TMC TRANSFORMERS
ESTABLISHED 1936

JAS-ANZ

Certified System
Quality
ISO 9001
SAI GLOBAL

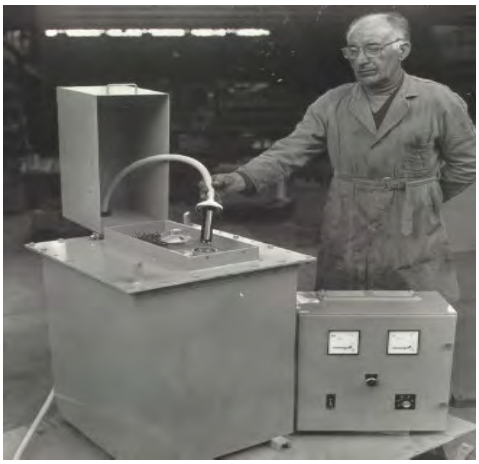
THE ORIGINAL TMC

Tried and Trusted for more than 85 Years

SPECIAL OIL COOLED CONVERTER
(RECTIFIER / INVERTER)
TRANSFORMERS

March 2024

TMC FOUNDATIONS



Transformers Manufacturing Company Pty Ltd - TMC began manufacturing high voltage oil cooled and air cooled transformers in Melbourne Australia in 1936.

TMC flourished during the following decades, building a reputation as a reliable manufacture of innovative and quality products supplied to private and government enterprises.

The engineer proprietors of TMC have always been hands-on and maintained a constant eye on evolving technologies and industry developments and have invested heavily in the most advanced European machinery to ensure the highest quality production output. Today TMC has one of the most complete and sophisticated transformer manufacturing facilities in the world.

In 2013, full control was assumed in Transformers Manufacturing Company España S.A. (TMC Spain) bringing together the strength of TMC Australia's deep engineering and meticulous manufacturing experience with the expansive production capabilities of the Spanish plant located in the Basque Region near Bilbao.

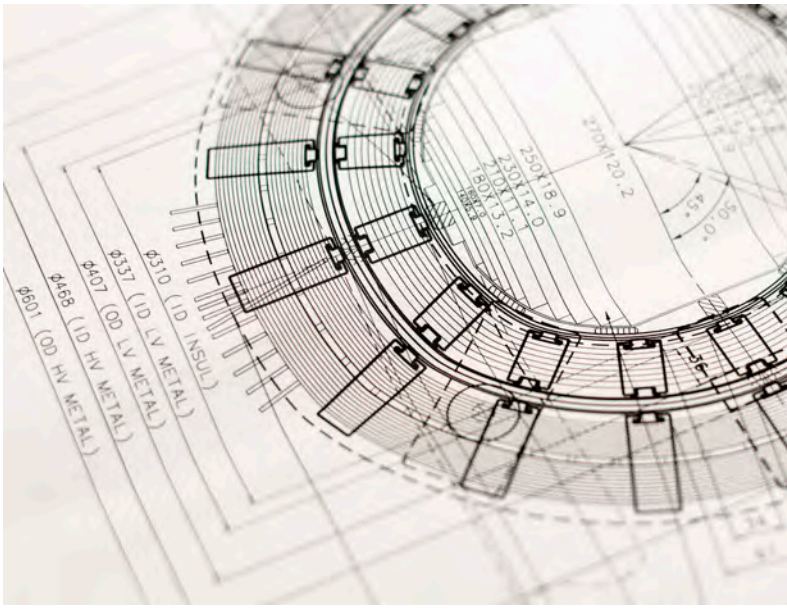
TMC Australia specialises in the manufacture of bespoke, often complex and highly sophisticated distribution and power transformers in both dry type - cast resin and vacuum pressure impregnated (VPI) – and oil cooled as well as reactors for a wide range of applications.

Decades of reliable, high quality output has earned TMC Australia a worldwide reputation for excellence in engineering and production.

TMC Australia's reference list is enviable as very few companies come close to the breadth of TMC's engineering and manufacturing expertise.

TMC is the only local manufacturer of cast resin transformers and one of only a handful of local manufacturers of oil cooled transformers in Australia.

Through its unyielding commitment to excellence, TMC has developed a strong and loyal customer base, many of which have been purchasing transformers from TMC for more than 50 years for installation all over Australia and around the world.



ENGINEERING

TMC follows meticulous design principles, developed and refined over decades and thousands of engineering projects which have served a wide range of industries and applications, particularly where reliability and quality are critical.

TMC engineers solve complex engineering challenges with innovative technical solutions. They work synergistically using a collaborative approach enabling all engineers access to the team's vast experience and expertise.

TMC engineers are closely connected to the manufacturing process and remain involved during production when new technical milestones are presented

Technical designs are carried out with the aid of proprietary software that solves transformer design algorithms for optimum electromagnetic and economic outcomes

TMC has designed and manufactured elegant and bespoke solutions for customers who have been unable to solve technical challenges elsewhere and has earned a worldwide recognition for its engineering ingenuity.

The engineering department has been equipped with the most modern scientific data processing facilities so as to ensure that the most economical unit can be easily and efficiently designed.

TMC engineers are ready to advise on the design and application of all products. A continuous program of research and development provides a constant flow of improvement in design, materials and performance.

Customer satisfaction is ensured by rigorous compliance with the quality assurance program.

TMC engineers continually research new methods and processes to deliver customers with optimum solutions.

SPECIAL OIL COOLED TRANSFORMERS

TMC has a long established reputation for manufacturing oil cooled transformers of the highest quality, built to last for complex applications where reliability is key.

TMC produces Special Oil Cooled Transformers with capacities up to 30MVA and voltages up to 72kV with optional On-Load Tap Changer.

TMC Oil Cooled Transformers are fitted with high quality detachable radiators and can be supplied with fans and pumps to increase the rated capacity (kVA).

The advanced tank design can be configured with options as specified by the customer, to facilitate use of the transformer in varying situations.

In its simplest form, the transformer is equipped with exposed LV and HV bushing type terminations.

For industrial installations, dual chamber, air filled cable boxes protect the terminals.

Where there are height limitations, plug and socket HV connections can be provided.

In extremely corrosive atmospheres, a stainless steel tank may be specified.

A conservator with Buchholz relay is supplied where gas formation, oil leakage or oil surge must be monitored.

TMC oil cooled converter transformers are designed, manufactured and tested in accordance with the latest issue of IEC and local applicable standards according to customer specifications

Transformer with oil containment bund

Transformer with conservator tank

CHARACTERISTICS

Oil cooled transformers have a number of distinct advantages depending on the particular application and installation.

PERFORMANCE

- High reliability
- Higher voltages / higher BIL
- Capacity to support high, immediate and short overloads
- Lower operating noise

ENVIRONMENTAL

- Modern dielectric fluids have high flash points and minimal environmental impact

ECONOMIC

- Longer life due to lower partial discharge
- May be smaller, more efficient and lower comparative cost than dry type

INSTALLATION ENVIRONMENT

- Ability to withstand damp, humid, saline and tropical environments
- Suitable for conditions with atmospheric contaminants such as metal, chemicals, dust
- Ability to operate in harsh, dusty and dirty conditions
- Oil Cooled Transformers are suitable for installation indoors or outdoors

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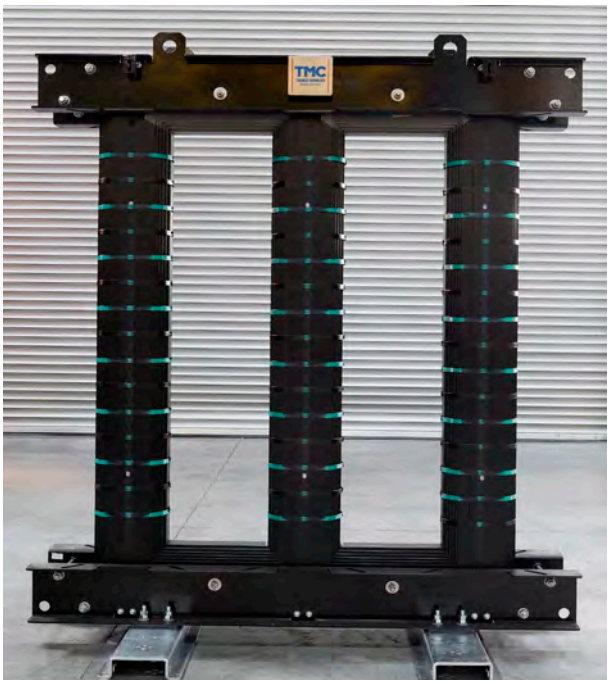
KEY COMPONENTS

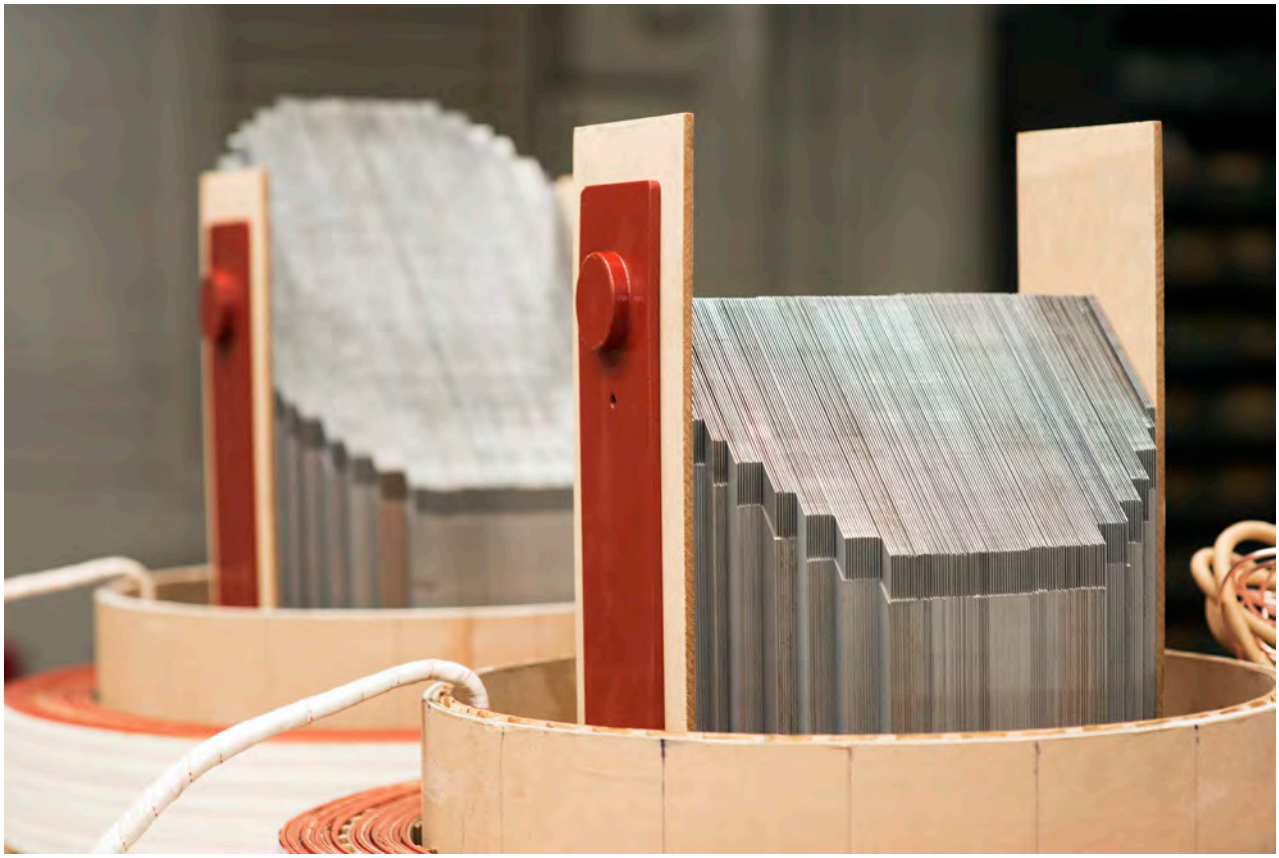
CORES

Cores are manufactured from prime quality, low loss, grain oriented ferro-silicon steel laminations, individually coated with high temperature, inorganic insulation.
Joints are fully mitred.

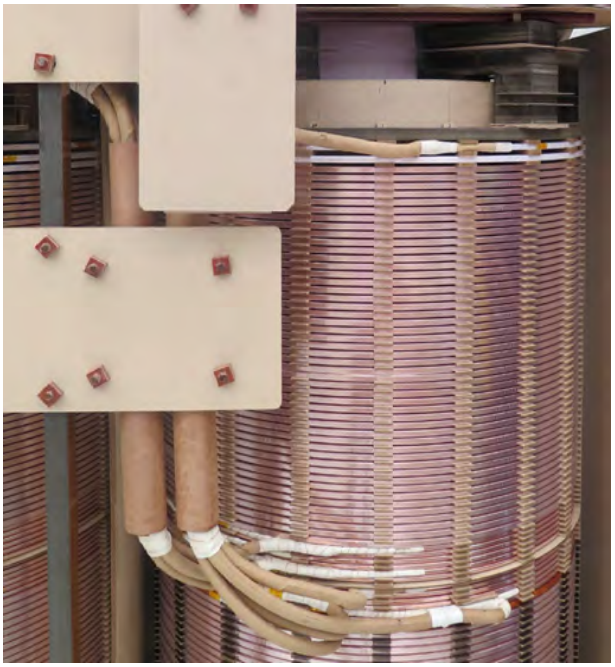
The yoke sections are firmly clamped between either laminated hardwood beams or sandblasted mild steel clamps.

Oil compatible insulating materials including pre-compressed presspahn paper and high voltage grade P3 paper Bakelite are used within the core assembly.





HIGH VOLTAGE (HV) WINDINGS



The high voltage windings are wound in disc formation using long life polyester film insulated rectangular strip conductor.

Specialised vertical wire winding machines are used, enabling ultra-low internal voltage stress designs.
The open disc formation of the winding creates multiple paths for oil flow ensuring a lower temperature gradient when the transformer is operated at rated power output with overloads.

Care is taken to equalise the electrical length of the windings to achieve optimum short circuit performance. The completed coils are oven cured to ensure complete bonding of interlayer components and to pre-shrink coils prior to assembly onto the core.

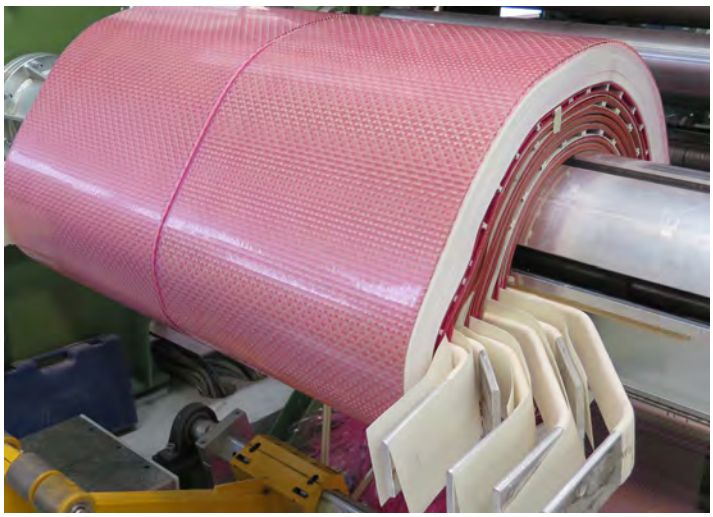
LOW VOLTAGE (LV) WINDINGS

The low voltage windings are wound from full-width foil to provide the high short circuit strength. The LV foil conductor edges are conditioned prior to winding, and each turn is insulated with three-ply high temperature oil compatible insulation.

Sophisticated winding machines enable insulation and conductor materials to be simultaneously wound, resulting in a very compact winding, capable of resisting radial and short circuit forces.

Generously dimensioned oil cooling ducts ensure a low temperature gradient when the transformer is operated at rated power output.

The completed coils are oven cured to ensure complete bonding of any interlayer components and pre-shrink coils prior to assembly onto the core



TANKS

Tanks are either Hermetically Sealed or Conservator Type.

The transformer tank is constructed from high strength grade 350 mild steel plate. After fabrication the tank is sandblasted and immediately painted with a three-coat outdoor epoxy paint system. The topcoat is re-coatable polyurethane.

Radiator banks from hot dip galvanised high quality, oval tube, thick wall steel can be provided for more efficient cooling. Radiator cooling fans are available to achieve ONAF power rating.

Conservator type tanks with Buchholz relay protection are offered with self-drying dehydrating breathers. Conservator oil/air separating bags are also available.

The tank lid and base are manufactured of robust steel boiler plate, and a skid base with or without wheels is provided.

After fabrication, the tank is sandblasted prior to complete immersion in oil resistant primer. Following cure in an infra-red oven, the final coats are applied and cured in subsequent cycles.

TAP CHANGERS

The transformer is fitted with a tapping switch clearly labelled for selection of the required voltage ratio.

Tap changing is available in both on-load and off-load configurations.

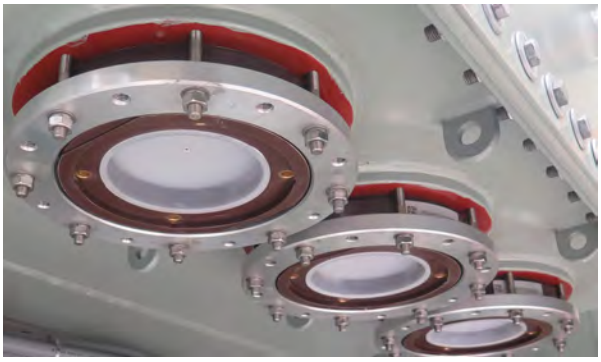
Both versions may be supplied with motor drive operation, with the on-load variety achieving automatic voltage regulation.

HIGH AND LOW VOLTAGE CONNECTIONS

High and low voltage bushing terminations are used to connect the transformer to the mains and to the load.

These are mounted on the transformer tank, sides or lid, or within separate cable termination boxes.

High voltage separable connector systems are available as alternatives to bushings up to 72kV



TRANSFORMER OIL

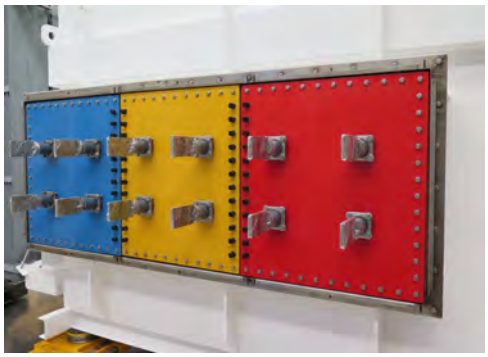
Prior to filling with oil, transformers are individually dried and degassed in an autoclave.

When the insulation resistance has reached a maximum, treated oil is introduced under vacuum, and the tank is sealed.

This procedure ensures that no air is admitted to the windings. The transformer oil has a low viscosity and high flash point and is dried and degassed prior to filling the transformer.

DESIGN AND MANUFACTURING OPTIONS including

- High efficiency (reduced losses)
- Reduced temperature rise
- Multiple primary voltage windings
- Multiple secondary windings
- Hybrid aluminium / copper windings
- Particular vector groups
- Low voltage / low voltage
- Seismic Reinforcement
- Different location options of high and low voltage connection terminals
- Three phase bank of monophasic construction
- Variable speed drives, rectifiers and excitation transformers (multi pulse - 6, 12, 18, 24, 36 & 48)
- Hermetically sealed or conservator type
- 5 limb cores to satisfy reduced height requirements
- Reduced sound level
- Alternative frequencies
- Various impedance voltage
- Enhanced insulation levels (BIL)
- Bespoke terminations
- Enhancements for extreme operating temperatures
- Enhanced corrosion protection
- Stainless steel tank / hardware
- Enhanced K Factors
- High flash point bio-based natural ester fluid or silicon based fluid
- Stainless steel tanks



OPTIONAL ACCESSORIES including

TEMPERATURE MEASUREMENT

- Measuring Device Marshalling Box
- Analogue Temperature Monitor
- Digital Temperature Monitors
- Fibre optic Test Monitors

TEMPERATURE CONTROL

- Cooling Radiator Banks
- Radiator Bank Fans
- Cooling Fan Controller

HIGH VOLTAGE DEVICES

- HV Earthing Switches
- HV Separable Connectors
- HV Bushings
- HV Surge Arresters
- HV Protection Current Transformers
- Motorised On-load Tap Changer
- Manual or Motorised Off-load Tap Changer

LOW VOLTAGE DEVICES

- LV Earthing Switches
- LV Bushings
- LV Protection Current Transformers

VIBRATION & SEISMIC CONTROL

- Wheel Type Vibration Dampeners
- Fixed Type Anti Vibration Device
- Seismic Springs
- Seismic Snubbers

OTHER OPTIONS

- Integrated Oil Bund
- Oil Tank Conservator with or without sealed oil bag
- Bucholz Relay
- Voltage Measurement Transformers
- Earthing Spheres
- Winding Earth Screen

CONVERTER (RECTIFIER / INVERTER) TRANSFORMERS

TMC produces oil cooled converter (rectifier / inverter) transformers with capacities up to 30MVA and voltages up to 72kV.

The transformers are suitable for uses such as traction, solar, wind and mine duty.

CHARACTERISTICS

- Transformers for multi pulse rectifiers.
- Star/Delta, interconnected star (zigzag), extended delta and polygon connections.
- Close coupling or loose coupling between secondaries.
- Interphase transformers can be designed and installed in the tank along with the main transformers.
- Secondary terminations can be arranged to align with rectifier connections.

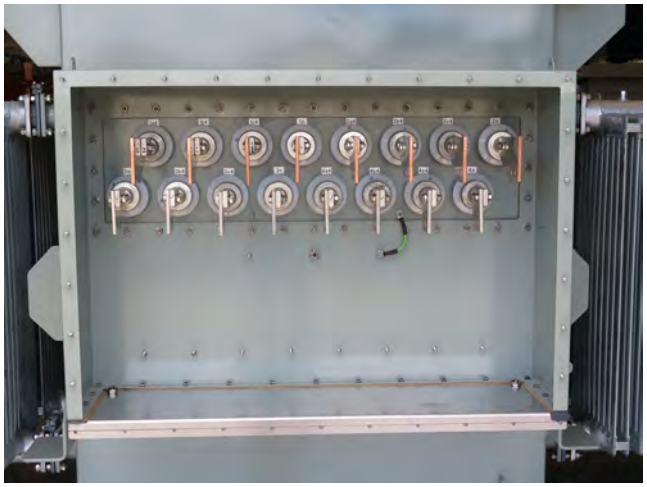
FAN COOLING

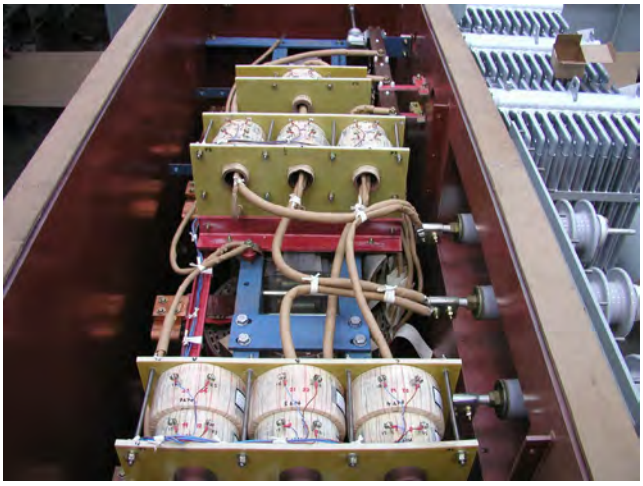
TMC oil cooled converter transformers can be supplied with fans and pumps to increase the rated capacity (kVA).

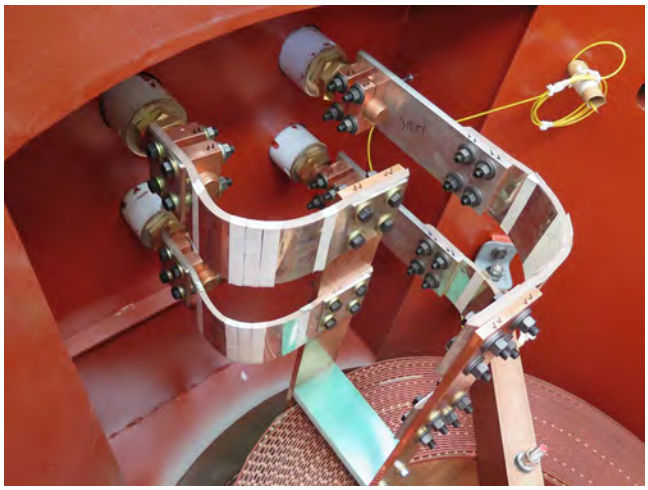
Forced directed oil circulation and/or forced air cooling of radiators permits a continuous power increase of up to 25% above the rated capacity.

Fans can be used to economically provide extra capacity for overload conditions such as cyclic load peaks and traction loads.

PHOTO REFERENCES







31107

40VDC 60Kadc ONAN
Rectifier Transformer
with integral Interphase Transformer

31850

5350kVA 66000/600-600V Yy0d1 ONAN
Railway Traction Rectifier Transformer
With 66kV Pfisterer Separable Connectors

32154

2000kVA 66000/11000 Dyn1 ONAN
Railway Traction Rectifier Transformer

31561

7723kVA 11000/364-364V Dyn1yn51 OFAF
Oil Cooled Transformer
(Refurbished in 2014, originally manufactured in 1993)

2000kVA 66000/11000V Dyn1 ONAN
Oil Cooled Transformer

30690

3300kVA 11000/111-111V Dd0y11 OFAN
Oil Immersed Transformer
With Forced Air Cooling To Remote Radiators

31165

12500/15000kVA 33000/11000V ONAF
Power Transformer With On Load Tap-Changer

30969

2190kVA 22000/177-177V Yd1 Dd0 ONAN
Oil Cooled Rectifier Transformer

31270

12500/15000kVA 33000/6600V Dyn11 ONAN/ONAF
Oil Cooled Transformer
with off-circuit tap changing switch

32018

3000KVA 6600/860-860-860-860V YZN+7.5ZN, DZN+7.5ZN-7.5 ONAN Oil Cooled Mining Transformer

31999

2900KVA 11000V YA0 ONAN
Oil Cooled Starting Autotransformer

0.5mH 4000 A 1500V ONAN
Traction DC Air Cored Reactor

www.tmc.com.au

CANADIAN STANDARDS ASSOCIATION CERTIFICATION

TMC TRANSFORMERS

ESTABLISHED 1936

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