vegaFLEX®

The Mirror 100% Aluminium

vegaflex

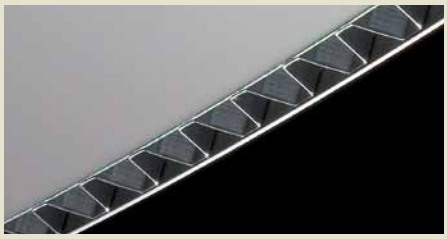
Combining the durable highly reflective surfaces of **Almeco vegaWR** products with the precise rigid curvature and light weig htof Doluflex structural panels,

vegaflex takes solar concentrating mirror structures to a new level in terms of:

- Choice and control of curvature
- Efficiency
- Ease of installation
- Low structural weight
- Freedom from the breakage problems of traditional structures
- High rigidity and strength

Highly reflective, tough surfaces

Almeco has, over nearly 50 years, developed its experience in the production of formable mirror surfaces based on aluminium reflectors. Their most recent developments have brought to the solar market a new product range, “vega”, with enhanced levels of reflection performance, up to 99%, achieved by using continuous air-to-air vacuum treatment to apply ultra-high reflective surfaces to aluminium strip. Almeco’s vega WR range combines the vega product technology with an additional highly robust protective barrier coat that assures a long term high reflectivity performance in outdoor reflector applications.



Strong and durable curved panels

Xeliox has been active in the Concentrating Solar Power (CSP) sector for some years, also developing complete installations thanks to the contributions and close collaboration of the principal solar research institutions in Europe. Xeliox has developed and patented a technology for making rigid aluminium parabolic concentrators using a sandwich structure of two aluminium sheets bonded to a trapezoidal corrugated core. The resulting curved panels have light weight, high mechanical strength and stiffness and very accurate geometry. The development of this precisely controlled stiffening method using corrugated aluminium to give close dimensional tolerances makes the product ideal for the application of solar concentrating mirrors.

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vegaflex are manufactured by combining the vega WR293 mirror surface with the Xelios rigid composite panel structure system incorporating a corrosion resistant aluminium sheet as the reverse side element.
This matching of materials results in a mirror panel where all the elements have the same thermal coefficient of expansion, minimising temperature effects on shape stability in changing conditions.
Customers are provided with the complete curved mirror ready for mounting on a space frame support structure. Low mirror weight and high stiffness simplifies the construction process and mounting requirements, significantly reducing costs. The exact shape and dimensional characteristics can be designed to meet customer requirements.

Technical characteristics

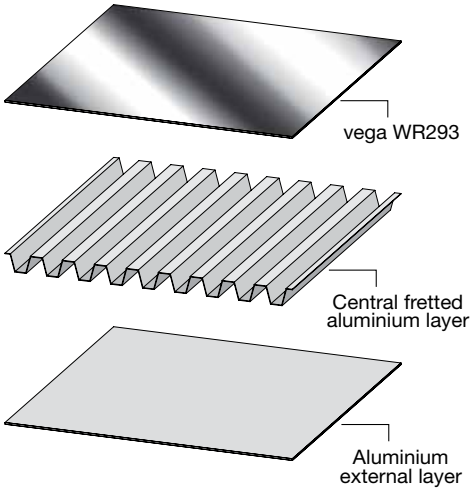
Panel structure, reflector size and curvature can be chosen to suit the particular application and the mechanical characteristics can be adjusted by varying the thickness of the different layers.
The exceptional flexural rigidity of the reflectors (over 10 times that of traditional systems) allows panels to resist high loads without deformation. Consequently, the mechanical support structure which supports and rotates the mirrors, and which in traditional installations is complex and heavy, can be streamlined and made more economical.

Mounting

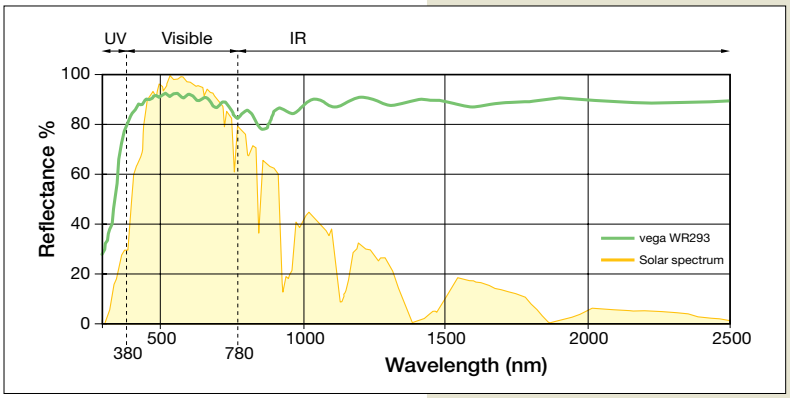
Thanks to its light weight and high rigidity, mounting can be made in a simple way with fewer mounting points. **vegaflex** can be attached in the same way as conventional mirrors, e.g. using adhesively bonded support pads fixed to a support frame. Alternatively the fully metallic nature of these panels allows them to be structurally attached directly from the mirror surface to a support frame without significant detriment to reflective performance. The support frames themselves can be simplified to take advantage of the mechanical robustness of the mirror element, with fewer fixing points.

The mirror surface

The vega high reflectance layers are deposited on a substrate of mirror finished brightened and anodized high purity aluminium which provides a high quality chemically stable surface to give maximum durability to the product and good bonding characteristics to the Doluflex panel.The PVD applied reflection enhancing system comprises a layer of 99.99% pure aluminium surmounted by two transparent optical layers of alternate low and high refractive index which increase the total reflectance of the surface to over 95%.The PVD layers are finally protected by a highly transparent, hard, weather resistant top coat which maintains a high reflectance performance (>93% TR) against the effects of abrasion and weathering of the mirror surface.



Spectral reflectance graph



vegaWR293

Technical reflectance characteristics

Property	vega WR193	vegaWR293	Standard
Total reflectance (solar spectra)	≥ 93%	≥ 94%	ASTM 891 – 87
Solar weighted specular reflectance of mirror surface	≥ 90%	≥ 92%	Internal Standard
Spectral Reflectance	See graph above	-	-
Focus on target (D70)	> 99,8%		Profilometer ENEA

Physical properties

Property	Typical value	standard
Specific weight	6 - 8 kg/m² *	-
Transverse stiffness	1.8 -3.5 kNm²/m*	UNI EN 63-DIN 53293
Longitudinal Stiffness	3.5 – 21.5 kNm²/m*	UNI EN 63-DIN 53293
Impact resistance	No breakage or coating failure	ISO 6271-1
Thermal expansion	23,5 x 10^{-6} / °C	-
Surface hardness	> 7H pencil hardness	ISO 15184

* depending on thickness

Durability

Property	Typical Value	Standard
Coating adhesion	No failure on cross hatch test	ISO 2409
UV resistance	< 3% reflectance change in 3000 h	ISO 4892-3
Neutral salt spray resistance	< 3% reflectance change in 3000 h	ISO 9227 NSS ASTM B 117

vegaflex 939

Nominal thickness mm	Effective thickness mm	Specific weight kg/m²	Rigidity E x I Nm²/m tool parallel to corrugation	Rigidity E x I Nm²/m tool perpendicular to corrugation
10	11	6,78	1768	3311
15	15,2	6,94	3010	6743
18	17,9	6,98	3074	9497
20	20	7,3	3086	12103
25	25	8,16	3200	18024

ADVANTAGES

Simplicity

Mirrors are supplied complete with rigid backing shaped to customers' specification.

Large scale modular structure

Thanks to their unique production technology, single element **vegaflex** curved mirrors can be produced with apertures up to 6500 mm.

Installation

Light weight (about 50% compared with traditional solutions) and robust mechanical properties result in easier and more economical installation with low breakage losses during assembly.

Design flexibility

vegaflex parabolic mirrors can be supplied with small concentrating apertures for 'micro' installations and with radius of curvature as small as 100 mm.

Robustness

Improved wind resistance and lack of breakage problems reduces maintenance costs and "down time", as well as offering reduced investment in the mechanical support structure.

Durability

Excellent durability – Almeco guarantees that reflectance of the mirrors will be maintained within 3% of their original value for a 10 year period *

Recyclability

vegaflex aluminium mirror panels are 100% recyclable

* -subject to the use of an appropriate reflector cleaning programme

APPLICATIONS

Compound Parabolic Concentrators for installation in plants for:

- Solar thermal and photovoltaic electricity generation (CSP & CSPV)
- Solar powered de-salination equipment
- Heat pump air conditioning systems
- Thermal fluids for industrial process heating

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ENG - 06/2012