Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA

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Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-16/0918 of 22 February 2019

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Schroeder fixing anchor List 20 SL
Product family to which the construction product belongs	cast-in anchors with internal threaded socket
Manufacturer	Friedrich Schroeder GmbH & Co. KG Hönnestraße 24 58809 Neuenrade DEUTSCHLAND
Manufacturing plant	
This European Technical Assessment contains	30 pages including 3 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 330012-00-0601

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Specific Part

1 Technical description of the product

The Schroeder fixing anchor List 20 SL in the size of M12, M16, M20, M24, M27 and M30 is an anchor consisting of an internal threaded socket pressed on a headed stud (type P) or welded to a headed stud (type FW) or a plate (type FS). The socket is made of galvanised steel or stainless steel. The anchor is imbedded surface-flush in the concrete. The anchorage is characterised by mechanical interlock at the head.

The product description is given in Annex A.

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

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 European 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 values for resistance for static and quasi-static loads and displacements	See Annex C1 to C10

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

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

In accordance with EAD No. 330012-00-0601, the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

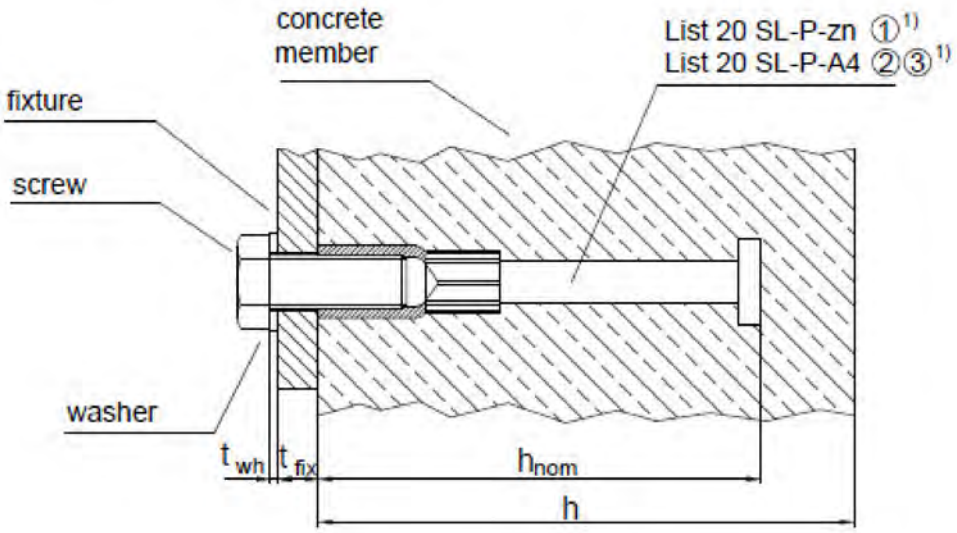
Issued in Berlin on 22 February 2019 by Deutsches Institut für Bautechnik

BD Dipl.-IOng. Andreas Kummerow
Head of Department

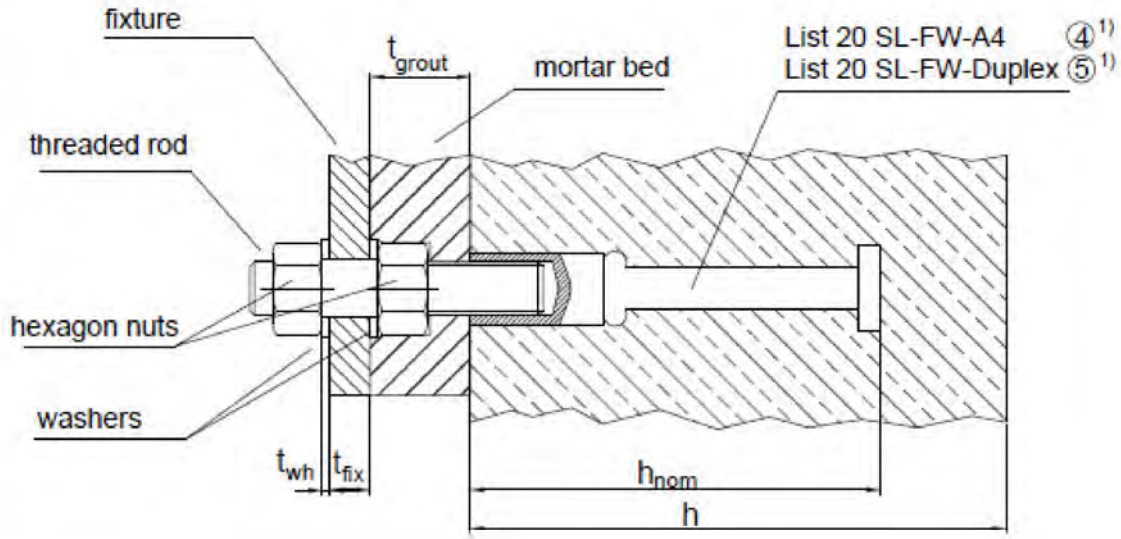
beglaubigt:
Müller

Deutsches Institut für Bautechnik DIBt

Anchor List 20 SL-P-zn and List 20 SL-P-A4 (example)



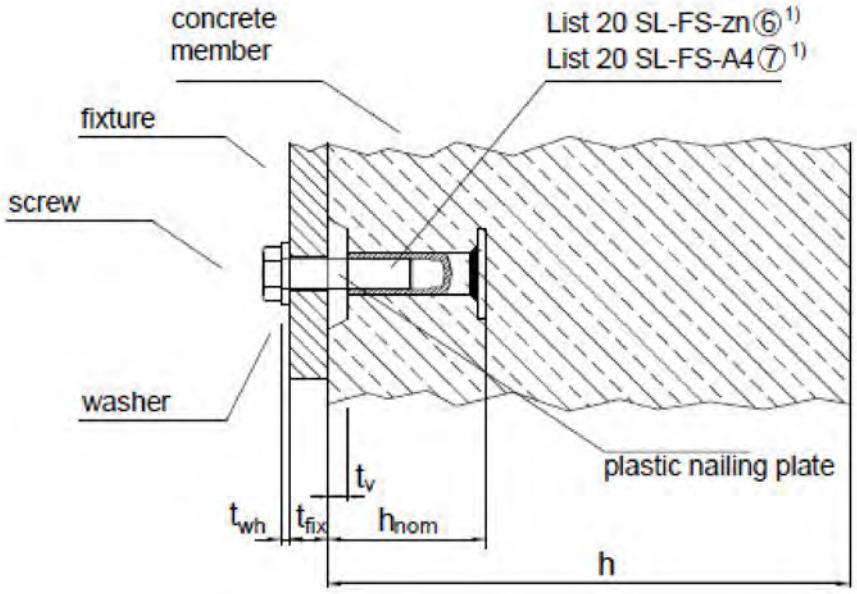
Anchor List 20 SL-FW-A4 and List 20-SL-FW-Duplex with lever arm (example)



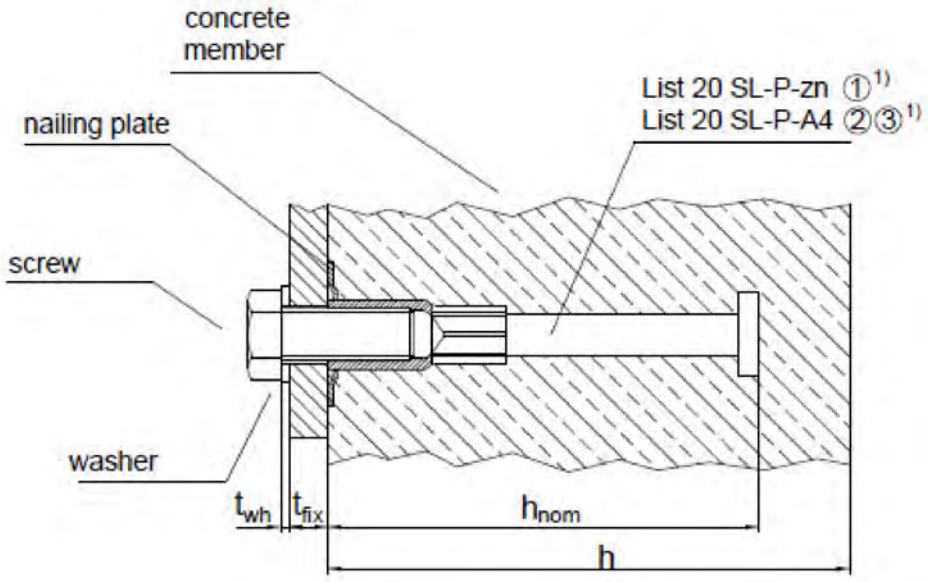
h =	thickness of concrete member	t_{wh} =	washer thickness
t_{grout} =	thickness of mortar bed	h_{nom} =	embedment depth
t_{fix} =	thickness of fixture	1) see annex A3 – A7	

Schroeder fixing anchor List 20 SL	Annex A1
Product description Installed condition	

Anchor List 20 SL-FS-zn and List 20 SL-FS-A4 with plastic nailing plate (example)



Anchor List 20 SL-P-zn and List 20 SL-P-A4 with welded nailing plate (example)



h =	thickness of concrete member	t_{wh} =	washer thickness
t_v =	thickness of plastic nailing plate	h_{nom} =	embedment depth
t_{fix} =	thickness of fixture	1) see annex A3 – A7	

Schroeder fixing anchor List 20 SL	Annex A2
Product description Installed condition	

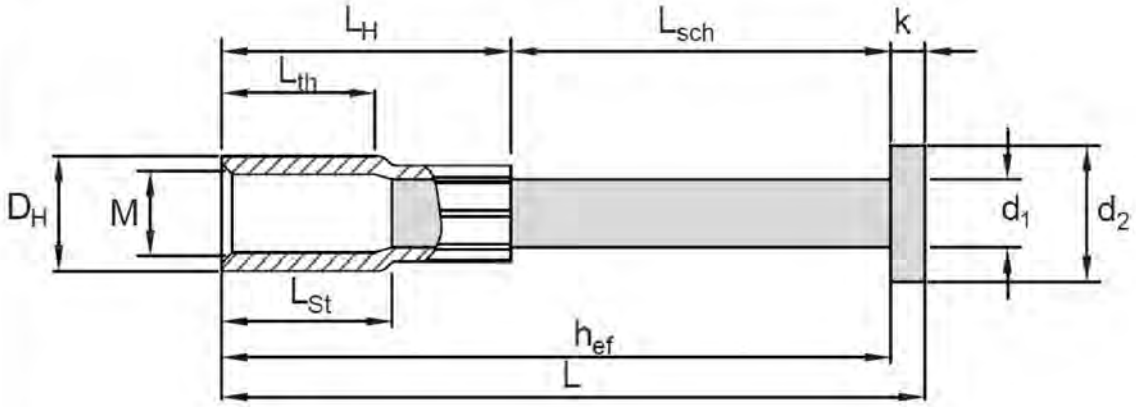


Fig A1

Table A1: Dimensions, Schroeder List 20 SL-P-zn ① - materials according annex A8

size	L	D_H	L_H	L_{th}	d_1	h_n	d_2	k	L_{sch}	L_{st}	L_H - L_{St}	h_{ef}
						[mm]						
M12	79	15.5	43	25	10	50	19	7.1	29	26	17	72
M12	104	15.5	43	25	10	75	19	7.1	54	26	17	97
M12	154	15.5	43	25	10	125	19	7.1	104	26	17	147
M12	≤ 204	15.5	≥ 43	≥ 25	10	≤ 175	19	7.1	≥ 20	≥ 26	≥ 17	L-k
M16	83	21.1	55	27	13	50	25	8	20	30	25	75
M16	108	21.1	55	27	13	75	25	8	45	30	25	100
M16	133	21.1	55	27	13	100	25	8	70	30	25	125
M16	183	21.1	55	27	13	150	25	8	120	30	25	175
M16	≤ 383	21.1	≥ 55	≥ 27	13	≤ 350	25	8	≥ 20	≥ 30	≥ 25	L-k
M20	140	27.0	70	32	16	100	32	8	62	35	35	132
M20	165	27.0	70	32	16	125	32	8	87	35	35	157
M20	190	27.0	70	32	16	150	32	8	112	35	35	182
M20	240	27.0	70	32	16	200	32	8	162	35	35	232
M20	≤ 440	27.0	≥ 70	≥ 32	16	≤ 400	32	8	≥ 30	≥ 35	≥ 35	L-k
M24	173	31.0	83	38	19	125	32	10	80	43	40	163
M24	198	31.0	83	38	19	150	32	10	105	43	40	188
M24	248	31.0	83	38	19	200	32	10	155	43	40	238
M24	298	31.0	83	38	19	250	32	10	205	43	40	288
M24	≤ 448	31.0	≥ 83	≥ 38	19	≤ 400	32	10	≥ 40	≥ 43	≥ 40	L-k
M30	213	39.5	98	56	25	150	40	12	103	57	41	201
M30	238	39.5	98	56	25	175	40	12	128	57	41	226
M30	313	39.5	98	56	25	250	40	12	203	57	41	301
M30	363	39.5	98	56	25	300	40	12	253	57	41	351
M30	≤ 513	39.5	≥ 98	≥ 56	25	≤ 450	40	12	≥ 50	≥ 57	≥ 41	L-k

h_n = Length of headed stud before pressing, L_H = socket length after pressing, L_{sch} = L - L_H - k

Designation: Schroeder List 20 SL-P-zn M … x L

Schroeder fixing anchor List 20 SL

Product description
Dimensions List 20 SL-P-zn ①

Annex A3

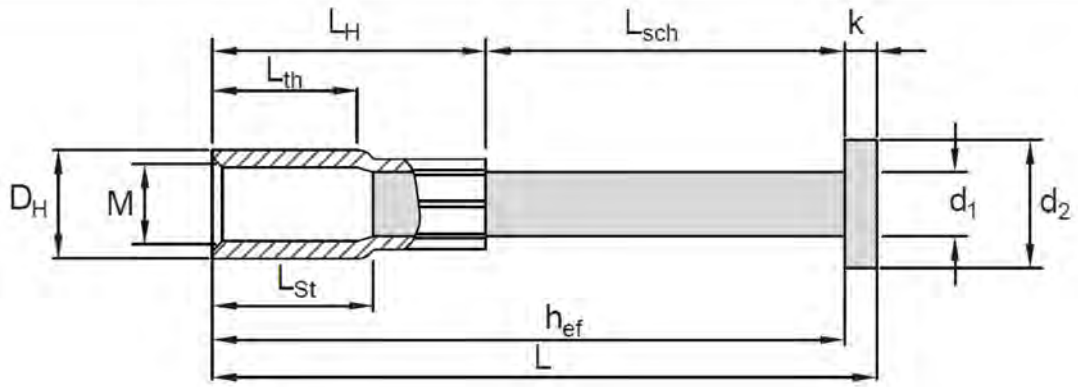


Fig A2

Table A2: Dimensions, Schroeder List 20 SL-P- A4 ②: M12 and M16 ③: M20, M24, M30 – materials according annex A8

size	L	D_H	L_H	L_{th}	d_1	h_n	d_2	k	L_{sch}	L_{St}	L_H - L_{St}	h_{ef}
						[mm]						
M12	79	15.5	42	25	10	50	19	7.1	30	26	16	72
M12	104	15.5	42	25	10	75	19	7.1	55	26	16	97
M12	154	15.5	42	25	10	125	19	7.1	105	26	16	147
M12	≤ 204	15.5	≥ 42	≥ 25	10	≤ 175	19	7.1	≥ 20	≥ 26	≥ 16	L-k
M16	83	21.1	56	27	13	50	25	8	19	30	26	75
M16	108	21.1	56	27	13	75	25	8	44	30	26	100
M16	133	21.1	56	27	13	100	25	8	69	30	26	125
M16	183	21.1	56	27	13	150	25	8	119	30	26	175
M16	≤ 383	21.1	≥ 56	≥ 27	13	≤ 350	25	8	≥ 20	≥ 30	≥ 26	L-k
M20	140	27.0	70	32	16	100	32	8	62	35	35	132
M20	165	27.0	70	32	16	125	32	8	87	35	35	157
M20	190	27.0	70	32	16	150	32	8	112	35	35	182
M20	240	27.0	70	32	16	200	32	8	162	35	35	232
M20	≤ 440	27.0	≥ 70	≥ 32	16	≤ 400	32	8	≥ 30	≥ 35	≥ 35	L-k
M24	173	31.0	87	38	16	125	32	8	78	42	45	165
M24	198	31.0	87	38	16	150	32	8	103	42	45	190
M24	248	31.0	87	38	16	200	32	8	153	42	45	240
M24	298	31.0	87	38	16	250	32	8	203	42	45	290
M24	≤ 448	31.0	≥ 87	≥ 38	16	≤ 400	32	8	≥ 30	≥ 42	≥ 45	L-k
M30	213	39.5	97	56	25	150	40	12	104	57	40	201
M30	238	39.5	97	56	25	175	40	12	129	57	40	226
M30	313	39.5	97	56	25	250	40	12	204	57	40	301
M30	363	39.5	97	56	25	300	40	12	254	57	40	351
M30	≤ 513	39.5	≥ 97	≥ 56	25	≤ 450	40	12	≥ 50	≥ 57	≥ 40	L-k

h_n = Length of headed stud before pressing, L_H = socket length after pressing, L_{sch} = L - L_H - k

Designation: Schroeder List 20 SL-P- A4 M … x L

Schroeder fixing anchor List 20 SL	Annex A4
Product descriptions Dimensions List 20 SL-P-A4 ②, ③	

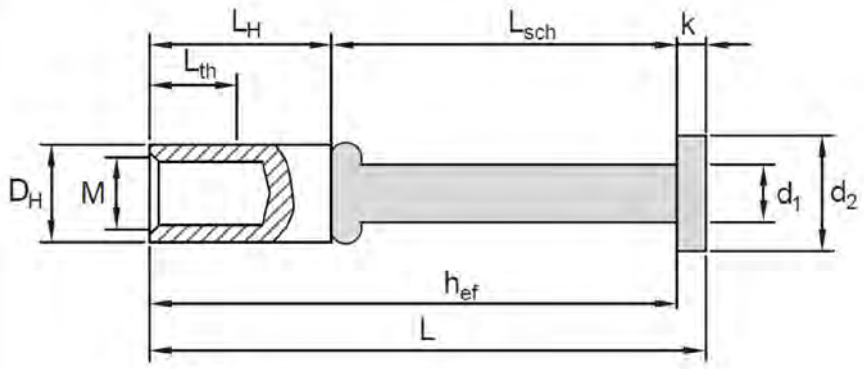


Fig A3

Table A3: Dimensions, Schroeder List 20 SL-FW- A4 ④ - materials according annex A 8

size	L	D_H	L_H	L_{th}	d_1	h_n	d_2	k	L_{sch}	h_{ef}
					[mm]					
M12	127	16.0	60	25	10	75	19	7.1	60	120
M12	152	16.0	60	25	10	100	19	7.1	85	145
M12	≤ 202	16.0	≥ 60	≥25	10	≤ 150	19	7.1	≥ 60	L-k
M16	127	22.0	60	28	16	75	32	8	59	119
M16	152	22.0	60	28	16	100	32	8	84	144
M16	202	22.0	60	28	16	150	32	8	134	194
M16	≤ 452	22.0	≥ 60	≥ 28	16	≤ 400	32	8	≥ 59	L-k
M20	150	27.0	60	33	16	100	32	8	82	142
M20	200	27.0	60	33	16	150	32	8	132	192
M20	250	27.0	60	33	16	200	32	8	182	242
M20	≤ 450	27.0	≥ 60	≥ 33	16	≤ 400	32	8	≥ 82	L-k
M24	152	36.0	60	38	22	100	35	10	82	142
M24	202	36.0	60	38	22	150	35	10	132	192
M24	252	36.0	60	38	22	200	35	10	182	242
M24	302	36.0	60	38	22	250	35	10	232	292
M24	≤ 502	36.0	≥ 60	≥ 38	22	≤ 450	35	10	≥ 82	L-k
M27	152	40.0	60	38	25	100	40	12	80	140
M27	227	40.0	60	38	25	175	40	12	155	215
M27	302	40.0	60	38	25	250	40	12	230	290
M27	352	40.0	60	38	25	300	40	12	280	340
M27	≤ 502	40.0	≥ 60	≥ 38	25	≤ 450	40	12	≥ 80	L-k
M30	152	45.0	60	38	25	100	40	12	80	140
M30	227	45.0	60	38	25	175	40	12	155	215
M30	302	45.0	60	38	25	250	40	12	230	290
M30	352	45.0	60	38	25	300	40	12	280	340
M30	≤ 502	45.0	≥ 60	≥ 38	25	≤ 450	40	12	≥ 80	L-k

h_n = Length of headed stud before welding, L_H = socket length after welding, L_{sch} = L - L_H - k

Designation: Schroeder List 20 SL-FW- A4 M … x L

Schroeder fixing anchor List 20 SL

Product Description
Dimensions List 20 SL-FW-A4 ④

Annex A5

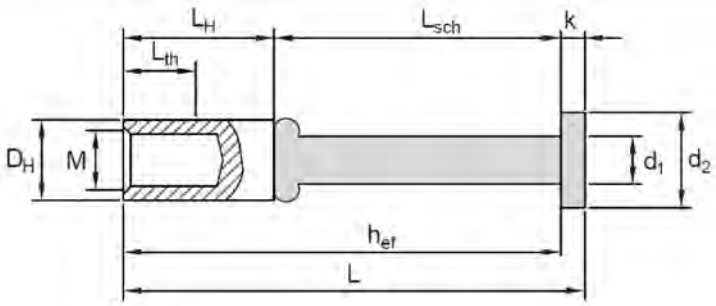


Fig A4

Table A4: Dimensions, Schroeder List 20 SL-FW-Duplex ⑤- materials according annex A8

size	L	D_H	L_H	L_{th}	d_1	h_n	d_2	k	L_{sch}	h_{ef}
					[mm]					
M12	132	16.0	60	25	13	75	25	8	64	124
M12	157	16.0	60	25	13	100	25	8	89	149
M12	≤ 407	16.0	≥ 60	≥ 25	13	≤ 350	25	8	≥ 64	L-k
M16	131	22.0	60	28	16	75	32	8	63	123
M16	156	22.0	60	28	16	100	32	8	88	148
M16	206	22.0	60	28	16	150	32	8	138	198
M16	≤ 356	22.0	≥ 60	≥ 28	16	≤ 400	32	8	≥ 63	L-k
M20	157	28.0	60	33	22	100	35	10	87	147
M20	207	28.0	60	33	22	150	35	10	137	197
M20	257	28.0	60	33	22	200	35	10	187	247
M20	≤ 507	28.0	≥ 60	≥ 33	22	≤ 450	35	10	≥ 87	L-k
M24	157	35.0	60	38	25	100	40	12	85	145
M24	207	35.0	60	38	25	150	40	12	135	195
M24	232	35.0	60	38	25	175	40	12	160	220
M24	257	35.0	60	38	25	200	40	12	185	245
M24	307	35.0	60	38	25	250	40	12	235	295
M24	≤ 507	35.0	≥ 60	≥ 38	25	≤ 450	40	12	≥ 85	L-k

h_n = Length of headed stud before welding, L_H = socket length after welding, L_{sch} = L - L_H - k

Designation: Schroeder List 20 SL-FW-Duplex M … x L

Table A5: Dimensions, Schroeder List 20 SL-FS-zn ⑥ and List 20 SL-FS-A4 ⑦ - materials according annex A8

size	L	D_H	L_H	L_{th} ≥	D_{Fp}	t_{Fp}	h_{ef}
				[mm]			
M12	55	15.5	52	45	35	3	52
M12	75	15.5	72	55	35	3	72
M16	45	21.1	41	35	40	4	41
M16	75	21.1	71	65	40	4	71
M16	≥ 30 ≤ 75	21.1	≥ 26 ≤ 71	≥ L-10	40	4	≥ 30–t_{Fp}

L_{th} = usable thread length

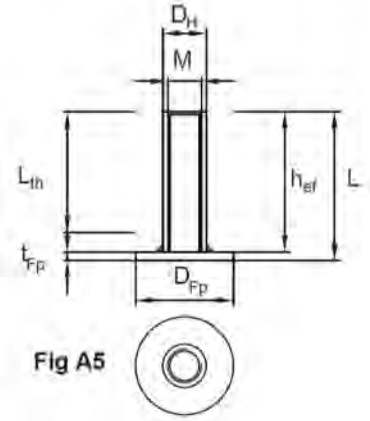


Fig A5

Designation: Schroeder List 20 SL-FS-zn M … x L or List 20 SL-FS- A4 M … x L

Schroeder fixing anchor List 20 SL	
Product descriptions Dimensions List 20 SL-FW-Duplex ⑤, SL-FS-zn ⑥ and SL-FS-A4 ⑦	Annex A6

Table A6: Installation aids (optional)

M	type	steel plates welded to the socket (Fig A6)										plastic plates (Fig A7)					
		20 SL-P-zn / -P- A4 / -FS-zn / -FS- A4					20 SL-FW- A4 / -FW - Duplex					type c nailing plate			type d adhesive plate		
		D_H	D_{Np}	a_{Np}	b_{Np}	t_{Np}	D_H	D_{Np}	a_{Np}	b_{Np}	t_{Np}	D_{Npp}	d_{Npp}	t_V	D_{pp}	d_{pp}	t_V
		[mm]															
12	b	16	48	-	-	1.2	16	48	-	-	1.2	58	47	10	50	44	3
16	b	21	48	-	-	1.2	22	48	-	-	1.2	58	47	10	50	44	3
20	a	27	-	72	38	2.0	27(28)[1]	-	72	38	2.0	58	47	10	50	44	3
24	a	31	-	72	38	2.0	36(35)[1]	-	100	46	2.5	58	47	10	50	44	3
27	a	-	-	-	-	-	40	-	100	46	3.0	58	47	10	-	-	-
30	a	39.5		100	46	2.5	45	-	-	-	-	58	47	10	-	-	-

1) ( ) - value for 20 SL-FW-Duplex

steel plate welded to the socket

type a - rectangular plate

type b - round plate

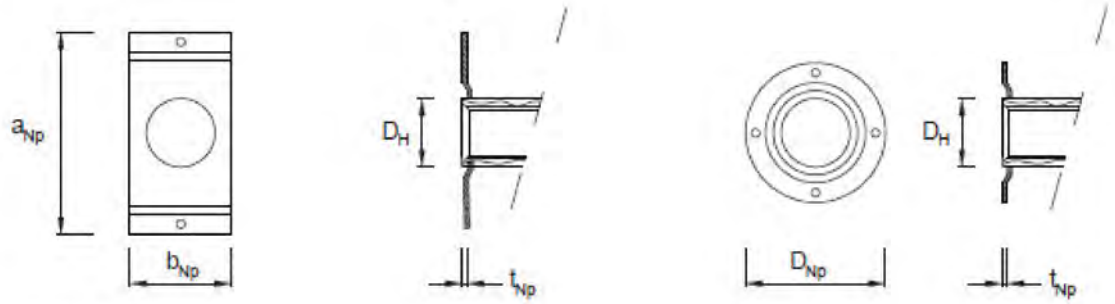


Fig A6

plastic plates screwed into the socket

type c - nailing plate

type d - adhesive plate

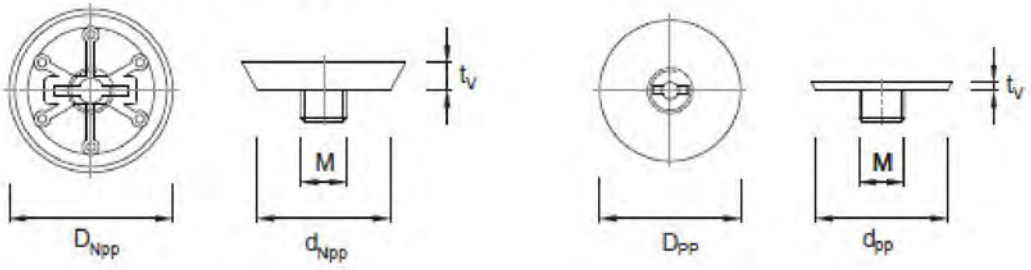


Fig A7

Schroeder fixing anchor List 20 SL

Product description
Installations aids – type a, type b, type c and type d

Annex A7

Table A7: Anchor designations and materials

Part	Component	①List 20 SL-P-zn: acc. Fig A1[1)]	②List 20 SL-P- A4 M12 und M16: acc. Fig. A2[1)]
1	Socket	EN 10305:2016, E 355+N,normalised, $f_{yk} \geq 355$ N/mm², $f_{uk} \geq 470$ N/mm², electrogalvanised [2)]	Stainless steel grade 1.4401, 1.4404 or 1.4571 acc. EN 10217-7:2014, $f_{yk} \geq 200$ N/mm², $f_{uk} \geq 490$ N/mm²
2	Headed stud	S235J2+C470 or S355 acc. EN 10025:2004, $f_{yk} \geq 375$ N/mm² and $f_{uk} \geq 470$ N/mm²	Stainless steel grade 1.4301, 1.4303 acc. EN 10088:2009, $f_{yk} \geq 350$ N/mm² and $f_{uk} \geq 540$ - 780 N/mm²
Part	Component	③List 20 SL-P- A4 M20, M24 und M30: acc. Fig. A2[1)]	④List 20 SL-FW-A4: acc. Fig. A3[1)]
1	Socket	Stainless steel grade 1.4401, 1.4404 or 1.4571 acc. EN 10217-7:2014, $f_{yk} \geq 200$ N/mm², $f_{uk} \geq 490$ N/mm²	Stainless steel acc. EN 10088:2009, 1.4401, 1.4404 or 1.4571, grade S355 (≤ M16) and S275 (≥ M20)
2	Headed stud	S235J2+C470 or S355 acc. EN 10025:2004, $f_{yk} \geq 375$ N/mm² and $f_{uk} \geq 470$ N/mm² - headed stud in the base of socket sealed	S235J2+C470 or S355 acc. EN 10025: 2004, $f_{yk} \geq 375$ N/mm² and $f_{uk} \geq 470$ N/mm²
Part	Component	⑤List 20 SL-FW-Duplex: acc. Fig. A4[1)]	
1	Socket	Stainless steel acc. EN 10088: 2009, 1.4462 - grade S460	
2	Headed stud	S235J2+C470 or S355 acc. EN 10025:2004, $f_{yk} \geq 375$ N/mm² and $f_{uk} \geq 470$ N/mm²	
Part	Component	⑥List 20 SL-FS-zn: acc. Fig. A5[1)]	⑦List 20 SL-FS-A: acc. Fig. A5[1)]
1	Socket	EN 10305:2016, E 355+N,normalised, $f_{yk} \geq 355$ N/mm², $f_{uk} \geq 470$ N/mm², electrogalvanised [2)]	Stainless steel grade 1.4401, 1.4404 or 1.4571 acc. EN 10217-7:2014, $f_{yk} \geq 200$ N/mm², $f_{uk} \geq 490$ N/mm²
3	End plate	EN 10025-2:2004, S355J0+AR, $f_{yk} \geq 355$ N/mm², $f_{uk} \geq 470$ N/mm², electrogalvanised [2)]	EN 10088: 2009, stainless steel grade 1.4401, 1.4404 or 1.4571, $f_{yk} \geq 220$ N/mm², $f_{uk} \geq 520$ N/mm²

1) Components are shown in Annex A11
2) Thickness of zinc coating ≥ 5 µm acc. EN ISO 4042:1999

Schroeder fixing anchor List 20 SL

Product description
Materials

Annex A8

Deutsches Institut für Bautechnik DIBt

List 20 SL-P-zn and 20 SL-P-A4

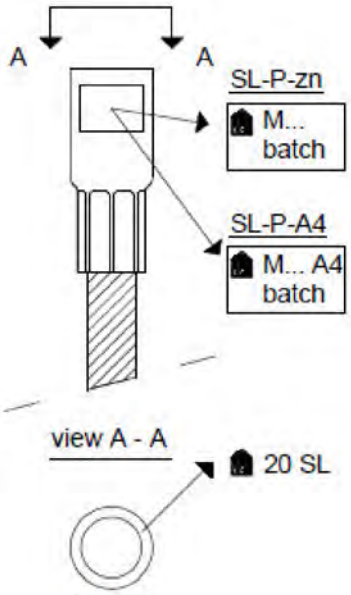


Fig A8

List 20 SL-FW-A4 and 20 SL-FW-Duplex

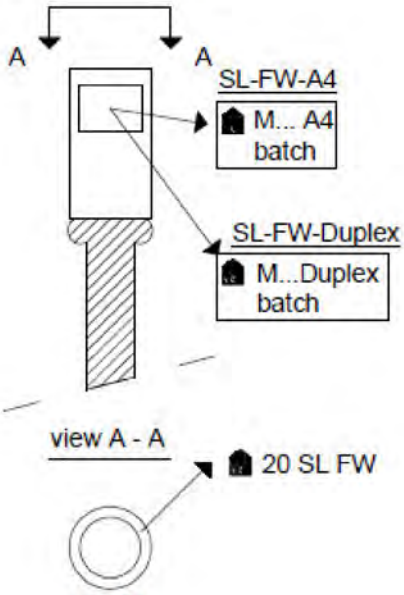


Fig A9

List 20 SL-FS-zn and 20 SL-FS-A4

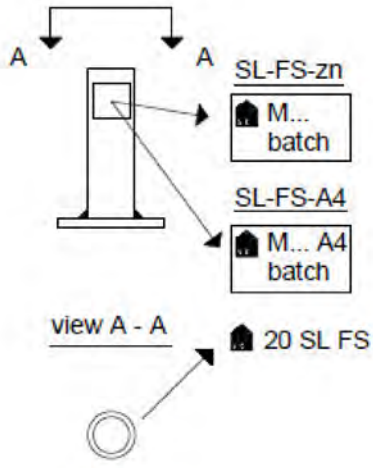


Fig A10

identifying mark of the producer

M ... diameter of the M-thread

batch batch number of the socket

Table A8: material of the socket

attribute	Anchor - List 20 SL-					
	P-zn	P-A4	FW-A4	FW-Duplex	FS-zn	FS-A4
color	yellow	silver-grey	silver-grey	silver-grey	yellow	silver-grey
magnetism	yes	no	no	yes	yes	no

Schroeder fixing anchor List 20 SL

Product description
Marking

Annex A9

Table A9: Anchor and fastenings

		1		2			3
		a	b	a	b	c	
Part	anchor, appr. fastenings[1)]	Insignificant corrosion exposure		Medium corrosion exposure			
		structures subjects to dry internal conditions		structures subject to external atmospheric exposure (including industrial and marine environments), or exposure in permanently damp internal condition, if no particular aggressive conditions such as permanent or alternate immission in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulfurization plants or road tunnels, where de-icing materials are used) exist.			
		Fixing anchor List 20 …					
1,2	Anchor acc. Annex A8	① SL-P-zn		②③ SL-P-A4	④ SL-FW-A4		⑤SL-FW-Duplex
1,3			⑥ SL-FS-zn			⑦ SL-FS-A4	
4	Optional steel plate – welded to the socket type a and type b acc. Annex A7	Sheet metal DC01 acc. EN 10130: 2006		Stainless steel grade 1.4401, 1.4404 or 1.4571 acc. EN 10088:2009			Stainless steel grade 1.4462 acc. EN 10088:2009
5	Washer	Steel acc. EN 10025:2005, electro-galvanised[2)], dimensions acc. EN ISO 7089/7090/7093:2000		Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009			Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009
6a	Screw	grade 5.6, 8.8 acc. EN ISO 898-1:2013, electrogalvanised[2)]		Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009; strength grade 50, 70, 80 acc. EN ISO 3506-1:2009			Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009; strength grade 70, 80 acc. EN ISO 3506-1:2009
6b	Threaded rod	grade 5.6, 8.8 acc. EN ISO 898-5:2012, electrogalvanised[2)]		Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009; strength grade 50, 70, 80 acc. EN ISO 3506-1:2009			Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009; strength grade 70, 80 acc. EN ISO 3506-1:2009
7b	Hexagon nut	grade 5, 8 acc. EN ISO 898-2:2012, electrogalvanised[2)]		Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009; strength grade 50, 70, 80 acc. EN ISO 3506-2:2009			Stainless steel 1.4401, 1.4404, 1.4571, 1.4362 or 1.4462 acc. EN 10088:2009; strength grade 70, 80 acc. EN ISO 3506-2:2009

1) Fastenings are shown in Annex A11
2) Thickness of zinc coating ≥ 5 µm acc. EN ISO 4042:1999

Schroeder fixing anchor List 20 SL

Product Description
Materials of components – part 1

Annex A10

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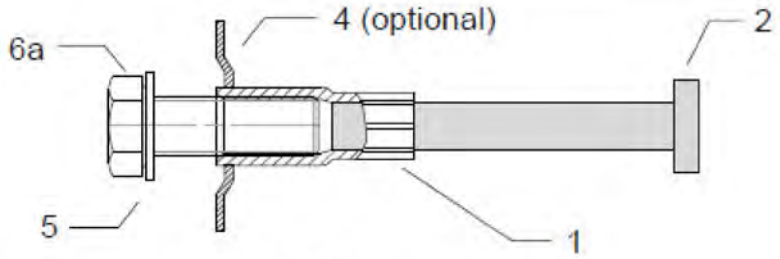
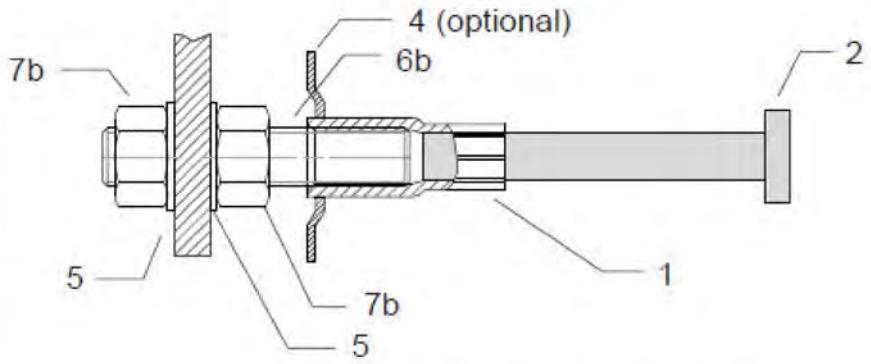
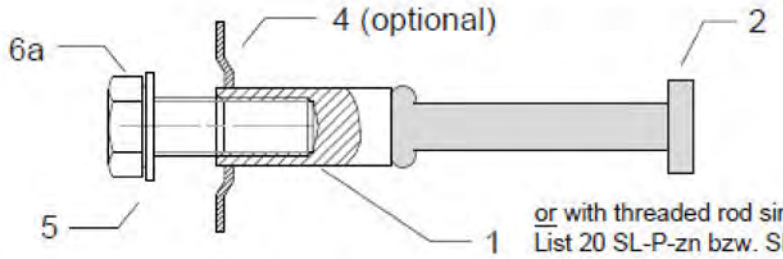
List 20 SL-P-zn / List 20 SL-P-A4



or

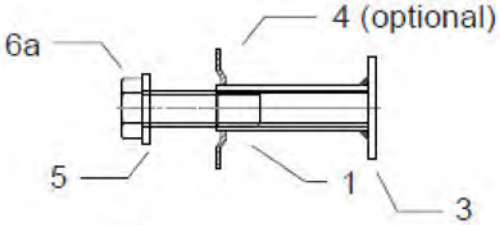


List 20 SL-FW-A4 / List 20 SL-FW-Duplex



or with threaded rod similar to List 20 SL-P-zn bzw. SL-P-A4

List 20 SL-FS-zn / List 20 SL-FS-A4



or with threaded rod similar to List 20 SL-P-zn bzw. SL-P-A4

Fig A11

Description of the components in Annex A8 and A10

Schroeder fixing anchor List 20 SL	Annex A11
Product Description Materials of components – part 2	

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Specifications of intended use

Anchorage subject to

- Static and quasi-static loads

Base materials

- Compacted, reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013
- Strength classes C20/25 to C50/60 according to EN 206:2013
- Cracked or uncracked concrete

Use conditions

- Structures subject to dry, internal conditions
  (Anchor and fastenings acc. Annex A10, column 1 - 3)
- Structures subject to external atmospheric exposure (including industrial and marine environments), or exposure in permanently damp internal condition, if no particular aggressive conditions exists. (Anchor and fastenings acc. Annex A10, column 2 - 3)
  Note: particularly aggressive conditions are e.g. permanent or alternate immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulfurization plants or road tunnels, where de-icing materials are used).

Design

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are preparded taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi-static actions are designed in accordance with:
  - CEN/TS 1992-4:2009, part 1 and 2
- Requirements for the fastenings (not included in anchor)

  washer
  - Material and dimensions in accordance with Annex A10

  screw, threaded rod
  - Material and dimensions in accordance with Annex A10
  - Strength class in accordance with Annex C1, C5, C6, C7
  - Length in accordance with Annex B3 and thickness of the fixture

  hexagonal nut
  - Material and dimensions in accordance with Annex A10
  - Strength class in accordance with Annex C1, C5, C6, C7

Schroeder fixing anchor List 20 SL	Annex B1
Intended use Specifications	

Deutsches Institut für Bautechnik DIBt

Installation

- Anchor installation is carried out by appropriately qualified workers and under supervision of the person responsible for technical matters on site
- Usage of the anchors only as supplied by the manufacturer without any manipulation or exchanging of components
- Installation of the anchors in accordance with the manufacturer's specifications given in Annex B5 and B6
- Anchors are to be fixed on the formwork so that no movement of the anchors will occur during the time of laying the reinforcement and of placing and compacting the concrete
- Concrete among anchors and especially under the head of the stud bolt or the foot-plate is compacted properly
- Inner area of the socket is to be protected against penetration of concrete
- Inner area of the socket made of galvanised steel is to be protected against water
- Inner area of the socket made of stainless steel is to be protected against oil
- Maximum installation torque and the minimum and maximum screw-in depth given in Annex B3 must not be exceeded

Schroeder fixing anchor List 20 SL	Annex B2
Intended use Specifications	

Table B1: Minimum and maximum screw-in depths

Anchor			① **List 20 SL-P-zn**					
Size			M12	M16	M20	M24	M30	
max. screw-in depth	$L_{sd,max}$	[mm]	25	27	32	38	56	
min. screw-in depth	$L_{sd,min}$	[mm]	12	16	20	24	30	
Anchor			②, ③ **List 20 SL-P- A4**					
Size			M12	M16	M20	M24	M30	
max. screw-in depth	$L_{sd,max}$	[mm]	25	27	32	38	56	
min. screw-in depth	$L_{sd,min}$	[mm]	11	14	18	22	27	
Anchor			④ **List 20 SL-FW - A4**					
Size			M12	M16	M20	M24	M27	M30
max. screw-in depth	$L_{sd,max}$	[mm]	25	28	33	38	38	38
min. screw-in depth	$L_{sd,min}$	[mm]	11	14	18	22	24	27
Anchor			⑤ **List 20 SL-FW - Duplex**					
Size			M12	M16	M20	M24		
max. screw-in depth	$L_{sd,max}$	[mm]	25	28	33	38		
min. screw-in depth	$L_{sd,min}$	[mm]	11	14	18	22		
Anchor			⑥ **List 20 SL-FS-zn,** ⑦ **List 20 SL-FS- A4**					
Size			M12		M16			
Lengths	L	[mm]	55	75	45	75	≥ 30 ≤ 75	
max. screw-in depth	$L_{sd,max}$	[mm]	45	65	35	65	L - 10 [1)]	
min. screw-in depth	$L_{sd,min}$	[mm]	12		16		16	

The following applies when using threaded bars in accordance with annex A10, table A9, line 6b: Screw threaded bar fully with $L_{sd,max}$ into socket hand-tight.
1) L according to Annex A6, table A5

Table B2: Installation torque

Anchor		List 20 SL-P-zn, SL-P-A4, SL-FW-A4, SL-FW-Duplex, SL-FS-zn, SL-FS-A4					
Size		M12	M16	M20	M24	M27	M30
min. T_{inst} / max. T_{inst} for fixing bolts strength grade 5.6, 8.8, 50, 70 and 80	[Nm]	10/18	30/40	60/80	90/120	140/160	180/260

Schroeder fixing anchor List 20 SL

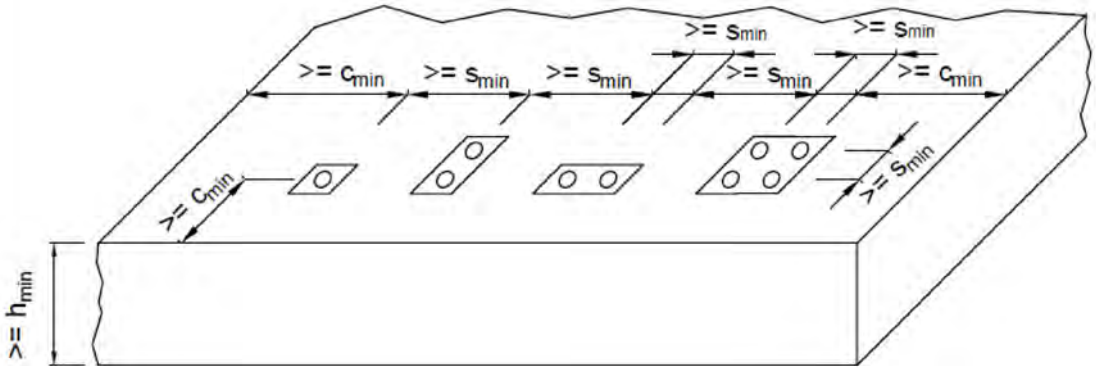
Intended use
Installation parameters

Annex B3

Table B3: Minimum thickness of concrete member, minimum spacing and edge distance

Anchor			① **List 20 SL-P-zn and** ②, ③ **List 20 SL-P-A4**						
Size	M		M12	M16	M20	M24		M30	
						P-zn	P-A4		
min. spacing	s_{min}	[mm]	50	70	80	100	80	100	
min. edge distance	c_{min}		50	50	50	70	50	100	
min. thickness of concrete member	h_{min}		h_{nom} + c_{nom} , c_{nom} acc. EN 1992-1-1:2004+AC 2010[2)]						
Anchor			④ **List 20 SL-FW-A4**				⑤ **List 20 SL-FW-Duplex**		
Size	M		M12	M16, M20	M24	M27, M30	M12	M16	M20	M24
min. spacing	s_{min}	[mm]	50	80	100	100	70	80	100	100
min. edge distance	c_{min}		50	50	70	100	50	50	70	100
min. thickness of concrete member	h_{min}		h_{nom} + c_{nom} , c_{nom} acc. EN 1992-1 -1:2004+AC 2010[2)]							
Anchor			⑥ **List 20 SL-FS-zn and** ⑦ **List 20 SL-FS-A4**						
Size	M		M12		M16				
Length	L	[mm]	55	75	45	75	30 ≤ L ≤75		
min.spacing [1)]	s_{min}		190	260	150	260	3,65 x h_{ef}		
min. edge distance [1)]	c_{min}		95	130	75	130	0,5 x s_{min}		
min. thickness of concrete member	h_{min}		h_{nom} + c_{nom} , c_{nom} acc. EN 1992-1-1:2004+AC 2010[2)]						

1) intermediate values can be obtained by linear interpolation.
2.) h_{nom} considers length of the anchor L and thickness (t_v) of optional installation aids (type c and d) acc. Annex A7



The spacing, edge distances and min. thicknesses of concrete member apply analogously when installing sockets in the end face of concrete member.

Schroeder fixing anchor List 20 SL

Intended use
Minimum thickness of concrete member, minimum spacing and edge distance

Annex B4

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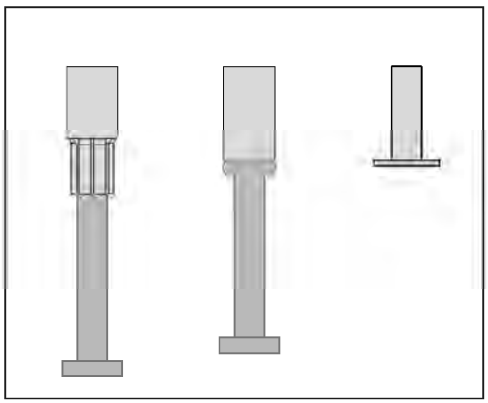
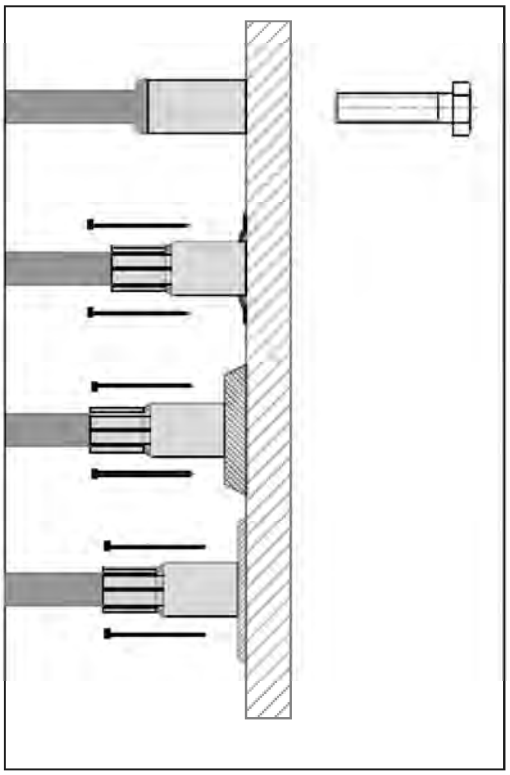
Installation instructions – part 1

1. Scope of supply



a. Select anchor according to drawings/documents.
   - List 20 SL-P-zn
   - List 20 SL-P-A4
   - List 20 SL-FW-A4
   - List 20 SL-FW-Duplex
   - List 20 SL-FS-zn
   - List 20 SL-FS-A4

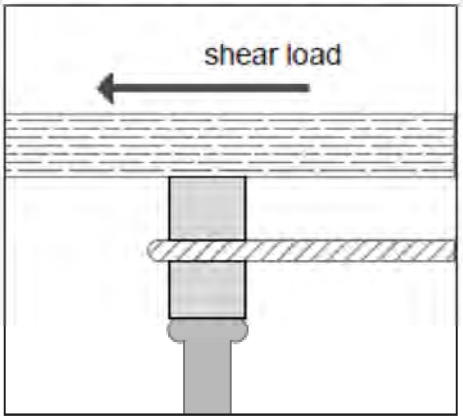
2. Fixing anchor on formwork



a. Fix anchor on formwork with:
   - a screw
   - a nailing plate welded to the socket
   - a plastic nailing plate
   - an adhesive plate

b. Prevent water and concrete from reaching the inside of the socket.

c. Install additional reinforcement if necessary. In the case of additional reinforcement to resist shear on the socket, make sure that the steel reinforcement presses against the socket.



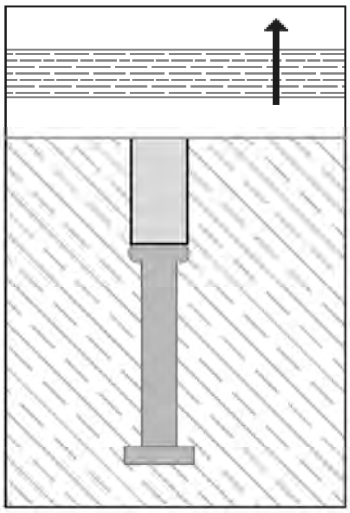
Schroeder fixing anchor List 20 SL	Annex B5
Intended use Installation instructions – part 1	

Deutsches Institut für Bautechnik DIBt

Installation instructions – part 2

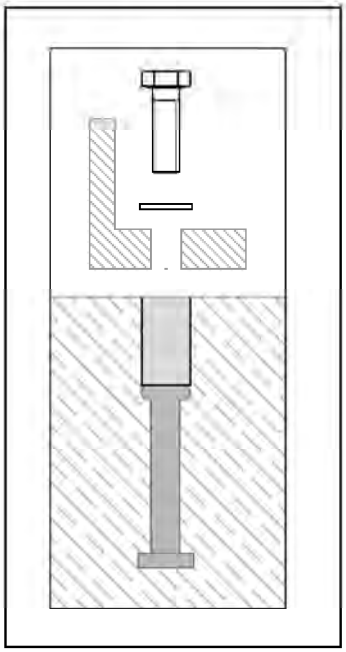
3. Pouring and compacting the concrete
   - Place the concrete carefully.
   - Make sure that the anchors do not move out of position.
   - Avoid contact between tools and anchors and if applicable additional reinforcement.
   - Do not move anchors by force or damage them

4. Setting of concrete and striking formwork



a. Make sure that the concrete has reached the necessary concrete compressive strength.
b. Remove fixing accessories and formwork.
c. Check thread for soiling and clean if necessary.
d. If necessary, insert a seal cap to protect the socket against soiling prior to mounting the fixing on the concrete.

5. Mounting fixture



a. Make sure that the concrete has reached the necessary concrete compressive strength
b. Check that the screw or threaded rod has the right length according to Annex B3, table B1
c. Remove seal cap if necessary
d. Components according to Annex A10, Line 5 to 7b
e. Mount the fixture.
f. The following applies when using threaded bars: Screw threaded bar fully into socket hand-tight.
g. Installation torque T_{Inst} according to Annex B3, Table B2 must not be exceeded
h. If available, follow the installation instructions for the respective fixing being mounted.

Schroeder fixing anchor List 20 SL	Annex B6
Intended use Installation instructions – part 2	

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Table C1: Characteristic resistances under tension load – steel failure

Anchor			**① List 20 SL-P-zn**				
Size			M12	M16	M20	M24	M30
Steel failure - with screw grade 5.6							
Characteristic resistance	$N_{Rk,s}$	[kN]	42.2	78.4	122.4	176.3	280.3
Partial safety factor [1]	γ_{Ms}	-	2.00				
Steel failure - with screw grade 8.8							
Characteristic resistance	$N_{Rk,s}$	[kN]	33.7	62.4	94.5	133.2	230.7
Partial safety factor [1]	γ_{Ms}	-	1.59	1.50			

Anchor			**List 20 SL-P-A4**				
			②		③		
Size			M12	M16	M20	M24	M30
Steel failure - with stainless steel screw grade 50							
Characteristic resistance	$N_{Rk,s}$	[kN]	42.2	80.7	122.4	165.7	279.9
Partial safety factor [1]	γ_{Ms}	-	2.94		2.86	2.94	
Steel failure - with stainless steel screw grade 70 or 80							
Characteristic resistance	$N_{Rk,s}$	[kN]	42.2	80.7	138.8	165.7	279.9
Partial safety factor [1]	γ_{Ms}	-	2.94				

Anchor			**④ List 20 SL-FW-A4**					
Size			M12	M16	M20	M24	M27	M30
Steel failure - with stainless steel screw grade 50								
Characteristic resistance	$N_{Rk,s}$	[kN]	42.2	78.4	122.4	176.3	229.7	280.3
Partial safety factor [1]	γ_{Ms}	-	2.86					
Steel failure - with stainless steel screw grade 70 or 80								
Characteristic resistance	$N_{Rk,s}$	[kN]	36.9	117.1	94.5	177.0	230.7	230.7
Partial safety factor [1]	γ_{Ms}	-	1.50	2.03	1.50			

Anchor			**⑤ List 20 SL-FW-Duplex**			
Size			M12	M16	M20	M24
Steel failure – with stainless steel screw grade 70						
Characteristic resistance	$N_{Rk,s}$	[kN]	59.0	109.7	171.4	246.8
Partial safety factor [1]	γ_{Ms}	-	1.87			
Steel failure – with stainless steel screw grade 80						
Characteristic resistance	$N_{Rk,s}$	[kN]	59.1	94.5	178.6	229.4
Partial safety factor [1]	γ_{Ms}	-	1.57	1.50		

Anchor			**⑥ List 20 SL-FS-zn**		**⑦ List 20 SL-FS-A4**	
Size			M12	M16	M12	M16
Steel failure - with screw			**grade 5.6**		**stainless steel grade 50**	
Characteristic resistance	$N_{Rk,s}$	[kN]	42.2	78.4	32.4	75.1
Partial safety factor [1]	γ_{Ms}	-	2.00		2.94	
Steel failure - with screw			**grade 8.8**		**stainless steel grade 70 or 80**	
Characteristic resistance	$N_{Rk,s}$	[kN]	40.5	77.4	32.4	75.1
Partial safety factor [1]	γ_{Ms}	-	1.59		2.94	

1) In absence of other national regulations.

Schroeder fixing anchor List 20 SL

Performances
Characteristic resistances under tension load – steel failure

Annex C1

Table C2: Characteristic resistances under tension load - pull-out failure

Anchor			**① List 20 SL-P-zn**				
Size			M12	M16	M20	M24	M30
Pull-out failure							
Cracked concrete - C20/25	$N_{Rk,p}$	[kN]	31	54	91	78	115
Uncracked concrete - C20/25	$N_{Rk,p}$	[kN]	43	75	127	109	161

Anchor			**List 20 SL-P-A4**				
			②		③		
Size			M12	M16	M20	M24	M30
Pull-out failure							
Cracked concrete - C20/25	$N_{Rk,p}$	[kN]	31	54	91	91	115
Uncracked concrete - C20/25	$N_{Rk,p}$	[kN]	43	75	127	127	161

Anchor			**④ List 20 SL-FW-A4**					
Size	-	[mm]	M12	M16	M20	M24	M27	M30
Pull-out failure								
Cracked concrete - C20/25	$N_{Rk,p}$	[kN]	31	91	91	87	115	115
Uncracked concrete - C20/25	$N_{Rk,p}$	[kN]	43	127	127	122	161	161

Anchor			**⑤ List 20 SL-FW-Duplex**			
Size	-	[mm]	M12	M16	M20	M24
Pull-out failure						
Cracked concrete - C20/25	$N_{Rk,p}$	[kN]	54	91	87	115
Uncracked concrete - C20/25	$N_{Rk,p}$	[kN]	75	127	122	161

Anchor			**⑥ List 20 SL-FS-zn**		**⑦ List 20 SL-FS-A4**	
Size	-	[mm]	M12	M16	M12	M16
Pull-out failure						
Cracked concrete - C20/25	$N_{Rk,p}$	[kN]	116	136	116	136
Uncracked concrete - C20/25	$N_{Rk,p}$	[kN]	163	191	163	191

Anchor			**List 20 SL-P-zn, SL-P-A4, SL-FW-A4, SL-FW-Duplex, SL-FS-zn, SL-FS-A4**					
Factors for increasing $N_{Rk,p}$ in cracked and uncracked concrete	ψ_c	-	C25/30:	1.20		C40/50:	2.00
			C30/37:	1.48		C45/55:	2.20
			C35/45:	1.80		C50/60:	2.40
Partial safety factor [1)]	γ_{Mp}	-	1.50				

1) In absence of other national regulations.

Schroeder fixing anchor List 20 SL

Performances
Characteristic resistances under tension load – pull-out

Annex C2

Table C3: Characteristic resistances under tension load – concrete cone failure, splitting failure

Anchor			**① List 20 SL-P-zn, ②/ ③ SL-P-A4, ④ SL-FW-A4, ⑤ SL-FW-Duplex**
size			all sizes
Concrete cone failure			
Effective embedment depth	h_{ef} [1]	[mm]	$h_{ef} = h_{nom} - k$
Factor accounting for anchorage mechanism in cracked and uncracked concrete	k_{cr}	-	8.5
	k_{ucr}	-	11,9
Characteristic spacing	$s_{cr,N}$	[mm]	$3.0 \times h_{ef}$
Characteristic edge distance	$c_{cr,N}$	[mm]	$1.5 \times h_{ef}$
Partial safety factor [2]	γ_{Mc}	-	1.50
Splitting failure			
Effective embedment depth	h_{ef} [1]	[mm]	$h_{ef} = h_{nom} - k$
Characteristic spacing	$s_{cr,sp}$ [3]	[mm]	$3.0 \times h_{ef}$
Characteristic edge distance	$c_{cr,sp}$ [3]	[mm]	$1.5 \times h_{ef}$
Partial safety factor [2]	γ_{Msp}	-	1.50

Anchor			**⑥ List 20 SL-FS-zn, ⑦ SL-FS-A4**
size			all sizes
Concrete cone failure			
Effective embedment depth	h_{ef} [1]	[mm]	$h_{ef} = h_{nom} - t_{Fp}$
Factor accounting for anchorage mechanism in cracked and uncracked concrete	k_{cr}	-	8.5
	k_{ucr}	-	11.9
Characteristic spacing	$s_{cr,N}$	[mm]	$5.56 \times h_{ef}$
Characteristic edge distance	$c_{cr,N}$	[mm]	$2.78 \times h_{ef}$
Partial safety factor [2]	γ_{Mc}	-	1.50
Splitting failure			
Effective embedment depth	h_{ef} [1]	[mm]	$h_{ef} = h_{nom} - t_{Fp}$
Characteristic spacing	$s_{cr,sp}$ [3]	[mm]	$5.56 \times h_{ef}$
Characteristic edge distance	$c_{cr,sp}$ [3]	[mm]	$2.78 \times h_{ef}$
Partial safety factor [2]	γ_{Msp}	-	1.50

1) h_{nom} = L without plastic installation aids acc. Annex A7, h_{nom} = L + t_v with plastic installation aids acc. Annex A7
2) In absence of other national regulations.
3) reinforcement resists splitting forces and limits crack width to w ≤ 0.3 mm acc. CEN/TS 1992-4-2:2009, section 6.2.6.2.

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Table C4: Displacement under tension load

Anchor			① **List 20 SL-P-zn**				
Size			M12	M16	M20	M24	M30
Headed stud diameter	d_1	[mm]	10	13	16	19	25
Displacements of up to 0.7 mm in the case of short term tensile actions in cracked and uncracked concrete under following loads [1)]		[kN]	14	20	25	30	45

Anchor			**List 20 SL-P-A4**				
			②		③		
Size			M12	M16	M20	M24	M30
Headed stud diameter	d_1	[mm]	10	13	16	16	25
Displacements of up to 0.7 mm in the case of short term tensile actions in cracked and uncracked concrete under following loads [1)]		[kN]	14	20	25	25	45

Anchor			④ **List 20 SL-FW-A4**					
Size			M12	M16	M20	M24	M27	M30
Headed stud diameter	d_1	[mm]	10	16	16	22	25	25
Displacements of up to 0.7 mm in the case of short term tensile actions in cracked and uncracked concrete under following loads [1)]		[kN]	14	25	25	35	45	45

Anchor			⑤ **List 20 SL-FW-Duplex**			
Size			M12	M16	M20	M24
Headed stud diameter	d_1	[mm]	13	16	22	25
Displacements of up to 0.7 mm in the case of short term tensile actions in cracked and uncracked concrete under following loads [1)]		[kN]	20	25	35	45

Anchor			⑥ **List 20 SL-FS-zn**		⑦ **List 20 SL-FS-A4**	
Size			M12	M16	M12	M16
Displacements of up to 0.7 mm in the case of short term tensile actions in cracked and uncracked concrete under following loads [1)]		[kN]	11	21	11	21

1) Displacements can increase to max. 1.8 mm under long term

Schroeder fixing anchor List 20 SL

Performances
Characteristic resistances under tension load - displacement

Annex C4

Table C5: Characteristic resistances under shear load - steel failure

Anchor			① Liste 20 SL-P-zn				
Size			M12	M16	M20	M24	M30
Shear load without lever arm - Steel failure with screw grade 5.6							
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	39.2	61.2	88.1	140.2
Partial safety factor [1]	γ_{Ms}	-	1.67				
Shear load without lever arm - Steel failure with screw grade 8.8							
Characteristic resistance	$V_{Rk,s}$	[kN]	20.2	38.7	66.6	79.5	134.3
Partial safety factor [1]	γ_{Ms}	-	1.32				
Shear load with lever arm - Steel failure with screw grade 5.6							
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	65.5	166.5	324.5	561.3	1,124.5
Partial safety factor [1]	γ_{Ms}	-	1.67				
Shear load with lever arm - Steel failure with screw grade 8.8							
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	104.8	266.4	519.3	898.0	1,799.2
Partial safety factor [1]	γ_{Ms}	-	1.25				

Anchor			Liste 20 SL-P-A4				
			②		③		
Size			M12	M16	M20	M24	M30
Shear load without lever arm - stainless steel screw grade 50							
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	40.3	61.2	82.9	140.0
Partial safety factor [1]	γ_{Ms}	-	2.45		2.38	2.45	
Shear load without lever arm - stainless steel screw grade 70 or 80							
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	40.3	69.4	82.9	140.0
Partial safety factor [1]	γ_{Ms}	-	2.45				
Shear load with lever arm - stainless steel screw grade 50							
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	65.5	166.5	324.5	561.3	1,124.5
Partial safety factor [1]	γ_{Ms}	-	2.38				
Shear load with lever arm - stainless steel screw grade 70							
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	91.7	233.1	454.5	1,195.9	1,574.3
Partial safety factor [1]	γ_{Ms}	-	1.56			2.45	1.56
Shear load with lever arm - stainless steel screw grade 80							
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	151.4	390.4	846.3	1,195.9	2,543.9
Partial safety factor [1]	γ_{Ms}	-	2.45				

1) In absence of other national regulations.

Schroeder fixing anchor List 20 SL

Performances
Characteristic resistances under shear load, steel failure – List 20 SL-P-zn and -A4

Annex C5

Table C6: Characteristic resistances under shear load - steel failure

Anchor			**④ List 20 SL-FW-A4**					
Size			M12	M16	M20	M24	M27	M30
Shear load without lever arm - stainless steel screw grade 50								
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	39.2	61.2	88.1	114.9	140.2
Partial safety factor [1)]	γ_{Ms}	-	2.38					
Shear load without lever arm - stainless steel screw grade 70								
Characteristic resistance	$V_{Rk,s}$	[kN]	29.6	58.5	77.9	123.4	199.2	196.2
Partial safety factor [1)]	γ_{Ms}	-	1.69		2.00	1.56	2.00	1.56
Shear load without lever arm - stainless steel screw grade 80								
Characteristic resistance	$V_{Rk,s}$	[kN]	29.6	58.5	77.9	165.4	199.2	257.5
Partial safety factor [1)]	γ_{Ms}	-	1.69		2.00			
Shear load with lever arm - stainless steel screw grade 50								
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	65.5	166.5	324.5	561.3	833.3	1,124.5
Partial safety factor [1)]	γ_{Ms}	-	2.38					
Shear load with lever arm - stainless steel screw grade 70								
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	91.7	233.1	454.4	785.8	1,166.6	1,574.3
Partial safety factor [1)]	γ_{Ms}	-	1.56					
Shear load with lever arm - stainless steel screw grade 80								
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	104.8	266.4	519.3	898.0	1,333.3	1,799.2
Partial safety factor [1)]	γ_{Ms}	-	1.33					

Anchor			**⑤ List 20 SL-FW-Duplex**			
Size			M12	M16	M20	M24
Shear load without lever arm - with stainless steel screw grade 70						
Characteristic resistance	$V_{Rk,s}$	[kN]	29.5	54.8	85.7	123.4
Partial safety factor [1)]	γ_{Ms}	-	1.56			
Shear load without lever arm - with stainless steel screw grade 80						
Characteristic resistance	$V_{Rk,s}$	[kN]	29.6	58.5	97.9	141.0
Partial safety factor [1)]	γ_{Ms}	-	1.30		1.33	
Shear load with lever arm - with stainless steel screw grade 70						
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	91.7	233.1	454.4	785.8
Partial safety factor [1)]	γ_{Ms}	-	1.56			
Shear load with lever arm - with stainless steel screw grade 80						
Characteristic resistance	$M^{\circ}_{Rk,s}$	[Nm]	104.8	266.4	519.3	898.0
Partial safety factor [1)]	γ_{Ms}	-	1.33			

1) In absence of other national regulations.

Schroeder fixing anchor List 20 SL

Performances
Characteristic resistances under shear load, steel failure – List 20 SL-FW-A4 and –Duplex

Annex C6

Table C7: Characteristic resistances under shear load - steel failure

Anchor			**⑥ List 20 SL-FS-zn**	
Size			M12	M16
Shear load without lever arm - Steel failure with screw grade 5.6				
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	39.2
Partial safety factor [1)]	γ_{Ms}	-	1.67	
Shear load without lever arm - Steel failure with screw grade 8.8				
Characteristic resistance	$V_{Rk,s}$	[kN]	20.2	38.7
Partial safety factor [1)]	γ_{Ms}	-	1.32	
Shear load with lever arm - Steel failure with screw grade 5.6				
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	65.5	166.5
Partial safety factor [1)]	γ_{Ms}	-	1.67	
Shear load with lever arm - Steel failure with screw grade 8.8				
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	104.8	266.4
Partial safety factor [1)]	γ_{Ms}	-	1.25	

Anchor			**⑦ List 20 SL-FS-A4**	
Size			M12	M16
Shear load without lever arm - Steel failure with screw grade 50				
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	40.3
Partial safety factor [1)]	γ_{Ms}	-	2.45	
Shear load without lever arm - Steel failure with screw grade 70 or 80				
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	40.3
Partial safety factor [1)]	γ_{Ms}	-	2.45	
Shear load with lever arm - Steel failure with screw grade 50				
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	65.5	166.5
Partial safety factor [1)]	γ_{Ms}	-	2.38	
Shear load with lever arm - Steel failure with screw grade 70				
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	91.7	233.1
Partial safety factor [1)]	γ_{Ms}	-	1.56	
Shear load with lever arm - Steel failure with screw grade 80				
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	151.4	390.4
Partial safety factor [1)]	γ_{Ms}	-	2.45	

1) In absence of other national regulations.

Schroeder fixing anchor List 20 SL

Performances
Characteristic resistances under shear load, steel failure – List 20 SL-FS-zn and -A4

Annex C7

Table C8: Characteristic resistances under shear load – concrete failure

Anchor				**① List 20 SL-P-zn ② ③ List 20 SL-P-A4**				
Size				M12	M16	M20	M24	M30
Concrete pry-out failure								
Factor		k_3	-	2.00				
Partial safety factor [1]		γ_{Mcp}	-	1.50				
Concrete edge failure (without supplementary reinforcement)								
Effective socket length		l_f	[mm]	h_{ef}				
Effective outside diameter		d_{nom}	[mm]	15.5	21.1	27	31	39.5
Partial safety factor [1]		γ_{Mc}	-	1.50				

Anchor				**④ List 20 SL-FW-A4 ⑤ List 20 SL-FW-Duplex**					
Size				M12	M16	M20	M24	M27	M30
Concrete pry-out failure									
Factor		k_3	-	2.00					
Partial safety factor [1]		γ_{Mcp}	-	1.50					
Concrete edge failure (without supplementary reinforcement)									
Effective socket length		l_f	[mm]	h_{ef}					
Effective out-side diameter	A4	d_{nom}	[mm]	16	22	27	36	40	45
	Duplex			16	22	28	35	-	-
Partial safety factor [1]		γ_{Mc}	-	1.50					

Anchor			**⑥ List 20 SL-FS-zn**		**⑦ List 20 SL-FS-A4**	
Size			M12	M16	M12	M16
Concrete pry-out failure						
Factor	k_3	-	k_3= 1.0 for h_{ef} < 60 mm k_3= 2.0 for h_{ef} ≥ 60 mm			
Partial safety factor [1]	γ_{Mcp}	-	1.50			
Concrete edge failure (without supplementary reinforcement)						
Effective socket length	l_f	[mm]	h_{ef}			
Effective outside diameter	d_{nom}	[mm]	15.5	21.1	15.5	21.1
Partial safety factor [1]	γ_{Mc}	-	1.50			

1) In absence of other national regulations.

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Table C9: Displacements under shear load

Anchor		① **List 20 SL-P-zn**				
Size		M12	M16	M20	M24	M30
Displacements of up to 1.5 mm in the case of short term actions in cracked and uncracked concrete under following shear loads [1)]	[kN]	15	20	30	45	75

Anchor		② ③ **List 20 SL-P-A4**				
Size		M12	M16	M20	M24	M30
Displacements of up to 1.5 mm in the case of short term actions in cracked and uncracked concrete under following shear loads [1)]	[kN]	15	20	30	30	75

Anchor		④ **List 20 SL-FW-A4**					
Size		M12	M16	M20	M24	M27	M30
Displacements of up to 1.5 mm in the case of short term actions in cracked and uncracked concrete under following shear loads [1)]	[kN]	15	30	30	60	75	75

Anchor		⑤ **List 20 SL-FW-Duplex**			
Size		M12	M16	M20	M24
Displacements of up to 1.5 mm in the case of short term actions in cracked and uncracked concrete under following shear loads [1)]	[kN]	20	30	60	75

Anchor		⑥ **List 20 SL-FS-zn**		⑦ **List 20 SL-FS-A4**	
Size		M12	M16	M12	M16
Displacements of up to 1.5 mm in the case of short term actions in cracked and uncracked concrete under following shear loads [1)]	[kN]	11	21	11	21

1) Displacements can increase to max. 2.0 mm under long term loads.

Schroeder fixing anchor List 20 SL

Performances
Displacements under shear load

Annex C9