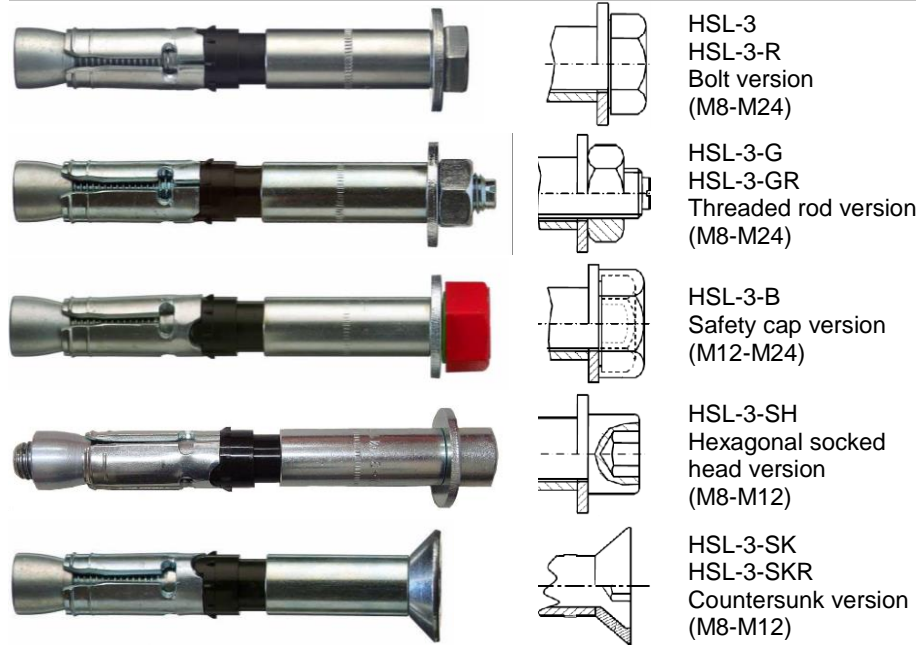


# HSL-3 / HSL-3-R expansion anchor

## Ultimate-performance heavy-duty expansion anchor

### Anchor versions

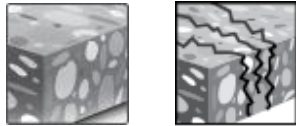


### Benefits

- Suitable for cracked concrete C20/25 to C50/60
- Suitable for all dynamic loads: seismic C1 and C2 <sup>a)</sup>, shock and fatigue
- Can be installed with hammer or diamond drilling for same performance
- Top shear performance due to high strength expansion and shear sleeves
- Automatic torque control with HSL-3-B
- Length can be customized to a specific project need
- Easily removable for temporary fastening or retrofit

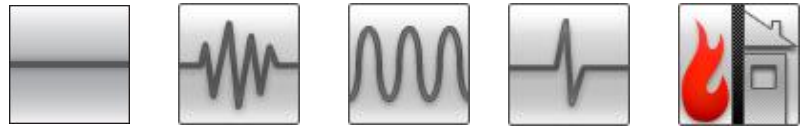
a) Condition valid only for HSL-3 carbon steel version

### Base material



Concrete (non-cracked)    Concrete (cracked)

### Load conditions



Static/quasi-static    Seismic ETA-C1, C2    Fatigue    Shock    Fire resistance

### Installation conditions



Hammer drilled holes    Diamond cored holes    Variable embedment depth

### Other information



European Technical Assessment    CE conformity    PROFIS Anchor design Software    Corrosion resistance

### Approvals/certificates

Description	Authority / Laboratory	No. / Date of issue
European technical Assessment <sup>a)</sup>	CSTB, Marne-la-Vallée	ETA-02/0042 / 2017-11-22
Fire test report	CSTB, Marne-la-Vallée	ETA-02/0042 / 2017-11-22
ICC-ES report incl. seismic <sup>b)c)</sup>	ICC evaluation service	ESR 1545 / 2017-01
Shock approval <sup>c)</sup>	Civil Protection of Switzerland	BZS D 08-601
Fire performance <sup>c)</sup>	Exova Warringtonfire	WF 327804/A / 2013-07-10
ACI 349-01 nuclear suitability <sup>c)</sup>	Wollmershauser consulting	WC 11-02 / 2011-09

a) All data given in this section according to ETA-02/0042, issue 2017-07-20.  
 b) For more details on Technical Data according to ICC please consult the relevant HNA FTM.  
 c) Certificate valid only for HSL-3 / HSL-3-G / HSL-3-B / HSL-3-SK / HSL-3-SH

### Static and quasi-static resistance (for a single anchor)

#### All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25,  $f_{ck,cube}=25$  N/mm<sup>2</sup>
- Values for HSL-3-R, HSL-3-SKR and HSL-3-GR only applicable for hammer drilling.

#### Effective anchorage depth <sup>a)</sup>

Anchor size		M8			M10			M12		
Eff. Anchorage depth	$h_{ef}$ [mm]	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$
		60	80	100	70	90	110	80	105	130
Anchor size		M16			M20			M24		
Eff. Anchorage depth	$h_{ef}$ [mm]	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$
		100	125	150	125	155	185	150	180	210

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR only available in sizes M8-M12

b) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.

#### Characteristic resistance

Anchor size		M8			M10			M12			
<b>Non-cracked concrete</b>											
Tension $N_{Rk}$	HSL-3 / HSL-3-B HSL-3-G HSL-3-SH / HSL-3-SK <sup>a)</sup>	[kN]	23,5	29,3	29,3	29,6	43,1	46,6	36,1	54,3	67,4
	HSL-3-R / HSL-3-SKR <sup>a)</sup> HSL-3-GR	[kN]	20,0	20,0	20,0	29,6	40,6	40,6	36,1	54,3	59,0
Shear $V_{Rk}$	HSL-3 / HSL-3-B	[kN]	31,1	31,1	31,1	59,2	60,5	60,5	72,3	89,6	89,6
	HSL-3-G	[kN]	26,1	26,1	26,1	41,8	41,8	41,8	59,3	59,3	59,3
	HSL-3-SH / HSL-3-SK <sup>a)</sup>	[kN]	31,1	-	-	59,2	-	-	72,3	-	-
	HSL-3-R, HSL-3-SKR <sup>a)</sup>	[kN]	44,4	44,4	44,4	59,2	62,7	62,7	72,3	81,4	81,4
	HSL-3-GR	[kN]	40,3	40,3	40,3	58,9	58,9	58,9	72,3	78,7	78,7
<b>Cracked concrete</b>											
Tension $N_{Rk}$	HSL-3 / HSL-3-B HSL-3-G HSL-3-SH / HSL-3-SK <sup>a)</sup>	[kN]	12,0	12,0	12,0	16,0	16,0	16,0	25,8	24,0	24,0
	HSL-3-R / HSL-3-SKR <sup>a)</sup> HSL-3-GR	[kN]	12,0	12,0	12,0	16,0	16,0	16,0	25,8	24,0	24,0
Shear $V_{Rk}$	HSL-3 / HSL-3-B	[kN]	30,1	31,1	31,1	42,2	60,5	60,5	51,5	77,5	89,6
	HSL-3-G	[kN]	26,1	26,1	26,1	41,8	41,8	41,8	51,5	59,3	59,3
	HSL-3-SH / HSL-3-SK <sup>a)</sup>	[kN]	30,1	-	-	42,2	-	-	51,5	-	-
	HSL-3-R, HSL-3-SKR <sup>a)</sup>	[kN]	33,5	44,4	44,4	42,2	61,5	62,7	51,5	77,5	81,4
	HSL-3-GR	[kN]	33,5	40,3	40,3	42,2	58,9	58,9	51,5	77,5	78,7
Anchor size		M16			M20			M24			
<b>Non-cracked concrete</b>											
Tension $N_{Rk}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	50,5	65,0	65,0	70,6	95,0	95,0	92,8	100,0	100,0
	HSL-3-R HSL-3-GR	[kN]	50,5	65,0	65,0	70,6	95,0	95,0	-	-	-
Shear $V_{Rk}$	HSL-3 / HSL-3-B	[kN]	101,0	141,2	158,5	141,2	186,0	186,0	185,5	204,5	204,5
	HSL-3-G	[kN]	101,0	120,6	120,6	141,2	155,3	155,3	185,5	204,5	204,5
	HSL-3-R	[kN]	101,0	128,2	128,2	141,2	145,2	145,2	-	-	-
	HSL-3-GR	[kN]	101,0	129,5	129,5	141,2	151,9	151,9	-	-	-

Anchor size		M16			M20			M24			
<b>Cracked concrete</b>											
Tension $N_{Rk}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	36,0	36,0	36,0	50,3	50,0	50,0	66,1	65,0	65,0
	HSL-3-R HSL-3-GR		36,0	36,0	36,0	50,3	50,0	50,0	-	-	-
Shear $V_{Rk}$	HSL-3 / HSL-3-B	[kN]	72,0	100,6	132,3	100,6	138,9	181,2	132,3	173,9	204,5
	HSL-3-G		72,0	100,6	120,6	100,6	138,9	155,3	132,3	173,9	204,5
	HSL-3-R		72,0	100,6	128,2	100,6	138,9	145,2	-	-	-
	HSL-3-GR		72,0	100,6	129,5	100,6	138,9	151,9	-	-	-

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.

### Effective anchorage depth <sup>a)</sup>

Anchor size		M8			M10			M12		
Eff. Anchorage depth	$h_{ef}$ [mm]	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$
		60	80	100	70	90	110	80	105	130
Anchor size		M16			M20			M24		
Eff. Anchorage depth	$h_{ef}$ [mm]	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$
		100	125	150	125	155	185	150	180	210

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR only available in sizes M8-M12

b) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.

### Design resistance

Anchor size		M8			M10			M12			
<b>Non-cracked concrete</b>											
Tension $N_{Rd}$	HSL-3 / HSL-3-B HSL-3-G HSL-3-SH / HSL-3-SK <sup>a)</sup>	[kN]	13,0	19,5	19,5	19,7	28,7	31,1	24,1	36,2	44,9
	HSL-3-R / HSL-3-SKR <sup>a)</sup> HSL-3-GR		13,3	13,3	13,3	19,7	21,7	21,7	24,1	31,6	31,6
Shear $V_{Rd}$	HSL-3 / HSL-3-B	[kN]	24,9	24,9	24,9	39,4	48,4	48,4	48,2	71,7	71,7
	HSL-3-G		20,9	20,9	20,9	33,4	33,4	33,4	47,4	47,4	47,4
	HSL-3-SH / HSL-3-SK <sup>a)</sup>		24,9	-	-	39,4	-	-	48,2	-	-
	HSL-3-R, HSL-3-SKR <sup>a)</sup>		31,3	35,5	35,5	39,4	40,2	40,2	48,2	52,2	52,2
	HSL-3-GR		31,3	32,2	32,2	39,4	47,1	48,2	63,0	63,0	67,3
<b>Cracked concrete</b>											
Tension $N_{Rd}$	HSL-3 / HSL-3-B HSL-3-G HSL-3-SH / HSL-3-SK <sup>a)</sup>	[kN]	6,7	6,7	6,7	10,7	10,7	10,7	17,2	16,0	16,0
	HSL-3-R / HSL-3-SKR <sup>a)</sup> HSL-3-GR		8,0	8,0	8,0	10,7	10,7	10,7	17,2	16,0	16,0
Shear $V_{Rd}$	HSL-3 / HSL-3-B	[kN]	20,1	24,9	24,9	28,1	41,0	48,4	34,3	51,6	71,1
	HSL-3-G		20,1	20,9	20,9	28,1	33,4	33,4	34,3	47,4	47,4
	HSL-3-SH / HSL-3-SK <sup>a)</sup>		20,1	-	-	28,1	-	-	34,3	-	-
	HSL-3-R, HSL-3-SKR <sup>a)</sup>		22,3	34,3	35,5	28,2	40,2	40,2	34,4	51,6	52,2
	HSL-3-GR		22,3	32,2	32,2	28,1	41,0	47,1	34,3	51,6	63,0

Anchor size		M16			M20			M24			
<b>Non-cracked concrete</b>											
Tension $N_{Rd}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	33,7	43,3	43,3	47,1	63,3	63,3	61,8	66,7	66,7
	HSL-3-R HSL-3-GR		33,7	43,3	43,3	47,1	63,3	63,3	-	-	-
Shear $V_{Rd}$	HSL-3 / HSL-3-B	[kN]	67,3	94,1	123,7	94,1	129,9	148,8	123,7	162,6	163,6
	HSL-3-G		67,3	94,1	96,5	94,1	124,2	124,2	123,7	162,6	163,6
	HSL-3-R		67,3	82,2	82,2	93,1	93,1	93,1	-	-	-
	HSL-3-GR		67,3	94,1	103,6	94,1	121,5	121,5	-	-	-
<b>Cracked concrete</b>											
Tension $N_{Rd}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	24,0	24,0	24,0	33,5	33,3	33,3	44,1	43,3	43,3
	HSL-3-R HSL-3-GR		24,0	24,0	24,0	33,5	33,3	33,3	-	-	-
Shear $V_{Rd}$	HSL-3 / HSL-3-B	[kN]	48,0	67,1	88,2	67,1	92,6	120,8	88,2	115,9	146,1
	HSL-3-G		48,0	67,1	88,2	67,1	92,6	120,8	88,2	115,9	146,1
	HSL-3-R		48,0	67,1	82,2	67,1	92,6	93,1	-	-	-
	HSL-3-GR		48,0	67,1	88,2	67,1	92,6	120,8	-	-	-

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR only available in sizes M8-M12

#### Effective anchorage depth <sup>a)</sup>

Anchor size		M8			M10			M12		
Eff. Anchorage depth	$h_{ef}$ [mm]	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$
		60	80	100	70	90	110	80	105	130
Anchor size		M16			M20			M24		
Eff. Anchorage depth	$h_{ef}$ [mm]	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$
		100	125	150	125	155	185	150	180	210

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR only available in sizes M8-M12

b) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.

#### Recommended loads <sup>b)</sup>

Anchor size		M8			M10			M12			
<b>Non-cracked concrete</b>											
Tension $N_{Rec}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	9,3	14,0	14,0	14,1	20,5	22,2	17,2	25,9	32,1
	HSL-3-SH / HSL-3-SK <sup>a)</sup> HSL-3-R / HSL-3-SKR <sup>a)</sup> HSL-3-GR		9,5	9,5	9,5	14,1	15,5	15,5	17,2	22,5	22,5
48,1	HSL-3 / HSL-3-B	[kN]	17,8	17,8	17,8	28,2	34,6	34,6	34,4	51,2	51,2
	HSL-3-G		14,9	14,9	14,9	23,9	23,9	23,9	33,9	33,9	33,9
	HSL-3-SH / HSL-3-SK <sup>a)</sup>		17,8	-	-	28,2	-	-	34,4	-	-
	HSL-3-R, HSL-3-SKR <sup>a)</sup>		22,4	25,4	25,4	28,2	28,7	28,7	34,4	37,3	37,3
	HSL-3-GR		22,4	23,0	23,0	28,2	33,7	33,7	34,4	45,0	45,0
<b>Cracked concrete</b>											
Tension $N_{Rec}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	4,8	4,8	4,8	7,6	7,6	7,6	12,3	11,4	11,4
	HSL-3-SH / HSL-3-SK <sup>a)</sup> HSL-3-R / HSL-3-SKR <sup>a)</sup> HSL-3-GR		5,7	5,7	5,7	7,6	7,6	7,6	12,3	11,4	11,4
Shear $V_{Rec}$	HSL-3 / HSL-3-B	[kN]	14,3	17,8	17,8	20,1	29,3	34,6	24,5	36,9	50,8
	HSL-3-G		14,3	14,9	14,9	20,1	23,9	23,9	24,5	33,9	33,9
	HSL-3-SH / HSL-3-SK <sup>a)</sup>		14,3	-	-	20,1	-	-	24,5	-	-
	HSL-3-R, HSL-3-SKR <sup>a)</sup>		15,9	24,5	25,4	20,1	28,7	28,7	24,5	36,9	37,3
	HSL-3-GR		15,9	23,0	23,0	20,1	29,3	33,7	24,5	36,9	45,0

Anchor size		M16			M20			M24			
<b>Non-cracked concrete</b>											
Tension $N_{Rec}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	24,0	31,0	31,0	33,6	45,2	45,2	44,2	47,6	47,6
	HSL-3-R HSL-3-GR		24,0	31,0	31,0	33,6	45,2	45,2	-	-	-
Shear $V_{Rec}$	HSL-3 / HSL-3-B	[kN]	48,1	67,2	88,4	67,2	92,8	106,3	88,4	116,1	116,9
	HSL-3-G		48,1	67,2	68,9	67,2	88,7	88,7	88,4	116,1	116,9
	HSL-3-R		48,1	58,7	58,7	66,5	66,5	66,5	-	-	-
	HSL-3-GR		48,1	67,2	74,0	67,2	86,8	86,8	-	-	-
<b>Cracked concrete</b>											
Tension $N_{Rec}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	17,1	17,1	17,1	24,0	23,8	23,8	31,5	31,0	31,0
	HSL-3-R HSL-3-GR		17,1	17,1	17,1	24,0	23,8	23,8	-	-	-
Shear $V_{Rec}$	HSL-3 / HSL-3-B	[kN]	34,3	47,9	63,0	47,9	66,2	86,3	63,0	82,8	104,3
	HSL-3-G		34,3	47,9	63,0	47,9	66,2	86,3	63,0	82,8	104,3
	HSL-3-R		34,3	47,9	58,7	47,9	66,2	66,5	-	-	-
	HSL-3-GR		34,3	47,9	63,0	47,9	66,2	86,3	-	-	-

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR only available in sizes M8-M12.

b) With overall partial safety factor for action  $\gamma = 1,4$ . The partial safety factors for action depend on thy type of loading and shall be taken from national regulations.

### Seismic resistance (for a single anchor)

All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Steel failure
- Minimum base material thickness
- Concrete C 20/25,  $f_{ck,cube}=25 \text{ N/mm}^2$
- $\alpha_{gap} = 0,5$
- Values for HSL-3-R, HSL-3-SKR and HSL-3-GR only applicable for hammer drilling

### Effective anchorage depth for seismic C2<sup>a)</sup>

Anchor size	M10			M12			M16			M20		
	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$
Eff. Anchorage depth $h_{ef}$ [mm]	70	90	110	80	105	130	100	125	150	125	155	185

a) HSL-3-SH and HSL-3-SK can only be set in position 1 and only available in sizes M8-M12.

### Characteristic resistance in case of seismic category C2

Anchor size		M10			M12			M16			M20			
Tension $N_{Rk,seis}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	12,2	12,2	12,2	21,9	25,8	25,8	30,6	34,2	34,2	40,1	40,1	40,1
	HSL-3-SH / HSL-3-SK		12,2	-	-	21,9	-	-	-	-	-	-	-	-
Shear $V_{Rk,seis}$	HSL-3 / HSL-3-B	[kN]	9,4	9,4	9,4	13,2	13,2	13,2	25,4	25,4	25,4	39,1	39,1	39,1
	HSL-3-G		9,0	9,0	9,0	11,3	11,3	11,3	22,3	22,3	22,3	25,1	25,1	25,1
	HSL-3-SH / HSL-3-SK		9,4	-	-	13,2	-	-	-	-	-	-	-	-

### Design resistance in case of seismic category C2

Anchor size		M10			M12			M16			M20			
Tension $N_{Rd,seis}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	8,1	8,1	8,1	14,6	17,2	17,2	20,4	22,8	22,8	26,7	26,7	26,7
	HSL-3-SH / HSL-3-SK		8,1	-	-	14,6	-	-	-	-	-	-	-	-
Shear $V_{Rd,seis}$	HSL-3 / HSL-3-B	[kN]	7,5	7,5	7,5	10,5	10,5	10,5	20,3	20,3	20,3	31,2	31,2	31,2
	HSL-3-G		7,2	7,2	7,2	9,0	9,0	9,0	17,8	17,8	17,8	20,1	20,1	20,1
	HSL-3-SH / HSL-3-SK		7,5	-	-	10,5	-	-	-	-	-	-	-	-

**Effective anchorage depth for seismic C1 <sup>a)</sup>**

Anchor size			M8			M10			M12		
Eff. Anchorage depth	$h_{ef}$	[mm]	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}^{b)}$	$h_{ef,2}$	$h_{ef,3}$
			60	80	100	70	90	110	80	105	130
Anchor size			M16			M20			M24		
Eff. Anchorage depth	$h_{ef}$	[mm]	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$	$h_{ef,1}$	$h_{ef,2}$	$h_{ef,3}$
			100	125	150	125	155	185	150	180	210

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR only available in sizes M8-M12

b) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.

**Characteristic resistance in case of seismic category C1**

Anchor size			M8			M10			M12		
Tension $N_{Rk,seis}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	12,0	12,0	12,0	16,0	16,0	16,0	21,9	24,0	24,0
	HSL-3-SH / HSL-3-SK		12,0	-	-	16,0	-	-	21,9	-	-
	HSL-3-R / HSL-3-SKR		12,0	12,0	12,0	16,0	16,0	16,0	21,9	24,0	24,0
Shear $V_{Rk,seis}$	HSL-3 / HSL-3-B	[kN]	8,9	8,9	8,9	22,1	22,1	22,1	29,1	29,1	29,1
	HSL-3-G		7,5	7,5	7,5	15,3	15,3	15,3	19,3	19,3	19,3
	HSL-3-SH / HSL-3-SK <sup>a)</sup>		8,9	-	-	22,1	-	-	29,1	-	-
	HSL-3-R / HSL-3-SKR		5,2	5,2	5,2	12,9	12,9	12,9	14,0	14,0	14,0
Anchor size			M16			M20			M24		
Tension $N_{Rk,seis}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	30,6	36,0	36,0	42,8	50,0	50,0	56,2	65,0	65,0
	HSL-3-R / HSL-3-SKR		30,6	36,0	36,0	42,8	50,0	50,0	56,2	65,0	65,0
	HSL-3 / HSL-3-B		57,1	57,1	57,1	54,9	54,9	54,9	81,8	81,8	81,8
Shear $V_{Rk,seis}$	HSL-3-G	[kN]	43,4	43,4	43,4	45,8	45,8	45,8	-	-	-
	HSL-3-R / HSL-3-SKR		29,6	29,6	29,6	29,6	29,6	29,6	-	-	-

**Design resistance in case of seismic category C1**

Anchor size			M8			M10			M12		
Tension $N_{Rd,seis}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	6,7	6,7	6,7	10,7	10,7	10,7	14,6	16,0	16,0
	HSL-3-SH / HSL-3-SK		6,7	-	-	10,7	-	-	14,6	-	-
	HSL-3-R / HSL-3-SKR		8,0	8,0	8,0	10,7	10,7	10,7	14,6	16,0	16,0
Shear $V_{Rd,seis}$	HSL-3 / HSL-3-B	[kN]	7,1	7,1	7,1	17,7	17,7	17,7	23,3	23,3	23,3
	HSL-3-G		6,0	6,0	6,0	12,2	12,2	12,2	15,4	15,4	15,4
	HSL-3-SH / HSL-3-SK		7,1	-	-	17,7	-	-	23,3	-	-
	HSL-3-R / HSL-3-SKR		4,2	4,2	4,2	8,3	8,3	8,3	9,0	9,0	9,0
Anchor size			M16			M20			M24		
Tension $N_{Rd,seis}$	HSL-3 / HSL-3-B HSL-3-G	[kN]	20,4	24,0	24,0	28,5	33,3	33,3	37,5	43,3	43,3
	HSL-3-R / HSL-3-SKR		20,4	24,0	24,0	28,5	33,3	33,3	-	-	-
	HSL-3 / HSL-3-B		40,8	45,6	45,6	43,9	43,9	43,9	65,4	65,4	65,4
Shear $V_{Rk,seis}$	HSL-3-G	[kN]	34,7	34,7	34,7	36,6	36,6	36,6	-	-	-
	HSL-3-R / HSL-3-SKR		19,0	19,0	19,0	19,0	19,0	19,0	-	-	-

## Materials

### Mechanical properties

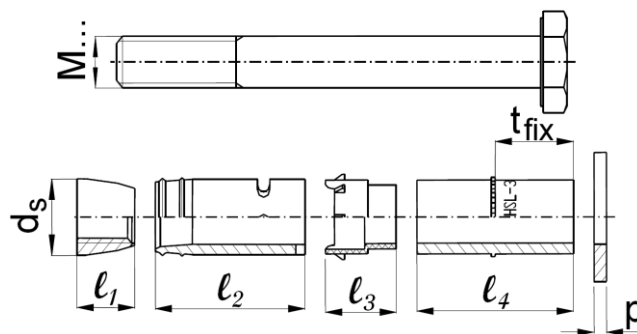
Anchor size		M8	M10	M12	M16	M20	M24
<b>HSL-3, HSL-3-G, HSL-3-B, HSL-3-SH, HSL-3-SK</b>							
Nominal tensile strength $f_{uk}$	[N/mm <sup>2</sup> ]	800	800	800	800	830	830
Yield strength $f_{yk}$	[N/mm <sup>2</sup> ]	640	640	640	640	640	640
Stressed cross-section $A_s$	[mm <sup>2</sup> ]	36,6	58,0	84,3	157	245	353
Moment of resistance $W$	[mm <sup>3</sup> ]	31,3	62,5	109,4	277,1	540,6	935,4
Design bending resistance without sleeve $M_{Rd,s}$	[Nm]	24,0	48,0	84,0	212,8	415,2	718,4
<b>HSL-3-R, HSL-3-GR, HSL-3-SKR</b>							
Nominal tensile strength $f_{uk}$	[N/mm <sup>2</sup> ]	700	700	700	700	700	-
Yield strength $f_{yk}$	HSL-3-R	560	450	450	450	450	-
	HSL-3-SKR						
	HSL-3-GR	560	560	560	560	560	-
Stressed cross-section $A_s$	[mm <sup>2</sup> ]	36,6	58,0	84,3	157	245	-
Moment of resistance $W$	[mm <sup>3</sup> ]	31,3	62,5	109,4	277,1	540,6	-
Design bending resistance without sleeve $M_{Rd,s}$	[Nm]	16,8	33,5	58,8	149,4	291,3	-

### Material quality

Part	Material
<b>Carbon Steel</b>	
HSL-3 Cone	Carbon steel, galvanized to $\geq 5 \mu\text{m}$
HSL-3-G Expansion sleeve	Carbon steel, galvanized to $\geq 5 \mu\text{m}$
HSL-3-B Collapsible element	POM Plastic element
HSL-3-SH Distance sleeve	Carbon steel, galvanized to $\geq 5 \mu\text{m}$
HSL-3 Washer	Carbon steel, galvanized to $\geq 5 \mu\text{m}$
HSL-3 Hexagonal bolt	Carbon steel, galvanized to $\geq 5 \mu\text{m}$ , rupture elongation $\geq 12\%$
HSL-3-G Hexagonal nut	Carbon steel, galvanized to $\geq 5 \mu\text{m}$
HSL-3-G Threaded rod	Carbon steel, galvanized to $\geq 5 \mu\text{m}$ , rupture elongation $\geq 12\%$
HSL-3-B Hexagonal bolt with safety cap	Carbon steel, galvanized to $\geq 5 \mu\text{m}$ , rupture elongation $\geq 12\%$
HSL-3-SH Hexagonal socket head screw	Carbon steel, galvanized to $\geq 5 \mu\text{m}$ , rupture elongation $\geq 12\%$
HSL-3-SK Countersunk bolt	Carbon steel, galvanized to $\geq 5 \mu\text{m}$ , rupture elongation $\geq 12\%$
HSL-3-SK Cup washer	Carbon steel, galvanized to $\geq 5 \mu\text{m}$
<b>Stainless Steel</b>	
HSL-3-R Cone	Stainless steel A4, coated
HSL-3-R Expansion sleeve	Stainless steel A4
HSL-3-GR Collapsible element	Plastic element
HSL-3-SKR Distance sleeve	Stainless steel A4
HSL-3-R Washer	Stainless steel A4, coated
HSL-3-R Hexagonal bolt	Stainless steel A4, coated, rupture elongation $\geq 12\%$
HSL-3-GR Hexagonal nut	Stainless steel A4, coated
HSL-3-GR Threaded rod	Stainless steel A4, coated, rupture elongation $\geq 12\%$
HSL-3-SKR Countersunk bolt	Stainless steel A4, coated, rupture elongation $\geq 12\%$
HSL-3-SKR Cup washer	Stainless steel A4, coated

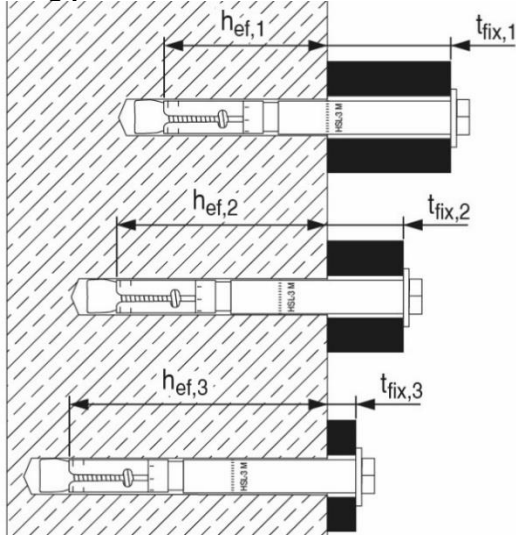
Anchor dimensions of HSL-3, HSL-3-G, HSL-3-B, HSL-3-B, HSL-3-SH, HSL-3-SK

Anchor version	Thread size	t <sub>fix</sub> [mm]		d <sub>s</sub> [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	l <sub>3</sub> [mm]	l <sub>4</sub> [mm]		p [mm]
		min	max					min	max	
HSL-3	M8	5	200	11,9	12	32	15,2	19	214	2
HSL-3-G	M10	5	200	14,8	14	36	17,2	23	218	3
HSL-3	M12	5	200	17,6	17	40	20	28	223	3
HSL-3-G	M16	10	200	23,6	20	54,4	24,4	34,5	224,5	4
HSL-3-B	M20	10	200	27,6	20	57	31,5	51	241	4
HSL-3	M24	10	200	31,6	22	65	39	57	247	4
HSL-3-SH	M8	5		11,9	12	32	15,2	19		2
	M10	20		14,8	14	36	17,2	38		3
	M12	25		17,6	17	40	20	48		3
HSL-3-SK	M8	10	20	11,9	12	32	15,2	18,2	28,2	2
	M10	20		14,8	14	36	17,2	32,2		3
	M12	25		17,6	17	40	20	40		3



## Setting information

### Setting positions a)



Setting position

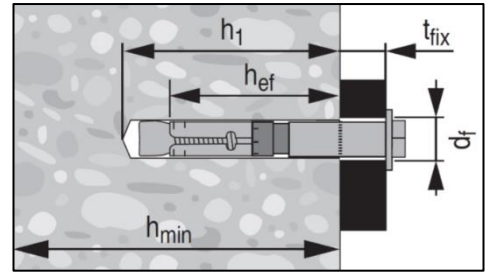
①

Setting position

②


Setting position

③



a) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.

### Setting details for HSL-3 / HSL-3-R

Anchor version		M8			M10			M12		
		①	②	③	①	②	③	①	②	③
Nominal diameter of drill bit	$d_0$ [mm]	12			15			18		
Max. cutting diameter of drill bit	$d_{cut}$ [mm]	12,5			15,5			18,5		
Max. diameter of clearance hole in the fixture	$d_f$ [mm]	14			17			20		
Setting position	$i$	①	②	③	①	②	③	①	②	③
Fixture thickness	$t_{fix,1}$ [mm]	5-200			5-200			5-200		
Effective fixture thickness	$t_{fix,i}$	$t_{fix,1}^{1)} - \Delta i$								
Reduction of fixture thickness	$\Delta i$ [mm]	0	20	40	0	20	40	0	25	50
Effective anchorage depth	$h_{ef,i}$ [mm]	60	80	100	70	90	110	80	105	130
Min. depth of drill hole	$h_{1,i}$ [mm]	80	100	120	90	110	130	105	130	155
Min. thickness of concrete member	$h_{min,i}$ [mm]	120	170	195	140	195	215	160	225	250
Width across flats	SW [mm]	13			17			19		
Installation torque (HSL-3-R)	$T_{inst}$ [Nm]	25			50 (35)			80		
Anchor version		M16			M20			M24 a)		
Nominal diameter of drill bit	$d_0$ [mm]	24			28			32		
Max. cutting diameter of drill bit	$d_{cut}$ [mm]	24,55			28,55			32,7		
Max. diameter of clearance hole in the fixture	$d_f$ [mm]	26			31			35		
Setting position	$i$	①	②	③	①	②	③	①	②	③
Fixture thickness	$t_{fix1}$ [mm]	10-200			10-200			10-200		
Effective fixture thickness	$t_{fix,i}$	$t_{fix,1}^{1)} - \Delta i$								
Reduction of fixture thickness	$\Delta i$ [mm]	0	25	50	0	30	60	0	30	60
Effective anchorage depth	$h_{ef,i}$ [mm]	100	125	150	125	155	185	150	180	210
Min. depth of drill hole	$h_{1,i}$ [mm]	125	150	175	155	185	215	180	210	240
Min. thickness of concrete member	$h_{min,i}$ [mm]	200	275	300	250	380	410	300	405	435
Width across flats	SW [mm]	24			30			36		
Installation torque	$T_{inst}$ [Nm]	120			200			250		

a) Anchor version M24 only available for HSL-3 carbon steel version.

**Setting details for HSL-3-G / HSL-3-GR**

Anchor version					M8			M10			M12		
Nominal diameter of drill bit	d <sub>0</sub>	[mm]	12			15			18				
Max. cutting diameter of drill bit	d <sub>cut</sub>	[mm]	12,5			15,5			18,5				
Max. diameter of clearance hole in the fixture	d <sub>f</sub>	[mm]	14			17			20				
Setting position	i		①	②	③	①	②	③	①	②	③		
Fixture thickness	t <sub>fix,1</sub>	[mm]	5-200			5-200			5-200				
Effective fixture thickness	t <sub>fix,i</sub>		t <sub>fix,1</sub> <sup>1)</sup> - Δi										
Reduction of fixture thickness	Δi	[mm]	0	20	40	0	20	40	0	25	50		
Effective anchorage depth	h <sub>ef,i</sub>	[mm]	60	80	100	70	90	110	80	105	130		
Min. depth of drill hole	h <sub>1,i</sub>	[mm]	80	100	120	90	110	130	105	130	155		
Min. thickness of concrete member	h <sub>min,i</sub>	[mm]	120	170	190 <sup>a)</sup> / 195	140	195	215	160	225	250		
Width across flats	SW	[mm]	13			17			19				
Installation torque	T <sub>inst</sub>	[Nm]	20 (30)			35 (50)			60 (80)				
Anchor version		M16			M20			M24 <sup>a)</sup>					
Nominal diameter of drill bit	d <sub>0</sub>	[mm]	24			28			32				
Max. cutting diameter of drill bit	d <sub>cut</sub>	[mm]	24,55			28,55			32,7				
Max. diameter of clearance hole in the fixture	d <sub>f</sub>	[mm]	26			31			35				
Setting position	i		①	②	③	①	②	③	①	②	③		
Fixture thickness	t <sub>fix1</sub>	[mm]	10-200			10-200			10-200				
Effective fixture thickness	t <sub>fix,i</sub>		t <sub>fix,1</sub> <sup>1)</sup> - Δi										
Reduction of fixture thickness	Δi	[mm]	0	25	50	0	30	60	0	30	60		
Effective anchorage depth	h <sub>ef,i</sub>	[mm]	100	125	150	125	155	185	150	180	210		
Min. depth of drill hole	h <sub>1,i</sub>	[mm]	125	150	175	155	185	215	180	210	240		
Min. thickness of concrete member	h <sub>min,i</sub>	[mm]	200	275	300	250	380	410	300	405	435		
Width across flats	SW	[mm]	24			30			36				
Installation torque	T <sub>inst</sub>	[Nm]	80 (120)			160 (200)			180				

a) Anchor version M24 only available for HSL-3-G carbon steel version.

**Setting details for HSL-3-B**

Anchor version					M12			M16			M20			M24		
Nominal diameter of drill bit	d <sub>0</sub>	[mm]	18			24			28			32				
Max. cutting diameter of drill bit	d <sub>cut</sub>	[mm]	18,5			24,55			28,55			32,7				
Max. diameter of clearance hole in the fixture	d <sub>f</sub>	[mm]	20			26			31			35				
Setting position	i		①	②	③	①	②	③	①	②	③	①	②	③		
Fixture thickness	t <sub>fix,1</sub>	[mm]	5 - 200			10 - 200			10 - 200			10 - 200				
Effective fixture thickness	t <sub>fix,i</sub>		t <sub>fix,1</sub> <sup>1)</sup> - Δi													
Reduction of fixture thickness	Δi	[mm]	0	25	50	0	25	50	0	30	60	0	30	60		
Effective anchorage depth	h <sub>ef,i</sub>	[mm]	80	105	130	100	125	150	125	155	185	150	180	210		
Min. depth of drill hole	h <sub>1,i</sub>	[mm]	105	130	155	125	150	175	155	185	215	180	210	240		
Min. thickness of concrete member	h <sub>min,i</sub>	[mm]	160	225	250	200	275	300	250	380	410	300	405	435		
Width across flats	SW	[mm]	24			30			36			41				
Installation torque	T <sub>inst</sub>	[Nm]	The torque moment is controlled by the safety cap													

**Setting details for HSL-3-SH<sup>a)</sup>**

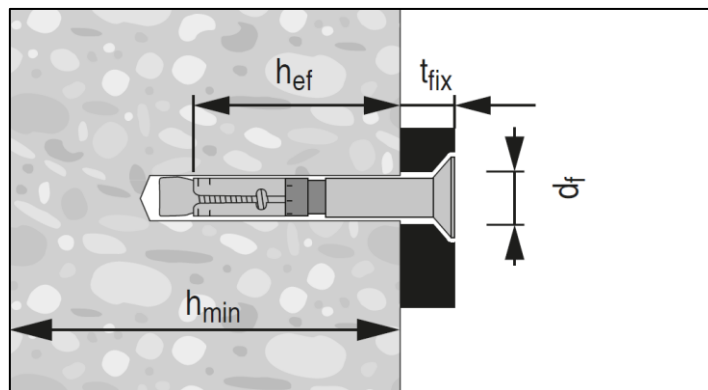
Anchor version		M8	M10	M12
Nominal diameter of drill bit	$d_0$ [mm]	12	15	18
Max. cutting diameter of drill bit	$d_{cut}$ [mm]	12,5	15,5	18,5
Max. diameter of clearance hole in the fixture	$d_f$ [mm]	14	17	20
Fixture thickness	$t_{fix}$ [mm]	5	20	25
Effective anchorage depth	$h_{ef}$ [mm]	60	70	80
Min. depth of drill hole	$h_1$ [mm]	85	95	110
Min. thickness of concrete member	$h_{min}$ [mm]	120	140	160
Width across flats	SW [mm]	6	8	10
Installation torque	$T_{inst}$ [Nm]	25	35	60

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.

#### Setting details for HSL-3-SK / HSL-3-SKR <sup>a)</sup>

Anchor version		M8	M10	M12
Nominal diameter of drill bit	$d_0$ [mm]	12	15	18
Max. cutting diameter of drill bit	$d_{cut}$ [mm]	12,5	15,5	18,5
Max. diameter of clearance hole in the fixture	$d_f$ [mm]	14	17	20
Top diameter of countersunk head in the fixture	$d_h$ [mm]	22,5	25,5	32,9
Bottom diameter of countersunk head in the fixture	$d_h$ [mm]	11,4	14,4	17,4
Height of the countersunk head in the fixture	$h_{cs}$ [mm]	5,8	6,0	8,0
Fixture thickness	$t_{fix}$ [mm]	10 – 20	20	25
Effective anchorage depth	$h_{ef}$ [mm]	60	70	80
Min. depth of drill hole	$h_1$ [mm]	80	90	105
Min. thickness of concrete member	$h_{min}$ [mm]	120	140	160
Width across flats	SW [mm]	5	6	8
Installation torque	$T_{inst}$ [Nm]	25 (18)	50	80

a) HSL-3-SH, HSL-3-SK and HSL-3-SKR can only be set in position 1.



### Installation equipment

Anchor size	M8	M10	M12	M16	M20	M24
Rotary hammer	TE 2 – TE 30			TE 40 – TE 80		
Diamond coring <sup>1)</sup>	DD 30-W + SPX-T				DD 30-W + SPX-T DD 120 + DD-BI	
Other tools	blow out pump, hammer, torque wrench <sup>2)</sup>					

1) Diamond coring not available for HSL-3-R, HSL-3-GR and HSL-3-SKR anchors.

2) HSL-3-B only requires a regular wrench as it automatically ensures correct torque is applied.

### Setting parameters for HSL-3, HSL-3-G, HSL-3-B, HSL-3-SH, HSL-3-SK

Anchor size		M8			M10			M12		
Setting position	i	①	②	③	①	②	③	①	②	③
Minimum base material thickness	$h_{min}$ [mm]	120	170	190	140	195	215	160	225	250
Minimum spacing	$s_{min}$ [mm]	60			70			80		
	for $c \geq$ [mm]	100			100			160		
Minimum edge distance	$c_{min}$ [mm]	60			70			80		
	for $s \geq$ [mm]	100			160			240		
Anchor size		M16			M20			M24		
Setting position	i	①	②	③	①	②	③	①	②	③
Minimum base material thickness	$h_{min}$ [mm]	200	275	300	250	380	410	300	405	435
Minimum spacing	$s_{min}$ [mm]	100			125			150		
	for $c \geq$ [mm]	240			300			300		
Minimum edge distance	$c_{min}$ [mm]	100			150			150		
	for $s \geq$ [mm]	240			300			300		

### Setting parameters for HSL-3-R, HSL-3-GR, HSL-3-SKR

Anchor size		M8			M10			M12			M14			M20		
Setting position	i	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③
Minimum base material thickness	$h_{min}$ [mm]	120	170	195	140	195	215	160	225	250	200	275	300	250	380	410
<b>Non-cracked concrete</b>																
Minimum spacing	$s_{min}$ [mm]	70			70			80			100			125		
	for $c \geq$ [mm]	100			100			160			240			300		
Minimum edge distance	$c_{min}$ [mm]	70			80			80			100			150		
	for $s \geq$ [mm]	140			160			240			240			300		
<b>Cracked concrete</b>																
Minimum spacing	$s_{min}$ [mm]	70			70			80			100			125		
	for $c \geq$ [mm]	100			100			170			240			300		
Minimum edge distance	$c_{min}$ [mm]	70			120			80			100			150		
	for $s \geq$ [mm]	140			160			240			240			300		

## Setting instructions

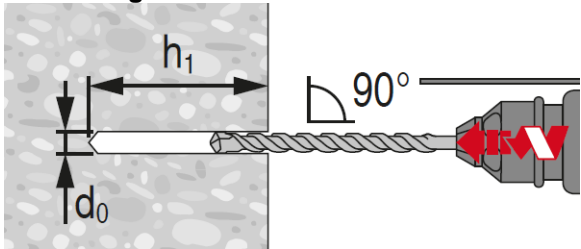
\*For detailed information on installation of each specific HSL-3 versions see instruction for use given with the package of the product.

Setting instruction	
<b>Hammer drilling</b>	
<b>1. Drilling</b> 	<b>2. Cleaning</b> 
<b>3. Installation</b> 	<b>4. Applying tightening torque</b> 
<b>Diamond drilling for HSL-3, HSL-3-B, HSL-3-G, HSL-3-SK, HSL-3-SH</b>	
<b>1. Drilling</b> 	<b>2. Cleaning</b> 
<b>3. Installation</b> 	<b>4. Applying tightening torque</b> 

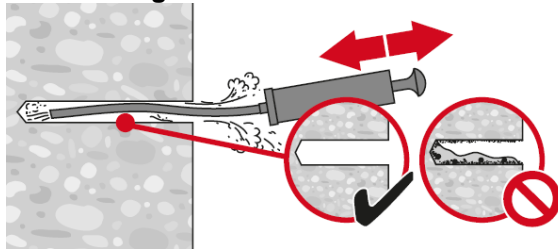
**HSL-3-B Safety cap**

**Hammer drilling**

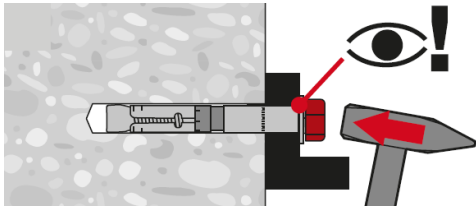
**1. Drilling**



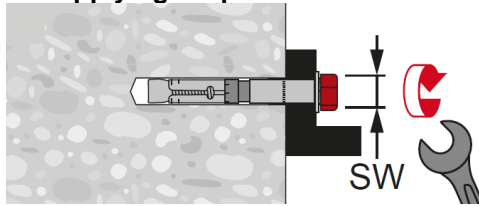
**2. Cleaning**



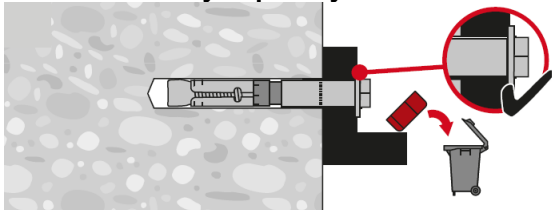
**3. Installation**



**4. Applying torque**

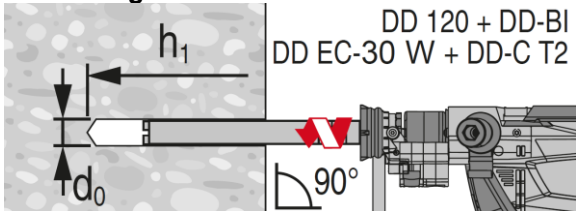


**5. Throw safety cap away**

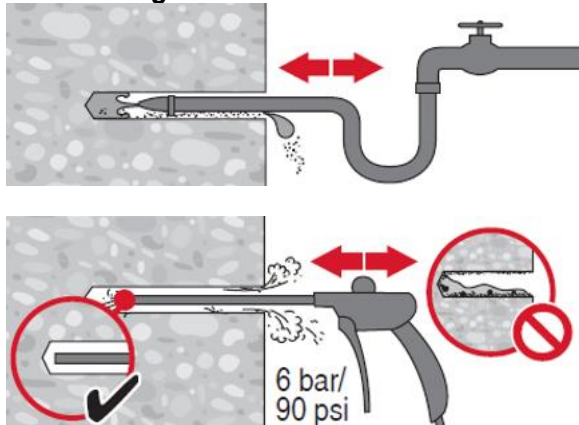


**Diamond drilling**

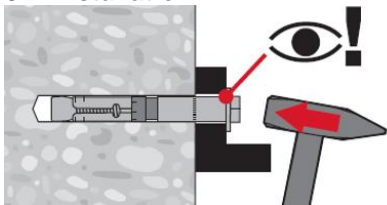
**1. Drilling**



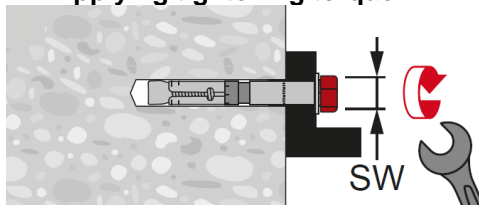
**2. Cleaning**



**3. Installation**



**4. Applying tightening torque**



**5. Throw the safety cap away**

