PUMATRONIX

ITSLUX

HIGH POWER, LOW CONSUMPTION AND INFRARED EMISSION

Product

Pumatronix Equipamentos Eletrônicos Ltda.

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Changes History

Date	Revision	Updated content
06/28/2022	2.0	Updating the format
10/04/2022	2.1	Updating the models
12/26/2022	2.1.1	Updating the Electrical Specifications
02/14/2023	2.2	Updating the models; Updating the weight of models; Detailing the mounting mechanism; Updating the electrical specifications; Updating the connection diagrams
04/15/2024	2.3	Updating the operating temperature
01/22/2025	2.3.1	Updating the Recommended Distance for the I3016 model

Overview

The continuous increase in population in urban areas implies major challenges in the public management of cities. Intelligent services using Information and Communication Technologies (ICTs) are becoming increasingly relevant in helping to monitor, control and make efficient and rapid decisions to solve the problems inherent in large concentrations of people, such as mobility and traffic safety, energy efficiency, public safety, supply control, among others.

The concept of Smart Cities is a global trend that classifies the strategic use of infrastructure and services based on the application of ICT solutions in urban planning and management, bringing results to society's social and economic needs. Thus, the use of Information Technology allows cities to develop economically while at the same time increasing the quality of life of their 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 illuminating devices in this range help capture images of vehicles by offering infrared illumination in pulsed mode, synchronized with the shooting of the photos, guaranteeing homogeneous illumination of the scene regardless of the ambient lighting conditions available.

Figure 1 - ITSLUX model I3016 (1224)

Handling Risks

	**This equipment must be powered from a direct current (DC) source. Do not connect any of the inputs directly to the power grid (AC)!**
	**Electric Shock: Do not open the illuminator box, as there are no serviceable or user settings parts. In the event of malfunctions, send the ITSLUX to Pumatronix Technical Support.**
	**Damage to the eyesight: The 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. In the event of malfunctions, send the ITSLUX to Pumatronix Technical Support.**
	**Oxidation Risk: The electrical and signal connections made to the ITSLUX bundle must be protected in a terminal box or similar structure to prevent oxidation of the connections and unwanted infiltration of liquids into the bundle and consequently into the ITSLUX.**
	**Loss of warranty: Opening the ITSLUX, the cable gland and exposing the equipment to moisture through the unprotected end of the cable will result in the loss of the product warranty.**

Models

There are various settings for illuminators, the main characteristic being the distance at which the object to be illuminated must be positioned.

Series	Model	Emission angle	Recommended shooting distance
Infrared	I1516 (1224)	16°	15 to 21m
	I3016 (1224)	16º	15 to 30m
	I3022 (1224)	22°	4 to 15m
	I3090 (1224)	90°	3 to 7m
	I6022 (1224)	22°	4 to 21m

Pumatronix Illuminator Model Equivalence	
ITSLUX 300	ITSLUX I6022 (1224)
SUPERLUX 150, ITSLUX I1516	ITSLUX I1516 (1224)
SUPERLUX 300, ITSLUX I3016	ITSLUX I3016 (1224) and I3022 (1224)

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

LED type	Number of LEDs	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 operate on both 12Vdc and 24Vdc.

Summary

1. About the Product

ITSLUX is a light-emitting electronic device that allows capturing images at night. The light emitted by this equipment is pulsed and is similar to that of a photographic flash bulb. Operating in this regime, the Pumatronix illuminators are activated during the *shutter* exposure time and have a short recharge time. This saves energy, extends the life of the LEDs and provides greater power with fewer LEDs.

When Pumatronix illuminators are connected to the Pumatronix ITSCAM range of image capture and processing devices, real-time information about the equipment is made available. This information corresponds to the illuminator's operating temperature and an operating status diagnosis. This diagnosis lists electrical problems such as an internal short circuit, the presence of a burnt-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 containing the information needed to integrate ITSLUX with an application
ITSCAM 600	Installation and Maintenance Guide	Guide containing the information needed to install and maintain the ITSCAM 600
ITSCAM 400	Installation and Maintenance Guide	Guide containing the information needed to install and maintain the ITSCAM 400

3. Mechanical Specifications

- Material: Polycarbonate
- IP protection: IP67
- Mounting: 4.8x13mm stainless steel pan head self-tapping bolts (not included, length varies according to application)

Rear view with measurements of distances between mounting points

- Interfaces: LED operating indicator and 6-way 22 AWG sleeve cable (unshielded)

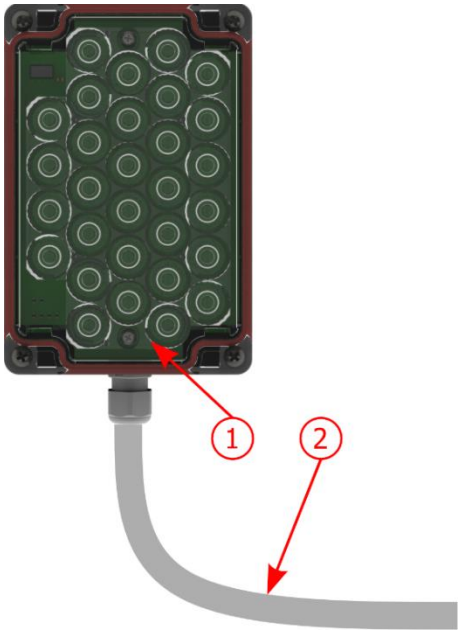
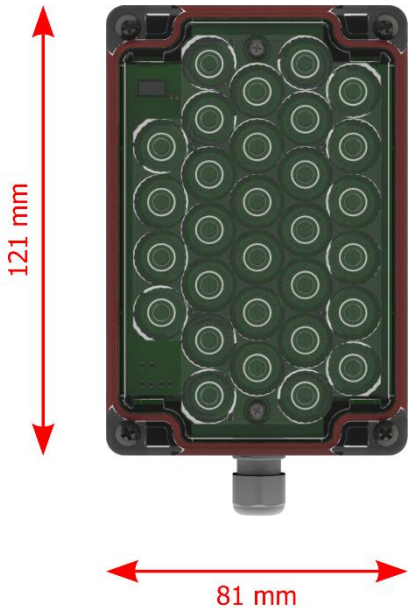


Figure 2 - ITSLUX Interface: 1) LED indicating operation; 2) Connection cable

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

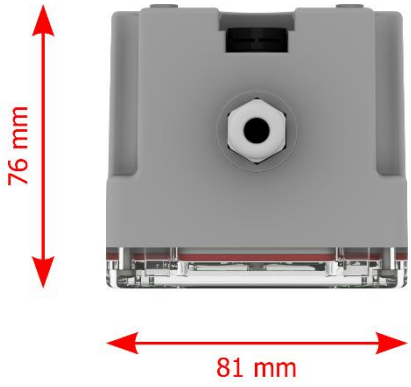
Model	Weight (grams)
I1516 (1224)	471.64 g
I3016 (1224)	509.95 g
I3022 (1224)	
I3090 (1224)	474.59 g
I6022 (1224)	593.84 g

- Dimensions: The cable gland connector is not considered in the dimensions, which are shown in millimeters:



Front view with measurements

Side view with measurements



Bottom view with measurements

ITSLUX Bracket

The illuminators in the ITSLUX range have UV protection and the product can be installed without protection. However, Pumatronix recommends including a bracket with flaps in the ITSLUX installation to protect it from vandalism and direct sunlight on the housing. In this way, the equipment's service life can be extended well beyond the warranty period.

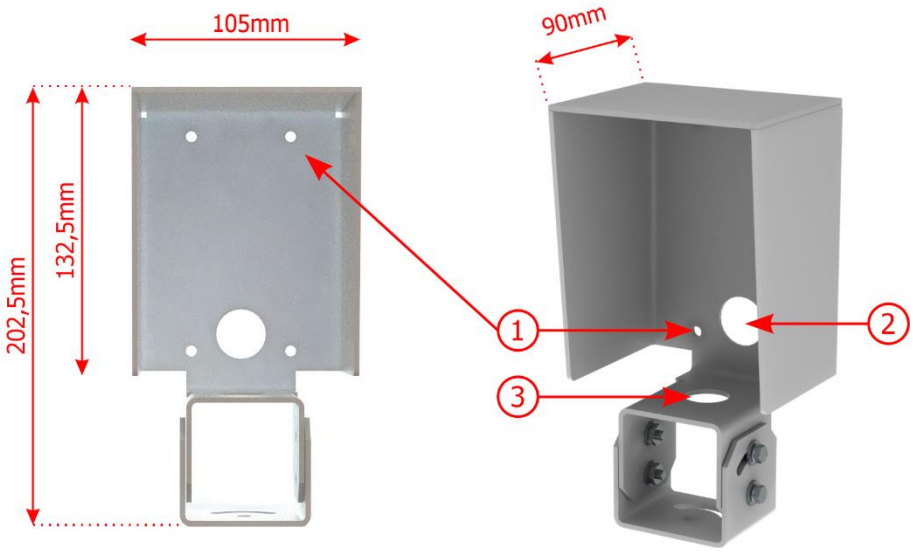


Figure 3 - ITSLUX Bracket: 1) 4 holes for mounting the ITSLUX device, 2) Opening for unblocking the valve, 3) Cable passage and cable gland

It is possible to develop a bracket or purchase the bracket that protects and extends the life of the ITSLUX at Pumatronix. The technical specifications for making the stand can also be obtained from an appropriate supplier.

The *ITSLUX bracket* can be mounted to a pole using the *Pole Bracket* as shown in the image:

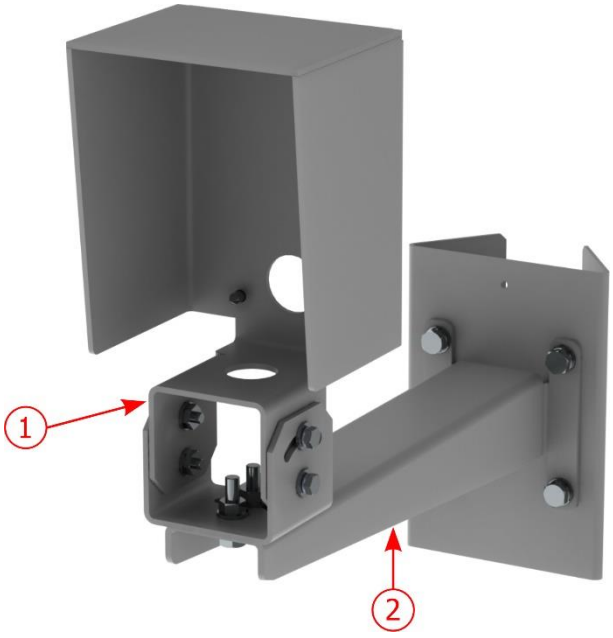


Figure 4 - ITSLUX Bracket (1) in conjunction with Pole Bracket (2)

Tripod Mounting

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

Mounting the illuminator using the *Mounting Mechanism* requires two ¼" diameter bolts and optionally allows the use of a guide pin, which makes it easier to attach to tripods. These bolts are not included, as the size may vary depending on the installation site.

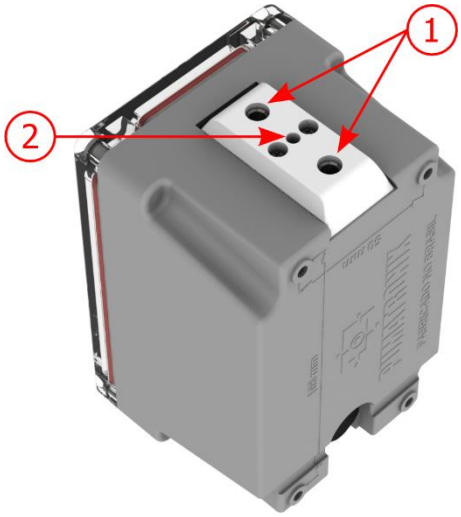


Figure 5 - Position of the Mounting Mechanism on the ITSLUX: 1) Thread for ¼" bolts; 2) Ø4mm hole for fixing guide pin

The use of the *Mounting Mechanism* attached to the frame of the ITSLUX illuminator requires assembly as shown in the image:

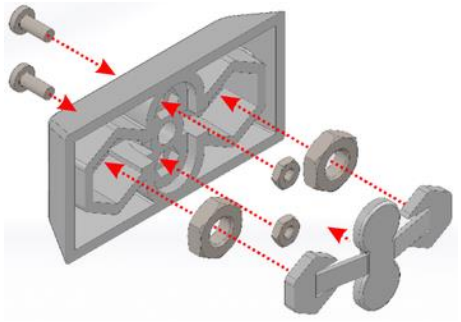


Figure 6 - Assembly diagram of the components of the Mounting Mechanism

The *Mounting Mechanism* is suitable for temporary installations. In fixed installations (on sites such as poles and gantries) the ITSLUX must be mounted on the back of the ITSLUX Bracket and in mobile applications (VTRs) the bracket must be customized for mounting on the bumper or on the front of the vehicle.

Pressure Relief Valve

The valve at the bottom of the ITSLUX illuminator relieves the pressure inside the housing, preventing thermal shocks to the product, such as summer rain, from generating differences in internal and external pressure and affecting the equipment's seal.

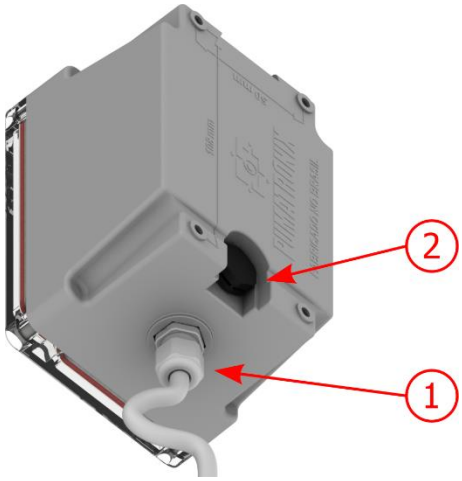


Figure 7 - Position of the pressure relief valve: 1) Cable gland; 2) Pressure relief valve

Overheating Protection

ITSLUX illuminators have an internal temperature monitoring system that automatically disables their activation if the temperature exceeds 80ºC. In this situation, the illuminator shots are deactivated until the internal temperature returns to acceptable values below 75ºC, when the shots are automatically enabled.

4. Electrical specifications

Wavelength	
Infrared light	850nm (nanometers)

Power Supply	**24Vdc**	
Stand By consumption	1W	
Peak current	I1516 (1224)	1.5A
	I3016 (1224), I3022 (1224) and I3090 (1224)	
	I6022 (1224)	

Power Supply	**12Vdc**	
Stand By consumption	1W	
Peak current	I1516 (1224)	3A
	I3016 (1224), I3022 (1224) and I3090 (1224)	
	I6022 (1224)	

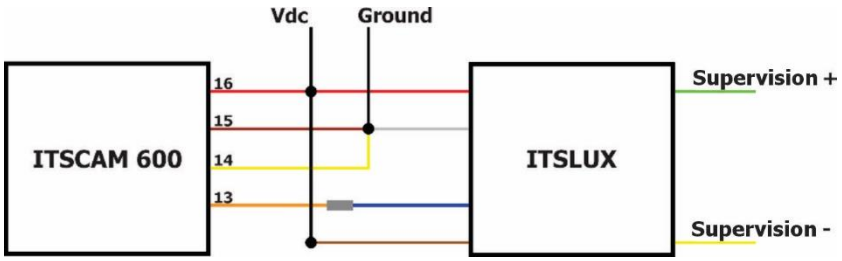
Electrical Connections

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 Shot Input
Blue	IN-	Negative Shot Input

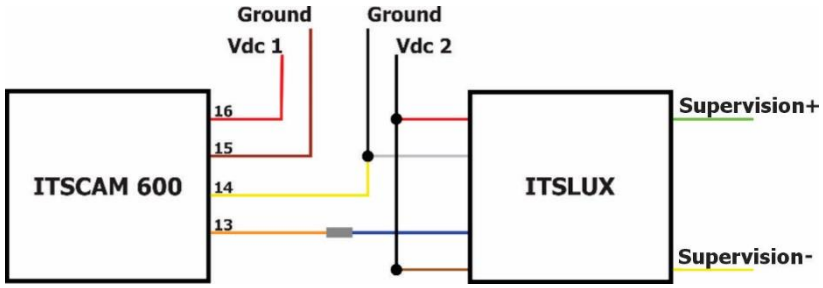
ITSLUX triggering: can be carried out via the RS-232 serial interface (with supervision of the equipment's status at each shot) or via the brown/blue wire pair that controls the shot input (without supervision option).

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

ITSLUX connection diagrams with ITSCAM 600

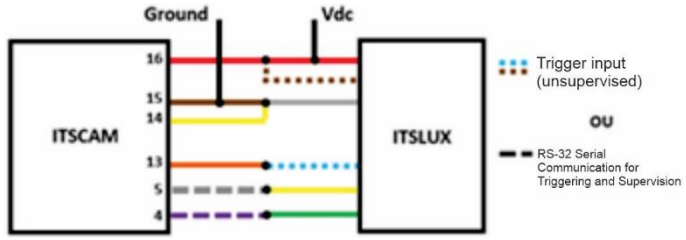


Connection using only one power supply

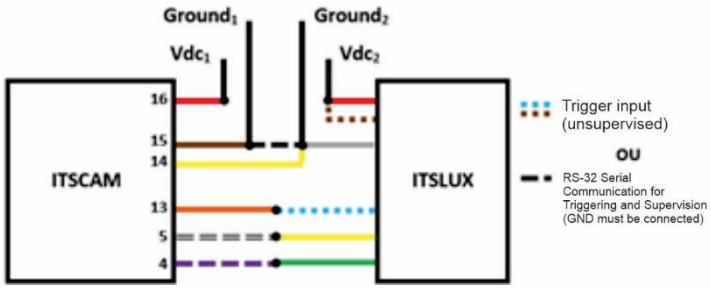


Connection using independent power supplies

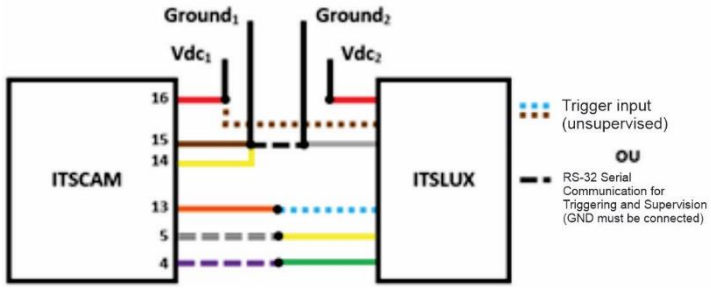
ITSLUX connection diagrams with ITSCAM 400



Connection using only one power supply



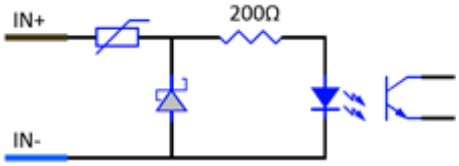
Connection using independent power supplies



Option to connect using independent power supplies

Inputs and Outputs

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

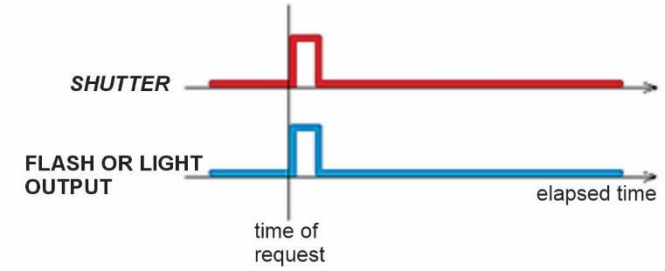


Information on the status of the illuminator can be acquired via RS-232 serial. This output must be connected to a compatible circuit or directly to the ITSCAM.

It is possible to request illuminators that are compatible with RS-485.

Triggering

The ITSLUX illuminators are on for as long as the input signal is triggered. When the illuminators are connected to the ITSCAM, the trigger occurs during the exposure time of the image sensor (*shutter*), as illustrated in the graphic. However, there is a maximum trigger time:



Illuminator trigger time limit	
ITSLUX I1516 (1224) ITSLUX I3016 (1224) ITSLUX I3022 (1224) ITSLUX I3090 (1224) ITSLUX I6022 (1224)	2ms

A feature of ITSLUX models with infrared LED is the actual delay of 3µs. This delay occurs between receiving the signal to trigger a shot and the actual emission of light. The shots per second capacity of the illuminators is shown in the table, when applying the common shutter values (exposure time of the image sensor):

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

Intermediate shot capacity values can be calculated with the desired triggering time and protection period required 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 triggering using ITSCAM devices can be found in the ITSCAM 400 *Integration Manual* (available at https://www.pumatronix.com.br).

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

Shot	Illuminator pulse width with ITSCAM 401	Illuminator pulse width with ITSCAM 411
1st	Image sensor exposure time	Image sensor exposure time
2nd	20µs	Configurable by ITSCAM
3rd	40µs	Image sensor exposure time
4º	Configurable by ITSCAM	Configurable by ITSCAM

Shot	Illuminator pulse width with ITSCAM 411
1st	Image sensor exposure time
2nd	Configurable by ITSCAM
3rd	Image sensor exposure time
4th	Configurable by ITSCAM

When serial communication is used, it is possible to configure the power of multiple shots by means of commands transmitted via the serial interface.

Shot	Pulse width of the illuminator configured via the serial interface
1st	Image sensor exposure time
2nd	Configurable by commands sent by serials
3rd	Configurable by commands sent by serials
4th	Configurable by commands sent by serials

Minimum Shutter Supported with RS-232 Shoot

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

Protection Time

Pumatronix illuminators have a protection mechanism that limits triggering at maximum intensity to preserve the integrity of the LEDs and maintain the product's durability. This protection time starts at the end of a shot and varies according to the model of illuminator used.

Using one of the ITSLUX Infrared models, it is possible to carry out up to three shots within the protection time. In this case, the non-triggering time is 128 times the sum of the lighting times.

ITSLUX Infrared protection time calculation
128 X sum of triggered time

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

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

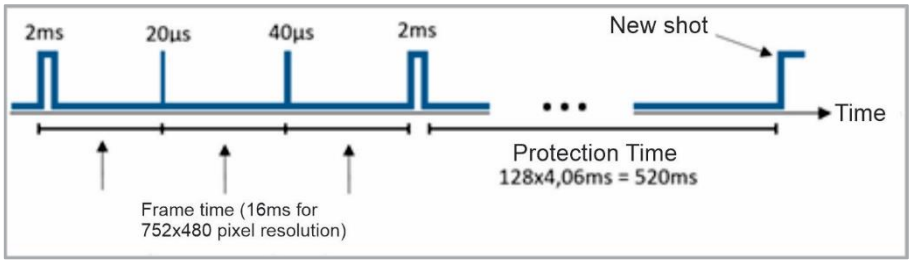
ITSLUX triggering by ITSCAM

The maximum triggering cycle for 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 shots
752x480px	16ms
1280x960px	41.6ms
1636x1220px	66.75ms

After the first shot, three shots can be made within the protection time. The duration of these triggers depends on the resolution of the ITSCAM sensor connected to the illuminator. For example, with a resolution of 752x480 pixels, the shots are: 20µs, 40µs and finally another shot of up to 2ms (equivalent to the exposure time of the image sensor). Using higher resolution capture equipment, 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 by ITSCAM.

After this lighting cycle, the protection time starts to count down. Shot requests received during this period are ignored and the illuminator is not triggered. The figure below illustrates the use of an infrared illuminator with an ITSCAM with a resolution of 752x480 pixels and a shutter speed of 1/500 (2ms exposure):



LED Indicator

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

Settings 1 (default)	LED lights up Red during initialization (approx. 3 seconds) and flashes with each shot

5. Software Specifications

The settings for ITSLUX behavior can be adjusted via the interface of the connected ITSCAM device, for which see the respective ITSCAM Integration Manual.

The ITSLUX Communication Protocol is detailed in the Integration Manual.

6. Licensing

The ITSLUX license covers the hardware of the device, in addition to the features presented in this manual. New bug fixes are made available in new firmware versions by Technical Support, via Pumatronix website.

7. Initial Settings

Installation Pre-Requisites

- Pressure valve: the pressure equalizer device located on the back of the ITSLUX illuminator must remain unobstructed in its place of installation.

Necessary Conditions for Installation

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

Figure 8 - Cable splice connector

Figure 9 - Splice box for cable connections

- Cable tip protection is strongly recommended to extend the life of the equipment, as it prevents the connections from oxidizing and liquids from seeping through the cable. This connection can be made with terminals on the wires tips and the use of a union bar:

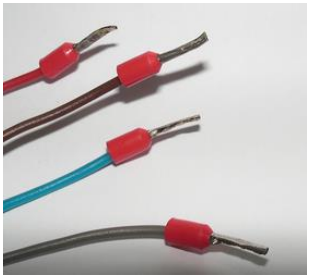


Figure 10 - Prepared wires with terminals on the tips

Loss of warranty: Opening the ITSLUX, the cable gland and exposing the equipment to moisture through the unprotected cable tip will result in the loss of the product warranty.

8. 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.

Preventive Maintenance

The installations and ITSLUX must be inspected periodically as part of preventive maintenance. Make sure that the illuminator is aligned in the direction of the vehicle's capture point.

The front of the ITSLUX can be hit by debris resulting from the movement of vehicles on the road or vandalism. This deterioration of the ITSLUX front cover can lead to a deterioration in the quality of lighting, so to ensure optimum illumination, periodically inspect the state of preservation of the polycarbonate front cover. If the quality of the captured image is poor due to low light and the ITSLUX front cover is found to be opaque, carry out the following procedures

1) Spray liquid or water on the glass of the protective housing 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.

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, 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.

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.

10. 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.

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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