



ITSCAM 450

HIGH PROCESSING POWER, CONNECTIVITY, AND EMBEDDED SOFTWARE

| Product

Pumatronix Equipamentos Eletrônicos Ltda.

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Change History

Date	Revision	Content updated
11/30/2023	1.0	Initial Version

ITSCAM 450 Family Overview

The ITSCAM 450 Family by Pumatronix represents a significant advancement in the product portfolio, providing exceptional solutions for various applications, including non-metrological speed enforcement, weighing scale inspection, customs control, toll collection, and electronic security and fencing for cities. Equipped with embedded License Plate Reading (LPR/OCR) features, the image capture architecture of this family stands out for its ability to read vehicle license plate characters. Additionally, it includes crucial characteristics that aid in identification, such as vehicle type, model, and color.

The ITSCAM 450 device is designed to operate under a wide range of conditions, offering precise vehicle readings and images in both high and low-speed scenarios, during daytime and nighttime, in both highway and urban environments. It can recognize a diverse range of vehicle plates, including reflective plates, non-reflective plates, red and non-reflective red plates, and even the new Mercosul standard, using Multiple Exposures in a single shot. Furthermore, the image capture system includes the reading of motorcycle license plates.

One characteristic of the ITSCAM 450 Family is the capture of images from up to two lanes simultaneously, with an accuracy rate exceeding 95%. This translates into unparalleled efficiency and accuracy.

The software-driven image capture system eliminates the need for installation and maintenance of costly physical ties. In addition, it allows the configuration of regions of interest in the image, which delimit, among others, in which part of the image the reading of plates must be performed, avoiding unnecessary information being processed and optimizing the operation of the device.

With the flexibility in lens choice, Pumatronix offers model options with external C, and CS lenses, as well as models with motorized LM lenses, all equipped with a CMOS sensor with a Global shutter for drag-free images. In this way, the system can operate the capture of images of vehicles with a speed of up to 150 km/h, providing accurate readings in high-speed scenarios.

Energy efficiency is a priority and the ITSCAM 450 is designed with low energy consumption. It communicates over IP protocols and offers optional PoE power, ensuring ease of integration.

With technical support throughout the national territory and the possibility of configuration and installation by a specialized technical team, the ITSCAM 450 from Pumatronix is the definitive choice for your high-speed card reading needs. Consult your salesperson to learn more about how this solution can optimize your operations and improve security in your environment.



*Figure 1 - ITSCAM 450 line
with CS Mount lenses*



*Figure 2 - ITSCAM 450 line
with motorized lenses*

Handling Risks



This equipment must be supplied with a direct current (DC) source with a voltage between 9 and 32 VdC. Do not connect any of the inputs directly to the mains (AC)!



Oxidation Risk: Electrical and data connections must be protected in a junction box or similar structure to prevent oxidation of the connections and unwanted infiltration of liquids in the cable.



This equipment may be accompanied by lenses, which are sensitive to mechanical impacts such as falls and extreme vibrations.



Installation Location: In cases where it is not possible to meet the installation specifications, it is recommended to consult Pumatronix Technical Support.

Models

Available Models	Resolution	Lens Type	Estimated range (in meters)*
ITSCAM 450 CS (S09L0AJ)	1920x1200px OnSemi	Manual CS Mount	10 to 50m (9-40mm) **
ITSCAM 450 CS (S09L0A)			
ITSCAM 450 LM (S09L8AJ)		Integrated motorized	8 to 50m (5-50mm)
ITSCAM 450 LM (S09L8A)			

* The estimated range is set according to the selected lens and identifies in which distance range the license plate characters remain readable in the OCR reading. When the device is used in conjunction with the illuminator the range may be limited to the applied model. For models with a motorized lens, the lens cannot be modified. For CS Mount type lenses, the presented lens models serve only as a reference of the respective range.

** * For this estimated range it is recommended to use Theia 9-40 mm lens.



Illuminator Installation: When using an illuminator in conjunction with the ITSCAM 450 device, check in the product specifications the minimum and maximum distance that must be observed about the position of the object to be illuminated.

Image sensors	Lens	Optionals
S09: CMOS 1920x1200px OnSemi	L0: CS Mount type manual lens	A: Digital Signature (TPM1.0)
	L8: 5-50mm (LM5X)	J: Embedded LPR

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1. Getting to Know the Product

The ITSCAM 450 line of image capture and processing devices was developed for traffic management, inspection, public safety, Smart City Applications, mobility systems, parking lots, and applications that require image capture. The 2.3MP image sensor of the ITSCAM 450 allows the capture and processing of images of up to two ranges. The sensor is combined with a set of lenses, which can be of the motorized or fixed type (CS Mount standard). On models that support fixed lenses, some circuits detect and control irises from DC models.

The quality and level of detail of the images captured with ambient and artificial lighting of the ITSCAM 450 comes from additional functionalities to the optical assembly (image sensor with lenses). Multiple Exposures can be captured for each photo request made to the equipment. This feature captures and processes more than one sequential image, with automatic variation of capture parameters.

The ITSCAM 450 maintains the standardization of the images, even when significant variations occur in the lighting conditions. This is possible by toggling the Image Setup Profiles. Profile changes are made by the equipment, based on the image level and time.

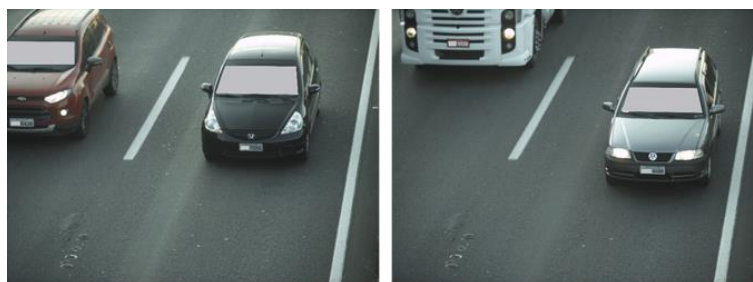


Figure 3 - Examples of daytime images captured with ITSCAM 450

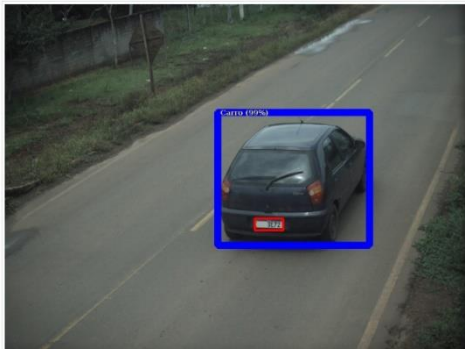


Figure 4 – Example of night images captured with ITSCAM 450

The ITSCAM 450 hardware has two (2) digital inputs for the connection of external sensors, such as loops, doppler sensors, and optical barriers, and has two (2) digital outputs that can be used to control external devices or to fire infrared illuminators used in low light situations. However, the ITSCAM 450 can capture images without the need for external sensors, enabling the software trigger (Virtual Trigger).

All images captured by the ITSCAM 450 pass through the new processor, which scans them for vehicles and license plates. Simultaneously with the detection of a vehicle, the classification between motorcycle, car, truck and bus is carried out. This functionality makes use of the CLASSIFIER image processing library.

In addition to the characterization of the vehicle present in the image, automatic recognition of the license plates of the vehicles present in the images (OCR) is available in the Brazilian, Argentina, Chile, Colombia, France, Mexico, Netherlands, Paraguay, Peru and Uruguay standards. Refer to Pumatronix Commercial for OCR availability of additional countries.



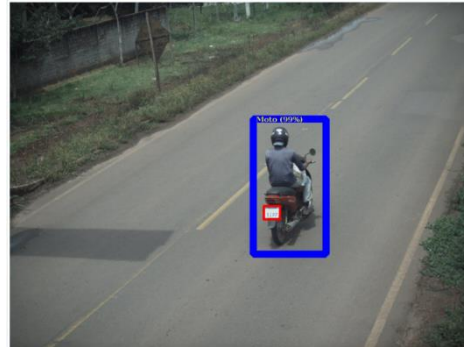
CLASSIFIER identifies a car



CLASSIFIER identifies a truck



CLASSIFIER identifies a bus



CLASSIFIER identifies a motorcycle

The ITSCAM 450 delivers photos in JPEG format and within these files, the comment field is filled with the data referring to each capture, containing the recognized plates, the type of vehicle identified, and the instantaneous settings of the equipment.

The ITSCAM 450 line offers 1 100Mbit/s Fast Ethernet port to facilitate connectivity at monitoring points and allow remote and simultaneous access by multiple users. Access can be through the equipment's Web Interface or applications can connect using the rest API Client, the File Transfer Protocol (FTP), the ITSCAMPRO server, or the LINCE server. Equipment access management is done by specifying the network Firewall rules or by specifying the Routes. The commands available through the rest API are detailed in the ITSCAM 450 Integration Manual.

2. Additional Documentation

Product	Link	Description
ITSCAM 450	Integration Manual	Programming and integration manual containing the necessary information for the integration of ITSCAM 450 with an application
ITSCAM 450	Installation and Maintenance Guide	Guide containing the information necessary to perform the installation and maintenance of ITSCAM 450
ITSLUX	Product Manual	ITSLUX illuminator manual

3. Generated Information

The ITSCAM 450 line captures images of up to two lanes in JPEG format and automatically makes available the characters of the license plates of Brazilian, Argentina, Chile, Colombia, France, Mexico, Netherlands, Paraguay, Peru, and Uruguay vehicles. For the release of recognition of additional country plates, please contact Pumatronix Commercial.

The plates read in the images, the data of the type, brand, model, and color* of the captured vehicle, in addition to the information about the configuration of the equipment are stored within the image files, in the JPEG field for the storage of comments. The quality of the generated JPEG files is adjustable and the images can receive the overlay of a caption with configurable content in each Profile. For each photo request, sequential captures can be sent with changes to the capture parameters (Multiple Exposures). The data of the vehicle type identified by the Classifier and the plates identified in the OCR Recognition are additionally delivered through the interface using the Snapshot function, which presents the captured image and all image metadata.

The redirection of the images captured by ITSCAM 450 can be done via a wired data network, through the Fast Ethernet port. Using the communication interfaces, the ITSCAM 450 images can be automatically sent to board management servers such as FTP, Lynx, or ITSCAMPRO.

In addition, monitoring of equipment operation and captures can be done in real-time with the Web Interface. The video with the images of the capture is available in MJPEG or H.264* format with adjustable quality, in addition to the live view available in a floating window, which can be shifted or minimized and optionally displays only the images of the captures taken, with the possibility of zoom and focus adjustment for the current profile.

The information about the Current State is made available on the home screen, which presents the equipment data, such as the Device ID (or Serial Number), the installed versions, and the 2 Inputs and 2 Outputs.

**Consult the Commercial sector of Pumatronix. Brand, model, and color are contracted separately.*

4. Mechanical Specifications

- Material: Aluminum and polycarbonate;
- IP protection: IP40 (requires protection box for external use);
- Fixation:

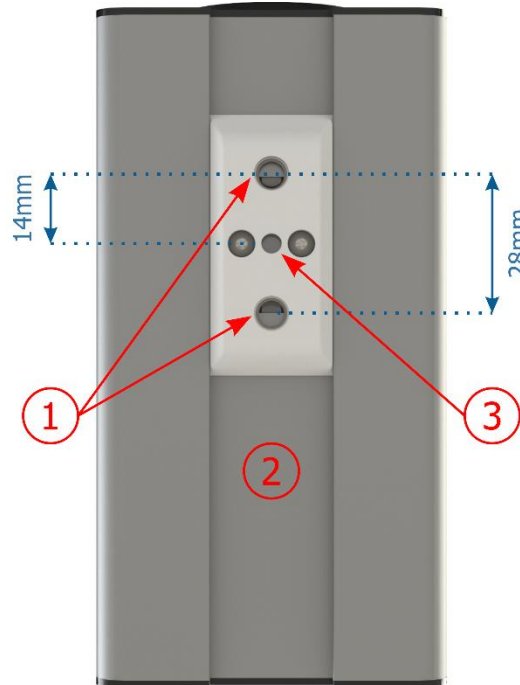


Figure 5 - Fixing mechanism of the ITSCAM 450: 1) Thread for 1/4" screws; 2) Rail for alteration of the fixing point; 3) Hole Ø4 mm for guide pin

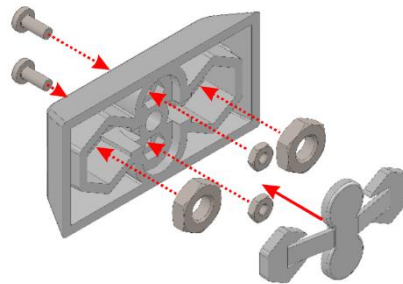


Figure 6 - Assembly of fastener components installed in ITSCAM 450

- Interfaces:

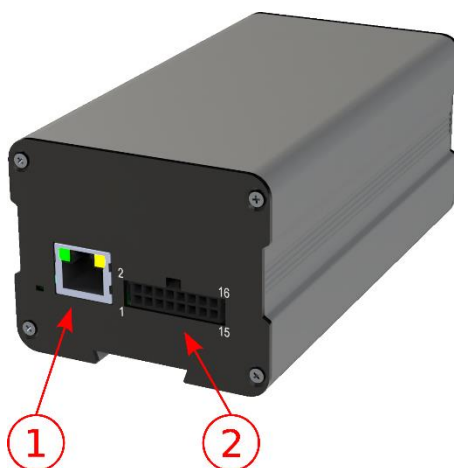


Figure 7 - Interfaces available on the device: 1) Ethernet; 2) Microfit 16-way (power connector, IOs, RS-232)

- Temperature: -10 to 65 °C with relative humidity of 5 to 95% and without condensation (tests performed in accordance with IEC 60068-2-2);
- Weight:

Model	Weight
ITSCAM 450 CS AD (S09L0AJ)	270 g + lens weight*
ITSCAM 450 CS (S09L0A)	270 g + lens weight*
ITSCAM 450 LM (S09L8AJ)	391 g
ITSCAM 450 LM (S09L8A)	391 g

*The lens model compatible with the ITSCAM 450 CS, supplied by Pumatronix, has an approximate weight:

- Lens 2.7-13.5mm: 55g
- Lens 9-40mm: 71g

- Dimensions:

The ITSCAM 450 CS versions use CS Mount type lenses and have the same dimensions, the total length being dependent on the lens model chosen.



Figure 7 – ITSCAM 450 CS

The ITSCAM 450 LM models feature integrated motorized lenses with a focal length of 5-50 mm and a filter to control the infrared light input:



Figure 8 – ITSCAM 450 LM

5. Electrical Specifications

- Power: Power over Ethernet - PoE 802.3af (Power 7 W/48 V) or with 9~32 Vdc source (recommended 12 Vdc $\pm 20\%$ or 24 Vdc $\pm 20\%$);
- Maximum input current: 0,65 A;
- Minimum and Maximum Consumption: 4,5~7 W;
- Maximum power: 7 W;
- Protection against polarity reversal: 28 V;
- Overvoltage protection (máx.): 28 V;
- Overcurrent protection: 0.5 A;
- Inrush current protection: 1.1 A.

ITSCAM 450 Interfaces	Electrical Specifications
1 Fast Ethernet port	5 kVAC dielectric isolation, ± 30 kV electrostatic discharge protection per contact - Level B (IEC 61000-4-2) and ± 30 kV by air (IEC 61000-4-2), EFT for peak forward current at 5/50 ns up to 40 A $\pm 5\%$ (IEC 61000-4-4) and 4 A surge current protection (tP = 8/20 μ s) (IEC 61000-4-5)
2 outputs (IOs on Microfit connector)	User-Programmable Bidirectional Isolated 3.75 kV Digital Interfaces (maximum current 50 mA, maximum voltage 28 Vdc, and impedance of 10 k Ω)
2 Serial RS-232 EIA/TIA ports (Microfit connector)	2 ports with a maximum transmission rate of 115,200 kbps and electrostatic discharge protection of ± 8 kV per contact (IEC 61000-4-2) and ± 15 kV by air (IEC 61000-4-2)

Interface	Connectivity Specifications
1 Fast Ethernet port	100 bit/s
Iris control (ITSCAM 450 CS models)	Supports lenses with DC type iris

Component	Image Processing Specifications
CPU	Quad core ARM Cortex-A7 and RISC-V MCU
RAM memory	LPDDR4 8Gbit x 32bit speed 2667Mbps
Image sensors	Global Shutter de 2.3 MP (1920x1200 px) Day/Night mode (generates color images by day and monochrome images by night)
Minimum and maximum shutter	Shutter minimum 48 μ s and maximum 30000 μ s (or 30 milliseconds)
Internal storage	Total de 8GB
NPU	2.0Tops
Watchdog	in hardware with a period of 50 seconds



Oxidation Risk: Electrical and data connections must be protected in a junction box or similar structure to prevent oxidation of the connections and unwanted infiltration of liquids in the cable.

Electrical Connections

On the back panel, there are two connectors: Ethernet for data communication and Microfit 16-way Molex 43025-1600 (datasheet available at <http://www.molex.com>). The electrical connections are made at the Microfit connector terminals, according to the specifications:

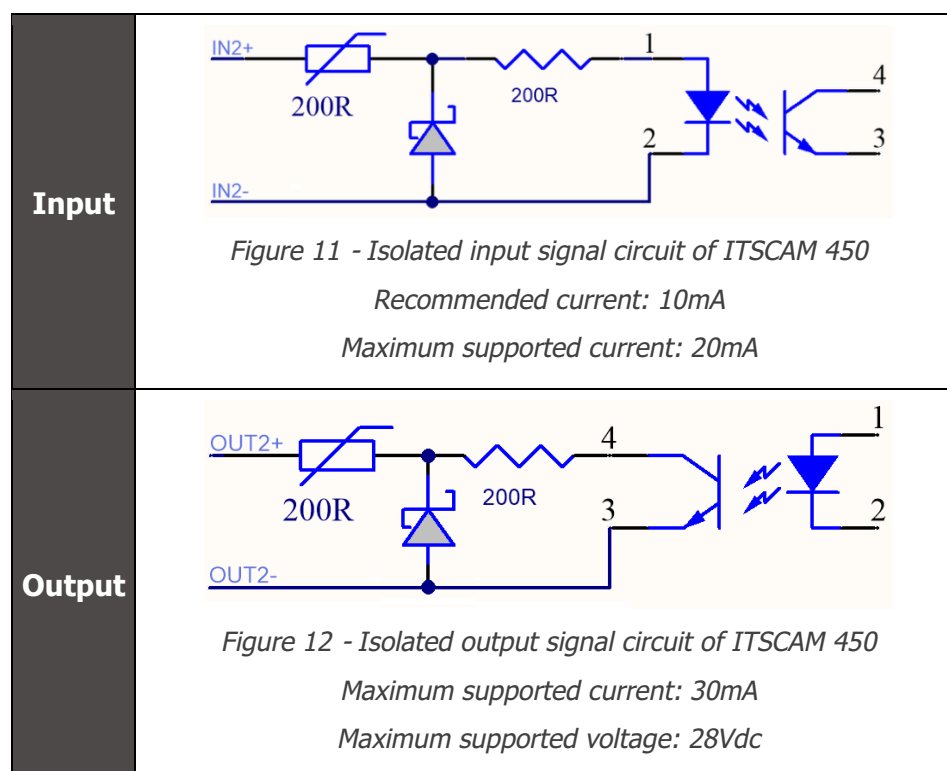


Figure 9 – Terminals of the Power and Signal Connector (Microfit) of ITSCAM 450

Terminal/Color	Signal	Description
1 - Green + White	RS232_RX1	RX RS232 1*
2 - Purple + White	RS232_TX1	TX RS232 1*
3 - Black + White	GND(RS232_1)	GND RS232 1*
4 - Purple	RS232_TX2	TX RS232 2*
5 - White	RS232_RX2	RX RS232 2*
6 - Brown+White	GND (RS232_2)	GND RS232 2*
7 - Gray	IN2+	Positive Terminal of Isolated Input 2
8 - Black	IN2-	Negative Terminal of Isolated Input 2

9 - Red + White	OUT2+	Positive Terminal of Isolated Output 2
10 - Blue+White	OUT2-	Negative Terminal of Isolated Output 2
11 - Green	IN1+	Positive Terminal of Isolated Input 1
12 - Blue	IN1-	Negative Terminal of Isolated Input 1
13 - Orange	OUT1+	Positive Terminal of Isolated Output 1
14 - Yellow	OUT1-	Negative Terminal of Isolated Output 1
15 - Brown	GND	Ground
16 - Red	Vin	Positive Voltage of 12 Vdc or 24 Vdc

The input and output signals are optically isolated and the circuits are arranged in the figure:



The 200-ohms resistors at the input and output have the function of providing basic protection to the circuit. However, it is up to the user to ensure that the current that will circulate both at the output and at the input does not exceed 20mA. Additional resistors must be inserted to reduce currents above the established limit. The circuit is sized so that the equipment can be connected to 5Vdc voltage sources without the need for an additional resistor, likewise for the trigger signal of the ITSLUX illuminator. Voltages greater than 5Vdc, on the other hand, require additional resistors to limit the current:

Source voltage	Indicated additional resistor
12Vdc	470 ohms
24Vdc	1000 ohms



Oxidation Risk: The electrical and signal connections made to the ITSCAM harness 450 and the data network cable must be protected in a junction box or similar structure to prevent oxidation of the connections and unwanted infiltration of liquids into the harness.

Trigger on the IOs

The ITSCAM 450 has 2 outputs that are dedicated to controlling the activation of the illuminator and 2 inputs for the installation of external sensors, such as loops and light barriers, which identify the moment of capture of the images (trigger).

The configuration process is done by software, using the web interface of the device or the communication protocol. Entries in ITSCAM 450 can be sensitized by: Rising Edge, Rising Edge, High Level and Low Level.



Specification of IOs: Maximum supported current of 50 mA and maximum supported voltage of 28 Vdc, but it is indicated to activate the circuit with 10 mA.

Ethernet connection

The ITSCAM 450 enables communication with other devices using the TCP/IP protocol. For such connection, the equipment provides a Fast Ethernet port (RJ-45 connector). It is indicated to use the EIA/TIA- 568A standard in the connections.

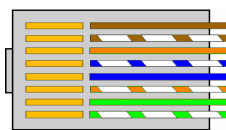


Figure 13 - RJ-45 connector standard EIA/TIA-568A

6. Software Specifications

The ITSCAM 450 has a web interface for evaluating the generated images and performing configurations. Access to the interface requires that the following be informed:

User	<i>admin</i>
Password	<i>1234</i>



Figure 14 - Web Interface Access Screen of the ITSCAM 450

Image Capture Architecture

To meet the applications of Intelligent Transport Systems (ITS), the ITSCAM 450 has several functionalities associated with image capture. These functionalities make up a general architecture and can be disabled by accessing the Image Profiles configured on the equipment. The image acquisition process begins with the image request method (trigger). This request can be made using external sensors, connected to one or more ports of the ITSCAM 450 (Inputs). In the configuration of the doors, it can be informed that the capture trigger will be done by edge (up, down, or both) or level (high and low).

There is an alternative to the use of external sensors connected to the inputs of the ITSCAM 450, which is the Trigger configuration for software activation. In this case, the activation can be at a Constant interval of time or when the equipment identifies movement in the image (Motion Trigger). Choosing Motion Trigger enables Motion Detector functionality. Another feature that improves the classification of vehicles present in the images is the Classifier, which analyzes the images and returns the type of vehicle.

After the definition of the image capture flow of ITSCAM 450, the Multiple Exposures per request functionality can be enabled. This technology allows you to configure two to four sequential images, with variations in capture parameters at each request.

The identification of the license plate of the vehicles present in the image can be done by enabling the OCR functionality, available for the countries specified in Generated Information. To increase the accuracy of the reading, the Majority Vote feature can be enabled.

Motion Detector

The definition of motion between two consecutive images of the ITSCAM 450 depends on the configured variation parameter. In addition to this sensitivity, the ROI (Region of Interest of the Image) in which the movement will be evaluated can be specified. When enabling a Region of Interest, the portion of the image that corresponds to a polygon with four vertices on the image and that remains shaded in the visualization must be defined.

CLASSIFIER

The ITSCAM 450 is capable of analyzing the captured images in real-time and evaluating the content present in the images. This analysis aims to distinguish motorcycles, cars, trucks, and buses from images that display only the lane. This analysis has a degree of classification certainty, considering samples of images that were used to generate this analysis. It is important to inform the correct type of installation, as the ITSCAM 450 can be used to capture two or one track simultaneously. In the case of two lanes, the Panoramic Scenario should be chosen. The Enable object tracking option of the Classifier allows you to define the Virtual Trigger Regions that operate by configuring the direction that vehicles travel in each lane of the lane (up to four lanes).

Multiple Exposures

The Multiple Exposure functionality of the ITSCAM 450 generates two to four sequential images per capture request, with different parameter settings. This feature can increase the hit rate in the automatic identification of the plates and identify vehicles that were covered up at the time of capturing the first image. Settings that may vary are:

- The intensity of the Flash always corresponds to a percentage of the initial shot. This option is available for the Pumatronix ITSLUX illuminator line;
- The exposure time of the image sensor (Shutter), generating images with variation in the amount of light captured;
- Digital post-processing (Gain), which allows you to lighten or darken images.

When using Multiple Exposures (or photos), the first capture allows non-reflective plates to be clearly viewed and the second capture will be done with a weak flash, which allows reflective plates not to be saturated and present better visualization:



Figure 15 - Multiple Exposures during the day



Figure 16 - Multiple Exposures at night

OCR

The ITSCAM 450 can recognize license plates of Brazilian, Argentina, Chile, Colombia, France, Mexico, Netherlands, Paraguay, Peru, and Uruguay vehicles simultaneously. When enabled, recognition is done on all captured images. For the release of recognition of additional country plates, please contact Pumatronix Commercial.

Depending on the flow of vehicles and the required processing of ITSCAM 450, the amount of processing threads can be changed. It is important to set a Processing Timeout, to discard the images in which the plate was not read. The effort spent on plate identification can be set in Processing Mode.

OCR recognition allows you to define an ROI (Region of Interest) on the image to reduce processing in regions of the image where you do not want to find a plate. In the ROI preview image, the size of the characters of the plates can be evaluated by configuring the size of the enabled grid, superimposed on the image preview.



The screenshot shows the 'Reconhecimento' (Recognition) configuration page in the ITSCAM 450 web interface. At the top, there are navigation links for 'Início' (Home) and 'Equipamento' (Equipment). Below the title 'Reconhecimento', there is a blue 'Aplicar' (Apply) button with a checkmark. A tabbed interface shows three tabs: 'Jidosha' (selected), 'Classifier', and 'Voto Majoritário'. Under the 'Jidosha' tab, there is a section for 'Habilitar OCR' (Enable OCR) with a toggle switch that is currently turned on. Below this, there are four tabs: 'Geral' (General), 'Região de Interesse' (Region of Interest - selected), 'Caracteres' (Characters), and 'Perspectiva' (Perspective). Under the 'Região de Interesse' tab, there is a section for 'Habilitar região de interesse' (Enable region of interest) with a toggle switch that is currently turned on. Below this, there is a section for 'Região' (Region) with a video feed showing a car on a road. A blue rectangular ROI is drawn over the car. Below the video feed, there is a toggle switch for 'Altura da grade' (Grid height) set to 100. At the bottom, there is a toggle switch for 'Usar ROI de resultado do Classifier' (Use ROI of result of Classifier) which is currently turned off.

Figure 17 – ITSCAM 450 Web Interface for OCR ROI (Region of Interest) Configuration

Majority Vote

The Majority Vote is a feature applied to the results of the automatic character reading step of vehicle license plates (OCR) and/or Classifier. This analytic determines which string best describes the vehicle license plate captured in the image. The algorithm compares the identification reliability of each character, based on the image of the character in perfect reading condition. This analysis can be performed only on the set of images of the Multiple Exposures or when using sequential images. Just set the parameters of Maximum different characters and Minimum interval between recognitions of identical plates. During the passage of the vehicle through the region monitored by ITSCAM 450, several images of the same vehicle may be captured for processing. However, the option to Send only the exposure with the best recognition can be enabled and the other images will be discarded.

Automatic Transition Between Image Profiles

ITSCAM 450 allows you to register up to four sets of equipment configurations, called Profiles. These settings correspond to image adjustments, framing (zoom and focus) and transition conditions between registered profiles. The change between profiles is automatic, when a time and/or image Level value is reached, which favors obtaining images with the ideal quality in any lighting situation. It is recommended to use one profile for captures with ambient light (daytime) and another for captures with artificial lighting (nighttime).

Refer to the Integration Manual for suggested settings for a profile's Transitions.

Receiving Images

The ITSCAM 450 can send the captured images to vehicle storage and monitoring centers in the ways described:

Server	Interaction with ITSCAM FF 450
FTP	The FTP server makes it possible to receive the images captured by ITSCAM FF 450
ITSCAMPRO	The ITSCAMPRO type server is used to send images and plates read by the on-board OCR. ITSCAMPRO is an application that concentrates images and plates. Various types of reports can be viewed and generated (see Pumatronix for more information about the application)
Cougar	The sending Cougar protocol is of the TCP type (port 60000), proprietary to Pumatronix, which guarantees the highest degree of configuration and flexibility in integration. See the Onboarding Handbook for more information
Lince	The Lince server is Pumatronix's cloud-based SaaS platform, ideal for consolidating large numbers of devices and implementing image-based electronic fencing
REST API Client	The REST API Client enables camera integration with a REST WEB server. Through a template language, the body of the submission and the headers can be customized to meet the needs of the server

7. Licensing

The license of ITSCAM 450 covers the hardware of the image capture and processing device, with automatic and embedded recognition of the license plates of the vehicles present in the images (OCR) in the Brazilian, Argentina, Chile, Colombia, France, Mexico, Netherlands, Paraguay, Peru and Uruguay standards, in addition to the functionalities presented in this manual. For the release of recognition of additional country plates, please contact Pumatronix Commercial. New features and bug fixes are made available in the new firmware versions, provided by Pumatronix Technical Support.

8. Initial Setup

Installation Prerequisites

The conditions at the monitoring site, before installation, are indispensable for the operation of the equipment.

Equipment installation location

To extract the best performance from the ITSCAM 450, it is recommended that its installation be made parallel to the track and with little horizontal inclination. Avoid covering up parts of the image with objects such as trees or vehicles from other lanes.

The zoom and focus adjustment aims to produce images in which the vehicle license plate characters are approximately 20 pixels high. However, the height of the characters can vary from 15 pixels to 30 pixels, and the best recognition indexes correspond to the height of 20 pixels.

In traffic inspection applications, ITSCAM 450 can be installed on poles or gantries with a minimum height of 3.5 meters and a maximum of 6 meters. The minimum vertical angle of 15° and the maximum of 45° between the center of the lens and a line parallel to the ground must be respected, adjusting zoom and focus for the best visibility of the vehicle plate. The distance from the ITSCAM 450 to the point of passage of the vehicles varies in the ITSCAM 450 CS Mount models, depending on the lens applied. In models with ITSCAM 450 LM motorized lens, the applied distance ranges from 10 to 50 meters. In night operations this distance varies according to the model of the illuminator applied.



Illuminator Installation: When using an illuminator in conjunction with the ITSCAM 450 device, check in the product specifications the minimum and maximum distance that must be observed in relation to the position of the object to be illuminated.

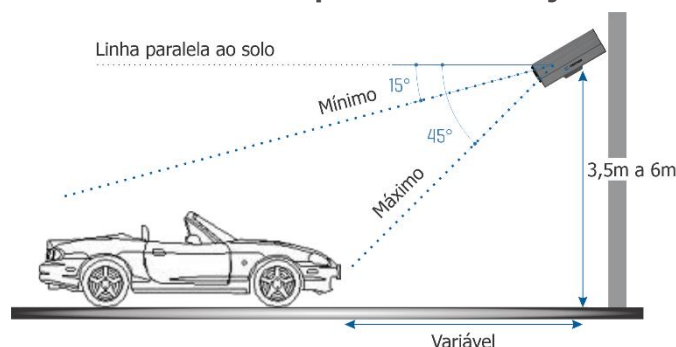


Figure 18 - Side view of the installation

The captured plate must have a maximum horizontal angle of 30° in relation to the side of the track:

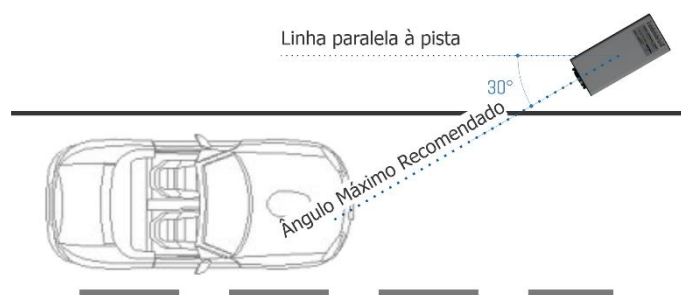


Figure 19 - Top view of the installation

Installing the ITSCAM 450 without following the informed distances compromises the quality of the captured images and reduces OCR recognition. If at the installation site, the requirements cannot be met, it is recommended to consult Pumatronix Technical Support.

Required Infrastructure

At the place of attachment of the equipment, there must be:

- Power point according to Electrical Specifications, near the installation point of the equipment;
- Connectivity with the data network near the installation point of the equipment (based on the chosen mode);
- Sheltered place for cable splices, for example, junction box, near the installation point of the equipment;
- Drilling for fixing the protection box support;
- Suitable screws for fixing the ITSCAM 450 protective housing at the installation site;
- Availability of Auxiliary Configuration Equipment (for framing conference and image adjustments), with the Google Chrome browser (version 85 or higher) installed.

Necessary Conditions for Installation

To extract the best performance from the ITSCAM 450, the installation must be carried out with little horizontal inclination and avoid the covering up of parts of the image with objects such as trees or vehicles from other lanes.

Check in the Installation and Maintenance Guide how to make the necessary connections.



Installation Location: In cases where it is not possible to meet the installation specifications, it is recommended to consult Pumatronix Technical Support.

Parameterization of the Network Interface

Ethernet Port Configuration	Default value
IP Address	192.168.0.254
Maintenance IP address	192.168.254.254
Network Mask	255.255.255.0

In situations where the network configuration of ITSCAM 450 is different from the standard, it is indicated to change the settings prior to the physical installation of the equipment on site. The changed network configuration is saved in flash memory, however it is effectively applied after restarting the equipment. When the change is made by the web interface, the restart is automatic, after confirmation of the change.

The ITSCAM 450 has a recovery IP address (192.168.254.254), for cases where the user changes the IP address mistakenly and loses connection to the device. The use of this IP address for access recovery is only available on a peer-to-peer connection with the equipment, when connected to the Ethernet port.



The maintenance IP address of ITSCAM 450 (192.168.254.254) is disabled when the primary IP address conflicts with it. Therefore, when manually configuring the network interface (Ethernet) of the equipment, values other than the maintenance IP must be applied, as there will be no way to recover the connection in extraordinary situations of loss of the primary IP.

The most common primary and maintenance IP address conflict situations are:

- ITSCAM 450 primary IP in range 192.168.254.x and netmask 255.255.255.0
- ITSCAM 450 primary IP in range 192.168.x.x and netmask 255.255.0.0
- ITSCAM 450 primary IP in range 192.168.254.x and netmask 255.0.0.0
- Netmask set to 0.0.0.0

Installation Guidelines

- 1) Fit the ITSCAM 450 to the protective case holder, leaving the lenses as close as possible to the holder glass;
- 2) Respecting the positioning distances of ITSCAM 450 (as indicated in Equipment Installation Location), attach the protection box. By fixing it on the ceiling (upside down) it is possible to configure the equipment to Rotate the image by 180° through the web interface;
- 3) Adjust the position of the protective box so that images are captured of the region in which the vehicles travel. If necessary, it is possible to crop the image, selecting only the region of interest (ROI) of the image in which the vehicles are effectively visible for image generation. In this option, the conversion time to JPEG is improved and does not affect Streams or live viewing;
- 4) Connect the Microfit connector harness to the ITSCAM 450, if DC power or equipment IOs are used:

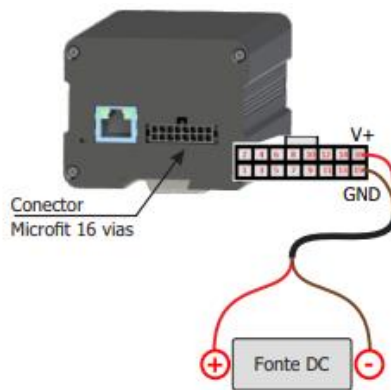


Figure 20 - Power and Signal Connector (Microfit) of ITSCAM 450

9. First Access

The web interface of the ITSCAM 450 can be used to quickly check the status of the equipment and the monitoring of the images in real-time. However, the equipment must be energized, following the Electrical Specifications. Availability of Auxiliary Configuration Equipment (for framing conference and image adjustments), with the Google Chrome browser (version 85 or higher) installed.

In addition, the Configuration Auxiliary Equipment must be on the same data network in ITSCAM 450 (with a network configuration compatible with that performed in ITSCAM 450). If a point-to-point connection is used, access to ITSCAM 450 can be done through the maintenance IP address 192.168.254.254. When entering the IP address of ITSCAM 450 in the browser address bar of the Auxiliary Configuration Equipment, it must be informed:

User	<i>admin</i>
Password	<i>1234</i>



Figure 21 - Web Interface Access Screen of ITSCAM 450

10. Care and Maintenance

Some care is needed to ensure the performance of the product and extend its service life.



Product Risks: The use of the product presents risks, which are presented in the Handling Risks section.

Firmware Update

Pumatronix periodically provides updates to the ITSCAM 450 with corrections of defects and inclusions of functionalities, by contacting Technical Support on the Pumatronix website. The device update process requires connecting to an Auxiliary Configuration Equipment that allows access to the ITSCAM 450 Web Interface, using one of the Web browsers:

- Internet Explorer 11 or higher;
- Google Chrome versão 38 or higher;
- Firefox versão 21 or higher;
- Opera 25 or higher;
- Safari 8 or higher.

Updating the ITSCAM 450 firmware requires some security measures during the procedure, to prevent the file from being corrupted and the ITSCAM 450 device from stopping working:

- 1) Keep the ITSCAM 450 device inactive during the update process, ensuring it is not requested by any service or other equipment on the network where it is installed;
- 2) Keep the ITSCAM 450 device always on during the execution of the update, taking the necessary measures to prevent it from being restarted or turned off;

Request the firmware file by filling out the form available in the Technical Support menu on the Pumatronix website:

Firmwares

Especifique abaixo os dados para download para receber o arquivo em seu e-mail.

Seu nome

Seu email

Sua empresa

Celular

Escolha o modelo

Série

ENVIAR MENSAGEM

Figure 22 – Firmware Request Form

If you have any questions, please contact Technical Support at suporte@pumatronix.com or WhatsApp +55 (41) 9203-8327.

ITSCAM 450 Firmware Update via Web Interface

- 1) Download the firmware file received by email (which starts with the name itscam450 and has the extension .swu) on the Auxiliary Configuration Equipment that will be used to connect to the ITSCAM 450;
- 2) Connect the Auxiliary Configuration Equipment to the same data network as ITSCAM 450;
- 3) Open the Auxiliary Configuration Equipment browser;
- 4) Enter the IP address of ITSCAM 450 (the default IP address is 192.168.0.254 and point-to-point connections can be made at 192.168.254.254);
- 5) Enter username and password;
- 6) Access the menu System > Update of the web interface of ITSCAM 450

 [Início](#) / [Sistema](#)

Atualização

Upload

Upload de arquivo



Clique aqui ou arraste um arquivo nesta área para fazer upload

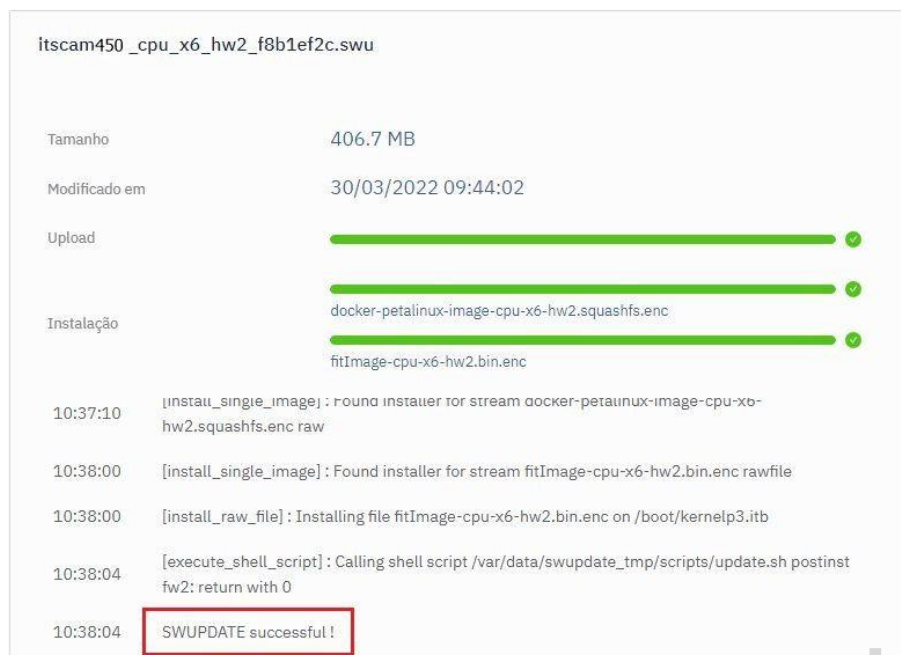
Suporta arquivos .swu

Reinicialização

Reinicia o equipamento. Recomendável após atualizações

Reiniciar ITSCAM 450 

- 7) Select or drag the firmware file (the update starts automatically and occurs in three steps, which are signaled by the progress bar);
- 8) Follow the Upload to reach 100%, and then the Installation, making sure that the device is not restarted or turned off and is not being requested by any service or other equipment on the network during the process. This security is necessary when performing this procedure to prevent the update from corrupting the firmware and causing the equipment to stop functioning;
- 9) Check the SWUPDATE successful message! which indicates the completion of the installation;



- 10) Click the Reset ITSCAM 450 butto;
- 11) Wait for the equipment to be restarted for the new firmware changes to be applied;
- 12) Finish the upgrade procedure by checking the firmware version indicated in the bar on top of the page.

Updating Analytics Licenses

The licenses of the Classifier and OCR image analytics libraries can be updated directly through the web interface. When receiving the .lic file provided by Technical Support, go to the System menu > Licenses in the interface:

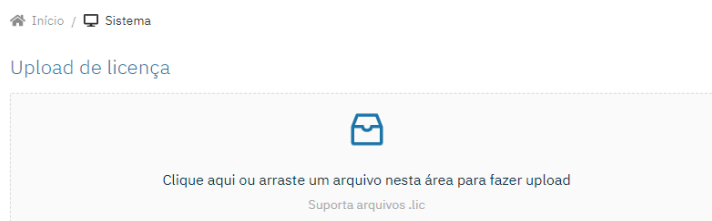


Figure 23 – ITSCAM 450 web interface for license update

Preventive Maintenance of ITSCAM 450 Device

The ITSCAM 450 image capture and processing device shall provide artifact-free images. However, if the outer surface of the lenses or protective housing has any dirt, the cleaning procedure must be performed:

- 1) Spray lens cleaning liquid onto the lens surface or water onto the protective housing glass, allowing the removal of excess dirt adhered to the surface;
- 2) Use a soft, fiber-free cloth to remove dirt by moving the cloth in only one Direction;
- 3) Wipe a dry cloth after finishing the cleaning and do not use force, as it is possible to damage the surface.

11. General warranty conditions

Pumatronix guarantees the product against any defect in the material or manufacturing process for a period of 1 year from the date of issuance of the invoice, provided that, at the discretion of its authorized technicians, a defect is found under normal conditions of use.

The replacement of defective parts and execution of services arising from this Warranty will only be carried out in the Authorized Technical Assistance of Pumatronix or a third party expressly indicated by it, where the product must be delivered for repair.

This Warranty will only be valid if the product is accompanied by a Maintenance Form duly completed and without erasures and accompanied by an Invoice.

Situations in which the Product loses its warranty

- 1) Use of software/hardware not compatible with the specifications of the Manual;
- 2) Connection of the product to the mains outside the standards established in the product manual and installations that present excessive voltage variation;
- 3) Infiltration of liquids from the opening/closing of the product;
- 4) Damage caused by natural agents (electric discharge, flood, sea spray, excessive exposure to climatic variations, among other factors) or excessive exposure to heat (beyond the limits established in the Manual);
- 5) Use of the product in environments subject to corrosive gases, with excessive moisture and/or dust;
- 6) Show signs of tampering with security seals;
- 7) Present opening and modification signals made by the Customer in product locations not authorized by Pumatronix;
- 8) Damage caused by accidents/falls/vandalism;
- 9) Display tampered and/or removed serial number;
- 10) Damage arising from the transport and packaging of the product by the Customer under conditions incompatible with it;
- 11) Misuse and in disagreement with the Instruction Manual.

12. Privacy Policy

Under the General Data Protection Law (LGPD) - Law No. 13.709, of August 14, 2018, this product has programmable functions for the capture and processing of images that may infringe the LGPD when used, together with other equipment, to capture personal data.

Pumatronix is not responsible for the purposes, use, and treatment of the images captured, and the control of the information and forms of operation of the product are the sole decision of the user or purchaser of the product.





www.pumatronix.com

