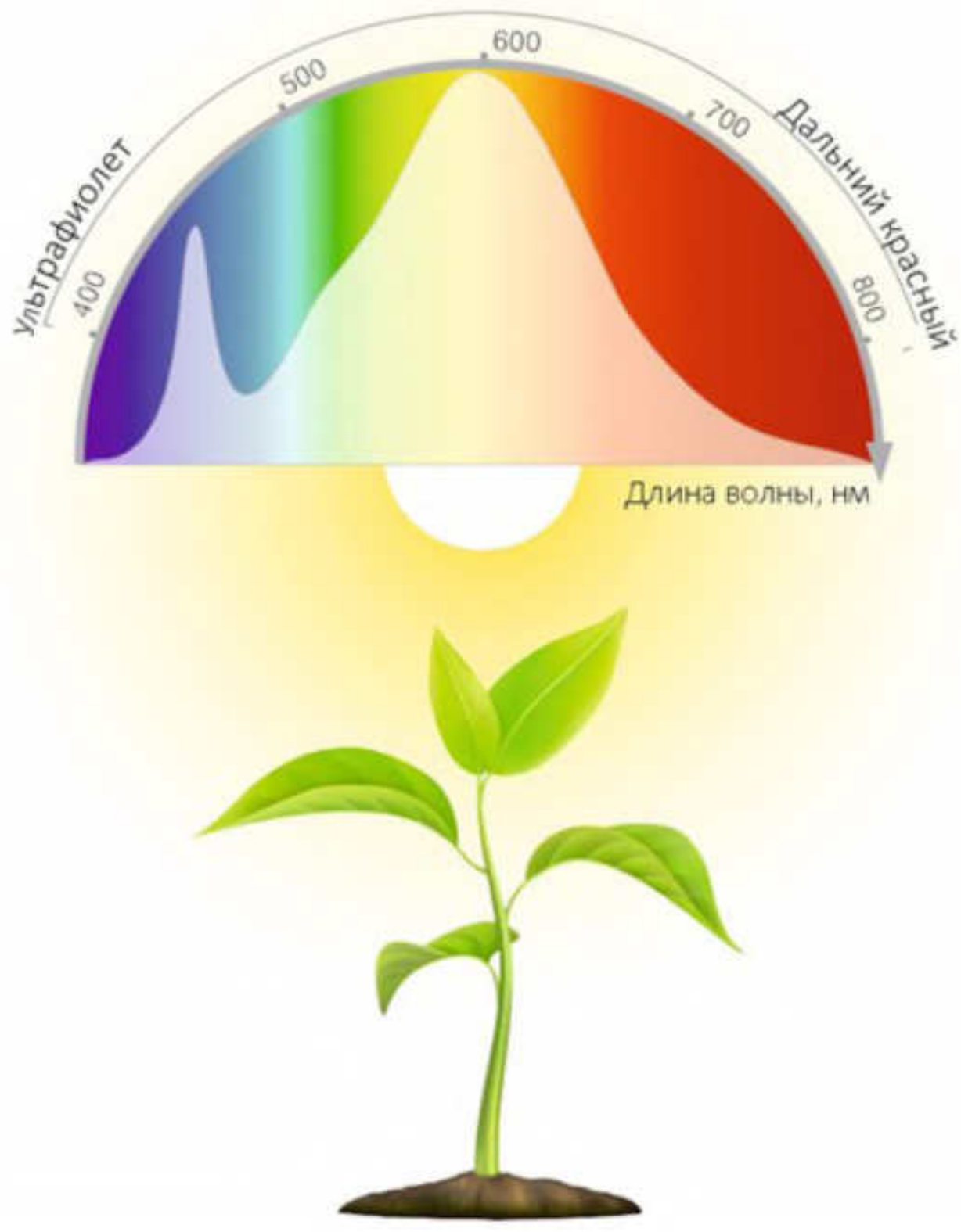
Artificial lighting of plants in greenhouses

Luminaire FLORA LED

DATA SHEET



Application

FLORA LED luminaires are designed to create energy-efficient artificial lighting in greenhouses:

- ✓ in addition to natural daylight;
- ✓ to control the light period (photoperiodic lighting);
- ✓ to completely replace daylight with artificial light (growing without daylight)

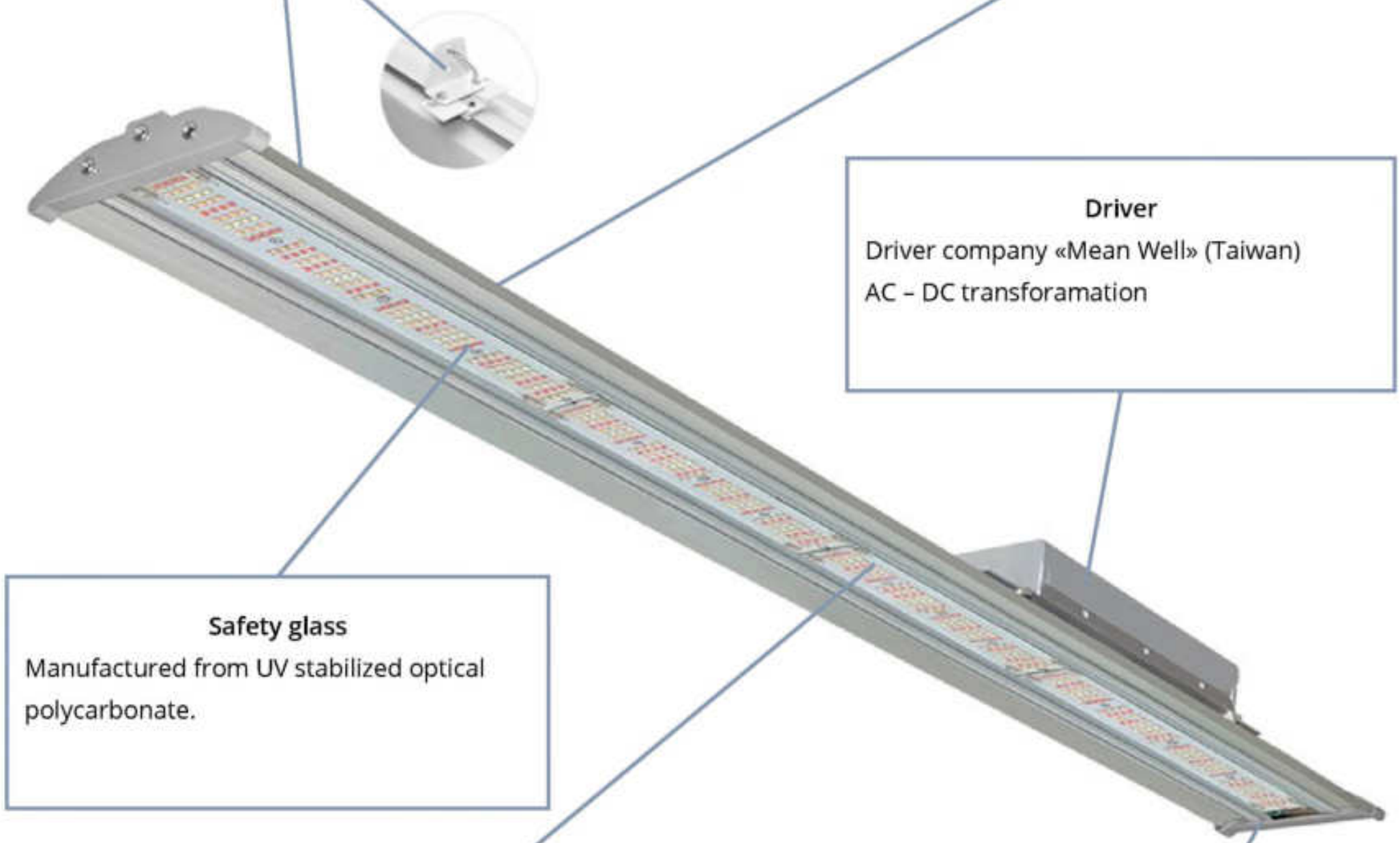
Design

Fastening

Allows you to install luminaire on the linear elements of the greenhouse structure: trays, cables, busbars.

Housing

Constructed from high quality aluminum and coated with a thick protective layer of aluminum oxide for long lasting protection.



Driver

Driver company «Mean Well» (Taiwan)

AC – DC transforamation

Safety glass

Manufactured from UV stabilized optical polycarbonate.

LEDs

As a light source, highly efficient energy-saving NICHIA LEDs (Japan) or Seoul Semiconductor (South Korea).

Covers

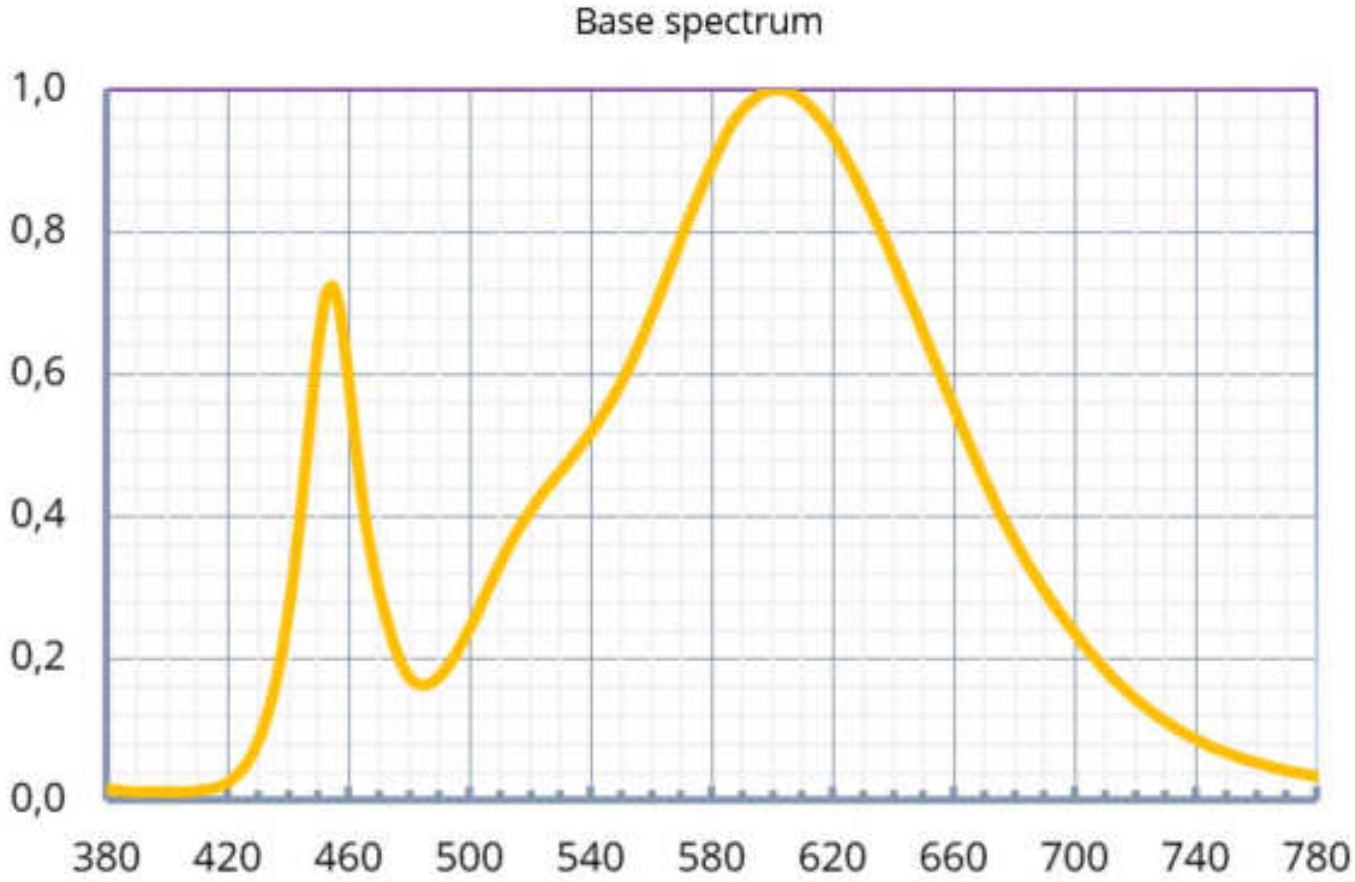
Made from durable polymer material. Sealing is made using high quality synthetic materials.

Technical parameters

Light distribution	direct light	Type of luminous intensity curve	Cosines
Supply voltage. V	230	Supply current frequency, Hz	50
Power factor	≥ 0,95	Energy efficiency class	A+
Operation temperature range, °C	- 1 ... + 40	Degree of protection	IP65

Designation	Power consumption, W	Radiation flux, W	Photon flux, µmol/s	Dimensions, mm	Weight, kg	Price, euro
The series of luminaires on the LEDs NICHIA (Japan)						
FLORA LED 50	55	22	105	400x134x80	1.2	60,00
FLORA LED 100	110	44	210	700x134x80	1.9	90,00
FLORA LED 150	160	66	315	1000x134x80	2.3	120,00
FLORA LED 200	215	88	420	1300x134x80	2.7	140,00
FLORA LED 250	260	110	525	1600x134x80	3.2	150,00
The series of luminaires on the LEDs Seoul Semiconductor (South Korea)						
FLORA LED 60/0.4	65	30	150	400x134x80	1.2	70,00
FLORA LED 120/0.7	130	60	300	700x134x80	1.9	105,00
FLORA LED 180/1.0	195	90	450	1000x134x80	2.3	135,00
FLORA LED 240/1.3	260	120	600	1300x134x80	2.7	160,00
FLORA LED 300/1.6	330	150	750	1600x134x80	4.0	200,00

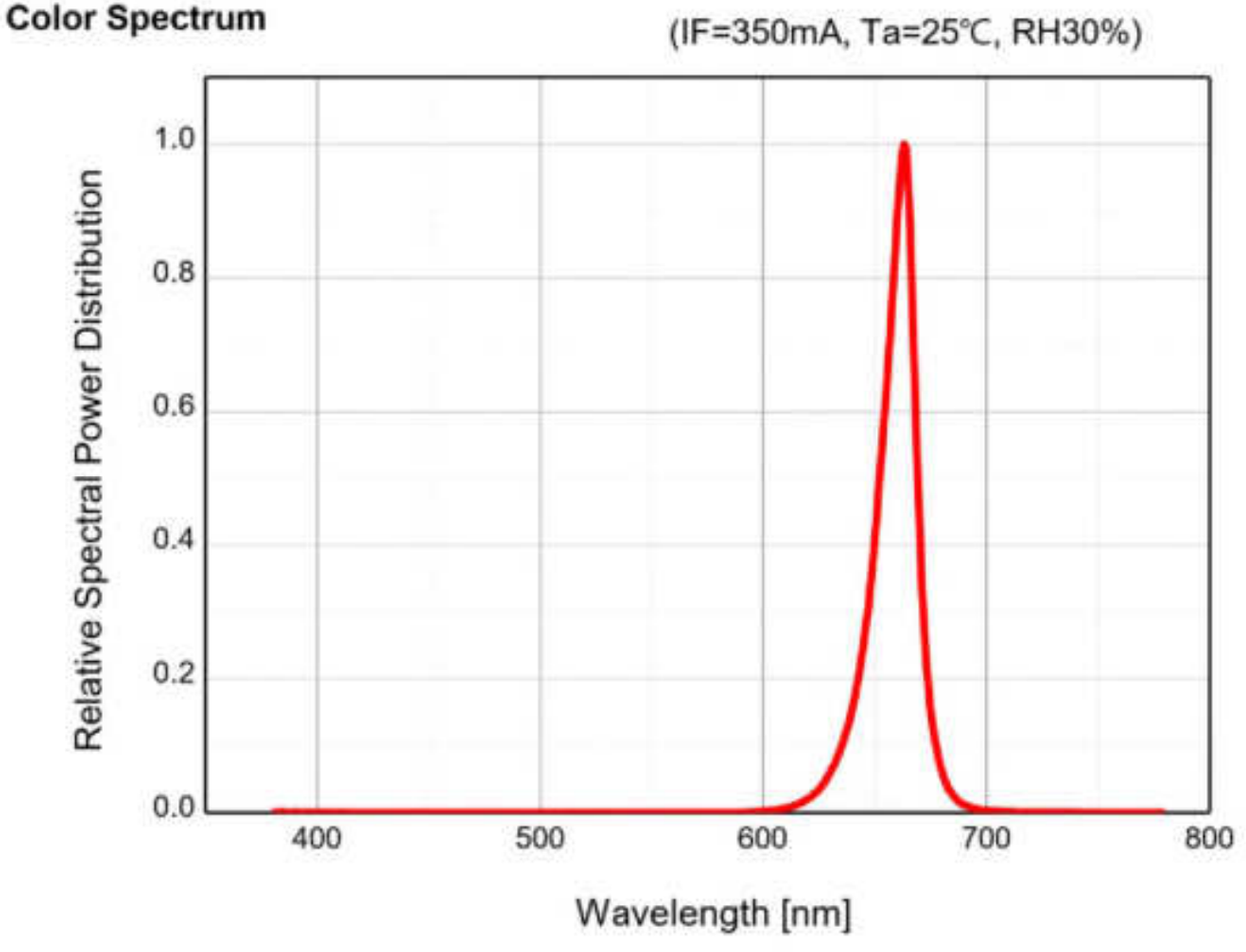
Base spectrum



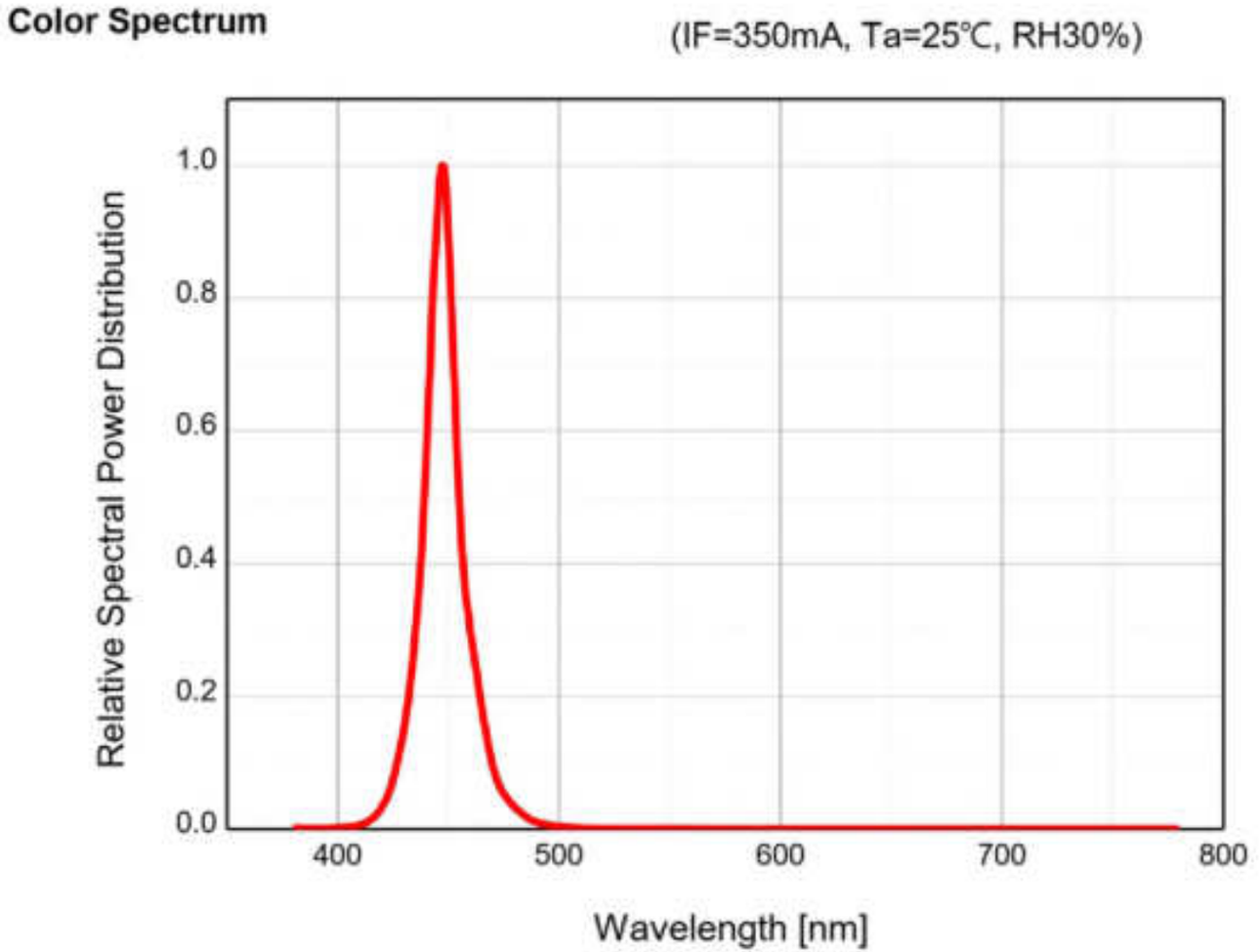
FLORA LED luminaires are a source of optical radiation in a wide range of wavelengths, including in the range of photosynthetic active radiation, ensuring the course of the whole variety of photobiological processes inherent in plant organisms.

FLORA LED 35 D120 (B)	45	18	70	250x134x80	0,9	85,00
FLORA LED 100 D120 (B)	90	36	140	550x134x80	1,9	120,00
FLORA LED 135 D120 (B)	135	54	210	700x134x80	2,0	150,00

Special spectrum "red"



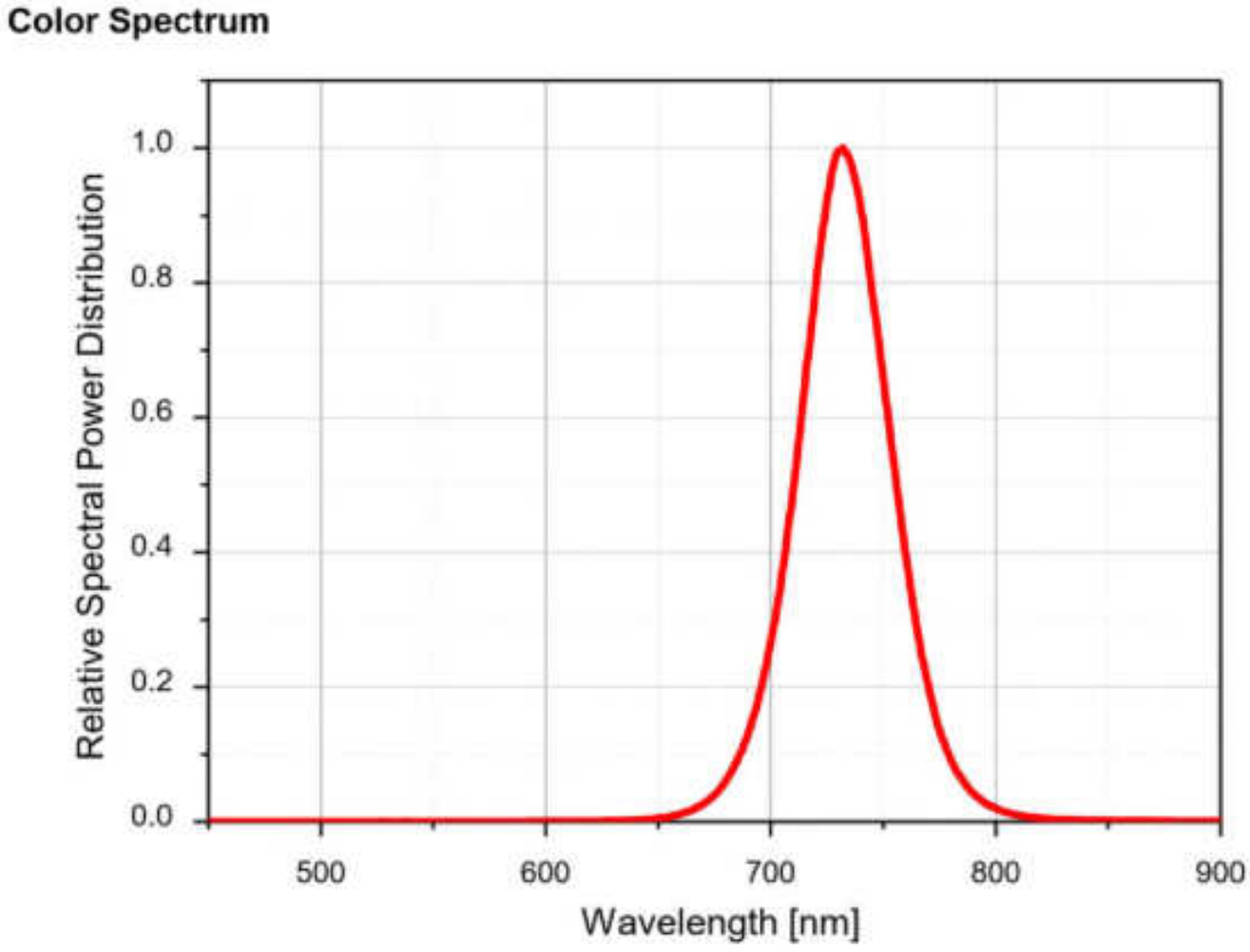
Special spectrum "blue"



Designation	Power con-sumption, W	Radiation flux, W	Photon flux, μmol/s	Dimensions, mm	Weight, kg	Price, euro

Designation	Power consumption, W	Radiation flux, W	Photon flux, µmol/s	Dimensions, mm	Weight, kg	Price, euro
FLORA LED 35 D120 (R)	35	15	85	250x134x80	0,9	80,00
FLORA LED 70 D120 (R)	70	30	170	400x134x80	1,6	115,00
FLORA LED 100 D120 (R)	100	45	255	550x134x80	1,9	145,00
FLORA LED 135 D120 (R)	135	60	340	700x134x80	2,0	170,00
FLORA LED 200 D120 (R)	180	75	425	850x134x80	2,3	200,00

Special spectrum "far red"

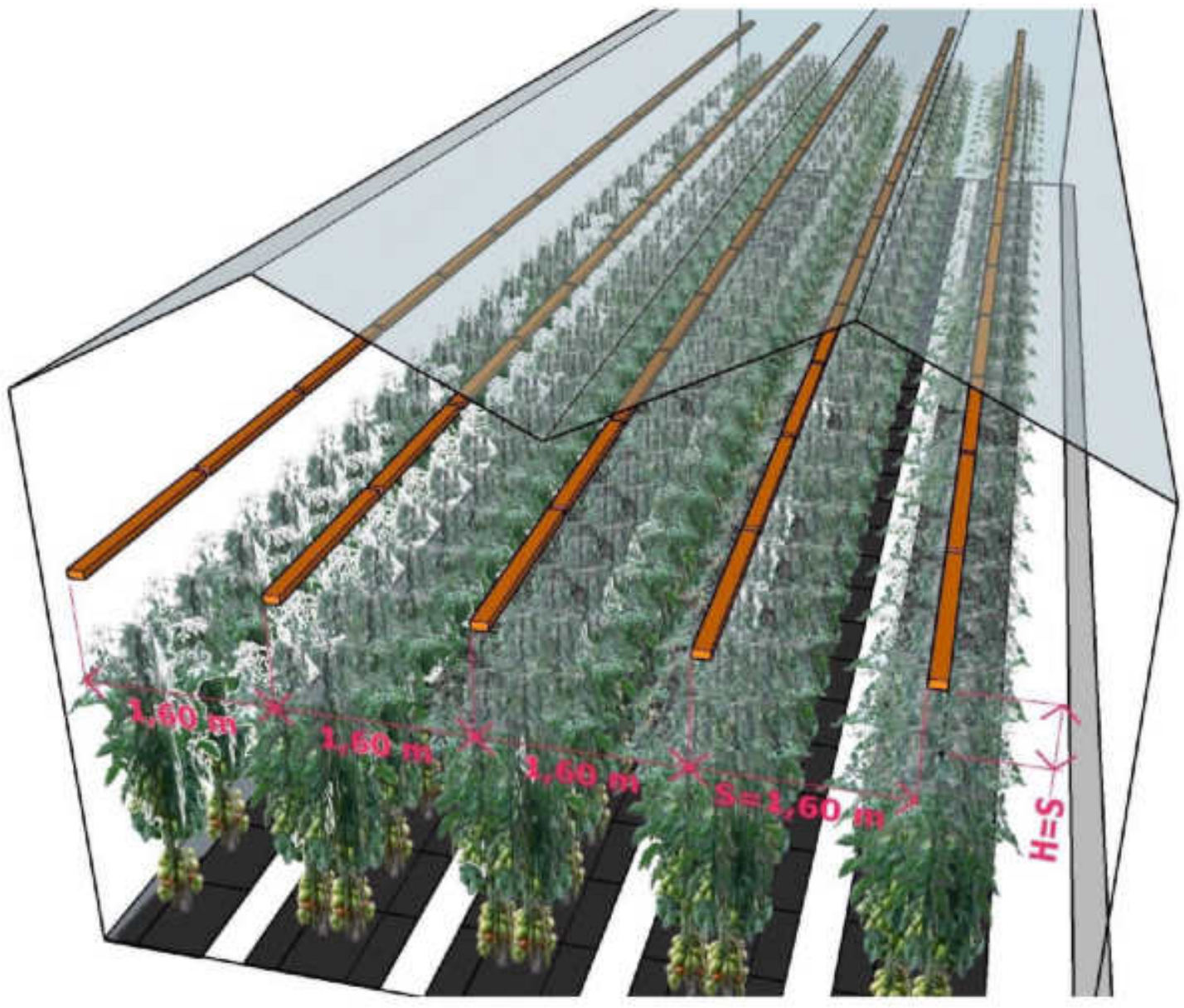


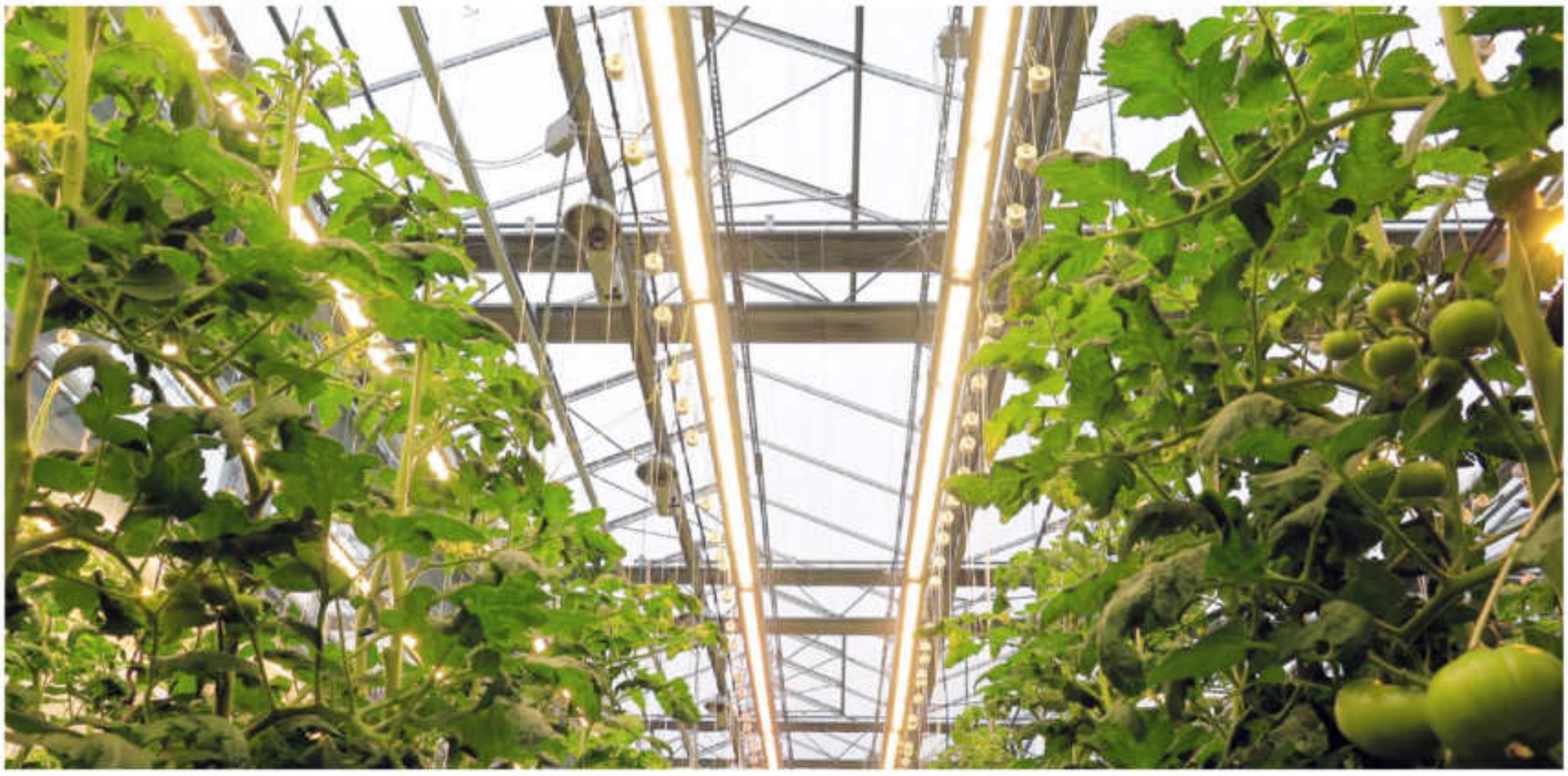
Designation	Power consumption, W	Radiation flux, W	Photon flux, µmol/s	Dimensions, mm	Weight, kg	Price, euro
FLORA LED 35 D120 (FR)	35	12	70	250x134x80	0,9	80,00
FLORA LED 70 D120 (FR)	70	24	140	400x134x80	1,6	115,00
FLORA LED 100 D120 (FR)	100	36	210	550x134x80	1,9	145,00
FLORA LED 135 D120 (FR)	135	48	280	700x134x80	2,0	170,00

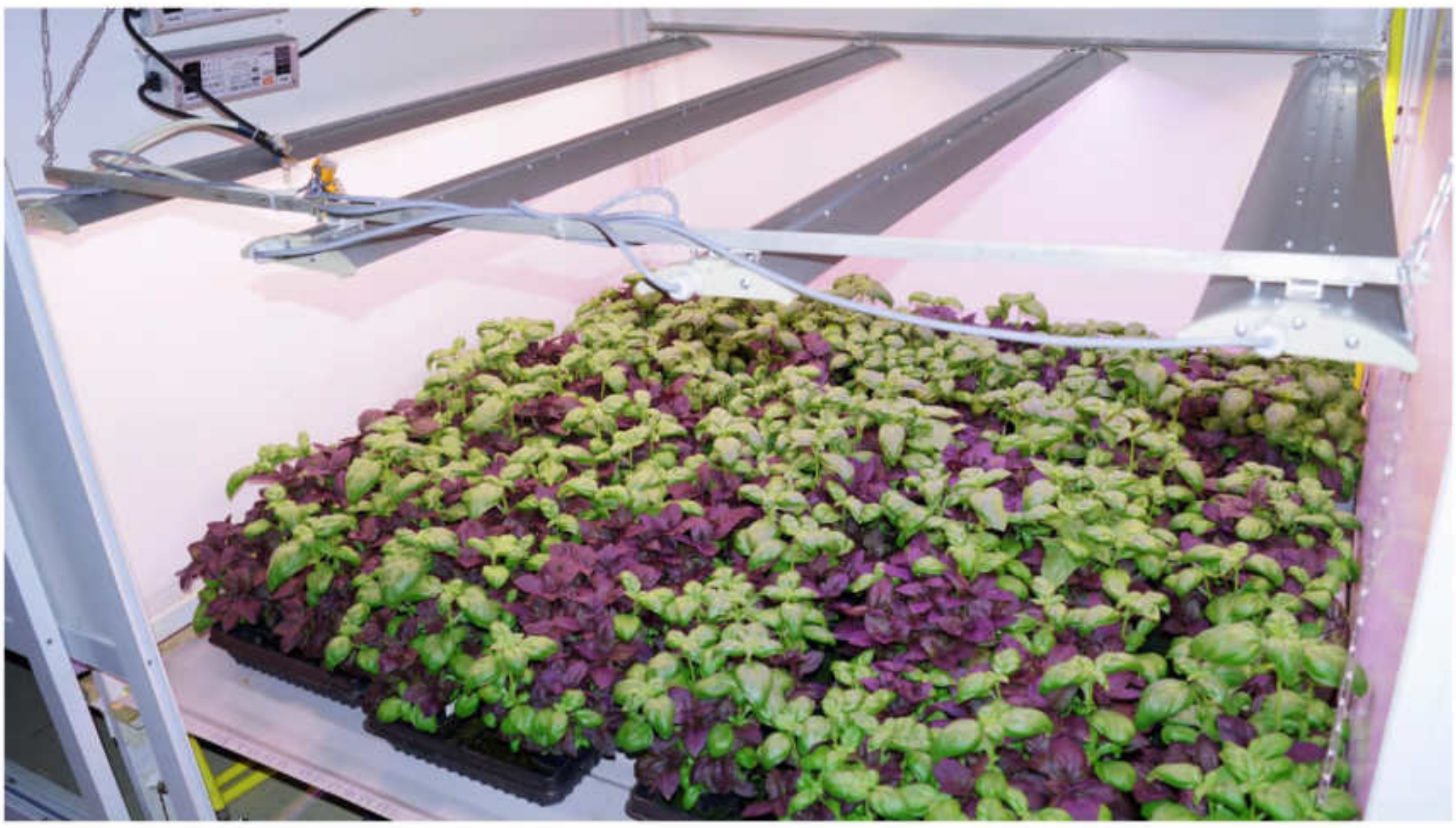
The nominal service life of the luminaires is 10 years with reliability indicators $L_{90}F_{10} \geq 60000$ hours (GOST R 56230-2014, IEC/PAS 62717:2011).
Warranty period of operation - 36 month.

Installation

Luminaires are recommended to be installed in the greenhouse with lines along the axis of symmetry of the trays (rows) with plants, adhering to the geometric ratio: the distance from the middle section of the upper tier of plants to the line of luminaires is equal to the distance between the trays. With such an arrangement of linear sources of optical radiation, the optimal irradiation of agrophytocenosis is achieved. For the installation of luminaires in greenhouses, it is recommended to use trays, cables, busbars, using lamp brackets.







DLI recommendation

The intensity of photosynthesis strongly depends on the irradiance of the phytocenosis of photosynthetic active radiation (photosynthetic irradiance). This dependence is expressed by a logarithmic curve, called the light curve of photosynthesis.

There are three characteristic sections of the photosynthesis curve:

01 Straight section up to irradiance level 100...150 W/m^2 or 500...750 µmol/m^2•s PAR (20000...30000 lx). In this area, the rate of photosynthesis increases in proportion to the increase in irradiance.

02 Curvilinear section up to irradiance level 250...300 W/m^2 or 1250...1500 µmol/m^2•s PAR (50000...60000 lx). In this area, the rate of photosynthesis slows down, but continues to increase, although not in proportion to the increase in irradiance.

03 Straight section. In this area, a further increase in irradiance does not cause a change in the rate of photosynthesis. The latter state is called the state of light saturation. In plants of the temperate zone, light saturation occurs at an irradiance of 100...200 W/m^2 or 500...1000 µmol/m^2•s PAR (20000...40000 lx).

Recommended levels of plant irradiation and daily dose of irradiation

Plants	DLI (Daily Light Integral)		PPFD	
	MJ/m^2	mol/m^2	W/m^2	µmol/m^2•s
Micropropagation of plants	0,5 – 1,0	2,5 – 5,0	10 – 20	50 – 100
Microgreens, green crops, seedlings	1,0 – 2,0	5,0 – 10,0	20 – 40	100 – 200
Berry crops	2,0 – 4,0	10,0 – 20,0	40 – 80	200 – 400
Vegetable crops (tomato, cucumber, pepper)	4,0 – 8,0	20,0 – 40,0	80 – 120	400 – 600

The following optimal standardized irradiance in the greenhouse is recommended:
40 W/m^2 (180 – 200 µmol/m^2•s) PAR with a photoperiod of 14 hours when growing seedlings;
100 W/m^2 (450 – 500 µmol/m^2•s) PAR with a photoperiod of 16 hours when growing plants for production.

In this case, the optimal daily amount of irradiation (dose) for seedlings will be 560 W•h/m^2 (2.0 MJ/m^2•day or 9–10 mol/m^2•day), and for growing plants for production - 1600 W •h/m^2 (5.8 MJ/m^2•d or 26 - 29 mol/m^2•d).

Approximate solar radiation and total PAR under average cloud conditions at 60^0 north latitudes

Solar radiation for period		Unit	Month											
			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Month	Total	MJ/m²	37	94	261	374	590	634	596	432	237	104	36	18
	PAR	MJ/m²	17	42	117	168	266	285	268	194	107	47	16	8
		mol/m²	75	190	529	757	1195	1284	1207	875	480	211	73	36
Day	Total	MJ/m²	1,2	3,4	8,4	12,5	19,0	21,1	19,2	13,9	7,9	3,4	1,2	0,6
	PAR	MJ/m²	0,5	1,5	3,8	5,6	8,6	9,5	8,7	6,3	3,6	1,5	0,5	0,3
		mol/m²	2	7	17	25	39	43	39	28	16	7	2	1

Approximate solar radiation and total PAR under average cloud conditions at 43^0 north latitudes

Solar radiation for period		Unit	Месяц											
			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Month	Total	MJ/m²	144	188	321	491	678	719	718	629	445	309	162	124
	PAR	MJ/m²	65	85	144	221	305	324	323	283	200	139	73	56
		mol/m²	292	381	650	994	1373	1456	1454	1274	901	626	328	251
Day	Total	MJ/m²	4,6	6,7	10,4	16,4	21,9	24,0	23,2	20,3	14,8	10,0	5,4	4,0
	PAR	MJ/m²	2,1	3,0	4,7	7,4	9,8	10,8	10,4	9,1	6,7	4,5	2,4	1,8
		mol/m²	9	14	21	33	44	48	47	41	30	20	11	8

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