Data Communication Solutions for Railway Applications

gross automation

Robust Industrial Data Communications – Made Easy

Westermo Worldwide

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Westermo was established in the early 1970s. The head office being located 150 km (93.2 miles) southwest of Stockholm in Sweden. Over the past three decades Westermo has grown with subsidiaries being established in Sweden, England, Germany, France, Singapore and sales partners appointed in over 30 Countries worldwide.

Today the Westermo brand name is synonymous with robust industrial data communications.

Our 35 years of experience in the industrial marketplace goes far beyond our own products. We understand the problems that can occur in applications installed in the toughest industrial environments and therefore we can offer you the most effective and economical solutions.

All our products are specifically designed to operate reliably in harsh industrial environments and in applications requiring the highest levels of reliability and availability.

Let Westermo be your first choice for robust industrial data communication solutions.

Westermo – A Worldwide Proven Track Record

Westermo have many years experience in both data communication technologies and railway applications both trackside and onboard the rolling stock. Our real expertise is in developing products that can function in the harshest environments and meeting the toughest approval specifications.

Westermo is familiar with mission critical applications in many industries and has therefore developed products and techniques that meet the many specific needs of the rail industry. The patented Westermo FRNT protocol allows for the fastest ring recovery in Ethernet networks – 20 ms for a ring with 200 switches. Our Wolverine range is developed around a technology that allows the creation of Ethernet networks on old installed copper cables that can stretch for tens of kilometres along the trackside.

Westermo are used to developing products to meet industry standards and we have particular focus on two for rail applications.

Trackside Applications

The critical standard for trackside systems is EN-50121-4 Electromagnetic compatibility. Emission and immunity of the signaling and telecommunications apparatus on railway applications.

Lynx, Wolverine, Viper, TD-23 and TD-36 all meet this standard.

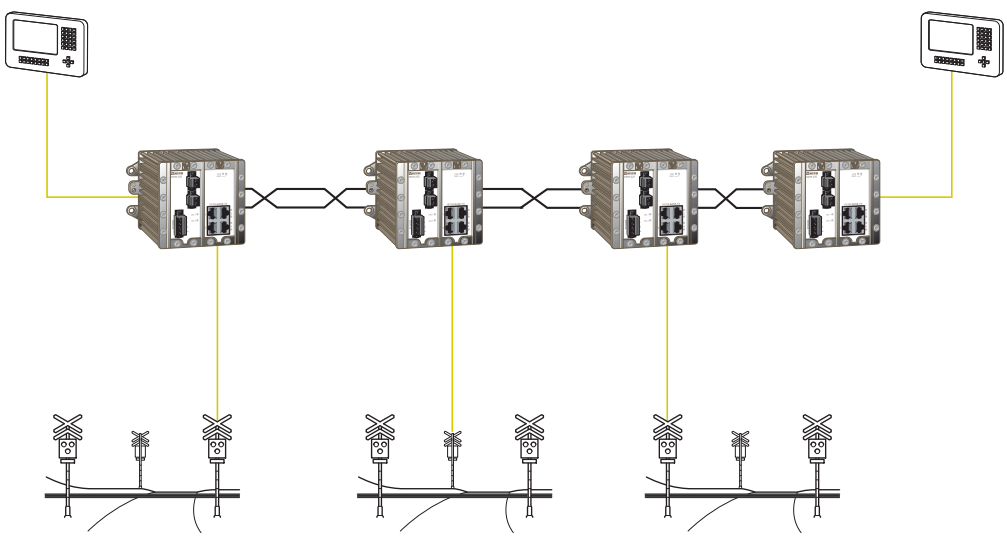
On-Board

EN 50155 is a special onboard standard for electronic equipment that encompasses not just EMC requirements but also shock, vibration extended temperature range and humidity. The Westermo Viper series meets this standard.

Wolverine Series

The Wolverine series utilises SHDSL technology on twisted pair cables to establish a high-speed remote connection. Instead of needing to install fibre cable, the SHDSL technology can provide a cost-effective solution by using old or existing cables. Data rates up to 5.7 Mbit/s and an operating distance of up to 15 kilometres (9.3 miles) at lower data rates can be achieved. Depending on which unit you choose, there are also features like a built-in four port switch to provide a complete network solution, redundant ring protocol with the worlds fastest recovery time (FRNT, 20 ms), serial to IP conversion allowing legacy devices on your Ethernet network and much more.

- Cost effective
- Makes use of old cables
- IP40
- EN-50121-4 compliant
- – 40˚C to +70˚C
- Transient Blocking Unit

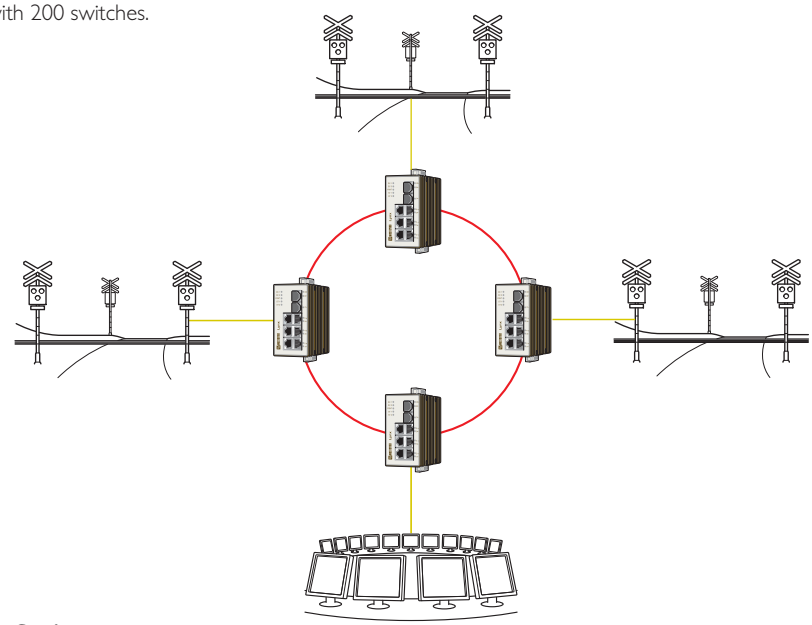


Lynx Series

The Lynx series is a family of Ethernet switches with differing function levels. All models are designed for extreme environments and with high MTBF figures giving you a reliable solution in safety critical applications. The entire range is compliant with the rail EMC standard for trackside applications - EN-50121-4.

The Lynx 400/1400 supports for the patented Westermo FRNT protocol offering the fastest ring recovery time for Ethernet networks – 20 ms for a ring with 200 switches.

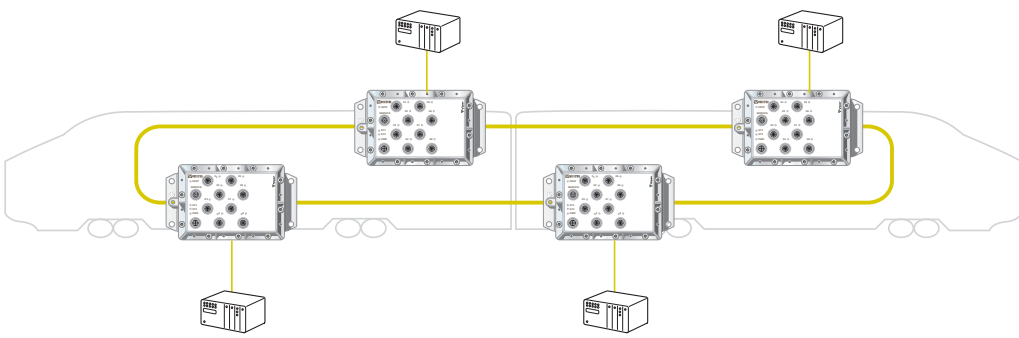
- 20 ms recovery time redundant Ethernet
- Fully managed with priority queues
- IP40
- EN-50121-4 compliant
- –40°C to +70°C
- Wide input range and redundant power supply



Viper Series

The Viper series is designed to guarantee data transmission under extreme conditions such as great mechanical stress or continuous vibration. The robust metal housing is sealed to IP65 and MTBF is calculated to more than a 100 years. The Viper is designed to meet the comprehensive rolling stock standard EN 50155 and also meets the trackside EMC standard – EN50121-4. The Viper 408 also has support for the patented Westermo FRNT protocol offering the fastest ring recovery time for Ethernet networks – 20 ms for a ring with 200 switches.

- EN 50155
- 20 ms recovery time redundant Ethernet
- Wide DC power range (24 – 110 VDC)
- No moving parts or electrolytic capacitors
- Ultra low power consumption (3.5W)



A product range to meet every demand

Westermo provides a full range of data communication solutions for such demanding applications as railways, aeronautics, defence, water treatment, substation automation, roads and tunnels. The staff at Westermo can provide the highest levels of service and technical support to help our customers to choose, configure and install the best solution for each specific application requirement. Our knowledge goes far beyond our own product range; we have a unique competence regarding your environment whether it is on a train, in an aeroplane, on the seabed or in a substation. To ensure a close relationship with the customer, Westermo has a local presence in more than 35 countries. The Westermo product line includes more than one thousand different types and versions of our modems, switches, routers, time servers and converters.

Viper series – Ultra slim M12 switch

The Viper series is a family of two 8-port managed switches with real-time properties for critical applications. The IP65 sealed metal case and rugged M12 front connectors of the unit make it robust and allows for the surrounding air temperature to be between –40 to +70°C. There are no sensitive or fragile components, hardening the product against shock and vibration making these units suitable for rolling stock usage.
The power supply operates over a wide input range from 24 to 110 VDC.

- EN 50155
- 20 ms recovery time redundant Ethernet
- SNMP management facility
- Wide DC power range (24 – 110 VDC)
- No moving parts or electrolytic capacitors
- Ultra low power consumption (3.5 W)
- Sealed to IP65
- SNMP, QoS, HoL

Viper

DDW-120 Ethernet Extender

The DDW-120 is a part of the Wolverine series – A plug-and-play Ethernet Extender that utilises SHDSL technology on twisted pair cables to establish a high-speed remote connection between two Ethernet networks. At shorter ranges the data rate will be as high as 5.7 Mbit/s. The distance can be up to 15 km (9.3 mi) at lower data rates. This unit can be used together with the DDW-22x.

- Up to 5.7 Mbit/s data transmission
- Up to 15 km (9.3 mi) on twisted pair
- LFF (Link Fault Forward)
- Redundant power input (10 – 60 VDC)
- Wide temperature range (–40°C to +70°C)
- Galvanic isolation and transient protection

Wolverine

DDW-22x Ethernet Extenders

The DDW-22x is a set of three Ethernet Extenders in the Wolverine series with different function levels. The units utilise SHDSL technology over twisted pair cables to establish a high-speed remote connection between two Ethernet networks. All three unit have a built in four port switch and extended type approvals and depending on which unit you choose there are also features like FRNT/RSTP redundancy protocol, Serial to IP conversion and much more.

- Up to 5.7 Mbit/s data transmission
- Up to 15 km (9.3 mi) on twisted pair
- FRNT/RSTP redundancy protocol
- Extensive line protection
- Wide temperature range (– 40˚C to +70˚C)
- Galvanic isolation and transient protection

Lynx Series – Compact high performance switch

The Lynx is a family of switches with different function levels and approvals. The switch can be configured with either 100 Mbit or Gbit transceivers offering transmission ranges up to 120 km. The Lynx is managed with four priority queues and features like Head of Line to blocking prevention ensure that the data is deterministic. The 400 and 1400 models are also equipped with the FRNT and RSTP redundancy protocol.

- Real time Ethernet
- Priority queues and priority scheduling
- FRNT/RSTP redundancy protocol
- Extensive line protection
- Wide temperature range (–40˚C to +70˚C)
- Galvanic isolation and transient protection

TD-23 – Multidrop modem (V.23)

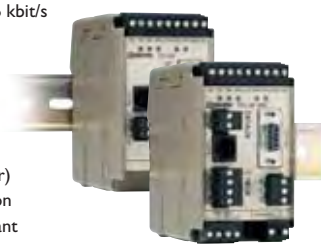
The TD-23 is a modem designed to satisfy industry's demands on reliability and functionality in environments with high levels of interference. The TD-23 communicates via 2- or 4 wire leased line according to the V.23 standard. Equipment with a RS-232 or RS-422/485 interface can be connected and communicate point-to-point or in a multidrop application.

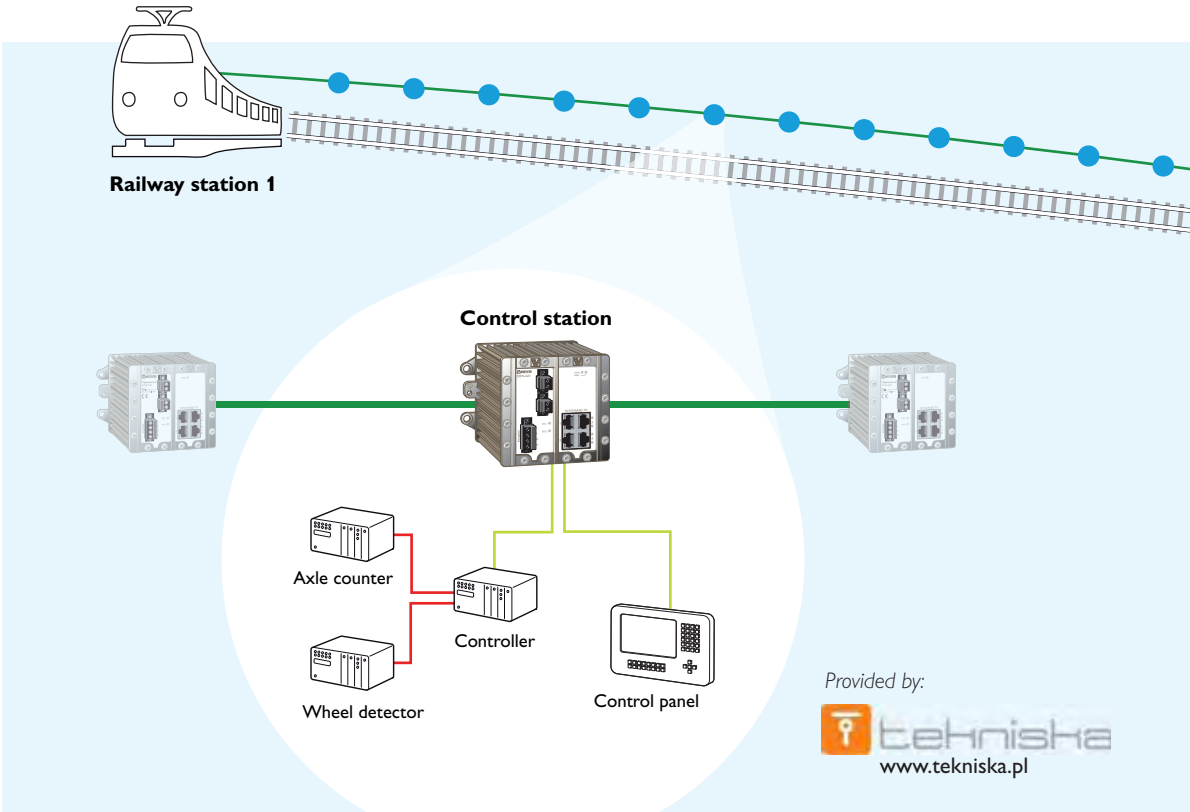
- Data rate 1200 bit/s (v.23)
- 2-wire/4-wire (half/full duplex)
- Transmission distance up to 25 km (15.5 mi)
- Transient protection
- Tri-galvanic isolation (Interface/line/power)
- EN-50121-4 compliant

TD-36/TD-36 485 – Telephone modem

The TD-36/TD-36 485 is designed to function reliably within industrial environments and in areas of high level interference. The TD-36 has an RS-232 interface and the TD-36 485 has an RS-232 and RS-422/485 interface supporting terminal data rates up to 115 kbit/s. The TD-36/TD-36 485 are V.34 modems meaning that they can support bidirectional data rates of up to 33.6 kbit/s on the PSTN or leased line side. Fast connect ensures that leased lines can re-establish connections in the range of 5 seconds.

- Extended temperature range (–25˚C to +70˚C)
- Data rate up to 33.6 kbit/s
- Terminal rate up to 115.2 kbit/s
- V.23 FDX/HDX with multidrop
- Transient protection
- Tri-galvanic isolation (Interface/line/power)
- Remote configuration
- EN-50121-4 compliant





First installation – completed May 2008
A chain of 15 DDW-220 link the control stations with SHDSL technology. Existing cabling was used. Distance between control stations 2 to 4 km.

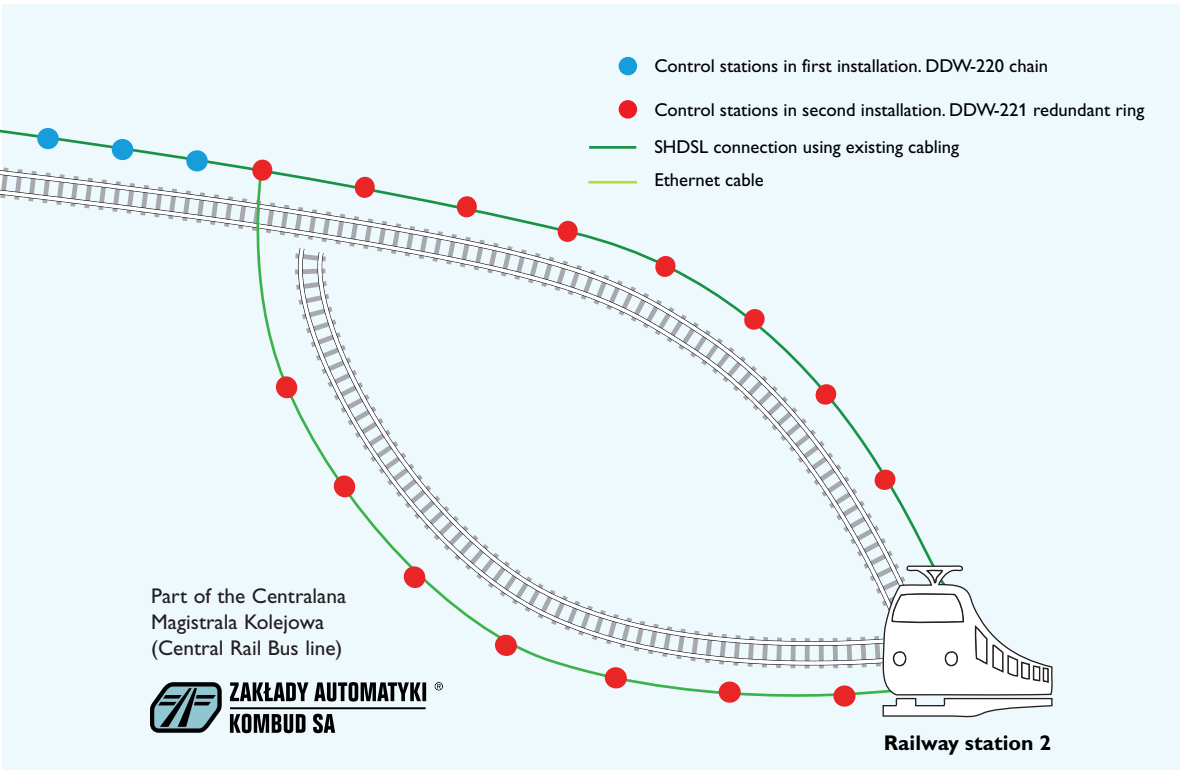
Safety critical railway control system

Poland's rail system is one of the largest in Europe, but in terms of quality and safety, there is a need for modernization. One of the companies employed for this is Zaklady Automatyki KOMBUD S.A., a Polish company that offers overall solutions for railway signalling, covering system design, production, implementation and maintenance.

A new safety system covering 100 km of railway line in central Poland has been built in two steps. A chain of 15 DDW-220 SHDSL Ethernet extenders connecting to a number of cabinets with traffic control equipment were installed in the first step. In the next step 15 DDW-221s were been added alongside the tracks of the Centralna Magistrala Kolejowa (Central Rail Bus line).

The safety system update on this route has resulted in increased safety on many levels, and by making use of pre-existing cabling, they have been able to keep the cost down. In contrast to previously used devices, the Wolverine series has several advantages – The wide variation of operating temperature (–40 to +70°C) as well as the Transient Blocking Unit on each line interface that provides both over-current and over-voltage protection thus allowing the line to handle indirect lightning strike transients are just some of them.

The railway control system is divided in sections covering about



Second installation – completed December 2008
A series of DDW-221 in a redundant ring configuration were added to the system.

2 km (1.24 mi) each. At the end of every section there is a control station that monitors the traffic and prevents conflicting movements. This makes ongoing movement of traffic impossible unless the route is proved to be safe. Signalling systems provide information of nearby trains and suggest a safe speed. Axle counters provide accurate information as to whether another train is in the same section. A start and reset detection point is installed in every section, and if the count is evaluated as zero the section is presumed to be clear for a second train. The decision to use pre-existing cabling to provide the data communication in this safety critical application worried the customer at first. Parts of the cables were in bad shape and some of them were up to 30 years old.

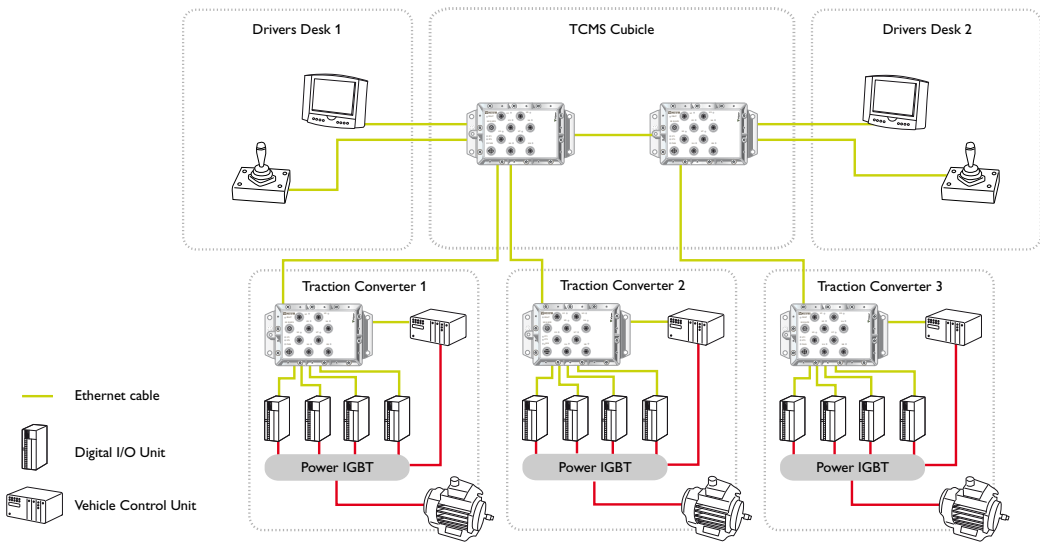
Westermo distributor, Tekniska, preformed on-site tests using DDW-220s which were connected to the actual cables and achieved perfect communication. Today this application uses more than 30 Wolverine Ethernet extenders installed over sections 2 to 4 km in distance.

There have been no reports of disruption to the communications in spite of poor cabling, harsh weather conditions and extreme temperature variations. Previous problems with equipment being damaged by lightning transients have completely stopped.

Locomotive propulsion and control network

Westermo has supplied the ultra robust M12 switch platform, Viper, to be used in a electric locomotives ordered by the Chinese Ministry of Railways. The project scope is for more than 500 locomotives into which 2500 Viper switches will be installed. The first locomotive was completed in December 2008 and the project is estimated to be completed by August 2012.

The Viper series fulfilled the customer's demands for a robust switch that could cope with continual engine vibration and surge levels of up to 8.4 kV. The easy wall mount and the slim design of the housing (W 175 x H 100 x D 50 mm) were other advantages that made the customer choose the Viper. Most importantly the Viper meets the EN 50155 standard for rolling stock applications.



Technology designed to take a beating

We regularly test our products to ensure quality at all times and safety is always an important consideration in our product design and production. Westermo products are certified and approved by some of the most trusted sources across the globe for product compliance. This is a small selection of approvals and standards that we work with:

II 3G EEx nA IIT5 The ATEX directive describes what equipment is allowed in an environment with a potentially explosive atmosphere. Even though the EU originally developed the directive, it is now being applied all over the world.

Westermo products approved to the ATEX directive: DDW-220, DDW-221, DDW-222

Class 1, Division 2 is the equivalent to the Ex classification we have in accordance with the ATEX directive, but for the US and Canadian market.
Westermo have obtained the Class 1, Division 2 certification though an independent third party approval company FM Approvals.

Westermo products with Class 1, Division 2 approval: LYNX-series.

DNV The leading international provider of services for managing risks, Det Norske Veritas (DNV), has approved Westermo units for marine usage according to DNV Standard for Certification 2.4:2006 (covers the requirements in IACS UR E10:2006). The approval by the independent third party proves Westermo compliance according to national and international standards.

Westermo products with DNV approval: SDW-550, LYNX-series.

UL 60950-1 This safety standard is applicable to Information Technology Equipment and specifies requirements intended to reduce risks of fire, electric shock or injury for the operator and layman who may come into contact with the equipment and, where specifically stated, for a service person. This standard is intended to reduce such risks with respect to installed equipment, whether it consists of a system of interconnected units or independent units, subject to installing, operating and maintaining the equipment in the manner prescribed by the manufacturer.

Westermo products certified according to UL 60950-1: TD-36 232, TD-36 485, TDW-33, GD-01, SDW-550.

EN 50155 A number of Westermo units have been tested according the European railway standard EN 50155 (Electronic Equipment Used On Rolling Stock). Performance standards are defined for a railway's operational environment, including shock, vibration, extended temperature range, humidity and many other factors. The standard has been defined so that electronics in rail cars will be able to operate continuously for approximately 250,000 hours.

Westermo products tested according to EN 50155: Viper-series.

EN 50121-4 outlines the principles for Electromagnetic compatibility (EMC) behaviour and management process for achieving EMC at the interface between railway infrastructures and trains. The objective of this standard is to specify the EMC emission and immunity requirements for railway products, and for the railway as an installation.

Westermo products tested according to EN 50121-4: LYNX-series, SDW-500 series, DDW-series, 200-series, Viper8, TD-36, TD-23, TD-29, MDW-45.

IEC 61850-3 is is an international standard for electrical substation systems. The standard enables integration of all protection, control, measurement and monitoring functions within a substation. It combines the convenience of Ethernet with the performance and security, which is essential in substations today.

Substation IEC 61850-3: LYNX-series,

In general almost all Westermo products complies with the immunity for industrial environments in accordance with **EN 61000-6-2** and emission for residential, commercial and light industrial environments in accordance with **EN 61000-6-3**.