



Mfpa Leipzig GmbH

Testing, inspection and certification body for
building materials, building products and building systems

Division III - Structural Fire Protection

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**Work Group 3.2 - Fire Behaviour of Building Components and special
Constructions**

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Advisory opinion no. GS 3.2/18-020-2 Ä

Replacement for GS 3.2/18-020-2

from 20 June 2018

1st copy

Subject matter: fischer FIS EM Plus injection system
Fire protection assessment concept for FIS EM Plus in combination with fischer anchor rod FIS A, fischer internal threaded anchor RG MI and reinforcing steel BSt 400 S, BSt 420 S, BSt460 S and BSt 500 S.

Client: fischerwerke GmbH & Co. KG
Otto-Hahn-Straße 15
79211 Denzlingen
Germany

Date of order: 14 February 2018

Person in charge: Dipl.-Ing. S. Bauer

Validity: 31 May 2023

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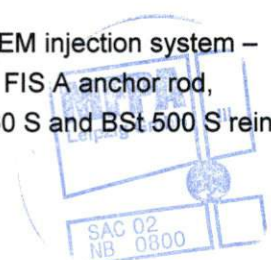
1 Objective and request

In the letter dated 14 February 2018, fischerwerke GmbH & Co. KG commissioned MFPA Leipzig GmbH with an advisory opinion on the reaction to fire behaviour of the fischer FIS EM Plus injection system, i. e. of the fischer FIS EM Plus injection mortar in combination with the fischer anchor rod FIS A, fischer internal threaded anchor RG MI and reinforcing bars, in each case positioned vertically to the surface of panels and walls which is exposed to fire from one side.

2 Principles and documents for the advisory opinion

The following principles and documents were used for the advisory opinion:

- [1] Technical Report TR 020 "Evaluation of Anchorages in Concrete concerning Resistance to Fire" (May 2004) of the European Organisation for Technical Approvals (EOTA),
- [2] European Technical Approval ETA-10/0012 by DIBt Berlin dated 16/02/2010: "fischer FIS EM injection system"; bonding anchors in sizes between \varnothing 8 mm and \varnothing 40 for the anchoring in concrete,
- [3] European Technical Approval ETA-17/0979 by DIBt Berlin dated 06/04/2018: "fischer injection system FIS EM Plus", bonded fastener for use in concrete,
- [4] Kordina, K.; Meyer-Ottens, C.: Concrete Fire Protection guide, publisher Construction and Technology, 1999,
- [5] Test report PB 3.2/10-245-1 from 17/05/2011 by MFPA Leipzig: "Testing according to Technical Report TR 020 "Evaluation of Anchorages in Concrete concerning Resistance to Fire" (May 2004) to determine the characteristic steel stresses under tensile stress of the fischer FIS EM injection system in combination with the fischer FIS A anchor rod made of steel (stability class 5.8)".
- [6] Advisory opinion dated 07/12/2010 by MFPA Leipzig GmbH: "fischer FIS EM injection system – Fire protection assessment concept for FIS EM in combination with fischer FIS A anchor rods, fischer RG MI internally threaded anchor and BSt 500 S reinforcing concrete"
- [7] Work report for the period 1978 – 1980 by Ruge, J. und Winkelmann, O. on the Collaborative Research Centre 148 - Fire behaviour of components - Subproject B4 - Deformation of structural, concrete and prestressing steels at high temperatures
- [8] DIN EN 13381-3:2015-06 – Test methods for determining the contribution to the fire resistance of structural members - Part 3: Applied protection to concrete members
- [9] DIN EN 206:2014-07 Concrete – Specification, performance, production and conformity
- [10] DIN EN 1992-1-2:2010-12 Design of concrete structures - Part 1-2: General rules - Structural fire design
- [11] Test report PB 3.2/18-020-1 from 19/03/2018 by MFPA Leipzig: "fischer FIS EM Plus injection system – Testing according to Technical Report TR 020 "Evaluation of Anchorages in Concrete concerning Resistance to Fire" (May 2004) to determine the characteristic steel stresses under tensile stress"
- [12] GS 3.2/13-104-1 Ä from 13/03/2014 by MFPA Leipzig GmbH: "fischer FIS EM injection system – Fire protection assessment concept for FIS EM in combination with fischer FIS A anchor rod, fischer RG MI internally threaded anchor and BSt 400 S, BSt 420 S, BSt460 S and BSt 500 S reinforcing steel."



Apart from these documents, the extensive testing experience of MFPA Leipzig with respect to the fire behaviour of fastenings and of reinforced concrete constructions is incorporated in the fire protection assessment.

In accordance with [8], temperature curves were taken as a basis for the advisory opinion, in particular for the heating behaviour of reinforced concrete elements made of normal concrete with quartzite aggregates. Figure 1 shows the heating depths for parts with unilateral exposure to fire.

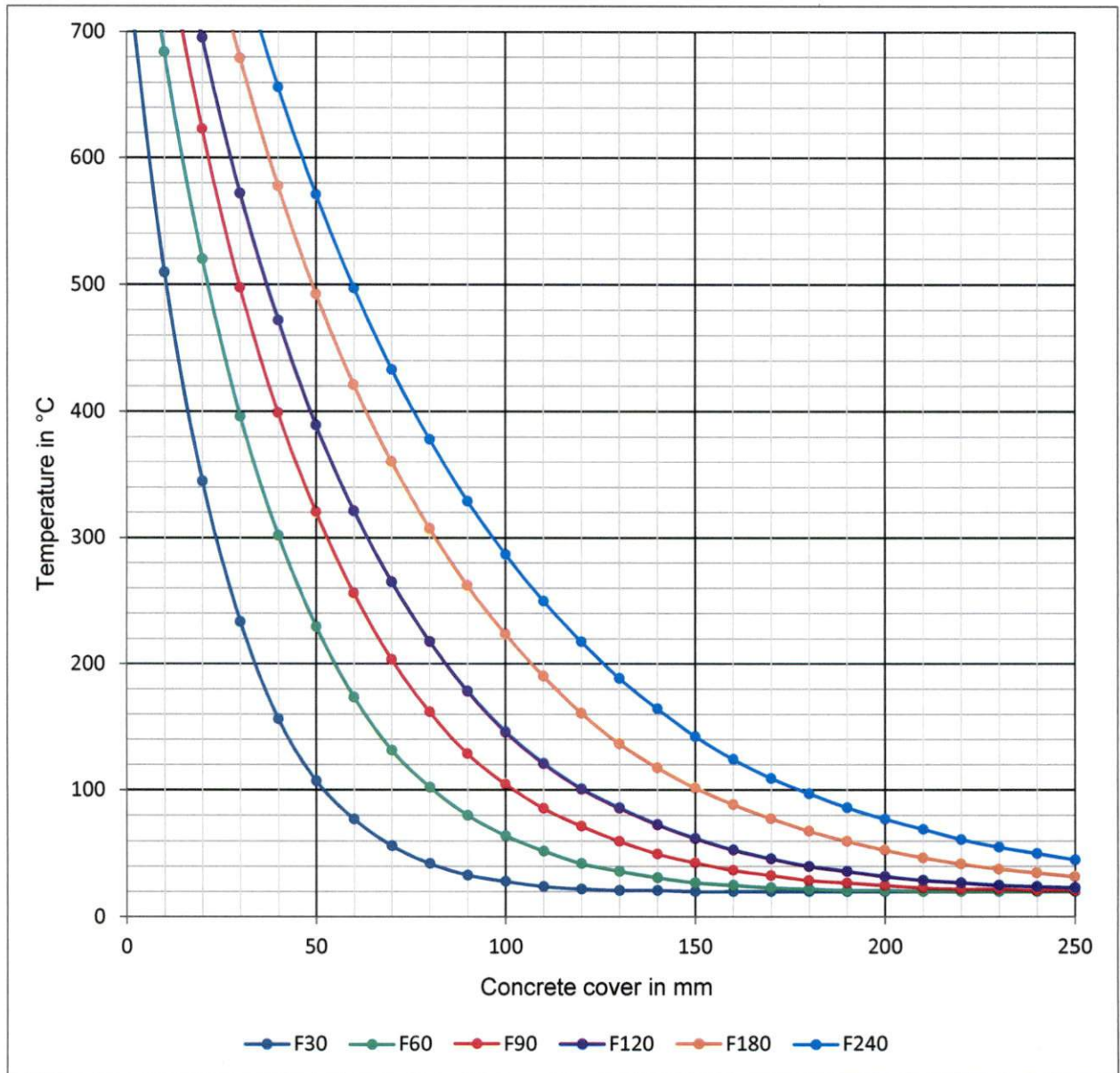
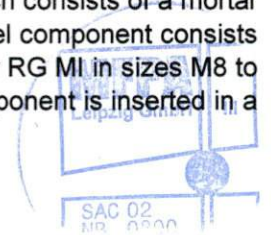


Fig. 1: Temperatures in reinforced concrete structural components after 30, 60, 90, 120, 180 and 240 minutes exposure to fire on one side in accordance with EN 1363-1, data from [8]

3 Description of the tested structure

The fischer FIS EM Plus injection system (according to [3]) is a bonded anchor which consists of a mortar cartridge with injection mortar fischer FIS EM Plus and a steel component. The steel component consists of a fischer anchor rod FIS A in sizes M8 to M30, a fischer internal threaded anchor RG MI in sizes M8 to M20 or a reinforcing bar with a diameter between 8 mm and 40 mm. The steel component is inserted in a



bore hole filled with injection mortar and anchored by the bond between the steel component, the injection mortar and the concrete. Details on the installation can be found in ETA 17/0979 [3]. Under predominantly static and quasi-static load, the dowel may be anchored in reinforced and unreinforced standard concrete of a stability class of at least C 20/25 and not higher than C 50/60 in accordance with DIN EN 206:2014-07 [8].

4 Fire protection assessment concept

The characteristic values for the resistance in the event of a fire are determined for the failure type "pulling out of the concrete" $N_{Rk,p,fi(t)}$ and "steel failure" $N_{Rk,s,fi(t)}$. They are based on the test results at increased temperatures for steel failure (see test reports [5] and [11]) and shear failure of the bonded surface (see advisory opinion [6] and [12]).

4.1 Anchorage of fischer anchor rod FIS A and fischer internal threaded anchor RG MI with the fischer FIS EM Plus injection system

The characteristic tension resistance for the steel failure of various thread diameters under central tension is listed in table 1 as a function of the determined fire-resistance period. Deviating from TR 020, the values were increased for a fire-resistance period of 30 minutes depending on the available test results. The increased R 30 values for steel failure are based on the mean value of the values from the rating line and rating curve. The averaged values are on the safe side and have been confirmed by available test results with longer fire-resistance periods.

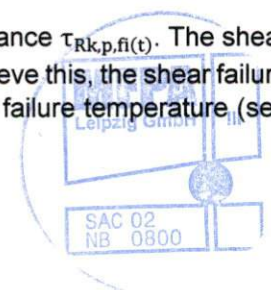
Table 1: Characteristic tension resistance $N_{Rk,s,fi(t)}$ in kN for the steel failure of the FIS EM Plus injection system, determined for steel 5.8, data from [4]

FIS EM Plus		M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
30 min	$N_{Rk,s,fi(30)}$	2.2	3.6	5.5	7.8	11.3	17.6	21.8	25.4	33.0	40.4
60 min	$N_{Rk,s,fi(60)}$	1.2	2.0	3.2	4.6	6.9	10.8	13.3	15.5	20.2	24.7
90 min	$N_{Rk,s,fi(90)}$	0.7	1.2	2.0	3.0	4.7	7.4	9.1	10.6	13.8	16.9
120 min	$N_{Rk,s,fi(120)}$	0.5	0.9	1.4	2.2	3.6	5.6	7.0	8.2	10.6	13.0
180 min	$N_{Rk,s,fi(180)}$	0.2	0.5	0.9	1.5	2.5	3.9	4.9	5.7	7.4	9.1
240 min	$N_{Rk,s,fi(240)}$	0.1	0.3	0.6	1.1	2.0	3.1	3.8	4.5	5.8	7.1

The characteristic resistance of the anchorage against pulling out of concrete is determined by equations

$$N_{Rk,p,fi(t)} = h_{ef} \cdot d \cdot \pi \cdot \tau_{Rk,p,fi(t)}$$

with the effective anchoring depth h_{ef} , the thread diameter d and the shear resistance $\tau_{Rk,p,fi(t)}$. The shear resistance has to be determined as a function of the concrete temperature. To achieve this, the shear failure of the bonded surface (see advisory opinion [6]) is analysed as a function of the failure temperature (see figure 2).



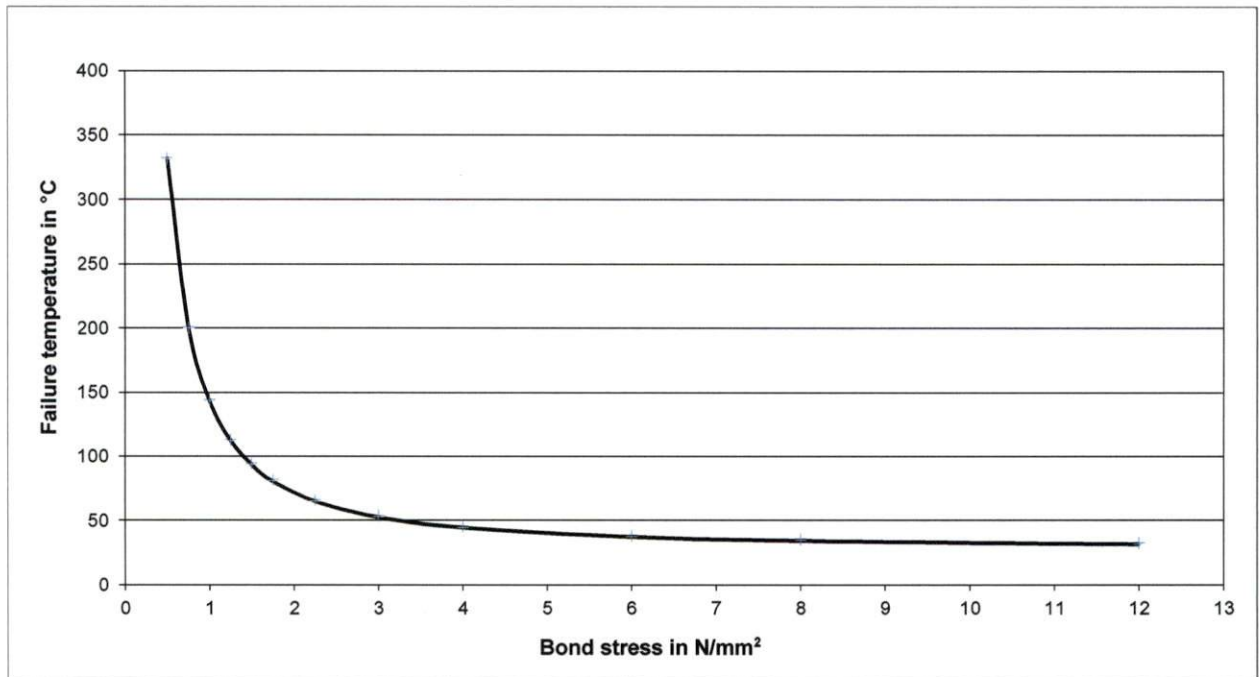


Fig. 2: Graphical representation of the rating curve of the failure temperature as a function of the bond stress of the Fischer FIS EM Plus injection system

This means that the shear resistance can be specified based on the identified approximation function

$$\tau_{Rk,p,fi}(\theta) = (0,008696 \theta_{c,d} - 0,243)^{-0,714}$$

as a function of the concrete temperature $\theta_{c,d}$. This value is, however, limited to 9 N/mm² by the characteristic bond strengths for anchor rods size M 30 which are specified in the approval [2].

Since the temperature of the shear plane in the concrete varies with the depth of the hole, the characteristic values for the resistance in the case of fire for the failure type "pulling out of the concrete" $N_{Rk,p,fi(t)}$ are determined through the integration of the critical, temperature-dependent bond stresses $\tau_{Rk,p,fi(t)}$ (multiplied by the bonded surface) as a function of the anchoring depth h_{ef} .

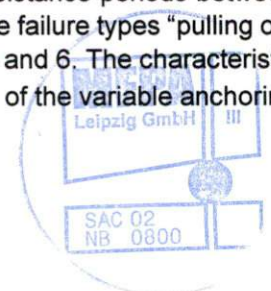
The characteristic values of the failure types "steel failure" and "pulling out of the mortar" are to be calculated depending on the variable anchoring depths. The FIS EM Plus injection system was designed according to TR 020, equation 2.1. The partial safety factor of the resistances under exposure to fire is $\gamma_{M,fi} = 1.0$.

The smaller resistance

$$N_{Rd,fi(t)} = \min(N_{Rk,p,fi(t)}, N_{Rk,s,fi(t)})$$

of the two possible failure cases "steel tension failure" and "pulling out of the concrete" is to be used for the assessment.

The calculation concept applies to Fischer anchor rod FIS A, \varnothing M8 to \varnothing M30, and the Fischer internal threaded anchor RG MI with the nominal diameter \varnothing M8 to \varnothing M20 and to fire-resistance periods between 30 minutes and 240 minutes. The determination of the characteristic values for the failure types "pulling out of the concrete" $N_{Rk,p,fi(t)}$ and "steel failure" $N_{Rk,s,fi(t)}$ is compiled in enclosures 5 and 6. The characteristic values of the failure types "concrete break-out" are to be calculated as a function of the variable anchoring depth using the equations 2.11 and 2.12 acc. to TR 020.



4.2 Reinforcing connection using the fischer FIS EM Plus injection system Verification of reinforcing steel used as an anchor

The characteristic values for the resistance in the event of a fire for the failure type "pulling out of concrete" $N_{Rk,p,ft(t)}$ were also determined for reinforcing steel used as an anchor through the integration of the critical temperature-dependent bond stresses as a function of the anchoring depth h_{ef} of the reinforcing bar and the duration of heating. Figure 3 explains the principle of function for the application as an anchor. The anchorage zone of the reinforcement is located vertical to the surface of the element exposed to fire and lies in different temperature areas.

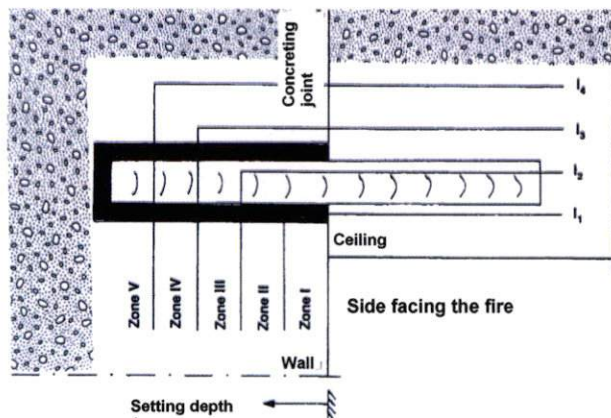


Figure 3: Schematic diagram of the reinforcement connection variant "anchorage"

The assessment concept applies for reinforcing steel variants with limits of elasticity from 400 to 500 MPa, for bars with a nominal diameter of \varnothing 8 mm to \varnothing 40 mm and for fire-resistance periods of 30 minutes to 240 minutes. The partial safety factor for the resistances under exposure to fire was set to $\gamma_{FI} = 1.0$.

The characteristic values against pulling out are compiled in enclosure 1 for BSt 400, in enclosure 2 for BSt 420, in enclosure 3 for BSt 460 and in enclosure 4 for BSt 500. The characteristic values for the resistance for the fire case for the failure type "steel failure" limit the values for the failure type "pulling out" and are shown with a grey background. Interim values may be interpolated. An extrapolation is not allowed. The quoted loads apply for the stress directions central tension, shear tension and diagonal tension at every angle.

The failure types "steel failure" and "concrete break-out" were not taken into account in this assessment. The connected structural element must display the same fire resistance as the anchor application.

5 Special notes

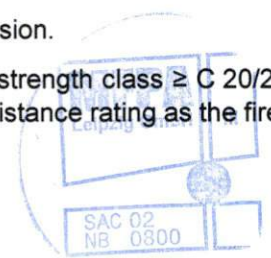
The above evaluation only applies to the fischer FIS EM Plus injection system which was installed in compliance with the installation instructions of fischerwerke GmbH & Co. KG or a general building authority approval or European Technical Assessment.

The test results can be transferred to stainless steel A4 and highly corrosion-resistant stainless steel (see approval [3]) with at least the same anchoring depth.

The assessment applies in general to a one-sided fire exposure of the structural elements. In the event of exposure to fire from several sides, the verification procedure can only be applied if the distance of the anchor to the outer edge is $c \geq 300$ mm and $\geq 2 h_{ef}$.

Based on this, the specified loads also apply to shear tension and/or diagonal tension.

The assessment only applies in conjunction with reinforced concrete ceilings of strength class \geq C 20/25 and \leq C 50/60 acc. to DIN EN 206:2014-07 [9] that have at least the same fire resistance rating as the fire-resistance period of the anchors.





In addition, the notes contained in DIN EN 1992-1-2:2010-12 [10] (see section 4.5) on the avoidance of concrete spalling apply. This means that the moisture content must be less than three percent by weight (or four percent according to the National Annex).

This document does not replace any certificate of conformity or usability as defined by the building regulations (national/European).

Leipzig, 20 June 2018

Dipl.-Ing. S. Hauswaldt

Head of Division

Dipl.-Ing. M. Juknat

Team Leader



Dipl.-Ing. S. Bauer

Test Engineer

List of enclosures

- Enclosure 1 Characteristic tensile load in a fire case for reinforcing steel BSt 400 S used as an anchor as a function of the fire-resistance period t_u
- Enclosure 2 Characteristic tensile load in a fire case for reinforcing steel BSt 420 S used as an anchor as a function of the fire-resistance period t_u
- Enclosure 3 Characteristic tensile load in a fire case for reinforcing steel BSt 460 S used as an anchor as a function of the fire-resistance period t_u
- Enclosure 4 Characteristic tensile load in a fire case for reinforcing steel BSt 500 S used as an anchor as a function of the fire-resistance period t_u
- Enclosure 5 Characteristic values under central tensile stress, load case fire, for the fischer FIS EM Plus injection system with fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C
- Enclosure 6 Characteristic values under central tensile stress, load case fire, for the fischer FIS EM Plus injection system with fischer internal threaded anchor RG MI made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C

Enclosure 1 Characteristic tensile load in a fire case for reinforcing steel BSt 400 S used as an anchor as a function of the fire-resistance period t_u

Table A 1.1: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
8	20.11	60	0.99	0.46	0.26	0.12	0.00	0.00
		70	1.54	0.70	0.43	0.26	0.00	0.00
		80	2.38	1.00	0.63	0.42	0.13	0.00
		90	3.87	1.39	0.88	0.61	0.27	0.12
		100	6.14	1.89	1.18	0.84	0.43	0.25
		110	8.40	2.54	1.55	1.10	0.61	0.40
		120	10.66	3.45	2.00	1.42	0.82	0.57
		130	12.92	4.79	2.55	1.80	1.07	0.75
		140	15.18	7.00	3.26	2.24	1.34	0.96
		150	17.45	9.26	4.19	2.78	1.66	1.20
		160	19.71	11.52	5.45	3.45	2.03	1.47
		170	20.11	13.78	7.30	4.28	2.45	1.77
		180	20.11	16.05	9.57	5.36	2.95	2.11
		190	20.11	18.31	11.83	6.79	3.52	2.50
		200	20.11	20.11	14.09	8.87	4.20	2.93
		210	20.11	20.11	16.35	11.13	5.02	3.42
		220	20.11	20.11	18.61	13.39	6.03	3.99
		230	20.11	20.11	20.11	15.65	7.29	4.64
		240	20.11	20.11	20.11	17.91	8.91	5.40
		250	20.11	20.11	20.11	20.11	11.11	6.30
260	20.11	20.11	20.11	20.11	13.37	7.37		
270	20.11	20.11	20.11	20.11	15.63	8.72		
280	20.11	20.11	20.11	20.11	17.90	10.48		
290	20.11	20.11	20.11	20.11	20.11	12.74		
300	20.11	20.11	20.11	20.11	20.11	15.01		
310	20.11	20.11	20.11	20.11	20.11	17.27		
320	20.11	20.11	20.11	20.11	20.11	19.53		
330	20.11	20.11	20.11	20.11	20.11	20.11		

grey background = steel failure decisive



Table A 1.2: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
10	31.42	60	1.23	0.57	0.32	0.15	0.00	0.00
		70	1.92	0.87	0.53	0.32	0.00	0.00
		80	2.98	1.25	0.79	0.53	0.16	0.00
		90	4.84	1.73	1.10	0.76	0.33	0.15
		100	7.67	2.36	1.48	1.05	0.54	0.32
		110	10.50	3.18	1.94	1.38	0.77	0.50
		120	13.32	4.31	2.50	1.78	1.03	0.71
		130	16.15	5.99	3.19	2.25	1.33	0.94
		140	18.98	8.75	4.07	2.80	1.68	1.21
		150	21.81	11.58	5.23	3.48	2.08	1.50
		160	24.63	14.40	6.81	4.31	2.54	1.84
		170	27.46	17.23	9.13	5.35	3.07	2.22
		180	30.29	20.06	11.96	6.69	3.68	2.64
		190	31.42	22.89	14.79	8.49	4.40	3.12
		200	31.42	25.71	17.61	11.08	5.25	3.67
		210	31.42	28.54	20.44	13.91	6.28	4.28
		220	31.42	31.37	23.27	16.74	7.53	4.99
		230	31.42	31.42	26.09	19.56	9.11	5.81
		240	31.42	31.42	28.92	22.39	11.13	6.75
		250	31.42	31.42	31.42	25.22	13.89	7.87
260	31.42	31.42	31.42	28.05	16.71	9.22		
270	31.42	31.42	31.42	30.87	19.54	10.90		
280	31.42	31.42	31.42	31.42	22.37	13.10		
290	31.42	31.42	31.42	31.42	25.20	15.93		
300	31.42	31.42	31.42	31.42	28.02	18.76		
310	31.42	31.42	31.42	31.42	30.85	21.59		
320	31.42	31.42	31.42	31.42	31.42	24.41		
330	31.42	31.42	31.42	31.42	31.42	27.24		
340	31.42	31.42	31.42	31.42	31.42	30.07		
350	31.42	31.42	31.42	31.42	31.42	31.42		

grey background = steel failure decisive



Table A 1.3: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		70	2.30	1.05	0.64	0.39	0.00	0.00
		80	3.57	1.50	0.95	0.63	0.19	0.00
		90	5.81	2.08	1.32	0.92	0.40	0.18
		100	9.20	2.83	1.77	1.25	0.64	0.38
		110	12.60	3.81	2.32	1.66	0.92	0.60
		120	15.99	5.18	3.00	2.13	1.23	0.85
		130	19.38	7.19	3.83	2.69	1.60	1.13
		140	22.77	10.50	4.89	3.36	2.02	1.45
		150	26.17	13.89	6.28	4.17	2.50	1.80
		160	29.56	17.28	8.17	5.17	3.05	2.20
		170	32.95	20.68	10.96	6.42	3.68	2.66
		180	36.35	24.07	14.35	8.03	4.42	3.17
		190	39.74	27.46	17.74	10.19	5.28	3.75
		200	43.13	30.86	21.14	13.30	6.30	4.40
		210		45.24	34.25	24.53	16.69	7.53
12	45.24	220		45.24	37.64	27.92	20.08	9.04
		230		45.24	41.03	31.31	23.48	10.93
		240		45.24	44.43	34.71	26.87	13.36
		250		45.24	45.24	38.10	30.26	16.66
		260		45.24	45.24	41.49	33.65	20.06
		270		45.24	45.24	44.89	37.05	23.45
		280		45.24	45.24	45.24	40.44	26.84
		290		45.24	45.24	45.24	43.83	30.24
		300		45.24	45.24	45.24	45.24	33.63
		310		45.24	45.24	45.24	45.24	37.02
		320		45.24	45.24	45.24	45.24	40.41
		330		45.24	45.24	45.24	45.24	43.81
		340		45.24	45.24	45.24	45.24	45.24
		350		45.24	45.24	45.24	45.24	45.24
		360		45.24	45.24	45.24	45.24	45.24
		370		45.24	45.24	45.24	45.24	45.24

grey background = steel failure decisive



Table A 1.4: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		70	2.69	1.22	0.75	0.45	0.00	0.00
		80	4.17	1.75	1.10	0.74	0.22	0.00
		90	6.78	2.43	1.54	1.07	0.47	0.21
		100	10.74	3.30	2.07	1.46	0.75	0.44
		110	14.70	4.45	2.71	1.93	1.07	0.70
		120	18.65	6.04	3.50	2.49	1.44	0.99
		130	22.61	8.39	4.47	3.14	1.86	1.32
		140	26.57	12.25	5.70	3.92	2.35	1.69
		150	30.53	16.21	7.33	4.87	2.91	2.10
		160	34.49	20.17	9.54	6.03	3.56	2.57
		170	38.45	24.12	12.78	7.49	4.30	3.10
		180	42.40	28.08	16.74	9.37	5.15	3.70
		190	46.36	32.04	20.70	11.89	6.16	4.37
		200	50.32	36.00	24.66	15.51	7.35	5.13
		210	54.28	39.96	28.62	19.47	8.79	5.99
		220	58.24	43.91	32.57	23.43	10.55	6.98
14	61.57	230	61.57	47.87	36.53	27.39	12.76	8.13
		240	61.57	51.83	40.49	31.35	15.58	9.46
		250	61.57	55.79	44.45	35.31	19.44	11.02
		260	61.57	59.75	48.41	39.26	23.40	12.90
		270	61.57	61.57	52.37	43.22	27.36	15.25
		280	61.57	61.57	56.32	47.18	31.32	18.34
		290	61.57	61.57	60.28	51.14	35.28	22.30
		300	61.57	61.57	61.57	55.10	39.23	26.26
		310	61.57	61.57	61.57	59.06	43.19	30.22
		320	61.57	61.57	61.57	61.57	47.15	34.18
		330	61.57	61.57	61.57	61.57	51.11	38.14
		340	61.57	61.57	61.57	61.57	55.07	42.09
		350	61.57	61.57	61.57	61.57	59.03	46.05
		360	61.57	61.57	61.57	61.57	61.57	50.01
		370	61.57	61.57	61.57	61.57	61.57	53.97
		380	61.57	61.57	61.57	61.57	61.57	57.93
		390	61.57	61.57	61.57	61.57	61.57	61.57

grey background = steel failure decisive



Table A 1.5: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
16	80.42	80	4.76	2.00	1.26	0.84	0.25	0.00
		90	7.75	2.77	1.76	1.22	0.53	0.24
		100	12.27	3.77	2.36	1.67	0.86	0.51
		110	16.80	5.08	3.10	2.21	1.22	0.80
		120	21.32	6.90	3.99	2.84	1.65	1.14
		130	25.84	9.59	5.10	3.59	2.13	1.51
		140	30.37	14.00	6.52	4.48	2.69	1.93
		150	34.89	18.52	8.37	5.56	3.33	2.40
		160	39.41	23.05	10.90	6.89	4.06	2.94
		170	43.94	27.57	14.61	8.56	4.91	3.55
		180	48.46	32.09	19.13	10.71	5.89	4.23
		190	52.99	36.62	23.66	13.59	7.04	5.00
		200	57.51	41.14	28.18	17.73	8.40	5.86
		210	62.03	45.66	32.70	22.25	10.04	6.85
		220	66.56	50.19	37.23	26.78	12.05	7.98
		230	71.08	54.71	41.75	31.30	14.58	9.29
		240	75.60	59.24	46.28	35.83	17.81	10.81
		250	80.13	63.76	50.80	40.35	22.22	12.59
		260	80.42	68.28	55.32	44.87	26.74	14.74
		270	80.42	72.81	59.85	49.40	31.27	17.43
		280	80.42	77.33	64.37	53.92	35.79	20.96
		290	80.42	80.42	68.89	58.44	40.32	25.49
		300	80.42	80.42	73.42	62.97	44.84	30.01
		310	80.42	80.42	77.94	67.49	49.36	34.54
320	80.42	80.42	80.42	72.02	53.89	39.06		
330	80.42	80.42	80.42	76.54	58.41	43.58		
340	80.42	80.42	80.42	80.42	62.93	48.11		
350	80.42	80.42	80.42	80.42	67.46	52.63		
360	80.42	80.42	80.42	80.42	71.98	57.16		
370	80.42	80.42	80.42	80.42	76.51	61.68		
380	80.42	80.42	80.42	80.42	80.42	66.20		
390	80.42	80.42	80.42	80.42	80.42	70.73		
400	80.42	80.42	80.42	80.42	80.42	75.25		
450	80.42	80.42	80.42	80.42	80.42	80.42		

grey background = steel failure decisive



Table A 1.6: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
18	101.78	80	5.36	2.25	1.42	0.95	0.28	0.00
		90	8.72	3.12	1.98	1.37	0.60	0.27
		100	13.81	4.24	2.66	1.88	0.96	0.57
		110	18.89	5.72	3.48	2.48	1.38	0.90
		120	23.98	7.76	4.49	3.20	1.85	1.28
		130	29.07	10.79	5.74	4.04	2.40	1.70
		140	34.16	15.75	7.33	5.05	3.02	2.17
		150	39.25	20.84	9.42	6.26	3.74	2.70
		160	44.34	25.93	12.26	7.75	4.57	3.31
		170	49.43	31.02	16.44	9.63	5.52	3.99
		180	54.52	36.11	21.52	12.05	6.63	4.76
		190	59.61	41.19	26.61	15.29	7.92	5.62
		200	64.70	46.28	31.70	19.95	9.46	6.60
		210	69.79	51.37	36.79	25.04	11.30	7.70
		220	74.88	56.46	41.88	30.12	13.56	8.97
		230	79.97	61.55	46.97	35.21	16.40	10.45
		240	85.05	66.64	52.06	40.30	20.04	12.16
		250	90.14	71.73	57.15	45.39	25.00	14.17
		260	95.23	76.82	62.24	50.48	30.09	16.59
		270	100.32	81.91	67.33	55.57	35.18	19.61
		280	101.78	87.00	72.42	60.66	40.27	23.59
		290	101.78	92.09	77.51	65.75	45.35	28.67
		300	101.78	97.18	82.60	70.84	50.44	33.76
		310	101.78	101.78	87.68	75.93	55.53	38.85
		320	101.78	101.78	92.77	81.02	60.62	43.94
		330	101.78	101.78	97.86	86.11	65.71	49.03
		340	101.78	101.78	101.78	91.20	70.80	54.12
		350	101.78	101.78	101.78	96.28	75.89	59.21
360	101.78	101.78	101.78	101.37	80.98	64.30		
370	101.78	101.78	101.78	101.78	86.07	69.39		
380	101.78	101.78	101.78	101.78	91.16	74.48		
390	101.78	101.78	101.78	101.78	96.25	79.57		
400	101.78	101.78	101.78	101.78	101.34	84.66		
450	101.78	101.78	101.78	101.78	101.78	101.78		

grey background = steel failure decisive



Table A 1.7: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
20	125.66	90	9.68	3.47	2.20	1.53	0.67	0.30
		100	15.34	4.71	2.95	2.09	1.07	0.63
		110	20.99	6.35	3.87	2.76	1.53	1.01
		120	26.65	8.63	4.99	3.55	2.06	1.42
		130	32.30	11.99	6.38	4.49	2.66	1.89
		140	37.96	17.50	8.15	5.61	3.36	2.41
		150	43.61	23.15	10.47	6.95	4.16	3.00
		160	49.27	28.81	13.62	8.61	5.08	3.67
		170	54.92	34.46	18.26	10.70	6.14	4.43
		180	60.58	40.12	23.92	13.39	7.36	5.28
		190	66.23	45.77	29.57	16.98	8.80	6.24
		200	71.89	51.43	35.23	22.16	10.51	7.33
		210	77.54	57.08	40.88	27.82	12.55	8.56
		220	83.20	62.74	46.53	33.47	15.07	9.97
		230	88.85	68.39	52.19	39.13	18.22	11.61
		240	94.51	74.05	57.84	44.78	22.26	13.51
		250	100.16	79.70	63.50	50.44	27.77	15.74
		260	105.81	85.35	69.15	56.09	33.43	18.43
		270	111.47	91.01	74.81	61.75	39.08	21.79
		280	117.12	96.66	80.46	67.40	44.74	26.21
290	122.78	102.32	86.12	73.06	50.39	31.86		
300	125.66	107.97	91.77	78.71	56.05	37.52		
310	125.66	113.63	97.43	84.36	61.70	43.17		
320	125.66	119.28	103.08	90.02	67.36	48.83		
330	125.66	124.94	108.74	95.67	73.01	54.48		
340	125.66	125.66	114.39	101.33	78.67	60.13		
350	125.66	125.66	120.05	106.98	84.32	65.79		
360	125.66	125.66	125.66	112.64	89.98	71.44		
370	125.66	125.66	125.66	118.29	95.63	77.10		
380	125.66	125.66	125.66	123.95	101.29	82.75		
390	125.66	125.66	125.66	125.66	106.94	88.41		
400	125.66	125.66	125.66	125.66	112.60	94.06		
450	125.66	125.66	125.66	125.66	125.66	122.34		
500	125.66	125.66	125.66	125.66	125.66	125.66		

grey background = steel failure decisive



Table A 1.8: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		90	10.65	3.81	2.42	1.68	0.74	0.33
		100	16.87	5.18	3.25	2.30	1.18	0.70
		110	23.09	6.99	4.26	3.03	1.68	1.11
		120	29.31	9.49	5.49	3.91	2.26	1.56
		130	35.53	13.19	7.02	4.94	2.93	2.08
		140	41.75	19.25	8.96	6.17	3.70	2.65
		150	47.97	25.47	11.51	7.65	4.58	3.30
		160	54.19	31.69	14.98	9.48	5.59	4.04
		170	60.41	37.91	20.09	11.77	6.75	4.88
		180	66.63	44.13	26.31	14.73	8.10	5.81
		190	72.85	50.35	32.53	18.68	9.68	6.87
		200	79.07	56.57	38.75	24.38	11.56	8.06
		210	85.30	62.79	44.97	30.60	13.81	9.41
		220	91.52	69.01	51.19	36.82	16.57	10.97
		230	97.74	75.23	57.41	43.04	20.05	12.77
		240	103.96	81.45	63.63	49.26	24.49	14.86
22	152.05	250	110.18	87.67	69.85	55.48	30.55	17.31
		260	116.40	93.89	76.07	61.70	36.77	20.27
		270	122.62	100.11	82.29	67.92	42.99	23.97
		280	128.84	106.33	88.51	74.14	49.21	28.83
		290	135.06	112.55	94.73	80.36	55.43	35.05
		300	141.28	118.77	100.95	86.58	61.65	41.27
		310	147.50	124.99	107.17	92.80	67.87	47.49
		320	152.05	131.21	113.39	99.02	74.09	53.71
		330	152.05	137.43	119.61	105.24	80.31	59.93
		340	152.05	143.65	125.83	111.46	86.53	66.15
		350	152.05	149.87	132.05	117.68	92.75	72.37
		360	152.05	152.05	138.27	123.90	98.97	78.59
		370	152.05	152.05	144.49	130.12	105.19	84.81
		380	152.05	152.05	150.71	136.34	111.41	91.03
		390	152.05	152.05	152.05	142.56	117.63	97.25
		400	152.05	152.05	152.05	148.78	123.85	103.47
		450	152.05	152.05	152.05	152.05	152.05	134.57
		500	152.05	152.05	152.05	152.05	152.05	152.05

grey background = steel failure decisive

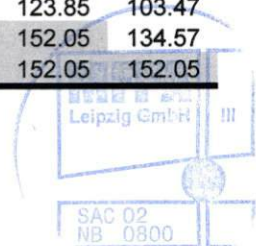


Table A 1.9: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		90	11.62	4.16	2.64	1.83	0.80	0.36
		100	18.41	5.66	3.54	2.51	1.29	0.76
		110	25.19	7.62	4.64	3.31	1.84	1.21
		120	31.98	10.35	5.99	4.26	2.47	1.71
		130	38.76	14.38	7.66	5.39	3.20	2.26
		140	45.55	21.00	9.78	6.73	4.03	2.89
		150	52.34	27.78	12.56	8.34	4.99	3.60
		160	59.12	34.57	16.35	10.34	6.09	4.41
		170	65.91	41.35	21.91	12.84	7.36	5.32
		180	72.69	48.14	28.70	16.07	8.84	6.34
		190	79.48	54.93	35.48	20.38	10.57	7.49
		200	86.26	61.71	42.27	26.60	12.61	8.80
		210	93.05	68.50	49.06	33.38	15.06	10.27
		220	99.83	75.28	55.84	40.17	18.08	11.96
		230	106.62	82.07	62.63	46.95	21.87	13.93
		240	113.41	88.85	69.41	53.74	26.72	16.21
		250	120.19	95.64	76.20	60.52	33.33	18.89
24	180.95	260	126.98	102.43	82.98	67.31	40.12	22.12
		270	133.76	109.21	89.77	74.09	46.90	26.15
		280	140.55	116.00	96.56	80.88	53.69	31.45
		290	147.33	122.78	103.34	87.67	60.47	38.23
		300	154.12	129.57	110.13	94.45	67.26	45.02
		310	160.91	136.35	116.91	101.24	74.04	51.80
		320	167.69	143.14	123.70	108.02	80.83	58.59
		330	174.48	149.92	130.48	114.81	87.62	65.38
		340	180.95	156.71	137.27	121.59	94.40	72.16
		350	180.95	163.50	144.06	128.38	101.19	78.95
		360	180.95	170.28	150.84	135.17	107.97	85.73
		370	180.95	177.07	157.63	141.95	114.76	92.52
		380	180.95	180.95	164.41	148.74	121.54	99.30
		390	180.95	180.95	171.20	155.52	128.33	106.09
		400	180.95	180.95	177.98	162.31	135.11	112.88
		450	180.95	180.95	180.95	180.95	169.04	146.80
		500	180.95	180.95	180.95	180.95	180.95	180.73
		550	180.95	180.95	180.95	180.95	180.95	180.95

grey background = steel failure decisive



Table A 1.10: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
25	196.34	100	19.17	5.89	3.69	2.61	1.34	0.79
		110	26.24	7.94	4.84	3.45	1.91	1.26
		120	33.31	10.78	6.24	4.44	2.57	1.78
		130	40.38	14.98	7.97	5.61	3.33	2.36
		140	47.45	21.87	10.19	7.01	4.20	3.02
		150	54.52	28.94	13.08	8.69	5.20	3.76
		160	61.58	36.01	17.03	10.77	6.35	4.59
		170	68.65	43.08	22.83	13.37	7.67	5.54
		180	75.72	50.15	29.90	16.73	9.20	6.61
		190	82.79	57.21	36.96	21.23	11.01	7.81
		200	89.86	64.28	44.03	27.70	13.13	9.16
		210	96.93	71.35	51.10	34.77	15.69	10.70
		220	103.99	78.42	58.17	41.84	18.84	12.46
		230	111.06	85.49	65.24	48.91	22.78	14.51
		240	118.13	92.56	72.31	55.98	27.83	16.88
		250	125.20	99.62	79.37	63.05	34.72	19.67
		260	132.27	106.69	86.44	70.11	41.79	23.04
		270	139.34	113.76	93.51	77.18	48.86	27.24
		280	146.40	120.83	100.58	84.25	55.92	32.76
		290	153.47	127.90	107.65	91.32	62.99	39.83
		300	160.54	134.97	114.72	98.39	70.06	46.89
		310	167.61	142.03	121.78	105.46	77.13	53.96
		320	174.68	149.10	128.85	112.52	84.20	61.03
		330	181.75	156.17	135.92	119.59	91.27	68.10
		340	188.82	163.24	142.99	126.66	98.33	75.17
350	195.88	170.31	150.06	133.73	105.40	82.24		
360	196.34	177.38	157.13	140.80	112.47	89.30		
370	196.34	184.45	164.19	147.87	119.54	96.37		
380	196.34	191.51	171.26	154.93	126.61	103.44		
390	196.34	196.34	178.33	162.00	133.68	110.51		
400	196.34	196.34	185.40	169.07	140.74	117.58		
450	196.34	196.34	196.34	196.34	176.09	152.92		
500	196.34	196.34	196.34	196.34	196.34	188.26		
550	196.34	196.34	196.34	196.34	196.34	196.34		

grey background = steel failure decisive



Table A 1.11: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
26	212.37	100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
		260	137.56	110.96	89.90	72.92	43.46	23.96
		270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
360	211.07	184.47	163.41	146.43	116.97	92.88		
370	212.37	191.82	170.76	153.78	124.32	100.23		
380	212.37	199.17	178.11	161.13	131.67	107.58		
390	212.37	206.53	185.46	168.48	139.02	114.93		
400	212.37	212.37	192.82	175.83	146.37	122.28		
450	212.37	212.37	212.37	212.37	183.13	159.04		
500	212.37	212.37	212.37	212.37	212.37	195.79		
550	212.37	212.37	212.37	212.37	212.37	212.37		

grey background = steel failure decisive



Table A 1.12: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
28	212.37	260	137.56	110.96	89.90	72.92	43.46	23.96
		270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
		360	211.07	184.47	163.41	146.43	116.97	92.88
		370	212.37	191.82	170.76	153.78	124.32	100.23
		380	212.37	199.17	178.11	161.13	131.67	107.58
		390	212.37	206.53	185.46	168.48	139.02	114.93
		400	212.37	212.37	192.82	175.83	146.37	122.28
		450	212.37	212.37	212.37	212.37	183.13	159.04
		500	212.37	212.37	212.37	212.37	212.37	195.79
		550	212.37	212.37	212.37	212.37	212.37	212.37

grey background = steel failure decisive



Table A 1.13: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
30	282.74	110	31.49	9.53	5.81	4.14	2.30	1.51
		120	39.97	12.94	7.49	5.33	3.09	2.13
		130	48.46	17.98	9.57	6.74	3.99	2.83
		140	56.94	26.25	12.22	8.41	5.04	3.62
		150	65.42	34.73	15.70	10.43	6.24	4.51
		160	73.90	43.21	20.43	12.92	7.62	5.51
		170	82.38	51.69	27.39	16.04	9.20	6.65
		180	90.87	60.18	35.87	20.08	11.05	7.93
		190	99.35	68.66	44.36	25.48	13.21	9.37
		200	107.83	77.14	52.84	33.24	15.76	11.00
		210	116.31	85.62	61.32	41.73	18.83	12.84
		220	124.79	94.10	69.80	50.21	22.60	14.96
		230	133.28	102.59	78.28	58.69	27.34	17.42
		240	141.76	111.07	86.77	67.17	33.40	20.26
		250	150.24	119.55	95.25	75.65	41.66	23.61
		260	158.72	128.03	103.73	84.14	50.14	27.65
		270	167.20	136.51	112.21	92.62	58.63	32.69
		280	175.69	145.00	120.69	101.10	67.11	39.31
		290	184.17	153.48	129.18	109.58	75.59	47.79
		300	192.65	161.96	137.66	118.06	84.07	56.27
		310	201.13	170.44	146.14	126.55	92.55	64.76
		320	209.61	178.92	154.62	135.03	101.04	73.24
		330	218.10	187.41	163.10	143.51	109.52	81.72
		340	226.58	195.89	171.59	151.99	118.00	90.20
		350	235.06	204.37	180.07	160.47	126.48	98.68
		360	243.54	212.85	188.55	168.96	134.96	107.17
		370	252.02	221.33	197.03	177.44	143.45	115.65
380	260.51	229.82	205.52	185.92	151.93	124.13		
390	268.99	238.30	214.00	194.40	160.41	132.61		
400	277.47	246.78	222.48	202.89	168.89	141.09		
450	282.74	282.74	264.89	245.30	211.30	183.50		
500	282.74	282.74	282.74	282.74	253.71	225.91		
550	282.74	282.74	282.74	282.74	282.74	268.32		
600	282.74	282.74	282.74	282.74	282.74	282.74		

grey background = steel failure decisive



Table A 1.14: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		120	42.64	13.80	7.99	5.68	3.29	2.27
		130	51.69	19.18	10.21	7.19	4.26	3.02
		140	60.73	28.00	13.04	8.97	5.38	3.86
		150	69.78	37.04	16.74	11.13	6.66	4.81
		160	78.83	46.09	21.80	13.78	8.13	5.88
		170	87.88	55.14	29.22	17.11	9.82	7.09
		180	96.92	64.19	38.27	21.42	11.78	8.46
		190	105.97	73.23	47.31	27.17	14.09	9.99
		200	115.02	82.28	56.36	35.46	16.81	11.73
		210	124.07	91.33	65.41	44.51	20.09	13.69
		220	133.11	100.38	74.46	53.56	24.11	15.95
		230	142.16	109.42	83.50	62.60	29.16	18.58
		240	151.21	118.47	92.55	71.65	35.62	21.61
		250	160.26	127.52	101.60	80.70	44.44	25.18
		260	169.30	136.57	110.65	89.75	53.49	29.49
		270	178.35	145.61	119.69	98.79	62.53	34.86
32	321.69	280	187.40	154.66	128.74	107.84	71.58	41.93
		290	196.45	163.71	137.79	116.89	80.63	50.98
		300	205.49	172.76	146.84	125.94	89.68	60.03
		310	214.54	181.80	155.88	134.98	98.73	69.07
		320	223.59	190.85	164.93	144.03	107.77	78.12
		330	232.64	199.90	173.98	153.08	116.82	87.17
		340	241.68	208.95	183.03	162.13	125.87	96.22
		350	250.73	217.99	192.07	171.17	134.92	105.26
		360	259.78	227.04	201.12	180.22	143.96	114.31
		370	268.83	236.09	210.17	189.27	153.01	123.36
		380	277.87	245.14	219.22	198.32	162.06	132.41
		390	286.92	254.18	228.26	207.36	171.11	141.45
		400	295.97	263.23	237.31	216.41	180.15	150.50
		450	321.69	308.47	282.55	261.65	225.39	195.74
		500	321.69	321.69	321.69	306.89	270.63	240.98
		550	321.69	321.69	321.69	321.69	315.87	286.21
		600	321.69	321.69	321.69	321.69	321.69	321.69

grey background = steel failure decisive



Table A 1.15: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
34	363.16	130	54.92	20.38	10.84	7.63	4.53	3.21
		140	64.53	29.75	13.85	9.53	5.71	4.10
		150	74.14	39.36	17.79	11.82	7.07	5.11
		160	83.75	48.97	23.16	14.64	8.63	6.25
		170	93.37	58.59	31.04	18.18	10.43	7.53
		180	102.98	68.20	40.66	22.76	12.52	8.98
		190	112.59	77.81	50.27	28.87	14.97	10.62
		200	122.21	87.42	59.88	37.68	17.86	12.46
		210	131.82	97.04	69.50	47.29	21.34	14.55
		220	141.43	106.65	79.11	56.90	25.62	16.95
		230	151.05	116.26	88.72	66.52	30.98	19.74
		240	160.66	125.88	98.34	76.13	37.85	22.96
		250	170.27	135.49	107.95	85.74	47.22	26.76
		260	179.88	145.10	117.56	95.35	56.83	31.33
		270	189.50	154.72	127.17	104.97	66.44	37.04
		280	199.11	164.33	136.79	114.58	76.06	44.55
		290	208.72	173.94	146.40	124.19	85.67	54.16
		300	218.34	183.55	156.01	133.81	95.28	63.78
		310	227.95	193.17	165.63	143.42	104.90	73.39
		320	237.56	202.78	175.24	153.03	114.51	83.00
		330	247.18	212.39	184.85	162.65	124.12	92.62
340	256.79	222.01	194.47	172.26	133.73	102.23		
350	266.40	231.62	204.08	181.87	143.35	111.84		
360	276.01	241.23	213.69	191.48	152.96	121.45		
370	285.63	250.85	223.30	201.10	162.57	131.07		
380	295.24	260.46	232.92	210.71	172.19	140.68		
390	304.85	270.07	242.53	220.32	181.80	150.29		
400	314.47	279.68	252.14	229.94	191.41	159.91		
450	362.53	327.75	300.21	278.00	239.48	207.97		
500	363.16	363.16	348.27	326.07	287.54	256.04		
550	363.16	363.16	363.16	363.16	335.61	304.10		
600	363.16	363.16	363.16	363.16	363.16	352.17		
650	363.16	363.16	363.16	363.16	363.16	363.16		

grey background = steel failure decisive



Table A 1.16: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
36	407.14	200	129.40	92.57	63.41	39.89	18.91	13.19
		210	139.57	102.75	73.58	50.07	22.60	15.41
		220	149.75	112.92	83.76	60.25	27.12	17.95
		230	159.93	123.10	93.94	70.43	32.80	20.90
		240	170.11	133.28	104.12	80.61	40.07	24.31
		250	180.29	143.46	114.30	90.79	49.99	28.33
		260	190.47	153.64	124.48	100.96	60.17	33.18
		270	200.64	163.82	134.66	111.14	70.35	39.22
		280	210.82	174.00	144.83	121.32	80.53	47.17
		290	221.00	184.17	155.01	131.50	90.71	57.35
		300	231.18	194.35	165.19	141.68	100.89	67.53
		310	241.36	204.53	175.37	151.86	111.07	77.71
		320	251.54	214.71	185.55	162.03	121.24	87.89
		330	261.72	224.89	195.73	172.21	131.42	98.06
		340	271.89	235.07	205.90	182.39	141.60	108.24
		350	282.07	245.24	216.08	192.57	151.78	118.42
		360	292.25	255.42	226.26	202.75	161.96	128.60
		370	302.43	265.60	236.44	212.93	172.14	138.78
		380	312.61	275.78	246.62	223.11	182.31	148.96
		390	322.79	285.96	256.80	233.28	192.49	159.13
400	332.96	296.14	266.98	243.46	202.67	169.31		
450	383.86	347.03	317.87	294.35	253.56	220.21		
500	407.14	397.92	368.76	345.25	304.46	271.10		
550	407.14	407.14	407.14	396.14	355.35	321.99		
600	407.14	407.14	407.14	407.14	406.24	372.88		
650	407.14	407.14	407.14	407.14	407.14	407.14		

grey background = steel failure decisive



Table A 1.17: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 400 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 400 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
40	502.64	200	143.77	102.85	70.45	44.33	21.01	14.66
		210	155.08	114.16	81.76	55.63	25.11	17.12
		220	166.39	125.47	93.07	66.94	30.14	19.94
		230	177.70	136.78	104.38	78.25	36.45	23.22
		240	189.01	148.09	115.69	89.56	44.53	27.01
		250	200.32	159.40	127.00	100.87	55.55	31.48
		260	211.63	170.71	138.31	112.18	66.86	36.86
		270	222.94	182.02	149.62	123.49	78.17	43.58
		280	234.25	193.33	160.93	134.80	89.48	52.41
		290	245.56	204.64	172.24	146.11	100.79	63.72
		300	256.87	215.95	183.55	157.42	112.10	75.03
		310	268.18	227.26	194.85	168.73	123.41	86.34
		320	279.49	238.57	206.16	180.04	134.72	97.65
		330	290.79	249.87	217.47	191.35	146.03	108.96
		340	302.10	261.18	228.78	202.66	157.33	120.27
		350	313.41	272.49	240.09	213.97	168.64	131.58
		360	324.72	283.80	251.40	225.28	179.95	142.89
		370	336.03	295.11	262.71	236.59	191.26	154.20
		380	347.34	306.42	274.02	247.89	202.57	165.51
		390	358.65	317.73	285.33	259.20	213.88	176.82
		400	369.96	329.04	296.64	270.51	225.19	188.13
450	426.51	385.59	353.19	327.06	281.74	244.67		
500	483.05	442.13	409.73	383.61	338.28	301.22		
550	502.64	498.68	466.28	440.15	394.83	357.77		
600	502.64	502.64	502.64	496.70	451.38	414.31		
650	502.64	502.64	502.64	502.64	502.64	470.86		
700	502.64	502.64	502.64	502.64	502.64	502.64		

grey background = steel failure decisive



Enclosure 2 Characteristic tensile load in a fire case for reinforcing steel BSt 420 S used as an anchor as a function of the fire-resistance period t_u

Table A 2.1: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		60	0.99	0.46	0.26	0.12	0.00	0.00
		70	1.54	0.70	0.43	0.26	0.00	0.00
		80	2.38	1.00	0.63	0.42	0.13	0.00
		90	3.87	1.39	0.88	0.61	0.27	0.12
		100	6.14	1.89	1.18	0.84	0.43	0.25
		110	8.40	2.54	1.55	1.10	0.61	0.40
		120	10.66	3.45	2.00	1.42	0.82	0.57
		130	12.92	4.79	2.55	1.80	1.07	0.75
		140	15.18	7.00	3.26	2.24	1.34	0.96
		150	17.45	9.26	4.19	2.78	1.66	1.20
		160	19.71	11.52	5.45	3.45	2.03	1.47
		170	21.11	13.78	7.30	4.28	2.45	1.77
		180	21.11	16.05	9.57	5.36	2.95	2.11
8	21.11	190	21.11	18.31	11.83	6.79	3.52	2.50
		200	21.11	20.57	14.09	8.87	4.20	2.93
		210	21.11	21.11	16.35	11.13	5.02	3.42
		220	21.11	21.11	18.61	13.39	6.03	3.99
		230	21.11	21.11	20.88	15.65	7.29	4.64
		240	21.11	21.11	21.11	17.91	8.91	5.40
		250	21.11	21.11	21.11	20.17	11.11	6.30
		260	21.11	21.11	21.11	21.11	13.37	7.37
		270	21.11	21.11	21.11	21.11	15.63	8.72
		280	21.11	21.11	21.11	21.11	17.90	10.48
		290	21.11	21.11	21.11	21.11	20.16	12.74
		300	21.11	21.11	21.11	21.11	21.11	15.01
		310	21.11	21.11	21.11	21.11	21.11	17.27
		320	21.11	21.11	21.11	21.11	21.11	19.53
		330	21.11	21.11	21.11	21.11	21.11	21.11

grey background = steel failure decisive



Table A 2.2: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
10	32.99	60	1.23	0.57	0.32	0.15	0.00	0.00
		70	1.92	0.87	0.53	0.32	0.00	0.00
		80	2.98	1.25	0.79	0.53	0.16	0.00
		90	4.84	1.73	1.10	0.76	0.33	0.15
		100	7.67	2.36	1.48	1.05	0.54	0.32
		110	10.50	3.18	1.94	1.38	0.77	0.50
		120	13.32	4.31	2.50	1.78	1.03	0.71
		130	16.15	5.99	3.19	2.25	1.33	0.94
		140	18.98	8.75	4.07	2.80	1.68	1.21
		150	21.81	11.58	5.23	3.48	2.08	1.50
		160	24.63	14.40	6.81	4.31	2.54	1.84
		170	27.46	17.23	9.13	5.35	3.07	2.22
		180	30.29	20.06	11.96	6.69	3.68	2.64
		190	32.99	22.89	14.79	8.49	4.40	3.12
		200	32.99	25.71	17.61	11.08	5.25	3.67
		210	32.99	28.54	20.44	13.91	6.28	4.28
		220	32.99	31.37	23.27	16.74	7.53	4.99
		230	32.99	32.99	26.09	19.56	9.11	5.81
		240	32.99	32.99	28.92	22.39	11.13	6.75
		250	32.99	32.99	31.75	25.22	13.89	7.87
		260	32.99	32.99	32.99	28.05	16.71	9.22
		270	32.99	32.99	32.99	30.87	19.54	10.90
		280	32.99	32.99	32.99	32.99	22.37	13.10
		290	32.99	32.99	32.99	32.99	25.20	15.93
		300	32.99	32.99	32.99	32.99	28.02	18.76
		310	32.99	32.99	32.99	32.99	30.85	21.59
		320	32.99	32.99	32.99	32.99	32.99	24.41
330	32.99	32.99	32.99	32.99	32.99	27.24		
340	32.99	32.99	32.99	32.99	32.99	30.07		
350	32.99	32.99	32.99	32.99	32.99	32.89		
360	32.99	32.99	32.99	32.99	32.99	32.99		

grey background = steel failure decisive



Table A 2.3: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		70	2.30	1.05	0.64	0.39	0.00	0.00
		80	3.57	1.50	0.95	0.63	0.19	0.00
		90	5.81	2.08	1.32	0.92	0.40	0.18
		100	9.20	2.83	1.77	1.25	0.64	0.38
		110	12.60	3.81	2.32	1.66	0.92	0.60
		120	15.99	5.18	3.00	2.13	1.23	0.85
		130	19.38	7.19	3.83	2.69	1.60	1.13
		140	22.77	10.50	4.89	3.36	2.02	1.45
		150	26.17	13.89	6.28	4.17	2.50	1.80
		160	29.56	17.28	8.17	5.17	3.05	2.20
		170	32.95	20.68	10.96	6.42	3.68	2.66
		180	36.35	24.07	14.35	8.03	4.42	3.17
		190	39.74	27.46	17.74	10.19	5.28	3.75
		200	43.13	30.86	21.14	13.30	6.30	4.40
		210	46.52	34.25	24.53	16.69	7.53	5.14
12	47.50	220	47.50	37.64	27.92	20.08	9.04	5.98
		230	47.50	41.03	31.31	23.48	10.93	6.97
		240	47.50	44.43	34.71	26.87	13.36	8.10
		250	47.50	47.50	38.10	30.26	16.66	9.44
		260	47.50	47.50	41.49	33.65	20.06	11.06
		270	47.50	47.50	44.89	37.05	23.45	13.07
		280	47.50	47.50	47.50	40.44	26.84	15.72
		290	47.50	47.50	47.50	43.83	30.24	19.12
		300	47.50	47.50	47.50	47.23	33.63	22.51
		310	47.50	47.50	47.50	47.50	37.02	25.90
		320	47.50	47.50	47.50	47.50	40.41	29.30
		330	47.50	47.50	47.50	47.50	43.81	32.69
		340	47.50	47.50	47.50	47.50	47.20	36.08
		350	47.50	47.50	47.50	47.50	47.50	39.47
		360	47.50	47.50	47.50	47.50	47.50	42.87
		370	47.50	47.50	47.50	47.50	47.50	46.26
		380	47.50	47.50	47.50	47.50	47.50	47.50

grey background = steel failure decisive



Table A 2.4: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
14	64.65	70	2.69	1.22	0.75	0.45	0.00	0.00
		80	4.17	1.75	1.10	0.74	0.22	0.00
		90	6.78	2.43	1.54	1.07	0.47	0.21
		100	10.74	3.30	2.07	1.46	0.75	0.44
		110	14.70	4.45	2.71	1.93	1.07	0.70
		120	18.65	6.04	3.50	2.49	1.44	0.99
		130	22.61	8.39	4.47	3.14	1.86	1.32
		140	26.57	12.25	5.70	3.92	2.35	1.69
		150	30.53	16.21	7.33	4.87	2.91	2.10
		160	34.49	20.17	9.54	6.03	3.56	2.57
		170	38.45	24.12	12.78	7.49	4.30	3.10
		180	42.40	28.08	16.74	9.37	5.15	3.70
		190	46.36	32.04	20.70	11.89	6.16	4.37
		200	50.32	36.00	24.66	15.51	7.35	5.13
		210	54.28	39.96	28.62	19.47	8.79	5.99
		220	58.24	43.91	32.57	23.43	10.55	6.98
		230	62.20	47.87	36.53	27.39	12.76	8.13
		240	64.65	51.83	40.49	31.35	15.58	9.46
		250	64.65	55.79	44.45	35.31	19.44	11.02
		260	64.65	59.75	48.41	39.26	23.40	12.90
		270	64.65	63.71	52.37	43.22	27.36	15.25
		280	64.65	64.65	56.32	47.18	31.32	18.34
		290	64.65	64.65	60.28	51.14	35.28	22.30
		300	64.65	64.65	64.24	55.10	39.23	26.26
310	64.65	64.65	64.65	59.06	43.19	30.22		
320	64.65	64.65	64.65	63.01	47.15	34.18		
330	64.65	64.65	64.65	64.65	51.11	38.14		
340	64.65	64.65	64.65	64.65	55.07	42.09		
350	64.65	64.65	64.65	64.65	59.03	46.05		
360	64.65	64.65	64.65	64.65	62.98	50.01		
370	64.65	64.65	64.65	64.65	64.65	53.97		
380	64.65	64.65	64.65	64.65	64.65	57.93		
390	64.65	64.65	64.65	64.65	64.65	61.89		
400	64.65	64.65	64.65	64.65	64.65	64.65		

grey background = steel failure decisive



Table A 2.5: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		80	4.76	2.00	1.26	0.84	0.25	0.00
		90	7.75	2.77	1.76	1.22	0.53	0.24
		100	12.27	3.77	2.36	1.67	0.86	0.51
		110	16.80	5.08	3.10	2.21	1.22	0.80
		120	21.32	6.90	3.99	2.84	1.65	1.14
		130	25.84	9.59	5.10	3.59	2.13	1.51
		140	30.37	14.00	6.52	4.48	2.69	1.93
		150	34.89	18.52	8.37	5.56	3.33	2.40
		160	39.41	23.05	10.90	6.89	4.06	2.94
		170	43.94	27.57	14.61	8.56	4.91	3.55
		180	48.46	32.09	19.13	10.71	5.89	4.23
		190	52.99	36.62	23.66	13.59	7.04	5.00
		200	57.51	41.14	28.18	17.73	8.40	5.86
		210	62.03	45.66	32.70	22.25	10.04	6.85
		220	66.56	50.19	37.23	26.78	12.05	7.98
		230	71.08	54.71	41.75	31.30	14.58	9.29
16	84.44	240	75.60	59.24	46.28	35.83	17.81	10.81
		250	80.13	63.76	50.80	40.35	22.22	12.59
		260	84.44	68.28	55.32	44.87	26.74	14.74
		270	84.44	72.81	59.85	49.40	31.27	17.43
		280	84.44	77.33	64.37	53.92	35.79	20.96
		290	84.44	81.85	68.89	58.44	40.32	25.49
		300	84.44	84.44	73.42	62.97	44.84	30.01
		310	84.44	84.44	77.94	67.49	49.36	34.54
		320	84.44	84.44	82.47	72.02	53.89	39.06
		330	84.44	84.44	84.44	76.54	58.41	43.58
		340	84.44	84.44	84.44	81.06	62.93	48.11
		350	84.44	84.44	84.44	84.44	67.46	52.63
		360	84.44	84.44	84.44	84.44	71.98	57.16
		370	84.44	84.44	84.44	84.44	76.51	61.68
		380	84.44	84.44	84.44	84.44	81.03	66.20
		390	84.44	84.44	84.44	84.44	84.44	70.73
		400	84.44	84.44	84.44	84.44	84.44	75.25
		450	84.44	84.44	84.44	84.44	84.44	84.44

grey background = steel failure decisive



Table A 2.6: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
18	106.87	80	5.36	2.25	1.42	0.95	0.28	0.00
		90	8.72	3.12	1.98	1.37	0.60	0.27
		100	13.81	4.24	2.66	1.88	0.96	0.57
		110	18.89	5.72	3.48	2.48	1.38	0.90
		120	23.98	7.76	4.49	3.20	1.85	1.28
		130	29.07	10.79	5.74	4.04	2.40	1.70
		140	34.16	15.75	7.33	5.05	3.02	2.17
		150	39.25	20.84	9.42	6.26	3.74	2.70
		160	44.34	25.93	12.26	7.75	4.57	3.31
		170	49.43	31.02	16.44	9.63	5.52	3.99
		180	54.52	36.11	21.52	12.05	6.63	4.76
		190	59.61	41.19	26.61	15.29	7.92	5.62
		200	64.70	46.28	31.70	19.95	9.46	6.60
		210	69.79	51.37	36.79	25.04	11.30	7.70
		220	74.88	56.46	41.88	30.12	13.56	8.97
		230	79.97	61.55	46.97	35.21	16.40	10.45
		240	85.05	66.64	52.06	40.30	20.04	12.16
		250	90.14	71.73	57.15	45.39	25.00	14.17
		260	95.23	76.82	62.24	50.48	30.09	16.59
		270	100.32	81.91	67.33	55.57	35.18	19.61
		280	105.41	87.00	72.42	60.66	40.27	23.59
		290	106.87	92.09	77.51	65.75	45.35	28.67
		300	106.87	97.18	82.60	70.84	50.44	33.76
		310	106.87	102.27	87.68	75.93	55.53	38.85
		320	106.87	106.87	92.77	81.02	60.62	43.94
		330	106.87	106.87	97.86	86.11	65.71	49.03
		340	106.87	106.87	102.95	91.20	70.80	54.12
		350	106.87	106.87	106.87	96.28	75.89	59.21
360	106.87	106.87	106.87	101.37	80.98	64.30		
370	106.87	106.87	106.87	106.46	86.07	69.39		
380	106.87	106.87	106.87	106.87	91.16	74.48		
390	106.87	106.87	106.87	106.87	96.25	79.57		
400	106.87	106.87	106.87	106.87	101.34	84.66		
450	106.87	106.87	106.87	106.87	106.87	106.87		

grey background = steel failure decisive



Table A 2.7: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
20	131.94	90	9.68	3.47	2.20	1.53	0.67	0.30
		100	15.34	4.71	2.95	2.09	1.07	0.63
		110	20.99	6.35	3.87	2.76	1.53	1.01
		120	26.65	8.63	4.99	3.55	2.06	1.42
		130	32.30	11.99	6.38	4.49	2.66	1.89
		140	37.96	17.50	8.15	5.61	3.36	2.41
		150	43.61	23.15	10.47	6.95	4.16	3.00
		160	49.27	28.81	13.62	8.61	5.08	3.67
		170	54.92	34.46	18.26	10.70	6.14	4.43
		180	60.58	40.12	23.92	13.39	7.36	5.28
		190	66.23	45.77	29.57	16.98	8.80	6.24
		200	71.89	51.43	35.23	22.16	10.51	7.33
		210	77.54	57.08	40.88	27.82	12.55	8.56
		220	83.20	62.74	46.53	33.47	15.07	9.97
		230	88.85	68.39	52.19	39.13	18.22	11.61
		240	94.51	74.05	57.84	44.78	22.26	13.51
		250	100.16	79.70	63.50	50.44	27.77	15.74
		260	105.81	85.35	69.15	56.09	33.43	18.43
		270	111.47	91.01	74.81	61.75	39.08	21.79
		280	117.12	96.66	80.46	67.40	44.74	26.21
290	122.78	102.32	86.12	73.06	50.39	31.86		
300	128.43	107.97	91.77	78.71	56.05	37.52		
310	131.94	113.63	97.43	84.36	61.70	43.17		
320	131.94	119.28	103.08	90.02	67.36	48.83		
330	131.94	124.94	108.74	95.67	73.01	54.48		
340	131.94	130.59	114.39	101.33	78.67	60.13		
350	131.94	131.94	120.05	106.98	84.32	65.79		
360	131.94	131.94	125.70	112.64	89.98	71.44		
370	131.94	131.94	131.36	118.29	95.63	77.10		
380	131.94	131.94	131.94	123.95	101.29	82.75		
390	131.94	131.94	131.94	129.60	106.94	88.41		
400	131.94	131.94	131.94	131.94	112.60	94.06		
450	131.94	131.94	131.94	131.94	131.94	122.34		
500	131.94	131.94	131.94	131.94	131.94	131.94		

grey background = steel failure decisive



Table A 2.8: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		90	10.65	3.81	2.42	1.68	0.74	0.33
		100	16.87	5.18	3.25	2.30	1.18	0.70
		110	23.09	6.99	4.26	3.03	1.68	1.11
		120	29.31	9.49	5.49	3.91	2.26	1.56
		130	35.53	13.19	7.02	4.94	2.93	2.08
		140	41.75	19.25	8.96	6.17	3.70	2.65
		150	47.97	25.47	11.51	7.65	4.58	3.30
		160	54.19	31.69	14.98	9.48	5.59	4.04
		170	60.41	37.91	20.09	11.77	6.75	4.88
		180	66.63	44.13	26.31	14.73	8.10	5.81
		190	72.85	50.35	32.53	18.68	9.68	6.87
		200	79.07	56.57	38.75	24.38	11.56	8.06
		210	85.30	62.79	44.97	30.60	13.81	9.41
		220	91.52	69.01	51.19	36.82	16.57	10.97
		230	97.74	75.23	57.41	43.04	20.05	12.77
		240	103.96	81.45	63.63	49.26	24.49	14.86
22	159.65	250	110.18	87.67	69.85	55.48	30.55	17.31
		260	116.40	93.89	76.07	61.70	36.77	20.27
		270	122.62	100.11	82.29	67.92	42.99	23.97
		280	128.84	106.33	88.51	74.14	49.21	28.83
		290	135.06	112.55	94.73	80.36	55.43	35.05
		300	141.28	118.77	100.95	86.58	61.65	41.27
		310	147.50	124.99	107.17	92.80	67.87	47.49
		320	153.72	131.21	113.39	99.02	74.09	53.71
		330	159.65	137.43	119.61	105.24	80.31	59.93
		340	159.65	143.65	125.83	111.46	86.53	66.15
		350	159.65	149.87	132.05	117.68	92.75	72.37
		360	159.65	156.09	138.27	123.90	98.97	78.59
		370	159.65	159.65	144.49	130.12	105.19	84.81
		380	159.65	159.65	150.71	136.34	111.41	91.03
		390	159.65	159.65	156.93	142.56	117.63	97.25
		400	159.65	159.65	159.65	148.78	123.85	103.47
		450	159.65	159.65	159.65	159.65	154.96	134.57
		500	159.65	159.65	159.65	159.65	159.65	159.65

grey background = steel failure decisive



Table A 2.9: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
24	190.00	90	11.62	4.16	2.64	1.83	0.80	0.36
		100	18.41	5.66	3.54	2.51	1.29	0.76
		110	25.19	7.62	4.64	3.31	1.84	1.21
		120	31.98	10.35	5.99	4.26	2.47	1.71
		130	38.76	14.38	7.66	5.39	3.20	2.26
		140	45.55	21.00	9.78	6.73	4.03	2.89
		150	52.34	27.78	12.56	8.34	4.99	3.60
		160	59.12	34.57	16.35	10.34	6.09	4.41
		170	65.91	41.35	21.91	12.84	7.36	5.32
		180	72.69	48.14	28.70	16.07	8.84	6.34
		190	79.48	54.93	35.48	20.38	10.57	7.49
		200	86.26	61.71	42.27	26.60	12.61	8.80
		210	93.05	68.50	49.06	33.38	15.06	10.27
		220	99.83	75.28	55.84	40.17	18.08	11.96
		230	106.62	82.07	62.63	46.95	21.87	13.93
		240	113.41	88.85	69.41	53.74	26.72	16.21
		250	120.19	95.64	76.20	60.52	33.33	18.89
		260	126.98	102.43	82.98	67.31	40.12	22.12
		270	133.76	109.21	89.77	74.09	46.90	26.15
		280	140.55	116.00	96.56	80.88	53.69	31.45
		290	147.33	122.78	103.34	87.67	60.47	38.23
		300	154.12	129.57	110.13	94.45	67.26	45.02
		310	160.91	136.35	116.91	101.24	74.04	51.80
		320	167.69	143.14	123.70	108.02	80.83	58.59
330	174.48	149.92	130.48	114.81	87.62	65.38		
340	181.26	156.71	137.27	121.59	94.40	72.16		
350	188.05	163.50	144.06	128.38	101.19	78.95		
360	190.00	170.28	150.84	135.17	107.97	85.73		
370	190.00	177.07	157.63	141.95	114.76	92.52		
380	190.00	183.85	164.41	148.74	121.54	99.30		
390	190.00	190.00	171.20	155.52	128.33	106.09		
400	190.00	190.00	177.98	162.31	135.11	112.88		
450	190.00	190.00	190.00	190.00	169.04	146.80		
500	190.00	190.00	190.00	190.00	190.00	180.73		
550	190.00	190.00	190.00	190.00	190.00	190.00		

grey background = steel failure decisive



Table A 2.10: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
25	206.16	100	19.17	5.89	3.69	2.61	1.34	0.79
		110	26.24	7.94	4.84	3.45	1.91	1.26
		120	33.31	10.78	6.24	4.44	2.57	1.78
		130	40.38	14.98	7.97	5.61	3.33	2.36
		140	47.45	21.87	10.19	7.01	4.20	3.02
		150	54.52	28.94	13.08	8.69	5.20	3.76
		160	61.58	36.01	17.03	10.77	6.35	4.59
		170	68.65	43.08	22.83	13.37	7.67	5.54
		180	75.72	50.15	29.90	16.73	9.20	6.61
		190	82.79	57.21	36.96	21.23	11.01	7.81
		200	89.86	64.28	44.03	27.70	13.13	9.16
		210	96.93	71.35	51.10	34.77	15.69	10.70
		220	103.99	78.42	58.17	41.84	18.84	12.46
		230	111.06	85.49	65.24	48.91	22.78	14.51
		240	118.13	92.56	72.31	55.98	27.83	16.88
		250	125.20	99.62	79.37	63.05	34.72	19.67
		260	132.27	106.69	86.44	70.11	41.79	23.04
		270	139.34	113.76	93.51	77.18	48.86	27.24
		280	146.40	120.83	100.58	84.25	55.92	32.76
		290	153.47	127.90	107.65	91.32	62.99	39.83
		300	160.54	134.97	114.72	98.39	70.06	46.89
		310	167.61	142.03	121.78	105.46	77.13	53.96
		320	174.68	149.10	128.85	112.52	84.20	61.03
		330	181.75	156.17	135.92	119.59	91.27	68.10
		340	188.82	163.24	142.99	126.66	98.33	75.17
350	195.88	170.31	150.06	133.73	105.40	82.24		
360	202.95	177.38	157.13	140.80	112.47	89.30		
370	206.16	184.45	164.19	147.87	119.54	96.37		
380	206.16	191.51	171.26	154.93	126.61	103.44		
390	206.16	198.58	178.33	162.00	133.68	110.51		
400	206.16	205.65	185.40	169.07	140.74	117.58		
450	206.16	206.16	206.16	204.41	176.09	152.92		
500	206.16	206.16	206.16	206.16	206.16	188.26		
550	206.16	206.16	206.16	206.16	206.16	206.16		

grey background = steel failure decisive



Table A 2.11: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
26	222.98	260	137.56	110.96	89.90	72.92	43.46	23.96
		270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
		360	211.07	184.47	163.41	146.43	116.97	92.88
		370	218.42	191.82	170.76	153.78	124.32	100.23
		380	222.98	199.17	178.11	161.13	131.67	107.58
		390	222.98	206.53	185.46	168.48	139.02	114.93
		400	222.98	213.88	192.82	175.83	146.37	122.28
		450	222.98	222.98	222.98	212.59	183.13	159.04
		500	222.98	222.98	222.98	222.98	219.89	195.79
		550	222.98	222.98	222.98	222.98	222.98	222.98

grey background = steel failure decisive



Table A 2.12: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
28	222.98	260	137.56	110.96	89.90	72.92	43.46	23.96
		270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
		360	211.07	184.47	163.41	146.43	116.97	92.88
		370	218.42	191.82	170.76	153.78	124.32	100.23
		380	222.98	199.17	178.11	161.13	131.67	107.58
		390	222.98	206.53	185.46	168.48	139.02	114.93
		400	222.98	213.88	192.82	175.83	146.37	122.28
		450	222.98	222.98	222.98	212.59	183.13	159.04
		500	222.98	222.98	222.98	222.98	219.89	195.79
		550	222.98	222.98	222.98	222.98	222.98	222.98

grey background = steel failure decisive



Table A 2.13: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
30	296.87	110	31.49	9.53	5.81	4.14	2.30	1.51
		120	39.97	12.94	7.49	5.33	3.09	2.13
		130	48.46	17.98	9.57	6.74	3.99	2.83
		140	56.94	26.25	12.22	8.41	5.04	3.62
		150	65.42	34.73	15.70	10.43	6.24	4.51
		160	73.90	43.21	20.43	12.92	7.62	5.51
		170	82.38	51.69	27.39	16.04	9.20	6.65
		180	90.87	60.18	35.87	20.08	11.05	7.93
		190	99.35	68.66	44.36	25.48	13.21	9.37
		200	107.83	77.14	52.84	33.24	15.76	11.00
		210	116.31	85.62	61.32	41.73	18.83	12.84
		220	124.79	94.10	69.80	50.21	22.60	14.96
		230	133.28	102.59	78.28	58.69	27.34	17.42
		240	141.76	111.07	86.77	67.17	33.40	20.26
		250	150.24	119.55	95.25	75.65	41.66	23.61
		260	158.72	128.03	103.73	84.14	50.14	27.65
		270	167.20	136.51	112.21	92.62	58.63	32.69
		280	175.69	145.00	120.69	101.10	67.11	39.31
		290	184.17	153.48	129.18	109.58	75.59	47.79
		300	192.65	161.96	137.66	118.06	84.07	56.27
		310	201.13	170.44	146.14	126.55	92.55	64.76
		320	209.61	178.92	154.62	135.03	101.04	73.24
		330	218.10	187.41	163.10	143.51	109.52	81.72
		340	226.58	195.89	171.59	151.99	118.00	90.20
		350	235.06	204.37	180.07	160.47	126.48	98.68
		360	243.54	212.85	188.55	168.96	134.96	107.17
		370	252.02	221.33	197.03	177.44	143.45	115.65
380	260.51	229.82	205.52	185.92	151.93	124.13		
390	268.99	238.30	214.00	194.40	160.41	132.61		
400	277.47	246.78	222.48	202.89	168.89	141.09		
450	296.87	289.19	264.89	245.30	211.30	183.50		
500	296.87	296.87	296.87	287.71	253.71	225.91		
550	296.87	296.87	296.87	296.87	296.12	268.32		
600	296.87	296.87	296.87	296.87	296.87	296.87		

grey background = steel failure decisive



Table A 2.14: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		120	42.64	13.80	7.99	5.68	3.29	2.27
		130	51.69	19.18	10.21	7.19	4.26	3.02
		140	60.73	28.00	13.04	8.97	5.38	3.86
		150	69.78	37.04	16.74	11.13	6.66	4.81
		160	78.83	46.09	21.80	13.78	8.13	5.88
		170	87.88	55.14	29.22	17.11	9.82	7.09
		180	96.92	64.19	38.27	21.42	11.78	8.46
		190	105.97	73.23	47.31	27.17	14.09	9.99
		200	115.02	82.28	56.36	35.46	16.81	11.73
		210	124.07	91.33	65.41	44.51	20.09	13.69
		220	133.11	100.38	74.46	53.56	24.11	15.95
		230	142.16	109.42	83.50	62.60	29.16	18.58
		240	151.21	118.47	92.55	71.65	35.62	21.61
		250	160.26	127.52	101.60	80.70	44.44	25.18
		260	169.30	136.57	110.65	89.75	53.49	29.49
		270	178.35	145.61	119.69	98.79	62.53	34.86
32	337.77	280	187.40	154.66	128.74	107.84	71.58	41.93
		290	196.45	163.71	137.79	116.89	80.63	50.98
		300	205.49	172.76	146.84	125.94	89.68	60.03
		310	214.54	181.80	155.88	134.98	98.73	69.07
		320	223.59	190.85	164.93	144.03	107.77	78.12
		330	232.64	199.90	173.98	153.08	116.82	87.17
		340	241.68	208.95	183.03	162.13	125.87	96.22
		350	250.73	217.99	192.07	171.17	134.92	105.26
		360	259.78	227.04	201.12	180.22	143.96	114.31
		370	268.83	236.09	210.17	189.27	153.01	123.36
		380	277.87	245.14	219.22	198.32	162.06	132.41
		390	286.92	254.18	228.26	207.36	171.11	141.45
		400	295.97	263.23	237.31	216.41	180.15	150.50
		450	337.77	308.47	282.55	261.65	225.39	195.74
		500	337.77	337.77	327.79	306.89	270.63	240.98
		550	337.77	337.77	337.77	337.77	315.87	286.21
		600	337.77	337.77	337.77	337.77	337.77	331.45
		650	337.77	337.77	337.77	337.77	337.77	337.77

grey background = steel failure decisive



Table A 2.15: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
34	381.32	130	54.92	20.38	10.84	7.63	4.53	3.21
		140	64.53	29.75	13.85	9.53	5.71	4.10
		150	74.14	39.36	17.79	11.82	7.07	5.11
		160	83.75	48.97	23.16	14.64	8.63	6.25
		170	93.37	58.59	31.04	18.18	10.43	7.53
		180	102.98	68.20	40.66	22.76	12.52	8.98
		190	112.59	77.81	50.27	28.87	14.97	10.62
		200	122.21	87.42	59.88	37.68	17.86	12.46
		210	131.82	97.04	69.50	47.29	21.34	14.55
		220	141.43	106.65	79.11	56.90	25.62	16.95
		230	151.05	116.26	88.72	66.52	30.98	19.74
		240	160.66	125.88	98.34	76.13	37.85	22.96
		250	170.27	135.49	107.95	85.74	47.22	26.76
		260	179.88	145.10	117.56	95.35	56.83	31.33
		270	189.50	154.72	127.17	104.97	66.44	37.04
		280	199.11	164.33	136.79	114.58	76.06	44.55
		290	208.72	173.94	146.40	124.19	85.67	54.16
		300	218.34	183.55	156.01	133.81	95.28	63.78
		310	227.95	193.17	165.63	143.42	104.90	73.39
		320	237.56	202.78	175.24	153.03	114.51	83.00
		330	247.18	212.39	184.85	162.65	124.12	92.62
		340	256.79	222.01	194.47	172.26	133.73	102.23
		350	266.40	231.62	204.08	181.87	143.35	111.84
		360	276.01	241.23	213.69	191.48	152.96	121.45
		370	285.63	250.85	223.30	201.10	162.57	131.07
		380	295.24	260.46	232.92	210.71	172.19	140.68
		390	304.85	270.07	242.53	220.32	181.80	150.29
		400	314.47	279.68	252.14	229.94	191.41	159.91
450	362.53	327.75	300.21	278.00	239.48	207.97		
500	381.32	375.81	348.27	326.07	287.54	256.04		
550	381.32	381.32	381.32	374.13	335.61	304.10		
600	381.32	381.32	381.32	381.32	381.32	352.17		
650	381.32	381.32	381.32	381.32	381.32	381.32		

grey background = steel failure decisive



Table A 2.16: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
36	427.50	200	129.40	92.57	63.41	39.89	18.91	13.19
		210	139.57	102.75	73.58	50.07	22.60	15.41
		220	149.75	112.92	83.76	60.25	27.12	17.95
		230	159.93	123.10	93.94	70.43	32.80	20.90
		240	170.11	133.28	104.12	80.61	40.07	24.31
		250	180.29	143.46	114.30	90.79	49.99	28.33
		260	190.47	153.64	124.48	100.96	60.17	33.18
		270	200.64	163.82	134.66	111.14	70.35	39.22
		280	210.82	174.00	144.83	121.32	80.53	47.17
		290	221.00	184.17	155.01	131.50	90.71	57.35
		300	231.18	194.35	165.19	141.68	100.89	67.53
		310	241.36	204.53	175.37	151.86	111.07	77.71
		320	251.54	214.71	185.55	162.03	121.24	87.89
		330	261.72	224.89	195.73	172.21	131.42	98.06
		340	271.89	235.07	205.90	182.39	141.60	108.24
		350	282.07	245.24	216.08	192.57	151.78	118.42
		360	292.25	255.42	226.26	202.75	161.96	128.60
		370	302.43	265.60	236.44	212.93	172.14	138.78
		380	312.61	275.78	246.62	223.11	182.31	148.96
		390	322.79	285.96	256.80	233.28	192.49	159.13
		400	332.96	296.14	266.98	243.46	202.67	169.31
450	383.86	347.03	317.87	294.35	253.56	220.21		
500	427.50	397.92	368.76	345.25	304.46	271.10		
550	427.50	427.50	419.65	396.14	355.35	321.99		
600	427.50	427.50	427.50	427.50	406.24	372.88		
650	427.50	427.50	427.50	427.50	427.50	423.77		
700	427.50	427.50	427.50	427.50	427.50	427.50		

grey background = steel failure decisive



Table A 2.17: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 420 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 420 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
40	527.77	200	143.77	102.85	70.45	44.33	21.01	14.66
		210	155.08	114.16	81.76	55.63	25.11	17.12
		220	166.39	125.47	93.07	66.94	30.14	19.94
		230	177.70	136.78	104.38	78.25	36.45	23.22
		240	189.01	148.09	115.69	89.56	44.53	27.01
		250	200.32	159.40	127.00	100.87	55.55	31.48
		260	211.63	170.71	138.31	112.18	66.86	36.86
		270	222.94	182.02	149.62	123.49	78.17	43.58
		280	234.25	193.33	160.93	134.80	89.48	52.41
		290	245.56	204.64	172.24	146.11	100.79	63.72
		300	256.87	215.95	183.55	157.42	112.10	75.03
		310	268.18	227.26	194.85	168.73	123.41	86.34
		320	279.49	238.57	206.16	180.04	134.72	97.65
		330	290.79	249.87	217.47	191.35	146.03	108.96
		340	302.10	261.18	228.78	202.66	157.33	120.27
		350	313.41	272.49	240.09	213.97	168.64	131.58
		360	324.72	283.80	251.40	225.28	179.95	142.89
		370	336.03	295.11	262.71	236.59	191.26	154.20
		380	347.34	306.42	274.02	247.89	202.57	165.51
		390	358.65	317.73	285.33	259.20	213.88	176.82
400	369.96	329.04	296.64	270.51	225.19	188.13		
450	426.51	385.59	353.19	327.06	281.74	244.67		
500	483.05	442.13	409.73	383.61	338.28	301.22		
550	527.77	498.68	466.28	440.15	394.83	357.77		
600	527.77	527.77	522.83	496.70	451.38	414.31		
650	527.77	527.77	527.77	527.77	507.93	470.86		
700	527.77	527.77	527.77	527.77	527.77	527.41		
750	527.77	527.77	527.77	527.77	527.77	527.77		

grey background = steel failure decisive



Enclosure 3 Characteristic tensile load in a fire case for reinforcing steel BSt 460 S used as an anchor as a function of the fire-resistance period t_u

Table A 3.1: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			h_{ef}	R30	R60	R90	R120	R180
		60	0.99	0.46	0.26	0.12	0.00	0.00
		70	1.54	0.70	0.43	0.26	0.00	0.00
		80	2.38	1.00	0.63	0.42	0.13	0.00
		90	3.87	1.39	0.88	0.61	0.27	0.12
		100	6.14	1.89	1.18	0.84	0.43	0.25
		110	8.40	2.54	1.55	1.10	0.61	0.40
		120	10.66	3.45	2.00	1.42	0.82	0.57
		130	12.92	4.79	2.55	1.80	1.07	0.75
		140	15.18	7.00	3.26	2.24	1.34	0.96
		150	17.45	9.26	4.19	2.78	1.66	1.20
		160	19.71	11.52	5.45	3.45	2.03	1.47
		170	21.97	13.78	7.30	4.28	2.45	1.77
		180	23.12	16.05	9.57	5.36	2.95	2.11
		190	23.12	18.31	11.83	6.79	3.52	2.50
8	23.12	200	23.12	20.57	14.09	8.87	4.20	2.93
		210	23.12	22.83	16.35	11.13	5.02	3.42
		220	23.12	23.12	18.61	13.39	6.03	3.99
		230	23.12	23.12	20.88	15.65	7.29	4.64
		240	23.12	23.12	23.12	17.91	8.91	5.40
		250	23.12	23.12	23.12	20.17	11.11	6.30
		260	23.12	23.12	23.12	22.44	13.37	7.37
		270	23.12	23.12	23.12	23.12	15.63	8.72
		280	23.12	23.12	23.12	23.12	17.90	10.48
		290	23.12	23.12	23.12	23.12	20.16	12.74
		300	23.12	23.12	23.12	23.12	22.42	15.01
		310	23.12	23.12	23.12	23.12	23.12	17.27
		320	23.12	23.12	23.12	23.12	23.12	19.53
		330	23.12	23.12	23.12	23.12	23.12	21.79
		340	23.12	23.12	23.12	23.12	23.12	23.12

grey background = steel failure decisive



Table A 3.2: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
10	36.13	60	1.23	0.57	0.32	0.15	0.00	0.00
		70	1.92	0.87	0.53	0.32	0.00	0.00
		80	2.98	1.25	0.79	0.53	0.16	0.00
		90	4.84	1.73	1.10	0.76	0.33	0.15
		100	7.67	2.36	1.48	1.05	0.54	0.32
		110	10.50	3.18	1.94	1.38	0.77	0.50
		120	13.32	4.31	2.50	1.78	1.03	0.71
		130	16.15	5.99	3.19	2.25	1.33	0.94
		140	18.98	8.75	4.07	2.80	1.68	1.21
		150	21.81	11.58	5.23	3.48	2.08	1.50
		160	24.63	14.40	6.81	4.31	2.54	1.84
		170	27.46	17.23	9.13	5.35	3.07	2.22
		180	30.29	20.06	11.96	6.69	3.68	2.64
		190	33.12	22.89	14.79	8.49	4.40	3.12
		200	35.94	25.71	17.61	11.08	5.25	3.67
		210	36.13	28.54	20.44	13.91	6.28	4.28
		220	36.13	31.37	23.27	16.74	7.53	4.99
		230	36.13	34.20	26.09	19.56	9.11	5.81
		240	36.13	36.13	28.92	22.39	11.13	6.75
		250	36.13	36.13	31.75	25.22	13.89	7.87
		260	36.13	36.13	34.58	28.05	16.71	9.22
		270	36.13	36.13	36.13	30.87	19.54	10.90
		280	36.13	36.13	36.13	33.70	22.37	13.10
		290	36.13	36.13	36.13	36.13	25.20	15.93
		300	36.13	36.13	36.13	36.13	28.02	18.76
		310	36.13	36.13	36.13	36.13	30.85	21.59
		320	36.13	36.13	36.13	36.13	33.68	24.41
		330	36.13	36.13	36.13	36.13	36.13	27.24
		340	36.13	36.13	36.13	36.13	36.13	30.07
		350	36.13	36.13	36.13	36.13	36.13	32.89
		360	36.13	36.13	36.13	36.13	36.13	35.72
		370	36.13	36.13	36.13	36.13	36.13	36.13

grey background = steel failure decisive



Table A 3.3: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		70	2.30	1.05	0.64	0.39	0.00	0.00
		80	3.57	1.50	0.95	0.63	0.19	0.00
		90	5.81	2.08	1.32	0.92	0.40	0.18
		100	9.20	2.83	1.77	1.25	0.64	0.38
		110	12.60	3.81	2.32	1.66	0.92	0.60
		120	15.99	5.18	3.00	2.13	1.23	0.85
		130	19.38	7.19	3.83	2.69	1.60	1.13
		140	22.77	10.50	4.89	3.36	2.02	1.45
		150	26.17	13.89	6.28	4.17	2.50	1.80
		160	29.56	17.28	8.17	5.17	3.05	2.20
		170	32.95	20.68	10.96	6.42	3.68	2.66
		180	36.35	24.07	14.35	8.03	4.42	3.17
		190	39.74	27.46	17.74	10.19	5.28	3.75
		200	43.13	30.86	21.14	13.30	6.30	4.40
		210	46.52	34.25	24.53	16.69	7.53	5.14
		220	49.92	37.64	27.92	20.08	9.04	5.98
12	52.02	230	52.02	41.03	31.31	23.48	10.93	6.97
		240	52.02	44.43	34.71	26.87	13.36	8.10
		250	52.02	47.82	38.10	30.26	16.66	9.44
		260	52.02	51.21	41.49	33.65	20.06	11.06
		270	52.02	52.02	44.89	37.05	23.45	13.07
		280	52.02	52.02	48.28	40.44	26.84	15.72
		290	52.02	52.02	51.67	43.83	30.24	19.12
		300	52.02	52.02	52.02	47.23	33.63	22.51
		310	52.02	52.02	52.02	50.62	37.02	25.90
		320	52.02	52.02	52.02	52.02	40.41	29.30
		330	52.02	52.02	52.02	52.02	43.81	32.69
		340	52.02	52.02	52.02	52.02	47.20	36.08
		350	52.02	52.02	52.02	52.02	50.59	39.47
		360	52.02	52.02	52.02	52.02	52.02	42.87
		370	52.02	52.02	52.02	52.02	52.02	46.26
		380	52.02	52.02	52.02	52.02	52.02	49.65
		390	52.02	52.02	52.02	52.02	52.02	52.02

grey background = steel failure decisive



Table A 3.4: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		70	2.69	1.22	0.75	0.45	0.00	0.00
		80	4.17	1.75	1.10	0.74	0.22	0.00
		90	6.78	2.43	1.54	1.07	0.47	0.21
		100	10.74	3.30	2.07	1.46	0.75	0.44
		110	14.70	4.45	2.71	1.93	1.07	0.70
		120	18.65	6.04	3.50	2.49	1.44	0.99
		130	22.61	8.39	4.47	3.14	1.86	1.32
		140	26.57	12.25	5.70	3.92	2.35	1.69
		150	30.53	16.21	7.33	4.87	2.91	2.10
		160	34.49	20.17	9.54	6.03	3.56	2.57
		170	38.45	24.12	12.78	7.49	4.30	3.10
		180	42.40	28.08	16.74	9.37	5.15	3.70
		190	46.36	32.04	20.70	11.89	6.16	4.37
		200	50.32	36.00	24.66	15.51	7.35	5.13
		210	54.28	39.96	28.62	19.47	8.79	5.99
		220	58.24	43.91	32.57	23.43	10.55	6.98
		230	62.20	47.87	36.53	27.39	12.76	8.13
14	70.81	240	66.15	51.83	40.49	31.35	15.58	9.46
		250	70.11	55.79	44.45	35.31	19.44	11.02
		260	70.81	59.75	48.41	39.26	23.40	12.90
		270	70.81	63.71	52.37	43.22	27.36	15.25
		280	70.81	67.66	56.32	47.18	31.32	18.34
		290	70.81	70.81	60.28	51.14	35.28	22.30
		300	70.81	70.81	64.24	55.10	39.23	26.26
		310	70.81	70.81	68.20	59.06	43.19	30.22
		320	70.81	70.81	70.81	63.01	47.15	34.18
		330	70.81	70.81	70.81	66.97	51.11	38.14
		340	70.81	70.81	70.81	70.81	55.07	42.09
		350	70.81	70.81	70.81	70.81	59.03	46.05
		360	70.81	70.81	70.81	70.81	62.98	50.01
		370	70.81	70.81	70.81	70.81	66.94	53.97
		380	70.81	70.81	70.81	70.81	70.81	57.93
		390	70.81	70.81	70.81	70.81	70.81	61.89
		400	70.81	70.81	70.81	70.81	70.81	65.84
		450	70.81	70.81	70.81	70.81	70.81	70.81

grey background = steel failure decisive



Table A 3.5: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		80	4.76	2.00	1.26	0.84	0.25	0.00
		90	7.75	2.77	1.76	1.22	0.53	0.24
		100	12.27	3.77	2.36	1.67	0.86	0.51
		110	16.80	5.08	3.10	2.21	1.22	0.80
		120	21.32	6.90	3.99	2.84	1.65	1.14
		130	25.84	9.59	5.10	3.59	2.13	1.51
		140	30.37	14.00	6.52	4.48	2.69	1.93
		150	34.89	18.52	8.37	5.56	3.33	2.40
		160	39.41	23.05	10.90	6.89	4.06	2.94
		170	43.94	27.57	14.61	8.56	4.91	3.55
		180	48.46	32.09	19.13	10.71	5.89	4.23
		190	52.99	36.62	23.66	13.59	7.04	5.00
		200	57.51	41.14	28.18	17.73	8.40	5.86
		210	62.03	45.66	32.70	22.25	10.04	6.85
		220	66.56	50.19	37.23	26.78	12.05	7.98
		230	71.08	54.71	41.75	31.30	14.58	9.29
16	92.49	240	75.60	59.24	46.28	35.83	17.81	10.81
		250	80.13	63.76	50.80	40.35	22.22	12.59
		260	84.65	68.28	55.32	44.87	26.74	14.74
		270	89.18	72.81	59.85	49.40	31.27	17.43
		280	92.49	77.33	64.37	53.92	35.79	20.96
		290	92.49	81.85	68.89	58.44	40.32	25.49
		300	92.49	86.38	73.42	62.97	44.84	30.01
		310	92.49	90.90	77.94	67.49	49.36	34.54
		320	92.49	92.49	82.47	72.02	53.89	39.06
		330	92.49	92.49	86.99	76.54	58.41	43.58
		340	92.49	92.49	91.51	81.06	62.93	48.11
		350	92.49	92.49	92.49	85.59	67.46	52.63
		360	92.49	92.49	92.49	90.11	71.98	57.16
		370	92.49	92.49	92.49	92.49	76.51	61.68
		380	92.49	92.49	92.49	92.49	81.03	66.20
		390	92.49	92.49	92.49	92.49	85.55	70.73
		400	92.49	92.49	92.49	92.49	90.08	75.25
		450	92.49	92.49	92.49	92.49	92.49	92.49

grey background = steel failure decisive



Table A 3.6: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	R Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
18	117.05	80	5.36	2.25	1.42	0.95	0.28	0.00
		90	8.72	3.12	1.98	1.37	0.60	0.27
		100	13.81	4.24	2.66	1.88	0.96	0.57
		110	18.89	5.72	3.48	2.48	1.38	0.90
		120	23.98	7.76	4.49	3.20	1.85	1.28
		130	29.07	10.79	5.74	4.04	2.40	1.70
		140	34.16	15.75	7.33	5.05	3.02	2.17
		150	39.25	20.84	9.42	6.26	3.74	2.70
		160	44.34	25.93	12.26	7.75	4.57	3.31
		170	49.43	31.02	16.44	9.63	5.52	3.99
		180	54.52	36.11	21.52	12.05	6.63	4.76
		190	59.61	41.19	26.61	15.29	7.92	5.62
		200	64.70	46.28	31.70	19.95	9.46	6.60
		210	69.79	51.37	36.79	25.04	11.30	7.70
		220	74.88	56.46	41.88	30.12	13.56	8.97
		230	79.97	61.55	46.97	35.21	16.40	10.45
		240	85.05	66.64	52.06	40.30	20.04	12.16
		250	90.14	71.73	57.15	45.39	25.00	14.17
		260	95.23	76.82	62.24	50.48	30.09	16.59
		270	100.32	81.91	67.33	55.57	35.18	19.61
		280	105.41	87.00	72.42	60.66	40.27	23.59
		290	110.50	92.09	77.51	65.75	45.35	28.67
		300	115.59	97.18	82.60	70.84	50.44	33.76
		310	117.05	102.27	87.68	75.93	55.53	38.85
		320	117.05	107.35	92.77	81.02	60.62	43.94
		330	117.05	112.44	97.86	86.11	65.71	49.03
340	117.05	117.05	102.95	91.20	70.80	54.12		
350	117.05	117.05	108.04	96.28	75.89	59.21		
360	117.05	117.05	113.13	101.37	80.98	64.30		
370	117.05	117.05	117.05	106.46	86.07	69.39		
380	117.05	117.05	117.05	111.55	91.16	74.48		
390	117.05	117.05	117.05	116.64	96.25	79.57		
400	117.05	117.05	117.05	117.05	101.34	84.66		
450	117.05	117.05	117.05	117.05	117.05	110.10		
500	117.05	117.05	117.05	117.05	117.05	117.05		

grey background = steel failure decisive



Table A 3.7: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
20	144.51	90	9.68	3.47	2.20	1.53	0.67	0.30
		100	15.34	4.71	2.95	2.09	1.07	0.63
		110	20.99	6.35	3.87	2.76	1.53	1.01
		120	26.65	8.63	4.99	3.55	2.06	1.42
		130	32.30	11.99	6.38	4.49	2.66	1.89
		140	37.96	17.50	8.15	5.61	3.36	2.41
		150	43.61	23.15	10.47	6.95	4.16	3.00
		160	49.27	28.81	13.62	8.61	5.08	3.67
		170	54.92	34.46	18.26	10.70	6.14	4.43
		180	60.58	40.12	23.92	13.39	7.36	5.28
		190	66.23	45.77	29.57	16.98	8.80	6.24
		200	71.89	51.43	35.23	22.16	10.51	7.33
		210	77.54	57.08	40.88	27.82	12.55	8.56
		220	83.20	62.74	46.53	33.47	15.07	9.97
		230	88.85	68.39	52.19	39.13	18.22	11.61
		240	94.51	74.05	57.84	44.78	22.26	13.51
		250	100.16	79.70	63.50	50.44	27.77	15.74
		260	105.81	85.35	69.15	56.09	33.43	18.43
		270	111.47	91.01	74.81	61.75	39.08	21.79
		280	117.12	96.66	80.46	67.40	44.74	26.21
290	122.78	102.32	86.12	73.06	50.39	31.86		
300	128.43	107.97	91.77	78.71	56.05	37.52		
310	134.09	113.63	97.43	84.36	61.70	43.17		
320	139.74	119.28	103.08	90.02	67.36	48.83		
330	144.51	124.94	108.74	95.67	73.01	54.48		
340	144.51	130.59	114.39	101.33	78.67	60.13		
350	144.51	136.25	120.05	106.98	84.32	65.79		
360	144.51	141.90	125.70	112.64	89.98	71.44		
370	144.51	144.51	131.36	118.29	95.63	77.10		
380	144.51	144.51	137.01	123.95	101.29	82.75		
390	144.51	144.51	142.66	129.60	106.94	88.41		
400	144.51	144.51	144.51	135.26	112.60	94.06		
450	144.51	144.51	144.51	144.51	140.87	122.34		
500	144.51	144.51	144.51	144.51	144.51	144.51		

grey background = steel failure decisive



Table A 3.8: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		90	10.65	3.81	2.42	1.68	0.74	0.33
		100	16.87	5.18	3.25	2.30	1.18	0.70
		110	23.09	6.99	4.26	3.03	1.68	1.11
		120	29.31	9.49	5.49	3.91	2.26	1.56
		130	35.53	13.19	7.02	4.94	2.93	2.08
		140	41.75	19.25	8.96	6.17	3.70	2.65
		150	47.97	25.47	11.51	7.65	4.58	3.30
		160	54.19	31.69	14.98	9.48	5.59	4.04
		170	60.41	37.91	20.09	11.77	6.75	4.88
		180	66.63	44.13	26.31	14.73	8.10	5.81
		190	72.85	50.35	32.53	18.68	9.68	6.87
		200	79.07	56.57	38.75	24.38	11.56	8.06
		210	85.30	62.79	44.97	30.60	13.81	9.41
		220	91.52	69.01	51.19	36.82	16.57	10.97
		230	97.74	75.23	57.41	43.04	20.05	12.77
		240	103.96	81.45	63.63	49.26	24.49	14.86
		250	110.18	87.67	69.85	55.48	30.55	17.31
22	174.86	260	116.40	93.89	76.07	61.70	36.77	20.27
		270	122.62	100.11	82.29	67.92	42.99	23.97
		280	128.84	106.33	88.51	74.14	49.21	28.83
		290	135.06	112.55	94.73	80.36	55.43	35.05
		300	141.28	118.77	100.95	86.58	61.65	41.27
		310	147.50	124.99	107.17	92.80	67.87	47.49
		320	153.72	131.21	113.39	99.02	74.09	53.71
		330	159.94	137.43	119.61	105.24	80.31	59.93
		340	166.16	143.65	125.83	111.46	86.53	66.15
		350	172.38	149.87	132.05	117.68	92.75	72.37
		360	174.86	156.09	138.27	123.90	98.97	78.59
		370	174.86	162.31	144.49	130.12	105.19	84.81
		380	174.86	168.53	150.71	136.34	111.41	91.03
		390	174.86	174.75	156.93	142.56	117.63	97.25
		400	174.86	174.86	163.15	148.78	123.85	103.47
		450	174.86	174.86	174.86	174.86	154.96	134.57
		500	174.86	174.86	174.86	174.86	174.86	165.67
		550	174.86	174.86	174.86	174.86	174.86	174.86

grey background = steel failure decisive



Table A 3.9: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		90	11.62	4.16	2.64	1.83	0.80	0.36
		100	18.41	5.66	3.54	2.51	1.29	0.76
		110	25.19	7.62	4.64	3.31	1.84	1.21
		120	31.98	10.35	5.99	4.26	2.47	1.71
		130	38.76	14.38	7.66	5.39	3.20	2.26
		140	45.55	21.00	9.78	6.73	4.03	2.89
		150	52.34	27.78	12.56	8.34	4.99	3.60
		160	59.12	34.57	16.35	10.34	6.09	4.41
		170	65.91	41.35	21.91	12.84	7.36	5.32
		180	72.69	48.14	28.70	16.07	8.84	6.34
		190	79.48	54.93	35.48	20.38	10.57	7.49
		200	86.26	61.71	42.27	26.60	12.61	8.80
		210	93.05	68.50	49.06	33.38	15.06	10.27
		220	99.83	75.28	55.84	40.17	18.08	11.96
		230	106.62	82.07	62.63	46.95	21.87	13.93
		240	113.41	88.85	69.41	53.74	26.72	16.21
		250	120.19	95.64	76.20	60.52	33.33	18.89
24	208.09	260	126.98	102.43	82.98	67.31	40.12	22.12
		270	133.76	109.21	89.77	74.09	46.90	26.15
		280	140.55	116.00	96.56	80.88	53.69	31.45
		290	147.33	122.78	103.34	87.67	60.47	38.23
		300	154.12	129.57	110.13	94.45	67.26	45.02
		310	160.91	136.35	116.91	101.24	74.04	51.80
		320	167.69	143.14	123.70	108.02	80.83	58.59
		330	174.48	149.92	130.48	114.81	87.62	65.38
		340	181.26	156.71	137.27	121.59	94.40	72.16
		350	188.05	163.50	144.06	128.38	101.19	78.95
		360	194.83	170.28	150.84	135.17	107.97	85.73
		370	201.62	177.07	157.63	141.95	114.76	92.52
		380	208.09	183.85	164.41	148.74	121.54	99.30
		390	208.09	190.64	171.20	155.52	128.33	106.09
		400	208.09	197.42	177.98	162.31	135.11	112.88
		450	208.09	208.09	208.09	196.24	169.04	146.80
		500	208.09	208.09	208.09	208.09	202.97	180.73
		550	208.09	208.09	208.09	208.09	208.09	208.09

grey background = steel failure decisive



Table A 3.10: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
25	225.80	100	19.17	5.89	3.69	2.61	1.34	0.79
		110	26.24	7.94	4.84	3.45	1.91	1.26
		120	33.31	10.78	6.24	4.44	2.57	1.78
		130	40.38	14.98	7.97	5.61	3.33	2.36
		140	47.45	21.87	10.19	7.01	4.20	3.02
		150	54.52	28.94	13.08	8.69	5.20	3.76
		160	61.58	36.01	17.03	10.77	6.35	4.59
		170	68.65	43.08	22.83	13.37	7.67	5.54
		180	75.72	50.15	29.90	16.73	9.20	6.61
		190	82.79	57.21	36.96	21.23	11.01	7.81
		200	89.86	64.28	44.03	27.70	13.13	9.16
		210	96.93	71.35	51.10	34.77	15.69	10.70
		220	103.99	78.42	58.17	41.84	18.84	12.46
		230	111.06	85.49	65.24	48.91	22.78	14.51
		240	118.13	92.56	72.31	55.98	27.83	16.88
		250	125.20	99.62	79.37	63.05	34.72	19.67
		260	132.27	106.69	86.44	70.11	41.79	23.04
		270	139.34	113.76	93.51	77.18	48.86	27.24
		280	146.40	120.83	100.58	84.25	55.92	32.76
		290	153.47	127.90	107.65	91.32	62.99	39.83
		300	160.54	134.97	114.72	98.39	70.06	46.89
		310	167.61	142.03	121.78	105.46	77.13	53.96
		320	174.68	149.10	128.85	112.52	84.20	61.03
		330	181.75	156.17	135.92	119.59	91.27	68.10
		340	188.82	163.24	142.99	126.66	98.33	75.17
350	195.88	170.31	150.06	133.73	105.40	82.24		
360	202.95	177.38	157.13	140.80	112.47	89.30		
370	210.02	184.45	164.19	147.87	119.54	96.37		
380	217.09	191.51	171.26	154.93	126.61	103.44		
390	224.16	198.58	178.33	162.00	133.68	110.51		
400	225.80	205.65	185.40	169.07	140.74	117.58		
450	225.80	225.80	220.74	204.41	176.09	152.92		
500	225.80	225.80	225.80	225.80	211.43	188.26		
550	225.80	225.80	225.80	225.80	225.80	223.60		
600	225.80	225.80	225.80	225.80	225.80	225.80		

grey background = steel failure decisive



Table A 3.11: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
		260	137.56	110.96	89.90	72.92	43.46	23.96
26	244.22	270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
		360	211.07	184.47	163.41	146.43	116.97	92.88
		370	218.42	191.82	170.76	153.78	124.32	100.23
		380	225.77	199.17	178.11	161.13	131.67	107.58
		390	233.12	206.53	185.46	168.48	139.02	114.93
		400	240.47	213.88	192.82	175.83	146.37	122.28
		450	244.22	244.22	229.57	212.59	183.13	159.04
		500	244.22	244.22	244.22	244.22	219.89	195.79
		550	244.22	244.22	244.22	244.22	244.22	232.55
		600	244.22	244.22	244.22	244.22	244.22	244.22

grey background = steel failure decisive

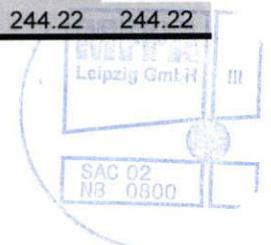


Table A 3.12: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
28	244.22	100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
		260	137.56	110.96	89.90	72.92	43.46	23.96
		270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
		360	211.07	184.47	163.41	146.43	116.97	92.88
		370	218.42	191.82	170.76	153.78	124.32	100.23
380	225.77	199.17	178.11	161.13	131.67	107.58		
390	233.12	206.53	185.46	168.48	139.02	114.93		
400	240.47	213.88	192.82	175.83	146.37	122.28		
450			244.22	244.22	229.57	212.59	183.13	
500			244.22	244.22	244.22	244.22	219.89	
550			244.22	244.22	244.22	244.22	244.22	
600			244.22	244.22	244.22	244.22	244.22	

grey background = steel failure decisive



Table A 3.13: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
30	325.15	110	31.49	9.53	5.81	4.14	2.30	1.51
		120	39.97	12.94	7.49	5.33	3.09	2.13
		130	48.46	17.98	9.57	6.74	3.99	2.83
		140	56.94	26.25	12.22	8.41	5.04	3.62
		150	65.42	34.73	15.70	10.43	6.24	4.51
		160	73.90	43.21	20.43	12.92	7.62	5.51
		170	82.38	51.69	27.39	16.04	9.20	6.65
		180	90.87	60.18	35.87	20.08	11.05	7.93
		190	99.35	68.66	44.36	25.48	13.21	9.37
		200	107.83	77.14	52.84	33.24	15.76	11.00
		210	116.31	85.62	61.32	41.73	18.83	12.84
		220	124.79	94.10	69.80	50.21	22.60	14.96
		230	133.28	102.59	78.28	58.69	27.34	17.42
		240	141.76	111.07	86.77	67.17	33.40	20.26
		250	150.24	119.55	95.25	75.65	41.66	23.61
		260	158.72	128.03	103.73	84.14	50.14	27.65
		270	167.20	136.51	112.21	92.62	58.63	32.69
		280	175.69	145.00	120.69	101.10	67.11	39.31
		290	184.17	153.48	129.18	109.58	75.59	47.79
		300	192.65	161.96	137.66	118.06	84.07	56.27
		310	201.13	170.44	146.14	126.55	92.55	64.76
		320	209.61	178.92	154.62	135.03	101.04	73.24
		330	218.10	187.41	163.10	143.51	109.52	81.72
		340	226.58	195.89	171.59	151.99	118.00	90.20
		350	235.06	204.37	180.07	160.47	126.48	98.68
		360	243.54	212.85	188.55	168.96	134.96	107.17
370	252.02	221.33	197.03	177.44	143.45	115.65		
380	260.51	229.82	205.52	185.92	151.93	124.13		
390	268.99	238.30	214.00	194.40	160.41	132.61		
400	277.47	246.78	222.48	202.89	168.89	141.09		
450	319.88	289.19	264.89	245.30	211.30	183.50		
500	325.15	325.15	307.30	287.71	253.71	225.91		
550	325.15	325.15	325.15	325.15	296.12	268.32		
600	325.15	325.15	325.15	325.15	325.15	310.73		
650	325.15	325.15	325.15	325.15	325.15	325.15		

grey background = steel failure decisive



Table A 3.14: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
32	369.94	120	42.64	13.80	7.99	5.68	3.29	2.27
		130	51.69	19.18	10.21	7.19	4.26	3.02
		140	60.73	28.00	13.04	8.97	5.38	3.86
		150	69.78	37.04	16.74	11.13	6.66	4.81
		160	78.83	46.09	21.80	13.78	8.13	5.88
		170	87.88	55.14	29.22	17.11	9.82	7.09
		180	96.92	64.19	38.27	21.42	11.78	8.46
		190	105.97	73.23	47.31	27.17	14.09	9.99
		200	115.02	82.28	56.36	35.46	16.81	11.73
		210	124.07	91.33	65.41	44.51	20.09	13.69
		220	133.11	100.38	74.46	53.56	24.11	15.95
		230	142.16	109.42	83.50	62.60	29.16	18.58
		240	151.21	118.47	92.55	71.65	35.62	21.61
		250	160.26	127.52	101.60	80.70	44.44	25.18
		260	169.30	136.57	110.65	89.75	53.49	29.49
		270	178.35	145.61	119.69	98.79	62.53	34.86
		280	187.40	154.66	128.74	107.84	71.58	41.93
		290	196.45	163.71	137.79	116.89	80.63	50.98
		300	205.49	172.76	146.84	125.94	89.68	60.03
		310	214.54	181.80	155.88	134.98	98.73	69.07
		320	223.59	190.85	164.93	144.03	107.77	78.12
		330	232.64	199.90	173.98	153.08	116.82	87.17
		340	241.68	208.95	183.03	162.13	125.87	96.22
		350	250.73	217.99	192.07	171.17	134.92	105.26
		360	259.78	227.04	201.12	180.22	143.96	114.31
		370	268.83	236.09	210.17	189.27	153.01	123.36
		380	277.87	245.14	219.22	198.32	162.06	132.41
		390	286.92	254.18	228.26	207.36	171.11	141.45
		400	295.97	263.23	237.31	216.41	180.15	150.50
		450	341.21	308.47	282.55	261.65	225.39	195.74
		500	369.94	353.71	327.79	306.89	270.63	240.98
		550	369.94	369.94	369.94	352.12	315.87	286.21
600	369.94	369.94	369.94	369.94	361.10	331.45		
650	369.94	369.94	369.94	369.94	369.94	369.94		

grey background = steel failure decisive



Table A 3.15: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		130	54.92	20.38	10.84	7.63	4.53	3.21
		140	64.53	29.75	13.85	9.53	5.71	4.10
		150	74.14	39.36	17.79	11.82	7.07	5.11
		160	83.75	48.97	23.16	14.64	8.63	6.25
		170	93.37	58.59	31.04	18.18	10.43	7.53
		180	102.98	68.20	40.66	22.76	12.52	8.98
		190	112.59	77.81	50.27	28.87	14.97	10.62
		200	122.21	87.42	59.88	37.68	17.86	12.46
		210	131.82	97.04	69.50	47.29	21.34	14.55
		220	141.43	106.65	79.11	56.90	25.62	16.95
		230	151.05	116.26	88.72	66.52	30.98	19.74
		240	160.66	125.88	98.34	76.13	37.85	22.96
		250	170.27	135.49	107.95	85.74	47.22	26.76
		260	179.88	145.10	117.56	95.35	56.83	31.33
		270	189.50	154.72	127.17	104.97	66.44	37.04
		280	199.11	164.33	136.79	114.58	76.06	44.55
		290	208.72	173.94	146.40	124.19	85.67	54.16
34	417.63	300	218.34	183.55	156.01	133.81	95.28	63.78
		310	227.95	193.17	165.63	143.42	104.90	73.39
		320	237.56	202.78	175.24	153.03	114.51	83.00
		330	247.18	212.39	184.85	162.65	124.12	92.62
		340	256.79	222.01	194.47	172.26	133.73	102.23
		350	266.40	231.62	204.08	181.87	143.35	111.84
		360	276.01	241.23	213.69	191.48	152.96	121.45
		370	285.63	250.85	223.30	201.10	162.57	131.07
		380	295.24	260.46	232.92	210.71	172.19	140.68
		390	304.85	270.07	242.53	220.32	181.80	150.29
		400	314.47	279.68	252.14	229.94	191.41	159.91
		450	362.53	327.75	300.21	278.00	239.48	207.97
		500	410.60	375.81	348.27	326.07	287.54	256.04
		550	417.63	417.63	396.34	374.13	335.61	304.10
		600	417.63	417.63	417.63	417.63	383.67	352.17
		650	417.63	417.63	417.63	417.63	417.63	400.23
		700	417.63	417.63	417.63	417.63	417.63	417.63

grey background = steel failure decisive

Table A 3.16: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
36	468.21	200	129.40	92.57	63.41	39.89	18.91	13.19
		210	139.57	102.75	73.58	50.07	22.60	15.41
		220	149.75	112.92	83.76	60.25	27.12	17.95
		230	159.93	123.10	93.94	70.43	32.80	20.90
		240	170.11	133.28	104.12	80.61	40.07	24.31
		250	180.29	143.46	114.30	90.79	49.99	28.33
		260	190.47	153.64	124.48	100.96	60.17	33.18
		270	200.64	163.82	134.66	111.14	70.35	39.22
		280	210.82	174.00	144.83	121.32	80.53	47.17
		290	221.00	184.17	155.01	131.50	90.71	57.35
		300	231.18	194.35	165.19	141.68	100.89	67.53
		310	241.36	204.53	175.37	151.86	111.07	77.71
		320	251.54	214.71	185.55	162.03	121.24	87.89
		330	261.72	224.89	195.73	172.21	131.42	98.06
		340	271.89	235.07	205.90	182.39	141.60	108.24
		350	282.07	245.24	216.08	192.57	151.78	118.42
		360	292.25	255.42	226.26	202.75	161.96	128.60
		370	302.43	265.60	236.44	212.93	172.14	138.78
		380	312.61	275.78	246.62	223.11	182.31	148.96
		390	322.79	285.96	256.80	233.28	192.49	159.13
		400	332.96	296.14	266.98	243.46	202.67	169.31
450	383.86	347.03	317.87	294.35	253.56	220.21		
500	434.75	397.92	368.76	345.25	304.46	271.10		
550	468.21	448.81	419.65	396.14	355.35	321.99		
600	468.21	468.21	468.21	447.03	406.24	372.88		
650	468.21	468.21	468.21	468.21	457.13	423.77		
700	468.21	468.21	468.21	468.21	468.21	468.21		

grey background = steel failure decisive



Table A 3.17: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 460 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 460 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
40	578.04	200	143.77	102.85	70.45	44.33	21.01	14.66
		210	155.08	114.16	81.76	55.63	25.11	17.12
		220	166.39	125.47	93.07	66.94	30.14	19.94
		230	177.70	136.78	104.38	78.25	36.45	23.22
		240	189.01	148.09	115.69	89.56	44.53	27.01
		250	200.32	159.40	127.00	100.87	55.55	31.48
		260	211.63	170.71	138.31	112.18	66.86	36.86
		270	222.94	182.02	149.62	123.49	78.17	43.58
		280	234.25	193.33	160.93	134.80	89.48	52.41
		290	245.56	204.64	172.24	146.11	100.79	63.72
		300	256.87	215.95	183.55	157.42	112.10	75.03
		310	268.18	227.26	194.85	168.73	123.41	86.34
		320	279.49	238.57	206.16	180.04	134.72	97.65
		330	290.79	249.87	217.47	191.35	146.03	108.96
		340	302.10	261.18	228.78	202.66	157.33	120.27
		350	313.41	272.49	240.09	213.97	168.64	131.58
		360	324.72	283.80	251.40	225.28	179.95	142.89
		370	336.03	295.11	262.71	236.59	191.26	154.20
		380	347.34	306.42	274.02	247.89	202.57	165.51
		390	358.65	317.73	285.33	259.20	213.88	176.82
400	369.96	329.04	296.64	270.51	225.19	188.13		
450	426.51	385.59	353.19	327.06	281.74	244.67		
500	483.05	442.13	409.73	383.61	338.28	301.22		
550	539.60	498.68	466.28	440.15	394.83	357.77		
600	578.04	555.23	522.83	496.70	451.38	414.31		
650	578.04	578.04	578.04	553.25	507.93	470.86		
700	578.04	578.04	578.04	578.04	564.47	527.41		
750	578.04	578.04	578.04	578.04	578.04	578.04		

grey background = steel failure decisive



Enclosure 4 Characteristic tensile load in a fire case for reinforcing steel BSt 500 S used as an anchor as a function of the fire-resistance period t_u

Table A 4.1: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		60	0.99	0.46	0.26	0.12	0.00	0.00
		70	1.54	0.70	0.43	0.26	0.00	0.00
		80	2.38	1.00	0.63	0.42	0.13	0.00
		90	3.87	1.39	0.88	0.61	0.27	0.12
		100	6.14	1.89	1.18	0.84	0.43	0.25
		110	8.40	2.54	1.55	1.10	0.61	0.40
		120	10.66	3.45	2.00	1.42	0.82	0.57
		130	12.92	4.79	2.55	1.80	1.07	0.75
		140	15.18	7.00	3.26	2.24	1.34	0.96
		150	17.45	9.26	4.19	2.78	1.66	1.20
		160	19.71	11.52	5.45	3.45	2.03	1.47
		170	21.97	13.78	7.30	4.28	2.45	1.77
		180	24.23	16.05	9.57	5.36	2.95	2.11
		190	25.13	18.31	11.83	6.79	3.52	2.50
8	25.13	200	25.13	20.57	14.09	8.87	4.20	2.93
		210	25.13	22.83	16.35	11.13	5.02	3.42
		220	25.13	25.09	18.61	13.39	6.03	3.99
		230	25.13	25.13	20.88	15.65	7.29	4.64
		240	25.13	25.13	23.14	17.91	8.91	5.40
		250	25.13	25.13	25.13	20.17	11.11	6.30
		260	25.13	25.13	25.13	22.44	13.37	7.37
		270	25.13	25.13	25.13	24.70	15.63	8.72
		280	25.13	25.13	25.13	25.13	17.90	10.48
		290	25.13	25.13	25.13	25.13	20.16	12.74
		300	25.13	25.13	25.13	25.13	22.42	15.01
		310	25.13	25.13	25.13	25.13	24.68	17.27
		320	25.13	25.13	25.13	25.13	25.13	19.53
		330	25.13	25.13	25.13	25.13	25.13	21.79
		340	25.13	25.13	25.13	25.13	25.13	24.05
		350	25.13	25.13	25.13	25.13	25.13	25.13

grey background = steel failure decisive



Table A 4.2: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
10	39.27	60	1.23	0.57	0.32	0.15	0.00	0.00
		70	1.92	0.87	0.53	0.32	0.00	0.00
		80	2.98	1.25	0.79	0.53	0.16	0.00
		90	4.84	1.73	1.10	0.76	0.33	0.15
		100	7.67	2.36	1.48	1.05	0.54	0.32
		110	10.50	3.18	1.94	1.38	0.77	0.50
		120	13.32	4.31	2.50	1.78	1.03	0.71
		130	16.15	5.99	3.19	2.25	1.33	0.94
		140	18.98	8.75	4.07	2.80	1.68	1.21
		150	21.81	11.58	5.23	3.48	2.08	1.50
		160	24.63	14.40	6.81	4.31	2.54	1.84
		170	27.46	17.23	9.13	5.35	3.07	2.22
		180	30.29	20.06	11.96	6.69	3.68	2.64
		190	33.12	22.89	14.79	8.49	4.40	3.12
		200	35.94	25.71	17.61	11.08	5.25	3.67
		210	38.77	28.54	20.44	13.91	6.28	4.28
		220	39.27	31.37	23.27	16.74	7.53	4.99
		230	39.27	34.20	26.09	19.56	9.11	5.81
		240	39.27	37.02	28.92	22.39	11.13	6.75
		250	39.27	39.27	31.75	25.22	13.89	7.87
		260	39.27	39.27	34.58	28.05	16.71	9.22
		270	39.27	39.27	37.40	30.87	19.54	10.90
		280	39.27	39.27	39.27	33.70	22.37	13.10
		290	39.27	39.27	39.27	36.53	25.20	15.93
		300	39.27	39.27	39.27	39.27	28.02	18.76
		310	39.27	39.27	39.27	39.27	30.85	21.59
		320	39.27	39.27	39.27	39.27	33.68	24.41
		330	39.27	39.27	39.27	39.27	36.51	27.24
		340	39.27	39.27	39.27	39.27	39.27	30.07
		350	39.27	39.27	39.27	39.27	39.27	32.89
360	39.27	39.27	39.27	39.27	39.27	35.72		
370	39.27	39.27	39.27	39.27	39.27	38.55		
380	39.27	39.27	39.27	39.27	39.27	39.27		

grey background = steel failure decisive



Table A 4.3: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		70	2.30	1.05	0.64	0.39	0.00	0.00
		80	3.57	1.50	0.95	0.63	0.19	0.00
		90	5.81	2.08	1.32	0.92	0.40	0.18
		100	9.20	2.83	1.77	1.25	0.64	0.38
		110	12.60	3.81	2.32	1.66	0.92	0.60
		120	15.99	5.18	3.00	2.13	1.23	0.85
		130	19.38	7.19	3.83	2.69	1.60	1.13
		140	22.77	10.50	4.89	3.36	2.02	1.45
		150	26.17	13.89	6.28	4.17	2.50	1.80
		160	29.56	17.28	8.17	5.17	3.05	2.20
		170	32.95	20.68	10.96	6.42	3.68	2.66
		180	36.35	24.07	14.35	8.03	4.42	3.17
		190	39.74	27.46	17.74	10.19	5.28	3.75
		200	43.13	30.86	21.14	13.30	6.30	4.40
		210	46.52	34.25	24.53	16.69	7.53	5.14
		220	49.92	37.64	27.92	20.08	9.04	5.98
		230	53.31	41.03	31.31	23.48	10.93	6.97
12	56.55	240	56.55	44.43	34.71	26.87	13.36	8.10
		250	56.55	47.82	38.10	30.26	16.66	9.44
		260	56.55	51.21	41.49	33.65	20.06	11.06
		270	56.55	54.61	44.89	37.05	23.45	13.07
		280	56.55	56.55	48.28	40.44	26.84	15.72
		290	56.55	56.55	51.67	43.83	30.24	19.12
		300	56.55	56.55	55.06	47.23	33.63	22.51
		310	56.55	56.55	56.55	50.62	37.02	25.90
		320	56.55	56.55	56.55	54.01	40.41	29.30
		330	56.55	56.55	56.55	56.55	43.81	32.69
		340	56.55	56.55	56.55	56.55	47.20	36.08
		350	56.55	56.55	56.55	56.55	50.59	39.47
		360	56.55	56.55	56.55	56.55	53.99	42.87
		370	56.55	56.55	56.55	56.55	56.55	46.26
		380	56.55	56.55	56.55	56.55	56.55	49.65
		390	56.55	56.55	56.55	56.55	56.55	53.04
		400	56.55	56.55	56.55	56.55	56.55	56.44
		450	56.55	56.55	56.55	56.55	56.55	56.55

grey background = steel failure decisive



Table A 4.4: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
14	76.97	70	2.69	1.22	0.75	0.45	0.00	0.00
		80	4.17	1.75	1.10	0.74	0.22	0.00
		90	6.78	2.43	1.54	1.07	0.47	0.21
		100	10.74	3.30	2.07	1.46	0.75	0.44
		110	14.70	4.45	2.71	1.93	1.07	0.70
		120	18.65	6.04	3.50	2.49	1.44	0.99
		130	22.61	8.39	4.47	3.14	1.86	1.32
		140	26.57	12.25	5.70	3.92	2.35	1.69
		150	30.53	16.21	7.33	4.87	2.91	2.10
		160	34.49	20.17	9.54	6.03	3.56	2.57
		170	38.45	24.12	12.78	7.49	4.30	3.10
		180	42.40	28.08	16.74	9.37	5.15	3.70
		190	46.36	32.04	20.70	11.89	6.16	4.37
		200	50.32	36.00	24.66	15.51	7.35	5.13
		210	54.28	39.96	28.62	19.47	8.79	5.99
		220	58.24	43.91	32.57	23.43	10.55	6.98
		230	62.20	47.87	36.53	27.39	12.76	8.13
		240	66.15	51.83	40.49	31.35	15.58	9.46
		250	70.11	55.79	44.45	35.31	19.44	11.02
		260	74.07	59.75	48.41	39.26	23.40	12.90
		270	76.97	63.71	52.37	43.22	27.36	15.25
		280	76.97	67.66	56.32	47.18	31.32	18.34
		290	76.97	71.62	60.28	51.14	35.28	22.30
		300	76.97	75.58	64.24	55.10	39.23	26.26
310	76.97	76.97	68.20	59.06	43.19	30.22		
320	76.97	76.97	72.16	63.01	47.15	34.18		
330	76.97	76.97	76.12	66.97	51.11	38.14		
340	76.97	76.97	76.97	70.93	55.07	42.09		
350	76.97	76.97	76.97	74.89	59.03	46.05		
360	76.97	76.97	76.97	76.97	62.98	50.01		
370	76.97	76.97	76.97	76.97	66.94	53.97		
380	76.97	76.97	76.97	76.97	70.90	57.93		
390	76.97	76.97	76.97	76.97	74.86	61.89		
400	76.97	76.97	76.97	76.97	76.97	65.84		
450	76.97	76.97	76.97	76.97	76.97	76.97		

grey background = steel failure decisive



Table A 4.5: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		80	4.76	2.00	1.26	0.84	0.25	0.00
		90	7.75	2.77	1.76	1.22	0.53	0.24
		100	12.27	3.77	2.36	1.67	0.86	0.51
		110	16.80	5.08	3.10	2.21	1.22	0.80
		120	21.32	6.90	3.99	2.84	1.65	1.14
		130	25.84	9.59	5.10	3.59	2.13	1.51
		140	30.37	14.00	6.52	4.48	2.69	1.93
		150	34.89	18.52	8.37	5.56	3.33	2.40
		160	39.41	23.05	10.90	6.89	4.06	2.94
		170	43.94	27.57	14.61	8.56	4.91	3.55
		180	48.46	32.09	19.13	10.71	5.89	4.23
		190	52.99	36.62	23.66	13.59	7.04	5.00
		200	57.51	41.14	28.18	17.73	8.40	5.86
		210	62.03	45.66	32.70	22.25	10.04	6.85
		220	66.56	50.19	37.23	26.78	12.05	7.98
		230	71.08	54.71	41.75	31.30	14.58	9.29
		240	75.60	59.24	46.28	35.83	17.81	10.81
16	100.53	250	80.13	63.76	50.80	40.35	22.22	12.59
		260	84.65	68.28	55.32	44.87	26.74	14.74
		270	89.18	72.81	59.85	49.40	31.27	17.43
		280	93.70	77.33	64.37	53.92	35.79	20.96
		290	98.22	81.85	68.89	58.44	40.32	25.49
		300	100.53	86.38	73.42	62.97	44.84	30.01
		310	100.53	90.90	77.94	67.49	49.36	34.54
		320	100.53	95.43	82.47	72.02	53.89	39.06
		330	100.53	99.95	86.99	76.54	58.41	43.58
		340	100.53	100.53	91.51	81.06	62.93	48.11
		350	100.53	100.53	96.04	85.59	67.46	52.63
		360	100.53	100.53	100.53	90.11	71.98	57.16
		370	100.53	100.53	100.53	94.63	76.51	61.68
		380	100.53	100.53	100.53	99.16	81.03	66.20
		390	100.53	100.53	100.53	100.53	85.55	70.73
		400	100.53	100.53	100.53	100.53	90.08	75.25
		450	100.53	100.53	100.53	100.53	100.53	97.87
		500	100.53	100.53	100.53	100.53	100.53	100.53

grey background = steel failure decisive



Table A 4.6: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		80	5.36	2.25	1.42	0.95	0.28	0.00
		90	8.72	3.12	1.98	1.37	0.60	0.27
		100	13.81	4.24	2.66	1.88	0.96	0.57
		110	18.89	5.72	3.48	2.48	1.38	0.90
		120	23.98	7.76	4.49	3.20	1.85	1.28
		130	29.07	10.79	5.74	4.04	2.40	1.70
		140	34.16	15.75	7.33	5.05	3.02	2.17
		150	39.25	20.84	9.42	6.26	3.74	2.70
		160	44.34	25.93	12.26	7.75	4.57	3.31
		170	49.43	31.02	16.44	9.63	5.52	3.99
		180	54.52	36.11	21.52	12.05	6.63	4.76
		190	59.61	41.19	26.61	15.29	7.92	5.62
		200	64.70	46.28	31.70	19.95	9.46	6.60
		210	69.79	51.37	36.79	25.04	11.30	7.70
		220	74.88	56.46	41.88	30.12	13.56	8.97
		230	79.97	61.55	46.97	35.21	16.40	10.45
		240	85.05	66.64	52.06	40.30	20.04	12.16
18	127.23	250	90.14	71.73	57.15	45.39	25.00	14.17
		260	95.23	76.82	62.24	50.48	30.09	16.59
		270	100.32	81.91	67.33	55.57	35.18	19.61
		280	105.41	87.00	72.42	60.66	40.27	23.59
		290	110.50	92.09	77.51	65.75	45.35	28.67
		300	115.59	97.18	82.60	70.84	50.44	33.76
		310	120.68	102.27	87.68	75.93	55.53	38.85
		320	125.77	107.35	92.77	81.02	60.62	43.94
		330	127.23	112.44	97.86	86.11	65.71	49.03
		340	127.23	117.53	102.95	91.20	70.80	54.12
		350	127.23	122.62	108.04	96.28	75.89	59.21
		360	127.23	127.23	113.13	101.37	80.98	64.30
		370	127.23	127.23	118.22	106.46	86.07	69.39
		380	127.23	127.23	123.31	111.55	91.16	74.48
		390	127.23	127.23	127.23	116.64	96.25	79.57
		400	127.23	127.23	127.23	121.73	101.34	84.66
		450	127.23	127.23	127.23	127.23	126.78	110.10
		500	127.23	127.23	127.23	127.23	127.23	127.23

grey background = steel failure decisive



Table A 4.7: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
20	157.08	90	9.68	3.47	2.20	1.53	0.67	0.30
		100	15.34	4.71	2.95	2.09	1.07	0.63
		110	20.99	6.35	3.87	2.76	1.53	1.01
		120	26.65	8.63	4.99	3.55	2.06	1.42
		130	32.30	11.99	6.38	4.49	2.66	1.89
		140	37.96	17.50	8.15	5.61	3.36	2.41
		150	43.61	23.15	10.47	6.95	4.16	3.00
		160	49.27	28.81	13.62	8.61	5.08	3.67
		170	54.92	34.46	18.26	10.70	6.14	4.43
		180	60.58	40.12	23.92	13.39	7.36	5.28
		190	66.23	45.77	29.57	16.98	8.80	6.24
		200	71.89	51.43	35.23	22.16	10.51	7.33
		210	77.54	57.08	40.88	27.82	12.55	8.56
		220	83.20	62.74	46.53	33.47	15.07	9.97
		230	88.85	68.39	52.19	39.13	18.22	11.61
		240	94.51	74.05	57.84	44.78	22.26	13.51
		250	100.16	79.70	63.50	50.44	27.77	15.74
		260	105.81	85.35	69.15	56.09	33.43	18.43
		270	111.47	91.01	74.81	61.75	39.08	21.79
		280	117.12	96.66	80.46	67.40	44.74	26.21
		290	122.78	102.32	86.12	73.06	50.39	31.86
		300	128.43	107.97	91.77	78.71	56.05	37.52
		310	134.09	113.63	97.43	84.36	61.70	43.17
		320	139.74	119.28	103.08	90.02	67.36	48.83
		330	145.40	124.94	108.74	95.67	73.01	54.48
		340	151.05	130.59	114.39	101.33	78.67	60.13
350	156.71	136.25	120.05	106.98	84.32	65.79		
360	157.08	141.90	125.70	112.64	89.98	71.44		
370	157.08	147.56	131.36	118.29	95.63	77.10		
380	157.08	153.21	137.01	123.95	101.29	82.75		
390	157.08	157.08	142.66	129.60	106.94	88.41		
400	157.08	157.08	148.32	135.26	112.60	94.06		
450	157.08	157.08	157.08	157.08	140.87	122.34		
500	157.08	157.08	157.08	157.08	157.08	150.61		
550	157.08	157.08	157.08	157.08	157.08	157.08		

grey background = steel failure decisive



Table A 4.8: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		90	10.65	3.81	2.42	1.68	0.74	0.33
		100	16.87	5.18	3.25	2.30	1.18	0.70
		110	23.09	6.99	4.26	3.03	1.68	1.11
		120	29.31	9.49	5.49	3.91	2.26	1.56
		130	35.53	13.19	7.02	4.94	2.93	2.08
		140	41.75	19.25	8.96	6.17	3.70	2.65
		150	47.97	25.47	11.51	7.65	4.58	3.30
		160	54.19	31.69	14.98	9.48	5.59	4.04
		170	60.41	37.91	20.09	11.77	6.75	4.88
		180	66.63	44.13	26.31	14.73	8.10	5.81
		190	72.85	50.35	32.53	18.68	9.68	6.87
		200	79.07	56.57	38.75	24.38	11.56	8.06
		210	85.30	62.79	44.97	30.60	13.81	9.41
		220	91.52	69.01	51.19	36.82	16.57	10.97
		230	97.74	75.23	57.41	43.04	20.05	12.77
		240	103.96	81.45	63.63	49.26	24.49	14.86
		250	110.18	87.67	69.85	55.48	30.55	17.31
22	190.06	260	116.40	93.89	76.07	61.70	36.77	20.27
		270	122.62	100.11	82.29	67.92	42.99	23.97
		280	128.84	106.33	88.51	74.14	49.21	28.83
		290	135.06	112.55	94.73	80.36	55.43	35.05
		300	141.28	118.77	100.95	86.58	61.65	41.27
		310	147.50	124.99	107.17	92.80	67.87	47.49
		320	153.72	131.21	113.39	99.02	74.09	53.71
		330	159.94	137.43	119.61	105.24	80.31	59.93
		340	166.16	143.65	125.83	111.46	86.53	66.15
		350	172.38	149.87	132.05	117.68	92.75	72.37
		360	178.60	156.09	138.27	123.90	98.97	78.59
		370	184.82	162.31	144.49	130.12	105.19	84.81
		380	190.06	168.53	150.71	136.34	111.41	91.03
		390	190.06	174.75	156.93	142.56	117.63	97.25
		400	190.06	180.97	163.15	148.78	123.85	103.47
		450	190.06	190.06	190.06	179.88	154.96	134.57
		500	190.06	190.06	190.06	190.06	186.06	165.67
		550	190.06	190.06	190.06	190.06	190.06	190.06

grey background = steel failure decisive



Table A 4.9: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the Fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
24	226.19	90	11.62	4.16	2.64	1.83	0.80	0.36
		100	18.41	5.66	3.54	2.51	1.29	0.76
		110	25.19	7.62	4.64	3.31	1.84	1.21
		120	31.98	10.35	5.99	4.26	2.47	1.71
		130	38.76	14.38	7.66	5.39	3.20	2.26
		140	45.55	21.00	9.78	6.73	4.03	2.89
		150	52.34	27.78	12.56	8.34	4.99	3.60
		160	59.12	34.57	16.35	10.34	6.09	4.41
		170	65.91	41.35	21.91	12.84	7.36	5.32
		180	72.69	48.14	28.70	16.07	8.84	6.34
		190	79.48	54.93	35.48	20.38	10.57	7.49
		200	86.26	61.71	42.27	26.60	12.61	8.80
		210	93.05	68.50	49.06	33.38	15.06	10.27
		220	99.83	75.28	55.84	40.17	18.08	11.96
		230	106.62	82.07	62.63	46.95	21.87	13.93
		240	113.41	88.85	69.41	53.74	26.72	16.21
		250	120.19	95.64	76.20	60.52	33.33	18.89
		260	126.98	102.43	82.98	67.31	40.12	22.12
		270	133.76	109.21	89.77	74.09	46.90	26.15
		280	140.55	116.00	96.56	80.88	53.69	31.45
		290	147.33	122.78	103.34	87.67	60.47	38.23
		300	154.12	129.57	110.13	94.45	67.26	45.02
		310	160.91	136.35	116.91	101.24	74.04	51.80
		320	167.69	143.14	123.70	108.02	80.83	58.59
330	174.48	149.92	130.48	114.81	87.62	65.38		
340	181.26	156.71	137.27	121.59	94.40	72.16		
350	188.05	163.50	144.06	128.38	101.19	78.95		
360	194.83	170.28	150.84	135.17	107.97	85.73		
370	201.62	177.07	157.63	141.95	114.76	92.52		
380	208.41	183.85	164.41	148.74	121.54	99.30		
390	215.19	190.64	171.20	155.52	128.33	106.09		
400	221.98	197.42	177.98	162.31	135.11	112.88		
450			226.19	226.19	211.91	196.24	169.04	146.80
500			226.19	226.19	226.19	226.19	202.97	180.73
550			226.19	226.19	226.19	226.19	226.19	214.66
600			226.19	226.19	226.19	226.19	226.19	226.19

grey background = steel failure decisive



Table A 4.10: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
25	245.43	100	19.17	5.89	3.69	2.61	1.34	0.79
		110	26.24	7.94	4.84	3.45	1.91	1.26
		120	33.31	10.78	6.24	4.44	2.57	1.78
		130	40.38	14.98	7.97	5.61	3.33	2.36
		140	47.45	21.87	10.19	7.01	4.20	3.02
		150	54.52	28.94	13.08	8.69	5.20	3.76
		160	61.58	36.01	17.03	10.77	6.35	4.59
		170	68.65	43.08	22.83	13.37	7.67	5.54
		180	75.72	50.15	29.90	16.73	9.20	6.61
		190	82.79	57.21	36.96	21.23	11.01	7.81
		200	89.86	64.28	44.03	27.70	13.13	9.16
		210	96.93	71.35	51.10	34.77	15.69	10.70
		220	103.99	78.42	58.17	41.84	18.84	12.46
		230	111.06	85.49	65.24	48.91	22.78	14.51
		240	118.13	92.56	72.31	55.98	27.83	16.88
		250	125.20	99.62	79.37	63.05	34.72	19.67
		260	132.27	106.69	86.44	70.11	41.79	23.04
		270	139.34	113.76	93.51	77.18	48.86	27.24
		280	146.40	120.83	100.58	84.25	55.92	32.76
		290	153.47	127.90	107.65	91.32	62.99	39.83
		300	160.54	134.97	114.72	98.39	70.06	46.89
		310	167.61	142.03	121.78	105.46	77.13	53.96
		320	174.68	149.10	128.85	112.52	84.20	61.03
		330	181.75	156.17	135.92	119.59	91.27	68.10
		340	188.82	163.24	142.99	126.66	98.33	75.17
		350	195.88	170.31	150.06	133.73	105.40	82.24
360	202.95	177.38	157.13	140.80	112.47	89.30		
370	210.02	184.45	164.19	147.87	119.54	96.37		
380	217.09	191.51	171.26	154.93	126.61	103.44		
390	224.16	198.58	178.33	162.00	133.68	110.51		
400	231.23	205.65	185.40	169.07	140.74	117.58		
450			245.43	240.99	220.74	204.41	176.09	152.92
500			245.43	245.43	245.43	239.75	211.43	188.26
550			245.43	245.43	245.43	245.43	245.43	223.60
600			245.43	245.43	245.43	245.43	245.43	245.43

grey background = steel failure decisive





Table A 4.11: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
26	265.46	260	137.56	110.96	89.90	72.92	43.46	23.96
		270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
		360	211.07	184.47	163.41	146.43	116.97	92.88
		370	218.42	191.82	170.76	153.78	124.32	100.23
		380	225.77	199.17	178.11	161.13	131.67	107.58
		390	233.12	206.53	185.46	168.48	139.02	114.93
		400	240.47	213.88	192.82	175.83	146.37	122.28
		450	265.46	250.63	229.57	212.59	183.13	159.04
		500	265.46	265.46	265.46	249.34	219.89	195.79
		550	265.46	265.46	265.46	265.46	256.64	232.55
		600	265.46	265.46	265.46	265.46	265.46	265.46

grey background = steel failure decisive



Table A 4.12: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the Fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		100	19.94	6.13	3.84	2.72	1.39	0.82
		110	27.29	8.26	5.03	3.59	1.99	1.31
		120	34.64	11.22	6.49	4.62	2.67	1.85
		130	41.99	15.58	8.29	5.84	3.46	2.45
		140	49.35	22.75	10.59	7.29	4.37	3.14
		150	56.70	30.10	13.60	9.04	5.41	3.91
		160	64.05	37.45	17.71	11.20	6.60	4.78
		170	71.40	44.80	23.74	13.90	7.98	5.76
		180	78.75	52.15	31.09	17.40	9.57	6.87
		190	86.10	59.50	38.44	22.08	11.45	8.12
		200	93.45	66.85	45.79	28.81	13.66	9.53
		210	100.80	74.21	53.14	36.16	16.32	11.13
		220	108.15	81.56	60.50	43.51	19.59	12.96
		230	115.51	88.91	67.85	50.86	23.69	15.09
		240	122.86	96.26	75.20	58.22	28.94	17.56
		250	130.21	103.61	82.55	65.57	36.11	20.46
		260	137.56	110.96	89.90	72.92	43.46	23.96
28	265.46	270	144.91	118.31	97.25	80.27	50.81	28.33
		280	152.26	125.66	104.60	87.62	58.16	34.07
		290	159.61	133.01	111.95	94.97	65.51	41.42
		300	166.96	140.37	119.30	102.32	72.86	48.77
		310	174.31	147.72	126.66	109.67	80.21	56.12
		320	181.67	155.07	134.01	117.02	87.57	63.47
		330	189.02	162.42	141.36	124.38	94.92	70.82
		340	196.37	169.77	148.71	131.73	102.27	78.17
		350	203.72	177.12	156.06	139.08	109.62	85.53
		360	211.07	184.47	163.41	146.43	116.97	92.88
		370	218.42	191.82	170.76	153.78	124.32	100.23
		380	225.77	199.17	178.11	161.13	131.67	107.58
		390	233.12	206.53	185.46	168.48	139.02	114.93
		400	240.47	213.88	192.82	175.83	146.37	122.28
		450	265.46	250.63	229.57	212.59	183.13	159.04
		500	265.46	265.46	265.46	249.34	219.89	195.79
		550	265.46	265.46	265.46	265.46	256.64	232.55
		600	265.46	265.46	265.46	265.46	265.46	265.46

grey background = steel failure decisive



Table A 4.13: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the Fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
30	353.42	110	31.49	9.53	5.81	4.14	2.30	1.51
		120	39.97	12.94	7.49	5.33	3.09	2.13
		130	48.46	17.98	9.57	6.74	3.99	2.83
		140	56.94	26.25	12.22	8.41	5.04	3.62
		150	65.42	34.73	15.70	10.43	6.24	4.51
		160	73.90	43.21	20.43	12.92	7.62	5.51
		170	82.38	51.69	27.39	16.04	9.20	6.65
		180	90.87	60.18	35.87	20.08	11.05	7.93
		190	99.35	68.66	44.36	25.48	13.21	9.37
		200	107.83	77.14	52.84	33.24	15.76	11.00
		210	116.31	85.62	61.32	41.73	18.83	12.84
		220	124.79	94.10	69.80	50.21	22.60	14.96
		230	133.28	102.59	78.28	58.69	27.34	17.42
		240	141.76	111.07	86.77	67.17	33.40	20.26
		250	150.24	119.55	95.25	75.65	41.66	23.61
		260	158.72	128.03	103.73	84.14	50.14	27.65
		270	167.20	136.51	112.21	92.62	58.63	32.69
		280	175.69	145.00	120.69	101.10	67.11	39.31
		290	184.17	153.48	129.18	109.58	75.59	47.79
		300	192.65	161.96	137.66	118.06	84.07	56.27
		310	201.13	170.44	146.14	126.55	92.55	64.76
		320	209.61	178.92	154.62	135.03	101.04	73.24
		330	218.10	187.41	163.10	143.51	109.52	81.72
		340	226.58	195.89	171.59	151.99	118.00	90.20
		350	235.06	204.37	180.07	160.47	126.48	98.68
		360	243.54	212.85	188.55	168.96	134.96	107.17
		370	252.02	221.33	197.03	177.44	143.45	115.65
		380	260.51	229.82	205.52	185.92	151.93	124.13
390	268.99	238.30	214.00	194.40	160.41	132.61		
400	277.47	246.78	222.48	202.89	168.89	141.09		
450	319.88	289.19	264.89	245.30	211.30	183.50		
500	353.42	331.60	307.30	287.71	253.71	225.91		
550	353.42	353.42	349.71	330.12	296.12	268.32		
600	353.42	353.42	353.42	353.42	338.53	310.73		
650	353.42	353.42	353.42	353.42	353.42	353.15		
700	353.42	353.42	353.42	353.42	353.42	353.42		

grey background = steel failure decisive



Table A 4.14: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the Fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
		120	42.64	13.80	7.99	5.68	3.29	2.27
		130	51.69	19.18	10.21	7.19	4.26	3.02
		140	60.73	28.00	13.04	8.97	5.38	3.86
		150	69.78	37.04	16.74	11.13	6.66	4.81
		160	78.83	46.09	21.80	13.78	8.13	5.88
		170	87.88	55.14	29.22	17.11	9.82	7.09
		180	96.92	64.19	38.27	21.42	11.78	8.46
		190	105.97	73.23	47.31	27.17	14.09	9.99
		200	115.02	82.28	56.36	35.46	16.81	11.73
		210	124.07	91.33	65.41	44.51	20.09	13.69
		220	133.11	100.38	74.46	53.56	24.11	15.95
		230	142.16	109.42	83.50	62.60	29.16	18.58
		240	151.21	118.47	92.55	71.65	35.62	21.61
		250	160.26	127.52	101.60	80.70	44.44	25.18
		260	169.30	136.57	110.65	89.75	53.49	29.49
		270	178.35	145.61	119.69	98.79	62.53	34.86
		280	187.40	154.66	128.74	107.84	71.58	41.93
32	402.11	290	196.45	163.71	137.79	116.89	80.63	50.98
		300	205.49	172.76	146.84	125.94	89.68	60.03
		310	214.54	181.80	155.88	134.98	98.73	69.07
		320	223.59	190.85	164.93	144.03	107.77	78.12
		330	232.64	199.90	173.98	153.08	116.82	87.17
		340	241.68	208.95	183.03	162.13	125.87	96.22
		350	250.73	217.99	192.07	171.17	134.92	105.26
		360	259.78	227.04	201.12	180.22	143.96	114.31
		370	268.83	236.09	210.17	189.27	153.01	123.36
		380	277.87	245.14	219.22	198.32	162.06	132.41
		390	286.92	254.18	228.26	207.36	171.11	141.45
		400	295.97	263.23	237.31	216.41	180.15	150.50
		450	341.21	308.47	282.55	261.65	225.39	195.74
		500	386.44	353.71	327.79	306.89	270.63	240.98
		550	402.11	398.95	373.02	352.12	315.87	286.21
		600	402.11	402.11	402.11	397.36	361.10	331.45
		650	402.11	402.11	402.11	402.11	402.11	376.69
		700	402.11	402.11	402.11	402.11	402.11	402.11

grey background = steel failure decisive



Table A 4.15: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
34	453.95	130	54.92	20.38	10.84	7.63	4.53	3.21
		140	64.53	29.75	13.85	9.53	5.71	4.10
		150	74.14	39.36	17.79	11.82	7.07	5.11
		160	83.75	48.97	23.16	14.64	8.63	6.25
		170	93.37	58.59	31.04	18.18	10.43	7.53
		180	102.98	68.20	40.66	22.76	12.52	8.98
		190	112.59	77.81	50.27	28.87	14.97	10.62
		200	122.21	87.42	59.88	37.68	17.86	12.46
		210	131.82	97.04	69.50	47.29	21.34	14.55
		220	141.43	106.65	79.11	56.90	25.62	16.95
		230	151.05	116.26	88.72	66.52	30.98	19.74
		240	160.66	125.88	98.34	76.13	37.85	22.96
		250	170.27	135.49	107.95	85.74	47.22	26.76
		260	179.88	145.10	117.56	95.35	56.83	31.33
		270	189.50	154.72	127.17	104.97	66.44	37.04
		280	199.11	164.33	136.79	114.58	76.06	44.55
		290	208.72	173.94	146.40	124.19	85.67	54.16
		300	218.34	183.55	156.01	133.81	95.28	63.78
		310	227.95	193.17	165.63	143.42	104.90	73.39
		320	237.56	202.78	175.24	153.03	114.51	83.00
		330	247.18	212.39	184.85	162.65	124.12	92.62
		340	256.79	222.01	194.47	172.26	133.73	102.23
		350	266.40	231.62	204.08	181.87	143.35	111.84
		360	276.01	241.23	213.69	191.48	152.96	121.45
		370	285.63	250.85	223.30	201.10	162.57	131.07
		380	295.24	260.46	232.92	210.71	172.19	140.68
390	304.85	270.07	242.53	220.32	181.80	150.29		
400	314.47	279.68	252.14	229.94	191.41	159.91		
450	362.53	327.75	300.21	278.00	239.48	207.97		
500	410.60	375.81	348.27	326.07	287.54	256.04		
550	453.95	423.88	396.34	374.13	335.61	304.10		
600	453.95	453.95	444.40	422.20	383.67	352.17		
650	453.95	453.95	453.95	453.95	431.74	400.23		
700	453.95	453.95	453.95	453.95	453.95	448.30		
750	453.95	453.95	453.95	453.95	453.95	453.95		

grey background = steel failure decisive



Table A 4.16: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
36	508.92	200	129.40	92.57	63.41	39.89	18.91	13.19
		210	139.57	102.75	73.58	50.07	22.60	15.41
		220	149.75	112.92	83.76	60.25	27.12	17.95
		230	159.93	123.10	93.94	70.43	32.80	20.90
		240	170.11	133.28	104.12	80.61	40.07	24.31
		250	180.29	143.46	114.30	90.79	49.99	28.33
		260	190.47	153.64	124.48	100.96	60.17	33.18
		270	200.64	163.82	134.66	111.14	70.35	39.22
		280	210.82	174.00	144.83	121.32	80.53	47.17
		290	221.00	184.17	155.01	131.50	90.71	57.35
		300	231.18	194.35	165.19	141.68	100.89	67.53
		310	241.36	204.53	175.37	151.86	111.07	77.71
		320	251.54	214.71	185.55	162.03	121.24	87.89
		330	261.72	224.89	195.73	172.21	131.42	98.06
		340	271.89	235.07	205.90	182.39	141.60	108.24
		350	282.07	245.24	216.08	192.57	151.78	118.42
		360	292.25	255.42	226.26	202.75	161.96	128.60
		370	302.43	265.60	236.44	212.93	172.14	138.78
		380	312.61	275.78	246.62	223.11	182.31	148.96
		390	322.79	285.96	256.80	233.28	192.49	159.13
400	332.96	296.14	266.98	243.46	202.67	169.31		
450	383.86	347.03	317.87	294.35	253.56	220.21		
500	434.75	397.92	368.76	345.25	304.46	271.10		
550	485.64	448.81	419.65	396.14	355.35	321.99		
600	508.92	499.71	470.54	447.03	406.24	372.88		
650	508.92	508.92	508.92	497.92	457.13	423.77		
700	508.92	508.92	508.92	508.92	508.03	474.67		
750	508.92	508.92	508.92	508.92	508.92	508.92		

grey background = steel failure decisive



Table A 4.17: Characteristic tensile load in a fire case for the "pulling out" type of failure for reinforcing steel BSt 500 S used as an anchor (reinforcing steel is not exposed to the fire)

Nominal diameter in mm	Characteristic yield strength in kN	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus injection system with reinforcing steel BSt 500 used as an anchor for the "pulling out" type of failure in the event of fire					
			R30	R60	R90	R120	R180	R240
40	628.30	200	143.77	102.85	70.45	44.33	21.01	14.66
		210	155.08	114.16	81.76	55.63	25.11	17.12
		220	166.39	125.47	93.07	66.94	30.14	19.94
		230	177.70	136.78	104.38	78.25	36.45	23.22
		240	189.01	148.09	115.69	89.56	44.53	27.01
		250	200.32	159.40	127.00	100.87	55.55	31.48
		260	211.63	170.71	138.31	112.18	66.86	36.86
		270	222.94	182.02	149.62	123.49	78.17	43.58
		280	234.25	193.33	160.93	134.80	89.48	52.41
		290	245.56	204.64	172.24	146.11	100.79	63.72
		300	256.87	215.95	183.55	157.42	112.10	75.03
		310	268.18	227.26	194.85	168.73	123.41	86.34
		320	279.49	238.57	206.16	180.04	134.72	97.65
		330	290.79	249.87	217.47	191.35	146.03	108.96
		340	302.10	261.18	228.78	202.66	157.33	120.27
		350	313.41	272.49	240.09	213.97	168.64	131.58
		360	324.72	283.80	251.40	225.28	179.95	142.89
		370	336.03	295.11	262.71	236.59	191.26	154.20
		380	347.34	306.42	274.02	247.89	202.57	165.51
		390	358.65	317.73	285.33	259.20	213.88	176.82
400	369.96	329.04	296.64	270.51	225.19	188.13		
450	426.51	385.59	353.19	327.06	281.74	244.67		
500	483.05	442.13	409.73	383.61	338.28	301.22		
550	539.60	498.68	466.28	440.15	394.83	357.77		
600	596.15	555.23	522.83	496.70	451.38	414.31		
650	628.30	611.78	579.37	553.25	507.93	470.86		
700	628.30	628.30	628.30	609.80	564.47	527.41		
750	628.30	628.30	628.30	628.30	621.02	583.95		
800	628.30	628.30	628.30	628.30	628.30	628.30		

grey background = steel failure decisive



Enclosure 5 Characteristic values under central tensile stress, load case fire, for the fischer FIS EM Plus injection system with fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C

Table A 5.1: Characteristic values under central tensile stress, load case fire, for the fischer FIS EM Plus injection system with fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C, anchor sizes M8 to M16

Nom. thread diameter in mm	Nom. drill diameter in mm	Anchoring depth in mm	Design load-bearing capacity in kN of the Fischer FIS EM Plus injection system with fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C for the event of fire						
			R30	R60	R90	R120	R180	R240	
M8	10	d_0	h_{ef}						
		60	0.99	0.46	0.26	0.12	0.00	0.00	
		70	1.54	0.70	0.43	0.26	0.00	0.00	
		80	2.20	1.00	0.63	0.42	0.13	0.00	
		90	2.20	1.20	0.70	0.50	0.20	0.10	
		100	2.20	1.20	0.70	0.50	0.20	0.10	
		110	2.20	1.20	0.70	0.50	0.20	0.10	
M10	12	60	1.23	0.57	0.32	0.15	0.00	0.00	
		70	1.92	0.87	0.53	0.32	0.00	0.00	
		80	2.98	1.25	0.79	0.53	0.16	0.00	
		90	3.60	1.73	1.10	0.76	0.33	0.15	
		100	3.60	2.00	1.20	0.90	0.50	0.30	
		110	3.60	2.00	1.20	0.90	0.50	0.30	
		120	3.60	2.00	1.20	0.90	0.50	0.30	
M12	14	70	2.30	1.05	0.64	0.39	0.00	0.00	
		80	3.57	1.50	0.95	0.63	0.19	0.00	
		90	5.50	2.08	1.32	0.92	0.40	0.18	
		100	5.50	2.83	1.77	1.25	0.64	0.38	
		110	5.50	3.20	2.00	1.40	0.90	0.60	
		120	5.50	3.20	2.00	1.40	0.90	0.60	
		130	5.50	3.20	2.00	1.40	0.90	0.60	
M14	16	70	2.69	1.22	0.75	0.45	0.00	0.00	
		80	4.17	1.75	1.10	0.74	0.22	0.00	
		90	6.78	2.43	1.54	1.07	0.47	0.21	
		100	7.80	3.30	2.07	1.46	0.75	0.44	
		110	7.80	4.45	2.71	1.93	1.07	0.70	
		120	7.80	4.60	3.00	2.20	1.44	0.99	
		130	7.80	4.60	3.00	2.20	1.50	1.10	
		140	7.80	4.60	3.00	2.20	1.50	1.10	
M16	18	80	4.76	2.00	1.26	0.84	0.25	0.00	
		90	7.75	2.77	1.76	1.22	0.53	0.24	
		100	11.30	3.77	2.36	1.67	0.86	0.51	
		110	11.30	5.08	3.10	2.21	1.22	0.80	
		120	11.30	6.90	3.99	2.84	1.65	1.14	
		130	11.30	6.90	4.70	3.59	2.13	1.51	
		140	11.30	6.90	4.70	3.60	2.50	1.93	
		150	11.30	6.90	4.70	3.60	2.50	2.00	
160	11.30	6.90	4.70	3.60	2.50	2.00			
170	11.30	6.90	4.70	3.60	2.50	2.00			

grey background = steel failure decisive



Table A 5.2: Characteristic values under central tensile stress, load case fire, for the Fischer FIS EM Plus injection system with Fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C, anchor sizes M20 to M27

Nom. thread diameter in mm	Nom. drill diameter in mm	Anchoring depth in mm	Design load-bearing capacity in kN of the Fischer FIS EM Plus injection system with Fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C for the event of fire					
			R30	R60	R90	R120	R180	R240
M20	24	90	9.68	3.47	2.20	1.53	0.67	0.30
		100	15.34	4.71	2.95	2.09	1.07	0.63
		110	17.60	6.35	3.87	2.76	1.53	1.01
		120	17.60	8.63	4.99	3.55	2.06	1.42
		130	17.60	10.80	6.38	4.49	2.66	1.89
		140	17.60	10.80	7.40	5.60	3.36	2.41
		150	17.60	10.80	7.40	5.60	3.90	3.00
		160	17.60	10.80	7.40	5.60	3.90	3.10
		170	17.60	10.80	7.40	5.60	3.90	3.10
M22	25	90	10.65	3.81	2.42	1.68	0.74	0.33
		100	16.87	5.18	3.25	2.30	1.18	0.70
		110	21.80	6.99	4.26	3.03	1.68	1.11
		120	21.80	9.49	5.49	3.91	2.26	1.56
		130	21.80	13.19	7.02	4.94	2.93	2.08
		140	21.80	13.30	8.96	6.17	3.70	2.65
		150	21.80	13.30	9.10	7.00	4.58	3.30
		160	21.80	13.30	9.10	7.00	4.90	3.80
		170	21.80	13.30	9.10	7.00	4.90	3.80
M24	28	90	11.62	4.16	2.64	1.83	0.80	0.36
		100	18.41	5.66	3.54	2.51	1.29	0.76
		110	25.19	7.62	4.64	3.31	1.84	1.21
		120	25.40	10.35	5.99	4.26	2.47	1.71
		130	25.40	14.38	7.66	5.39	3.20	2.26
		140	25.40	15.50	9.78	6.73	4.03	2.89
		150	25.40	15.50	10.60	8.20	4.99	3.60
		160	25.40	15.50	10.60	8.20	5.70	4.41
		170	25.40	15.50	10.60	8.20	5.70	4.50
M27	30	100	20.71	6.36	3.98	2.82	1.45	0.85
		110	28.34	8.58	5.23	3.72	2.07	1.36
		120	33.00	11.65	6.74	4.79	2.78	1.92
		130	33.00	16.18	8.61	6.06	3.59	2.55
		140	33.00	20.20	11.00	7.57	4.54	3.26
		150	33.00	20.20	13.80	9.39	5.62	4.06
		160	33.00	20.20	13.80	10.60	6.86	4.96
		170	33.00	20.20	13.80	10.60	7.40	5.80
		180	33.00	20.20	13.80	10.60	7.40	5.80
		190	33.00	20.20	13.80	10.60	7.40	5.80

grey background = steel failure decisive



Table A 5.3: Characteristic values under central tensile stress, load case fire, for the fischer FIS EM Plus injection system with fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C, anchor size M30

Nom. thread diameter in mm	Nom. drill diameter in mm	Anchoring depth in mm	Design load-bearing capacity in kN of the Fischer FIS EM Plus injection system with fischer anchor rod FIS A made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C for the event of fire						
			R30	R60	R90	R120	R180	R240	
M30	35	h_{ef}							
		120	39.97	12.94	7.49	5.33	3.09	2.13	
		130	40.40	17.98	9.57	6.74	3.99	2.83	
		140	40.40	24.70	12.22	8.41	5.04	3.62	
		150	40.40	24.70	15.70	10.43	6.24	4.51	
		160	40.40	24.70	16.90	12.92	7.62	5.51	
		170	40.40	24.70	16.90	13.00	9.10	6.65	
		180	40.40	24.70	16.90	13.00	9.10	7.10	
		190	40.40	24.70	16.90	13.00	9.10	7.10	
		200	40.40	24.70	16.90	13.00	9.10	7.10	

grey background = steel failure decisive





Enclosure 6 Characteristic values under central tensile stress, load case fire, for the fischer FIS EM Plus injection system with fischer internal threaded anchor RG MI made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C

Table A 6.1: Characteristic values under central tensile stress, load case fire, for the fischer FIS EM Plus injection system with fischer internal threaded anchor RG MI made of zinc-plated carbon steel as well as stainless steel A4 and highly corrosion-resistant steel C, anchor sizes M8 to M20

Nom. thread diameter in mm	Nom. drill diameter in mm d_0	Anchoring depth in mm h_{ef}	Design load-bearing capacity in kN of the fischer FIS EM Plus with fischer internal threaded anchor RG MI as well as stainless steel, sizes M8 to M20 for the event of fire					
			R30	R60	R90	R120	R180	R240
M8	14	90	2.20	1.20	0.70	0.50	0.20	0.10
M10	18	90	3.60	1.73	1.10	0.76	0.33	0.15
M12	20	120	5.50	3.20	2.00	1.40	0.90	0.60
M16	24	160	11.30	6.90	4.70	3.60	2.50	2.00
M20	32	200	17.60	10.80	7.40	5.60	3.90	3.10

grey background = steel failure decisive

