

Standardized data format for lighting design – Structure and Features

Introduction

DIAL and RELUX are jointly developing a new, open data format for luminaires and sensors called Global Lighting Data Format (GLDF), which can be used in the companies' two lighting design programs, DIALux and Relux, among others.

Motivation

Stakeholders

Luminaire manufacturers face the situation that users inside demand product information in different formats and for different purposes. With this new format, the manufacturer needs to deliver only one product data file to serve all platforms.

Planners and designers use different programs for different use cases. Product data is expected to be available and, of course, consistent across all applications. If conflicting information for a product is supplied from different sources, this leads to additional clarification effort or even to incorrect planning. A file that can be read by all programs therefore offers great advantages.

Software manufacturers need up-to-date and comprehensive product information. This data must contain the information required for the respective application purpose. Ideally, the digital design process provides for the project to become more and more concrete in the planning process. The data must therefore provide more and more precise information. Software programs from any application area, from CAD to technical building equipment (MEP) to facility management (FM), have access to complete data.

Framework Parameters

The manufacturers of lighting design software - DIAL and Relux - have years of experience in the correct representation and application of luminaire data. Furthermore, years of cooperation with luminaire manufacturers have resulted in a great understanding of the exchange of product data between luminaire manufacturers and software producers.

Electronic luminaire catalogs must serve several purposes. On the one hand, they must provide up-to-date and accurate technical descriptions, but on the other hand, they must also help planners find the right selection of luminaires. In some cases, modern lighting systems allow users to configure products individually, putting together modules and requiring correct data for this purpose as well.

In contrast to many other technical products, the combination of 3D model and physical property (luminous intensity distribution body) is not trivial for luminaires. Far-field photometry reduces the location of the light emission to a single point, and its location and orientation must be correctly defined in the 3D model. In addition, the assignment of the light emission direction to the geometry is standardized differently internationally (e.g., in EN and IES standards) and thus leads to further difficulties. If then also different light emissions are defined in a luminaire and / or different light spectra are assigned, a very good understanding of photometry must be available.

In addition to lighting designers, electrical designers and architects are also interested in accurate information. Photorealistic visualizations, correct bill of materials (BOM) takeoff and collision checks are just a few of the other requirements.

By developing this format together, DIAL and Relux have succeeded in combining the accumulated experience of the leading luminaire manufacturers and the leading planning software producers. The collaboration of the two companies in industry and standardization bodies, such as ZVEI or IESNA, was also beneficial. This makes it very likely that this format will become established in the market.

The **Global Lighting Data Format (GLDF)** offers advantages for all parties involved in the planning process. Thus, we achieve a win-win-win situation.

Current status of electronic documentation of luminaires

Different descriptions for luminaires exist for different purposes.

For the generation of technical data sheets or for the calculation of a lighting installation, there are the photometrics standard formats such as Eulumdat (Axel Stockmar, 1990), LM63 (IESNA, 1986), TM-14 (CIBSE, 1988) or UNI 11733-2019 (Norma UNI, 2019). These formats serve the purpose of documenting physical properties of luminaires or lamps. Properties recorded by measurement are mapped and can be interpreted by means of formulas and standardized application rules. These formats contain hardly any other information, which is, however, required for a complete BIM process including lighting installation design, commercial processing, or facility management.

For information required by retailers, for example, there is the ETIM format, which is established in Germany but also in other countries. This is designed for the exchange of data between manufacturers and retailers and summarizes product descriptions in a defined data formatting and description structure. Lighting designs are not possible with this format.

Modern data formats used in **CAD** and **lighting design programs** include ULD (DIALux) ROLF (RELUX), RFA (Revit) or IFC (OPEN BIM). These formats combine different requirements. For example, in the case of lighting design programs, this includes the ability to calculate light and the most complete product information possible for selection and ordering. Whereas the RFA and IFC data formats attempt to map the product in the CAD and BIM process without sufficiently considering the lighting technology.

Current status of the new Global Lighting Data Format (GLDF)

The new Global Lighting Data Format (GLDF) is being developed to fully represent luminaires and presence or motion sensors for all these applications. Preliminary work from various committees, such as the BIM working group of the ZVEI, has been incorporated. Part of the GLDF is of course photometric and spectral information, geometric, electrotechnical, commercial and maintenance information. The characteristics are described in CEN TS 17623, "BIM Properties for lighting - Luminaires and sensing devices". In addition, further parameters can be stored. A GLDF can, in the spirit of BIM, accompany the project from the initial design phase to recycling.

DIAL and Relux have designed a data structure that can map all the above parameters, thus enabling the exchange of this data between applications and stakeholders. To reach the largest possible number of users, the format and associated documentation is provided free of charge by DIAL and Relux.

The format will continue to be curated by the participating companies in the future and will be further developed according to the requirements. Software tools and documentation will be provided by DIAL and RELUX. Since GLDF is open and free, a variety of offerings (payware, freeware, open source) will certainly develop around this format. During 2021, the release of the documentation is foreseen. A beta phase of the format will start in the first half of 2021, after which software vendors (lighting design, CAD, PIM...) and luminaire manufacturers will have to implement and offer this format in their systems.

Design and Structure

The GLDF is built in the form of an XML structure (Extensible Markup Language). This is ideally suited for the representation of hierarchically structured data. Further advantages are readability for humans and machines, platform independence and a very wide distribution.

The GLDF is a container format in which the data supplier can integrate all contents. This includes texts, images, light distribution curves (LVK), spectra, 3D models, etc. A product can also contain different, complementary information. For example, a luminaire can be described as a cuboid with length, width, and height, but in addition it can also provide a detailed 3D model. The reading application can then decide whether a simple or a complex model is displayed. Products can be simple or complex according to reality. So, it is possible to represent a simple recessed luminaire as well as a complex lighting system with many light outlets, individually dimmable and for "Human Centric Lighting" applications also color changeable. In addition, equipped with motion sensor and emergency lighting unit.

The structure is defined in such a way that both individual elements and the entire content can be signed. This makes it possible to see whether the content has been changed. This gives the manufacturer or the supplier of the data and planner great security when using GLDF files. If parts have been changed, e.g. power consumption, LVK or manufacturer designation, this is immediately recognizable by checking the signature.

Together with the **documentation**, an **XML schema definition** (XSD) is also provided. Software developers can use this to implement the GLDF interface in a PIM (Product Information Management) system quite easily. The XSD defines the structure as well as the data types.

It is up to the producer of each software which data the respective software takes over from the available framework. Thus, a program can couple the range of the read in information quite to the licensing by the end user (user) or over the licensing of the provider of the data (manufacturer). A combination is also possible. The signing of the data offers a wide range of possibilities here.

The GLDF contains "must", "can" and "may" elements. A completely filled Eulumdat file would be sufficient as minimum information to produce a GLDF file. However, it must be clear to the User that it would be pointless to save an Eulumdat file as a GLDF file. Only by enriching it with more information than the pure light distribution plus housing dimensions, the GLDF file gets its usefulness. Alternative photometry formats to Eulumdat already exist, GLDF is not intended for that.

The GLDF format includes the possibility to represent the geometry of a product in three ways.

- As simple geometry, cuboid or cylinder with the length, height and width or diameter (as part of the generic model)
- As a generic 3D model, where an archetype is described, and the associated dimensions are defined (e.g., floor lamp with the dimensions for base, pole and lamp head)
- - As a realistic 3D model with geometric, photometric, and mechanical information in **OBJ format**. Here, textures, arbitrary rotation angles and multiple light apertures can be defined. "L3D" model.

More information about geometry description and **L3D** is included in the second presentation by Mr. Robert Heinze.

→ Necessary data elements

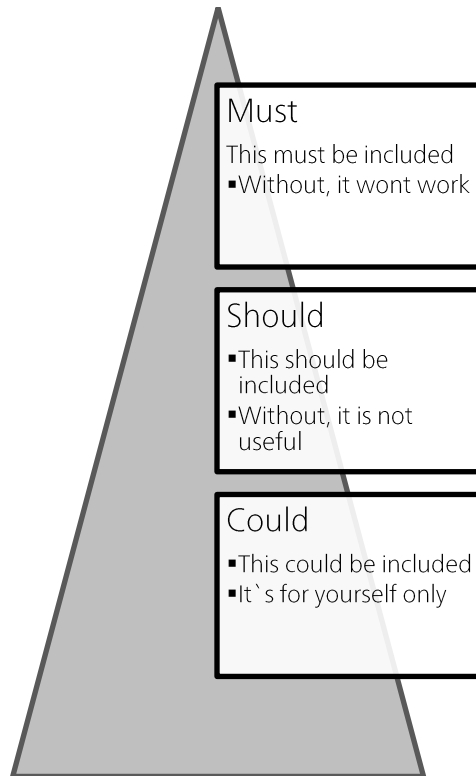
The contents of an Elumdat file (LDT) would suffice, but not an IES (missing geometry).

→ Meaningful data elements

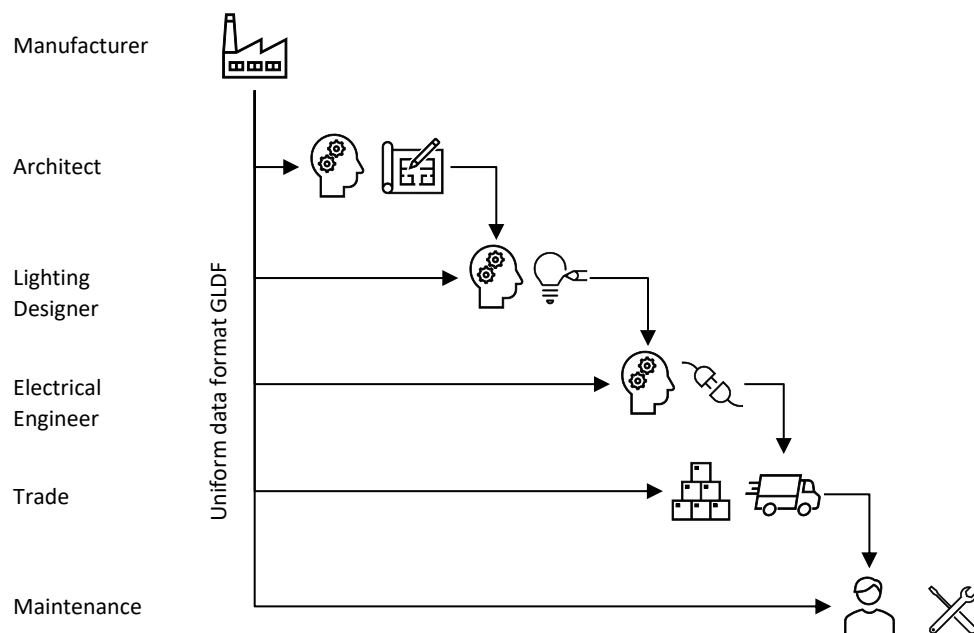
All contents of the BIM parameter list (and others) are provided, 3D models.

→ User: Internally defined data elements.

Everyone can attach further data elements he needs for himself.



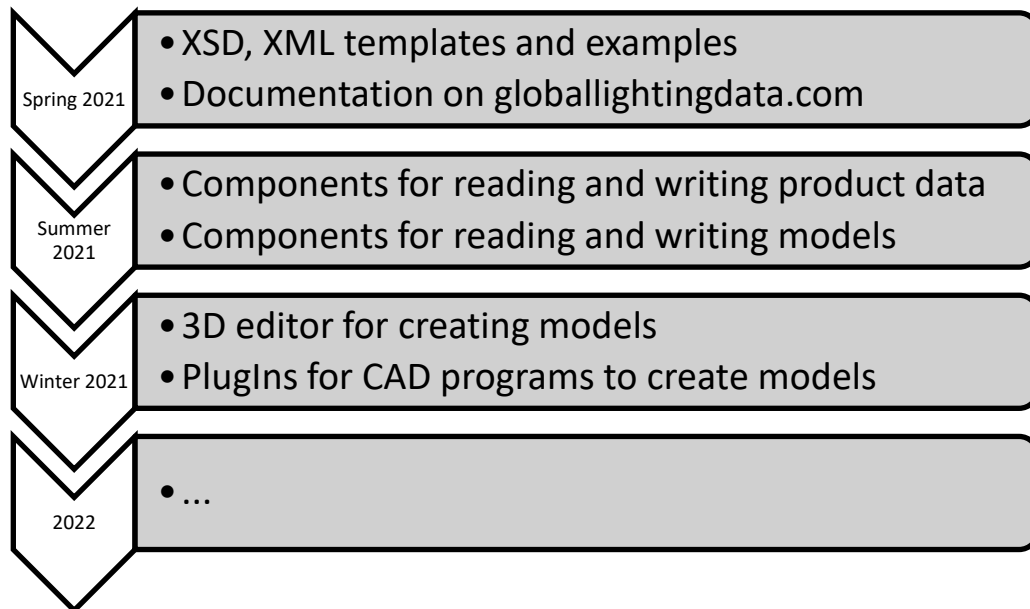
The great benefit that comes from the Global Lighting Data Format is that manufacturers only need to maintain and provide a single format. All processes that want to use the manufacturer's data can retrieve their information from the GLDF. Planners: inside, they can find all the information about a product in the GLDF. The file can be used in all programs and applications he/she uses. Information is always identical, deviations due to different data statuses are excluded. Software manufacturers find excellent information for their (planning) programs. Manufacturers are motivated to maintain the information and keep it up to date, since they do not have to create new formats for all application purposes.



Further information, dates

More information about the Global Lighting Data Format will soon be available on the DIAL and Relux websites. The website www.globallightingdata.com offers a description of the format, tools, sample files and the possibility to send suggestions and comments to the authors.

The roadmap described below may change due to unforeseen circumstances.



References

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CIBSE. 1988. TM14:1988, CIBSE Standard File Format for the Electronic Transfer of Luminaire Photometric Data. London, UK: Chartered Institution of Building Services Engineers.

UNI 11733:2019, Light and lighting - Standard file format for the electronic transfer of photometric and spectrometric data from luminaires and lamps.

ETIM Deutschland e.V., www.etim-international.com

CEN/TS 17623 2020, BIM properties for lighting - Luminaires and sensors.

IFC Industry Foundation Classes, www.buildingsmart.com

OBJ Format, Wavefront Technologies, open data format for describing 3D geometry, <https://www.fileformat.info/format/wavefrontobj/egff.htm>

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