SLOVENSKI STANDARD
SIST EN 14024:2023

01-september-2023

Nadomešča:
SIST EN 14024:2005

Kovinski profili s prekinjenim toplotnim mostom - Mehanske lastnosti - Zahteve, izračuni in preskušanja

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 à rupture de pont thermique - Performances mécaniques - Exigences, preuve et essais pour évaluation

Ta slovenski standard je istoveten z: **EN 14024:2023**

ICS:

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

SIST EN 14024:2023 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14024

July 2023

ICS 91.060.10; 91.060.50

Supersedes EN 14024:2004

English Version

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

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

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

This European Standard was approved by CEN on 12 June 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 14024:2023 E

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European foreword

This document (EN 14024:2023) 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of an identical text or by endorsement, at the latest by January 2024, and conflicting national standards shall be withdrawn at the latest by January 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14024:2004.

The main changes compared to the previous edition EN 14024:2004 are:

— new geometric design types have been introduced;

— the distinction between the two “Use categories” "W" and "CW" has been superseded by one category that includes both windows (W) and curtain walls (CW);

— revision of the clauses dealing with testing and test sequence;

— new Annex D dealing with simple products which typically do not need a static proof by calculation;

— inclusion of FEM analysis for specific non-symmetric profiles, as alternative validated method for static proof;

— Annex A: introduction of the semi-probabilistic approach in regard of static proof;

— Annex C: introduction of a full set of formulae to determine the maximal cross-section loads, contact shear strength and mid-span deformation for a simply supported beam loaded with a uniformly distributed load and subjected to a uniformly distributed temperature load.

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 deals with the general field of application: profiles in windows, doors and façades.

In the design process, the safety aspect is part of national competency. For this reason, the definition of specific products that normally do not require tests or proof by calculation for the determination of mechanical properties, is a task of national specifications. This document applies when national specifications require tests or proof by calculation to determine the characteristic values of mechanical properties of the thermal barrier profile and to assess the suitability of the thermal barrier material.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

1 Scope

This document specifies requirements for assessment of the mechanical strength of metal profiles incorporating a thermal barrier having mechanical performance depending on their intended use.

It also specifies the tests to determine the characteristic values of mechanical properties of the thermal barrier profile and to assess the effect of different conditionings of the thermal barrier on the mechanical performance of the connection.

This document does not apply to thermal barriers which do not give a contribution to the mechanical resistance of the profiles.

This document is applicable to thermal barrier profiles designed mainly for windows, doors, screens and curtain walls.

This document does not apply to thermal barriers made only of metal profiles connected with metal pins or screws.

This current edition of EN 14024 will supersede EN 14024:2004. Differences in test procedures between the two versions will not lead to significant differences in test results. Therefore, existing test results according to EN 14024:2004 are considered as equivalent to new test results according to the current edition of EN 14024.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 12519, *Windows and pedestrian doors — Terminology*

EN 14351-1, *Windows and doors — Product standard, performance characteristics — Part 1: Windows and external pedestrian doorsets*

EN 16759:2021, *Bonded glazing for doors, windows and curtain walling — Verification of mechanical performance of bonding*

EN ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2)*

EN ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system (ISO 7500-1)*

EN ISO 22088-3, *Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 3: Bent strip method (ISO 22088-3)*

EN ISO 22088-4, *Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 4: Ball or pin impression method (ISO 22088-4)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply / the terms and definitions given in EN 12519 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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 to entry: The thermal barrier contributes to load transmission.

3.2
temperature categories
two temperature categories are defined and to be chosen according to the intended use (see Table 1)

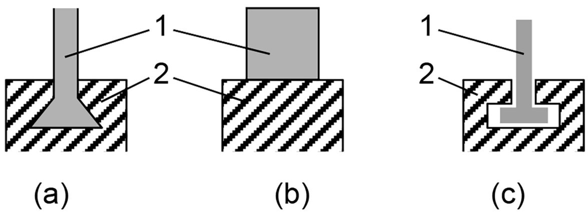
Table 1 — Temperature categories and test temperature

Temperature category	Low test temperature LT	High test temperature HT
TC1	(−10 ± 2) °C	(70 ± 3) °C
TC2	(−20 ± 2) °C	(80 ± 3) °C

Note 1 to entry: Temperature category TC2 includes Temperature category TC1.

Note 2 to entry: When specifically required (i.e. by the local climatic conditions or for specific application/project), voluntary tests can be carried out at adapted temperatures (LT and HT).

3.3
mechanical design systems
see Figure 1



Key

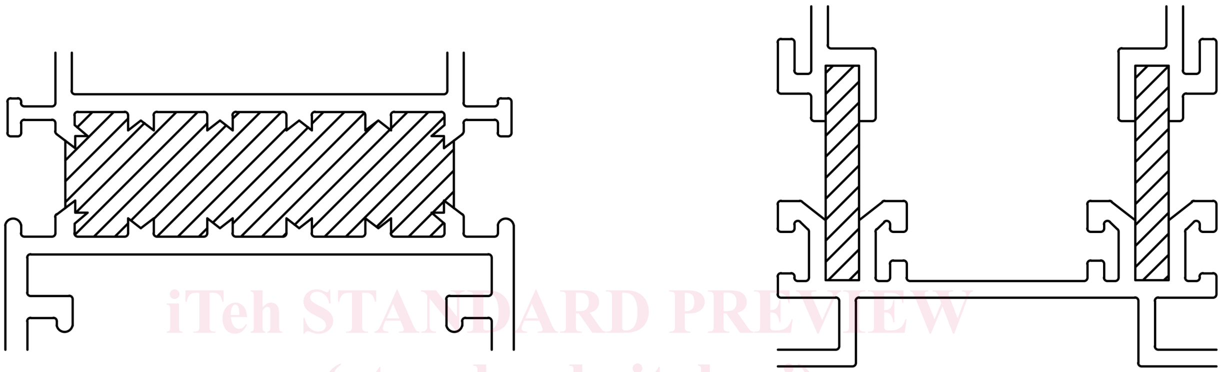
1 thermal barrier
2 metal
(a) Type A system
(b) Type B system
(c) Type C system

Figure 1 — Schematic diagram of mechanical design systems

3.3.1
Type A system
system which is designed to transfer shear and in which shear failure will not reduce significantly the transverse tensile strength

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

Note 1 to entry: E.g.: resin or foam poured into the gap between the two metal sections and hardened only by chemical reaction (Figure 2 a)) or flat strips of thermal barrier, only glued into the metal grooves (Figure 2 b)).



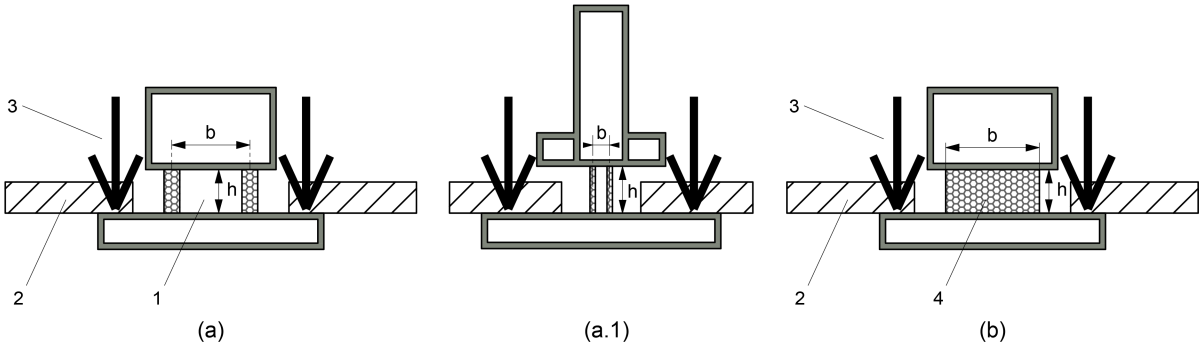
a) **b)**

Figure 2 — Examples of mechanical design systems Type B

3.3.3
Type C system
system for which the shear transfer is not taken into account

3.4
geometric design types
the following classification can be applied for thermal barrier profiles designed for windows, doors, curtain walls and their secondary parts

3.4.1
Type 1 profile
profile in which the thermal barrier is symmetrically loaded (see Figure 3), e.g. thermal barrier profile used in stick systems of curtain walls, symmetrically loaded (Figure 3 (a.1))



Key

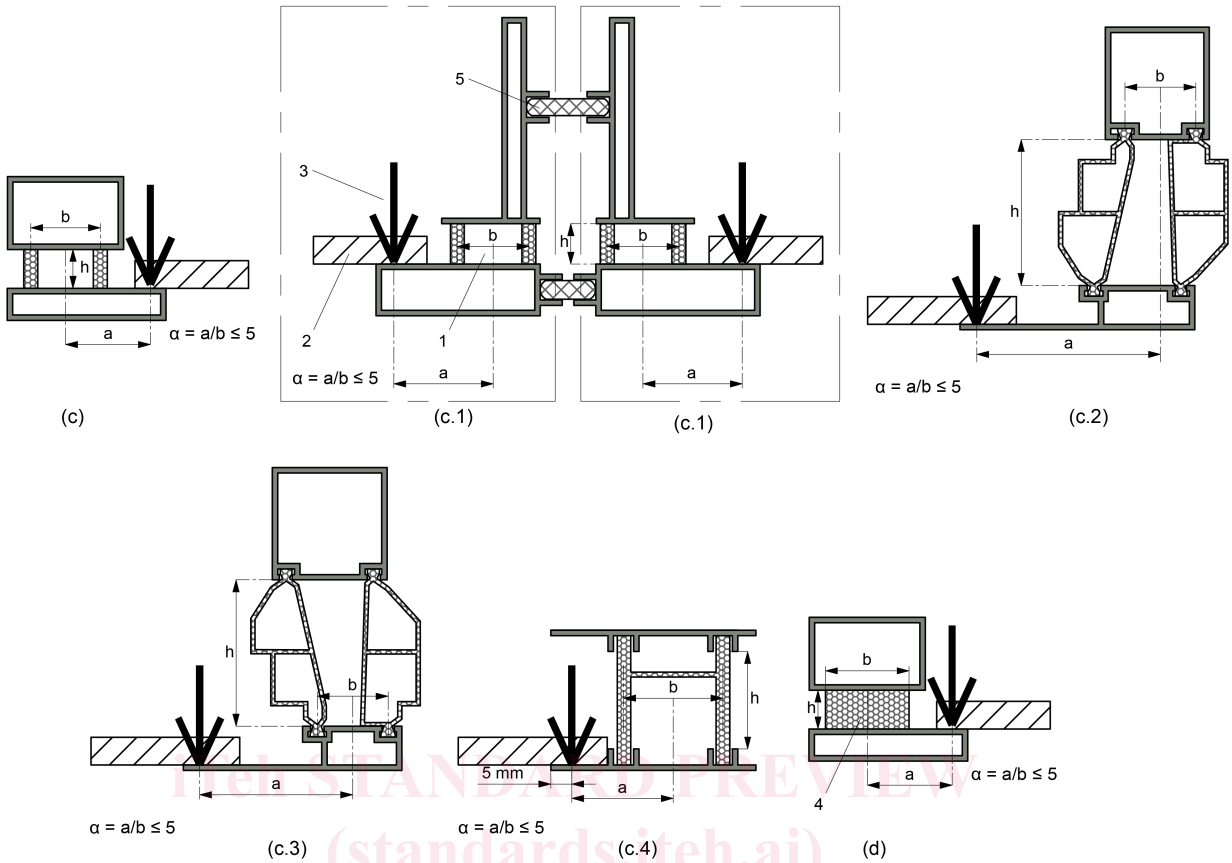
1 thermal barrier profile
2 glass pane
3 line load
4 mechanical design system type B

Figure 3 — Examples of geometric design type 1 (symmetrically loaded profile)

3.4.2

Type 2 profile

profile in which the thermal barrier is nearly symmetrically loaded, i.e. the eccentricity of the load $\alpha = a/b$ does not exceed the value of 5 (see Figure 4), e.g. thermal barrier profile used in unitized systems of curtain walls, nearly symmetrically loaded (Figure 4 (c.1))



Key

1 thermal barrier profile
2 glass pane
3 line load
4 mechanical design system type B
5 connection having no mechanical performances or no thermal barrier function (excluded from this document)

Figure 4 — Examples of geometric design type 2 (nearly symmetrically loaded profiles with eccentricity $\alpha = a/b \leq 5$)

Note 1 to entry: 5 mm is the reasonable distance, depending on the thermal barrier profile system, between the end of the profile and the central line of the groove (i.e. the foot of the gaskets).

3.4.3
Type 3 profile

profile in which the thermal barrier is asymmetrically loaded (see Figure 5), i.e. all profiles not covered by type 1 and type 2 with the resulting load parallel to the axis of the thermal barrier

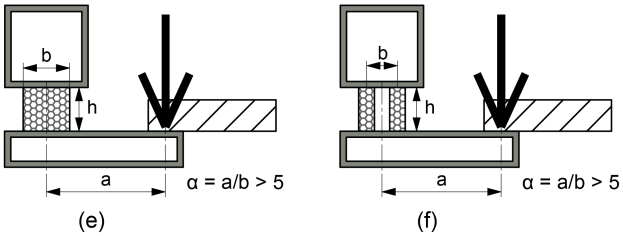


Figure 5 — Examples of geometric design type 3 (asymmetrically loaded profiles with eccentricity $\alpha = a/b > 5$)

3.4.4

Type 4 profile

profiles in which the resulting load is not parallel to the axis of the thermal barrier (e.g. non-symmetrically loaded profiles, see Figure 6). These geometric design types are not covered by this standard. The test method for some of these profiles are described in EN 16759:2021, Annex F. For non-symmetric profiles not covered by EN 16759, specific testing and/or a FEM analysis is required

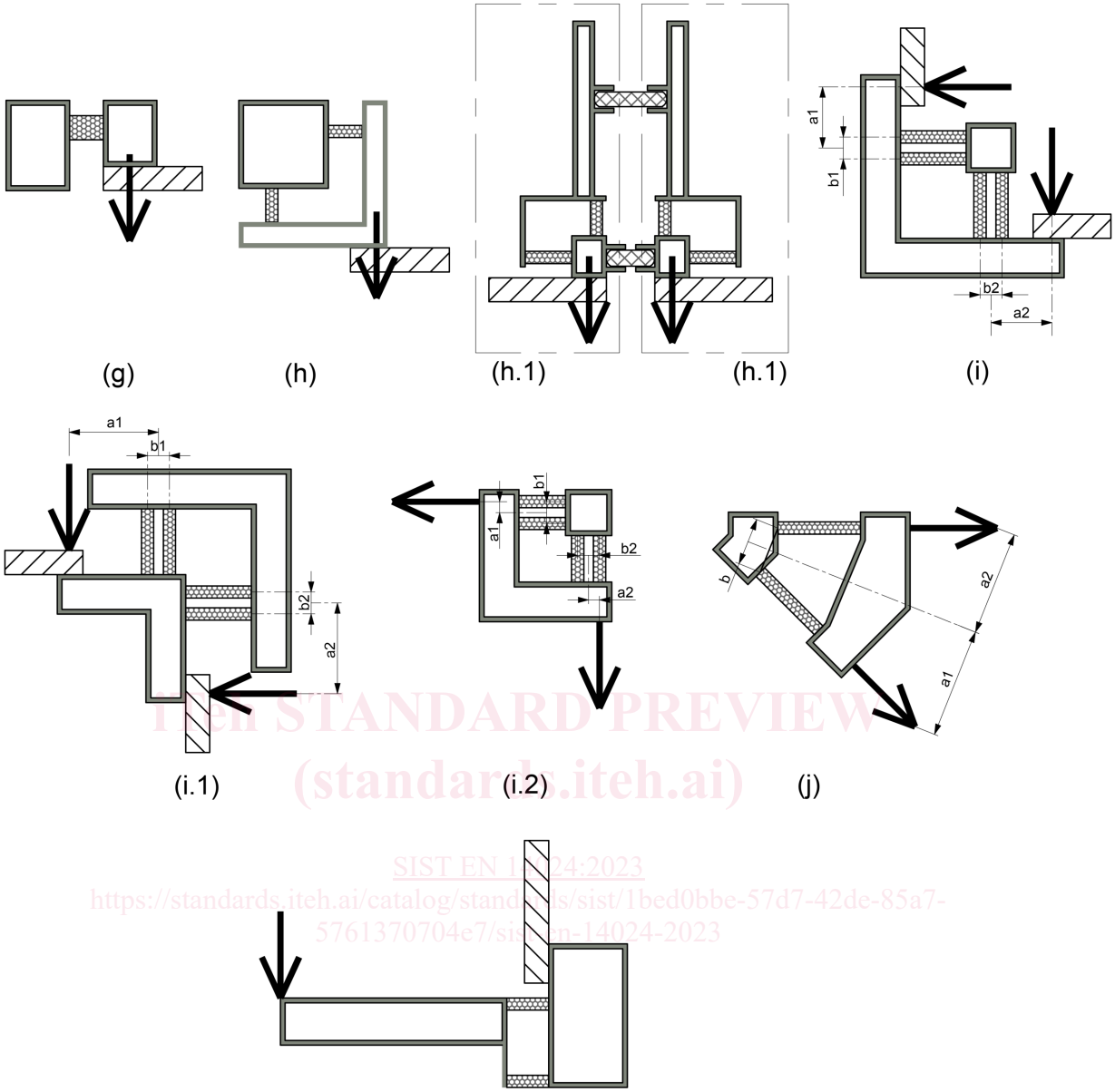


Figure 6 — Examples of geometric design type 4 (non-symmetrically loaded profiles)

For type 4, it is recommended to carry out a specific test simulating the real application of the load, since the behaviour of the profile depends on the way the profile is clamped and loaded.

4 Symbols and abbreviations

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

A_1	Area of the metal section 1 [mm^2]
A_2	Area of the metal section 2 [mm^2]
Ao	Cross-section area of profile shell n°1
Aq	Parameter for the calculation of the normal stresses σ_q for a uniformly distributed load
A_T	Parameter for the calculation of the normal stresses σ_T for a uniformly distributed ΔT
Au	Cross-section area of profile shell n°2
a	The lever arm of the acting moment measured from the centre line of (b) and the centre point of the load application area [mm]
b	The smallest dimension of the lever arm of the resistant moment of the thermal barrier [mm]
B_q	Parameter for the calculation of the maximal shear strength T_q for a simply supported beam with uniformly distributed load q
c	Elasticity constant [N/mm^2]
C	Measure of the effect of the elastic connection
C_d	Limiting design value of the relevant serviceability criterion
C_q	Parameter for the calculation of the mid-span deflection w_q for the uniformly distributed load
C_T	Parameter for the calculation of the mid-span deflection w_T for the uniformly distributed ΔT
E	Module of elasticity (i.e. Young module) [N/mm^2]
E_d	Effect of the action(s)
$E_{ULS;d}$	Design value of the effect of the action(s), expressed as calculated stress, caused by action(s) at the ultimate limit state
$E_{SLS;d}$	Design value of the effect of the action(s), expressed as calculated stress, caused by action(s) at the serviceability limit state
$E\{F_{SLS;d}\}$	Calculation of the effect of the serviceability limit state design value
$E\{F_{ULS;d}\}$	Calculation of the effect of the ultimate limit state design value
f	Remaining deformation after artificial ageing, method 2 [mm]
F	Force [N]
F_d	Design value of the action
$F_{SLS;d}$	Serviceability limit state design value of a single action or of a combination of actions

$F_{ULS;d}$	Ultimate limit state design value of a single action or of a combination of actions.
FEM	Numerical simulation analysis
G	Value of self-weight load
GC	Gravity centre of the compound profile
GC_o	Gravity centre of profile shell n°1
GC_u	Gravity centre of profile shell n°2
h	Initial height of the thermal barrier as the smallest distance between the metal sections in correspondence of the clamping point of the thermal barriers. See Figure 3, Figure 4 and Figure 5
I_1	Moment of inertia of the metal section 1
I_2	Moment of inertia of the metal section 2
I_{eff}	Effective moment of inertia [mm^4]
I_l	Moment of inertia of the loose compound
I_o	Second moment of area of profile shell n° 1
I_r	Moment of inertia of the rigid compound
I_u	Second moment of area of a profile shell n° 2
I_s	Rigid moment of inertia [mm^4]
l	Length of the test specimen [mm]
L	Span of the framing member [mm]
M_q	Maximal bending moment that for a simply supported beam with uniformly distributed load q
M_T	Maximal bending moment that for a simply supported beam with uniformly distributed temperature load
PA	Polyamide
PU	Polyurethanes
PPE	Polyphenylene ether
q	Uniformly distributed load
Q	Transverse tensile strength [N/mm]
$Q_{k,1}$	Value of the single action or dominant action
$Q_{k,i}$	Values of the actions which are not dominant
Q_{des}	Design transverse tensile strength [N/mm]
Q_q	Parameter for the calculation of the maximal shear strength T_q for a simply supported beam with uniformly distributed load q