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Advisory Opinion No. GS 6.1/23-006-2

10.11.2023

Translation of the original German document GS 6.1/23-006-2

Object:	Evaluation of the performance characteristics in case of fire of trapeze frame systems using fischer frame angle pieces PUWF according to EAD 280016-00-0602 - abbreviated version
Client:	**fischerwerke GmbH & Co. KG** Klaus-Fischer-Straße 1 72178 Waldachtal Germany
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This document covers 14 pages, including 0 appendices.

Contents

1 Objectives and procedure

MFPA Leipzig GmbH was commissioned by fischerwerke GmbH & Co. KG to carry out an evaluation of performance characteristics according to EAD 280016-00-0602 [N1] for trapeze frame systems using fischer frame angle pieces PUWF. With respect to the thermal loading, the standard temperature time curve (STTC) according to [N2] is considered. The evaluation is carried out on the basis of test results.

The present document includes a summary of the design concept for fire design and the associated characteristic performance properties. For a detailed derivation of the performance characteristics, please refer to [G1].

2 Description of the construction

2.1 Individual components

2.1.1 Frame angle piece

Fischer frame angle pieces PUWF are used to connect two mounting channels at right angles or to connect a mounting channel to the substrate in the form of a base connector (see Figure 1). The connection to the substrate is carried out using the round and oblong hole.

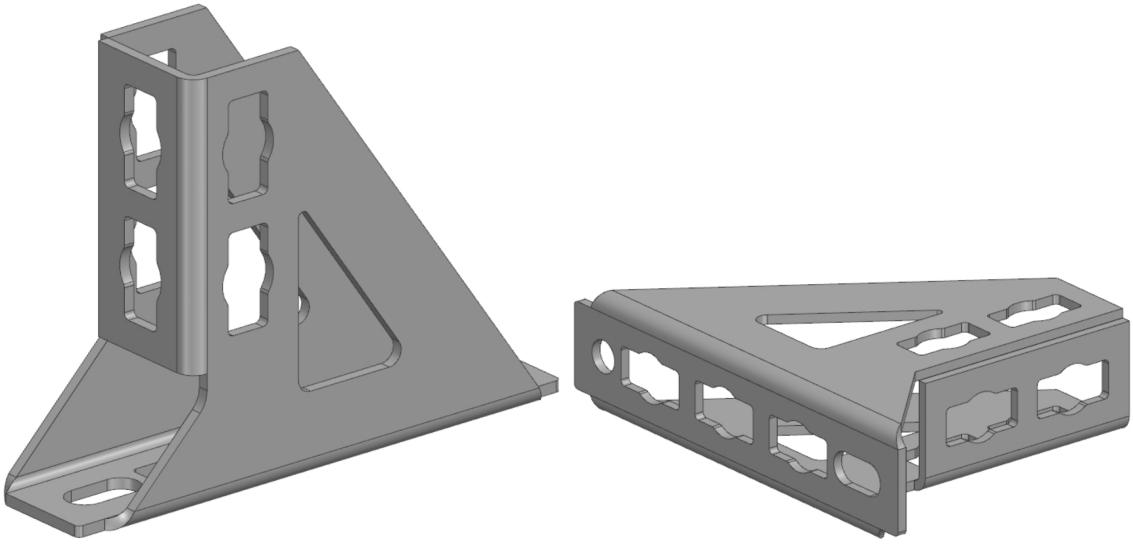

Figure 1: fischer frame angle piece PUWF: Geometry

2.1.2 Mounting channels

The FUS 41/2,5 and FUS 41D/2,5 mounting channels used for the trapeze frame systems investigated are shown in Figures 2 and 3. With [P1] a current European Technical Assessment is available for the mounting channels used.

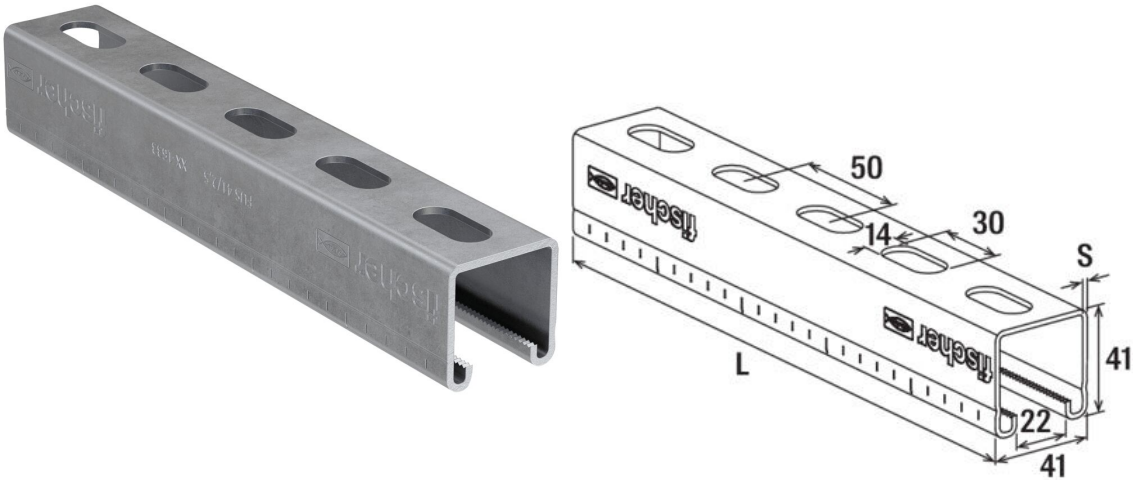

Figure 2: fischer mounting channel FUS 41/2,5: Geometry

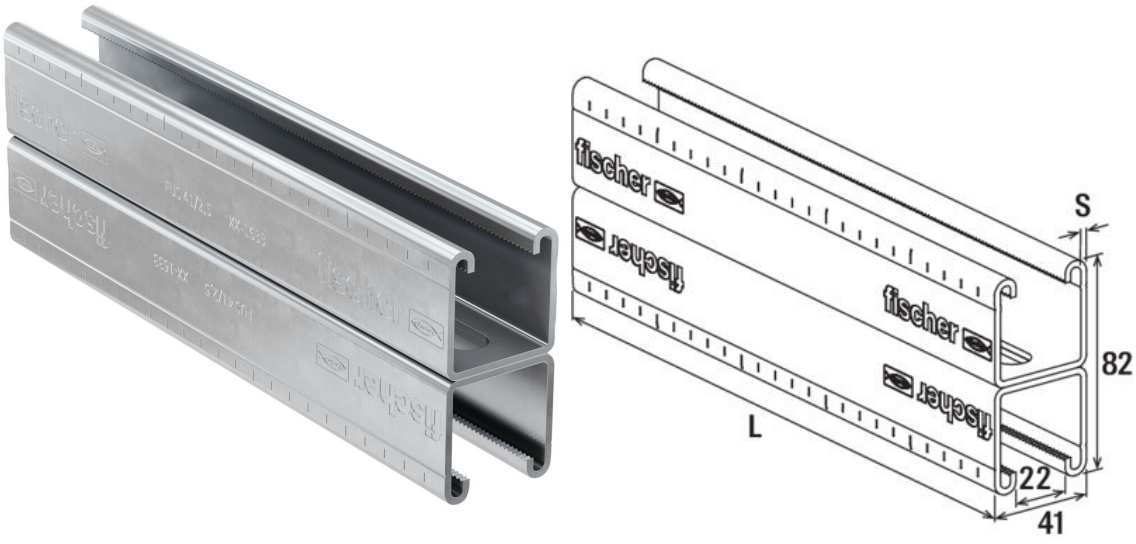

Figure 3: fischer mounting channel FUS 41D/2,5: Geometry

2.1.3 Channel connector

The mounting channel are connected to the frame angle piece PUWF using fischer push-through connectors PFCN 41 (see Figure 4). Both in the case of an angle connection between two mounting channels and in the case of a base connection, two push-through connectors are arranged per mounting channel. In all cases, the fastening is carried out in the open side of the mounting channel with a tightening torque of $M_T = 40Nm$.

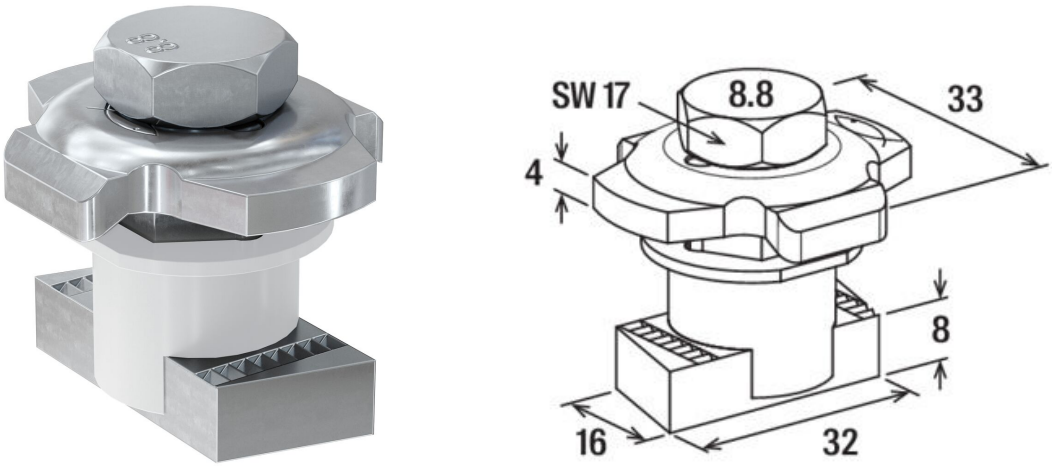

Figure 4: fischer push-through connector PFCN 41: Geometry

2.2 Trapeze frame systems

Using the components specified in Section 2.1, trapeze frame systems can be built as described below. The FUS 41/2,5 mounting channel is used as vertical construction elements, while the FUS 41D/2,5 mounting channel is used for one or two horizontal levels (cf. Figure 5). The vertically arranged mounting channels are always installed continuously over the entire height of the trapeze frame with the open side facing outwards. All vertical as well as all horizontal mounting channels have the same length.

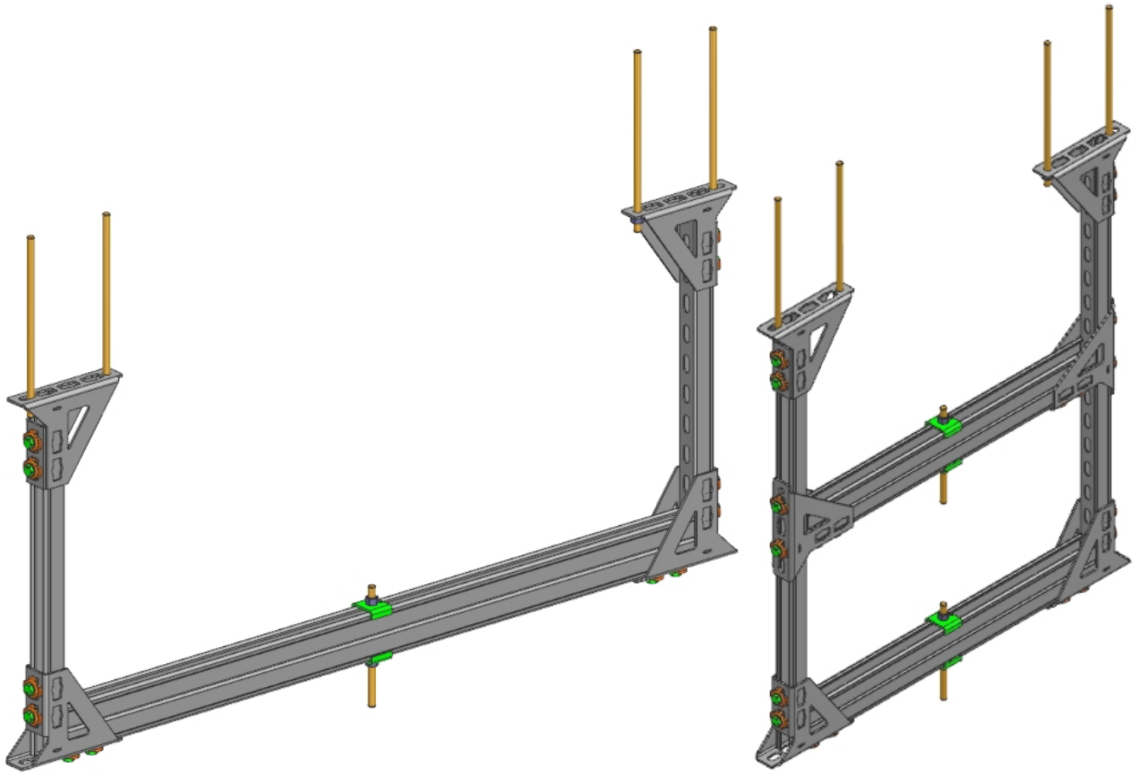

Figure 5: fischer trapeze frame systems: Design examples with one and two horizontal levels

The angle connections of the mounting channels are carried out using the fischer frame angle piece PUWF and two fischer push-through connectors PFCN 41 per connection side as shown in Figure 6.

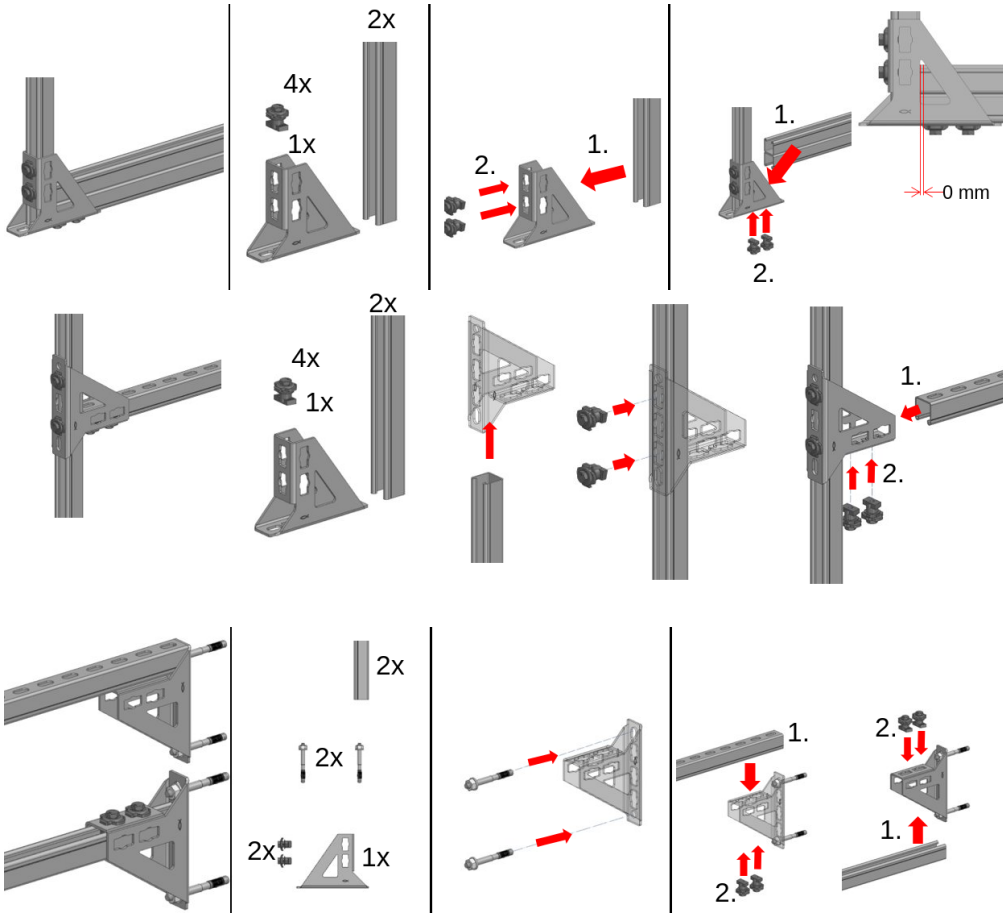

Figure 6: fischer trapeze frame systems: Execution of angle and base connections

The base connections are also carried out using the fischer frame angle piece PUWF and two fischer push-through connectors PFCN 41. The trapeze frame is fastened to the substrate using the round and oblong hole provided in the frame angle piece (see Figure 6). In addition to the inwardly rotated arrangement of the frame angle piece shown in Figure 5, a setup rotated by 90° is possible. Corresponding design examples are shown in Figure 7.

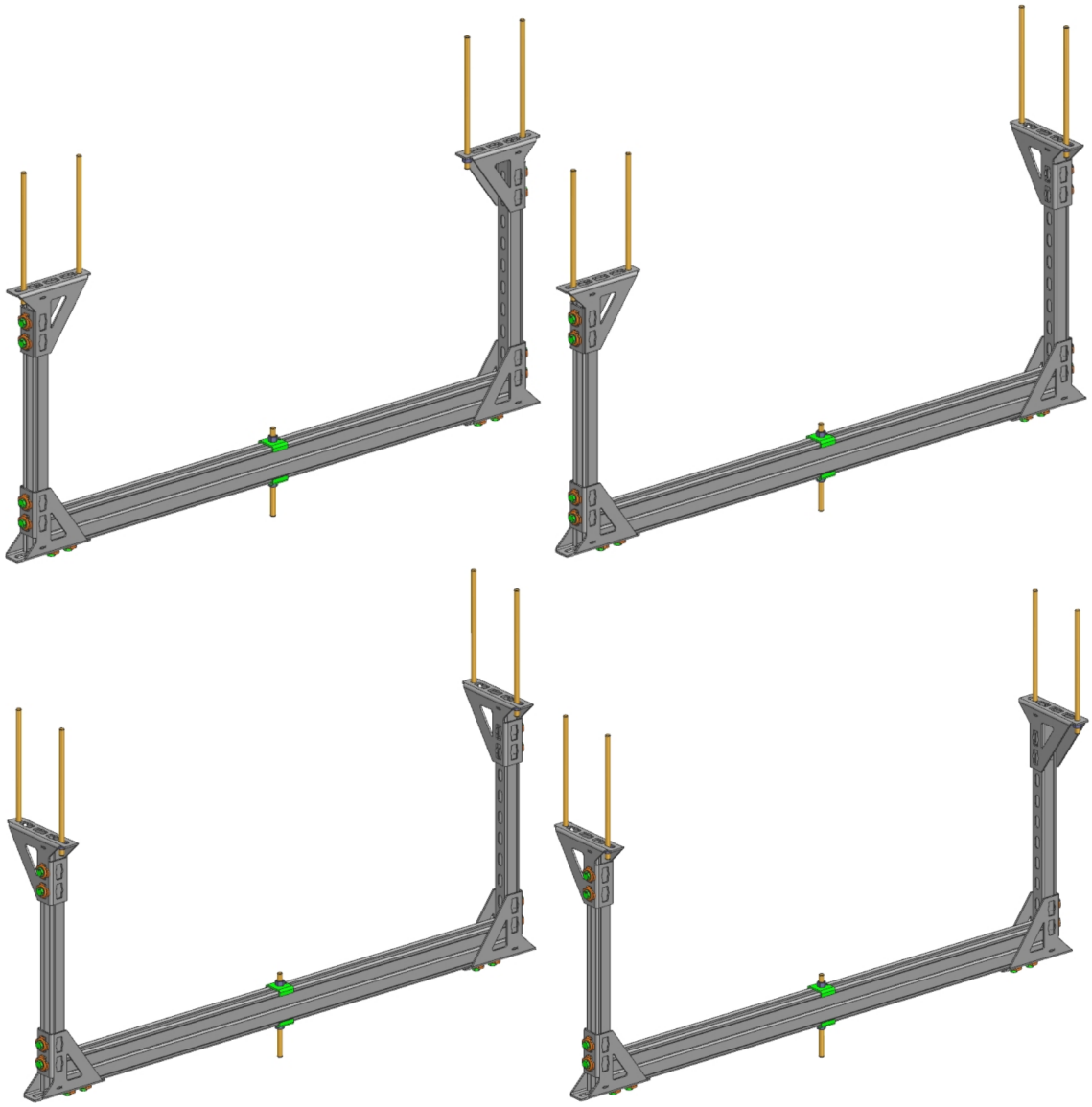

Figure 7: fischer trapeze frame systems: Design examples regarding the base connections

The trapeze frame systems investigated in this document are intended to be suspended from the ceiling.

3 References

3.1 Utilised guidelines, rules and standards

The analyses are based on the following guidelines, rules and standards:

[N1] EAD 280016-00-0602: Products for installation systems for supporting technical building equipment; 06/2020

[N2] DIN EN 1363-1:2020-05: Fire resistance tests - Part 1: General Requirements; German version EN 1363-1:2020

3.2 Reference documents

The analyses are based on the following additional documents:

3.2.1 ETAs and verifications of usability

[P1] ETA-21/0140: fischer channel FUS 21/1,5, FUS 21/2,0, FUS 21/2,5, FUS 41/1,5, FUS 41/2,0, FUS 41/2,5, FUS 62/2,5, FUS 21D/2,0, FUS 41D/2,5 and FUS 62D/2,5 – Products for installation systems for supporting technical building equipment – Deutsches Institut für Bautechnik, 17.03.2021

[P2] ETA-21/0155: fischer drilled plate 41 10,5 and HK 41 12,5 – Products for installation systems for supporting technical building equipment – Deutsches Institut für Bautechnik, 10.05.2022

3.2.2 Assessment and test reports

[G1] Gutachterliche Stellungnahme Nr. GS 6.1/23-006-1: Bewertung der Leistungseigenschaften im Brandfall von U-Joch-Konstruktionen mit fischer Schienenwinkelverbindern PUWF gemäß EAD 280016-00-0602. – MFPA Leipzig GmbH; 12.10.2023

4 Evaluation of the performance characteristics

4.1 Design concept

The determination of the performance characteristics in case of fire for trapeze frame systems using fischer frame angle pieces PUWF is based on experimental investigations using the procedure anchored in EAD 280016-00-0602 [N1], Annex F, Annex G and Annex H. The performance characteristics reported below include the load-bearing behaviour and deformation behaviour of the trapeze frame systems.
It should be explicitly noted at this point that the performance characteristics determined below in case of fire are only valid for the trapeze frame system itself, but not for its connection to the substrate. The same applies to the area of local load transfer to the horizontal mounting channel. This must be verified separately if the design differs from the examined design.

4.2 Performance characteristics in case of fire

The characteristic values summarised below are valid for trapeze frames suspended from the ceiling with

- one horizontal level
  - bracing height: $h = 600mm$,
  - clear span: $s \leq 1250mm$
- two horizontal levels
  - bracing height: $h = 900mm$,
  - clear span: $s \leq 1250mm$,
  - height of intermediate level h_z: $\frac{1}{3} \cdot h \leq h_z \leq \frac{2}{3} \cdot h$

consisting of

- vertical construction elements
  - two mounting channels FUS 41/2,5 of length h, open side outwards
- horizontal levels
  - one or two mounting channels FUS 41D/2,5 of length s
- angle connections
  - frame angle piece PUWF,
  - two push-through connectors PFCN 41 each connection side, $M_T = 40Nm$
- base connections
  - frame angle piece PUWF,
  - two push-through connectors PFCN 41, $M_T = 40Nm$,
  - any constructively possible orientation of the frame angle piece,

which are installed in accordance with the manufacturer's instructions.

The values given below are valid in combination with the following load transmitting construction:

- threaded rod M12, strength class $\geq$ 8.8,
- two fischer channel washers HK 41 12,5 according to [P2],
- two hexagon nuts M12, $M_T \geq 30Nm$.

In case of deviating load transmitting constructions, the load transmitting components as well as the local area of load transmission of the mounting channels have to be verified separately.

The load-bearing capacities given below are valid for a mechanical loading of the horizontal levels, each with a mid-span single load or uniformly distributed loads, with $\sum F_{dist} \leq F_{Rk}$.

In the case of trapeze frame systems with two horizontal levels, the load-bearing capacities F_{Rk} are to be understood per level and must not be exceeded in any level. The deformations determined for the lower level may also be assumed for the intermediate level as a simplification.

In the case of trapeze frame systems with two horizontal levels, the spacing of the levels and the load distribution must be dimensioned in such a way that contact of the intermediate level with the lower level caused by deformations is avoided.

	fire duration [min]			
	30	60	90	120
one level	2262	1416	1134	992
two levels, load per level	1310	806	637	553

Table 1: fischer trapeze frame systems: Characteristic load-bearing capacities $F_{Rk}(t)$ [N]

	δ $[mm]$	$F_{Rk,30}(\delta)$
one level	50	592
	75	711
	100	810
	125	895
	150	972
	175	1042
	200	1106
	225	1167
	250	1224
two levels	50	478
	60	531
	70	580
	80	627
	90	670
	100	712

Table 2: fischer trapeze frame systems: Characteristic load-bearing capacities $F_{Rk,30}(\delta)$ $[N]$ for $t = 30min$ depending on deformation δ $[mm]$

	fire duration $[min]$		
	60	90	120
one level	-	-	-
two levels	346.2	346.2	346.2

Table 3: fischer trapeze frame systems: Maximum deformation δ_{max} $[mm]$ for $t > 30min$

5 Signatures

The results of the tests relate exclusively to the items tested. This document does not replace a certificate of conformity or suitability according to national and European building codes.

Leipzig, 10.11.2023

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