TECHNICAL HANDBOOK

TO WORK

GEORGIAN BAR

2012

To work and assemble Georgian bar with the following assembling methods:

SWIFT System

MITERING System

GERMANELLA System

v. 1.0.6

INDEX

Introduction to handbook

This handbook aims at teaching the user how to make Georgian bar panels. It is not exhaustive and provide instructions about how to make symmetrical grids. The appendix shows ways of use of the curving machine.

Therefore, the handbook represent a good guidance for whomever starts working Georgian bars.
A definition of Georgian bar system is: the way of connecting among various different items (profiles, fittings and patterns) trough a manufacture process to make architectural elements for doors and windows.

Manufacture process shown in this handbook are:

- Swift system
- Mitering system
- Germanella system

Tables from 1 to 4 show the nominal dimensions of Georgian bars and their workings.
Table 5 group shows how to drill Georgian bar for raking drawing Swift System.
Table 6 group shows how to work Georgian bar for diamond drawings.
Table 7 includes the list of single processing and corresponding machines & equipment produced by AL7 Meipa Srl. A short description is included.

The appendix provides an example to show relationship between processing and machines and a typical layout of machines & equipment necessary to work Georgian bars.

Enjoy your work!

Introduction to Georgian bar and AL7 Production

The beginning…
AL7 Meipa srl was the first company to set Georgian grilles inside IG units (1973) and since then, it has been producing them guaranteeing high quality in all production stages: from slitting to packaging.

Environmental protection
In full respect for the environment, **AL7 Meipa Srl** has banned chromo from the 9 stages pretreatment of aluminum since the end of 90s and does not use any glues nor solvents in foiling Georgian bars.

Style & Design
More than 30 kinds of Georgian bars different in shapes and dimensions allow to meet all aesthetical requirements: ancient and modern balance. With a width from 9 to 45 mm to meet all architectural requirements and a height from 5 to 10 mm for spacers from 6 mm upwards.

Finishes & Foils
Surfaces are powder-coated by extraordinary long-lasting natural pigments with high capacities to stand extended exposure to sunlight and corrosion. Surfaces are anodized by chemical polishing and foils are certified by the most famous quality label organizations of the field.

Quality & Certifications
AL7 Meipa Georgian bars are Qualicoat® & Qualanod® certified, manufactured in accordance with EN 1279 regulation, adjustable to any architectural need, highly resistant at any latitude and climatic zone, and long-lasting. Their linear thermal transmittance is basically null: centesimal (EN 10077).

Architectural restoration of buildings
AL7 Meipa Srl proposes a wide range of solutions of Georgian bars inside insulating glass of doors and windows both for stylish buildings and for architectural restoration of buildings as required by town planning building regulations.

Georgian style enables window partitions and, for the same decorative effect, more energy conservation than Georgian bars outside insulating glass (EN 14351, annex J).

Thanks to **AL7 Meipa** powder coating and foiling plants, machines and equipment, it is possible to make and assemble decorative grilles with special finishes and shapes.

Georgian decorative grilles can be assembled by different systems depending on requirements.

Introduction to Georgian bar assembly methods

There are different methods to assemble Georgian bar, in this handbook will show three of them. Anyway we will introduce:

- Square cut and key
- Milled joints
- Mitred joints
- Half lap joints (Germanella)

Square cut and key
The most common and fastest method of grille assembly. Each piece of bar is square cut to length and the adjacent pieces are held together with nylon key.
Only a saw and drill with measuring jig or staple table are required.
This method is less suitable for special finishes where the nylon keys need to be color matched to the profile.

Milled joints
Grilles are assembled using continuous mullions (vertical rods) which are drilled (or notched) at the transom (horizontal rod) position. The end(s) of each transom bar are milled to fit precisely over the mullion (overlap). A pin trough the hole in the mullion mates with connectors hidden inside the transoms. This type of grille takes longer to produce, but results in a very rigid grille of any shapes or finishes. A special purpose milling machine is required.

Mitred joints
Each piece of bar is cut a 45° chamfer at the joint end. The 4 adjacent bars then fitted over a key (internal) which holds them a 90° to each other and is hidden inside the profile. This system allows any color of profile to be assembled using the same key. The grille is not particularly rigid. A dedicated machine is required or a purpose gauge to apply on cutting machine.

Half lap joints (Germanella)
Grilles are assembled using both continuous mullions and transoms. Both profiles are notched out at the joint position to half their depth. The mullion and transom can then be nested into each other. A clip on cap is employed to cover the joint. Production of this type of grille requires a saw and a purpose punching device.

Following a features comparison among different assembling method:

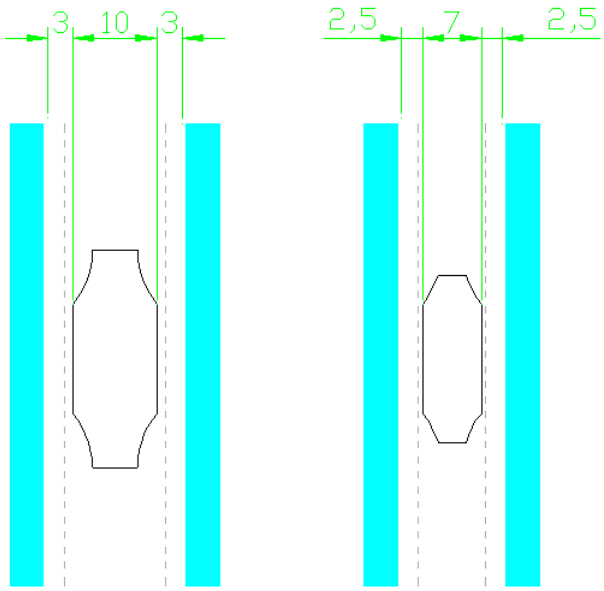
SYSTEM	Economy	Easyness	Finishes	Shapes	Stiffness	Light-fastness
Key Joints	⇗⇗	⇗⇗	⇘⇘	⇔	⇘	⇘⇘
Miter Joints	⇔	⇗	⇗	⇔	⇘	⇗⇗
Milled Joints	⇘	⇘	⇗⇗	⇗⇗	⇗⇗	⇗⇗
Half lap Joints	⇗	⇗	⇘	⇗⇗	⇗	⇗⇗

Choice of Georgian bar

In addition to aesthetical matters, it is important to point out that the choice of the type of Georgian bar depends on different but correlated factors.
The main one is the distance between glass and profile, which must be at least 2,5 – 3 mm (pic. 1).
Consequently, the typology of the Georgian bar will be correlated to spacer dimension, panel dimension, glass rigidity, etc…

Examples:

Spacer Dimensions	Max Width Georgian bar
16 mm	10 mm
14 mm	8 mm
12 mm	7 mm
10 mm	5 mm



pic. 1

SWIFT System

1. SWIFT System

Swift system consists in the assemblage of overlapping vertical and horizontal rods (pics 2a, 2b and 2c).

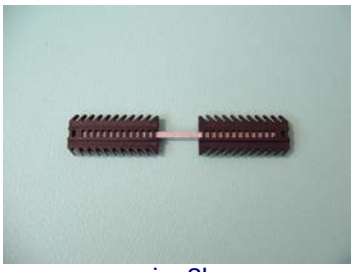
pic. 2a

pic. 2b

pic. 2c

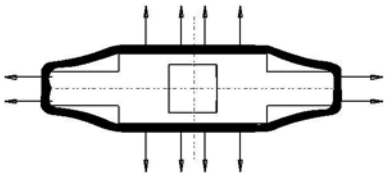
A perfect rod overlapping is obtained by milling horizontal rods and fixing them by assembling sets made up of two plastic accessories and a metal insert (pic. 3a and 3b).

pic. 3a



pic. 3b

Plastic insert guarantees a perfect torsional rigidity as it adheres to all four sides of the profile (pic. 4).



pic. 4

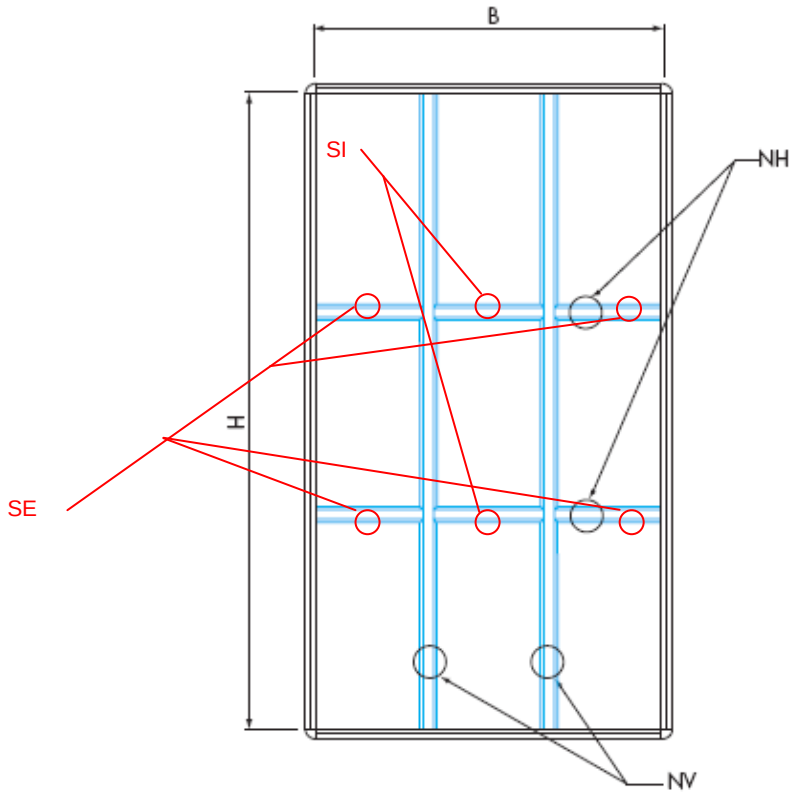
Once assembled the grid, it will be fixed to the frame made up of spacers stapled together. Fixing is made by plastic edge keys having a special space to hold exclusively the staple ends in order to avoid they have any direct contact with the Georgian bar (pic. 5).

pic. 5

1.1. Grid elements

To make a grid, the start-up data are the following:

- Internal dimensions of the frame made up of spacers: Base **B** and Height **H**
- Width of Georgian bar: **LP**
- Number of horizontal rods (MULLIONS): **NH**
- Number of vertical rods (TRANSOMS): **NV**



pic. 6

The vertical rods must be punched to put in the insert of the assembling set.
The horizontal rods will be cut and the pieces obtained will be chamfered and milled:

- On one end (external horizontal rods)
- On both ends (internal horizontal rods)

Then, you have to determine the quantity of the elements necessary to assemble the grid:

- internal horizontal rods
- external horizontal rods
- vertical rods
- assembling set
- plastic edge keys

EXAMPLE:
Grid with 2 horizontal rods and 2 vertical rods.

$$NV \text{ (number of horizontal rods)} = 2$$

$$NH \text{ (number of horizontal rods)} = 2$$

The number of internal horizontal rods will be 2.
For calculations, use the following formula:

$$(NV - 1) \times NH = (2 - 1) \times 2 = 2$$

The number of external horizontal rods will be 4.
For calculations, use the following formula:

$$NH \times 2 = 2 \times 2 = 4$$

The number of assembling sets will be 4.
For calculations, use the following formula:

$$NH \times NV = 2 \times 2 = 4$$

The number of edge keys will be 8.
For calculations, use the following formula:

$$(NH + NV) \times 2 = (2 + 2) \times 2 = 8$$

External horizontal rods ***Transoms***	**Internal horizontal rods** ***Transoms***	**Vertical rods** ***Mullions***
Cut	Cut	Cut
Chamfer at 45° of the first end	Chamfer at 45° of the first end	Punching
Milling of the chamfered part	Chamfer at 45° of the second end	Insertion of assembling set
Assemblage of edge keys	Milling of the first end	Assemblage of edge keys
	Milling of the second end	Assemblage of horizontal rods

Fixing of the grid to the frame

1.2. Grid calculation

Once determined the elements of the grid, that is:

- Internal dimensions of the frame made up of spacers: Base **B** and Height **H**
- Width of Georgian bar: **LP**
- Number of horizontal rods: **NH**
  - Number of internal horizontal rods : **HI**
  - Number of external horizontal rods: **HE**
- Total length of horizontal rods: **LH**
- Number of vertical rods : **NV**
- Total length of vertical rods : **LV**

proceed with the calculation of total lengths of horizontal and vertical rods.

1.3. Total lengths of horizontal and vertical rods

While calculating the total length of horizontal and vertical rods, consider the numerical coefficient **CF (thermal expansion coefficient + thickness of edge key),** which varies on the basis of two factors:

- thickness of plastic edge keys : **EC**
- average thermal expansion of the profile: **TE**

as two edge keys per rod (horizontal or vertical) are demanded, the **CF (thermal expansion coefficient + thickness of edge key)** will be the following:

$$CF = 2 \text{ x } EC + TE \cong 4 \text{ mm}$$

Example:

Once determinded the internal horizontal and vertical dimensions of the frame, **B** and **H**, equal to:

$$B = 601 \text{ mm}$$

$$H = 1400 \text{ mm}$$

calculate the length of horizontal and vertical rods.

In this case, the numerical coefficient **CF (thermal expansion coefficient + thickness of edge key)** will be subtracted from the base as follows:

LH (total length of horizontal rods)

$$LH = B - CF = 601 - 4 = 597 \text{ mm}$$

LV (total length of vertical rods)

$$LV = H - CF = 1400 - 4 = 1396 \text{ mm}$$

The obtained rods will undergo further workings before being assembled.

1.4. Calculation of horizontal rods

Once obtained the length of horizontal rods **LH**, calculate the length of single elements (pic. 6)::
- Length of external horizontal rods : **SE**
- Length of internal horizontal rods : **SI**

The two most important factors for calculation are:
- Profile width : **LP**
- Profile overlap : **SP**

See table no.1.

In detail:

$$SE = \frac{LH - (LP \times NV)}{NV + 1} + SP$$

$$SI = SE + SP$$

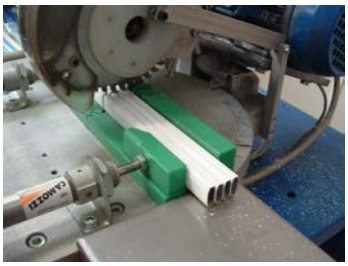
Example:
Starting from our example and given the total horizontal length of 597 mm, you will obtain with good approximation for a profile **16 mm wide (=LP) and with overlap 3,5 mm (=SP)**:

$$SE = \frac{597 - (16 \times 2)}{2 + 1} + 3{,}5 = 191{,}8 \text{ mm}$$

$$SI = 191{,}8 + 3{,}5 = 195{,}3 \text{ mm}$$

1.5. How to make horizontal rods

The horizontal rods, both internal and external, are obtained by the first cut processing (pic. 7a and 7b). In the first case, they will be chamfered and milled on both ends. In the second case, they will be chamfered at 45° on both corners (pic. 8a/8b and 8c) and milled (pic. 8d and 8e) only in the end that overlaps the verical rod. The plastic edge keys will be inserted in the external horizontal rods only for the final assemblage into the frame made up of spacers.



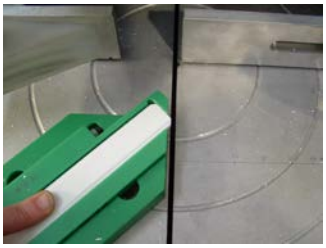
pic. 7a

pic. 7b

1.6. Chamfer at 45° and milling

Width of the chamfer at 45° (=**PS**) depends on the profile type, as shown in Table no. 2.

pic. 8a



pic. 8b

pic. 8c

pic. 8

Milling as well depends on the profile type. The milling depth **MD** is shown in Table no. 3.

Machine Code 7003

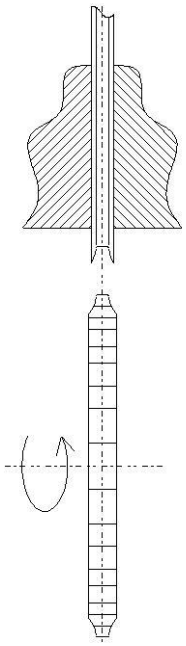
Machine Code 6000

Machine Code 6003

pic. 8d

MILLING PROCESSING

Milling processing devised by AL7 Meipa Srl achieves high precision and quality thanks to the perfect symmetry between the Georgian bar to mill and the milling cutter.

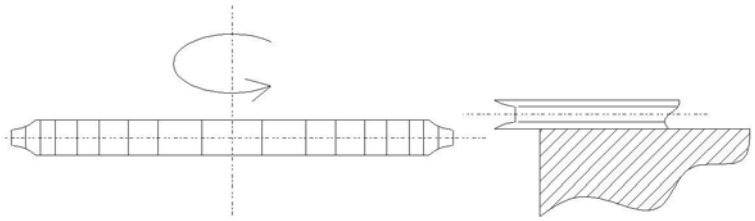


Such a symmetry is obtained thanks to:

1. Structural symmetry of the profile
2. Vertical centring of the Georgian bar to mill

Structural symmetry of the profile is given by the high quality standards of AL7 Meipa Srl's production processing and by its high frequency Roll Forming technology.

Vertical centring of the Georgian bar enables to mill vertically, contrary to many other milling systems.
Working axis of the milling machine is lined up with the symmetry axis of the Georgian bar and this guarantees a symmetrical milling.
On the contrary, horizontal milling, executed on extruded Georgian bars, does not always guarantees a symmetrical milling of the Georgian bar.
In case of horizontal milling of the Georgian bar, particularly of the extruded one, it is always leaned onto a plane and the working axis varies according to the thickness of the Georgian bar.



In this way, milling is not uniform and varies according to the profile without guaranteeing a perfect junction.

1.7. Chamfer at various angles

In case you want to join two different types of Georgian bars (pic. 9), for example 18x08mm and 26x08mm, the chamfer angle will change accordingly as shown in table 4.

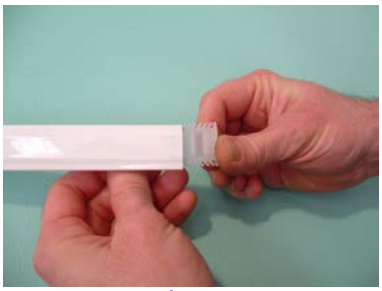
18 V / 26 H 26 V / 18 H 45 V / 18 H

pic. 9

1.8. Insertion of edge key

The plastic edge key is inserted in the unworked end of external horizontal rods only.
It is used for the final assemblage of the grid into the frame(pic.10).

See paragraph about fixage into frame.



pic. 10

1.9. Calculation of vertical rods

Once calculated the total length of the vertical rod, punch the profiles.
The punching machine is equipped of a millimetric rod with a position indicator. The position of this indicator (=**TV**) results from the following formula:

$$TV = \frac{LV - \left(\frac{LP}{2} \times NH\right)}{NH + 1}$$

Example:

Going on with our example where

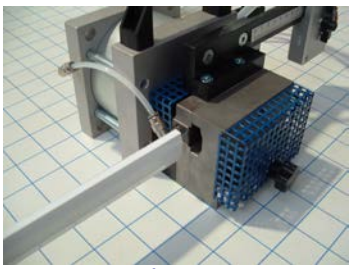
$$LH = 597 \text{ mm}$$

the result is that:

$$TV = \frac{1396 - \left(\frac{16}{2} \times 2\right)}{2+1} = 460 \text{ mm}$$

1.10. How to make vertical rods

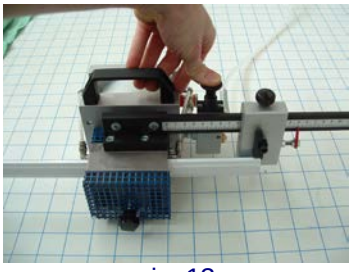
Once positioned the punching press indicator, put the profile in the suitable slit (pic. 11) and lean it against the suitable block (pic. 12).



pic. 11

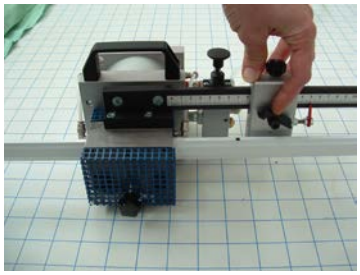
pic. 12

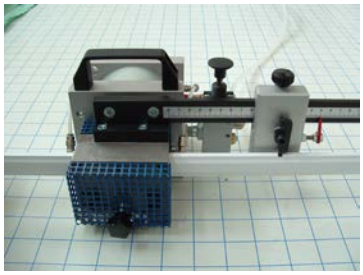
Push the button to start punching (pic. 13).

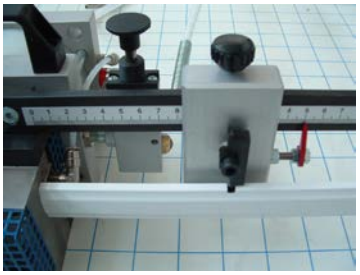


pic. 13

Lift the block (pic. 14 and pic. 15) to make the Georgian bar slide and lower it once again connected with punching (pic. 16).


pic. 14


pic. 15


pic. 16

Go on working in sequence as long as all desired punching on the vertical rod are made.
Once all processings are finished, insert the plastic edge keys, as done for external horizontal rods.

1.11. Insertion of assembling kit

Insert the pin of the assembling kit into the punching of the vertical rod and block it by inserting the the opposite plastic accessory (pics. 17, 18, 19, 20).


pic. 17


pic. 18


pic. 19

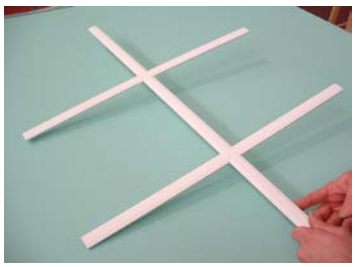

pic. 20

1.12. Insertion of horizontal rods

Once inserted the assembling kits, fit in the horizontal rods (pic. 21, pic. 22 and pic.23).

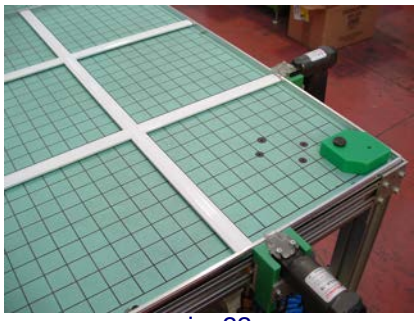

pic. 21

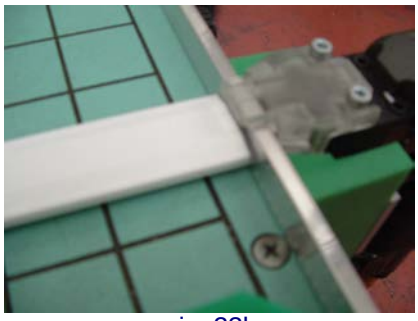

pic. 23

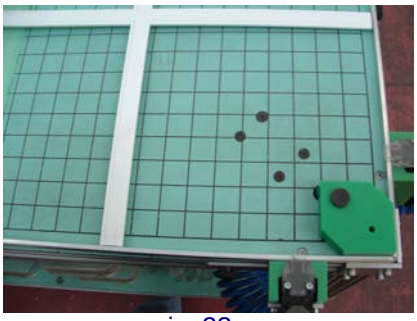

pic. 22

1.13. Grid fixing to frame

When the grid is ready, fix it to frame by the suitable stapling table. Position the frame made up of spacers on the corner of the stapling table and fasten it by the pneumatic control block. Then, fix the assembled grid (pic. 23a, pic. 23b and pic. 23c)


pic. 23a


pic. 23b

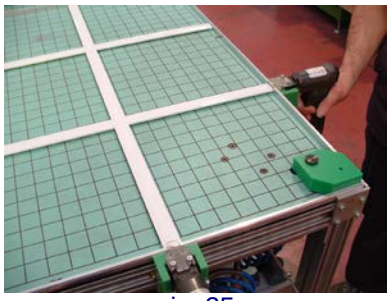

pic. 23c

Fit the grid height to the spacer height by means of gauges (as per spacer) as per picture no. 23d.

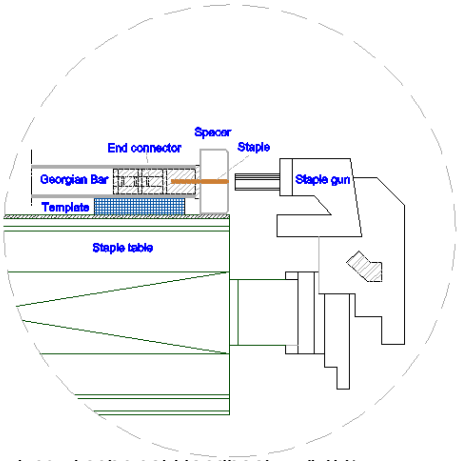

pic. 23d

Fixing is achieved by stapling the grid to the frame connected with every edge key (pics. 24 and 25).


pic. 24


pic. 25

Once fixed the grid to the frame, the panel is finished.



FOCUS

For a correct operation use between table and Georgian bar a template with dimension:

High template = High Spacer/2 – HP/2

Example:
High Spacer = 16 mm
HP = 8 mm

High template = 4 mm

1.14. Summary of processings

External horizontal rods *Transoms*	Internal horizontal rods *Transoms*	Vertical rods *Mullions*
Cut	Cut	Cut
Chamfer at 45° of the first end	Chamfer at 45° of the first end	Punching
Milling of the chamfered part	Chamfer at 45° of the second end	Insertion of assembling set
Assemblage of edge keys	Milling of the first end	Assemblage of edge keys
	Milling of the second end	Assemblage of horizontal rods

Fixing of the grid to the frame

1.15. Fixing at variable angles

To fix at variable angles (pic. 26a, 26b and pic. 27), use an assembling set with special screw (pic. 28).

pic. 26a

pic. 26b

pic. 27

pic. 28

The rod where the assembling set with special screw is inserted must be punched by using the suitable drill-drive template (pic. 29a, 29b).


pic. 29a

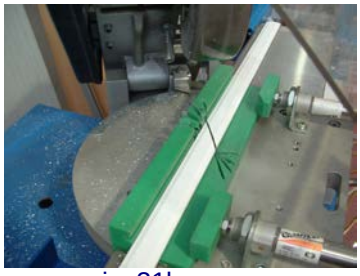

pic.29b

The screw of the assembling set is screwed as shown in picture no. 30.


pic. 30

For angles like 90°, follow the same instructions as per horizontal rods.
For variable angles different from 90°, cut the rod to assemble at the desired degrees, e.g. 30°, 45°, 60°, etc... (pic. 31a, 31b).

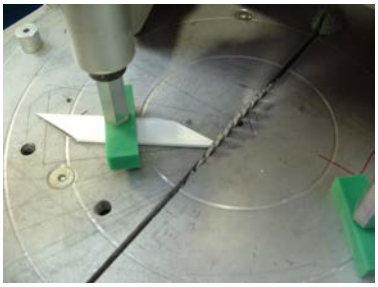

pic. 31a


pic. 31b

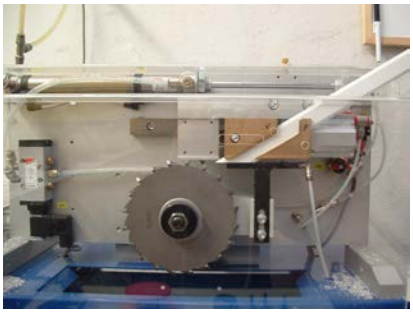
Chamfer and mill the cut rod (pic. 32).


pic. 32

Then, tip the milled profile at the desired angle (pic. 33a, 33b).



pic. 33a



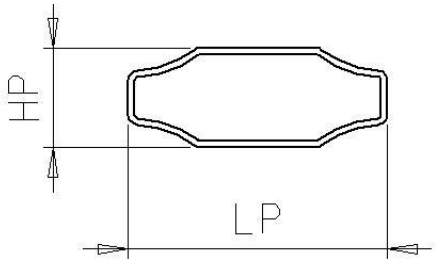
Machine Code 7003 pic. 33b

Machine Code 6000 pic. 33b

Table no. 1 (overlapping – SWIFT System)

Approximate the data at 0,5 mm

	PROFILE	WIDTH	HEIGHT	OVERLAP
		LP	HP	SP
VICTORIA	N70317	15,5	6,5	3,8
	N75257	25	6,6	3,8
	T76457	45,5	6,7	3,8
VARSAVIA	N18087	18,2	7,5	4,5
	N26087	25,7	7,4	6,5
	T45087	45,2	7,5	11,9
SUPER	NS1810	18,1	10,1	4,2
	NS2610	26,2	10	7
	TS4510	45	10,2	12
MINI SWIFT	T10808	10,1	8	2,4
	T10818	10,2	8,2	2
	T10757	10,2	8,2	2



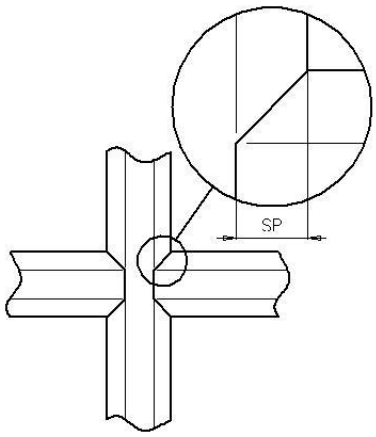


Table no. 2 (chamfering at 45° - SWIFT System)

Approximate the data at 0,5 mm

	PROFILE	CHAMFER AT 45°
		PS
VICTORIA	N70317	3,9
	N75257	3,9
	T76457	3,9
VARSAVIA	N18087	4,6
	N26087	6,6
	T45087	12
SUPER	NS1810	4,3
	NS2610	7,1
	TS4510	12,1
MINI SWIFT	T10808	2,5
	T10818	2,1
	T10757	2,1

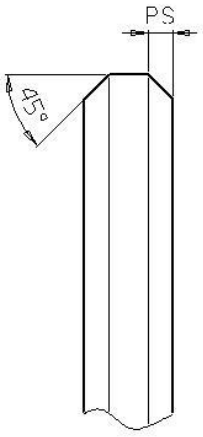


Table no. 3 (milling depth – SWIFT System)

Approximate the data at 0,5 mm

	PROFILE	MILLING DEPTH
		MD
VICTORIA	N70317	3,8
	N75257	3,8
	T76457	3,8
VARSAVIA	N18087	4,5
	N26087	6,5
	T45087	11,9
SUPER	NS1810	4,2
	NS2610	7
	TS4510	12
MINI SWIFT	T10808	2,4
	T10818	2
	T10757	2

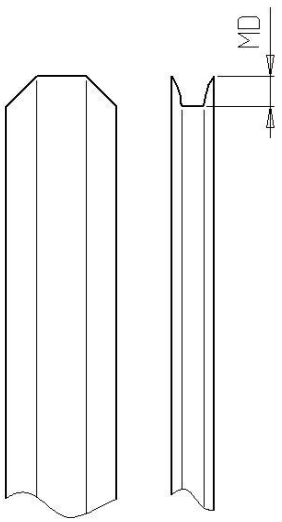


Table no. 4 (chamfering at variable angles – SWIFT System)

MILLED PROFILE	RECEIVING PROFILE	ANGLE
N18087	N26087	35°
N18087	T45087	28,5°
N26087	T45087	21°
NS1810	NS2610	33,5°
NS1810	TS4510	20°
NS2610	TS4510	30,5°

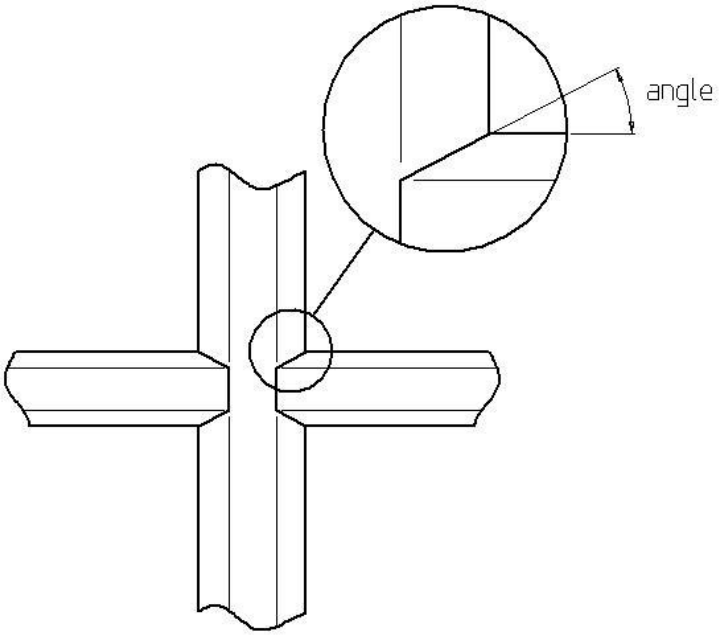
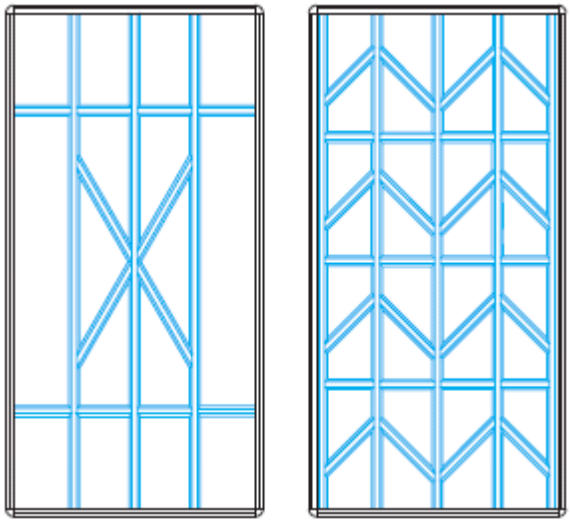


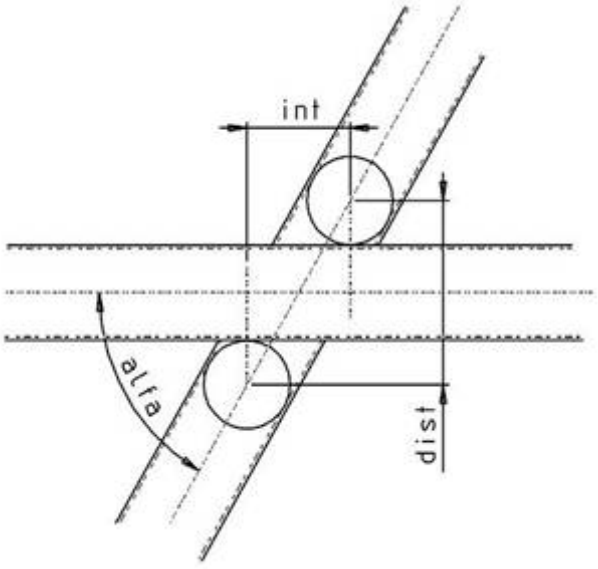
Table no. 5 (drilling – SWIFT System)

TABLES TO DRILL GEORGIAN BARS FOR RAKING DRAWINGS SWIFT SYSTEM



FORMULA :

int (distance between centers) = dist/tgα
α = *alfa* angle between the Georgian bars



Coupling set with special screw

TABLES TO DRILL VICTORIA PROFILES N70317 AND N75257 RAKING DRAWINGS

N70317
dist (distance between powder-coated Georgian Bars) = 29,60 mm
dist (distance between Renolit®-foiled Georgian Bars) = 30,20 mm

N75257
dist (distance between powder-coated Georgian Bars) = 48,50 mm
dist (distance between Renolit®-foiled Georgian Bars) = 49,10 mm

Drilling table to assemble the coupling set with special screw code 7077

DRILLING DIAM. 2,00 MM

N70317 Profile			
Powder-coated		**Renolit®-foiled**	
α angle (°)	int (distance between centers) (mm)	α angle (°)	int (distance between centers) (mm)
15	110,50	15	112,60
20	81,40	20	82,90
25	63,50	25	64,70
30	51,30	30	52,30
35	42,30	35	43,10
40	35,30	40	36,00
45	29,60	45	30,20
50	24,90	50	25,30
55	20,70	55	21,10
60	17,10	60	17,40

Drilling table to assemble the coupling set with special screw code 7576

DRILLING DIAM. 2,00 MM

N75257 Profile			
Powder-coated		**Renolit®-foiled**	
α angle (°)	int (distance between centers) (mm)	α angle (°)	int (distance between centers) (mm)
15	181,10	15	183,20
20	133,30	20	134,80
25	104,10	25	105,20
30	84,10	30	85,00
35	69,30	35	70,10
40	57,80	40	58,50
45	48,50	45	49,10
50	40,70	50	41,20
55	34,00	55	34,40
60	28,00	60	28,40

TABLES TO DRILL VARSAVIA PROFILES N18087 AND N26087 RAKING DRAWINGS

N18087
dist (distance between powder-coated Georgian Bars) = 34,80 mm
dist (distance between Renolit®-foiled Georgian Bars) = 35,40 mm

N26087
dist (distance between powder-coated Georgian Bar) = 49,50 mm
dist (distance between Renolit®-foiled Georgian Bars) = 50,10 mm

Drilling table to assemble the coupling set with special screw code 1808B

DRILLING DIAM. 2,50 MM

N18087 Profile			
Powder-coated		**Renolit®-foiled**	
α angle (°)	int (distance between centers) (mm)	α angle (°)	int (distance between centers) (mm)
15	129,90	15	132,00
20	95,70	20	97,20
25	74,70	25	75,90
30	60,30	30	61,30
35	49,70	35	50,50
40	41,50	40	42,20
45	34,80	45	35,40
50	29,20	50	29,70
55	24,40	55	24,80
60	20,10	60	20,40

Drilling table to assemble the coupling set with special screw code 2608B

DRILLING DIAM. 2,50 MM

N26087 Profile			
Powder-coated		**Renolit®-foiled**	
α angle (°)	int (distance between centers) (mm)	α angle (°)	int (distance between centers) (mm)
15	184,80	15	186,90
20	136,10	20	137,60
25	106,20	25	107,40
30	85,80	30	86,70
35	70,70	35	71,50
40	59,00	40	59,70
45	49,50	45	50,10
50	41,60	50	42,00
55	34,70	55	35,10
60	28,60	60	28,90

TABLES TO DRILL SUPER PROFILES NS1810 AND NS2610 RAKING DRAWINGS

NS1810
dist (distance between powder-coated Georgian Bars) = 35,10 mm
dist (distance between Renolit®-foiled Georgian Bars) = 35,65 mm

NS2610
dist (distance between powder-coated Georgian Bars) = 50,90 mm
dist (distance between Renolit®-foiled Georgian Bars) = 51,45 mm

Drilling table to assemble the coupling set with special screw code 1810B

DRILLING DIAM. 2,50 MM

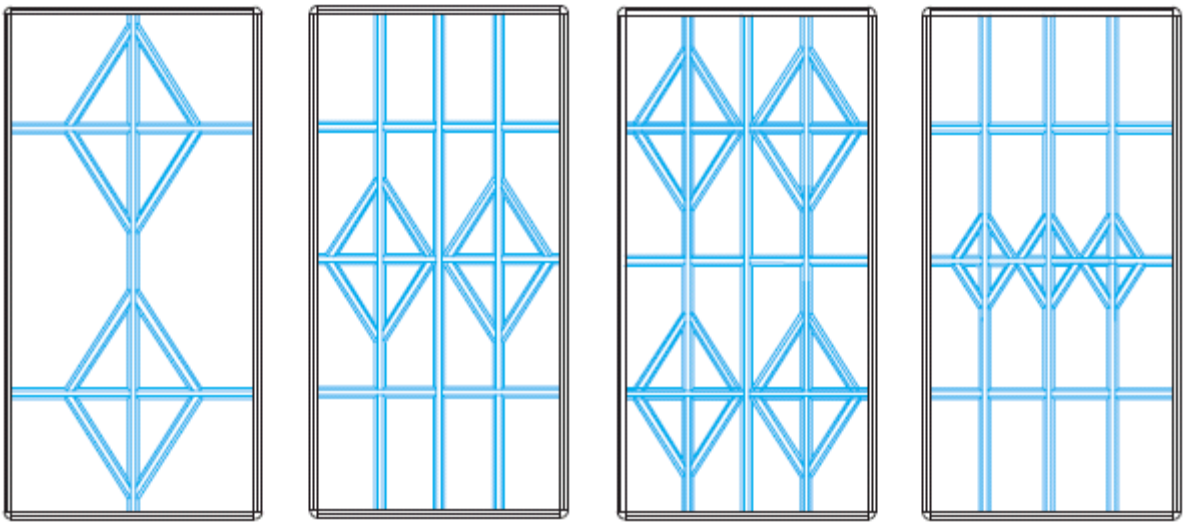
NS1810 Profile			
Powder-coated		**Renolit®-foiled**	
α angle (°)	int (distance between centers) (mm)	α angle (°)	int (distance between centers) (mm)
15	131,10	15	-----
20	96,50	20	-----
25	75,30	25	-----
30	60,80	30	-----
35	50,20	35	-----
40	41,90	40	-----
45	35,10	45	-----
50	29,50	50	-----
55	24,60	55	-----
60	20,30	60	-----

Drilling table to assemble the coupling set with special screw code 2610B

DRILLING DIAM. 2,50 MM

NS2610 Profile			
Powder-coated		**Renolit®-foiled**	
α angle (°)	int (distance between centers) (mm)	α angle (°)	int (distance between centers) (mm)
15	190,10	15	192,10
20	139,90	20	141,40
25	109,20	25	110,40
30	88,20	30	89,20
35	72,70	35	73,50
40	60,70	40	61,40
45	50,90	45	51,50
50	42,70	50	43,20
55	35,70	55	36,10
60	29,40	60	29,70

Table no. 6 (calculations for diamond drawings – SWIFT System)



LP : EXTERNAL WIDTH OF THE GEORGIAN BAR
IP : INTERNAL WIDTH OF THE GEORGIAN BAR
SP : VALUE OF OVERLAPPING OF GEORGIAN BARS

POWDER-COATED GEORGIAN BAR (E.G. WHITE K010 FINISH) TABLE OF DIMENSIONS

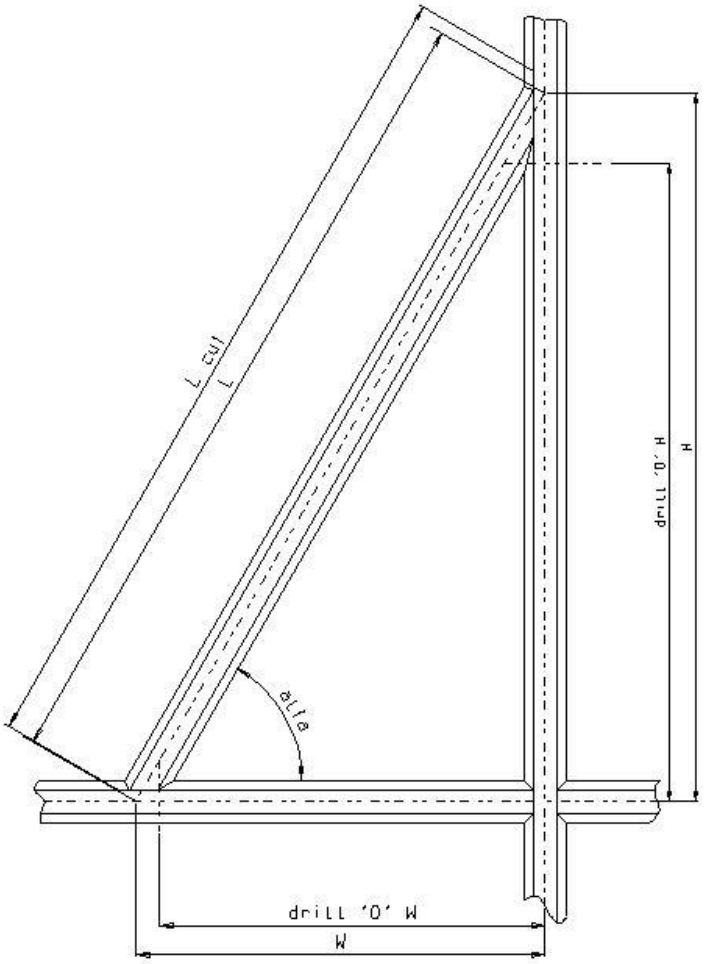
GEORGIAN BAR	WIDTH	DISTANCE BETWEEN CETERS	OVERLAPPING	COUPLING SET WITH SPECIAL SCREW	HOLE
	LP	IP	SP	CODE	DIAM. MM
N70317	15,50	14,20	3,80	7077	2,00
T70317	15,80	14,00	3,50	7077	2,00
N75257	25,00	23,70	3,80	7576	2,00
T75257	25,30	23,50	3,50	7576	2,00
N18087	18,20	16,90	4,50	1808B	2,50
N26087	25,70	24,40	6,50	2608B	2,50
NS1810	18,10	16,80	4,20	1810B	2,50
NS2610	26,20	24,90	7,00	2610B	2,50

RENOLIT®-FOILED GEORGIAN BAR (E.G. LE01-K0L1 FINISHES) TABLE OF DIMENSIONS

GEORGIAN BAR	WIDTH	DISTANCE BETWEEN CETERS	OVERLAPPING	COUPLING SET WITH SPECIAL SCREW	HOLE
	LP	IP	SP	CODE	DIAM. MM
N70317	16,10	14,20	3,80	7077	2,00
T70317	16,40	14,00	3,50	7077	2,00
N75257	25,60	23,70	3,80	7576	2,00
T75257	25,90	23,50	3,50	7576	2,00
N18087	18,80	16,90	4,50	1808B	2,50
N26087	26,30	24,40	6,50	2608B	2,50
NS1810	18,70	16,80	4,20	1810B	2,50
NS2610	26,80	24,90	7,00	2610B	2,50

Calculations to make a diamond with:

H = known height of diamond
W = known width of diamond



Data:

H : height from half of the diamond to the center of the Georgian bar (mm)
W : width from half of the diamond to the center of the Georgian bar (mm)

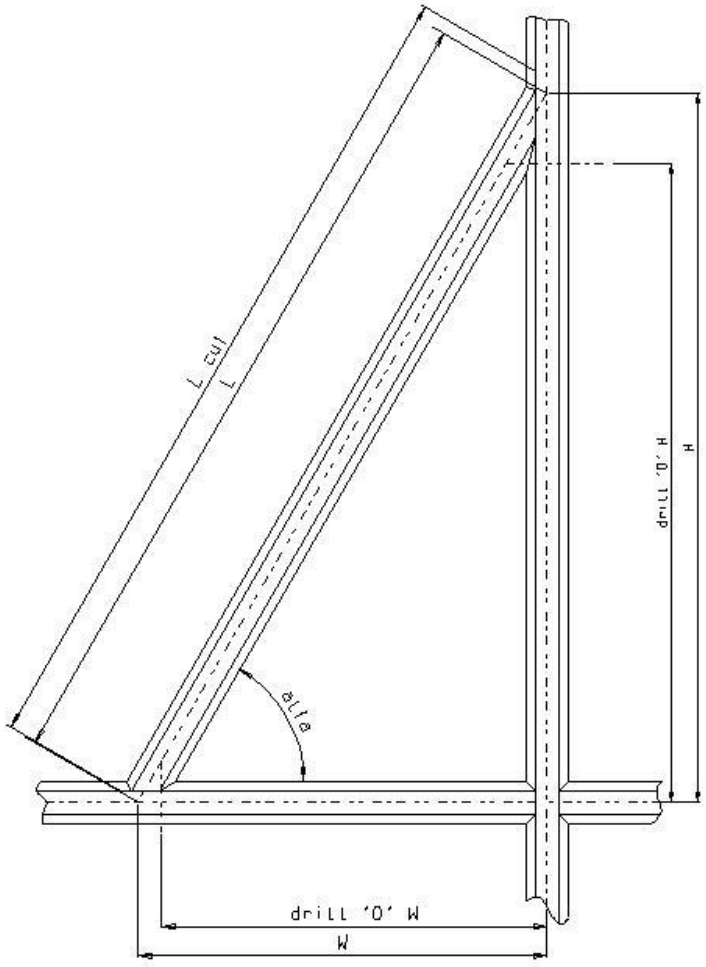
LP : external dimension of the Georgian bar (mm)
IP : internal dimension of the Georgian bar (mm)
SP : dimension of overlapping of the Georgian bars (mm)

α : diamond angle (°)
L : length from the side of the diamond to the center of the Georgian bar (mm)
Lcut : cut length of the side of the diamond (mm)
Ho : vertical position of the hole from the center of the Georgian bar (mm)
Wo : horizontal position of the hole from the center of the Georgian bar (mm)

Calculations:

α = ARCTAN(H/W)
Ho = H-(LP+IP)/2xTAN(α)
Wo = W-(LP+IP)/2xTAN(90-α)
Lcut = (IP/2+SP)/COS(α)+(LP/2)xTAN(α) +(IP/2+SP)/SIN(α)+(LP/2)/TAN(α)+√((Ho-LP/2-IP/2)²+(Wo-LP/2-IP/2)²)

Calculations to make a diamond with:
α = known angle
L = known side



Data:

L : length from the side of the diamond to the center of the Georgian bar (mm)
α : diamond angle (°)

LP : external dimension of the Georgian bar (mm)
IP : internal dimension of the Georgian bar (mm)
SP : dimension of overlapping of Georgian bars (mm)

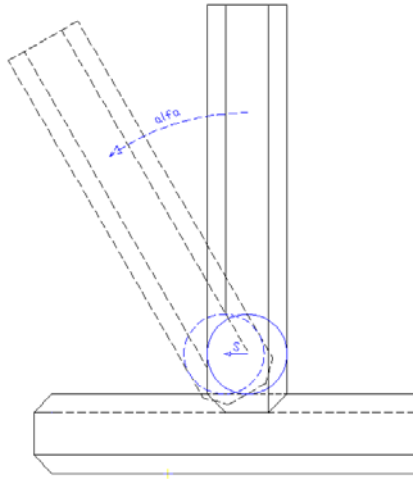
H : height from half of the diamond to the center of the Georgian bar (mm)
W : width from half of the diamond to the center of the Georgian bar (mm)
Lcut : cut length of the side of the diamond (mm)
Ho : vertical position of the hole from the center of the Georgian bar (mm)
Wo : horizontal position of the hole from the center of the Georgian bar (mm)

Calculations:

H = LxSIN(α)
W = LxCOS(α)
Ho = H-(LP+IP/2xTAN(α)
Wo = W-(LP+IP)/2xTAN(90-α)
Lcut = (IP/2+SP)/COS(α)+(LP/2)xTAN(α) +(IP/2+SP)/SEN(α)+(LP/2)/TAN(α)+√((Ho-LP/2-IP/2)²+(Wo-LP/2-IP/2)²)

SHORTCUTS

Keeping as a swing centre the 90° connection point, where is it necessary to drill to apply a coupling set? Answering is to calculate S



Data:
IP : internal dimension of the Georgian bar (mm)
SP : dimension of overlapping of the Georgian bars (mm)
α : angle (°)

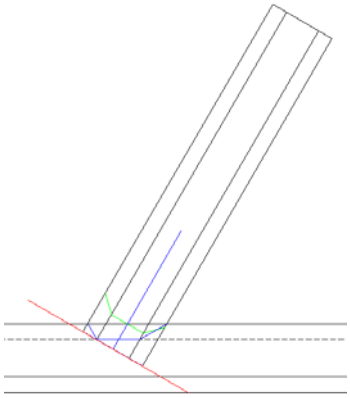
S : distance between hole 90° connection and α° connection

$$S = \frac{IP/2}{tg(\Pi - \alpha)}$$

Example: N26087
IP = 24.40 mm
α = 30°

$$S = \frac{12.20}{tg(180° - 30°)} = 7.04mm$$

Swinging of an α angle how much is the total length of the rod? Cutting at 90°(A) or α°(B) with centre line datum?

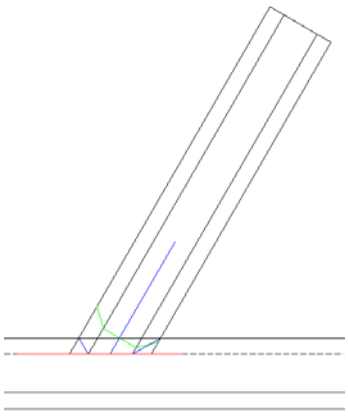


(A)
LP : external dimension of the Georgian bar (mm)
SP : dimension of overlapping of the Georgian bars (mm)
α : angle (°)

$$S = \frac{SP}{\cos(\alpha)} + \frac{\left(\frac{LP}{2} - SP\right)}{tg(\Pi - \alpha)}$$

Example: N26087
LP = 25.70 mm
SP = 6.50 mm
α = 30°

$$S = \frac{6.50}{\cos(30)} + \frac{\left(\frac{25.70}{2} - 6.50\right)}{tg(180 - 30)} = 11.17mm$$



(B)

$$S = \frac{SP}{\cos(\alpha)}$$

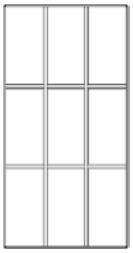
Example: N26087
SP = 6.50 mm
α = 30°

$$S = \frac{6.50}{\cos(30)} = 7.51mm$$

Table no. 7 (processing vs. machines and equipments – SWIFT System)

PROCESSING	CODE	DESCRIPTION	REMARKS
Cutting bars	16313	The cutting machine (up-down) can carry out calibrated cuts from 0° to 60°	Suggested only for cutting bar
	16320	Down-up profile cutting machine. The disc-blade operates from bottom up. The indexed cutting head can rotate from 45° right to 45° left (90°)	
	2023	Automatic machine to optimize cutting. Interface with software design. Also can drill mullions and sorts mechanically grill elements	Very high production. Software interface
Chamfering horizontal elements	16313 + 16320.xx	Cutting machine 16313 can fit in slot gauges (16320.xx) to chamfer profiles	This solution is indicated for very low production
	16320 + 16320.xx	Cutting machine 16320 can fit in slot gauges (16320.xx) to chamfer profiles	This solution is indicated for low production and variable angle
	16315 + 16320.xx	Chamfering machine purposed for this operation and purpose gauges	Purpose machine
Milling horizontal elements	6000	Manual milling machine to mill any angles and arcs	Versatile and for complex
	6003	Manual milling machine to mill 6-8 profiles at once	High production
	7003	Automatic milling machine to eliminate any kind of set up and produce easily crossing profile (i.e. 26 on 45)	No set up and high precision
Punching vertical elements	11000, 16100 16125, 16233 16224, 16225 16324	Pneumatic punching machine for the central notching of mullion	Any punching machines can work only one kind of profile
Drilling vertical elements	2023	Automatic machine to optimize cutting. Interface with software design. Also can drill mullions and sorts mechanically grill elements	Very high production. Software interface
Drilling transom, spokes, etc…	7722 + 7xxx	Pneumatic drill + drilling template	
Curving arcs	7011	Manual curving machine	Only Germanella Profile
	7021	Manual curving machine	
	7022	Semiautomatic curving machine	
	7030	Automatic curving machine	Touch screen, memorize and 4 different function modes
Drilling arcs	7722 + 70xx	Pneumatic drill + adjustable drilling template	
Assembling grills	16400	Plain table equipped with sliding bearing	
Fixing grills at frame	16402	Complete staple table equipped with pedal and vice kit for the clamping of frames and 2 pneumatic staple guns. The guns have vertical adjustment and are mounted on special roller guides.	

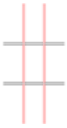
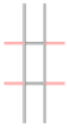
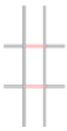
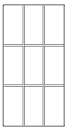
Grill Elements vs. Machines: Examples

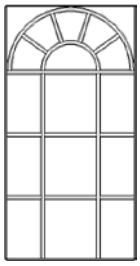


Example: Victoria 16x7, code N70317.

This draw is composed by three different kinds of elements. Following will see how to work any of them and with which machines or equipments.
Processing and machine have a corresponding number.

Machines used: 16313, 16315, 16100, 6000
Equipment used: 16402

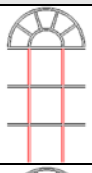
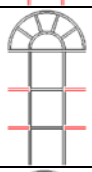
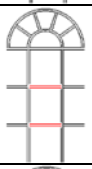
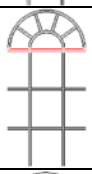
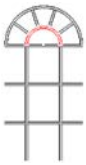
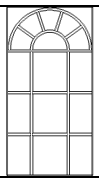
Draw	Description	Processing	Machines
	**Vertical elements**	1. Cutting length 2. Punching	1. 16313 2. 16100
	**External horizontal elements**	1. Cutting length 2. Chamfering at 45° of connecting end 3. Milling of the chamfered part	1. 16313 2. 16315 3. 6000
	**Internal horizontal elements**	1. Cutting length 2. Chamfering at 45° of the first end 3. Chamfering at 45° of the second end 4. Milling of the first end 5. Milling of the second end	1. 16313 2. 16315 3. 16315 4. 6000 5. 6000
	**Assembling & fixing**	1. Staple	1. 16402

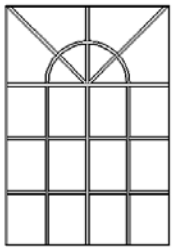


Example: Victoria 16x7, code N70317.

This draw is composed by seven different kinds of elements. Following will see how to work any of them and with which machines or equipments.
Processing and machine have a corresponding number.

Machines used: 16313, 16315, 16320, 16100, 7003 and/or 6000
Equipment used: 7016, 7018, 7722, 16402

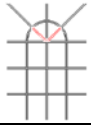
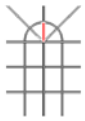
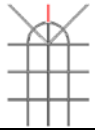
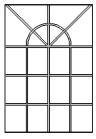
Draw	Description	Processing	Machines
	**Vertical elements**	3. Cutting length 4. Punching 5. Chamfering at 45° of connecting end 6. Milling of the chamfered part	3. 16313 4. 16100 5. 16315 6. 7003
	**External horizontal elements**	4. Cutting length 5. Chamfering at 45° of connecting end 6. Milling of the chamfered part	4. 16313 5. 16315 6. 7003
	**Internal horizontal elements**	6. Cutting length 7. Chamfering at 45° of the first end 8. Chamfering at 45° of the second end 9. Milling of the first end 10. Milling of the second end	6. 16313 7. 16315 8. 16315 9. 7003 10. 7003
	**Transom**	1. Cutting length 2. Drilling twice downward to screw coupling set to fix vertical rods 3. Drilling four times upward to screw coupling set to fix arcs	1. 16313 2. 7722 + 7016 3. 7722 + 7016
	**Spokes**	1. Cutting length 2. Chamfering at 45° of the first end 3. Chamfering at 45° of the second end 4. Milling of the first end 5. Milling of the second end	1. 16313 2. 16315 3. 16315 4. 7003 5. 7003
	**Arc (smaller)**	1. Cutting length 2. Curving 3. Cutting ends 4. Milling of the first end 5. Milling of the second end 6. Chamfering at 45° of the first end 7. Chamfering at 45° of the second end 8. Drilling upward four times to screw coupling sets and fix spokes	1. 16313 2. 7030 3. 16320 4. 6000 5. 6000 6. 16320 7. 16320 8. 7722 + 7018
	**Arc (bigger)**	1. Cutting length 2. Curving 3. Cutting ends 4. Milling of the first end 5. Milling of the second end 6. Chamfering at 45° of the first end 7. Chamfering at 45° of the second end 8. Drilling downward four times to screw coupling sets and fix spokes	1. 16313 2. 7030 3. 16320 4. 6000 5. 6000 6. 16320 7. 16320 8. 7722 + 7018
	**Assembling & fixing**	1. Staple	1. 16402



Example: Varsavia 26x8, code N26087.

This draw is composed by nine different kinds of elements. Following will see how to work any of them and with which machines or equipments.
Processing and machine have a corresponding number.

Machines used: 16313, 16315, 16320, 16223, 7003, 6000
Equipment used: 7024

Draw	Description	Processing	Machines
	**Vertical elements**	1. Cutting length 2. Punching 3. Chamfering at 45° of connecting end 4. Milling of the chamfered part	1. 16313 2. 16223 3. 16315 4. 7003
	**External horizontal elements**	1. Cutting length 2. Chamfering at 45° of connecting end 3. Milling of the chamfered part	1. 16313 2. 16315 3. 7003
	**Internal horizontal elements**	1. Cutting length 2. Chamfering at 45° of the first end 3. Chamfering at 45° of the second end 4. Milling of the first end 5. Milling of the second end	1. 16313 2. 16315 3. 16315 4. 7003 5. 7003
	**Transom**	1. Cutting length 2. Drilling three times downward to screw coupling set to fix vertical rods 3. Drilling five times upward to screw coupling set to fix arc and spokes	1. 16313 2. 7024 3. 7024
	**Internal diagonal thru' spokes**	1. Cutting length 2. Chamfering at 45° of the first end 3. Milling of the first end 4. Milling of the second end (transom connection) 5. Chamfering at variable angle of the second end	1. 16313 2. 16315 3. 7033 4. 6000 5. 16320
	**Internal vertical thru' spokes**	1. Cutting length 2. Chamfering at 45° of the first end 3. Chamfering at 45° of the second end 4. Milling of the first end 5. Milling of the second end	1. 16313 2. 16315 3. 16315 4. 7003 5. 7003
	**External diagonal thru' spokes**	1. Cutting length 2. Chamfering at 45° of the first end 3. Milling of the first end 4. Cutting diagonally the second end	1. 16313 2. 16315 3. 7003 4. 16320
	**External diagonal thru' spokes**	1. Cutting length 2. Chamfering at 45° of the first end 3. Milling of the first end	1. 16313 2. 16315 3. 7003
	**Arc**	1. Cutting length 2. Curving 3. Cutting ends 4. Chamfering at 45° of the first end 5. Chamfering at 45° of the second end 6. Milling of the first end 7. Milling of the second end 8. Drilling downward three times to screw coupling sets and fix spokes 9. Drilling upward three times to screw coupling set and fix spokes	1. 16313 2. 7030 3. 16320 4. 16320 5. 16320 6. 6000 7. 6000 8. 7024
	**Assembling & fixing**	1. Staple	1. 16402

MITERING System

2. MITERING System

Each piece of bar is cut a 45° chamfer at the joint end. The four adjacent bars then fitted over a key (internal) which holds them a 90° to each other and is hidden inside the profile. This system allows any color of profile to be assembled using the same key, but can be time consuming to manufacture and does not produce a particularly rigid grille. An accurate saw capable of cutting at 45° or a dedicated machine is required to produce mitre jointed grilles.

Following it will show how to mitre profile with a purpose machine, for cutting length and fixing see Swift System paragraphs.

The Mitering machine (code **3000**) is automatic and is used to mitre Georgian bar to make crossings and "T" connections.
It has been conceived to reduce at least the time needed to change equipment. Such an object is pursued thanks to the possibility to adjust simply vices to work profiles both painted and foiled.

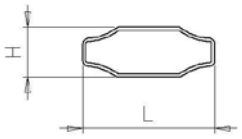
This Mitering machine works at the same time 4 or 5 profiles. It works also any kind of profiles in its range work without changing any equipment and is designed to reduce at minimum setup time.
Mitering machine is easy to adjust: mechanical indicator moves vertically vice group to insert 4-5 profiles together.

pic. a

The most important advantage is that all profiles are workable without any changes (tools or equipments). This solutions overtake problems to combine profiles and centre keys of different colours or wood-grain finishes.
Over, this solutions is more economic compare to milling system, because is possible to work thinner profiles (0.4 mm). Anyway it is no possible to achieve a good stiffness of grill.

Range Work:

- Height (H): from 5 mm to 10 mm
- Width (L): from 15 mm to 26 mm
- Thickness wall: from 0.4 mm



This machine is equipped with two vices (1 horizontal and 1 vertical) and in contrast to traditional methods are moved profiles and not motors.

This system reduces vibration and increases cutting precision.
Once cut, profiles are assembled with an internal key, final results is shown as following.

pic. b

profiles are fitted over an internal key which holds them at 90° to each other.

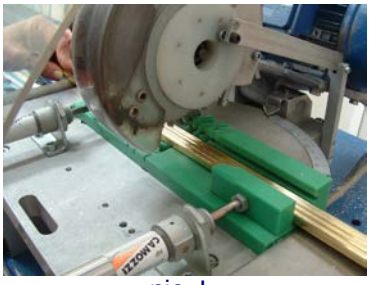
pic. c

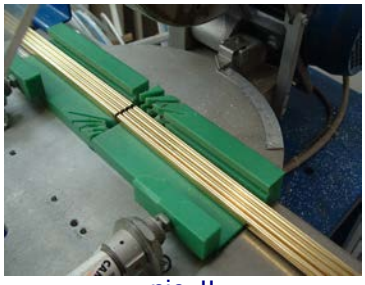
GERMANELLA System

3. GERMANELLA System

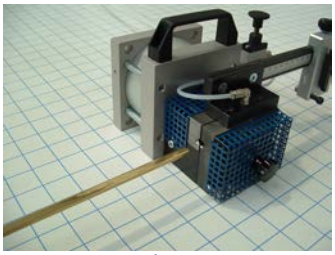
It is an exclusive system to assemble frames using GERMANELLA profiles, extruded, HF elettro-welded coated or pre-anodized.
The main characteristic of this system is that punched profiles are overlapped and fixed by clip accessories.

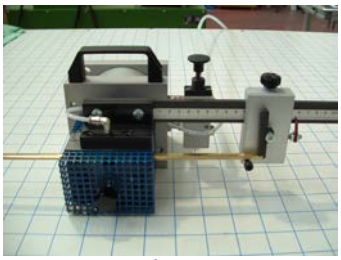
Cut the Georgian bars as shown for SWIFT System (pic. I, II).

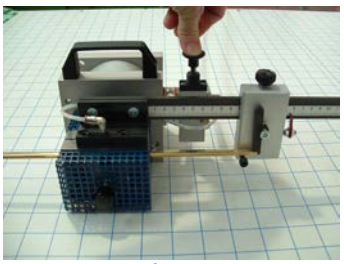

pic. I


pic. II

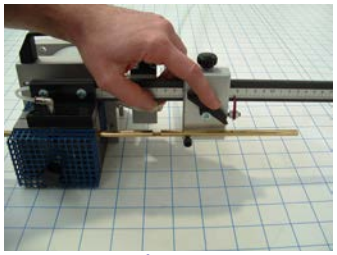
For this system, there are only horizontal and vertical rods, which are both punched (pic. III. IV, V).

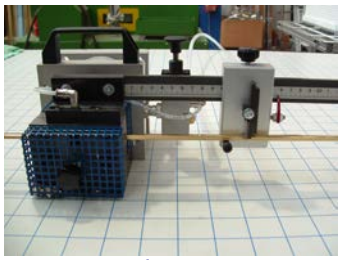

pic. III

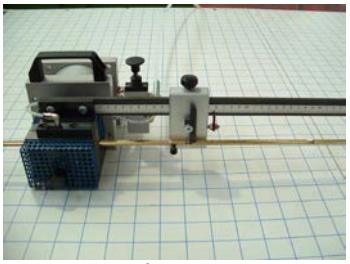

pic. IV


pic. V

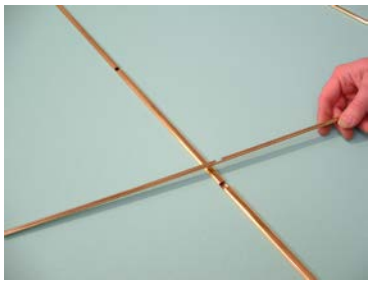
As per SWIFT System, go on with punching (pic. VI, VII, VIII).

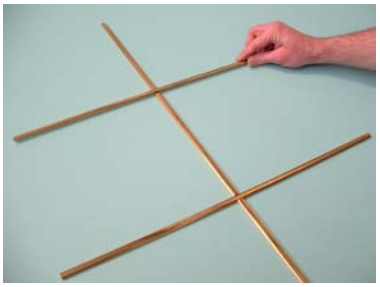

pic. VI


pic. VII

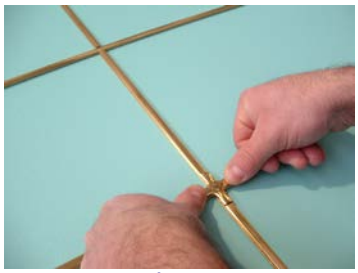

pic. VIII

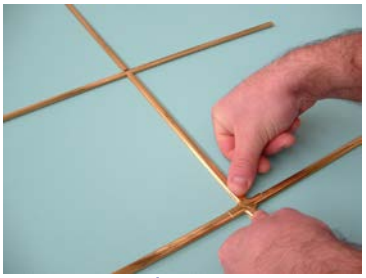
The punched rods overlap on punchings as shown in the picture hereunder (pic. IX, X).

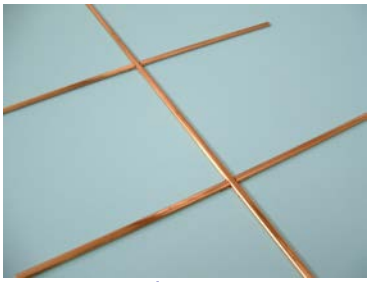

pic. IX

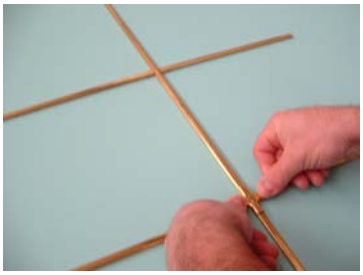

pic. X

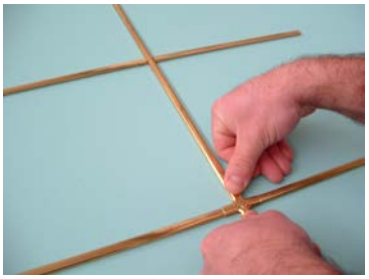
The overlapped rods are fixed on both sides by clip accessories, as per pictures XI-XV.


pic. XI


pic. XII

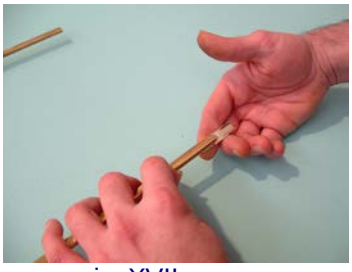

pic. XIII


pic. XIV


pic. XV

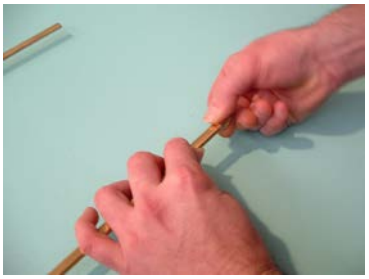
After assemblage, insert the plastic edge keys in the ends to staple to the frame (pic. XVI, XVII).


pic. XVI


pic. XVII

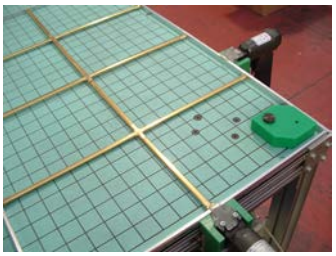
Then, assemble the aluminium edge keys in clips (pic. XVIII, XIX).

pic. XVIII

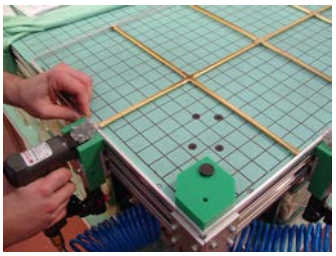


pic. XIX

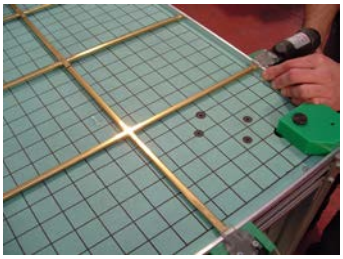
The fixing of the grid to the frame made up of spacers is analogous to that one of SWIFT system (pic. XX, XXI, XXII).



pic. XX



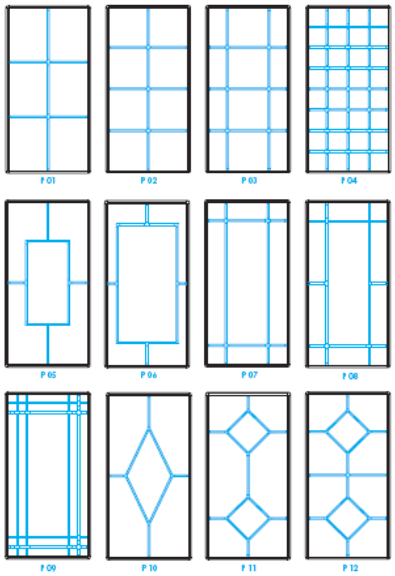
pic. XXI

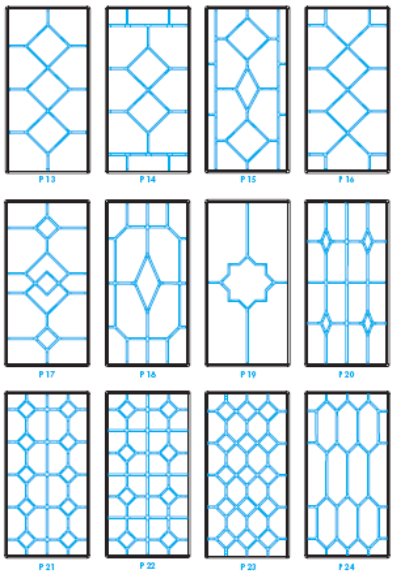


pic. XXII

EXAMPLES

All examples have been drawn from our catalogues.





Example (A): calculation of a traditional Georgian grille

B = Horizontal internal dimensions of spacer

H = Vertical internal dimension of spacer

SP = Terminal thickness (1,5 mm)

DT = Thermical elongation margin (0,5 mm)

LH = Total length of horizontal rods

LV = Total length of vertical rods

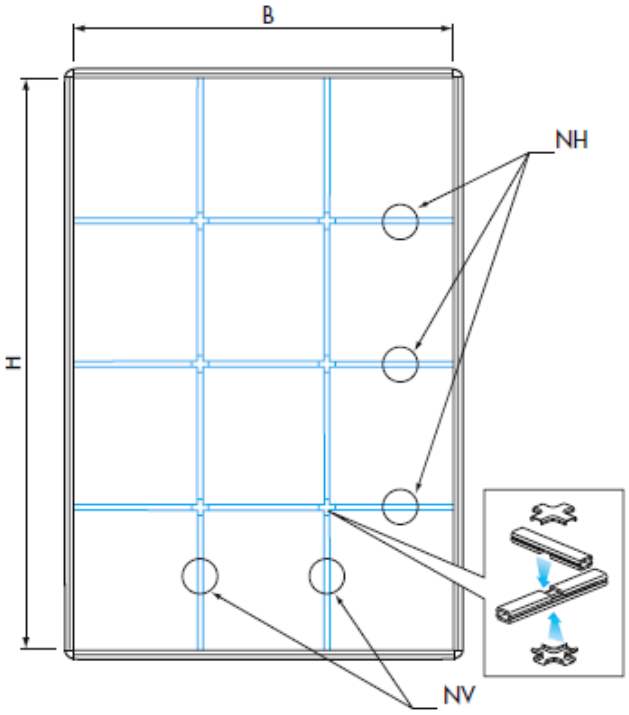
LP = Profile width (9 mm)

NH= Quantity of horizontal rods

NV = Quantity of vertical rods

SH = Cutting dimension of horizontal elements

SV = Cutting dimension of vertical elements



$$LH = B - 2 \times (SP + DT) \qquad LV = H - 2 \times (SP + DT)$$

$$SH = \frac{LH - (LP \times NV)}{NV + 1} \qquad SV = \frac{LV - (LP \times NH)}{NH + 1}$$

Let us assume the following dimensions:

LP = 9 mm
B = 601 mm
H = 1400 mm
NH = 3
NV = 2

It follows that:

$$LH = B - 2 \times (SP + DT) = 601 - 2 \times (1.5 + 0.5) = 597mm$$

$$LV = H - 2 \times (SP + DT) = 1400 - 2 \times (1.5 + 0.5) = 1396mm$$

$$SH = \frac{LH - (LP \times NV)}{NV + 1} = \frac{597 - (9 \times 2)}{2 + 1} = 193mm$$

$$SV = \frac{LV - (LP \times NH)}{NH + 1} = \frac{1396 - (9 \times 3)}{3 + 1} = 342.25mm$$

The result is that we need 3 horizontal rods of **597 mm** and 2 vertical rods of **1396 mm** length and to position the punching machine finger at **193 mm** and **342.3 mm** respectively.

Example (B): calculation of 90° branches

B = Horizontal internal dimension of air-spacer frame

H = Vertical internal dimension of air-spacer frame

D = Diagonal of the diamond referred to the profile central-line

L = Side of the diamond

E = Distance from the crossing centre to the profile stop (=11 mm)

X = Cutting length of the profiles to make the diamond sides

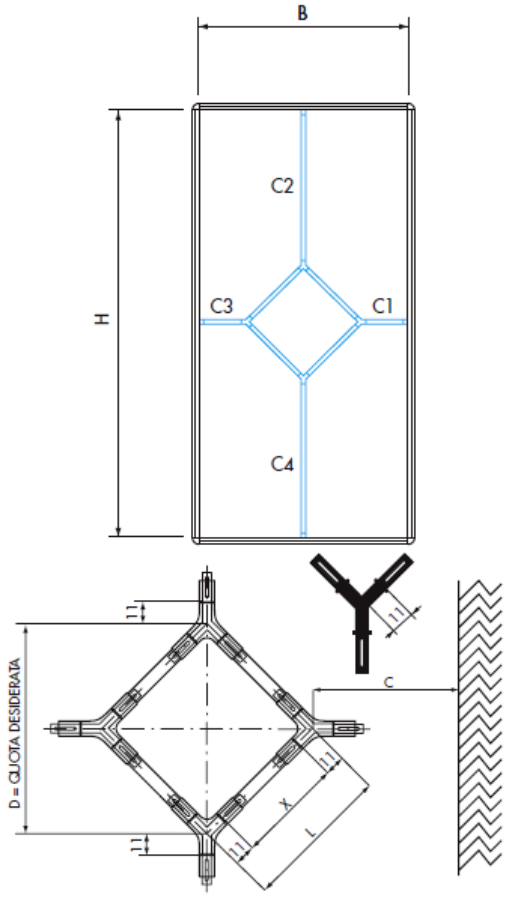
C = (C1, C2, C3, C4) = Distance of the junction-centre from the inside of the airspacer frame

SH = Length of side branches

SV = Length of vertical branches

SP = Edge key thickness

DT = Thermal elongation



$$L = \frac{D}{1.41} \qquad X = L - 22mm$$

$$SH = \frac{B - 2\times(SP + DT + E) - D}{2} \qquad SV = \frac{H - 2\times(SP + DT + E) - D}{2}$$

Let us assume the following dimensions:

B = 600 mm
H = 1400 mm
D = 100 mm

It follows that:

$$L = \frac{D}{1.41} = \frac{100}{1.41} = 70.92mm \qquad X = L - 22 = 70.92 - 22 = 48.92mm$$

$$SH = \frac{B - 2\times(SP + DT + E) - D}{2} = \frac{600 - 2\times(1.5 + 0.5 + 11) - 100}{2} = 237mm$$

$$SV = \frac{H - 2\times(SP + DT + E)}{2} = \frac{1400 - 2\times(1.5 + 0.5 + 11)}{2} = 637mm$$

Example (C): calculation of 60° - 120° branches

B = Horizontal internal dimension of air-spacer frame

H = Vertical internal dimension of air-spacer frame

D1 = Longer diagonal of the diamond referred to the profile central line

D2 = Shorter diagonal of the diamond referred to the profile central line

L = Side of the diamond

E = Distance from the crossing centre to the profile stop (=10 mm)

X = Cutting length of the profiles to make the diamond sides

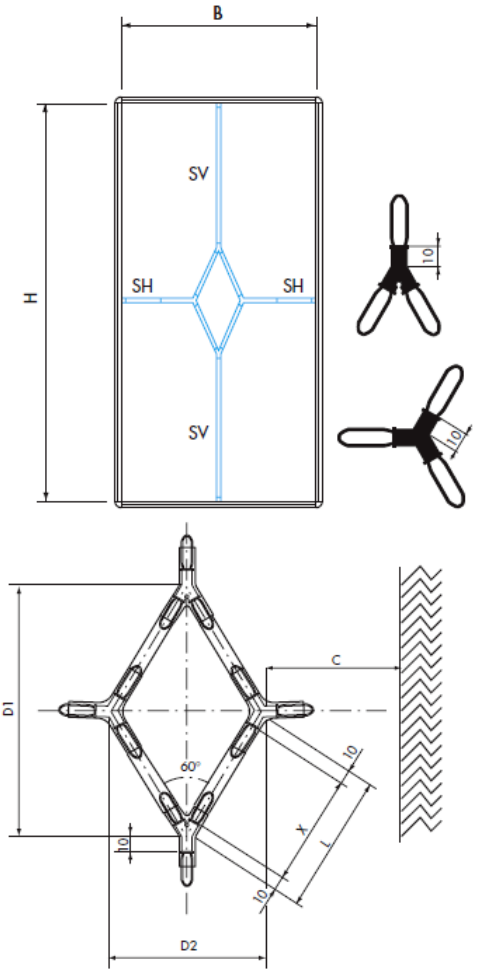
C = (C1, C2, C3, C4) = Distance of the junction-centre from the inside of the airspacer frame

SH = Length of side branches

SV = Length of vertical branches

SP = Thickness of edge key (1,5 mm)

DT = Thermal break (0,5 mm)



$$L = D_2 = \frac{D_1}{1.732} \qquad X = L - 20mm$$

$$SH = \frac{B - 2\times(SP + DT + E) - D_2}{2} \qquad SV = \frac{H - 2\times(SP + DT + E) - D_1}{2}$$

Let us assume the following dimensions:

B = 600 mm
H = 1400 mm
D_1 = 300 mm

It follows that:

$$L = D_2 = \frac{D_1}{1.732} = \frac{300}{1.732} = 173.2mm \qquad X = L - 20 = 173.2 - 20 = 153.20mm$$

$$SH = \frac{B - 2\times(SP + DT + E) - D_2}{2} = \frac{600 - 2\times(1.5 + 0.5 + 10) - 173.2}{2} = 201.4mm$$

$$SV = \frac{H - 2\times(SP + DT + E) - D_1}{2} = \frac{1400 - 2\times(1.5 + 0.5 + 10) - 300}{2} = 538mm$$

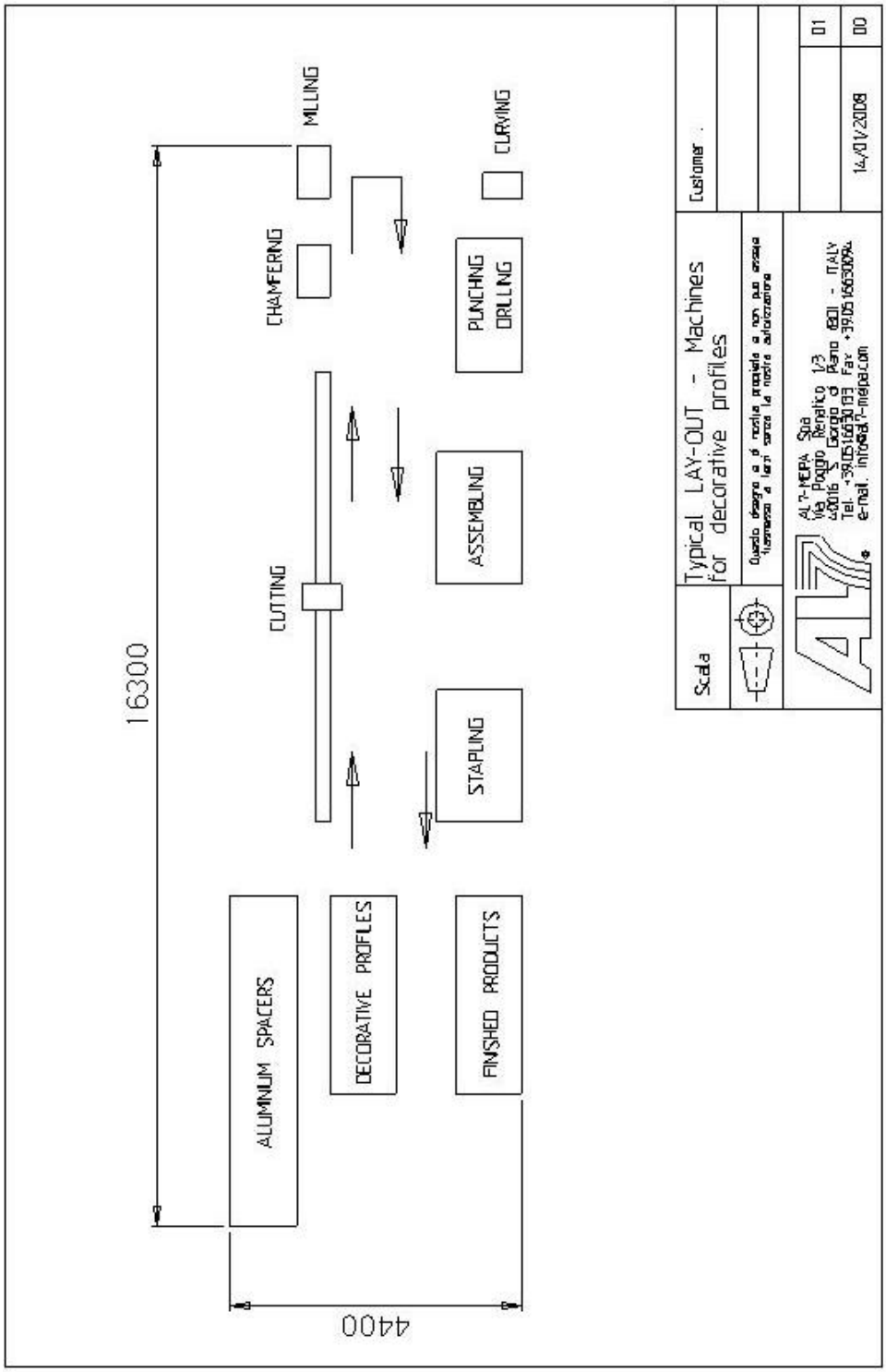
APPENDIX

Table no. 8

SUMMARY OF PROCESSING

PROCESSING	DESCRIPTION OF THE MACHINE	CODE OF THE MACHINE
Cutting	Cutting machine	16313-16320
Chamfering	Cutting machine + drill-drive templates	16313-16320-16315 16320.xx
Milling	Milling machine + milling kit	600, 6003, 7003 7003.xx
Punching	Punching machine	11100-16100-16125 16233-16224-16225 16234
Curving	Curving machine	7020-7020S-7022-7030
Assembling	Plain table	16400
Stapling	Complete table	16402

Layout


MILLING
CHAMFERING
CURVING
PUNCHING
DRILLING
ASSEMBLING
CUTTING
STAPLING
ALUMINIUM SPACERS
DECORATIVE PROFILES
FINISHED PRODUCTS
16300
4400
Typical LAY-OUT - Machines
for decorative profiles
Scala
Customer
14/01/2008
01
00