PUMATRONIX

ITSCAM FF 600

HIGH POWER ON IMAGE PROCESSING

Product

Pumatronix Equipamentos Eletrônicos Ltda.

Rua Bartolomeu Lourenço de Gusmão, 1970. Curitiba, Brasil

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

Send comments about this document to suporte@pumatronix.com

Information contained in this document is subject to change without prior notice.

Pumatronix reserves the right to modify or improve this material without obligation to notify the changes or improvements.

Pumatronix grants permission to download and print this document, provided that the electronic or physical copy of this document contains the full text. Any changes to this content are strictly prohibited.

Changes History

Date	Revision	Updated content
05/29/2024	1.3	Updating models; Updating the Classifier specifications; Updating Mechanical Specifications; Updating Minimum and maximum consumption; Nomenclature updating in Image Capture Architecture; Updating the ITSCAMPRO Mobile interface to version 2.12.0
08/22/2024	1.3.1	Updating the Interfaces image
10/30/2024	1.4	Inclusion of new models Updating image sensors
05/08/2025	1.5	Update of the S12 sensor resolution; Update of the product dimensions; Inclusion of Anatel approval; Update of model codes; Electrical specifications of the S12 sensor, Software and Installation Location; Update of internal and external storage memory; SAD-816
12/16/2025	1.5.1	Inclusion of license plate formats (SAD-855)
03/09/2026	1.5.2	Inclusion of the I3090 illuminator model specification (SAD-1052)

Overview

The ITSCAM 600 Family offers a powerful image processing engine and the flexibility to embed customized software, allowing adaptation to specific project needs. Furthermore, it provides connectivity via cables, Wi-Fi or mobile data to ensure perfect communication in any scenario.

Our latest technology allows authorities, technicians and city managers to interact in real time, transforming the management of city infrastructure. This results in safer and higher quality urban environments for citizens, while enabling agile and effective actions to promote the sustainable growth of smart cities.

The ITSCAM FF 600 is a low energy consumption device, making it a viable option for solar power, demonstrating our commitment to sustainability. This versatility is reflected in applications ranging from traffic enforcement and urban mobility systems to public and private security monitoring, customs enclosures, parking and access control, as well as highway concessionaires.

Figure 1 - ITSCAM FF 600

As a state-of-the-art device, it is designed to offer total security and integrity to the data captured. Equipped with Digital Signature, this technology guarantees that the information received by the end user can be validated and in the event of an attempt to alter or manipulate the data, it will be promptly identified, providing absolute confidence in the authenticity of the information. In addition to this security applied to the information generated, the ITSCAM 600 Family has Data Encryption, which can be used as an additional layer of protection when accessing the device and sending data to servers, ensuring that only authorized recipients have access to the images. This security measure prevents unauthorized individuals from intercepting or viewing the information, maintaining the privacy and confidentiality of the data at all times.

The ITSCAM 600's video capture technology includes a video encoder that supports H.264, H.265 and MJPEG formats, as well as a 2MP and 5MP global shutter sensor with HDR sensor or 2.3MP global shutter sensor on FHD models, optimized to minimize the negative effects of poor lighting and ensure sharper nighttime images. The result is superior image quality, even in challenging weather conditions, providing an accurate reading of license plates in environments with a high volume of traffic, ideal for Free Flow systems.

In addition, the ITSCAM 600 Family features an open platform that allows video to be captured and processed directly on the device, eliminating the need for computers and routers. Its sturdy metal frame provides excellent heat dissipation, while simultaneous processing of up to 3 lanes, hardware Flash synchronization and low power consumption guarantee superior performance in a variety of applications.

The ability to delimit specific areas of interest with the ROI (Region of Interest) function further expands the algorithm's motion detection possibilities.

With flexibility in the choice of lenses, Pumatronix offers a choice of models with CS external lenses, as well as models with LM motorized lenses, all equipped with a CMOS sensor with Global shutter for drag-free images. As a result, the system is able to capture images of vehicles at speeds of up to 180 km/h on models with the 2MP sensor and up to 200 km/h on models with the 2.3MP sensor, providing accurate readings in high-speed scenarios.

With nationwide technical support and the possibility of settings and installation by a specialized technical team, the ITSCAM 600 from Pumatronix is the definitive choice for your high-speed license plate reading needs. Consult your salesperson to find out more about how this solution can optimize your operations and improve security in your environment.

Handling Risks

ANATEL	**Anatel Approval No. 06943-24-10157** **Resolution 680 – ATO 14448:** **This equipment is not entitled to protection against harmful interference and must not cause interference in duly authorized systems. For more information, see the ANATEL website http://www.gov.br/anatel.**
	**Electric Shock: Handle the ITSCAM FF 600 with care, as it operates on 127 or 220Volts (AC) and when installing the external power lead on the product's Connection Board, it must always be done with the power switched off to prevent the risk of electric shock.**
	**Risk of infiltration: To prevent liquids from getting in, the unused cable gland must remain unwired and closed, with the rubberized protector simulating the installation wire.**
	**Oxidation Risk: The electrical and signal connections made to the ITSCAM FF 600's bundle and the data network cable must be protected in a terminal box or similar structure to prevent unwanted liquid infiltration into the bundle and consequent oxidation of the ITSCAM FF 600's connections.**
	**Installation Site: In cases where the installation specifications cannot be met, it is recommended to consult Pumatronix Technical Support.**
	**Loss of Warranty: The absence of an electrical grounding system can cause the ITSCAM FF 600 to burn out and the correct grounding of the product is mandatory on the part of the user.**
	**Loss of Warranty: Suitable conductors must be used, with a gauge compatible with that of the cable gland, as there is a risk of water entering the product. In the same way, the unused cable gland must remain unplugged and closed, with the rubberized protector simulating the installation wire, in order to prevent liquids from entering.**
	**Loss of Warranty: The parts that make up the ITSCAM FF 600 must not be altered and there are no repairs that the user can carry out on the product.**

Models

The ITSCAM FF 600 image capture and processing device reads license plates in places with adequate ambient lighting and in low-light situations it is necessary to purchase a separate illuminator per monitored lane, 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 600 LM AD IOT (CP1I5)	1636x1220px HDR	Integrated Motorized	10 to 37m (15-55mm)
ITSCAM FF 600 LM AD (CP1I6)			
ITSCAM FF 600 FHD LM AD (CP1I3)	1920X1200px		4 to 45m (4.7-47mm)
ITSCAM FF 600 FHD LM AD IOT (CP1I4)			
ITSCAM FF 600 (C1I61)	2688x2005px HDR		10 to 37m (15-55mm)
ITSCAM FF 600 (C1I51)			

* The estimated range is defined according to the lens selected and identifies at what distance range the license plate characters remain legible in the OCR reading. The type of motorized lens cannot be changed, as it is an integral part of the equipment's electronic circuitry.

Protection Box	ITSCAM 600 device model applied*
CP1: no heating	**I3**: ITSCAM 600 FHD LM AD (S09L3N2AJP) **I4**: ITSCAM 600 FHD LM AD IOT (S09L3W1N2AJP) **I5**: ITSCAM 600 LM AD IOT (S06L5W1AJP) **I51**: ITSCAM 600 LM AD IOT (S12L5W1AJP) **I6**: ITSCAM 600 LM AD (S06L5AJP) **I61**: ITSCAM 600 LM AD (S12L5AJP)

*For more information on the model and functionalities of the image capture and processing device applied, see the ITSCAM 600 product manual.

Summary

1. About the Product

The ITSCAM FF 600 range of image capture and processing devices has been developed for traffic management, enforcement, Smart City Applications, mobility systems, parking lots and applications that require image capture. The ITSCAM FF 600's 2MP and 5.3MP image sensor allows images of up to two lanes to be captured and processed, while the ITSCAM 600 FHD's 2.3MP image sensor allows images of up to three lanes to be captured and processed. The sensor is combined with a motorized lens assembly.

The quality and level of detail of the images captured with ambient and artificial lighting on the ITSCAM FF 600 comes from the additional functionalities of the optical assembly (image sensor with lenses). On models with a 2MP and 5.3MP image sensor there is a proprietary HDR (High Dynamic Range) algorithm to bring out the details of very dark and very light areas of the images. *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.

ITSCAM FF 600 keeps images standardized, even when there are significant variations in lighting conditions. This is possible by toggling the image settings *Profiles*. Profile changes are made by the equipment, based on the level of the image and the time of day.

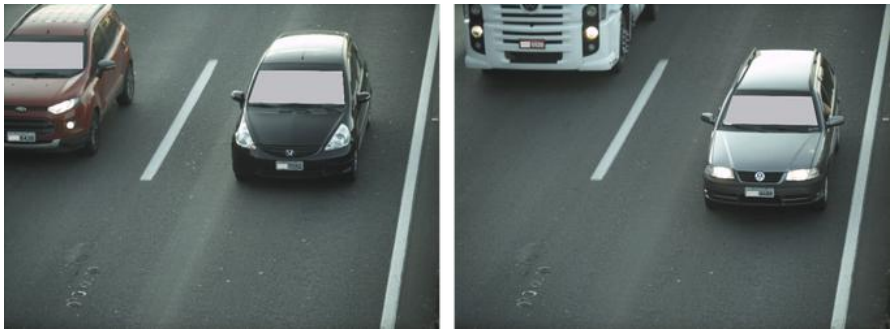


Figure 2 - Examples of daytime images captured with ITSCAM FF 600

Figure 3- Examples of nighttime images captured with ITSCAM FF 600

The ITSCAM FF 600 hardware models have 4 input or output ports (*IOs*), with IO1 and IO2 dedicated to controlling artificial lighting (flash), which is usually triggered automatically in low light situations. The IO3 and IO4 are available for the installation of external sensors, such as loops and light barriers, which identify the moment of image capture (*trigger*). However, the ITSCAM FF 600 can capture images without the need for external sensors by enabling software capture (*Motion Detector*).

All images captured by the ITSCAM FF 600 pass through the Quad-Core processor with neural network accelerator, which scans them for vehicles. Identification extends to distinguishing between *motorcycles*, *cars*, *trucks* and *buses*, as well as reading characteristics such as brand, model and color. This function is called *Classifier* and can be performed with high precision, detecting vehicles even in situations where the

license plate is missing or the characters are not very distinct. Along with identifying the type of vehicle 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 in the image, automatic character recognition (OCR) of license plates is available for the old Brazilian standard and Mercosur (OCR):

- *Old Brazilian standard*: LLL-NNNN (e.g., ABC-1234)
- *Mercosur Standard*: LLL-NLNN (e.g., ABC-1D23)

Check with Pumatronix Sales for the availability of OCR recognition for other Mercosur countries.

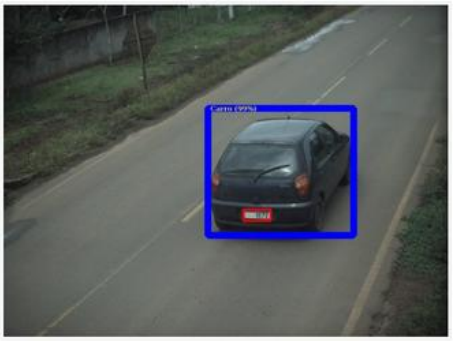


Figure 4 - Classifier identifies a car

Figure 5 - Classifier identifies a truck

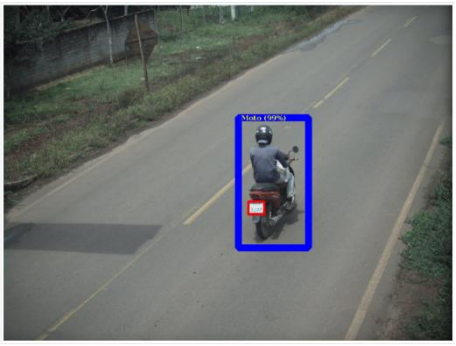


Figure 6 - Classifier identifies a motorcycle

Figure 7 - Classifier identifies a bus

The ITSCAM FF 600 delivers photos in JPEG format and within these files, the comments field is filled in with data relating to each capture, containing the coordinates of the image location, the license plates recognized, the type of vehicle identified and the instantaneous settings of the equipment.

The ITSCAM FF 600 range offers 2 Gigabit Ethernet ports on the rear panel of the ITSCAM 600 device to facilitate connectivity at monitoring points and allow remote and simultaneous access by multiple users. Access can be via the device's Web Interface or applications can connect using the REST API, FTP (File Transfer Protocol), the ITSCAMPRO server or the Lince(R) platform. Access to the device is managed by specifying the network's firewall rules or by specifying *Routes*. The commands available via the REST API are detailed in the Integration Manual for the ITSCAM 600 device.

The *ITSCAM FF 600 LM AD IOT (CP1I5)* and *ITSCAM FF 600 FHD LM AD IOT (CP1I4)* models present additional connectivity features. 4G and 3G mobile cellular technologies are available for connection to the equipment, as well as Wi-Fi and IoT M2M communication. The images captured by these ITSCAM models can be georeferenced automatically, as long as an external antenna is connected to receive the GPS signal.

2. Additional Documentation

Product	Link	Description
ITSCAM 600	Product Manual	ITSCAM 600 Product Manual
	Integration Manual	Programming and integration manual containing the information needed to integrate ITSCAM 600 with an application
ITSCAM FF 600	Installation and Maintenance Guide	Guide containing the information needed to install and maintain the ITSCAM FF 600
ITSLUX	Product Manual	ITSLUX lighting manual
ITSCAMPRO Mobile	Product Manual	ITSCAMPRO Mobile software manual

3. Generated Information

The ITSCAM FF 600 line of devices captures images of up to three lanes in JPEG format and automatically provides the characters of Brazilian license plates (in the old standard and Mercosur). The license plates read in the images, the type of vehicle captured and information about the equipment's configuration are stored within the image files, in the JPEG field for storing comments. The quality of the JPEG files generated is adjustable and the images can be overlaid with text with configurable content in each Profile. For each photo request, sequential captures can be sent with changes to the capture parameters (Multiple Exposures). The captures obtained can be viewed through the interface on the Snapshot and Trigger screens, which present the user with the image metadata, such as the vehicle type data (whether Car, Motorcycle, Bus or Truck), the brand, model and color of the vehicle identified by the Classifier and the license plates identified in OCR Recognition.

The images captured by the ITSCAM FF 600 can be redirected via a wired data network (using the independent Gigabit Ethernet ports), via a Wi-Fi network or using 4G and 3G mobile data networks. Using the communication interfaces, ITSCAM FF 600 images can be sent automatically via the device's Web Interface or applications can connect using the REST API Client, the FTP (File Transfer Protocol) protocol, the ITSCAMPRO server or the LINCE server.

In addition, the operation of the equipment and the captures can be monitored in real time via the ITSCAM 600 web interface or the ITSCAMPRO Mobile plugin, which displays the data from the captures made via the interface in the form of a Record Report, detailed in the Software Specifications. The video with the capture images is available in MJPEG, H.264 or H.265 format with adjustable quality, in addition to the live view available in a floating window, which can be scrolled or minimized and which optionally displays only the images of the captures made, with the possibility of adjusting the zoom and focus for the current profile.

The Current Status information is available on the home screen, which shows the device's 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 Inputs and Outputs.

4. Mechanical Specifications

- Protection Box material: Steel in painted finish
- IP protection: IP66;
- Mounting: use the *Post Bracket* that is supplied with the product. More information on the mounting can be found in the ITSCAM FF 600 Installation and Maintenance Guide.

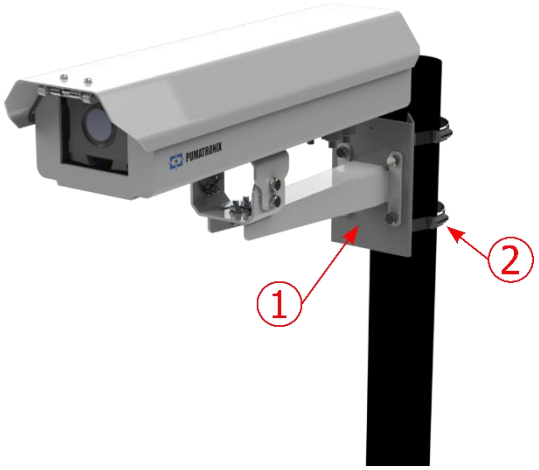


Figure 8 - Poste mounting: 1) Post Bracket; 2) Stainless steel clamp

- Frame adjustment: by moving the joint at the base of the equipment

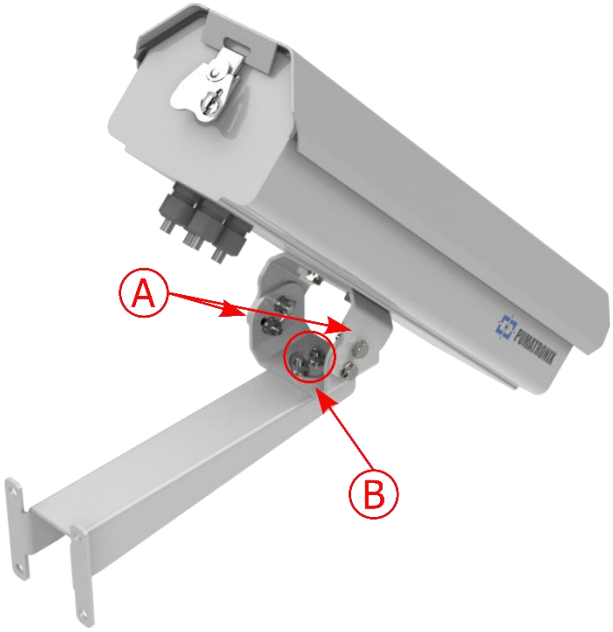


Figure 9 - Possible adjustments to the joint at the base of the equipment: A) Vertical inclination; B) Horizontal rotation

- Interfaces: connectors available for access on the rear panel of the ITSCAM 600 device

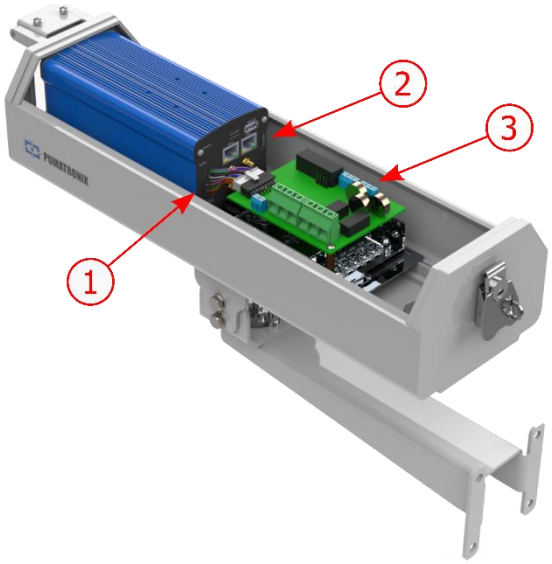
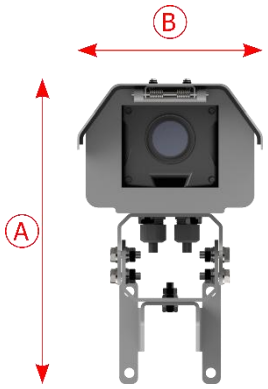
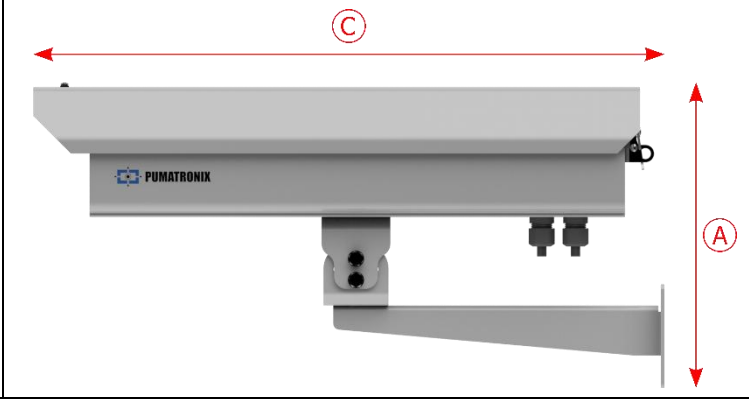


Figure 10 - Connections available on the ITSCAM FF 600 device: 1) Microfit; 2) Ethernet connectors, SMA male for antennas, USB, SD Card and SIM Card; 3) Connectors on the Connection Board*

*There may be variations depending on the ITSCAM FF 600 model.

The ITSCAM 600's 16-way Microfit connector is factory connected to the *Connection Board*. This connection must not be changed. If you have any questions, please contact Technical Support for advice.

- Maximum operating temperature (inside the Box): -10° to 65° C (with relative humidity of 5 to 95% and no condensation)
- Weight and Dimensions:

Front View	Side View
	

	A) Height	B) Width	C) Total Length
Dimensions in millimeters	251	148	505
Weight	2.75 Kg*		

*When connecting ITSLUX illuminators, the total weight of the set of equipment can reach 3.11 kg, depending on the model used. The mechanical specifications of the ITSLUX illuminator can be found in the product manual.

5. Electrical Specifications

- Power Supply: 90 VAC~264 VAC (grounding required at the installation site)
- Maximum input current: 1.5A
- Minimum and Maximum Consumption:
    - *ITSCAM FF 600 LM AD IOT (CP1I5)* and *ITSCAM FF 600 FHD LM AD IOT (CP1I4)* models: 8.5~10 W
    - *ITSCAM FF 600 LM AD* and *ITSCAM FF 600 FHD LM AD* models: 7.5~9 W
- Typical power: 24 W at maximum steady state
- Maximum power: 63 W only when starting up the equipment
- Surge protection: IEC 61000-4-5 2 KV
- Electrostatic discharge protection (DC supply): ±30 kV by contact - Level B (IEC 61000-4-2/AEC Q100-002) and ±30 kV by air (IEC 61000-4-2/AEC Q100-002)
- Protection against fast electrical transients (EFT) (DC supply): direct current peak at 10/1000 µs up to 53.3 A ±5% (ISO 7637 and IEC 61000-4-4)
- Protection against inrush current: 8 A in 2 seconds (IEC 63129:2020)

Connection Board Interface	Electrical specifications
4 inputs/outputs (IOs)	Digital, user-programmable bidirectional 3.75 kV isolation (maximum current 50 mA, maximum voltage 28 Vdc and impedance 10 kΩ)
RS-485/422 Serial Port	Half Duplex port with electrostatic discharge protection of ±8 kV by contact (IEC 61000-4-2) and ±15 kV by air (IEC 61000-4-2)
RS-232 EIA/TIA Serial Port	Port with a maximum transmission rate of 115,200 kbps and electrostatic discharge protection of ±8 kV by contact (IEC 61000-4-2) and ±15 kV by air (IEC 61000-4-2)

ITSCAM 600 device interface	Electrical Specifications
2 Gigabit Ethernet ports	5 kVAC dielectric insulation, electrostatic discharge protection of ±30 kV by contact - Level B (IEC 61000-4-2) and ±30 kV by air (IEC 61000-4-2), EFT for direct peak current in 5/50 ns up to 40 A ±5 % (IEC 61000-4-4) and surge current protection of 4 A (tP = 8/20 µs) (IEC 61000-4-5)
External storage	Protection against electrostatic discharge of ±8 kV by contact (IEC 61000-4-2) and ±15 kV by air (IEC 61000-4-2)
USB 2.0 port (host)	Protection against electrostatic discharge of ±8 kV by contact (IEC 61000-4-2) and ±15 kV by air (IEC 61000-4-2)
Wi-Fi*	Protection against electrostatic discharge ±8 kV by contact (IEC 61000-4-2) and ±15 kV by air (IEC 61000-4-2) and the high gain external antenna (2.45 GHz ISM, U-NII, Wi-Fi, WLAN Whip, 2.4~2.5 GHz 2.8 dBi
4G and 3G*	Electrostatic discharge protection ±8 kV by contact (IEC 61000-4-2) and ±15 kV by air (IEC 61000-4-2) and high gain straight external antennas (850 MHz, 900 MHz, 1. 8 GHz, 1.9 GHz, 2.1 GHz CDMA, DCS, EDGE, GPRS, GSM, HSPA, PCS, UMTS, WCDMA, 824~960 MHz, 1.71~2.17 GHz 1.42 dBi, 1.91 dBi, 2.51 dBi, 3.23 dBi, 2.89 dBi) (certificates: GCF, FCC, ANATEL, NCC, RCM, CE)

ITSCAM 600 device interface	Electrical Specifications
GPS*	Qualcomm® IZat ™ Gen8C Lite Multi-constellation Glonass, BeiDou/Compass, Galileo and QZSS, with 1.57~1.58 GHz 2 dBic external active antenna

*Available in ITSCAM FF 600 LM AD IOT (CP1I5) and ITSCAM FF 600 FHD LM AD IOT (CP1I4) models.

Interface	Connectivity Specifications
External storage	2.0 microSD card with support for up to 128 GB
Wi-Fi*	IEEE 802.11 b/g/n bands 2.4 GHz standard, with UDP throughput of 46 Mbps and TCP/IP throughput of 28 Mbps
4G and 3G*	LTE-FDD/LTE-TDD/WCDMA/GSM technologies in the bands: LTE FDD: B1/B2/B3/B4/B5/B7/B8/B28, LTE-TDD: B40, WCDMA: B1/B2/B5/B8, GSM/EDGE: Quad-band
2 Gigabit Ethernet ports	10/100/1000 tri-speed
IoT M2M*	150 Mbps downlink and 50 Mbps uplink supported

*Available in ITSCAM FF 600 LM AD IOT (CP1I5) and ITSCAM FF 600 FHD LM AD IOT (CP1I4) models.

Component	Image Processing Specifications
CPU	Quad-core ARM™ A53 (1.2 GHz)
RAM memory	16 Gb LPDDR4 (2100 Mbps and 1050 MHz)
2 MP image sensor ITSCAM FF 600 LM AD IOT (CP1I5) and ITSCAM FF 600 LM AD (CP1I6) models	2 MP Global Shutter (1636x1220 px), with proprietary HDR technology and Day/Night mode (generates color images during the day and monochrome images at night) Physical size of the sensor: 1/1.18" Internal frame rate: 15 fps Minimum shutter of 1/12500 (80 µs) and maximum of 1/15.6 (64ms, 64000 µs)
2.3 MP image sensor ITSCAM FF 600 FHD LM AD (CP1I3) and ITSCAM FF 600 FHD LM AD IOT (CP1I4) models	2.3 MP Global Shutter (1920x1200 px), with Day/Night mode (generates color images during the day and monochrome images at night) Physical size of the sensor: 1/2.6" Internal frame rate: 30 fps Minimum Shutter of 48 µs and maximum of 30000 µs (or 30 ms)
5.3 MP image sensor ITSCAM FF 600 (CP1I51) and ITSCAM FF 600 (CP1I61) models	5.3 MP Global Shutter (2688x2005 px), with Day/Night mode (generates color images during the day and monochrome images at night) Physical size of the sensor: 1/1.8" Internal frame rate: 25 fps Minimum Shutter of 80 µs and maximum of 64000 µs (or 64 ms)
Internal storage	Up to 8 GB available for user data (total 16 GB)
External storage	Micro SD 2.0 card supports up to 128 GB
Watchdog	on hardware with a period of 50 seconds

Anatel Approval No. 06943-24-10157
Resolution 680 – ATO 14448:
This equipment is not entitled to protection against harmful interference and must not cause interference in duly authorized systems. For more information, see the ANATEL website http://www.gov.br/anatel.

Oxidation Risk: The electrical and signal connections made to the ITSCAM FF 600's bundle and the data network cable must be protected in a terminal box or similar structure to prevent unwanted liquid infiltration into the bundle and consequent oxidation of the ITSCAM FF 600's connections.

5.1. Electrical Connections

Electrical and signal connections are made on the ITSCAM FF 600 Connection Board and some data connections are available on the rear panel of the ITSCAM 600 device, as specified in the Mechanical Specifications. See the Installation and Maintenance Guide for more information and illustrations of the possible connection methods.

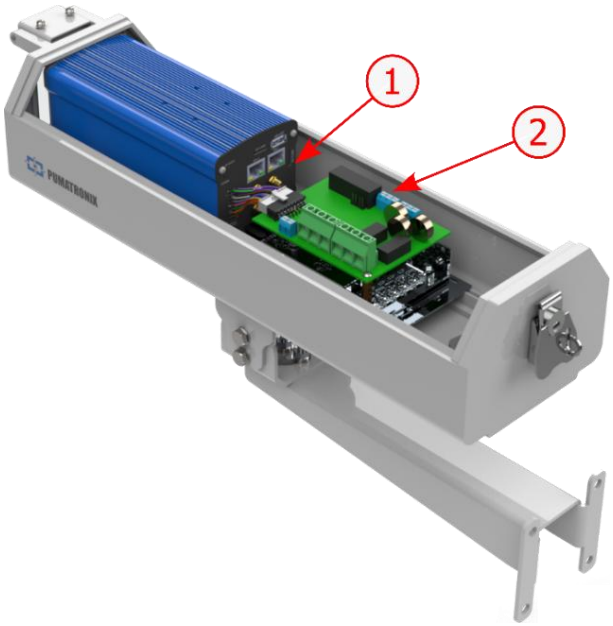
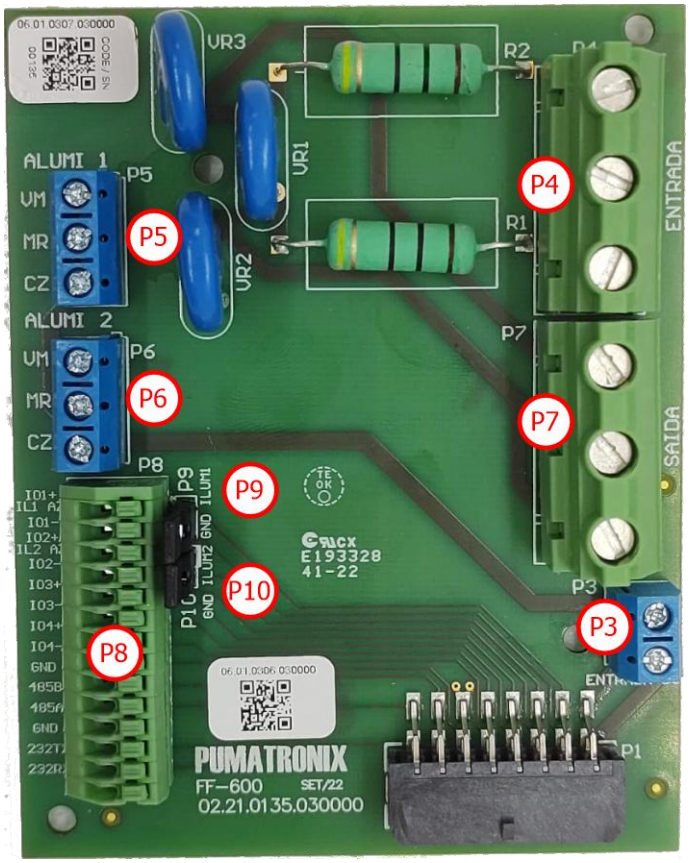


Figure 11 - Available connection interfaces: 1) Connectors on the ITSCAM 600 device; 2) Connectors on the Connection Board

- Connectors available on the Connection Board:



Connector	Interfaces	Color	Description	Use
P4	N	Red or Light Blue*	Neutral	AC power input
	TERRA	Yellow + Green*	Ground	
	L	Red*	Phase	
P7	N	White	Neutral	DC power supply
	GND	Green	Ground	
	L	Blue	Phase	
P3	DC-	Brown	24V	Power Supply PCB
	DC+	Red		
P5	VM	Red	Power Supply	Illuminator power supply 1
	MR	Brown	IN+	
	CZ	Gray	GND	
P6	VM	Red	Power Supply	Illuminator power supply 2
	MR	Brown	IN+	
	CZ	Gray	GND	
P8	IO1+	Blue	Illuminator 1	Connection of configurable input and/or output signals
	IO1-	-	Connect Jumper 9	
	IO2+	Blue	Illuminator 2	

Connector	Interfaces	Color	Description	Use
	IO2-	-	Connect Jumper 10	
	IO3+	-	IOs	
	IO3-	-		
	IO4+	-		
	IO4-	-		
	485 GND	-	RS-485	RS-485 protocol connection
	485B	-		
	485A	-		
	232 GND	-	RS-232	RS-232 protocol connection
	232 TX	-		
	232 RX	-		
P9	**GND /ILUM1**	-	Illuminator 1	Connect jumper when using Pumatronix illuminators
P10	**GND /ILUM2**	-	Illuminator 2	

*Colors according to NBR 5410 and user can provide 110 VAC or 220 VAC installation.

5.1.1. Shot on IOs

The ITSCAM FF 600 has 4 connections on the *Connection Board* that can be used as inputs or outputs (IOs). IO1 and IO2 are dedicated to controlling the triggering of the illuminator and IO3 and IO4 are available for the installation of external sensors, such as loops and light barriers, which identify the moment of image capture (trigger).

The set-up process is done by software, using the ITSCAM 600 device's web interface or communication protocol. ITSCAM FF 600 ports set as Input can be sensitized by: Rising Edge, Falling Edge, High Level and Low Level.

IOs specification: Maximum supported current of 50 mA and maximum supported voltage of 28 Vdc. The nominal trigger current of the circuit is 10 mA.

5.2. Illuminator Connection

In low-light situations where the ITSCAM FF 600 is installed, it is possible to use up to two illuminators connected to the *Connection Board*. The use of illuminators is optional and requires a minimum distance of 50 centimeters from the image capture device.

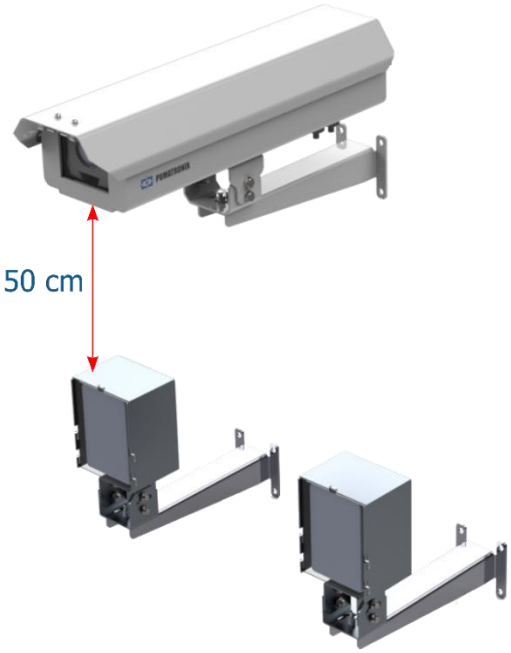


Figure 12 - Example of the installation of 2 illuminators considering the minimum distance from ITSCAM FF 600

IP Protection: In order to prevent liquids from entering, the unused cable gland must remain unwired, closed and with the rubberized protector simulating the installation wire.

Illuminator Installation: When using an illuminator in conjunction with the ITSCAM FF 600 device, check the product specifications for the minimum and maximum distance that must be observed in relation to the position of the object to be illuminated.

The ITSLUX I3090 model can be installed with a minimum distance of 30 cm and should be used for distances greater than 2 meters and less than 7 meters.

5.3. Ethernet Connection

The ITSCAM FF 600 allows communication with other devices using the TCP/IP protocol. For this connection, the equipment provides two Gigabit Ethernet ports (RJ-45 connector) on the rear of the ITSCAM 600 device. It is recommended to use the EIA/TIA-568A standard for connections.

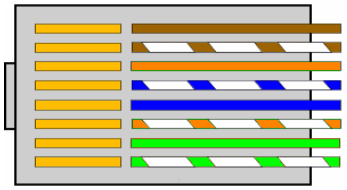


Figure 13 - EIA/TIA-568A standard RJ-45 connector

Ethernet ETH2 network interface: The ITSCAM FF 600's second network interface is disabled in the equipment's default configuration.

5.4. Antenna Connection

The images captured by the ITSCAM FF 600 can be geolocated using the equipment's built-in GPS. Wi-Fi, 4G and 3G signals can also be amplified using an external antenna with an SMA-type connector (male connector, i.e. with a central pin).

The connectors for the Wi-Fi, 3G/4G signal antennas are available on the ITSCAM FF 600 LM AD IOT (CP1I5) and ITSCAM FF 600 FHD LM AD IOT (CP1I4) models, on the rear panel of the ITSCAM 600 device. The serigraphy on the equipment's rear panel helps to identify the connectors for the antennas:

Figure 14 - SMA connectors for the antennas (there may be variations depending on the model)*

1	Wi-Fi Antenna	**3**	MOV Antenna
2	GPS Antenna	**4**	4G/3G Antenna

*The models indicated have antennas for connection. In non-standard installation sites where the antenna is not effective in the application, please contact Pumatronix support.

Specification of 4G and 3G Technologies: Consult Pumatronix Technical Support for use of the ITSCAM 600 in other countries.

6. Software Specifications

The data generated by the ITSCAM FF 600 is stored and made available through a plugin installed on the ITSCAM 600 device, which has a Web interface for evaluating the generated images and performing configurations such as Network, OCR and Trigger, for example.

The plugin used by default for the ITSCAM FF 600 is ITSCAMPRO Mobile, installed in the factory process and allows access to the data extracted from the image captures, in the Record Report format.

Access to both interfaces requires that a username and password be entered, considering the factory default data on ITSCAM 600 Device First Access.

6.1.1. Multiple Users

ITSCAM FF 600 allows for greater control of access and changes to the equipment, because when multiple users are created with simultaneous remote access, each one's activity 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 600 device's Integration Manual.

6.2. Image Capture Architecture

To meet the needs of Intelligent Transportation Systems (ITS) applications, the ITSCAM FF 600 has several features associated with image acquisition. These functionalities make up a general architecture and can be disabled by accessing the equipment's settings *Profiles*. The image acquisition process begins with how the images are requested (*Trigger*). This request can be made via external sensors connected to one or more of the ITSCAM FF 600's ports (IOs configured as *Inputs*). In the settings for the ports, you can specify whether the capture trigger will be by edge (up, down or both) or level (high and low).

There is an alternative to using external sensors connected to the ITSCAM FF 600's *Connection Board*, which is the settings of the trigger for capturing an image triggered by software. In this case, it can be triggered at a *Constant* time interval or when the device identifies movement in the image (motion trigger), enabling the *Motion Detector* feature.

Once the ITSCAM FF 600's image capture workflow has been defined, the *Multiple Exposures* feature can be enabled on request. This technology allows two to eight sequential images to be set, with the capture parameters varying with each request.

The license plates of the vehicles in the image can be identified by enabling OCR processing, which is available for recognizing the characters on license plates from different countries. To increase the accuracy of the reading, the *Majority Vote* feature can be enabled.

The feature that promotes more complete recognition of vehicles in images is the *Classifier*, which is responsible for identifying the type of vehicle detected in the image, as well as the characteristics of the brand, model and color.

6.2.1. Motion Detector

The definition of movement between two consecutive ITSCAM FF 600 images depends on the configured variation parameter, which considers for the *Motion Detector* a minimum time interval between triggers and a variation *Threshold* required to be activated. In addition, it allows the specification of a *Region of Interest*, which delimits the portion of the image in which the movement will be evaluated, corresponding to a polygon with four vertices, drawn over the visualization image.

6.2.2. Classifier

ITSCAM FF 600 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 show only the road. This *Classifier*'s analysis has a degree of certainty of classification, considering samples of images that were used to generate this analytic. It is important to specify the correct type of installation, as the ITSCAM FF 600 can be used to capture two or three road lanes simultaneously, depending on the model used. From two lanes of the road, the *Panorama* 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 road, with capacity for up to four loops.

By enabling *Vehicle Characteristics Reading*, the *Classifier* processes the reading of vehicle characteristics such as brand, model and color, in addition to the other options enabled, which can increase processing time.

6.2.3. Multiple Exposures

The ITSCAM FF 600's *Multiple Exposures* feature generates two to eight sequential images per capture request settings. This feature can increase the hit rate in automatic license plate identification and identify vehicles that were covered up when the first image was captured. The settings that may vary are:

- *Flash* intensity, always corresponding to a percentage of the initial shot. This option is available for the ITSLUX range of illuminators by Pumatronix, designed to deliver the best results with *Multiple Exposures*;
- The exposure time of the image sensor (*Shutter*), generating images with a variation in the amount of light captured;
- Digital post-processing (*Gain*), which allows images to be lightened or darkened.

Thus, varying the *Gain*, *Shutter* and *Flash* settings in each of the exposures allows, for example, the non-reflective plates to be clearly visualized in the first capture, while adjusting the flash to low in the second capture allows the reflective plates to be better visualized by preventing them from being saturated in the image:

6.2.4. OCR

The ITSCAM FF 600 can recognize license plates from Brazil (in the Brazilian and Mercosur standards), Argentina, Chile, Mexico, Paraguay, Uruguay and the entire Southern Cone simultaneously. When enabled, recognition is performed on all captured images. Depending on the flow of vehicles and the processing demands of the ITSCAM 600, the number of *Processing Threads* can be changed. It's important to set a *Processing Time Limit* in order to discard images where it wasn't possible to read the license plate. The effort spent identifying the card can be set in *Processing Mode*.

OCR allows the definition of a *ROI* (Region of Interest) in the image of order to reduce the processing of regions of the image where it is not desired to find plates. Access the ITSCAM 600 device's Integration Manual for all available OCR settings.

6.2.5. Majority Vote

The *Majority Vote* is a feature applied to the results of the automatic license plate character reading stage (OCR) and/or the *Classifier*. This analytic defines which sequence 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 the character in perfect reading condition. This analysis can be done only on the set of *Multiple Exposures* images or using sequential images.

6.2.6. Automatic Transition Between Image Profiles

ITSCAM FF 600 allows registering up to four sets of equipment configurations, called *Profiles*. These settings correspond to image adjustments, framing (zoom and focus) and the transition conditions between the registered profiles. Switching between profiles is automatic when a time and/or image *Level* value is reached, which makes it easier to obtain images of 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). See the Integration Manual and Product Manual for technical information on these technologies.

6.2.7. Information Security

Digital Signature and *Encryption* are the security mechanisms for the information generated by the ITSCAM 600 family devices. *Digital Signature* technology allows that the information received by the end user can be validated and in the event of an attempt to alter or manipulate the data, it will be promptly identified. *Encryption* ensures that only authorized recipients have access to the images, preventing unauthorized individuals from intercepting or viewing the information. See the ITSCAM 600 Integration Manual and Product Manual for technical information on these technologies.

6.2.8. Log Report

When you access the ITSCAMPRO Mobile software interface, in the *Report* > *Log Report* menu, it is possible to retrieve the data from the stored logs using the filter options. The results are presented in log format, based on the application of filter criteria in the search, detailed in the ITSCAMPRO Mobile software manual.

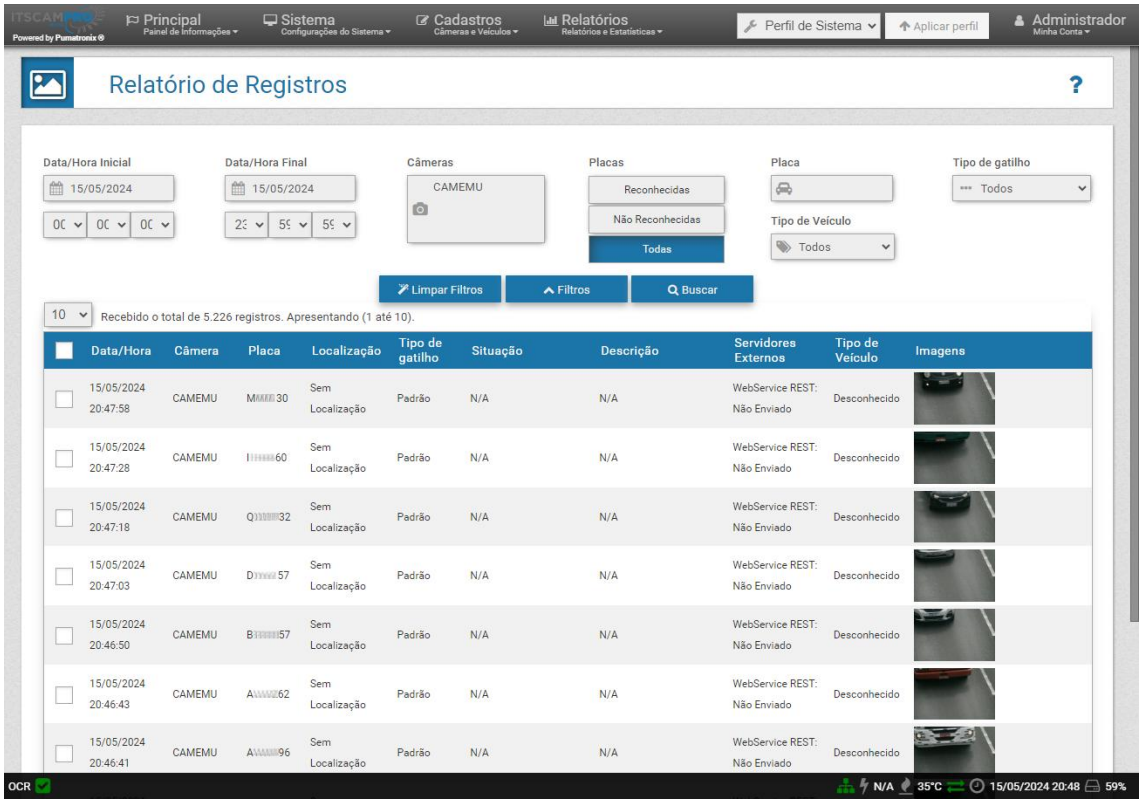


Figure 15 – ITSCAMPRO Mobile Log Report Screen

The Actions available for logs are *Export selected logs* (in CSV format), *Export selected logs* (with images) in ZIP format or *Remove selected logs*.

6.2.9. Detailed Log Information

When accessing the images in the *Log Report*, the log details are displayed in tabs and contain the data obtained from the capture:

- Sequence of captured images, which can be enlarged or viewed on full screen or copied (by clicking on the download button next to them);
- Log number generated in the Mobile ITSCAMPRO;

- License plate read automatically. If the user has permission to change the license plate, an edit button is displayed next to it;
- Temporal information on image acquisition (date and time of capture);
- Spatial information (equipment identification and geographical location, when the map is enabled);
- Option to delete the log if the user has permission;
- Vehicle details (category).

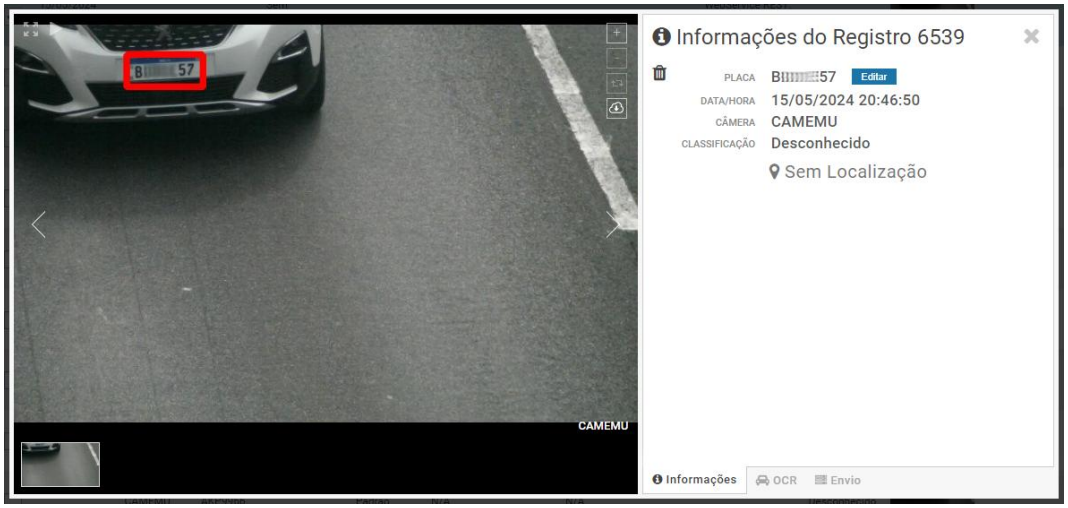


Figure 16 - Log Information Screen Initial Tab

Information on the OCR processed for the log can be obtained from the OCR tab and refers to:

- the time spent on the recognition process;
- to the background color shown on the license plate;
- the type of license plate, which can be motorcycle or not;
- to the license plate's origin country;
- the OCR's hit probability for each identified character.

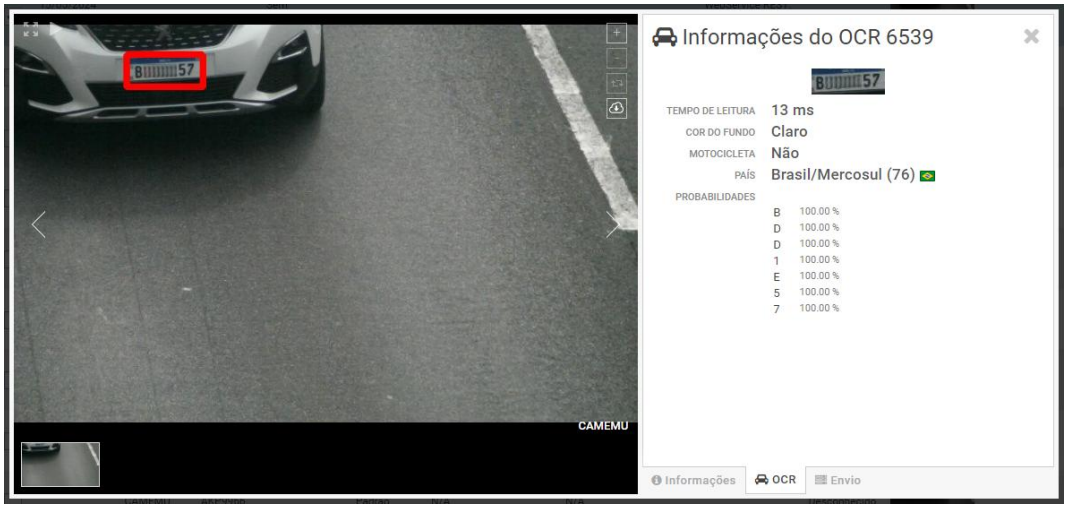


Figure 17 - Log Information Screen OCR tab

On the *Sending* tab, you can check the status of log sending for each of the servers enabled in the system:

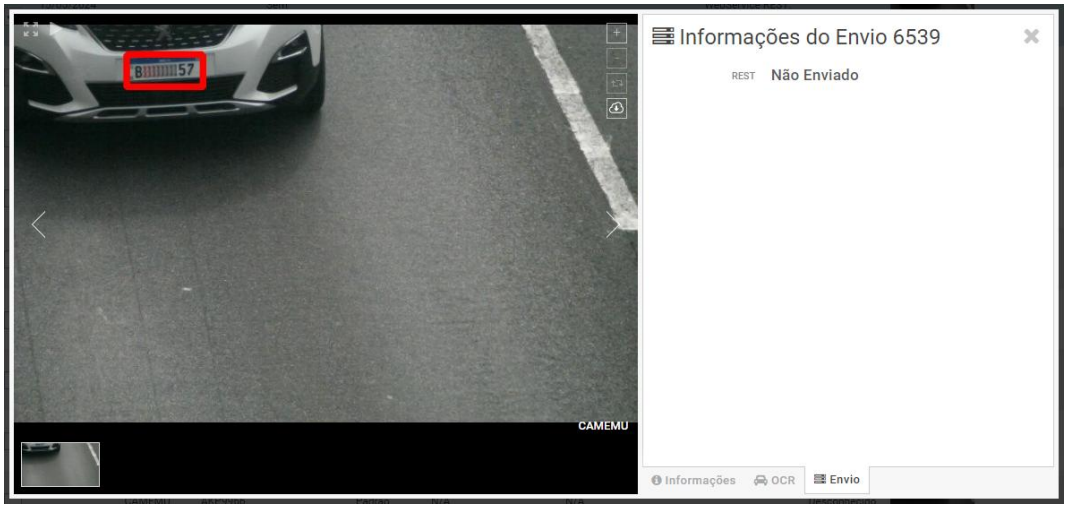


Figure 18 - Log Information Screen Sending tab

6.2.10. Available Integrations

ITSCAM FF 600 can send captured images to vehicle storage and monitoring centers in the ways described:

Server	Integration with ITSCAM FF 600
FTP	The FTP server makes it possible to receive the images captured by the ITSCAM FF 600
ITSCAMPRO	The ITSCAMPRO-type server is used to send images and license plates read by the on-board OCR. ITSCAMPRO is an application that concentrates images and license plates. Various types of reports can be viewed and generated (contact Pumatronix for more information on the application)
Lince	The Lince server is Pumatronix's SaaS cloud platform, ideal for concentrating large numbers of devices and implementing electronic image fencing.
WebService REST	Integration of ITSCAMPRO Mobile with systems using Web Service REST architecture.
PM-PR*	Integration of ITSCAMPRO Mobile with the Paraná's Military Police system
PM-MG*	Integration of ITSCAMPRO Mobile with the Minas Gerais' Military Police (PM-MG) system
Detecta-SP*	Integration of ITSCAMPRO Mobile with the Detecta-SP system
SPIA PRF*	Integration of ITSCAMPRO Mobile with the PRF (Brazilian Federal Highway Police) system

*Integration with the PM-PR, PM-MG, Detecta-SP and SPIA-PRF systems is for specific use in Brazil and depends on the release of the license in ITSCAM FF 600.

7. Licensing

The ITSCAM FF 600 license covers the hardware of the image capture and processing device, with automatic on-board recognition of the license plate of the vehicles present in the images (OCR) in the old Brazilian and Mercosur standards, in addition to the functionalities presented in this manual. To have license plates from additional countries recognized, please contact the Pumatronix Sales department.

New features and bug fixes are made available in new firmware versions, provided by Pumatronix Technical Support.

8. Initial Settings

8.1. Installation Pre-Requisites

The conditions at the monitoring site, prior to installation, are indispensable to the equipment's operation.

8.1.1. Equipment Installation Site

The ITSCAM FF 600 line can be installed in urban and road environments, and the framing can be adjusted to capture up to three lanes. When installing on the highway, the minimum height limits specified for the location must be respected, as well as the equipment's maximum vertical inclination angle of 45°. Higher angles of vertical inclination generate significant deformations in the images, which implies a reduction in the automatic recognition rate of the license plates detected in the images:

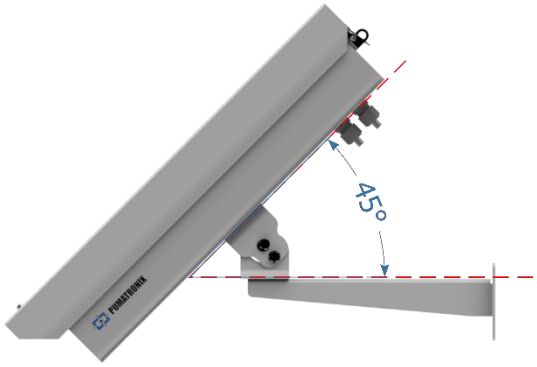
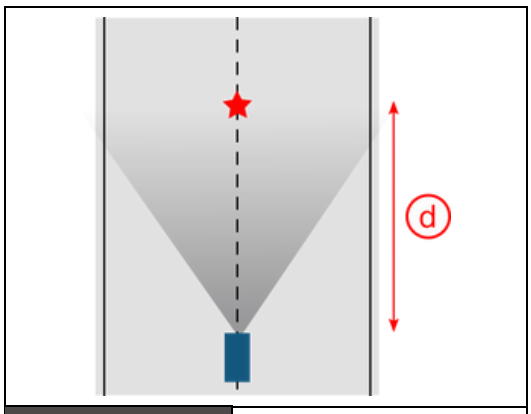


Figure 19 - Maximum angle of inclination of the ITSCAM FF 600 Protection Box

When installing the ITSCAM FF 600, the linear distance between the equipment and the center of the image must be considered when positioning the equipment on the track. In night operations, this distance varies according to the model of illuminator used. The installation diagram for capturing images of two road lanes indicates the ideal position of the equipment over the center of the road:



d minimum	4 meters*
d maximum	45 meters*

*Variable according to the model applied, specified in Models.

Illuminator Installation: When using an illuminator in conjunction with the ITSCAM FF 600 device, check the product specifications for the minimum and maximum distance that must be observed in relation to the position of the object to be illuminated.

Attention must be paid to the restrictions on positioning equipment in places where vehicles circulate if the ITSCAM FF 600 is installed on a side structure. When choosing this type of installation, the equipment should be located at the closest and safest distance from the road. The height of the equipment must consider the maximum vertical angle of 45° and the possibility of obscuration. This masking of vehicles captured in the far lane is done by large vehicles traveling in the near lane.

Installing the ITSCAM FF 600 without following the specified distances compromises the quality of the captured images and reduces OCR recognition. If the requirements cannot be met at the installation site, it is recommended to consult Pumatronix Technical Support.

8.1.2. Necessary Infrastructure

At the equipment's fixing point, there must be:

- Power supply point in accordance with the Electrical Specifications, close to the equipment installation point;
- Data network connectivity near the equipment installation point (based on the chosen mode);
- Post for mounting the equipment bracket;
- Availability of an *Auxiliary Configuration Equipment* (for checking framing and image adjustments), with the Google Chrome browser (version 85 or higher) installed.

8.2. Necessary Conditions for Installation

To get the best performance from the ITSCAM FF 600, the equipment should be installed with a low horizontal inclination, avoiding parts of the image being obscured by objects such as trees or vehicles in other lanes.

Installation Site: In cases where the installation specifications cannot be met, it is recommended to consult Pumatronix Technical Support.

8.2.1. Network Interface Parameterization

The ITSCAM FF 600 has two network interfaces: ETH1 and ETH2. In the factory default settings, the first network interface (ETH1) has the settings shown and the second network interface (ETH2) is disabled:

ETH1 Port Setup	Default value
IP address	192.168.0.254
Maintenance IP address	192.168.254.254
Netmask	255.255.255.0

ITSCAM FF 600 connectivity: Check on Wi-Fi Network Setup how to setup the Wi-Fi, 4G and 3G network interfaces as they are disabled in the equipment's factory settings.

In situations where the ITSCAM FF 600's network settings differ from the standard, it is advisable to change the settings before physically installing the equipment on site. The changed network settings are saved in the flash memory, but are effectively applied after the equipment is restarted. When the change is made via the web interface, the restart is automatic once the change has been confirmed.

The ITSCAM FF 600 has a maintenance IP address (192.168.254.254), in case the user changes the IP address by mistake and loses connection with the device. The use of this IP address for access recovery is only available in a point-to-point connection with the equipment, when connected to the ETH1 port.

The ITSCAM FF 600 maintenance IP (192.168.254.254) is disabled when the primary IP address conflicts with it. Therefore, when manually setting the equipment's network interface (Ethernet), values other than the maintenance IP must be applied, as there will be no way to recover the connection in extraordinary situations when the primary IP is lost.

The most common situations in which the primary IP address conflicts with the maintenance address are:

- Primary IP of ITSCAM FF 600 in the 192.168.254.x range and netmask 255.255.255.0;
- Primary IP of ITSCAM FF 600 in the 192.168.x.x range and netmask 255.255.0.0;
- Primary IP of ITSCAM FF 600 in the 192.x.x.x range and netmask 255.0.0.0;
- Netmask set to 0.0.0.0.

8.2.2. Wi-Fi Network Setup

ITSCAM FF 600 connectivity: The Wi-Fi, 4G and 3G network interfaces are disabled in the equipment's factory settings.

1) Access the device's web interface with the data entered in the network interface parameterization;
2) Go to the *Equipment* > *Network* menu under the *Wi-Fi* tab;
3) Select *Station (STA)* Operation Mode to connect to an existing Wi-Fi network;
4) Click on the *SSID* field and the nearby Wi-Fi networks available for connection are listed for selection;
5) Select the Authentication Protocol to be used: *Open* (no authentication), *WEP* or *WPA/WPA2 PSK*;
6) Enter the password to access the selected Wi-Fi network;
7) Click on the *Apply* button at the top of the page when validating the data entered.

Select the *Access Point (AP)* operating mode only when the device should be used as an access point to an available Wi-Fi network:

1) Enter the identification data *(SSID)*, the *Country*, the *Channel* and the *Authentication Protocol* that will be used to distribute the Wi-Fi connection;
2) Enter the *IP Address* and *Subnet Mask* of the *DHCP Server* determining the address range for the equipment connecting to the *Access point*.

Use an IP address for the DHCP server that is different from the one used to access the ITSCAM FF 600 device in order to avoid conflicts and malfunctioning of the data network.

8.2.3. 3G or 4G Network Setup

Some mobile internet operators require manual setting of network data:

1) Access the device's web interface with the data entered in the network interface parameterization;
2) Go to the *Equipment* > *Network* menu on the *Mobile* tab;
3) Click *Enable* and the settings fields will be visible;
4) Enter custom data whenever it is necessary to set up operator information. By default, the information is:

a. APN: http://[provider's name].com.br;
b. User: [provider's name];
c. Password: [provider's name];

5) Click *Apply* to save the network settings.

9. ITSCAM 600 Device First Access

The ITSCAM 600 device's web interface can be used to quickly check the status of the equipment and the location being captured in the images. However, the equipment must be powered, following the Electrical Specifications. An *Auxiliary Configuration Equipment* (for checking framing and image adjustments) the Google Chrome browser (version 85 or higher) installed shall be used.

In addition, the *Auxiliary Configuration Equipment* must be on the same data network as the ITSCAM FF 600 (with a network setting compatible with the ITSCAM FF 600). If a point-to-point connection is used, ITSCAM FF 600 can be accessed via the maintenance IP address *192.168.254.254*. When typing the IP address of the ITSCAM FF 600 into the address bar of the *Auxiliary Configuration Equipment* browser, it must be entered:

User	*admin*
Password	*1234*

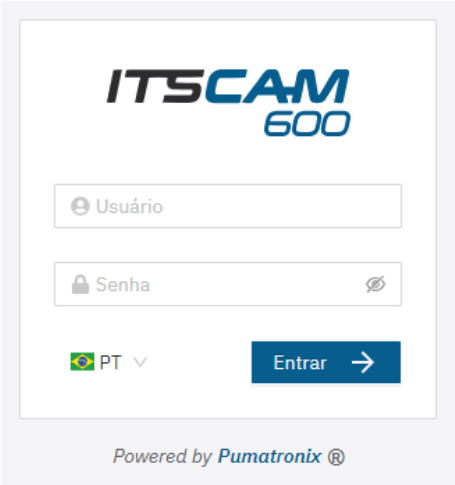


Figure 20 - ITSCAM 600 device access screen

10. First Access to the ITSCAMPRO Mobile Plugin

The web interface of the ITSCAMPRO Mobile plugin is used to extract the data captured by the ITSCAM FF 600. It must be accessed from an *Auxiliary Configuration Equipment*, connected to the same data network as the ITSCAM FF 600 device, via the address for external access or by devices that have the Android/iOS application installed.

The default address for accessing the plugin is 192.168.0.254:9080. If a point-to-point connection is used, the ITSCAM FF 600 can be accessed via the maintenance IP address 192.168.254.254:9080, via ETH1.

To access the system, use the Google Chrome browser (version 85 or higher), entering the IP address provided in the navigation bar and then the user credentials. However, on first access, it is advisable to

create the other users and restrict the use of the *administrator* account. To log in for the first time, use the factory default data on the login screen:

User	**admin**
Password	*admin*

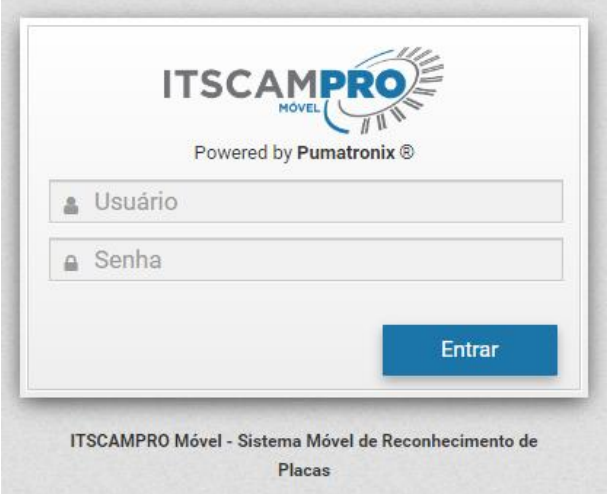


Figure 21 - ITSCAMPRO Mobile software login screen

11. Care and Maintenance

Certain precautions are necessary to ensure the product's performance and extend its useful life.

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

11.1. Firmware Update

Pumatronix periodically makes available* updates for the ITSCAM FF 600 with defect corrections and feature additions, by contacting Technical Support on the Pumatronix website. The process of updating the equipment requires an *Auxiliary Configuration Equipment* to connect to the equipment and can be done directly through its web interface using one of the installed 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 600 firmware requires some security measures during the procedure to prevent the file from being corrupted and the ITSCAM FF 600 device from stopping working:

1) Keep the ITSCAM FF 600 device inactive during the update process, ensuring that it is not requested by any service or other equipment on the network where it is installed;
2) Keep the ITSCAM FF 600 device switched on at all times while the update is running, taking the necessary measures to prevent it from restarting or being switched off;

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

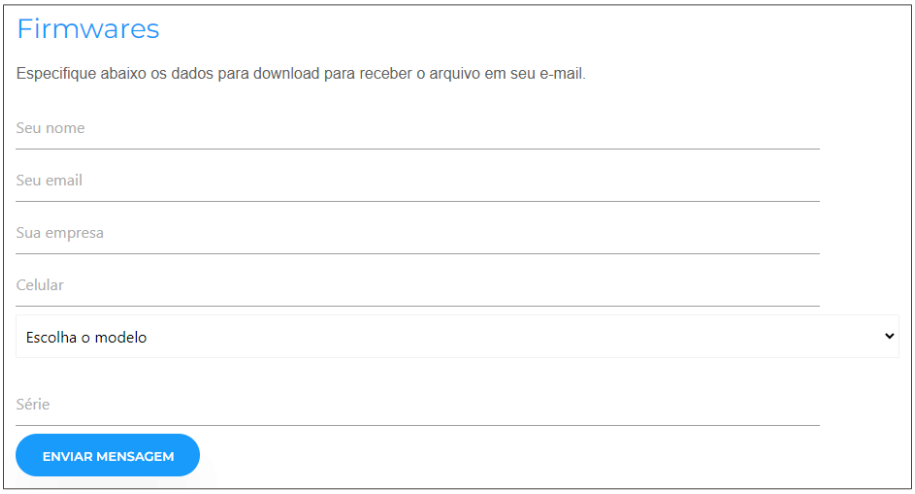


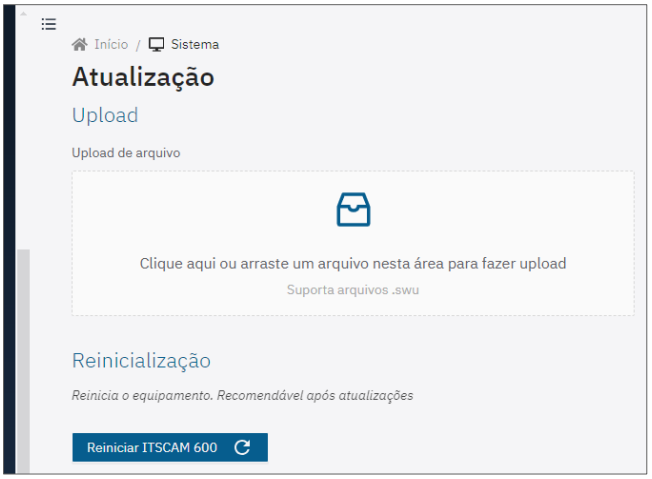
Figure 22- Firmware Online Request Form

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

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

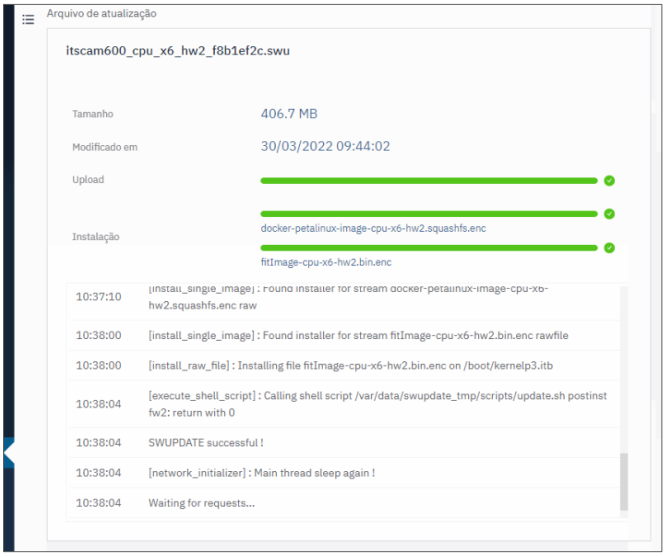
11.1.1. ITSCAM FF 600 Firmware Update via Web Interface

1) Download the firmware file received by e-mail (which starts with the name itscam600 and has the extension *.swu*) to the *Auxiliary Configuration Equipment* that will be used to connect to the ITSCAM FF 600;
2) Connect the *Auxiliary Configuration Equipment* to the same data network as the ITSCAM FF 600;
3) Open the *Auxiliary Configuration Equipment* browser;
4) Enter the IP address of the ITSCAM FF 600 (the default IP address is 192.168.0.254 and point-to-point connections can be made via 192.168.254.254);
5) Enter the username and password;
6) Access the *System > Update* menu on the ITSCAM FF 600 web interface



7) Select or drag the firmware file (the update starts automatically and takes place in three stages, which are signaled by the progress bar);

8) Monitor that the *Upload* reaches 100%, and then the *Installation,* making sure that the device is **not** restarted or disconnected and that it 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 the equipment from stopping working;
9) Check the *SWUPDATE successful!* message, which indicates that the installation is complete



10) Click on the *Restart* ITSCAM 600 button;
11) Wait for the equipment to restart so that the new firmware changes are applied;
12) Finish the update procedure by checking the firmware version indicated in the top bar of the page.

11.1.2. (Restricted Procedure) ITSCAM FF 600 Recovery by Factory Reset

Data Loss: All files, images and settings stored on the ITSCAM FF 600 are lost when performing the Recovery procedure.

Restoring the ITSCAMPRO Mobile plugin: When performing the factory recovery process on the ITSCAM FF 600, the ITSCAMPRO Mobile plugin stops. To restore the functionality of the plugin, it is necessary to contact support to release the plugin and update the licenses.

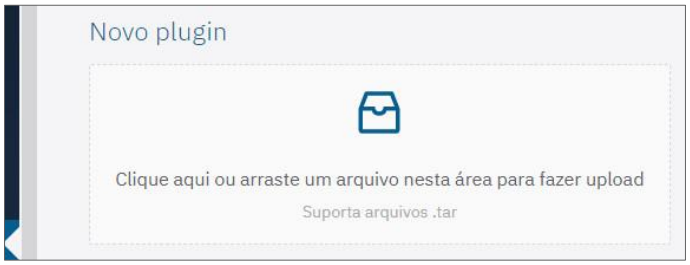
The ITSCAM FF 600 recovery procedure requires an SD card with a minimum capacity of 4 GB that can be formatted.

1) Download the ITSCAM FF 600 recovery file (file with .tar extension) (contact Pumatronix Technical Support for access to the file);
2) Format the SD card using FAT32;
3) Unzip the recovery file onto the formatted SD card;
4) Disconnect the ITSCAM FF 600 from the power supply;
5) Insert the SD card into the ITSCAM FF 600 (on the rear panel of the ITSCAM 600);
6) Keeping the *RESET* button pressed, power the ITSCAM FF 600;
7) Release the RESET button when the status LED is green;
8) Check the *status LED* flashing red, which indicates that the recovery process is in progress;
9) Check the *status LED* flashes green, which indicates that the recovery is complete;
10) Switch off ITSCAM FF 600;
11) Remove the SD card from the slot and turn the equipment back on.

11.2. Updating the ITSCAMPRO Mobile Plugin

The ITSCAM FF 600 has the ITSCAMPRO Mobile software plugin integrated on the SD card, which provides the user with a user-friendly interface and simple operation. Updating to the latest version allows to take advantage of updates and new features. The process of updating the plugin takes place following these steps:

1) Download the firmware file received by e-mail (which starts with the name *itscampromovel* and has the extension *.tar*) to the *Auxiliary Configuration Equipment* that will be used to connect to the ITSCAM FF 600;
2) Connect the *Auxiliary Configuration Equipment* to the same data network as the ITSCAM FF 600;
3) Open the *Auxiliary Configuration Equipment* browser;
4) Enter the IP address of the ITSCAM FF 600 (the default IP address is 192.168.0.254 and point-to-point connections can be made via 192.168.254.254);
5) Access the *System > Plugins* menu on the ITSCAM FF 600 web interface;
6) Select the *Stop* function for the current plugin at the bottom of the page;
7) Click on *Remove* current plugin;
8) Start the process of installing the new version of the plugin by inserting the relevant file into the area;



9) Create the redirection ports as described:
    a. - 80 (private) → 9080 (public);
    b. - 2000 → 2000;
    c. - 2005 → 2005;
    d. - 10000 → 10000;
10) Click on *Install*;
11) Please allow enough time for the entire shipping and installation process to be completed. Depending on the network situation, it may take up to 15 minutes for the whole process to be completed;
12) Force the plugin to start by clicking on the *Start* button;
13) Check after this first initialization that the plugin is automatically initialized when accessing the system from the ITSCAM 600 device.

11.3. Updating Analytics Licenses

Licenses for the *Classifier* and OCR image analytics libraries can be updated directly via the web interface. When receiving the *.lic* file provided by Technical Support, access the *System > Licenses* menu in the interface and drag it to the indicated area:

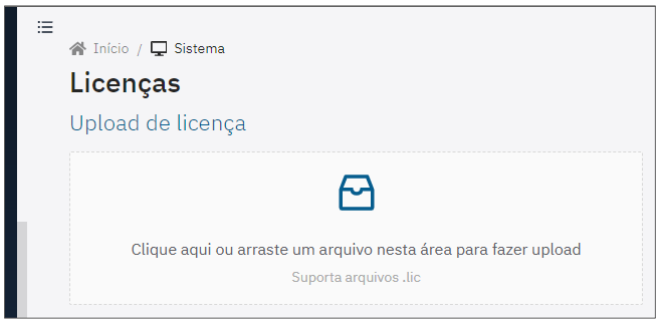


Figure 23 – ITSCAM 600 web interface on updating licenses

11.4. Preventive Maintenance

The ITSCAM FF 600 image capture and processing device must provide artifact-free images. However, if there is any dirt on the outside surface of the lenses or housing, the cleaning procedure should be carried out:

1) Spray lens cleaning liquid on the surface of the lenses or water on the glass of the protective case, so that excess dirt adhering to the surface can be removed.;
2) Use a soft, lint-free cloth to remove dirt, moving the cloth in one direction only;
3) Wipe with a dry cloth to finish cleaning and do not use force as this can damage the surface.

Figure 24 - ITSCAM FF 600 protective glass

12. General Warranty Conditions

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

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

This Warranty will only be valid if the product is accompanied by a *Maintenance Form* that has been duly filled in and has not been erased and is accompanied by an Invoice.

12.1. Situations in Which the Product Loses its Warranty

1) Using software/hardware not compatible with the specifications in the Manual;

2) Connecting the product to the mains outside the standards set out in the product manual and installations with excessive voltage variation;
3) Infiltration of liquids from opening/closing the product;
4) Damage caused by natural agents (electric shock, flooding, salt spray, excessive exposure to climatic variations, among other factors) or excessive exposure to heat (beyond the limits established in the Manual);
5) Using the product in environments subject to corrosive gases, excessive humidity and/or dust;
6) Showing signs of tampering with security seals;
7) Showing signs of opening or modification by the Customer in places of the product not authorized by Pumatronix;
8) Damage caused by accidents/falls/vandalism;
9) Displaying a tampered and/or removed serial number;
10) Damage resulting from the Customer's transportation and packaging of the product in conditions incompatible with it;
11) Misuse and not in accordance with the instruction manual.

13. Privacy Policy

In compliance with the General Data Protection Law (LGPD) - Law No. 13709, dated August 14, 2018, this product has programmable functions for capturing and processing images that may infringe the LGPD when used in conjunction 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 control of the information and ways of operating the product are the sole decision of the user or purchaser of the product.


PUMATRONIX
www.pumatronix.com