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Independent Technical Assessment for fischer HybridPower 10x90 under fire exposure based on EAD 330232-01-0601 and EAD 330284-00-0601-v01

Report no.: 25-005-2(0)

Technical Report

Name of product:
fischer HybridPower 10x90

Type of product:
Plastic anchor with metal power wedge

Manufacturer:
fischerwerke GmbH & Co. KG

Validity:
5 years

Technical Assessment is based on:
EAD 330232-01-0601, EAD 330284-00-0601-v01, 25-005-1(0)

09/07/2025

1 Task and Aim

The characteristic fire resistance of the fischer HybridPower in concrete under pure tension load, inclined load and shear load is assessed in this report in accordance with EAD 330284-00-0604-v01 and EAD 330232-01-0601.

For this purpose, fire tests were conducted in concrete. The anchors were subjected to pure tensile loading (0°), inclined loading (45°), and shear loading (90°). Screws with a hexagon head and an integrally formed washer were used as inserts. The fire tests were performed at the MPA of the University of Stuttgart using the fischer HybridPower in size 10 with a screw diameter of d = 7 mm. The anchors were exposed to a standard fire defined by the standard temperature curve according to EN1363-1:2020-05.

The characteristic fire resistance in concrete is evaluated for a shear load and a 45° inclined tensile load according to EAD 330284-00-0604-v01 and under tension load according to EAD 330232-01-0601. The evaluation is based on detailed results summarised in the test report Fi 638/01-25/07 dated 05.05.2025 and on the assessment report 25-005-1(0) dated 25.06.2025.

The characteristic fire resistance is valid for the following conditions:

- all material versions
- head type FUS and type T
- uncracked and cracked concrete (note, that uncracked concrete is generally not present in case of fire)

According to EN-1992-4:2018 the recommended partial factor for materials is $\gamma_{M,fi}$ = 1,0 for steel failure and concrete related failure modes under shear loading. For concrete related failure modes under tension $\gamma_{M,fi} = 1{,}0 \cdot \gamma_{inst}$ is recommended.

2 Description of the product

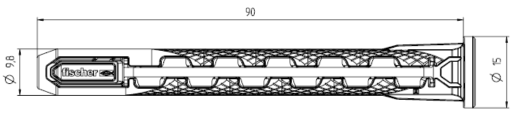
2.1 General description

The fischer HybridPower is a plastic anchor consisting of a plug sleeve made of polyamide combined with a metal skeleton (power wedge) and a special screw made of either galvanised steel, galvanised steel with an additional organic coating, or stainless steel (see Figure 2.1). The anchor sleeve expands when the special screw is screwed in, pressing the sleeve against the borehole wall. The power wedges interlock with the base material, ensuring secure anchorage. The screw is available with two different head types, a hexagon head (type FUS) and a countersunk head (type T). In the fire tests galvanised screws with hexagon head were used. The plastic sleeve consists of Polyamid PA6 and a metal skeleton. An installed anchor is shown in Figure 2.3. A technical drawing of the anchor and the screws is shown in Figure 2.2.

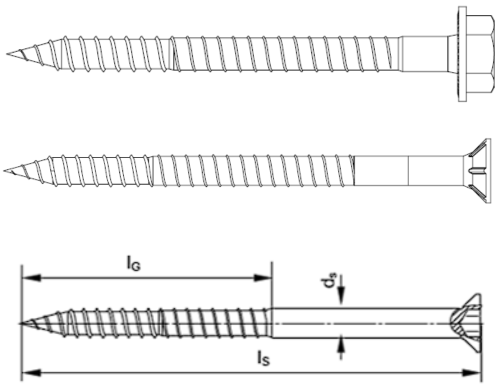
a) HybridPower 10x90 FUS

b) HybridPower 10x90 T

Figure 2.1: HybridPower (sleeve: size 10, screw: size 7)



a) Sleeve



b) Screws FUS and T

Figure 2.2: Technical drawings of the sleeve and the screws of HybridPower

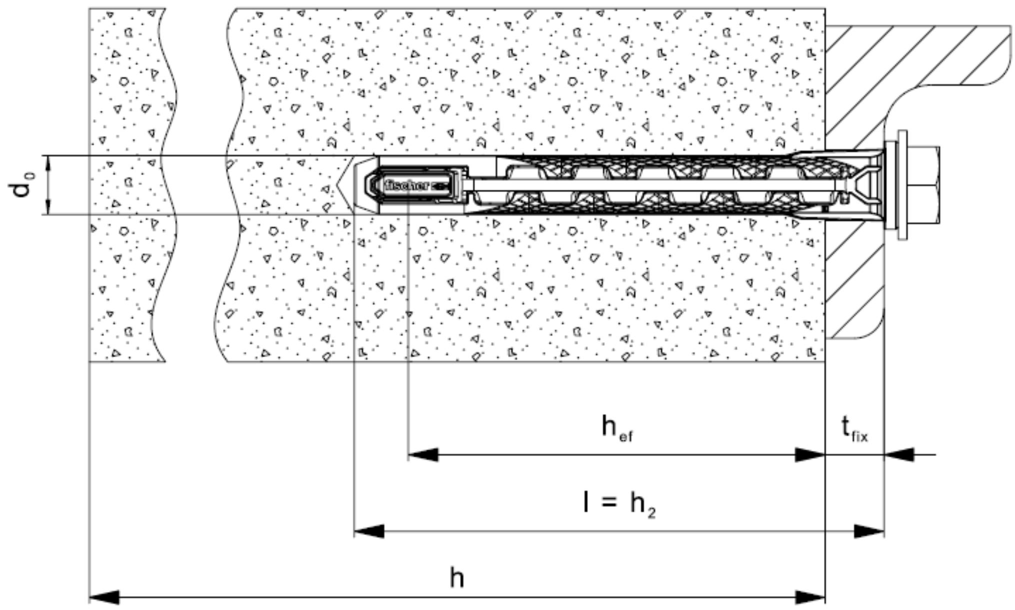


Figure 2.3: Installed anchor HybridPower (10x90 FUS, push-through installation).

Screw

The screws are made of either galvanised steel, galvanised steel with an additional organic coating, or stainless steel. The material of the screws used in the tests is marked in bold (see Table 2.1). The range of validity for all steel grades can be justified by the fact that the assessments are based on test results with carbon steel anchors. According to EAD 330232-01-0604, it can be assumed that the carbon steel version represents the less favorable case compared to the stainless steel version as it results in a shorter fire resistance duration. Therefore, the results summarised in this report are applicable to all material versions.

Table 2.1: Materials of screws 10x90 FUS and T (material used in tests is marked in bold).

Anchor	Screw			Material
	d_s [mm]	l_G [mm]	l_s [mm]	
HybridPower	7,0	≥ 77	≥ l_G+10	• **Galvanised steel gvz with Zn5/Ag or Zn5/An according to EN ISO 4042:2022** • Electro galvanised steel gvz with Zn5/Ag or Zn5/An according to EN ISO 4042:2022 with additional organic coating (Zn5/Ag/T7 or Zn5/An/T7) in three layers (total layer thickness ≥ 6 µm) • Stainless steel "A2" of corrosion resistance class CRC II according to EN 1993-1-4:2006 + A1:2015 • stainless steel "A4" or "R" of corrosion resistance class CRC III according to EN 1993-1-4:2006 + A1:2015

Plastic sleeve

The plastic sleeve consists of Polyamid PA6. The drawing is shown in Figure 2.2.

2.2 Base material

The anchors are intended for use in both cracked and uncracked concrete of strength classes ranging from C20/25 to C50/60.

2.3 Head forms

As noted above, two different head types are available for the screw with a hexagonal head (type FUS) and countersunk head (type T). In the tests, only the hexagonal head was used. However, the same screw types (FUS and T) are also used for the fischer DuoXpand, which already holds a valid ETA under fire exposure. The assessment with this anchor concluded that both screw head types show the same behavior under fire exposure. Therefore, the characteristic fire resistance values assessed in this report are valid for both head types.

2.4 Installation of the product

The installation instruction is shown in Figure 2.4. The essential installation parameters are listed in Table 2.2.

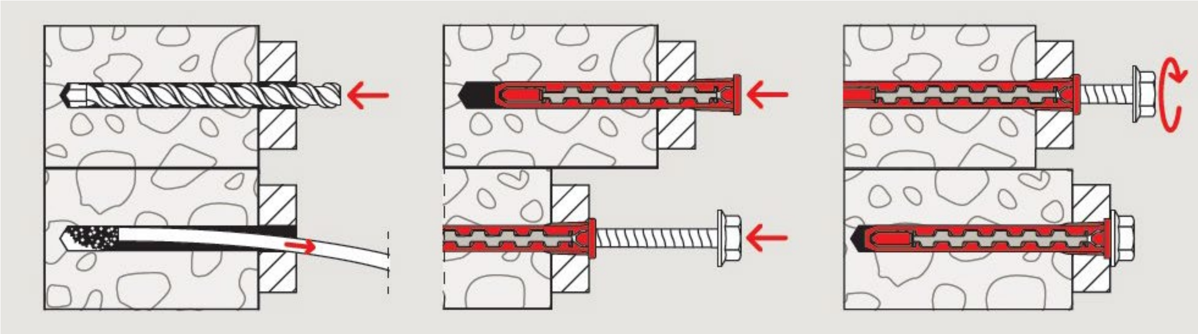


Figure 2.4: Installation instruction of HybridPower, type FUS (type T is analogous).

Table 2.2: Installation parameters of HybridPower.

Drill hole diameter	Anchor length	Minimum drill hole depth	Screw dimension	Effective anchorage depth	Maximum thickness of fixture	Setting tool
d_0	l	h	d_s x l_s	h_{ef}	$t_{fix,max}$	
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[-]
10	90	90	7,0 x 89 (FUS) 7,0 x 87 (T)	70	10	TX40

3 Performance of the product under fire exposure

3.1 Fire resistance according to EAD 330232-01-0601

3.1.1 Tension loading (0°) (steel failure and pull-out failure)

The characteristic fire resistance to steel and pull-out failure for the HybridPower in concrete are listed in Table 3.1.

Table 3.1: Fire resistance to steel and pull-out failure in concrete for HybridPower.

Fire resistance class	Load direction	$N_{Rk,p,fi}$ or $N_{Rk,s,fi}$	$\sigma_{Rk,s,fi}$
[-]	[-]	[kN]	[N/mm²]
R30	0°	0,45	11,59
R60		0,35	9,05
R90		0,25	6,51
R120		0,20	5,23

3.1.2 Concrete cone failure

The fire resistance to concrete cone failure of HybridPower is listed in Table 3.2.

Table 3.2: Fire resistance to concrete cone failure for HybridPower.

Screw diameter	h_{ef}	A_s	$N^0_{Rk,c,C20/25}$	$N^0_{Rk,c,fi(90)}$	$N^0_{Rk,c,fi(120)}$
[-]	[mm]	[mm²]	[kN]	[kN]	[kN]
7	70	38,5	20,2	7,1	5,6

3.1.3 Steel failure under shear load

Shear tests under fire exposure were conducted in accordance with EAD 330284. Since the assessment methodology is identical for both EADs, the results obtained according to EAD 330284 are also applicable to EAD 330232. The corresponding values are listed in Table 3.3.

Table 3.3: Fire resistance to steel failure under shear load with and without lever arm for HybridPower.

Fire resistance class	$\tau_{Rk,s,fi}$	$V_{Rk,s,fi}$	W_{el}	$M^0_{Rk,s,fi}$
[-]	[N/mm²]	[kN]	[mm³]	[Nm]
R30	99,17	2,0	33,7	2,09
R60	76,64	1,5		1,62
R90	50,90	1,0		1,07
R120	38,03	0,8		0,80

3.1.4 Concrete pryout failure

The fire resistance to concrete pry-out failure is listed in Table 3.4.

Table 3.4: Fire resistance to concrete pryout failure for HybridPower.

Screw diameter	h_{ef}	A_s	$N^0_{Rk,c,C20/25}$	$N^0_{Rk,c,fi(90)}$	$N^0_{Rk,c,fi(120)}$	k_8	$V_{Rk,cp,fi(90)}$	$V_{Rk,cp,fi(120)}$
[-]	[mm]	[mm²]	[kN]	[kN]	[kN]	[-]	[kN]	[kN]
7	70	38,5	20,2	7,1	5,6	2,0	14,1	11,3

3.1.5 Concrete edge failure

The fire resistance to concrete edge failure is listed in Table 3.5.

Table 3.5: Fire resistance to concrete edge failure for HybridPower.

Screw diameter	d_{nom}	$h_{ef} = l_f$	$c_{cr,fi}$	k_9	α	β	f_{ck}	$V^0_{Rk,c}$	$V^0_{Rk,c,fi(90)}$	$V^0_{Rk,c,fi(120)}$
[-]	[mm]	[mm]	[mm]	[-]	[-]	[-]	[N/mm²]	[kN]	[kN]	[kN]
7	7	70	140	1,7	0,07	0,05	20	18,2	4,6	3,6

3.2 Fire resistance according to EAD 330284-00-0604-v01

3.2.1 Tests under inclined loading (45°) (steel failure and pull-out failure)

The characteristic fire resistance to steel and pull-out failure for the HybridPower in concrete is listed in Table 3.6.

Table 3.6: Fire resistance to steel and pull-out failure in concrete for HybridPower.

Fire resistance class	**Load direction**	**$F_{Rk,p,fi}$**	**$\sigma_{Rk,s,fi}$**
[-]	**[-]**	**[kN]**	**[N/mm²]**
R30	45°	1,58	41,11
R60		1,10	28,55
R90		0,62	15,99
R120		0,37	9,71

3.2.2 Tests under shear loading (90°) (steel failure)

The characteristic fire resistance to steel failure for the HybridPower in concrete under shear load is listed in Table 3.7.

Table 3.7: Fire resistance to steel and pull-out failure in concrete for HybridPower.

Fire resistance class	**Load direction**	**$F_{Rk,p,fi}$**	**$\sigma_{Rk,s,fi}$**
[-]	**[-]**	**[kN]**	**[N/mm²]**
R30	90°	1,99	99,17
R60		1,54	76,64
R90		1,02	50,90
R120		0,76	38,03

3.2.3 Characteristic fire resistance for shear load with lever arm

The characteristic fire resistance for shear load with lever arm is listed in Table 3.8.

Table 3.8: Fire resistance to steel failure for shear load with lever arm for HybridPower.

Fire resistance class	**$F_{Rk,s,fi}$**	**$\sigma_{Rk,s,fi}$**	**W_{el}**	**$M^0_{Rk.s,fi}$**
[min]	**[kN]**	**[N/mm²]**	**[mm³]**	**[Nm]**
R30	0,45	11,6	33,7	0,47
R60	0,35	9,0		0,37
R90	0,25	6,5		0,26
R120	0,20	5,2		0,21

3.2.4 Interaction of fire resistance for load directions between 45° and 90°

For the HybridPower the characteristic fire resistance for load directions between 45° and 90° is listed in Table 3.9.

According to EAD 330284-00-0604-v01, for fastening of facade systems, the load bearing behaviour of the specific screwed-in plastic anchor with a diameter ≥ 10mm and a metal screw with a diameter ≥ 7mm and a h_{ef} of ≥ 50mm and a plastic sleeve made of polyamide PA6 with no permanent centric tension load and only for shear load without lever arm $F_{Rk,fi,90}$ = 0,8 kN applies. The fire resistance $F_{Rk,fi,90}$ = 0,8 kN is justified for a load direction of $\alpha \geq 57°$ with a constant tensile load of 1,1 kN.

Table 3.9: Characteristic fire resistances for pull-out and steel failure in concrete (cracked and uncracked) as a function of load direction (based on maximum tensile component from 45° inclined loading tests).

Load direction [°]	**Characteristic fire resistance $F_{Rk,p/s,fi}$ [kN]**			
	R30	**R60**	**R90**	**R120**
0	-[1)]	-[1)]	-[1)]	-[1)]
≥45	1,58	1,10	0,62	0,37
≥60	1,99	1,54	0,87	0,53
≥75	1,99	1,54	1,02	0,76
90	1,99	1,54	1,02	0,76

1) Pure tension loading is not allowed according to EAD 330284. Pure tension loading is covered by EAD 330232 (see Section 3.1).

4 Summary

The characteristic fire resistance assessed according to both standards EAD 330232-01-0601 and EAD 330284-00-0601v01 are given in Table 4.1 and Table 4.2.

Table 4.1: Fire resistance for different failure modes for HybridPower according to EAD 330232-01-0601.

Failure mode		**Characteristic fire resistance [kN]**			
		R30	**R60**	**R90**	**R120**
Tension loading					
Pull-out or steel failure	$N_{Rk,p,fi}$ or $N_{Rk,s,fi}$	0,45	0,35	0,25	0,20
Concrete cone failure	$N^0_{Rk,c,fi}$	7,1	7,1	7,1	5,6
Shear loading					
Steel failure	$V_{Rk,s,fi}$	2,0	1,5	1,0	0,8
Pryout failure	$V_{Rk,cp,fi}$	14,1	14,1	14,1	11,3
Concrete edge failure	$V^0_{Rk,c,fi}$	4,6	4,6	4,6	3,6

Table 4.2: Fire resistance for different failure modes for HybridPower according to EAD 330284-00-0601v01.

Failure mode		**Load direction**	**Characteristic fire resistance [kN]**			
			R30	**R60**	**R90**	**R120**
Pull-out or steel failure	$F_{Rk,p,fi}$ or $F_{Rk,s,fi}$	0	-[1)]	-[1)]	-[1)]	-[1)]
		≥45	1,58	1,10	0,62	0,37
		≥60	1,99	1,54	0,87	0,53
		≥75	1,99	1,54	1,02	0,76
		90	1,99	1,54	1,02	0,76

1) Pure tension loading is not allowed according to EAD 330284. Pure tension loading is covered by EAD 330232 (see Table 4.1).

According to EN-1992-4:2018 the recommended partial factor for materials is $\gamma_{M,fi}$ = 1,0 for steel failure and concrete related failure modes under shear loading. For concrete related failure modes under tension $\gamma_{M,fi} = 1{,}0 \cdot \gamma_{inst}$ is recommended.

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