

A Siemens Metro train is shown traveling through a city street. The train is silver and black, with "METRO" and a logo on its side. It is moving along tracks that are partially submerged in water, creating splashes. In the background, there are modern buildings, including one with a red sign that says "One City Centre". A fountain with water spraying upwards is visible on the right side of the frame. The Siemens logo is in the top left corner.

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Tranguard Imu 100 inductive transmission system

Efficient and reliable rail operations



Attractive urban transport instead of stress and traffic congestion

Trainguard Imu 100 inductive transmission system

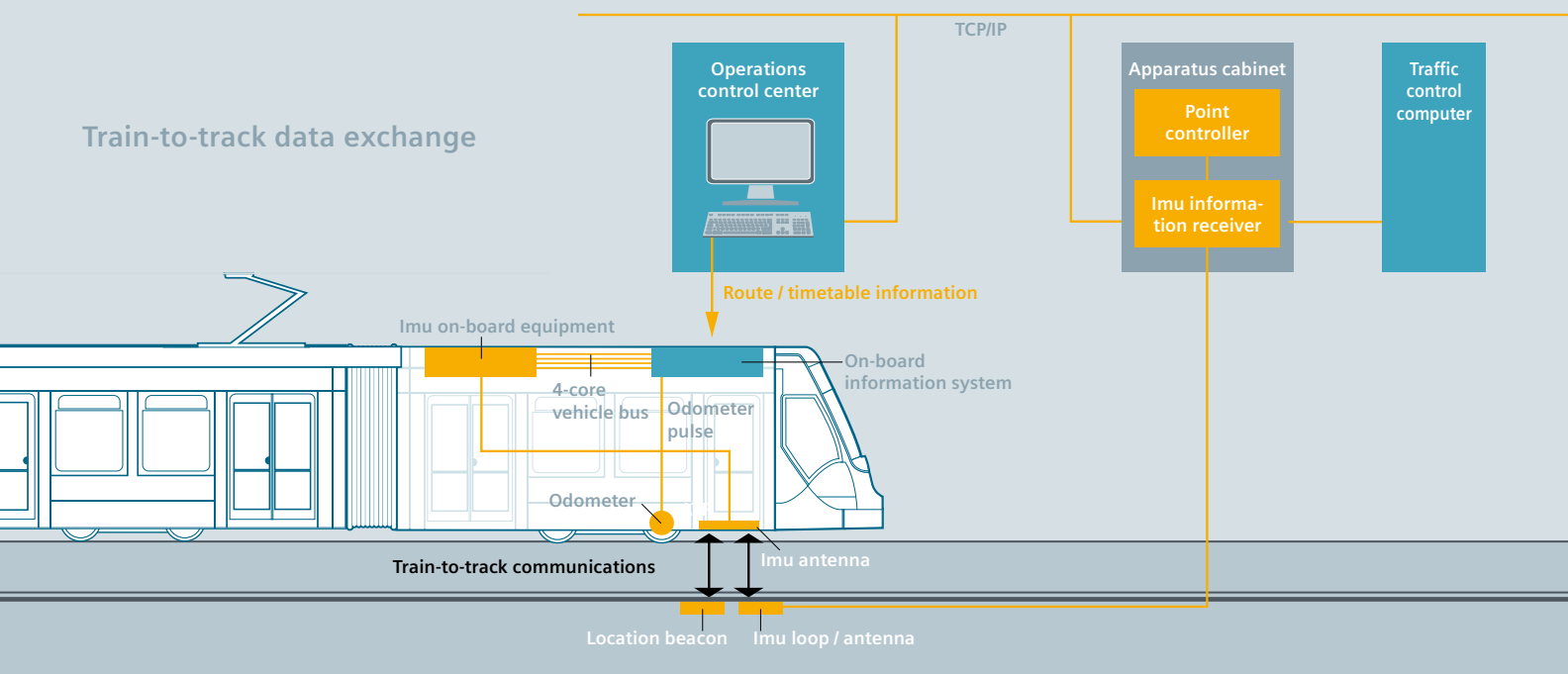
Cities are becoming increasingly larger and more complex. This also imposes increased requirements on mass transit systems. Their operators have to cope with rapidly growing traffic flows and passengers' rising expectations. Their success is measured against factors such as safety, punctuality, convenience and environmental friendliness.

Siemens' intelligent and future-oriented mass transit concepts support operators in successfully meeting these challenges.

We regard our customers as partners who we support through our work in sustainably developing their urban environment and making their public mass transit both efficient and effective. You thus boost your passengers' quality of life and the attractiveness of your city as a business location.

With its know-how, Siemens has created the basis for efficiently solving the diverse problems of transport. This can be done, for example, with optimized operations management systems which allow shorter intervals and traveling times. The high economic efficiency of our systems offers considerable financial advantages to operators. We reduce life-cycle costs by ensuring a high level of system availability and using low-maintenance systems.

In recent years, traveling by light rail systems and trams has become increasingly popular. Stressworne motorists are now changing over to buses, trams and trains. Public urban transport has become considerably more attractive. Modern operations management systems enable the optimum monitoring of operations and thus ensure efficiency and time savings. The keyword here is the interchange of information between trackside and on-board equipment.



A system with many advantages

Trainguard Imu 100 for more efficiency in operations management

From the vehicle to the track and back again

Transmission of information and location-related control commands

The Trainguard Imu 100 system is an information transmission system with a modular design. It is used for transmitting information from the vehicle to the track and vice versa. Data is transmitted in the form of telegrams at a rate of 50 kBaud using time-division multiplexing. A large volume of transmitted data is thus available for controlling equipment in mass transit systems.

The Trainguard Imu 100 inductive transmission system meets the requirements of modern transport systems for

- short headways
- high traveling speed
- high level of availability
- simple configurability and maintainability
- up-to-the-minute passenger information
- reduction in the number of duties for the crew
- effective train tracking for daily operations

Always on stand-by

Train-to-track information transmission

Telegrams transmitted from the vehicle are received by the Trainguard Imu 100 receiver via antennas or loops. The received data is then forwarded to connected units via various interfaces. In this way, it is possible to transmit control commands to interlockings or the entire vehicle telegram to a control center.

Location information is transmitted to the vehicle via location beacons. Data is exchanged via an air gap of max. 400 mm between the vehicle antenna and the trackside antenna or loop.

The Trainguard Imu 100 system is mainly used for transmitting

- setting requests to point controllers and light-rail signal control systems
- vehicle telegrams to depot control systems for dispatching purposes
- vehicle positions for tracking purposes
- commands to traffic control computers and level-crossing systems
- trackside data to the vehicle (e.g. door release, step board height)
- control commands for platform screen doors

as well as for precise determination of the vehicle position for up-to-the-minute and accurate passenger information.



Imu 100 receiver CPU850
(Extended type)



Imu 100 receiver CPU850
(Standard type)



Imu 100 receiver CPU850
(Compact type)

Reliability all along the track

Trainguard Imu 100 trackside and on-board equipment

Everything for reliable operations CPU850 receiver

The CPU850 receiver of the Trainguard Imu 100 system is the central trackside unit. This unit is connected to the trackside receive elements (antennas and loops) via coaxial cables which can have a length of up to 4,000 m. The telegrams received via the receive elements are checked and evaluated by the Trainguard Imu 100 receiver. Subsequently, the received information can be forwarded via serial interfaces (TCP/IP, RS232, RS485, TTY) or relay contacts. Moreover, the serial interfaces allow easy integration of the Trainguard Imu 100 receivers into a bus system.

The Trainguard Imu 100 receiver has been designed as a plug-in module for 19" mounting racks. All interfaces are accessible on the front panel.

The receiver can be project-specifically configured via a conventional null modem cable and a PC. Therefore, the Imu 100 receiver comes with the required IMUProject software which, amongst other things, allows flexible parameterization of the serial interface. Configuration of the relay contacts depending on the vehicle telegram contents is also possible.

The received vehicle data is stored in a history memory, which can be read out via IMUProject. This allows the received vehicle data to be traced back for each receive element, for instance.

The Trainguard Imu 100 receiver is available as a 42-units-wide variant (Extended type) to which up to eight receive elements can be connected. 16 output relays are available. In addition, a 30-units-wide variant (Standard type) with eight output relays is available, to which up to four receive elements can be connected.

Furthermore, a 21-units-wide variant (Compact type) with three antennas is available. The device can be supplied with either direct current (24 V) or alternating current (100–240 V) and may be used for synchronizing the internal time via a radio signal.

Receive/send elements

Vehicle

On the vehicle, the send/receive antennas can be used. Both antennas feature send and receive functions and only differ in their cable entry (PG gland or plug connection).

Track

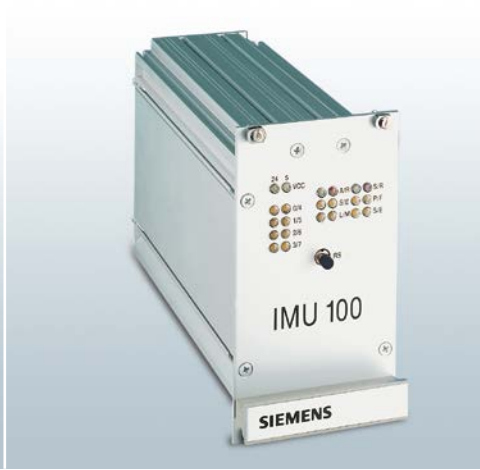
The antenna and the loop amplifier with connected track conductor cable are used as receive elements for the Trainguard Imu 100 receiver.

The track conductor is set to a loop to ensure – for example at stopover stations – the reception of messages even in the case of insufficient stopping accuracy of the vehicle at standstill.

A switching point can also be used as a trackside receive antenna. Via this switching point, a switching output is issued upon detection of a vehicle without any separate power supply. The power needed for switching is solely generated by the vehicle telegram when the vehicle passes the antenna.



Receive antenna



Vehicle unit (box)

Vehicle unit

In unidirectional operation (transmission of data from the vehicle to the track), the vehicle unit comprises a power supply module and a processing module.

In bidirectional operation (transmission from the vehicle to the track and vice versa), an additional receive module is used. The modules are installed in a plug-in module (14 units wide, 3 units high) for 19" mounting racks. Switch-over is cyclical between the send and receive functions, thus enabling send and receive functionality via a vehicle antenna. Bidirectional operation is realized by means of a vehicle unit. For this purpose, the Com 100 switching module (12 units wide, 3 units high) is used in addition to the vehicle unit.

The interfaces to the peripheral units are also accessible via a 14-units-wide (12-units-wide when a Com 100 module is used) backplane on the rear.

The following connections are available:

- 24 V battery voltage
- vehicle antenna
- vehicle bus (integrated on-board information system)
- driver console direction keys (left, straight, right, request) as well as additional parallel inputs and outputs for other purposes.

When connecting to an integrated on-board information system, predefined information (e. g. line number, turn-around number, vehicle number, etc.) can be taken over from the vehicle unit and forwarded to the track via the vehicle antenna mounted underneath the vehicle.

The driver is permanently provided with status messages from the Trainguard Imu 100 which are displayed by the integrated on-board information system. Via separate pushbuttons, manual requests (e. g. point control commands) can be issued by the driver. These requests can be used if the scheduled route is to be changed at points.

Upon receipt of a line telegram, the received data is forwarded in less than 90 ms to the integrated on-board information system and can be used to synchronize the vehicle position, for example.

Furthermore, the line data can be output directly by the Trainguard Imu 100 vehicle unit on a circuit-related basis.

Test unit – convenient checking for vehicle and line

The Trainguard Imu 100 test device is used for testing the transmission of data telegrams at the interface (air gap) between the on-board equipment and the trackside equipment of the inductive transmission system. This test device is able to simulate both the on-board equipment and the trackside equipment (transmission and reception of telegrams) and to display the telegram contents.

Either mains-powered testing (24 V DC or 100 to 240 V AC) or mains-independent testing is possible. In the latter case, power is supplied by a built-in storage battery.





Selected references

Trainguard Imu 100: a system with proven reliability – worldwide

More and more rail operators are relying on the capability of modern operations management systems made by Siemens – the innovative tools for reducing costs and improving operations. Our systems are helping rail operators in busy metropolitan areas by offering a level of mobility to meet the demands of modern-day life. Thanks to their user-friendliness and flexibility, our inductive transmission systems have proven to be reliable in day-to-day service for a lot of customers.

Trainguard Imu 100 is used in more than 1000 tram, light rail transit and metro vehicles throughout the world. This system is being continuously maintained and refined for the growing requirements of rail operators in mass transit.



Facts speak for themselves

Technical data

Imu 100 system data

Transmission method	Time-division multiplexing (frequency shift keying)
Transmission frequencies	823.5 kHz/875 kHz
Transmission rate	50 kBaud
Form of transmission	Telegram with start and stop flags
Data volume	≤ 96 usable bits
Transmission air gap	up to 400 mm
Mean deviation	± 100 mm
Speed range	≤ 200 km/h (unidirectional), ≤ 100 km/h (bidirectional)

Imu 100 receiver CPU850

Operating voltage	4 V DC ± 25% or 100 to 240 V AC/50 to 60 Hz
Power consumption	max. 38 W
Weight	DC version 3.3 kg; AC version 3.6 kg
Antenna cable	Coaxial cable (e.g. V45460-D17-B6)
Cable length	4,000 m (when using above-mentioned coaxial cable)

Extended type Dimensions	3 units high, 42 units wide, designed as plug-in module for 19" mounting racks Width 213 mm Height 130 mm incl. front panel (plug-in height 110 mm) Depth 250 mm incl. handle (plug-in depth 234 mm)
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Interfaces	Power supply 8 receive elements (antennas, loops) PC interface Serial output interfaces (RS232, RS485, TTY, TCP/IP) 16 output relays with changeover contacts
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Standard type Dimensions	3 units high, 30 units wide, designed as plug-in module for 19" mounting racks Width 152 mm Height 130 mm incl. front panel (plug-in height 110 mm) Depth 216 mm incl. handle (plug-in depth 200 mm)
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Interfaces	Power supply 4 receive elements (antennas, loops) PC interface Serial output interfaces (RS232, RS485, TTY, TCP/IP) 8 output relays with changeover contacts
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Compact type Dimensions	3 units high, 21 units wide, designed as plug-in module for 19" mounting racks Width 107 mm Height 130 mm incl. front panel (plug-in height 110 mm) Depth 195 mm incl. handle (plug-in depth 180 mm)
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Interfaces	Power supply 3 receive elements (antennas, loops) PC interface Serial output interfaces (RS232, TCP/IP) 3 optocoupler outputs
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Vehicle unit

Operating voltage	24 V DC +20% / -25%
Power consumption	max. 10 W
Weight	1 kg
Antenna cable	2 x two-wire twisted pair (e.g. V45551-D22-B6)
Cable length	100 m (when using above-mentioned cable)
Dimensions	3 units high, 14 units wide, designed as plug-in module for 19" mounting racks Width 71 mm Height 130 mm incl. front panel (plug-in height 110 mm) Depth 190 mm incl. handle (plug-in depth 175 mm)
Interfaces	Power supply Send/receive antenna Vehicle bus (integrated on-board information system) Driver console direction keys (e.g. left, straight, right, request) Additional digital inputs and outputs for other purposes

Send / receive elements

S25448-M2-A2 receive antenna

Dimensions	300 mm x 150 mm x 80 mm
Weight	3 kg

S25060-X10-X20 switching point

Dimensions	300 mm x 150 mm x 80 mm
Weight	3 kg

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The information in this document contains general descriptions of the technical options available. The required features should therefore be specified in each individual case at the time of closing the contract. For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action and integrate each component into a holistic, state-of-the-art security concept. Third-party products that may be in use should also be considered.