

# TECHNICS

## minimal windows®

[www.minimal-windows.com](http://www.minimal-windows.com)



**ARCHITECT'S MANUAL**



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## System

Facing width	: 21 mm
Installation flush to the floor	: possible
Installation flush to the ceiling	: possible
Max. leaf height	: 4 m
Min. B/H	: 1/3
Max. leaf weight	: 500 kg
Max. leaf area sliding	: 8 m <sup>2</sup>
Max. leaf area fix	: 18 m <sup>2</sup>
Overall insulation glass thickness	: 26 up to 34 mm
Automated sliding leaf	: yes
Accessibility	: DIN 18040-1, DIN 18040-2

## Building physics

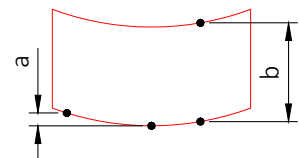
U <sub>w</sub> -Values (dep. on glass type & dimensions)	: ≥ 1.1 W/(m <sup>2</sup> K)
Air permeability	: up to Classe 4 → EN 12207
Resistance to rain penetration	: up to Classe 7A → EN 12208
Resistance to wind loads	: up to Classe C4/B5 → EN 12210
Sound insulation	: up to 39 dB → ISO 717-1

## Safety

Resistance to burglary	: up to RC 2 → EN 1627
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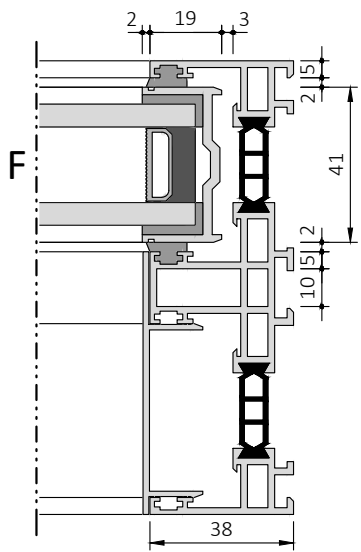
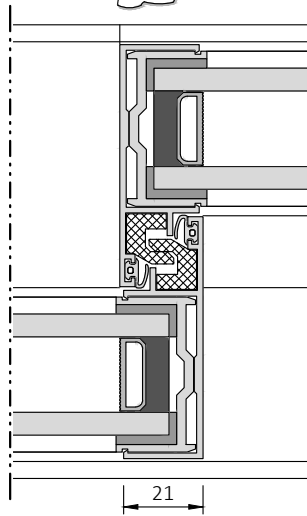
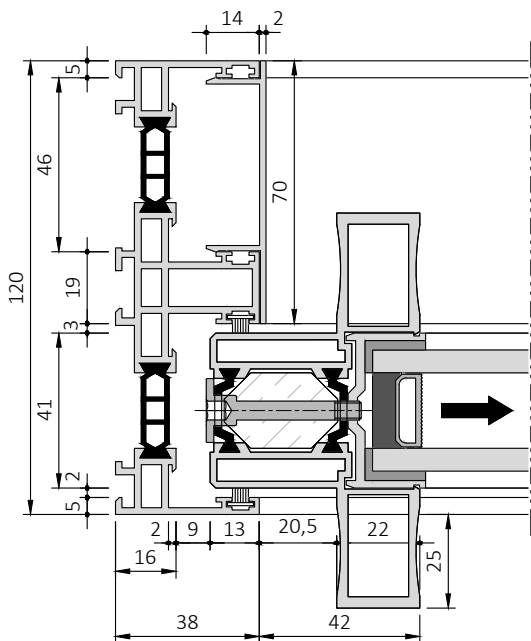
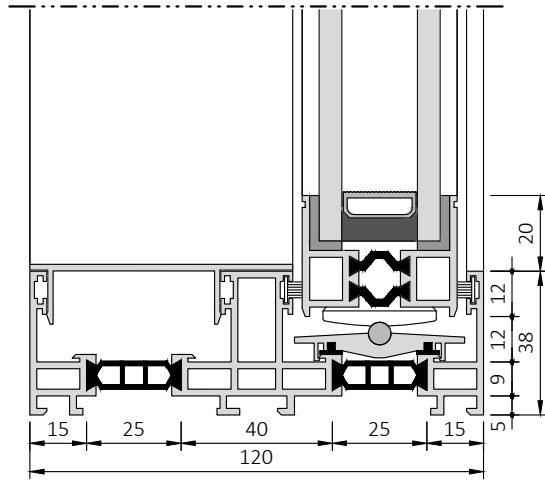
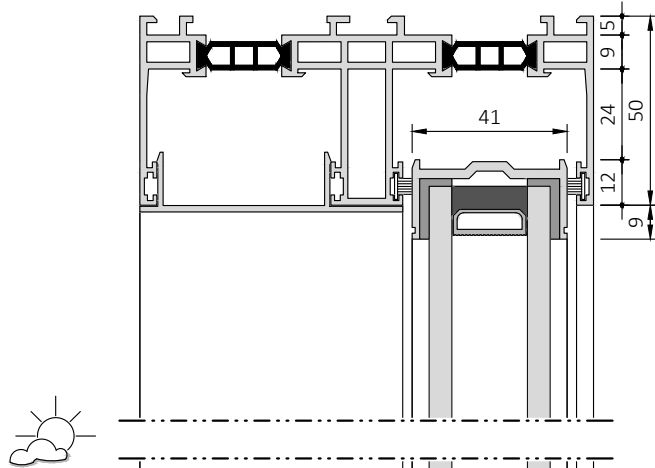
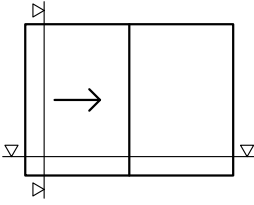
## Max. allowable bending of outer frame

During assembly		
a	: ± 0.5	mm / m
b	: ± 1	mm
During operation		
a	: ± 1	mm / m
b	: + 2 / - 5	mm



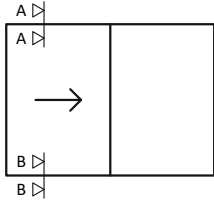
Survey

M 1:2



Outer frame

M 1:2

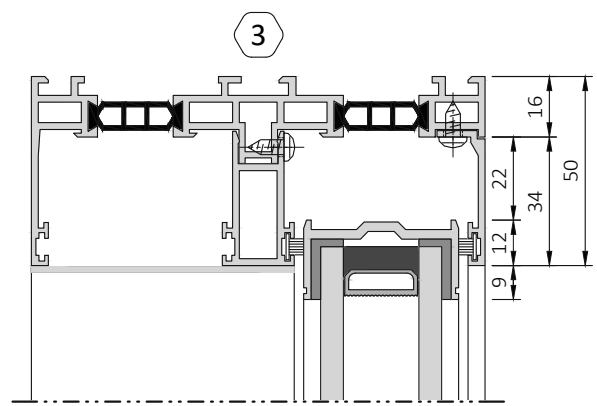
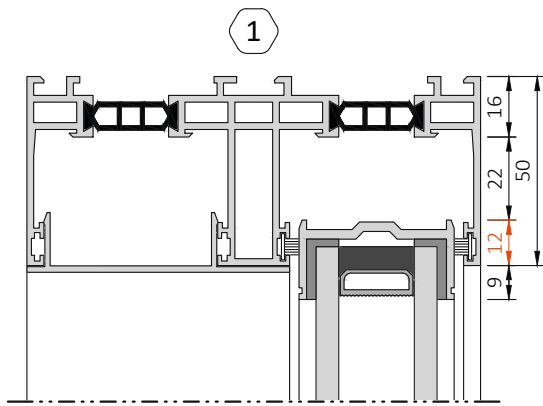
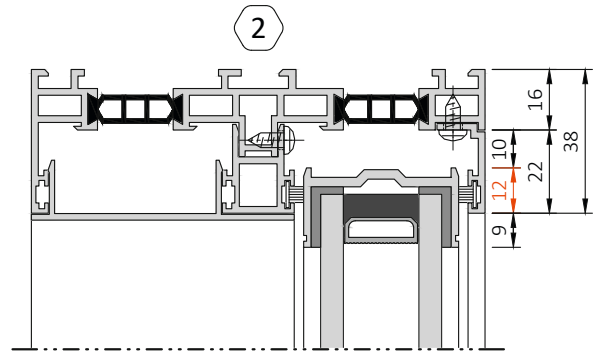


A-A

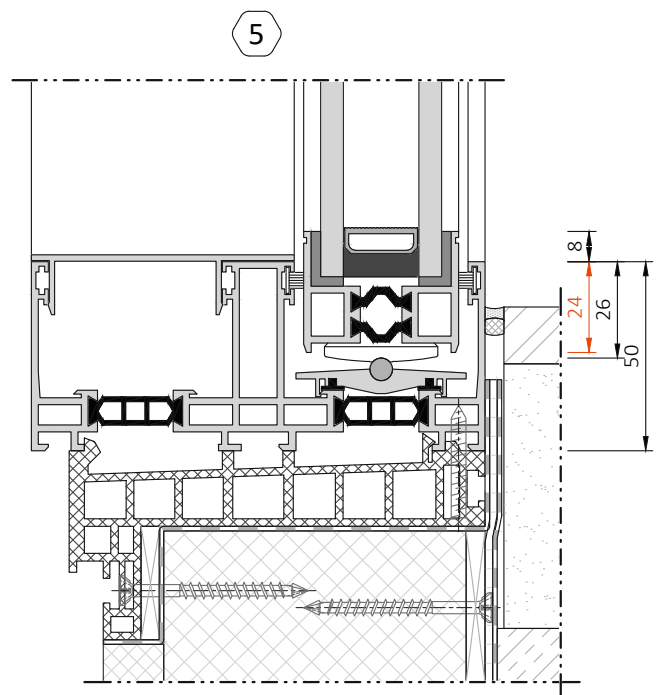
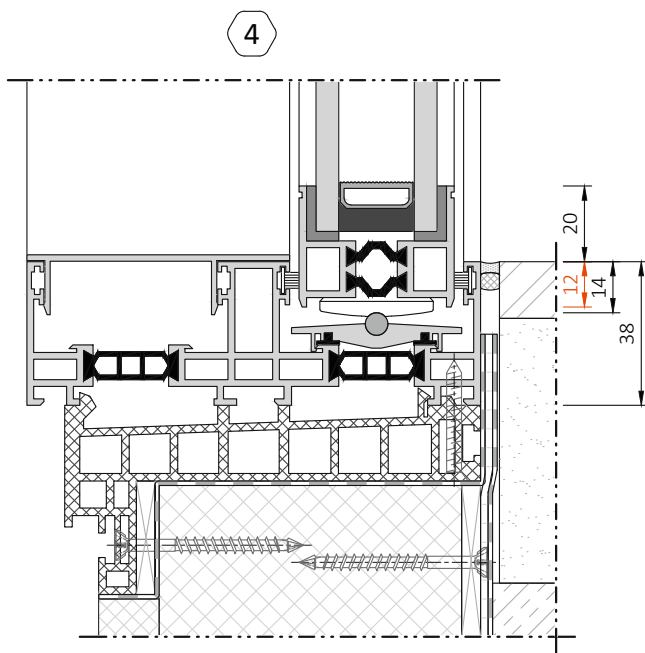
Combination possibilities

	1	2	3
4	✓	✓	✓
5	✗	✓	✓

2 is not recommendable

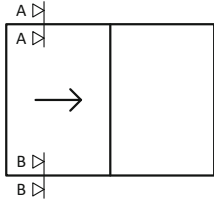


B-B



Outer frame freeway

M 1:2

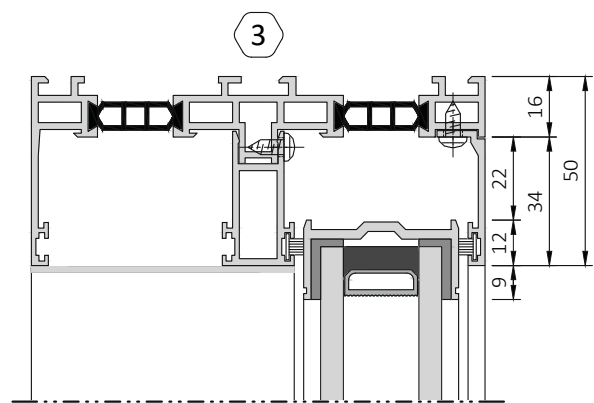
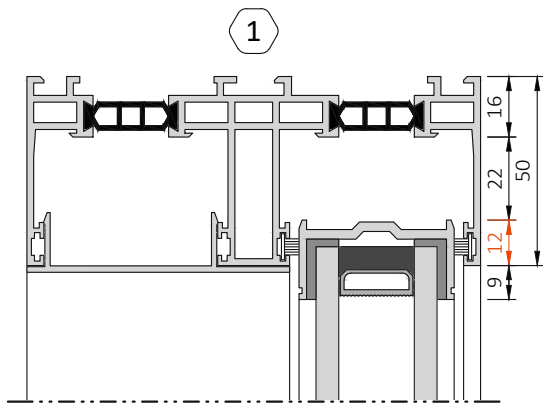
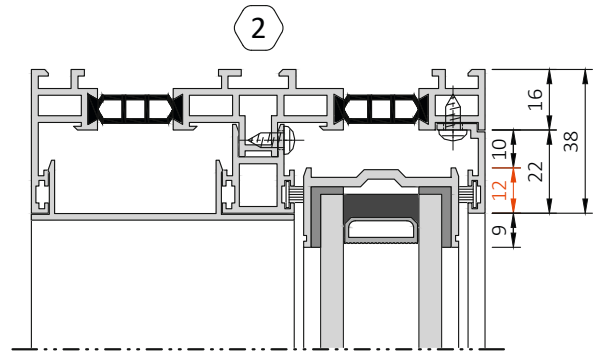


A-A

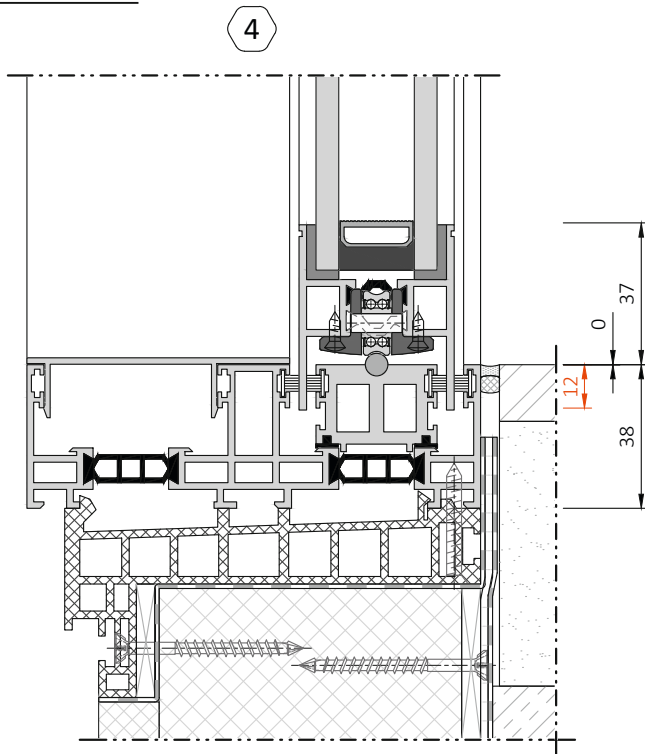
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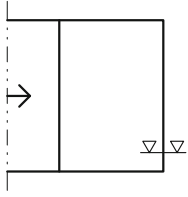
	①	②	③
④	✓	✓	✓

2 is not recommendable



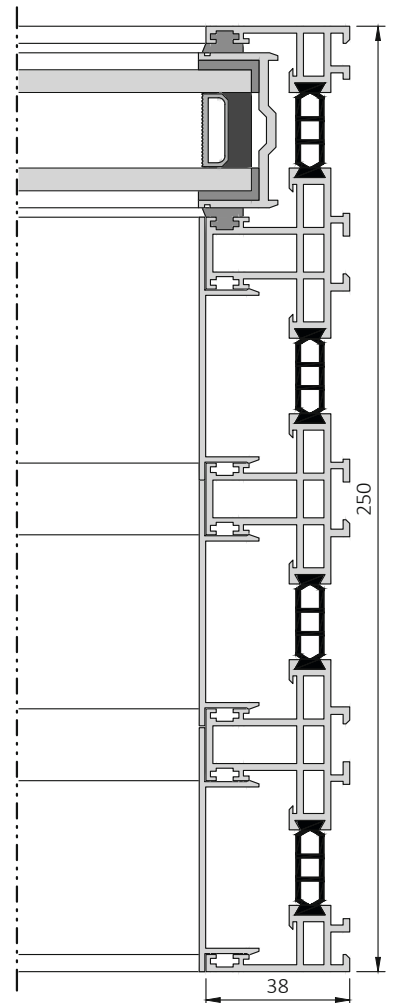
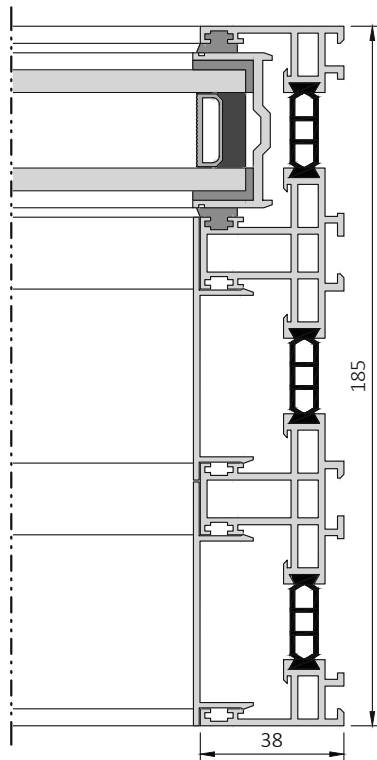
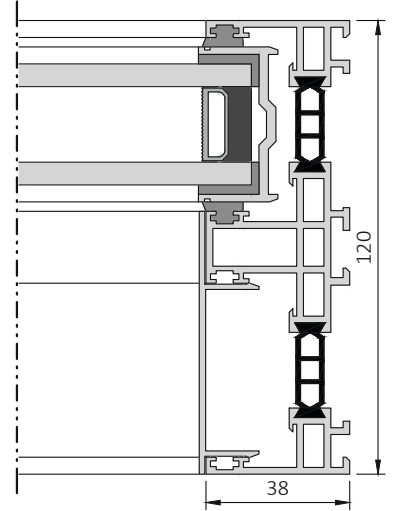
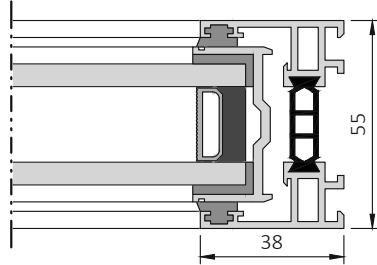
B-B

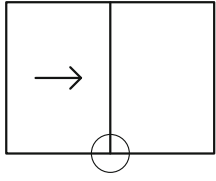




Outer frame

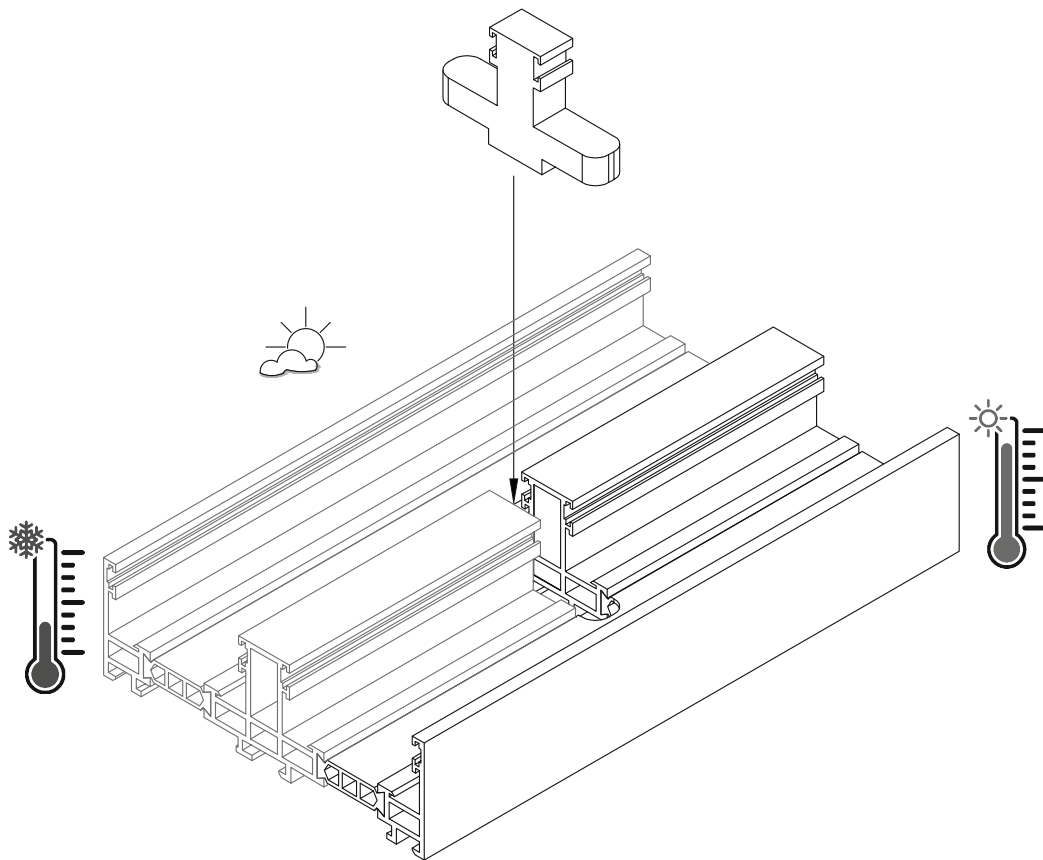
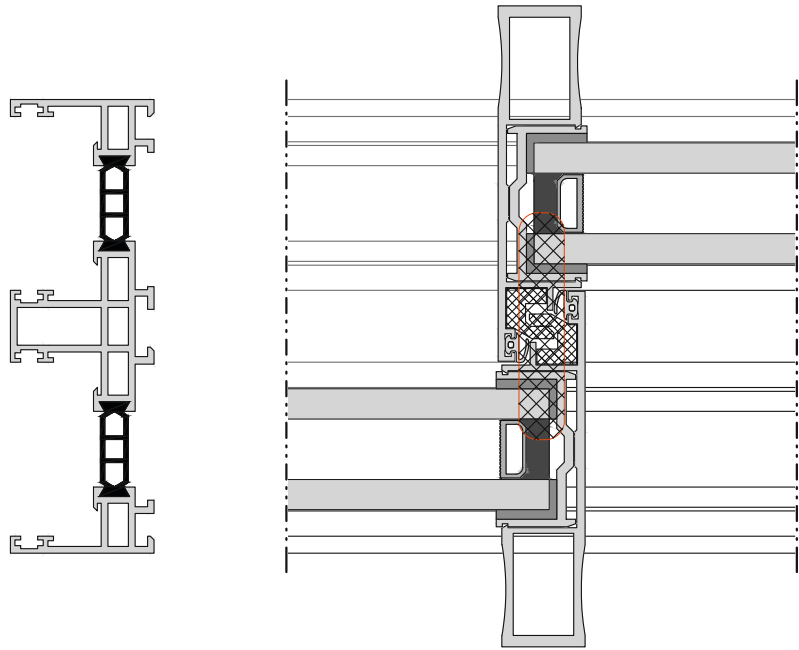
M 1:2





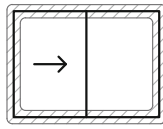
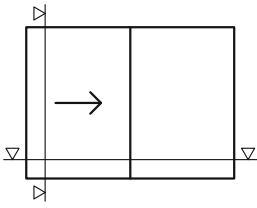
Outer frame: Z-Schell separator

M 1:2

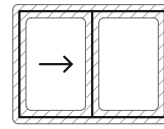


Leaf frame: KE-32n - sliding leaf

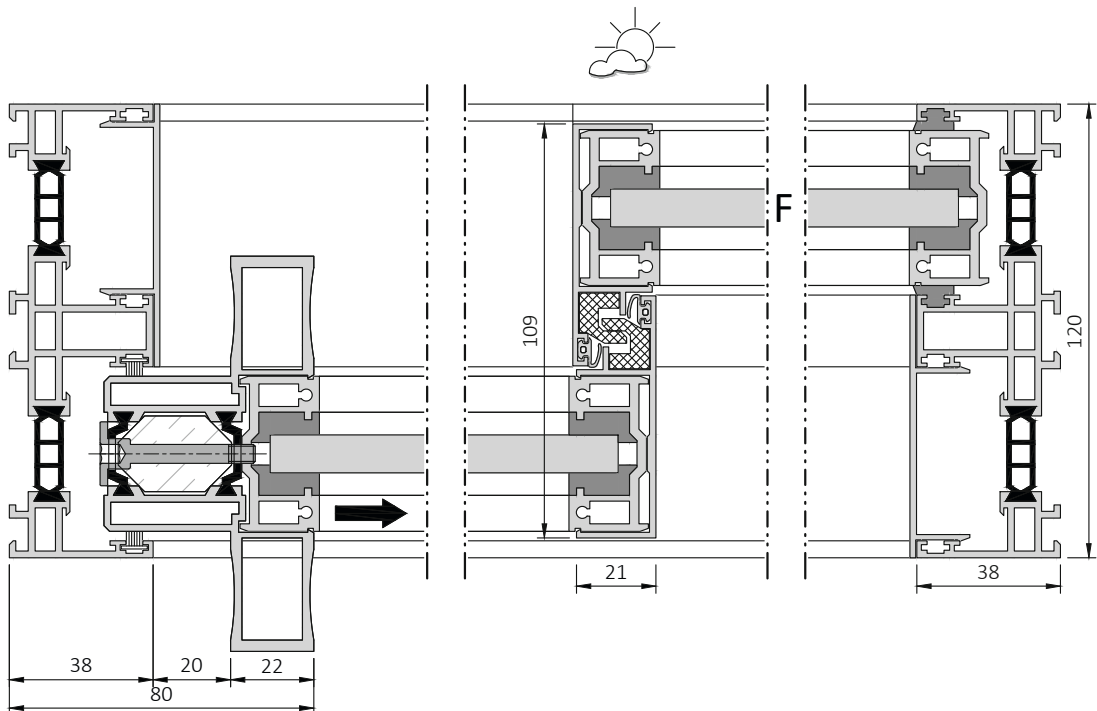
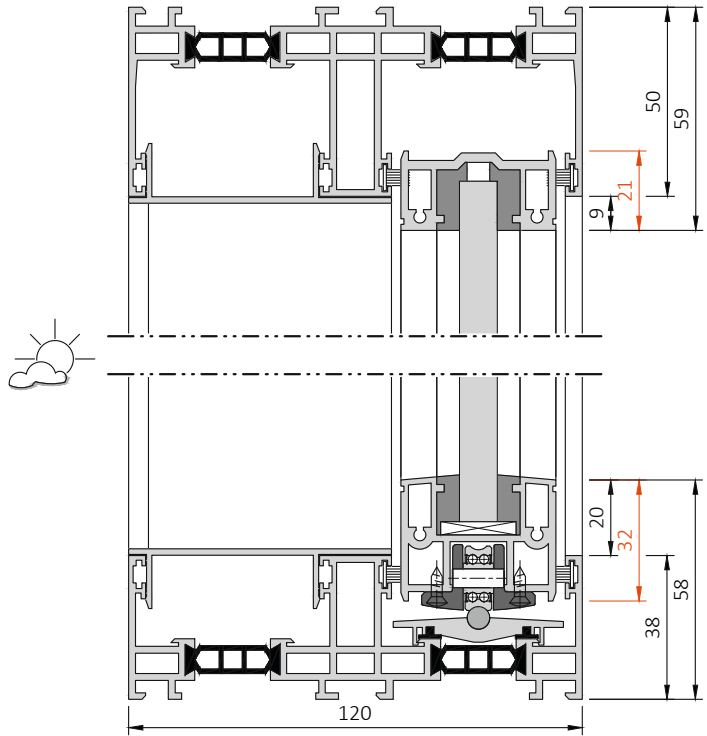
M 1:2



$U_w \geq 5.0 \text{ W/m}^2\text{K}$

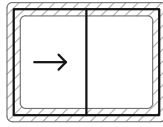
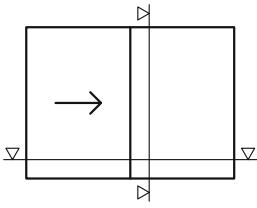


$U_w \geq 5.0 \text{ W/m}^2\text{K}$

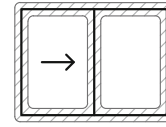


Leaf frame: KE-32n - fix leaf

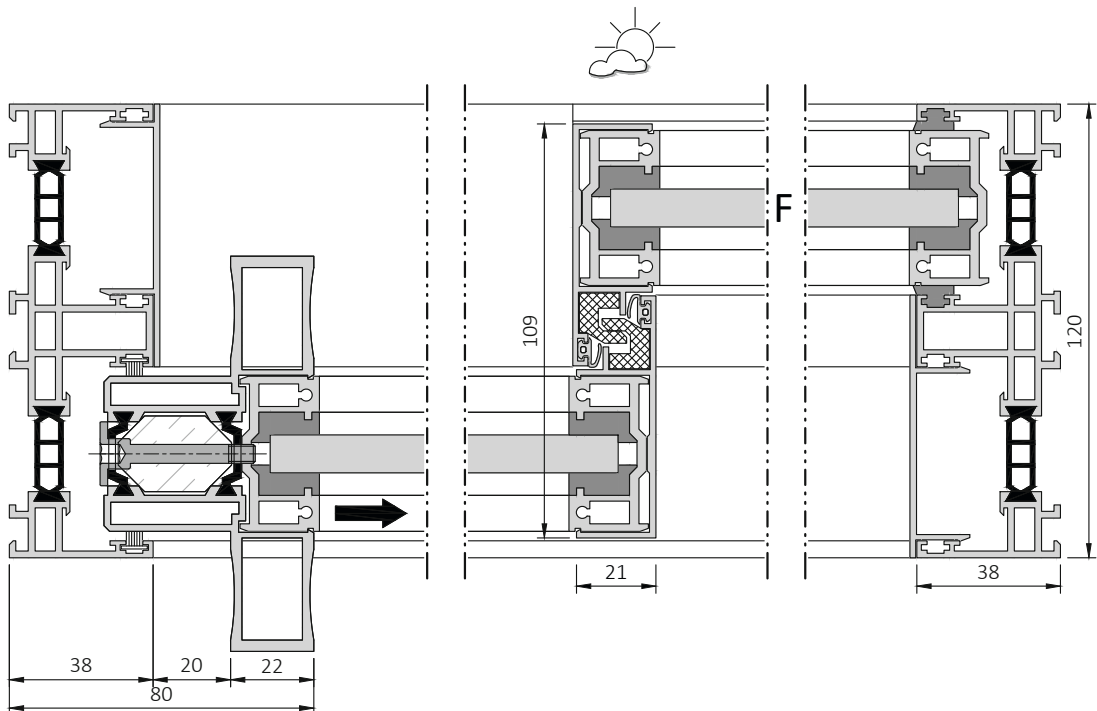
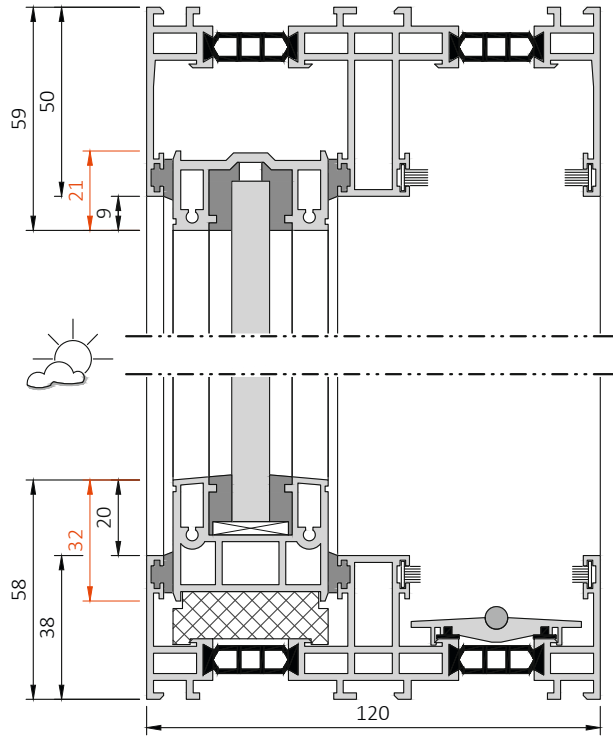
M 1:2

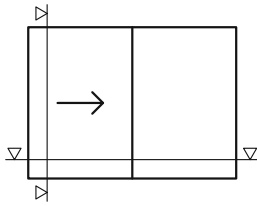


$U_w \geq 5.0 \text{ W/m}^2\text{K}$



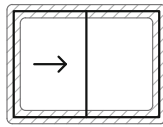
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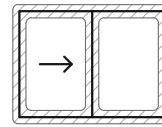


Leaf frame: KE-32 - sliding leaf

M 1:2

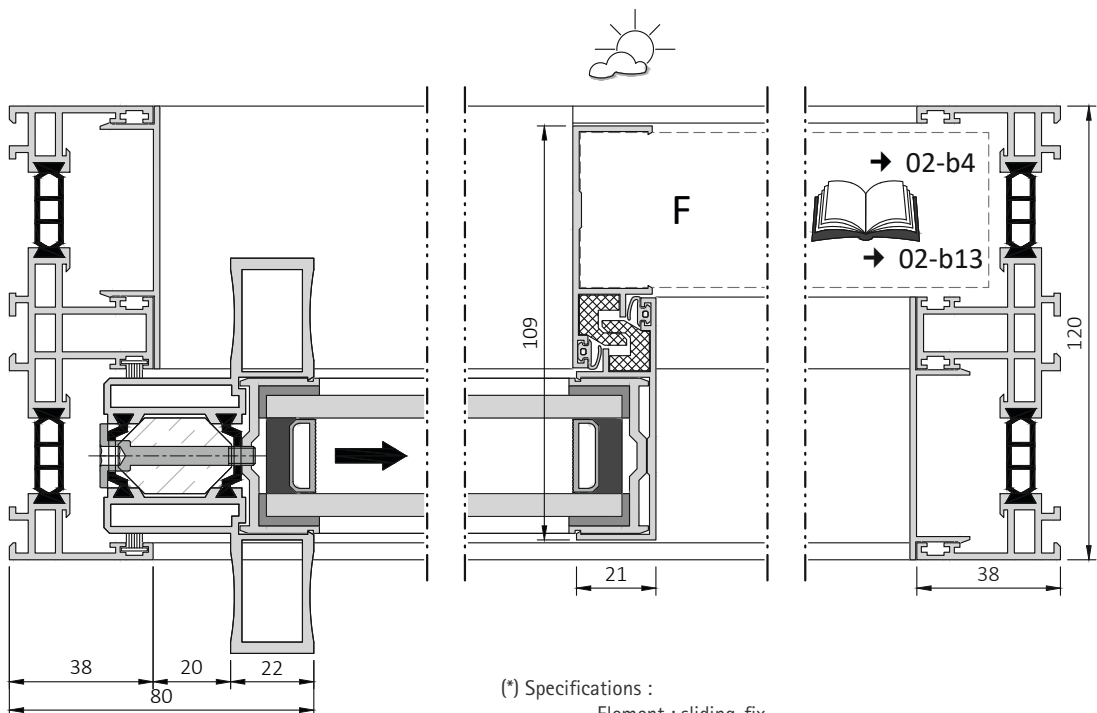
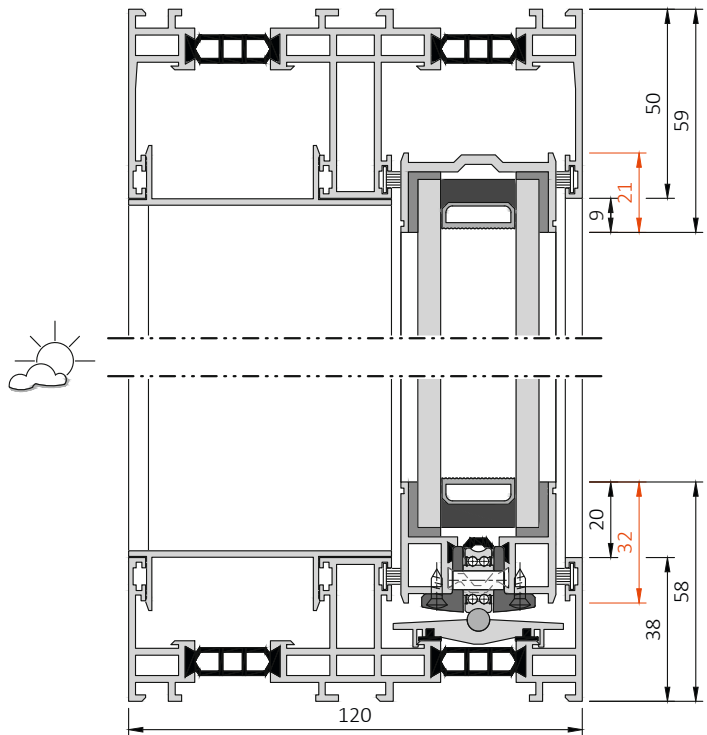


$U_f \text{ } \emptyset \text{ } 6.09 \text{ W/m}^2\text{K (*)}$

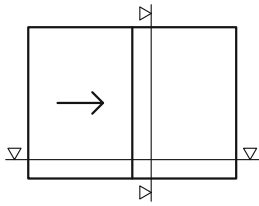


$U_f \text{ } \emptyset \text{ } 6.63 \text{ W/m}^2\text{K (*)}$

$U_w \text{ } \emptyset \text{ } 1.64 \text{ W/m}^2\text{K (*)}$

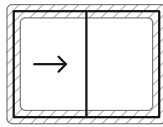


(\*) Specifications :  
 Element : sliding-fix  
 Size : 4.500 x 2.300 mm  
 Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

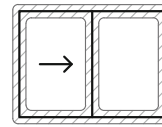


Leaf frame: KE-32 - fix leaf

M 1:2

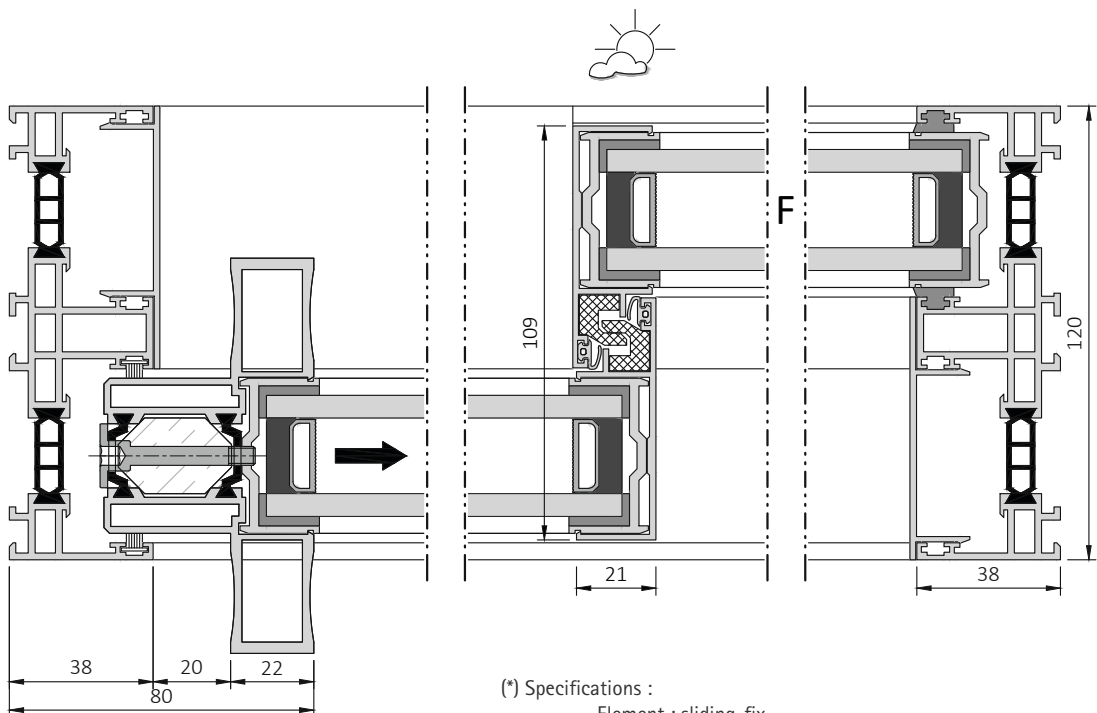
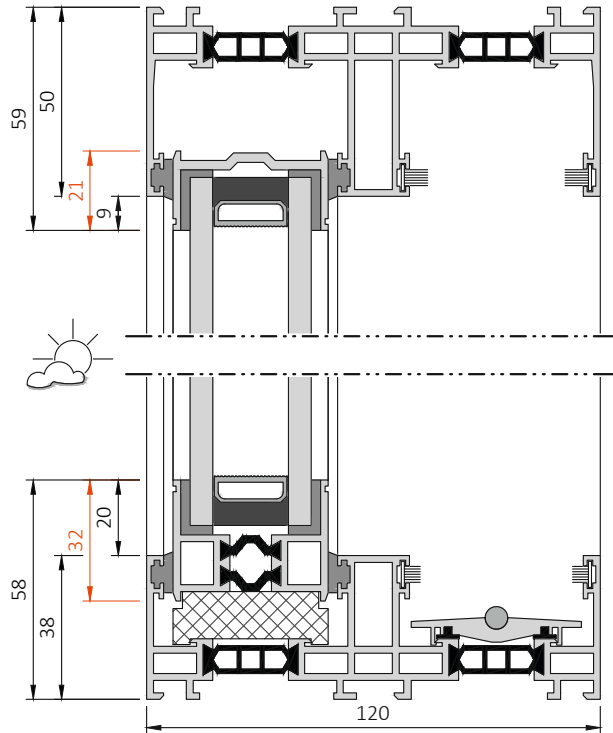


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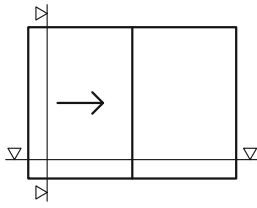


$U_f \text{ } \emptyset \text{ } 6.63 \text{ W/m}^2\text{K (*)}$

$U_w \text{ } \emptyset \text{ } 1.64 \text{ W/m}^2\text{K (*)}$

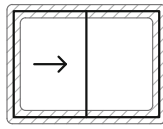


(\*) Specifications :  
 Element : sliding-fix  
 Size : 4.500 x 2.300 mm  
 Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

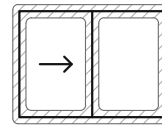


Leaf frame: KE-32h - sliding leaf

M 1:2

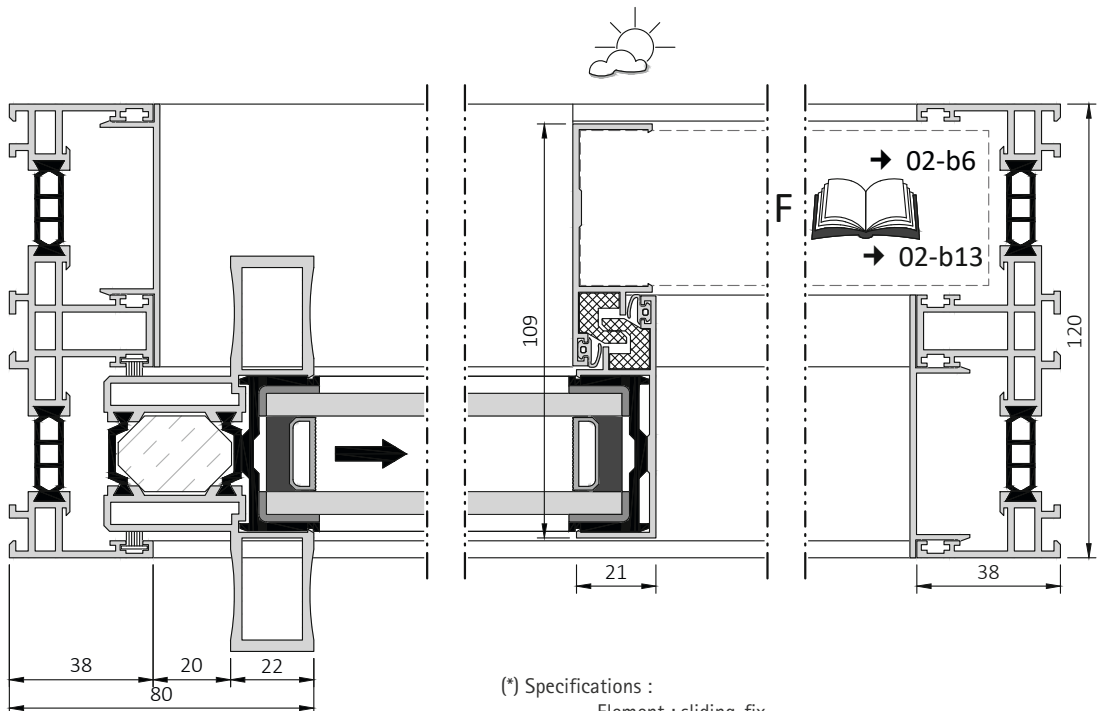
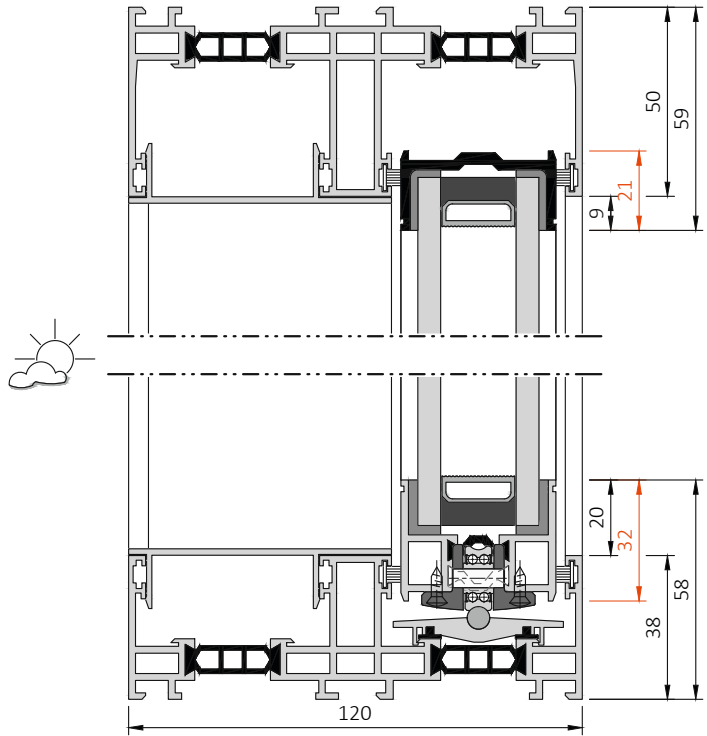


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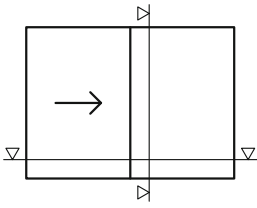


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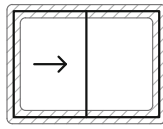


(\*) Specifications :  
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 Size : 4.500 x 2.300 mm  
 Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

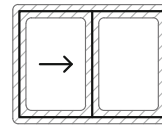


Leaf frame: KE-32h - fix leaf

M 1:2

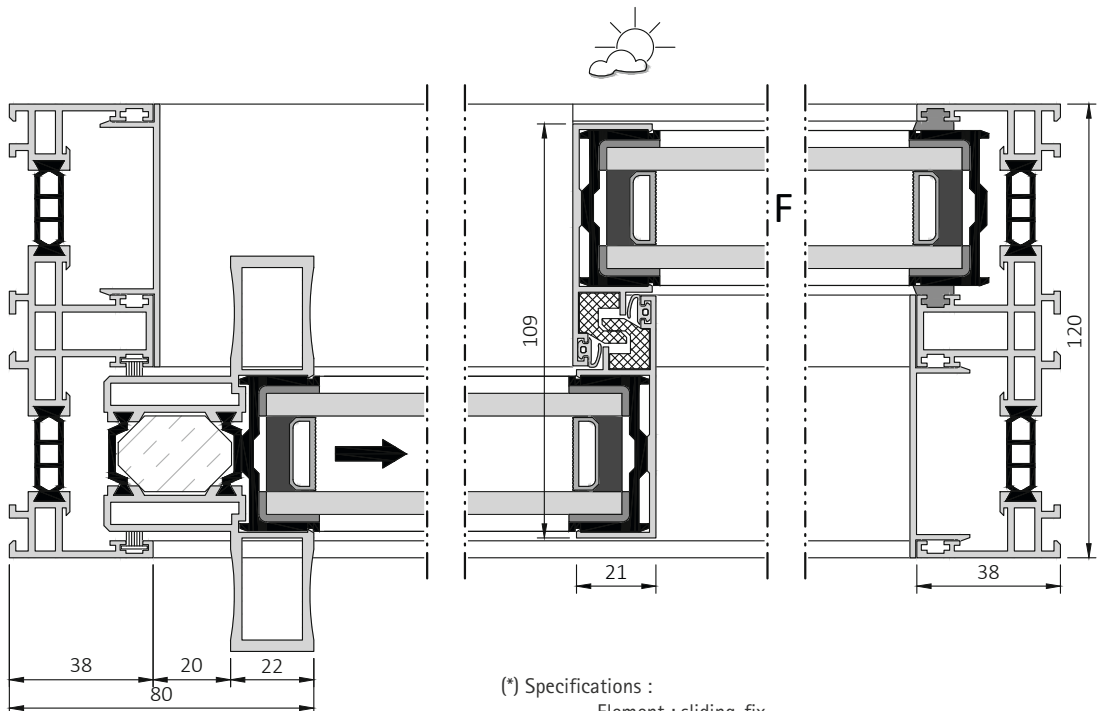
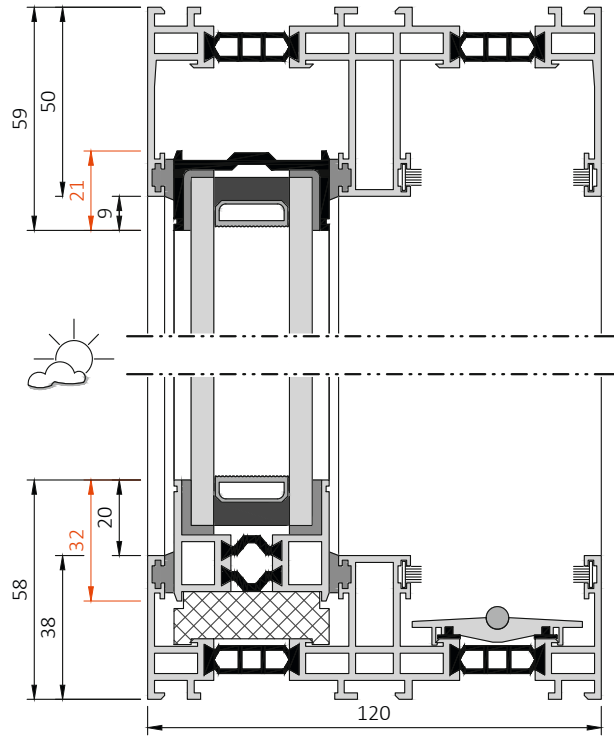


$U_f \text{ } \emptyset \text{ } 3.53 \text{ W/m}^2\text{K (*)}$



$U_f \text{ } \emptyset \text{ } 4.16 \text{ W/m}^2\text{K (*)}$

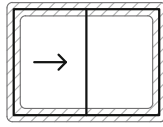
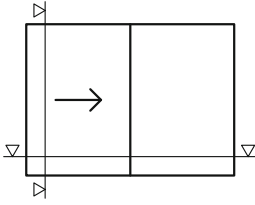
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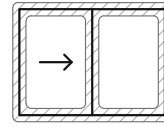
(\*) Specifications :  
 Element : sliding-fix  
 Size : 4.500 x 2.300 mm  
 Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

Leaf frame freeway: KE-49n - sliding leaf

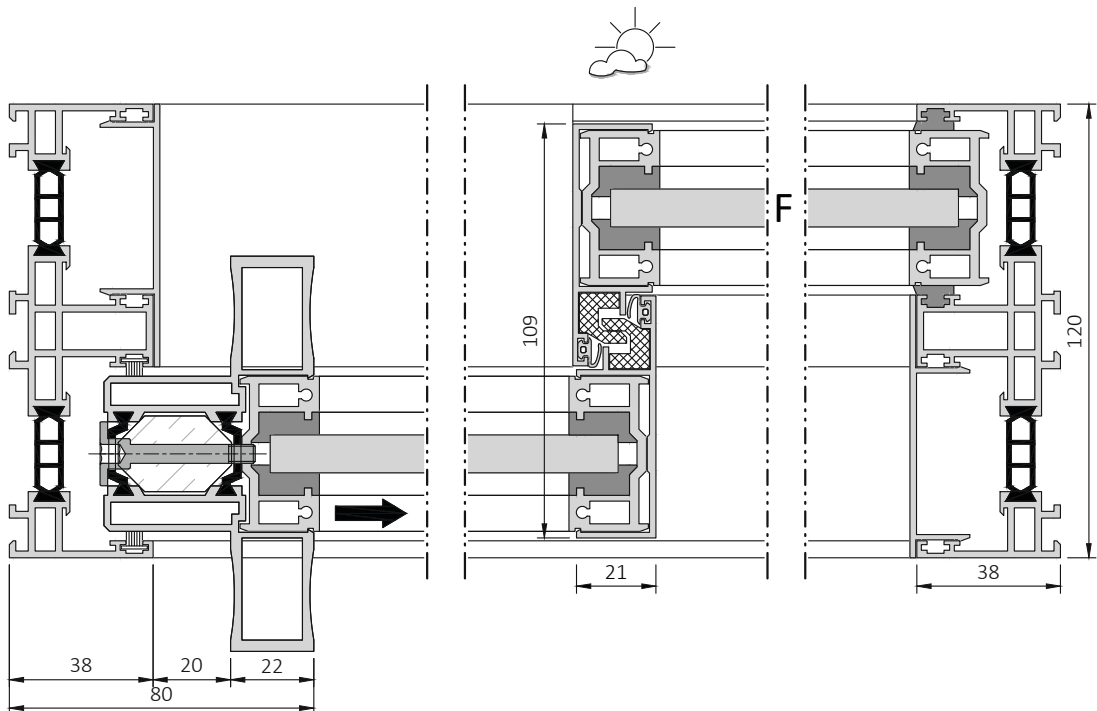
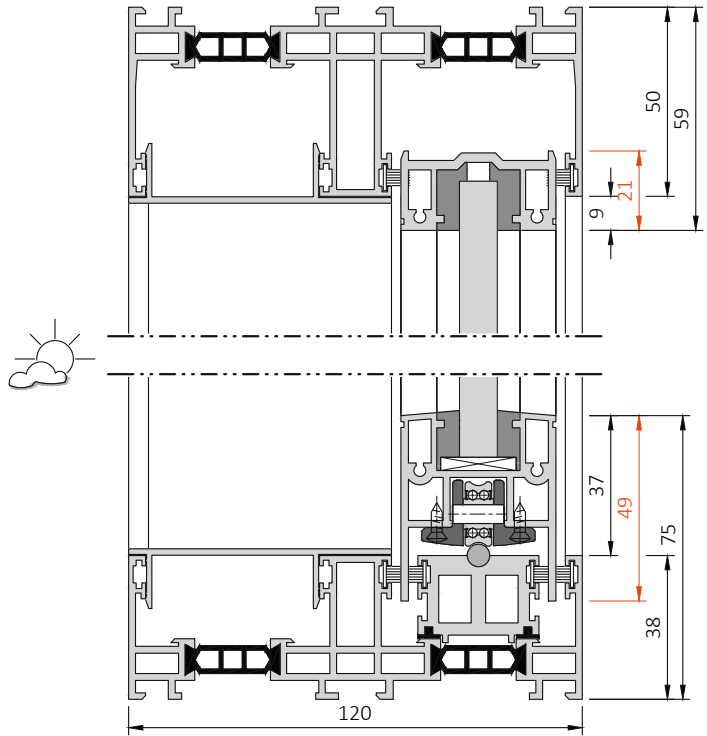
M 1:2



$U_w \geq 5.0 \text{ W/m}^2\text{K}$

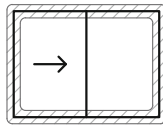
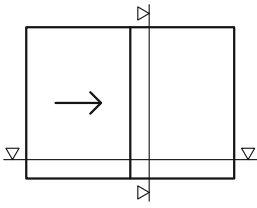


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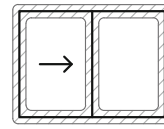


Leaf frame freeway: KE-49n - fix leaf

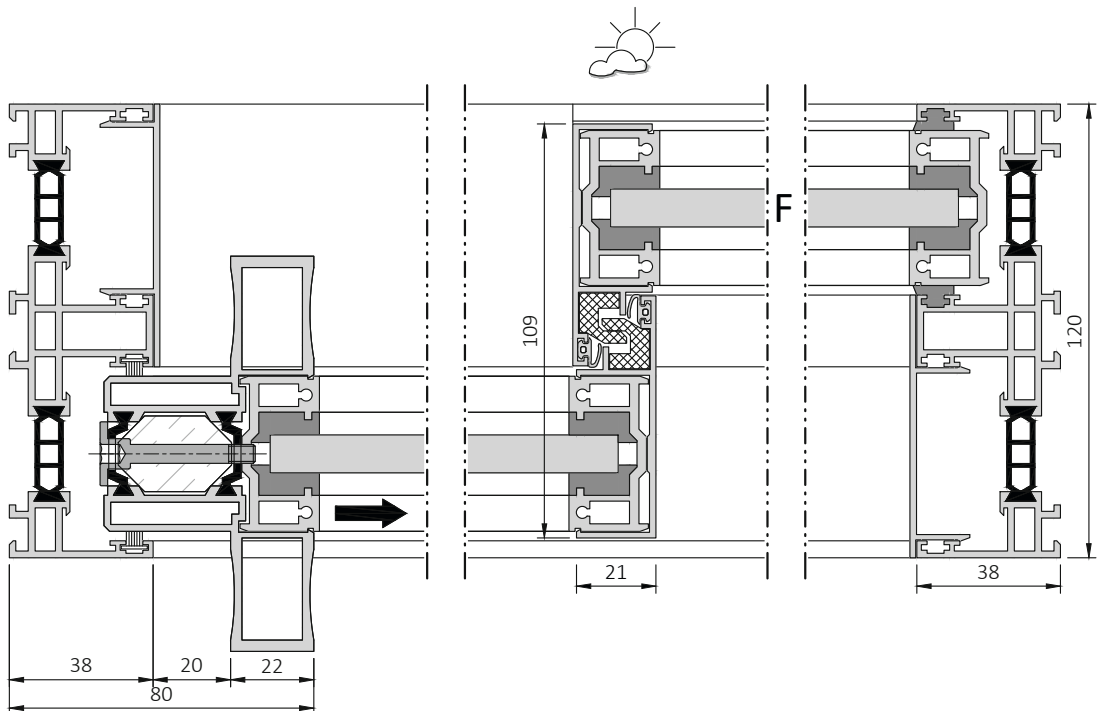
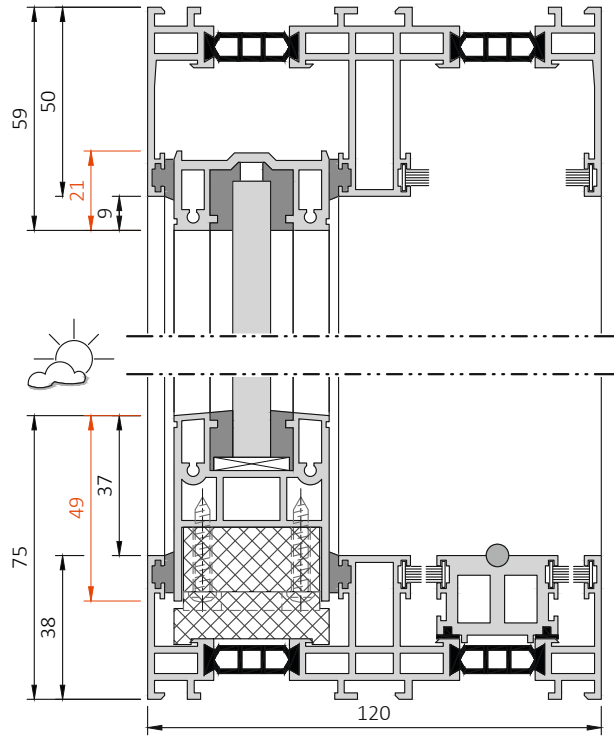
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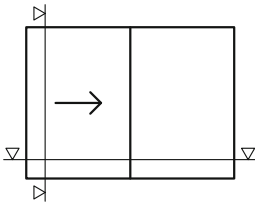


$U_w \geq 5.0 \text{ W/m}^2\text{K}$



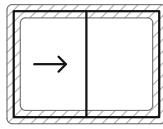
$U_w \geq 5.0 \text{ W/m}^2\text{K}$



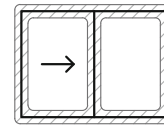


Leaf frame freeway: KE-49 - sliding leaf

M 1:2

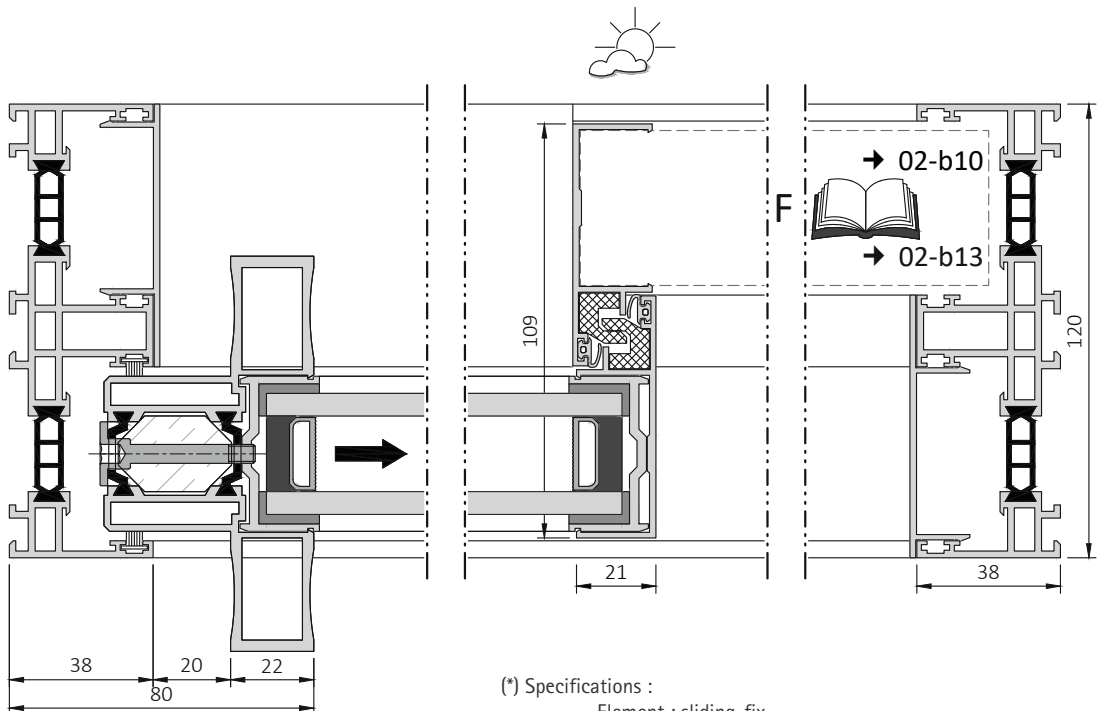
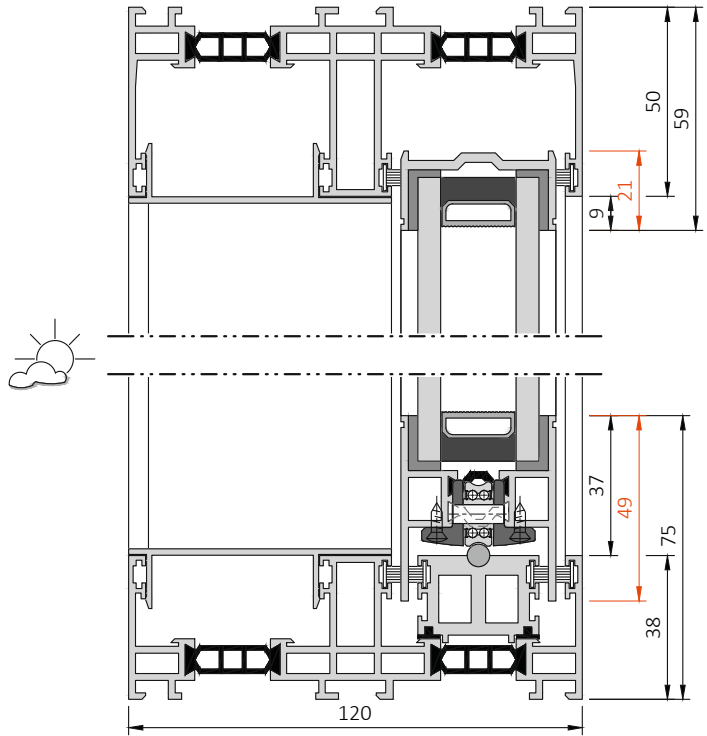


$U_f \text{ } \emptyset \text{ } 6.09 \text{ W/m}^2\text{K (*)}$

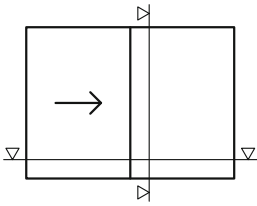


$U_f \text{ } \emptyset \text{ } 6.63 \text{ W/m}^2\text{K (*)}$

$U_w \text{ } \emptyset \text{ } 1.64 \text{ W/m}^2\text{K (*)}$

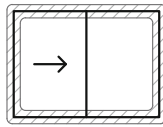


(\*) Specifications :  
 Element : sliding-fix  
 Size : 4.500 x 2.300 mm  
 Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

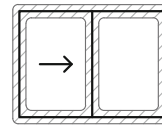


Leaf frame freeway: KE-49 - fix leaf

M 1:2

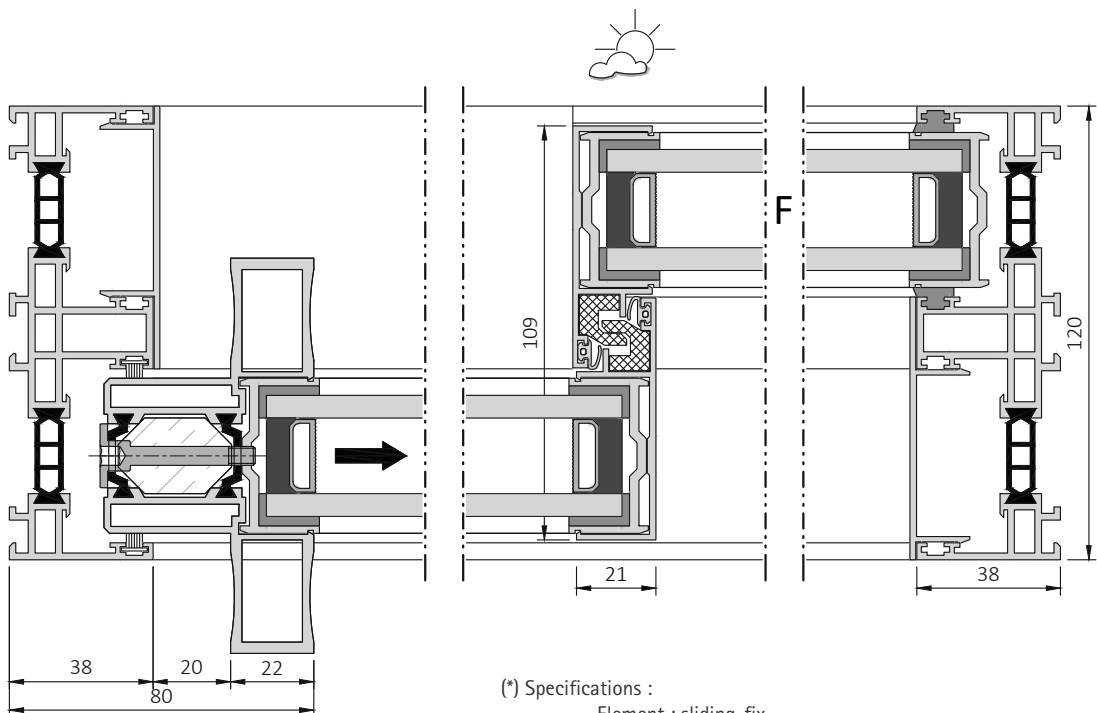
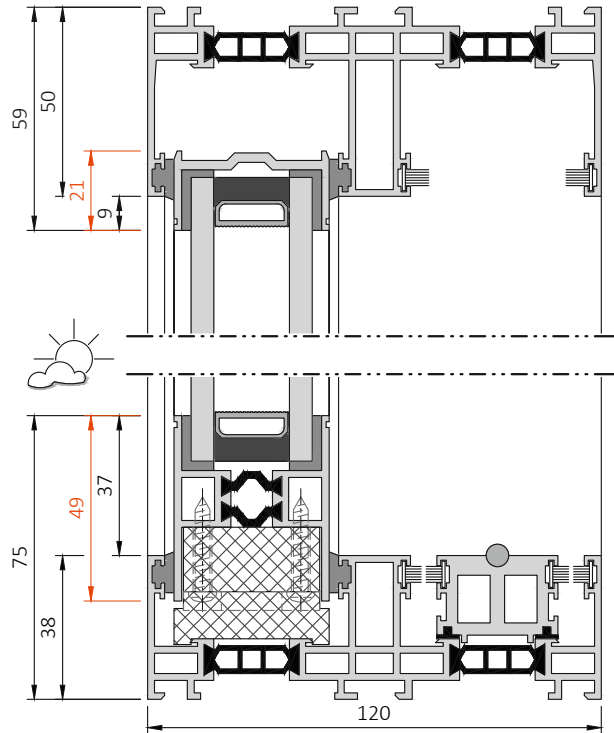


$U_f \text{ } \emptyset \text{ } 6.09 \text{ W/m}^2\text{K (*)}$

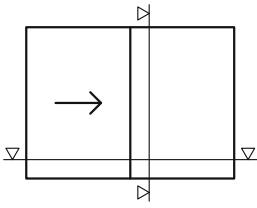


$U_f \text{ } \emptyset \text{ } 6.63 \text{ W/m}^2\text{K (*)}$

$U_w \text{ } \emptyset \text{ } 1.64 \text{ W/m}^2\text{K (*)}$

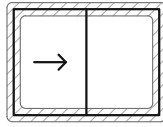


(\*) Specifications :  
 Element : sliding-fix  
 Size : 4.500 x 2.300 mm  
 Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

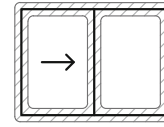


Leaf frame freeway: KE-49h - sliding leaf

M 1:2

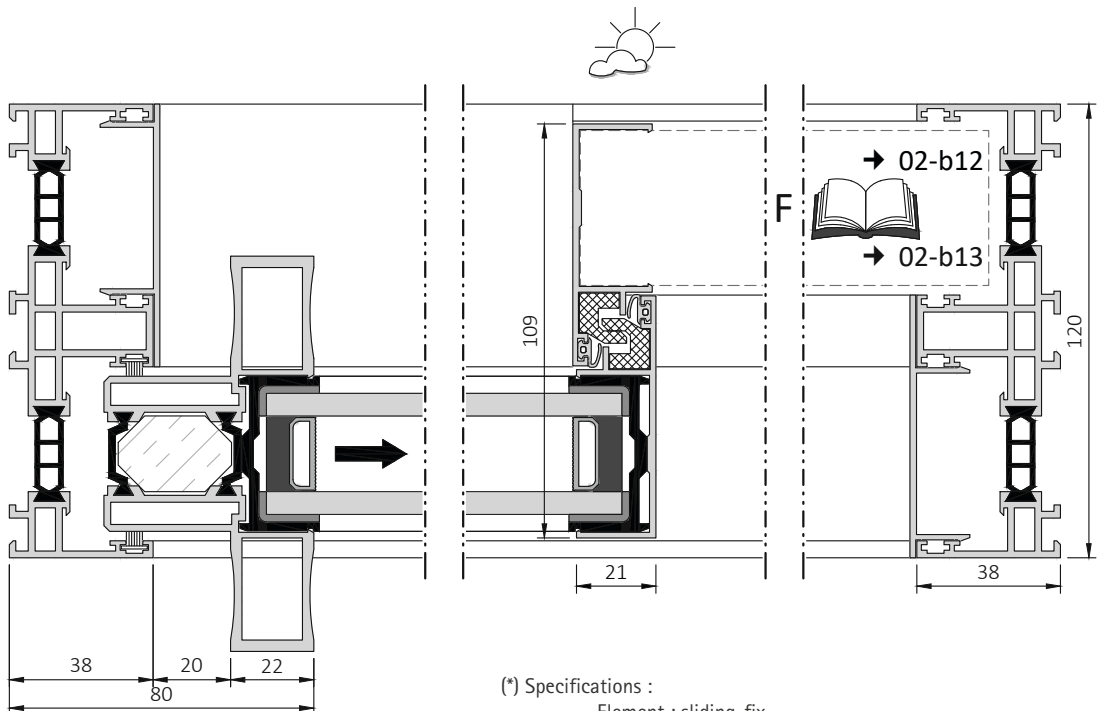
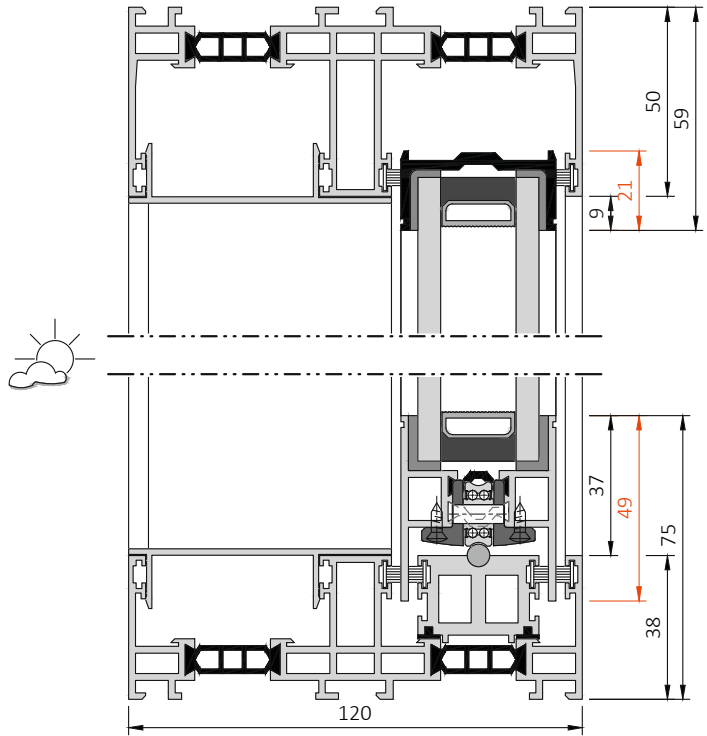


$U_f \text{ } \emptyset \text{ } 3.53 \text{ W/m}^2\text{K (*)}$

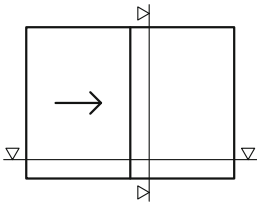


$U_f \text{ } \emptyset \text{ } 4.16 \text{ W/m}^2\text{K (*)}$

$U_w \text{ } \emptyset \text{ } 1.43 \text{ W/m}^2\text{K (*)}$

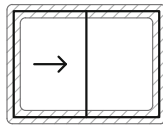


(\*) Specifications :  
 Element : sliding-fix  
 Size : 4.500 x 2.300 mm  
 Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

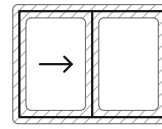


Leaf frame freeway: KE-49h - fix leaf

M 1:2

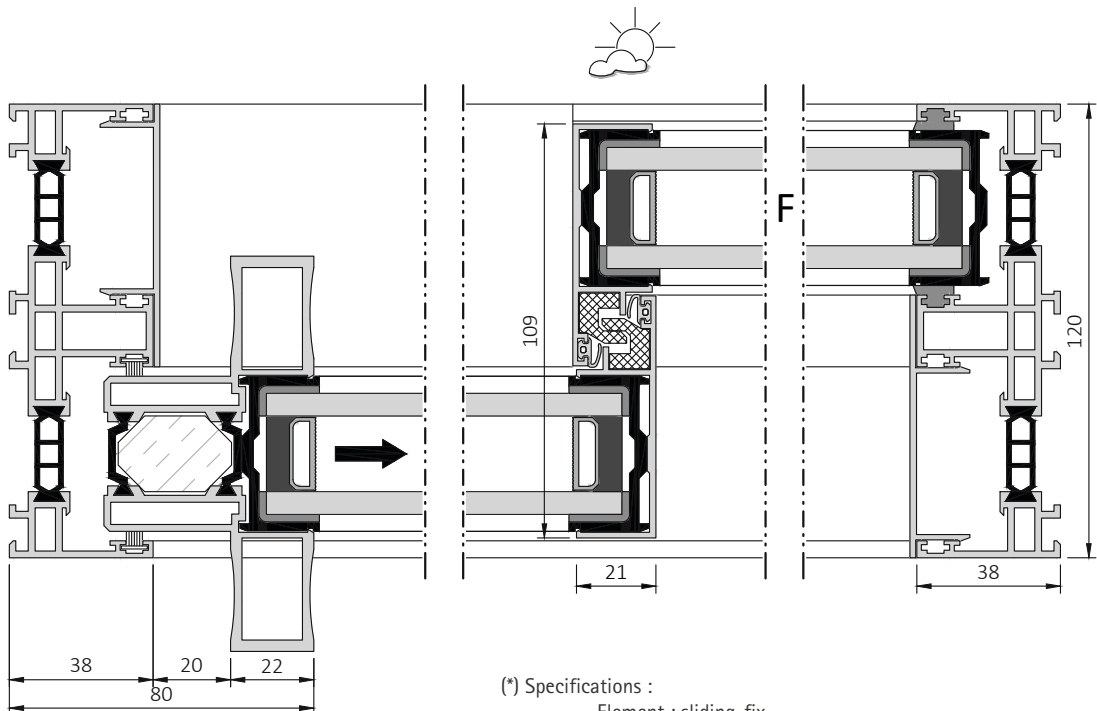
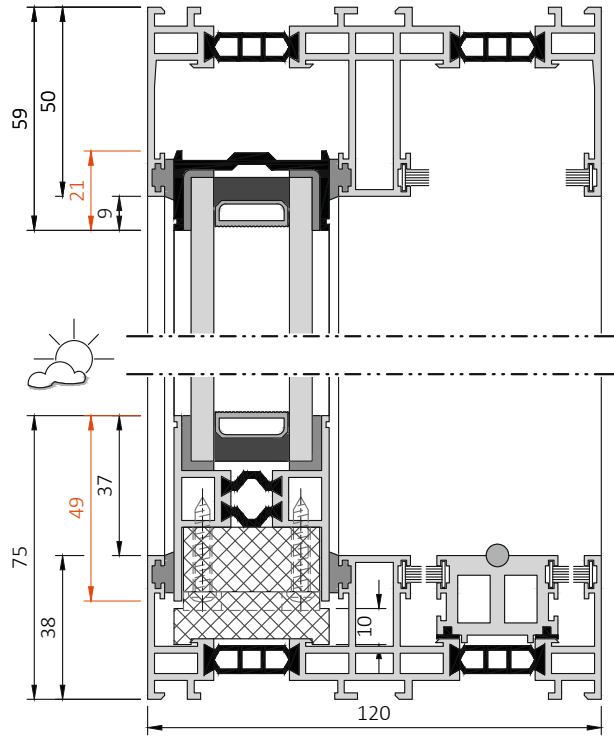


$U_f \text{ } \emptyset \text{ } 3.53 \text{ W/m}^2\text{K (*)}$



$U_f \text{ } \emptyset \text{ } 4.16 \text{ W/m}^2\text{K (*)}$

$U_w \text{ } \emptyset \text{ } 1.43 \text{ W/m}^2\text{K (*)}$



(\*) Specifications :

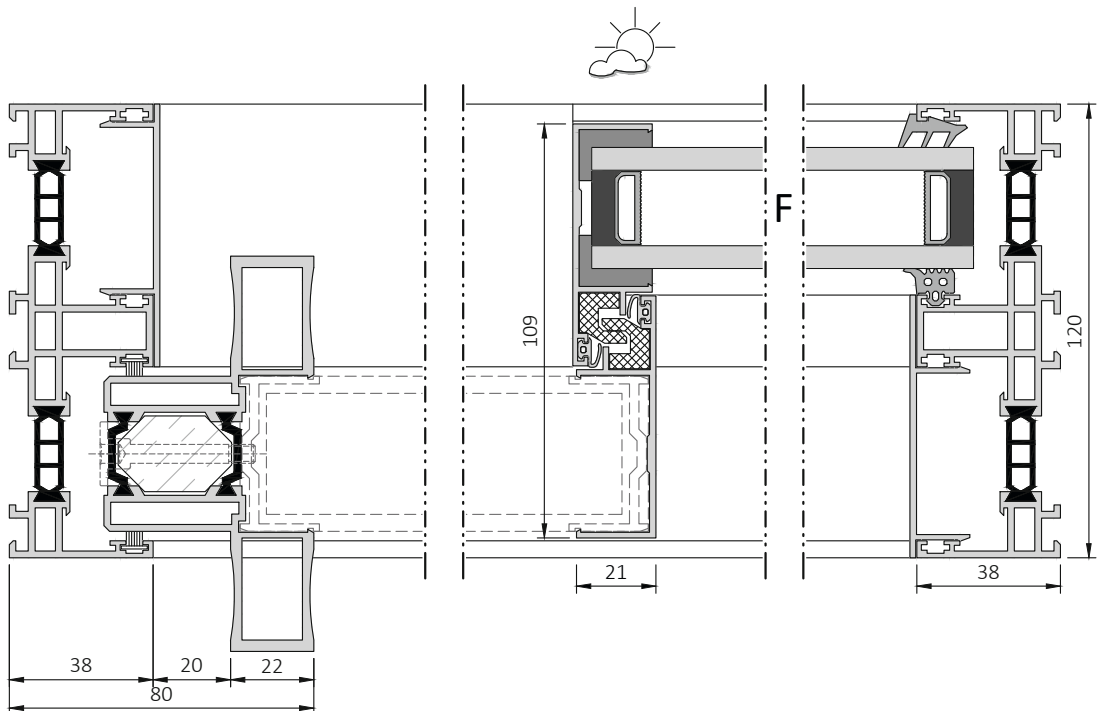
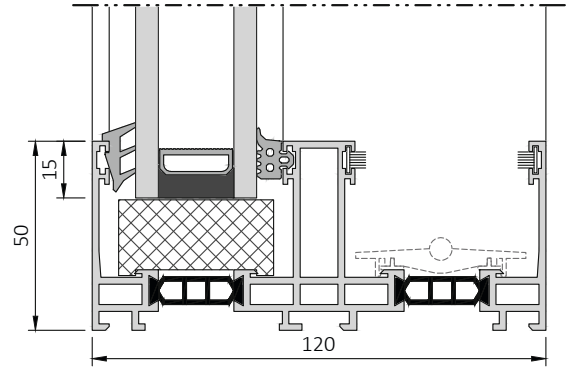
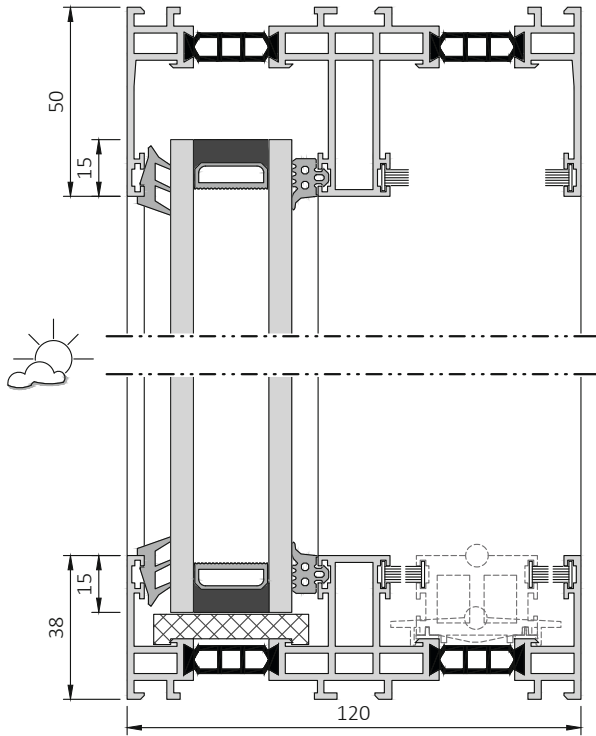
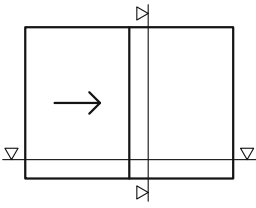
Element : sliding-fix

Size : 4.500 x 2.300 mm

Glass :  $U_g \text{ } 1.1 \text{ W/m}^2\text{K} - \Psi_g \text{ } 0.050 \text{ W/m}^2\text{K}$

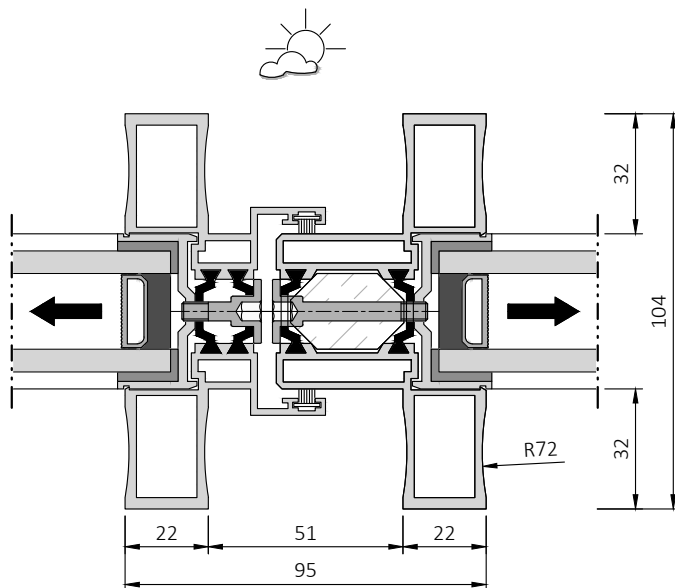
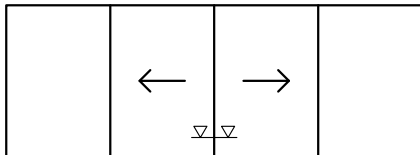
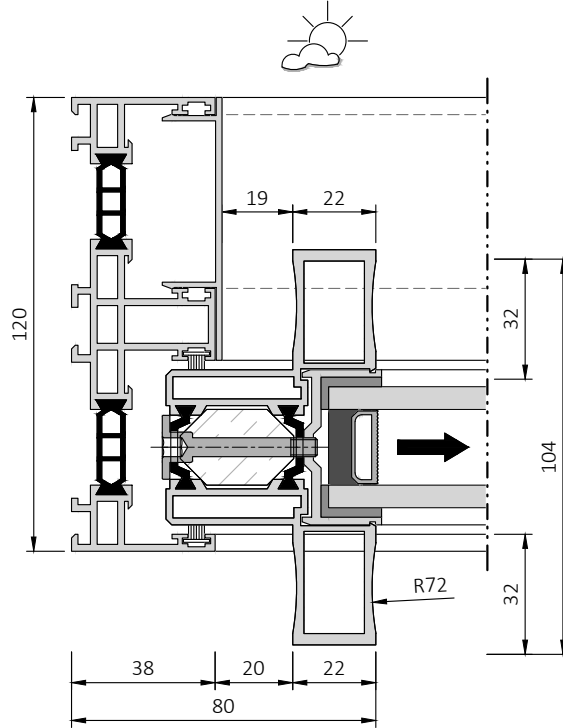
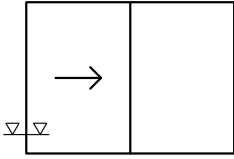
**Leaf frame: fix without U-profile**  
 - suitable for KE-32 / KE-32h / KE-49 / KE-49h

M 1:2



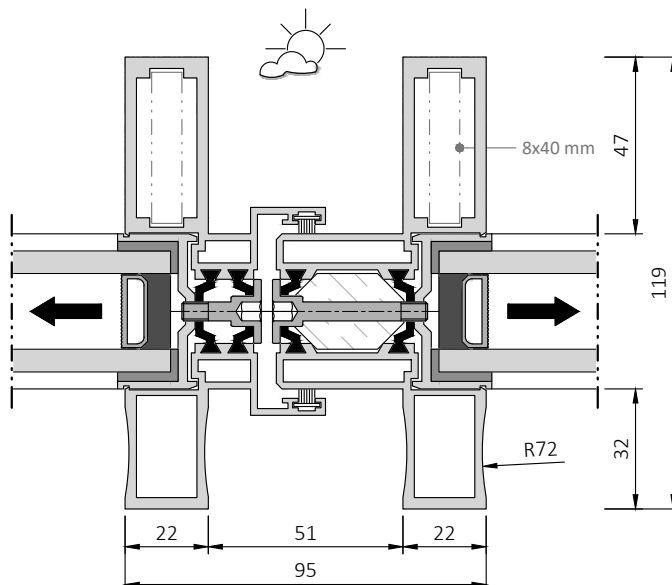
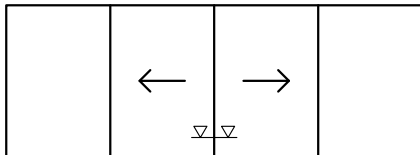
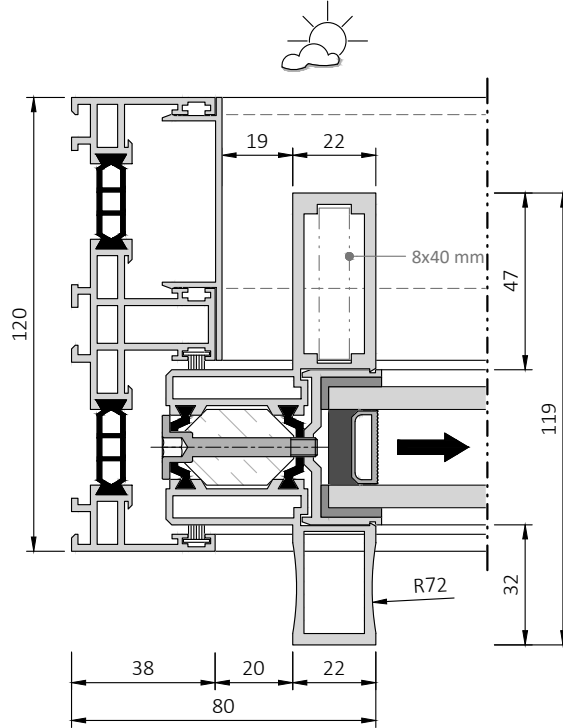
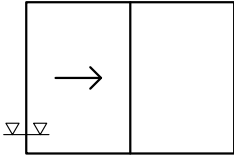
Handle bar- double vent profiles: G4 / ST4

M 1:2



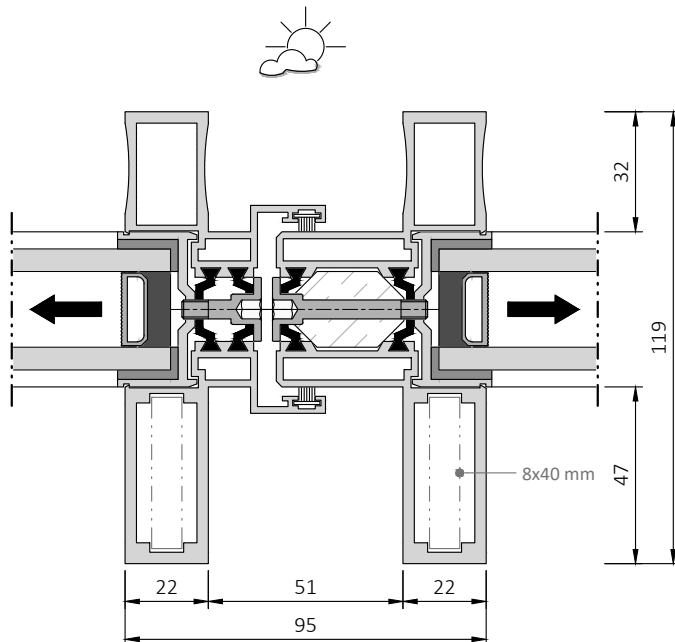
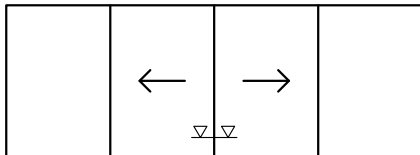
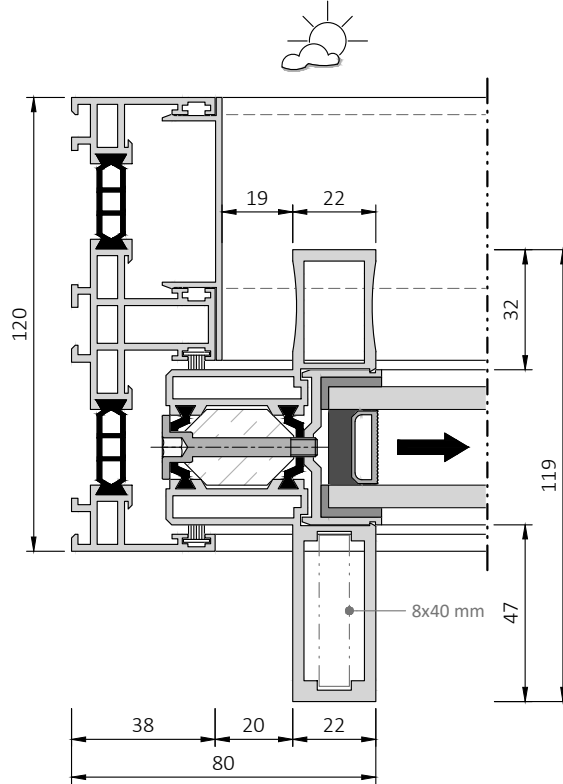
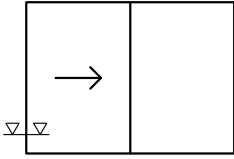
Handle bar- double vent profiles: G5 / ST5

M 1:2



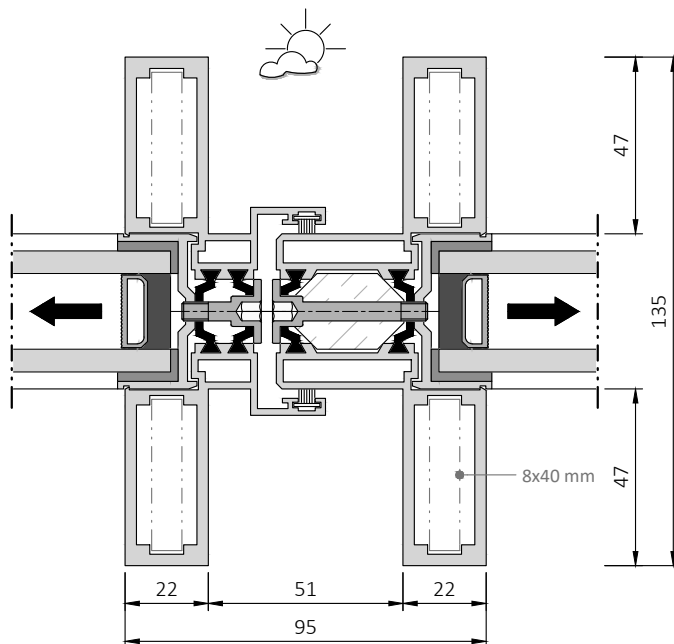
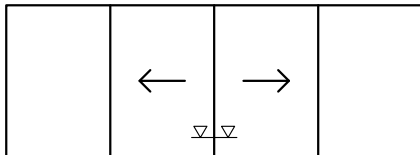
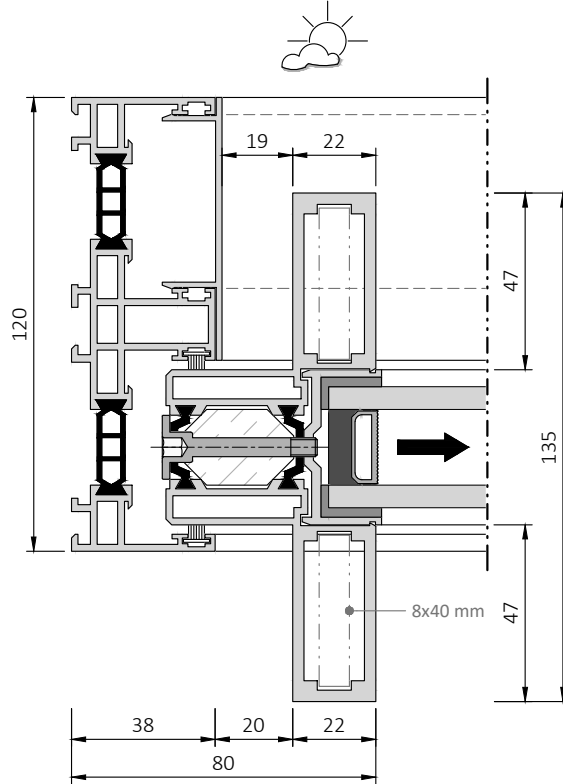
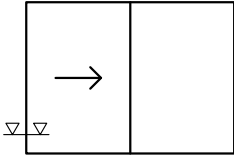
Handle bar- double vent profiles: G6 / ST6

M 1:2



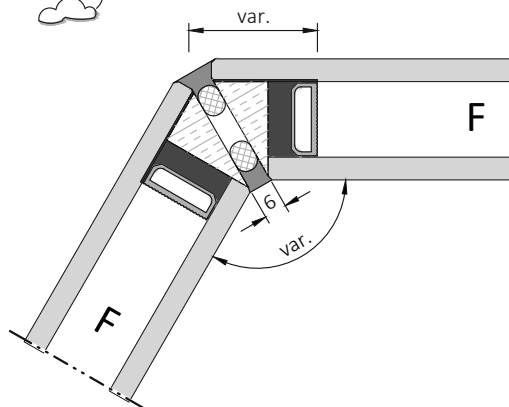
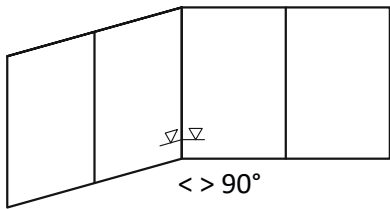
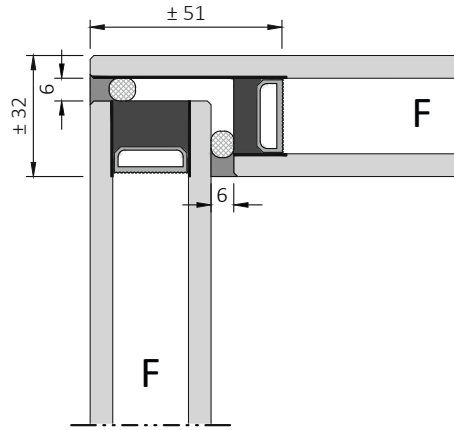
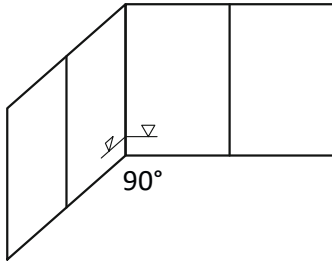
Handle bar- double vent profiles: G7 / ST7

M 1:2



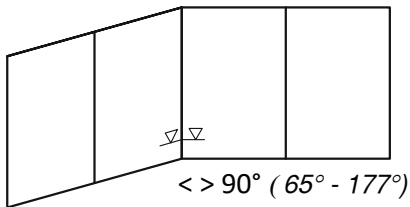
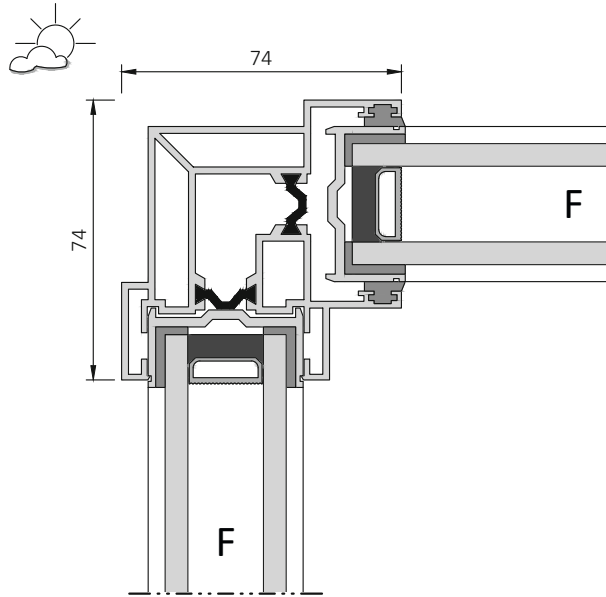
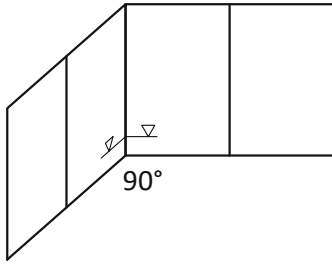
Corners: all-glass

M 1:2

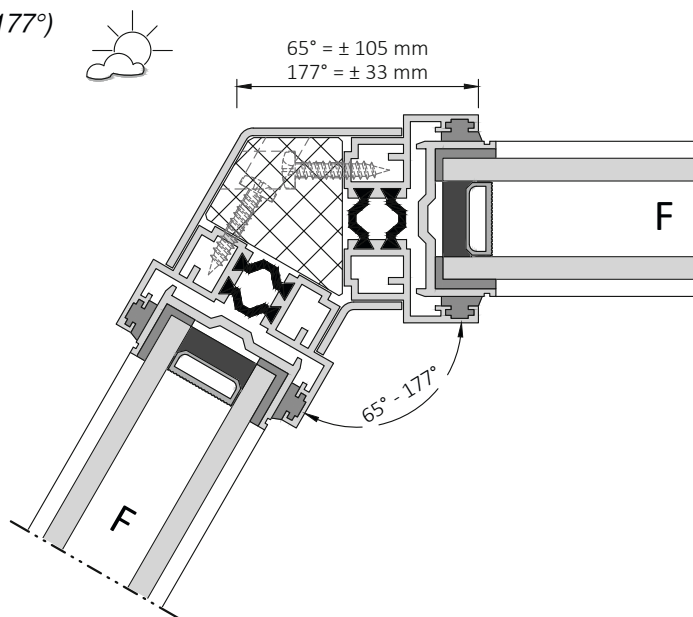


Corners: profiles

M 1:2

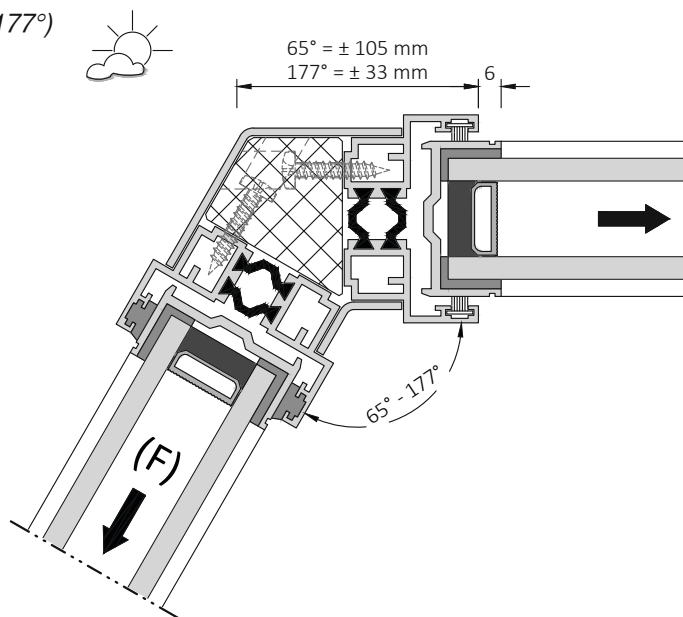
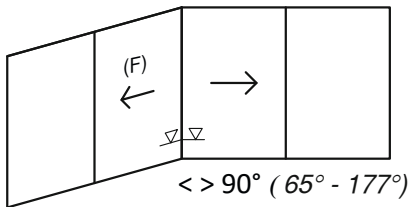
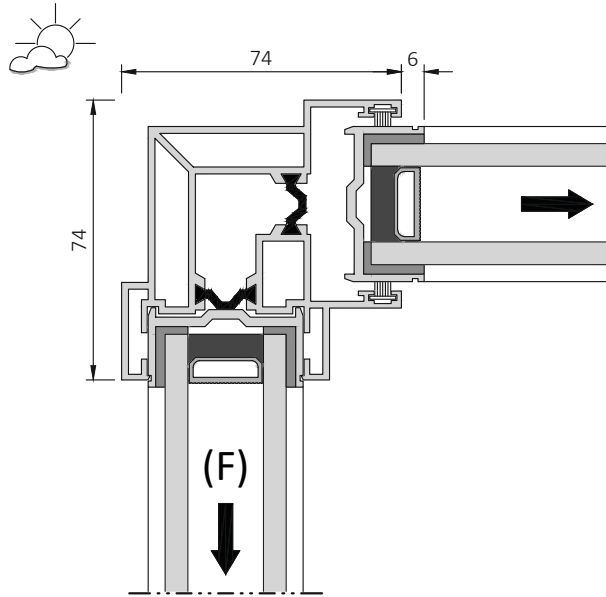
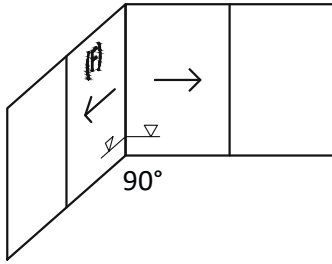


< > 90° (65° - 177°)



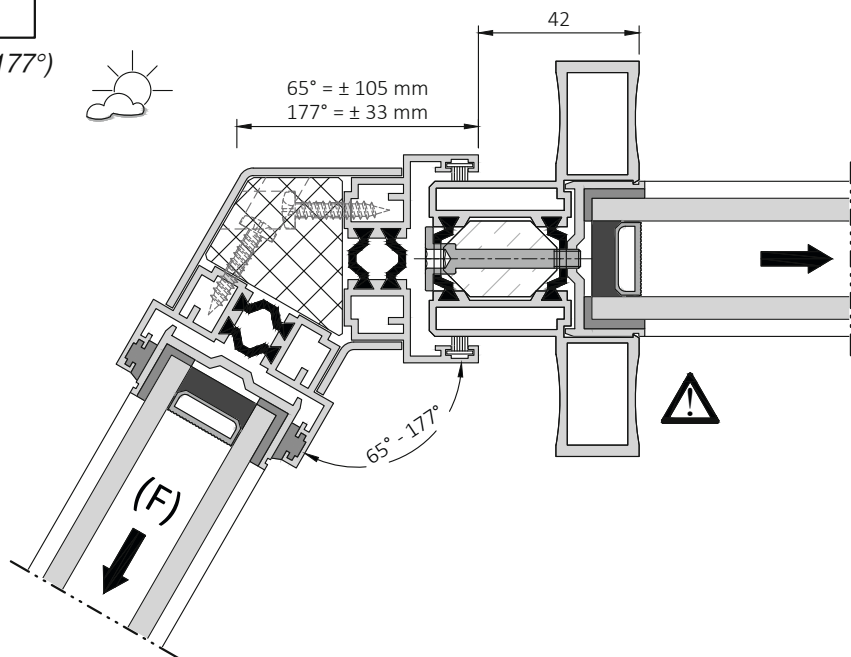
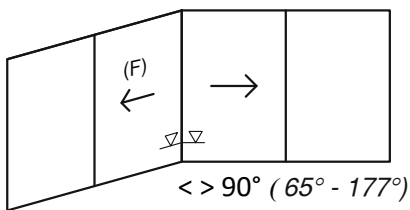
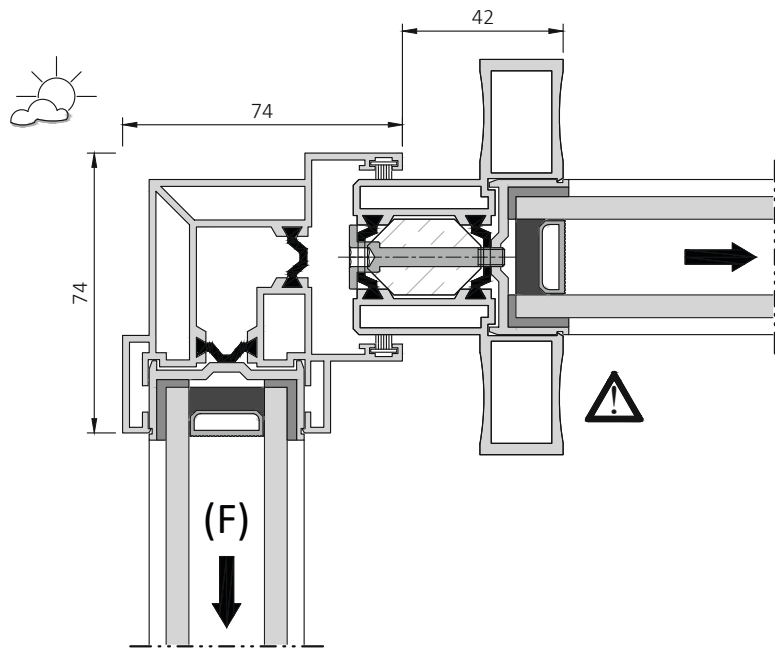
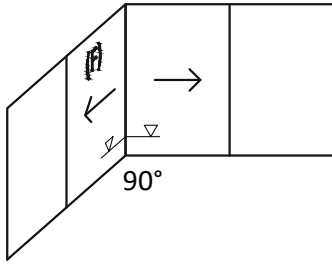
Corners: profiles

M 1:2



Corners: profiles

M 1:2

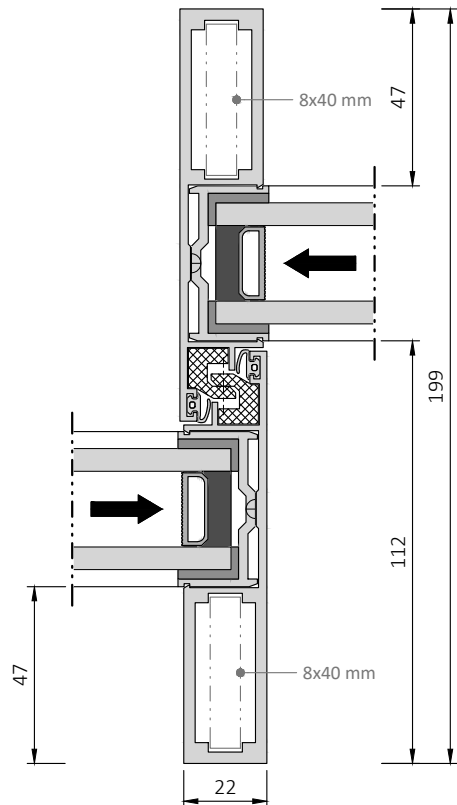
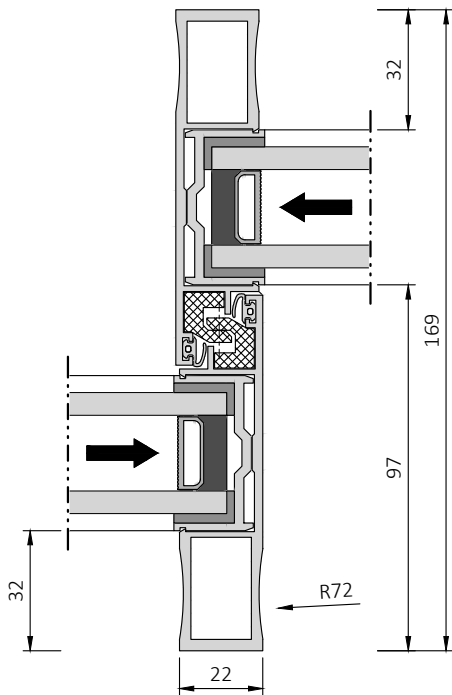
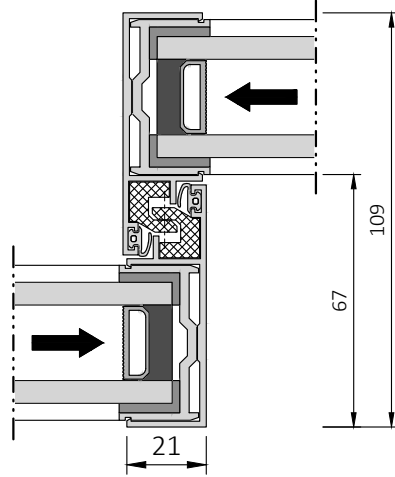
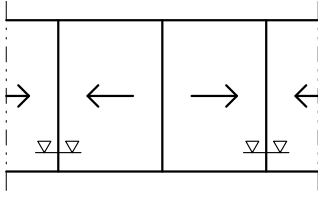


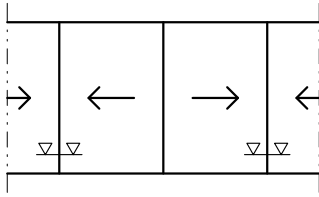
**IMPORTANT**

In a sliding/sliding corner solution, slot aeration can only occur if the second leaf also has a lock. Place the lock only on the junction profiles, not on the handle bars.

Junction profiles: type Z - ZK1 - ZK2

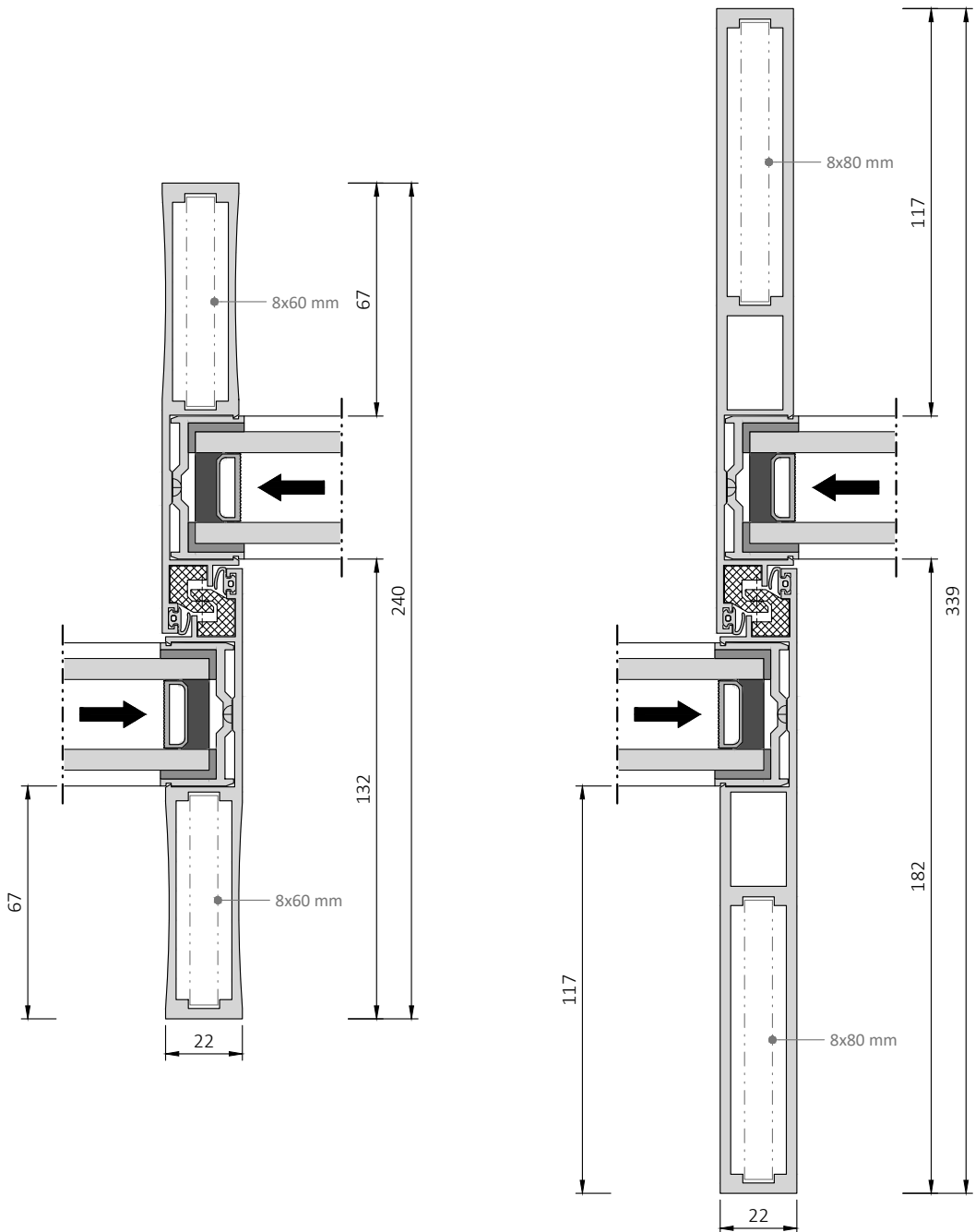
M 1:2





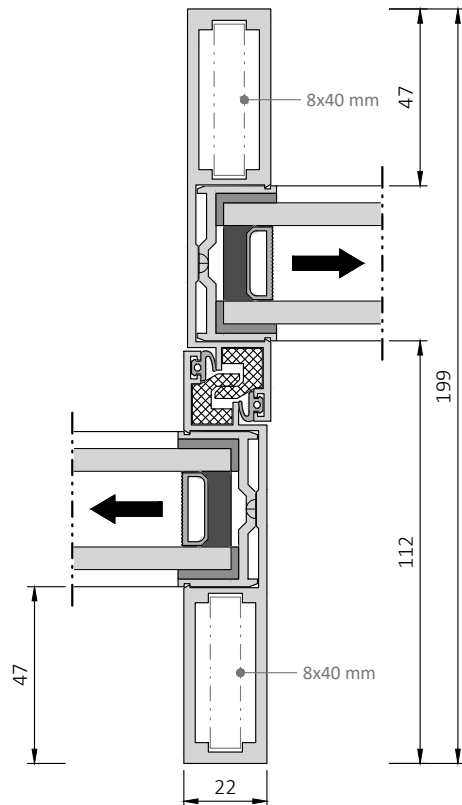
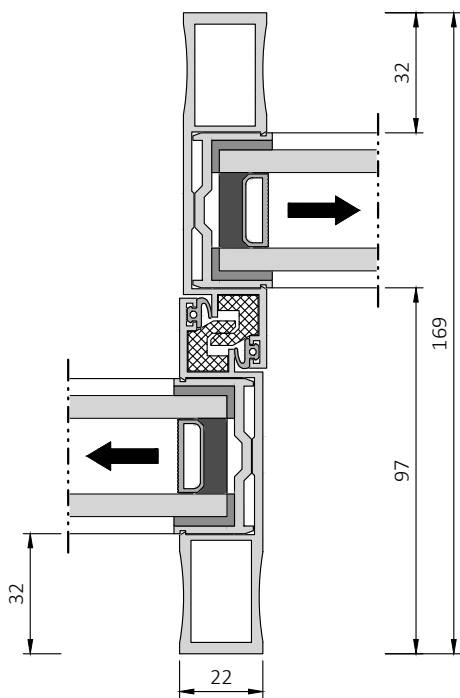
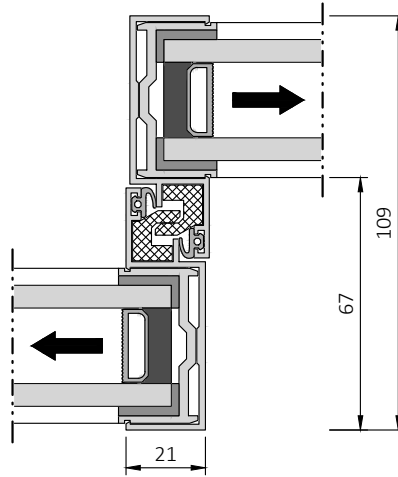
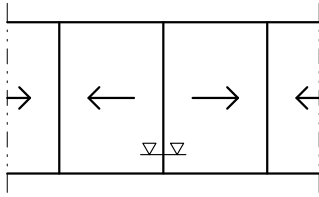
Junction profiles: type ZK3 - ZK5

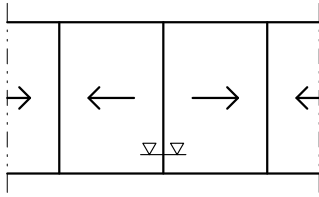
M 1:2



Junction profiles: typ A - AK1 - AK2

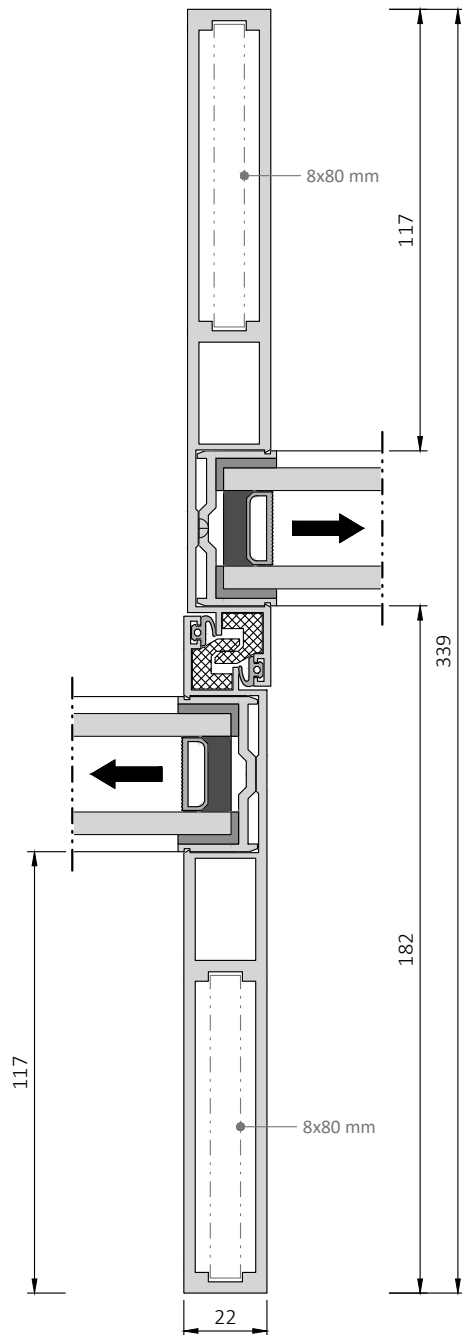
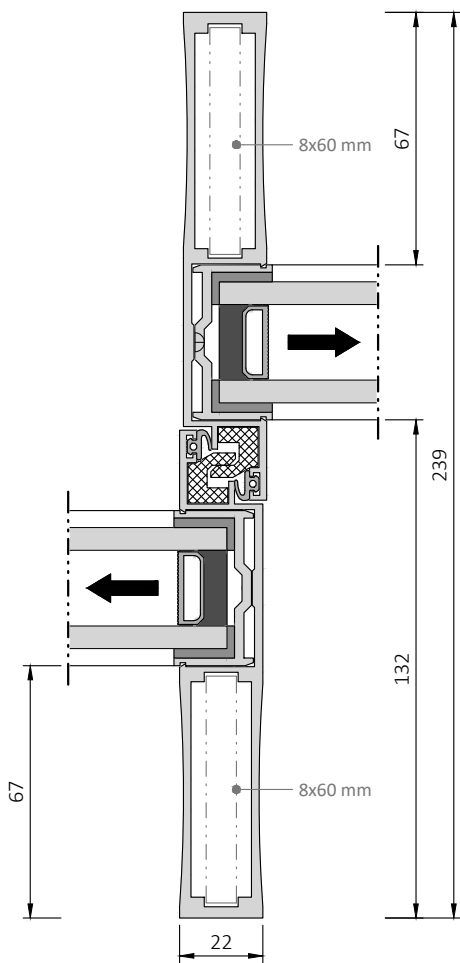
M 1:2

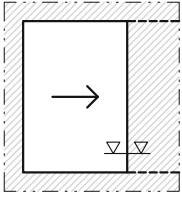




Junction profiles: typ AK3 - A52

M 1:2



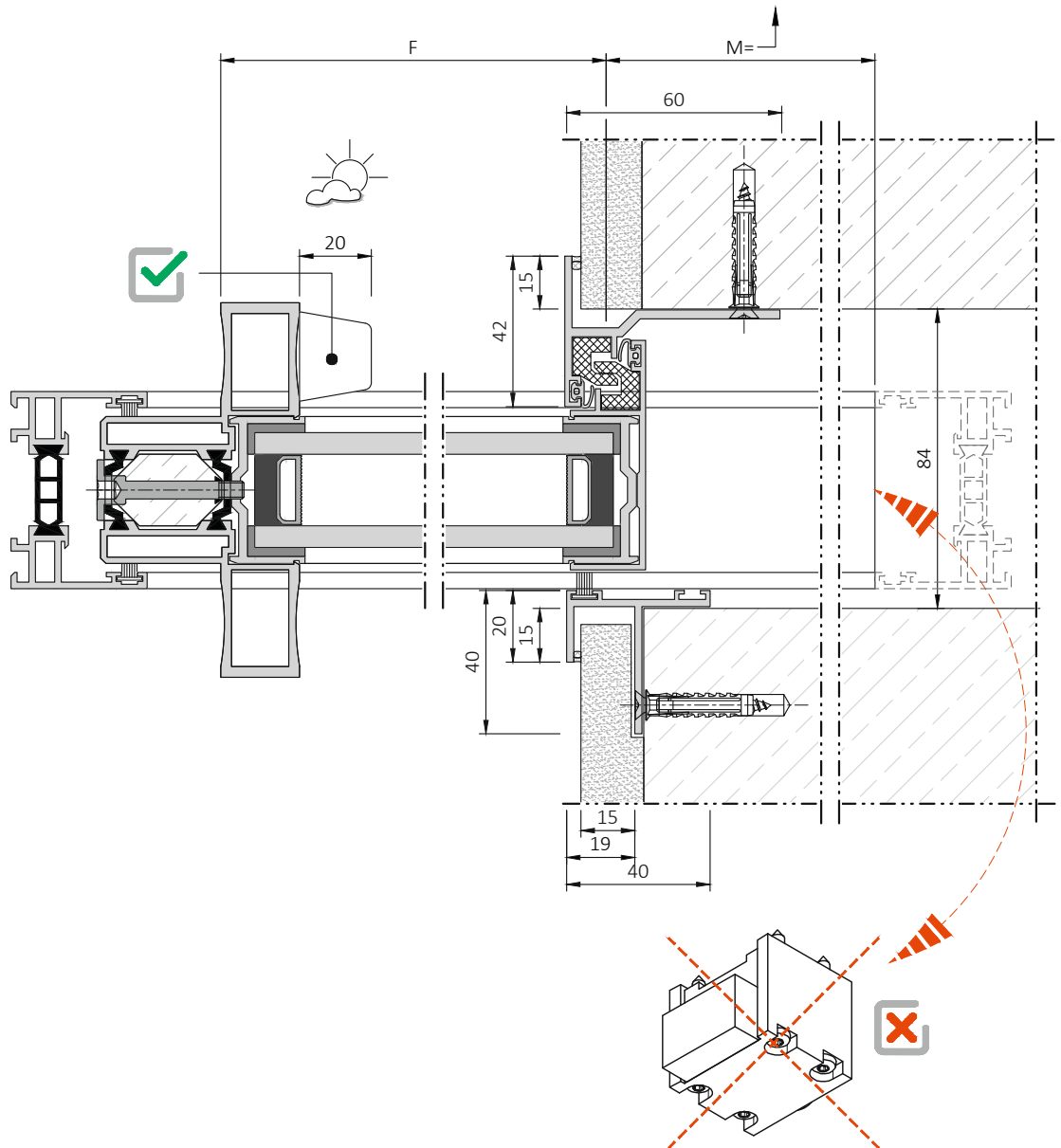


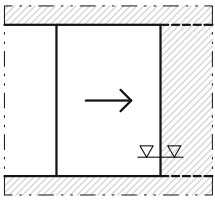
Pocket door: 1 track

M 1:2

		$M_{\min (*)} = F + 100$
		$M_{\min (*)} = F + 200$

(\*) to allow glass change

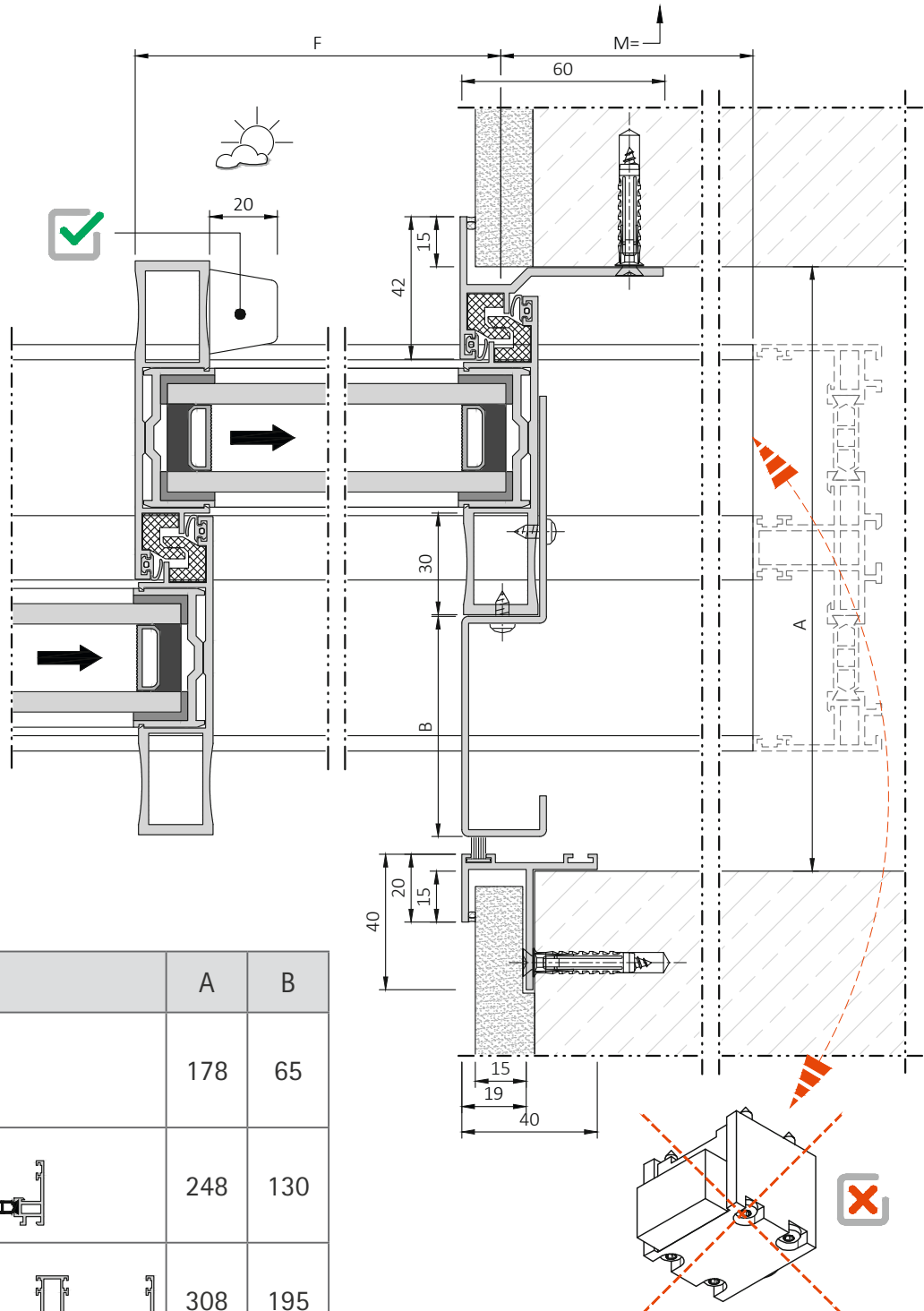




Pocket door: 2-3-4 tracks

M 1:2

	$M_{\min (*)} = F + 100$
	$M_{\min (*)} = F + 200$



Rail	A	B
	178	65
	248	130
	308	195

Locking: bar locking

M 1:2

Type 1



Type 1a



Type 2



Type 3



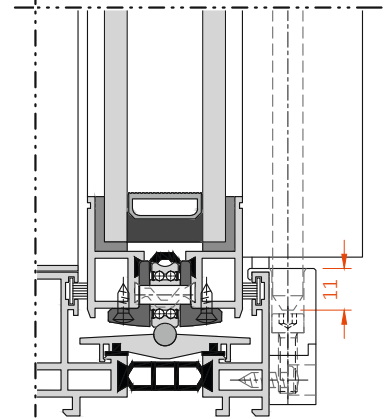
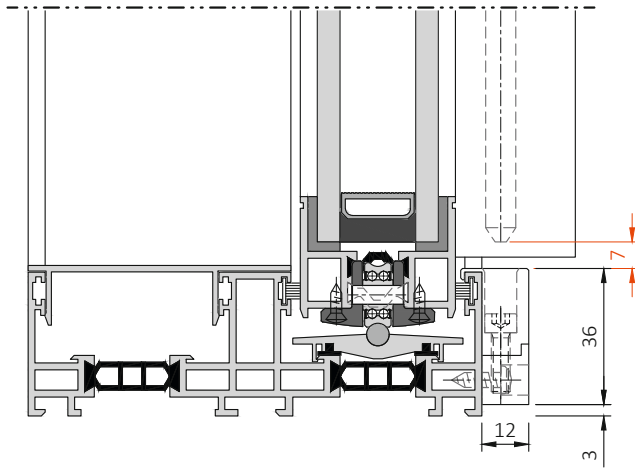
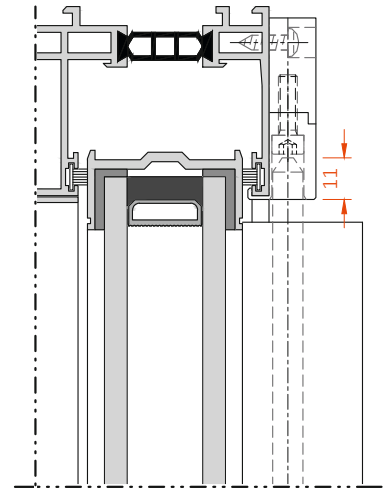
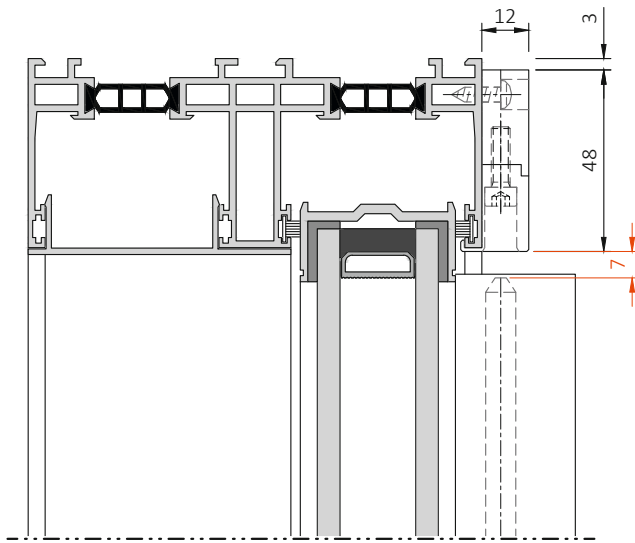
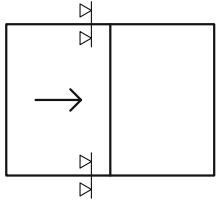
Type 4



	2-Point	4-Point
Type 1/1a	✓	✓
Type 2	✓	✓
Type 3	✓	✗
Type 4	✓	✗

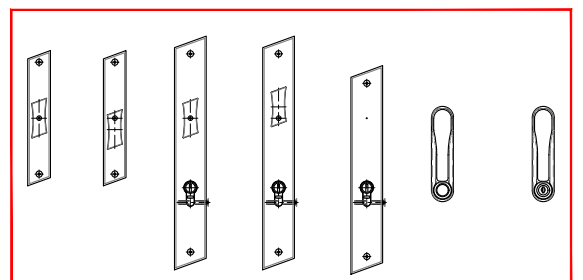
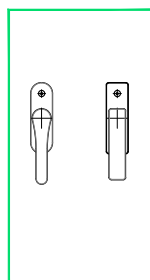
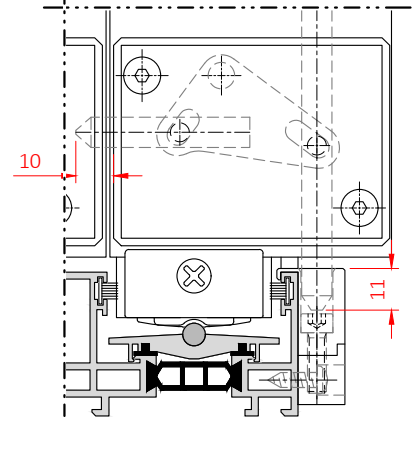
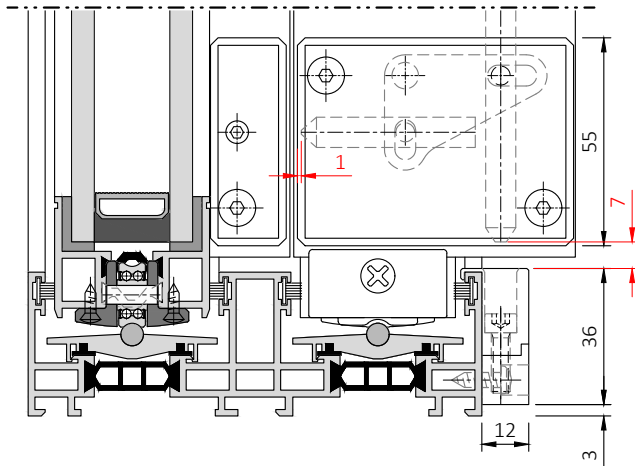
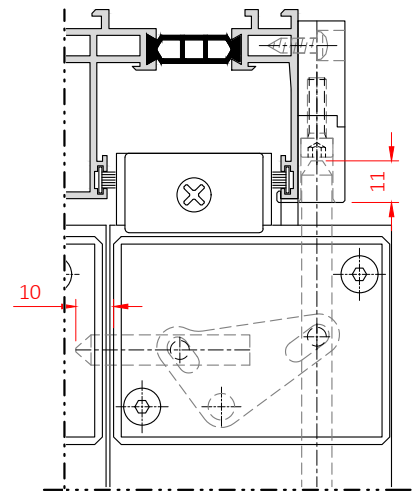
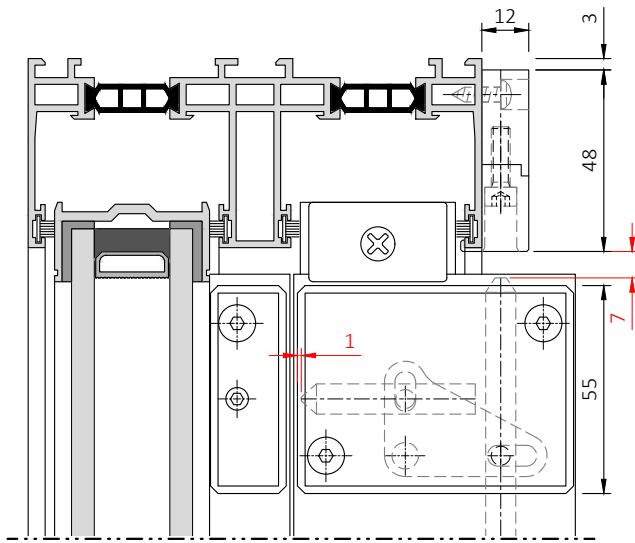
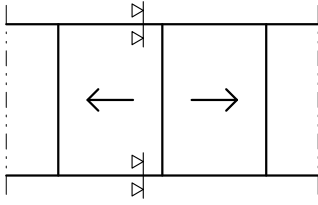
Locking: 2-point bar locking

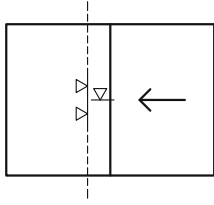
M 1:2



Locking: 4-point bar locking

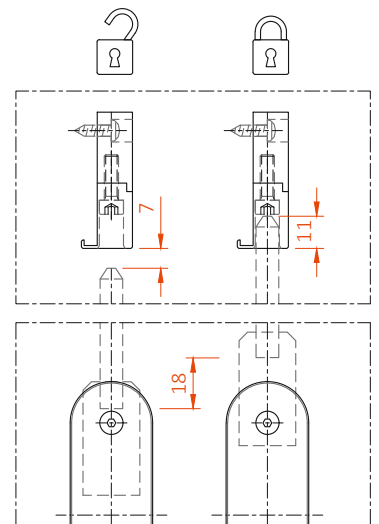
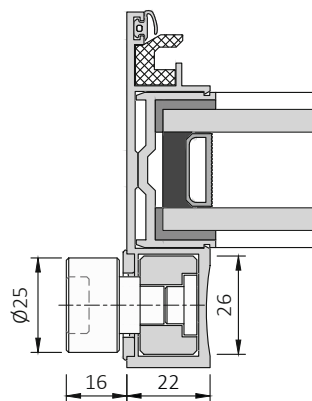
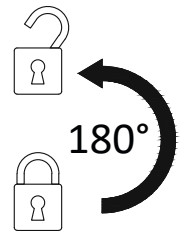
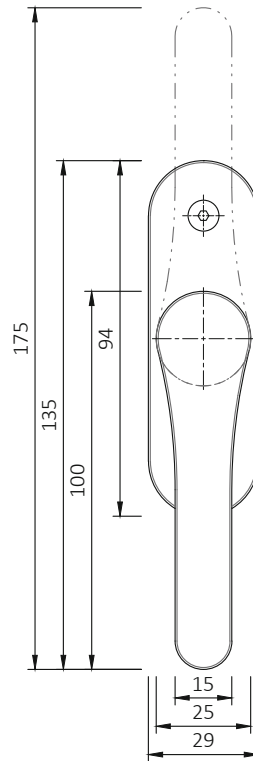
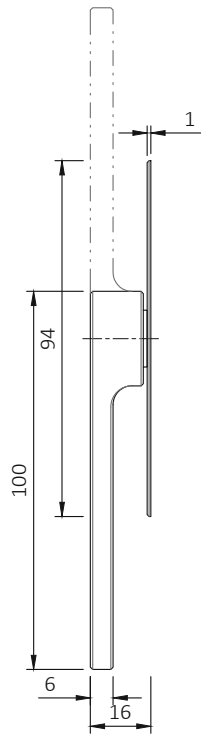
M 1:2

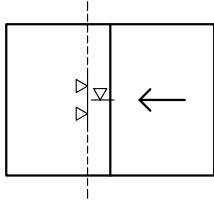




Locking: type 1

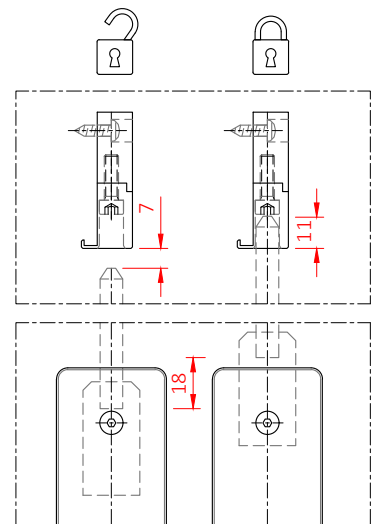
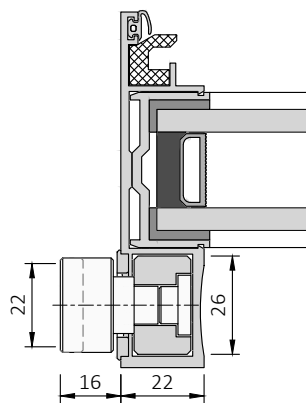
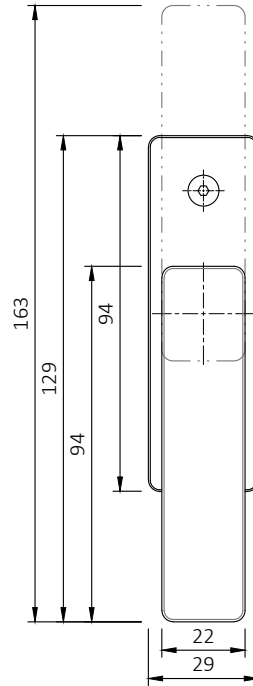
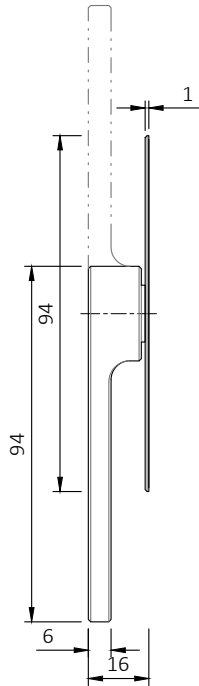
M 1:2





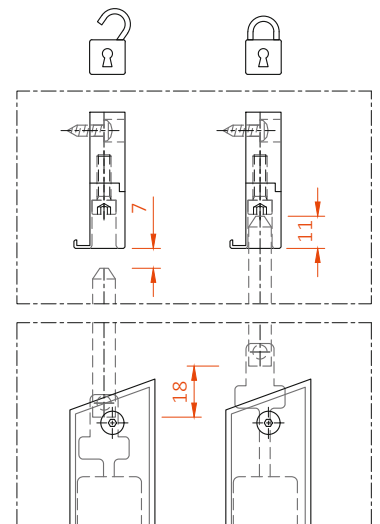
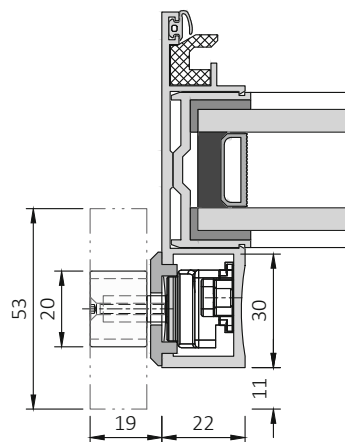
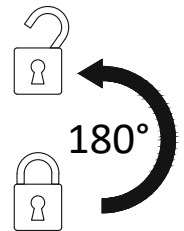
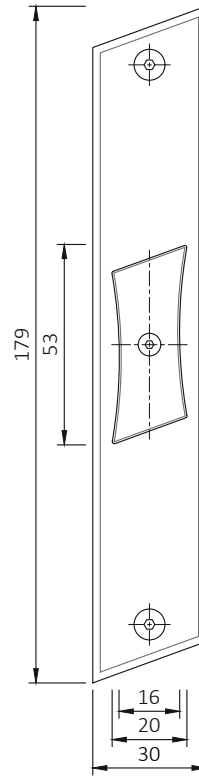
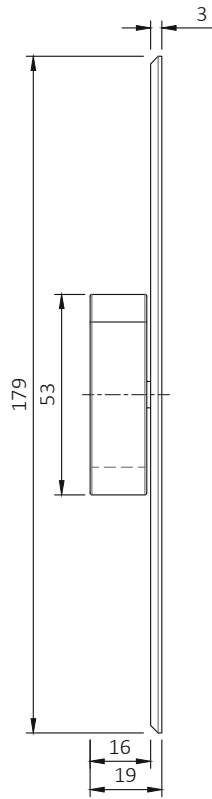
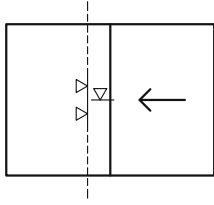
Locking: type 1a

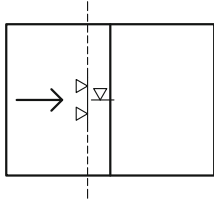
M 1:2



Locking: type 2-M

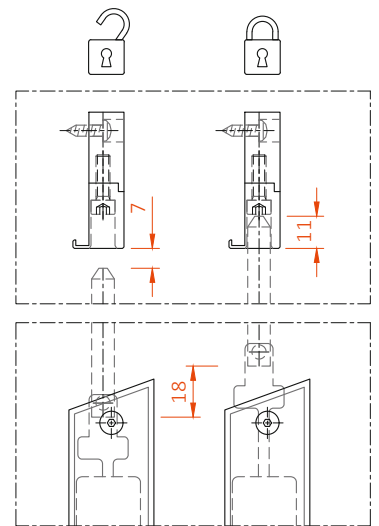
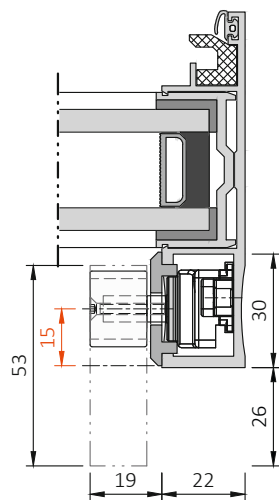
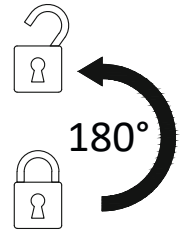
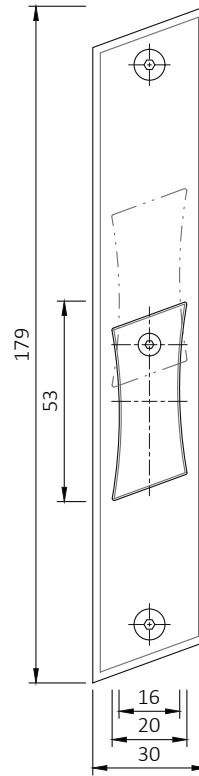
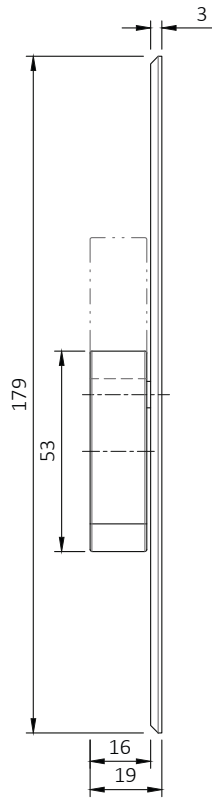
M 1:2





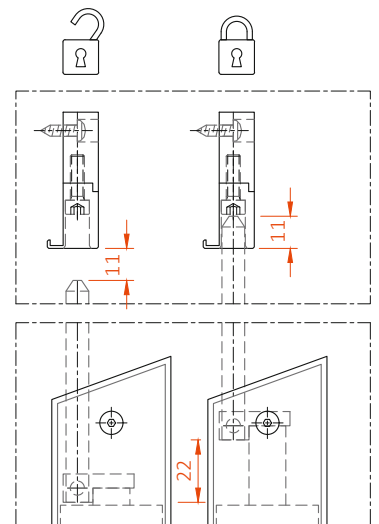
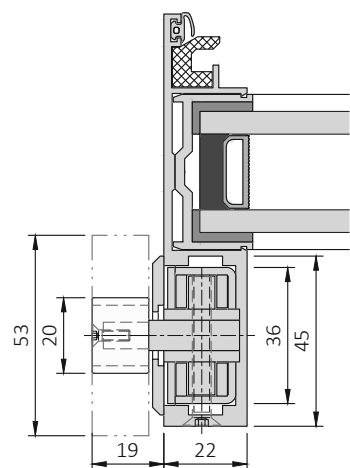
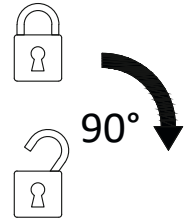
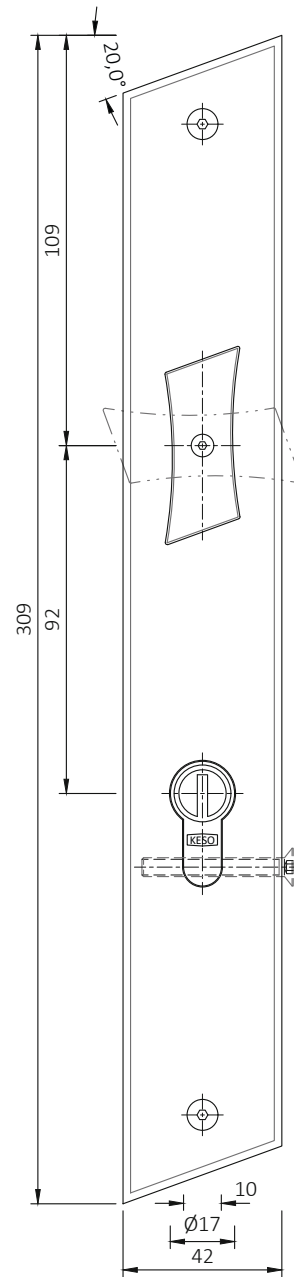
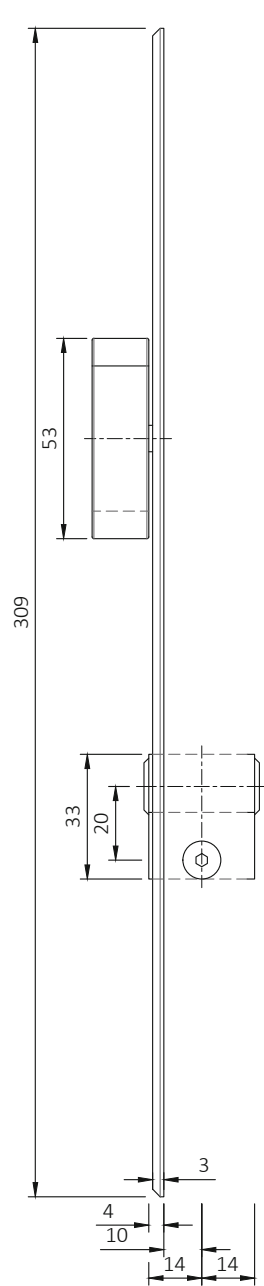
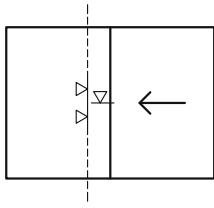
Locking: type 2-V

M 1:2



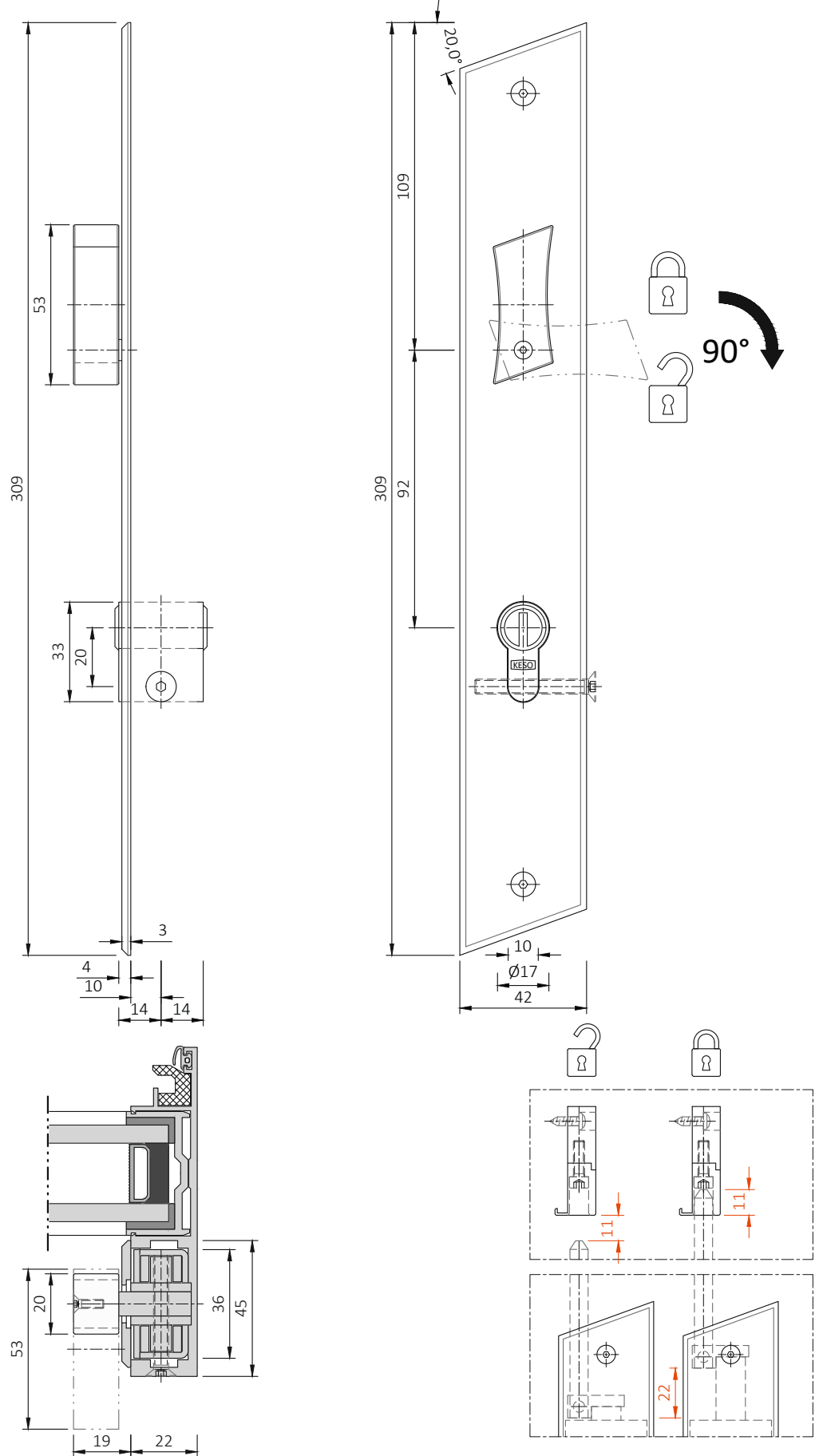
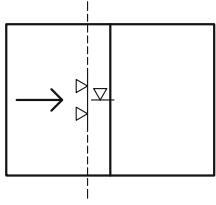
Locking: type 3-M

M 1:2



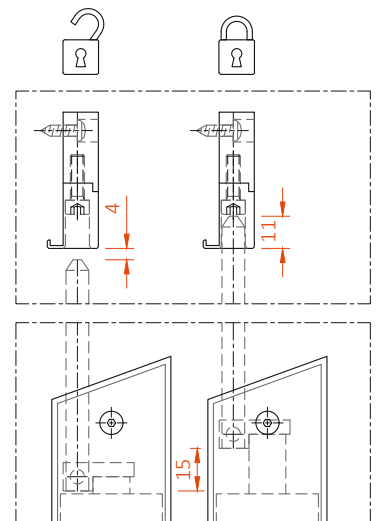
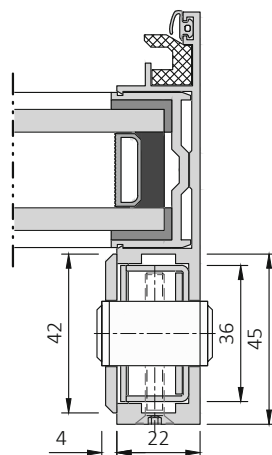
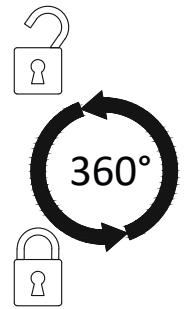
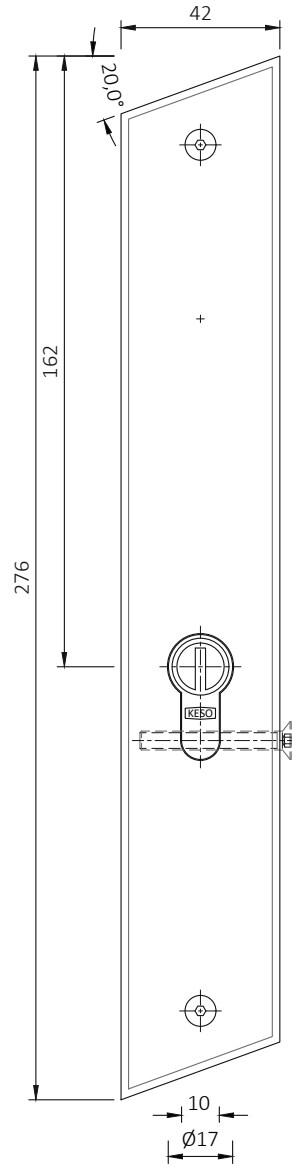
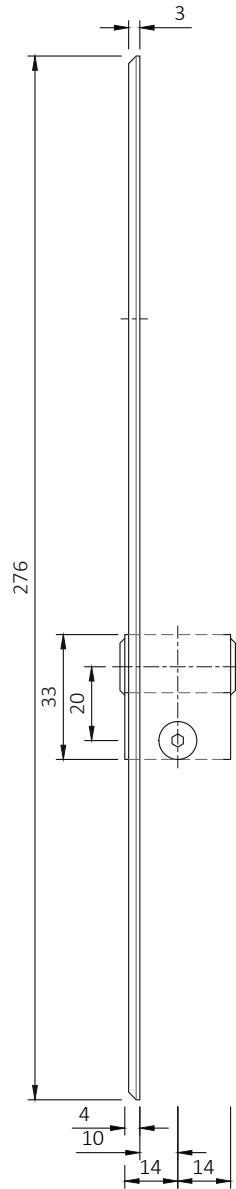
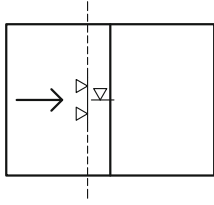
Locking: type 3-V

M 1:2



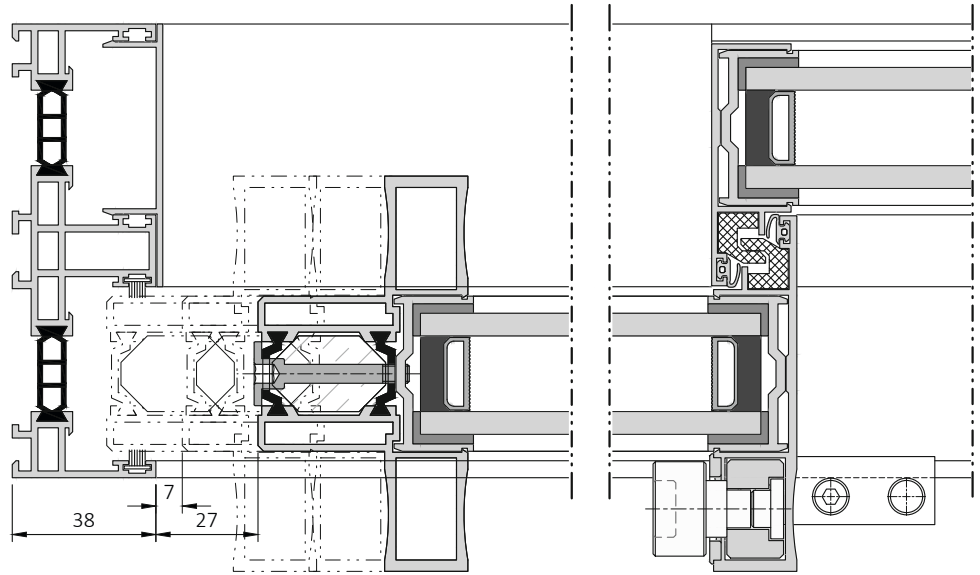
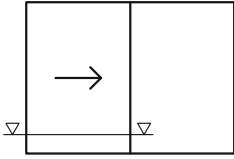
Locking: type 4

M 1:2



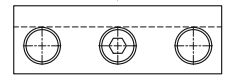
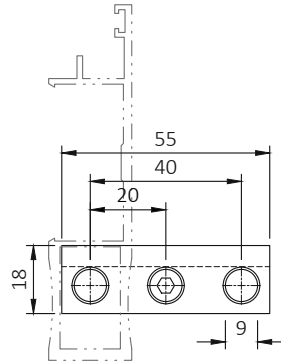
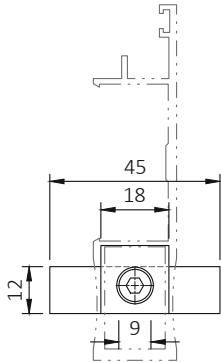
Locking: bottom- & ceiling sleeve

M 1:2

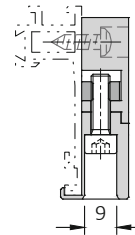
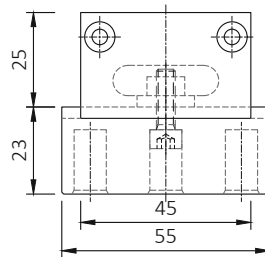
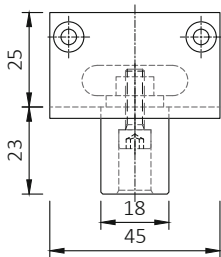


simple

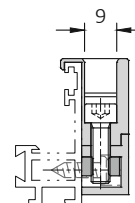
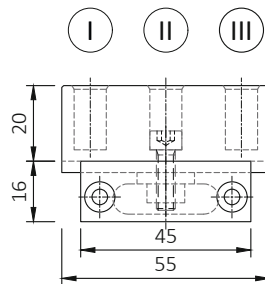
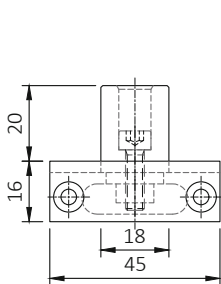
slot-aeration



7 mm 27 mm



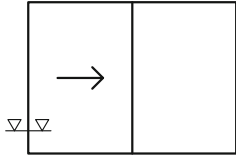
ceiling-sleeve



bottom-sleeve

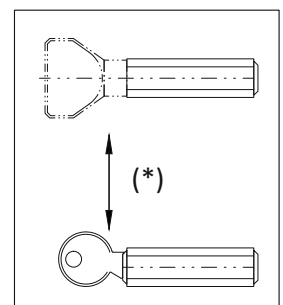
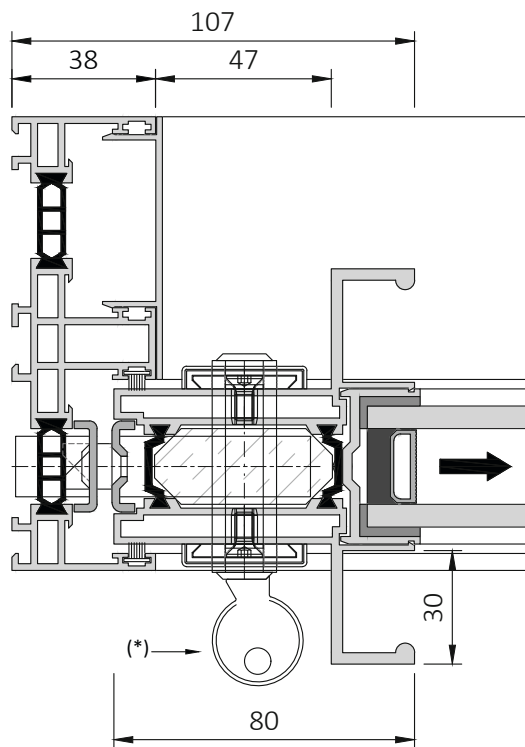
-3 mm / +3 mm

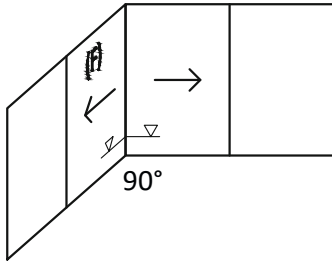
-3 mm / +3 mm



**Locking: claw bold lock  
inside and outside lockable with cylinder**

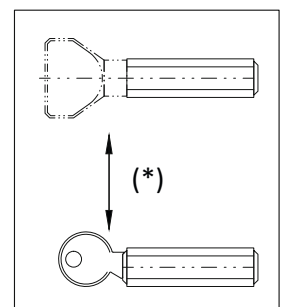
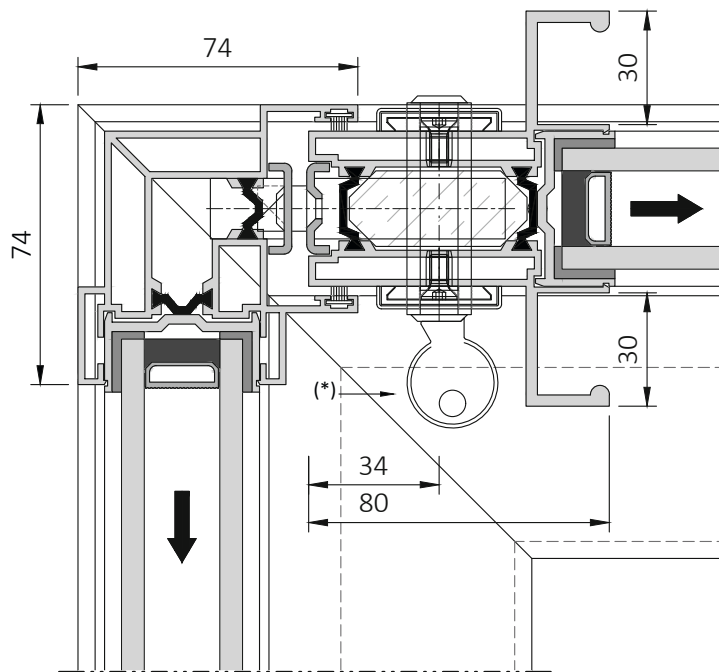
M 1:2

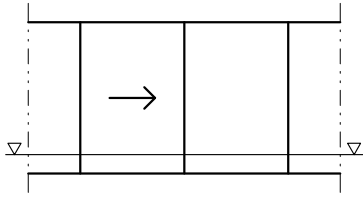




**Locking: claw bold lock**  
inside and outside lockable with cylinder

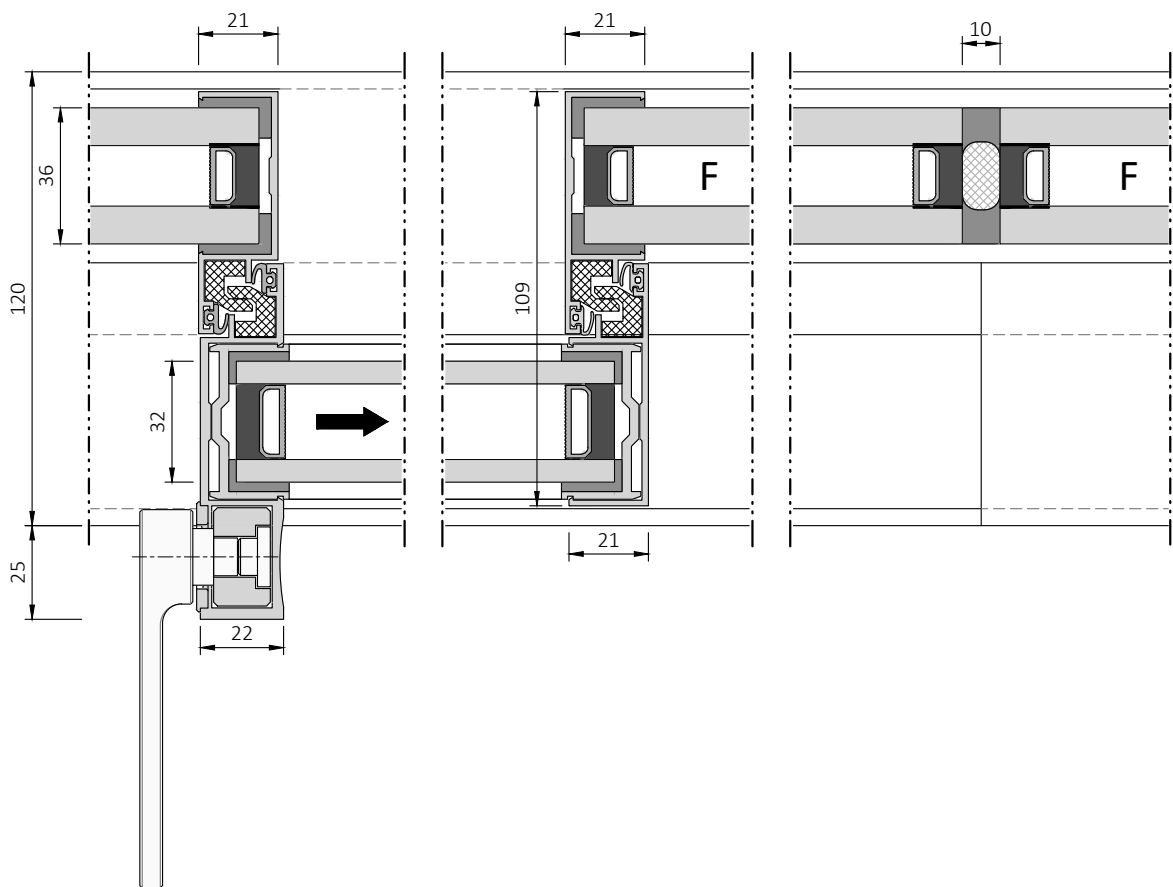
M 1:2





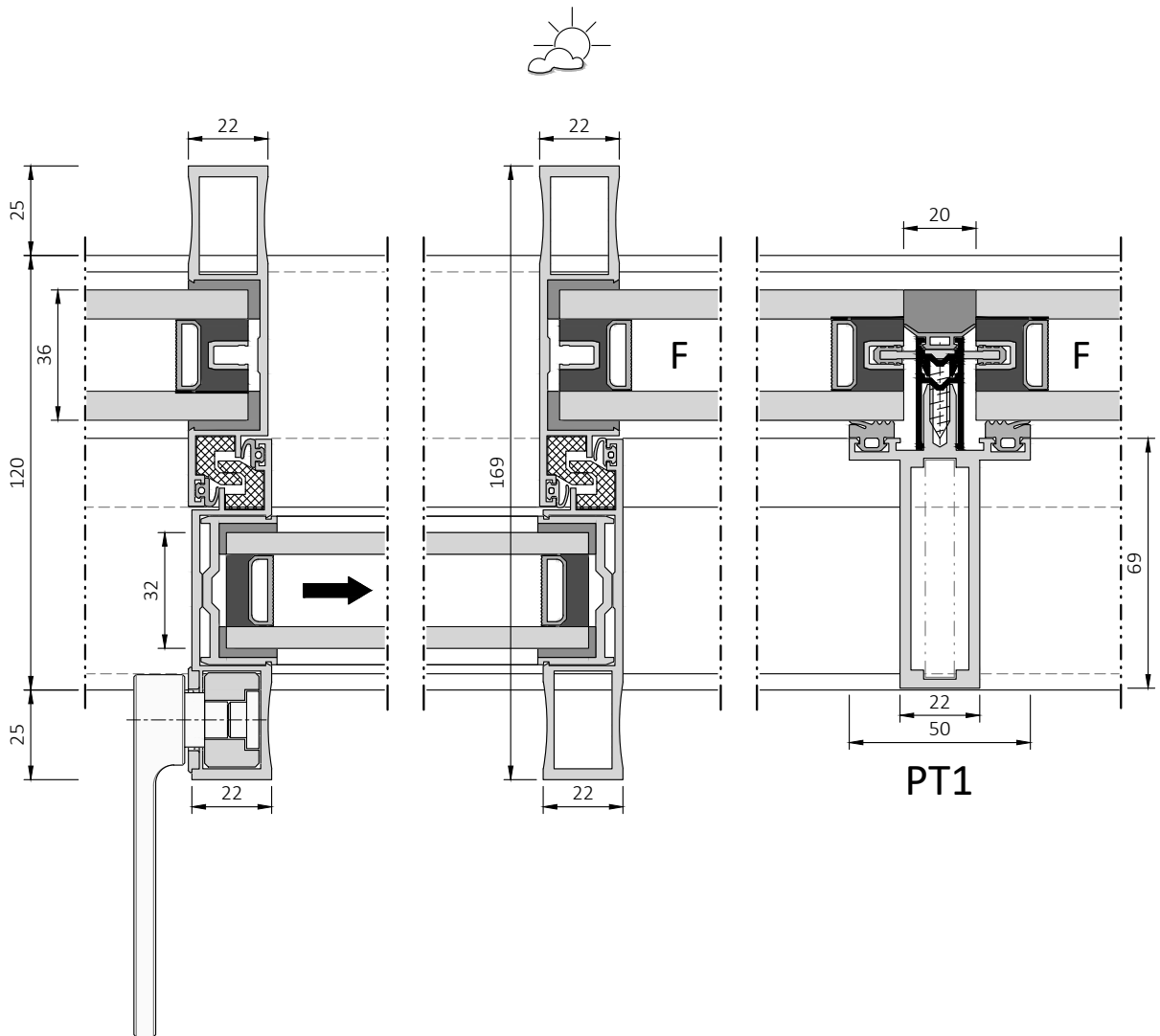
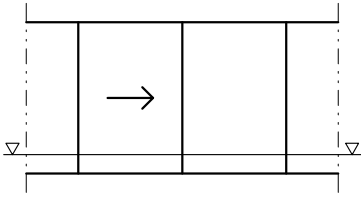
highline: type 1 Glass-To-Glass

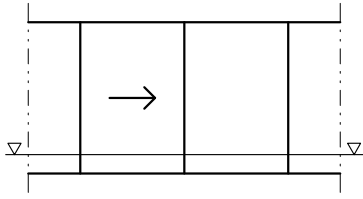
M 1:2



highline: type 2 Semi-SG

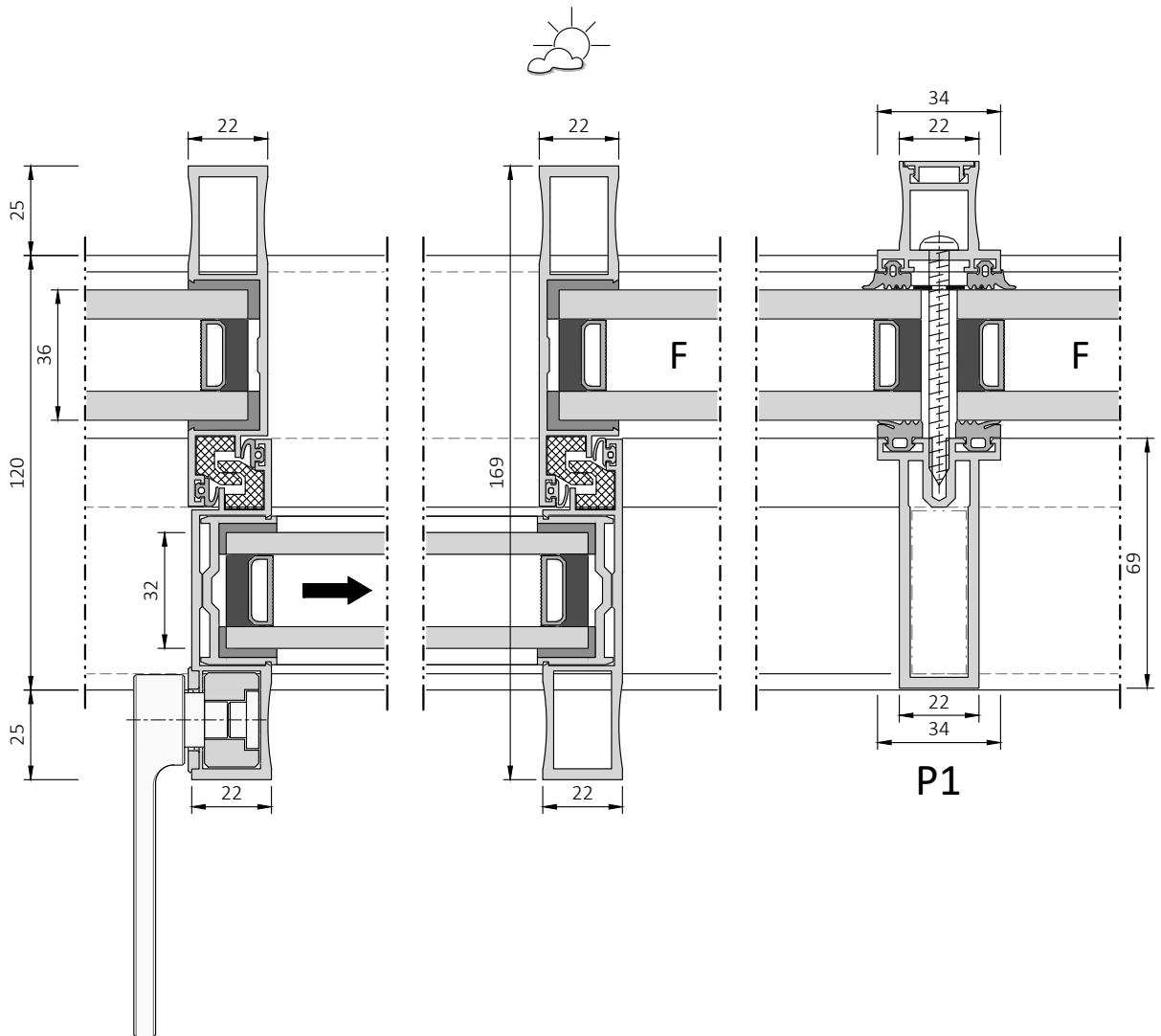
M 1:2





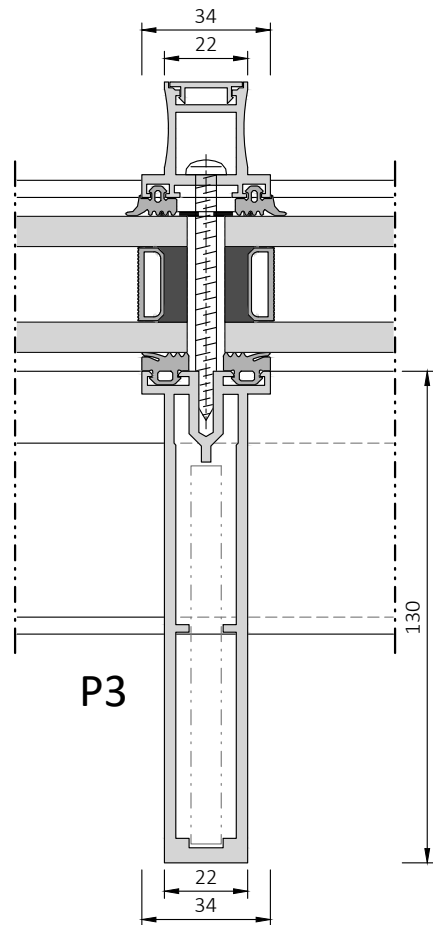
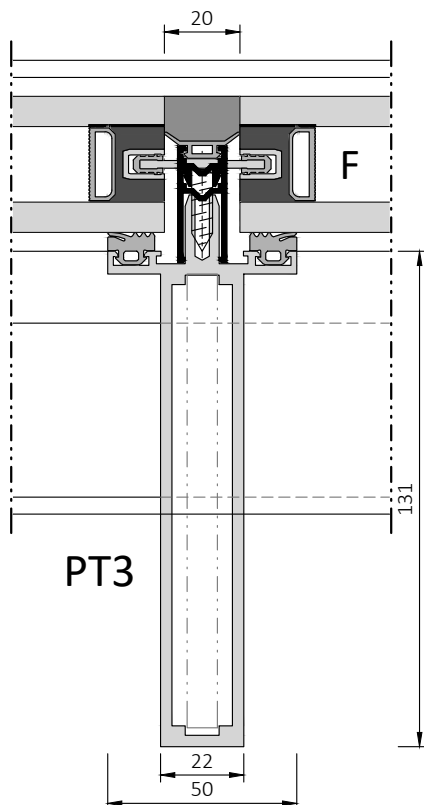
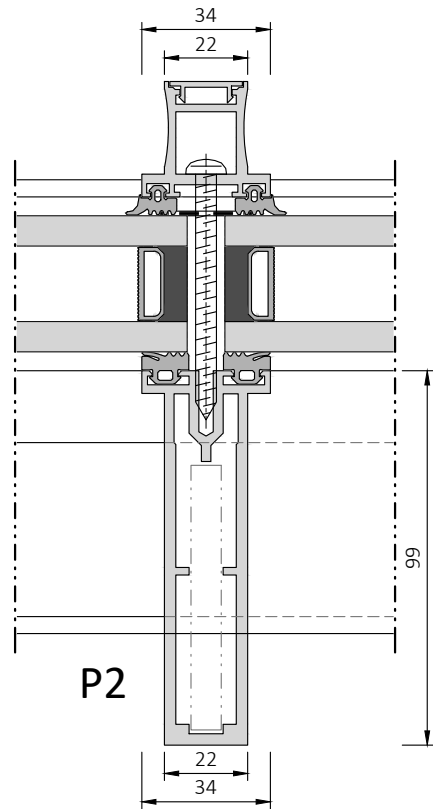
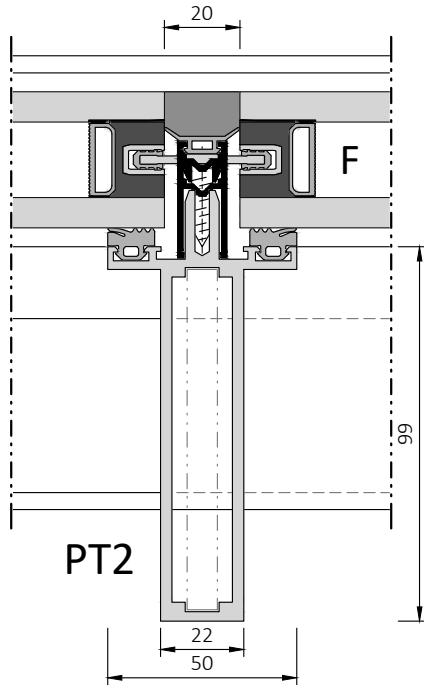
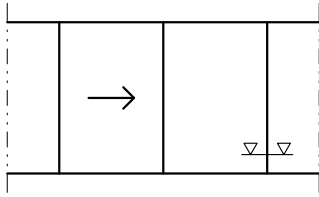
highline: type 3 Cover-Cap-Look

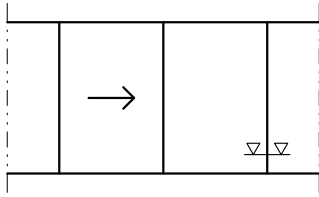
M 1:2



highline: type 2 & 3 larger posts

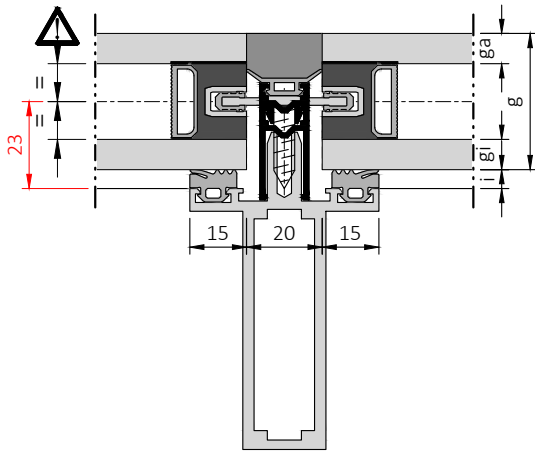
M 1:2





highline: glazing possibilities

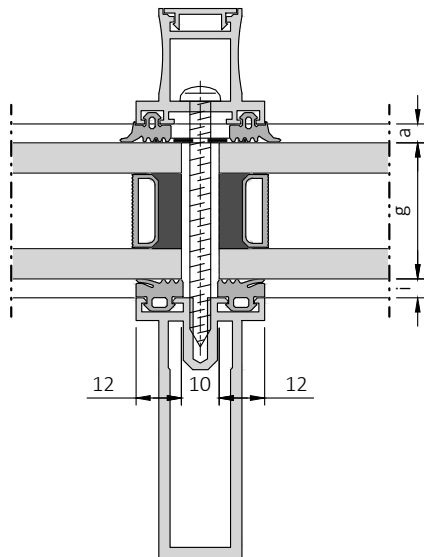
M 1:2



Type 2 Semi-SG

g	ga	gs	gi	i
32	6	20	6	7
32	8	16	8	7
36	8	20	8	5
36	10	16	10	5

Special designs available on request

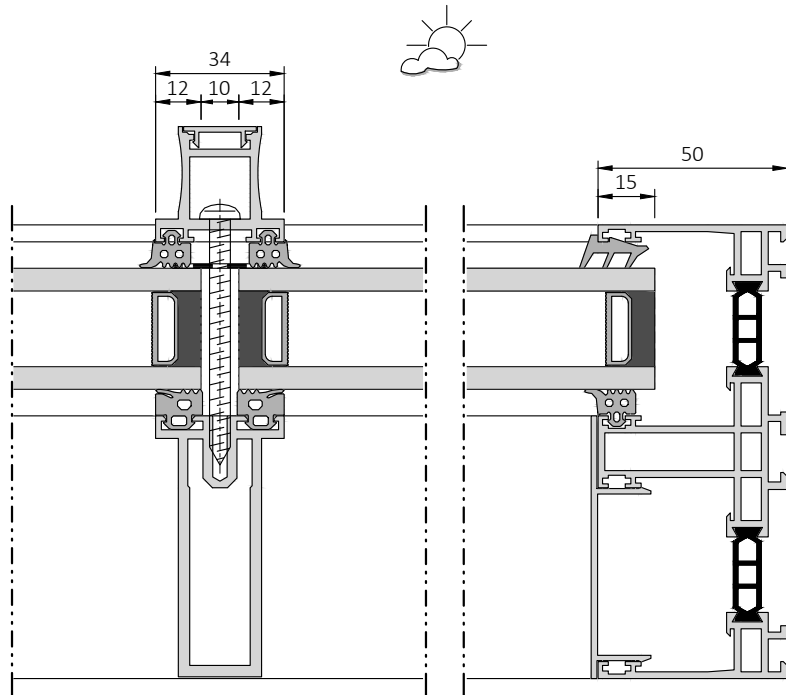
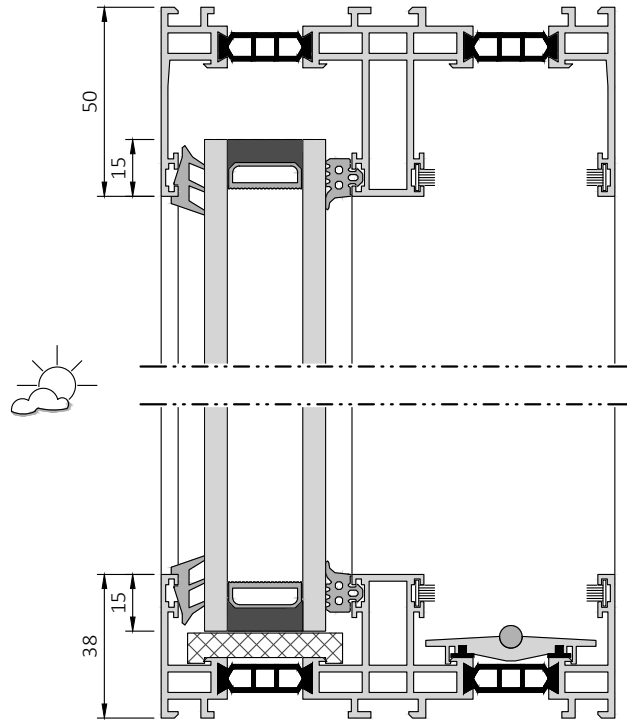
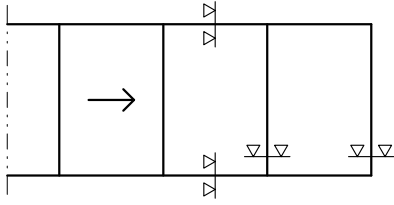


Type 3 Cover-Cap-Look

g	a	i
29	7	9
30	7	9
31	7	7
32	7	7
33	5	7
34	5	7
35	5	5
36	5	5

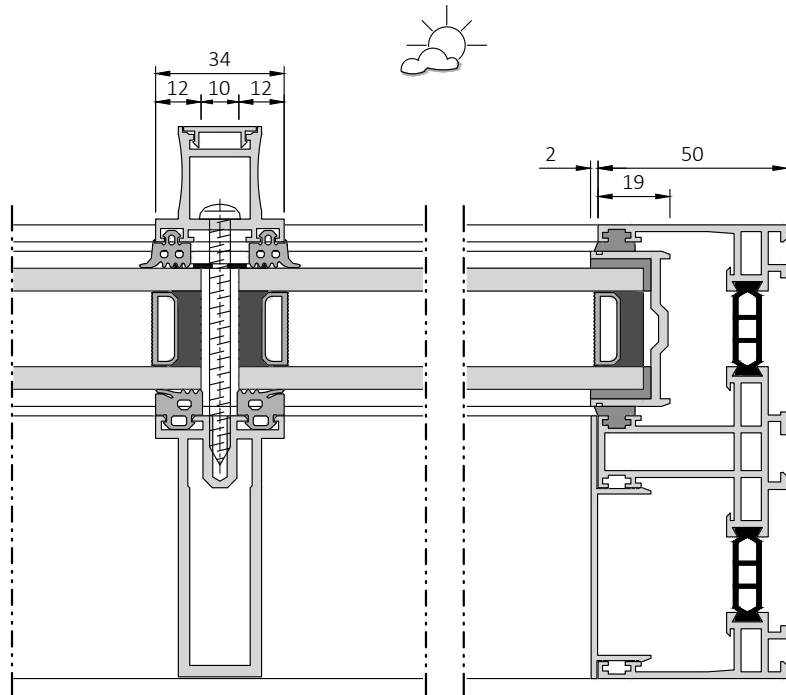
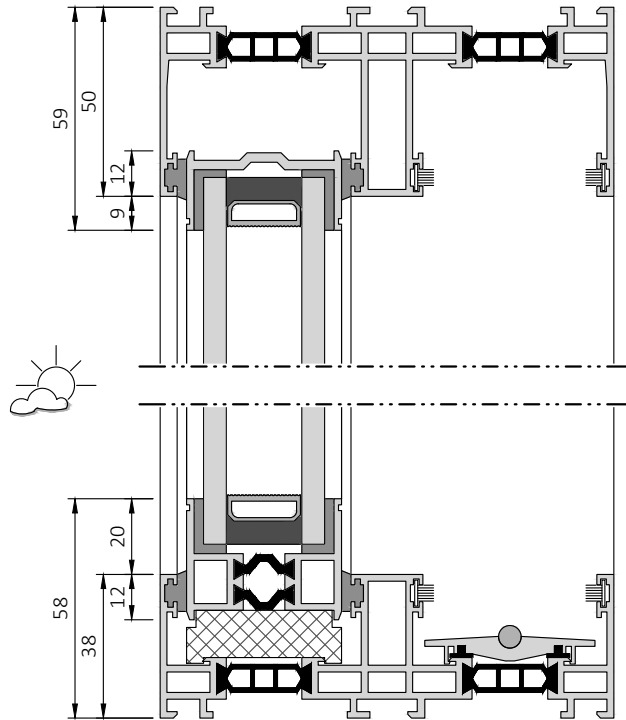
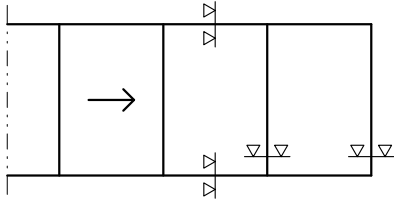
highline: without U-glazing profile

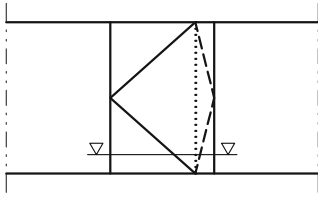
M 1:2



highline: with U-glazing profile

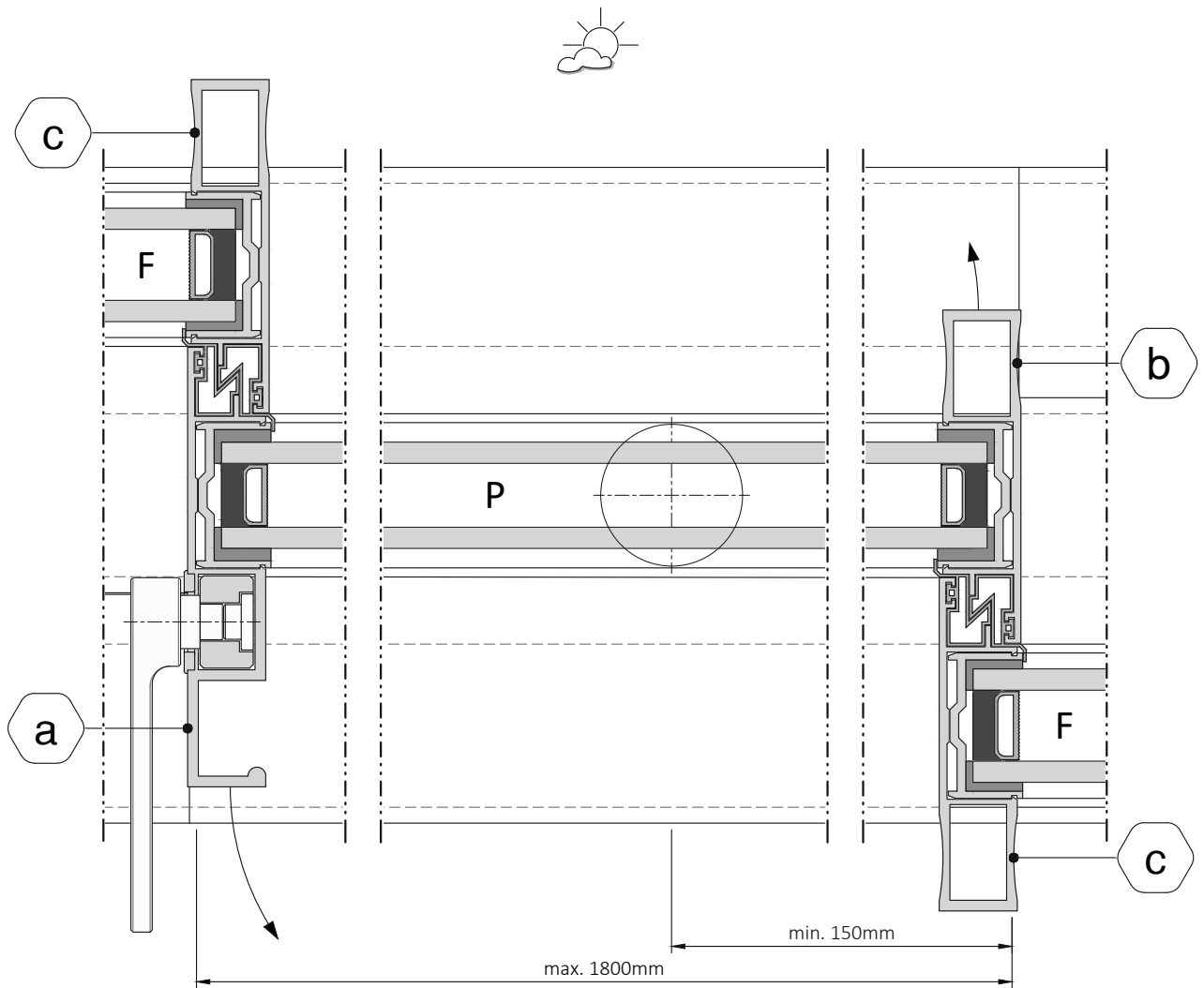
M 1:2

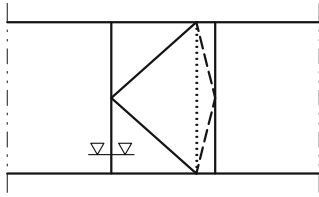




**pivot door alternating**

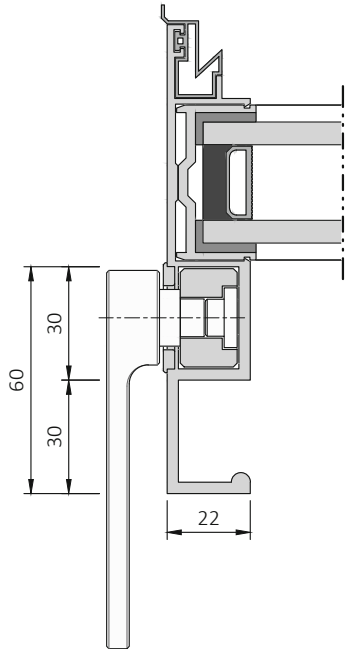
M 1:2



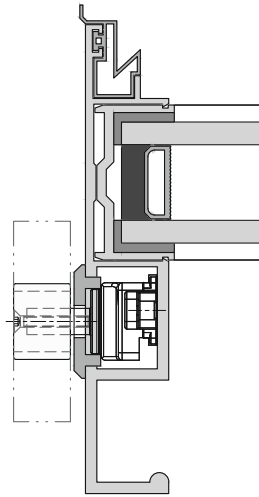


**pivot door alternating**  
- position (a) : locking

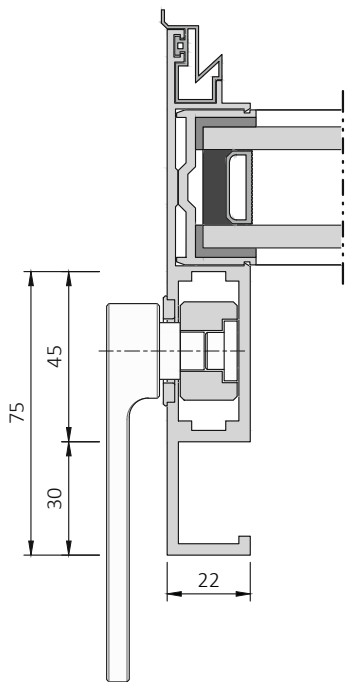
M 1:2



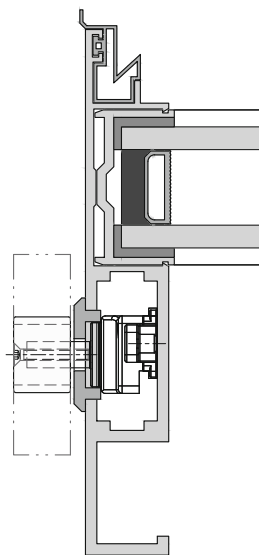
ZK1 G PT : Type 1



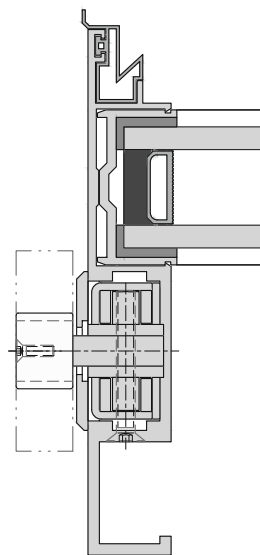
Type 2



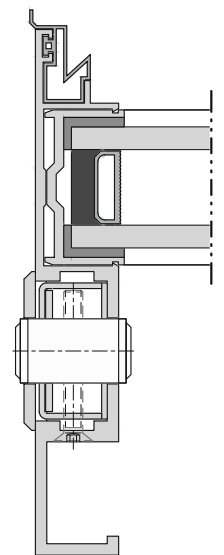
ZK2 G PT : Type 1



Type 2



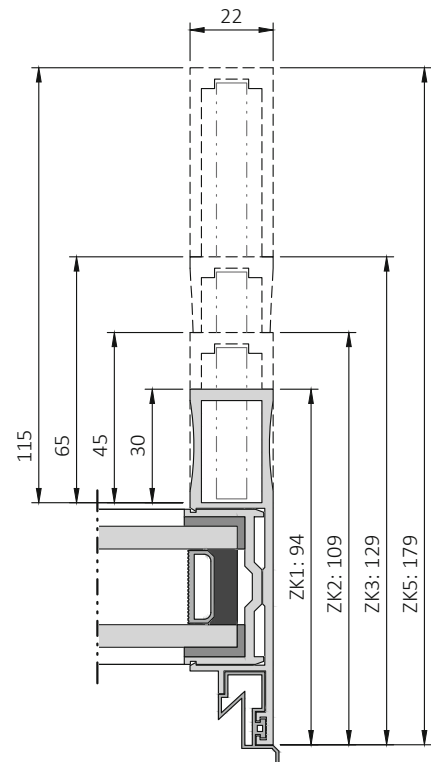
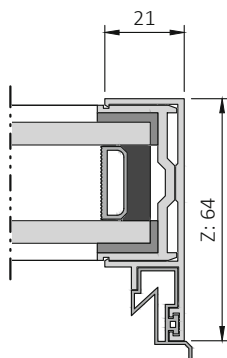
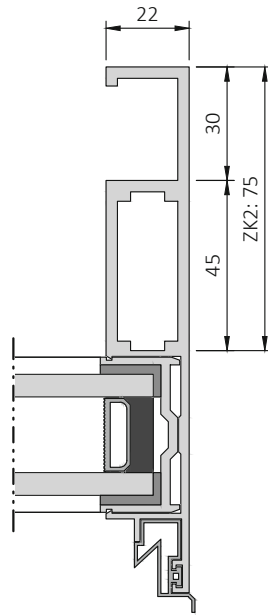
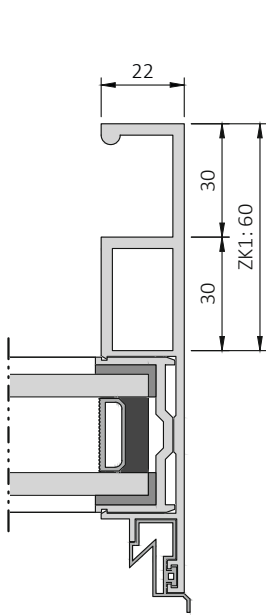
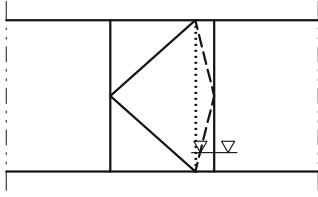
Type 3

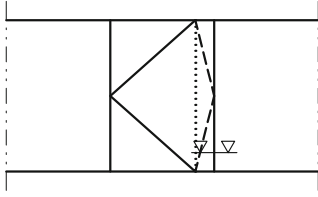


Type 4

**pivot door alternating**  
 - position (b) : junction profiles

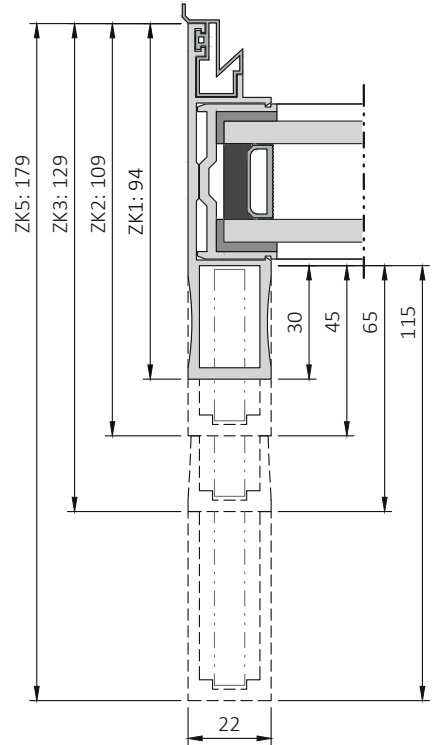
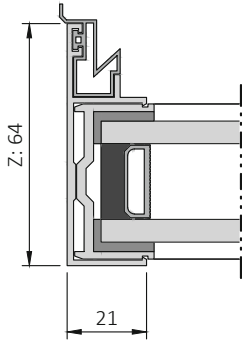
M 1:2

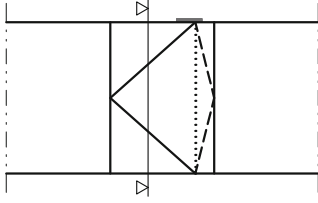




**pivot door alternating**  
**- position © : junction profiles**

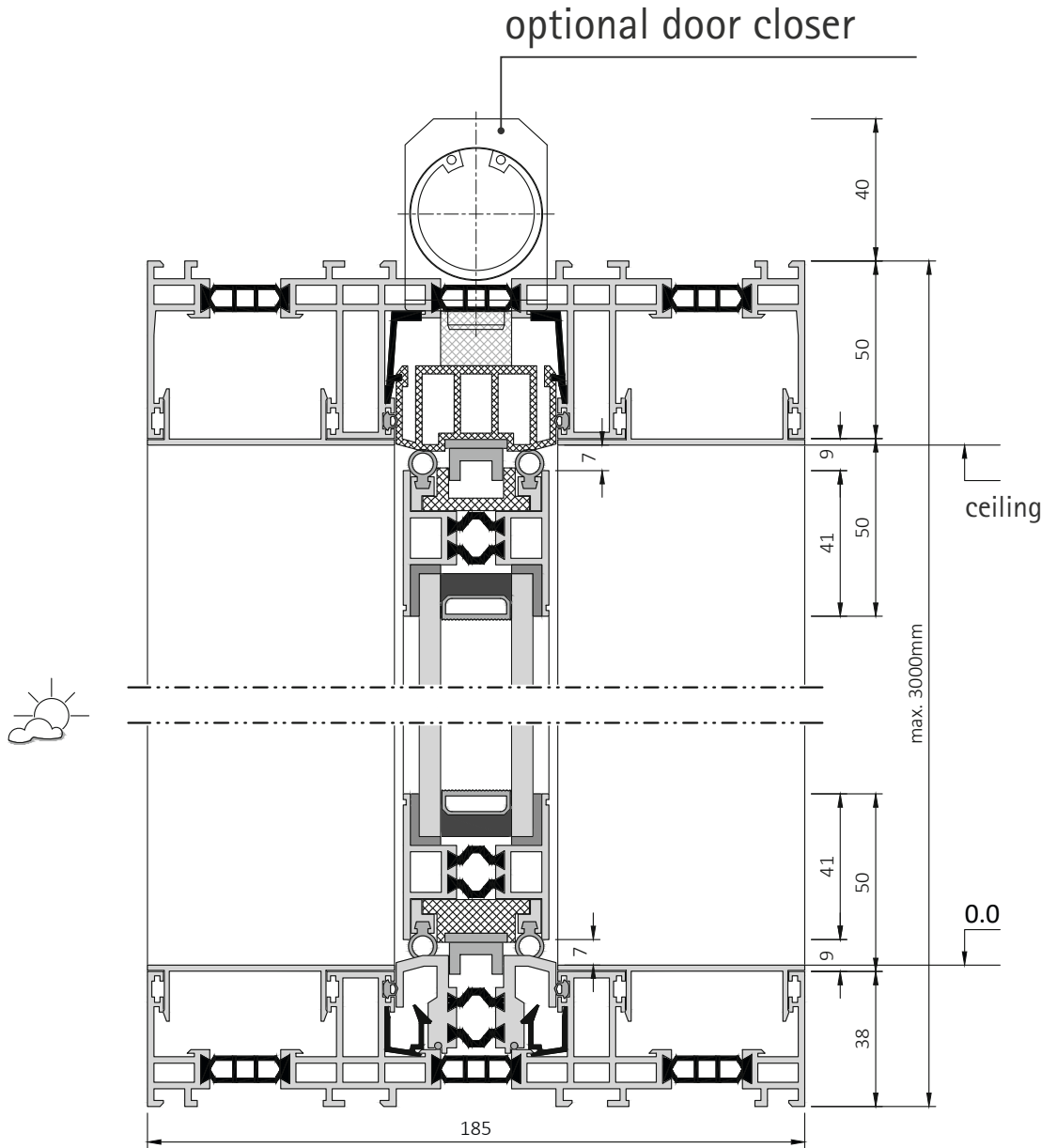
M 1:2





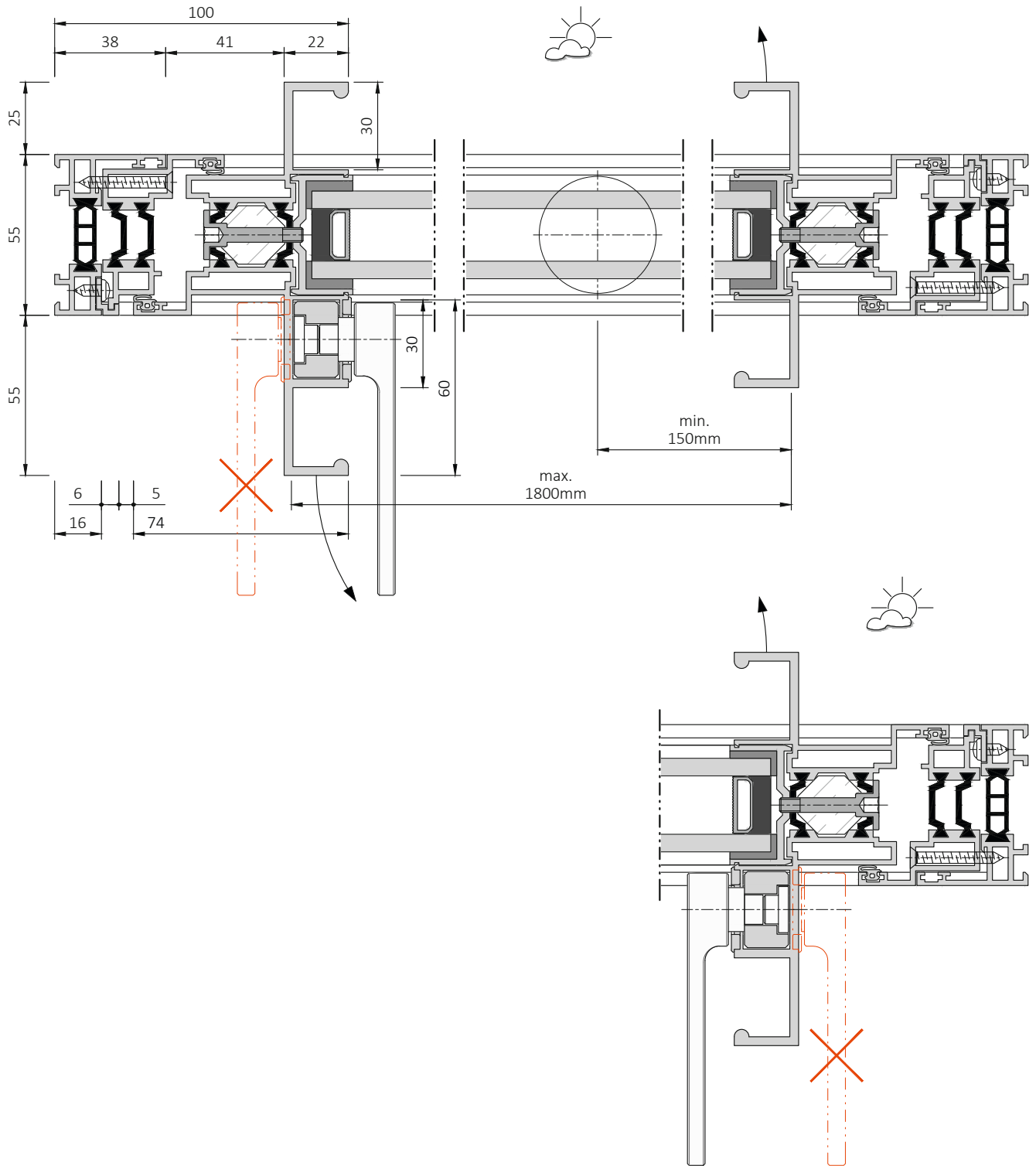
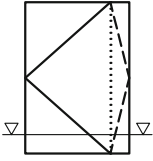
**pivot door alternating**

M 1:2



**pivot door stand alone  
- bar locking**

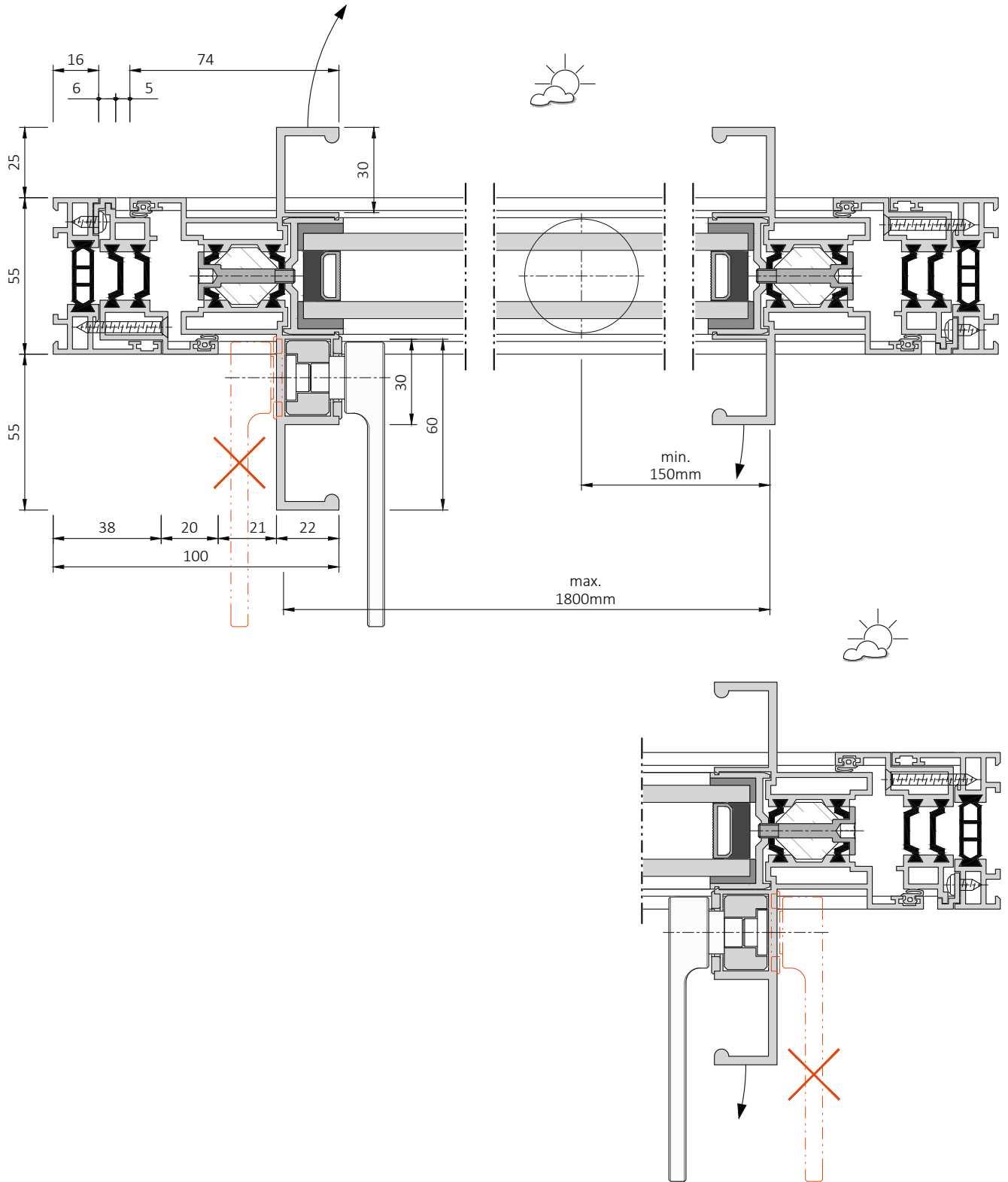
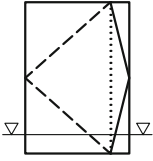
M 1:2



Optional : lockable on both sides

**pivot door stand alone  
- bar locking**

M 1:2

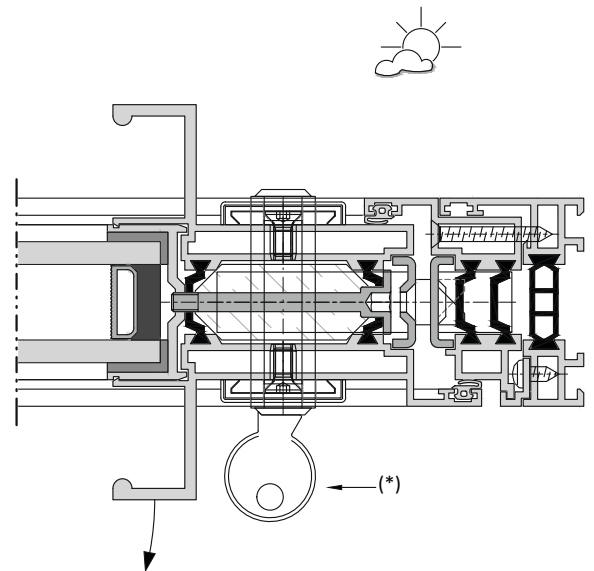
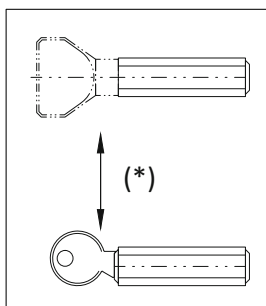
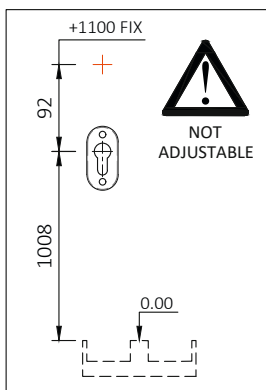
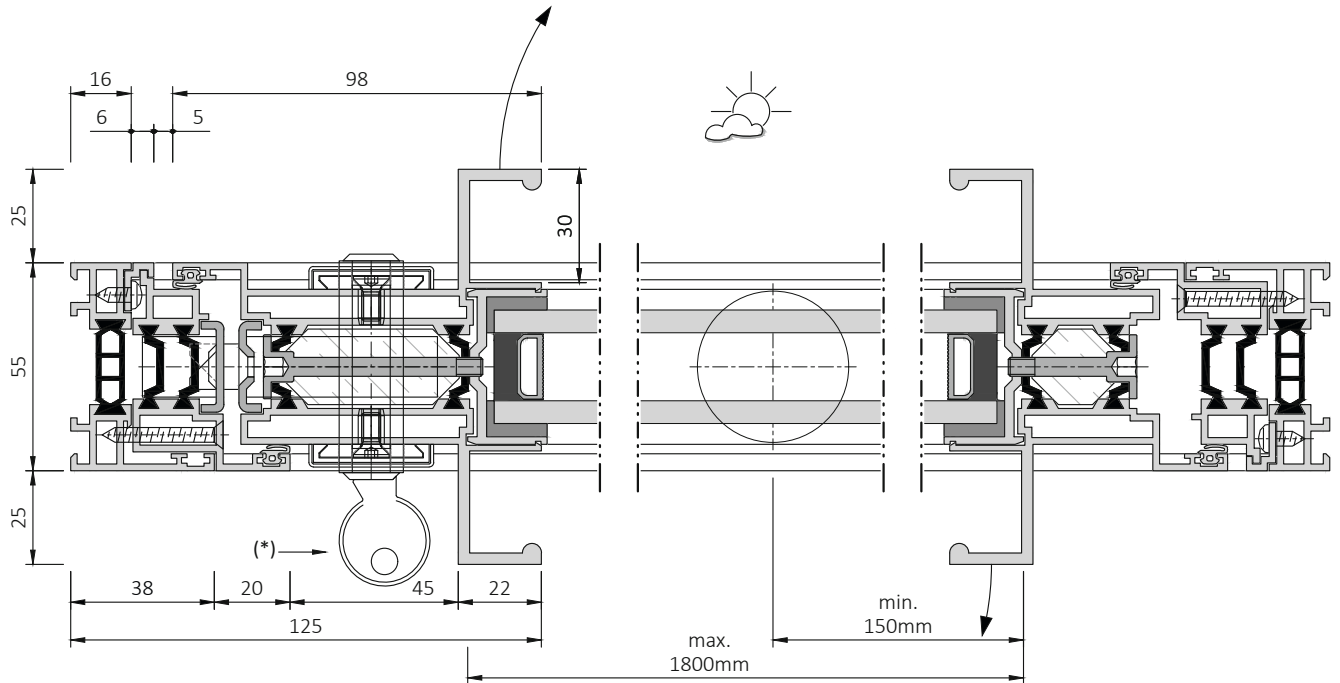
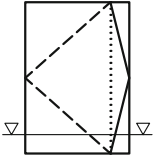


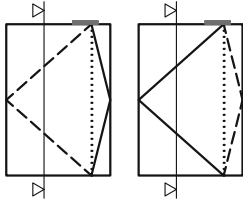
Optional : lockable on both sides



**pivot door stand alone**  
**- inside and outside lockable with cylinder**

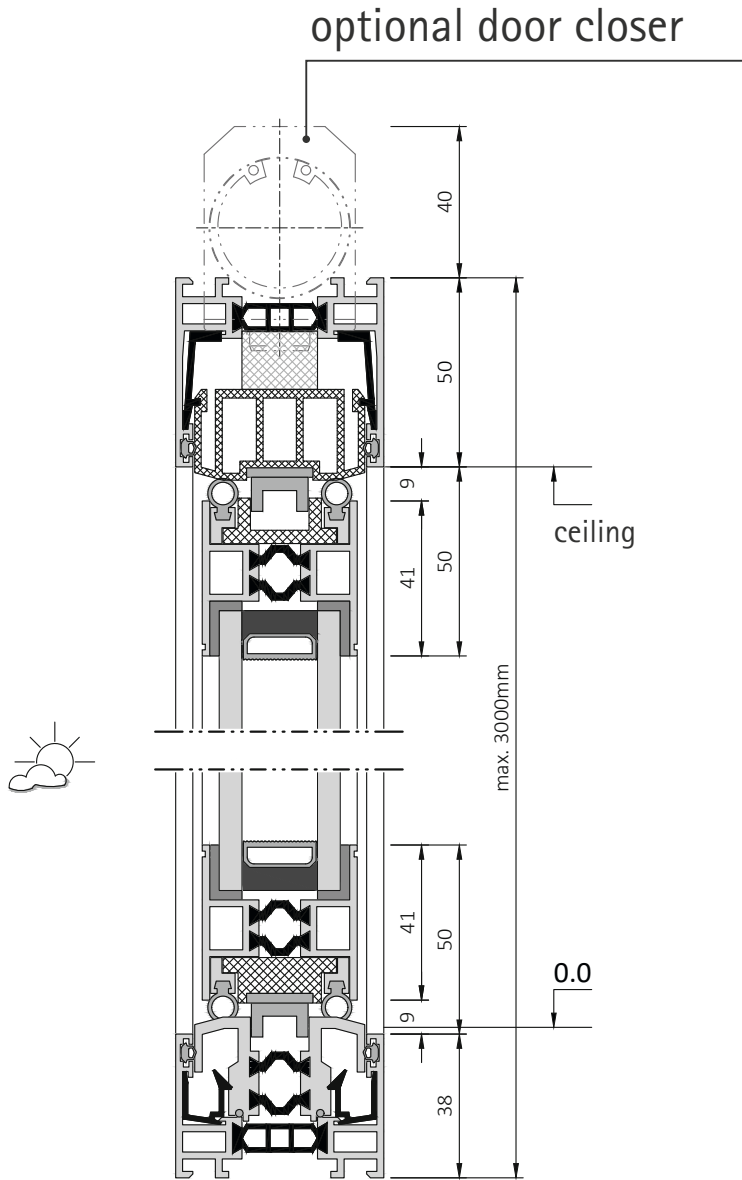
M 1:2





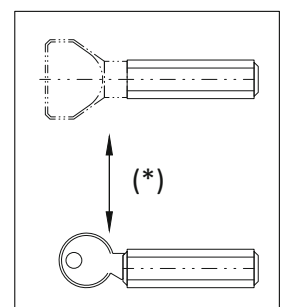
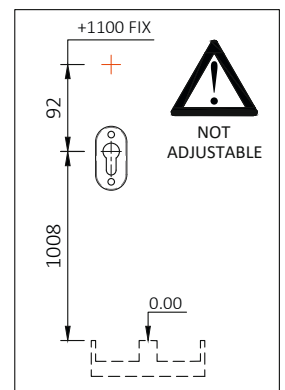
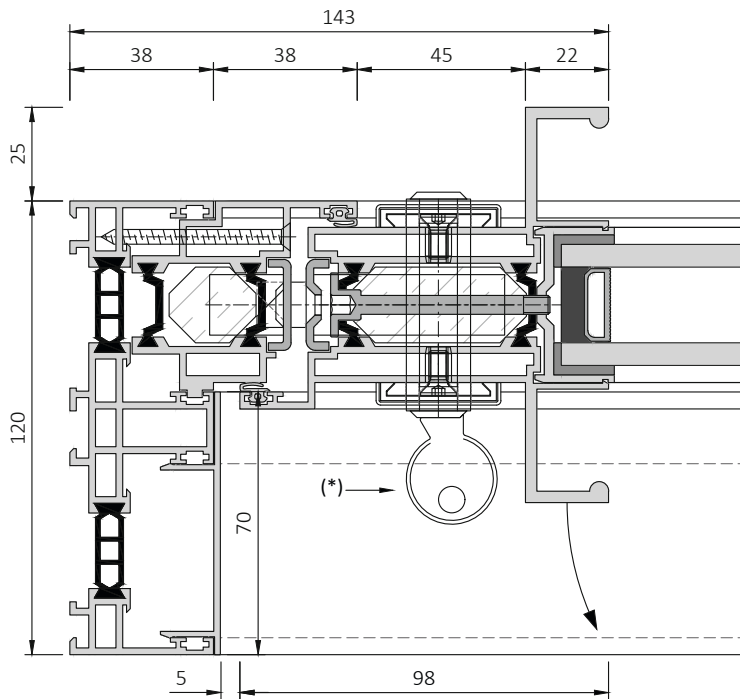
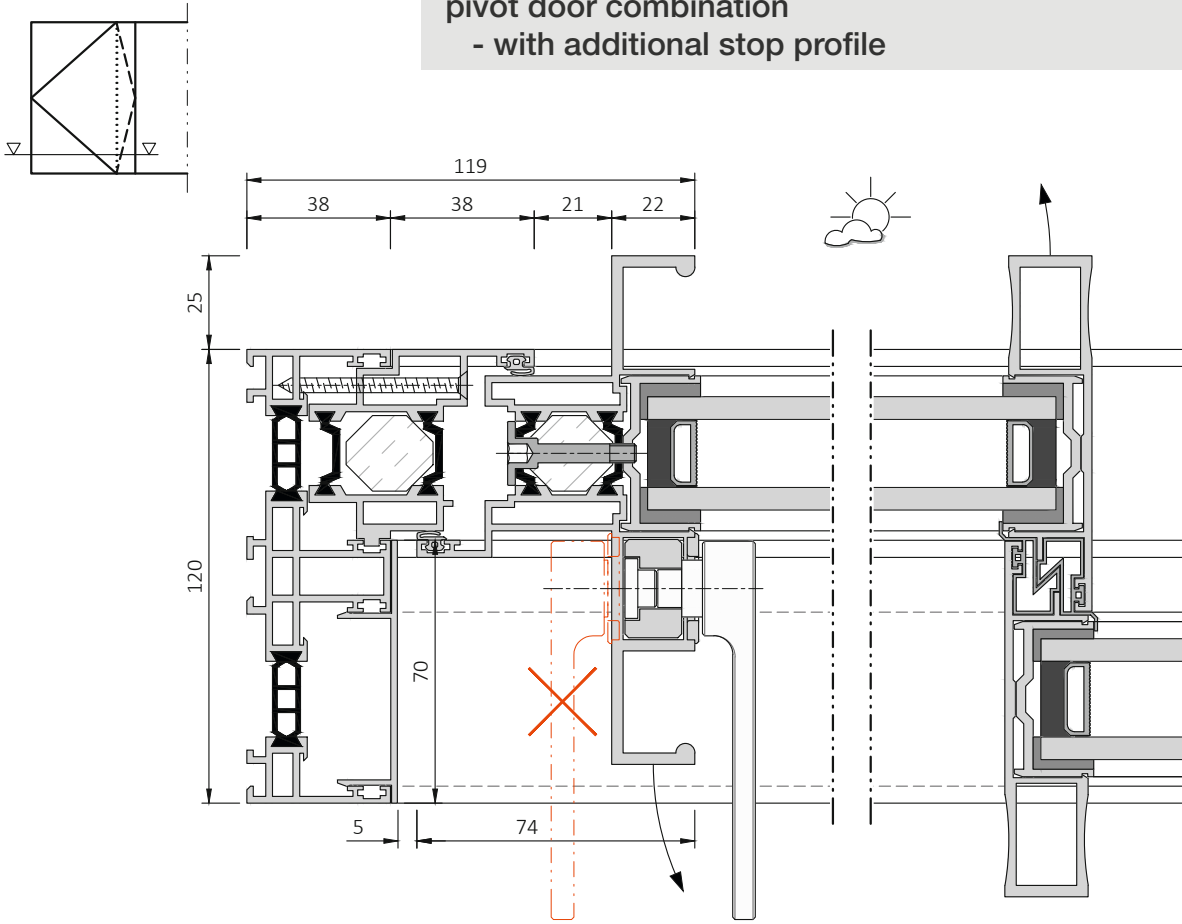
**pivot door stand alone**

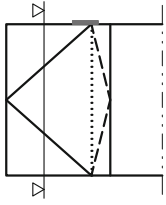
M 1:2



**pivot door combination**  
- with additional stop profile

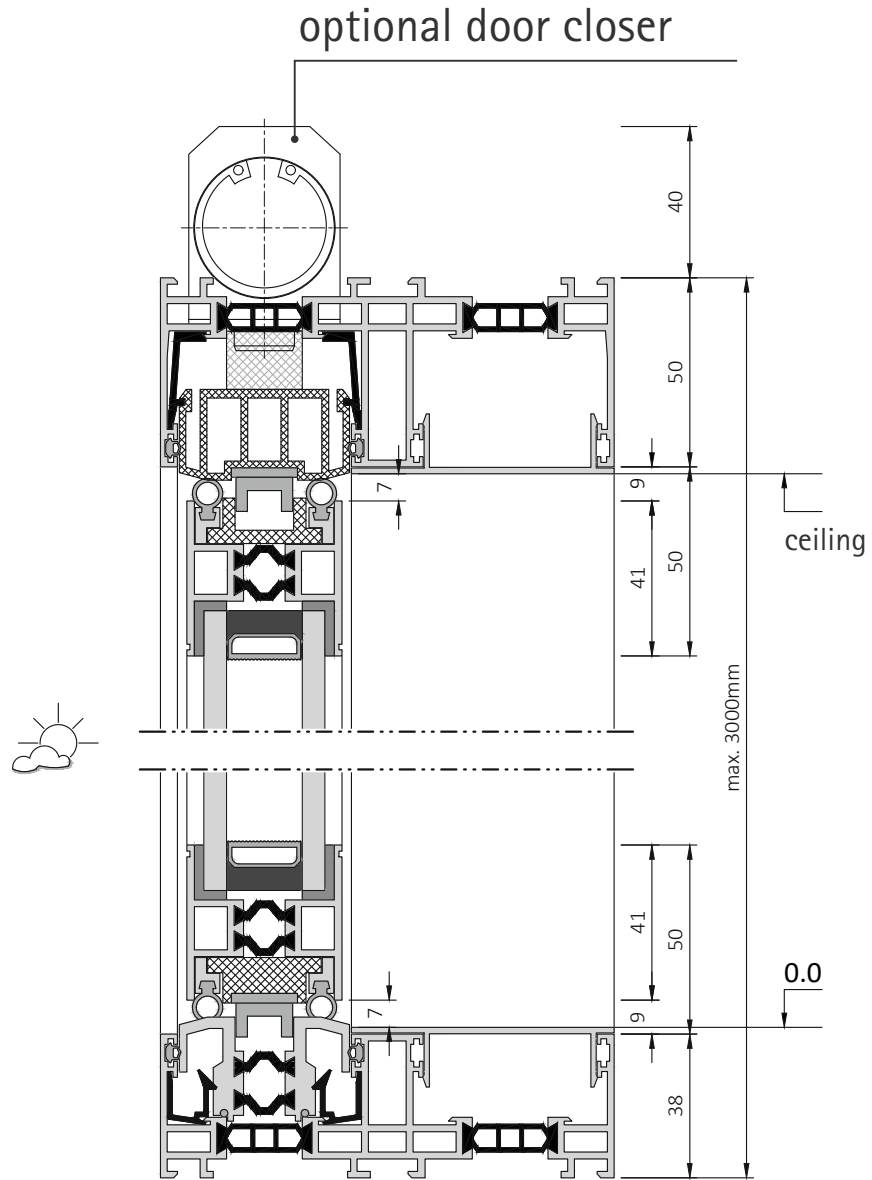
M 1:2





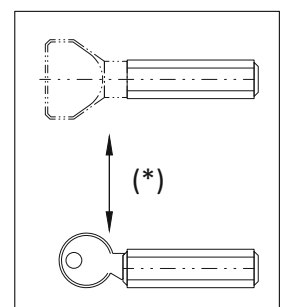
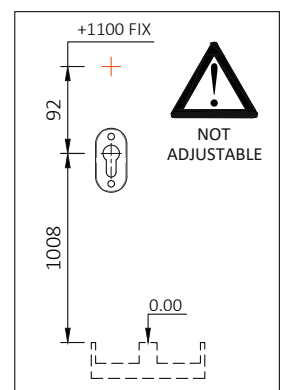
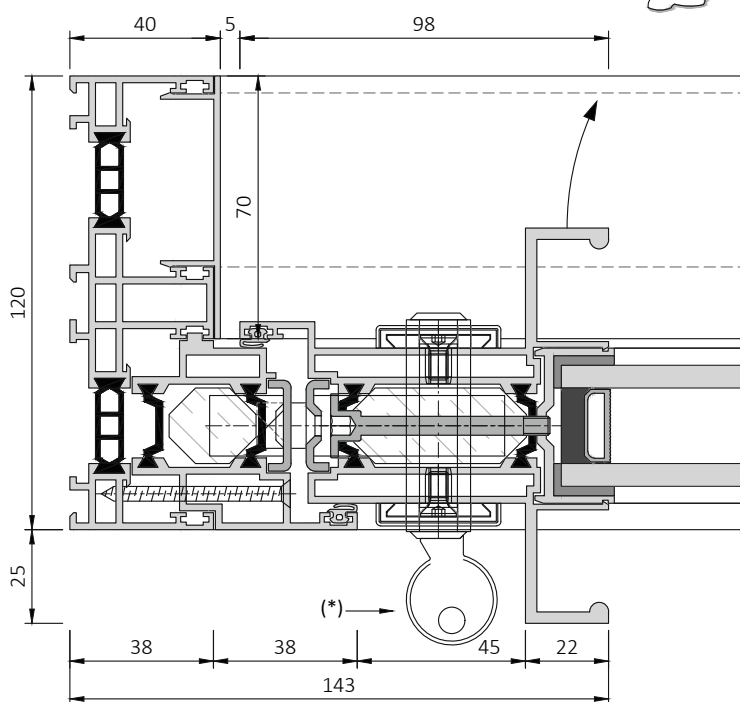
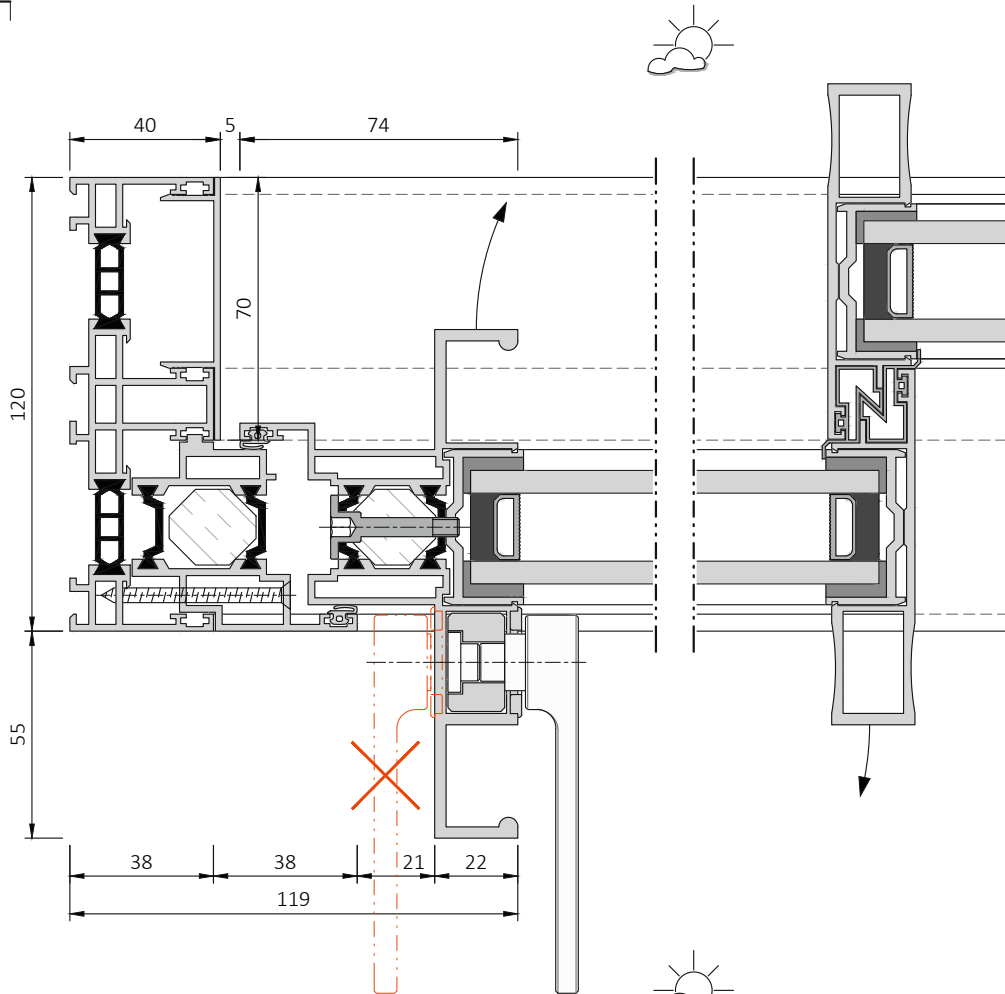
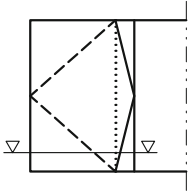
**pivot door combination**  
**- with additional stop profile**

M 1:2



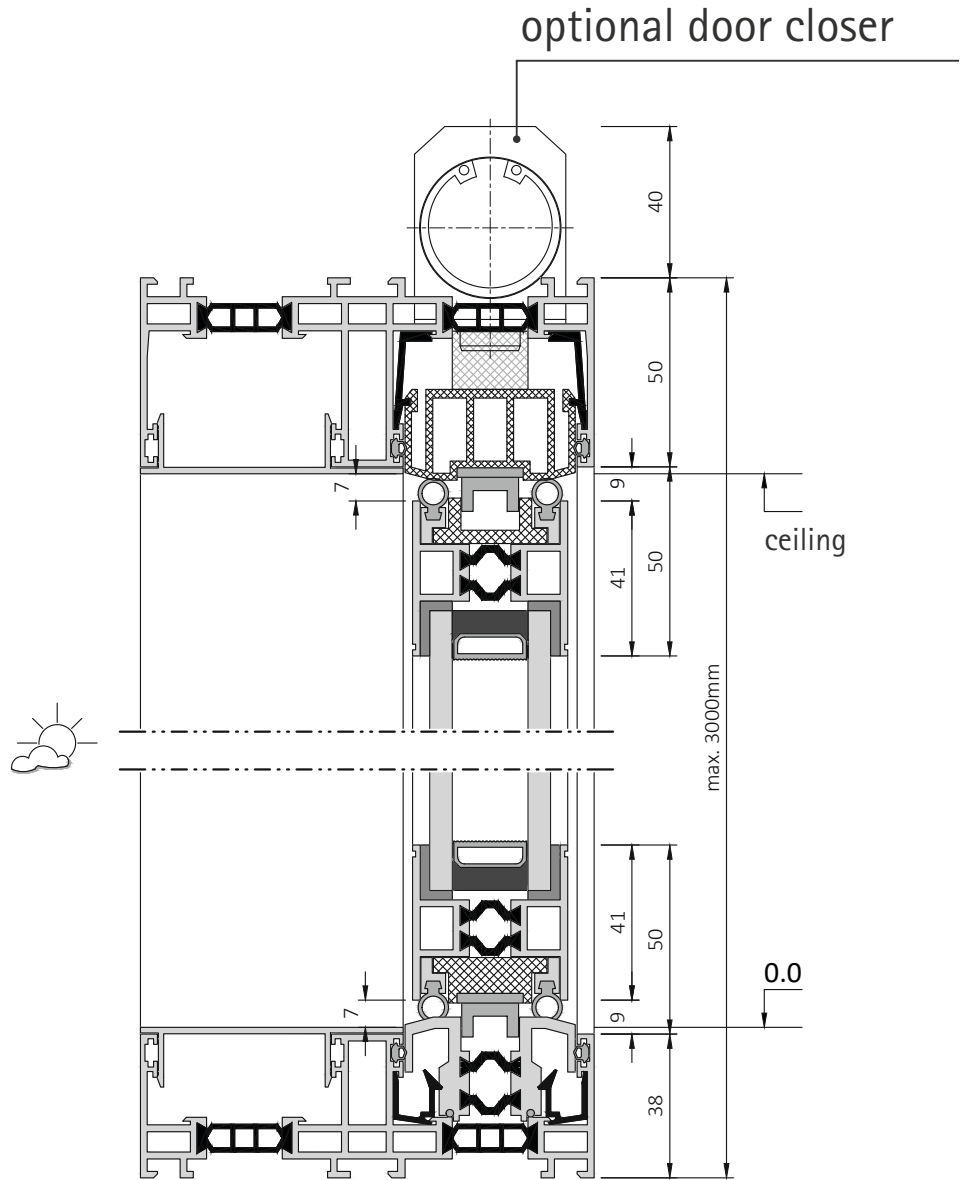
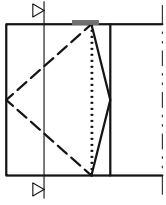
**pivot door combination  
- with additional stop profile**

M 1:2



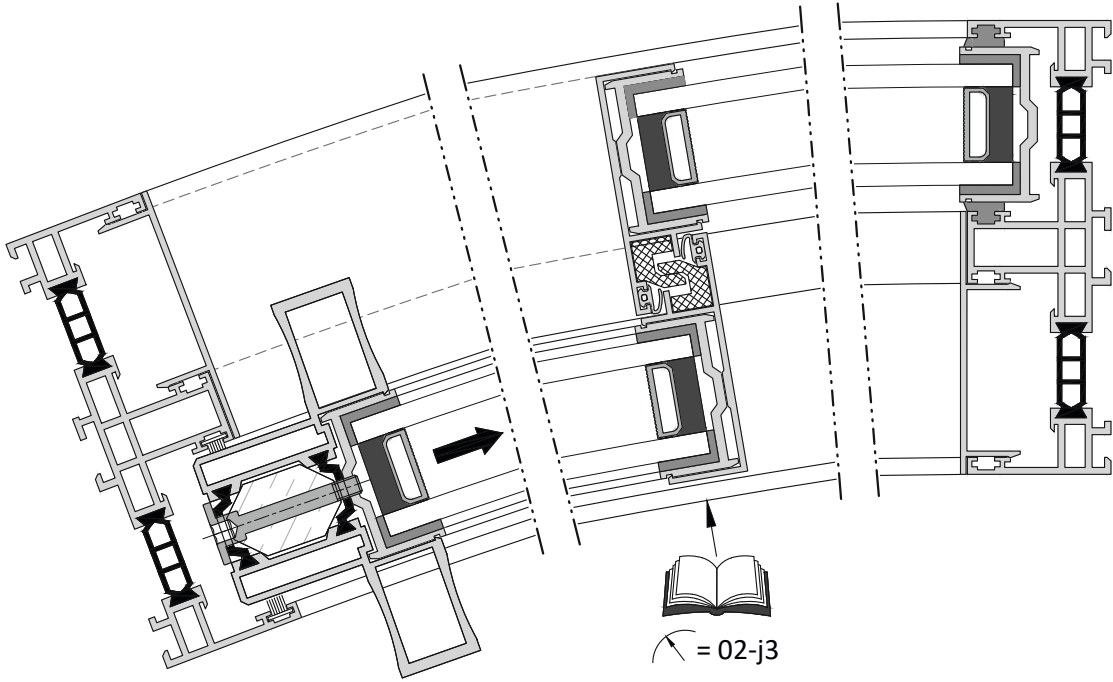
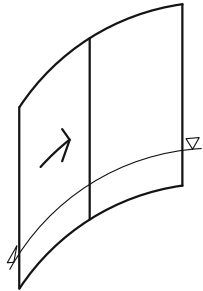
**pivot door combination**  
**- with additional stop profile**

M 1:2



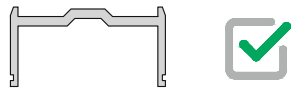
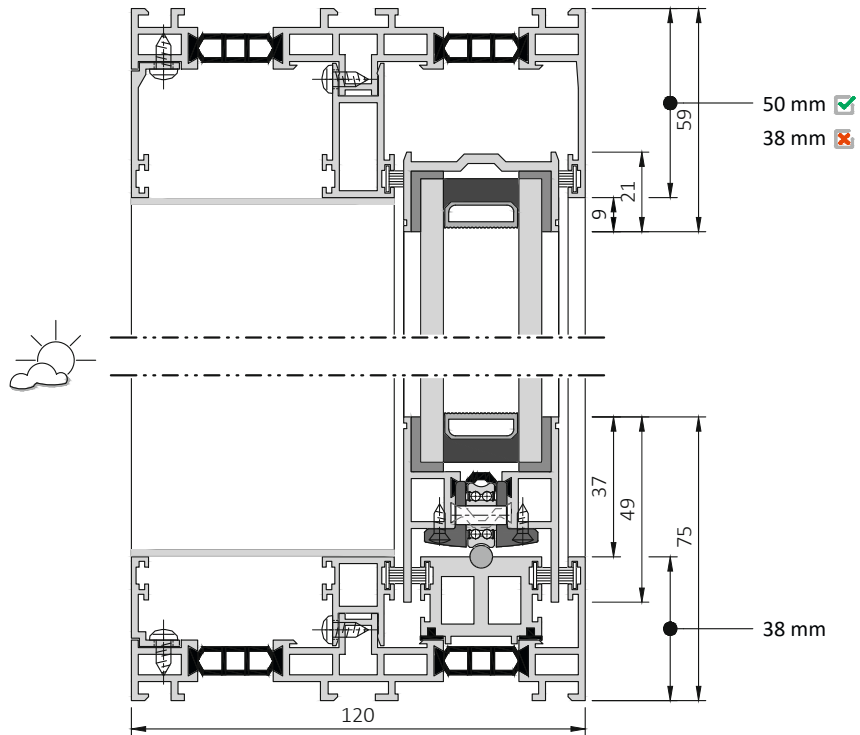
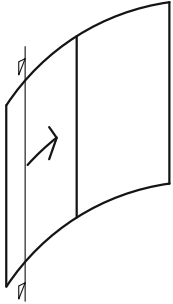
curve : KE-49 freeway

M 1:2

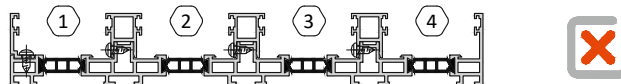
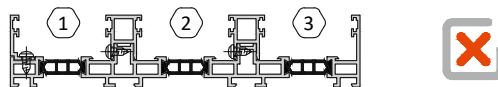
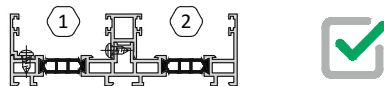
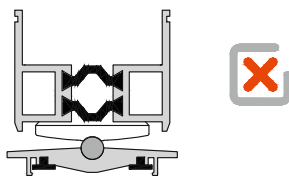
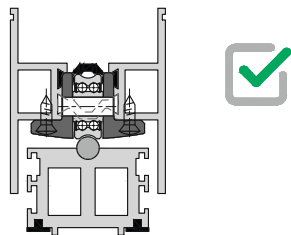


curve : KE-49 freeway

M 1:2

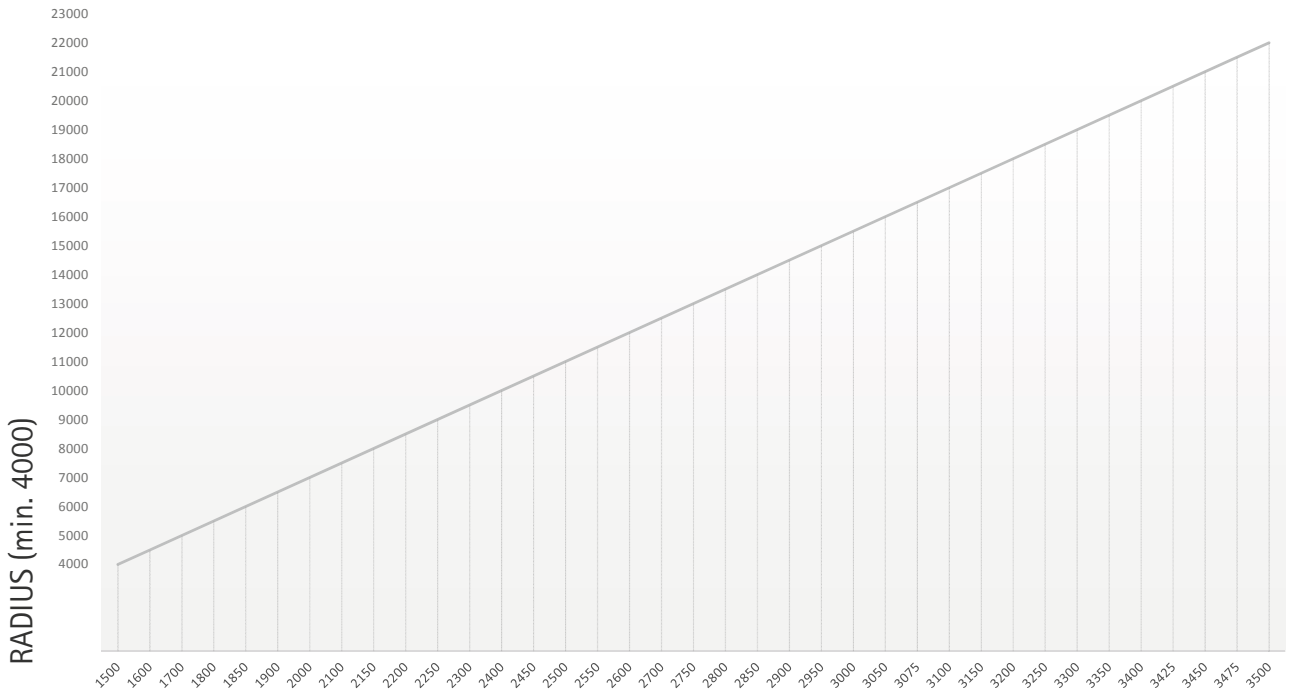
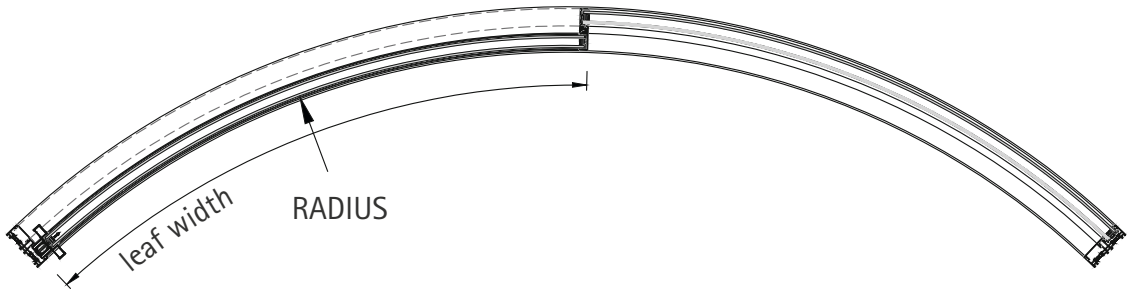
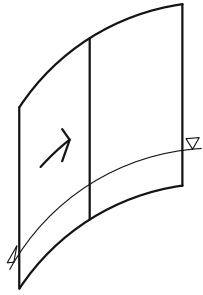


not possible:  
 KE-32  
 KE-32h  
 KE-49h



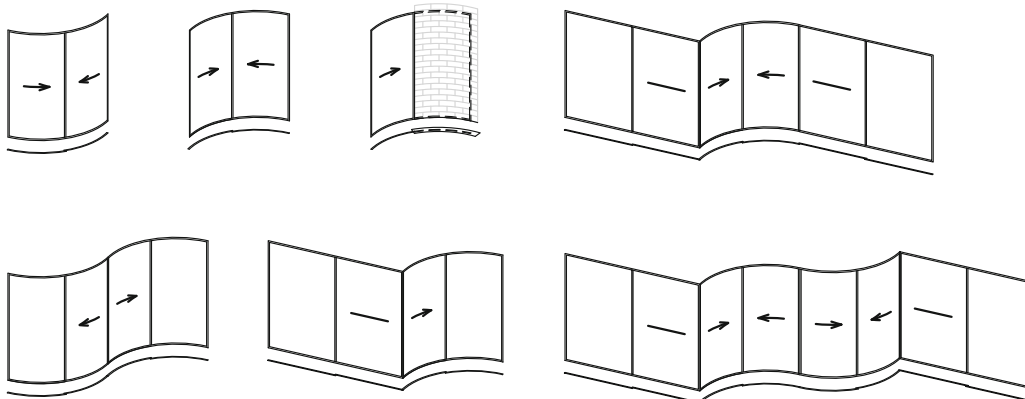
curve : KE-49 freeway

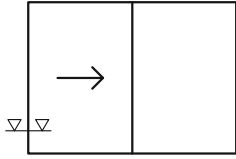
M 1:2



max. leaf width

some possibilities

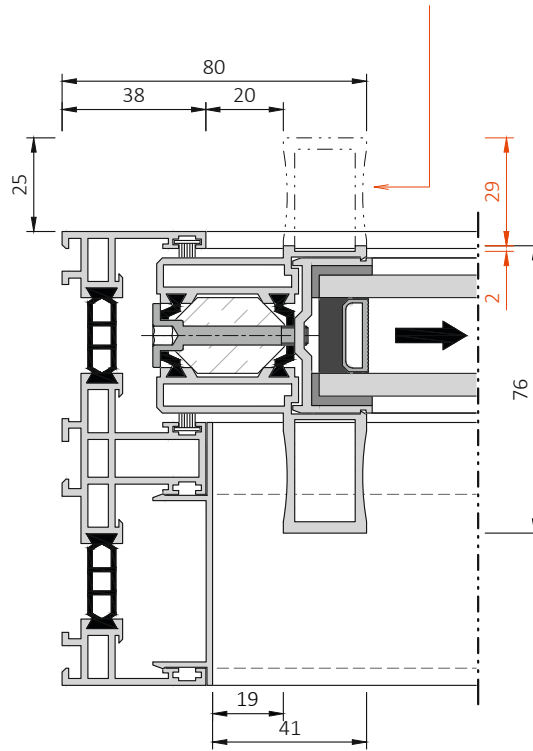




**Project solutions**  
**- modified handle bar G4**

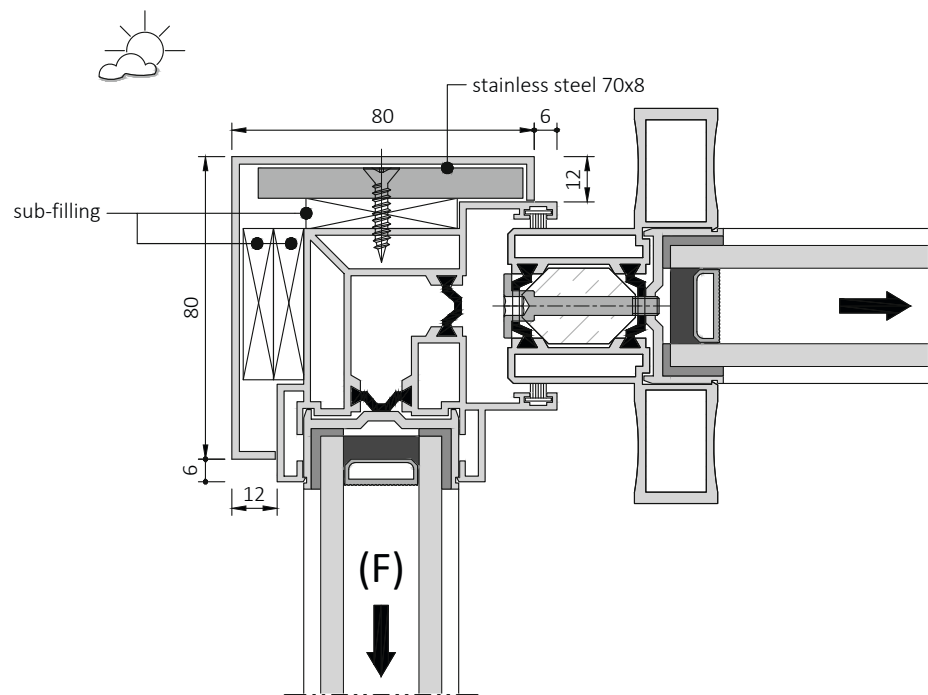
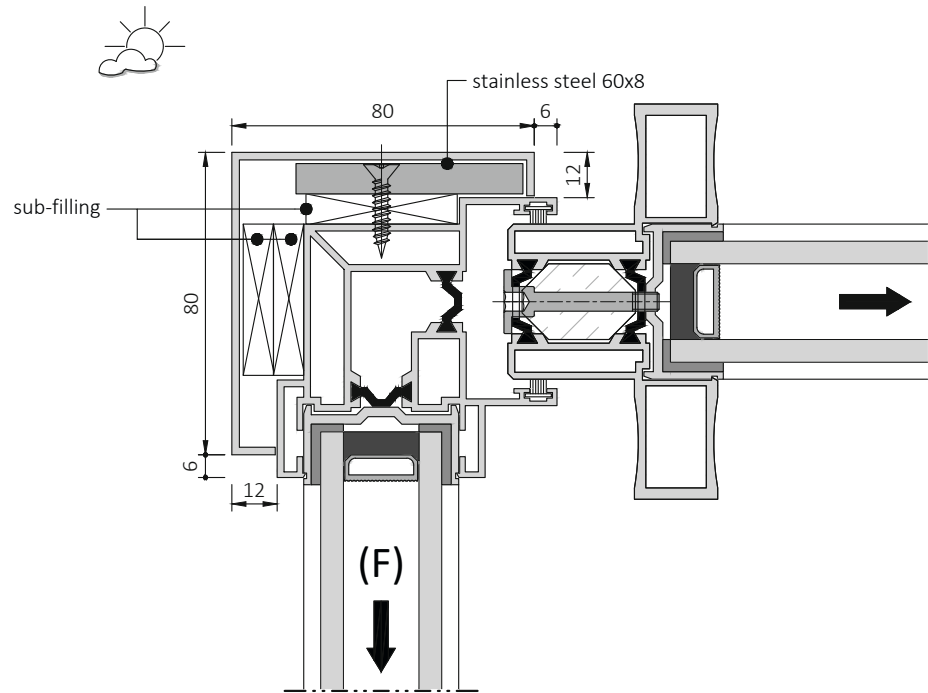
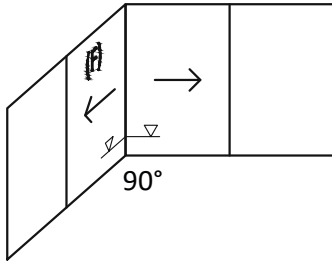
M 1:2

trimmed (before coating)!

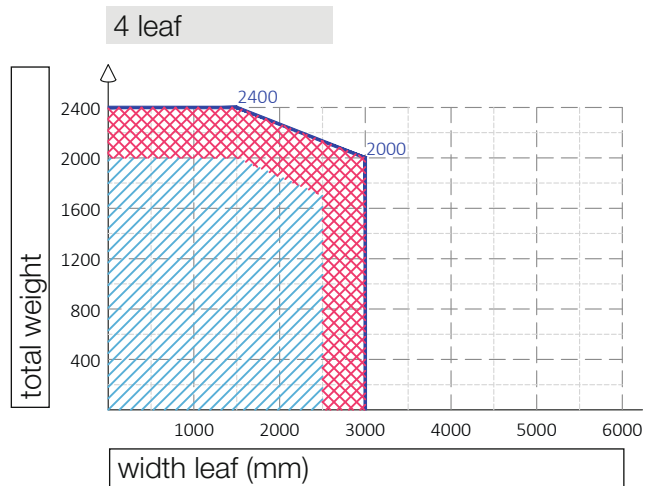
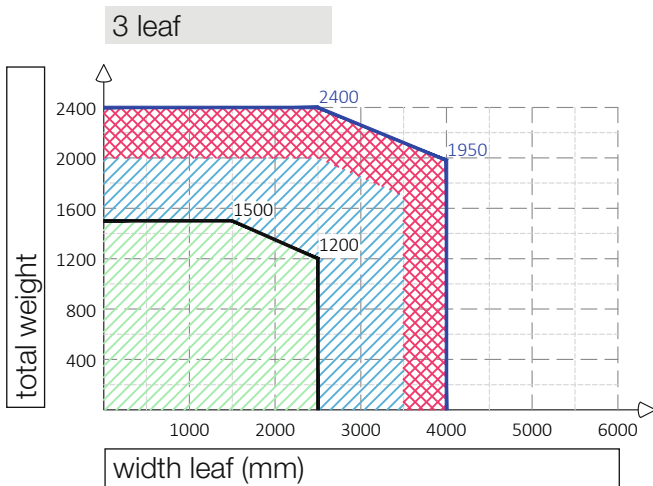
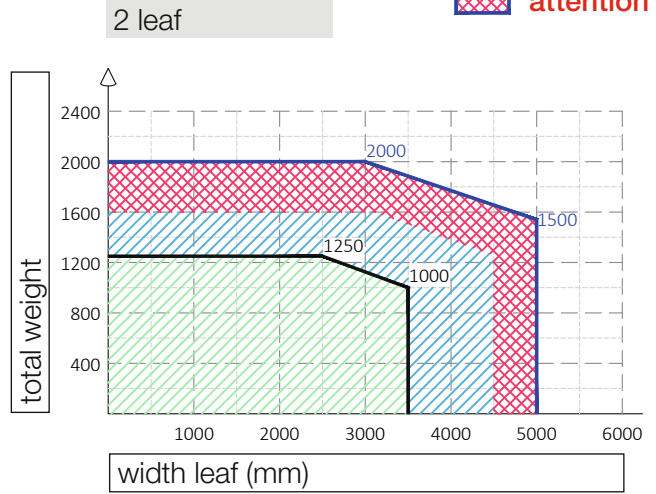
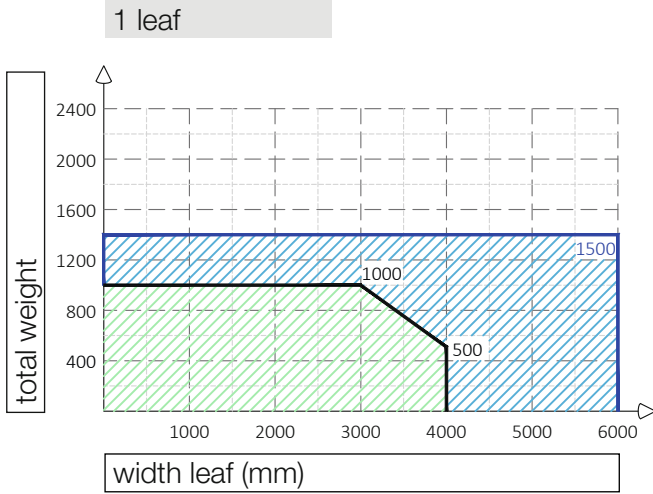


**Project solutions**  
**- Reinforced corner post**

M 1:2



Selection criterion table



attention

In the red zone are a number of factors that play a role in determining possible weight.

- Standard or freeway/floor
- Orientation (north, east, south, west)
- Direct or partial solar radiation
- Or constant shadow (roof overhang)
- Color of the window (light or dark color)

Examples of

**the best** and



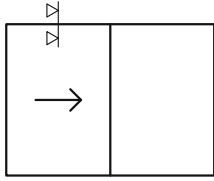
- standard
- north
- shadow
- light color

**the most difficult** scenario



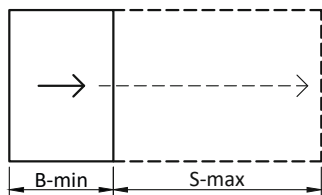
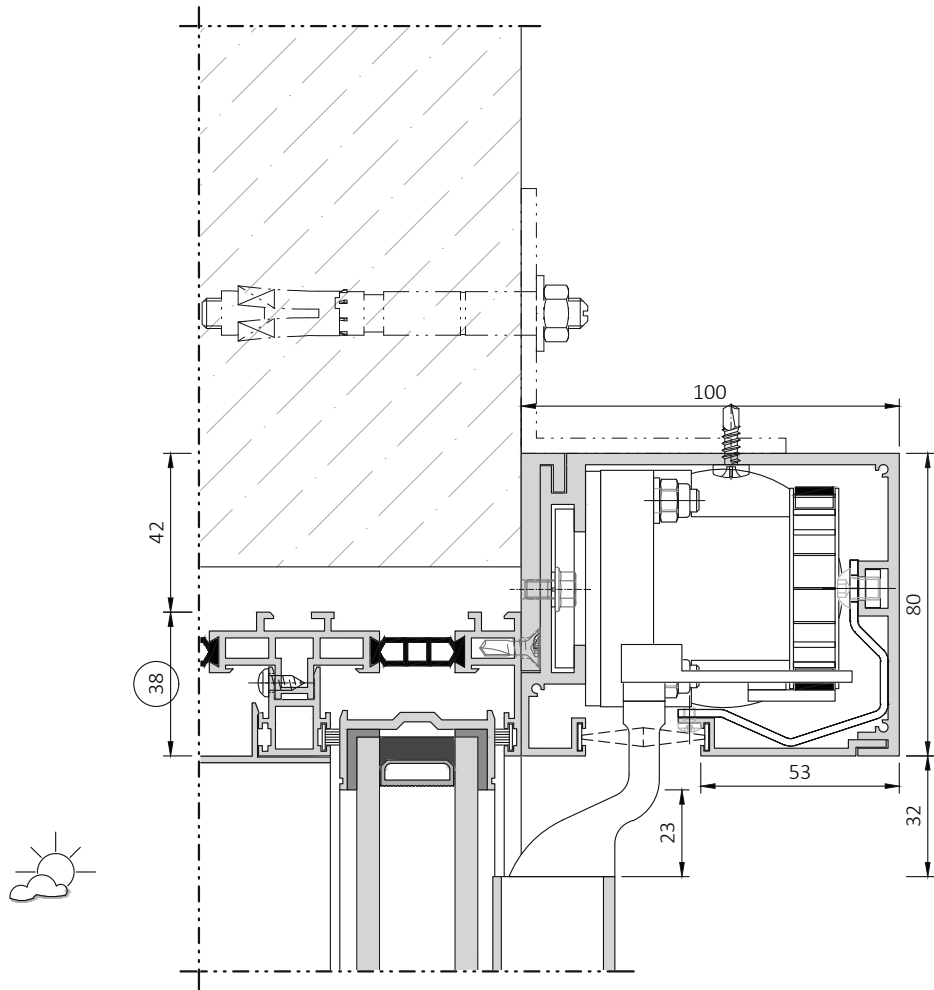
- freeway
- south
- direct and constant radiation
- dark color

? In case of doubt, we will be happy to assist you.

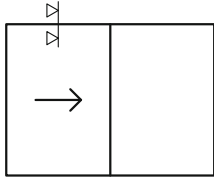


Linear drive system: LD350 | LD700

M 1:2

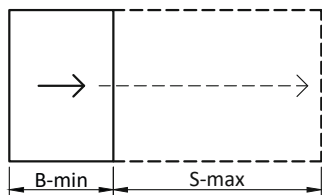
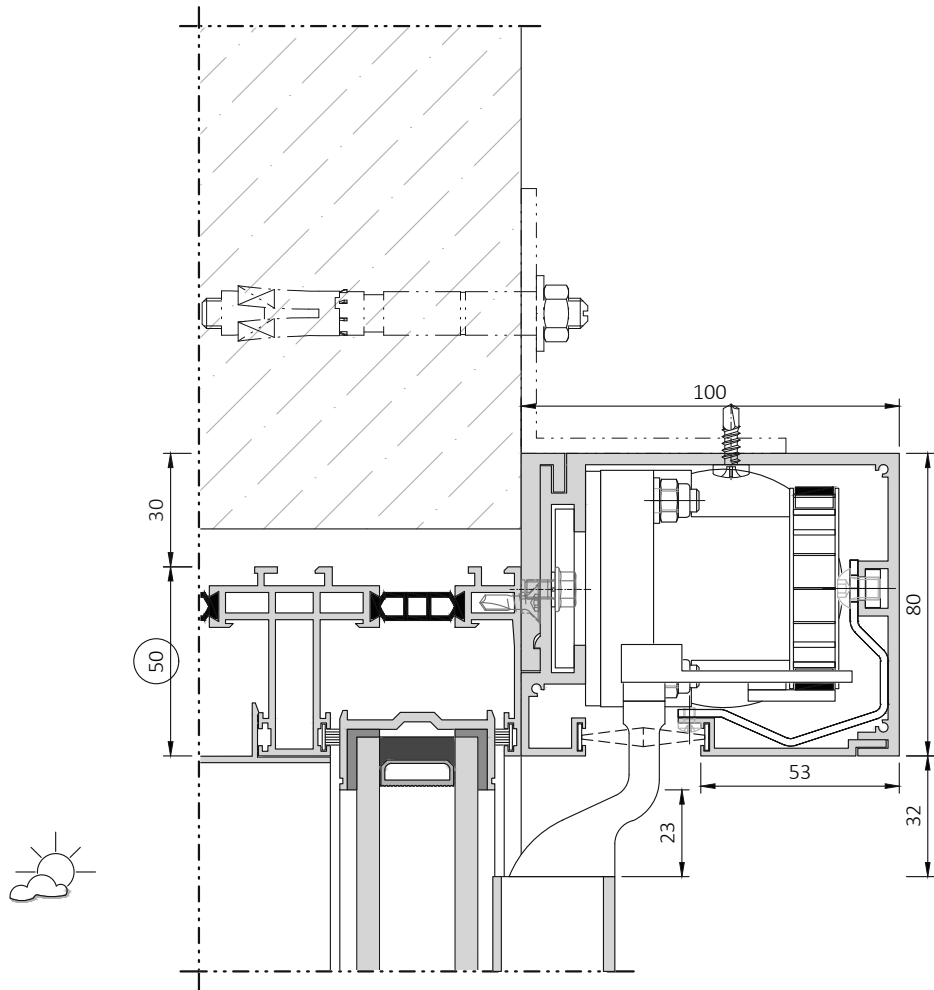


<b>B-min</b>	
LD350	= 1.400 mm
LD700	= 1.400 mm
<b>S-Max =</b>	
LD350	= 10.000 mm
LD700	= 12.000 mm



Linear drive system: LD350 | LD700

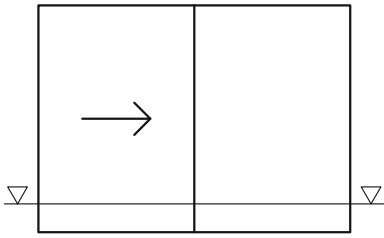
M 1:2



<b>B-min</b>	
LD350	= 1.400 mm
LD700	= 1.400 mm
<b>S-Max =</b>	
LD350	= 10.000 mm
LD700	= 12.000 mm

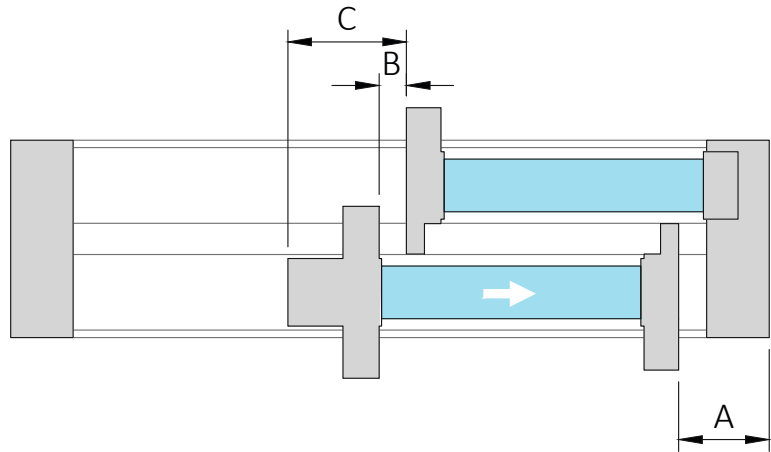
Opening width of the drive way (\*)

(\*) Measures with equal glass dimensions



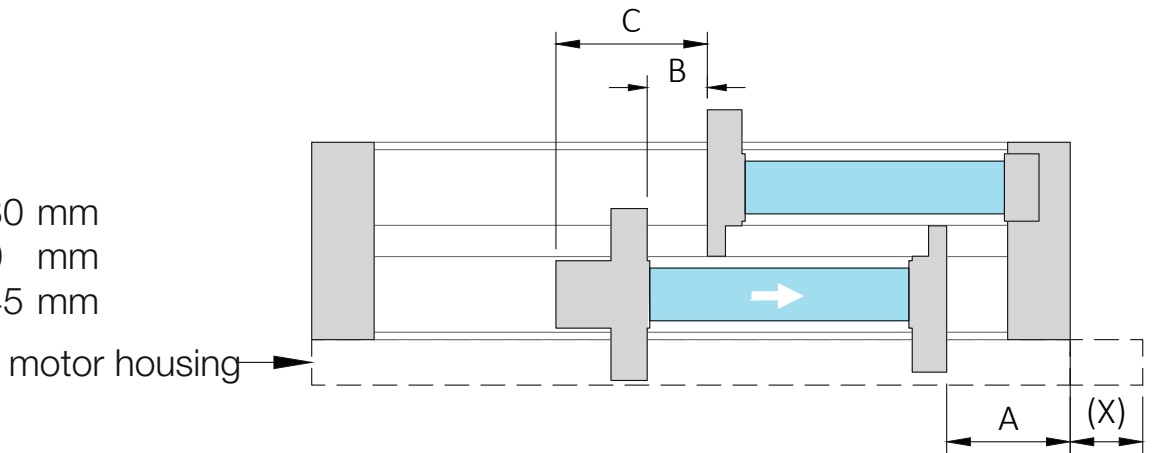
Without electrical opening

- A = 60 mm
- B = 20 mm
- C = 75 mm



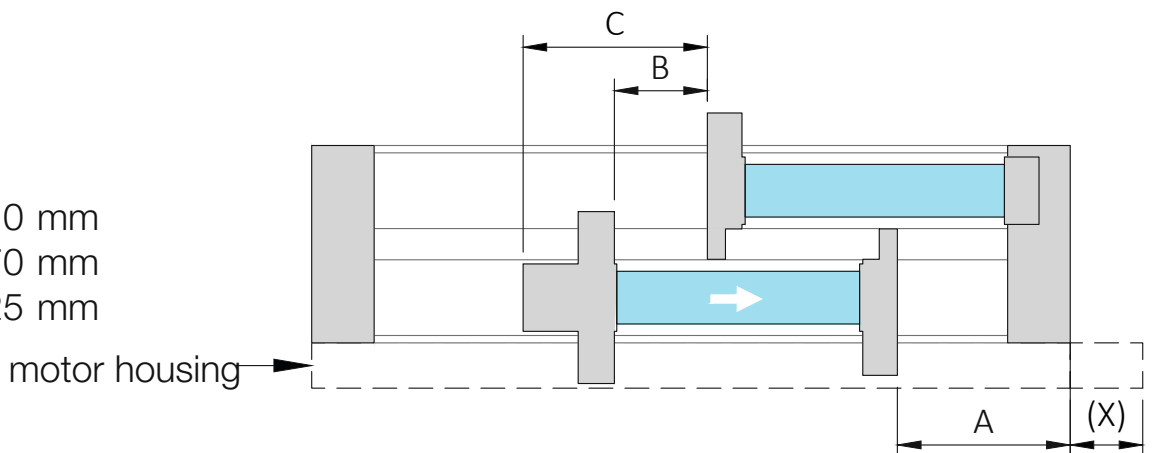
With LD350

- A = 130 mm
- B = 90 mm
- C = 145 mm

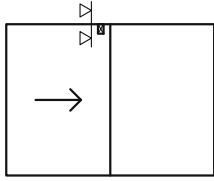


With LD700

- A = 310 mm
- B = 270 mm
- C = 325 mm

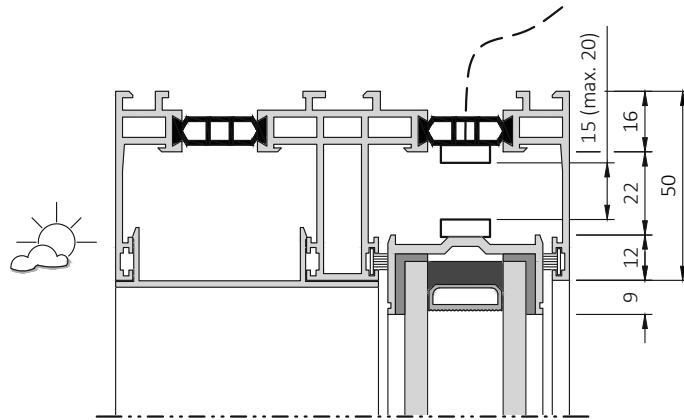


Dimensions A-B-C can be reduced if the motor housing is longer (X) than the sliding window.



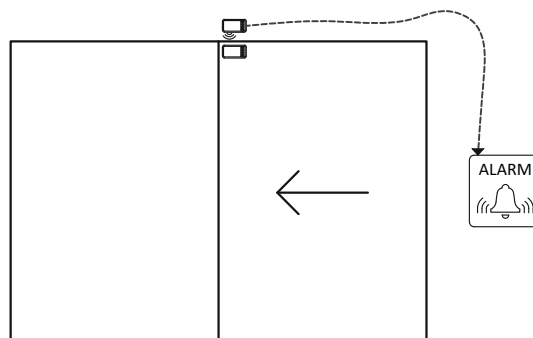
Opening monitoring

M 1:2



Sliding leaf

VdS-Klasse: B



Possible combinations

LD350 / LD700

: ✓

Electromechanical lock

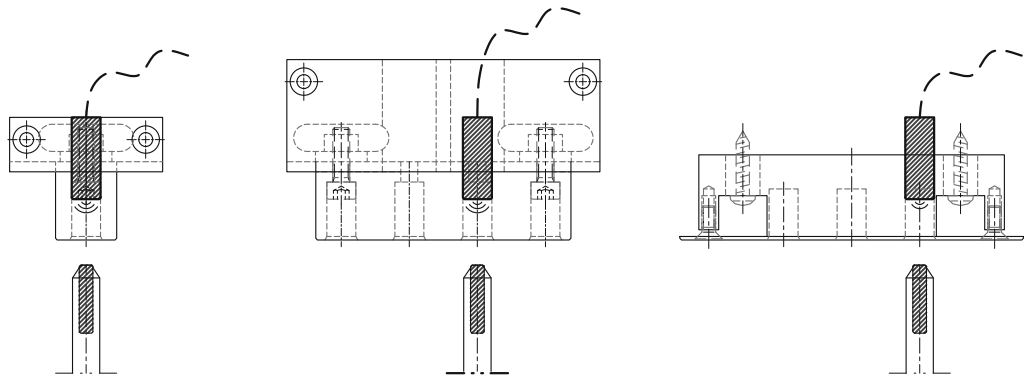
: ✓

Closure monitoring

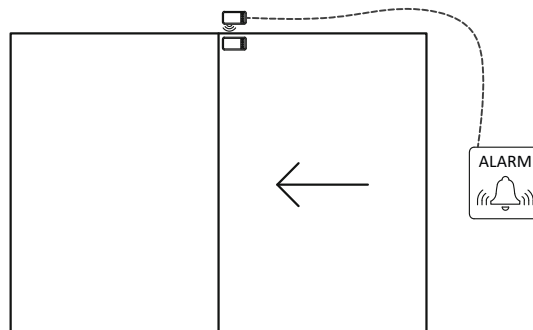
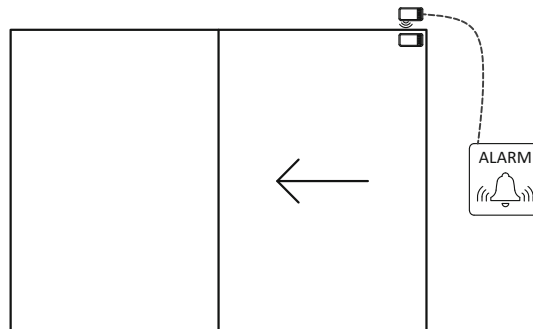
: ✓

Closure monitoring

Ceiling-sleeve



Handle bar side or junction profile side



Possible combinations

LD350 / LD700

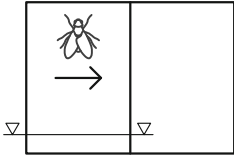
: ✓

Electromechanical lock

: ✓

Opening monitoring

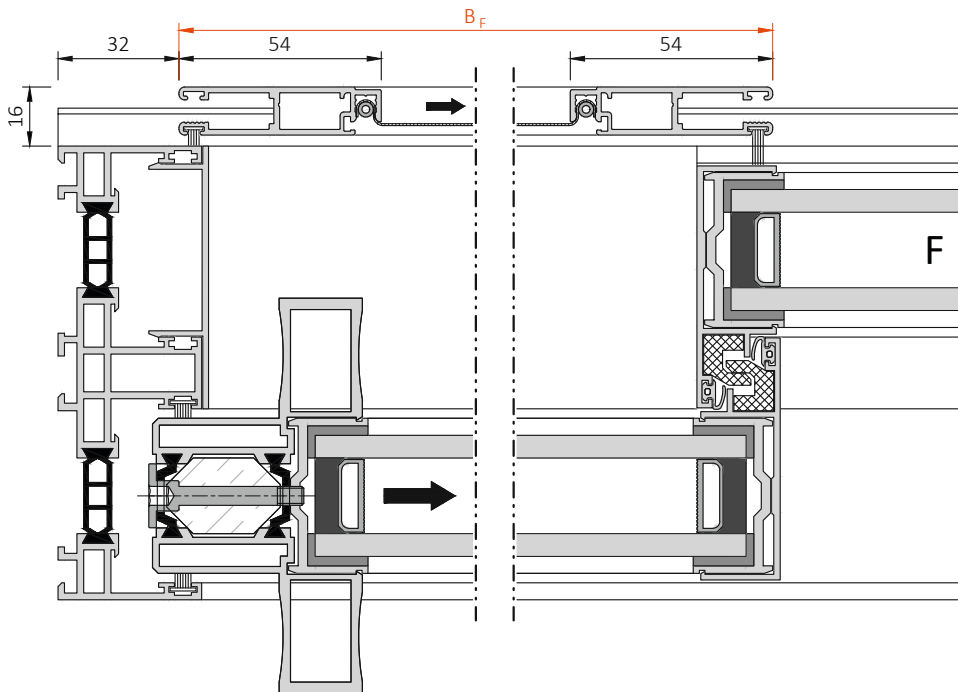
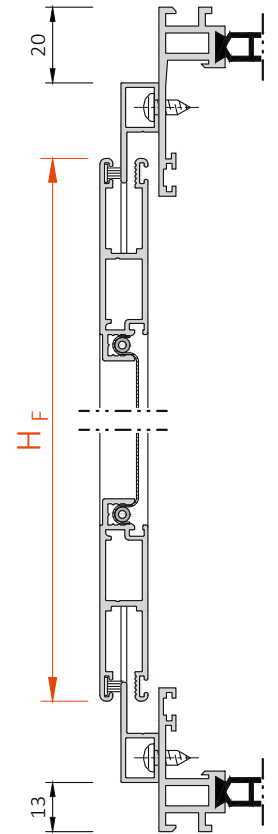
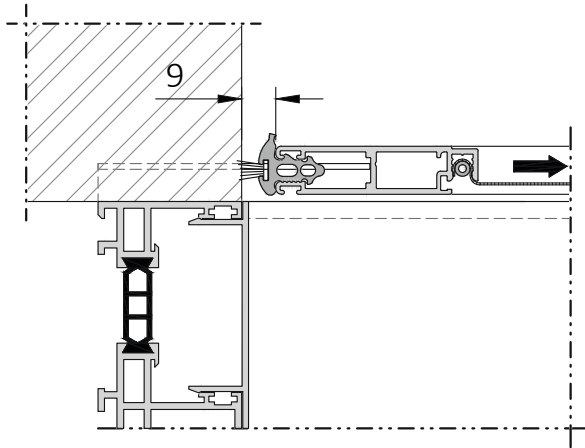
: ✓

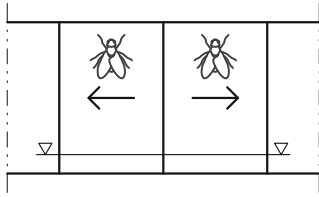


**Insect screens ST3**

M 1:2

$H_F \leq 2500$  mm  
 $B_F \text{ max} = 2400$  mm

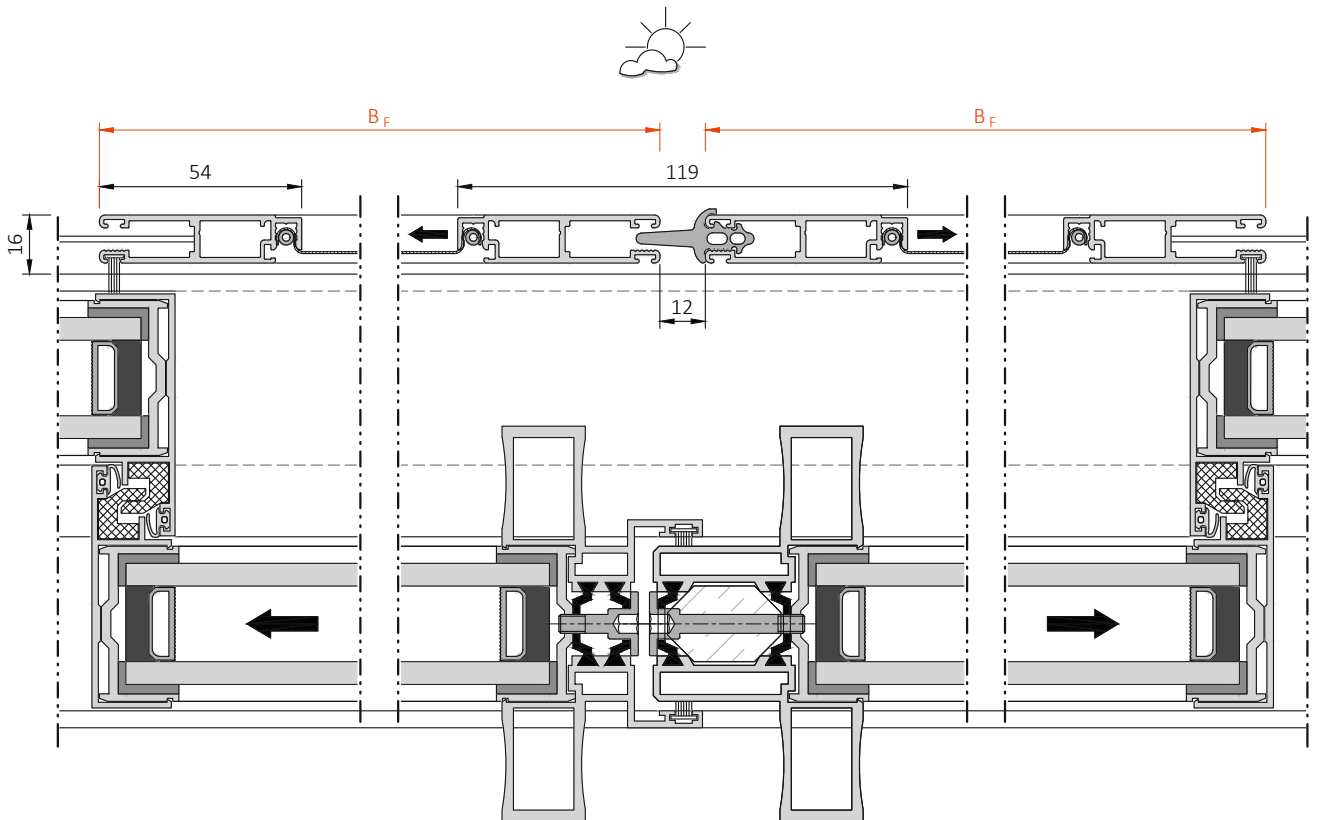
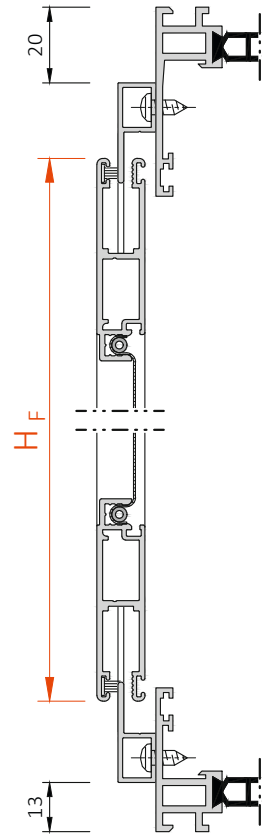


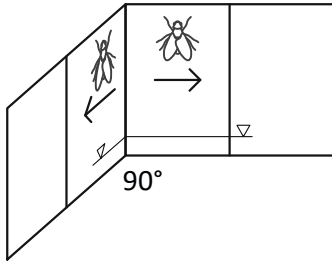


**Insect screens ST3: double vent**

M 1:2

$H_F \leq 2500$  mm  
 $B_F \text{ max} = 2400$  mm

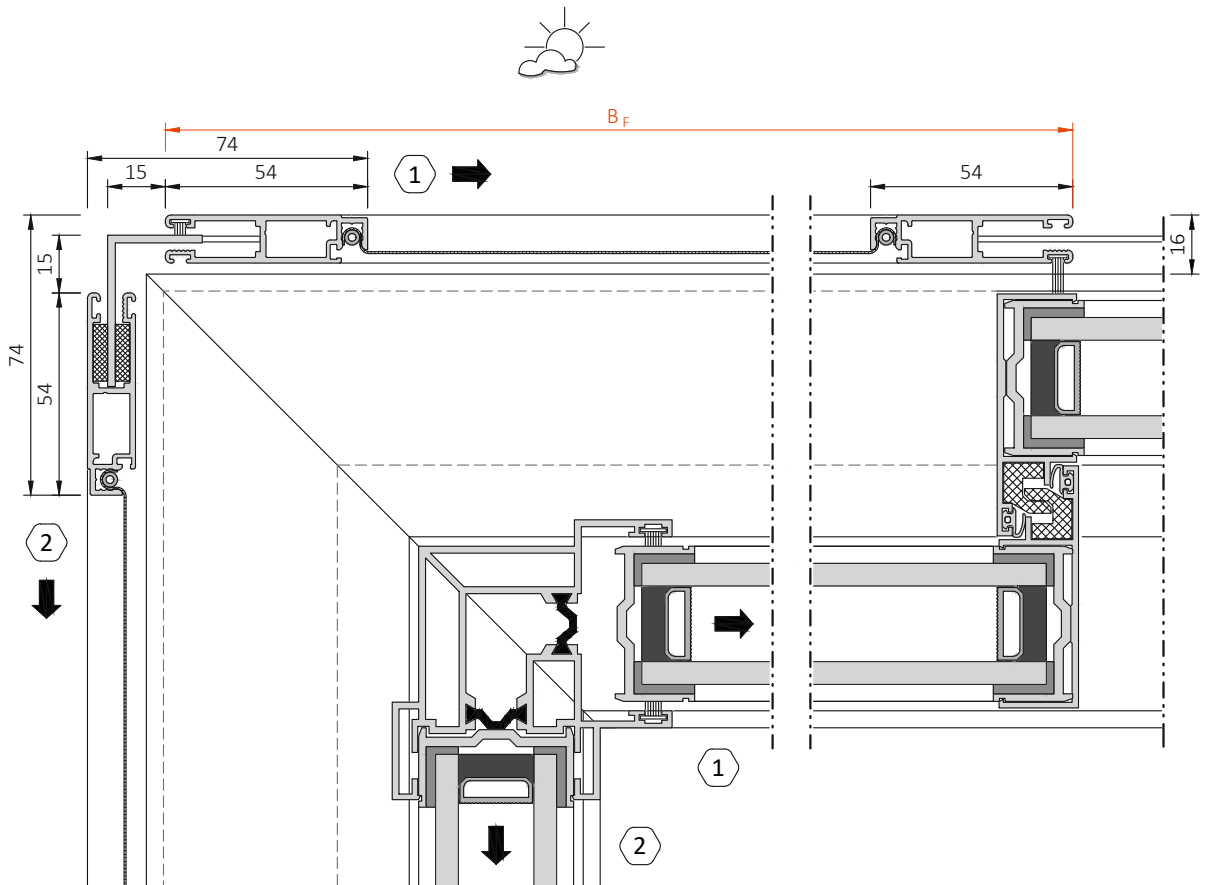
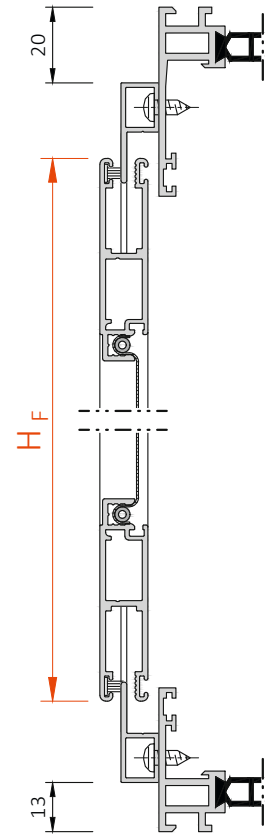




**Insect screens ST3: corner**

M 1:2

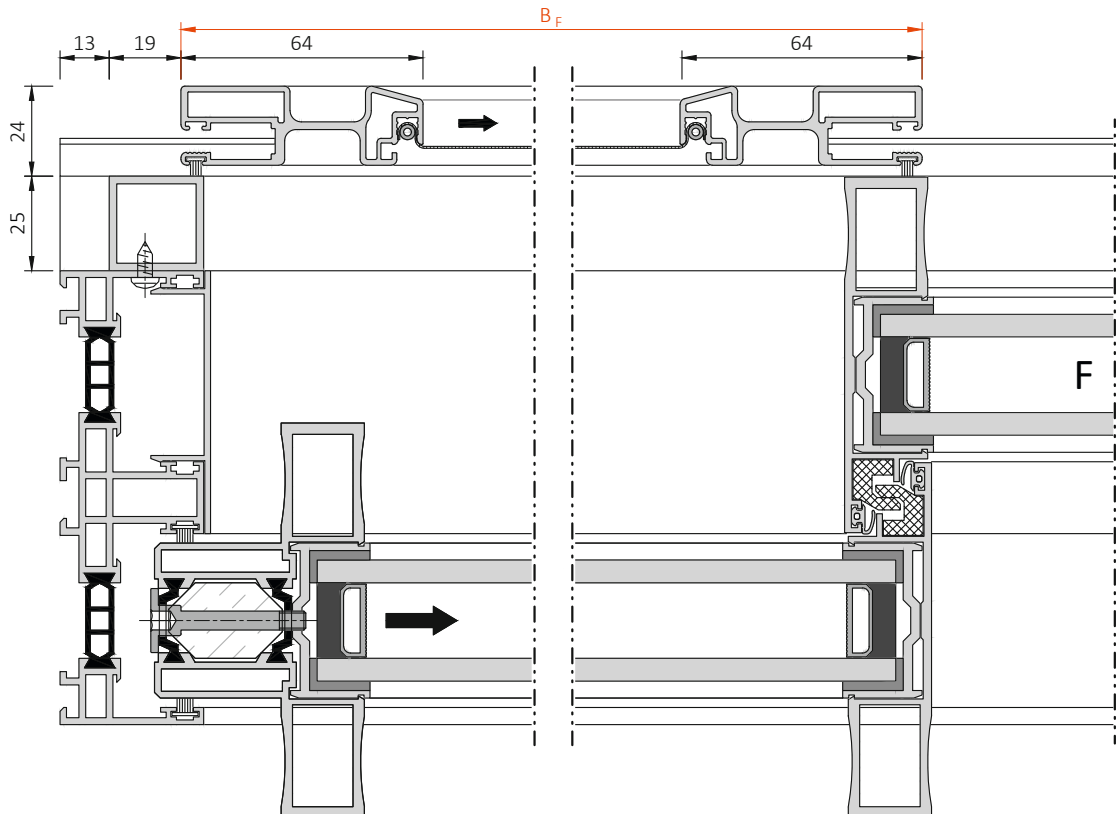
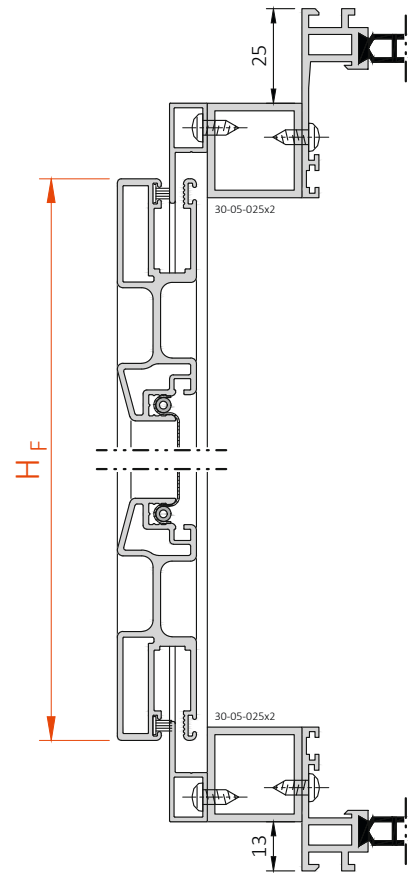
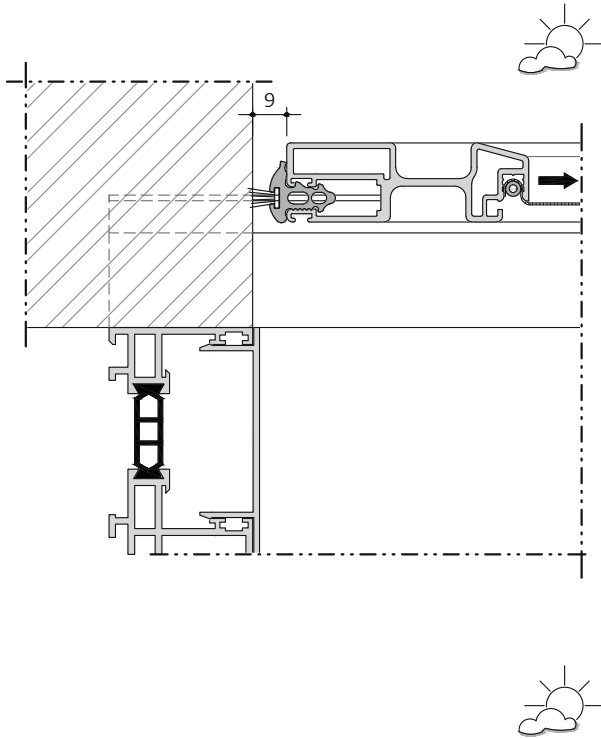
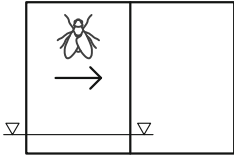
$H_F \leq 2500$  mm  
 $B_F \text{ max} = 2400$  mm

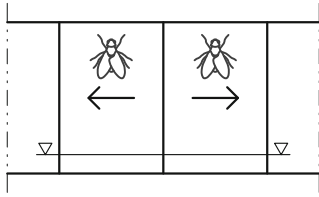


**Insect screens ST4**

M 1:2

$H_F > 2500$  mm  
 $H_F \text{ max} = 4000$  mm  
 $B_F \text{ max} = 2400$  mm

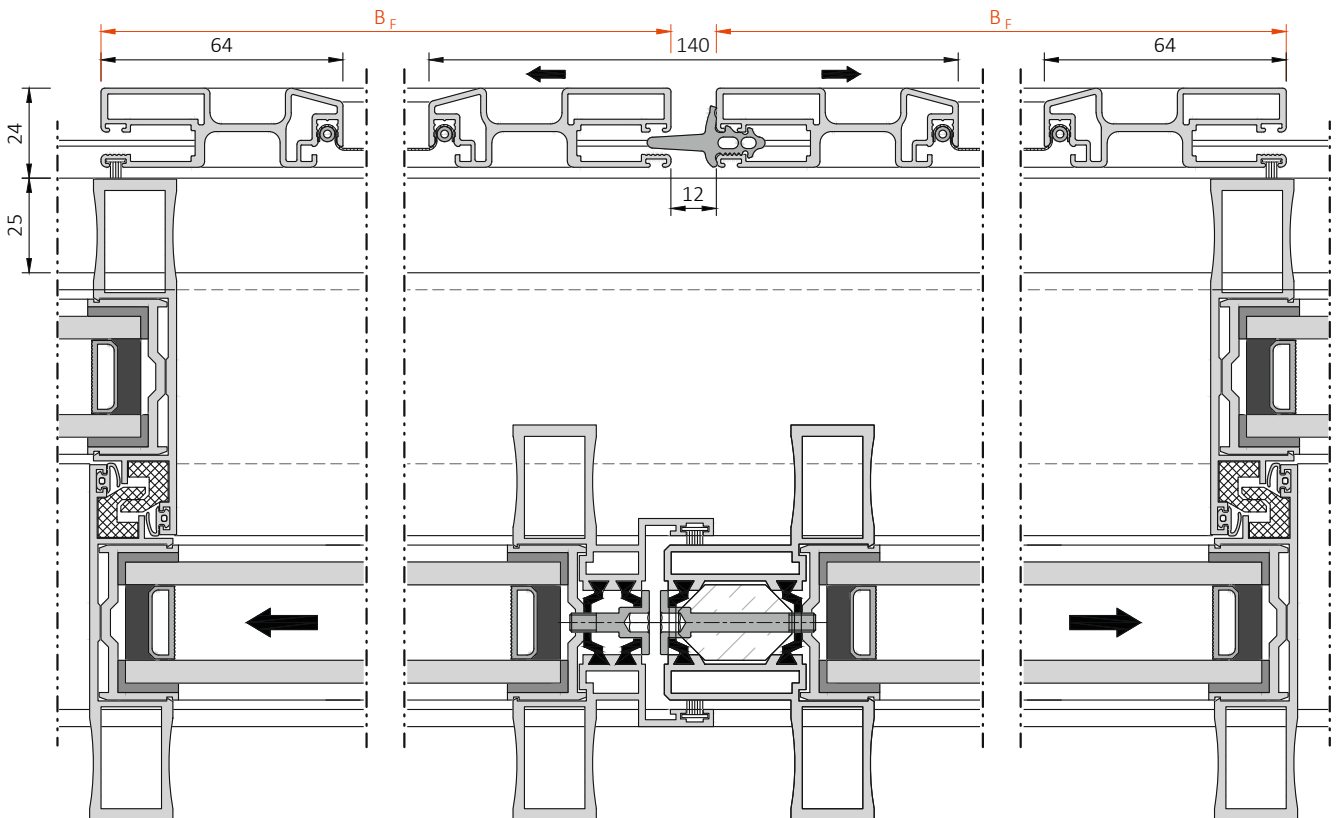
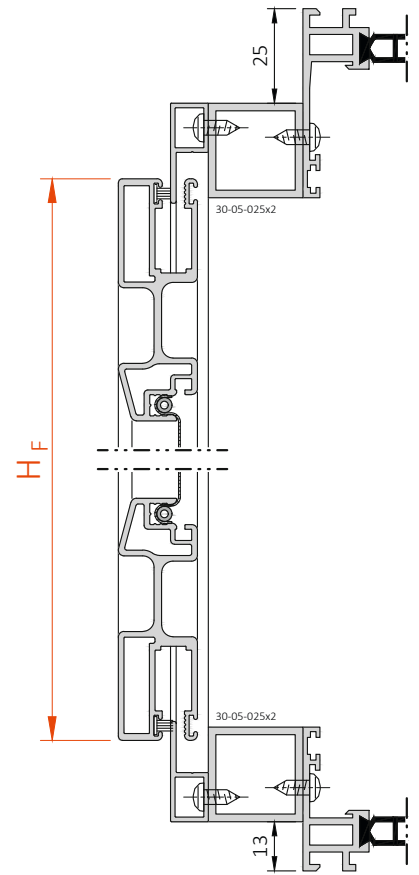




**Insect screens ST4: double vent**

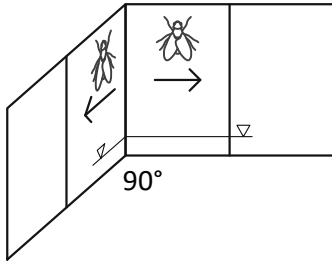
M 1:2

$H_F > 2500$  mm  
 $H_F \text{ max} = 4000$  mm  
 $B_F \text{ max} = 2400$  mm

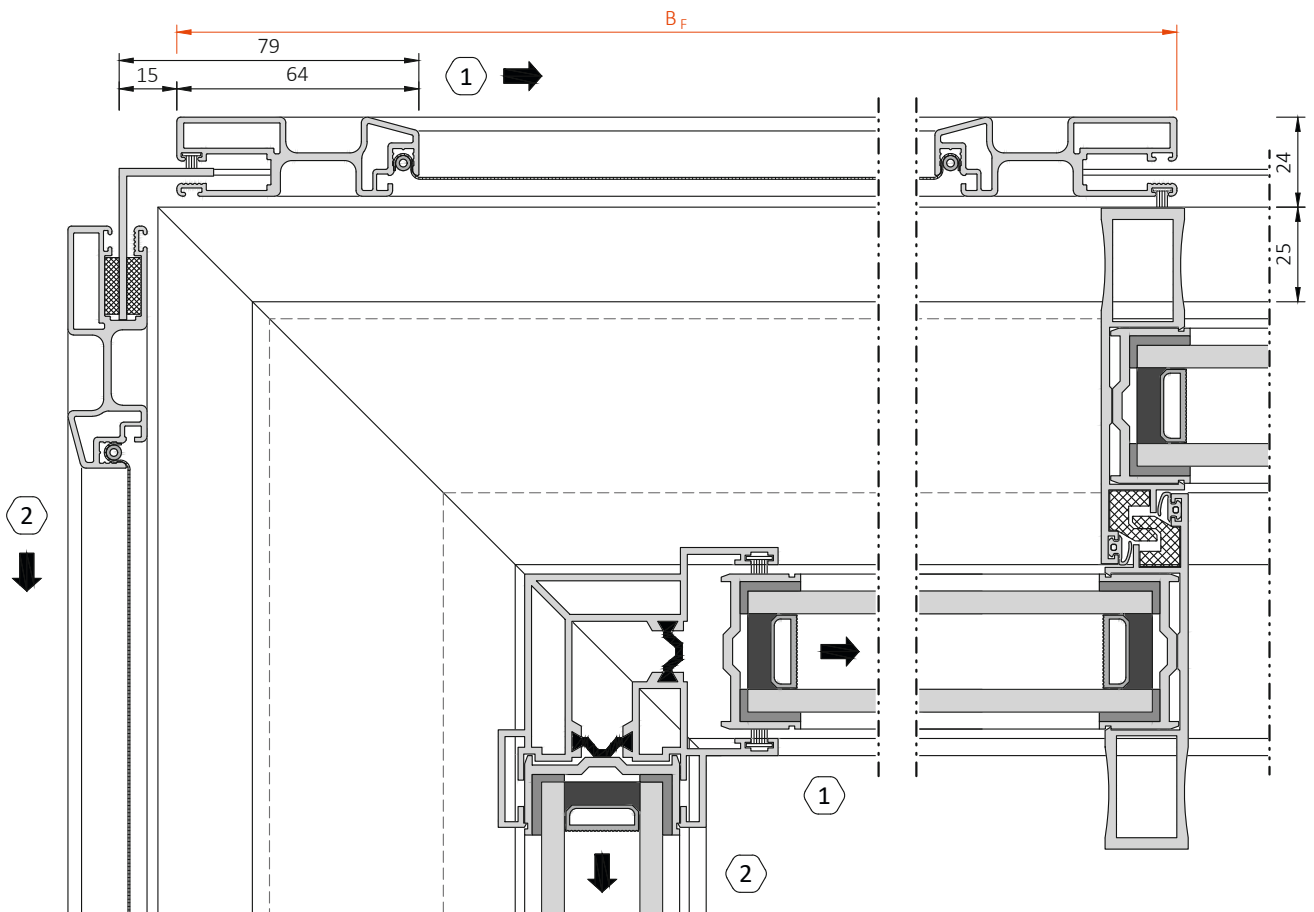
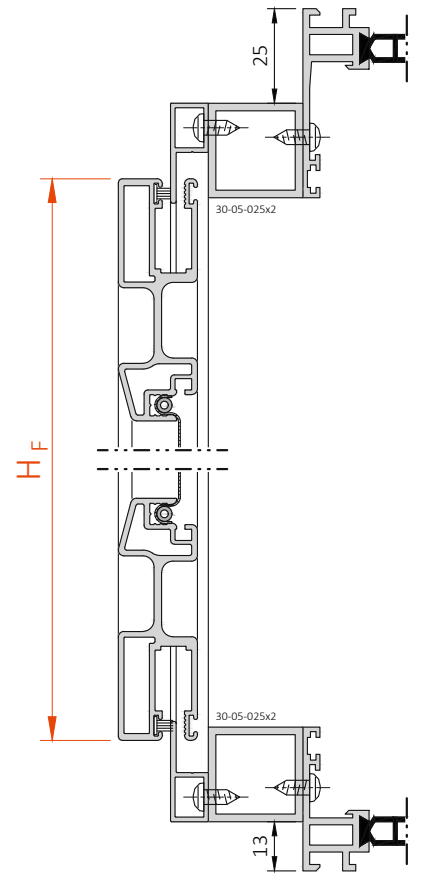


Insect screens ST4: corner

M 1:2

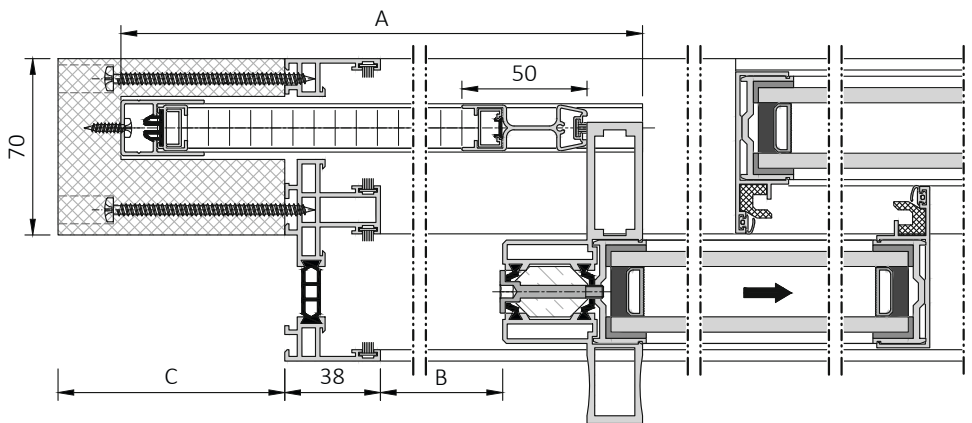
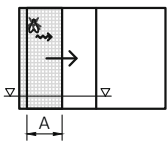
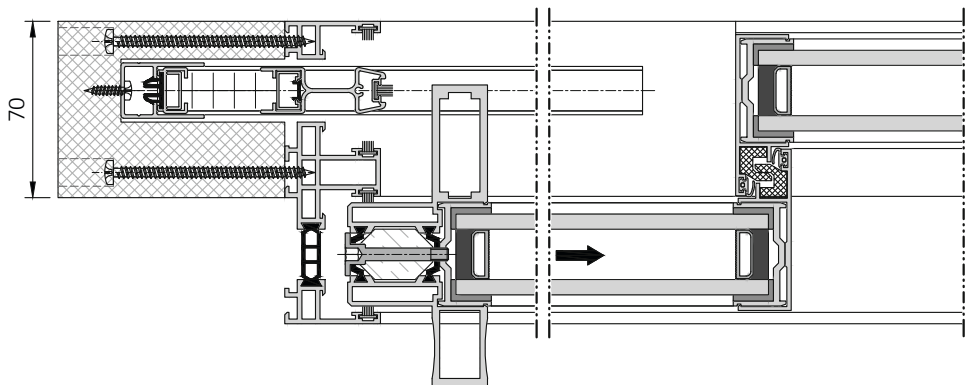
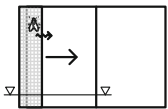
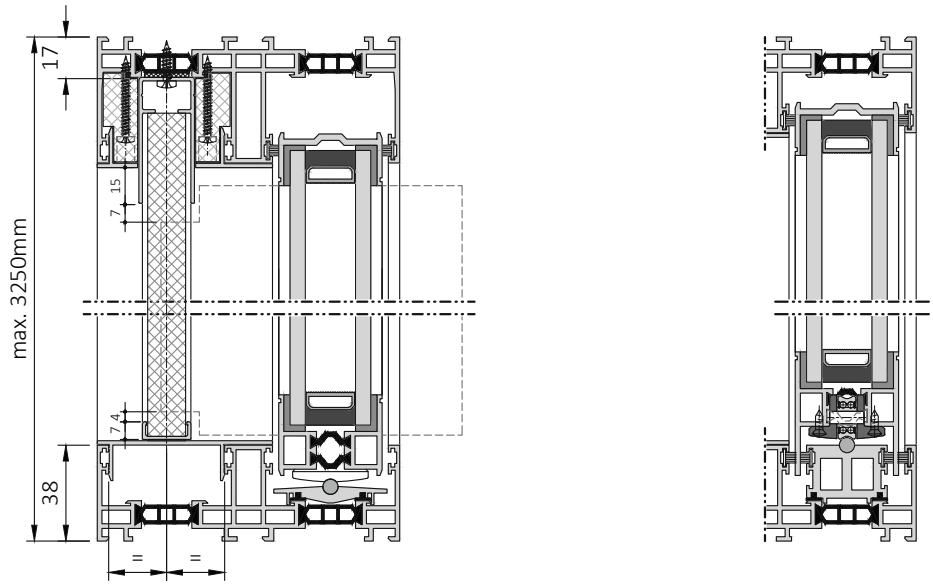
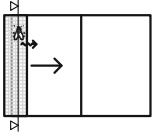


$H_F > 2500 \text{ mm}$   
 $H_F \text{ max} = 4000 \text{ mm}$   
 $B_F \text{ max} = 2400 \text{ mm}$



Insect screens: pleated blinds

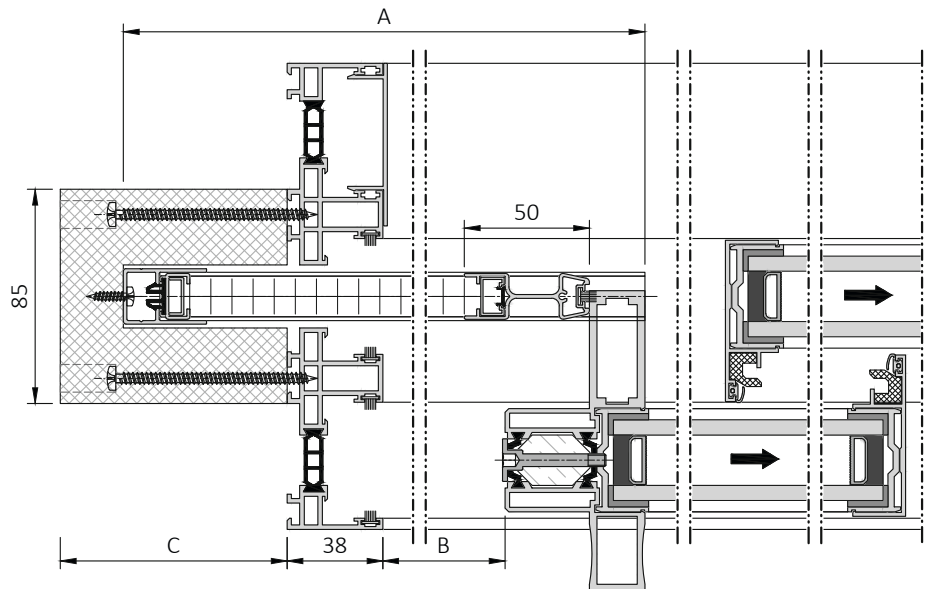
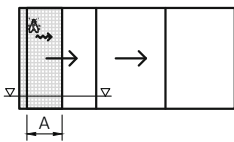
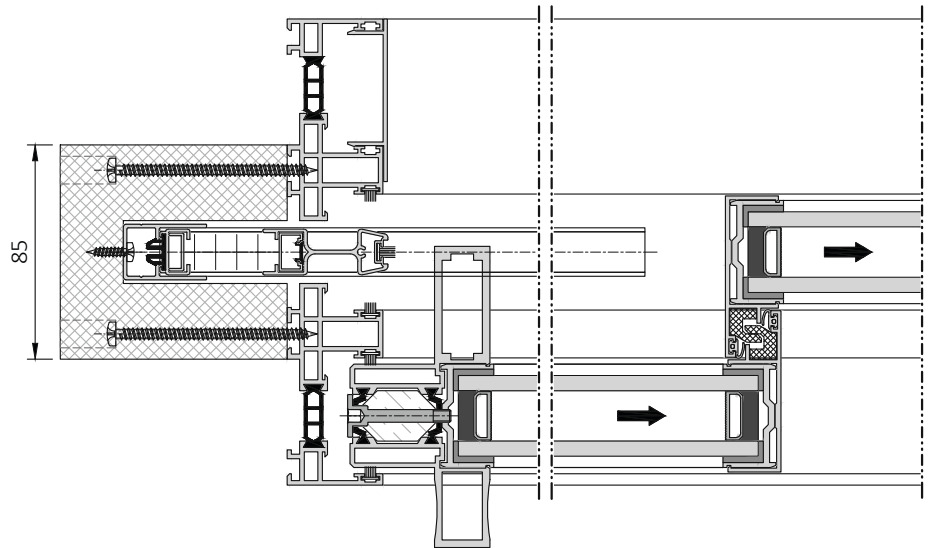
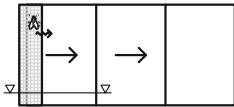
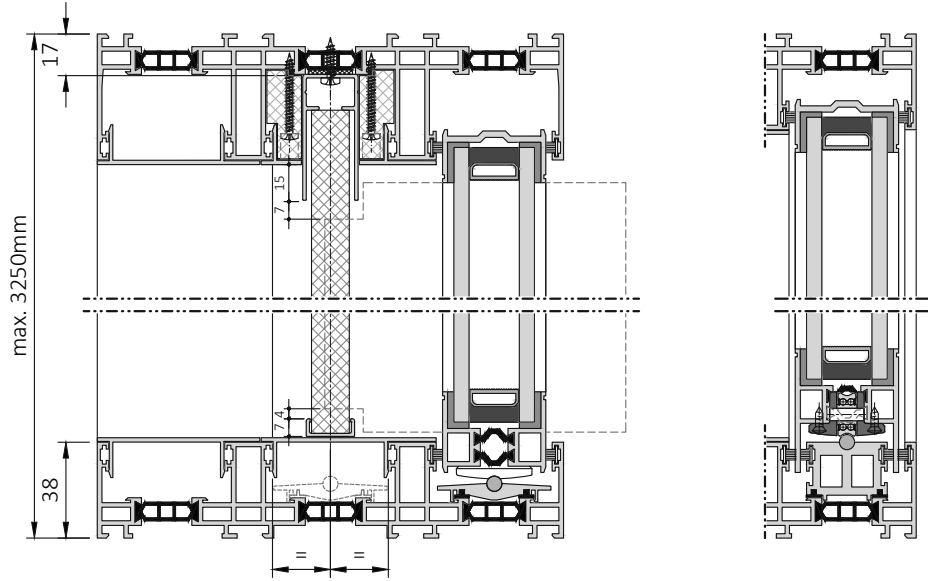
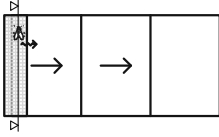
M 1:2



Color plisse profiles = black		
Dimensions		
A	B (max)	C
> 1000mm * 1300mm	≈1160mm	90 mm
> 1301mm * 2000mm	≈1850mm	105 mm

Insect screens: pleated blinds

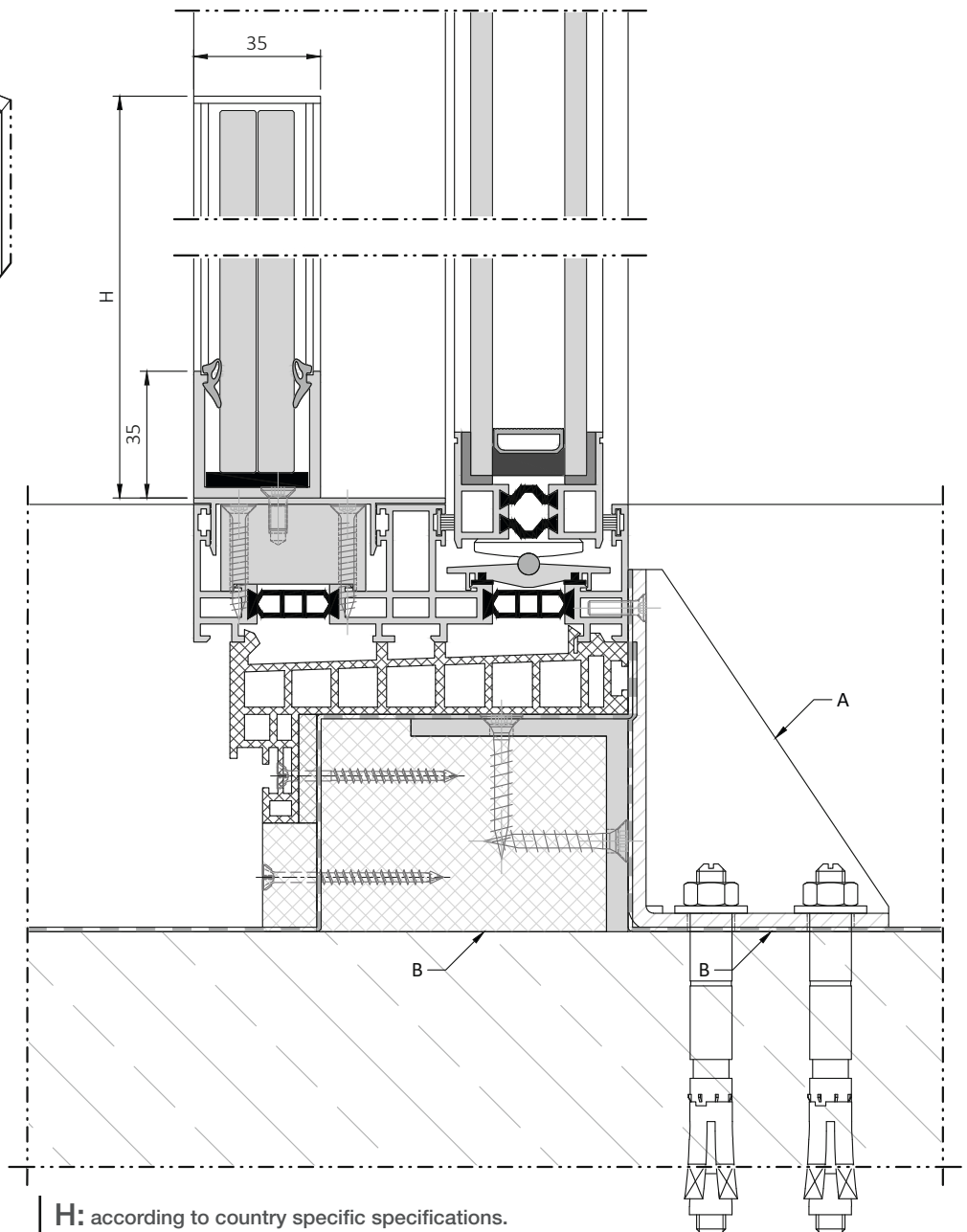
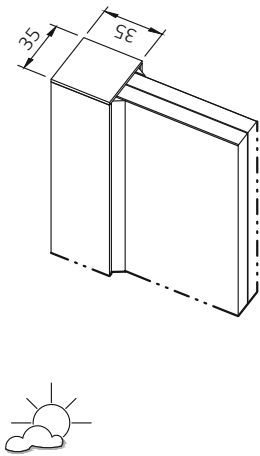
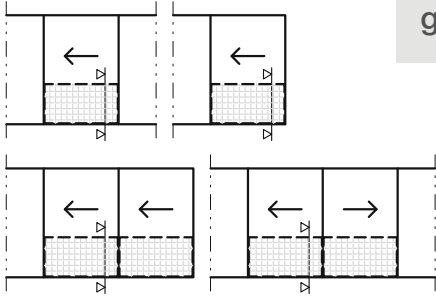
M 1:2



Color plisse profiles = black		
Dimensions		
A	B (max)	C
> 1000mm * 1300mm	≈1160mm	90 mm
> 1301mm * 2000mm	≈1850mm	105 mm

guardline

M 1:2



**H:** according to country specific specifications.

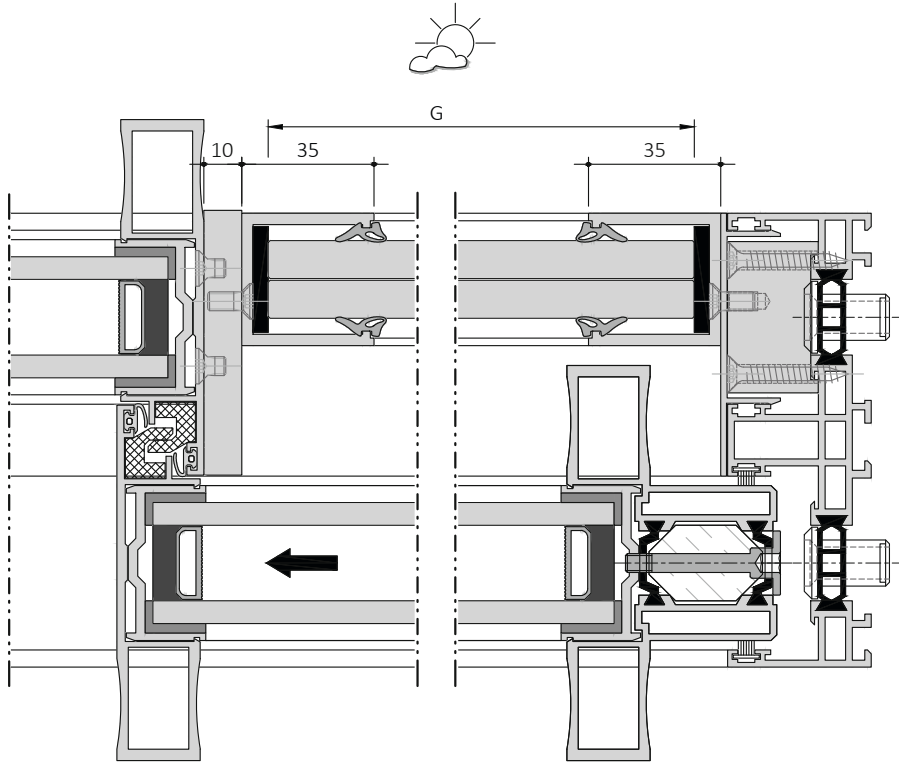
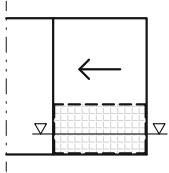
**A:** with a higher structure, statically adjusted mounting brackets must be used.

**B:** fixing according to technical building regulations.  
Technically regulated fasteners have to be selected to match the substrate (concrete, masonry, wood, steel).

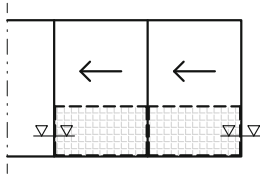


guardline

M 1:2

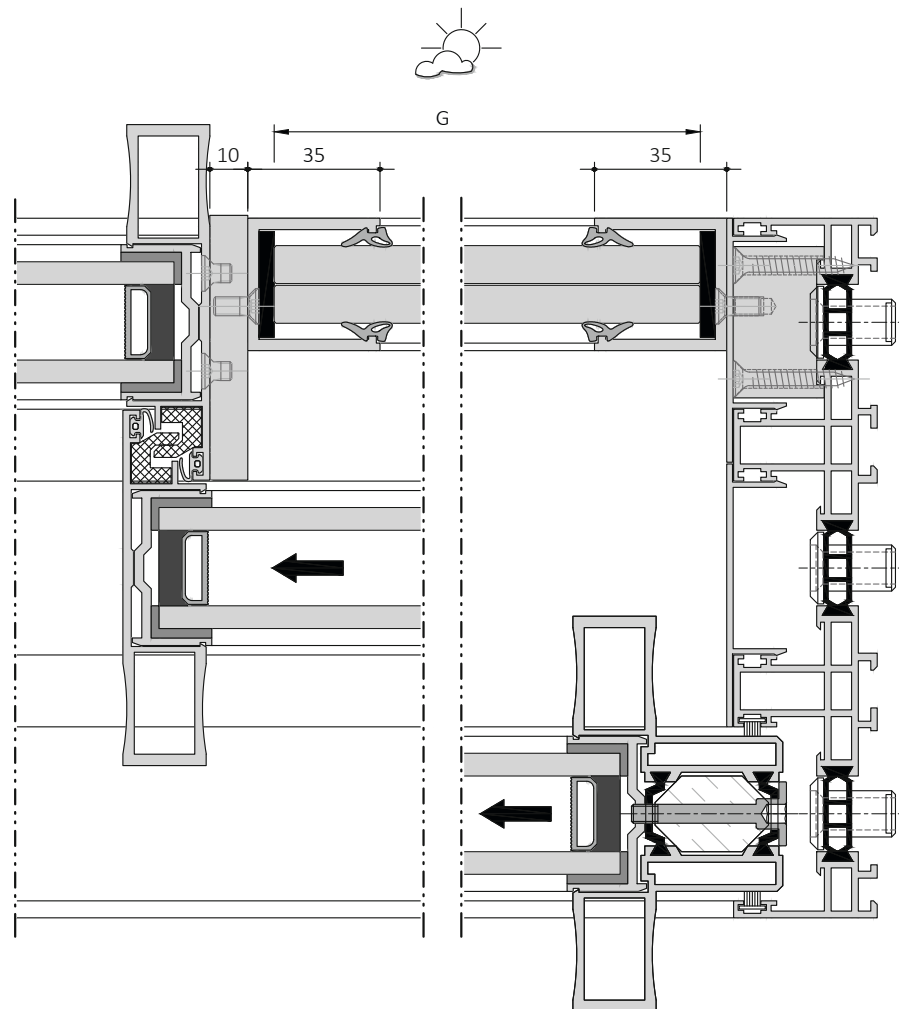


G: Glass composition look at "Planung & Bestellung" KEL-15-0085

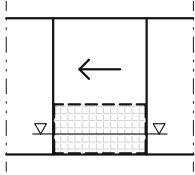


guardline

M 1:2

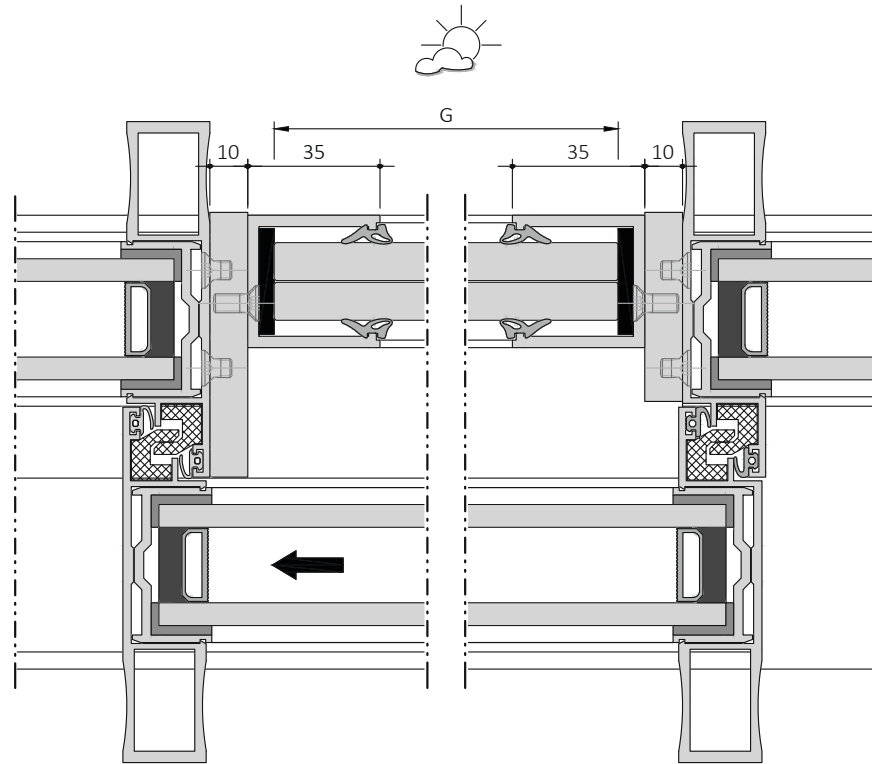


**G:** Glass composition look at "Planung & Bestellung" KEL-15-0085

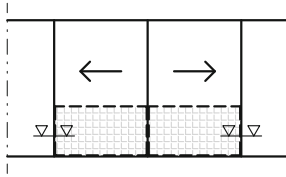


guardline

M 1:2

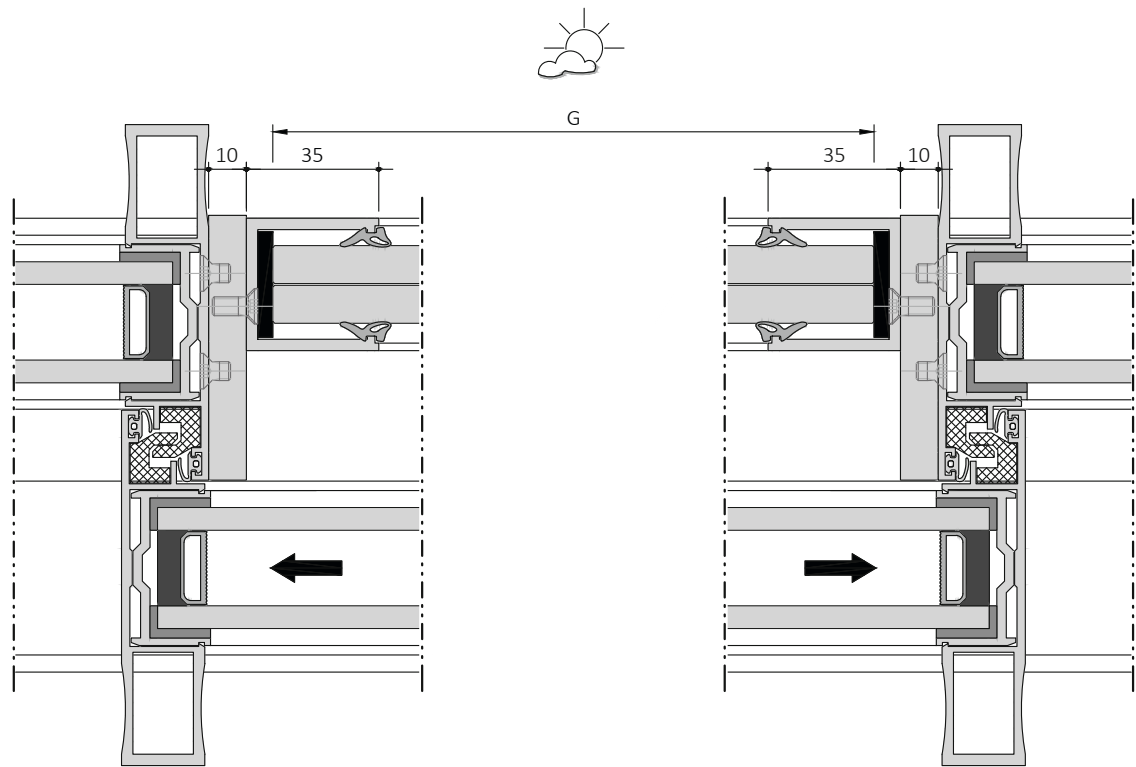


**G:** Glass composition look at "Planung & Bestellung" KEL-15-0085



guardline

M 1:2



**G:** Glass composition look at "Planung & Bestellung" KEL-15-0085


**Air permeability - Resistance to rain penetration -  
Resistance to wind loads**

Report Nr. 40-4/11

<b>Auftraggeber und Hersteller</b>	<b>KELLER AG/SA 38-40, route de Wilwerdange L-9911 Troisvierges</b>
<b>Bezeichnung des Prüfgegenstandes</b>	<b>1-flg. Schiebeelement mit Festfeld Minimal Windows 2980mm x 2980mm</b>
<b>Prüfauftrag / Prüfgrundlage und Prüfergebnis</b>	<b>Nachweis der Leistungseigenschaften : - Luftdurchlässigkeit gemäß EN 1026 <b>Klasse 4</b> - Schlagregendichtheit gemäß EN 1027 <b>Klasse 7A</b> - Widerstand gegen Windlast. gemäß EN 12211 <b>Klasse C4 / B5</b></b>
<b>Datum der Prüfung</b>	<b>13. Januar 2011</b>
<b>Ort der Prüfung</b>	<b>PIV Prüfinstitut Schlösser und Beschläge Velbert D-42551 Velbert, Wallstr. 41</b>
<b>Datum des Prüfberichtes</b>	<b>09. Februar 2011</b>
<b>Umfang des Prüfberichtes</b>	<b>1 Seite Deckblatt 24 Seiten Anlagen</b>
<b>Zusatzbedingungen zu diesem Prüfbericht</b>	<b>1. Es gelten unsere Geschäftsbedingungen 2. Die Prüfergebnisse beziehen sich nur auf den geprüften Prüfgegenstand 3. Der Prüfbericht darf nicht verändert und nur als Ganzes veröffentlicht werden.</b>

**Unterschrift**


.....  
**R. Ehle, Institutsleiter**

Akkreditierte Prüfstelle nach DIN EN ISO/IEC 17025  
Akkreditierte Zertifizierungsstelle nach DIN EN 45011 (PIV CERT)  
Prüf-, Überwachungs- und Zertifizierungsstelle nach dem Bauproduktengesetz (BauPG)  
RAL-Prüfstelle für Schlösser und Beschläge nach RAL-RG 607 / ff  
Überwachungs- und Zertifizierungsstelle nach Landesbauordnung (LBO)  
Bau-BG-Prüfstelle für Fahrwerkrollen · DIN CERTCO anerkannte Prüfstelle

Institutsleitung:  
Rainer Ehle, Dipl.- Ing.

Es gelten unsere  
Geschäftsbedingungen



**Air permeability - Resistance to rain penetration -  
Resistance to wind loads**

Report Nr. AZT0046.14

**TEST REPORT CERTIFICATE**

**NATA Lab. No. :** 15147

**AZT Number :** AZT0046.14

**Report Date :** 11<sup>th</sup> March 2014

**Test Date :** 11<sup>th</sup> March 2014

**Customer Details :** Keller AG 38-40, Route De Wilwerdange L-9911 Troisvierges

**Manufacturer Details :** Keller AG

**Product Tested :** Unit Type : Sliding / Fixed Door

Unit Code : Keller Minimal Window

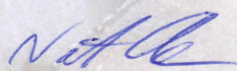
Unit Size : 2570mm High X 4000mm Wide

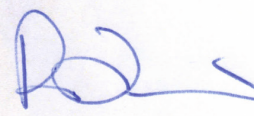
**Objective :** Testing To AS2047

**Deflection Ratio:** 1/180 Residential

**Test Results :**

<u>Requirement</u>	<u>Procedure</u>	<u>Rating</u>	<u>Result</u>
As Per Test Method			
AS4420.2	Structural Deflection	2200 Pa	Pass
AS4420.3	Operating Force (Initial / Constant)	180/110 N	Pass
AS4420.4	Air Infiltration	75/150 Pa	Pass
AS4420.5	Water Penetration	300 Pa	Pass
AS4420.6	Ultimate Strength	3000 Pa	Pass

  
Nathan Olsen  
Testing officer

  
Rob Irwin  
Manager




**Air permeability - Resistance to rain penetration -  
Resistance to wind loads**

pivot

Report Nr. 40-7/19

**Der Firma**

We confirm, that the company

KELLER AG/SA

38-40, route de Wilwerdange  
L-9911 Troisviergeswird bescheinigt, dass sie am  
at the date of

18. März/ March 2019

für das Produkt  
for the product3-flg. Fensterelement minimal windows® pivot  
Triple casement window element minimal windows® pivotGröße des Probekörpers  
Size of the specimen

5432 mm x 2980 mm

in der Ausführung  
in the versionFest-Pivot-Fest  
Fixed-pivot-fixedfolgende Leistungsanforderungen erfüllt hat:  
has met the following performance requirements:mit der Luftdurchlässigkeit nach/  
with the air permeability according to  
DIN EN 1026:2016-09

4

DIN EN 12207:2000-06, Klasse/ Class  
mit der Schlagregendichtheit nach/  
with the watertightness according to

DIN EN 1027:2016-09

6A

DIN EN 12208:2000-06, Klasse/ Class  
und dem Widerstand gegen Windlast nach/  
and the resistance to windload according to

DIN EN 12211:2016-10

DIN EN 12210:2016-09, Klasse/ Class


C2/B3

Diesem Prüfzeugnis liegt der Prüfbericht Nr. 40-7/19 des PIV als Beurteilungsgrundlage zugrunde.  
Die Gültigkeit des Prüfzeugnisses bleibt so lange erhalten, wie sich die Prüfgrundlage und / oder das  
geprüfte Produkt nicht ändern.

This certificate is based on the evaluation of test report no. 40-7/19 by PIV.

The validity of the test certificate will persist as long as the testing-base and / or the products are not changed.

D-42551 Velbert, 14. Mai/ May 2019

  
S. Holz, Staatl. gepr. Techniker/  
State-certified technical engineer  
Laborleiter/ Laboratory Manager

  
G. Röhling, Dipl.-Ing. (FH)  
Prüfer/ Verifier

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Akkreditierte Zertifizierungsstelle nach DIN EN ISO/IEC 17065  
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Überwachungs- und Zertifizierungsstelle nach Landesbauordnung (LBO)  
RAL-Prüfstelle für Schlösser und Beschläge · DIN CERTCO anerkannte Prüfstelle

Institutsleitung:  
Andrea Horsthemke (B.Eng.)

Es gelten unsere  
Geschäftsbedingungen



FB\_3\_40\_01\_19


**Air permeability - Resistance to rain penetration -  
Resistance to wind loads**

pivot

Report Nr. 40-8/19

**Der Firma**

We confirm, that the company

KELLER AG/SA

38-40, route de Wilverdange  
L-9911 Troisviergeswird bescheinigt, dass sie am  
at the date of

19. März/ March 2019

für das Produkt  
for the product

1-flg. Fensterelement minimal windows® pivot  
 Single casement window element minimal windows® pivot

Größe des Probekörpers  
Size of the specimen

1976 mm x 2980 mm

in der Ausführung  
in the versionPivot  
Pivotfolgende Leistungsanforderungen erfüllt hat:  
has met the following performance requirements:mit der Luftdurchlässigkeit nach/  
with the air permeability according to

DIN EN 1026:2016-09

DIN EN 12207:2000-06, Klasse/ Class

4 / 2

mit der Schlagregendichtheit nach/  
with the watertightness according to

DIN EN 1027:2016-09

DIN EN 12208:2000-06, Klasse/ Class

6A / 2A

und dem Widerstand gegen Windlast nach/  
and the resistance to windload according to

DIN EN 12211:2016-10

DIN EN 12210:2016-09, Klasse/ Class

C2/B3 / B1


Schließzustand: **verschlossen** / eingerastet  
Locking situation: **locked** / latched

Diesem Prüfzeugnis liegt der Prüfbericht Nr. 40-8/19 des PIV als Beurteilungsgrundlage zugrunde.  
Die Gültigkeit des Prüfzeugnisses bleibt so lange erhalten, wie sich die Prüfgrundlage und / oder das  
geprüfte Produkt nicht ändern.

This certificate is based on the evaluation of test report no. 40-8/19 by PIV.

The validity of the test certificate will persist as long as the testing-base and / or the products are not changed.

D-42551 Velbert, 15. Mai/ May 2019

  
 S. Holz, Staatl. gepr. Techniker/  
 State-certified technical engineer

Laborleiter/ Laboratory Manager

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 G. Röhling, Dipl.-Ing. (FH)  
 Prüfer/ Verifier

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 Akkreditierte Zertifizierungsstelle nach DIN EN ISO/IEC 17065  
 Prüf-, Überwachungs- und Zertifizierungsstelle nach der EU-BauPVO  
 Überwachungs- und Zertifizierungsstelle nach Landesbauordnung (LBO)  
 RAL-Prüfstelle für Schlösser und Beschläge · DIN CERTCO anerkannte Prüfstelle

 Institutsleitung:  
 Andrea Horsthemke (B.Eng.)

 Es gelten unsere  
 Geschäftsbedingungen


FB\_3\_40\_01\_19

**Resistance to burglary**

Report Nr. 10-000206-PB04-A01-05-en-01

Client	<b>Keller AG/SA</b> Route de Wilwerdange 38-40 9991 Troisvierges Luxembourg
Product	Burglar resistance sliding windows with fixed light
Designation	Minimal Windows
Overall dimensions (W x H) (Frame)	4,021 mm x 2,652 mm
Material, System	Aluminium profiles with thermal break, Minimal Windows
Attack side	External face of construction
Type of opening	single leaf, sliding
Glazing	Class A3 acc. to DIN 52290 (Class P4 A acc. to EN 356) two roller Type 25-04-110 of the company Astec – espagnolette lock Type Minimal Windows of the company Astec with aluminium alloy locking bar Ø 8 mm - two inlet sockets Type 25-04-420 of the company Keller - detachable handle Type Minimal Windows of the company Astec
Hardware	According to the installation construction dated July 2010 of the company Keller AG/SA
Installation	To ensure the burglar resistance the handle must be removed in locked condition.
Special features	

**Basis**  
DIN V ENV 1627 : 1999  
Windows, doors, shutters – Burglar resistance – Requirements and classification  
DIN V ENV 1628 : 1999  
DIN V ENV 1629 : 1999  
DIN V ENV 1630 : 1999  
Test Report 10-000206-PB04-A01-05-de-01 dated 19.11.2010

**Representation**



**Instruction for use**

The present test report serves to demonstrate the burglar resistance.

**Validity**

The data and results refer solely to the tested and described specimen. The burglar resistance test does not allow any statement to be made on any further characteristics regarding performance and quality of the construction presented.

In deviation from the tested design the following size modifications are permitted:  
in width +10% and -20%  
in height +10% and -20%

**Burglar resistance**



**Resistance class 2**

**ift Rosenheim**  
13.09.2012



Robert Krippahl, Dipl.-Ing. (FH)  
Deputy Head of Testing Department  
Building Components



Günter Borrmann, Dipl.-Ing. (FH)  
Operating Testing Officer  
Mechanics

**Notes on publication**

The ift-Guidance Sheet „Conditions and Guidance for the Use of ift Test Documents“ applies. The cover sheet can be used as an abstract.

**Contents**

The report contains a total of 66 pages  
1 Object  
2 Procedure  
3 Detailed results  
4 Assessment  
Annex 1 (14 pages)  
Annex 2 (38 pages)

Sound insulation

Report Nr. 10-000206-PB02-A01-04-en

Client **Keller AG/SA**  
Route de Wilwerdange 38-40  
9991 Troisvierges  
Luxembourg

**Basis**  
EN ISO 140-1 : 1997+A1:2004  
EN ISO 140-3 : 1995+A1:2004  
EN ISO 717-1 : 1996+A1:2006

10-000206-PB02-A01-04-de  
dated 7 September 2010

Product	Sliding door, single leaf with fixed part
Designation	Minimal Windows
External dimension (W x H)	4,021 mm x 2,652 mm
Material	Aluminium - profiles and Aluminium profiles with thermal break
Type of opening	Sliding
Rebate seals	Brush seals without slat, Lip seal
Filling	Insulating glass unit, 10 LSG/16/6
Special features	This element was during testing mounted in a steel sub frame.

**Representation**



**Instructions for use**

This test report serves to demonstrate the airborne sound insulation of a building element.

Applicable for Germany

- $R_{w,R}$  as per DIN 4109:  
( $R_w$  corresponds to  $R_{w,P}$ ,  
 $R_{w,R} = R_{w,P} - 2$  dB)
- $R_{w,R}$  for "Bauregelliste"

**Validity**

The data and results given relate solely to the tested and described specimen.

Testing the sound insulation does not allow any statement to be made on further characteristics of the present construction regarding performance and quality.

**Notes on publication**

The **ift** Guidance Sheet "Conditions and Guidance for the Use of **ift** Test Documents" applies.

The cover sheet can be used as abstract.

**Contents**

The test report contains a total of 11 pages:

- 1 Object
  - 2 Procedure
  - 3 Detailed results
  - 4 Instructions for use
- Data sheet (1 page)

Weighted sound reduction index  $R_w$   
Spectrum adaptation terms C and  $C_{tr}$



$$R_w (C; C_{tr}) = 36 (-2;-4) \text{ dB}$$

**ift Rosenheim**  
22.03.2013



Dr. Joachim Hessinger, Dipl.-Phys.  
Head of Testing Department  
Building Physics



Andreas Preuss, Dipl.-Ing. (FH)  
Head of Laboratory  
Building Acoustics

**Fall-proof glazing**

Report Nr. P-15-101

**Deutsches Glasbau  
Institut GmbH**

Grafenhauser StraÙe 36

D - 64293 Darmstadt

T: +49 6151 97199 - 0

F: +49 6151 97199 - 20

E: [info@d-g-i.eu](mailto:info@d-g-i.eu)W: [www.d-g-i.eu](http://www.d-g-i.eu)**Versuchsbericht P-15-101****VersuchsdurchfUhrung am 04.11.2015**

Gegenstand: Pendelschlagversuche (weicher Stori) an einer absturzsichernden Verglasung in Anlehnung an DIN 18008 Teil 4

Bauteil: Absturzsichernde raumhohe Verglasung mit Schiebeelement

Auftraggeber: Keller AG/SA  
38-40, Route de Wilwerdange  
L - 9911 Troisvierges

VersuchsfUhrung: Deutsches Glasbau Institut GmbH

Datum: 15. Dezember 2015

Prof. Dr.- Ing. Hans-Werner Nordhues  
Leiter der Prufstelle

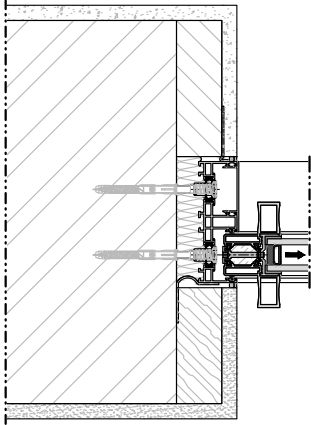
Dipl.- Ing. Sarah Eckhardt  
Stellv. Leiterin der Prufstelle

Dieser Bericht umfasst 17 Seiten.

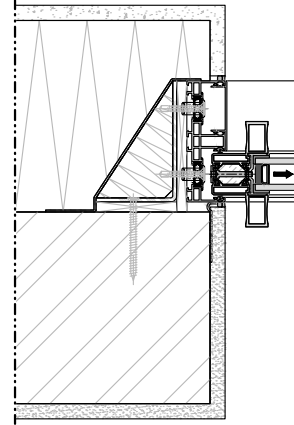
*Die Veroffentlichung des vorliegenden Versuchsberichtes, auch auszugsweise, sowie die Verwendung fur Werbungszwecke bedarf der Genehmigung der Prufstelle.*

Content

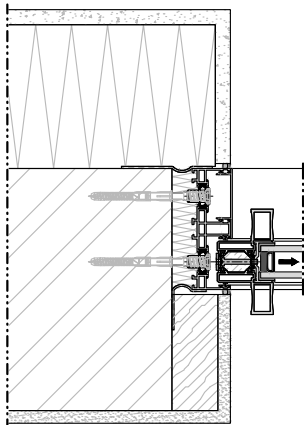
**a** Wall monolithic



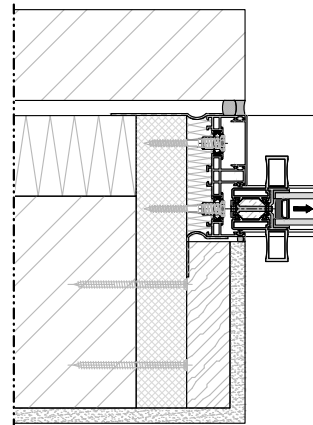
**b** Wall ETIC: Insulating level  
(External Thermal Insulation Composite)



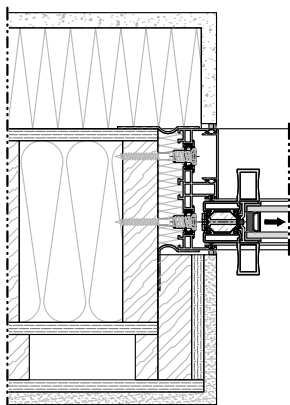
**c** Wall ETIC: wall level  
(External Thermal Insulation Composite)



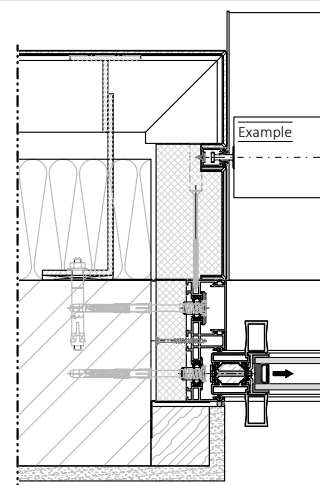
**d** Wall cavity insulated

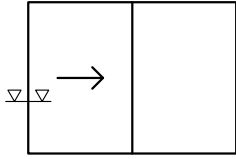


**e** Timber frame wall



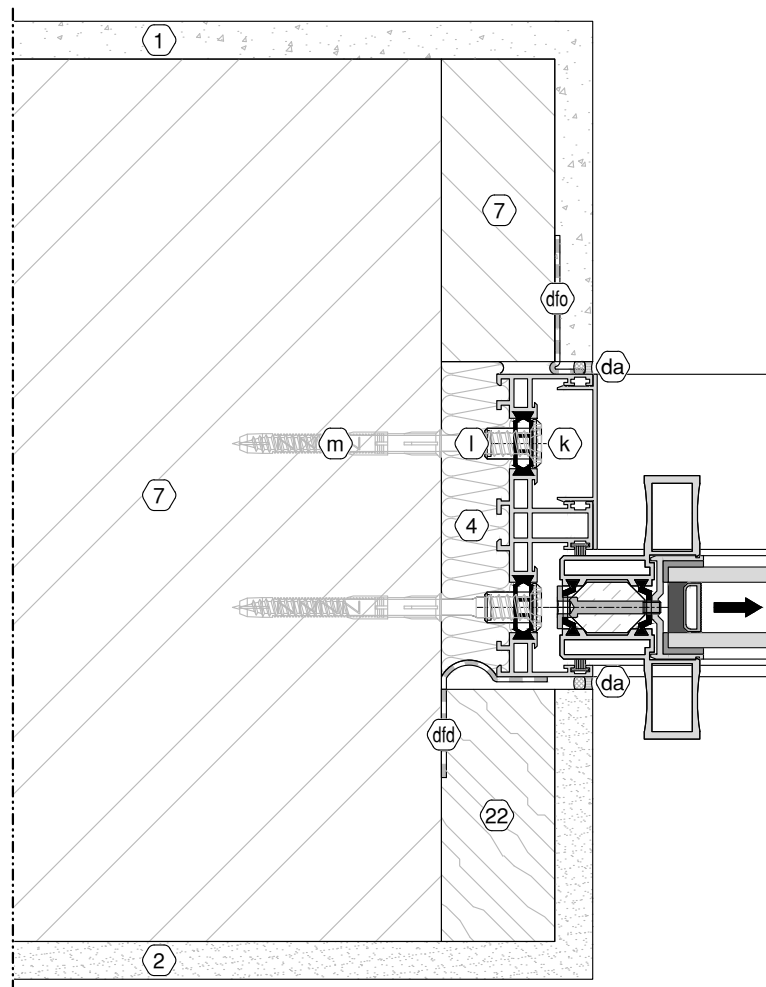
**f** Ventilated facade system





Wall monolithic: sections

M 1:3



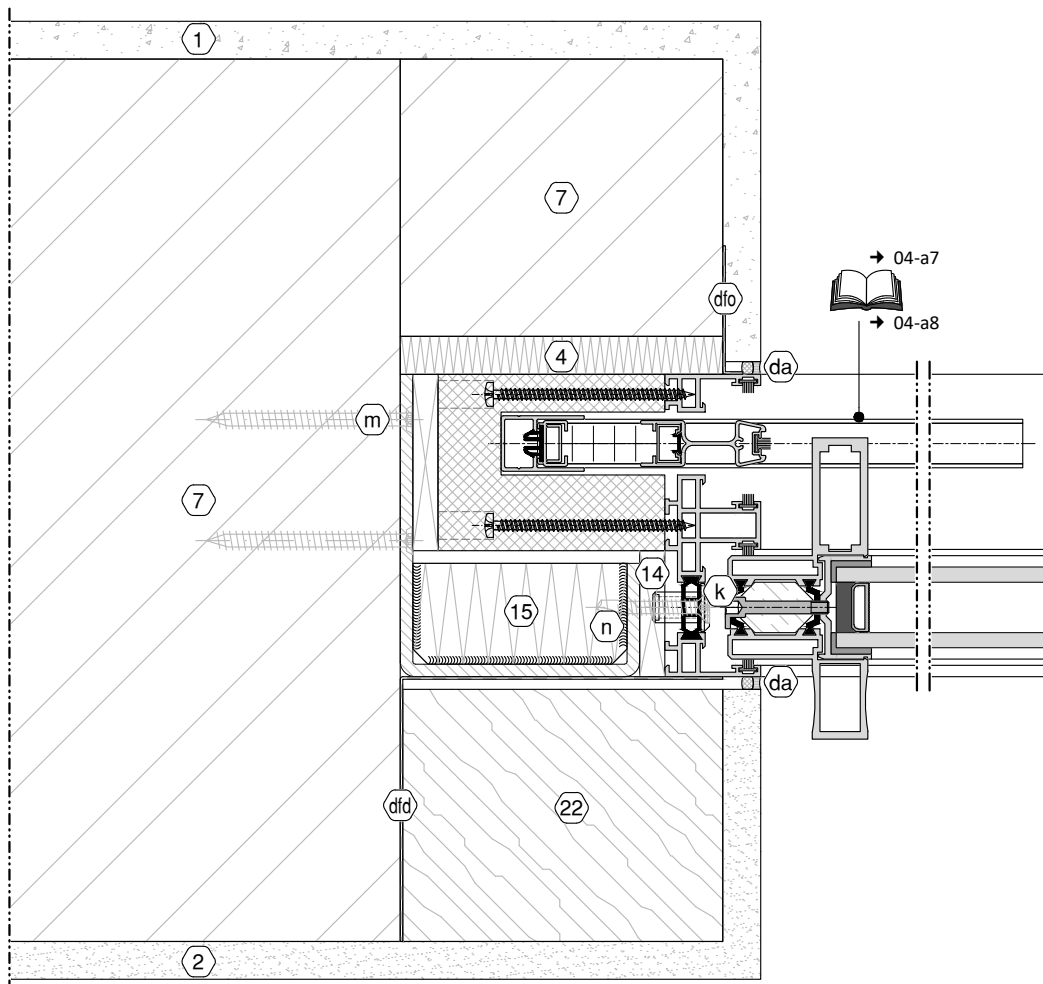
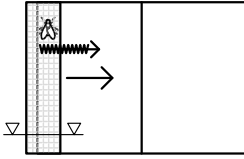
Number legend: see overview at page 06-g



The building connections shown are schematic representations and must be adjusted for the project planning according to the structural conditions and the country-specific requirements.

Wall monolithic: sections  
- connection with plisse insect screens

M 1:3

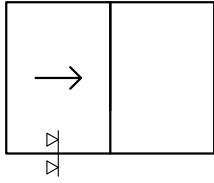


Number legend: see overview at page 06-g




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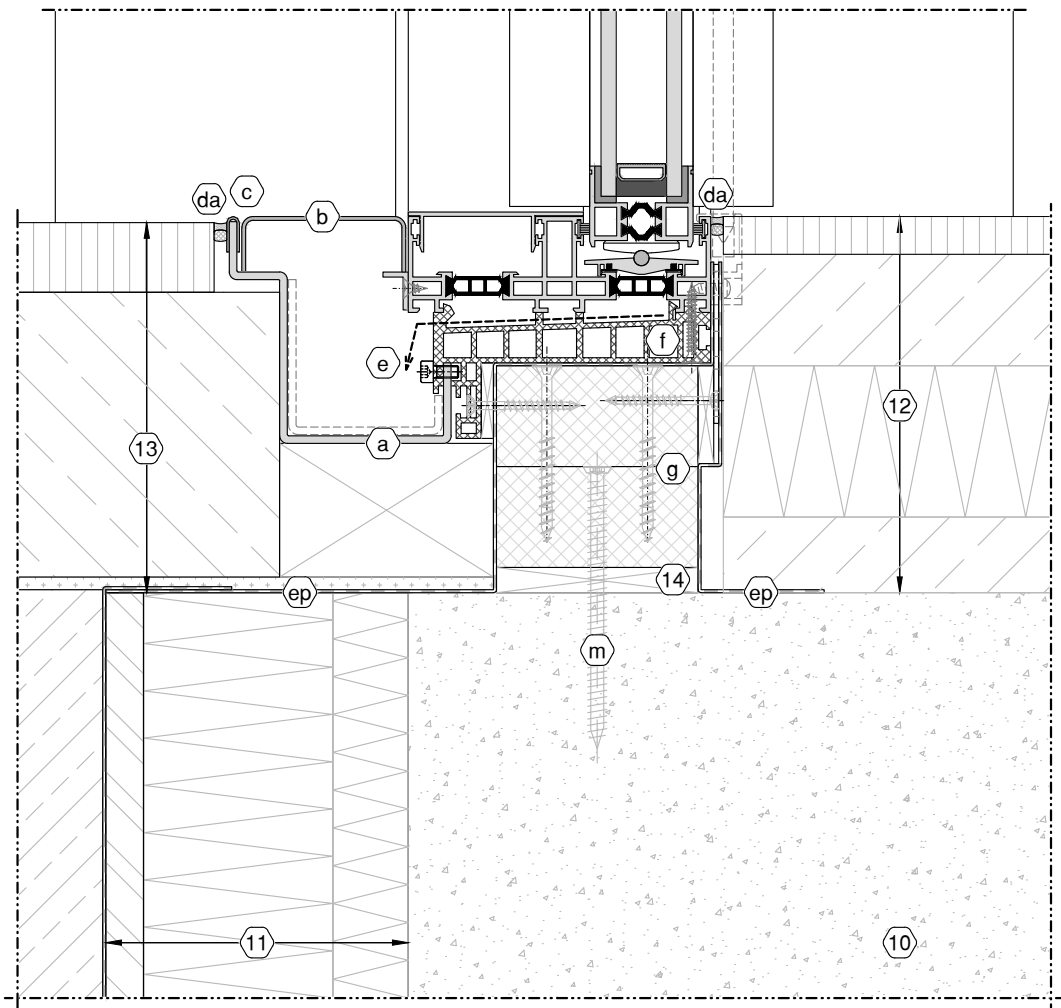




**Wall monolithic: sections  
- visible drainage gutter**

M 1:3

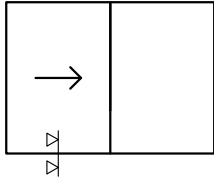
 suitable for all wall systems



Number legend: see overview at page 06-g




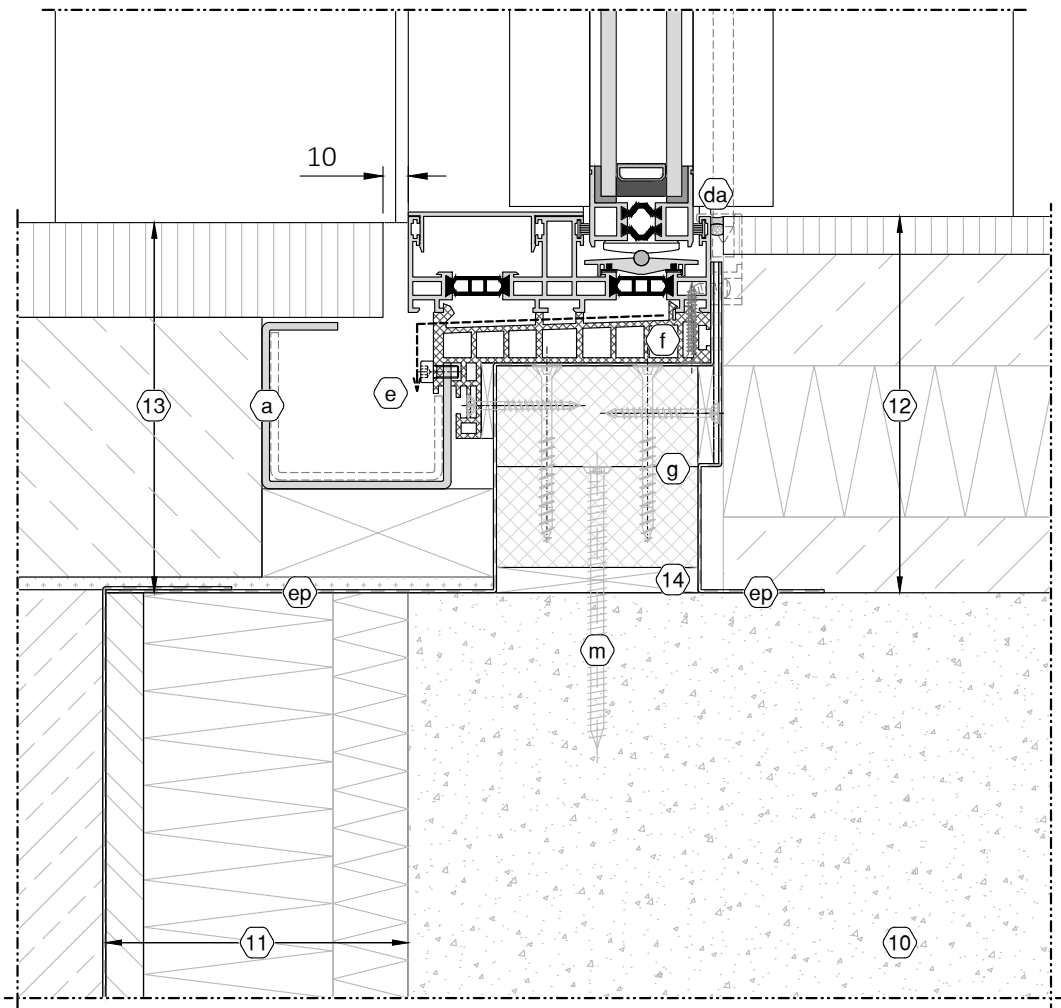
The building connections shown are schematic representations and must be adjusted for the project planning according to the structural conditions and the country-specific requirements.



**Wall monolithic: sections  
- non visible drainage gutter**

M 1:3

 suitable for all wall systems

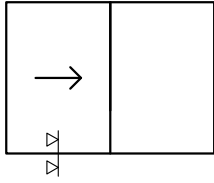


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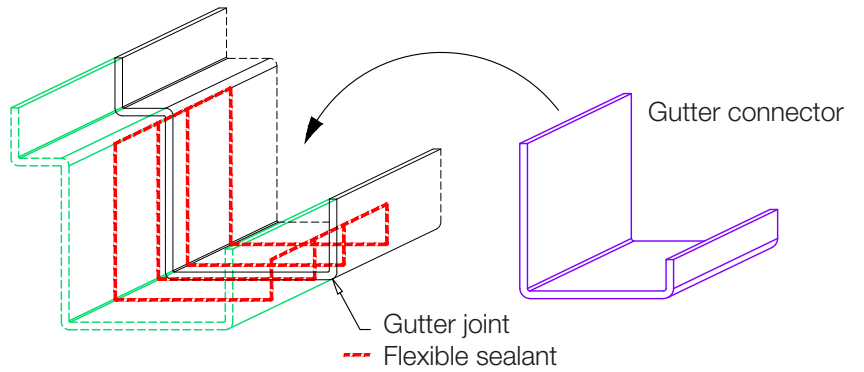
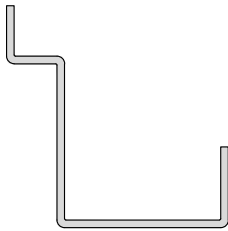


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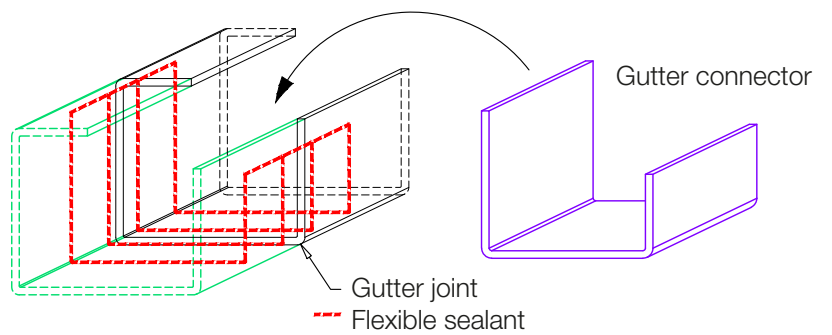
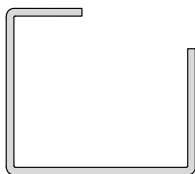
Mandatory on-site gutter connection operations

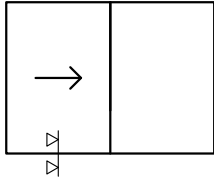


visible drainage gutter




non visible drainage gutter





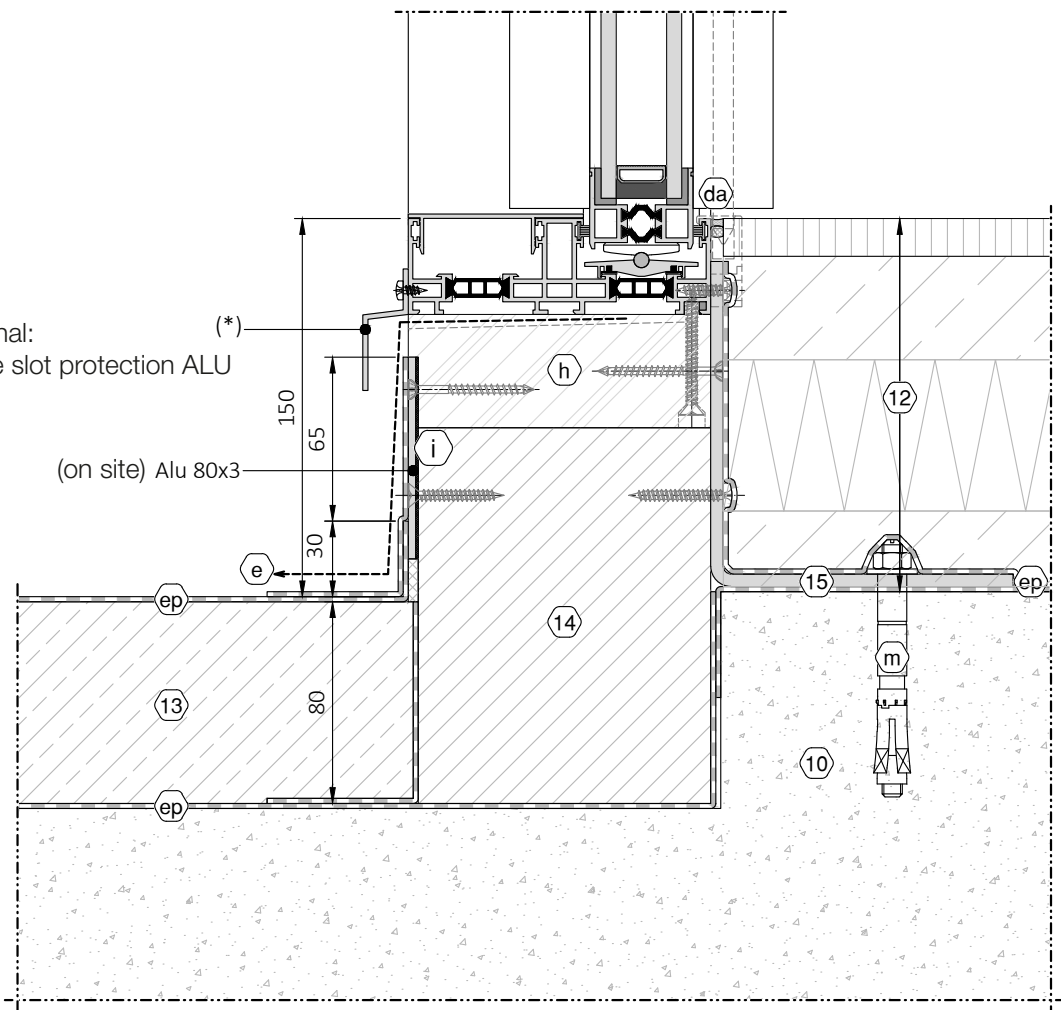
**Wall monolithic: sections**  
**- Floor connection with flush connection**

M 1:3

 suitable for all wall systems

(\*) Optional:  
 Drainage slot protection ALU

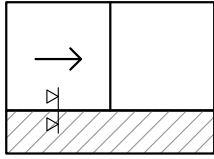
(on site) Alu 80x3



Number legend: see overview at page 06-g

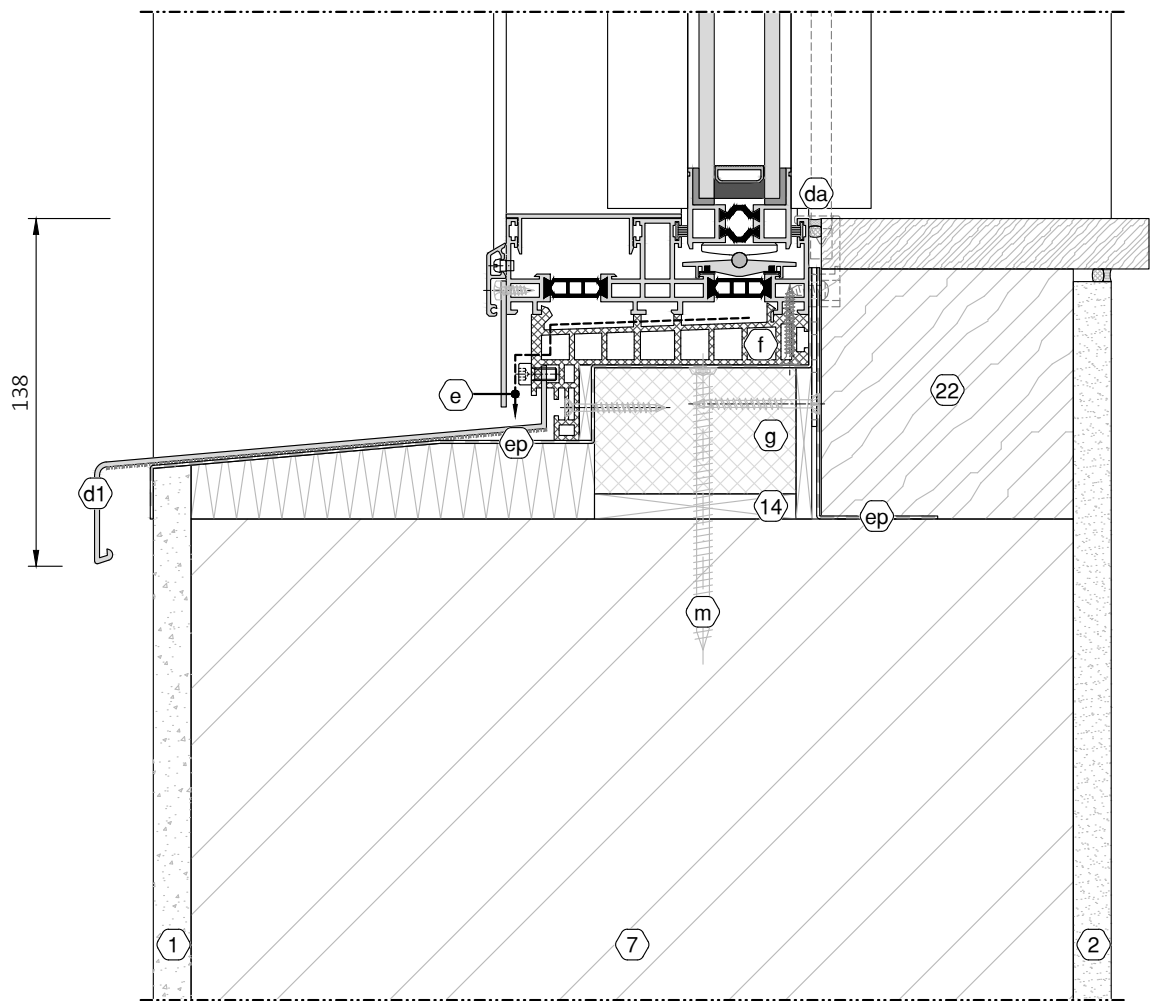


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Wall monolithic: sections  
- windowsill system: standard

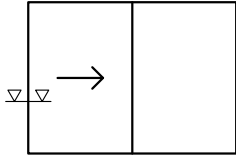
M 1:3



Number legend: see overview at page 06-g

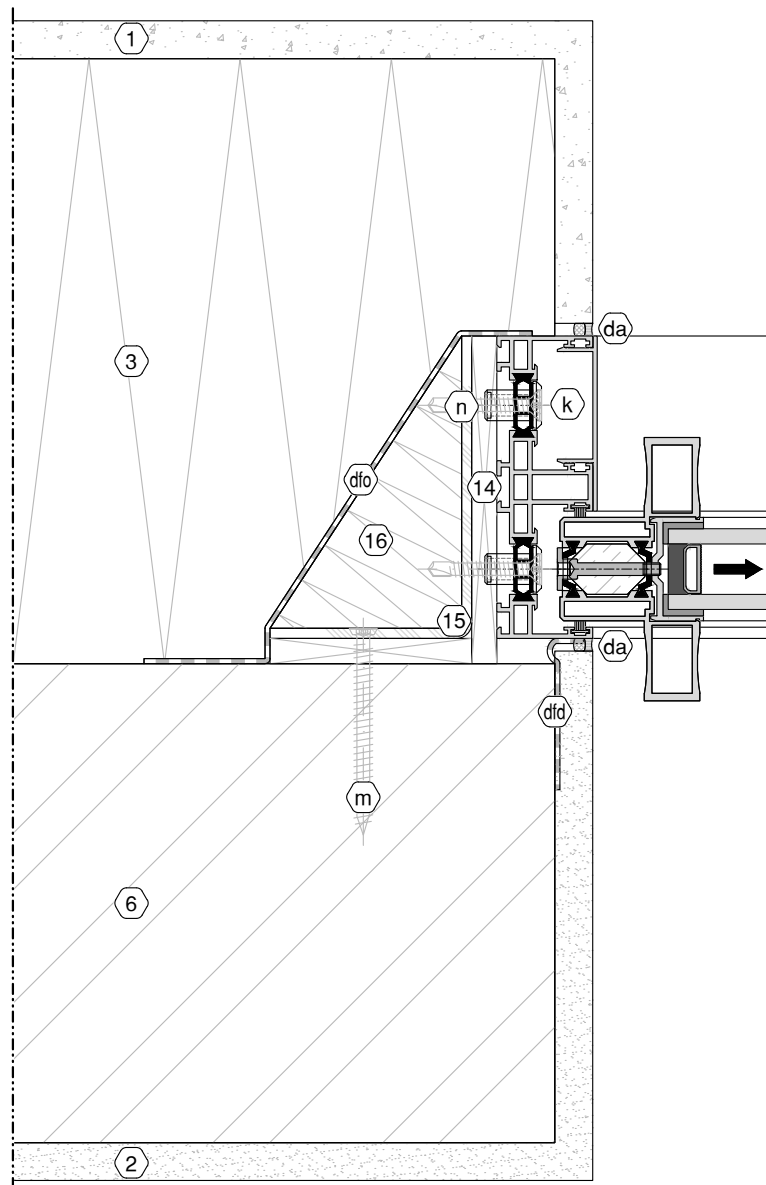


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Wall ETIC - insulating level: sections

M 1:3



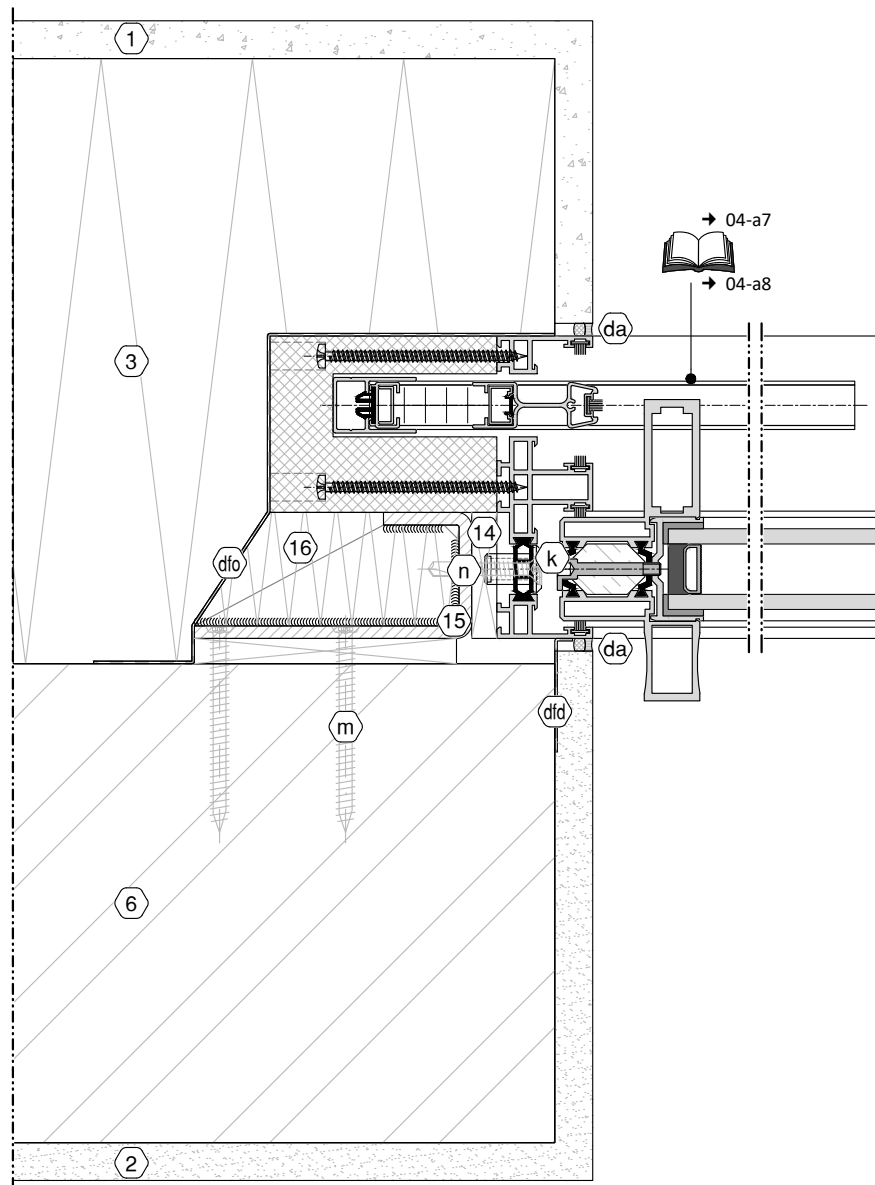
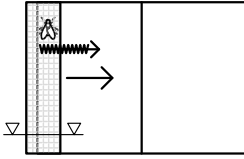
Number legend: see overview at page 06-g



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Wall ETIC - insulating level: sections  
- connection with plisse insect screens

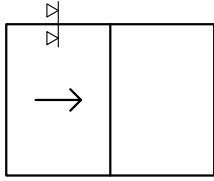
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Number legend: see overview at page 06-g

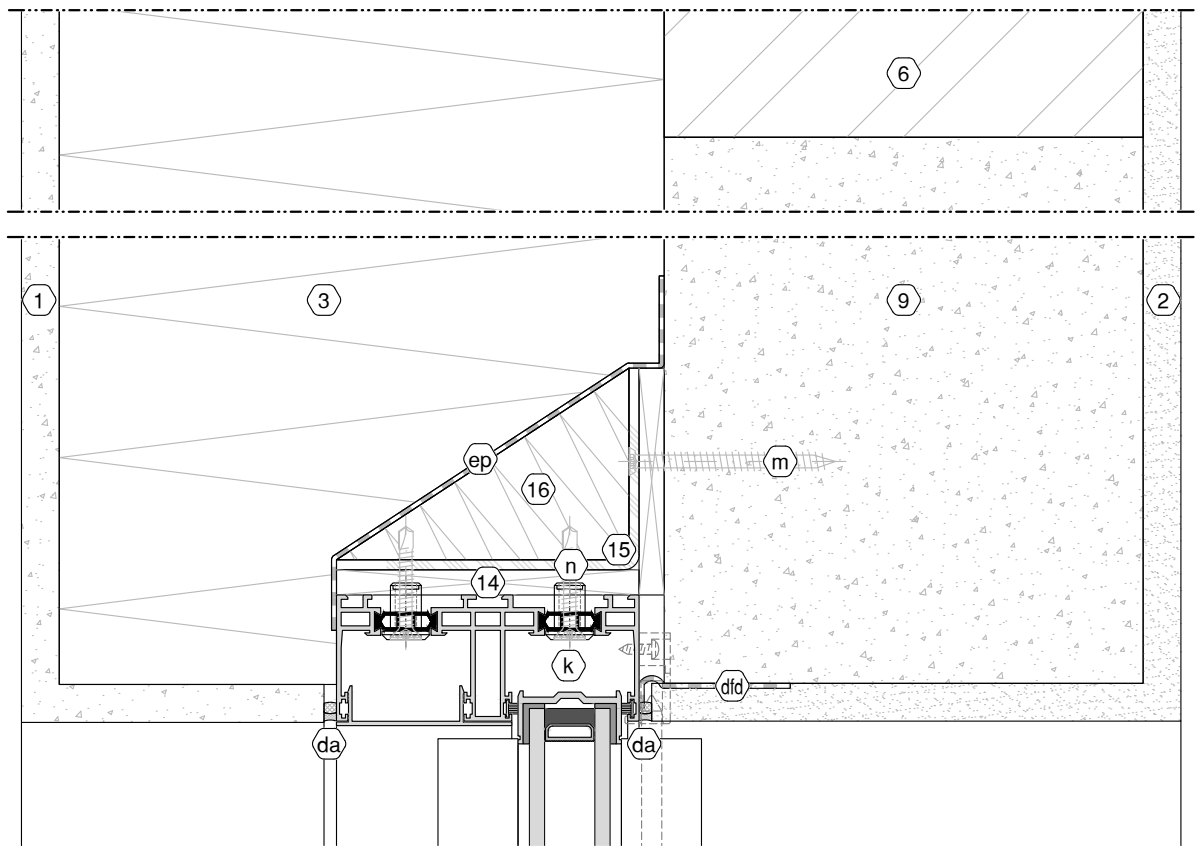


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Wall ETIC - insulating level: sections

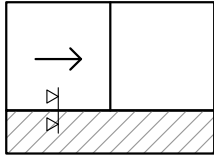
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Number legend: see overview at page 06-g

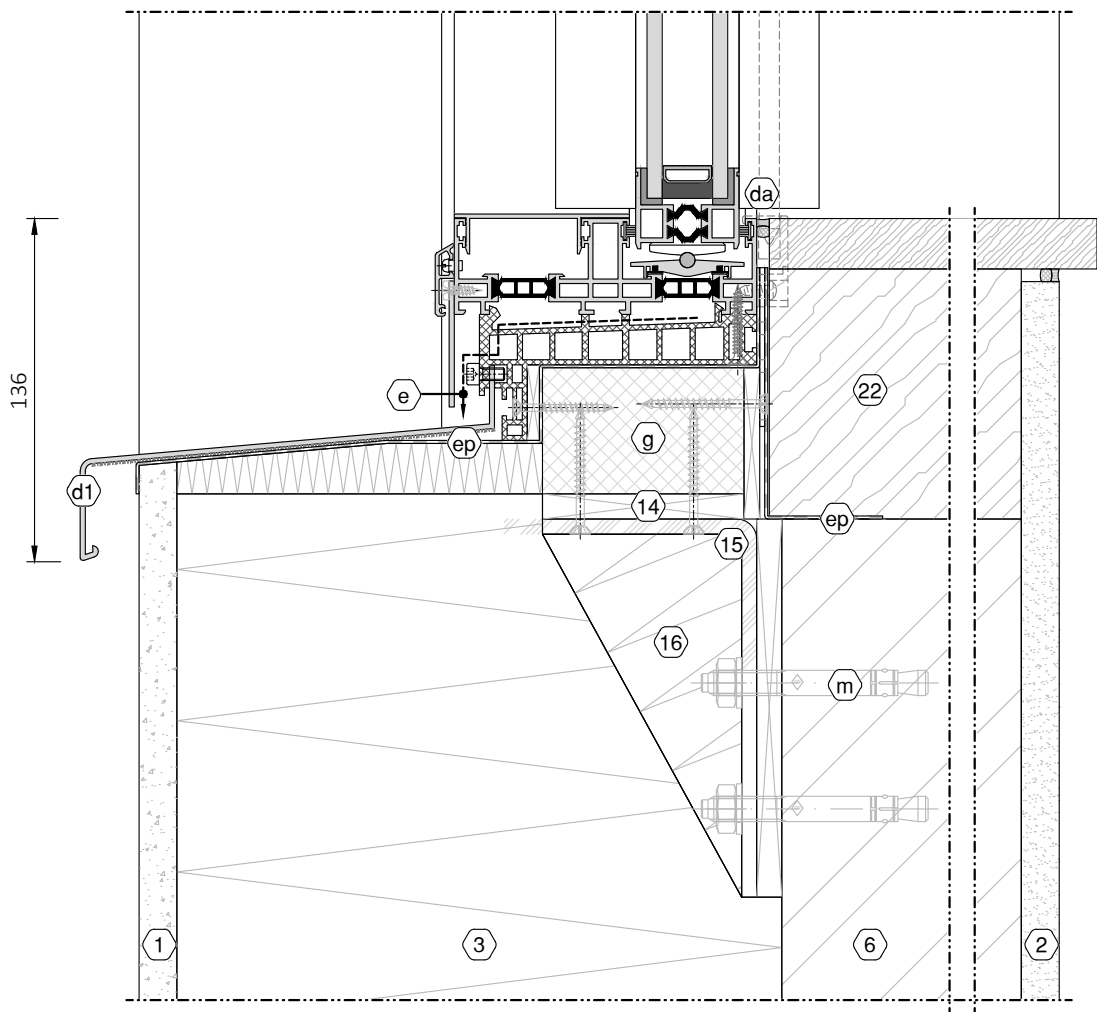


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Wall ETIC - insulating level: sections  
- windowsill system: standard

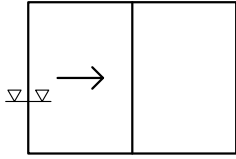
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Number legend: see overview at page 06-g

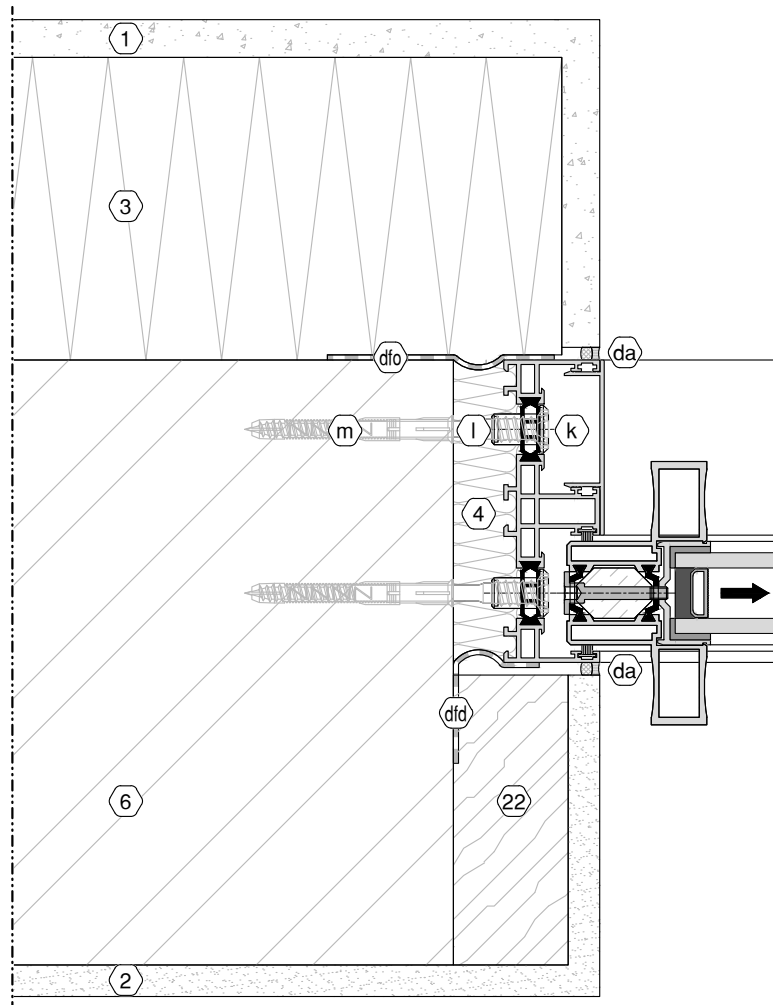


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Wall ETIC - wall level: sections

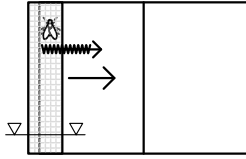
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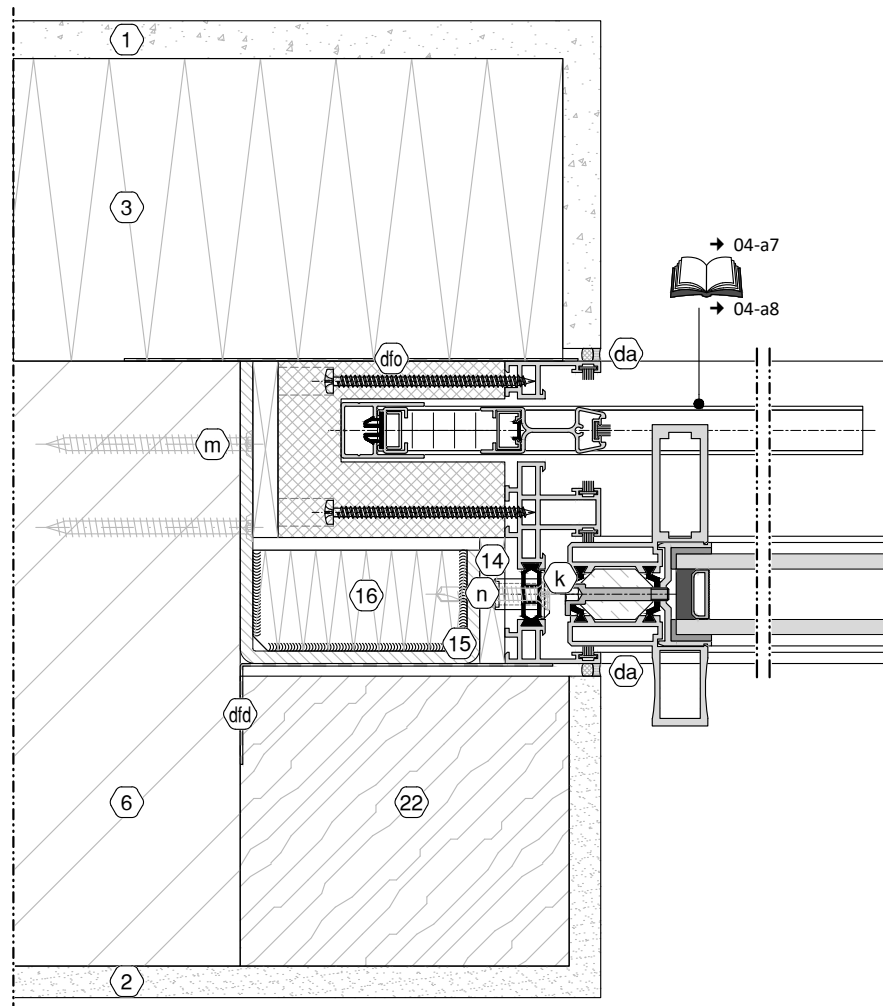


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Wall ETIC - wall level: sections  
- connection with plisse insect screens

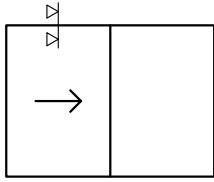
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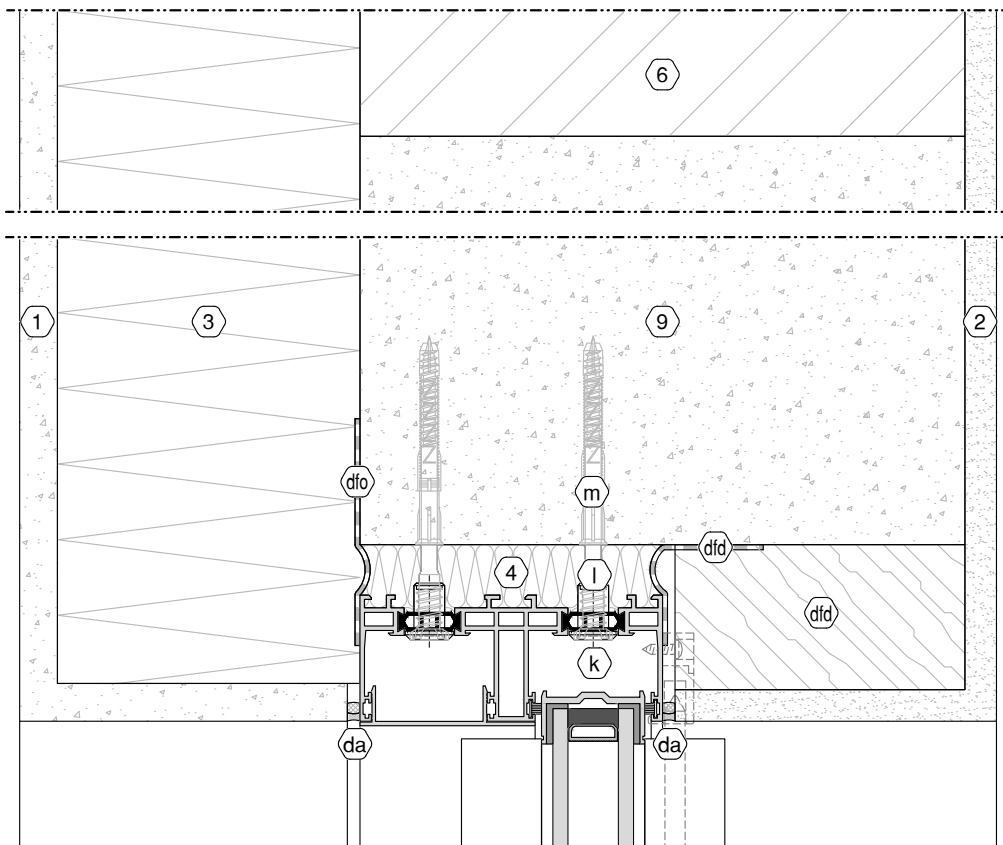


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Wall ETIC - wall level: sections

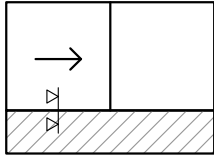
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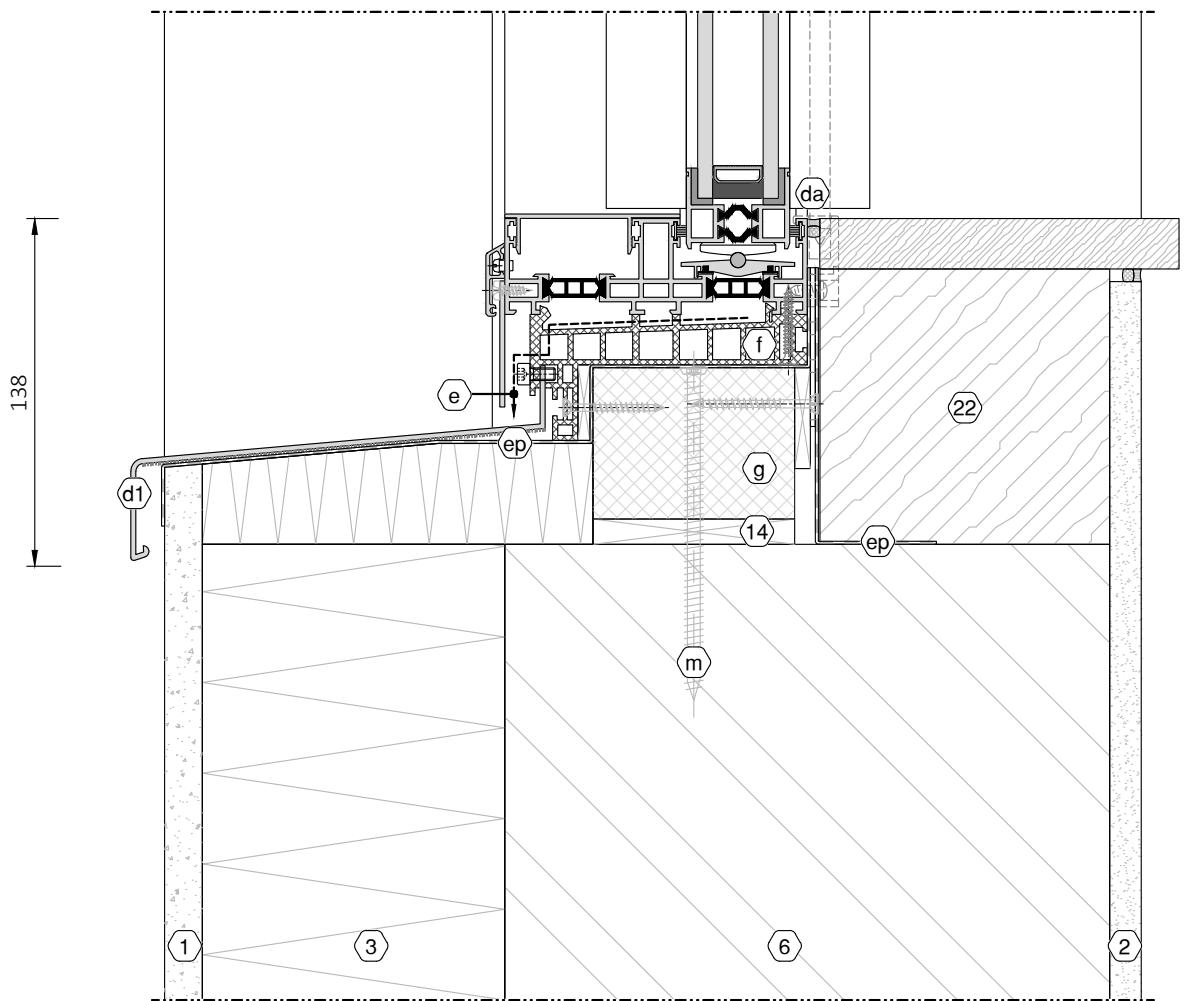


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Wall ETIC - wall level: sections  
- windowsill system: standard

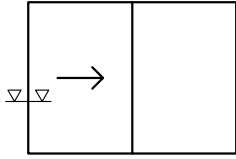
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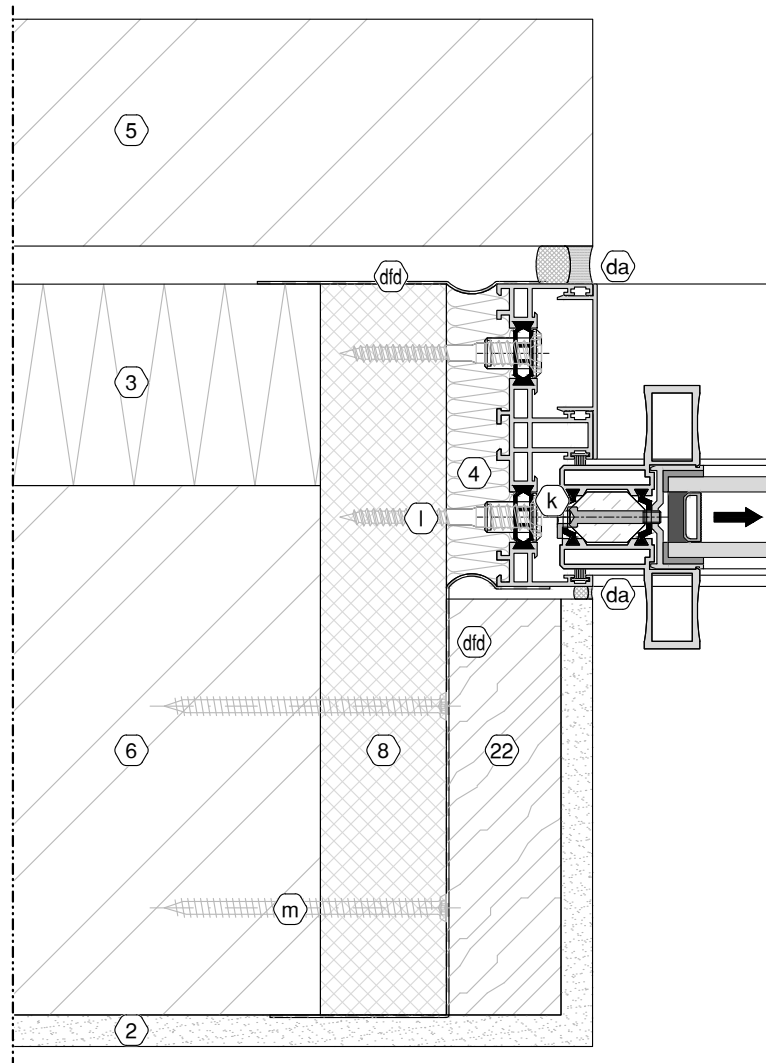


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Wall cavity insulated: sections

M 1:3



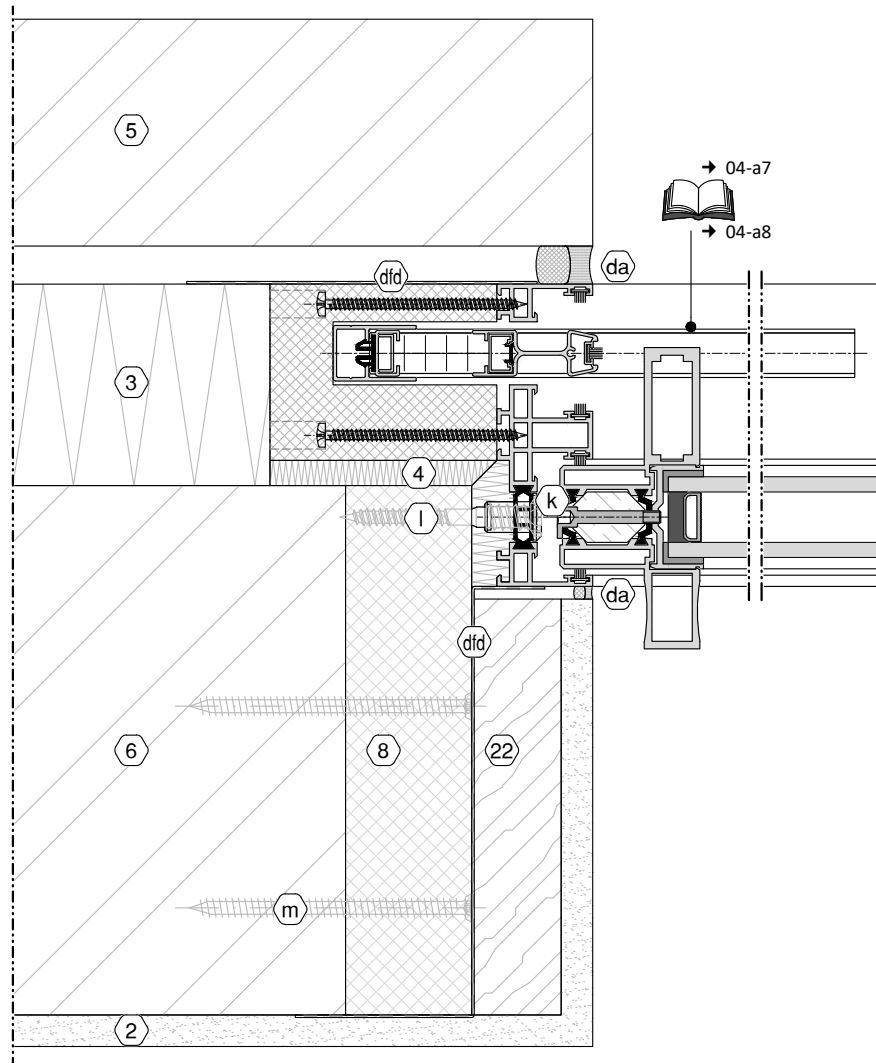
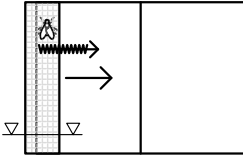
Number legend: see overview at page 06-g



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Wall cavity insulated: sections  
- connection with plisse insect screens

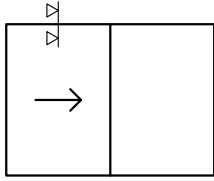
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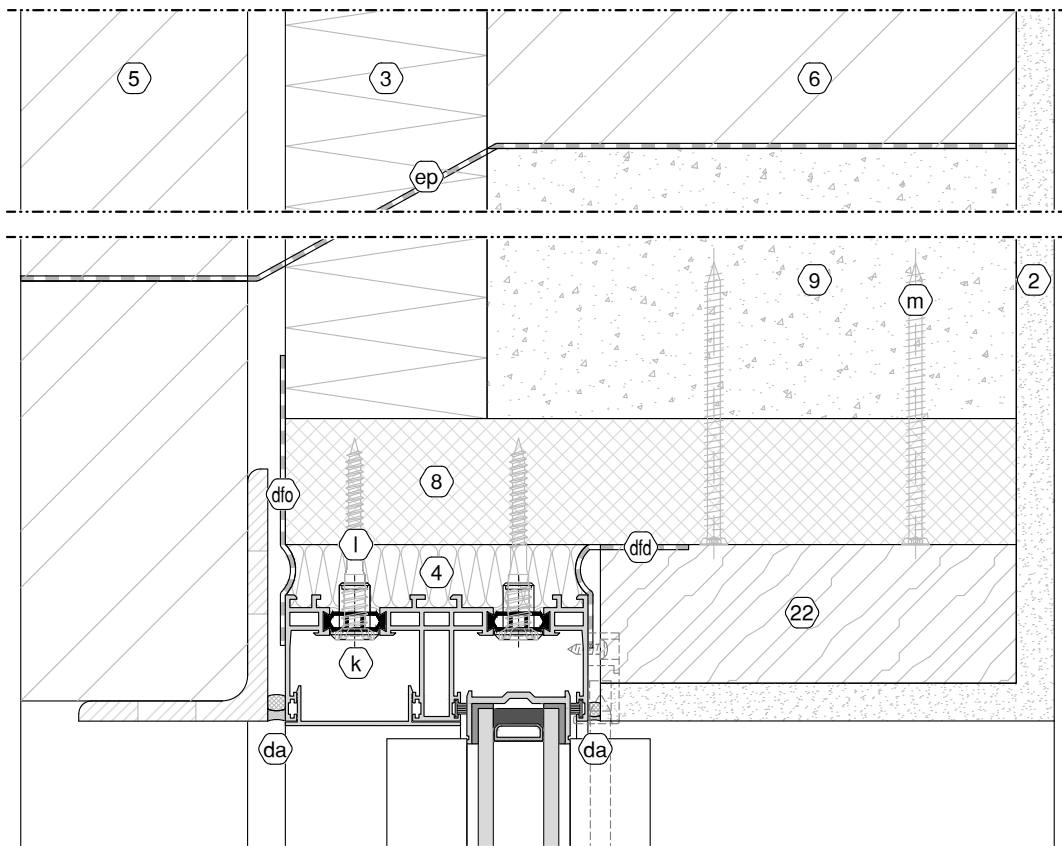


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Wall cavity insulated: sections

M 1:3



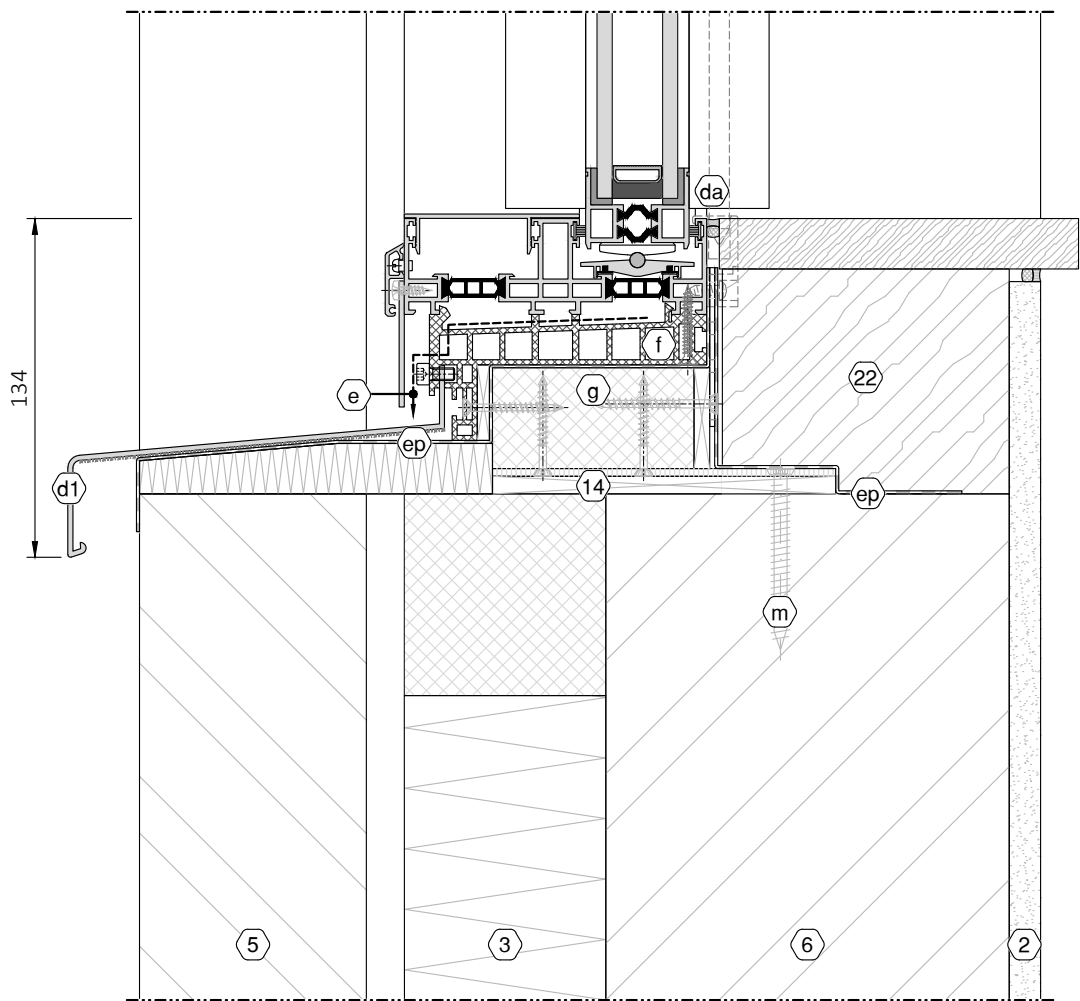
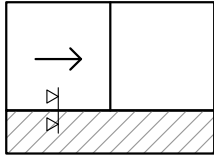
Number legend: see overview at page 06-g



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Wall cavity insulated: sections  
- windowsill system: standard

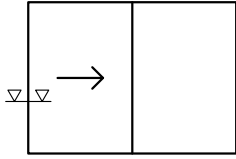
M 1:3



Number legend: see overview at page 06-g

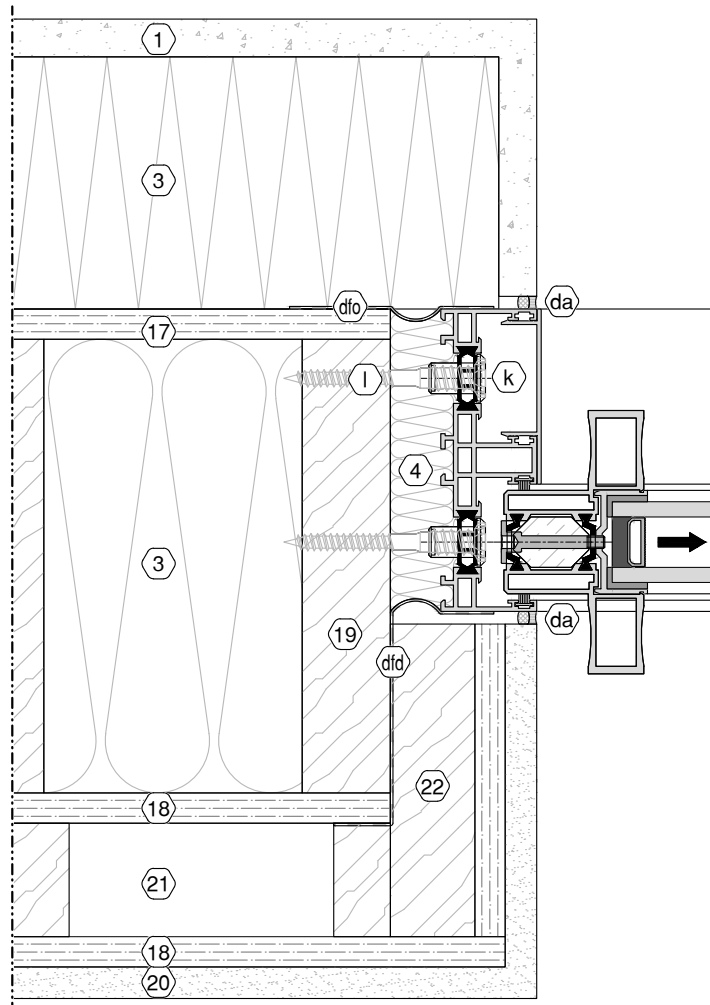


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Timber frame wall: sections

M 1:3



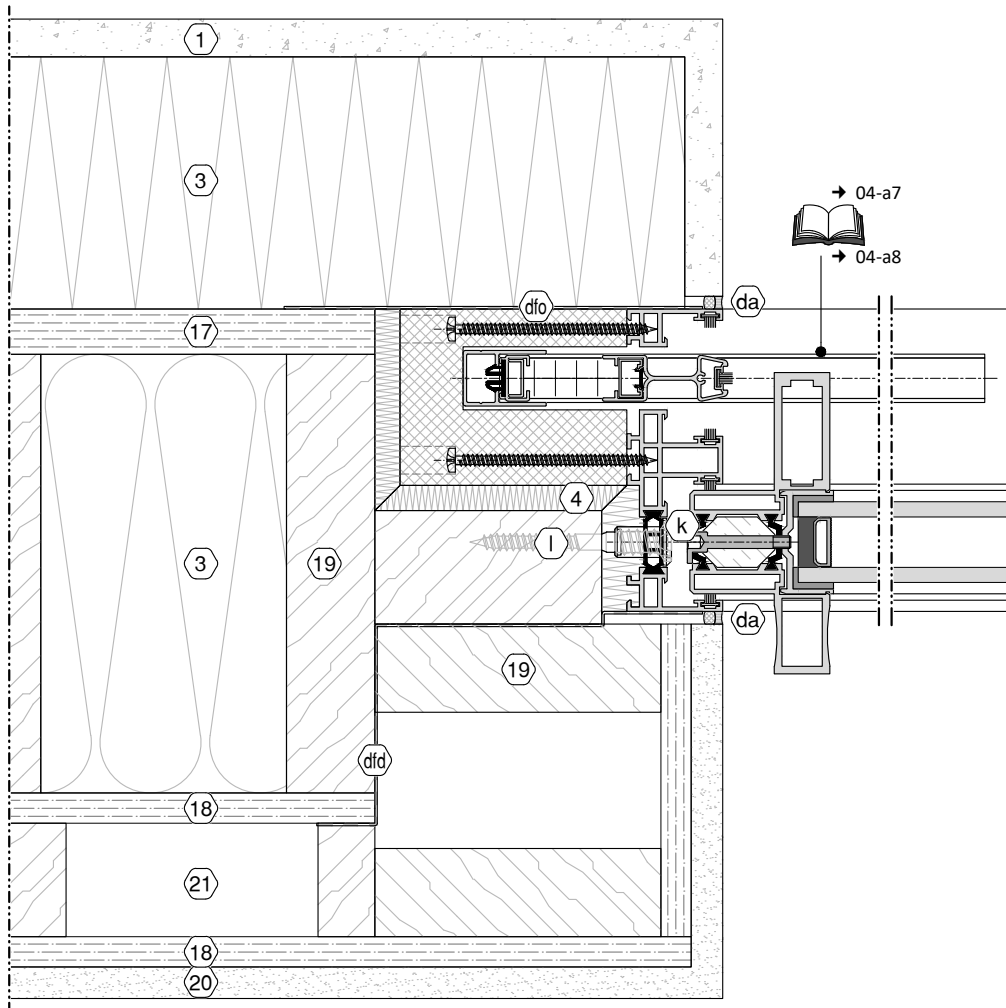
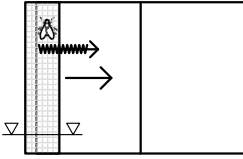
Number legend: see overview at page 06-g



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Timber frame wall: sections  
- connection with plisse insect screens

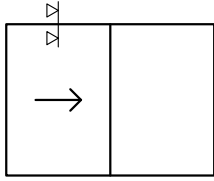
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Number legend: see overview at page 06-g

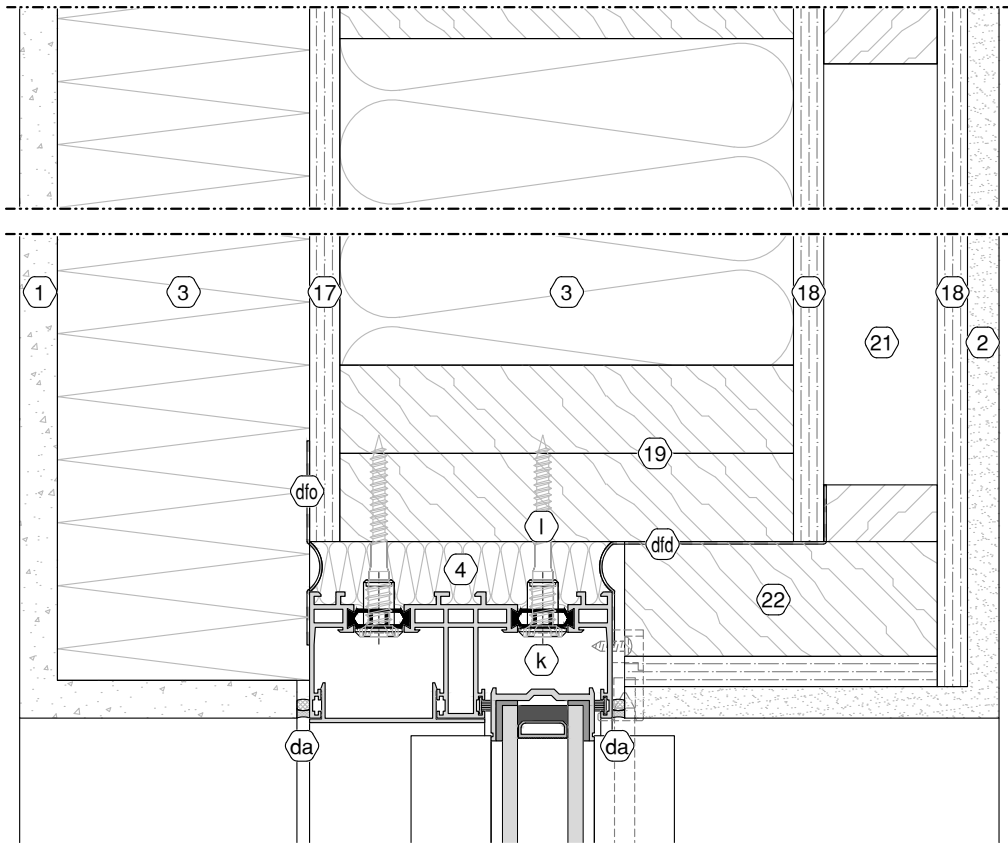


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Timber frame wall: sections

M 1:3



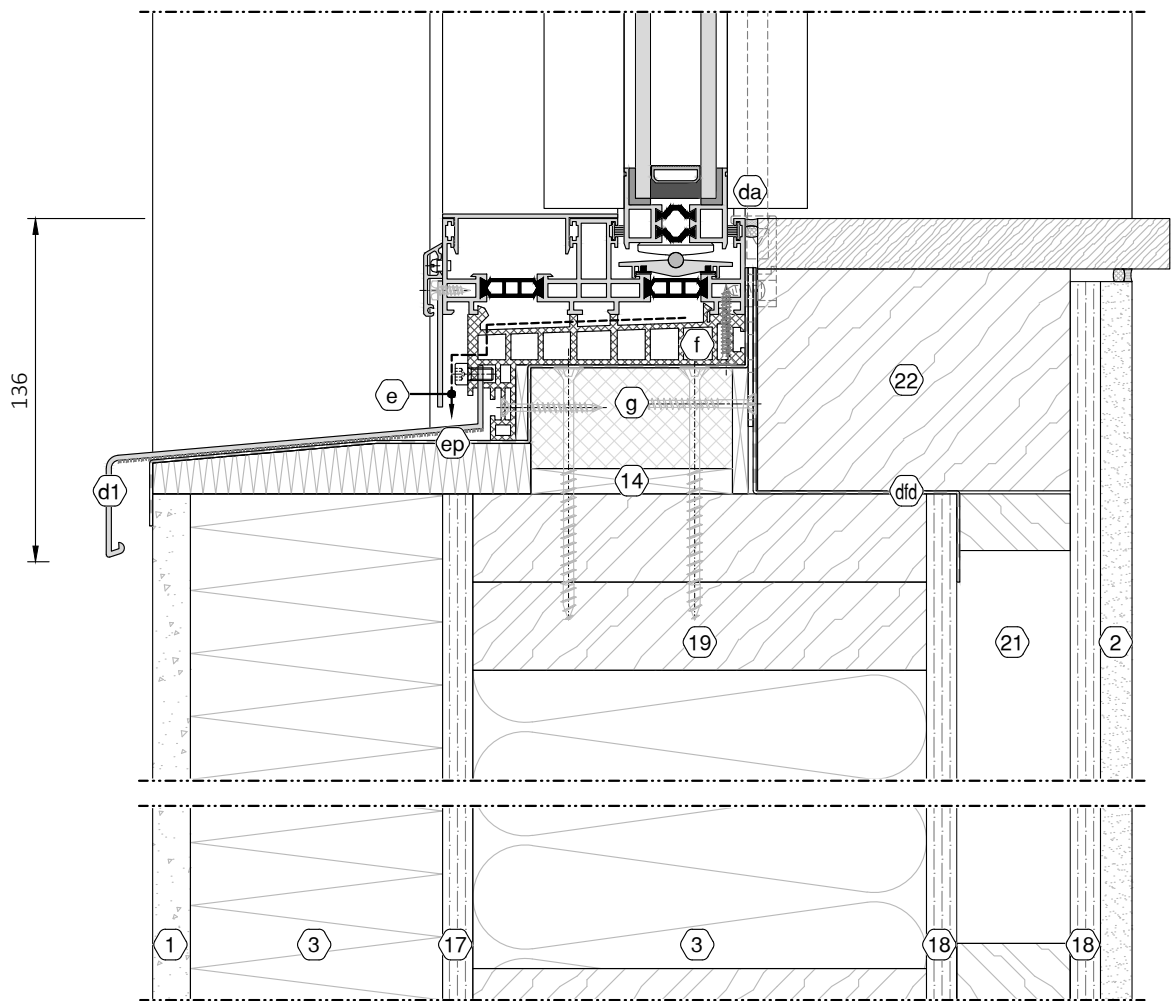
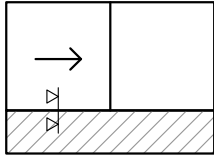
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Timber frame wall: sections  
- windowsill system: standard

M 1:3



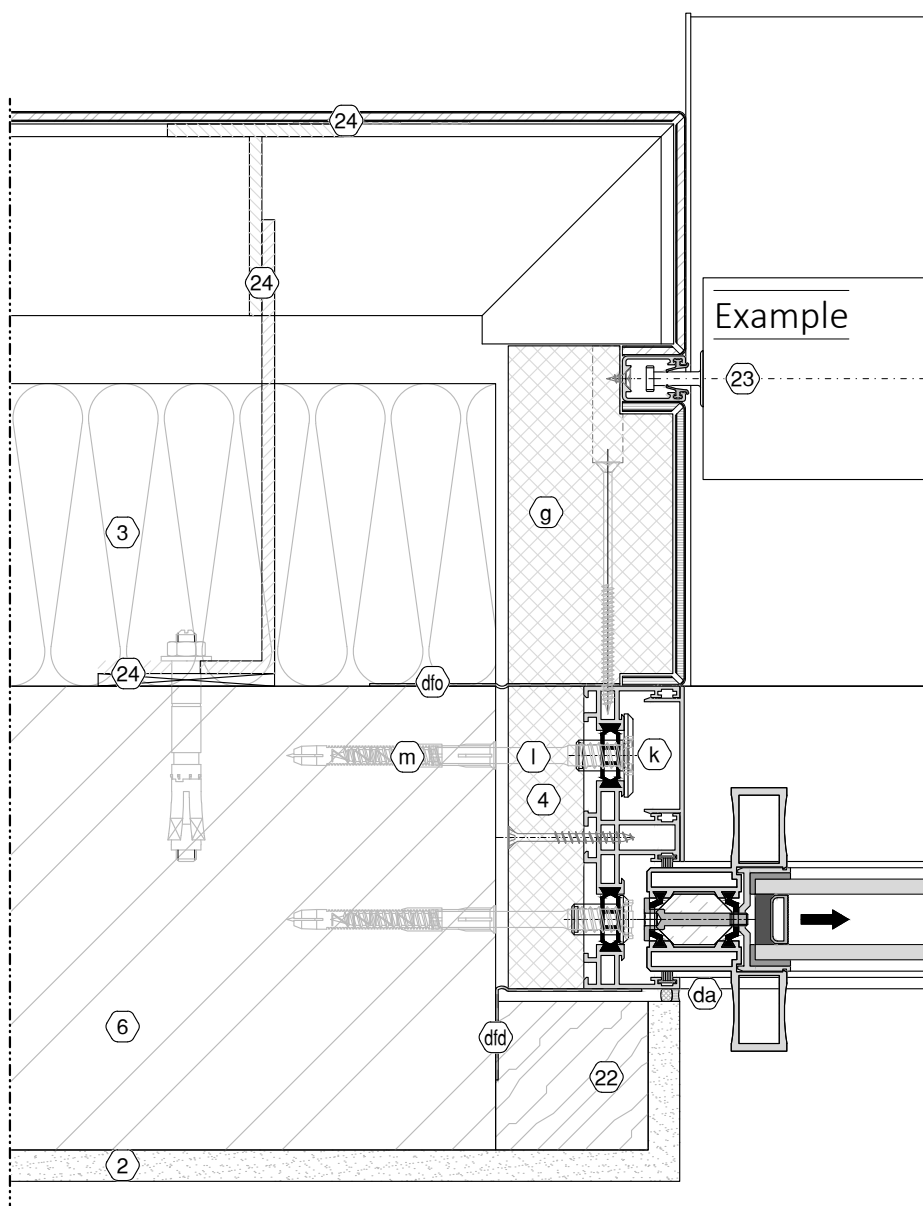
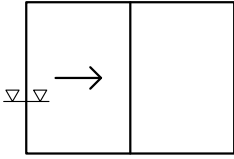
Number legend: see overview at page 06-g



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Ventilated facade system: sections

M 1:3



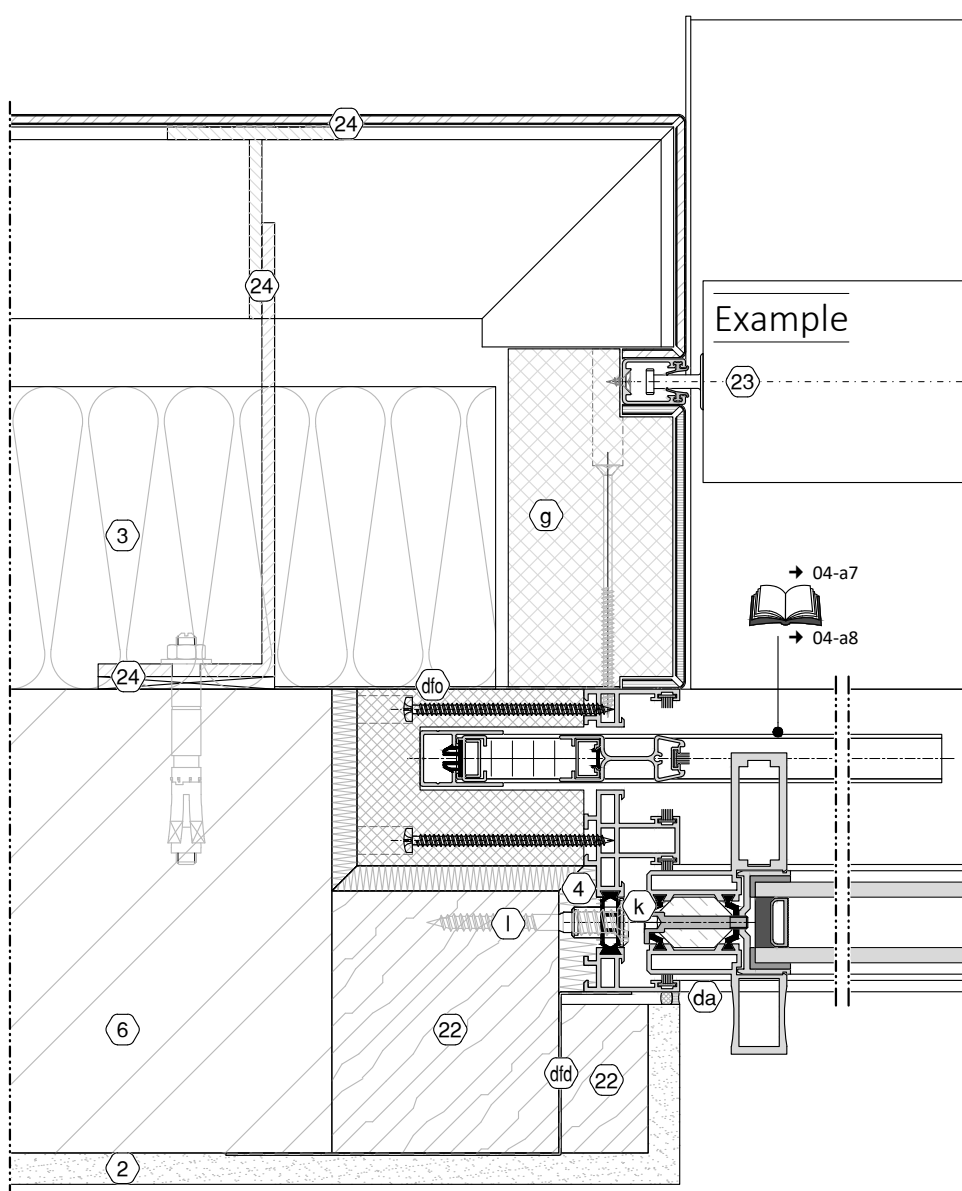
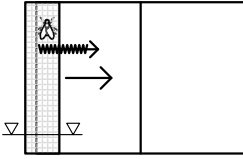
Number legend: see overview at page 06-g



The building connections shown are schematic representations and must be adjusted for the project planning according to the structural conditions and the country-specific requirements.

Ventilated facade system: sections  
- connection with plisse insect screens

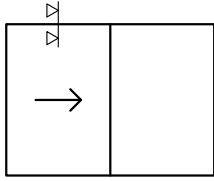
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Number legend: see overview at page 06-g

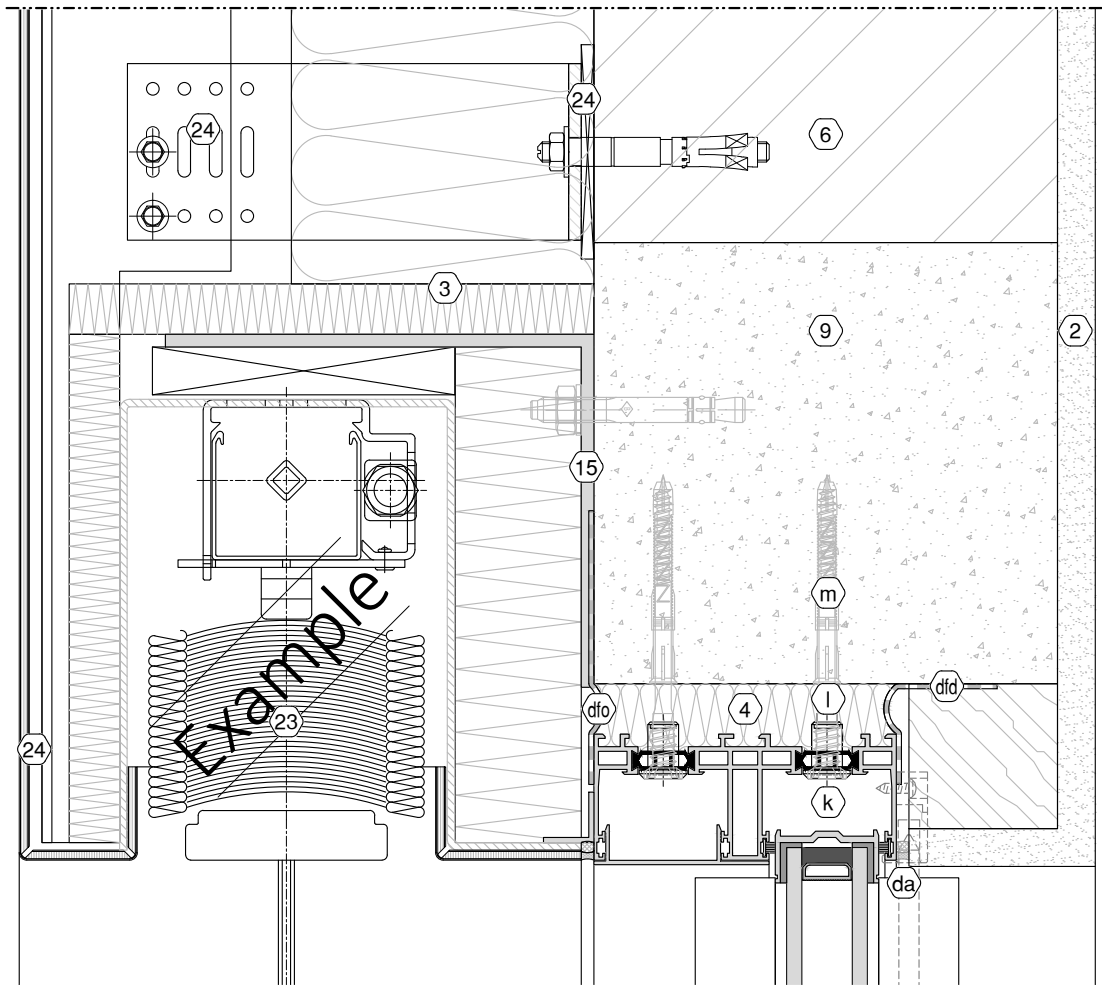


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Ventilated facade system: sections

M 1:3



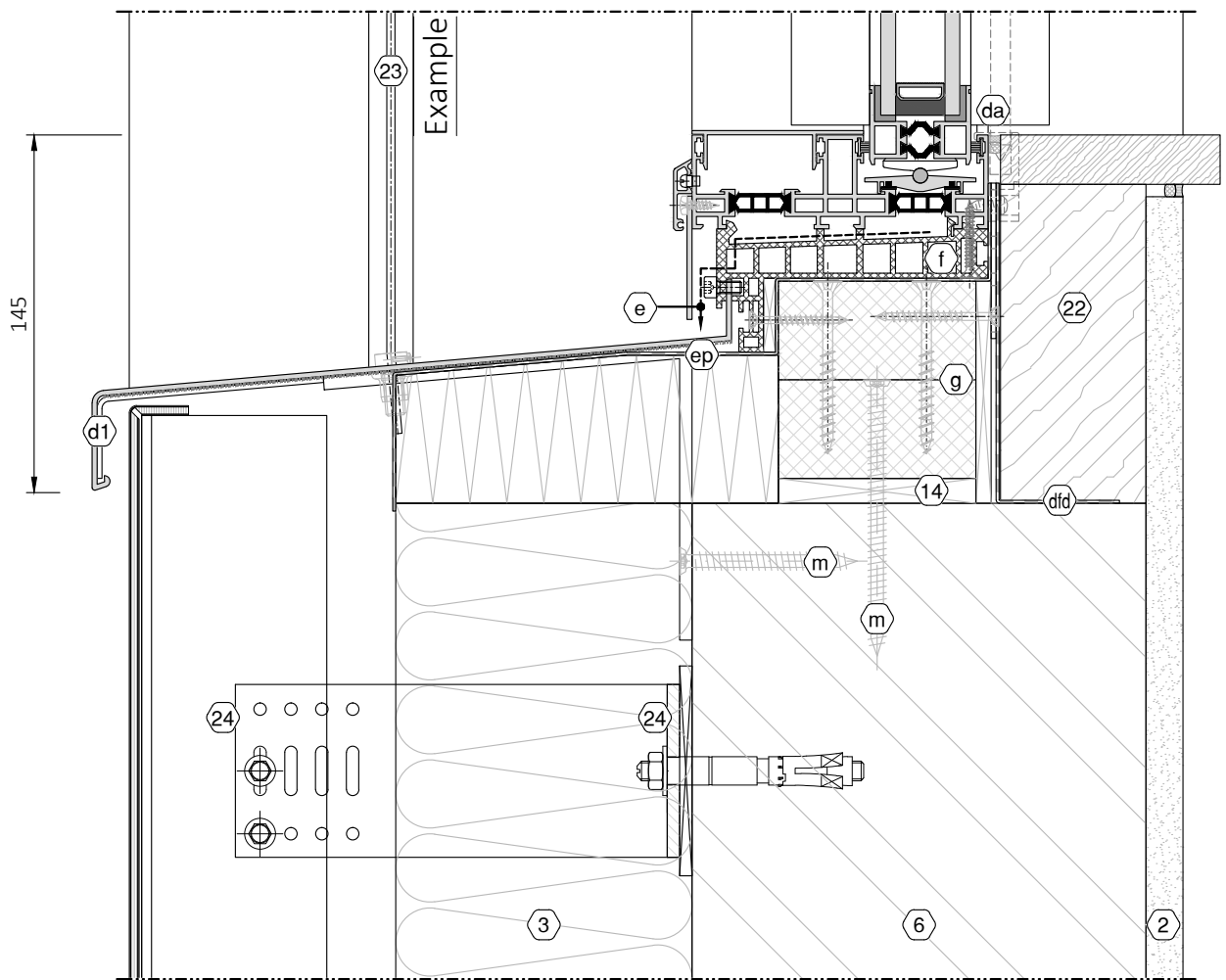
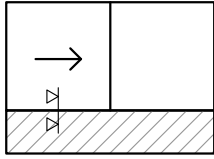
Number legend: see overview at page 06-g



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Ventilated facade system: sections  
- windowsill system: standard

M 1:3



Number legend: see overview at page 06-g



The building connections shown are schematic representations and must be adjusted for the project planning according to the structural conditions and the country-specific requirements.

## Legende

1	Exterior plaster
2	Interior plaster
3	Thermal insulation
4	Flexifoam
5	Exterior wall (façade)
6	Interior brickwork
7	Thermal insulation bricks
8	KELLER base stone
9	Concrete lintel
10	Concrete plate
11	Concrete plate edge
12	Floor structure
13	Terrace structure
14	Pressure resistant (plastic) underlay
15	Steel/alu angle profile (with reinforcement)
16	Insulating blocks
17	DWD board
18	OSB board
19	Wooden wall structure
20	Gypsum fiberboard
21	Installation level
22	Filling in general
23	Venetian blinds / roller blinds
24	Ventilated facade system
25	Floor strip
26	Blind drainage slot
a	Drainage gutter [aluminum 3.3315 (EN AW-5005)]
b	Gutter cover [stainless steel 1.4301 (AISI 304)]
c	Edge protection [stainless steel 1.4401 (AISI 316)]
d	Windowsill system
e	Drainage
f	Drainage base [PVC-U]
g	Substructure [KELLER base stone]
h	PET
i	EPDM cellular rubber
k	Fixing bushing
l	Topstar
m	Anchor / wall screw
n	Zebra Pias AW30
da	Permanently elastic sealing
dfo	Vapour diffusion-permeable film
dfd	Vapour diffusion-tight film
de	Sealing foil EPDM



The connections shown are schematic representations and must be adjusted for the project planning according to the structural conditions on site and the country-specific requirements.

## 07. LEGAL NOTICE

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*This document (\*) is drawn up in English, French and German language versions. In case of any discrepancy, the English version of the document shall prevail.*

*(\*) : architect's manual - technics - englisch 01-2025*

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