SLOVENSKI STANDARD
oSIST prEN 14024:2021

01-november-2021

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: **prEN 14024**

ICS:

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

oSIST prEN 14024:2021 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 91.060.10; 91.060.50

Will supersede EN 14024:2004

English Version

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

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 33.

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

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European foreword

This document (prEN 14024:2021) 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 14024:2004.

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.

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.

Thermal barriers which do not give a contribution to the mechanical resistance of the profiles are excluded from this document.

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

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 ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2:2013)*

EN 12519, *Windows and pedestrian doors — Terminology*

EN 14351-1:2006+A2:2016, *Windows and doors — Product standard, performance characteristics — Part 1: Windows and external pedestrian doorsets*

EN ISO 22088-4, *Plastics — Determination of resistance to environmental stress cracking (ESC) — Part 4: Ball or pin impression method (ISO 22088-4:2006)*

EN 1991-1-4, *Eurocode 1: Actions on structures — Part 1-4: General actions — Wind actions*

prEN 16759:2019, *Bonded glazing for doors, windows and curtain walling — Verification of mechanical performance of bonding*

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

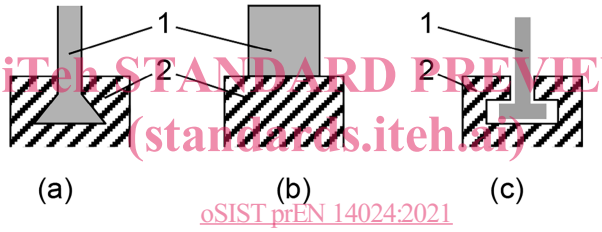
Temperature category	Low test temperature LT	High test temperature HT
TC 1	(−10 ± 2) °C	(70 ± 3) °C
TC 2	(−20 ± 2) °C	(80 ± 3) °C

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

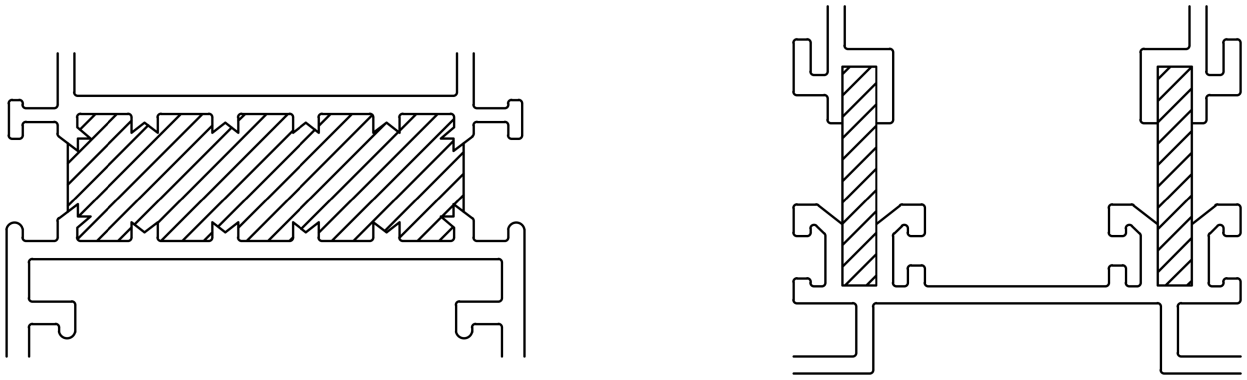
3.3.1
Type A system

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)).



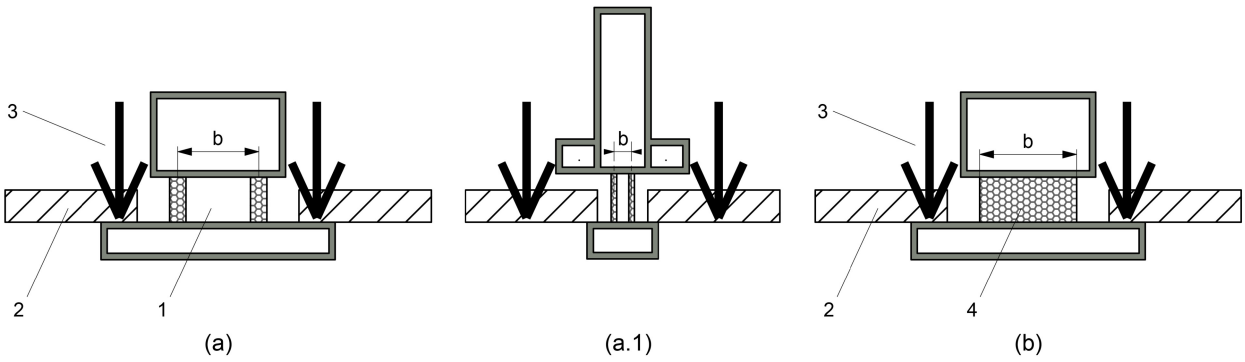
a) b)

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 profile designed for windows, doors, curtain walls and its 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))



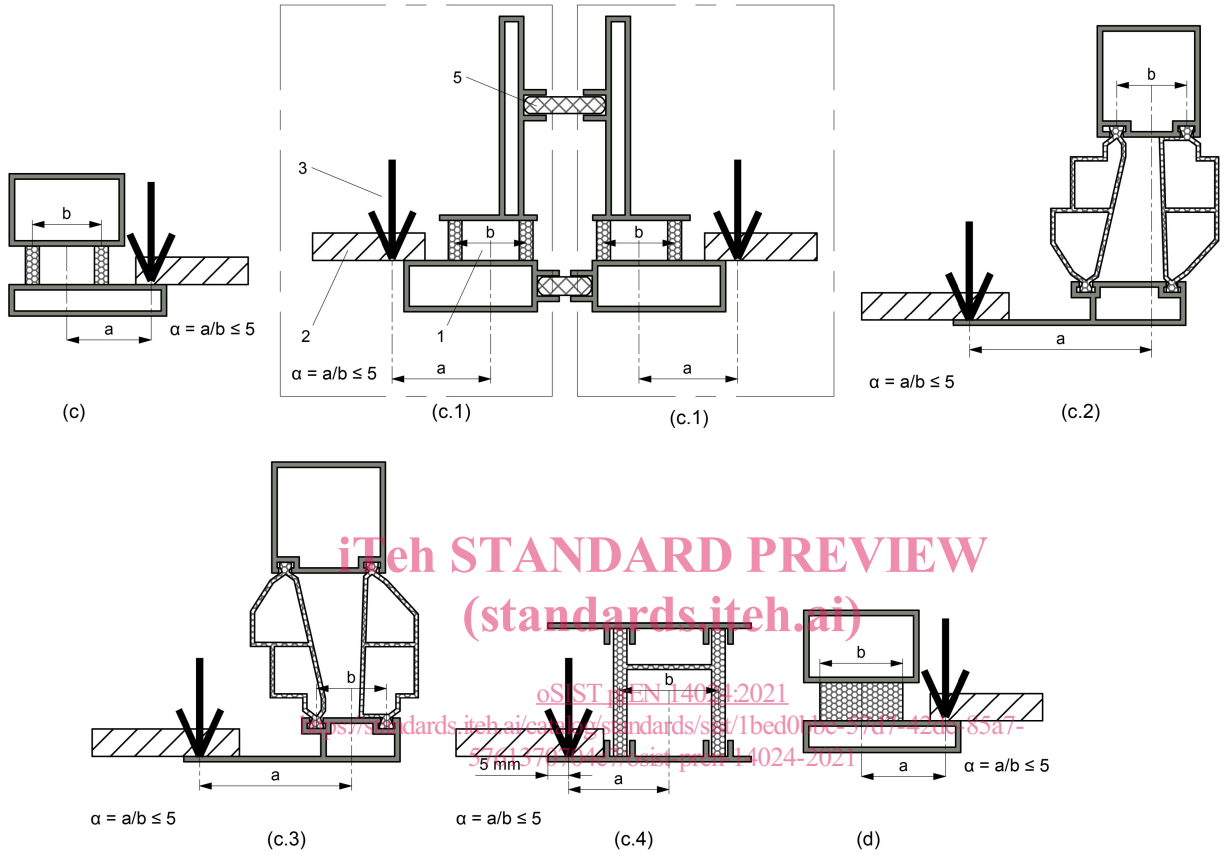
Key
1 thermal barrier profile
2 glass pane
3 line load
4 mechanical design system type B

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

3.4.2

Type 2 profile

profile whose thermal barrier is nearly symmetrically loaded, i.e. the eccentricity of the load α=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 symmetrical loaded profiles with eccentricity α = a/b ≤ 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 whose 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

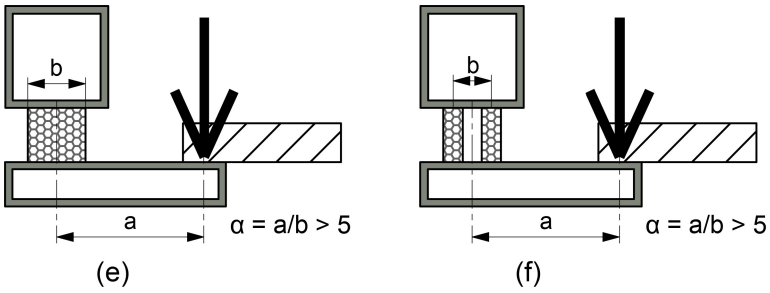


Figure 5 — Examples of geometric design type 3 (asymmetrically loaded profiles with eccentricity α = a/b > 5)

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 prEN 16759:2019, Annex F. For non-symmetric profiles not covered by prEN 16759, specific testing and/or a FEM analysis is required

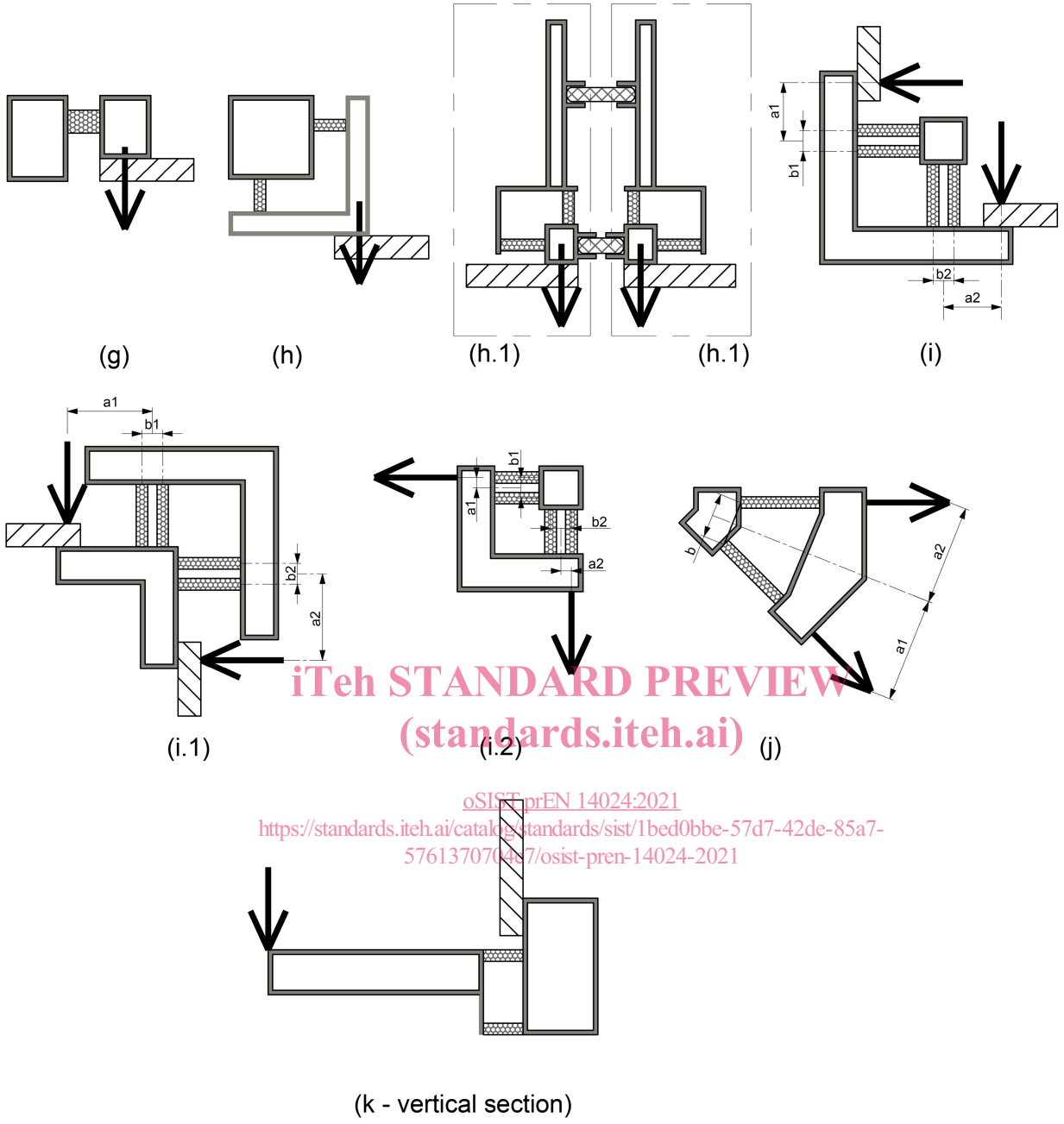


Figure 6 — Examples of geometric design type 4 (non-symmetrically loaded profiles)

Note 1 to entry: 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 [mm²]
A_2	Area of the metal section 2 [mm²]
a_1	Distance between: the centre of mass of metal section 1 and the centre of mass of the composite profile [mm]
a_2	Distance between: the centre of mass of metal section 2 and the centre of mass of the composite profile [mm]
a_3	Distance between: the centre of mass of metal section 1 and the centre of mass of metal section 2 [mm]
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]
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
E	Module of elasticity (i.e. Young module) [N/mm^2]
E_d	Effect of the action(s)
EULS;d	Design value of the effect of the action (s), expressed as calculated stress, caused by action (s) at the ultimate limit state
ESLS;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
FSLS;d	Serviceability limit state design value of a single action or of a combination of actions.
FULS;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
h	Height of the thermal barrier
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_s	Rigid moment of inertia [mm^4]
l	Length of the test specimen [mm]
L	Span of the framing member [mm]
PA	Polyamide
PU	Polyurethanes
PUR	Polyurethanes
PPO	Polyphenylene Oxide
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
R_C	Characteristic value of the resistance to the actions
R_d	Design value of the resistance to the actions
s	Standard deviation of the series under consideration
SLS	*Service Limit State*
ULS	*Ultimate Limit State*
T	Shear strength [N/mm]
$TC1$	Temperature category 1
$TC2$	Temperature category 2
t_m	Thickness of the metallic wall
t_b	Thickness of the thermal barrier
w_d	Allowable deflection
w_{max}	Maximum deflection calculated for the design load
Δh	Remaining deformation after artificial ageing, method 1 [mm]
ΔF	Increase of the load [N]
ΔT	Temperature differences [K]
$\Delta\delta$	Displacement [mm]
λ	Parameter depending on the geometry of the profile section, the elasticity constant c of the thermal barrier and the modulus of elasticity E of the metal and also on the span of the framing member L
α	Eccentricity of the load application, calculated as "a/b"

v	Compound part of the rigid moment of inertia
$\varphi_{c,s}$	Creep factor under shear load NOTE the corresponding symbol in accordance with EN 14024:2004 was: A_2
$\varphi_{c,t}$	Creep factor under transversal load
γ_G	Partial factor for permanent, also accounting for model uncertainties and dimensional variations
γ_m	Partial safety factor of the material
γ_M	Partial safety factor of the material that takes into account also the kind of connection and not only the material property (γ_m)
γ_Q	Partial factor for variable actions, also accounting for model uncertainties and dimensional variations
γ_{Rd}	Design factor for type B NOTE the corresponding symbol in accordance with EN 14024:2004 was: A_1
σ_{max}	Maximum stress calculated for the design load
ψ	Combination factors for the actions
$\psi_{0,i}$	Combination factors for the actions which are not dominant
ψ_1	Partial factor for a frequent value of a variable action
ψ_2	Combination factor for a quasi-permanent value of a variable action
$\psi_{2,i}$	Combination factor for a quasi-permanent value of a variable action

For the purposes of this document, the following indexes apply.

c	Characteristic value which has a 95 % chance of being exceeded based on a normal distribution with 75 % confidence
d	Design value
HT	High temperature
LT	Low temperature
M1	After artificial ageing, method 1
M2	After artificial ageing, method 2
M3	After artificial ageing, method 3
Max.	Maximum
mean	Mean value