Centre Scientifique et Technique du Bâtiment
84 avenue Jean Jaurès
CHAMPS-SUR-MARNE
F-77447 Marne-la-Vallée Cedex 2
Tél. : (33) 01 64 68 82 82
Fax : (33) 01 60 05 70 37

Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
www.eota.eu

European Technical Assessment

ETA-14/0069 of 05/06/2020

English translation prepared by CSTB - Original version in French language

General Part

Nom commercial *Trade name*	**Hilti HMU-P and HMU-PF**
Famille de produit *Product family*	**Cheville métallique à verrouillage de forme, en acier au carbone, pour fixation en béton fissuré et non fissuré : diamètres M10, M12 et M16** ***Undercut fastener, made of carbon steel for use in cracked and uncracked concrete: sizes M10, M12 and M16***
Titulaire *Manufacturer*	Hilti Corporation Feldkircherstrasse 100 FL-9494 Schaan Principality of Liechtenstein
Usine de fabrication *Manufacturing plants*	Hilti plants
Cette evaluation contient *This Assessment contains*	16 pages incluant 14 annexes qui font partie intégrante de cette évaluation *16 pages including 14 annexes which form an integral part of this assessment*
Base de l'ETE *Basis of ETA*	EAD 330232-01-0601
Cette evaluation remplace: *This Assessment replaces*	*ETE-14/0069 valide à compter du 24/12/2015* *ETA-14/0069 with validity dated from 24/12/2015*

Specific Part

1 Technical description of the product

The HILTI HMU-PF undercut fastener in the size of M10, M12 and M16 is a fastener made of carbon steel with hot dip galvanized coating, and the HILTI HMU-P undercut fastener in the size of M10 and M12 is a fastener made of carbon steel with zinc-plated coating. They are placed into a hole drilled with a special stop drill bit and self-cutting undercut with a special setting tool. The nut is torque tightened to complete the fastening of the fixture.

The illustration and the description of the product are given in Annexes A.

2 Specification of the intended use

The performances given in Section 3 are only valid if the fastener is used in compliance with the specifications and conditions given in Annexes B.

The provisions made in this European technical assessment are based on an assumed working life of the fastener of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	**Performance**
Characteristic tension resistance	See Annex C1
Characteristic shear resistance	See Annex C2
Displacements	See Annex C3
Characteristic resistance under seismic action C1	See Annex C4
Characteristic resistance under seismic action C2	See Annex C5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	**Performance**
Reaction to fire	Fasteners satisfy requirements for Class A1
Characteristic tension resistance under fire	See Annex C7
Characteristic shear resistance under fire	See Annex C8

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances contained in this European technical assessment, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For basic requirement safety in use the same criteria are valid as for basic requirement mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was determined for this product.

3.8 General aspects relating to fitness for use

Durability and Serviceability are only ensured if the specifications of intended use according to Annex B1 are kept.

4 Assessment and verification of constancy of performance (AVCP)

According to the Decision 96/582/EC of the European Commission[1], as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or Class	System
Metal fasteners for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	—	1

5 Technical details necessary for the implementation of the AVCP system

Technical details necessary for the implementation of the Assessment and verification of constancy of performance (AVCP) system are laid down in the control plan deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of fasteners for issuing the certificate of conformity CE based on the control plan.

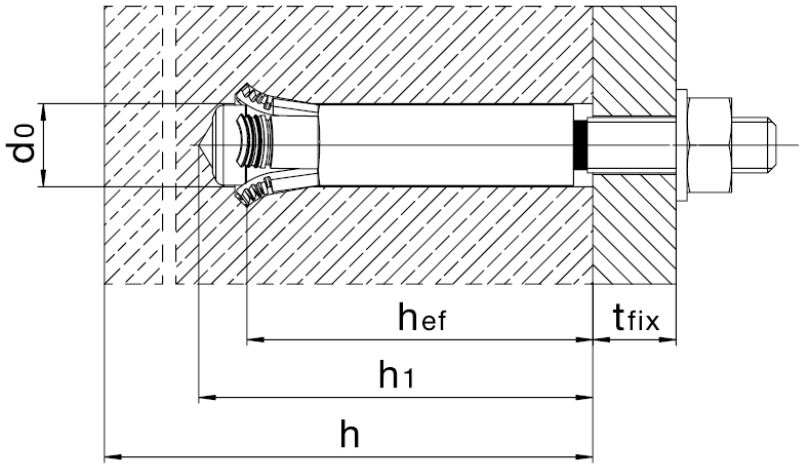
Issued in Marne La Vallée on 05-06-2020 by

Head of the Structure, Masonry and Partition Division *The original French version is signed*

Anca Cronopol

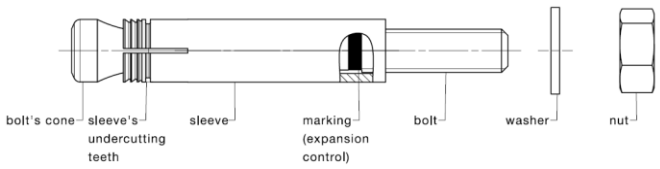
[1] Official Journal of the European Communities L 254 of 08.10.1996

Installed condition



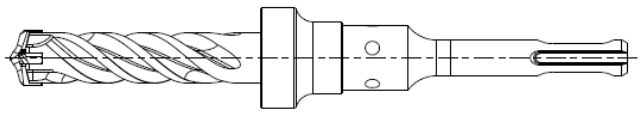
Product description

Undercut fastener HMU-P and HMU-PF



Marking on the sleeve:
HMU-P or HMU-PF
followed by MX x Y where
MX = thread diameter
Y = effective embedment depth
e.g. HMU-PF M16x100

Stop drill bit HMU



Marking on the drill bit:
TE-C-HMU-B or TE-Y-HMU-B
followed by MX x Y where
MX = thread diameter
Y = effective embedment depth
e.g. TE-C-HMU-B M10x60

Setting tool HMU

Marking on the setting tool:
TE-C-HMU-ST or TE-Y-HMU-ST
followed by MX where
MX = thread diameter
e.g. TE-C-HMU-ST-M12

HMU Undercut Fastener	
Product description Installed condition and product description	**Annex A1**

Table A1: Required stop drill bits and setting tools for HMU-P/PF

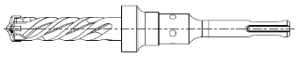
Fastener 	**Stop drill bit** 		**Setting tool** 	
	TE-C connection end	**TE-Y** connection end	**TE-C** connection end	**TE-Y** connection end
HMU-P/PF M10x60	TE-C HMU-B M10X60	-	TE-C-HMU-ST-M10	-
HMU-P/PF M12x80	TE-C-HMU-B M12x80	-	TE-C-HMU-ST-M12	-
HMU-PF M16x100	TE-C-HMU-B M16x100	TE-Y-HMU-B M16x100	TE-C-HMU-ST-M16	TE-Y-HMU-ST-M16
HMU-PF M16x125	TE-C-HMU-B M16x125	TE-Y-HMU-B M16x125	TE-C-HMU-ST-M16	TE-Y-HMU-ST-M16

Table A2: Materials

Designation	**Material**
HMU-P	
Threaded bolt with cone	Cold formed heat treated steel, elongation at failure ≥ 12%, necking at failure ≥ 52%, wax coated (after zinc plating), electroplated zinc coated ≥ 5 µm
Sleeve	Steel tube, electroplated zinc coated ≥ 5 µm
Washer	Acc. to DIN 125-1 140 HV March 1990, electroplated zinc coated ≥ 5 µm
Nut	Hexagon nut acc. to DIN 934, electroplated zinc coated ≥ 5 µm
HMU-PF	
Threaded bolt with cone	Cold formed heat treated steel, elongation at failure ≥ 12%, necking at failure ≥ 52%, wax coated (after hot dip galvanization), hot dip galvanized ≥ 50µm
Sleeve	Steel tube, hot dip galvanized ≥ 50 µm
Washer	Acc. to DIN 125-1 140 HV March 1990, hot dip galvanized ≥ 50 µm
Nut	Hexagon nut acc. to DIN 934, hot dip galvanized ≥ 50 µm

Specifications of intended use

Fasteners subject to:

- Static or quasi-static loads.
- Seismic actions for Performance Category C1 and C2.
- Fire exposure.

Base materials:

- Reinforced or unreinforced normal weight concrete 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):

- Structures subject to dry indoor conditions, indoor with temporary condensation

Design:

- The fasteners are designed in accordance with EN 1992-4 "Design of concrete structures – Part4: Design of fastenings for use in concrete" under the responsibility of an engineer experienced in fasteners and concrete work.
- For seismic application the fasteners are designed in accordance with EN 1992-4, Annex C "Design of fastenings under seismic actions".
- For application with resistance under fire exposure the fasteners are designed in accordance with EN 1992-4, Annex D "Exposure to fire – design method".
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings.

Installation:

- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the fastener only as supplied by the manufacturer without exchanging the components of a fastener.
- Fastener installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Effective anchorage depth, edge distances and spacing not less than the specified values without minus tolerances.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength mortar and no shear or oblique tension loads in the direction of aborted hole.

Table B1: Specifications of intended use

Fasteners subject to:	**HMU-P**	**HMU-PF**
Static and quasi static loading in cracked and uncracked concrete	M10-M16	M10-M16
Seismic performance category C1	M10-M16	M10-M16
Seismic performance category C2	-	M10-M16[1)]
Fire exposure	M10-M16	M10-M16

1) HMU-PF M16x125 only.

Table B2: Fastener dimensions

HMU			**M10**	**M12**	**M16**	**M16**
Length of the fastener	L	[mm]	109,5-139,5	133-176	167-197	222-239
Expansion sleeve length	l_{sleeve}	[mm]	61	80,6	100	125
Height of nut	h_{nut}	[mm]	8,94	11,5	15,0	

Table B3: Installation parameters

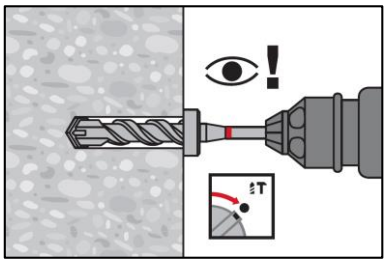
HMU			**M10**	**M12**	**M16**	**M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Nominal diameter of drill bit	d_0	[mm]	15	18	23	23
Max. cutting diameter of drill bit [2)]	d_{cut}	[mm]	15,5	18,5	23,0	23,0
Max. diameter of clearance hole in the fixture	d_{f}	[mm]	12	14	18	18
Fixture thickness	t_{fix}	[mm]	2[1)] - 50	2[1)] - 65	0[1)] - 60	0[1)] - 75
Min. depth of drill hole	h_1	[mm]	69	92	115	140
Min. thickness of concrete member	h_{min}	[mm]	120	160	200	250
Torque wrench width	SW	[mm]	17	19	24	24
Installation torque	T_{inst}	[Nm]	30	45	120	120
Minimum spacing	s_{min}	[mm]	60	90	100	100
	$c \geq$	[mm]	55	90	100	100
Minimum edge distance	c_{min}	[mm]	55	90	100	100
	$s \geq$	[mm]	60	90	100	100

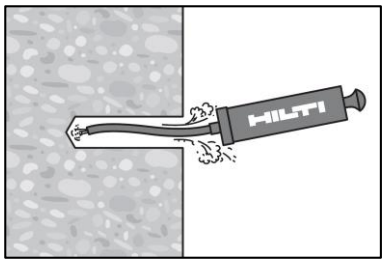
1) When thickness of attachment is less than 3mm, big washer acc. to DIN1052 standard needs to be used.

2) Use special stop drill bit TE-C-HMU-B and TE-Y-HMU-B only

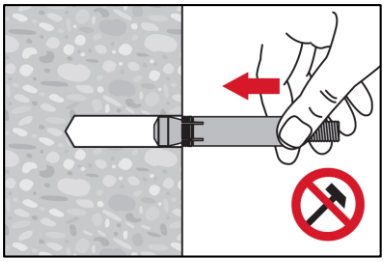
Installation instruction

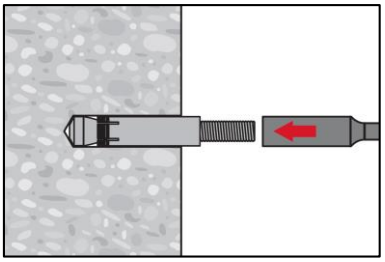
Hole drilling and cleaning

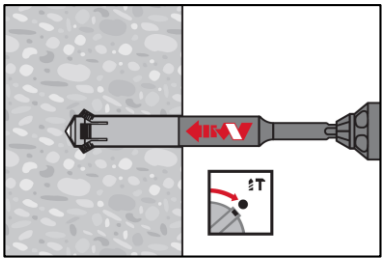




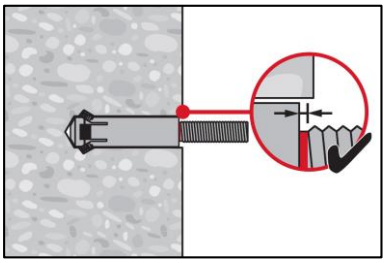
Fastener setting



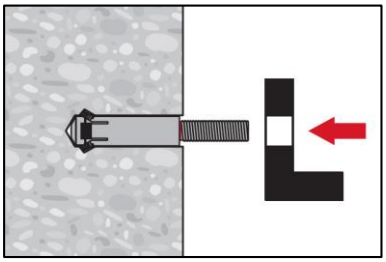


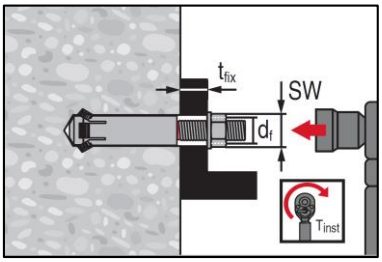


Checking of correct setting



Fastener torqueing





HMU Undercut Fastener	
Intended use Installation instruction	**Annex B3**

Table C1: Characteristic resistance under tension load in case of static and quasi-static loading

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Steel failure						
Partial safety factor	γ_{Ms} [1)]	[-]	1,5			
Characteristic resistance	$N_{Rk,s}$	[kN]	46,4	67,4	125,6	
Pullout failure						
Characteristic resistance in concrete C20/25						
Installation safety factor	γ_{inst}	[-]	1,0			
Uncracked concrete	$N_{Rk,p,ucr}$	[kN]	24	40	50	70
Cracked concrete	$N_{Rk,p,cr}$	[kN]	17	30	38	50
Increasing factor concrete strength ψ_c	C30/37	[-]	1,22			
	C40/50	[-]	1,41			
	C50/60	[-]	1,58			
Concrete cone and splitting failure						
Installation safety factor	γ_{inst}	[-]	1,0			
Factor for cracked concrete	$k_{ucr,N}$	[-]	11,0			
Factor for uncracked concrete	$k_{cr,N}$	[-]	7,7			
Spacing	$s_{cr,N}$	[mm]	180	240	300	375
Edge distance	$c_{cr,N}$	[mm]	90	120	150	188
Spacing (splitting)	$s_{cr,sp}$	[mm]	230	300	300	375
Edge distance (splitting)	$c_{cr,sp}$	[mm]	115	150	160	200

1) In absence of other national regulations

Table C2: Characteristic resistance under shear load in case of static and quasi-static loading

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Steel failure without lever arm						
Partial safety factor	γ_{Ms} [1)]	[-]	1,25			
Ductility factor	k_7	[-]	0,8			
Characteristic resistance	$V_{Rk,s}$	[kN]	23,2	33,7	62,8	
Steel failure with lever arm						
Partial safety factor	γ_{Ms} [1)]	[-]	1,25			
Ductility factor	k_7	[-]	0,8			
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	59,8	104,6	266,8	
Concrete pryout failure						
Pry-out factor	k_8	[-]	2,0			
Installation safety factor	γ_{inst}	[-]	1,0			
Concrete edge failure						
Effective length of fastener under shear loading	$l_f = h_{ef}$	[mm]	60	80	100	125
Outside diameter of fastener	d_{nom}	[mm]	14,50	17,50	21,60	
Installation safety factor	γ_{inst}	[-]	1,0			

1) In absence of other national regulations

Table C3: Displacements under tension load in case of static and quasi-static loading

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Tension load in uncracked concrete C20/25	N	[kN]	10,89	16,76	23,43	32,74
Displacement	δ_{N0}	[mm]	0,10	0,49	0,14	0,29
	$\delta_{N\infty}$	[mm]	1,36	1,79	1,57	1,57
Tension load in uncracked concrete C50/60	N	[kN]	17,21	26,50	37,04	51,76
Displacement	δ_{N0}	[mm]	0,09	1,67	0,74	1,16
	$\delta_{N\infty}$	[mm]	1,36	1,79	1,57	1,57
Tension load in cracked concrete C20/25	N	[kN]	7,62	11,73	16,40	22,92
Displacement	δ_{N0}	[mm]	0,44	0,88	0,34	0,65
	$\delta_{N\infty}$	[mm]	1,36	1,79	1,57	1,57
Tension load in cracked concrete C50/60	N	[kN]	12,05	18,55	25,93	36,23
Displacement	δ_{N0}	[mm]	0,85	0,98	0,26	0,62
	$\delta_{N\infty}$	[mm]	1,36	1,79	1,57	1,57

Table C4: Displacements under shear load in case of static and quasi-static loading

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Tension load in cracked and uncracked concrete C20/25 to C50/60	V	[kN]	12,37	19,27	37,83	
Displacement	δ_{V0}	[mm]	3,19	1,95	3,84	
	$\delta_{V\infty}$	[mm]	4,78	2,93	5,75	

[1)] Additional displacement due to anular gap between fastener and fixture is to be taken into account.

Table C5: Characteristic resistance under tension load in case of seismic category C1

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Steel failure						
Partial safety factor	$\gamma_{Ms,C1}$ [1)]	[-]	1,5			
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	46,4	67,4	125,6	
Pullout failure						
Installation safety factor	γ_{inst}	[-]	1,0			
Characteristic resistance	$N_{Rk,p,C1}$	[kN]	17,0	30,0	38,0	50,0
Concrete cone failure						
Installation safety factor	γ_{inst}	[-]	1,0			

[1)] In absence of other national regulations

Table C6: Characteristic resistance under shear load in case of seismic category C1

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Steel failure without lever arm						
Partial safety factor	$\gamma_{Ms,C1}$ [1)]	[-]	1,25			
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	20,9	33,7	62,8	
Concrete pryout failure						
Installation safety factor	γ_{inst}	[-]	1,0			
Concrete edge failure						
Installation safety factor	γ_{inst}	[-]	1,0			

[1)] In absence of other national regulations

Table C7: Characteristic resistance under tension load in case of seismic category C2

Size			**HMU- PF M10**	**HMU- PF M12**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	125
Steel failure					
Partial safety factor	$\gamma_{Ms,C2}$ [1)]	[-]		1,5	
Characteristic resistance	$N_{Rk,s,C2}$	[kN]	46,4	67,4	125,6
Pullout failure					
Installation safety factor	γ_{inst}	[-]		1,0	
Characteristic resistance	$N_{Rk,p,C2}$	[kN]	17,0	28,0	50,0
Concrete cone failure					
Installation safety factor	γ_{inst}	[-]		1,0	

[1)] In absence of other national regulations

Table C8: Characteristic resistance under shear load in case of seismic category C2

Size			**HMU-PF M10**	**HMU-PF M12**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	125
Steel failure without lever arm					
Partial safety factor	$\gamma_{Ms,C2}$ [1)]	[-]		1,25	
Characteristic resistance	$V_{Rk,s,C2}$	[kN]	18,6	28,7	41,5
Concrete pryout failure					
Installation safety factor	γ_{inst}	[-]		1,0	
Concrete edge failure					
Installation safety factor	γ_{inst}	[-]		1,0	

[1)] In absence of other national regulations

Table C9: Displacements under tension load in case of seismic category C2

Size			**HMU-PF M10**	**HMU-PF M12**	**HMU-PF M16**
Displacement DLS	$\delta_{N,C2(DLS)}$	[mm]	3,69	6,48	6,06
Displacement ULS	$\delta_{N,C2(ULS)}$	[mm]	13,07	16,24	19,75

Table C10: Displacements under shear load in case of seismic category C2

Size			**HMU-PF M10**	**HMU-PF M12**	**HMU-PF M16**
Displacement DLS	$\delta_{V,C2(DLS)}$	[mm]	5,21	3,93	5,11
Displacement ULS	$\delta_{V,C2(ULS)}$	[mm]	8,73	6,09	8,74

Table C11: Characteristic resistance under tension load in cracked and uncracked concrete under fire exposure[1)2)]

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Steel failure						
Characteristic resistance	$N_{Rk,s,fi(30)}$	[kN]	0,87	1,69	3,14	
	$N_{Rk,s,fi(60)}$	[kN]	0,75	1,26	2,36	
	$N_{Rk,s,fi(90)}$	[kN]	0,58	1,10	2,04	
	$N_{Rk,s,fi(120)}$	[kN]	0,46	0,84	1,57	
Pullout failure						
Characteristic resistance ≥ C20/25	$N_{Rk,p,fi(30)}$	[kN]	4,25	7,50	9,50	12,50
	$N_{Rk,p,fi(60)}$	[kN]	4,25	7,50	9,50	12,50
	$N_{Rk,p,fi(90)}$	[kN]	4,25	7,50	9,50	12,50
	$N_{Rk,p,fi(120)}$	[kN]	3,40	6,00	7,60	10,00
Concrete cone failure and splitting failure[3)]						
Characteristic resistance ≥ C20/25	$N^0_{Rk,c,fi(30)}$	[kN]	4,80	9,86	17,22	30,08
	$N^0_{Rk,c,fi(60)}$	[kN]	4,80	9,86	17,22	30,08
	$N^0_{Rk,c,fi(90)}$	[kN]	4,80	9,86	17,22	30,08
	$N^0_{Rk,c,fi(120)}$	[kN]	3,84	7,88	13,77	24,06
Characteristic Spacing	$s_{cr,N,fi}$	[mm]	240	320	400	500
Characteristic Edge distance	$c_{cr,N,fi}$	[mm]	120	160	200	250

[1)] Design under fire exposure is performed according to the design method given in EN 1992-4. Under fire exposure usually cracked concrete is assumed. The design equations are given in EN 1992-4, Annex D.

[2)] EN 1992-4 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} \geq 300$ mm and $\geq 2 \cdot h_{ef}$.

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

[4)] In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1,0$ is recommended.

Table C12: Characteristic resistance under shear load in cracked and uncracked concrete under fire exposure[1)2)]

Size			**HMU-P/PF M10**	**HMU-P/PF M12**	**HMU-PF M16**	**HMU-PF M16**
Effective embedment depth	h_{ef}	[mm]	60	80	100	125
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s,fi(30)}$	[kN]	0,87	1,69	3,14	
	$V_{Rk,s,fi(60)}$	[kN]	0,75	1,26	2,36	
	$V_{Rk,s,fi(90)}$	[kN]	0,58	1,10	2,04	
	$V_{Rk,s,fi(120)}$	[kN]	0,46	0,84	1,57	
Steel failure with lever arm						
Characteristic resistance	$M^0_{Rk,s,fi(30)}$	[Nm]	1,12	2,62	6,67	
	$M^0_{Rk,s,fi(60)}$	[Nm]	0,97	1,96	5,00	
	$M^0_{Rk,s,fi(90)}$	[Nm]	0,75	1,70	4,34	
	$M^0_{Rk,s,fi(120)}$	[Nm]	0,60	1,31	3,34	
Concrete pryout failure						
Pryout factor	k_8	[-]	2,0			
Characteristic resistance ≥ C20/25	$V_{Rk,cp,fi(30)}$	[kN]	9,60	19,71	34,44	60,16
	$V_{Rk,cp,fi(60)}$	[kN]	9,60	19,71	34,44	60,16
	$V_{Rk,cp,fi(90)}$	[kN]	9,60	19,71	34,44	60,16
	$V_{Rk,cp,fi(120)}$	[kN]	7,68	15,77	27,55	48,13
Concrete edge failure						
Effective length of fastener under shear loading	$l_f = h_{ef}$	[mm]	60	80	100	125
Outside diameter of fastener	d_{nom}	[mm]	14,50	17,50	21,60	

[1)] Design under fire exposure is performed according to the design method given in EN 1992-4. Under fire exposure usually cracked concrete is assumed. The design equations are given in EN 1992-4, Annex D.

[2)] EN 1992-4 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} \geq 300$ mm and $\geq 2 \cdot h_{ef}$.