



SEGSPTL32 – Technical specification Rev.09

Warning Light for Power Distribution Overhead Lines





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1. Scope

This specification defines main technical characteristics of Obstruction Light for overhead power lines SEGSPTL32 type, designed and manufactured by Clampco Sistemi; in addition applicable reference standards are also indicated.

2. Introduction

Power distribution overhead wires, often suspended to widely spaced masts, constitute an almost invisible obstacle to low flying aircraft, often making ineffective the installation of warning beacons on the masts themselves.

An obvious solution to this problem is installing the marking lights directly on the wires.

Nevertheless there are significant technical difficulties to a low-cost extraction of power from a distribution system which carries high voltages and wide range AC current. Moreover the warning system should not add to the existing power distribution wires the burden of additional cabling, with its possibly serious isolation problems. These facts rule out the recourse to conventionally powered light sources. The ideal warning light must be able to power itself while clamped to a single wire of the line.

Two approaches are possible for the solution of this problem:

- extracting energy from the electric field between two wires of the power line;
- extracting energy from the magnetic field surrounding one of the power line wires .

The first approach takes advantage of the high electric potential gradient between conductors, but to allow capacitive extraction of the power required from the warning light a strong enough capacitive coupling is requested. This means that very long and huge conductors must be suspended parallel to the line using glass/ceramic isolators: in fact several meters of suspended conductor are generally required, the total length being inversely proportional to the line voltage. The light source generally is a special gas discharge lamp, able to operate with very low current levels and high voltage drop (some kV). The protecting tube housing the lamp, suspended parallel to the line wire at about 0.5 m, can be long up to 1 m. The total weight of this devices is about 25 kg for 380 kV lines and 50 kg for 110 kV lines

Clampco Sistemi has followed the second approach (inductive coupling) which offers many advantages, as described in the following pages.

3. SEGSPTLXX Inductive Coupling Device

Clampco Sistemi, thanks to its long experience in warning beacons and Aircraft Warning Light System design and manufacturing, has realised the SEGSPTL32 family product, an innovative obstacle warning light for power distribution lines.



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4. Dimensions

The SEGSPTL32 Warning Light is energised by the magnetic field surrounding the power distribution wire, through an electronic circuit able to provide up to 20 Watt power supply.

The magnetic field power extraction concept has allowed the design and construction of this considerably compact clamp-on Warning Light of about 7.5 kg total weight and (Ø) 350 x (h) 370 mm overall dimensions.



Fig. 1 – Warning Light SEGSPTL32 plus faraday cage



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5. Applicable current ranges

The SEGSPTL32 is intended primarily for medium and high voltage lines up to 420 kV. However, according to the selected model, it works on any AC 50 Hz, 8 to 3.000 Amp. conductor with cable diameter from 10 mm to 38 mm. AC 60 Hz version is also available on request. The following table summarizes the models available and the applicable current range:

SEGSPTL32 (32cd) ICAO type B

Model	$I_{\text{shut down}}$ (A rms)	$I_{32 \text{ cd}}$ (A rms)	I_{min} (A rms)	I_{max} (A rms)
Mod. 10-500	6	9	10	500
Mod. 24-1000	18	22	24	1000
Mod. 48-2000	38	44	48	2000
Mod. 80-3000	58	65	80	3000

TABLE 1 – Electrical characteristics of SEGSPTL32 devices.

- I_{max} is the nominal maximum current of the conductor;

- I_{min} is the minimum rms current required for nominal light emission; if I_{min} is exceeded once, for at least 1 minute (bootstrap time), SEGSPTL32 is able to operate even at currents lower than I_{min} , but light emission decreases with current.

- $I_{\text{xx cd}}$ is the minimum current value required to generate red light of xx cd intensity.

- $I_{\text{shut down}}$ is switch off current; no light will be generated below this current value. New automatic bootstrap is then required as soon as current increases once more.

6. Installation

Fixing of SEGSPTL32 to the wire is eased both by its compact dimension and by its simple locking system, resulting in very fast installation.

The SEGSPTL32 can be directly clamped and fixed to the line conductor (or better to a protective 'armour rod') in less than 4 minutes, using one hand tool only (exagon key 6mm). The small dimensions of the SEGSPTL32 allows easy installation even when the phase line is realised with 2-wire or 3-wire conductors.

Of course the diameter of the HV cable or of the protective 'armour rod' must be indicated at the order to define the correct dimension of the clamping shells. See the attached 'Instruction Installation' sheet (rev 6).



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7. Constructing materials

The light source and most of the circuitry are housed under a 5 mm thick unbreakable transparent polycarbonate cap (Impact test level: 20J). Cap holder is made of die cast aluminium, protected by thick red paint. The clamping head and cable bushes are made of UV resistant, non flammable polyamide. The lower ring is made of hot dip galvanised steel. All fixing screws are made of stainless steel AISI 304. Corrosion or damage of the supporting conductor are averted, since no metallic part of SEGSPTL32 is in contact with it (but the equipotential pigtail made of tinned copper).

8. Expected life

The SEGSPTL32 very long operating life (without need of maintenance or service) suits perfectly the difficult and expensive access to the power distribution wires.

Solid state light sources (LED) with extremely high MTBF (more than 100.000 hours continuous operation) and assemblies insensitive to vibrations and harsh environmental conditions have been selected. Constant current power supply and series-parallel connection of the LEDs assure intrinsic immunity from isolated LED failures and guarantees stable photometric performance over long operating times.

9. Photometric characteristics.

The SEGSPTL32's bulb is a steady, low intensity Type **B** source fully compliant to I.C.A.O. (Vol.1, Annex 14, Chap. 6.3) and F.A.A. (L-810 obstruction light).

The light emission pattern, omni-directional on the horizontal plane, guarantees more than 32 Cd. with a vertical elevation total angle of 23°.

Light colour is compliant with the relevant chromatic specifications of I.C.A.O. standard (CIE).

10. Warning light activation

The device is provided with low ambient light turn-on (photocell switch inside). Activation ambient light threshold is set to about 50 lux.

11. Environmental conditions

The SEGSPTL32 is protected against moisture or dust (IP 66 protection degree) and is designed to withstand heavy environmental conditions. The device ambient temperature range goes from -35°C to +60°C (UNI 9429/89 test procedure).

The SEGSPTL32 conforms to the applicable demands of EN 60598 product standard (Low Voltage European directive 73/23 EEC and 93/68 EEC) and is corrosion resistant (UNI ISO 9227/93 test procedure - salty hot fog, 400 testing hours)- Thanks to the co-operation with VERBUND AG, the Austrian power



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distribution public company, three SEGSPTLXX warning lights are undergoing continuous “field tests” on overhead power line since 1998

12. Wind load

At 160 km/h wind speed the following additional loads are expected on the supporting line conductor:

- lateral thrust = 140 N
- torque = 18 Nm.

The enclosed nylon clamping shells prevent the sliding and rotation of the device with respect to the line cable.

13. Immunity to Lightning

The SEGSPTL32 internal circuitry is protected against impulse interference that may occur during lightning overvoltage on the line (as certified by the test report n. 7720/B/07 released in Jun 2007 by EGU HV Lab. Praha - Czech Republic)

14. Corona Extinction Voltage and Radio Interference Voltage measurements

The SEGSPTL32 warning light is protected by a Faraday/Corona Shield which floats at the same electric potential of its supporting conductor. The conductive and dielectric parts of SEGSPTL32 are shaped to limit the maximum electric field well below critical value for corona effect (as certified by the test report n. 9270/B/07 released in Jun 2007 by EGU HV Lab. Praha - Czech Republic).

Also R.I.V has been measured according CISPR18-2 and found below the limits fixed by the EN50341-3-19 European Standard (as certified by the test report n. 9270/B/07 released in Jun 2007 by EGU HV Lab. Praha - Czech Republic).

This means that SEGSPTL can be used in lines up to 420 kV nominal voltage and more.

15. Immunity to AC overcurrents (line Short Circuit)

The SEGSPTL32 internal circuitry is protected against line AC overcurrents that may occur during short circuit fault or switching operations on the line (as certified by the test report n.A7007686 released in Apr 2007 by CESI HV Lab. Milan - Italy)



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16. EMC compliance

All versions of the SEGSPTLXX are compliant to the European Directive 89/336 EEC on Electromagnetic Compatibility, according to the following standards:

- Radiated Emissions, EN 55011, class A
- Conducted Emissions, EN 55011, class A
- Radiated Immunity, EN 61000-4-3
- RF Conducted Immunity, EN 61000-4-6
- ESD, EN 61000-4-2

Of course SEGSPTL32 warning light is immune to very strong 50-60 Hz magnetic and electric fields.

17. LF Signalling compatibility

The SEGSPTL32 is compatible with transmission systems which use low frequency signals conducted by line wires.

The additional attenuation and the level of generated electric disturbances are negligible even with many warning beacons clamped to the same line.

18. SEGSPTL32 Product Family technical data

Compatible conductor Diameter	Ø 10 mm ÷ 38 mm
AC line max voltage / frequency	420 kV / 50 or 60 Hz
Conductor current range at full spec.	according to model
Power absorption from line	20W (lamp on) 5W (stand-by state)
Overall dimensions	diam=350 mm, H=370mm
Weight	7.5 kg
Type of obstacle light	I.C.A.O., low intensity source
Lamp Type	ultrabright LED array
Min light intensity at lobe peak (+8°)	32 Cd
Light beam (Full Width Half Power)	23° in elevation
Light Colour	red (according to CIE)
Ambient temperature range	-35°C ÷ 60°C
Protection degree	IP 66
Internal photoelectric sensor technical data:	
On delay time/Off delay time	10 sec / 40 sec
Amb. Luminance activ. threshold	standard factory set: 50 lux