Photonic Universe SELM modules

Solar for metal, bitumen and membrane roofs

Photonic Universe **SELM** are ultralight and flexible CIGS solar panels which, among other applications, are intended for roofing felt, membrane and metal roofs as a base, where the end product becomes a discreet solar roof. Photonic Universe **SELM** modules are suitable for flat and sloping roofs and follow the shape of the roof, regardless of whether it is flat or curved. No additional mounting is required to angle the panels.

The solar panels are only 2 mm thin, and come in 2 variants: **SELM2** (358 mm wide) and **SELM3** (516 mm wide), with lengths ranging from 1 m up to 4 m. The solar panels weigh less than 3 kg / m2. With such low weight, Photonic Universe **SELM** is a new alternative for roofs with weight restrictions. This means little to no costs for strengthening the roof structure. Thanks to the low weight, you can also cover more roof space and increase the number of solar panels on your roof – resulting in more solar power.

Photonic Universe **SELM** is suitable for installation on commercial properties, industrial buildings, warehouses, and sports arenas, but also apartment buildings and private homes.

Flexible solar panels allow installation on curved surfaces and uniquely designed roof structures.

Self-adhesive backing for fast, streamlined installation on roofs.

Minimal weight enables easy and safe installation without penetrating the waterproofing layer of the roof.

Roof access – the solar panels can be carefully walked on during maintenance thanks to their shatterproof and crack-resistant properties.

Superior shading performance – bypass diodes between each cell ensure that shading on one or more solar cells only affects the current cells instead of the entire panel.

Highly efficient CIGS cells without toxic cadmium thanks to the unique technological advancements of the production system.

Most sustainable production – only 4 to 6 g of CO2 / kWh of emissions during production and the lifecycle of these solar panels compared to several times more for standard crystalline solar panels.

Made in Sweden – the entire supply chain from cells to production is based in Sweden. This means low climate footprint and sustainable working practices.

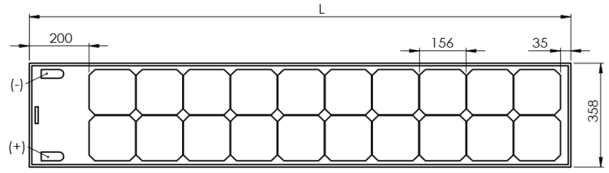
MADE IN SWEDEN

TÜVRheinland CERTIFIED

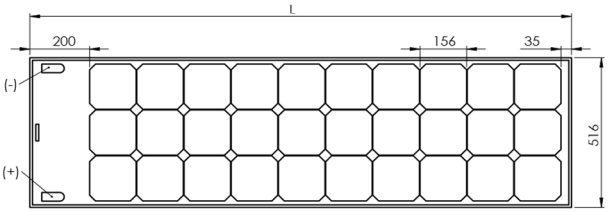
CE

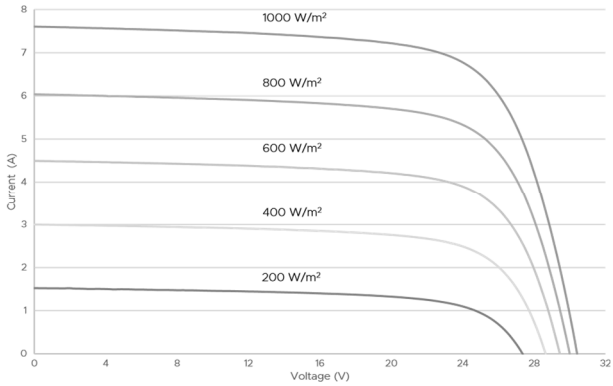
Technical characteristics

SELM 2



SELM 3





Electrically Photonic Universe **SELM** solar panels consist of thin film solar cells (CIGS) on an ultra-thin 15-micron stainless steel substrate connected in series. The cells are protected and encapsulated by several film layers to ensure long-term durability. The modules are delivered with IP68 rated junction boxes to endure a robust, weather resistant electrical connection. Photonic Universe **SELM** solar panels can be retrofitted to an existing roof or mounted simultaneously with a complete roof replacement, without drilling holes in the roof's waterproofing layer.

PRODUCT INFORMATION	SELM2	SELM3
SELM model	**SELM 2 x 24**	**SELM 3 x 24**
Number of cells (1 bypass diode between each cell)	**48**	**72**
Weight	**4 kg/panel**	**5.8 kg/panel**
Width	**358 ±5 mm**	**516 ±5 mm**
Length	**4025 ±10mm**	**4025 ±10 mm**
Thickness	**2 ±0,5 mm**	
Roof pitch	**min 5.7 °**	
Minimum bend radius	**0,25 m**	
Cell type thin film	**CIGS (Cu (In, Ga) Se2)**	
Product warranty	**10 years**	
Power guarantee after 10 years	**90 %**	
Power guarantee after 25 years	**80 %**	
Certifications (TÜV Rheinland certified)	**IEC 61730, IEC 61215 (ongoing for SELM8)**	
Fire Safety	**BROOF (t2)***	

TECHNICAL DATA	SELM2	SELM3
Nominal Power, P_{MAX}**	**165 W**	**245 W**
Power/m²	**114.5 W/m²**	**117.8 W/m²**
Power/kg	**41.3 W/kg**	**42.2 W/kg**
Maximum Power Voltage, V_{MPP}	**25.0 V**	**37.5 V**
Maximum Power Current, I_{MPP}	**6.7 A**	**6.7 A**
Open Circuit Voltage, V_{OC}**	**30.4 V**	**45.6 V**
Short Circuit Current, I_{SC}**	**7.7 A**	**7.7 A**
Maximum Series Fuse Rating	**10 A**	
Maximum System Voltage, V_{DC}	**1000 V**	
Protection class against electrical shock	**II**	
Design Load***	**± 3600 Pa**	
Module operating range	**-40 to +85 °C**	
Temperature coefficient, P_{MAX} (W), γ	**-0.3992 % / °C**	
Temperature coefficient, V_{OC} (V), β	**-0.3279 % / °C**	
Temperature coefficient, ISC (A), α	**0.0099 % / °C**	

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* Classification has been carried out by RISE Research Institutes of Sweden AB in accordance with EN 13501-5-2016.
** Testing performed at STC (Standard test conditions): solar radiation of 1000 W/m2 with perpendicular incidence towards the module surface, module temperature 25°C, Air mass 1.5 (AM 1.5 spectrum). The tolerance for the value is ±10%.
*** Test load ± 5400 Pa, Max altitude: 2000 m.

SELM2

Product Name	Number of Cells	Length (mm)	Extended Length (mm)	Pmax (W)	Voc (V)	Isc (A)	Vmp (V)	Imp (A)
2 x 4	**8**	**865**	**1025**	**25**	**5.1**	**7.6**	**3.8**	**6.6**
2 x 5	**10**	**1023**	**1183**	**35**	**6.4**	**7.6**	**5.3**	**6.6**
2 x 6	**12**	**1181**	**1341**	**40**	**6.7**	**7.6**	**6.0**	**6.6**
2 x 7	**14**	**1339**	**1499**	**45**	**8,.9**	**7.6**	**6.8**	**6.6**
2 x 8	**16**	**1497**	**1657**	**55**	**10.1**	**7.6**	**8.3**	**6.6**
2 x 9	**18**	**1655**	**1815**	**60**	**11.4**	**7.6**	**9.0**	**6.6**
2 x 10	**20**	**1813**	**1973**	**65**	**12.6**	**7.6**	**9.8**	**6.6**
2 x 11	**22**	**1971**	**2131**	**75**	**13.9**	**7.6**	**11.4**	**6.6**
2 x 12	**24**	**2129**	**2289**	**80**	**15.2**	**7.6**	**12.1**	**6.6**
2 x 14	**28**	**2445**	**2605**	**95**	**17.7**	**7.6**	**14.4**	**6.6**
2 x 16	**32**	**2761**	**2921**	**110**	**20.3**	**7.6**	**16.7**	**6.6**
2 x 18	**36**	**3077**	**3237**	**125**	**22.9**	**7.6**	**18.9**	**6.6**
2 x 20	**40**	**3393**	**3553**	**140**	**25.5**	**7.6**	**21.2**	**6.6**
2 x 22	**44**	**3709**	**3869**	**150**	**27.8**	**7,6**	**22.7**	**6.6**
2 x 24	**48**	**4025**	**4185**	**165**	**30.4**	**7.6**	**25.0**	**6.6**

SELM3

Product Name	Number of Cells	Length (mm)	Extended Length (mm)	Pmax (W)	Voc (V)	Isc (A)	Vmp (V)	Imp (A)
3 x 4	**12**	**865**	**1025**	**40**	**7.6**	**7.6**	**6.1**	**6.6**
3 x 5	**15**	**1023**	**1183**	**50**	**9.5**	**7.6**	**7.6**	**6.6**
3 x 6	**18**	**1181**	**1341**	**60**	**11.4**	**7.6**	**9.1**	**6.6**
3 x 7	**21**	**1339**	**1499**	**70**	**13.3**	**7.6**	**10.6**	**6.6**
3 x 8	**24**	**1497**	**1657**	**80**	**15.2**	**7.6**	**12.1**	**6.6**
3 x 9	**27**	**1655**	**1815**	**90**	**17.1**	**7.6**	**13.6**	**6.6**
3 x 10	**30**	**1813**	**1973**	**100**	**19.0**	**7.6**	**15.2**	**6.6**
3 x 11	**33**	**1971**	**2131**	**110**	**20.9**	**7.6**	**16.7**	**6.6**
3 x 12	**36**	**2129**	**2289**	**120**	**22.8**	**7.6**	**18.2**	**6.6**
3 x 14	**42**	**2445**	**2605**	**140**	**26.6**	**7.6**	**21.2**	**6.6**
3 x 16	**48**	**2761**	**2921**	**165**	**30.4**	**7.6**	**24.3**	**6.6**
3 x 18	**54**	**3077**	**3237**	**185**	**34.2**	**7.6**	**27.3**	**6.6**
3 x 20	**60**	**3393**	**3553**	**205**	**38.0**	**7.6**	**30.3**	**6.6**
3 x 22	**66**	**3709**	**3869**	**225**	**41.8**	**7.6**	**33.4**	**6.6**
3 x 24	**72**	**4025**	**4185**	**245**	**45.6**	**7.6**	**36.4**	**6.6**

SELM2

SELM3