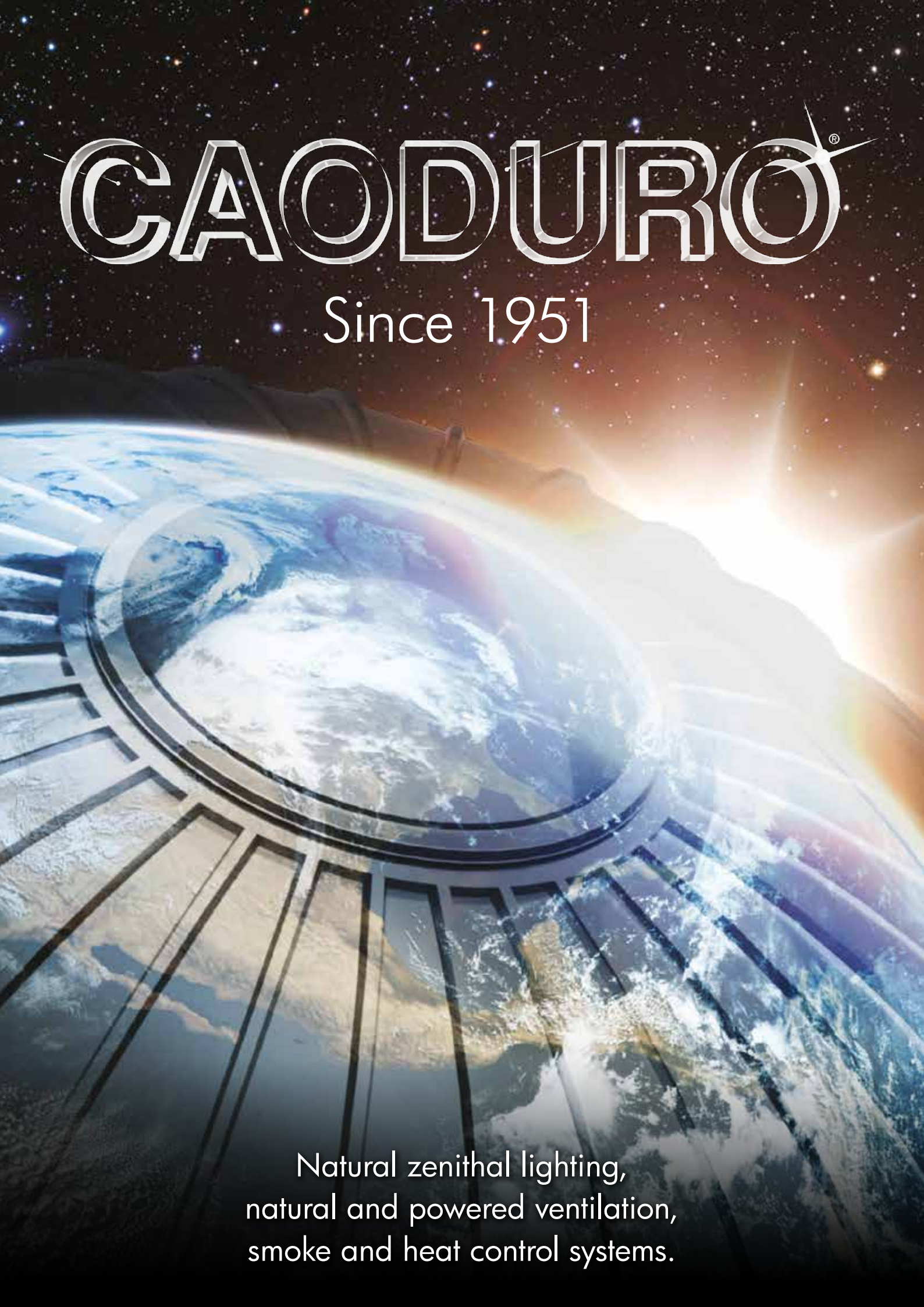

CAODURO®
Since 1951
Natural zenithal lighting,
natural and powered ventilation,
smoke and heat control systems.

INDEX

From a punctured tyre...

The story begins with a man, Isidoro Caoduro, a puncture on a tyre of an Italian car, and a representative of an English company. It was the year 1951 in San Felice street, in Vicenza. This meeting, a coincidence born by chance, brought that man to undertake a new business. Different projects in terms of commissioning and application, serial productions of characters for signs, display cases for bars, ceiling lamps, caravan windows, windshields for cars and boats let him know thoroughly the plastic material.

At the end of the 50s, these products were joined by the telephone booths, armchairs, tables and Plexiglas chairs for elite furniture, and skylights made of polymethyl methacrylate. These ones gradually found more and more space on the roofs of factories, thanks to the development of the prefabrication.

In 1964, following a dispute over the use of the Fiduplex brand with the company producer of Plexiglas sheets, which had registered both Plexiglas and Plex, Mr Isidoro Caoduro was imposed to change the name or to buy the company's sheets requirement that in the meantime was growing up. Mr Isidoro decided to be free, modifying the name in FX Caoduro, which contains the first and the last letter from Fiduplex, arriving in 1980 to the present Caoduro S.p.A.

In the new factories in Cavazzale at the beginning of the 80s, with the collaboration of the Genoese architect Renzo Piano, curved modules made of solid polycarbonate were realized. These elements allowed the IBM traveling expo to be produced. Between 1989 and 1990 the biggest pieces all over the world took shape: one thermoformed piece over 15 m^2 wide, made of polycarbonate, an extremely resistant and self-extinguishing material. Polycarbonate has been, in fact, used for the 45,000 m^2 cover of San Paolo stadium in Naples, for creating beams of light in Delle Alpi stadium in Turin, and for part of the cover of Palermo stadium. All these realizations were made in occasion of the 1990 World Cup in Italy.

Thanks to extremely versatile and unique equipment for the thermoforming process, designed within our company, many important projects were developed. Among these: the pedestrian covered bridge in Moscow, which is actually a mall 265 m long, military university in Mu'tah (Jordan), Don Giovanni Hotel in Prague, Bucarest airport, Ferrari museum in Maranello. Hundreds of covers of industrial buildings and commercial centres of the most famous brands in Europe were realized, theatres like La Scala in Milan and La Fenice in Venice were provided also with smoke and heat ventilators *SMOKE OUT*®, first in Italy to be made in compliance with Italian UNI 9494 Standard and CE marked, to meet the full requirements of European EN 12101-2 Standard.

There are many achievements in Italy and abroad that now exceed twenty or thirty years of age, keeping the characteristics of the original products almost unaltered, from warmer climates such as Jordan and the Arab countries, to colder ones like Russia and Kazakhstan.

Caoduro S.p.A. owns one hundred patents, which provide added value to our products. These are already excellent thanks to a careful design and a use of top materials, thus ensuring a first-class level in terms of aesthetics, functionality and durability.

From monobloc domes to continuous skylights. From self-supporting structures to those classic or special ribbed. From natural smoke and heat exhaust ventilators for applications in roof or wall to powered smoke and heat exhaust ventilators. We can satisfy every design need in the best way, thanks to our experience gained in more than 67 years of history.

...to today

From the first shed in Olmo di Creazzo, to the present factory in Chiuppese Street in Cavazzale, Vicenza.

A covered area of 13,200 m^2 on almost 30,000 m^2 of land, then increased in 2010 with the automated warehouse thus reaching about 16,000 m^2 covered. Here takes place the realization of thermoformed roofing elements made of polycarbonate and polymethyl methacrylate for industrial and residential buildings.

We offer standard solutions ranging from the smallest 45x45 cm dome, up to remarkable sizes like self-supporting domes without metal structure, with a maximum diameter of 785 cm. We can examine various cases and offer customized solutions, from which new products often come to life. A striking example is our natural smoke and heat exhaust ventilator *SMOKE OUT®* dual purpose: to the emergency ventilation function we added the daily ventilation function of rooms, whenever you want.

Domes, skylights, ribbed structures, frames, upstands, control boxes, roof and wall exhaust ventilators, smoke and fire curtains, electric and manual opening devices up to 15 m long, natural and powered smoke and heat exhaust ventilation systems. This is what time and experience have taught us.

In addition to manufacturing area, in this building take place also the management offices, administrative, commercial and above all, the technical office.

On these desks the pieces that today are installed in Italy and all over the world are designed in every detail. Starting from the freehand and the technical drawing to the modern 3D CAD software, our attention to the components has always been great, thus guaranteeing you a quality product, from design to use.

The polycarbonate sheets are heated by hot air ovens, which are able to reach the optimal temperature for thermoforming elements up to a size of 250x750 cm. The moulds of all our products are made in the internal modelling department.

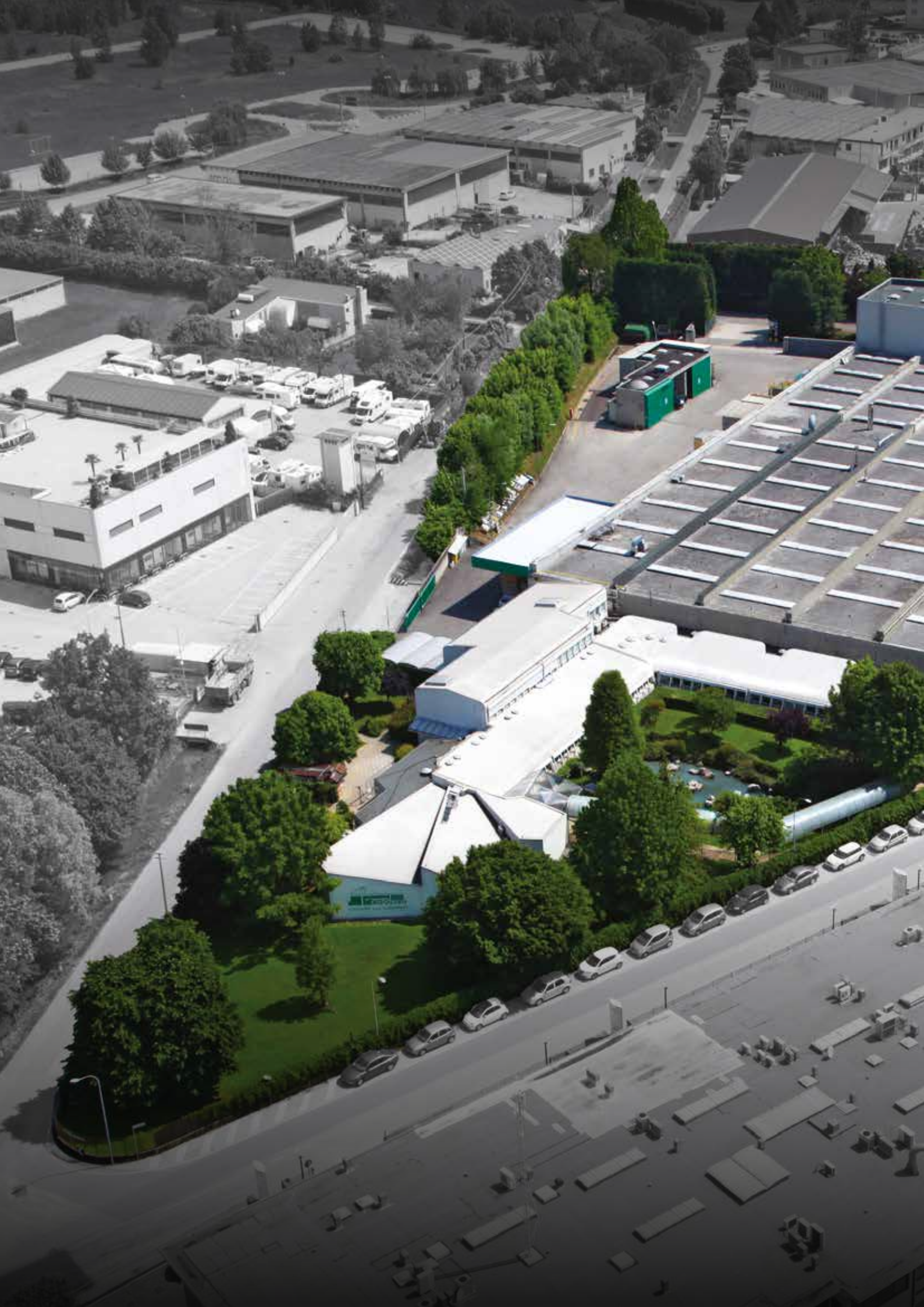
The whole producing program is computerized and automated. It also allows sheets to be loaded in the ovens using robots.

The transformation of polyester resins for the realization of prefabricated upstands takes place in a special department equipped with a varnishing machine with a station for resins spraying, an annealing station with a hot air oven and a trimming station.

Close to the production department, the technical and testing sector operates. New high technology computerized equipment allows to have both a real evaluation of the stress-strain of the materials due to point and uniform loads and a technical prior evaluation. Studies on finite element methods let us know the behaviour of the thermoformed material in detail, reducing at most the concentrations of residual stresses and obtaining more homogeneous thickness in our products.

Caoduro's technical and testing sector has been the first in Italy, since 1990, to be equipped with a test plant for measuring Aa (aerodynamic free area) on smoke and heat exhaust ventilators, which dimensions can reach a size of 230x300 cm. This allowed us to be at the vanguard, being the first to get CE marking in compliance to EN 12101-2 Standard.


CAODURO



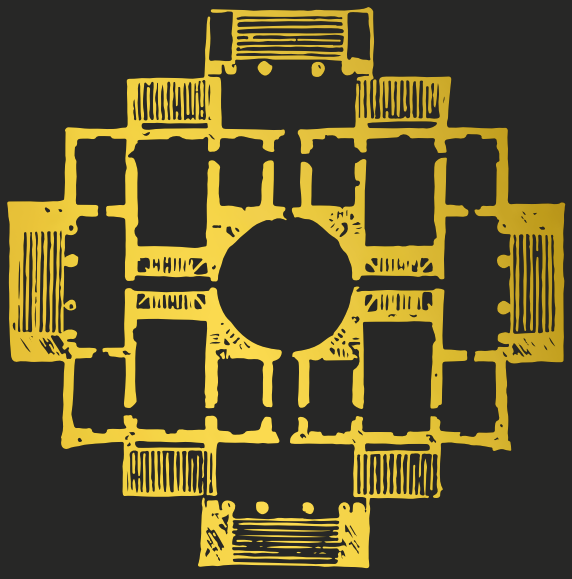

CADDURO

Know and let people know

Strengthened by our motto, our attention over the years has not only been aimed to our products, but also to the world that surround us.

Always working with architects and designers, since 1985 we have supported activities that returned to the city of Vicenza various spaces and monuments. Among these we have Basilica Palladiana, which has been closed for years after being used as a covered basketball court, Palazzo Chiericati and Teatro Olimpico, which today hosts significant events in the city.

It is important to remember the architectural exhibitions with designers and opinion leaders such as Mario Botta, Renzo Piano, Gino Valle and others, that started the *Andrea Palladio Architecture International Award* in 1987. The competition was open to all under-40 architects and designers. The jury was composed by Francesco Dal Co, professor of architectural history at University of Venice and Yale University, Rafael Moneo, professor of architectural composition at Madrid University School of Architecture; James Stirling, professor at several European and American universities; Manfredo Tafuri, professor of architectural history at University of Venice.



Premio "Andrea Palladio"

The Award was born to take up the challenge of young architects, who complained about the attention dedicated only to big and famous names in the sector. Therefore, the brothers Paolo and Carlo decided to create this event, bringing the 20 finalists to exhibit their projects at the Basilica Palladiana, then to take part to the award ceremony at the Teatro Olimpico and eventually to have a gala dinner at the Palazzo Chiericati, thus using the three main Palladio's monuments in the city. The price, a great amount of money, allowed the winner architects to open architectural firms with innovative technologies and grow up increasing the proficiency in the sector.

Under the high patronage of the President of the Italian Republic, from the beginning with 30 participating nations and 685 works in competition, the numbers have grown up to the fourth edition in 1993. This one involved 68 nations with guests of honour like Queen Noor of Jordan, King Hussein's wife and the President of the Italian Senate Giovanni Spadolini.

On this trail, Basilica Palladiana has become a space where many important events take place, up to the recent pictorial art exhibitions.

Since 1997 CAODURO® has also been sponsoring *Dedalo Minosse International Architecture Commissioning Award*, which occurs every two years and has now come to its tenth edition. The peculiarity of this award is to be the only international award assigned to the client of the architecture and not to the architect or to the work. This is to promote the quality of transformation of the territory, through the enhancement of the figure of the client, in the belief that without a "good client", a "good architecture" can not be achieved. The following picture shows the

Dedalo Minosse

PREMIO INTERNAZIONALE ALLA COMMITTENZA DI ARCHITETTURA / INTERNATIONAL PRIZE FOR COMMISSIONING A BUILDING

prizegiving to the mountain climber Reinhold Messner for having commissioning the *Messner Mountain Museum*.

Great attention has been paid to minor sports teams in Vicenza, helping them from minor divisions and bringing them to the major ones. Among these: Asiago Ice Hockey, the women's volleyball team, the inline hockey team, which has been led to the first division and the waterpolo team, which has been led to the second division.

This is to give the possibility to boys and young men to discover, grow up and excel in sport disciplines thanks to CAODURO® brand.


radio asia


HISTORY
RESEARCH
EXPERIENCE
VANGUARD

IBM Travelling Pavilion

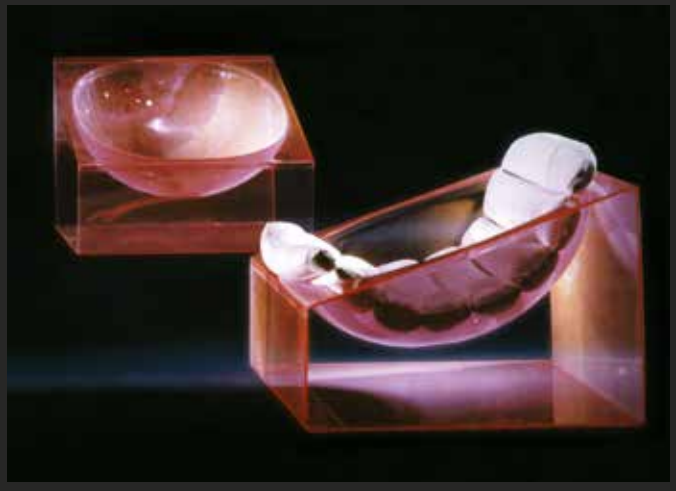
Designed by architect Renzo Piano for IBM computers Travelling Pavilion, the structure was created in two units to speed up the transfer operations from a city to another. Paris, Rome, London, Milan are some of the 20 stages involved in the exhibition.

The transparent polycarbonate covering is modular: the single piece consists of three diamonds. Each of the 34 arches is composed of 4 modules placed on a wooden and metallic support structure.

Furniture Design

A production developed in the 80s, which included chairs, armchairs, sofas, tables, telephone booths for interiors and exteriors and modular furniture for various uses.

Everything has been produced by thermoforming polycarbonate or polymethyl methacrylate sheets and obtaining monolithic pieces. Depending on the object then, a piece could be assembled with metal frames or finishes, or could be coupled together to create new functions. As an example, the modular *Mandrake* furniture is usable as a coffee table if alone or as a bookcase if more pieces are joined.

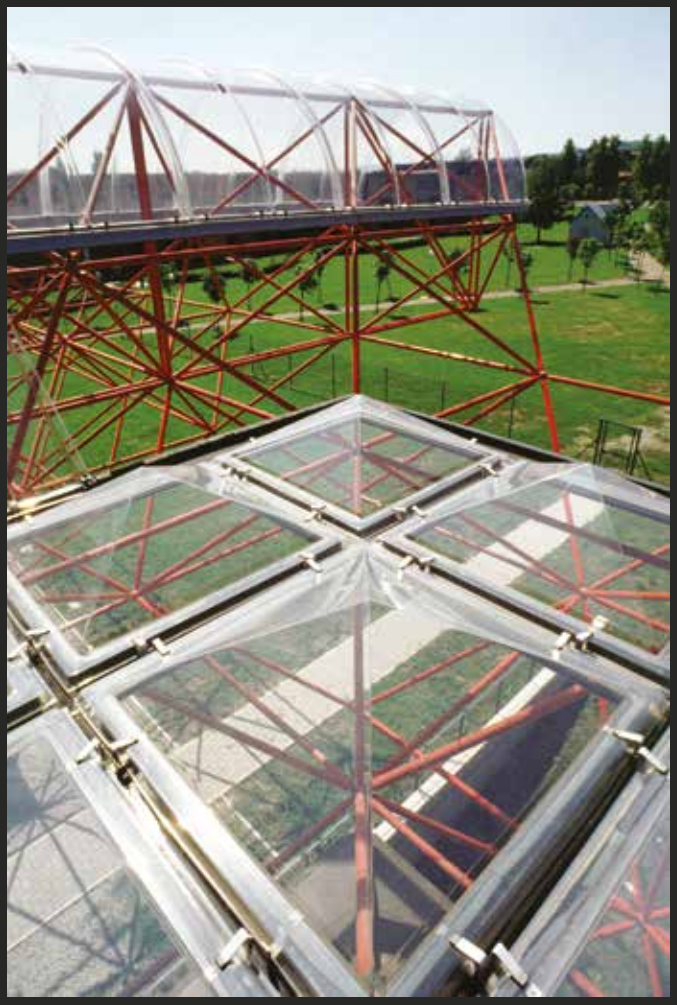


1990 World Cup Italy

We realized the biggest polycarbonate pieces all over the world for Naples' *San Paolo* Stadium covering: each piece reaches over 15 m^2 surface.

Because of the radial design of the roofing, the pieces of each channel were made with modifiable moulds, thus permitting conical polycarbonate transparent smoky grey vaults to fit together.

The 52 blades of light in Turin's *Delle Alpi* Stadium, on the other hand, were made by moulding transparent polycarbonate sheets into vaults, in order to cover the 42 meters width of the roofing.

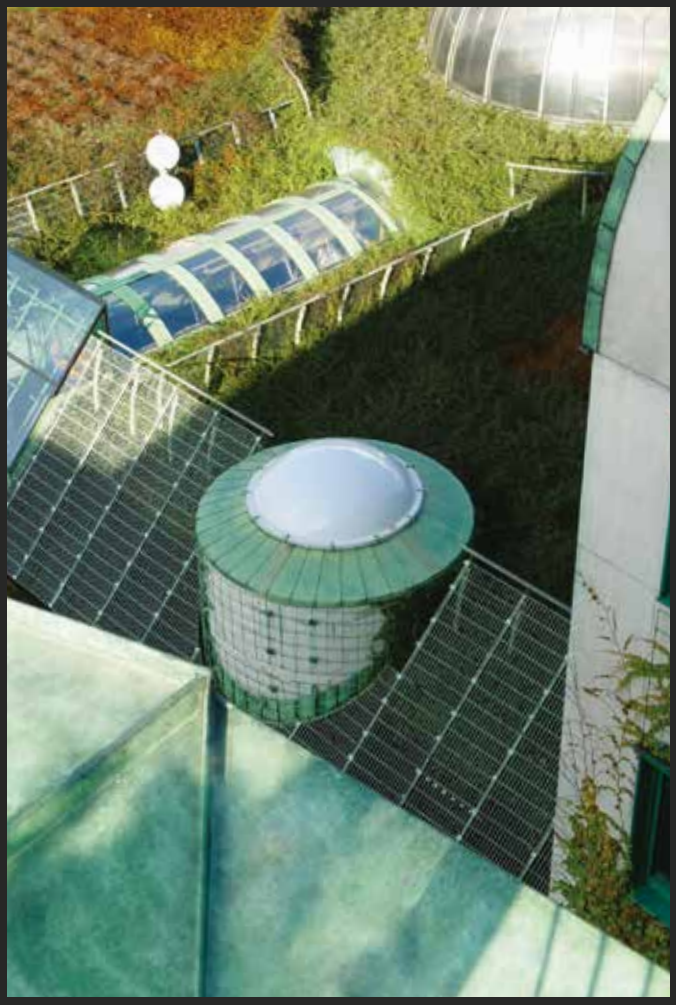


Ferrari Museum

A cover made with *Diamante* series domes and a 3 m wide and 38 m long transparent polymethyl methacrylate tunnel.

The Library

In the heart of Warsaw, just a few steps from the Vistula River, you can find one of our transparent polycarbonate ribbed domes. In addition to the normal ribs, this dome is distinguished by ribs on each of the slices. On it, an opal polycarbonate *Vela* dome is installed.



On the Moscova River

A covered pedestrian 265 m long bridge, actually a mall, is part of a project involving an entire neighbourhood on the river bank. The covering is realized on the principle of ribbed tunnels, with pre-painted aluminium profiles and cold bended double skin transparent polycarbonate, with thermal break.

In Yas Marina with *Formula 1*

A new generation circuit opened in 2009, whose buildings have our *040 FX* series continuous skylights and openable monobloc domes on their roofs.

On historical buildings

Our *Diamante* series double skin transparent polymethyl methacrylate domes are placed on Palazzo Vecchio roof in Florence.

Even the antique embraces the modern.

In the garden

268 *Vela* series domes have been installed on a 13,950 m^2 covering. Many solutions have been adopted: opal or transparent polycarbonate, fixed or electric opening frame, with anti-falling grid, with smoke ventilation function and with sliding sunshade curtain in the offices area.

Six *035 FX* series skylights with *SMOKE OUT*® device have even been installed on the roof.

On the factories

Factory roofing where *035 FX* series continuous skylights have been installed. The skylights have dual purpose openings: daily ventilation and smoke exhaust ventilation *SMOKE OUT*® in case of emergency.

In addition to the dual purpose openings, some skylights are installed on metallic finned upstand in order to ensure continuous natural ventilations to the rooms below.

On commercial buildings

035 FX series continuous skylights with *SMOKE OUT®* device for natural smoke and heat ventilation.

NATURAL ZENITHAL LIGHTING

The material

Technical specifications

All CAODURO® products like **domes**, **skylights** and **tunnels** are made with the best quality **polycarbonate** sheets. These are UV rays protected in order to ensure greater durability against yellowing and have a **B-s1-d0 or B-s2-d0 fire reaction classification** according to **EN 13501-1:2007+A1:2009 Standard.**

Technical specifications of transparent polymers, hereinafter compared, refer to polycarbonate (PC) and polymethyl methacrylate (PMMA) and can provide a first element to consider in judging polymer behaviour during application.

Transparent semi-manufactured products such as polyvinyl chloride (PVC), polystyrene (PS), glass fibre-reinforced polymer (GFRP) and several translucid materials have been intentionally disregarded. This is because currently, due to exposure to atmospheric agents in the middle latitudes of Italy, they show a deterioration of optical (opacification) and mechanical (brittleness) specifications that exceed quality products requirements.

Characteristics	ISO Standards	Unit	PC	PMMA
Density	1183-1	Kg/m^3	1,200	1,190
Limit flexural stress	178	MPa	90	130
Tensile stress at yield	527-1, -2	MPa	> 60	76
Charpy impact strength	179-1	KJ/m^2	80	12
Vicat softening temperature	306	°C	148	115
Thermal conductivity	8,302	W/(m°K)	0.20	0.17
Light transmission*	13468-2	%	87	92

***The values refer to a 3mm thick transparent solid polycarbonate.**
Technical data have been kindly provided by main manufacturers.

Fastening

The polycarbonate sheets manufacturer warns: "*Holes drilled in Makrolon® sheets impair the strength of the sheets. Bearing in mind the relatively high linear thermal expansion coefficient of Makrolon® compared with metal or glass, structural measures should be taken to ensure the Makrolon® part can move freely under temperature fluctuations. During fastening work make sure that the Makrolon® sheet is not excessively stressed by local pressure forces*".

On these considerations we have realized CAODURO® **patented clamp**.

Material	Linear thermal expansion coefficient [mm/(m·K)]	Expansion at Δ 20°C [mm]
Makrolon®	0.065	1.30
Aluminium	0.024	0.48
Steel	0.012	0.24
Glass	0.008	0.16

Examples of expansion of a sheet measuring 1 m in length under a temperature increase of 20°C.

Colorations

Our **standard** production uses polycarbonate sheets protected against UV rays, solid or alveolar, in **clear transparent** and **opal white** colours.

Depending on quantity and sizes, it is possible to request domes and skylights with **different colours** or with ***Climate Control*** polycarbonate sheets.

Domes and skylights cleaning

In normal conditions **rainwater is enough** for cleaning domes and skylights.

For a **better cleaning, after abundant rinsing** of polycarbonate surfaces **to eliminate any slag and/or abrasive residues, neutral soap dissolved in water** can be used, provided this does not strictly contain abrasives or solvents. **Rub with a soft sponge** the neutral soap dissolved in water and then rinse.

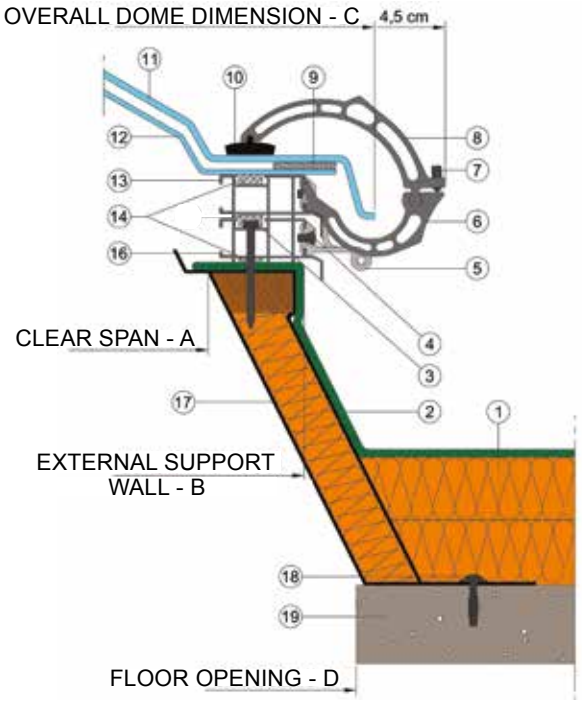
The use of substances such as alcohol, acetone, petrol, etc. can cause the breakdown and the decay of polycarbonate resistance properties.

CAODURO® patented clamp

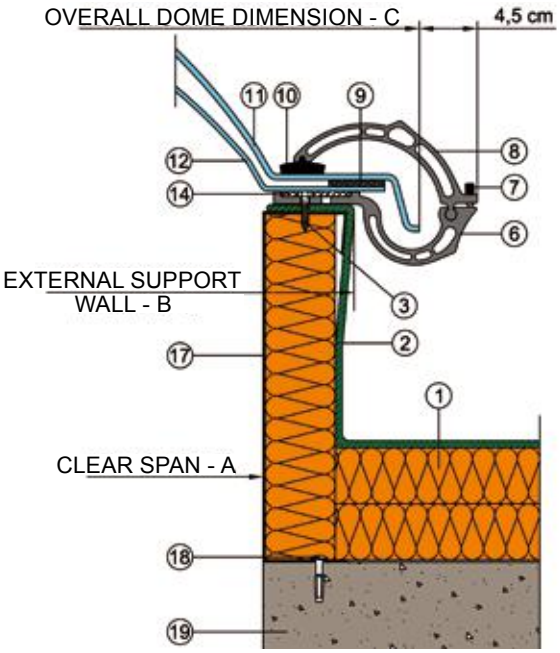
The only clamp, in spite of the countless imitations on the market, which **can resist up to 200 kg tension load.**

Applications for monobloc domes

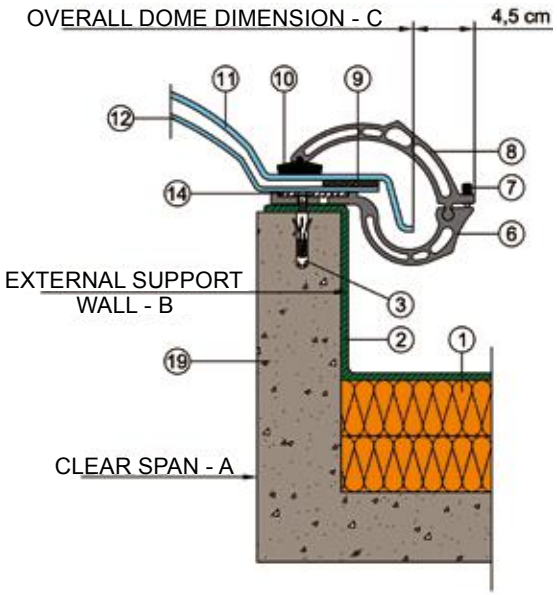
OPENABLE DOUBLE SKIN DOME ON PREFABRICATED GFRP UPSTAND



FIXED DOUBLE SKIN DOME ON METALLIC UPSTAND



FIXED DOUBLE SKIN DOME ON CONCRETE WALL



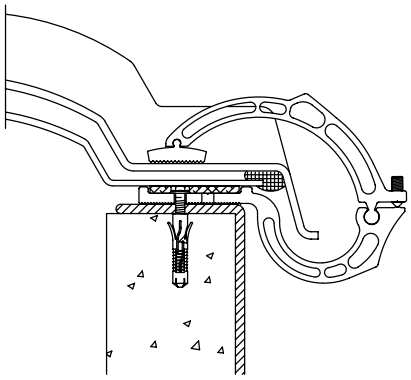
LEGEND

1. Roofing insulation on client's charge
2. Waterproofing on client's charge.
3. Frame fixing-self tapping screw.
4. Hinge fixing screw.
5. Aluminium hinge.
6. Aluminium lower clamp.
7. Clamp fixing screw.
8. Aluminium upper clamp.
9. Double-adhesive sealing joint.
10. EPDM clamp gasket.
11. External skin.
12. Internal skin.
13. Aluminium upper frame.
14. Expanded polyethylene gasket.
16. Aluminium lower frame.
17. Prefabricated GFRP upstand.
18. Upstand fastening.
19. Concrete slab.

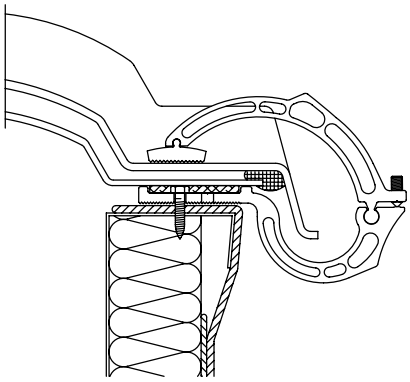
Applications for continuous skylights

fixed double skin skylights

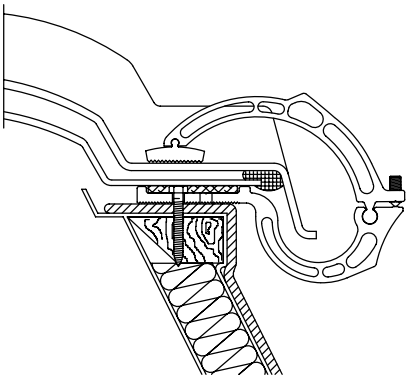
ON CONCRETE WALL



ON METALLIC UPSTAND

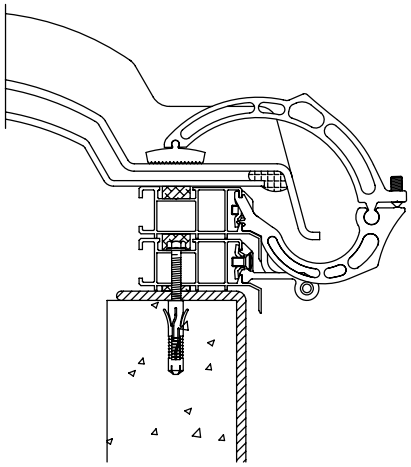


ON PREFABRICATED GFRP UPSTAND

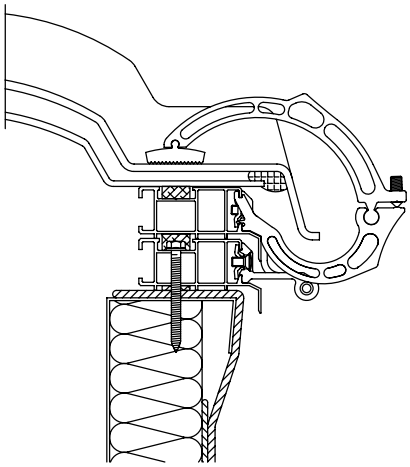


openable double skin skylights

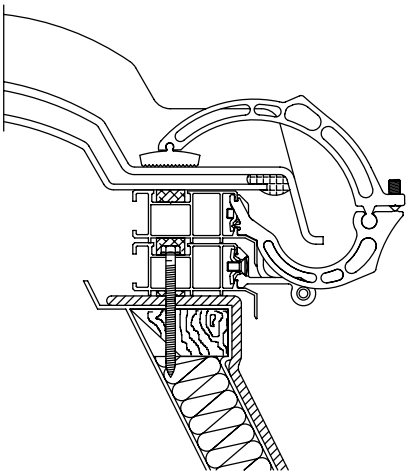
ON CONCRETE WALL



ON METALLIC UPSTAND

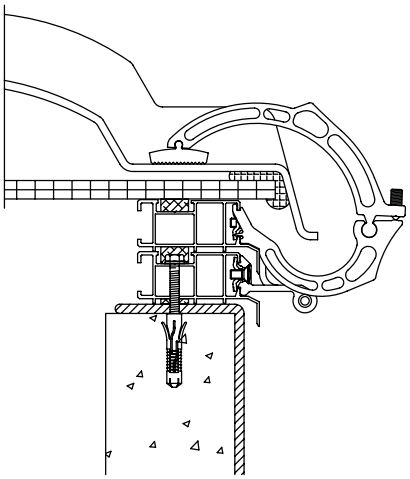


ON PREFABRICATED GFRP UPSTAND

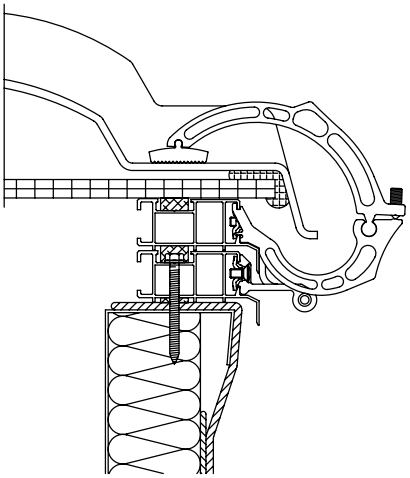


openable double skin *M35 FX* skylights

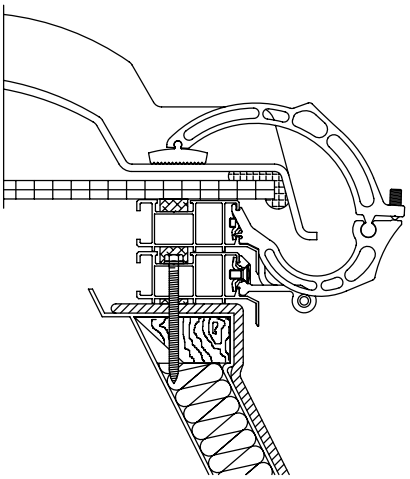
ON CONCRETE WALL



ON METALLIC UPSTAND



ON PREFABRICATED GFRP UPSTAND



Old roofs adjusted to current regulations

More and more often existing buildings roofs have to be adjusted to current regulations, regarding smoke and heat exhaust ventilation systems (SHEVS). Old and new conception roofs, made with *Onda Europa* 177/51 curved or flat plate on "Y" beams, made it difficult to insert the smoke and heat exhaust ventilators, since there were no connection bases between the plate and the device.

CAODURO® has designed and built a series of prefabricated glass fibre-reinforced plastic (GFRP) and metallic upstands, both insulated with rigid polyurethane foam panels.

Recommended for the higher light output and for the ease and speed of installation, GFRP and metallic upstands are an effective solution to the problem.

By means of a **targeted operation**, the individual plates are replaced with prefabricated upstands which, being finished both internally and externally, do not require any additional treatment.

Another **advantage** is the possibility of installing on them electric daily ventilation devices, as well as the dual purpose *SMOKE OUT*®.

BEFORE

AFTER

CAODURO®

Monobloc domes

***Vela* series** domes are manufactured by thermoforming first quality polycarbonate (PC) sheets, in **clear transparent** or **opal white colour**, UV rays protected in order to guarantee longer duration against yellowing, with reaction to fire classification B-s1-d0 according to EN 13501-1 Standard. In addition to **robustness**, **light diffusion** and **thermal insulation**, they have an **excellent impact behaviour** and guarantee an **high resistance to heat** in all those situations where the safety of people and things is a determinant factor which cannot be ignored.

Their **peculiar shape**, which ensures strength and a better light output, makes our domes a really effective system of natural zenithal lighting.

The availability of different solutions in **single, double and triple skin** allows to install the domes in the most different environmental conditions.

Thanks to this range of solutions, we can solve the problem of thermal insulation that is becoming more and more important in terms of energy saving. This is one of the reasons that led CAODURO® to create new models: **double skin *M125 FX*** and **triple skin *M126 FX***, which are realized with external and intermediate skin made of thermoformed solid polycarbonate sheet, internal skin made of flat alveolar polycarbonate sheet.

The **fastenings** are made with **standard clamps**, which offer the **maximum guarantee to water tightness and thermal expansion**.

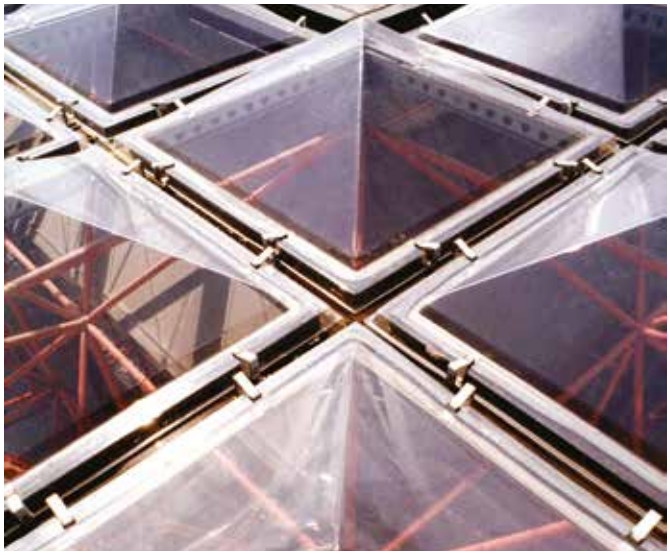
In order to get a correct installation, the domes need a perimeter support with thickness to the finished of any sheaths of 6.5 cm on concrete walls, wood, prefabricated glass fibre-reinforced plastic (GFRP) or metallic upstands.

***Diamante* series** domes are manufactured by thermoforming polycarbonate (PC) sheets too, in standard colours and UV rays protected.

They are made **only upon request** in square and rectangular shape, with the dimensions indicated on pages 34-35 except for 180x180 cm and 200x200 cm.

Thanks to a wide range of accessories, our domes can be employed in private dwellings as well as in commercial and industrial buildings: a quality product guaranteed over time.

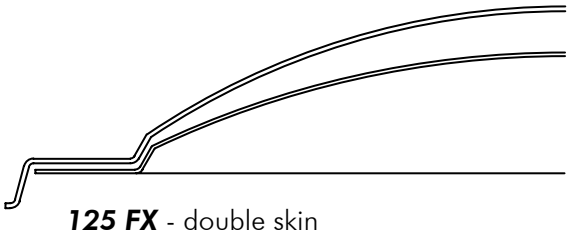
CAODURO® domes are manufactured and tested according to the following European Standard which requires CE marking: EN 1873 *Prefabricated accessories for roofing - Individual rooflights of plastics – Product specification and test methods*.



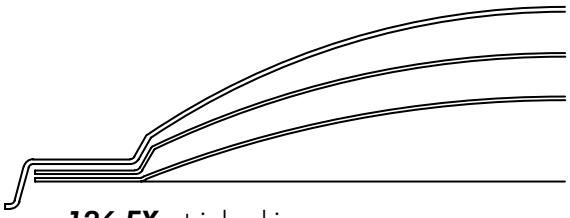
Thermal transmittance values up to U=1.1 W/m²K

Vela series
(standard production)

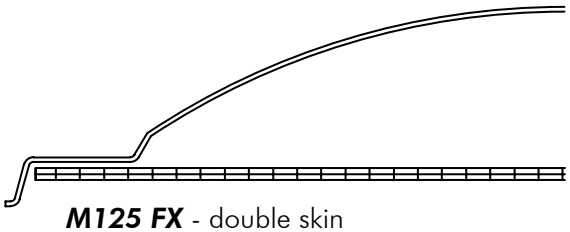
115 FX - single skin



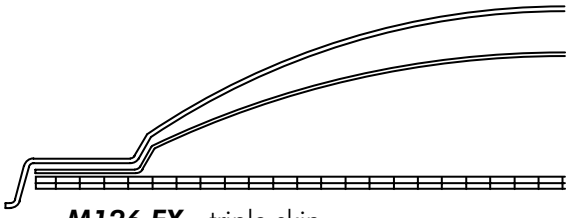
125 FX - double skin



126 FX - triple skin



M125 FX - double skin

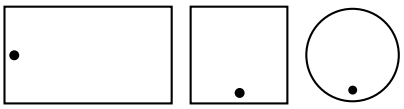


M126 FX - triple skin

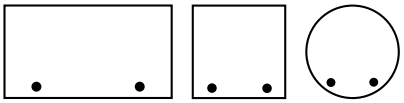
Our domes can be opened with a manual action (**MN**), electric action (**EL**), as manhole (**PU**), for natural smoke and heat exhaust ventilation (**NSHEV**) and for smoke disposal.

The pushing point can be single (**S**), single with hooks (**SG**) or tandem (**T**) and is placed according to the following scheme.

Manual/Electric Single



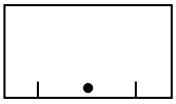
Manual/Electric Tandem



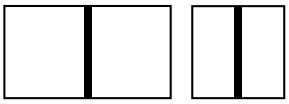
Manhole Single

Manhole Tandem

Single with hooks

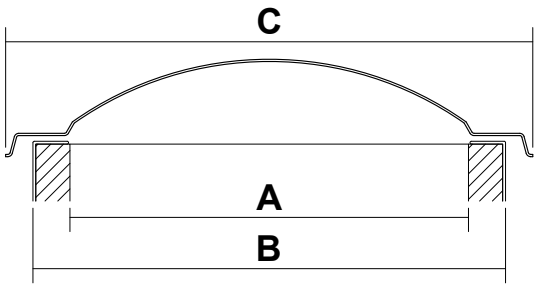


NSHEV

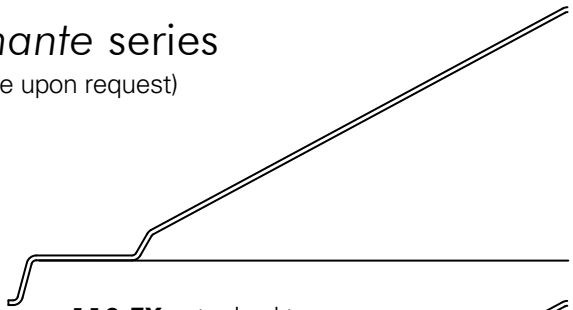


The reference measurements of our domes are clear span, external support wall to the finish including possible sheaths and overall dome dimension, described below.

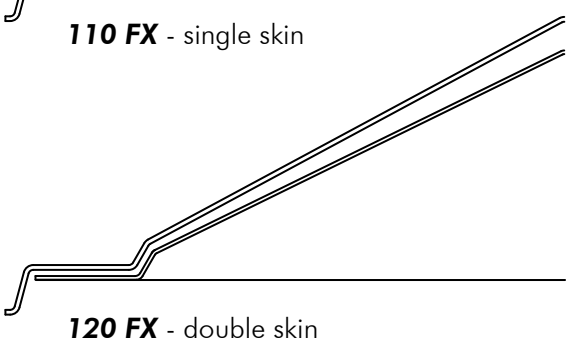
A - Clear span
B - External support wall
C - Overall dome dimension



Diamante series
(made upon request)



110 FX - single skin



120 FX - double skin

Diamante series domes and polymethyl methacrylate (PMMA) domes are only available UPON REQUEST AND DEPENDING ON THE QUANTITIES

Circular domes

Dimensions			Clamps	Models						Openings				
A	B	C		115 FX	125 FX	126 FX	M125 FX	M126 FX	K160 FX	MN	EL	SG	PU	NSHEV
⌀ 45	⌀ 58	⌀ 67	2	●	●	●	●	●			S			
⌀ 70	⌀ 83	⌀ 92	3	●	●	●	●	●		S	S			
⌀ 80	⌀ 93	⌀ 102	4	●	●	●	●	●		S	S			
⌀ 95	⌀ 108	⌀ 117	4	●	●	●	●	●		S	S			
⌀ 100	⌀ 113	⌀ 122	4	●	●	●	●	●	●	S	S			
⌀ 120	⌀ 133	⌀ 142	5	●	●	●	●	●	●	S	S			
⌀ 135	⌀ 148	⌀ 157	6	●	●	●	●	●		S	S			
⌀ 155	⌀ 168	⌀ 177	7	●	●	●	●	●	●	T	T			
⌀ 170	⌀ 183	⌀ 192	8	●	●	●	●	●	●	T	T			
⌀ 180	⌀ 193	⌀ 202	8	●	●	●	●	●		T	T			
⌀ 200	⌀ 215	⌀ 222	8	●	●	●	●	●		T	T			

Dimensions in cm.

Square domes

Dimensions			Clamps	Models						Openings				
A	B	C		115 FX	125 FX	126 FX	M125 FX	M126 FX	K160 FX	MN	EL	SG	PU	NSHEV
45x45	58x58	67x67	2	●	●	●	●	●		S	S			
70x70	83x83	92x92	3	●	●	●	●	●		S	S		●	●
80x80	93x93	102x102	4	●	●	●	●	●	●	S	S		●	●
95x95	108x108	117x117	4	●	●	●	●	●		S	S		●	●
100x100	113x113	122x122	4	●	●	●	●	●	●	S	S		●	●
120x120	133x133	142x142	6	●	●	●	●	●	●	S	S			●
125x125	138x138	147x147	6	●	●	●	●	●		S	S			●
140x140	153x153	162x162	8	●	●	●	●	●		T	T	●		●
150x150	163x163	172x172	8	●	●	●	●	●		T	T	●		●
155x155	168x168	177x177	8	●	●	●	●	●	●	T	T	●		●
170x170	183x183	192x192	10	●	●	●	●	●	●	T	T	●		●
180x180	193x193	202x202	10	●	●	●	●	●		T	T	●		
200x200	215x215	222x222	12	●	●	●				T	T	●		

Dimensions in cm.

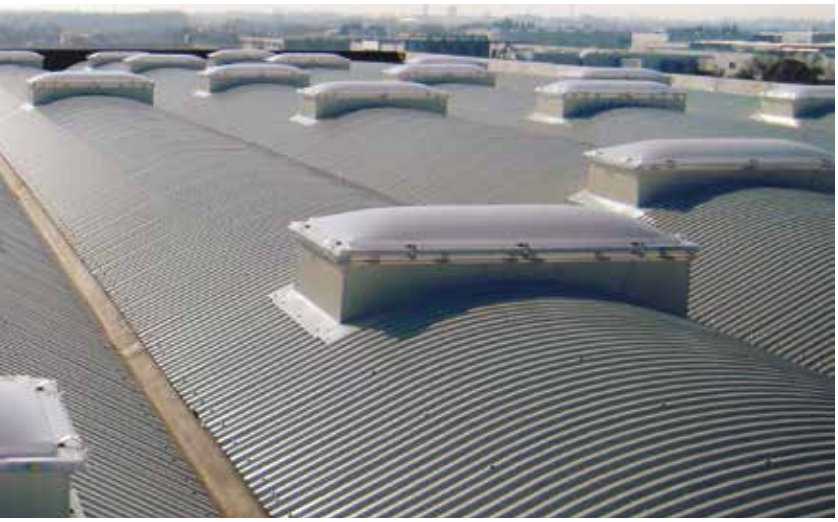
Rectangular domes

Dimensions			Clamps	Models						Openings				
A	B	C		115 FX	125 FX	126 FX	M125 FX	M126 FX	K160 FX	MN	EL	SG	PU	NSHEV
45x70	58x83	67x92	3	●	●	●	●	●		S	S			
50x250	63x263	72x272	8	●	●	●	●	●		S	S			●
55x155	68x168	77x177	6	●	●	●	●	●		S	S			●
60x100	73x113	82x122	4	●	●	●	●	●		S	S		●	●

Dimensions			Clamps	Models						Openings				
A	B	C		115 FX	125 FX	126 FX	M125 FX	M126 FX	K160 FX	MN	EL	SG	PU	NSHEV
60x250	73x263	82x272	8	●	●	●	●	●		S	S	●		●
70x100	83x113	92x122	4	●	●	●	●	●		S	S		●	●
70x120	83x133	92x142	6	●	●	●	●	●		S	S		●	●
70x170	83x183	92x192	6	●	●	●	●	●	●	S	S			●
70x230	83x243	92x252	10	●	●	●	●	●		S	S	●		●
80x120	93x133	102x142	6	●	●	●	●	●		S	S		●	●
80x180	93x193	102x202	6	●	●	●	●	●		S	S	●		●
80x220	93x233	102x242	8	●	●	●	●	●		S	S	●		●
80x250	93x263	102x272	10	●	●	●	●	●	●	S	S	●		●
80x300	93x313	102x322	10	●	●	●	●	●		T	T	●		
85x205	98x218	107x227	8	●	●	●	●	●	●	S	S	●		●
90x170	103x183	112x192	8	●	●	●	●	●		S	S			●
90x200	103x213	112x222	8	●	●	●	●	●		S	S			●
90x220	103x233	112x242	10	●	●	●	●	●		S	S			●
90x240	103x253	112x262	10	●	●	●	●	●		S	S			●
90x250	103x263	112x272	10	●	●	●	●	●		S	S			●
95x155	108x168	117x177	8	●	●	●	●	●		S	S			●
100x120	113x133	122x142	6	●	●	●	●	●		S	S			●
100x150	113x163	122x172	8	●	●	●	●	●	●	S	S			●
100x200	113x213	122x222	8	●	●	●	●	●	●	S	S	●		●
100x220	113x233	122x242	8	●	●	●	●	●	●	S	S	●		●
100x250	113x263	122x272	10	●	●	●	●	●	●	T	T	●		●
100x300	113x313	122x322	10	●	●	●	●	●		T	T	●		
120x170	133x183	142x192	10	●	●	●	●	●	●	S	S			●
120x200	133x213	142x222	10	●	●	●	●	●		T	T	●		●
120x220	133x233	142x242	10	●	●	●	●	●	●	T	T	●		●
120x240	133x253	142x262	10	●	●	●	●	●	●	T	T	●		●
120x250	133x263	142x272	10	●	●	●	●	●	●	T	T	●		●
120x265	133x278	142x287	12	●	●	●	●	●		T	T	●		
120x300	133x313	142x322	12	●	●	●	●	●		T	T	●		
125x250	138x263	147x272	10	●	●	●	●	●		T	T	●		●
140x250	153x263	162x272	14	●	●	●	●	●	●	T	T	●		●
150x250	163x263	172x272	14	●	●	●	●	●	●	T	T	●		●
160x200	173x213	182x222	12	●	●	●	●	●		T	T	●		●
160x250	173x263	182x272	14	●	●	●	●	●	●	T	T	●		●
170x265	183x278	192x287	14	●	●	●	●	●		T	T	●		

Dimensions in cm.

Diamante **series domes and polymethyl methacrylate (PMMA) domes are only available UPON REQUEST AND DEPENDING ON THE QUANTITIES**



Continuous skylights

035 FX series

***035 FX* series** continuous modular skylights are manufactured by thermoforming first quality polycarbonate (PC) sheets, in **standard opal white colour**.

In addition to **robustness** and **light diffusion**, they have an **excellent impact behaviour** and guarantee an **high resistance to heat** in all those situations where the safety of people and things is a determinant factor which cannot be ignored.

Each intermediate element, 180/270 cm long, is realized with **stiffening ribs** 30 cm spaced. Cutting appropriately the ribs, it is possible to obtain sub-multiple 30, 60 or 90 cm long.

These skylights are surely the ideal solution to take advantage of natural zenithal lighting, as their **modularity** permits to have very long roof openings. The possibility of obtaining solutions in **single**, **double** or **triple skin** allows to install our skylights in the most different environmental conditions. Thanks to this range of solutions, we can solve the problem of thermal insulation that is becoming more and more important in terms of energy saving. This is one of the reasons that led CAODURO® to create new models.

M35 FX series allows double or triple skin solutions. It is realized with the external skin made of solid thermoformed sheet (single or double) and gives greater guarantees of weather resistance, while the internal skin, consisting of a flat alveolar polycarbonate sheet, provides a better thermal transmittance value.

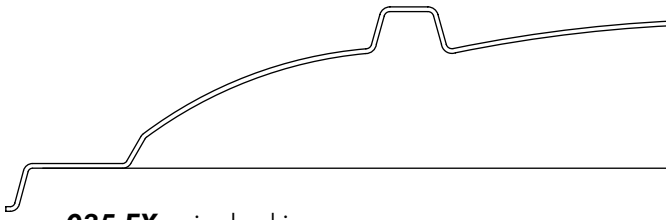
The **fastenings** are made with **standard clamps**, which offer the **maximum guarantee to water tightness and thermal expansion**.

In order to get a correct installation, the skylights need a perimeter support with thickness to the finished of any sheaths of 7.5 cm on concrete walls, wood, prefabricated glass fibre-reinforced plastic (GFRP) or metallic upstands.

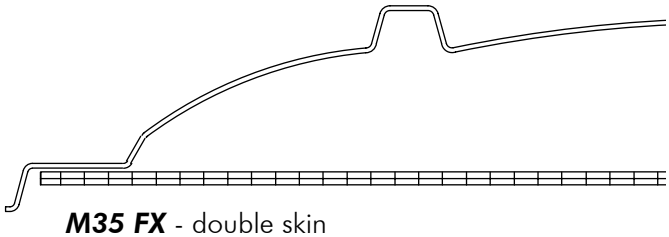
CAODURO® skylights are manufactured and tested according to the following European Standard which requires CE marking: EN 14963 *Roof coverings – Continuous rooflights of plastics with or without upstands – Classification, requirements and test methods*.

It is possible to apply to each model the whole or partial opening systems, listed on pages 52-54.

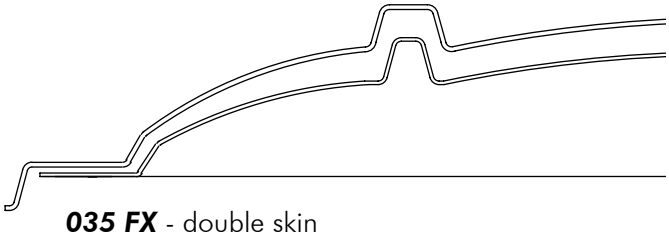
Thanks to a wide range of accessories, our skylights can be employed in private dwellings as well as in commercial and industrial buildings: a quality product guaranteed over time.



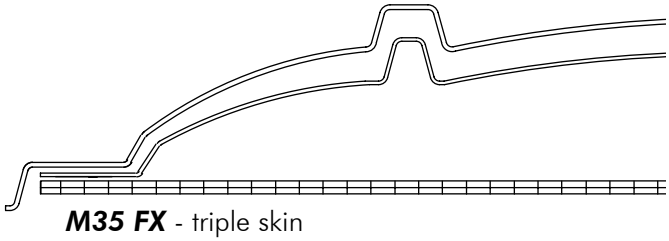
035 FX - single skin



M35 FX - double skin



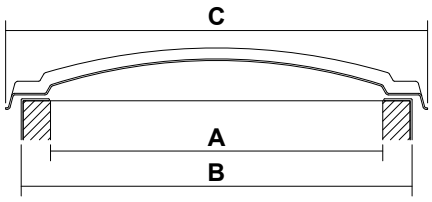
035 FX - double skin



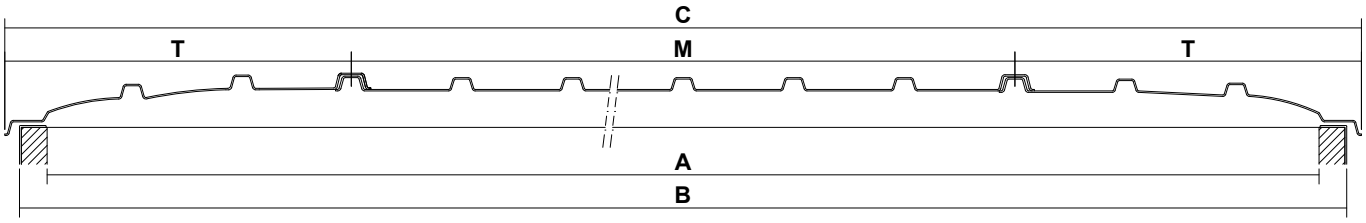
M35 FX - triple skin

Thermal transmittance values up to U=1.1 W/m²K

Dimensions



A - Clear span
B - External support wall
C - Overall skylight dimension
M - Intermediate element
T - Head element



A	70	75	85	90	100	110	120	125	130	140	150*	165*	175	185	200	230	240	250	300
B	85	90	100	105	115	125	135	140	145	155	165	180	190	200	215	245	255	265	315
C	92	97	107	112	122	132	142	147	152	162	172	187	197	207	222	252	262	272	330
T	90	90	90	90	90	90	90	90	90	90	90	90	90	90	180	180	180	180	180
M	180	180	180	180	180	180	180	180	180	180	270	270	180	180	180	180	180	180	180
035	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
M35	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

***element with a length different than 180 cm.**
Dimensions in cm.

Polymethyl methacrylate (PMMA) skylights are only available UPON REQUEST AND DEPENDING ON THE QUANTITIES

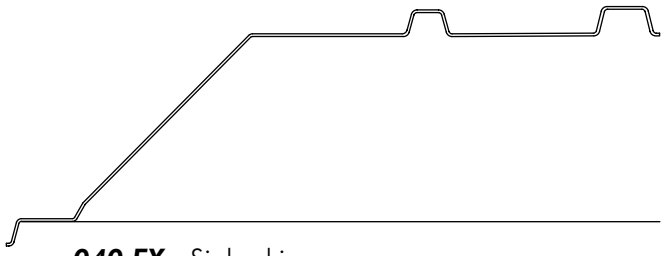
040 FX - 045 FX series

Continuous modular ***040 FX*** (**single skin**) and ***045 FX*** (**double skin**) series skylights are manufactured by thermoforming first quality polycarbonate (PC) sheets, in **standard opal white colour**.

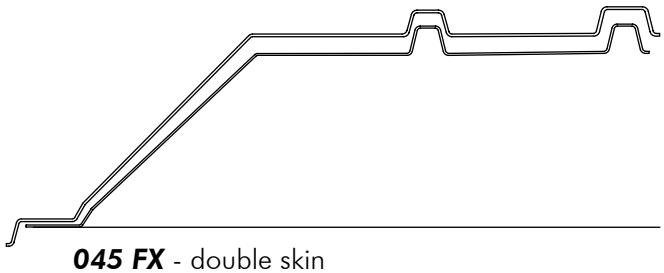
Each intermediate element, 180 cm long, is realized with 7 stiffening ribs 30 cm spaced. Cutting appropriately the ribs, it is possible to obtain sub-multiple 30, 60 or 90 cm long.

These skylights are surely the ideal solution to take advantage of natural zenithal lighting, as their **modularity** permits to have very long roof openings.

It is possible to apply to both models the whole or partial opening systems, listed on pages 52-54.

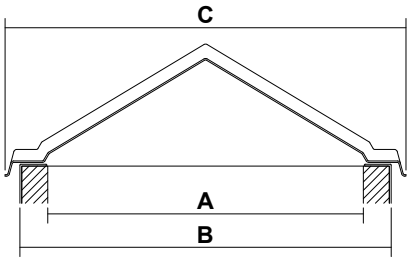


040 FX - Sigle skin

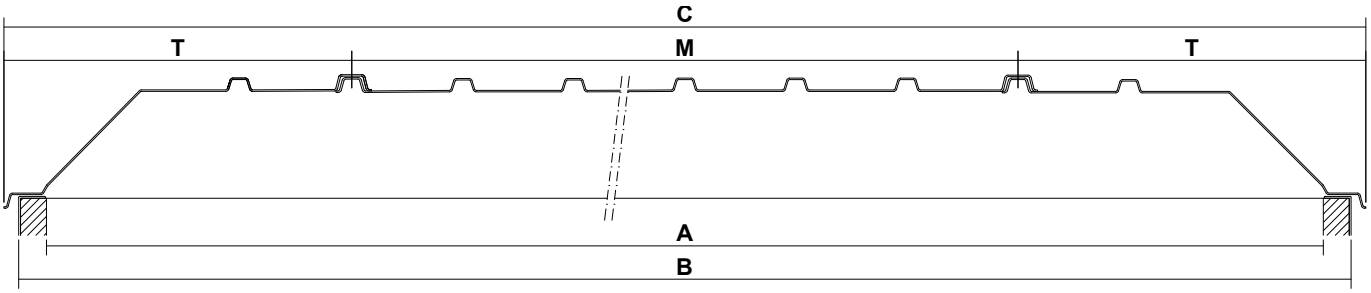


045 FX - double skin

Dimensions



A - Clear span
B - External support wall
C - Overall skylight dimension
M - Intermediate element
T - Head element



A	50	65	85	95	100	105	110	120*	125	135	140	150	160	175	200	220**
B	65	80	100	110	115	120	125	135	140	150	155	165	175	190	215	235
C	72	87	107	117	122	127	132	142	147	157	162	172	182	197	222	242
T	90	90	90	90	90	90	90	90	90	90	90	90	90	90	60	60
M	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	175

***cross element available upon request.**
****element with a length different than 180 cm.**
Dimensions in cm.

Polymethyl methacrylate (PMMA) skylights are only available UPON REQUEST AND DEPENDING ON THE QUANTITIES

Alveolar polycarbonate

K160 FX series monobloc domes

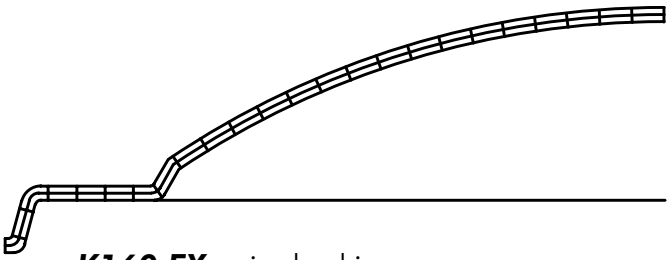
K160 FX series monobloc domes have been introduced for their **excellent thermal insulation** at the expense of great load bearing capacity obtained with solid polycarbonate sheets and a lower hail resistance. They are manufactured by thermoforming **alveolar polycarbonate** sheets, **UV rays protected**, in **standard opal white colour**, with reaction to fire classification B-s2-d0 according to EN 13501-1 Standard.

Available dimensions and opening systems are listed on pages 34-35.

The **fastenings** are made with **standard clamps**, which offer the **maximum guarantee to water tightness and thermal expansion**.

In order to get a correct installation, the domes need a perimeter support with thickness to the finished of any sheaths of 6.5 cm on concrete walls, wood, prefabricated glass fibre-reinforced plastic (GFRP) or metallic upstands.

CAODURO® domes are manufactured and tested according to the following European Standard which requires CE marking: EN 1873 *Prefabricated accessories for roofing - Individual rooflights of plastics – Product specification and test methods*.



K160 FX - single skin

K35 FX series continuous skylights

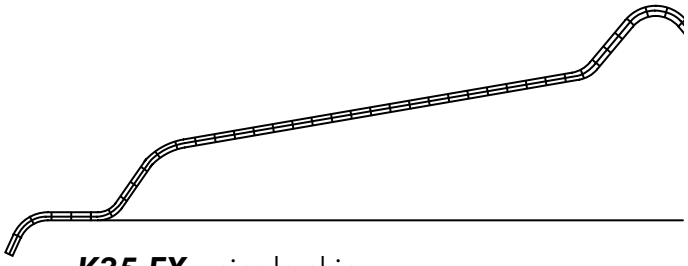
In order to meet the new market needs, ***K35 FX*** series has been introduced for its **excellent thermal insulation**, at the expense of a great load bearing capacity obtained with solid polycarbonate sheets (*035 FX* and *M35 FX*) and a lower hail resistance. *K35 FX* series is manufactured by thermoforming **alveolar polycarbonate** sheets, **UV rays protected**, in **standard opal white colour**, with reaction to fire classification B-s2-d0 according to EN 13501-1 Standard.

It is possible to apply to this series the whole or partial opening system, listed on pages 52-54.

The **fastenings** are made with **standard clamps**, which offer the **maximum guarantee to water tightness and thermal expansion**.

In order to get a correct installation, the skylights need a perimeter support with thickness to the finished of any sheaths of 7.5 cm on concrete walls, wood, prefabricated glass fibre-reinforced plastic (GFRP) or metallic upstands.

CAODURO® skylights are manufactured and tested according to the following European Standard which requires CE marking: EN 14963 *Roof coverings – Continuous rooflights of plastics with or without upstands – Classification, requirements and test methods*.

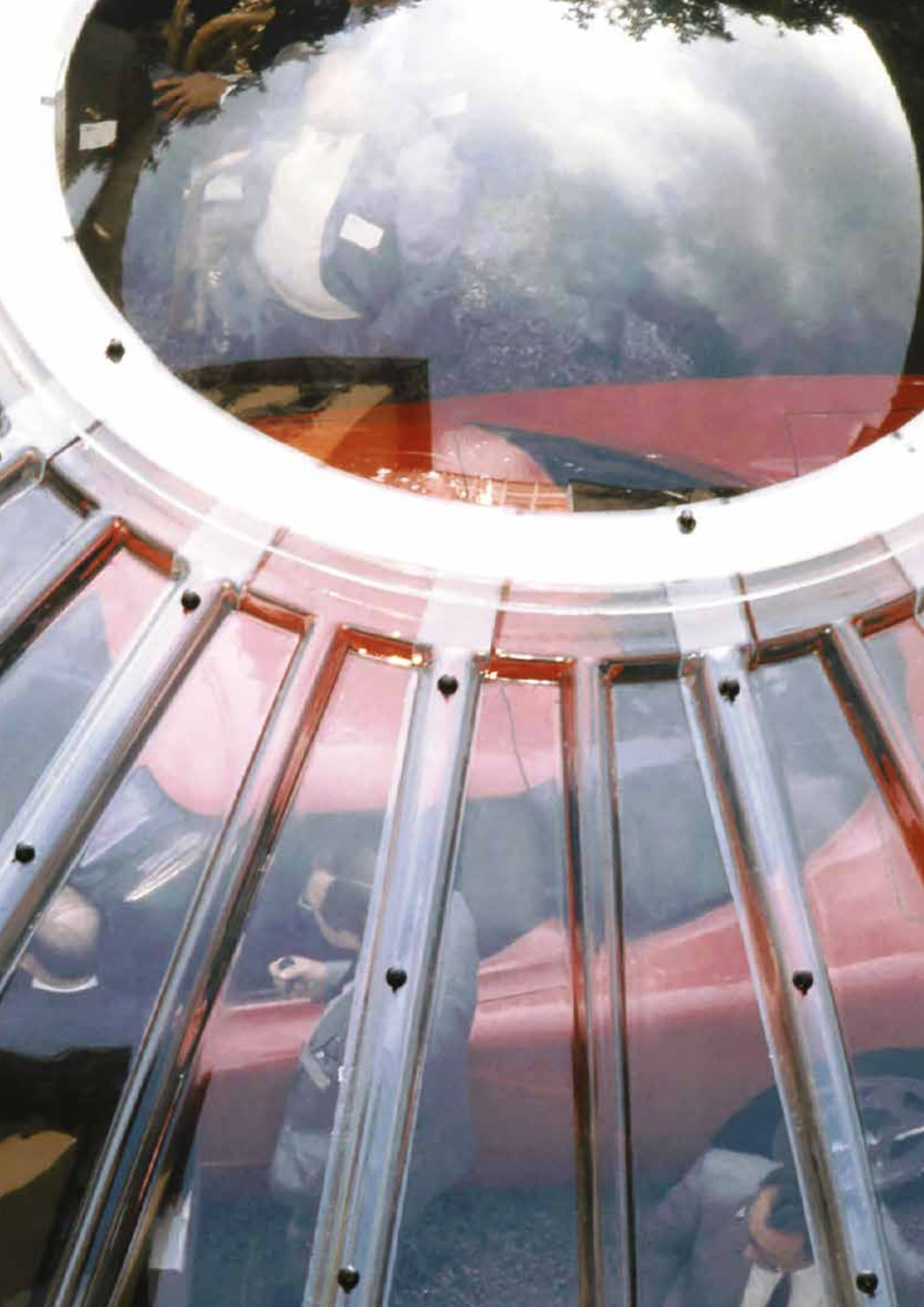


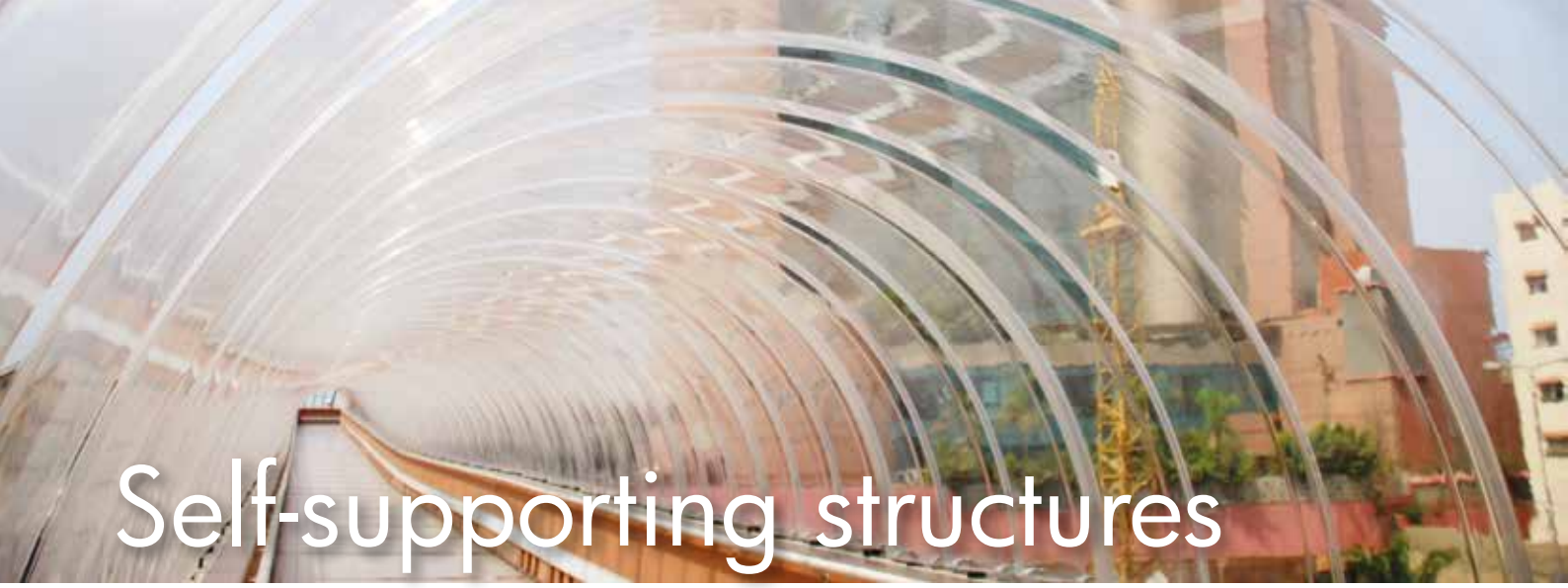
K35 FX - single skin

Dimensions

A	85	90	100	110	120	125	140	150	165
B	100	105	115	125	135	140	155	165	180
C	107	112	122	132	142	147	162	172	187
T	90	90	90	90	90	90	90	90	90
M	180	180	180	180	180	180	180	180	180

Further dimensions are available upon request and depending on the quantities.
Dimensions in cm.





Self-supporting structures

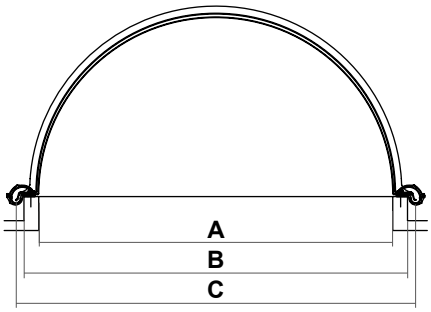
Self-supporting thermoformed tunnels

Manufacturing consists of heat-bending high quality thermoplastic polymers sheets, such as polycarbonate (PC).

Thermoforming process induces a partial orientation of the polymer molecules. During moulding, **stiffening ribs** are realized every 90 cm in order to make the **tunnel self-supporting** and able to withstand standard static and dynamic stresses as required. It is possible to obtain 90 cm long elements by cutting the centre of intermediate ribs (60 cm long elements in case of 300 cm modules).

The **absence of metal ribs avoids** the formation of thermal bridges and, therefore, possible **condensation forming**. The **tunnel** is so **completely transparent** and the spreading light is uniform.

Vertical closing head elements are **available upon request** for every size. They are manufactured by thermoforming flat sheets in two different shapes according to the tunnel size: **smooth and slightly rounded** or **moulded with reinforcing ribs**. Moulded ribs improve rigidity of the element, making it stable and safe even for the biggest dimensions.



A - Clear span
B - External support wall
C - Overall tunnel dimension
M - Intermediate element
F - Rib spacing

A	100	120	140	160	180	200	220	240	300
B	115	135	155	175	195	215	235	255	315
C	122	142	162	182	202	222	242	262	322
M	180	180	180	180	180	180	180	180	180
F	90	90	90	90	90	90	90	90	60

Dimensions in cm.

Head elements

A	100	120	140	160	180	200	220	240	300
	Thermoformed smooth and slightly rounded					Thermoformed with ribs			

Self-supporting modular domes

This production is still **CAODURO®'s pride** as regards the technology applied to thermoplastic products.

One of a kind, this type of dome is **self-supporting** with no need of metallic structures up to 800 cm diameter. The mathematical model for the static study of the dome was conceived by the Material Engineering Department of the University of Padua.

Since the dome is completely transparent, **light passes uniformly**. Moreover, because of the **absence of metal ribs** there are no compatibility problems between different materials due to the thermal expansion at different temperatures, and thermal bridges can be avoided.

In case **daily ventilation** is required, the central top ring can be supplied with an **electric opening device**. Motorization, connection and positioning of the power supply remain visible.

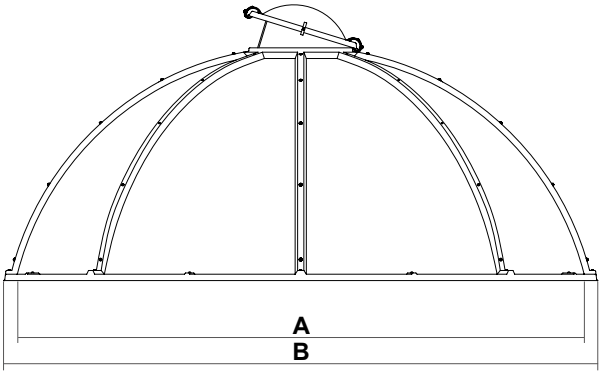
Single skin solution is recommended where there are no particular problems related to thermal insulation (external structures, etc.). **Double skin** solution is instead suggested for coverings to be installed on buildings having a controlled climate, where a low thermal transmittance improves the inside comfort.

Standard colours are **opal white** or **clear transparent**.

Single skin

Clear span A	Ext. support wall B	Electric opening	Segments
⌀ 400	⌀ 418	●	8
⌀ 455	⌀ 470	●	8
⌀ 760	⌀ 785	●	16

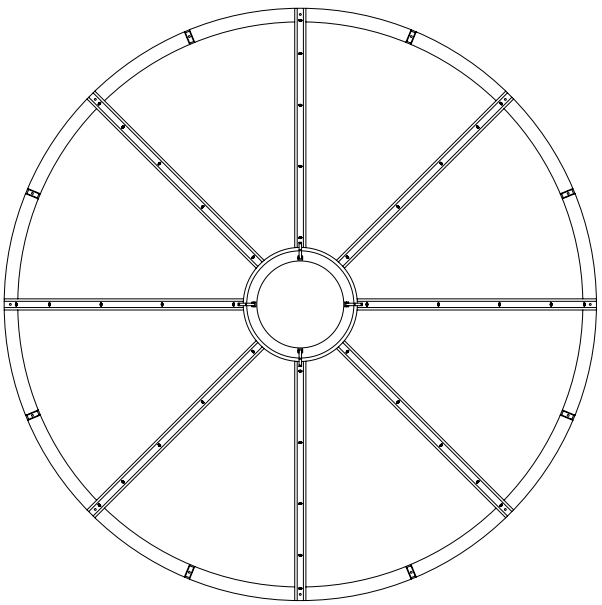
Dimensions in cm.



Double skin

Clear span A	Ext. support wall B	Electric opening	Segments
⌀ 395	⌀ 418	●	8
⌀ 450	⌀ 470	●	8
⌀ 750	⌀ 785	●	16

Dimensions in cm.



Ribbed structures

S series skylights

S series **ribbed skylights** have been conceived to offer the designer a **standard** product.

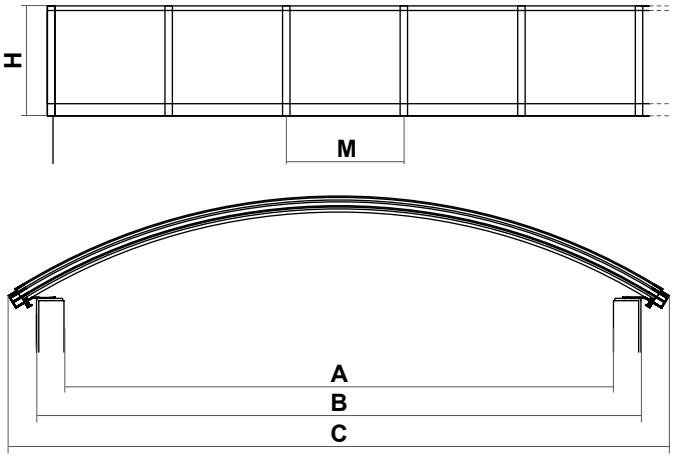
First quality materials, modular flexibility given by the aluminium rib structure together with a pleasant aesthetic aspect make this product the **right choice for every application need**.

S series skylights can be **single or double skin**, using solid polycarbonate (PC) sheets or, upon request, alveolar polycarbonate sheets.

Rib spacings M vary according to the sheet type used, as shown in the table. Any excess in length compared to the expected multiples of the modules is compensated with an element that can be positioned laterally or centrally to the skylight, depending on the shape of the hole.

Such as standard continuous skylights, even *S* series ribbed skylights **can be provided with manual or electric partial opening devices** (one or more pushing points depending on the size), or with **whole opening devices** by means of **electric** motor and about 70 cm long racks.

A - Clear span
B - External support wall
C - Overall tunnel dimension
M - Intermediate element
H - 1/7 B



A	85	100	120	150*	180*	200*
B	100	115	135	165	195	215
C	110	125	145	175	205	225
M - solid polycarbonate					207.5 cm	
M - alveolar polycarbonate					212.5 cm	

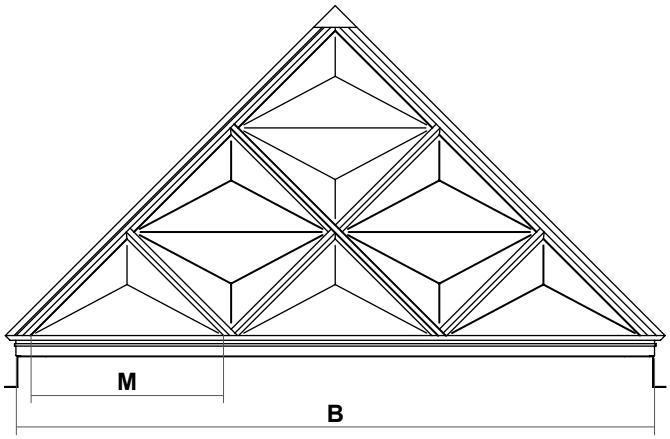
*** Inner reinforcement rib on the centre of the module.**
Dimensions in cm.

Thermoformed ribbed pyramids

Ribbed pyramids on **square bases** are realised with thermoformed sheets, with **45° inclined pitches**.

The system consists of **aluminium ribs** and **moulded sheets** having rhomboidal shape with **pyramidal triangles** which give **non-deformability** to the elements. The **skin** can be **single or double** for a better thermal insulation.

Ribbed pyramids are made with solid polycarbonate (PC) sheets, in **clear transparent**, **opal white** or **smoky bronze colours**. The ribs are made of extruded aluminium alloy, protected by anodizing or by epoxy powder coating.



M	B	B	B	B	B
175	350	525	700	875	**
200	400	600	800	1000	**
300	300*				

*** Pyramid with 30° inclined solid polycarbonate pitches.**
**** For base dimensions over 800 cm and 875 cm, bearing structure will be supported by a properly treated steel frame.**
Dimensions in cm.

Flat ribbed pyramids

Ribbed pyramids with flat sheets are similar to the previous pyramids as far as the structural part is concerned, while they differ in terms of sheets.

For this application **alveolar polycarbonate sheets**, in **clear transparent** or **opal white colour**, are overlaid by solid polycarbonate sheets in order to ensure greater resistance to hail.

The ribs are made of extruded aluminium alloy, protected by anodizing or by epoxy powder coating.

Ribbed tunnels, ribbed domes and ribbed *Pagoda* shaped domes

The system, entirely designed and built in CAODURO®, consists of **aluminium ribs and cold bended sheets** in order to provide the greatest flexibility and design freedom. There are in fact **no particular constraints** as regards, for example, the arch height, the distance between the ribs and the transparent sheet thickness.

Standard production uses polycarbonate sheets in clear transparent or opal white colour, **extruded aluminium alloy ribs** protected by natural, black or dark brown colour **anodizing** or **epoxy powder** RAL 9010 white colour **coating**.

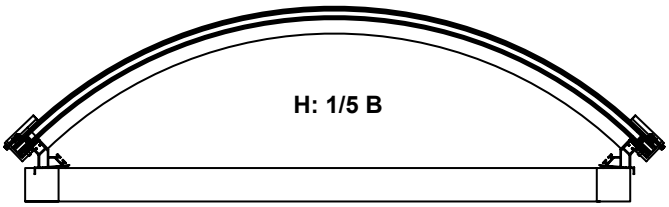
Different colours are available upon request.

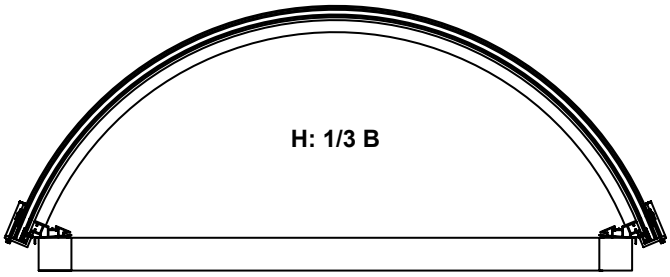
Polycarbonate sheet has a good cold bending performance which, while manufacturing, causes a certain stress that has to be taken into account when choosing the right sheet thickness according to the tunnel diameter.

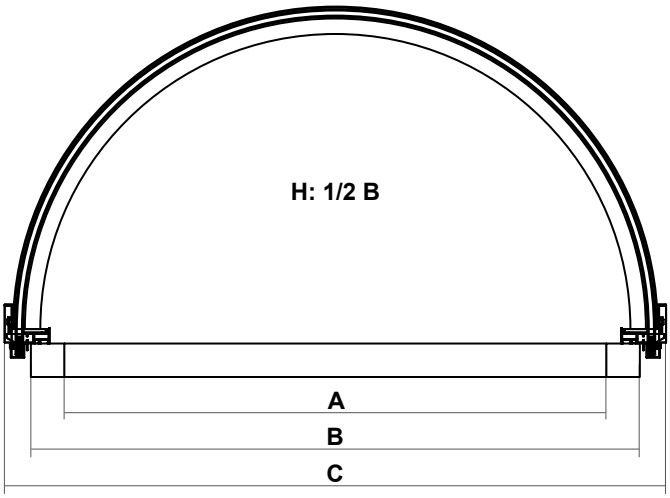
All these **details** allow us to offer a roof cover with **cold bended sheets less stressed** and, as a result, with **greater technical characteristics** and **durability**.

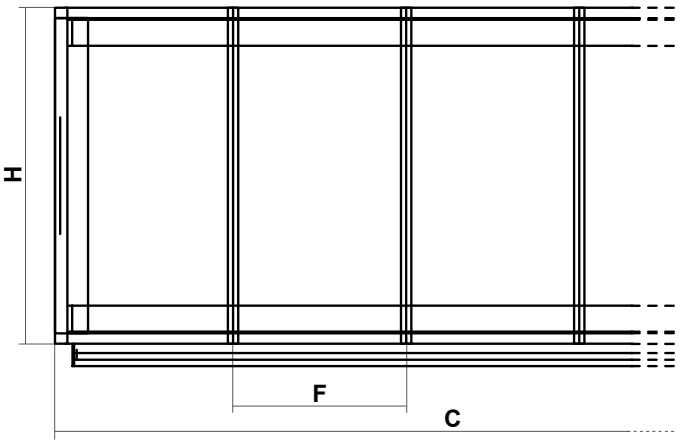
The use of alveolar polycarbonate, due to its particular rigid structure (multiwall with ribs), requires great attention not to use cold bended sheets with a lower bending radius than those recommended by the sheets manufacturer, so that stress does not affect mechanical performance of the product over time. Alveolar polycarbonate, moreover, presents a marked decay of optical characteristics (yellowing, fragility). In order to reduce this phenomenon, standard CAODURO® tunnel production with this kind of sheet is exclusively employed using **both UV rays protected walls**.

All models, systems and structures shown below are protected by international patents.

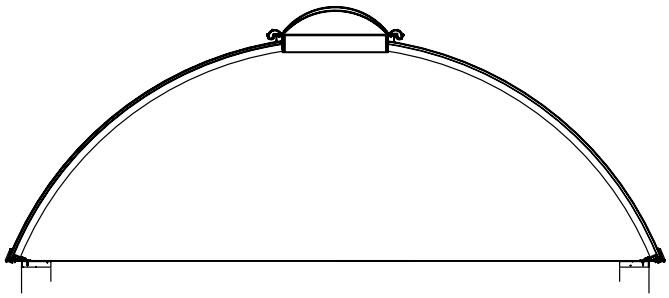


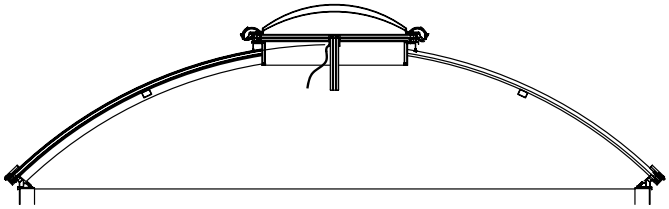


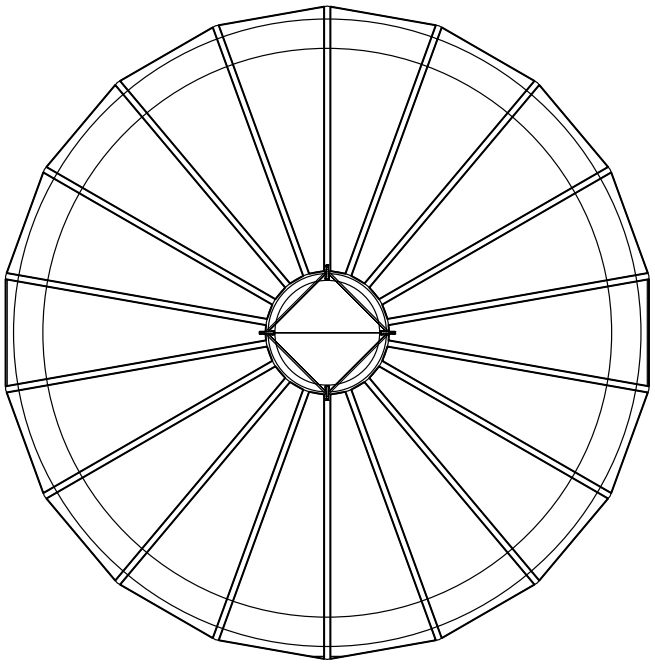


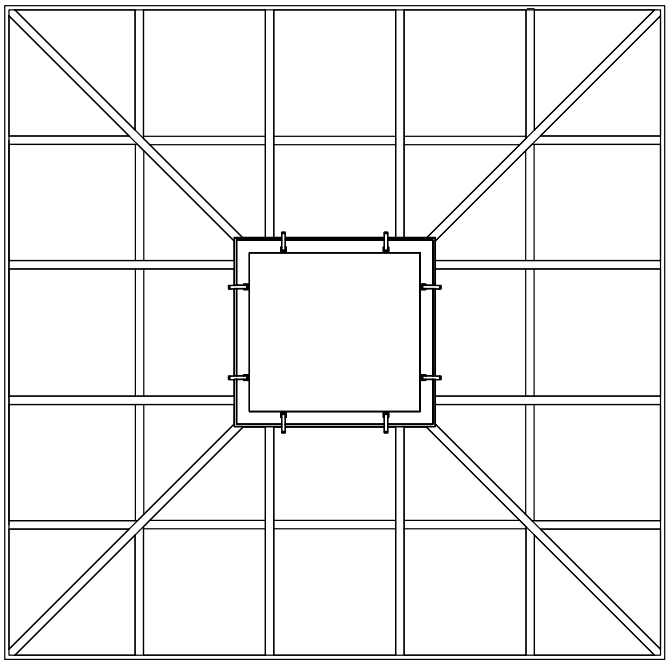


A - Clear span
B - External support wall
C - Overall tunnel dimension
F - Rib spacing
H - Arch height









Special coverings

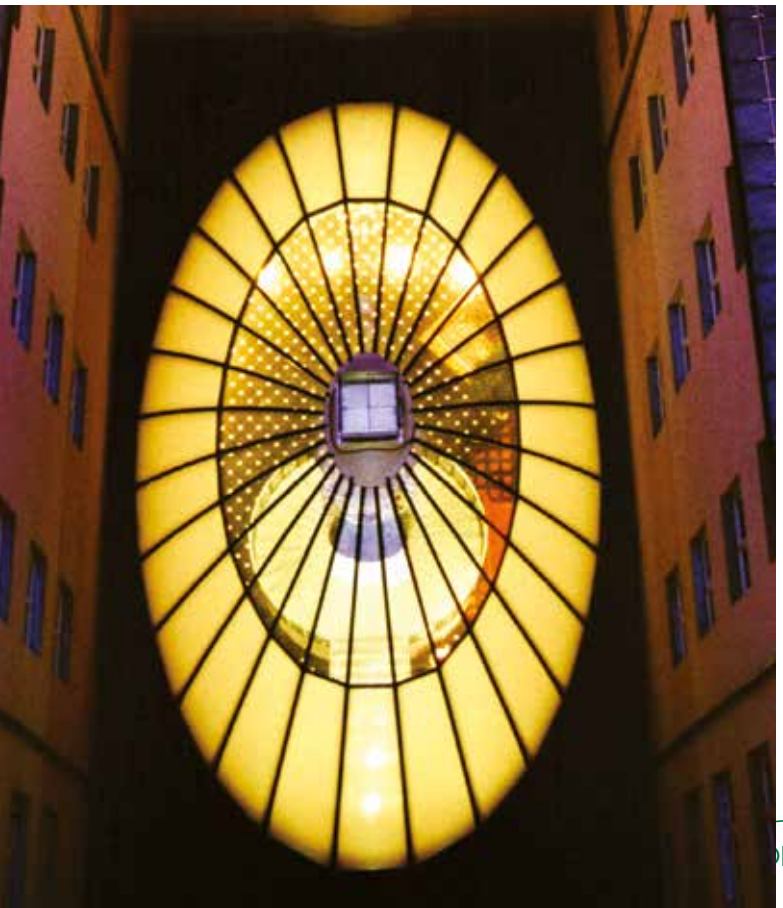
All those coverings that are not included in standard production regarding **structural details**, **dimensions** or **shape**, fall within the category "**custom made special coverings**".

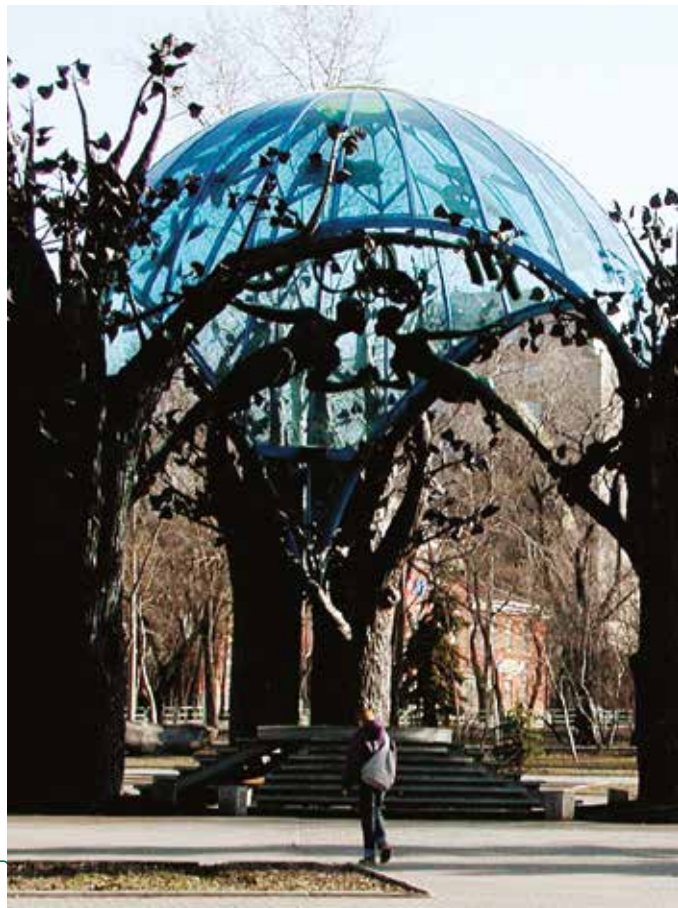
Best solutions are studied with the collaboration of designers and clients from every point of view, with particular **attention to aesthetic**, **functional** and **economic aspects**. Most of the time the final result is a combination of standard products that gives rise to one of a kind roof cover.

Technical experience, gained over 65 years in the field of domes and skylights, gives the possibility to our technicians to participate to the creation of special roof coverings from the very beginning.

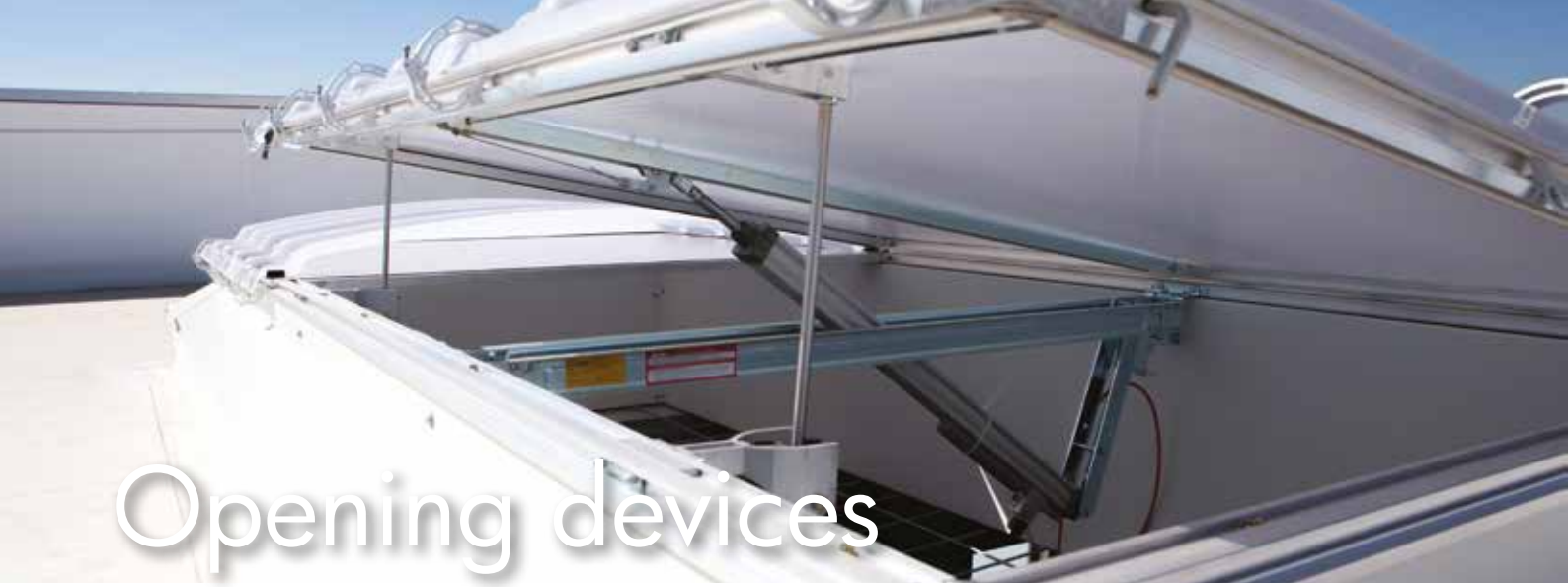
Therefore, CAODURO® proposes itself as an ideal partner as far choice of materials, shape definition and structural tests are concerned. The most actual way to be on the market.

Thanks to a close collaboration with architects and designers and the confidence of our clients, CAODURO® will more and more mean "*not only skylights*".





DAILY VENTILATION SYSTEM



Opening devices

All CAODURO® domes and skylights can be equipped with **opening devices** for **daily ventilation**, electric or manual, **applicable to any support structure**.

These devices are designed with aluminium profiles for circular, square and rectangular shapes.

Moreover, they can be connected to ***AIR FLOW***™ devices to improve the ventilation system performance of each room (see pages 90-91).

For applications on monobloc domes, see the diagram on page 33 and the dimensions tables on pages 34-35.

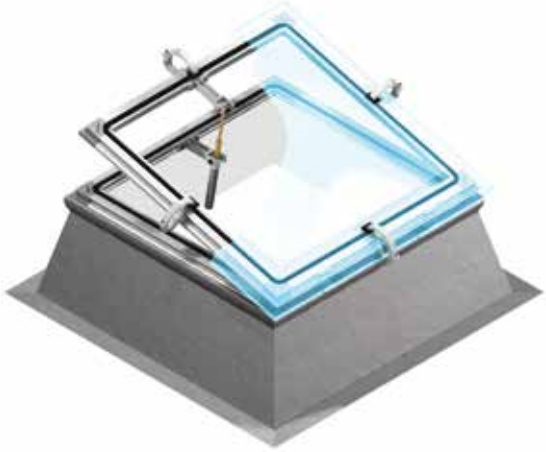
Manual opening device

Manual opening devices are made of aluminium profiles, moved by a screw jack which is actioned by a crank handle available in different lengths.

Depending on the size of the dome, it is possible to install one (**single drive**) or two (**tandem drive**) screw jacks connected to each other and actioned by a single crank handle.

Regarding tandem opening device, pushing points are placed on the long side of the dome.

For continuous skylights, manual opening device is available on 180 cm intermediate elements.



Manhole opening device

Manhole opening device is **used exclusively to allow occasional access to the roof**, for example in case of maintenance.

The **opening** is actioned **from the inside** with a locking/unlocking handle **provided with one or two gas springs** depending on the size of the dome. These gas pistons help the operator to open the dome until reaching an 80°-90° angle.

Upon request the **opening from the outside** is available.

Electric opening device

Electric opening devices are made of aluminium profiles, moved by **one or two** 230 V single-phase electric **motors**. The end of stroke switch and motor thermal protection are included.

SG bound electric opening device

The new **patented** opening device named ***SG bound electric opening device*** increases the range of electric openings, focusing attention on **resistance in particular conditions**.

These devices are made, for square and rectangular shaped domes, with aluminium profiles. The opening is always operated by a 230 V single-phase electric **motor**, provided with an end of stroke switch and a motor thermal protection. **Frame tightness** is always **guaranteed by 3 holding points**, both while closing and with open skylight. For continuous skylights, the opening device is available on 180 cm intermediate elements, with clear span greater than 125 cm.

U1 bound electric opening device

The new **patented** opening device named ***U1 bound electric opening device*** is applied to continuous skylights up to 7.20 m length, focusing attention on **resistance in particular conditions**.

The opening is operated by **one to four** 230 V single-phase electric **motors**, each provided with an end of stroke switch and a motor thermal protection. **Frame tightness** is always **guaranteed by the motors and by retaining points**, both while closing and with open skylight.

Electric opening device with motor and racks

All CAODURO® domes and skylights can be equipped with **opening devices** for **daily ventilation**, electric or manual, **applicable to any support structure**.

These devices are designed with aluminium profiles for circular, square and rectangular shapes.

Moreover, they can be connected to ***AIR FLOW***™ devices to improve the ventilation system performance of each room (see pages 90-91).

Vertical™

Vertical™ is a **patented electric opening device** with motor and racks with **vertical lifting**. **It can be applied to both monobloc domes and continuous skylights** and allows the **whole opening** with adjustable height.

A **230 V central motor** allows, by means of a **connecting rod**, the mechanical movement of the **racks with an opening stroke length up to 100 cm upon request**.

The flashings, made of opal polycarbonate, galvanized steel or prepainted steel allow to keep the skylight open even in case of rain, at a reduced height.

Low thermal transmittance profile *BT*

Following European Directive 2002/91/CE, Italian Legislative Decree D.Lgs n° 311 and subsequent D.Lgs n° 192, Italy has aligned itself with other member countries as far as energetic performance arrangements to be respected are concerned.

Always in the forefront proposing innovative products with low environmental impact, CAODURO® has integrated the production range with new solutions in order to adequate standard production to new requirements.

The problem concerned especially openable domes and skylights, which use aluminium extruded profiles without thermal break. As known, this constructive mode greatly penalizes thermal performance of the product. Thanks to specific studies and the use of innovative technologies, CAODURO® has developed a **special patented profile to be applied to the frame**.

BT is the new CAODURO® profile that extends the existing products range. Applied to aluminium frames, it improves thermal performance, ensuring compliance with the strictest local regulations. **Its use allows access to tax incentives** provided on the matter by the new financial laws on energy saving.

Made of extruded PVC, grey coloured, it responds to the most demanding requirements: **low thermal transmittance**, **savings**, **comfort** and **strength**, **care in aesthetics**.

Thanks to special rails, it can be applied even to existing frames **quickly and easily**.

BT is a **patented** CAODURO® **profile**. A guarantee of reliability and duration over time.

CRX1 and CTX1 for 230 V AC motors radio control

The pair composed by ***CTX1* transmitter** and ***CRX1* radio receiver** allows to command **opening and closing of up to two 230 V standard motors* connected in parallel**, each with 200 W absorption maximum.

During installation it is necessary to respect 30 cm minimum distance between the receiver and adjacent metal structures and the 20 cm minimum distance between the receiver and another receiver.

CRX1 features are: IP protection rating 55, power supply 230 V AC 50 Hz, operating temperature from -20 °C to +60 °C, Class II (after installation), radio frequency 433.420 MHz, relay contacts 3.15 A – 250 V AC.

***For the control of A02024 motors please contact our technical service.**

Sunshade sliding curtain and insect screen

Sunshade sliding curtain is available with **both electric and manual operation**. It is **installed upon request** under the upstand of our domes or on the ceiling in presence of false-ceilings or chimneys of lighting.

Insect screen is fixed and installed upon request under the frame or under the upstand.

GUARDIAN™ wind and rain detector

***GUARDIAN*™ patented weather detection system**, which can be connected to electric opening devices, allows domes and skylights **automatic closing in case of wind and rain**, even if the opening has been occurred by a remote button.

If domes and skylights have been accidentally left open, this device, by acting on their forced closing, allows the underneath compartments to be preserved from possible atmospheric precipitations and avoids damage to domes and skylights themselves in presence of strong wind.

Connecting **CAODURO® *MDR2* module** to the motors it is possible to manage the **opening and closing by remote control**.

Electric wiring diagrams and complete manuals are available by contacting our offices.

***GUARDIAN*™** detector **is equipped with a wind-rain sensor**, for which it is possible to choose the speed of intervention. The sensor has to be installed in an open-air place.

One of a kind, it allows domes and skylights closure upon weather sensor signal even if the opening has been occurred from a remote control and not from the control system itself.

***GUARDIAN*™ is deactivated in the event of a fire emergency, thus avoiding to hinder the opening of *SMOKE OUT*® systems.**

MDR2 module for parallel connection of domes and skylights

It allows to power a group of 230 V single-phase motors and connect it to other modules in order to **obtain a centralized automation of domes and skylights in the roof**. It is also possible to control only the group of skylights directly connected using the local commands provided with this module.

The installed ***MDR2* modules** can be **simultaneously operated by the connected *GUARDIAN*™ detector**. An unlimited quantity of *MDR2* modules can be controlled from each output of the detector, while still allowing general action using the external buttons or the detector panel buttons.

It is not possible to use motors with different voltage than 230 V mains for *GUARDIAN*™ wind and rain detector neither for *MDR2* module. The maximum current for each motor output is 5 A, 230 V.


CAODURO®

SMOKE AND HEAT EXHAUST VENTILATION SYSTEMS

Absolute safety with NSHEV CAODURO®

The main task of smoke and heat exhaust ventilators is to ensure personal safety in the event of fire and to facilitate rescue work as much as possible. Ensuring a smoke-free layer above the floor makes the outflow of people safe and panic-free, as well as guarantees rescue team an easy identification of fire sources. It is now well known that deaths in case of such an event are almost exclusively caused by the presence of smoke (as a product of combustion including hot and toxic gases) and not directly from the fire itself.

In order to solve these problems, Italian UNI 9494 Standard was first designated as system standard, then integrated with EN 12101-2 Standard as heat and smoke exhaust ventilation product standard, which provides precise rules regarding the construction of ventilators, their quantity and their installation on the roof.

Italian UNI 9494 Standard makes the number of heat and smoke ventilators depend on the building size, the type of material stowed, the presence of alarm systems. Moreover, in order to ensure the aerodynamic efficiency of the system, it requires the presence of openings for fresh air intake, positioned in the lower part of the building such as to amplify the upward effect of hot gases.

It will be designer's task to decide the location of these openings in order to drive smoke in the opposite direction to safety exits in the event of fire, thus ensuring an easy evacuation of people. The possibility of discharging smoke exhaust in the upper part due to the upward effect delays the possible collapse of the building structures.

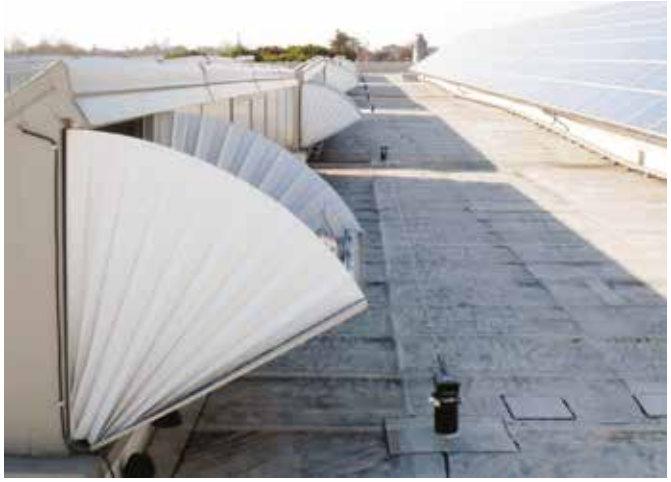
Our products

Always careful with safety issues, CAODURO® offers NSHEV natural smoke and heat exhaust ventilators complete with a wide range of remote control systems, so as to satisfy current standards as well as various design requirements.

Production goes from simple manual remote activation device up to the most complete system, which can control both emergency ventilation opening and daily ventilation opening/closing.

The operation of the system as a whole relies on activation of a thrust mechanism using compressed gas, powerful and reliable, such as to ensure the opening of natural ventilators even in the most critical snow or wind conditions. Internal energy is supplied by micro CO_2 gas cylinders, while the remote actuation device can be operated electrically or by means of adduction lines connecting the various natural ventilators to a control unit, equipped with CO_2 or N_2 cylinders.

The closing of natural ventilators in two points, which has always been a feature of our products, guarantees over time the essential frame integrity compared to that of a single point.



A wide range of accessories makes these systems flexible and able to satisfy the most varied project needs and applications. Special attention has been paid to periodic devices maintenance, providing automatic systems in order to simplify and reduce intervention times. The compact appearance of the actuation system favours both the lighting characteristics of the skylight and the aerodynamic free area.

In addition to NSHEV opening only, CAODURO® offers an innovative system with both smoke and heat exhaust ventilation function and daily ventilation opening/closing function.

Simplicity, reliability, resistance and low cost are the strengths of these CAODURO® products.

An example before and after the fire

Only a few can tell a lived experience beyond the prevention theory and the following photos prove how a fire hit a commercial building in Verona, about ten years ago.

As described above, the sudden action of our natural ventilators has avoided damage to the building bearing structure, lowering the internal temperature thanks to the smoke ventilation, thus increasing the time in which rescue teams could operate. Further evidence of the absence of heavy damage is that the **building has been saved** and opened again in a short time, bringing it back to the original state only with little maintenance. Regarding prevention and emergency, our products ensure the safety you need.

BEFORE

AFTER

SMOKE ARIES®

The SMOKE ARIES® device is a zenithal single flap **NSHEV operating with an electric motor**. It is born from the evolution of the SMOKE OUT® pneumatic smoke and heat evacuator.

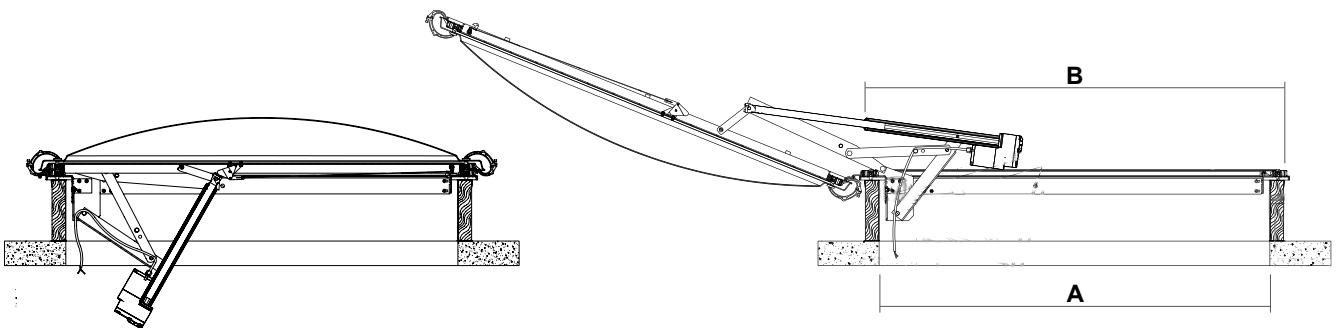
The SMOKE ARIES® is also tested and certified according to the EN12101-2 standard for both smoke and heat evacuation and daily ventilation (certified for 10,000 opening and closing cycles).

The SMOKE ARIES® is operated by a low voltage electric geared motor which makes it very versatile both for use in fire emergency situations and for ordinary daily ventilation uses.

The fields of use of these devices are multiple.

SMOKE ARIES® is a patented device and complies with the UNI EN 12101-2 standard.

Wind load	WL 1500		
Operational reliability	Re 300		
Opening under load	SL 250	SL 500	SL 1000
Low ambient temperature	T(00)		
Resistance to heat	B300		
PC domes	Euroclass B s1 d0		



SMOKE ARIES® closed

SMOKE ARIES® open

Use of a single electric motor for opening and closing operations

There will no longer be the need to use pneumatic systems, compressed gas cylinders or additional electrical systems for dedicated to ventilation. Special safety hooks ensure that the frame adheres to the counter frame when the device is closed.

Reduction of management costs due to periodic checks

Periodic surveillance and control are limited to opening and closing tests from the ground floor, without having to replace components such as CO2 cylinders. The new SMOKE ARIES® greatly reduces the amount of access to the roof, thus limiting the risk of accidents.

Closing of devices from the ground following an emergency opening or false alarms

The re-closing is managed from the ground through an external push-button panel. This convenient and easy management offers a great advantage for all those cases where it is difficult to reach the covers for reclosing the devices. Eliminates manual intervention on the roof in case of accidental opening. It also offers the possibility of closing the devices following false alarms.

Absence of auxiliary thrust devices

The Smoke Aries does not require the presence of auxiliary thrust devices (such as gas springs) that favor opening under load (Classification SL1000, SL500, SL250). A significant advantage as gas springs may lose strength over time.

Guaranteed operation

The operator, with high frequency and total free of charge, has the possibility to check the correct functioning of the ENFC SMOKE ARIES by means of the opening and closing command from the ground.

Home automation technology

The possibility of using the device for daily ventilation of the premises is not secondary.

Where it is very important to be able to sanitize the rooms with repeated air changes, the management of the operating logics is delegated to a dedicated electrical panel.

As optional Home automation technology to manage device openings from a smartphone or terminal, favoring the sanitization of the rooms and other functions such as line control and device status.

The devices can be controlled remotely via application from smartphones, tablets and notebooks.

SMOKE ARIES®: dimensions and absorptions

Square monobloc domes

Clear span AE (cm)	xternal support wall B (cm)	SL250 (A)	SL500 (A)	SL1000 (A)
80x80	93x93	1,6	2	2,9
95x95	108x108	2	2,6	4
100x100	113x113	2	2,6	4
120x120	133x133	2,7	3,7	6
125x125	138x138	3	4,2	6,5
140x140	153x153	4	5,4	8,7
150x150	163x163	4,5	6,4	/
155x155	168x168	4,5	6,4	/
170x170	183x183	7	/	/

Rectangular monobloc domes

Clear span A (cm)	External support wall B (cm)	SL250 (A)	SL500 (A)	SL1000 (A)
80x120	93x133	2	2,6	4
80x180	93x193	2,4	3,3	5
80x220	93x233	2,4	3,3	5
80x250	93x263	2,7	3,7	5,6
85x205	98x218	2,4	3,3	5,1
90x170	103x183	2,7	3,3	5,1
90x200	103x213	2,9	4,1	6,5
90x220	103x233	2,9	4,1	6,5
90x240	103x253	3,1	4,5	7,5
90x250	103x263	3,1	4,5	7,5
95x155	108x168	2,7	3,3	5,1
100x120	113x133	2,7	3	5
100x150	113x163	2,7	3,3	5,1
100x200	113x213	2,9	4,1	6,5
100x220	113x233	3,1	4,5	7,5
100x250	113x263	3.3	4,7	7,8
120x170	133x183	3,4	4,8	7,1
120x200	133x213	3,7	5	8,5
120x220	133x233	3,7	5,4	8,9
120x250	133x263	4	5,9	10
125x250	138x263	4,1	6	/
140x250	153x263	5,3	8,6	/
150x250	163x263	6,3	9	/
160x250	173x263	6,5	9,6	/

SMOKE ARIES®: dimensions and absorptions

Continuous skylight

Clear span A (cm)	SL250 (A)	SL500 (A)	SL1000 (A)
85x175	2,4	3,3	5
85x210	2,4	3,3	5,2
85x240	2,7	3,7	5,6
90x175	2,7	3,3	5,1
90x240	3,1	4,5	7,5
95x175	2,8	3,6	5,7
95x240	3,2	4,6	7,6
100x175	2,7	3,7	5,8
100x210	3,1	4,5	7,5
100x240	3,3	4,7	7,8
105x175	2,9	4,1	6,5
110x175	3,3	4,7	7
110x240	3,7	5,6	9,7
120x175	3,5	4,9	7,2
120x210	3,6	5,1	8,6
120x240	3,9	5,8	9,9
125x175	3,7	5	8,3
125x240	4	5,9	/
135x175	4,5	6,4	/
135x240	5,2	8,5	/
140x175	4,4	6,7	/
140x240	5,2	8,5	/
150x175	5	7	/
150x210	6	8,7	/
150x240	6,2	8,9	/
165x175	6,3	9	/
165x210	6,5	9,5	/
165x240	6,7	9,8	/
200x120	7,5	/	/

NOTE: absorption referred to installation on roofs with a slope of up to 10%. For higher slopes, request absorption at the CAODURO site

SMOKE OUT®

Smoke and heat natural exhaust ventilators **NSHEV** are designed by CAODURO® with the ***SMOKE OUT®*** mark, **compliant** with **Regulation (EU) No 305/2011**, provided with **CE marking**, **tested** and **certified** according to **EN 12101-2** Standard by a notified body.

They are available in a wide range of sizes and suitable for any type of roofing. Realized with quality materials, their **operation** is based on activation **by means of compressed gas**. The **opening**, being powerful and reliable, **is ensured even in the most critical snow and wind conditions**, with a **160° angle**. The **closing in two points**, compared to that of a single point, makes the **device stable and guaranteed against accidental openings**.

The *SMOKE OUT®* can be **integrated with a traditional electric opening device** for air exchange needs, thus obtaining a single element able to satisfy both smoke and heat exhaust ventilation function and the lighting and ventilation requirements of rooms. The product is **CE marked** according to **EN 12101-2** Standard **at 10,000 cycles**.

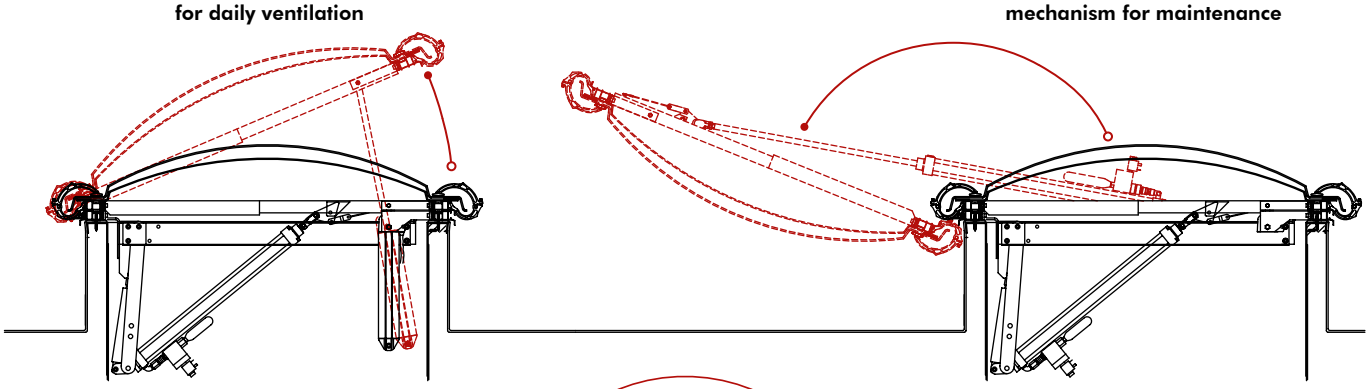
The *SMOKE OUT®* without electric motors can be supplied with ***Open and Close*** **system** which allows **opening and closing** for **maintenance operations only**, for a maximum of **300 cycles**, **by means of pneumatic tubes network and remote control**.

Any kind of remote control, whether pneumatically or electrically driven, can be connected to this device.

Thanks to a tested system it is possible to combine the dual purpose, ***SMOKE OUT®*** and **daily ventilation** opening, on all devices ranges both for monobloc domes and continuous skylights.

SMOKE OUT®
with electric opening mechanism for daily ventilation

SMOKE OUT®
with pneumatic opening mechanism for maintenance



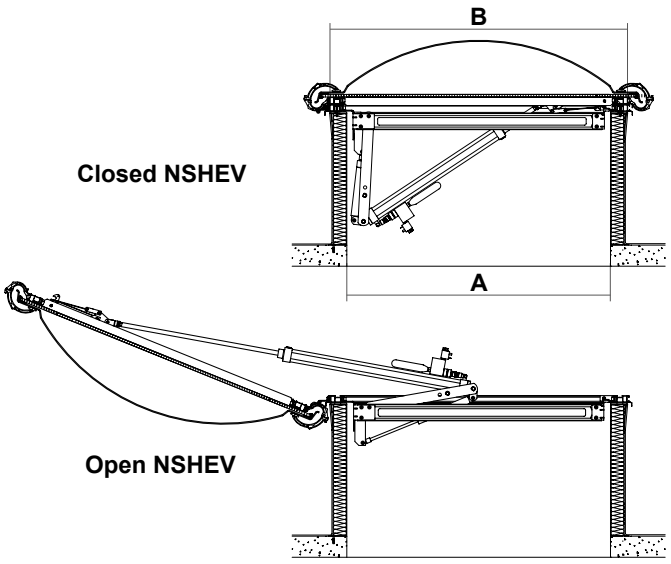
Application on monobloc domes

Performance and qualification requirements

Wind load	WL 1500	WL 1500
Operational reliability	Re 300*	Re 300*
Opening under load	SL 1000	SL 500
Low ambient temperature	T(00)	T(00)
Resistance to heat	B300	B300
PC domes	Euroclass B s1 d0	
PMMA domes	Euroclass E	

***10,000 cycles dual purpose with electric motor.**

The *Open and Close* pneumatic system can be installed on all NSHEV *SMOKE OUT*® devices, except for ones with dimension A 50x250, 55x155, 60x100 and 60x250.



Square

Clear span A	Ext. support wall B	Additional electric opening*	Electric opening stroke
70x70	83x83	S	30
80x80	93x93	S	30
95x95	108x108	S	30
100x100	113x113	S	30
120x120	133x133	S	30
125x125	138x138	S	30
140x140	153x153	T	30
150x150	163x163	T	30
155x155	168x168	T	30
170x170	183x183	T	30

Dimensions in cm.
***S: single opening (1 motor); T: tandem opening (2 motors).**

Rectangular

Clear span A	Ext. support wall B	Additional electric opening*	Electric opening stroke
50x250	63x263	T	20
55x155	68x168	S	20
60x100	73x113	S	20
60x250	73x263	T	20
70x100	83x113	S	30
70x120	83x133	S	30
70x170	83x183	T	30
70x230	83x243	T	30
80x120	93x133	S	30
80x180	93x193	T	30
80x220	93x233	T	30
80x250	93x263	T	30
85x205	98x218	T	30
90x170	103x183	T	30
90x200	103x213	T	30
90x220	103x233	T	30
90x240	103x253	T	30
90x250	103x263	T	30
95x155	108x168	S	30
100x120	113x133	T	30
100x150	113x163	T	30
100x200	113x213	T	30
100x220	113x233	T	30
100x250	113x263	T	30
120x170	133x183	T	30
120x200	133x213	T	30
120x220	133x233	T	30
120x240	133x253	T	30
120x250	133x263	T	30
125x250	138x263	T	30
140x250	153x263	T	30
150x250	163x263	T	30
160x200	173x213	T	30
160x250	173x263	T	30

Dimensions in cm.
Aerodynamic free area Aa value of each device can be requested by contacting our offices.
***S: single opening (1 motor); T: tandem opening (2 motors).**

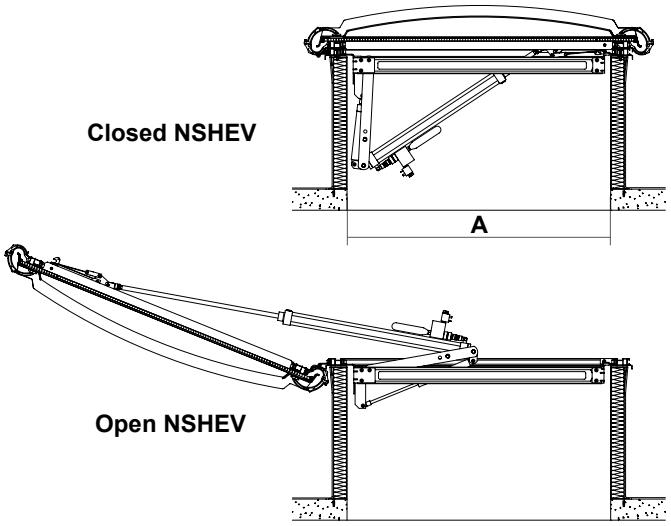
Application on continuous skylight

Performance and qualification requirements

Wind load	WL 1500	WL 1500
Operational reliability	Re 300*	Re 300*
Opening under load	SL 1000	SL 500
Low ambient temperature	T(00)	T(00)
Resistance to heat	B300	B300
PC domes	Euroclass B s1 d0	
PMMA domes	Euroclass E	

***10,000 cycles dual purpose with electric motor.**

The *Open and Close* pneumatic system can be installed on all NSHEV *SMOKE OUT*® devices, except for ones with dimension A 65x175.



Clear span A	Additional electric opening*	Electric opening stroke
65x175	T	30
70x175	T	30
75x175	T	30
85x175	T	30
85x210	T	30
85x240	T	30
90x175	T	30
90x240	T	30
95x175	T	30
95x240	T	30
100x175	T	30
100x210	T	30
100x240	T	30
105x175	T	30
110x175	T	30
110x240	T	30
120x175	T	30
120x210	T	30
120x240	T	30
125x175	T	30
125x240	T	30
135x175	T	30
135x240	T	30
140x175	T	30
140x240	T	30
150x175	T	30
150x210	T	30
150x240	T	30
165x175	T	30
165x210	T	30
165x240	T	30

Dimensions in cm.
Aerodynamic free area Aa value of each device can be requested by contacting our offices.
***S: single opening (1 motor); T: tandem opening (2 motors).**


CAODURO®

SMOKE OUT VERT™

The application of natural smoke and heat exhaust ventilators for walls and saw-tooth roofs deserves a more in-depth analysis. The NSHEVs installed on buildings walls could be in fact exposed to overpressures due to wind effects, or could be directly hit by headwinds, thus rejecting smoke inside the building itself. Therefore, only a careful evaluation of the designer allows to predict the real NSHEVS operating conditions, by assessing the presence of causes which can negatively influence smoke and heat exhaust ventilation in the event of fire, with any external weather condition.

The ***SMOKE OUT VERT™*** natural smoke and heat exhaust ventilators for walls, manufactured by CAODURO®, **comply with Regulation (EU) No 305/2011**. They are provided with **CE marking**, **tested** and **certified** according to **EN 12101-2** Standard by a notified body with the **aerodynamic free area evaluated in absence of wind conditions**.

The device is made up of a natural anodized aluminium vertical frame (with or without thermal break), built with extruded profiles.

Aluminium span-in glazing bead are suitable for holding alveolar polycarbonate sheets in opal or transparent colours or glass sheets.

The frame can be opened with a single leaf with a central cross-piece, complete with hinges, gaskets and fastening hardware.

Awning window opening device is made up of a support bracket anchored to the frame, a double effect pneumatic actuating cylinder and a decelerator with brake function to slow down the opening. Moreover, it is equipped with an actuator device with non-thermosensitive element as required by standards, unless otherwise specified.

Inspection and maintenance take place by opening the device from the outside.

There are two sealing points for fastening against possible accidental openings, which ensure frame stability in presence of extreme weather conditions.

Opening for daily ventilation by means of electric motor or compressed air is an optional.

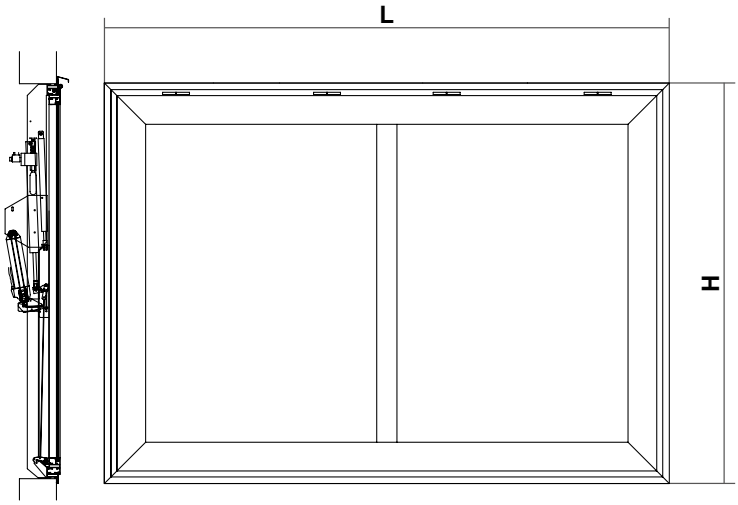
Performance and qualification requirements

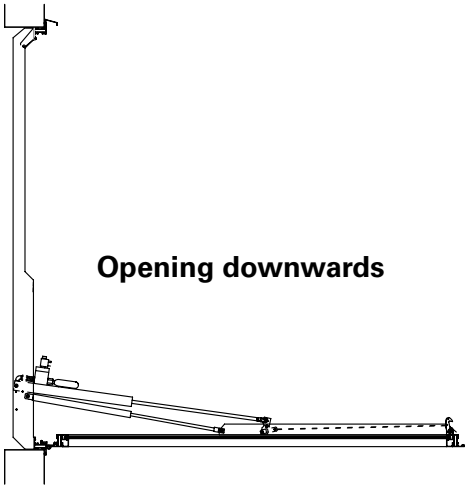
Wind load	WL 1500
Operational reliability	Re 300*
Opening under load	NA
Low ambient temperature	T(00)
Resistance to heat	B300
Alveolar PC sheets	Euroclass B s1 d0
Glass sheets	Euroclass A1

***10,000 cycles dual purpose**

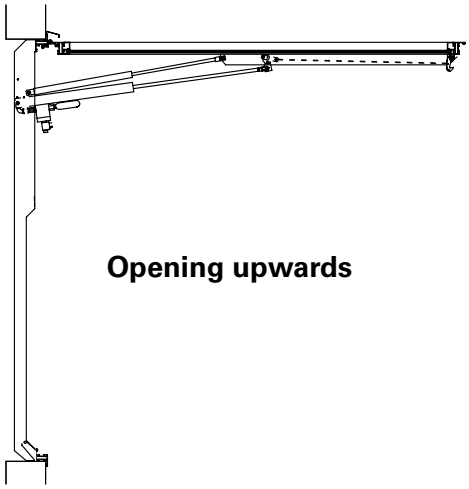
Frame clear span A	**Wall opening LxH**	
Minimum dimension	No thermal brake frame	Thermal brake frame
60x60	69x69	70x70
Maximum dimension		
160x250	169x259	170x260
250x160	259x169	260x170

Aerodynamic free area Aa value of each device can be requested by contacting our offices.
Dimensions in cm.

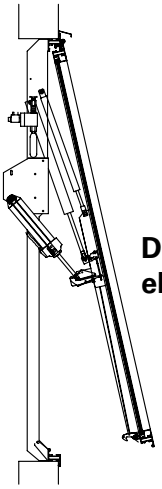




Opening downwards



Opening upwards



Daily ventilation electric opening

SMOKE SHED™

The use of NSHEVs for walls requires that natural smoke and heat exhaust ventilation system, NSHEVS, always has enough NSHEVs available on a wall of the building not exposed to winds. It also requires that NSHEVS is supplemented by a wind speed and direction control system, thus avoiding the opening of devices exposed to headwinds.

Compliance with these circumstances, which are necessary to ensure correct NSHEVS operating with any weather condition, leads to double the number of NSHEVs required and to insert a control and command circuit into the system, with a significant increase in costs. The use of roof NSHEVs on saw-tooth roofs can protect the device from side wind but does not give full guarantee that in each configuration there is no headwind which contrasts smoke exit.

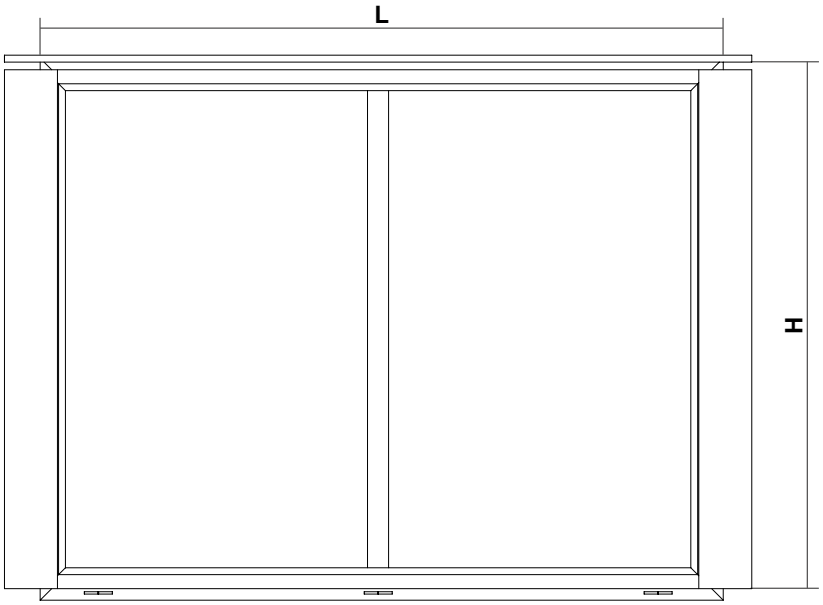
Upon these considerations CAODURO® has developed its ***SMOKE SHED™***, designed and patented with suitable **retractable aerodynamic spoilers**, which are activated only when the device opens in case of fire. These **guarantee the Aa value** (aerodynamic free area) **evaluated in presence of wind**. The **opening angle is optimized** in order to obtain this Aa value and does not have any protrusion, which normally the market offers with an unsightly effect.

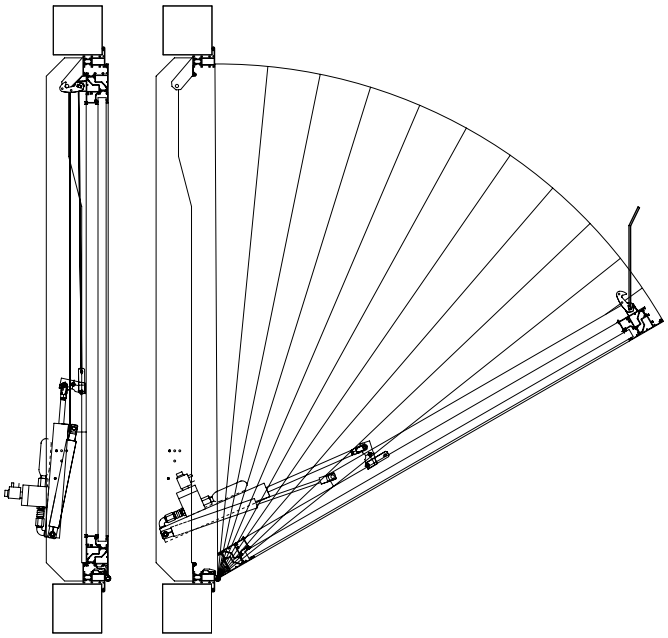
SMOKE SHED™ was **tested in laboratory** with an **horizonal 10 m/s speed wind**, as required by Aa evaluation tests.

SMOKE SHED™ natural smoke and heat exhaust ventilators for walls and saw-tooth roofs comply with **Regulation (EU) No 305/2011**. They are provided with **CE marking**, **tested** and **certified** according to **EN 12101-2** Standard by a notified body with the **aerodynamic free area evaluated in presence of wind**.

SMOKE SHED™ allows to create **safe NSHEVS** in all conditions: with NSHEVs installed on saw-tooth roofs; with NSHEVs installed on walls; without wind speed and direction control systems. It also **reduces NSHEVS cost** by decreasing the number of NSHEVs and by simplifying the command and control system. **Accordions** and **spoilers** are always closed and **come out only in case of fire**, thus keeping the façades appearance unchanged, unlike imitations. The **attention to details is maximum**, and **continuity of the elements is guaranteed in their closed position**.

SMOKE SHED™ is a **patented device** and **complies with EN 12101-2** Standard.





Performance and qualification requirements

Wind load	WL 1500
Operational reliability	Re 300*
Opening under load	SL 0
Low ambient temperature	T(00)
Resistance to heat	B300
Alveolar PC sheets	Euroclass B s1 d0
Glass sheets	Euroclass A1

***10,000 cycles dual purpose with electric motor**

Frame clear span A	**Wall opening LxH**	
Minimum dimension	No thermal brake frame	Thermal brake frame
55x55	64x64	65x65
Maximum dimension		
250x160	259x169	260x170

Aerodynamic free area Aa value of each device can be requested by contacting our offices.
The realization is custom made.
Dimensions in cm.

Accordions and spoilers are always closed and come out only in case of fire, thus keeping the façades appearance unchanged, unlike imitations.

SMOKE LAME

SMOKE LAME™ TT, for roofs

SMOKE LAME™ TT complies with **Regulation (EU) No 305/2011**. It is provided with **CE marking**, **tested** and **certified** according to **EN 12101-2** Standard.

The structure is composed by a perimeter frame and extruded aluminium louvre holder profiles, complete with EPDM gaskets. The louvres can contain alveolar polycarbonate sheets UV rays protected, in clear transparent or opal white colours, or alveolar polycarbonate sheets coupled with aluminium external ones thus obtaining blank louvres.

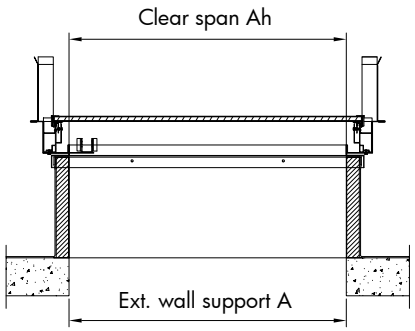
The **opening device** can be **electric** with 24V DC low voltage motors suitable for direct connection for opening by automatic/manual control in case of fire. Otherwise, the opening device can be **pneumatic**, with low gas consumption, complete with a thermosensitive individual drive unit. The actuator is equipped with *MINI-TERMICO™* group calibrated at 68°C, unless otherwise specified, which is provided with a suitable CO_2 cylinder. The latter operates the pneumatic cylinder to allow the louvers opening. A release system allows opening for inspection and for maintenance from the outside.

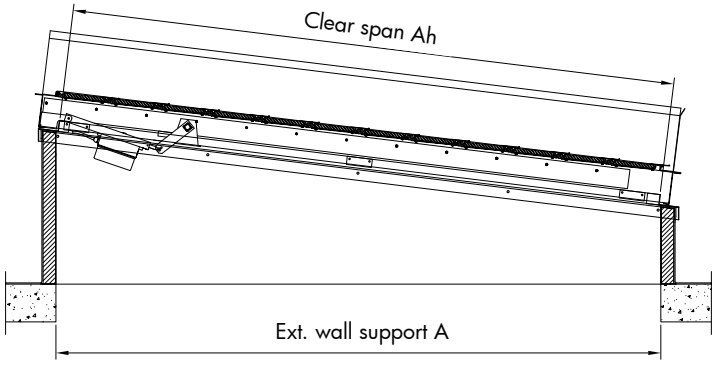
Electric motors and opening commands let the *SMOKE LAME™ TT* be used for rooms daily ventilation too, thus obtaining a **dual purpose device**, **certified to 10,000 cycles**.

Performance and qualification requirements

Wind load	WL 1500
Operational reliability	Re 300*
Opening under load	SL 0
Low ambient temperature	T(00)
Resistance to heat	B300

***10,000 cycles dual purpose**





Louver height H: 20 cm
Minimum custom made dimensions
Clear span (AxAh): 55x80 cm (4 louvers)
Maximum custom made dimensions
Clear span (AxAh): 160x240 cm (12 louvers)

SMOKE LAME™ PT, for walls

SMOKE LAME™ PT complies with **Regulation (EU) No 305/2011**. It is provided with **CE marking**, **tested** and **certified** according to **EN 12101-2** Standard.

The structure is composed by a perimeter frame and extruded aluminium louvre holder profiles, complete with EPDM gaskets. The louvres can contain alveolar polycarbonate sheets UV rays protected, in clear transparent or opal white colours, or alveolar polycarbonate sheets coupled with aluminium external ones thus obtaining blank louvres.

SMOKE LAME™ PT is provided with side spoilers for **saw-tooth roof applications**. **Side spoilers** are available upon request for wall applications.

The **opening device** can be **electric** with 24V DC low voltage motors suitable for direct connection for opening by automatic/manual control in case of fire. Otherwise, the opening device can be **pneumatic**, with low gas consumption, complete with an actuator. This one is equipped with non-thermosensitive element as required by standards, unless otherwise specified, which is provided with a suitable CO_2 cylinder. The latter operates the pneumatic cylinder to allow the louvers opening.

A release system allows opening for inspection and for maintenance from the outside.

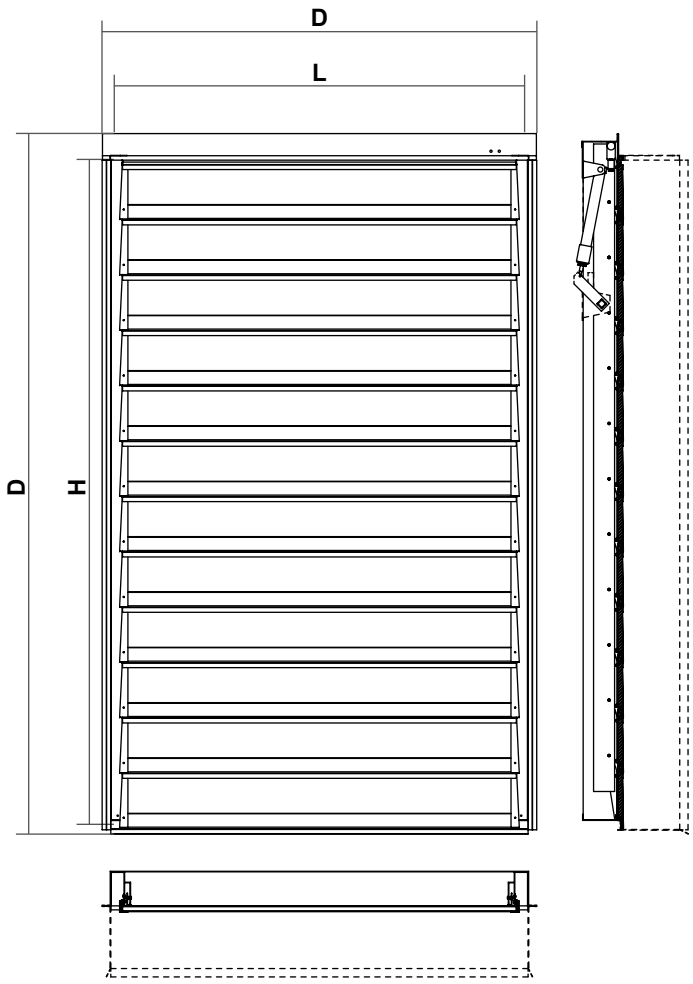
Electric motors and opening commands let the *SMOKE LAME™ PT* be used for rooms daily ventilation too, thus obtaining a **dual purpose device**, **certified to 10,000 cycles**.

Performance and qualification requirements

Wind load	WL 1500
Operational reliability	Re 300*
Opening under load	SL 0
Low ambient temperature	T(00)
Resistance to heat	B300

***10,000 cycles dual purpose**

Louver height H: 20 cm
Minimum custom made dimensions
Clear span (LxH): L 55 cm, H 80 cm (4 louvers)
Wall opening (D): L+16 x H+6 cm
Maximum custom made dimensions
Clear span (LxH): 160x240 / 240x160 cm (12 louvers)
Wall opening (D): L+16 x H+6 cm



AIR FLOW™

Italian **UNI 9494 Standard** has always established that buildings protected by smoke and heat exhaust ventilators has to be equipped with **openings for fresh air intake, which start working automatically and simultaneously with the activation of smoke and heat exhaust ventilation system**.

This is why we have developed *AIR FLOW*™ fresh air intake device, for walls applications in the lower parts of the rooms. It can be connected to CAODURO® smoke and heat exhaust ventilators and can also be used for daily ventilation.

The structure is composed by a perimeter frame and extruded aluminium louvre holder profiles, complete with EPDM gaskets. The louvres can contain alveolar polycarbonate sheets UV rays protected, in clear transparent or opal white colours, or alveolar polycarbonate sheets coupled with aluminium external ones thus obtaining blank louvres.

AIR FLOW™ is available in the following versions:

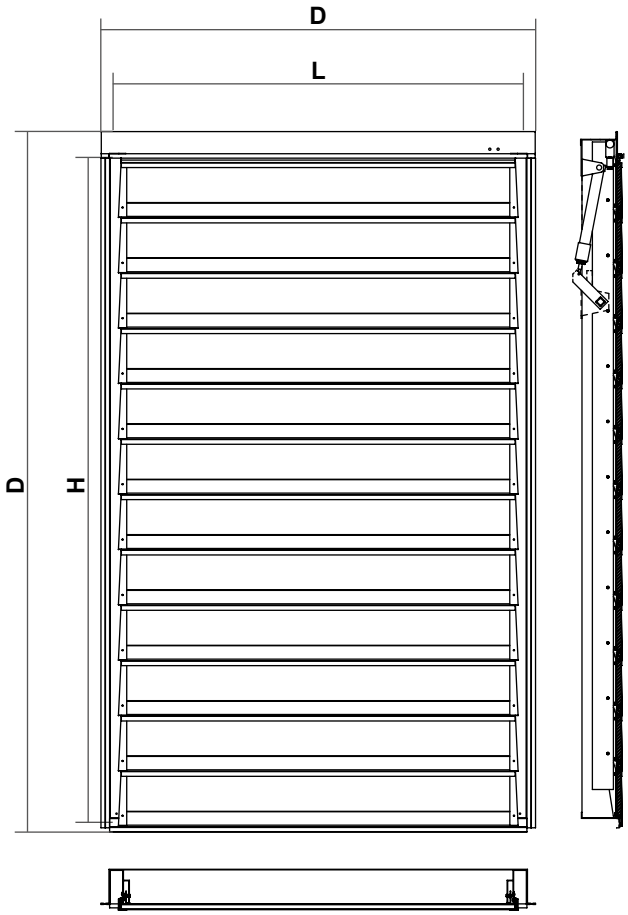
AIR FLOW*™ *E (basic version), **electrically operated with low-voltage motors, connectable to a smoke detection system** (connection management is under care and charge of a qualified installer);

***AIR FLOW*™ *PLUS*, electrically operated with low-voltage motors**, provided with **electronic interface and *AAF* control panel** for automatic opening management, with signal from fire detection system and/or remote manual control;

***AIR FLOW*™ *PN*, pneumatically operated**, provided with **actuator with *MINI-ENERGY*™ group and CO_2 cylinder**. **It can be activated by an *MDE01/MDE04* control panel** for automatic opening management, with signal from fire detection system and/or remote manual control.

All of our products are manufactured according to the quality management procedures of the EN ISO 9001 Standard, using top rated materials and providing high level results.

Louver height H: 20 cm
Minimum custom made dimensions
Clear span (LxH): L 55 cm, H 80 cm (4 louvers)
Wall opening (D): L+16 x H+6 cm
Maximum custom made dimensions
Clear span (LxH): 160x240 / 240x160 cm (12 louvers)
Wall opening (D): L+16 x H+6 cm



AAF box and *AAF Advanced* box

AAF box **controls 4 intake systems** connected via data bus, provides alternating current for **battery charging**, **monitors the system** and assigns identifications to the peripheral units. On the panel there are signals that indicate the presence of 230V mains, the proper CAN-BUS functioning and the power supply status of the central unit and remote peripheral batteries. Status and alarm warnings are indicated by LED lights and a buzzer. There are also central opening and closing buttons for all the units connected to the network and a reset button.

The reset button is essential for the system initialization after an alarm signal received from an *MDE01/MDE04* control panel or from the fire protection system. On the electronic board, inside the case, there is a selector and a button for the peripheral units identification (ID).

The base unit is assigned the 0 number by default, while the other units must be assigned a sequential ID numbers from 1 to 4 during the programming phase.

AAF Advanced Box can **control up to 9 *AIR FLOW*™ *PLUS* units** and has a **signalling kit** to report **alarms**. Moreover, it reports possibly **fault status** to the fire control panel and **activates other NSHEV control devices**, both *MDE01/MDE04*. Finally, it controls active smoke and fire curtains or *SMOKE OUT*® devices.

It is possible to integrate a temperature sensor into each peripheral unit, thus allowing the opening of an individual device only when set threshold is exceeded. Temperatures may be different from device to device and can be remotely programmed by using *MS1* monitoring kit (available upon request). The latter also allows the computer display information on system status: the set temperatures, local temperatures, battery voltages, the number of IDs connected, errors and faults on the central and peripheral units.

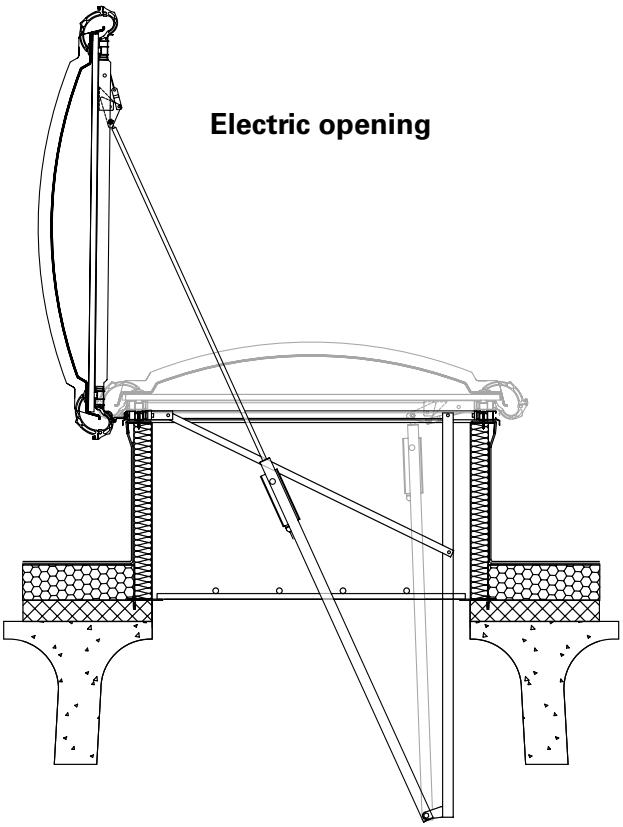
Smoke and heat disposal openings

The Italian Decree **D.M. 03/08/2015** introduced fire-fighting technical rules valid for all activities not regulated before. The Decree has brought the concept of **emergency smoke and heat disposal**, in order to facilitate flames extinguishing by rescuers. Emergency smoke and heat disposal is operated **through suitable openings** that generally are the same openings ordinarily available.

With this mind, we have increased our range of products for smoke and heat control with **optimized openings for smoke disposal**. These, connected to a smoke and fire detection system, are able to open up to let smoke escape and allow a more efficient action by rescue teams.

Openings maximum angle (up to 90°) is **agreed in design stage**, depending on both the size of the hole which can be square or rectangular, and the model of monobloc dome or continuous modular skylight that covers the opening.

Beside these, *Vertical*™ opening device can be added, with whole or partial opening system, available for both monobloc domes and modular continuous skylights.



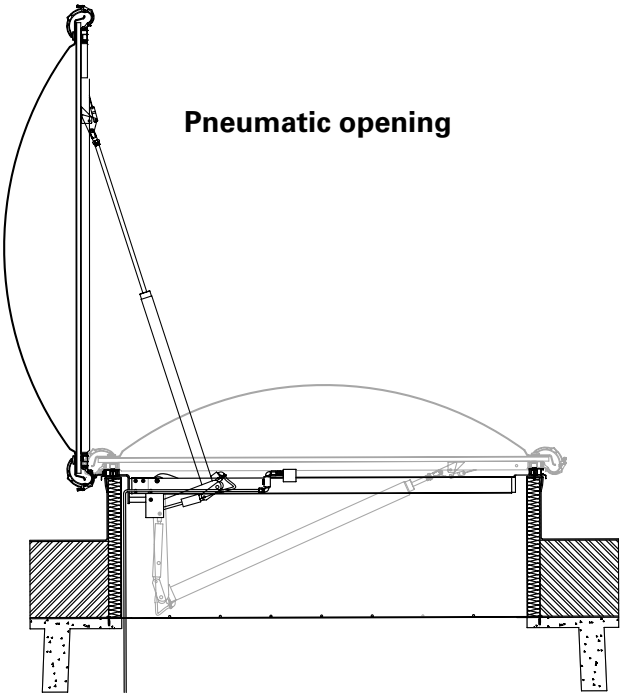
Electric opening

Smoke disposal device is **driven by** an **electric motor with variable voltage**, **variable stroke** and electric end of stroke switch **or by a pneumatic cylinder**. It consists of a frame and counter frame made with shaped tubular profile with extruded aluminium rectangular section and transversal profiles. Die-cast corner brackets avoid the caulking that could cause water infiltration. Hinges and aluminium accessories are fixed to the frame by sliding plates, so as to avoid drilling and milling that could case frame weakening and water infiltrations.

Opening and closing actions **for daily ventilation** can be **exclusively managed by** electric or pneumatic **CAODURO® control boxes**, which are available upon request. These can be provided with *GUARDIAN*™ control unit and its wind-rain sensor (see page 58). The latter is able to command the immediate closing of the connected device in case of adverse weather conditions.

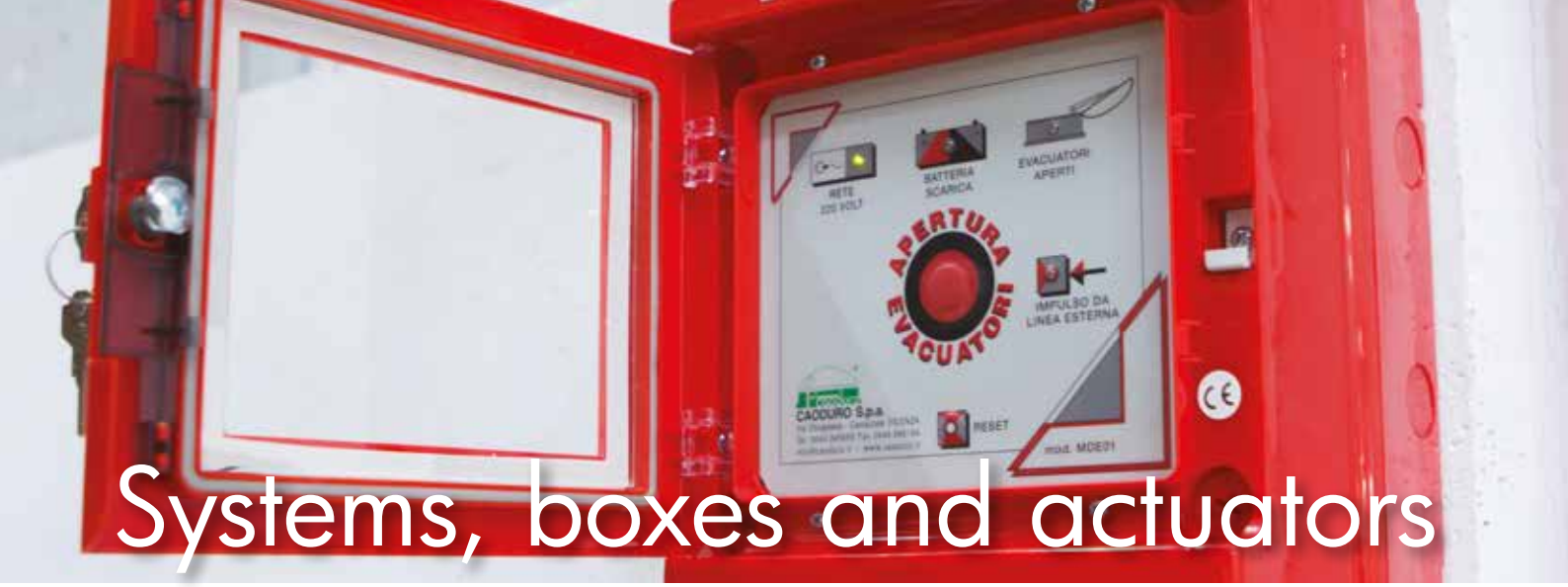
Automatic closing is however inhibited if the fire emergency signal is active.

The device in open position is constrained by one or more pushing points. It is recommended not to open the device for daily ventilation in case of strong wind or adverse weather conditions unless you have installed *GUARDIAN*™ control unit and its wind-rain sensor.



Pneumatic opening

These devices are available for both monobloc domes, square and rectangular shaped, and modular continuous skylights.

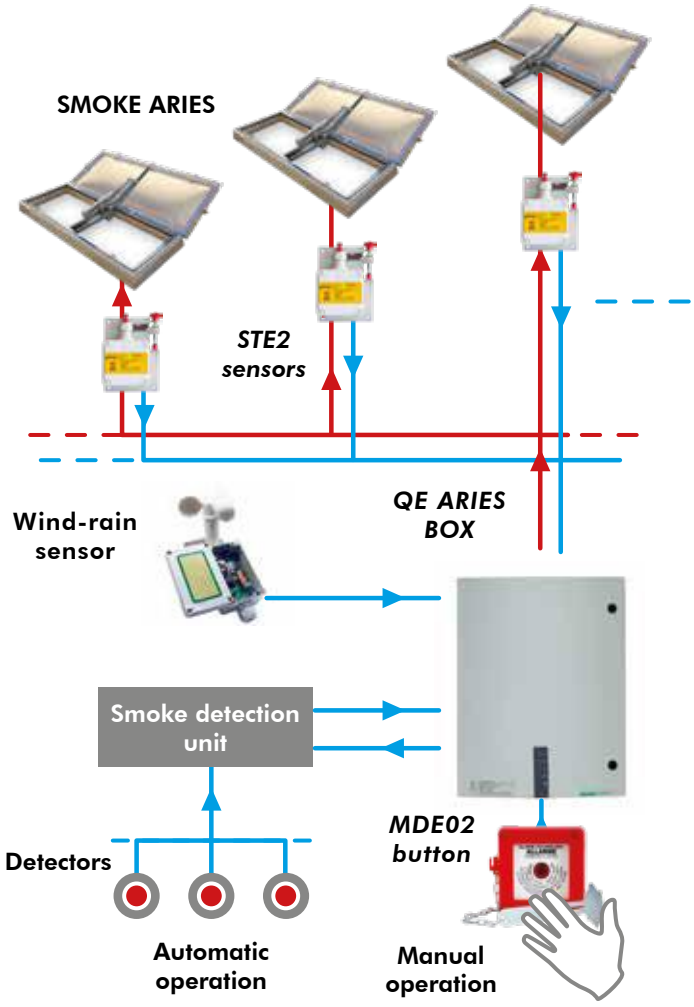


Systems, boxes and actuators

Electric smoke and heat evacuation system with SMOKE ARIES NSHEV

It is a simplified system as it is aimed at powering only the motors of the evacuators operating at very low voltage. Emergency opening upon reaching a certain temperature inside the premises is always guaranteed thanks to the presence of the STE2 thermoelectric sensor. By connecting the evacuators to the QE ARIES series panels, automatic emergency opening can be managed by receiving the signal from the BMS fire control unit.

The control panel is designed for the management of rain and wind weather events. It will be sufficient to add the appropriate sensor to be able to use the evacuators in complete safety also as natural ventilation devices. The strengths of this system are the fast reclosing from the ground in the presence of false alarms, the constant and free verification of the correct operation of the system by the tenant and the low demand for control and maintenance operations. The section of the system cables must be sized according to the characteristic absorption data of each evacuator that is part of the system.



QE ARIES Box

The QE ARIES series of control panels is characterized by the presence of multiple product configurations. From the reduced capacity switchboard for the management of one or two evacuators up to the extended capacity switchboard for the management of countless devices.

The switchboards guarantee two outgoing lines, however extendable to six for the management of more compartments. The panels are in fact equipped with buffer batteries of adequate capacity to ensure the opening of the evacuators even in the absence of a 230V mains (within 72 hours). The LEDs on the front panel allow the operator to easily read the current status of the panel and the system lines. The panel pre-sets the times for opening the evacuators in the ventilation position and, thanks to the management of adverse wind and rain events, ensures automatic closure.

The panels can be connected to the fire alarm control unit for automatic opening and can be controlled by the remote buttons of the MDE02 series.

Wind-rain sensor

The weather station completes the already extensive functions of the QE ARIES panel. Included in the motherboard of the panel, the control unit can be activated by simply positioning the appropriate sensor on the cover to be connected to the panel.

The sensor allows the detection of wind and rain weather events and ensures easy and safe use of the system also for natural ventilation functions of the rooms

Sensore *STE2*

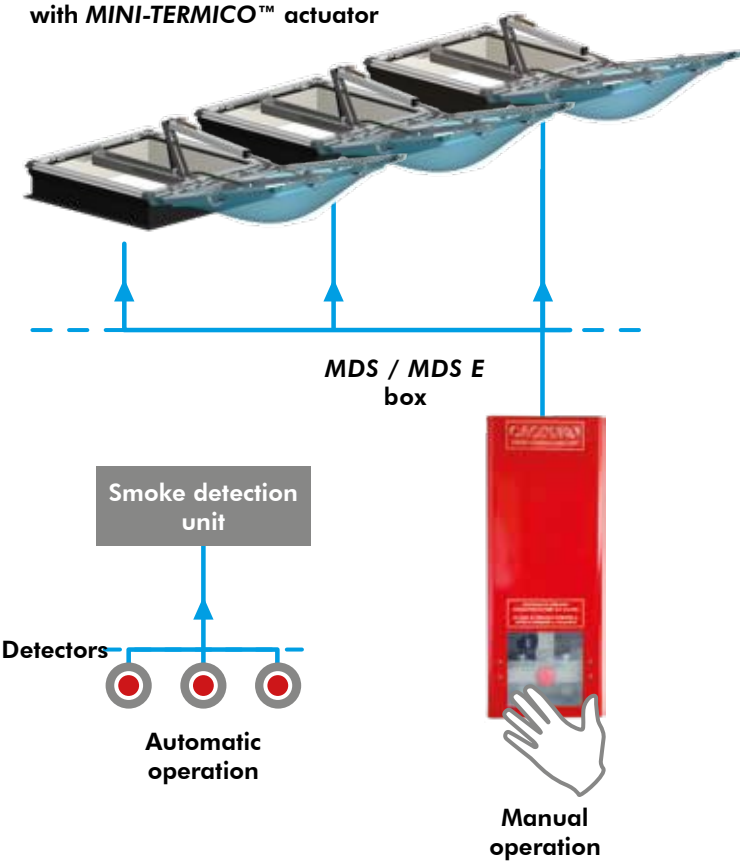
The STE2 thermoelectric sensor allows you to meet the request of the UNI 9494-1 standard which requires the presence on board the evacuator of a thermosensitive device. The additional fuse guarantees the protection of the power line in the event of high absorption that could occur due to system anomalies.

Natural smoke and heat exhaust ventilation pneumatic system with manual or automatic operation

MDS/MDS E box contains special CO_2 cylinders which ensure an instant opening to the connected NSHEVs, by expanding the gas into pneumatic system pipes. Cylinders action is obtained manually by pressing a button on the ***MDS/MDS E*** box or remotely by an electrical pulse controlled by a smoke and heat detection unit.

MINI-TERMICO™ group, which is installed on every *SMOKE OUT®*, allows autonomous and automatic emergency opening of individual devices for set up temperatures, in case of mains absence and without any possibility of manual action. ***MDS E*** box can also be operated electrically by means of pulses sent from ***MDE01/MDE04*** box or ***QE CP*** box.

SMOKE OUT®
with *MINI-TERMICO™* actuator



MDS / MDS E box

This **box is used to activate CO_2 pneumatically driven NSHEVs** by breaking glass and **pushing a button**. It requires a system with copper pipes on which gas internal cylinders are sized, depending on the number and the dimension of heat and smoke ventilators and the lengths of the lines.

The box can be **integrated with an *Open and Close* function** for daily ventilation, maintenance and testing.

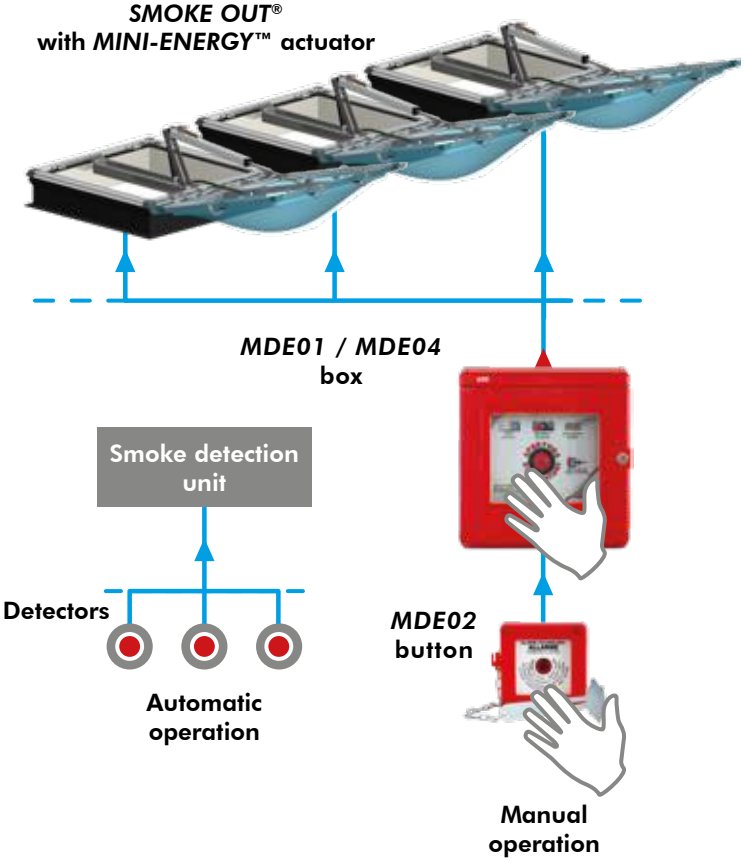
Natural smoke and heat exhaust ventilation electric system with manual or automatic operation

The emergency signal, which is given to ***MDE01/MDE04*** box by external ***MDE02*** button, by the button on the box itself or by the central unit, activates ***MINI-ENERGY***™ group. This one is present on each ***SMOKE OUT***® and operates the thrust cylinder by means of the expansion of gas cylinder.

Another ***MINI-ENERGY***™ group function is the autonomous and automatic emergency opening of individual devices in the event of mains absence, for set up temperatures. *MINI-ENERGY*™ group is installed on every ***SMOKE OUT***®.

The actuator control cables must be sized considering the number of smoke and heat ventilators and the length of the lines.

SMOKE OUT®
with *MINI-ENERGY*™ actuator



MDE01 / MDE04 box

MDE01 box is an **electric control box for remote opening**, which can control **up to 8 NSHEVs**. It guarantees operations even in absence of 230V mains, it performs **periodic tests on system functionality** and **battery status**, and it points out possible problems, failures or mains absence.

MDE04 box has the same features and signals, but differs for an **increased battery case** and the **possibility to control up to 24 NSHEVs**.

MDE02 emergency button

***MDE02* is an emergency button** with break glass. **It transmits a pulse to the active *MDE01/MDE04* box and activates the alarm system state**.

MDE02* buttons can be connected** in series to ***MDE01/MDE04 box with **no quantity or distance limits** from the latter.

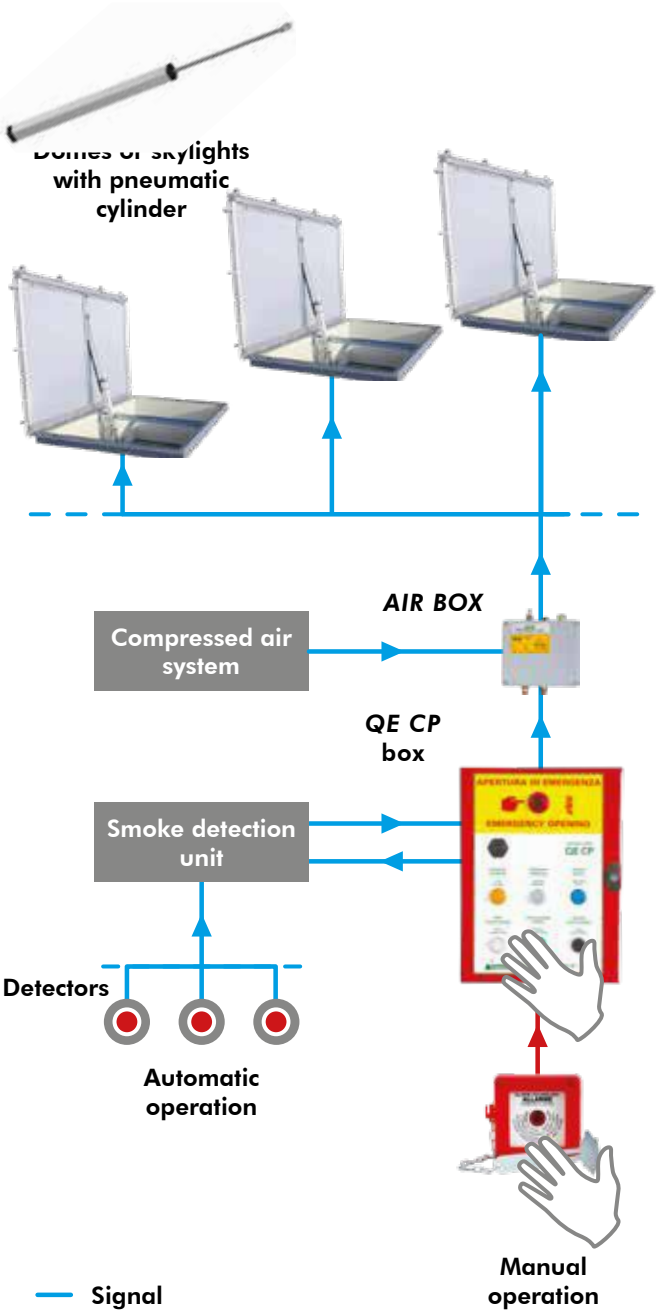
Smoke disposal system with pneumatic opening

The **emergency opening** of a smoke disposal pneumatic system can be operated **by means of a smoke detection system signal or by a manual action**. The latter is activated by pressing the **button on the panel** or a connected ***MDE02*** button.

In both cases, *QE CP* box collects emergency signals and, by acting on *AIR BOX*, supplies the pneumatic system with the air necessary to open smoke disposal devices.

By replacing *AIR BOX* with *MDS E* box described above, system operation is guaranteed even in the event of a system compressor malfunction. In this way the system can be used as a NSHEVS with *Open and Close* function.

Emergency opening is followed by an **acoustic signal** and the feedback contact opening.



QE CP pneumatic box

QE CP pneumatic box is a framework for **smoke and heat disposal devices management in a single group**. It also **allows daily ventilation opening and closing**.

It must be combined with the opening control system composed of ***AIR BOX*** or ***MDS E*** box.

In **combination with** optional ***GUARDIAN***™ weather detection unit and its sensor, *QE CP* pneumatic box automatically closes open devices in case of adverse weather conditions. Automatic re-closing is stopped if fire emergency signal is active.

Operation is guaranteed even in the event of 230V mains absence. In that case manual opening for daily ventilation is inhibited, while the emergency opening is always active.

The number of connectable devices depends exclusively on system compressed air cylinders or compressor sizing.

AIR BOX

AIR BOX is a compressed air exchange device able to operate opening and closing of connected pneumatic devices.

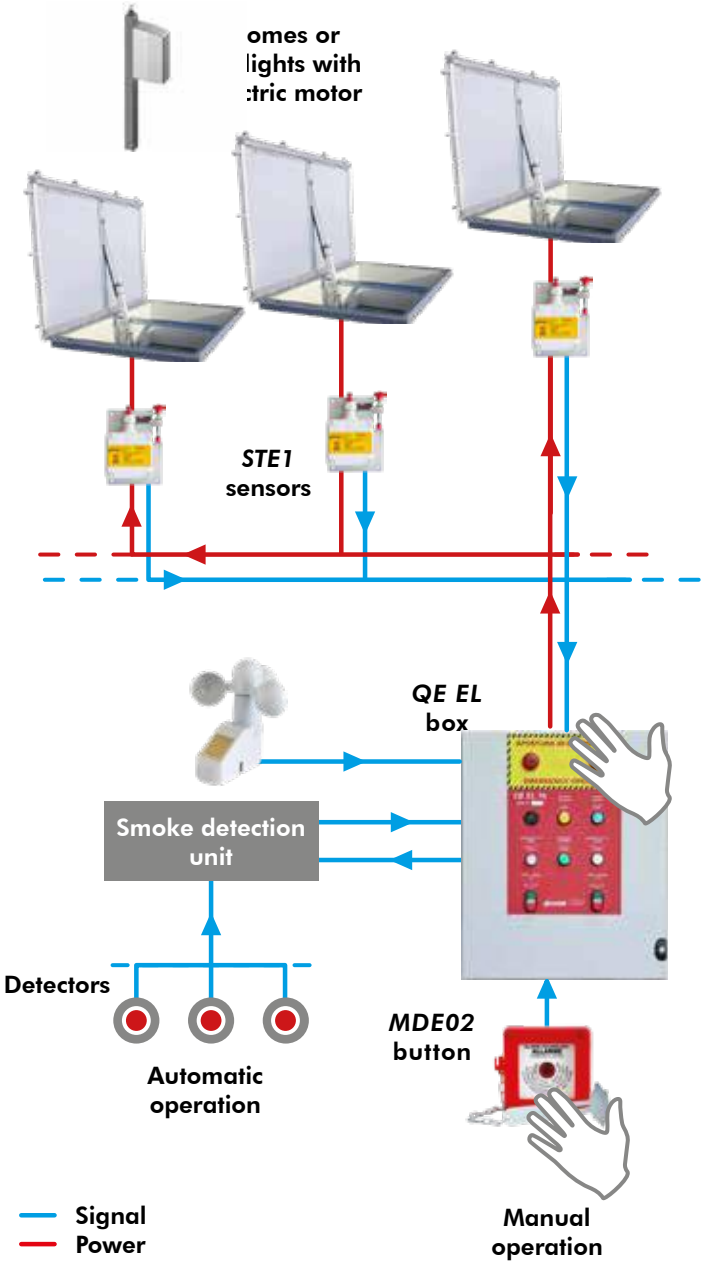
Optional internal sensor is able to signal any lack of pressure in the system.

Smoke disposal system with electric opening

The **emergency opening** of a smoke disposal electric system, ***QE EL*** box controlled, can be operated by a **smoke detection system signal or by manual action**. The latter is activated by pressing the **button on the panel** or a connected ***MDE02*** button.

In an emergency the box can also be operated by CAODURO® **thermoelectric sensor *STE1***, which is installed on every opening and activates itself at set up temperatures.

Emergency opening is followed by an **acoustic signal** and the feedback contact opening.



QE EL 8/16/32 electric box

QE EL electric box is a framework that **manages up to 8 devices, divided into two groups of four, and allows them opening and closing for daily ventilation**.

In **combination with** optional ***GUARDIAN™*** weather detector unit and its sensor, *QE EL* electric box automatically closes open devices in case of adverse weather conditions. Automatic re-closing is stopped if fire emergency signal is active.

Operation is guaranteed even in the event of 230V mains absence, thanks to a **backup battery**. In that case manual opening for daily ventilation is inhibited, while the emergency opening is always active.

230V mains absence is signalled by a cyclic acoustic signal, which become continuous when the battery is low.

STE1 sensor

STE1 is a CAODURO® **thermoelectric sensor** which is **installed close to the opening device**. It is **provided with a thermosensitive element** that **breaks with a programmed temperature** and transmits fire emergency signal to the connected *QE EL* box. Consequently, system smoke disposal electric devices open.

Actuator with *MINI-TERMICO™* group

NSHEV are normally provided with a standard **individual device** consisting of an actuator with ***MINI-TERMICO™*** group. The latter is **equipped with mini CO_2 cylinders** and a **thermosensitive element**, usually calibrated at 68°C, which can be replaced with other elements calibrated at higher temperatures.

In this case the smoke ventilator is activated exclusively by detecting an equal or higher temperature than that the one set by thermosensitive element.

After each event, both emergency and test, thermosensitive elements and CO_2 cylinders have to be replaced, while the actuator has to be reset.

Thermosensitive elements with programmed break temperature

Red 68°C | **Green 93°C** | **Light blue 118°C** | **Blue 141°C** | **Violet 182°C** | **Non-thermosensitive element for *SMOKE VERT™* system**

Actuator with electrically controlled *MINI-ENERGY™* group

Smoke ventilators remote opening with electric control required the presence of actuators with pyrotechnic group. This had a double limitation because the actuator had to be replaced after each event, even test ones, since it was not resettable and could also be triggered by thunderbolts or by radiofrequency, due to low level intervention threshold.

This involved a significant cost to replace the pieces and much more expensive inconveniences in case accidental smoke ventilators openings occurred during rain or at night.

The need to remove these problems has led to develop our original and **patented *MINI-ENERGY™*** actuator. In addition to being **resettable**, it is highly reliable because it is **not affected by thunderbolts** or by **radiofrequency**, as certified by European Standard (electromagnetic compatibility test No. 97/DL – No. 259 05/09/2000). Moreover, **low energy consumption** (250mA – 24V DC) and the simplicity of installation make it **suitable to be placed in already active existing systems** with pyrotechnic actuators, without any intervention on wiring or on UPS.

Smoke and fire curtains

To complete its range of safety products, CAODURO® introduces smoke curtains and fire curtains, thus implementing the most complete and functional fire systems in wide spaces.

Italian **UNI 9494 Standard considers ceiling compartments not greater than 1,600 m²** (some cases up to 2,600 m²), divided by smoke curtains.

Smoke is the main cause of life risk in case of fire. The following graphics indicate smoke behaviour in wide spaces, with or without smoke curtains.

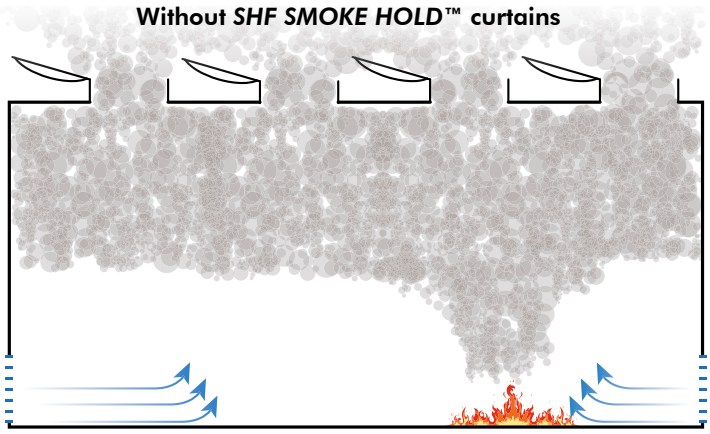
SMOKE HOLD™ smoke curtains allow **wide spaces compartmentation** and facilitate smoke conveyance in a given area, **thus creating a smoke-free layer** in the lower part of the room, thanks to the **combined action of NSHEV *SMOKE OUT*®** and ***AIR FLOW***™ air intake devices.

The use of *SMOKE HOLD*™ smoke curtains guarantees more safety to people by providing easy escape routes. Moreover, rescue teams are facilitated to entry and damage to the building are reduced, while the fire is limited and isolated for an extended time.

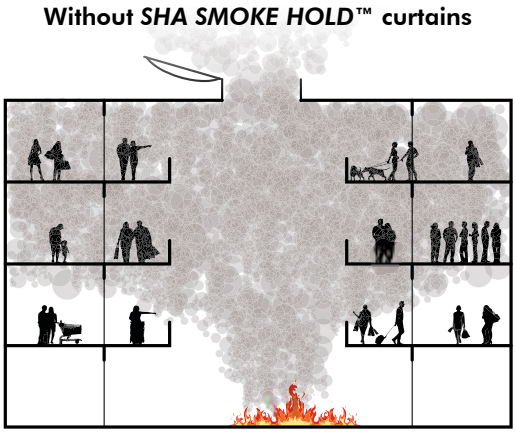
SMOKE HOLD™ smoke curtains **can be fixed** (**SHF**) or **active** (**SHA**).

Curtains are made of special flexible materials, which are smoke and fire resistant and hermetic.

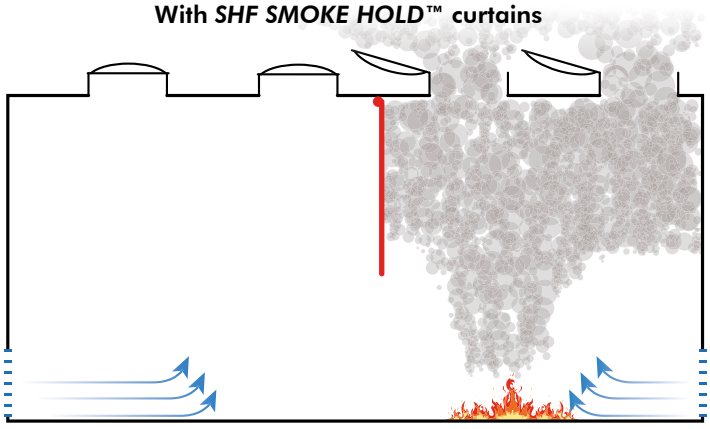
Without *SHF SMOKE HOLD*™ curtains



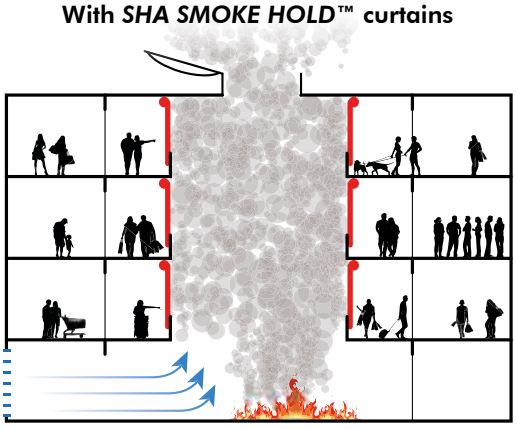
Without *SHA SMOKE HOLD*™ curtains



With *SHF SMOKE HOLD*™ curtains



With *SHA SMOKE HOLD*™ curtains



Smoke curtains classification

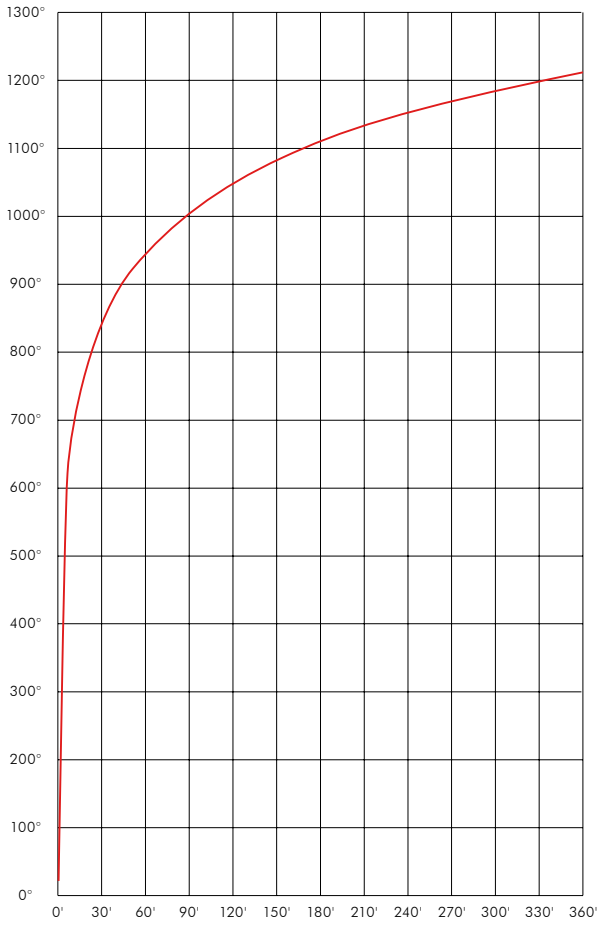
EN 12101-1 Standard provides two classifications for smoke curtains depending on temperature/time resistance test to which they are submitted.

Standard classification to 600°C constant temperature

Classification	Temperature	Time
D 30	600°	30'
D 60	600°	60'
D 90	600°	90'
D 120	600°	120'
DA	600°	over 120'

Classification to increasing high temperature according to EN 1363-1 curve

Classification	Temperature	Time
DH 30	see curve	30'
DH 60	see curve	60'
DH 90	see curve	90'
DH 120	see curve	120'
DHA	see curve	over 120'



Fixed smoke curtains
SMOKE HOLD™ - SHF

***SMOKE HOLD™ - SHF* fixed smoke curtains comply** with **Regulation (EU) No 305/2011**. They are provided with **CE marking**, **tested** and **certified** according to **EN 12101-1** Standard by a notified body.

SMOKE HOLD™ - SHF curtains are **certified** up to: **DA 180**.

Curtains are made of a flexible fiberglass fabric coated with grey aluminium polymer on both sides. The upper edge of the fabric, provided with a reinforced side, is fastened to the structure by means of a metal profile, thus making the fabric adhere to the ceiling.

The lower edge of the curtains is provided with a pocket containing a steel profile that acts as a counterweight.

All fabric seams are machine-made with stainless steel wire.

Active smoke curtains
SMOKE HOLD™ - SHA

SMOKE HOLD™ - SHA active smoke curtains **comply** with **Regulation (EU) No 305/2011**. They are provided with **CE marking**, **tested** and **certified** according to **EN 12101-1** Standard by a notified body.

These curtains **work entirely on gravity**, are **fail-safe** and incorporate all the latest electronic innovations. They consist of a galvanized metal roller box containing a curtain made of flexible fiberglass fabric coated with grey aluminium polymer on both sides, rolled up on a winding roller with a 24V motor and with almost unlimited lengths.

The lower edge of the curtains is provided with a steel profile that acts as a counterweight in order to stabilize the descend and mechanically blocks the closing. This profile is finished with a white polycarbonate shaped cover.

With active smoke curtains, smoke accumulation areas can be created. The curtains fall to a certain height that must be higher than the smoke layer calculated according to ventilation systems. This height must not affect escape routes.

Smoke curtains can be placed in ceilings with open spaces in order to prevent smoke rising to the upper floors and spreading to other rooms.

Any space between ceiling and the roller box can be closed by a fabric strip just like the curtain. This one is fastened to the box, stretched and fastened to the ceiling in order to avoid any smoke infiltration.

Side retaining and sliding guides guarantee the lateral seal of smoke and heat, thus allowing a linear descend of the curtain. The guides, made of galvanized metal sheet, are necessary for curtains that operate at high temperatures (DH) and are **available upon request for standard curtains** (D). On the sides of the curtains, special pins are applied to the fabric to allow its sliding inside lateral guides.

Active fire curtains
FIRE HOLD™ - FHA

Fire compartmentation is becoming increasingly important in buildings design and construction. The presence of fire curtains in buildings guarantees safe escape routes through a proper space compartmentation. Moreover, fire spread in various areas is avoided while smoke and hot gases are guided to ventilation systems.

FIRE HOLD™ - FHA active fire curtains **work entirely on gravity**, are **fail-safe** and incorporate all the latest electronic innovations.

They consist of a galvanized metal roller box containing a curtain made of flexible fiberglass fabric coated with grey aluminium polymer on both sides, rolled up on a winding roller with a 24V motor.

The lower edge of the curtains is provided with a steel T-shaped profile that acts as a counterweight in order to stabilize the descend and mechanically blocks the closing.

Fire curtains are also provided with **side guides** that **guarantee the fire resistance between curtains fabric and compartments**. These prevent fabric waving in the event of a fire due to positive or negative pressures, which are generated inside buildings.

On the sides of the curtains, special pins are applied to the fabric to allow its sliding inside lateral guides, which are made of galvanized metal sheet.

FIRE HOLD™ - FHA active fire curtains are **classified** according to **EN 13501-2** Standard "Fire classification of construction products and building elements", **with test report** according to **EN 1634-1** Standard for non-insulated fire doors.

Active curtains functioning and *GCP* control panel

SMOKE HOLD™ - SHA and ***FIRE HOLD™ - FHA*** active curtains **functioning** is managed through a ***GCP control panel*** operating at 230V AC.

Each *GCP* is able to control up to 6 24V motors (3 motors with great size curtains).

Each motor is connected to an *MCC* control circuit contained in a specific box which is placed on the same side of the motor, above the roller box. The roller motors are connected to the *GCP*, thus creating a loop circuit by means of 4 mm^2 bipolar (+ ground) cables, not exceeding 100 m length.

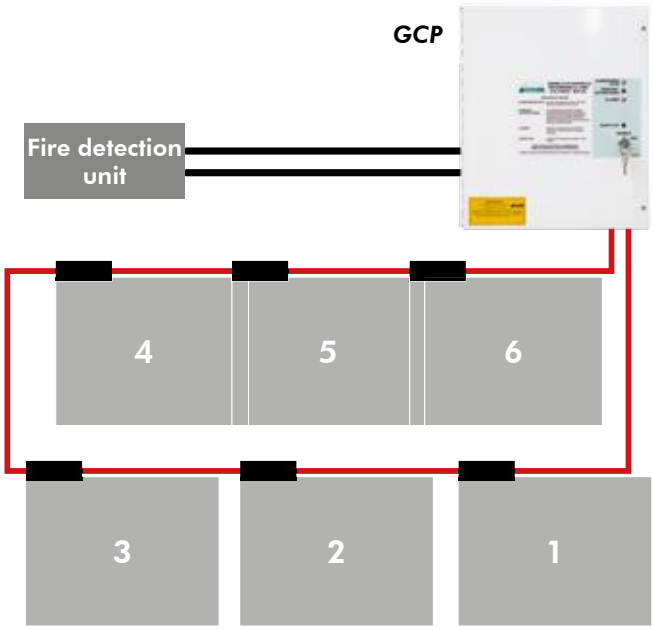
Under normal operating conditions, *GCP* powers 24V curtains motors, keeping the curtains inside roller boxes.

In the event of an alarm signal from the fire detection system (the latter excluded from our supply), the GCP opens the circuit contact and removes power supply to the curtains motors. Therefore, the curtains automatically fall by gravity (fail-safe), with controlled speed, positioning themselves at a pre-established height.

When the alarm signal is reset, *GCP* restores power supply to the motors and the curtains retract themselves. When the curtains are completely retracted, the limitation circuit detects the complete rewinding and power supply is reduced to stand-by value.

Each *GCP* is supplied with two 12V 7A backup batteries, which allow to maintain the control of the system in case of main power failure.

Battery voltage is continuously monitored and, in case it falls below 85% of the rated charge, it will be disconnected by lowering the curtain under gravity effect at controlled speed.



***SMOKE HOLD™ SHA / FIRE HOLD™ FHA* active curtains**

Power supply:	230V 50Hz
Batteries:	Rechargeable, 4 hours duration, 2x7Ah
Fire alarm contact:	Open in alarm, fail-safe
Test modality:	Key switch
LEDs:	Green LED = mains on
	Yellow LED = charge / battery fault
	Red LED = fire alarm status good
Dimensions:	340 x 400 (h) x 105 mm


ZONA
A3

UPSTANDS

Upstands

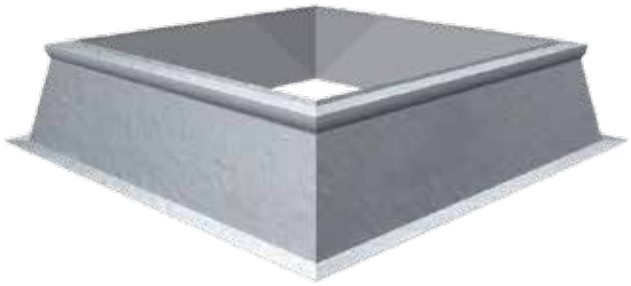
Standard GFRP monobloc upstands

Standard GFRP monobloc upstands are realized with **glass fibre-reinforced polyester**, **white pigmented on the internal side**. They are **insulated** with rigid expanded polyurethane panels, density 35±1 kg/m^3.

Thanks to their **easy and quick installation** and because of the **great light diffusion** given by the shape, prefabricated upstands are particularly suitable as an alternative to traditional concrete support walls, which are expensive and difficult to realize, especially if circular.

They are **impact resistant**, **weather resistant**, dimensionally **stable** and **designed to collect any condensation water**.

They are available in the dimensions and heights shown in the tables alongside.



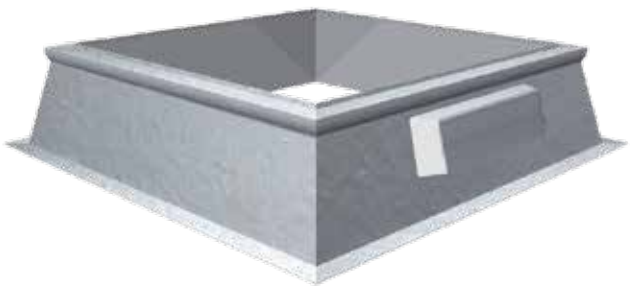
GFRP monobloc upstands with extractors

Similar to the standard GFRP ones, this kind of upstands can be made in the dimensions shown in the tables alongside, with a height of 50 cm.

GFRP monobloc upstands with extractors are particularly suitable for spaces where **continuous ventilation**, both natural or powered, is required in order to get an air exchange without the use of traditional openings.

The extractor is tangential, with a 240 m^3/h flow rate and a shielded single-phase motor (230 V, 37 W) able to operate with temperatures from -30°C to +50°C.

The air flow is protected by an anti-insect net.



Dimensions

Circular monobloc upstands

Clear span A	External support wall B	Floor opening D	H 20	H 30	H 50
⌀ 45	⌀ 58	⌀ 65	●		
⌀ 70	⌀ 83	⌀ 90	●		
⌀ 70	⌀ 83	⌀ 100	●	●	●
⌀ 95	⌀ 108	⌀ 115	●		
⌀ 95	⌀ 108	⌀ 120	●	●	
⌀ 100	⌀ 113	⌀ 120	●		
⌀ 120	⌀ 133	⌀ 140	●		
⌀ 120	⌀ 133	⌀ 150	●	●	●
⌀ 135	⌀ 148	⌀ 155	●		
⌀ 155	⌀ 168	⌀ 175	●		
⌀ 155	⌀ 168	⌀ 180	●	●	
⌀ 170	⌀ 183	⌀ 190	●		
⌀ 170	⌀ 183	⌀ 200	●		
⌀ 200	⌀ 215	⌀ 220	●		

Dimensions in cm.

Square monobloc upstands

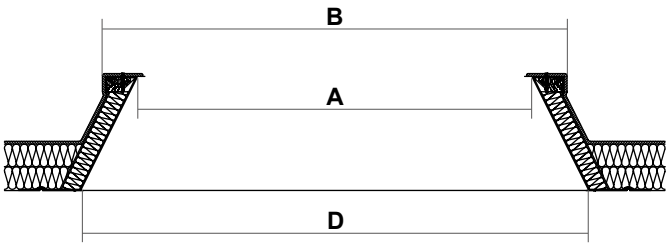
Clear span A	External support wall B	Floor opening D	H 20	H 30	H 50
45x45	58x58	65x65	●		
70x70	83x83	90x90	●	●	●
70x70	83x83	100x100	●	●	●
80x80	93x93	100x100	●		
95x95	108x108	115x115	●		●
95x95	108x108	120x120	●	●	●
100x100	113x113	120x120	●		
120x120	133x133	140x140	●		
120x120	133x133	150x150	●	●	●
155x155	168x168	175x175	●		
155x155	168x168	180x180	●	●	
170x170	183x183	190x190	●		
170x170	183x183	200x200	●	●	
180x180	193x193	190x190		●	
180x180	193x193	200x200	●		
200x200	215x215	220x220	●		

Dimensions in cm.

Rectangular monobloc upstands

Clear span A	External support wall B	Floor opening D	H 20	H 30	H 50
45x70	58x83	65x90	●	●	
55x155	68x168	75x175	●	●	
70x120	83x133	90x140	●		
70x120	83x133	100x150	●		
70x170	83x183	90x190	●		
70x170	83x183	100x200	●	●	
70x230	83x243	90x250		●	
85x205	98x218	105x225	●		
90x170	103x183	100x200	●		
95x155	108x168	115x175	●		
95x155	108x168	120x180	●		
100x200	113x213	120x220	●	●	●
100x220	113x233	120x240	●	●	
120x170	133x183	140x190	●		
120x170	133x183	150x200	●		
120x220	133x233	140x240	●		
120x265	133x278	140x285	●		
120x265	133x278	150x300	●		
170x265	183x278	190x285	●		

Dimensions in cm.



Onda Europa GFRP monobloc upstand

These **upstands** are realized with ***Onda Europa*** **profile 177/51 cm pitch**.

The **easy installation** and the **limited intervention area** make them particularly suitable to be placed in corrugated roofing sheets.

They are realized with a 20 or 25 cm height and their structure is very similar to standard GFRP upstands.

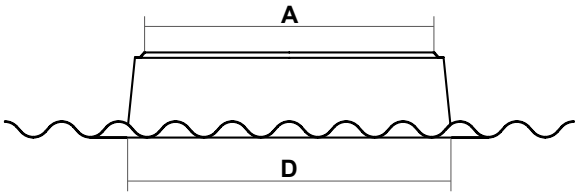
Just like the other monobloc upstands, the various opening systems can be applied to get, in addition to a great light diffusion, even an optimal daily ventilation or a smoke and heat exhaust ventilation system.

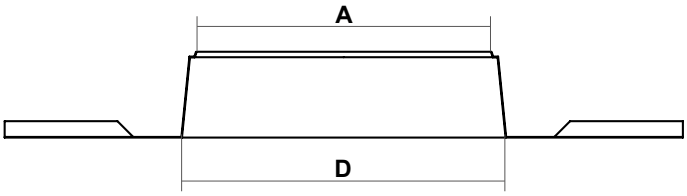
In order to avoid any infiltration, **this kind of upstand must be installed on pitched roofs**, where the slopes are useful to ensure water outflow.

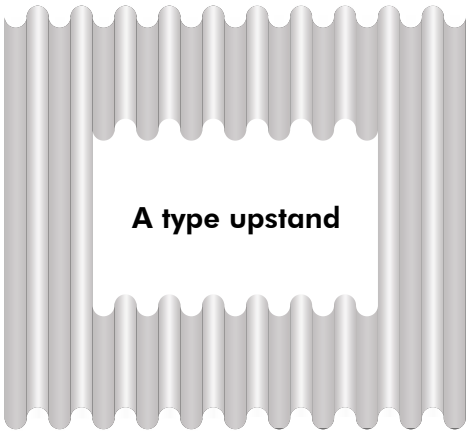
Dimensions

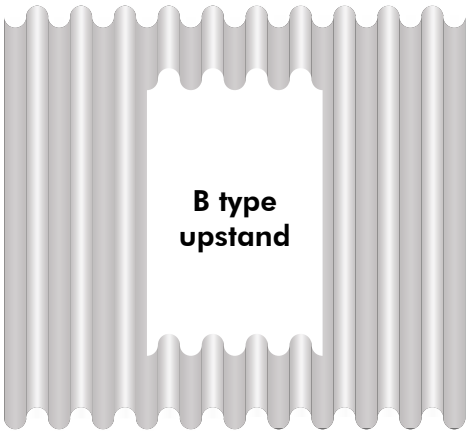
Upstand type	Floor opening D	Dome clear span A
A / B	100x100	95x95
A / B	150x150	120x120
A / B	100x150	70x120
A	80x240	70x230
A	90x260	80x250
A	95x215	85x205
A	110x210	100x200
A	110x260	100x250
A	130x275	120x265
A	140x240	120x220

For particular requirements we realize upstands on client's sample.
Dimensions in cm.









GFRP monobloc upstands on corrugated roofing sheets

GFRP monobloc upstands on corrugated roofing sheets are realized with **glass-fibre reinforced polyester**, **white pigmented on the internal side**. They are **insulated** with rigid expanded polyurethane panels, density 35±1 kg/m^3. Suitable for pitched metal roofs, their **external side is raw**, **grey coloured** and treated with proper **waterproofing** special compound. The internal side is white painted and smoothed in order to get a better light diffusion.

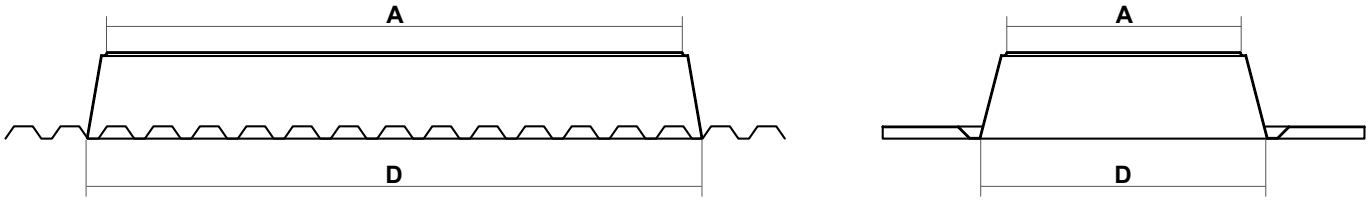
Just like the other monobloc upstands, the various opening systems can be applied to get, in addition to a great light diffusion, even an optimal daily ventilation or a smoke and heat exhaust ventilation system.

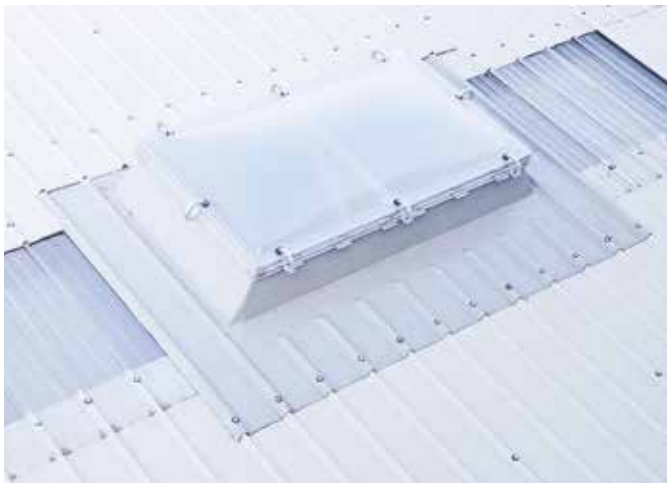
In order to avoid any infiltration, **this kind of upstand must be installed on pitched roofs**, where the slopes are useful to ensure water outflow.

Dimensions

Dome clear span A	Floor opening D
60x250	60÷80
70x120	90÷110
70x230	80÷100
85x205	90÷110
100x200	95÷110
100x200	115÷130
100x250	95÷130
120x120	130÷145
120x220	130÷145

For particular requirements we realize upstands on client's sample.
Dimensions in cm.



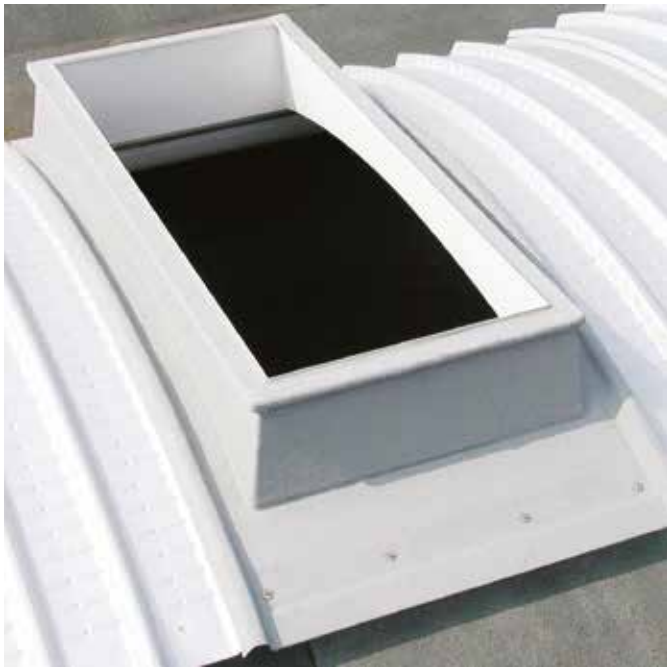


GFRP monobloc upstands for bended sandwich panel

Prefabricated upstands for bended sandwich panel are suitable for curved roofs with panels radius 330 cm, 375 cm, 600 cm type *Elycop/Fratelli Re*, *Rexcop*, *Archimede*, *Italpannelli*, etc. or additional radii upon request.

They are realized with **glass-fibre reinforced polyester**, **white pigmented on the internal side**. They are **insulated** with rigid expanded polyurethane panels, density 35±1 kg/m^3, thickness from 4 to 8 cm. The **external side is raw**, **grey coloured** and treated with proper **waterproofing** special compound. The internal side is white painted and smoothed in order to get a better light diffusion.

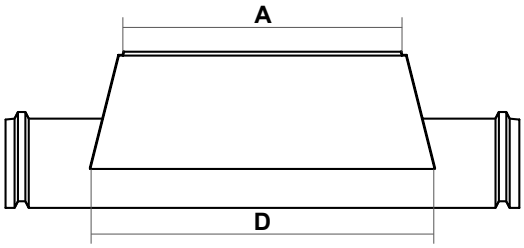
Just like the other monobloc upstands, the various opening systems can be applied to get, in addition to a great light diffusion, even an optimal daily ventilation or a smoke and heat exhaust ventilation system.

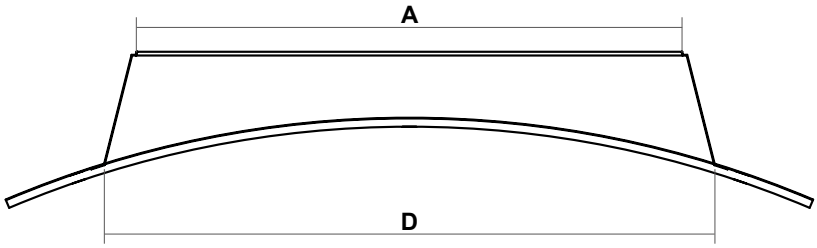


Dimensions

Radius 330		Radius 375		Radius 600	
Panel length	**Clear span A**	**Panel length**	**Clear span A**	**Panel length**	**Clear span A**
230-410	85x205	250-290	100x200	300-450	60x250
260-450	100x200	220-420	120x175	250-410	85x205
320-450	100x250	270-470	120x225	250-380	100x200
230-450	120x170			350-450	100x250
260-400	120x220			310-450	160x250
320-460	160x250				

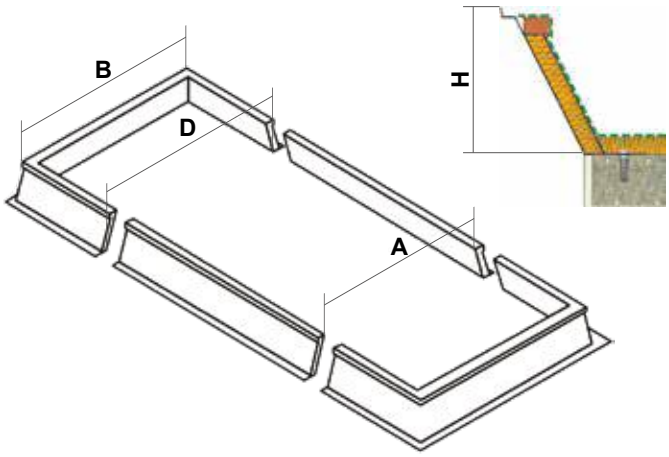
For particular requirements we realize upstands on client's sample.
Dimensions in cm.





GFRP continuous modular upstands

GFRP continuous modular upstands are designed to be used with continuous skylights as they are made with **modular** elements in order to obtain long length structures. They are realized with **glass-fibre reinforced polyester**, **white pigmented on the internal side and designed to collect possible condensation water**. They are **insulated** with rigid expanded polyurethane panels, density 35±1 kg/m^3.



Dimensions

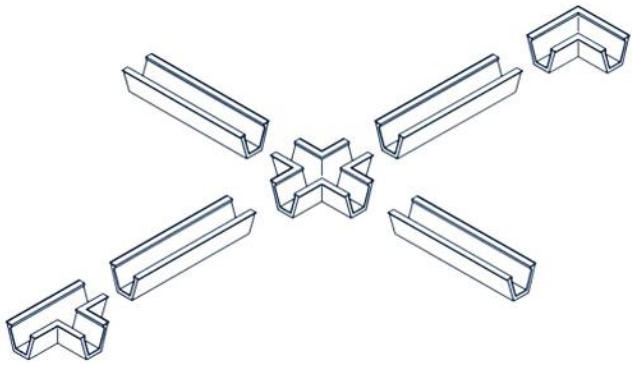
A	B	D	H 20	H 30	H 50
50	65	72	●		
65	80	87	●		
75	90	97	●	●	●
85	100	107	●	●	●
95	110	117	●	●	●
100	115	122	●	●	●
105	120	127	●	●	●
110	125	132	●	●	●
120	135	142	●	●	●
125	140	147	●	●	●
130	145	152	●	●	●
135	150	157	●	●	●

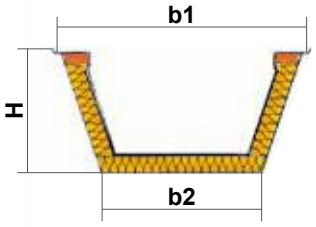
A	B	D	H 20	H 30	H 50
140	155	162	●	●	●
150	165	172	●	●	●
160	175	182	●	●	●
165	185	187	●	●	●
175	190	197	●	●	●
185	200	207	●	●	●
200	215	222	●	●	●
220	235	242	●	●	●
230	235	252	●	●	●
240	245	262	●	●	●
250	265	272	●	●	●

Dimensions in cm.

GFRP continuous modular upstands with gutter

GFRP upstands with gutter are designed to be used with continuous skylights, thermoformed tunnels and ribbed tunnels as they are made with **modular** elements in order to obtain long length structures. They are realized with **glass-fibre reinforced polyester**, **white pigmented on the internal side and designed to collect possible condensation water**. They are **insulated** with rigid expanded polyurethane panels, density 35±1 kg/m^3.





Dimensions

H	b1	b2
18	30	20
25*	30	20
30**	60	40

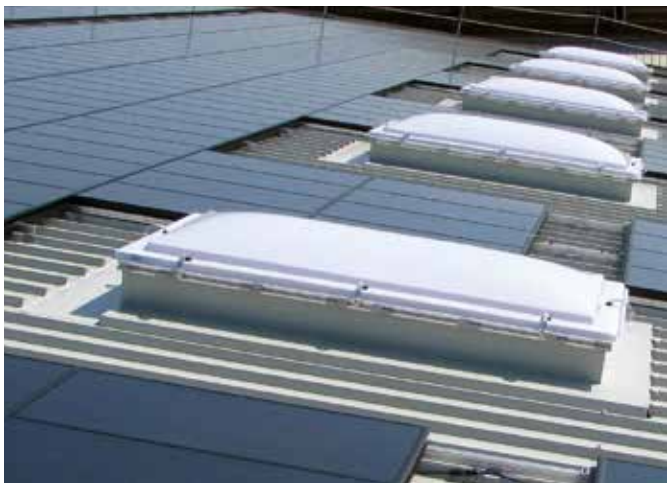
***available with cross elements, T-shaped elements and angular elements.**
****H 25 and H 30 cm gutters are self-supporting and available with elements length 500 cm.**
Dimensions in cm.

Metallic upstands

Metallic upstands are suitable for monobloc domes and continuous skylights and are generally made of **galvanized metal bent sheet**.

This kind of upstands can be **produced upon request** with **different materials**, such as aluminium or prepainted steel, with **different heights** or **truncated pyramid shape** to fit the existing floor opening. **Thermal insulation** is guaranteed by an insulating high density self-extinguishing panel. This panel can be employed for roofs with either bituminous or synthetic waterproofing coat.

Upon request, upstands **casings** can be provided to complete and finish them.



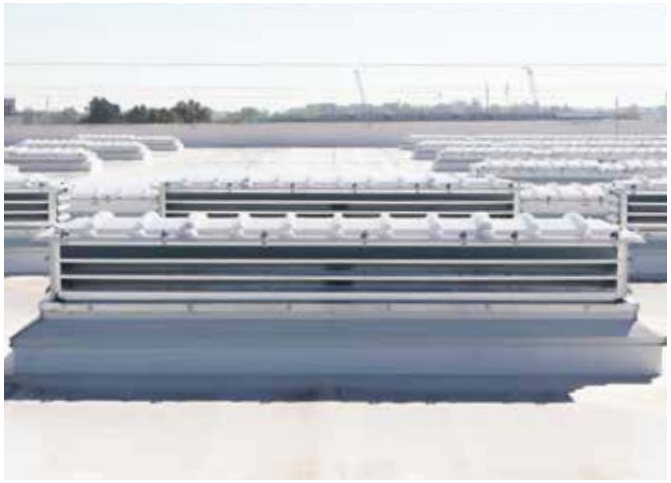
Metallic upstands for continuous ventilation

Metallic finned upstands are designed with the purpose of a **continuous natural ventilation**.

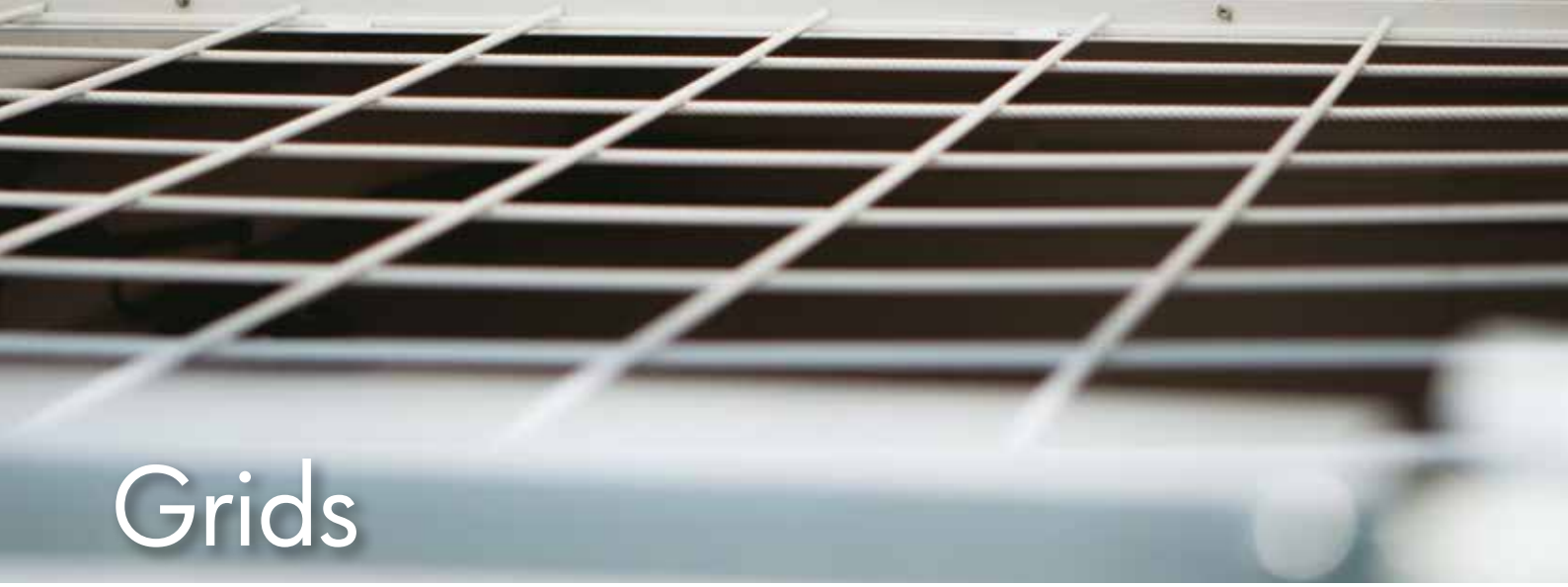
Made of **galvanized steel**, **prepainted steel** or **aluminium**, they are **resistant to stresses and suitable for outdoor installation**.

An **anti-insect net** is installed in the internal side to prevent possible intrusions.

These upstands are **custom made** and can be paired with all monobloc domes, continuous skylights or tunnels.



GRIDS



Grids

Anti-falling and anti-intrusion grids

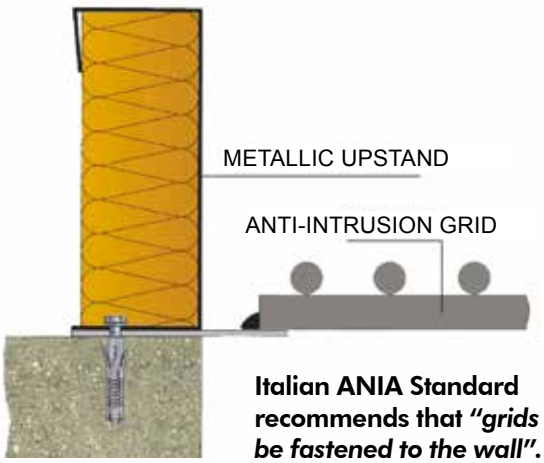
Anti-falling grids are essential in case safety has to be guaranteed against falling from height.

Anti-intrusion grids are made according Italian ANIA Standard, in order to avoid intrusions from the outside.

The **installation** is **carried out together with upstands**, either metallic or prefabricated, in such a way to make the whole thing a **unique irremovable element**.

They are made of **galvanized metal mesh** with rods or with metallic grids *Keller/Orsogril* type, perimetrically edged with a roof fastening profile. Their **design** and typology are **custom made**.

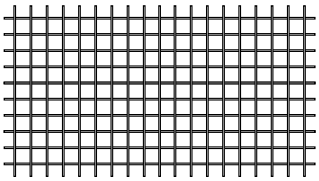
The mesh grids 50x50 Ø3 mm and 200x200 Ø8 mm are equipped with a test report.

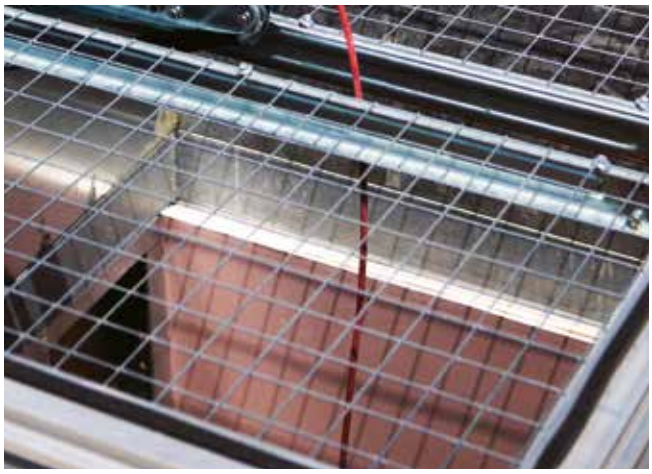


Italian ANIA Standard recommends that *"grids must be fastened to the wall"*.

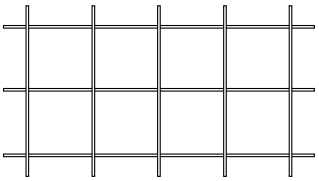
Standard dimensions

Anti-falling
Mesh 50x50 mm
Rod Ø 3 mm

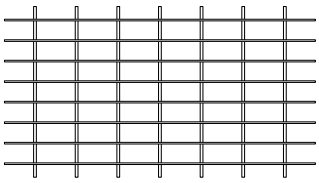




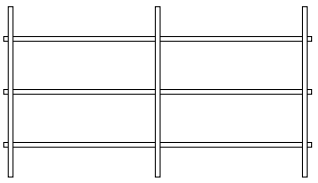
Anti-falling
Mesh 200x200 mm
Rod Ø 8 mm



Anti-intrusion
Mesh 63×132 mm
Plate 3×30 mm



ANIA anti-intrusion
Mesh 180x500 mm
Rod Ø 16 mm



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