

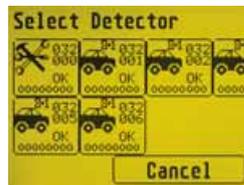
**SIEMENS**



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## Sittraffic SST5

Outstation for the control  
of motorway traffic management systems



# Managing traffic with Sitrtraffic SST5 outstations



## **Enhanced safety and improved traffic flows on freeways and motorways**

Traffic management systems on motorways can be used to warn drivers of congestion, black ice or fog on the section ahead, thus helping reduce accident numbers. The speed limits set by the system make traffic flow more smoothly and evenly, which increases throughput at critically high traffic loads and minimizes the risk of congestion and accidents. The outstations also serve to record traffic and environmental data and control the variable message signs on major interurban roads.

## **Tried and tested: Siemens technology in action**

Building on many years of experience in designing outstations, Siemens has launched Sitrtraffic SST5, the newest generation of outstations for the control of traffic management systems. The SST5 complies fully with the current TLS 2012 standard (Technische Lieferbedingungen für Streckenstationen), which stipulates the technical delivery conditions for outstations. As the relevant standard for outstations in Germany, Austria and Slovenia, the TLS is also the relevant technical standard in many other countries around the world. Our Sitrtraffic SST5 is also in full conformity with the CE standards currently in force in Europe.



**The heart of the traffic management system:**

**The Sitraffic SST5 outstation**

The Sitraffic SST5 outstation works as the central field-level controller of traffic management systems. The numerous interfaces of the control system allow the link-up of a wide variety of data terminals, such as detectors, environmental sensors, display panel as well as other operational components. Siemens supplies all technical components for traffic management systems, from the control center down to the individual controllers – scalability guaranteed.

# Sitraffic SST5 for the control of a motorway monitoring and control point



The components of an outstation are distributed over the following functional and locational units:

- Switch cabinet containing the controller
- Measurement point
- Display panel system
- Data transmission

The **switch cabinet** contains the controller as well as the power supply equipment for the outstation. The controller module uses the partyline bus and the communications computer to communicate with the relevant control subcenter. All field bus devices are connected to the switch cabinet and controlled from there. The control module also monitors and reports the operational status of the entire outstation.

The **measuring point** consists of traffic detectors that monitor key parameters of the vehicles passing on the individual lanes, for instance a double induction loop embedded in the road surface combined with a processing module housed in the switch cabinet. Or a number of overhead detectors mounted on the gantry to monitor the traffic from above. The detectors collect the traffic data and transmit them via a communication bus to the controller.

In addition, measurement and control points include **environmental sensors**, which can also be connected directly to the controller. The sensors record a variety of data, such as temperature, visibility and road conditions or wind speeds.

The **display panel system** consists of several variable message signs, either mounted on a gantry or on supports at the roadside. The variable message signs display various types of driver information, for instance hazard warnings, speed limits, no-passing signs, situation-specific signs or lane-use signals. The Sitraffic SST5 outstation is compatible with prismatic or LED-type variable message signs and with traffic signal heads. The system's modular design allows easy and flexible combination of different components and technologies to tailor the outstation to the specific needs of the location and the project.

In addition to the functions specified in the TLS 2012, the Sitraffic SST5 outstation offers a range of other valuable features:

- A generously dimensioned touch screen for even more convenient data display and system operation
- Multiple data transmission options: serial or via Ethernet (TCP/IP), wireless or cable-bound (conventional or fiber optic cable)
- Integrated software download facilities right through to field equipment level
- Modular software design for flexible adaptation to the customer's requirements
- Backplane allows flexible addition of various interfaces on the platter at any time

# The Sitraffic SST5 outstation

Since their introduction in 1992, several generations of the Siemens family of controllers have proven their worth in numerous projects around the world.

## **Sitraffic SST5**

The Sitraffic SST5 outstation has been designed for multiple functions, including recording traffic and environmental data and controlling LED-based or prismatic variable message signs, LED signal heads, traffic control equipment such as barriers/gates and ramp-metering systems as well as other components used in traffic management systems. The outstation has been designed for use with complex traffic management and guidance systems comprising a large number of field devices.

The basic version of the SST5 consists of a controller with 9 serial interfaces, 2 analog interfaces, 64 digital interfaces, 2 Ethernet interfaces and 2 USB ports. In addition it is prepared for accommodating up to eight Siemens double-loop detector modules, a touch screen display, an internal 230 V AC/24 V DC power supply unit as well as several expansion boards for additional serial and digital interfaces and/or for the connection of additional components via Profibus/CAN bus. Since the cables are connected on the rear side of the frame, Sitraffic SST5 outstations are generally installed in swiveling frames.

As an option, the Sitraffic SST5 can be extended using 19" racks for accommodating additional components (double-loop detectors, modems, etc.).

The Sitraffic SST5, just like the other outstations of the Sitraffic SST5 family, has been designed for optimum energy efficiency and low power consumption ("green" technology). The Sitraffic SST5 is powered either using an internal 230 V AC/24 V DC supply unit or via an OPS module mounted on a hat rail, which functions as UPS and offers optional phase monitoring capability. The internal cabinet lighting uses low-energy LED technology.

To meet the ever stricter requirements and allow new functions, the outstations need to be equipped with powerful hardware. The functionality and options of the Sitraffic SST5/ComBox5 combination have been designed to meet the specifications in the TLS, i.e. the technical delivery conditions for outstations as published by the German Federal Highway Research Institute BASt.

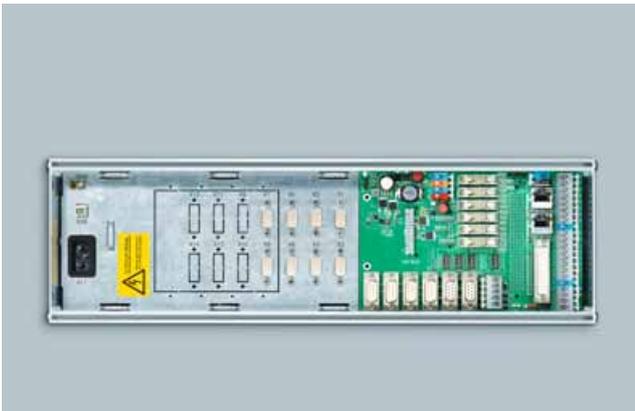
But Siemens is doing more: The new Sitraffic SST5 has been designed for easy assembly, operation and maintenance. Certified for EMC (without cabinet), the Sitraffic SST5 family is compatible with a wide range of cabinet types. As standard option, the Sitraffic SST5 can be ordered with an NKT cabinet.

The Sitraffic SST5 is equipped with an extended redundancy function. In contrast to conventional redundant systems, this redundancy function allows the parallel operation of two processors and consequently the simultaneous polling of all sensors and actors. This in turn enables an immediate switch from the active to the passive outstation function.

The basic version of the Sitraffic SST5 serves also as the basis for the communication computer Sitraffic ComBox5. The resulting limited variety of modules and components helps optimize spare parts management for our service team as well as for the customer.



Sitraffic SST5 19" rack (front)



Sitraffic SST5 19" rack (rear)



Sitraffic SST5 modules mounted in a 2N cabinet



Sitraffic SST5 cabinet with LED lighting and door contacts

# The Sitraffic SST5-Stella outstation

## **Sitraffic SST5-Stella**

The Sitraffic SST5-Stella outstation has been designed for multiple functions, including recording traffic and environmental data and controlling LED-based or prismatic variable message signs, LED signal heads, traffic control equipment such as barriers/gates and ramp metering systems as well as other components used in complex traffic management systems.

The basic version contains a controller with 5 serial interfaces, two analog interfaces, 30 digital interfaces, 1 Ethernet interface and 2 USB ports. In addition, the Sitraffic SST5-Stella is prepared for accommodating up to 12 Siemens LD4-FH double-loop detector modules and various DIN rail modem modules (FSK modems, GPRS, UMTS, etc.).

The Sitraffic SST5-Stella, just like the other outstations of the Sitraffic SST5-Stella family, has been designed for optimum energy efficiency and low power consumption ("green" technology). The Sitraffic SST5-Stella is powered via an internal 230 V AC/24 V DC supply unit, with a power consumption rate of 7 W max. Besides the version using an 230 V AC/24 V DC power supply, the Sitraffic SST5-Stella is also available in a version using off-peak electricity (with 24 V DC battery incl. charge controller) or a version without power supply unit (for instance for 12/24 V DC supply from an external source such as a solar module or a fuel cell).

To meet the ever stricter requirements and allow new functions, the outstations need to be equipped with powerful hardware. The features and options included in our Sitraffic SST5-Stella are based on the TLS specifications. In addition, however, the new SST5-Stella has been designed for easy assembly, operation and maintenance. In the standard version, the Sitraffic SST5-Stella comes in a 10 cabinet including mast fixation equipment.

## **Sitraffic SST5-Stella SC**

Our Sitraffic SST5-Stella SC outstation offers the same functions for monitoring and controlling field equipment as Sitraffic SST5-Stella.

The SC version of Sitraffic SST5-Stella has been designed mainly for incorporation in existing cabinets without IP54 protection.

The basic version contains a controller with 5 serial interfaces, 2 analog interfaces, 30 digital interfaces, 1 Ethernet interface and 2 USB ports. In addition, it is prepared for the accommodation of up to 8 Siemens double-loop detectors and various DIN rail modem modules (FSK modem, GPRS, UMTS etc.).

The Sitraffic SST5-Stella SC, just like the other outstations of the Sitraffic SST5 family, has been designed for optimum energy efficiency and low power consumption ("green" technology). The Sitraffic SST5-Stella SC outstation is powered via an internal 230 V AC/24 V DC supply unit, with a power consumption rate of 7 W max.

The features and options included in our Sitraffic SST5-Stella SC are based on the TLS specifications. In addition, however, the new Sitraffic SST5-Stella SC has been designed for easy assembly, operation and maintenance. As a standard, the Sitraffic SST5-Stella SC comes in a Siemens plastic housing (8HP1107, 460 × 307 × 147 mm).

The basic version of the Sitraffic SST5-Stella serves at the same time as the basis for the communication computer Sitraffic ComBox5-SC. The resulting limited variety of modules and components helps optimize spare parts management for our service team as well as for the customer.

## **Sitraffic SST5-Stella MK**

Our Sitraffic SST5-Stella MK outstation offers the same functions for monitoring and controlling field equipment as the Sitraffic SST5-Stella.

The "MK" version of the Sitraffic SST5-Stella is very compact and has been designed primarily for incorporation in existing IP54-protected cabinets that offer but little room for additional modules.

With the Sitraffic SST5-Stella MK, the customer benefits from a high degree of flexibility in specifying the number of functions and interfaces. In the basic version, it offers the same functions as Sitraffic SST5-Stella SC.

The Sitraffic SST5-Stella MK, just like the other outstations of the Sitraffic SST5 family, has been designed for optimum energy efficiency and low power consumption ("green" technology). It is powered via an internal 230 V AC/24 V DC supply unit, with a power consumption rate of 7 W max.

The features and options included in our Sitraffic SST5-Stella MK are based on the TLS specifications. In addition, however, the new Sitraffic SST5-Stella MK has been designed for easy assembly, operation and maintenance. In the standard version, the Sitraffic SST5-Stella MK is mounted on a hat rail.

For additional information, please see the brochure on Sitraffic ComBox5.



Sitraffic SST5-Stella in a 10 cabinet (closed)



Sitraffic SST5-Stella in a 10 cabinet (door open)



Sitraffic SST5-Stella SC in a plastic housing (closed)



Sitraffic SST5-Stella MK mounted on top-hat rail

# Data capture

## Traffic data

The traffic detectors register all vehicles passing through their detection range, count and classify them and determine vehicle speed, the number of passengers and the time gaps. Detectors can monitor traffic on one or on several lanes. The Sitraffic SST5 collects the measurement data provided by the detectors and aggregates them across user-configurable measurement intervals to produce short- and long-term data.

The Sitraffic SST5 outstation allows connection of all currently used traffic detectors:

- Loop detectors (e.g. Siemens LD4-F detectors)
- Overhead detectors (e.g. radar, infrared and ultrasonic technology or a combination)

## Weather and environmental data

All commonly deployed sensors for monitoring weather and environmental data can be linked up to the SST5 outstation. The data captured by the sensor, for instance on air temperature, precipitation, wind speeds or visibility range, are transmitted to the outstation, where they are processed and forwarded to the control center. Among other detection products, Siemens markets its own brightness sensor, called HLS, which is also available as HLS+ with integrated heating module.

## Sensor connection

The sensors can be connected either directly via serial RS485 or analog interfaces or, in the case of analog sensors, via Siemens' own Decentral Environment Sensor Interface, DESI, which uses the Siemens protocol SiTOS to transmit the analog signals via a serial RS485 interface to the outstation. Detectors may be installed up to 1,000 m from the outstation; the DESI and the analog sensors can be located up to 20 m apart.

## Uses

Capturing and processing traffic and environmental data may be implemented as an integral function of traffic management systems, speed monitoring systems, permanent traffic counting stations, or weather information systems. In a traffic management system, the measured data form either the basis or important auxiliary input for decisions about speed limits to be set or warnings and information to be displayed. Depending on the local requirements and customer requests, the outstation can also be combined with fully automated speed limit display systems, weather warning stations (for visibility, precipitation, etc.) or black ice warning displays (road conditions, thickness of water film, etc.). For this purpose, the Sitraffic SST5 outstation can be flexibly configured and expanded. If desired, the additional systems can be implemented within the same unit.



LD4-FH loop detector



LD4-F loop detector



Triple radar detector



Brightness sensor HLS+ (Siemens AG)

# Controlling variable message signs (VMS)



## Siemens VMS control (IRC/LDBR)

For variable message signs, Siemens offers a proprietary controller that directly controls the LED chains of a VMS. The control functions are implemented using wire-saving distributed technology: Lamp switches. Data transmission and monitoring elements are installed directly in the VMS unit. The variable message signs mounted on a gantry are series-connected to the controller using a power supply and a telecommunications cable. This substantially reduces the installation effort. When copper cables are used, control unit and VMS may be installed up to 1,000 m apart; fiber-optic cables can bridge even greater distances. This provides ample scope for selecting the optimum location for the controller even in unfavorable geographical conditions.

## LED monitoring

The VMS controller from Siemens offers a special, patented feature: Once every second, the continuous monitoring function switches all LED chains off for one microsecond, an undetectably short period for the road users. This allows a permanent availability check of all components, even light sources or LED chains that are currently dark. In the event of a malfunction, the system sends an alarm message to the subcenter. What makes the monitoring function so important is the fact that it detects also malfunctions in signal patterns that are activated only rarely or in specific hazard situations (e.g. fog warning signs).

### Adjustable symbol brightness

The brightness of the VMS can be set in 1-percent increments to values between 0 and 100 %. The corresponding control command is issued either by the subcenter or by a local brightness sensor system. For this purpose, the brightness sensor is mounted very close to the sign in question to obtain the actual brightness values on site.

### Comprehensive display security features

To reliably prevent hazards for the road users due to faulty signs or non-compatible sign combinations (e.g. caused by electrical failures of the VMS controller, the signal heads or the cables), the Sitraffic SST5 is equipped with multiple display security features.

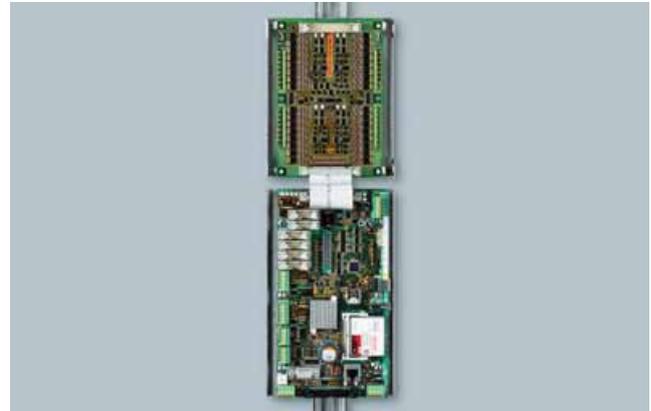
Besides the usual interlocking of display patterns (e.g. red X vs. green arrow for emergency lane opening), Ethernet connections offer the option of interlocking several outstations along the road section.

In case of major failures, the entire display system will be deactivated. A partial failure will trigger the appropriate response. The Sitraffic SST5's response to failures can be defined in the configuration data.

A hardware interlock allows a higher level of display security – for advanced security-related applications. Regardless of the software settings, this interlock function can block signs that are incompatible with the situation. It is used for instance in lane changing systems or in tunnels with switchable lane directions.

### Controlling other display systems

Besides switching LED-based variable message signs, the Sitraffic SST5 outstation can also be used to control prismatic signs. The interface to the sign manufacturer's system is located, as needed, between the Siemens controller and the motor of the prism control, so that the controller can take over sign calibration and control. There are also digital contacts available for interfacing with the drive motors. End switches monitor the correct position of the prisms. The controller can also be used to monitor and control user-definable text displays, variable direction signs, fully graphic displays and various other signs.



LED control modules (Siemens AG)



Sign (Siemens AG)

# The Sitraffic SST5 outstation can do even more

## Operational messages

The Sitraffic SST5 outstation features various modules for monitoring the system's operating status and sending operational messages. The OPS module manages the digital inputs and outputs for door contacts or other warnings or messages such as heater operation and monitors the power supply phases and the UPS. The controller board contains a sensor for measuring the internal temperature in the cabinet.

The monitoring data are shown directly on the outstation's display, stored and reported to the subcenter.

The following components and values can be monitored:

- Any number of door contacts
- Cabinet temperature and interior lighting
- Cabinet heater, ventilation, anti-theft device (e.g. for solar panels)
- Mains voltage and availability of UPS batteries for backup
- Vehicle height measurements, for instance before tunnels

In case of a power outage, a battery provides the controller with sufficient power to remain in operation for several minutes and send a power-out message to the subcenter. This message facilitates fault identification because it narrows down the cause to the power supply and rules out communication network failures or controller faults.

## C2I – Car-to-Infrastructure

The "Car-to-Infrastructure" group of functions makes it possible to establish communication links between vehicles and traffic control infrastructure for an exchange of information.

## Ramp metering

To prevent slow-downs on the main lanes of a freeway or motorway, so-called ramp metering systems can be installed on the access ramps to limit the number of vehicles entering the motorway. Especially in conurbations, ramp metering is used to prevent freeway congestion without overly delaying the traffic on the access ramps.

For this purpose, an outstation can be configured as a ramp metering system, using a variety of strategies (e.g. ALINEA, RWS or RE) in autonomous operation, i.e. without recourse to commands from a traffic control center.

## System control

Every control module and every IOC (input/output concentrator) contains a group of functions for system control. One of the main tasks of this system control is managing the addresses and the communication activities themselves.

## Equipment control

The group of functions for equipment control has been designed for controlling safety-critical field bus equipment such as barriers/gates and height measurement points. Special attention has been paid to safety of the field bus coupling and the switching commands.

## Tunnel control

The Sitraffic SST5 outstation features special functions for direct coupling with a tunnel control center. In the event of specified incidents (e.g. fire), the equipment can be controlled directly from the tunnel control center.

## User-friendly manual operation via the graphical touch panel

The graphical operator panel makes local operation and switching of the outstation easy and convenient. The combination of graphical display and touch screen is integrated in the front panel of the SST5 and allows manual system operation and the display of operational status values. The design of the menu-controlled user navigation, including menu structure and operating elements, is in full compliance with the TLS specifications. The soft keys allow convenient data entry and conversion into outstation commands. Moreover, the display and entry masks can be custom-tailored.



User-friendly manual operation via the graphical touch panel



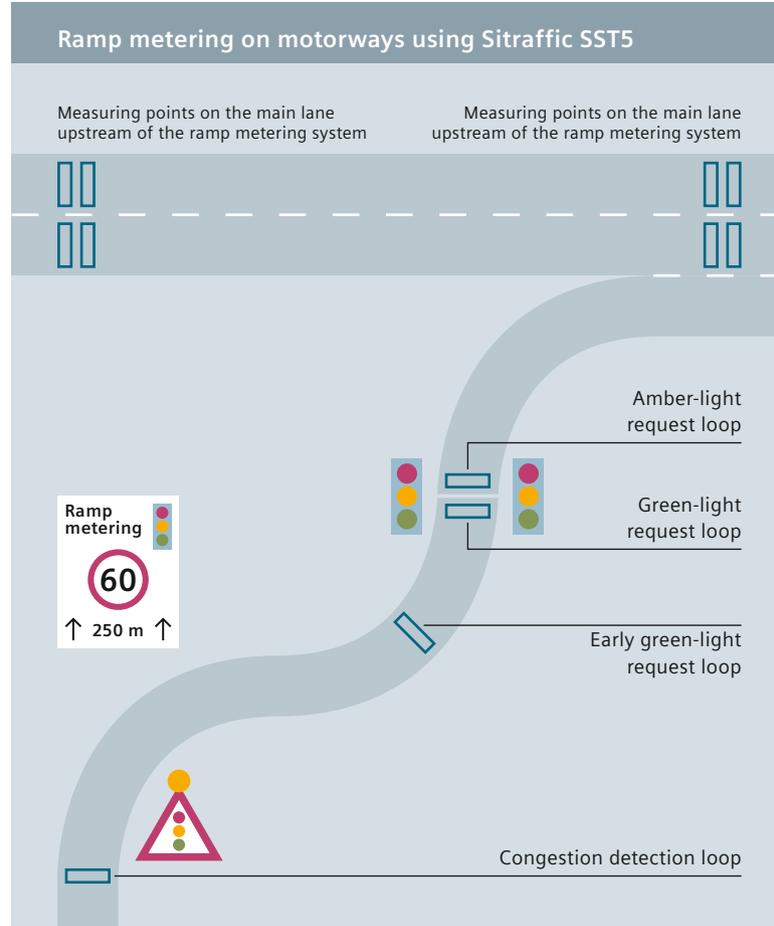
Display screen for equipment selection

### Service software for in-depth system analysis

The service software with its extensive range of functions has been designed primarily for maintenance purposes. A subset of the functions, however, is also useful for the general operation of the outstation. The software runs on a commercially available Microsoft Windows® laptop PC plugged into the central service connector of the main Sitrtraffic SST5 unit.

The service software runs under Microsoft Windows®; operation is menu-controlled and user-guided. The menu is structured hierarchically, i.e. self-explanatory icons on the main menu screen allow the user to select the different functions.

There are several authorization levels protected by different login names for basic operating functions and parameter configuration to prevent unauthorized changes.

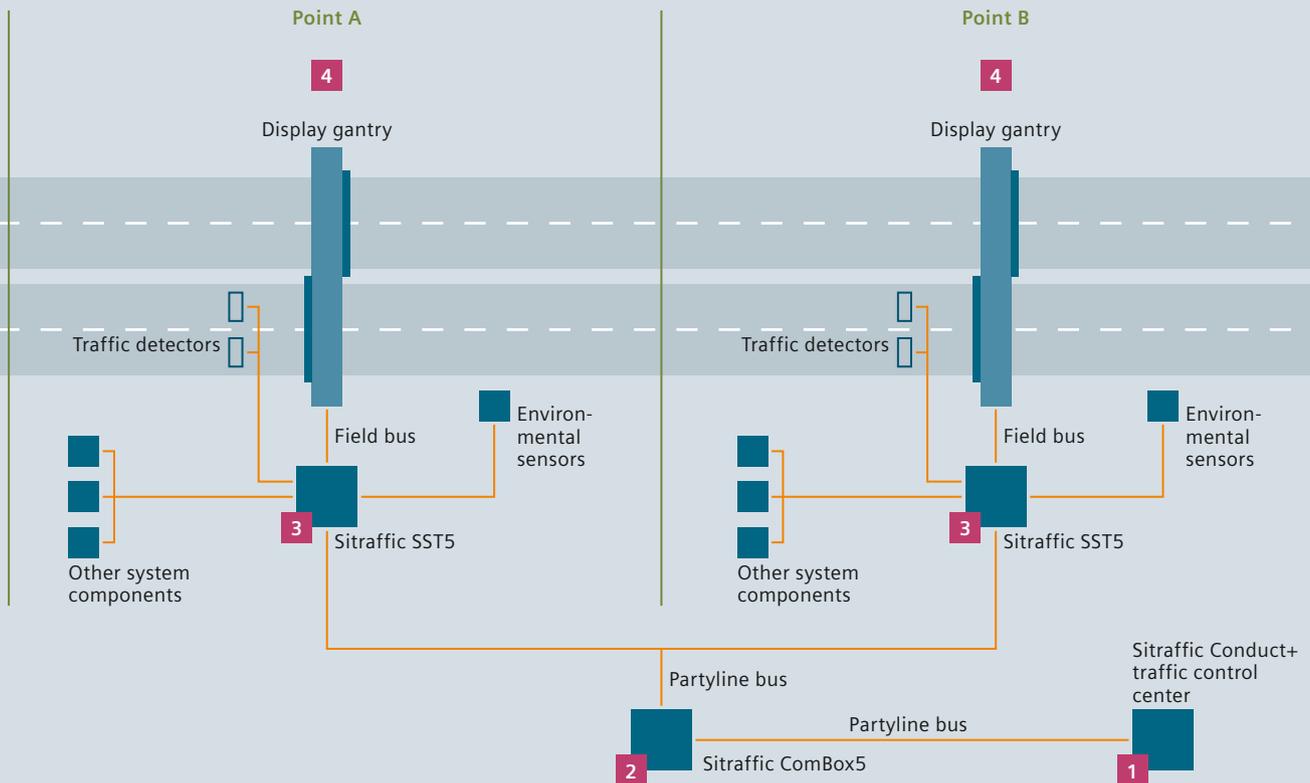


For remote maintenance purposes, the service software can also access the controller from the customer's network via TCP/IP, for instance directly from the control center or from a maintenance station.

As an option, a service tool application is available to operate the Sitrtraffic SST5 outstation on site using an Android smartphone (special adapter required).

# Layout of a traffic management system using Sitraffic products

Typical system layout of a traffic management system



A traffic management system is hierarchically structured.

**1** A traffic control center controls one or several traffic management systems. The solution of choice for traffic control centers is Siemens' Sitraffic Conduct+. For the control and management of traffic across a large road network, traffic control centers can be linked up to higher-level traffic management centers.

**2** Downstream of the traffic control center, so-called communication computers (or KRI in TLS terminology) are deployed. The corresponding Siemens product is called Sitraffic ComBox5. The Sitraffic ComBox5 in turn uses partyline buses (serial, TCP/IP) for communication with the outstations. Up to 16 serial partyline buses as well additional TCP/IP-based partyline buses can be connected to the Sitraffic ComBox5 to control far beyond 100 outstations in total.

**3** The outstation, located at the roadside close to the field devices to be controlled, is the central control unit on field level. The modules housed in the outstation cabinet manage the power distribution and the transmission of data and commands.

**4** Each SST5 controller governs one or several measurement or display points. In the figure above, one SST5 governs point A, another point B. All data terminals, i.e. the sensors and actors on field level, are connected to the controller and communicate via the so-called field bus.

# Communications network

## Communication with the control center

The communication between control center and outstation always complies with the specifications of the currently applicable TLS. Of course, our products also support older versions. Regardless of the transmission technology implemented, the TC57 protocol or the TLS over IP protocol can be used, depending on the requirements of the application at hand. The outstation can communicate directly with the control center or via a so-called communications computer (KRI).

## Communications computer

The communications computer (KRI) is the central link between the control center and the outstation. Using partyline bus connections, the KRI can communicate with a virtually unlimited number of outstations and forward the aggregated operating data to one or several control centers, which do not need information on the physical topology of the outstations. The KRI serves as the central data hub between the control center and the outdoor equipment on field level. In addition, the KRI can take on a range of special tasks, for instance in connection with tunnel control. For this purpose, the KRI is equipped with an additional direct connection to the tunnel control center via potential-free contacts so that in an emergency situation, it can receive commands from the tunnel control center and pass them on to the connected outstations for an immediate response on field level.

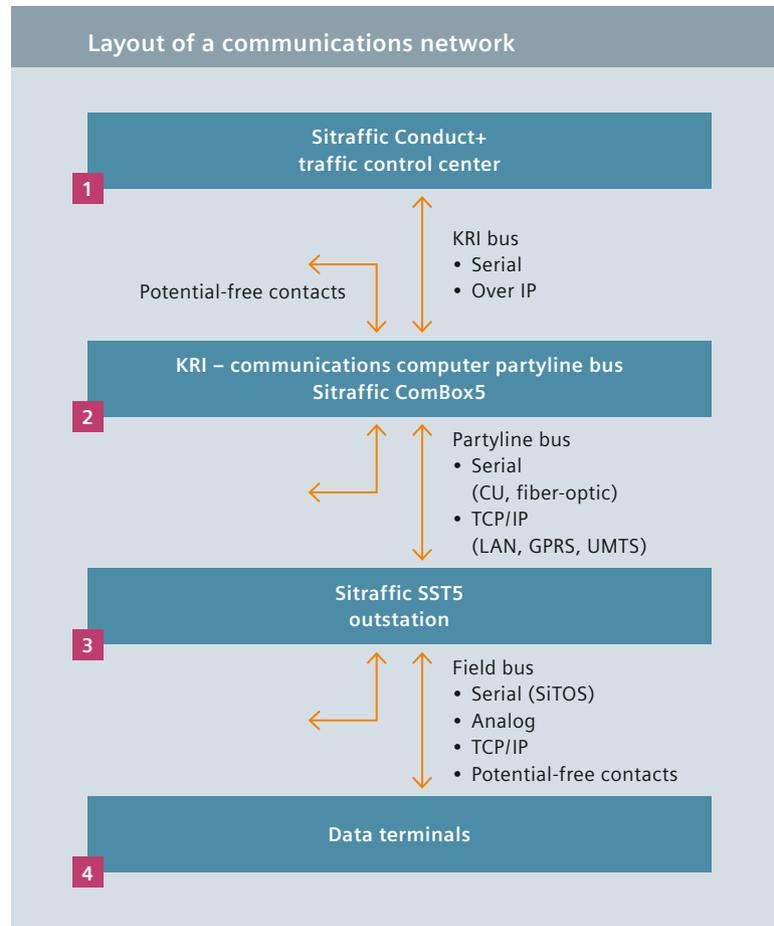
## Data transmission options:

### fiber-optic cables or wireless technology

Besides conventional wire-bound transmission technologies, for instance via partyline modems, the Sitraffic SST5 outstation can also use fiber-optic cables to communicate with the traffic control center or the connected field equipment. Another option is wireless data transmission, either using local, license-free radio networks or WLAN, GPRS or UMTS.

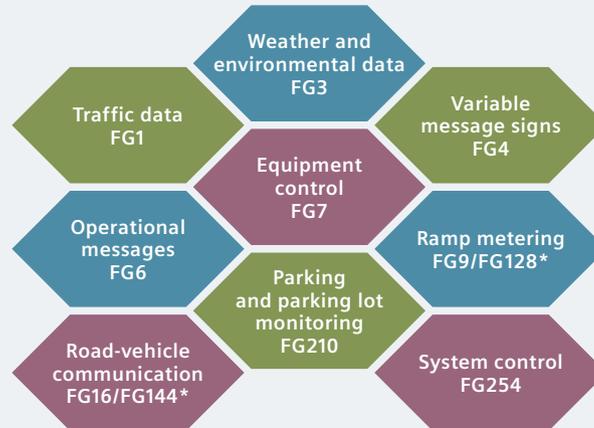
## Communication with data terminals

There are multiple possibilities for communication between the outstation and the data terminals. Besides serial communication connections based on the SiTOS protocol (Siemens Traffic Outdoor Station), analog signal transmission or potential-free contacts can be used for data exchange with the field devices. SiTOS is a proprietary Siemens communications protocol supporting the field devices of all leading manufacturers. In addition, there are a variety of other serial and parallel protocols for communicating with field devices, as is communication via network protocols (TCP/IP, FTP, etc.).



# Modularly structured system layout for communication with the data terminals

The functions are clustered in several function groups:



The Sitraffic SST5 outstation supports all functions specified by the TLS standard and offers a sufficient number of interfaces for all required data input and output devices. The functions are clustered in function groups:

## Traffic data (FG1)

- Loop detectors for up to 8 vehicle classes (such as LD4-F)
- Overhead detectors based on radar, passive infrared or ultrasonic technology for up to 8+1 vehicles classes (e.g. Heimdall, PIR, TT298)
- Detectors for traffic detection from the side of the road
- Detectors connected via digital inputs

## Weather and environmental data (FG3)

Air temperature, wind direction, dew point, air pressure, humidity, freezing temperature, precipitation intensity, road surface temperature, daylight brightness, wind speed, visibility range, subground temperature, type of precipitation, thickness of water film

## Variable message signs (FG4)

Variable message signs with LED- or halogen light sources (defined character set), prismatic signs, flashing signs, lane-use signals, user-programmable pixel-based displays (Mono, RGB), digital controllers, user-definable text displays, signal heads

## Operational messages (FG6)

The following components can be monitored: Cabinet temperature, heater, lightning protection, interior cabinet lighting, mains phases and UPS, door contacts, anti-theft devices, solar panel, height sensors

## Equipment control (FG7)

Ventilation fans, pumping stations, lighting systems, cabinet control, in-pavement lighting, external signal heads

## Ramp metering (FG9/FG128\*)

- Ramp metering
- Dual ramp metering

\*FG128: Third-party ramp metering systems

## Road-vehicle communication (FG16/FG144\*)

- SAE communication via WLAN

\*FG144: Car-to-Infrastructure (TLS 2012)

## Parking and parking lot monitoring (FG210)

- Parking bay occupation
- Vehicle identification

## System control (FG254)

- Service tool (RS232, LAN, WLAN, GSM, GPRS, ISM modem, touch screen)
- Radio-controlled clock (GPS/DCF77)
- Partyline and local bus
- SiTOS bus, individual-vehicle data bus
- Police radar/section control (RS232, RS485, RS422, LAN, WLAN, GSM, GPRS, ISM and FSK modem)

# Technical specifications

## Sitraffic SST5

Standards	TLS 93-2012, CE mark
Mechanical features	Sitraffic SST5 in swiveling frame with/without 2N cabinet (outstation design is independent of cabinet type)
Mains supply	230/400 V at 50 Hz (single- or three-phase)
Power supply/UPS	Uninterruptible power supply with maintenance-free NiCd rechargeable battery, service-friendly construction and integrated monitoring function (operating status messages), outstation power supply with up to 38 W mounted on the backplane of the cabinet, buffering time: 5 min (in compliance with TLS)
Control module/processor	OMC-I module (CPU with 800 MHz, 2 MB SRAM, 512 MB flash disc, 256 MB main memory)
Interfaces	2 × 100 MBit Ethernet; 9 serial COMs, of which 4 × RS485/422 isolated (optional 17 COMs); 64 digital IOs, of which 8 × 24 V inputs and 8 × Open Collector High-Current outputs (optional 112 IOs); 1 special extension for bus (e.g. for Profibus, Profinet, CAN ...); 2 analog 20 mA inputs
Traffic data	LD4-F loop detector, overhead detectors, detectors with digital output, communication with detectors via: RS485, RS232, LAN, digital or wireless connection (license-free)
Weather/ environmental data	Brightness sensor, environmental and weather data sensor (precipitation, temperature, road condition, wind and other environmental data), chemical data such as pollutants (NO, NO <sub>2</sub> , NO <sub>x</sub> , PM <sub>xx</sub> ), noise level (sound pressure level), communication with sensors: RS485, RS232, LAN or analog
Variable message signs	VMS based on LED chain or matrix technology with new lamp switch controller IRC/LDBR (design in compliance with VDE0832 incl. power- and voltage-monitored outputs and dynamic self-tests, but not failsafe at all times) prismatic signs, flashing signal heads, traffic light systems, DiVista displays, ...
Operational messages	Integrated in the PS/UPS unit as a standard; all operational messages per TLS specification
Equipment control	E.g. barriers/gates, height measurements, in-pavement lighting, ...
Ramp metering	E.g. ALINEA, RWS or RE
Car-to-Infrastructure	Communication between vehicle and infrastructure
Modem	FSK (Siemens FMR), fiber-optic cable, radio, WLAN, GPRS or UMTS
Touch panel	Monochrome fully graphical display with 240 × 128 pixels (optional 320 × 240 pixels) for easy manual operation
Service/IBS	Software upload from the Sitraffic ComBox5 to Sitraffic SST5 and all connected data terminals, e.g. VMS (IRC) via service interface integrated in the controller or via FTP (wire-bound, wireless)
Tools	PC-based diagnosis tool, or service application for Android smartphone
Other	GPS clock (e.g. to synchronize stand-alone systems)
Temperature range	-40 to +80 °C (without heater)
Dimensions/weight	1-row 19" standard rack, ca. 50 × 27 × 25 cm (3U)/approx. 10 kg
Uses	<ul style="list-style-type: none"> <li>• Outstation compliant to TLS 93-2012 (controller, input/output concentrator)</li> <li>• Traffic management systems</li> <li>• Congestion intervention systems</li> <li>• Weather detection systems (e.g. fog or wind warning systems)</li> <li>• Speed monitoring and warning system</li> <li>• Traffic counters in continuous operation as per TLS and BAST</li> <li>• Urban traffic counters, e.g. at freeway ramps or Park&amp;Ride lots</li> <li>• Mobile congestion warning systems</li> </ul>

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Printed in Germany  
DEI 73/48980 PA 07133.  
Dispo No. 22300 K No. 690  
Order No. A19100-V350-B155-X-7600

The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.