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ΕΛΛΗΝΙΚΗ ΤΕΧΝΙΚΗ ΠΡΟΔΙΑΓΡΑΦΗ

HELLENIC TECHNICAL SPECIFICATION

Χωνευτοί φανοί επισήμανσης διαδρόμου αεροδρομίου

Airfield runway inset luminaires

Preamble

This Hellenic Technical Specification revises and replaces ELOT TS 1501-06-04-01-00:2009.

This Hellenic Technical Specification was prepared by Experts and checked and evaluated in its field by a Supervisor/Specialist - Expert, who assisted the work of the Technical Committee ELOT/TE99 "Specifications of Technical Works", the secretariat of which belongs to the Directorate for Standardisation of the Hellenic Organization for Standardization (ELOT).

The text of this Hellenic Technical Specification ELOT TS 1501-06-04-01-00 was adopted on 24.03.2023 by ELOT/TE 99 in accordance with the Regulation on the drafting and publication of Hellenic Standards and Specifications.

The European, international and national standards referred to in the standardisation references are available by ELOT.

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Introduction

This Hellenic Technical Specification (HTS) is part of the technical texts originally prepared by the Ministry for the Environment, Spatial Planning and Public Works and the Institute for Constructions Economy (IOK) and was subsequently edited by ELOT in order to be applied to the construction of national public technical works, with a view to produce works that are robust and capable of meeting and satisfying the needs which have dictated their construction, and be beneficial for the society as a whole.

Under a contract between NQIS/ELOT and the Ministry for Infrastructure and Transport (online publication number 6EOB465XΘΞ-02T), ELOT was assigned the editing and update as 2nd Edition of three hundred fourteen (314) Hellenic Technical Specifications (HTS), in accordance with the applicable European Standards and Regulations and the procedures laid down in the Regulation on the drafting and publication of Hellenic Standards and Specifications and in the Regulation on the establishment and operation of Technical Standardization Instruments.

This Hellenic Technical Specification was prepared by the contractor of the restricted tender No 1/2020 for the award of the work "Revision of the 1st edition of 314 HTS" (online publication number Ω EEAO Ξ M Γ - Ξ H Δ), checked and evaluated in its field by a Supervisor/Specialist - Expert and submitted for Public Consultation. It was approved by the Technical Committee ELOT/TE 99 "Specifications of Technical Works", which was set up by the Decision of the Managing Director of the NQIS, $\Delta \nu$. Σ . 285-19/08-02-2019 ($\Delta \Delta$ A6 $\Omega \Delta$ PO Ξ M Γ -15 Ξ).

This HTS covers the requirements arising from the EU law, the relevant New Approach Directives currently in force and the National Law, and refers to and is compatible with harmonised European standards.

Airfield runway inset luminaires

1 Objective

The purpose of this Technical Specification is the installation of high-illuminating Airfield central and lateral runway inset luminaires in accordance with the applicable European and international EASA and ICAO specifications. The inset luminaires shall also be fitted for marking the lateral limits of the runway when for reasons of manoeuvre the aircraft cannot be fitted with elevated luminaires.

2 Standardization references

This Technical Specification incorporates –by way of references– provisions of other publications, whether dated or not. These references refer to the respective parts of the text and a list of these publications is presented thereafter. In case of references to dated publications, any subsequent amendments or revisions thereof shall apply to this document when incorporated in it by means of amendment or revision. With regard to references to undated publications, their latest version shall apply.

ELOT EN 55015	Limits and	metho	ds of	measure	ment o	f radio	o dist	turban	ce cł	naraci	eristics	of
	electrical	lighting	and	similar	equipn	nent (Ορια	και	μέθο	δοι	uετρήσ	εων
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	παρόμοιων συσκευών											

ELOT EN 61000-3-2 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current \leq 16 A per phase) -- Ηλεκτρομαγνητική συμβατότητα (EMC) - Μέρος 3-2: Όρια - Όρια εκπομπών αρμονικού ρεύματος (ρεύμα εισόδου συσκευής μέχρι και 16 A ανά φάση)

ELOT EN 61000-3-3

Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection -- Ηλεκτρομαγνητική συμβατότητα (EMC) - Μέρος 3-3: Όρια - Περιορισμός μεταβολών τάσης, διακυμάνσεων τάσης και τρεμοσβήματος σε δημόσια συστήματα τροφοδοσίας χαμηλής τάσης, για συσκευές που έχουν ονομαστικό ρεύμα ≤16 Α ανά φάση και δεν υπόκεινται σε υπό συνθήκη

ELOT EN 61547 Equipment for general lighting purposes - EMC immunity requirements -- Εξοπλισμός για φωτισμό γενικής χρήσης - Απαιτήσεις ατρωσίας EMC

ELOT EN IEC 60598-1 Luminaires - Part 1: General requirements and tests -- Φωτιστικά σώματα - Μέρος 1: Γενικές απαιτήσεις και δοκιμές

ELOT EN IEC 61820-1 Electrical installations for aeronautical ground lighting at aerodromes - Part 1: Fundamental principles -- Ηλεκτρικές εγκαταστάσεις για αεροναυτική σήμανση εδάφους σε αεροδρόμια - Μέρος 1: Θεμελιώδεις αρχές

Electrical installations for lighting and beaconing of aerodromes - Characteristics of inset and elevated luminaires used on aerodromes and heliports -- Ηλεκτρικές εγκαταστάσεις φωτισμού και σήμανσης αεροδρομίων - Χαρακτηριστικά των ένθετων και ανυψωμένων φωτιστικών που χρησιμοποιούνται σε αεροδρόμια και ελικοδρόμια

IEC TS 61827

CS-ADR-DSN EASA Certification Specifications and Guidance Material for Aerodrome Design

(Issue 6, 29 March 2022)

ICAO Annex 14 Runway leading - in lighting systems

FAA AC 150/5345-46E Specification for Runway and Taxiway Light Fixtures -- Ομοσπονδιακή Αρχή

Αεροπορίας ΗΠΑ

NATO STANAG 3316 Airfield Lighting.

3 Terms and definitions

The following terms and definitions are used in this Technical Specification:

3.1 Runway

It is generally defined as the specified rectangular area of <u>airport</u> intended for landings and take-offs of aircraft. The corridor is the main and most characteristic infrastructure of any civilian or military <u>airport</u>. Frequently used the term <u>airway</u>, which is not identical to the runway, and is part of the airspace in which aircraft can be flown. The word runway is also found in aviation terminology as **landing/take-off runway**.

3.2 Non-precision instrument approach corridors

They are met at small to medium-sized airfields and depending on their surface, they may have threshold markings, runway shaft identifiers, and sometimes a mark at 300 m, known as a target point, or sometimes a mark at 500 m.

These runways also provide horizontal positioning guidance to aircrafts with an instrument approach via a non-directional range beacon, via an omnidirectional range beacon (VHF Omnidirectional Range - <u>VOR</u>) or through the Global Positioning System - <u>GPS</u>) etc.

3.3 Precision instrument approach corridors

They are met at medium to large sized airfields and include stopways -optional for airfields, operating jet-type aircraft-, thresholds, runway identifiers, targeting point and wheel contact zone marks at 150 m, 300 m, 450 m, 600 m, 750 m and 900 m. Precision runways provide both horizontal and vertical guidance for instrument approaches.

3.4 Runway centerline lighting system - RCLS

It consists of underfloor inset luminaires along the axis of the runway at distances of 15 m. This system shall be found in precision instrument approach corridors to facilitate landings at night (see Figure 1) or under adverse conditions of visibility (see Figure 1 and 2).

They usually emit white light, with the exception of the last 900 m (3 000 ft) of the runway, of which at 600 m they emit red and white light alternately, indicating the warning zone and in the last 300 meters they emit red light, indicating the end of the runway.

These luminaires may emit white or red light so that the direction of use of the corridor can be reversed by maintaining the above sequence of colours.



Figure 1 – The border and axis marking lights of the runway as seen from the aircraft cockpit



Figures 2 and 3 – Examples of airfield runway inset luminaires.

4 Requirements

4.1 General

The system of airfield runway inset luminaires is a key component of the equipment and must meet the safety requirements of EASA and ICAO, as well as the requirements for functionality and reliability at normal (night) and adverse weather conditions (low visibility), in accordance with Regulation (EU) No 139/2014 (Bibliography [26])

The touch of the system is done through automation devices located in the Control Tower or other alternative point or by the pilot of the aircraft via remote control, in accordance with the provisions of the Airport Operating Rules.

For the design and operational characteristics of these systems, those set out in EASA's CS-ADR-DSN Specifications (Greece is a member country of this European Agency), ICAO Directives (Annex 14, Volume I, paragraph 5.3.12 for use in corridor categories I, II and III) which have been included in the Greek Regulatory Framework (see Bibliography [1] and NATO STANAG Regulation 3316) are applicable (if airports are used for military purposes).

Regarding to luminaires (F/S), ELOT EN IEC 60598-1 is applicable, while their standardisation follows internationally FAA Specifications AC 150/5345-46E (FAA L-850A and L-850B illuminators), which provide detailed technical data, in contrast to EASA CS-ADR-DSN and ICAO Annex 14, which focus on the location and functional characteristics of luminaires.

The European Standards ELOT EN 55015 and ELOT EN 61000-3-2, ELOT EN 61000-3-3, ELOT EN 61547 and the Technical Specification IEC TS 61827 apply and must comply with the requirements of Directive 2014/30/EU (EMC) and Joint Ministerial Decision No 37764/873/Φ342/02.06.20166 (Government Gazette, Series II, No 1602) transposing it into national law. These standards are compatible with the above provisions.

Electrical equipment intended for use at a rated voltage between 50 V and 1000 V for alternating current and between 75 V and 1500 V for direct current shall comply with the requirements of Directive 2014/35/EU (LVD) and Joint Ministerial Decision No 51157/DBN 1129/2016 (Government Gazette, Series II, No 1425).

In addition, it must comply with the requirements of Directive 2011/65/EU (RoHS) and Presidential Decree 114/2013 (Government Gazette, Series I, No 147).

If the power stations carry wireless parts must comply with the Radio Equipment Directive 2014/53/EC and Presidential Decree 98/2017 (Government Gazette, Series I, No 139), which transposes it into national law, if Directives 2014/30/EU and 2014/35/EU. do not apply.

The equipment to be installed must therefore:

- (a) bear the CE marking and all the mandatory markings set out in the above-mentioned institutional framework
- (b) be accompanied by an EU declaration(s) of conformity.

The EU directives and the standards by which the material type tests were carried out must be clearly stated in the declaration of conformity.

The device (coordinates of the mounting points) and the individual characteristics of the system (brightness, colour of light emitted, power supply, operating automation, etc.) shall meet the runway operation requirements to ensure the safe take-off-landing conditions of aircraft.

The installation study of the system must be carried out by a technical consultant specialised in the design and certification of airfields.

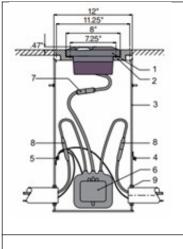
4.2 Technical characteristics of luminaires

These are standard dimensions and functional structures that must be accompanied by certificates that meet the requirements of EASA, ICAO, NATO and FAA as well as the current European Standards and Directives depending on the regulatory framework under which the airport is designed and certified as a whole.

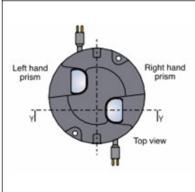
Table 1 below lists the individual elements of a standard airfield runway inset luminaire.

Components Body casting 1 2/3 White (clear) prism 2/3 Red dichroic prism 2/3 Blank for prism aperture Prism gasket Prism clamp gasket Prism retaining clamp Lampholder Lamp retaining spring Lamp, MR16, 6.6A, 49W 10 Lamp gasket 11 Lamp by-pass disc assembly 12 45W by-pass disc 'O' ring seal 13 Cable gland assembly 14 'B' type plug lead

Table 1 - Subparts of standard airfield runway inset luminaire



- 1. ZA181 fixture
- 12" FAA L-868B mounting adapter (30-AA122820)
- 3. FAA L-868 base (one piece)
- 4. Outer earth terminal
- 5. Inner earth terminal
- 6. Isolation transformer (L-830)
- 7. Secondary connection
- 8. Primary connector (L-823)
- 9. Grommet



Top view of luminaire



Intersection Y-Y



The luminaire shall be a bi-directional inset, intended for marking both the axis and the sides of the runway, in particular in the positions included in the field of manoeuvre of aircraft

It shall be equipped with pre-focused or pre-focused halogen lamps with a lifetime of at least 1500 hours at maximum brightness.

The power supply is made from a $6.6\,\mathrm{A}$ series circuit, through an isolation transformer, in a separate housing.

The lamp shall be suitable for installation and full fitting to a prefabricated standard metal base of a shallow type and for operation at temperatures from -20°C to +55°C, unless the Study provides for a wider operating temperature range (extreme climatic conditions).

The inclination of the upper surface of the luminaire protruding from the floor surface shall not be more than 20°. The final projection of the luminaire from the finished surface of the runway shall not exceed 2.5 cm.

The body and main parts of the luminaire shall be made of pressed aluminium alloy with high precision machining.

The luminaire must be installed in strict compliance with the manufacturer's instructions.

The luminaire must be accompanied by the accessories listed in Table 1, i.e. lamp body, top cover, metal retainer ring, optical system after the prisms, pre-focused lamps with lamps, metal base, bipolar power cable with special connector – plug, retaining and sealing ring, screws, earthing hollows, etc.

All the above components shall consist of materials fully resistant to oxidation and internal temperatures from the operation of the luminaire.

All materials for fixture and support (screws, etc.) must be made of stainless steel.

The sealing of the luminaire shall be achieved by using rubber flange.

The construction of the optical system and the electrical part of the luminaire shall ensure comfortable maintenance and access to the intervention points. The sealing of the luminaire after a change of lamp shall be ensured by the repositioning of the existing gaskets, without the need to apply waterproofing additives.

Please note that the installation of the main runway line lamps must be carried out by qualified personnel, with proven experience in similar installations.

5 Installation methodology

Please note that no work can be carried out without timely information and authorisation from the competent authority of the airport. If work is carried out within the operating hours of the terminal it is necessary to have a competent airport body for safety reasons (e.g. accident avoidance, etc.)

The luminaire shall be installed on a special socket (base) of the same construction house, within a recess of the road surface of the runway, as provided for in the drawings. It shall be fixed to the position of mounting with the manufacturer's intended material, usually epoxy or other adhesive material of two components, a fine fluid and a viscous one, which shall be compatible with the asphalt or the concrete of the runway.

These components must be preheated to the temperature prescribed by the producer, mixed and applied in accordance with his instructions, to an ambient temperature of at least 8°C, without the application of external heating.

The storage temperature of adhesives must not exceed 30°C, and the manufacturer's instructions should generally be applied.

The adhesive material is recommended to have the following properties:

a) Elongation under tensile voltage 70 kg/cm² 8%,

b) Coefficient of thermal expansion
 c) Coefficient of linear expansion
 d) 0.00090-0.00120 (cm³/°C)
 e) 0.00030-0.00040 (cm/cm°C)

d) Steel adhesion 70 kg/cm²
 e) Cement adhesion 14 kg/cm²

The inset luminaire shall be installed in such a way that it is best bonded to the reception base and does not rotate or rise from its final position.

The strength of the luminaire and the way in which it is mounted shall ensure that the element is completely deformed through an aircraft.

Wells are required in all directional positions of the power cables according to the details of the system installation design.

6 Criteria for accepting an installed system

After the installation of the luminaires, it is necessary to touch the system in order to verify the proper operation of all the luminaires of the line and to carry out an on-site photometric sample check with a portable measuring device. A designated representative of the Airport Authority must be present during this audit.

It must also be checked that waste, material residues, packaging, tools, etc. have been removed from the places where the lamps were installed.

The finding of non-compliance with the requirements of this Decision entails rejection of the work.

Any additional requirements of the Competent Authority may be specified in the Contractual Issues and/or the Project Study.

7 Method of measurement of works

The airfield runway inset luminaires shall be measured as fully installed and functional units with their lamp, their base and all their accessories.

The luminaire/base system shall be understood as fully installed and connected to the electric power lines and fully complying with the technical characteristics specified in the Design and the conditions of this Technical Specification.

The power line of the lamps shall be measured in particular, in accordance with the Conventional Issues of the Project and the relevant Study.

Annex A (informative)

Health, Safety and Environmental Protection Terms

A.1 General

During the execution of the works, the applicable provisions on Occupational Health and Safety Measures shall be met and employees shall be equipped with the necessary Personal Protective Equipment (PPE), as appropriate, which must comply with the provisions of Regulation 2016/425 (EU).

The requirements laid down in the approved SAF/FAY of the project must also be strictly observed, in accordance with the Ministerial Decisions SGDE/DIPAD/oɪk/889 (Government Gazette, Series II, No 16/14-01-2003) and the SGPR/DIPAD/oɪk/177 (Government Gazette, Series II, No 266/14-01-2001).

A.2 Health and safety measures

Attention is drawn to the following:

- (1) Possible risks during transport, unloading, movement of the material must be assessed
- (2) Use of compressed air tools
- (3) Element drilling (powder, ejecting materials).
- (4) It is absolutely necessary to clean the installation areas of lamps from waste or material which could potentially be hazardous to either the aircraft and its equipment or endanger airport workers, visitors or passengers (FOD- Foreign Object Damage). Examples include waste, excess materials, packaging, tools, nails, cables, etc.
- (5) Attention should be paid to the non-engagement of operations with any movements of aircraft, vehicles or passengers, due to the risk of damage or injury.
- (6) Directive 92/57/EC (as transposed into Greek legislation by Presidential Decree 305/96) and the Greek legislation on health and safety matters (see Bibliography) and the corresponding individual airport safety procedures should be applied.
- (7) The Contractor/Supplier-Manufacturer of the system must provide more specific safety and protection instructions for both the installation of the system and its operation thereafter apart from the SAF/FAY.

Workers must in all cases be equipped with the required personal protective equipment (PPE), depending on the object and location of the work to be carried out and the type of equipment used. The PPE must be in good condition, free of damage, bear a CE marking and a declaration of conformity in accordance with the provisions of Regulation. (EU) 2016/425 and fall under the following Standards:

Table A.1 — Requirements for PPE

Type of PPE	Relevant Standard
Respiratory protective devices – Filtering half masks to protect against particles – Requirements, testing, marking	ELOT EN 149
Protective gloves against mechanical risks	ELOT EN 388
Industrial safety helmets	ELOT EN 397
Eye and face protection for use at work – Part 1: General requirements	ELOT EN ISO 16321-1
Eye and face protection at work – Part 3: Additional requirements for mesh type protectors	ELOT EN ISO 16321-3
Personal protective equipment – Safety footwear	ELOT EN ISO 20345

Bibliography

- [1] Government Gazette 1816/11-9-2007, Adoption of Annex 14, Volume 1, 4th edition, Amendment 7 of the International Civil Aviation Organisation on "Airports-Design and Operations of Airfield" issued under the Chicago Convention
- [2] ICAO Doc 9157. Part 4. Edition 5, :7/12/2021 "Aerodrome Design Manual. Part 4. Visual Aids"
- [3] FAA AC 150/5340-26B, Maintenance of Airport Visual Aid Facilities
- [4] FAA:AC 150/5340 -30F, Design and Installation Details for Airport Visual Aids
- [5] FAA:AC150/5345-12F, Specification for Airport and Heliport Beacons
- [6] FAA:AC150/5345 39E, Specification for L-853, Runway and Taxiway Retroreflective Markers
- [7] FAA L-861T., LED Taxiway Edge Lights
- [8] FAA: Engineering Brief No 67C, Aight sources other than incandescent and xenon for airport and obstruction lighting fixtures
- [9] Directive 92/57/EU, "Minimum Health and Safety Requirements for Temporary and Mobile Works"
- [10] Greek legislation on health and safety (Presidential Decree 17/96, Presidential Decree 159/99, etc.).
- [11] Presidential Decree 85/91, "Protection of workers from the risks arising from exposure to noise at work, in compliance with Directive 86/188/EEC" (Government Gazette, Series I, No 38)
- [12] Presidential Decree 396/94 "Minimum health and safety requirements for the use by workers of personal protective equipment at the workplace, in compliance with Directive 89/656/EEC" (Government Gazette, Series I, No 220)
- [13] Presidential Decree 105/95, "Minimum requirements for the provision of safety and/or health signs at work, in compliance with Directive 92/58/EEC" (Government Gazette, Series I, No 67).
- [14] Presidential Decree 17/96, "Implementation of measures to promote improvements in the health and safety of workers" in compliance with Directive 89/391/EEC and 91/383/EEC (Government Gazette, Series I, No 11)
- [15] Presidential Decree 305/96 "Minimum safety and health requirements at temporary or mobile constructions sites, in compliance with Directive 92/57/EEC", in conjunction with Circular No 130159/7.5.97 of the Ministry for Labour and Circular No 11 (Protocol No. Δ16α/165/10/258/AΦ/19.5.97) of the Ministry for the Environment, Spatial Planning and Public Works regarding the above Presidential Decrees (Government Gazette, Series I, No 212)
- [16] Presidential Decree 148, Environmental liability for the prevention and remedying of damage to the environment Harmonisation with Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 (Government Gazette, Series I, No 190)
- [17] Law 4042/2012, Criminal protection of the environment Harmonisation with Directive 2008/99/EC framework for the production and management of waste Harmonisation with Directive 2008/98/EC Regulation of matters of the Ministry of Environment, Energy and Climate Change (Government Gazette, Series I, No 24).
- [18] Regulation (EU) 2016/425 of the European Parliament and of the Council of 9 March 2016 on personal protective equipment and repealing Council Directive 89/686/EEC.
- [19] Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

- [20] Joint Ministerial Decision 37764/873/Φ342/02.06.2016, "Electromagnetic compatibility Adaptation of Greek legislation to Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014" (Government Gazette, Series II, No 1602)
- [21] Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment intended for use within certain voltage limits (LVD, Low Voltage Directive)
- [22] Joint Ministerial Decision No 51157/DTBN 1129/2016 (Government Gazette, Series II, No 1425/20.5.2016), Adaptation of Greek legislation to Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment intended for use within certain voltage limits.
- [23] Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain Hazardous Substances in electrical and electronic equipment (Directive RoHS, Restriction of use of certain Hazardous Substances)
- [24] Presidential Decree 114/2013 on the "Restriction of use of certain hazardous substances in electrical and electronic equipment, in compliance with Directive 2011/65/EU of the European Parliament and of the Council" (Government Gazette, Series I, No 147).
- [25] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC
- [26] Presidential Decree 98/2017, Harmonisation of Greek legislation with Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 (OJ L 153/22.05.2014) on the making available on the market of radio equipment and repealing Directive 1999/5/EC. (Government Gazette, Series I, No 139)
- [27] Commission Regulation (EU) No 139/2014 of 12 February 2014 laying down requirements and administrative procedures relating to airfields pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council
- [28] Regulation (EU) 2018/1139 of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency.