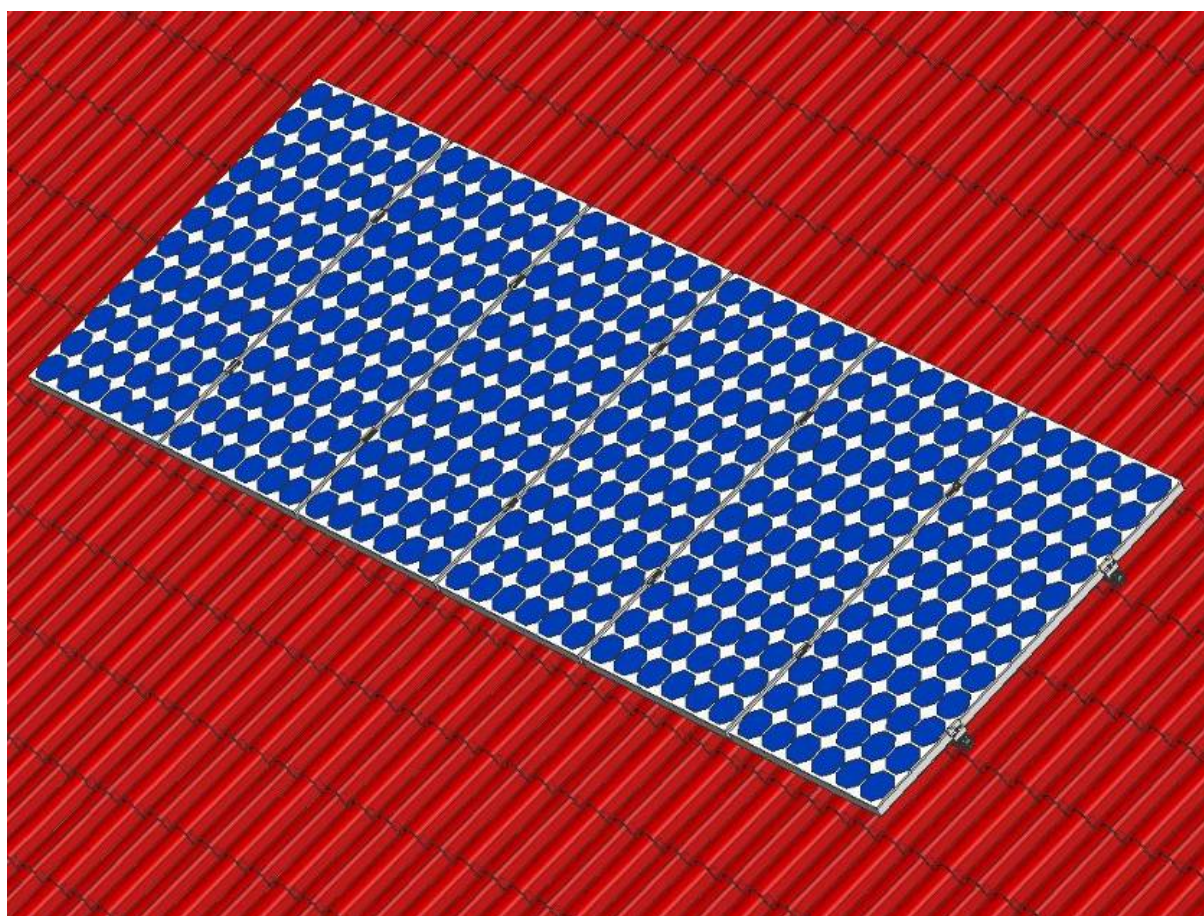


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1 General information

1.1 General description

Mounting system for the installation of photovoltaic (PV) or solar thermal (ST) panels.

1.2 Reference documents

Standards:

- EN 755-2:2008 «Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties»
- EN ISO 3506-1:2009 «Mechanical properties of corrosion-resistant stainless-steel fasteners - Part 1: Bolts, screws and studs»
- EN ISO 3506-2:2010 «Mechanical properties of corrosion-resistant stainless-steel fasteners - Part 2: Nuts»
- EN 10088-2:2005 «Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes»
- EN 1990:2002/A1:2005 «Eurocode - Basis of structural design»
- EN 1991-1-3:2003 «Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads»
- EN 1991-1-4:2005/A1:2010 «Eurocode 1 - Actions on structures - Part 1-4: General actions - Wind actions»
- EN 1999-1-1:2009 «Eurocode 9 - Design of aluminium structures - Part 1-1: General structural rules»

Test reports:

- RP083-07 "Sistema Solar-fix"

1.3 Application filed

The system has been conceived for the fixing of PV and ST on sloped surfaces, in order to obtain an architectural semi-integration of the plant with the covering, generally with variable inclinations from 10° to 50°.

Compatible with fischer SaMontec system.

Designers an/or installators must check the durability of the system considering the environmental conditions, according to Eurocode 9.

1.4 Type of surface

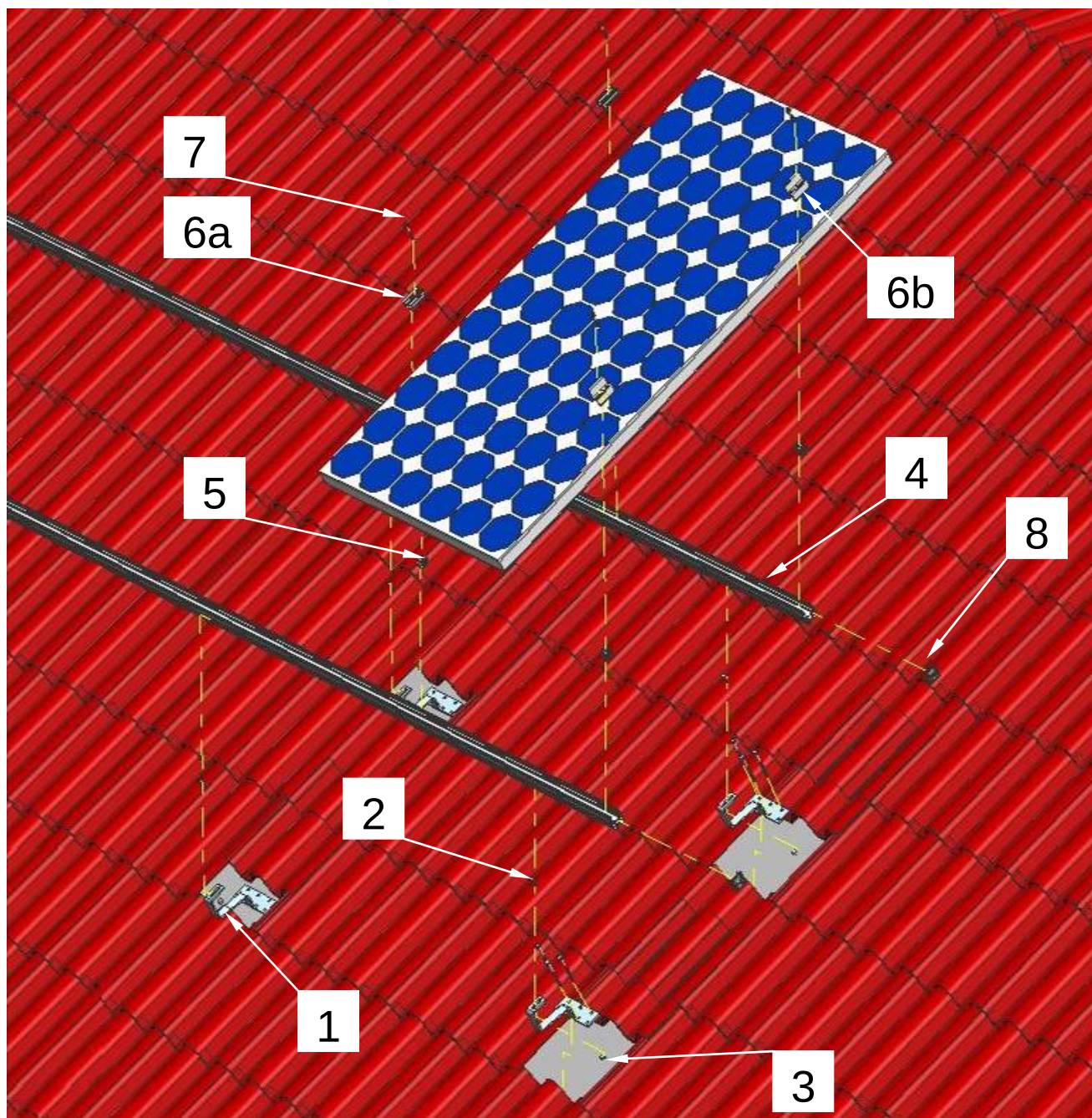
The system is suitable for applications on sloped surfaces, especially civil and industrial building covers made by roof tiles, Arabic tiles, etc. The bearing structure of the roof cover can be concrete, hollow slabs, concrete and bricks, wood, etc...

As the load bearing capacity of the system depends on the proper installation of the metal structure, designers and/or installators must check the type and conditions of the surface and choose the fixing accordingly.

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2 Building requirements

2.1 Drawing of the system on sloped roof



Notes:

- PV module is not supplied by fischer;
- choose the proper fixing system according to the type of substrate: for a correct choice see fischer General Catalogue or contact fischer Technical Service, toll-free number. 800-844078.

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2.2 System components and accessories

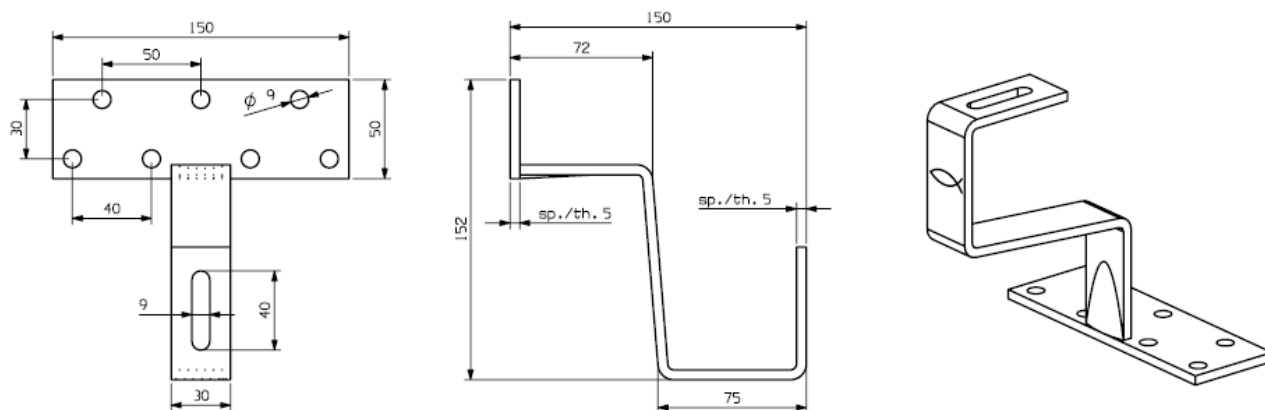
n°	name	description	material	notes
1	GT150	roof tile hook h=150mm	stainless steel X5CrNi 18-10 EN 10088-2:2005	Alternative hooks, to be chosen according to surface and loads
	GT130	roof tile hook h=130mm	stainless steel X5CrNi 18-10 EN 10088-2:2005	
	GT150/8	roof tile hook h=150mm, spessore 8mm	stainless steel X5CrNi 18-10 EN 10088-2:2005	
	GT130/8	roof tile hook h=130mm, 8mm thickness	stainless steel X5CrNi 18-10 EN 10088-2:2005	
	GTR	adjustable roof tile with TB M8 DIN603 screws+ M8 DIN6923/EN1661 fanged nuts	stainless steel X5CrNi 18-10 EN 10088-2:2005 + stainless steel A2-70 EN ISO 3506-1/-2:2009	
	GTT	adjustable roof tile hook with TB M8 DIN603 screws+ M8 DIN6923/EN1661 flanged nuts	stainless steel X5CrNi 18-10 EN 10088-2:2005 + stainless steel A2-70 EN ISO 3506-1/-2:2009	
	GC	adjustable roof tile hook TB with M8 DIN603 nuts + M8 DIN6923/EN1661 flanged nuts	stainless steel X5CrNi 18-10 EN 10088-2:2005 + stainless steel A2-70 EN ISO 3506-1/-2:2009	
	GTP	flat roof tile hook	stainless steel X5CrNi 18-10 EN 10088-2:2005	Supplied with GT – GTP – GC – GTR – GTT
2	SKS	M8 DIN933/EN-ISO4017 hex head screw	stainless steel A2-70 EN ISO 3506-1:2009	
3	MU F	M8 DIN6923/EN1661 flanged nut	stainless steel A2-70 EN ISO 3506-2:2009	
4	SolarFish	Profile	aluminium	see SDT130A1
5	FCN	M8 hammer nut	aluminium + nylon	Available as preassembled PMC or PMF - seeSDT130A1
6a	MC	Middle clamp	aluminium	
6b	MF	Final clamp	aluminium	
7	TCEI	TCEI M8 DIN912/EN-ISO4762 screw	stainless steel	
8	AK SP	Cap for SolarFish profile	nylon	see SDT130A1
	TE legno	d=8mm DIN571/UNI704 wood screw	stainless steel A2 EN ISO 3506-1:2009	Different lengths available
	SPL AL	5mm spacer plate for GT-GTP- GC hooks	aluminium AW6060 T66 EN 755-2:2008	

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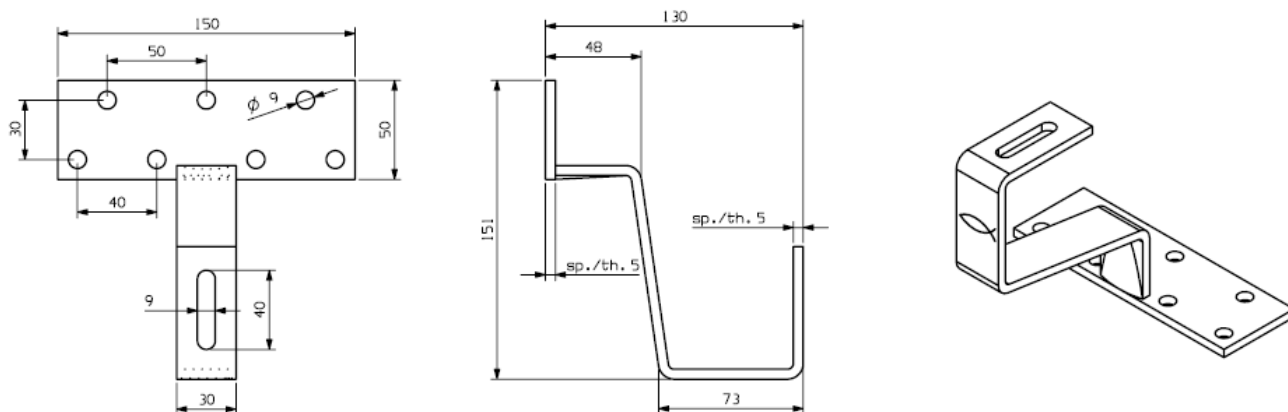
3 Technical data

3.1 Main dimensions and mechanical features

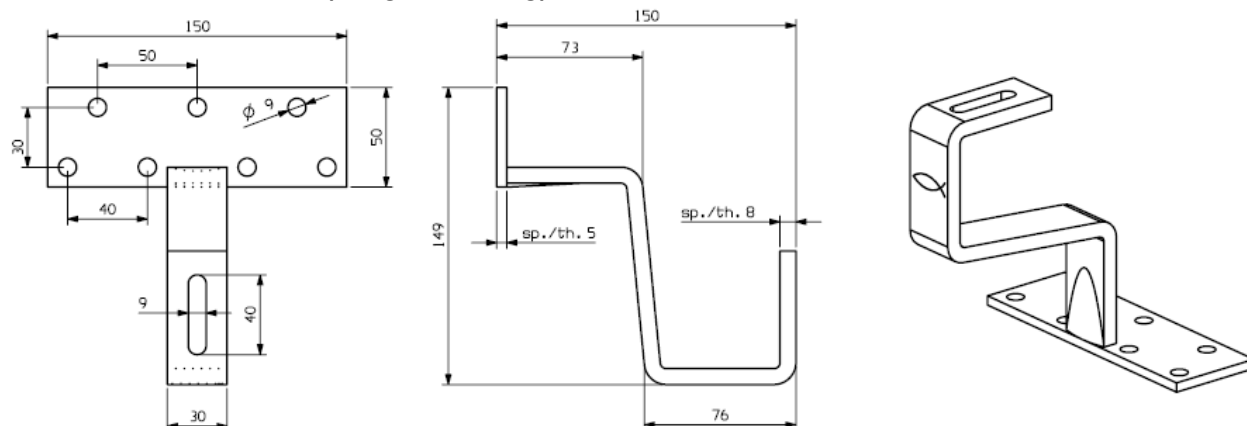
GT150 roof tile hook (weight 0,60 kg)



- GT130 roof tile hook (weight 0,57 kg)

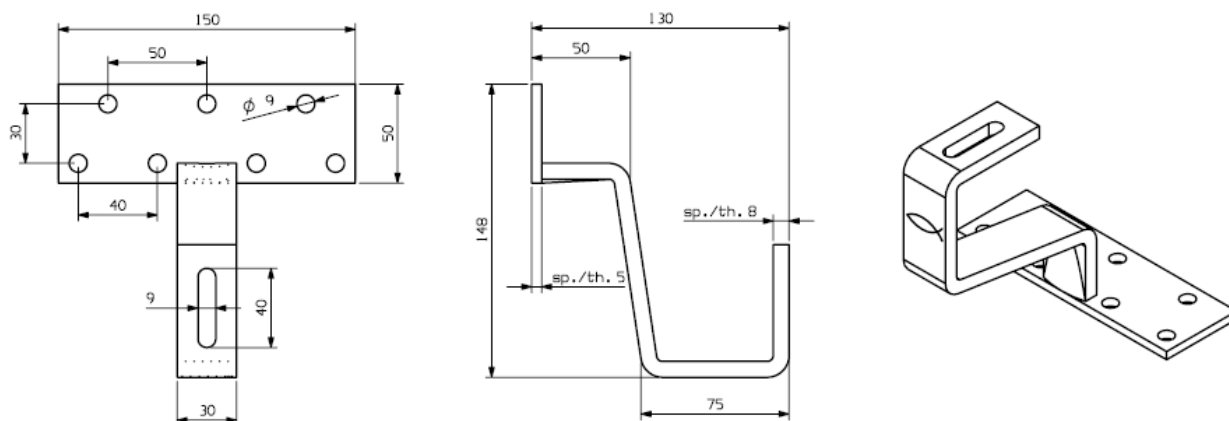


- GT150/8 roof tile hook (weight 0,78 kg)

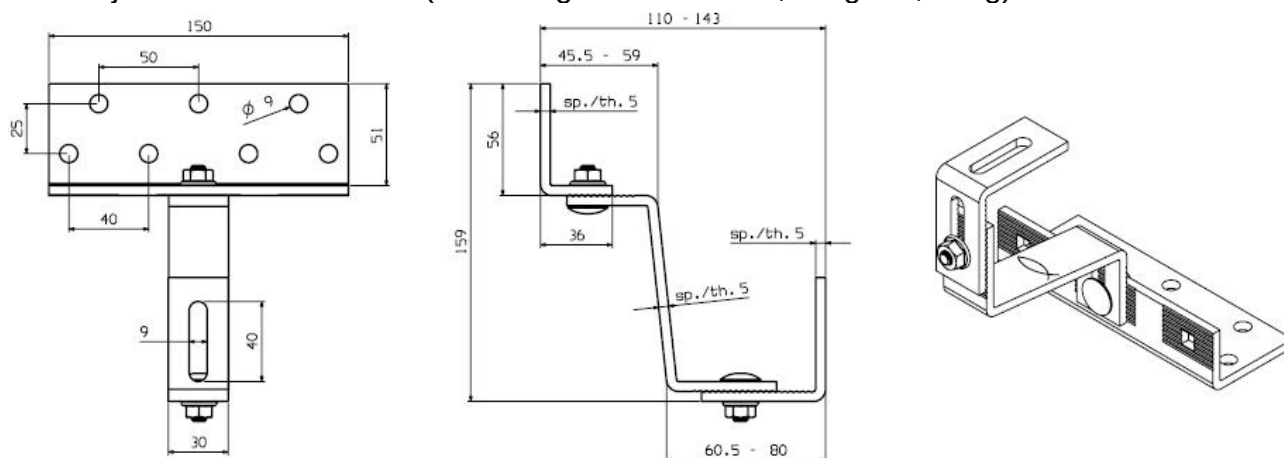


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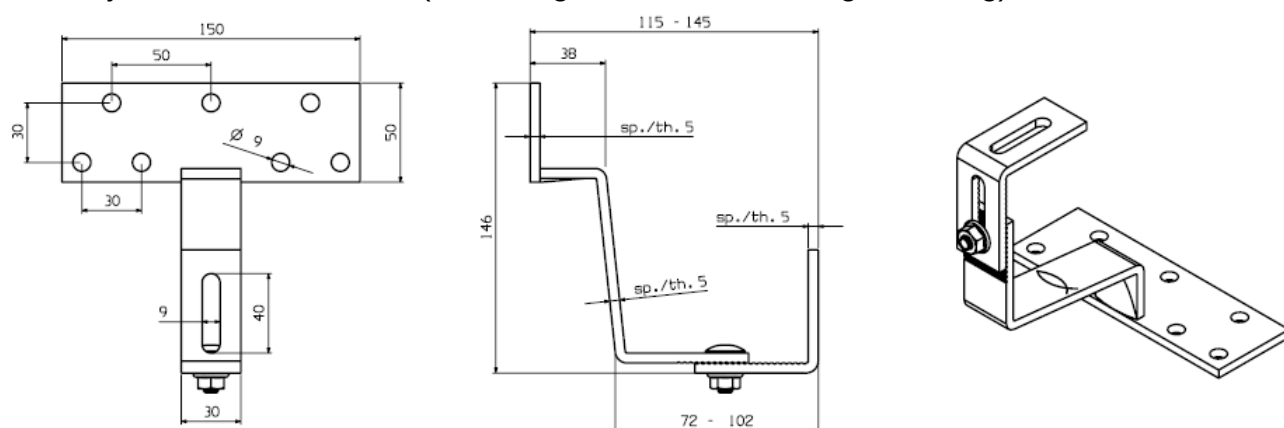
- GT130/8 roof tile hook (weight 0,73 kg)



- GTR adjustable roof tile hook (hook height 110/143mm, weight 0,83 kg)

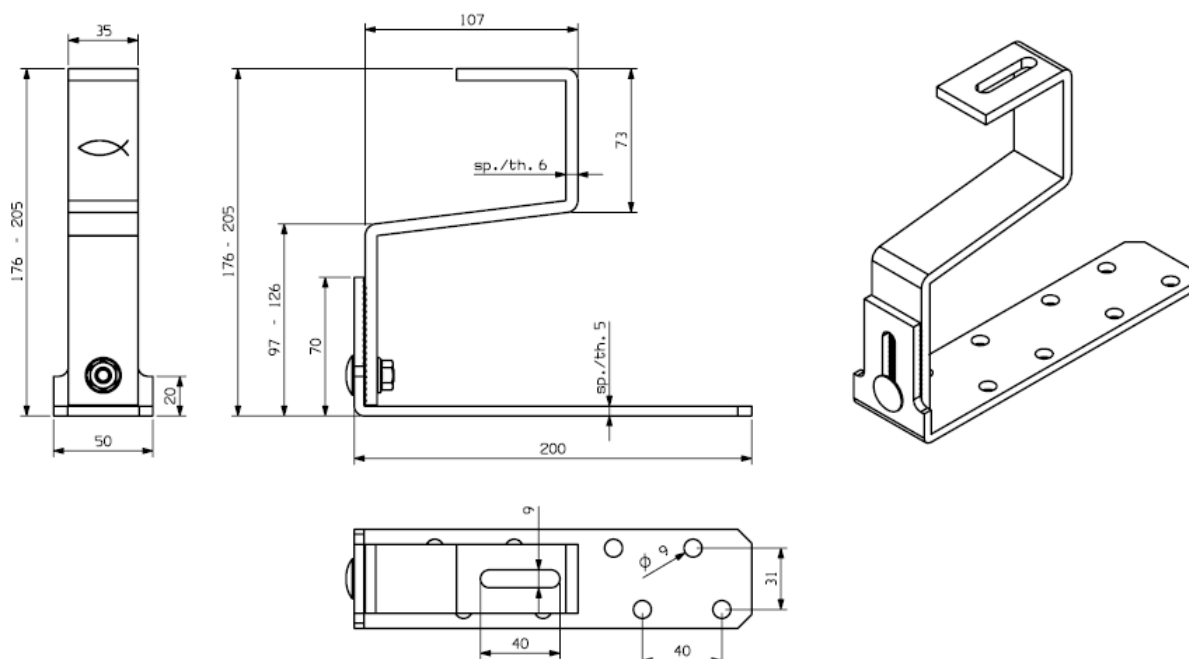


- GTT adjustable roof tile hook (hook height 115/145mm, weight 0,60 kg)

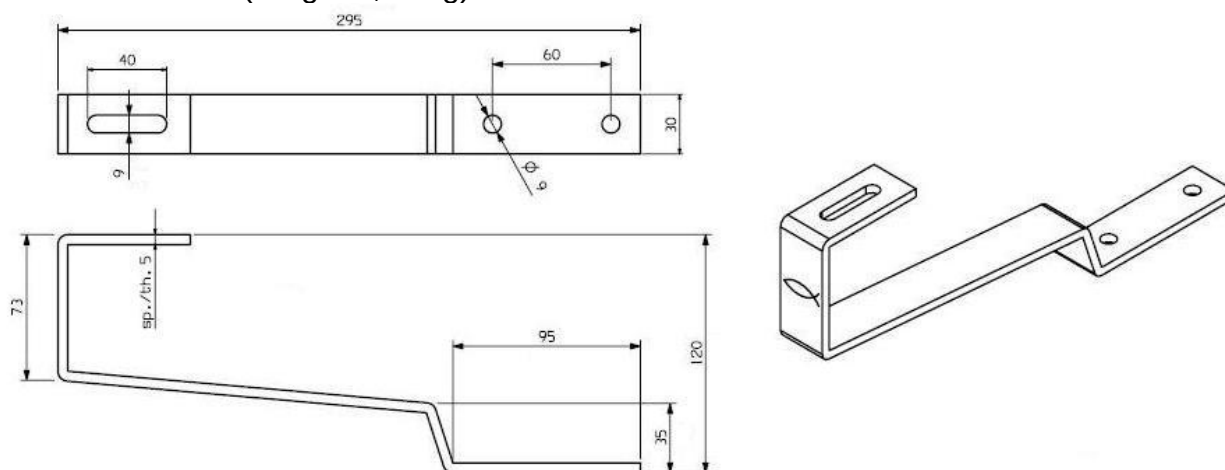


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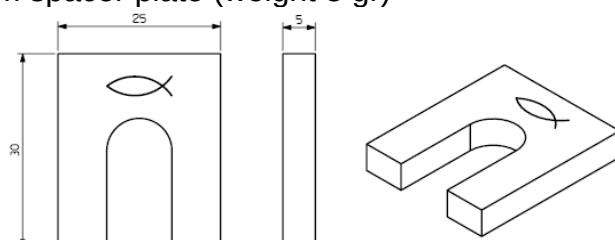
- GC adjustable arabic tile hook (hook height 176/205mm, weight 1,00 kg)



- GTP flat tile hook (weight 0,50 kg)



- SPL AL 5mm spacer plate (weight 8 gr)



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3.2 Installation instruction

For standard mounting those tools are needed: n.1 socket (or open end) wrench size 13mm for SKS and MU F nuts (to fix SolarFish profile to GT/GTR/GTT/GC hooks- torque 10Nm) and n.1 Allen wrench size 6mm for TCEI screws (to fix MC-MF-PMC-PMF clamps- torque 10Nm).

Fixing between Solar-fix structure and roof has to be chosen paying attention to the type of substrate under the covering:

- for concrete and bricks, several fischer mechanical and chemical fixings are available, to be used with hooks (Ø9mm holes);
- for wood, TE Ø8 hexagonal head screws have to be used with hooks.

For the installation of TE wood n.1 socket or open end wrench size 13mm is needed

Recommendations:

- fix the hook to the support always using the existing holes of the base (at least two fixings for each hook, possibly not with contiguous holes);
- tighten up (torque at least 10 Nm) the screws of adjustable brackets (GTR, GTT and GC) before installing the profiles;
- use always the existing slot in the higher part of the hook for the fixing of SolarFish profile.

4 Statics of the system

4.1 General information and reference standards

The dimensioning of profile and support elements has been done on the basis of static analysis according to Eurocodes EC0 and EC9 (EN 1990 and EN 1999-1-1). Snow and wind loads for European countries can be found in Eurocode EC1 (EN 1991-1-3 and EN 1991-1-4).

4.2 Load cases

All loads (structure weight, snow, wind) are supposed not to work at the same moment having maximum intensity, but they could work together with different ratio (semi-probabilistic method).

Worst "Load Cases" (LC) are:

LC1: $1.35 \cdot \text{structure weight} + 1.5 \cdot (\text{snow} + 0.6 \cdot \text{wind})$

LC2: $1.35 \cdot \text{structure weight} + 1.5 \cdot (0.5 \cdot \text{snow} + \text{wind})$

LC3: $0.9 \cdot \text{structure weight} + 1.5 \cdot \text{wind}$

LC1 and LC2 are worst conditions for pressure wind, LC3 for wind in depression.

Coefficients 1.35, 1.5 e 0.9 are used as "elastic" ultimate limit state of elements, where stresses are limited to $R_{p0.2}$ (about profile SolarFish) or where stress causes a 0.8mm maximum permanent deformation at the end of wing (about hooks).

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At the same time, structures have to satisfy working limit state for overmuch deformations: this calculation is made having former coefficients = 1 and deformations limited to 1/150 of distance between supports (about profile SolarFish) or 10mm (about hooks).

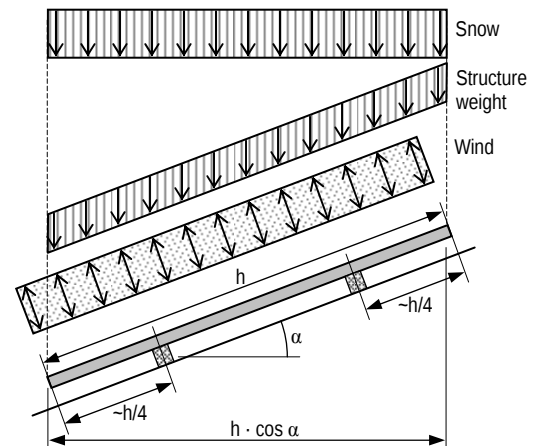
Weight of PV-modules is supposed to be 15 Kg/m².

4.3 Static schemes

As regards SolarFish profiles, four or more configurations were considered.

As regards hooks, analysis and tests were made to get minimum limit loads to be used on wind and snow calculations

All loads are supposed to be equally distributed, as picture above. Results are given only about that loading configuration.



4.4 Load diagrams: general information

Load diagrams give the distance between supports according to module height and working with wind/snow combination, starting from load/m². In case of wind load in depression (LC3), where snow load is null, starts only from wind load/m².

Load values have to be nominal, not amplified by semi-probabilistic combination coefficients, because comparisons with values obtained from LC has been done during graphs building.

ATTENTION: when SolarFish profile has only two or three supports, you have to reduce the distance given by diagrams of 20%.

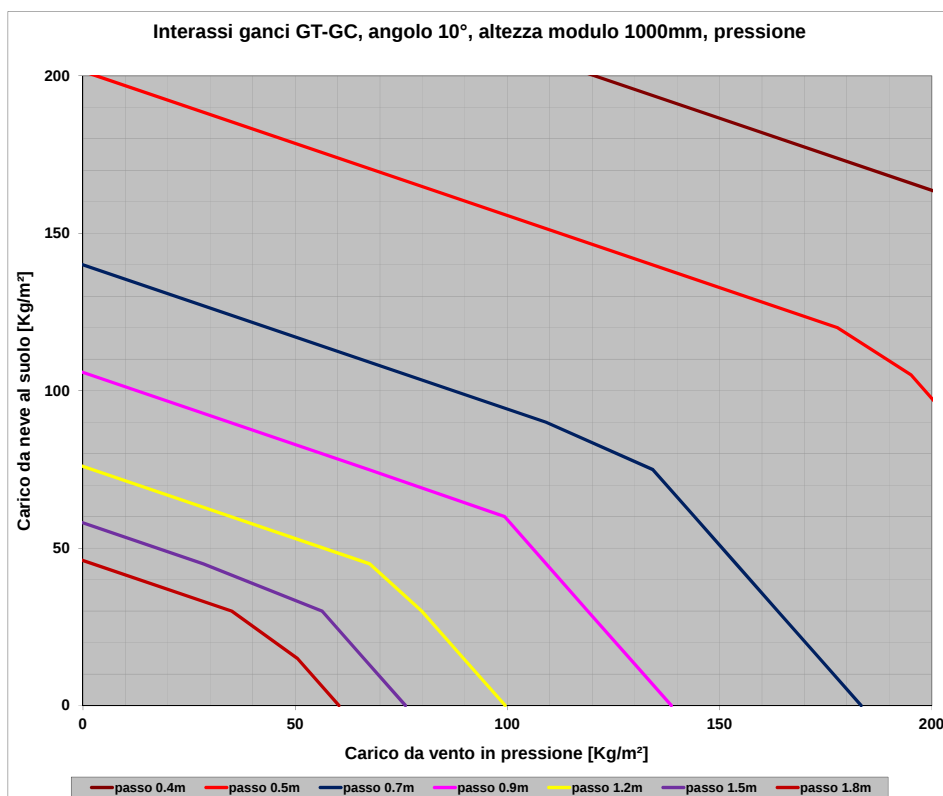
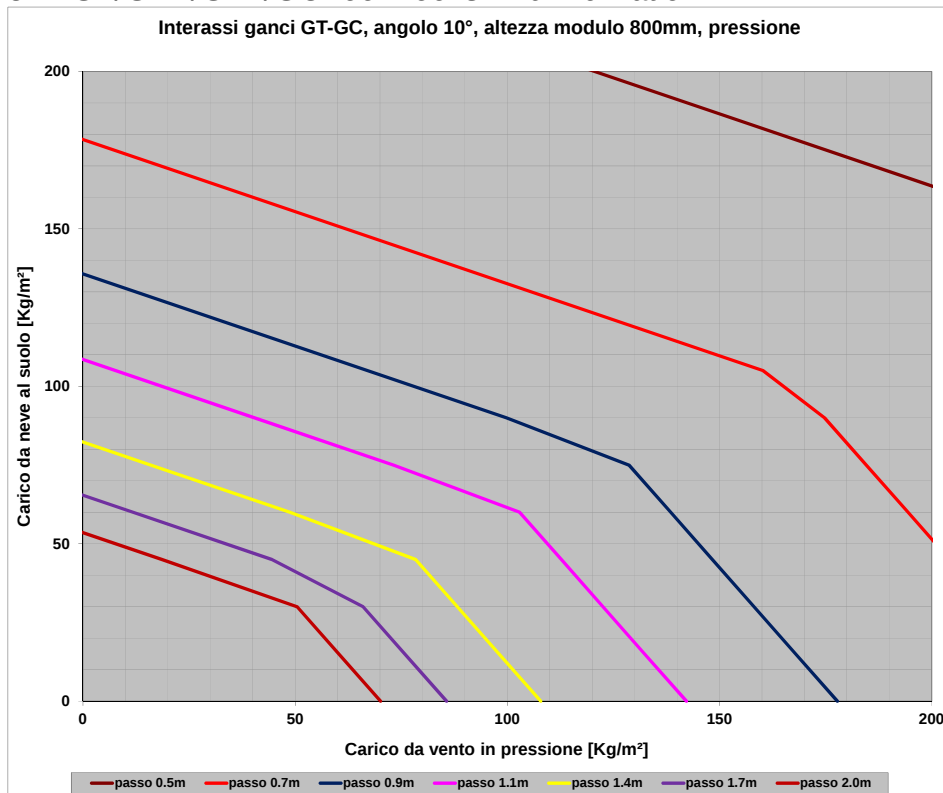
4.5 Load diagrams: systems for sloped roof with GT/GTR/GTT/GC hooks

The following diagrams regard the complete system GT/GTR/GTT/GC hooks+ SolarFish profiles, analyzed considering all possible LC load combinations and according to the different roof inclinations.

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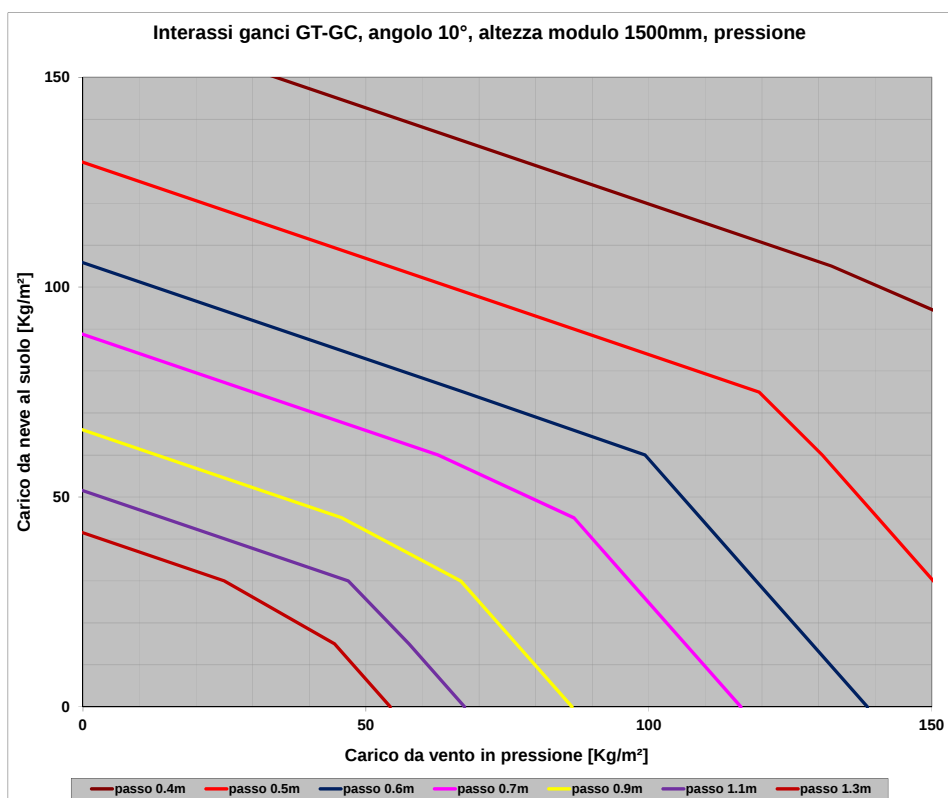
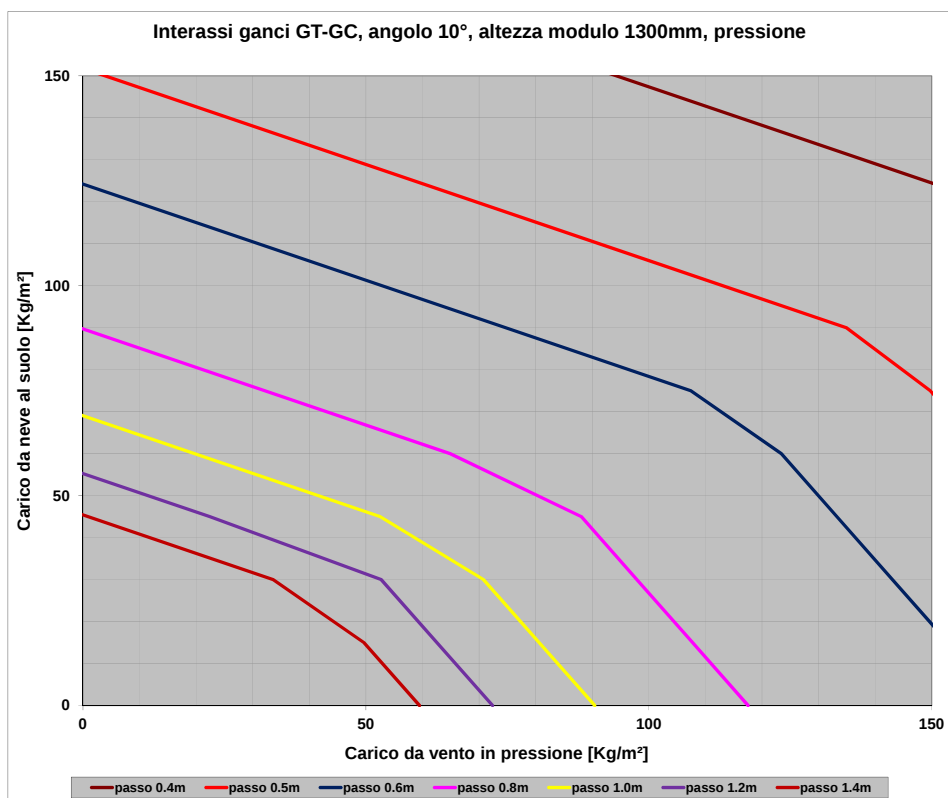
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

4.5.1 GT/GTR/GTT/GC roof hooks - 10°inclination



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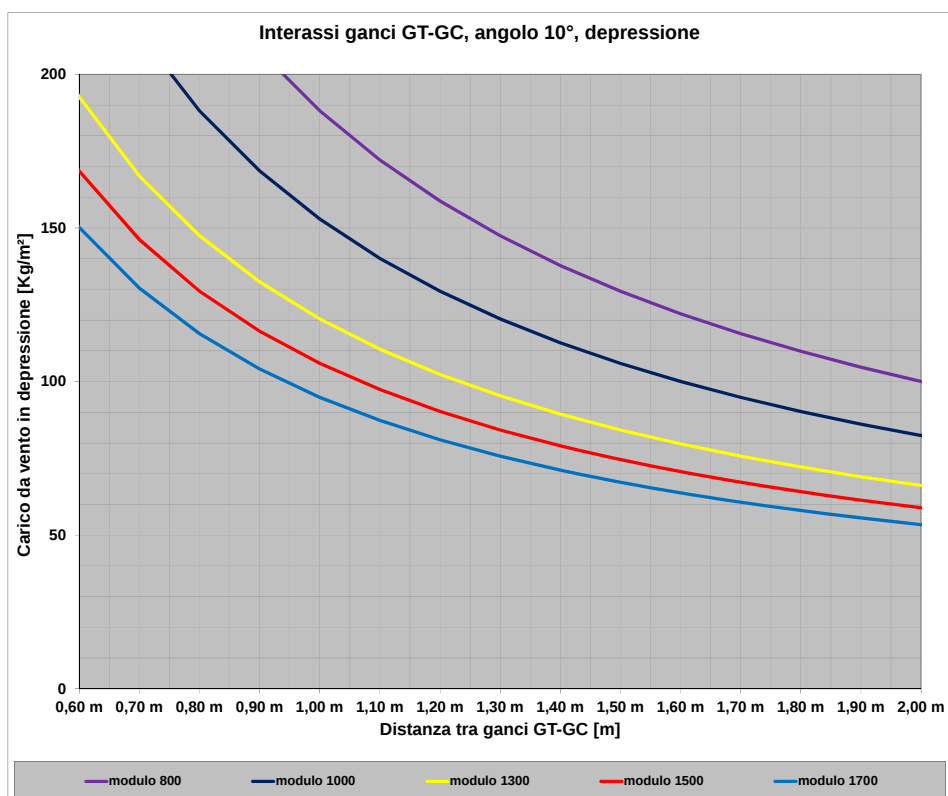
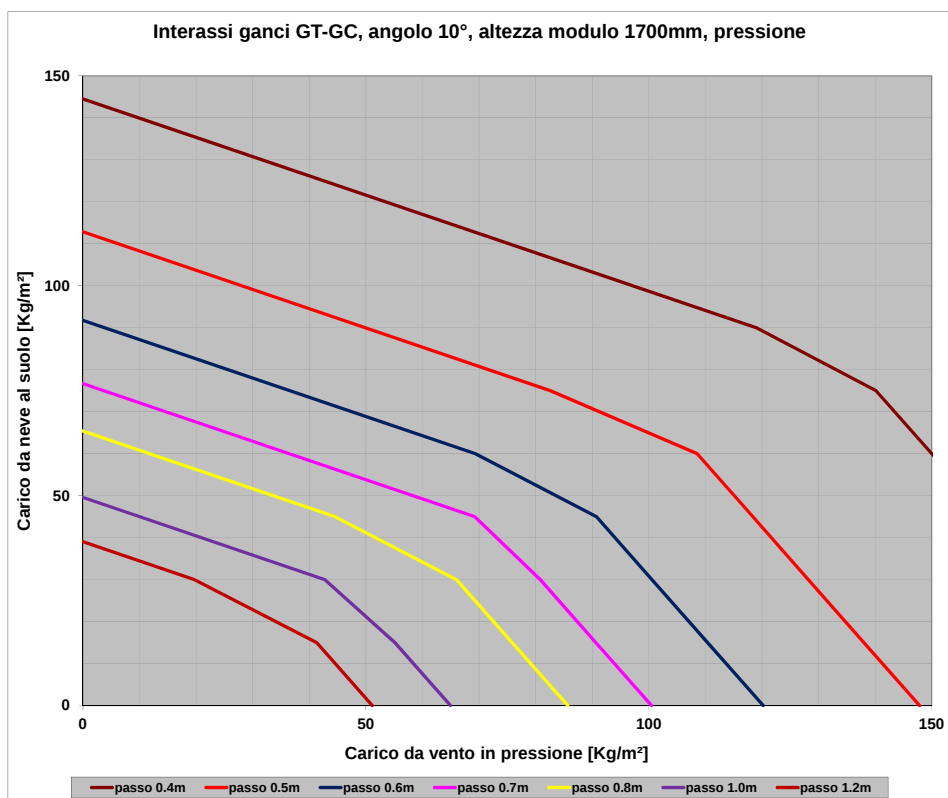
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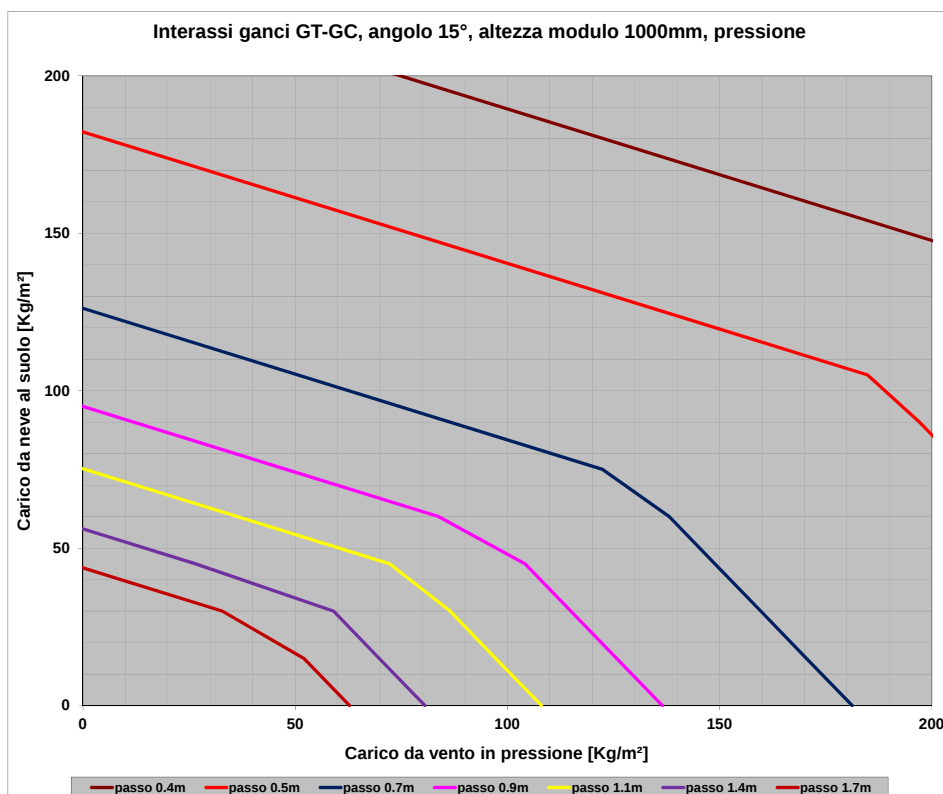
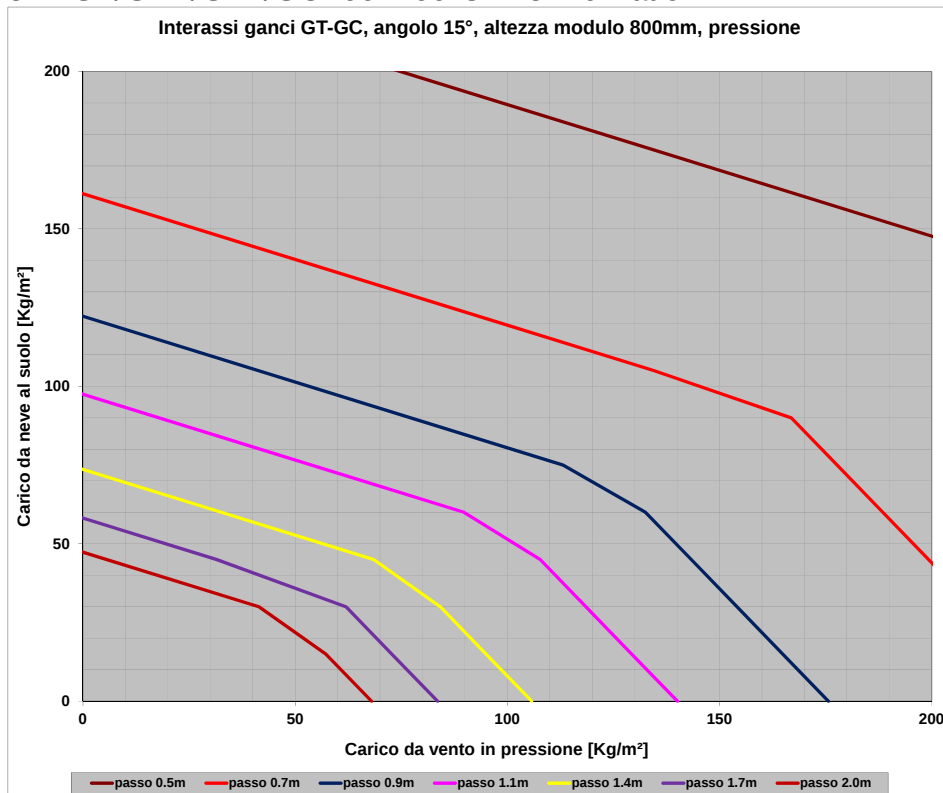
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TECHNICAL DATA SHEET

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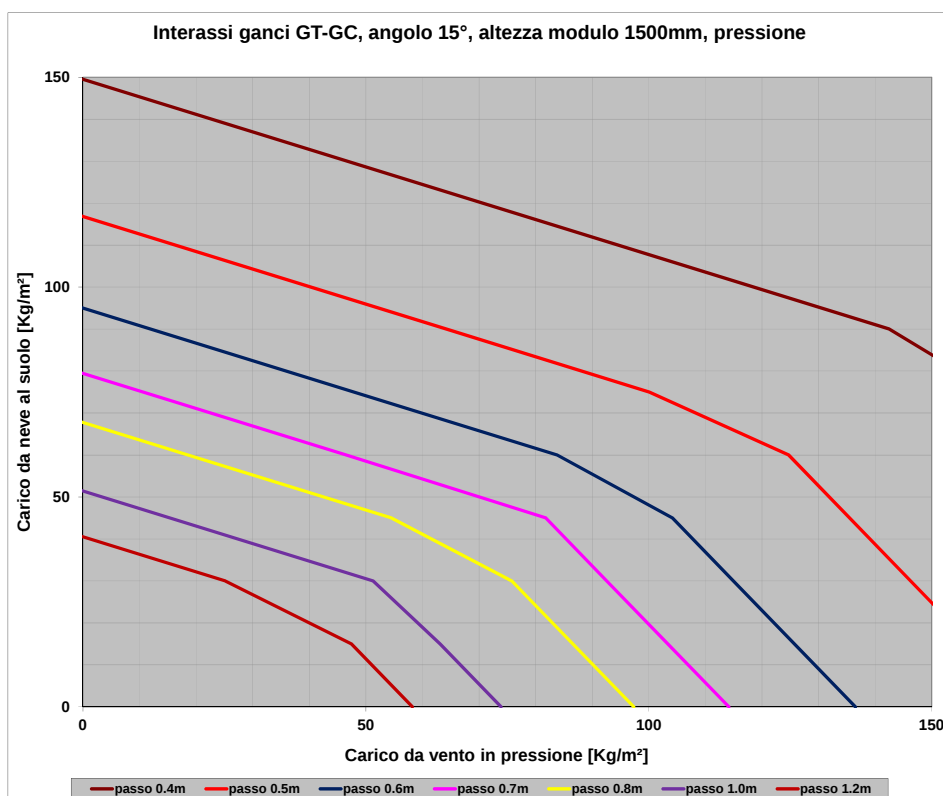
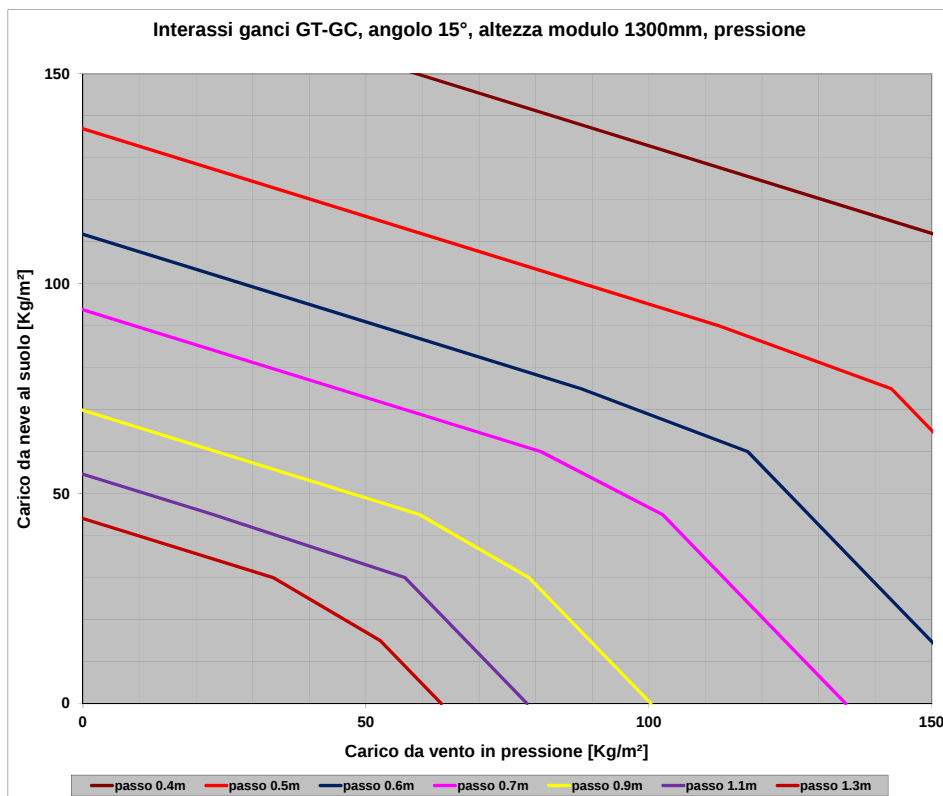
4.5.2 GT/GTR/GTT/GC roof hooks - 15° inclination



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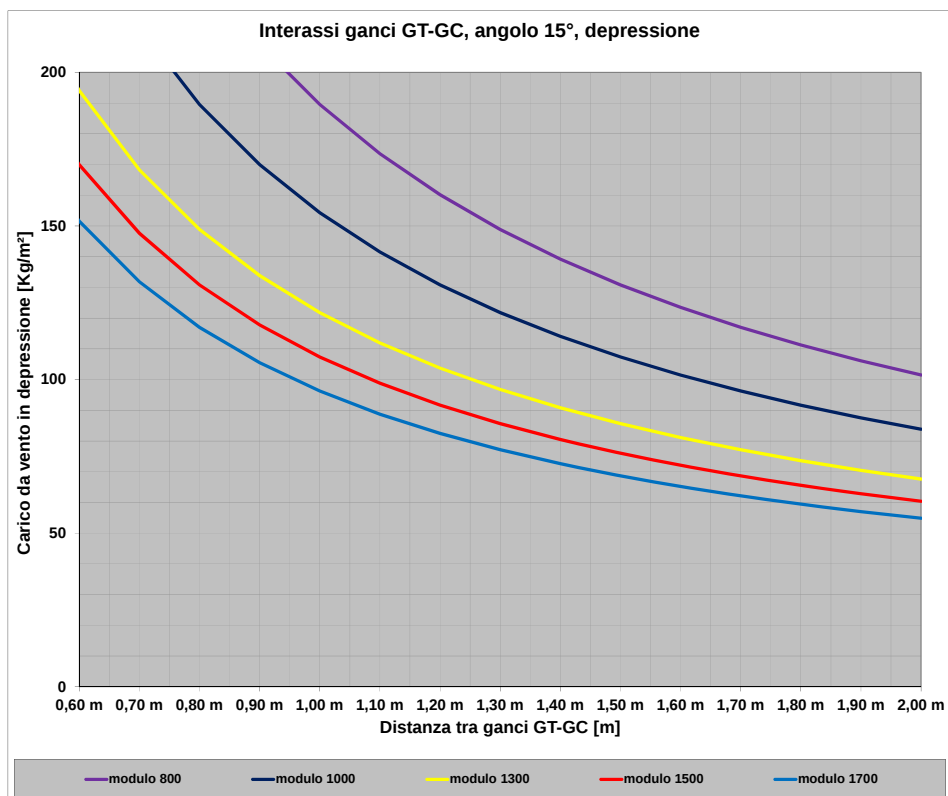
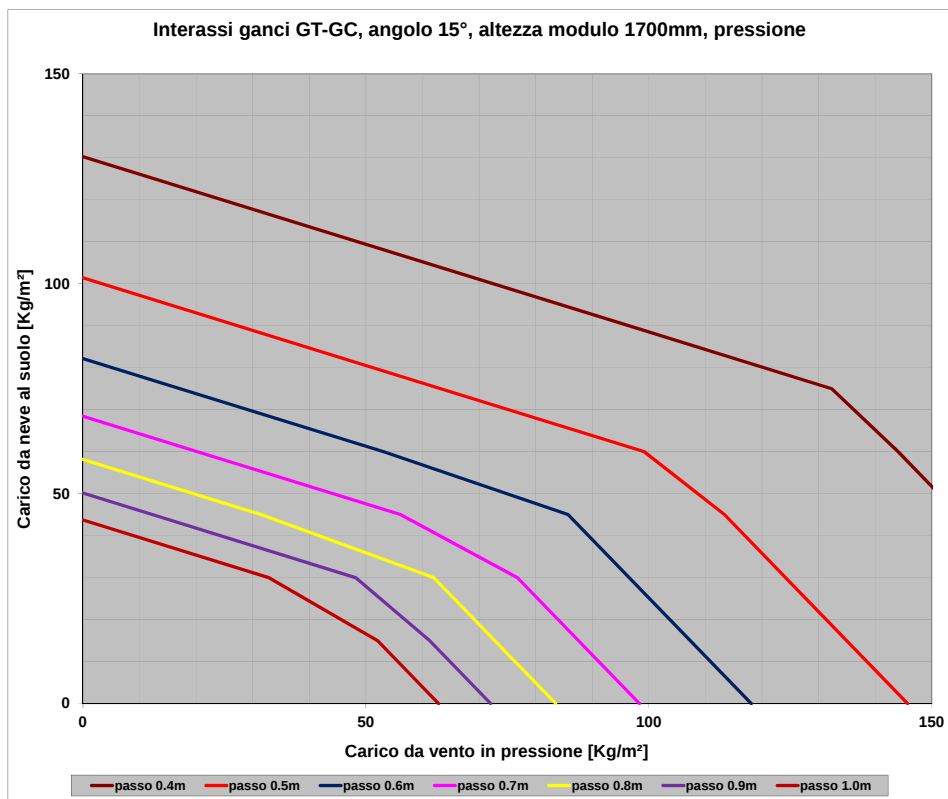
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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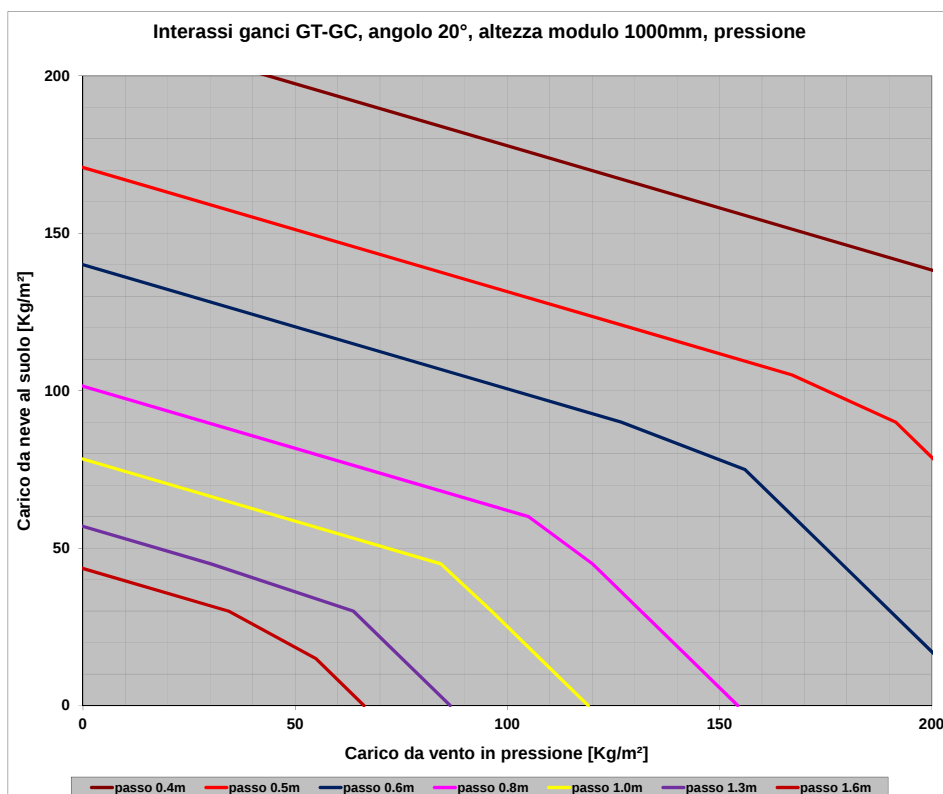
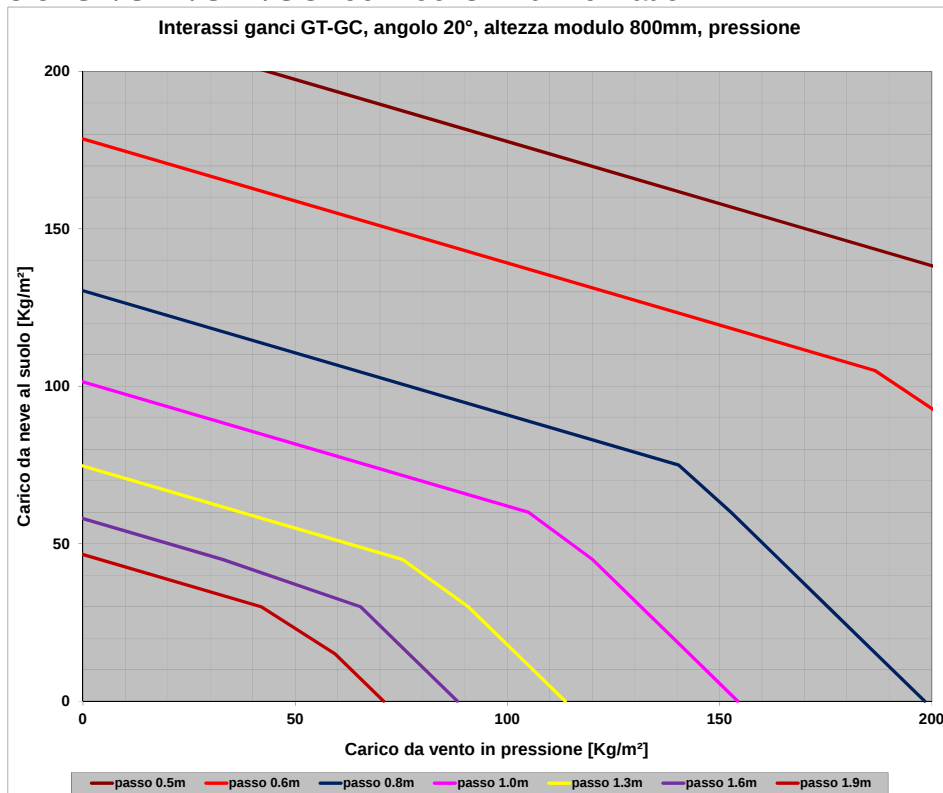
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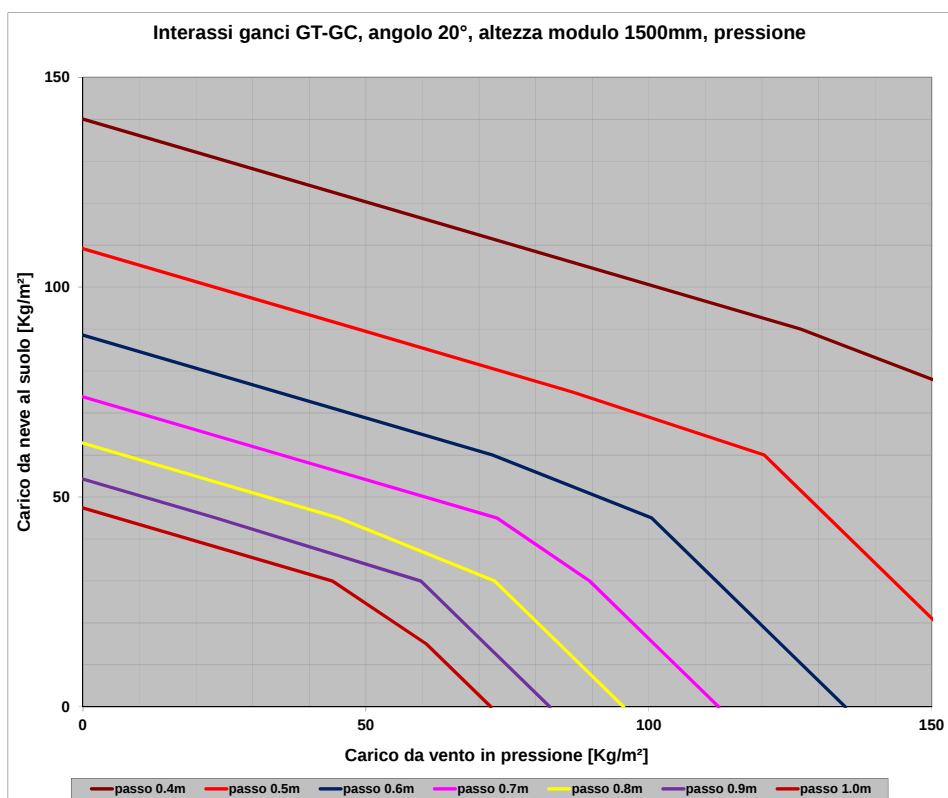
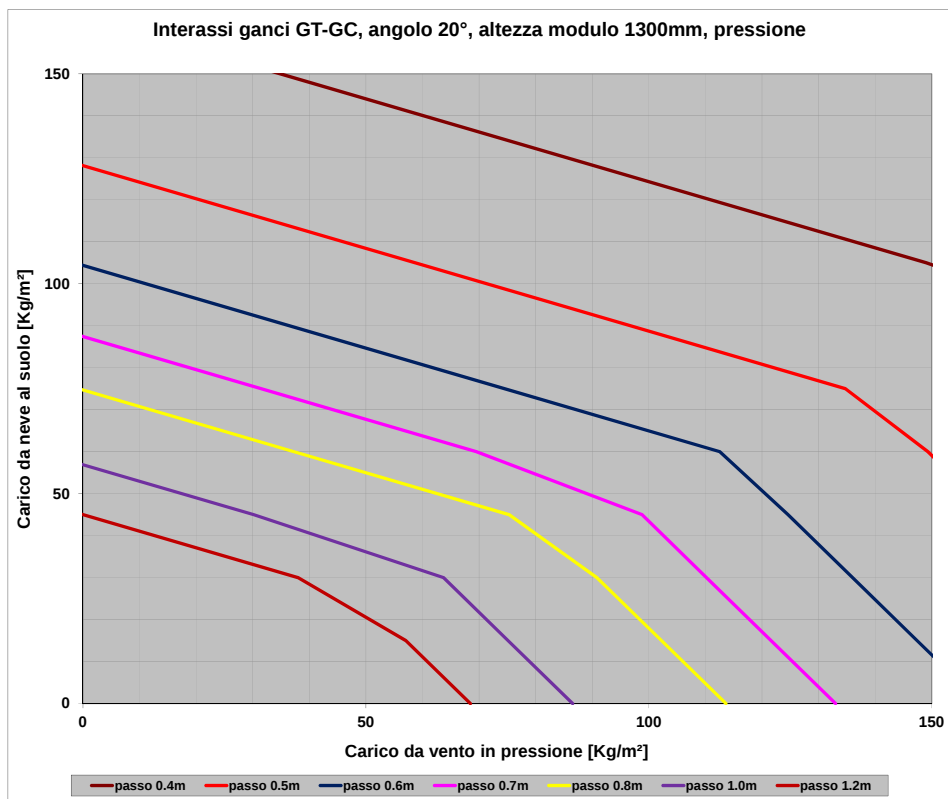
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

4.5.3 GT/GTR/GTT/GC roof hooks - 20° inclination



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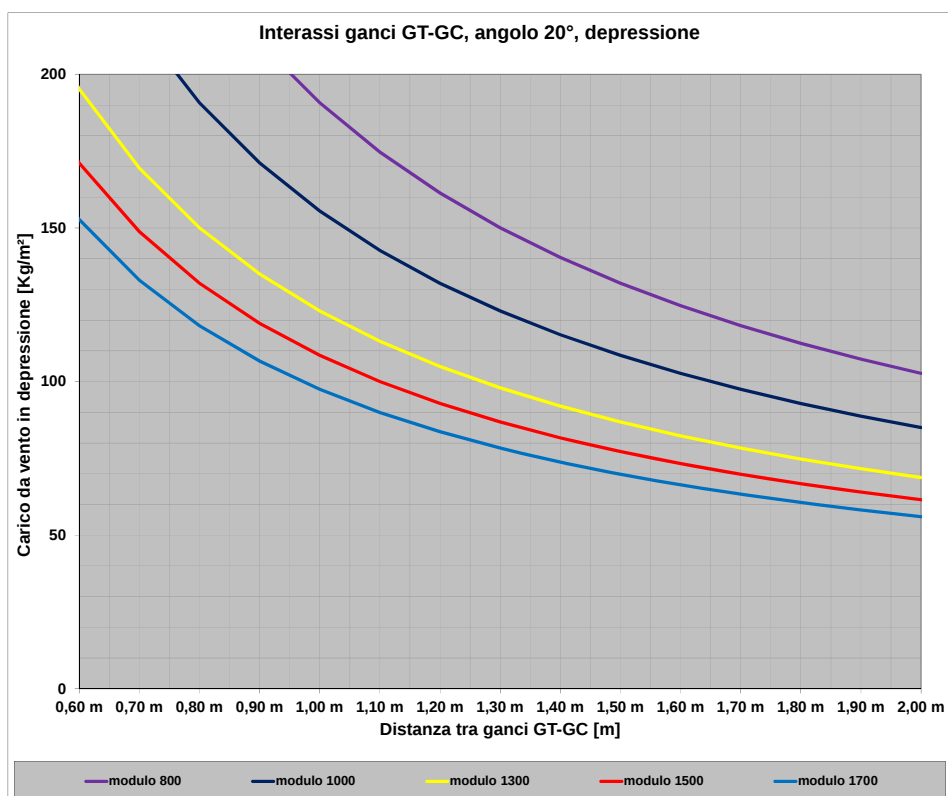
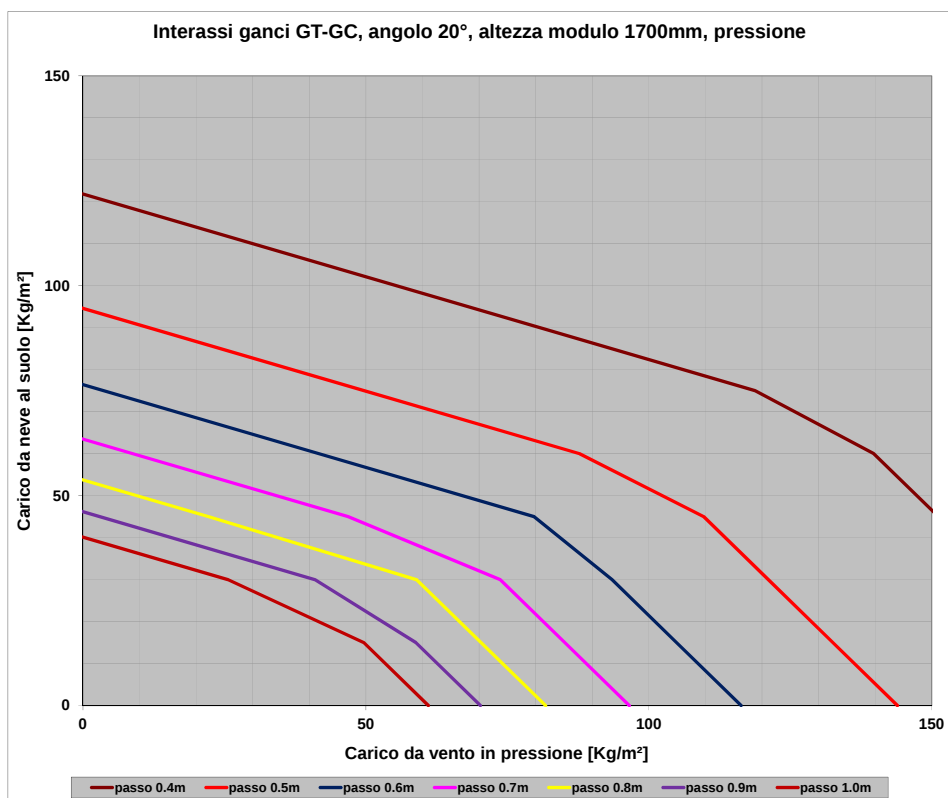
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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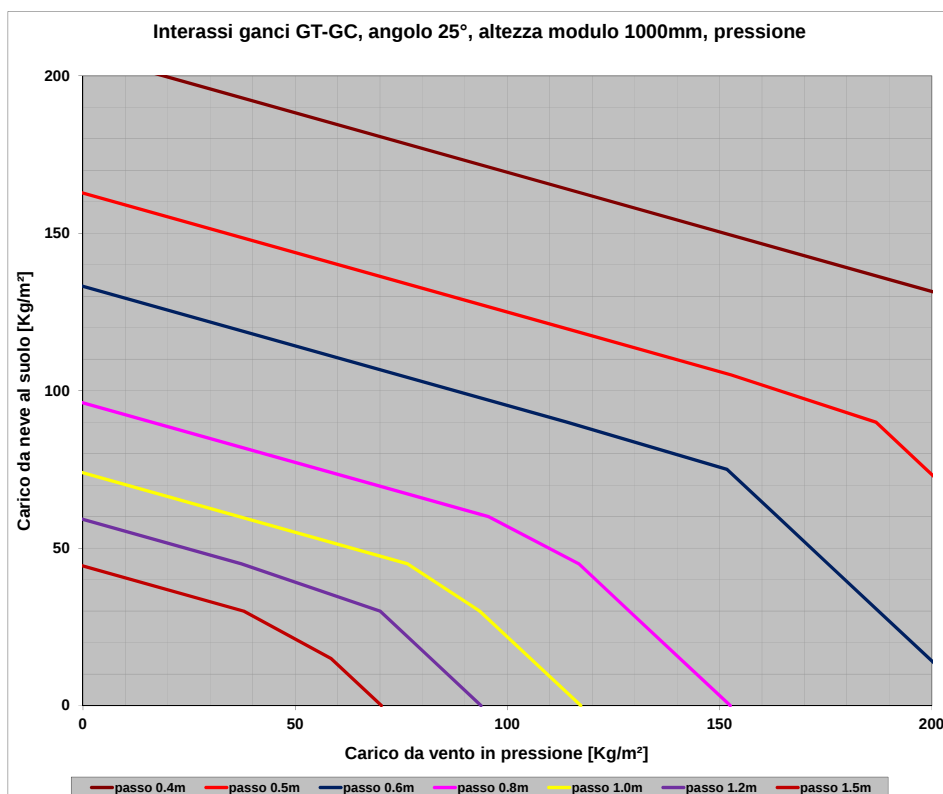
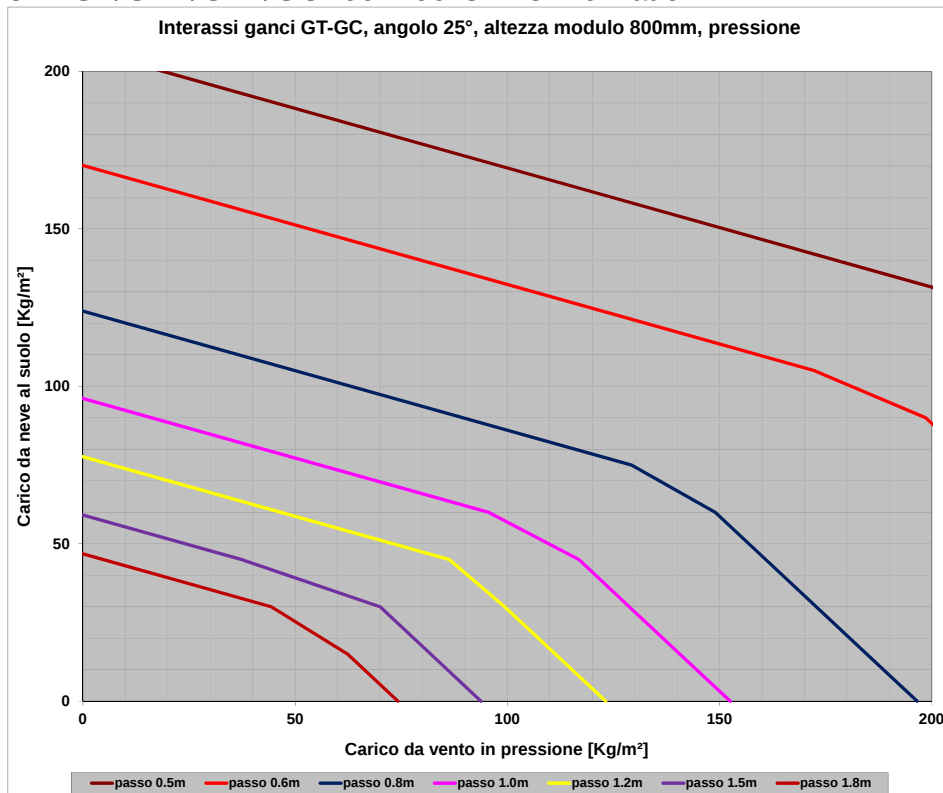
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



TECHNICAL DATA SHEET

Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

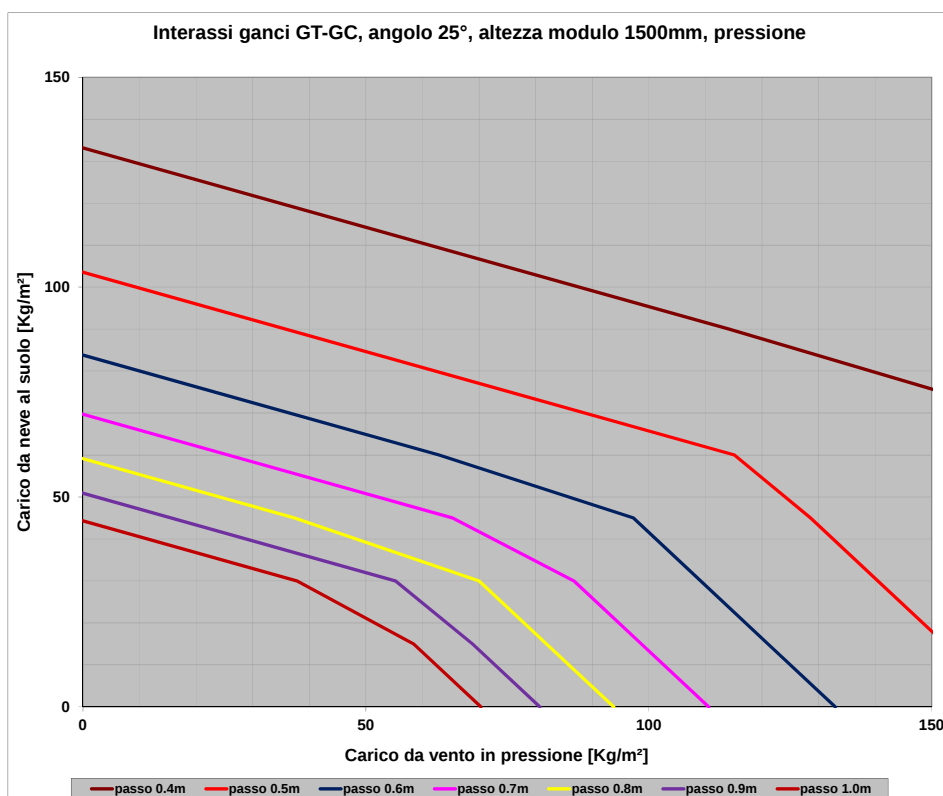
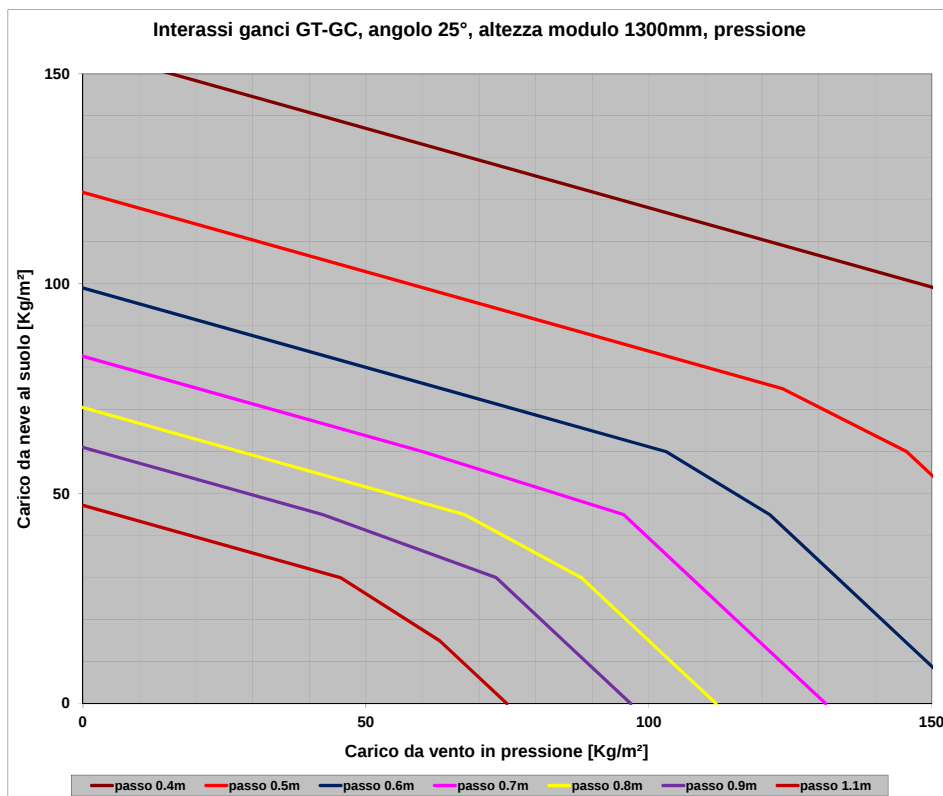
4.5.4 GT/GTR/GTT/GC roof hooks - 25° inclination



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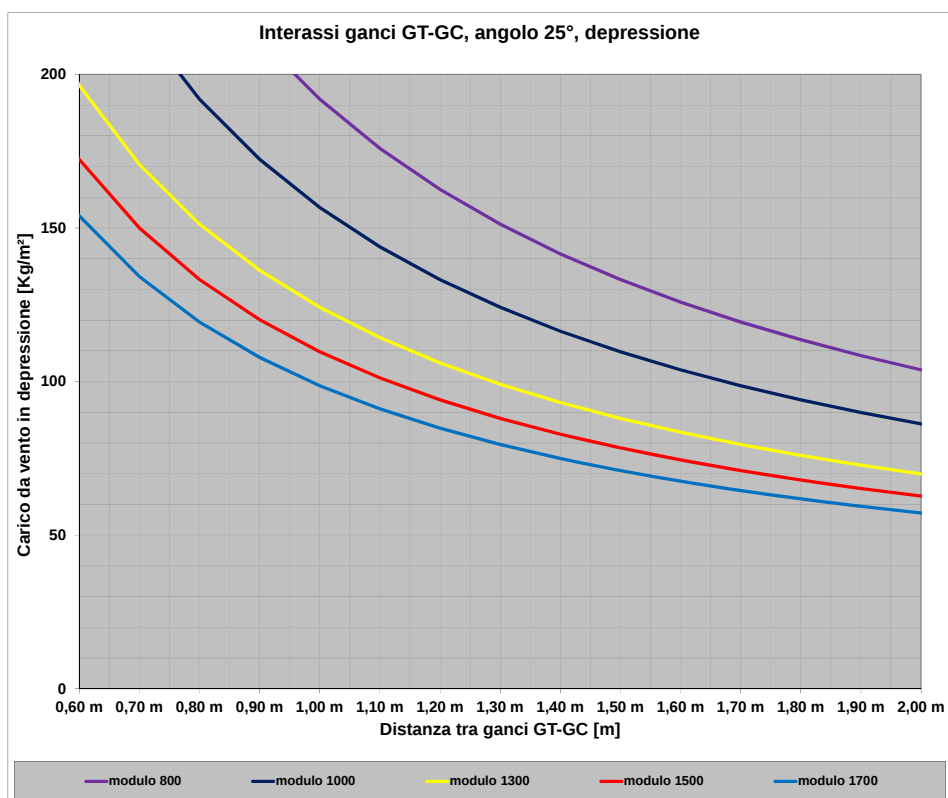
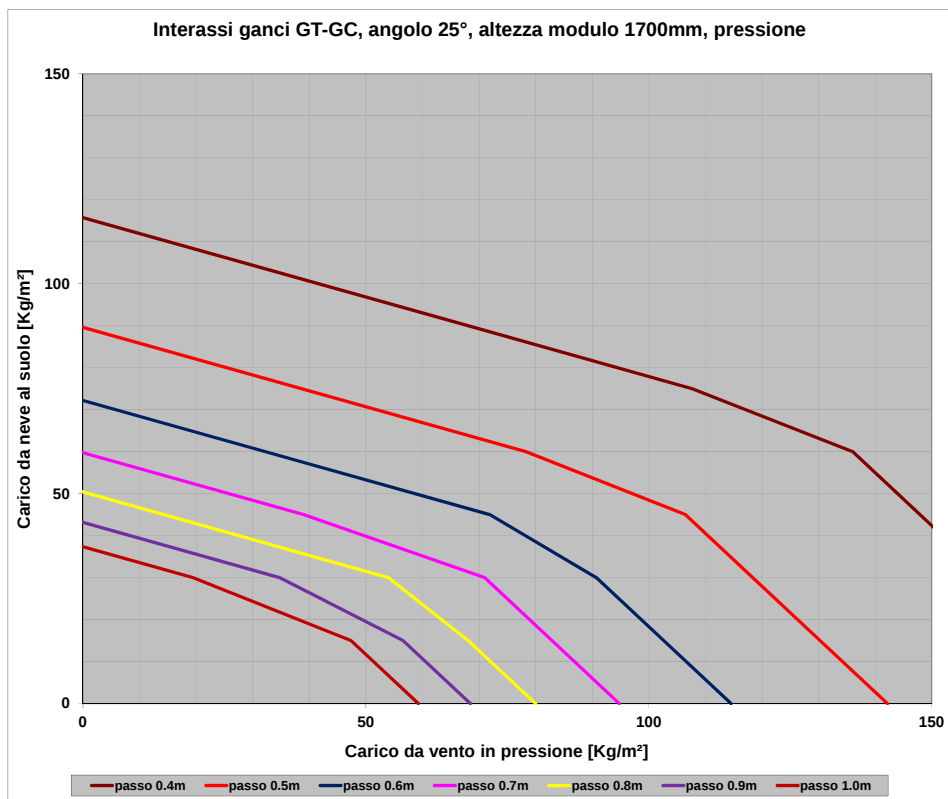
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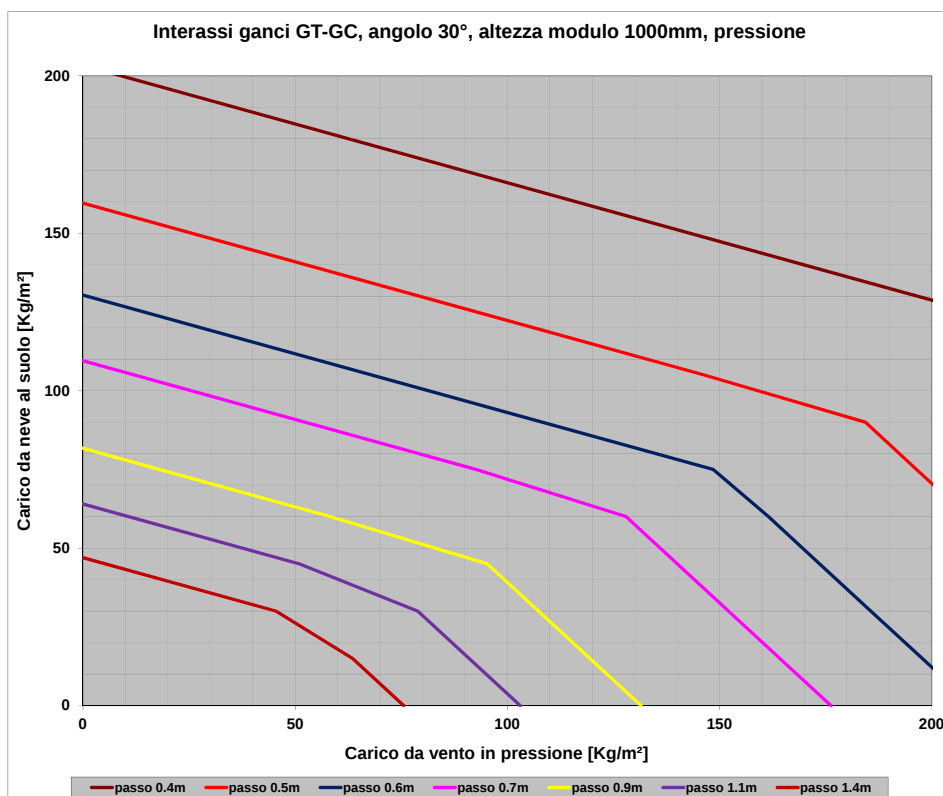
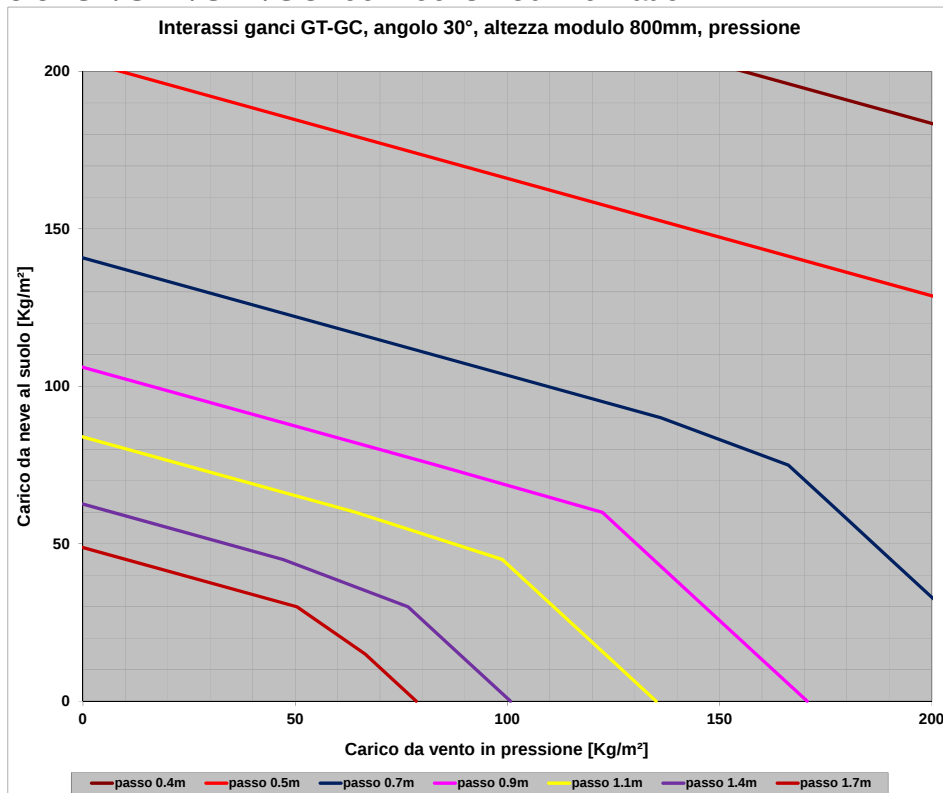
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

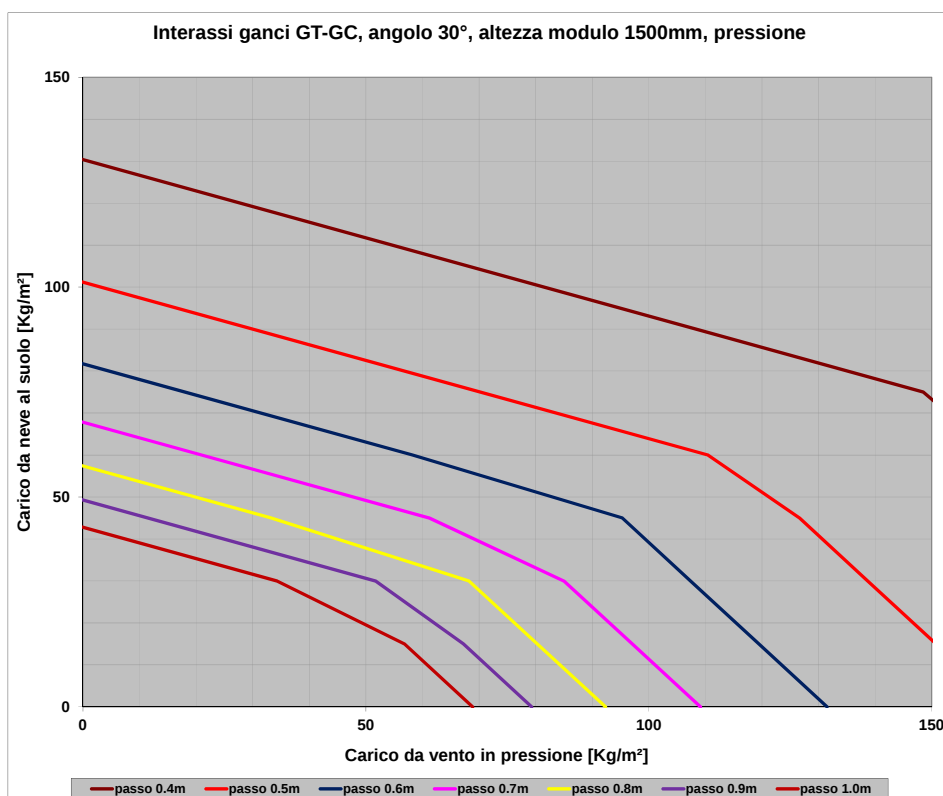
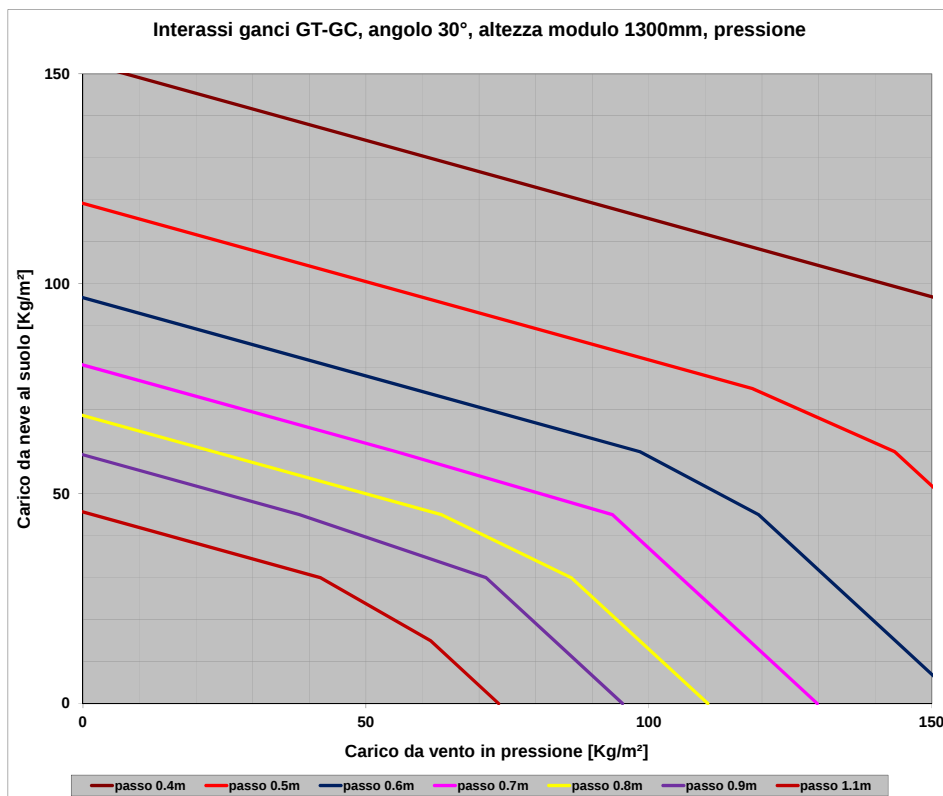
4.5.5 GT/GTR/GTT/GC roof hooks - 30° inclination



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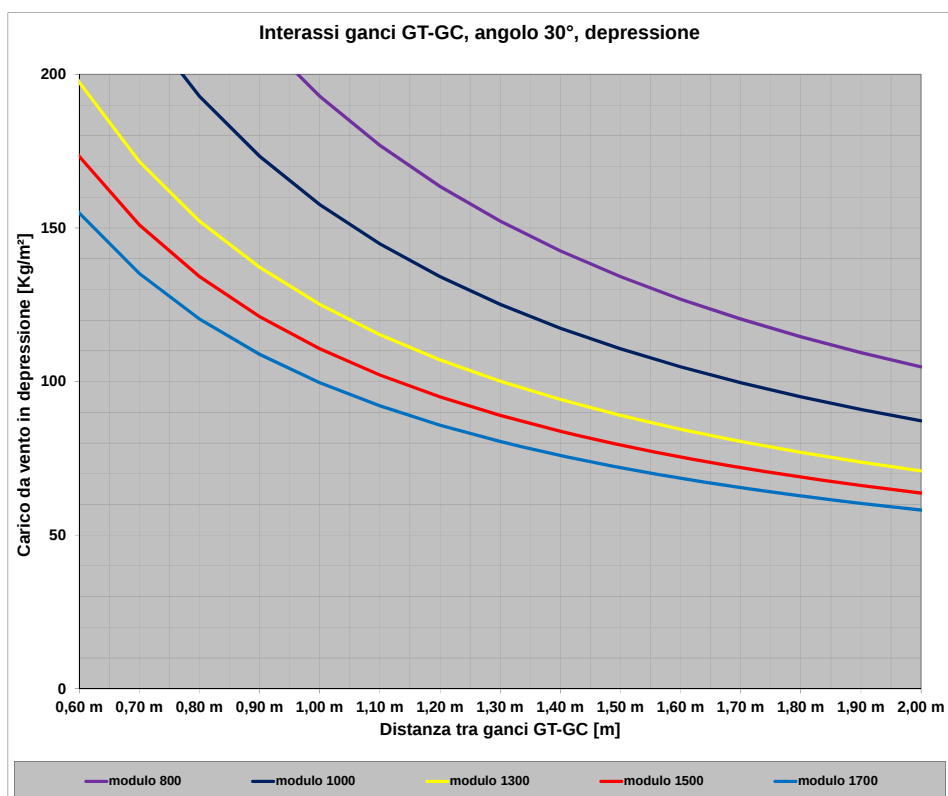
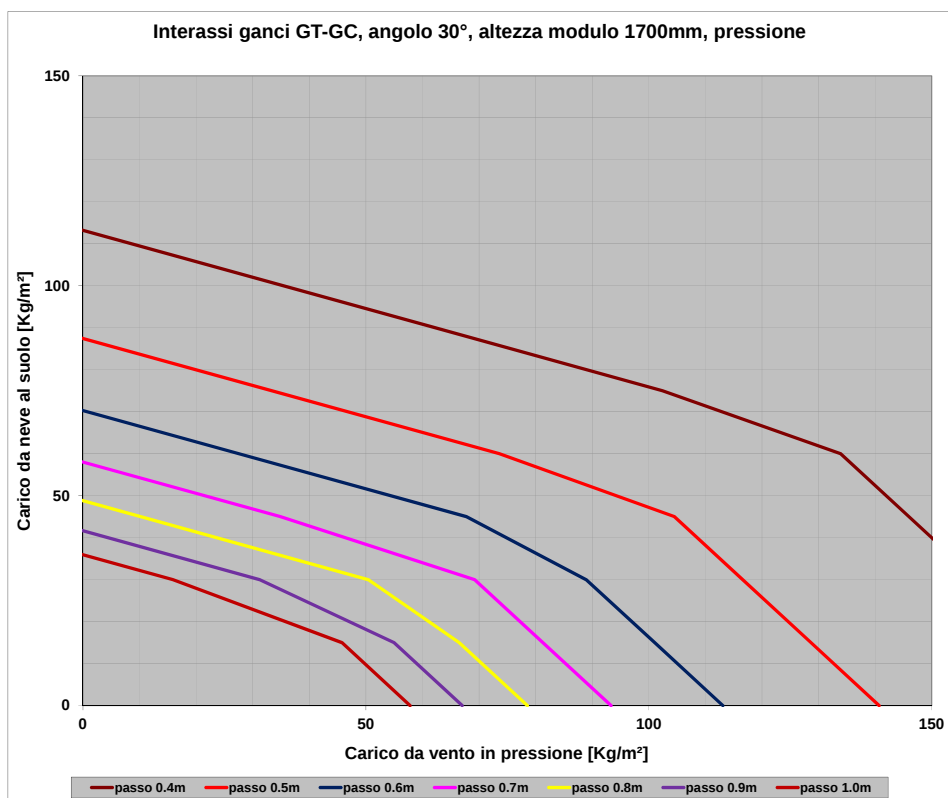
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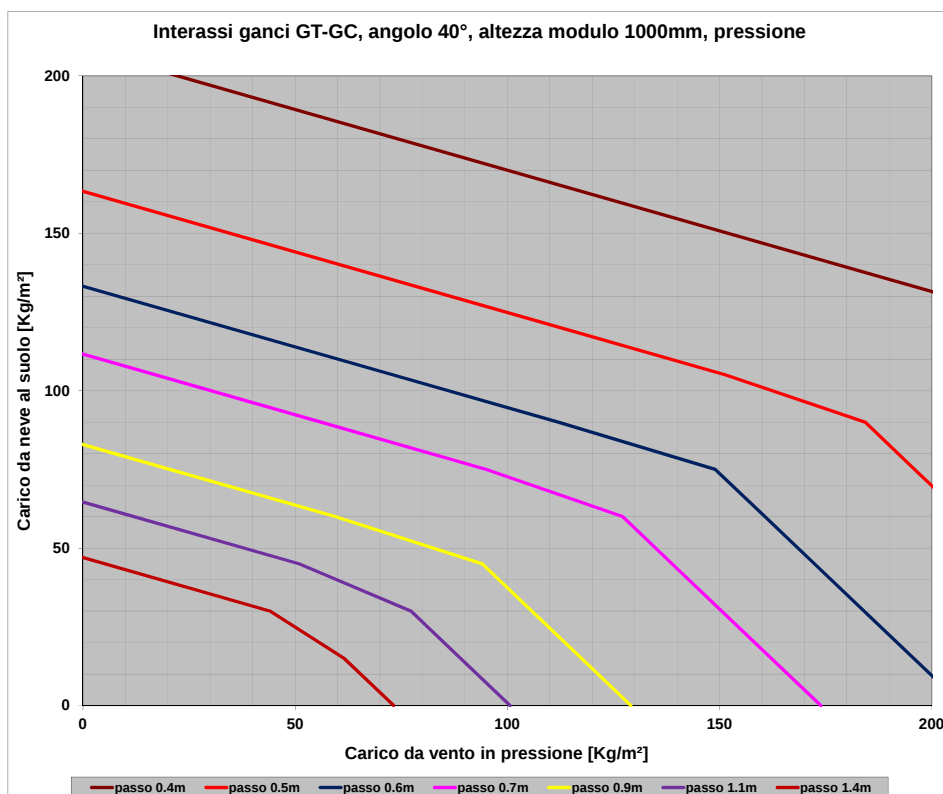
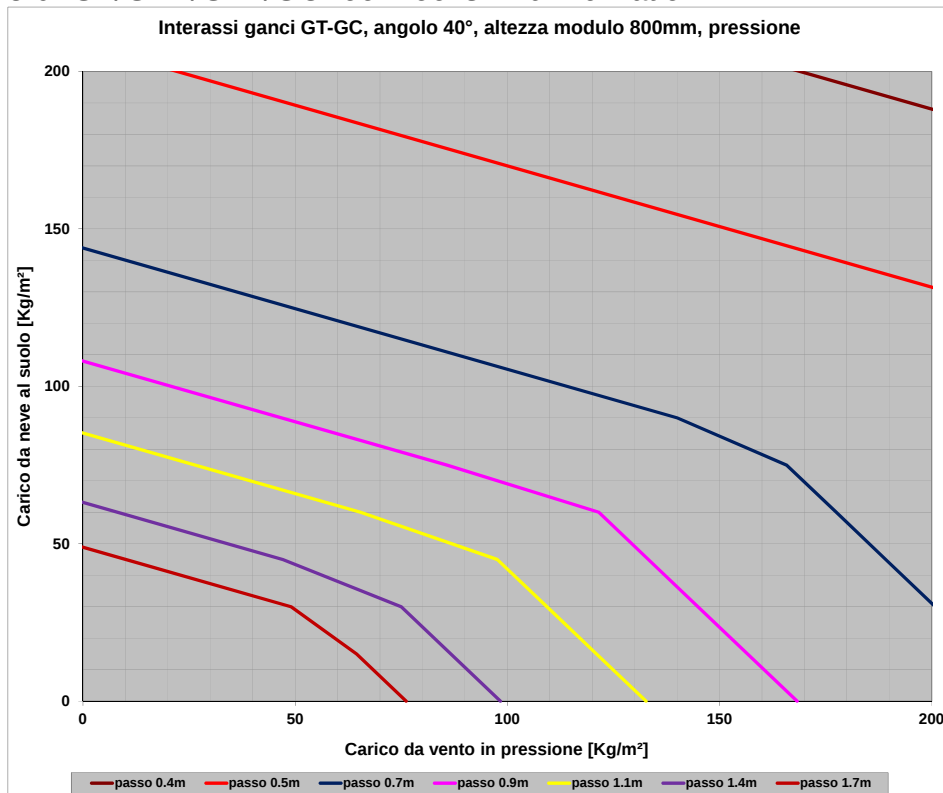
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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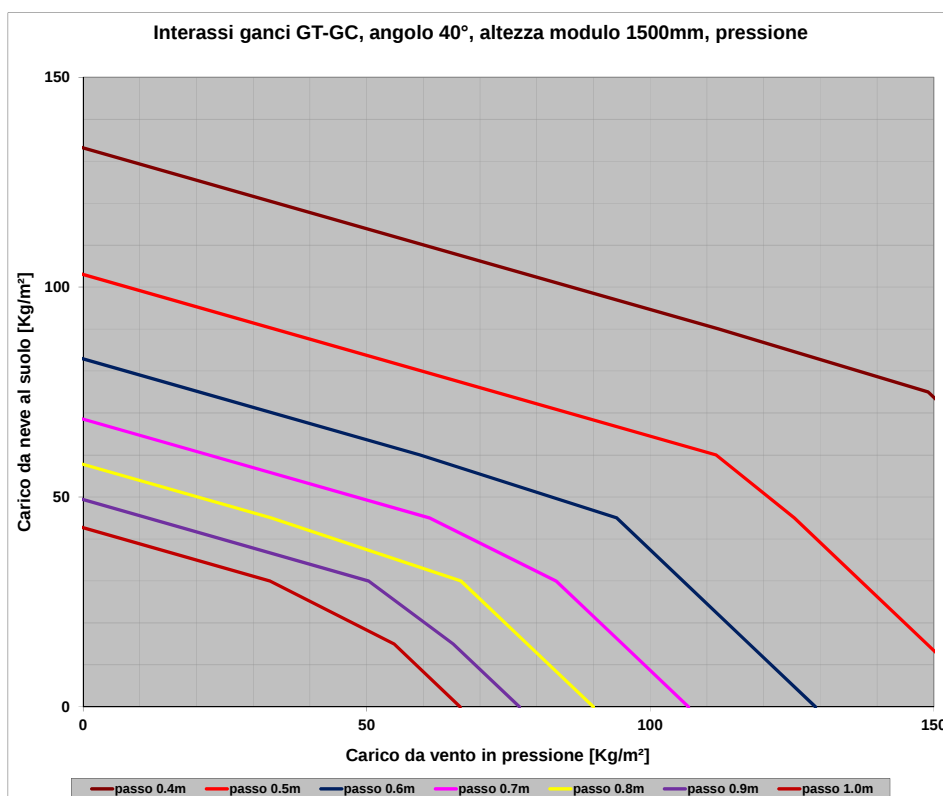
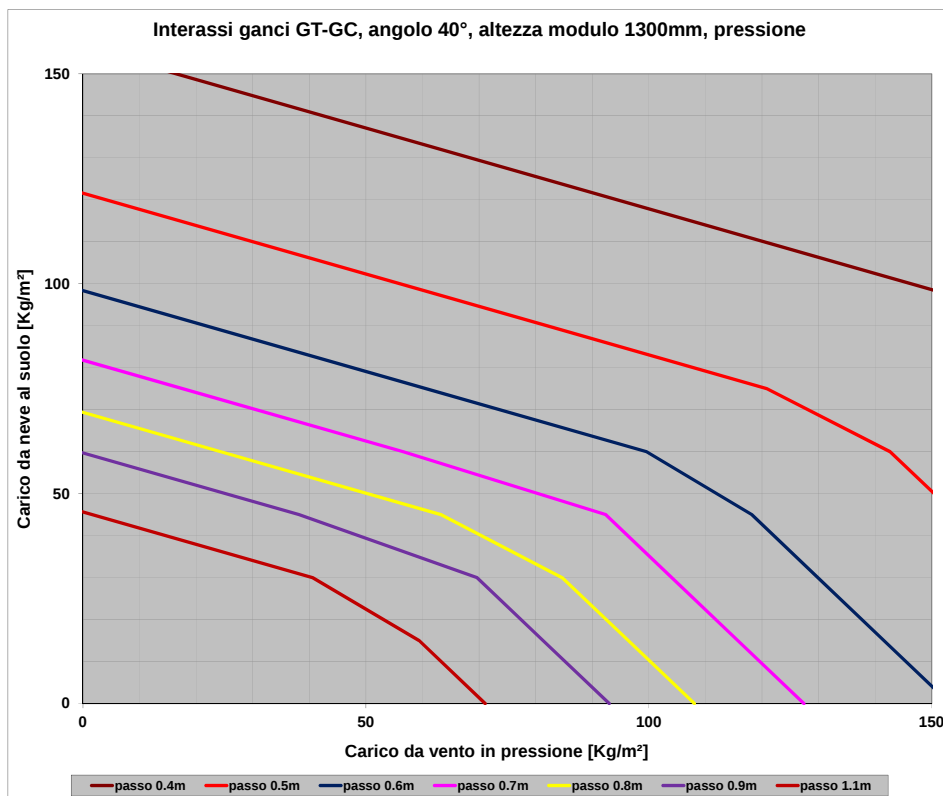
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

4.5.6 GT/GTR/GTT/GC roof hooks - 40° inclination



TECHNICAL DATA SHEET

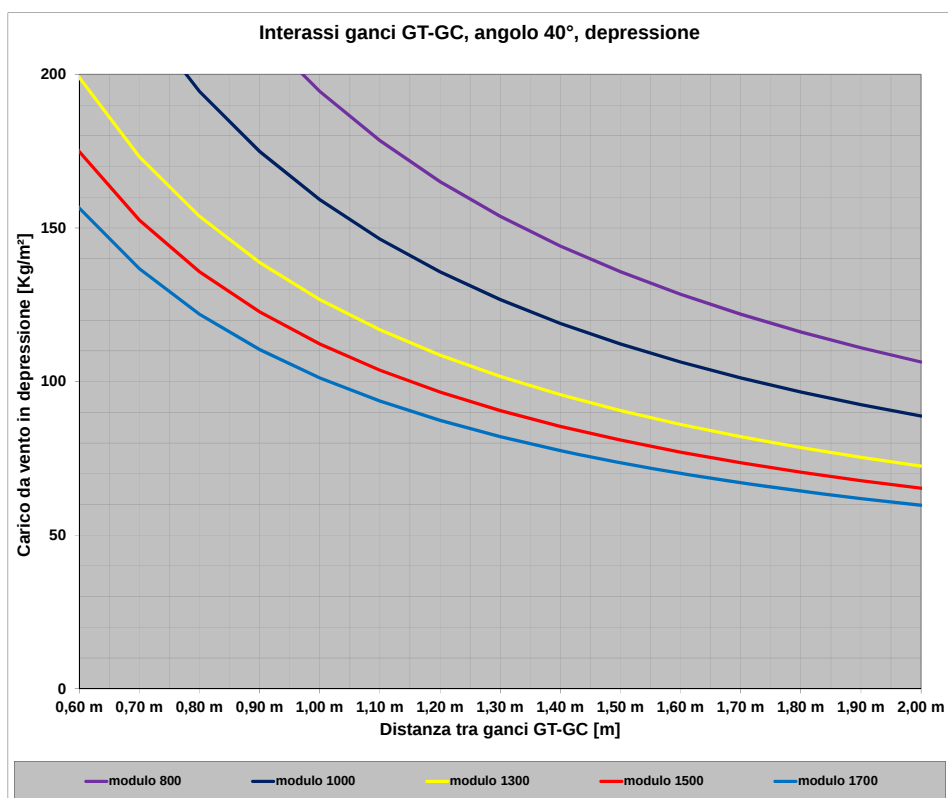
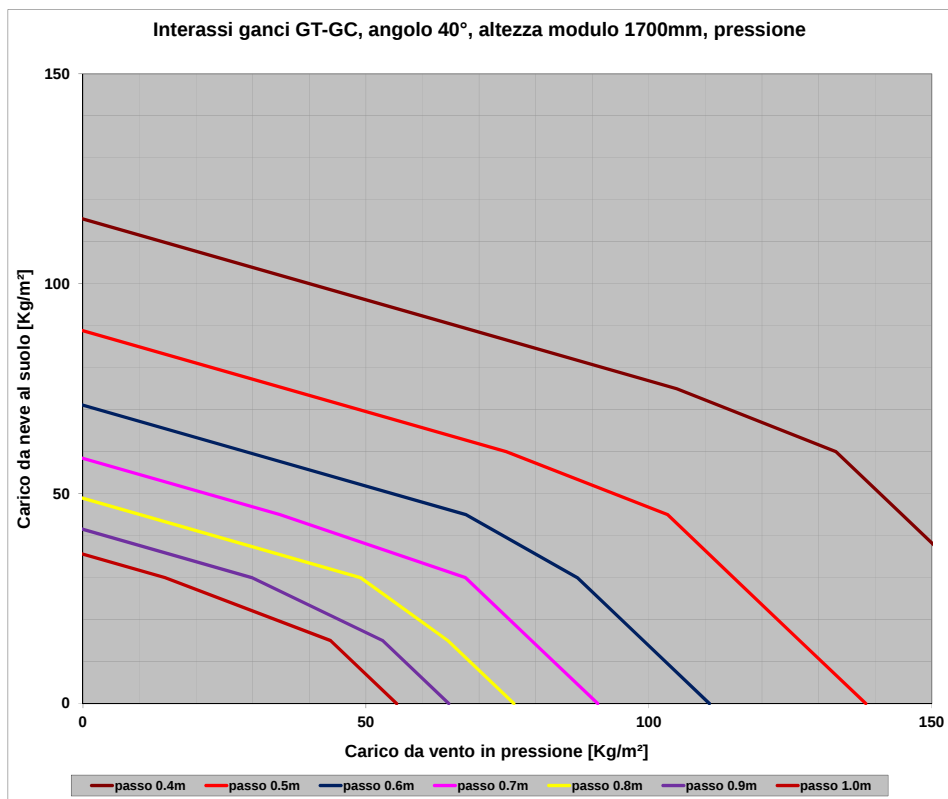
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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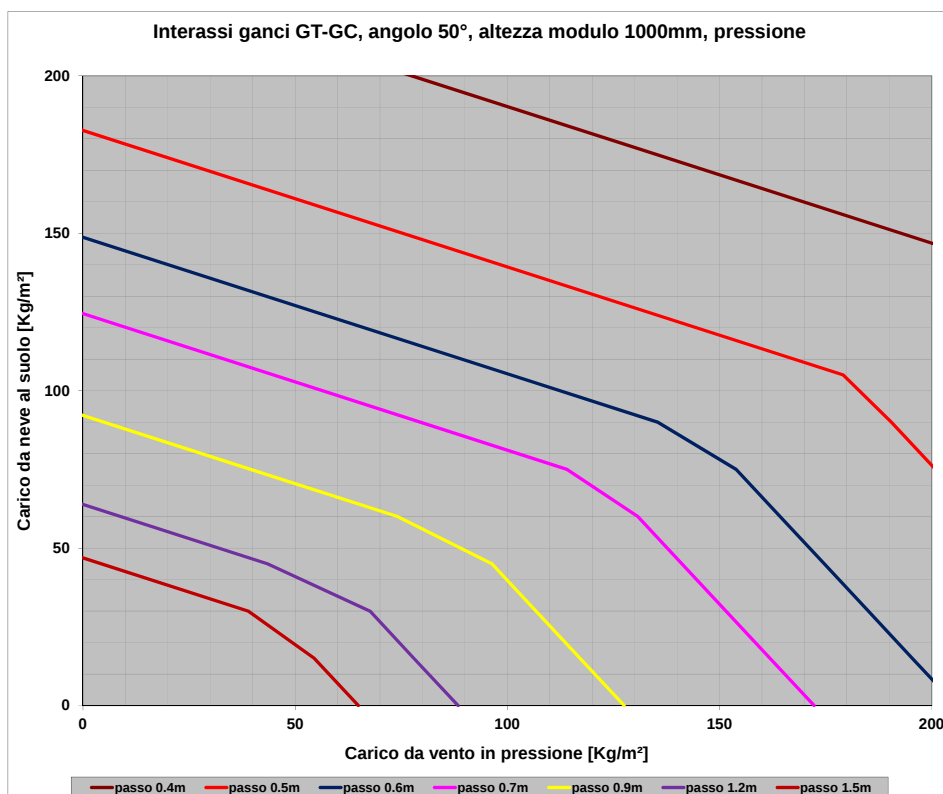
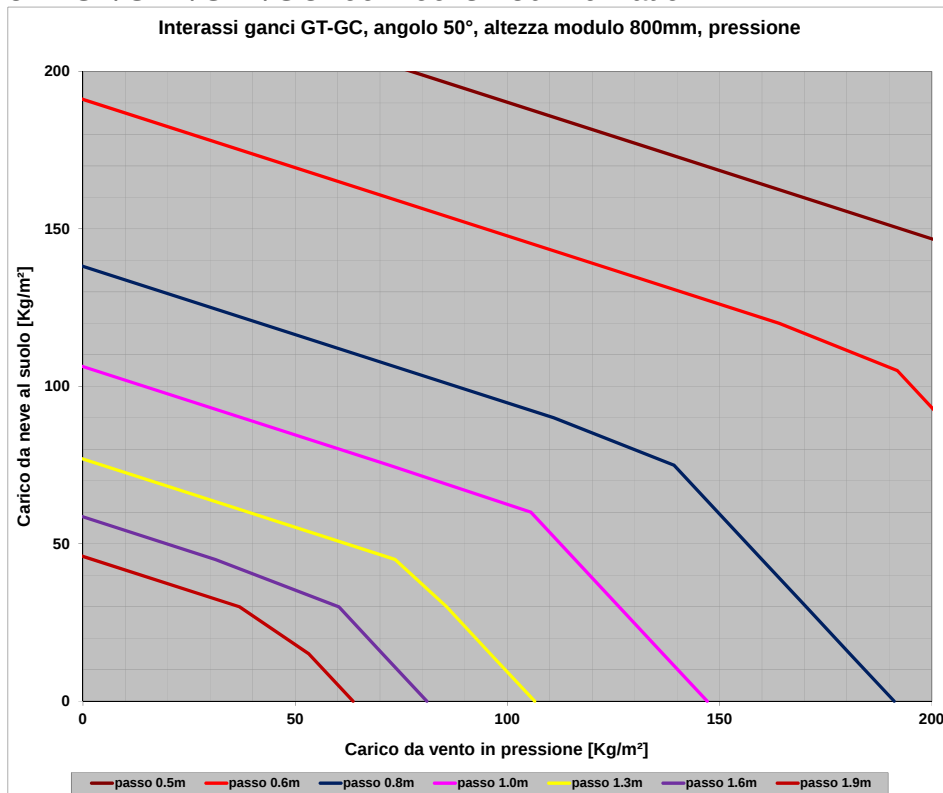
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



TECHNICAL DATA SHEET

Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

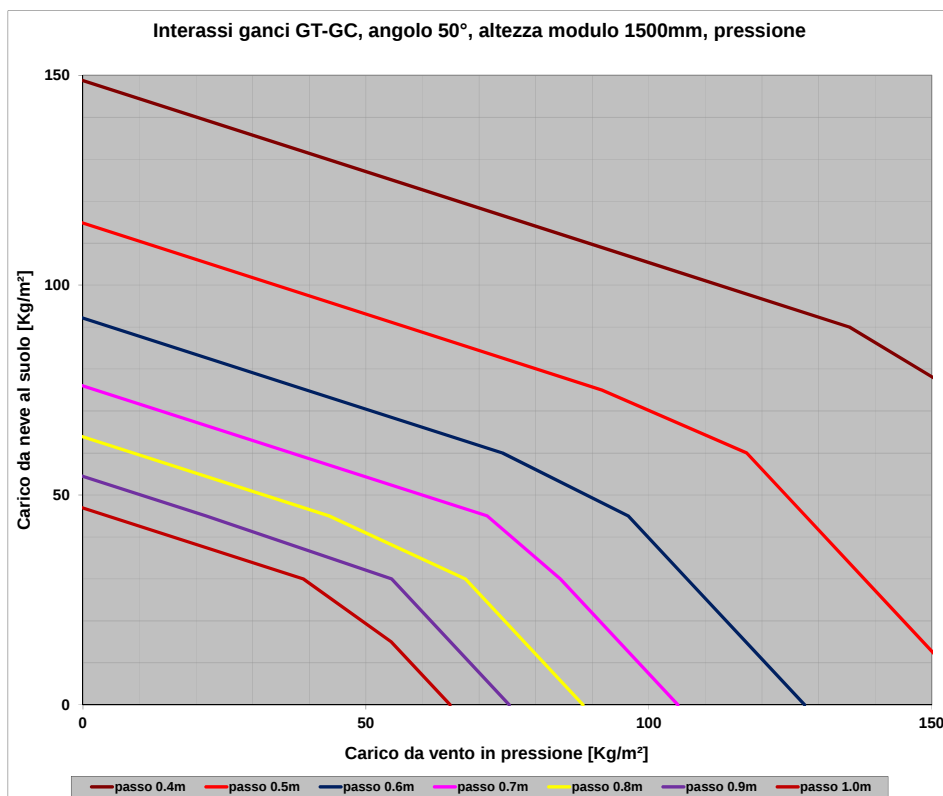
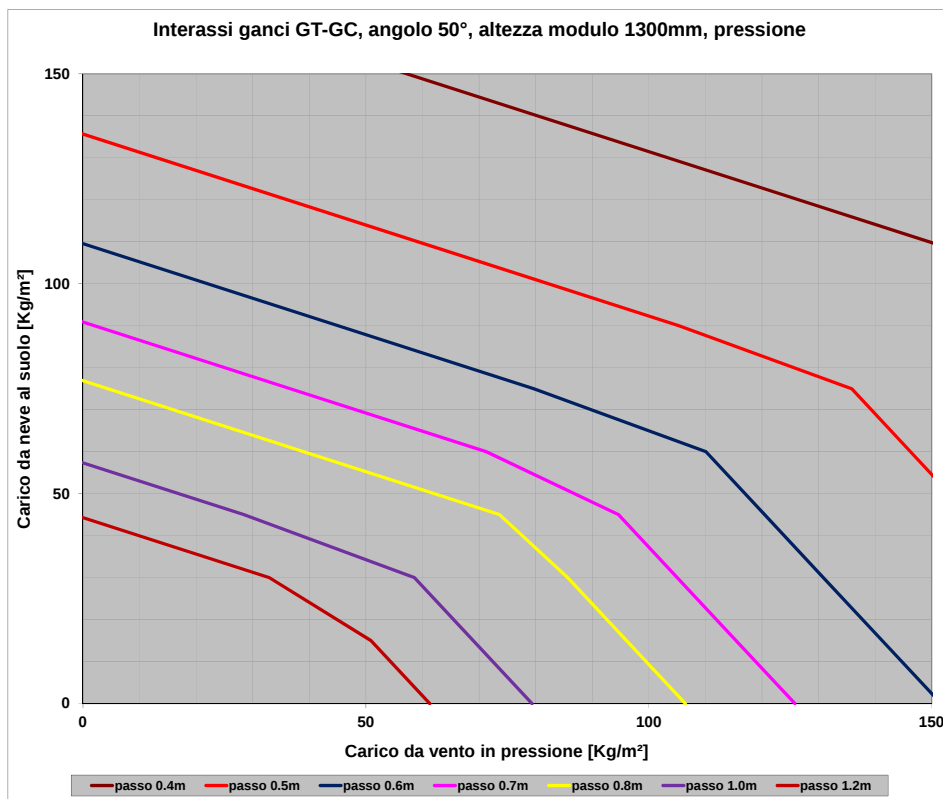
4.5.7 GT/GTR/GTT/GC roof hooks - 50°inclination



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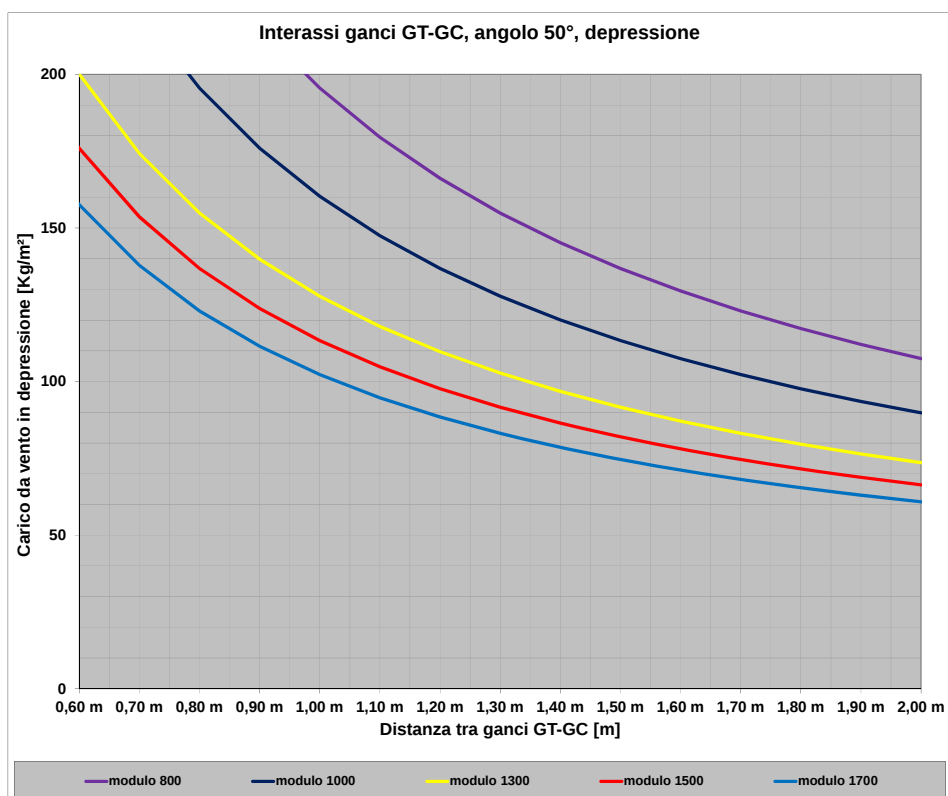
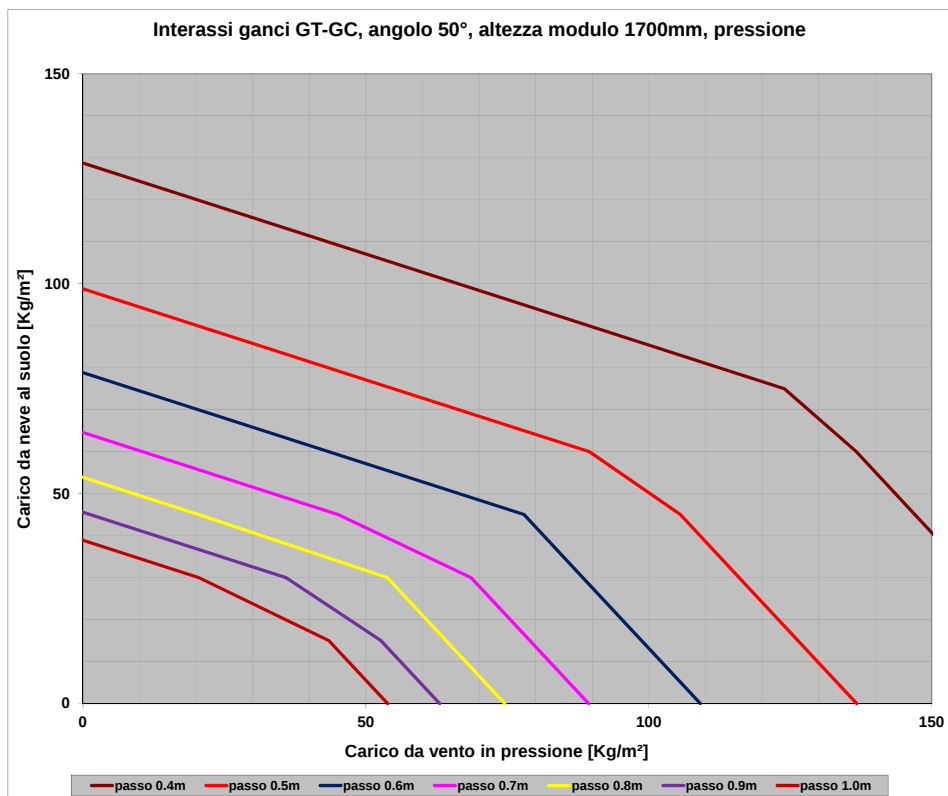
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

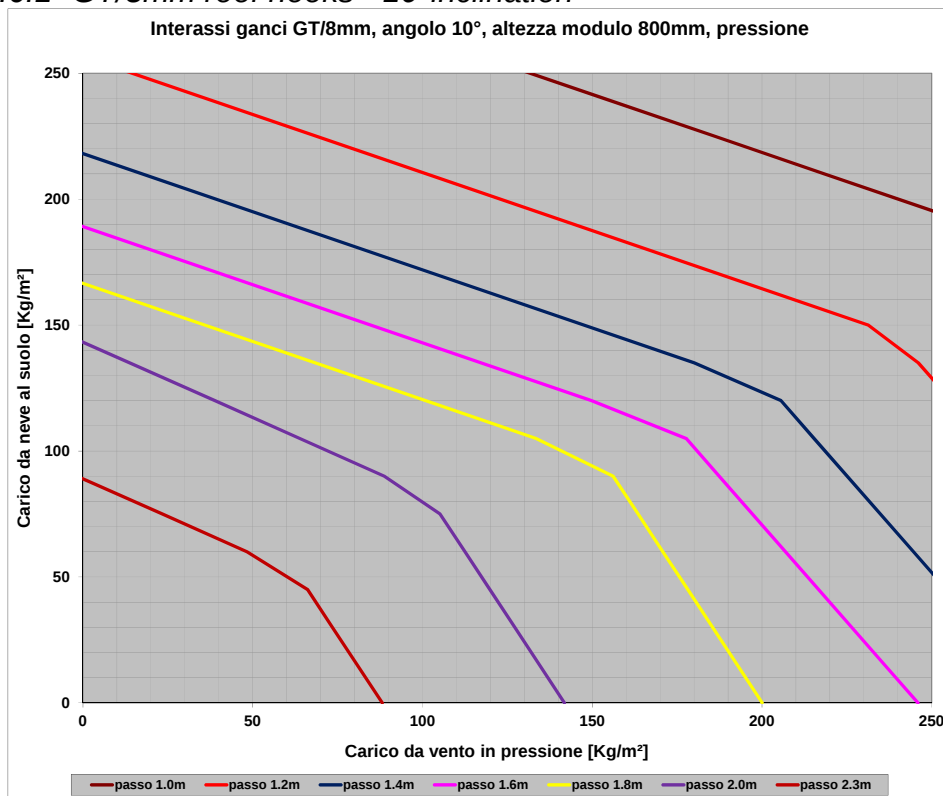


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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)		

4.6 Load diagrams: systems for sloped roofs with GT/8mm hooks

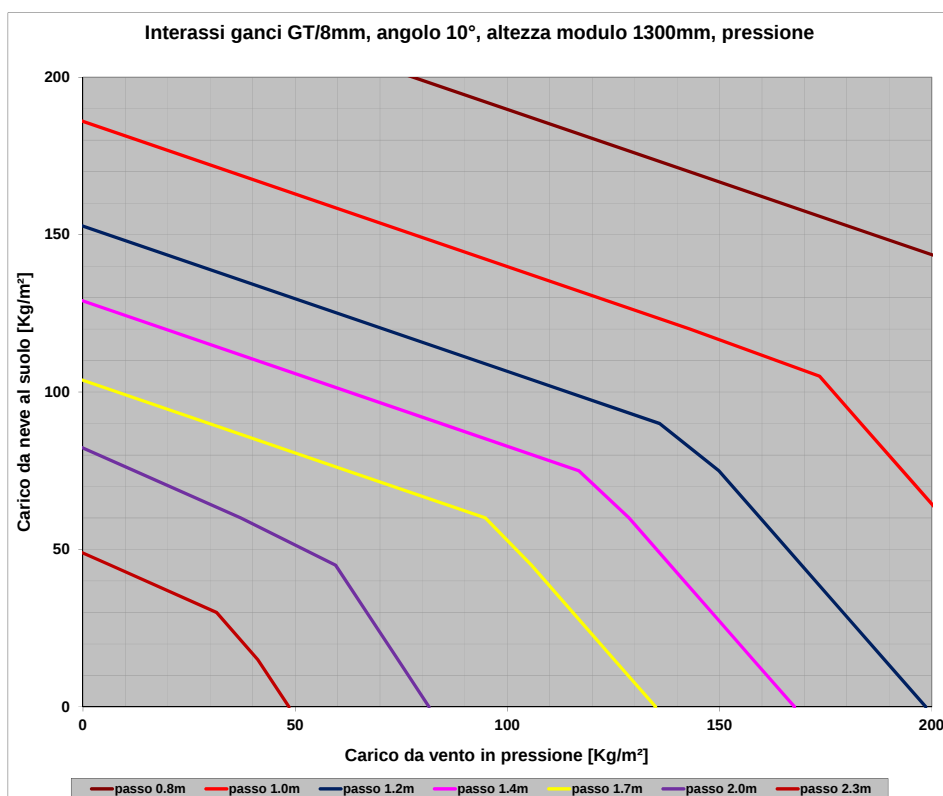
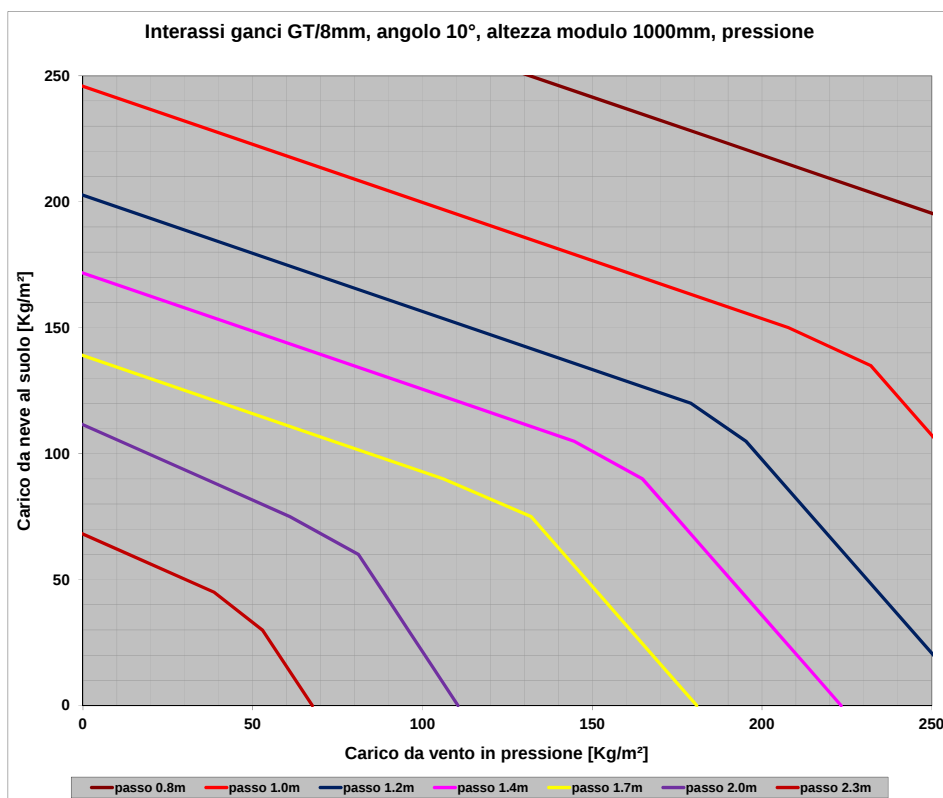
The following diagrams regard complete systems GT/8mm hooks+ SolarFish profiles, analyzed considering all possible LC load combinations in the different roof inclinations.

4.6.1 GT/8mm roof hooks - 10° inclination



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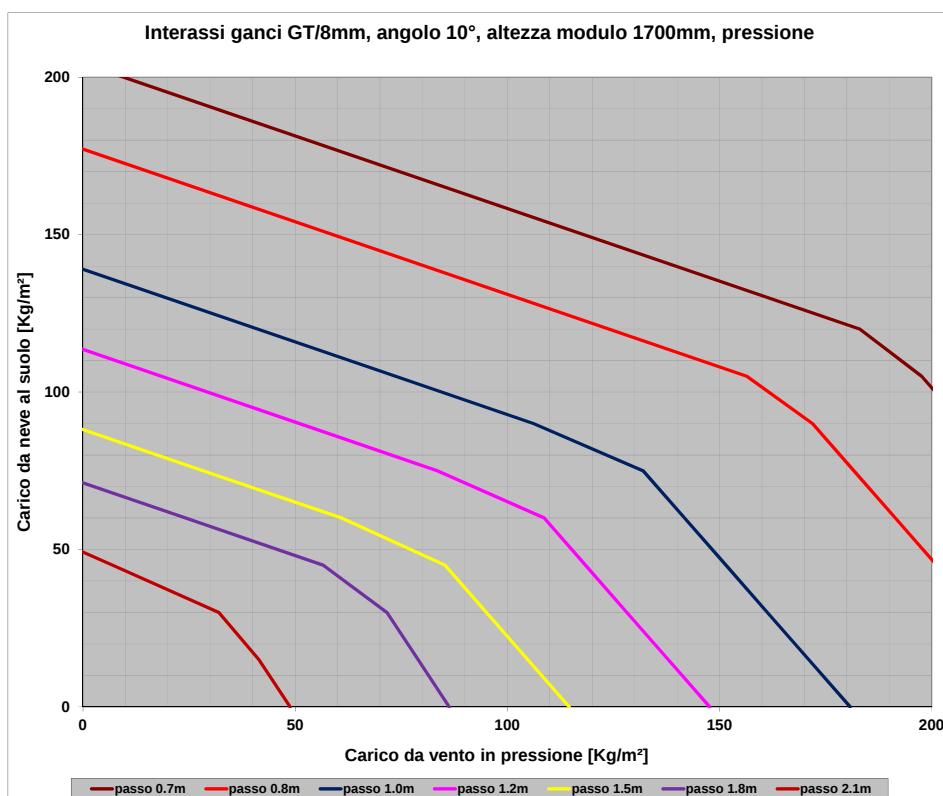
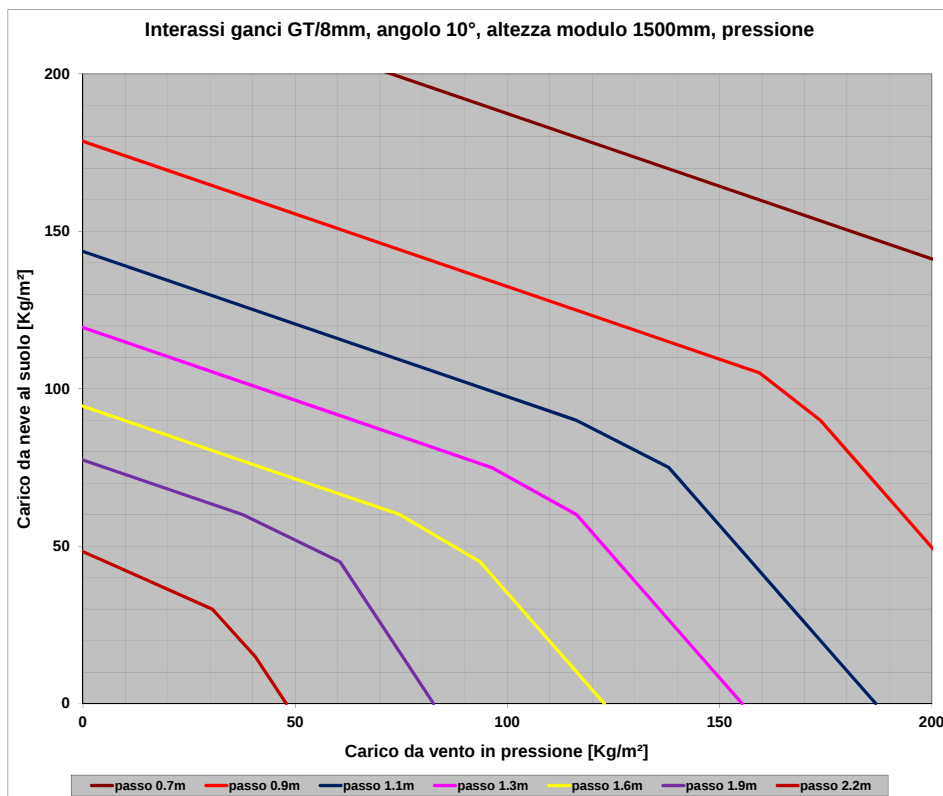
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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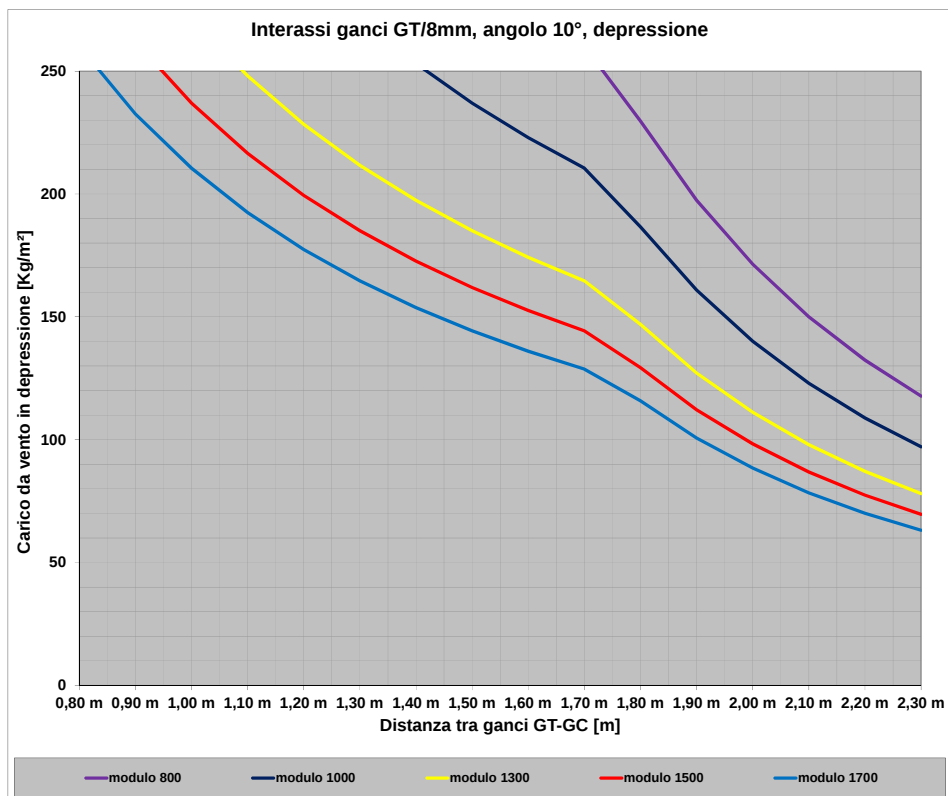
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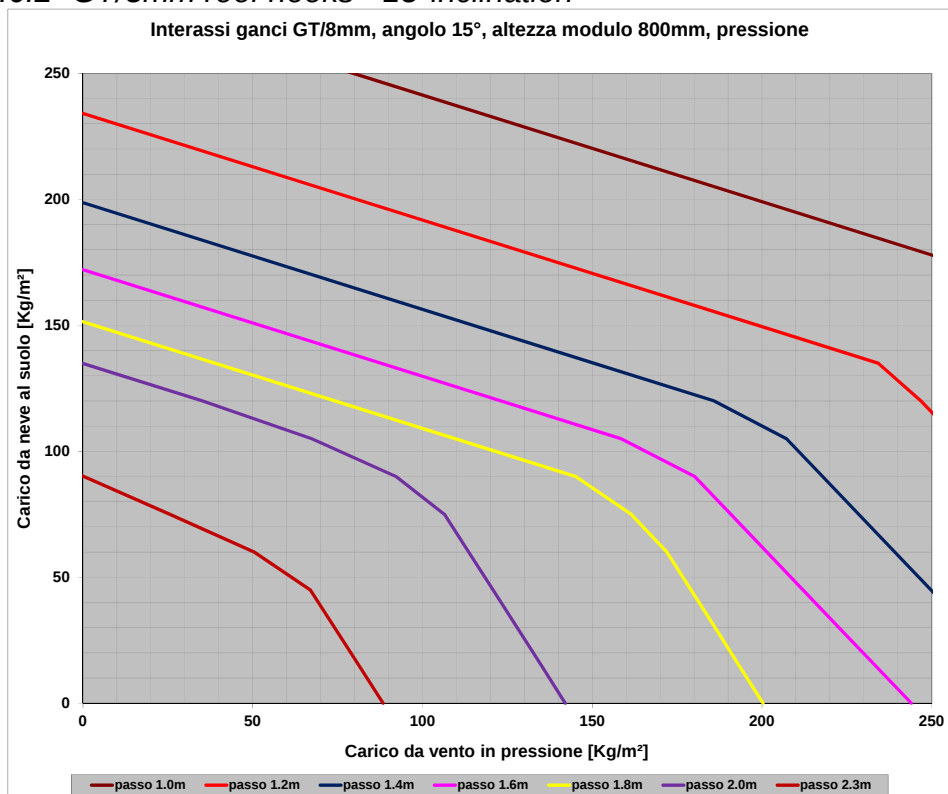
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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

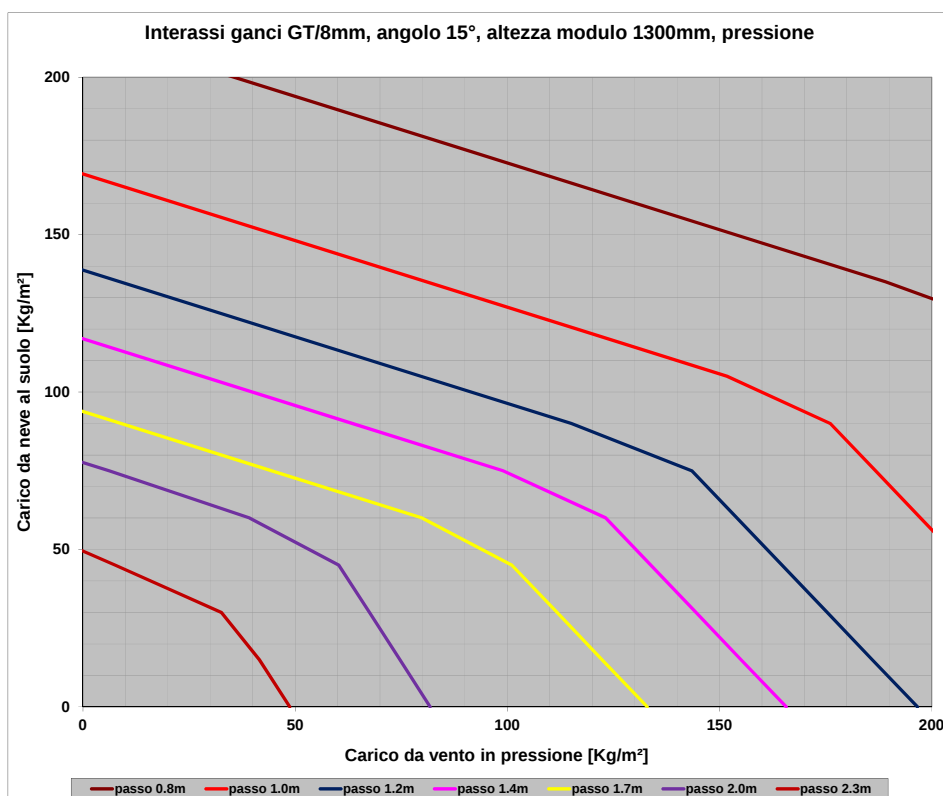
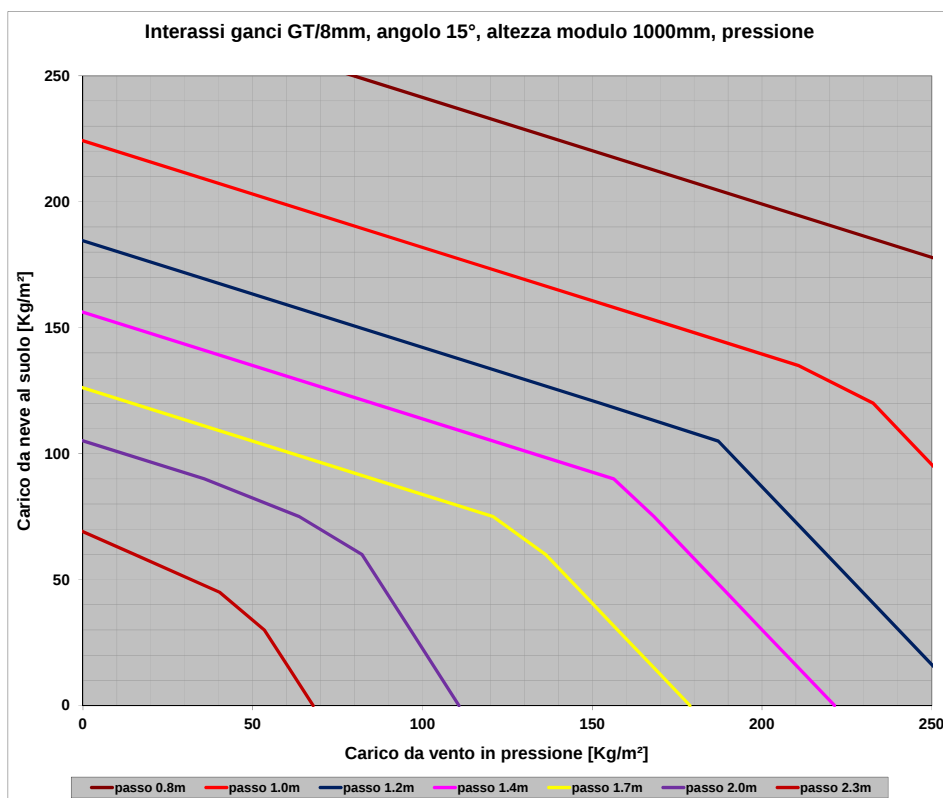


4.6.2 GT/8mm roof hooks - 15°inclination



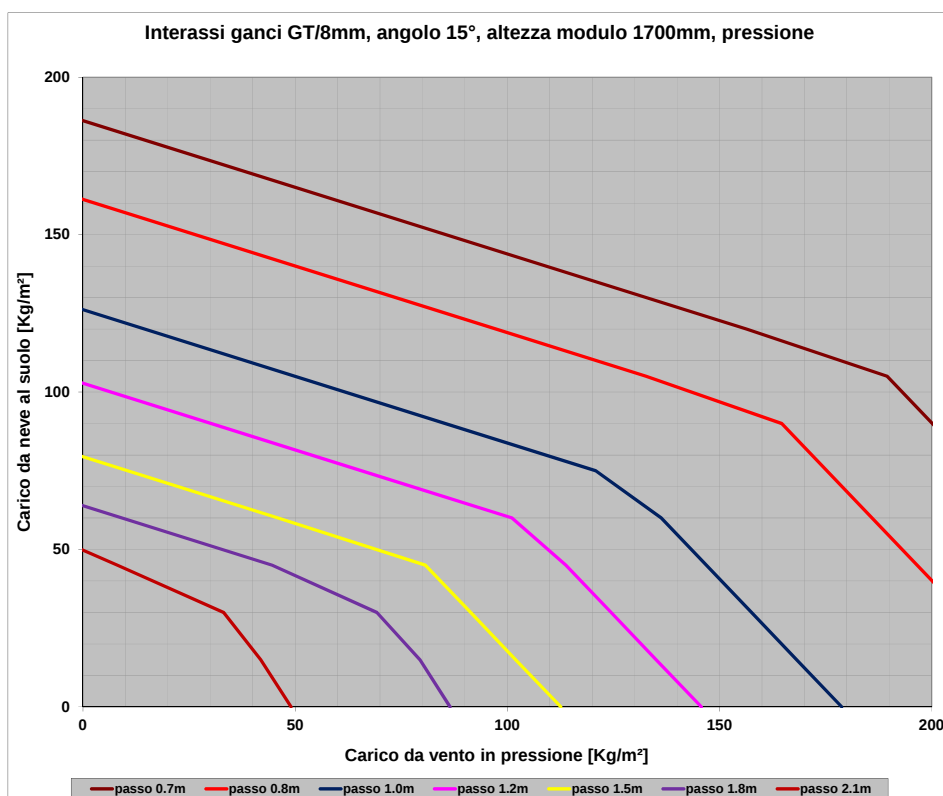
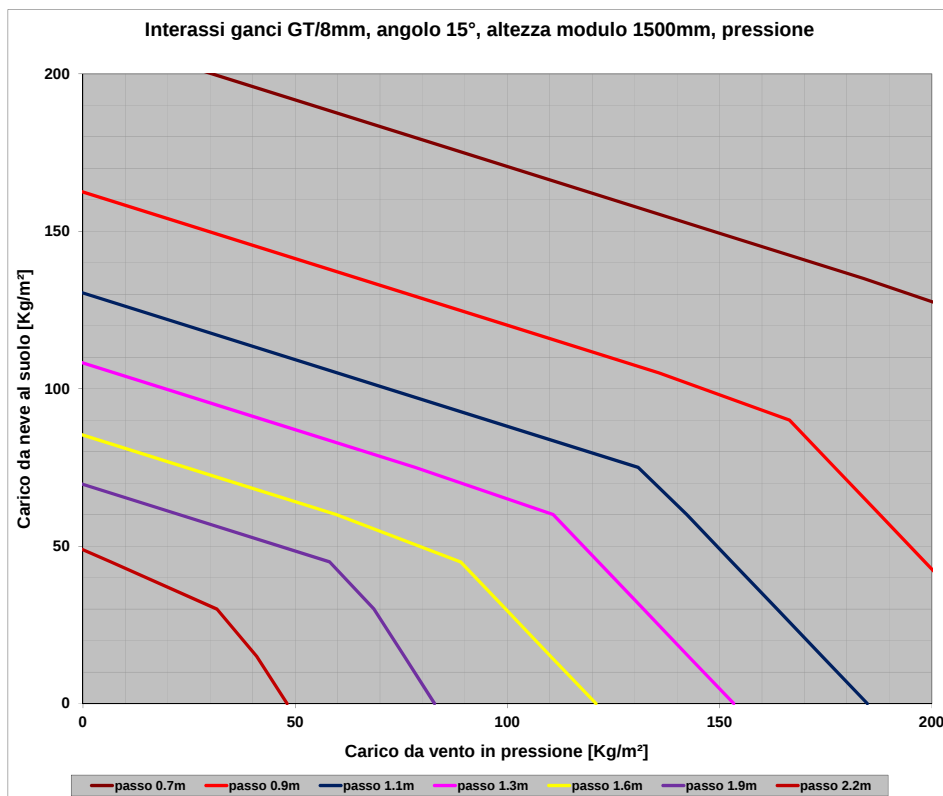
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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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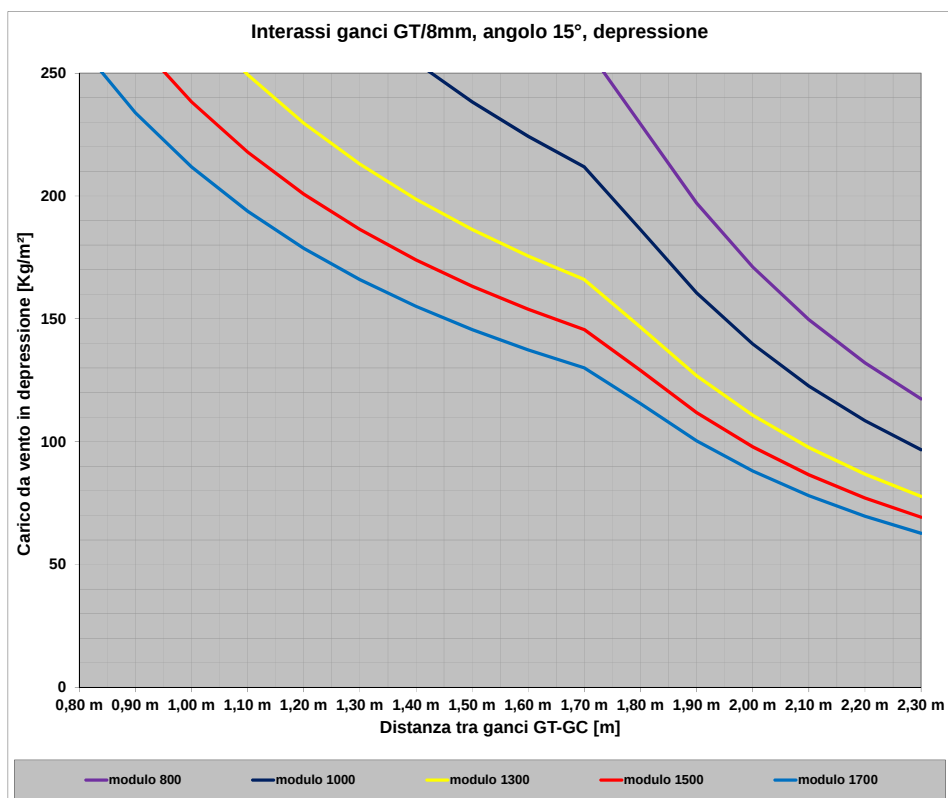
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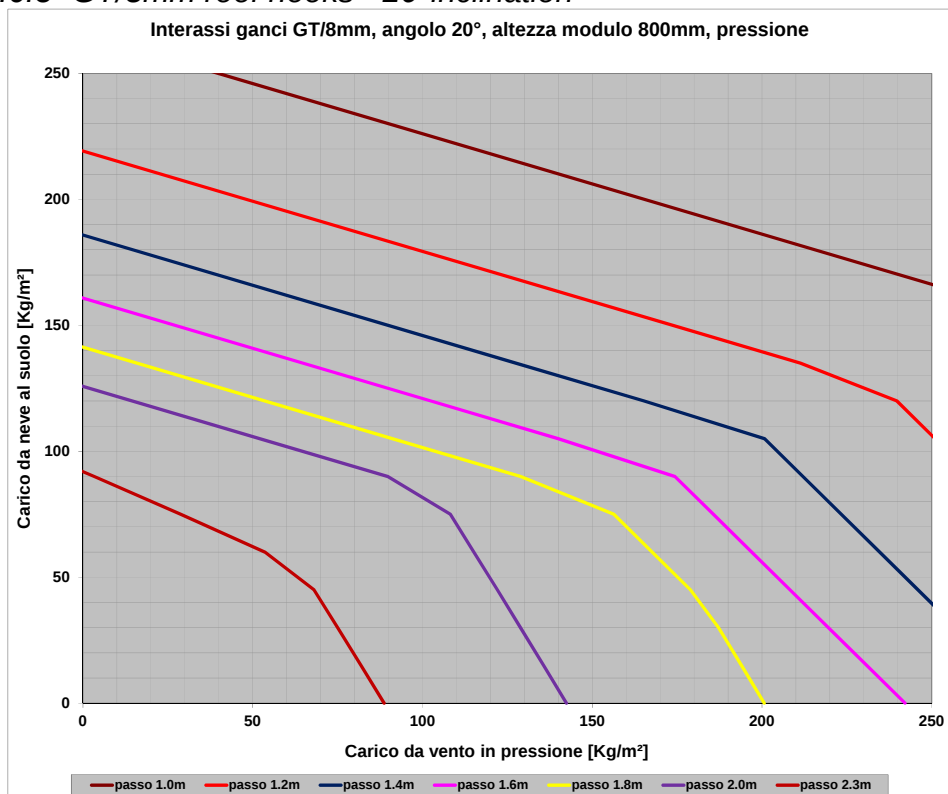
TECHNICAL DATA SHEET

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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

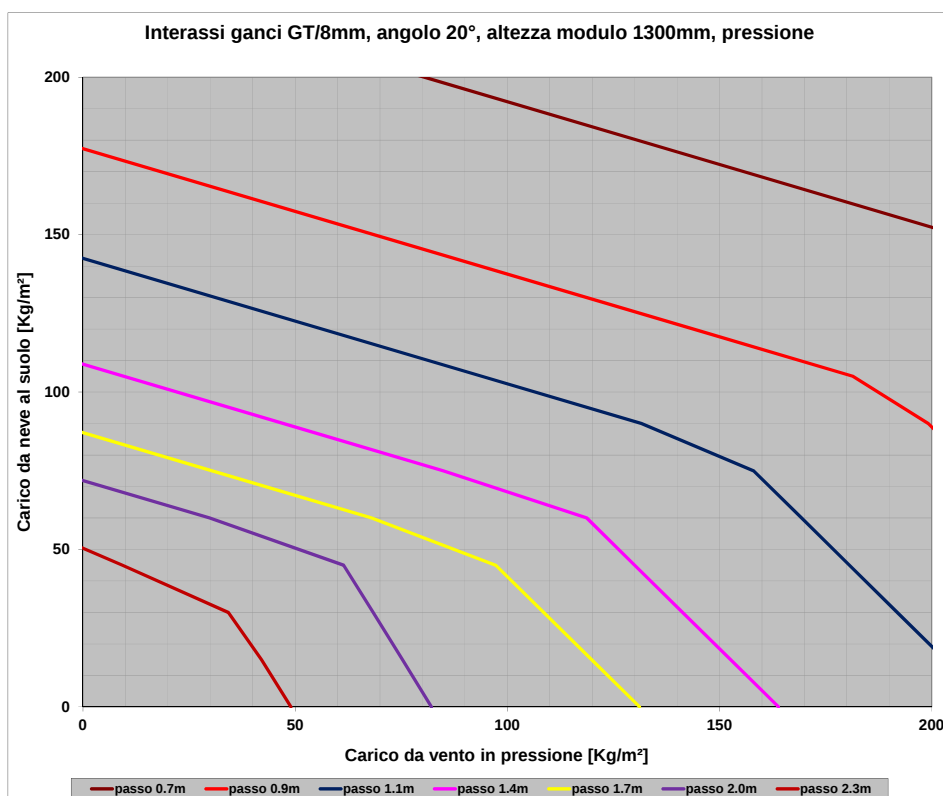
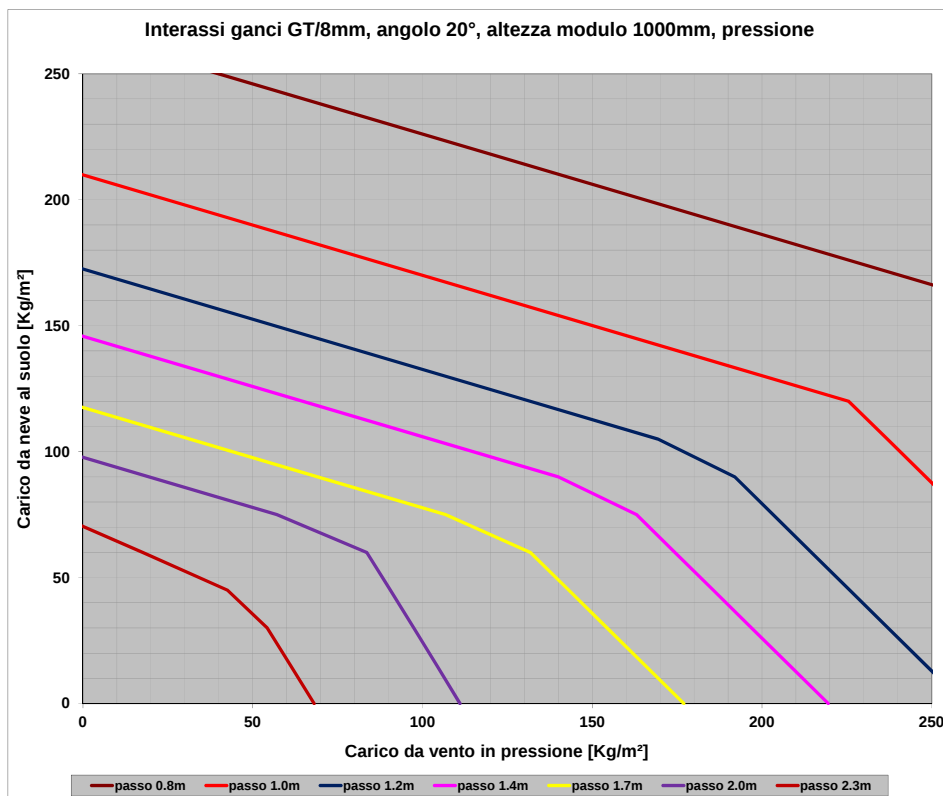


4.6.3 GT/8mm roof hooks - 20° inclination



TECHNICAL DATA SHEET

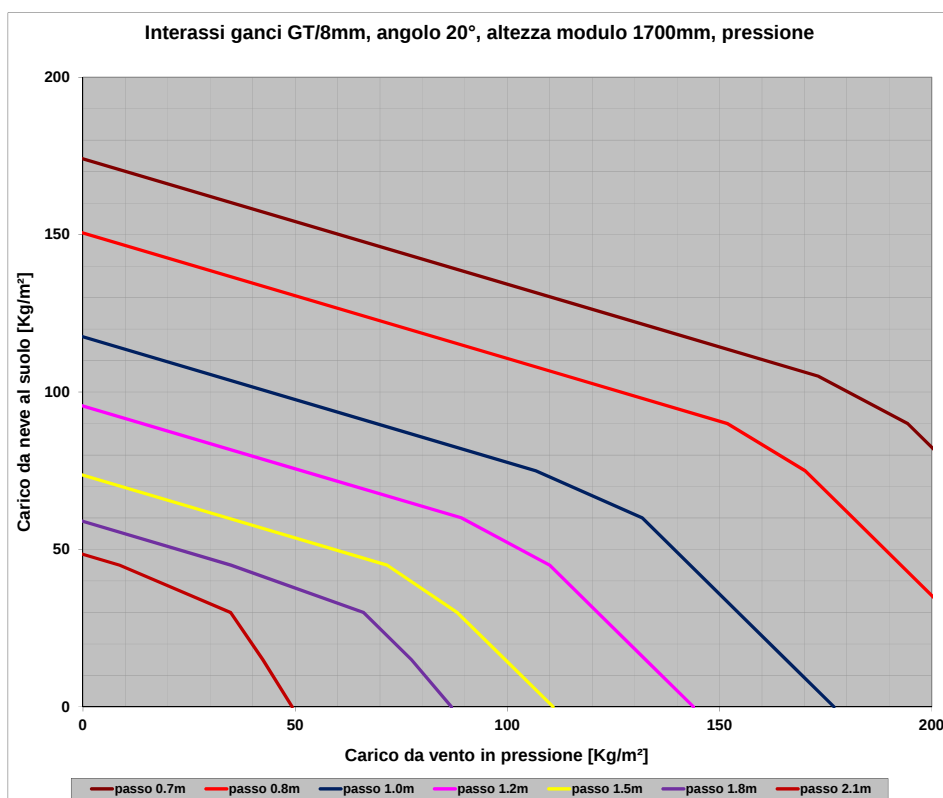
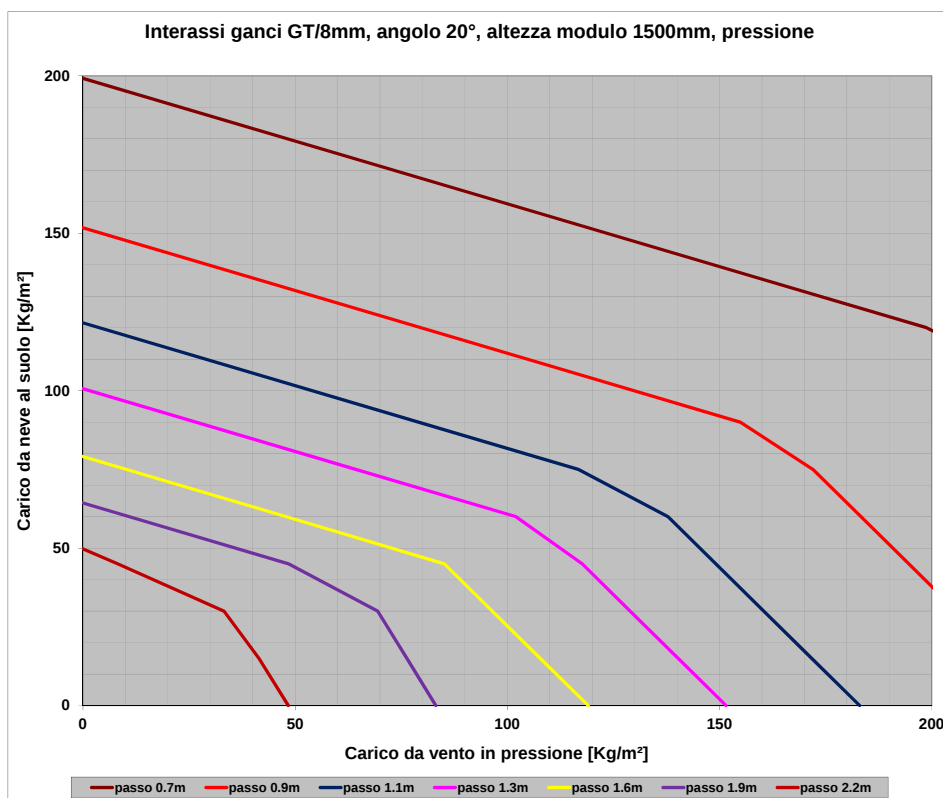
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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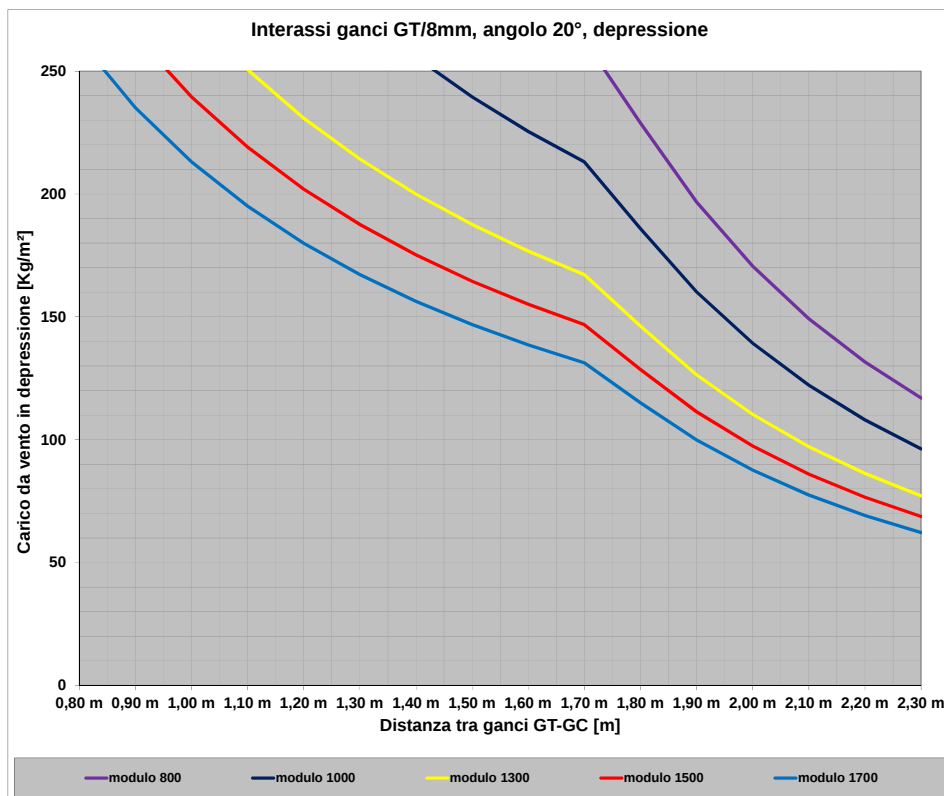
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



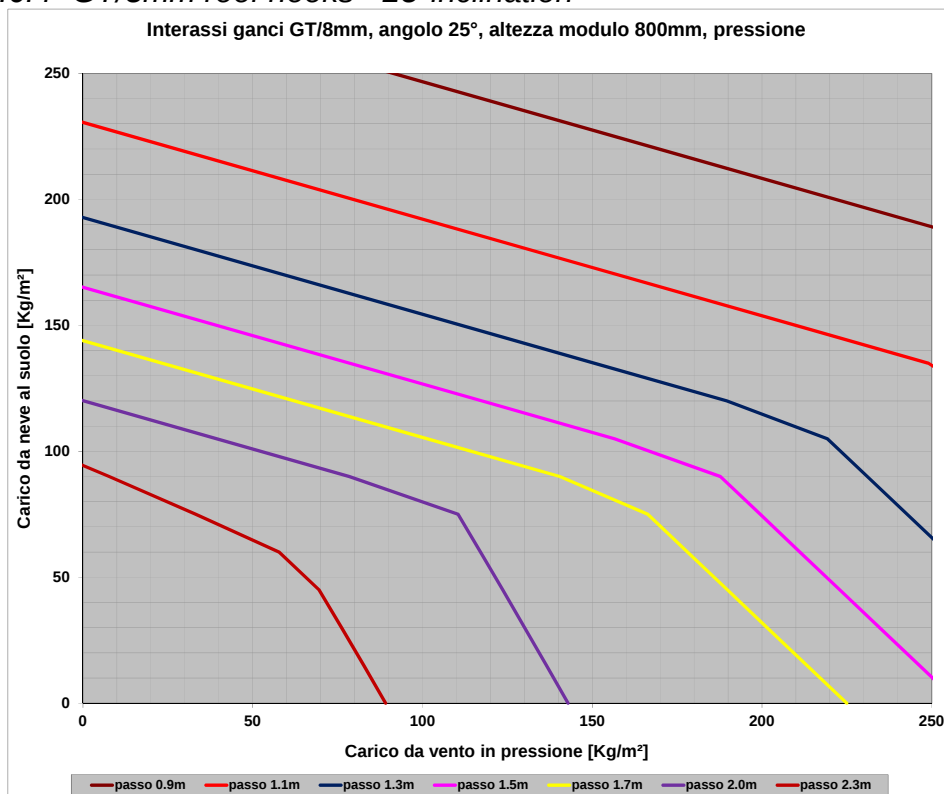
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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



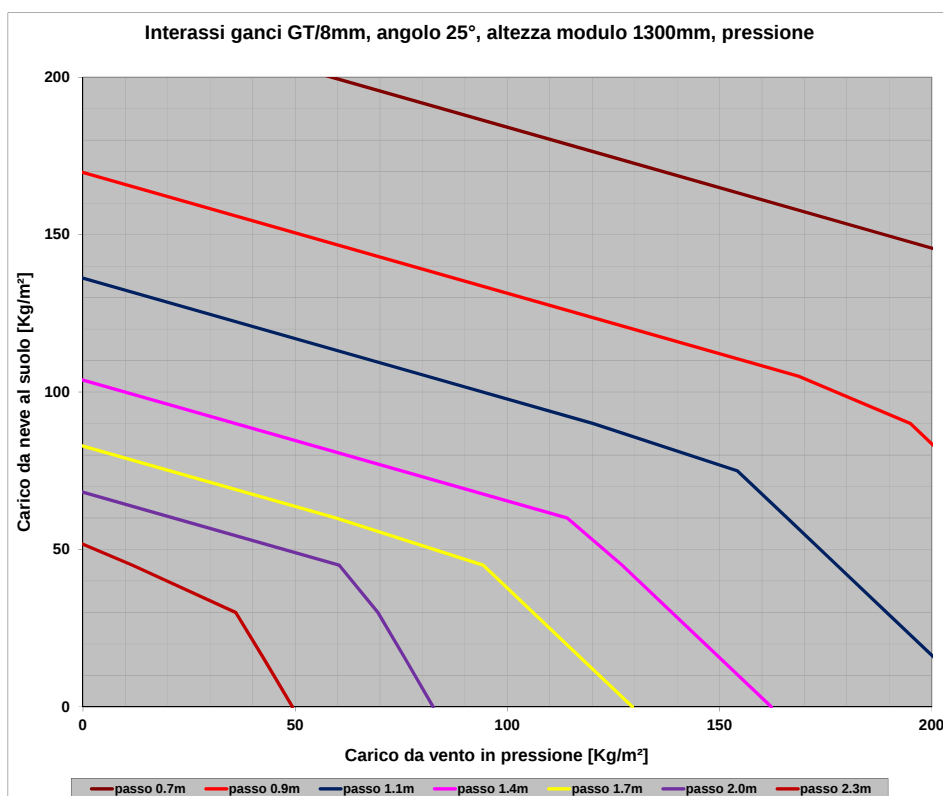
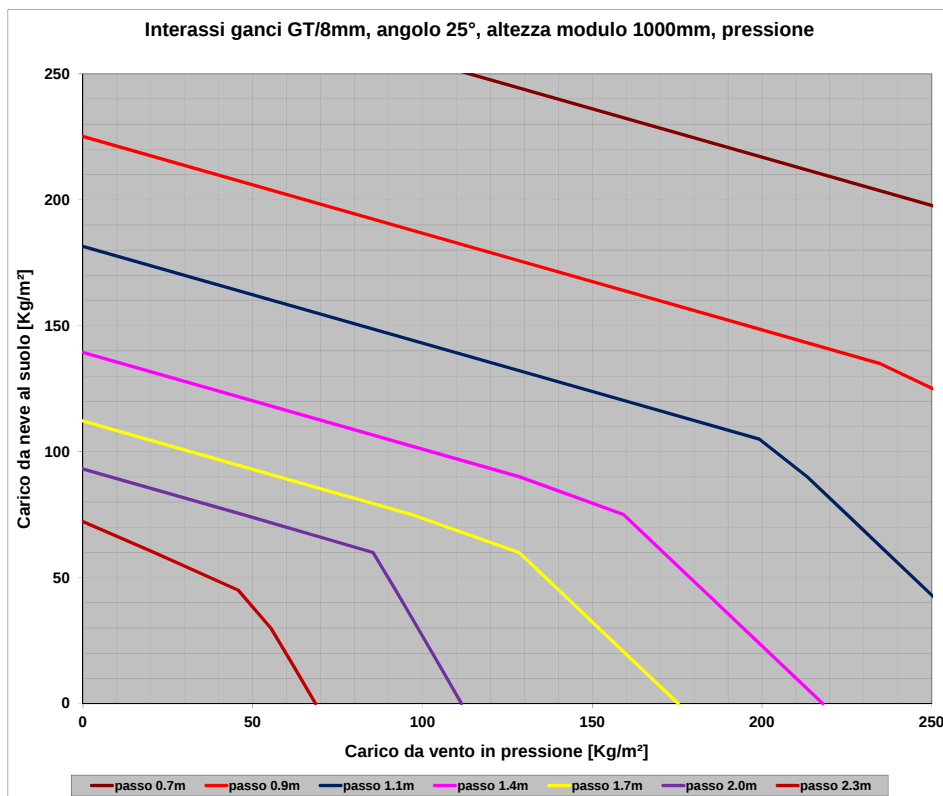
4.6.4 GT/8mm roof hooks - 25°inclination



TECHNICAL DATA SHEET

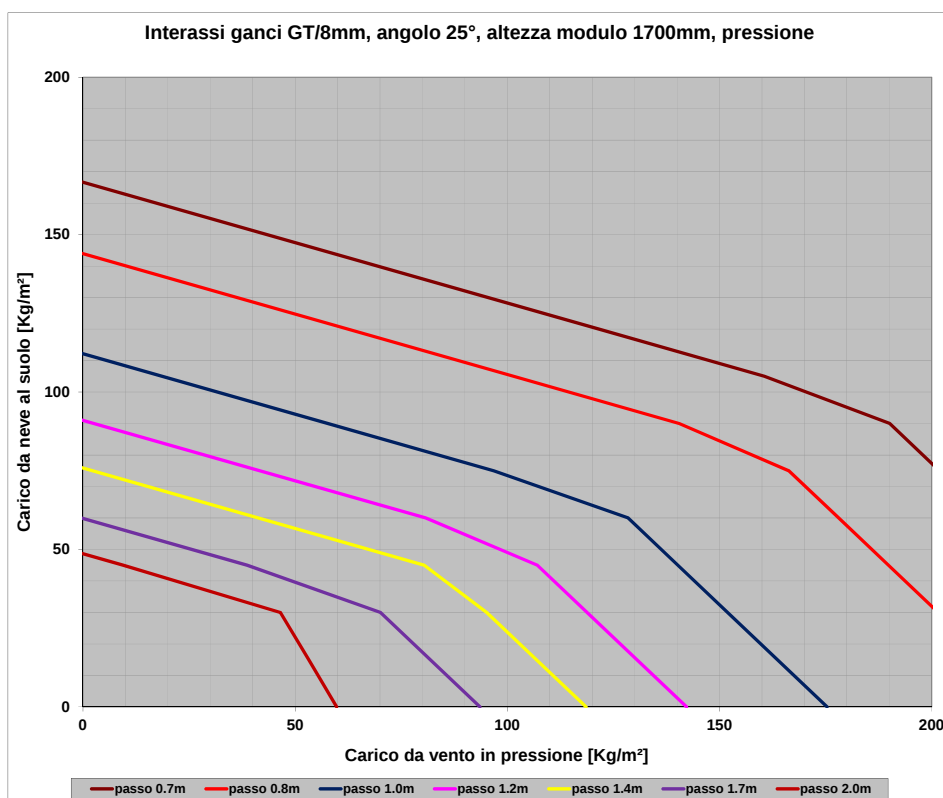
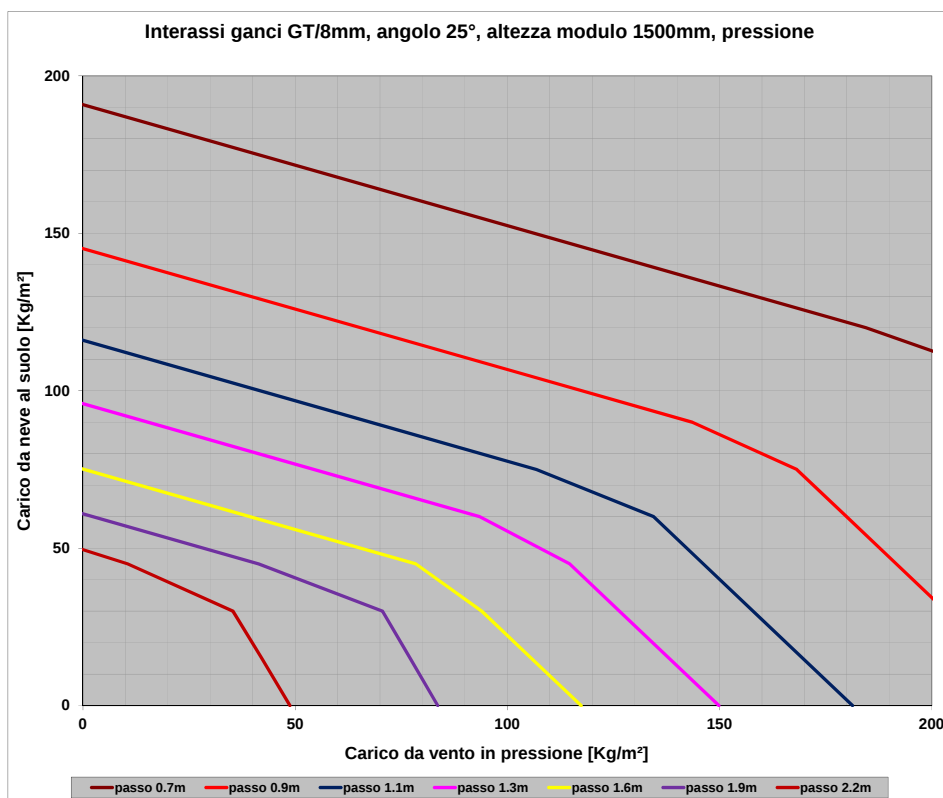
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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



TECHNICAL DATA SHEET

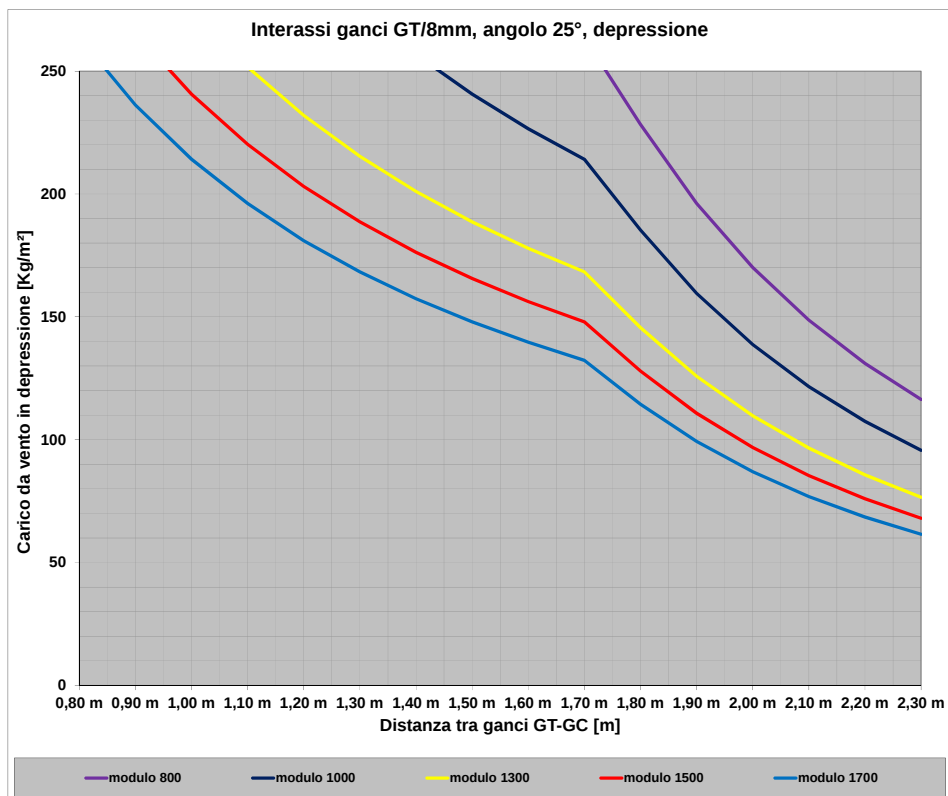
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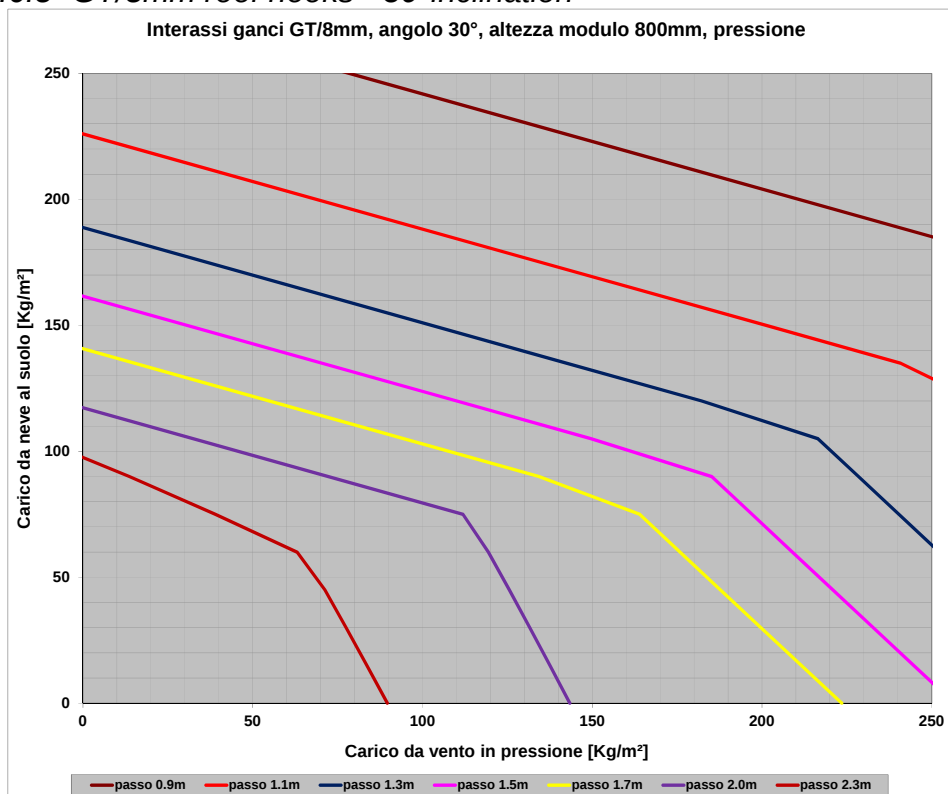
TECHNICAL DATA SHEET

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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

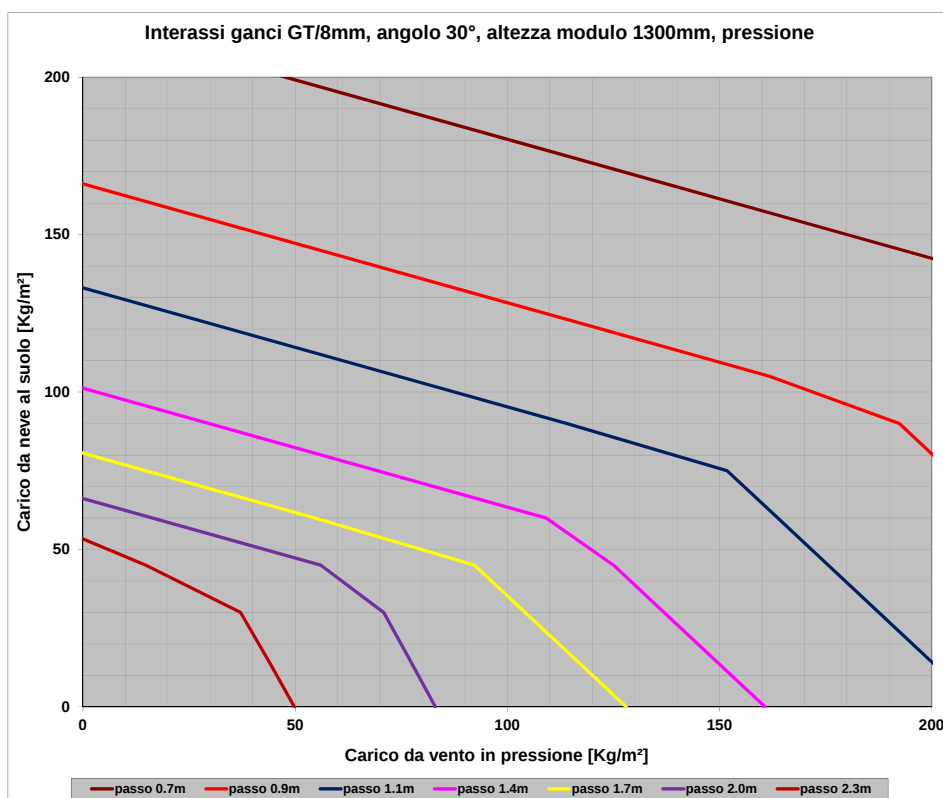
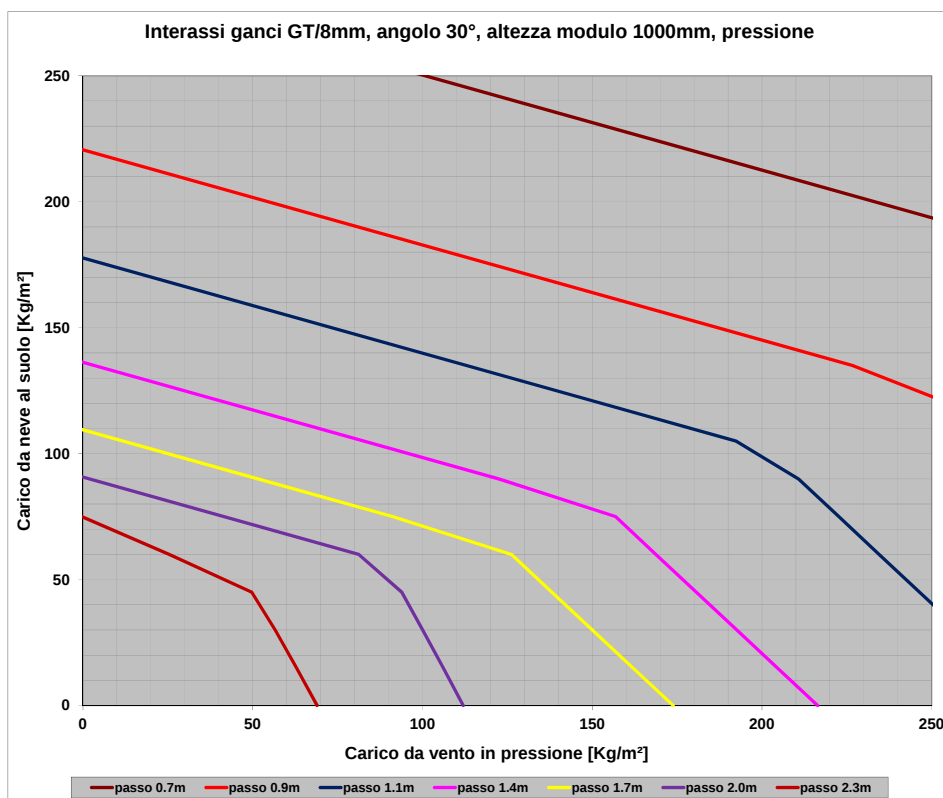


4.6.5 GT/8mm roof hooks - 30°inclination



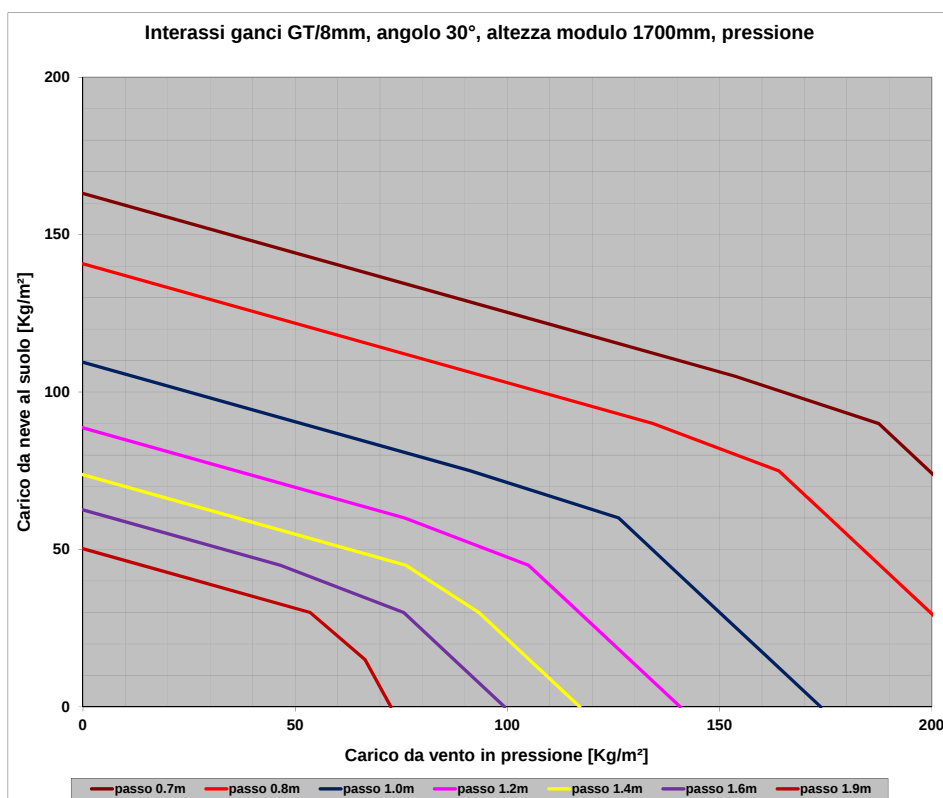
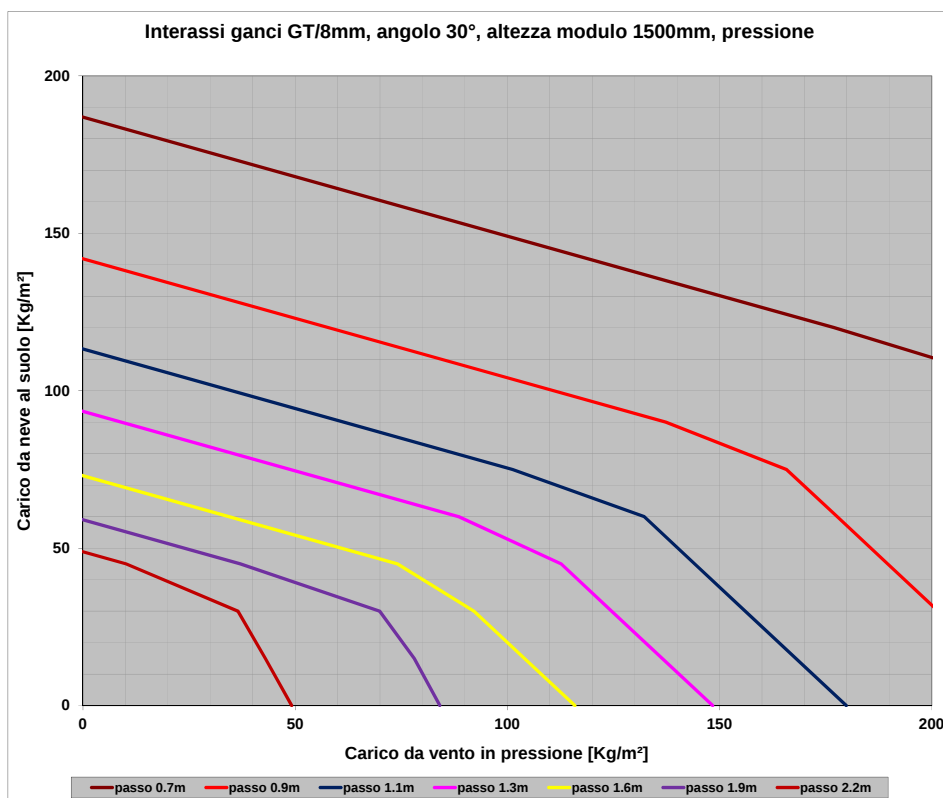
TECHNICAL DATA SHEET

Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



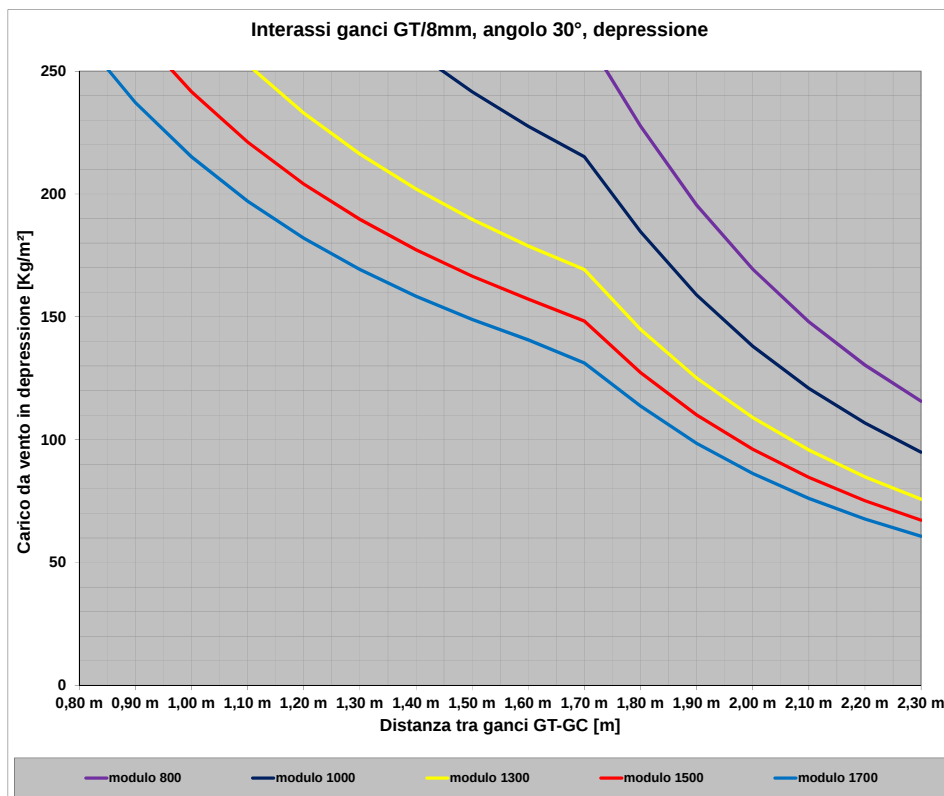
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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

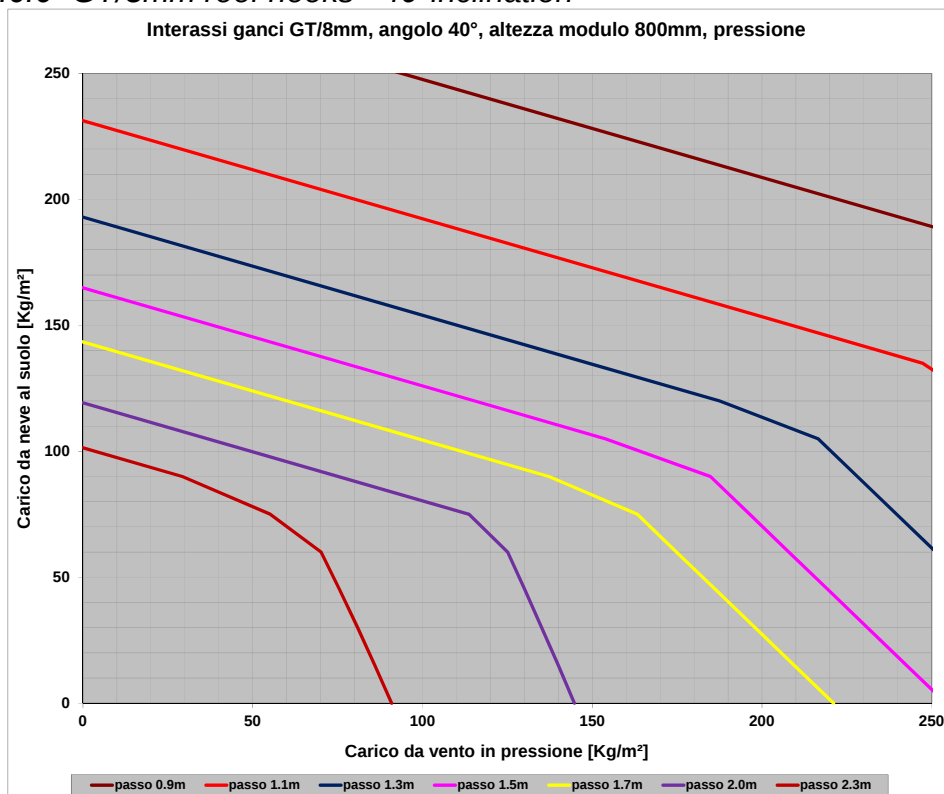


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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)

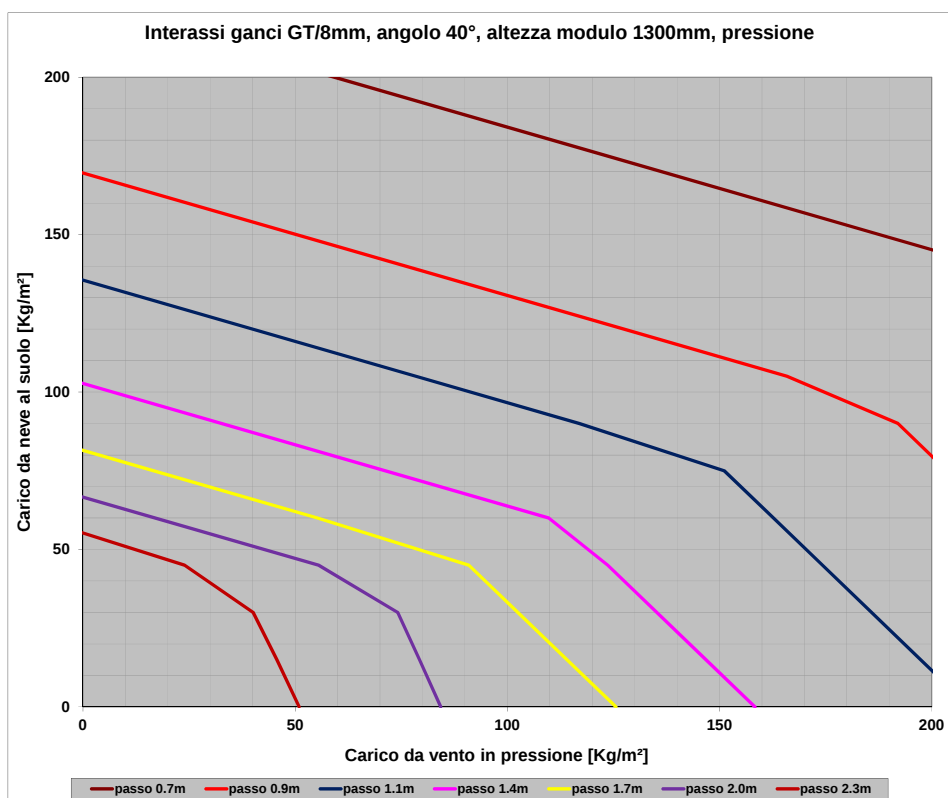
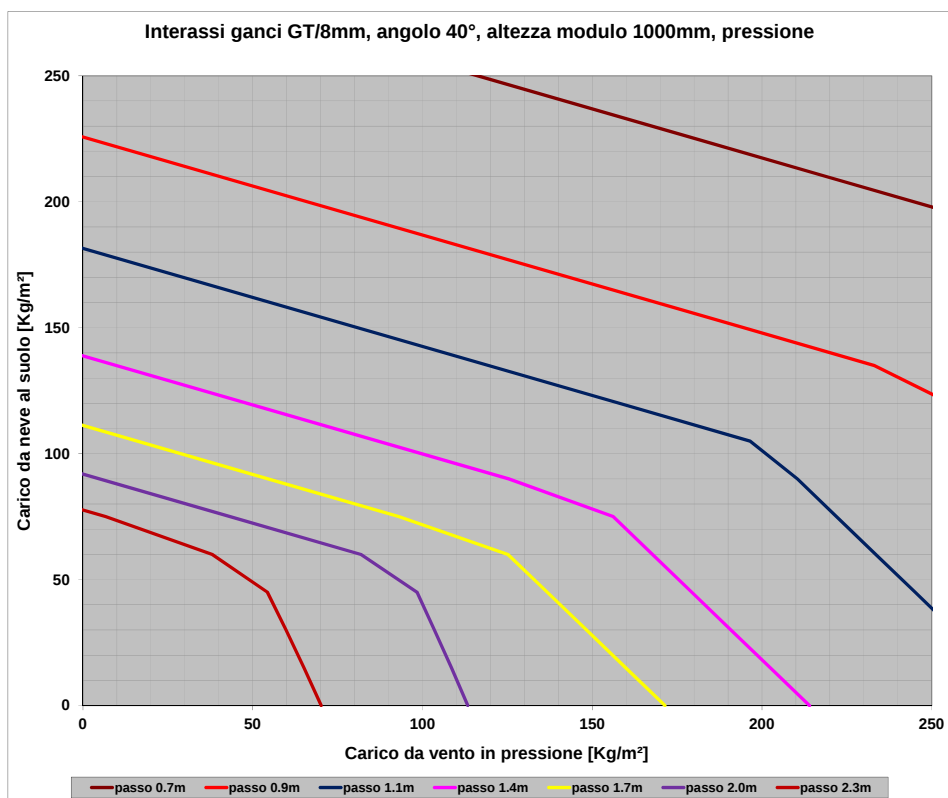


4.6.6 GT/8mm roof hooks - 40°inclination



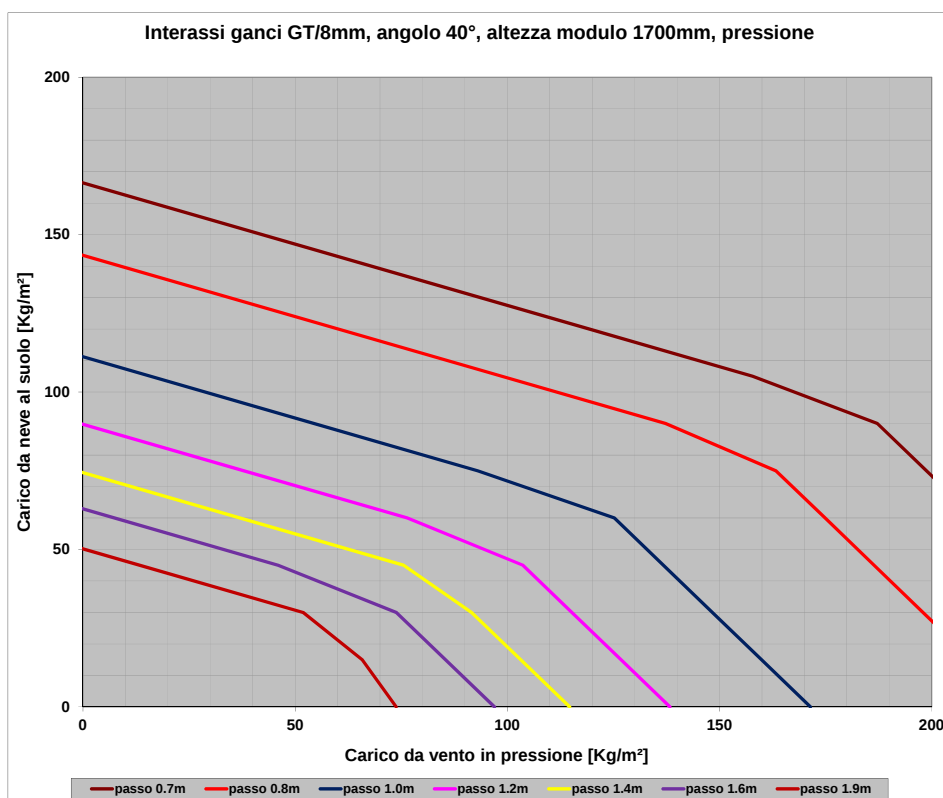
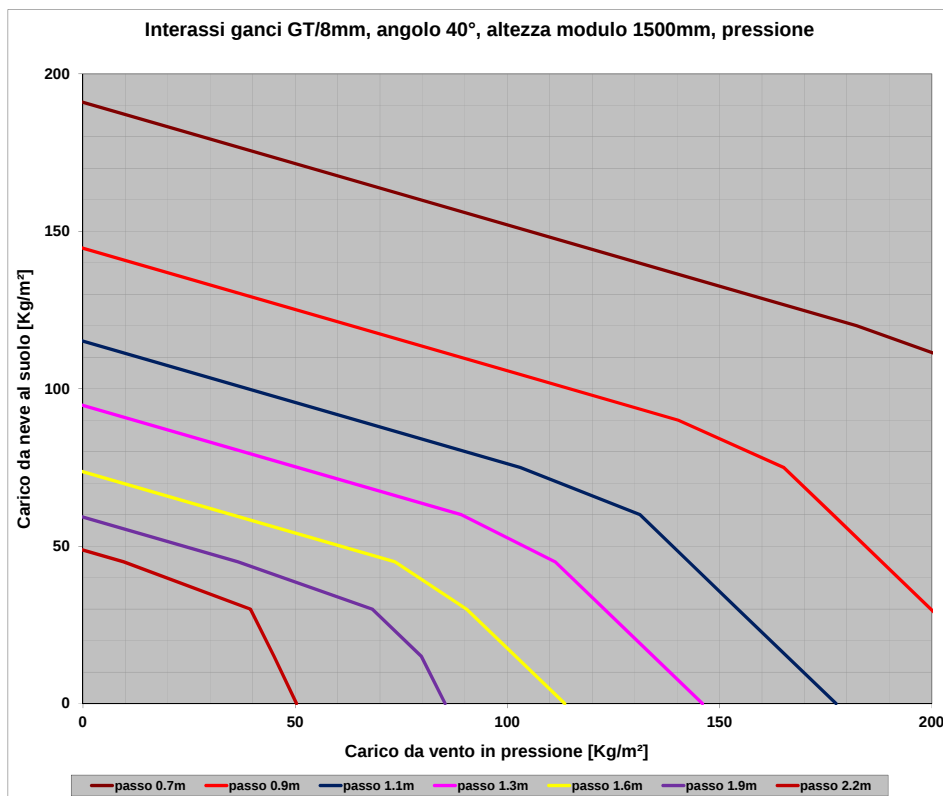
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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



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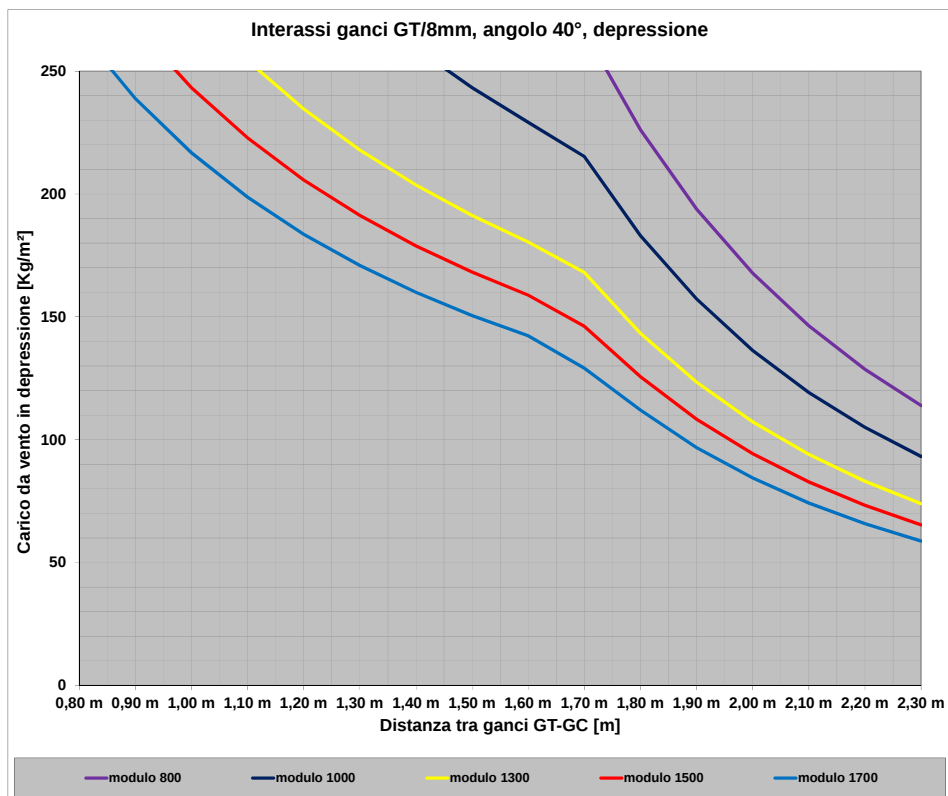
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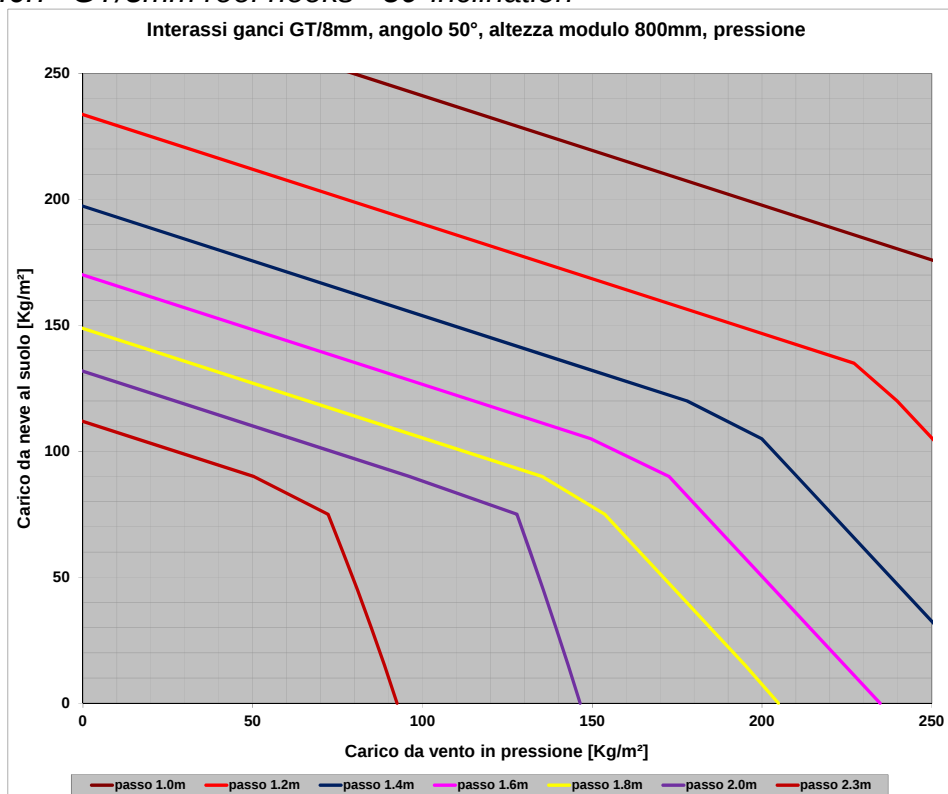
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Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



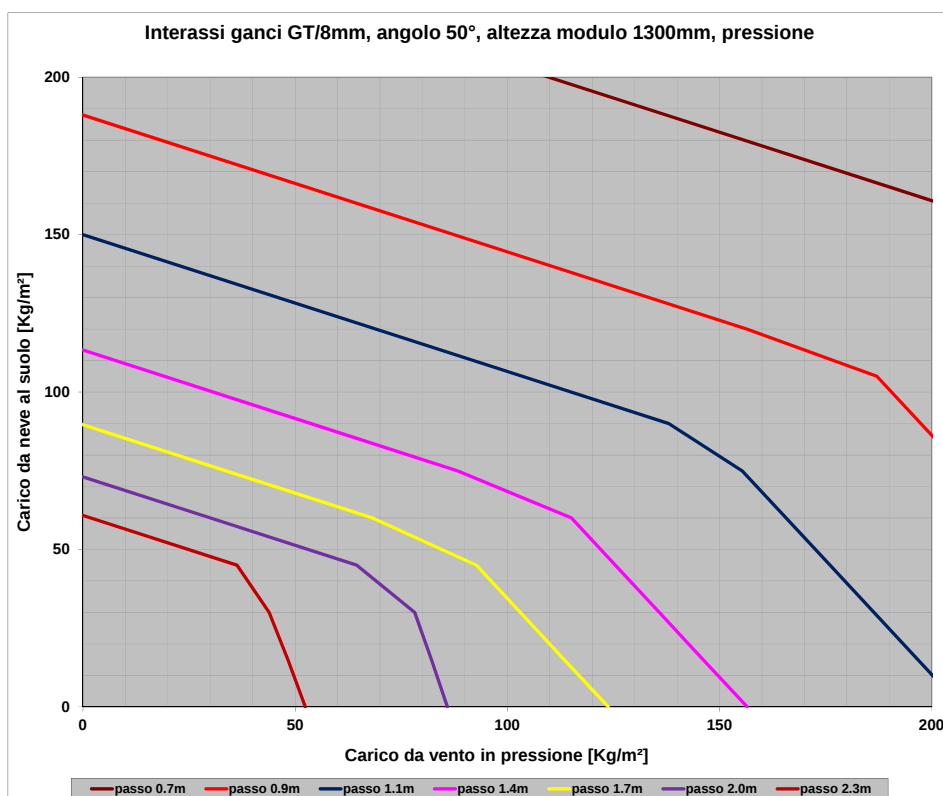
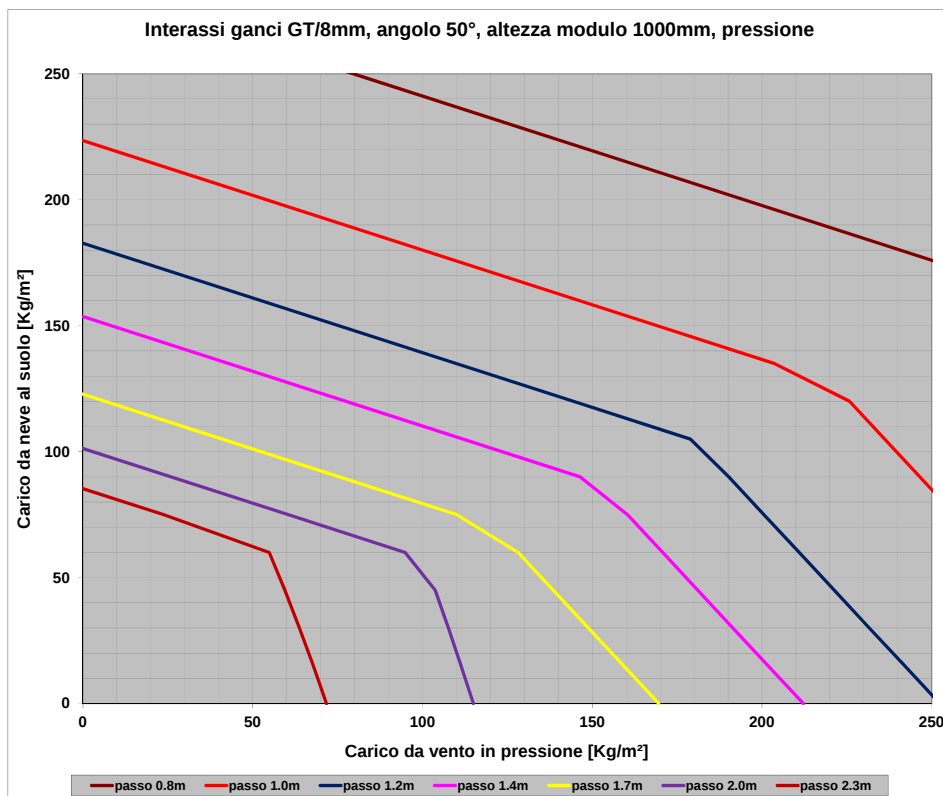
4.6.7 GT/8mm roof hooks - 50°inclination



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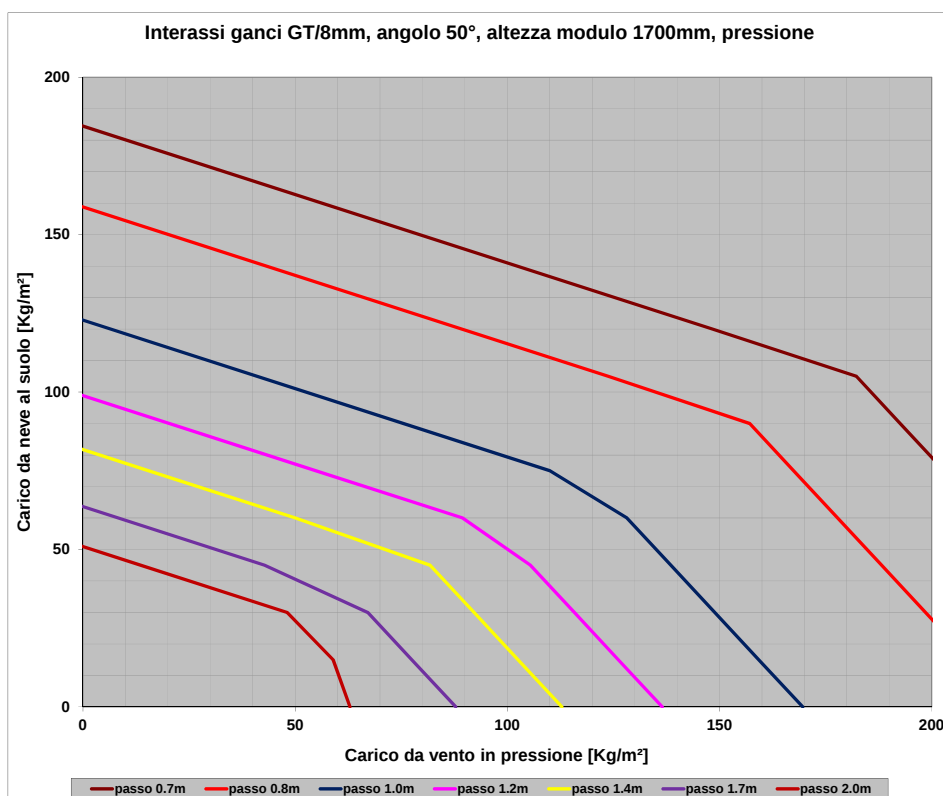
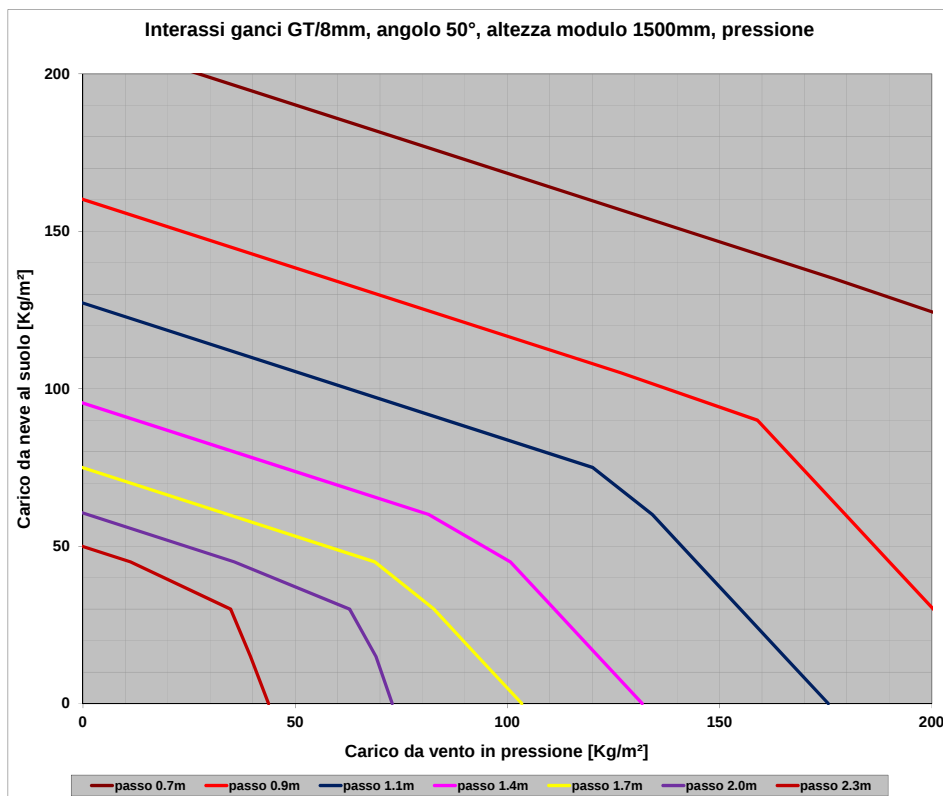
Subject: SolarFish system for sloped roof (roof tiles, Arabic tiles)



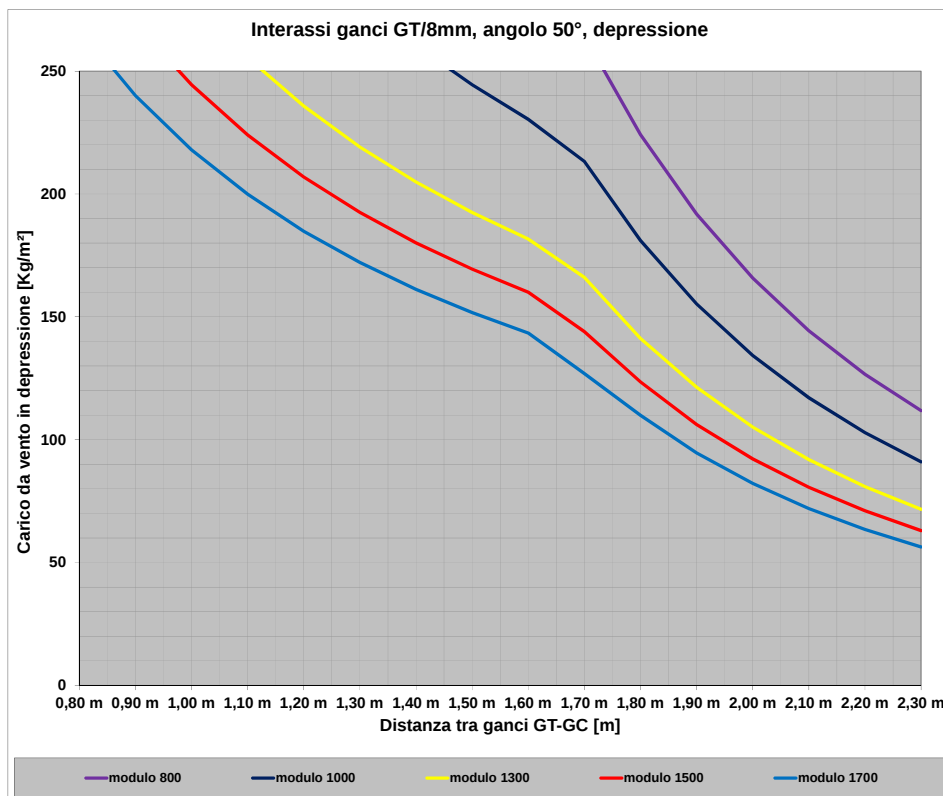
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4.7 Load diagrams: systems for sloped roofs with GTP hooks

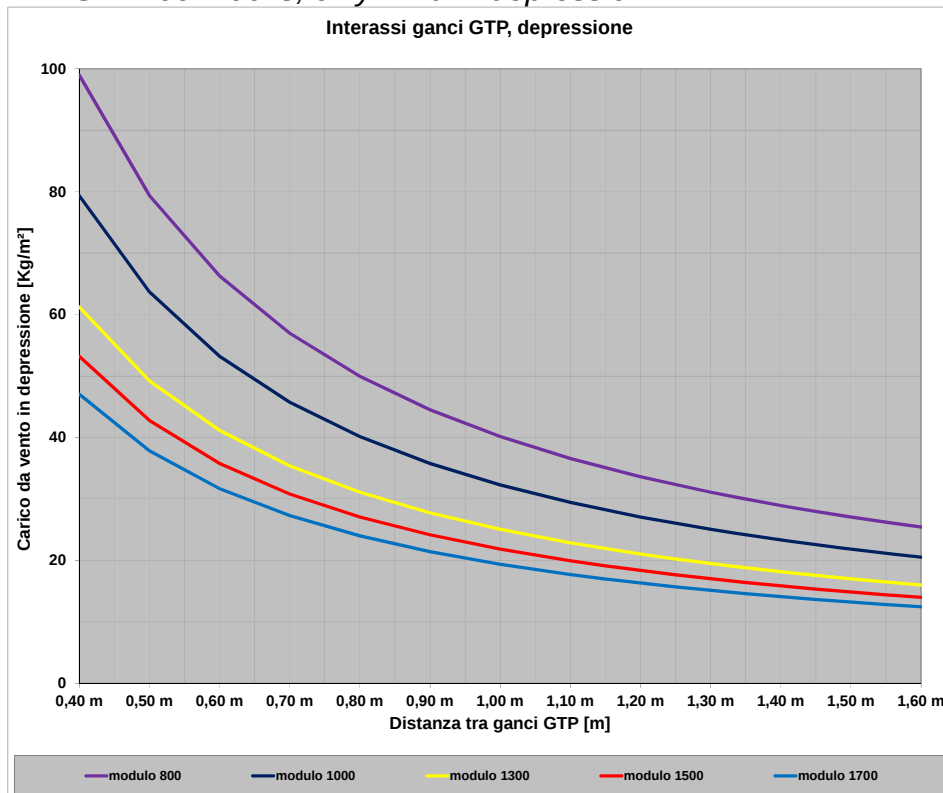
The following diagram regard the complete system GTP hooks + SolarFish profiles, analyzed considering all possible LC load combinations.

The peculiar shape of GTP hook, placed directly on the covering, requires a dimensioning with wind in depression. To check the compression caused by snow loads see load diagrams of SolarFish profile in SDT130A1.

As the resistance of the hook is not influenced by roof inclination, one diagram is sufficient.

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4.7.1 GTP roof hooks, only wind in depression



- All products must be used and installed strictly according to the instructions published by fischer Italia.
- Information and advices in this Technical Data Sheet are based on principles and calculations defined in fischer technical instructions, manuals, standards or other information hold as correct when it was written. Values resulted from tests made in lab conditions. User has responsibility to verify and control if site conditions, components, fixing devices, tools, etc. are complying with Technical Data Sheet conditions. Responsibility on product choice about final using appertain to the Customer.
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