

УНИВЕРЗИТЕТ У НИШУ
ЕЛЕКТРОНСКИ ФАКУЛТЕТ

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UNIVERSITY OF NIŠ
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12 44 19 19

ПРИМУЉЕНО: 14.01.2019

Орган	Својим	Број	Правом	Број
VIII		404-148/18	1	-

Izveštaj

09.01.2019
01/05-028/19-001

verifikacije priloženih fotometrijskih proračuna i stručno
mišljenje u vezi istih

Mesto	Sombor
Predmet	Stručna verifikacija fotometrijskih proračuna u okviru javne nabavke „ZAMENA POSTOJEĆIH SVETILJKI SA ENERGETSKI EFIKASNIJIM LED SVETILJKAMA (ZAMENA ŽIVINIH SVETILJKI)“
Datum kreiranja Izveštaja	09.01.2019. god.

Izrada proračuna

Dejan Jovanović

Šef laboratorije za električne instalacije i
osvetljenje

Dragan Vučković

D e k a n



Prof. dr Dragan Mančić

Predmet ispitivanja

Na osnovu zahteva GRADSKE UPRAVE GRADA SOMBORA, ODELJENJA ZA KOMUNALNE DELATNOSTI, IMOVINSKO-PRAVNE I STAMBENE POSLOVE br 352-1763/2018-XVI od 25.12.2018 god. izvršeni su fotometrijski proračuni sa raspodelama jačine svetlosti (LDT fajlovima) koji su dostavljeni od strane naručioca posla. Podaci za svetlotehničke projekte su u skladu sa zahtevom naručioca preuzeti iz izveštaja fotometrijskih proračuna koje je dostavio naručilac posla.

Rezultati ispitivanja

Nakon što smo izvršili fotometrijske proračune sa dostavljenim podacima za četiri zahtevana tipa saobraćajnica, utvrđeno je da se rezultati u izveštajima fotometrijskih proračuna koji su dostavljeni od strane naručioca podudaraju sa rezultatima koje smo mi dobili.

Što se odgovora na pitanja tiče, jasno je da su energetske efikasnije svetiljke čije su karakteristike 145 lm/W i 150 lm/W u odnosu na svetiljke čije su karakteristike 118 lm/W i 128 lm/W.

Moramo da napomenemo da na efikasnost svetiljki utiču kako karakteristike LED izvora koji su ugrađeni u svetiljci tako i sočiva koja se koriste da bi se dobila odgovarajuća raspodela jačine svetlosti kojom će se zadovoljiti zahtevani nivoi sjajnosti (u ovom slučaju i zahtevani nivoi horizontalne osvetljenosti) saobraćajnica.

Bitno je napomenuti da smo proračunima utvrdili da za Tip saobraćajnice 1 (Apatinski put) sve zahteve iz tenderske dokumentacije može da zadovolji svetiljka od 120 W (AG-LD120KM) iako je u izveštajima fotometrijskih proračuna koje ste nam dostavili korišćena svetiljka snage od 150 W (AG-LD150KL). Pretpostavljamo da je svetiljka snage 120 W jeftinija od svetiljke snage 150 W što će smanjiti vrednost početne investicije.

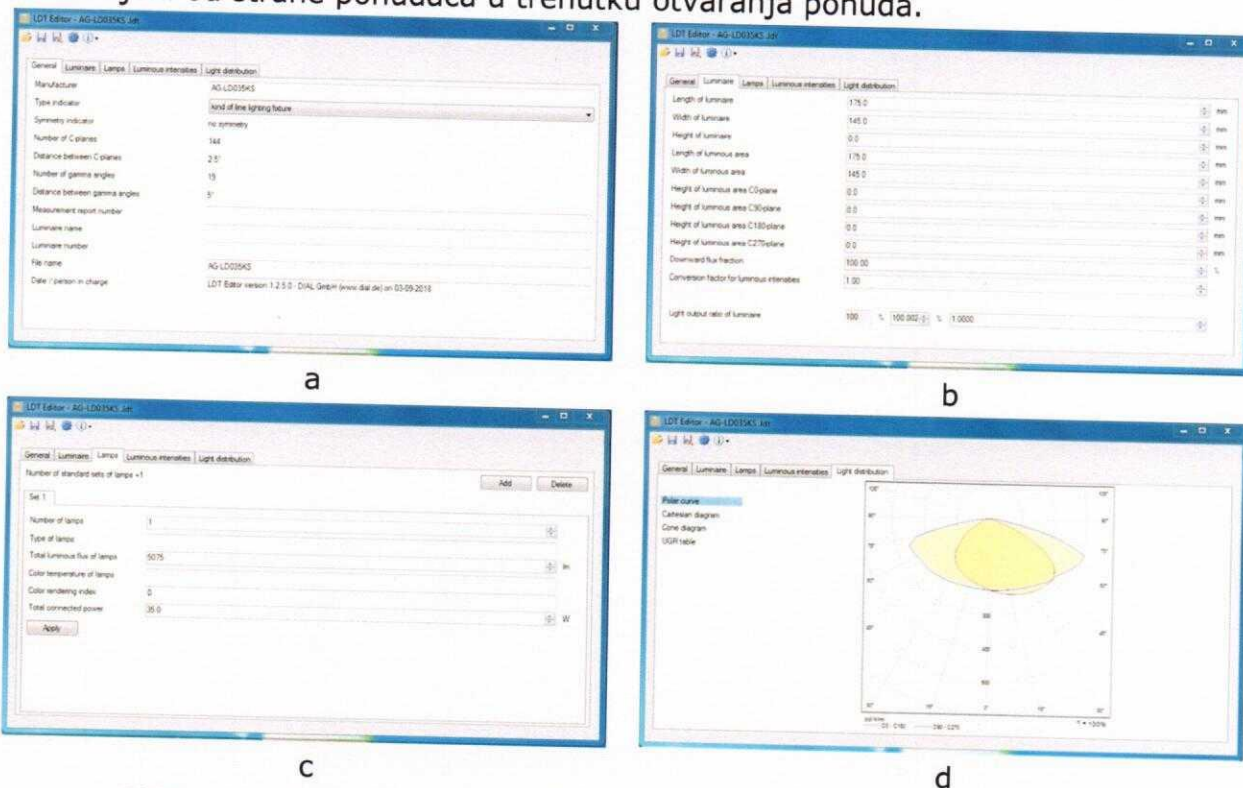
Što se tiče dostavljenih raspodela jačina svetlosti svetiljki moramo da napomenemo da smo primetili da su svi LDT fajlovi editovani 3.9.2018 godine od strane DIALUX LDT Editor-a (<https://www.dial.de/en/ldt-current-version/>). Ovo je evidentirano u svakom LDT fajlu u delu gde je potrebno da se upiše datum i osoba koja je vršila merenja u Laboratoriji. Podaci u LDT fajlovima o dimenziji svetiljke su diskutabilni jer je sama svetiljka veća od površine koja zrači svetlost zbog dela u kome se nalazi drajver i ostala oprema. Stoga Vam skrećemo pažnju da proverite da li raspodele jačine svetlosti odgovaraju podacima iz „Izveštaja o merenju fotometrijskih karakteristika prema standardima LM79-08“, koje ste dobili kroz ponudu kako je definisano u konkursnoj dokumentaciji.

Dokaz o datumu editovanja LDT fajlova za svetiljku AG-LD035KS je na Slici 1, a već smo napomenuli da je ista situacija i sa ostalim LDT fajlovima.

Takodje je bitno da Vam skrenemo pažnju da su svi izveštaji fotometrijskih proračuna koje ste nam dostavili urađeni 29.9.2018. godine. Iz konkursne dokumentacije smo videli da je otvaranje ponuda bilo 17.9.2018 godine, tako da su ovi Izveštaji kreirani nakon otvaranja ponuda, pa Vam skrećemo pažnju da

2.9.2018

proverite da li ovi izveštaji fotometrijskih proračuna odgovaraju Izveštajima koji su dostavljeni od strane ponuđača u trenutku otvaranja ponuda.



Slika 1: Podaci o raspodeli jačine svetlosti svetiljke AG-LD035KS u DIALUX LDT Editor-u

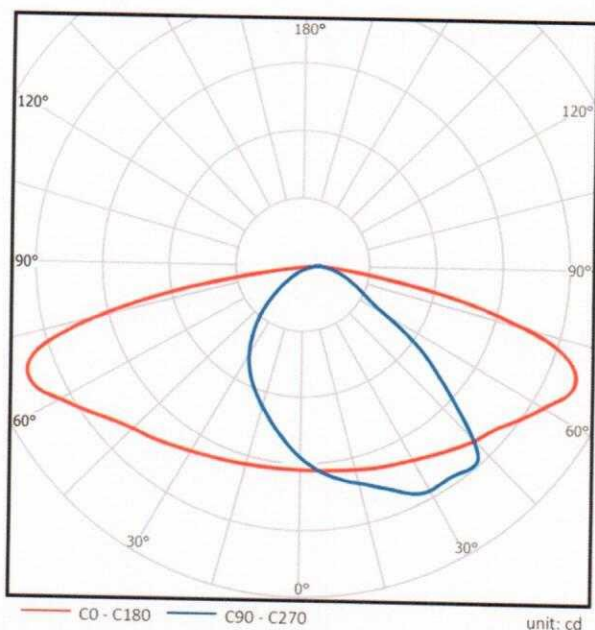
Takođe treba napomenuti da dostavljeni LDT fajlovi imaju zarotirane podatke o raspodeli svetlosne jačine i kao takvi se ne mogu bez korekcije (rotiranja podataka) koristiti u DIALUX evo paketu u kome je ažuriran najnoviji standard koji definiše svetlotehničke zahteve za saobraćajnice, već se samo mogu koristiti u paketu DIALUX 4 u kome se više ne ažuriraju aktuelni standardi.

Inače smo, za svetiljke čije ste nam LDT fajlove poslali, pokušali da na internetu nađemo izvode iz kataloga i LDT fajlove, ali to nismo uspeali. Nakon pretraživanja naziva svetiljki koje ste nam poslali, došli smo do toga da se oni jedino prikazuju na sajtu Insituta Vinča (https://www.vin.bg.ac.rs/Biro/OU-Reg_2018.pdf), koji je izdao potvrde o usaglašenosti za iste. Na tom sajtu stoji da je proizvođač AG svetiljki „Hangzhou ZGSM Technology Co.Ltd., 1188 Jinxi Rd.S., Linglong Industrial Estate, Lin'an City, Zhejiang Prov., 311301, China“. Korišćenjem ovih informacija došli smo do raspodela jačina svetlosti svetiljke koje imaju identične nazive sa AG svetiljkama, stim što u nazivu tih svetiljki umesto oznake AG stoji oznaka ZGSM. U PDF fajlovima dostupnim na internetu (jedan od njih je na adresi

<https://www.ledljios.com/uploads/2/4/3/3/24331162/r201709201750474545704.pdf>) u kojima su date raspodele jačine svetlosti se jasno vidi da je raspodela jačine svetlosti u ravnima C0-180, C90-270, ispravno data, što dodatno ukazuje na to da treba proveriti LDT fajlove koje ste nam poslali jer su u njima te ravni zarotirane (već smo napomenuli da je evidentirano da su ti fajlovi editovani). Na slici 2 je data raspodela jačine svetlosti iz izvoda iz kataloga svetiljki sa oznakom ZGSM. Ovde je

IR-11-11

evidentno da je raspodela jačine svetlosti u predmetnim ravnima (crvena i plava linija) data ispravno.



Slika 2: Izvod iz kataloga svetiljki sa oznakom ZGSM na kojima je raspodela jačine svetlosti u ravnima C0-180 i C90-270 ispravno data

Primetili smo da je za određeni tip saobraćajnica u Tenderskoj dokumentaciji dato da su one „nekategorisane“ i da se za njih vrši samo proračun osvetljenosti a ne i proračun sjajnosti. Naime za sve saobraćajnice za motorni pogon je bitno da se vrši proračun sjajnosti. Sjajnost je veličina koju treba proračunati i ispuniti zahteve iz standarda jer ljudsko oko registruje samo sjajnost i ni jednu drugu fotometrijsku veličinu. Naša preporuka je da za sve saobraćajnice odredite svetlotehničku klasu prema uputstvima iz standarda kako bi se definisao zahtevani nivo i ravnomernost sjajnosti saobraćajnice.

Inače sto se verifikacije izvedenog osvetljenja tiče bitno je napomenuti da je potrebno izvršiti eksperimentalna merenja sjajnosti saobraćajnice (cd/m^2), kako bi se verifikovali podaci iz fotometrijskih proračuna.

Sva zapažanja do kojih smo došli ukazuju da je potrebno, pre donošenja konačne odluke po osnovu javne nabavke, temeljno proveriti i ispitati sve podatke koji su Vam dostavljani.

Kraj izveštaja i stručnog mišljenja

LB-1506

Република Србија
Аутономна Покрајина Војводина
ГРАД СОМБОР
ГРАДСКА УПРАВА
ОДЕЉЕЊЕ ЗА КОМУНАЛНЕ
ДЕЛАТНОСТИ,
ИМОВИНСКО-ПРАВНЕ И
СТАМБЕНЕ ПОСЛОВЕ

Број: 352-1763 /2018-XVI

Дана: 25.12.2018.год.

С о м б о р

УНИВЕРЗИТЕТ У НИШУ
ЕЛЕКТРОНСКИ ФАКУЛТЕТ
Ул. Александра Медведева 14
18000 Ниш

ПРЕДМЕТ: Стручна верификација фотометријског прорачуна

Поштовани

Молимо Вас да за потребе Града Сомбора извршите верификацију фотометријског прорачуна. Као прилог вам шаљемо прорачун који је урађен у пдф формату и матрицу светилки које су коришћене за прорачун. Интересује нас да ли са матрицама које су Вам послете уз овај допис добијате вредности које су наведене у Вама достављеном фотометријском прорачуну. Желио бих Вас напоменути да сви параметри који утичу на прорачун који будете радили морају бити индентични са парапетрима из прорачуна чију верификацију вршите.

Такође вас молимо да нам одговорите на следећа питања:

1. Да ли је енергетски ефикаснија светиљка чија је карактеристика 145 lm/W или енергетски ефикаснија светиљка чија је енергетска ефикасност 118 lm/W?
2. Да ли је енергетски ефикаснија светиљка чија је карактеристика 150 lm/W или је енергетски ефикаснија светиљка чија је енергетска ефикасност 128 lm/W?

Обрађивач:
Петричевић Велимир дипл.инж.ел.
025/468247
vpetricevic@sombor.rs

НАЧЕЛНИК,
Латас Игор



1

APATINSKI PUT

Partner for Contact:
Order No.:
Company:
Customer No.:

Date: 29.09.2018
Operator:

APATINSKI PUT

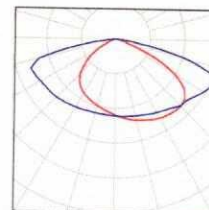
Project Cover	1
Table of contents	2
Luminaire parts list	3
AG-LD150KL	
Luminaire Data Sheet	4
LDC (Polar)	5
LDC (Linear)	6
Luminance Diagram	7
Street 1	
Planning data	8
Luminaire parts list	9
Photometric Results	10
False Color Rendering	11
Valuation Fields	
Roadway 1	
Results overview	12
Isolines (E)	13
Table (E)	14
Observer	
Observer 1	
Isolines (L)	15
Observer 2	
Isolines (L)	16

Operator
Telephone
Fax
e-Mail

APATINSKI PUT / Luminaire parts list

8 Pieces AG-LD150KL
Article No.:
Luminous flux (Luminaire): 22501 lm
Luminous flux (Lamps): 22500 lm
Luminaire Wattage: 150.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.

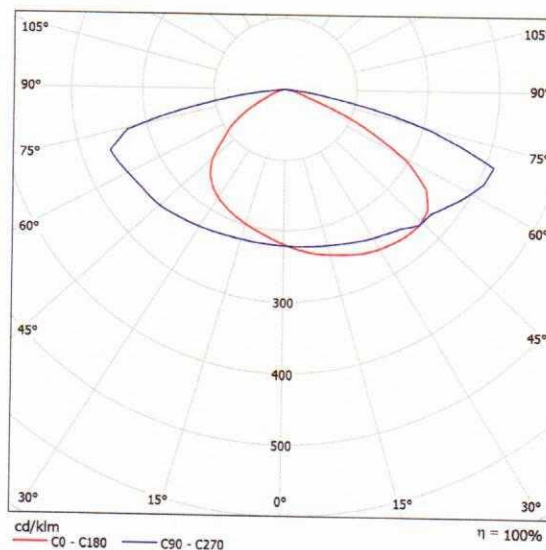


Operator
Telephone
Fax
e-Mail

AG-LD150KL / Luminaire Data Sheet

Luminous emittance 1:

See our luminaire catalog for an image of the luminaire.



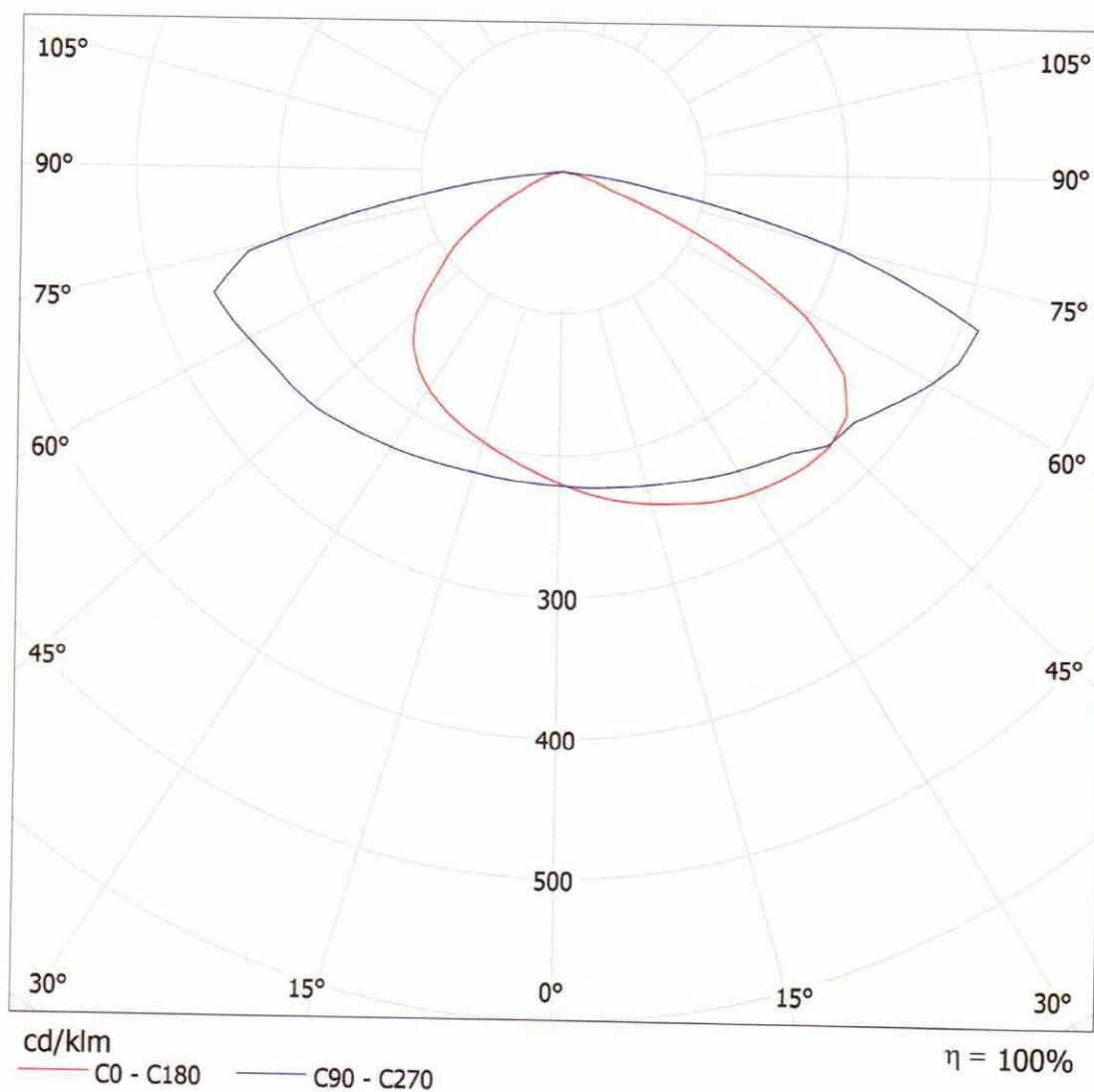
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100

Due to missing symmetry properties, no UGR table can be displayed for this luminaire.

Operator
Telephone
Fax
e-Mail

AG-LD150KL / LDC (Polar)

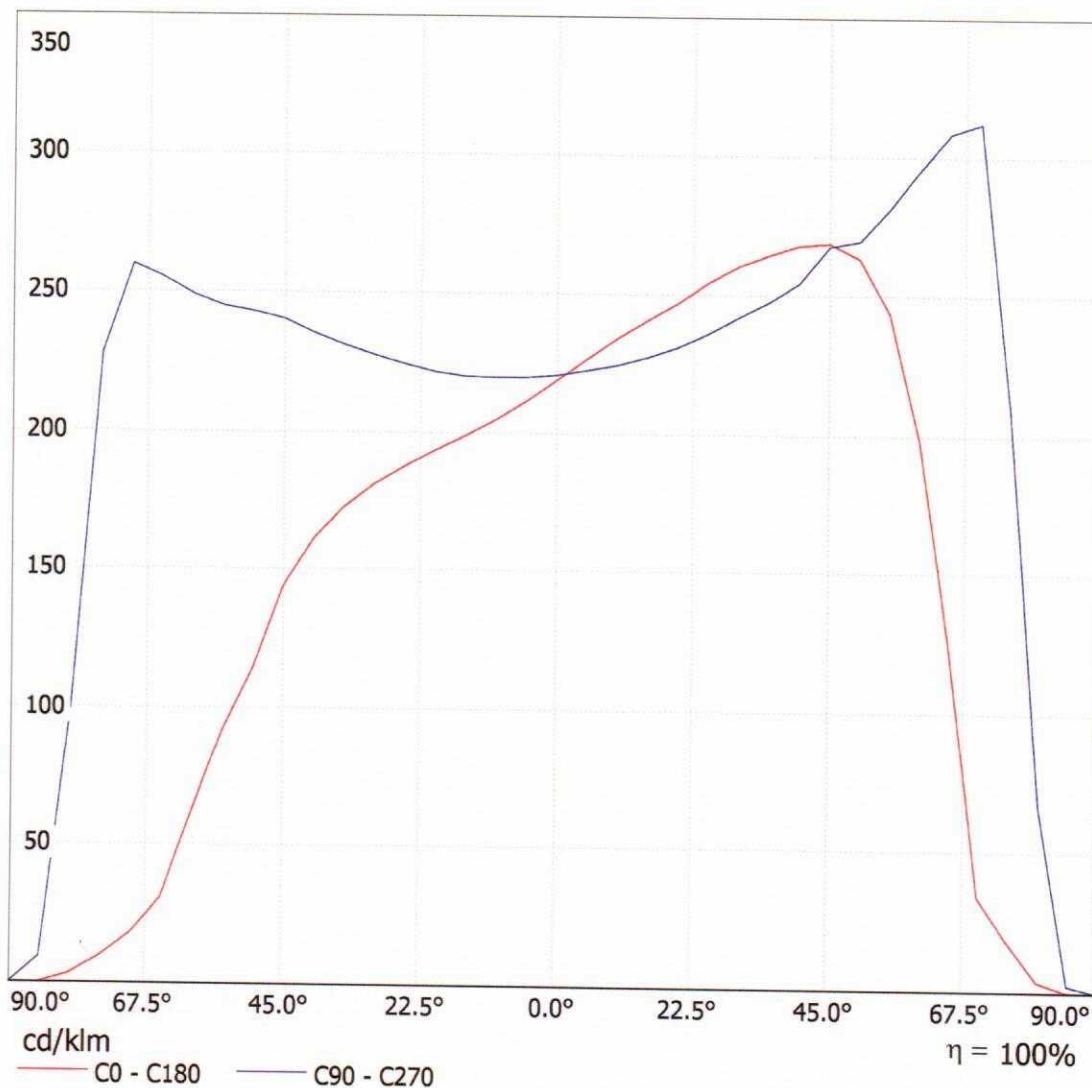
Luminaire: AG-LD150KL
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

AG-LD150KL / LDC (Linear)

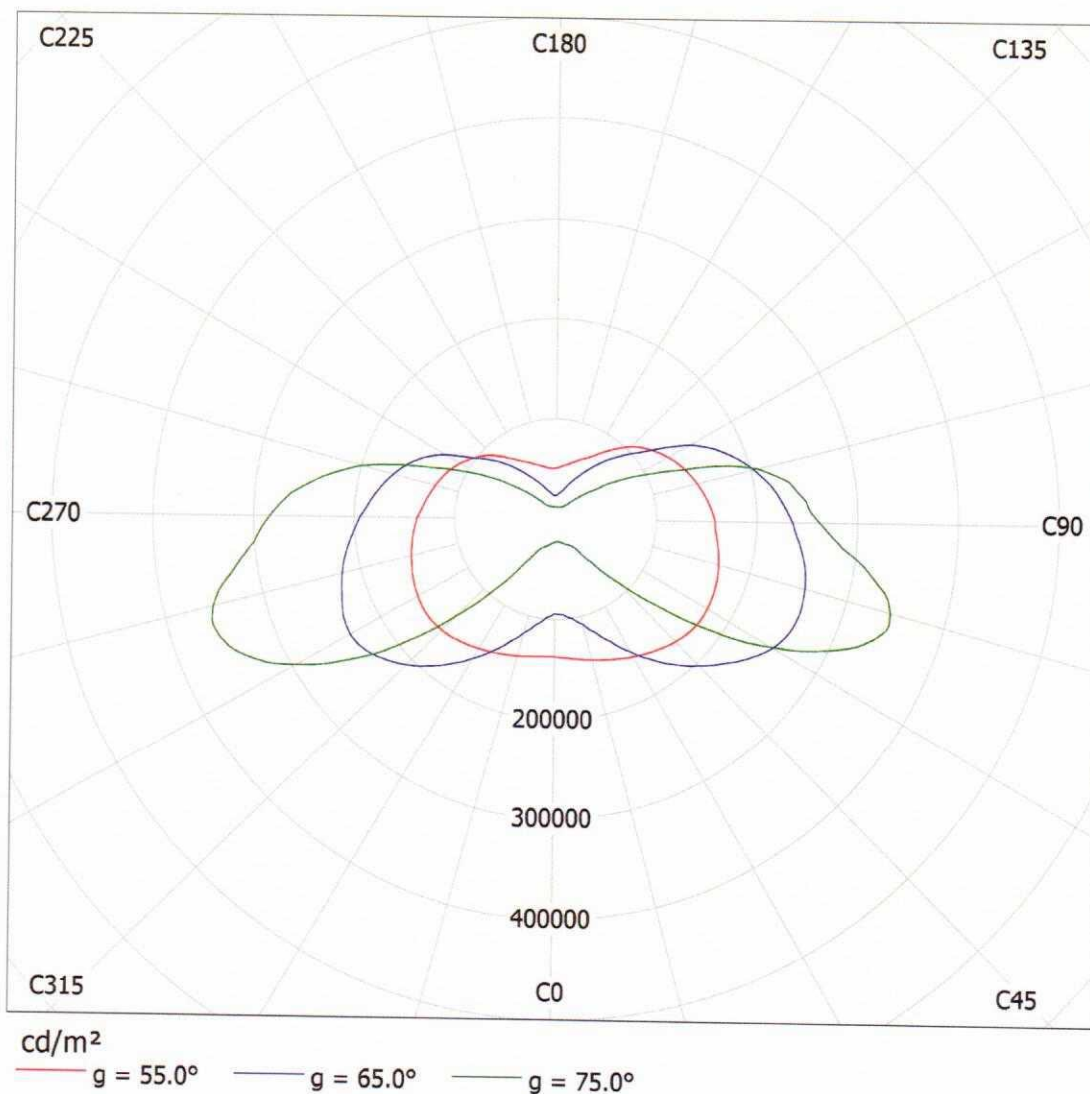
Luminaire: AG-LD150KL
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

AG-LD150KL / Luminance Diagram

Luminaire: AG-LD150KL
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

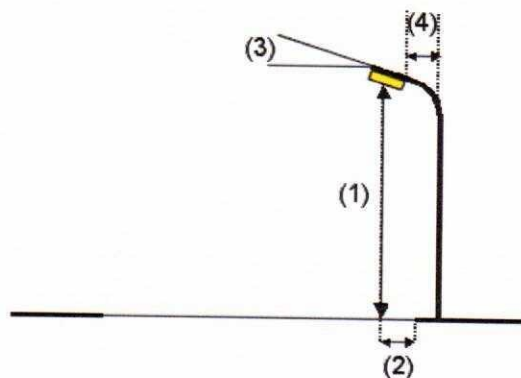
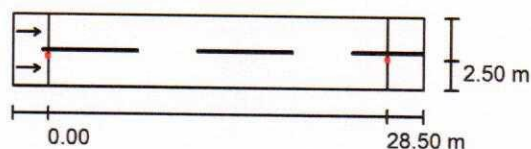
Street 1 / Planning data

Street Profile

Roadway 1 (Width: 6.000 m, Number of lanes: 2, tarmac: R3, q0: 0.070)

Light loss factor: 0.80

Luminaire Arrangements



Luminaire:	AG-LD150KL
Luminous flux (Luminaire):	22501 lm
Luminous flux (Lamps):	22500 lm
Luminaire Wattage:	150.0 W
Arrangement:	Single row, bottom
Pole Distance:	28.500 m
Mounting Height (1):	11.500 m
Height:	11.500 m
Overhang (2):	2.500 m
Boom Angle (3):	0.0 °
Boom Length (4):	4.000 m

Maximum luminous intensities

at 70°:	345 cd/klm
at 80°:	167 cd/klm
at 90°:	0.00 cd/klm

Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.

No luminous intensities above 90°.

Arrangement complies with luminous intensity class G1.

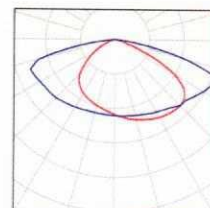
Arrangement complies with glare index class D.1.

Operator
Telephone
Fax
e-Mail

Street 1 / Luminaire parts list

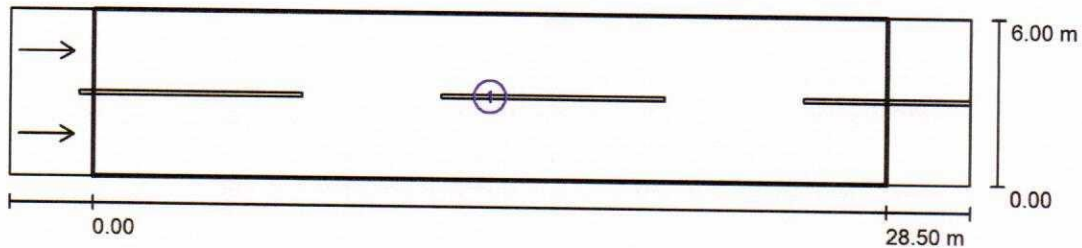
AG-LD150KL
Article No.:
Luminous flux (Luminaire): 22501 lm
Luminous flux (Lamps): 22500 lm
Luminaire Wattage: 150.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.



Operator
Telephone
Fax
e-Mail

Street 1 / Photometric Results



Light loss factor: 0.80

Scale 1:247

Calculation Field List

- 1 Roadway 1
Length: 28.500 m, Width: 6.000 m
Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 1.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME3a

(All lighting performance requirements are met.)

	L_{av} [cd/m ²]	U0	UI	TI [%]	SR
Calculated values:	2.02	0.74	0.93	7	0.88
Required values according to class:	≥ 1.00	≥ 0.40	≥ 0.70	≤ 15	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

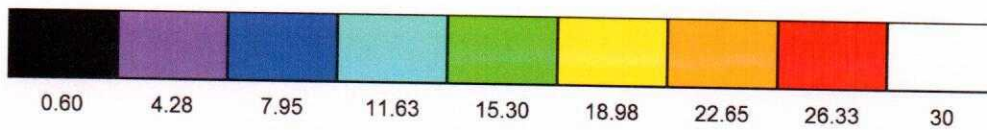
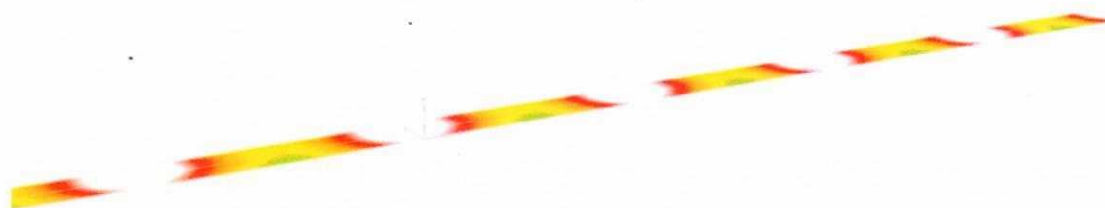
APATINSKI PUT

DIALux

29.09.2018

Operator
Telephone
Fax
e-Mail

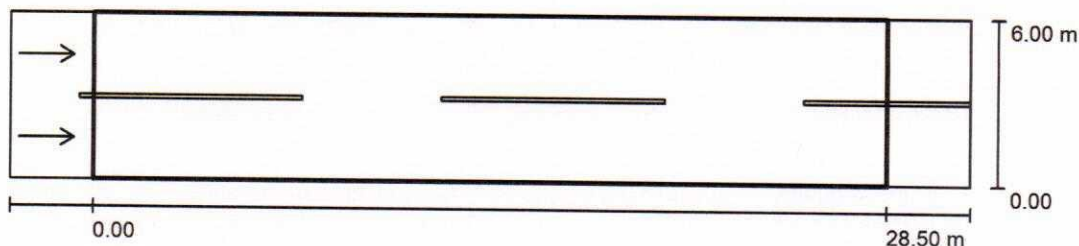
Street 1 / False Color Rendering



lx

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Results overview



Light loss factor: 0.80

Scale 1:247

Grid: 10 x 6 Points

Accompanying Street Elements: Roadway 1.

tarmac: R3, q0: 0.070

Selected Lighting Class: ME3a

(All lighting performance requirements are met.)

Calculated values:

Required values according to class:

Fulfilled/Not fulfilled:

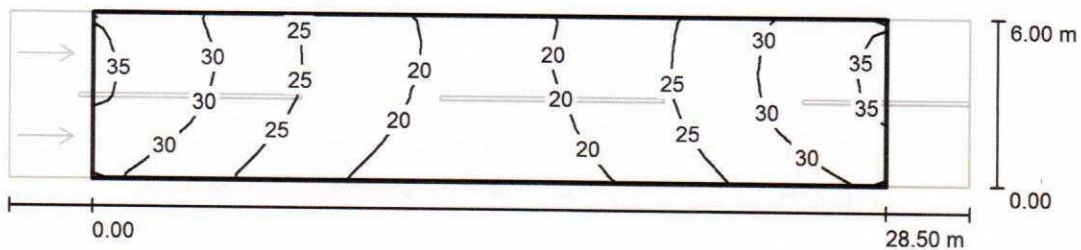
L_{av} [cd/m ²]	U0	UI	TI [%]	SR
2.02	0.74	0.93	7	0.88
≥ 1.00	≥ 0.40	≥ 0.70	≤ 15	≥ 0.50
✓	✓	✓	✓	✓

Assigned observer (2 Pieces):

No.	Observer	Position [m]	L_{av} [cd/m ²]	U0	UI	TI [%]
1	Observer 1	(-60.000, 1.500, 1.500)	2.02	0.74	0.93	7
2	Observer 2	(-60.000, 4.500, 1.500)	2.05	0.76	0.93	7

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Isolines (E)



Values in Lux, Scale 1 : 247

Grid: 10 x 6 Points

 E_{av} [lx]
25 E_{min} [lx]
18 E_{max} [lx]
35 $u0$
0.691 E_{min} / E_{max}
0.508

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Table (E)



5.500	34	30	25	21	19	19	21	26	30	34
4.500	34	30	25	21	19	19	22	26	31	<u>35</u>
3.500	34	30	25	21	19	19	21	26	31	<u>35</u>
2.500	34	30	25	21	19	19	21	26	31	34
1.500	32	28	24	20	<u>18</u>	<u>18</u>	21	25	29	33
0.500	30	27	23	19	<u>18</u>	<u>18</u>	20	23	28	31
m	1.425	4.275	7.125	9.975	12.825	15.675	18.525	21.375	24.225	27.075

Attention: The coordinates refer to the image above. Values in Lux.

Grid: 10 x 6 Points

E_{av} [lx]
25

E_{min} [lx]
18

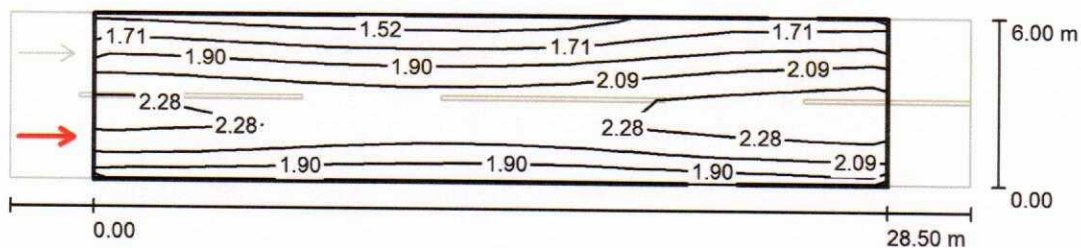
E_{max} [lx]
35

$u0$
0.691

E_{min} / E_{max}
0.508

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Observer 1 / Isolines (L)

Values in Candela/m², Scale 1 : 247

Grid: 10 x 6 Points

Observer Position: (-60.000 m, 1.500 m, 1.500 m)

tarmac: R3, q0: 0.070

Calculated values:

L_{av} [cd/m ²]	U0	UI	TI [%]
2.02	0.74	0.93	7

Required values according to class ME3a:

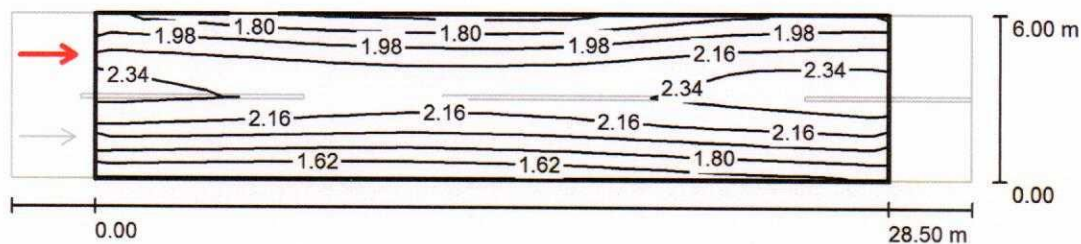
≥ 1.00	≥ 0.40	≥ 0.70	≤ 15
-------------	-------------	-------------	-----------

Fulfilled/Not fulfilled:

✓	✓	✓	✓
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Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Observer 2 / Isolines (L)



Values in Candela/m², Scale 1 : 247

Grid: 10 x 6 Points

Observer Position: (-60.000 m, 4.500 m, 1.500 m)

tarmac: R3, q0: 0.070

	L_{av} [cd/m ²]	U0	UI	TI [%]
Calculated values:	2.05	0.76	0.93	7
Required values according to class ME3a:	≥ 1.00	≥ 0.40	≥ 0.70	≤ 15
Fulfilled/Not fulfilled:	✓	✓	✓	✓

ULICE MAKSIMA GORKOG I ARSENIJA ČARNOJEVIĆA

Partner for Contact:
Order No.:
Company:
Customer No.:

Date: 29.09.2018
Operator:

Operator
Telephone
Fax
e-Mail

Table of contents

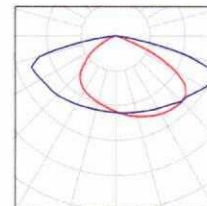
ULICE MAKSIMA GORKOG I ARSENIJA ČARNOJEVIĆA	
Project Cover	1
Table of contents	2
Luminaire parts list	3
AG-LD120KM	
Luminaire Data Sheet	4
LDC (Polar)	5
LDC (Linear)	6
Luminance Diagram	7
Street 1	
Planning data	8
Luminaire parts list	9
Photometric Results	10
False Color Rendering	11
Valuation Fields	
Roadway 1	
Results overview	12
Isolines (E)	13
Table (E)	14
Observer	
Observer 1	
Isolines (L)	15
Observer 2	
Isolines (L)	16

Operator
Telephone
Fax
e-Mail

ULICE MAKSIMA GORKOG I ARSENIJA ČARNOJEVIĆA / Luminaire parts list

7 Pieces AG-LD120KM
Article No.:
Luminous flux (Luminaire): 18000 lm
Luminous flux (Lamps): 18000 lm
Luminaire Wattage: 120.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.

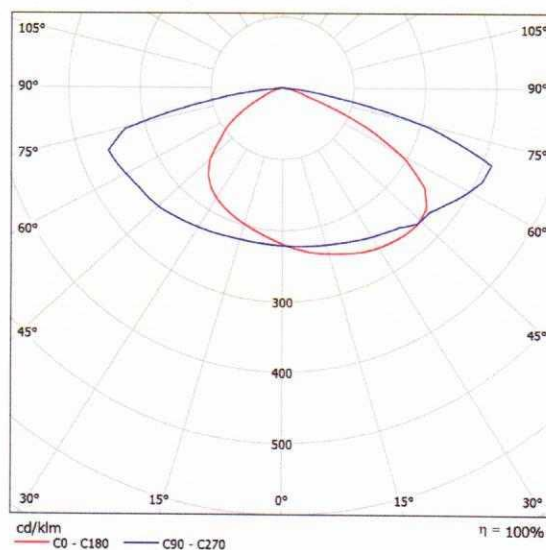


Operator
Telephone
Fax
e-Mail

AG-LD120KM / Luminaire Data Sheet

See our luminaire catalog for an image of the luminaire.

Luminous emittance 1:



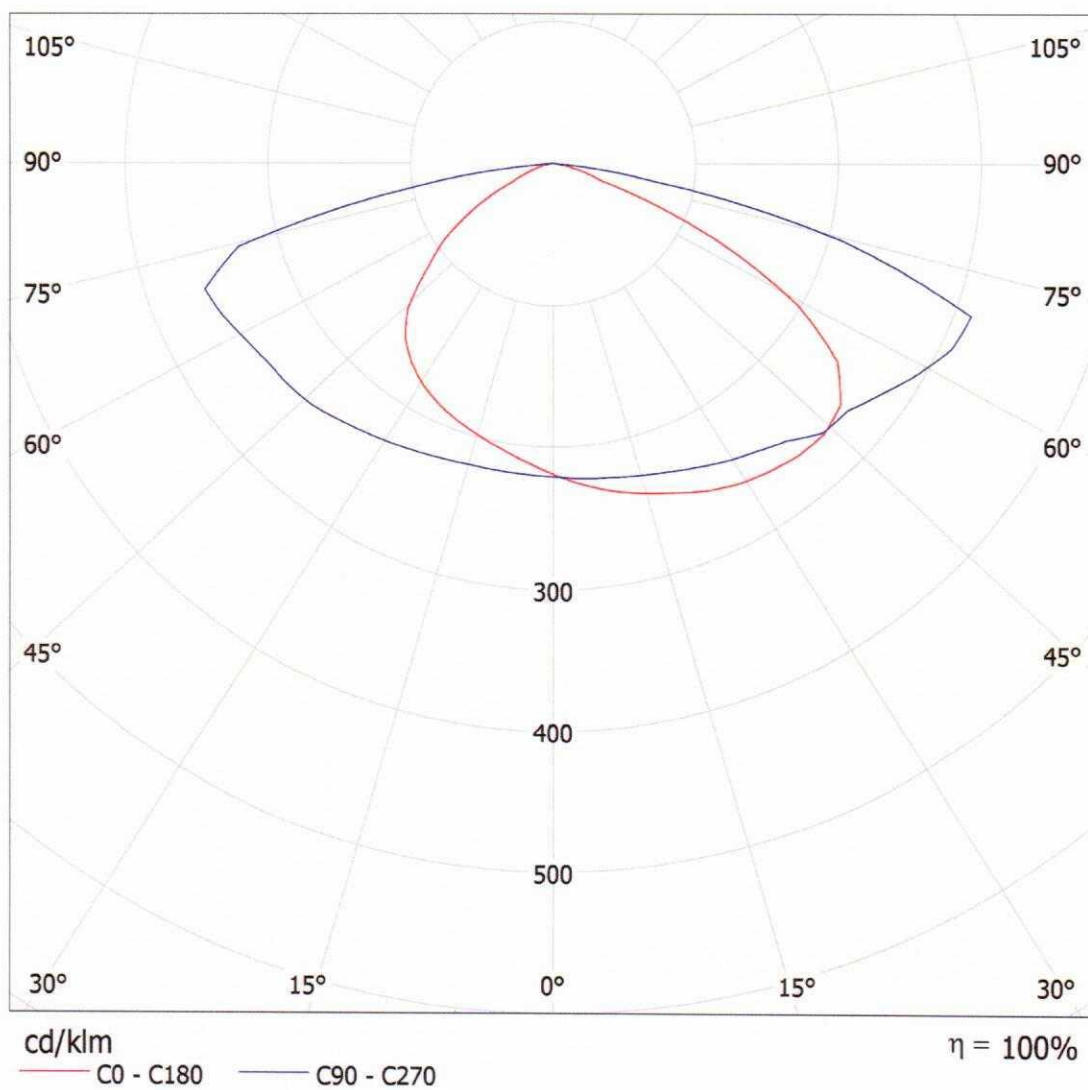
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100

Due to missing symmetry properties, no UGR table can be displayed for this luminaire.

Operator
Telephone
Fax
e-Mail

AG-LD120KM / LDC (Polar)

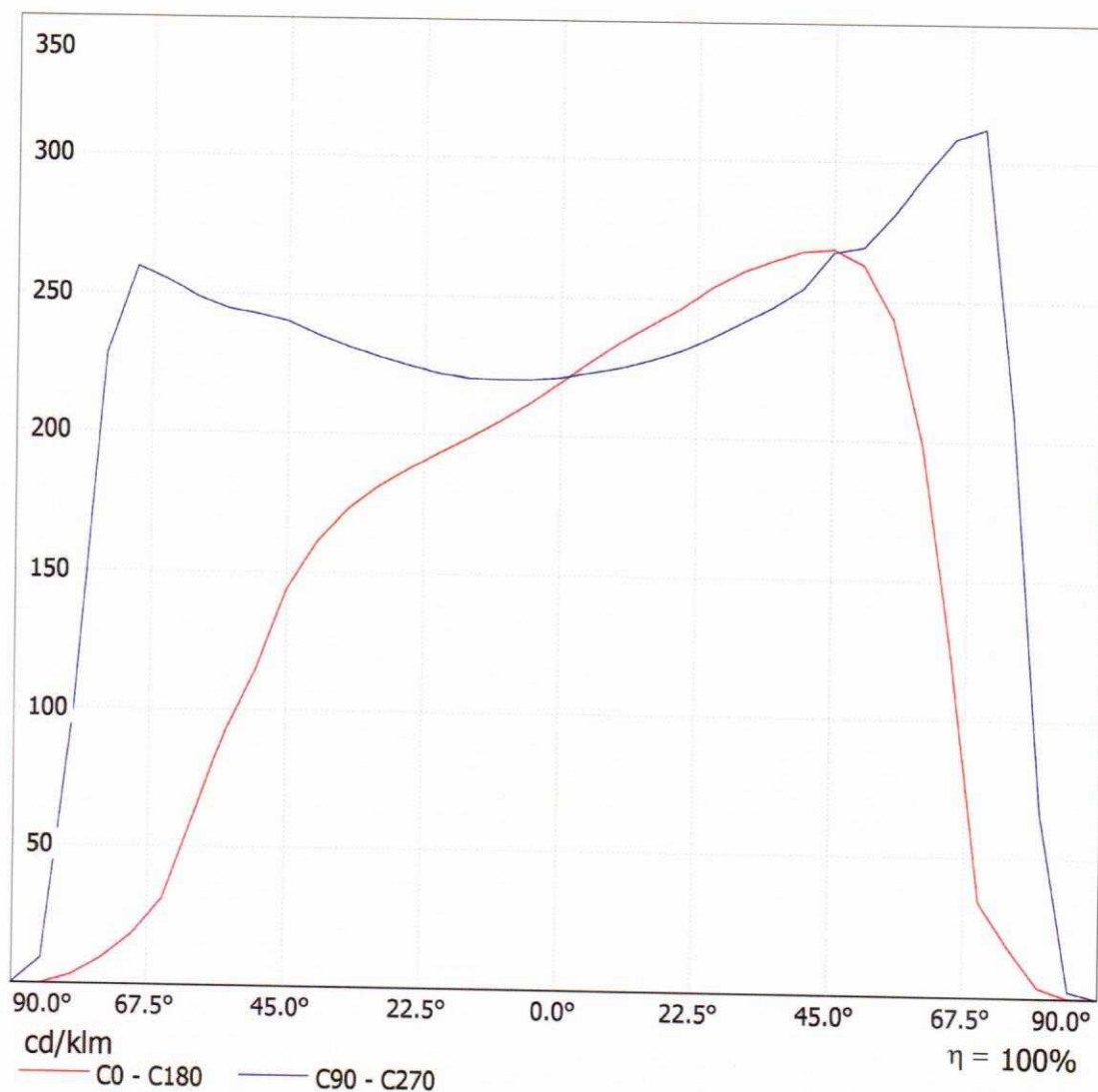
Luminaire: AG-LD120KM
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

AG-LD120KM / LDC (Linear)

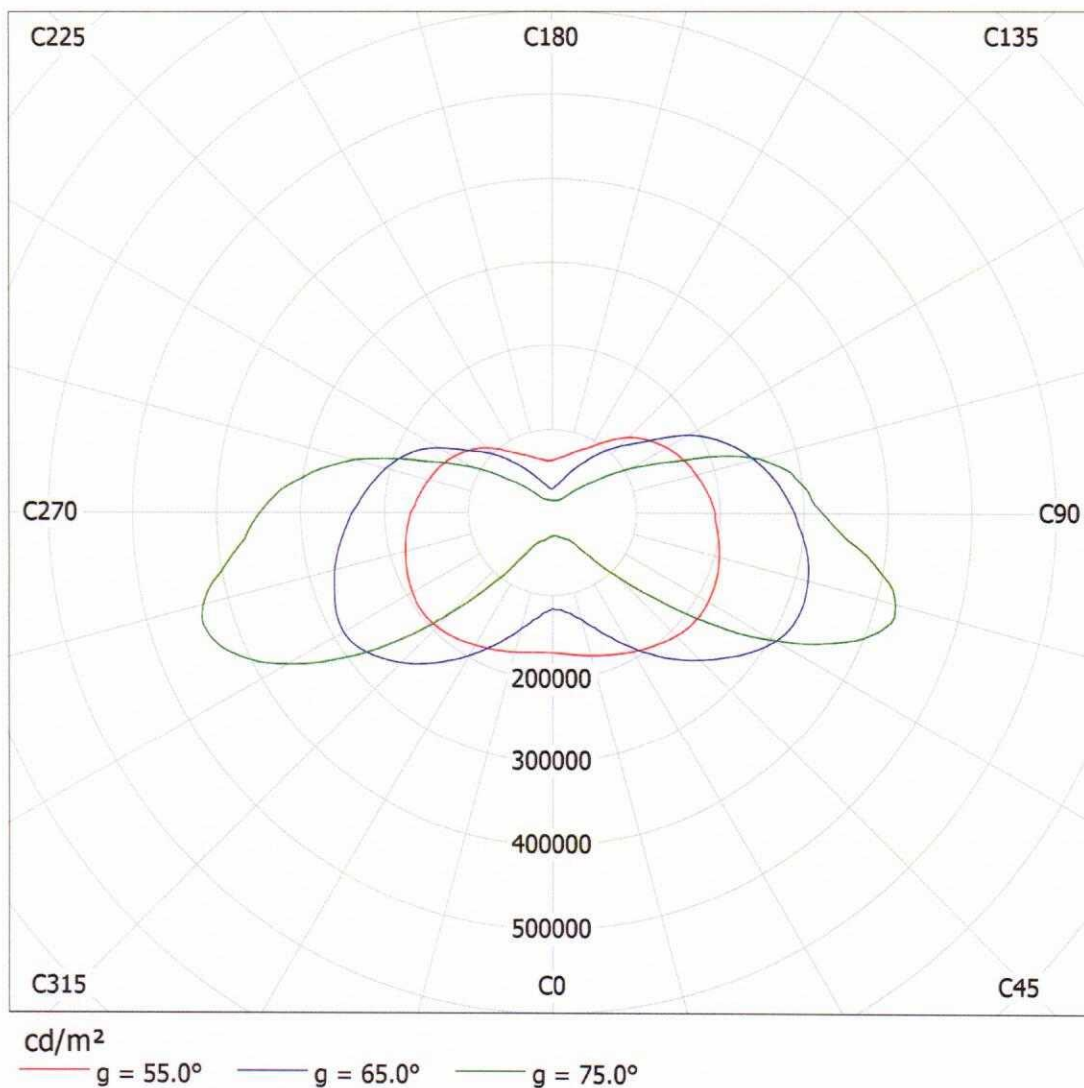
Luminaire: AG-LD120KM
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

AG-LD120KM / Luminance Diagram

Luminaire: AG-LD120KM
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

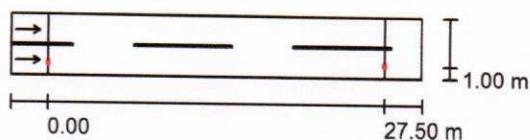
Street 1 / Planning data

Street Profile

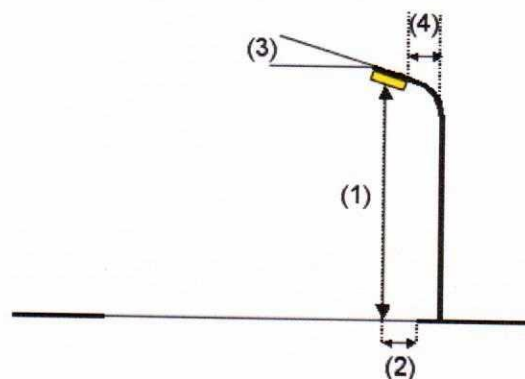
Roadway 1 (Width: 5.000 m, Number of lanes: 2, tarmac: R3, q0: 0.070)

Light loss factor: 0.80

Luminaire Arrangements



Luminaire:	AG-LD120KM
Luminous flux (Luminaire):	18000 lm
Luminous flux (Lamps):	18000 lm
Luminaire Wattage:	120.0 W
Arrangement:	Single row, bottom
Pole Distance:	27.500 m
Mounting Height (1):	10.000 m
Height:	10.000 m
Overhang (2):	1.000 m
Boom Angle (3):	0.0 °
Boom Length (4):	1.500 m



Maximum luminous intensities

at 70°:	345 cd/klm
at 80°:	167 cd/klm
at 90°:	0.00 cd/klm

Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.

No luminous intensities above 90°.

Arrangement complies with luminous intensity class G1.

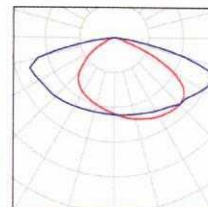
Arrangement complies with glare index class D.1.

Operator
Telephone
Fax
e-Mail

Street 1 / Luminaire parts list

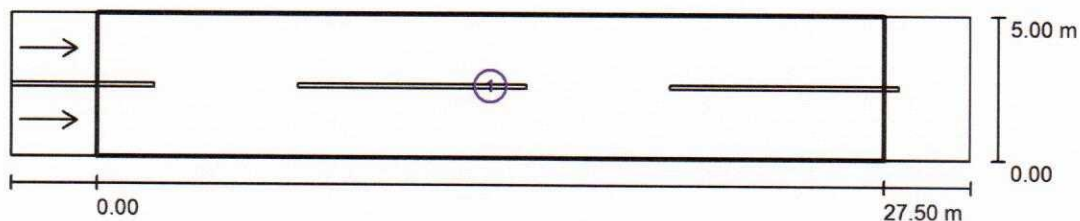
AG-LD120KM
Article No.:
Luminous flux (Luminaire): 18000 lm
Luminous flux (Lamps): 18000 lm
Luminaire Wattage: 120.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.



Operator
Telephone
Fax
e-Mail

Street 1 / Photometric Results



Light loss factor: 0.80

Scale 1:240

Calculation Field List

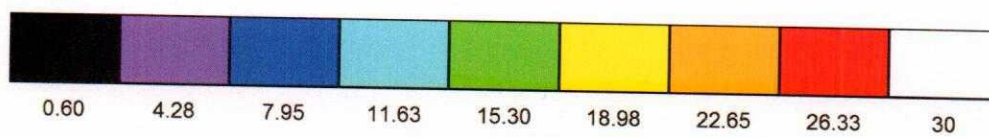
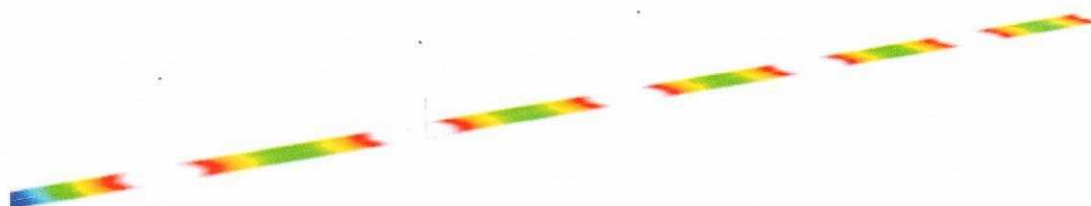
- 1 Roadway 1
Length: 27.500 m, Width: 5.000 m
Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 1.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME4a

(All lighting performance requirements are met.)

	L_{av} [cd/m ²]	U0	UI	TI [%]	SR
Calculated values:	1.90	0.67	0.88	8	0.89
Required values according to class:	≥ 0.75	≥ 0.40	≥ 0.60	≤ 15	≥ 0.50
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

Operator
Telephone
Fax
e-Mail

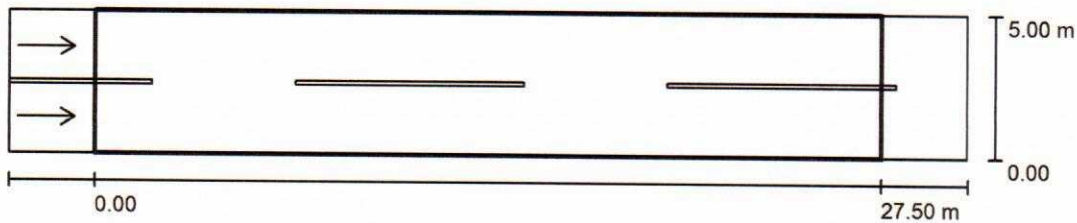
Street 1 / False Color Rendering



lx

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Results overview



Light loss factor: 0.80

Scale 1:240

Grid: 10 x 6 Points

Accompanying Street Elements: Roadway 1.

tarmac: R3, q0: 0.070

Selected Lighting Class: ME4a

(All lighting performance requirements are met.)

Calculated values:

Required values according to class:

Fulfilled/Not fulfilled:

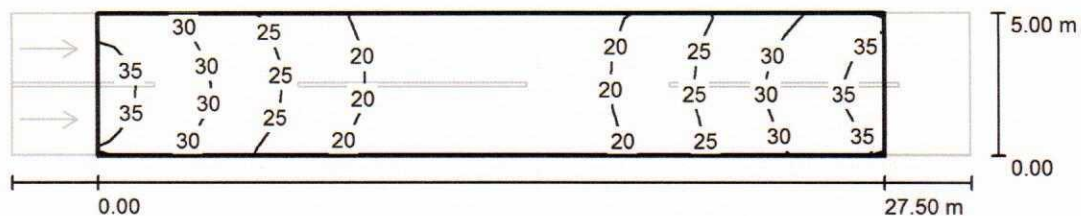
L_{av} [cd/m ²]	U0	UI	TI [%]	SR
1.90	0.67	0.88	8	0.89
≥ 0.75	≥ 0.40	≥ 0.60	≤ 15	≥ 0.50
✓	✓	✓	✓	✓

Assigned observer (2 Pieces):

No.	Observer	Position [m]	L_{av} [cd/m ²]	U0	UI	TI [%]
1	Observer 1	(-60.000, 1.250, 1.500)	1.90	0.67	0.92	8
2	Observer 2	(-60.000, 3.750, 1.500)	1.98	0.73	0.88	7

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Isolines (E)



Values in Lux, Scale 1 : 240

Grid: 10 x 6 Points

 E_{av} [lx]
25 E_{min} [lx]
16 E_{max} [lx]
35 $u0$
0.653 E_{min} / E_{max}
0.455

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Table (E)



4.583	33	28	23	19	<u>16</u>	<u>16</u>	19	23	29	33
3.750	34	29	24	19	17	17	19	24	30	34
2.917	<u>35</u>	30	24	19	17	17	19	24	30	<u>35</u>
2.083	<u>35</u>	30	24	19	17	17	20	24	31	<u>35</u>
1.250	<u>35</u>	29	23	19	<u>16</u>	<u>16</u>	19	24	30	<u>35</u>
0.417	33	28	22	18	<u>16</u>	<u>16</u>	19	23	29	34
m	1.375	4.125	6.875	9.625	12.375	15.125	17.875	20.625	23.375	26.125

Attention: The coordinates refer to the image above. Values in Lux.

Grid: 10 x 6 Points

E_{av} [lx]
25

E_{min} [lx]
16

E_{max} [lx]
35

u_0
0.653

E_{min} / E_{max}
0.455

Operator
Telephone
Fax
e-Mail

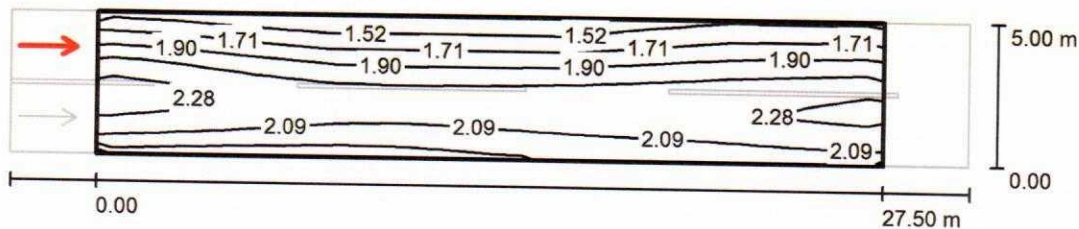
Values in Candela/m², Scale 1 : 240

Grid: 10 x 6 Points
Observer Position: (-60.000 m, 1.250 m, 1.500 m)
tarmac: R3, q0: 0.070

	L_{av} [cd/m ²]	U0	U1	Tl [%]
Calculated values:	1.90	0.67	0.92	8
Required values according to class ME4a:	≥ 0.75	≥ 0.40	≥ 0.60	≤ 15
Fulfilled/Not fulfilled:	✓	✓	✓	✓

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Observer 2 / Isolines (L)



Values in Candela/m², Scale 1 : 240

Grid: 10 x 6 Points

Observer Position: (-60.000 m, 3.750 m, 1.500 m)

tarmac: R3, q0: 0.070

	L_{av} [cd/m²]	U0	UI	TI [%]
Calculated values:	1.98	0.73	0.88	7
Required values according to class ME4a:	≥ 0.75	≥ 0.40	≥ 0.60	≤ 15
Fulfilled/Not fulfilled:	✓	✓	✓	✓

3

ULICE VLADIKE NIKOLAJA I FRANJE RAČKOG

Partner for Contact:
Order No.:
Company:
Customer No.:

Date: 29.09.2018
Operator:

Operator
Telephone
Fax
e-Mail

ULICE VLADIKE NIKOLAJA I FRANJE RAČKOG

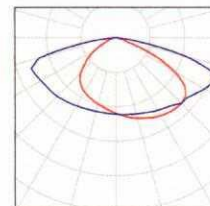
Project Cover	1
Table of contents	2
Luminaire parts list	3
AG-LD060KM	
Luminaire Data Sheet	4
LDC (Polar)	5
LDC (Linear)	6
Luminance Diagram	7
Street 1	
Planning data	8
Luminaire parts list	9
Photometric Results	10
False Color Rendering	11
Valuation Fields	
Roadway 1	
Results overview	12
Isolines (E)	13
Table (E)	14
Observer	
Observer 1	
Isolines (L)	15
Observer 2	
Isolines (L)	16

Operator
Telephone
Fax
e-Mail

ULICE VLADIKE NIKOLAJA I FRANJE RAČKOG / Luminaire parts list

7 Pieces AG-LD060KM
Article No.:
Luminous flux (Luminaire): 9000 lm
Luminous flux (Lamps): 9000 lm
Luminaire Wattage: 60.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.

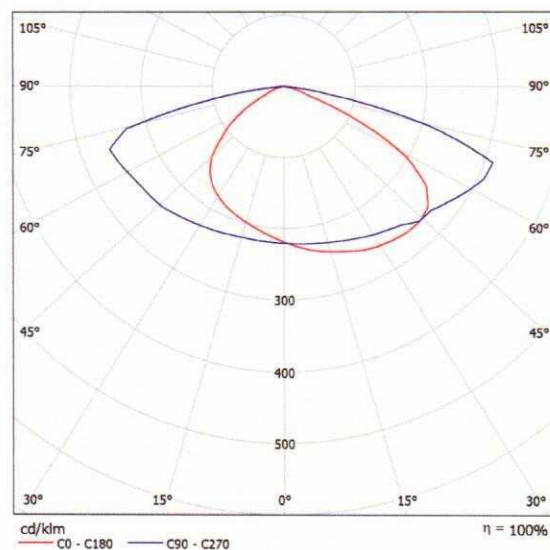


Operator
Telephone
Fax
e-Mail

AG-LD060KM / Luminaire Data Sheet

See our luminaire catalog for an image of the luminaire.

Luminous emittance 1:



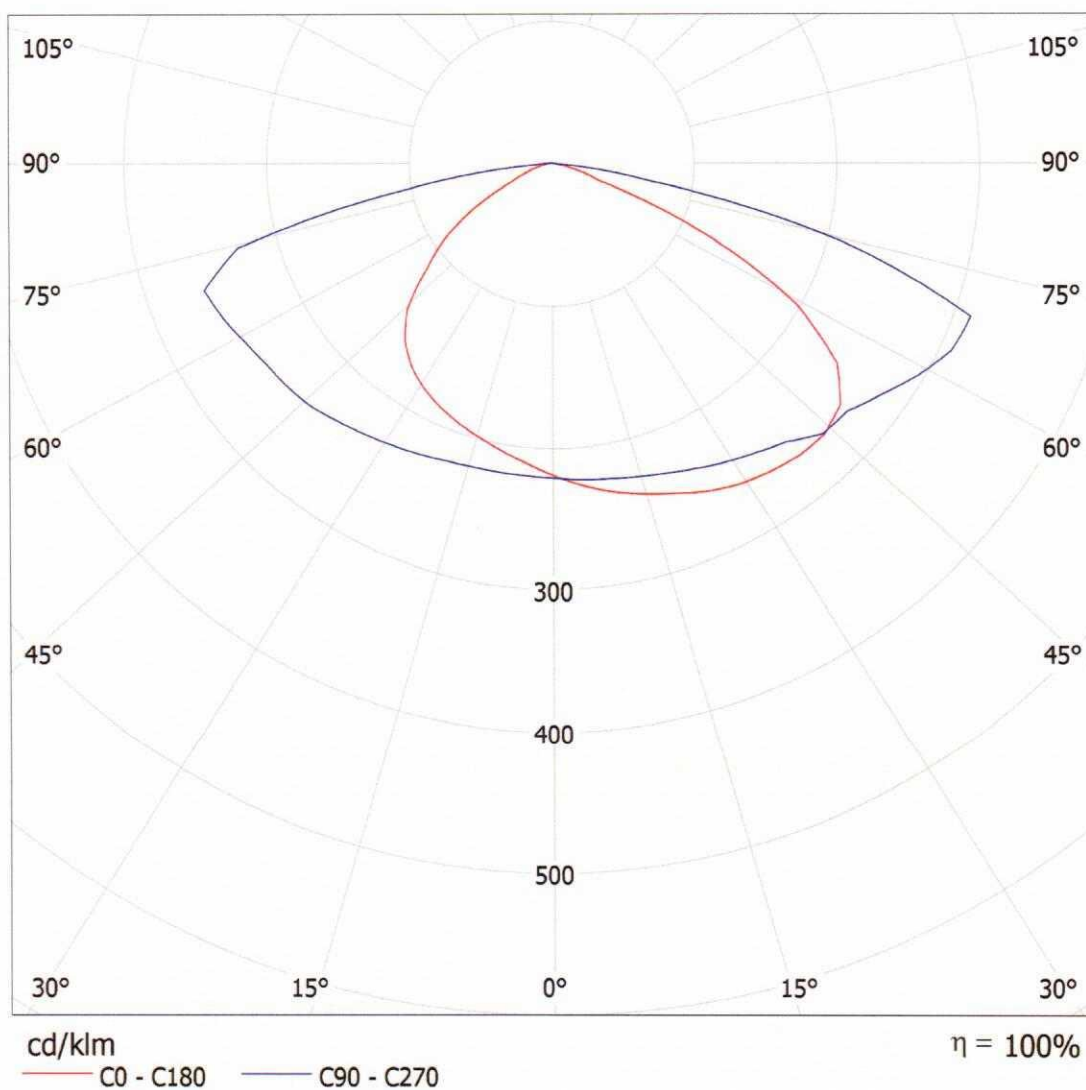
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100

Due to missing symmetry properties, no UGR table can be displayed for this luminaire.

Operator
Telephone
Fax
e-Mail

AG-LD060KM / LDC (Polar)

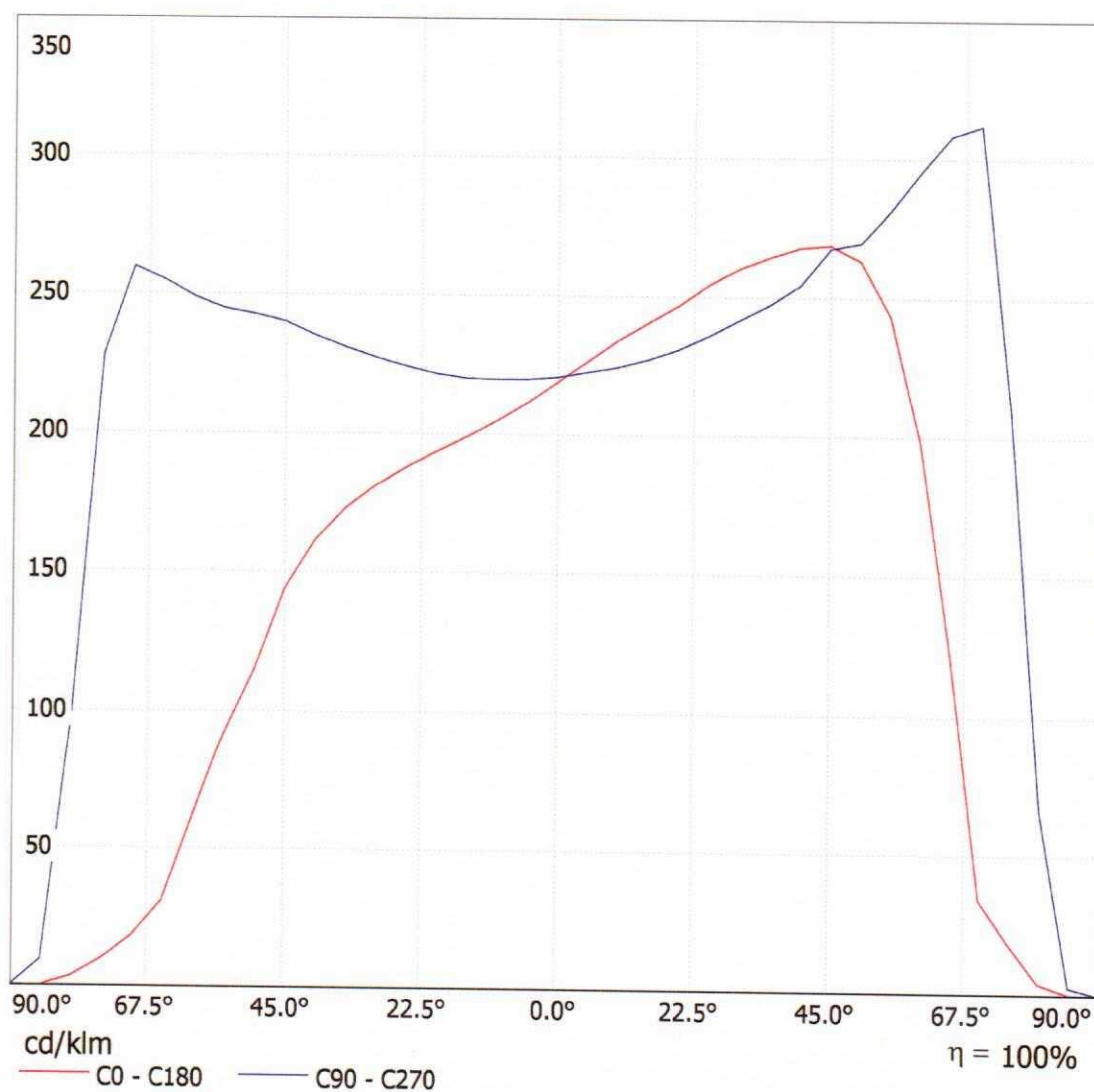
Luminaire: AG-LD060KM
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

AG-LD060KM / LDC (Linear)

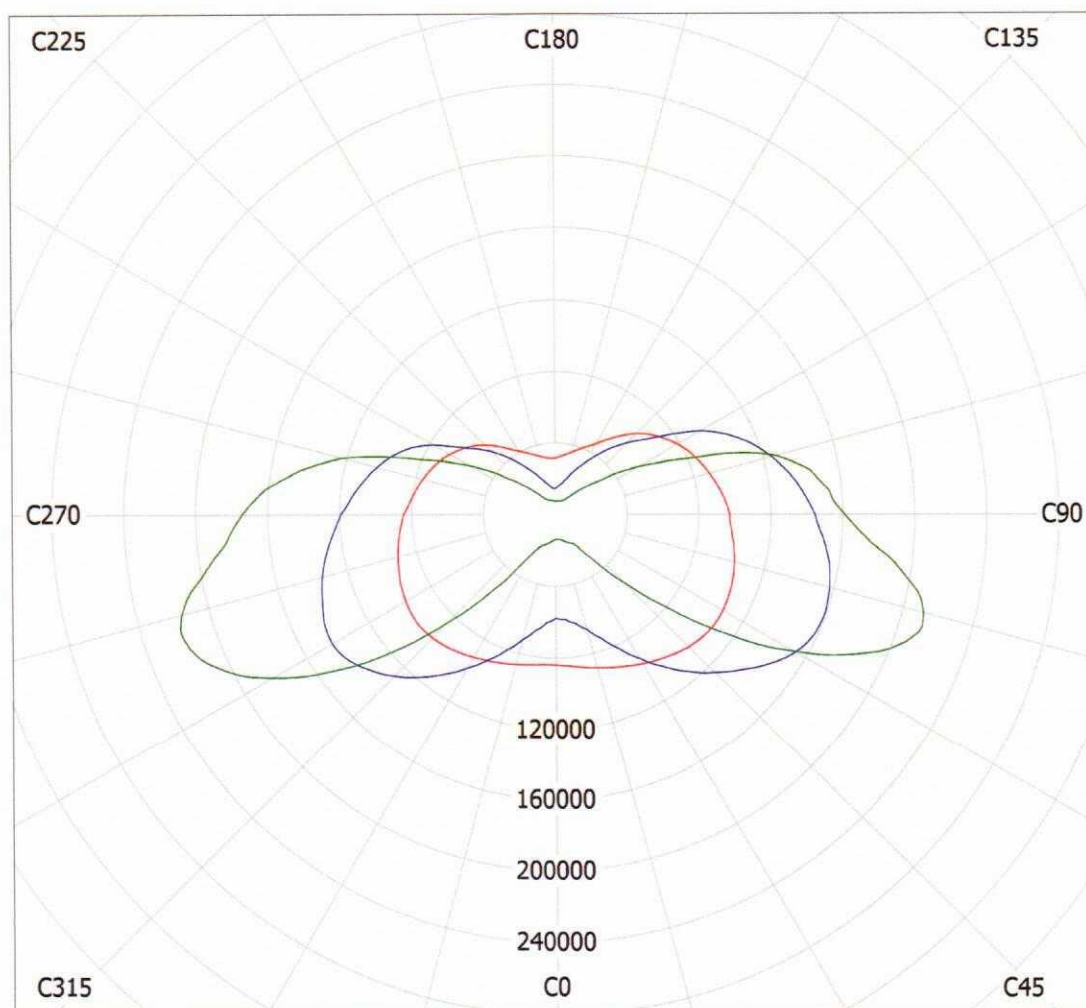
Luminaire: AG-LD060KM
Lamps: 1 x



Operator
Telephone
Fax
e-Mail

AG-LD060KM / Luminance Diagram

Luminaire: AG-LD060KM
Lamps: 1 x



cd/m^2

— $g = 55.0^\circ$ — $g = 65.0^\circ$ — $g = 75.0^\circ$

Operator
Telephone
Fax
e-Mail

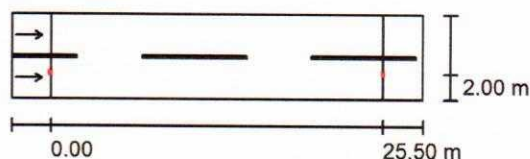
Street 1 / Planning data

Street Profile

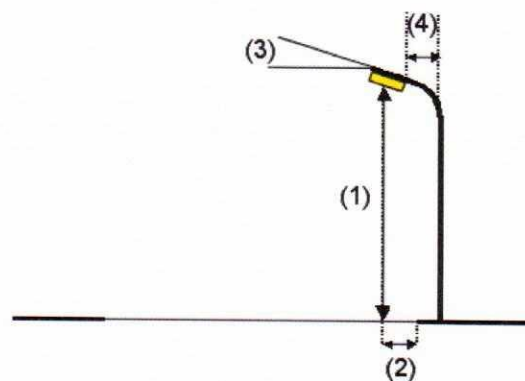
Roadway 1 (Width: 6.500 m, Number of lanes: 2, tarmac: R3, q0: 0.070)

Light loss factor: 0.80

Luminaire Arrangements



Luminaire:	AG-LD060KM
Luminous flux (Luminaire):	9000 lm
Luminous flux (Lamps):	9000 lm
Luminaire Wattage:	60.0 W
Arrangement:	Single row, bottom
Pole Distance:	25.500 m
Mounting Height (1):	10.000 m
Height:	10.000 m
Overhang (2):	2.000 m
Boom Angle (3):	0.0 °
Boom Length (4):	2.500 m



Maximum luminous intensities

at 70°:	345 cd/klm
at 80°:	167 cd/klm
at 90°:	0.00 cd/klm

Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.

No luminous intensities above 90°.

Arrangement complies with luminous intensity class G1.

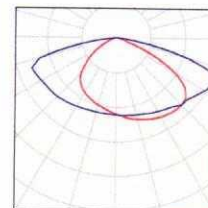
Arrangement complies with glare index class D.3.

Operator
Telephone
Fax
e-Mail

Street 1 / Luminaire parts list

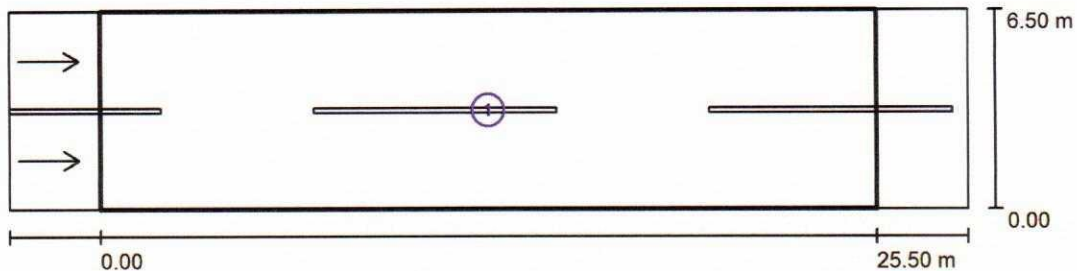
AG-LD060KM
Article No.:
Luminous flux (Luminaire): 9000 lm
Luminous flux (Lamps): 9000 lm
Luminaire Wattage: 60.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.



Operator
Telephone
Fax
e-Mail

Street 1 / Photometric Results



Light loss factor: 0.80

Scale 1:226

Calculation Field List

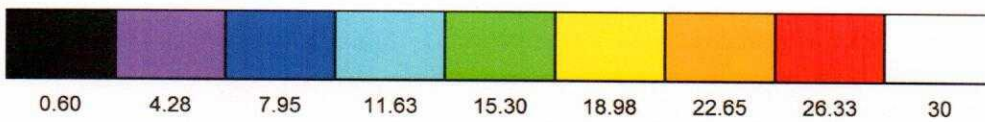
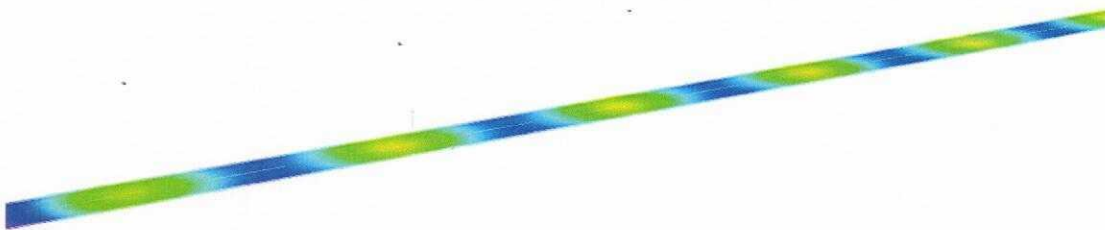
- 1 Roadway 1
Length: 25.500 m, Width: 6.500 m
Grid: 10 x 6 Points
Accompanying Street Elements: Roadway 1.
tarmac: R3, q0: 0.070
Selected Lighting Class: ME6

(All lighting performance requirements are met.)

	L_{av} [cd/m ²]	U0	UI	TI [%]	SR
Calculated values:	0.98	0.65	0.87	7	0.83
Required values according to class:	≥ 0.30	≥ 0.35	≥ 0.40	≤ 15	/
Fulfilled/Not fulfilled:	✓	✓	✓	✓	✓

Operator
Telephone
Fax
e-Mail

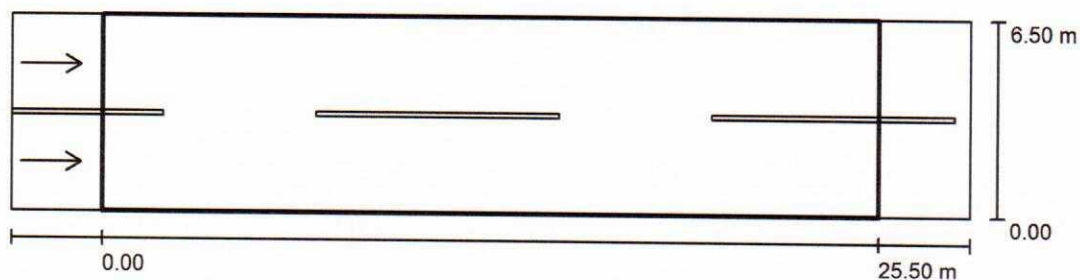
Street 1 / False Color Rendering



lx

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Results overview



Light loss factor: 0.80

Scale 1:226

Grid: 10 x 6 Points

Accompanying Street Elements: Roadway 1.

tarmac: R3, q0: 0.070

Selected Lighting Class: ME6

(All lighting performance requirements are met.)

Calculated values:

Required values according to class:

Fulfilled/Not fulfilled:

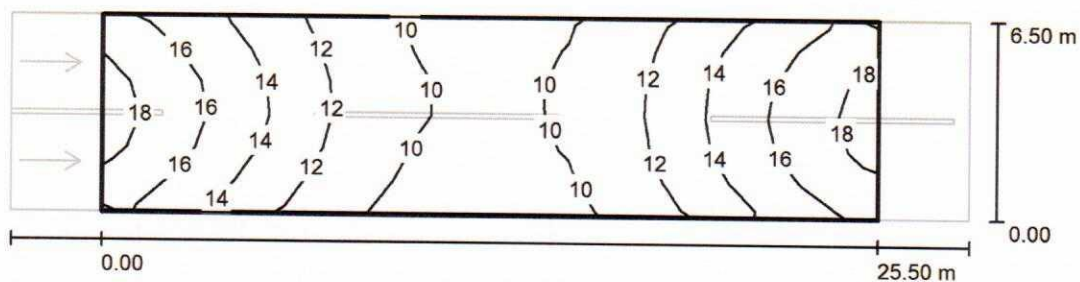
L_{av} [cd/m ²]	U0	UI	TI [%]	SR
0.98	0.65	0.87	7	0.83
≥ 0.30	≥ 0.35	≥ 0.40	≤ 15	/
✓	✓	✓	✓	✓

Assigned observer (2 Pieces):

No.	Observer	Position [m]	L_{av} [cd/m ²]	U0	UI	TI [%]
1	Observer 1	(-60.000, 1.625, 1.500)	0.98	0.65	0.93	7
2	Observer 2	(-60.000, 4.875, 1.500)	1.01	0.72	0.87	6

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Isolines (E)



Values in Lux, Scale 1 : 226

Grid: 10 x 6 Points

E_{av} [lx]
13

E_{min} [lx]
8.94

E_{max} [lx]
18

$u0$
0.686

E_{min} / E_{max}
0.494

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Table (E)



5.958	16	15	12	10	9.36	9.37	11	13	15	16
4.875	17	15	13	11	9.52	9.52	11	13	16	17
3.792	<u>18</u>	16	13	11	9.56	9.57	11	13	16	<u>18</u>
2.708	<u>18</u>	16	13	11	9.50	9.50	11	13	16	<u>18</u>
1.625	17	15	12	10	9.30	9.36	11	13	16	<u>18</u>
0.542	16	14	12	9.88	<u>8.94</u>	9.02	10	12	15	16
m	1.275	3.825	6.375	8.925	11.475	14.025	16.575	19.125	21.675	24.225

Attention: The coordinates refer to the image above. Values in Lux.

Grid: 10 x 6 Points

E_{av} [lx]
13

E_{min} [lx]
8.94

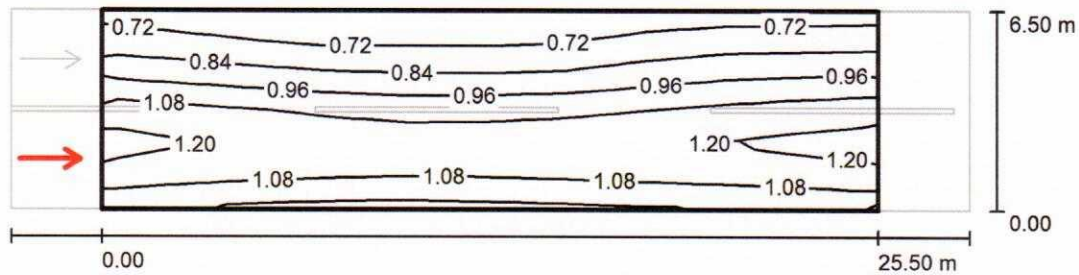
E_{max} [lx]
18

u_0
0.686

E_{min} / E_{max}
0.494

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Observer 1 / Isolines (L)



Values in Candela/m², Scale 1 : 226

Grid: 10 x 6 Points

Observer Position: (-60.000 m, 1.625 m, 1.500 m)

tarmac: R3, q0: 0.070

Calculated values:

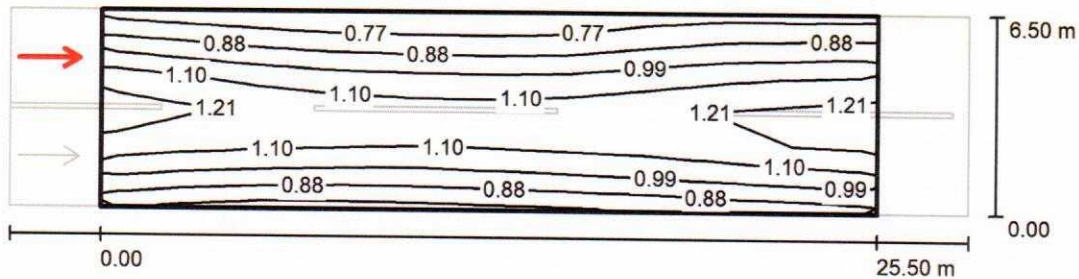
Required values according to class ME6:

Fulfilled/Not fulfilled:

L_{av} [cd/m²]	U0	UI	TI [%]
0.98	0.65	0.93	7
≥ 0.30	≥ 0.35	≥ 0.40	≤ 15
✓	✓	✓	✓

Operator
Telephone
Fax
e-Mail

Street 1 / Roadway 1 / Observer 2 / Isolines (L)



Values in Candela/m², Scale 1 : 226

Grid: 10 x 6 Points

Observer Position: (-60.000 m, 4.875 m, 1.500 m)

tarmac: R3, q0: 0.070

Calculated values:

L_{av} [cd/m²]	U0	UI	TI [%]
1.01	0.72	0.87	6

Required values according to class ME6:

≥ 0.30	≥ 0.35	≥ 0.40	≤ 15
-------------	-------------	-------------	-----------

Fulfilled/Not fulfilled:

✓	✓	✓	✓
---	---	---	---

NEKATEGORISANE ULICE

Prilikom proračuna, definisana je klasa asfalta R3 $q_0=0,07$.

Partner for Contact:
Order No.:
Company:
Customer No.:

Date: 29.09.2018
Operator:

Operator
Telephone
Fax
e-Mail

Table of contents

NEKATEGORISANE ULICE

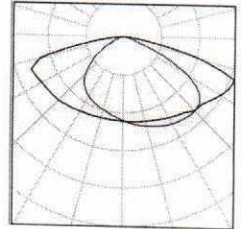
Project Cover	1
Table of contents	2
Luminaire parts list	3
AG-LD035KS	3
Luminaire Data Sheet	4
LDC (Polar)	5
Luminance Diagram	6
Exterior Scene 7	7
Planning data	8
Luminaire parts list	9
Luminaires (coordinates list)	9
Exterior Surfaces	
Roadway 1	
Surface 3	
Isolines (E)	10
Greyscale (E)	11
Value Chart (E)	12

Operator
Telephone
Fax
e-Mail

NEKATEGORISANE ULICE / Luminaire parts list

1 Pieces AG-LD035KS
Article No.:
Luminous flux (Luminaire): 5075 lm
Luminous flux (Lamps): 5075 lm
Luminaire Wattage: 35.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.



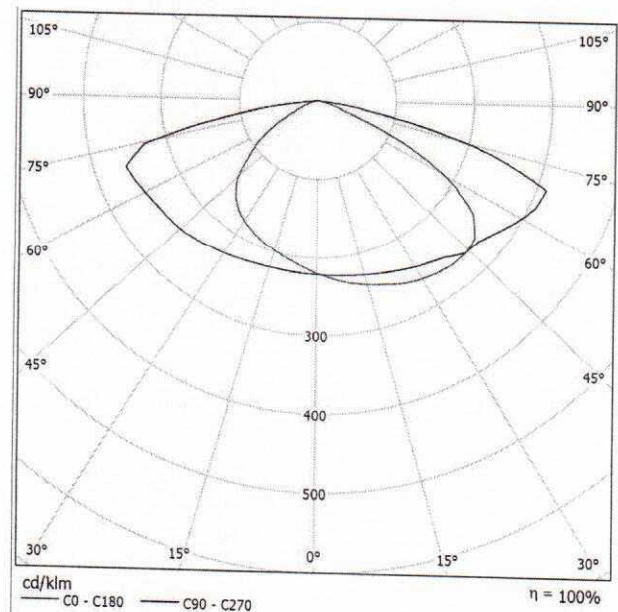


Operator
Telephone
Fax
e-Mail

AG-LD035KS / Luminaire Data Sheet

See our luminaire catalog for an image of the luminaire.

Luminous emittance 1:



Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100

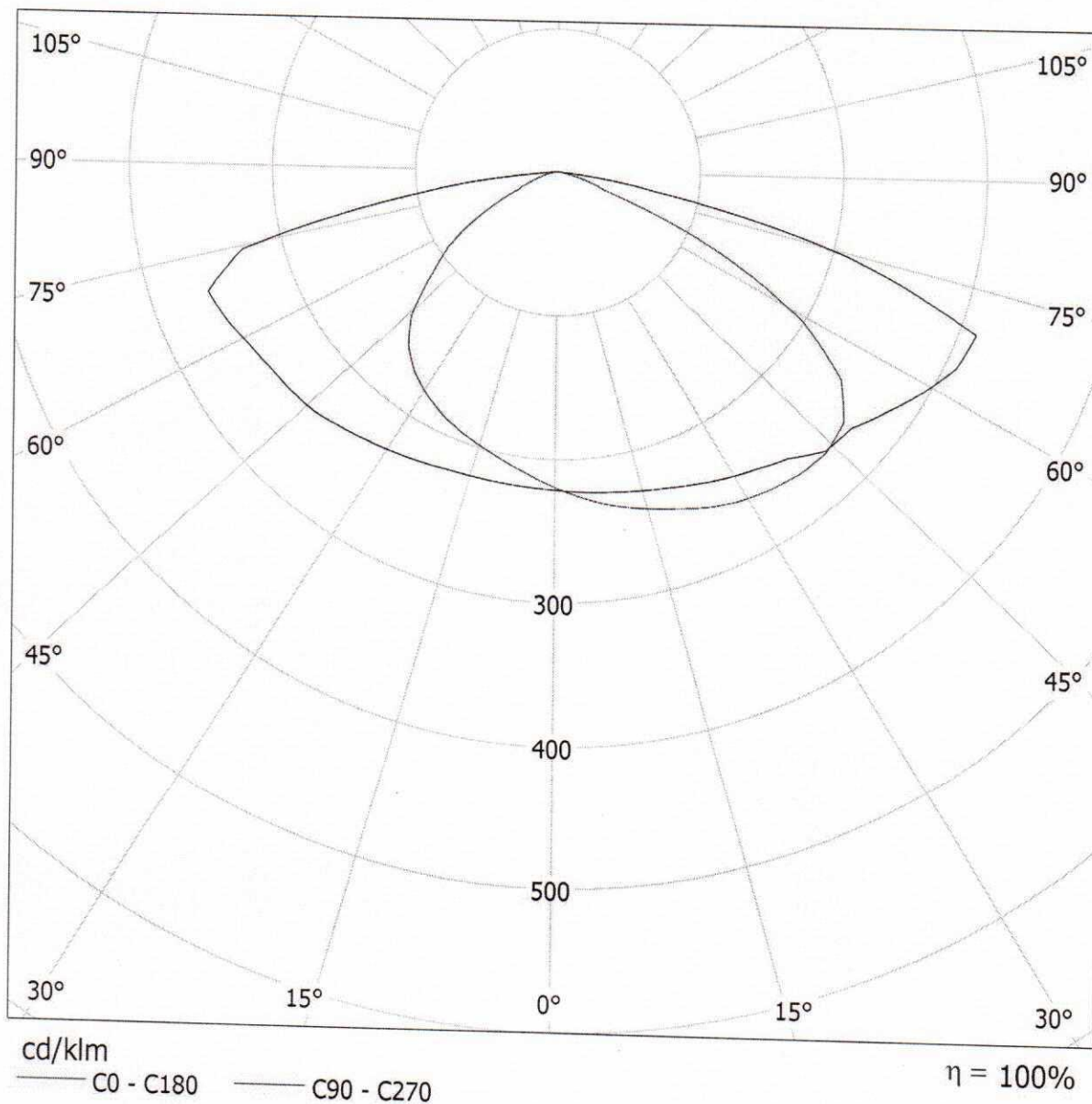
Due to missing symmetry properties, no UGR table can be displayed for this luminaire.



Operator
Telephone
Fax
e-Mail

AG-LD035KS / LDC (Polar)

Luminaire: AG-LD035KS
Lamps: 1 x

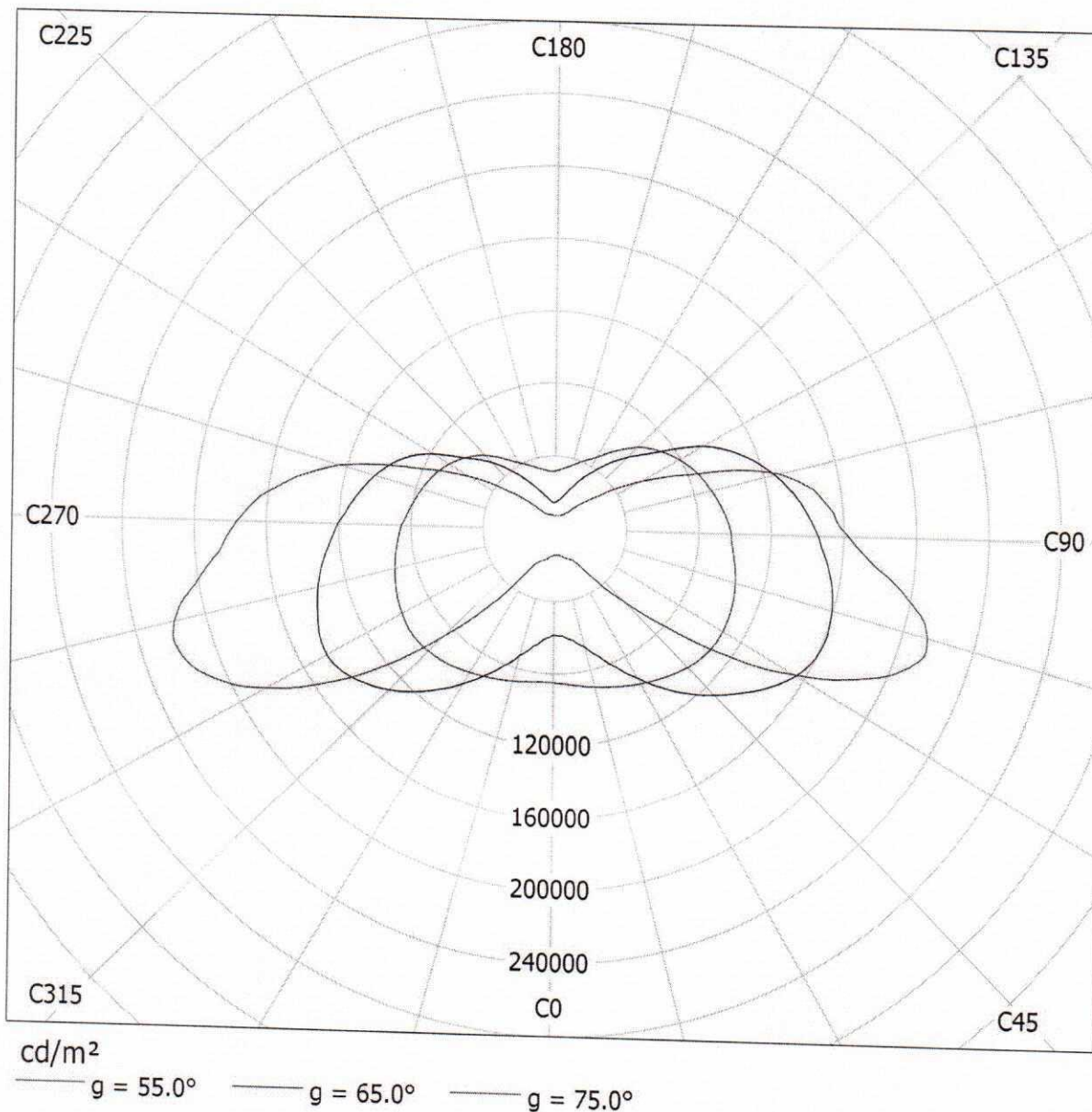




Operator
Telephone
Fax
e-Mail

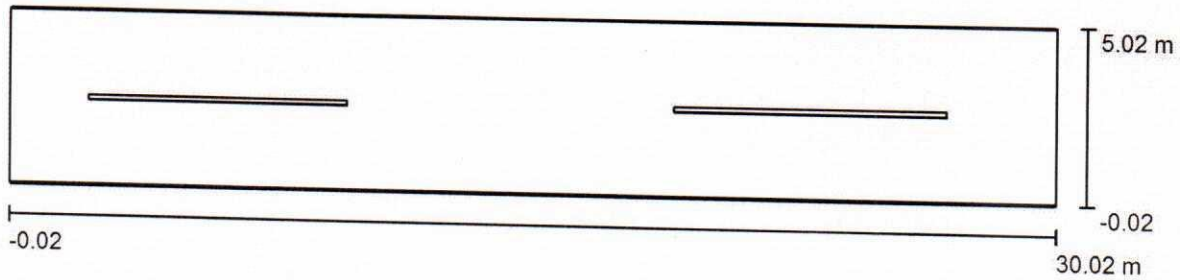
AG-LD035KS / Luminance Diagram

Luminaire: AG-LD035KS
Lamps: 1 x





Operator
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Exterior Scene 7 / Planning data

Light loss factor: 0.80, ULR (Upward Light Ratio): 0.0%

Scale 1:215

Luminaire Parts List

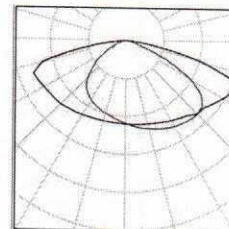
No.	Pieces	Designation (Correction Factor)	Φ (Luminaire) [lm]	Φ (Lamps) [lm]	P [W]
1	1	AG-LD035KS (1.000)	5075	5075	35.0
Total:			5075	5075	35.0

Operator
Telephone
Fax
e-Mail

Exterior Scene 7 / Luminaire parts list

1 Pieces AG-LD035KS
Article No.:
Luminous flux (Luminaire): 5075 lm
Luminous flux (Lamps): 5075 lm
Luminaire Wattage: 35.0 W
Luminaire classification according to CIE: 100
CIE flux code: 35 71 96 100 100
Fitting: 1 x User defined (Correction Factor
1.000).

See our luminaire
catalog for an image of
the luminaire.

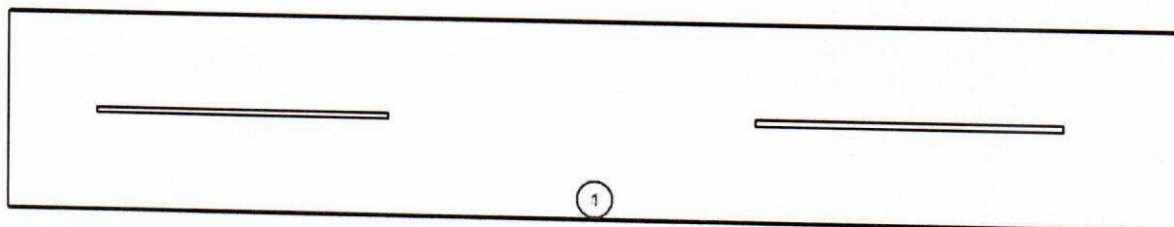




Operator
Telephone
Fax
e-Mail

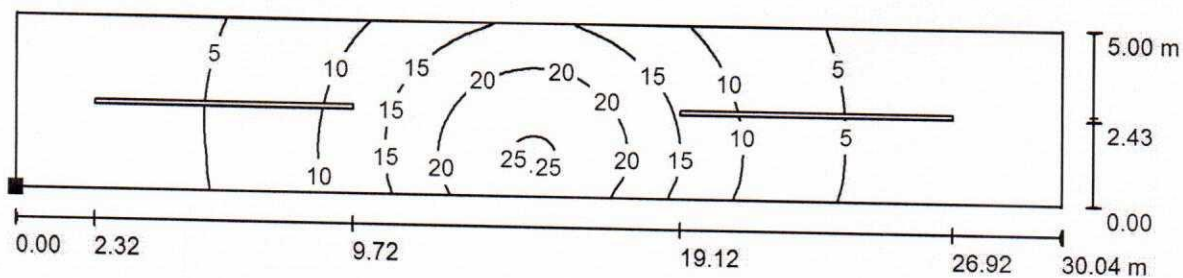
Exterior Scene 7 / Luminaires (coordinates list)**AG-LD035KS**

5075 lm, 35.0 W, 1 x 1 x User defined (Correction Factor 1.000).



No.	Position [m]			Rotation [°]		
	X	Y	Z	X	Y	Z
1	15.000	0.500	6.000	0.0	0.0	0.0

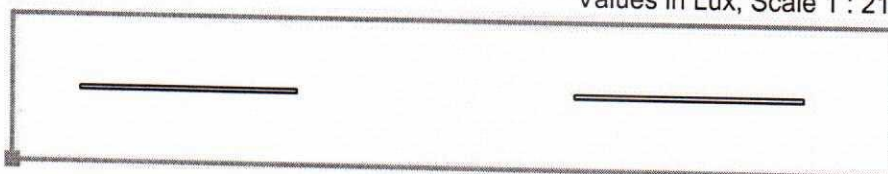
Operator
Telephone
Fax
e-Mail

Exterior Scene 7 / Roadway 1 / Surface 3 / Isolines (E)

Position of surface in external scene:

Marked point:
(-0.020 m, 0.000 m, 0.000 m)

Values in Lux, Scale 1 : 215



Grid: 128 x 64 Points

E_{av} [lx]
9.42

E_{min} [lx]
1.49

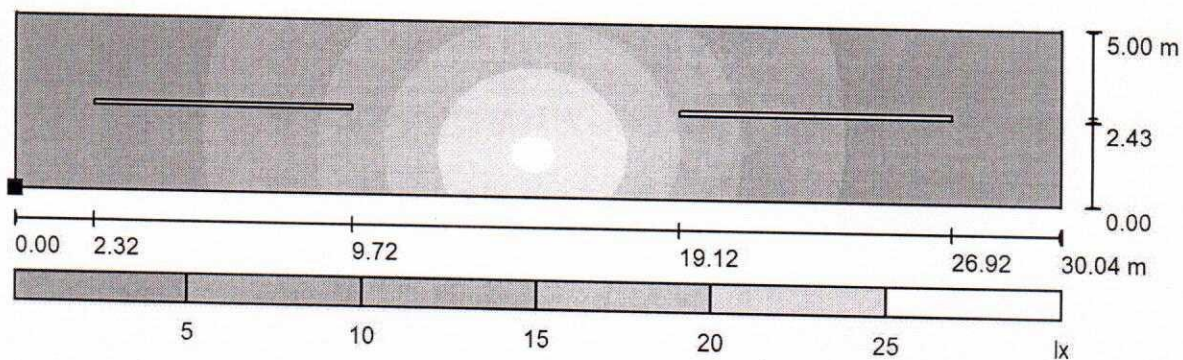
E_{max} [lx]
25

u_0
0.159

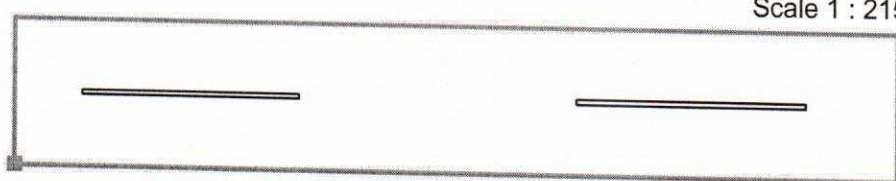
E_{min} / E_{max}
0.059



Operator
Telephone
Fax
e-Mail

Exterior Scene 7 / Roadway 1 / Surface 3 / Greyscale (E)

Position of surface in external scene:
Marked point:
(-0.020 m, 0.000 m, 0.000 m)



Grid: 128 x 64 Points

E_{av} [lx]
9.42

E_{min} [lx]
1.49

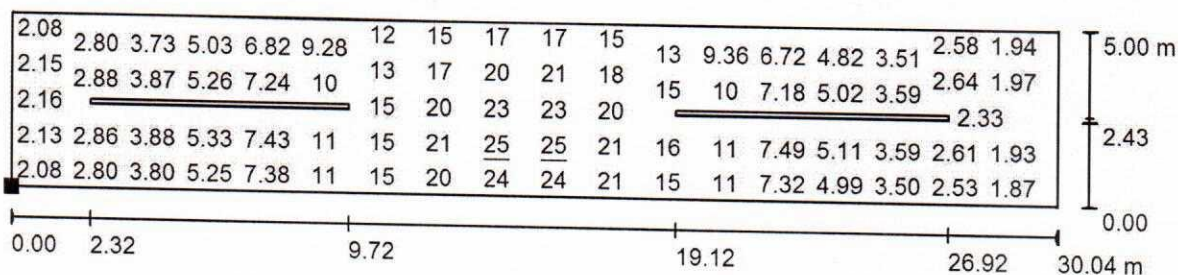
E_{max} [lx]
25

$u0$
0.159

E_{min} / E_{max}
0.059

Operator
Telephone
Fax
e-Mail

Exterior Scene 7 / Roadway 1 / Surface 3 / Value Chart (E)



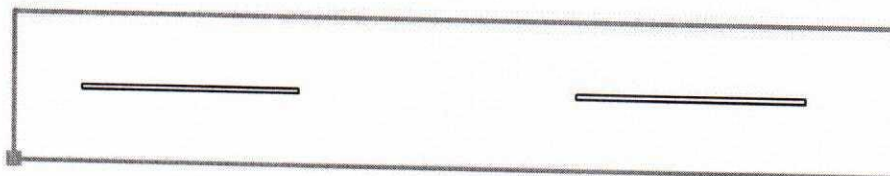
Not all calculated values could be displayed.

Values in Lux, Scale 1 : 215

Position of surface in external scene:

Marked point:

(-0.020 m, 0.000 m, 0.000 m)



Grid: 128 x 64 Points

E_{av} [lx]
9.42

E_{min} [lx]
1.49

E_{max} [lx]
25

$u0$
0.159

E_{min} / E_{max}
0.059