

THERMAL SIMULATION REPORT

Report Number:	TCL2014-SWA-012
Prepared For:	Steel Window Association 42 Heath Street Tamworth Staffordshire B79 7HJ
Door System Identifier:	W40
Lock Panel Frame Identifier:	SWZ7
Outer Frame Identifier:	SW8
Vent Frame Identifier:	SW5
Glazing System:	4mm Planitherm One/4S – 8mm 90% Krypton – 4mm Planilux -8 mm 90% Krypton – 4mm Planitherm One/4S
Spacer Bar:	8mm Edgetech Super Spacer Standard with butyl secondary sealant
Notes:	Stainless Steel Bead Reference Drawing SWA-W40-012

Result

Thermal Transmittance (U_{Door})	1.5	W/(m ² K)
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(Door Configuration as defined in BS EN 14351-1 Annex E)
(1230mm wide x 2180 high – single leaf)

Report Prepared By Dr Gary Morgan
 Therm Consulting

Signed: *G. Morgan*

Date: 21st May 2014

The simulations in this report were performed using Win Iso Pro 7.80
strictly according to EN ISO 10077 – 2:2012
The files generated are attached to this report as appendices



GENERAL WINDOW / DOOR U VALUE

Frame Elements

Frame Element (Name)	Area (mm ²)	Area (m ²)	Uframe	Sight Line Length (mm)	Sight Line Length (m)	Psi value	Area x Uf	Lengthx Psi	Total Heat Flow
Head	63504.1	0.063504	6.048	1122	1.122	0.0510	0.384073	0.057222	0.441294797
Left Jamb	114804.23	0.114804	6.048	2072	2.072	0.0510	0.694336	0.105672	0.800007995
Right Jamb	114804.23	0.114804	6.048	1852	1.852	0.0510	0.694336	0.094452	0.788787995
Sill	63504.1	0.063504	6.048	1122	1.122	0.0510	0.384073	0.057222	0.441294797
Lock Frame	20520.149	0.02052	6.368	546	0.546	0.0480	0.130672	0.026208	0.156880306
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0

Note, when dealing with Transom or Mullion sections, take the average of both sight line dimensions.

Totals		0.377137							2.62826589
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Glazing

Glazing Pane	Area (mm ²)	Area (m ²)	Uglass		Area x Ug	Total Heat Flow
Glass	2288924.4	2.288924	0.602		1.377932	1.37793249
Lock Panel	15339.919	0.01534	0.709		0.010876	0.010876003
		0			0	0
		0			0	0
		0			0	0
		0			0	0
		0			0	0
		0			0	0
		0			0	0

Totals		2.304264				1.388808493
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Overall Window / Door Dimensions	
Height (mm)	2180
Width (mm)	1230

Total Window / Door Area m ² =	2.6814	Total Window / Door Area Calculated =	2.681401	% Error	-0.00004230
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Note - Both areas should match to better than 1%, if not, check figures carefully

Window / Door U value = 1.5

Version 11 23/10/2012. Calculations according to BS EN 673:2011

Number of spaces	Help					
2						
	Spaces		1		2	
Glazing orientation						
	Vertical					
Resistivity panes	1	m·K/W	P a n e 1		P a n e 2	
	Outside		90%		90%	
Emissivities						
Calculate						
			Gas		Gas	
			Krypton		Krypton	
Thickness (mm)	4.0		8	4.0	8	44
Normal emissivity			0.01	0.89	0.89	0.01
$\sum d_j r_j =$	0.052		Uncoated		Uncoated	

For uncoated surfaces input 0.89 for normal emissivity, which corresponds to a corrected emissivity of 0.837

Iteration number	U value	$\sum 1/h_s$	λ_{eff}	ΔT	λ_{eff}	ΔT
	W/(m ² ·K)	(m ² ·K)/W	W/(mK)		W/(mK)	
1	0.602	1.4398	0.0111	7.5	0.0111	7.5
2	0.602	1.4398	0.0111	7.5	0.0111	7.5

Simulation software: WinIso2D 7.80

Date: 21.05.2014

File: C:\Users\Gary\Documents\MyDocs from Thermbridge\Thermal Simulation Output Files\Steel Window Association\May 2014\W40 - SIMULATIONS Doors and Windows\W40-012\Lock Panel.f2d



Calculation of the thermal transmission coefficient U_f according to EN ISO 10077-2:2003-12

Simulation model:

Dimensions (width x height): 200,00 x 54,99 mm

Number of elements in simulation model: X-direction: 100; Y-direction: 28



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 2,838 W/m

2D thermal conductance L_{2D} : 0,142 W/mK

Length top/left: 200,00 mm

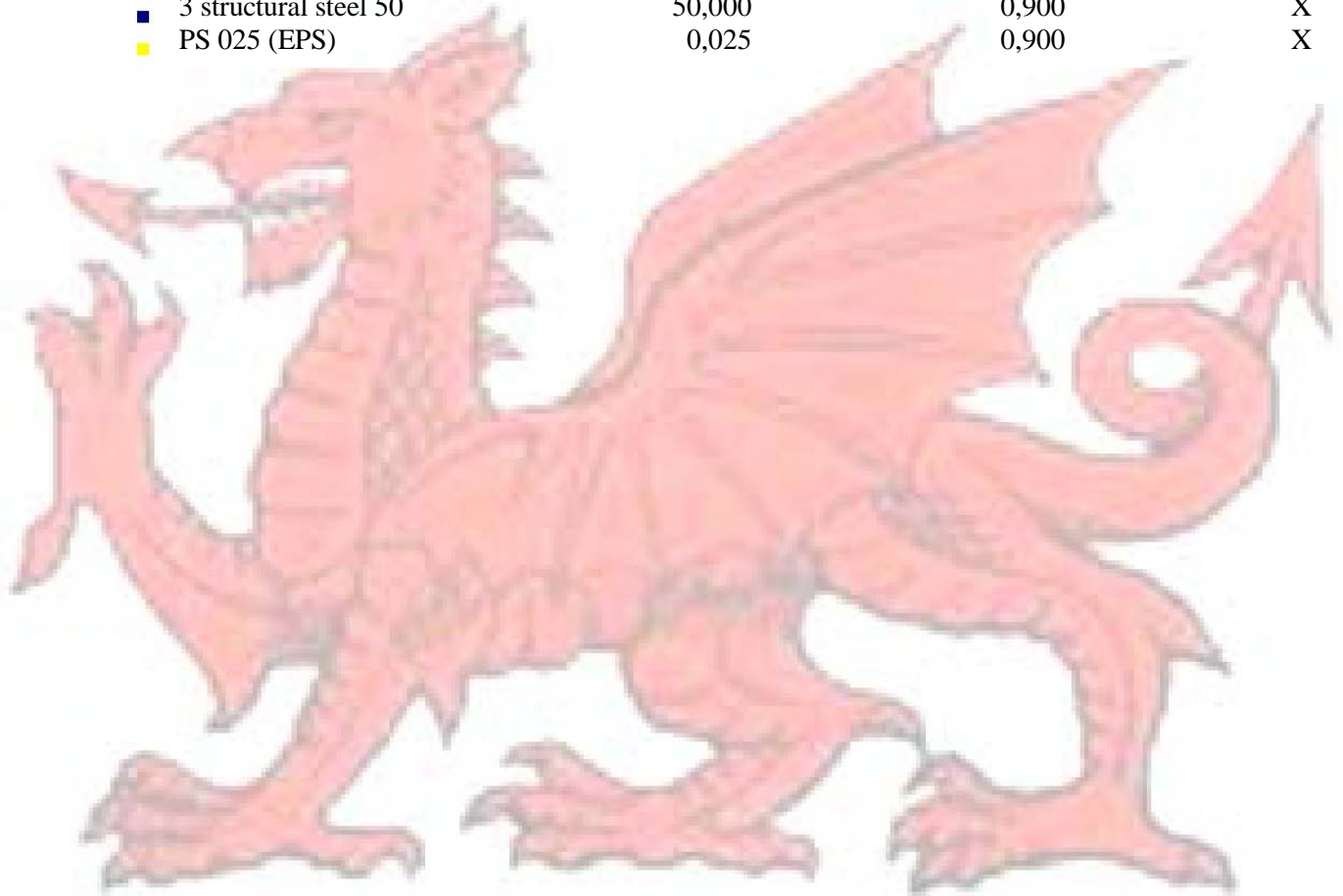
U-value top/left: 0,709 W/m²K

Length bottom/right: 0,00 mm

U-value bottom/right: 0,000 W/m²K

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
ADIABAT	0,000	0,000	0,000	
■ 1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-2,838	X
■ 1 boundary condition intside 0,13, 20°C, 50%	0,130	20,000	2,838	X
Material	L (W/mK)	Emiss		10077 konform
■ 3 structural steel 50	50,000	0,900		X
■ PS 025 (EPS)	0,025	0,900		X



Simulation software: WinIso2D 7.80

Date: 21.05.2014

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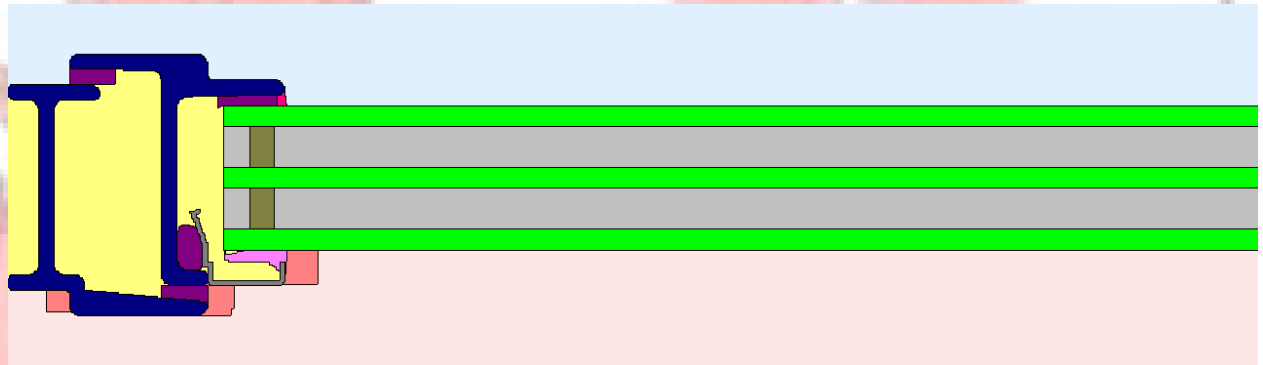


Calculation of the linear thermal transmission coefficient Ψ according to EN ISO 10077-2

Simulation model:

Dimensions (width x height): 243,99 x 70,90 mm

Number of elements in simulation model: X-direction: 207; Y-direction: 133



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance Rse: 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance Rsi 1: 0,130 m²K/W

Surface resistance Rsi 2: 0,200 m²K/W

Results:

Temperature difference dT: 20,00 K

Total heat flow Q: 9,842 W/m

2D thermal conductance L2D: 0,492 W/mK

Length top/left: 190,00 mm

U-value top/left: 0,602 W/m²K

Length bottom/right: 0,00 mm

U-value bottom/right: 0,000 W/m²K

Ψ -value: 0,051 W/mK

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-9,842	X
1 boundary condition intside 0,13, 20°C, 50%	0,130	20,000	7,673	X
1 boundary condition intside 0,20, 20°C, 50%	0,200	20,000	2,168	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
2 Float Glass 1.0	1,000	0,837	X
3 stainless steel 17	17,000	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 Super Spacer Standard	0,130	0,900	X
6 butyle	0,240	0,900	X
SZR L=0.0108	0,011	0,900	-

Simulation software: WinIso2D 7.80

Date: 21.05.2014

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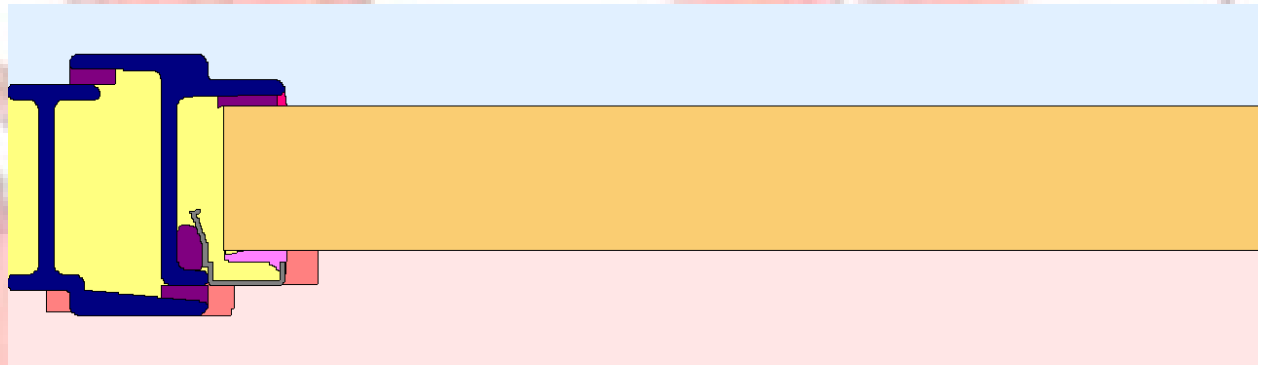


Calculation of the thermal transmission coefficient U_f according to EN ISO 10077-2:2003-12

Simulation model:

Dimensions (width x height): 243,99 x 70,90 mm

Number of elements in simulation model: X-direction: 207; Y-direction: 133



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 10,450 W/m

2D thermal conductance $L2D$: 0,523 W/mK

Length 1: 190,00 mm

U-value 1: 1,031 W/m²K

Length 2: 0,00 mm

U-value 2: 0,000 W/m²K

U_f -value: 6,048 W/m²K

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-9,842	X
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	7,673	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	2,168	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
2 Float Glass 1.0	1,000	0,837	X
3 stainless steel 17	17,000	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 Super Spacer Standard	0,130	0,900	X
6 butyle	0,240	0,900	X
SZR L=0.0108	0,011	0,900	-

Simulation software: WinIso2D 7.80

Date: 21.05.2014

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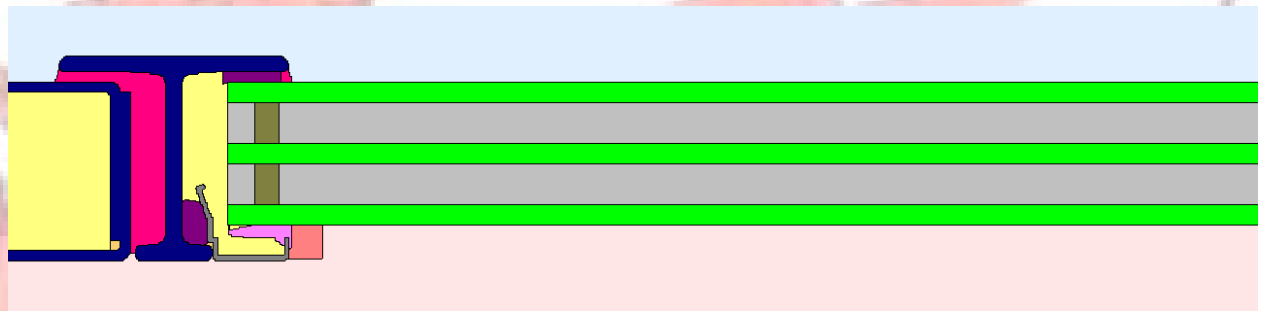


Calculation of the linear thermal transmission coefficient Ψ according to EN ISO 10077-2

Simulation model:

Dimensions (width x height): 245,09 x 60,00 mm

Number of elements in simulation model: X-direction: 200; Y-direction: 93



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance Rse: 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance Rsi 1: 0,130 m²K/W

Surface resistance Rsi 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q: 10,244 W/m

2D thermal conductance L2D: 0,512 W/mK

Length top/left: 190,00 mm

U-value top/left: 0,602 W/m²K

Length bottom/right: 0,00 mm

U-value bottom/right: 0,000 W/m²K

Ψ -value: 0,048 W/mK

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-10,244	X
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	9,561	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	0,682	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
2 Float Glass 1.0	1,000	0,837	X
3 stainless steel 17	17,000	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 Super Spacer Standard	0,130	0,900	X
6 butyle	0,240	0,900	X
SZR L=0.0108	0,011	0,900	-

Simulation software: WinIso2D 7.80

Date: 21.05.2014

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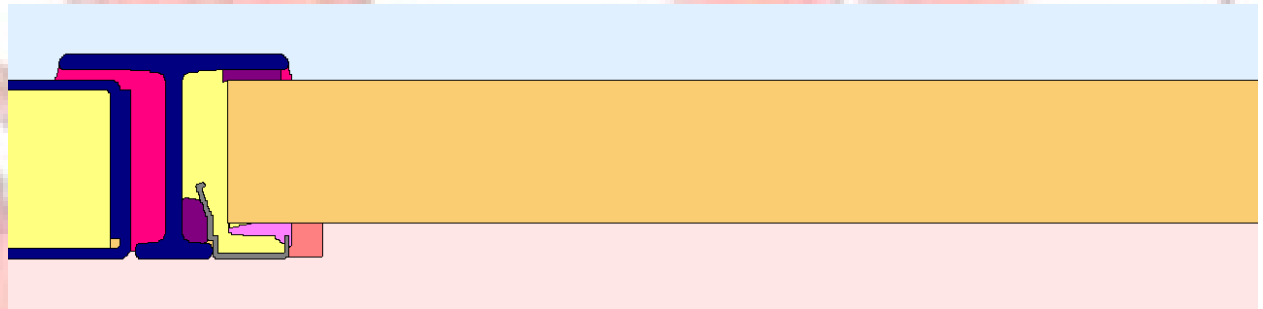


Calculation of the thermal transmission coefficient U_f according to EN ISO 10077-2:2003-12

Simulation model:

Dimensions (width x height): 245,09 x 60,00 mm

Number of elements in simulation model: X-direction: 200; Y-direction: 93



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 10,923 W/m

2D thermal conductance L_{2D} : 0,546 W/mK

Length 1: 190,00 mm

U-value 1: 1,031 W/m²K

Length 2: 0,00 mm

U-value 2: 0,000 W/m²K

U_f -value: 6,368 W/m²K

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-10,244	X
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	9,561	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	0,682	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
2 Float Glass 1.0	1,000	0,837	X
3 stainless steel 17	17,000	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 Super Spacer Standard	0,130	0,900	X
6 butyle	0,240	0,900	X
SZR L=0.0108	0,011	0,900	-