Maintenance factors of LED products

MAINTENANCE FACTOR

= factor with which pollution, ageing and lower light output of light sources is taken into account in lighting calculations.

The maintenance factor is calculated by means of four parameters *(in accordance with CIE97 publication for indoor lighting)*

MF: LLMF * LSF * LMF * RMF

- **LLMF**: Lamp Lumen Maintenance Factor
- **LSF**: Lamp Survival Factor
- **LMF**: Luminaire Maintenance Factor
- **RMF**: Room Maintenance Factor

1. Indicative maintenance factors

We take into account the following data for the calculation of indicative maintenance factors:

- **LLMF** = lowest values per product range (see overview)

- **LSF** = = 1. We take into account the immediate replacement of the luminaire (= spot replacement). This implies that in the event of a luminaire failure (as a result of a driver failure or defect) the defective luminaire is replaced.

- **LMF** = 0.95 for clean office environments; 0.89 for normal industrial environments

- **RMF** = 0.94 for clean office environments (reflection factor 70/50/20) or 0.95 for normal industrial environments (reflection factor 50/30/20), subject to three-yearly cleaning. (in accordance with CIE97 publication for indoor lighting)

For the LMF and RMF values we publish typical values for a specific space. Exact values, which take into account various degrees of dust pollution, different cleaning intervals or reflection factors can be consulted in the CIE97 standard.

All data is calculated for an ambient temperature Tq = 25°C.

Overview of lowest LLMF per product range and indicative maintenance factors for 50,000-hour period of use.

	LLMF	MF	
Luminaire	50.000 h	Application	50.000 h
D1 / D2 / D3	97%	Office	87%
D42	98%	Office	88%
D9	98%	Office	88%
E2	96%	Industry	81%
E4	96%	Industry	81%
E5M R0	94%	Industry	79%
E5M R1	85%	Industry	72%
E6	86%	Industry	73%
E7	96%	Industry	81%
E8	92%	Industry	78%
FLARE	97%	Office	87%
R3	98%	Office	88%
R7	98%	Office	88%
R8	93%	Office	83%
U23	87%	Office	78%
U25	98%	Office	88%
U3	95%	Office	85%
U7	95%	Office	85%
US	91%	Office	81%
V2M11	99%	Office	88%
V2M1F/J	97%	Office	87%
V3	96%	Office	86%

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2. Accurate maintenance factors

ETAP makes data available to calculate **accurate maintenance factors**, depending on the intended **period of use**. For example, no overdimensioned lighting studies are offered and it is possible to ensure that an installation will continue to meet the specified lighting levels up to the intended period of use.

- You can consult the **LLMF for several periods of use**

- We also take **LSF = 1 (spot replacement)** into account for accurate studies, as we assume that the luminaires will be replaced immediately in the event of a defect.

- For each product and f**or a specific period of use**, we publish Cx values indicating the expected failure rate. These Cx values will enable you to schedule potential maintenance on the installation.

U712R1/LEDN2430D, LLMF and Cx values per period of use

Time (khrs)	LLMF (%)	Cx (%)
10	100	2
20	99	4
30	99	6
40	98	8
50	98	10
60	98	12

If 100 luminaires are installed, 2 luminaires will need to be replaced after 10,000 burning hours. Ten luminaires can potentially become defective after 50,000 burning hours.

Cx values are based on driver failure. The reason for this assumption can be found in the Lighting Europe guide. (www.lightingeurope.org)

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