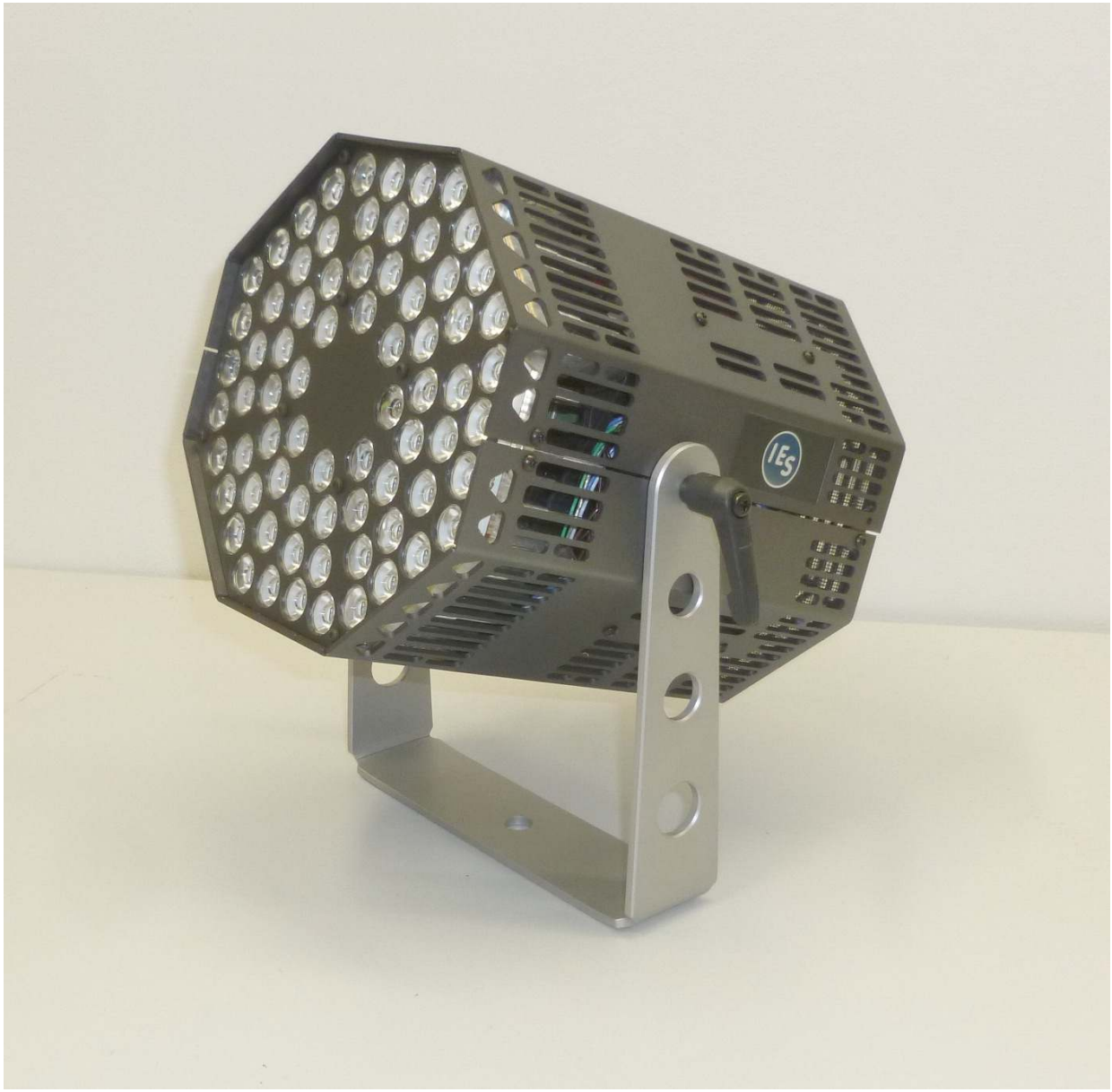
IES 4438
LED Sync Lamp

SYSTEM DESCRIPTION

LED SyncLamp for High Speed Video, delivering more than 200 000 lm in sync mode from a small and light weight design. Ideally suited for stand alone test stand use or as well for networked arrays of many lamps.



Revision TH11

Contents

1 General

1.1 Intended usage

This lighting equipment is designed for the field of high speed video filming and is not indended for general illumination. The lamp is made for indoor use in industrial environments, like test stands for component testing, sled testing facilities, or full scale crash testing, where maximum light output is needed. It is small and light weight and perfectly suited for test stands. It can provide more than 200 000 lumens in sync mode.

The lamp can be used standalone with no communication or external signal. Or it can be used with a switch ON/OFF signal (closing contact). Or it can be used with communication over USB or ethernet for control with a PC software.

1.2 Cautions, Do´s and Dont´s

Artificial optical radiation, risk group 2. Never stare into the LED as it may be harmfull to the eyes. Do not suppress the lid closing reflex. Turn away from lamp, if eyes are hit from the light.

Caution HOT. High power LED heads will generate heat. The lamp case may be hot.

Caution fire. High intensity light from the LED heads will be absorbed from materials and cause heating of those materials. Keep a reasonable distance between LED lamps and objects.

Caution high voltage (110 or 230 V) inside the lamp. Restricted access to the inside - only electricians or trained personel may open the lamp.

Air cooling and fan inside. The lamps require flow of clean air for cooling. Ensure uninhibited air flow. Keep all air inlets and outlets clean and open.

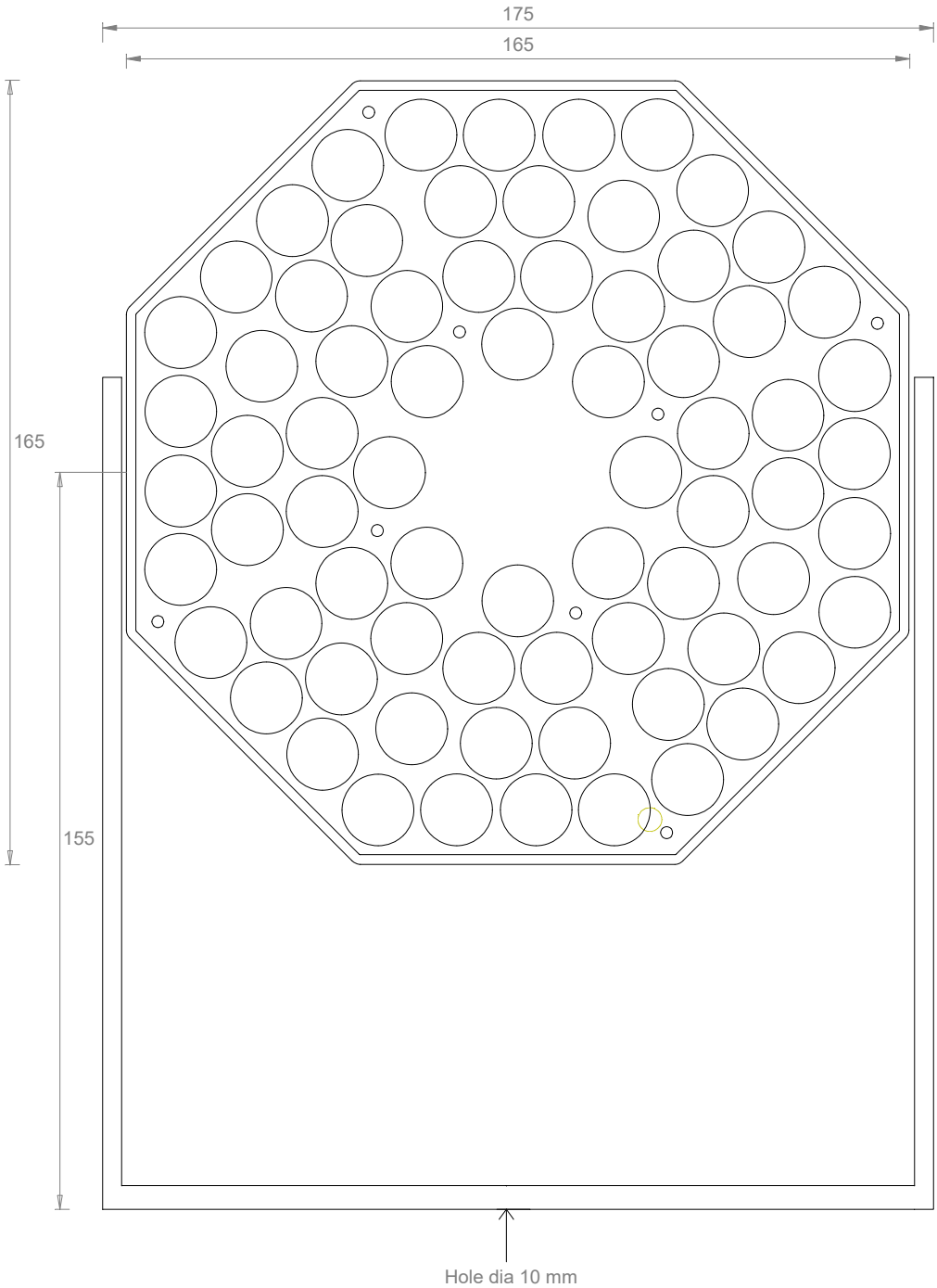
Attention! Prevent fluids or rain getting into the lamp.

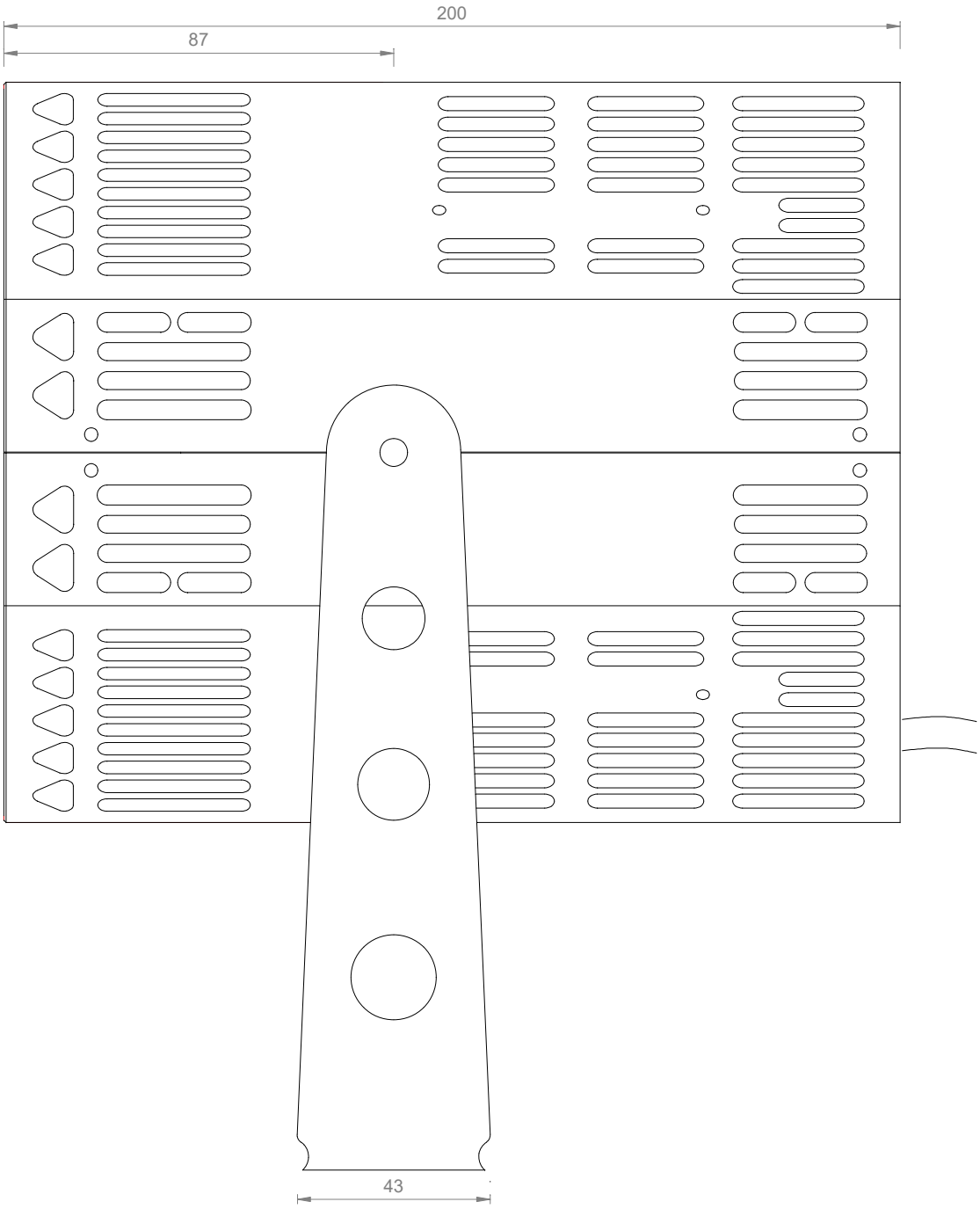
Attention! Keep away dust from SyncLamps. Take same care to the lenses of lamps as you do for the lens of cameras.

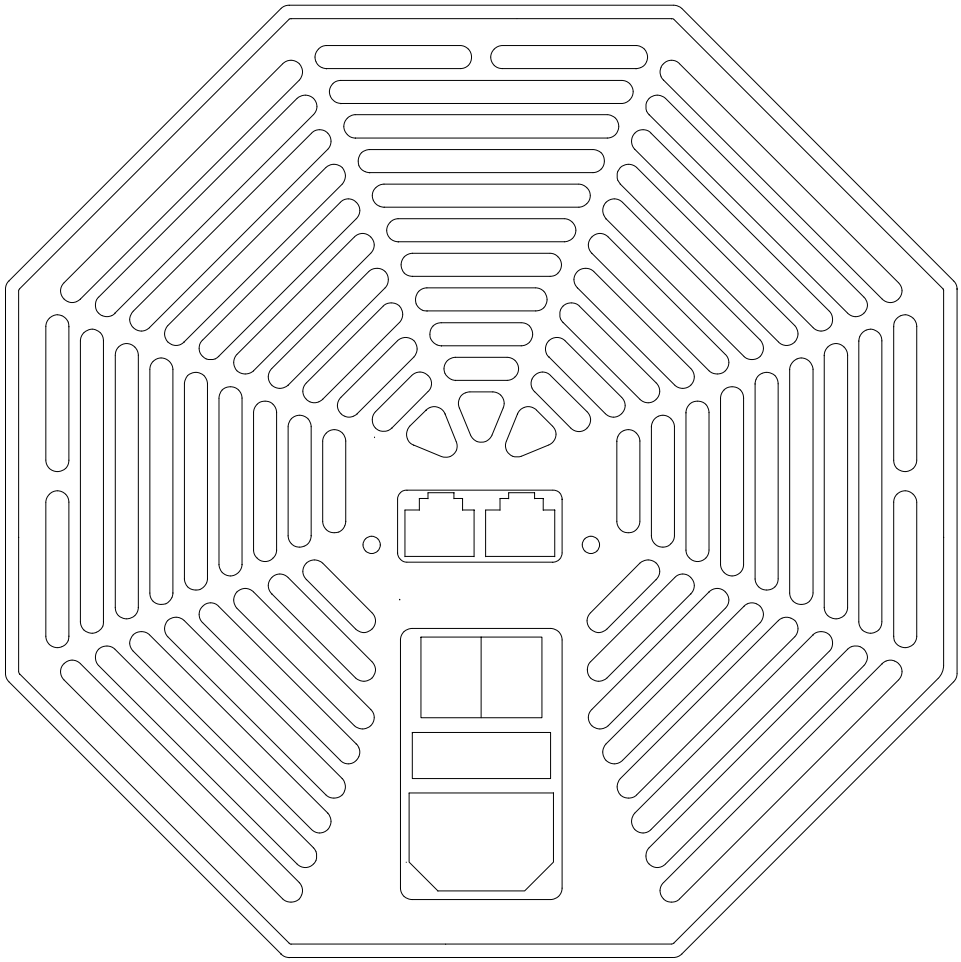
Attention! Do not use heavy pressurized or oiled air for cleaning of lenses. Do not use pure alcohol for cleaning the lenses. Use a brush or cleaned dry soft pressurized air (like for cameras). If wet cleaning is required, use an alcohol+water mixture (window cleaner) or houesehold dish wash soaps.

1.3 Mounting information

The drawings below shows the main measures.

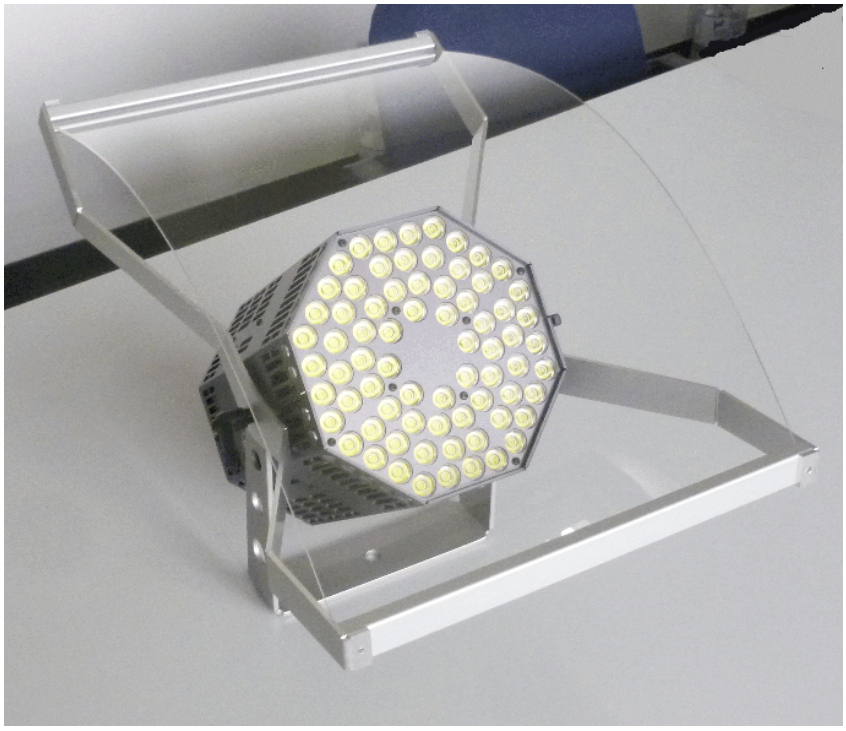



200
87
43



1.4 Rain hood

The lamp is made for indoor use. For occasionally outdoor use a protective rain hood is available.



1.5 USB Interface

The lamps can be connected to a PC using a USB interface. This interface is only required once for a lamp group. Several lamps (up to 32) can be daisy chained one after another and be set up or controlled over just one interface.

The USB interface is powered from the PC USB port and needs no seperate supply.

The USB interface has one BNC Sync input and accepts a 5 V TTL/CMOS synchronisation signal, which is distributed to every connected lamp.

1.6 Ethernet Interface

The lamps can be connected to a PC using an Ethernet interface.

This interface is only required once for a lamp group. Several lamps (up to 32) can be daisy chained one after another and be set up or controlled over just one interface.

The Ethernet interface is powered from a small wall plug supply (24 V). It can be set to a fixed IP address in the usesr network.

The Ethernet interface has one BNC Sync input and accepts a 5 V TTL/CMOS synchronisation signal, which is distributed to every connected lamp.

2 Connectors and Rear Panel elements

All connectors are located at the back of the device. The lamp has one connector for power supply and two connectors for signals.

2.1 SUPPLY connector

The SUPPLY connector is used to connect this device to the power grid 110 VAC to 240 VAC with a standard IEC cable. The lamp is sold international and delivered *without* a cable, as these cables vary from country to country.

The cable must be specified for current 10 A.

A fuse is located near the mains switch. A second, spare fuse is provided in the fuse holder compartment. In case of replacement use these values:

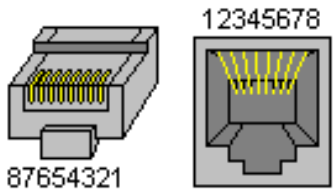
Voltage	Replacement fuse
110 VAC	10 A slow
240 VAC	5 A slow

2.2 BUS connector

The lamp has two signal connectors of type RJ-45. These are directly interconnected one-by-one and can be used interchangeable. This connector type is commonly used for ethernet, but in this case it is NOT ETHERNET. Do not make connections to other ethernet devices or ethernet switches.

The signals and pinout is given in the table.

Pin	Signal
1	
2	
3	
4	CMD+
5	CMD-
6	
7	SYNC+
8	SYNC-
Case	REFGND



Several lamps can easily be daisy-chained one after another using standard patch cables. This makes installation of lamp groups very flexibel and quick.

The signals CMD+ and CMD- are differential signalling for communication. IES provides several interfaces for communication with the lamps, including USB and ethernet.

The signals SYNC+ and SYNC- are differential signalling for SYNC. It is recommended to use RS-485 levels, but in smaller systems the lamps will work fine with TTL 5 V levels. In this case, the signal should connect to SYNC+ and the return (GND) should connect to shield. SYNC- is left open then.

3 Functional Description

3.1 Power ON behaviour

The lamp is switched ON with the switch at its rear side. Switching ON does not necessary mean that light is produced. It is merely just a logical ON state.

The lamp can be configured to be ON after beeing switched on, or be configured to remain off after beeing switched on. In the second case, the lamp must receive a hardware signal or a command to produce light.

Consider a small test setup. A user would want the lamp to produce light just after switching it ON.

Now consider a huge testing area with hundred lamps. Nobody would want all lamps to be automatically ON after an electricity down/back cycle. They should only go ON after sending a command.

To cover these opposite needs, the lamps are configurable by software. The configuration is stored non-volatile and is made effective after the logical switch ON.

The default configuration ex works is to go ON after switching on.

3.2 SYNC and CONT modes

The lamp can be operated in several different modes.

Cont mode

After the lamp is switched on (or after the command LAMPxx) it produces light in continuous mode. If a sync signal is present, it is ignored. This mode offers 100% illumination and can be used for an infinite operation time.

ContEna mode

This mode is like Cont mode, but the input signal SYNC+ is evaluated to decide if the lamp should be ON or OFF. If SYNC+ is held high (5 V), the lamp is ON, and if this signal is low (GND) the lamp is OFF. This mode enables to switch on/off the lamp (or multiple lamps that are daisy chained) with a simple closing contact switch.

The lamp has an internal pullup resistor (4k7) on SYNC+ so an open input (no cable connected) is interpreted as high, meaning lamp ON.

FollowEdge mode

In this mode, after the lamp is switched on (or after the command LAMPxx), it produces timed light pulses in response of a rising edge at the SYNC+ input. The light pulse parameters can be configured by commands and stored in the lamp. The parameters are

Duration of the pulse, i.e. pulse width
Delay of pulses to edge of sync signal
Number of pulses for one sync edge (multipuls feature)
Period between multi-pulses

If the SYNC+ input is held low, the lamp is OFF. If SYNC+ input sees pulses, the lamps follows this

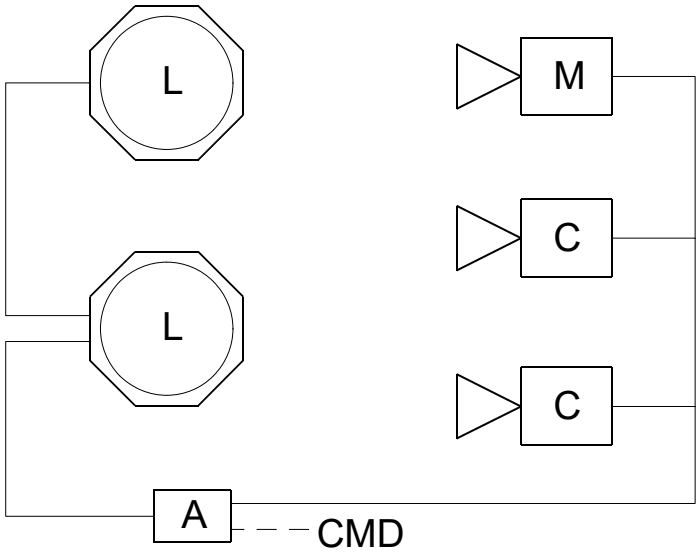
signal. The FollowEdge mode is especially useful with cameras that output a sync signal only when armed. Then this signal would activate the light automatically for picture taking, but lamp is OFF when the camera is not recording.

SmartPll mode
In this mode the lamp synchonizes itself to a permanent and stable sync input signal. After some ten seconds the PLL is locked and the lamp produces light pulses like in FollowEdge mode. In contrast to FollowEdge, if the sync signal is cut or is disturbed, the PLL ensures the light pulses to continue. The light will be in sync for tens of seconds, even after a sync cable was cut.
This mode is implemented on demand and most usefull in mobile or dynamic szenarios, but not so important in stationary installations.

In both sync modes, the illumination strength during the light pulse can be set to more than 100%. The light will apear darker to the human eye than in CONT mode, but it will be seen up to more than double bright from the synchronized cameras.

3.3 Sync-Topologies

Depending on the size of an illumination set different approaches to a suitable overall sync solution are possible. The next picture shows a setup for a small example system, consisting of only two lamps and three cameras.



In such a small system, one camera M can act as a sync master. Camera M outputs a sync signal (such as TTL, 5 V) and the other cameras receive this signal as their sync in. The lamps L are daisy chained and also receive this sync signal from camera M.

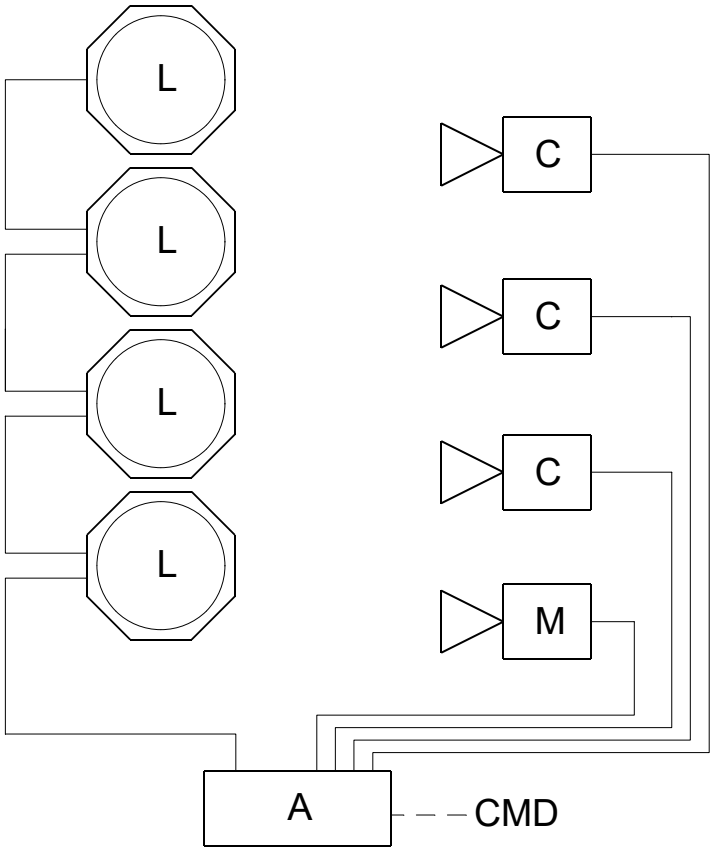
Many cameras use cabling with BNC type connections. This enables easy connections between M and C+C. The SyncLamp 4438 has daisy chain cables of type RJ-45. To feed in the sync signal, an adaptor A is needed.

This adaptor A can in its minimal version just be a cable with a BNC at the one end and an RJ-45 connector at the other end. A better version of A includes an USB interface, which enables to communicate with the lamps.

This kind of topology is limited by the driver capability of camera M. If many devices C, L and longer cable lengths are involved, the signal must be buffered.

This is shown in the next picture. A master camera M feeds its sync out signal into a distribution box A like IES0139, which provides 8 buffered outputs. From here several cameras C and numerous lamps or lamp groups L can be driven with clean sync signals.

Again, this box can optionally have a CMD interface for communication with the lamps via USB.



This setup is well suitable for test stands with physical dimension of one room.

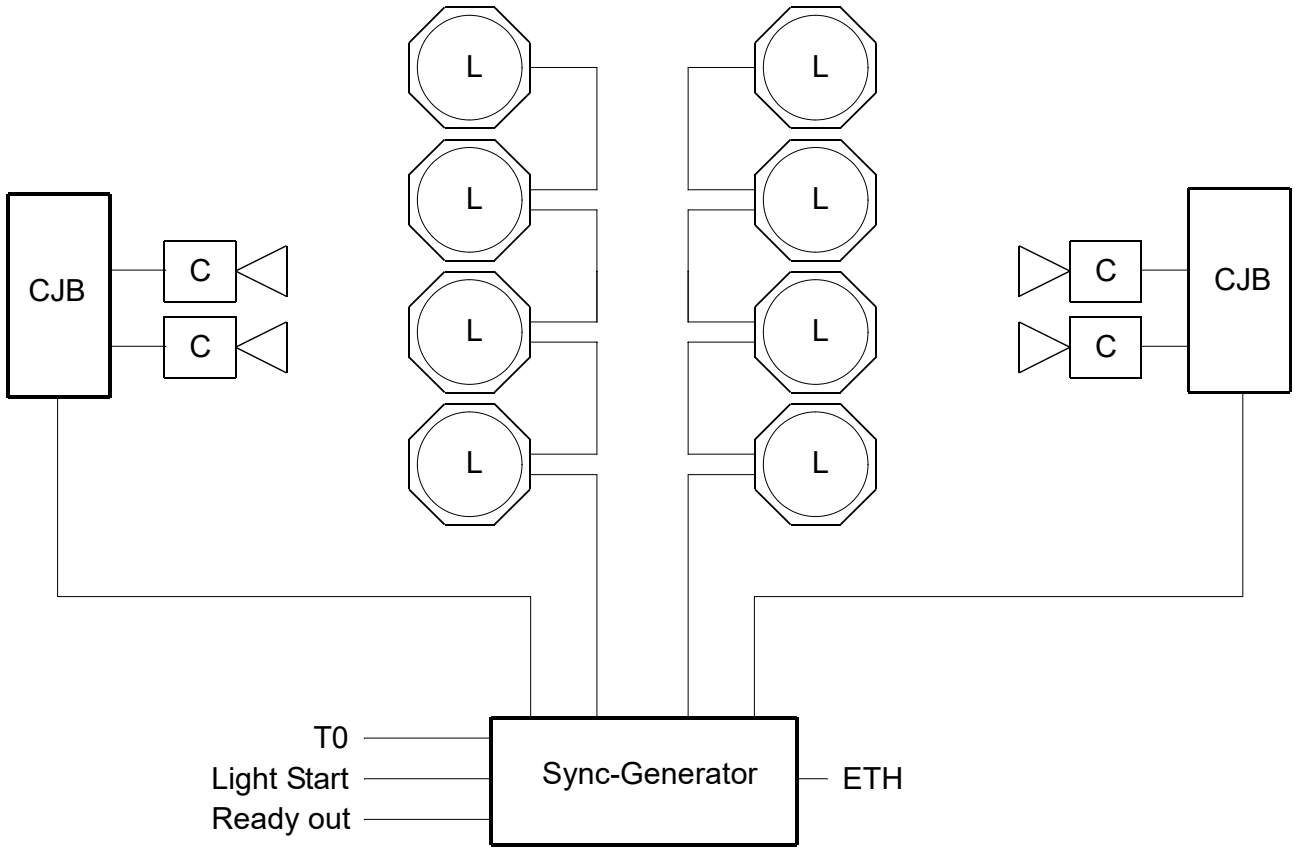
If dimension is larger, like in a full scale crash test scenario, cables are long and there a are many devices to receive a sync signal, then a dedicated SyncGenerator, like IES4732, is mandantory.

The next picture shows this topology. There is no master camera. The sync signal for the complete system is generated in the SyncGenerator. Also, this device acts a the head of T0 distribution and as an I/O interface for light start or light ready signals.

Lamps are controlled by hardware signals (connected to the sync generator), or by commands over the ethernet interface.

Cameras are connected to CJB´s (camera junction boxes, like IES0087), and receive their sync from the SyncGenerator.

All signals are differential and suitable for long distances.

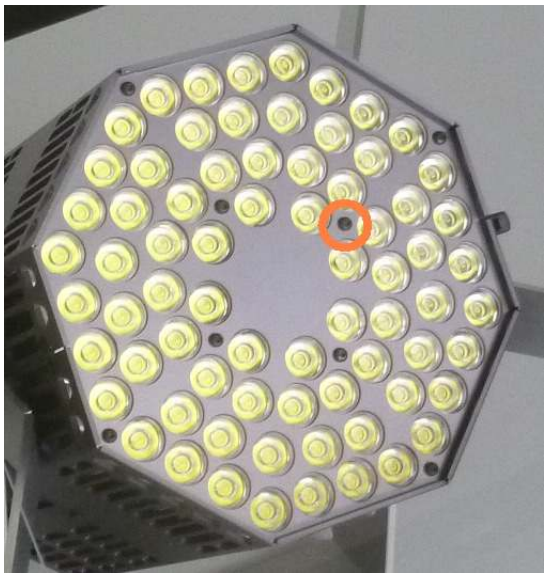


3.4 Changing the lens plate

The lens plate of the lamp can be changed by the user. Several different illumination angles can be achieved by using the appropriate lens plates.

To dismount the lens plate, screw off 8 pcs of M2 scews (see marking in photograph) and take off the plate. Be careful:

- Do not bend the plate
- Take off straight, not in an angle



To mount a plate, first identify the correct rotation angle of the plate, so the lenses match the LED chips.

Then put the plate in place with no force and no bending and straight, not in an angle. Take care not to damage the chip lenses. The chip lenses are weak and sensitive. Chips will stop working after a delay of days or weeks, even if their lens was only minor mechanical damaged or cut.

Do not touch the chip lenses with your fingers.

Finally lock the screws. Keep in mind M2 is a small size and no big torque should be applied.

3.5 Technical Data

Metrics	
Dimensions	200 x 165 x 165 mm³
Weight lamp	2.9 kg
Weight holder	0.17 kg

Environment	
Temperature range	0°C … +40°C
Acceleration	not tested

Electrical Interface	
Connector	IEC for Power, RJ-45 for Sync and CMD
Power	110-230 VAC, 1 kW
Fan life time	70000 h

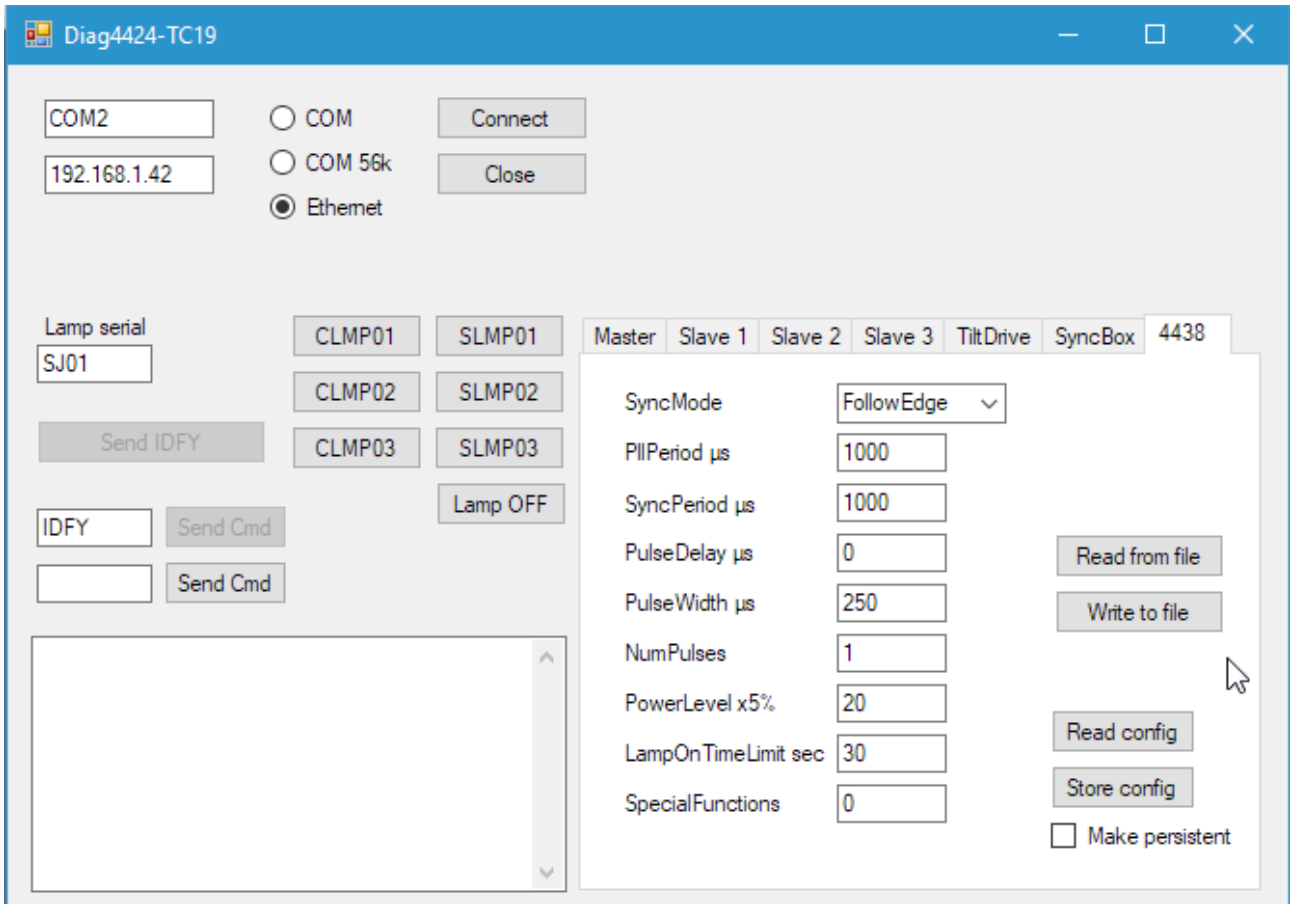
Illumination Parameters	
Illumination angle	36°, 48°, 60°, 120°
Lumen output cont mode	96 000 lm
Lumen output sync mode	> 200 000 lm

Illumination strength vs lens angle and distance (single lamp, cont mode)				
Angle	**1 m**	**2 m**	**3 m**	**4 m**
36°	186 klx	47 klx	21 klx	12.5 klx
48°	115 klx	29 klx	13 klx	7.7 klx
60°	89 klx	22 klx	10 klx	6 klx
120°	31 klx	8 klx	3.7 klx	2.2 klx

4 Software

4.1 Diag 4438

IES provides a free PC software named "Diag4438", which is primary intended for diagnostic purposes, but can also be used to setup and control single lamps or small groups of lamps.



To connect to a a lamp, first choose the type of interface you use. If using the USB interface choose "COM 56k". Press "connect".

Next, input the lamp serial number, like "SJ01" in picture above.

Now commands can be sent to the lamp and answers are shown. Use command "IDFY" for a first test and watch the answer in the text box.

Go to the tab 4438 and read out the current configuration of the lamp. All text fields are populated with the actual values in the lamp.

If changes are desired, input the values in text fields and press "Store config". The new values are now used by the lamp. The values are a volatile and not stored permanently in the lamp, so get lost after power off. If user wants to store values permanently, check "Make persistent" before pressing "Store config".

Settings can also be written to a config file, or loaded from one ("Read from file").

5 CE Conformity

We,

IES Ingenieurbüro für Elektronikentwicklung und Spezialgerätebau Dr.-Ing. U. Bahr
In den Waashainen 2
38108 Braunschweig
Germany

hereby declare in sole responsibility, that our product

IES 4438 LED Sync Lamp

complies in conception and production with the following EU standards

2014/30/EC (EMC)

2014/35/EC (LVD)

2006/25/EC (AOR)

2011/65/EU (RoHS)

Applied standards:

EN 61000-6-2
EN 61000-6-4
EN 62471

If any modifications are applied from the end user, this declaration is invalid.

2018-12-01
(Date)

U. Bahr
(Dr.-Ing. U. Bahr, company owner)