SLOVENSKI STANDARD
SIST EN 14024:2005

01-januar-2005

Kovinski profili s prekinjenim toplotnim mostom - Mehanske lastnosti - Zahteve, izraþuni in preskuģanja

Metal profiles with thermal barrier - Mechanical performance - Requirements, proof and tests for assessment

Metallprofile mit thermischer Trennung - Mechanisches Leistungsverhalten - Anforderungen, Nachweis und Prüfungen für die Beurteilung

Profilés métalliques a rupture de pont thermique - Performances mécaniques - Exigences, preuve et essais pour évaluation

Ta slovenski standard je istoveten z: EN 14024:2004

ICS:

91.060.10	Stene. Predelne stene. Fasade	Walls. Partitions. Facades
91.060.50	Vrata in okna	Doors and windows

SIST EN 14024:2005 en

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14024

October 2004

ICS 91.060.10; 91.060.50

English version

Metal profiles with thermal barrier - Mechanical performance - Requirements, proof and tests for assessment

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 14024:2004: E

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Foreword

This document (EN 14024:2004) has been prepared by Technical Committee CEN/TC 33 "Doors, windows, shutters, building hardware and curtain walling", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2005, and conflicting national standards shall be withdrawn at the latest by April 2005.

This text includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This document specifies requirements for assessment of the mechanical strength of metal profiles incorporating a thermal barrier. It also specifies the tests to determine the characteristic values of mechanical properties of the thermal barrier profile and to assess the suitability of the thermal barrier material used.

This document applies to thermal barrier profiles designed mainly for windows, doors, window walls and curtain walls. It does not apply to thermal barriers made only of metal profiles connected with metal pins or screws.

Thermal barrier profiles are used in various fields of applications and demand a differing assessment of their mechanical performance depending on their intended use. This document takes this into account by two fields of application: one for windows, doors and related components and one for profiles in façades.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 4600*, Plastics – Determination of environmental stress cracking (ESC) – Ball or pin impression method (ISO 4600:1992).*

3 Terms, definitions and symbols

For the purposes of this document, the following terms, definitions and symbols apply.

3.1
thermal barrier profile
profile composed of two or more metal sections connected by at least one thermally insulating (non-metallic) part

NOTE 1 The thermal barrier contributes to load transmission.

NOTE 2 The thermal barrier can be continuous or in parts.

3.2 Use categories

3.2.1
category W
thermal barrier profiles mainly designed for windows, doors and secondary constituent parts of curtain walls

NOTE Thermal barrier profiles designed for windows and doors do not usually require proof by calculation for mechanical resistance.

3.2.2
category CW
thermal barrier profiles mainly designed for the constituent parts of curtain walls with spans greater than 2,25 m

NOTE Constituent parts of curtain walls usually need proof by calculation relating to mechanical resistance and deflection.

3.2.3
temperature categories
two temperature categories, defined and to be chosen according to the intended use

Temperature category	Low test temperature LT	High test temperature HT
TC 1	(-10 ± 2) °C	(70 ± 3) °C
TC 2	(-20 ± 2) °C	(80 ± 3) °C

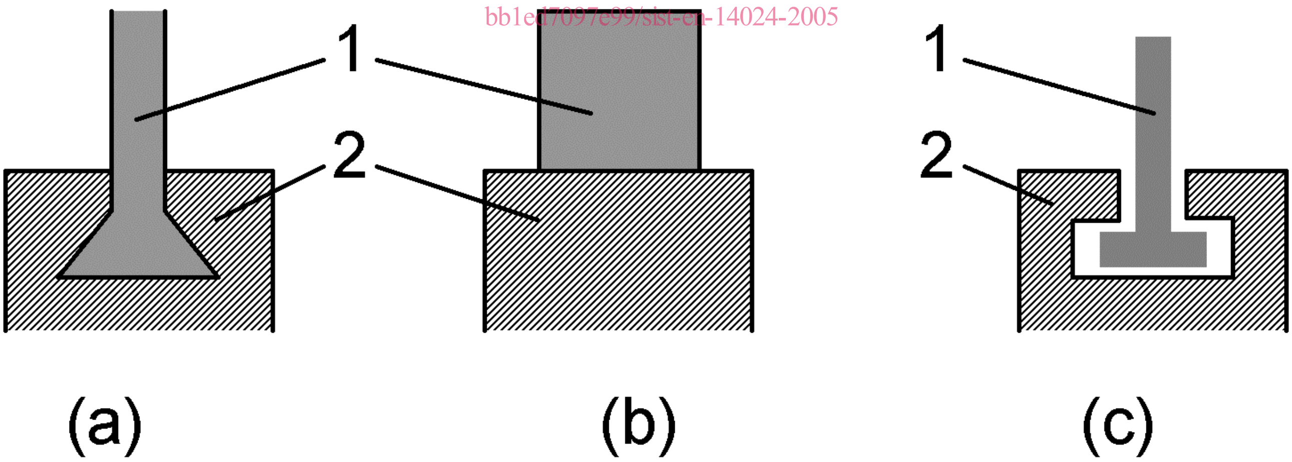
NOTE Temperature category TC 2 includes temperature category TC 1.

3.3 Mechanical design systems

3.3.1
type A system
system which is designed to transfer shear and in which shear failure will not negatively affect the transverse tensile strength

3.3.2
type B system
system which is designed to transfer shear and in which shear failure will negatively affect the transverse tensile strength

3.3.3
type O system
system which is designed to transfer no shear to the thermal barrier or profile which has an insufficient shear strength



a) Type A system b) Type B system c) Type O system

Key

1 Thermal barrier

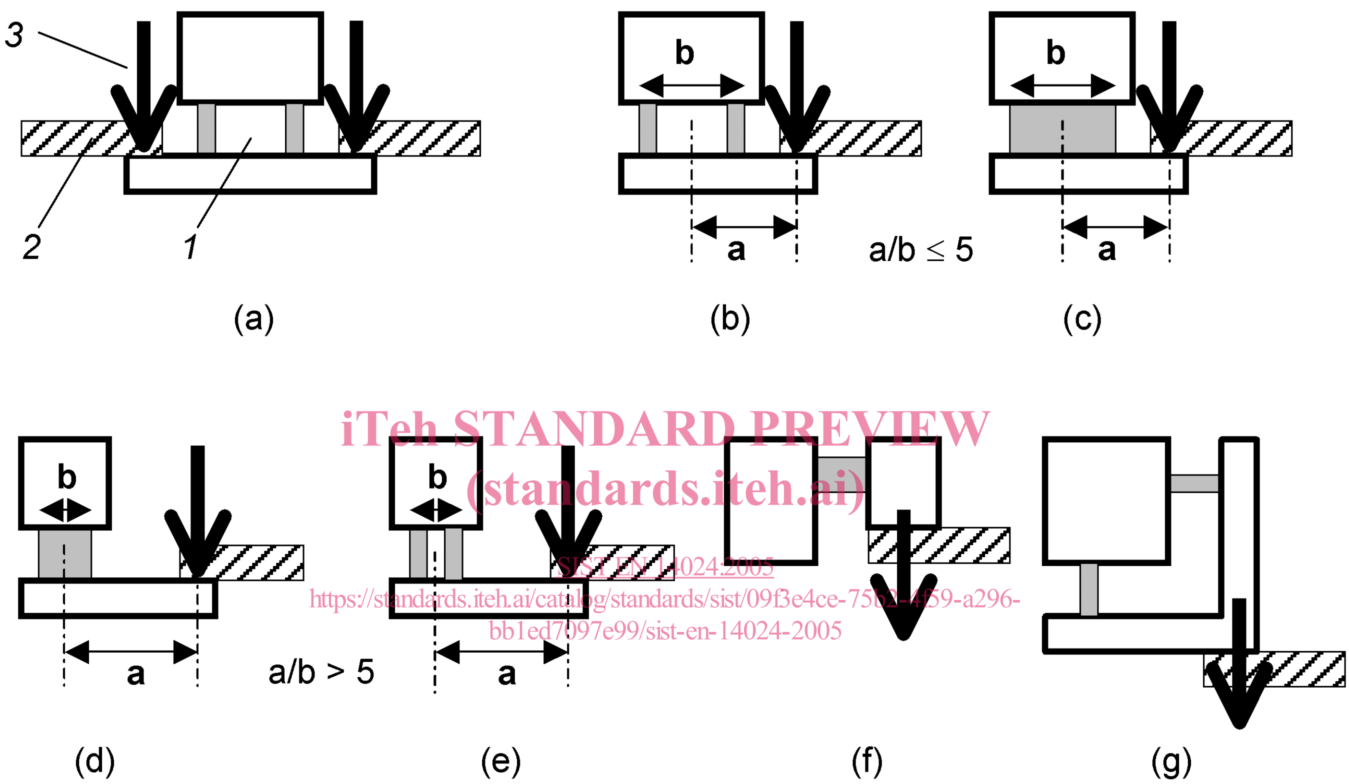
2 Metal

Figure 1 — Schematic diagram of mechanical design systems

3.4 Geometric design types

3.4.1
type 1 profile
profile in which the load is symmetric (see Figure 2a)) or near to symmetry, i.e. the eccentricity of the load a/b does not exceed the value 5 (see Figure 2b) and c))

3.4.2
type 2 profile
profile in which the load is asymmetric, i.e. all profiles not covered by type 1 (see Figure 2d), e), f) and g))



a) symmetrically loaded profile (type 1)

b) and c) near symmetrically loaded profiles with eccentricity a/b ≤ 5 (type 1)

d) and e) asymmetrically loaded profiles with eccentricity a/b > 5 (type 2)

f) and g) non-symmetric profiles (type 2)

Key

1 Thermal barrier profile

2 Infill elements (i.e. glass or panels)

3 Line load

Figure 2 — Examples of geometric design types

3.5 Symbols and indexes

Symbol	Meaning	Unit
Q	transverse tensile strength	N/mm
T	shear strength	N/mm
c	elasticity constant	N/mm²
l	length of the test specimen	mm
f	deformation	mm
Δh	deformation	mm
F	force	N
A_1	design factor for type B	
A_2	creep factor	
Indexes		
c	characteristic value which has a 95% chance of being exceeded based on a logarithmic normal distribution with 75% confidence	
N	new, before artificial ageing	
M1	after artificial ageing, method 1	
M2	after artificial ageing, method 2	
M3	after artificial ageing, method 3	
mean	mean value	
req	required	
max	maximum	
LT	low temperature	
RT	room temperature	
HT	high temperature	

4 Requirements

4.1 General

For assessing the shear depending on the thermal barrier systems, three types A, B and O (see 3.3) shall be distinguished.

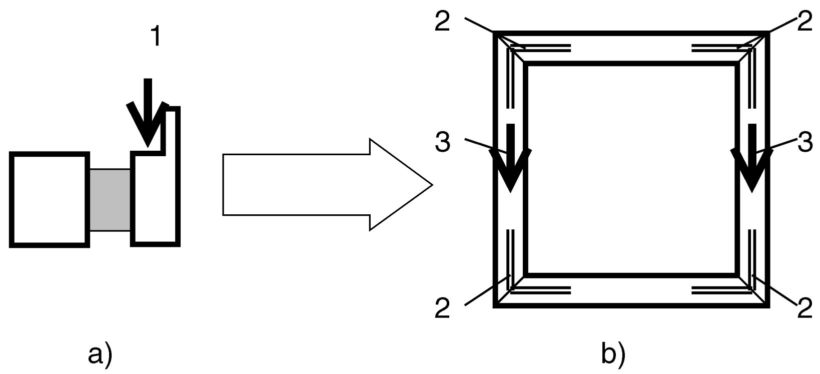
Because of the intrinsic safety of type A, shear and tensile strength may be considered independently, whereas type B requires an assessment under superposition of loads.

The transverse tensile strength of type A and type O shall be determined after simulated shear failure. For type O only the transverse tensile strength shall be determined, no shear strength and elasticity constant will be given.

Permanent loads which stress the thermal barrier are not covered by this document with the following exceptions:

a) the tension (transversal tensile stress) caused by conventional glazing systems with preformed seals;

b) in the case of type A or type B systems the shear stress in the vertical profile caused by the self-weight of the infill element. The transfer of the load from the horizontal profile to the vertical profile by mechanical means is required (see Figure 3).



a) horizontal profile section

b) front view of a frame

Key

1 Self-weight of infill element

2 Mechanical means (mechanical edge connection)

3 Transferred self-weight

Figure 3 — Transfer of the self-weight of the infill element to the vertical profile by mechanical means

4.2 Material of the thermal barrier

Thermal barrier composed of non-metallic materials, e.g. PA or PU based systems or improved synthetic materials, shall be tested in accordance with 5.2.

The aim of the test procedures is to assess the thermal barrier material independently of the shape of the thermal barrier and of the profile design.

Materials used for the thermal barrier shall conform to the following requirements:

a) the characteristic value of transverse tensile strength after immersion in water (see 5.2.2) or after exposure to humidity (see 5.2.3) shall correspond to Q_{req} given in Table 1 depending on the category of use. The decrease of the characteristic value shall not exceed 30 % as compared to Q_c^N at the corresponding temperature;

b) customary window and facade cleaning agents or cutting and drilling oils shall not cause tensile cracks (see 5.2.4);

c) exposure to sudden stress (see 5.2.5) shall not cause decrease in characteristic value of transverse tensile strength of more than 30 % as compared to $Q_c^N{}_{RT}$.

4.3 Mechanical resistance

Depending on the category of use of the profile and the type of the thermal barrier system (geometry and technology) the characteristic values of the mechanical resistance shall conform to the requirements of Table 1.

EXAMPLE $Q_c^{M1}{}_{LT} \geq Q_{req}$ in category CW means that the characteristic transverse tensile strength after ageing method 1 determined at low temperature LT should be not less than 20 N/mm.

Table 1 — Requirements for strength and deformation

Type	Category W		Category CW
	Q_{req} = 12 N/mm		Q_{req} = 20 N/mm
Geometry 1 (symmetric)			
A+B	$T_{c}{}^{N}{}_{RT} \geq 24$ N/mm Ageing method 1 $\Delta h \leq 1$ mm $Q_{c}{}^{M1}{}_{LT} \geq Q_{req}$ $Q_{c}{}^{M1}{}_{HT} \geq Q_{req}$	Ageing method 2 $f \leq 2$ mm $Q_{c}{}^{M2}{}_{RT} \geq 12$ N/mm $T_{c}{}^{M2}{}_{RT} \geq 24$ N/mm	Proof according to 4.4 Ageing method 1 $\Delta h \leq 1$ mm $Q_{c}{}^{M1}{}_{LT} \geq Q_{req}$ $Q_{c}{}^{M1}{}_{HT} \geq Q_{req}$ Ageing method 3 A_2
O	Ageing method 1 $\Delta h \leq 1$ mm $Q_{c}{}^{M1}{}_{LT} \geq Q_{req}$ $Q_{c}{}^{M1}{}_{HT} \geq Q_{req}$	Ageing method 2 $f \leq 2$ mm $Q_{c}{}^{M2}{}_{RT} \geq 12$ N/mm	Proof according to 4.4 Ageing method 1 $\Delta h \leq 1$ mm $Q_{c}{}^{M1}{}_{LT} \geq Q_{req}$ $Q_{c}{}^{M1}{}_{HT} \geq Q_{req}$
Geometry 2 (non-symmetric)			
A+B	$T_{c}{}^{N}{}_{RT} \geq 24$ N/mm Ageing method 2 $f \leq 3$ mm $Q_{c}{}^{M2}{}_{RT} \geq Q_{req}$ $T_{c}{}^{M2}{}_{RT} \geq 24$ N/mm		Not covered by this document
O	Ageing method 2 $f \leq 3$ mm $Q_{c}{}^{M2}{}_{RT} \geq Q_{req}$		

4.4 Static proof

Thermal barrier profiles designed for category W normally do not require proof by calculation for mechanical resistance (ultimate limit state). Calculation of deflection (serviceability state) may be necessary.

A proof by calculation relating to mechanical resistance and deflection shall be performed for thermal barrier profiles designed for category CW. Calculations shall be based on the acknowledged provisions and technology (see Annex A).

Based on the resulting characteristic data, and if there are identical connecting areas, thermal barrier profiles with differing metal profile sections can be calculated (see Annex B).