ITSCAM FF 450

HIGH PROCESSING, CONNECTIVITY AND EMBEDDED SOFTWARE

Product

Pumatronix Equipamentos Eletrônicos Ltda.

Rua Bartolomeu Lourenço de Gusmão, 1970. Curitiba, Brasil

Visit our website https://www.pumatronix.com

Send comments on this document to suporte@pumatronix.com

Change History

Date	Revision	Content updated
11/30/2023	1.0	Initial Version
06/13/2024	1.1	Model update; Update of Mechanical Specifications; Update of Electrical Specifications; Information Security Specification;
03/17/2025	1.2	Updating the Protective Case material (SAD-734)
04/28/2025	1.3	Added ITSCAM FF 450 model (CP6I9); Removed CP1 box model; Updated model image, dimensions and weight (SAD-742)

Revision 1.3

Overview

The Pumatronix ITSCAM FF 450 Family represents an important advance in the product portfolio, offering exceptional solutions for a variety of applications, including inspection, weighing scales, security, electronic fencing, and police and tax operations. 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 FF 450 device is designed to operate in a wide variety of conditions, providing accurate reading and imaging of vehicles at both high and low speeds, day and night, in highway and urban scenarios. It has the ability to recognize a diverse range of vehicle license plates, including reflective, non-reflective, red and non-reflective red license plate models, through Multiple Exposures in a single shot, even considering the new Mercosur standard. Furthermore, the image capture system covers the reading of motorcycle license plates.

One characteristic of the ITSCAM FF 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.

Figure 1 - ITSCAM FF 450

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.

Pumatronix offers models with an LM motorized lens, 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 FF 450 is designed for low energy consumption. It communicates via IP protocols and offers optional PoE power, ensuring ease of integration and complete security and integrity of captured data.

Equipped with a Digital Signature, it guarantees that the information received by the end user can be validated and, in the event of an attempt to change or manipulate the data, it will be promptly identified, providing absolute confidence in the authenticity of the information. Furthermore, the ITSCAM FF 450 family has data encryption that can be used as an additional layer of protection when accessing the device and sending data to servers, which ensure that only authorized recipients have access to the images. This

security measure prevents unauthorized individuals from intercepting or viewing information, maintaining the privacy and confidentiality of data at all times.

With technical support throughout the national territory and the possibility of configuration and installation by a specialized technical team, the ITSCAM FF 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.

Handling Risks

⚠️	**Electric shock: Handle the ITSCAM FF 450 carefully, as it operates with 127 or 220 Volts (AC) and during the installation of the external power supply conductor on the product's Connection Board, it must always be carried out with the power off to prevent the risk of electric shock.**
⚠️	**Risk of infiltration: To prevent the entry of liquids, the unused cable gland must remain wireless and closed, with the rubberized protector simulating the installation wire.**
⚠️	**Oxidation Risk: The electrical and signal connections, made in the harness of the ITSCAM FF 450 and in the data network cable, must be protected in a junction box or similar structure to avoid the unwanted infiltration of liquids in the harness and the consequent oxidation of the connections of the ITSCAM FF 450.**
⚠️	**Installation Location: In cases where it is not possible to meet the installation specifications, it is recommended to consult Pumatronix Technical Support.**
⚠️	**Loss of Warranty: The absence of the electrical grounding system may cause the ITSCAM FF 450 to burn and the correct grounding of the product is mandatory on the part of the user.**
⚠️	**Loss of Warranty: Appropriate conductors must be used, with a gauge compatible with that of the cable gland, at the risk of water entering the product. Likewise, the unused cable gland must remain wireless and closed, with the rubberized protector simulating the wire of the installation, to prevent the entry of liquids.**
⚠️	**Loss of Warranty: The parts that make up the ITSCAM FF 450 must not be changed and there are no repairs that the user can perform on the product.**

Revision 1.3

Models

The ITSCAM FF 450 image capture and processing device reads plates in places with adequate ambient lighting and situations with low light, it is necessary to purchase separately one illuminator per lane monitored range, up to a maximum of two illuminators, such as the ITSLUX from Pumatronix or compatible lighting equipment.

Available Models	Resolution	Lens Type	Estimated range (in meters) *
ITSCAM FF 450 (CP6I7)	1920x1200px	Integrated motorized	8 to 50 meters (5-50mm)
ITSCAM FF 450 (CP6I9)	2048x1536px		8 to 70 meters (5-50mm)

*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. The type of motorized lens cannot be modified, as it is an integral part of the equipment's electronic circuit.

Protection Box	Applied ITSCAM 450 device model
CP6: no heating (box model CPV9)	**I7**: ITSCAM 450 LM (S09L8AJ) **I9:** ITSCAM 450 LM (S11L10AJ)

*For more information on the model and functionalities of the image capture and processing device applied, access the ITSCAM 450 Product Manual.

Summary

Revision 1.3

1. Getting to Know the Product

The ITSCAM FF 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 ITSCAM FF 450 2.3MP and 3MP image sensors allows the capture and processing of images of up to two tracks of the monitored track. The sensor is combined with a set of motorized-type lenses.

The quality and level of detail of the images captured with ambient and artificial lighting of the ITSCAM FF 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 FF 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.
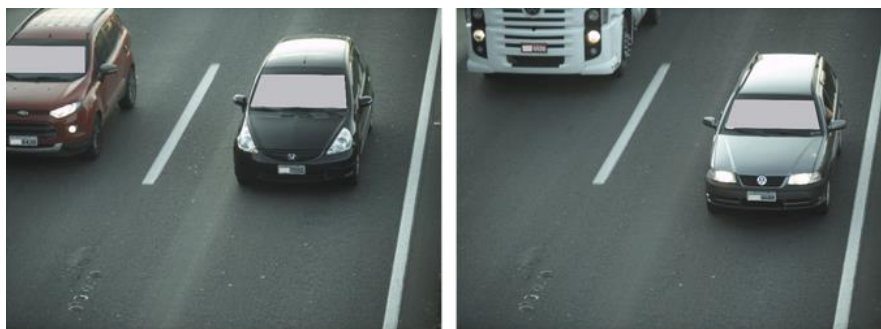

Figure 2 - Examples of daytime images captured with ITSCAM FF 450

Figure 3 - Examples of daytime images captured with ITSCAM FF 450

The ITSCAM FF 450 hardware has 2 (two) digital inputs for connecting external sensors, such as loops, doppler sensors and optical barriers and has 2 (two) digital outputs that can be used to control external devices or to trigger infrared illuminators, used in low light situations. However, the ITSCAM FF 450 can capture images without the need for external sensors, enabling capture to be triggered by software (or enable the *Enable object tracking with Classifier* option).

All images captured by the ITSCAM FF 450 go through the Quad Core ARM processor with neural network processor, which scans them in search of vehicles and license plates. Simultaneously with the detection of a vehicle, the classification between motorcycle, car, truck or bus is carried out. This functionality makes use of the Classifier image processing library, which can be carried out with high precision, detecting vehicles even in situations where the license plate is missing or the characters are poorly distinguished.

Along with identifying the vehicle type in the Classifier, it is possible to define regions that operate the Virtual Loop in the image (Virtual trigger regions). In addition to characterizing the vehicle present in the image, automatic character recognition (OCR) of vehicle license plates present in the images is available, considering all standards in Brazil, Argentina, Chile, Colombia, France, Mexico, Holland, Paraguay, Peru and Uruguay , on plate models with or without reflective film in day and night mode. Consult Pumatronix Commercial for the availability of OCR recognition for other Mercosur countries.
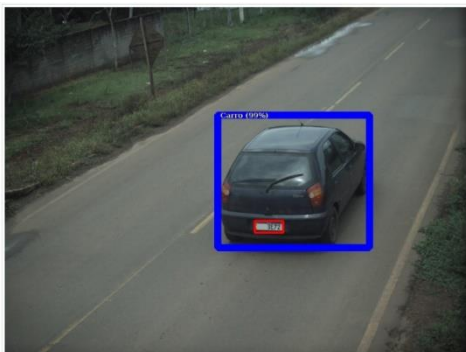

Figure 4 - Classifier identifies a car

Figure 5 - Classifier identifies a truck

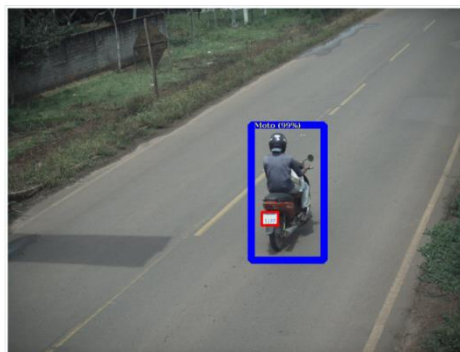*Figure 6 - Classifier identifies a bus*

Figure 7 - Classifier identifies a motorcycle

The ITSCAM FF 450 delivers photos in JPEG format and within these files, the comments field is filled with data regarding each capture, including recognized license plates, the type of identified vehicle, and the equipment's instant settings.

The ITSCAM FF 450 provides 1 100 Mbit/s Fast Ethernet port to facilitate connectivity at the 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 via the Lince(R) platform. Access management to the equipment is done by specifying the network Firewall rules or even 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 FF 450	Installation and Maintenance Guide	Guide containing the information necessary to perform the installation and maintenance of ITSCAM FF 450

Product	Link	Description
ITSCAM 450	Product Manual	ITSCAM 450 Product Manual
ITSCAM 450	Integration Manual	Programming and integration manual containing the necessary information for the integration of ITSCAM 450 with an application
ITSLUX	Product Manual	ITSLUX illuminator manual

3. Generated Information

The ITSCAM FF 450 line of devices captures images of up to two tracks in JPEG format and automatically makes the characters of vehicle license plates available in Brazil (in Brazilian and Mercosur standards), Argentina, Chile, Colombia, France, Mexico, Netherlands, Paraguay, Peru and Uruguay.

The license plates read in the images, data on the type, make, model and color* of the captured vehicle, as well as information about the equipment configuration are stored within the image files, in the JPEG field intended for storing comments. The quality of the generated JPEG files is adjustable and the images can be overlaid with 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 captured captures can be viewed through the interface on the Snapshot and Trigger screens, which present the user with the image's metadata, such as data on the type of vehicle (whether Car, Motorcycle, Bus or Truck), the make, model and color of the vehicle. vehicle identified by Classifier and license plates identified in OCR Recognition.

The redirection of images captured by the ITSCAM FF 450 can be done via a wired data network, through the Fast Ethernet port. Using the communication interfaces, images from the ITSCAM FF 450 can be sent automatically via the equipment's Web Interface or applications can connect using the REST API Client, the FTP protocol (File Transfer Protocol), the ITSCAMPRO server, the LINCE server and APIs that allow integration with systems of security agencies* such as PM-PR, PRF (SPIA), PM-MG (Helios), Detecta-SP and Cortex.

Furthermore, monitoring of equipment operation and captures can be done in real time through the ITSCAM 450 Web interface. The video with the capture images is available in MJPEG format with adjustable quality, in addition to live viewing available in a window floating, which can be moved or minimized and which optionally displays only the images from the captures taken, with the possibility of adjusting zoom and focus for the current profile.

Information about the Current Status is available on the home screen, which presents equipment data, such as the Device ID (or Serial Number), the installed versions, the performance status of the CPU, memory and storage, the GPS and the 2 Inputs and 2 digital outputs.

Functionality depends on an agreement signed between the client and the responsible public body.

4. Mechanical Specifications

- Protective Case Material: Aluminum in painted finish
- IP protection: IP66
- Fixing: use of the Pole Holder that accompanies the product. Further fastening information can be accessed in the ITSCAM FF 450 Installation and Maintenance Guide
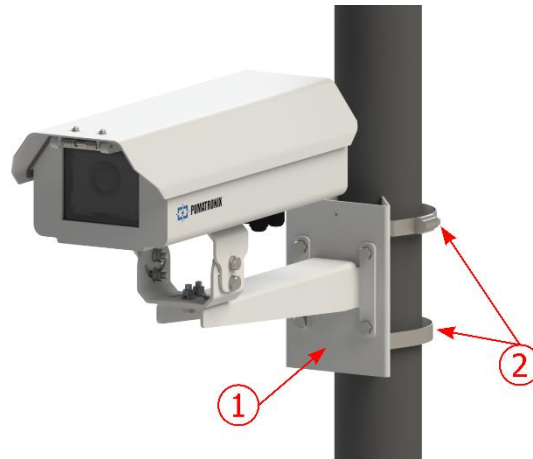
Revision 1.3

Figure 8 - Pole fastening: 1) Pole support; 2) Stainless steel clamp

- Framing adjustment: with the movement of the articulation at the base of the equipment

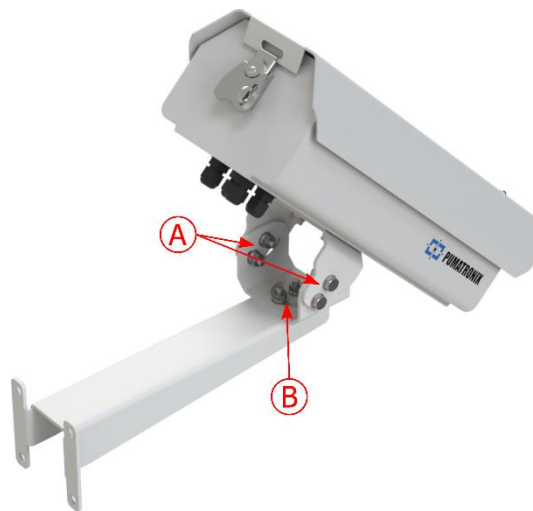*Figure 9 - Possible adjustments for the articulation at the base of the equipment: A) Vertical inclination; B) Horizontal rotation*

- Interfaces: Ethernet connector available on the rear panel of the ITSCAM 450 device and Connection Board connectors, detailed in Electrical Connections
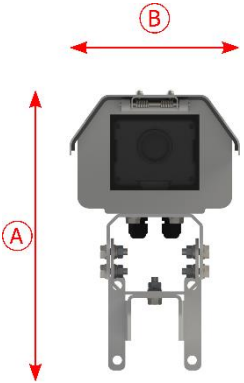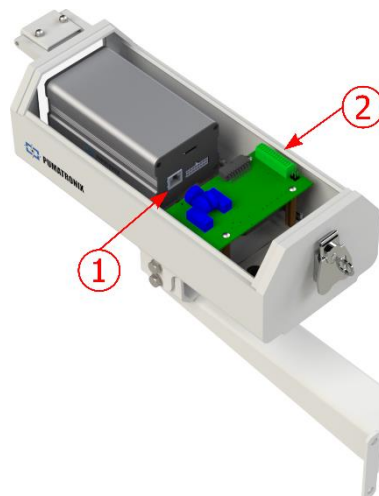

Figure 10 - Connections available on the ITSCAM FF 450 device: 1) Ethernet; 2) Connection Board Connectors

> **The 16-way Microfit connector of the ITSCAM 450 is factory-connected to the Connection Board. This connection should not be changed. If you have any questions, please contact Technical Support for guidance.**

- Maximum operating temperature (inside the Box): -10°C to 65°C (with relative humidity from 5 to 95% and without condensation)
- Dimensions and Weight:

Model ITSCAM FF 450 (CP6I7) or ITSCAM FF 450 (CP6I9)	
Front View	**Side View**

	A) Height	B) Width	C) Length
Dimensions (in millimeters)	251	148	445
Weight	1,85Kg*		

*When connecting one ITSLUX illuminator, the total weight of the equipment set can reach 4,20 kg, depending on the model used. The mechanical specifications of the ITSLUX illuminator can be accessed in the product manual.

5. Electrical Specifications

- Power: 100 VAC~277 VAC (mandatory grounding at the installation site)
- Maximum input current: 0,65 A
- Typical consumption (daytime profile): 7 W;
- Typical consumption (nighttime profile): 18W (considering an ITSLUX 3016 or 3022 illuminator);
- Maximum power supplied by internal power supply: 30W;
- Surge protection (DC power): L-N: ±0.5, 1, 2kV IEC/EN61000-4-5:2014 + A1:2017
- Electrostatic discharge protection (DC power): ±8 kV per contact (IEC61000-4-2:2009) and ±2, 4, 8, 15 kV per air (EN61000-4-2:2008)
- Fast electrical transient protection (EFT) (DC power): ±2 kV (IEC/EN61000-4-4:2012)

Connection Board Interface	Electrical Specifications
2 outputs	Digital with isolation 3.75 (maximum current 50 mA, maximum voltage 28 Vdc and impedance 10 kΩ)
2 inputs	

2 RS-232 EIA/TIA Serial ports	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)

ITSCAM 450 Device Interface	Electrical Specifications
1 Fast Ethernet port	Dielectric isolation of 5 kVAC, electrostatic discharge protection of ±30 kV per contact - Level B (IEC 61000-4-2) and ±30 kV through air (IEC 61000-4-2), EFT for direct current surge in 5 /50 ns up to 40 A ±5 % (IEC 61000-4-4) and 4 A surge current protection (tP = 8/20 µs) (IEC 61000-4-5)

ITSCAM 450 Device Interface	Connectivity Specifications
1 Fast Ethernet port	100 Mbit/s

Component	Image Processing Specifications
CPU	Quad core ARM
RAM memory	LPDDR4 8Gbit x 32bit speed 2667Mbps
2.3 MP image sensor	Global Shutter de 2.3 MP (1920x1200px) Day/Night mode (generates color images by day and monochrome images by night) Sensor physical size: 1/2.6" Internal frame rate: 30 fps Minimum shutter of 48 µs and maximum of 30000 µs (or 30 ms)
3 MP image sensor	Global Shutter de 3 MP (2048x1536px) Day/Night mode (generates color images by day and monochrome images by night) Sensor physical size: 1/3.1" Internal frame rate: 25 fps Minimum shutter of 24 µs and maximum of 30000 µs (or 30 ms)
Internal storage	Total 6 GB free for the user, without possibility of expansion
NPU	2.0Tops
Watchdog	in hardware with a period of 50 seconds

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

5.1. Electrical connections

Electrical and signal connections are made on the Connection Board of the ITSCAM FF 450 and the data connection is available on the rear panel of the ITSCAM FF 450 device, as specified in Mechanical Specifications. Access the Installation and Maintenance Guide for more information and illustrations of possible connection ways.

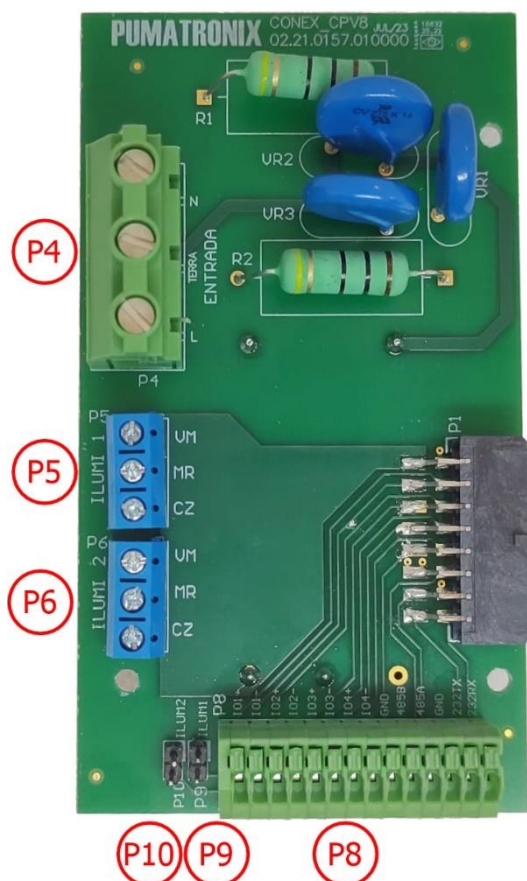- Connectors available on the Connection Board:

Figure 11 - Connection board for the ITSCAM FF 450 model (CP1I7)

Connector	Interfaces	Color	Description	Use
P4	**N**	Red or Light Blue*	Neutral	AC power input
	GROUND	Yellow + Green*	Ground	
	L	Red*	Phase	
	DC+	Red		
P5	**VM**	Red	Power supply	Illuminator power 1
	MR	Brown	IN+	
	CZ	Grey	GND	
P6	**VM**	Red	Power supply	Illuminator power 2
	MR	Brown	IN+	
	CZ	Grey	GND	
P8	**IO1+**	Blue	OUT 1+ (Illuminator 1)	Connecting output signals
	IO1-	-	OUT 1- (Connect Jumper 9)	
	IO2+	-	IN 1+	Input 1
	IO2-	-	IN 1-	

Connector	Interfaces	Color	Description	Use
	IO3+	Blue	OUT 2+ (Illuminator 2)	Connecting output signals
	IO3-	-	OUT 2- (Connect Jumper 10)	
	IO4+	-	IN 2+	Input 2
	IO4-	-	IN 2-	
	485 GND	-	GND (RS-232)	RS-232 protocol connection
	485 B	-	RX-2	
	485 A	-	TX-2	
	232 GND	-	GND (RS-232)	
	232 TX	-	TX-1	
	232 RX	-	RX-1	
P9	GND /ILUM1	-	Illuminator 1	Connect jumper when using Pumatronix illuminators
P10	GND /ILUM2	-	Illuminator 2	

*Colors as indicated in NBR 5410 and the user can make available in the installation 110 VAC or 220 VAC.

5.1.1. Trigger on the IOs

The ITSCAM FF 450 has 4 connections on the Connection Board that can be used as inputs or outputs (Ios), with IO1 and IO2 used as outputs, dedicated to the control of the illuminator drive, and IO3 and IO4 Applied to the input of signals, available for the installation of external sensors, such as loops and light barriers, which identify the moment of capturing the images (trigger).

The configuration process is carried out through software, utilizing the ITSCAM 450 device's web interface or communication protocol. The ITSCAM FF 450 ports configured as Input can be sensitized by: Rising Edge, Falling Edge, High Level, and Low Level.

⚠️ **Specification of IOs: Maximum supported current of 50 mA and maximum supported voltage of 28 Vdc. The rated drive current of the circuit is 10 mA.**

5.2. Illuminator Connection

In low light situations at the ITSCAM FF 450 installation site, it is possible to apply up to two illuminators, connected to the Connection Plate, with the ITSLUX I1516 illuminator or the ITSLUX I3016 illuminator being supported. The application of illuminators is optional and requires that a minimum distance of 50 centimeters from the image capture device be maintained, as indicated:
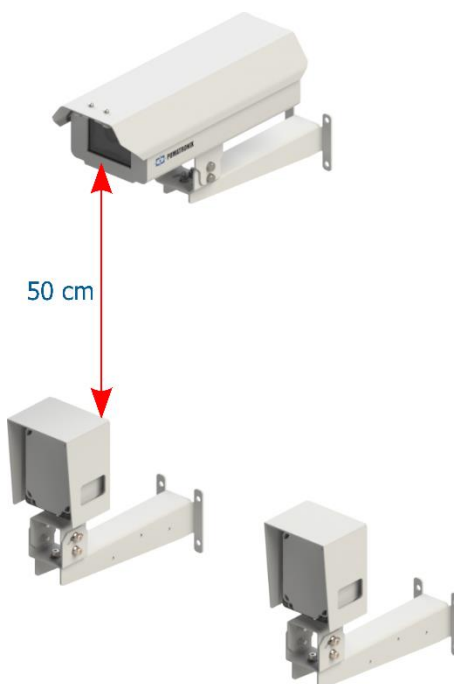
Figure 12 - Example of the application of the illuminator considering the minimum distance in relation to ITSCAM FF 450

⚠️ **IP Protection: To prevent liquid ingress, any unused cable gland must remain wire-free, closed, and sealed with a rubber protector to simulate the installation wire.**

⚠️ **Illuminator Installation: When using an illuminator in conjunction with the ITSCAM FF 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.**

5.3. Ethernet Connection

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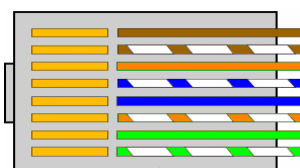

Figure 13 - RJ-45 connector standard EIA/TIA-568A

6. Software Specifications

The ITSCAM FF 450 device can be accessed via the Web interface to evaluate the generated images and make settings such as Network, OCR and Trigger, for example. Access to the interface requires that you be informed:

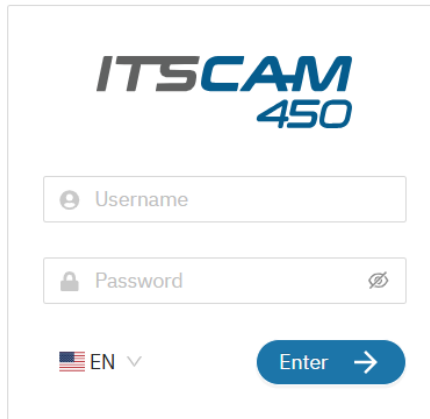| User	admin
Password	*1234*

Figure 14 - Web Interface Access Screen of ITSCAM FF 450

6.1.1. Multiple Users

The ITSCAM FF 450 allows greater control of access and changes to the equipment, as when multiple users are created with remote and simultaneous access, the activity of each one can be tracked in the system logs. Users have an Administrator or Operator access profile, with the permissions characteristic of each profile, detailed in the ITSCAM 450 device Integration Manual.

6.2. Image Capture Architecture

To meet Intelligent Transport Systems (ITS) applications, the ITSCAM FF 450 has several features associated with image acquisition. 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 form (Trigger). This request can be made through external sensors, connected to one or more ITSCAM FF 450 ports (IOs configured as Inputs). When configuring the doors, it can be informed that the capture trigger will be done by edge (rising, falling or both) or level (high and low).

There is an alternative to using external sensors connected to the ITSCAM FF 450 Connection Board, which is the configuration of the trigger for capturing an image activated by software. In this case, the activation can be at a constant time interval or when the equipment identifies movement in the image (Motion trigger), enabling the Motion Detector functionality.

After defining the image capture flow of the ITSCAM FF 450, the Multiple Exposures functionality can be enabled on request. This technology allows you to configure two to four sequential images, with variation in capture parameters for each request.

Identification of the license plate of vehicles present in the image can be done by enabling OCR processing, available for recognizing license plate characters from different countries. To increase reading accuracy, the Majority Vote functionality can be enabled.

The functionality that promotes more complete recognition of vehicles in images is the Classifier, responsible for identifying the type of vehicle detected in the image.

6.2.1. Motion Detector

The definition of movement between two consecutive ITSCAM FF 450 images depends on the configured variation parameter, which considers for the Motion Detector a time interval between shots (triggers) and a variation Threshold required to be activated. Additionally, it allows you to specify a Region of interest,

which defines which portion of the image the movement will be evaluated in, which corresponds to a polygon with four vertices, drawn on the visualization image.

6.2.2. Classifier

The ITSCAM FF 450 is capable of analyzing 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 only display the track. This analysis has a degree of classification certainty, considering image samples that were used to generate this analysis. It is important to inform the correct type of installation, as the ITSCAM FF 450 can be used to capture up to two tracks simultaneously. In the case of two tracks, the Panoramic scenario must be chosen.

The Classifier's Enable object tracking option allows you to define regions that operate the Virtual Loop (Virtual Trigger Regions), by configuring the direction in which vehicles travel in each lane of the monitored road, with capacity for up to four lanes.

6.2.3. Multiple Exposures

The Multiple Exposure functionality of the ITSCAM FF 450 generates two to four sequential images per capture request, with different parameter settings. This functionality can enhance the accuracy rate in the automatic identification of license plates and vehicles that might have been obscured during the initial image capture. Settings that may vary are:

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

Therefore, the varied adjustments in each of the exposures allow, for example, the non-reflective plates to be clearly visualized in the first capture and in the second capture, adjusting the weak flash, allows the reflective plates to be seen better, by preventing them from becoming visible. saturated in the image.

6.2.4. OCR

The ITSCAM FF 450 can recognize vehicle license plates from Brazil (in Brazilian and Mercosur standards), Argentina, Chile, Colombia, France, Mexico, Netherlands, Paraguay, Peru and Uruguay simultaneously. When enabled, recognition is performed on all captured images. To enable license plate recognition for additional countries, please contact Pumatronix Commercial.

Depending on the flow of vehicles and the processing required from the ITSCAM 450, the number of processing threads can be changed. It is important to define a Processing Timeout, with the aim of discarding images in which it was not possible to read the plate. The effort spent on plate identification can be set in Processing Mode.

OCR recognition allows you to define an ROI (Region of Interest) in the image with the aim of reducing the processing of regions of the image where you do not want to find plaque. Access the ITSCAM 450 Device Integration Manual for all available OCR configurations.

6.2.5. Majority Vote

Majority Vote is a functionality applied to the results of the automatic character reading stage on vehicle license plates (OCR) and/or the Classifier. This analytics determines which string of characters best describes the license plate captured in the image. The algorithm compares the identification reliability of each character, based on the image of a character in perfect reading conditions. This analysis can be performed only on the Multiple Exposure image set or when using sequential images. For more information about Majority Vote settings, see the ITSCAM 450 device manual.

6.2.6. Automatic Transition Between Image Profiles

ITSCAM FF 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 a profile for light-capturing. Environment (daytime period) and another for captures with artificial lighting (nighttime).

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

6.3. Information security

Digital Signature and Data Encryption are the security mechanisms for information generated by devices in the ITSCAM 450 family. Digital Signature technology allows the information received by the end user to be validated and in the event of an attempt to change or manipulate the data, will be promptly identified. Data encryption ensures that only authorized recipients have access to images, preventing unauthorized individuals from intercepting or viewing the information.

Consult the ITSCAM 450 Integration Manual and Product Manual for technical information on these technologies.

6.4. Available Integrations

The ITSCAM FF 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)
Lince	The Lince server is Pumatronix 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 FF 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

8.1. Installation Requirements

The pre-installation conditions at the monitoring site are essential for the proper functioning of the equipment.

8.1.1. Equipment installation location

The ITSCAM FF 450 line can be installed in urban and road environments, making it possible to adjust the frame to capture one or two lanes of the track. When installing on the highway, the minimum height limits specified for the site must be respected, as well as the maximum vertical inclination angle of 45° of the equipment. Larger angles of vertical inclination generate significant deformations in the images, which implies a reduction in the automatic recognition rate of the license plates of the vehicles captured in the images:

Figure 15 - Maximum Angle of Inclination of the ITSCAM FF 450 Protection Box

In the installation of the ITSCAM FF 450, the linear distance (d) between the equipment and the center of the image must be considered when positioning the equipment on the road. In night operations, this distance varies according to the model of illuminator applied. The installation diagram for capturing images of two lanes of the runway indicates the ideal position of the equipment over the center of the runway:

d minimum	4 meters*
d maximun	45 meters*
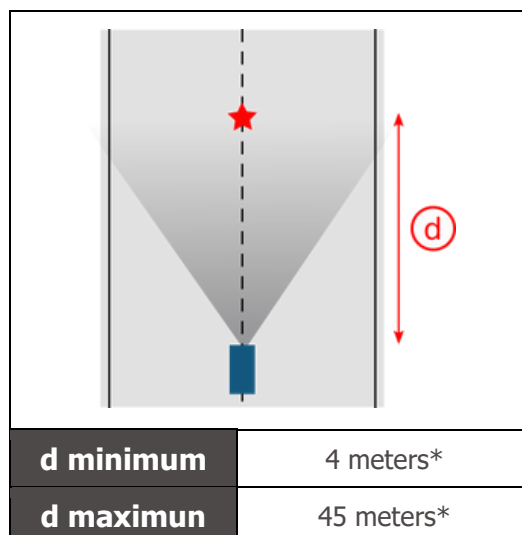
⚠️ **ITSCAM FF 450 Installation Suggestion: The suggested information is based on the focal length of the motorized lenses of the ITSCAM FF 450 line and the ITSLUX illuminators from Pumatronix. Installations may be made outside the recommended standard, but the automatic recognition rates of vehicle license plates may be affected. In case of doubt or installation situation other than the one presented, consult Pumatronix Technical Support.**

Attention to equipment positioning restrictions in vehicle circulation locations must be maintained if installing the ITSCAM FF 450 in a side structure. When choosing this type of installation, the equipment must be at the closest and safest distance from the track. The height of the equipment must take into account the maximum vertical angle of 45° and the possibility of covering vehicles on the track, captured in the farthest lane is done by large vehicles traveling in the nearest lane.

8.1.2. 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 data network near the installation point of the equipment (based on the chosen mode);
- Pole for fixing the equipment support;
- Availability of an Auxiliary Configuration Equipment (for framing conference and image adjustments), with the Google Chrome browser (version 85 or higher) installed.

8.2. Necessary Conditions for Installation

To extract the best performance from the ITSCAM FF 450, the installation must be carried out with little horizontal inclination and avoiding the covering up of parts of the image by 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.**

8.2.1. 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 FF 450 is different from the standard, it is indicated to change the settings before 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 FF 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 FF 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, 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 FF 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

9. First Access

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

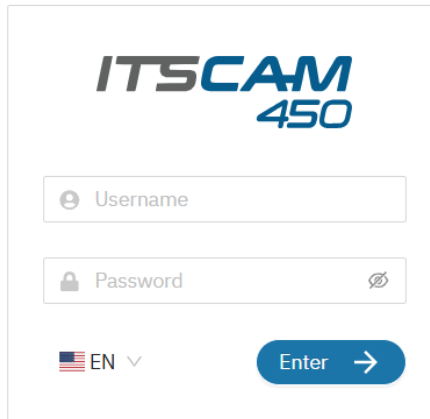| User	admin
Password	*1234*

Figure 16 - Web Interface Access Screen of ITSCAM FF 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.**

10.1. Firmware Update

Pumatronix periodically provides updates to the ITSCAM FF 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 FF 450 Web Interface, using one of the Web browsers:

- Microsoft Edge 109 or higher;
- Google Chrome version 85 or higher;
- Firefox version 21 or higher;
- Opera 25 or higher;
- Safari 8 or higher.

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

1) Keep the ITSCAM FF 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 FF 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

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

Pumatronix will provide releases with bug fixes or security enhancements for up to 3 years after the product is discontinued and removed from the portfolio.

10.1.1. Updating ITSCAM FF 450 Firmware 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 FF 450;
2) Connect the Auxiliary Configuration Equipment to the same data network as ITSCAM FF 450;
3) Open the Auxiliary Configuration Equipment browser;
4) Enter the IP address of ITSCAM FF 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 FF 450
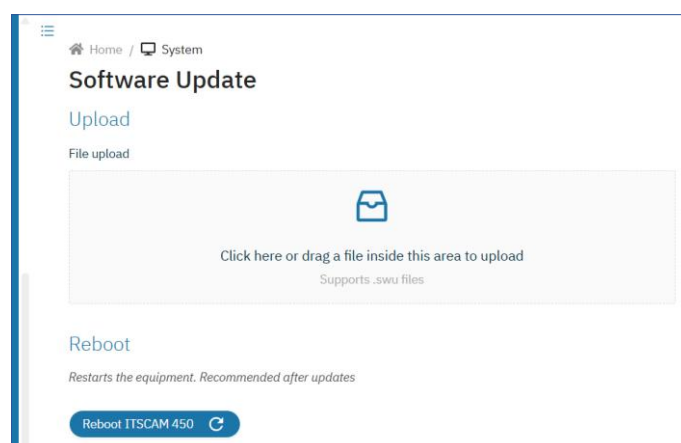
7) Select or drag the firmware file (the update starts automatically and occurs in three steps, which are signaled by the progress bar);
8) Follow the Upload to reach 100%, and then the Installation process, making sure that the device is not restarted or turned off and that it is not being requested by no service or other equipment on the network during the process. This security is required when performing this procedure to prevent the update from corrupting the firmware and the equipment from stopping working;
9) Check the SWUPDATE successful message! which indicates the completion of the installation
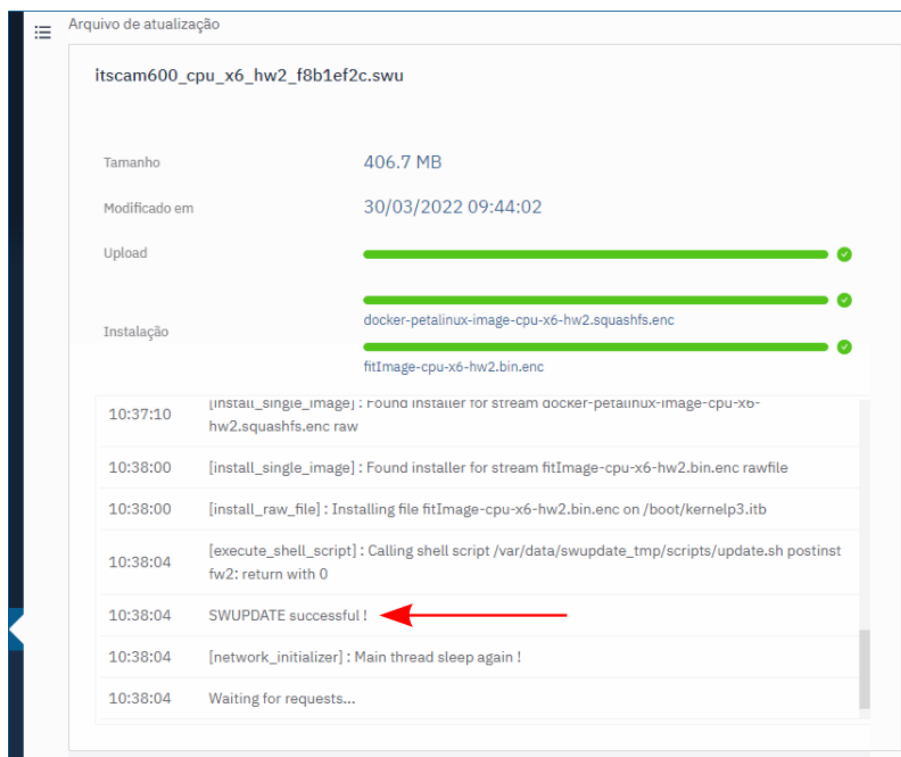
10) Click the Reset ITSCAM 450 button;
11) Wait for the equipment to be restarted for the new firmware changes to be applied;
12) Finish the upgrade procedure by checking the firmware version indicated in the top bar of the page.

10.1.2. Updating Analytics Licenses

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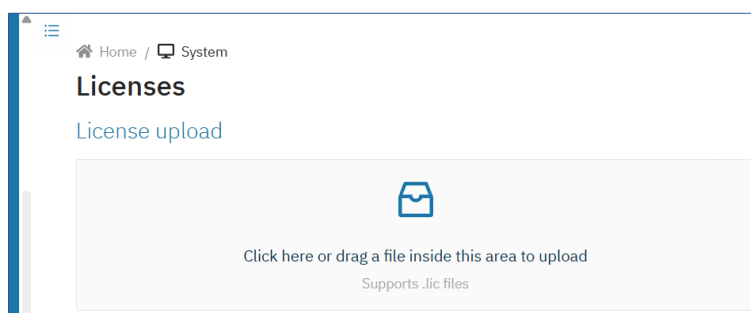

Figure 17 - ITSCAM FF 450 Web Interface Screen in License Update

10.2. Preventive Maintenance

The ITSCAM FF 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.

Figure 18 - Protective glass of ITSCAM FF 450

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.

11.1. 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.

Revision 1.3

11.2. 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.

The equipment does not collect, use or store personal information, whether sensitive or not, for its operation.

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.

PUMATRONIX

www.**pumatronix**.com