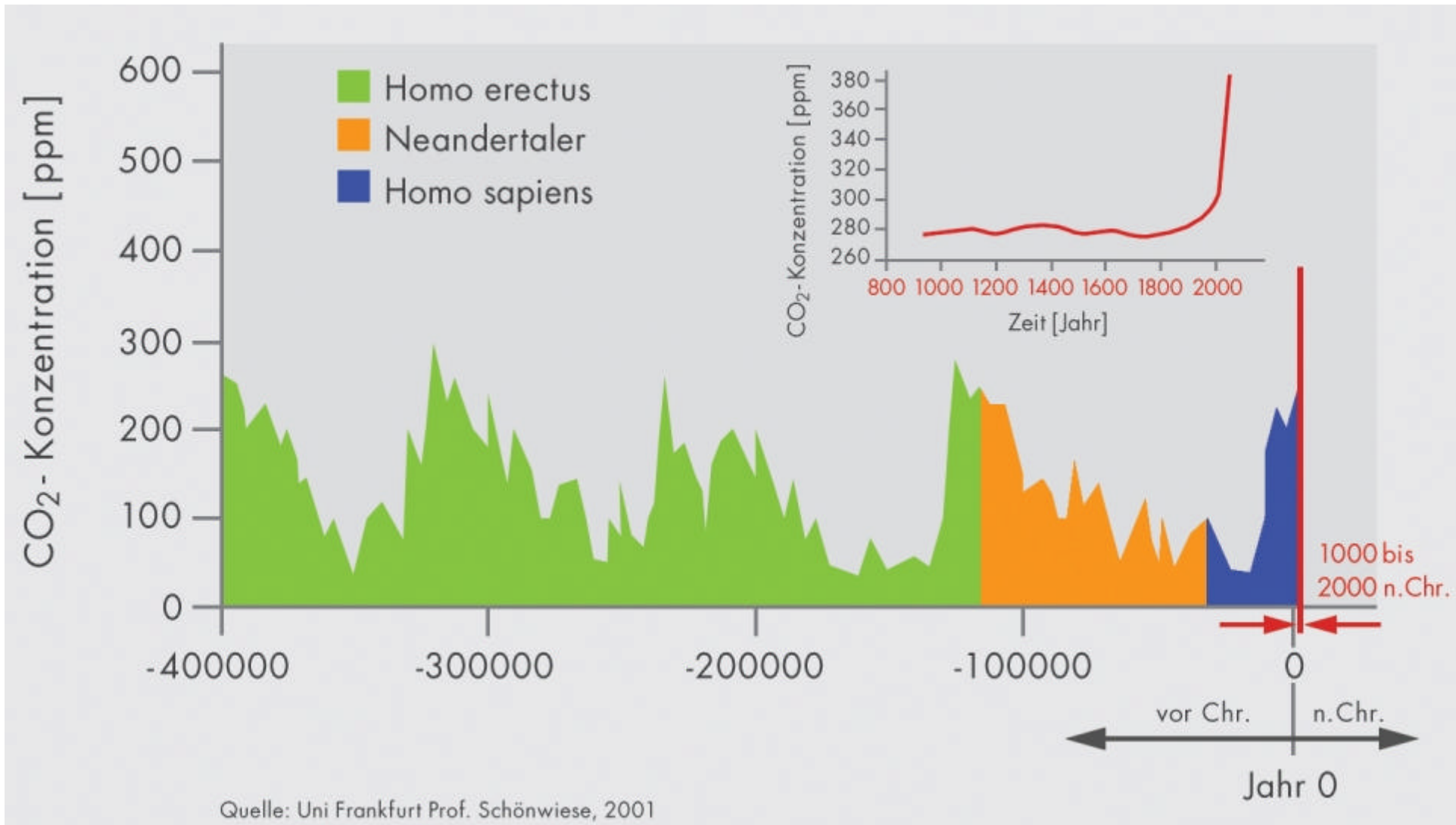
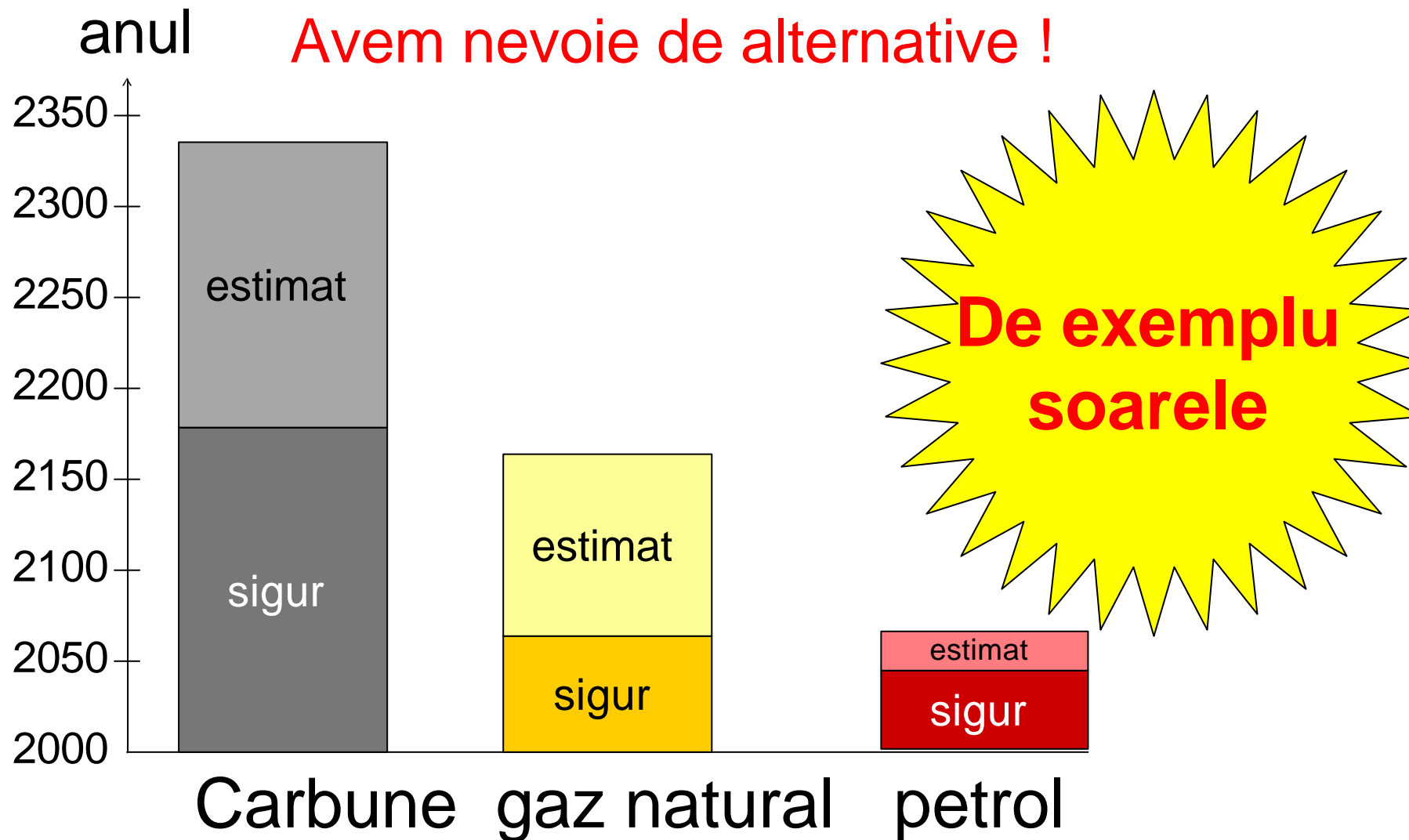

Sisteme solare TopSon F3/F3-Q



Concentratie CO2



Rezervele surselor conventionale de energie



Fundamente

De aproximativ 4.000.000.000 de ani soarele a oferit energie gratuita si va oferi aceasta energie pentru 10.000.000.000 de ani.

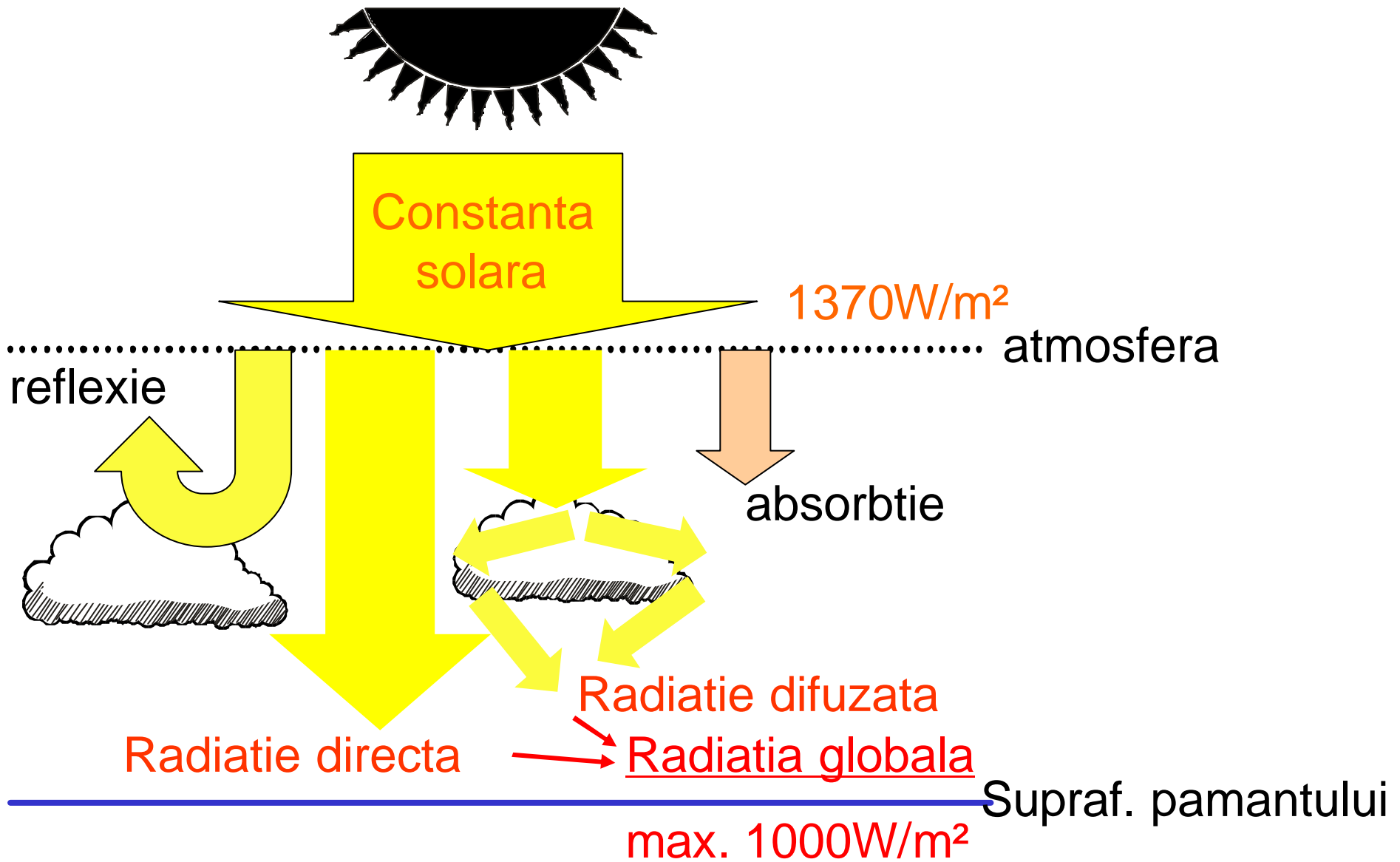


O 1/2 de lumina solara acopera energia totala necesara pe pamant pentru 1 an.



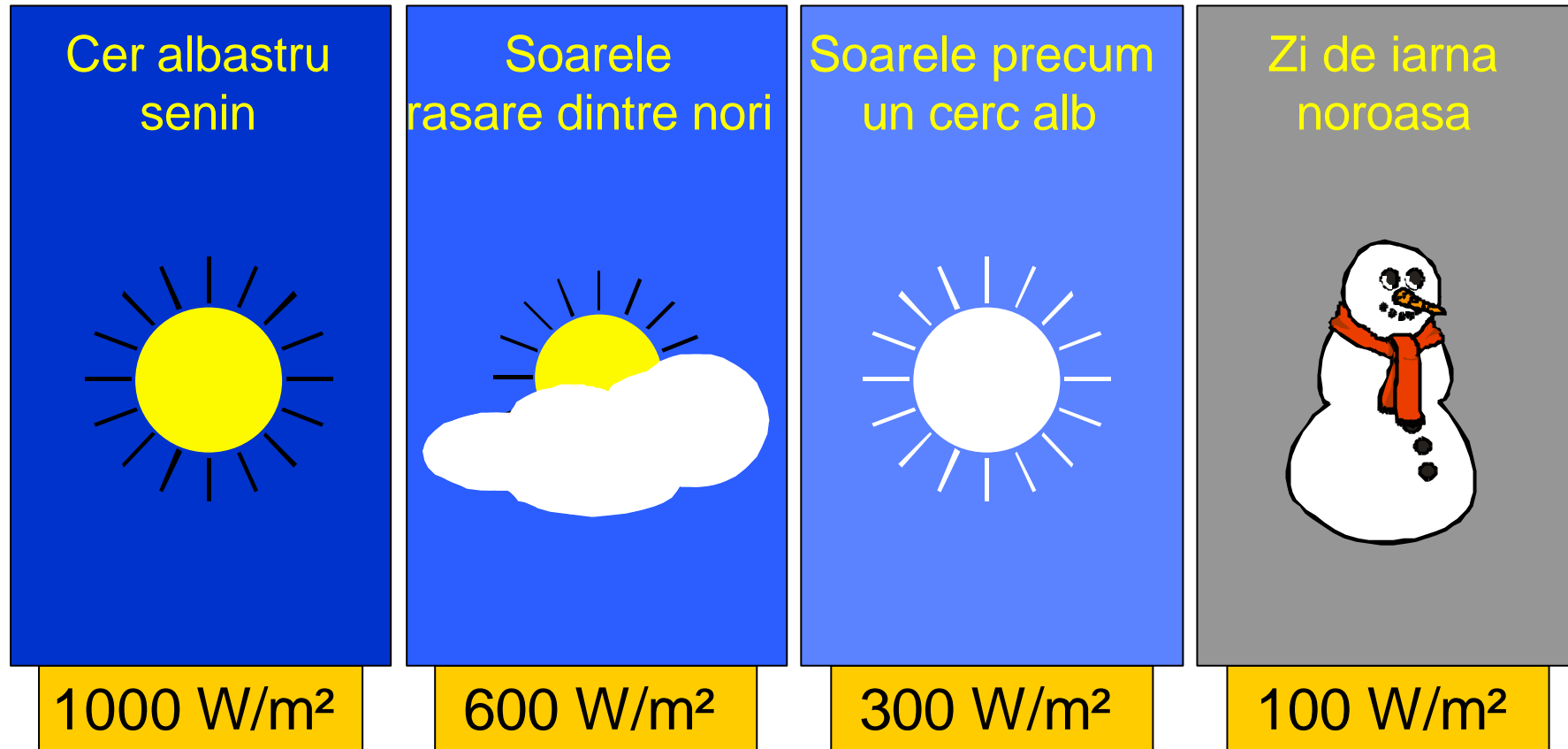
900 pana la 1400 kWh/m² vor fi radiati de soare in fiecare an in Europa.

Radiatia solara pe pamant



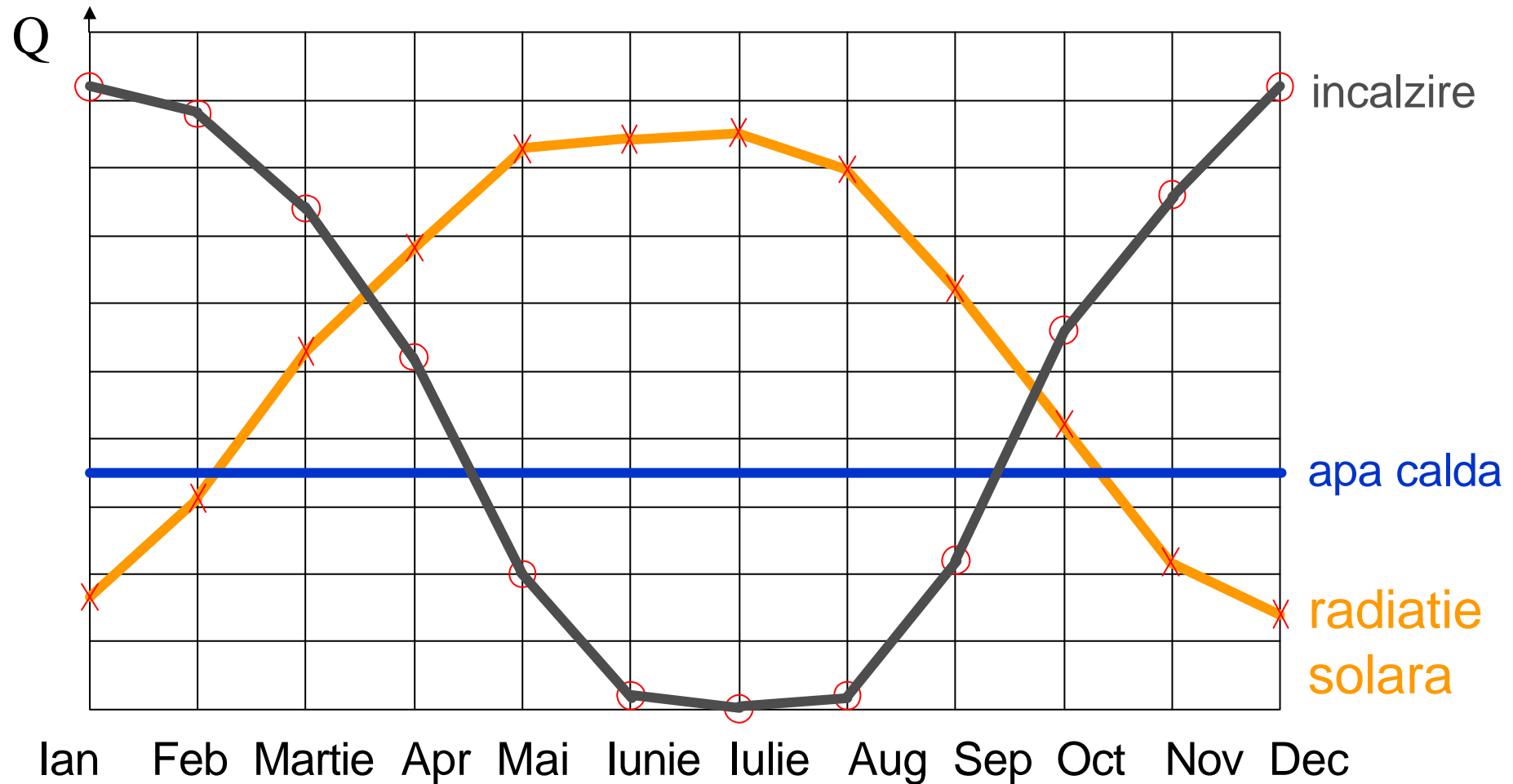
Intensitatea radiatiei

Zile insorite sunt deasemenea si iarna



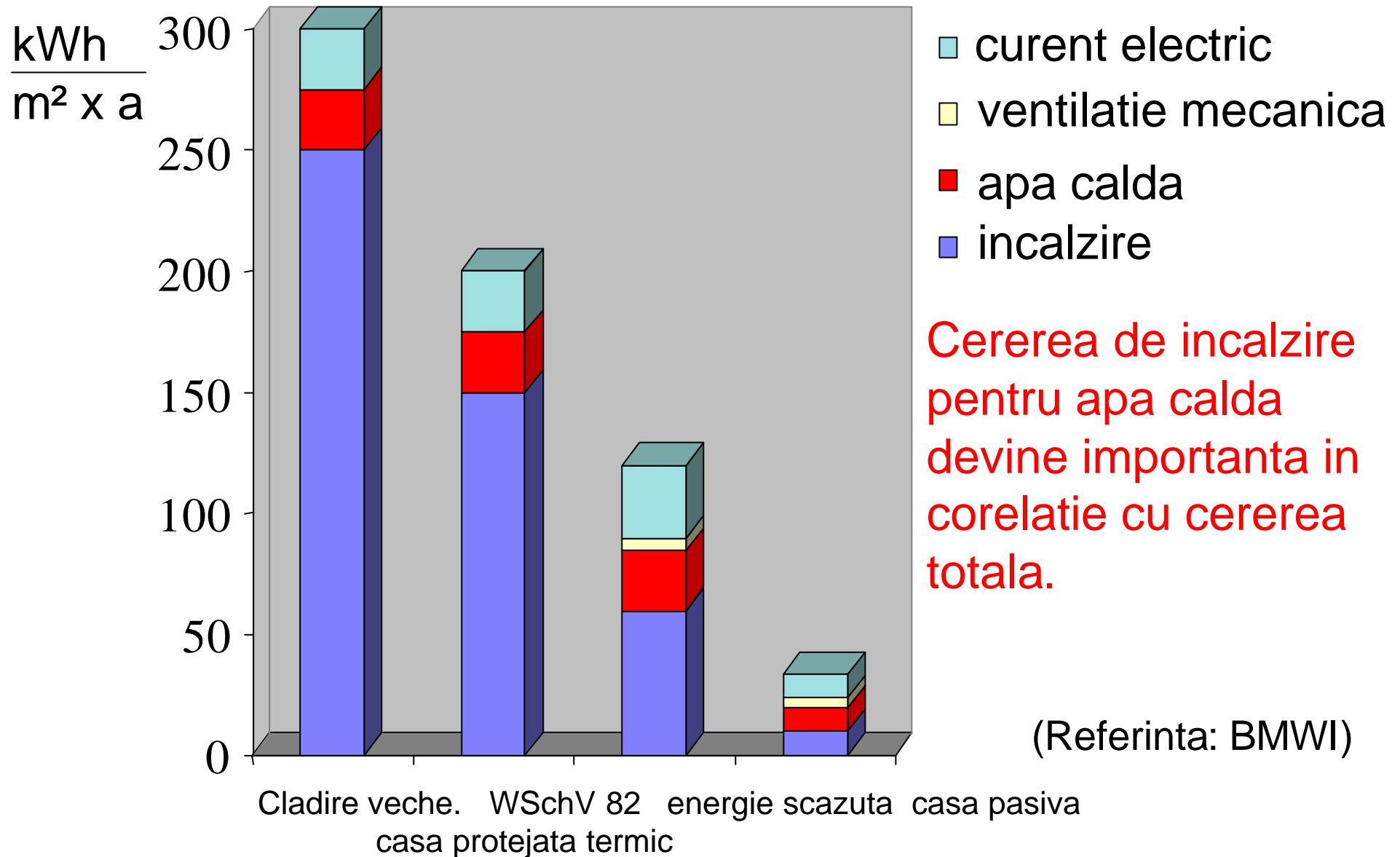
**Radiatia globala in Germania consta in lumina difuzata de 50-70%.
Colectorii trebuie sa se adapteze acestei lumini.**

Energia intr-un an

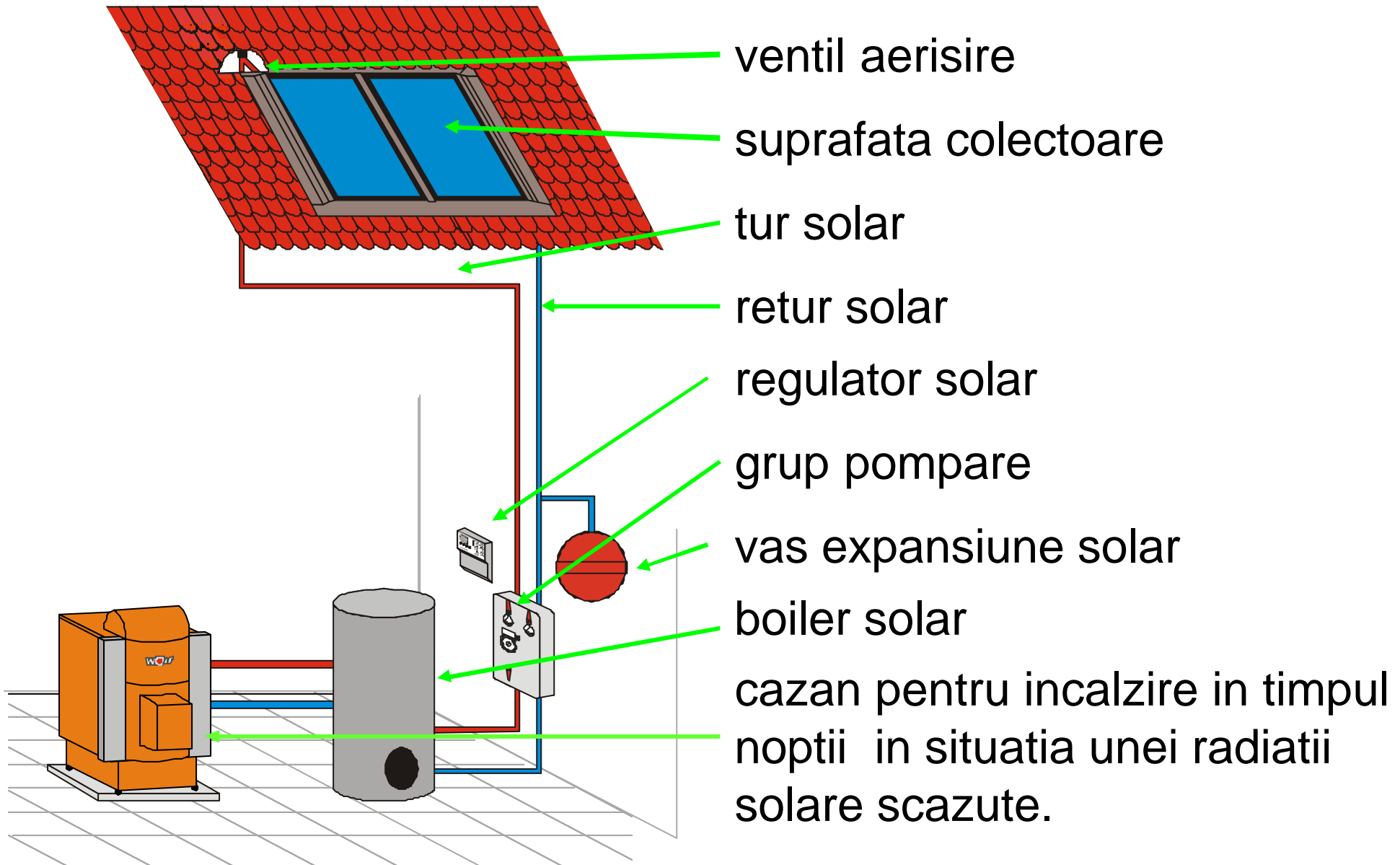


Deoarece apa calda este necesara si in lunile de vara, aplicatia sistemelor solare este special conceputa pentru asta.

Aplicatia energiei in casa pe m² locuit si an



Componentele sistemului



Panou solar TopSon F3

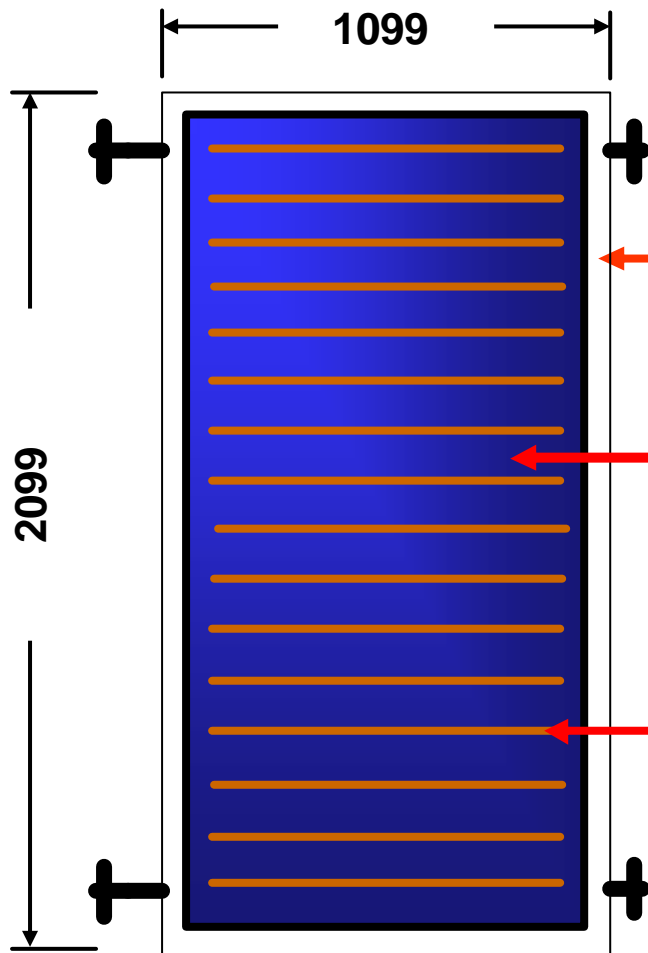


Distinctia „Ingerul albastru“ datorita:

- **eficienta ridicata**
- **productie ecologica**
- **materiale reciclabile**
- **conectari variabile**

5 ani garantie

Design



adancime: 110mm
greutate: 40 kg

- conectare cu piulite si garnituri plate G^{3/4}“
racordabile dreapta/stanga

- cadru din aluminiu
rezistent la coroziune

- 3,2 mm geam de siguranta solar
aria: bruta = 2,3 m², neta = 2,0 m²
securizat termic

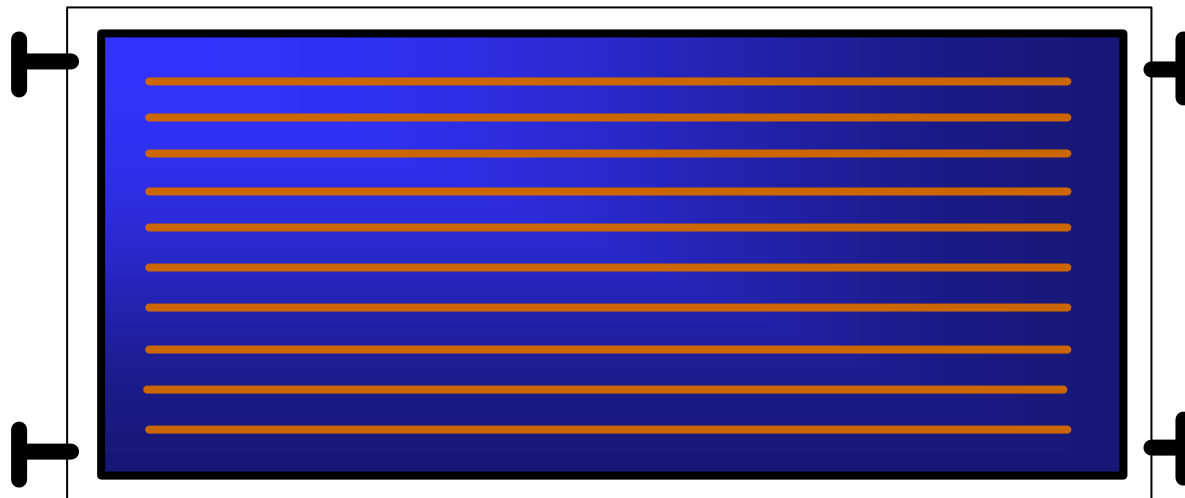
- acoperire cu o absorbtie puternica

- captator din cupru --> forma: serpentina
1,7 litri capacitate --> sudat ultra sonic

- izolatie: vata minerala 60 mm
- laterale (rama): 15 mm

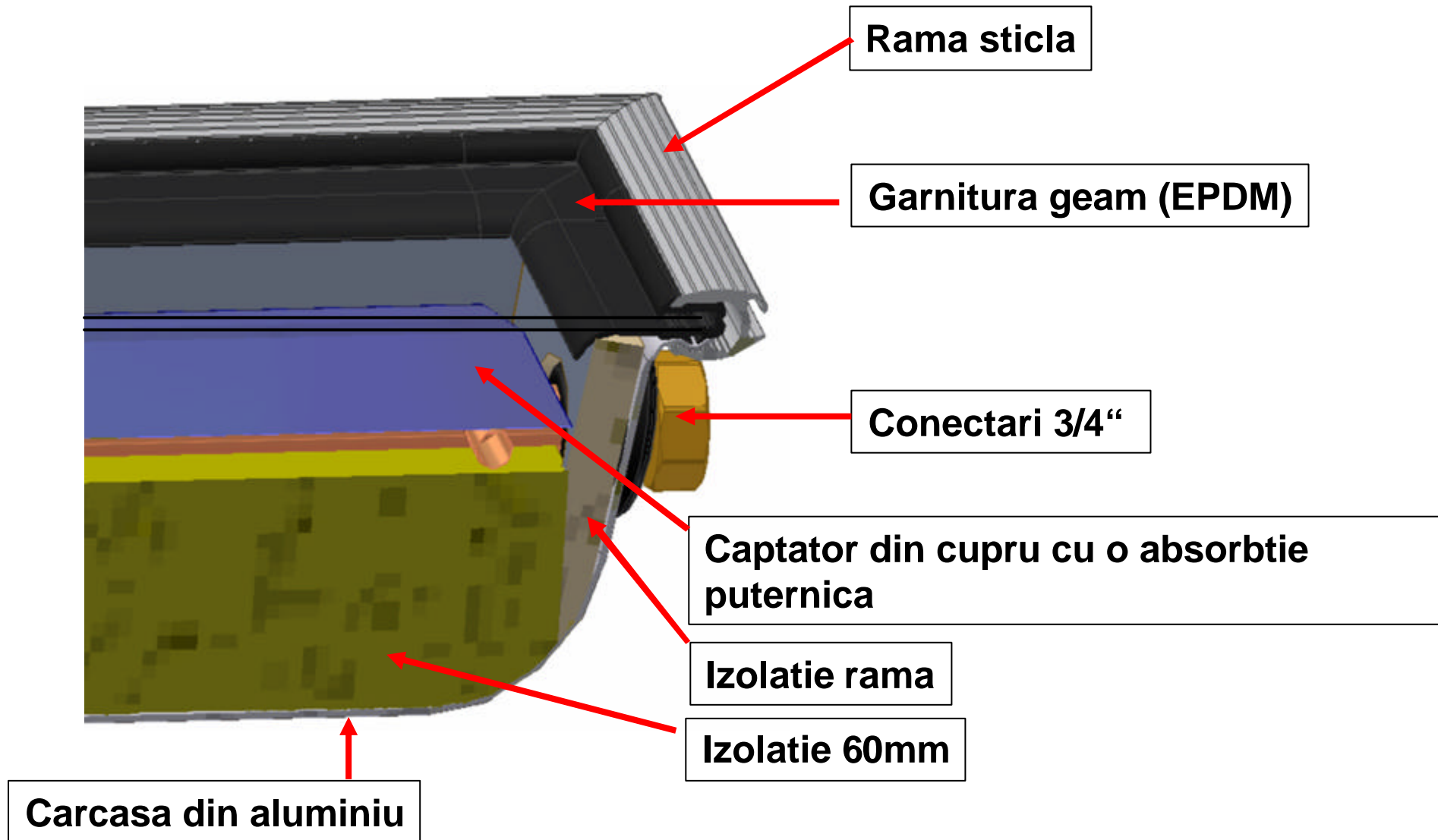
- ventile de aerisire diagonale sub conectari

Design TopSon F3-Q

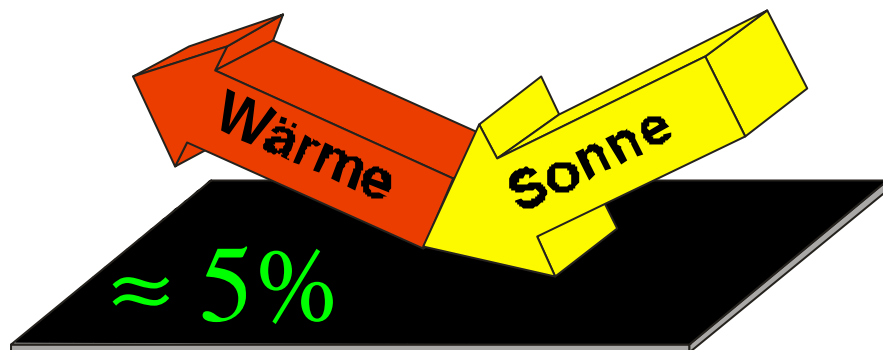


- Conectare cu piulite si garnituri plate G^{3/4}“, racordabile dreapta/stanga
- Cadru din aluminiu rezistent la coroziune
- 3,2 mm geam de siguranta solar, aria: bruta = 2,3 m², neta = 2,0 m² securizat termic
- acoperire cu o absorbtie puternica
- captator din cupru --> forma: serpentina, 1,7 litri capacitate --> sudat ultra sonic
- izolatie: vata minerala 60 mm, - laterale (rama): 15 mm
- greutate: 41 kg

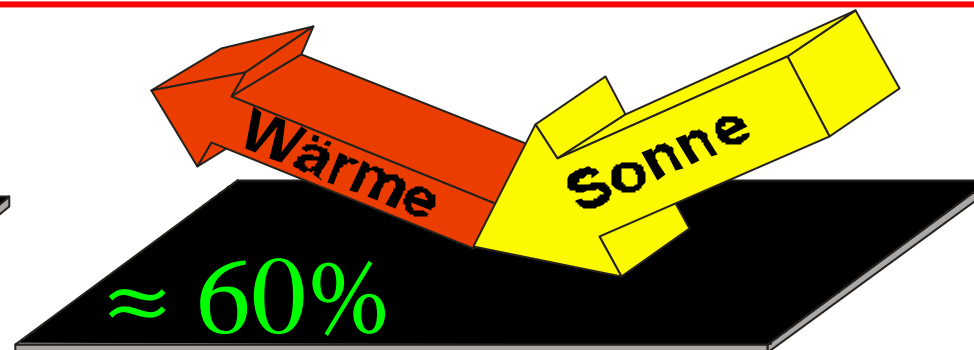
Structura



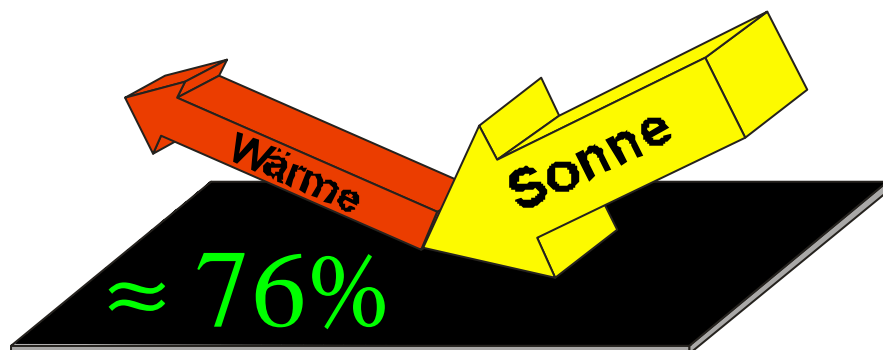
Captator: acoperiri



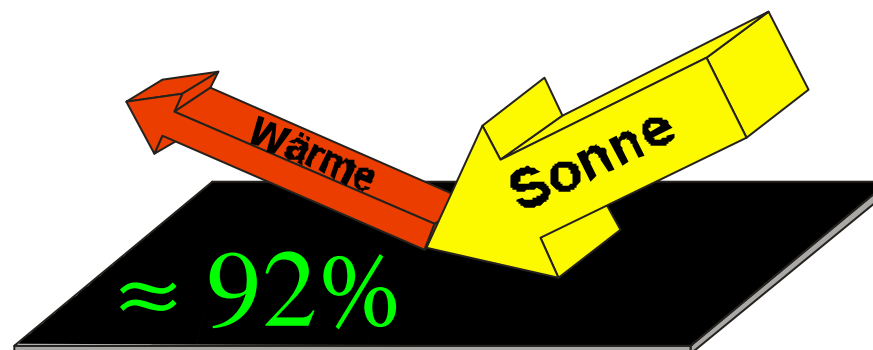
foaie de cupru
absorbit / reflectat
5% / 95%



acoperire cu vopsea absorbanta
absorbit / reflectat
80% / 20% emisie aprox. 25%



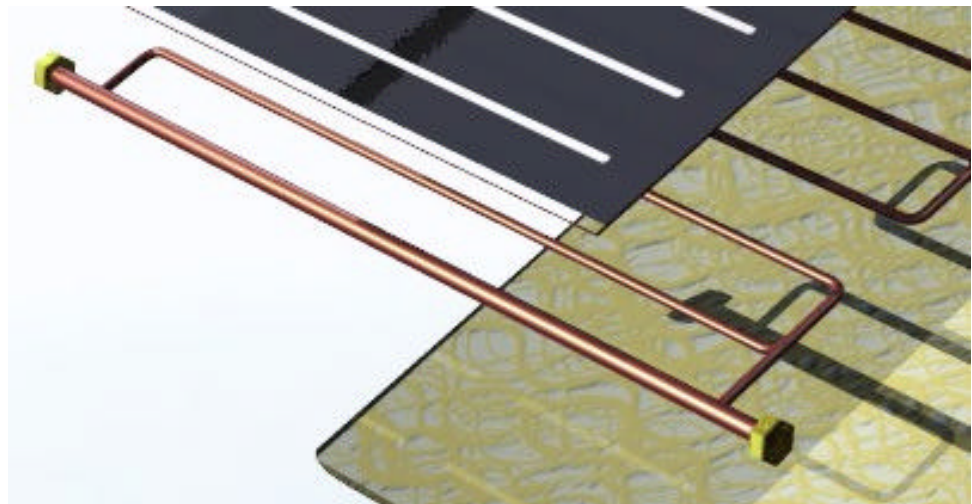
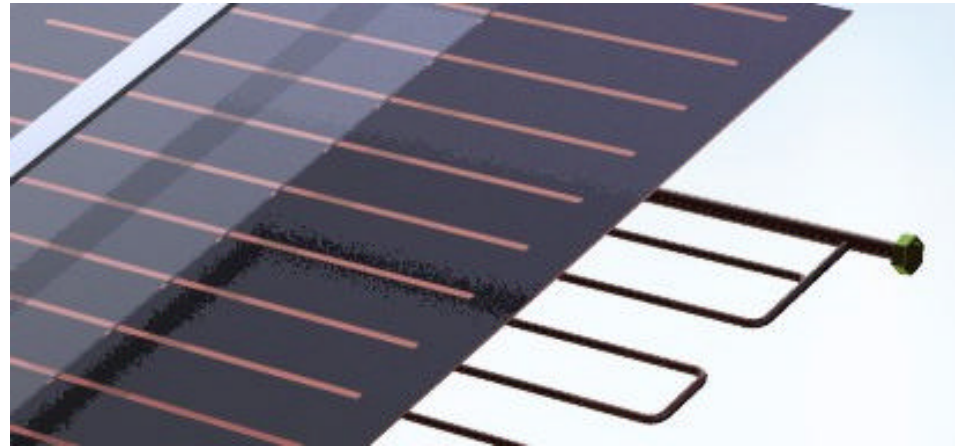
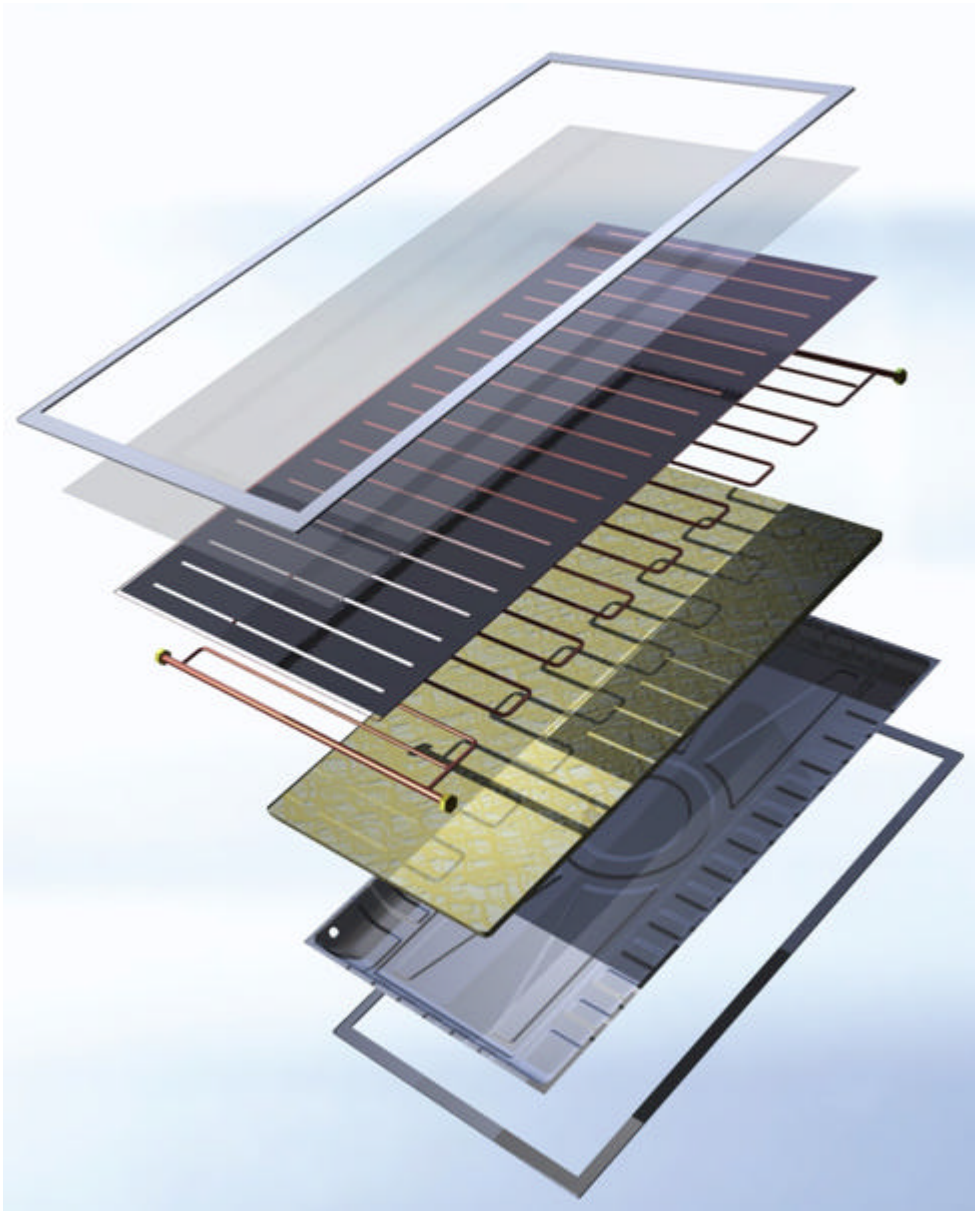
acoperire neagra cromata
absorbit / reflectat
85% / 15% emisie aprox. 11%



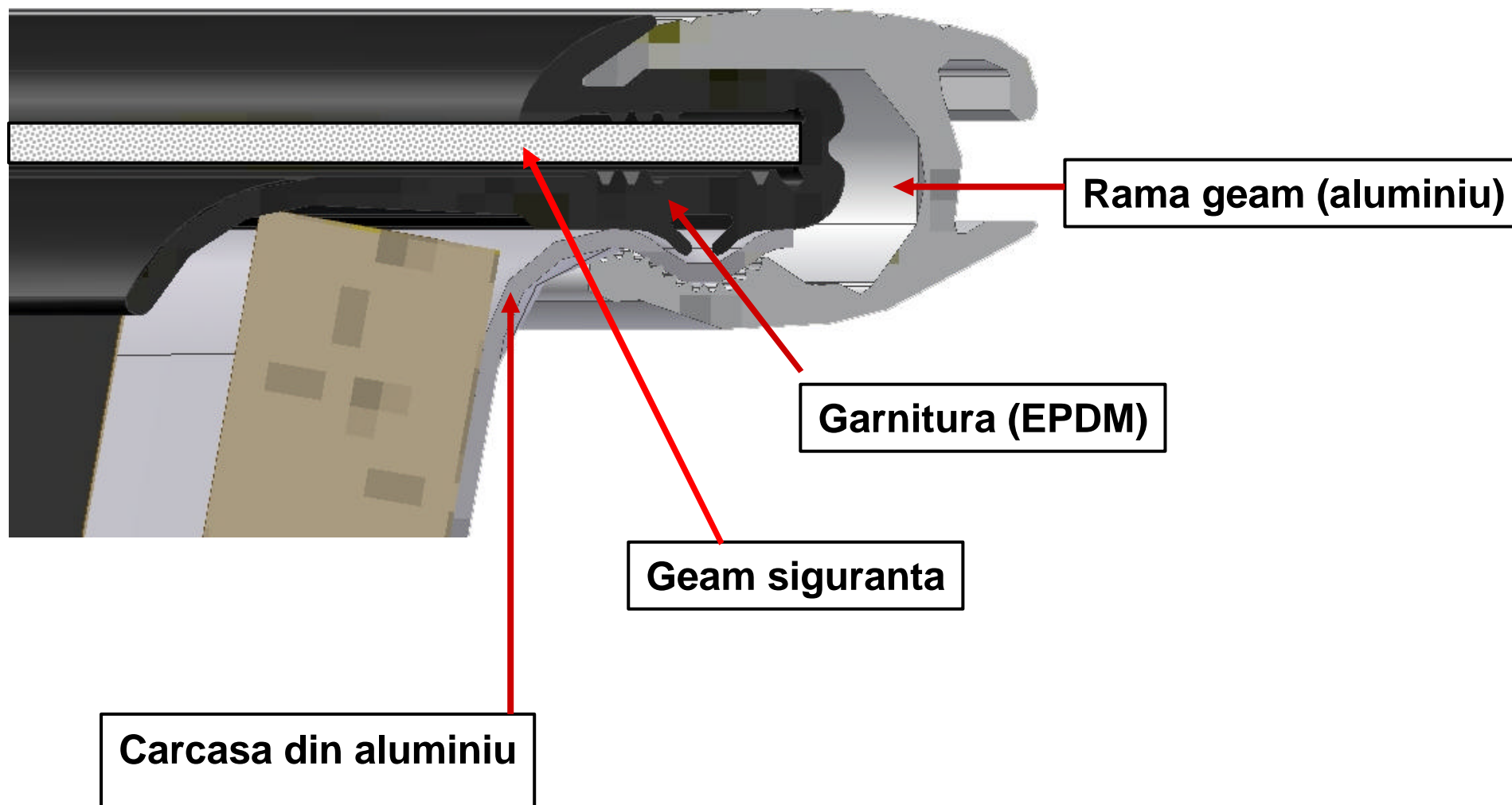
acoperire puternic absorbanta
absorbit / reflectat
97% / 3% emisie aprox. 5%

(productie ecologica)

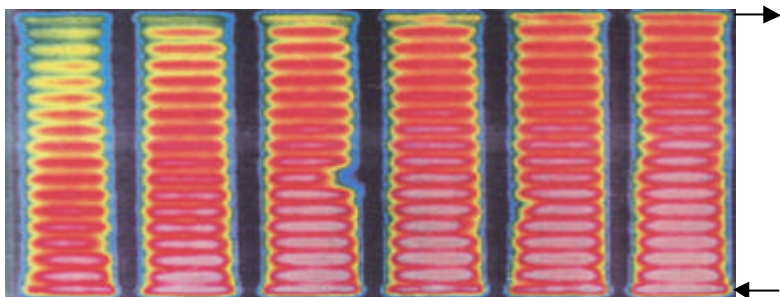
Structura



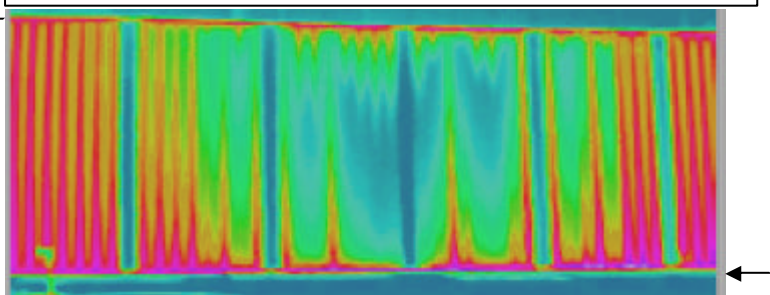
Garnitura gear



Sistem de circulatie



**Sistem cu serpentina dispusa
orizontal:
distributie uniforma**

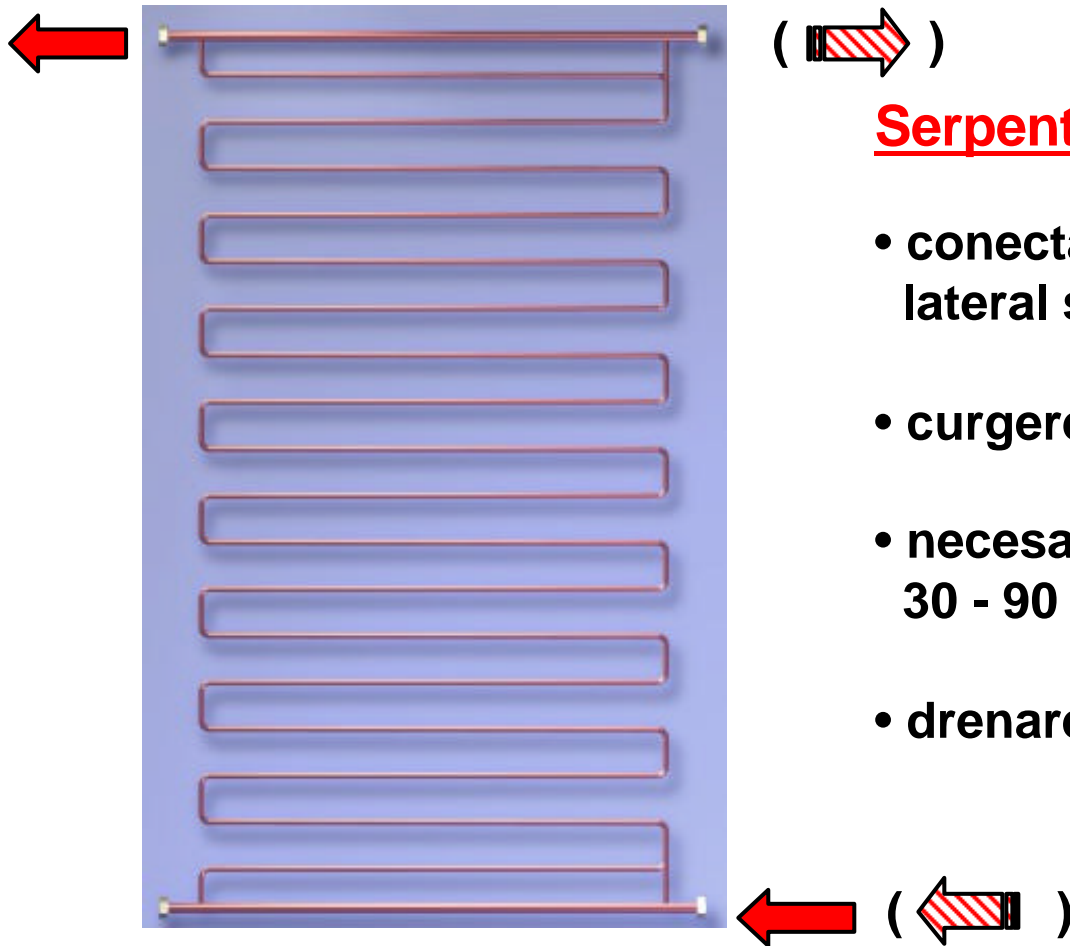


**Sistem cu serpentina dispusa
vertical:
distributie neuniforma**

Sistem serpentina

- pana la **5 panouri conectabile** orizontal
- latura de conectare la libera alegere
- pana la **10 panouri diagonal conectabile**
- curgere lina
- pierderi de presiune mai scazute
- necesar scazut de debit
- compensatori liniari

Circulatie



Serpentina - avantaje

- conectari variabile lateral sau diagonal
- curgere lina
- necesar scazut de debit 30 - 90 l / h x panou
- drenare eficienta

Dimensiunile tevilor

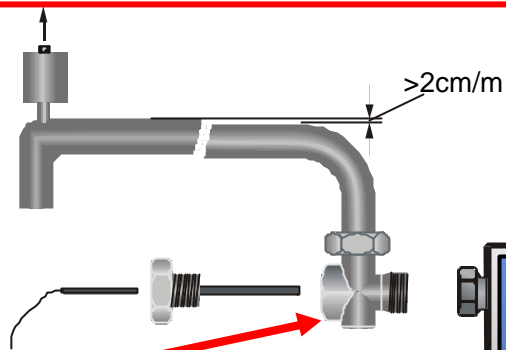
Debit ridicat (90 l/(h*panou), ANRO 20°C)					Debit scazut (50 l/(h*panou), ANRO 20°C)					
panouri	lungime totala		dimensiune	grup	panouri	lungime totala		dimensiune	grup	
	teava		teava	pompare		teava		teava	pompare	
2	to	10 m	15x1	25-40	2	to	20 m	12x1	25-40	
	to	20 m	18x1	25-40		to	60 m	15x1	25-40	
	to	60 m	15x1	25-60		3	to	10 m	12x1	25-40
	to	140 m	18x1	25-60			to	30 m	15x1	25-40
3	to	10 m	18x1	25-40	to		35 m	12x1	25-60	
	to	30 m	15x1	25-60	to	100 m	15x1	25-60		
	to	80 m	18x1	25-60	4	to	20 m	15x1	25-40	
4	to	50 m	18x1	25-60		to	60 m	18x1	25-40	
	to	100 m	18x1	25-80		to	80 m	15x1	25-60	
	to	120 m	22x1	25-60	5	to	10 m	15x1	25-40	
5	to	40 m	18x1	25-60		to	40 m	18x1	25-40	
	to	90 m	18x1	25-80		to	60 m	15x1	25-60	
	to	100 m	22x1	25-60	6	to	10 m	15x1	25-40	
6	to	30 m	18x1	25-60		to	30 m	18x1	25-40	
	to	60 m	18x1	25-80		to	40 m	15x1	25-60	
	to	60 m	22x1	25-60		to	100 m	18x1	25-60	
	to	160 m	22x1	25-80	7	to	20 m	18x1	25-40	
7	to	10 m	22x1	25-60		to	30 m	15x1	25-60	
	to	30 m	28x1,5	25-60		to	80 m	18x1	25-60	
	to	80 m	22x1	25-80	8	to	25 m	15x1	25-60	
8	to	50 m	22x1	25-80		to	50 m	15x1	25-80	
	to	140 m	28x1,5	25-80		to	60 m	18x1	25-60	
9	to	10 m	22x1	25-80	9	to	18 m	15x1	25-60	
	to	50 m	28x1,5	25-80		to	40 m	15x1	25-80	
						to	50 m	18x1	25-60	
						to	100 m	18x1	25-80	
					10	to	40 m	18x1	25-60	
						to	80 m	18x1	25-80	
						to	80 m	22x1	25-60	

Functionare tevi

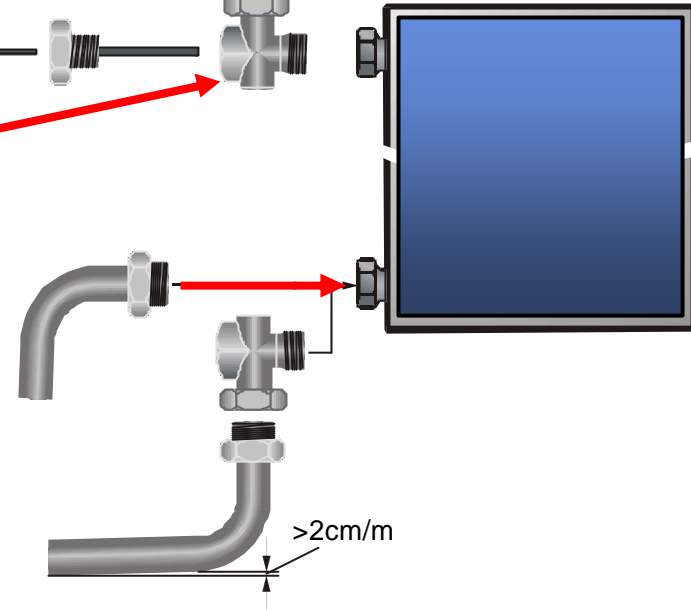
- **Tehnologia de conectare trebuie sa ia in considerare in unele cazuri, temperaturi foarte ridicate !
(temperaturi de pana la 180°C)**
- **Izolatia trebuie sa aiba o rezistenta termica ridicata!**
- **La exterior, izolatia trebuie sa fie rezistenta la razele ultraviolete, ar trebui sa aiba o protectie mecanica impotriva grindinei!**
- **Nu utilizati ventile de aerisire automate**
- **Luati in considerare dilatarea termica!
(tevine din Cupru au un coeficient mare de dilatare la temperaturi ridicate)**

Asamblare F3

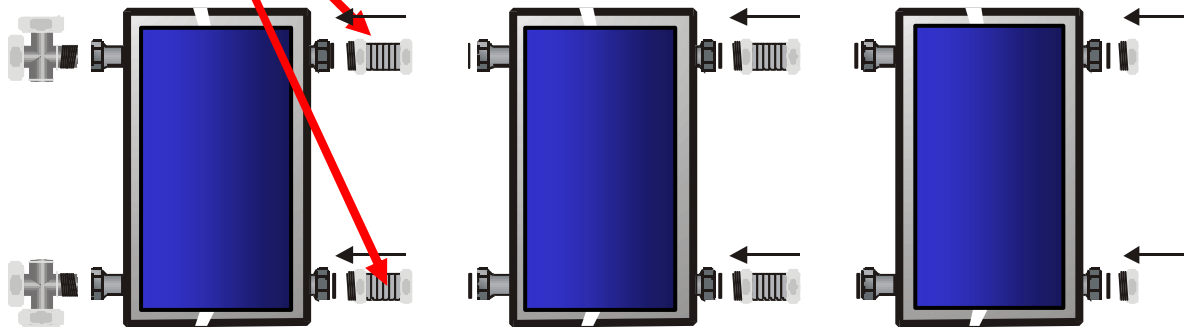
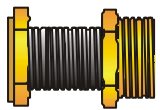
Panta catre ventilului de aerisire



Element de conectare din bronz pentru racordarea turului + sonda temperatura panou



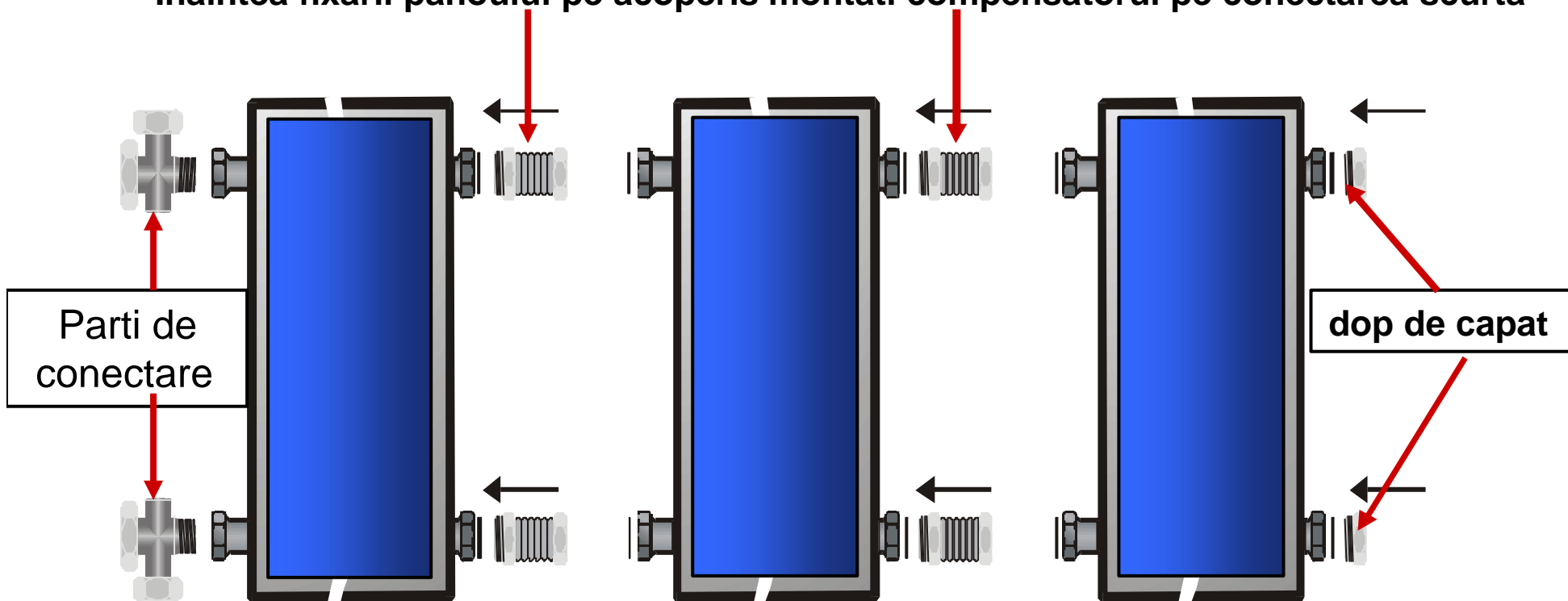
Compensatori din otel inoxidabil pentru conectarile panoului



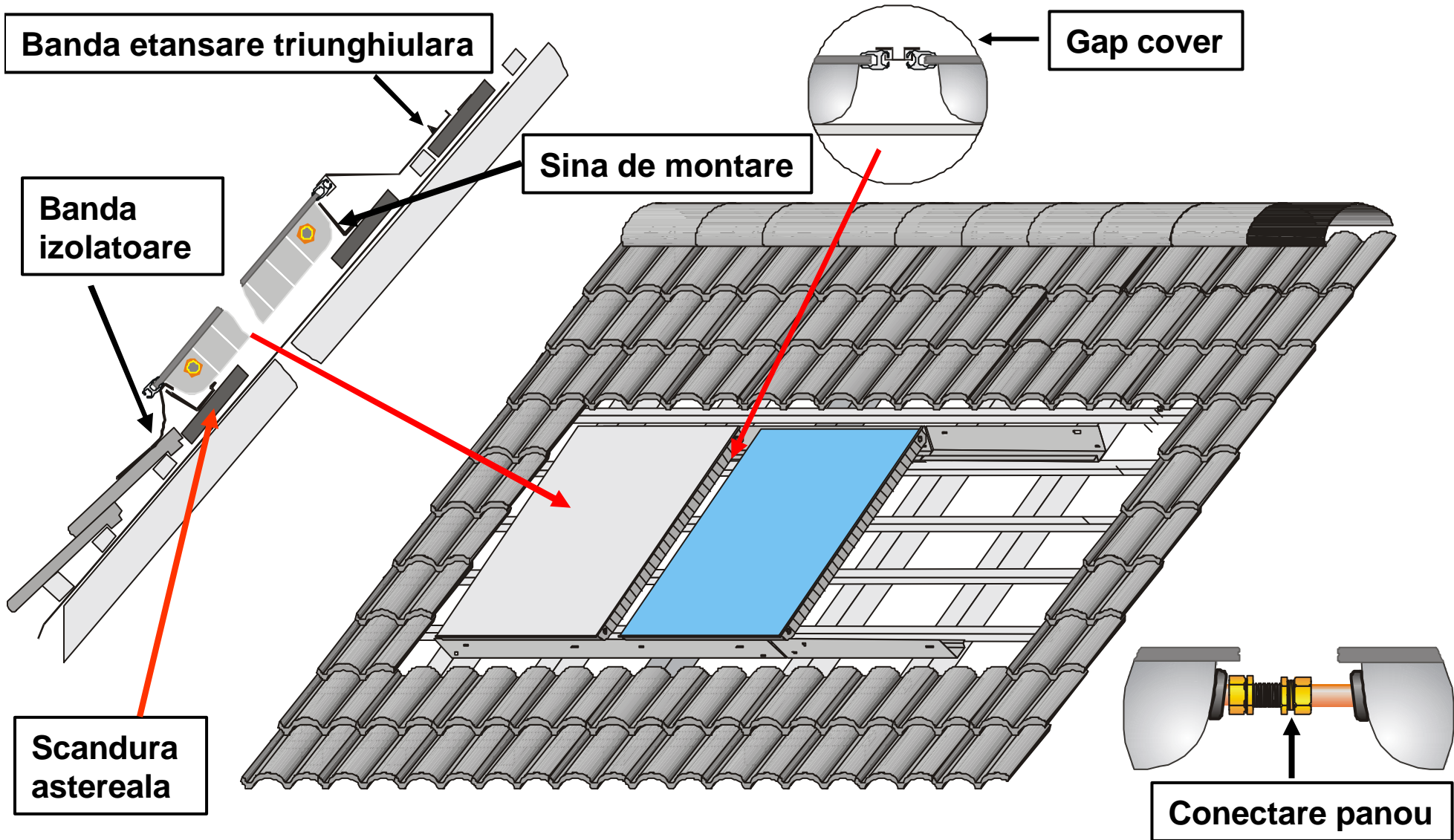
Asamblare F3

Atentie – conectarile au doua lungimi diferite

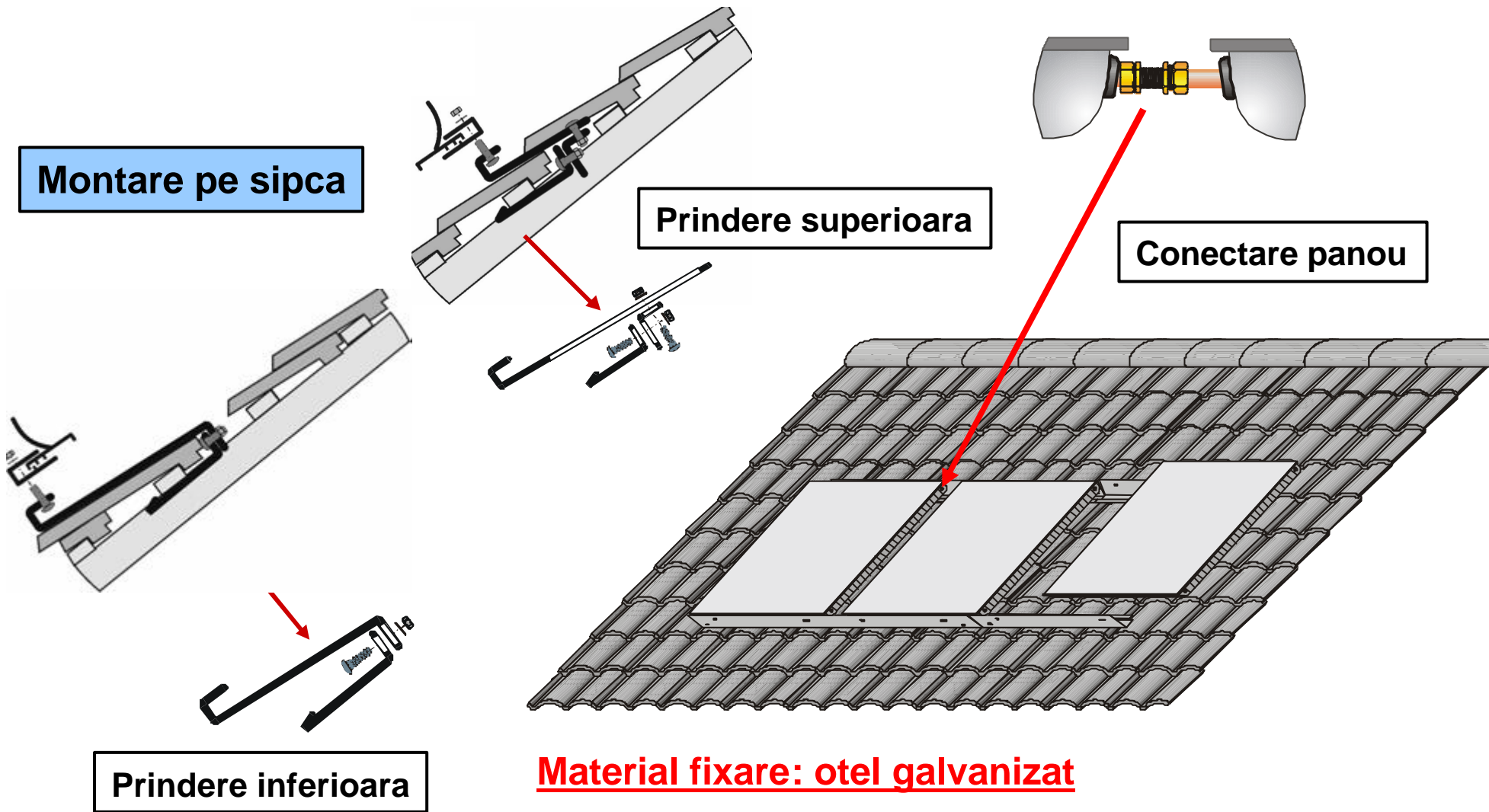
Inaintea fixarii panoului pe acoperis montati compensatorul pe conectarea scurta



Asamblare F3 in acoperis



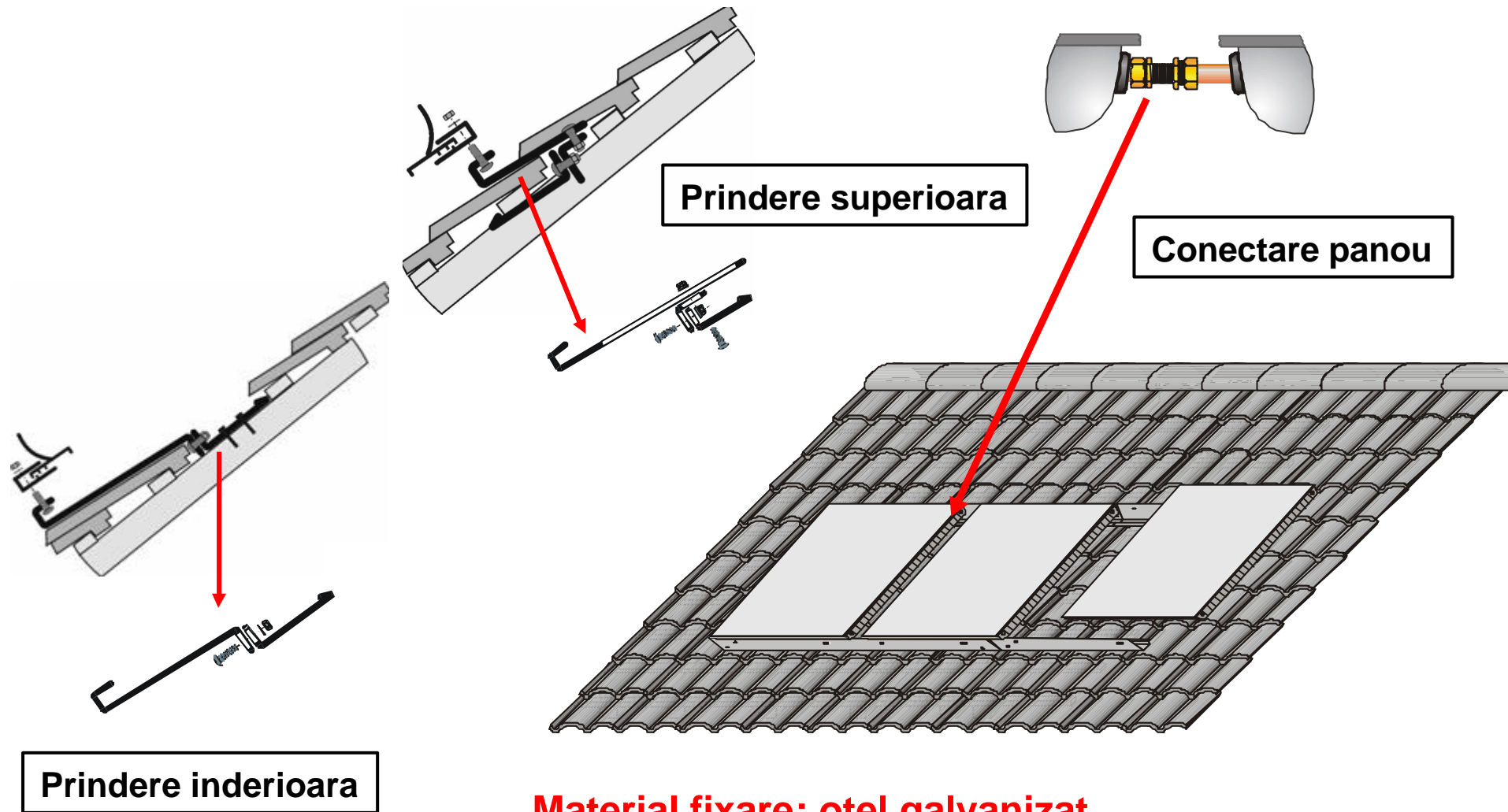
Asamblare F3 pe acoperis



Material fixare: otel galvanizat

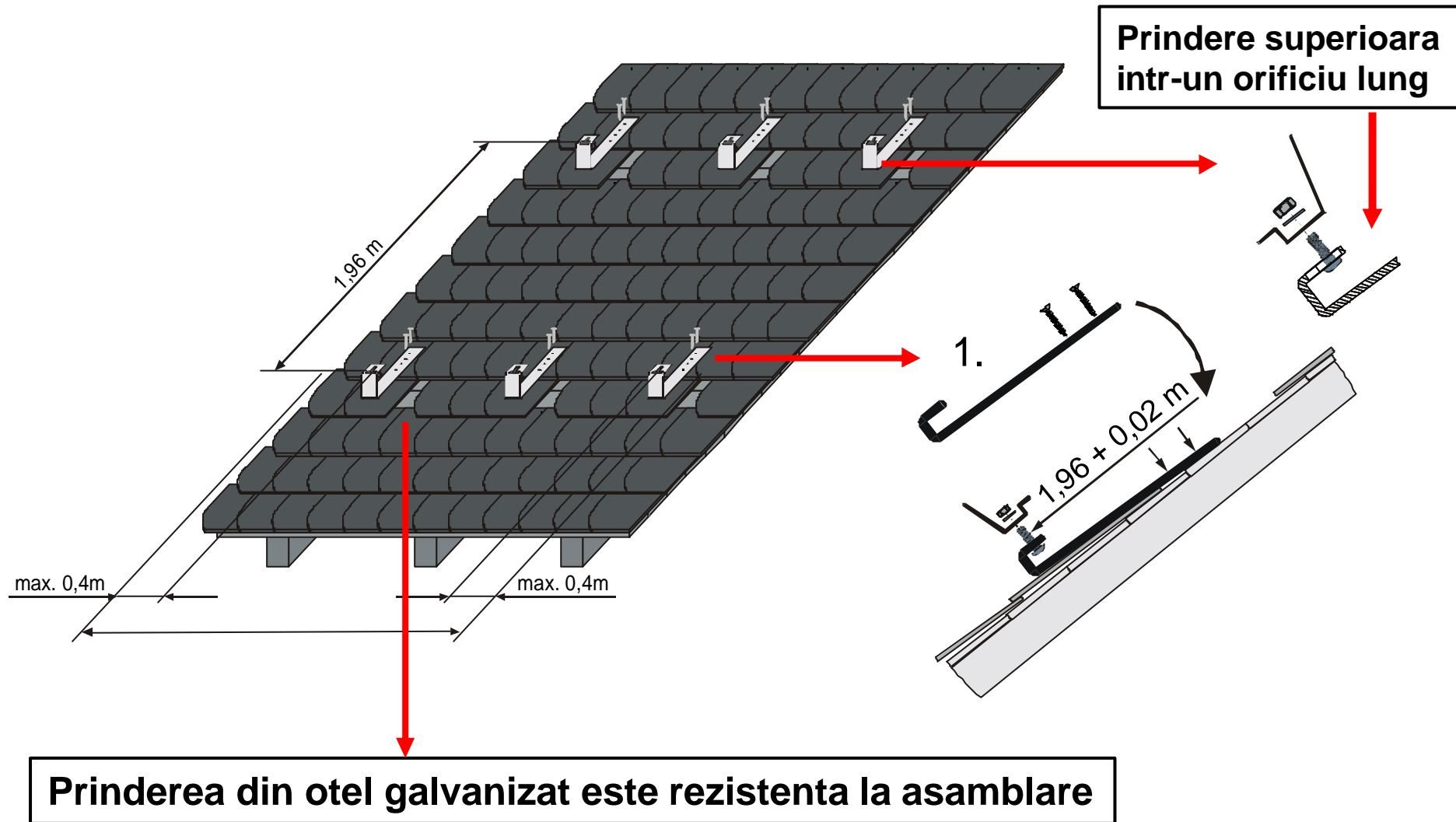
Prinderi pentru diferite grosimi de sipca

Asamblare F3 in acoperis

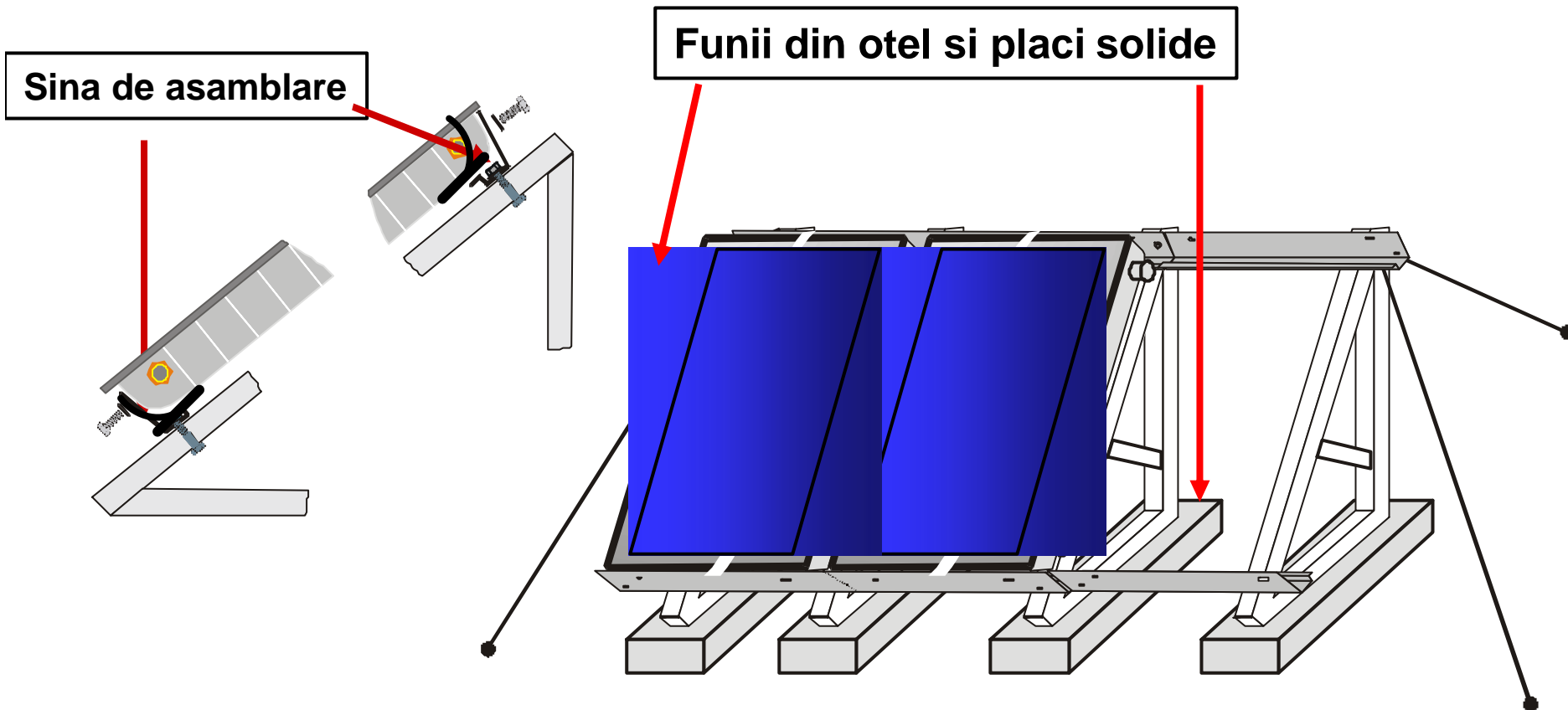


Material fixare: otel galvanizat

Asamblare F3 pe acoperis de ardezie



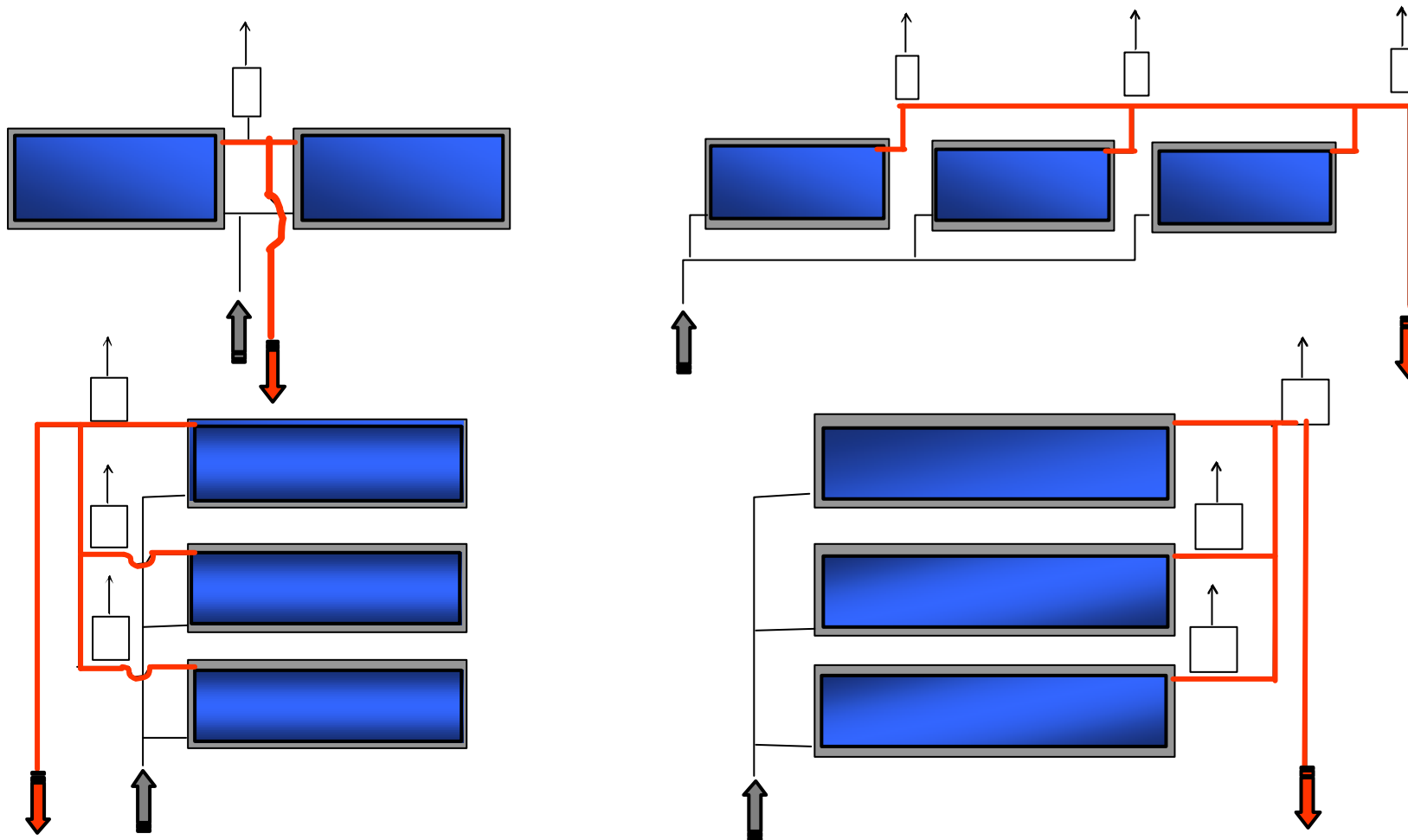
Asamblarea F3 pe acoperisuri plane



Luati in considerare stabilitatea acoperisului!

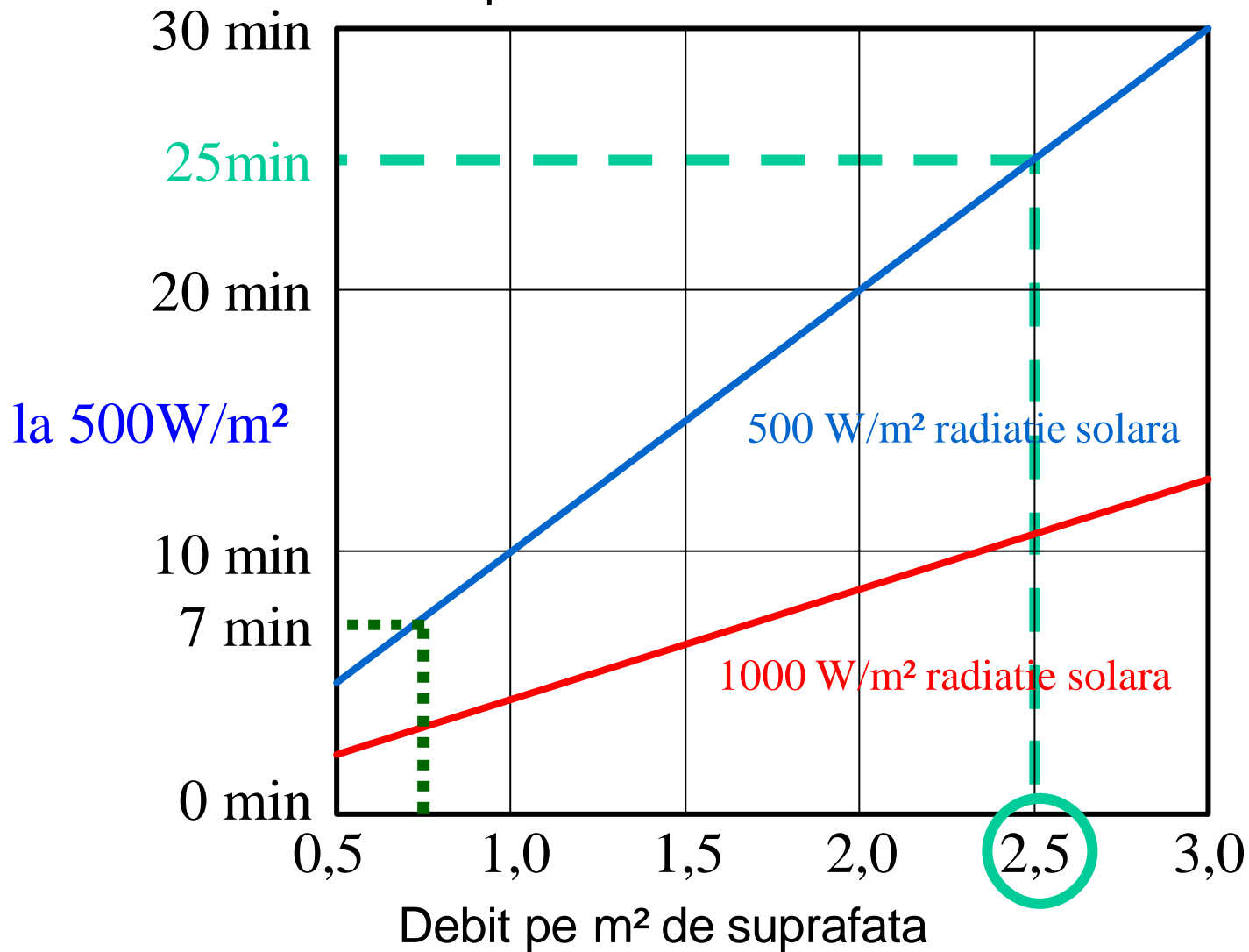
Cadru triunghiular din aluminiu

Pentru mai multe panouri utilizati sistemul Tichelmann

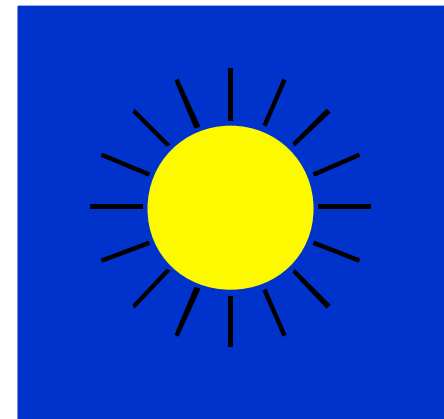
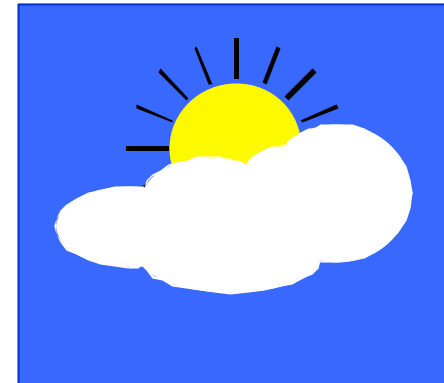


Incalzirea panoului solar

Temperatura solara $\Delta T = 30K$

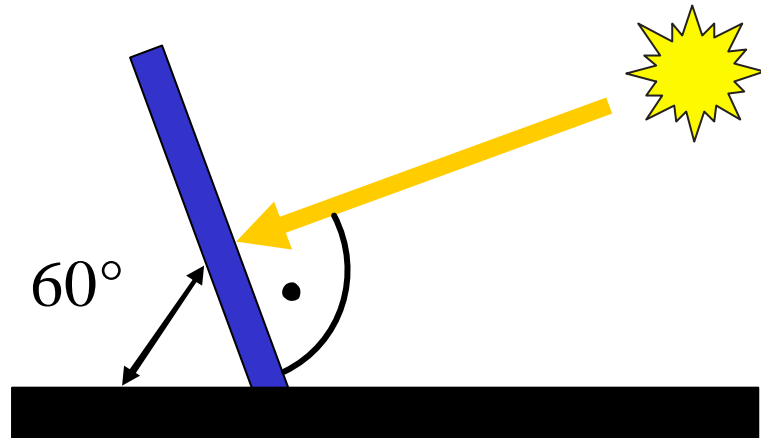


Wolf TopSon F3: 0.7 l/m²

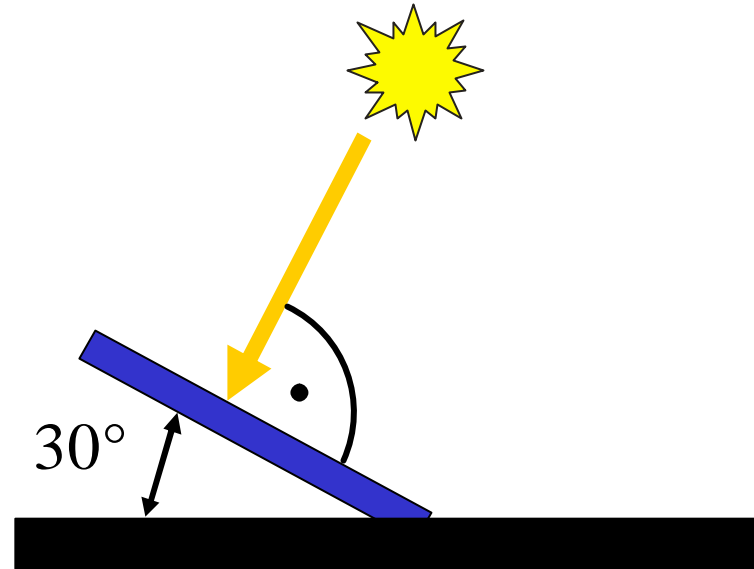


Unghiul de inclinare

Exploatarea predominanta iarna



Exploatarea predominanta vara



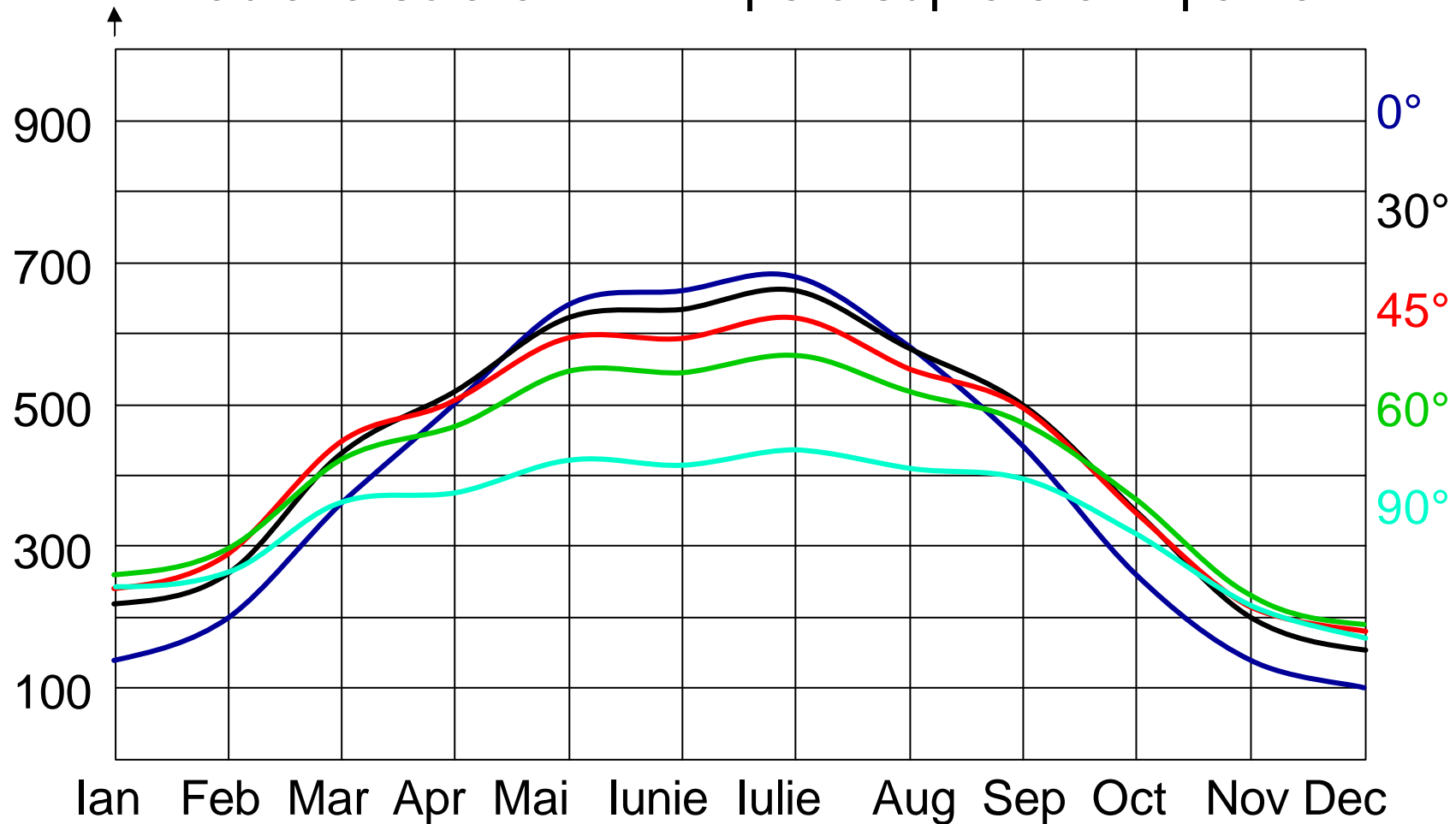
Suprafata prismatica a geamului solarului optimizeaza
Transmisia luminii catre suprafata absorbanta.

Cu unghiul de inclinare uzual al acoperisului de ardezie
Este posibila o functionare optima.

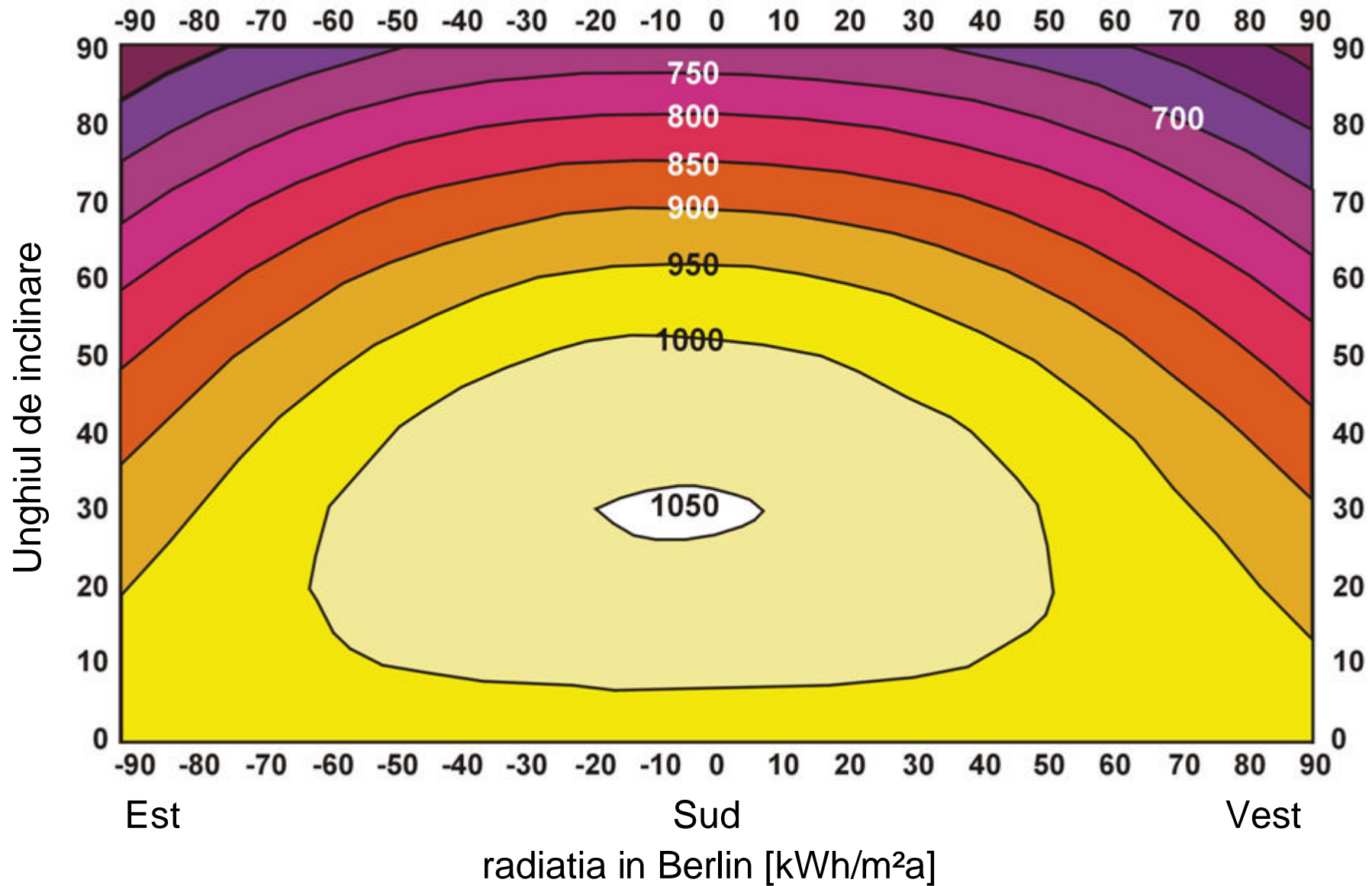
Unghiul corespunzator de inclinare va fi respectat la
dimensionarea instalatiei prin factori de corectie.

Unghiul de inclinare

Radiatia solara in kWh pe o suprafata in panta



Unghiul de inclinare / panta acoperisului



Grupul de pompare

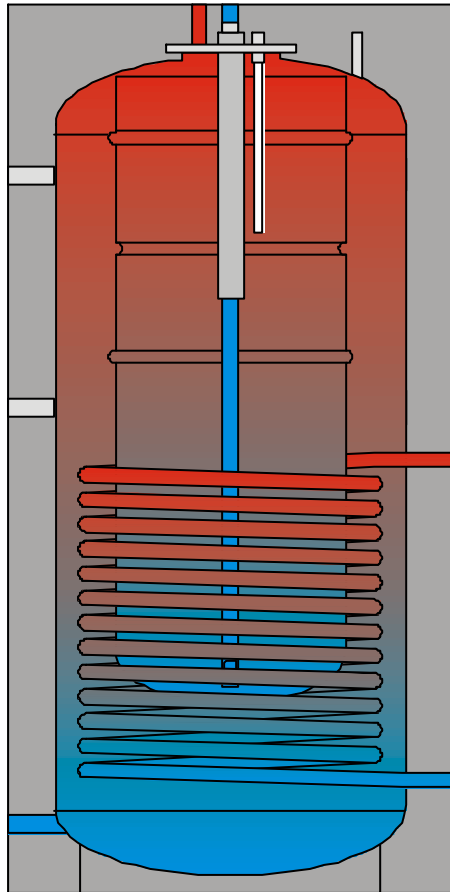
- complet izolat
- cu controlul debitului (90 l/h pe controler)
- supapa de siguranta 6 bar
- pompa in 3 trepte (pentru DigiSolar /... MF viteza controlata pas cu pas via un semnal PWM)



Rezervor de stocare

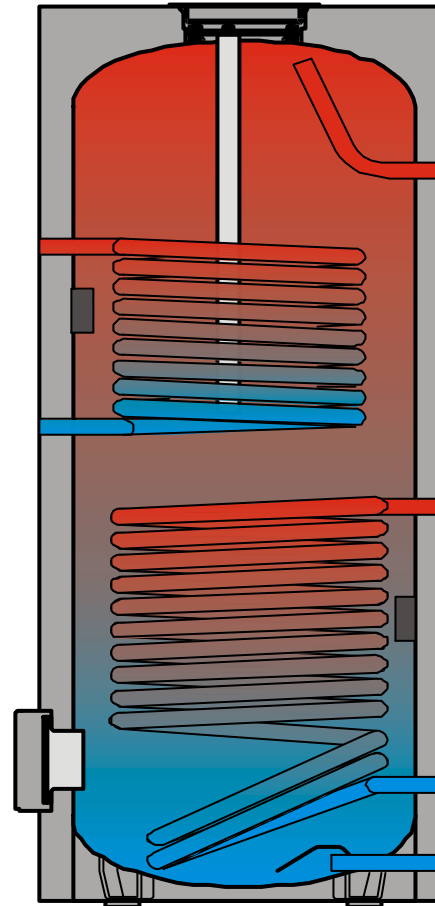
Boiler cu manta dubla SED

Capacitate: 750 ltr
(apa calda: 280 ltr)



Boiler bivalent SEM-1

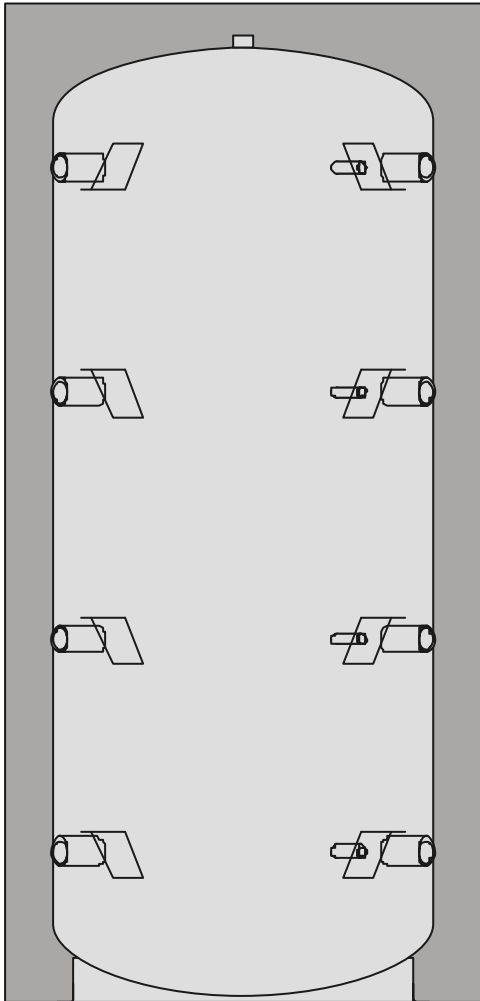
Capacitate: 300 - 1000 ltr
(disponibil in 5 marimi)



Vas tampon

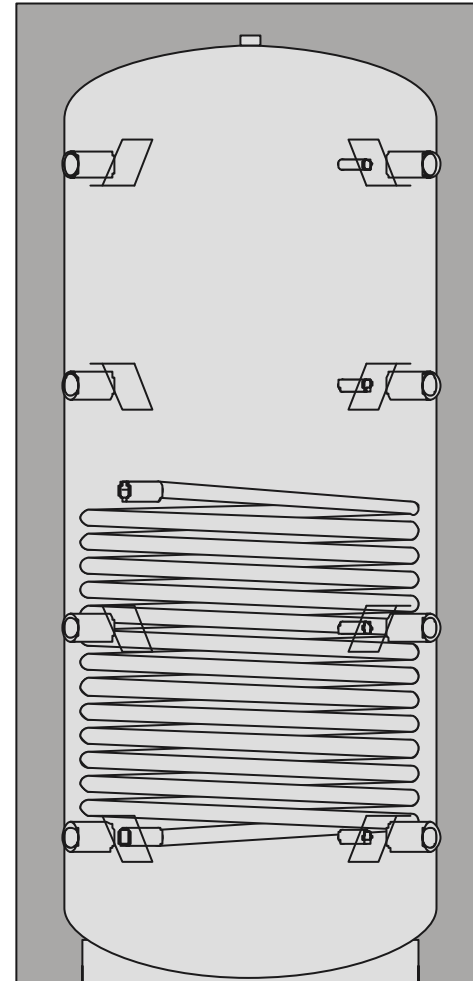
Vas tampon SPU-2

capacitate: 500 -1500 ltr



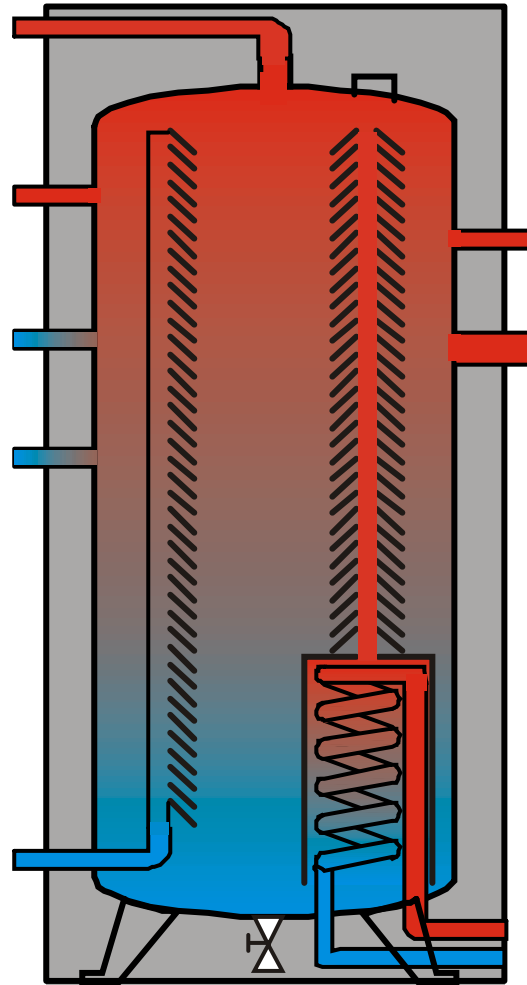
Vas tampon SPU-2-W

capacitate: 500 - 1500 ltr

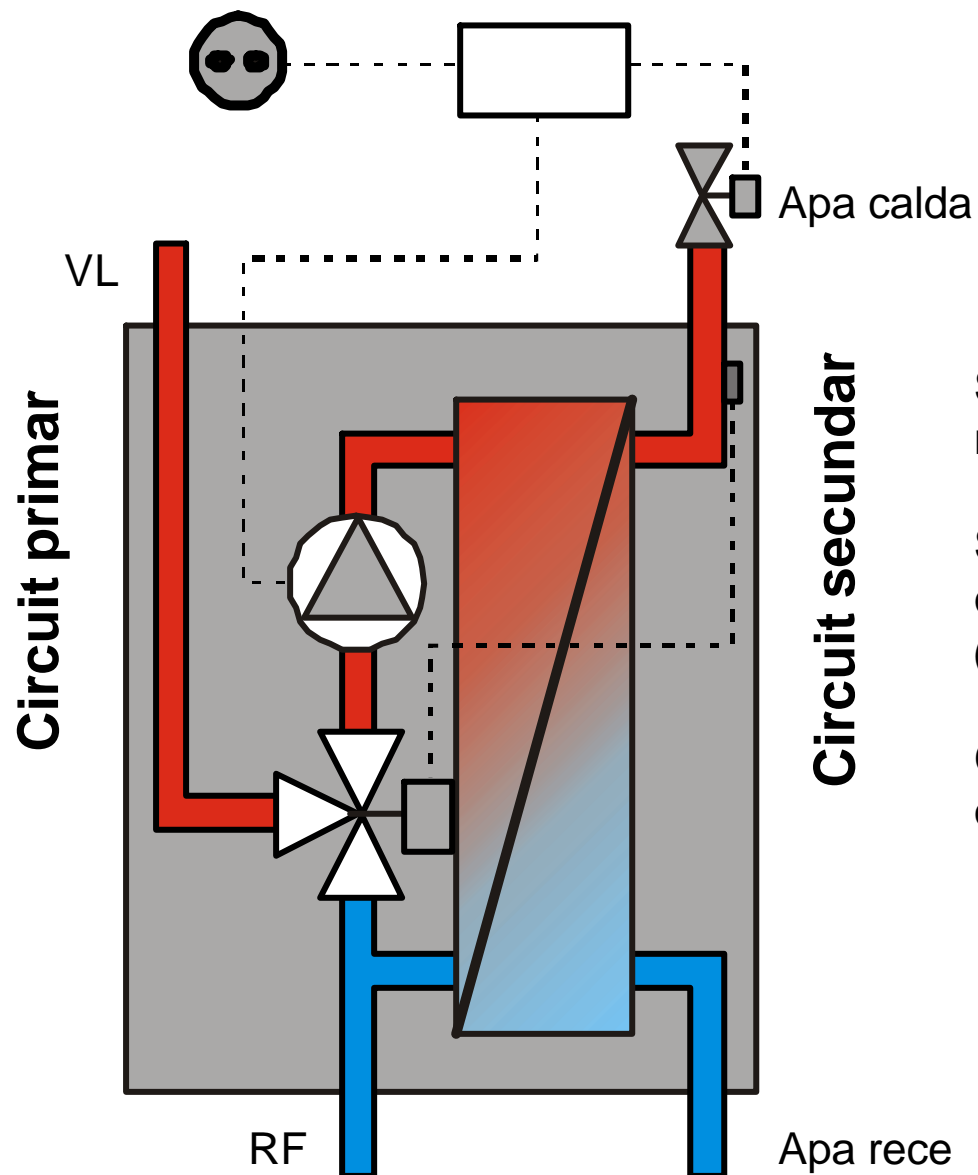


Boiler stocare tip 850

Capacitate: 850 ltr



Statie apa calda menajera

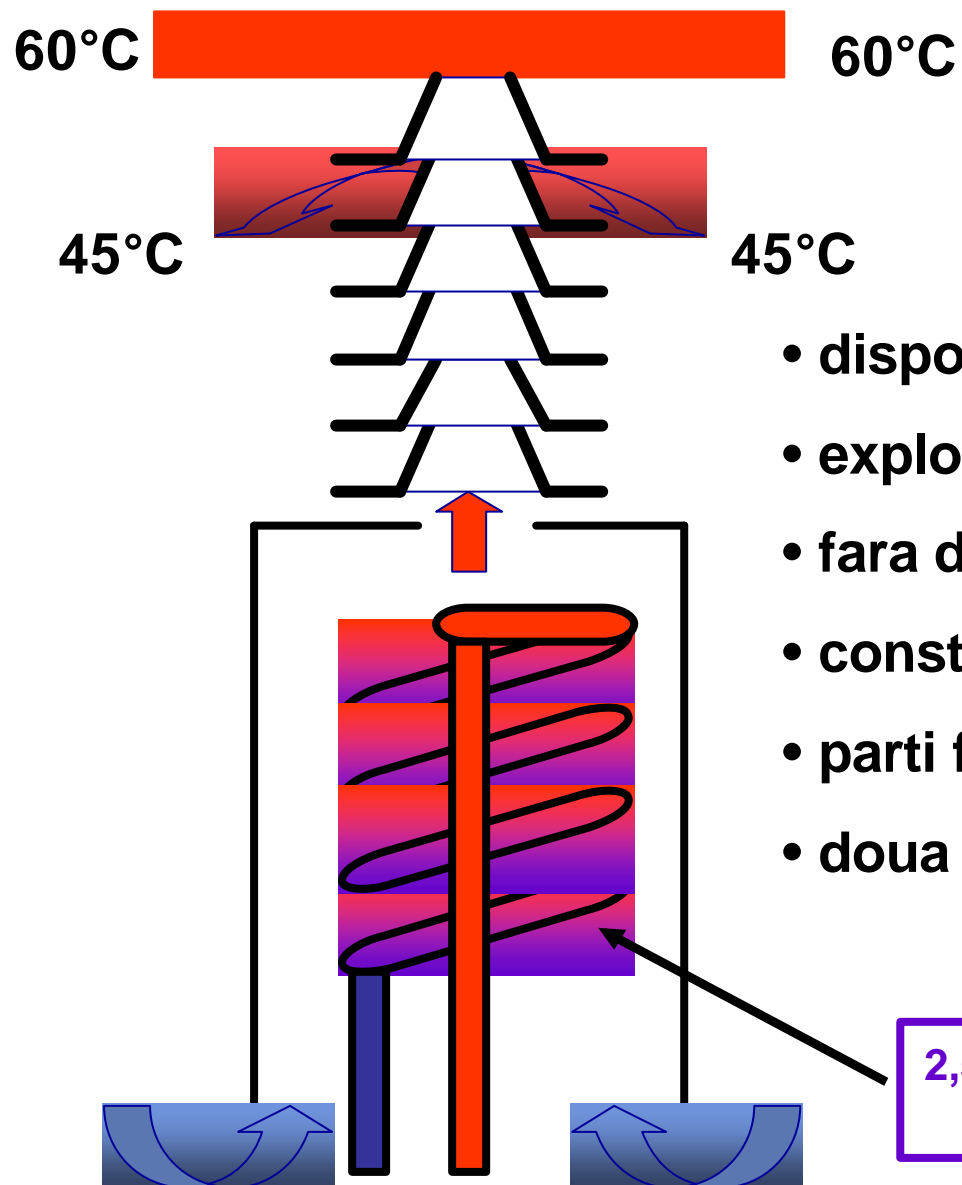


**Statie completa apa calda menajera:
montat, izolat si cablat.**

**Statie de apa proaspata din otel inoxidabil:
capacitate:
(60/20 - 10/45) 50kW (=20 l/min.)**

**Conexiune circulatie:
debit > 1 l/min.**

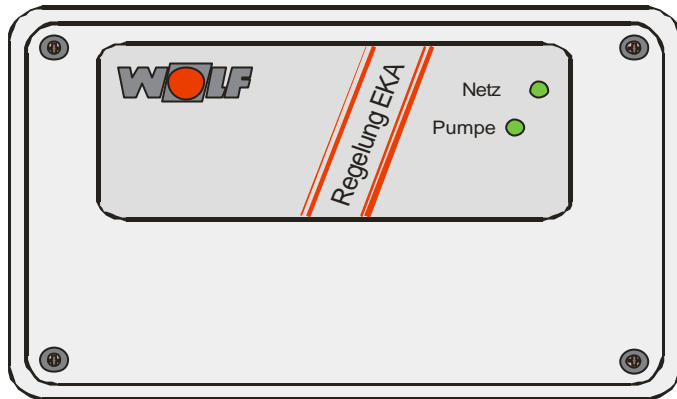
Construcție stratificată a.c.m în boilerul de stocare



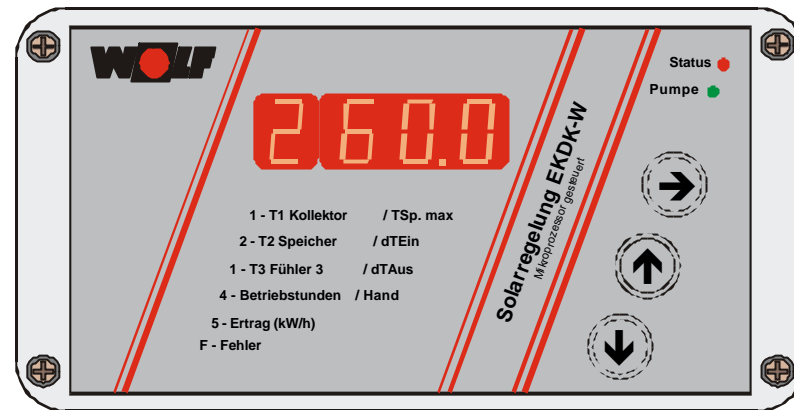
- dispozitiv brevetat
- exploatare optimă a energiei
- fără deteriorarea straturilor
- construcție stratificată precis dimensionată
- părți fixe
- două dispozitive de stratificare

Regulatoare circuit solar

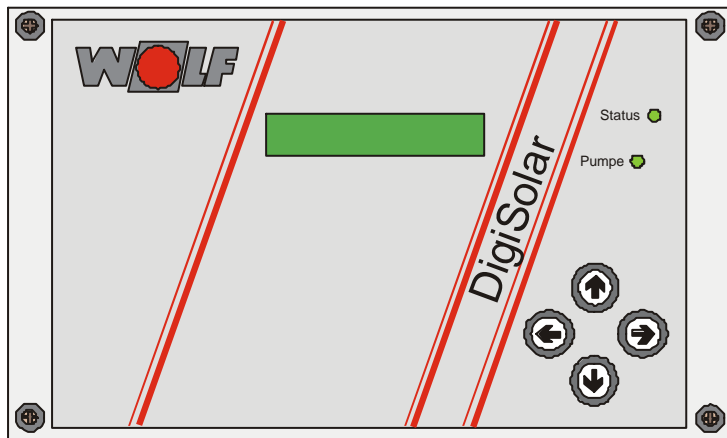
Control un circuit -EKA



Control un circuit - EKDK-W



Control doua circuite



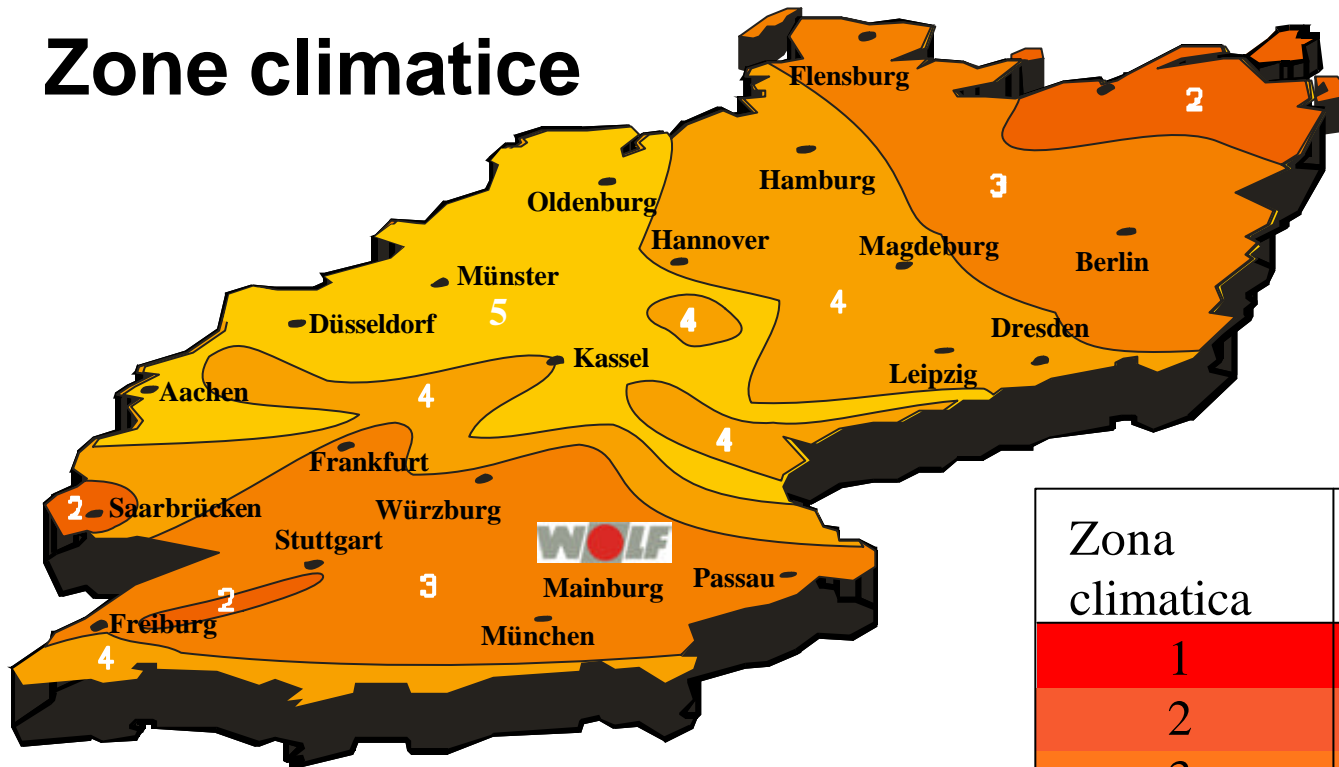
Control trei circuite



Factori pentru dimensionarea colectoarelor solari

Orele cu soare la locul operatiunii trebuie cunoscute in avans.

Zone climatice

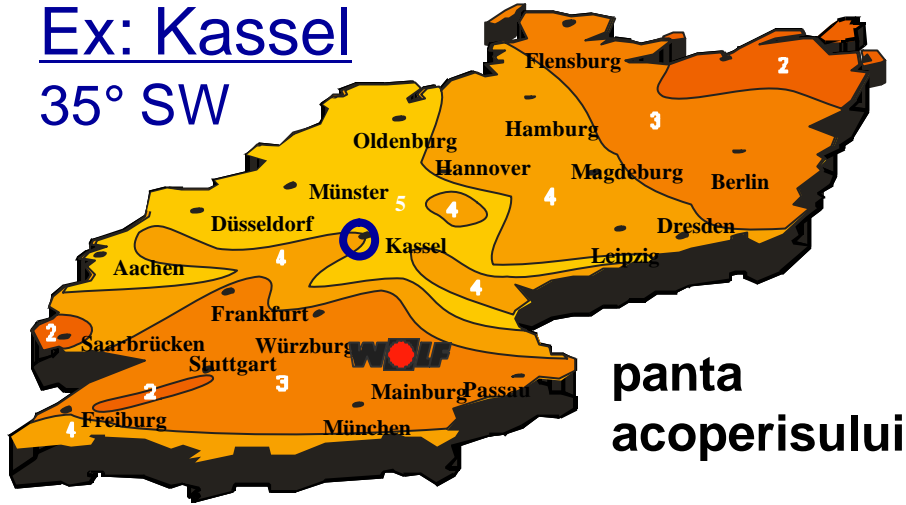


Zona climatica	ore cu soare	factor
1	1900-2000	0,8
2	1800-1900	0,9
3	1700-1800	1,0
4	1600-1700	1,1
5	1500-1600	1,2

Selectia

Ex: Kassel

35° SW



zona climatica	ore cu soare	factor
1	1900-2000	0,8
2	1800-1900	0,9
3	1700-1800	1,0
4	1600-1700	1,1
5	1500-1600	1,2

Panta acoperisul	Orientarea colectoarelor		
	S	SO / SW	O / W
20°	1,2	1,2	1,3
25°	1,1	1,2	1,3
35°	1,0	1,2	1,5
45°	1,0	1,1	1,5
55°	1,1	1,2	1,6
65°	1,2	1,3	1,7
75°	1,3	1,5	1,8

cererea de apa calda				
scazuta		normala		ridicata
0,6	0,8	1,0	1,2	1,5
factor		factor		factor

factor climatic z.		factor panta acoperis		factor cerere de apa calda		numar ocupanti		numar colectori
1,2	X	1,2	X	1,0	X	4	X	0,4 = 2,3

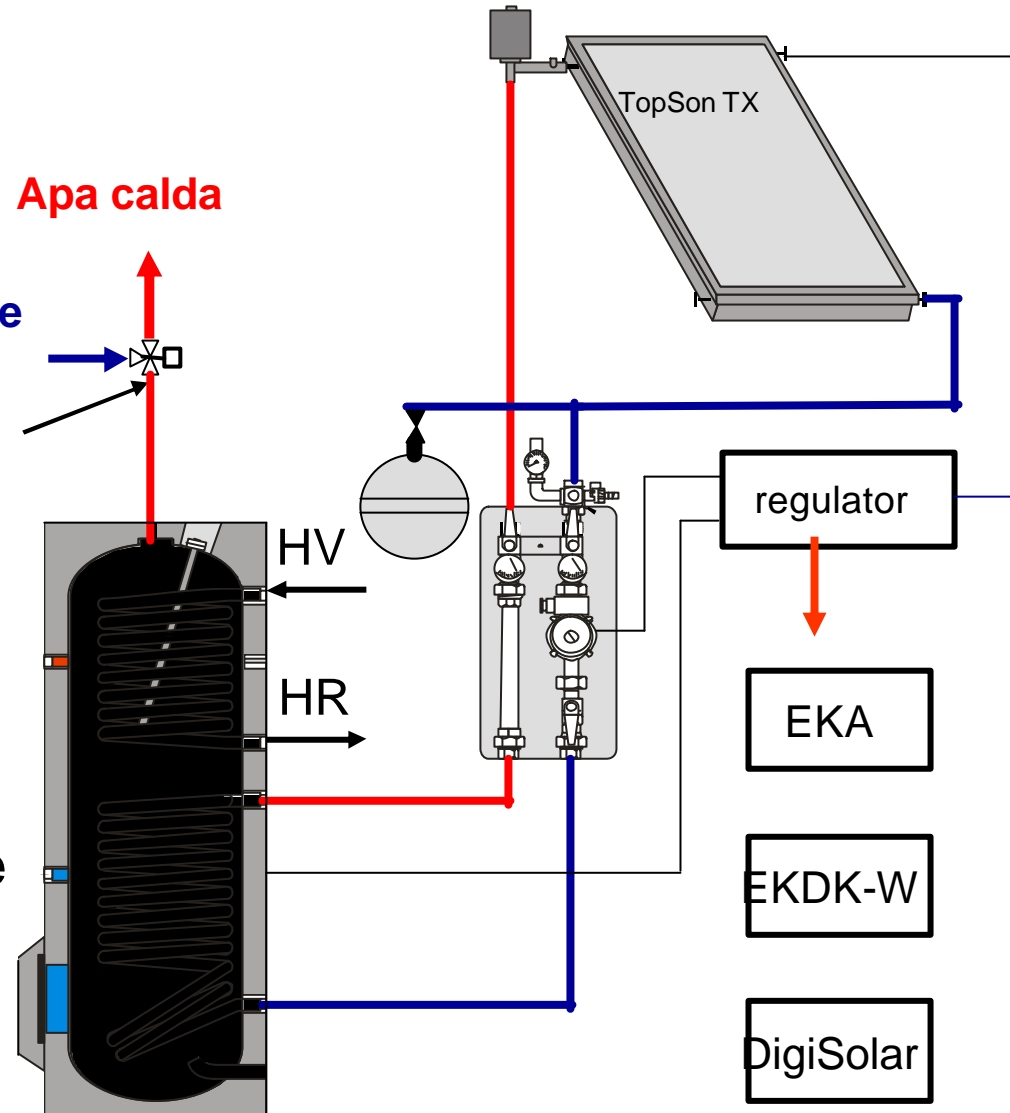
numar ocupanti		factor cerere de apa calda		marime rezervor
4	X	1,0	X	75lTr. = 300 ltr.

Standard sistem solar

Vana de amestec este necesara
daca temperatura in rezervorul de
stocare atinge 60°C
(protectie oparire).

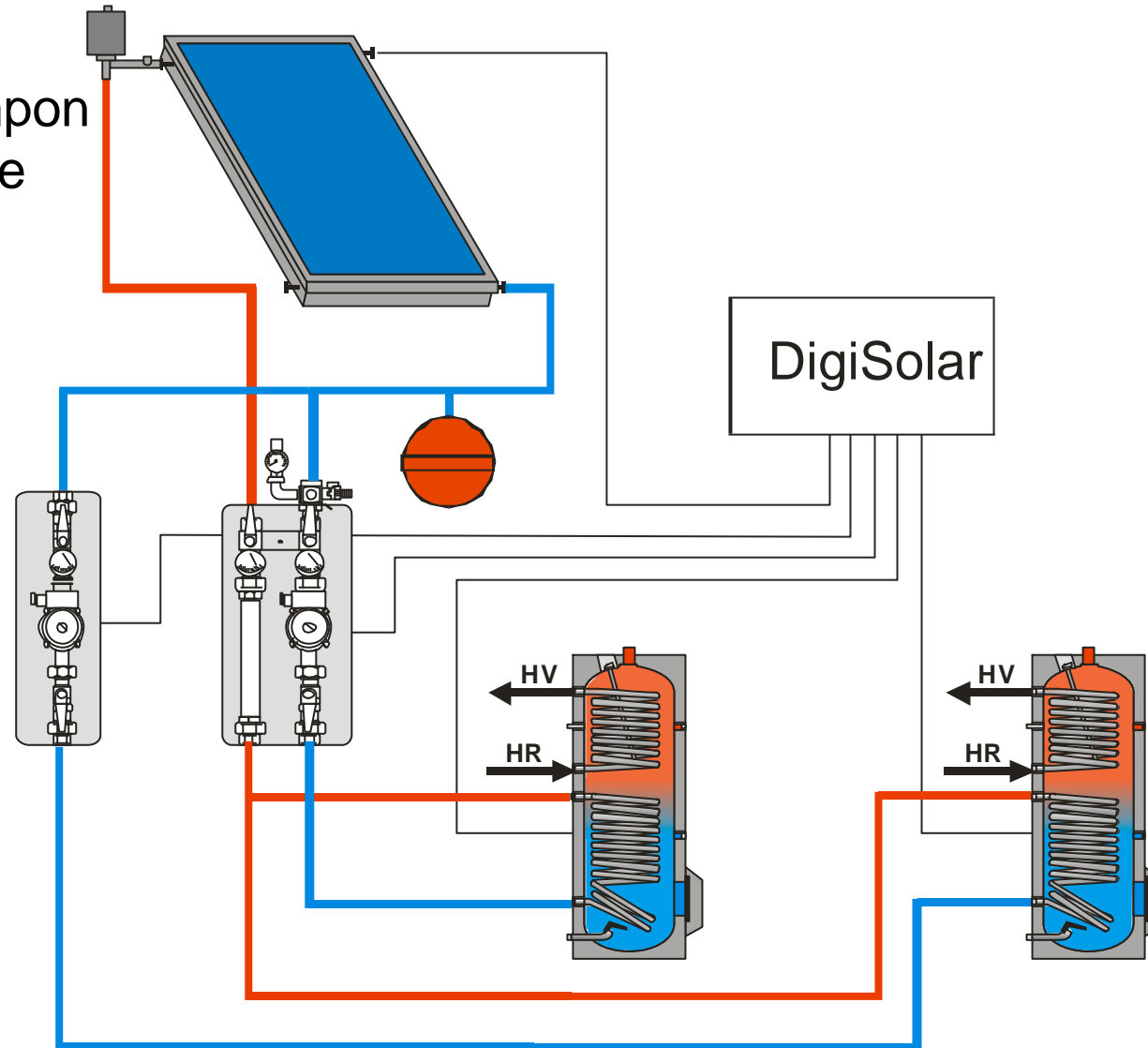
Vana de amestec

Cu cat este mai mare temperatura
in boiler cu atat se stocheaza mai
multa energie in el.
Este rezonabil sa utilizati tempera-
turi ridicate in rezervorul de stocare
daca calcificarea va fi scazuta.



Sistem solar cu doua boilere bivalente

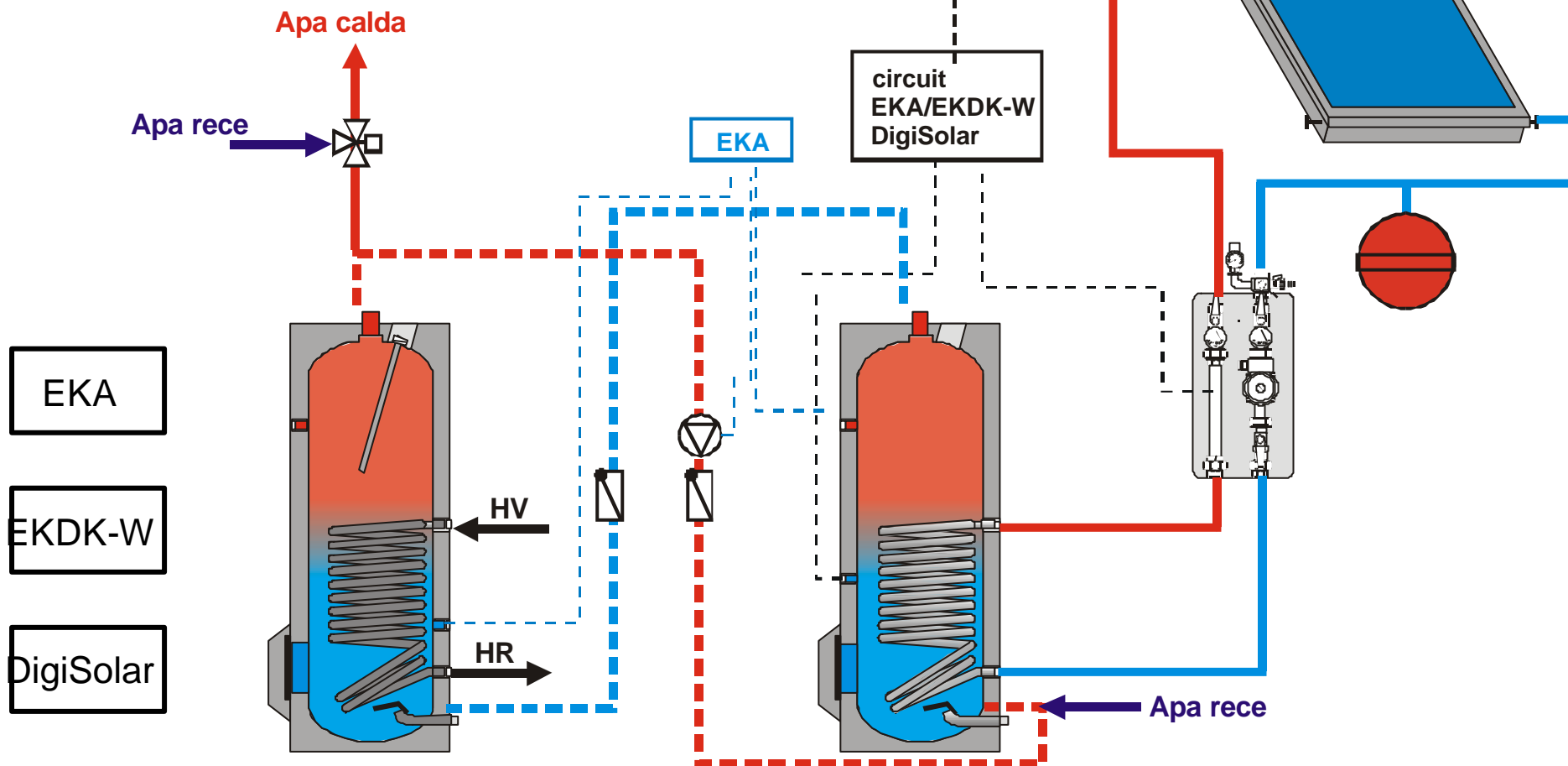
Al 2-lea circuit poate fi un al doilea boiler, un vas tampon pentru sistemul de incalzire sau pentru piscina etc..



Sistem solar cu doua boilere cu preparare-stocare

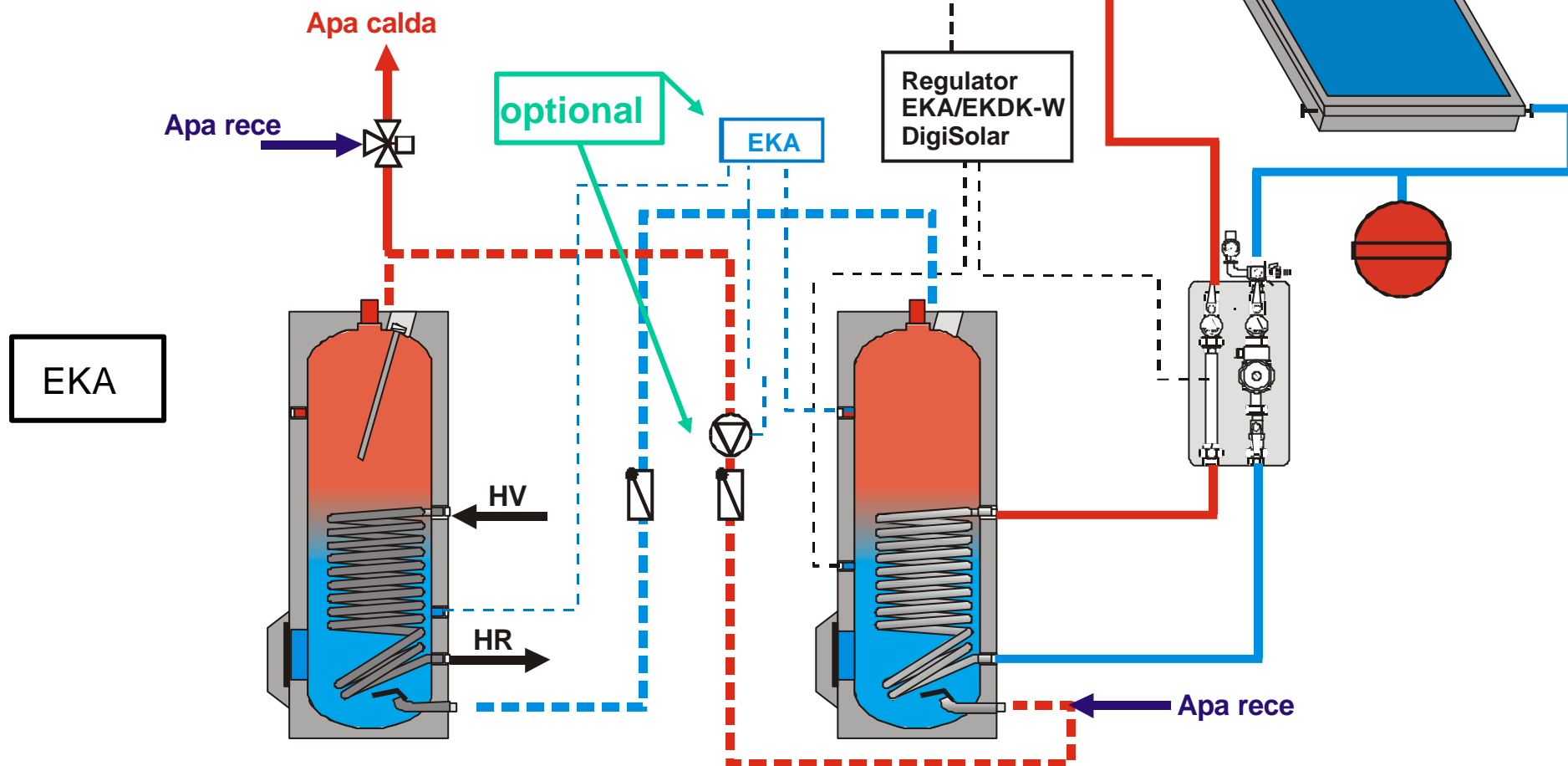
Solutia este recomandata in general acolo unde nu poate fi instalat un boiler inalt.

Ex: attic

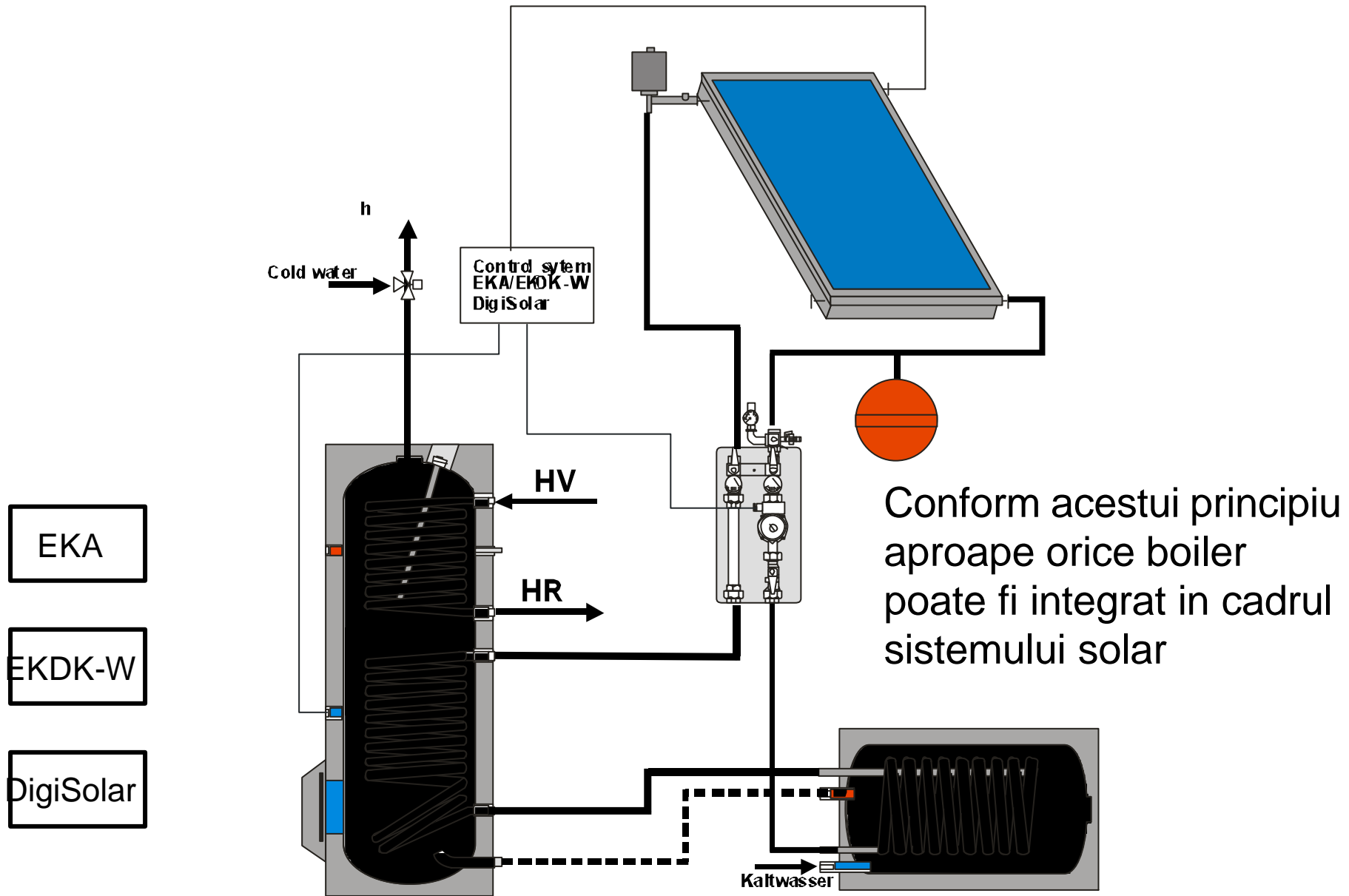


Sistem solar cu doua boilere a.c.m

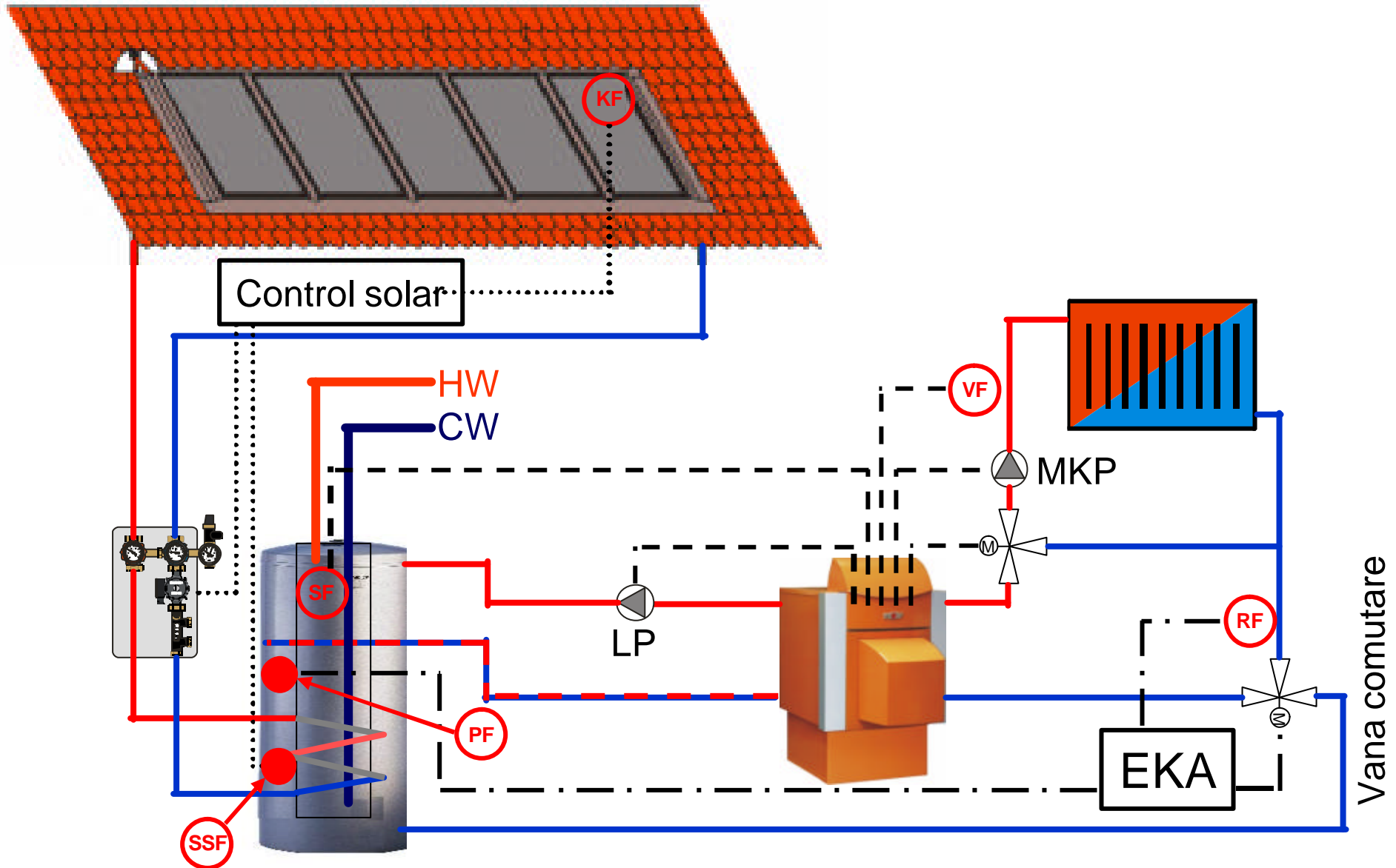
Regulatorul aditional EKS executa o comutare automata a a.c.m in al doilea boiler prin Intermediul liniei de circulatie.



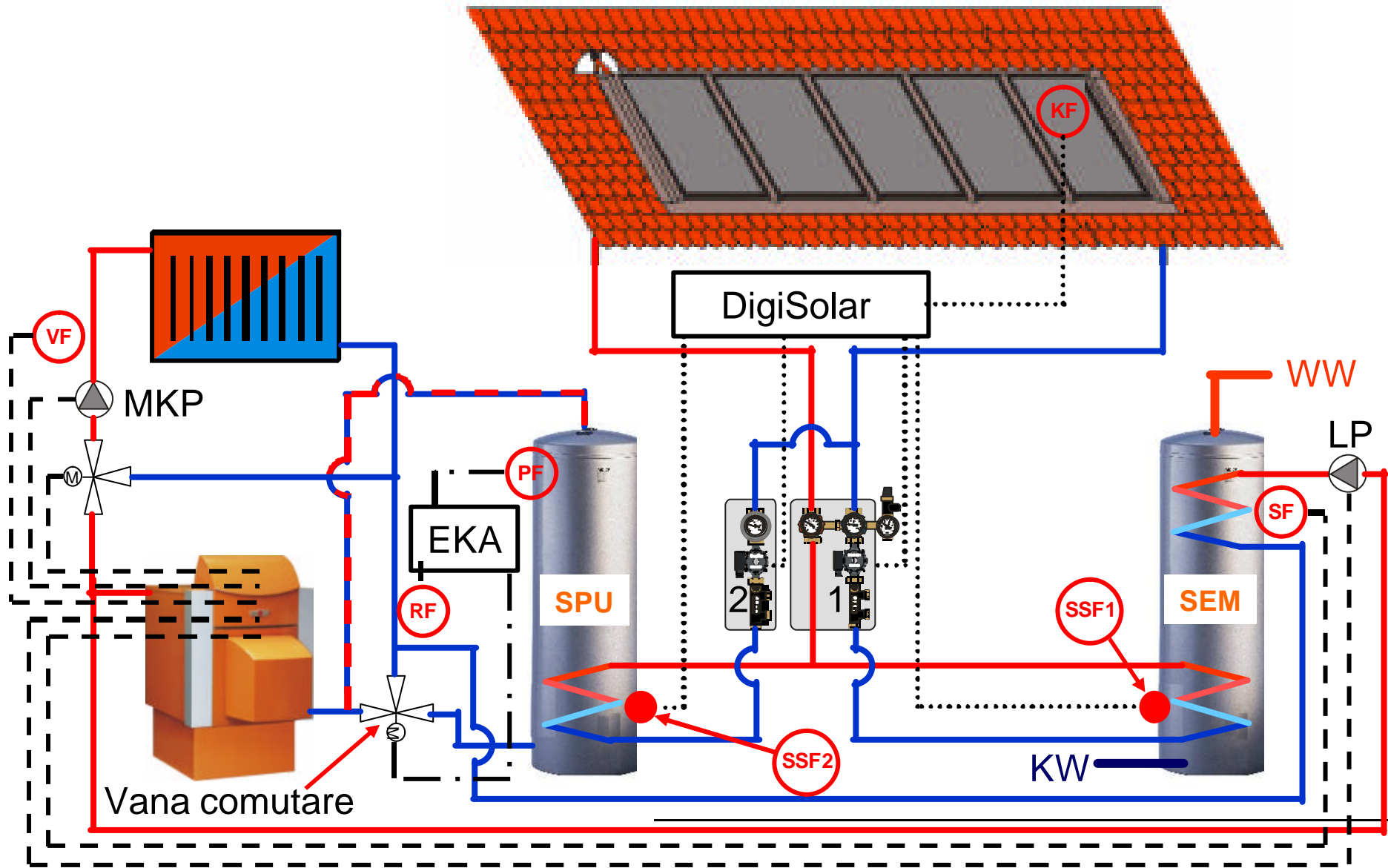
Sistem solar cu un boiler deja existent



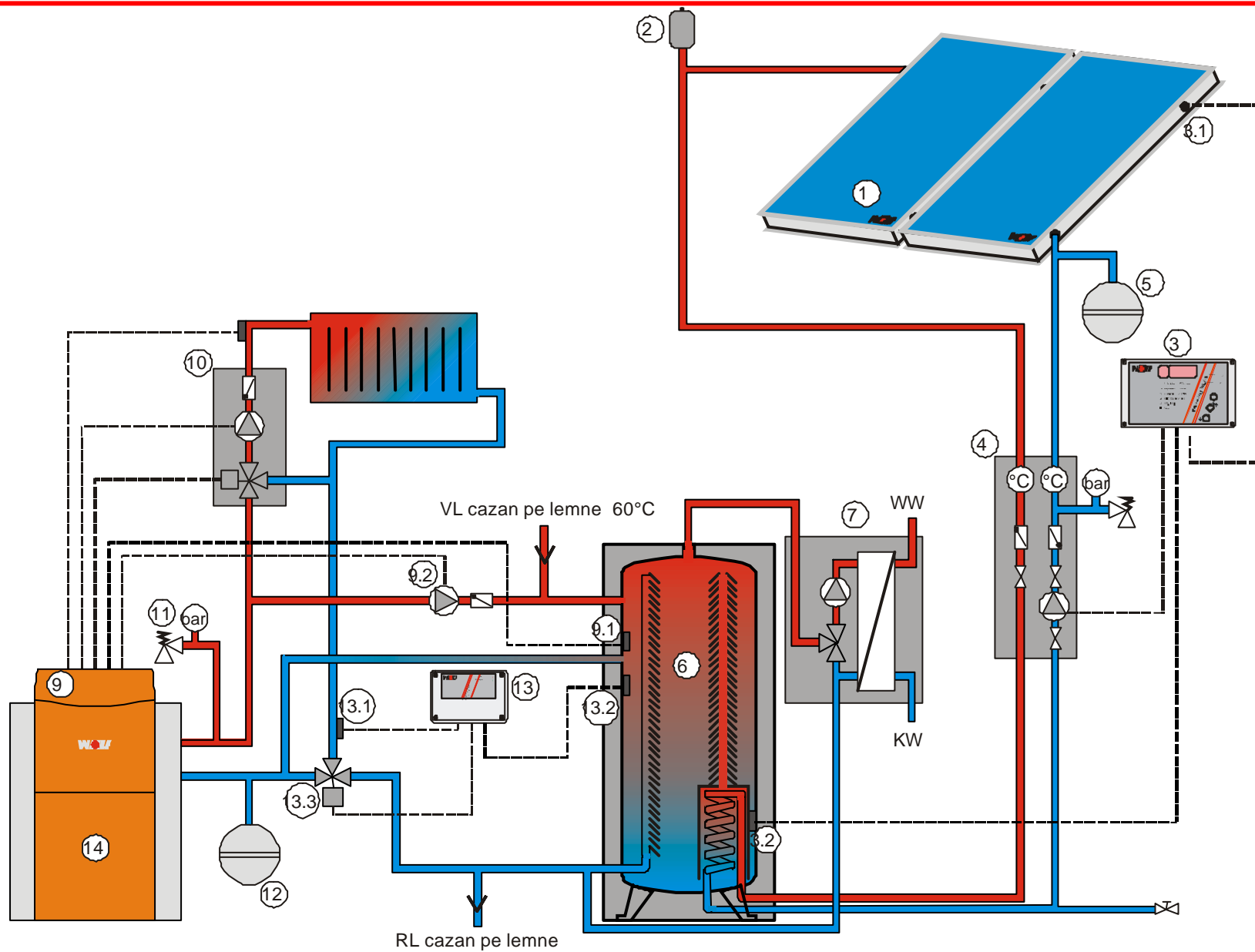
Suport incalzire solara cu boiler dublu SED-6/2



Suport incalzire solara cu vas tampon SPU



Schema hidraulica a boilerului stratificat



Dimensionarea vasului de expansiune solar

$$\underline{VN = \frac{(VG \times 0,1 + VA \times 1,1)}{N}}$$

VN = volumul nominal al vasului de expansiune

VG = cantitatea totala de lichid din circuitul solar in ltr.

VA = volumul de lichid din colectori in ltr.

N = eficienta

N = $\frac{Pe - Po}{Po}$ = presiunea admisibila a boilerului in bar

Pe+1 **Pe** = presiunea sistemului in bar (recomandata:

Pe = presiunea supapei de siguranta -0.5 bar

Exemplu: 5 colectori (1.1 Liter) 30 m teava-Cu 18x1 (capacitate 0.2 ltr/m)
boiler 500 ltr. / WT total 1.95 ltr

$$VN = \frac{(5 \times 1,1 + 30 \times 0,2 + 1,95) \times 0,1 + (5 \times 1,1) \times 1,1}{\frac{(6 - 0,5) - 2,5}{(6 - 0,5) + 1}} = \frac{7,395}{0,462} = 16,00$$

Selectat: vas expansiune ltr.

Exemplu dimensionare estimativ:
Sistem solar cu vas tampon pentru suport incalzire

Cerinte: Q_H bei + - 0°C (aproximativ 60% din Q_n)

Volum vas tampon

Exemplu:
$$\frac{Q_H \times h/d \times 860}{5 \text{ kW} \times 8 \text{ h} \times 860} / \frac{Dt}{35} = \text{Volum vas tampon ltr.}$$
$$= 982,12 \text{ ltr.}$$

Aprox. = SPU 1.000 ltr. capacitate

Suprafata colectoare ceruta in m²

Volum vas tampon ltr / capacitate min. de stocare / m² suprafata colectoare

$$\frac{1000}{ca.80 \text{ ltr.}} = 12,50 \text{ m}^2$$

Cantitatea ceruta de colectori TopSon TX

suprafata colectoare ceruta m² / m² / colector

$$\frac{12,50}{2,1} = 5,9 \text{ buc.}$$

Aprox. = 6 colectori

Recomandare: vas tampon de 160-200 ltr. /colector