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European Technical Assessment

ETA 23/0707 of 19/03/2024

Technical Assessment Body issuing the ETA: Technical and Test Institute for Construction Prague	
Trade name of the construction product	R-HLX
Product family to which the construction product belongs	Product area code: 33 Concrete screw for use in cracked and uncracked concrete
Manufacturer	Rawlplug S.A. Ul. Kwidzyńska 6 51-416 Wrocław Poland
Manufacturing plant	Manufacturing Plant No 2
This European Technical Assessment contains	13 pages including 11 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	EAD 330232-01-0601 Mechanical fasteners for use in concrete
This version replaces	ETA 23/0707 issued on 30/11/2023

1. Technical description of the product

The R-HLX concrete screw in sizes of 10, 12 and 14 is made of carbon steel with coating.

The anchor is screwed into a drilled cylindrical 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 installed anchor is shown in Annex A1.

2. Specification of the intended use in accordance with the applicable EAD

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 provisions made in this European Technical Assessment are based on an assumed working life of the anchor 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 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 (static and quasi-static loading)	See Annex C 1 and C 2
Displacement	See Annex C 1 and C 2
Characteristic resistance for seismic performance category C1 and C2	See Annex C 4

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1 according to EN 13501-1
Resistance to fire	Seen Annex C 3

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

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

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Technical and Test Institute for Construction Prague.

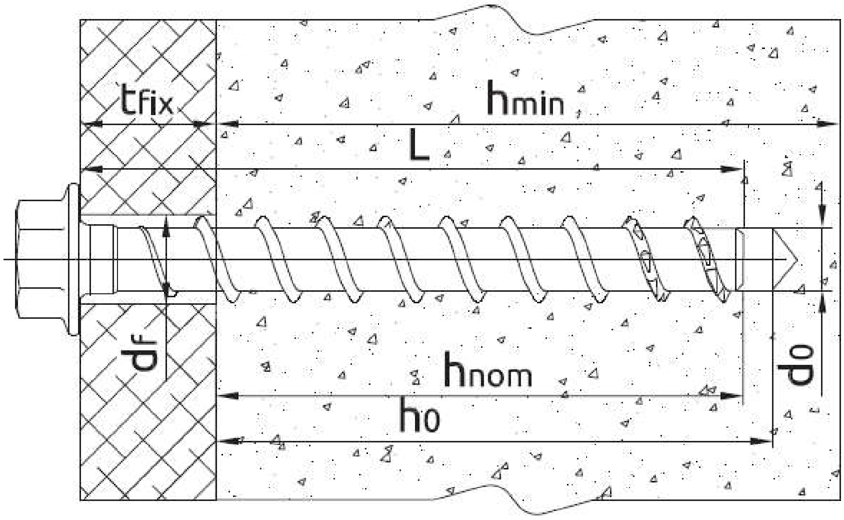
Issued in Prague on 19.03.2024

By

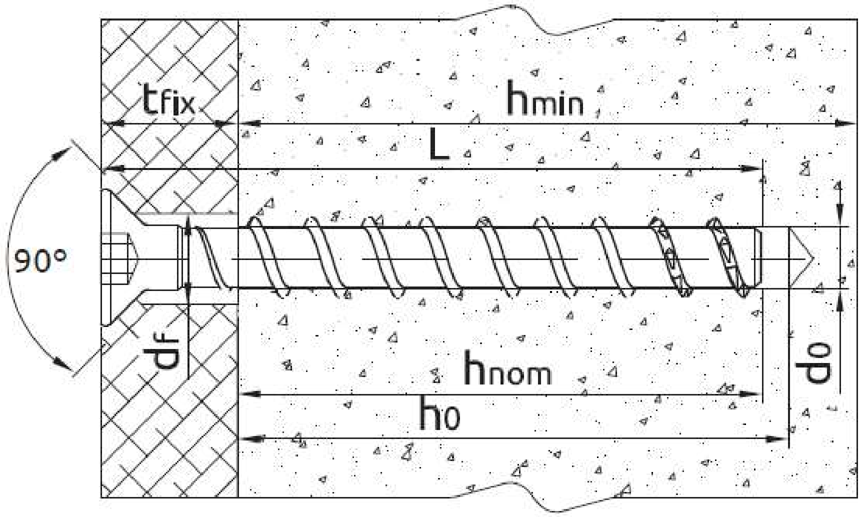
Ing. Jiří Studnička, Ph.D.
Head of the Technical Assessment Body

1 Official Journal of the European Communities L 254 08.10.1996

R-HLX-HF - Installed screw



R-HLX-CS - Installed screw

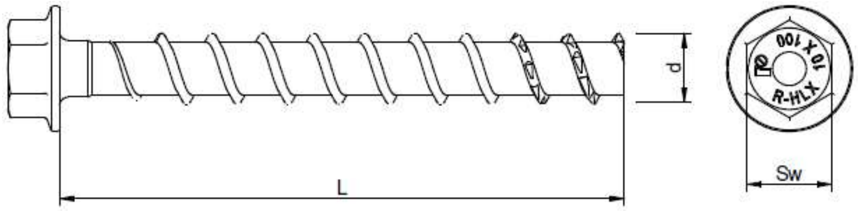
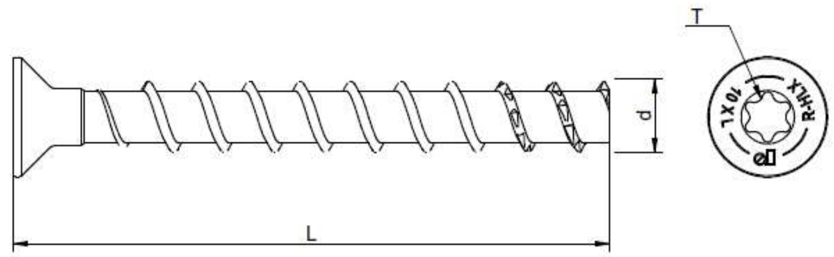
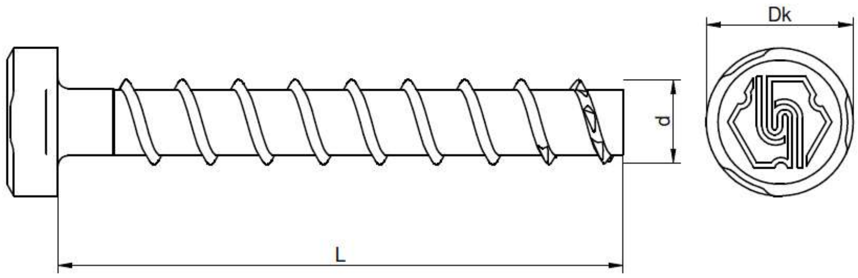


R-HLX	**Annex A 1**
Product description Installed conditions	

Table A1 - Materials

Material
Carbon steel; rupture elongation $A_5 \geq 12\%$ Galvanized zinc plating (≥ 5 μm), acc ISO 4042 or Zinc flake (≥ 5 μm), acc. ISO 10683

R-HLX – Types

Type	Design
R-HLX-HF	
R-HLX-CS	
HLX-SI	

R-HLX and HLX-SI – Marking

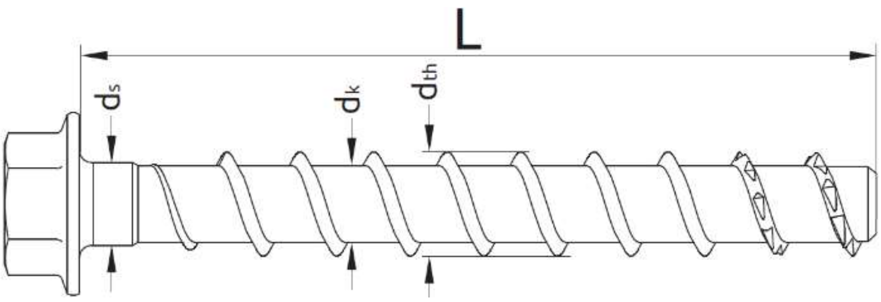
Marking:
R-HLX Identifying mark of the producer
D x L, where:
D – screw size [mm], e. g. 10
L – length of a screw [mm], e. g. 100

HLX-SI-12x100-ZF head

R-HLX	Annex A 2
Product description Materials Marking	

Table A2 - Dimensions

Nominal diameter	d_{nom}	[mm]	10	12	14
Threaded outer diameter	d_{th}	[mm]	12,7	14,9	16,9
Core diameter	d_k	[mm]	9,3	11,5	13,3
Shaft diameter	d_s	[mm]	9,8	11,95	13,85
Head sizes R-HLX-HF	Sw	[-]	SW15	SW17	SW21
Head sizes CS	T	[-]	T50	T50	T50



R-HLX

Product description
Dimensions

Annex A 3

Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads
- Fire exposure
- Seismic performance category C1
- Seismic performance category C2, only standard embedment depth

Base materials
- Cracked or uncracked concrete.
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206:2013+A1:2016.

Use conditions (Environmental conditions)
- Structures subject to dry internal conditions.

Design:
- The anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- The anchorages are designed in accordance with the EN 1992-4:2018 and Technical Report TR 055, Edition February 2018.
- Anchorages under fire exposure have to be designed in accordance with EN 1992-4, Annex D.
- Anchorages under seismic actions have to be designed in accordance with EN 1992-4, Annex C.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. positions of the fastener relative to reinforcement or to support, etc.).

Installation:
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging any components of the anchor.
- Anchor installation in accordance with the manufacturer’s specifications and drawings using the appropriate tools.
- Effective anchoring depth, edge distance and spacing not less than the specified values without minus tolerance.
- In case of aborted drill hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application.

Table B1 - Installation parameters for standard embedment depth

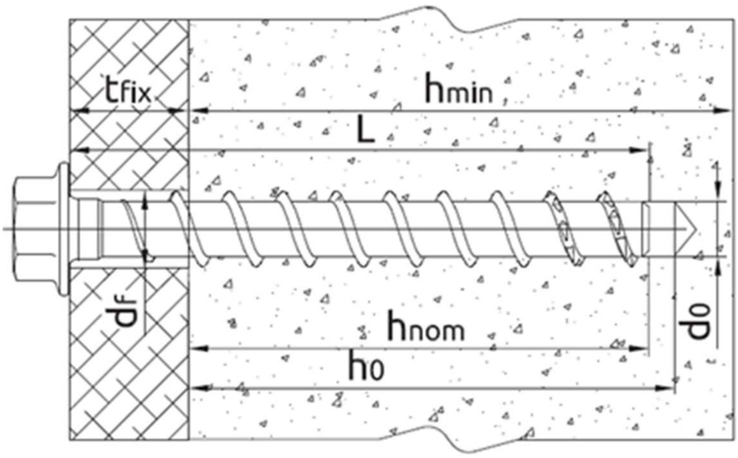
Type	Drill hole diameter d_0 [mm]	Maximum cutting diameter $d_{cut,max}$ [mm]	Nominal embedment depth h_{nom} [mm]	Min. hole depth h_0 [mm]	Max. hole diameter in fixture d_f [mm]	Maximum installation torque $T_{imp,max}$ [Nm]	Minimum thickness of concrete member h_{min} [mm]	Minimum spacing s_{min} [mm]	Minimum edge distance c_{min} [mm]
R-HLX 10	10	10,45	85	95	14	1000	130	60	60
R-HLX 12	12	12,45	100	110	16	1000	155	80	80
R-HLX 14	14	14,45	115	125	18	1000	190	100	100

Table B2 - Installation parameters for medium embedment depth

Type	Drill hole diameter d_0 [mm]	Maximum cutting diameter $d_{cut,max}$ [mm]	Nominal embedment depth h_{nom} [mm]	Min. hole depth h_0 [mm]	Max. hole diameter in fixture d_f [mm]	Maximum installation torque $T_{imp,max}$ [Nm]	Minimum thickness of concrete member h_{min} [mm]	Minimum spacing s_{min} [mm]	Minimum edge distance c_{min} [mm]
R-HLX 10	10	10,45	75	85	14	1000	120	60	60
R-HLX 12	12	12,45	80	90	16	1000	130	80	80
R-HLX 14	14	14,45	85	95	18	1000	130	100	100

Table B3 – Installation parameters for reduced embedment depth

Type	Drill hole diameter d_0 [mm]	Maximum cutting diameter $d_{cut,max}$ [mm]	Nominal embedment depth h_{nom} [mm]	Min. hole depth h_0 [mm]	Max. hole diameter in fixture d_f [mm]	Maximum installation torque $T_{imp,max}$ [Nm]	Minimum thickness of concrete member h_{min} [mm]	Minimum spacing s_{min} [mm]	Minimum edge distance c_{min} [mm]
R-HLX 10	10	10,45	55	65	14	1000	100	60	60
R-HLX 12	12	12,45	60	70	16	1000	110	80	80
R-HLX 14	14	14,45	65	75	18	1000	110	100	100



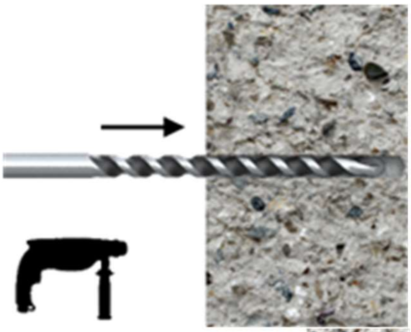
R-HLX

Intended use
Installation parameters

Annex B 2

Installation instructions I

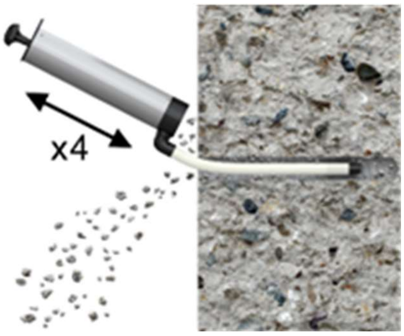
1a



1. Drill the hole with a hammer drill (1a) or a dust-free drill (1b) to the required depth according to the table.

1b

2.



2. Clean the hole (blow dust at least 4 times with the hand pump). When using a dust-free drill bit (1b), it is not necessary to clean the hole.

3.

3. Screw the concrete screw into the hole with an impact wrench and a suitable impact socket. Tighten until the fixture is clamped to the substrate.
   Installation with any tangential impact wrench.

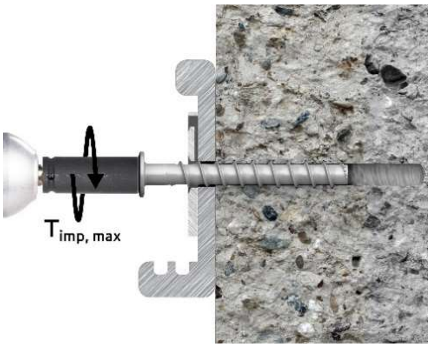
4.

4. Finish screwing when the screw head is in full contact with the fastened element/substrate. The screw head must not be damaged.

R-HLX	**Annex B 3**
Intended use Installation instructions I	

Installation instructions II: filling of the annular gap

3.



3. Place the sealing ring on the fixture. Screw the concrete screw into the hole using an impact wrench and an appropriate impact socket. Tighten until the element is pressed to the surface. Installation using any impact wrench with a tangential impact.

4.

4. Finish screwing in when the screw head and the ring are in contact with the fastened element/substrate. The screw head must not be damaged.

5.

5. Place the dispensing nozzle in the opening of the sealing ring. Fill the annular gap with resin.

6.

6. Correctly installed screw with a sealing ring filled with resin.

R-HLX	**Annex B 4**
Intended use Installation instructions II	

Table C1 – Characteristic resistance under tension load

Size			10			12			14		
Nominal embedment depth	h_{nom}	[mm]	55	75	85	60	80	100	65	85	115
Steel failure											
Characteristic resistance	$N_{Rk,s}$	[kN]	54,3			83,1			111,1		
Partial safety factor	γ_{Ms}	[-]	1,5								
Pull-out failure											
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p,ucr}$	[kN]	13,4 [1)]	22,3 [1)]	27,6 [1)]	15,4 [1)]	24,6 [1)]	35,2 [1)]	16,9 [1)]	26,4 [1)]	43,4 [1)]
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p,cr}$	[kN]	9,4 [1)]	15,6 [1)]	19,3 [1)]	10,7 [1)]	17,2 [1)]	24,6 [1)]	11,8 [1)]	18,5 [1)]	30,4 [1)]
Increasing factor for concrete C25/30	ψ_c	[-]	1,10								
Increasing factor for concrete C30/37	ψ_c	[-]	1,22								
Increasing factor for concrete C35/45	ψ_c	[-]	1,34								
Increasing factor for concrete C40/50	ψ_c	[-]	1,41								
Increasing factor for concrete C45/55	ψ_c	[-]	1,48								
Increasing factor for concrete C50/60	ψ_c	[-]	1,55								
Concrete cone and splitting failure											
Effective embedment depth	h_{ef}	[mm]	42	59	68	46	63	80	49	66	92
Factor for concrete cone failure for uncracked concrete	$k_{ucr,N}$	[-]	11,0								
Factor for concrete cone failure for cracked concrete	$k_{cr,N}$	[-]	7,7								
Robustness	γ_{inst}	[-]	1,2	1,0	1,0	1,2	1,0	1,0	1,2	1,2	1,2
Spacing – concrete cone failure	$s_{cr,N}$	[mm]	$3 \cdot h_{ef}$								
Spacing – splitting failure	$s_{cr,sp}$	[mm]	120	180	200	140	200	240	150	200	280
Edge distance – concrete cone failure	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$								
Edge distance – splitting failure	$c_{cr,sp}$	[mm]	60	90	100	70	100	120	75	100	140

[1)] limited to $N^0_{Rk,c}$

Table C2 – Displacement under tension load

Size			10			12			14		
Nominal embedment depth	h_{nom}	[mm]	55	75	85	60	80	100	65	85	115
Tension load in uncracked concrete	N	[kN]	7,03	15,03	19,28	8,02	17,92	30,52	10,41	21,63	38,86
Displacement	δ_{N0}	[mm]	0,4	0,4	0,6	0,4	0,4	0,6	0,4	0,6	0,7
	$\delta_{N\infty}$	[mm]	1,2	1,1	1,2	1,2	1,1	1,2	1,3	1,2	1,4
Tension load in cracked concrete	N	[kN]	4,55	9,05	13,62	6,60	10,25	22,56	7,60	14,30	28,41
Displacement	δ_{N0}	[mm]	0,4	0,4	0,5	0,5	0,5	0,7	0,6	0,7	0,7
	$\delta_{N\infty}$	[mm]	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0

Table C3 – Characteristic resistance under shear load

Size			10			12			14		
Nominal embedment depth	h_{nom}	[mm]	55	75	85	60	80	100	65	85	115
Steel failure without lever arm											
Characteristic resistance	$V^0_{Rk,s}$	[kN]	27,2			41,6			55,6		
Ductility factor	k_7	[-]	1,0								
Partial safety factor	γ_{Ms}	[-]	1,25								
Steel failure without lever arm											
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	75,8			143,4			221,7		
Partial safety factor	γ_{Ms}	[-]	1,25								
Concrete cone pry-out failure											
Pry-out factor	k_8	[-]	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
Installation safety factor	γ_{inst}	[-]	1,0								
Concrete edge failure											
Effective length of anchor	l_f	[mm]	55	75	85	60	80	100	65	85	115
Anchor diameter	d_{nom}	[mm]	10			12			14		
Installation safety factor	γ_{inst}	[-]	1,0								

Table C4 – Displacement under shear load

Size			10	12	14
Shear load in cracked and uncracked concrete	V	[kN]	14,33	20,81	27,81
Displacement	δ_{V0}	[mm]	1,1	1,4	1,7
	$\delta_{V\infty}$	[mm]	1,7	2,1	2,6

R-HLX

Performances
Characteristic resistance under shear load
Displacement under shear load

Annex C 2

Table C5 – Characteristic values for fire resistance under tension load[1)]

Size			10			12			14		
Nominal embedment depth	h_{nom}	[mm]	55	75	85	60	80	100	65	85	115
Fire resistance duration at 30 minutes											
Steel failure	$N_{Rk,s,fi(30)}$	[kN]	6,6			11,4			15,2		
Pull-out failure	$N_{Rk,p,fi(30)}$	[kN]	2,3	3,9	4,8	2,6	4,3	6,1	2,9	4,6	7,6
Fire resistance duration at 60 minutes											
Steel failure	$N_{Rk,s,fi(60)}$	[kN]	5,0			8,5			11,4		
Pull-out failure	$N_{Rk,p,fi(60)}$	[kN]	2,3	3,9	4,8	2,6	4,3	6,1	2,9	4,6	7,6
Fire resistance duration at 90 minutes											
Steel failure	$N_{Rk,s,fi(90)}$	[kN]	3,4			5,7			7,6		
Pull-out failure	$N_{Rk,p,fi(90)}$	[kN]	2,3	3,9	4,8	2,6	4,3	6,1	2,9	4,6	7,6
Fire resistance duration at 120 minutes											
Steel failure	$N_{Rk,s,fi(120)}$	[kN]	2,6			4,3			5,7		
Pull-out failure	$N_{Rk,p,fi(120)}$	[kN]	1,8	3,1	3,8	2,1	3,4	4,9	2,3	3,6	6,0
Spacing	$s_{cr,N}$	[mm]	$4\ h_{ef}$								
Edge distance	$c_{cr,N}$	[mm]	$2\ h_{ef}$								
In case of fire attack from more than one side, the edge distance of the anchor has to be ≥ 300 mm and ≥ 2 h_{ef}											

[1)] In absence of other national regulations, the partial safety factor for resistance under fire exposure is recommended $\gamma_{M,fi}$ = 1,0 for steel failure and concrete related failure modes under shear loading.
For concrete related failure under tension $\gamma_{M,fi} = 1{,}0 \cdot \gamma_{inst}$

Table C6 – Characteristic values for fire resistance under shear load[1)]

Size			10			12			14		
Nominal embedment depth	h_{nom}	[mm]	55	75	85	60	80	100	65	85	115
Fire resistance duration at 30 minutes											
Characteristic resistance	$V_{Rk,s,fi(30)}$	[kN]	6,6			11,4			15,2		
Characteristic bending resistance	$M^0_{Rk,s,fi(30)}$	[Nm]	9,3			19,7			30,4		
Fire resistance duration at 60 minutes											
Characteristic resistance	$V_{Rk,s,fi(60)}$	[kN]	5,0			8,5			11,4		
Characteristic bending resistance	$M^0_{Rk,s,fi(60)}$	[Nm]	7,0			14,8			22,9		
Fire resistance duration at 90 minutes											
Characteristic resistance	$V_{Rk,s,fi(90)}$	[kN]	3,4			5,7			7,6		
Characteristic bending resistance	$M^0_{Rk,s,fi(90)}$	[Nm]	4,8			9,9			15,3		
Fire resistance duration at 120 minutes											
Characteristic resistance	$V_{Rk,s,fi(120)}$	[kN]	2,6			4,3			5,7		
Characteristic bending resistance	$M^0_{Rk,s,fi(120)}$	[Nm]	3,7			7,4			11,5		

[1)] In absence of other national regulations, the partial safety factor for resistance under fire exposure is recommended $\gamma_{M,fi}$ = 1,0 for steel failure and concrete related failure modes under shear loading.
For concrete related failure under tension $\gamma_{M,fi} = 1{,}0 \cdot \gamma_{inst}$

R-HLX

Performances
Resistance to fire

Annex C 3

Table C7 – Characteristic resistance under seismic action category C1

Size			10			12			14		
Nominal embedment depth	h_{nom}	[mm]	55	75	85	60	80	100	65	85	115
Tension load											
Steel failure	$N_{Rk,s,C1}$	[kN]	54,3			83,1			111,1		
Pull-out failure	$N_{Rk,p,C1}$	[kN]	8,6	14,4	17,8	7,6	12,2	17,5	8,4	13,1	21,6
Shear load											
Steel failure	$V_{Rk,s,C1}$	[kN]	18,7			28,7			38,3		
Reduction factor according to EN 1992-4:2018 without gap filling	α_{gap}	[-]	0,5								
Reduction factor according to EN 1992-4:2018 with gap filling (see Annex B 4)	α_{gap}	[-]	1,0								

Table C8 – Characteristic resistance under seismic action category C2

Size			10	12	14
Nominal embedment depth	h_{nom}	[mm]	85	100	115
Tension load					
Steel failure	$N_{Rk,s,C2}$	[kN]	54,3	83,1	111,1
Pull-out failure	$N_{Rk,p,C2}$	[kN]	8,5	13,3	19,3
Shear load					
Steel failure	$V_{Rk,s,C2}$	[kN]	8,0	22,3	21,6
Reduction factor according to EN 1992-4:2018 without gap filling	α_{gap}	[-]	0,5		
Reduction factor according to EN 1992-4:2018 with gap filling (see Annex B 4)	α_{gap}	[-]	1,0		

Table C9 – Displacement under tension and shear load - seismic action category C2

Size			10	12	14
Nominal embedment depth	h_{nom}	[mm]	85	100	115
$\delta_{N,eq(DLS)}$		[mm]	0,36	0,44	0,57
$\delta_{N,eq(ULS)}$		[mm]	1,29	1,65	2,55
$\delta_{V,eq(DLS)}$		[mm]	5,59	5,00	6,66
$\delta_{V,eq(ULS)}$		[mm]	7,10	7,90	9,24