

ITSCAMPRO

ITSCAMPRO NM1

SOLUTION FOR DETECTING AND SCREENING NON-METROLOGICAL INFRACTIONS

| Product

Pumatronix Equipamentos Eletrônicos Ltda.

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Changes History

Date	Revision	Updated content
09/26/2024	1.0	Initial issue referring to Software version 1.6.1
10/14/2024	2.0.0	Initial issue referring to Software version 1.7.0 Addition of the <i>NM1 Compact Frame</i> model; General updating of components

Overview

The management of Smart Cities through the use of Information and Communication Technologies (ICTs) is a trend in public management. These technologies are becoming more and more relevant for inspection, monitoring, control and efficient and rapid decision-making. In addition, they make it possible to scale the implementation of a solution, using fewer human resources, greater geographical coverage, 24-hour monitoring with greater data reliability.

ITSCAMPRO NM1 is a complete solution for non-metrological inspection. Composed of integrated hardware and software, it contains image capture and processing devices, illuminators, a control panel and offers integration with systems such as NEVADA/SIGAEM and ITSCAMPRO. Implementing this solution allows for better economic development, increased quality of life and more efficient urban operations in Smart Cities.

ITSCAMPRO NM1 is the solution developed by Pumatronix for application in various traffic flow monitoring and management requirements. It makes it possible to register devices and collect images, providing detailed information on the capture, such as license plate identification (OCR), date and time, the infraction detected and the data from the sensors installed in the lane.

The main facilities and functionalities offered by the system are:

- Detection of the presence of vehicles using intelligent algorithms for analyzing the images generated, called *Virtual Trigger*, which is non-intrusive to the road surface;
- Logs of vehicle traffic flow;
- Automatic license plate recognition (OCR);
- Image logs (in JPEG format);
- Video logs for counterevidence of a violation;
- Temporary storage of violations in the system, until they are sent to the sorting system;
- Possibility of operating according to schedule;
- Precision clock;
- Digital Signature of logs;
- Integration with the NEVADA/SIGAEM and CETAI-BHTRANS systems.

This INMETRO-approved system contributes to greater safety for society by meeting the various traffic control needs, such as the inspection of infractions under the CTB - Brazilian Traffic Code, meeting the specific requirements of non-metrological automatic systems:

- DENATRAN's Ordinance No. 16, dated 09/21/2004:
 - 1) Running a red light (Art. 208);
 - 2) Stopping the vehicle on the crosswalk when the light changes (Art. 183);
 - 3) When moving, failing to keep the vehicle in the lane designated for it by the regulatory signaling (Art. 185, item I);
 - 4) Driving a vehicle in a lane or Road regulated as Exclusive Circulation for a certain type of vehicle (Art. 184, items I and II);
- DENATRAN's Ordinance No. 27, dated 06/30/2005:
 - 5) Driving in places and at times not permitted by the regulations established by the competent authority for all types of vehicles (Art. 187, item I);
- DENATRAN's Ordinance No. 263, dated 11/28/2007:
 - 6) Performing U-turns in places prohibited by signaling (Art. 206, item I);
 - 7) Performing right or left turns in places prohibited by signaling (Art. 207);

- DENATRAN's Ordinance No. 870, dated 10/26/2010:
 - 8) Failing to enter vehicle weighing areas (Art. 209);
 - 9) Crossing, without authorization, a roadblock located at the exit of vehicle weighing areas (Art. 209).

Handling Risks



Use of an installed monitoring point: The system supports the inspection of more than one violation at the same monitoring point, as long as the necessary framing for the panoramic image is applied in the *Main Module*.



Data Storage: The data generated by ITSCAMPRO NM1 is sent to the NEVADA/SIGAEM or CETAI (BHTRANS) system for storage. To see the logs recorded, access the interface of the respective integrated software. Passage logs can be sent to ITSCAMPRO when there is integration.



Visualization of the images generated in ITSCAMPRO NM1: In order to be able to temporarily view images of the offending vehicle on the main screen of the ITSCAMPRO NM1 software, the capture device must be configured to *Send images to the web*.



Security Locking: The *NM1 Frame* or *NM1 Compact Frame* allows different types of locking, such as padlocks or proprietary code keys, according to the criteria of the requirements.



Use Restriction: Never disconnect the *Hardkey* from the *Local Processing Unit*, as this component is responsible for automatically reading license plates from captured images.



Data distribution: The content generated by ITSCAMPRO NM1 (captured images and data) is protected by a username and password. However, it is up to the system administrator to control the users who have access to the information and the dissemination of the content.



Roadside installation: If the number of lanes in the road exceeds 3, one of the *Secondary Modules* can be mounted on the opposite side of the road, so that there is no image distortion or masking of the license plate of the vehicle located in the far lane, which has a greater angle between the image capture and processing device and the vehicle.



Oxidation Risk: The electrical and signal connections made to the ITSCAM bundle and the data network cable must remain protected in the *Protection Box* to prevent oxidation of the connections and unwanted infiltration of liquids into the bundle.



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



Damage to the eyesight: The ITSLUX illuminator and the integrated illuminator of the ITSCAM VIGIA+ device emit thermal and light energy (not visible in infrared models), so it is not recommended to look directly at the LEDs. It is also not recommended to use any optical instruments to look directly at the LEDs.

Models

The ITSCAMPRO NM1 system consists of three modules with different functions for installation at a vehicle traffic monitoring point on a road:

- Main Module, contains the equipment responsible for acquiring the panoramic image, indicating the context of the infraction committed, composed of:
 - 1 ITSCAM VIGIA+ image capture and processing device.

Available model	Position	Resolution	Estimated range (in meters)*
ITSCAM VIGIA+ (S07L1IT1P)	Panoramic	640x480 px	NA

*License plate characters remain legible in the OCR reading within the distance range of the estimated range, defined according to the lens applied to the model. The 640x480 px resolution model (S07 sensor) is only used for panoramic monitoring, without OCR reading.

- Secondary Module, consisting of:
 - 1 ITSCAM 411 image capture and processing device;
 - 1 *Protection Box*, model PTX12, which accommodates the ITSCAM 411 capture device;
 - 1 ITSLUX illuminator, ITSLUX I1516 (0932) or ITSLUX I3090 (0932) models.

Available model	Position	Resolution	Estimated range (in meters)*
ITSCAM 411 (S04L3)	Front or Rear	1280x960 px	4 to 45m (4.7-47mm)



Use of an installed monitoring point: The system supports the inspection of more than one infraction at the same monitoring point, as long as the necessary framing for the panoramic image is applied in the *Main Module*.

- Tertiary Module, comprising:
 - *Electrical Devices* necessary for the operation of the system, compatible with the frame model;
 - *NM1 Frame* or *NM1 Compact Frame*, to accommodate the respective *Electrical Devices* and weather protection.

NM1 Frame model available	Dimensions (LxWxH)	Electrical Devices
NM1 Frame	452 x 243 x 618 mm	• General Connector • Power Supply Unit • Switch • ULP Power Supply • Electrical Surge Protector (220Vac Circuit) • Circuit breaker • Cooler • ULP-Local Processing Unit with Hardkey • Surveillance board • Electrical Surge Protector (24Vac Circuit) • Solid State Relay • Relay (24Vdc, 127Vac or 220Vac)

NM1 Compact Frame	432 x 240 x 446 mm	• General Connector • Power Supply Unit • Switch • Plug socket • Electrical Surge Protector (220Vac Circuit) • Circuit breaker • ULP-Local Processing Unit with Hardkey • Surveillance board • Electrical Surge Protector (24Vac Circuit) • Solid State Relay • Relay (24Vdc, 127Vac or 220Vac)
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The figure shows an example of how the ITSCAMPRO NM1 system can be installed, when mounted to a pole on the road:



Figure 1 - Example of ITSCAMPRO NM1 installation at a road monitoring point, containing: 1) Main Module, 2) Secondary Modules, 3) Tertiary Module

The ITSCAMPRO NM1 modules are installed according to the type of violation to be inspected, considering the different framing and configuration requirements that must be met, as specified in the [Surveillance Positioning Requirements](#).

The general traffic and conduct rules governing the use of roadways and traffic offenses are established by the Brazilian Traffic Code-CTB. Failure to comply with any of the articles of the CTB constitutes a traffic violation, which can be detected by ITSCAMPRO NM1:

- 1) Stopping the vehicle on the crosswalk when the light changes (Art. 183);
- 2) Driving a vehicle in a lane or Road regulated as Exclusive Circulation for a certain type of vehicle (Art. 184);
- 3) When the vehicle is moving, failing to keep it in the lane designated for it by the regulatory signaling (Art. 185);
- 4) Driving in places and at times not permitted by established regulations (Art. 187);
- 5) Performing U-turns in places prohibited by signaling (Art. 206);
- 6) Performing right or left turns in places prohibited by signaling (Art. 207);
- 7) Running a red light (Art. 208);
- 8) Failing to enter vehicle weighing areas (Art. 209);
- 9) Crossing, without authorization, a roadblock located at the exit of vehicle weighing areas (Art. 209).

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1. About the Product

The ITSCAMPRO NM1 system consists of a set of equipment and software capable of detecting the presence of vehicles using a method that is not intrusive to the road surface, applying intelligent algorithms for graphical analysis of the images captured by the device, called *Virtual Trigger*. This feature captures an image at the moment when movement is detected when a vehicle passes by, through image analysis carried out by the ITSCAMPRO NM1 *Secondary Module*, which performs statistical analysis to determine which images are most likely to contain a vehicle.

When applied to vehicle flow monitoring, the positioning of the ITSCAMPRO NM1 modules in the installation is defined by the type of violation to be monitored, and correct operation is guaranteed by connecting the modules as shown in the diagram:

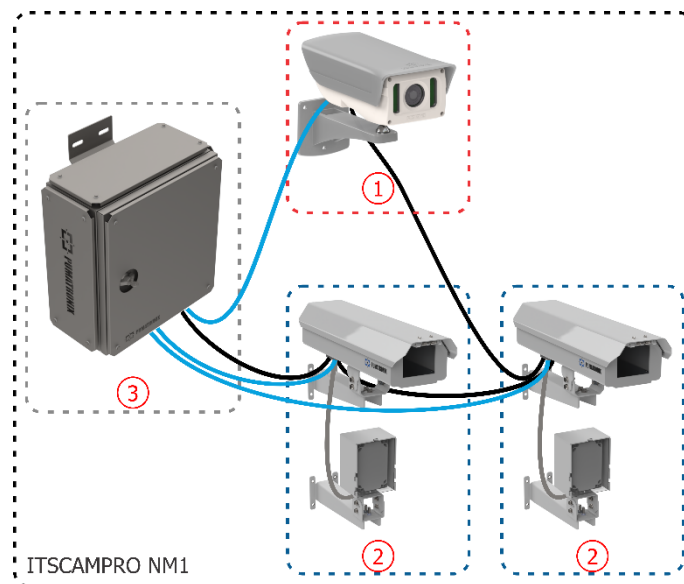


Figure 2 - Diagram illustrating the connection between the ITSCAMPRO NM1 Modules: 1) Main Module, 2) Secondary Module, 3) Tertiary Module

ITSCAMPRO NM1 is operated by three interconnected modules with different functions:

- *Main Module*, which works together with the *Secondary Modules* and sends the data to the *Tertiary Module*. It supports the processing of a maximum of 3 simultaneously connected *Secondary Modules* and is responsible for:
 - Capturing a panoramic image of the site;
 - Storing logs made and/or received;
 - Setting parameters for each type of violation;
 - Sending the logs to the ULP-Local Processing Unit.
- *Secondary Module*, which monitors and sends data to the *Primary Module* for a lane and is responsible for:
 - Detecting the presence of vehicles through image analysis (Virtual Trigger);
 - Recognizing the license plate;
 - Capturing an image of the offending vehicle;
 - Sending the data to the *Main Module*;
- *Tertiary Module*, which offers the accessory items and the *ULP-Local Processing Unit*, with support for processing data from up to 3 tracks when the ITSCAM device is set up for continuous capture (*Virtual Trigger*), or up to 8 lanes when configured for physical trigger, when using the inductive

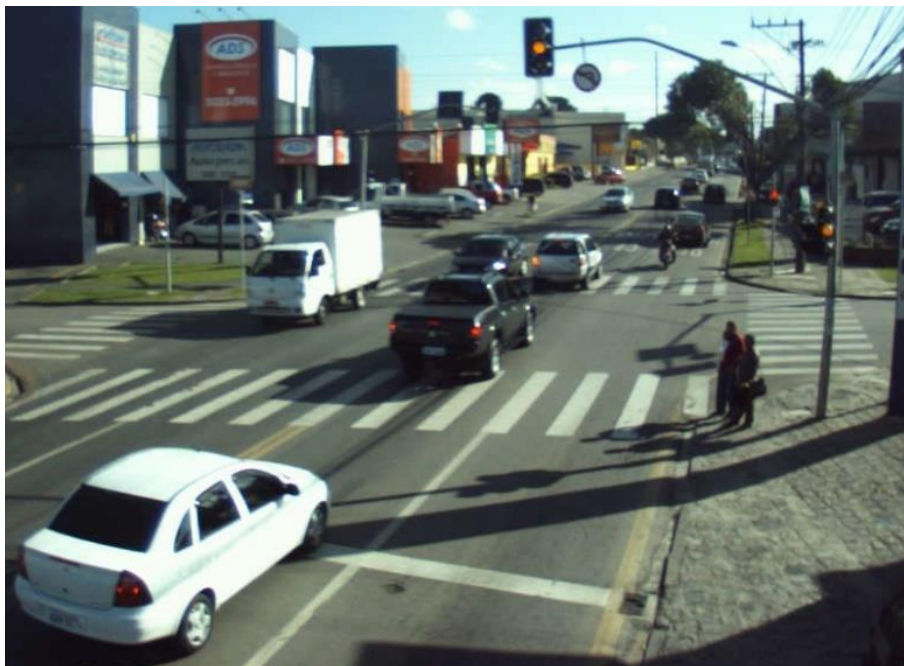
loop. It shows the factory built-in devices attached to the internal panel of the respective frame, with their respective functions:

- *ULP - Local Processing Unit*, which stores the data captured from the monitored lanes;
- Data network infrastructure equipment, which connects to the *Main Module* and the *Secondary Module*;
- Power supply, which energizes the entire assembly of connected equipment;
- *Electrical Devices* to protect against surges and short circuits;
- GPS;
- Mechanism for receiving signals associated with violations (signal indicating the status of the traffic light group's red light or inductive loop signal).

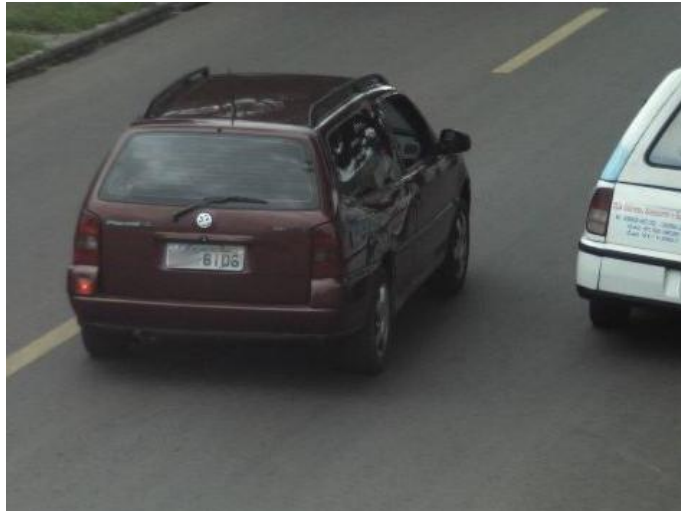
2. Information Generated

ITSCAMPRO NM1 is mainly responsible for generating the images that contain the information used to monitor the vehicle traffic on the roads and that prove the violations related to the Brazilian Traffic Code:

- 1) The image and video with panoramic framing, showing all the items in the environment that characterize the context in which the violation happened, is generated by the ITSCAM VIGIA+ device in the Main Module:



- 2) The image of the vehicle, with the license plate identified in the OCR reading and which allows the category and model of the vehicle to be identified, is generated by the ITSCAM 411 device in the Secondary Module:



- 3) The violation log contains the synchronized images captured by the *Main Module* and *Secondary Module*, which correspond to the same identified vehicle and make it possible to attest to the type of violation committed. Violation logs can be viewed via the NEVADA/SIGAEM system interface.

2.1. Log Query

The logs made contain the data processed by the ITSCAMPRO NM1 and can be viewed and managed via the ITSCAMPRO or NEVADA/SIGAEM software interface, which also makes it possible to manage violations to be sent to a violation server.



Data Storage: The data generated by ITSCAMPRO NM1 is sent to the NEVADA/SIGAEM or CETAI (BHTRANS) system for storage. To see the logs recorded, access the interface of the respective integrated software. Passage logs can be sent to ITSCAMPRO when there is integration.

The example of a violation log generated by ITSCAMPRO NM1 and displayed in NEVADA/SIGAEM refers to article 208 of the Brazilian Traffic Code, which prohibits '*Running a red traffic light or mandatory stop sign*':



OCR



Panorâmica



Auxiliar

Reproduzir Vídeo

LOCAL/SENTIDO: R. Bartolomeu Loureno de Gusmao
 FAIXA DE MONITORAMENTO: Faixa 1 DATA: Quarta-feira 16/10/2024 HORARIO: 14h52min44s
 MODELO DO EQUIPAMENTO: ITSCAMPRO-NM1 FIXO CODIGO DO EQUIPAMENTO: NM1_Pumatronix
 CODIGO DA INFRACAO: 773-01 DESCRICAO DA INFRACAO: Evadir-se sem pagar pedagio
 REG. INMETRO: 009046/2019

NUM. DA IMAGEM: 00026825



Registro 050396

Placa A 63

Etapa Triagem

Status Ativo

Atualizar TAG

TAG : ---
 Emissor : ---
 Status Passagem : ---
 Status Atual : ---

sigam inserir o registro 050396 na etapa triagem

16/10/2024 14:53:27

Figure 3 - Violation log displayed on the NEVADA interface

2.2. Interface Viewing

When accessing the ITSCAMPRO NM1 system, the *Violation Viewing* home screen shows a preview of the images captured for the most recent log of a violation committed by the vehicle, containing the images captured live by the *Main Module* and *Secondary Module* equipment and the respective license plates detected in the OCR reading carried out on each device.



Visualization of the images generated in ITSCAMPRO NM1: In order to be able to temporarily view images of the offending vehicle on the main screen of the ITSCAMPRO NM1 software, the capture device must be configured to *Send images to the web*.

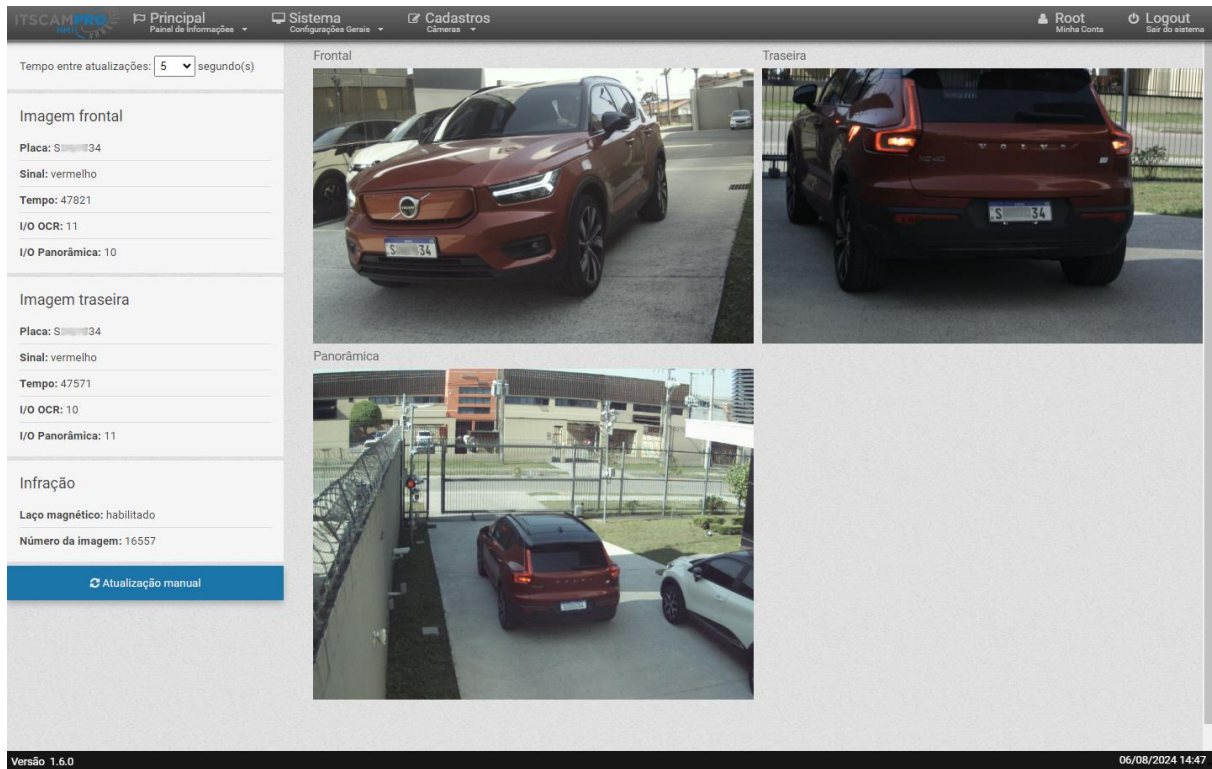


Figure 4 - Violation Viewing home screen

3. Additional Documentation

Product	Link	Description
ITSCAM VIGIA+	Product Manual	Manual with advanced settings for the ITSCAM VIGIA+ image capture device
	Integration Manual	Programming and integration manual containing the information needed to integrate the ITSCAM 400 family with an application
	Installation and Maintenance Guide	Guide containing the information needed to install and maintain ITSCAM VIGIA+
ITSLUX	Product Manual	Manual with ITSLUX image capture device advanced settings
	Integration Manual	Programming and integration manual containing the information needed to integrate ITSCAM 600 with an application
	Installation and Maintenance Guide	Guide containing the information needed to install and maintain ITSLUX
ITSCAMPRO NM1	Installation and Maintenance Guide	Guide containing the information needed to install and maintain ITSCAMPRO NM1
	Integration Manual	Programming and integration manual containing the information needed to integrate ITSCAMPRO NM1 with an application

4. Mechanical Specifications

The ITSCAMPRO NM1 system is a set of modules connected to each other as shown in the [Diagram illustrating connections between modules](#).

4.1. Main Module

The *Main Module* consists of:

- 1 ITSCAM VIGIA+ image capture and processing device.

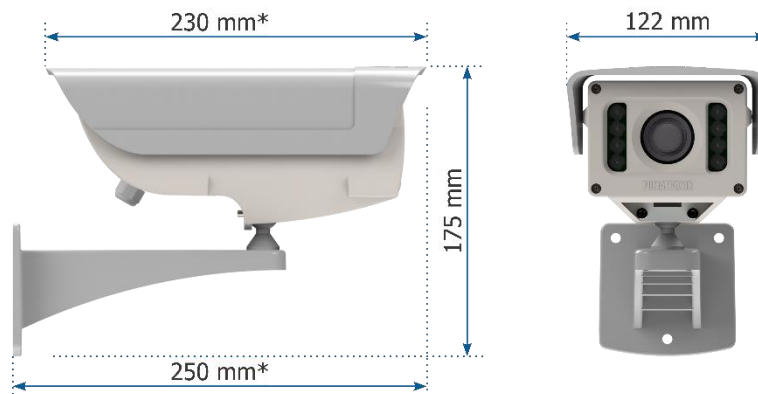


Figure 5 - ITSCAM VIGIA+ dimensions

**Dimension considering the Sliding Flap in its initial position.*

- Material: Polycarbonate with UV protection;
- IP protection: IP67;
- Mounting:

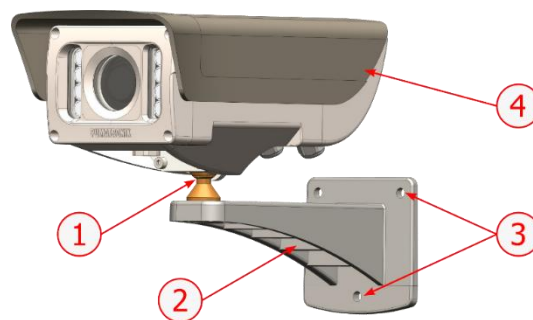


Figure 6 - VIGIA+ Bracket mounting: 1) Tilt adjustment of the VIGIA+ device; 2) VIGIA+ bracket; 3) Mounting points, using 3/16" bolts; 4) Sliding flap, adjusted to the frame

- The VIGIA+ Fastener, together with the Reinforcement and 2 M4 Allen 3mm bolts, allow the equipment to be attached to the VIGIA+ Bracket:

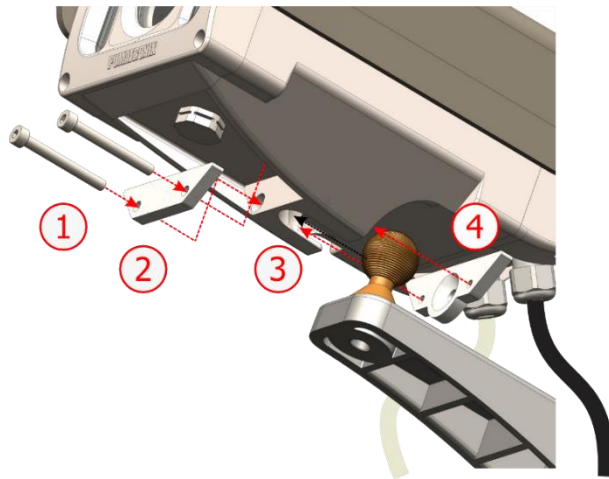


Figure 7 - VIGIA+ Fastener assembly: 1) 3mm M4 Allen bolts (2 units); 2) Reinforcement; 3) VIGIA+ cavity; 4) Fastener

- Interfaces: Ethernet connection and 12-way sleeve cable;
- Operating temperature: -10°C to 60°C;
- Weight: 955g;
- Mechanical Protection: Adjustable flap (to protect lenses from direct sunlight);
- Lenses: Motorized, with infrared correction and 3-10mm focal length;
- Illuminator: Infrared, integrated and with variable light output.



Damage to the eyesight: The illuminator integrated into the equipment emits thermal and light energy (not visible because it is infrared lighting), so it is not recommended to look directly at the LEDs. It is also not recommended to use any optical instruments to look directly at the LEDs. In the event of malfunctions, send the product to Pumatronix Technical Support.



ITSCAM VIGIA+ assembly: Check the correct way to assemble ITSCAM VIGIA+ set with its support by accessing the device's Installation and Maintenance Guide.

4.2. Secondary Module

The *Secondary Module* consists of:

- 1 ITSCAM 411 image capture and processing device;
- 1 PTX12 Protection Box;
- 1 ITSLUX illuminator with mounting bracket, where applicable.

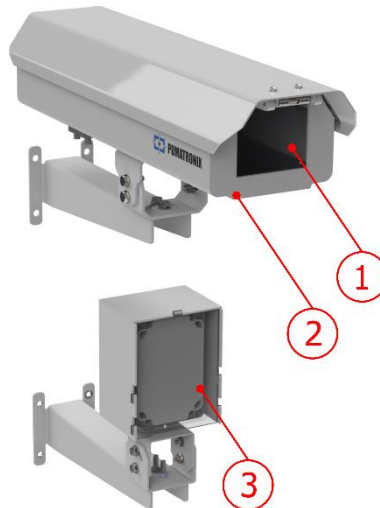


Figure 8 - Secondary Module: 1) ITSCAM 411, 2) PTX12 Protection Box, 3) ITSLUX with bracket

4.2.1. Protection Box

The *Protection Box* is responsible for packaging and protecting image capture and processing devices and connections from the weather. It is supplied with a bracket for mounting to a variety of structures.

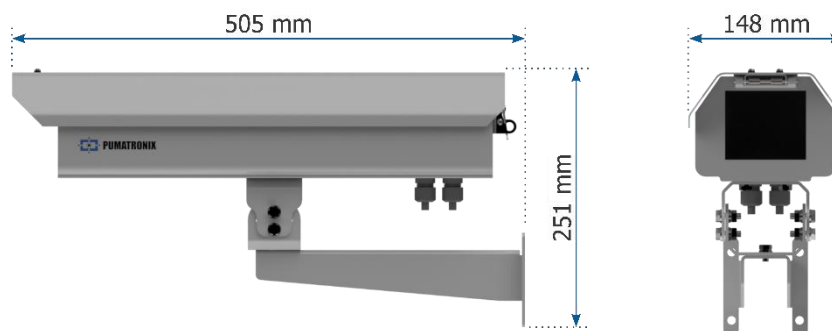


Figure 9 - PTX12 Protection Box Dimensions

- Material: Die-cast and extruded aluminum, injected aluminum front and back covers finished in 26MT beige semi-matte textured polyester electrostatic paint;
- IP protection: IP66;
- Mounting:
 - Cast aluminum multi-angle support, with aluminum swivel secured with stainless steel bolts. It is possible to request *XYZ Bracket*, which allows horizontal, vertical and diagonal movement:

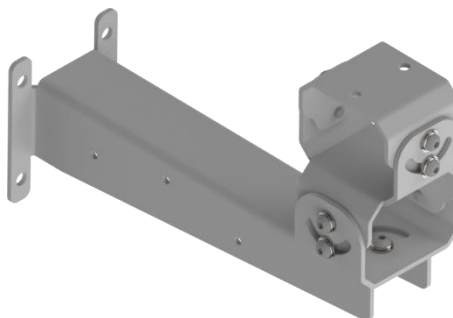


Figure 10 - Optional XYZ bracket:

- Internal rail made of aluminum for adjusting the mounting of the image capture device;

- Resistance: High degree of tamper resistance with IK10 certification;
- Interfaces:
 - 4 PG7 cable glands;
 - Stainless steel quick lock for use with padlock/lock;
 - Aluminum top cover with pivoting opening, with a set of springs, forcing it to close and open;
 - 5mm thick glass display;
- Sealing:
 - EVA under the entire top cover;
 - It has 4 PG7 cable glands with nut and rubber O-ring;
- Approximate weight: 3.55g;
- Temperature: -10°C to 65°C.

4.2.2. ITSLUX Illuminator

An ITSLUX can optionally be attached to the *Secondary Module* for nighttime lighting or to illuminate the road with reduced vehicle visibility. It is supplied with a mounting bracket.

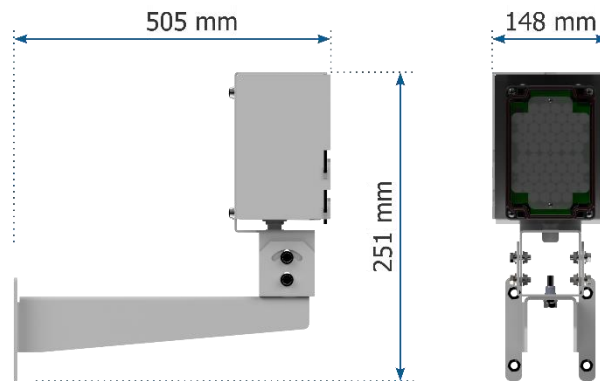


Figure 11 - ITSLUX with bracket

- Material: Polycarbonate;
- Protection Grade: IP67;
- Mounting: ITSLUX Bracket;
- Interfaces: LED operating indicator, 6-way 22 AWG sleeve cable (unshielded) and cover

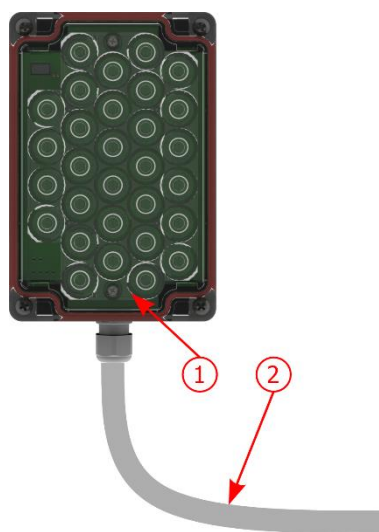


Figure 12 - ITSLUX Interface: 1) LED operating indicator; 2) 6-way sleeve cable

- Approximate weight: 472g (ITSLUX) + 1,250g (Bracket);
- Operating temperature: -10°C to 65°C.



Damage to the eyesight: ITSLUX illuminators emit thermal and light energy (not visible in infrared models), so it is not recommended to look directly at the LEDs. It is also not recommended to use any optical instruments to look directly at the LEDs.



ITSLUX assembly: Check the correct way to assemble the ITSLUX set with its support by accessing the device's Installation and Maintenance Guide.

4.3. Tertiary Module

The *Tertiary Module* consists of:

- NM1 Frame or NM1 Compact Frame that accommodates and protects Electrical Devices and connections;
- Electrical Devices responsible for operating the ITSCAMPRO NM1 system.

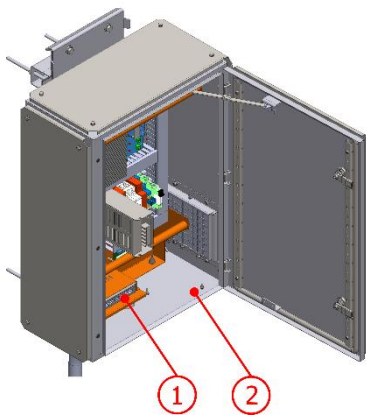


Figure 13 - Tertiary Module with NM1 Frame: 1) Electrical Devices; 2) NM1 Frame

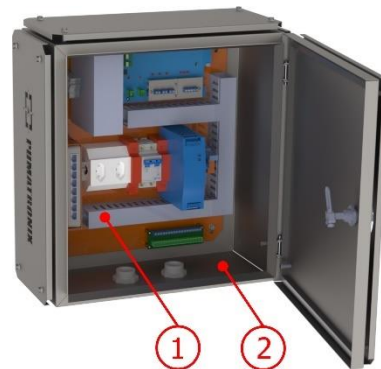
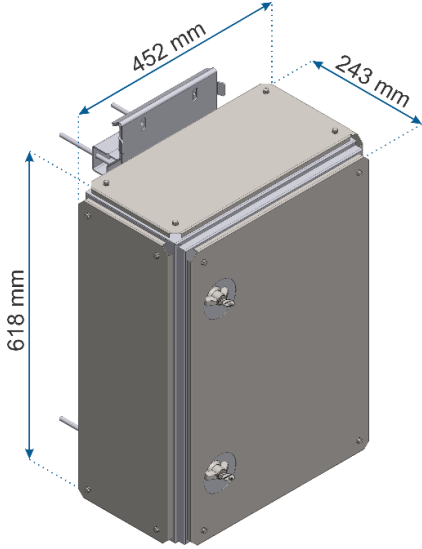
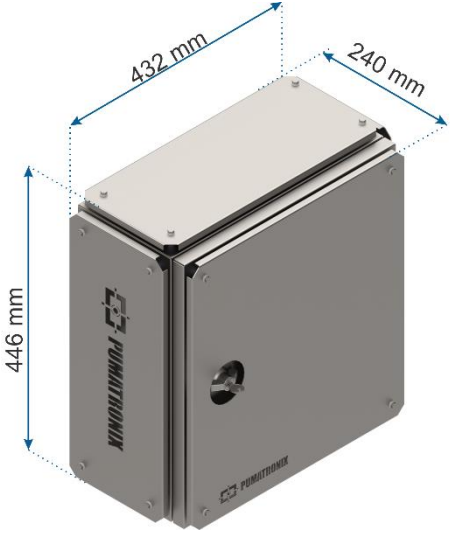


Figure 14 - Tertiary Module with NM1 Compact Frame: 1) Electrical Devices; 2) NM1 Frame

4.3.1. NM1 Frame and NM1 Compact Frame

The *NM1 Frame* or *NM1 Compact Frame* is responsible for storing and protecting *electrical devices* and connections from the weather. It is supplied with an attached bracket that allows it to be mounted to pole structures of varying shapes. The mechanical specifications of each can be compared in the table:

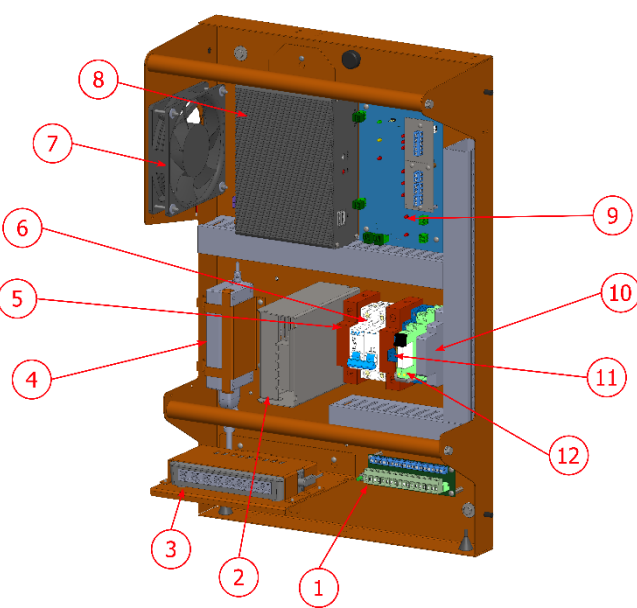
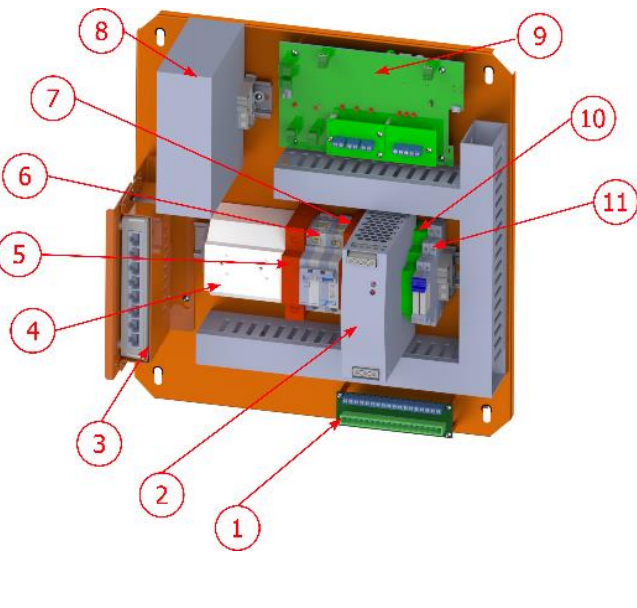
NM1 Frame	NM1 Compact Frame
	
Figure 15 – NM1 Frame Dimensions	Figure 16 - NM1 Compact Frame Dimensions
• Material: Steel with RAL 7032 Paintwork; • IP protection: IP65; • Mounting: Bolted to the upper and lower support; • Bracket: The bracket can be installed on flat surfaces (such as columns and walls) and poles of varying shapes; • Mechanical Protection: Thermal dissipation via Cooler (optional) and Deflectors; • Interfaces: It has two locks and a mechanism that keeps the door open during the maintenance process; • Connections: Sealtube on the base to protect the cable routing; • Operating temperature: -10°C to 60°C.	• Material: Galvanized Aisi 1020 carbon steel; • IP protection: IP66; • Mounting: Bolted to the upper and lower support; • Bracket: The bracket can be installed on flat surfaces (such as columns and walls) and poles of varying shapes; • Mechanical Protection: Thermal dissipation through the side plates; • Interfaces: Deadbolt lock and mechanism that keeps the door open during the maintenance process; • Connections: Sealtube on the base to protect the cable routing; • Operating temperature: -10°C to 55°C.



Security Locking: The *NM1 Frame* or *NM1 Compact Frame* allows different types of locking, such as padlocks or proprietary code keys, according to the criteria of the requirements.

4.3.2. Electrical Devices

The Electrical Devices are arranged internally in the *NM1 Frame* or *NM1 Compact Frame* and support the operation of the ITSCAMPRO NM1 system. The *Electrical Devices* that act on the electrical protection mechanisms are fixed to the internal panel and are detailed in the [Electrical Specifications](#):

NM1 Frame Electrical Devices	NM1 Compact Frame Electrical Devices
	
- General Connector - Power Supply Unit - Switch - ULP Power Supply - Electrical Surge Protector (220Vac Circuit, 2 units) - Circuit breaker - Cooler - ULP-Local Processing Unit with Hardkey - Surveillance Board - Electrical Surge Protector (24Vac Circuit) - Solid State Relay - Relay (24Vdc, 127Vac or 220Vac)	- General Connector - Power Supply Unit - Switch - Brazilian standard plug according to ABNT NBR 14136, 10A (2 units) - Electrical Surge Protector (220Vac Circuit) - Circuit breaker - Electrical Surge Protector (220Vac Circuit) - ULP-Local Processing Unit with Hardkey - Surveillance board - Electrical Surge Protector (24Vac Circuit) - Solid State Relay

5. Electrical Specifications

- Power Supply: 110Vac or 220VacC (10%), or 9-36Vdc
- Supply Voltage Frequency: 60Hz (+/- 10%)
- Maximum consumption: 1kWh
- Average consumption (two lanes): 0.2kWh
- Protection against Atmospheric Discharges/Surge at the entrance: 4kA, 8/20 μ s

The system supports the simultaneous use of up to 3 *Secondary Modules* connected to the *Auxiliary Module*, considering the configuration used for continuous image capture, or *Virtual Trigger*.

The ITSCAMPRO NM1 is compatible with the installation of a solar panel to power the set. In the same way, a UPS can be used for system safety, internally to the Control Switchboard, according to the demands of each installation site, as long as it complies with the nominal power supply specifications of ITSCAMPRO NM1.

5.1. Main Module

- Power Supply: 9 to 28Vdc (1A) or Standard 802.3af Power Over Ethernet (PoE);
- Connections: The two connectors available on the *Main Module* interface are used for:
 - Communication: RJ-45 Ethernet connector;
 - Power supply, external connections and Red Signal (traffic light)/External Trigger.

5.2. Secondary Module

- Power Supply: 12 Vdc or 24 Vdc
- Connections: The connectors available on the *Secondary Module* interface are used for:
 - Communication: RJ-45 Ethernet connector;
 - ITSLUX Illuminator Power Supply or Trigger Signal.

5.3. Tertiary Module

The *Tertiary Module* is responsible for the ITSCAMPRO NM1 system's connections, provided on the interfaces of the installed *Electrical Devices*, which offer:

- Power;
- External communication;
- Connection to the *Main Module* and *Secondary Modules*.

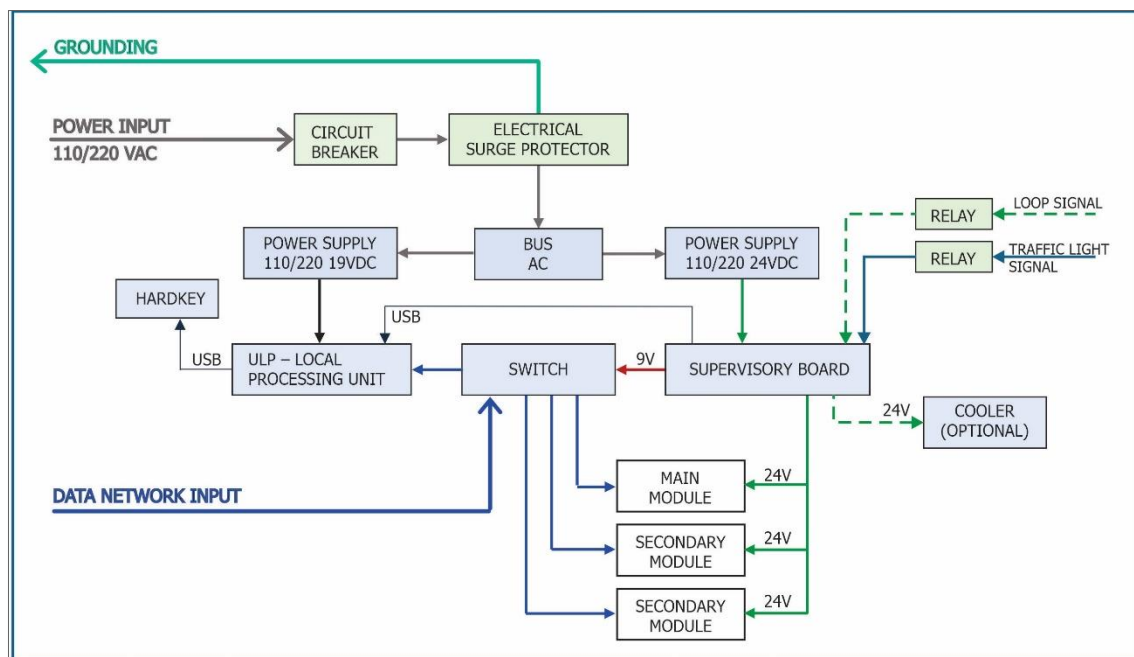


Figure 17 - Electrical Diagram* of Connections in Tertiary Module with NM1 Frame

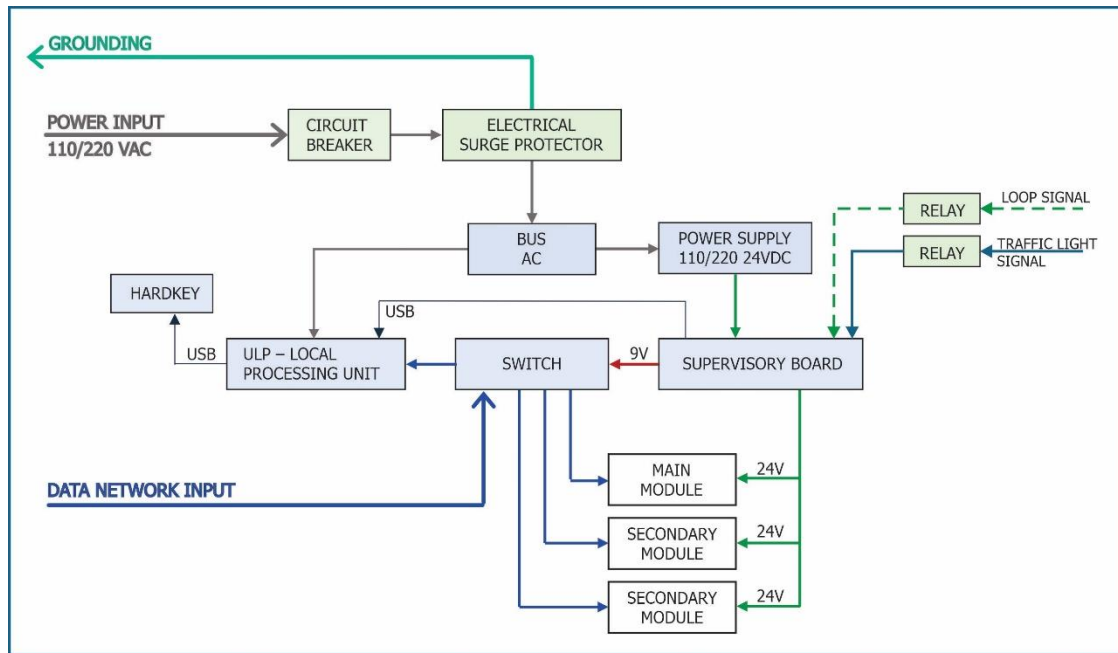


Figure 18 - Electrical Diagram* of Connections in Tertiary Module with NM1 Compact Frame

* The internal connections of the Tertiary Module may differ according to the devices used, which change according to the inspection in which ITSCAMPRO NM1 is applied. For example, if there is no need to analyze the traffic signal for the type of inspection, as in the case of Exclusive Lane monitoring, the Traffic Signal Converter is no longer installed.

5.3.1. Surveillance board (Module Monitoring Unit)

The *Surveillance board* is the electronic component responsible for supplying power to the equipment in the *Main Module* and *Secondary Module* and for monitoring the operation and communication of the ITSCAMs and the *Local Processing Unit (ULP)*. When it identifies malfunctions in any component of the ITSCAMPRO NM1, this board acts on the installation.

The connections to the *Surveillance board* are detailed in the NM1 Installation and Maintenance Guide.

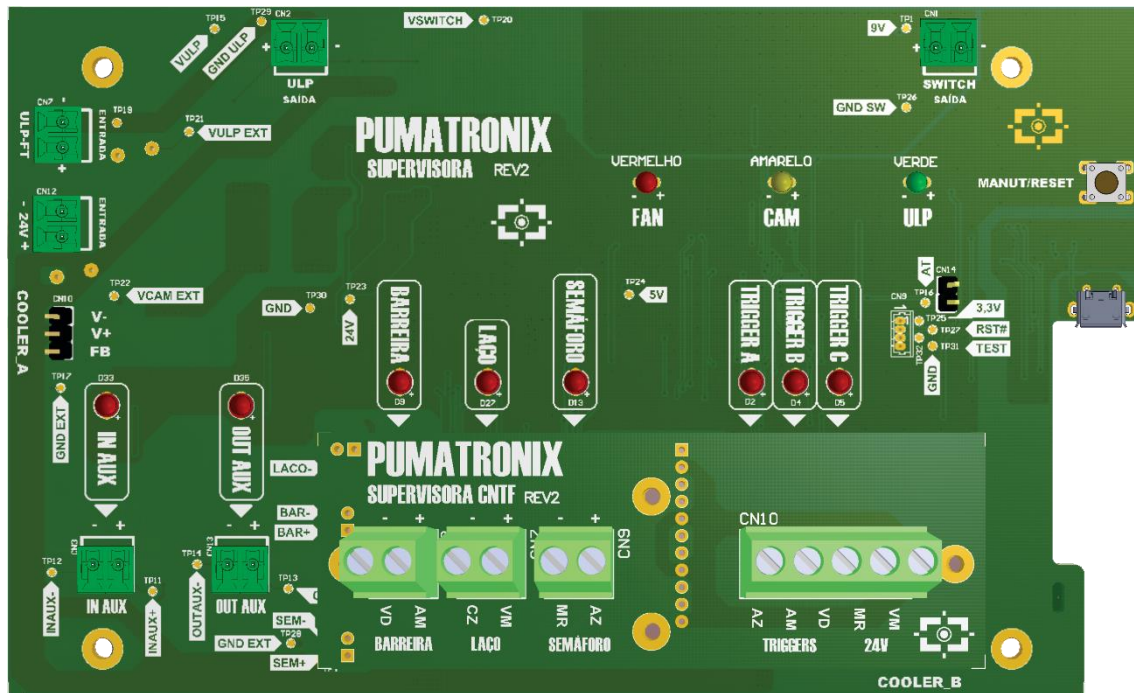


Figure 19 - Surveillance board Rev2

- Interfaces:
 - MANUT button for temporarily suspending monitoring activities to carry out maintenance;
 - Indicator LEDs for the activation of the road sensors;
 - Indicator LEDs for the signals sent to the ITSCAM devices;
 - Indicator LEDs for the monitored components (ULP, Cooler and Switch).
- Operating temperature: -10°C to 50°C.

The cables numbered in the diagram must be used for connections to the *Surveillance board*:

- 1) Power connection: 1 0.75 3-way Pp cable;
- 2) Power supply connection: 1 2-way cable;
- 3) Connection to lane sensor: 1 2-way cable (for each sensor);
- 4) Connection to ITSCAM VIGIA+: 1 shielded 8x22AWG sleeve cable;
- 5) Data connection: 3 CAT-5E Furukawa External cables (one for each ITSCAM VIGIA+).

5.3.1.1. Behavior of the LEDs on the Surveillance board

The Surveillance board Rev2 displays equipment supervision information via the LED interface. Each LED indicates the behavior of a specific component or piece of equipment, as detailed in the table.

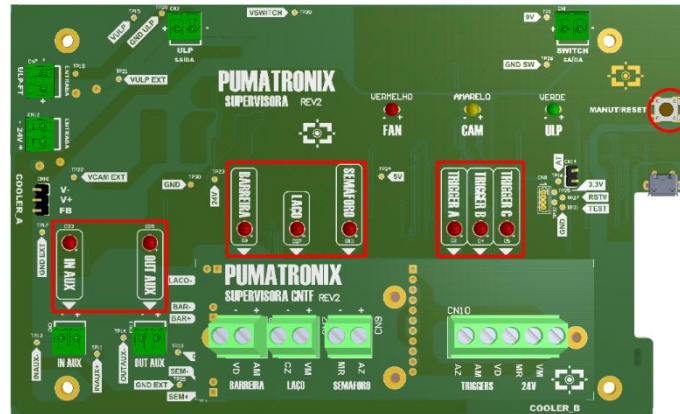


Figure 20 - LED position on the Surveillance board Rev2

Interface	Behavior
MANUT/RESET button	When pressing the <i>Surveillance board</i> maintenance mode button, the supervisory status of the board is temporarily switched off for 10 minutes. In this mode, the connected equipment can be accessed to carry out some quick maintenance within the time limit, in which the green LED named ULP remains flashing.
TRIGGER A, TRIGGER B and TRIGGER C	They indicate that the signal has been sent to the trigger in ITSCAM and light up when it is sent.
BARRIER, LOOP and TRAFFIC LIGHT	They indicate the signals received from the lane, according to the identification on the <i>Surveillance board</i> . The corresponding LED lights up when the signal is received.
IN AUX	Indicates signal input, lighting up when received.
OUT AUX	Indicates the output of the signal, lighting up when it is sent.

5.3.2. 110/220 - 24Vdc Power Supply

The Power supply is responsible for supplying voltage to the *Main Module*, *Secondary Module*, ITSLUX, Switch and *Surveillance board*.



Figure 21 - Mean Well Power Supply

- Interfaces: Vin, Vout and grounding
- Power: 120W
- Connections: Terminal type
- Power Supply: 85~264Vac (full range)
- Operating temperature: -20°C to 60°C
- Protection: Overload
- Output: 24Vdc

5.3.3. Switch

The *Switch* is responsible for interconnecting the data network of the modules, *ULP (Local Processing Unit)* and the utility company. It offers communication that is always available for data transmission. Regardless of whether the equipment on the network has different speeds, it provides communication without affecting speed. The model used in the *NM1 Frame* and *NM1 Compact Frame* is the INTELBRAS 8-Port Switch:



- Interfaces: 8 Ethernet RJ-45 (10/100Mbps) ports;
- Power Supply: Input 100-240Vac / 50-60Hz; Output 12Vdc / 0.5A
- Operating temperature: 0°C to 40°C

5.3.4. Local Processing Unit (ULP)

The *Local Processing Unit (ULP)* is responsible for:

- acquisition of the images captured by the devices (*Main Module* and *Secondary Module*);
- identification of the license plate captured in the image via OCR (Optical Character Recognition) reading;
- video recording showing the moment when the vehicle committed the traffic violation.

NM1 Frame	NM1 Compact Frame
 Figure 22 - TECSYS Local Processing Unit (ULP)	 Figure 23 - JHCTECH Local Processing Unit (ULP)
• Interface: Ethernet RJ-45 and USB; • Architecture: x86 • Power Supply: Source with 110~220Vac input and 12Vdc output; • Operating temperature: -10°C to 50°C	• Interface: Ethernet RJ-45 and USB; • Power Supply: 9-36Vdc; • Operating temperature: -20°C to 60°C

5.3.5. Hardkey

The *Hardkey* is a USB flash drive-like device that contains the ITSCAMPRO NM1 OCR software license. This means that vehicle license plate identification will not be performed if the *Hardkey* is connected to the *Local Processing Unit* of the *Tertiary Module*.





Use Restriction: Never disconnect the *Hardkey* from the *Local Processing Unit*, as this component is responsible for automatically reading license plates from captured images.

5.3.6. Cooler (Optional)

The *Tertiary Module* cooler with *NM1 Frame* is an optional item and can be used to reduce the internal temperature of the frame structure, favoring the operation of the product in various environments.



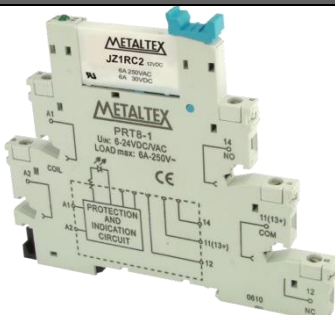
Figure 24 – Cooler (Optional)

- Interface: Power/status connector connected to the *Surveillance board*
- Power Supply: 24Vdc
- Operating temperature: -10°C to 50°C

5.3.7. Electrical Protection Devices

Among the *Electrical Devices* are those that offer protection in the electrical connections, which are distinguished according to the model of the *Tertiary Module*, as indicated in the table:

Two-Phase Circuit Breaker	
	The two-phase circuit breaker is designed to protect the ITSCAMPRO NM1 against possible damage caused by surges and short circuits, by shutting down the entire set.
	• Type: Two-phase • Supported load: 10A
Electrical Surge Protector (220Vac Circuit)	
	The Surge Protector for power grids with 127Vac or 220Vac operating voltage is installed after the input circuit breaker and has the function of protecting circuit elements against electrical voltage surges, usually caused by atmospheric overvoltages or by maneuvers in the electrical system.
	• Operating temperature: -40°C to +70°C • Maximum surge current: 15kA to 90kA

Electrical Surge Protector (24Vdc Circuit)	
	The power grid Surge Protector is a protective component installed in the circuit after the input circuit breaker and whose function is to protect the circuit elements against electrical voltage surges.
	• Operating temperature: -40°C to +70°C • Maximum discharge current: 10kAC • Rated load current: 10AC • Maximum voltage 38Vdc
24Vdc, 127Vac or 220Vac Electromechanical Relay	
	The 24Vdc, 127Vac or 220Vac relay has the function of interconnecting and protecting the traffic light signal from the road installation with the <i>Tertiary Module</i>.
	• Voltage at the input (coil): 24Vdc, 127 or 220Vac (depending on the traffic light signal) • Output voltage: 127 or 220V (depending on the customer's premises) • Output: 6A
Solid State Relay	
	The Solid State Relay has the function of interconnecting and protecting the signals coming from the utility installation with the <i>Tertiary Module</i>.
	• Voltage at the input: 24Vdc • Maximum switching voltage: 28Vdc • Minimum load: 20mA

6. Software Specifications

The ITSCAMPRO NM1 software is operated by the *ULP-Local Processing Unit* located in the *Tertiary Module*. The software is used to set up communication for sending violations to the NEVADA/SIGAEM or CETAI system, which will receive the logs made, the devices and the respective violations that will be applied by the installed ITSCAMPRO NM1 set. Sending logs to ITSCAMPRO is also set up.

To access the ITSCAMPRO NM1 software interface, an *Auxiliary Configuration Equipment* with a Google Chrome browser (version 85 or higher) installed is required.

6.1. Compatibility

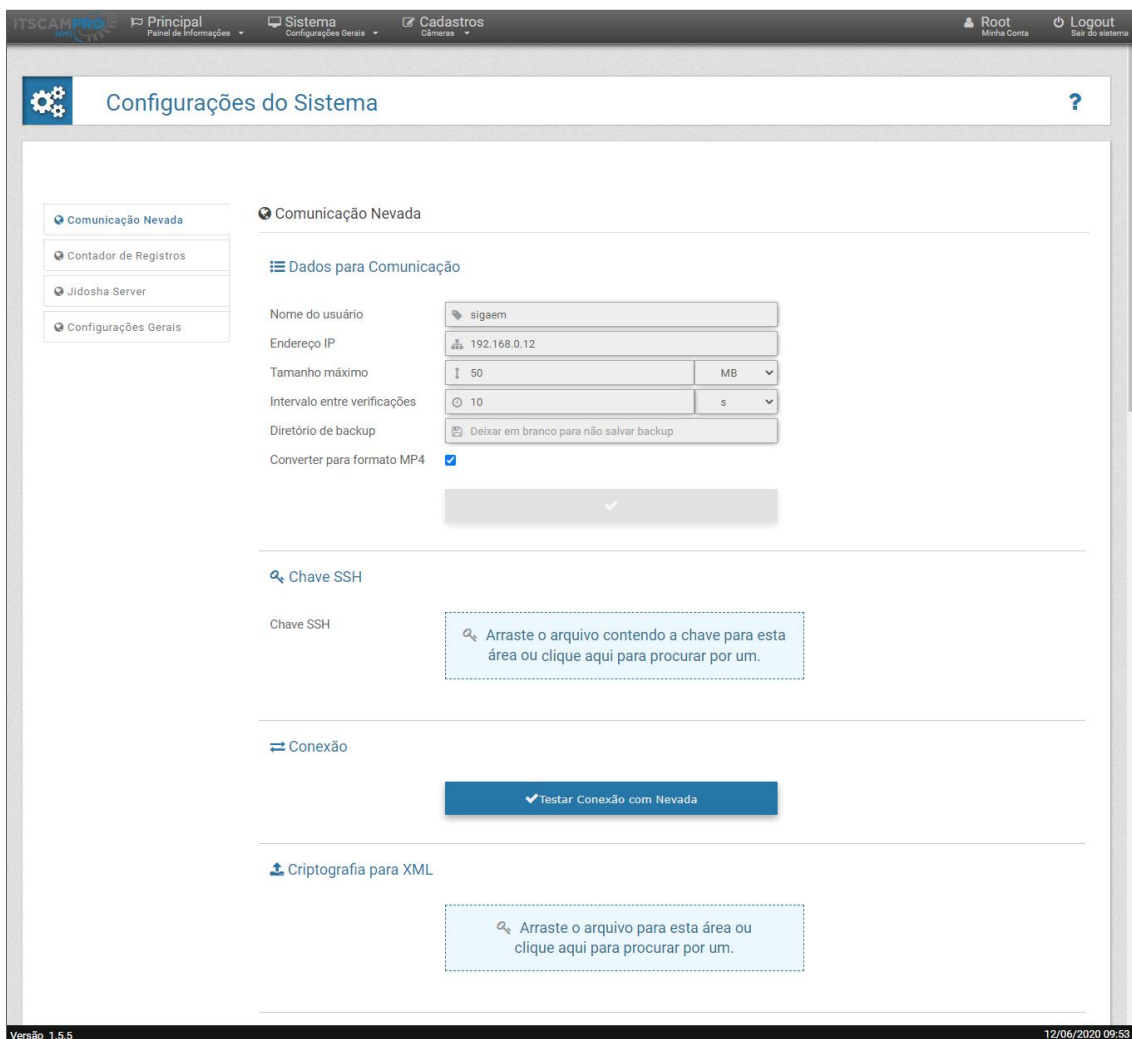
NEVADA/SIGAEM: This version can be used to send non-metrological infringements to NEVADA/SIGAEM from version 1.4.12 onwards. It is recommended that previous versions be updated to a version higher than 1.4.12 so that the logs generated can be received correctly by the systems.

ITSCAMPRO: When using ITSCAMPRO NM1 with version 1.4.0 or higher sending traffic logs to an ITSCAMPRO server, ITSCAMPRO must be updated to version 1.4.2 or higher.

Linux Installation: To update ITSCAMPRO NM1, contact Pumatronix Technical Support so that the software installation package can be made available or use an approved version server.

6.2. Integration with NEVADA/SIGAEM

The ITSCAMPRO NM1 system allows the collected data to be sent to a compatible NEVADA/SIGAEM system in order to store and manage the logs made. This integration must be specified by accessing the configuration options in *System > Nevada Communication*:



The screenshot shows the 'Configurações do Sistema' (System Settings) page. On the left, there is a sidebar with navigation links: 'Comunicação Nevada', 'Contador de Registros', 'Jidosha Server', and 'Configurações Gerais'. The main content area is titled 'Comunicação Nevada' and contains several sections:

- Dados para Comunicação:** This section contains input fields for:
 - Nome do usuário: sigae
 - Endereço IP: 192.168.0.12
 - Tamanho máximo: 50 MB
 - Intervalo entre verificações: 10 s
 - Diretório de backup: Deixar em branco para não salvar backup
 - Converter para formato MP4: ☒
- Chave SSH:** This section has a label 'Chave SSH' and a dashed box with the text: 'Arraste o arquivo contendo a chave para esta área ou clique aqui para procurar por um.'
- Conexão:** This section contains a blue button labeled 'Testar Conexão com Nevada'.
- Criptografia para XML:** This section has a dashed box with the text: 'Arraste o arquivo para esta área ou clique aqui para procurar por um.'

At the bottom of the interface, the version 'Versão 1.5.5' is displayed on the left, and the date and time '12/06/2020 09:53' are displayed on the right.

Figure 25 - Communication settings options

On this screen, on *Communication Data*, the system that will receive the logs generated is identified and the integration is set up:

- **Username:** Identification used to connect to NEVADA/SIGAEM;
- **IP address:** Address of the server on which NEVADA/SIGAEM is installed;
- **Maximum size:** Maximum size, in bytes, KB or MB, allowed for the use of the log directory. When this size is exceeded, the oldest log folders will be deleted until the log directory is smaller than the defined size;

- *Interval between checks:* Time interval, in seconds or minutes, between checks carried out on the log directory by the monitoring service, which checks the total size of the directory and the presence of files that indicate a complete log for transmission;
- *Backup directory:* Indication of the directory in which the backup of the compressed log files should be saved. Whenever a new file is copied to this directory, the oldest files are deleted. Leave this field blank so as not to store backup files;
- *Convert to MP4 format:* When selected, the video created in the log is converted to MP4 format before being compressed, backed up and sent. When it doesn't convert, the default format used is AVI.
- *SSH Key:* The configuration of the SSH Key with the NEVADA/SIGAEM server promotes a secure connection between the equipment, ensuring the transfer of data and making it impossible for information to be breached. It consists of importing the file generated by NEVADA/SIGAEM containing the public encryption key used to authenticate the communication. If it is not in the ITSCAMPRO NM1 system, the connection cannot be established. After importing the switch, to test communication with NEVADA/SIGAEM use the *Test Connection* with Nevada button.
- *Encryption for XML:* The *Encryption for XML* setting requires uploading the public encryption key generated by NEVADA/SIGAEM to XML, which uses the RSA standard. The standard used for the generated images is AES.

6.2.1. Log Counter

By setting up the *Log Counter*, the images generated by ITSCAMPRO NM1 will be identified with the number entered, which always refers to the next log that will be sent to the server. To change or reset the log counter, simply fill in the field with the number that identifies the images:

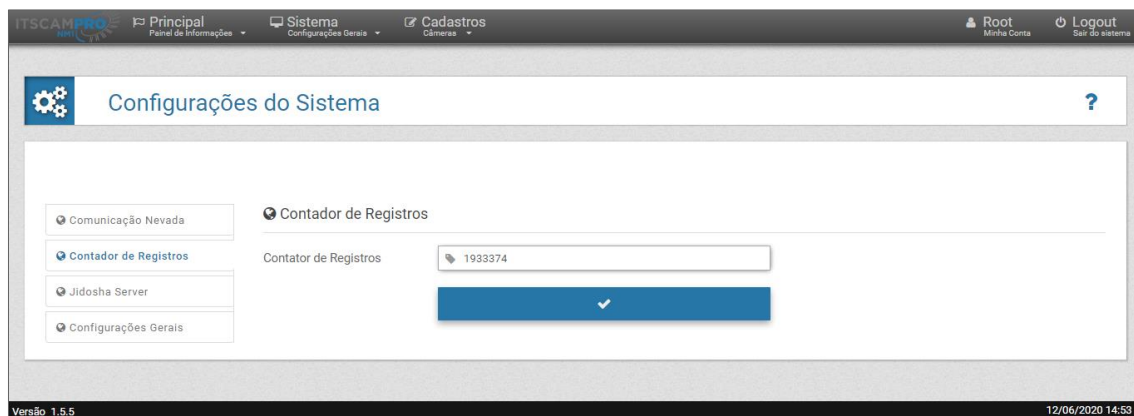


Figure 26 - Log Counter settings screen

7. Licensing

The ITSCAMPRO NM1 software license is a single file associated with the hardware on which the system is installed. If it is necessary to install it on another processing unit, a new license must be requested from Pumatronix Technical Support.

ITSCAMPRO NM1 version 1.7.0 is compatible with ITSCAM and ITSCAM VIGIA+ devices from version 17.31 onwards.



Data distribution: The content generated by ITSCAMPRO NM1 (captured images and data) is protected by a username and password. However, it is up to the system administrator to control the users who have access to the information and the dissemination of the content.

8. Initial Settings

Prior to installing ITSCAMPRO NM1, the pre-requisites must be met and certain conditions must be met for the installation to be supported and successful.

8.1. Installation Pre-Requisites

ITSCAMPRO NM1 requires the following resources in order to be installed and to function correctly during operation:

- *Power Grid*, 110/220Vac supply and 1kWh supply capacity;
- *Connectivity* (Data Network), for access to equipment and data transmission. The speed of this interface must be compatible with the data volume of the installation point;
- *Infrastructure* for mounting the equipment that makes up each module, which can be installed on Poles, Gantries and Signs or Signaling Structures on the road;
- *Ducts* to protect the connections, used in the electrical installation and connections between modules.

8.1.1. Inspection Positioning Requirements

When installing the equipment for each ITSCAMPRO NM1 module, consideration must be given to which violations will be monitored and specific positioning, framing and setting requirements applied. To do this, the devices can be mounted to existing structures on the road, such as Poles, Signs or existing Sign Structures and Gantries. The latter favors better framing for capturing images of vehicles by allowing them to be positioned centrally in relation to the road, as illustrated:

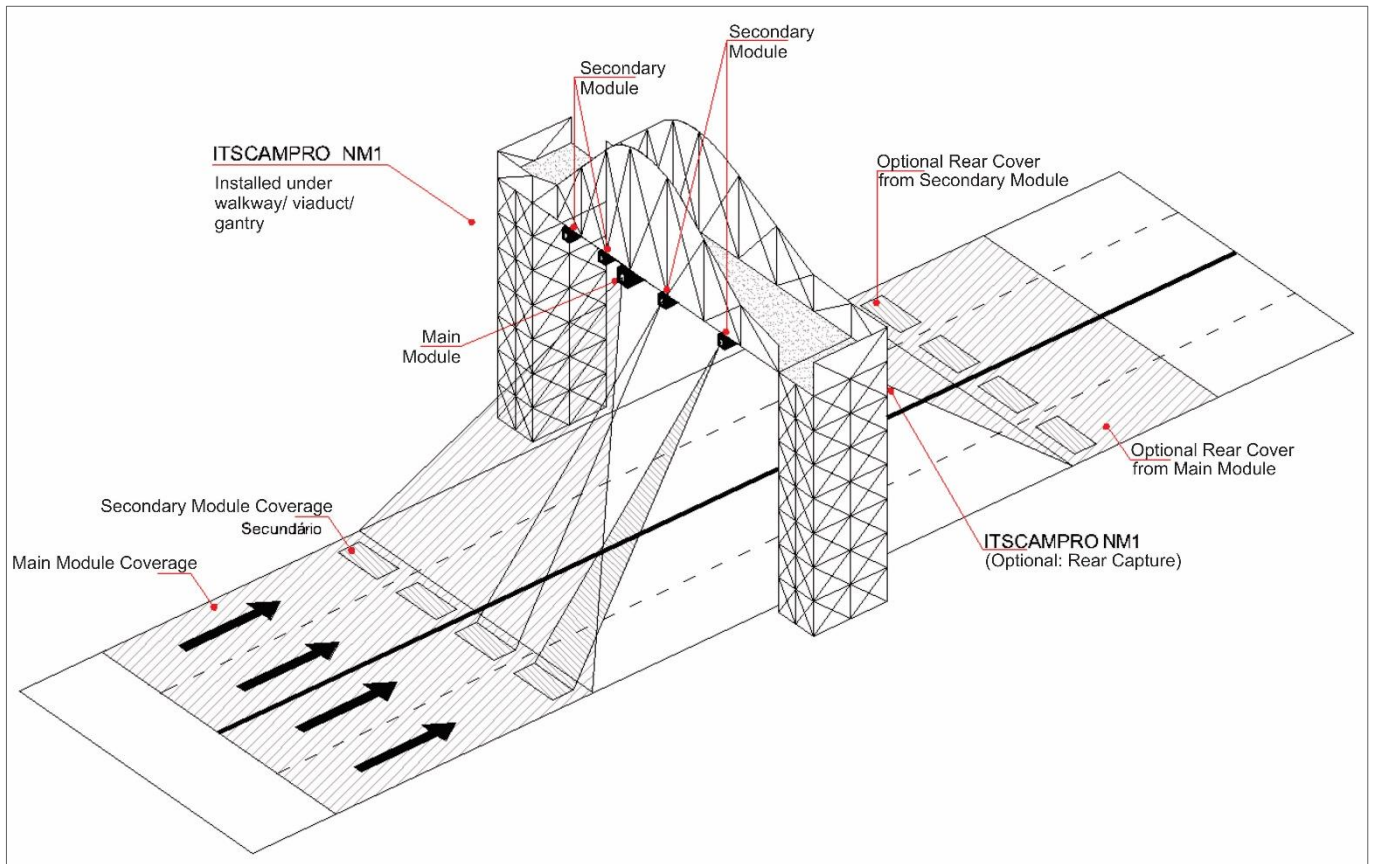
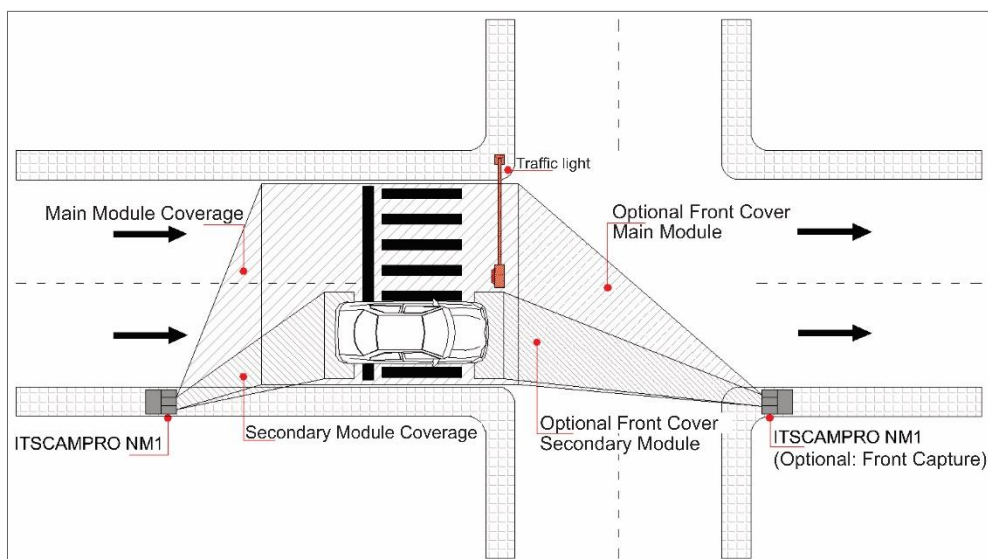


Figure 27 - Examples of mountings in Gantries

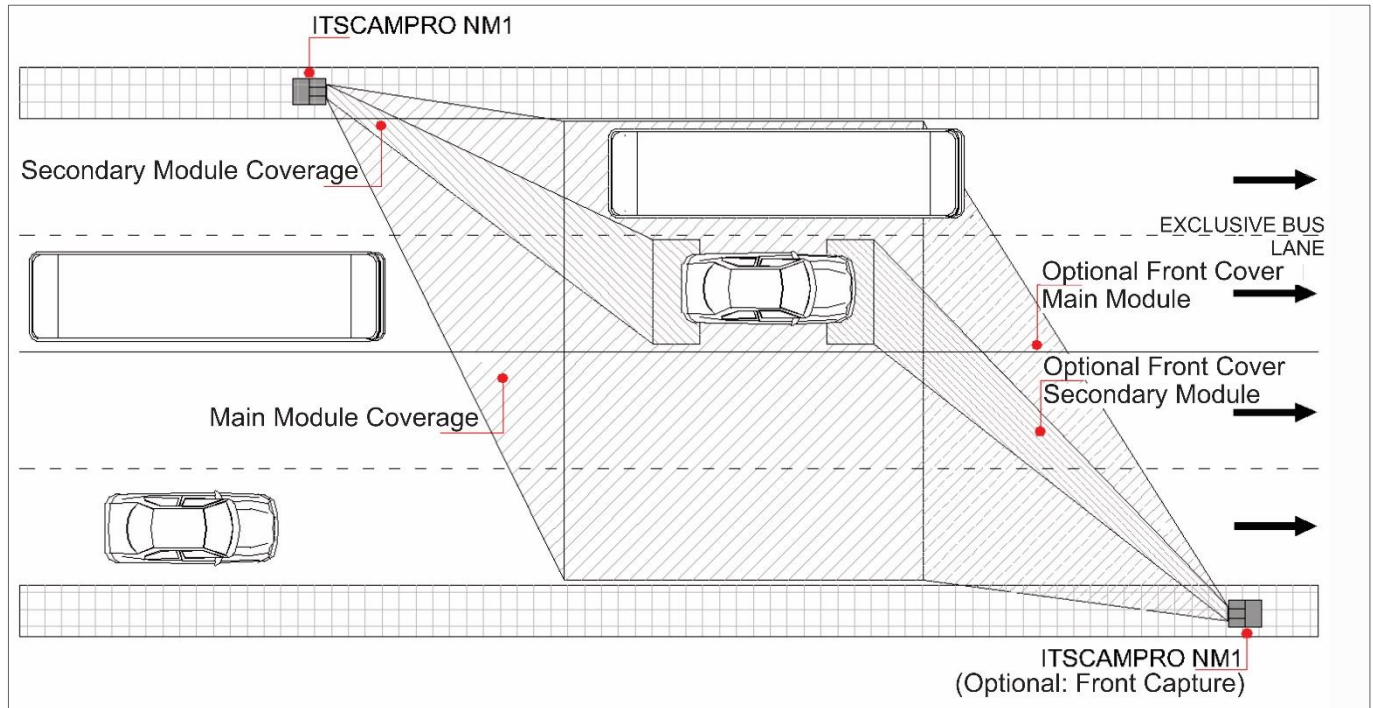
In order for the visual information generated to be sufficient to prove the violation committed and generate the log, it is essential that the distance and angle requirements in relation to the object to be monitored be applied. The positioning of the *Main Module* and *Secondary Module* in the installation should favor the recommended framework for the type of infraction being monitored, as shown in the illustrative figures of the monitoring points:

- 1) Stopping the vehicle on the crosswalk when the light changes (Article 183):



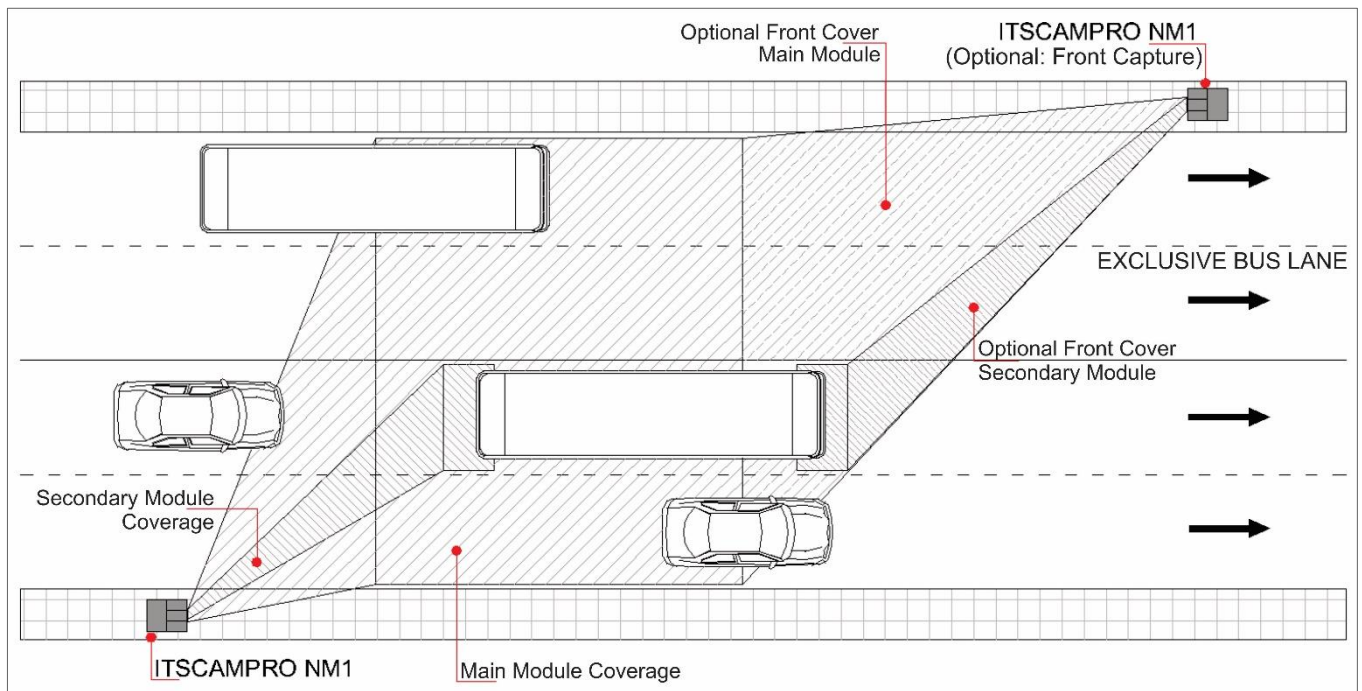
This model is capable of detecting a vehicle that remains on the crosswalk during a red light cycle. When installed in an appropriate location and integrated with the traffic light system, it is possible to register the digital image of the offending vehicle together with a panoramic image/video of the location that allows proof of the violation, showing the traffic light group in red and the vehicle in an irregular situation, located on the crosswalk.

- 2) Driving a vehicle in a lane or road regulated as exclusive for a certain type of vehicle, or exclusive for public passenger transport vehicles (Article 184):



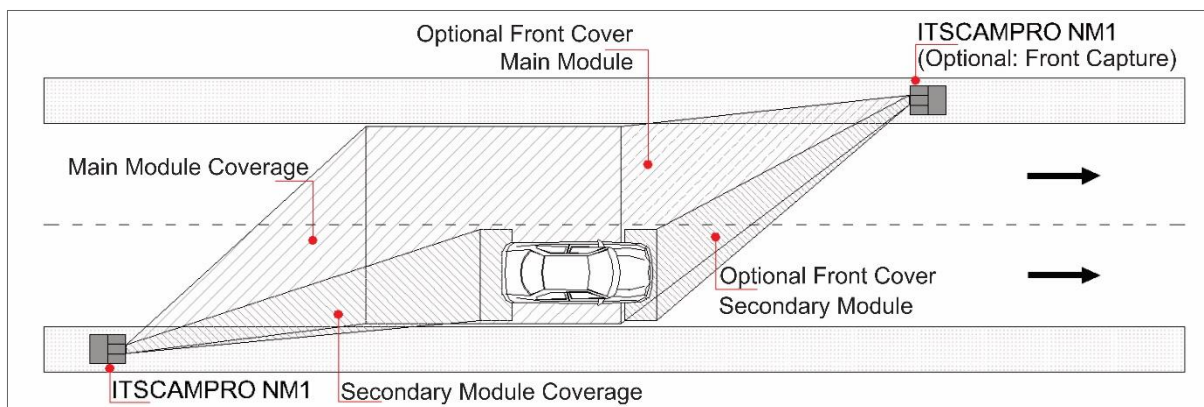
This model is able to detect and register vehicles driving in the Exclusive Lane of the road. Through license plate recognition and digital image processing, the system is able to distinguish the category of vehicle and, with the set parameters, registers the vehicle that is not allowed to circulate in the Exclusive Lane of a road. It also allows registering the panoramic image/video of the event, for full identification of the lane and the unauthorized vehicle located in it.

- 3) Failing to keep the vehicle moving in the lane designated for it by the regulatory signaling (Article 185):



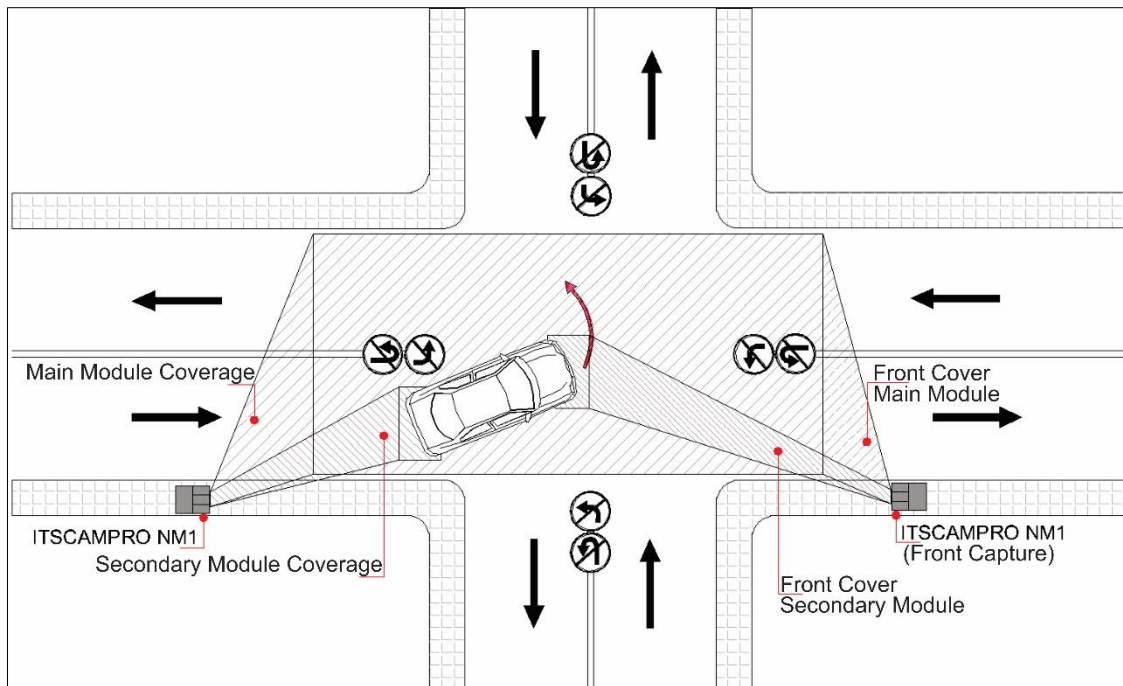
When installed in an appropriate place, this model allows the detection of moving vehicles that are traveling in a lane other than the one intended for their category (e.g. trucks and buses). It is possible to register the digital image of the offending vehicle together with the panoramic image/video of the scene, so that it is possible to identify the vehicle positioned in a lane other than the one intended for it and the lane in which it should have remained.

- 4) Driving in places and at times not permitted by the regulations established by the competent authority (Article 187):



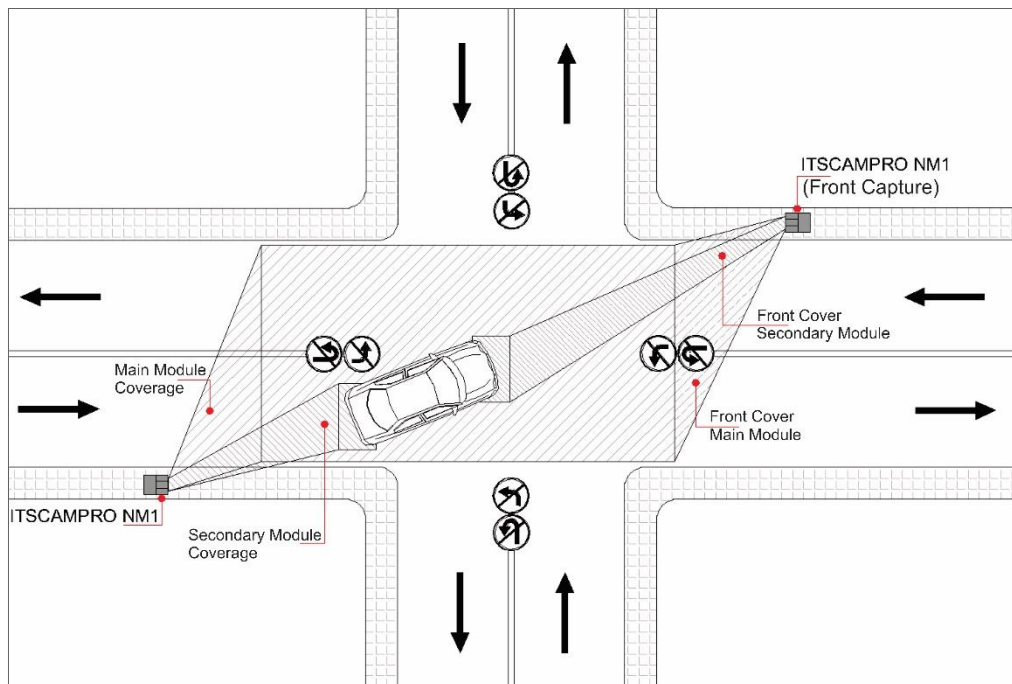
Through its internal precision clock, this model makes it possible to distinguish between vehicles traveling on a specific road, considering the time regulated by the municipality's road space rationing system. Using digital image processing, the system is able to distinguish the vehicle category and automatically read the license plate. Together with the panoramic image/video of the site, it allows the identification of the road to see where the violation was committed. To do this, the modules can be positioned above or diagonally to the capture object.

5) Performing U-turns in places prohibited by signaling (Article 206):



In this model, which detects the U-turn, two monitoring points are required, using at least one additional *Secondary Module* and one *Auxiliary Module*. By installing a monitoring point on the road being monitored and another on the road where the U-turn is prohibited, the system reads the license plates and registers the infraction when the same plate is read on both roads in a short period of time. It is possible to register the digital image of the offending vehicle together with the panoramic image/video showing the signaling post and the vehicle making the prohibited U-turn, which allows proof of the violation.

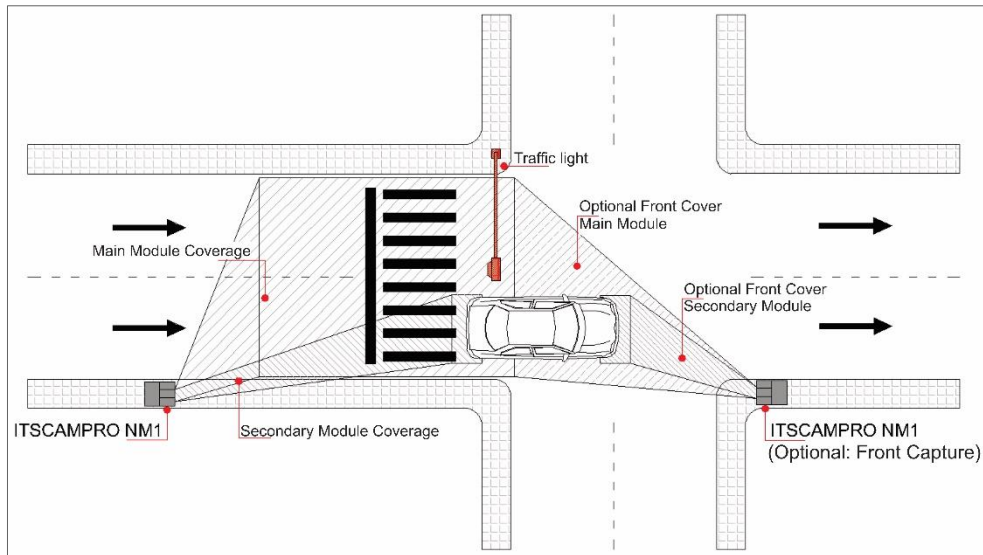
6) Performing right or left turns in places prohibited by signaling (Article 207):



When inspecting prohibited conversions, two monitoring points are required, using at least one additional *Secondary Module* and one *Auxiliary Module*. By installing a monitoring point on the monitored road and

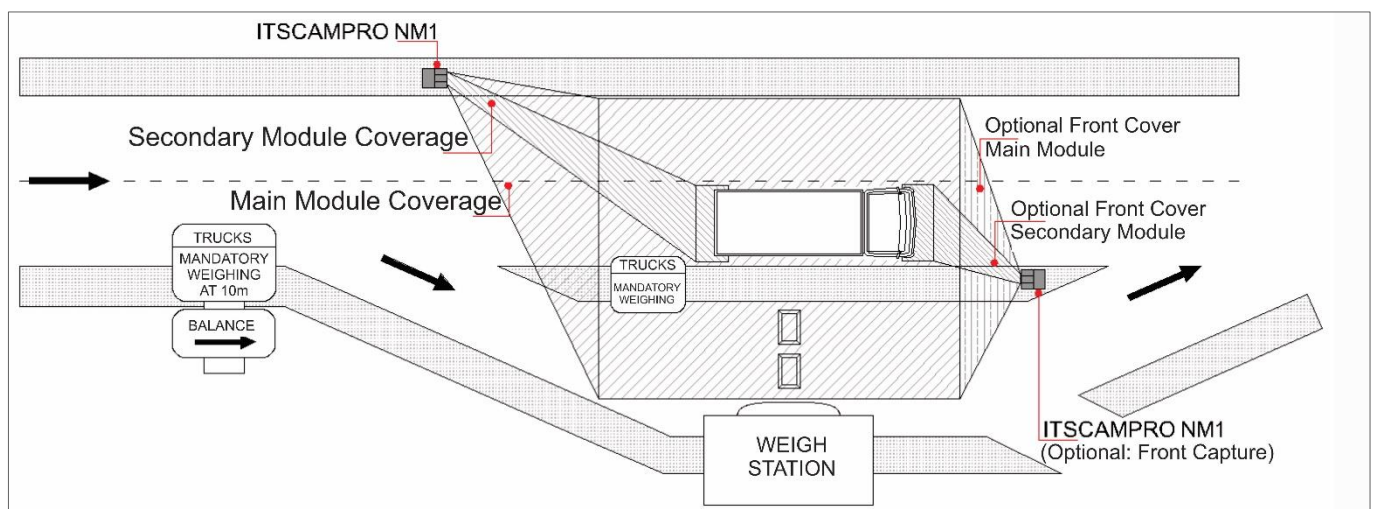
another on the road where the turn is prohibited, the system reads the license plates and registers the violation when the same plate is read on both roads in a short period of time. It is possible to register the digital image of the offending vehicle together with the panoramic image/video showing the signaling post and the vehicle making the prohibited turn, which allows proof of the violation.

7) Running a red light or a mandatory stop sign (Article 208):



When installed in an appropriate location, this model is able to detect vehicles running red lights when it is integrated into the traffic light system. It allows recording the digital image of the offending vehicle together with a panoramic image/video of the location showing the traffic light group on red and the vehicle in front of the traffic light, proving that the violation has been committed. The modules must be fixed to a structure positioned in such a way as to capture both the license plate and the scene at the time of the violation, in order to identify the traffic light signal.

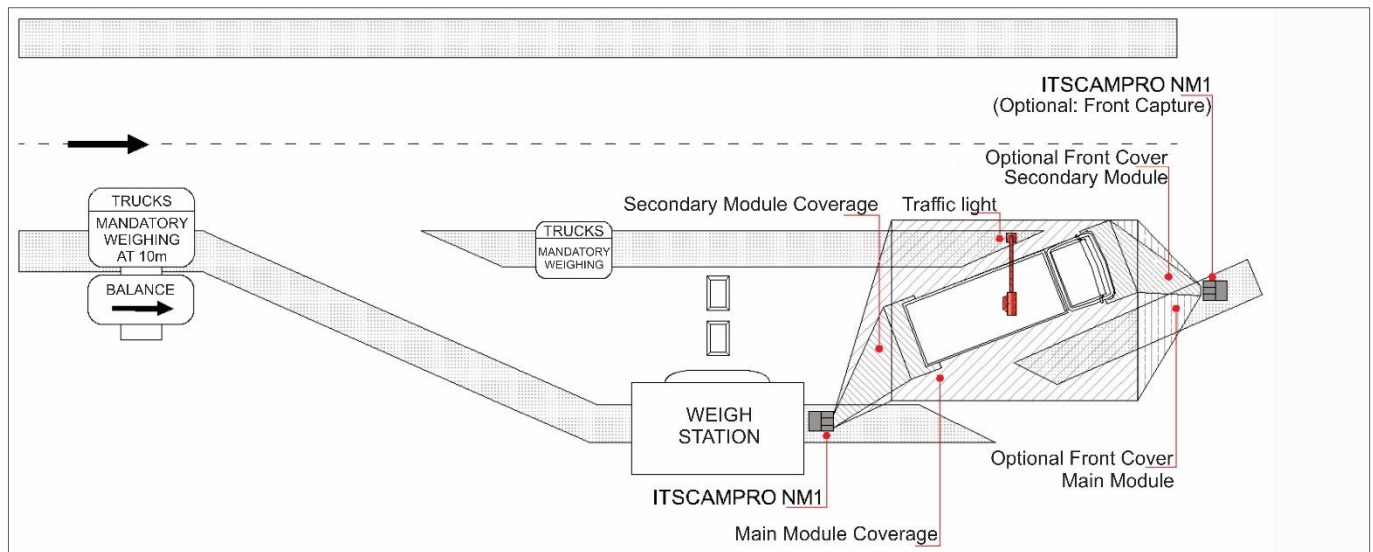
8) Crossing, without authorization, a roadblock with or without signs or auxiliary devices intended for weighing vehicles (Article 209):



When installed in an appropriate location, this model detects the crossing of a roadblock with signs in areas intended for weighing vehicles (e.g. trucks and buses). It is possible to register the digital image of the offending vehicle together with the panoramic image/video of the place containing the signaling post

indicating the mandatory entry to the weighing area and the vehicle that did not enter, outside the weighing area. The modules can be positioned above or diagonally to the capture object.

9) Failing to enter vehicle weighing areas (Article 209):



When installed in an appropriate place, this model is able to detect vehicles that have not entered the payment area, located after the mandatory weighing. It allows registering the digital image of the offending vehicle together with the panoramic image/video of the location showing the red traffic light indicating that the vehicle has been taken to the yard and is returning to the road.

8.2. Necessary Conditions for Installation

Detecting the presence of vehicles through digital image processing at each monitoring point requires that the equipment's positioning conditions are met, and must favor the quality required for the captured image:

- *ITSCAM and ITSCAM VIGIA+ Network Setup:* The installation's ITSCAM and ITSCAM VIGIA+ devices must be accessed separately to set up the IP address, in order to avoid the conflicts that can occur on the network;
- *Removing visual obstructions:* The location chosen to position the image capture and processing devices must ensure that the images produced are free from areas covered by architectural structures, trees, vehicles from other lanes, among other elements;
- *Defining the position of the Tertiary Module:* Positioning should allow installation as close as possible to the other modules so that connections are shorter and therefore less exposed;
- *Defining the position of the Main Module:* Positioning must favor the capture of a panoramic image of the road, in order to register the scenario that characterizes the violation (traffic lights, vertical signaling, traffic situation), as specified in the [Surveillance Positioning Requirements](#);
- *Defining the position of the Secondary Module:* The positioning must favor the focus of the image of a vehicle, corresponding to a road lane, allowing the clear capture of the license plate for OCR reading, which can be for the Front or Rear license plate of the vehicle, as specified in [Surveillance Positioning Requirements](#).



Roadside installation: If the number of lanes in the road exceeds 3, one of the modules can be mounted on the opposite side of the road, so that there is no image distortion or obscuring of the license plate of the vehicle located in the far lane, which has a greater angle between the image capture and processing device and the vehicle.

8.2.1. Network Interface Parameterization

If the application using ITSCAM VIGIA+ has a network setting that differs from the equipment's factory default, it is advisable to change the network setting before installing it on the local network. ITSCAM VIGIA+'s default network settings are:

Settings	Default value
IP address	192.168.0.254
Maintenance IP address	192.168.254.254
Netmask	255.255.255.0

In situations where the network settings of ITSCAM devices 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.

ITSCAM devices have a recovery IP address (192.168.254.254), for cases where the user changes the IP address by mistake and loses connection with the device. The use of this IP address to recover access is only available in a point-to-point connection with the equipment.



The maintenance IP address of ITSCAM devices (192.168.254.254) is disabled when the primary IP address conflicts with it. Therefore, when manually setting up 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 if the set up IP address is lost.

The most common situations in which the primary and maintenance IP addresses conflict are:

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

8.2.2. Positioning Adjustments for ITSCAM VIGIA+

To extract the best performance from ITSCAM VIGIA+, it is recommended that it be installed parallel to the road with little horizontal inclination. In situations where there are reflections such as sunlight, adjust the *Sliding Flap* to the best position to prevent interference with image quality:

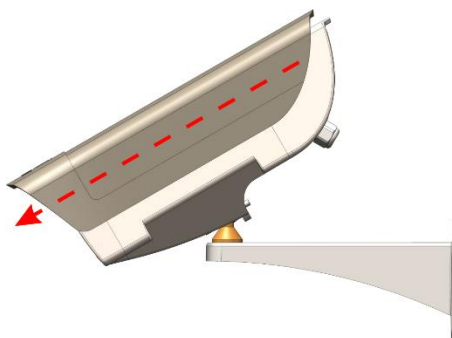


Figure 28 - Illustration of the direction of extension of the Sliding Flap

See the product's Installation Guide for the device's other positioning settings, considering the mounting to the *VIGIA+ Bracket*.

8.2.3. Image Framing Adjustments

The function of image capture devices requires specific positioning and framing adjustments, considering the capture of front, rear or panoramic images. In the *Panoramic* position, the frame must show the entire context of the violation committed, containing in a single image all the elements that make it possible to characterize the violation committed. In the *Front* and *Rear* positions, the framing should favor the reading of the OCR that identifies the license plate. The requirements for framing the respective image are detailed in the Installation and Maintenance Guide.

The image must be framed via the web interface of the respective device, which allows viewing the image and adjusting Zoom and Focus, as well as advanced settings. For advanced information on the setting options, please refer to the Integration Manual for the respective device.

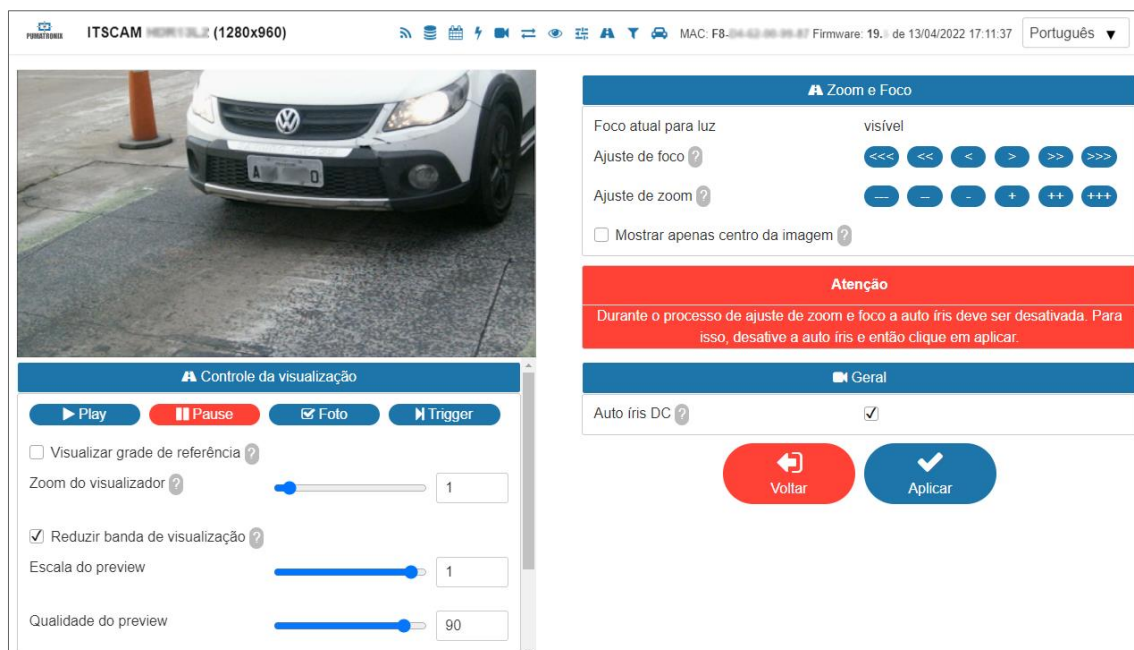


Figure 29 – Example screen of the ITSCAM device's web interface with image display and zoom and focus options

9. First Access

Once the ITSCAMPRO NM1 system modules have been installed, and the equipment has been properly installed and powered up, the ITSCAMPRO NM1 system interface can be accessed using an *Auxiliary Configuration Device* with the Google Chrome browser (version 85 or higher) installed. When entering the IP address in the browser's address bar, you must enter the factory default username and password:

ITSCAMPRO NM1 IP	10.0.0.2
ITSCAMPRO NM1 Netmask	255.255.255.0
User	root
Password	root

The factory default network settings uses *DHCP*. In order to connect to the network, the portable device must have a DHCP server. If necessary, set up the data network following the steps in the ITSCAMPRO NM1 Installation Guide before using the system for the first time.

The Pumatronix ITSCAM image capture web interface can be used to quickly check the equipment's status and monitor images in real time. Each piece of equipment can be accessed by entering the IP address of the respective device into a browser, from an *Auxiliary Configuration Device* connected to the same data network. The advanced settings options are described in the Integration Manual for the respective device.

10. Care and Maintenance

Some precautions are necessary to ensure the performance of the ITSCAMPRO NM1 and extend its useful life by protecting the equipment, as they reduce the likelihood of failure or degradation of its operation. The steps indicated for preventive maintenance do not replace the guidelines recommended in the Installation and Maintenance Guide.



Product Risks: The use of the product presents risks, which are presented in the section [Handling Risks](#).

10.1. System Update

To perform the update, access the *System > System Update* menu on the interface. It is possible to enable *Automatic Update* for the system. When clicking on the *Enable Automatic Update* checkbox, you must select the repository in which the update will be carried out, which can be *Wetec Standard* or *Custom*. In this last option, an IP address must be entered.

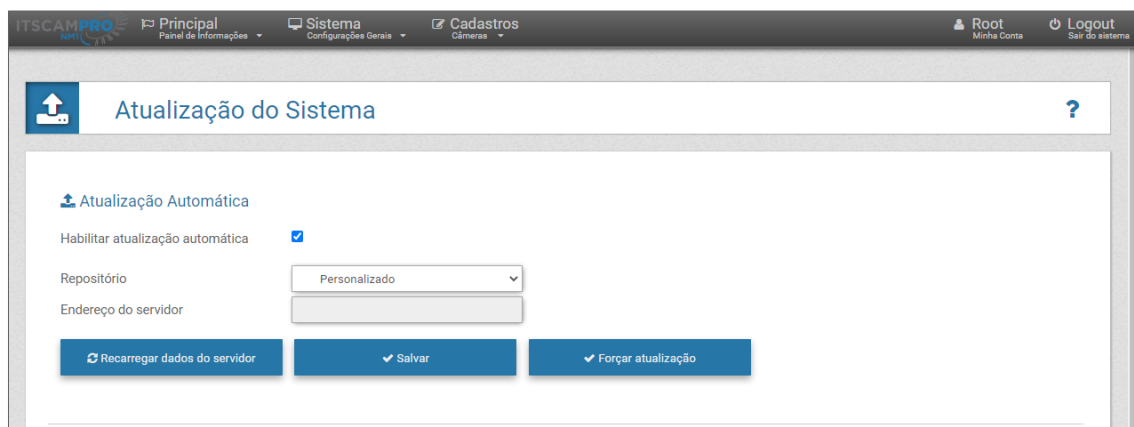
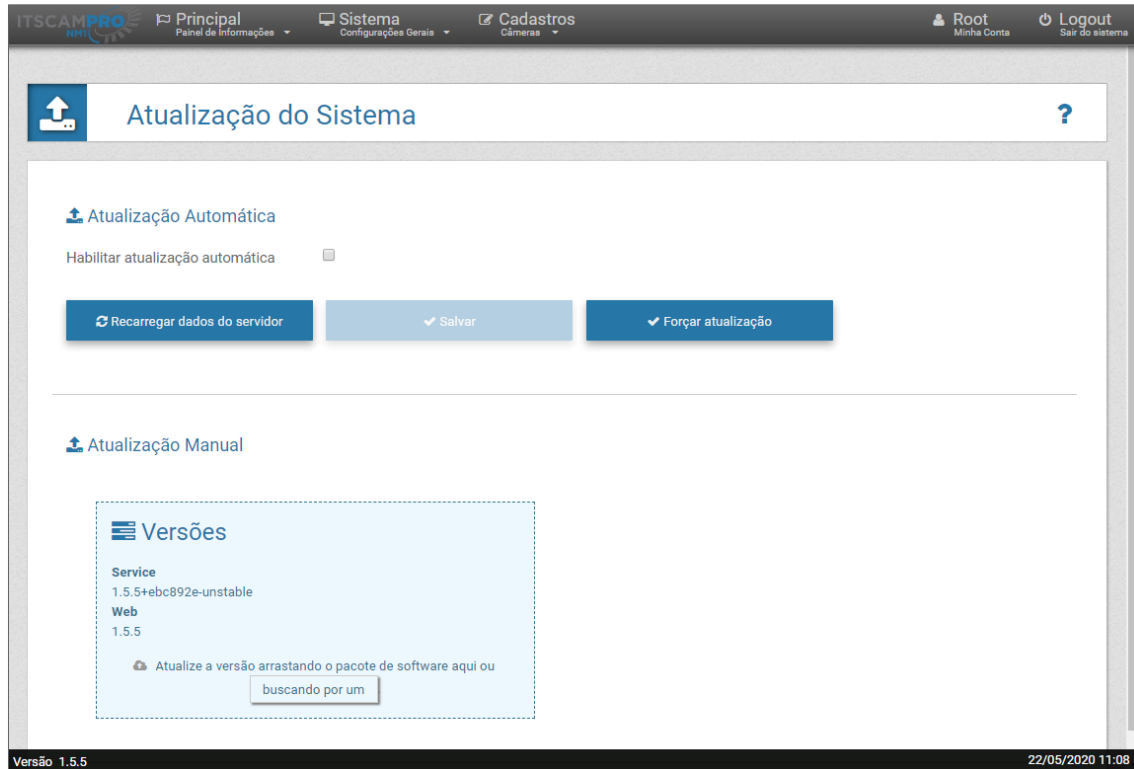


Figure 30 - Automatic system update screen

Follow the sequence of steps to perform the *Manual Update*:

- 1) Download the files for the new version: The update files will be available for download from the Pumatronix website. ITSCAMPRO NM1 has 2 software packages, which can be upgraded individually. The process takes place in the background, after the update file has been sent;
- 2) Access the *Tertiary Module's ULP-Local Processing Unit* of the ITSCAMPRO NM1 system with the aid of an *Auxiliary Configuration Equipment*;
- 3) Go to the *System > System Update* menu:



- 4) Install the *nm1-[software version]-x86_64.swu* update package by dragging the file into the *Versions* area or clicking on the link to search for a saved file;
- 5) Install the *nm1-web_[software version].swu* update package by dragging the file into the *Versions* area or clicking on the link to search for a saved file.

10.2. Preventive Maintenance



Maintenance interval: The maintenance procedures described in this manual have a suggested frequency, however there may be situations in which the activities should be carried out at shorter intervals.

10.2.1. Protection Box Preventive Maintenance

The glass in the *Protection Box* display should be cleaned periodically. Cleaning is recommended every three months or whenever images show artifacts that prevent viewing.



Figure 31 - Protection Box display position

To clean the outer surface of the display glass efficiently, follow the steps below:

- 1) Spray the glass with water so that excess dirt adhering to the surface can be removed;
- 2) Use a soft, lint-free cloth to remove dirt, moistened only with water and moving the cloth in one direction only;
- 3) Wipe with a dry cloth after cleaning.

10.2.2. ITSCAM VIGIA+ Device Preventive Maintenance

The ITSCAM VIGIA+ image capture and processing device must provide images that identify the presence of the vehicle in the virtual loop. However, if the outer surface of the lenses is dirty, identification can be compromised. To maintain image quality, clean the lens acrylic every six months or whenever dirt is noticed when monitoring the images displayed via the software interface.



Figure 32 - Lenses display position

To clean the outer surface of the lenses efficiently, follow the steps below:

- 1) Spray the acrylic with water so that excess dirt adhering to the surface can be removed;
- 2) Use a soft, lint-free cloth to remove dirt, moistened only with water and moving the cloth in one direction only;
- 3) Wipe with a dry cloth after cleaning and do not use force as this can damage the acrylic.



Acrylic maintenance: When cleaning and drying the lenses, do not use force as this can damage the acrylic.

10.2.3. Electrical Preventive Maintenance

The supply voltage of the device located furthest from the connection to the *NM1 Frame* or *NM1 Compact Frame* should preferably be measured every six months by accessing the *Protection Box* of the respective module. The measured voltage must be at least **20V**.

The electrical installations should preferably be checked at monthly intervals:

- Status of the *Surveillance board* LEDs;
- Presence of humidity at the installation site of the *Surveillance board* in the *NM1 Frame* or *NM1 Compact Frame*;
- Presence of moisture in the devices and connections installed in the *Main Module* and in each *Secondary Module*.

11. 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.

11.1. 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.

12. 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.





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