

ITSLUX

HIGH POWER, LOW CONSUMPTION AND INFRARED EMISSION

| Product

Pumatronix Equipamentos Eletrônicos Ltda.

Rua Bartolomeu Lourenço de Gusmão, 1970. Curitiba, Brasil

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Change History

Date	Revision	Content updated
06/28/2022	2.0	Format update
10/04/2022	2.1	Models update
12/26/2022	2.1.1	Electrical Specifications update
02/14/2023	2.2	Model updates; Model Weight updates; Detailing of the Attachment Mechanism; Electrical Specifications update; Connection Diagrams updates
04/15/2024	2.3	Operating Temperature Update

Overview

The continuous increase in the population in urban areas implies great challenges in the public management of cities. Smart services that use Information and Communication Technologies (ICT) have become increasingly relevant to help monitor, control and make efficient and fast decisions to solve problems inherent to the large concentration of people, such as mobility and security in traffic, energy efficiency, public safety, supply control, among others.

The concept called (Smart Cities) is a global trend that classifies the strategic use of infrastructure and services from the application of ICT solutions in urban planning and management, bringing results to the social and economic needs of society. Therefore, the use of Information Technologies allows cities to develop economically while increasing the quality of life of the inhabitants by generating efficiency in urban operations.

Examples of these technologies are Intelligent Transportation Systems (ITS), in which Pumatronix products such as ITSLUX illuminators are used. The lighting devices of this line favor the capture of vehicle images by offering infrared lighting, in pulsed mode, synchronized with the shooting of the photos, guaranteeing the homogeneous lighting of the scene regardless of the available ambient lighting condition.



Figure 1 - ITSLUX model I3016 (1224)

Handling Risks



This equipment must be powered by a direct current (DC) source. Do not connect any of the inputs directly to mains power (AC)!



Electrical Shock: Do not open the illuminator case as there are no user-serviceable or user-serviceable parts. In the event of a malfunction, return the ITSLUX to Pumatronix Technical Support.



Impair vision: Illuminators emit heat and light energy (not visible on infrared models), so looking directly at the LEDs is not recommended. It is also not recommended to use any optical instrument to look directly at the LEDs. In the event of a malfunction, return the ITSLUX to Pumatronix Technical Support.



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



Loss of warranty: Opening the ITSLUX, the cable gland and exposing the equipment to moisture through the unprotected cable end will void the product warranty.

Models

There are several illuminator configurations, the main characteristic being the distance at which the object to be illuminated must be positioned.

Series	Model	Emission angle	Recommended capture distance
Infrared	I1516 (1224)	16°	15 a 21m
	I3016 (1224)	16°	15 a 28m
	I3022 (1224)	22°	4 a 15m
	I3090 (1224)	90°	3 a 7m
	I6022 (1224)	22°	4 a 21m

Equivalence of Pumatronix illuminator models	
ITSLUX 300	ITSLUX I6022 (1224)
SUPERLUX 150, ITSLUX I1516	ITSLUX I1516 (1224)
SUPERLUX 300, ITSLUX I3016	ITSLUX I3016 (1224) e I3022 (1224)

The technical characteristics of the ITSLUX models can be identified in the designator of the model's name:

LED Type	LED Quantity	Emission angle	Supply voltage *
I: Infrared	15: 15 LEDs 30: 30 LEDs 60: 60 LEDs	16: 16° 22: 22° 90: 90°	1224: bivolt 12 or 24 Vdc

* Models with a bivolt option work with both 12 Vdc and 24 Vdc.

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1. Knowing the Product

The ITSLUX is an electronic light-emitting device that allows you to capture night images. The light emission of this equipment is produced in a pulsed manner and is similar to that of a photographic flash with a lamp. Operating in this regime, Pumatronix illuminators are activated during the image sensor's exposure time (shutter) and have a short recharge time. So, there is energy savings, longer LED life and higher power with fewer LEDs.

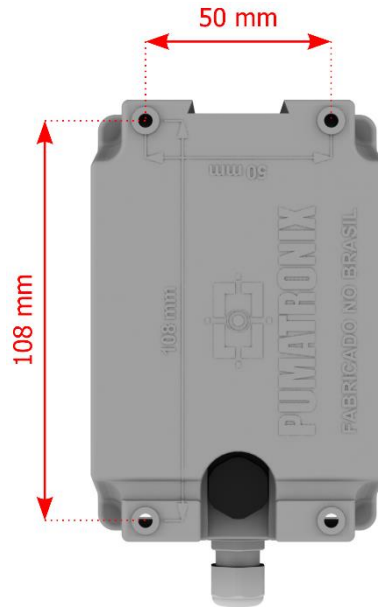
When Pumatronix illuminators are connected to Pumatronix's line of ITSCAM image capture and processing devices, real-time information about the equipment is available. This information corresponds to the operating temperature of the illuminator and a diagnosis of the operating status. This diagnostic list electrical problems such as an internal short, the presence of a burned-out LED (including the location of the fault), and the voltage level of the capacitors.

2. Additional documentation

Product	Link	Description
ITSLUX	Integration manual	Programming and integration manual that contains the necessary information for the integration of ITSLUX with an application
ITSCAM 600	Installation and Maintenance Guide	Guide containing the information necessary to install and maintain the ITSCAM 600
ITSCAM 400	Installation and Maintenance Guide	Guide containing the information necessary to install and maintain the ITSCAM 400

3. Mechanical specifications

- Material: Polycarbonate
- IP protection: IP67
- Fixation: 4.8x13 mm stainless steel pan head self-tapping screws (not included, variable length, depending on application)



Rear view of distance dimensions between fixing points

- Interfaces: Function indicator LED and 22 AWG 6-way multiway cable (unshielded)

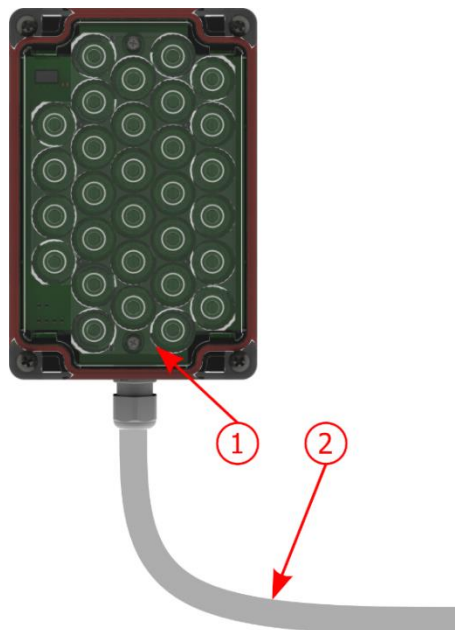


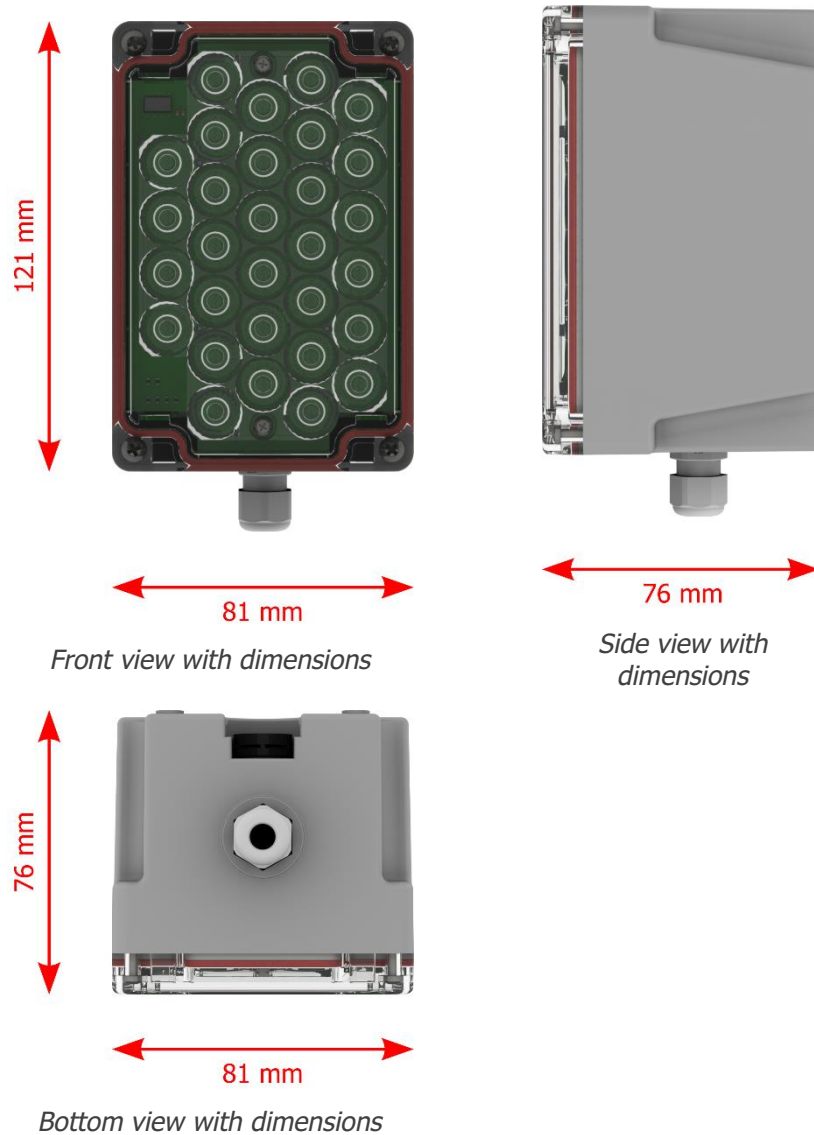
Figure 2 - ITSLUX Interface: 1) LED indicating operation; 2) Connections cable

- Operating temperature: -10°C to 65°C;
- Weight:

Model	Weight (grams)
I1516 (1224)	471,64g
I3016 (1224)	509,95g
I3022 (1224)	
I3090 (1224)	474,59g

I6022 (1224)	593,84g
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- Dimensions: The cable gland connector is not considered in the dimensions, which are presented in millimeters:



ITSLUX Bracket

The illuminators of ITSLUX line have UV protection and the product can be installed without protection. However, Pumatronix recommends including a flanged bracket when installing the ITSLUX which protects it from vandalism and direct sunlight on the housing. This way, the life of the equipment can be extended far beyond the warranty period.

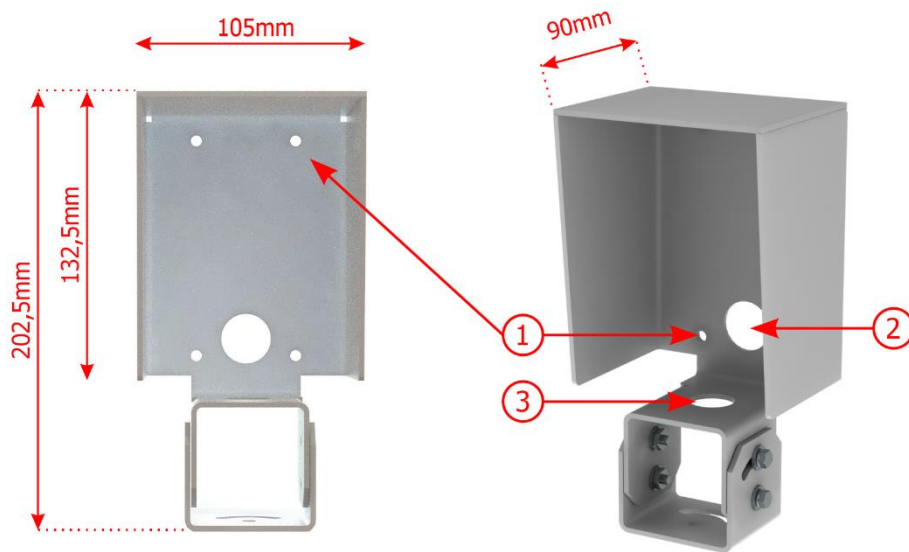


Figure 3 - ITSLUX Bracket: 1) 4 Hole for ITSLUX device attachment, 2) Opening for valve clearance, 3) Cable passage and cable press

You can build a bracket or purchase the one that protects and extends the life of ITSLUX at Pumatronix. Technical specifications for making the bracket may also be available from a suitable supplier.

The *ITSLUX Bracket* allows you to attach it to a pole, with the help of the *Pole Bracket*, as shown in the picture:

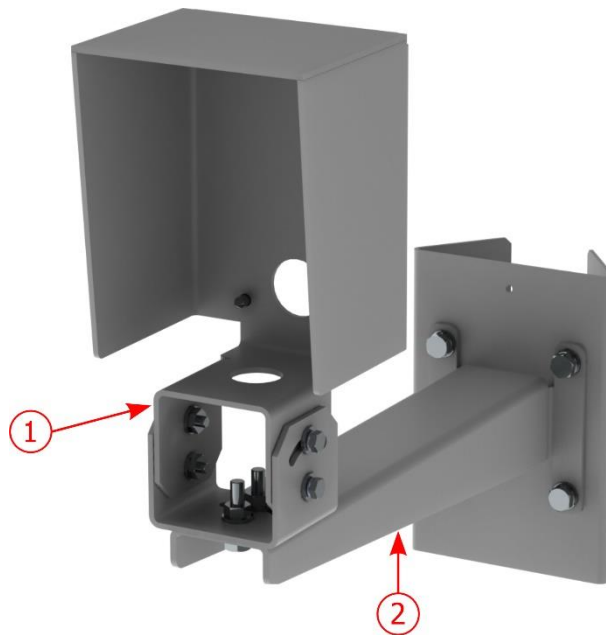


Figure 4 - ITSLUX Bracket (1) in conjunction with Pole Bracket (2)

Attachment Mechanism

The ITSLUX line allows for easy fixing, for testing and installation adjustments by using the *Attachment Mechanism* (bracket not included, must be quoted separately).

To attach the illuminator using the *Attachment Mechanism*, two 1/4" diameter screws are required and optionally allows the use of a guide pin, which facilitates the attachment to tripods. These screws are not included as the size may vary depending on the installation location.

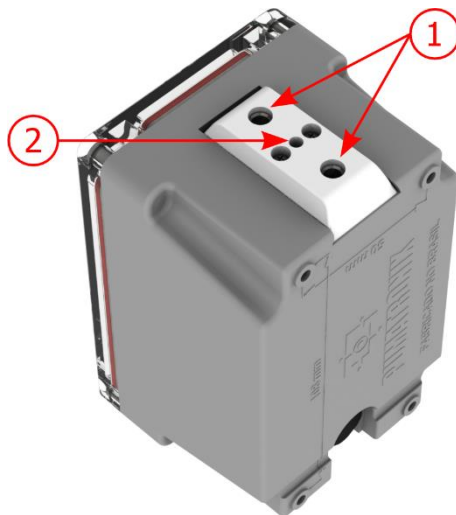


Figure 5 - Attachment Mechanism Position in ITSLUX: 1) Thread for screws 1/4"; 2) Ø4mm hole for pin fixing guide

The use of the *Attachment Mechanism* connected to the structure of the ITSLUX illuminator requires assembly as shown in the image:

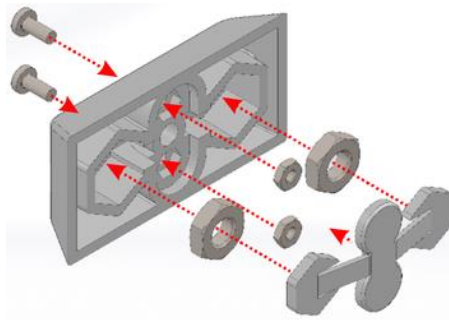


Figure 6 - Assembly order of Attachment Mechanism components



The *Attachment Mechanism* is suitable for temporary installations. In fixed installations (in places such as poles and porches) ITSLUX must be fixed to the back of the ITSLUX Bracket and in mobile applications (VTRs) bracket must be customized for fixing to the bumper or front of the vehicle.

Pressure Relief Valve

The valve located at the lower rear part of the ITSLUX illuminator has the function of relieving the internal casing pressure, avoiding thermal shocks to the product, such as summer rain, which can generate differences in internal and external pressure and affect the sealing of the equipment.

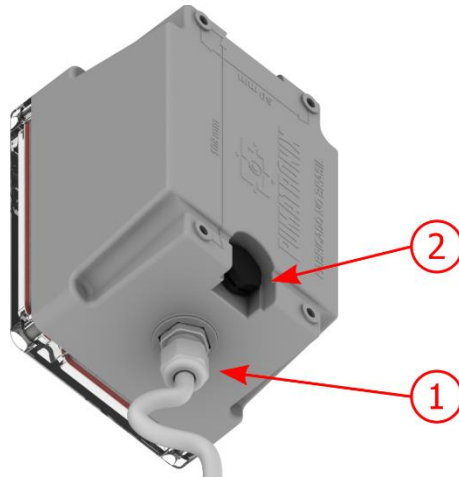


Figure 7 - Position of pressure relief valve: 1) Cable press; 2) Pressure relief valve

Overheat protection

ITSLUX illuminators have an internal temperature monitoring system that automatically disables their activation if the temperature exceeds the limit of 80°C. In this situation, the illuminator triggers are disabled until the internal temperature returns to acceptable values below 75°C, at which point the triggers will be automatically enabled.

4. Electrical specifications

Wavelength	
Infrared light	850nm (nanometers)

Power	24Vdc	
Standby Consumption	1W	
Peak current	I1516 (1224)	1,5A
	I3016 (1224), I3022 (1224) and I3090 (1224)	
	I6022 (1224)	

Power	12Vdc	
Standby Consumption	1W	
Peak current	I1516 (1224)	3A
	I3016 (1224), I3022 (1224) and I3090 (1224)	
	I6022 (1224)	

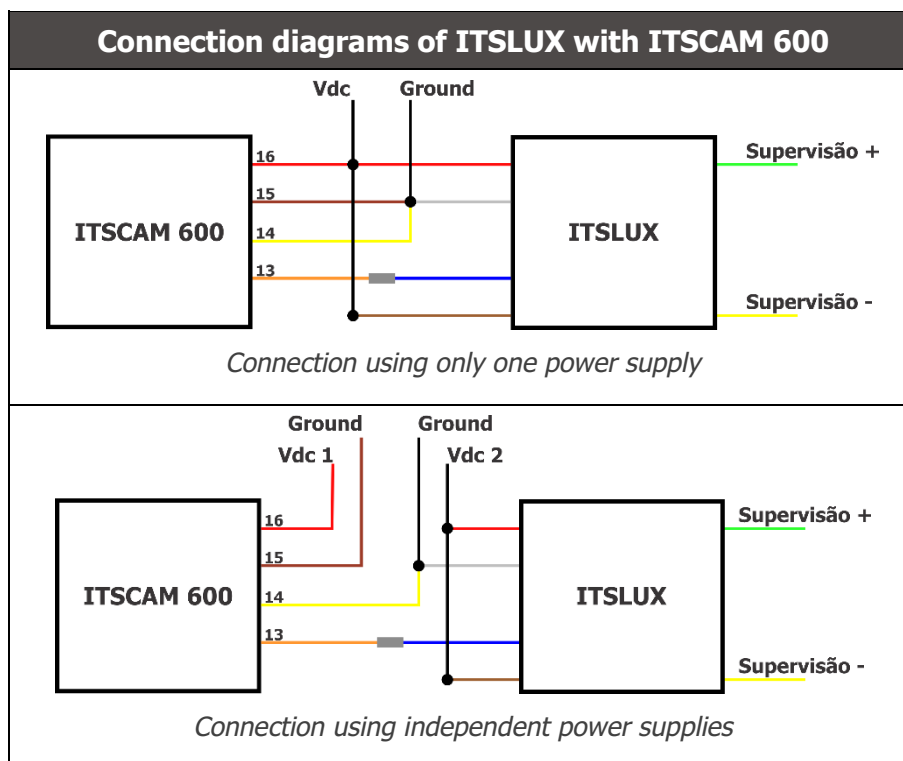
Electric connections

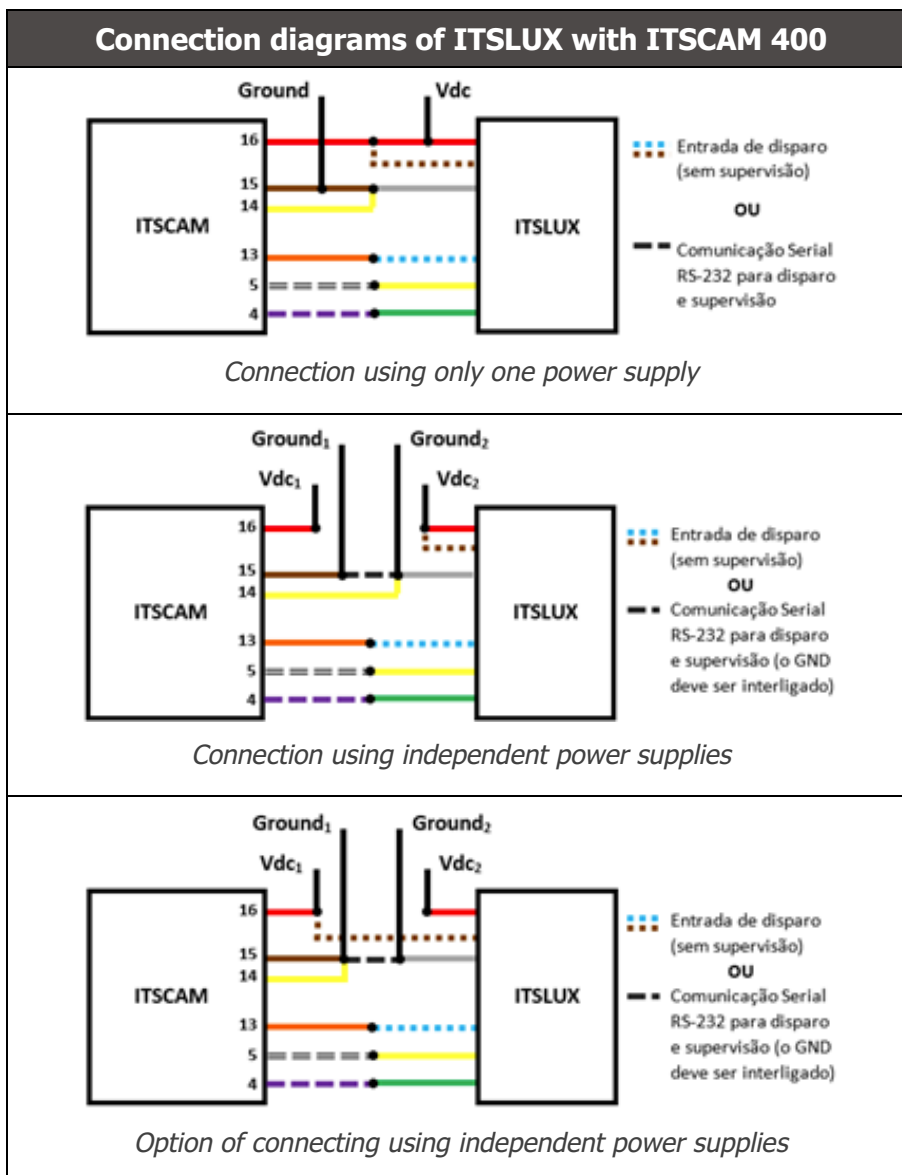
Terminal	Signal	Description
Red	V+	Positive Voltage
Gray	GND	Ground
Yellow	RS-232_Tx	Tx Communication Terminal
Green	RS-232_Rx	Rx communication terminal
Brown	IN+	Positive input trigger
Blue	IN-	Negative input trigger



ITSLUX activation: it can be done through the RS-232 serial interface (with equipment status supervision at each trigger) or through the pair of brown/blue cables that controls the trigger input (without supervision option).

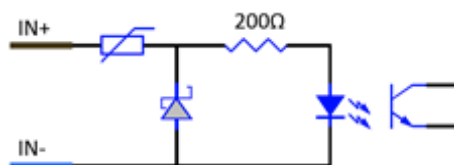
The possible options to connect ITSLUX illuminators with ITSCAM consider the signals available in the equipment and the power supply used. For more details on the connections available with the ITSCAM device used, access the manual and the Installation and Maintenance Guide corresponding to the product.





Inputs and outputs

The isolated trigger input of the ITSLUX illuminators has a circuit that allows the connection of image capture equipment other than ITSCAM, but compatible with the input.

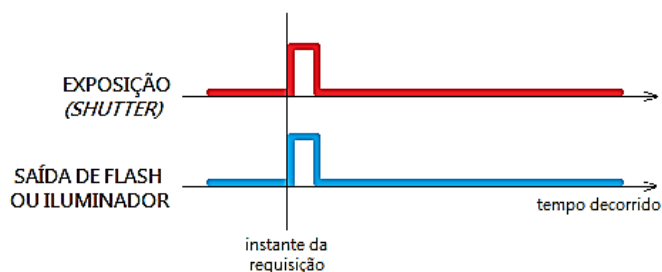


Illuminator status information can be acquired via serial RS-232. This output must be connected to a compatible circuit or directly to ITSCAM.

There is the possibility of ordering RS-485 compatible illuminators.

Triggering

ITSLUX illuminators are on as long as the input signal is on. When the illuminators are connected to ITSCAM, triggering occurs during the image sensor's exposure time (shutter), as illustrated in the graph. However, there is a maximum activation time:



Illuminator activation timeout	
ITSLUX I1516 (1224)	2ms
ITSLUX I3016 (1224)	
ITSLUX I3022 (1224)	
ITSLUX I3090 (1224)	
ITSLUX I6022 (1224)	

A characteristic of the ITSLUX models with infrared LED is the real delay of 3 μ s. This delay occurs between receiving the signal to activate a trigger and the actual emission of light. The illuminators' shots per second capability is shown in the table, applying common shutter values (image sensor exposure time):

Shots per second capacity	
Shutter	Infrared ITSLUX
1/500	4
1/750	6
1/1000	8
1/1500	12
1/2000	16

Intermediate trigger capacity values can be calculated with the desired trigger time and required protection period for each illuminator model.

Multiple Shots with ITSLUX

The infrared illuminators have a system that allows up to four sequential shots with different intensities. Detailed information on activation with ITSCAM devices can be found in the ITSCAM 400 Integration Manual (available at <http://www.pumatronix.com.br>).

The way ITSLUX is activated, when used in conjunction with an ITSCAM, varies depending on the resolution of the image sensor:

Shooting	ITSCAM 401 Illuminator Pulse Width	ITSCAM 411 Illuminator Pulse Width
1°	Image sensor exposure time	Image sensor exposure time
2°	20µs	Configurable by ITSCAM
3°	40µs	Image sensor exposure time
4°	Configurable by ITSCAM	Configurable by ITSCAM

Shooting	ITSCAM 411 Illuminator Pulse Width
1°	Image sensor exposure time
2°	Configurable by ITSCAM
3°	Image sensor exposure time
4°	Configurable by ITSCAM

When serial communication is used, you can set the power of various outlets by commands transmitted over the serial interface.

Shooting	Pulse length of the illuminator configured through the serial interface
1°	Image sensor exposure time
2°	Configurable by commands sent by serial
3°	Configurable by commands sent by serial
4°	Configurable by commands sent by serial

Minimum supported shutter with RS-232 trigger

Regardless of the device connected to ITSLUX, there is a minimum shutter value that can be assigned to all exposures requested by RS-232. This minimum value is 100 microseconds. If it is necessary to take a shot with illumination below this limit, the illuminator *trigger maximum period* must be set. This setting can only be accessed/modified via the RS-232 serial interface and must be undone in order for the ITSLUX to function properly for shutter values greater than 100 microseconds.

Protection Time

Pumatronix illuminators have a protection mechanism that limits activations to maximum intensity to preserve the LEDs integrity and maintain the durability of the product. The count of this protection time begins at the end of a trigger and varies depending on the model of illuminator used.

Using one of the ITSLUX Infrared models, it is possible to make up to three shots within the protection time. In this case, the non-trigger time is 128 times the sum of the illumination times.

ITSLUX infrared protection time calculation
128 X sum of tripped time

To illustrate the protection time that illuminators of ITSLUX line have, the table associates the main shutter values (image sensor exposure time):

Illuminator protection time	
Shutter	Infrared ITSLUX
1/500	256ms
1/750	170ms
1/1000	128ms
1/1500	85ms
1/2000	64ms

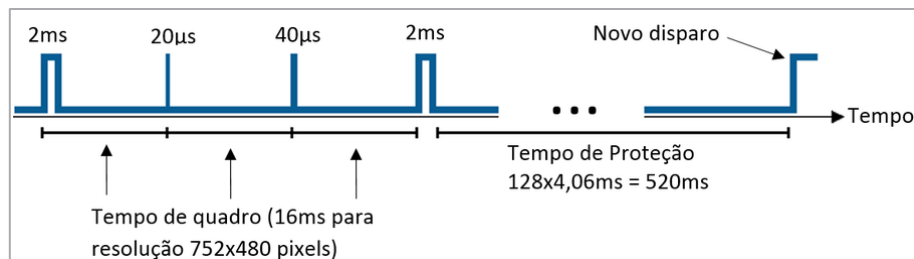
Activation of ITSLUX by ITSCAM

The maximum activation cycle of the infrared illuminators consists of an initial pulse of up to 2ms (equivalent to the exposure time). The intervals between shots correspond to the ITSCAM frame time, as shown in the table:

ITSCAM Resolution	Time between ITSLUX intakes
752x480px	16ms
1280x960px	41,6ms
1636x1220px	66,75ms

After the first shot, three shots may be fired in the protection time. The duration of these triggers depends on sensor resolution of the ITSCAM connected to the illuminator. For example, with a resolution of 752x480 pixels, the shots are: 20 μ s, 40 μ s and finally another shot of up to 2ms (equivalent to the exposure time of the image sensor). Using capture equipment with higher resolution, the time of the second shot can be configured, the third shot is equivalent to the shutter and the fourth shot can also be configured through ITSCAM.

After this power cycle, the protection time starts counting. Firing requests received during this period are ignored and the illuminator is not activated. The following figure illustrates the use of an infrared illuminator with an ITSCAM resolution of 752x480 pixels and a shutter of 1/500 (2 ms exposure):



Indicative LED

The operating regime during illuminator operation is indicated by the LED located on the front of the illuminator, which is factory configured as follows:

Configuration 1 (default)	LED lights up red during startup (approximately 3 seconds) and flashes at every shot
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5. Software Specifications

The configuration of ITSLUX behavior can be adjusted through the interface of the connected ITSCAM device, to do this consult the Integration Manual of the respective ITSCAM.

The ITSLUX Communication Protocol is detailed in the Integration Manual.

6. License

The ITSLUX license includes the hardware of the device, in addition to the features presented in this manual. New bug fixes are made available in new firmware releases by Technical Support via [Pumatronix](http://Pumatronix.com) website.

7. Initial setting

Installation Prerequisites

- Pressure valve: it is necessary that the pressure compensation device located on the back of the ITSLUX illuminator remains clear in its installation location.

Necessary conditions for installation

- Electrical and signal connections made to the ITSLUX harness must be protected in a junction box or similar structure to prevent oxidation of the connections and unwanted infiltration of liquids into the harness. Examples of structures used to protect connections:



Figure 8 - Connector for cable splicing



Figure 9 - Splice Box for Wires Connections

- Protection of cable ends is strongly recommended to prolong the life of the equipment, since it prevents oxidation of the connections and the infiltration of liquids through the cable. This connection can be made with terminals at the ends of the cables and the use of a syndal bar:

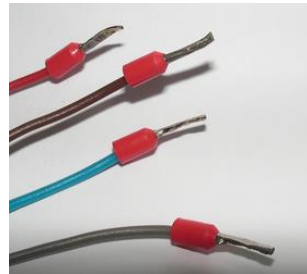


Figure 10 - Prepared wires with terminals on the ends



Loss of warranty: Opening the ITSLUX, cable gland and exposing the equipment to moisture through the unprotected end of the cable will void the product warranty.

8. Care and maintenance

Some care is necessary to ensure product performance and prolong its useful life.



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

Preventive Maintenance

- Periodically it is necessary to carry out an inspection of the facilities and in ITSLUX, as a preventive maintenance measure.
- Confirm that the illuminator is aligned towards the capture point of the vehicle.
- The fragments can collide in the front part of the ITSLUX as a result of the movement of vehicles on the road or acts of vandalism. This deterioration of the ITSLUX front cover can lead to a loss in lighting quality, therefore, to ensure optimal lighting, periodically inspect the state of conservation of the polycarbonate front cover. If the quality of the captured image is poor due to low light and it is verified that the front cover of the ITSLUX is opaque, perform the following procedures:
 - 1) Spray lens cleaning liquid on the lens surface or water on the glass of the protective case, so that excess dirt attached to the surface can be removed;

- 2) Use a soft, lint-free cloth to remove dirt, moving the cloth in one direction only;
- 3) Use a dry cloth to finish cleaning and do not use force, as it is possible to damage the surface.

9. 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, a defect is found under normal conditions of use.

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

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

Situations in which the Product Loses the Warranty

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

10. Privacy Policy

In compliance with the Brazilian General Data Protection Act (LGPD) - Law No. 13.709 of August 14, 2018, this product has programmable functions for capturing and processing images that may violate the LGPD when used in conjunction with other equipment to capture personal data.

Pumatronix is not responsible for the purposes, use and handling of images captured, whereas control over product information and forms of operation are solely the responsibility of the product user or buyer.





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