

# How to make Upvc doors and windows

## The calculation of the size of the profile

### 1. The calculating basis of the cutting size of the profile

#### 1.1 The interstice of the wall opening

The size of the wall opening is the original size before the fitting up the window and door. You should keep some interstice before installing the window and door: usually 15-25mm each side for the convenience of regulating the levelness and verticality of the window and door. You will get the size of the finished product after you subtract the interstice of the wall opening from the size of the wall opening. And the following is calculated according to the size of finished product.

#### 1.2 Welding allowance

You should save some welding allowance before welding the profile. The welding allowance of the PVC profile is 3mm according to the domestic and foreign experience. Therefore, all the welding point of the profile should be saved 3mm welding allowance beforehand.

#### 1.3 Interstice between the window frame and window sash

You can calculate the inside size of the sash and then subtract the interstice when calculating the size of the window and door.

### 2. Specific calculation

Different type of window is different in its calculation, and we will explain the process of the calculation. The following is the size of the profile section used in calculation:

#### 2.1 The fixed window GSC58-1209

See the drawing on the right: there are four pieces of window frame profiles A.B.C.D and mid-frame E

i get the size of the finished window according to that of the wall opening. The size of the wall opening 1200×900mm (the size of the wall opening is calculated by width×height), then subtract 20mm each side from the size of the wall opening will be the size of finished window.

ii calculate the size of the profile according to the size of the finished window.

58mm typee profile: the size of the cutting profile = the size of the finished window + welding allowance (3mm), if the two end is going to be welded then will plus 3mm×2.

A=B=1160+(3×2)=1166      2 pieces

C=D=860=860+(3×2)=866      2 Pieces

iii V-shape cutting

The frame A and B will be welded with mid-frame E, therefore you need to cut the V-shape notch and you must mark the position and the depth of the notch. You should locate the

locating board to the right place of the rod, if the acme of the notch is 1000mm from the end of the profile, then the distance is lv, the notch depth is regulated by the handle, as indicated on the depth rod is hv, and the V-shape cutting notch should be at the middle part of the A and B.

$$h=1/2A=1/2B=1166/2=583$$

As to the calculation means of the V-shape notch please see the drawing 图 4

The V-shape notch is isosceles right angle trigon. The hypotenuse is the width of mid-frame welded with V-shape notch, hv is the height of the hypotenuse, the  $hv=1/2$ the width of mid-frame according to the theorem, and the V-shape notch also need welding allowance, therefore the  $hv=1/2$ the width of the mid-frame – 3mm., the first example is the profile with the thickness of the window frame 58mm and the width of mid-frame is 68mm, therefore the  $hv=68/2-3=31$

iv the length of the first cutting is L1, turn over the profile and place it against the locating board after the first cutting. And the mid-frame will be in shape after second cutting, and the length of the mid-frame is L2 which is the size of the profile after two cuttings. The difference between L2 and L1 is the width of the mid-frame (1/2 width of the mid-frame each end). After the first cutting, the long edge of the mid-frame is L1 and the short edge is L0.  $L1=L0 + 2 \times (\text{width of the mid-frame})$  therefore the

$L0 = \text{the size of the finished window} - (\text{the width of the window frame} \times 2) + (2 \times \text{welding allowance})$

We will get the data after we put the relevant figure into the above-mentioned formula.  $L1=860-56 \times 2 + 68 \times 2 + 3 \times 2=890$

Then we make out the following list according to the above – mentioned calculation.

58 window frame:	A=B	1166	2 pieces
	lv=583	hv=31	
58 window frame:	C=D	866	2 pieces
58 mid-frame:	890		1 piece
Hardware accessory			
1. K-type rubber tape		8m	
2. Fixed parts:		1	

The plastic swing window is welded by the mid-frame, therefore whether it is two-frame window or three-frame window all has mid-frames (foreign country also has the swing-window without mid-frame)

### 3. The second example is PSC50-1215

The window is made from profile with the thickness of the window frame 50mm, we will calculate the size of the finished window 1160x1460 according to the size of the wall opening 1200x1500. then we will make the separating size 1000mm and 460mm and 1000mm marked at the middle position of the mid-frame in the drawing 9. This window made up of four window frames profile A,B,C,D, and two mid-frame profile E and F the window

casement is also made of mid-frame profile.

And the following is the calculation of the size of the cutting profile:

i 50 window frame:

$$A=B=1160 \times 3 \times 2 = 1166 \quad 2 \text{ Pieces}$$

$$C=D=1460 + 3 \times 2 = 1466 \quad 2 \text{ Pieces}$$

ii V-shape cutting notch: the frame B, C, D, E in the drawing 8 need V-shape cutting notch.

$$lvB=1166/2=583 \quad \rightarrow \quad hv=64/2-3=29$$

$$lvCD=1000+3=1003$$

( 64 is the width of the mid-frame of the profile with 50mm thickness)

### 3.1 mid-frame

i the two ends of the mid-frame E should be welded with the window frame C and D, the calculation of the mid-frame E is same as that of the first example.

$$E=1160-50 \times 2 + 64 \times 2 + 3 \times 2 = 1194$$

1194 is the size of the mid-frame after the first cutting, the size is  $1194-64=1130$  after the second cutting.

The V-shape cutting notch on the mid-frame E after the two cutting on the mid-frame E, therefore the length of the E is 1130, the notch therefore is on the middle point of the E,  $lvE=1130/2=565$

ii one end of the mid-frame F is welded with the window frame and the other end is welded with the mid-frame. Therefore L2 equals to the height of 1000 subtract the width of the one-side frame and the half the width of the mid-frame.  $F=1000-50-64/2+64 \times 2+3 \times 2=1052$

We will conclude the formula of the calculation of the mid-frame after we summarize the process of the calculation.

And the calculation of the mid-frame can be classified into two situations:

① welded with the window frame:

-The width of the window frame + the width of the mid-frame

②welded with the mid-frame

-1/2the width of the mid-frame + the width of the mid-frame

All the calculation of the mid-frame can adopts the above-mentioned formula, and the following is other situations:

① welded with the window frame with both ends

-The width of the window frame  $\times 2$  + the width of the mid-frame  $\times 2$

② welded with the mid-frame with both ends

$-1/2$ The width of the window frame + the width of the mid-frame $\times 2$

③ one end welded with the window frame and the other end welded with the mid-frame

-The width of the window frame  $-1/2$ the width of the mid-frame + the width of the mid-frame $\times 2$

Notice: the above-mentioned calculation doesn't include the welding allowance.

The casement is also made of the mid-frame profile, you should first calculate the inside size of the window frame which is A0 and B0 in the drawing 9, and then plus the overlapping of the casement and the window frame. Both a. and b. are frame one side and mid-frame the other side, therefore

a. =  $1160/2 - \text{the width of the window frame} - 1/2 \text{the width of the mid-frame}$ ; b. =  $1000 - (\text{the width of the window frame} - \text{the width of the mid-frame})/2$

You should refer to the small side section of the window frame when you calculate the cutting size of the profile. The width of both the window frame and the mid-frame in the above-mentioned formula is the size of the small section. We can find out the width of the window frame is 33mm and the width of the mid-frame is 30mm from the section drawing of the profile

Usually the overlapping amount is 7-9mm, the amount of the overlapping between the casement and window frame should be as big as possible on the precondition that it won't affect the opening and closing of the casement and the installation of the hardware fittings. On that case the hermetic rubber tape can cover the window frame completely and the hermetic function is greatly improved.

We calculate according to the amount of 8mm overlapping in the second example:

$$a = 1160/2 - 33 - 30/2 + 8 \times 2 + 3 \times 2 = 554 \text{mm}$$

$$b = 1000 - 33 - 30/2 + 8 \times 2 + 3 \times 2 = 974 \text{mm}$$

We choose the overlapping amount between the window frame and casement 8mm in the above calculation, we can alter it according to different hardware fittings and the situation of the hardware fittings installation.

Therefore we make the following list of the cutting size of the profile according to the above calculation:

50mm type window frame:

A=B	1166	2 Pieces
lvB=583	hv=29	
C=D	1466	2 Pieces
lv=1003	hv=29	

50mm type mid-frame:

E	1194	1 Piece
lv=565	hv=29	
F	1052	1 Piece
a	554	4 Pieces
b	974	4 Pieces

### 3. 2 technical requirement

- i all the window frame and mid-frame is made of 50 sery profile.
- ii the glazing bead is chosen separately.

### 3.3 The hardware accessories

① hinge (80mm)	4 Pieces
② wind-shield	2 Pieces
③ handle	4 Pieces
④ O-type rubber tape	
⑤ K-type rubber tape	

### 4. The third example: PSC50-1818

50mm type window frame:

A=B	1766	2 Pieces
lvA=883	hv=29	
lvb1.2=583	hv=29	

C=D	1766	2 Pieces
lv=1203	hv=29	

50mm type mid-frame:

E	1794	1 Piece
lv1=865	hv=29	
L2.3=565	hv=29	

F	612	1 Piece
G=H	1252	2 Pieces
a	554	4 Pieces
b	1172	4 Pieces

Generally speaking, it is inadvisable for the size of the casement to be too big, it is usually between 550×1200. Therefore you should aware the width of two casements of the swing window.

#### 4.1 technical requirements

i all the window frame and mid-frame is made of 50 type profile.

ii the glazing bead is chosen separately.

iii **before install the hinge**

iv one side of the fixed steel on the E, G, H should face to the fixed casement

#### 4.2 The hardware accessories

① hinge (xinxiang 12")	4 Pieces
② handle	4 Pieces
③ O-type rubber tape	
④ K-type rubber tape	

#### 4.3 V-shape notch

V1 is at the middle point of the mid-frame E, and the calculation of the  $lv_1$  is same as the means as mentioned above. V2 and V3 are in alignment with the V-shape notch of on the nether frame B (see the drawing 10). The width of the window frame is 50,  $lv_1=29$  and 21mm with 3mm welding allowance will be left after the V-shape cutting, and the mid-frame also has 3mm welding allowance, therefore  $lv_2=580-(21-3-3)=565$

The above-mentioned is the calculation of the 50mm type profile, and the calculation of the other types of the profile can be deduced by it.

Notice: this window is made of the Xinxiang 12" hinge with four rods, and the amount of overlapping between the window frame and casement adopts 7mm each side.

### 5. Sliding window

The sliding door is different from the swing door, and the common profile used in the sliding door is the type of profile with the thickness 85mm, the section drawing of window frame, casement and cap seal please see the flowing drawing:

You should use the joining profile to join the sliding door together with the fixed window or other type of window.

#### 5.1 The forth example: TSC85-1518

The size of the wall opening is 1500×1800, and the size of the finished window is 1460×1760

This window is made up of sliding window and fixed window, and the thickness of the profile piece is contained in the height of the window. That is to say:

The height of the finished window=the height of the sliding window + the thickness of the joining profile +the height of the fixed window.

The size and section is different made by different profile manufacturer. And we use the profile with the thickness of 23mm in this example, the calculation of the fixed window is mentioned above and we will calculate the cutting size of the profile on the sliding window

① the window frame:

$$A=B=1460+3\times 2=1466$$

$$C=D=1177+3\times 2=1183$$

② Casement:

The important point of the calculation of the size of the casement is that the vertical profile of two casements overlap completely.

The size of the vertical profile of the casement is

$$60 \text{ (the width of the casement)} + 2 \text{ (the thickness of the collision-proof mat)} = 62\text{mm}$$

Therefore the calculation of the cutting size of the a is:

$$a = 1460/2 - \text{the width of the window frame} + \text{overlapping amount} + (\text{the width of the casement} + \text{the thickness of the cap seal})/2 - \text{the thickness of the cap seal} + \text{the welding allowance} = 1460/2 - 51 + 9 + (60 + 2)/2 - 2 + 3 \times 2 = 723\text{mm}$$

The sliding on the track of the sliding window is assisted by the pulley in fixed on the nether horizontal profile which may affect the height of the vertical casement, the overlapping amount between the nether horizontal casement and the frame is decided by the height of the pulley and the groove depth of the casement. Usually the height of the pulley is 10mm-14mm. Therefore the cutting size of the b is:

$$b = 1177 - \text{width of the window frame} + \text{overlapping amount} - \text{width of the window frame} + \text{overlapping amount} + \text{the welding allowance}$$

Because there is no pulley between the top horizontal casement and the window frame, we usually make the overlapping amount same as that of the left and the right casement that will be more equal.

$$b = 1177 - 51 + 9 - 51 + 9 + 3 \times 2 = 1099\text{mm}, \text{ it can also be calculated this way: } b = 1177 - 51 \times 2 + 21 + 3 \times 2 = 1102\text{mm}$$

③ cap seal: The size of the cap seal= the cutting size of the vertical casement –the welding allowance

We will make the following list of cutting size according to the above calculation

50 window frame:

$$A1=B1$$

1466

2 Pieces

lv=733	hv=29	
C1=D1	566	2 Pieces
85 window frame		
A2=B2	1466	2 Pieces
C2=D2	1193	2 Pieces
a	723	4 Pieces
b	1099	4 Pieces
Cap seal	1093	2 Pieces
Joining profile	1460	1 Piece
Steel reinforcement	1600	2 Pieces

④ technical requirement

- i use the type of profile with the thickness of 85mm and 50mm
- ii the glazing bead is chosen separately
- iii the joining profile with the steel reinforcement in it.

⑤ hardware accessories

- i pulley 4 Pieces
- ii collision-proof mat 4 Pieces
- iii
- iv K- type rubber tape
- v semicircle lock 1
- vi wind- proof 2

## 5.2 The sliding window with three or four casements

The sliding window with three casements share the equal size (the width of each casement is same) and the ventilation amount is less than 1/3, therefore this type of window is rare. Usually the common sliding window with three casements with the width of the middle casement equals to that of two side casements. The ventilation amount of such type of sliding window can reach 1/2. Similar to the sliding door with two casements, the vertical profile of the two casements on the juncture overlaps when the window is in close condition.

When you calculate the cutting size of the a1 and a2, you should first subtract 42 from the size of the finished window 1760 that is:  $1760-42 \times 2$ , and then divided by 4,  $1760-42 \times 2 / 4$ . we therefore calculate the a1 and a2 from the above calculation:

$$a1 = 1760 - 42 \times 2 / 4 + 2 / 2 - 2 + 3 \times 2 = 454 \text{mm}$$

$$a2 = (1760 - 42 \times 2 / 4) \times (62 / 2 - 2) \times 2 + 3 \times 2 = 902 \text{mm}$$

if you calculate precisely, you should also take the thickness of the window lock into consideration. The window lock installed on the two movable casements, the two window locks collide with each other when you open the casement. Therefore the movable casement should be smaller and the fixed casement should be bigger correspondingly. For example, if the thickness of the window lock is 24mm, then the movable casement decrease  $24/2=12\text{mm}$ , the fixed casement increases  $24/2 \times 2=24\text{mm}$ ,

$$a'1=a1-12=442\text{mm} \quad a'2=b1+24=926\text{mm}$$

You can make the height of the fixed casement higher to make the top and nether horizontal profile overlap with the window frame completely if the width of the frame is too big. You can fill the steel reinforcement into the vertical casement to make the frame stand upright.

$$B2=\text{the height of the window frame}-\text{the width of the window frame} \times 2 + 21 \times 2 + 3 \times 2 \\ = 1177 - 51 \times 2 + 21 \times 2 + 3 \times 2 = 1123\text{mm}$$

You should install the fixed casement into the window frame before installation according to the above calculation.

### 5.3 List of the cutting size of the profile

#### 50 type profile

Window frame: A1=B1	1766	2 pieces
lv=883	hv=29	
C1=D1	566	2 pieces
E	594	1 piece

#### 85 type profile:

##### Window frame:

A2=B2	1766	2 pieces
C2=D2	1183	2 pieces

##### Casement:

a <sub>1</sub>	442	4 pieces
b <sub>1</sub>	1099	4 pieces
a <sub>2</sub>	926	2 pieces
b <sub>2</sub>	1123	2 pieces
Cap seal	1093	2 pieces
Cap seal	1117	2 pieces
Joining profile	1760	1 piece
Steel	1900	

### 5.4 Technical requirement

i all the window frame and mid-frame is made of 50 and 85 type profile.

ii the glazing bead is chosen separately.

#### 5.5 hardware accessories

i pulley

4 Pieces

ii collision-proof mat

4 Pieces

iii semicircle lock

2

iv wind- proof

4

