



SUNBREAKER

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TODAY ONE CAN RATIONALISE EVEN LIGHT



The adjustable NACO sunbreaker has been designed to guarantee ideal conditions in every surrounding. It allows infiltration of light according to your wish and helps in achieving a pleasant inside temperature at any time of the day.

The sunbreaker absorbs up to 80% of the solar heat and helps to reduce climatization cost by up to 30%. Its simple and elegant structure is easily adaptable to all kinds of constructions such as private dwellings, offices, factories, hotels, restaurants, hospitals, schools and

sports centres: wherever the necessity arises to create better living and working conditions by controlled light infiltration.

The sunbreaker blades are made of:

- Anodised or pre-painted aluminium sheet in the following standard colours:
 - White semi-gloss AC 1323
 - Dark brown AC 4304
 - Silver AC 2306
 - Light bronze AC 4342
- Extruded aluminium profiles painted in RAL colours.

The framework is constructed in prepainted or anodised extruded aluminum, or in zinc-plated and prepainted steel.

The use of highly resistant, light alloys ensures durability. The complete structure has been tested

for wind loads of up to 120 km/hr. NACO subbreakers can easily be installed direct onto the sill or onto supporting brackets and do not require maintenance. The sunbreaker can be operated manually, by an adjustable friction control device, mechanically by electrical remote control or automatically with an electronic device that allows the required light intensity to be maintained by automatically adjusting the blades to an ideal angle.

*Below: Head-office of Viadukt, Zagreb, Croatia.
Opposite page:
Above: The "Ship" building at Ljubljana, Slovenia.
Below, left: The "München Order Center"
Munich, Bavaria.
Below, right: Mercedes headquarters at Ljubljana,
Slovenia.*



SUNBREAKER



ELLIPSOID SUNBREAKER

PART NUMBERS

1. Internal top channel
2. External bottom channel
3. Top axle
4. Bottom axle
5. Blade endcap
6. Ellipsoid blade
(15/21/30/45 cm)
7. Channel reinforcement
8. Small circlip
9. Location block
10. Grub screw
11. Connection rod joint
12. Connection rod
13. Screwed-on support
bracket
14. Cover plate
15. Walled-up support bracket
16. Electrical remote control
unit connector plate
17. Teleflex connector plate
18. Manual friction control
operator
19. Head bolt for fixing support
bracket onto frame
20. Expansion bolt
21. Large circlip
22. Blocking plate



BLADE

The blade is made from prepainted aluminium sheet, LAMCOLOR ALCAN, previously cut to size. It has an ellipsoid shape which gives an attractive appearance and makes it particularly robust; it has in fact been tested for wind loads of up to 120 km/hr. Subsequently the endcaps are fitted and internal reinforcements are used. LAMCOLOR consists of aluminium sheet type 3103 H 44, thickness 0.7/0.8 - the best available for the building sector - which is then paint treated. NACO sunbreakers can be supplied in the following standard colours:

- White semi-gloss AC 1323
- Dark brown AC 4304
- Silver AC 2306
- Light bronze AC 4342

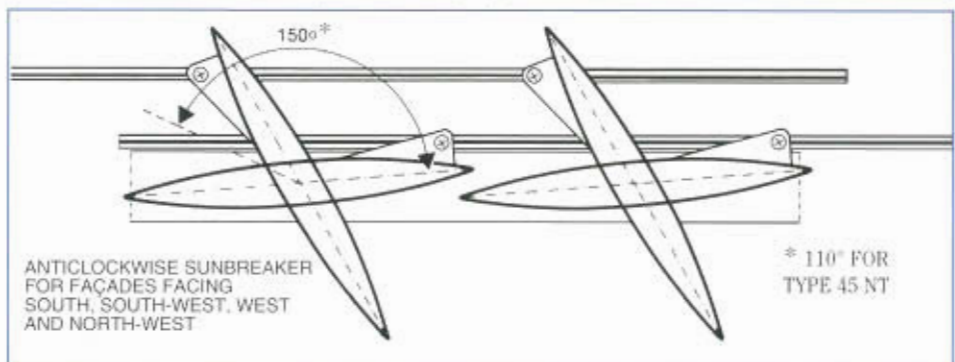
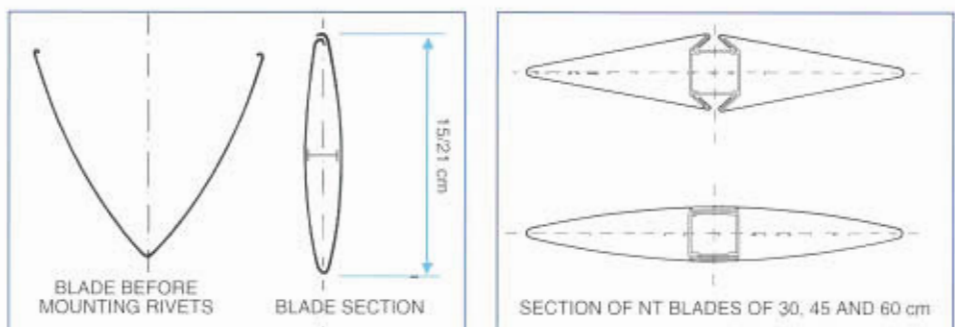
For projects which exceed 350 m² the NACO sunbreaker can be supplied in any other colour of the ALCAN or RAL scale; in this case delivery has to be discussed and agreed individually. All colours, both semi-gloss or metallic, are produced with first class semi-gloss polyamide resins.

SUNBREAKER BLADE 30 NT, 45 NT AND 60 NT

The sunbreaker blade has a very clear line and an exceptional aerodynamic profile; its finish gives the whole structure a touch of class. Absolutely without rivets, the blade consists of two parts fitted to a central section.

At its ends it is closed by black endcaps, fitted under pressure for the type 30 NT and screwed on for the type 45 NT and the type 60 NT.

For façades exposed to south, south-west, west and north-west, NACO can supply blades which open anti-clockwise, for a better light regulation.



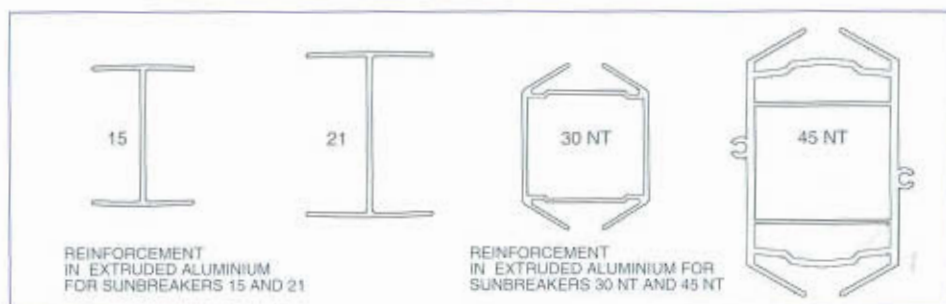
Above: Centro Commerciale at Ventimiglia, Imperia.
Below: A. Mondadori Editore headquarters in Segrate, Milan.



SUNBREAKER

BLADE REINFORCEMENT

The reinforcement of the blades consists of extruded aluminium.



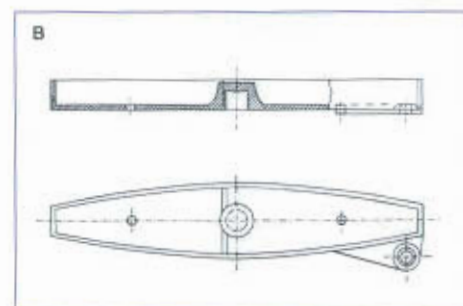
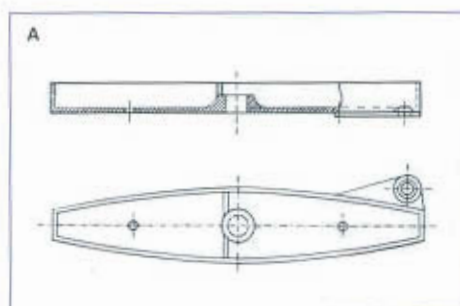
ENDCAP

The endcap of the blade is made of nylon 6 reinforced with 30% fibreglass, which guarantees durability and indeformability in highly polluted atmospheres.

A) Upper cap with hole

B) Lower cap with blind hole.

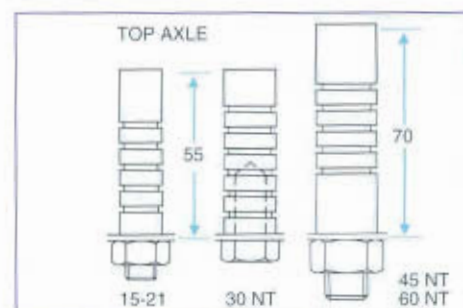
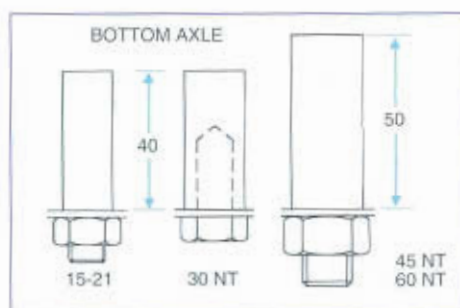
The caps are fixed to the blade with aluminium rivets. For the blade 30 NT the cap is fixed by pressure, for the 45 NT it is screwed on. For the 60 NT it is screwed on in diecast aluminium.



BLADE FIXING AXLES

The axles for the sunbreakers type 15 and 21 are in aluminium and have a ϕ of 14 mm, for the type 30 NT the axels are of ϕ 17. The first are screwed onto the frames with M 10 inox nuts, the latter with M 10x20 inox bolts.

The axles for the type 45 NT and 60 NT are black zinc plated steel and have a ϕ of 20 mm. They are scewed on with M 14 inox nuts.



FRAME

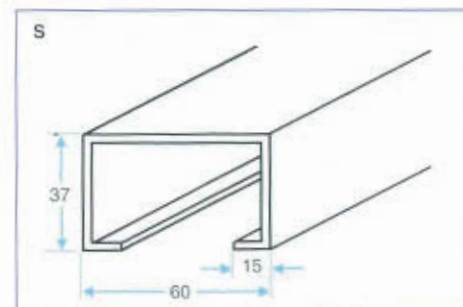
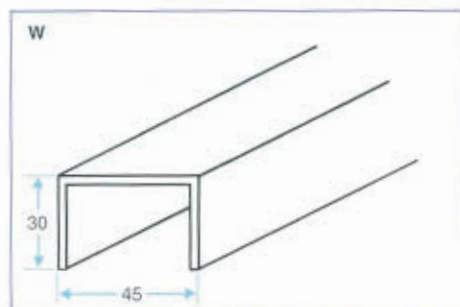
W) APPLICATION ON WINDOW SILL

Frame in extruded aluminium of 2.5 mm thickness, prepainted in black, white or anodised.

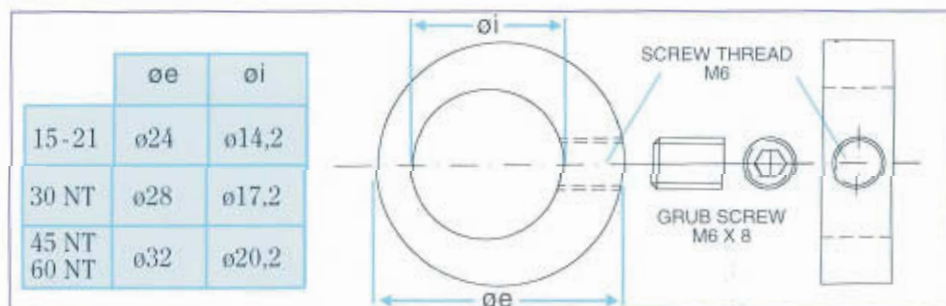
S) APPLICATION ON SUPPORT BRACKETS

The frame is made of anodised, black or white prepainted extruded aluminium of 3 mm thickness.

The frames, both for sill and support brackets, can also be obtained from first choice zinc-plated steel of 2 mm thickness to be then stovebaked in white or black.

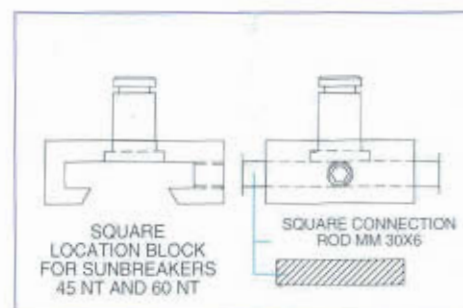
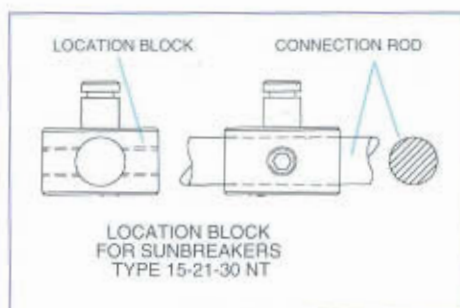


LOCK RING for sunbreaker in horizontal position.



LOCATION BLOCK

In anodised aluminium, manufactured from 24 mm diameter bars for sunbreakers type 15, 21 and 30 NT, while for type 45 NT and type 60 NT they are obtained from an extruded profile which holds the connection rod of 30x6 mm.



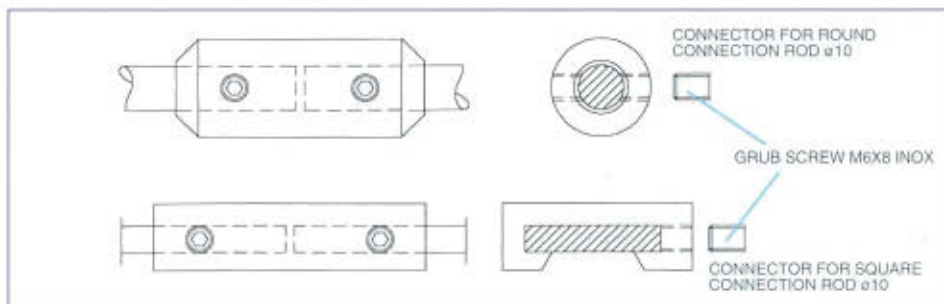
SUNBREAKER

CONNECTION ROD

Is used to connect all the blades in order to obtain simultaneous movement.
For types 15, 20, and 30 NT it is a round aluminium profile of ϕ 10 mm;
for types 45 NT and 60 NT it is a natural anodised aluminium plate 30x6 mm.
It is supplied in 3 m bars.

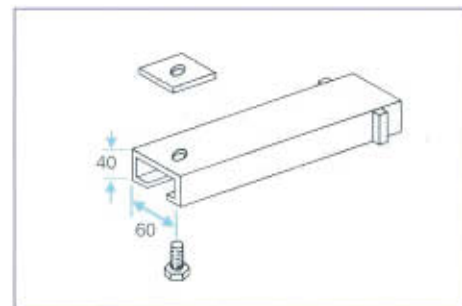
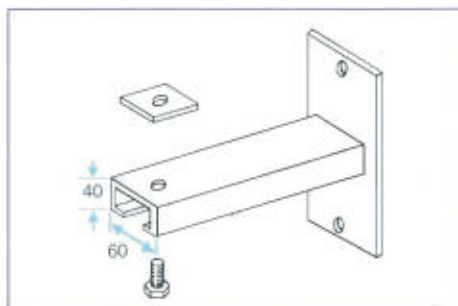
CONNECTION ROD JOINT

Connects various rods together in case of larger openings.



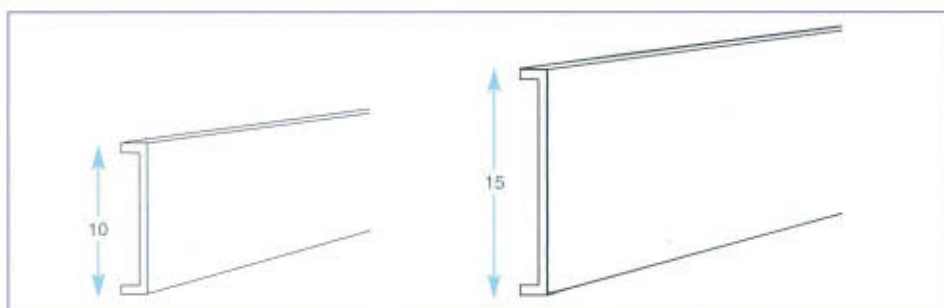
SCREWED-ON SUPPORTING BRACKETS

Machined from mild steel sheets of 3 mm thickness, "C"-section. Electrolytically zinc treated and then painted.
The support bracket is welded onto a base plate made of mild steel which has holes for fixing the bolts.



WALLED-UP SUPPORTING BRACKETS

C-section, machined from mild-steel sheets treated as above; welded reinforcement at the end which will allow a better setting into the wall.



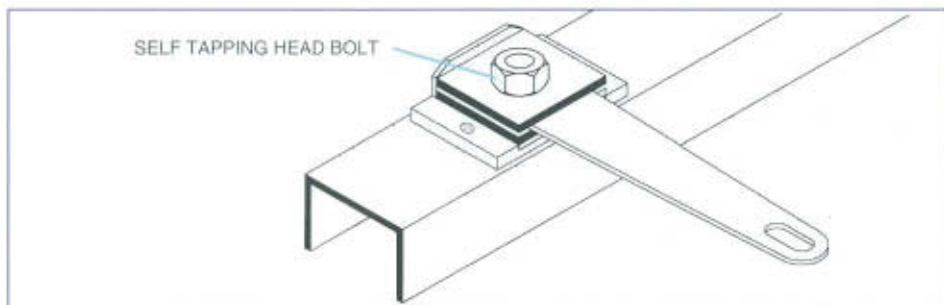
COVER PLATE

Quality finish made of the same material as the blades.

- 10 cm for frames on simple brackets.
- 15 cm for intermediate frames.

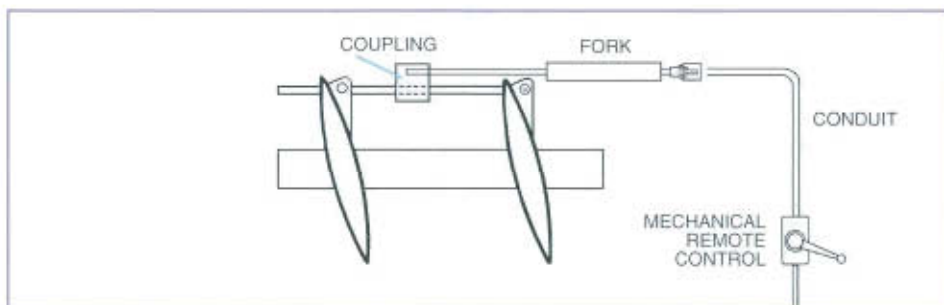
FRICTION

For manual control of the sunbreaker a selftapping head bolt which -by means of a nylon ring acting on the fixing plate- stiffens the movement of the blades according to request. Made of stainless steel: the cheapest system for moving the blades.



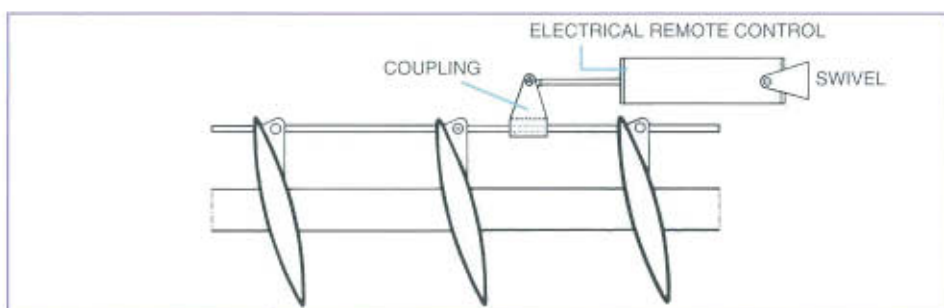
MECHANICAL REMOTE CONTROL

Allows for easy operation from the inside of the building. An elegant handle operates a cable which transmits the movement to the sunbreaker.



ELECTRICAL REMOTE CONTROL

Enables control from inside by means of a simple switch, allowing remote operation of the sunbreaker at any distance. The motor is built for external operation and is not affected by rain or humidity.





Above: The sunbreaker type 21 (white) near Amsterdam, Netherlands.

In the centre: The sunbreaker type 15 silver used in the Gema in Berlin, Germany.

Below: An example of Naco sunbreaker type 30 applied on the roof of a school in San Remo.

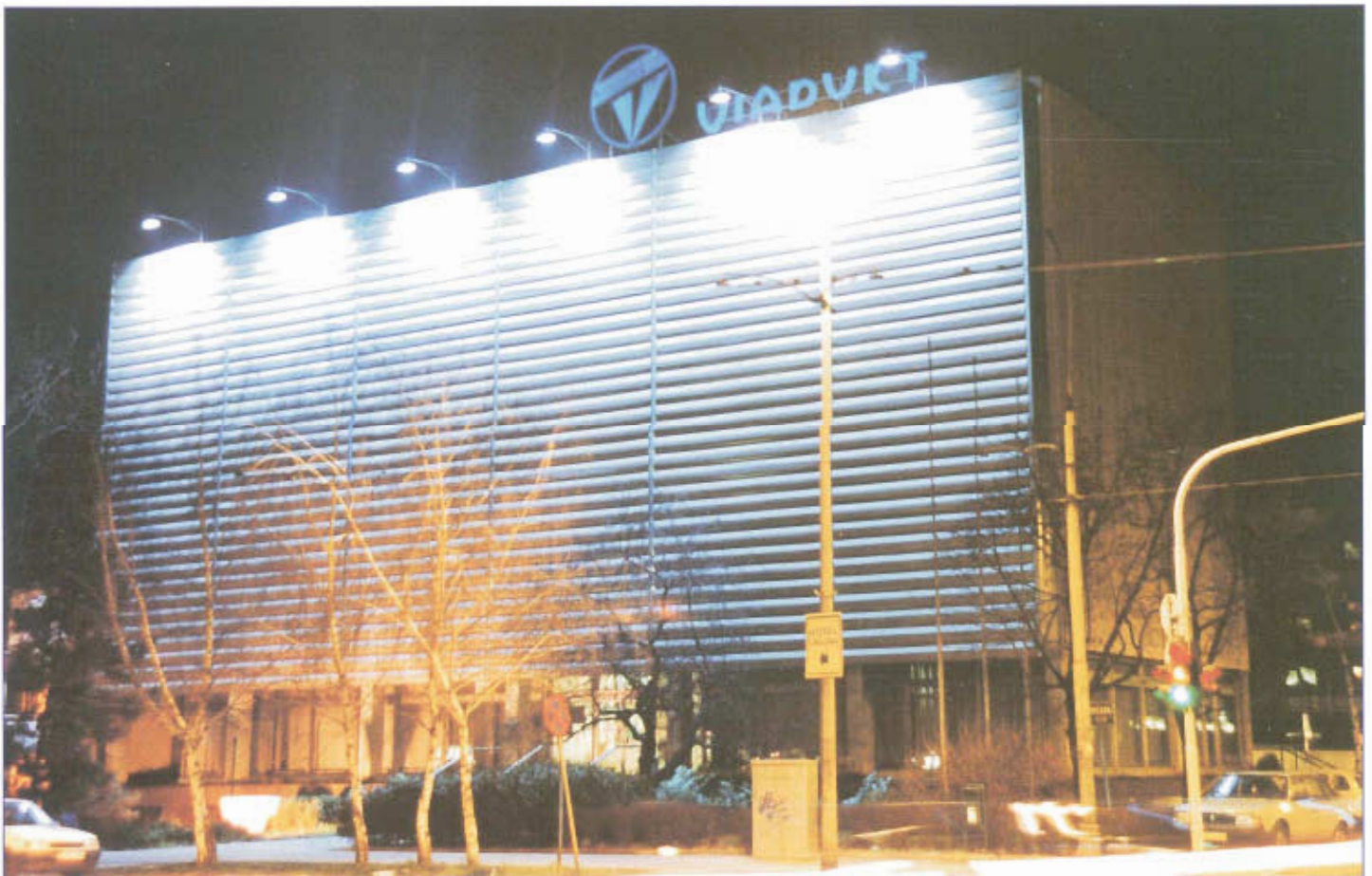




Above: Main offices of SEMAG in Milan with the use of sunbreakers type 30 NT in white, on external support brackets.

Right: The roof of the Eutron headquarters use the sunbreaker type 30 NT in white.

Below: Headquarters of Viadukt by night, Zagreb, Croatia.



STRUCTURE

The NACO sunbreaker is a structure consisting of a frame and ellipsoid shaped blades which rotate on a rigid axle fixed to the bottom channel frame. The blades are 15, 21, 30, 45 and 60 cm, the maximum size available are shown on the table aside. For setting purposes the blades are connected by an aluminium rod of 10 mm diameter, with location blocks. The connection rod is fixed in the following way:

- introduce the rod in the location blocks (one for each blade), insert the latter in the hole of the support of each blade and fix them with small circlips
- close all the blades and fix the location blocks with headless screws. The blades are supported and rotate on the axle of bottom channel frame. The top axle has five machined grooves; this system allows a tolerance of ± 1 cm, by mounting the large circlip on a higher or lower groove.

Accessories:

SMALL CIRCLIP

LARGE CIRCLIP

LOCATION BLOCK

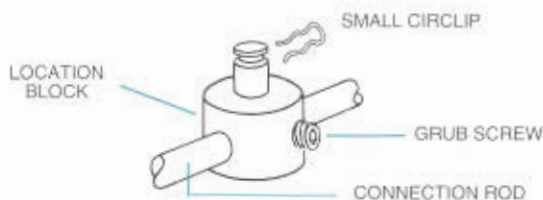
GRUB SCREW

CONNECTOR

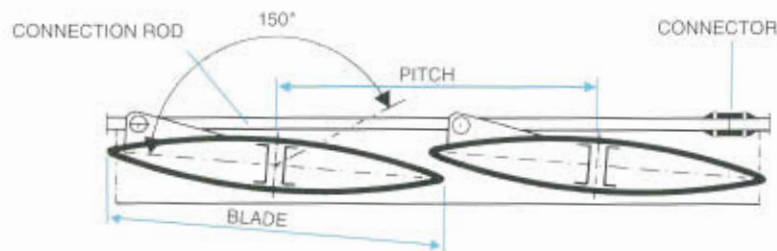
CONNECTION ROD length 300 cm

(For bigger lengths the rods can be connected by one or more connectors)

BLOCKING RING



MAXIMUM SIZE OF THE BLADES (data refers to a wind speed of 120 km/hr)			
	Blade (cm)	Pitch (cm)	MAX size (cm)
Pressfolded	15	14	360
	21	20	350
	30 NT	29	390
	45 NT	44	500
	60 NT	59	450
Extruded	21 E	20	380
	25 E	24	420
	30 E	29	480
	45 E	44	550
	60 E	59	530



APPLICATIONS

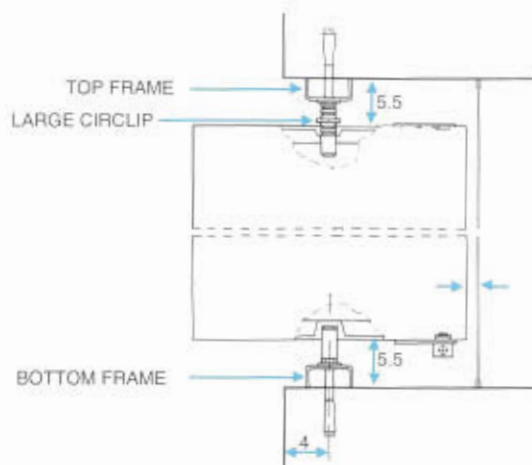
ONTO WINDOW-SILL

The simplest and cheapest application; the frames are fixed directly onto the window-sill using 8 x 85 mm expansion bolts, at one metre centres, which provide a good setting even if the thickness of the plaster on cement exceeds 10 mm.

The minimum width of the window-sill to allow the mounting of the sunbreaker are:

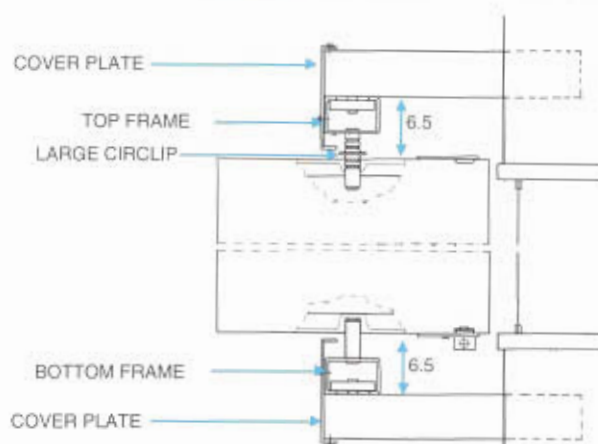
Type 15	cm 15
Type 21	cm 18
Type 30 NT	cm 22
Type 45 NT	cm 30
Type 60 NT	cm 37

If an electrical motor has to be fitted, these measurements increase by 12 cm.



ONTO SUPPORT BRACKETS

The choice of type of support bracket is governed by the structure to which these have to be fixed (see: Application onto support brackets). The length of these brackets is determined by possible protrusions of the wall (window-sills or vertical fall pipes) so as to allow the blades to move freely. If necessary, some of the blades can remain in a closed position to avoid obstacles. Support brackets and frame can be covered by a channel made of the same material as the blades.



MOUNTING ON SUPPORT BRACKETS

SCREWED-ON SUPPORT BRACKETS

It is important to study the structure onto which the brackets have to be fitted. The drawing shows the method of fixing to concrete by means of expansion bolts. Top and bottom brackets are the same, whereas the middle bracket is designed to hold two frames intended for applications over 4 meters in height. A cover plate made of the same material and in the same colour as the blades conceals the brackets.

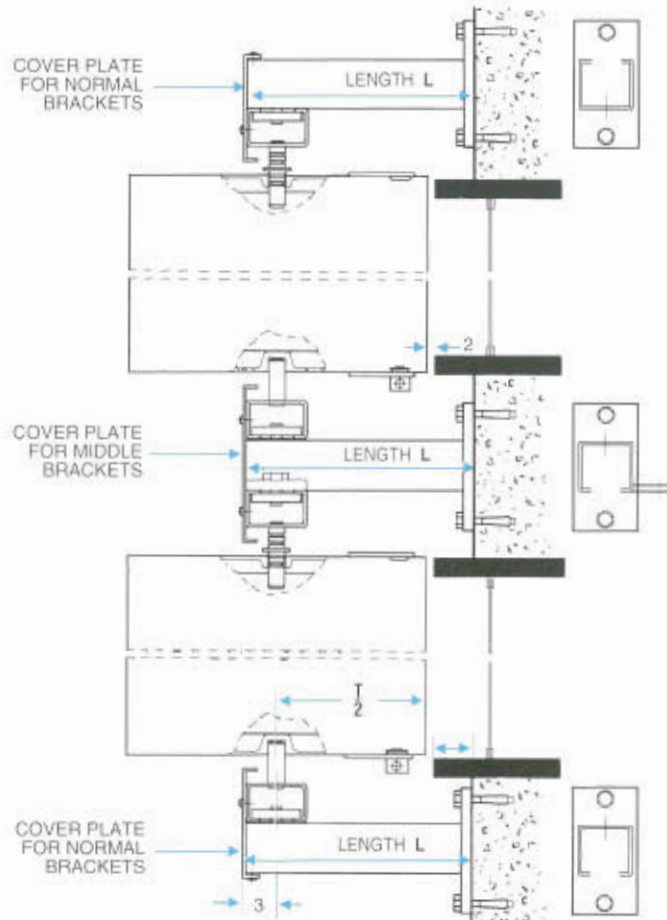
Part numbers of accessories:

NORMAL SCREWED-ON SUPPORT BRACKET (ACFRMEAV) with two expansion bolts 10 x 85 mm, one screw M10 x 30, one blocking plate. Please always indicate the length L.

MIDDLE SCREWED-ON SUPPORT BRACKET (ACFRMEAI) with two expansion bolts 10 x 85 mm, 1 screw M10 x 30, 2 blocking plates. Please always indicate the length L.

COVER PLATE cm 10 (ACFRCO 10) for normal brackets.
COVER PLATE cm 15 (ACFRCO 15) for middle brackets.

$$L = \text{MIN, TOTAL LENGTH} = 3 + T/2 + 2 + S$$



WALLED-IN SUPPORTING BRACKETS

In all types of walls where expansion bolts do not guarantee a perfect setting, supporting brackets must be built in to a minimum depth of 12 cm to ensure correct fixing.

Part numbers of accessories:

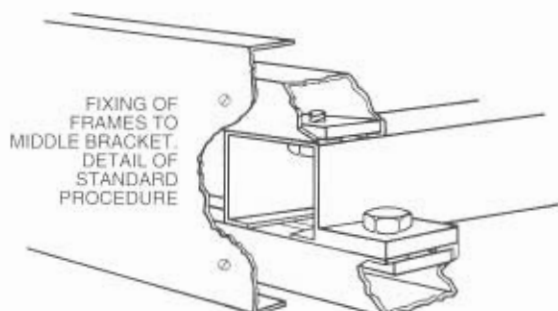
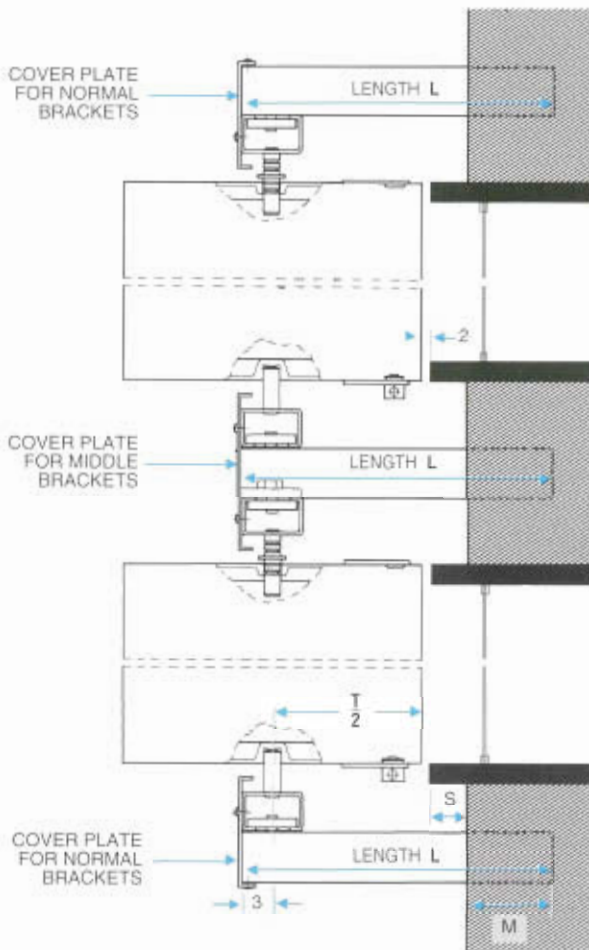
NORMAL SUPPORTING BRACKET (ACFRMEMU)
 Please always indicate total length (protrusion + encasement) with one screw M10 x 30 and one blocking plate.

MIDDLE BRACKET (ACFREMI)
 Please always indicate total length (protrusion + encasement) with two screws M10 x 30 and two blocking plates.

COVER PLATE cm 10 (ACFRCO 10) for normal brackets.
COVER PLATE cm 15 (ACFRCO 15) for middle brackets.

The standard fixing procedure for NACO sunbreakers is quick and needs no welding. A screw and plate holding the frame to the bracket is tightened. The maximum distance between brackets is 150 cm so as to ensure that the standard frame of 319 cm of length always rests on at least three brackets.

$$L = \text{MIN, TOTAL LENGTH} = 3 + T/2 + 2 + S + M$$

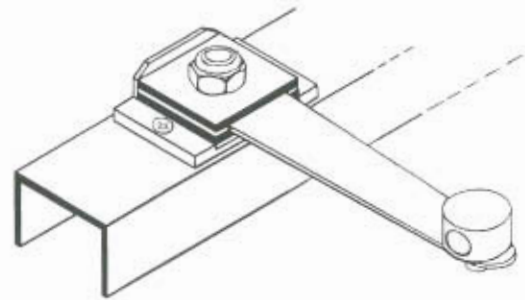


CONTROL SYSTEMS

MANUAL CONTROL BY FRICTION

Each manual friction control can hold up to 20 blades and is regulated by means of a self-tapping screw. The friction is fitted in the centre of the frame, between two blades, it is fixed to the connection rod by means of a location block.

Type 15	Code number	ACFRCF 15
Type 21	Code number	ACFRCF 21
Type 30	Code number	ACFRCF 30
Type 45	Code number	ACFRCF 45
Type 60	Code number	ACFRCF 60



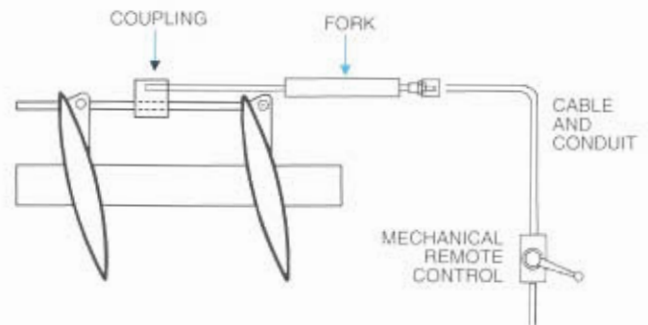
MECHANICAL REMOTE CONTROL

By means of a small handle the sunbreaker is easily operated from the inside of the building. The "cable and conduit" system used for transmitting the movement resolves most cases of mechanical remote control (ask for fixing instructions).

Part numbers of accessories:

MECHANICAL CONTROL (ACFRMME)
with coupling and 3 m of cable
and conduit for maximum 10 m² of sunbreaker

COUPLING (ACFRATCM)

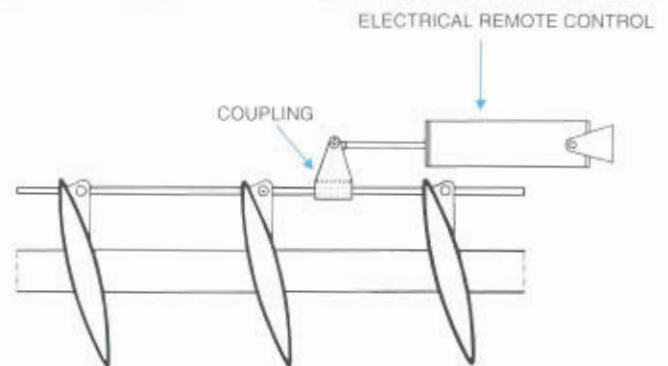


ELECTRICAL REMOTE CONTROL

One motor can move applications up to 20 m². For larger applications two or more motors can be connected in series for obtaining the opening of all the blades with one or more switches. (Follow the instructions of the builder). The motor is fitted next to the frame on a supporting bracket, or on the sill between blades and window. The voltage is: 220 V monophasic or 24 V direct current plus power pack; all the motors are provided with end-travel and can be connected to anti-fire, anti-rain and anti-wind security systems.

TYPE	TRAVEL	TYPE	TRAVEL
Type 15 - 21 E	Travel 12 cm	Type 45 NT	Travel 17 cm
Type 21	Travel 17 cm	Type 45 E	Travel 34 cm
Type 25 E	Travel 17 cm	Type 60 NT	Travel 50 cm
Type 30 NT	Travel 23 cm	Type 60 E	Travel 50 cm

ELECTRICAL CONTROL - Code number (ACFRMEL)
with motor, switch, coupling to rod and support bracket.

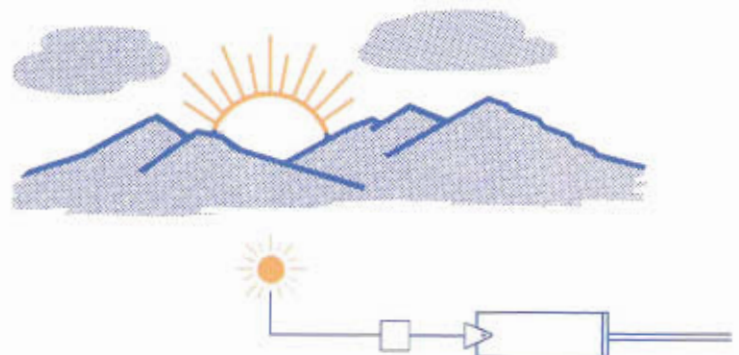


AUTOMATIC CONTROL WITH ELECTRONIC DEVICE

An electronic device keeps the desired light intensity inside the room by automatically adjusting the blades to an ideal angle.

Code number (ACFRMEL)
complete with 1 box, 1 photocell and 1 light-regulator

TYPE	TRAVEL	TYPE	TRAVEL
Type 15 - 21 E	Travel 10 cm	Type 45 NT	Travel 17 cm
Type 21	Travel 13 cm	Type 45 E	Travel 23 cm
Type 25 E	Travel 13 cm	Type 60 NT	Travel 30 cm
Type 30 NT	Travel 17 cm	Type 60 E	Travel 30 cm



TYPE 15

Table for calculating number of blades

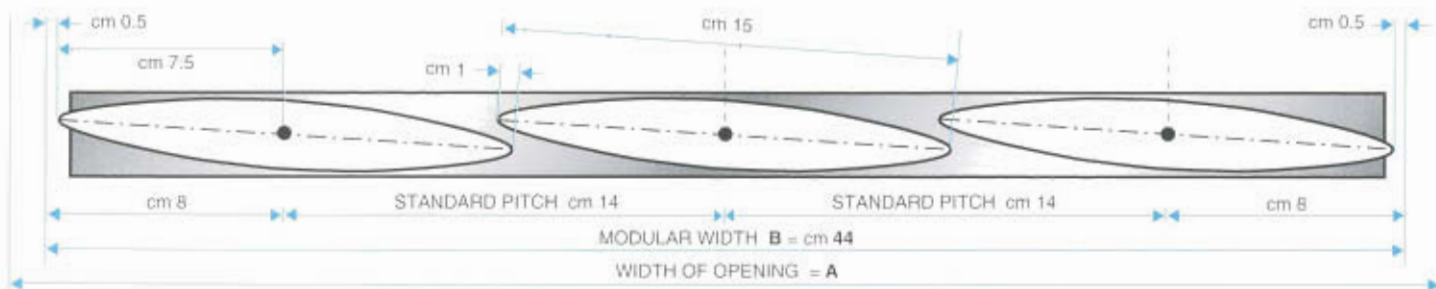
In the closed position the installation should allow a gap of 5 mm each side, so that the blades do not foul the walls or structure.

The width A of the opening must thus be larger than or equal to B. For the height H of the opening and the distance between the supporting brackets, in case of embossed application, the maximum tolerance is ± 1 cm.

The standard thread is 14 cm, for the blades overlap 1 cm. Thus the standard formula:

$$B = (N \times 14 \text{ cm}) + 2 \text{ cm} \text{ with } N = \frac{B-2 \text{ cm}}{14 \text{ cm}}$$

where N indicates the number of blades and B the modular width in cm.



B	N	B	N	B	N	B	N	B	N	B	N	B	N
16	1	436	31	856	61	1276	91	1696	121	2116	151	2536	181
30	2	450	32	870	62	1290	92	1710	122	2130	152	2550	182
44	3	464	33	884	63	1304	93	1724	123	2144	153	2564	183
58	4	478	34	898	64	1318	94	1738	124	2158	154	2578	184
72	5	492	35	912	65	1332	95	1752	125	2172	155	2592	185
86	6	506	36	926	66	1346	96	1766	126	2186	156	2606	186
100	7	520	37	940	67	1360	97	1780	127	2200	157	2620	187
114	8	534	38	954	68	1374	98	1794	128	2214	158	2634	188
128	9	548	39	968	69	1388	99	1808	129	2228	159	2648	189
142	10	562	40	982	70	1402	100	1822	130	2242	160	2662	190
156	11	576	41	996	71	1416	101	1836	131	2256	161	2676	191
170	12	590	42	1010	72	1430	102	1850	132	2270	162	2690	192
184	13	604	43	1024	73	1444	103	1864	133	2284	163	2704	193
198	14	618	44	1038	74	1458	104	1878	134	2298	164	2718	194
212	15	632	45	1052	75	1472	105	1892	135	2312	165	2732	195
226	16	646	46	1066	76	1486	106	1906	136	2326	166	2746	196
240	17	660	47	1080	77	1500	107	1920	137	2340	167	2760	197
254	18	674	48	1094	78	1514	108	1934	138	2354	168	2774	198
268	19	688	49	1108	79	1528	109	1948	139	2368	169	2788	199
282	20	702	50	1122	80	1542	110	1962	140	2382	170	2802	200
296	21	716	51	1136	81	1556	111	1976	141	2396	171	2816	201
310	22	730	52	1150	82	1570	112	1990	142	2410	172	2830	202
324	23	744	53	1164	83	1584	113	2004	143	2424	173	2844	203
338	24	758	54	1178	84	1598	114	2018	144	2438	174	2858	204
352	25	772	55	1192	85	1612	115	2032	145	2452	175	2872	205
366	26	786	56	1206	86	1626	116	2046	146	2466	176	2886	206
380	27	800	57	1220	87	1640	117	2060	147	2480	177	2900	207
394	28	814	58	1234	88	1654	118	2074	148	2494	178	2914	208
408	29	828	59	1248	89	1668	119	2088	149	2508	179	2928	209
422	30	842	60	1262	90	1682	120	2102	150	2522	180	2942	210

Above: Industrial halls in Crema, Italy, with application of type 30 white sunbreakers.

Below: Covered gymnasium in Haute Savoie (France), with horizontal application of type 15 silver sunbreaker.

Formula for special pitch

When the width of the opening is smaller than the modular width (i.e. A is smaller than B), one can foresee, within acceptable limits, a specially reduced pitch, with bigger overlapping of the blades. Thus the formula:

$$P_s = \frac{A-16 \text{ cm}}{N-1} \text{ with } B_s = [(N-1) \times P_s] + 16 \text{ cm}$$

where B_s is the non standard width.



TYPE 21

Table for calculating number of blades

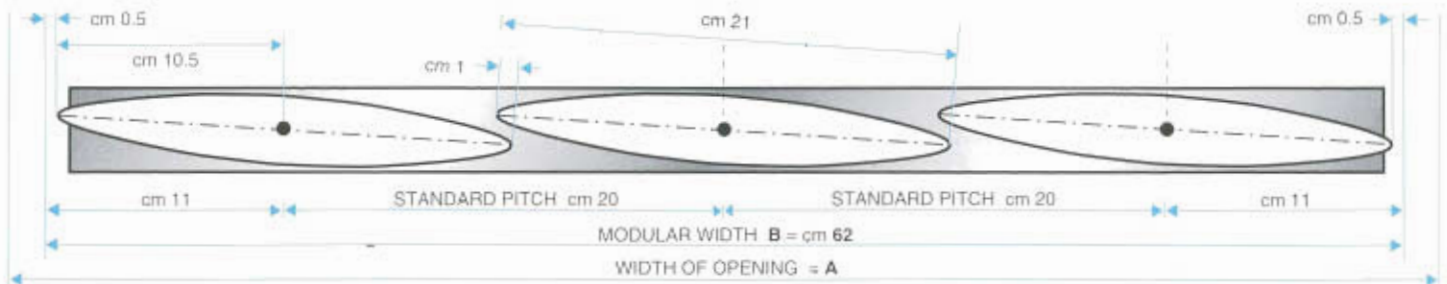
In the closed position the installation should allow a gap of 5 mm each side, so that the blades do not foul the walls or structure.

The width A of the opening must thus be larger than or equal to B. For the height H of the opening and the distance between the supporting brackets, in case of embossed application, the maximum tolerance is ± 1 cm.

The standard thread is 20 cm, for the blades overlap 1 cm. Thus the standard formula:

$$B = (N \times 20 \text{ cm}) + 2 \text{ cm} \text{ with } N = \frac{B-2 \text{ cm}}{20 \text{ cm}}$$

where N indicates the number of blades and B the modular width in cm.



B	N	B	N	B	N	B	N	B	N	B	N	B	N	B	N
22	1	622	31	1222	61	1822	91	2422	121	3022	151	3622	181	4222	211
42	2	642	32	1242	62	1842	92	2442	122	3042	152	3642	182	4242	212
62	3	662	33	1262	63	1862	93	2462	123	3062	153	3662	183	4262	213
82	4	682	34	1282	64	1882	94	2482	124	3082	154	3682	184	4282	214
102	5	702	35	1302	65	1902	95	2502	125	3102	155	3702	185	4302	215
122	6	722	36	1322	66	1922	96	2522	126	3122	156	3722	186	4322	216
142	7	742	37	1342	67	1942	97	2542	127	3142	157	3742	187	4342	217
162	8	762	38	1362	68	1962	98	2562	128	3162	158	3762	188	4362	218
182	9	782	39	1382	69	1982	99	2582	129	3182	159	3782	189	4382	219
202	10	802	40	1402	70	2002	100	2602	130	3202	160	3802	190	4402	220
222	11	822	41	1422	71	2022	101	2622	131	3222	161	3822	191	4422	221
242	12	842	42	1442	72	2042	102	2642	132	3242	162	3842	192	4442	222
262	13	862	43	1462	73	2062	103	2662	133	3262	163	3862	193	4462	223
282	14	882	44	1482	74	2082	104	2682	134	3282	164	3882	194	4482	224
302	15	902	45	1502	75	2102	105	2702	135	3302	165	3902	195	4502	225
322	16	922	46	1522	76	2122	106	2722	136	3322	166	3922	196	4522	226
342	17	942	47	1542	77	2142	107	2742	137	3342	167	3942	197	4542	227
362	18	962	48	1562	78	2162	108	2762	138	3362	168	3962	198	4562	228
382	19	982	49	1582	79	2182	109	2782	139	3382	169	3982	199	4582	229
402	20	1002	50	1602	80	2202	110	2802	140	3402	170	4002	200	4602	230
422	21	1022	51	1622	81	2222	111	2822	141	3422	171	4022	201	4622	231
442	22	1042	52	1642	82	2242	112	2842	142	3442	172	4042	202	4642	232
462	23	1062	53	1662	83	2262	113	2862	143	3462	173	4062	203	4662	233
482	24	1082	54	1682	84	2282	114	2882	144	3482	174	4082	204	4682	234
502	25	1102	55	1702	85	2302	115	2902	145	3502	175	4102	205	4702	235
522	26	1122	56	1722	86	2322	116	2922	146	3522	176	4122	206	4722	236
542	27	1142	57	1742	87	2342	117	2942	147	3542	177	4142	207	4742	237
562	28	1162	58	1762	88	2362	118	2962	148	3562	178	4162	208	4762	238
582	29	1182	59	1782	89	2382	119	2982	149	3582	179	4182	209	4782	239
602	30	1202	60	1802	90	2402	120	3002	150	3602	180	4202	210	4802	240

Above:
Office building
in Milan with ty-
pe 30 silver
sunbreaker.

Below:
A supermarket
in Milan with
the white
sunbreaker
type 30 as roof
application.

Formula for special pitch

When the width of the opening is smaller than the modular width (i.e. A is smaller than B), one can foresee, within acceptable limits, a specially reduced pitch, with bigger overlapping of the blades. Thus the formula:

$$Ps = \frac{A-22 \text{ cm}}{N-1} \text{ with } Bs = [(N-1) \times Ps] + 22 \text{ cm}$$

where Bs is the non standard width.



TYPE 30 NT

Table for calculating number of blades

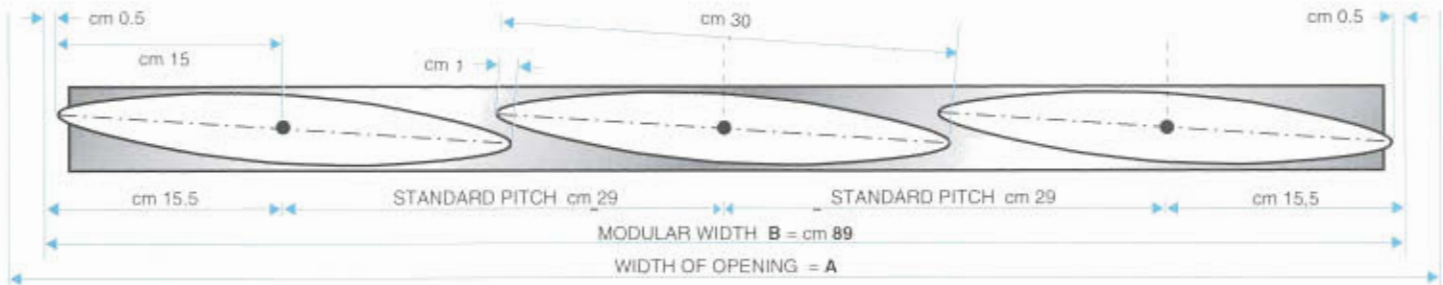
In the closed position the installation should allow a gap of 5 mm each side, so that the blades do not foul the walls or structure.

The width A of the opening must thus be larger than or equal to B. For the height H of the opening and the distance between the supporting brackets, in case of embossed application, the maximum tolerance is ± 1 cm.

The standard thread is 29 cm, for the blades overlap 1 cm. Thus the standard formula:

$$B = (N \times 29 \text{ cm}) + 2 \text{ cm} \text{ with } N = \frac{B-2 \text{ cm}}{29 \text{ cm}}$$

where N indicates the number of blades and B the modular width in cm.



B	N	B	N	B	N	B	N	B	N	B	N	B	N
31	1	901	31	1771	61	2641	91	3511	121	4381	151	5251	181
60	2	930	32	1800	62	2670	92	3540	122	4410	152	5280	182
89	3	959	33	1829	63	2699	93	3569	123	4439	153	5309	183
118	4	988	34	1858	64	2728	94	3598	124	4468	154	5338	184
147	5	1017	35	1887	65	2757	95	3627	125	4497	155	5367	185
176	6	1046	36	1916	66	2786	96	3656	126	4526	156	5396	186
205	7	1075	37	1945	67	2815	97	3685	127	4555	157	5425	187
234	8	1104	38	1974	68	2844	98	3714	128	4584	158	5454	188
263	9	1133	39	2003	69	2873	99	3743	129	4613	159	5483	189
292	10	1162	40	2032	70	2902	100	3772	130	4642	160	5512	190
321	11	1191	41	2061	71	2931	101	3801	131	4671	161	5541	191
350	12	1220	42	2090	72	2960	102	3830	132	4700	162	5570	192
379	13	1249	43	2119	73	2989	103	3859	133	4729	163	5599	193
408	14	1278	44	2148	74	3018	104	3888	134	4758	164	5628	194
437	15	1307	45	2177	75	3047	105	3917	135	4787	165	5657	195
466	16	1336	46	2206	76	3076	106	3946	136	4816	166	5686	196
495	17	1365	47	2235	77	3105	107	3975	137	4845	167	5715	197
524	18	1394	48	2264	78	3134	108	4004	138	4874	168	5744	198
553	19	1423	49	2293	79	3163	109	4033	139	4903	169	5773	199
582	20	1452	50	2322	80	3192	110	4062	140	4932	170	5802	200
611	21	1481	51	2351	81	3221	111	4091	141	4961	171	5831	201
640	22	1510	52	2380	82	3250	112	4120	142	4990	172	5860	202
669	23	1539	53	2409	83	3279	113	4149	143	5019	173	5889	203
698	24	1568	54	2438	84	3308	114	4178	144	5048	174	5918	204
727	25	1597	55	2467	85	3337	115	4207	145	5077	175	5947	205
756	26	1626	56	2496	86	3366	116	4236	146	5106	176	5976	206
785	27	1655	57	2525	87	3395	117	4265	147	5135	177	6005	207
814	28	1684	58	2554	88	3424	118	4294	148	5164	178	6034	208
843	29	1713	59	2583	89	3453	119	4323	149	5193	179	6063	209
872	30	1742	60	2612	90	3482	120	4352	150	5222	180	6092	210

Above:
The building of the Environment Ministry in Athens, Greece, built using sunbreaker type 21E.

Below:
Olmo headoffice in Bergamo, Italy, with sunbreaker type 30 on supporting brackets.

Formula for special pitch

When the width of the opening is smaller than the modular width (i.e. A is smaller than B), one can foresee, within acceptable limits, a specially reduced pitch, with bigger overlapping of the blades. Thus the formula:

$$P_s = \frac{A-31 \text{ cm}}{N-1} \text{ with } B_s = [(N-1) \times P_s] + 31 \text{ cm}$$

where B_s is the non standard width.



TIPO 45 NT

Table for calculating number of blades

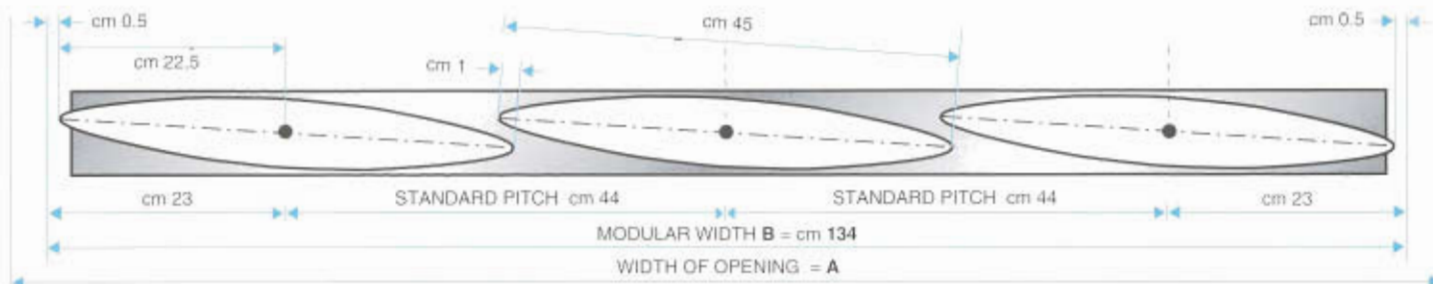
In the closed position the installation should allow a gap of 5 mm each side, so that the blades do not foul the walls or structure.

The width A of the opening must thus be larger than or equal to B. For the height H of the opening and the distance between the supporting brackets, in case of embossed application, the maximum tolerance is ± 1 cm.

The standard thread is 44 cm, for the blades overlap 1 cm. Thus the standard formula:

$$B = (N \times 44 \text{ cm}) + 2 \text{ cm} \text{ with } N = \frac{B - 2 \text{ cm}}{44 \text{ cm}}$$

where N indicates the number of blades and B the modular width in cm.



B	N	B	N	B	N	B	N	B	N	B	N	B	N	B	N
46	1	1366	31	2686	61	4006	91	5326	121	6646	151	7966	181	9286	211
90	2	1410	32	2730	62	4050	92	5370	122	6690	152	8010	182	9330	212
134	3	1454	33	2774	63	4094	93	5414	123	6734	153	8054	183	9374	213
178	4	1498	34	2818	64	4138	94	5458	124	6778	154	8098	184	9418	214
222	5	1542	35	2862	65	4182	95	5502	125	6822	155	8142	185	9462	215
266	6	1586	36	2906	66	4226	96	5546	126	6866	156	8186	186	9506	216
310	7	1630	37	2950	67	4270	97	5590	127	6910	157	8230	187	9550	217
354	8	1674	38	2994	68	4314	98	5634	128	6954	158	8274	188	9594	218
398	9	1718	39	3038	69	4358	99	5678	129	6998	159	8318	189	9638	219
442	10	1762	40	3082	70	4402	100	5722	130	7042	160	8362	190	9682	220
486	11	1806	41	3126	71	4446	101	5766	131	7086	161	8406	191	9726	221
530	12	1850	42	3170	72	4490	102	5810	132	7130	162	8450	192	9770	222
574	13	1894	43	3214	73	4534	103	5854	133	7174	163	8494	193	9814	223
618	14	1938	44	3258	74	4578	104	5898	134	7218	164	8538	194	9858	224
662	15	1982	45	3302	75	4622	105	5942	135	7262	165	8582	195	9902	225
706	16	2026	46	3346	76	4666	106	5986	136	7306	166	8626	196	9946	226
750	17	2070	47	3390	77	4710	107	6030	137	7350	167	8670	197	9990	227
794	18	2114	48	3434	78	4754	108	6074	138	7394	168	8714	198	10034	228
838	19	2158	49	3478	79	4798	109	6118	139	7438	169	8758	199	10078	229
882	20	2202	50	3522	80	4842	110	6162	140	7482	170	8802	200	10122	230
926	21	2246	51	3566	81	4886	111	6206	141	7526	171	8846	201	10166	231
970	22	2290	52	3610	82	4930	112	6250	142	7570	172	8890	202	10210	232
1014	23	2334	53	3654	83	4974	113	6294	143	7614	173	8934	203	10254	233
1058	24	2378	54	3698	84	5018	114	6338	144	7658	174	8978	204	10298	234
1102	25	2422	55	3742	85	5062	115	6382	145	7702	175	9022	205	10342	235
1146	26	2466	56	3786	86	5106	116	6426	146	7746	176	9066	206	10386	236
1190	27	2510	57	3830	87	5150	117	6470	147	7790	177	9110	207	10430	237
1234	28	2554	58	3874	88	5194	118	6514	148	7834	178	9154	208	10474	238
1278	29	2598	59	3918	89	5238	119	6558	149	7878	179	9198	209	10518	239
1322	30	2642	60	3962	90	5282	120	6602	150	7922	180	9242	210	10562	240

Above:
Headoffice of Banca Popolare di Brescia in Italy with sunbreaker type 30 on sill.

Below:
Headquarters of 'Parco Tecnologico Agroalimentare dell'Umbria', in Todi, Italy, with white sunbreaker type 30 NT.

Formula for special pitch

When the width of the opening is smaller than the modular width (i.e. A is smaller than B), one can foresee, within acceptable limits, a specially reduced pitch, with bigger overlapping of the blades. Thus the formula:

$$P_s = \frac{A - 46 \text{ cm}}{N - 1} \text{ with } B_s = [(N - 1) \times P_s] + 46 \text{ cm}$$

where B_s is the non standard width.



TYPE 60 NT

Table for calculating number of blades

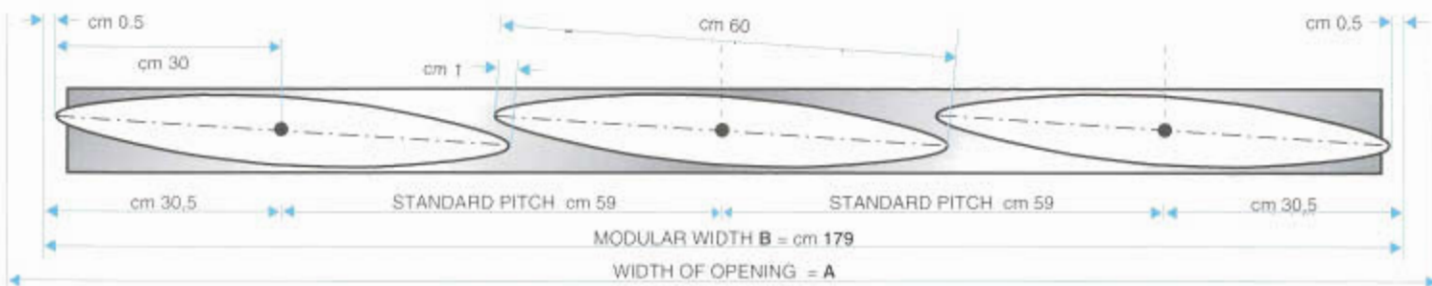
In the closed position the installation should allow a gap of 5 mm each side, so that the blades do not foul the walls or structure.

The width A of the opening must thus be larger than or equal to B. For the height H of the opening and the distance between the supporting brackets, in case of embossed application, the maximum tolerance is ± 1 cm.

The standard thread is 59 cm, for the blades overlap 1 cm. Thus the standard formula:

$$B = (N \times 59 \text{ cm}) + 2 \text{ cm} \text{ with } N = \frac{B-2 \text{ cm}}{59 \text{ cm}}$$

where N indicates the number of blades and B the modular width in cm.



B	N	B	N	B	N	B	N	B	N	B	N	B	N
61	1	1831	31	3601	61	5371	91	7141	121	8911	151	10681	181
120	2	1890	32	3660	62	5430	92	7200	122	8970	152	10740	182
179	3	1949	33	3719	63	5489	93	7259	123	9029	153	10799	183
238	4	2008	34	3778	64	5548	94	7318	124	9088	154	10858	184
297	5	2067	35	3837	65	5607	95	7377	125	9147	155	10917	185
356	6	2126	36	3896	66	5666	96	7436	126	9206	156	10976	186
415	7	2185	37	3955	67	5725	97	7495	127	9265	157	11035	187
474	8	2244	38	4014	68	5784	98	7554	128	9324	158	11094	188
533	9	2303	39	4073	69	5843	99	7613	129	9383	159	11153	189
592	10	2362	40	4132	70	5902	100	7672	130	9442	160	11212	190
651	11	2421	41	4191	71	5961	101	7731	131	9501	161	11271	191
710	12	2480	42	4250	72	6020	102	7790	132	9560	162	11330	192
769	13	2539	43	4309	73	6079	103	7849	133	9619	163	11389	193
828	14	2598	44	4368	74	6138	104	7908	134	9678	164	11448	194
887	15	2657	45	4427	75	6197	105	7967	135	9737	165	11507	195
946	16	2716	46	4486	76	6256	106	8026	136	9796	166	11566	196
1005	17	2775	47	4545	77	6315	107	8085	137	9855	167	11625	197
1064	18	2834	48	4604	78	6374	108	8144	138	9914	168	11684	198
1123	19	2893	49	4663	79	6433	109	8203	139	9973	169	11743	199
1182	20	2952	50	4722	80	6492	110	8262	140	10032	170	11802	200
1241	21	3011	51	4781	81	6551	111	8321	141	10091	171	11861	201
1300	22	3070	52	4840	82	6610	112	8380	142	10150	172	11920	202
1359	23	3129	53	4899	83	6669	113	8439	143	10209	173	11979	203
1418	24	3188	54	4958	84	6728	114	8498	144	10268	174	12038	204
1477	25	3247	55	5017	85	6787	115	8557	145	10327	175	12097	205
1536	26	3306	56	5076	86	6846	116	8616	146	10386	176	12156	206
1595	27	3365	57	5135	87	6905	117	8675	147	10445	177	12215	207
1654	28	3424	58	5194	88	6964	118	8734	148	10504	178	12274	208
1713	29	3483	59	5253	89	7023	119	8793	149	10563	179	12333	209
1772	30	3542	60	5312	90	7082	120	8852	150	10622	180	12392	210

Above and below: Naco sunbraker used as a partition wall in a show-room in Osaka, Japan.

Formula for special pitch

When the width of the opening is smaller than the modular width (i.e. A is smaller than B), one can foresee, within acceptable limits, a specially reduced pitch, with bigger overlapping of the blades. Thus the formula:

$$Ps = \frac{A-61 \text{ cm}}{N-1} \text{ with } Bs = |(N-1) \times Ps| + 61 \text{ cm}$$

where Bs is the non standard width.



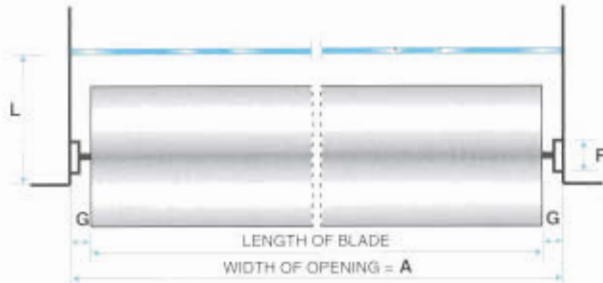
PROJECT

For project-planning and carrying out the installation, one must consider all the data as per indications on the drawings.

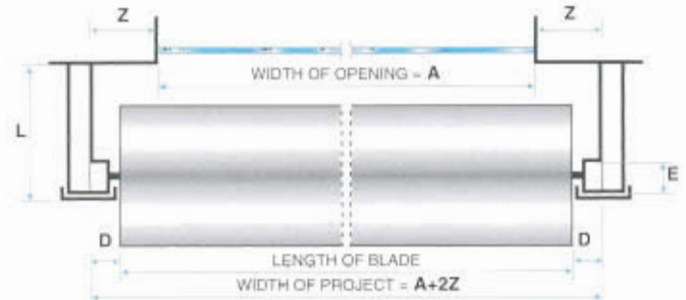
TO DETERMINE THE LENGTH OF BLADES:

	TYPE 15	TYPE 21	TYPE 30NT	TYPE 45NT	TYPE 60NT
L	min. 14 cm	min. 18 cm	min. 22 cm	min. 30 cm	min. 37 cm
F	4.5 cm	4.5 cm	4.5 cm	6 cm	6 cm
G	5.5 cm	5.5 cm <td 5.5 cm	6.5-8 cm	6.5-8 cm	
D	6.5 cm	6.5 cm	6.5 cm	6.5-8 cm	6.5-8 cm
E	6 cm	6 cm	6 cm	6 cm	6 cm

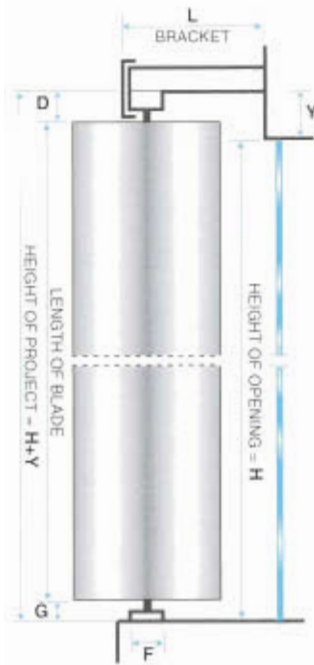
HORIZONTAL ON WINDOW SILL



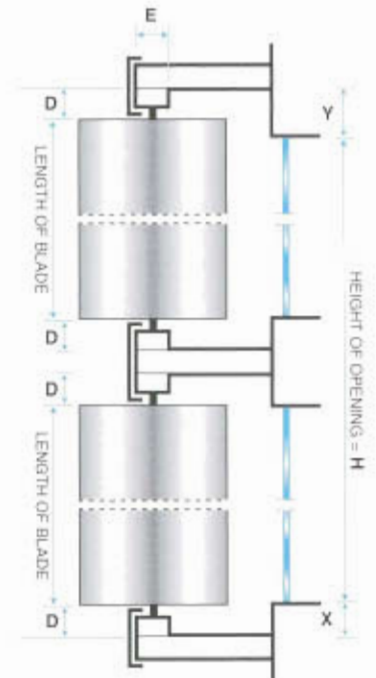
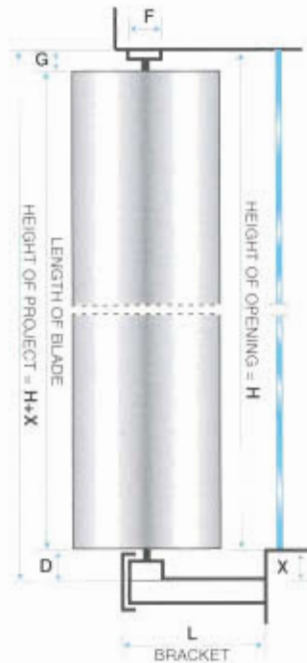
HORIZONTAL ON SUPPORT BRACKETS



VERTICAL ON WINDOW SILL AND SUPPORT BRACKET



VERTICAL OVER 4 METERS



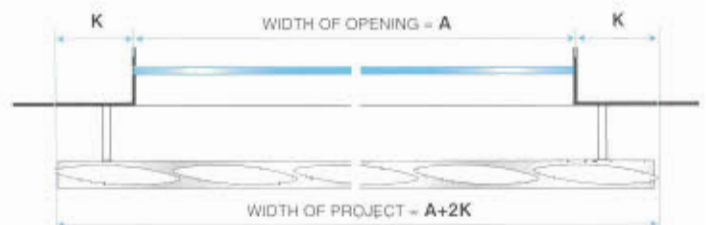
TO DETERMINE THE NUMBER OF BLADES:

On the basis of the widths indicated below, one can determine the number of blades, consulting the table.

VERTICAL ON WINDOW SILL

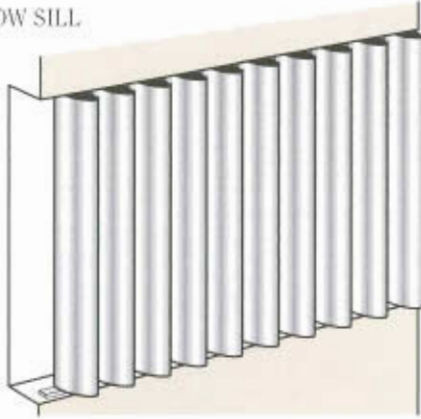


VERTICAL ON SUPPORT BRACKETS



EXAMPLES OF APPLICATION

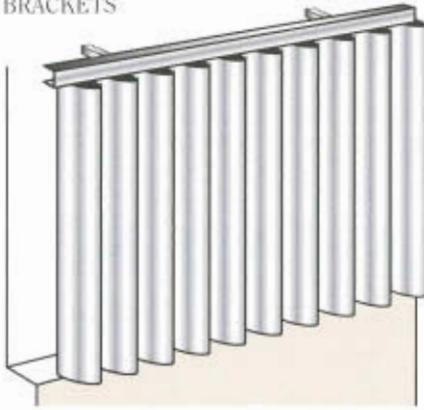
VERTICAL ON WINDOW SILL



VERTICAL ON SUPPORT BRACKETS



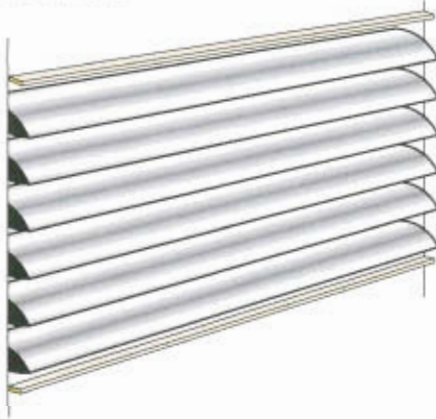
WITH TOP SUPPORT BRACKETS



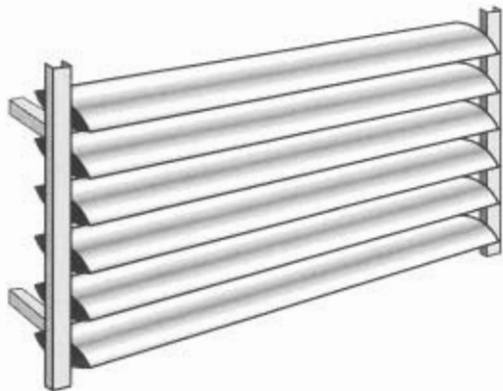
WITH BOTTOM SUPPORT BRACKETS



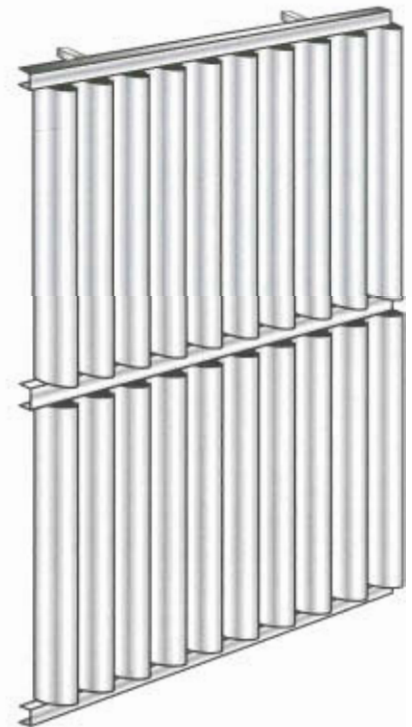
HORIZONTAL ON WINDOW SILL



HORIZONTAL ON SUPPORT BRACKETS



VERTICAL OVER 4 METERS



SUNBREAKER



Three photos of an ERG petrol station, with annexed café and halls in Salerno. The type of sunbreaker used is type 30 NT, colour white.



EXTRUDED SUNBREAKER

BLADE 21 E

The profile of this blade has been studied for obtaining particular effects such as total exclusion of light by overlapping and drainage of rainwater by giving the blades the right inclination, when they cover an internal area.

The aluminium is 15/10 thick and two internal ribs give the blade strength and assure a good protection wherever it is mounted.

The blade can also be applied horizontally up to a length of 3,8 meters without any risk of bending because of its weight.

The thickness of the blade is 37 mm. The endcaps are the same as for type 15 Ellipsoid and are screwed inside the extruded profile so that they cannot be seen.

All accessories and frames are the same as for type 21 standard.

The weight of this blade is 2000 g/m.

BLADE 25 E

This blade is 250 mm wide, 40 mm thick and weighs 3800 g/m. Its ellipsoid shape recalls, in a smaller scale, that of the other sections. The aluminium is 18/10 thick.

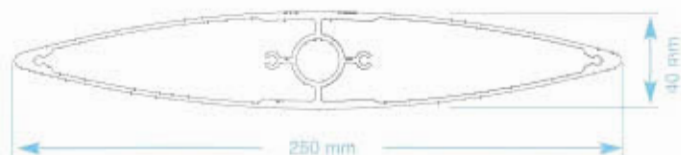
The endcaps are in 3 mm thick aluminium and are screwed on the blade by means of 4 self-tapping steel screws per side.

Accessories, frames and controls are those used for ellipsoid blades type 15 and 21.

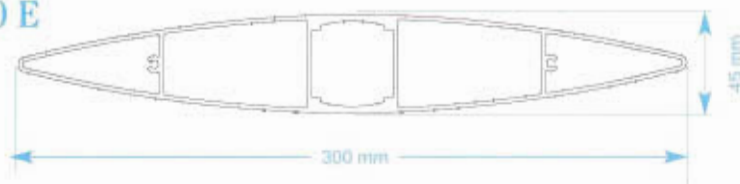
21 E



25 E



30 E



BLADE 30 E

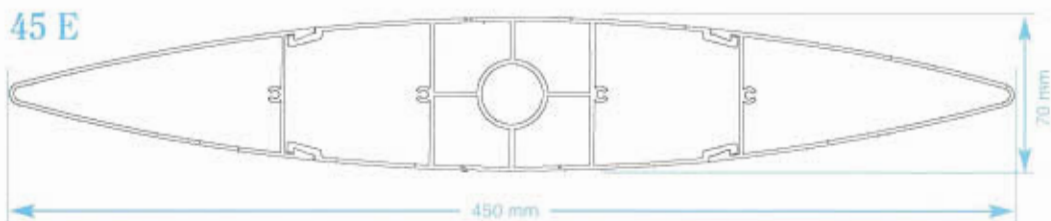
The profile shows a similar shape to the ellipsoid blade of 30 NT, the blade is realized in one single piece of 300 mm width, with a thickness of 45 mm and a weight of 4600 g/m. The aluminium is 20/10 thick.

The endcaps are of die-cast aluminium screwed to the blade with two stainless steel self-tapping screws. All the accessories, the frames and controls are the same as the ones used for type 30 NT.

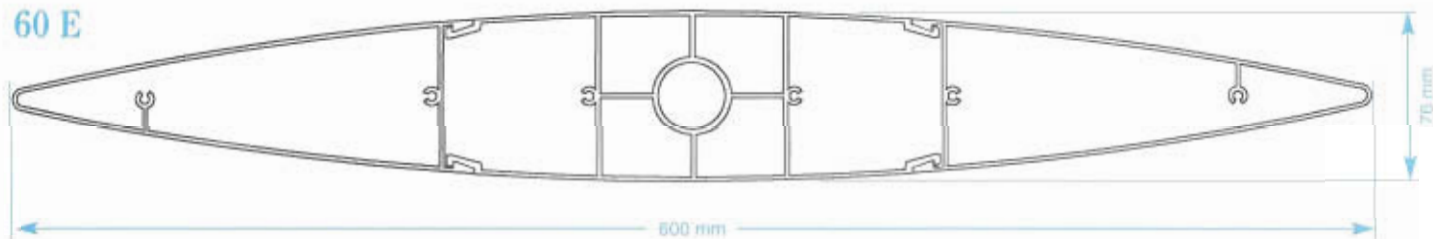
BLADE 45 E

The section of this 450 mm blade is similar to the one of type 60 E; it also consists of 3 parts: a central piece and two snapped-on lateral wings.

The thickness of the blade is 70 mm and its weight is 7800 g/m. The aluminium has a thickness of 20/10. Endcaps can be in die-cast aluminium or in a flat sheet laser or waterjet-shaped. The accessories and adjustment mechanism are the same as for type 60 E.



60 E



BLADE 60 E

The blade is 600 mm wide and 76 mm thick and consists of 3 parts: a central piece on which two identical lateral wings snap on, creating thus a very compact ellipsoid extruded profile (see drawing).

In vertical position these blades can reach a length of 650 cm, whereas in horizontal position their length should not exceed 530 cm, because of the weight of the blade (10600 g/m). The average

thickness of the aluminium is 20/10. The axles on which the blades rotate are made from full, round, stainless steel, diameter 20 mm or the same black zinc-plated steel. The axles do not touch the aluminium, but rotate in brass bushes, inserted in the round hole of the central piece and held there by a die cast aluminium endcap, screwed at each end of the blade with six self tapping screws in stainless steel.

The bottom endcap contains the control wing, on which the square location block is mounted which holds the rectangular connection rod 30 x 6 mm in anodised aluminium. Blades can be adjusted manually or electrically.

As far as the finish is concerned, blades can be supplied oxidated, electro-coloured or powder coated in any RAL colours.

EXTRUDED SUNBREAKER

BLADE 120 E

Fair Hall architecture is bound to change according to the market's demand. It also has to be adequate to the permanence of people even without complicated air climatization devices.

Designed by von Gerkan, Marg and Partner, Hall 6 of the Düsseldorf Fair blends exceptional expositional needs - an area of 24 000 m², an internal height of 29 m and a base of 160 x 160 m - with an essential architecture in which the NACO

sunbreakers play the most important role. Given the extraordinary size of the Hall, NACO produced special sunbreakers in extruded aluminium with a cross-section of 1170 x 180 mm, a maximum length of 5 m, weighing 33 kg/m. The blades, painted in RAL 9006, can rotate on their axis from 0° to 120°.

Since the supporting structure is inside the Hall, the element that most characterises the façade is the design made by the great



Left: A corner of Hall 6 of the Düsseldorf Fair (Germany).

Right: A section of the blade 120 E with its typical "gull-wing" shape.

Below: Front view of the southern façade of Hall 6.

Opposite page: left, Hall 6 with the blades completely open and, below, completely shut.

Right: Detail of the blades seen from the inside.



EXTRUDED SUNBREAKER



aluminium panels. These are able to change the look of the building: horizontal, they emphasise the windows behind; closed, they create a solid mass on the outside and completely block off the light in the inside. The area covered by NACO sunbreakers is 9200 metres square. The distance that separates the blades from the window panes is 925 mm.

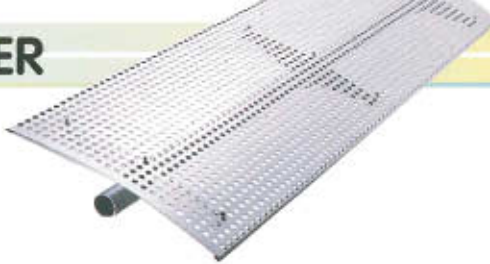
The blades are commanded by a linear engine thanks to a decentralised control.

The angle of the blades can vary, thus controlling the amount of light and sun rays admitted in the Hall, where it is possible to pass from light, guaranteed by the glass walls, to complete darkness.



AIRLUX SUNBREAKER

PERFORATED SHEET USED FOR SUNBREAKERS



AirLux, a recent member of the family of NACO sunbreakers, consists of a special entirely perforated single blade and looks particularly elegant.

On the contrary of the elliptically shaped sunbreakers, AirLux is made of a lacquered aluminium sheet of 20/10 thickness and 600 mm width (on request it can also be produced with different widths).

Perforation, which can be obtained in different ways, is based on two main criteria: the diameter of the holes and their distance (distance of two holes next to each other).

In one of the first realisations with this system the holes had a diameter of 15 mm and their distance was 25 mm, which means that the sum of all the holes is only 28.2% of the total surface of aluminium sheet; in this way 28.2% of the sunrays pass through the sheet and 71.8% are screened off.

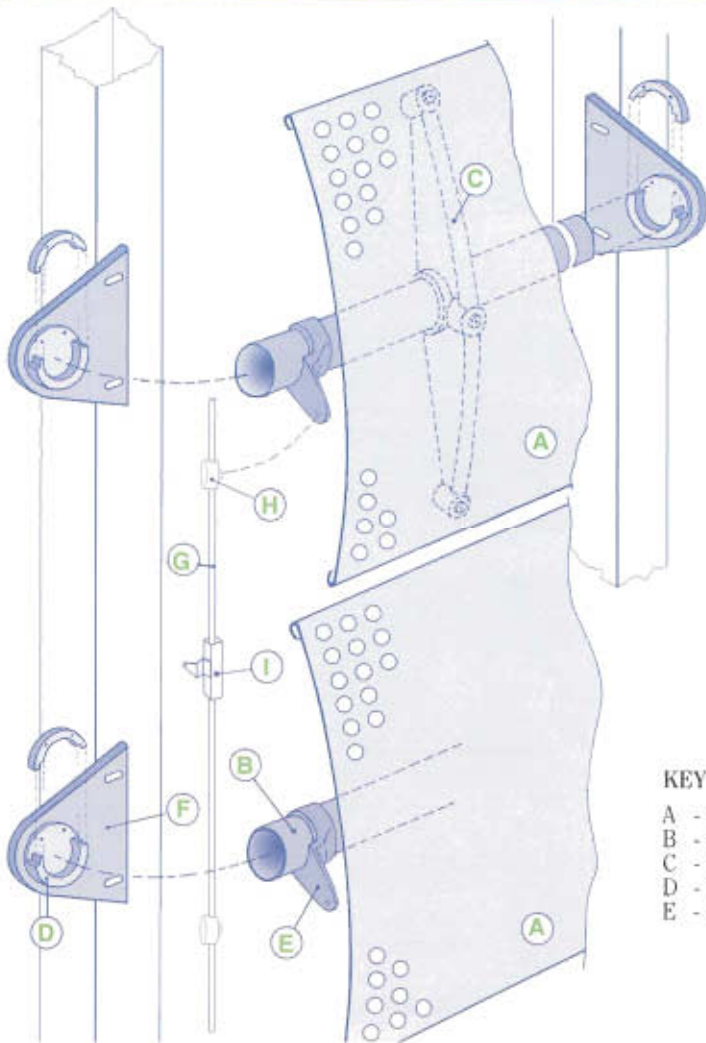
The strong reduction of irradiation together with a good luminosity guaranteed to the internal rooms by the perforated blades are the strong points of this new system which furthermore assures a very typical architectural touch.

On this page: AirLux sunbreaker applied to a multipurpose building in Potsdam, Germany. Below: AirLux type 30 applied to the S.T. Microelectronic of Catania, Italy.

Opposite page: An interesting combination of perforated sunbreakers and Schüco solar panels in a recently restored renaissance furnace.



AIRLUX SUNBREAKER



Amongst the technological innovations it has to be underlined that the perforated sunbreaker has lateral bushes in which the support-profile rotate.

Blades are produced in lengths up to 4 meters and can protrude on the sides more than 1 meter (just like the wings of an airplane) without necessity of support.

The first NACO AirLux sunbreaker has been installed on a multipurpose building in Potsdam, Germany, i.e. the administration offices of the Saving Bank for the Building Industry, where more than 4.400 m² have been used.

The support profile is made of aluminium, 28/10 thickness, 60 mm diameter (B). The sustaining bushes (D), the shoes (C) which hold the perforated blades (A) and the control handle (E) are in Nylon 6, 30% glass-fibre reinforced. Connecting gear, screws and bolts are in stainless steel. The motor for adjusting the blades is mounted externally, just like all other types of sunbreakers.

KEY

- | | |
|--------------------------------------|--|
| A - Perforated blade | F - Brackets |
| B - Support-profile | G - Connection rod
in stainless steel |
| C - Shoe | H - Location block |
| D - Lateral bush holding the profile | I - Motor - connection piece |
| E - Control-handle | |

FIXED SUNBREAKER

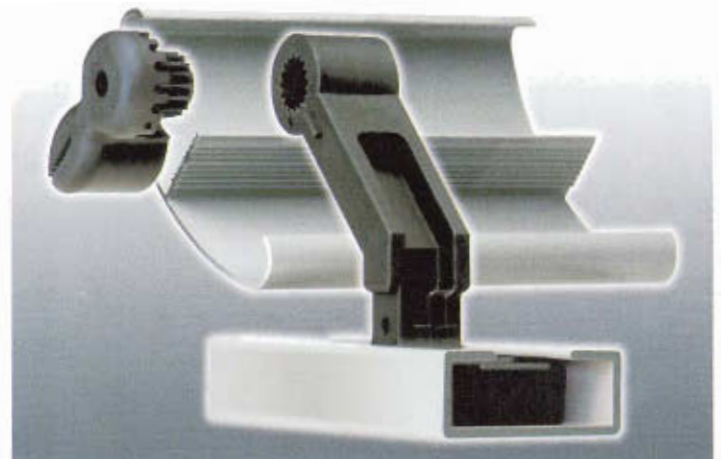
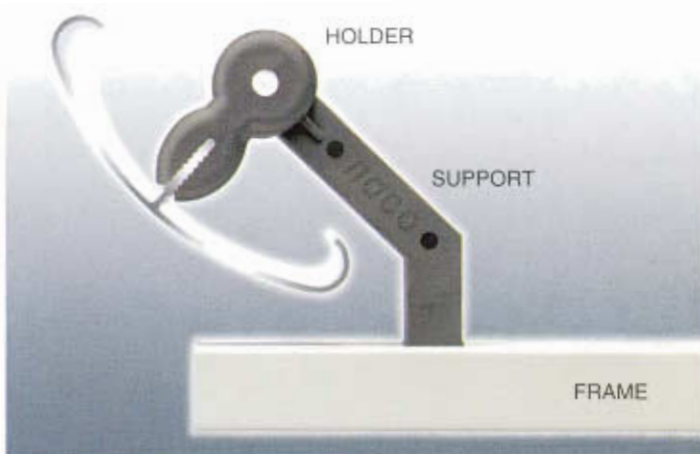
EURO 10

Euro 10 gets its name thanks to its easily recognisable section shape, similar to the Euro currency symbol.



Structure

The EURO 10 blade is an extruded profile of 100 mm section width with a strengthening rib on the inside having small built-in teeth to allow a solid "snap-on" in the tapered clip of the support. The support consists of a "tapered clip" and a "base support". The clip can be inserted in the base support in one of nine possible angles. Each position differs from the other by 22.5°. Both elements are made of black nylon 6, with 30% glas fiber reinforcement and are UV rays stabilised. The base support is inserted in a custom-made, C-shaped, extruded aluminium profile, which can be anodised or RAL coated in the same finish of the blade itself.



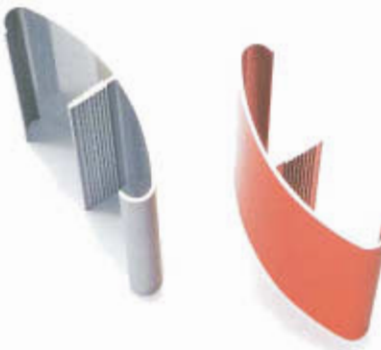
FIXED SUNBREAKER

Applications

The EURO 10 blade can be supplied in bars of up to 6500 mm length. The system can be installed in both vertical and horizontal position such as hanging roofs, façades or glass roofs. The standard C-shaped profile can easily be secured to a supporting structure that allows possible distances between the blade supports in excess of 2500 mm.

Installation

The installation of the EURO 10 is simplified by its design. The "base supports" are inserted inside the C-shaped profile (53 x 22mm) so that the heart to heart distance between the blades (104 mm) is established. The first and the last support are secured by means of a simple self-tapping screw. Inserting the "tapered clips" simply by pushing them inside the side-hole of the "base supports", determines the desired blade angle. The blades are then installed by sliding them into the "beak" of the tapered clip assuring teeth contact. The chosen blade angle will influence the amount of sunlight being screened by the system.



Left: The Euro 10 blades, front view.

Above: The section of the Euro 10 blade.

Right: The 9 positions in which it is possible to fix the blades to determine the quantity of light filtered.

Below: The distance between the C-shaped profiles must not exceed 2500 mm.



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The international airport of Malpensa 2000, Milan, uses Naco sunbreakers.



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1^a Ediz. MARZO 2001



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