



INSTITUT GRAĐEVINARSTVA HRVATSKE d.d.
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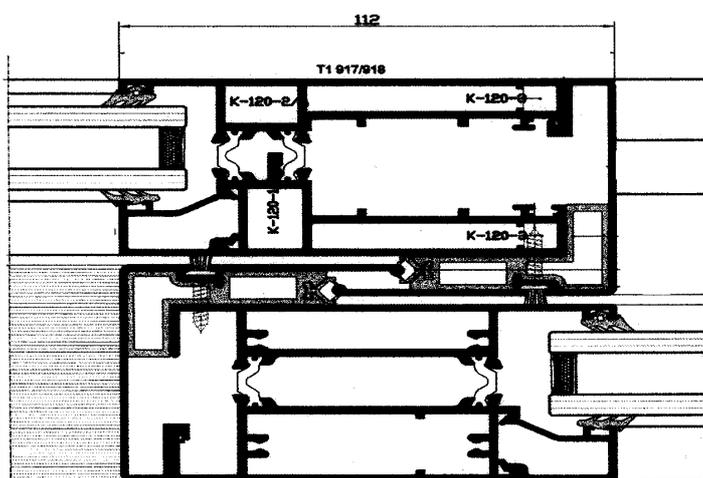
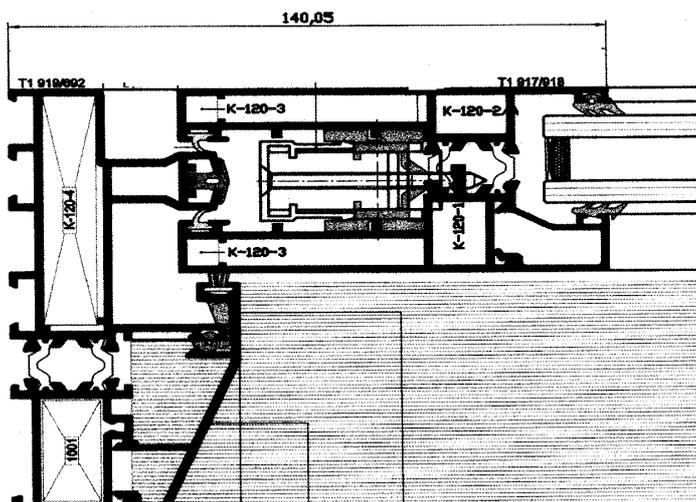
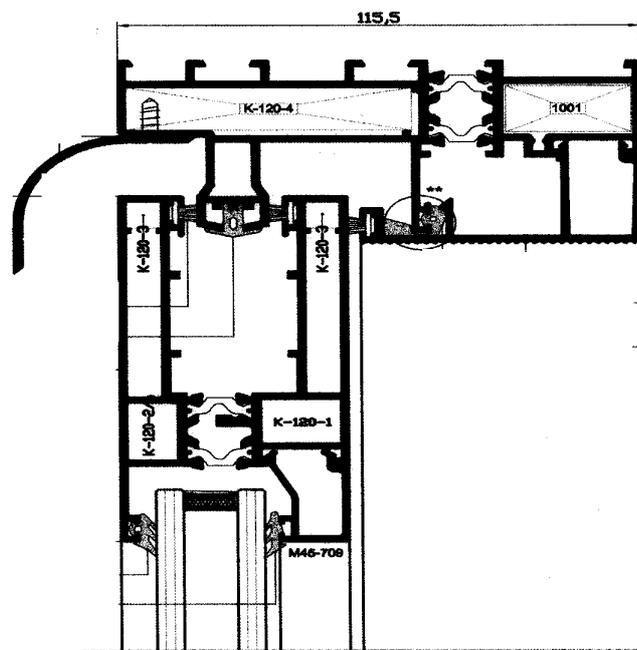
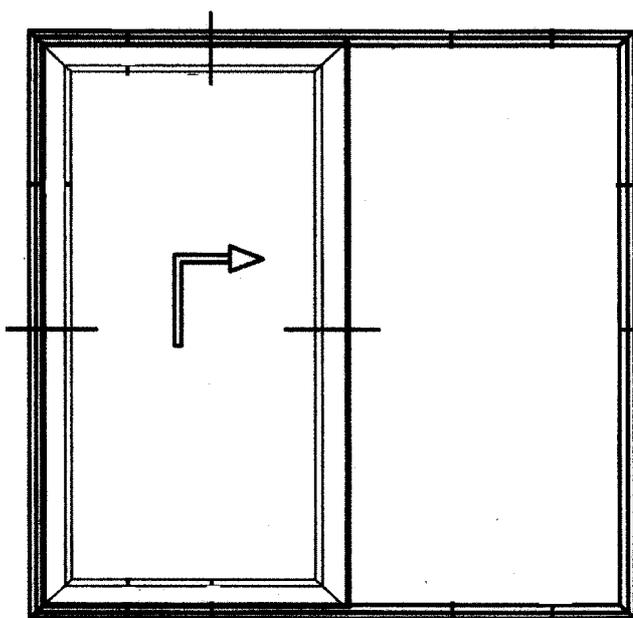
IZVJEŠTAJ O ISPITIVANJU BR. 2920-875/06

Opis ispitnog uzorka:

Ispitivanja zrakopropusnosti, vodonepropusnosti, otpornosti na opterećenje vjetroṃ i zvučne izolacije provedena su na uzorku klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom, vanjskih izmjera 2,0 m x 2,10 m. Otvarajući dio je izmjera 1,005 m x 2,1 m. Uzorak je ostakljen IZO staklom debljine 24 mm (6 mm vanjsko float staklo + 12 mm zrak + 6 mm unutarnje float staklo s low-e premazom).

Upotrebene su brtve EPDM kvalitete proizvođača COMPLASTEX (Italija), poliamidi proizvođača TECHNOFORM (Njemačka) i sljedeći okovi:

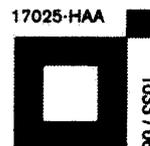
- kutnici iz al. slitine AlMgSi0.5 – proizvođač FEAL-Široki Brijeg,
- okov za zatvaranje po obodu sa ručkom - proizvođač NOTTER (Njemačka).





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- kutnici iz al. slitine AlMgSi0.5 – proizvođač FEAL-Široki Brijeg,
- okov za zatvaranje po obodu sa ručkom - proizvođač NOTTER (Njemačka).

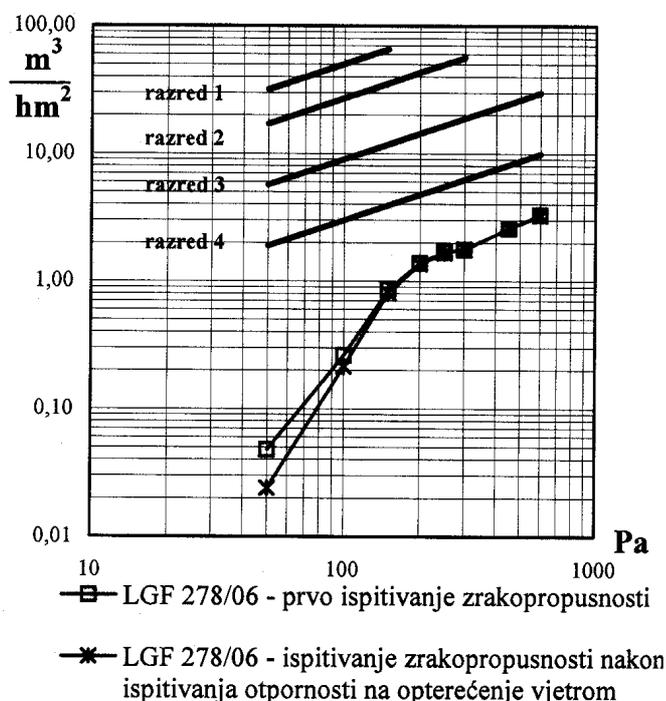
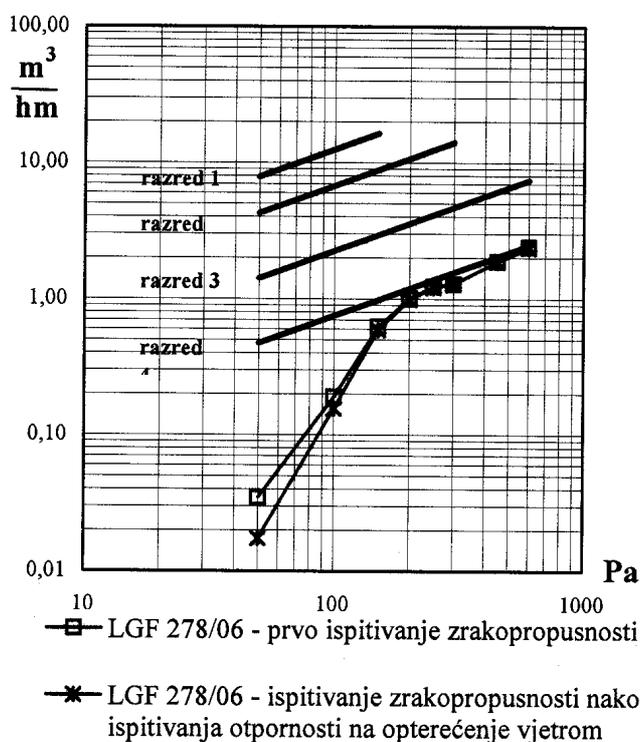
DIO: ZRAKOPROPUSNOST

Ispitivanje klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom, označene kao LGF 278/06, provedeno je u skladu s HRN EN 1026:2000, pozitivnim i negativnim opterećenjem na tlak.

Ploština ispitnog uzorka: $A = 4,20 \text{ m}^2$.

Duljina sljubnica ispitnog uzorka: $l = 5,78 \text{ m}$.

Protok zraka po jedinici duljine sljubnica i po jedinici ploštine uzorka prikazan je, kao funkcija razlike tlakova, dijagramima i tablicama u nastavku.

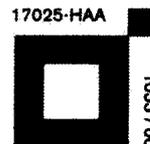


S obzirom na zrakopropusnost, ispitana klizna stijena TERMO 120+ plus s integriranim fiksnim dijelom, ostakljena IZO-staklom debljine 24 mm, proizvođača FEAL d.o.o. d.o.o., može se svrstati u *razred 4*, u skladu s HRN EN 12207:2001.



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DIO: VODONEPROPUSNOST

Rezultati ispitivanja prikazani su tablicom:

TLAK Δp (Pa)	VRIJEME τ (min)	LGF 278/06	RAZRED (HRN EN 12208:2001)
0	15	+	1 A
50	5	+	2 A
100	5	+	3 A
150	5	+	4 A
200	5	+	5 A
250	5	+	6 A
300	5	+	7 A
450	5	+	8 A
600	5	+	9 A

- + Znači da nije došlo do propuštanja vode.
- ▽ Znači da je došlo do propuštanja vode.

Tijekom ispitivanja u skladu s HRN EN 1027:2001, u rasponu natisnog tlaka od 0 Pa do 600 Pa, ispitani uzorak LGF 278/06 nije propustio vodu.

S obzirom na vodonepropusnost, ispitana klizna stijena TERMO 120+ plus s integriranim fiksnim dijelom, ostakljena IZO-staklom debljine 24 mm, proizvođača FEAL d.o.o. d.o.o., može se svrstati u razred 9A, u skladu s HRN EN 12208:2001.

DIO: OTPORNOST NA OPTEREĆENJE VJETROM

REZULTATI ISPITIVANJA ČEONOG SAVIJANJA

Ispitivanje je provedeno na otvarajućem dijelu ispitnog uzorka klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom gdje postoji najveći razmak između dva susjedna učvršćenja kliznog krila i dovratnika.

B – mjerno mjesto na sredini između A i C mjesta (oznaka na crtežu),

A – mjerno mjesto u gornjoj točki učvršćenja kliznog krila za dovratnik (oznaka na crtežu),

C – mjerno mjesto u donjoj točki učvršćenja kliznog krila za dovratnik (oznaka na crtežu),

A_0 , B_0 , C_0 , – početno stanje s obzirom na pomak koje je ugođeno tako da pokazuje 0 mm pri $\Delta p = 0$ (Pa),

A_P – čeonni pomak na mjernom mjestu A pri iskazanoj razlici tlakova P1,

B_P – čeonni pomak na mjernom mjestu B pri iskazanoj razlici tlakova P1,

C_P – čeonni pomak na mjernom mjestu C pri iskazanoj razlici tlakova P1,

$F_P = (B_P) - ((A_P) + (C_P))/2$ - čeonno savijanje,

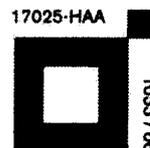
L = 1,46 m - razmak između točaka A i C,

$F_{rp} = F_P / L$ - relativno čeonno savijanje.



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TLAK Δp (Pa)	LGF 278/06					TLAK Δp (Pa)	LGF 278/06				
	A_P (mm)	B_P (mm)	C_P (mm)	F_P (mm)	F_{rp} ($\times 10^{-4}$)		A_P (mm)	B_P (mm)	C_P (mm)	F_P (mm)	F_{rp} ($\times 10^{-4}$)
100	-0,2	-0,3	-0,1	-0,15	-1,03	-100	0,1	0,3	0,1	0,25	1,71
200	-0,3	-0,5	-0,3	-0,20	-1,37	-200	0,3	0,6	0,3	0,35	2,40
300	-0,4	-0,8	-0,4	-0,40	-2,74	-300	0,4	0,9	0,5	0,50	3,42
400	-0,6	-1,1	-0,5	-0,55	-3,77	-400	0,5	1,2	0,7	0,65	4,45
500	-0,8	-1,3	-0,6	-0,60	-4,11	-500	0,6	1,5	0,9	0,80	5,48
600	-0,9	-1,6	-0,8	-0,75	-5,14	-600	0,8	1,8	1,1	0,90	6,16
700	-1,0	-1,9	-0,8	-1,00	-6,85	-700	0,9	2,0	1,3	0,95	6,51
800	-1,2	-2,1	-0,9	-1,05	-7,19	-800	1,1	2,2	1,5	0,95	6,51
900	-1,3	-2,4	-1,0	-1,25	-8,56	-900	1,2	2,6	1,6	1,25	8,56
1000	-1,5	-2,6	-1,1	-1,30	-8,90	-1000	1,3	2,8	1,6	1,40	9,59
1100	-1,6	-2,8	-1,2	-1,40	-9,59	-1100	1,5	3,0	1,8	1,40	9,59
1200	-1,8	-3,0	-1,2	-1,50	-10,27	-1200	1,5	3,1	1,8	1,50	10,27

S obzirom na relativno čeono savijanje, na dijelu ispitnog uzorka klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom (laboratorijska oznaka uzorka LGF 278/06), proizvođača FEAL d.o.o., može se svrstati u razred C ($F_{rp} < 1/300$), u skladu s HRN EN 12210:2001, budući da je maksimalno relativno čeono savijanje iznosilo 1/973.

REZULTATI ISPITIVANJA OTPORNOSTI PROMJENJIVIM TLAKOM P2

Ispitivanje je provedeno s 50 impulsa promjenjivog tlaka P2 od ± 600 Pa, a iznosi polovicu maksimalnog tlaka P1.

Nakon provedenog opterećenja, na uzorku klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom (laboratorijska oznaka uzorka LGF 278/06), nije bilo vidljivih oštećenja niti promjena na cijelom uzorku, kao niti promjena u funkcionalnosti ili oštećenja otvarajućeg dijela.

REZULTATI SIGURNOSNOG ISPITIVANJA

Ispitivanje sigurnosti je provedeno s jednim impulsom od -1800 Pa i s jednim impulsom od $+1800$ Pa.

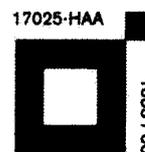
Nakon provedenog opterećenja, na uzorku klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom (laboratorijska oznaka uzorka LGF 278/06), nije bilo vidljivih napuknuća na bilo kojem dijelu uzorka (staklo, okvir i okovi), niti je došlo do otvaranja otvarajućeg dijela.

Ponovljeno ispitivanje zrakopropusnosti na uzorku klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom (laboratorijska oznaka uzorka LGF 278/06), nakon ispitivanja otpornosti na opterećenje vjetrom, pokazuje da nije došlo do povećanja vrijednosti od 20 %, već je došlo do smanjenja propusnosti zraka u odnosu na prvo ispitivanje zrakopropusnosti.

S obzirom na ispitivanje otpornosti na opterećenje vjetrom, ispitani uzorak klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom (laboratorijska oznaka uzorka LGF 278/06), proizvođača FEAL d.o.o., može se svrstati u razred C 3, u skladu s HRN EN 12210:2001.



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DIO: ZVUČNA IZOLACIJA

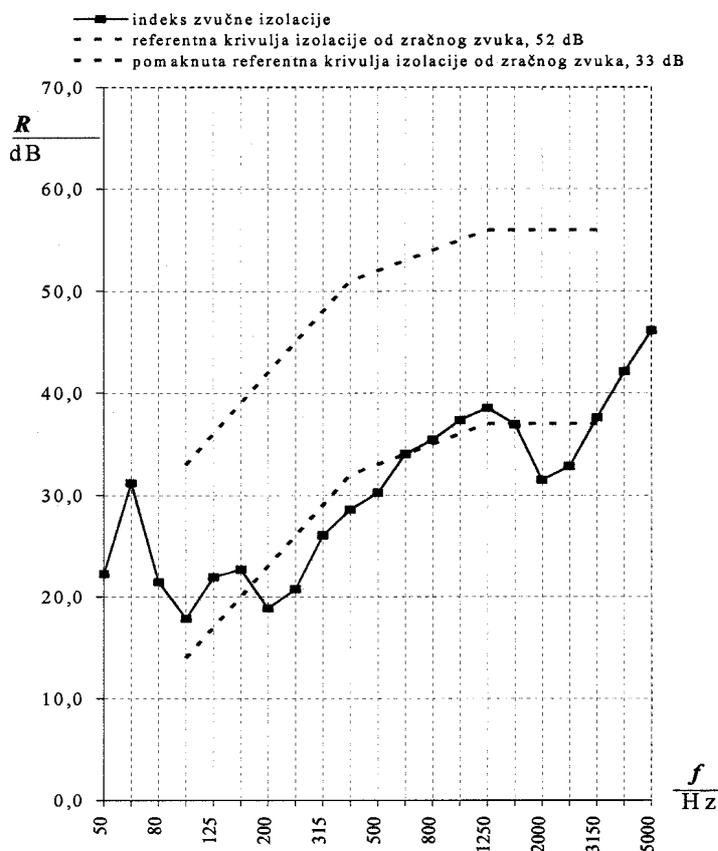
Indeks zvučne izolacije ispitivanog uzorka prikazan je, kao funkcija frekvencije, dijagramom i tablicom.
 Pri iskazivanju rezultata ispitivanja rabljene su ove oznake:

- f središnja frekvencija terca (Hz),
- R indeks zvučne izolacije (dB),
- R_w vrednovani indeks zvučne izolacije (dB)

Tablica:

Dijagram:

frekvencija f (Hz)	terca R (dB)
50	22,3
63	31,2
80	21,5
100	17,9
125	22,0
160	22,7
200	18,9
250	20,8
315	26,1
400	28,6
500	30,2
630	34,0
800	35,4
1000	37,3
1250	38,5
1600	36,9
2000	31,5
2500	32,8
3150	37,6
4000	42,1
5000	46,1



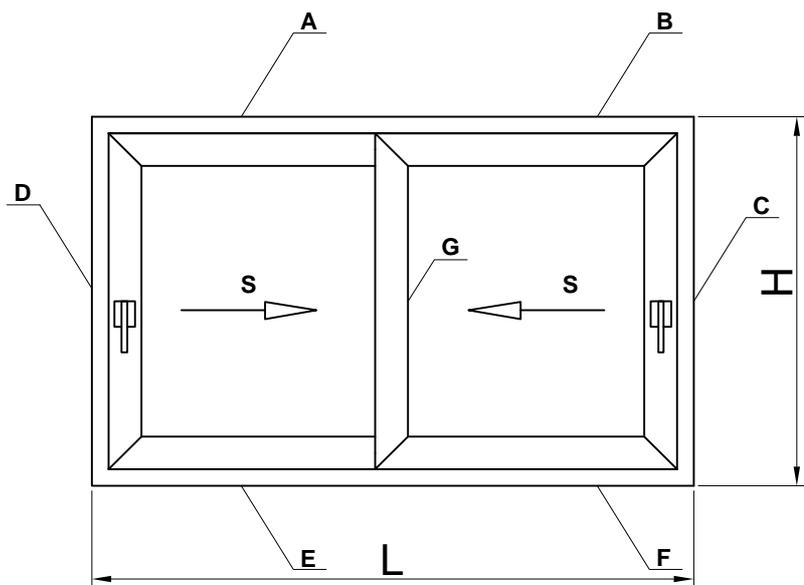
Temeljem rezultata ispitivanja, vrednovani indeks zvučne izolacije za ispitani uzorak klizne stijene TERMO 120+ plus s integriranim fiksnim dijelom (laboratorijska oznaka uzorka LGF 278/06), proizvođača FEAL d.o.o., u skladu s normom HRN EN ISO 717-1:1998., iznosi:

$$R_w (C; C_{tr}; C_{50-5000}; C_{tr,50-5000}) = 33 (-1; -4; -1; -5) \text{ dB.}$$

Voditelj ispitivanja:

Zlatko Frančić

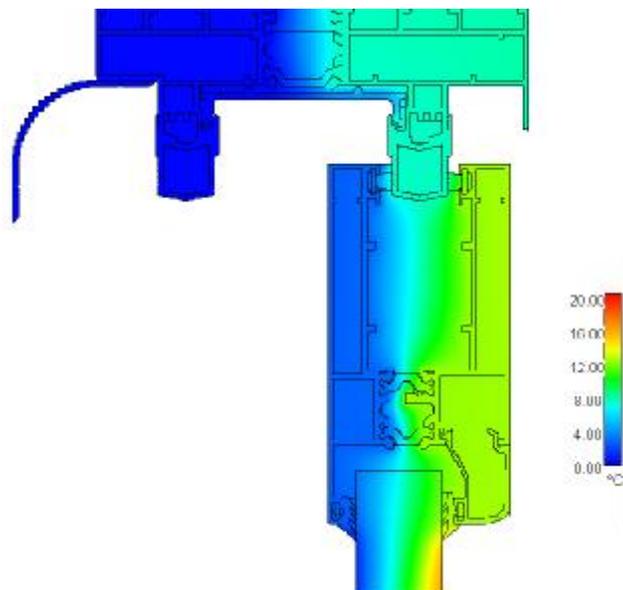
dr. sc. Ivica Kušević, dipl. ing. fizike



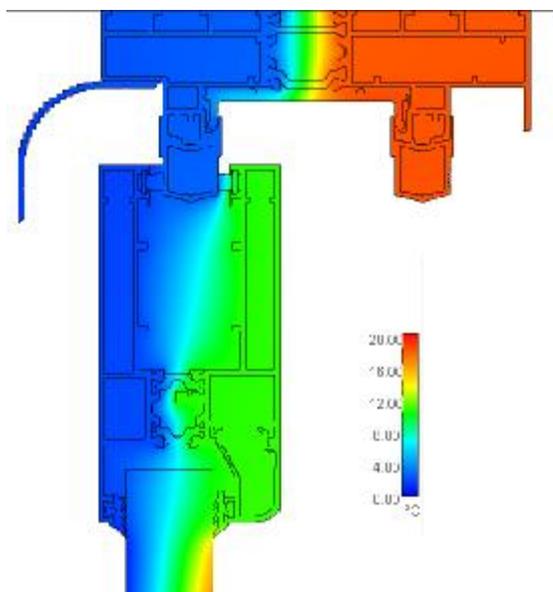
Proračun koeficijenta prolaska topline počiva na dvodimenzionalnoj numeričkoj metodi konačnih elemenata određene prema prEN ISO 10077-2.

DIMENZIJE	L	(m)	2.6
	H	(m)	2.4
A-vodoravnica	U_A	(W/m ² K)	5.59
B-vodoravnica	U_B	(W/m ² K)	5.62
C-okomica	U_C	(W/m ² K)	4.2
D-okomica	U_D	(W/m ² K)	4.4
E-vodoravnica	U_E	(W/m ² K)	4.4
F-vodoravnica	U_F	(W/m ² K)	4.2
G-prečka	U_G	(W/m ² K)	5.58
S-staklo	U_S	(W/m ² K)	1.1
Kombinacija stakla i profila	U_w	(W/m ² K)	2.14

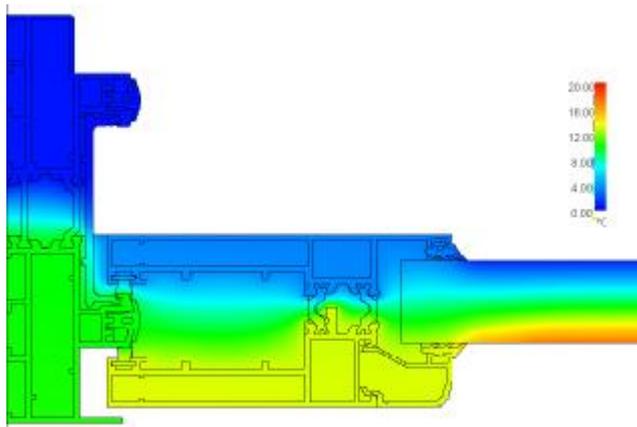
Temperaturni dijagram za A



Temperaturni dijagram za B



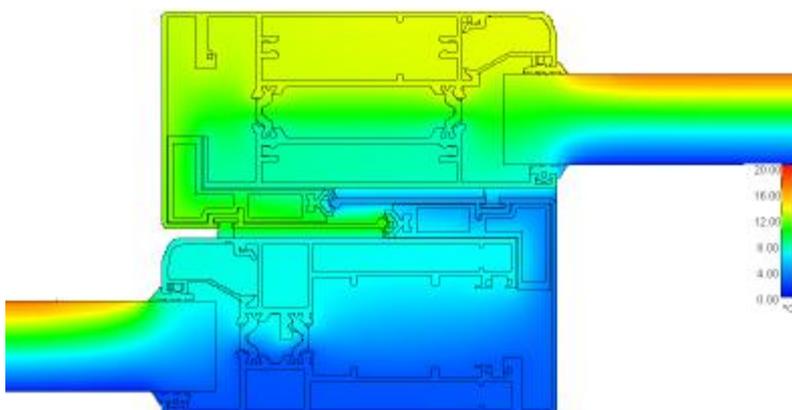
Temperaturni dijagram za D i E

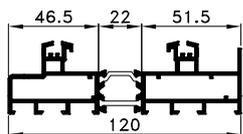


Temperaturni dijagram za C i F

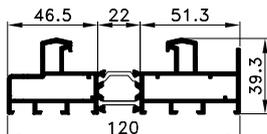


Temperaturni dijagram za G

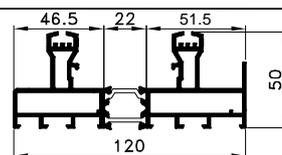




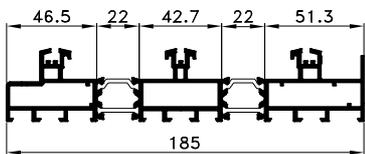
T1 920/922
tež.:2.06 kg/m'



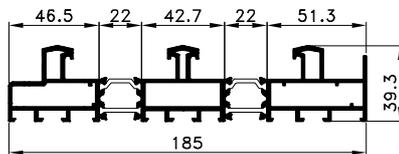
T1 901/902
tež.:2.05 kg/m'



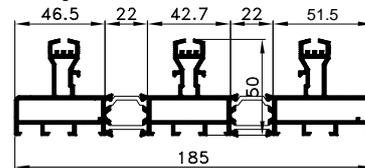
T1 928/929
tež.:2.328 kg/m'



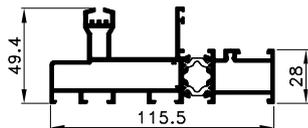
T1 920/21/22
tež.:3.14 kg/m'



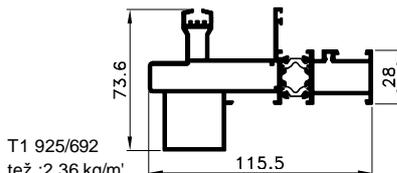
T1 901/2/3
tež.:3.16 kg/m'



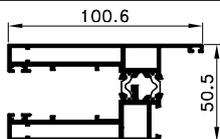
T1 928/29/30
tež.:3.579 kg/m'



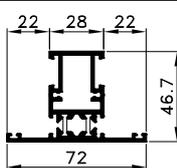
T1 919/692
tež.:2.11 kg/m'



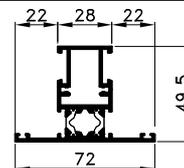
T1 925/692
tež.:2.36 kg/m'



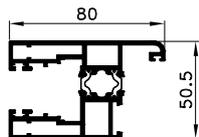
T1 917/918
tež.:2.18 kg/m'



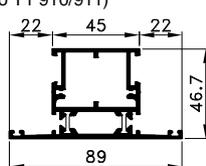
FT-0104/TK
tež.:1.28 kg/m'
(za krilo T1 910/911)



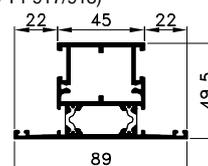
FT-0104
tež.:1.27 kg/m'
(za krilo T1 917/918)



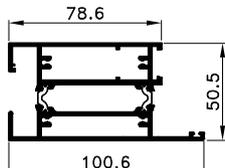
T1 910/911
tež.:1.81 kg/m'



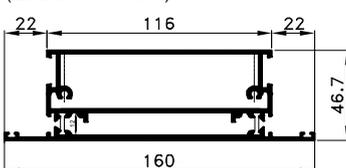
FT-0105/TK
tež.:1.508 kg/m'
(za krilo T1 910/911)



FT-0105
tež.:1.548 kg/m'
(za krilo T1 917/918)



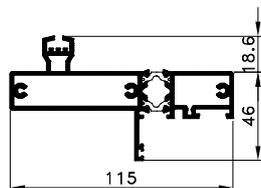
T1 923/924
tež.:2.10 kg/m'



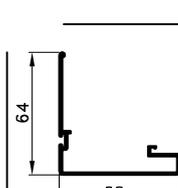
FT-0113/TK
tež.:2.886 kg/m'
(za krilo T1 910/911)



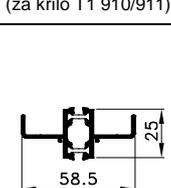
FT-0113
tež.:2.926 kg/m'
(za krilo T1 917/918)



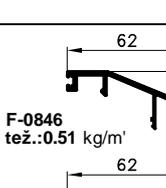
T1 926/927
tež.:2.089 kg/m'



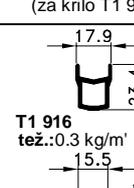
T1 912
tež.:0.63 kg/m'



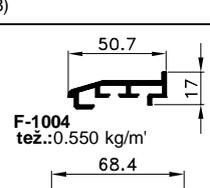
T1 913/2
tež.:0.8 kg/m'



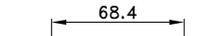
F-0846
tež.:0.51 kg/m'



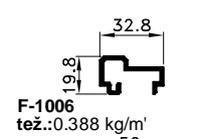
T1 916
tež.:0.3 kg/m'



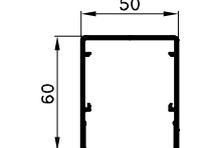
F-1004
tež.:0.550 kg/m'



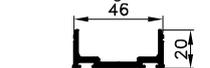
F-1005
tež.:0.639 kg/m'



F-1006
tež.:0.388 kg/m'



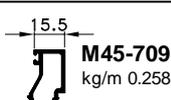
FMO 50/61
tež.:0.785 kg/m'



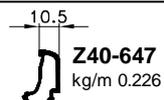
FMO-50/20-D
tež.:0.558 kg/m'



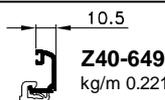
Z40-660
kg/m 0.179



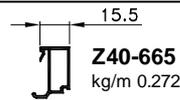
M45-709
kg/m 0.258



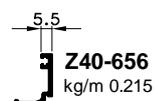
Z40-647
kg/m 0.226



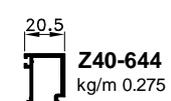
Z40-649
kg/m 0.221



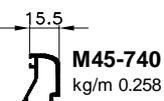
Z40-665
kg/m 0.272



Z40-656
kg/m 0.215



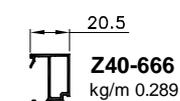
Z40-644
kg/m 0.275



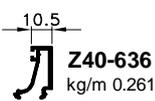
M45-740
kg/m 0.258



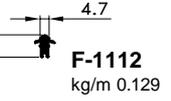
Z40-662
kg/m 0.245



Z40-666
kg/m 0.289



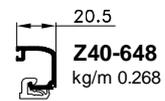
Z40-636
kg/m 0.261



F-1112
kg/m 0.129



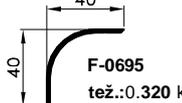
Z40-646
kg/m 0.286



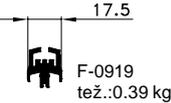
Z40-648
kg/m 0.268



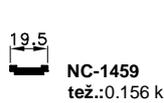
Z40-667
kg/m 0.358



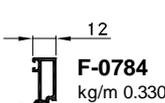
F-0695
tež.:0.320 kg/m'



F-0919
tež.:0.39 kg/m'



NC-1459
tež.:0.156 kg/m'



F-0784
kg/m 0.330

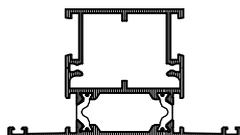
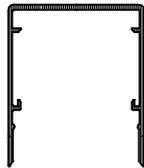
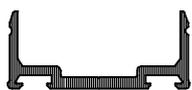


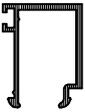
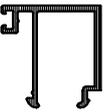
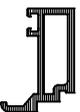
Z40-668
kg/m 0.326

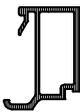
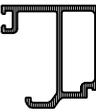
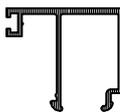
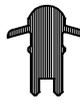
Oznaka	Izgled-presjek	Težina /kg/m/	Opseg /mm/	Ix /cm ⁴ /	Wx /cm ³ /
T1 920-922		2.06	564.64		
T1 920/21/22		3.14	832.53		
TI 901/902		2.05	496		
T1 901/2/3		3.16	731		
T1 928/929		2.328	647.84		
T1 928/29/30		3.579	963.623		
T1 919/692		2.11	586.77		
T1 925/692		2.36	586.40		
T1 926/927		2.09	465.228		

Oznaka	Izgled-presjek	Težina /kg/m/	Opseg /mm/	Ix /cm ⁴ /	Wx /cm ³ /
T1 917/918		2.18	527.8		
T1 910/911		1.81	374		
F-1004		0.55	228.464		
F-1005		0.639	268.460		
F-1006		0.388	167.402		
T1 923/924		2.10	436.15		
T1 912		0.63	334		
T1 913/2		0.8	238		
T1 916		0.3	91.5		

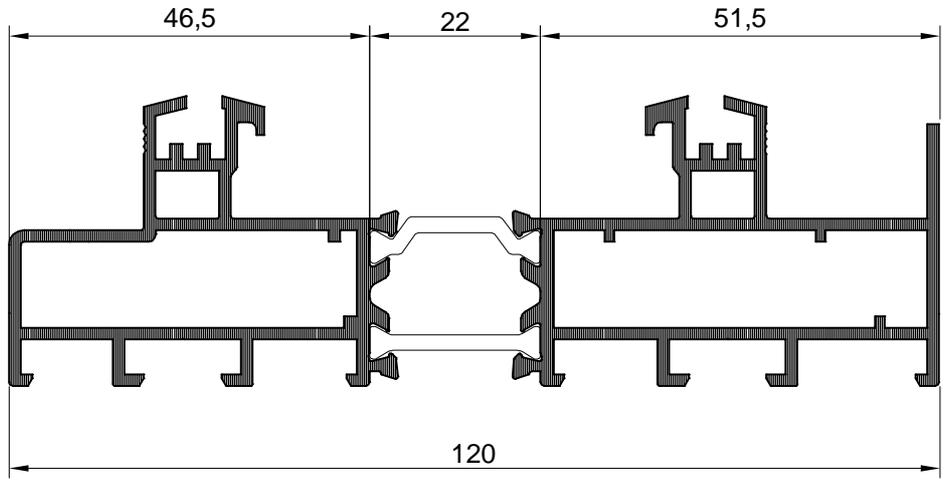
Oznaka	Izgled-presjek	Težina /kg/m ³ /	Opseg /mm/	Ix /cm ⁴ /	Wx ₃ /cm ³ /
F-0852		0.24	78.30		
F-0919		0.39	142.28		
F-0695		0.320	138.00		
F-0846		0.51	249.082		
F-0847		0.643	310.936		
FT-0104/TK	 prečka za krilo T1 910/911	1.28	341		
FT-0105/TK	 prečka za krilo T1 910/911	1.508	375		
FT-0113/TK	 prečka za krilo T1 910/911	2.886	531		
FT-0104	 prečka za krilo T1 917/918	1.27	341		

Oznaka	Izgled-presjek	Težina /kg/m/	Opseg /mm/	Ix /cm ⁴ /	Wx ₃ /cm ³ /
FT-0105	 <p>prečka za krilo T1 917/918</p>	1.548	375		
FT-0113	 <p>prečka za krilo T1 917/918</p>	2.926	531		
FMO 50/61		0.785	365.55		
FMO 50/20-D		0.558	184.82		
NC-1459		0.156	51		
Z40-660		0.179	89		
Z40-656		0.215	107		
Z40-636		0.261	141		
M45-709		0.258	153		

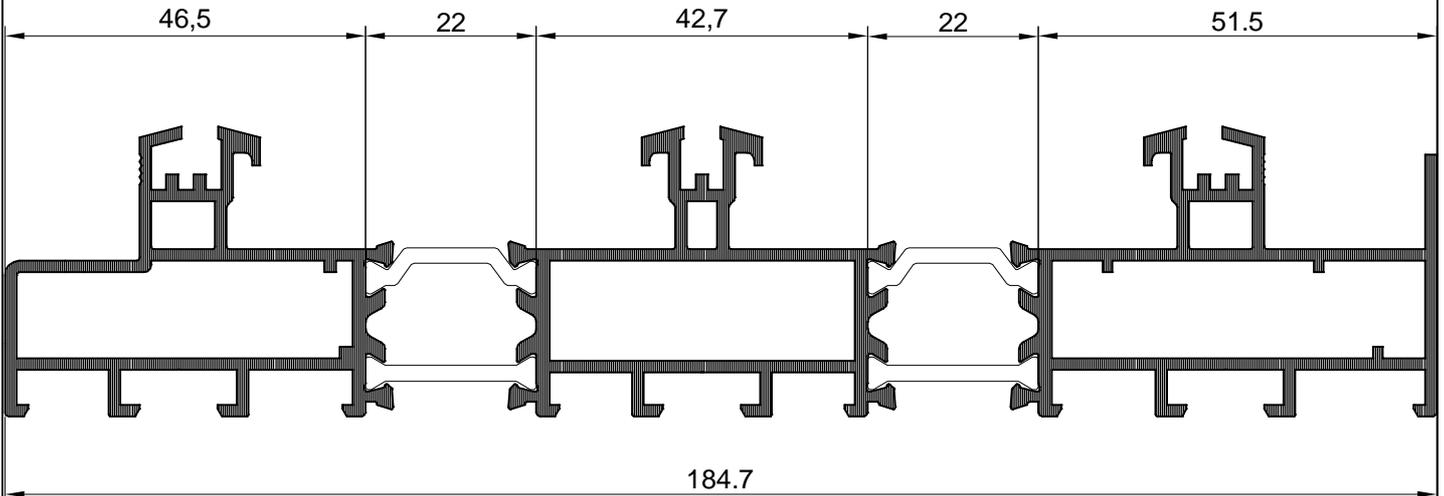
Oznaka	Izgled-presjek	Težina /kg/m'	Opseg /mm/	Ix /cm ⁴ /	Wx ₃ /cm ³ /
Z40-644		0.275	166		
Z40-658		0.318	184		
Z40-647		0.226	137		
M45-740		0.258	148		
Z40-646		0.286	157		
Z40-649		0.221	105		
Z40-662		0.245	116		
Z40-648		0.268	125		
F-0784		0.33	105.40		

Oznaka	Izgled-presjek	Težina /kg/m'	Opseg /mm'	Ix /cm ⁴ '	Wx ₃ /cm ³ '
Z40-665		0.30	106.00		
Z40-666		0.289	122		
Z40-667		0.358	139		
Z40-653		0.348	201		
F-1112		0.129	45.43		

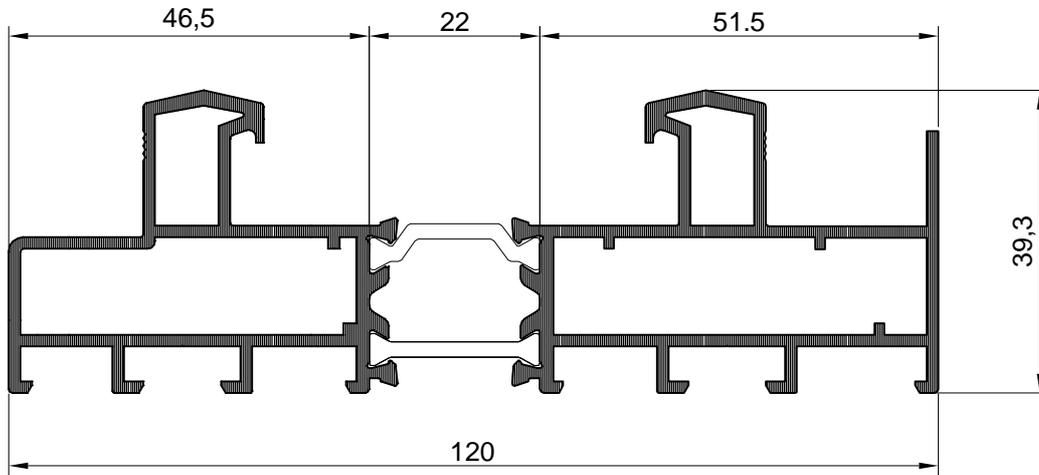
T1 920/922
 tež.:2.06 kg/m'



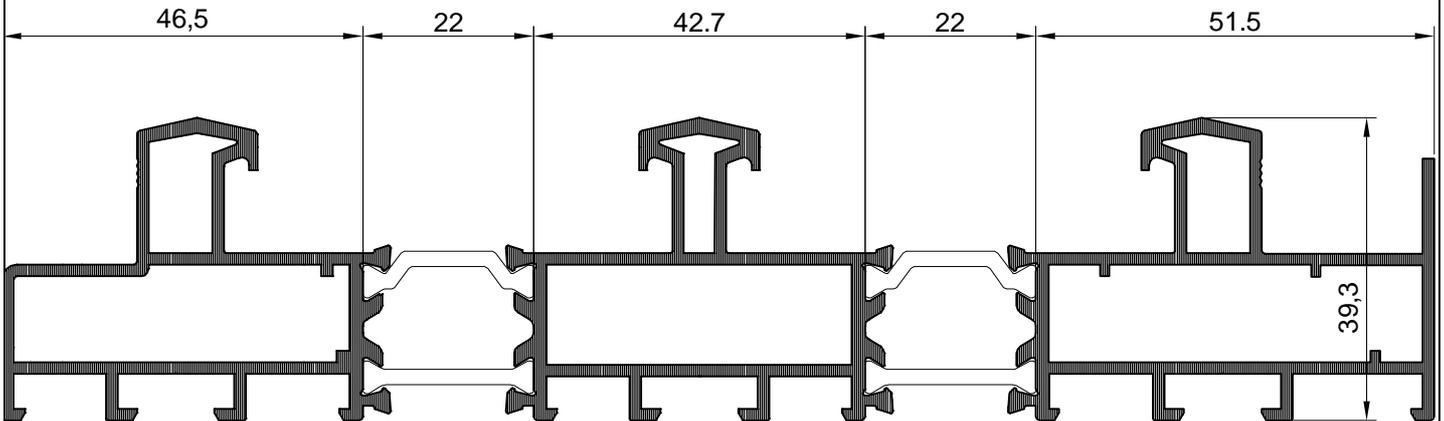
T1 920/21/22
 tež.:3.14 kg/m'



TI 901/902
tež.:2.05 kg/m'

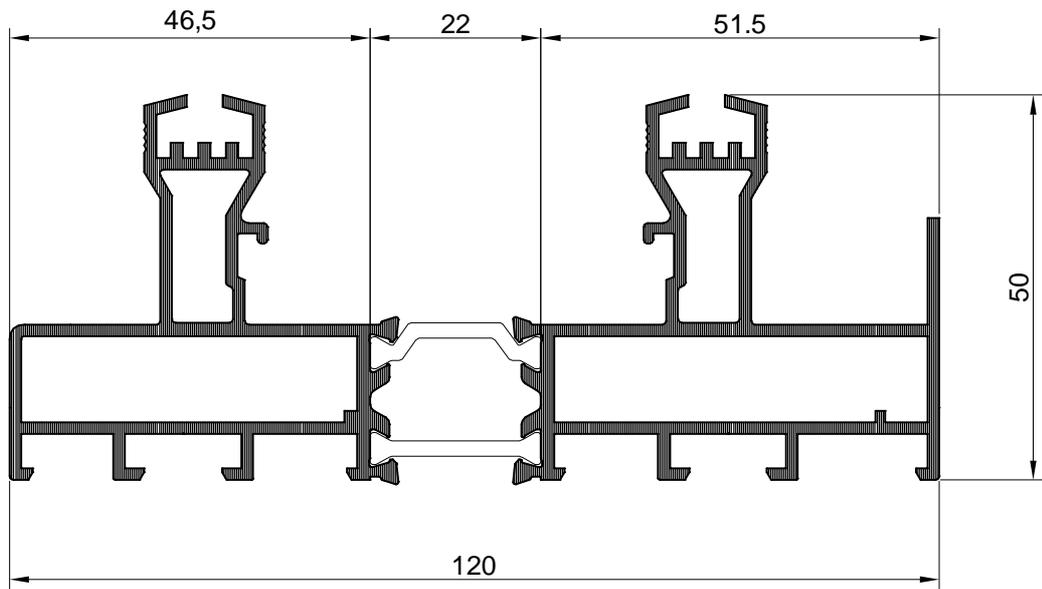


TI 901/2/3
tež.:3.16 kg/m'



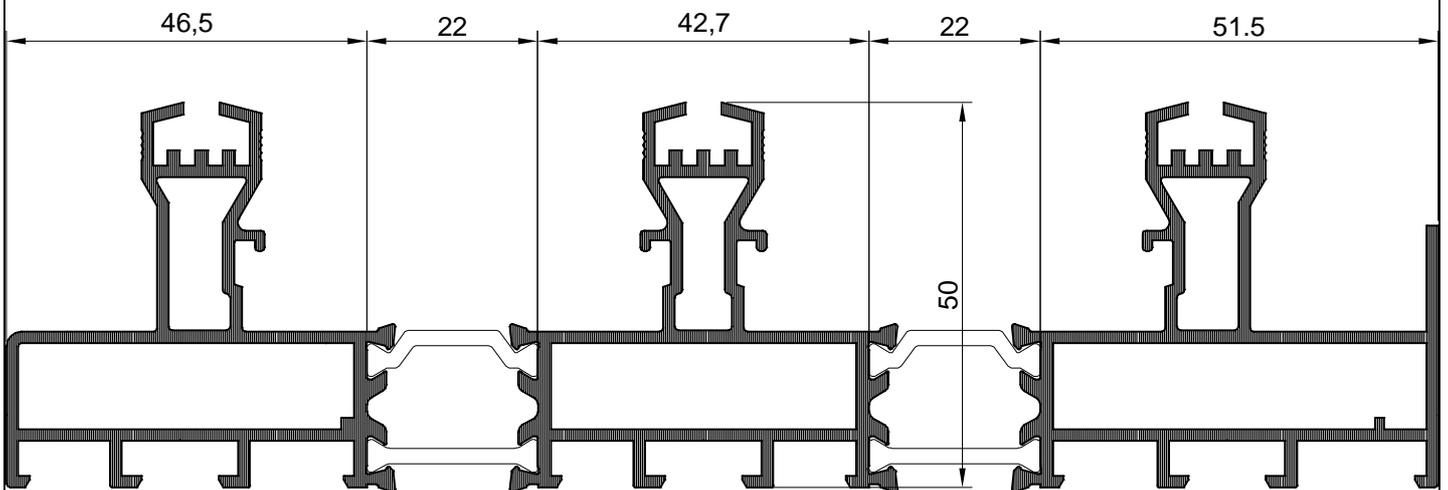
TI 928/929

tež.: 2.328 kg/m'

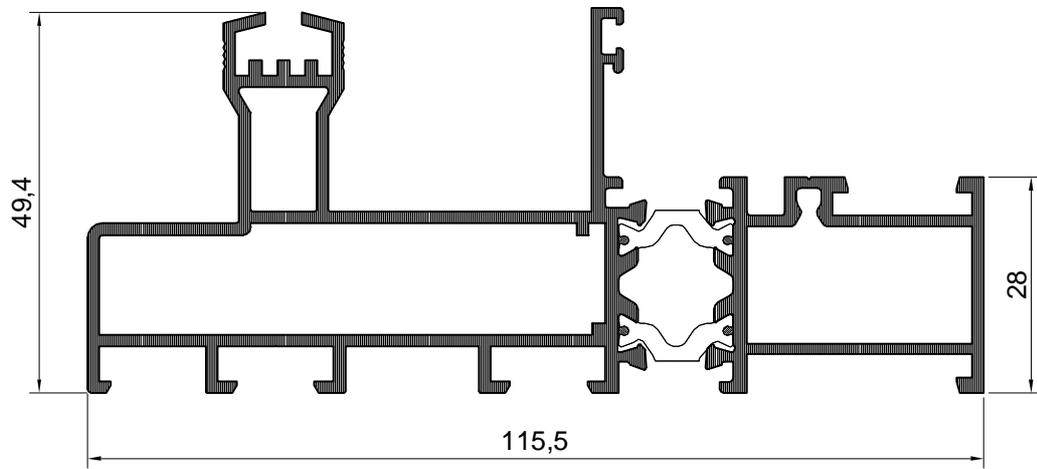


TI 928/29/30

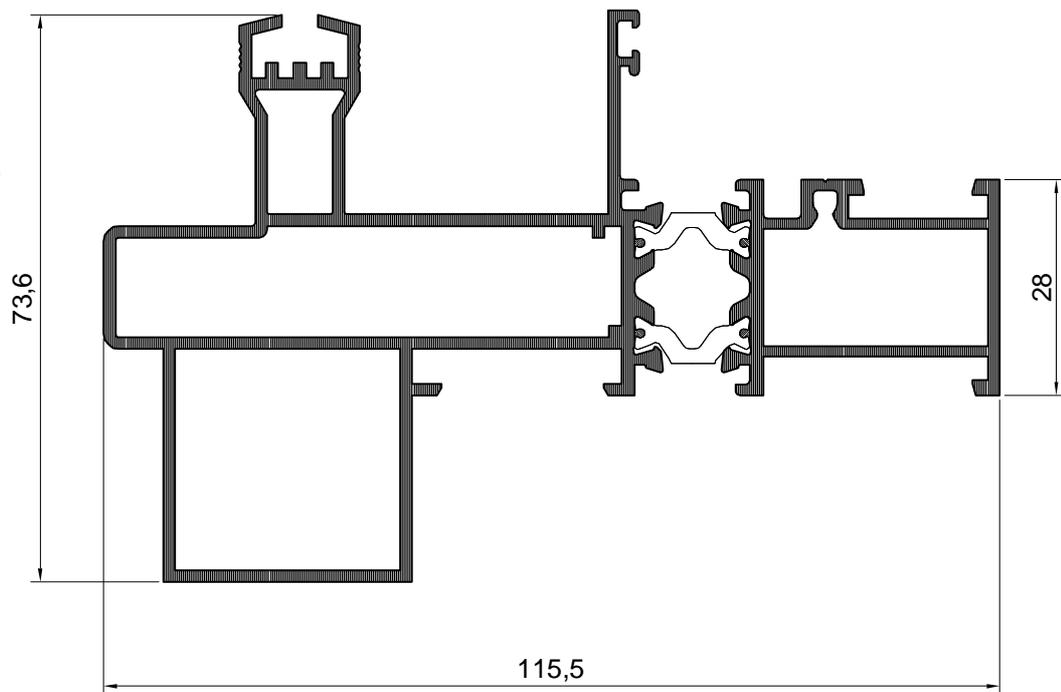
tež.: 3.579 kg/m'



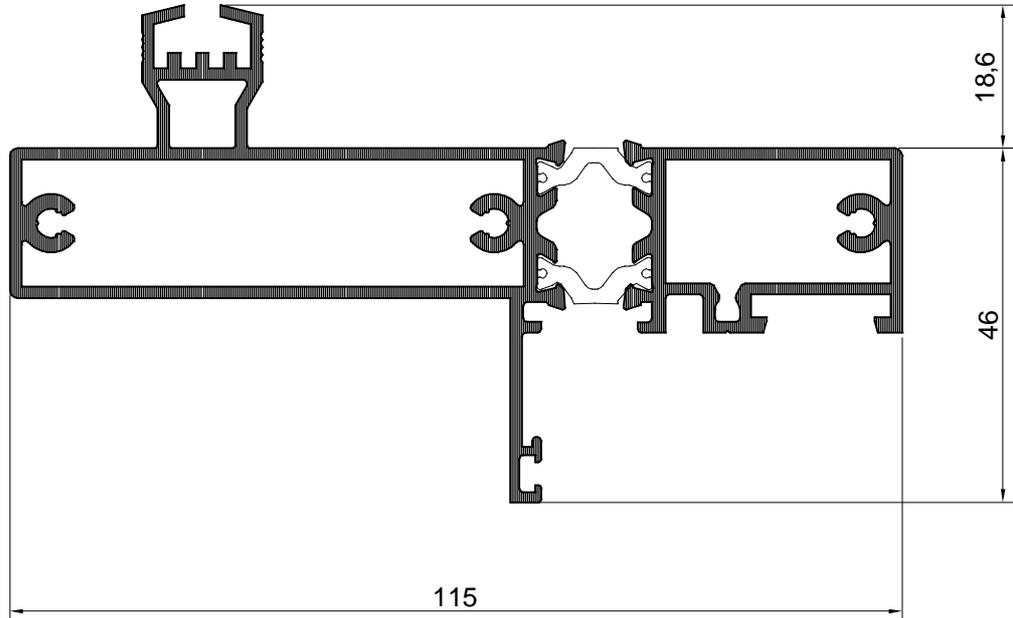
T1 919/692
tež.:2.11 kg/m'



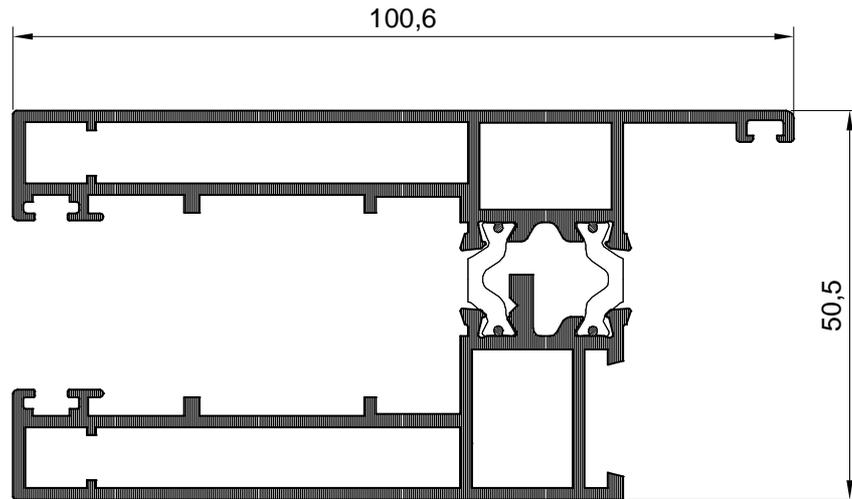
T1 925/692
tež.:2.36 kg/m'



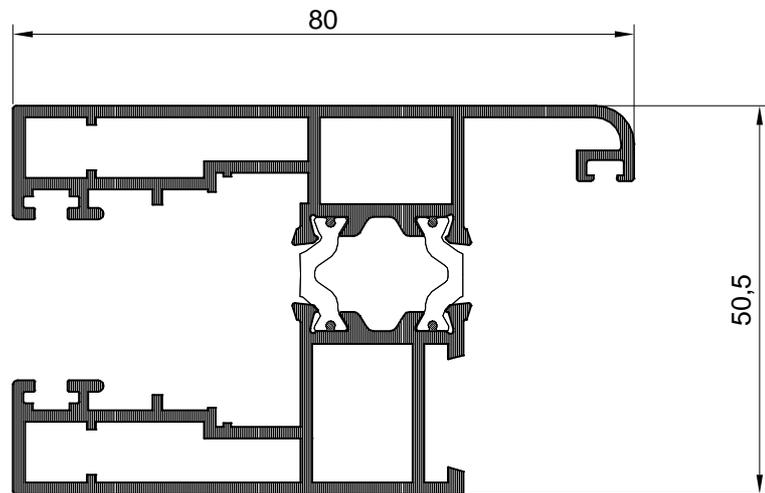
T1 926/927
tež.:2.089 kg/m'



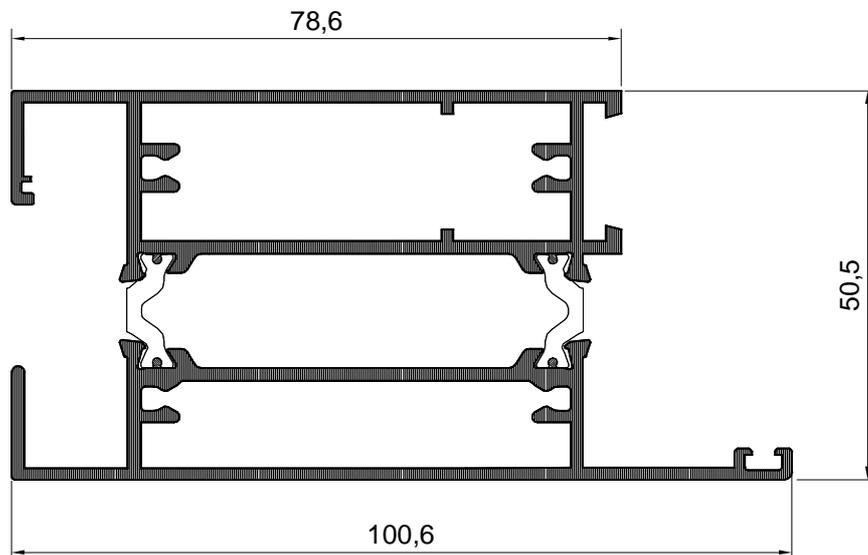
T1 917/918
tež.:2.18 kg/m'



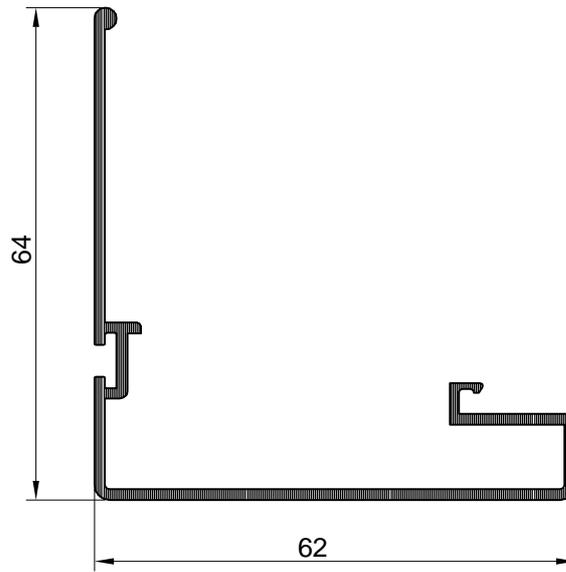
T1 910/911
tež.:1.81 kg/m'



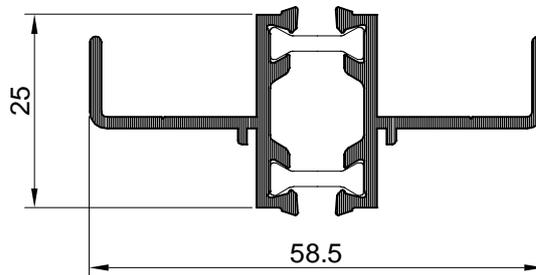
T1 923/924
tež.:2.10 kg/m'



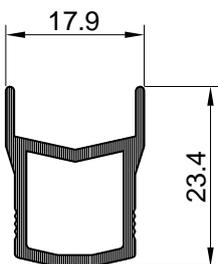
T1 912
tež.:0.63 kg/m'



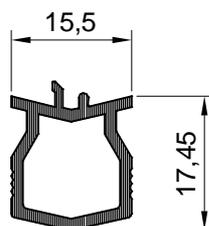
T1 913/2
tež.:0.8 kg/m'



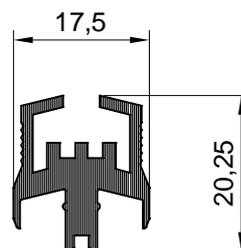
T1 916
tež.:0.3 kg/m'



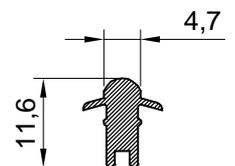
F-0852
tež.:0.24 kg/m'

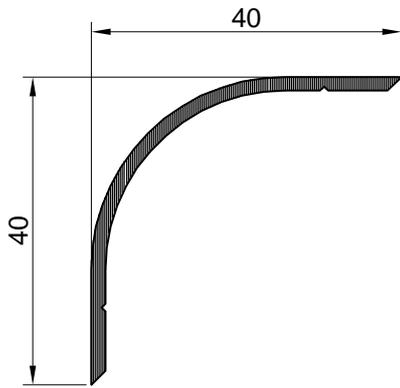
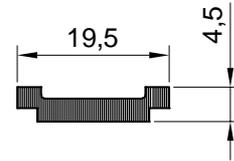
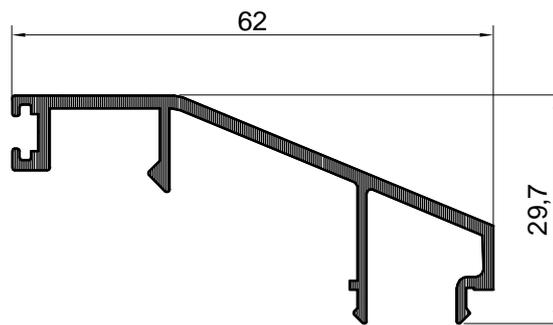
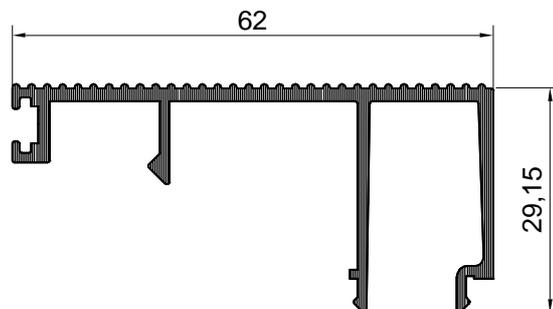


F-0919
tež.:0.39 kg/m'

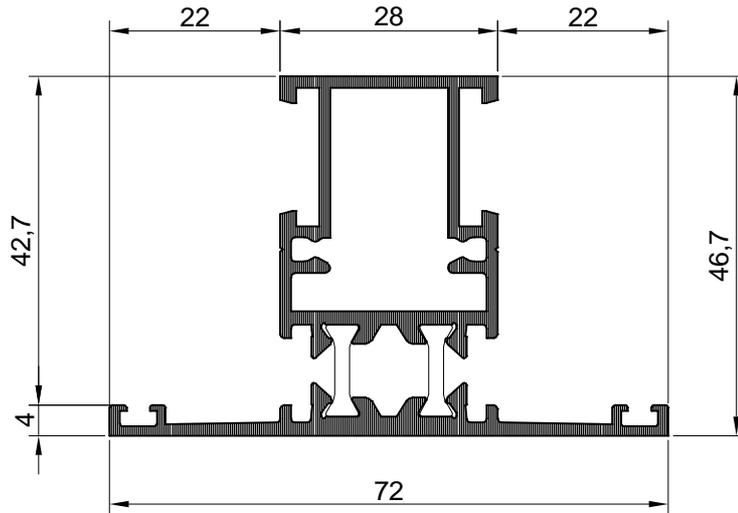


F-1112
tež.:0.129 kg/m'

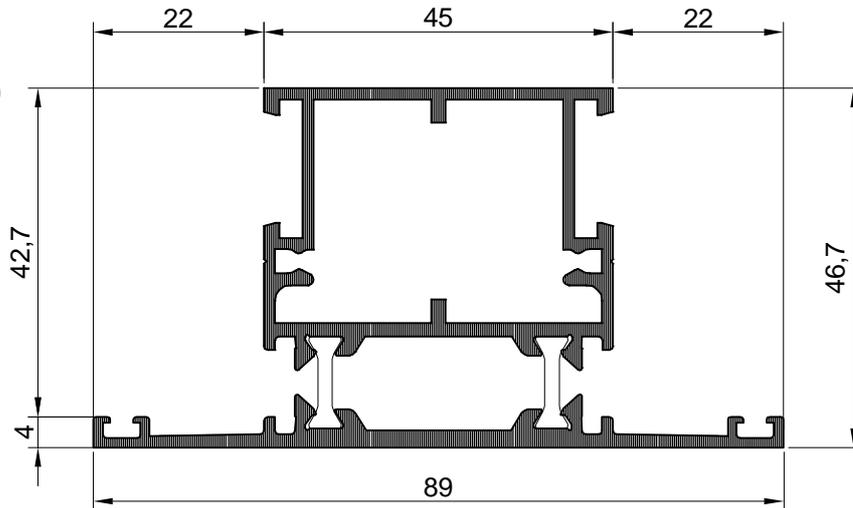


F-0695
tež.:0.320 kg/m'**NC-1459**
tež.:0.156 kg/m'**F-0846**
tež.:0.51 kg/m'**F-0847**
tež.:0.643 kg/m'

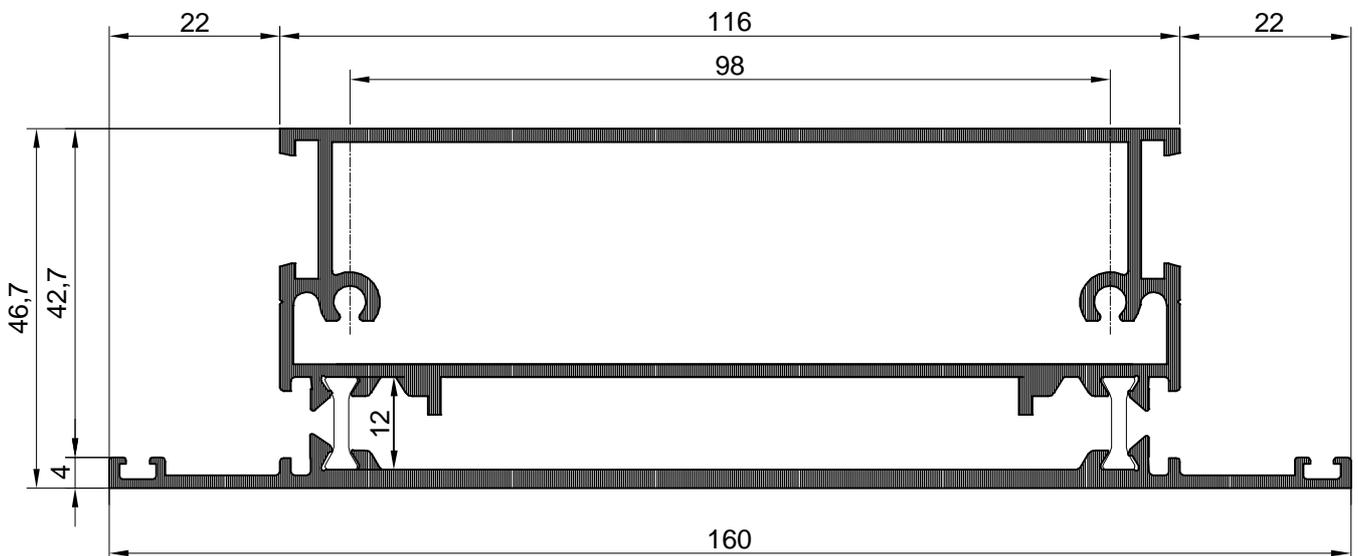
FT-0104/TK
 tež.:1.28 kg/m'
 (za krilo T1 910/911)



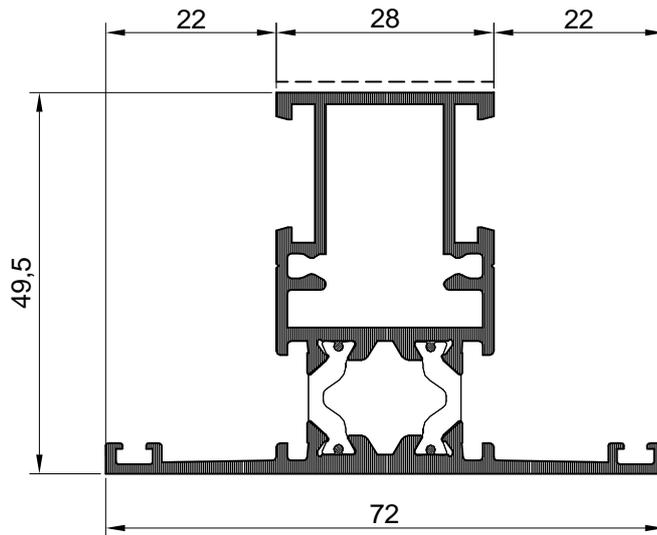
FT-0105/TK
 tež.:1.508 kg/m'
 (za krilo T1 910/911)



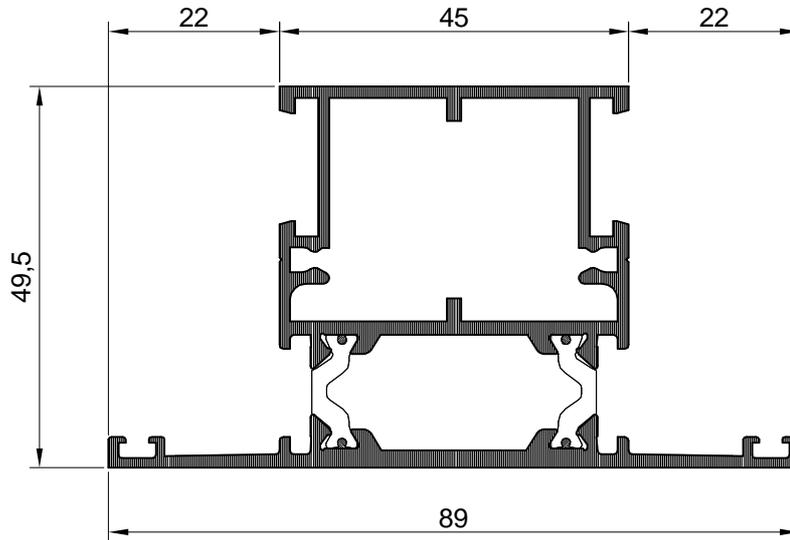
FT-0113/TK
 tež.:2.886 kg/m'
 (za krilo T1 910/911)



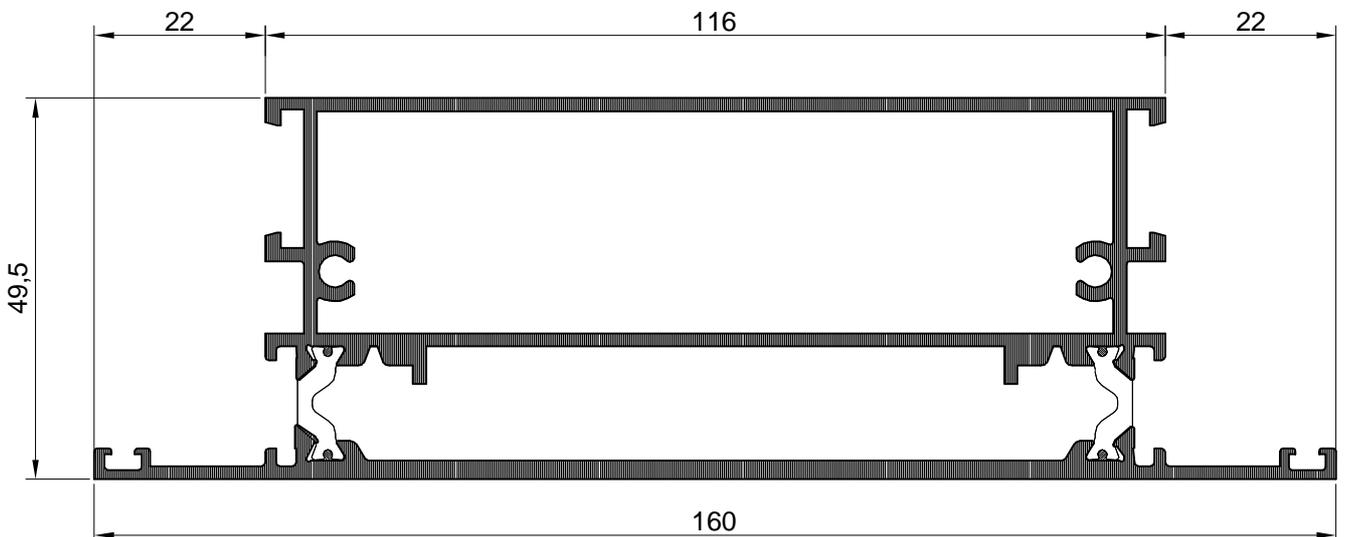
FT-0104
 tež.:1.27 kg/m'
 (za krilo T1 917/918)



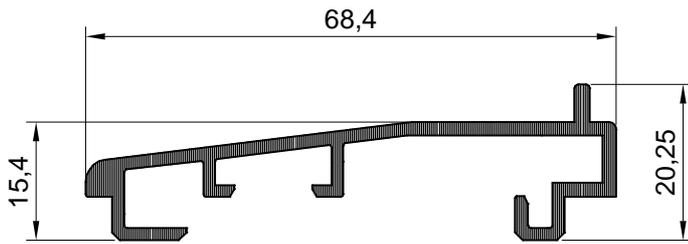
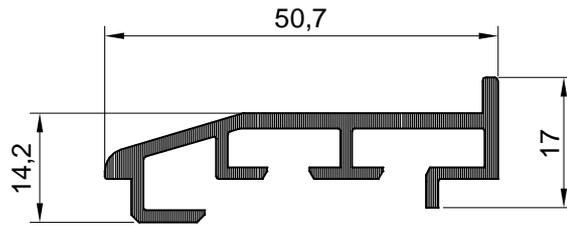
FT-0105
 tež.:1.548 kg/m'
 (za krilo T1 917/918)



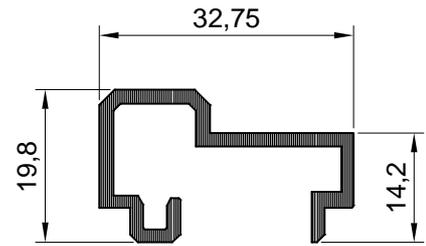
FT-0113
 tež.:2.926 kg/m'
 (za krilo T1 917/918)



F-1004
tež.:0.550 kg/m'

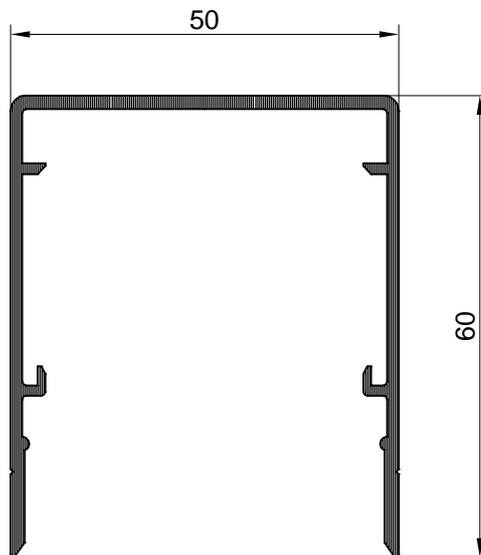


F-1005
tež.:0.639 kg/m'

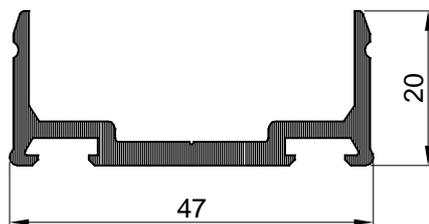


F-1006
tež.:0.388 kg/m'

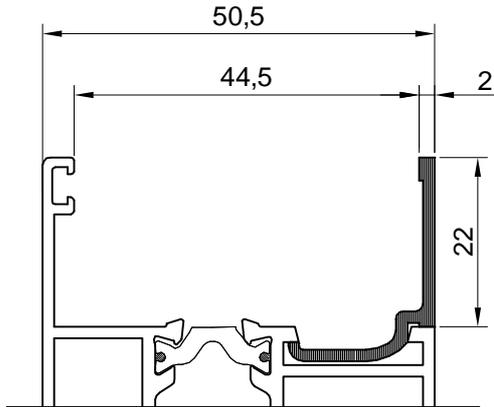
FMO 50/61
tež.:0.785 kg/m'



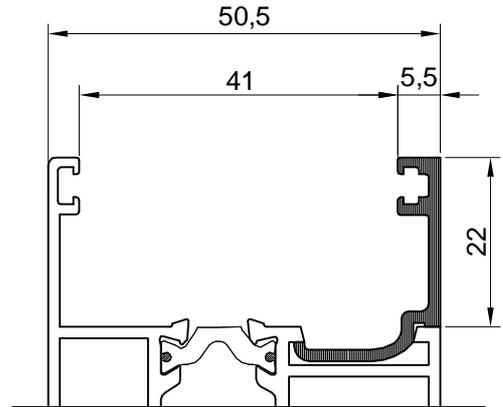
FMO 50/20-D
tež.:0.558 kg/m'



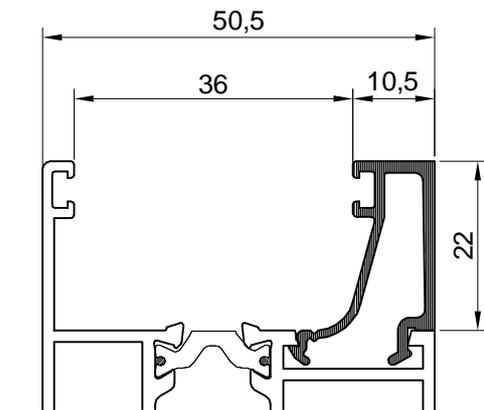
Z40-660
tež.:0.179 kg/m'



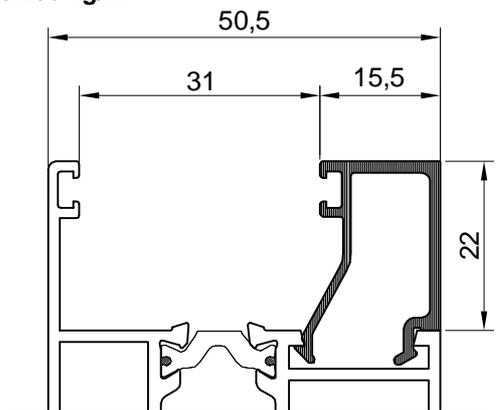
Z40-656
tež.:0.215 kg/m'



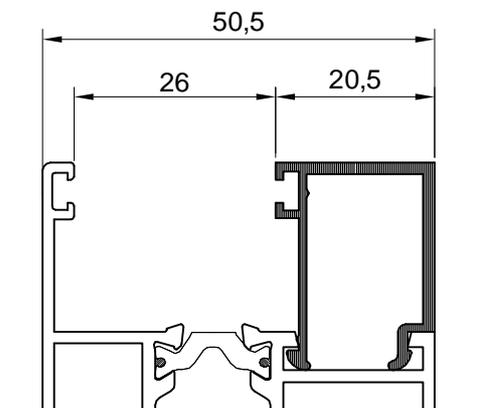
Z40-636
tež.:0.261 kg/m'



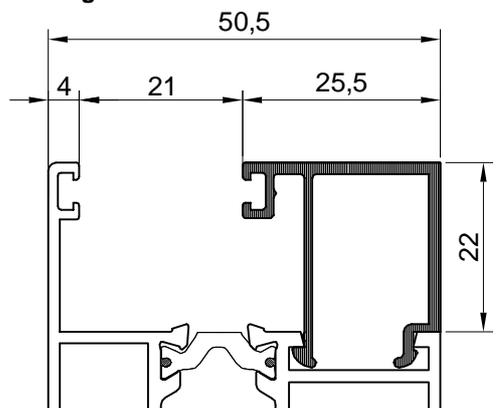
M45-709
tež.:0.258 kg/m'



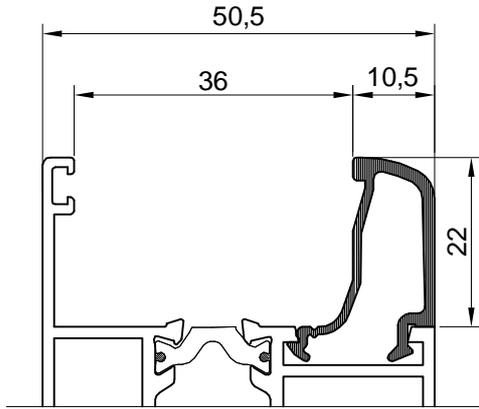
Z40-644
tež.:0.275 kg/m'



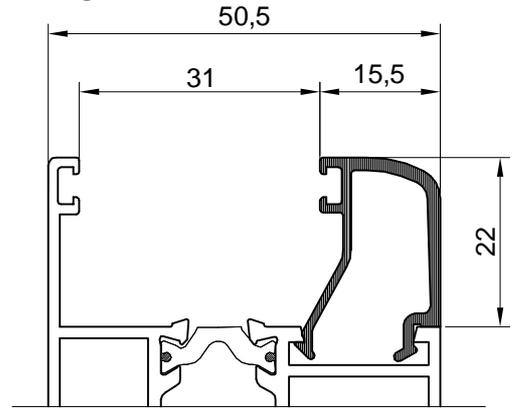
Z40-658
tež.:0.318 kg/m'



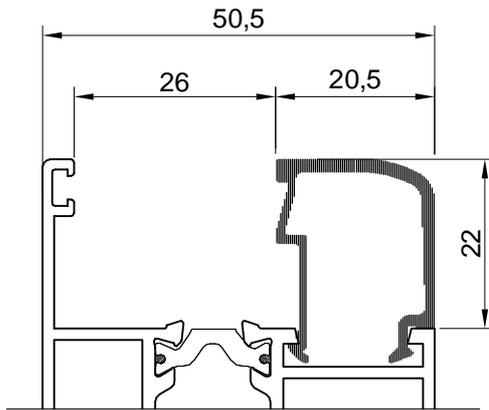
Z40-647
tež.:0.226 kg/m'



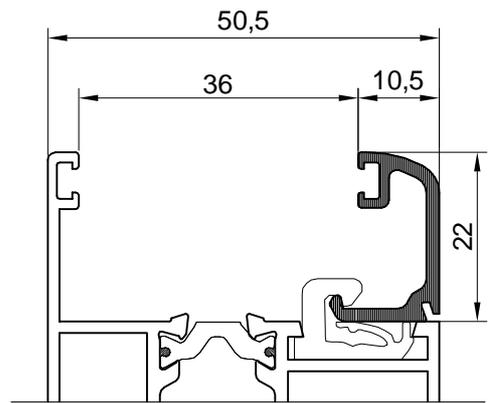
M45-740
tež.:0.258 kg/m'



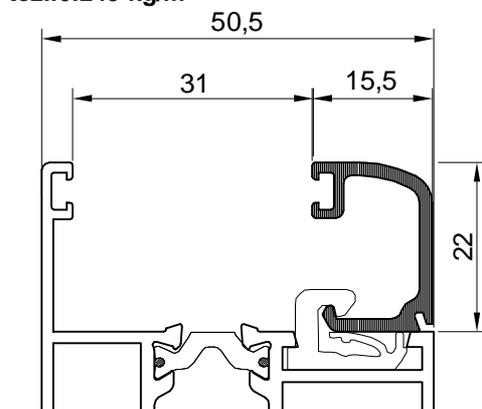
Z40-646
tež.:0.286 kg/m'



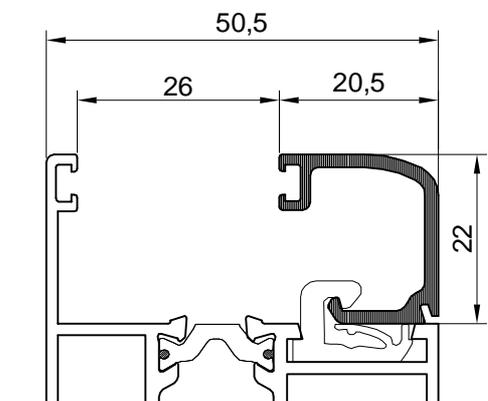
Z40-649
tež.:0.347 kg/m'



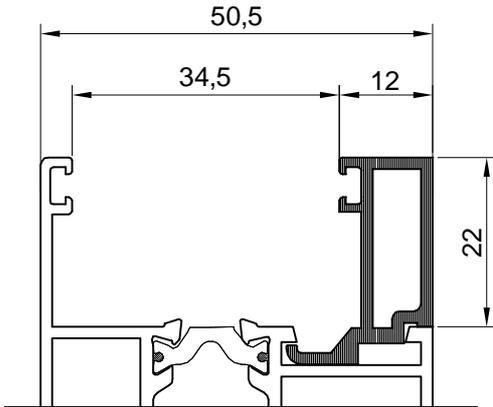
Z40-662
tež.:0.245 kg/m'



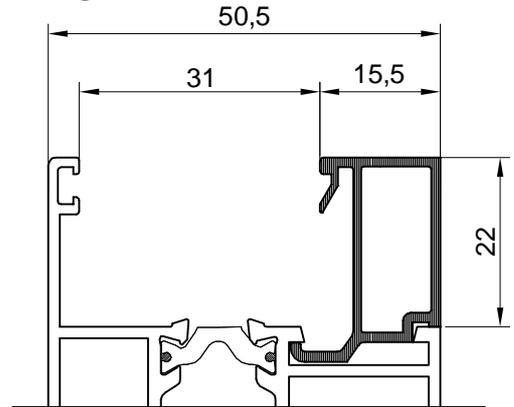
Z40-648
tež.:0.268 kg/m'



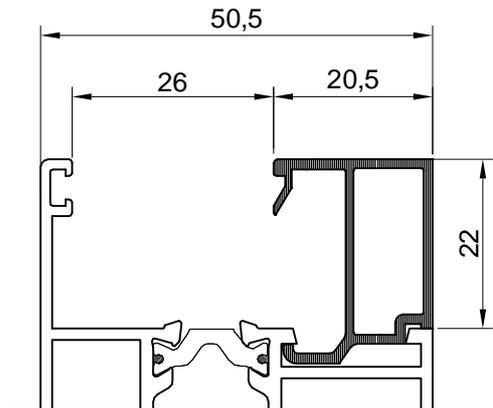
F-0784
tež.:0.33 kg/m'



Z40-665
tež.:0.272 kg/m'



Z40-666
tež.:0.289 kg/m'



Z40-667
tež.:0.358 kg/m'

