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European Technical Assessment

ETA 25/1049
30/ 10/ 2025

English translation prepared by IETcc. Original version in Spanish language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)
Trade name of the construction product	**Fix master FIXCON PRO concrete screw**
Product family to which the construction product belongs	Concrete screw of sizes 6, 8, 10, 12 and 14 for use in cracked and non-cracked concrete.
Manufacturer	Ferrometal Oy Karhutie 9, 01900 Nurmijärvi, Finland Website:www.ferrometal.fi
Manufacturing plant(s)	Nurmijärvi plant 1
This European Technical Assessment contains	30 pages + 4 annexes, which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	European Technical Assessment EAD 330232-01-0601 “Mechanical Fasteners for use in concrete”, ed. December 2019

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

SPECIFIC PART

1. Technical description of the product

This ETA covers post-installed mechanical metal fasteners placed into pre-drilled holes perpendicular to the surface (maximum deviation 5°) in concrete and anchored therein by mechanical means such as friction or mechanical interlock. Mechanical fasteners are often used to connect structural elements and non-structural elements to structural components.

The **Fix master FIXCON PRO concrete screw** is a type of anchor made of carbon steel and stainless steel (A4 stainless 316 Bimetal). The anchor is made of carbon steel for sizes 6,8,10,12 and 14 and of stainless steel for sizes 6,8,10.

Item	Designation	Fix master FIXCON PRO concrete screw (Carbon Steel)	Fix master FIXCON PRO concrete screw (A4 stainless 316 Bimetal)
1	Anchor Body	Carbon steel wire rod cold forged. Allowed coatings: • Zinc plated ≥ 5 µm ISO 4042 Zn5 • Silver ruspert 1000/2000hours ISO9227 • Zinc flake ≥ 5 µm EN 10683 • Mechanical plated ≥ 30 µm EN ISO 12683 Zn 40 M(Fe)	Shaft and head: stainless steel grade A4 ISO 3506-1 Tip: hardened carbon steel

Both are screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

The product and its installation description are shown in annexes A.

2. Specification of the intended use in accordance with the applicable European Assessment Document.

2.1 Intended use(s)

This ETA, the assessment is made to determine characteristic values of the mechanical fastener for calculation according to EN 1992-4.

Mechanical fastener placed into pre-drilled holes for use in compacted reinforced or unreinforced normal weight concrete with strength classes in the range C12/15 to C90/105 all in accordance with EN 206.

The fasteners are intended to be used:

Anchorages subjected to:

- Static or quasi static loads: all sizes and embedment depths.
- Fire exposure up to 120 minutes
- Performances C1 and C2 (seismic) for SS Carbon Steel screws and SS A4 stainless Bimetal Stainless Steel screw as shown below:

Screw Size	**6**		**8**		**10**			**12**		**14**	
Drill Size	**6**		**8**		**10**			**12**		**14**	
h_{nom}	40	55	50	60	60	70	85	75	105	75	110
SS Carbon Steel											
Static or quasi static loads	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
C1	✓	✓	✓	✓	✓	✓	✓		✓		✓
C2			✓	✓	✓	✓	✓		✓		✓
Fire exposure up to 120 minutes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SS A4 stainless Bimetal A4-316											
Static or quasi static loads	✓	✓	✓	✓		✓	✓				
C1	✓	✓	✓	✓		✓	✓				
C2				✓			✓				
Fire exposure up to 120 minutes	✓	✓	✓	✓		✓	✓				

Base materials:

- Reinforced and unreinforced normal weight concrete without fibers according to EN 206:2013 + A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A1:2016.
- Cracked and uncracked concrete.

Use conditions (environmental conditions):

- The anchor Carbon Steel shall be used in dry internal conditions.
- The anchor A4 stainless 316 Bimetal shall be used in dry internal conditions, external atmospheric exposure (including industrial and marine environment) or permanent internal damp conditions if there are no particular aggressive conditions. Such particular aggressive conditions are e.g., permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g., in desulphurization plants or road tunnels where de-icing materials are used). Atmospheres under Corrosion Resistance Class CRC III according to EN 1993-1-4:2006+A1:2015 annex A.
- The anchor may be used for anchorages with requirements related to resistance to fire.

According to this ETA concrete screws are intended to be used where the scatter of required torque for installation is lower than 30%

2.2 Relevant general conditions for the use of the product

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a maximum working life of the fastener for the intended use of 50 and/or 100 years when installed in the works (provided that the fastener is subject to appropriate installation) These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[1].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete.
- Verifiable calculation rules and drawings are prepared taking into account of the loads to be attached. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.)
- Anchorages under static or quasi-static loads are designed for design Method A in accordance with EN 1992-4:2018
- Anchorages under seismic actions are designed in accordance with EN 1992-4:2018. Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure. Fastening in stand-off installation or with grout layer are not allowed.
- Anchorages under fire exposure are designed in accordance with EN 1992-4:2018. It must be ensured that local spalling of the concrete cover does not occur.
- Shear assessment only covers the shear force induced by the fixed piece, i.e. the piece located between the anchor head and the concrete block (piece contained in t_{fix}, see Drawing A1).

Installation:

- Hammer drilling only.
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the anchor is not possible.
- The head of the anchor is supported on the fixture, as it is shown in Drawing A1, and it must not be damaged.

[1] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

Fix master FIXCON PRO concrete screw installation parameters:

CARBON STEEL	6		8		10			12		14	
h_{nom} [mm]	40	55	50	60	60	70	85	75	105	75	110
d_0 [mm]	6		8		10			12		14	
d_f [mm]	9		12		14			16		18	
d_s [mm]	7.5		10.5		12.5			14.2		16.5	
d_k [mm]	5.4		7.2		9.0			11.3		13.6	
h_{min} [mm]	80	100	100	100	100	105	130	120	170	120	175
h_1 [mm]	50	65	60	70	70	85	100	90	120	90	130
h_{ef} [mm]	29	42	37	45	44	52	65	57	82	56	86
T_{inst} [mm]	15		25		50			60		80	
t_{fix} [mm]*	L-40	L-55	L-50	L-60	L-60	L-70	L-85	L-75	L-105	L-75	L-110
s_{min} [mm]	35	50 45	35	50	50	60	70	70	70	75	100
c_{min} [mm]	35	35 45	35	50	40	60	60	45	45	45	100

* L = Total length of the fastener

A4 STAINLESS 316 BIMETAL	6		8		10	
h_{nom} [mm]	40	55	50	60	70	85
d_0 [mm]	6		8		10	
d_f [mm]	9		12		14	
d_s [mm]	7.5		10.5		12.5	
d_k [mm]	5.2		7.3		9.3	
h_{min} [mm]	100	100	100	100	105	130
h_1 [mm]	50	65	60	70	85	100
h_{ef} [mm]	29	42	37	45	52	65
T_{inst} [mm]	15	20	25		50	
t_{fix} [mm]	L-40	L-55	L-50	L-60	L-60	L-70
s_{min} [mm]	35	35	35	50	60	70
c_{min} [mm]	35	35	35	50	60	60

* L = Total length of the fastener

The performances given in section 3 are only valid if the anchor is used in compliance with the specifications and conditions given above and in annex B.

3. Performance of the product and references to the methods used for its assessment

The identification tests and the assessment for the intended use of this product according to the Basic Work Requirements (BWR) were carried out in compliance with EAD 330232-01-0601, The characteristics of each system shall correspond to the respective values laid down in following tables of this ETA, checked by IETcc.

3.1. Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Static or quasi static actions	See annexes C1 to C7
Essential characteristic and displacements for seismic performance categories C1 and C2	See annexes C8 and C12

3.2. Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for class A1
Resistance to fire	See annex D

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to the decision 96/582/EC of the European Commission a system 1 of assessment and verification of constancy of performance (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) N.º 305/2011) applies.

The system to be applied is 1.

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document.

Technical details necessary for the implementation of the AVCP system are laid down in the control plan which is deposited at IETcc[(2)].

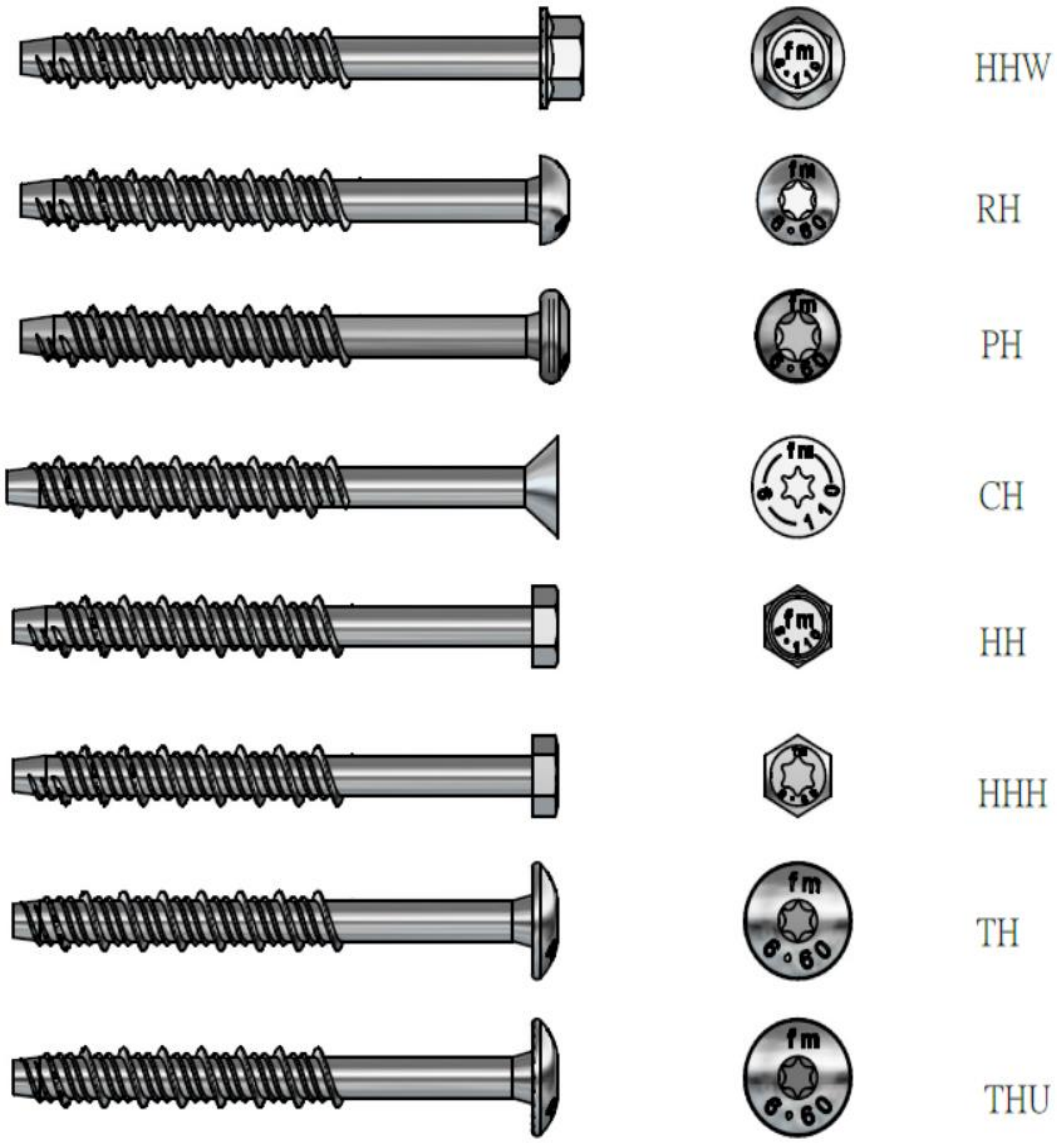
Prepared by: Julián Rivera Lozano (Innovative Products Assessment Unit, IETcc – CSIC)

Issued in Madrid on 30th of October 2025

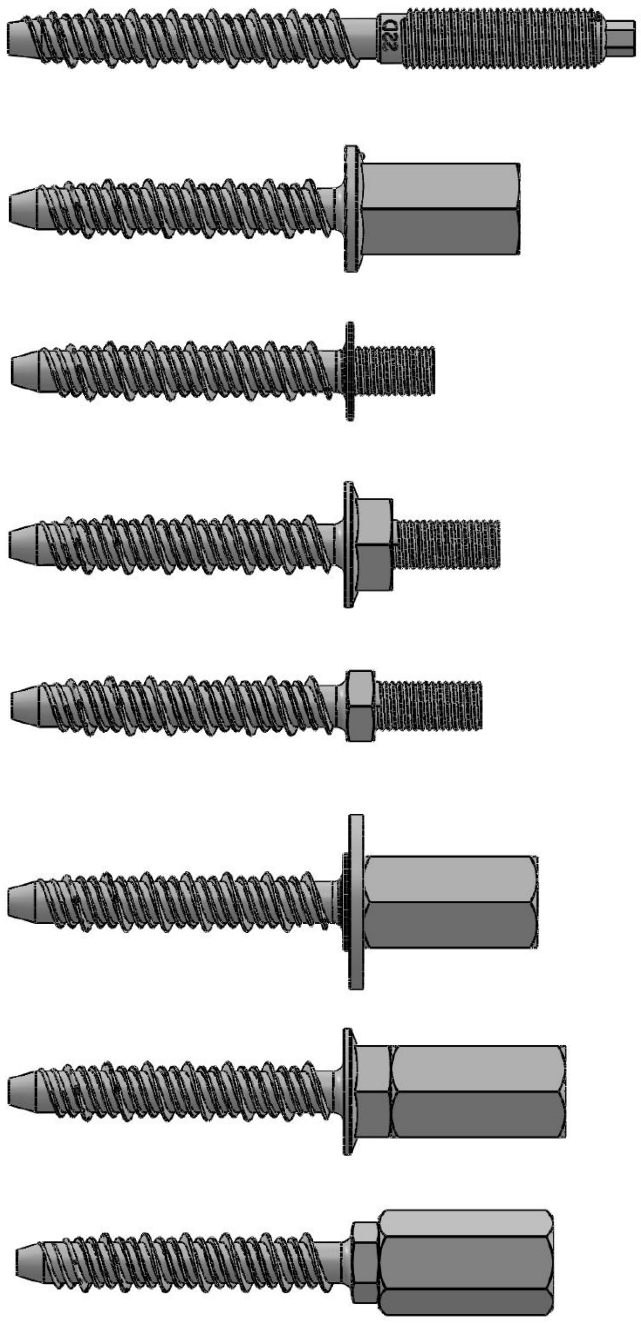
Director
on behalf of Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc – CSIC)

[(2)] The Control Plan is a confidential part of the ETA and only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

Product and identification

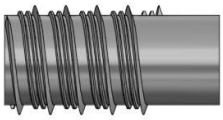


Fix master FIXCON PRO concrete screw	
Product description Identification	**Annex A1**



Fix master FIXCON PRO concrete screw	
Product description Identification	**Annex A2**


HHB




IM

Fix master FIXCON PRO concrete screw	
Product description Identification	**Annex A3**

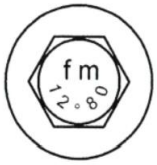
Marking/Identification on anchor:

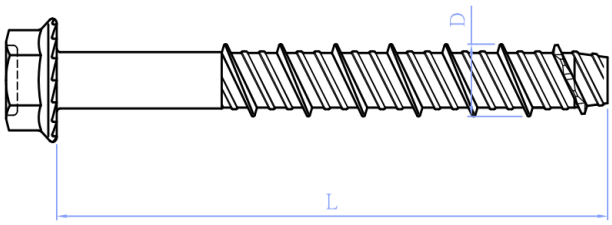
- Outer diameter
- Length
- Anchor type:

-	Hex head with washer	HHW
-	Round head	RH
-	Pan head	PH
-	Countersunk head	CH
-	Hex head	HH
-	Hex head, hexalobular recess	HHH
-	Truss head	TH
-	Truss head with underhead ribs	THU
-	Connection thread with hexagon drive	CTH
-	Internal thread	IT
-	Flat washer head with connection thread	FHC
-	Hex washer head with connection thread	HHC
-	Hex head with connection thread	HHCT
-	SSF flex with coupler nut	SFN
-	SSO flex with coupler nut	SSFN
-	SSU flex with coupler nut	SFCN
-	SSG flex without washer	HHB
-	Screw in Screw anchor, Sissy Anchor	IM

Fix master FIXCON PRO concrete screw	
Product description Identification and materials	**Annex A4**

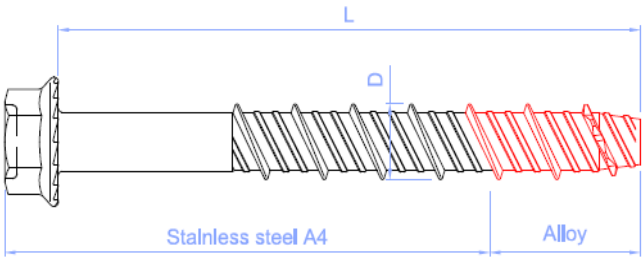
Carbon Steel





Head marking:
Identifying mark
Outer diameter of thread: e.g. D=12
Length L: e.g. 80 mm
Material: Carbon Steel

A4 stainless 316 Bimetal

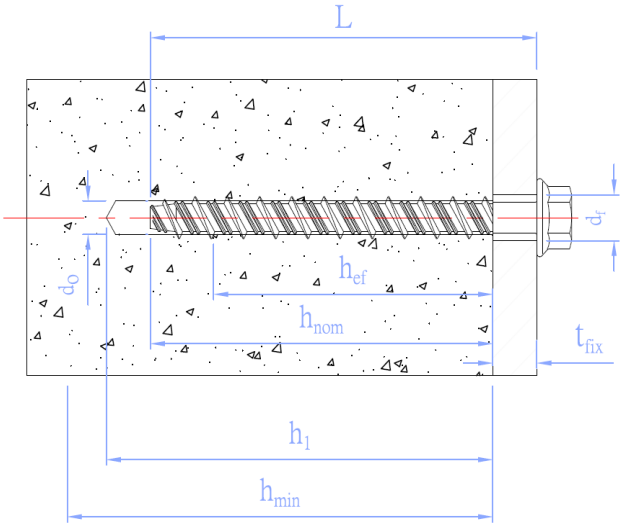


Head marking:
Identifying mark
Drill bit size: e.g. 8 mm
Length L: e.g. 75 mm
Material: A4 Stainless Steel (Marking A4)

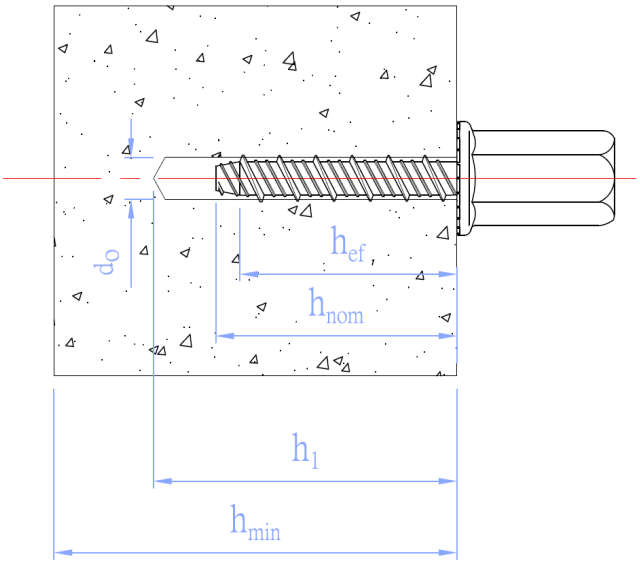
Fix master FIXCON PRO concrete screw	
Product description Identification and materials	**Annex A5**

Installed condition

h_{ef}: Effective anchorage depth
h_1: Depth of drilled hole
h_{nom}: Overall anchor embedment depth in the concrete
h_{min}: Minimum thickness of concrete member
t_{fix}: Thickness of fixture
d_0: Nominal diameter of drill bit
d_f: Diameter of clearance hole in fixture
t_{fix}: Fixture thickness

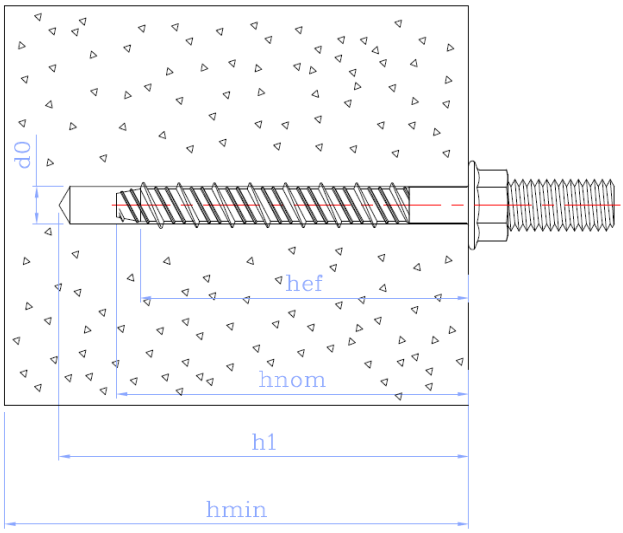


Drawing A1. Installed condition for anchors HHW, RH, PH, CH, HH, HHH, TH and THU .



Drawing A2. Installed condition for anchors CTH, IT, FHC, HHC, HHCT, SFN, SSFN, SFCN and HHB.

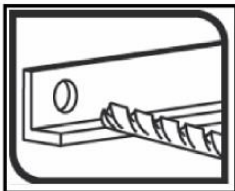
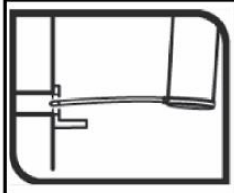
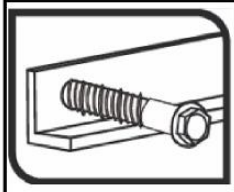
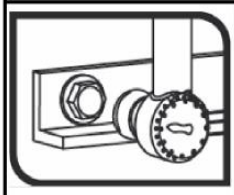
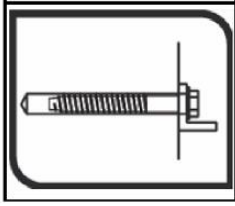
Fix master FIXCON PRO concrete screw	
Product description Installed condition	**Annex A6**



Drawing A3. Installed condition for anchors CTH, IT, FHC, HHC, HHCT, SFN, SSFN, SFCN and HHB

Fix master FIXCON PRO concrete screw	
Product description Installed condition	**Annex A7**

Installation process

	1. DRILL Drill a hole into the base material of correct diameter and depth by using a carbide drill bit in rotary plus hammer mode.
	2. BLOW and CLEAN Remove dust and debris from hole and loose particles left from drilling by using hand pump, compressed air or vacuum.
	3. INSTALL Hold screw anchor perpendicular direction into the base material through fixtures.
	4. APPLY TORQUE Select a power impact wrench or a torque wrench(e.g: Bosch GDS 18E, power input: 500 W; torque: 50-250 Nm). Power impact wrench does not exceed over torque Tinst.
	5. CHECK The head must be undamaged and in contact with the fixture. When screw head attach fixture or concrete surface firmly, furthre turning of the head is unnecessary.

Fix master FIXCON PRO concrete screw	
Intended use installation procedure	**Annex B**

Table C1: Characteristic values to tension loads for Carbon Steel

Characteristic values of resistance to tension loads of design method A			Performance						
			6		8		10		
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85
Tension loads: steel failure									
$N_{Rk,s}$	Tension steel characteristic resistance:	[kN]	18.7		32.7		51.2		
γ_{Ms}	Partial safety factor: 1)	[-]	1.5		1.5		1.5		
Tension loads: pull-out failure in concrete									
$N_{Rk,p,ucr}$	Tension characteristic resistance in C20/25 uncracked concrete:	[kN]	6.0	9.0	12.5 2)	12.0	23.5 2)	20.0 2)	35 2)
$N_{Rk,p,cr}$	Tension characteristic resistance in C20/25 cracked concrete:	[kN]	3.0	6.0	6.5	9.0	14.5 2)	12.0	24.5 2)
ψ_c	C30/37	[-]	1.16	1.22	1.16	1.08	1.14	1.04	1.18
ψ_c	C40/45	[-]	1.29	1.41	1.28	1.15	1.25	1.07	1.33
ψ_c	C50/60	[-]	1.40	1.55	1.39	1.19	1.34	1.09	1.46
Tension loads: concrete cone and splitting failure									
γ_{ins}	Installation safety factor: 1)	[-]	1.2	1.2	1.2	1.2	1.2	1.2	1.0
h_{ef}	Effective embedment depth:	[mm]	29	42	37	45	44	52	65
$k_{ucr,N}$	Factor for uncracked concrete:	[-]	11.0						
$N^0_{Rk,c,ucr}$	Tension characteristic resistance in C20/25 uncracked concrete: 3)	[kN]	7.7	13.4	11.1	14.9	14.4	18.4	25.8
$k_{cr,N}$	Factor for cracked concrete:	[-]	7.7						
$N^0_{Rk,c,cr}$	Tension characteristic resistance in C20/25 cracked concrete: 3)	[kN]	5.4	9.4	7.8	10.4	10.1	12.9	18.0
$s_{cr,N}$	Critical spacing:	[mm]	3.0 x h_{ef}						
$c_{cr,N}$	Critical edge distance:	[mm]	1.5 x h_{ef}						
$s_{cr,sp}$	Critical spacing (splitting):	[mm]	3.0 x h_{ef}						
$c_{cr,sp}$	Critical edge distance (splitting):	[mm]	1.5 x h_{ef}						

1) In absence of other national regulations
2) Pull-out failure is not decisive ($N^0_{Rk,c} < N_{Rk,p}$)
3) Equation 7.2 from EN 1992-4:2018

Fix master FIXCON PRO concrete screw	
Performances Characteristic values for tension loads	**Annex C1**

Table C1: Characteristic values to tension loads for Carbon Steel (continuation)

Characteristic values of resistance to tension loads of design method A			Performance			
			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	75	105	75	110
Tension loads: steel failure						
$N_{Rk,s}$	Tension steel characteristic resistance:	[kN]	80.6		115.9	
γ_{Ms}	Partial safety factor: [1]	[-]	1.5		1.5	
Tension loads: pull-out failure in concrete						
$N_{Rk,p,ucr}$	Tension characteristic resistance in C20/25 uncracked concrete:	[kN]	25.5 [2]	41.0 [2]	30.0 [2]	40.0 [2]
$N_{Rk,p,cr}$	Tension characteristic resistance in C20/25 cracked concrete:	[kN]	19.5 [2]	33.5 [2]	20.0 [2]	30.0 [2]
ψ_c	C30/37	[-]	1.10	1.08	1.13	1.04
ψ_c	C40/45	[-]	1.17	1.15	1.24	1.07
ψ_c	C50/60	[-]	1.23	1.20	1.33	1.09
Tension loads: concrete cone and splitting failure						
γ_{ins}	Installation safety factor: [1]	[-]	1.2	1.0	1.2	1.0
h_{ef}	Effective embedment depth:	[mm]	57	82	56	86
$k_{ucr,N}$	Factor for uncracked concrete:	[-]	11.0			
$N^0_{Rk,c,ucr}$	Tension characteristic resistance in C20/25 uncracked concrete: [3]	[kN]	21.2	36.5	20.6	39.2
$k_{cr,N}$	Factor for cracked concrete:	[-]	7.7			
$N^0_{Rk,c,cr}$	Tension characteristic resistance in C20/25 cracked concrete: [3]	[kN]	14.8	25.6	14.4	27.5
$s_{cr,N}$	Critical spacing:	[mm]	3.0 x h_{ef}			
$c_{cr,N}$	Critical edge distance:	[mm]	1.5 x h_{ef}			
$s_{cr,sp}$	Critical spacing (splitting):	[mm]	3.0 x h_{ef}			
$c_{cr,sp}$	Critical edge distance (splitting):	[mm]	1.5 x h_{ef}			

[1] In absence of other national regulations
[2] Pull-out failure is not decisive ($N^0_{Rk,c} < N_{Rk,p}$)
[3] Equation 7.2 from EN 1992-4:2018

Fix master FIXCON PRO concrete screw	
Performances Characteristic values for tension loads	**Annex C2**

Table C2: Characteristic values to tension loads for A4 stainless 316 Bimetal

Characteristic values of resistance to tension loads of design method A			Performance					
			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Tension loads: steel failure								
$N_{Rk,s}$	Tension steel characteristic resistance:	[kN]	17.0		33.5		54.3	
γ_{Ms}	Partial safety factor: 1)	[-]	1.5		1.5		1.5	
Tension loads: pull-out failure in concrete								
$N_{Rk,p,ucr}$	Tension characteristic resistance in C20/25 uncracked concrete:	[kN]	6.0	13.5 2)	11.0 2)	17.5 2)	22.0 2)	33.5 2)
$N_{Rk,p,cr}$	Tension characteristic resistance in C20/25 cracked concrete:	[kN]	3.0	11.5 2)	7.5 2)	12.5 2)	17.5 2)	25.5 2)
ψ_c	C30/37	[-]	1.09	1.11	1.09	1.12	1.09	1.13
ψ_c	C40/45	[-]	1.16	1.20	1.16	1.21	1.16	1.23
ψ_c	C50/60	[-]	1.22	1.27	1.21	1.28	1.22	1.31
Tension loads: concrete cone and splitting failure								
γ_{ins}	Installation safety factor: 1)	[-]	1.0	1.2	1.0	1.2	1.2	1.2
h_{ef}	Effective embedment depth:	[mm]	29	42	37	45	52	65
$k_{ucr,N}$	Factor for uncracked concrete:	[-]	11.0					
$N^0_{Rk,c,ucr}$	Tension characteristic resistance in C20/25 uncracked concrete: 3)	[kN]	7.7	13.4	11.1	14.9	18.4	25.8
$k_{cr,N}$	Factor for cracked concrete:	[-]	7.7					
$N^0_{Rk,c,cr}$	Tension characteristic resistance in C20/25 cracked concrete: 3)	[kN]	5.4	9.4	7.8	10.4	12.9	18.0
$s_{cr,N}$	Critical spacing:	[mm]	3.0 x h_{ef}					
$c_{cr,N}$	Critical edge distance:	[mm]	1.5 x h_{ef}					
$s_{cr,sp}$	Critical spacing (splitting):	[mm]	3.0 x h_{ef}					
$c_{cr,sp}$	Critical edge distance (splitting):	[mm]	1.5 x h_{ef}					

1) In absence of other national regulations
2) Pull-out failure is not decisive ($N^0_{Rk,c} < N_{Rk,p}$)
3) Equation 7.2 from EN 1992-4:2018

Fix master FIXCON PRO concrete screw	
Performances Characteristic values for tension loads	**Annex C3**

Table C3: Displacements under tension loads for Carbon Steel

Characteristic values of displacements under tension loads of design method A			Performance						
			6		8		10		
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85
Displacements under tension loads in uncracked concrete									
N	Service tension load in uncracked concrete C20/25 to C50/60:	[kN]	2.4	3.6	4.4	4.8	5.7	9.5	12.3
δ_{N0}	Short term displacement under tension loads:	[mm]	0.06	0.40	0.08	0.40	0.09	0.40	0.12
$\delta_{N\infty}$	Long term displacement under tension loads:	[mm]	0.30	1.00	0.35	1.10	0.40	1.40	0.55
Displacements under tension loads in cracked concrete									
N	Service tension load in cracked concrete C20/25 to C50/60:	[kN]	1.2	2.4	2.5	3.6	4.0	5.7	8.6
δ_{N0}	Short term displacement under tension loads:	[mm]	0.10	0.60	0.12	0.70	0.15	0.50	0.17
$\delta_{N\infty}$	Long term displacement under tension loads:	[mm]	1.10	1.40	1.20	1.20	1.25	1.40	0.55

Characteristic values of displacements under tension loads of design method A			Performance			
			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	75	105	75	110
Displacements under tension loads in uncracked concrete						
N	Service tension load in uncracked concrete C20/25 to C50/60:	[kN]	11.3	18.1	8.2	19.0
δ_{N0}	Short term displacement under tension loads:	[mm]	0.08	0.10	0.10	0.90
$\delta_{N\infty}$	Long term displacement under tension loads:	[mm]	0.40	0.40	0.45	1.40
Displacements under tension loads in cracked concrete						
N	Service tension load in cracked concrete C20/25 to C50/60:	[kN]	7.7	13.3	5.7	11.9
δ_{N0}	Short term displacement under tension loads:	[mm]	0.13	0.15	0.20	0.60
$\delta_{N\infty}$	Long term displacement under tension loads:	[mm]	1.25	1.35	1.32	1.20

Table C4: Displacements under tension loads for A4 stainless 316 Bimetal

Characteristic values of displacements under tension loads of design method A			Performance					
			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Displacements under tension loads in uncracked concrete								
N	Service tension load in uncracked concrete C20/25 to C50/60:	[kN]	2.95	5.47	4.44	7.06	8.76	13.42
δ_{N0}	Short term displacement under tension loads:	[mm]	0.11	0.15	0.23	0.32	0.39	0.54
$\delta_{N\infty}$	Long term displacement under tension loads:	[mm]	0.40	0.50	0.55	0.55	0.60	0.65
Displacements under tension loads in cracked concrete								
N	Service tension load in cracked concrete C20/25 to C50/60:	[kN]	1.46	4.66	3.09	5.08	7.02	10.25
δ_{N0}	Short term displacement under tension loads:	[mm]	0.18	0.25	0.43	0.54	0.64	0.72
$\delta_{N\infty}$	Long term displacement under tension loads:	[mm]	1.13	1.20	1.33	1.40	1.47	1.47

Fix master FIXCON PRO concrete screw	
Performances Displacement under tension loads	**Annex C4**

Table C5: Characteristic values to shear loads for Carbon Steel

Characteristic values of resistance to shear loads			Performance						
			6		8		10		
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85
Shear loads: steel failure without lever arm									
$V_{Rk,s}$	Shear steel characteristic resistance:	[kN]	9.3	7.5	16.3		25.6		
k_7	k_7 factor:[1)]	[-]	0.8		0.8		0.8		
γ_{Ms}	Partial safety factor: [2)]	[-]	1.25		1.25		1.25		
Shear loads: steel failure with lever arm									
$M^0_{Rk,s}$	Characteristic bending moment:	[Nm]	15.2		35.3		69.3		
γ_{Ms}	Partial safety factor: [2)]	[-]	1.25		1.25		1.25		
Shear loads: concrete pryout failure									
k_8	k_8 factor:	[-]	1.0	1.0	1.2	1.0	1.0	1.0	2.0
γ_{inst}	Installation safety factor: [2)]	[-]	1.0		1.0		1.0		
Shear loads: concrete edge failure									
l_f	Effective anchorage depth under shear loads:	[mm]	29	42	37	45	44	52	65
d_{nom}	Nominal outer diameter of screw:	[mm]	6	6	8	8	10	10	10
γ_{inst}	Installation safety factor: [2)]	[-]	1.0		1.0		1.0		

[1)] The diameter of the clearance hole does not meet the values given in EN 1992-4 Table 6.1. However, the group resistance under shear loading has been verified in the assessment through testing and accounted for in the factor k_7.
[2)] In absence of other national regulations.

Characteristic values of resistance to shear loads			Performance			
			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	75	105	75	110
Shear loads: steel failure without lever arm						
$V_{Rk,s}$	Shear steel characteristic resistance:	[kN]	40.3		57.9	
k_7	k_7 factor:[1)]	[-]	0.8		0.8	
γ_{Ms}	Partial safety factor: [2)]	[-]	1.25		1.25	
Shear loads: steel failure with lever arm						
$M^0_{Rk,s}$	Characteristic bending moment:	[Nm]	137.1		235.9	
γ_{Ms}	Partial safety factor: [2)]	[-]	1.25		1.25	
Shear loads: concrete pryout failure						
k_8	k_8 factor:	[-]	1.5	2.0	1.6	2.0
γ_{inst}	Installation safety factor: [2)]	[-]	1.0		1.0	
Shear loads: concrete edge failure						
ℓ_f	Effective anchorage depth under shear loads:	[mm]	57	82	56	86
d_{nom}	Nominal outer diameter of screw:	[mm]	12	12	14	14
γ_{inst}	Installation safety factor: [2)]	[-]	1.0		1.0	

[1)] The diameter of the clearance hole does not meet the values given in EN 1992-4 Table 6.1. However, the group resistance under shear loading has been verified in the assessment through testing and accounted for in the factor k_7.
[2)] In absence of other national regulations.

Fix master FIXCON PRO concrete screw	
Performances Characteristic values for shear loads	**Annex C5**

Table C6: Characteristic values to shear loads for A4 stainless 316 Bimetal

Characteristic values of resistance to shear loads			Performance					
			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Shear loads: steel failure without lever arm								
$V_{Rk,s}$	Shear steel characteristic resistance:	[kN]	8.5		16.7		27.2	
k_7	k_7 factor:[1)]	[-]	0.8	0.8	1.0		1.0	
γ_{Ms}	Partial safety factor: [2)]	[-]	1.25		1.25		1.25	
Shear loads: steel failure with lever arm								
$M^0_{Rk,s}$	Characteristic bending moment:	[Nm]	13.3		36.6		75.7	
γ_{Ms}	Partial safety factor: [2)]	[-]	1.25		1.25		1.25	
Shear loads: concrete pryout failure								
k_8	k_8 factor:	[-]	1.0	1.0	1.0	1.0	1.09	2.0
γ_{inst}	Installation safety factor: [2)]	[-]	1.0		1.0		1.0	
Shear loads: concrete edge failure								
l_f	Effective anchorage depth under shear loads:	[mm]	29	42	37	45	52	65
d_{nom}	Nominal outer diameter of screw:	[mm]	6	6	8	8	10	10
γ_{inst}	Installation safety factor: [2)]	[-]	1.0		1.0		1.0	

[1)] The diameter of the clearance hole does not meet the values given in EN 1992-4 Table 6.1. However, the group resistance under shear loading has been verified in the assessment through testing and accounted for in the factor k_7.
[2)] In absence of other national regulations.

Fix master FIXCON PRO concrete screw	
Performances Characteristic values for shear loads	**Annex C6**

Table C7: Displacements under shear loads for Carbon Steel

Characteristic values of displacements under shear loads of design method A			Performances						
			6		8		10		
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85
Displacements under shear loads in uncracked concrete									
V	Service shear load in uncracked concrete C20/25 to C50/60:	[kN]	3.0	3.6	4.4	4.8	5.7	9.5	12.3
δ_{V0}	Short term displacement under shear loads:	[mm]	0.47	0.4	0.50	0.40	0.40	0.40	0.80
$\delta_{V\infty}$	Long term displacement under shear loads:	[mm]	0.70	1.0	0.75	1.10	0.60	1.40	1.20
Displacements under shear loads in cracked concrete									
V	Service shear load in cracked concrete C20/25 to C50/60:	[kN]	2.1	2.4	3.1	3.6	4.0	5.7	8.6
δ_{V0}	Short term displacement under shear loads:	[mm]	0.40	0.60	0.45	0.70	0.50	0.50	0.6
$\delta_{V\infty}$	Long term displacement under shear loads:	[mm]	0.60	1.40	0.67	1.20	0.75	1.40	0.90

Characteristic values of displacements under shear loads of design method A			Performances			
			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	75	105	75	110
Displacements under shear loads in uncracked concrete						
V	Service shear load in uncracked concrete C20/25 to C50/60:	[kN]	8.4	17.4	8.2	19.0
δ_{V0}	Short term displacement under shear loads:	[mm]	1.00	1.10	0.55	0.90
$\delta_{V\infty}$	Long term displacement under shear loads:	[mm]	1.50	1.80	0.82	1.4
Displacements under shear loads in cracked concrete						
V	Service shear load in cracked concrete C20/25 to C50/60:	[kN]	5.9	12.2	5.7	11.9
δ_{V0}	Short term displacement under shear loads:	[mm]	0.85	1.00	0.50	0.60
$\delta_{V\infty}$	Long term displacement under shear loads:	[mm]	1.20	1.50	0.75	1.20

[1)] No Performance Determined (NPD)

Table C8: Displacements under shear loads for A4 stainless 316 Bimetal

Characteristic values of displacements under shear loads of design method A			Performances					
			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Displacements under shear loads in uncracked concrete								
V	Service shear load in uncracked concrete C20/25 to C50/60:	[kN]	2.7	3.3	4.0	5.3	8.0	11.2
δ_{V0}	Short term displacement under shear loads:	[mm]	1.42	1.55	1.64	1.75	1.78	2.11
$\delta_{V\infty}$	Long term displacement under shear loads:	[mm]	2.13	2.33	2.46	2.63	2.67	3.17
Displacements under shear loads in cracked concrete								
V	Service shear load in cracked concrete C20/25 to C50/60:	[kN]	1.9	2.3	2.8	3.7	5.6	7.8
δ_{V0}	Short term displacement under shear loads:	[mm]	1.22	1.34	1.45	1.52	1.57	1.67
$\delta_{V\infty}$	Long term displacement under shear loads:	[mm]	1.83	2.01	2.18	2.28	2.36	2.51

Fix master FIXCON PRO concrete screw

Performances

Displacements under shear loads

Annex C7

Table C9: Essential characteristics for seismic performance category C1 for Carbon Steel

Essential characteristics for seismic performance category C1			Performance						
			6		8		10		
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85
Steel failure for tension and shear loads									
$N_{Rk,s,C1}$	Characteristic resistance:	[kN]	18.7		32.7	32.7	51.2	51.2	51.2
γ_{Ms}	Partial safety factor [1]:	[--]	1.5	1.5	1.5	1.5	1.5	1.5	1.5
$V_{Rk,s,C1}$	Characteristic resistance:	[kN]	6.5	7.5	11.9	16.3	21.5	19.7	24.3
γ_{Ms}	Partial safety factor [1]:	[--]	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Pull out failure									
$N_{Rk,p,C1}$	Characteristic resistance in cracked concrete:	[kN]	3.8	5.6	6.7	9.0	6.1	8.7	24.0
γ_{inst}	Robustness:	[--]	1.2	1.2	1.2	1.2	1.2	1.2	1.0
Concrete cone failure									
h_{ef}	Effective embedment depth:	[mm]	29	42	37	45	44	52	65
$s_{cr,N}$	Concrete Spacing:	[mm]	87	126	111	135	132	156	195
$c_{cr,N}$	Cone failure Edge distance:	[mm]	43	63	55	67	66	78	98
γ_{inst}	Installation safety factor:	[--]	1.2	1.2	1.2	1.2	1.2	1.2	1.0
Concrete pry-out failure									
k_8	Pry-out factor:	[--]	1.0	1.0	1.2	1.2	1.0	1.0	2.0
γ_{inst}	Installation safety factor:	[--]	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Concrete edge failure									
$\ell_f = h_{ef}$	Effective length of fastener under shear loads:	[mm]	29	42	37	45	44	52	65
d_{nom}	Nominal outer diameter of screw:	[mm]	6	6	8	8	10	10	10
γ_{inst}	Installation safety factor:	[--]	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Fix master FIXCON PRO concrete screw	**Annex C8**
Performances Essential characteristics for seismic performance category C1	

Table C9: Essential characteristics for seismic performance category C1 for Carbon Steel (Continuation)

Essential characteristics for seismic performance category C1			Performances	
			12	**14**
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	105	110
Steel failure for tension and shear loads				
$N_{Rk,s,C1}$	Characteristic resistance:	[kN]	80.6	115.9
γ_{Ms}	Partial safety factor [1]:	[--]	1.5	1.5
$V_{Rk,s,C1}$	Characteristic resistance:	[kN]	39.9	57.9
γ_{Ms}	Partial safety factor [1]:	[--]	1.25	1.25
Pull out failure				
$N_{Rk,p,C1}$	Characteristic resistance in cracked concrete:	[kN]	24.3	30.0
γ_{inst}	Robustness:	[--]	1.0	1.0
Concrete cone failure				
h_{ef}	Effective embedment depth:	[mm]	82	86
$s_{cr,N}$	Concrete Spacing:	[mm]	246	258
$c_{cr,N}$	cone failure Edge distance:	[mm]	123	129
γ_{inst}	Installation safety factor:	[--]	1.0	1.0
Concrete pry-out failure				
k_8	Pry-out factor:	[--]	2.0	2.0
γ_{inst}	Installation safety factor:	[--]	1.0	1.0
Concrete edge failure				
$\ell_f = h_{ef}$	Effective length of fastener under shear loads:	[mm]	82	86
d_{nom}	Nominal outer diameter of screw:	[mm]	12	14
γ_{inst}	Installation safety factor:	[--]	1.0	1.0

Fix master FIXCON PRO concrete screw	**Annex C9**
Performances Essential characteristics for seismic performance category C1	

Table C10: Essential characteristics for seismic performance category C1 for A4 stainless 316 Bimetal

Essential characteristics for seismic performance category C1			Performances					
			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Steel failure for tension and shear loads								
$N_{Rk,s,C1}$	Characteristic resistance:	[kN]	17.0	17.0	33.5	33.5	54.3	54.3
γ_{Ms}	Partial safety factor [1]:	[--]	1.5	1.5	1.5	1.5	1.5	1.5
$V_{Rk,s,C1}$	Characteristic resistance:	[kN]	7.4	7.4	11.2	16.7	19.0	23.6
γ_{Ms}	Partial safety factor [1]:	[--]	1.25	1.25	1.25	1.25	1.25	1.25
Pull out failure								
$N_{Rk,p,C1}$	Characteristic resistance in cracked concrete:	[kN]	2.1	4.1	6.2	6.5	8.3	12.8
γ_{inst}	Robustness:	[--]	1.0	1.2	1.0	1.2	1.2	1.2
Concrete cone failure								
h_{ef}	Effective embedment depth:	[mm]	29	42	37	45	52	65
$s_{cr,N}$	Concrete Spacing:	[mm]	87	126	111	135	156	195
$c_{cr,N}$	cone failure Edge distance:	[mm]	43	63	55	67	78	97
γ_{inst}	Installation safety factor:	[--]	1.2	1.2	1.2	1.2	1.2	1.2
Concrete pry-out failure								
k_8	Pry-out factor:	[--]	1.0	1.0	1.0	1.0	1.09	2.0
γ_{inst}	Installation safety factor:	[--]	1.0	1.0	1.0	1.0	1.0	1.0
Concrete edge failure								
$\ell_f = h_{ef}$	Effective length of fastener under shear loads:	[mm]	29	42	37	45	52	65
d_{nom}	Nominal outer diameter of screw:	[mm]	6	6	8	8	10	10
γ_{inst}	Installation safety factor:	[--]	1.0	1.0	1.0	1.0	1.0	1.0

Fix master FIXCON PRO concrete screw	**Annex C10**
Performances Essential characteristics for seismic performance category C1	

Table C11: Essential characteristics for seismic performance category C2 for Carbon Steel

Essential characteristics for seismic performance category C2			Performances						
			8		10			12	14
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	50	60	60	70	85	105	110
Steel failure for tension and shear loads									
$N_{Rk,s,C2}$	Characteristic resistance:	[kN]	32.7	32.7	51.2	51.2	51.2	80.6	115.9
γ_{Ms}	Partial safety factor [1]:	[--]	1.5	1.5	1.5	1.5	1.5	1.5	1.5
$V_{Rk,s,C2}$	Characteristic resistance:	[kN]	12.1	13.7	16.1	15.0	16.1	28.3	41.1
γ_{Ms}	Partial safety factor [1]:	[--]	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Pull out failure									
$N_{Rk,p,C2}$	Characteristic resistance in cracked concrete:	[kN]	2.0	5.2	4.0	6.5	11.0	3.2	9.6
γ_{inst}	Robustness:	[--]	1.2	1.2	1.2	1.2	1.0	1.0	1.0
Concrete cone failure									
h_{ef}	Effective embedment depth:	[mm]	37	45	44	52	65	82	86
$s_{cr,N}$	Concrete Spacing:	[mm]	111	135	132	156	195	246	258
$c_{cr,N}$	cone failure Edge distance	[mm]	55	68	66	78	98	123	129
γ_{inst}	Installation safety factor:	[--]	1.2	1.2	1.2	1.2	1.0	1.0	1.0
Concrete pry-out failure									
k_8	Pry-out factor:	[--]	1.2	1.0	1.0	1.0	2.0	2.0	2.0
γ_{inst}	Installation safety factor:	[--]	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Concrete edge failure									
$\ell_f = h_{ef}$	Effective length of fastener under shear loads:	[mm]	37	45	44	52	65	82	86
d_{nom}	Nominal outer diameter of screw:	[mm]	8.0	8.0	10.0	10.0	10.0	12.0	14.0
γ_{inst}	Installation safety factor:	[--]	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Displacements									
$\delta_{N,C2\ (DLS)}$	Displacement at	[mm]	0.37	0.15	0.59	0.39	0.35	0.65	0.73
$\delta_{V\ C2\ (DLS)}$	Damage Limitation State:[2]	[mm]	3.73	4.15	3.31	3.86	5.16	5.65	5.67
$\delta_{N,C2\ (ULS)}$	Displacement at	[mm]	1.31	1.41	3.52	1.68	1.11	4.66	2.06
$\delta_{V,C2\ (ULS)}$	Ultimate Limitation State:[2]	[mm]	7.08	8.27	5.54	7.77	7.90	12.14	7.90

DLS: Damage Limitation State: see EN 1992-4, 2.2.1)
ULS: Ultimate Limitation State: see EN 1992-4 2.2.1)

[1] In absence of other national regulations.
[2] The listed displacements represent mean values.

Fix master FIXCON PRO concrete screw	
Performances Essential characteristics for seismic performance category C2	**Annex C11**

Table C12: Essential characteristics for seismic performance category C2 for A4 stainless 316 Bimetal

Essential characteristics for seismic performance category C2			Performances	
			8	10
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	60	85
Steel failure for tension and shear loads				
$N_{Rk,s,C2}$	Characteristic resistance:	[kN]	33.5	54.3
γ_{Ms}	Partial safety factor [1]:	[--]	1.5	1.5
$V_{Rk,s,C2}$	Characteristic resistance:	[kN]	7.46	16.3
γ_{Ms}	Partial safety factor [1]:	[--]	1.25	1.25
Pull out failure				
$N_{Rk,p,C2}$	Characteristic resistance in cracked concrete:	[kN]	3.0	7.0
γ_{inst}	Robustness:	[--]	1.2	1.2
Concrete cone failure				
h_{ef}	Effective embedment depth:	[mm]	45	65
$s_{cr,N}$	Concrete Spacing:	[mm]	135	195
$c_{cr,N}$	cone failure Edge distance	[mm]	67	97
γ_{inst}	Installation safety factor:	[--]	1.2	1.2
Concrete pry-out failure				
k_8	Pry-out factor:	[--]	1.0	2.0
γ_{inst}	Installation safety factor:	[--]	1.0	1.0
Concrete edge failure				
$\ell_f = h_{ef}$	Effective length of fastener under shear loads:	[mm]	45	65
d_{nom}	Nominal outer diameter of screw:	[mm]	8.0	10.0
γ_{inst}	Installation safety factor:	[--]	1.0	1.0
Displacements				
$\delta_{N,C2\ (DLS)}$	Displacement at	[mm]	0.55	0.56
$\delta_{V\ C2\ (DLS)}$	Damage Limitation State:[2]	[mm]	3.67	4.65
$\delta_{N,C2\ (ULS)}$	Displacement at	[mm]	1.75	1.76
$\delta_{V,C2\ (ULS)}$	Ultimate Limitation State:[2]	[mm]	6.84	12.31

DLS: Damage Limitation State: see EN 1992-4, 2.2.1)
ULS: Ultimate Limitation State: see EN 1992-4 2.2.1)

[1] In absence of other national regulations.
[2] The listed displacements represent mean values.

Fix master FIXCON PRO concrete screw	Annex C12
Performances Essential characteristics for seismic performance category C2	

Table D1: Characteristic values to fire resistance for Carbon Steel

Fire resistance duration = 30 minutes			Performances										
			6		8		10			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85	75	105	75	110
Tension loads, steel failure													
$N_{Rk,s,fi,30}$	Characteristic resistance:	[kN]	0.23	0.23	0.41	0.41	0.95	0.95	0.95	2.02	2.02	2.91	2.91
Pull-out failure													
$N_{Rk,p,fi,30}$	Character. resistance in concrete:	[kN]	0.77	1.43	1.58	2.28	3.66	3.60	6.09	4.85	8.38	5.04	7.43
Concrete cone failure [1)]													
$N_{Rk,c,fi,30}$	Character. resistance in concrete:	[kN]	0.78	1.97	1.43	2.34	2.21	3.36	5.86	4.22	10.48	4.04	11.81
Shear loads steel failure without lever arm													
$V_{Rk,s,fi,30}$	Characteristic resistance	[kN]	0.23	0.23	0.41	0.41	0.95	0.95	0.95	2.02	2.02	2.91	2.91
Shear loads, steel failure with lever arm													
$M_{Rk,s,fi,30}$	Characteristic bending resistance:	[Nm]	0.19	0.19	0.44	0.44	1.29	1.29	1.29	3.43	3.43	5.93	5.93

Fire resistance duration = 60 minutes			Performances										
			6		8		10			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85	75	105	75	110
Tension loads, steel failure													
$N_{Rk,s,fi,60}$	Characteristic resistance:	[kN]	0.21	0.21	0.37	0.37	0.83	0.83	0.83	1.51	1.51	2.18	2.18
Pull-out failure													
$N_{Rk,p,fi,60}$	Character. resistance in concrete:	[kN]	0.77	1.43	1.58	2.28	3.66	3.60	6.09	4.85	8.38	5.04	7.43
Concrete cone failure [1)]													
$N_{Rk,c,fi,60}$	Character. resistance in concrete:	[kN]	0.78	1.97	1.43	2.34	2.21	3.36	5.86	4.22	10.48	4.04	11.81
Shear loads steel failure without lever arm													
$V_{Rk,s,fi,60}$	Characteristic resistance:	[kN]	0.21	0.21	0.37	0.37	0.83	0.83	0.83	1.51	1.51	2.18	2.18
Shear loads, steel failure with lever arm													
$M_{Rk,s,fi,60}$	Characteristic bending resistance:	[Nm]	0.17	0.17	0.40	0.40	1.12	1.12	1.12	2.57	2.57	4.45	4.45

[1)] As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Note: In absence of other national regulations, the partial safety factor for resistance under fire exposure $\gamma_{M,fi}$ = 1.0 is recommended for steel failure and concrete related failure modes under shear loading. In case of concrete related failure modes under tension $\gamma_{M,fi} = \gamma_{inst}$..

Fix master FIXCON PRO concrete screw	**Annex D1**
Performances Characteristic values for fire resistance	

Table D1: Characteristic values to fire resistance for Carbon Steel (continuation)

Fire resistance duration = 90 minutes			Performances										
			6		8		10			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85	75	105	75	110
Tension loads, steel failure													
$N_{Rk,s,fi,90}$	Characteristic resistance:	[kN]	0.16	0.16	0.29	0.29	0.64	0.64	0.64	1.31	1.31	1.89	1.89
Pull-out failure													
$N_{Rk,p,fi,90}$	Character. resistance in concrete:	[kN]	0.77	1.43	1.58	2.28	3.66	3.60	6.09	4.85	8.38	5.04	7.43
Concrete cone failure [1)]													
$N_{Rk,c,fi,90}$	Character. resistance in concrete:	[kN]	0.78	1.97	1.43	2.34	2.21	3.36	5.86	4.22	10.48	4.04	11.81
Shear loads steel failure without lever arm													
$V_{Rk,s,fi,90}$	Characteristic resistance:	[kN]	0.16	0.16	0.29	0.29	0.64	0.64	0.64	1.31	1.31	1.89	1.89
Shear loads, steel failure with lever arm													
$M_{Rk,s,fi,90}$	Characteristic bending resistance:	[Nm]	0.13	0.13	0.31	0.31	0.86	0.86	0.86	2.23	2.23	3.85	3.85

Fire resistance duration = 120 minutes			Performances										
			6		8		10			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85	75	105	75	110
Tension loads, steel failure													
$N_{Rk,s,fi,120}$	Characteristic resistance:	[kN]	0.11	0.11	0.20	0.20	0.51	0.51	0.51	1.01	1.01	1.45	1.45
Pull-out failure													
$N_{Rk,p,fi,120}$	Character. resistance in concrete:	[kN]	0.62	1.14	1.27	1.82	2.93	2.88	4.87	3.88	6.70	4.03	5.94
Concrete cone failure [1)]													
$N_{Rk,c,fi,120}$	Character. resistance in concrete:	[kN]	0.62	1.57	1.15	1.87	1.77	2.69	4.69	3.38	8.39	3.23	9.45
Shear loads steel failure without lever arm													
$V_{Rk,s,fi,120}$	Characteristic resistance:	[kN]	0.11	0.11	0.20	0.20	0.51	0.51	0.51	1.01	1.01	1.45	1.45
Shear loads, steel failure with lever arm													
$M_{Rk,s,fi,120}$	Characteristic bending resistance:	[Nm]	0.09	0.09	0.22	0.22	0.69	0.69	0.69	1.71	1.71	2.96	2.96

[1)] As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Note: In absence of other national regulations, the partial safety factor for resistance under fire exposure $\gamma_{M,fi}$ = 1.0 is recommended for steel failure and concrete related failure modes under shear loading. In case of concrete related failure modes under tension $\gamma_{M,fi} = \gamma_{inst.}$.

Fix master FIXCON PRO concrete screw	
Performances Characteristic values for fire resistance	**Annex D2**

Table D2: Spacing and edge distances for Carbon Steel

Spacing and edges distances			Performances										
			6		8		10			12		14	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	60	70	85	75	105	75	110
h_{ef}	Effective anchorage depth:	[mm]	29	42	37	45	44	52	65	57	82	56	86
$S_{cr,N}$	Spacing	[mm]	116	168	148	180	176	208	260	228	328	224	344
S_{min}	Minimum spacing	[mm]	35	45	35	50	50	60	70	70	70	75	100
$C_{cr,N}$	Edge distance	[mm]	58	84	74	90	88	104	130	114	164	112	172
C_{min}	Minimum edge distance (one side fire)	[mm]	35	45	35	50	40	60	60	45	45	45	100
C_{min}	Minimum edge distance (two sides fire)	[mm]	300	300	300	300	300	300	300	300	300	300	300
γ_{Msp}	Partial safety factor*)	[-]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

*) In absence of other national regulations

Concrete pry-out failure

k_8 factor values for Fix master FIXCON PRO concrete screw made of Carbon Steel in Table C5
According EN 1992-4:2018, these values of k_8 factor and the relevant values of $N_{Rk,c,fi}$ given in the above tables have to be considered in design.

Concrete edge failure

The characteristic resistance $V^0_{RK,c,fi}$ in C20/25 to C50/60 concrete is determined by:
$V^0_{RK,c,fi} = 0.25 \times V^0_{RK,c}$ (≤ R90) and $V^0_{RK,c,fi} = 0.20 \times V^0_{RK,c}$ (R120)
With $V^0_{RK,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature according to EN 1992-4:2018.

Fix master FIXCON PRO concrete screw	
Performances Characteristic values for fire resistance	**Annex D3**

Table D3: Characteristic values to fire resistance for A4 stainless316 Bimetal

Fire resistance duration = 30 minutes			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Tension loads, steel failure								
$N_{Rk,s,fi,30}$	Characteristic resistance	[kN]	0.21		0.84		1.70	
Pull-out failure								
$N_{Rk,p,fi,30}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.53	2.94	1.95	3.20	4.42	6.46
Concrete cone failure[1)]								
$N_{Rk,c,fi,30}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.78	1.97	1.43	2.34	3.36	5.86
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,30}$	Characteristic resistance	[kN]	0.21		0.84		1.70	
Shear loads, steel failure with lever arm								
$M_{Rk,s,fi,30}$	Characteristic bending resistance	[Nm]	0.17		0.92		2.37	

Fire resistance duration = 60 minutes			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Tension loads, steel failure								
$N_{Rk,s,fi,60}$	Characteristic resistance	[kN]	0.19		0.67		1.36	
Pull-out failure								
$N_{Rk,p,fi,60}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.53	2.94	1.95	3.20	4.42	6.46
Concrete cone failure[1)]								
$N_{Rk,c,fi,60}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.78	1.97	1.43	2.34	3.36	5.86
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,60}$	Characteristic resistance	[kN]	0.19		0.67		1.36	
Shear loads, steel failure with lever arm								
$M_{Rk,s,fi,60}$	Characteristic bending resistance	[Nm]	0.15		0.73		1.90	

Fire resistance duration = 90 minutes			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Tension loads, steel failure								
$N_{Rk,s,fi,90}$	Characteristic resistance	[kN]	0.15		0.50		1.09	
Pull-out failure								
$N_{Rk,p,fi,90}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.53	2.94	1.95	3.20	4.42	6.46
Concrete cone failure[1)]								
$N_{Rk,c,fi,90}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.78	1.97	1.43	2.34	3.36	5.86
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,90}$	Characteristic resistance	[kN]	0.15		0.50		1.09	
Shear loads, steel failure with lever arm								
$M_{Rk,s,fi,90}$	Characteristic bending resistance	[Nm]	0.12		0.55		1.52	

[1)] As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Note: In absence of other national regulations, the partial safety factor for resistance under fire exposure $\gamma_{M,fi}$ = 1.0 is recommended for steel failure and concrete related failure modes under shear loading. In case of concrete related failure modes under tension $\gamma_{M,fi} = \gamma_{inst.}$.

Fix master FIXCON PRO concrete screw	**Annex D4**
Performances Characteristic values for fire resistance	

Table D3: Characteristic values to fire resistance for A4 stainless 316 Bimetal (continuation)

Fire resistance duration = 120 minutes			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
Tension loads, steel failure								
$N_{Rk,s,fi,120}$	Characteristic resistance	[kN]	0.11		0.42		0.95	
Pull-out failure								
$N_{Rk,p,fi,120}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.42	2.35	1.56	2.56	3.54	5.17
Concrete cone failure[1)]								
$N_{Rk,c,fi,120}$	Character. resistance in concrete C20/25 to C50/60	[kN]	0.62	1.57	1.15	1.87	2.69	4.69
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,120}$	Characteristic resistance	[kN]	0.11		0.42		0.95	
Shear loads, steel failure with lever arm								
$M_{Rk,s,fi,120}$	Characteristic bending resistance	[Nm]	0.08		0.46		1.33	

[1)] As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Note: In absence of other national regulations, the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1.0$ is recommended for steel failure and concrete related failure modes under shear loading. In case of concrete related failure modes under tension $\gamma_{M,fi} = \gamma_{inst.}$.

Table D4: Spacing and edge distances for A4 stainless 316 Bimetal

Spacing and edge distances			6		8		10	
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	40	55	50	60	70	85
h_{ef}	Effective anchorage depth:	[mm]	29	42	37	45	52	65
$S_{cr,N}$	Spacing	[mm]	116	168	148	180	208	260
S_{min}	Minimum spacing	[mm]	35	35	35	50	60	70
$C_{cr,N}$	Edge distance	[mm]	58	84	74	90	105	130
C_{min}	Minimum edge distance (one side fire)	[mm]	35	35	35	50	60	70
C_{min}	Minimum edge distance (two sides fire)	[mm]	300	300	300	300	300	300
γ_{Msp}	Partial safety factor[*)]	[-]	1.0	1.0	1.0	1.0	1.0	1.0

[*)] In absence of other national regulations

Concrete pry-out failure

k_8 factor values for Fix master FIXCON PRO concrete screw made of A4 stainless 316 Bimetal Steel in Table C6 According EN 1992-4:2018, these values of k_8 factor and the relevant values of $N_{Rk,c,fi}$ given in the above tables have to be considered in design.

Concrete edge failure

The characteristic resistance $V^0_{RK,c,fi}$ in C20/25 to C50/60 concrete is determined by:
$V^0_{RK,c,fi} = 0.25 \times V^0_{RK,c}$ (≤ R90) and $V^0_{RK,c,fi} = 0.20 \times V^0_{RK,c}$ (R120)
With $V^0_{RK,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature according to EN 1992-4:2018.

Fix master FIXCON PRO concrete screw	**Annex D5**
Performances Characteristic values for fire resistance	