

Section 12

12

Thermal / Insulation



General:

Global warming and energy conservation have been linked by many experts in this field and the Government of the United Kingdom have committed themselves to reducing carbon emissions. This commitment is evident by reference to Building Regulations - Approved Document 'L' that is published in separate sections as follows:

- Approved Document L1A - Conservation of Fuel & Power - New Dwellings.
- Approved Document L1B - Conservation of Fuel & Power - Existing Dwellings.
- Approved Document L2A - Conservation of Fuel & Power - New Buildings other than Dwellings.
- Approved Document L2B - Conservation of Fuel & Power - Existing Buildings other than Dwellings.

The performance of building products may be expressed in terms of 'Thermal Conductivity' (*lambda-value*) OR, 'Thermal Transmittance' (*U value*):

Thermal Conductivity:

The rate at which a material will pass heat. Expressed in units of Watts per metre per degree of temperature difference (W/mK).

Thermal Transmittance:

The measure of how much heat will pass through one square metre of a structure when the air temperatures on either side differ by one degree. U-values are expressed in units of Watts per square metre per degree of temperature difference (W/m²K).

The Thermal Transmittance or U-value performance is generally applied to doorsets.

Thermal Transmittance can be measured by use of three methods:

BS EN 12567-1:2010 - 'Hot Box' method. This provides for the physical measurement of specimens.

BS EN ISO 10077-1:2006 - Calculation of thermal transmittance - General.

NOTE: This method is used by reference to Tables in Building Regulations - Approved Document L1A - Table 2 and Approved Document L2A - Table 4.

BS EN ISO 10077-2:2012 - Calculation of thermal transmittance - Numerical method for frames.

NOTE: This method provides for calculations related to the characteristics of particular products.

In practice, energy conservation relates to a building as a whole but with this performance being determined by considering the combined influence of each component. The savings resulting from the careful selection of one element can be offset against the performance of other elements to meet the performance requirements for a building as a whole.

For Dwellings, the Government's preferred method for determining an energy rating is by use of the 'Standard Assessment Procedure' (*SAP*). This provides for a method for calculating a 'Carbon Index' that can be used to demonstrate that dwellings comply with Approved Document 'L'.

The maximum U-value performances for doorsets is published by reference to tables in Approved Documents L1A, L1B, L2A and L2B. When calculated, using the method defined by reference to BS EN ISO 10077-2:2012 the performance of doorsets based upon the use of Strebord[®] door cores compares favourably with these maximum values (*when based upon the specimen details shown in this section*). Further, being of a solid core construction, the Strebord[®] door core provides for an excellent base for improving thermal insulation performances by the addition of appropriate facing materials.

For further advice concerning the thermal transmittance performance of Strebord[®] door cores please contact our Technical Support Department:

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Clock House,
Station Approach,
Shepperton,
Middlesex TW17 8AN

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Thermal Insulation

Strebord® and Thermal Transmittance:

Generally thermal transmittance considerations apply to external doorsets. However, U - value data has been requested by users for Strebord® based doorsets and this Section provides for guidance where this consideration applies.

The thermal transmittance performance of a doorset will vary according to the particular doorset design. Considerations include:

- Doorset size and configuration.
- Frame component materials and dimensions.
- Operating gap dimensions.
- Type, size and position of seals (if used).
- Door face material.
- Glass type and glazed area.

BS EN ISO 10077-2:2012 calculations have been determined for Strebord® based doorsets using the following criteria:

- Door leaf dimension = 2040x926mm being the largest single leaf door size anticipated by reference to BS 4787 Pt.1. in both nom. 44mm and 54mm thickness with 0.5mm veneer facings and doors 8mm lipped on all edges with nom. 640kg/m³ hardwood.
- Frame lining section = 95x32mm (ex. 100x35mm = ex. 4x1¹/₂in).
- Frame material = Nom. 500kg/m³ Softwood OR Nom. 700kg/m³ Hardwood.
- Frame used with a nom. 37x12mm (ex 50mm = 2in. (pinned) planted doorstop with silicon mastic sealant used between the stop and the frame lining.
- Operating gaps - Head and Stiles = 3mm - being the maximum dimension anticipated by reference to BS4787 Pt.1 when used without sealing systems.
- Operating gap - Threshold = 3mm - being the dimension required for doorsets with sills by reference to BS4787 Pt.1 and the maximum threshold gap permitted for smoke sealed doorsets used without additional threshold seals.

NOTE: The calculated performance relates to the specimen details in isolation and does not consider surrounding structures or methods of installation.

Sealing Systems:

To provide for further guidance, performances have been re-measured to illustrate the influence of sealing. These calculations are based upon the use of Norsound Ltd. seals.

Perimeter sealing systems used are:

A/ 44mm Strebord - Norsound 710 seal to head and jambs with Norsound 810 automatic door bottom used at the threshold in conjunction with a Norsound 625 flat threshold plate.

B/ 44mm Strebord - Norsound 710 seal to head and jambs with Norsound 650 stepped threshold with seal the threshold.

C/ 54mm Strebord - Norsound 710 seal to head and jambs and Norsound 720 to the door leaf stiles and head (*interrupted for hinge blades*) with Norsound 810 automatic door bottom used at the threshold in conjunction with a Norsound 625 flat threshold plate.

D/ 54mm Strebord - Norsound 710 seal to head and jambs and Norsound 720 to the door leaf stiles and head (*interrupted for hinge blades*) with Norsound 650 stepped threshold with seal the threshold.

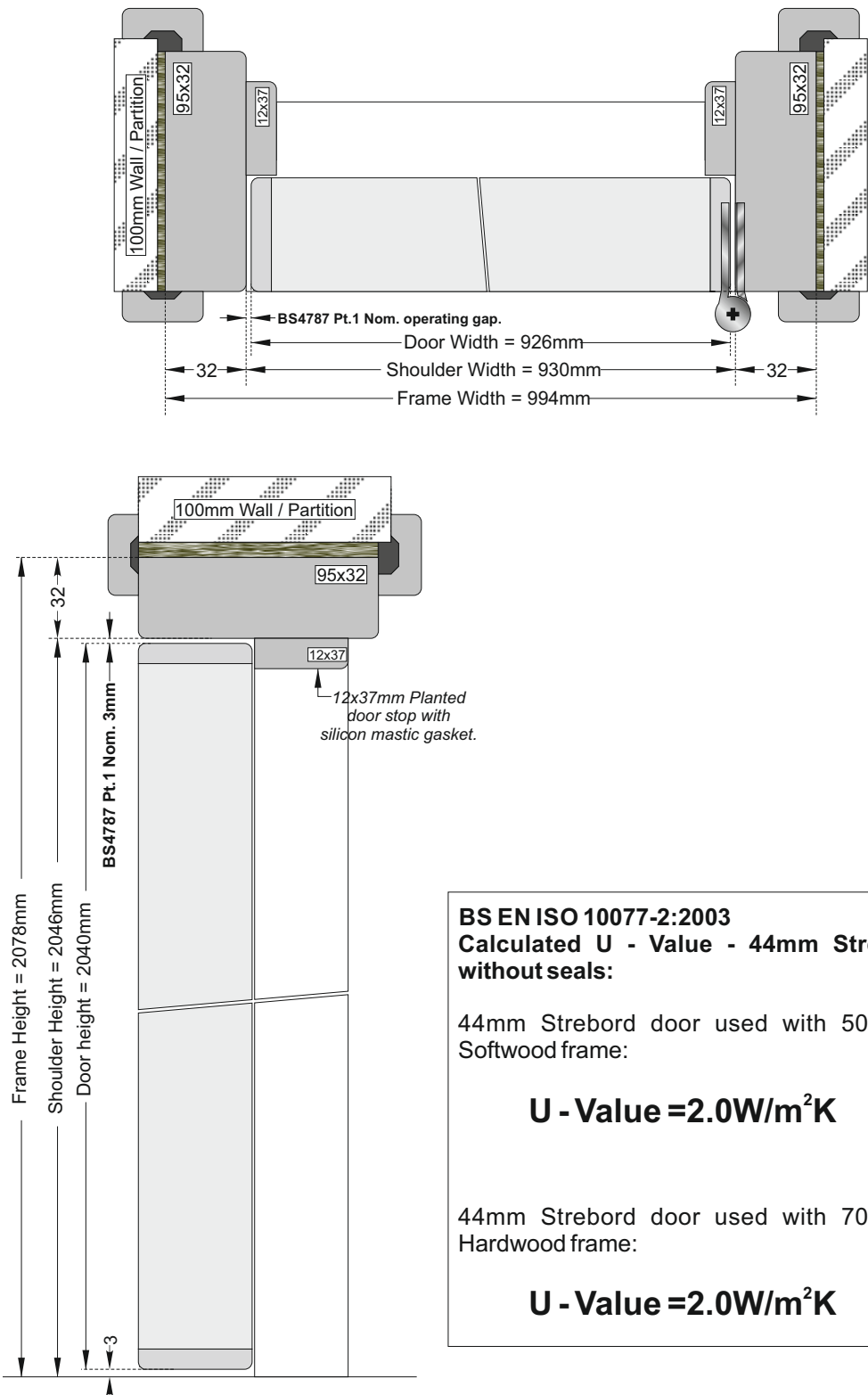
Glazing:

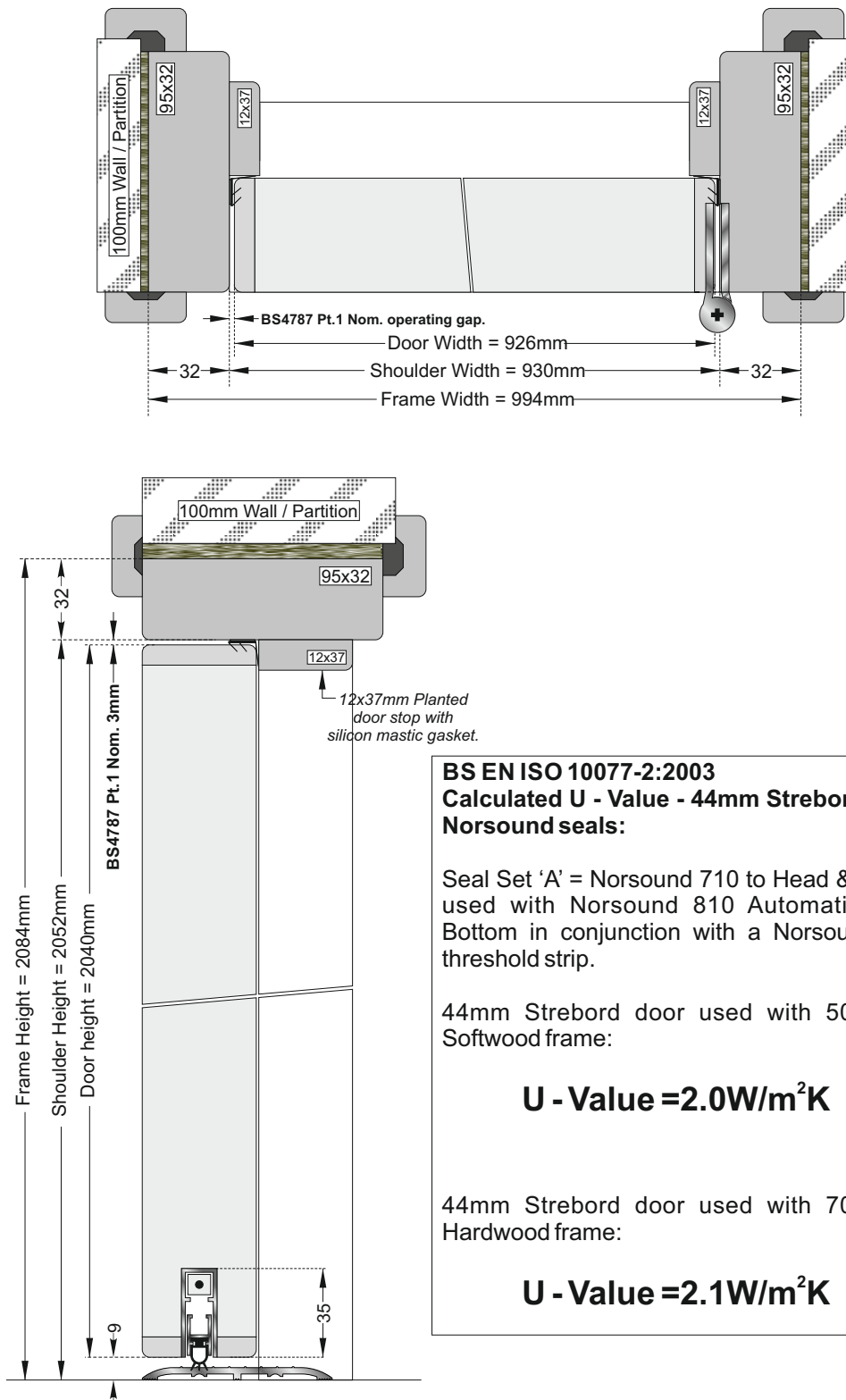
Calculations in this section do not include for glazing. The performance of glazed doors will vary according to glass type and glazed area *For guidance (centre pane) performances for glazed elements are indicated as follows:*

- **Single pane clear glass - 'U' value = approx. 5.4W/m²K**
- **Double glazed unit using non specialist glass types - 'U' value = approx. 2.6W/m²K**
- **Sealed glazed units using specialist glass types e.g. Pilkington 'E' glass with air = approx. 1.8W/m²K.**
- **Sealed glazed units using specialist glass types e.g. Pilkington 'E' glass with argon gas = approx. 1.6W/m²K.**

44mm Strebord® Unsealed.

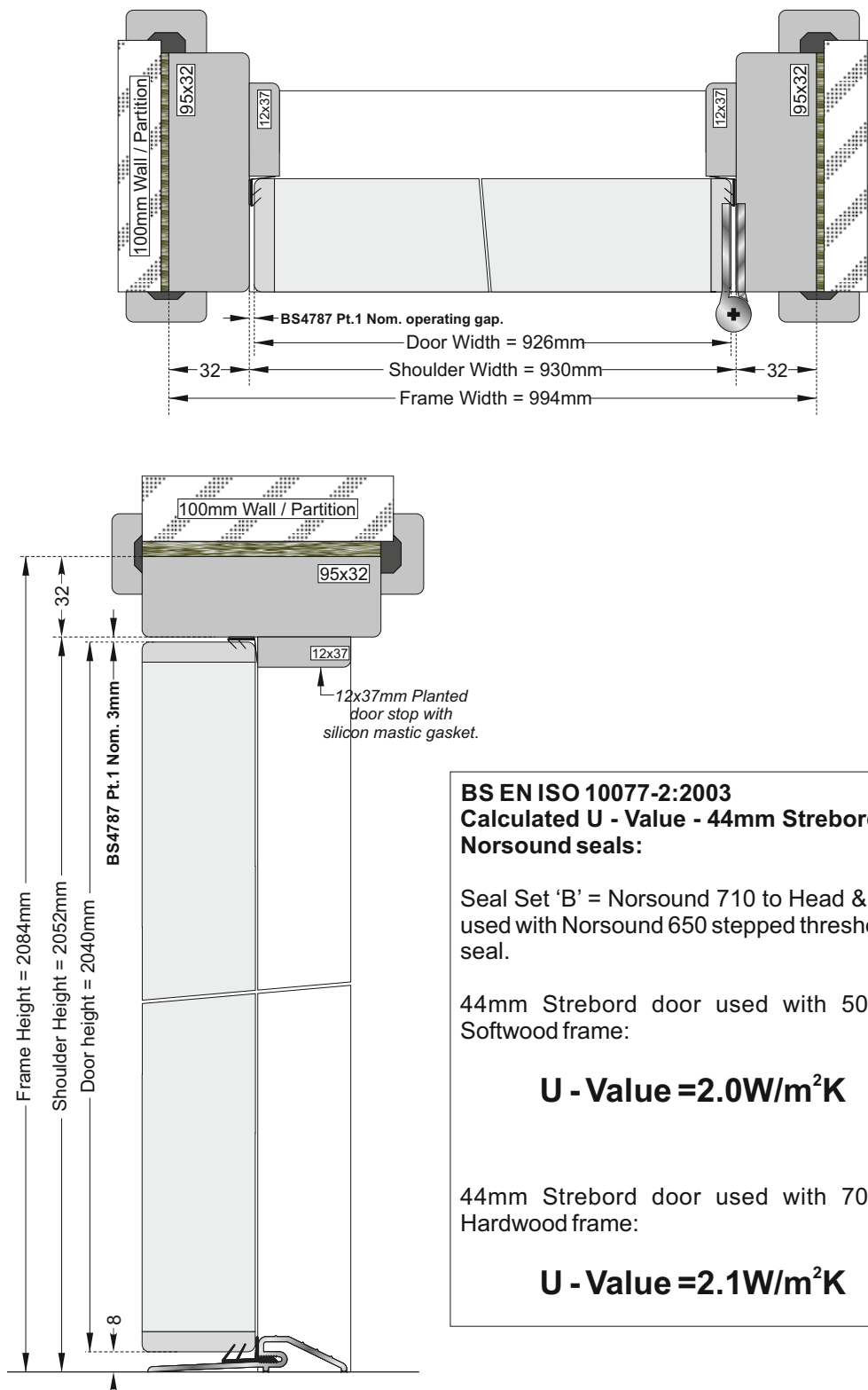
Fig. 12.1



Thermal Insulation
Q 44mm Strebord® - Norsound 710 / 810 sealing:
Fig. 12.2


Q 44mm Strebord® - Norsound 710 / 650 sealing:

Fig. 12.3



BS EN ISO 10077-2:2003
Calculated U - Value - 44mm Strebord® with Norsound seals:

Seal Set 'B' = Norsound 710 to Head & Jambs used with Norsound 650 stepped threshold with seal.

44mm Strebord door used with 500kg/m³ Softwood frame:

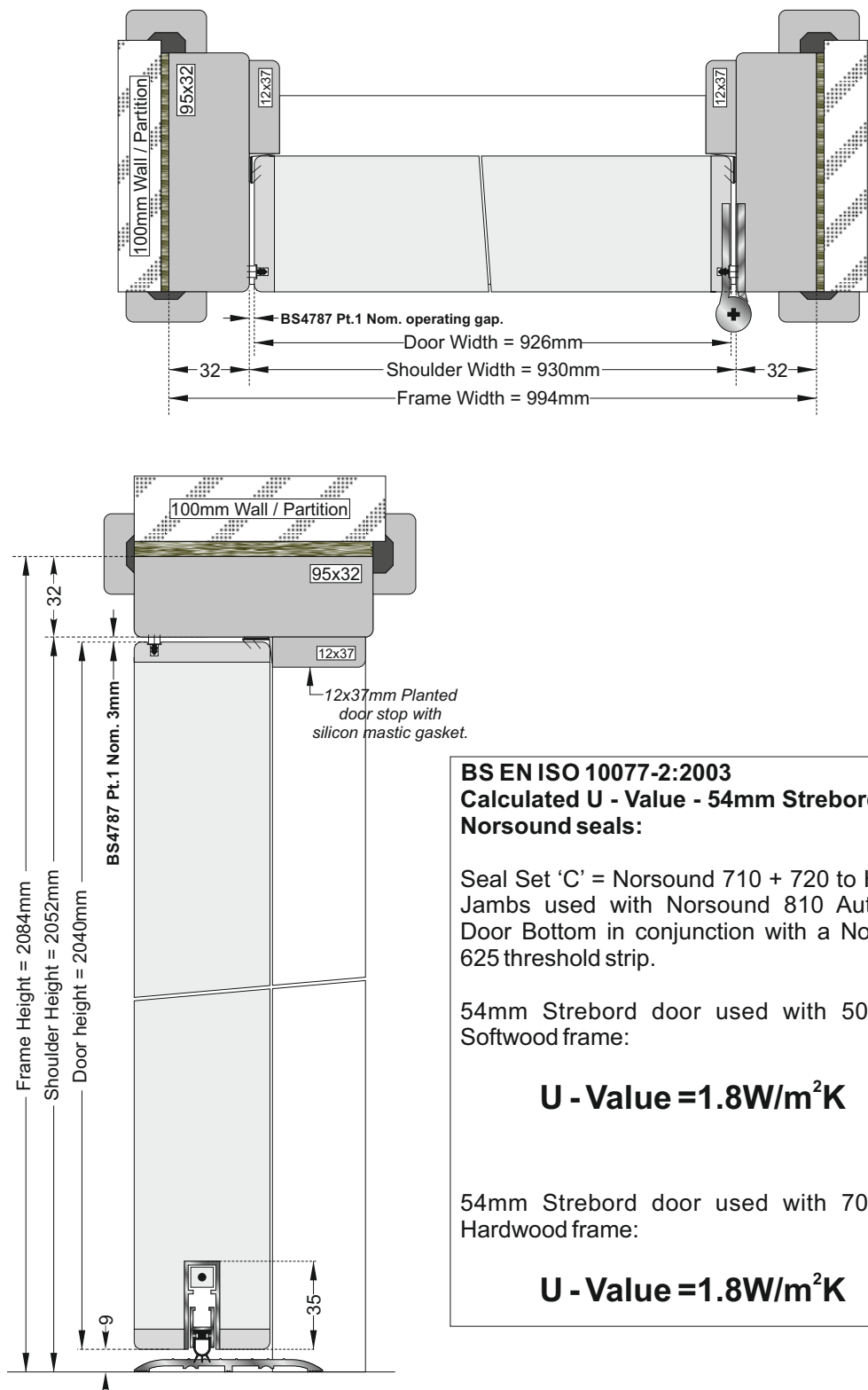
U - Value = 2.0W/m²K

44mm Strebord door used with 700kg/m³ Hardwood frame:

U - Value = 2.1W/m²K

Q 54mm Strebord® - Norsound 710+720 / 810 sealing:

Fig. 12.5



BS EN ISO 10077-2:2003
Calculated U - Value - 54mm Strebord® with Norsound seals:

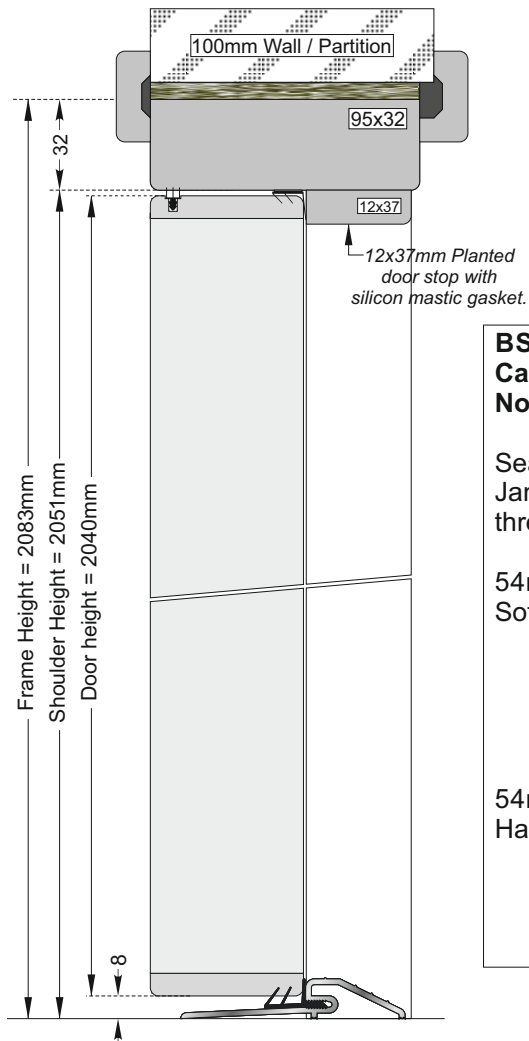
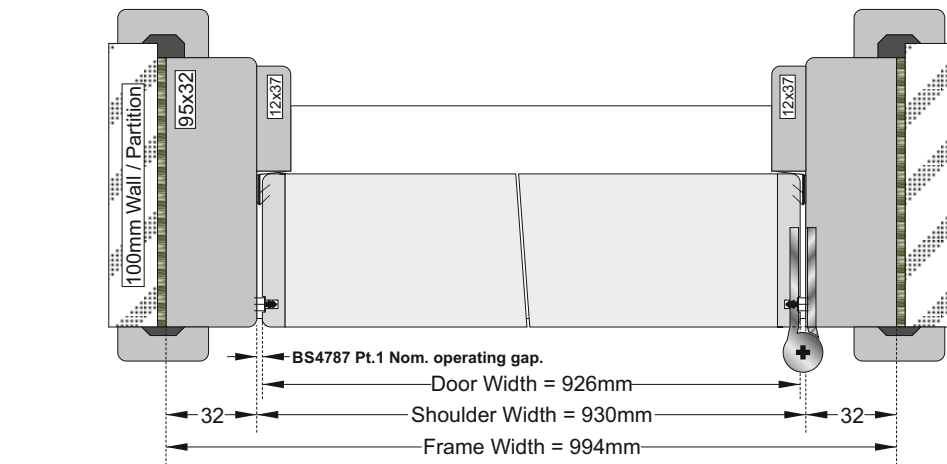
Seal Set 'C' = Norsound 710 + 720 to Head & Jambes used with Norsound 810 Automatic Door Bottom in conjunction with a Norsound 625 threshold strip.

54mm Strebord door used with 500kg/m³ Softwood frame:

U - Value = 1.8W/m²K

54mm Strebord door used with 700kg/m³ Hardwood frame:

U - Value = 1.8W/m²K

Thermal Insulation
Q 54mm Strebord® - Norsound 710+720 / 650 sealing:
Fig. 12.6

BS EN ISO 10077-2:2003
Calculated U - Value - 54mm Strebord® with Norsound seals:

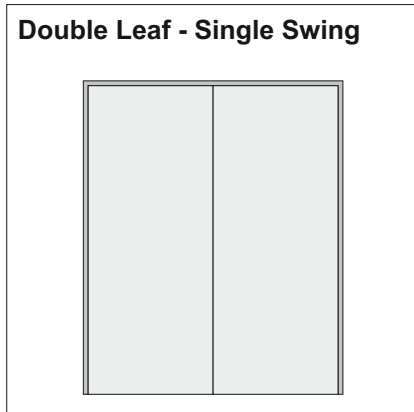
Seal Set 'D' = Norsound 710 + 720 to Head & Jamb used with with Norsound 650 stepped threshold with seal.

54mm Strebord door used with 500kg/m³ Softwood frame:

$$\mathbf{U - Value = 1.8W/m^2K}$$

54mm Strebord door used with 700kg/m³ Hardwood frame:

$$\mathbf{U - Value = 1.8W/m^2K}$$



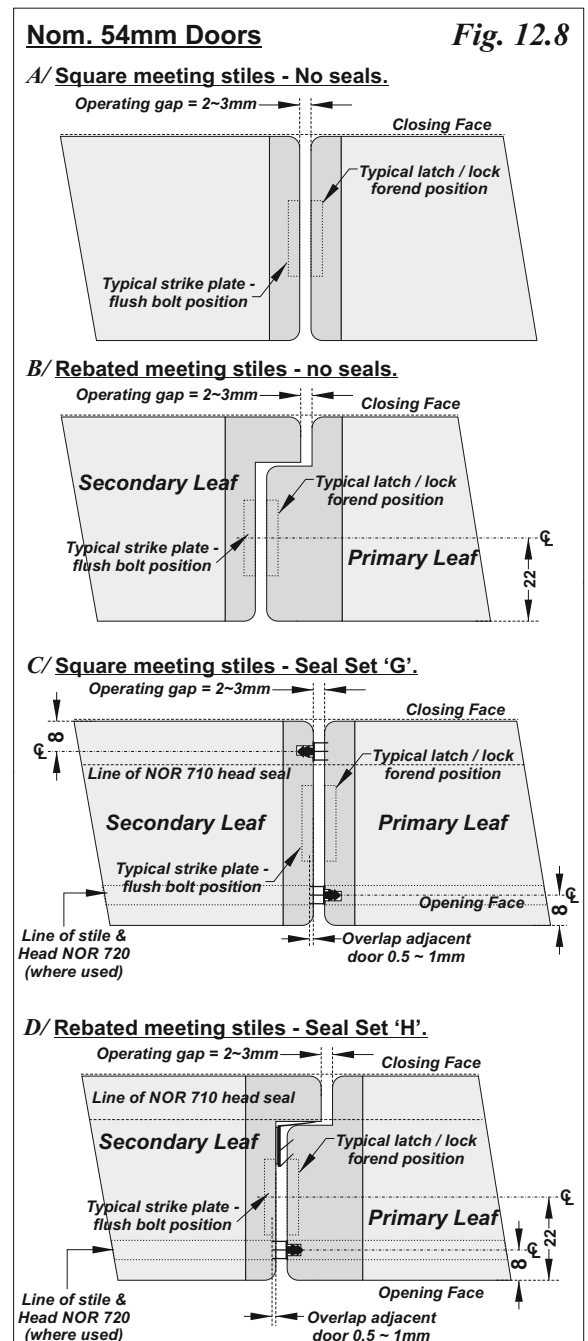
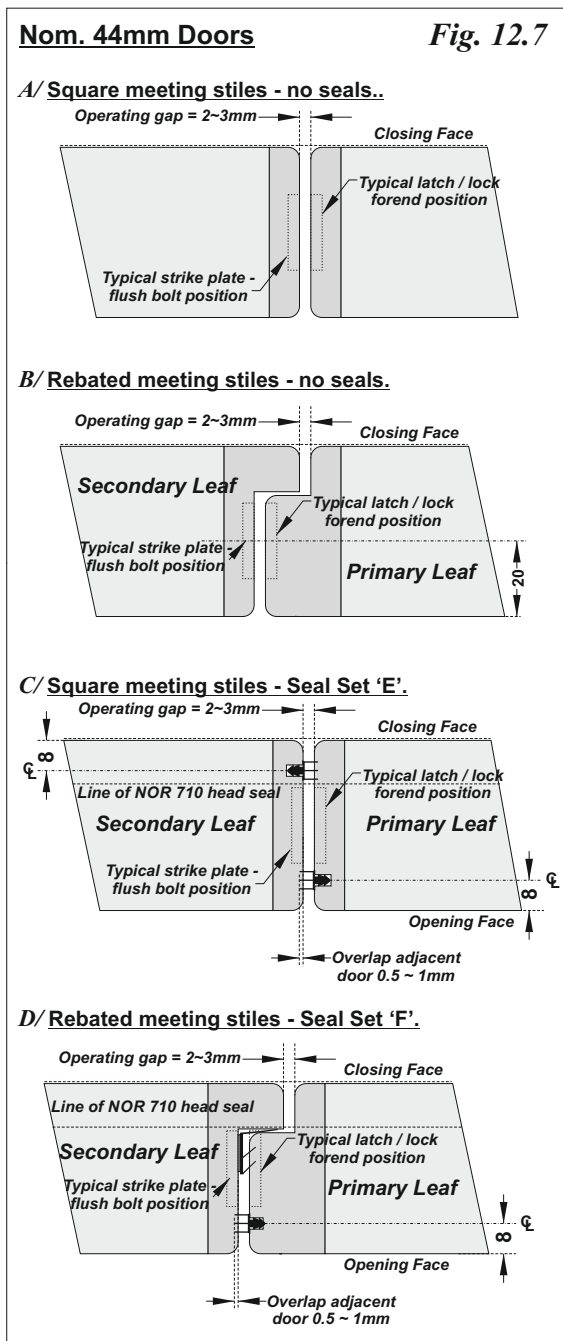
Double Leaf Doorsets:

U - Values can also be calculated for double leaf doorsets.

Generally the use of rebated meeting stiles is recommended as there is otherwise no doorstop to cover the operating gap at the meeting stile.

NOTE: The use of astragals could also be considered as an alternative to rebating.

The use of astragal meeting stile seals can be considered as an alternative to rebating or used in addition to rebating to improve performance.



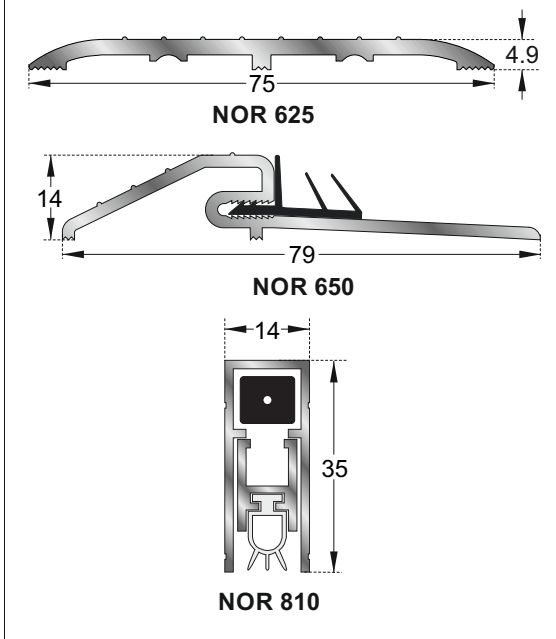
Thermal Insulation
44mm & 54mm Strebord® - Thermal Insulation
Nom. 500kg/m³ Softwood Frames

Door Leaf Dimensions(s) mm			Sealing System / Operating Gap Dimension				Refer to Detail	U' value W/m ² K
Height	Width	Thickness	Jamb	Head	Threshold	Meeting Stiles		
2040	926	44	NIL 3mm	NIL 3mm	NIL 3mm	N/A	<i>Fig. 12.1</i>	2.0
2040	926	44	NOR710 3mm	NOR710 3mm	NOR810 + NOR625	N/A	<i>Fig. 12.2</i>	2.0
2040	926	44	NOR 710 3mm	NOR 710 3mm	NOR 650	N/A	<i>Fig. 12.3</i>	2.0
2040	2No. 926	44	NIL 3mm	NIL 3mm	NIL 3mm	Square - NIL 3mm	<i>Fig. 12.1</i> <i>Fig. 12.7A</i>	2.0
2040	2No. 926	44	NIL 3mm	NIL 3mm	NIL 3mm	Rebated - NIL 3mm	<i>Fig. 12.1</i> <i>Fig. 12.7B</i>	2.0
2040	2No. 926	44	NOR710 3mm	NOR710 3mm	NOR810 + NOR625	Square - 2No. NOR720	<i>Fig. 12.2</i> <i>Fig. 12.7C</i>	2.1
2040	2No. 926	44	NOR710 3mm	NOR710 3mm	NOR810 + NOR625	Rebated - NOR710 + NOR720	<i>Fig. 12.2</i> <i>Fig. 12.7D</i>	2.1
2040	2No. 926	44	NOR 710 3mm	NOR 710 3mm	NOR 650	Square - 2No. NOR720	<i>Fig. 12.3</i> <i>Fig.12.7C</i>	2.1
2040	2No. 926	44	NOR 710 3mm	NOR 710 3mm	NOR 650	Rebated - NOR710 + NOR720	<i>Fig. 12.3</i> <i>Fig.12.7D</i>	2.1
2040	926	54	NIL 3mm	NIL 3mm	NIL 3mm	N/A	<i>Fig. 12.4</i>	1.8
2040	926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR810 + NOR625	N/A	<i>Fig. 12.5</i>	1.8
2040	926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR 650	N/A	<i>Fig. 12.6</i>	1.8
2040	2No. 926	54	NIL 3mm	NIL 3mm	NIL 3mm	Square - NIL 3mm	<i>Fig. 12.4</i> <i>Fig. 12.8A</i>	1.8
2040	2No. 926	54	NIL 3mm	NIL 3mm	NIL 3mm	Rebated - NIL 3mm	<i>Fig. 12.4</i> <i>Fig. 12.8B</i>	1.8
2040	2No. 926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR810 + NOR625	Square - 2No. NOR720	<i>Fig. 12.5</i> <i>Fig. 12.8C</i>	1.8
2040	2No. 926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR810 + NOR625	Rebated - NOR710 + NOR720	<i>Fig. 12.5</i> <i>Fig. 12.8D</i>	1.8
2040	2No. 926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR 650	Square - 2No. NOR720	<i>Fig. 12.6</i> <i>Fig.12.8C</i>	1.8

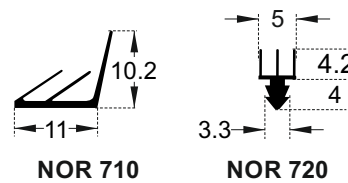
Thermal Insulation
44mm & 54mm Strebord® - Thermal Insulation

Nom. 700kg/m³ Hardwood Frames

Door Leaf Dimensions(s) mm			Sealing System / Operating Gap Dimension				Refer to Detail	U' value W/m ² K
Height	Width	Thickness	Jamb	Head	Threshold	Meeting Stiles		
2040	926	44	NIL 3mm	NIL 3mm	NIL 3mm	N/A	<i>Fig. 12.1</i>	2.0
2040	926	44	NOR710 3mm	NOR710 3mm	NOR810 + NOR625	N/A	<i>Fig. 12.2</i>	2.1
2040	926	44	NOR 710 3mm	NOR 710 3mm	NOR 650	N/A	<i>Fig. 12.3</i>	2.1
2040	2No. 926	44	NIL 3mm	NIL 3mm	NIL 3mm	Square - NIL 3mm	<i>Fig. 12.1</i> <i>Fig. 12.7A</i>	2.0
2040	2No. 926	44	NIL 3mm	NIL 3mm	NIL 3mm	Rebated - NIL 3mm	<i>Fig. 12.1</i> <i>Fig. 12.7B</i>	2.0
2040	2No. 926	44	NOR710 3mm	NOR710 3mm	NOR810 + NOR625	Square - 2No. NOR720	<i>Fig. 12.2</i> <i>Fig. 12.7C</i>	2.1
2040	2No. 926	44	NOR710 3mm	NOR710 3mm	NOR810 + NOR625	Rebated - NOR710 + NOR720	<i>Fig. 12.2</i> <i>Fig. 12.7D</i>	2.1
2040	2No. 926	44	NOR 710 3mm	NOR 710 3mm	NOR 650	Square - 2No. NOR720	<i>Fig. 12.3</i> <i>Fig.12.7C</i>	2.1
2040	2No. 926	44	NOR 710 3mm	NOR 710 3mm	NOR 650	Rebated - NOR710 + NOR720	<i>Fig. 12.3</i> <i>Fig.12.7D</i>	2.1
2040	926	54	NIL 3mm	NIL 3mm	NIL 3mm	N/A	<i>Fig. 12.4</i>	1.8
2040	926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR810 + NOR625	N/A	<i>Fig. 12.5</i>	1.8
2040	926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR 650	N/A	<i>Fig. 12.6</i>	1.8
2040	2No. 926	54	NIL 3mm	NIL 3mm	NIL 3mm	Square - NIL 3mm	<i>Fig. 12.4</i> <i>Fig. 12.8A</i>	1.8
2040	2No. 926	54	NIL 3mm	NIL 3mm	NIL 3mm	Rebated - NIL 3mm	<i>Fig. 12.4</i> <i>Fig. 12.8B</i>	1.8
2040	2No. 926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR810 + NOR625	Square - 2No. NOR720	<i>Fig. 12.5</i> <i>Fig. 12.8C</i>	1.8
2040	2No. 926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR810 + NOR625	Rebated - NOR710 + NOR720	<i>Fig. 12.5</i> <i>Fig. 12.8D</i>	1.8
2040	2No. 926	54	NOR 710 + NOR720 3mm	NOR 710 + NOR720 3mm	NOR 650	Square - 2No. NOR720	<i>Fig. 12.6</i> <i>Fig.12.8C</i>	1.8

Sealing Systems:
Thresholds & Threshold Seals: Fig. 12.9


The BS EN ISO 10077-2:2003 calculations used in this section are based upon the use of Norsound Ltd. seals where the use of seals is illustrated in the relevant details. Seals from alternative sources may be used where they provide for similar functions.

Head / Jamb & Meeting Stile Seals:
Fig. 12.10


Whereas a threshold strip should be with soft floor finishes (*e.g. carpet*), the Norsound 810 Automatic Door Bottom may be used without a threshold strip in conjunction with hard floor finishes without detriment to the indicated U - value performances provided that the gap from the bottom of the door to the top of the floor finish shown in *Fig. 12.2* is reduced from 9mm to 4mm.

It is recommended that jamb, head and meeting stile seals are located to minimise influences on operating forces. The illustrations in this section show seal locations that result in seals at the closing stiles being in contact with the frame or adjacent door for the last 8 ~ 9mm of closing (*or first 8~9mm of opening*).

Project Applications:

BS EN ISO 10077-2:2003 calculations apply to specific designs, as such, the U - value performances shown in this section relate to the particular illustrated designs and are indicative of the potential performances for Strebord[®] based doorsets.

The calculations were determined on behalf of Falcon Panel Products Ltd. by BM TRADA and this section is 'Q' Marked on that basis.

Reference should be made to an expert authority providing for BS EN ISO 10077-2:2012 calculations to suit particular design applications.

BS EN ISO 10077-2:2012 calculations can be provided by:

Chiltern Dynamics
 Chiltern House,
 Stocking Lane,
 Hughenden Valley,
 High Wycombe,
 Buckinghamshire HP14 4ND

Tel: 01494 569800
 Fax: 01494 564895