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The Sicore ANPR camera system

Setting new standards in automated vehicle recognition

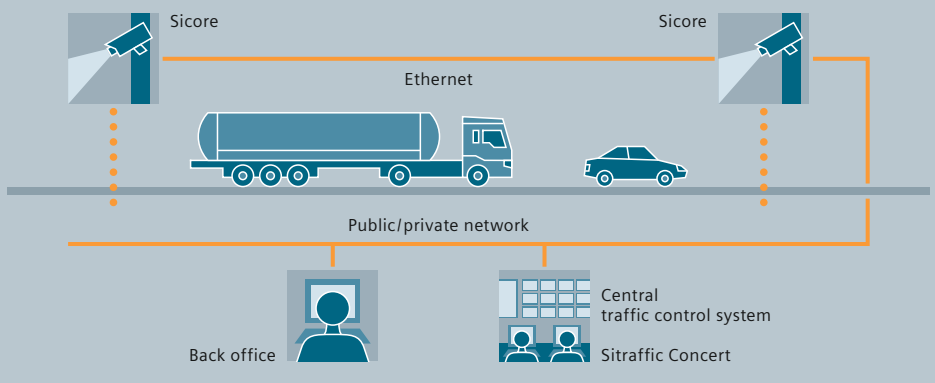
The compact, light-weight Sicore cameras can be mounted on virtually any roadside equipment installation

What exactly is Sicore?

Sicore is a fully integrated (embedded) camera that automatically recognizes number plates and thus uniquely identifies each vehicle. For this purpose, Sicore captures front or rear views of the vehicle. The integrated image processing software automatically scans the stream of incoming images for any vehicle and its number plate.

If desired, the camera transmits the results of the reading process, including the associated images, to a down-stream processing system. Commercially available interfaces are used for communication. Infrared illumination allows Sicore to operate by night as well as by day. The camera can be mounted on all roadside installations such as sign gantries, posts, bridge railings or other.

Possible applications:
- Travel time measurements
- Tolling systems
- Parking and access control systems
- Security applications
- Section speed control
- Identification of hazardous material signs



Sicore is easy to integrate because the data are transmitted via FTP or FTPS (FTP over SSL)

Who knows how to read any type of script can also read any number plate

Siemens can look back on more than 30 years of experience in developing and manufacturing systems for automated optical character recognition. In more than 40 countries around the world, our systems automatically read postal addresses, providing efficient solutions for the complex problems of postal automation. Thus it comes as no surprise that Siemens, as one of the global market leaders in this technological area, can offer also an outstanding solution for automated number plate recognition: Sicore®.

For a wide range of traffic engineering applications
The enormous potential of automated number plate reading systems has only just started to be made use of. With its exceptionally wide range of possible applications, Sicore offers many advantages. Of course, for each country the actual implementation is adapted to take the national data security regulations into account.

Tolling systems. The exact knowledge of when and where a certain vehicle was traveling makes it possible to precisely calculate road usage fees – without OBU. Sicore will collect all required data for you.

Travel time measurements. Data about current travel times is an important tool for traffic control measures and road user information. Sicore can be used to carry out such measurements at any desired interval, providing truly accurate and up-to-date data.

Parking and access control systems. Storing the car's number plate together with the parking ticket code will effectively prevent car theft from car parks because the exit barrier will only open if the parking ticket presented matches the number plate. Sicore reliably records every single vehicle.

Security applications. In many areas it is a question of security to identify all vehicles entering certain premises and to monitor closely when they leave again. Sicore is the tool of choice for such applications.

Section speed control. Measuring the average vehicle speed for an entire road section often proves more effective in making drivers comply with speed limits than conventional speed checks. Only vehicles that take at least a defined period of time to travel from point A to point B have been driving at or below the permitted speed. Sicore can take over the automated number plate reading and matching needed for this advanced method of speed control.

Additional vehicle data.* For traffic control applications it is usually of considerable value to record not only number plates and average vehicle speed, but also other individual vehicle data. A simple software upgrade allows Sicore to reliably identify vehicle class (passenger car/truck) and accurately measure instantaneous speed without an additional detector. Sicore can collect this information for every single vehicle and thus provide the traffic management system with very valuable supplementary data.

Identification of hazardous material signs. If the system knows exactly which type of material is being transported by a hazardous goods truck, the appropriate safety and security applications can be activated and the right intervention measures triggered in case of an emergency. Sicore reliably collects and provides the required data.

Full data privacy protection
The Sicore software uses powerful algorithms for anonymizing number plate data, ensuring full compliance with data privacy regulations.

The anti-glare sun shade and a high-power infrared illumination system ensure an optimum recognition performance under all light conditions

* Available as of the end of 2011

Benefits that are setting completely new standards

Sicore has a whole range of outstanding features that provide benefits for every user and any type of application. In a nut-shell: With Sicore, there is now a commercially available system that sets a completely new benchmark in terms of efficiency, reliability, user-friendliness and cost-effectiveness.

Fewer cameras, lower costs
Sicore can be used to monitor up to two lanes simultaneously – and even different travel directions – because Sicore recognizes also a vehicle's rear number plates. This reduces the number of cameras required, considerably lowering the capital expenditure needs.

Maximum recognition rate even for high travel speeds
The integrated Siemens recognition and reading technology reaches recognition rates of up to 98 percent – for vehicle travel speeds of up to 250 km/h (155 mph). The generic algorithms allow the parallel recognition of number plates from many different countries. This high data quality minimizes post-processing and further increases the overall cost effectiveness and profitability of the solution.

This camera is able to reliably read the number plate even of a vehicle traveling at 250 km/h (155 mph)

The high performance level is reached at night just as well as during the day since the infrared LEDs ensure optimum illumination of the detection zone.

Extended service life with 24/7 availability
The robust Sicore system components are designed for a long service life. As they require virtually no maintenance except for periodic cleaning, they can be operated around the clock. No fan is needed for the absolutely dependable operation of the cameras at ambient temperatures between –30 °C and +60 °C. Even for the infrared illumination unit, which in other camera systems is often a critical component, we have achieved an extended service life because Sicore works with extremely short exposure times. In connection with the intelligent shutter control, this significantly reduces the wear on the unit.

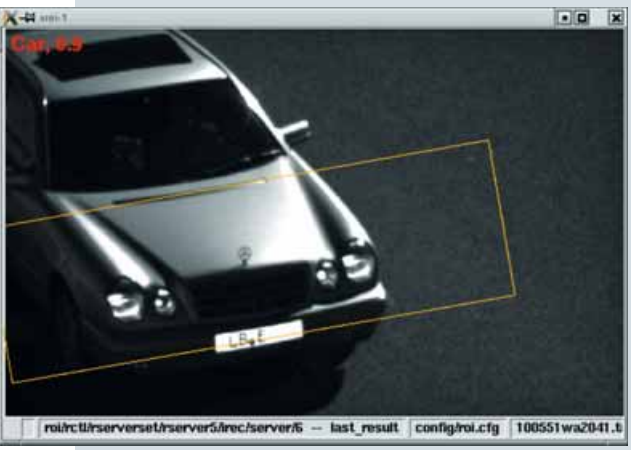
Easy to install, easy to operate, easy to integrate
A Sicore camera is connected via a single main cable for power supply as well as data transmission. Thanks to its wide detection zone, often one Sicore system is sufficient – no tedious mechanical adjustment of several camera systems is necessary. The web-based user interface makes system operation very user-friendly. Via the remote access function, the user can monitor the cameras' operational status and set the freely configurable parameters. As the camera is equipped exclusively with standard hard- and software interfaces, Sicore can be easily and seamlessly integrated into an overall traffic management system.

The Sicore ANPR camera system: Key advantages at a glance ...
- Easy installation
- Extended lane coverage (2 lanes, up to 7 m)
- Excellent recognition performance for vehicles speeds of up to 250 km/h (155 mph)
- Recognition rate of 98 percent
- Largely maintenance-free

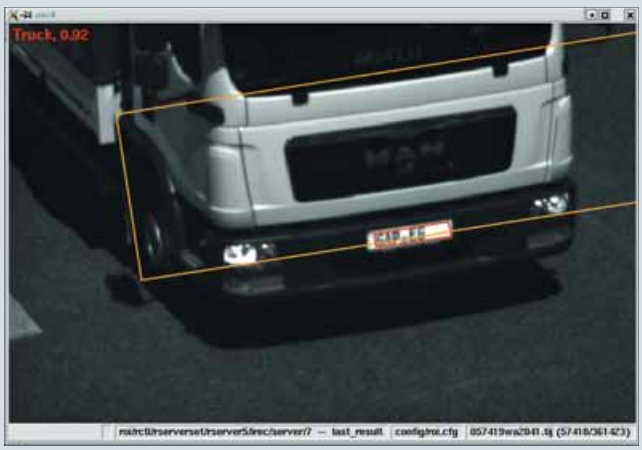
Sicore can be easily incorporated in sign gantries supporting traffic control devices

The user interface is well structured and self-explanatory, featuring a clear and unambiguous display

Knowing about the hazardous goods being currently transported through a tunnel and how best to handle them in case of an emergency is an important safety factor



Passenger car or truck? Sicore always knows the difference, zooms in or out accordingly ...



... and selects the picture detail that allows optimum number plate recognition

Sicore features and technical data

General		
	Standard version	Wide-angle version
Lane width covered	3.5 m	7 m
Detection zone	5 m to 30 m	10 m to 35 m
Day- and nighttime operation	Highly sensitive camera with integrated infrared LED illumination (spectral range not visible for humans)	
Shutter control	A high-performance algorithm automatically adapts the shutter time to varying weather conditions. No special settings required during initial startup.	
Max. vehicle speed	Up to 250 km/h (155 mph)	
Video trigger	Stand-alone operation with automated number plate identification, no external trigger necessary	
Number plate recognition and recorded results	Industry-leading Siemens ARTread™ recognition engine for outstanding performance. Result record contains: • Number plate string (optionally hashed) • Confidence level of read result • Travel direction • Instantaneous speed • Time stamp • Country of origin (based on number plate syntax) • Vehicle class • Hazardous material sign	
Images	IR black/white overview, number plate detail, optional color overview screen, all images JPEG compressed	
Search lists	System maintains two search lists with up to 1 million entries. If the detected number plate matches a data set in the list, certain predefined actions can be triggered.	
Evidence recorded	The recognition result data and the evidence images bear an electronic signature and a time stamp	
Data privacy protection	• Hardware-based integrity monitoring using TPM • TPM signature for result data • Anonymized number plate data • Integrated Firewall • Result record encryption • Secured software upload (only software with a Siemens signature can be uploaded)	
Operational modes	• Online – in connection with a downstream processing system • Offline – optional internal flash memory for storing the recorded data for later analysis	
Video surveillance	Live video via web-based user interface, or image transfer to downstream system	
Setup	• Remote setup via web-based user interface using a standard internet browser • Configuration file update (optionally via downstream system)	
Software updates	Remote update via web-based user interface or command-based interface	

Hardware	
Housing	Chromized, powder-coated aluminum housing with rubber gaskets provides sealed, rugged enclosure with optimal heat dissipation
Front window	Optically active front window for efficient, optimal illumination of the detection zone
Anti-glare sun shade	Minimizes the stray light factor and protects the camera against overheating by direct sun radiation
Connection	Via two metal-sealed connector sockets, with metal covers for protection when not plugged in
Temperature range for operation	–30 °C to +60 °C
Protection class	IP66 – no ingress of dust; splash-proof, protected against powerful water jets from any direction
Vibration	Designed to withstand harsh environments
Expected service life	The extremely short shutter time of the infrared illumination system allows for an especially long useful life and maintenance-free operation
Dimensions	185 mm × 210 mm × 386 mm (W × H × D) including anti-glare sun shade
Weight	5.7 kg
Color	RAL 7004 (signal gray)

System	
Infrared sensor	CMOS 752 × 480 pixels or CCD 1624 × 512 pixels
Camera for color overview screen	CMOS 752 × 480 pixels, synchronized with IR camera, color images (option); depends on ambient light for color operation
Frames per second	Adaptive, up to 20 frames per second
Optical system	C-Mount 2/3", f = 9 mm, 12.5 mm, 16 mm, 25 mm, 35 mm; the focal length defining the operating distance is factory-set
Illumination	150 infrared LEDs, wave length = 850 nm, pulsed operation
Processor	Integrated CPU, based on Intel Atom or Core 2 Duo (option), fanless operation
Clock/calendar	Internal clock, synchronized via external NTP time server; additional GPS time signal (option)
Operating system	Linux
Power supply	17 to 26 V DC, 25 W (typically)
Ethernet	10/100/1000 Base-T
Serial interface	RS232, RS485
Relay output	24 V/20 mA relay driver with overload protection
Trigger input	Optically isolated, with overload protection, 1 mA driving current
Modem (option)	Integrated tri-band modem GPRS/EGPRS (900/1800/1900 MHz)

More information for enhanced safety

The new generation of Sicore cameras not only reads number plates, but can also collect additional information that will help make our roads a much safer place.

With a high degree of accuracy, Sicore identifies Passenger cars and trucks, ...
Wherever a ban on truck through-traffic has to be enforced automatically, Sicore is the camera system of choice. Sicore distinguishes between passenger-type vehicles and truck-type vehicles and combines this classification with the recognized number plate in a single data record. Extensive tests have proven the classification rate to exceed 95 percent accuracy on average. To enable such a high recognition rate, Sicore has been equipped with a whole range of neural networks "trained" to recognize a variety of vehicle pictures.

... Hazardous material class and handling, ...
In an emergency it can be literally of vital importance to know which hazardous materials are currently being transported on a critical road section, for instance in a tunnel, and how they must be handled in case of fire etc. This is another application for which Sicore camera systems have been designed. They can detect hazardous material signs on trucks and read the Kemler and UN codes. Then the Siemens control center system searches the respective data base for the required plain-text information.

... Number plates from many different countries ...
Every country uses its own number plate layout and syntax. Working with a data base containing country number plates, Sicore is able to read any number plate and allocate it to its country of origin. This is an indispensable feature for toll schemes involving different fees for domestic and foreign vehicles.

... and even wrong-way drivers
Sicore cannot only read number plates, but also distinguish travel directions. If a vehicle approaches or moves away from the camera contrary to the pre-defined preferred direction, the system can trigger an alarm and transmit the required pictorial evidence in real time. This allows the early detection of wrong-way drivers – with the resulting enormous gain in safety.

Sicore reads the number plate, the country code and the hazardous material sign, including Kemler and UN codes. In the back office, all data are displayed for easy analysis

Facts and figures about Sicore: For the technical details of our Sicore camera system, please unfold page 6

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