



ST900
intersection controller

Traffic Solutions

SIEMENS



ST900 intersection controller

Building on the experience of over 20 years microprocessor traffic controller design, the Siemens ST900 family offers both familiarity and a number of exciting new features.

It is designed for maximum flexibility providing Intersection, Pelican, Puffin and Toucan strategies to UK Highways Agency specifications TR2500, at both LV (230V) and ELV (48V) output drive levels.

The controller is compatible with the whole range of Siemens street-furniture, including Helios LED signals, LED nearside signals and LED wait indicators, which all offer significant power cost savings over conventional signals.

Integrated 230V and ELV 48V lamp switching

The ST900 retains the robust and proven design features of the ST800 when configured as a standard 230V controller, whilst the ST900 ELV provides a new and highly innovative 48V system implementation.

The use of ELV as implemented in the ST900 ELV controller offers a wide range of benefits, including:

- Increased electrical safety for members of the public in the event of damage to the signal installation
- Increased electrical safety for personnel working on or around the intersection
- Reduced power costs
- Reduced cabling costs
- Improved lamp monitoring of very low power LED traffic and pedestrian signals

To deliver these benefits reliably, the ST900 ELV incorporates many unique design features including:

Use of a fully rectified 48V ELV supply: The use of a full wave rectified ELV supply allows very efficient semiconductor switches to be used, reducing unnecessary heating effects in the controller, contributing to improved reliability and lower power consumption.

Active short circuit protection on all outputs: Often the most frequently damaged components within a traffic controller are the output drive switches, which are particularly vulnerable to cable faults and short circuits. The ST900 ELV design incorporates an active short circuit protection system on all lamp outputs, ensuring that even under direct short circuit conditions, the outputs are protected from damage.

Active residual current quench on all outputs: The power requirements of LED-based street furniture are becoming ever lower. As this occurs, there is an increased risk that stray and residual voltages, remaining present after a signal is switched off, will cause the controller to register conflict or correspondence faults incorrectly. The ST900 ELV is ready today to deal with the very low power signals expected in the future, as each output is equipped with an active circuit that eliminates these stray voltages, without wasting power when the signals are switched on.

Intelligent lamp switch system: The ST900 ELV provides an intelligent lamp switch card that implements full voltage monitoring on each of its 32 outputs, using two separate safety systems. Current and voltage monitoring on each output is also provided, so that any output may be used for any signal colour. Additionally, ELV LED traffic signals as well as LED nearside and wait indicators can be monitored directly, without the need for any additional intelligence in the signals themselves.

This high degree of flexibility allows output use to be optimised, for example, only using a single drive for green arrows, making the most efficient use of the available controller hardware.

- Fully integrated 230V and ELV 48V lamp drive systems
- Up to 32 phases, 32 stages and 8 independent streams. Up to 248 digital inputs/output lines
- Highly reliable and proven operating software
- Integral lamp monitoring of all phases and signal colours
- Modular construction - available in an outercase or as a 19 inch, 6U rack
- Simple installation - easily retro-fitted to existing controller cabinets
- Dual processor safety system
- Multi-mode operation including advanced 'ripple' stage change algorithm



Advanced architecture

The ST900 family supports existing components, such as the highly reliable ST800 lamp switch cards for 230V lamp switching. In addition, the family also incorporates a new high-speed serial bus architecture, allowing greater freedom in the location of a range of dedicated components, including new I/O cards, intelligent detector backplanes and ELV lamp switches.

Enhanced I/O capability

Using its new serial architecture, the ST900 family is able to support up to 248 I/O lines allowing up to a maximum of 240 digital inputs or up to 96 isolated digital outputs to be provided, depending on the controller configuration.

The serial I/O cards are designed as 'intelligent terminal blocks' and are located directly where needed within the controller cabinet to optimise street wiring. In installations where very large numbers of street cable connections are needed, the serial bus architecture allows the I/O cards to be easily located in an adjacent cabinet, easing potential installation problems.

To aid flexibility further, standard loop detector cards are also connected to the controller using the same efficient serial bus, via intelligent backplane adaptor cards.

Modular construction

Three main construction options are available, which are modular and can be expanded to meet the needs of a wide range of intersection applications.

Standard 230V outercase: A single-door outercase providing a 6U controller logic rack and equipment mounting frame, as well as extensive street cable termination capability. Up to 32 phases can be accommodated together with detectors and ancillary equipment including Outstation Transmission Units (OTUs), Outstation Monitoring Units (OMUs) and other approved items. Manual panel access is provided through a separately locked access door contained within the main outercase door.

Standard 48V outercase: This offers the same basic outercase as the LV system but with an enhanced 6U controller rack. This accommodates the ST900 central processor and logic power supplies, as well as space for up to 12, 4-channel detector cards and a semi-integral OMU, UTMC OTU or MOVA unit.

Flexibility is enhanced by locating the lamp switch cards directly within the controller cabinet, very close to their street cable termination positions, minimising interconnecting cables and improving reliability.

Where very large intersections are to be accommodated, additional ELV lamp switch and I/O cards may be located in an adjacent cabinet, significantly easing installation and maintenance of street wiring.

Free standing logic rack: Rack-only solutions are provided for both the LV and ELV controllers, housing the main logic power supplies, central processor and lamp switch cards.

An extensive range of mounting kits is available for fitting the ST900 into a variety of existing cabinets, providing a particularly cost-effective route to controller modernisation.



Simplified installation

Installation is simplified by the modular nature of the equipment. The controller root and cabinet, complete with street cable and mains supply termination may be installed without the logic rack, which can be added at a later date. An extensive inbuilt self-test facility, which validates both the controller hardware and the street connections, provides an invaluable aid to controller commissioning.

Reliable facility-rich software

The ST900 operating software is based on the well proven and highly reliable ST800 software suite and offers many features and facilities including:

- 32 phases, 32 stages
- 8 streams
- 8 maximum green sets
- 8 hurry calls which are in priority order
- 8 uni-directional detector loop units
- Multi-mode operation with stage ripple change facility for improved intersection capacity
- Fully configurable lamp sequences for worldwide application
- Fully integral and configurable lamp monitoring of both incandescent and LED signals
- Flexible part-time and start-up modes, allowing any stream to be sent in and out of part-time mode without affecting any others.
- Enhanced cableless linking facility with sophisticated plan timetables and 32 plan groups.
- Improved event timetable which supports actions based on 32 independent events and simplified programming
- Enhanced time system with full date details
- Date stamped rolling log providing detailed history of events and faults, coupled with improved presentation to aid recognition of entries
- Uncomplicated user interface compatible with simple single line handset terminals and PC / PDA devices, including Siemens Siacom.





User configurable

The IC4 configurator provides a Windows-based, easy to use tool for generating configuration data sets for the complete family of Siemens controllers, including the ST700, ST800, ST900 and ST900 ELV. Data is entered via a series of 'forms' and is validated for correctness as part of a sophisticated error checking process.

Enhanced navigation aids and selectable levels of configuration complexity, insulate the user from controller facilities that are not being used, simplifying the configuration process. The configuration PROM generated by IC4 contains the data required to allow the controller to operate, as well as the configuration source data, ensuring that it can never be lost. The data can be retrieved via the handset port in typically less than one minute and subsequently edited to create a new PROM.

Existing data for T200, T400 and ST800 controllers can be imported as the basis of new ST900 family configurations, significantly easing controller upgrades. Similarly Linsig™ generated data files can be imported.

The optional controller emulator links seamlessly with IC4 to provide an advanced environment for de-bugging and proving ST700, ST800 and ST900 family configurations. It ensures a highly accurate representation of the controller's operation on a PC, using the same software source files as the appropriate controller firmware.

Once configured and installed, most controller timings and many other parameters may be altered using a simple hand-held terminal or PC.

For non-UK applications the same terminal may be used to change more widespread parameters including number of stages and number and types of phases. This allows a single configuration PROM to be created and then quickly customised on-street.

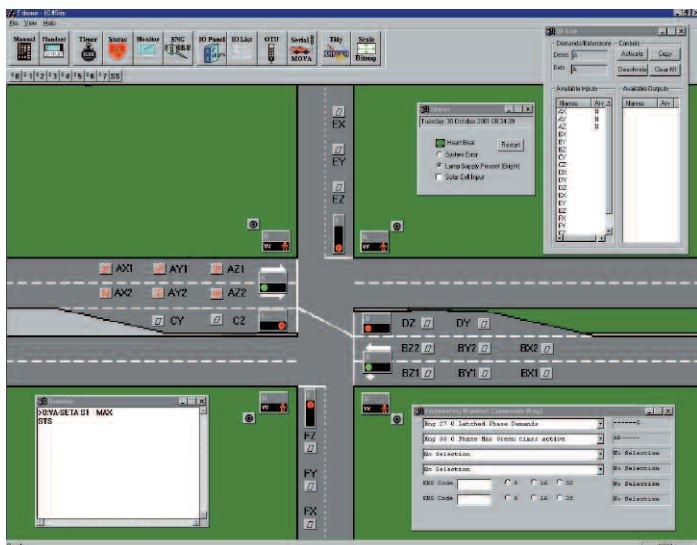
The IC4 system also provides a sophisticated 'View Differences' feature, allowing changes from the original configuration, made via the terminal, to be easily highlighted and a new timing data to be downloaded to the controller without the need to extinguish the signals.

Enhanced safety features

Two independent microprocessors and comprehensive hardware self-check features ensure an unprecedented level of controller safety. All phase output colours are provided with dual-channel voltage monitoring, allowing the controller to be configured to perform green-green, green-yellow and green-red/yellow conflict monitoring.

In addition the controller offers in-built lamp monitoring sensors to allow a wide range of tungsten halogen, tungsten filament and LED-based signals to be monitored for failure.

For UK applications, conflicts or other major failures result in the signals being extinguished in a fail-safe manner. For non-UK use, the controller has an option to feature a built-in hardware fail flash. This offers selectable 'off' or flash red/yellow for each phase, with programmable mark/space and flash rate.



Technical specification

Inbuilt modes of operation

- Manual
- Fixed-Time
- Vehicle Actuated
- Urban Traffic Control
- Pedestrian Fixed Vehicle Period
- Pedestrian Vehicle Actuated
- Bus/Light Rail Transit
- Part-Time
- Cableless Linking
- Hurry Call
- Emergency Priority

Phases and stages

- Number of hardware phases: 1-32 (Phase sequences programmable)
- Number of independent streams: 8
- Number of stages: 32
- Number of max. green periods per phase: 8
- Number of phase delays: 120
- Number of call and cancel timers: 8
- Number of all red extension units: 7
- Number of hurry calls: 8
- Number of emergency/priority units: 8

High-speed vehicle detection

Integral speed discrimination, double/triple speed assessment

- Number of assessors: 16

Cableless linking facilities

- Number of plans: 16
- Number of groups per plan: 32
- Number of time switch settings: 64
- Number of group influences: 10
- Timing sources 50/60Hz mains, Internal crystal or optional GPS clock

Inputs and outputs

- Number of digital inputs: 0-240 compliant to TR2523
- Number of isolated digital outputs: 0-96 compliant to TR2523

(Actual number of inputs and outputs possible depends on configuration, up to a maximum of 248 in total)

Lamp switch

- Lamp switching type: Solid state
- Maximum lamp load per lamp switch card: 20A

Standard 230V controller

- Number of phase outputs per lamp switch card: 24 (arranged as 8, 3 aspect phases)
- Maximum lamp load per output switch: 4A
- Number of lamp switch cards supported: 4
- Maximum total lamp load: 20A
- Heavy current options: 30A
- Lamp supply voltage: As per input supply
- Signal dimming: 120V, 140V, 160V AC RMS (Dimming not supported for 100V and 110V input)

ELV controller

- Number of phase outputs per lamp switch card: 32 (each fully configurable as red, yellow or green)
- Maximum lamp load per output switch: 2A (multiple outputs may be used where higher current required)
- Number of lamp switch cards supported: 6 (3 max per ST900 cabinet)
- Maximum total lamp load: 20A
- Heavy current options: 40A
- Lamp supply voltage: 48V RMS, (rectified and negative w.r.t. protective earth)
- Signal dimming: 27.5V RMS, (rectified and negative w.r.t. protective earth)

Other facilities

- Standby mode: Signals off or software flash
- Failure mode:
 - Signals off
 - Hardware flash
 - Software flash on a per-stream basis
 - Hardware/software flash - selectable flash red or yellow per phase.
 - Mark/space and flash rate selectable for whole controller.
- High-speed handset port 1200, 9600 and 19200 baud. Port is auto-bauding to match incoming data

Electrical

- Input power supply ($\pm 15\%$): 100V, 110V, 220V, 230V, 240V AC RMS
- Supply frequency: 50/60Hz $\pm 4\%$

Environmental

- Designed to meet: UK TR2500, EN12675, EN50278
- Supply interruption: Continuous operation up to 50ms break
- Supply failure: Automatic restart without operator intervention
- Operating temperature range: -25°C to $+70^{\circ}\text{C}$

Dimensions

Standard outercase

- Height: 1160mm
- Width: 725mm
- Depth: 420mm

Rack system

- Height: 266mm
- Width: 482mm
- Depth: 280mm (Rack system requires minimum 15mm clearance in front of fixing plane)

Compatibility

- Able to drive and lamp monitor:
 - Standard UK HI incandescent signal heads and standard regulatory signs
 - Siemens Helios standard LED and CLS signal heads
 - Siemens Helios ELV signal heads
 - Siemens Helios ELV low power regulatory signs
 - Siemens ELV nearside indicators
 - Siemens ELV LED wait indicators

Other signals may be compatible – consult Siemens for details

Cuckoo kits

ST900

- Siemens T200, T400, ST800
- Microsense MTC and Sentinel
- Peek TSC3 and TRX

ST900 ELV

- Siemens T200, T400, ST800
- Microsense MTC and Sentinel
- Peek TSC3 and TRX

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