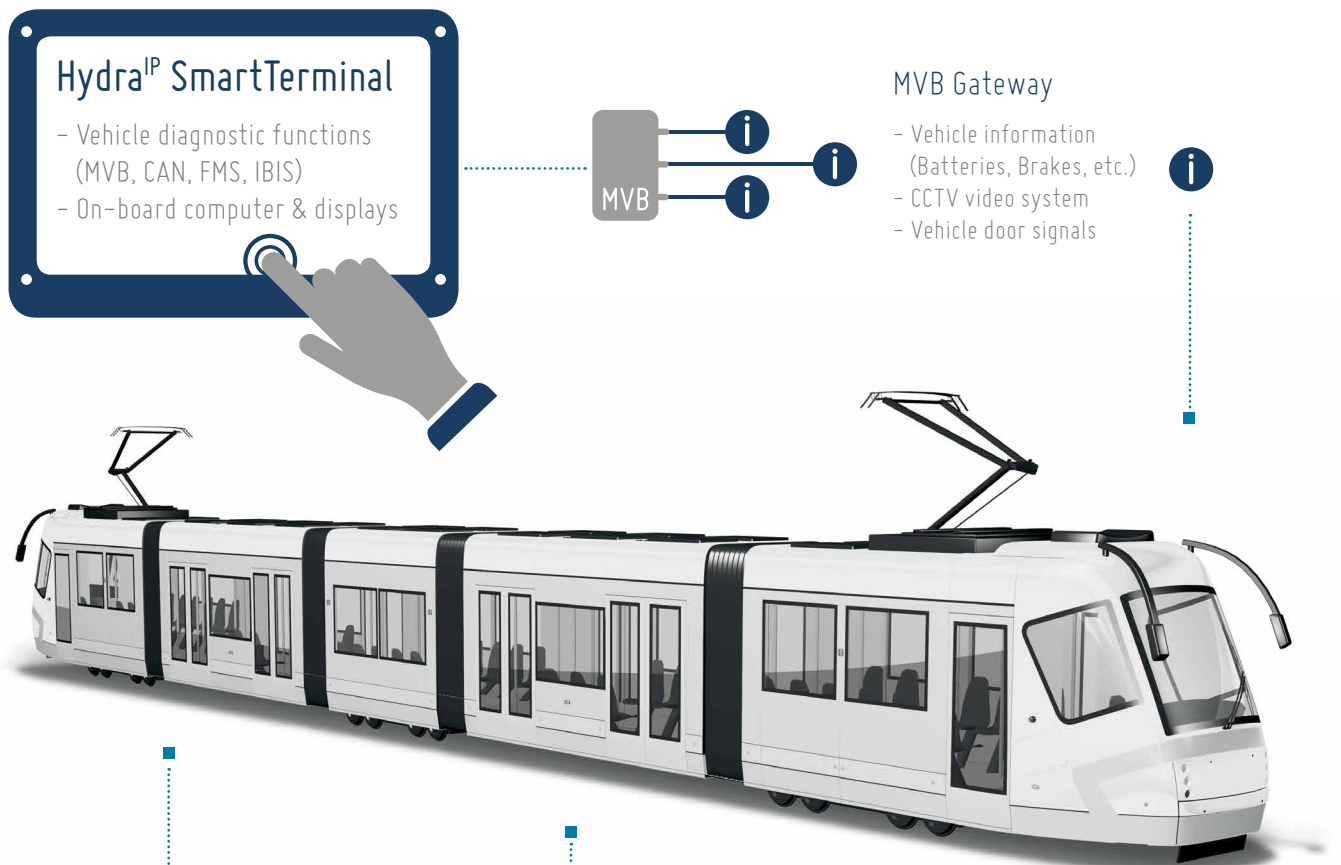


Hydra^{IP} SmartSystem MVB

Smart on-board computer system for rail vehicles

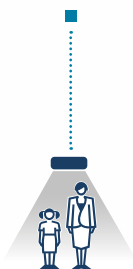


Hydra^{IP} SmartTerminal

- Vehicle diagnostic functions (MVB, CAN, FMS, IBIS)
- On-board computer & displays

MVB Gateway

- Vehicle information (Batteries, Brakes, etc.)
- CCTV video system
- Vehicle door signals



People Counting

- Sensors (infrared, time of flight, 3D, stereo camera)
- Data concentration, transmission and control by HydraIP APCS Controller unit/HydraIP Mobile Digital Video Recorder



Video Surveillance

- Analogue, IP & digital video (DV) cameras and monitors



Data Transmission

- Data transfer to back office
- Mobile communications (WLAN, 3G/4G)
- Global navigation satellite system (GPS)



Fleet Management System

- Process optimizing
- Fleet information and control
- Maintenance & diagnostics
- Ressource management
- Vehicle management



Rear view mirror system

- Driver assistant system



Video & APCS On-board recording units

- Recording of audio, video and additional data

EDRESEARCH

DResearch Fahrzeugelektronik GmbH



Same cockpit – new technology. Italian public transport provider ATM Milano has successfully started to deploy trams featuring a modular on-board computer system. The ATM Milano project sees the HydraIP SmartSystem MVB replacing the vehicle technology previously used in the trams. The tried-and-tested generation of HydraIP MR4xxx Mobile Digital Video Recorders has been supplemented with the newly developed HydraIP SmartTerminal on-board computer and HydraIP MDC cameras, along with rear mirror cameras.

At first glance, nothing has changed for the rail staff. The touch-screen software looks the same, and the trams can return to immediate operation following the retrofit, with no extra training needed. However, on closer inspection, the new functions become apparent in the familiar interface. Video management is integrated into the MVB software application which is running on the HydraIP SmartTerminal. The application can switch between operation mode “video surveillance” and “vehicle control management” via touch-screen to access the information they need at any given time.

In the event of vehicle faults, stored instructions with images are displayed for the driver, enabling the fault to be located quickly and immediate action to be taken to rectify the issue.

The images provided by the newly installed interior cameras and rear mirror cameras on the HydraIP SmartTerminal on high resolution display. The HydraIP SmartTerminal is the smallest and most slim Touchscreen Terminal which combines video management as well as the vehicle data bus (MVB).

ATM Milano is the first to deploy the HydraIP SmartSystem MVB. The HydraIP SmartSystem MVB was developed by DRResearch Fahrzeugelektronik GmbH in cooperation with GECO s.r.l. and advanced to series-production stage within of two years. The result of this development is a new, modular on-board computer system for all rail vehicles featuring an MVB IEC 61375 data bus. Depending on customers need the basic system (HydraIP SmartTerminal and HydraIP Video system) can be extended by additional modules such



The basic system of ATM Milano

The basic system consists of a video surveillance, SmartTerminal (HMI) and the MVB vehicle bus

Hydra^{IP} Smart Terminal

Applications:

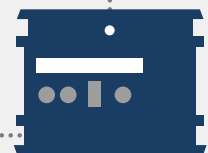
- MVB Diagnostic
- CCTV Video

Multifunction
Vehicle Bus
(MVB)



CCTV Cameras

Ethernet
IEEE 802.3



Hydra^{IP}
Recording unit

Train Communication Network TCN
(IEC 61375-1)

Benefits and added value

Flexibility

- The HydralIP SmartTerminal can be integrated into almost any driver cockpit and is compatible with the MVB data bus.

Multifunctionality

- The HydralIP SmartSystem MVB is a multifunctional platform that integrates several individual sub-systems (e.g. APCS, CCTV, vehicle diagnostic MVB, Reaview Mirror System)

Modularity, standards and open interfaces

- The system can be easily upgraded with additional options, such as control center communication, fleet management and automatic passenger counting.
- The overall system works on the basis of open standards such as Ethernet IEEE 802.3, IEC 61375, IBIS VDV300 and IBIS-IP VDV301.

Maintenance free by industrial design

- The overall system and all components are produced on an industrial scale and designed to have a long service life.
- The components are largely maintenance-free — the overall system only requires minimal preventative maintenance.

Cost efficiency and investment security

- With all aspects considered, the overall system is much cheaper than buying individual subsystems and components (monitor, data communication, video surveillance, automatic passenger counting).
- Open interfaces and international standards offer investment security
- Weight reduction and reduced power consumption

Data protection and security

- The system incorporates the HydralIP SmartLock security system.
- Gateway for data bus IEC 61375-3-1 MVB.
- Data protection requirements and data security are satisfied in accordance with European norms and standards.

Certifications and approvals

- All system components are approved for use in rail vehicles and meet the requirements of EN 50155, EN 50121-3-2, EN 61373, EN 60068-2-1 and EN 60068-2-2.
- All system components satisfy the requirements of the EN 45545 fire protection standard.



as automatic passenger counting (APCS) and data communication to a Back Office Application in the control center (DResearch Fleet Management System).

The HydralIP SmartTerminal, an on-board computer system (HMI) with a capacitive 12-inch touchscreen, forms the centrepiece of the HydralIP SmartSystem MVB. The anti-glare display consists of chemically strengthened glass (bonded) and offers 1280 x 800 px resolution. The system features an integrated 8GB SSD on which the operating system (LINUX) and the MVB application are stored.

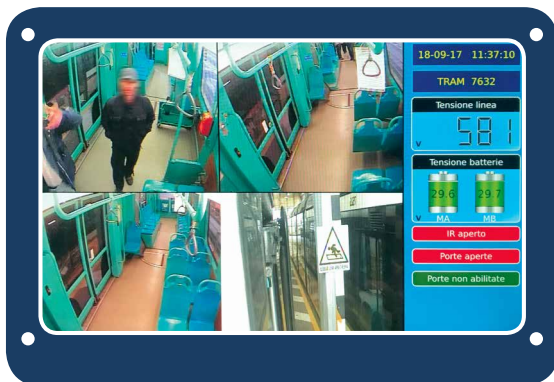
The software application for the SmartTerminal was developed in collaboration with GECCO s.r.l. and aligned to the customer-specific needs. The goal was to enable rail staff to continue to work with an interface with the same look and feel as the previous system, rather than be presented with a completely new graphical interface. To achieve this goal, DResearch Fahrzeugelektronik GmbH banked on GECCO's expertise. The result of this cooperation is a combination of the familiar, graphical user interface from the original board computer supplemented with modern elements and additional functions.

The HydralIP MR4xxx video system records in black box mode, meaning it can be configured to save recordings for a number of days before automatically overwriting them. The video data is saved on a data storage device that can be removed with the help of an electronic key called the HydralIP SmartKey. This ensures that only authorized personnel have access to the video data.

innovations on board.

The video images that the HydraIP SmartSystem MVB uses to display are supplied by the HydraIP cameras for interior and exterior surveillance.

ATM Milano's trains feature the new, analogue HydraIP MDC cameras. Boasting a compact and minimal design, they are quick to install and can be easily integrated into all existing analogue video systems



and all type of vehicles. The MDC1100 is the first camera worldwide which allows installation based on magnetic system. This ensures a quick and easily. The camera board is mounted in a magnetic sphere, enabling the direction to be set permanently as part of a simple process. The sphere itself does not need to be fixed in place mechanically as the lens is permanently held in position by magnetic forces.

The HydraIP SmartSystem MVB can be tailored to all rail vehicles featuring an MVB IEC 61375 data bus. It was manufactured in accordance with international standards. Featuring open interfaces, it can also be integrated into existing on-board systems.

Easy installation and integration in existing systems, modular design and tailored solutions such as installation frames for the on-board computer system and software application with vehicle diagnostics, driver assistant systems and video surveillance — all of these factors make the HydraIP SmartSystem MVB a future-proof alternative for all vehicles featuring the MVB IEC 61375 data bus.



DResearch Fahrzeugelektronik GmbH
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