- UL® listed high voltage transformers