AMiT
transportation

Electronics
for rolling stock
and public transport

System and Solutions, Products

EN

Electronics
for rolling stock
and public transport

Systems and Solutions

Products

controls, networks, diagnostics

HMI	VEHICLE	**COMPU**
RS485 CAN ETH MVB	RS485 CAN ETH MVB	

RECORDING UNITS	CAMERAS	CAMERA COVERS	**CCTV**
ETH	ETH		

UIC AUDIO GATEWAYS	MICROPHONES	AUDIO AMPLIFIERS	AUDIO DIGITIZERS	**AUDIO**
UIC ETH	ETH	ETH	ETH	

MODULAR SUBRACK	GATEWAYS	MODULES	ANALYZERS	CONVERTERS	**TCN**
	ETH WTB MVB TRDP	WTB MVB TRDP	WTB MVB	ETH CAN RS485	

MODULAR SUBRACK	VEHICLE CONTROL UNITS	I/O UNITS	PLC UNITS	FUSE MODULES	**TCMS**
	CAN TRDP	CAN TRDP	ETH	CAN	
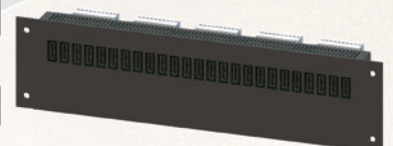
RELIABLE PRODUCTS
FOR A SAFER AND GREENER
ROLLING STOCK

passengers

TRDP · WTB · MVB · UIC · ETH · RS485 · CAN

UTERS

WiFi
ROUTERS	ACCESS POINTS
ETH	ETH
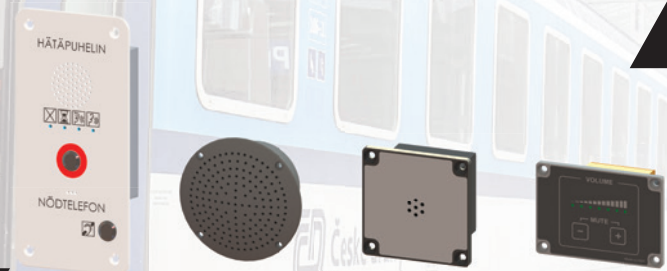
AUDIO
INTERCOMS	SPEAKERS	MICROPHONES	VOLUME CONTROLS
ETH		ETH	ETH

HÄTÄPUHELIN
NÖDTELEFON
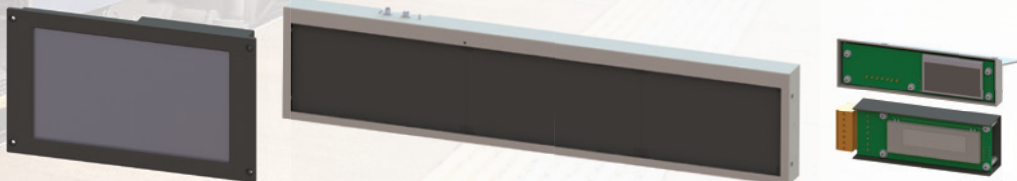
DISPLAYS
TFT	LED	VFD / OLED
ETH	ETH RS485 INDOOR / OUTDOOR	RS485

ETHERNET
SWITCHES	ROUTERS
ETH	ETH

AMiT
transportation

The company

AMiT, spol. s r.o.

is a traditional Czech manufacturer of industrial electronics, modern and reliable solutions for public and mass transport, industrial and building automation.

AMiT embraces the principles of social responsibility, emphasising company sustainability development through corporate culture improvement and responsible behaviour towards society.

Vision

We want to become both a reliable supplier in the rail and rolling stock industry and a respected partner for quality in electronic engineering, manufacturing and services.
Concerning employees, we support their togetherness with the company and increase their responsibility for all of the company's successes and business results.

Mission

Our mission is to discover, develop and deliver reliable, smart and cost-performance efficient products, applications and complex solutions for rolling stock and public transport and to interconnect vehicles, passengers and railway and mass transport operating personnel into the transport ecosystem.

Values

- People and Partnership
- Technology and Innovation
- Quality and Support

We base business and technological partnerships on innovations, the company's engineering expertise, and friendly and high-proficient staff. The featured products and solutions will meet your requirements while reaching or even crossing the technological, qualitative and geographical boundaries of your expectations. For example, you can encounter them on trams, subway, high-speed and commuter trains, locomotives and passenger wagons.

We specialise in developing and delivering complex electronic solutions for demanding operating environments of transport, which must fulfil requirements for high quality, reliability and the relevant technical standards of the given operation, of course. Our tried-and-tested knowledge, state-of-the-art technological background and friendly approach promise you satisfaction in all stages of the supply of our products and solutions and at very affordable conditions.

AMiT
transportation

Membership

ACRI (Czech Railway Industry Association)
SDP ČR (Association of Transport Companies, Czech Republic)
IEC TC9 WG43 (IEC 61375)
IEC TC9 WG46 (IEC 62580)
Trainet SG

Quality policy

Our company's goal is to satisfy customers' demands, ensure their maximum satisfaction, and innovate and extend the product portfolio, achieving business success while increasing the internationally-accepted quality levels of products and services that bear the AMiT brand.

Certifications and Approvals
ISO 9001
EN 50155
EN 15085-2
UIC 556
2016/797/EU

Environmental policy

An environmentally-friendly and coordinated approach to protecting the environment and respecting customers' requirements and needs is an integral part of our company's strategy of support and sustainable development. This undertaking is reflected in the company's environmental policy and includes:

- corporate principles of behaviour focussed on minimising the impact of its business activities on the environment
- an approach to continuously improving employees' working conditions
- monitoring customers' environmental requirements
- as part of marketing
- planning processes, and management of precautionary measures
- principles of developing a company environmental management system

The main advantages of our products and solutions

- complexity of offer
- high reliability
- excellent level of support
- wide range of operating conditions
- comfortable transfer of information
- high degree of configurability and customisation of products
- special certification of the company and products
- (UIC, EN 50155) great affordability

HISTORY

Year	Event
1992	Company established, focused on customised development
1993	First standard control systems for industrial automation
1997	Certification of quality control systems in accordance with ISO 9001
1998	Development and production of control systems for railways
2000	Mass production on own surface mounting machines
2001	Own EMC testing centre
2002	CECOMM control system for rolling stock
2005	Change in head office, new production area, and modernized production
2009	Distributed IP-based surveillance system
2010	Passenger information system
2011	WTB gateway and MVB communication unit
2014	WiFi access point and LTE routers for passenger in train
2015	Expansion of production area and testing center
2017	Waterproof variant Panel (HMI) and Vehicle Computer
2018	TRDP Converters
2020	New office space, headquarters Prague
2021	New production hall Prague

Customer care includes

- individual approach to the customer
- customer support for the entire period of the project life cycle
- strict compliance with the international standards (UIC, EN 50155)
- guarantee of a 36-month warranty for all our products, which may be extended
- continuous use of the best procedures and new trends in the field

PARTNERS

Our partners are an integral part of our company and the basis for further developing the portfolio of customers' products and services to satisfy their requirements in domestic and foreign markets. The most important ones include the manufacturers and suppliers of mass transport vehicles, the professional academic public from secondary schools and universities, and the public transport operators.
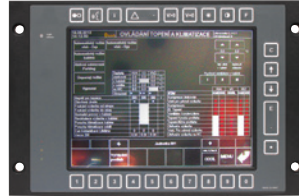
Components of the passenger information system

CCTV - surveillance systems
- CCTV over an IP network
- Key components: interior and exterior IP cameras, IP displays, recording unit and Ethernet infrastructure
- EN 50155 compliant
- Designed to the specific requirements of a project

Control units / HMI
- Panel computers (APxxx series) and vehicle computers (PPxxx series)
- PC based (Windows, Linux)
- Intel CPU / ARM
- For applications in rolling stock (HMI, control, diagnostics, communications)
- Configurable to meet varied requirements
- Designed for extreme operating conditions
- Variety of communication options
- Robust mechanical construction

PA - audio systems
- IP modular system to provide:
  - automatic acoustic announcements to passengers
  - driver's communication to passengers
  - intercom between vehicle crew and driver
  - passenger emergency communication
- EN 50155 compliant

SRS - seat reservation systems
- Reservation system displays in rolling stock
- OLED / TFT / VDF technology for open passenger carriages
- The customer can adjust and finish the vehicle reservation system themselves as needed in the specific project

PVS - passenger visual system
- LED, TFT, LCD and VFD display units for:
  - passenger information systems
  - IP surveillance systems
  - seat reservation systems
- Interior and exterior design of display units
- Wide range of operating temperatures
- Rugged design for rolling stock

UIC audio gateways
- Provide:
  - the public announcement in carriages
  - the telephone line to enable communication of crew with driver
  - the radiotelephone line to communicate with dispatching centres
- Communication with vehicle sections through the serial line RS485

PWLAN - on-board WiFi
- Enables to provide data, audio and video communication services for passengers, vehicle crews and fleets
- WiFi (2,4 or 5 GHz)
- GSM communication 3G/LTE/5G
- Supports QoS, routing and firewall rules
- EN 50155 compliant

TCN gateways
- Modular or compact design
- TCN gateway with up to 3 different communication lines (Ethernet, MVB, WTB, CAN, ETH)
- Operating temperature range -40 °C to +70 °C
- UIC 556 certified
- EN 50155 compliant

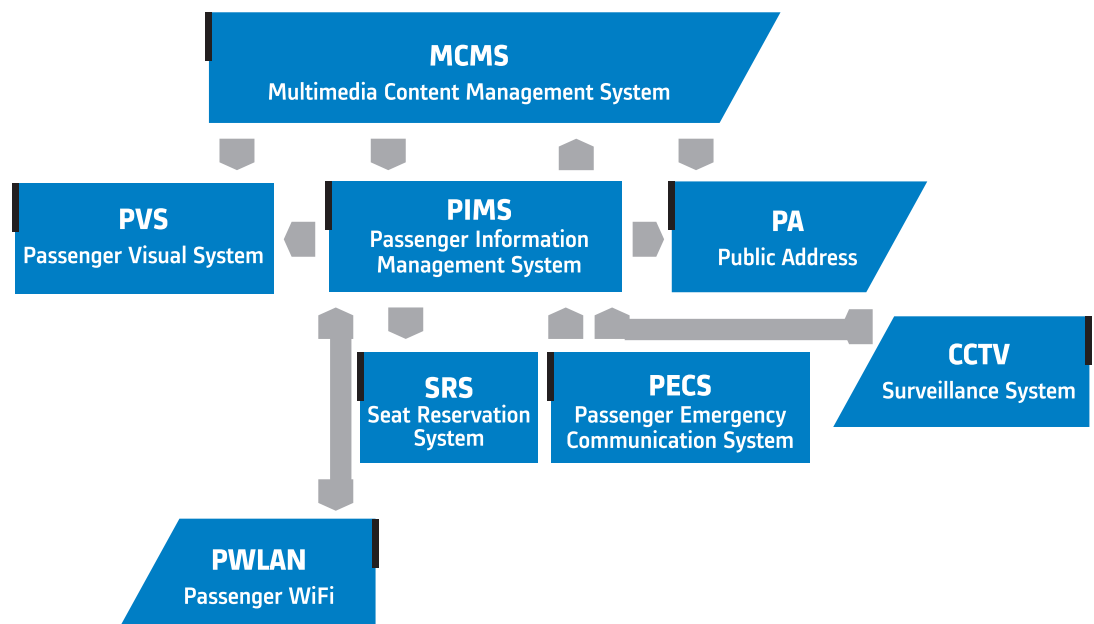## Communication and diagnostic units
- GPS
- GSM / LTE
- GSM-R
- WiFi
- Ethernet M12
- EN 50155 compliant

AMiT PIS - passenger information system

AMiT offers wide range of products and systems, from basic core solution of simple passenger announcement functions to complex solutions according to customer's choice.

The **AMiT passenger information system** is designed as a modular system whose final appearance can be customized by adding and modifying individual components or sub-systems and by programming the functions specified in the project. The core of PIS includes the IP reservation system, the IP audio system, IP surveillance system and the IP display system. All components use a single communication infrastructure (RS485, Ethernet) which provides maximum flexibility to the final solution.

The entire information system provides the following – information from the train seat reservation system, information displaying on the interior and exterior LED and TFT display units, the diagnostics displaying of other technical equipment, passenger announcements and audio communication of operational staff. PIS further enables connection to the WTB train communication bus and/or Ethernet train backbone, GSM and WiFi data transmission, and GPS positioning. The AMiT PIS passenger information system meets all the requirements of current European directives and both UIC 176 and UIC 556 standards.

MCMS
Multimedia Content Management System

PVS
Passenger Visual System

PIMS
Passenger Information Management System

PA
Public Address

SRS
Seat Reservation System

PECS
Passenger Emergency Communication System

CCTV
Surveillance System

PWLAN
Passenger WiFi

- Comprehensive passenger information system
- Easy to integrate
- Adaptable to suit individual requirements
- Ensuring a high standard of information at low operational cost
- IP network standardised system
- Extensive experience
- EN 50155 compliant

Solutions for

trams ~ metro ~ high speed and commuter trains ~ locomotives ~ carriages (RIC)

PVS - **passenger visual** system

IP display units are deployed as informational panels and displays into passenger information systems, as well as reservation systems and IP surveillance (CCTV) in public passenger transport. Rugged LED and TFT panels and displays are available in indoor and outdoor versions and are designed for very reliable operation in railway and rolling stock. They are suitable also for retrofitting of existing fleet.

Reliability, excellent visibility and total cost of ownership efficiency are key benefits of the IP display units. All display units are thoroughly tested in our test centre and validated in demanding operations of public environments.

Components of display system

LED panels

- Design for passenger information systems interios or exterior design with automatic brightness control
- Extremely wide range of operating temperatures
- Rugged construction
- LED / RGB / RGBW
- Expected MTBF min. 50 000 hrs
- RS485 / Ethernet communication interface

TFT displays

- Design for
  - CTV systems
  - camera rear-view mirrors use
  - passenger information systems
- Interior or exterior design with automatic brightness control
- Wide range of operating temperatures
- Rugged design for rolling stock
- Single or double side screen design

Route map displays

- Interior or exterior design with automatic brightness control
- Wide range of operating temperatures
- Rugged design for rolling stock
- RGB / RGBW

SRS - seat reservation system

A seat reservation system can be a part of a passenger information system of compartment or open passenger carriages. There are two types of reservation displays. To control seat reservation displays can be used e.g. control computer of information system. The reservation displays are designed mechanically so that their assembly could be done for example into luggage shelves above seats.

Components of seat reservation system

TFT displays
· Interior design with automatic brightness control
· Wide range of operating temperatures
· Rugged design for rolling stock
· 10,4"
· M12 Ethernet
· EN 50155 compliant

VFD displays
· variable mechanical design
· VFD displays
· CAN communication
· geographical addressing, concatenation
· extended range of operating
· temperatures -40 °C to 70 °C
· EN 50155 compliant

OLED displays
· variable mechanical design
· OLED displays
· CAN communication
· geographical addressing, concatenation
· extended range of operating
· temperatures -20 °C to 70 °C
· EN 50155 compliant

Components of the CCTV

IP cameras
· Vandal-proof
· Exterior heated covers with IP65 protection (machine washable)
· Design of camera covers can be customized
· Pictures can be rotated manually 90°, 180° and 270°
· Fault-diagnosis of individual cameras
· Picture mirroring (rearview mirror mode of operation)
· Detection of camera lens covering

Camera covers
· Designed for mounting on the body of the vehicle
· Available in right or left versions and with or without a cable grommet
· Different colour options are based on the customer's needs
· Suitable for MOXA, AXIS, Vivotek, NEXCOM IP cameras
· Designed for automatic vehicle washes
· Power supply 24V DC

Recording units
· Designed on the basis of an industrial computer with OS Linux
· H.264 and MJPEG compression
· Browsing data from IP cameras.
· Mass storage recording medium
· Circular buffer recording mode (the old data is automatically re-written when the disk is full)
· Control from vehicle computer commands via the Ethernet
· SOS mode – optional on-line transfer of video data directly to dispatch center
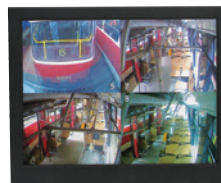
TFT monitors
· Designed for:
  · CCTV camera systems
  · camera rear-mirrors
  · passenger information system
· Robust design for rolling stock
· Wide range of operating temperatures
· M12 Ethernet
· Rearview mirror IP displays

Ethernet switches
· Unmanaged and configurabled industrial Ethernet switches and routers
· Version with PoE
· Robust design
· Version RJ45/M12 connector
· Wider temperature range -40 to 70 °C
· Designed for extreme climatic conditions
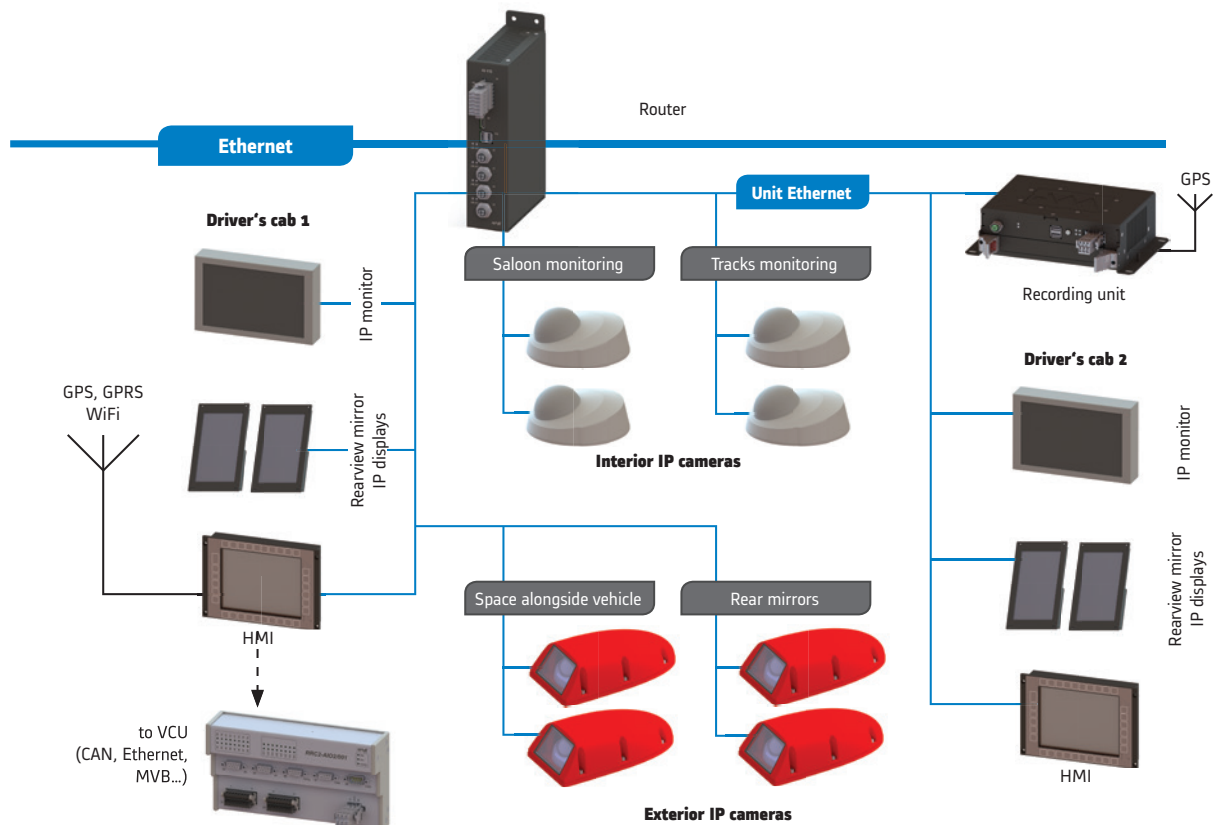· EN 50155 compliant

ACASYS Studio
· Displays live views of one or several cameras at the same time
· Option of playing recorded data with different speed (rewind, fast forward) Stop/pause
· Forward/backward frame-by-frame jogging
· Zoom on a picture
· Searching based on criteria (e.g. carriage no., time, place, SOS recording, line no., direction, station)

CCTV - surveillance
system

The **ACASYS VS surveillance system** provides more security and prevents vandalism and other crimes in vehicles by monitoring video data from IP cameras located inside and outside vehicles.

The IP surveillance system uses the same Ethernet communication infrastructure as other systems in the vehicle and can be easily integrated into the higher-level control. The functions of the recording unit and the method of data transfer can be adapted to the specific requirements of a project. The interior and exterior camera cove

Router

Ethernet

GPS

Unit Ethernet

Driver's cab 1

IP monitor

Saloon monitoring

Tracks monitoring

Recording unit

GPS, GPRS WiFi

Rearview mirror IP displays

Driver's cab 2

IP monitor

Interior IP cameras

HMI

Space alongside vehicle

Rear mirrors

Rearview mirror IP displays

to VCU (CAN, Ethernet, MVB...)

HMI

Exterior IP cameras

- • **Provides more security and prevents vandalism**
- • **Uses video data from IP cameras located inside and outside vehicles**
- • **Option of storing data to help prove crime or the cause of accidents**
- • **Recorded data can be analyzed using the Acasys Studio program**

- • **Modular system designed according to project requirements**
- • **Customisation to meet specific standards and rules**
- • **Modern European standard technologies**
- • **EN 50155 compliant**

Components of audio system

IP amplifiers

- Audio amplifier with a power output of 2 × 30W
- Digital transmission of audio over Ethernet
- RJ45 or M12 Ethernet
- LEDs
- On-wall mounting, passive cooling
- Protection against overheating
- Power supply 24V DC

Digitizers

- Digitalization of input audio signal
- Digital transmission via Ethernet network
- Connection of microphone to another link input
- Output to loudspeakers for listening
- 2 inputs for buttons with LEDs
- RJ45 or M12 Ethernet
- LEDs
- On-wall mounting, passive cooling
- Protected against overheating
- Power supply 24V DC

UIC audio gateways

- Provides public announcements in carriages
- Radiotelephone (connection and communications with central office)
- Audio gateway connected to the train's audio system through the interface specified in UIC 568
- Provides redundant analog anouncements in the event of Ethernet infrastructure breakdown
- Optional priority announcements

Microphone units

- Analog and digital microphone units
- Microphones designed for driver's cabin
- Optional ambient microphones in passenger area (for adjusting volume automatically)
- Ambient microphones with signal transfer via Ethernet
- Microphone for driver with gooseneck and message routing buttons
- LEDs
- Mounted on panel

IP intercoms

- Digital transmission of audio signal via Ethernet
- RJ45 or M12 Ethernet
- LCD or OLED display
- Illuminated button
- Microphone and loudspeaker with IP40 protection rate
- Stainless panel for mounting on walls

IP microtelephone

- Digital transmission of audio signal via Ethernet
- Handset with magnetic holder
- Operated by two illuminated buttons
- Output for connecting to an external loudspeaker, ringing and silent monitoring
- Stainless panel for mounting on the wall
- Vandal-proof types of buttons
- Ethernet 10/100 Mbps interface

SIP gateway

- 1 × GPS
- 1 × GSM / LTE
- 1 × WiFi
- 1 × Ethernet M12
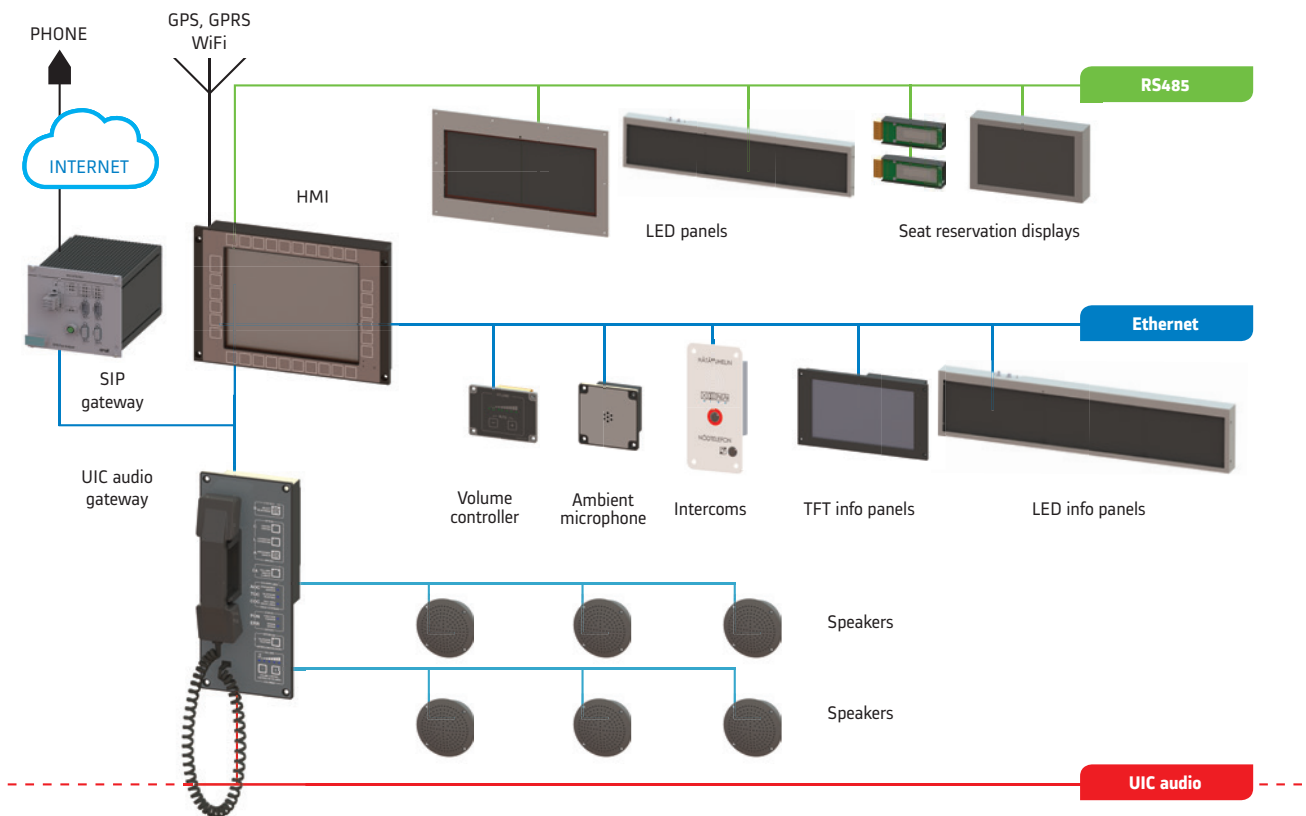
Other audio components

- MP3 Player unit
- Loudspeakers
- Sound control units for passengers
- Interconnecting audio module for UIC bus
- Ambient microphones
- Ethernet switches

PA - audio
system

The **AMiT audio system** is a digital audio system for rolling stock that provides all the essential requirements of vehicle audio communication as automatic acoustic announcements to passengers from a central information system.

These include the driver's communication to passengers, an intercom between the driver and the conductor and passenger emergency communication with the conductor and the driver. The IP audio system is a modular system whose final appearance depends on the specific project requirements.

PHONE

GPS, GPRS WiFi

RS485

INTERNET

HMI

LED panels

Seat reservation displays

Ethernet

SIP gateway

UIC audio gateway

Volume controller

Ambient microphone

Intercoms

TFT info panels

LED info panels

Speakers

Speakers

UIC audio

- **Digital audio system for rolling stock**
- **Provides all essential requirements for vehicle audio communication:**
  - automatic acoustic announcements to passengers
  - driver's communication to passengers
  - intercom between driver and conductor
  - passenger emergency communication with conductor and driver

- **Modular system design according to project requirements**
- **Meets all requirements of standards and rules**
- **Modern European standard technologies**

Components of the on-board WiFi solution:

- Internet access for passengers in carriages
- Supports QoS operation, as well as routing and firewall rules
- Simple system configuration to increase data transmission and the availability of the service, and the system's redundancy
- Swift and smart GPS GeoFencing
- Aggregation of wireless connections

- Separation of passenger and operator WiFi networks (VLAN)
- Other technologies can be connected, e.g. CCTV, PIS, reservation systems, infotainment, VoIP and control systems
- Flexible solution for both new and current vehicles
- Robust redundace concepts
- EN 50155 compliant

2G / 3G / 4G / 5G routers

- Max. 4 integrated LTE modems with max. 4 SIM cards/modem
- 2x WiFi 802.11a/b/g/n/ac/ax
- GPS / Glonass
- Integrated Ethernet switch (optional)
- Smart switching of mobile network operators
- Aggregation of GSM connections
- Remote management and control of routers
- EN 50155 compliant

WiFi access points

- Fast internet access for passengers and secured wireless access for vehicle-operating personnel
- Switched Ethernet interfaces allow other systems to be connected, e.g. Passenger Information System, infotainment, IP audio system, IP surveillance system
- 2x WiFi 802.11a/b/g/n/ac/ax
- 2.4 GHz/5 GHz
- EN 50155 compliant

GSM and GPS antennas
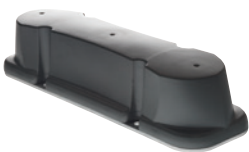
- Damage-proof external antennas for 2G/3G/LTE/5G networks
- GSM MIMO antennas guarantee the best possible modem performance
- Option to have a built-in GPS antenna
- Recommended to use a GPS antenna with amplifier for seamless positioning
- EN 50155 compliant

WiFi antennas

- Interior and exterior, directional and omni-directional antennas for WiFi 2.4 and 5 GHz bands optimally 2x2 MIMO antennas
- Suitable for double-decker rolling stock
- EN 50155 compliant

PWLAN - passenger WiFi on board system

Flexible WiFi solutions, i.e. all the devices involved in providing it, use the fast Ethernet network of a vehicle. They can be used to equip both new vehicles (including double-decker rolling stock) and older ones, which are equipped with an Ethernet network or any necessary cabling.

The configuration of each system varies depending on the length of vehicles and the interior layout, number of passengers and even the number of users who are expected to use the WiFi connection.
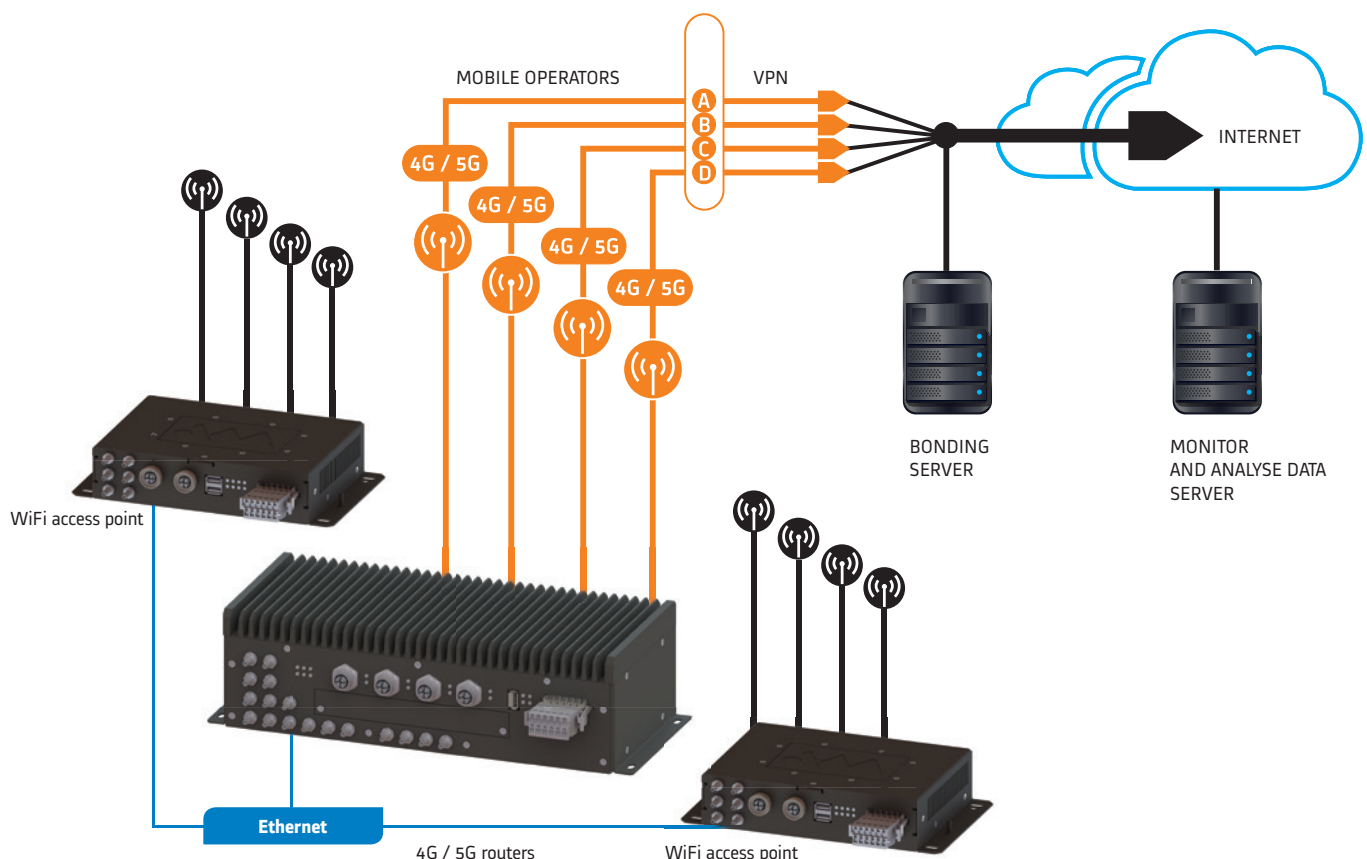
A key part of the solution is the 5G / LTE router with its integrated switch and module determining GPS / Glonass positioning. The router serves as a receiver of signals from the transmitters of mobile operators and positioning satellites and can also separate Wi-Fi networks for passengers from the vehicle operator's network (VLAN). In its basic configuration, one 5G / LTE router includes up to four modems, each of which allows the use of up to four SIM cards individually.

The signal from various transmitters, i.e. from different operators can be received due to the large number of SIM

cards, which improves the quality of connecting vehicles to GSM networks. This is primarily used for the smart switching between operators, e.g. when crossing national borders.

The 2G / 3G / 4G / 5G router can be acquired as a simple dedicated device or as a modular computer with expandable functionality for a 19" rack (RAVA product line).

Access points to WiFi (WiFi AP) ensure fast internet access for passengers and secured wireless access for vehicles operating personnel. Their switching Ethernet interfaces allow other systems to be connected, e.g. the Passenger Information System, infotainment, the IP audio system and the IP surveillance system.

MOBILE OPERATORS VPN INTERNET

4G / 5G

BONDING SERVER

MONITOR AND ANALYSE DATA SERVER

WiFi access point

Ethernet

4G / 5G routers

WiFi access point

HMI
panel computers

Rugged and temperature-durable on-board computers for rolling stock applications
Used as HMI units for driver's desk, control of passenger information system, surveillance system control/display unit or diagnostics and communication units

- Versions with TFT 7" , 10,4" , 12,1" , 15" and touch screen Resistive / Capacitive
- Up to 32 keys with backlight which can   be customised
- Intel and ARM version
- No moving parts (fan or HDD)

- Operation system Linux or Windows
- Waterproof variant
- Wide operating temperature range -40 °C to 70 °C
- Wide range of power supply voltages
- 24 V / 36 V / 72V / 110 V (-30 % to +25 %)
- EN 50155 compliant

HMI
Panel Computers

	AW3xxx	APTXAxxx	AIPQM1070
Processor	Intel ATOM x6414RE quadcore, 4× 1.5GHz, 4GB RAM, 32GB eMMC FLASH	ARM Cortex A-53, Quad core, 4× 1.6 GHz, 2 GB LPDDR4, 4 GB eMMC	ARM A8, 800MHz, 256MB RAM, 1GB NoFlash
FLASH	None / CFast slot / mSATA		None / CFast slot / mSATA
Operation system	None / Linux / Windows		None / Linux / Windows
Display	TFT LCD 10,4", 12,1", 15"		TFT LCD 7"7
Keyboard	None / 32 keys, backlight, UIC612-01 / 26 keys, backlight, Customized print		None
Touch screen	None / Resistive / PCT		PCT
USB	2 × USB 2.0 type A / 1 × USB 2.0 M12, 5-pin, A-code		2 × USB 2.0 M12, 5-pin, A-code
Audio	None / Stereo input / Stereo output		None
Ethernet interface	1 / 2 × Ethernet 10 / 100 Mbps (M12, D-coded)		1 × Ethernet 10 / 100 Mbps (M12)
RS232	None / 1 ×		None
RS485 / RS422	None / 1 × / 2 ×		None
CAN	None / 1 × / 2 ×		None
MVB	None / 1 ×		None
Wireless	WiFi - None / 1 × 802.11a/b/g/n/ac (2,4, 5 GHz) GPS - None / 1 x GPS GLONASS GSM - None / 1 x 2G / 3G / 4G (LTE)		None
Power supply	24 V / 36 V / 72V / 110 V (-30 % to +25 %)		24 V (-30 % to +25 %)
Protection front panel	IP65		IP65
Protection back panel	IP20 / IP54		IP20 / IP54
Operating temperature range	-30 °C to 70 °C / -40 °C to 70 °C		-30 °C to 70 °C
Mounting	AMiT / UIC612-01 / Customized		AMiT
Weight	Typ. 4,00 kg		Typ. 1,20 kg
Standards	EN 50155, EN 50121-3-2, EN 45545-2		

VEHICLE
computers

Rugged and temperature-durable on-board computers for rolling stock applications

Used for driver's desk, control of passenger information system, surveillance system control/display unit or diagnostics and communication units

- No moving parts (fan or HDD)
- Operation system Linux or Windows
- Intel and ARM version
- Waterproof variant

- Wide operating temperature range -40 °C to 70 °C
- Wide range of power supply voltages 24 V / 36 V / 72V / 110 V (-30 % to +25 %)
- EN 50155 compliant
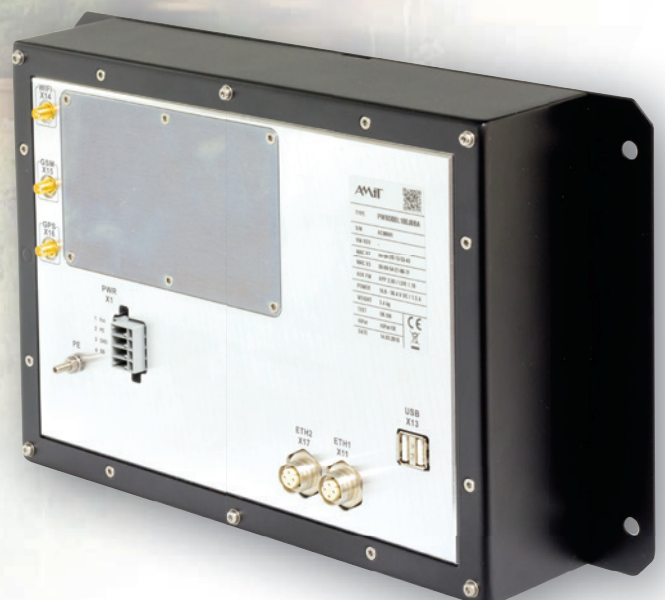
Vehicle Computers	PWxxx	PPXI7xxx
Processor	Intel ATOM x6414RE quadcore, 4× 1.5GHz, 4GB RAM, 32GB	Intel Core i7-8850H, 6 cores, 2.6 GHzeMMC FLASH
	ARM Cortex A-53, Quad core, 4× 1.6 GHz, 2 GB LPDDR4, 4 GB	
FLASH	None / CFast slot / mSATA	None / SD slot / mSATA / 2.5" SSD
Operation system	None / Linux / Windows	
USB	2 × USB 2.0 type A, 1 × USB 2.0 M12, 5-pin, A-code	1 × USB 3.0 type A, 1 × USB 2.0 M12, 5-pin, A-code
Audio	None / Stereo input / Stereo output	-
Ethernet interface	1 / 2 × Ethernet 10 / 100 Mbps (M12, D-coded)	2 × 1 Gbps, connector M12 8-pin X-coded, socket
RS232	None / 1 ×	
RS485	None / 1 × / 2 × / 1 × RS422	-
CAN	None / 1 × / 2 ×	-
MVB	None / 1 ×	-
Wireless	WiFi - None / 1 × 802.11a/b/g/n/ac (2,4, 5 GHz) GPS - None / 1 x GPS GLONASS GSM - None / 1 x 2G / 3G / 4G (LTE)	-
Power supply	24 V / 36 V / 72V / 110 V (-30 % to +25 %)	16.8 V to 50.4 V DC
Protection	IP65 / IP20	
Operating temperature range	-40 °C to 70 °C	
Mounting	On the base plate	
Weight	Typ. 4.00 kg	Typ. 9.7 kg
Standards	EN 50155, EN 50121-3-2, EN 45545-2	

Alternative usable

Recording units	PPSxxx

Ethernet router	RB-RTExxx

RECORDING
units

Main applications: video-recording from CCTV systems, audio-data recording, metadata storage for passenger information systems, diagnostics data recording.

Other functions on demand: disk mirroring (RAID), remote configuration of devices, wireless transmission.

- OS Linux platform
- Secure storage of data which does not allow changes
- SSD recording media
- Native Ethernet wire transfer
- Easy integration into LAN / WAN
- Accessible administration functions from remote
- terminal or through LAN
- SOS mode – on-line data transmission to the control centre
- Web server for on-line data monitoring
- Supercap power backup for safe power-down
- EN 50155 compliant

Recording units

	PPSxxx	PPSXDxxx
CPU	Intel ATOM x6414RE quadcore, 4× 1.5GHz, 4GB RAM, 32GB eMMC FLASH	ARM Cortex A-53, Quad core, 4× 1.6 GHz, 2 GB LPDDR4, 4 GB eMMC
OS	Linux	
Disks - separately supplied		
SSD - industrial design	256 GB / 512 GB / 1 TB / 2 TB	
SSD - commercial design	256 GB / 512 GB / 1 TB / 2 TB	
Ethernet with connector type	M12 100 Mbps / M12 1 Gbps	
USB	2 x USB 2.0, A type	
Power supply	24 V / 36 V / 110 V DC (-30 % to +25 %)	
Operating temperature range		
with SDD – industrial design	-40 °C to 70 °C	
with SDD – commercial design	0 °C to 70 °C	
Cover protection rate	IP20	
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**	

The PPS1xxx product line of recording units are industrial computer-based devices using the Linux operating system. The units are intended for the reliable and steady recording of voice, video, diagnostics and metadata into recording disks. Recorded data can be transmitted by directly connecting an Ethernet cable to the recording unit and by retrieving data remotely or directly from storage disks using reading units.

Data recording is carried out in a circular buffer, i.e. after the disk capacity is full the old data is automatically overwritten with new data. The device allows a time limitation of record keeping to be set up. This functionality has been prepared to meet individual national legislative requirements on the time storing of sensitive data.

The unit supports the recording of audio and video formats transmitted through the RTP protocol. ACASYS Studio 2 software is supplied together with a recording unit, which stores data from the surveillance system to manage and analysis the video data.

AUDIO
devices

Digital audio system for railway and rolling stock.
Modular system – the system design according
to project requirements.
Modern European standard technologies.

- IP audio equipment for vehicle communication system
- Communication through Ethernet lines with M12
- Wide range of operating temperatures -40 °C to 70 °C

- EN 50155 compliant
- UIC audio gateways meet the requirements
  of UIC 556 and UIC 568

UIC Audio Gateways

RRAM-MCT/E30-Ax

Buttons	7 × buttons under foil with LED indication
External audio input	1 x audio signal
Power audio output	2x
Audio interface standard	UIC558, UIC568
Ethernet interface	1 x Ethernet, 100 Mbps, M12
Power supply	16.8 V DC to 33.6 V DC

Telephones

RRAM-MCT/Ax

Buttons	2× anti-vandal type, 12 mm
External audio input	1 x audio signal
Silent monitoring output	1× audio signal for loudspeaker
Protection rate	IP40 (front panel) / IP20 (rear panel)
Ethernet interface	1 x Ethernet, 100 Mbps, M12
Power supply	24 V DC (-30 % to +25 %)

IP intercom

RRAM-ICTNxx

Loudspeaker	Electrodynamic, 2 W, 250 Hz to 10 kHz
Microphone	Electret, 30 Hz to 16 kHz
Button	1 × anti-vandal type with green LED back-lit
Display	OLED, monochrom, (128 × 64) pixels
Ethernet interface	1 x Ethernet, 100 Mbps, M12, D - Code
Power supply	116.8 V DC to 33.6 V DC / PoE
Cover protection rate	IP40 / IP20

Microphone for drivers

RRAS-GNMxxx

Frequency range	100 Hz to 16 kHz
Backlight	contour LED
Buttons	2x
Protection rate	IP40 (front panel) / IP20 (rear panel)
Gooseneck length	460 mm
Operating temperature	-40 °C to 70 °C

IP Audio Amplifier

RRAM-PWAxx

Permanent sinus power	2 × 30 W
Peak music power	2 × 48 W
Min. load impedance	4 Ω / channel
Interfaces	Ethernet 10 / 100 Mbps, M12
Power supply	16.8 V DC to 33.6 V DC
Cover protection rate	IP20

IP Audio Digitizer

RRAM-MCTNxx

Audio inputs	1× microphone, 1× link
Connector	microphone input: D-Sub DE-9, link input: BNC
Digital inputs	2× contact
Interfaces	Ethernet 10 / 100 Mbps, M12
Power supply	16.8 V DC to 33.6 V DC / PoE according
Cover protection rate	IP20
Operating temperature	-40 °C to 70 °C

MP3 audio player

RRAM-PMPPxx

Audio output	2 × 5 W sinus
Frequency range	30 Hz to 22 kHz
Recommended loudsp.	min. 8 Ω, min. 10 W
Supported audio format	MPEG 1 Layer-3 (MP3)
Internal memory	128 MB FLASH
Interfaces panel	Ethernet 10 / 100 Mbps, M12
Operating temperature	-40 °C to 70 °C

SIP Audio Gateway

RRU-CU/BA

GPS	1 ×
GSM / LTE	1 × EGSM class 10 / UMTS / HSPA+ / LTE
WIFI	1 × 802.11a/b/g/n, 2,4 GHz
Interfaces	Ethernet 10 / 100 Mbps, M12
Power supply	16.8 V DC to 33.6 V DC / PoE according
Cover protection rate	IP20
Operating temperature	-40 °C to 70 °C

Standards	EN 50155, EN 50121-3-2, EN 45545-2

WiFi
devices

The AMiT internet solution for railway and rolling stock is built on infrastructure assembled of GSM routers (WRT product line), WiFi access points (WAP product line) and supplementary components like antennas and cabling.

- **Triple play solution**
  - Passengers
  - Crew (Staff)
  - Train (Fleet)
- **GSM communication 2G / 3G / 4G (LTE) / 5G**
- **GSM - R**
- **MIMO / Diversity**
- **Mini PCI Express slot**
- **On-board communication 802.11a/b/g/n/ac/ax (2.4 or 5 GHz)**

- **2×2 MIMO / 3×3 MIMO / 4×4 MIMO**
- **Optional features include:**
  - Password protection
  - Data encoding protection
  - URL blacklist
  - Manageable Connection Policy, and more ...
- **Unattended switching connection when crossing national borders via GPS**
- **EN 50155 compliant**

Wifi routers	WRAxxx	WRAXDxxx
CPU	Intel ATOM x6414RE quadcore, 4× 1.5GHz, 4GB RAM, 32GB eMMC FLASH	ARM Cortex A-53, Quad core, 4× 1.6 GHz, 2 GB LPDDR4, 4 GB eMMC
SSD	none / 4 - 512 GB	
LTE modem / Mini PCI Express slot	2 - 4 ×	
Communication standards	EGSM class 10 / UMTS / HSPA+ / LTE / 5G	
RF	MIMO / Diversity	
SIM card slots	1 - 4 per modem	
Connection point	2 × SMA per modem	
GPS / Glonass	1 ×	
Connection point	1 × SMA	
WiFi	2 ×	
Communication standards	802.11a/b/g/n/ac/ax (2.4 GHz or 5 GHz)	
RF	2 x 2 MIMO / 3 x 3 MIMO / 4 x 4 MIMO	
Connection point	2 × / 3 × RSMA / QMA	
Ethernet	4 ×	
Data transmission rate	1 Gbps / 100 Mbps / 10 Mbps	
Connection point	8-pin connector M12, X-coded	
USB	2 × USB 2.0	
Connection point	2 × connector type A, host	
IO	3 × digital input / output	
Power supply / consumption	24 V / 36 V (-30 % to +25 %)	
Cover protection rate	IP20 / IP54	
Operating temperature range	-40 °C to 70 °C	
Weight	2.48 kg	

Wifi Access Point	WAPXxx
CPU	ARM Cortex A-53, Quad core, 4× 1.6 GHz
WiFi	2 ×
Communication standards	802.11a/b/g/n/ac/ax (2.4 GHz or 5 GHz)
RF	2 x 2 MIMO / 3 x 3 MIMO / 4 x 4 MIMO
Connection point	2 × / 3 × RSMA / QMA
Ethernet	1 - 2 ×
Data transmission rate	1 Gbps / 100 Mbps / 10 Mbps
Connection point	8-pin connector M12, X-coded
USB	2 × USB 2.0
Connection point	2 × connector type A, host
IO	2 × digital input/output, 24 V DC
Power supply	24 V / 36 V (-30 % to +25 %)
Operating temperature	-40 °C to 70 °C
Cover protection rate	IP20
Weight	1.50 kg

Communication and diagnostic units	RRU-CU/AA
CPU	ARM A8, 800MHz, 256MB RAM, 1GB NoFlash
GPS	1 × SMA connector
GSM / LTE	1 × EGSM class 10 / UMTS / HSPA+ / LTE
GSM - R	Triorail TRM-5
WiFi	1 × 802.11a/b/g/n, 2.4 GHz
Ethernet	1 × 10 / 100 Mbps M12
Dimensions (w × h × d)	(106 × 128 × 205) mm
Power supply	16.8 V to 33.6 V DC
Operating temperature	-40 °C to 70 °C
Cover protection rate	IP20
Weight	1.16 kg

Standards	EN 50155, EN 50121-3-2, EN 45545-2

TFT
information panels

Displays designed for surveillance system (CCTV), rear-view mirror or passenger information system (PIS)

Rugged and temperature-durable TFT panels for rolling stock applications

Customization based on specific project requirement

- Variable mechanical versions (on wall, front panel, VESA 100 mounting, on glass, on console)
- single monitor / double displays monitor
- 10 / 100 Mbps Ethernet
- Application software for surveillance systems or PIS

- Project-based of customization of software
- Wide operating temperature range -30 °C to 70 °C
- UIC 176 version available
- TSI PRM compliant
- EN 50155 compliant

TFT information panel types (**Ethernet, M12 D-code**)

Type	Size	Dis-plays	Resolution	Mounting	Dimensions (mm)	Protection rate	UIC 176
AIPQB1215Wxxx	21,5"	1×	1920x1080	open frame on the ceiling on the wall	(554 × 360 × 251)	IP00 IP20 IP50	2.4
AIPDB1215Wxxx	21,5"	2×	1920x1080		(554 × 360 × 326)		2.4
AIPQB1185Wxxx	18,5"	1×	1366x768		(518 × 314 × 151)		2.4
AIPDB1185Wxxx	18,5"	2×	1366x768		(554 × 360 × 251)		2.4
AIPB1A0L103KONA	10,4"	1×	1024x768	in the panel	(345 × 217 × 116)	IP65 / IP20	2.4

TFT panels common parameters

Display	TFT LED LCD
Back–lit	LED
Ethernet interface	1 × (10 / 100 Mbps), M12, D-coded
Power supply	24 V DC
Galvanic isolation	Yes
Operating temperature range	-30 °C to 70 °C
	0 °C to 50 °C
Mounting	open frame / on the ceiling / on the wall
Application software	Project customized
Operation system	Linux

Standards	**EN 50155, EN 50121-3-2, EN 45545-2**

AIPQB1215Wxxx

AIPDB1185Wxxx

AIPB1Axx

LED
information panels

Dot matrix information panels are designed for passenger information systems. There are exterior and interior panel versions available. The LED panels are ideal for use in rolling stock applications due to the extremely wide range of operating temperatures where they can be used and their robust design.

- Variable mechanical versions
- Light sensor / Automatic brightness control
- RS485 interface
- Ethernet interface
- Variable WC Symbol

- Wide operating temperature range -40 °C to 70 °C
- UIC 176 versions available
- TSI PRM compliant
- EN 50155 compliant

LED panels common parameters

Display	LED
LED colour	Yellow - 590 nm typ., Red - 633 nm typ., White (different color options on demand), RGBW
Resolution	Optional
Pitch (mm)	4 / 5 / 6 / 8
Front panel protection	Open frame / IP30 / IP65
Light sensor	Automatic brightness control
Brightness	Internal - typ. 200 cd/m², External - typ. 800 cd/m²
Light sensor	Automatic brightness control
Interface	RS485 / Ethernet
Galvanic isolation	Yes
Power supply	24 V DC / 110 V DC
Galvanic isolation	Yes
Cover color	Typically RAL7035, RAL9005 (different color options on demand)
Operating temperature range	-40 °C to 70 °C

Standards	EN 50155, EN 50121-3-2, EN 45545-2

RGB LED - Route Map Displays

Type	Resolution	Pitch (mm)	Colour	Brightness (cd/m²)	Dimensions (mm)	Front panel protection	UIC 176
Interface: Ethernet							
DLM100/A	1 x 40		RGB	800	(720 × 98 × 27)	IP00	-
Standards			EN 50155, EN 50121-3-2, EN 45545-2				

SEAT
reservation displays

VFD / OLED displays are used as reservation system terminals for open passenger carriages in railway rolling stock. The customer can adjust and finish the vehicle reservation system themselves as needed in the specific project.

- **CANOpen / RS485**
- **Wide operating temperature range -40 °C to 70 °C**
- **EN 50155 compliant**

LCD / VFD Displays	AMT2020/A	AMT3010/A1
Display	VFD	OLED
Backlight, colour	Green	YELLOW
Size	128 × 32 pixels	128 × 64 pixels
Communication	1 × RS485	1 × RS485
Power supply	16.8 V DC to 50.4 V DC	
Operating temperature	-40 °C to 70 °C	
Mounting	To the shelf frame, 2× M4 screw	
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**	

COVERS
for Camera

Exterior camera covers (housings) are designed for mounting on a vehicle body. The covers are according to their side of installation on the vehicle body available in left or right variation, and their colour according to customer requirement. This covers are designed for the following IP cameras types below.

- **Part of IP surveillance system (CCTV) for rolling stock**
- **variants with internal heating glass or without heating**
- **variants with chemical tempered glass and sapphire glass**
- **autonomous regulation of heating independent of the camera**
- **Goretex grommets**
- **EN 50155 compliant**

Camera Covers

	KKR-AL01H/xxx	KKR-AL01/xxx
Recommended camera	AXIS AP3905-RxxA (B) MK II, MOXA VPORT P06	
Heating variants	heated glass / tempered glass / sapphire glass	none
Heater power supply	24 V DC (-30 % to +25 %)	none
Heating power	7.8 W for temperatures below -5 °C	none
Current consumption	0,65 A at 24 V DC	-
Cover protection rate	IP65	
Colour	black / other colour on demand	
Operating temperature	-40°C to 70°C	
Mounting	on the vehicle body	
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**	

Vehicle Control Units (VCU)
Remote I/O Units
Power supply Units
Subrack

TCMS units

SUBRACK Train Control & Management System

Subrack vehicle control unit with communication and I/O card mainly for TCMS applications.
Rugged and temperature-durable control system for rolling stock applications.

- **Subrack train control system**
- **CANopen DS 401 communication protocol**
- **MVB interface EMD, ESD (double line attachment)**
- **10 / 100 Mbps Ethernet (M12 connector attachment)**
- **WTB interface (UIC 556 certified)**
- **Standby redundancy within subtrack (CPU, power,**

   gateway unit, I/O units)
- **Wide operating temperature range -40 °C to 70 °C**
- **Wide range of power supply voltages**
   24 V DC to 110 V DC
- **EN 50155 compliant**

Power supply units

Type	RV-PW04/100x
Max power	40W
Power supply	24 V / 48 V / 72 V / 110 V DC

Vehicle Control Units

Type	RV-CPMC/1x01
MVB Class	class 1: DS + PD class 2: DS + PD + MD class 3: DS + PD + BA class 4: DS + PD + MD + BA
CAN	1 - 6
CANopen	Master
Ethernet	10 / 100 Mbps (M12)

SUBRACK 19" system Central Control Unit

Type	RV-CPTRDP/1100
Protocol	TRDP TCNOpen 1.3.3.0
Ethernet	Ethernet connector M12
Interfaces	CAN interface, connector concatenation
	Internal communication interface RAVA
Power supply	24 V DC
Operating temperature range	-40 °C to 70 °C
Dimension	8HP x 3V
Mounting	19" subrack RV-RC0xx
Standards	EN 50155, EN 50121-3-2, EN 45545-

Subrack Units
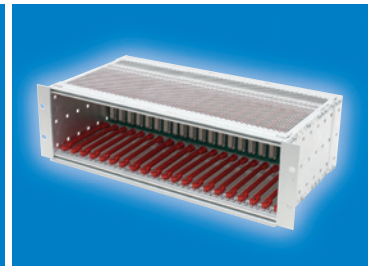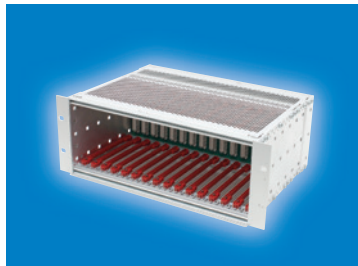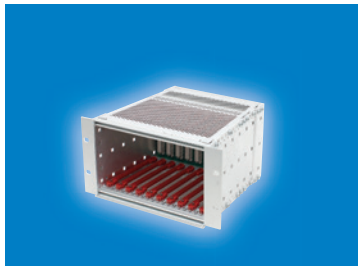
Type	RV-RC010	RV-RC015	RV-RC021
Number of slots	10	15	21

Units specific parameters

Type	DI	DO	AI	AO
RV-I/0111	32 (24 V)			
RV-O/0211	24 (24 V / 4 A, HSS)			
RV-F/0211	24 (24 V / 4 A, HSS)			
RV-A/1110	12 (0 mA to 30 mA)			
Standards	EN 50155, EN 50121-3-2, EN 45545-2			

TCMS units

DISTRIBUTED Train Control & Management System

Vehicle control units with distributed I/O for control of vital or non-vital parts of rolling stock (TCMS, CCTV, PIS applications). Rugged and temperature-durable control system for rolling stock applications.

- Distributed train control system
- CANopen DS 401 communication protocol
- TRDP communication protocol
- Concatenated CAN
- Geographical configuration of the node
- Operational software with redundant

- CAN communication
- Powerful development tool TrolStudio
- Wide operating temperature range -40 °C to 70 °C
- 24 V DC or 48 V DC power supply
- EN 50155 compliant

RRT2-AIO/001

	RRCPU-xxx	RRC2-CPxxx
Vehicle Control Units		
CPU	STM 32F427	STM 32F437
Processing FLASH memory	2 MB	
Archive FLASH memory	128 MB	
RTC	Yes	
Back-up battery	RAM + RTC	
Inputs	8 × DI 24 V DC + 1 × AI (4 mA to 20 mA)	3 × DI 24 V DC + 1 × AI (4 mA to 20 mA)
Outputs	3 × DO 24 V DC / 4 A (MOS)	1 × RDO 24 V DC / 4 A, Switching contact
CAN	4 × / 8 ×	8 ×
Ethernet	10 / 100 Mbps (RJ45)	10 / 100 Mbps (M12)
Power supply	24 V DC	
Cover protection rate	IP30	
Operating temperature range	-40 °C to 70 °C	
Mounting	35 mm DIN rail	
Weight	1.40 kg	1.62 kg
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**	

	RRC2-xx	RRT2-xx
Remote I/O Units		
CAN interface	1 ×	-
Communication rate	250 / 500 / 1000 kbit	-
Ethernet	-	Ethernet connector M12
Communication protocol	CANopen DS 401	TRDP TCNOpen 1.3.3.0
Power supply	24 V DC / 48 V DC	
Cover protection rate	IP30	
Operating temperature range	-40 °C to +70 °C	
Mounting	35 mm DIN rail	
Weight	1.25 kg	
Dimensions (w × h × d)	(199 × 110 × 69) mm	
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**	

Remote I/O Units specific parameters

Type	DI	DO	RDO	AI	AO	Communication	Vcc
RRC-I/001	32	-	-	-	-	CANopen	24 V DC
RRC-I/005	32	-	-	-	-	CANopen	48 V DC
RRC-IO/001	16	8	-	-	-	CANopen	24 V DC
RRC-AIO/001	12	6	-	4	-	CANopen	24 V DC
RRC-AIO/201	12	6	-	4	-	CANopen	24 V DC
RRC-IOR/001	12	7	2	-	-	CANopen	24 V DC
RRC-O/001	-	16	-	-	-	CANopen	24 V DC
RRC-O/005	-	16	-	-	-	CANopen	48 V DC
RRC-ION/001	12	8	-	-	4	CANopen	24 V DC
RRC2-IO/001	16	8	-	-	-	CANopen	24 V DC
RRC2-AIO/001	16	8	-	4	-	CANopen	24 V DC
RRC2-I/001	32	-	-	-	-	CANopen	24 V DC
RRT2-IO/001	16	8	-	-	-	Ethernet / TRDP	24 V DC
RRT2-AIO/001	16	8	-	4	-	Ethernet / TRDP	24 V DC
RRT2-I/001	32	-	-	-	-	Ethernet / TRDP	24 V DC

TCMS units

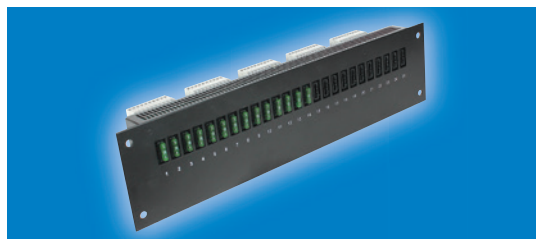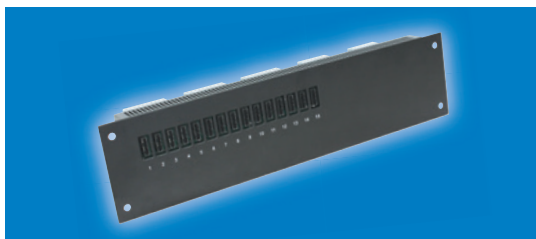## **DISTRIBUTED** Train Control & Management System

RRFSxx units are designated to protect electrical circuits of rolling stock and provide actual fuse status information to the vehicle control system. The units meet the requirements of EN 50155 (electronic equipment of rolling stock) class TX and related standards.

- 15 / 25 × fuse base with fuse status reading
- Supplementary universal inputs/outputs
- CANopen DS 401 communication protocol
- Concatenated CAN

- Geographical configuration of the unit
- Wide operating temperature range -40 °C to 70 °C
- 24 V DC power supply
- EN 50155 compliant

Fuse modules specific parameters	RRFS15/001	RRFS25/001
Number of fuses	15	25
DI	10	10
DO	8	-
AI	1	-
Vcc	24 V DC	24 V DC

Common parameters

Maximum current for one fuse	25 A DC
Max. total current for three fuses side by side	45 A DC
Fused voltage	24 V DC
Fuse type	Flat automotive fuses UNIVAL, automotive circuit breakers, size 1170
CAN interface	1 ×
Communication rate	250 kbit
Communication protocol	CANopen DS 401
Power supply	24 V DC
Protection rate	IP20
Operating temperature	-40 °C to 70 °C
Mounting	In-to the panel
Weight	2 kg
Dimensions (w × h × d)	(450 × 110 × 76) mm
Standards	EN 50155, EN 50121-3-2, EN 45545-2

TCMS units

DISTRIBUTED Train Control & Management System

An industrial computer equipped with the necessary hardware and software, designed to take over and perform control functions - process control, control of equipment on railways and rolling stock.

- 8 DI, 8DO, 8 AI, 4AO
- Display 320 × 240 pixels, colour
- Ethernet
- RS232 + RS485

- DetStudio / Gen 2 E+ programming and debugging
- Wide operating temperature range -40 °C to 70 °C
- EN 50155 compliant
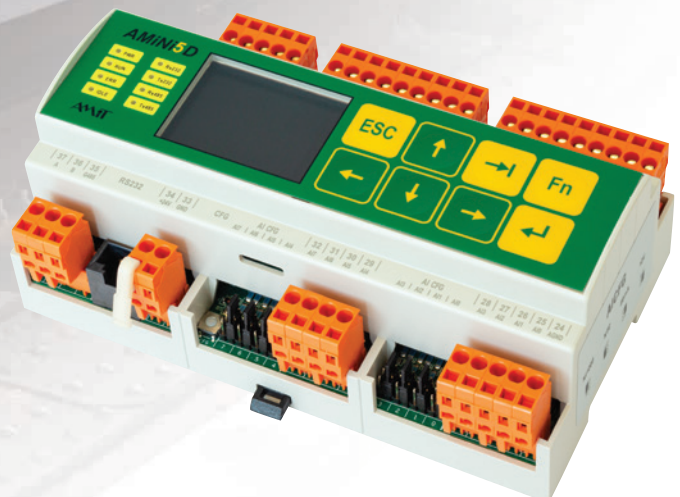
Compact control system with display
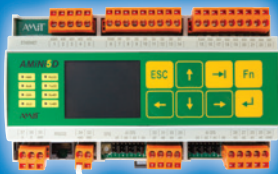
	AMINI5D/Z1
CPU	STM32F437
FLASH memory	2 MB + 16 MB
RAM memory	1 MB + 16 MB
Slot for memory card	Micro SD
Display	TFT IPS (320 × 240) pixels
Digital inputs	8× DI with GI
Analogue inputs	8 AI without GI
Digital outputs	8× DO with GI
Analogue outputs	8 AO without GI
RS232	1 × without GI, connector RJ45
RS485	1 × with GI, connector WAGO231
Ethernet	10/100 Mbps, connector RJ45
Power supply	19.2 V DC to 28.8 V DC
Signal connection	WAGO 231 clamp connectors
Operating temperature	-20°C to +70°C
Mounting	DIN rail 35 mm
Weight	0.36 kg
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**

Compact control system
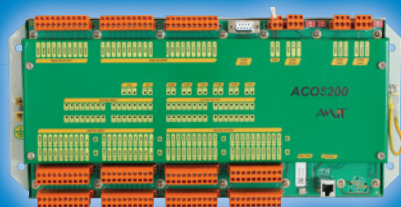
	ACOS200/Z1
CPU	STM32F427
FLASH memory	2 MB + 4 MB / 32 KB
RAM memory	1 MB
Slot for memory card	Micro SD
RAM + RTC backup	CR2477 lithium battery removable module
Digital inputs	32 × DI with GI
Analogue inputs	16 × AI without GI
Digital outputs	32 × DO with GI
Analogue outputs	8 × AO without GI
RS232	1 × connector D-Sub DE-9
RS485	1 × connector WAGO 231
Ethernet	10/100 Mbps, M12, D-coded
Power supply	14.4 V DC to 33.6 V DC
Signal connection	WAGO 231 clamp connectors
Operating temperature	-40 °C to 70 °C
Mounting	4 × ø 6 mm hole
Weight	2,04 kg
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**

TCN units

Train Communication Network

Gateway between vehicle and train bus, part of train communication network (TCN) . Ensure inter-operability between different cars (standardized according to IEC 61375-1, UIC 556).
Robust and temperature-durable gateways that fulfil demanding requirements for operating on rolling stock.

- **Compact and modular version**
- **WTB gateway with up to 3 different communication lines**
- **WTB interface (with doubled line)**
- **100 Mbps Ethernet (M12 connector attachment)**
- **MVB interface EMD / ESD (double line attachment)**
- **CAN interface (concatenated attachment)**

- **Standby redundancy within subrack (gateway unit, power)**
- **Wide operating temperature range -40 °C to 70 °C**
- **Wide range of power supply voltages 24 V DC to 110 V DC**
- **UIC 556 certified**
- **EN 50155 compliant**

Product line

RRU-W.. (compact)	Ethernet	CAN	MVB	RV-W.. (modular)
RRU-WE/100x	•			RV-WE/1000
RRU-WEM/115x	•		•	RV-WEM/1150
RRU-WEC/110x	•	•		RV-WEC/1100

WTB gateway common parameters

WTB interface	1 × (double line attachment)
Connection	4 × (D-sub DE-9)
Ethernet interface	1 × (10 / 100 Mbps)
Connection	M12, D-coded
MVB interface	1 × (double line attachment)
Interface type	EMD / ESD
Connection	2 × (D-sub DE-9)
MVB class	class 1, class 2
CAN interface	1 × / 2 ×
Communication rate	Up to 1 Mbit
Connection	2 × (D-sub DE-9, concatenation of units)
CANopen	Master
Protection rate	IP20
Operating temperature range	-40 °C to +70 °C
Power supply	24 V / 48 V / 72 V / 110 V DC
Development tools	WTB Bus Analyzer / MVB Bus Analyzer / TCN Protocol Stack
Standards	EN 50155, EN 50121-3-2, IEC 61375-2-1, IEC 61375-3-1, UIC 556

TCN units

Train Communication Network

Analysers of the WTB and MVB bus are passive bus elements, which monitor the traffic on the bus and pass it to the Ethernet bus in UDP frames. A PC is attached to the Ethernet bus with a program for receiving and evaluating the UDP frames.

- WTB network compact analyzer
- WTB interface with doubled line
- MVB network compact analyzer
- MVB interface of EMD/ESD type with redundant lines

- Ethernet 100 Mbps
- Processing and analysis of data on PC
- Wide operating temperature range -40 °C to 70 °C
- Power supply voltage 24 V DC

MVB Analyzer

RB-MVB/AN02	
MVB interface	1 × (2 redundant lines), Class 0
Interface type	EMD + ESD
Connectors	2 × D-Sub DE-9 (concatenation)
Communication rate	1.5 Mbps ±0.01 %
Ethernet	1 ×
Communication rate	10 / 100 Mbps
Galvanic isolation	Yes
Connector	RJ45
Power supply	16,8 V to 33,6 V DC
Protection rate	IP20
Mounting	2 × ø 6 mm hole
Operating temperature	-40 °C to 70 °C
Weight	0,9 kg
Dimensions (w × h × d)	(33 × 228 × 87) mm
Standards	**EN 50155, EN 50121-3-2, IEC 61375-2-1, IEC 61375-3-1, UIC 556**

WTB Analyzer

RRU-WTB/AN01	
WTB interface	1 × (redundant line)
Galvanic isolation	Yes
Connectors	4 × D-sub DE-9 connector according to IEC 61375-1 ed.2
Communication rate	1 Mbps ±0.01 %
Ethernet	1 ×
Communication rate	100 Mbps
Galvanic isolation	Yes
Connector	RJ45
Power supply	16,8 V to 33,6 V DC
Protection rate	IP30
Mounting	Into 19" subrack
Operating temperature	-40 °C to 70 °C
Weight	1,55 kg
Dimensions (w × h × d)	(142 × 129 × 185) mm
Standards	**EN 50155, EN 50121-3-2, IEC 61375-2-1, IEC 61375-3-1, UIC 556**

The analyser only monitors the bus - it is „invisible" for other devices. All WTB or MVB frames on the bus are monitored. A timestamp is added to each frame and then passed to the Ethernet bus within the UDP frame. More MVB or WTB frames can be stored into a single UDP frame in order to optimize the utilization of the Ethernet bus.

The open source program Wireshark is used on the PC for which an plug-in is supplied. Wireshark is generally a widely-used software, that has become the standard for network protocols analysis. It is possible to use this program with a supplied plug-in to view the individual frames of TCN communication and also to get some statistical information from the WTB or MVB layer, e.g. the minimum and maximum gap between master and slave frame. It is also possible to analyse protocols from higher layers (TCN PD and TCN MD protocol). Moreover, when analysing the TCN MD protocol, it can view the whole TCN messages; when UIC E-Telegrams is being transmitted, its header and even the individual items for standard E-Telegrams is viewable. The user is allowed to modify or extend the supplied plug-in arbitrarily, e.g. to add an analysis of its own application protocol.

TCN units

Train Communication Network

The MVB converters mediate conversion of various communication lines to a MVB line. The converters can be used to units connecting with Ethernet or CAN communication lines to the MVB line.
The conversion processing of communication is provided in both directions.

- MVB / Ethernet / CAN / RS485 / TRDP converters
- MVB according to IEC 61375-3-1 standard
- Robust vibration-proof Ethernet connections with M12
- Wide operating temperature range -40 °C to 70 °C
- EN 50155 compliant
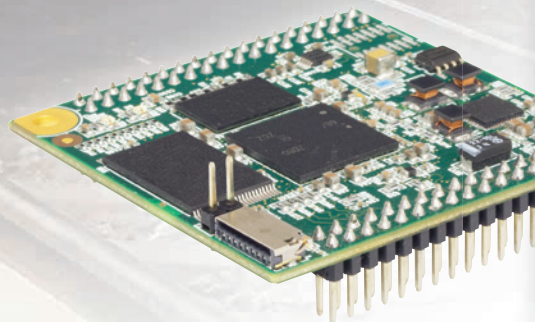
MVB Gateways

|	**RB-RTM/xBxxx** (MVB / Ethernet)	**RB-RTM/xAxxx** (MVB / CAN)
MVB interface	1 × (redundant line)	
MVB class	Class 1 / Class 2 / Class 4 without MD / Class 4	
Interface type	EMD / ESD (depending to module outer wiring) / OGF	
Connectors	2 × D-Sub DE-9 (concatenation)	
Communication rate	1.5 Mbps ±0.01 %	
Interface	1 × Ethernet	1 × CAN
Communication rate	10 / 100 Mbps	Max. 1 Mbps
Galvanic isolation	Yes	Yes
Connector	M12, D-coded	2 × D-Sub DE-9 (concatenation)
Power supply	16,8 V to 33,6 V DC	
Protection rate	IP20	
Mounting	2 × ø 6 mm hole	
Operating temperature	-40 °C to 70 °C	
Weight	0,9 kg	0,9 kg
Dimensions (w × h × d)	(33 × 228 × 113) mm	(55 × 228 × 85) mm
Application software	Project customized	
Standards	**EN 50155, EN 50121-3-2, EN 61373, EN 45545-2, IEC 61375-3-1**	

MVB Module

MVB class	Class 1 / Class 2 / Class 4 without MD / Class 4
MVB interface	1× (2 redundant lines)
Interface type	EMD / ESD (depending to module outer wiring) / OGF
Interface for host CPU	1 × (parallel / UART / LPC)
Communication rate	Depends on chosen interface type
Logical levels	3.3 V LVTTL
Dimensions (w × h × d)	(50.0 × 48.0 × 12.0) mm
Standards	**EN 50155, EN 50121-3-2, EN 61373, EN 60068-2-1, EN 60068-2-2, IEC 61375-3-1**

Module with TRDP protocol
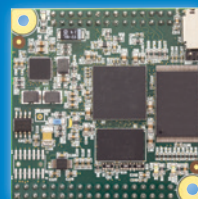
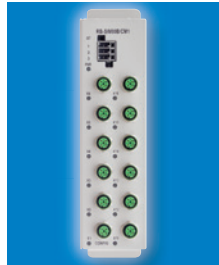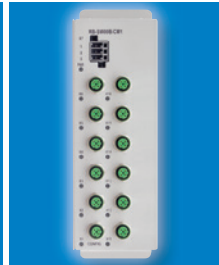|	
Protocol	TRDP TCNOpen 1.3.3.0
Interfaces	2× interface Ethernet, external PHY, RMII
Host interface	UART / CAN / SPI / Eth
Power supply	5.0 V DC
Dimension	(55 × 55 × 19) mm
Operating temperature range	-40 °C to 70 °C
Mounting	2 × ø 3.2 mm hole
Standards	**EN 50155, EN 50121-3-2, EN 61373, EN 60068-2-1, EN 60068-2-2**

Managed Switches

ETHERNET
units

Ethernet network has been successfully used and proven as inexpensive and reliable means of real-time on-board rolling stock communication. Ethernet elements of train networks meet the demanding requirements for resistance to extreme temperatures, dust, moisture, vibration and against electromagnetic interference.

- 6 and 12 ports Ethernet switches
- 10 / 100 Mbps / 1 Gbps
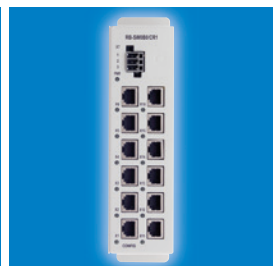- Robust vibration-proof
- PoE version available

- Connections with M12 or RJ45
- Wide operating temperature range -40 °C to 70 °C
- EN 50155 compliant

Ethernet switches with **M12**

	RB-SW006/CM1	RB-SW00B/CM1	RB-SW024/CM1	RB-SW060/CM1	RB-SW00B/DM1	RB-SW02D/DM1
Number of ports	6	12	2 + 4	6	12	8
Ports with PoE			-		6	6
10 / 100 / 1000 Mbps		-	2	6	-	2
10 / 100 Mbps	6	12	4	-	12	6
Connectors	6 x M12, D-coded	12 x M12, D-coded	2 × M12, X-coded 4 × M12, D-coded	6 × M12, X-coded	12 × M12, D-coded	2 × M12, X-coded 6 × M12, D-coded
Power supply			16,8 V to 33,6 V DC			
Power consumption	Max. 0,3 A at 24 V DC	Max. 0,5 A at 24 V DC	Max. 0,3 A at 24 V DC		Max. 1,8 A at 24 V DC	Max. 3,5 A at 24 V DC
Cover protection rate			IP20			
Operating temperature range			-40 °C to 70 °C			
Mounting	2 × ø 5,5 mm hole	4 × ø 5,5 mm hole	2 × ø 5,5 mm hole	2 × ø 5,5 mm hole	4 × ø 5,5 mm hole	4 × ø 5,5 mm hole
Weight	0,89 kg	1,90 kg	0,98 kg		1,50 kg	1,70 kg
Dimensions (w × h × d)	(33 × 233 × 116) mm	(55 × 233 × 116) mm	(33 × 233 × 116) mm	(33 × 233 × 116) mm	(77 × 233 × 116) mm	(90 × 233 × 116) mm
Standards			**EN 50155, EN 50121-3-2, EN 45545-2**			

Ethernet switches with **RJ45**

	RB-SW060/CR1	RB-SW0B0/CR1	RB-SW0E0/DR1
Number of ports	6	12	12
Ports with PoE		-	6
10 / 100 / 1000 Mbps	6	12	12
Connectors		RJ45	
Power supply		16,8 V to 33,6 V DC	
Power consumption	Max. 0,3 A at 24 V DC	Max. 0,5 A at 24 V DC	Max. 3,5 A at 24 V DC
Cover protection rate		IP20	
Operating temperature range		-40 °C to 70 °C	
Mounting	2 × ø 5,5 mm hole	4 × ø 5,5 mm hole	4 × ø 5,5 mm hole
Weight	0,98 kg	1,20 kg	1,90 kg
Dimensions (w × h × d)	(33 x 233 x 103) mm	(55 x 233 x 103) mm	(85 x 233 x 103) mm
Standards		**EN 50155, EN 50121-3-2, EN 45545-2**	

ETHERNET
units

Ethernet network has been successfully used and proven as inexpensive and reliable means of real-time on-board rolling stock communication. Ethernet elements of train networks meet the demanding requirements for resistance to extreme temperatures, dust, moisture, vibration and against electromagnetic interference.

- 6 and 12 ports Ethernet switches
- 10 / 100 Mbps / 1 Gbps
- Robust vibration-proof
- PoE version available

- Connections with M12 or RJ45
- Wide operating temperature range -40 °C to 70 °C
- EN 50155 compliant

Ethernet switches with M12

	RB-SW006/AM1	RB-SW006/NM1
Number of ports	5 + 1	5 + 1
Ports with PoE	5	-
Ports without PoE	1	5 + 1
10 / 100 / 1000 Mbps	-	
10 / 100 Mbps	5	
100 Mbps	1	
Connectors	M12, D-coded	
Power supply	16,8 V to 33,6 V DC	9 V to 33,6 V DC
Power consumption	Max. 2,2 A at 24 V DC	Max. 0,2 A at 24 V DC
Cover protection rate	IP20	
Operating temperature range	-40 °C to 70 °C	
Mounting	4 × ø 6 mm hole	2 × ø 6 mm hole
Weight	1,20 kg	0,87 kg
Dimensions (w × h × d)	(74 × 180 × 121) mm	(33 × 234 × 99) mm
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**	

Ethernet switches with RJ45

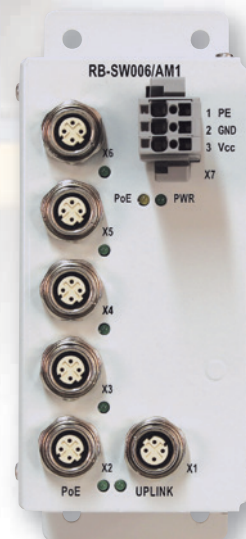|	RD-SW006/AR1	RB-SW006/NR1
Number of ports	5 + 1	5 + 1
Ports with PoE	5	-
Ports without PoE	1	5 + 1
10 / 100 Mbps	5	
100 Mbps	1	
Connectors	RJ45	
Power supply	16,8 V to 33,6 V DC	9 V to 33,6 V DC
Power consumption	Max. 2,2 A at 24 V DC	Max. 0,2 A at 24 V DC
Cover protection rate	IP20	
Operating temperature range	-40 °C to 70 °C	
Mounting	35 mm DIN rail	2 × ø 6 mm hole
Weight	1,02 kg	0,70 kg
Dimensions (w × h × d)	(65 × 124 × 126) mm	(33 × 193 × 88) mm
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**	

ETHERNET
units

Ethernet network has been successfully used and proven as inexpensive and reliable means of real-time on-board rolling stock communication. Ethernet elements of train networks meet the demanding requirements for resistance to extreme temperatures, dust, moisture, vibration and against electromagnetic interference.

- **Ethernet / CAN / RS485 / IO converters**
- **Robust vibration-proof Ethernet connections with M12**
- **Wide operating temperature range -40 °C to 70 °C**
- **EN 50155 compliant**

Ethernet converters

RRC-PPx (Ethernet / CAN / RS485)	
Ethernet	1× 100 Mbps Full Duplex, M12, D-coded / IO
RS485 interface	2× with galvanic isolation, D-Sub DE-9
Power supply	16,8 V to 33,6 V DC
Power consumption	Max. 0,15 A at 24 V DC
Cover protection rate	IP20
Operating temperature range	-40 °C to 70 °C
Mounting	2 × ø 6 mm hole
Weight	0,7 kg
Application software	Project customized

Ethernet converters

RRC-PPx (Ethernet / CAN / RS485)	
Ethernet	1× 100 Mbps Full Duplex, M12, D-coded / IO
RS485 interface	2× with galvanic isolation, D-Sub DE-9
CAN	1× (concatenation)
Power supply	16,8 V to 33,6 V DC
Power consumption	Max. 0,15 A at 24 V DC
Cover protection rate	IP20
Operating temperature range	-40 °C to 70 °C
Mounting	2 × ø 6 mm hole
Weight	0,9 kg
Application software	Project customized

Ethernet - I/O converters

RRC-PPx (Ethernet / CAN / RS485)	
Ethernet	1× 100 Mbps Full Duplex, M12, D-coded / IO
RS485 interface	2× with galvanic isolation, D-Sub DE-9
CAN	2× (concatenation)
Digital I/O	16 × DI , 2 × DO , 24 V DC
Power supply	16,8 V to 33,6 V DC
Power consumption	Max. 0,15 A at 24 V DC
Cover protection rate	IP20
Operating temperature range	-40 °C to 70 °C
Mounting	4 × ø 6 mm hole
Weight	1,2 kg
Application software	Project customized
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**

ETHERNET
units

Ethernet network has been successfully used and proven as inexpensive and reliable means of real-time on-board rolling stock communication. Ethernet elements of train networks meet the demanding requirements for resistance to extreme temperatures, dust, moisture, vibration and against electromagnetic interference.

- Ethernet TCN router
- Robust vibration-proof Ethernet connections with M12
- Wide operating temperature range -40 °C to 70 °C
- Supplied for example as vehicle computer
- EN 50155 compliant

Ethernet router

RB-RTE040/00A	
Ethernet	4×
Port types	2× ETB, 2× ECN
Communication rate	10 / 100 / 1000 Mbps Full Duplex
Connectors	M12, D-coded
Power supply	16,8 V to 33,6 V DC
Cover protection rate	IP20
Operating temperature range	-40 °C to 70 °C
Mounting	4 × ø 6 mm hole
Weight	1 kg
Application software	Project customized
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**

Ethernet router

ERT03	
Ethernet	3×
Port types	2× ETB, 1× ECN
Communication rate	100 Mbps Full Duplex
Connectors	M12, D-coded
Power supply	16,8 V to 33,6 V DC
Power consumption	Max. 0,15 A at 24 V DC
Cover protection rate	IP20
Operating temperature range	-40 °C to 70 °C
Mounting	2 × ø 6 mm hole
Weight	1 kg
Application software	Project customized
Standards	**EN 50155, EN 50121-3-2, EN 45545-2**

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