SLOVENSKI STANDARD
SIST-TS CLC/TS 50537-2:2010

01-april-2010

Železniške naprave - Vgrajeni deli za transformatorje vlečnih tokokrogov in hladilni sistem - 2. del: Črpalka za izolacijsko tekočino transformatorjev in dušilk vlečnih tokokrogov

Railway applications - Mounted parts of the traction transformer and cooling system - Part 2: Pump for insulating liquid for traction transformers and reactors

Bahnanwendungen - Anbauteile des Haupttransformators und Kühlsystems - Part 2: Pumpe für Isolierflüssigkeiten für Haupttransformatoren und Drosselspulen

Applications ferroviaires - Accessoires des transformateurs de traction et systèmes de refroidissement - Partie 2: Pompe pour liquide isolant des transformateurs principaux et bobines d'inductance

Ta slovenski standard je istoveten z: **CLC/TS 50537-2:2010**

ICS:

29.180	Transformatorji. Dušilke	Transformers. Reactors
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

SIST-TS CLC/TS 50537-2:2010 **en**

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CLC/TS 50537-2

February 2010

ICS 29.180; 45.060.10

English version

Railway applications - Mounted parts of the traction transformer and cooling system - Part 2: Pump for insulating liquid for traction transformers and reactors

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This Technical Specification was approved by CENELEC on 2010-01-22.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Ref. No. CLC/TS 50537-2:2010 E

Foreword

This Technical Specification was prepared by Working Group 24 of SC 9XB, Electromechanical material on board of rolling stock, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

It was circulated for voting in accordance with the Internal Regulations, Part 2, Subclause 11.3.3.3 and was accepted as a CENELEC Technical Specification on 2009-12-11.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following date was fixed:

– latest date by which the existence of the CLC/TS has to be announced at national level (doa) 2010-07-22

The CLC/TS 50537 series "*Railway applications – Mounted parts of the traction transformer and cooling system*" consists of four different parts:

- Part 1: HV bushing for traction transformers;
- Part 2: Pump for insulating liquid for traction transformers and reactors;
- Part 3: Water pump for traction converters;
- Part 4: Gas and liquid actuated (Buchholz) relay for liquid immersed transformers and reactors with conservator for rail vehicles.

The CLC/TS 50537 series shall be read in conjunction with CLC/TS 50534 [1] "*Railway applications – Generic system architectures for onboard electric auxiliary power systems*".

This standardization project was derived from the EU-funded Research project MODTRAIN (MODPOWER). It is part of a series of standards, referring to each other. The hierarchy of the standards is intended to be as follows:

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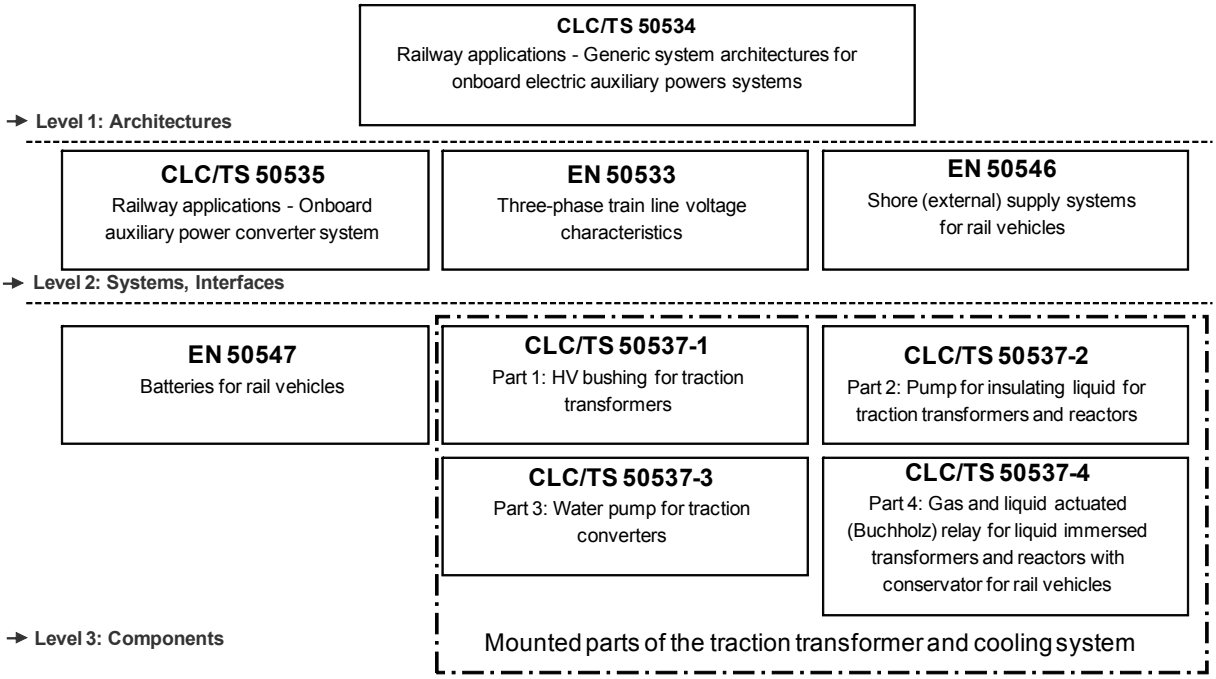
1) Under development.

Overview on the technical framework
CLC/TS 50534 defines the basis for other depending standards



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1 Scope

This Technical Specification covers requirements for electric pumps which generate the circulation of insulation liquid in traction transformers and reactors of rail vehicles and their associated cooling system.

The pumps covered by this Technical Specification are rotodynamic pumps driven by a squirrel cage induction motor which is immersed in the insulating liquid.

CLC/TS 50537-2 gives consideration to both technical and normative requirements of the railway environment and restricts the variety provided by industry-wide standards for pumps (for example EN 50216-7 and EN ISO 9906). It determines requirements and tests enabling the interchangeability especially regarding electrical, mechanical and hydraulic interfaces. Furthermore, service conditions are described.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TS 45545 (series):2009 [2]	Railway applications – Fire protection on railway vehicles
CLC/TS 50467	Railway applications – Rolling stock – Electrical connectors, requirements and test methods
CLC/TS 50534 [3]	Railway applications – Generic system architecture for onboard electric auxiliary power systems
EN 1092-1:2001 [4]	Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1: Steel flanges
EN 1092-2:1997	Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 2: Cast iron flanges
EN 1092-4:2002	Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 4: Aluminium alloy flanges
EN 1561	Founding – Grey cast irons
EN 1563	Founding – Spheroidal graphite cast irons
EN 1706:1998	Aluminium and aluminium alloys – Castings – Chemical composition and mechanical properties
EN 50125-1:1999	Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock
EN 50216-7:2002	Power transformer and reactor fittings – Part 7: Electric pumps for transformer oil
EN 50533 [3]	Three-phase train line voltage characteristics

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2) Part 5 is of CENELEC origin – Other parts are from CEN.

3) Under development.

4) Superseded by EN 1092-1:2007.

EN 60034-1:2004	Rotating electrical machines – Part 1: Rating and performance (IEC 60034-1:2004)
EN 60034-9:2005	Rotating electrical mashines – Part 9: Noise limits (IEC 60034-9:2003, mod.)
EN 60085:2004 [5)]	Electrical insulation – Thermal classification (IEC 60085:2004)
EN 60349-2:2001	Railway applications – Rotating electrical machines for rail and road vehicles – Part 2: Electronic converter-fed alternating current motors (IEC 60349-2:1993, mod.)
EN 60529:1991 + A1:2000	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989 + A1:1999)
EN 60721-3-5:1997	Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 5: Ground vehicle installations (IEC 60721-3-5:1997)
EN 61373:1999	Railway applications – Rolling stock equipment – Shock and vibration tests (IEC 61373:1999)
EN ISO 9906:1999 + corr. Dec. 2004	Rotodynamic pumps – Hydraulic performance acceptance tests – Grades 1 and 2 (ISO 9906:1999)
ISO 281:2007	Rolling bearings – Dynamic load ratings and rating life
ISO 4406:1999	Hydraulic fluid power – Fluids – Methods for coding level of contamination by solid particles

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
rotodynamic pump
pumps based on bladed impellors which rotate within the fluid to impart a tangential acceleration to the fluid and a consequent increase in the energy of the fluid. The purpose of the pump is to convert this energy into pressure energy of the fluid to be used in the associated piping system.

In-line pumps and radial pumps are rotodynamic pumps

3.2
in-line pump (axial flow pump)
pump with the suction and delivery flow being on the same axis. In the case of transformer pumps, the axis of the flanges is usually the same as the axis of rotation of the pump rotor

3.3
radial flow pump
pump with the suction and delivery flow pointing in perpendicular direction. For transformer pumps the axis of the delivery flange is usually perpendicular to the rotation of the motor

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5) Superseded by EN 60085:2008.

4 Operating conditions

4.1 General

The insulating liquid pump is used for the cooling of transformers on rail vehicles. The operation of the pump may be affected by the conditions that occur under normal train service conditions, e.g. corrosive gases, carbon dust and other matter from brake shoes and pads or vibration stress.

Among all service conditions described in this part, malfunction of the pump shall not occur.

4.2 Environmental conditions

The pump shall ensure appropriate functioning under the given environmental conditions:

Temperature range:

- Environmental temperature: -25 °C ... 80 °C
  Other values may be agreed between customer and supplier.
- Transport and storage: -40 °C ... 80 °C
  Condensation shall be avoided.

Altitude: up to 1 400 m
(EN 50125-1:1999, class A1)

Humidity: 0 % ... 100 %

Climate class: EN 60721-3-5:1997, 5K2

Biological classification: EN 60721-3-5:1997, 5B3

Chemical classification: EN 60721-3-5:1997, 5C3

Contamination: EN 60721-3-5:1997, 5F3

Mechanical-active matters: EN 60721-3-5:1997, 5S3

Rain: EN 60721-3-5:1997, 5K3

Solar radiation: EN 60721-3-5:1997, 5K3

Shock and vibration: The pump shall be able to withstand shock and vibration as stated in EN 61373. See also 14.3.14.

4.3 Cooling liquid

Different liquids may be used within the transformer, which are typically used for cooling as well as insulating.

Generally, the pump shall be able to operate with mineral oil, ester and silicone fluid (including chemical matters). The maximum temperature of the cooling liquid is 135 °C for thermal steady state. Other values shall be agreed between manufacturer and customer.

Unless otherwise agreed in the contract, the oil quality is assumed to be at least according to level 15-12 of ISO 4406.

Motor cooling and bearing lubrication shall be effected by circulation of the liquid being pumped.

4.4 Storage and transport conditions

As far as possible, the pumps shall be delivered ready to be installed.

Before storage or transport, it shall be made sure that the pumps are clean and free of all foreign matter and contamination.

During transport and/or storage deterioration caused by condensation shall be avoided by solid covers being shut tightly. On customer request, the pump shall be pressured with an appropriate gas.

Suitable packaging shall be chosen depending on the place and method of delivery. To prevent any possible damage resulting from long-term storage (e.g. on bearings, sealings), the manufacturer shall specify, the way and the orientation in which the pump shall preferably be stored.

5 Electrical requirements

5.1 Power supply

The preferred value and the characteristics of the supply voltage are defined in EN 50533. Other values shall be agreed between manufacturer and customer.

The pumps shall be qualified for direct switch on within the defined operating range of voltage and frequency.

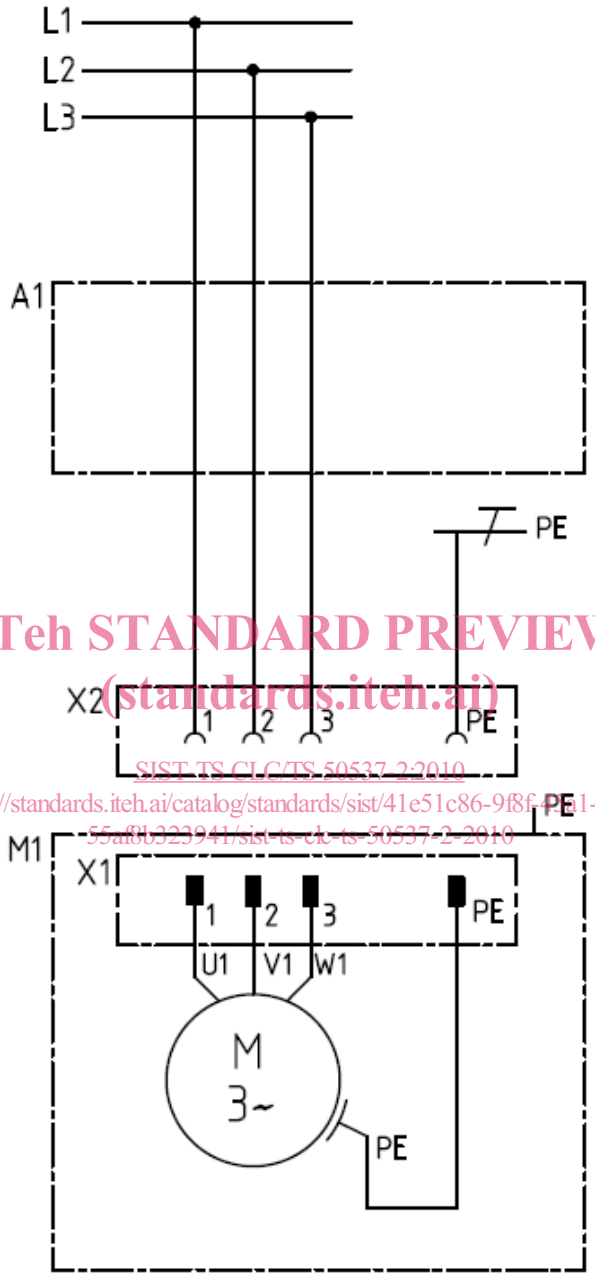
In addition, the pump shall be able to start between 90 % and 110 % rated voltage within the temperature range defined in 4.2 while using the cooling liquid given in 4.3 without excessive heating.

The manufacturer shall specify the permanent current at rated voltage which the motor is able to withstand without being damaged (worst case in agreement with the customer).

A terminal for potential equalisation shall be provided (see Figure 1).

5.2 Electrical connection with three-phase train line

Figure 1 shows how the pump is typically connected to the three-phase train line.



Key

A1: Safety device with e.g.
- Fuses
- Motor protecting switch

X1: Socket housing
X2: Connector
M1: Motor with socket housing

Figure 1 – Typical connection to three-phase train line