

LED LINEAR ALLROUND – GEN. 3

IPOO BUILT-IN MODULES



LED LINEAR ALLROUND – GEN. 3

WU-M-541/xx-C/D, xx-AW, xx-822

These modules were designed for built-in into luminaire casings. They enable a modular luminaire design.

The modules are available in four shapes (4, 8, 12 or 16 LEDs) and in up to 6 white colour tones.

Typical Applications (depending on the choice of optics)

- Integration in luminaires
- Street lighting, urban street lighting
- Tunnel lighting
- Flood and area lighting
- Indoor lighting
- Industrial lighting for:
 - Production halls
 - Warehouses
- Lighting for sports facilities

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■ **HIGHLY EFFICIENT: UP TO 172 LM/W**
AT $T_p = 60\text{ }^\circ\text{C}$, $I_f = 350\text{ mA}$

■ **FLEXIBLE LIGHT DISTRIBUTION BY VARIOUS ATTACHMENT OPTICS**

■ **HUGE RANGE OF CCT & CRI VARIANTS**

■ **INITIAL COLOUR ACCURACY: 5 SDCM**
(except Amber White & 2200 K versions)

■ **PROTECTION AGAINST TRANSIENT MAIN PEAKS: 4 KV**


■ **ZHAGA-COMPLIANT MOUNTING DIMENSION**

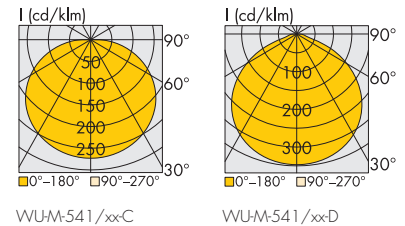
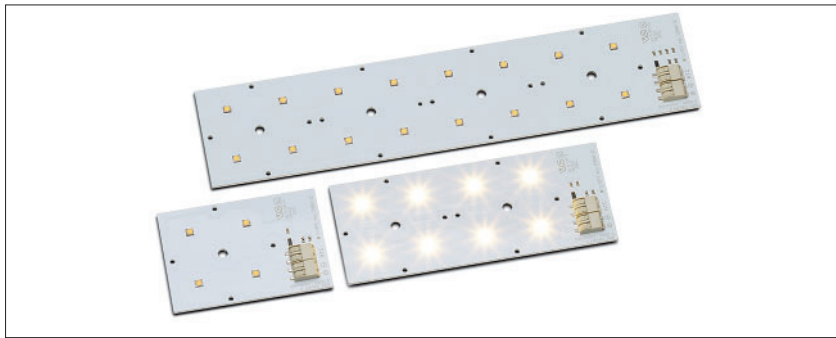
■ **VDE APPROVED (ACC. TO EN 62031)**
(except Amber White, 2200 K & 2700 K versions)



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Technical Notes

- LED built-in module for integration into luminaires 
- 4, 8, 12 or 16 high-efficiency High Power LEDs
- Dimensions (excl. optics) LxVxH
 - 4 LEDs: 71.1x49.5x6 mm
 - 8 LEDs: 121.9x49.5x6 mm
 - 12 LEDs: 172.7x49.5x6 mm
 - 16 LEDs: 223.5x49.5x6 mm
- Push-in terminals for quick and simple wiring (WAGO series 2060)
- Suitable for standard 2x2 optics
- Design for optimum thermal management
- Degree of protection: IPOO
- ESD protection class 2
- NTC resistor for external driver feedback of module temperature
Type: NCP18xH103J03RB
- Inverse-polarity protection



Electrical Characteristics

at $t_p = 60\text{ }^\circ\text{C}$

Type	No. of LEDs	Voltage DC (V)												Temperature coefficient mV/K	Power consumption (W)																	
		350 mA			700 mA			1050 mA			1400 mA				350 mA			700 mA			1050 mA			1400 mA								
WU-M-541		min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	
/4C	4	10.0	11.0	11.5	10.4	11.5	12.0	10.8	11.9	12.4	11.2	12.3	12.8	-9.9	3.5	3.9	4.0	7.3	8.0	8.4	11.4	12.5	13.0	15.6	17.2	17.9*						
/4D	4	10.1	11.0	12.3	10.5	11.5	12.7	10.7	11.7	13.0	10.9	11.9	13.3	-8.6	3.5	3.9	4.3	7.3	8.0	8.9	11.2	12.3	13.7	15.3	16.7	18.6						
/8C	8	20.0	22.1	22.9	20.9	23.0	23.9	21.7	23.9	24.8	22.3	24.6	25.5	-19.8	7.0	7.7	8.0	14.6	16.1	16.7	22.8	25.1	26.1	31.2	34.4	35.7						
/8D	8	20.1	22.0	24.6	20.9	22.9	25.5	21.4	23.4	26.1	21.8	23.9	26.6	-17.3	7.0	7.7	8.6	14.6	16.0	17.8	22.5	24.6	27.4	30.6	33.5	37.2						
/8-AW	8	19.9	22.1	23.1	20.8	23.0	24.0	21.6	23.8	24.8	22.2	24.5	25.4	-17.0	7.0	7.7	8.1	14.6	16.1	16.8	22.7	25.0	26.0	31.1	34.3	35.6						
/12C	12	30.0	33.1	34.4	31.3	34.5	35.9	32.5	35.8	37.3	33.5	36.8	38.3	-29.8	10.5	11.6	12.0	21.9	24.1	25.1	34.1	37.6	39.1	46.9	51.6	53.6						
/12D	12	30.2	33.1	36.8	31.4	34.4	38.2	32.1	35.2	39.1	32.8	35.8	39.8	-25.9	10.6	11.6	12.9	22.0	24.0	26.8	33.7	36.9	41.1	45.9	50.2	55.8						
/12-AW	12	29.9	33.2	34.7	31.2	34.6	36.0	32.4	35.7	37.2	33.3	36.7	38.1	-25.5	10.4	11.6	12.1	21.8	24.2	25.2	34.0	37.5	39.1	46.7	51.4	53.3						
/12-822	12	31.3	34.7	37.7	32.8	36.2	39.2	34.0	37.4	40.4	34.8	38.2	41.2	-30.0	11.0	12.2	13.2	23.0	25.3	27.4	35.7	39.2	42.4	48.8	53.5	57.7						
/16C	16	40.0	44.1	45.9	41.7	46.0	47.8	43.4	47.8	49.7	44.6	49.1	51.1	-39.7	14.0	15.4	16.1	29.2	32.2	33.5	45.5	50.2	52.2	62.5	68.8	71.5						
/16D	16	40.2	44.1	49.1	41.8	45.8	51.0	42.8	46.9	52.1	43.7	47.8	53.1	-34.5	14.1	15.4	17.2	29.3	32.1	35.7	45.0	49.2	54.7	61.2	66.9	74.4						
/16-AW	16	39.8	44.3	46.2	41.6	46.1	48.0	43.2	47.6	49.6	44.4	48.9	50.8	-34.0	13.9	15.5	16.2	29.1	32.3	33.6	45.4	50.0	52.1	62.2	68.5	71.1						
/16-822	16	41.7	46.2	50.2	43.7	48.2	52.2	45.3	49.8	53.8	46.4	50.9	57.9	-40.0	14.6	16.2	17.6	30.6	33.7	36.5	47.6	52.3	56.5	65.0	71.3	76.9						

Use of external LED constant current driver required.

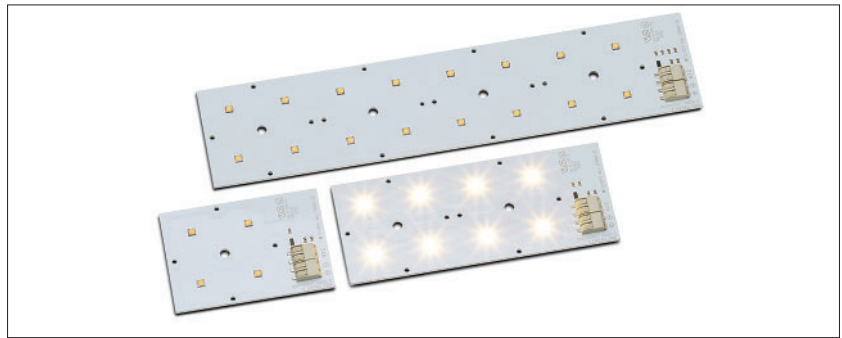
Maximum Ratings

Exceeding the maximum ratings can lead to destruction of the module.

Type	Operation current mA	Operation temperature range at t_c point		Storage temperature range		Max. allowed repetitive peak current (mA)		
		$^\circ\text{C}$ min.	$^\circ\text{C}$ max.	$^\circ\text{C}$ min.	$^\circ\text{C}$ max.	C/D types	AW types	822 types
All types	350	-30	+85	-30	+85	2270	1600	1500
	700	-30	+85	-30	+85	2060	1500	1500
	1050	-30	+80	-30	+85	1940	1400	1500
	1400	-30	+70	-30	+85	1860	1400	1500
	1500	-30	+65	-30	+85	1840	—	—

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Optical Characteristics

at $t_p = 60\text{ °C}$

Type	Ref. No.	Colour	Correlated colour temperature K	Luminous flux* (lm) and typ. efficiency (lm/W)												CRI** Ra	Photo-metric code
				350 mA			700 mA			1050 mA			1400 mA				
WUM				min.	typ.	typ.	min.	typ.	typ.	min.	typ.	typ.	min.	typ.	typ.		
LED Linear Allround – 4 LEDs																	
541/4-C-830	563249	warm white	3000 ^{-90/+185}	515	580	150	945	1065	132	1295	1455	116	1595	1795	104	≥ 80	830/579
541/4-C-840	563251	neutral white	4000 ^{-235/+230}	555	605	157	1020	1115	139	1395	1525	122	1875	1875	109	≥ 80	840/579
541/4-C-850	563254	cool white	5000 ^{-265/+360}	515	585	152	945	1075	134	1295	1470	117	1815	1815	106	≥ 80	850/579
541/4-D-730	567434	warm white	3000 ^{-90/+185}	590	625	162	1115	1180	147	1535	1625	132	1915	2030	121	≥ 70	730/579
541/4-D-740	567435	neutral white	4000 ^{-235/+230}	630	660	171	1185	1240	155	1635	1705	139	2040	2130	127	≥ 70	740/579
541/4-D-750	567436	cool white	5000 ^{-265/+360}	630	665	172	1185	1245	155	1635	1720	140	2040	2145	128	≥ 70	750/579
LED Linear Allround – 8 LEDs																	
541/8-C-830	563256	warm white	3000 ^{-90/+185}	1030	1155	150	1895	2130	132	2590	2910	116	3195	3585	104	≥ 80	830/579
541/8-C-840	563258	neutral white	4000 ^{-235/+230}	1110	1210	157	2040	2230	139	2790	3045	121	3440	3755	109	≥ 80	840/579
541/8-C-850	563261	cool white	5000 ^{-265/+360}	1030	1170	152	1895	2150	134	2590	2940	117	3195	3625	105	≥ 80	850/579
541/8-D-730	567441	warm white	3000 ^{-90/+185}	1185	1255	163	2225	2360	147	3065	3250	132	3830	4060	121	≥ 70	730/579
541/8-D-740	567442	neutral white	4000 ^{-235/+230}	1265	1320	171	2375	2480	155	3270	3415	139	4085	4260	127	≥ 70	740/579
541/8-D-750	567443	cool white	5000 ^{-265/+360}	1265	1325	172	2375	2495	156	3270	3435	140	4085	4290	128	≥ 70	750/579
541/8-AW	564819	amber white	—	765	920	120	1450	1740	108	2045	2455	98	2555	3065	89	—	—
LED Linear Allround – 12 LEDs																	
541/12-C-830	567027	warm white	3000 ^{-90/+185}	1545	1735	150	2840	3190	132	3885	4365	116	4790	5380	104	≥ 80	830/579
541/12-C-840	567028	neutral white	4000 ^{-235/+230}	1660	1815	157	3060	3340	138	4185	4570	121	5160	5635	109	≥ 80	840/579
541/12-C-850	567029	cool white	5000 ^{-265/+360}	1545	1750	151	2840	3225	134	3885	4410	117	4790	5440	105	≥ 80	850/579
541/12-D-730	567448	warm white	3000 ^{-90/+185}	1775	1880	162	3340	3540	147	4600	4875	132	5745	6085	121	≥ 70	730/579
541/12-D-740	567449	neutral white	4000 ^{-235/+230}	1895	1975	171	3560	3715	154	4910	5125	139	6125	6395	127	≥ 70	740/579
541/12-D-750	567450	cool white	5000 ^{-265/+360}	1895	1990	172	3560	3740	156	4910	5155	140	6125	6430	128	≥ 70	750/579
541/12-AW	567022	amber white	—	1150	1380	119	2175	2610	108	3090	3685	98	3835	4600	89	—	—
541/12-822	567030	warm white	2200 ^{±120}	1050	1130	93	1900	2045	81	2570	2760	70	3060	3290	62	≥ 80	822/7xx
LED Linear Allround – 16 LEDs																	
541/16-C-830	563263	warm white	3000 ^{-90/+185}	2055	2310	150	3790	4255	132	5180	5815	116	6385	7175	104	≥ 80	830/579
541/16-C-840	563265	neutral white	4000 ^{-235/+230}	2215	2420	157	4080	4455	138	5580	6090	121	6880	7510	109	≥ 80	840/579
541/16-C-850	563268	cool white	5000 ^{-265/+360}	2055	2335	151	3790	4305	134	5180	5880	117	6385	7250	105	≥ 80	850/579
541/16-D-730	567455	warm white	3000 ^{-90/+185}	2370	2510	163	4450	4720	147	6135	6505	132	7655	8115	121	≥ 70	730/579
541/16-D-740	567456	neutral white	4000 ^{-235/+230}	2525	2635	171	4750	4955	155	6545	6830	139	8165	8525	127	≥ 70	740/579
541/16-D-750	567457	cool white	5000 ^{-265/+360}	2525	2650	172	4750	4985	155	6545	6870	140	8165	8575	128	≥ 70	750/579
541/16-AW	563521	amber white	—	1535	1840	120	2900	3480	108	4095	4910	98	5105	6125	89	—	—
541/16-822	563520	warm white	2200 ^{±120}	1400	1505	93	2535	2725	81	3425	3680	70	4080	4385	62	≥ 80	822/7xx

On account of the complex manufacturing process of the modules, the above values only represent statistical variables.

The values do not necessarily correspond exactly to the actual parameters of every single product, which can vary from the typical specification.

* Measurement tolerance of luminous flux: $\pm 7\%$ | ** Measurement tolerance CRI: ± 2

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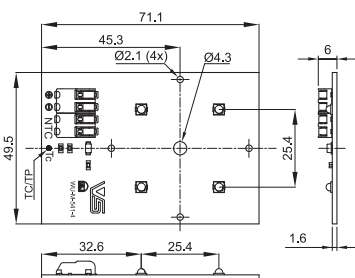
Operating Life

Modules	Operating life in hours at measured temperature at I_p point											
	I_f 350 mA			I_f 700 mA			I_f 1050 mA			I_f 1400 mA		
	40 °C	60 °C	85 °C	40 °C	60 °C	85 °C	40 °C	60 °C	80 °C	40 °C	60 °C	70 °C
L80/B10*	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000
L70/B10*	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000	> 108,000

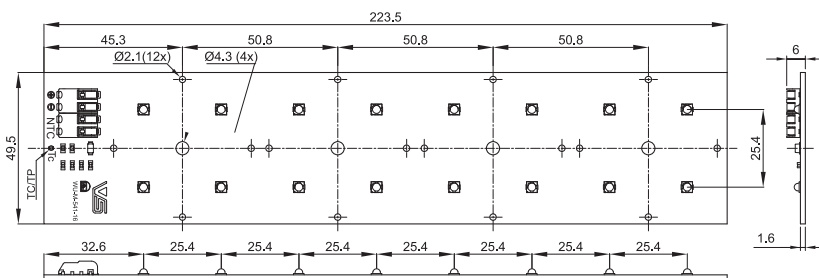
These values do not refer to the colour temperature. | * Lxx/Byy (lumen maintenance at xx%, failure rate yy%)
 These values are only valid for WU-M-541/xx-C/D modules.

Mechanical Dimensions

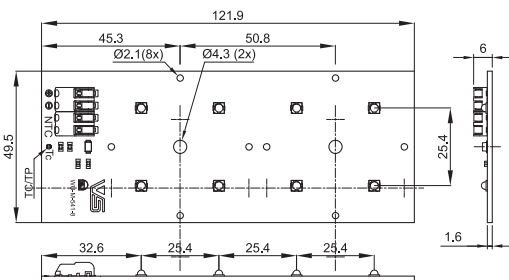
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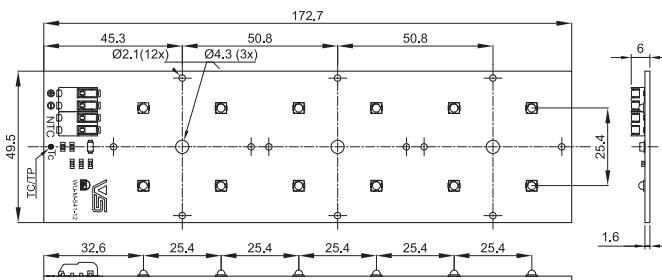
WU-M-541-16



WU-M-541-8

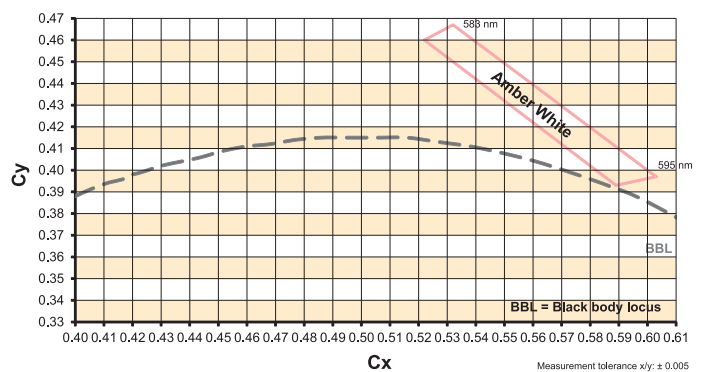
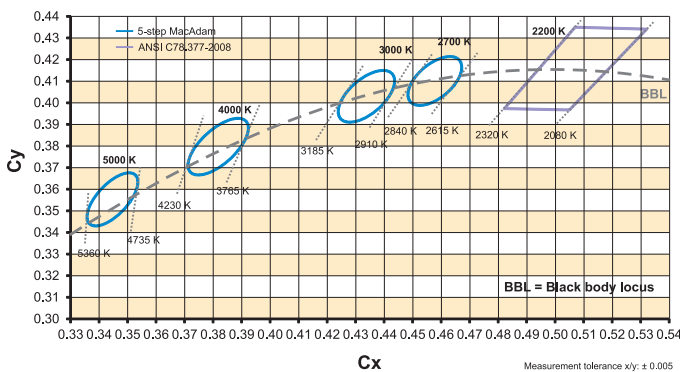


WU-M-541-12



All holes \varnothing 2.1 mm are fixing holes for optics. | All holes \varnothing 4.3 mm are fixing holes for PCB.

Bins



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Assembly and Safety Information

Installation must be carried out under observation of the relevant regulations and standards. The LED modules are designed for operation within a casing or luminaire. Safety regulations acc. to EN 60598 has to be observed. Installation must be carried out in a voltage-free state (i.e. disconnection from the mains).

- LED built-in modules must not be subjected to any undue mechanical stress, e. g.:
 - handle LED modules carefully
 - avoid shear and compressive forces onto the optics during handling and installation
 - avoid vibrations of more than 2 kHz, 40 G
- The module must be fixed onto a thermally conductive surface with 1 to 4 M3 screws (respectively M4). Recommended torque: $0,6 \pm 0,1$ Nm.
 - In case of using 2x2-array lenses (available from third party suppliers), please refer to your lens supplier to define the max. allowed torque to be applied to the screws (usually M3).
 - In this regard please observe also the usage of proper thermal interface material. Make sure not to go below the min. contact pressure needed. The installation instructions of the selected interface materials have to be followed.
- When installing/screwing the module into a luminaire, please ensure that the cables are not squeezed between luminaire/heat sink and LED module. Also ensure that the mounting surface is clean and flat. For a reliable thermal attachment, we recommend the mounting surface flatness of ≤ 0.2 mm.
- Safe operation only possible by the use of external constant current sources (I_{max} . see table "Electrical Characteristics").
- Operation is dependent on constant current drivers that should provide the following protective measures:
 - short-circuit protection
 - overload protection
 - overheating protection
- Please ensure the correct polarity of the leads prior to commissioning. Reversed polarity can destroy the modules.
- The maximum output of the power supply must be observed.
- For optimal load of used constant current driver the modules can only be connected in series. The quantity of LED modules is limited by the sum of forward voltage and the capacity of used constant current driver. Safety regulations acc. to EN 60598 has to be observed if the sum of forward voltage exceed the permitted touchable value.
- The clearance and creepage distances of LED modules WU-M-541/xxX are designed for working voltages up to 500 V DC (basic insulation) acc. to EN 62031/EN 60598.
- If a system consists of multiple LED Linear Allround modules connected to a single driver, only one module will be monitored by the NTC. That means that one module is in "master" mode operated and the rest are operated in "slave" mode.
- Please ensure standard ESD (electrostatic discharge) protection measures are employed when handling and installing LED modules. Electrostatic discharge can damage LEDs.
- To ensure problem-free operation, the specified maximum temperature at the t_c and t_p point (see "Operating Life") must be observed (measured in accordance with EN 60598-1). To satisfy this point, it is necessary to put measures in place to ensure any heat is dissipated from the LED module to the environment.
- To ensure good thermal contact, it is recommended to use proper thermal interface material (e.g. thermal paste, phase change or thermal pads).
- When mounting LED Linear Allround modules directly on the luminaire housing, we recommend to use aluminum of at least 3 mm thickness. Thicker material will improve the heatflow through the luminaire, resulting in a lower t_p temperature on the module itself.
- Use anodised or painted surfaces rather than blank surfaces to enhance the heat-transfer via thermal radiation.
- Try to limit as far as possible the number of thermal interfaces in the primary heat path towards ambient air. For the primary heat path use solely materials with high thermal conductivity (e.g. aluminum).
- The LED Linear Allround modules are built-in modules and have no IP-classification (IPOO). They are not designed for operation in "open air". In the event of outdoor applications or applications in damp locations, care must be taken to protect LED assembly modules against humidity, splashes and jets of water. Any corrosion damage resulting from humidity or contact with condensation will not be recognised as a defect or manufacturing fault. LED assembly modules are not specially protected against foreign bodies or dust. Depending on the type of application, further protection must be ensured to prevent dust and foreign bodies from entering.
- A parallel connection of the modules is not allowed.
- Operating LED modules in the presence of certain chemical substances or in chemically enriched (aggressive) environments can impair module functionality or even cause total module failure. Detailed information can be found in our "Chemical Incompatibility" PDF on our website www.vossloh-schwabe.com

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Assembly and Safety Information

- The photobiological safety of the LED modules must be classified into risk groups in accordance with EN 62471: 2008.
 - general lighting
exempt group: WU-M-541/xxX
 - other applications
risk group 2: WU-M-541/xxX



Assessment in acc. with IEC/TR 62778:

Given a clearance of more than d_{min} , within which the lighting intensity limit of $E_{thr} = 943 \text{ lx}$ for 5000 K ($E_{thr} = 1497 \text{ lx}$ for $\leq 4000 \text{ K}$) is attained, the classification goes down to risk group 1.

Applied Standards

EN 62031

LED modules for general lighting – Safety specifications



EN 62471

Photobiological safety of lamps and lamp systems

Product Guarantee

- 5 years
- The conditions for the Product Guarantee of the Vossloh-Schwabe Group shall apply as published on our homepage (www.vossloh-schwabe.com).
We will be happy to send you these conditions upon request.

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