Designated according to The Construction Products (Amendment etc.) (EU Exit) Regulations 2020

UK Technical Assessment	UKTA-0836-23/6698 of 05/07/2023
Technical Assessment Body issuing the UK Technical Assessment:	British Board of Agrément
Trade name of the construction product:	Hilti screw anchor HUS4
Product family to which the construction product belongs:	Mechanical fastener for use in concrete
Manufacturer:	Hilti Aktiengesellschaft Feldkircherstrasse 100 9494 SCHAAN FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant(s):	Hilti plants
This UK Technical Assessment contains:	39 pages including 3 Annexes which form an integral part of this assessment.
This UK Technical Assessment is issued in accordance with The Construction Products (Amendment etc.) (EU Exit) Regulations 2020 on the basis of:	UKAD 330232-00-0601 Mechanical fasteners for use in concrete

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1. Technical description of the product

The Hilti screw anchor HUS4 is an anchor in sizes 8, 10, 12, 14 and 16 mm made of galvanized or stainless steel. The anchor is 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.

Product and product description are given in Annex A.

2. Specification of the intended use(s) in accordance with the applicable UK Assessment Document (hereinafter UKAD)

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

The verifications and assessment methods on which this UK Technical Assessment is based lead to the assumption of a working life of the anchor of at least 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 and references to the methods used for its assessment

3.1. Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annexes B4 to B9, Annexes C1, C3 and C5
Characteristic resistance to shear load (static and quasi-static loading)	See Annexes C2, C4 and C5
Displacements (static and quasi-static loading)	See Annexes C15 and C16
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annexes C5 to C9 and C17

3.2. Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annexes C10 to C14

3.3. Health, hygiene and the environment (BWR 3)

Not relevant.

3.4. Safety and accessibility in use (BWR 4)

Not relevant.

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)

No performance assessed.

3.8. Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied

4.1. System of assessment and verification of constancy of performance

According to UKAD No. 330232-00-0601 and Annex V of the Construction Products Regulation (Regulation (EU) 305/2011) as brought into UK law and amended, the system of assessment and verification of constancy of performance (AVCP) 1 applies.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the British Board of Agrément and made available to the UK Approved Bodies involved in the conformity attestation process.

5.1. UKCA marking for the product/ system must contain the following information:

- Identification number of the Approved Body
- Name/registered address of the manufacturer of the product/ system
- Marking including date of Marking and the intended use as stated in the Designated technical specification
- Unique identification code of the product type
- The reference number of the Declaration of Performance
- The level or class of the performance declared
- The reference to the Designated technical specification applied
- UKTA number

On behalf of the British Board of Agrément	
Date of Issue: 5 July 2023	**Hardy Giesler** Chief Executive Officer

British Board of Agrément,
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Croxley Park
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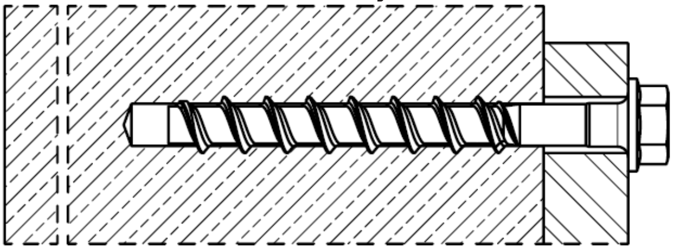
ANNEX A1
Product description
Installed condition with and without adjustment

This annex applies to the product described in the main body of the UK Technical Assessment.

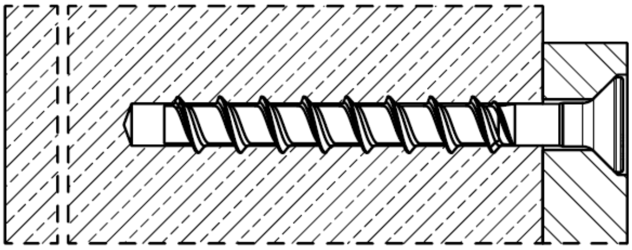
Installed condition without adjustment



HUS4-H (Hexagon head configuration sizes 8, 10, 12, 14 and 16)

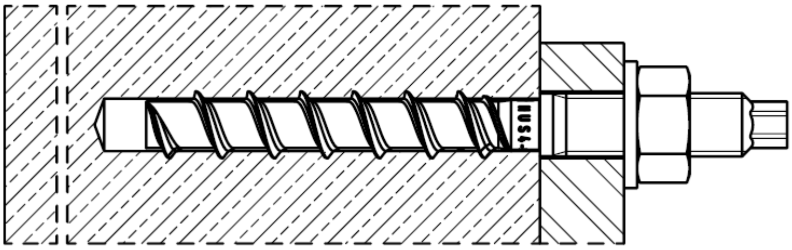
HUS4-HF (Hexagon head configuration sizes 8, 10, 14 and 16)

HUS4-HR (Hexagon head configuration sizes 6, 8, 10 and 14)



HUS4-C (Countersunk head configuration sizes 8 and 10)

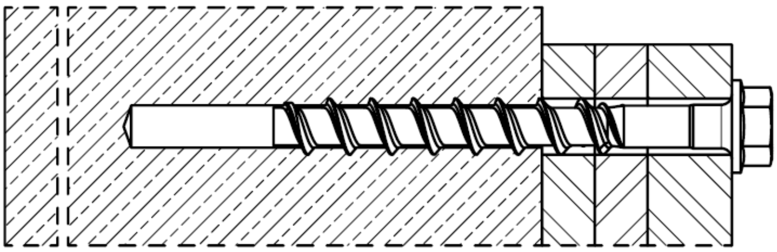
HUS4-CR (Countersunk head configuration sizes 6, 8 and 10)



HUS4-A
(Threaded rod connection
sizes 10 with M12 and 14 with M16)

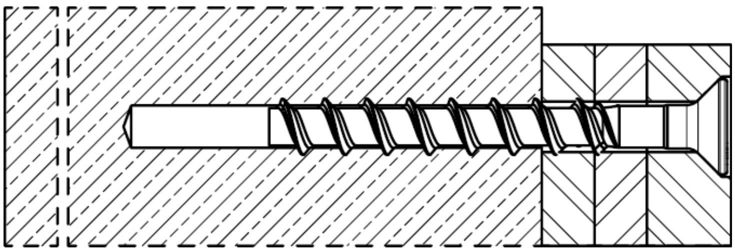
HUS4-AF
(Threaded rod connection
sizes 10 with M12 and 14 with M16)

Installed condition with adjustment - h_{nom2}, h_{nom3}



HUS4-H (Hexagon head configuration sizes 8, 10, 12, and 14)

HUS4-HF (Hexagon head configuration sizes 8, 10, and 14)



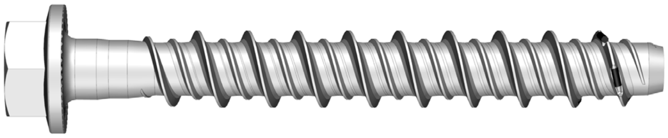
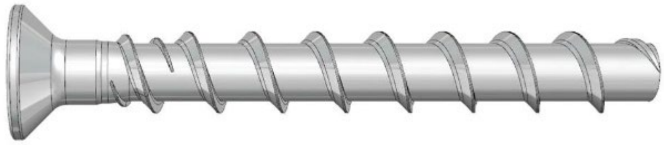
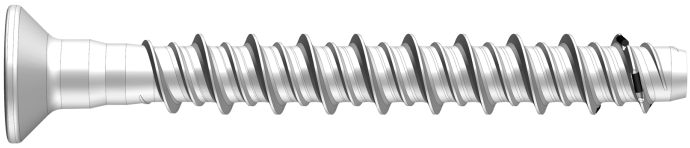
HUS4-C (Countersunk head configuration sizes 8 and 10)

ANNEX A2
Product description
HUS4 screw types

This annex applies to the product described in the main body of the UK Technical Assessment.

Table A1: Screw types

Hilti HUS4-H, sizes 8,10, 12, 14 and 16, hexagonal head configuration, galvanized carbon steel **Hilti HUS4-HF**, sizes 8,10, 14 and 16, hexagonal head configuration, carbon steel multilayer coating

Hilti HUS4-HR, sizes 6, 8, 10 and 14 hexagonal head configuration, stainless steel

Hilti HUS4-C, sizes 8 and 10, countersunk head configuration, galvanized carbon steel

Hilti HUS4-CR, sizes 6, 8 and 10 countersunk head configuration, stainless steel

Hilti HUS4-A, size 10 with external thread M12 and size 14 with external thread M16, galvanized carbon steel **Hilti HUS4-AF,** size 10 with external thread M12 and size 14 with external thread M16, carbon steel multilayer coating


ANNEX A3
Product description
HUS4 screw types, Filling set and Hilti injection mortar
Materials

This annex applies to the product described in the main body of the UK Technical Assessment.

Table A2: Hilti filling set (for HUS4-H (F, R) and HUS4-A (F)) and Hilti injection mortar

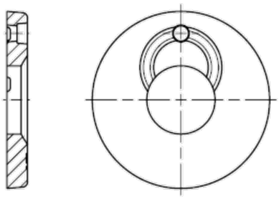
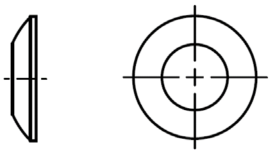
Filling washer	Spherical washer	Injection mortar
		 Hilti HIT-HY … with UKTA Hilti HIT-RE … with UKTA

Table A3: Materials

Part	Material
HUS4-H(F), HUS4-C and HUS4-A(F) screw anchor	Carbon steel Rupture elongation $A_5 \leq 8\%$
HUS4-HR and HUS-CR	Stainless steel (A4 grade) Rupture elongation A5 > 8% Stainless steel of corrosion resistance class CRC III according to EN 1993-1-4:2006+A1:2015 1.4401 or 1.4404 according to EN 10088-1:2014
Hilti Filling set (carbon steel)	Filling washer: Carbon steel Spherical washer: Carbon steel
Hilti Filling set (stainless steel)	Corrosion resistance class CRC III according to EN 1993-1-4:2006+A1:2015 Filling washer: Stainless steel A4 according to ASTM A240/A 240M:2019 Spherical washer: Stainless steel A4 according to EN 10088-1:2014

ANNEX A4
Production description
Fastener dimensions and head marking

This annex applies to the product described in the main body of the UK Technical Assessment.

Table A4: Filling set dimensions

Filling set size			**M10**	**M12**	**M16**	**M20**
Diameter	d_{vs}	[mm]	42	44	52	60
Thickness	h_{vs}	[mm]	5	5	6	6
HUS4-H (F, R) 			8	10	12 + 14	16
HUS4-A (F) 			-	10	14	-

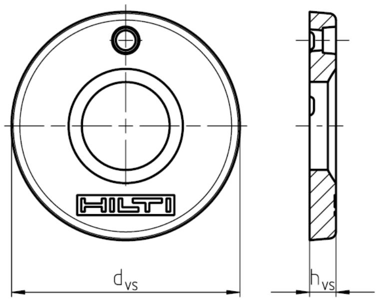
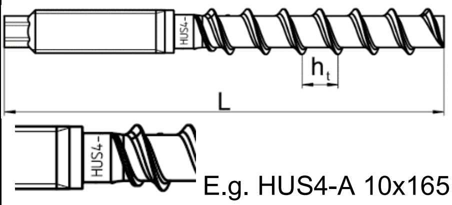


Table A5: Fastener dimensions and marking HUS4-A(F)

Fastener size HUS4-			**A(F) 10**			**A(F) 14**		
Nominal fastener diameter	d	[mm]	10			14		
Metric thread conection			M12			M16		
Pitch of the thread	h_t	[mm]	10			14		
Nominal embedment depth			h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
	h_{nom}	[mm]	55	75	85	65	80	115
Effective embedment depth	h_{ef}	[mm]	$h_{ef} = 0.85 * (h_{nom} – 0,5 * h_t) \le h_{ef,max}$					
Limits of effective embedment depth	$h_{ef,max}$	[mm]	68.0			91.8		
Length of screw minimum / maximum	L	[mm]	120 / 165			155 / 205		



E.g. HUS4-A 10x165

HUS4:	Hilti Universal Screw 4th generation
A: **AF**:	Galvanized thread connection, Thread connection, multilayer coating
10:	Nominal screw diameter d [mm]
165:	Length of screw L [mm]
8:	Carbon steel
K:	Length identification HUS4-A 10x165

G	**I**	**K**	**J**	**L**	**N**
10x120	10x140	10x165	14x155	14x185	14x205

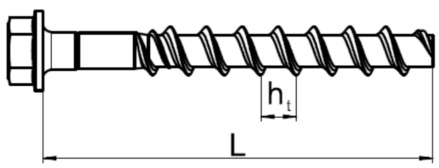
ANNEX A5
Production description
Fastener dimensions and head marking

This annex applies to the product described in the main body of the UK Technical Assessment.

Table A6: Fastener dimensions and marking HUS4-H...

Fastener size HUS4-			**H(F) 8**			**H(F) 10**			**H 12**			**H(F) 14**			**H(F) 16**	
Nominal fastener diameter	d	[mm]	8			10			12			14			16	
Pitch of the thread	h_t	[mm]	8			10			12			14			13.2	
Nominal embedment depth			h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}
	h_{nom}	[mm]	40	60	70	55	75	85	60	80	100	65	85	115	85	130
Effective embedment depth	h_{ef}	[mm]	$h_{ef} = 0{,}85 * (h_{nom} – 0{,}5 * h_t) \leq h_{ef,max}$													
Limits of effective embedment depth	$h_{ef,max}$	[mm]	56.1			68.0			79.9			91.8			104.9	
Length of screw minimum / maximum	L	[mm]	45 / 150			60 / 305			70 / 150			75 / 150			100 / 205	

Fastener size HUS4-			**HR 6**	**HR 8**		**HR 10**		**HR 14**	
Nominal fastener diameter	d	[mm]	6	8		10		14	
Pitch of the thread	h_t	[mm]	4.75	7.6		8.0		9.8	
Non-load bearing tip	h_s	[mm]	-	1.03		2.43		4.1	
Nominal embedment depth			h_{nom1}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
	h_{nom}	[mm]	55	60	80	70	90	70	110
Effective embedment depth	h_{ef}	[mm]	$h_{ef} = 0.85 * (h_{nom} – 0{,}5 * h_t – h_s) \leq h_{ef,max}$						
Limits of effective embedment depth	$h_{ef,max}$	[mm]	45	64		71		86	
Length of screw minimum / maximum	L	[mm]	60 / 70	65 / 105		75 / 130		80 / 135	



HUS4:	Hilti Universal Screw 4th generation
H: **HF**: **HR**:	Galvanized hexagonal head, Hexagonal head, multilayer coating Stainless steel hexagonal head,
10:	Nominal screw diameter d [mm]
100:	Length of screw [mm]

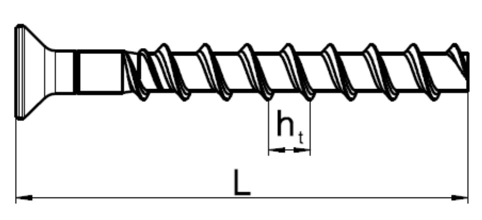
ANNEX A6
Production description
Fastener dimensions and head marking

This annex applies to the product described in the main body of the UK Technical Assessment.

Table A7: Fastener dimensions and marking HUS4-C...

Fastener size HUS4-			**C 8**			**C 10**		
Nominal fastener diameter	d	[mm]	8			10		
Pitch of the thread	h_t	[mm]	8			10		
Nominal embedment depth			h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
	h_{nom}	[mm]	40	60	70	55	75	85
Effective embedment depth	h_{ef}	[mm]	$h_{ef} = 0.85 * (h_{nom} – 0,5 * h_t) \leq h_{ef,max}$					
Limits of effective embedment depth	$h_{ef,max}$	[mm]	56.1			68.0		
Length of screw minimum / maximum	L	[mm]	55 / 85			70 / 120		

Fastener size HUS4-			**CR 6**	**CR 8**		**CR 10**	
Nominal fastener diameter	d	[mm]	6	8		10	
Pitch of the thread	h_t	[mm]	-	7.6		8.0	
Non-load bearing tip	h_s	[mm]	-	1.03		2.43	
Nominal embedment depth			h_{nom2}	h_{nom2}	h_{nom3}	h_{nom2}	h_{nom3}
	h_{nom}	[mm]	55	60	80	70	90
Effective embedment depth	h_{ef}	[mm]	$h_{ef} = 0,85 * (h_{nom} – 0,5 * h_t – h_s) \leq h_{ef,max}$				
Limits of effective embedment depth	$h_{ef,max}$	[mm]	45	64		71	
Length of screw minimum / maximum	L	[mm]	60 / 70	65 / 95		75 / 105	

		**HUS4**:	Hilti Universal Screw 4th generation
		C: **CR:**	Galvanized ountersunk head, Stainless steel ountersunk head,
		10:	Nominal screw diameter d [mm]
		100:	Length of screw L [mm]

ANNEX B1
Intended use
Specifications

This annex applies to the product described in the main body of the UK Technical Assessment.

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loadings
- Seismic action for performance categories C1 and C2 for HUS4-H(F)/-C/-A(F) (carbon steel screw)
- Seismic action for performance category C1: HUS4-HR/-CR (stainless steel screw)
- Fire exposure

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013+A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206-1:2010+A1:2016.
- Cracked and uncracked concrete.

Use conditions (Environmental conditions):

- Anchorages subject to dry internal conditions: all screw types
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006+A1:2015
  - Stainless steel according to Annex A3 Table A3, screw types HUS4-HR/-CR: CRC III

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- 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 (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with:
  EN 1992-4:2018 and EOTA Technical Report TR 055 edition February 2018.
- In case of requirements to resistance to fire local spalling of the concrete cover must be avoided.

Installation:

- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the 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 fastener must not be possible.
- The head of the fastener (HUS4-H (F, R) and HUS4-C/-CR) must be supported on the fixture and is not damaged.
- Hilti filling set is suitable for HUS4-H (F, R) and HUS4-A (F)

ANNEX B2
Intended use
Specifications

This annex applies to the product described in the main body of the UK Technical Assessment.

Specifications of intended use: Drilling and cleaning for HUS4 carbon steel
Table B1: Static and quasi-static loading for HUS4-H(F)/-C/-A(F)

HUS4-H(F)/-C/-A(F) carbon steel		**Fastener size and embedment depth h_{nom}**
Cracked and uncracked concrete		
Hammer drilling (HD) [(1)]	Cleaned	Sizes 8 to 16 at all h_{nom}
	Not cleaned	Sizes 8 to 14 at all h_{nom}
Hammer drilling with Hilti hollow drill bit TE-CD (HDB) [(1)]		Sizes 12 and 14 at all h_{nom}
Uncracked concrete		
Diamond coring (DD) DD30-W handheld and with stand DD-EC1 handheld		Sizes 10 to 14 at h_{nom3}

[(1)] Adjustment according to Annex B11 is possible for sizes 8 to 14 at h_{nom2+3}

Table B2: Seismic performance category C1 for HUS4-H(F)/-C/-A(F)

HUS4-H(F)/-C/-A(F) carbon steel		**Fastener size and embedment depth h_{nom}**
Hammer drilling (HD) [(1)]	Cleaned	Sizes 8 to 14 at h_{nom2+3} Size 16 at h_{nom1+2}
	Not cleaned	Sizes 8 to 14 at h_{nom2+3}
Hammer drilling with Hilti hollow drill bit TE-CD (HDB) [(1)]		Sizes 12 and 14 at h_{nom2+3}

[(1)] Adjustment according to Annex B11 is possible for sizes 8 to 14 at h_{nom2+3}

Table B3: Seismic performance category C2 for HUS4-H(F)/-C/-A(F)

HUS4-H(F)/-C/-A(F) carbon steel		**Fastener size and embedment depth h_{nom}**
Hammer drilling (HD) [(1)]	Cleaned	Sizes 8 to 14 at h_{nom3}
	Not cleaned	Sizes 8 to 14 at h_{nom3}

[(1)] Adjustment according to Annex B11 is possible for sizes 8 to 14 at h_{nom3}

Table B4: Static and quasi-static loading under fire exposure for HUS4-H(F)/-C/-A(F)

HUS4-H(F)/-C/-A(F) carbon steel		**Fastener size and embedment depth h_{nom}**
Hammer drilling (HD) [(1)]	Cleaned	Sizes 8 to 16 at all h_{nom}
	Not cleaned	Sizes 8 to 14 at all h_{nom}
Hammer drilling with Hilti hollow drill bit TE-CD (HDB) [(1)]		Sizes 12 and 14 at all h_{nom}

[(1)] Adjustment according to Annex B11 is possible for sizes 8 to 14 at h_{nom2+3}

ANNEX B3
Intended use
Specifications

This annex applies to the product described in the main body of the UK Technical Assessment.

Specifications of intended use: Drilling and cleaning for HUS4 stainless steel
Table B5: Static and quasi-static loading for HUS4-HR/-CR

HUS4-HR/-CR stainless steel			**Fastener size and embedment depth h_{nom}**
Cracked and uncracked concrete			
Hammer drilling (HD)	Cleaned		Sizes 6 to 14 at all h_{nom}
	Not cleaned		

Table B6: Seismic performance category C1 for HUS4-HR/-CR

HUS4-HR/-CR stainless steel			**Fastener size and embedment depth h_{nom}**
Hammer drilling (HD)	Cleaned		Sizes 8 to 14 at h_{nom2}
	Not cleaned		Sizes 8 to 14 at h_{nom2}

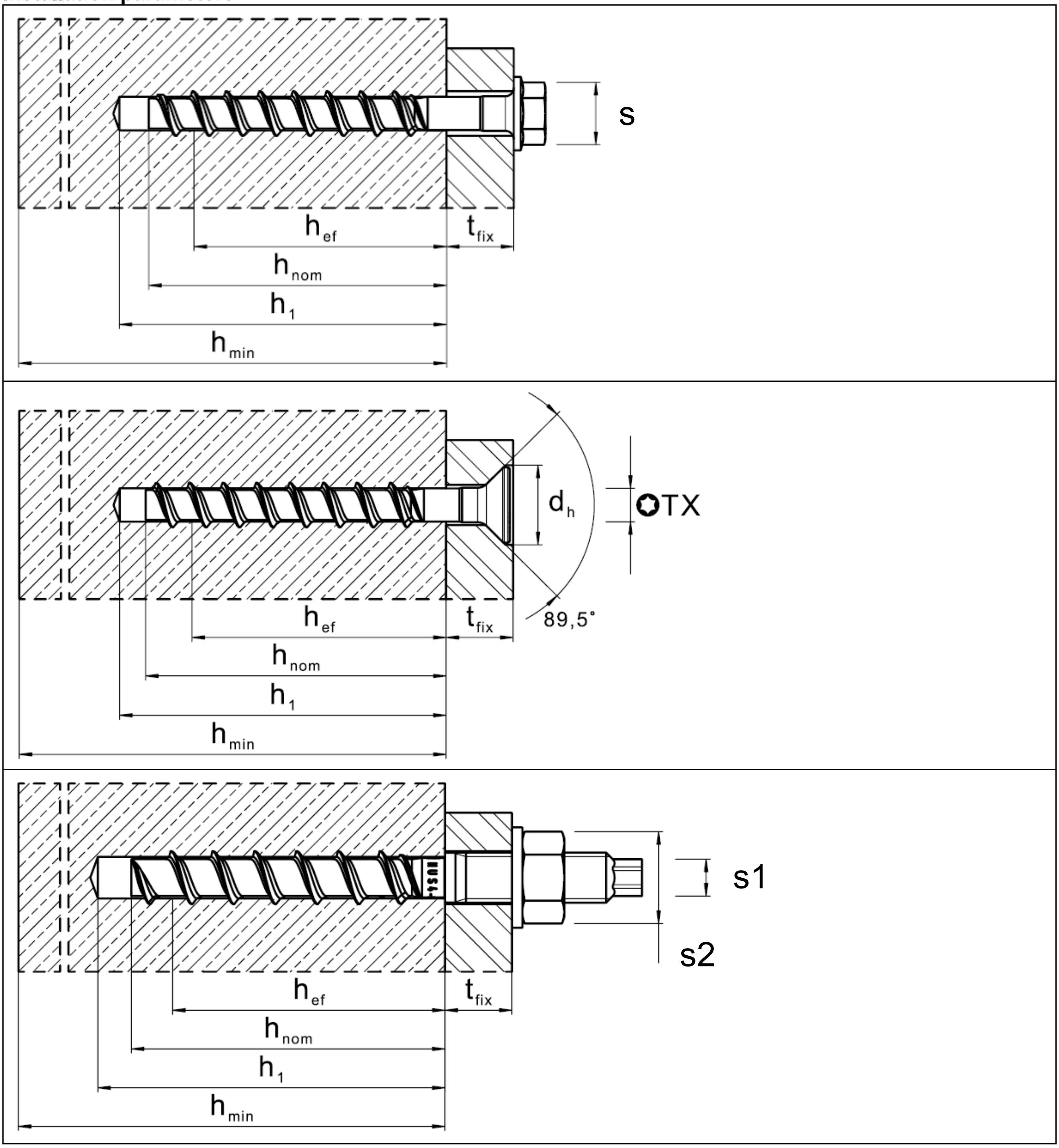
Table B7: Static and quasi-static loading under fire exposure for HUS4-HR/-CR

HUS4-HR/-CR stainless steel			**Fastener size and embedment depth h_{nom}**
Hammer drilling (HD)	Cleaned		Sizes 6 to 14 at all h_{nom}
	Not cleaned		Sizes 6 to 14 at all h_{nom}

ANNEX B4
Intended use
Installation parameters

This annex applies to the product described in the main body of the UK Technical Assessment.

Installation parameters



ANNEX B5
Intended use
Installation parameters

This annex applies to the product described in the main body of the UK Technical Assessment.

Table B8: Installation parameters HUS4-8 and 10

Fastener size HUS4 **Type**			**8** **H(F), C**			**10** **H(F), C, A(F)**		
			h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth	h_{nom}	[mm]	40	60	70	55	75	85
Nominal drill hole diameter	d_0	[mm]	8			10		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8.45			10.45		
Cutting diameter of diamond core bit	$d_{cut} \leq$	[mm]	-			9.9		
Clearance hole diameter through setting	d_f min	[mm]	11			13		
	d_f max	[mm]	12			14		
Clearance hole diameter pre setting (A-type)	$d_f \leq$	[mm]	-			14		
Wrench size (H, HF-type)	s	[mm]	13			15		
Wrench size for hex head (A-type)	s1	[mm]	-			8		
Wrench size for nut (A-type)	s2	[mm]	-			19		
Maximum installation torque (A-type)	max T_{inst}	[Nm]	-			40		
Torx size (C-type)	TX	-	45			50		
Diameter of countersunk head	d_h	[mm]	18			21		
Depth of drill hole for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h_{nom} + 10 mm)					
			50	70	80	65	85	95
Depth of drill hole for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	(h_{nom} + 10 mm) + 2 * d_0					
			66	86	96	85	105	115
Depth of drill hole (with adjustability) for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h_{nom} + 20 mm)					
			-	80	90	-	95	105
Depth of drill hole (with adjustability) for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	(h_{nom} + 20 mm) + 2 * d_0					
			-	96	106	-	115	125
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	(h_1 + 30 mm)					
			80	100	120	100	130	140
Minimum spacing	$s_{min} \geq$	[mm]	35			40		
Minimum edge distance	$c_{min} \geq$	[mm]	35			40		
Hilti Setting tool [(1)]			SIW 6AT-A22 1/2" SIW 6-22 1/2" gear 1			SIW 6AT-A22 1/2" SIW 22T-A 1/2" SIW 6-22 1/2" SIW 8-22 1/2" gear 1 SIW 9-A22 3/4"		

[(1)] Installation with other impact screw driver of equivalent power is possible

ANNEX B6
Intended use
Installation parameters

This annex applies to the product described in the main body of the UK Technical Assessment.

Table B9: Installation parameters HUS4-12 and 14

Fastener size HUS4			**12**			**14**		
Type			**H**			**H(F), A(F)**		
			h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth	h_{nom}	[mm]	60	80	100	65	85	115
Nominal drill hole diameter	d_0	[mm]	12			14		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12.50			14.50		
Cutting diameter of diamond core bit	$d_{cut} \leq$	[mm]	12.2			-		
Clearance hole diameter through setting	$d_f \frac{min}{max}$	[mm]	16			18		
Clearance hole diameter pre setting (A-type)	$d_f \leq$	[mm]	-			18		
Wrench size (H, HF-type)	s	[mm]	17			21		
Wrench size for hex head (A-type)	s1	[mm]	-			12		
Wrench size for nut (A-type)	s2	[mm]	-			24		
Maximum installation torque (A-type)	max T_{inst}	[Nm]	-			80		
Depth of drill hole for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h_{nom} + 10 mm)					
			70	90	110	75	95	125
Depth of drill hole for uncleanded hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	(h_{nom} + 10 mm) + 2 * d_0					
			94	114	134	103	123	153
Depth of drill hole (with adjustability) for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h_{nom} + 20 mm)					
			-	100	120	-	105	135
Depth of drill hole (with adjustability) for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	(h_{nom} + 20 mm) + 2 * d_0					
			-	124	144	-	133	163
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	(h_1 + 30 mm)					
			110	130	150	120	160	200
Minimum spacing	$s_{min} \geq$	[mm]	50			60		
Minimum edge distance	$c_{min} \geq$	[mm]	50			60		
Hilti Setting tool (1)			SIW 22T-A 1/2” SIW 6-22 1/2” SIW 8-22 1/2" SIW 9-A22 3/4”			SIW 22T-A 1/2” SIW 6-22 1/2” SIW 8-22 1/2" SIW 9-A22 3/4”		

(1) Installation with other impact screw driver of equivalent power is possible.

ANNEX B7
Intended use
Installation parameters

This annex applies to the product described in the main body of the UK Technical Assessment.

Table B10: Installation parameters HUS4-16

Fastener size HUS4			**16**	
Type			**H(F)**	
			h_{nom1}	h_{nom2}
Nominal embedment depth	h_{nom}	[mm]	85	130
Nominal drill hole diameter	d_0	[mm]	16	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	16,50	
Clearance hole diameter through setting	$d_f \leq$	[mm]	20	
Wrench size	s	[mm]	24	
Depth of drill hole for cleaned hole hammer drilling or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h_{nom} + 10 mm)	
			95	140
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	130	195
Minimum spacing	$s_{min} \geq$	[mm]	90	
Minimum edge distance	$c_{min} \geq$	[mm]	65	
Hilti Setting tool (1)			SIW 22T-A 1/2” SIW 6-22 1/2” SIW 8-22 1/2" SIW 9-A22 3/4”	

(1) Installation with other impact screw driver of equivalent power is possible.

ANNEX B8
Intended use
Installation parameters

This annex applies to the product described in the main body of the UK Technical Assessment.

Table B11: Installation parameters HUS4-HR/-CR 6 and 8

Fastener size HUS4 **Type**			**6** **HR, CR**	**8** **HR, CR**	
			h_{nom1}	h_{nom1}	h_{nom2}
Nominal embedment depth	h_{nom}	[mm]	55	60	80
Nominal drill hole diameter	d_0	[mm]	6	8	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6.40	8.45	
Clearance hole diameter	$d_f \leq$	[mm]	9	12	
Wrench size (H-type)	s	[mm]	13	13	
Torx size (C-type)	TX	[-]	30	45	
Diameter of countersunk head	d_h	[mm]	11	18	
Depth of drill hole for cleaned hole hammer drilling or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h_{nom} + 10mm)		
			65	70	90
Depth of drill hole for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	(h_{nom} + 10 mm) + 2 * d_0		
			77	86	106
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	(h_1 + 30 mm)		
			100	100	120
Minimum spacing	$s_{min} \geq$	[mm]	35	45	60
Minimum edge distance	$c_{min} \geq$	[mm]	35	45	60
Hilti Setting tool (1)			SIW 6AT-A22 1/2” gear 3	SIW 22T-A 1/2” SIW 6AT-A22 1/2” gear 3 SIW 6-22 1/2” gear 2	

(1) Installation with other impact screw driver of equivalent power is possible.

ANNEX B9
Intended use
Installation parameters

This annex applies to the product described in the main body of the UK Technical Assessment.

Table B12: Installation parameters HUS4-HR/-CR 10 and 14

Fastener size HUS4			**10**		**14**	
Type			**HR, CR**		**HR**	
			h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Nominal embedment depth	h_{nom}	[mm]	70	90	70	110
Nominal drill hole diameter	d_0	[mm]	10		14	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10.45		14.50	
Clearance hole diameter	$d_f \leq$	[mm]	14		18	
Wrench size (H-type)	s	[mm]	15		21	
Torx size (C-type)	TX	[-]	50		-	
Diameter of countersunk head	d_h	[mm]	21		-	
Depth of drill hole for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h_{nom} + 10mm)			
			80	100	80	120
Depth of drill hole for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	(h_{nom} + 10 mm) + 2 * d_0			
			100	120	108	148
Installation Torque	T_{inst}	[Nm]	45		65	
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	120	140	140	160
Minimum spacing	$s_{min} \geq$	[mm]	50		60	
Minimum edge distance	$c_{min} \geq$	[mm]	50		60	
Hilti Setting tool (1)			SIW 22T-A 1/2” SIW 6AT-A22 1/2” gear 3 SIW 6-22 1/2” gear 2		SIW 22T-A 1/2” SIW 6-22 1/2” gear 2 SIW 8-22 1/2" gear 1 SIW 9-A22 3/4”	

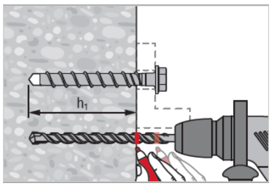
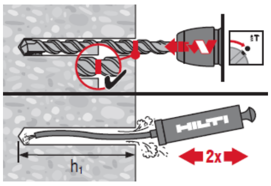
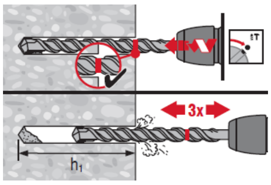
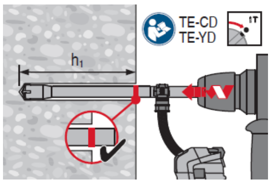
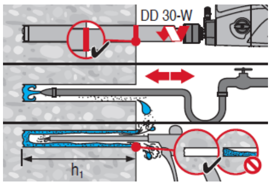
(1) Installation with other impact screw driver of equivalent power is possible.

ANNEX B10
Intended use
Installation instructions

This annex applies to the product described in the main body of the UK Technical Assessment.

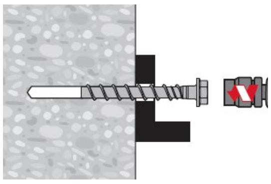
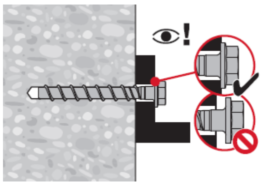
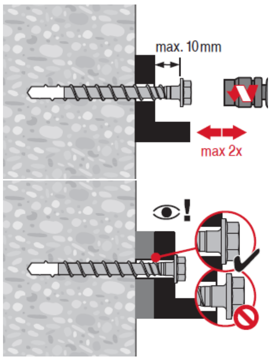
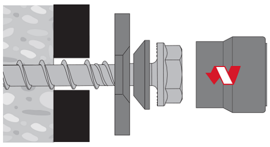
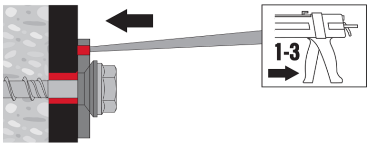
Installation instructions

Hole drilling and cleaning

Hammer drilling (HD) all sizes for carbon and stainless steel screw types (size 16 with cleaning only)	
	Mark drilling depth h_1 for pre or through installation. For details of drilling depth h_1, see Tables B5 to B9.
	Cleaning needed in downward and horizontal installation direction with drill hole depth. $h_1 = h_{nom} + 10$ mm
	No cleaning is allowed in upward installation direction. No cleaning is allowed in downward and horizontal installation direction when 3x ventilation [(1)] after drilling is executed. Drill hole depth $h_1 = h_{nom} + 10$ mm+ 2 * d_0 [(1)] Moving the drill bit in and out of the drill hole three times after the recommended drilling depth h_1 is achieved. This procedure must be done with both revolution and hammer functions activated in the drilling machine. For more details read the relevant installation instruction (MPII).
Hammer drilling with Hilti hollow drill bit (HDB) TE-CD sizes 12 and 14 for carbon steel screw types	
	No cleaning needed. $h_1 = h_{nom} + 10$ mm
Diamond coring with DD-EC1 or DD-30W sizes 10 to 14 for carbon steel screw types	
	Cleaning needed in all installation directions. $h_1 = h_{nom} + 10$ mm

ANNEX B11
Intended use
Installation instructions

This annex applies to the product described in the main body of the UK Technical Assessment.

<table>
<tr><td colspan="2">Fastener setting without adjustment</td></tr>
<tr><td colspan="2">Setting by impact screw driver</td></tr>
<tr><td></td><td>Setting parameters listed in Tables B5 to B7.</td></tr>
<tr><td colspan="2">Setting check</td></tr>
<tr><td></td><td></td></tr>
<tr><td colspan="2">Fastener setting with adjustment for carbon steel screw types</td></tr>
<tr><td colspan="2">Adjusting process</td></tr>
<tr><td>
</td><td>A screw can be adjusted a maximum of two times. The total allowed thickness of shims added during the adjustment process is 10 mm. The final embedment depth after adjustment process must be larger or equal to h_{nom2} or h_{nom3}.</td></tr>
<tr><td colspan="2">Fastener setting with Hilti filling set</td></tr>
<tr><td></td><td></td></tr>
<tr><td colspan="2">Injection of Hilti HIT mortar and curing time</td></tr>
<tr><td>
</td><td>Fill the annular gap between screw and fixture with 1-3 strokes of a Hilti injection mortar HIT-HY … or HIT-RE … .
Follow the installation instructions supplied with the respective Hilti injection mortar.
After required curing time t_{cure} the fastening can be loaded.</td></tr>
</table>

ANNEX C1
Performances
Essential characteristics under static and quasi-static load in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C1: Essential characteristics under static and quasi-static load in concrete for HUS4 carbon steel size 8 and 10

Fastener size HUS4				**8**			**10**		
Type				**H(F), C**			**H(F), C, A(F)**		
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	40	60	70	55	75	85
Adjustment									
Total maximum thickness of adjustment layers		t_{adj}	[mm]	-	10	10	-	10	10
Maximum number of adjustments		n_a	[-]	-	2	2	-	2	2
Steel failure for tension load									
Characteristic resistance		$N_{Rk,s}$	[kN]	36.0			55.0		
Partial factor		$\gamma_{Ms,N}$ (1)	[-]	1.5					
Pull-out failure									
Characteristic resistance in uncracked concrete C20/25		$N_{Rk,p}$	[kN]	$\geq N^0_{Rk,c}$ (3)			13	22	$\geq N^0_{Rk,c}$ (3)
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	5.5	$\geq N^0_{Rk,c}$ (3)				
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$		ψ_c	[-]	$(f_{ck}/20)^{0,5}$					
Concrete cone and splitting failure									
Effective embedment depth		h_{ef} (2)	[mm]	30.6	47.6	56.1	42.5	59.5	68.0
Factor for	Uncracked	$k_{ucr.N}$	[-]	11.0					
	Cracked	$k_{cr.N}$	[-]	7.7					
Concrete cone failure	Edge distance	$c_{cr.N}$	[mm]	1.5 h_{ef}					
	Spacing	$s_{cr.N}$	[mm]	3 h_{ef}					
Characteristic resistance		$N^0_{Rk.sp}$	[kN]	$N_{Rk,p}$					
Splitting failure	Edge distance	$c_{cr.sp}$	[mm]	1.5 h_{ef}			1.65 h_{ef}		
	Spacing	$s_{cr.sp}$	[mm]	3 h_{ef}			3.3 h_{ef}		
Installation factor		γ_{inst}	[-]	1.0			1.2	1.0	

(1) In absence of other national regulations.
(2) In case $h_{nom} > h_{nom1}$ and $< h_{nom3}$ the actual h_{ef} for concrete failure can be calculated according to: $h_{ef} = 0.85 * (h_{nom} - 0.5 * h_t)$
(3) $N^0_{Rk.c}$ according to EN 1992-4:2018

ANNEX C2
Performances
Essential characteristics under static and quasi-static load in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C1 continued

Fastener size HUS4			**8**			**10**		
Type			**H(F), C**			**H(F), C, A(F)**		
			h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth	h_{nom}	[mm]	40	60	70	55	75	85
Steel failure for shear load								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	18.8		21.9	28.8		32.0
Partial factor	$\gamma_{Ms,V}$ [(1)]	[-]	1.25					
Ductility factor	k_7	[-]	0.8					
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	32			64		
Concrete pry-out failure								
Pry-out factor	k_8	[-]	1.0	2.0		1.0	2.0	
Concrete edge failure								
Effective length of fastener	l_f	[mm]	40	60	70	55	75	85
Outside diameter of fastener	d_{nom}	[mm]	8			10		

(1) In absence of other national regulations.

ANNEX C3
Performances
Essential characteristics under static and quasi-static load in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C2: Essential characteristics under static and quasi-static load in concrete for HUS4 carbon steel size 12 to 16

Fastener size HUS4				**12**			**14**			**16**	
Type				**H**			**H(F), A(F)**			**H(F)**	
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	60	80	100	65	85	115	85	130
Adjustment											
Total maximum thickness of adjustment layers		t_{adj}	[mm]	-	10	10	-	10	10	-	-
Maximum number of adjustments		n_a	[-]	-	2	2	-	2	2	-	-
Steel failure for tension load											
Characteristic resistance		$N_{Rk,s}$	[kN]	79.0			101.5			107.7	
Partial factor		$\gamma_{Ms,N}$ (1)	[-]	1.5							
Pull-out failure											
Characteristic resistance in uncracked concrete C20/25		$N_{Rk,p}$	[kN]	$\geq N^0_{Rk,c}$ (3)						22	46
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	10	$\geq N^0_{Rk,c}$ (3)					16	32
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$		ψ_c	[-]	$(f_{ck}/20)^{0,5}$							
Concrete cone and splitting failure											
Effective embedment depth		h_{ef} (2)	[mm]	45.9	62.9	79.9	49.3	66.3	91.8	66.6	104.9
Factor for	Uncracked	$k_{ucr,N}$	[-]	11.0							
	Cracked	$k_{cr,N}$	[-]	7.7							
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}							
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}							
Characteristic resistance		$N^0_{Rk,sp}$	[kN]	$N_{Rk,p}$							
Splitting failure	Edge distance	$c_{cr,sp}$	[mm]	1.65 h_{ef}			1.60 h_{ef}				
	Spacing	$s_{cr,sp}$	[mm]	3.30 h_{ef}			3.20 h_{ef}				
Installation factor		γ_{inst}	[-]	1.0							

(1) In absence of other national regulations.
(2) In case $h_{nom} > h_{nom1}$ and $< h_{nom3}$ the actual h_{ef} for concrete failure can be calculated according to: $h_{ef} = 0.85 * (h_{nom} – 0.5 * h_t)$
(3) $N^0_{Rk,c}$ according to EN 1992-4:2018

ANNEX C4
Performances
Essential characteristics under static and quasi-static load in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C2 continued

Fastener size HUS4 **Type**			**12** **H**			**14** **H(F), A(F)**			**16** **H(F)**	
			h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}
Nominal embedment depth	h_{nom}	[mm]	60	80	100	65	85	115	85	130
Steel failure for shear load										
Characteristic resistance	$V^0_{Rk,s}$	[kN]	38.9		44.9	55	62		65.1	73.1
Partial factor	$\gamma_{Ms,V}$ [(1)]	[-]	1.25							
Ductility factor	k_7	[-]	0.8							
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	120			186			240	
Concrete pry-out failure										
Pry-out factor	k_8	[-]	2.0							
Concrete edge failure										
Effective length of fastener	l_f	[mm]	60	80	100	65	85	115	85	130
Outside diameter of fastener	d_{nom}	[mm]	12			14			16	

[(1)] In absence of other national regulations.

ANNEX C5
Performances
Essential characteristics under static and quasi-static load in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C3: Essential characteristics under static and quasi-static load in concrete for HUS4 stainless steel

Fastener size HUS4				**6**	**8**		**10**		**14**	
Type				**HR, CR**	**HR, CR**		**HR, CR**		**HR**	
				h_{nom1}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	55	60	80	70	90	70	110
Steel failure for tension and shear load										
Characteristic resistance		$N_{Rk,s}$	[kN]	24.0	34.0		52.6		102.2	
Partial factor		$\gamma_{Ms,N}$ (1)	[-]	1.4						
Characteristic resistance		$V_{Rk,s}$	[kN]	17.0	26.0		33.0		55.0	77.0
Partial factor		$\gamma_{Ms,V}$ (1)	[-]	1.5						
Ductility factor		k_7	[-]	1.0						
Characteristic resistance		$M^0_{Rk,s}$	[Nm]	19	36		66		193	
Pull-out failure										
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	5	8.5	15	12	16	12	25
Characteristic resistance in uncracked concrete C20/25		$N_{Rk,p}$	[kN]	9	12	16	16	25	$\geq N^0_{Rk,c}$ (2)	
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$		ψ_c	[-]	$(f_{ck}/20)^{0,5}$						
Concrete cone and splitting failure										
Effective anchorage depth		h_{ef}	[mm]	45	47	64	54	71	52	86
Factor for	Cracked	$k_{cr,N}$	[-]	7.7						
	Uncracked	$k_{ucr,N}$	[-]	11.0						
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}						
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}						
Splitting failure	Edge distance	$c_{cr,sp}$	[mm]	1.5 h_{ef}	1.5 h_{ef}		1.8 h_{ef}		1.8 h_{ef}	
	Spacing	$s_{cr,sp}$	[mm]	3 h_{ef}	3 h_{ef}		3.6 h_{ef}		3.6 h_{ef}	
Robustness		γ_{inst}	[-]	1,4	1.0	1.2	1.2	1.0	1.2	
Concrete pry-out failure										
Pry-out factor		k_8	[mm]	1.5	2.0					
Concrete edge failure										
Effective length of anchor		$l_f = h_{ef}$	[mm]	45	47	64	54	71	52	86
Effective diameter of anchor		d_{nom}	[mm]	6	8		10		14	

(1) In absence of other national regulations.
(2) $N^0_{Rk,c}$ according to EN 1992-4:2018

ANNEX C6
Performances
Essential characteristics for seismic performance category C1 in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C4: Essential characteristics for seismic performance category C1 in concrete for HUS4 carbon steel

Fastener size HUS4				**8**		**10**		**12**		**14**	
Type				**H(F), C**		**H(F), C, A(F)**		**H**		**H(F), A(F)**	
				h_{nom2}	h_{nom3}	h_{nom2}	h_{nom3}	h_{nom2}	h_{nom3}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	60	70	75	85	80	100	85	115
Steel failure for tension and shear load											
Characteristic resistance		$N_{Rk,s,C1}$	[kN]	36.0		55.0		79.0		101.5	
Partial factor		$\gamma_{Ms,N}$ (1)	[-]	1.5							
Characteristic resistance		$V_{Rk,s,C1}$	[kN]	18.8		26.7		38.9		22.5	34.5
Partial factor		$\gamma_{Ms,V}$ (1)	[-]	1.25							
Reduction factor according to EN 1992-4:2018 Annular gap unfilled		α_{gap}	[-]	0.5							
Reduction factor according to EN 1992-4:2018 Annular gap filled		α_{gap}	[-]	1.0							
Pull-out failure											
Characteristic resistance in cracked concrete		$N_{Rk,p,C1}$	[kN]	$\geq N^0_{Rk,c}$ (3)							
Concrete cone failure											
Effective embedment depth		h_{ef} (2)	[mm]	47.6	56.1	59.5	68.0	62.9	79.9	66.3	91.8
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}							
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}							
Installation factor		γ_{inst}	[-]	1.0							
Concrete pry-out failure											
Pry-out factor		k_8	[-]	2.0							
Concrete edge failure											
Effective length of fastener		l_f	[mm]	60	70	75	85	80	100	85	115
Outside diameter of fastener		d_{nom}	[mm]	8		10		12		14	

(1) In absence of other national regulations.
(2) In case $h_{nom} > h_{nom2}$ and $< h_{nom3}$ the actual h_{ef} for concrete failure can be calculated according to “$h_{ef} = 0.85 * (h_{nom} – 0,5 * h_t)$
(3) $N^0_{Rk,c}$ according to EN 1992-4:2018

ANNEX C7
Performances
Essential characteristics for seismic performance category C1 in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C4 continued

Fastener size HUS4 **Type**				**16** **H(F)**	
				h_{nom1}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	85	130
Steel failure for tension and shear load					
Characteristic resistance		$N_{Rk,s,C1}$	[kN]	107.7	
Partial factor		$\gamma_{Ms,N}$ (1)	[-]	1.5	
Characteristic resistance		$V_{Rk,s,C1}$	[kN]	42.9	25.3
Partial factor		$\gamma_{Ms,V}$ (1)	[-]	1.25	
Partial factor annular gap unfilled		α_{gap}	[-]	0.5	
Partial factor annular gap filled		α_{gap}	[-]	1.0	
Pull-out failure					
Characteristic resistance in cracked concrete		$N_{Rk,p,C1}$	[kN]	7.5	19.0
Concrete cone failure					
Effective embedment depth		h_{ef} (2)	[mm]	66.6	104.9
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}	
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}	
Installation factor		γ_{inst}	[-]	1.0	
Concrete pry-out failure					
Pry-out factor		k_8	[-]	2.0	
Concrete edge failure					
Effective length of fastener		l_f	[mm]	85	130
Outside diameter of fastener		d_{nom}	[mm]	16	

(1) In absence of other national regulations.
(2) In case $h_{nom} > h_{nom2}$ and $< h_{nom3}$ the actual h_{ef} for concrete failure can be calculated according to “$h_{ef} = 0.85 * (h_{nom} – 0.5 * h_t)$

ANNEX C8
Performances
Essential characteristics for seismic performance category C1 in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C5: Essential characteristics for seismic performance category C1 in concrete for HUS4 stainless steel

Fastener size HUS4 **Type**				**8** **HR, CR**	**10** **HR, CR**	**14** **HR**
				h_{nom2}	h_{nom2}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	80	90	110
Steel failure for tension and shear load						
Characteristic resistance		$N_{Rk,s,C1}$	[kN]	34.0	52.6	102.2
Partial factor		$\gamma_{Ms,N}$ (1)	[-]	1.4		
Characteristic resistance		$V_{Rk,s,C1}$	[kN]	11.1	17.9	53.9
Partial factor		$\gamma_{Ms,V}$ (1)	[-]	1.5		
Pull-out failure						
Characteristic resistance in cracked concrete		$N_{Rk,p,C1}$	[kN]	7.7	12.5	17.5
Concrete cone failure						
Effective embedment depth		h_{ef}	[mm]	64	71	86
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}		
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}		
Robustness		γ_{inst}	[-]	1.2	1.0	1.2
Concrete pry-out failure						
Pry-out factor		k_8	[-]	2.0		
Concrete edge failure						
Effective length of fastener		$l_f = h_{ef}$	[mm]	64	71	86
Outside diameter of fastener		d_{nom}	[mm]	8	10	14

(1) In absence of other national regulations.

ANNEX C9
Performances
Essential characteristics for seismic performance category C2 in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C6: Essential characteristics for seismic performance category C2 in concrete for HUS4 carbon steel

Fastener size HUS4				**8**	**10**	**12**	**14**
Type				**H(F), C**	**H(F), C, A(F)**	**H**	**H(F), A(F)**
				h_{nom3}	h_{nom3}	h_{nom3}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	70	85	100	115
Adjustment							
Total maximum thickness of adjustment layers		t_{adj}	[mm]	10	10	10	10
Maximum number of adjustments		n_a	[-]	2	2	2	2
Steel failure for tension							
Characteristic resistance		$N_{Rk,s,C2}$	[kN]	36.0	55.0	79.0	101.5
Partial factor		$\gamma_{Ms,N}$ (1)	[-]	1.5			
Steel failure for shear load							
Partial factor		$\gamma_{Ms,V}$ (1)	[-]	1.25			
Installation with Hilti filling set (HUS4-H and HUS4-A)							
Characteristic resistance		$V_{Rk,s,C2}$	[kN]	13.9	21.5	27.2	46.5
Partial factor annular gap filled		α_{gap}	[-]	1.0			
Installation without Hilti filling set							
Characteristic resistance		$V_{Rk,s,C2}$	[kN]	9.4	13.7	22.5	34.4
Partial factor annular gap not filled		α_{gap}	[-]	0.5			
Pull-out failure							
Characteristic resistance in cracked concrete		$N_{Rk,p,C2}$	[kN]	2.7	5.4	11.4	17.7
Concrete cone failure							
Effective embedment depth		h_{ef}	[mm]	56.1	68.0	79.9	91.8
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}			
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}			
Installation factor		γ_{inst}	[-]	1.0			
Concrete pry-out failure							
Pry-out factor		k_8	[-]	2.0			
Concrete edge failure							
Effective length of fastener		l_f	[mm]	70	85	100	115
Outside diameter of fastener		d_{nom}	[mm]	8	10	12	14

(1) In absence of other national regulations.

ANNEX C10
Performances
Essential characteristics under fire exposure in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C7: Essential characteristics under fire exposure in concrete for HUS4-H carbon steel

Fastener size HUS4-H(F)				**8**			**10**		
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	40	60	70	55	75	85
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)									
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	2.6			4.1	4.2	
	R60	$F_{Rk,s,fi}$	[kN]	1.9			3.1	3.1	
	R90	$F_{Rk,s,fi}$	[kN]	1.2			2.2	2.3	
	R120	$F_{Rk,s,fi}$	[kN]	0.9			1.5	1.7	
	R30	$M^0_{Rk,s,fi}$	[Nm]	2.3			4.8	4.9	
	R60	$M^0_{Rk,s,fi}$	[Nm]	1.7			3.6	3.7	
	R90	$M^0_{Rk,s,fi}$	[Nm]	1.1			2.6	2.7	
	R120	$M^0_{Rk,s,fi}$	[Nm]	0.8			1.8	1.9	
Pull-out failure									
Characteristic resistance	R30 R60 R90	$N^0_{Rk,p,fi}$	[kN]	1.3	2.8	3.6	2.3	3.9	4.7
	R120	$N^0_{Rk,p,fi}$	[kN]	1.0	2.2	2.8	1.9	3.1	3.7
Concrete cone failure									
Characteristic resistance	R30 R60 R90	$N^0_{Rk,c,fi}$	[kN]	0.8	2.6	4.0	2.0	4.7	6.5
	R120	$N^0_{Rk,c,fi}$	[kN]	0.7	2.1	3.2	1.6	3.7	5.2
Edge distance									
R30 to R120		$c_{cr,fi}$	[mm]	2 h_{ef}					
In case of fire attack from more than one side, the minimum edge distance must be ≥ 300 mm									
Fastener spacing									
R30 to R120		$s_{cr,fi}$	[mm]	2 $c_{cr,fi}$					
Concrete pry-out failure									
R30 to R120		k_8	[-]	1,0	2,0		1,0	2,0	
The anchorage depth must be increased for wet concrete by at least 30 mm compared to the given value									

ANNEX C11
Performances
Essential characteristics under fire exposure in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C7 continued

Fastener size HUS4-H(F)				**12**			**14**			**16**	
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	60	80	100	65	85	115	85	130
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)											
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	7.5	7.6	7.6	10.3	10.4	10.5	10.6	10.7
	R60	$F_{Rk,s,fi}$	[kN]	5.5	5.7	5.8	7.7	7.9	8.0	8.1	8.2
	R90	$F_{Rk,s,fi}$	[kN]	3.7	3.9	4.1	5.2	5.6	5.8	5.7	5.9
	R120	$F_{Rk,s,fi}$	[kN]	2.8	3.0	3.1	3.9	4.2	4.4	4.3	4.5
	R30	$M^0_{Rk,s,fi}$	[Nm]	11.4	11.6	11.6	18.9	19.2	19.3	23.7	23.9
	R60	$M^0_{Rk,s,fi}$	[Nm]	8.4	8.8	8.9	14.1	14.6	14.8	18.1	18.3
	R90	$M^0_{Rk,s,fi}$	[Nm]	5.7	6.0	6.2	9.5	10.2	10.7	12.7	13.2
	R120	$M^0_{Rk,s,fi}$	[Nm]	4.3	4.6	4.7	7.2	7.7	8.1	9.6	10.0
Pull-out failure											
Characteristic resistance	R30 R60 R90	$N^0_{Rk,p,fi}$	[kN]	2.6	4.2	6.1	2.9	4.5	7.5	4.6	8.7
	R120	$N^0_{Rk,p,fi}$	[kN]	2.1	3.4	4.9	2.3	3.6	6.0	3.7	7.0
Concrete cone failure											
Characteristic resistance	R30 R60 R90	$N^0_{Rk,c,fi}$	[kN]	2.4	5.4	9.8	2.9	6.1	13.9	6.2	19.4
	R120	$N^0_{Rk,c,fi}$	[kN]	1.9	4.3	7.8	2.3	4.9	11.1	4.9	15.5
Edge distance											
R30 to R120		$c_{cr,fi}$	[mm]	2 h_{ef}							
In case of fire attack from more than one side, the minimum edge distance must be ≥ 300 mm											
Fastener spacing											
R30 to R120		$s_{cr,fi}$	[mm]	2 $c_{cr,fi}$							
Concrete pry-out failure											
R30 to R120		k_8	[-]	2.0							
The anchorage depth must be increased for wet concrete by at least 30 mm compared to the given value											

ANNEX C12
Performances
Essential characteristics under fire exposure in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C8: Essential characteristics under fire exposure in concrete for HUS4-C carbon steel

Fastener size HUS4-C				**8**			**10**		
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	40	60	70	55	75	85
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)									
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	0.5			1.0		
	R60	$F_{Rk,s,fi}$	[kN]	0.4			0.9		
	R90	$F_{Rk,s,fi}$	[kN]	0.3			0.7		
	R120	$F_{Rk,s,fi}$	[kN]	0.2			0.6		
	R30	$M^0_{Rk,s,fi}$	[Nm]	0.4			1.2		
	R60	$M^0_{Rk,s,fi}$	[Nm]	0.3			1.0		
	R90	$M^0_{Rk,s,fi}$	[Nm]	0.2			0.8		
	R120	$M^0_{Rk,s,fi}$	[Nm]	0.2			0.6		
Pull-out failure									
Characteristic resistance	R30 R60 R90	$N^0_{Rk,p,fi}$	[kN]	1.3	2.8	3.6	2.3	3.9	4.7
	R120	$N^0_{Rk,p,fi}$	[kN]	1.0	2.2	2.8	1.9	3.1	3.7
Concrete cone failure									
Characteristic resistance	R30 R60 R90	$N^0_{Rk,c,fi}$	[kN]	0.8	2.6	4.0	2.0	4.7	6.5
	R120	$N^0_{Rk,c,fi}$	[kN]	0.7	2.1	3.2	1.6	3.7	5.2
Edge distance									
R30 to R120		$c_{cr,fi}$	[mm]	$2\ h_{ef}$					
In case of fire attack from more than one side, the minimum edge distance must be ≥ 300 mm									
Fastener spacing									
R30 to R120		$s_{cr,fi}$	[mm]	$2\ c_{cr,fi}$					
Concrete pry-out failure									
R30 to R120		k_8	[-]	1.0	2.0		1.0	2.0	
The anchorage depth must be increased for wet concrete by at least 30 mm compared to the given value									

ANNEX C13
Performances
Essential characteristics under fire exposure in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C9: Essential characteristics under fire exposure in concrete for HUS4-A carbon steel

Fastener size HUS4-A(F)				**10**			**14**		
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	55	75	85	65	85	115
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)									
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	4.2			8.4		
	R60	$F_{Rk,s,fi}$	[kN]	3.3			6.8		
	R90	$F_{Rk,s,fi}$	[kN]	2.5			5.1		
	R120	$F_{Rk,s,fi}$	[kN]	2.1			4.3		
	R30	$M^0_{Rk,s,fi}$	[Nm]	4.8			15.4		
	R60	$M^0_{Rk,s,fi}$	[Nm]	3.8			12.4		
	R90	$M^0_{Rk,s,fi}$	[Nm]	2.9			9.3		
	R120	$M^0_{Rk,s,fi}$	[Nm]	2.4			7.8		
Pull-out failure									
Characteristic resistance	R30 R60 R90	$N^0_{Rk,p,fi}$	[kN]	2.3	3.9	4.7	2.9	4.5	7.5
	R120	$N^0_{Rk,p,fi}$	[kN]	1.9	3.1	3.7	2.3	3.6	6.0
Concrete cone failure									
Characteristic resistance	R30 R60 R90	$N^0_{Rk,c,fi}$	[kN]	2.0	4.7	6.5	2.9	6.1	13.9
	R120	$N^0_{Rk,c,fi}$	[kN]	1.6	3.7	5.2	2.3	4.9	11.1
Edge distance									
R30 to R120		$c_{cr,fi}$	[mm]	$2\ h_{ef}$					
In case of fire attack from more than one side, the minimum edge distance must be ≥ 300 mm									
Fastener spacing									
R30 to R120		$s_{cr,fi}$	[mm]	$2\ c_{cr,fi}$					
Concrete pry-out failure									
R30 to R120		k_8	[-]	1,0	2.0				
The anchorage depth must be increased for wet concrete by at least 30 mm compared to the given value									

ANNEX C14
Performances
Essential characteristics under fire exposure in concrete

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C10: Essential characteristics under fire exposure in concrete for HUS4 stainless steel

Fastener size HUS4				**6**		**8**				**10**				**14**	
Type				**HR**	**CR**	**HR**		**CR**		**HR**		**CR**		**HR**	
				h_{nom1}		h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	55		60	80	60	80	70	90	70	90	70	110
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)															
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	4.9	0.2	9.3		0.8		18.5		1.4		41.7	
	R60	$F_{Rk,s,fi}$	[kN]	3.3	0.2	6.3		0.6		12.0		1.1		26.9	
	R90	$F_{Rk,s,fi}$	[kN]	1.8	0.2	3.2		0.5		5.4		0.9		12.2	
	R120	$F_{Rk,s,fi}$	[kN]	1.0	0.1	1.7		0.4		2.4		0.8		5.4	
	R30	$M^0_{Rk,s,fi}$	[Nm]	4.0	0.2	8.2		0.8		19.4		1.5		65.6	
	R60	$M^0_{Rk,s,fi}$	[Nm]	2.7	0.2	5.5		0.7		12.6		1.2		42.4	
	R90	$M^0_{Rk,s,fi}$	[Nm]	1.4	0.1	2.8		0.5		5.7		0.9		19.2	
	R120	$M^0_{Rk,s,fi}$	[Nm]	0.8	0.1	1.5		0.4		2.5		0.8		8.5	
Concrete pull-out failure															
Characteristic resistance	R30 R60 R90	$N_{Rk,p,fi}$	[kN]	1.3		1.5	3.0	1.5	3.0	2.3	4.0	2.3	4.0	3.0	6.3
	R120	$N_{Rk,p,fi}$	[kN]	1.0		1.2	2.4	1.2	2.4	1.8	3.2	1.8	3.2	2.4	5.0
Edge distance															
R30 to R120		$c_{cr,fi}$	[mm]	$2\ h_{ef}$											
Anchor spacing															
R30 to R120		$s_{cr,fi}$	[mm]	$2\ c_{cr,fi}$											
Concrete pry-out failure															
R30 to R120		k_8	[-]	1.5		2.0									

ANNEX C15
Performances
Displacement values in case of static and quasi-static loading

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C11: Displacements under tension loads for HUS4 carbon steel

Fastener size HUS4 **Type**				**8** **H(F), C**			**10** **H(F), C, A(F)**		
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	40	60	70	55	75	85
Cracked concrete C20/25 to C50/60	Tension Load	N	[kN]	2.6	5.4	6.9	3.8	7.5	8.6
	Displacement	δ_{N0}	[mm]	0.1	0.3	0.4	0.2	0.4	0.4
		$\delta_{N\infty}$	[mm]	0.3	0.4	0.4	0.7	0.7	0.9
Uncracked concrete C20/25 to C50/60	Tension Load	N	[kN]	3.7	7.1	9.1	5.2	10.5	12.2
	Displacement	δ_{N0}	[mm]	0.1	0.2	0.2	0.1	0.3	0.3
		$\delta_{N\infty}$	[mm]	0.3	0.4	0.4	0.7	0.7	0.9

Fastener size HUS4 **Type**				**12** **H**			**14** **H(F), A(F)**			**16** **H(F)**	
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	60	80	100	65	85	115	85	130
Cracked concrete C20/25 to C50/60	Tension Load	N	[kN]	5.1	8.2	11.7	5.7	8.6	14.4	8.7	16.7
	Displacement	δ_{N0}	[mm]	0.3	0.4	0.6	0.3	0.4	0.7	0.1	0.4
		$\delta_{N\infty}$	[mm]	0.9	0.9	1.2	1.3	1.3	1.5	1.3	1.4
Uncracked concrete C20/25 to C50/60	Tension Load	N	[kN]	6.8	10.8	15.5	7.5	11.7	19.1	11.5	22.9
	Displacement	δ_{N0}	[mm]	0.2	0.3	0.4	0.2	0.3	0.5	0.4	0.3
		$\delta_{N\infty}$	[mm]	0.9	0.9	1.2	1.3	1.3	1.5	1.3	1.4

Table C12: Displacements under tension loads for HUS4 stainless steel

Fastener size HUS **Type**				**6** **HR, CR**	**8** **HR, CR**		**10** **HR, CR**		**H**		**14** **HR**	
				h_{nom1}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Nominal anchorage depth		h_{nom}	[mm]	55	60	80	70	90	70	85	70	110
Cracked concrete C20/25 to C50/60	Tension load	N	[kN]	1.7	2.4	4.8	3.6	6.3	3.0	4.1	4.8	9.9
	Displacement	δ_{N0}	[mm]	0.4	0.5	0.7	0.3	0.6	0.2	0.3	0.9	1.4
		$\delta_{N\infty}$	[mm]	0.5	0.7	1.1	0.6	1.1	0.3	0.7	1.1	1.4
		$\delta_{N,seis}$	[mm]	(1)	(1)	1.2	(1)	1.2	(1)	1.2	(1)	0.4
Uncracked concrete C20/25 to C50/60	Tension load	N	[kN]	3.1	4.8	6.3	6.3	9.9	4.8	6.8	7.5	16.0
	Displacement	δ_{N0}	[mm]	0.8	0.7	1.6	0.3	1.3	0.2	0.3	0.7	1.0
		$\delta_{N\infty}$	[mm]	0.8	0.7	1.6	0.3	1.3	0.3	0.7	0.7	1.0

(1) No performance assessed.

ANNEX C16
Performances
Displacement values in case of static and quasi-static loading

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C13: Displacements under shear loads for HUS4 carbon steel

Fastener size HUS4				**8**			**10**		
Type				**H(F), C**			**H(F), C, A(F)**		
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	40	60	70	55	75	85
Concrete C20/25 to C50/60	Shear Load	V	[kN]	10.7	10.7	12.5	16.5	16.5	18.3
	Displacement	δ_{V0}	[mm]	1.3	1.1	0.9	1.4	1.3	1.0
		$\delta_{V\infty}$	[mm]	2.0	1.7	1.4	2.1	2.0	1.5

Fastener size HUS4				**12**			**14**			**16**	
Type				**H**			**H(F), A(F)**			**H(F)**	
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}
Nominal embedment depth		h_{nom}	[mm]	60	80	100	65	85	115	85	130
Concrete C20/25 to C50/60	Shear Load	V	[kN]	22.2	22.2	25.7	31.4	35.4	35.4	37.2	41.8
	Displacement	δ_{V0}	[mm]	1.6	1.6	0.9	5.3	5.3	4.0	2.3	1.8
		$\delta_{V\infty}$	[mm]	2.3	2.4	1.4	7.9	7.9	6.0	3.5	2.7

Table C14: Displacements under shear loads for HUS4 stainless steel

Fastener size HUS4				**6**	**8**		**10**		**14**	
Type				**HR, CR**	**HR, CR**		**HR, CR**		**HR**	
				h_{nom1}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Nominal anchorage depth		h_{nom}	[mm]	55	60	80	70	90	70	110
Concrete C20/25 to C50/60	Shear load	V	[kN]	7.8	11.0	12.4	13.6	15.7	12.9	27.3
	Displacement	δ_{V0}	[mm]	0.4	2.0	2.3	1.1	1.7	3.5	3.9
		$\delta_{V\infty}$	[mm]	0.5	2.4	2.9	1.5	2.4	3.9	4.3
		$\delta_{V,C1}$	[mm]	(1)	(1)	4.8	(1)	5.3	(1)	7.6

(1) No performance assessed.

ANNEX C17
Performances
Displacement values in case of seismic C2 loading

This annex applies to the product described in the main body of the UK Technical Assessment.

Table C15: Displacements under tension and shear loads for seismic category 2 for HUS 4 carbon steel.

Fastener size HUS4 **Type**			**8** **H(F), C**	**10** **H(F), C, A(F)**	**12** **H**	**14** **H(F), A(F)**
			h_{nom3}	h_{nom3}	h_{nom3}	h_{nom3}
Nominal embedment depth	h_{nom}	[mm]	70	85	100	115
Tension load						
Displacement DLS	$\delta_{N,C2\ (DLS)}$	[mm]	0.59	0.80	0.77	1.06
Displacement ULS	$\delta_{N,C2\ (ULS)}$	[mm]	1.36	3.66	2.78	3.89
Shear load with Hilti filling set (HUS4-H and HUS4-A)						
Displacement DLS	$\delta_{V,C2\ (DLS)}$	[mm]	1.85	1.72	1.73	2.52
Displacement ULS	$\delta_{V,C2\ (ULS)}$	[mm]	5.44	6.88	5.62	6.79
Shear load without Hilti filling set						
Displacement DLS	$\delta_{V,C2\ (DLS)}$	[mm]	4.64	5.02	4.90	4.93
Displacement ULS	$\delta_{V,C2\ (ULS)}$	[mm]	7.96	8.97	7.00	9.14

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