



IEC PAS 63329

Edition 1.0 2020-10

# PUBLICLY AVAILABLE SPECIFICATION



---

**Zhaga interface specification Book 1 and Book 14**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.140.99

ISBN 978-2-8322-8946-4

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	9
INTRODUCTION.....	11
<b>Subdivision 1</b> .....	<b>12</b>
Zhaga Interface Specification Book 14 .....	12
Summary (informative) .....	12
Background.....	12
Contents .....	12
Intended Use.....	12
<b>1</b> General .....	<b>13</b>
1.1 Introduction.....	13
1.2 Scope .....	13
1.3 Conformance and references .....	13
1.3.1 Conformance .....	13
1.3.2 References .....	14
1.4 Definitions.....	14
1.5 Acronyms.....	15
1.6 Symbols.....	15
1.7 Conventions.....	15
1.7.1 Precedence .....	15
1.7.2 Cross references .....	15
1.7.3 Informative text.....	15
1.7.4 Terms in capitals .....	15
1.7.5 Units of physical quantities .....	15
1.7.6 Decimal separator .....	15
1.7.7 Limits .....	15
<b>2</b> Overview (Informative) .....	<b>15</b>
2.1 General.....	15
2.2 Description of the LED Module and the LED Light Engine .....	16
2.3 Outline of this Book.....	16
<b>3</b> Mechanical interface.....	<b>18</b>
3.1 Drawing principles .....	18
3.2 Overview of the mechanical interface.....	18
3.3 Definition of the mechanical interface of the LED Module and LED Light Engine .....	18
3.3.1 Definition of Book 14 LED Modules or LLEs for different categories.....	18
3.3.2 Definition of the support Cap .....	19
3.3.3 Definition of contact Cap.....	19
3.3.4 Mass .....	19
3.4 Definition of the mechanical interface of the Luminaire .....	19
3.4.1 Definition of Book 14 Luminaires for different categories .....	19
3.4.2 Definition of the support Holder .....	20
3.4.3 Definition of contact Holder.....	20
<b>4</b> Photometric interface.....	<b>20</b>
4.1 Light Emitting Surface.....	20
4.2 Operating conditions .....	21
4.3 Luminous flux .....	21
4.4 Luminous intensity distribution .....	21

4.5	Luminance uniformity .....	21
4.6	Correlated color temperature .....	21
4.7	Color rendering index.....	21
5	Electrical interface .....	21
5.1	Electrical interface between LED Module and Luminaire .....	21
5.1.1	Nominal input current and forward voltage .....	21
5.1.2	Electrical insulation.....	22
5.1.3	Hot plugging .....	22
5.2	Electrical interface between LLE and Luminaire .....	22
5.2.1	Mains power .....	22
5.2.2	Electrical insulation.....	23
6	Thermal interface .....	23
7	Control interface .....	23
7.1	Dimming (optional).....	23
8	Compliance test tools .....	25
8.1	LED Module/LED Light Engine test tools .....	25
8.1.1	Gauges for test of mechanical interface .....	25
8.1.2	Test Fixture PETF (photometric and electrical) .....	25
8.2	Luminaire test tools.....	25
8.2.1	Gauges for test of mechanical interface .....	25
9	LED Module/LED Light Engine Compliance Tests .....	26
9.1	LED Module/LED Light Engine mechanical interface tests.....	26
9.1.1	Test of the dimensions D, W, H and A of the LLE .....	26
9.1.2	Test of the contact Cap of the LED Module or LLE.....	26
9.1.3	Test of the retention path of the contact Cap of the LED Module or LLE .....	26
9.1.4	Test of the contact position of the contact Cap of the LED Module or LLE.....	27
9.1.5	Test of the key dimensions of the contact Cap of the LED Module or LLE.....	27
9.1.6	Test of the key of the contact Cap of the LED Module or LLE .....	27
9.1.7	Test of the support Cap of the LED Module or LLE .....	28
9.2	LED Module/LED Light Engine photometric interface tests .....	28
9.2.1	Test on luminous flux.....	28
9.2.2	Test on correlated color temperature (CCT).....	28
9.2.3	A.1.2.4 Test on color rendering index .....	28
9.3	LED Light Engine Electrical interface tests.....	29
9.4	LED Module Electrical interface tests .....	29
9.5	LED Module/LED Light Engine thermal interface tests .....	29
9.6	LED Light Engine control interface tests .....	29
9.6.1	Test of dimming functionality .....	29
9.7	LED Module/LED Light Engine Product Data Set test.....	29
10	Luminaire compliance tests .....	30
10.1	Luminaire mechanical interface tests .....	30
10.1.1	Test of the dimensions L, W, H and A1 of the Luminaire .....	30
10.1.2	Test of the contact Holder of the Luminaire – part 1.....	30
10.1.3	Test of the contact Holder of the Luminaire – part 2.....	30
10.1.4	Test of the contact Holder of the Luminaire – part 3.....	31
10.1.5	Test of the key of the contact Holder of the Luminaire – part 1 .....	31
10.1.6	Test of the key of the contact Holder of the Luminaire – part 2 .....	31

10.1.7	Test of support Holder of the Luminaire .....	32
10.2	Luminaire for LED Light Engine Electrical interface tests .....	32
10.3	Luminaire for LED Module Electrical interface tests .....	32
10.4	Luminaire Product Data Set test.....	32
Annex A	Product Data Set requirements .....	34
LED Module/LED Light Engine	Product Data Set .....	34
Luminaire	Product Data Set .....	34
Annex B	History of Changes .....	35
<b>Subdivision 2</b>	.....	<b>36</b>
Zhaga	Interface Specification Book 1 .....	36
Summary	(informative) .....	36
Background	.....	36
Contents	.....	36
Intended Use	.....	36
<b>1</b>	<b>General</b> .....	<b>37</b>
1.1	Introduction.....	37
1.2	Scope .....	37
1.3	Conformance and references .....	37
1.3.1	Conformance .....	37
1.3.2	Normative references.....	37
1.3.3	Informative references .....	38
1.4	Common definitions .....	38
1.5	Common acronyms .....	40
1.6	Common symbols .....	40
1.7	Common conventions.....	41
1.7.1	Cross references .....	41
1.7.2	Informative text.....	41
1.7.3	Terms in capitals .....	41
1.7.4	Units of physical quantities .....	41
1.7.5	Decimal separator.....	41
<b>2</b>	<b>Overview of Zhaga (informative)</b> .....	<b>42</b>
2.1	About Zhaga .....	42
2.2	Zhaga building blocks and interfaces .....	42
2.3	Compatibility and Interchangeability.....	44
2.4	Product Data Set .....	45
2.5	Compliance testing .....	45
2.5.1	Certification .....	45
2.5.2	Market surveillance .....	46
2.6	Compatibility check.....	46
2.7	Zhaga product certification.....	47
<b>3</b>	<b>Mechanical interface</b> .....	<b>47</b>
3.1	Drawing principles .....	47
3.2	Mechanical interface between Separate ECG and Luminaire.....	47
3.3	Thermal expansion .....	47
3.4	Demarcation (Informative).....	47
<b>4</b>	<b>Photometric interface</b> .....	<b>49</b>
4.1	Light Emitting Surface .....	49
4.1.1	LES categories .....	50

4.2	Operating conditions for measuring photometric parameters .....	50
4.3	Luminous flux .....	51
4.4	Luminous intensity distribution .....	52
4.4.1	Beam angle and beam angle categories.....	53
4.5	Luminance uniformity.....	53
4.6	Correlated color temperature (CCT).....	53
4.7	Color rendering index (CRI) .....	54
4.8	Luminaire Optics (informative) .....	54
5	Electrical interface .....	54
5.1	Electrical insulation (informative) .....	54
6	Thermal interface .....	54
6.1	Background information (informative).....	54
6.2	Generic thermal interface model .....	55
6.2.1	General case .....	55
6.2.2	Test Fixture TPTF .....	57
6.2.3	Rated Operating Temperature and safety (informative) .....	57
6.2.4	Thermal overload protection (Informative).....	57
6.2.5	Ambient Temperature .....	57
6.2.6	Luminaires with multiple LLEs or multiple LED Modules .....	58
6.2.6.1	Separate heat sinks .....	58
6.2.6.2	One heat sink .....	58
6.2.7	Thermal compatibility check.....	58
6.2.8	Thermal uniformity .....	59
6.2.9	Thermal Interface Material .....	60
6.2.10	Surface planarity and roughness.....	60
6.2.11	Aging of LED Light Engine or LED Module/LED Array (informative).....	60
6.2.12	Empty .....	60
6.2.13	Ambient Temperature and thermal resistance ( $R_{th}$ ).....	60
6.3	Simplified thermal interface model .....	61
6.3.1	General case .....	61
6.3.2	Rated Operating Temperature and safety (informative) .....	61
6.3.3	Thermal overload protection (informative) .....	61
6.3.4	Thermal compatibility check.....	61
6.3.5	Thermal Interface Material .....	62
6.3.6	Surface planarity and roughness.....	62
6.3.7	Aging of LED Light Engine or LED Module/LED Array (informative).....	62
7	Control interface .....	62
Annex A	Compliance tests .....	63
A.0	LED Module/LED Array compliance tests.....	63
A.0.1	LED Module/LED Array mechanical interface test .....	63
A.0.1.1	Test in the mechanical interface or the LED Module/LED Array .....	63
A.0.1.1.1	Test equipment.....	63
A.0.1.1.2	Test conditions .....	63
A.0.1.1.3	Test procedure .....	63
A.0.1.1.4	Pass criteria .....	63
A.0.2	LED Module/LED Array photometric interface tests .....	63
A.0.2.1	Test on Luminous Flux.....	63
A.0.2.1.1	Test equipment.....	63

A.0.2.1.2	Test conditions .....	63
A.0.2.1.3	Test procedure .....	64
A.0.2.1.4	Pass criteria .....	64
A.0.2.2	Test on Relative Partial Luminous Flux and beam angle .....	64
A.0.2.2.1	Test equipment.....	64
A.0.2.2.2	Test conditions .....	64
A.0.2.2.3	Test procedure .....	64
A.0.2.2.4	Pass criteria .....	64
A.0.2.3	Test on correlated color temperature (CCT).....	65
A.0.2.3.1	Test equipment.....	65
A.0.2.3.2	Test conditions .....	65
A.0.2.3.3	Test procedure .....	65
A.0.2.3.4	Pass criteria .....	65
A.0.2.4	Test on color rendering index .....	65
A.0.2.4.1	Test equipment.....	65
A.0.2.4.2	Test conditions .....	66
A.0.2.4.3	Test procedure .....	66
A.0.2.4.4	Pass criteria .....	66
A.0.2.5	Test on Luminance Uniformity .....	66
A.0.3	LED Module/LED Array thermal interface tests.....	66
A.0.3.1	Test on thermal power ( $P_{th}$ ).....	66
A.0.3.1.1	Test equipment.....	66
A.0.3.1.2	Test conditions .....	66
A.0.3.1.3	Test procedure .....	66
A.0.3.1.4	Pass criteria .....	67
A.0.4	LED Module/LED Array electrical interface tests .....	67
A.0.5	LED Module/LED Array Product Data Set test.....	67
A.0.5.1	Test.....	67
A.0.5.2	Pass criteria .....	67
A.1	LLE compliance tests.....	67
A.1.1	LLE mechanical interface tests .....	67
A.1.1.1	Test of the mechanical interface of the Integrated LLE .....	67
A.1.1.1.1	Test equipment.....	67
A.1.1.1.2	Test conditions .....	67
A.1.1.1.3	Test procedure .....	68
A.1.1.1.4	Pass criteria .....	68
A.1.2	LLE photometric interface tests.....	68
A.1.2.1	Test on Luminous Flux.....	68
A.1.2.1.1	Test equipment.....	68
A.1.2.1.2	Test conditions .....	68
A.1.2.1.3	Test procedure .....	68
A.1.2.1.4	Pass criteria .....	68
A.1.2.2	Test on Relative Partial Luminous Flux and beam angle .....	68
A.1.2.2.1	Test equipment.....	69
A.1.2.2.2	Test conditions .....	69
A.1.2.2.3	Test procedure .....	69
A.1.2.2.4	Pass criteria .....	69
A.1.2.3	Test on correlated color temperature (CCT).....	69

A.1.2.3.1	Test equipment.....	69
A.1.2.3.2	Test conditions .....	70
A.1.2.3.3	Test procedure .....	70
A.1.2.3.4	Pass criteria .....	70
A.1.2.4	Test on color rendering index .....	70
A.1.2.4.1	Test equipment.....	70
A.1.2.4.2	Test conditions .....	70
A.1.2.4.3	Test procedure .....	70
A.1.2.4.4	Pass criteria .....	71
A.1.2.5	Test on Luminance Uniformity .....	71
A.1.3	LLE thermal interface tests .....	71
A.1.3.1	Test on thermal power ( $P_{th}$ ).....	71
A.1.3.1.1	Test equipment.....	71
A.1.3.1.2	Test conditions .....	71
A.1.3.1.3	Test procedure .....	71
A.1.3.1.4	Pass criteria .....	71
A.1.3.2	Test on Thermal power through the Thermal Interface Surface ( $P_{th,rear}$ ) .....	72
A.1.3.2.1	Test equipment.....	72
A.1.3.2.2	Test conditions .....	72
A.1.3.2.3	Calibration of $P_{th,rear}$ test setup .....	73
A.1.3.2.4	Measurement of $P_{th,rear}$ of the LLE.....	74
A.1.3.2.5	Pass criteria .....	74
A.1.3.3	Empty .....	75
A.1.3.4	Empty .....	75
A.1.3.5	Temperature stabilization .....	75
A.1.3.6	Position of measurement point for the temperature $t_r$ .....	75
A.1.4	LLE electrical interface tests .....	75
A.1.5	LLE control interface tests .....	75
A.1.6	LLE Product Data Set test.....	75
A.1.6.1	Test.....	75
A.1.6.2	Pass criteria .....	75
A.2	Luminaire compliance tests .....	76
A.2.1	Luminaire mechanical interface tests .....	76
A.2.1.1	Test of the mechanical dimensions of the Luminaire .....	76
A.2.1.1.1	Test equipment.....	76
A.2.1.1.2	Test conditions .....	76
A.2.1.1.3	Test procedure .....	76
A.2.1.1.4	Pass criteria .....	76
A.2.2	Luminaire photometric interface tests.....	76
A.2.3	Luminaire thermal interface tests .....	76
A.2.3.1	Empty .....	76
A.2.4	Luminaire electrical interface tests.....	76
A.2.5	Luminaire control interface tests .....	76
A.2.6	Luminaire Product Data Set test.....	77
A.2.6.1	Test.....	77
A.2.6.2	Pass criteria .....	77
Annex B	Guidelines for Demarcation measurement.....	78
Annex C	History of changes.....	80

Figure 1-1 – 3D-drawings of the Book 14 LED Module or LED Light Engine (informative).....	13
Figure 2-1 – Schematic overview of the Book 14 LED Module or LLE with Caps and Luminaire with Holders. ....	16
Figure 3-1 – Mechanical dimensions of the Book 14 LED Module and LED Light Engines .....	18
Figure 3-2 – Mechanical dimensions of Book 14 luminaires .....	20
Figure 2-1 – Schematic overview of a Luminaire and one or more non-integrated LED Light Engines.....	43
Figure 2-2 – Schematic overview of a Luminaire and one or more integrated LED Light Engines .....	43
Figure 2-3 – Schematic overview of a LED Light Engine with Integrated ECG .....	44
Figure 2-4 – Schematic overview of a LED Light Engine with Separate ECG.....	44
Figure 2-5 – Overview of test and certification of Zhaga products .....	46
Figure 2-6 – Compatibility check.....	47
Figure 3-1 – Example of a Demarcation Model (2-dimensional).....	48
Figure 3-2 – Example of a product which is compliant with the Demarcation Model.....	48
Figure 3-3 – Example of a product which is not compliant with the Demarcation Model.....	48
Figure 3-4 – Example of a product which is not compliant with the Demarcation Model.....	49
Figure 4-1 – Rotationally symmetric solid angle bounded by the polar angles $\gamma_1$ and $\gamma_2$ which is used to define the Relative Partial Luminous Flux.....	53
Figure 6-1 – Thermal model of a LLE – Luminaire or a LED Module – Luminaire combination .....	55
Figure 6-2 – Power conversion .....	56
Figure 6-3 – Position of the Thermal Interface Surface in case of a configuration with TIM .....	60
Figure A-1 – Heat sensor equipment with Test Fixture and LLE-under-test .....	72
Figure A-2 – Calibration of the heat flux measurement setup .....	73
Figure A-3 – Position of measurement point for the temperature $t_r$ .....	75
Figure B-1 – Example of a LED Array .....	78
Figure B-2 – Example of a LED Array with sections .....	78
Figure B-3 – Example of a LED Array with measurement points .....	79
Table 3-1 – Values of dimensions for the Book 14 LED Modules and LED Light Engines .....	19
Table 3-2 – Values of dimensions for the Book 14 Luminaire .....	20
Table 5-1 – Electrical input characteristics of the LED Module .....	22
Table 5-2 – Electrical output characteristics of the Luminaire.....	22
Table 5-3 – Mains power characteristics of the LLE and the Luminaire .....	23
Table B-1 – Changes from Edition 1.1 to Edition 1.2. ....	35
Table 4-1 – Definition of circular LES categories.....	50
Table 4-2 – Test voltages for different Rated input voltages of the LLE.....	51
Table 4-3 – Definition of luminous flux categories .....	52
Table 4-4 – Definition of beam angle categories .....	53
Table C-1 – Changes from Edition 1.7 to Edition 1.8.....	80



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ZHAGA INTERFACE SPECIFICATION BOOK 1 AND BOOK 14**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is an intermediate specification made available to the public and needing a lower level of consensus than an International Standard to be approved by vote (simple majority).

IEC PAS 63329 has been processed by subcommittee 34A: Electric light sources, of IEC technical committee 34: Lighting.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

<b>Draft PAS</b>	<b>Report on voting</b>
34A/2196/DPAS	34A/2206/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 2 years starting from the publication date. The validity may be extended for a single period up to a maximum of 2 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

This PAS is a reproduction of Zhaga Book 1 Edition 1.8 and Book 14 Edition 1.2 with no changes introduced.

The document layout, terms and definitions, etc within this PAS therefore do not follow the normal IEC drafting rules that would be applied for an International Standard.

Subdivision 1 comprises Zhaga Book 14 Edition 1.2 – Socketable Flat LED Module and LED Light Engine.

Subdivision 2 comprises Zhaga Book 1 Edition 1.8 – Overview and common information, which is essential to the interpretation of Zhaga Book 14 (and future Zhaga books).

The future intention is for the content of this PAS to be incorporated within one or more International Standards and at this time any conflict with IEC Directives and drafting rules will be addressed.

## **Subdivision 1**

### **Zhaga Interface Specification Book 14**

#### **Summary (informative)**

##### **Background**

The Zhaga Consortium is a global lighting-industry organization that aims to standardize components of LED luminaires, including LED light engines, LED modules, LED arrays, holders, electronic control gear (LED drivers) and connectivity fit systems.

Zhaga has created a set of interface specifications, known as Books. Each Book defines one or more components of an LED luminaire by means of the mechanical, photometric, electrical, thermal, and control interfaces of the component to its environment. This makes such products interchangeable in the sense that it is easy to replace one product with another, even if they have been made by different manufacturers.

##### **Contents**

This Book 14 defines three socketable LED light engines (with integrated electronic control gears) and three socketable LED modules (without integrated electronic control gears). The intended application is in free air or in a Luminaire that does not introduce a significant temperature increase. Each LED module and LED light engine is identified by a designation.

The LED Modules and the LLEs feature contact caps which fit in corresponding contact holders of the luminaire. The contact caps and contact holders have keys matching specific electrical characteristics of the LED module or the LED light engine. Each key is identified by a designation.

This Book should be read together with Zhaga Book 1.

##### **Intended Use**

The LED modules and the LED light engines defined in this Book 14 are intended to be installed and replaced by professionals and non-professionals.

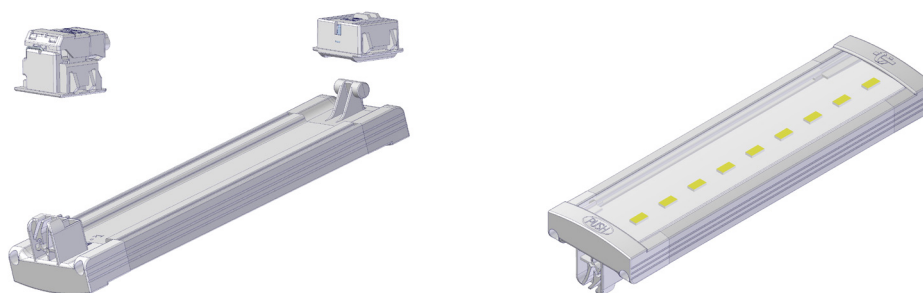
## 1 General

### 1.1 Introduction

The Zhaga Consortium is a global organization that aims to standardize components of LED Luminaires. A LED Luminaire is a lighting fixture for general lighting that contains a light source based on solid-state technology. Such light sources, including LED Modules and LED Light Engines, typically consist of one or more LEDs combined with an Electronic Control Gear (LED driver). Other components of LED Luminaires include LED Arrays, Holders, and connectivity fit systems.

Zhaga has created a set of interface specifications, known as Books, which define the interfaces between a component and its environment. Book 1 is a special Book in the sense that it provides common information, which is relevant to all other Books in the series. In addition, Book 1 defines requirements and compliance tests, which are applicable across multiple Zhaga books. Such Books refer to those requirements and compliance tests as applicable.

### 1.2 Scope



**Figure 1-1 – 3D-drawings of the Book 14 LED Module or LED Light Engine (informative)**

This Book 14 defines three socketable LED Light Engines (with integrated Electronic Control Gears) and three socketable LED Modules (without integrated Electronic Control Gears). These LED Modules and LLEs have a rectangular shape and are typically applied in general lighting applications. These products are intended to be installed and replaced by professionals and non-professionals.

Figure 1-1 shows informative 3D-drawings of such a LED Module or LLE. The intended application is in free air or in a Luminaire that does not introduce a significant temperature increase. Each LED Module and each LED Light Engine is identified by a designation.

The LED Modules and the LLEs feature contact Caps which fit in corresponding contact Holders of the Luminaire. The contact Caps and contact Holders have keys matching specific electrical characteristics of the LED Module or LED Light Engine. Each key is identified by a designation.

### 1.3 Conformance and references

#### 1.3.1 Conformance

All provisions in the Zhaga interface Specifications are mandatory, unless specifically indicated as recommended, optional or informative. Verbal expressions of provisions in the Zhaga interface specifications follow the rules provided in Clause 7 of ISO/IEC Directives, Part 2:2018. For clarity, the word “shall” indicates a requirement that is to be followed strictly in order to conform to the Zhaga interface specifications, and from which no deviation is

permitted. The word “should” indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

### 1.3.2 References

For references that are not listed in this section, see [Book 1]. For undated references, the most recently published edition applies.

[Book 1]	Zhaga Interface Specification, Book 1: Overview and Common Information
[IEC 60598-1]	Luminaires – Part 1: General requirements and tests
[NEMA SSL 7A]	Phase Cut Dimming for Solid State Lighting: Basic Compatibility, NEMA SSL 7A-2013
[7004-187]	IEC 60061-1 standard sheet 7004-187
[7005-187]	IEC 60061-2 standard sheet 7005-187
[7005-187A]	IEC 60061-3 standard sheet 7006-187A
[7006-187B]	IEC 60061-3 standard sheet 7006-187B
[7006-187C]	IEC 60061-3 standard sheet 7006-187C
[7006-187D]	IEC 60061-3 standard sheet 7006-187D
[7006-187E]	IEC 60061-3 standard sheet 7006-187E
[7006-187F]	IEC 60061-3 standard sheet 7006-187F
[7006-187G]	IEC 60061-3 standard sheet 7006-187G
[7006-187I]	IEC 60061-3 standard sheet 7006-187I
[7006-187J]	IEC 60061-3 standard sheet 7006-187J
[7006-187K]	IEC 60061-3 standard sheet 7006-187K
[7006-187L]	IEC 60061-3 standard sheet 7006-187L