Sveučilište u Zagrebu
Arhitektonski fakultet
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Faculty of Architecture

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ZAJEDNICA DAVATELJA PVC SUSTAVA ZA GRAĐEVINSKU STOLARIJU
Hrvatska gospodarska komora

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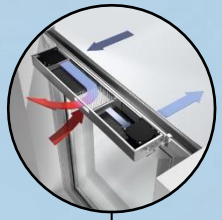
ALUKÖNIGSTAHL

Ventilacijski sustavi za kvalitetniji zrak

dipl.ing. stroj., Marin Kučiš

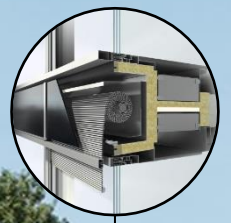
Stambeni objekti

ALUKÖNIGSTAHL

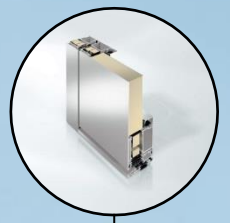


Ventilacijski sustavi

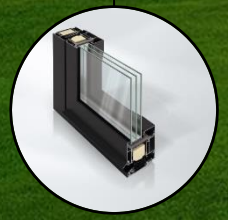
Automatizacija zgrade



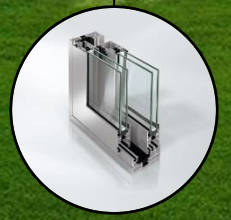
Sustavi zaštite od sunca



Sustavi za vrata



Sustavi za prozore



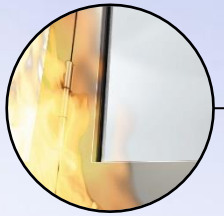
Klizni sustavi

Obrade površina

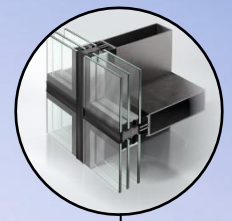
Poslovni i industrijski objekti

Sustavi za ventilaciju

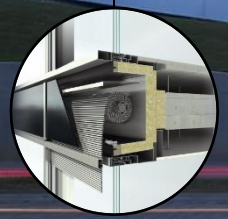
Protupožarni sustavi



Sustavi za fasade



Sustavi za vrata i prozore



Sustavi zaštite od sunca

Automatizacija zgrade

Unutarnje pregradne stijene

DECENTRALIZIRANA VENTILACIJA

Prednosti decentralizirane ventilacije i evaluacija pri certificiranju

• Prednosti decentralizirane ventilacije:		
• Mali utrošak energije, povrat topline, renoviranje:	DGNB – ENV 1.1	(troškovi životnog ciklusa)
• Pročišćeni zrak ulazi u prostor (prašina, pelud, CO2, isparenja, mirisi...):	DGNB - SOC 1.2	(kvaliteta zraka)
• Laka regulacija temperature, rel. vlažnosti i brzine strujanja zraka u prostoru:	DGNB - SOC 1.1	(toplinska ugodnost)
• Bez instalacija u spuštenim stropovima i podovima:	DGNB - ECO 2.1	(prostorna prilagodljivost)
• Uw, vodotijesnost, zrakopropusnost:	DGNB - TEC 1.3	(kvaliteta ovojnice)
• Lako i jednostavno održavanje, modularnost:	DGNB - TEC 1.4	(dostupnost instalacije)

DGNB

Relevance factor
Share of total score

TOPIC	CRITERIA GROUP	CRITERION	OFFICE	EDUCATION	RESIDENTIAL	HOTEL	CONSUMER MARKET	SHOPPING CENTRE	DEPARTMENT STORE	LOGISTICS	PRODUCTION
ENVIRONMENTAL QUALITY (ENV)	EFFECTS ON THE GLOBAL AND LOCAL ENVIRONMENT (ENV1)	ENV1.1	8 9.5%	8 9.5%	8 9.5%	8 9.5%	8 9.5%	8 9.0%	8 9.5%	8 9.5%	8 9.5%
		ENV1.2	4 4.7%	4 4.7%	4 4.7%	4 4.7%	4 4.7%	4 4.5%	4 4.7%	4 4.7%	4 4.7%
		E NV1.3	2 2.4%	2 2.4%	2 2.4%	2 2.4%	2 2.4%	2 2.3%	2 2.4%	2 2.4%	2 2.4%
	RESOURCE CONSUMPTION AND WASTE GENERATION (ENV2)	ENV2.2	2 2.4%	2 2.4%	2 2.4%	2 2.4%	2 2.4%	2 2.3%	2 2.4%	2 2.4%	2 2.4%
		ENV2.3	2 2.4%	2 2.4%	2 2.4%	2 2.4%	2 2.4%	3 3.4%	2 2.4%	2 2.4%	2 2.4%
		ENV2.4	1 1.2%	1 1.2%	1 1.2%	1 1.2%	1 1.2%	1 1.1%	1 1.2%	1 1.2%	1 1.2%
ECONOMIC QUALITY (ECO)	LIFE CYCLE COST (ECO1)	ECO1.1	4 10.0%	4 10.0%	4 10.0%	4 10.0%	4 10.0%	4 10.0%	4 10.0%	4 10.0%	4 12.9%
	ECONOMIC DEVELOPMENT (ECO2)	ECO2.1	3 7.5%	3 7.5%	3 7.5%	3 7.5%	3 7.5%	3 7.5%	3 7.5%	3 7.5%	3 9.6%
		ECO2.2	2 5.0%	2 5.0%	2 5.0%	2 5.0%	2 5.0%	2 5.0%	2 5.0%	2 5.0%	0 0%
SOCIOCULTURAL AND FUNCTIONAL QUALITY (SOC)	HEALTH, COMFORT AND USER SATISFACTION (SOC1)	SOC1.1	4 4.1%	4 3.6%	4 4.3%	4 3.9%	4 4.5%	4 4.5%	4 4.5%	4 4.3%	4 4.3%
		SOC1.2	5 5.1%	5 4.5%	5 5.4%	5 4.9%	4 4.5%	4 4.5%	4 4.5%	5 5.4%	5 5.4%
		SOC1.3	2 2.0%	3 2.7%	0 0%	3 2.9%	0 0%	0 0%	0 0%	0 0%	0 0%
		SOC1.4	3 3.1%	3 2.7%	3 3.2%	2 2.0%	3 3.4%	3 3.4%	3 3.4%	3 3.2%	3 3.2%
		SOC1.5	2 2.0%	2 1.8%	2 2.1%	2 2.0%	2 2.3%	2 2.3%	2 2.3%	0 0%	0 0%
		SOC1.6	2 2.0%	2 1.8%	2 2.1%	2 2.0%	2 2.3%	2 2.3%	2 2.3%	5 5.4%	5 5.4%
		SOC1.7	1 1.0%	2 1.8%	1 1.1%	2 2.0%	1 1.1%	1 1.1%	1 1.1%	4 4.3%	4 4.3%
	FUNCTIONALITY (SOC2)	SOC2.1	3 3.1%	4 3.6%	4 4.3%	3 2.9%	4 4.5%	4 4.5%	4 4.5%	0 0%	0 0%

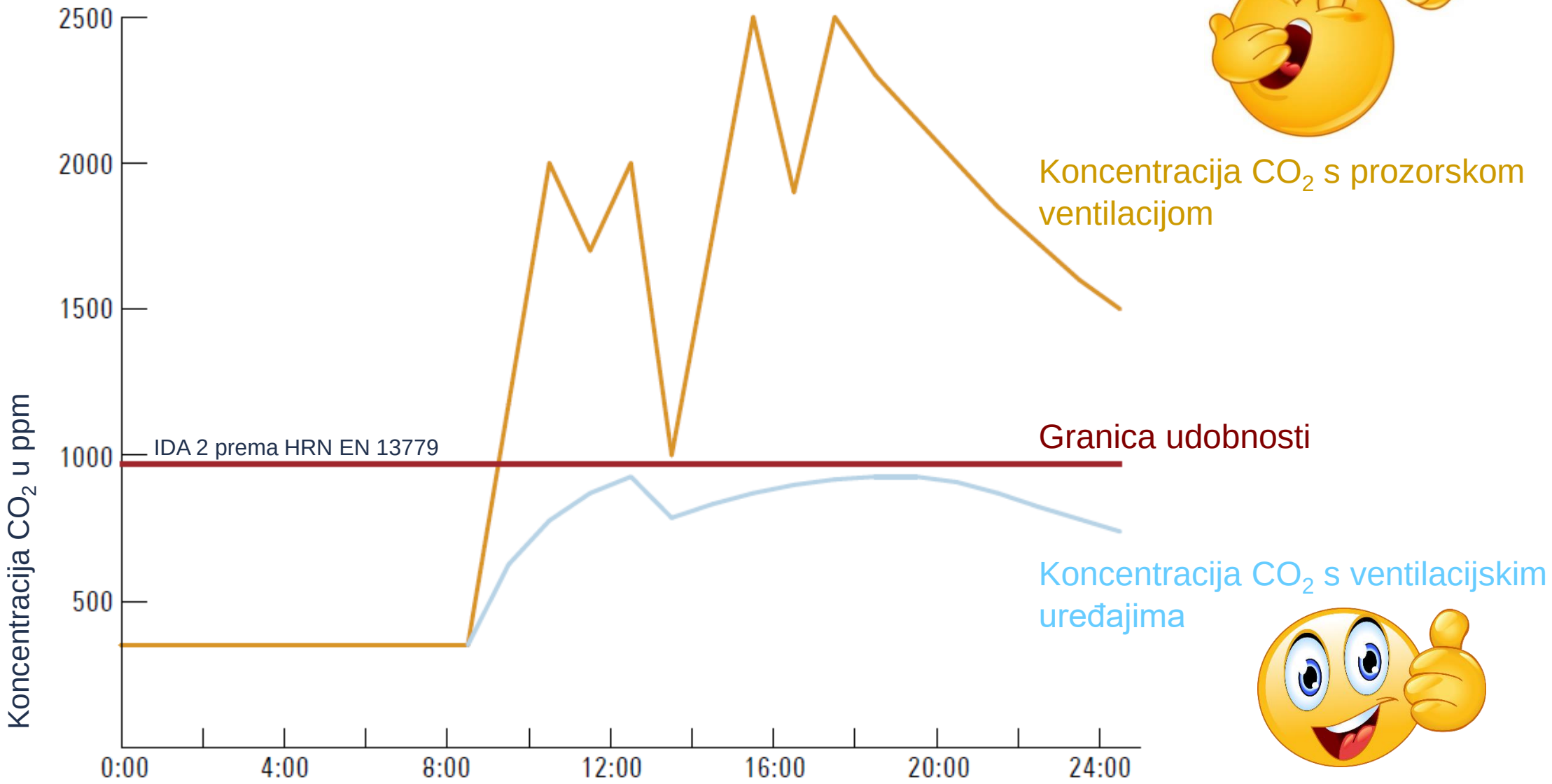
TOPIC	CRITERIA GROUP	CRITERION	OFFICE	EDUCATION	RESIDENTIAL	HOTEL	CONSUMER MARKET	SHOPPING CENTRE	DEPARTMENT STORE	LOGISTICS	PRODUCTION
TECHNICAL QUALITY (TEC)	TECHNICAL QUALITY (TEC1)	TEC1.1	4 2.5%	4 2.5%	4 2.5%	4 2.5%	4 2.9%	4 2.9%	4 2.9%	4 2.7%	4 2.7%
		TEC1.2	3 1.9%	3 1.9%	3 1.9%	3 1.9%	0 0%	0 0%	0 0%	0 0%	0 0%
		TEC1.3	4 2.5%	4 2.5%	4 2.5%	4 2.5%	3 2.1%	3 2.1%	3 2.1%	4 2.7%	4 2.7%
		TEC1.4	3 1.9%	3 1.9%	3 1.9%	3 1.9%	3 2.1%	3 2.1%	3 2.1%	3 2.0%	3 2.0%
		TEC1.5	2 1.3%	2 1.3%	2 1.3%	2 1.3%	2 1.4%	2 1.4%	2 1.4%	2 1.4%	2 1.4%
		TEC1.6	4 2.5%	4 2.5%	4 2.5%	4 2.5%	4 2.9%	4 2.9%	4 2.9%	4 2.7%	4 2.7%
		TEC1.7	1 0.6%	1 0.6%	1 0.6%	1 0.6%	2 1.4%	2 1.4%	2 1.4%	2 1.4%	2 1.4%
		TEC3.1	3 1.9%	3 1.9%	3 1.9%	3 1.9%	3 2.1%	3 2.1%	3 2.1%	3 2.0%	3 2.0%
PROCESS QUALITY (PRO)	PLANNING QUALITY (PRO1)	PRO1.1	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%
		PRO1.4	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%
		PRO1.5	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%
		PRO1.6	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%
	CONSTRUCTION QUALITY ASSURANCE (PRO2)	PRO2.1	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%
		PRO2.2	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%
		PRO2.3	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%	3 1.6%
		PRO2.4	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%
		PRO2.5	1 0.5%	1 0.5%	1 0.5%	1 0.5%	1 0.5%	1 0.5%	1 0.5%	1 0.5%	1 0.5%
SITE QUALITY (SITE)	SITE QI (SITE1)	SITE1.1	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%
			%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%
			%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%	2 1.1%
		SITE1.4	3 1.7%	3 1.7%	3 1.7%	3 1.7%	3 1.7%	3 1.7%	3 1.7%	3 1.7%	3 1.7%

EN 13779 (EN 16798-3)	Opis	Koncentracija CO_2	Satni protok zraka po osobi	EN 15251 (EN 16798-1)	
IDA 1	**Visoka kvaliteta zraka**	**<800 ppm**	**72 m^3/h**	**I**	**Za osjetljivu populaciju: starije osobe, djeca, ljudi s raznim poteškoćama**
IDA 2	**Srednja kvaliteta zraka**	**800-1000 ppm**	**45 m^3/h**	**II**	**Novogradnja i renovirani objekti**
IDA 3	**Umjereno niska kvaliteta zraka**	**1000-1400 ppm**	**29 m^3/h**	**III**	**Postojeći objekti**
IDA 4	**Niska kvaliteta zraka**	**>1400 ppm**	**18 m^3/h**	**IV**	**Objekti koji su u upotrebi određeni period u godini.**

Projektiranje prema EN 13779/16798-3 za uredske objekte

*IDA = InDoor Air-quality

Porast koncentracije CO_2 u uredu sa / bez ventilacijskih jedinica

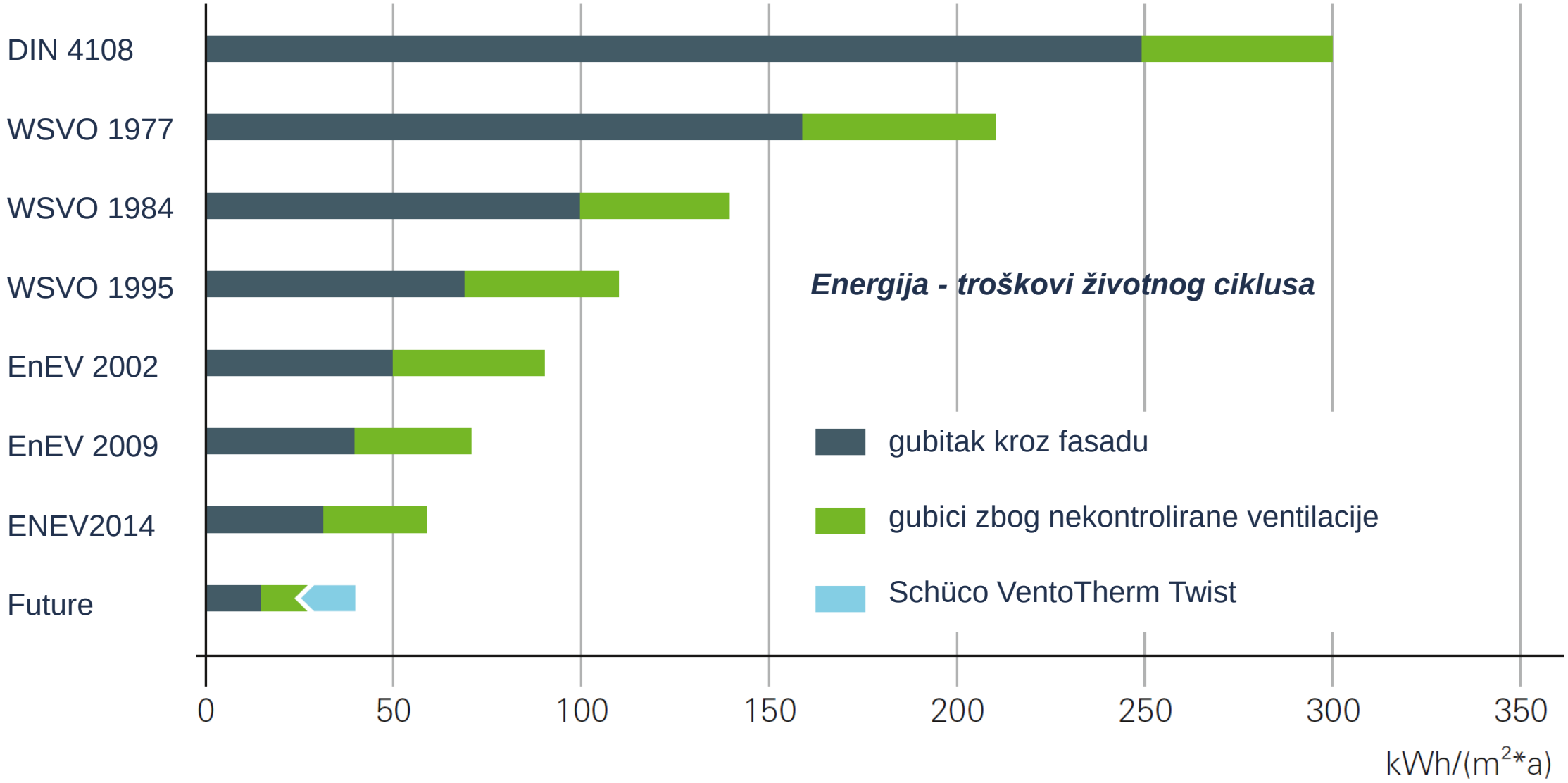


Koncentracija CO_2 s prozorskom ventilacijom

Granica udobnosti

Koncentracija CO_2 s ventilacijskim uređajima

Maksimizacija energetske učinkovitosti | Minimalizacija energetskih gubitaka



Energija - troškovi životnog ciklusa

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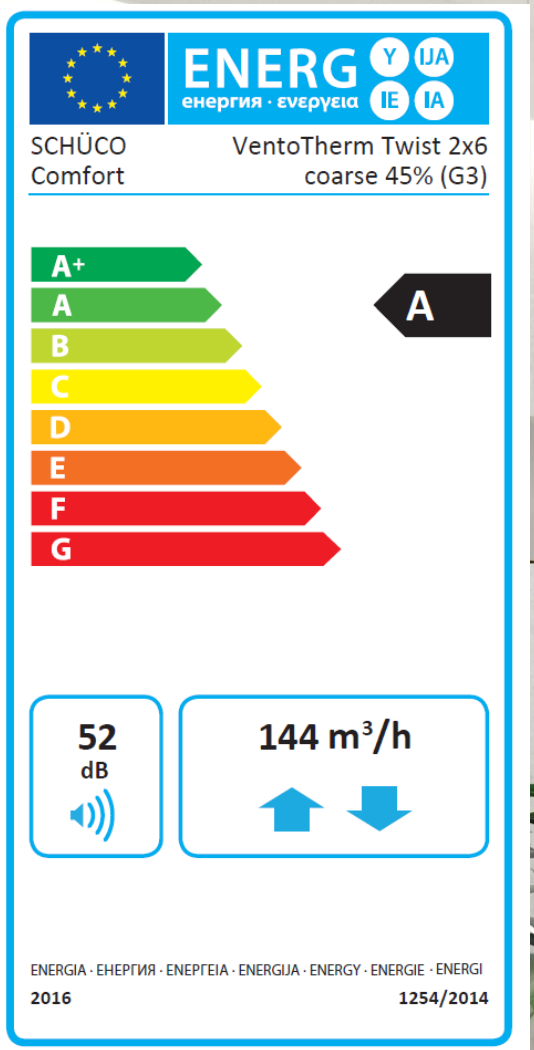

Schüco VentoTherm Twist

Decentralizirani ventilacijski uređaj s rekuperacijom zraka, povratom topline

Schüco VentoTherm Twist

Decentralizirani ventilacijski uređaj s rekuperacijom zraka, povratom topline

Idealno za renoviranje - troškovi životnog ciklusa

Modularnost – dostupnost instalacije

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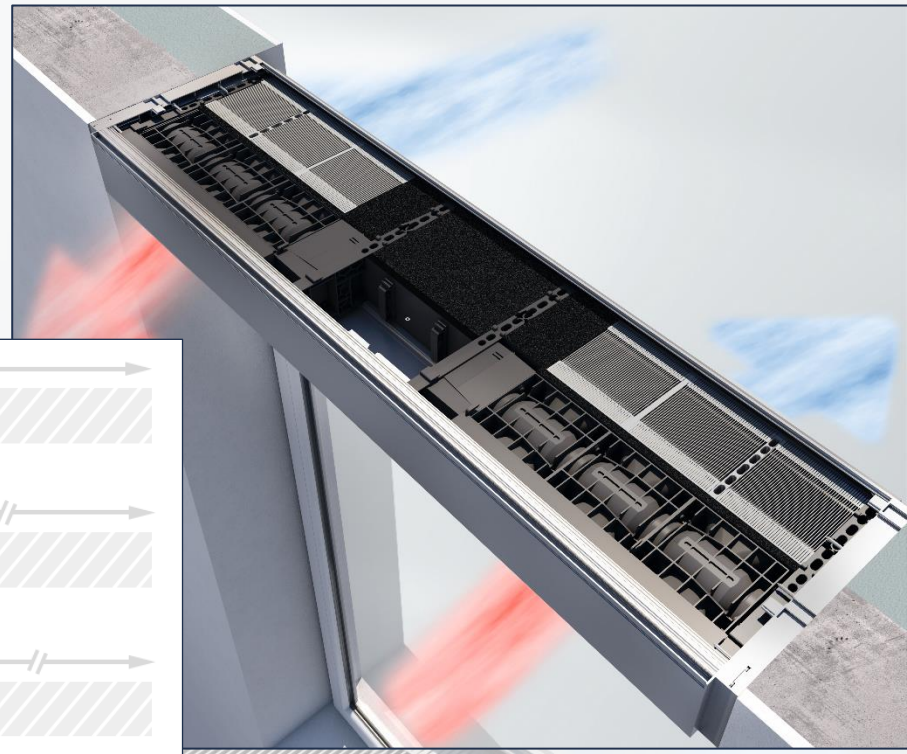
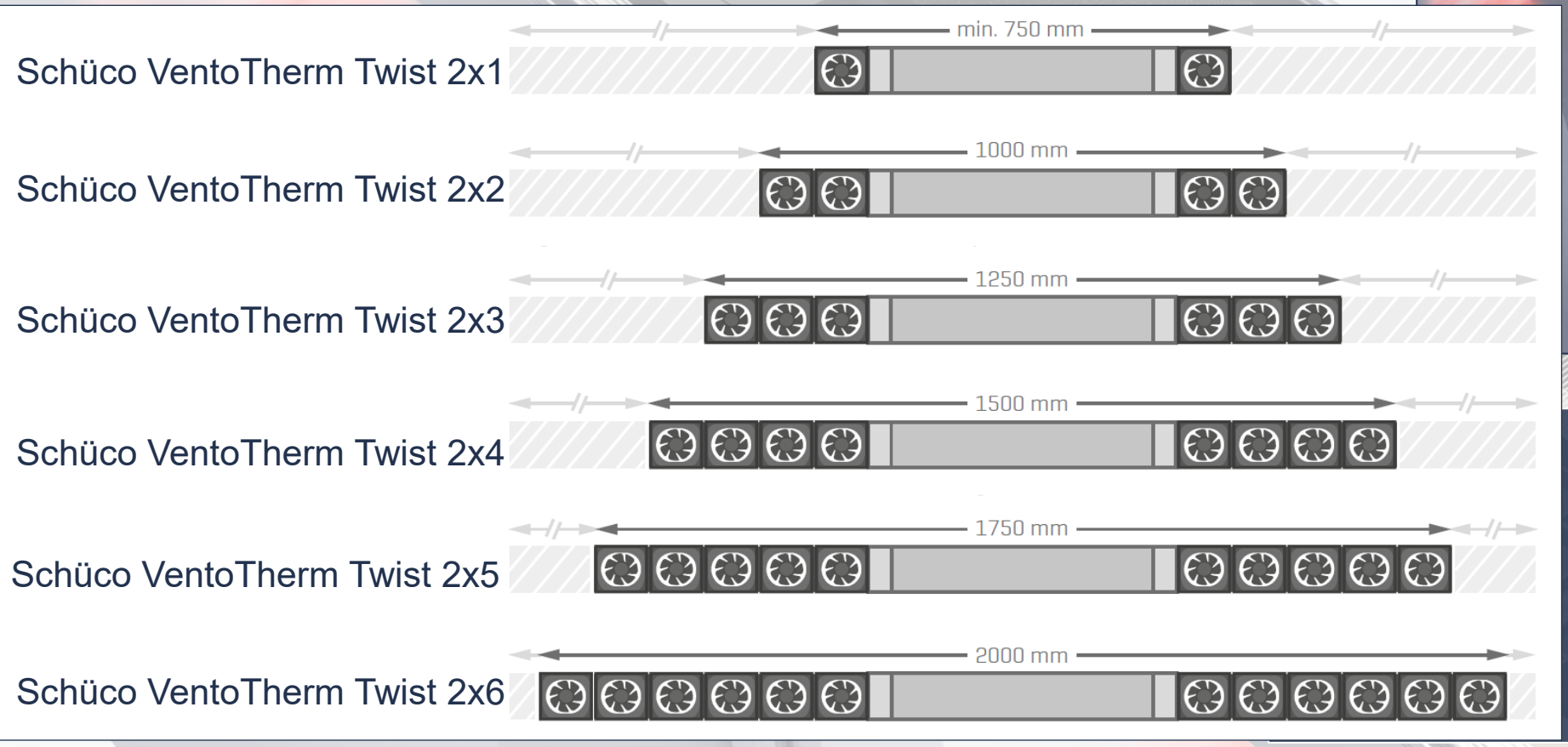




U ovisnosti o traženom **volumenu protoka,** broj ventilatorskih modula **može biti prilagođen** od 2x1 do 2x6.

Broj ljudi u prostoriji: 25

Troškovi životnog ciklusa

ALUKÖNIGSTAHL

Potencijalni protok zraka [m^3/h] = Protok zraka po uređaju određene konfiguracije

Schüco VentoTherm Twist	2 x 6 Ventilatora			2 x 5 Ventilatora			2 x 4 Ventilatora			2 x 3 Ventilatora			2 x 2 Ventilatora			2 x 1 Ventilator		
	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter
minimalna izmjena	40,5	36,0	29,4	33,8	30,0	24,5	27,0	24,0	19,6	20,3	18,0	14,7	13,5	12,0	9,8	6,8	6,0	4,9
nominalna izmjena	**81,0**	**72,0**	**58,9**	**67,5**	**60,0**	**49,0**	**54,0**	**48,0**	**39,2**	**40,5**	**36,0**	**29,4**	**27,0**	**24,0**	**19,6**	**13,5**	**12,0**	**9,8**
maksimalna izmjena	162,0	144,0	117,7	135,0	120,0	98,0	108,0	96,0	78,4	81,0	42,0	58,8	54,0	48,0	39,2	27,0	24,0	19,6

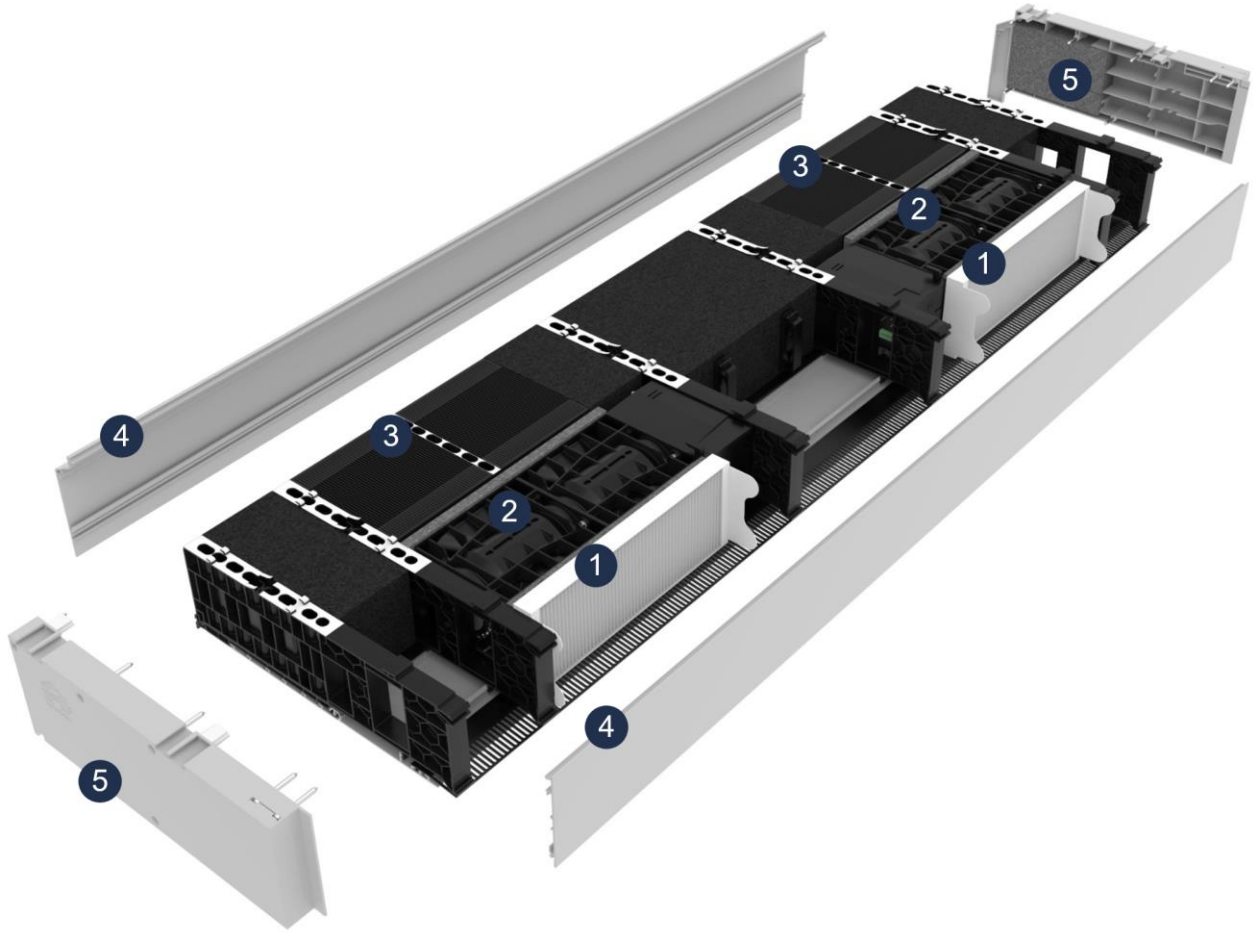
Broj potrebnih uređaja za udovoljavanje uvjeta određene kategorije kvalitete zraka prema HRN EN 13779

Visoka unutarnja kvaliteta zraka	IDA 1	72 m3/h	750 ppm															
Broj uređaja	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter
minimalna izmjena	44	50	61	53	60	73	67	75	92	89	100	122	133	150	184	265	300	367
nominalna izmjena	**22**	**25**	**31**	**27**	**30**	**37**	**33**	**38**	**46**	**44**	**50**	**61**	**67**	**75**	**92**	**133**	**150**	**184**
maksimalna izmjena	11	13	15	13													75	92
Prosječna kvaliteta zraka	IDA 2	45 m3/h	900 ppm															
Broj uređaja	w/o filter	G3 filter	F7 filter	w/o filter	G3												filter	F7 filter
minimalna izmjena	28	31	38	33													188	230
nominalna izmjena	**14**	**16**	**19**	**17**	**19**	**23**	**21**	**23**	**29**	**28**	**31**	**38**	**42**	**47**	**57**	**83**	**94**	**115**
maksimalna izmjena	7	8	10	8	9	11	10	12	14	14	27	19	21	23	29	42	47	57
Umjereno niska kvaliteta zraka	IDA 3	29 m3/h	..200 ppm															
Broj uređaja	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter
minimalna izmjena	18	20	25	21	24	30	27	30	37	36	40	49	54	60	74	107	121	148
nominalna izmjena	**9**	**10**	**12**	**11**	**12**	**15**	**13**	**15**	**18**	**18**	**20**	**25**	**27**	**30**	**37**	**54**	**60**	**74**
maksimalna izmjena	4	5	6	5	6	7	7	8	9	9	17	12	13	15	18	27	30	37
Niska kvaliteta zraka	IDA 4	18 m3/h	..600 ppm															
Broj uređaja	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter	w/o filter	G3 filter	F7 filter
minimalna izmjena	11	13	15	13	15	18	17	19	23	22	25	31	33	38	46	66	75	92
nominalna izmjena	**6**	**6**	**8**	**7**	**8**	**9**	**8**	**9**	**11**	**11**	**13**	**15**	**17**	**19**	**23**	**33**	**38**	**46**
maksimalna izmjena	3	3	4	3	4	5	4	5	6	6	11	8	8	9	11	17	19	23

(25*45)/72 ~ 16 uređaja

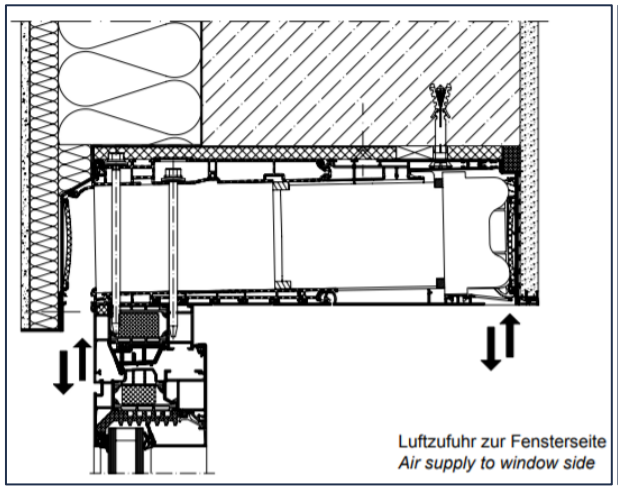
16 x 13.2 W = 0.21 kW

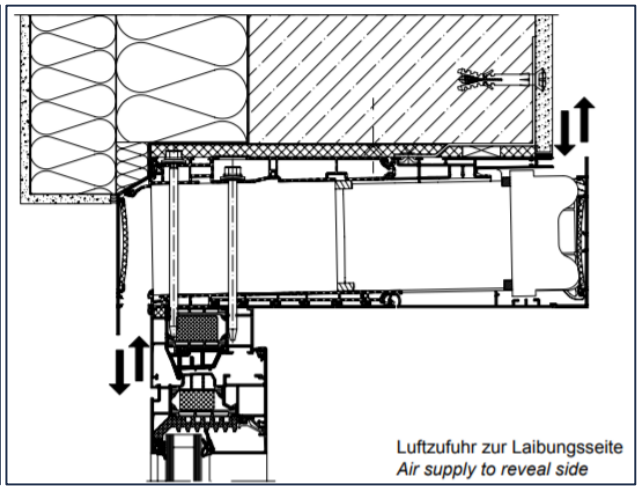
1. G3 (45%) ili F7 (75%) filter
2. ventilatorske jedinice za izmjenu
3. jedinice za rekuperaciju
4. aluminijsko kučište
5. plastične kape

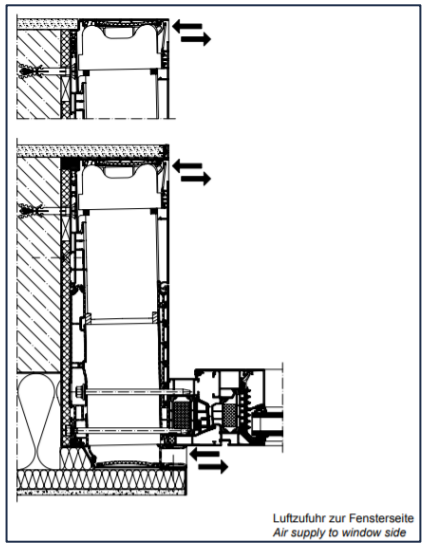


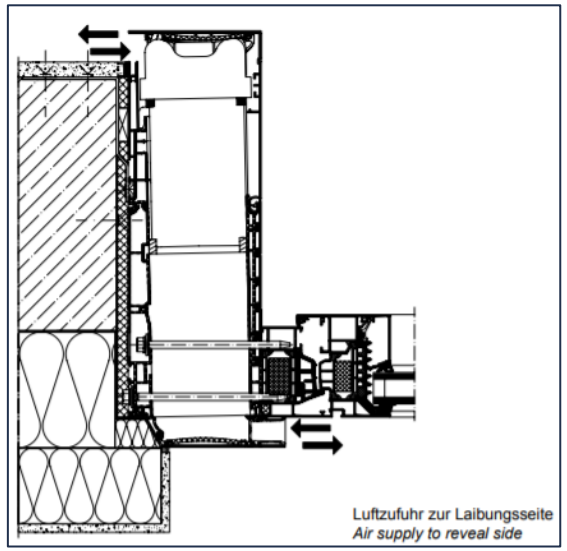
- unaprijeđena rekuperacija: cca. 80%; (EN 13141-8)
- veća fleksibilnost protoka zraka: do cca. 140 m³/h

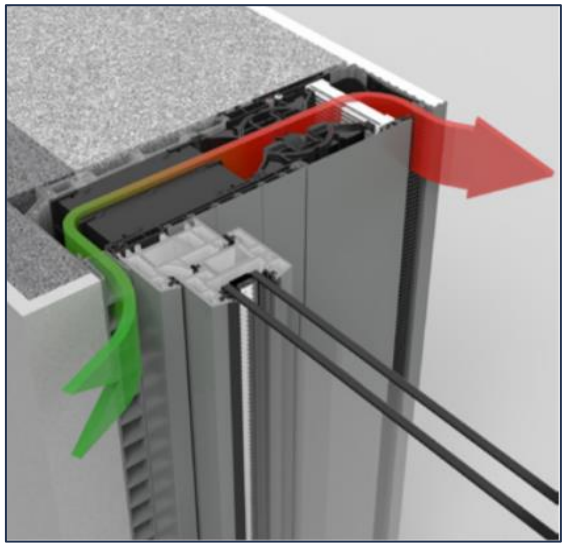
Toplinska ugodnost – brzina i smjer strujanja

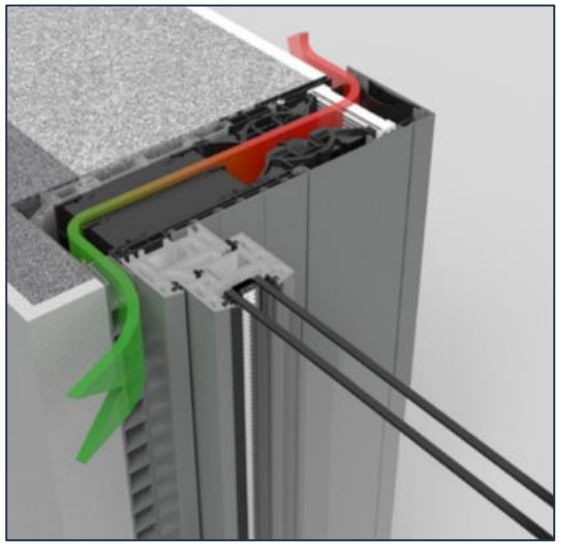






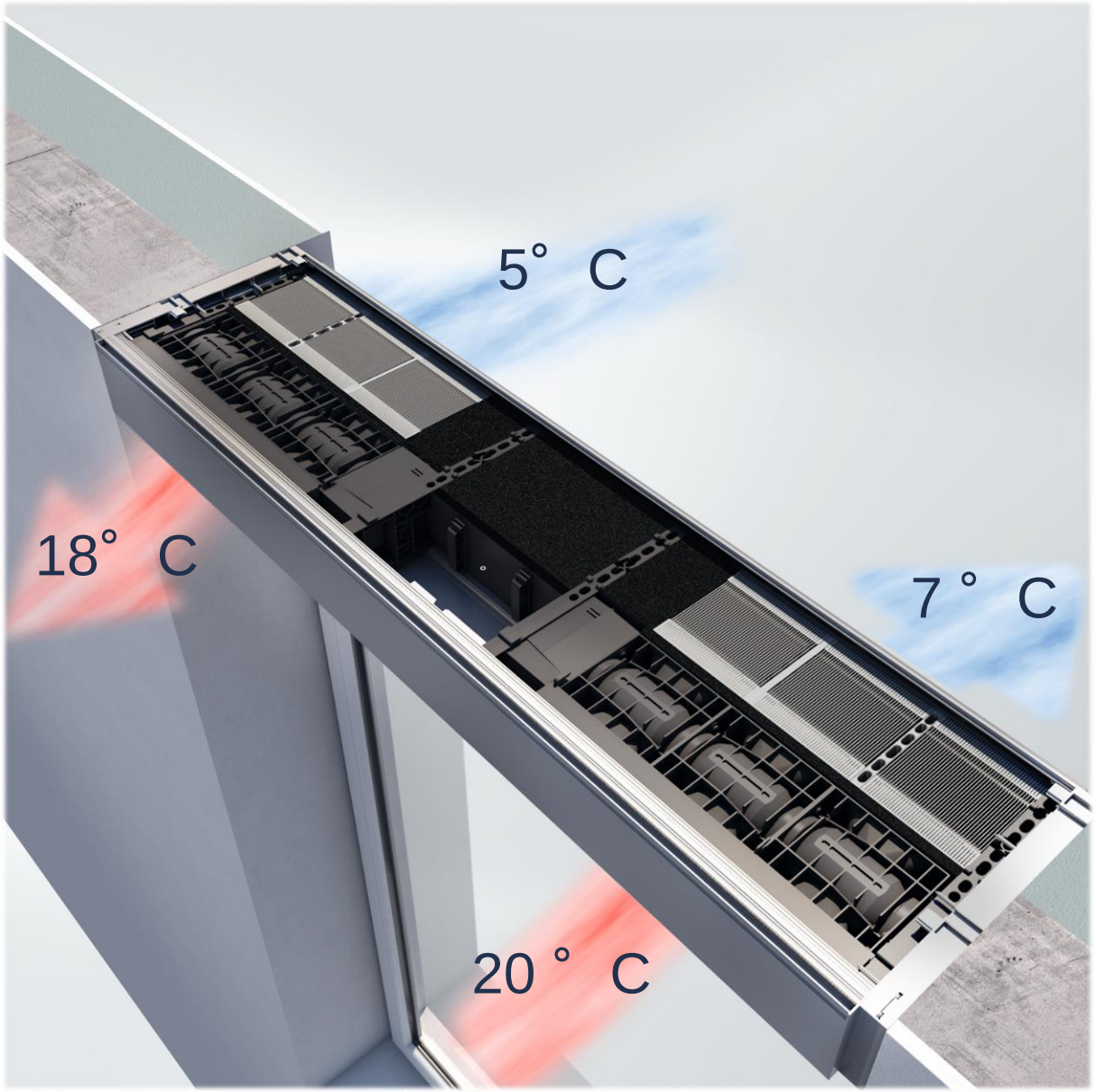






Troškovi životnog ciklusa

Automatski mod	Najbolja kvaliteta zraka
Tihi mod	Ekstremno tiho
Bypass funkcija	Hlađenje ljeti
Automat. zatvaranje	Maksimalna vodotijesnost
Mod privremenog ulaska zraka	Konekcija na odvodnju zraka iz kupaone



Basic: Upravljanje prekidačima

- ručna kontrola zraka
- jednostavno za instalaciju zahvaljujući bežičnoj komunikaciji
- baterijsko napajanje

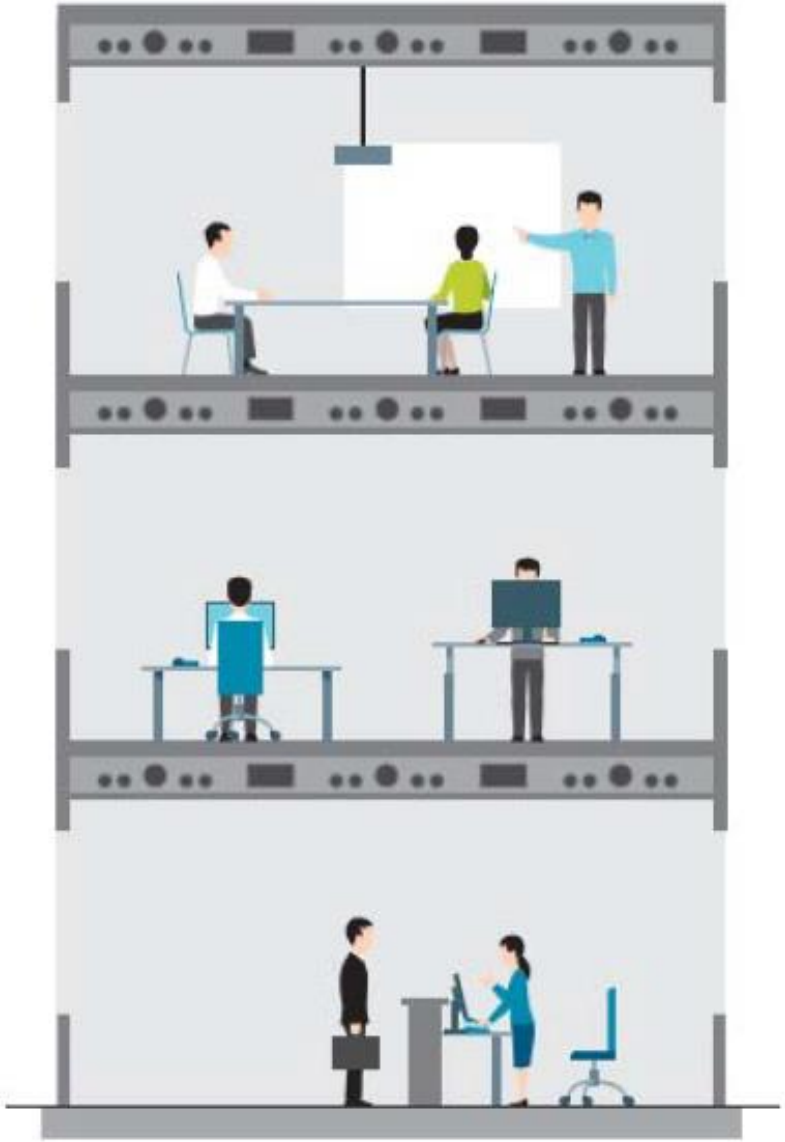
Comfort: Touchscreen

- integriran senzor kvalitete za kontrolu ventilacije za postizanje traženih parametara
- individualno programiranje timer-a
- vrlo jednostavno za instalaciju, zahvaljujući bežičnoj komunikaciji
- kao ventilator, zahtjeva 230 V konekciju

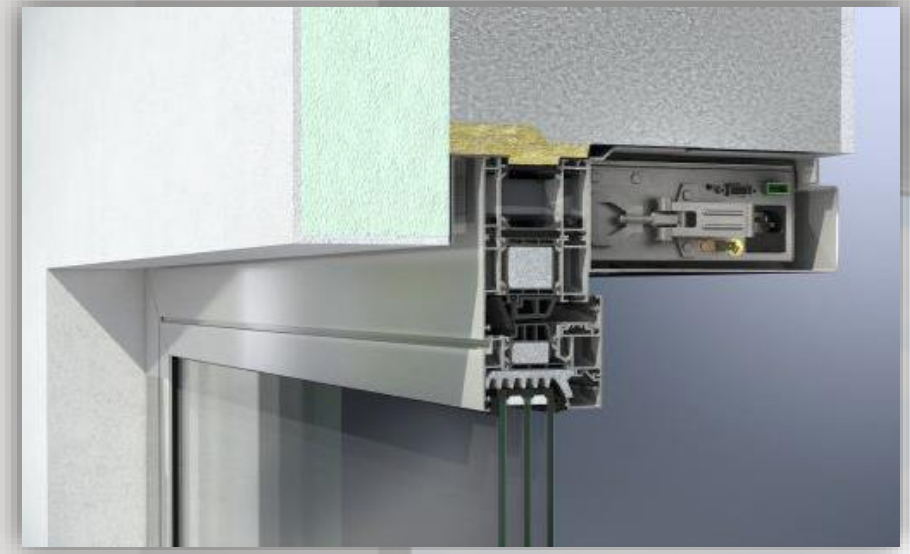
visina stropa, poželjno – preko 3 m

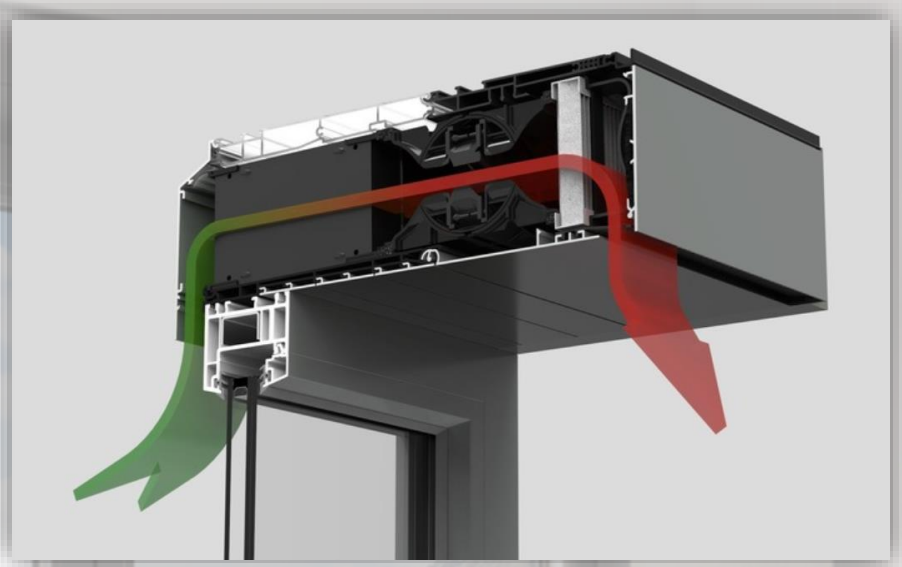
VentoTherm Twist – 3 m zajedno s ventilacijom

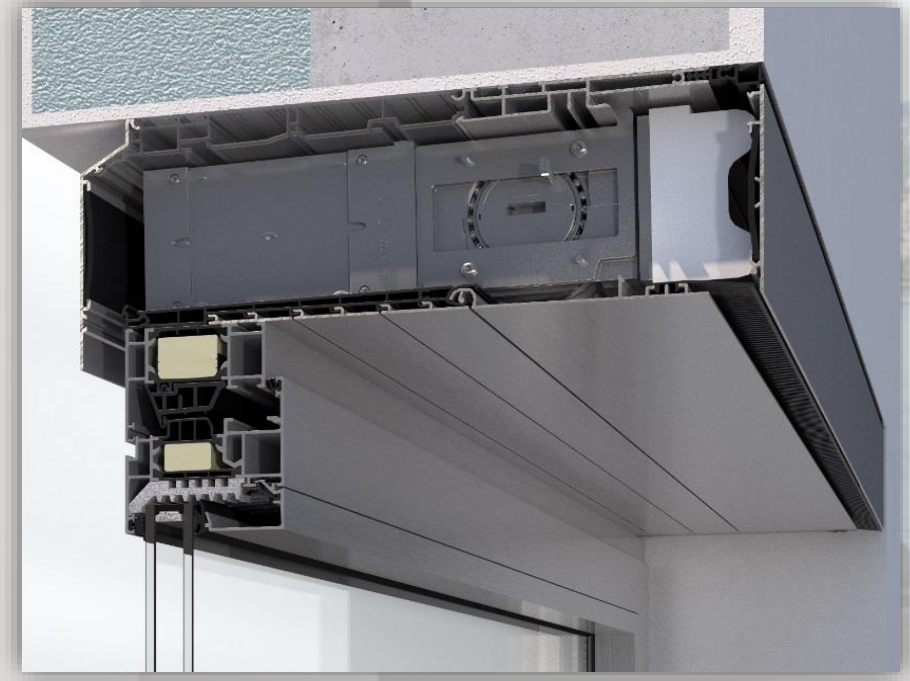
ušteda, cca 15%



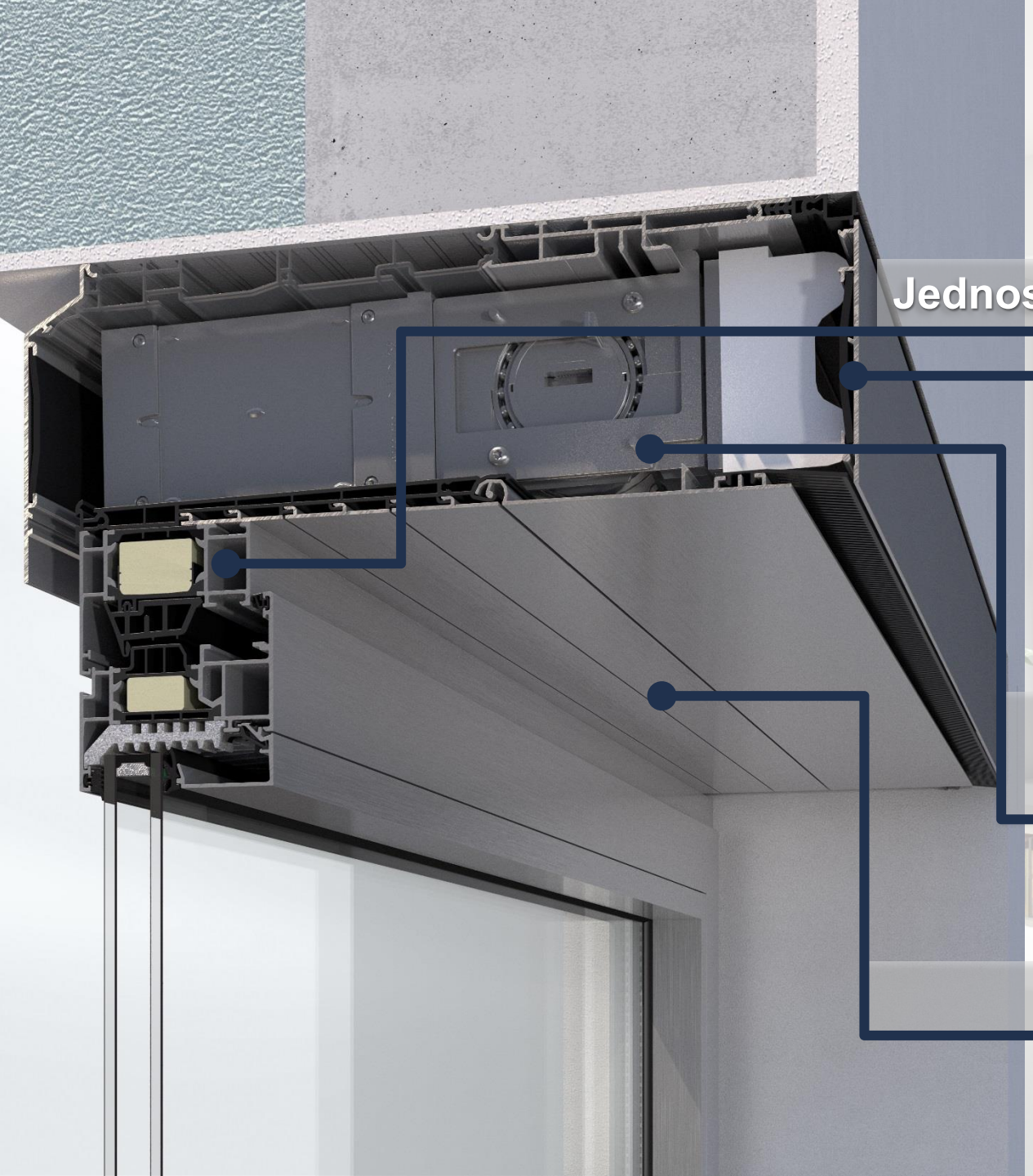
Kvaliteta ovojnice







- 0.85 W/m2K < Uw < 1.0 W/m2K
- vodotijesnost min. 600 Pa
- prigušenje vanjske buke:
  - u radu: 32 dB
  - u mirovanju: 41 dB



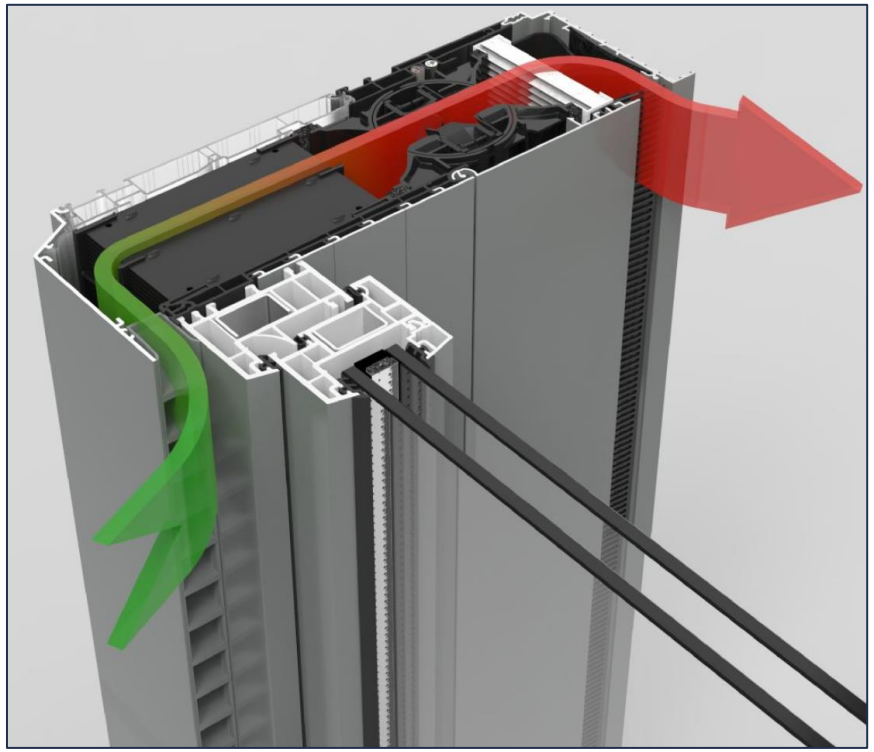
Jednostavno pričvršćenje vijcima na jedinicu

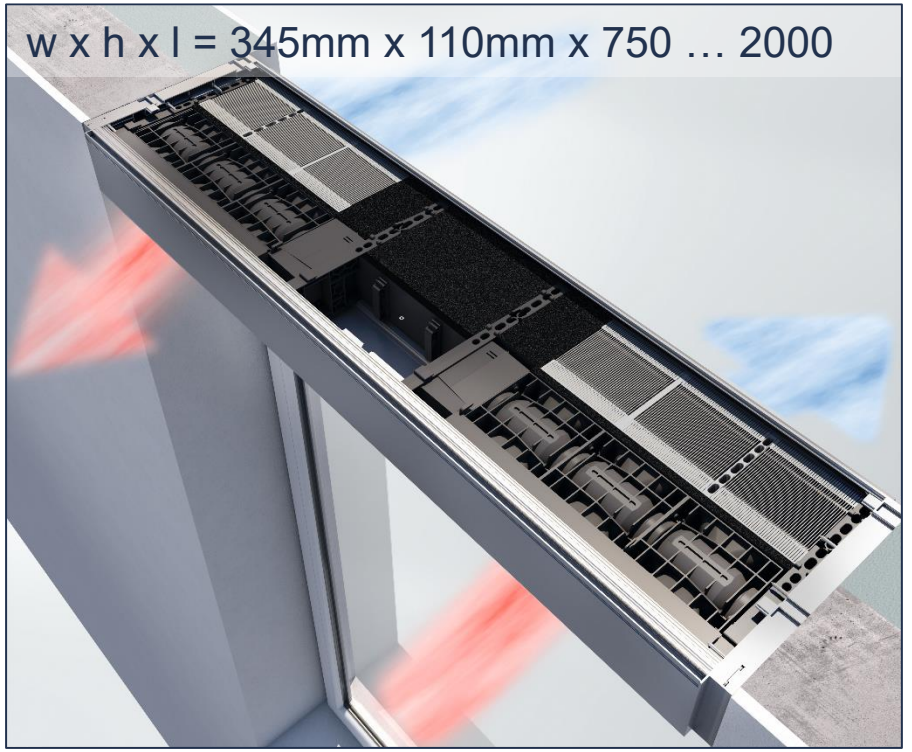
Horizontalna i vertikalna opcija ugradnje

Jednostavno održavanje bez posebnih alata zahvaljujući modularnosti komponenata

Prilagođena narudžba i isporuka

Dimenzije – dostupnost instalacije





SVJEŽI ZRAK.

BEZ BUKE.

BEZ HLADNOĆE.

BEZ PELUDI.

BEZ PRAŠINE.

SCHÜCO

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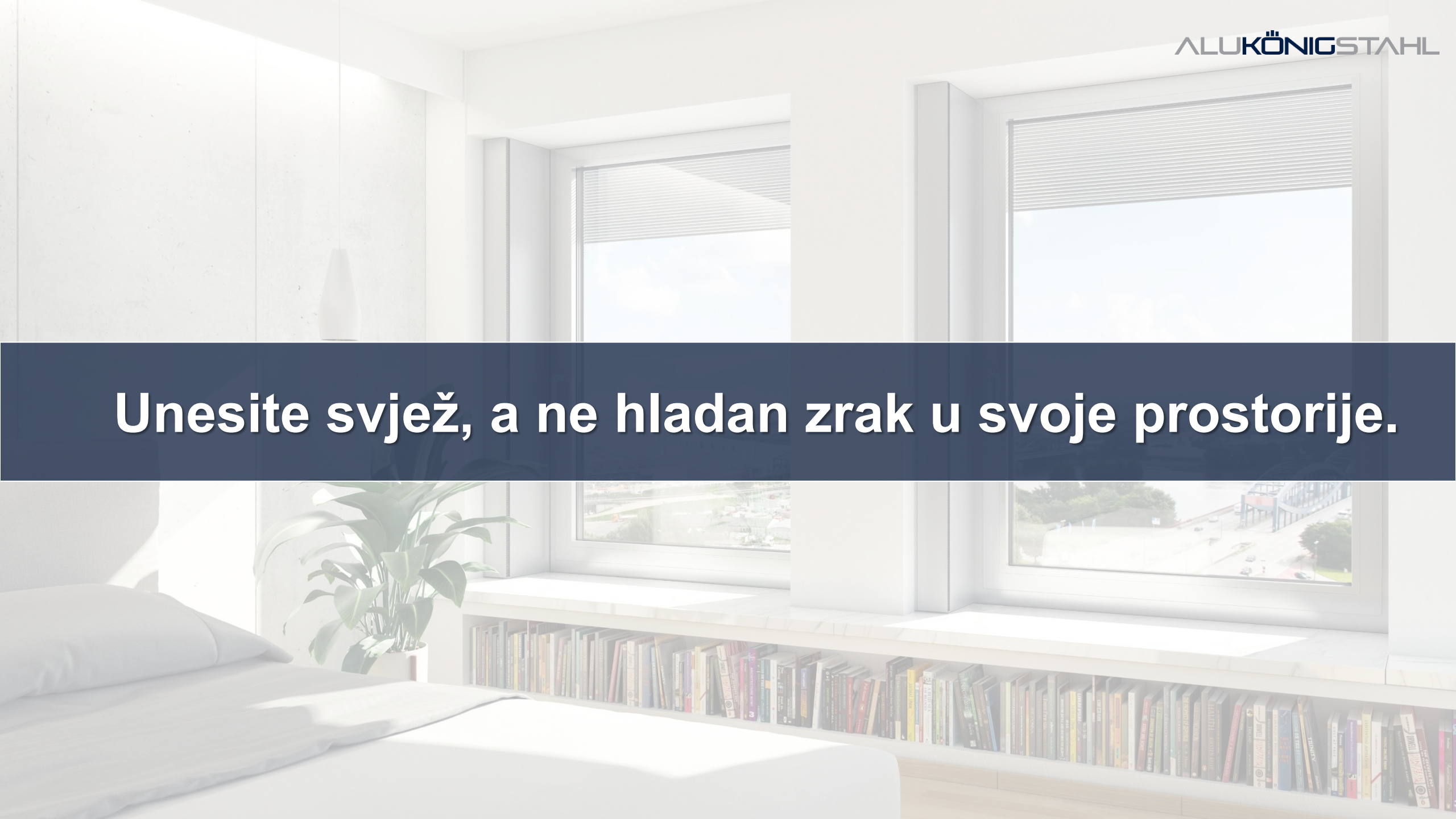
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