MFPA Leipzig GmbH

Testing, Inspection and Certification Authority for
Construction Products and Construction Types

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Advisory Opinion No. GS 3.2/14-175-2

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Subject matter:	Advisory opinion on the strength and deformation behavior of the Fischer FRS pipe clamps.
Client:	**fischerwerke GmbH & Co. KG** Klaus-Fischer-Straße 1 D - 072178 Waldachtal
Date of order:	22. October 2014
Identification:	none
Person in charge:	Dipl.-Wirtsch.-Ing. Sabine Kramer
Validity:	22 January 2020

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1 Objective and request

MFPA Leipzig GmbH was commissioned on 22. October 2014 by fischerwerke GmbH & Co. KG to prepare an advisory opinion on the strength and deformation behaviour of the FRS pipe clamps with a exposure to fire and anchorage in a reinforced concrete base.

2 Principles and documents for the advisory opinion

The following documents were taken into account for the advisory opinion:

[1] RAL-GZ 656 Fire-tested pipe supports from May 2010 of the Deutschen Instituts für Gütesicherung und Kennzeichnung e.V. (German Institute for Quality Assurance and Certification).

[2] Technical data sheets for the FRS pipe clamps from the firm of fischerwerke GmbH & Co. KG.

[3] Test report 3649/834/12 – CM from 20.07.2012 of the MPA Braunschweig: testing and evaluation of the fire behaviour of fischer pipe clamps FRS-M8/M10 (FRS 12-15 to FRS 87-92) made from electrogalvanised steel under a central tensile stress with threaded rods (dimension M8 and M10, strength class ≥ 4.8) to determine the fire-resistance period.

[4] Test report PB 3.2/14-175-1 from 08.04.2015 of MFPA Leipzig GmbH: FRS pipe clamps in the sizes 108-116 and 165-168 – test in compliance with RAL-GZ 656 (May 2010) to determine the strength and deformation behaviour.

[5] DIN EN 1993-1-2:2010-12 Eurocode 3: Design of steel structures - Part 1-2: General rules - Structural fire design

[6] Model guideline for technical fire protection requirements on conduit systems (Model Conduit Systems Guideline MLAR) as amended on 17.11.2005

3 Description of the construction

The FRS pipe clamps are two-screw pipe clamps with a combination connection thread. They are made from two metal strips of electrogalvanised steel (material number 1.0332) which have a pre-assembled EPDM sound insulation lining. The terminal nut for thread dimensions M8/M10 is welded onto the top edge of the clamp. The two metal strips are connected on both sides with an M6 locking screw.

The sizes 63-67 and 87-92 were tested with M8 threaded rods and the sizes 108-116 and 165-168 with M10 threaded rods.

Further details of the material, dimensions of the tested samples as well as the test conditions and observations can be found in the corresponding test reports [3], [4].

4 Fire protection assessment

The permissible loads are determined on the basis of GAL-GZ 656 Fire-tested pipe supports: 2010-05 [1]. The following characteristic parameters for the load under central tension can be quoted for the FRS pipe clamps on this basis (Table 1).

Table 1 Characteristic maximum tension resistance for the FRS pipe clamps

FRS pipe clamps		Permissible maximum load as a function of the fire-resistance period			
Span range	**Nominal size**	**30**	**60**	**90**	**120**
[mm]	**[inch]**	**Max. F [kN]**			
12-15	1/4"	0.56	0.29	0.20	0.15
15-19	3/8"				
20-24	1/2"				
25-30	3/4'				
32-37	1"				
40-45	1 1/4"				
48-54	1 1/2"				
55-61	-				
63-67	2"				
72-80	2 1/2"	0.79	0.49	0.36	0.29
87-92	3"				
108-116	4"	0.63	0.39	0.29	0.23
121-128	-	1.00	0.51	0.34	0.25
133-141	5"				
159-165	-				
165-168	6"				

The graphical analysis of the test results as well as the corresponding fire-resistance period can be found in Annex 1.

5 Restrictions on use

The foregoing assessment for the FRS pipe clamps excludes their use for cable systems with integrated functional integrity acc. to DIN 4102-12: 1998-11. Further assessments and proofs are needed with respect to the overall system for such applications.

The FRS pipe clamps can be used to fasten non-flammable pipes. In accordance with the comments on MLAR, flammable pipes with an outer diameter of $d_a \leq 160$ mm can also be used if these are encapsulated in non-flammable, alu-foil-laminated insulation shells (melting point > 1000 °C, thickness > 30 mm, density approx. 80 – 120 kg/m³). The insulation must be secured with approx. 6 windings of binding wire per metre. A precondition is that corresponding proof of suitability from a recognised materials testing authority is provided.

If the FRS pipe clamps are used in the intermediate ceiling area of suspended counter ceiling constructions that are relevant with respect to fire protection, a minimum gap "a" is defined on the safe side between the upper side of the suspended ceiling and the lower side of the clamps. The goal is to rule out any negative influence of the counter ceiling construction due to temperature-related vertical deformations of the clamps as well as the linear changes of the threaded rods.

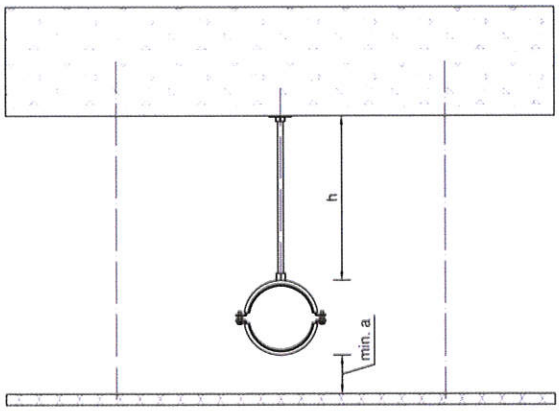


Figure 1 Illustration of use of the fischer FRS pipe clamps in the intermediate ceiling area

The minimum gaps "min a" are shown in Table 2. The values shown there take into account the temperature-related change in length of the threaded rods used for suspension purposes as well as the maximum vertical deformations as a function of the span of the clamps.

The minimum gaps "min a" quoted here for components below this that are relevant for fire protection correspond to the maximum safety gaps assuming that the maximum permissible loads under exposure to fire corresponding to Table 1act on the system.

Table 2 Minimum gaps "min a" for maximum permissible loads when the FRS pipe clamps are used in the intermediate ceiling area of counter ceilings relevant for fire protection

FRS pipe clamp		**Minimum gaps "min a" for suspended heights "ha"**			
Span range	**Nominal size**	**ha ≤ 250**	**ha ≤ 500**	**ha ≤ 750**	**ha ≤ 1000**
[mm]	**[inch]**	**min a [mm]**			
12-15	1/4“	51	54	57	60
15-19	3/8“				
20-24	1/2“				
25-30	3/4“				
32-37	1“				
40-45	1 1/4“				
48-54	1 1/2“				
55-61	-				
63-67	2“				
72-80	2 1/2“	50	53	56	59
87-92	3“				
108-116	4“	61	64	66	69
121-128	-	61	63	66	69
133-141	5“				
159-165	-				
165-168	6“				

Since the useful height in the intermediate ceiling area in practice is often limited, the aforementioned maximum safety gaps may not always be able to be realized. For this reason, reduced loads were determined for the system to be assessed which guarantee that with an exposure to fire acc. to the standard temperature-time curve for 30 minutes, the minimum gap "min a" = 50 mm is not exceeded.

The following Table 3 shows the maximum loads for minimum gaps "min a" ≤ 50 mm to structural components below the FRS pipe clamps with respect to the requirements of the model conduit systems guideline (MLAR) as amended on 17.11.2005.

Table 3 Maximum load at which the maximum deformation of the overall structure is ≤ 50 mm with a fire-resistance period of 30 minutes

FRS pipe clamp		**Maximum load with a fire-resistance period of 30 minutes and "min a" ≤ 50 mm for suspended heights "ha"**			
Span range	**Nominal size**	**ha ≤ 250**	**ha ≤ 500**	**ha ≤ 750**	**ha ≤ 1000**
[mm]	**[inch]**	**Max F [kN]**			
12-15	1/4"	0.56	0.56	0.56	0.51
15-19	3/8"				
20-24	1/2"				
25-30	3/4"				
32-37	1"				
40-45	1 1/4"				
48-54	1 1/2"				
55-61	-				
63-67	2"				
72-80	2 1/2"	0.65	0.62	0.59	0.57
87-92	3"				
108-116	4"	0.48	0.43	0.39	0.35
121-128	-	0.96	0.89	0.82	0.75
133-141	5"				
159-165	-				
165-168	6"				

The minimum gap "min a" refers to the deformations of the overall construction consisting of pipe clamps and threaded rods under exposure to fire. Additional deformations, e.g. from the installations (e.g. pipes) have to be investigated separately.

6 Special notes

The foregoing assessment only applies for the tested FRS pipe clamps of electrogalvanised steel that have been installed in accordance with the mounting instructions in the technical data sheets of the firm of fischerwerke GmbH & Co. KG.

On account of the better high-temperature behaviour of stainless steels, the figures also apply for pipe clamps and bolts with the same dimensions of stainless steel A2/A4.

The assessment only applies in conjunction with M8 and M10 threaded rods (strength class ≥ 4.8) and in components that can be classified in at least the fire-resistance class corresponding to the fire-resistance period of the rail constructions.

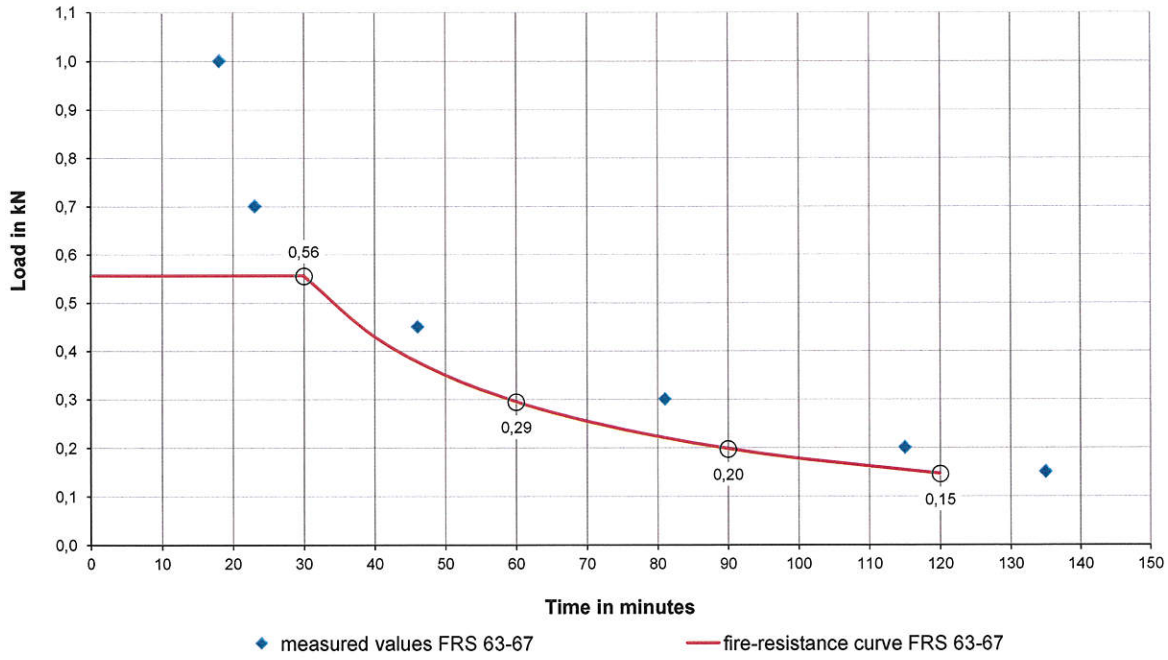
The pipe clamps have to be fastened to ceiling constructions with fasteners that have corresponding fire protection verification.

Leipzig, 17 April 2015

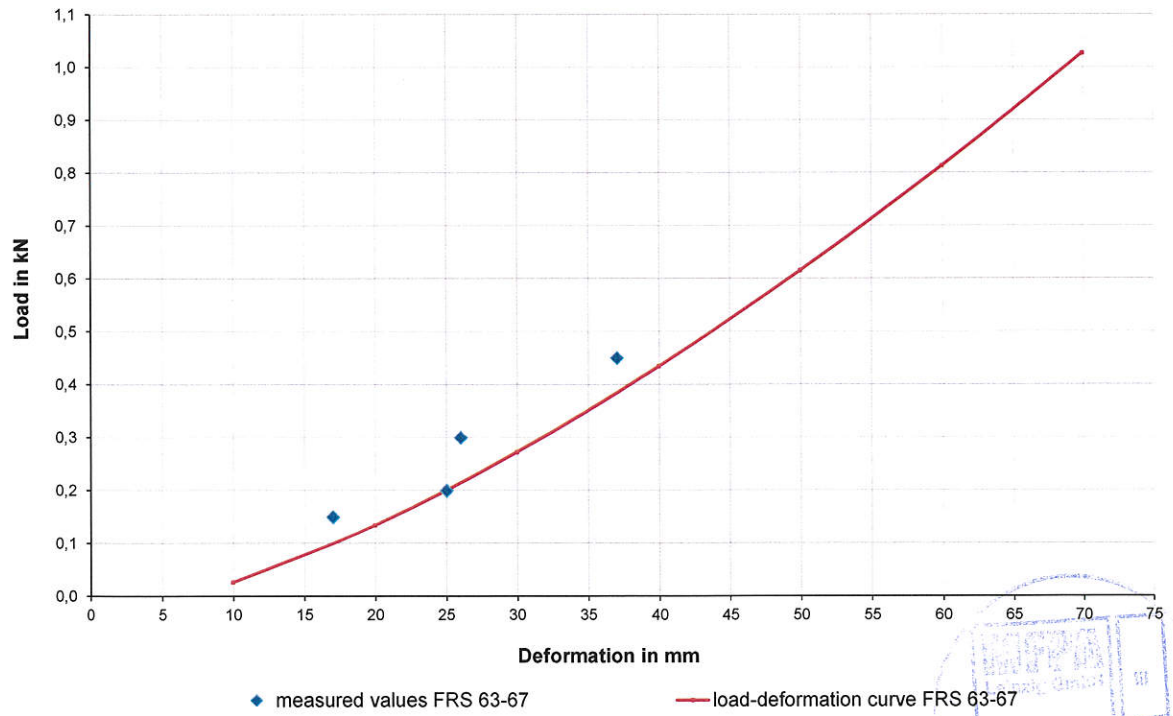
Dipl.-Ing. S. Hauswaldt	Dipl.-Ing. M. Juknat	Dipl.-Wirtsch.-Ing. S. Kramer
Head of Business Division	*Head of Work Group*	*Testing Engineer*

Annex 1 Graphical analysis of the test results

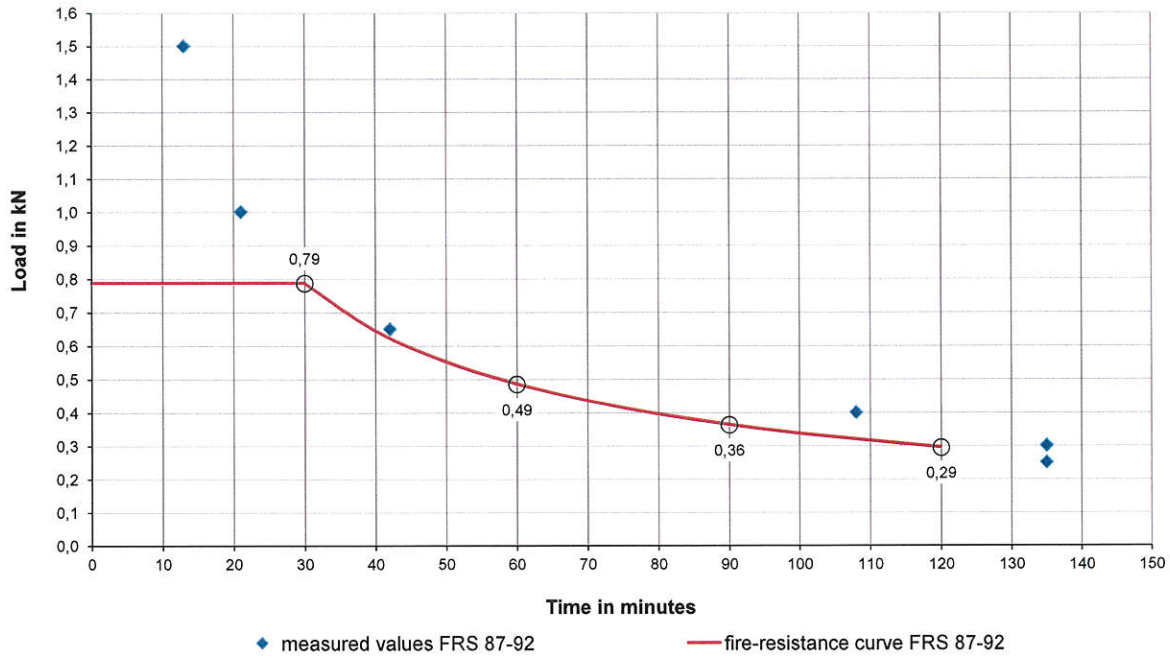
Fire-resistance period for the pipe clamps FRS 63-67



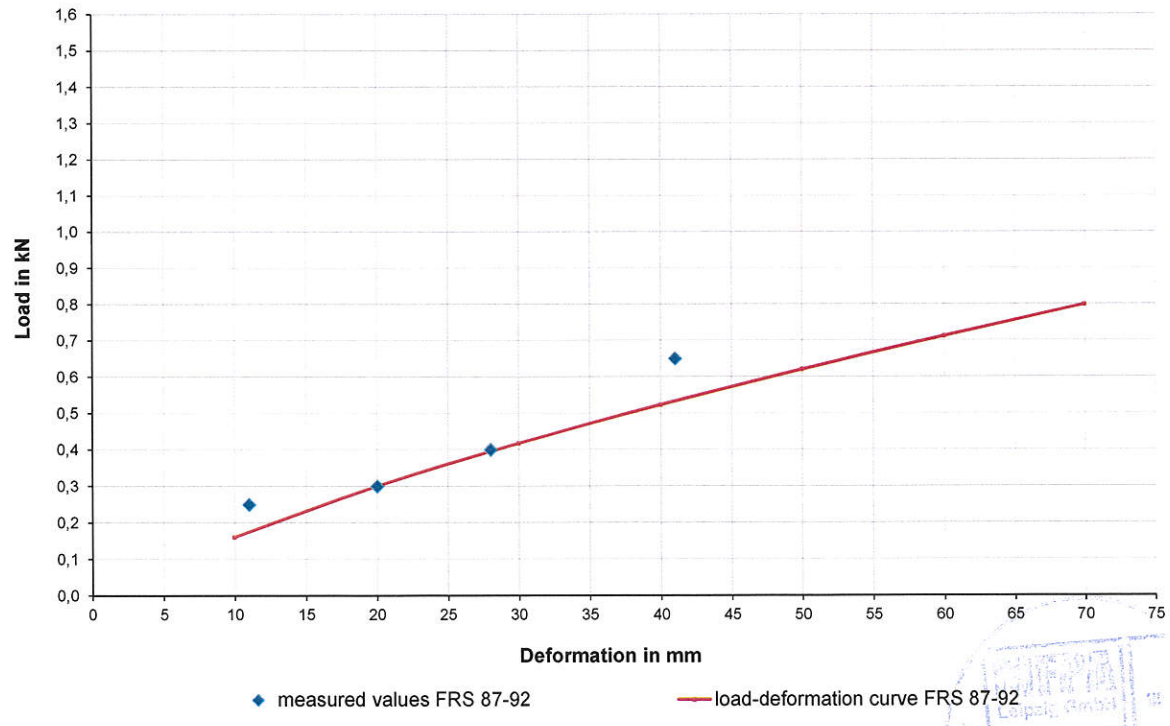
Load-deformation curve for the pipe clamp FRS 63-67 with a fire-resistance period of 30 minutes



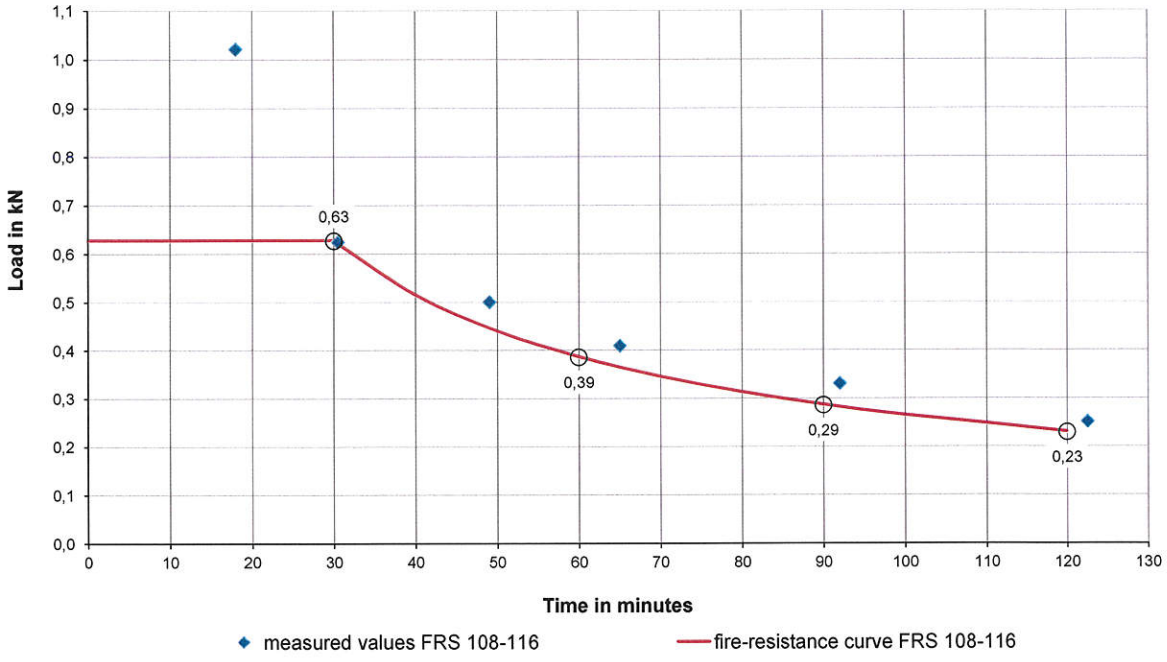
Fire-resistance period for the pipe clamps FRS 87-92



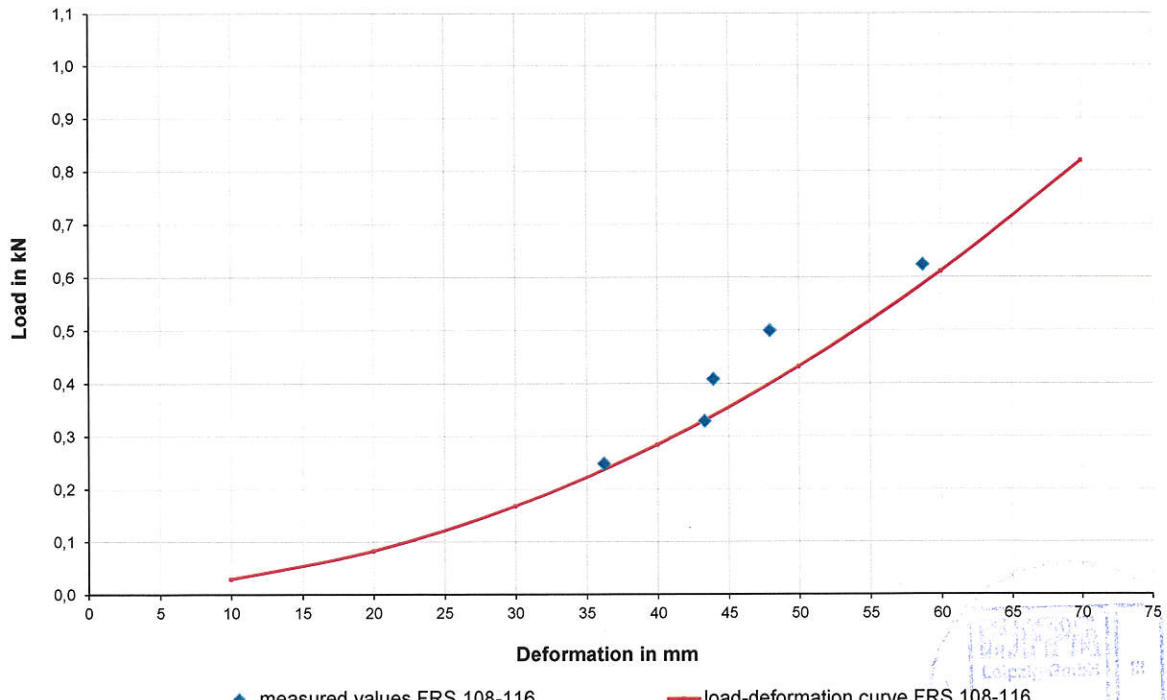
Load-deformation curve for the pipe clamp FRS 87-92 with a fire-resistance period of 30 minutes



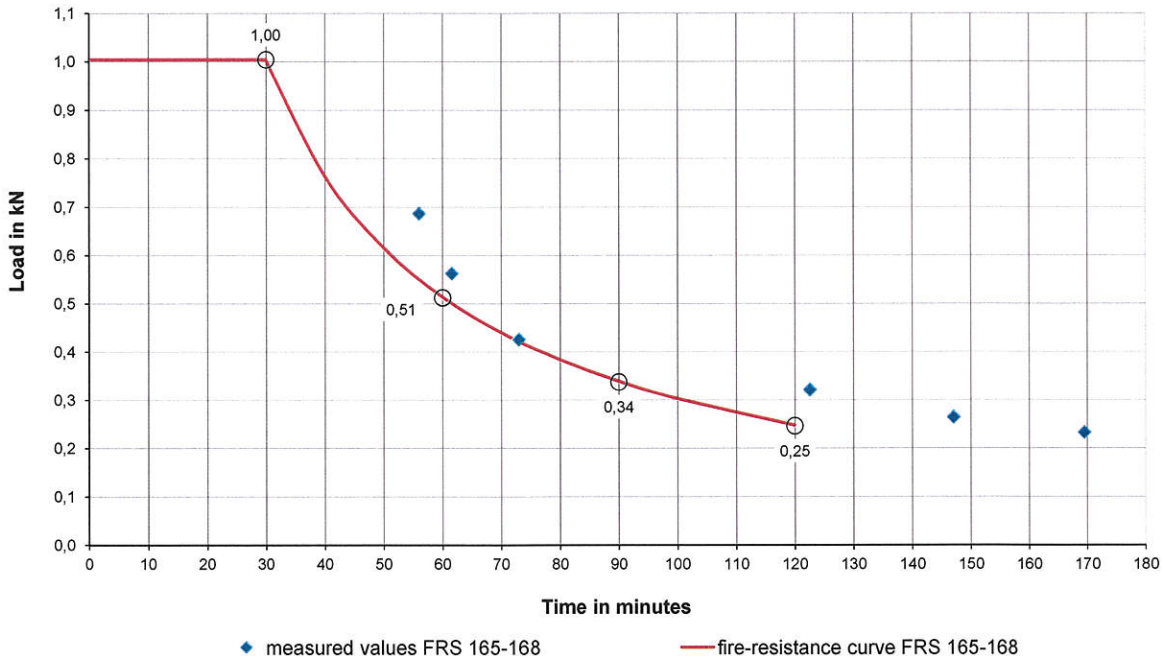
Fire-resistance period for the pipe clamps FRS 108-116



Load-deformation curve for the pipe clamp FRS 108-116 with a fire-resistance period of 30 minutes



Fire-resistance period for the pipe clamps FRS 165-168



Load-deformation curve for the pipe clamp FRS 165-168 with a fire-resistance period of 30 minutes