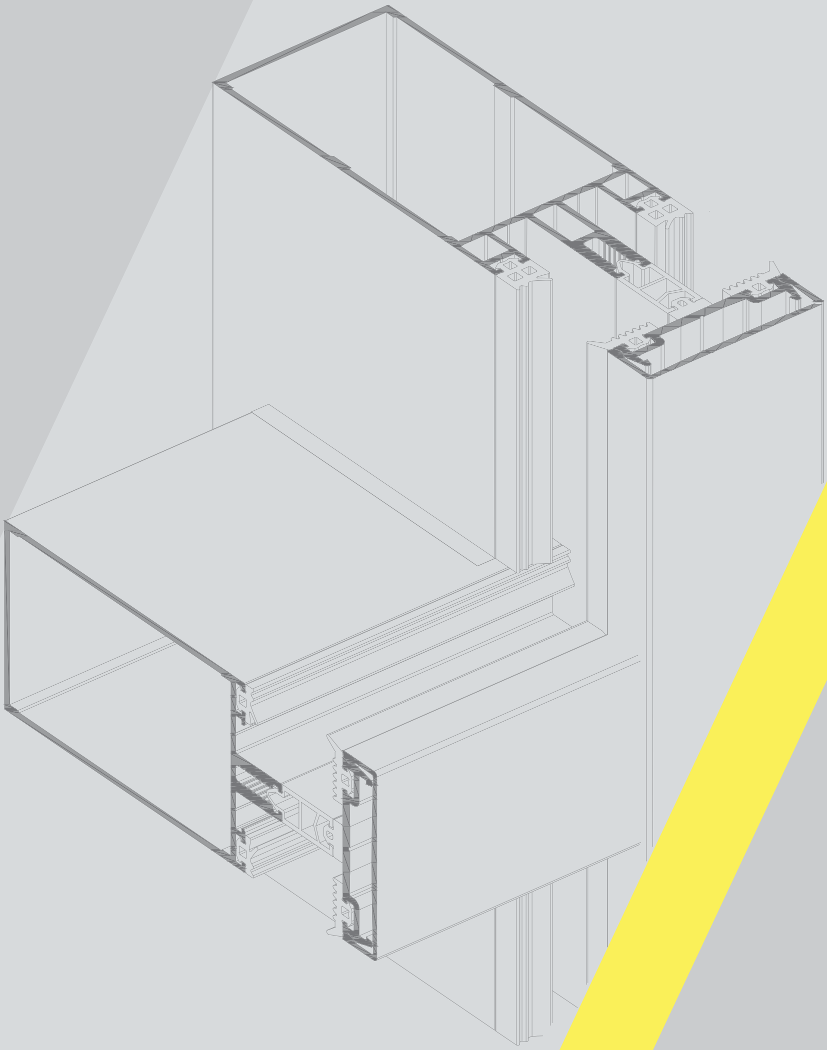
ALUFAR

FT 50



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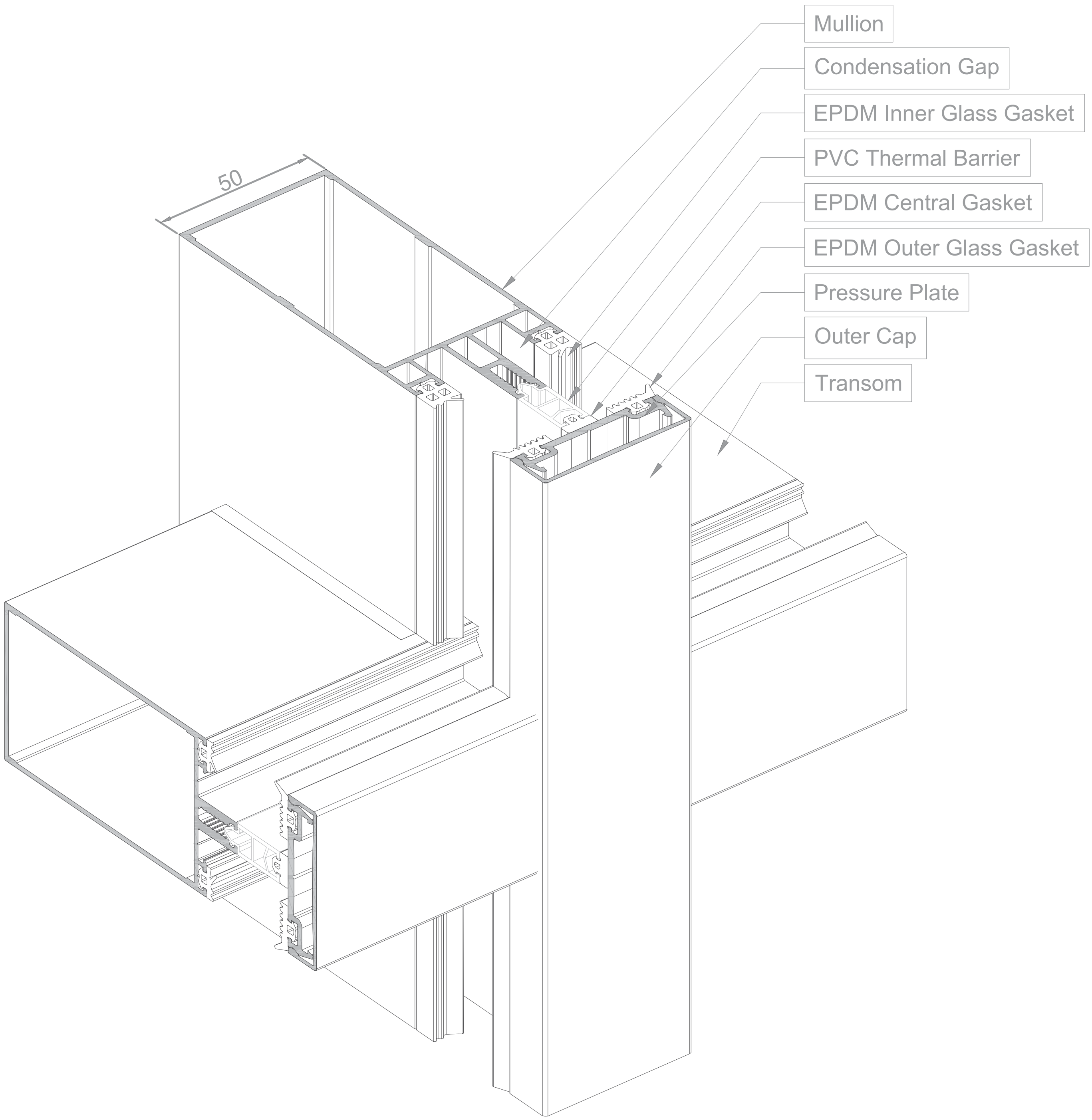
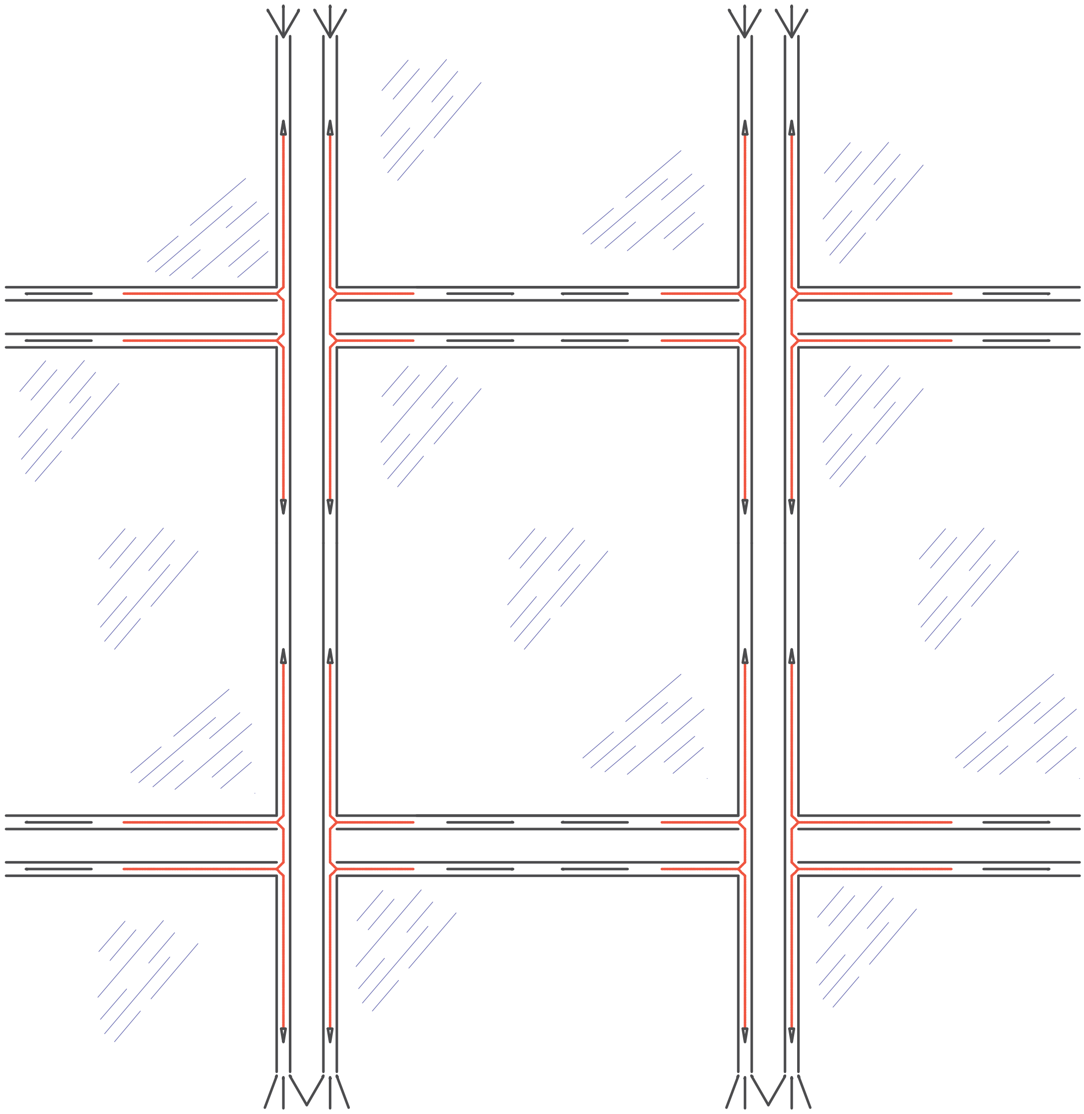
ALUFAR®

SYSTEM INFO

System Characteristic





THE FT 50 SYSTEM IS DESIGNED TO COMBINE THE CHANNELS IN THE VERTICAL AND HORIZONTAL PROFILES. POSSIBLE CONDENSATION IS HOWEVER GUIDED FROM THE HORIZONTAL PROFILE TO THE VERTICAL PROFILE CHANNEL AND THE SIGNS ARE DESIGNED TO DRAIN OUT THE WATER.

AT THE SAME TIME, THIS SYSTEM PERFORMS THE REQUIRED VENTILATION ON THE FACADE AND DRY THE MOISTURE CREATED BY CONDENSATION.

ALUFAR®

STRUCTURAL CALCULATION

The mullions must be fixed on at least two fixing brackets, which in turn must be fixed onto the building framework and **never** on a brickwall. The fixing brackets must fullfil the following criteria:

- Transfer safely all loads from the facade resulting from the wind pressure, weight of mullions and transoms and weight of infill panels
- Take up the dilatation of mullions caused by fluctuations in temperature.

ATTENTION

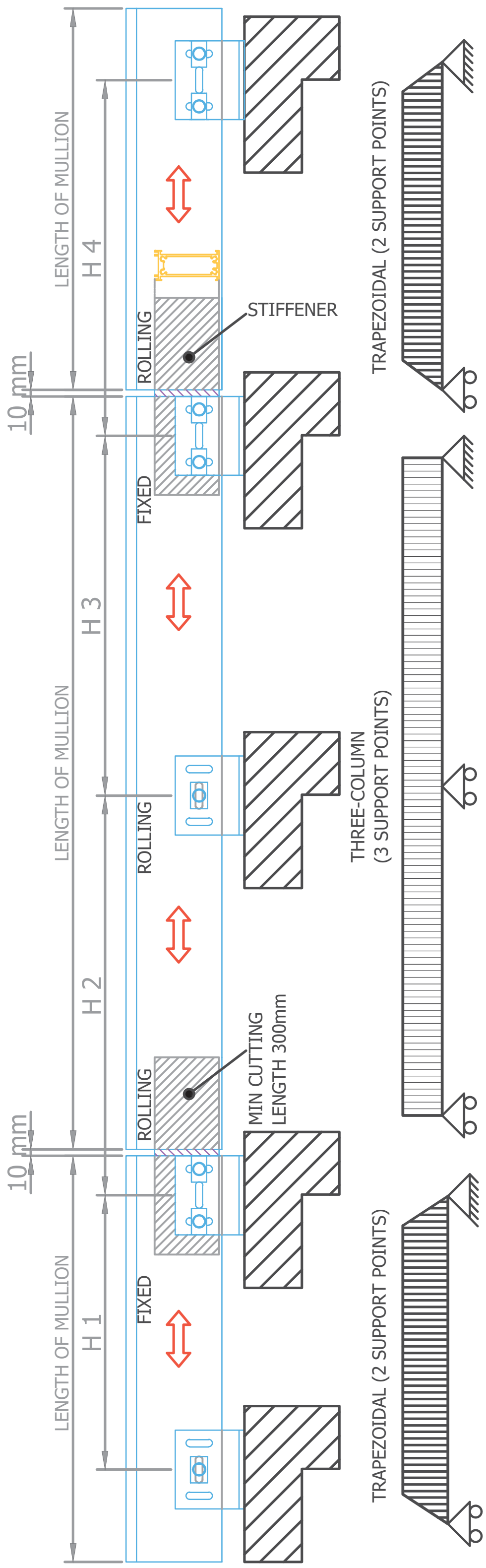
In case that is required to use fixing brackets other than those recommended by ALUFAR, their performance must be prooved by written structural calculation report.

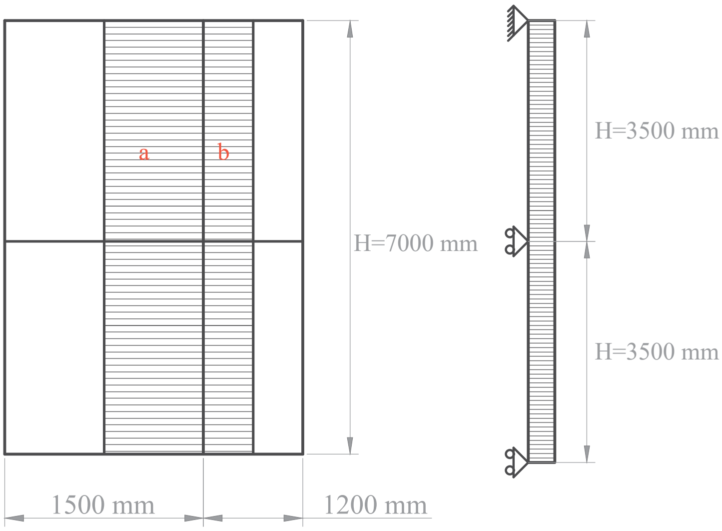
A mullion is **fixed permanently** only at **one** point and at **one or more points** in fixed in such way so that **dilatation not to be impaired**.

In case that the mullion is anchored at two points the load case is trapezoidal. However, in case that the mullion is anchored at three points the load case is rectangular.

IMPORTANT NOTE:

The distance between the fixing brackets, the number of fixing brackets, as well as any special requirements regarding stability of the facade must always be taken into consideration by the structural engineer responsible for the project, as the solutions presented in these pages are indicative.





Example 3

Installation height: 8 - 20 m
Wind load: 96 Kp/m²
Height : 3500 mm
Maximum deflection of insulating glass pane: 8 mm

From Table 4:

Distance between 2 mullions a',b'	Moment of Inertia
a' = 1.5 m	J_a = 44.7 cm^4
b' = 1.2 m	J_b = 35.8 cm^4

Required moment of inertia, **J_x**, is:
$J_x = J_a + J_b = 80.5\ cm^4$

As the wind load is 96Kp/m² the moment of inertia has to be multiplied by the correction factor 1.6:

$J_x = 80.5x1.6=128.8\ cm^4$

SELECTION OF THE PROPER MULLION

The selection of the proper aluminium section of a transom and/ or of a mullion is in accordance to DIN 18056, for a permissible deflection of H/300 in the distance between supports, considering the wind
pressure, the position and the height of the building,as stated in DIN 1055 part 4.

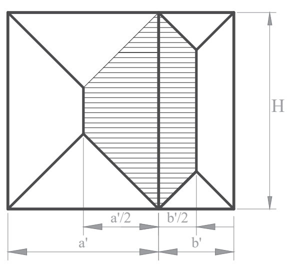
SELECTION OF THE PROPER MULLION, SUBJECTED TO WIND LOAD

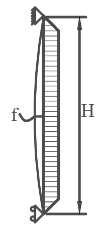
Type of loading: single span beam subjected to trapezoidal loading or triangular loading, twin span beam subjected to rectangular loading

TRAPEZOIDAL LOAD
The moment of inertia of a mullion, supported at two points, subjected to wind load is given by the following equation:

$$J_x = \frac{p\,(a'/2)\,H^4}{1920\,E_{al}\,f}\,10^8\left[25-40\,\frac{(a'/2)^2}{H^2}+16\,\frac{(a'/2)^4}{H^4}\right]\ \text{cm}^4 \qquad (1)$$

Jx	= Moment of inertia	cm^4
p	= Wind pressure	Kp/m²
a' , b'	= Distance between mullions	m
H	= Distance between supports	m
E_{al}	= Modulus of elasticity	Kp/m²
f	= Deflection	m

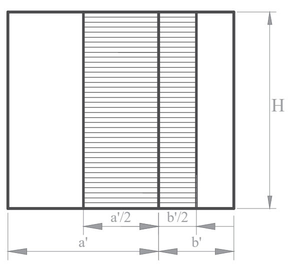


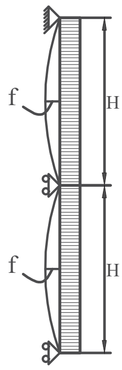


Always f < H/300
and f < 0.008 m

RECTANGULAR LOAD
The required moment of inertia of a mullion, supported at three points, subjected to wind load is given by the following equation:

$$J_x = \frac{p\times(a'/2)\times H^4\times 10^8}{185\times E_{al}\times f}\ \text{cm}^4 \qquad (2)$$





Jx	= Moment of inertia	cm^4
p	= Wind pressure	Kp/m²
a' , b'	= Distance between mullions	m
H	= Distance between fixing brackets	m
E_{al}	= Modulus of Elasticity	Kp/m²
f	= Deflection	m

Always f < H/300
and f < 0.008 m

SELECTION OF THE PROPER MULLION

If the required moment of inertia J_x is to be determined for a deflection other than H/300, e.g between the edges of the glass panes, the the moment of inertia which has been evaluated must be corrected by the following factor:

$$\frac{H}{300 \times f_{permissible}} \quad (3)$$

If, because of the division by transoms, the deflection limit has to be complied within the case of the longest glass edge (H_g) in the frame, the required moment of inertia must be corrected by the following factor:

$$\frac{H}{300 \times f_{permissible}} \times \left(\frac{H_g}{H}\right)^2 \quad (4)$$

In tables 2 and 4 the required moment of inertia J_x was evaluated for a wind load of 60 Kp/m² and deflection H/300.

The assumptions on the following examples are:

- Deflection: f = H/300 & 0.008 m
- Modulus of Elasticity of Aluminium: $E = 7 \times 10^9$ Kp/m²

Tables 2 and 4 list the required moment of inertia J_x for wind pressure of 60 Kp/m²
In the case of different wind load, conversion is necessary. Tables 1 and 3 include conversion factors for different wind loads.

SELECTION OF THE PROPER TRANSOM

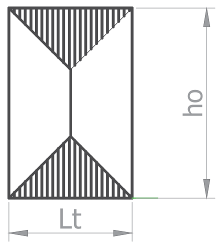
The transom is subjected both to wind load,self load (caused by its own weight) and the weight of the infill, such as glazing, panels etc.

SELECTION OF THE PROPER TRANSOM, SUBJECTED TO WIND LOAD

The moment of inertia of a transom subjected to wind load is given by the following equations:

α) $\frac{L_t}{h_o} \leq 1$

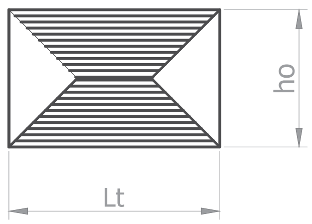
$$J_x = \frac{p \times \left(L_t/2\right) \times L_t^4 \times 10^8}{120 \times E_{al} \times f} \quad cm^4 \quad (5)$$



$\frac{L_t}{h_o} \leq 1$

β) $\frac{L_t}{h_o} > 1$

$$J_x = \frac{p \left(h_o/2\right) L_t^4}{1920 \; E_{al} f} \, 10^8 \left[25 - 40 \frac{\left(h_o/2\right)^2}{h_o^2} + 16 \frac{\left(h_o/2\right)^4}{h_o^4} \right] \quad cm^4 \quad (6)$$



$\frac{L_t}{h_o} > 1$

Jx	= Moment of inertia	cm^4
p	= Wind pressure	Kp/m²
Lt	= Lenght of transom	m
E	= Modulus of Elasticity	Kp/m²
f	= Deflection	mm

Always f < H/300
and f < 0.008 m

CALCULATION OF THE REQUIRED GLASS PANE THICKNESS

The required pane thickness is given by the following equations:

α) For $H_g/L_g \leq 3$ $\quad t = \sqrt{\frac{10 \times L_g \times H_g \times p}{72}}$ (mm) (7)

β) For $H_g/L_g > 3$ $\quad t = \frac{L_g \times \sqrt{10 \times p}}{4.9}$ (mm) (8)

where:

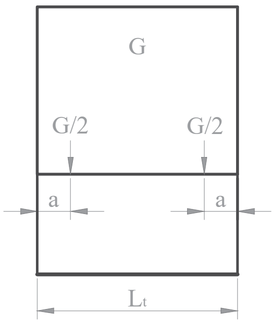
t	= Minimum theoretical thickness	mm
p	= Wind pressure	Kp/m²
L_g	= The smallest dimension of the glass pane	m
H_g	= The largest dimension of the glass pane	m

In the case of selection of double thermal insulating glazing, the t**otal thickness of the glazing is equal to the** t**h**e **thickness of a single glass pane** (evaluated using the above equations) multiplied by **1.5**, while for triple glazing by **1.7**. The specific weight of glass is 2.5 Kp/m²x mm

SELECTION OF THE PROPER TRANSOM

SELECTION OF THE PROPER TRANSOM SUBJECTED BOTH TO THE WEIGHT OF THE OVERHEAD GLASS PANE, AS WELL AS, TO SELF LOAD

1) The required moment of inertia of a transom due to the weight of the glazing is given by:



$$J_{y1} = \frac{G \times a \times 10^8}{48 \times E_{al} \times f_1}\left(3L_t^{\,2} - 4a^2\right) \quad cm^4 \quad (9)$$

where:

G	= weight of glass pane	Kp
f_1	= $L_t/300$ και $f_1<0.003$	m
Lt	= Length of transom	m

Suggested distance (ɑ) of the setting blocks of the glass pane : ά= 0.150 m

2) The required moment of inertia of a transom subjected to self weight loading is given by:

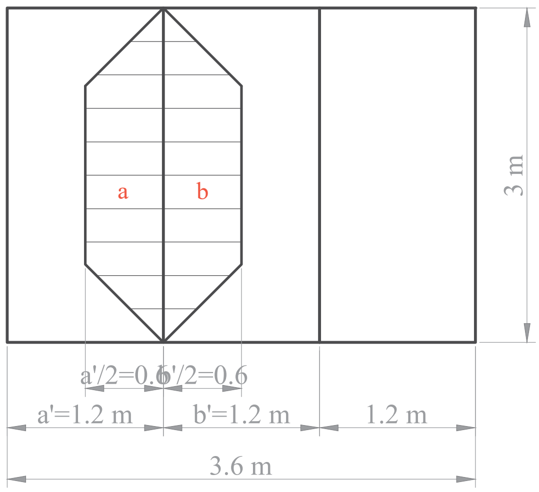
$$J_{y2} = \frac{5 \times q \times L_t^{\,4} \times 10^8}{384 \times E_{al} \times f_2} \quad cm^4 \quad (10)$$

q	= Weight of transom per linear meter	Kp/m
L_t	= Length of the transom	m
f_2	= $L_t/300$ and <0.003	m

Total required moment of inertia J_y:

$$J_y = J_{y1} + J_{y2} \quad cm^4 \quad (11)$$

ATTENTION: PLEASE NOTE THAT THE ABOVE CALCULATIONS ARE INDICATIVE AND DO NOT FORM A COMPLETE STRESS ANALYSIS



Example 1

Installation height: 8 - 20 m
Wind load: 96 Kp/m²
Height : 3 m
Maximum deflection of insulating glass pane: 8 mm

From table 2 to determine the required moment of inertia:

Distance between 2 mullions a',b'	Moment of Inertia
a' = 1.2 m	J_a = 50.8 cm^4
b' = 1.2 m	J_b = 50.8 cm^4

Required moment of inertia, **J_x**, is:
$J_x = J_a + J_b = 101.6\ cm^4$

As the wind load is 96Kp/m² the moment of inertia has to be multiplied by the correction factor 1.6:
$Jx = 101.6x1.6=162.6\ cm^4$

The maximum bending arrow f is required to be 8 mm, so it must be checked if the required moment of inertia must be increased:

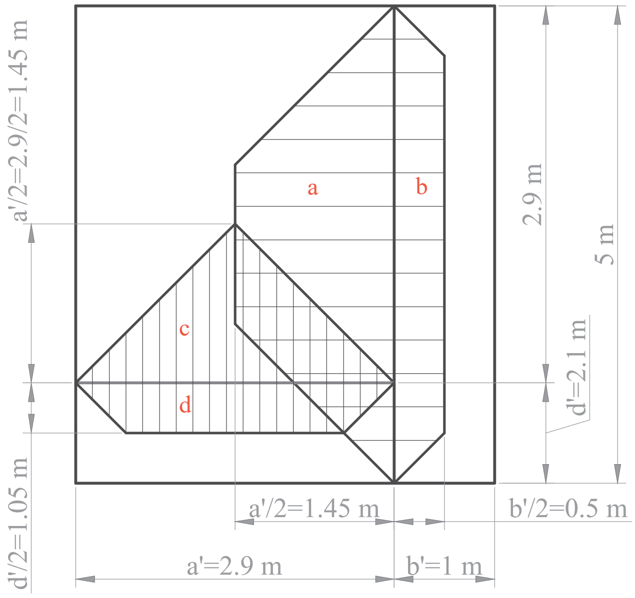
Correction factor for pane edge :

$$\frac{H}{300 \times f_{permissible}} = \frac{300}{300 \times 0.8} = 1.25 > 1$$

Since the correction factor is >1 therefore, is necessary to increase the required moment of inertia

$Jxreq = 1.25xJ_x = 203.2\ cm^4$

The mullion that can be used is the following:
E-85104 (Jx=252.5 cm^4, Jy=38 cm^4)



Example 2

Selection of required transom in a complex construction

Installation height: 0 - 8 m
Wind load: 60 Kp/m^2
Height of structure : 5 m
Maximum dimension of the glass pane H_g : 2.9 m
Maximum distance between mullions: 2.9 m
Maximum deflection of insulating glass pane: 8 mm

1. Determination of required moment of inertia for the mullion

From table 2:

Distance between 2 mullions a',b'	Moment of Inertia
a' = 2.9 m	J_a = 528 cm^4
b' = 1 m	J_b = 205.9 cm^4

The required moment of inertia is: $J_x = J_a + J_b = 733.9\ cm^4$

Because of the division by transoms, the deflection limit has to be complied within the case of the longest glass edge in the frame, the required moment of inertia must be corrected by the following factor:

$$\frac{H}{300 \times f_{permissible}} \left(\frac{H_g}{H}\right)^2 = \frac{500}{300 \times 0.8} \left(\frac{290}{500}\right)^2 = 0.7 < 1$$

Since the correction factor is <1 therefore, no correction is required

2. Determination of the required moment of inertia of the transom subjected to wind load

As L/ho=1 (2.9/ 2.9=1) the load is triangular, therefore the moment of inertia is evaluated from equation (5).

$$J_c = \frac{60 \times \left(2.9/2\right) \times 2.9^4 \times 10^8}{120 \times 7 \cdot 10^9 \times \left(2.9/300\right)} = 75.8\ cm^4$$

As $L/h_o > 1$ (2.9/ 2.1=1) the load is trapezoidal, therefore the moment of inertia J_d is evaluated from equation (6).

$$J_d = \frac{60 \times 1.05 \times 2.9^4}{1920 \times 7 \cdot 10^9 \times \left(2.9/300\right)} 10^8 \left[25 - 40\ \frac{1.05^2}{2.9^2} + 16\ \frac{1.05^4}{2.9^4}\right] = 68.7\ cm^4$$

The required moment of inertia is: $J_x = J_c + J_d = 144.5\ cm^4$

Calculation of the required glass pane thickness

$$\left(\frac{H_g}{L_g}\right) = \frac{2.9}{2.9} = 1 < 3$$

Since H/L < 3:

$$t = \sqrt{\frac{10 \times L_g \times H_g \times p}{72}} = \sqrt{\frac{10 \times 2.9 \times 2.9 \times 60}{72}} \Rightarrow t = 8.4mm$$

As double thermal insulating glazing will be used, the thickness of the single pane must be multiplied by 1.5:

$$t_{final} = 1.5 \times 8.4 = 12.6\ \ mm \Rightarrow t_{final} \approx 13\ \ mm$$

Weight of the glass pane, G, is calculated as follows :

$$G = t \times \rho_{glass} \times L \times H \qquad G = 13 \times 2.5 \times 2.9 \times 2.9 = 273.3\ \ Kp$$

Required moment of inertia for a transom subjected to the weight of the glass pane:

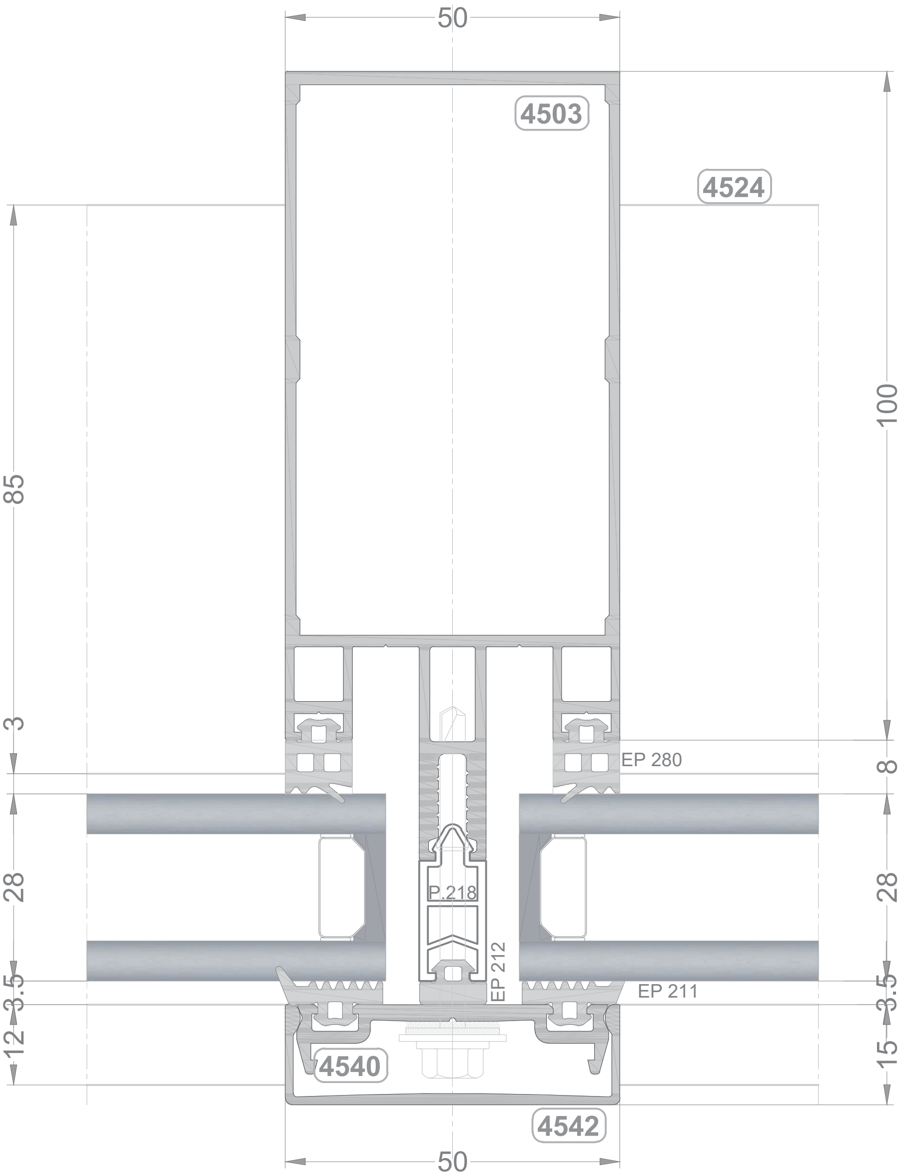
$$J_{y1} = \frac{G \times a \times 10^8}{48 \times E_{al} \times f_1}\left(3L_t^2 - 4a^2\right) \qquad J_{y1} = \frac{273.3 \times 0.15 \times 10^8 \times (3 \times 2.9^2 - 4 \times 0.15^2)}{48 \times 7 \times 10^9 \times 0.003} = 102.3\ \ cm^4$$

As there is no available transom with $J_y=102\ cm^4$ is required to reinforce the transom having the maximum moment of inertia Jy with a hollow steel section.In case that is required to use a 'fit in' transom, E-85307 has the greatest moment of inertia Jy ($J_x=398.7\ cm^4$, $J_y=42.5\ cm^4$). The steel section that can be used for reinforcment has dimensions 100x40x5 mm ($J_x=141.1\ cm^4$ $J_y=31.5\ cm^4$).
As the modulus of Elasticity of steel is 3 times greater than the modulus of elasticity of aluminium:
$J_y' = 31.5 \times 3 = 94.5\ cm^4$

The combined section has a moment of inertia:
$J_y'' = J_{ytransom} + J_y' = 42.5 + 94.5 = 137\ cm^4$

DETAILS

CLASSIC LINE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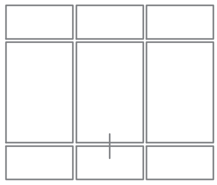

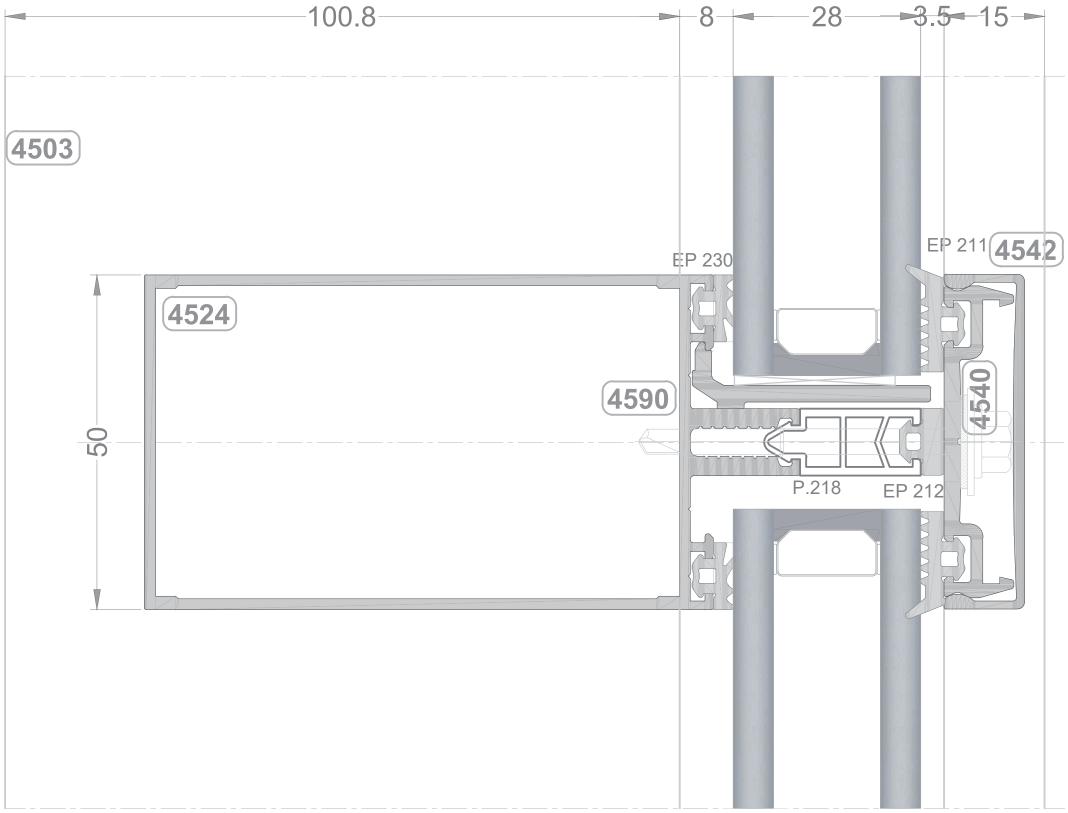
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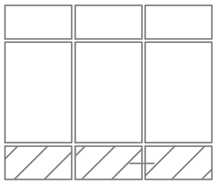

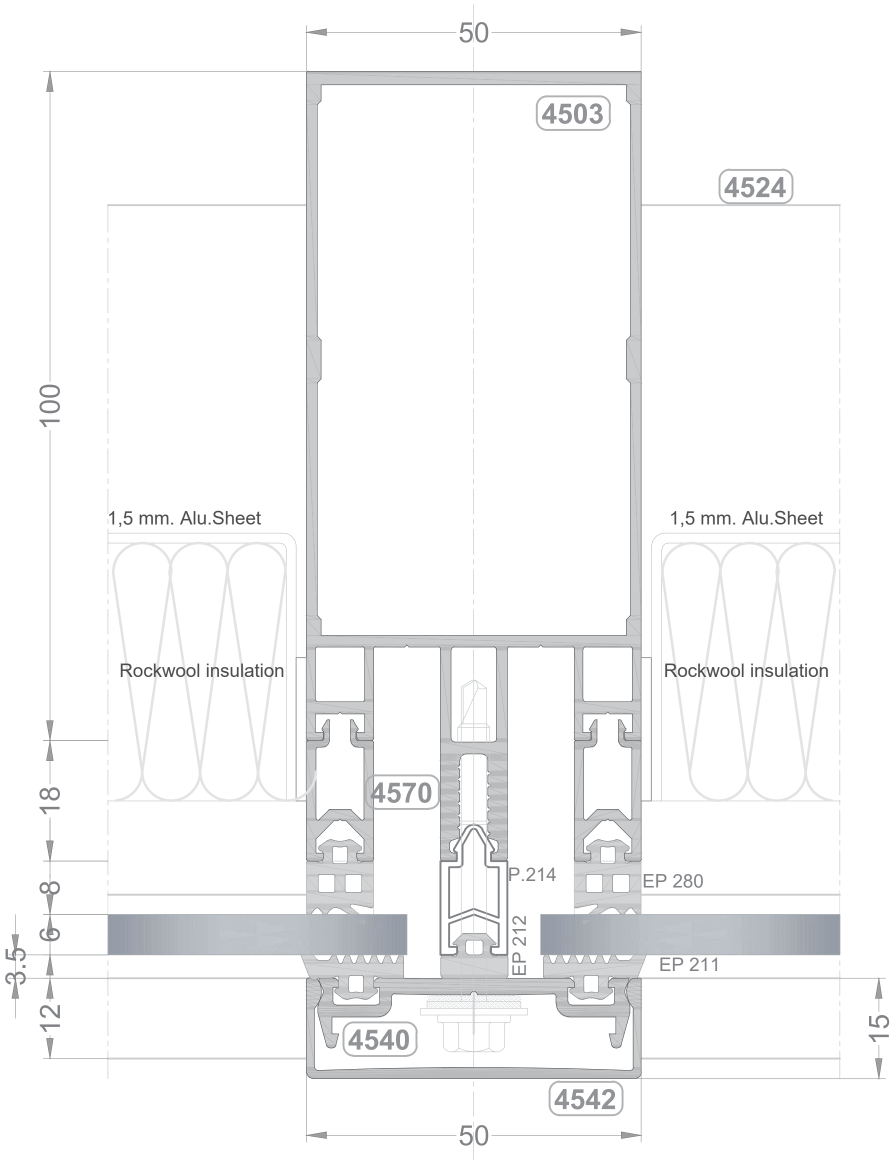
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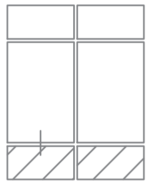

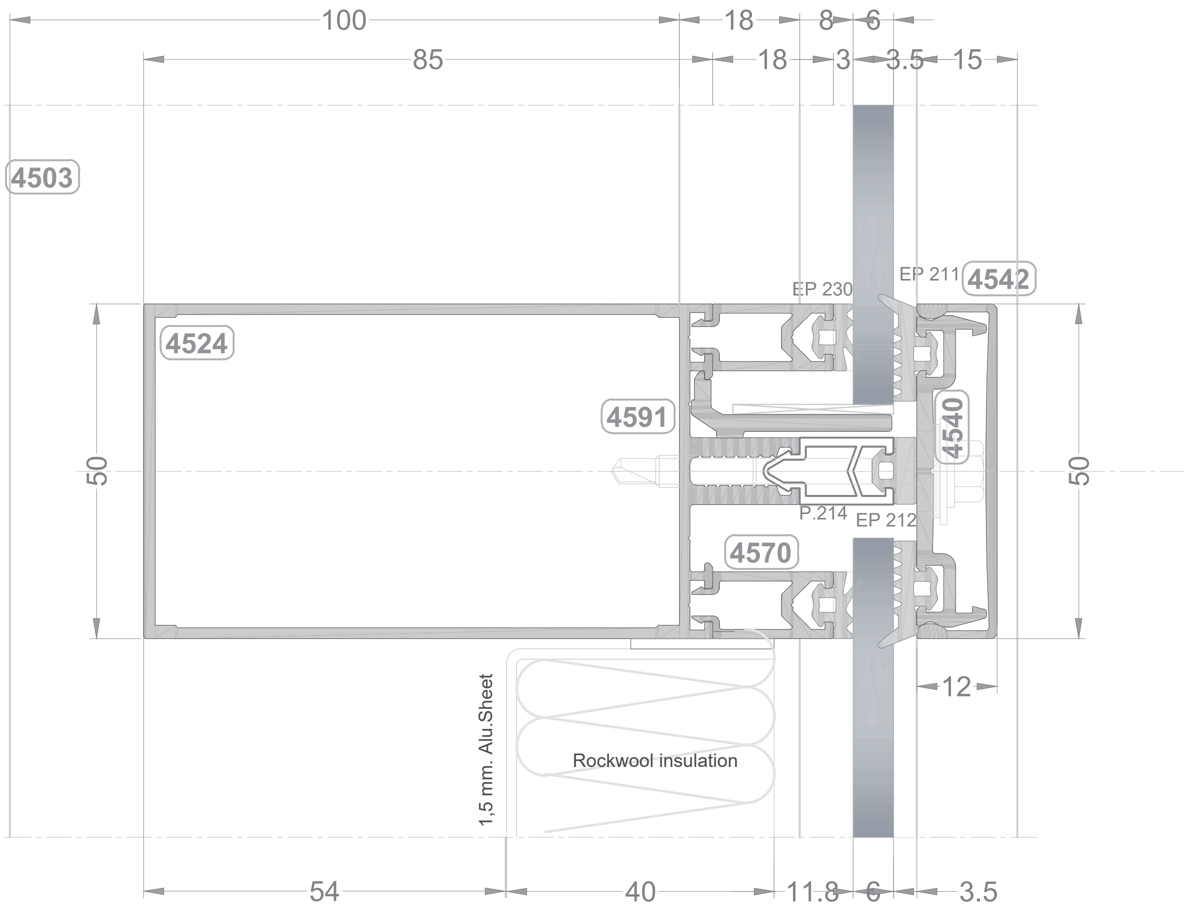
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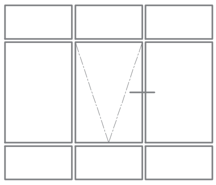

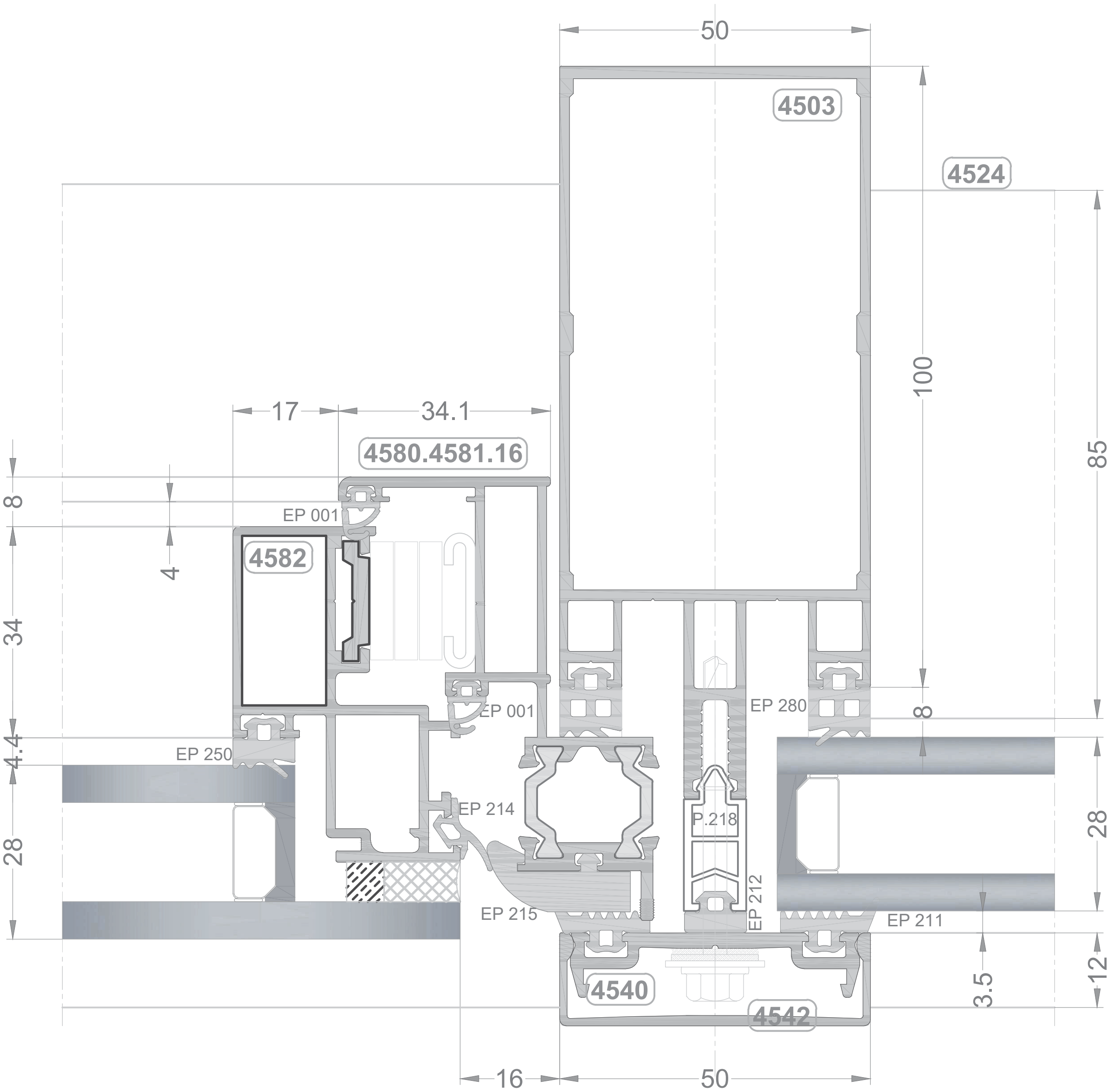
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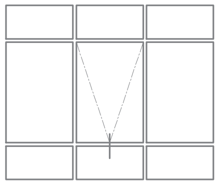

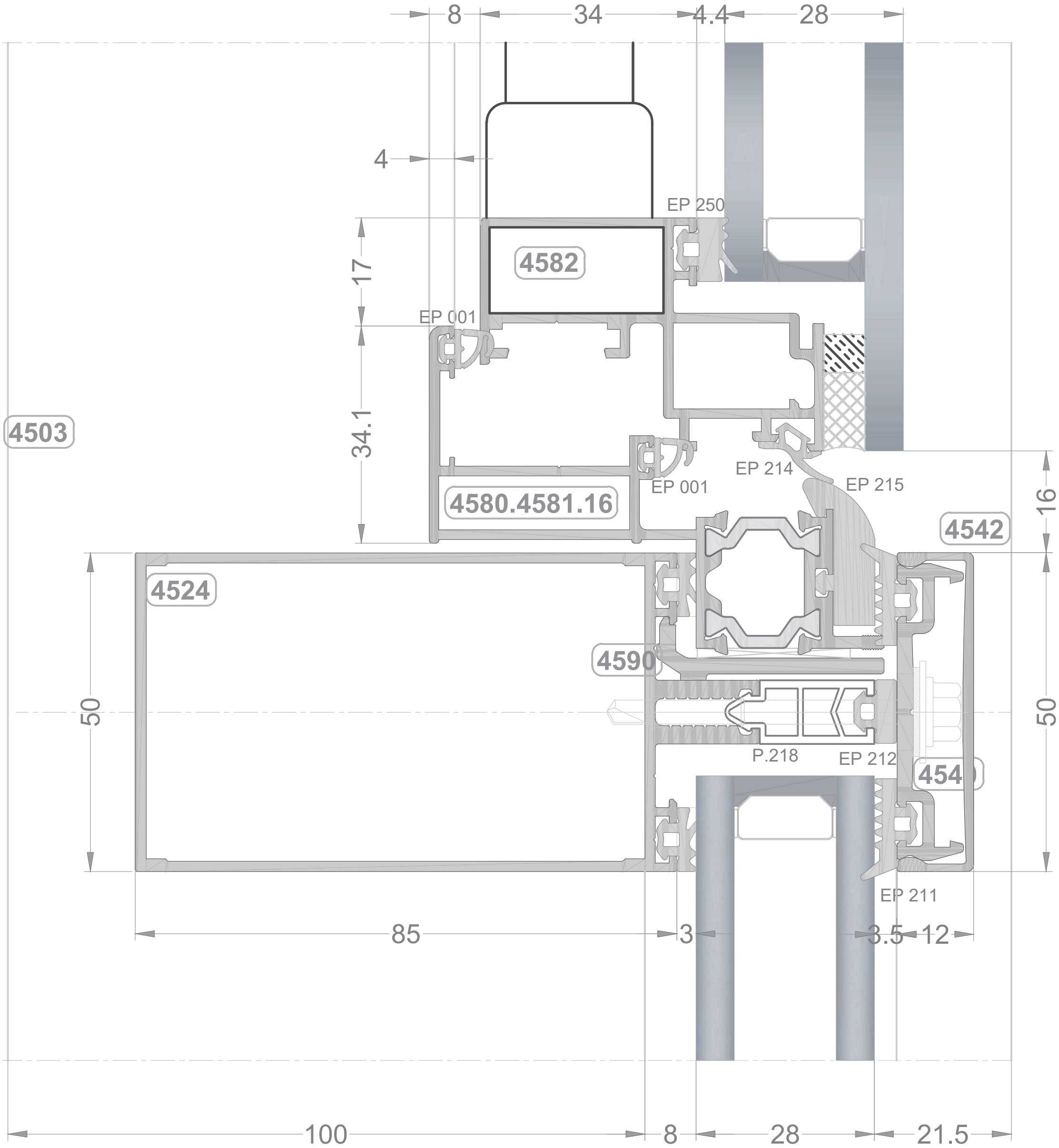
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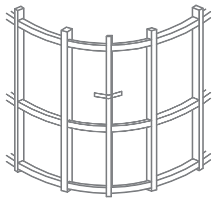

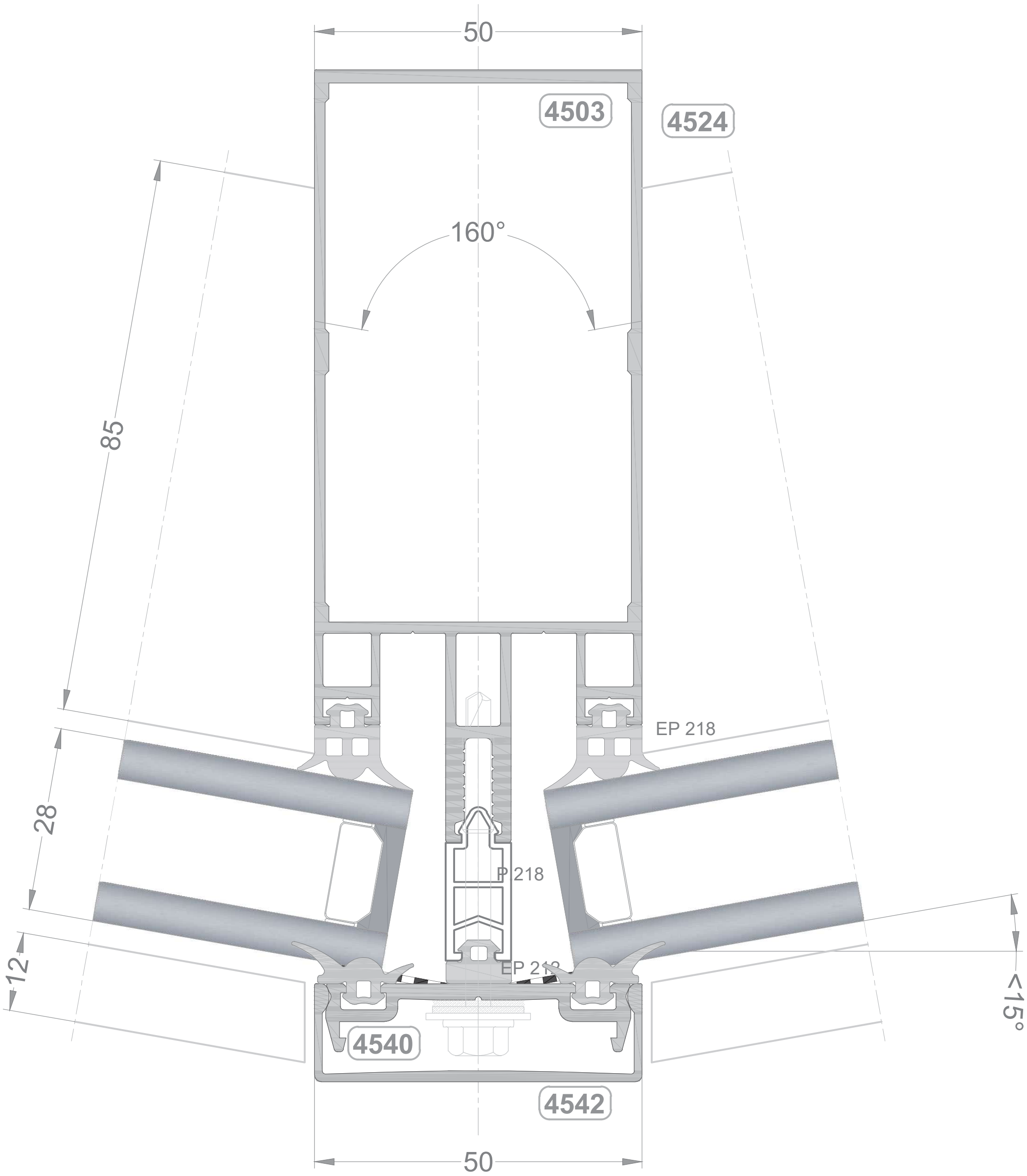
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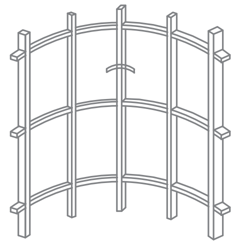

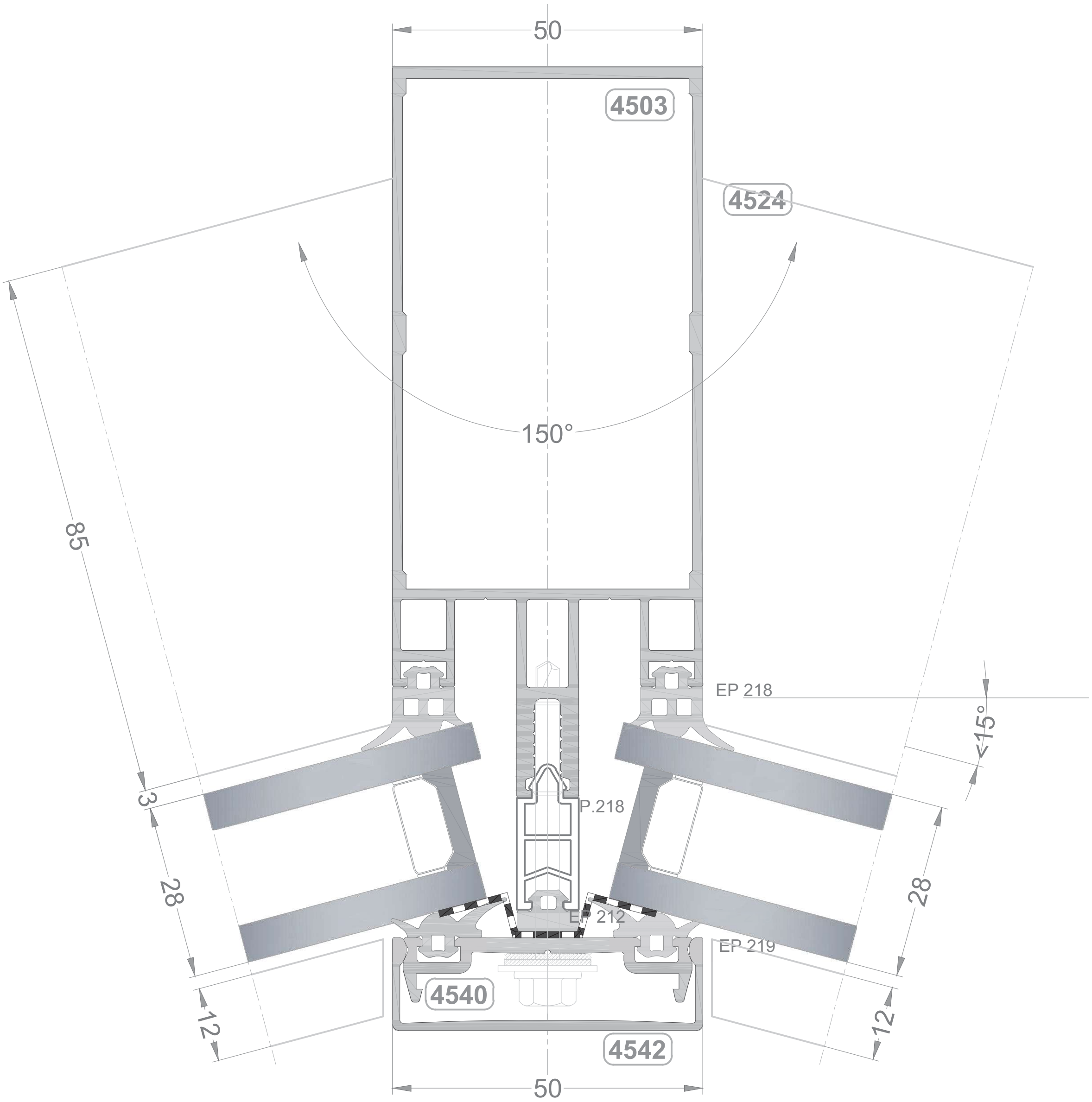
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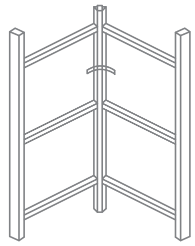

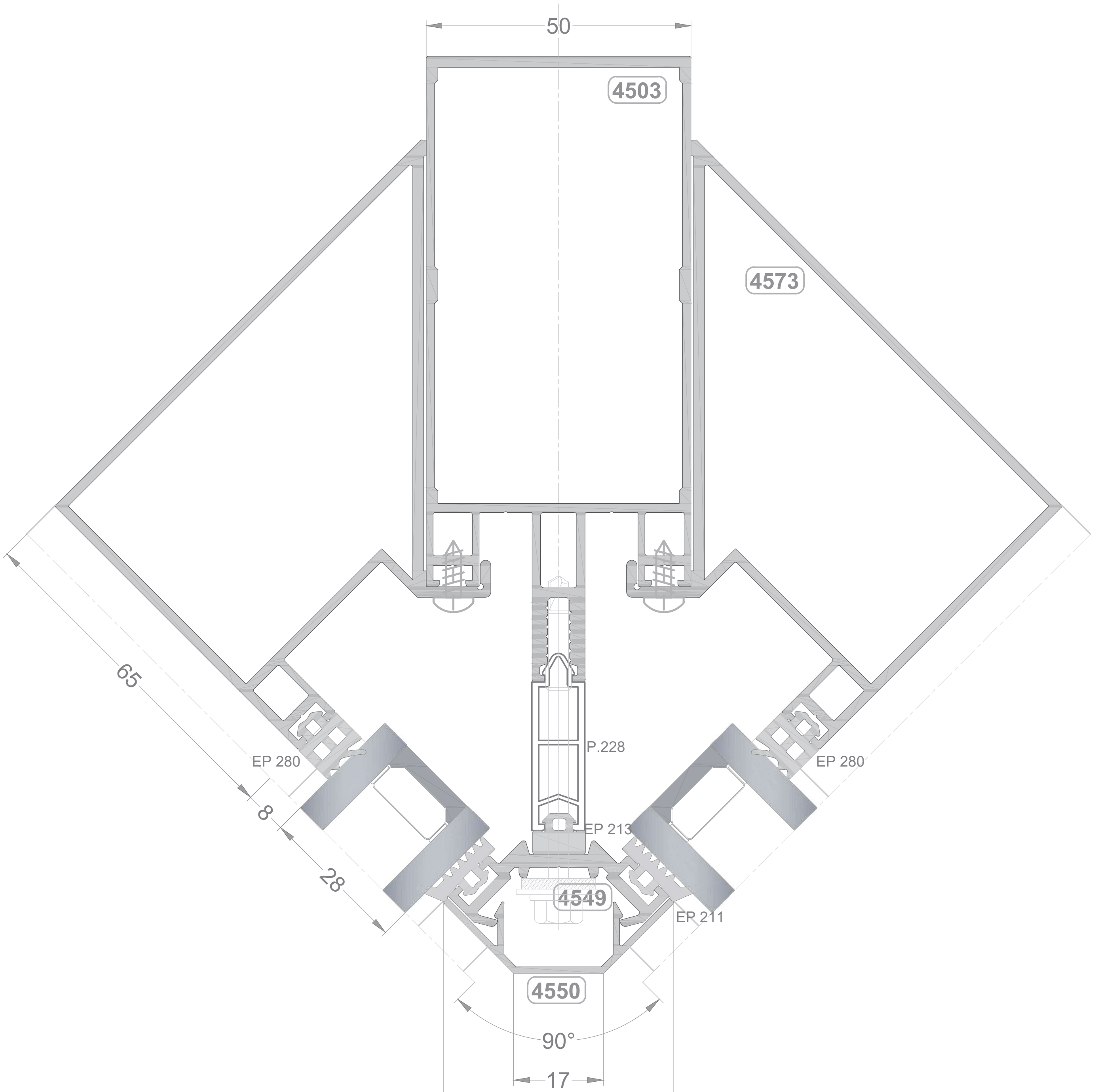
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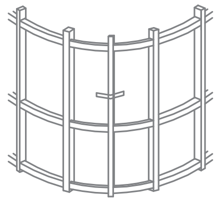

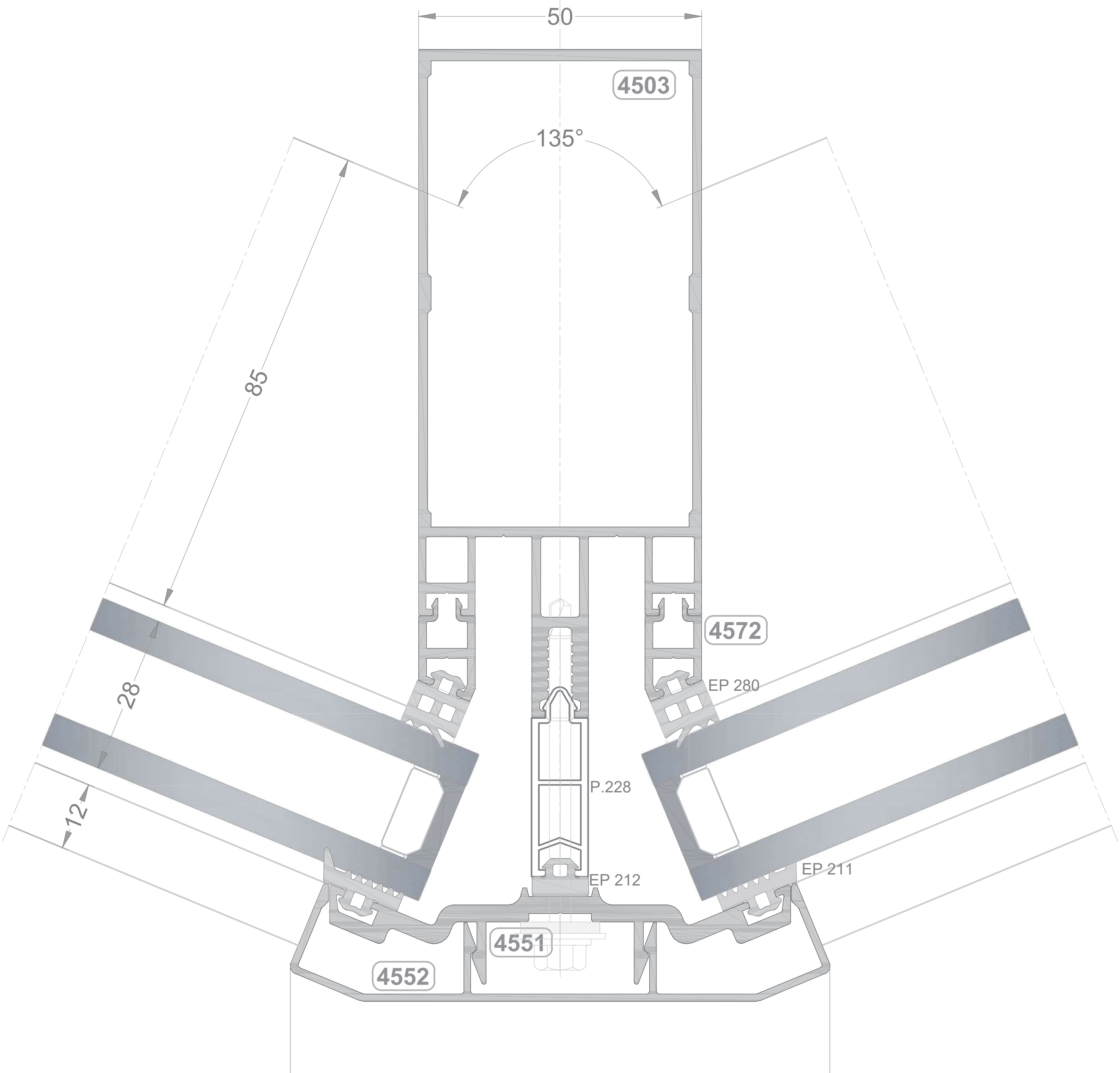
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EP 212
EP 211
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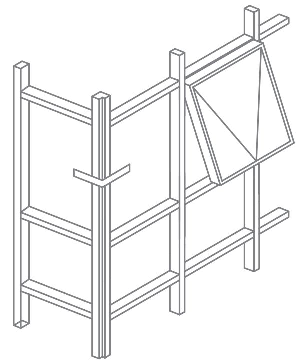

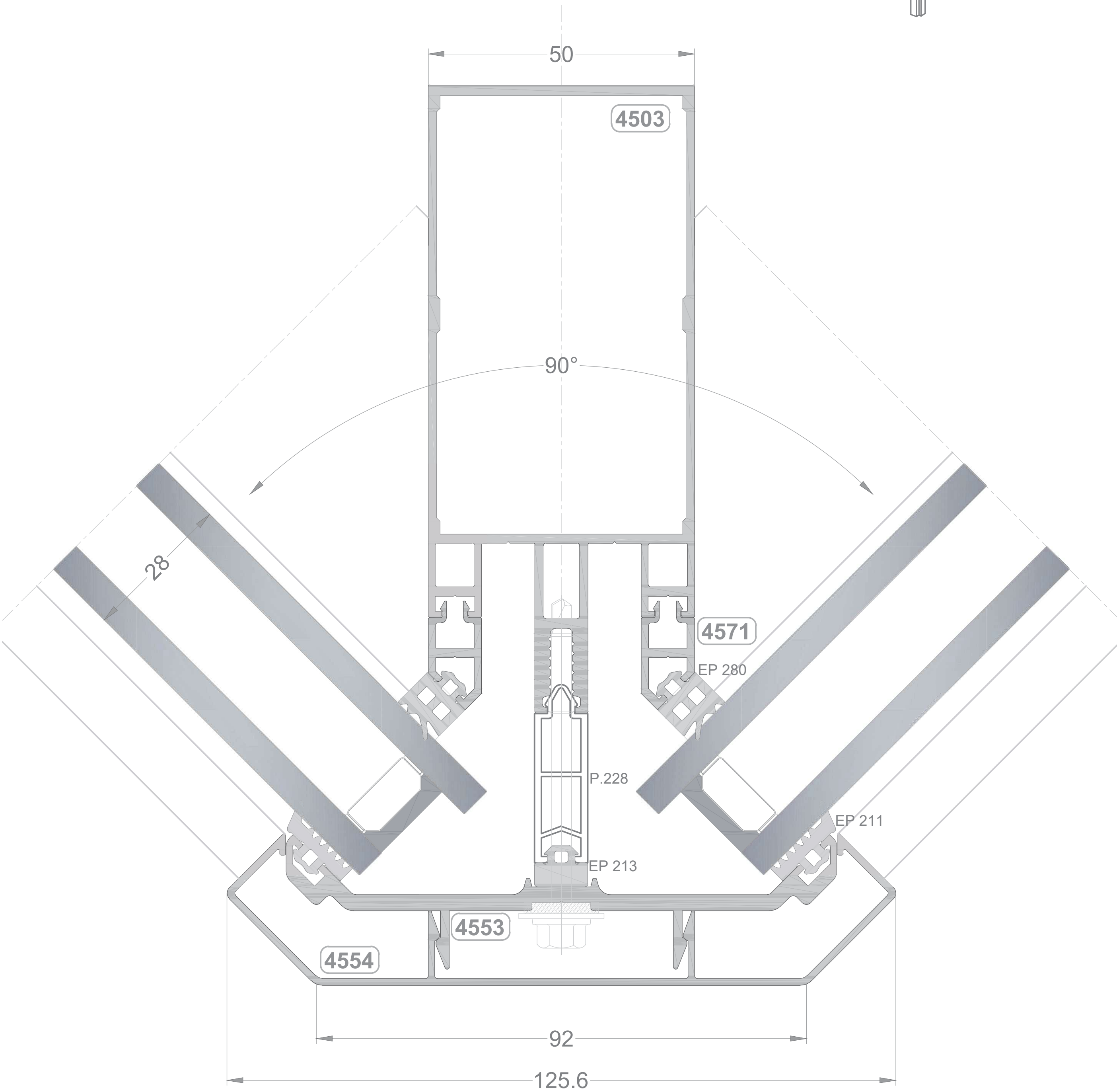
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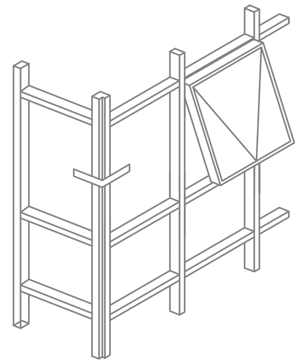

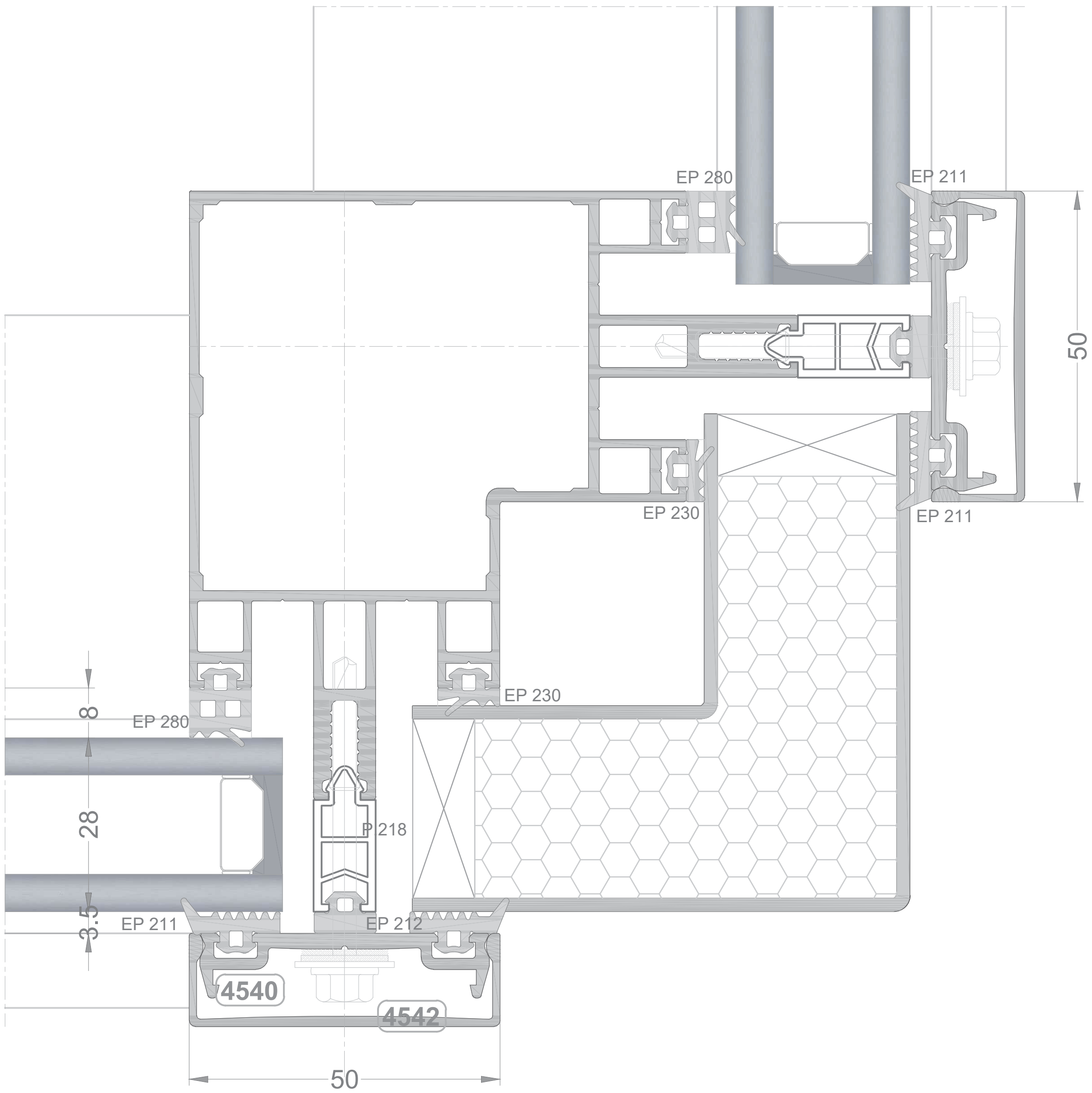
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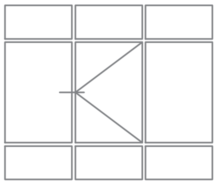

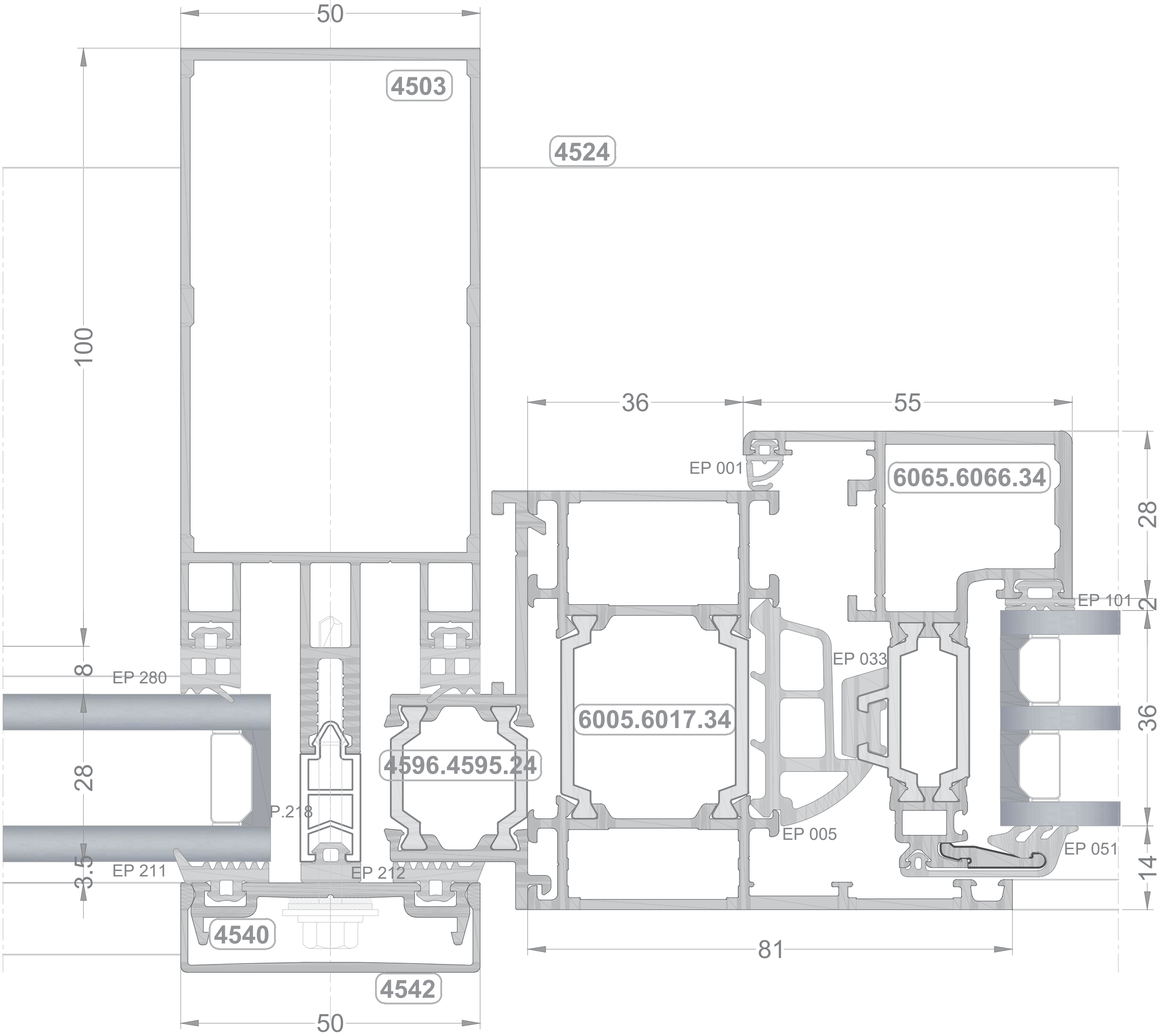
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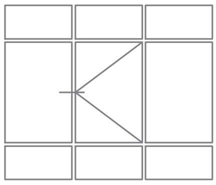

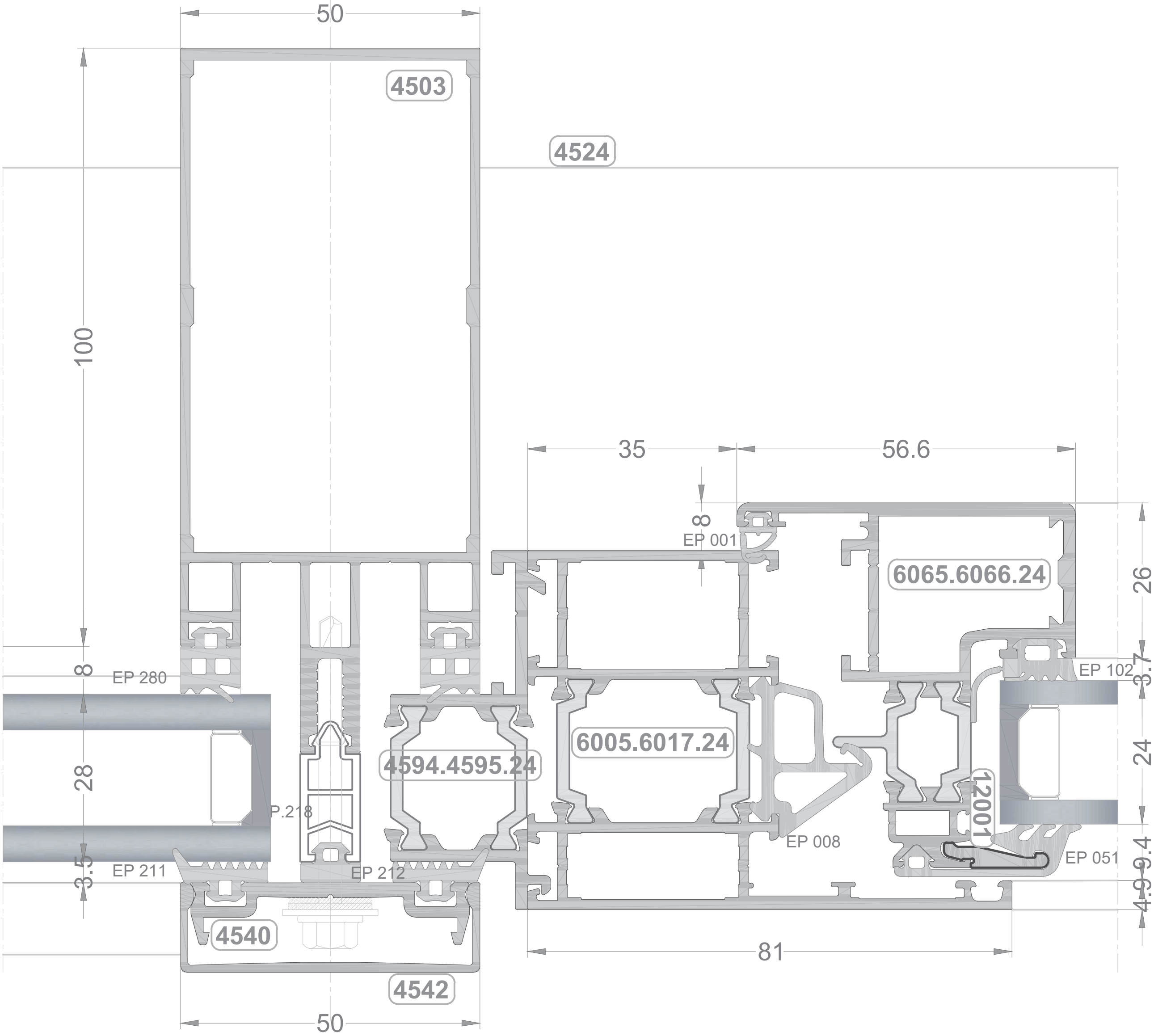
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6005.6017.24
28
24
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EP 211
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3.5
9.4
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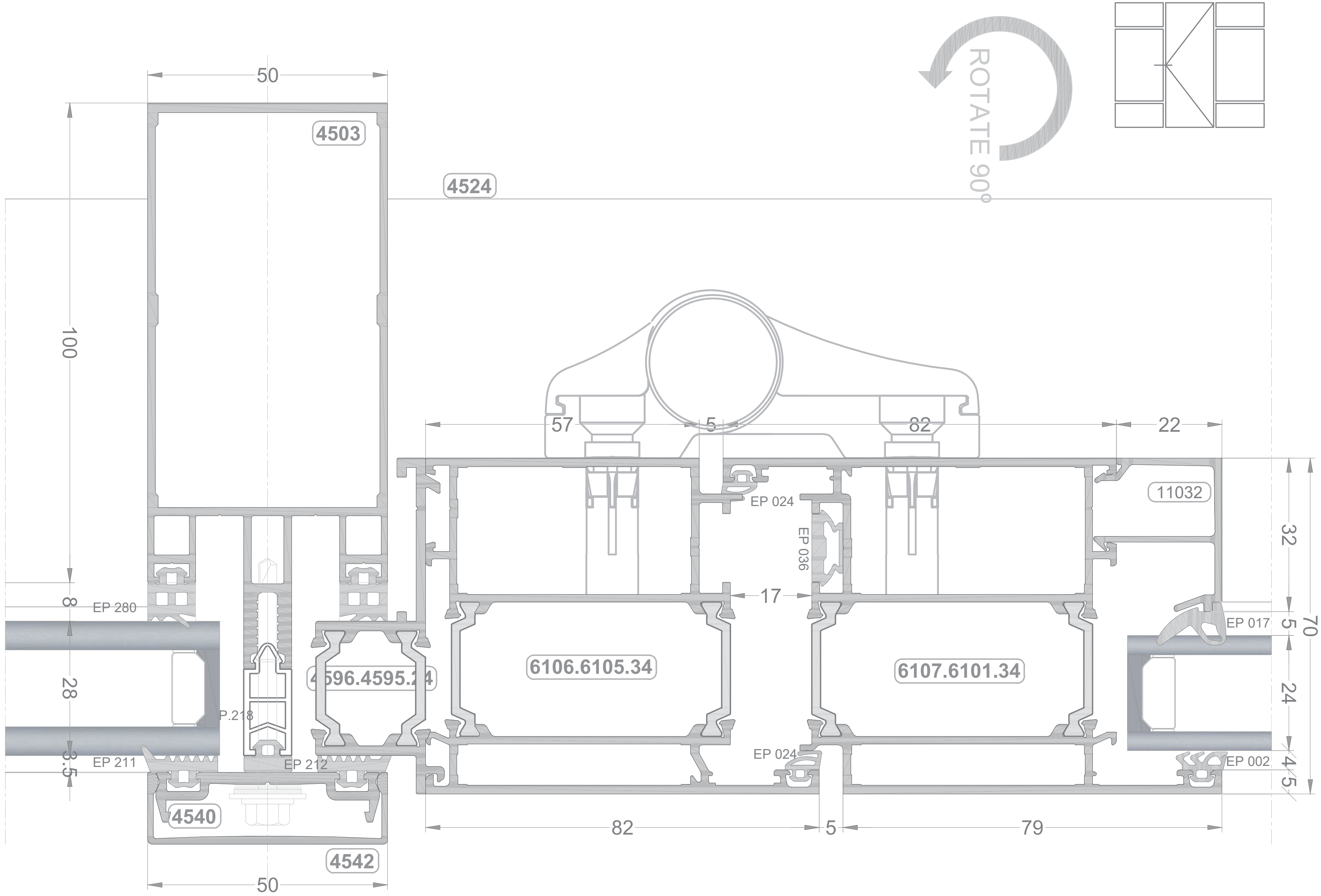

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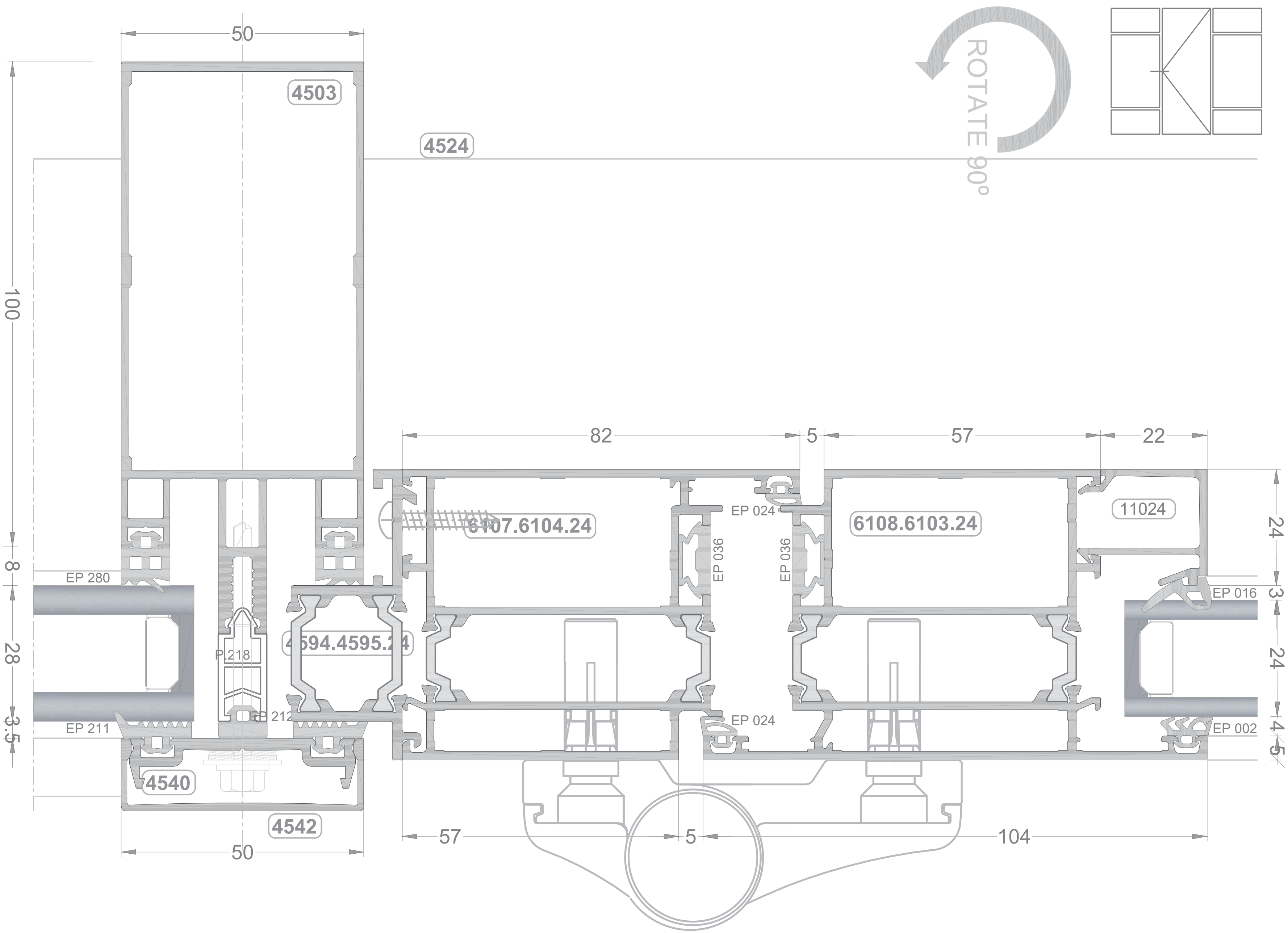

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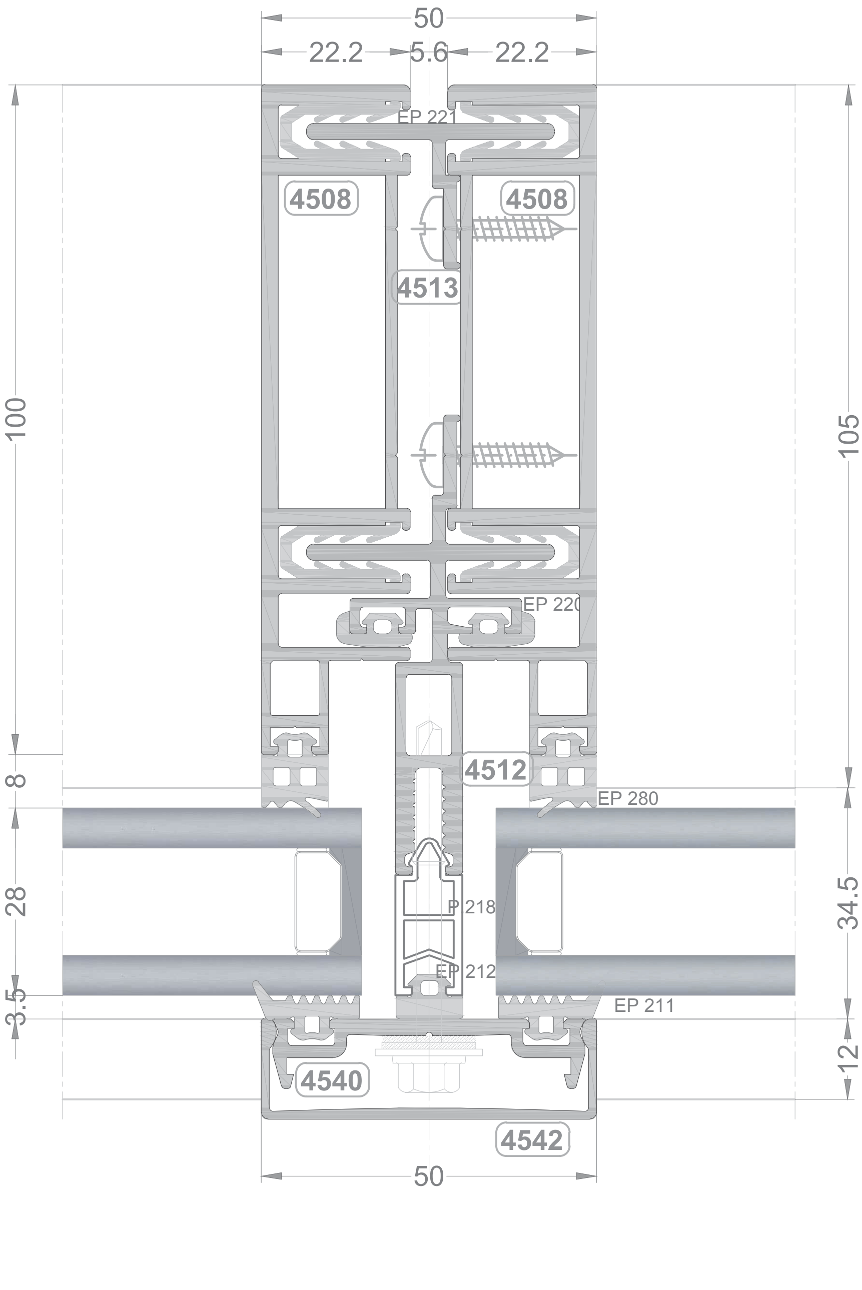
/DETAILS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105
EP 220
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P 218
34.5
EP 212
3.5
EP 211
12
4540
4542
50

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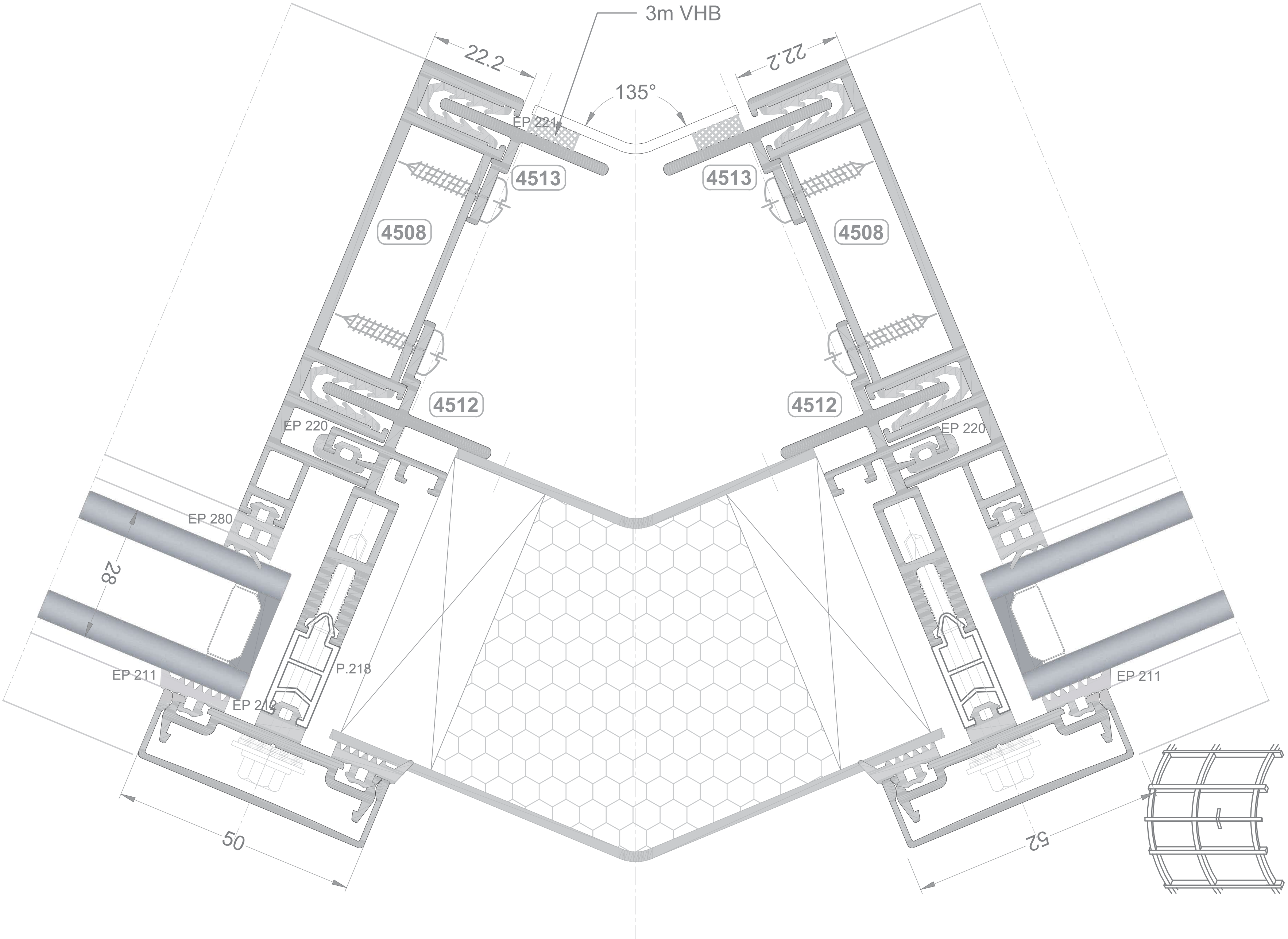
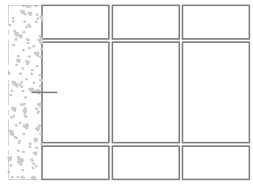
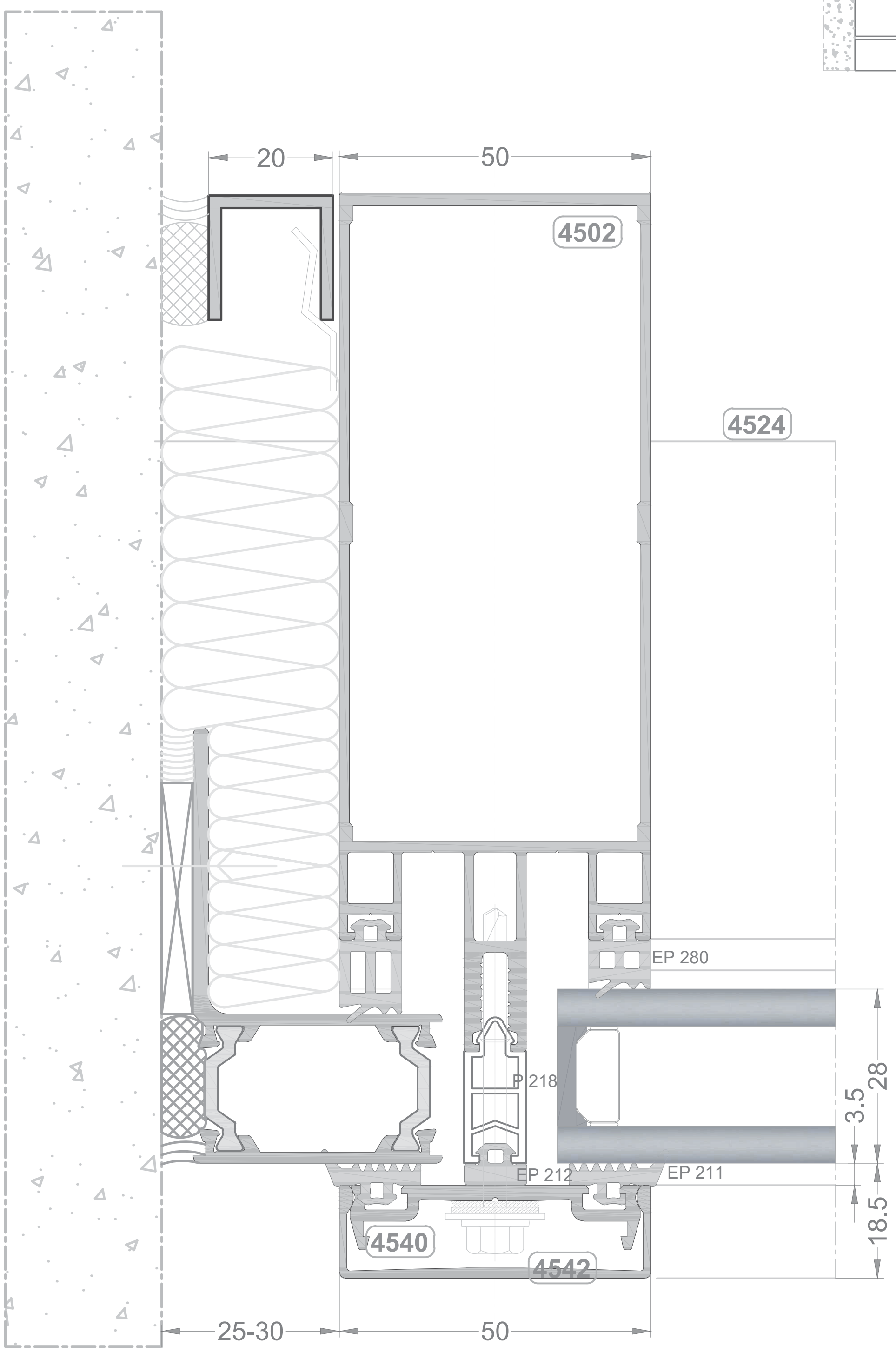
/DETAILS






20
50
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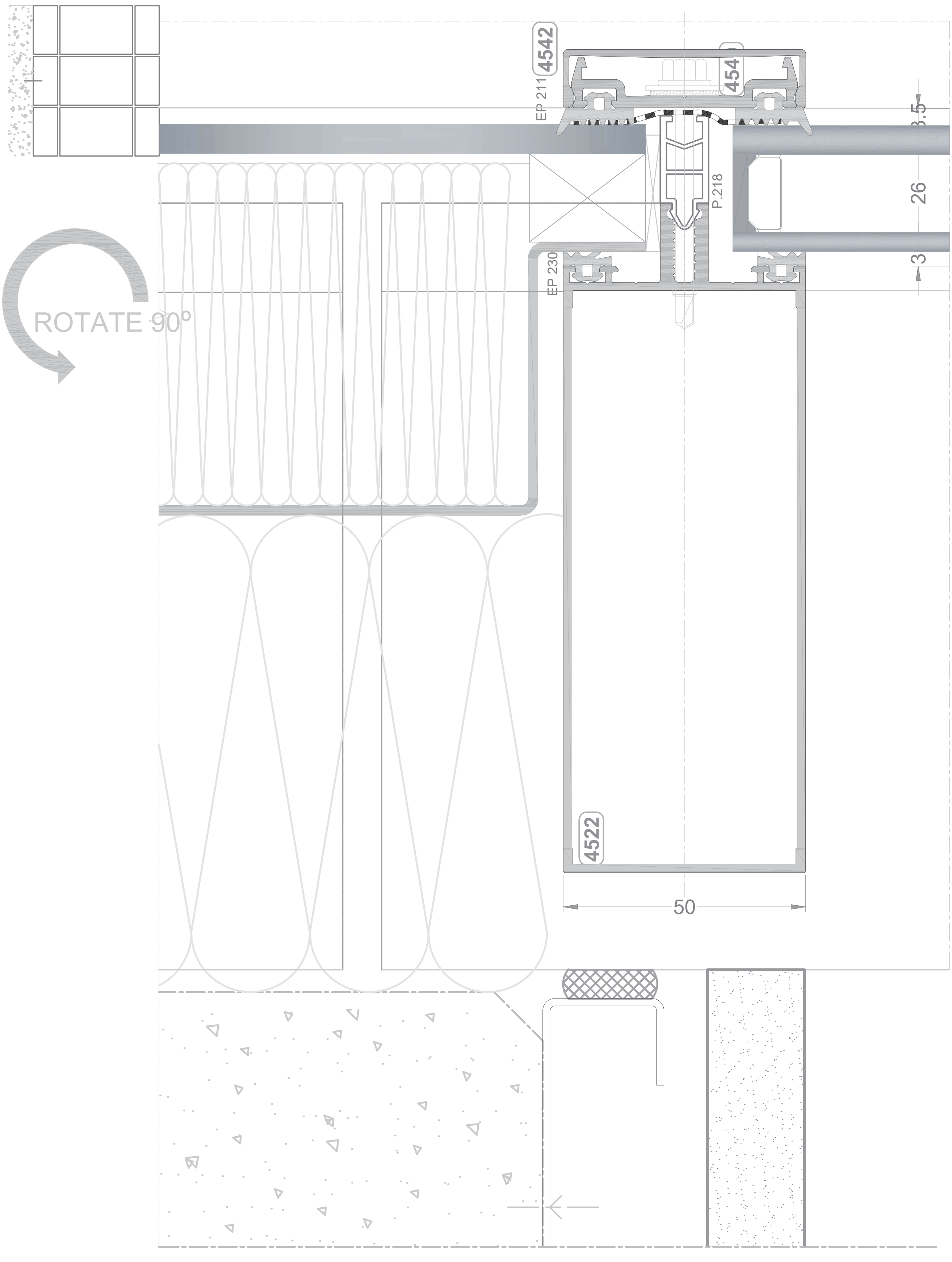
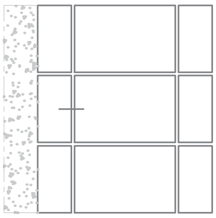
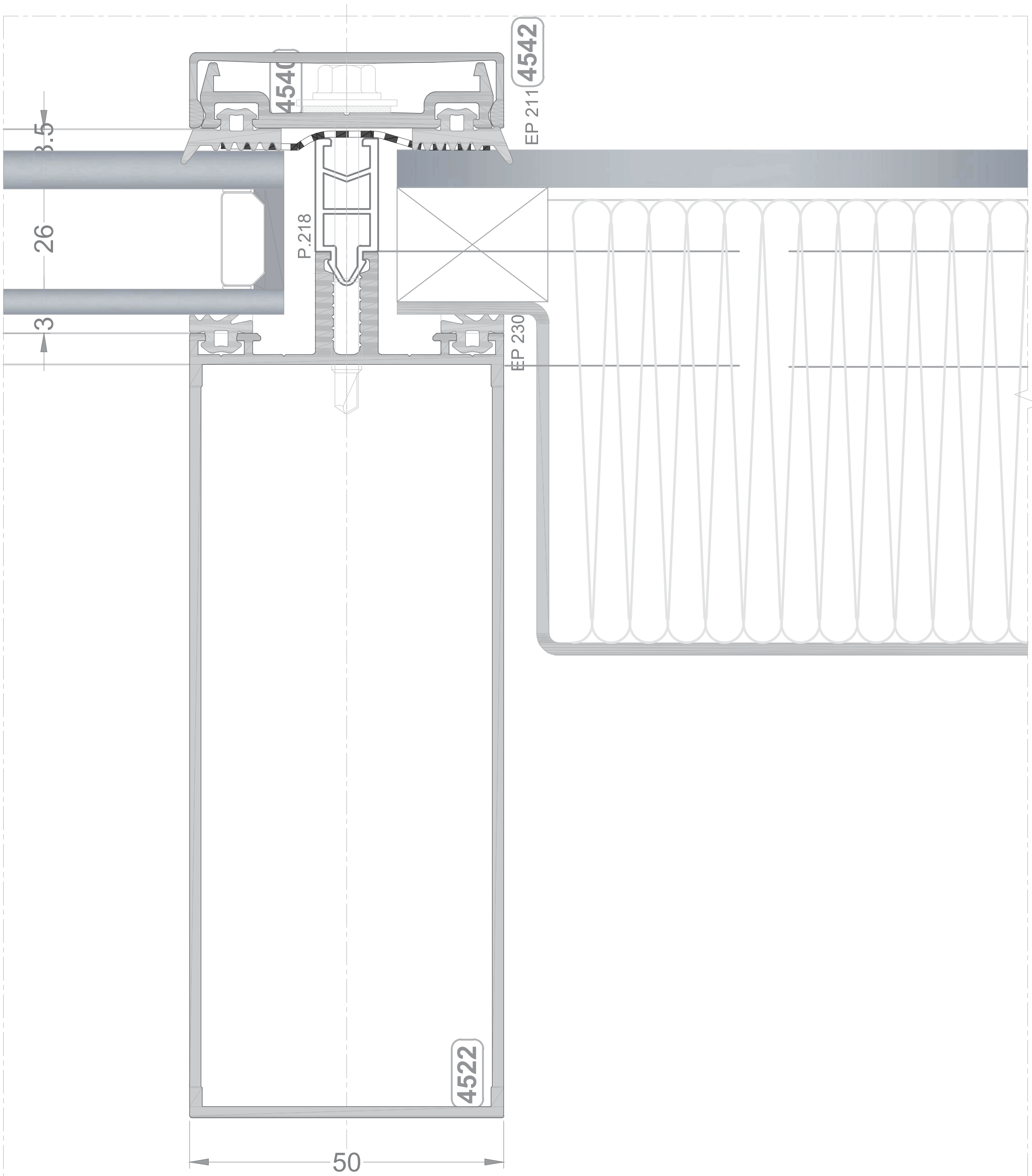
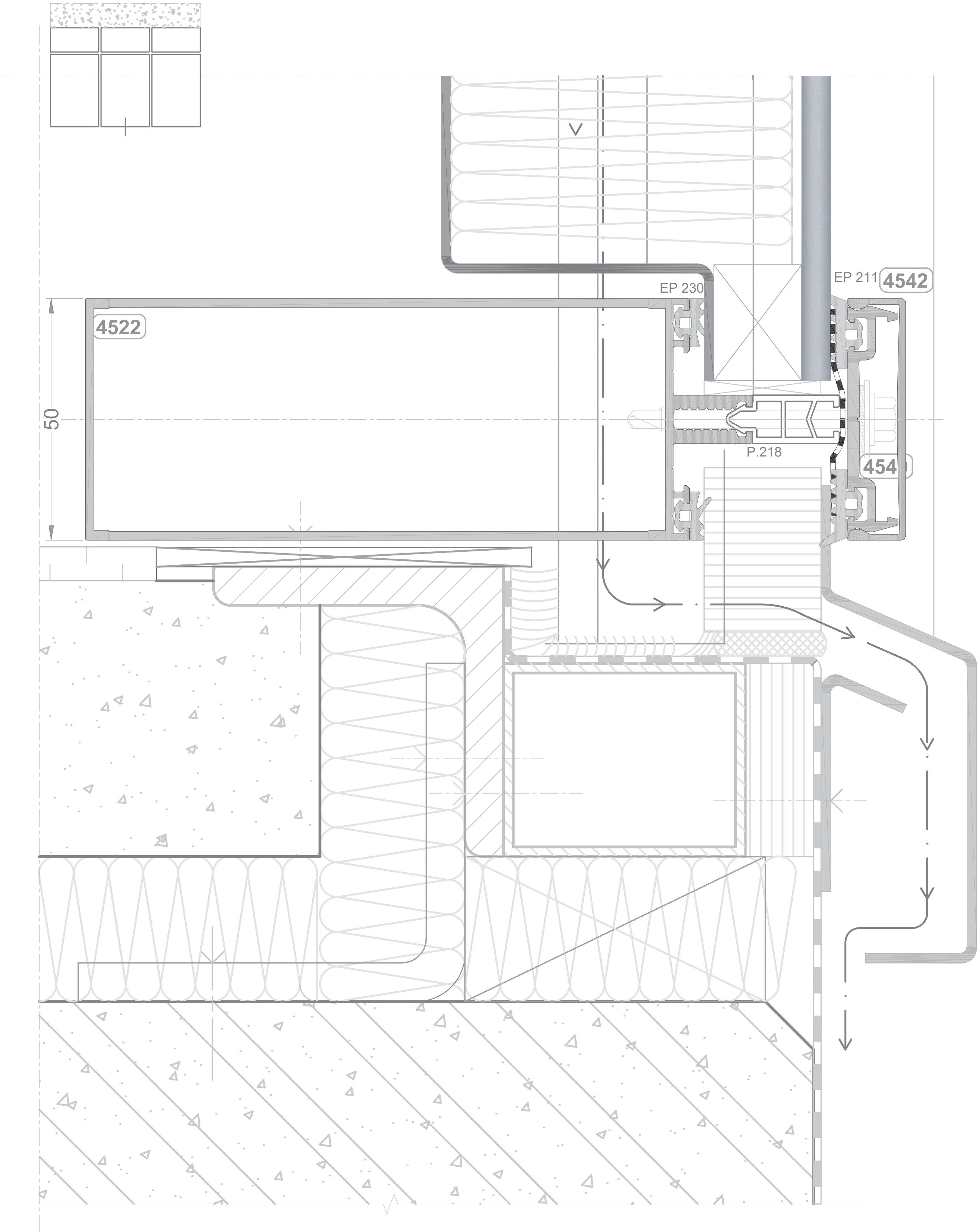
EP 280
P 218
EP 212
EP 211
4540
4542
3.5
28
18.5
25-30
50


ROTATE 90º
4542
EP 211
454
P.218
EP 230
3.5
26
3
4522
50



ROTATE 90°




EP 230
EP 211
4542
4522
50
P.218
454

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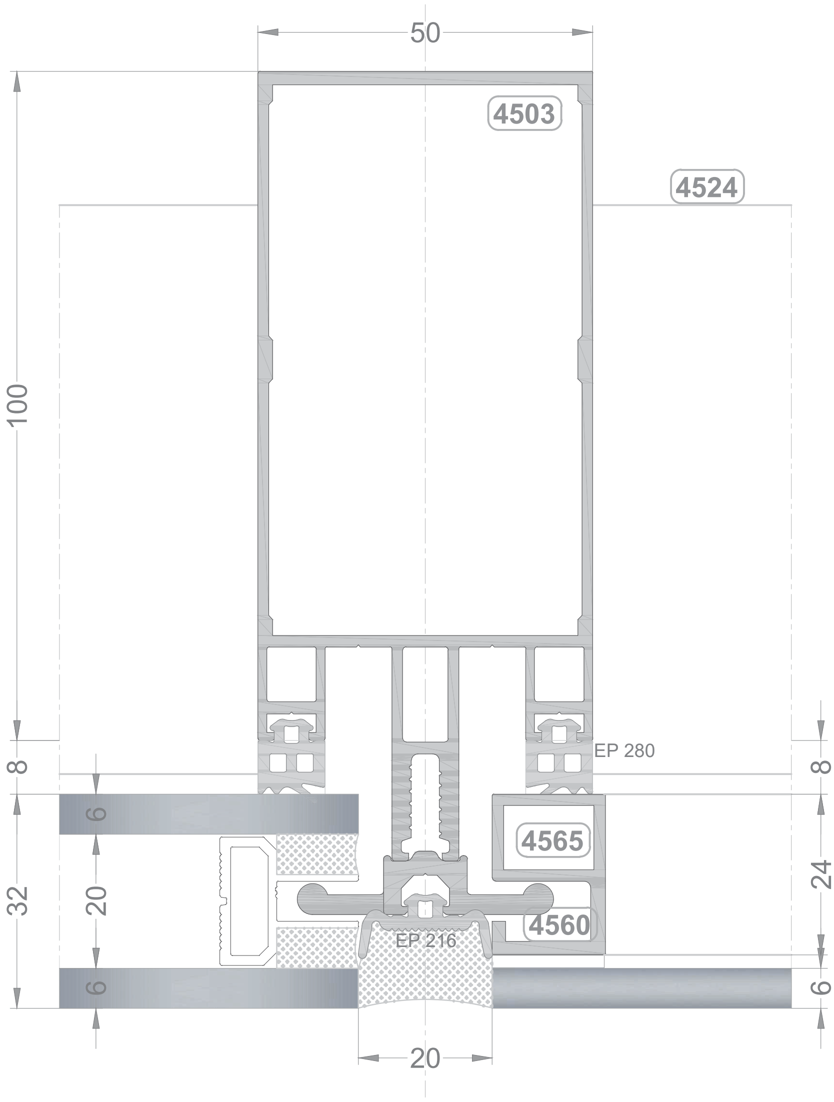
SILICONE LINE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100
EP 280
8
8
6
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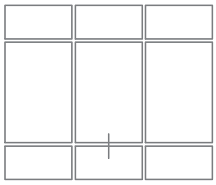
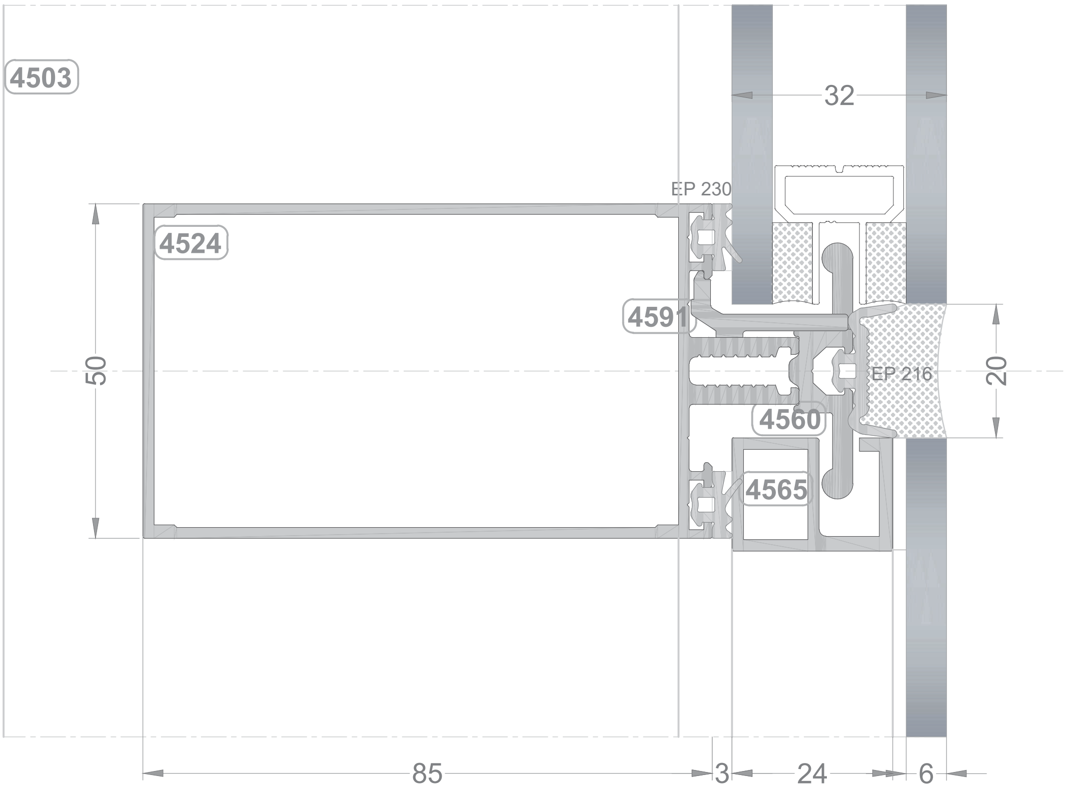
24
32
20
4560
EP 216
6
6
20

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32
EP 230
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EP 216
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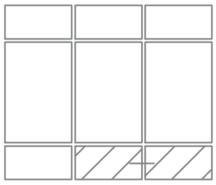
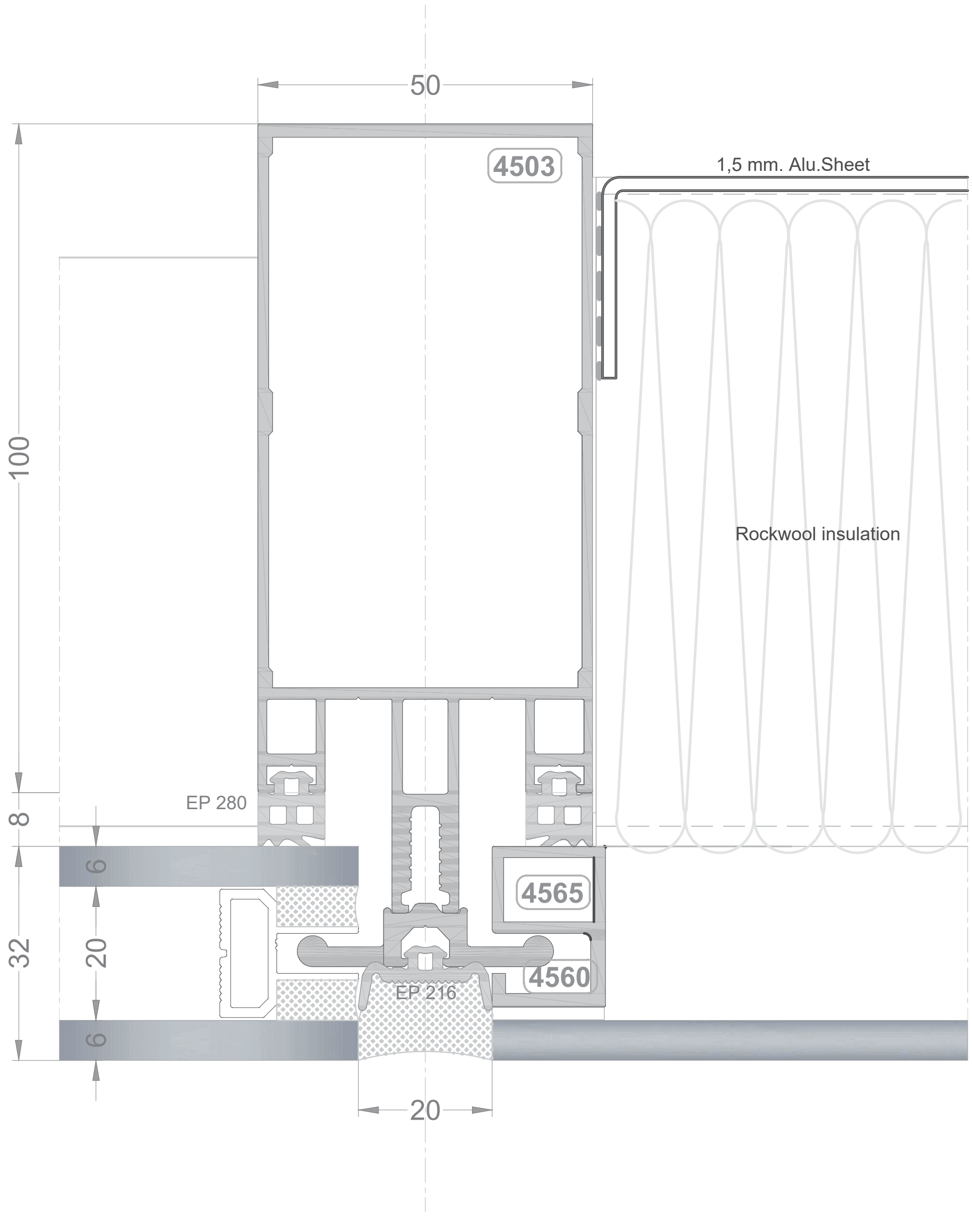
85
3
24
6

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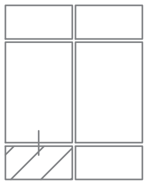
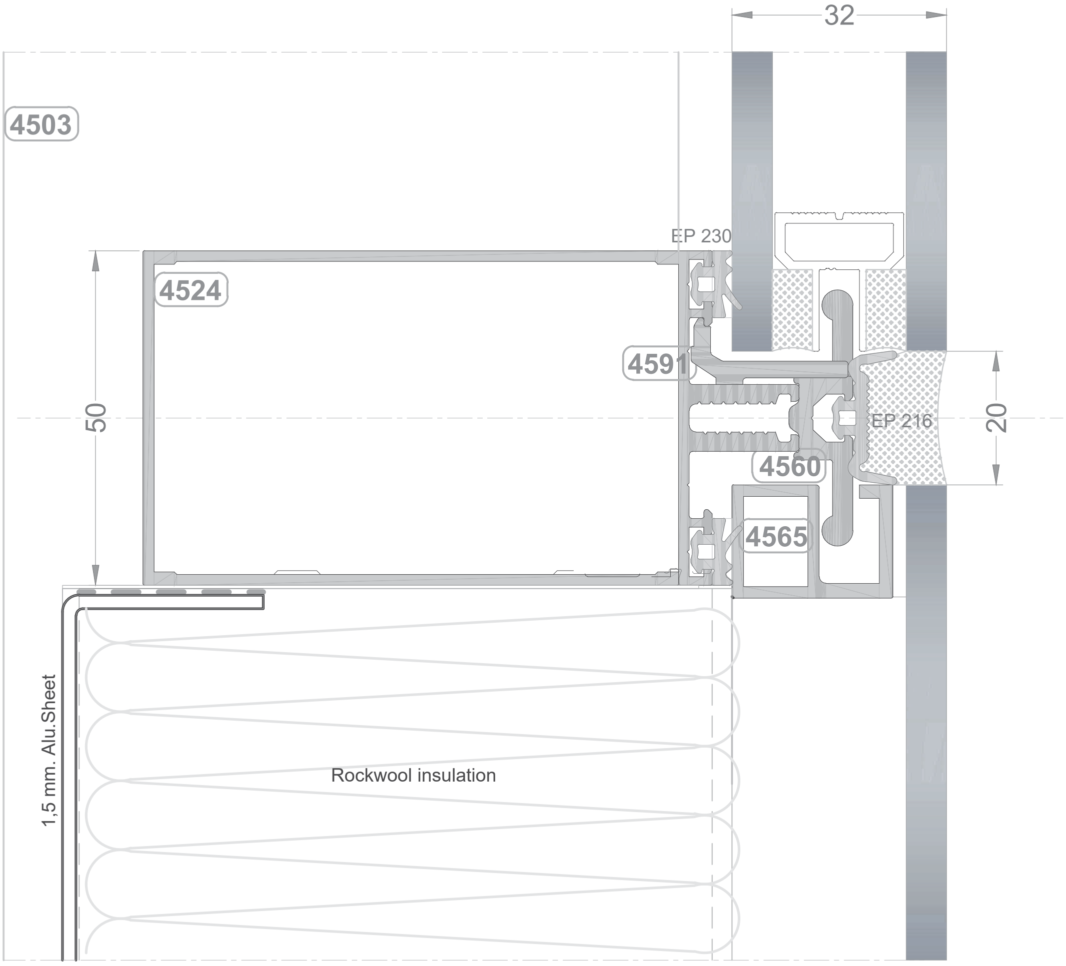
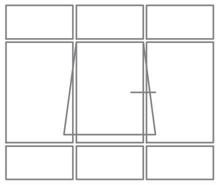
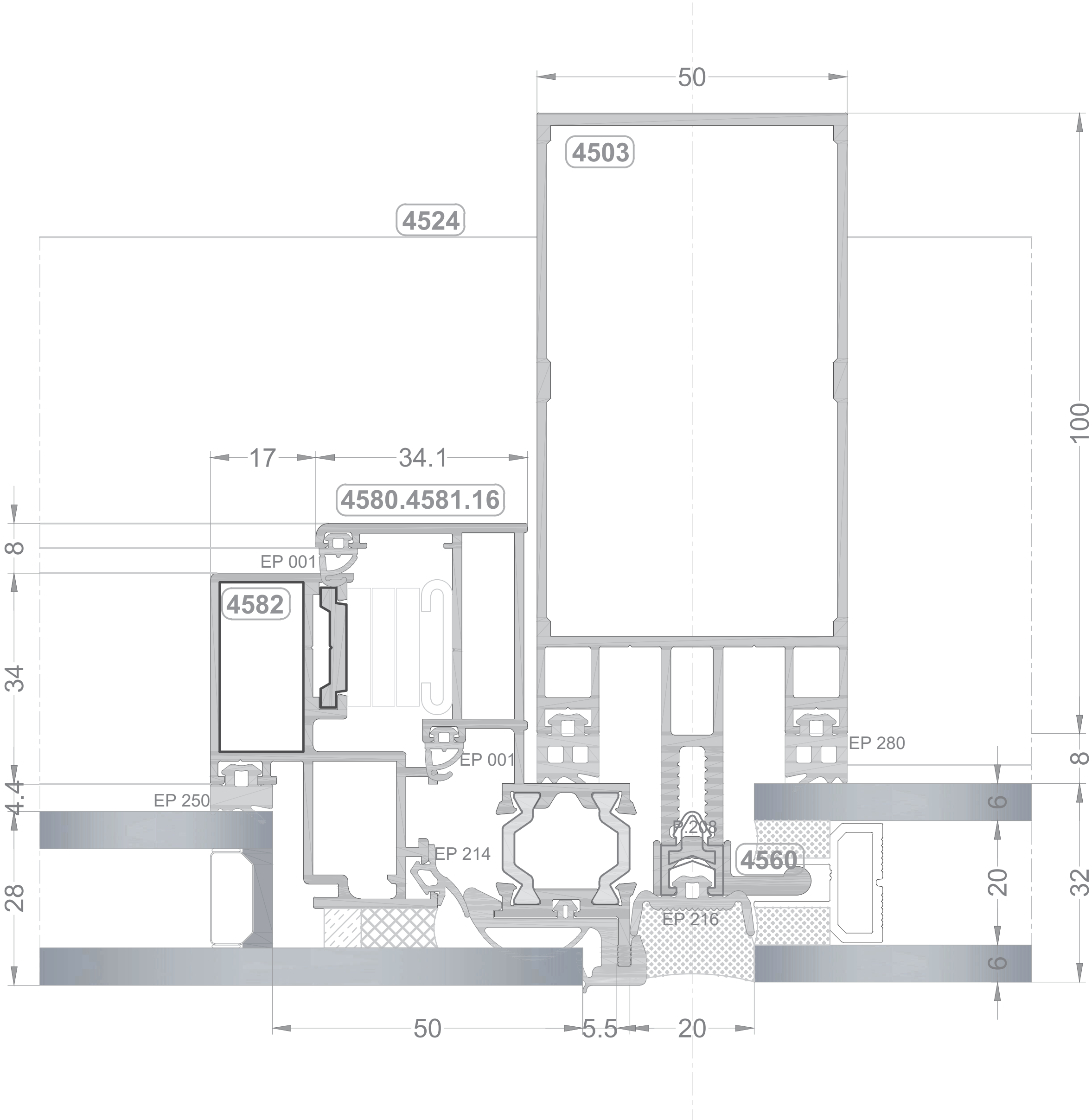
4503
1,5 mm. Alu.Sheet
100
Rockwool insulation
8
EP 280
6
4565
32
20
4560
EP 216
6
20




32
4503
EP 230
4524
4591
50
EP 216
20
4560
4565
1,5 mm. Alu.Sheet
Rockwool insulation

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4503
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8
EP 001
4582
34
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P 208
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32
EP 216
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5.5
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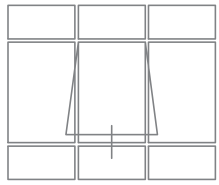

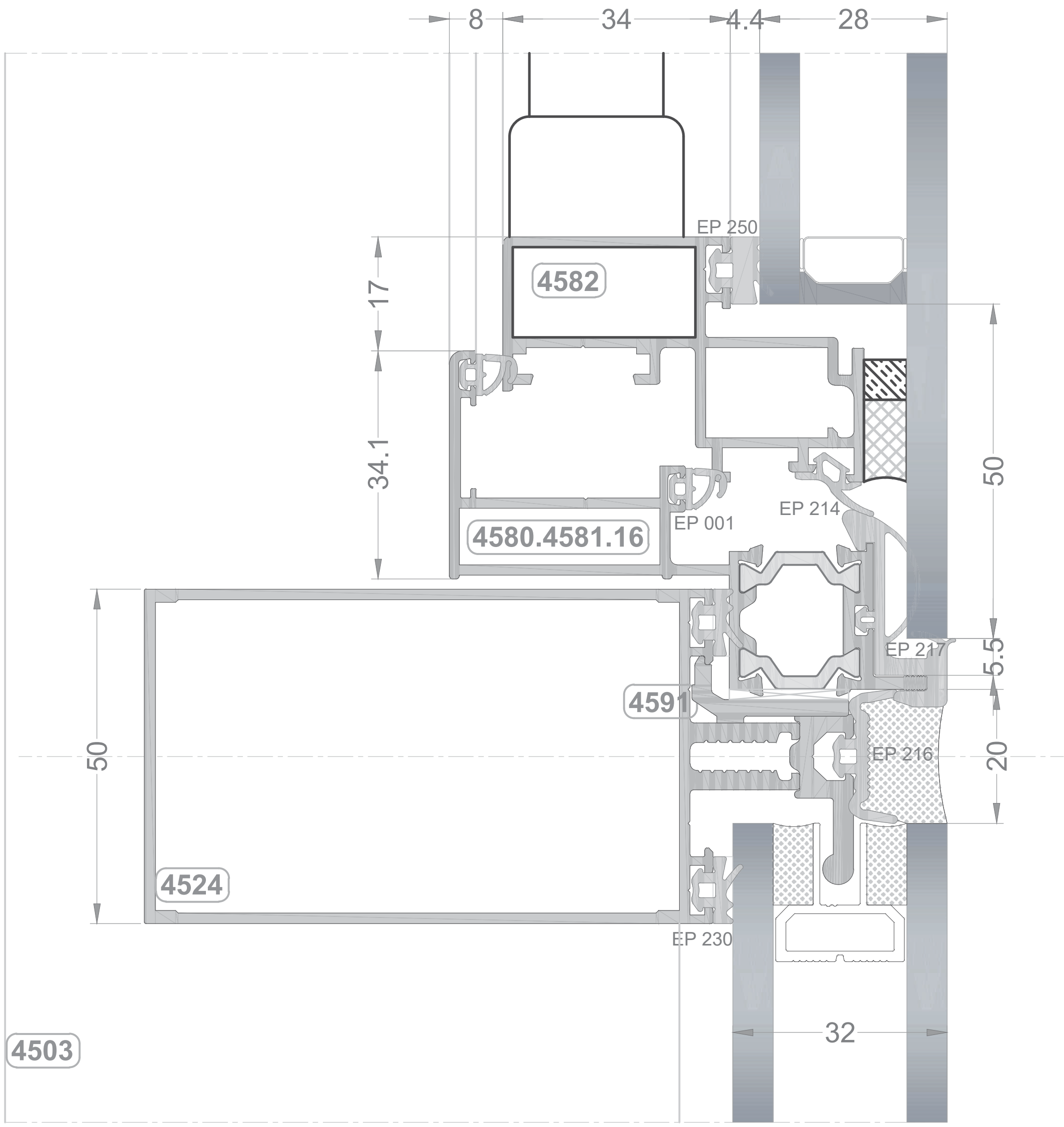
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4.4
28
EP 250
4582
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34.1
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EP 214
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EP 217
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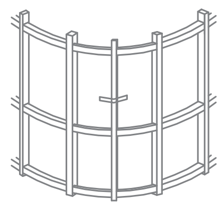
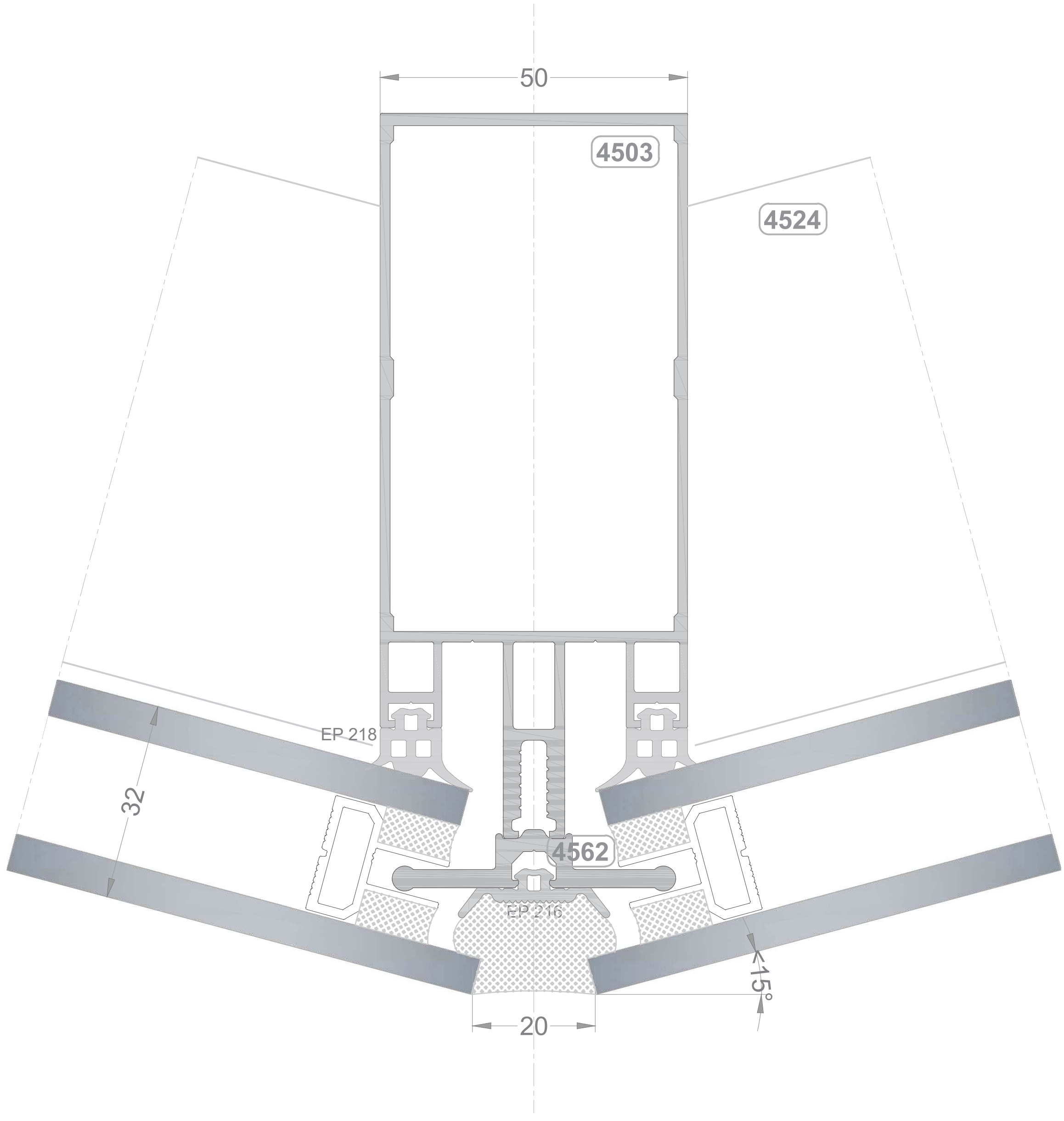
EP 216
20
50
4524
EP 230
32
4503

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EP 218
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4562
EP 216
15°
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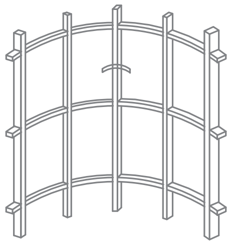

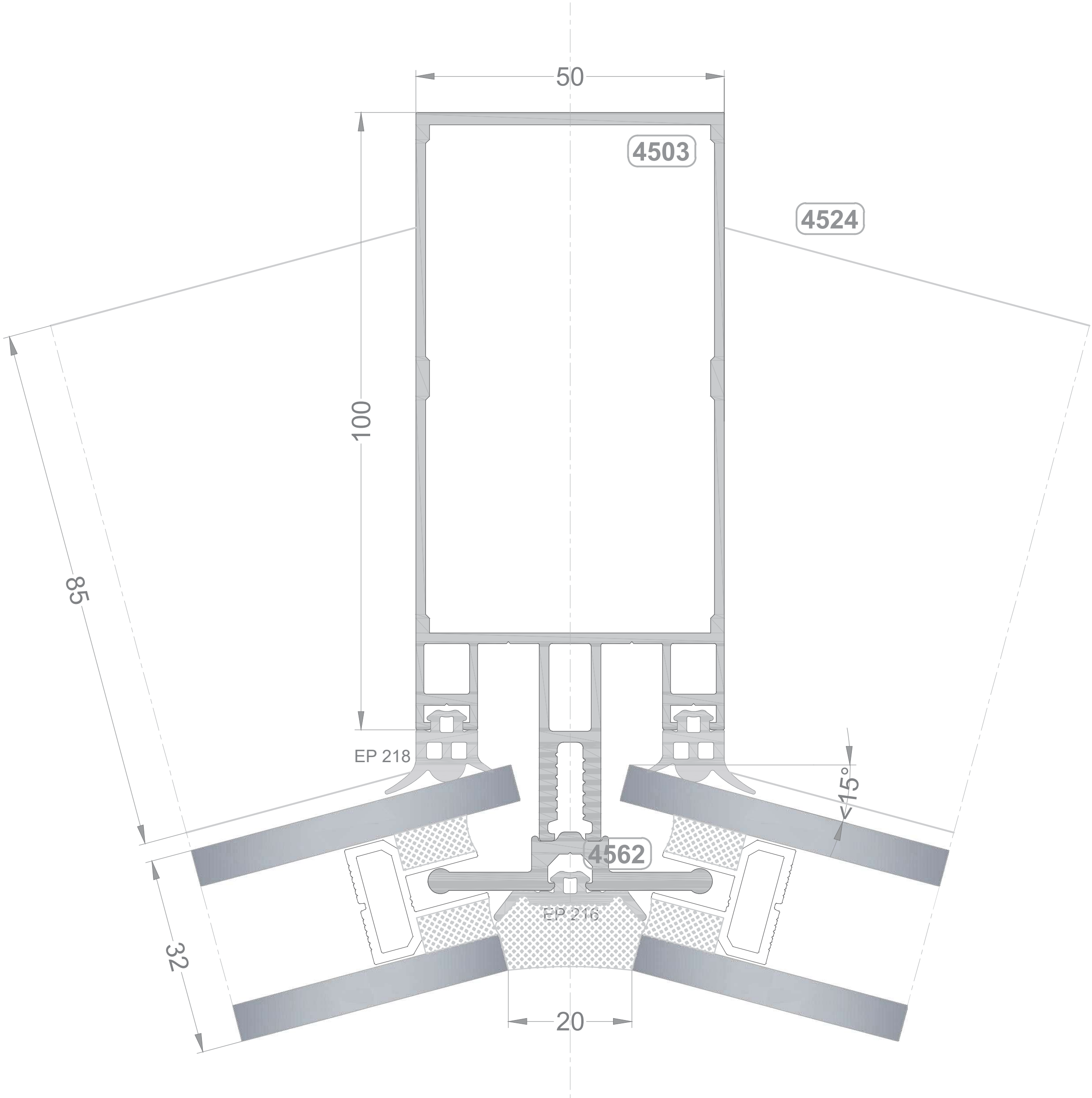
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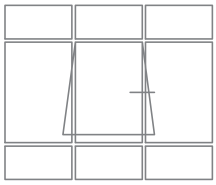
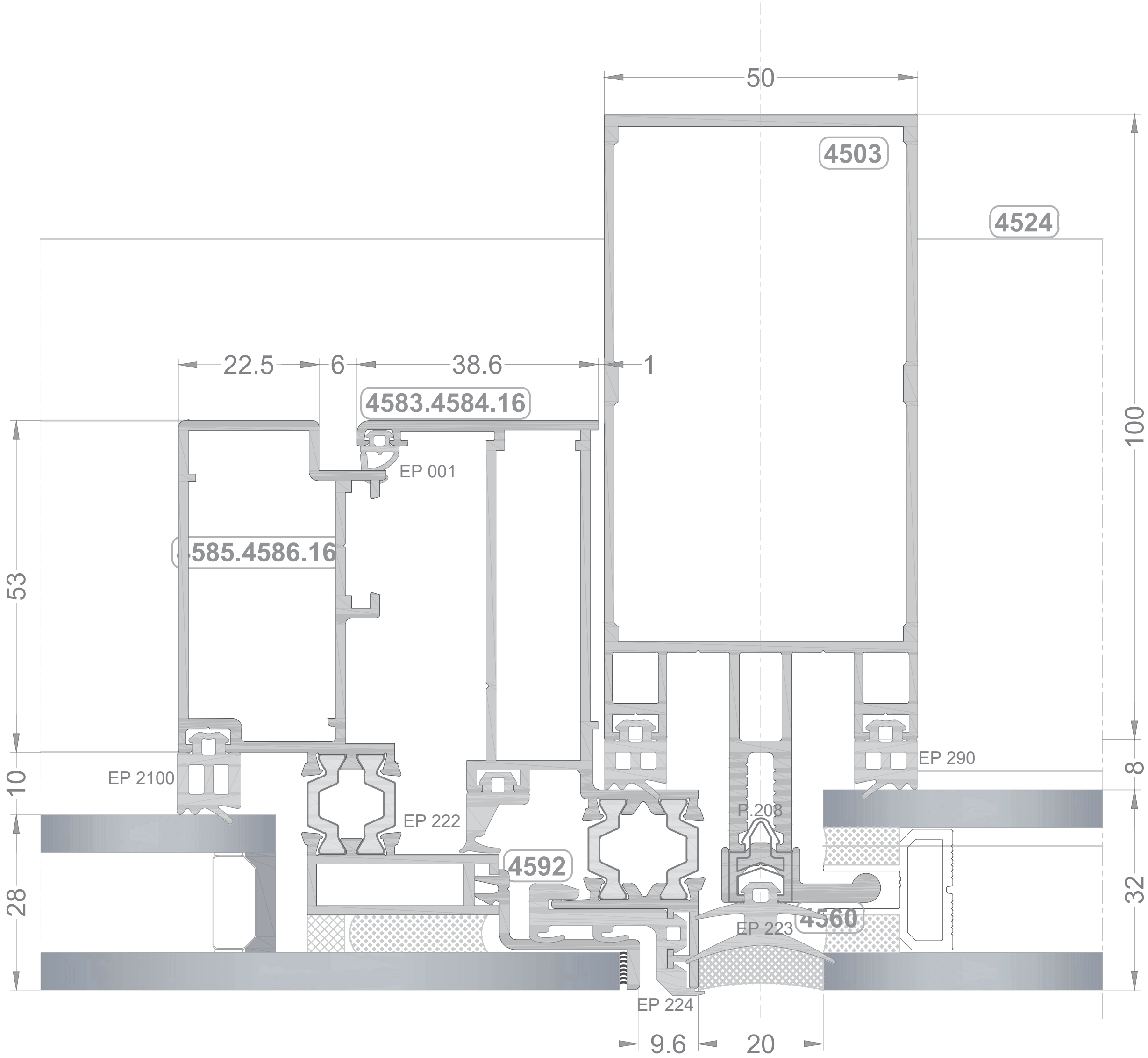
EP 216
32
20

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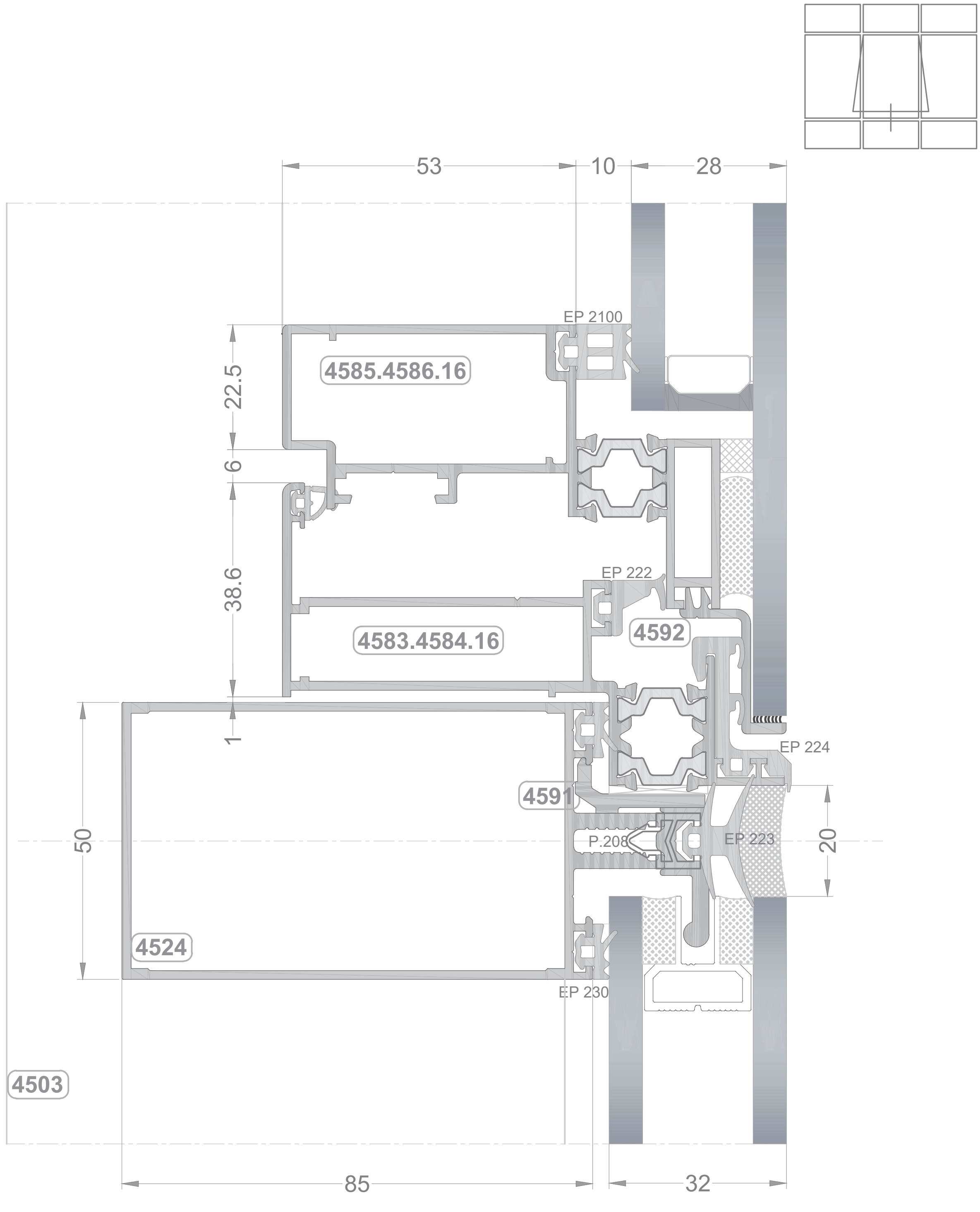
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EP 224
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EP 223
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32

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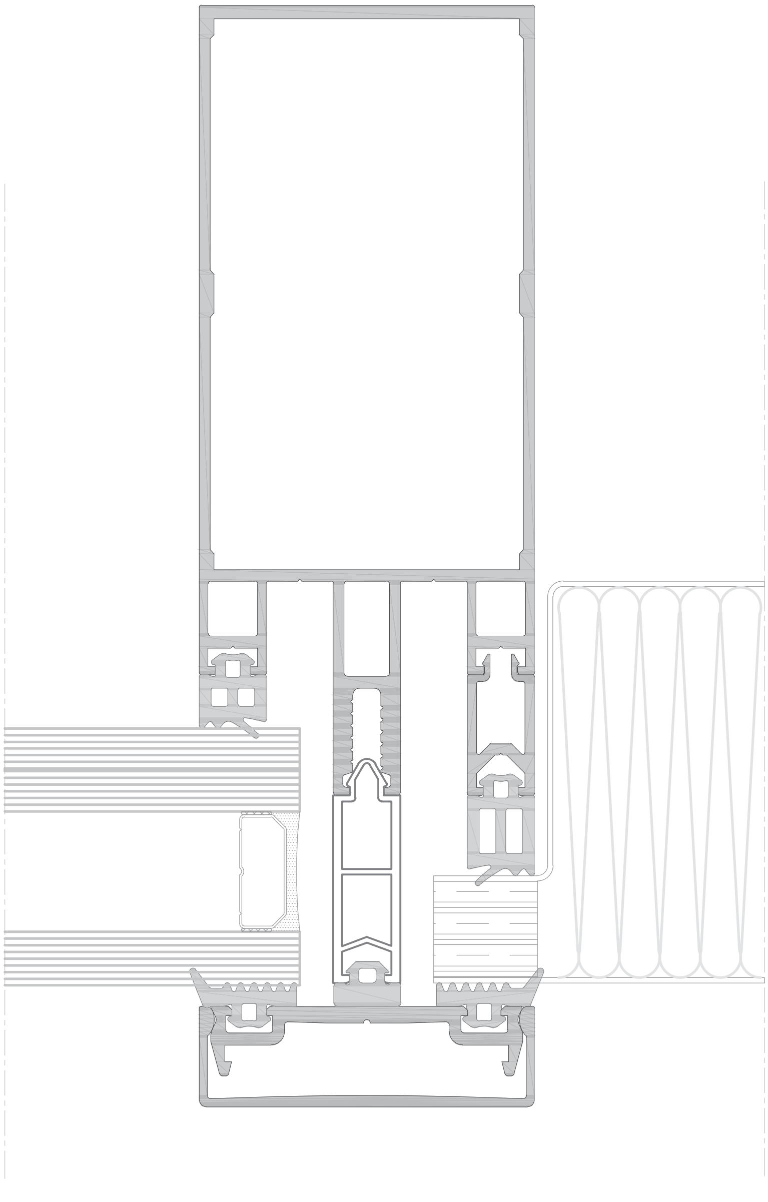
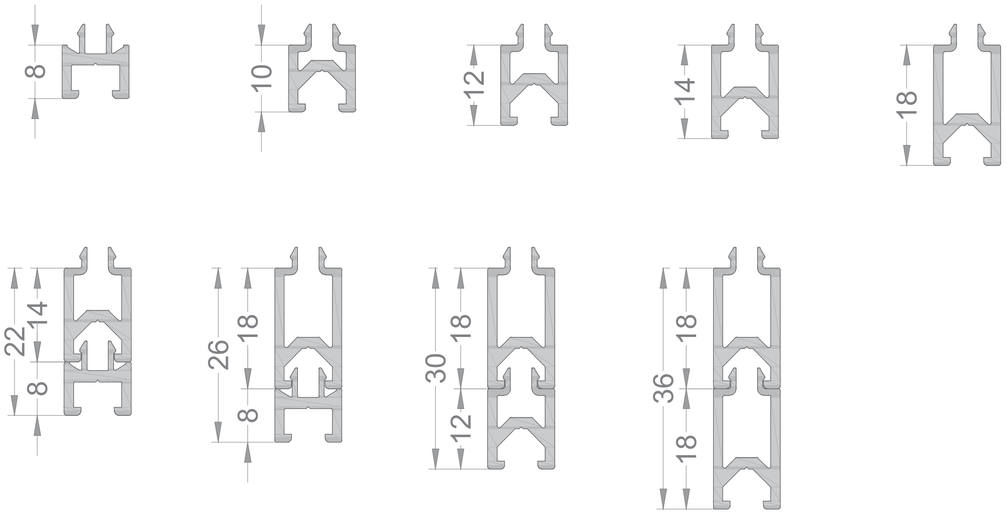
GLAZING

GLASS AND PANEL COMBINATIONS



GLASS COMBINATIONS :

GLAZING BEAD COMBINATIONS :



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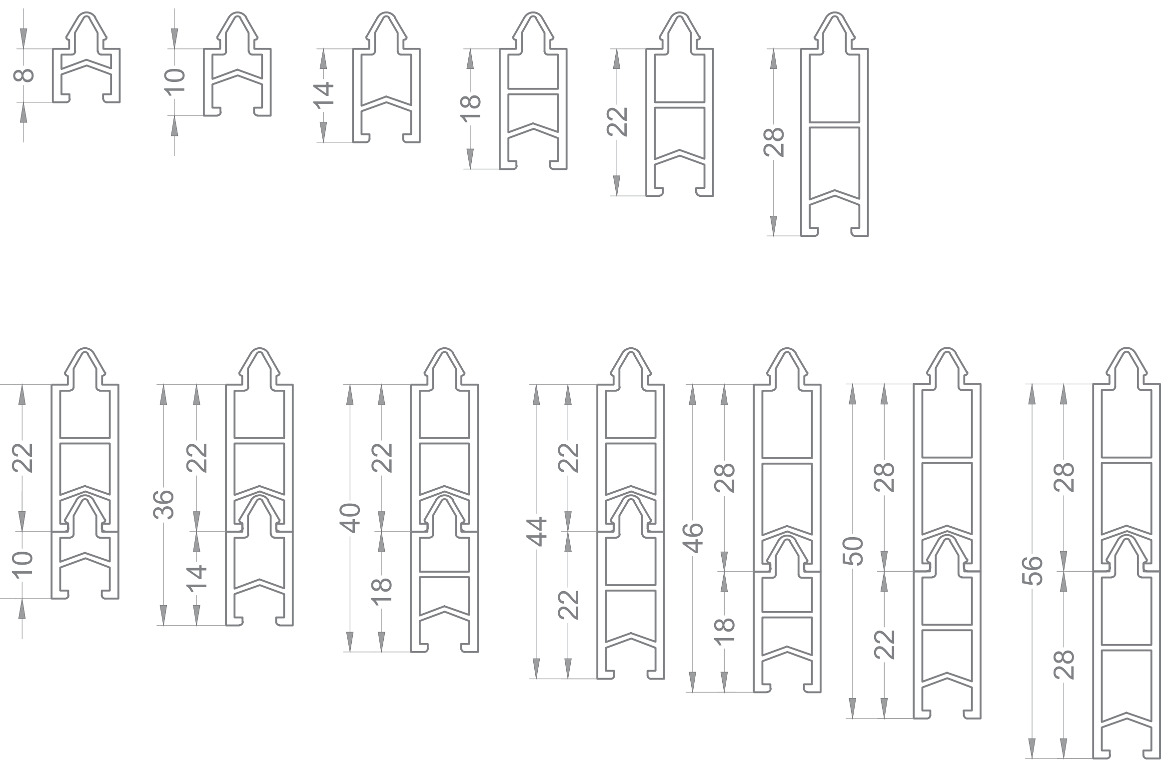

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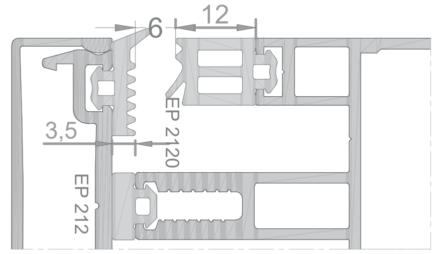

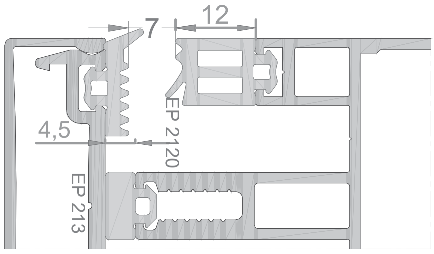

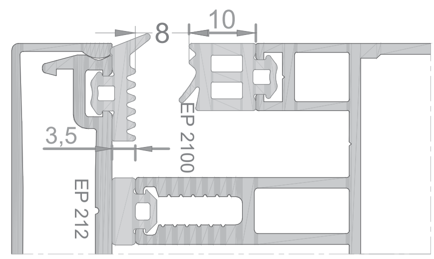

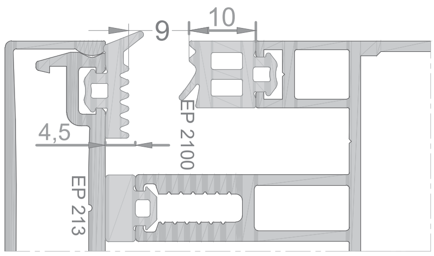

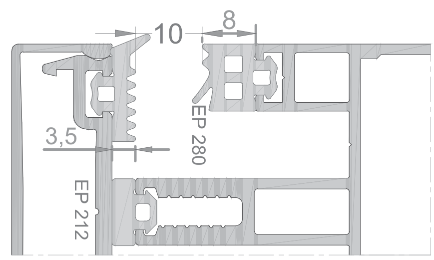

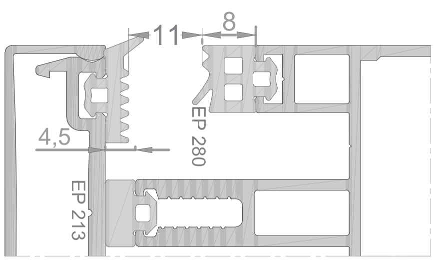

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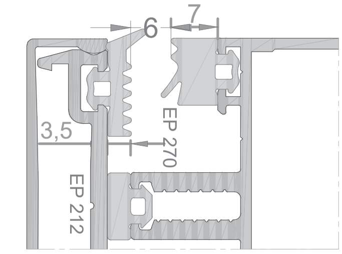

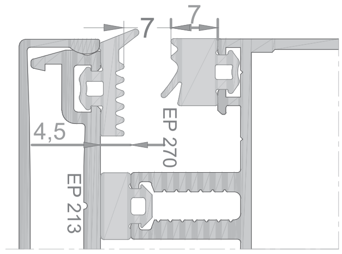

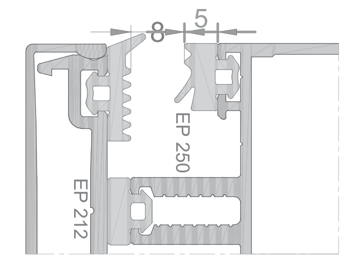

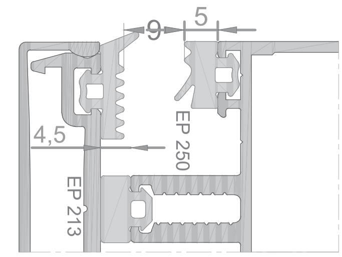

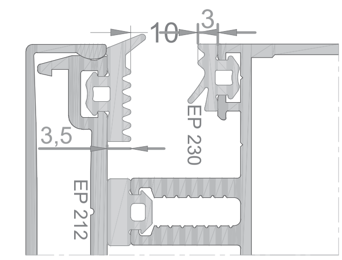

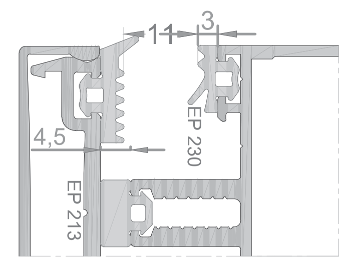

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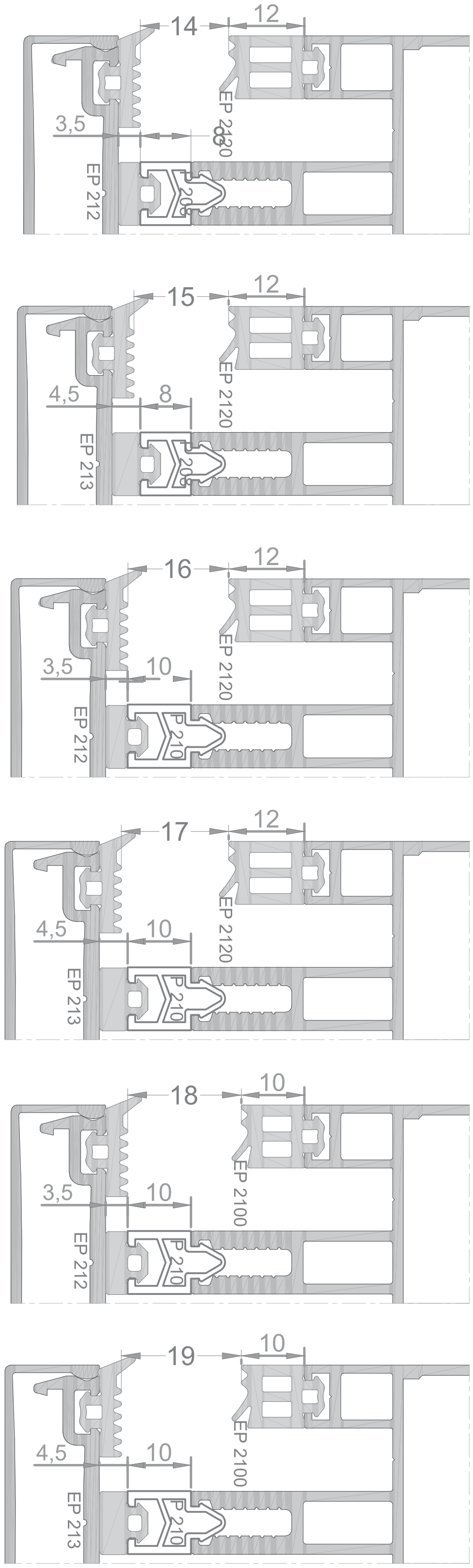

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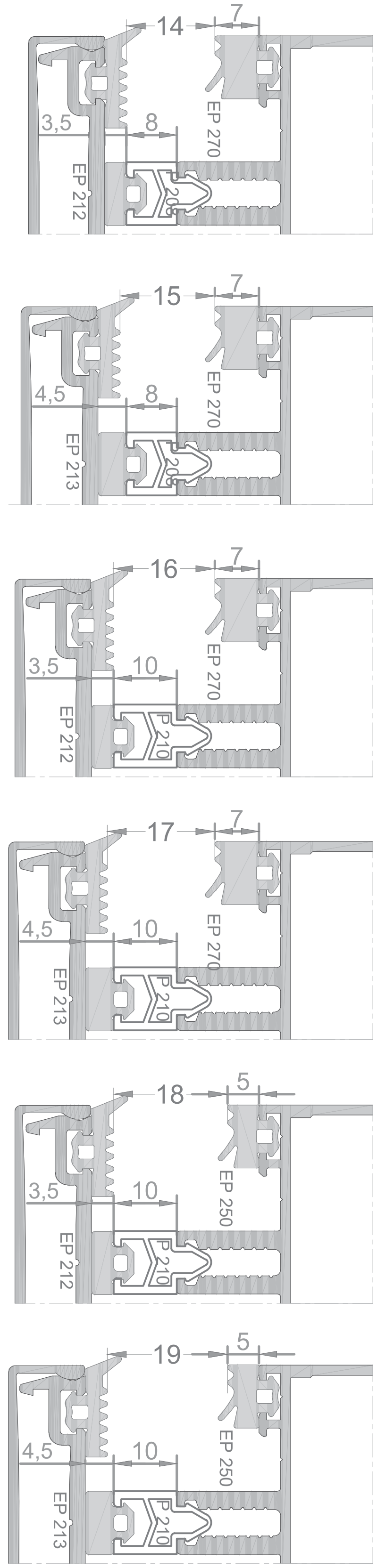

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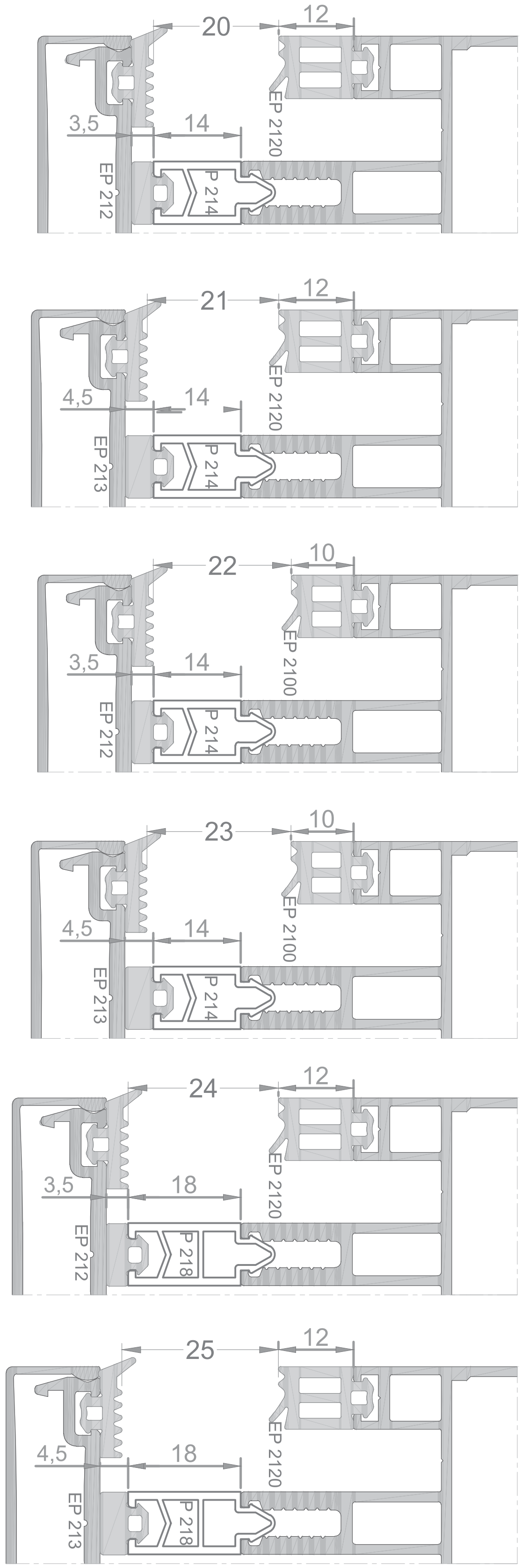

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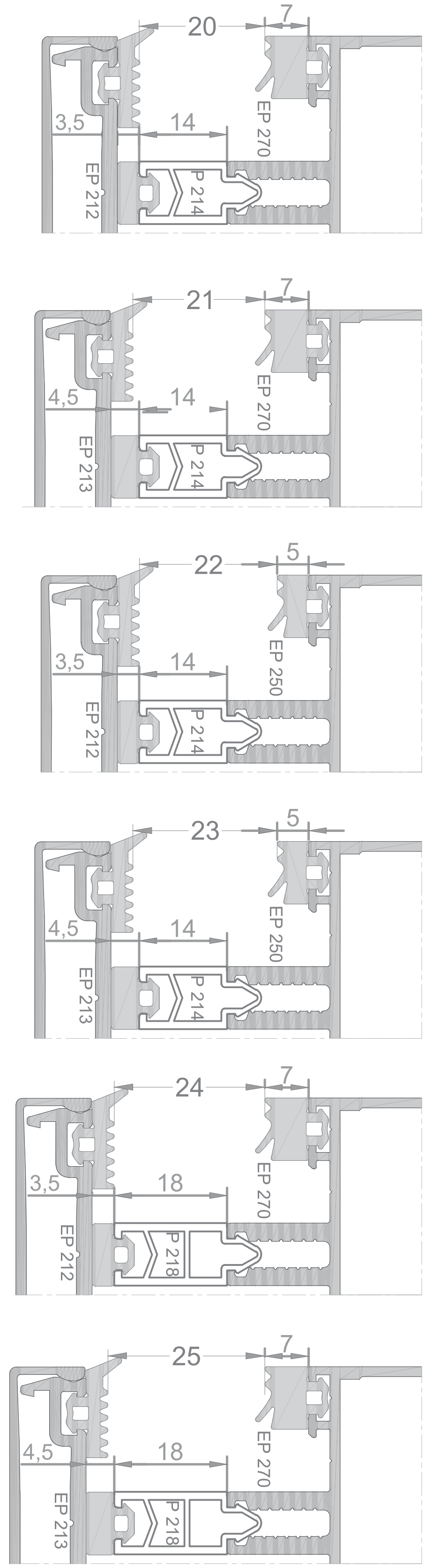

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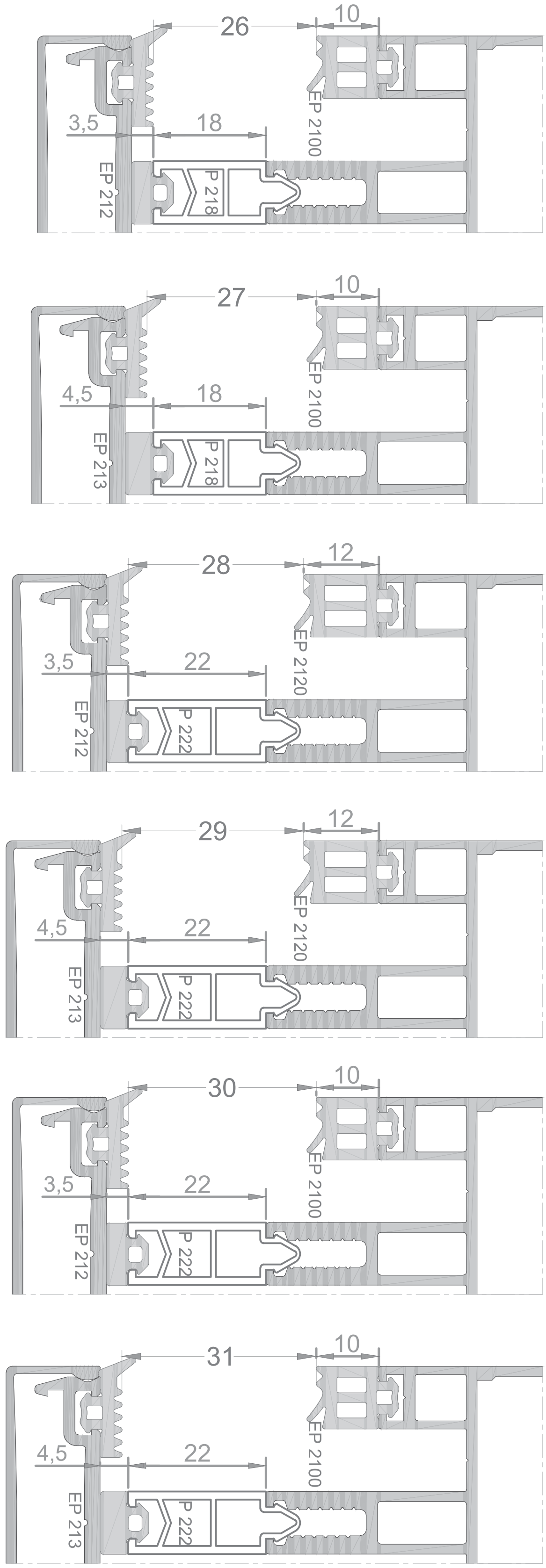

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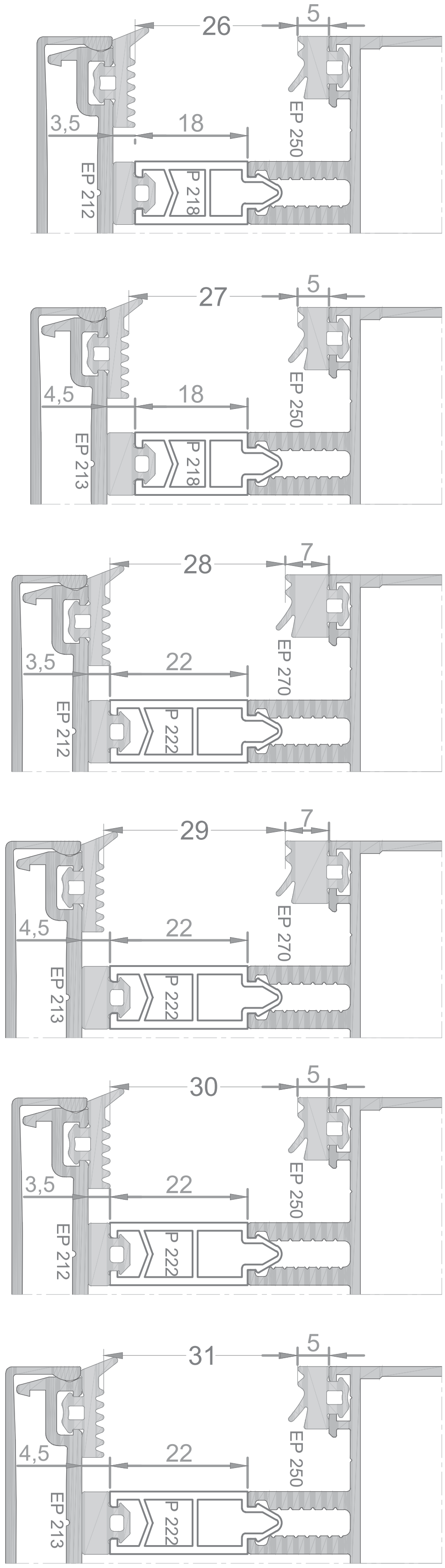

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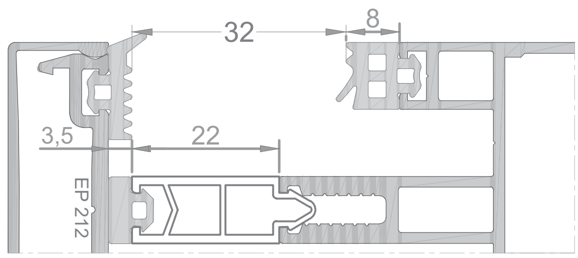

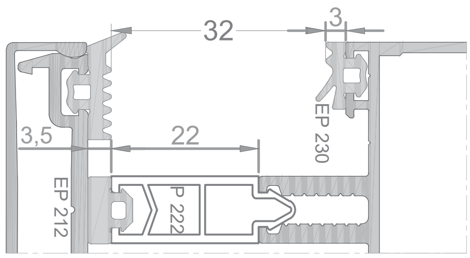

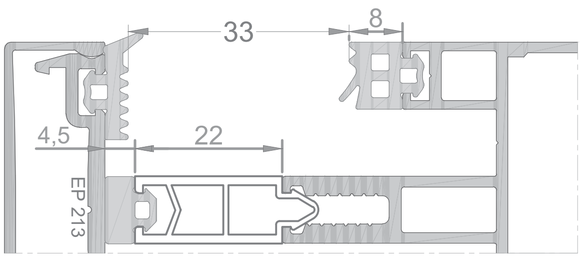

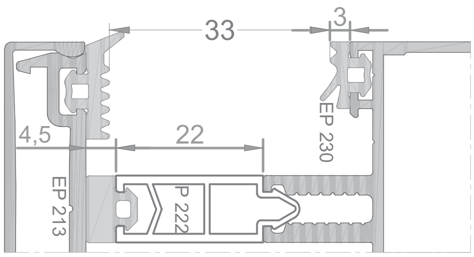

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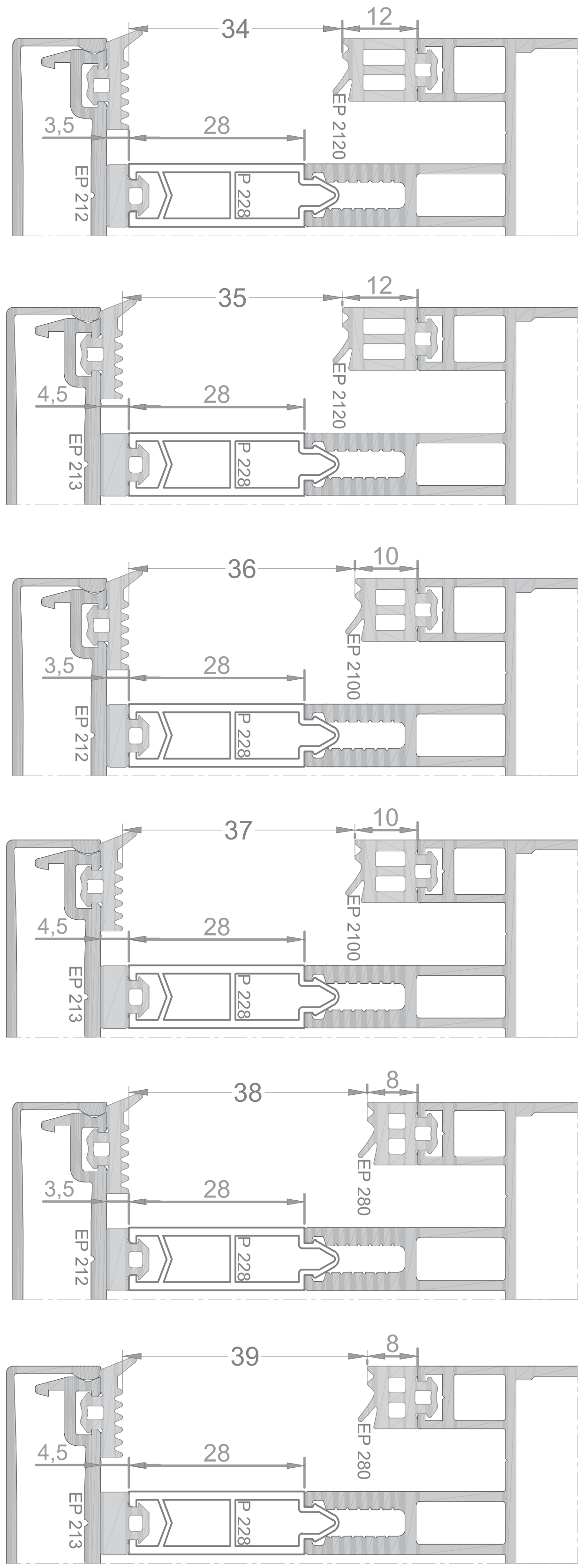

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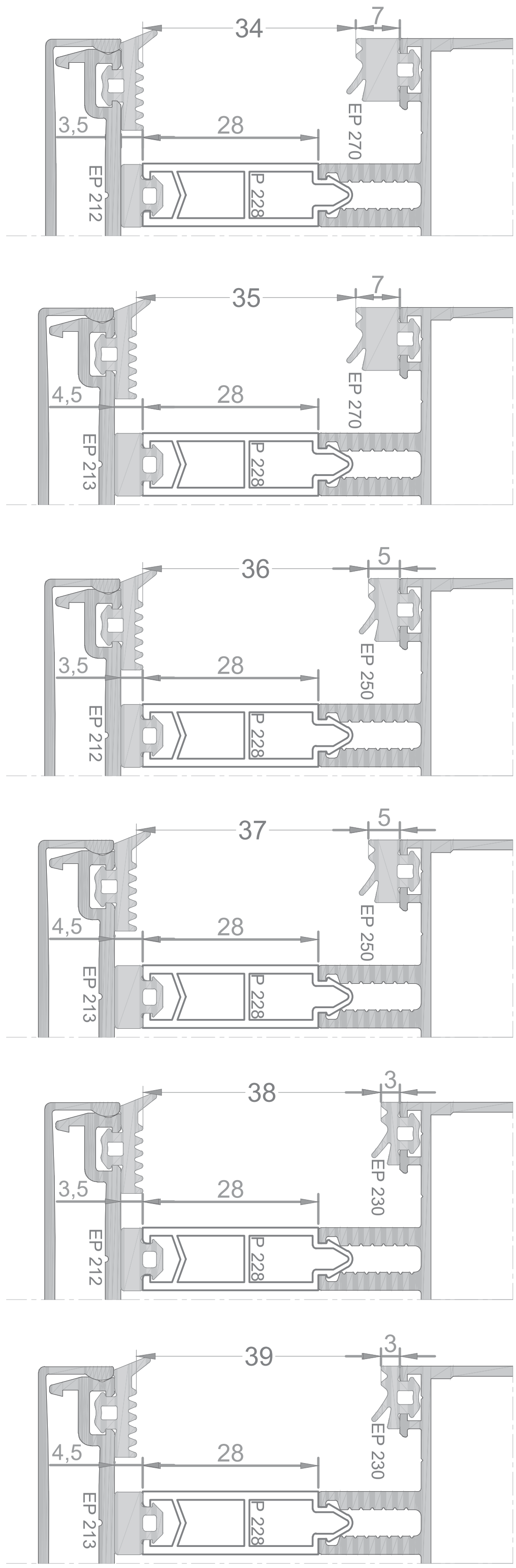

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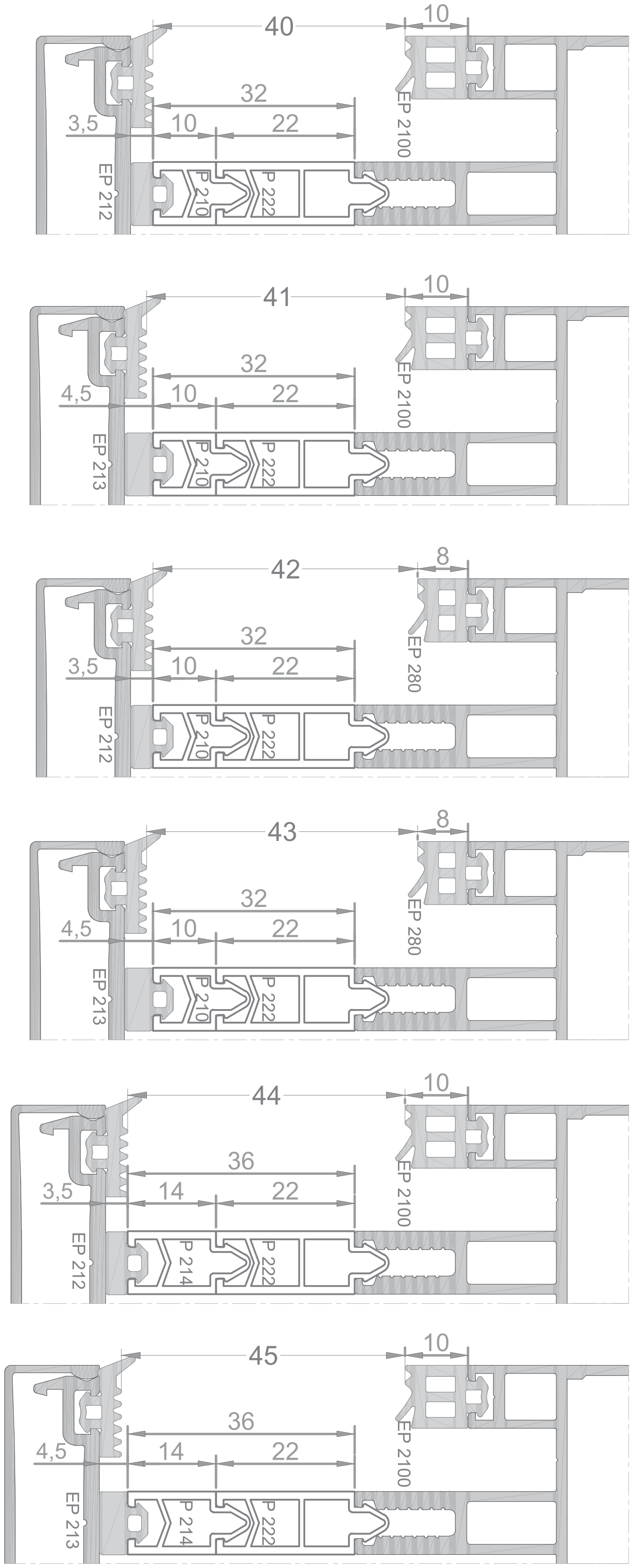

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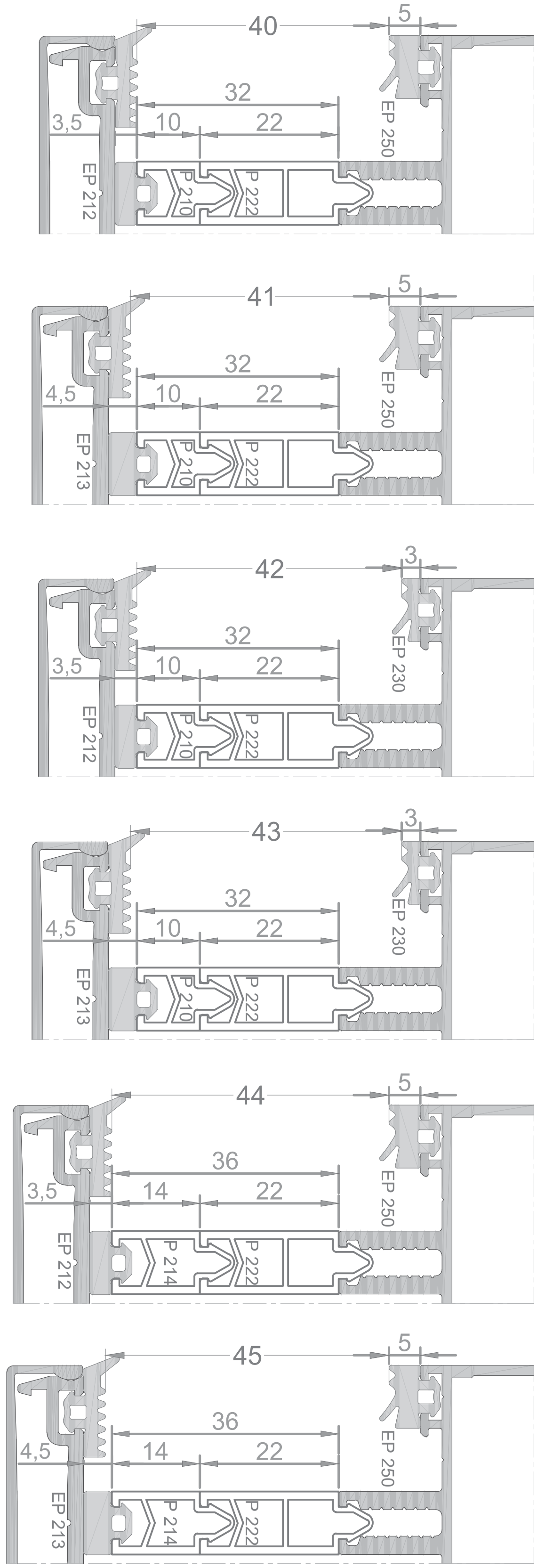

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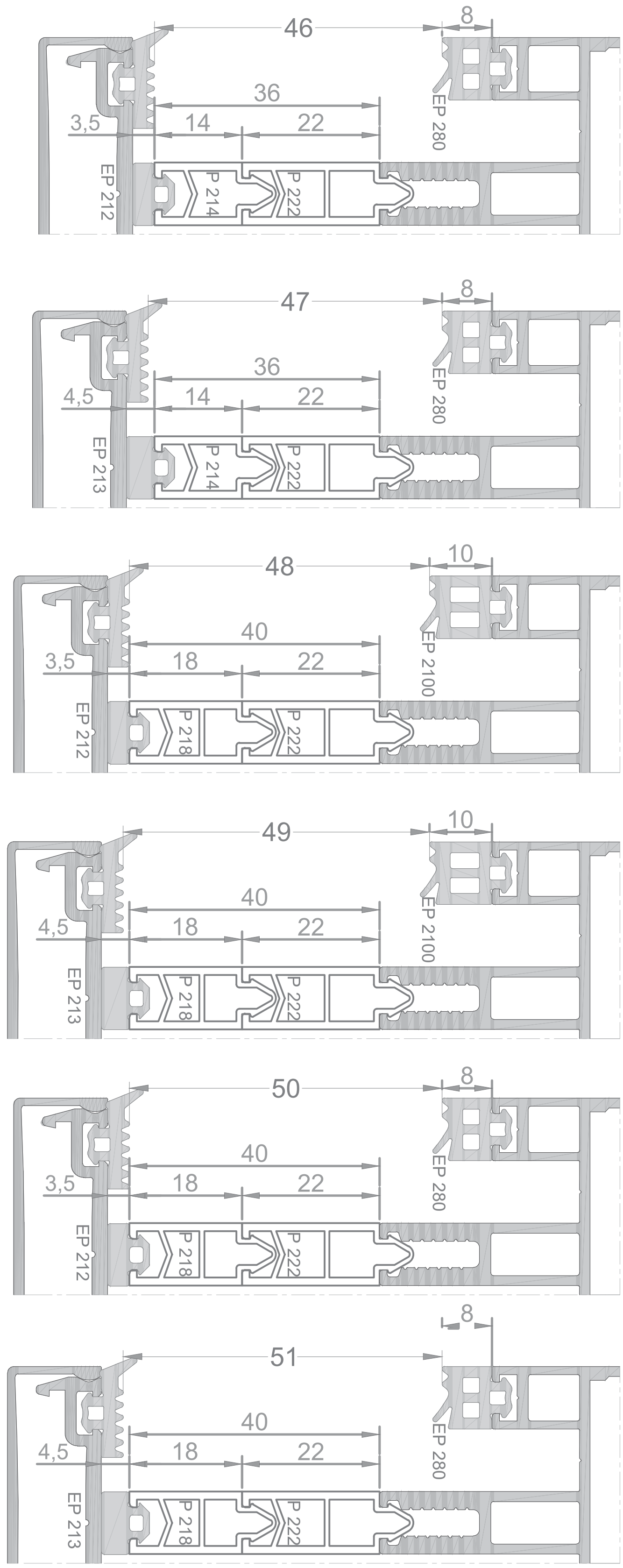

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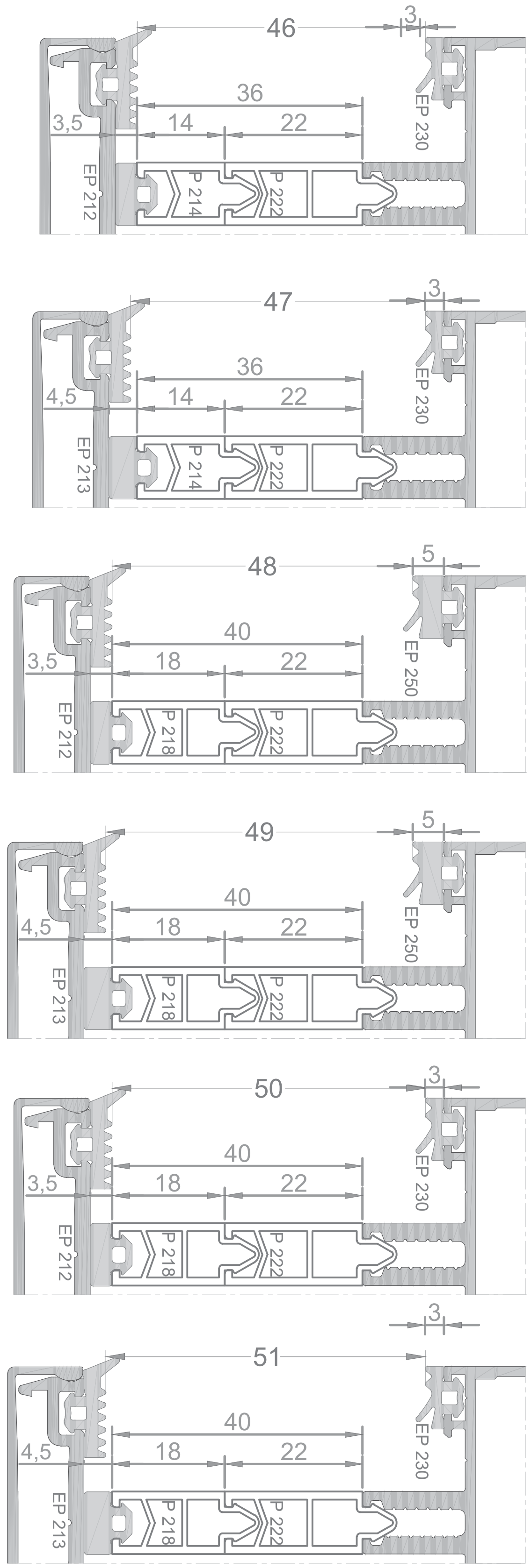

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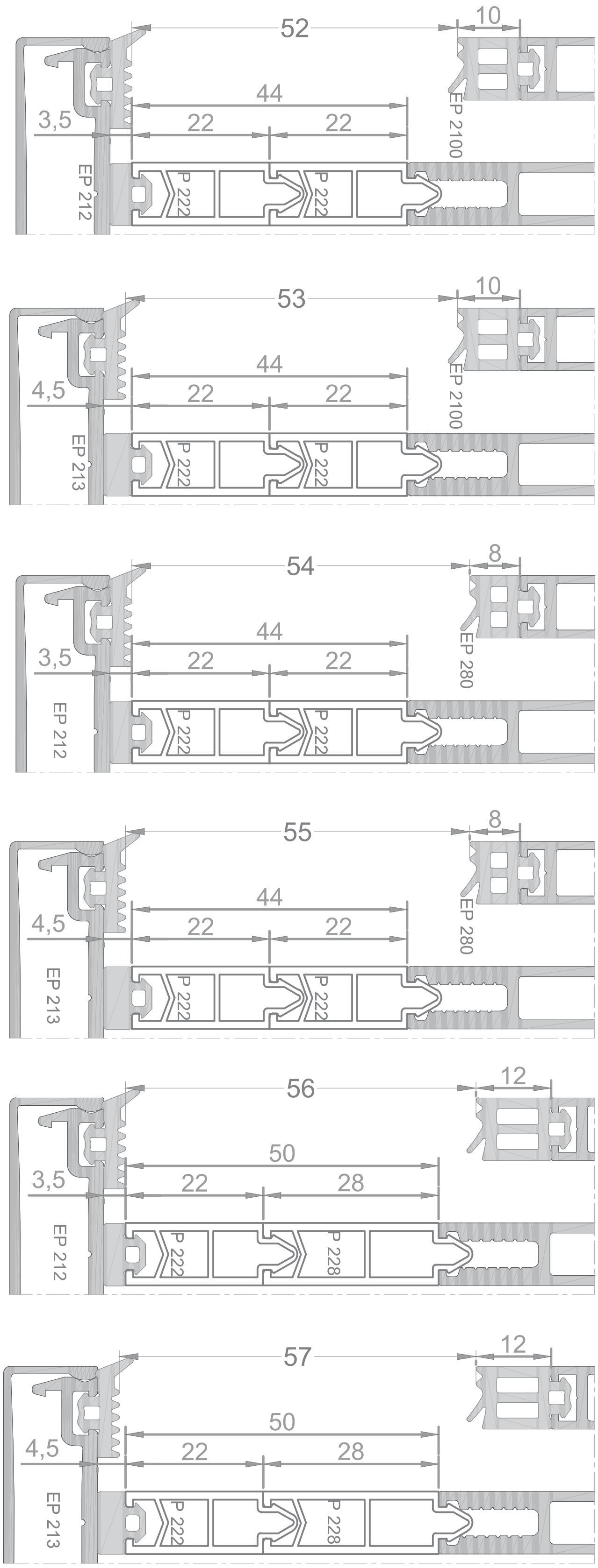

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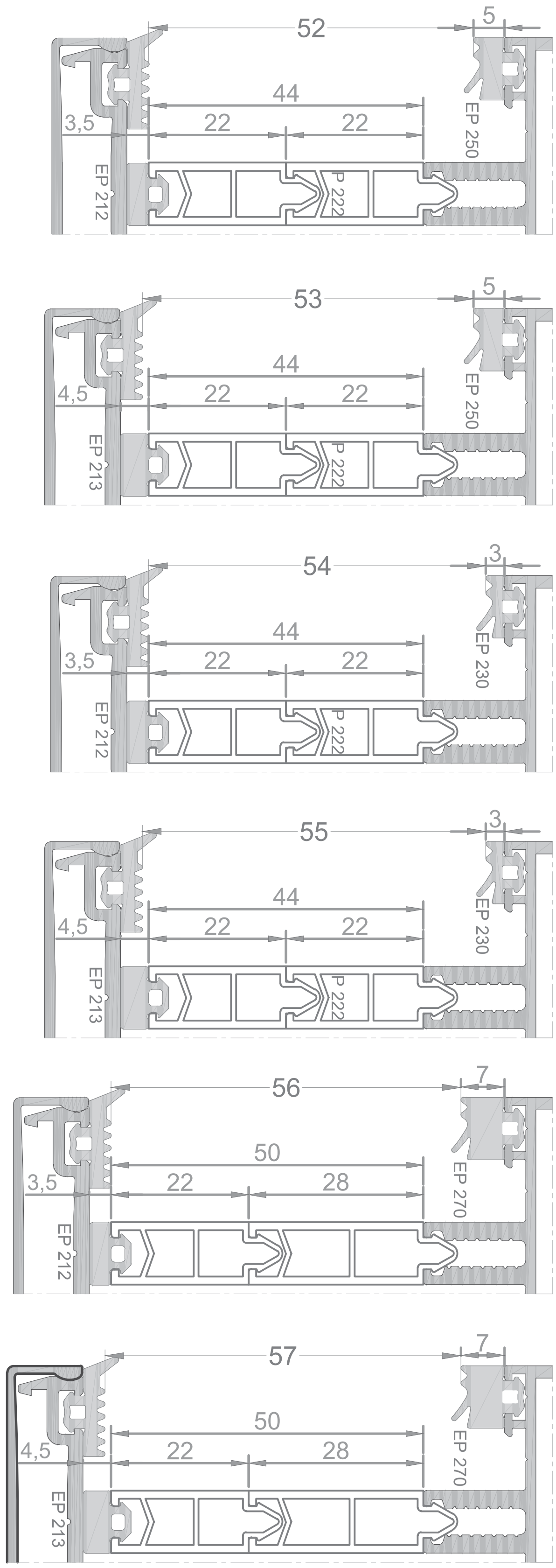
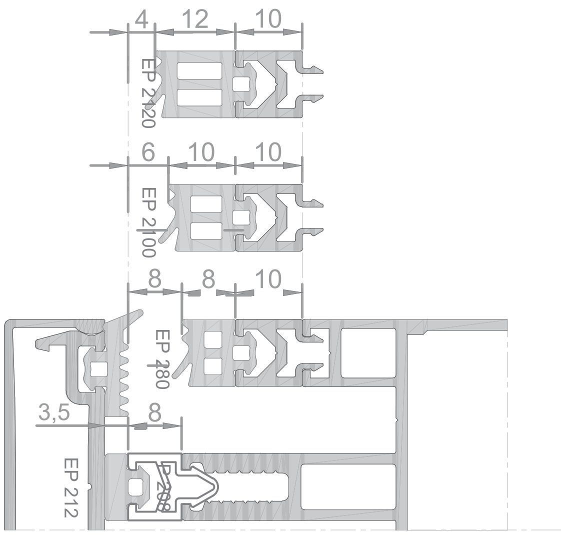
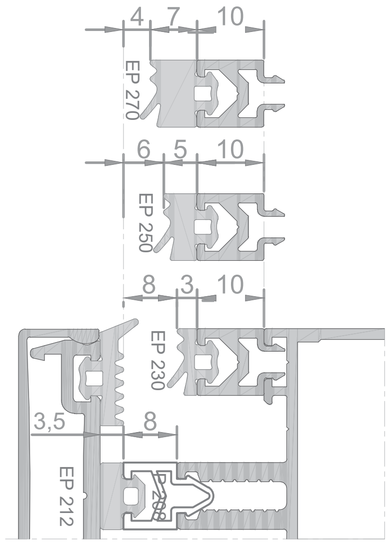
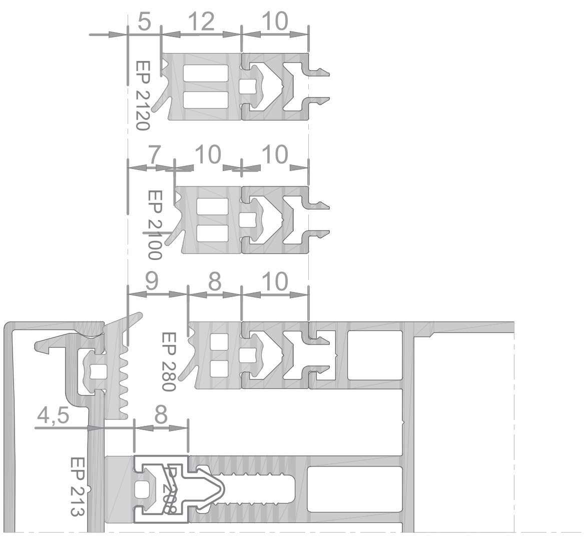
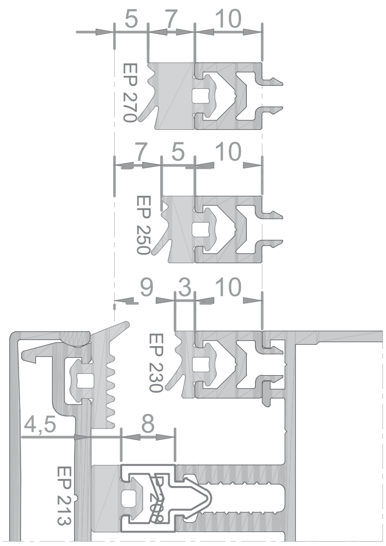


10 mm Glazing Bead 8 mm Thermal Barrier









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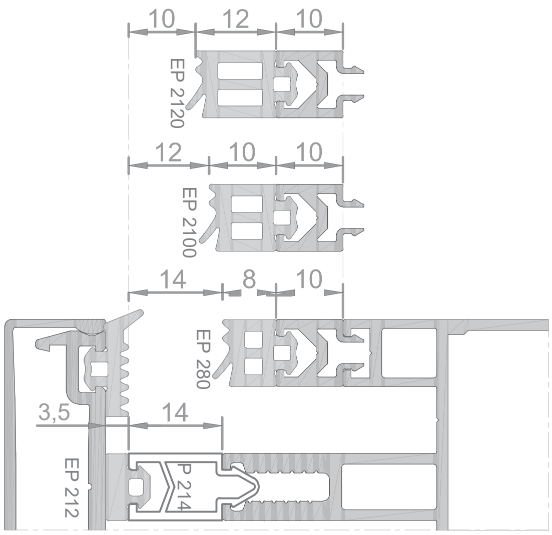
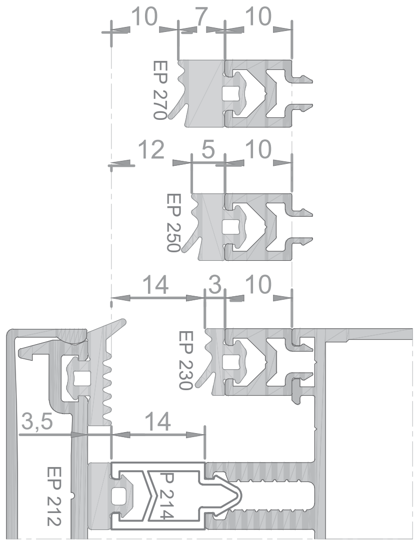
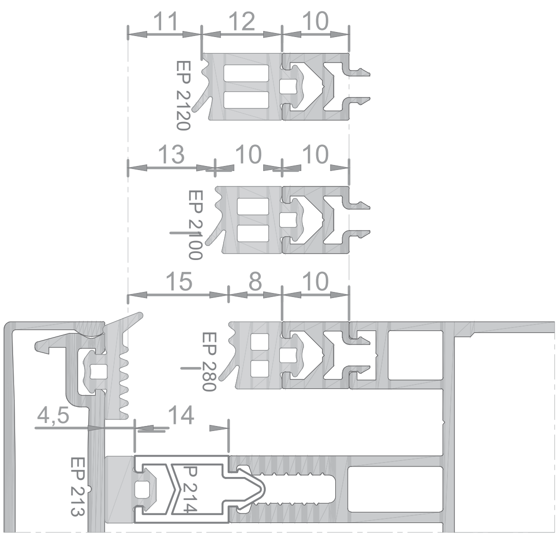
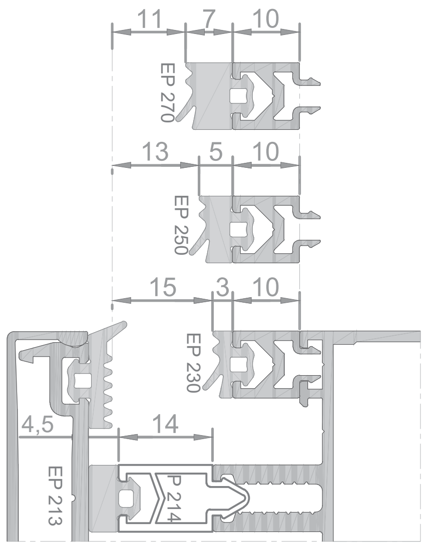
TRANSOM

10 mm Glazing Bead 14 mm Thermal Barrier









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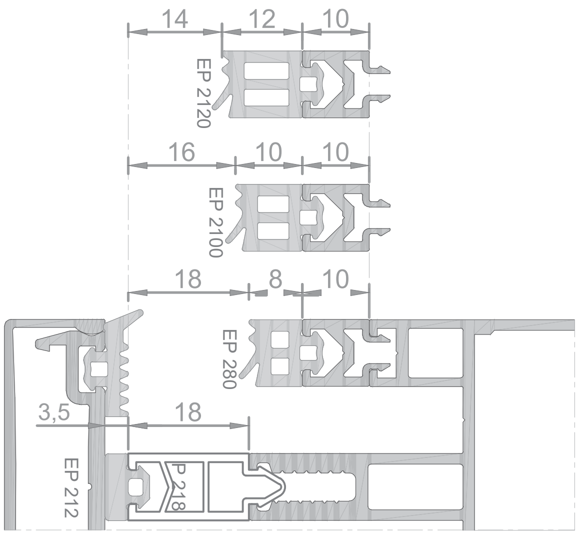
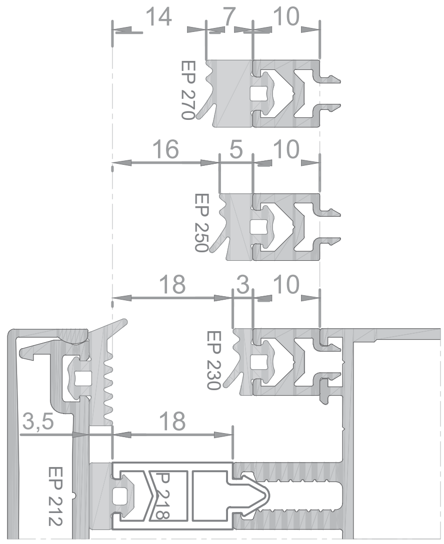
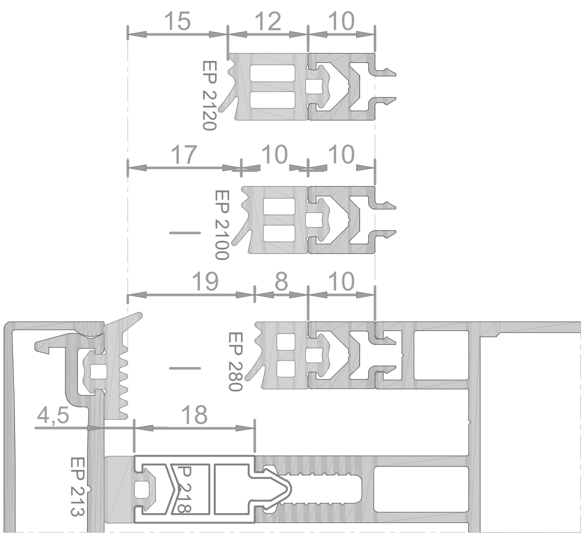
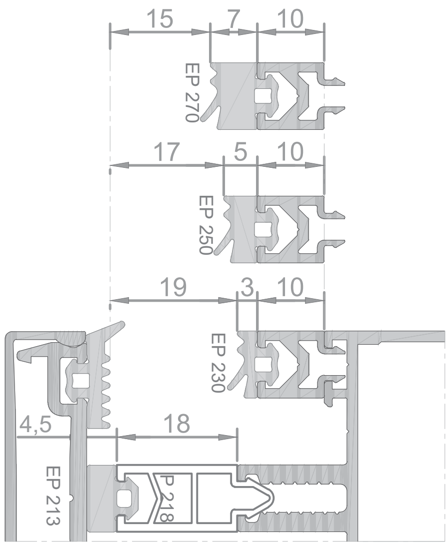
TRANSOM

10 mm Glazing Bead 18 mm Thermal Barrier









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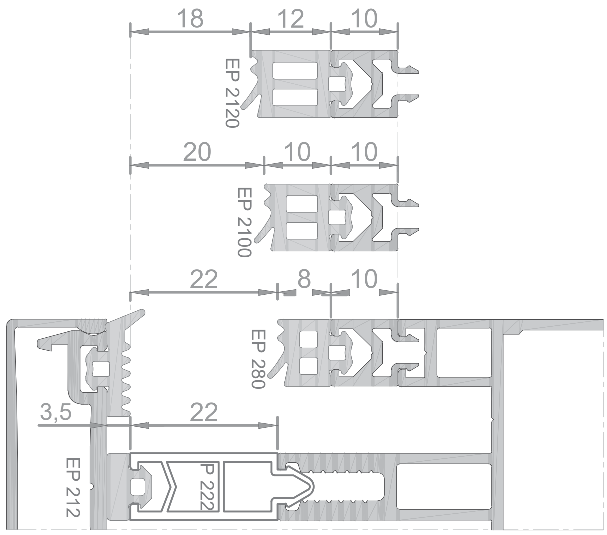
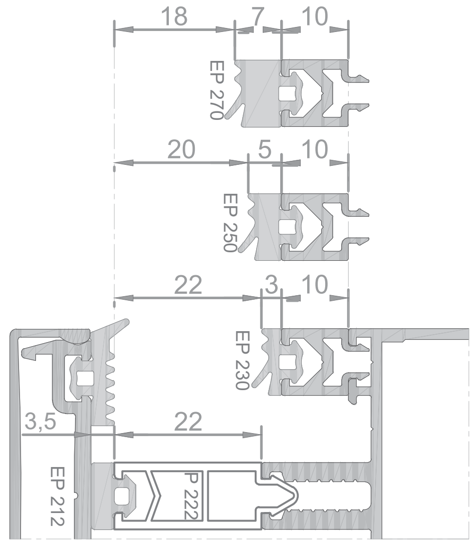
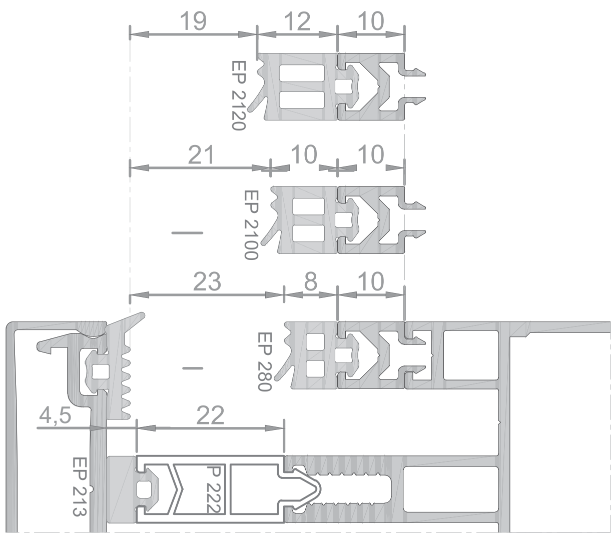
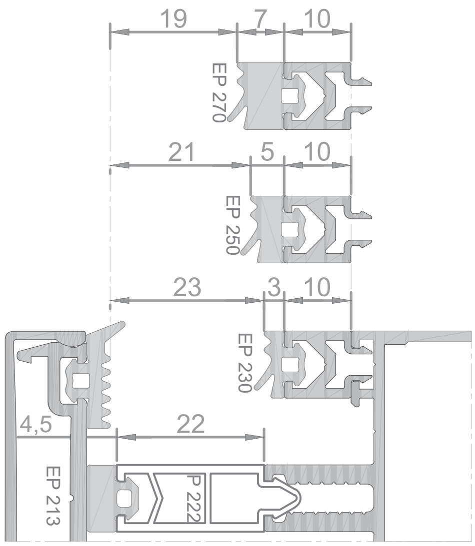
TRANSOM

10 mm Glazing Bead 22 mm Thermal Barrier









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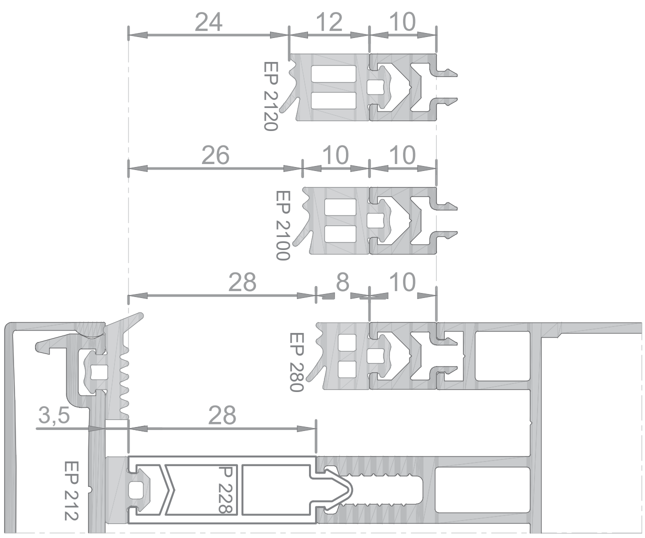

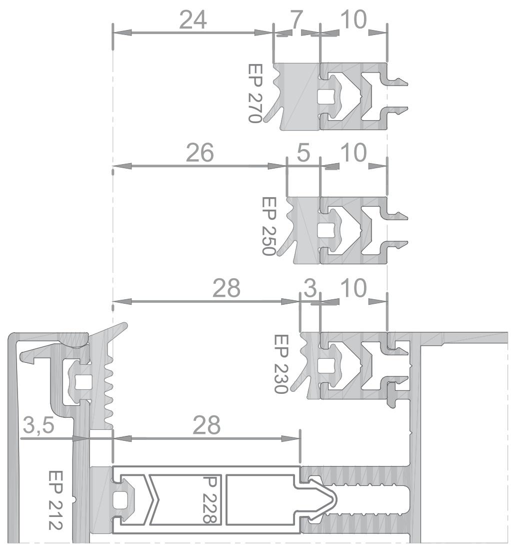

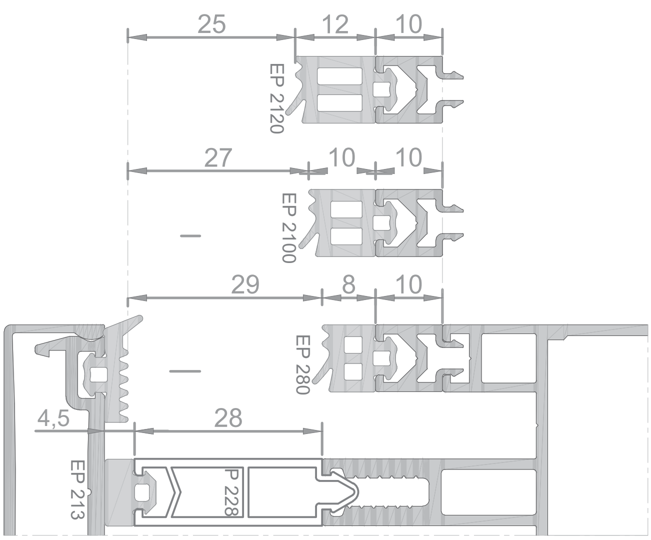

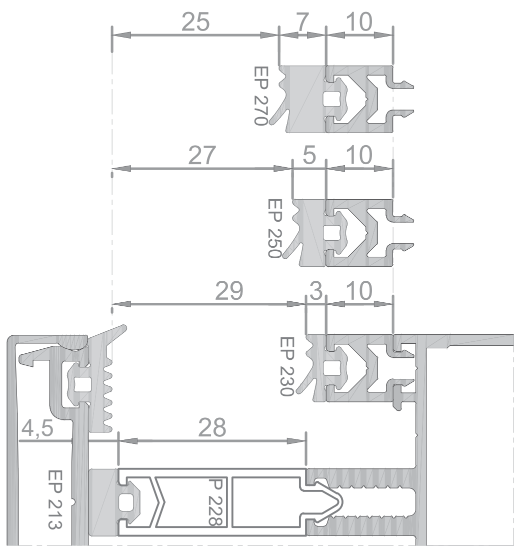

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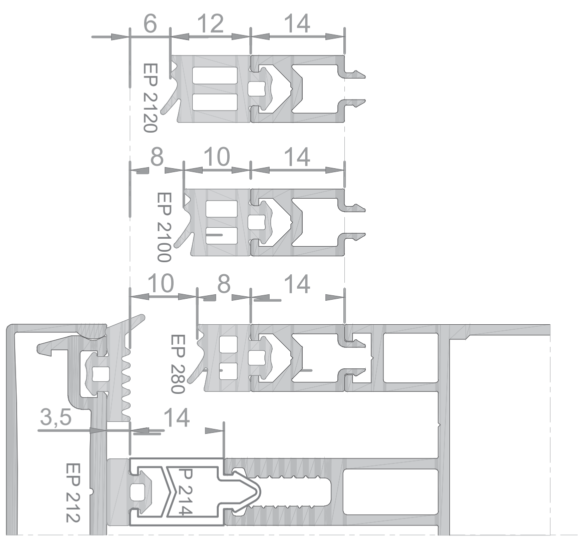
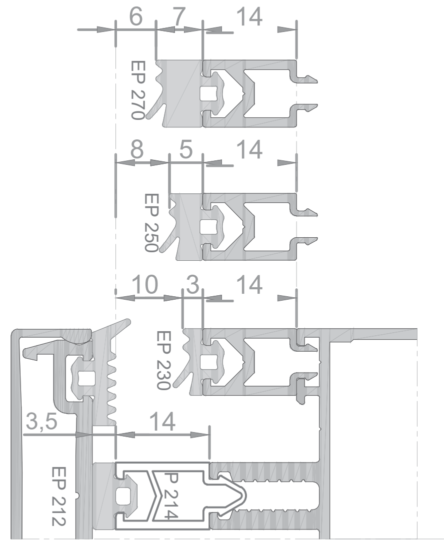
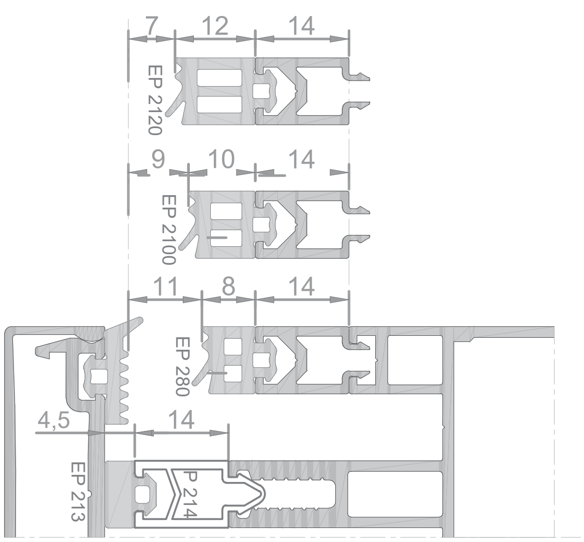
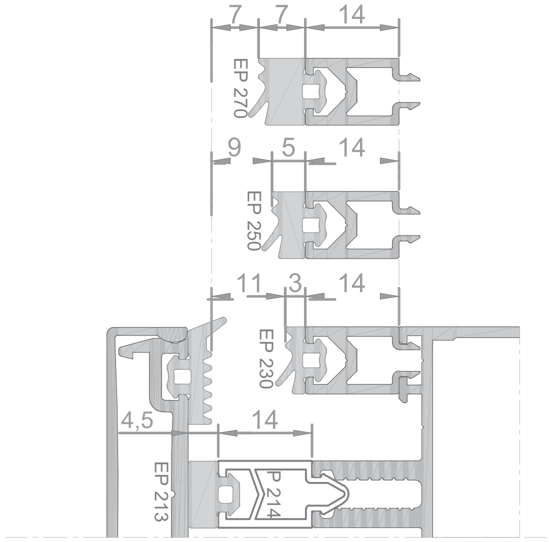
TRANSOM

14 mm Glazing Bead 14 mm Thermal Barrier









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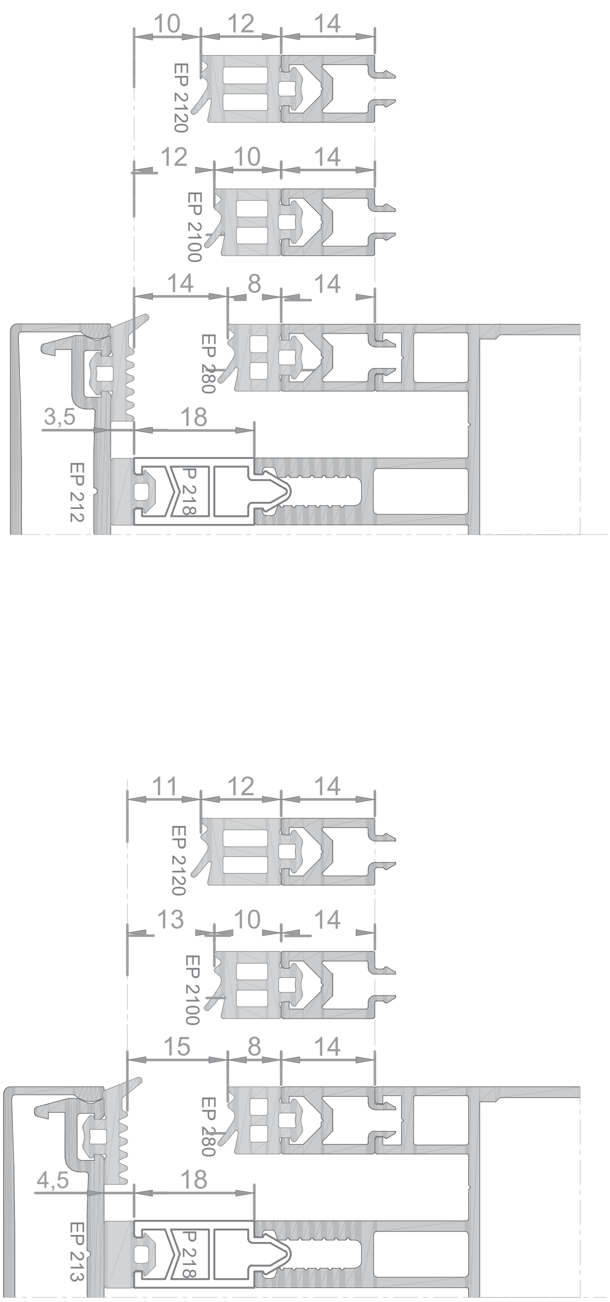
TRANSOM

14 mm Glazing Bead 18 mm Thermal Barrier



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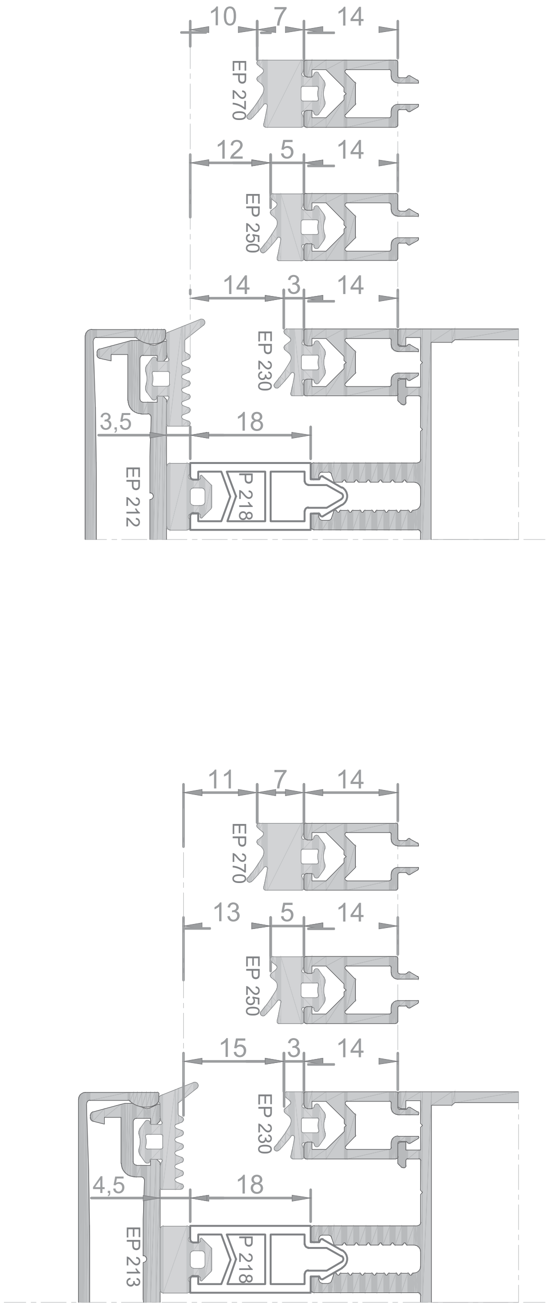
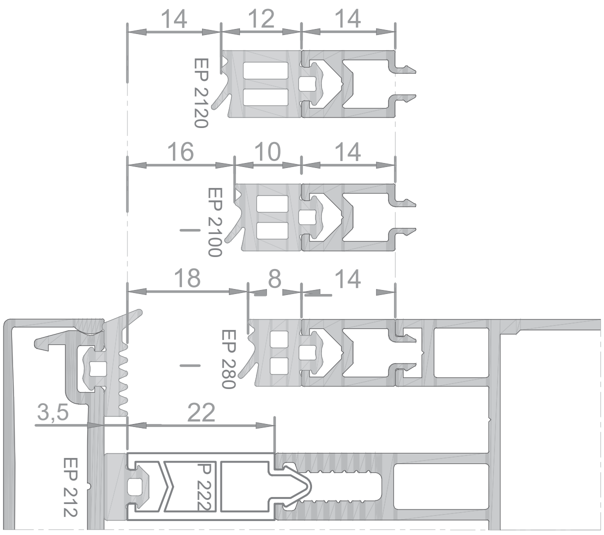
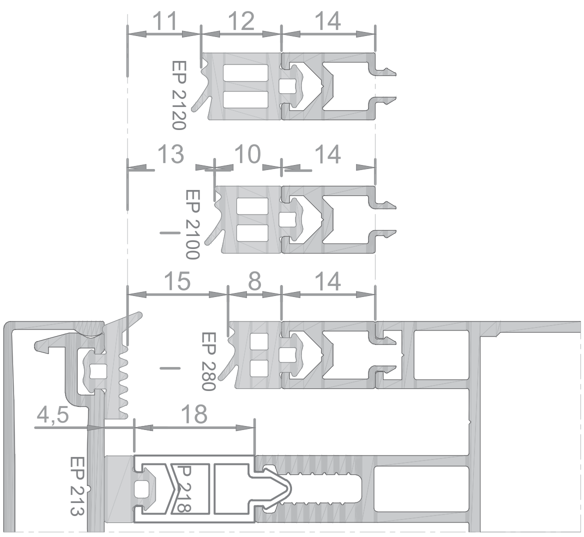


TRANSOM

14 mm Glazing Bead 22 mm Thermal Barrier





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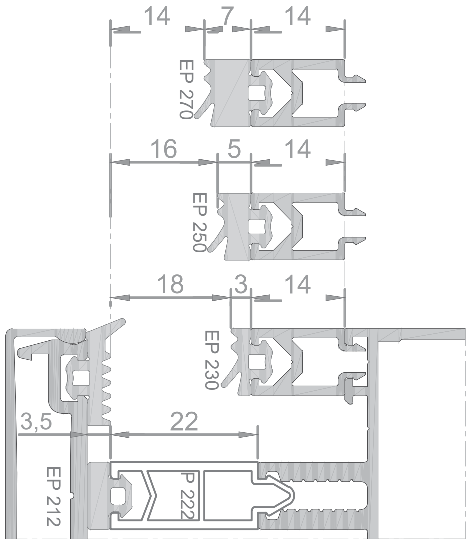

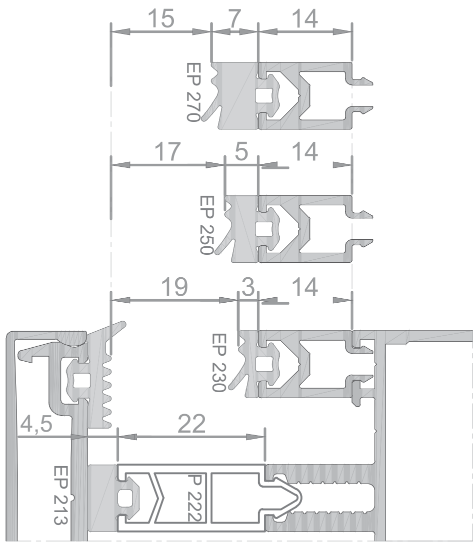

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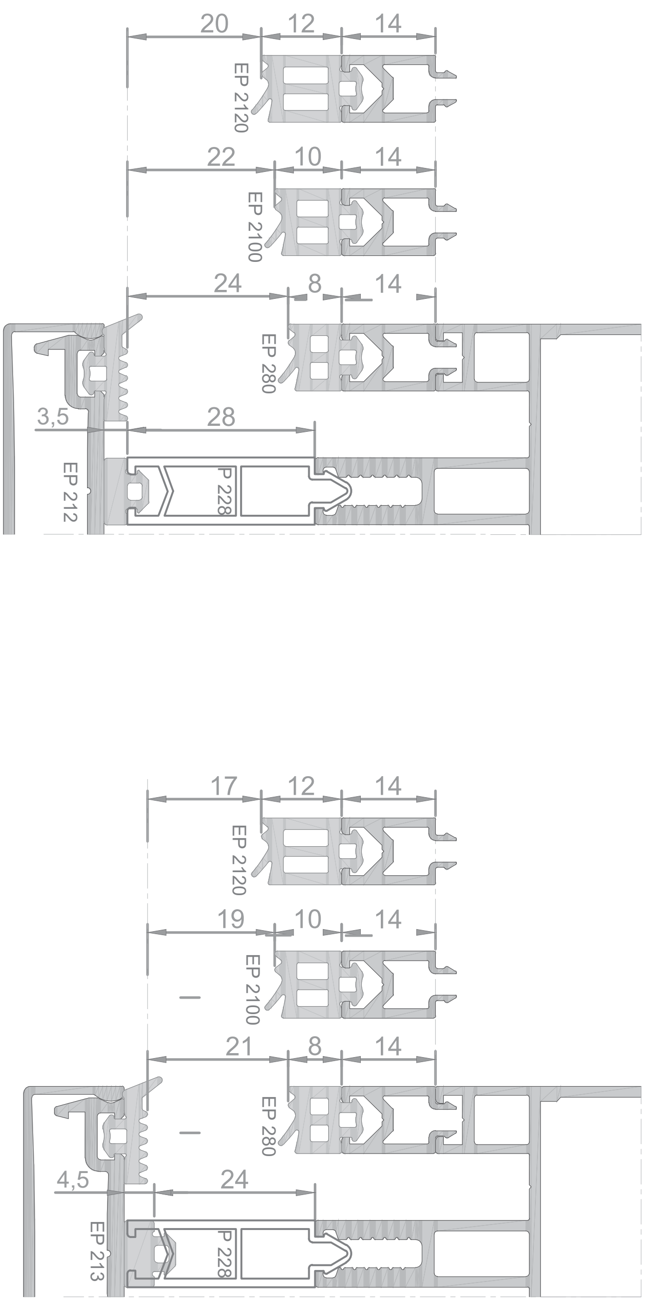
14 mm Glazing Bead 28 mm Thermal Barrier



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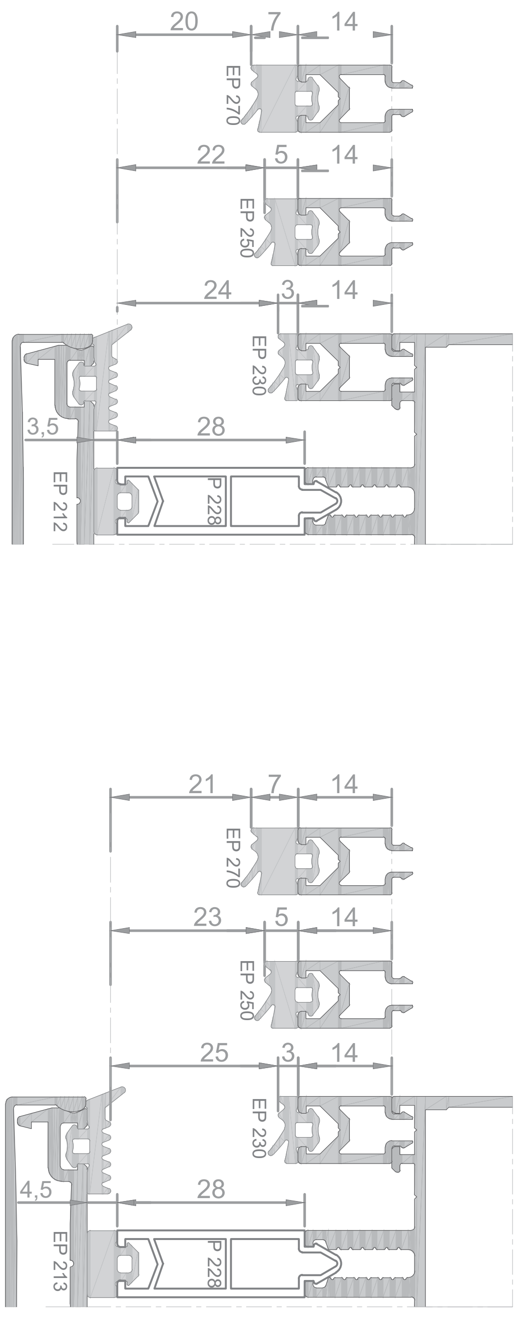
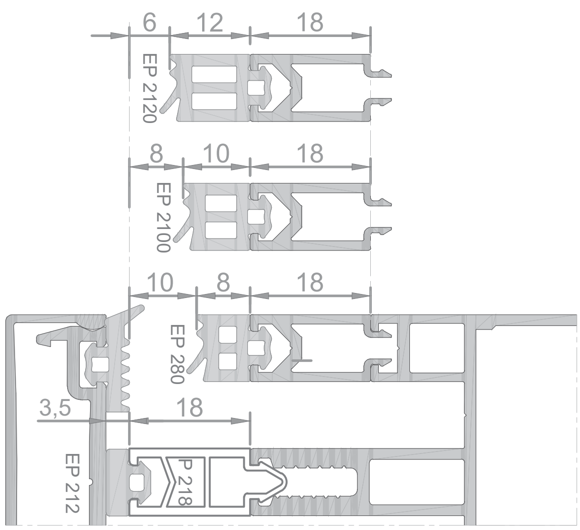
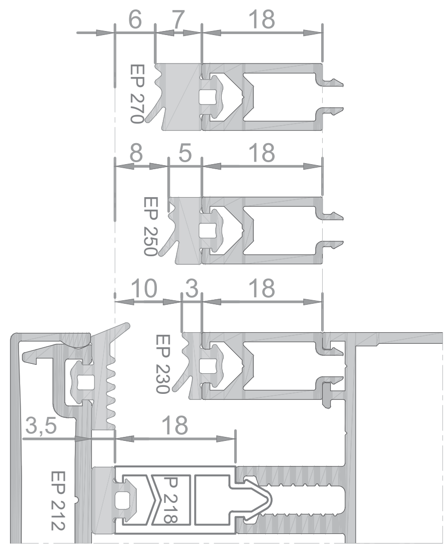
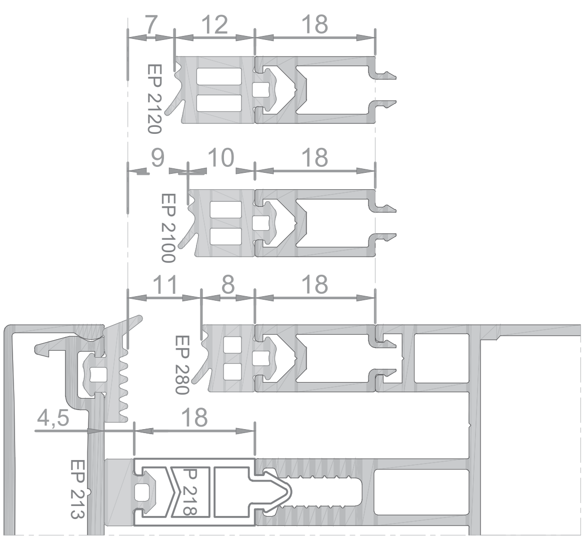


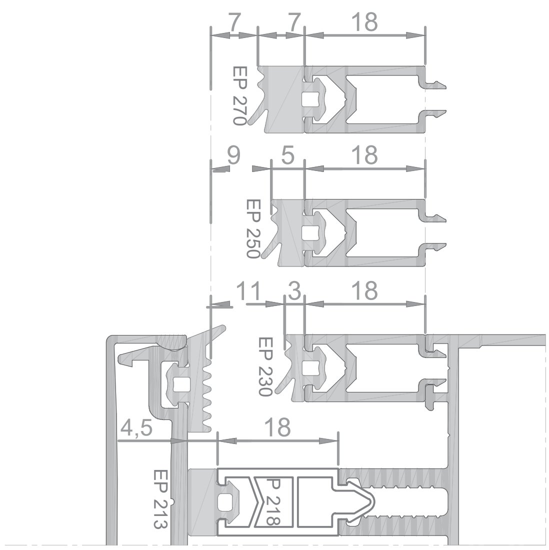
TRANSOM

18 mm Glazing Bead 18 mm Thermal Barrier









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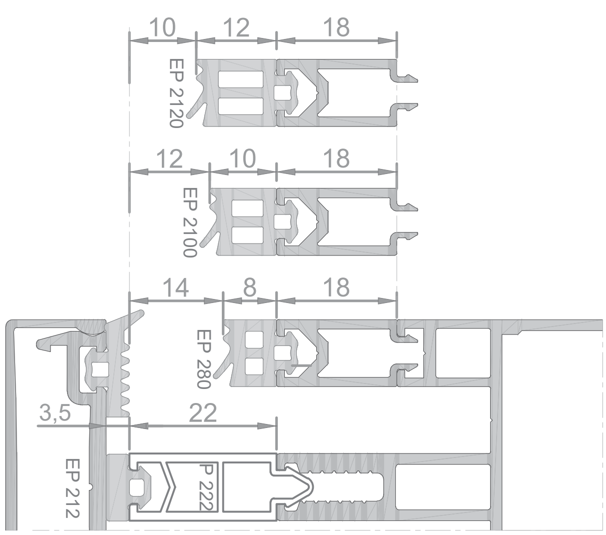
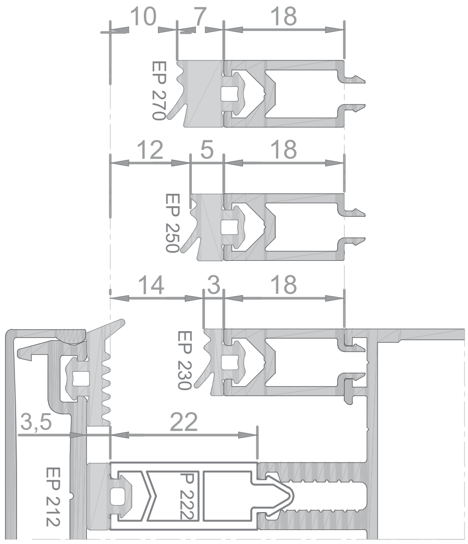
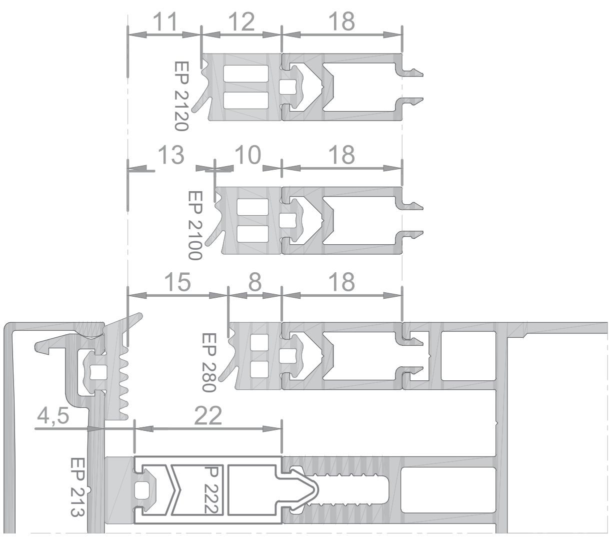
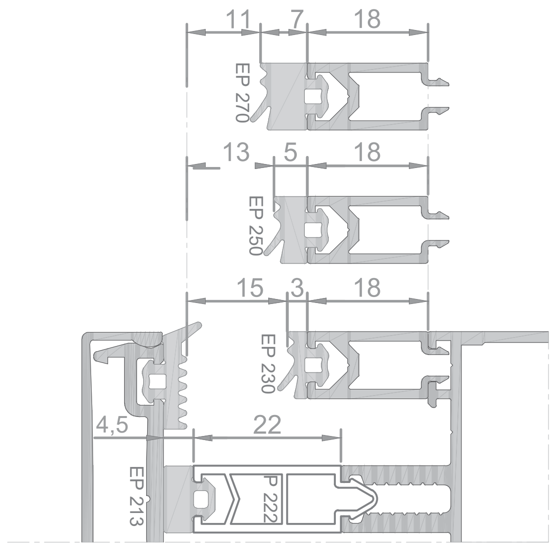
TRANSOM

18 mm Glazing Bead 22 mm Thermal Barrier









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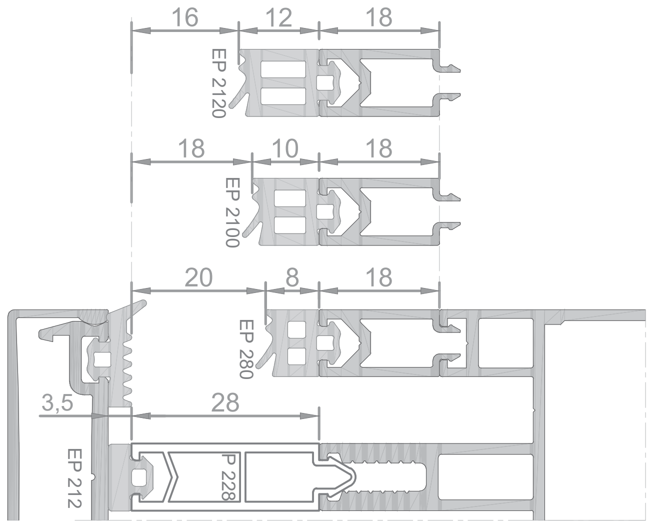
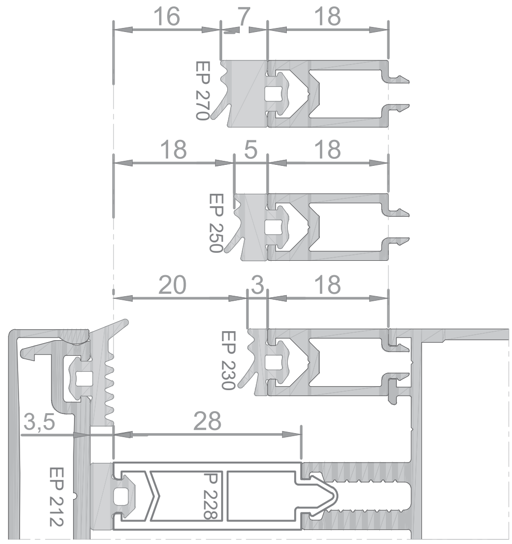
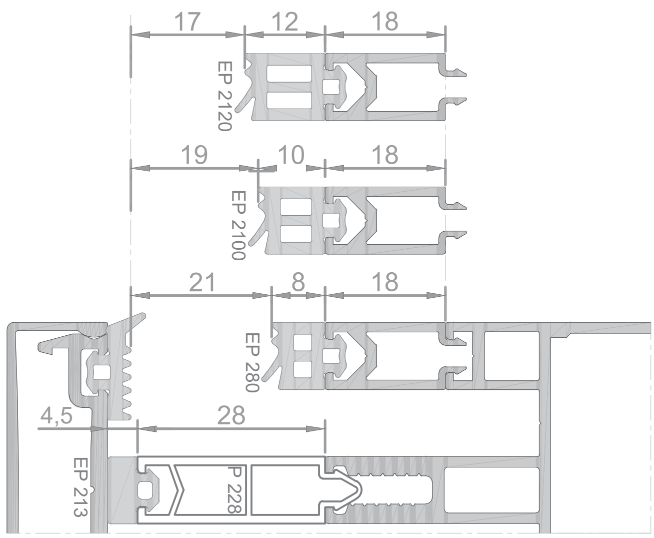
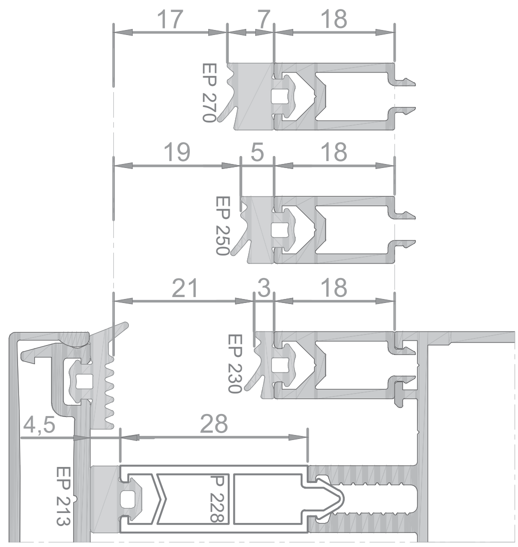
18 mm Glazing Bead 28 mm Thermal Barrier









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