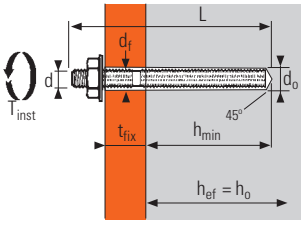
EPCON G5

Zinc Coated Anchor Stud (G5.8)

Epoxy Resin - High Performance

Performance	Material	Installation
	Zn	

ICC-ES EVALUATION REPORT



Technical Data

EPCON G5 with Chemset Stud	Anchor depth (mm)	Max thick of fixture (mm)	Drill depth (mm)	Min thick of base material (mm)	Ø Thread (mm)	Ø Drill bit (mm)	Total anchor length (mm)	Max tighten torque (Nm)	Chemset stud code	Ramset power tool code	Drill bit type-size
	$h_{ef,min}$	t_{fix}	h_o	h_{min}	d	d_o	L	T_{inst}			
M8	80	15	80	100	8	10	110	10	CS08110	DD527	R3 PLUS-10
M10	90	20	90	115	10	12	130	20	CS10130	DD527	R3 PLUS-12
M12	110	25	110	140	12	14	160	30	CS12160	DD527	R3 PLUS-14
M16	125	35	125	160	16	18	190	60	CS16190	DD543	R3 PLUS-18
M20	170	65	170	215	20	25	260	120	CS20260	DD565	R3 MAX-25
M24	210	63	210	270	24	28	300	200	CS24300	DD565	R3 MAX-28
M30	280	70	280	350	30	35	380	400	CS30380	DD565	R3 MAX-35

EPOXY G5 Two part cartridge, 100% epoxy resin - vol. 650ml

MATERIAL

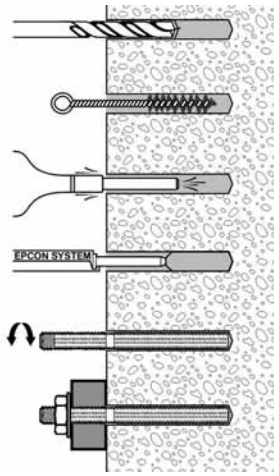
Stud:
Grade 5.8

Hexagonal Nut:
Grade 6 or 8

Washer:
Steel

Coating:
Zinc Coated 5µm

INSTALLATION



Anchor Mechanical Properties

CARBON STEEL Grade 5.8	M8	M10	M12	M16	M20	M24	M30
f_{uk} (N/mm²) Min. tensile strength	540	540	540	520	520	520	520
f_{yk} (N/mm²) Yield strength	430	430	430	420	420	420	420
A_s (mm²) Stressed cross-section	36.6	58	84.3	157	245	353	522.8
W_{el} (mm³) Elastic section modulus	31.2	62.3	109.2	277.5	540.9	935.5	1,686.0
$M^0_{Rk,s}$ (Nm) Characteristic bending moment	20.2	40.4	70.7	173.1	337.5	583.8	1,052.1
M (Nm) Recommended bending moment	16.2	32.3	56.6	138.5	270.0	467.0	841.7

Setting Time before applying load

Ambient temperature (ºC)	Max time for installation (min)	Waiting time before applying load (hr)
32ºC	8.5	2
27ºC	12	2
20ºC	15	2
16ºC	18	3
10ºC	21	6

Chemical Resistance of EPCON G5 Anchor

Chemical substances	Resistance	Chemical substances	Resistance
Xylene	1	Toluene	2
Gasoline	1	10% Nitric Acid	2
20% Caustic NaOH (Sodium Hydroxide)	1	8.5% Ammonium Hydroxide	2
Fresh Water	1	5% Bleach	3
Salt Water	1	Acetone	3
10% Sulfuric Acid (H2 SO4)	2	Glacial Acetic Acid	3
3.5% Hydrochloric Acid (HCL)	2	Methanol	3
9% Phosphoric Acid	2	Methylene Chloride	3

1 = High resistance (Anchors could be submerged in these materials)
2 = Medium resistance (Anchors could be temporary submerged due to splash or spill)
3 = Low resistance (Anchors should be limited to splash and spill followed by immediate cleanup)

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Number of Anchors per cartridge

Stud diameter	8	10	12	16	20	24	30
Drilling Ø (mm)	10	12	14	18	25	28	35
Drilling depth (mm)	80	90	110	125	170	210	280
No. of anchors per cartridge							
EPCON G5 (650ml)	206.9	127.7	76.8	40.9	15.6	10.1	4.8

Ultimate Loads ($N_{Ru,m}$, $V_{Ru,m}$) / Characteristic Loads (N_{Rk}, V_{Rk}) in kN

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef} (mm)	80	90	110	125	170	210	280
$N_{Ru,m}$ (kN)	21.3	33.8	49.2	88.2	137.6	198.2	293.6
N_{Rk} (kN)	19.8	31.3	45.5	81.6	127.4	183.6	271.9

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Ru,m}$ (kN)	12.8	20.3	29.5	52.9	82.6	118.9	176.2
V_{Rk} (kN)	11.9	18.8	27.3	49.0	76.4	110.1	163.1

Design Loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}}{\gamma_{Mc,N}} \qquad V_{Rd} = \frac{V_{Rk}}{\gamma_{Ms,V}}$$

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef} (mm)	80	90	110	125	170	210	280
N_{Rd} (kN)	13.2	20.9	30.3	54.4	84.9	122.4	181.2

$\gamma_{Ms,N} = 1.5$ *(steel failure)*

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rd} (kN)	9.5	15.0	21.9	39.2	61.2	88.1	130.5

$\gamma_{Ms,V} = 1.25$

Recommended Loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}}{\gamma_{Mc,N} \cdot \gamma_F} \qquad V_{rec} = \frac{V_{Rk}}{\gamma_{Ms,V} \cdot \gamma_F}$$

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef} (mm)	80	90	110	125	170	210	280
N_{rec} (kN)	9.4	14.9	21.7	38.9	60.7	87.4	129.5

$\gamma_F = 1.4$

$\gamma_{Ms,N} = 1.5$ *(steel failure)*

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{rec} (kN)	6.8	10.7	15.6	28.0	43.7	62.9	93.2

$\gamma_F = 1.4$

$\gamma_{Ms,V} = 1.25$

steel failure

EPCON G5

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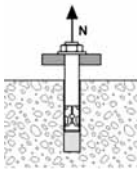
CC-Method

TENSILE in kN

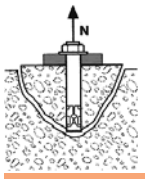


Pull-out resistance
Concrete strength 30 N/mm²

$$N_{Rd,p} = N^0_{Rd,p} \cdot f_B \cdot f_T$$

$N^0_{Rd,p}$	Design pull-out resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
h_{ef}	80	90	110	125	170	210	280
$N^0_{Rd,p}$ (kN)	15.3	26.7	33.8	45.5	59.1	90.1	150.1

$\gamma_{Mc,N} = 1.8$

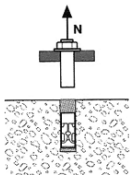


Concrete cone resistance
Concrete strength 30 N/mm²

$$N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_T \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,c}$	Design cone resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
h_{ef} (mm)	80	90	110	125	170	210	280
$N^0_{Rd,c}$ (kN)	26.3	31.4	42.5	51.4	81.6	112.0	172.5

$\gamma_{Mc,N} = 1.5$

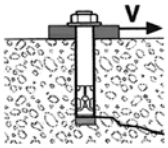


Steel resistance

$N_{Rd,s}$	Steel design tensile resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
$N_{Rd,s}$ (kN)	13.2	20.9	30.3	54.4	84.9	122.4	181.2

$\gamma_{Ms,N} = 1.5$

SHEAR in kN

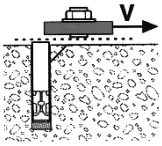


Concrete edge resistance
Concrete strength 30 N/mm²

$$V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_{\beta,V} \cdot \Psi_{s\text{-}c,V}$$

$V^0_{Rd,c}$	Design concrete edge resistance at a minimum edge distance (c_{min})						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
h_{ef} (mm)	80	90	110	125	170	210	280
c_{min}	40	45	55	65	85	105	140
s_{min}	40	45	55	65	85	105	140
$V^0_{Rd,c}$ (kN)	2.6	3.4	5.1	7.3	12.4	18.7	32.6

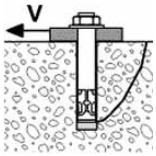
$\gamma_{Mc,V} = 1.5$



Steel resistance

$V_{Rd,s}$	Steel design shear resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
$V_{Rd,s}$ (kN)	9.5	15.0	21.9	39.2	61.2	88.1	130.5

$\gamma_{Ms,V} = 1.25$



Concrete pry-out failure
Concrete Strength 30 N/mm²

$$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_B \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp}$	Design pry-out resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
$V^0_{Rd,cp}$ (kN)	52.7	62.9	84.9	102.9	163.2	224.0	344.9

$\gamma_{Mc,V} = 1.5$

$$N_{Rd} = \min (N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$$
$$\beta N = N_{Sd} / N_{Rd} \le 1$$

$$V_{Rd} = \min (V_{Rd,c} ; V_{Rd,s} ; V_{Rd,cp})$$
$$\beta V = V_{Sd} / V_{Rd} \le 1$$

$$\beta N + \beta V \le 1.2$$

f_B INFLUENCE OF CONCRETE

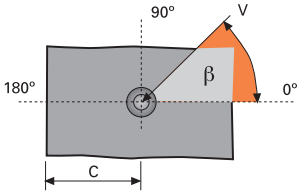
Concrete Grade	f_B	Concrete Grade	f_B
C16/20	0.81	C35/45	1.21
C20/25	0.90	C40/50	1.28
C25/30	1.00	C45/55	1.34
C30/37	1.10	C50/60	1.40

f_T INFLUENCE OF EMBEDMENT DEPTH

$$f_T = \frac{h_{act}}{h_{ef}} \quad \text{where: } h_{ef} \le h_{act} \le 2h_{ef}$$

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

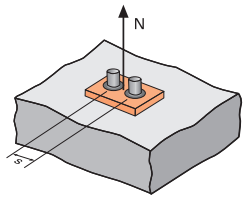
Angle β [°]	$f_{\beta,V}$
0~50	1.0
60	1.1
70	1.2
80	1.5
90~180	2.0



EPCON G5
Zinc Coated Anchor Stud (G5.8)

CC-Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0.5 + \frac{s}{4h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{min} = 0.5h_{ef}$

$s_{cr,N} = 2h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

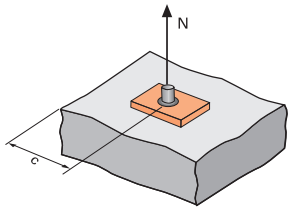
Spacing, s — Reduction Factor Ψ_s Non-cracked concrete

	M8	M10	M12	M16
40	0.63			
45	0.64	0.63		
55	0.67	0.65	0.63	
65	0.70	0.68	0.65	0.63
85	0.77	0.74	0.69	0.67
105	0.83	0.79	0.74	0.71
140	0.94	0.89	0.82	0.78
160	1.00	0.94	0.86	0.82
180		1.00	0.91	0.86
220			1.00	0.94
250				1.00

Spacing, s — Reduction Factor Ψ_s Non-cracked concrete

	M20	M24	M30
85	0.63		
105	0.65	0.63	
140	0.71	0.67	0.63
160	0.74	0.69	0.64
180	0.76	0.71	0.66
220	0.82	0.76	0.70
250	0.87	0.80	0.72
300	0.94	0.86	0.77
340	1.00	0.90	0.80
370		0.94	0.83
420		1.00	0.88
560			1.00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0.275 + 0.725 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{min} = 0.5h_{ef}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group

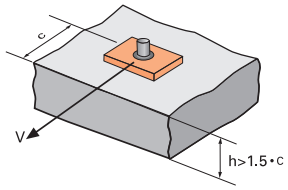
Edge, c — Reduction Factor $\Psi_{c,N}$ Non-cracked concrete

	M8	M10	M12	M16
40	0.63			
45	0.68	0.63		
55	0.77	0.71	0.63	
65	0.86	0.79	0.70	0.65
80	1.00	0.91	0.80	0.73
90		1.00	0.86	0.79
110			1.00	0.91
125				1.00

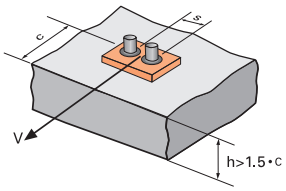
Edge, c — Reduction Factor $\Psi_{c,N}$ Non-cracked concrete

	M20	M24	M30
85	0.63		
105	0.72	0.63	
120	0.78	0.68	
140	0.87	0.75	0.63
170	1.00	0.86	0.71
210		1.00	0.81
250			0.92
280			1.00

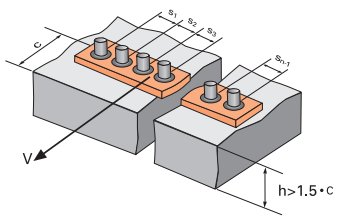
$\Psi_{s-c,V}$ INFLUENCED OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



$$\Psi_{s-c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



$$\Psi_{s-c,V} = \frac{3c + s}{6c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



FOR SINGLE ANCHOR FASTENING — Reduction Factor $\Psi_{s-c,V}$ Non-cracked concrete

$\frac{c}{c_{min}}$	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
$\Psi_{s-c,V}$	1.00	1.31	1.66	2.02	2.41	2.83	3.26	3.72	4.19	4.69	5.20	5.72

FOR 2 ANCHORS FASTENING — Reduction Factor $\Psi_{s-c,V}$ Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
1.0	0.67	0.84	1.03	1.22	1.43	1.65	1.88	2.12	2.36	2.62	2.89	3.16
1.5	0.75	0.93	1.12	1.33	1.54	1.77	2.00	2.25	2.50	2.76	3.03	3.31
2.0	0.83	1.02	1.22	1.43	1.65	1.89	2.12	2.38	2.63	2.90	3.18	3.46
2.5	0.92	1.11	1.32	1.54	1.77	2.00	2.25	2.50	2.77	3.04	3.32	3.61
3.0	1.00	1.20	1.42	1.64	1.88	2.12	2.37	2.63	2.90	3.18	3.46	3.76
3.5		1.30	1.52	1.75	1.99	2.24	2.50	2.76	3.04	3.32	3.61	3.91
4.0			1.62	1.86	2.10	2.36	2.62	2.89	3.17	3.46	3.75	4.05
4.5				1.96	2.21	2.47	2.74	3.02	3.31	3.60	3.90	4.20
5.0					2.33	2.59	2.87	3.15	3.44	3.74	4.04	4.35
5.5						2.71	2.99	3.28	3.57	3.88	4.19	4.50
6.0						2.83	3.11	3.41	3.71	4.02	4.33	4.65

FOR OTHER CASE OF FASTENINGS

$$\Psi_{s-c,V} = \frac{3c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3nc_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

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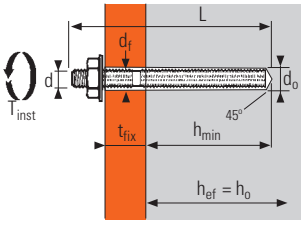
Epoxy Resin - High Performance

Performance	Material	Installation
	Zn	

ICC-ES EVALUATION REPORT



MATERIAL

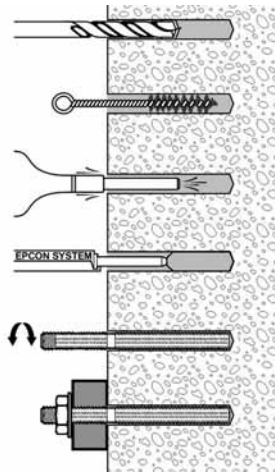
Stud:
Grade 8.8

Hexagonal Nut:
Grade 8 or 10

Washer:
Steel

Coating:
Zinc Coated 5µm

INSTALLATION



Technical Data

EPCON G5	Anchor depth (mm)	Max thick of fixture (mm)	Drill depth (mm)	Min thick of base material (mm)	Ø Thread (mm)	Ø Drill bit (mm)	Total anchor length (mm)	Max tighten torque (Nm)	Ramset power tool code	Drill bit type-size
	$h_{ef,min}$	t_{fix}	h_o	h_{min}	d	d_o	L	T_{inst}		
M8	80	15	80	100	8	10	110	10	DD527	R3 PLUS-10
M10	90	20	90	115	10	12	130	20	DD527	R3 PLUS-12
M12	110	25	110	140	12	14	160	30	DD527	R3 PLUS-14
M16	125	35	125	160	16	18	190	60	DD543	R3 PLUS-18
M20	170	65	170	215	20	25	260	120	DD565	R3 MAX-25
M24	210	63	210	270	24	28	300	200	DD565	R3 MAX-28
M27	240	60	240	300	27	30	340	300	DD565	R3 MAX-30
M30	280	70	280	350	30	35	380	400	DD565	R3 MAX-35
M33	300	80	300	375	33	38	420	1200	DD565	R3 MAX-38
M36	330	90	330	413	36	40	460	1500	DD565	R3 MAX-40
M39	360	100	360	450	39	45	510	1800	DD565	R3 MAX-45

Anchor Mechanical Properties

CARBON STEEL Grade 8.8	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
f_{uk} (N/mm²) Min. tensile strength	800	800	800	800	800	800
f_{yk} (N/mm²) Yield strength	640	640	640	640	640	640
A_s (mm²) Stressed cross-section	36.6	58	84.3	157	245	353
W_{el} (mm³) Elastic section modulus	31.2	62.3	109.2	277.5	540.9	935.5
$M^0_{Rk,s}$ (Nm) Characteristic bending moment	30.0	59.8	104.8	266.4	519.3	898.1
M (Nm) Recommended bending moment	24.0	47.8	83.9	213.1	415.4	718.5
CARBON STEEL Grade 8.8		**M27**	**M30**	**M33**	**M36**	**M39**
f_{uk} (N/mm²) Min. tensile strength		800	800	800	800	800
f_{yk} (N/mm²) Yield strength		640	640	640	640	640
A_s (mm²) Stressed cross-section		427	522.8	647	759	913
W_{el} (mm³) Elastic section modulus		1,245.0	1,668.0	2,322.0	2,951.0	3,860.0
$M^0_{Rk,s}$ (Nm) Characteristic bending moment		1,195.2	1,601.3	2,229.1	2,833.0	3,705.6
M (Nm) Recommended bending moment		956.2	1,281.0	1,783.3	2,266.4	2,964.5

Setting Time before applying load

Ambient temperature (°C)	Max time for installation (min)	Waiting time before applying load (hr)
32°C	8.5	2
27°C	12	2
20°C	15	2
16°C	18	3
10°C	21	6

Chemical Resistance of EPCON G5 Anchor

Chemical substances	Resistance	Chemical substances	Resistance
Xylene	1	Toluene	2
Gasoline	1	10% Nitric Acid	2
20% Caustic NaOH (Sodium Hydroxide)	1	8.5% Ammonium Hydroxide	2
Fresh Water	1	5% Bleach	3
Salt Water	1	Acetone	3
10% Sulfuric Acid (H2 SO4)	2	Glacial Acetic Acid	3
3.5% Hydrochloric Acid (HCL)	2	Methanol	3
9% Phosphoric Acid	2	Methylene Chloride	3

1 = High resistance (Anchors could be submerged in these materials)
2 = Medium resistance (Anchors could be temporary submerged due to splash or spill)
3 = Low resistance (Anchors should be limited to splash and spill followed by immediate cleanup)

EPCON G5

Zinc Coated Anchor Stud (G8.8)

Number of Anchors per cartridge

Stud diameter	8	10	12	16	20	24	27	30	33	36	39
Drilling Ø (mm)	10	12	14	18	25	28	30	35	38	35	45
Drilling depth (mm)	80	90	110	125	170	210	240	280	300	330	360
No. of anchors per cartridge											
EPCON G5 (650ml)	206.9	127.7	76.8	40.9	15.6	10.1	7.7	4.8	3.8	3.1	2.3

Ultimate Loads ($N_{Ru,m}$, $V_{Ru,m}$) / Characteristic Loads (N_{Rk}, V_{Rk}) in kN

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24
h_{ef} (mm)	80	90	110	125	170	210
$N_{Ru,m}$ (kN)	31.6	50.1	72.8	109.1	141.8	216.2
N_{Rk} (kN)	29.3	46.4	67.4	81.8	106.3	162.1

Anchor size	M27	M30	M33	M36	M39
h_{ef} (mm)	240	280	300	330	360
$N_{Ru,m}$ (kN)	264.7	360.3	419.1	485.3	595.6
N_{Rk} (kN)	198.5	270.2	314.3	364.0	446.7

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24
$V_{Ru,m}$ (kN)	19.0	30.1	43.7	81.4	127.0	183.0
V_{Rk} (kN)	17.6	27.8	40.5	75.4	117.6	169.4

Anchor size	M27	M30	M33	M36	M39
$V_{Ru,m}$ (kN)	221.4	271.0	335.4	393.5	473.3
V_{Rk} (kN)	205.0	250.9	310.6	364.3	438.2

Design Loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}}{\gamma_{Mc,N}} \qquad V_{Rd} = \frac{V_{Rk}}{\gamma_{Ms,V}}$$

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24
h_{ef} (mm)	80	90	110	125	170	210
N_{Rd} (kN)	19.5	30.9	45.0	45.5	59.1	90.1

Anchor size	M27	M30	M33	M36	M39
h_{ef} (mm)	240	280	300	330	360
N_{Rd} (kN)	110.3	150.1	174.6	202.2	248.2

$\gamma_{Mc,N}$ = 1.8

$\gamma_{Ms,N}$ = 1.5 *(steel failure)*

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24
V_{Rd} (kN)	14.1	22.3	32.4	60.3	94.1	135.6

Anchor size	M27	M30	M33	M36	M39
V_{Rd} (kN)	164.0	200.8	248.4	291.5	350.6

$\gamma_{Ms,V}$ = 1.25

Recommended Loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}}{\gamma_{Mc,N} \cdot \gamma_F} \qquad V_{rec} = \frac{V_{Rk}}{\gamma_{Ms,V} \cdot \gamma_F}$$

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24
h_{ef} (mm)	80	90	110	125	170	210
N_{rec} (kN)	13.9	22.1	32.1	32.5	42.2	64.3

Anchor size	M27	M30	M33	M36	M39
h_{ef} (mm)	240	280	300	330	360
N_{rec} (kN)	78.8	107.2	124.7	144.4	177.3

γ_F = 1.4

$\gamma_{Mc,N}$ = 1.8

$\gamma_{Ms,N}$ = 1.5 *(steel failure)*

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24
V_{rec} (kN)	10.0	15.9	23.1	43.1	67.2	96.8

Anchor size	M27	M30	M33	M36	M39
V_{rec} (kN)	117.1	143.4	177.5	208.2	250.4

γ_F = 1.4

$\gamma_{Ms,V}$ = 1.25

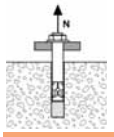
steel failure

EPCON G5

Zinc Coated Anchor Stud (G8.8)

CC-Method

TENSILE in kN



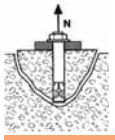
Pull-out resistance
Concrete strength 30 N/mm²

$$N_{Rd,p} = N^0_{Rd,p} \cdot f_B \cdot f_T$$

$N^0_{Rd,p}$	Design pull-out resistance					
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
h_{ef}	80	90	110	125	170	210
$N^0_{Rd,p}$ (kN)	15.3	26.7	33.8	45.5	59.1	90.1

$N^0_{Rd,p}$	Design pull-out resistance				
Anchor size	**M27**	**M30**	**M33**	**M36**	**M39**
h_{ef}	240	280	300	330	360
$N^0_{Rd,p}$ (kN)	110.3	150.1	174.6	202.2	248.2

$\gamma_{Mc,N} = 1.8$



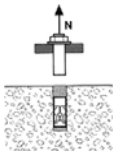
Concrete cone resistance
Concrete strength 30 N/mm²

$$N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_T \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,c}$	Design cone resistance					
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
h_{ef} (mm)	80	90	110	125	170	210
$N^0_{Rd,c}$ (kN)	26.3	31.4	42.5	51.4	81.6	112.0

$N^0_{Rd,c}$	Design cone resistance				
Anchor size	**M27**	**M30**	**M33**	**M36**	**M39**
h_{ef} (mm)	240	280	300	330	360
$N^0_{Rd,c}$ (kN)	136.9	172.5	191.3	220.6	251.4

$\gamma_{Mc,N} = 1.5$



Steel resistance

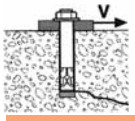
$N_{Rd,s}$	Steel design tensile resistance					
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$N_{Rd,s}$ (kN)	19.5	30.9	45.0	83.7	130.7	188.3

$N_{Rd,s}$	Steel design tensile resistance				
Anchor size	**M27**	**M30**	**M33**	**M36**	**M39**
$N_{Rd,s}$ (kN)	227.7	278.8	345.1	404.8	486.9

$\gamma_{Ms,N} = 1.5$

$$N_{Rd} = \min (N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$$
$$\beta N = N_{Sd} / N_{Rd} \le 1$$

SHEAR in kN



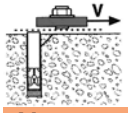
Concrete edge resistance
Concrete strength 30 N/mm²

$$V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_{\beta,V} \cdot \Psi_{s\text{-}c,V}$$

$V^0_{Rd,c}$	Design concrete edge resistance at a minimum edge distance (c_{min})					
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
h_{ef} (mm)	80	90	110	125	170	210
c_{min}	40	45	55	65	85	105
s_{min}	40	45	55	65	85	105
$V^0_{Rd,c}$ (kN)	2.6	3.4	5.1	7.3	12.4	18.7

$V^0_{Rd,c}$	Design concrete edge resistance at a minimum edge distance (c_{min})				
Anchor size	**M27**	**M30**	**M33**	**M36**	**M39**
h_{ef} (mm)	240	280	300	330	360
c_{min}	120	140	150	165	180
s_{min}	120	140	150	165	180
$V^0_{Rd,c}$ (kN)	24.3	32.6	37.8	45.6	54.1

$\gamma_{Mc,V} = 1.5$

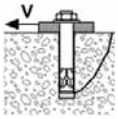


Steel resistance

$V_{Rd,s}$	Steel design shear resistance					
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$V_{Rd,s}$ (kN)	14.1	22.3	32.4	60.3	94.1	135.6

$V_{Rd,s}$	Steel design shear resistance				
Anchor size	**M27**	**M30**	**M33**	**M36**	**M39**
$V_{Rd,s}$ (kN)	164.0	200.8	248.4	291.5	350.6

$\gamma_{Ms,V} = 1.25$



Concrete pry-out failure
Concrete Strength 30 N/mm²

$$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_B \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp}$	Design pry-out resistance					
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$V^0_{Rd,cp}$ (kN)	52.7	62.9	84.9	102.9	163.2	224.0

$V^0_{Rd,cp}$	Design pry-out resistance				
Anchor size	**M27**	**M30**	**M33**	**M36**	**M39**
$V^0_{Rd,cp}$ (kN)	273.7	344.9	382.5	441.3	502.8

$\gamma_{Mc,V} = 1.5$

$$V_{Rd} = \min (V_{Rd,c} ; V_{Rd,s} ; V_{Rd,cp})$$
$$\beta V = V_{Sd} / V_{Rd} \le 1$$

$$\beta N + \beta V \le 1.2$$

f_B INFLUENCE OF CONCRETE

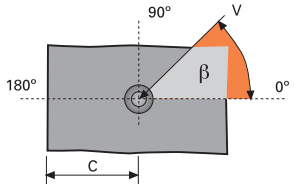
Concrete Grade	f_B	Concrete Grade	f_B
C16/20	0.81	C35/45	1.21
C20/25	0.90	C40/50	1.28
C25/30	1.00	C45/55	1.34
C30/37	1.10	C50/60	1.40

f_T INFLUENCE OF EMBEDMENT DEPTH

$$f_T = \frac{h_{act}}{h_{ef}} \quad \text{where: } h_{ef} \le h_{act} \le 2h_{ef}$$

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

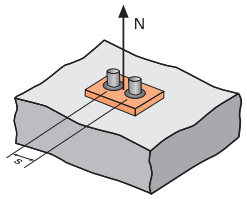
Angle β [°]	$f_{\beta,V}$
0~50	1.0
60	1.1
70	1.2
80	1.5
90~180	2.0



EPCON G5
Zinc Coated Anchor Stud (G8.8)

CC-Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0.5 + \frac{s}{4h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{min} = 0.5h_{ef}$

$s_{cr,N} = 2h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

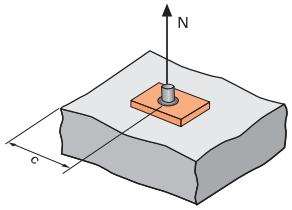
Spacing, s — Reduction Factor Ψ_s Non-cracked concrete

	M8	M10	M12	M16	M20	M24
40	0.63					
45	0.64	0.63				
55	0.67	0.65	0.63			
65	0.70	0.68	0.65	0.63		
85	0.77	0.74	0.69	0.67	0.63	
105	0.83	0.79	0.74	0.71	0.65	0.63
140	0.94	0.89	0.82	0.78	0.71	0.67
160	1.00	0.94	0.86	0.82	0.74	0.69
180		1.00	0.91	0.86	0.76	0.71
220			1.00	0.94	0.82	0.76
250				1.00	0.87	0.80
340					1.00	0.90
420						1.00

Spacing, s — Reduction Factor Ψ_s Non-cracked concrete

	M27	M30	M33	M36	M39
120	0.63				
140	0.65	0.63			
155	0.66	0.64	0.63		
165	0.67	0.65	0.64	0.63	
180	0.69	0.66	0.65	0.64	0.63
300	0.81	0.77	0.75	0.73	0.71
400	0.92	0.86	0.83	0.80	0.78
480	1.00	0.93	0.90	0.86	0.83
560		1.00	0.97	0.92	0.89
600			1.00	0.95	0.92
660				1.00	0.96
720					1.00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0.275 + 0.725 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{min} = 0.5h_{ef}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group

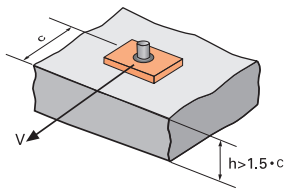
Edge, c — Reduction Factor $\Psi_{c,N}$ Non-cracked concrete

	M8	M10	M12	M16	M20	M24
40	0.63					
45	0.68	0.63				
55	0.77	0.71	0.63			
63	0.84	0.78	0.69	0.64		
80	1.00	0.91	0.80	0.73		
85		0.95	0.83	0.76	0.63	
90		1.00	0.86	0.79	0.65	
105			0.96	0.88	0.72	0.63
110			1.00	0.91	0.74	0.65
125				1.00	0.80	0.70
150					0.91	0.79
170					1.00	0.86
210						1.00

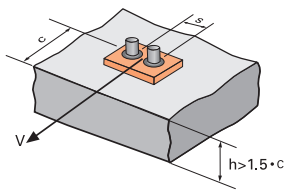
Edge, c — Reduction Factor $\Psi_{c,N}$ Non-cracked concrete

	M27	M30	M33	M36	M39
120	0.63				
140	0.69	0.63			
150	0.72	0.66	0.63		
165	0.77	0.70	0.67	0.63	
180	0.81	0.74	0.71	0.67	0.63
240	1.00	0.89	0.85	0.80	0.75
250		0.92	0.87	0.82	0.77
280		1.00	0.95	0.89	0.83
300			1.00	0.93	0.87
330				1.00	0.93
360					1.00

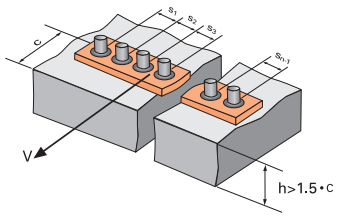
$\Psi_{s-c,V}$ INFLUENCED OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



$$\Psi_{s-c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



$$\Psi_{s-c,V} = \frac{3c + s}{6c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



FOR SINGLE ANCHOR FASTENING — Reduction Factor $\Psi_{s-c,V}$ Non-cracked concrete

$\frac{c}{c_{min}}$	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
$\Psi_{s-c,V}$	1.00	1.31	1.66	2.02	2.41	2.83	3.26	3.72	4.19	4.69	5.20	5.72

FOR 2 ANCHORS FASTENING — Reduction Factor $\Psi_{s-c,V}$ Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
1.0	0.67	0.84	1.03	1.22	1.43	1.65	1.88	2.12	2.36	2.62	2.89	3.16
1.5	0.75	0.93	1.12	1.33	1.54	1.77	2.00	2.25	2.50	2.76	3.03	3.31
2.0	0.83	1.02	1.22	1.43	1.65	1.89	2.12	2.38	2.63	2.90	3.18	3.46
2.5	0.92	1.11	1.32	1.54	1.77	2.00	2.25	2.50	2.77	3.04	3.32	3.61
3.0	1.00	1.20	1.42	1.64	1.88	2.12	2.37	2.63	2.90	3.18	3.46	3.76
3.5		1.30	1.52	1.75	1.99	2.24	2.50	2.76	3.04	3.32	3.61	3.91
4.0			1.62	1.86	2.10	2.36	2.62	2.89	3.17	3.46	3.75	4.05
4.5				1.96	2.21	2.47	2.74	3.02	3.31	3.60	3.90	4.20
5.0					2.33	2.59	2.87	3.15	3.44	3.74	4.04	4.35
5.5						2.71	2.99	3.28	3.57	3.88	4.19	4.50
6.0						2.83	3.11	3.41	3.71	4.02	4.33	4.65

FOR OTHER CASE OF FASTENINGS

$$\Psi_{s-c,V} = \frac{3c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3nc_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

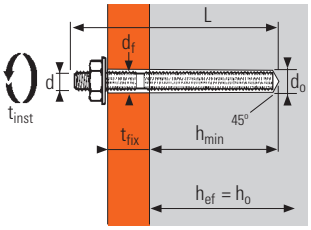
EPCON G5

Stainless Steel Anchor Stud (SUS316)

Epoxy Resin - High Performance

Performance	Material	Installation
	A4 316	

ICC-ES EVALUATION REPORT



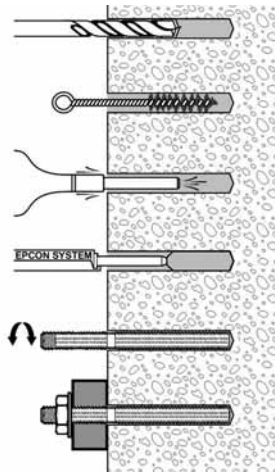
MATERIAL

Stud:
SUS316

Hexagonal Nut:
SUS316

Washer:
SUS316

INSTALLATION



Technical Data

EPCON G5 with Chemset Stud SS	Anchor depth (mm)	Max thick of fixture (mm)	Drill depth (mm)	Min thick of base material (mm)	Ø Thread (mm)	Ø Drill bit (mm)	Total anchor length (mm)	Max tighten torque (Nm)	Chemset stud code	Ramset power tool code	Drill bit type-size
	h_{ef}	t_{fix}	h_o	h_{min}	d	d_o	L	T_{inst}			
M8	80	15	80	100	8	10	110	10	CS08110SS	DD527	R3 PLUS-10
M10	90	20	90	115	10	12	130	20	CS10130SS	DD527	R3 PLUS-12
M12	110	25	110	140	12	14	160	30	CS12160SS	DD527	R3 PLUS-14
M16	125	35	125	160	16	18	190	60	CS16190SS	DD543	R3 PLUS-18
M20	170	65	170	215	20	25	260	120	CS20260SS	DD565	R3 MAX-25
M24	210	63	210	270	24	28	300	200	CS24300SS	DD565	R3 MAX-28
M30	280	70	280	350	30	35	380	400	CS30380SS	DD565	R3 MAX-35

EPOXY G5 Two part cartridge, 100% epoxy resin - vol. 650ml

Anchor Mechanical Properties

STAINLESS STEEL SUS316	M8	M10	M12	M16	M20	M24	M30
f_{uk} (N/mm²) Min. tensile strength	650	650	650	650	650	650	500
f_{yk} (N/mm²) Yield strength	450	450	450	450	450	450	250
A_s (mm²) Stressed cross-section	36.6	58	84.3	157	245	353	522.8
W_{el} (mm³) Elastic section modulus	31.2	62.3	109.2	277.5	540.9	935.5	1,686.0
$M^0_{Rk,s}$ (Nm) Characteristic bending moment	24.4	48.6	85.2	216.4	421.9	729.7	1,011.6
M (Nm) Recommended bending moment	15.7	31.4	54.9	139.6	272.2	470.8	652.6

Setting Time before applying load

Ambient temperature (°C)	Max time for installation (min)	Waiting time before applying load (hr)
32°C	8.5	2
27°C	12	2
20°C	15	2
16°C	18	3
10°C	21	6

Chemical Resistance of EPCON G5 Anchor

Chemical substances	Resistance	Chemical substances	Resistance
Xylene	1	Toluene	2
Gasoline	1	10% Nitric Acid	2
20% Caustic NaOH (Sodium Hydroxide)	1	8.5% Ammonium Hydroxide	2
Fresh Water	1	5% Bleach	3
Salt Water	1	Acetone	3
10% Sulfuric Acid (H2 SO4)	2	Glacial Acetic Acid	3
3.5% Hydrochloric Acid (HCL)	2	Methanol	3
9% Phosphoric Acid	2	Methylene Chloride	3

1 = High resistance (Anchors could be submerged in these materials)

2 = Medium resistance (Anchors could be temporary submerged due to splash or spill)

3 = Low resistance (Anchors should be limited to splash and spill followed by immediate cleanup)

EPCON G5

Stainless Steel Anchor Stud (SUS316)

Number of Sealings per cartridge

Stud diameter	8	10	12	16	20	24	30
Drilling Ø (mm)	10	12	14	18	25	28	35
Drilling depth (mm)	80	90	110	125	170	210	280
No. of anchors per cartridge							
EPCON G5 (650ml)	206.9	127.7	76.8	40.9	15.6	10.1	4.8

Ultimate Loads ($N_{Ru,m}$, $V_{Ru,m}$) / Characteristic Loads (N_{Rk}, V_{Rk}) in kN

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef} (mm)	80	90	110	125	170	210	280
$N_{Ru,m}$ (kN)	25.7	40.7	59.2	110.2	141.8	216.2	360.3
N_{Rk} (kN)	23.8	37.7	54.8	102.1	106.3	162.1	270.2

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Ru,m}$ (kN)	15.4	24.4	35.5	66.1	103.2	148.7	169.4
V_{Rk} (kN)	14.3	22.6	32.9	61.2	95.6	137.7	156.8

Design Loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}}{\gamma_{Mc,N}} \qquad V_{Rd} = \frac{V_{Rk}}{\gamma_{Ms,V}}$$

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef} (mm)	80	90	110	125	170	210	280
N_{Rd} (kN)	15.3	24.3	35.4	65.8	59.1	90.1	150.1

$\gamma_{Mc,N}$ = 1.8
$\gamma_{Ms,N}$ = 1.55 *(steel failure)*
$\gamma_{Mc,N}$ = 2.00 *(steel failure ≥ M30)*

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rd} (kN)	9.2	14.6	21.2	39.5	61.6	88.8	78.4

$\gamma_{Ms,V}$ = 1.55 for M8 to M24
$\gamma_{Ms,V}$ = 2.00 for M30

Recommended Loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}}{\gamma_{Mc,N} \cdot \gamma_F} \qquad V_{rec} = \frac{V_{Rk}}{\gamma_{Ms,V} \cdot \gamma_F}$$

TENSILE @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef} (mm)	80	90	110	125	170	210	280
N_{rec} (kN)	11.0	17.4	25.3	47.0	42.2	64.3	107.2

γ_F = 1.4
$\gamma_{Mc,N}$ = 1.8
$\gamma_{Ms,N}$ = 1.55 *(steel failure M8 - M24)*
$\gamma_{Mc,N}$ = 2.00 *(steel failure ≥ M30)*

SHEAR @ Concrete strength 30 N/mm²

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{rec} (kN)	6.6	10.4	15.2	28.2	44.0	63.4	56.0

γ_F = 1.4
$\gamma_{Ms,V}$ = 1.55 for M8 to M24
$\gamma_{Ms,V}$ = 2.00 for M30

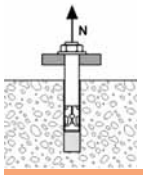
steel failure

EPCON G5

Stainless Steel Anchor Stud (SUS316)

CC-Method

TENSILE in kN

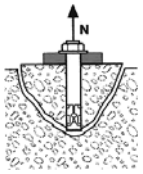


Pull-out resistance
Concrete strength 30 N/mm²

$$N_{Rd,p} = N^0_{Rd,p} \cdot f_B \cdot f_T$$

$N^0_{Rd,p}$	Design pull-out resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
h_{ef} (mm)	80	90	110	125	170	210	280
$N^0_{Rd,p}$ (kN)	15.3	26.7	33.8	45.5	59.1	90.1	150.1

$\gamma_{Mc,N} = 1.8$

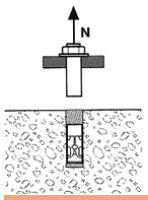


Concrete cone resistance
Concrete strength 30 N/mm²

$$N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_T \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,p}$	Design cone resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
h_{ef} (mm)	80	90	110	125	170	210	280
$N^0_{Rd,c}$ (kN)	26.3	31.4	42.5	51.4	81.6	112.0	172.5

$\gamma_{Mc,N} = 1.5$

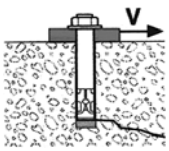


Steel resistance

$N_{Rd,s}$	Steel design tensile resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
$N_{Rd,s}$ (kN)	15.3	24.3	35.4	65.8	102.7	148.0	130.7

$\gamma_{Ms,N} = 1.55$ for M8 to M24
$\gamma_{Ms,N} = 2.00$ for M30

SHEAR in kN

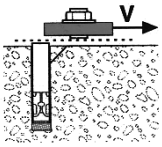


Concrete edge resistance
Concrete strength 30 N/mm²

$$V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_{\beta,V} \cdot \Psi_{s\text{-}c,V}$$

$V^0_{Rd,c}$	Design concrete edge resistance at a minimum edge distance (c_{min})						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
h_{ef} (mm)	80	90	110	125	170	210	280
c_{min}	40	45	55	65	85	105	140
s_{min}	40	45	55	65	85	105	140
$V^0_{Rd,c}$ (kN)	2.6	3.4	5.1	7.3	12.4	18.7	32.6

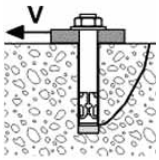
$\gamma_{Mc,V} = 1.5$



Steel resistance

$V_{Rd,s}$	Steel design shear resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
$V_{Rd,s}$ (kN)	9.2	14.6	21.2	39.5	61.6	88.8	78.4

$\gamma_{Ms,V} = 1.55$ for M8 to M24
$\gamma_{Ms,V} = 2.00$ for M30



Concrete pry-out failure
Concrete Strength 30 N/mm²

$$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_B \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp}$	Design pry-out resistance						
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
$V^0_{Rd,cp}$ (kN)	52.7	62.9	84.9	102.9	163.2	224.0	344.9

$\gamma_{Ms,V} = 1.5$

$$N_{Rd} = \min (N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$$
$$\beta N = N_{Sd} / N_{Rd} \le 1$$

$$V_{Rd} = \min (V_{Rd,c} ; V_{Rd,s}; V_{Rd,cp})$$
$$\beta V = V_{Sd} / V_{Rd} \le 1$$

$$\beta N + \beta V \le 1.2$$

f_B INFLUENCE OF CONCRETE

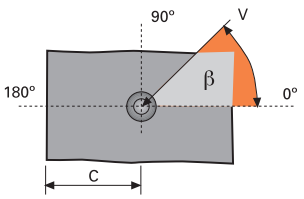
Concrete Grade	f_B	Concrete Grade	f_B
C16/20	0.81	C35/45	1.21
C20/25	0.90	C40/50	1.28
C25/30	1.00	C45/55	1.34
C30/37	1.10	C50/60	1.40

f_T INFLUENCE OF EMBEDMENT DEPTH

$$f_T = \frac{h_{act}}{h_{ef}} \quad \text{where: } h_{ef} \le h_{act} \le 2h_{ef}$$

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0~50	1.0
60	1.1
70	1.2
80	1.5
90~180	2.0

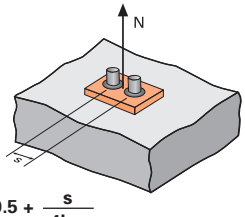


EPCON G5

Stainless Steel Anchor Stud (SUS316)

CC-Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0.5 + \frac{s}{4h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{min} = 0.5h_{ef}$

$s_{cr,N} = 2h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

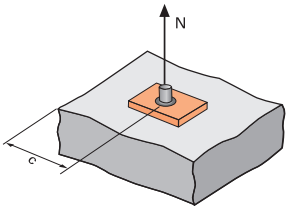
Spacing, s — Reduction Factor Ψ_s Non-cracked concrete

	M8	M10	M12	M16
40	0.63			
45	0.64	0.63		
55	0.67	0.65	0.63	
65	0.70	0.68	0.65	0.63
85	0.77	0.74	0.69	0.67
105	0.83	0.79	0.74	0.71
140	0.94	0.89	0.82	0.78
160	1.00	0.94	0.86	0.82
180		1.00	0.91	0.86
220			1.00	0.94
250				1.00

Spacing, s — Reduction Factor Ψ_s Non-cracked concrete

	M20	M24	M30
85	0.63		
105	0.65	0.63	
140	0.71	0.67	0.63
160	0.74	0.69	0.64
180	0.76	0.71	0.66
220	0.82	0.76	0.70
250	0.87	0.80	0.72
300	0.94	0.86	0.77
340	1.00	0.90	0.80
370		0.94	0.83
420		1.00	0.88
560			1.00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0.275 + 0.725 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{min} = 0.5h_{ef}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group

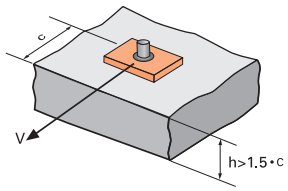
Edge, c — Reduction Factor $\Psi_{c,N}$ Non-cracked concrete

	M8	M10	M12	M16
40	0.63			
45	0.68	0.63		
55	0.77	0.71	0.63	
65	0.86	0.79	0.70	0.65
80	1.00	0.91	0.80	0.73
90		1.00	0.86	0.79
110			1.00	0.91
125				1.00

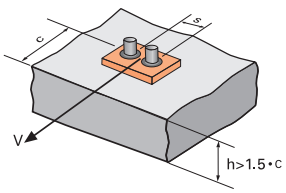
Edge, c — Reduction Factor $\Psi_{c,N}$ Non-cracked concrete

	M20	M24	M30
85	0.63		
105	0.72	0.63	
120	0.78	0.68	
140	0.87	0.75	0.63
170	1.00	0.86	0.71
210		1.00	0.81
250			0.92
280			1.00

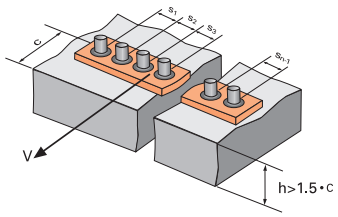
$\Psi_{s-c,V}$ INFLUENCED OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



$$\Psi_{s-c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



$$\Psi_{s-c,V} = \frac{3c + s}{6c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



FOR SINGLE ANCHOR FASTENING — Reduction Factor $\Psi_{s-c,V}$ Non-cracked concrete

$\frac{c}{c_{min}}$	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
$\Psi_{s-c,V}$	1.00	1.31	1.66	2.02	2.41	2.83	3.26	3.72	4.19	4.69	5.20	5.72

FOR 2 ANCHORS FASTENING — Reduction Factor $\Psi_{s-c,V}$ Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
1.0	0.67	0.84	1.03	1.22	1.43	1.65	1.88	2.12	2.36	2.62	2.89	3.16
1.5	0.75	0.93	1.12	1.33	1.54	1.77	2.00	2.25	2.50	2.76	3.03	3.31
2.0	0.83	1.02	1.22	1.43	1.65	1.89	2.12	2.38	2.63	2.90	3.18	3.46
2.5	0.92	1.11	1.32	1.54	1.77	2.00	2.25	2.50	2.77	3.04	3.32	3.61
3.0	1.00	1.20	1.42	1.64	1.88	2.12	2.37	2.63	2.90	3.18	3.46	3.76
3.5		1.30	1.52	1.75	1.99	2.24	2.50	2.76	3.04	3.32	3.61	3.91
4.0			1.62	1.86	2.10	2.36	2.62	2.89	3.17	3.46	3.75	4.05
4.5				1.96	2.21	2.47	2.74	3.02	3.31	3.60	3.90	4.20
5.0					2.33	2.59	2.87	3.15	3.44	3.74	4.04	4.35
5.5						2.71	2.99	3.28	3.57	3.88	4.19	4.50
6.0						2.83	3.11	3.41	3.71	4.02	4.33	4.65

FOR OTHER CASE OF FASTENINGS

$$\Psi_{s-c,V} = \frac{3c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3nc_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$