INDO CONSTRUCTION FASTENING SYSTEMS

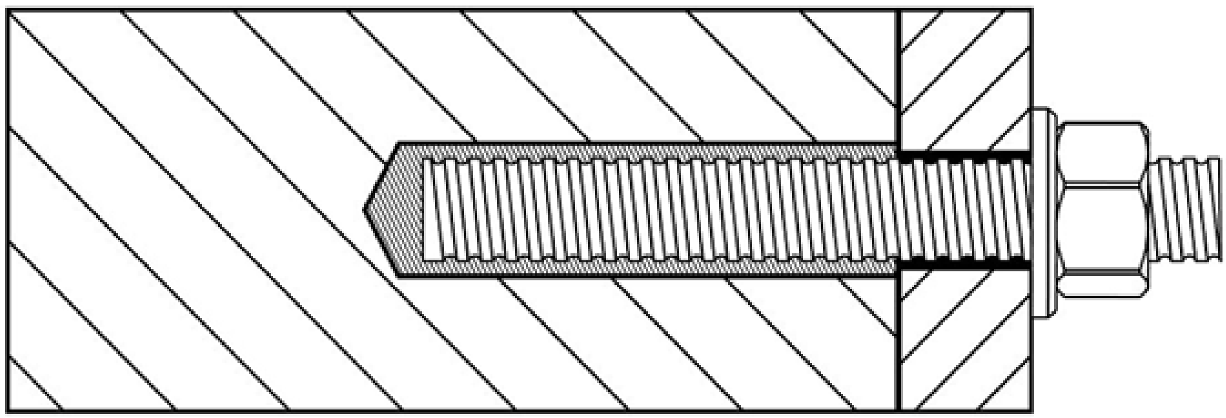
A brand of Indo Spark Group Since 1978

CM350/420VESF

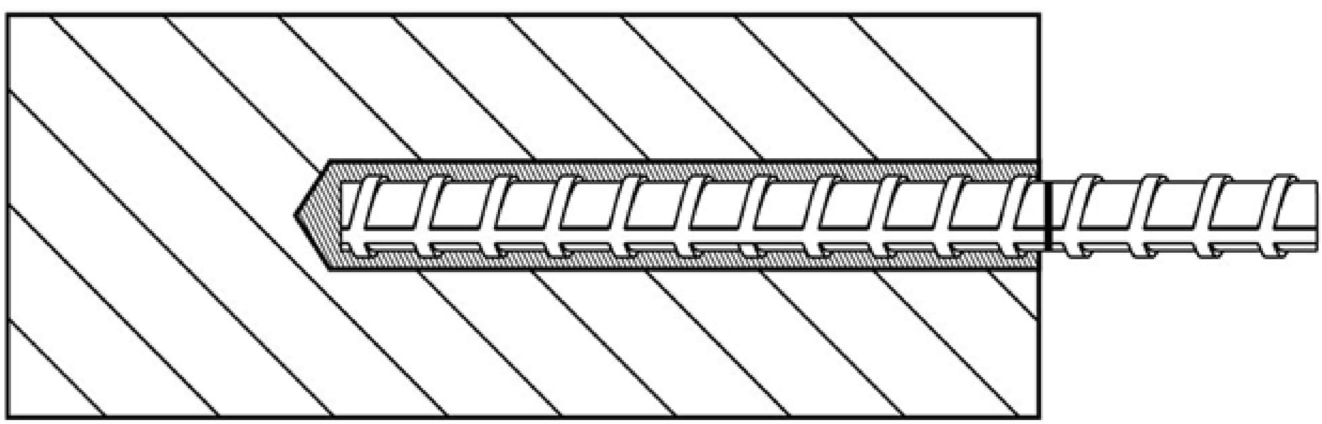
Technical Datasheet

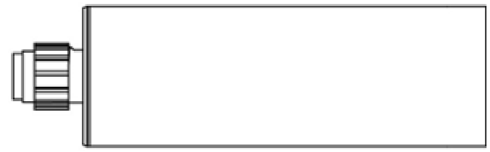
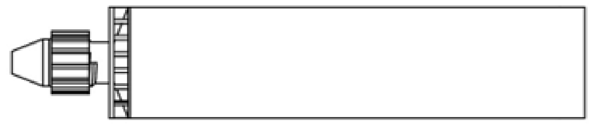
for galvanised or stainless steel bonded anchor

Threaded rod



Reinforcing bar



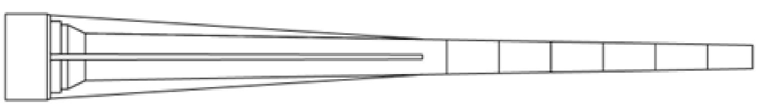
Cartridge type	Product	Volume	
Coaxial cartridge	ICFS CM VESF, VESF-Tropical	380 ml 410 ml 420 ml	
Side by side cartridge	ICFS CM VESF, VESF-Tropical	345 ml 350 ml 360 ml 825 ml	
Two part foil in a single piston component cartridge	ICFS CM VESF, VESF-Tropical	300 ml	

Marking of the mortar cartridges

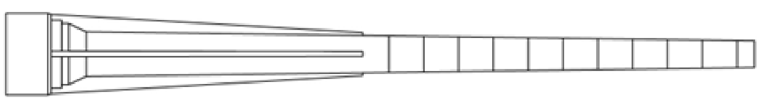
Identifying mark of the producer, Trade name, Charge code number, Storage life, Curing and processing time

Mixing nozzle

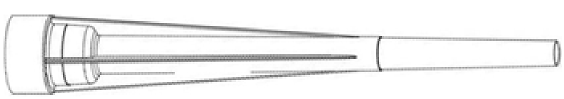
MN 300



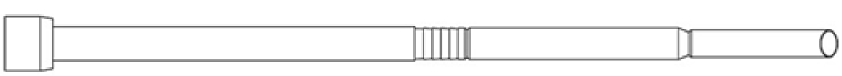
CMWN



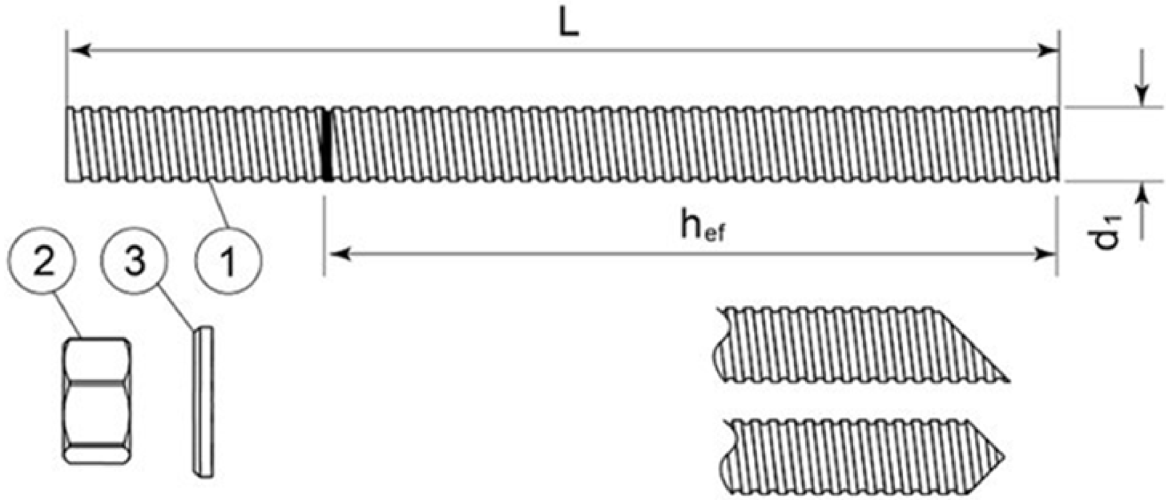
EZ-Flow



MN 400



Threaded rod M8, M10, M12, M16, M20, M24



Standard commercial threaded rod with marked embedment depth

Part	Designation	Material
Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042 or Steel, Hot-dip galvanized ≥ 40 µm acc. to EN ISO 1461 and EN ISO 10684 or Steel, zinc diffusion coating ≥ 15 µm acc. to EN 13811		
1	Anchor rod	Steel, EN 10087 or EN 10263 CAS 5.8, CAS 8.8, CAS 10.9* EN ISO 898-1
2	Hexagon nut EN ISO 4032	According to threaded rod, EN 20898-2
3	Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094	According to threaded rod
	Stainless steel	
1	Anchor rod	CAS A2-70, CAS A4-70, CAS A4-80 EN ISO 3506
2	Hexagon nut EN ISO 4032	According to threaded rod
3	Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094	According to threaded rod
	High corrosion resistant steel	
1	Anchor rod	CAS HCR, CAS UHCR EN 10088-1
2	Hexagon nut EN ISO 4032	According to threaded rod
3	Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094	According to threaded rod

*Galvanized rod of high strength are sensitive to hydrogen induced brittle failure

Rebar Ø8, Ø10, Ø12, Ø16, Ø20, Ø25

Standard commercial reinforcing bar with marked embedment depth

Product Form		Bars and de-coiled rods	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t / f_y)_k$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force ε_{uk} (%)		≥ 5,0	≥ 7,5
Bendability		Bend / Rebend test	
Maximum deviation fromnominal mass (individual bar) (%)	Nominal bar size (mm) ≤ 8 > 8	± 6,0 ± 4,5	
Bond: Minimum relative rib area, $f_{R,min}$	Nominal bar size (mm) 8 to 12 > 12	0,040 0,056	

Anchorages subject to:
- Static and quasi-static load.

Base materials
- Uncracked concrete.
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206-1:2000-12.

Temperature range:
- -40°C to +80°C (max. short. term temperature +80°C and max. long term temperature +50°C) Use conditions (Environmental conditions)
- (X1) Structures subject to dry internal conditions (zinc coated steel, stainless steel, high corrosion resistance steel).
- (X2) Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel A4, high corrosion resistant steel).
- (X3) Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist (high corrosion resistant steel).

Note:
Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Concrete conditions:
- I1 – installation in dry or wet (water saturated) concrete and use in service in dry or wet concrete.
- I2 – installation in water-filled (not sea water) and use in service in dry or wet concrete

Design:

- The anchorages are designed in accordance with the EN 1992-4 under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings.

Installation

- Hole drilling by hammer drilling, dustless drilling or diamond core drilling mode.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Installation direction:

- D3 – downward and horizontal and upwards (e.g. overhead) installation

HDB – Hollow Drill Bit System

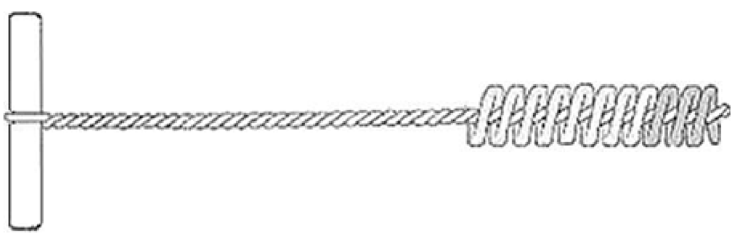
Heller Duster Expert hollow drill bit

- SDS-Plus ≤ 16mm
- SDS-Max ≥ 16mm

Class M vacuum

- Minimum flow rate 266 m^3/h (74 l/s

Cleaning brush



Applicator gun

A

B

C

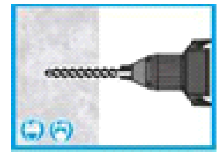
D

E

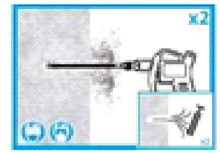
Applicator gun	Cartridge	
A	**Coaxial**	380ml 420ml
B	**Side by side**	345ml 360ml
C	**Foil capsule**	300ml
D	**Foil capsule**	300ml
E	**Side by side**	825ml

SOLID SUBSTRATE INSTALLATION METHOD

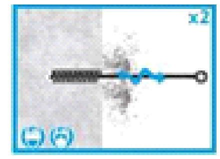
1. Using the SDS hammer drill (HD) in rotary hammer mode for drilling, with a carbide tipped drill bit of the appropriate size, drill the hole to the specified hole diameter and depth.

1


2. Select the correct air lance, insert to the bottom of the hole, and depress the trigger for 2 seconds. The compressed air must be clean and free from water and oil, with a minimum pressure of 90 psi (6 bar). A manual pump may be used for certain diameters and depths; check the approval document. Perform the blowing operation twice.

2


3. Select the correct size hole cleaning brush. Ensure that the brush is in good condition and of the correct diameter. Insert the brush to the bottom of the hole, using a brush extension if needed to reach the bottom. Withdraw with a twisting motion. There should be a positive interaction between the bristles of the brush and the sides of the drilled hole. Perform the brushing operation twice.

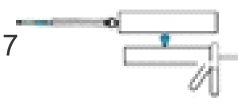
3


4. Repeat step 2 (blowing operation x2)

5. Repeat step 3 (brushing operation x2)

6. Repeat step 2 (blowing operation x2)

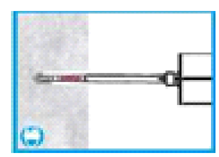
7. Select the most appropriate static mixer nozzle, checking that the mixing elements are present and t for purpose. Never modify the mixer. Attach the mixer nozzle to the cartridge. Check the dispensing tool is in good working order. Place the cartridge into the dispensing tool.

7


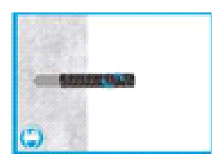
8. Extrude some resin to waste until an even coloured mixture is achieved. The cartridge is now ready for use.

8


9. Insert the mixing nozzle to the bottom of the hole. Extrude the resin and slowly withdraw the nozzle from the hole. Ensure no air voids are created as the nozzle is withdrawn. Inject resin until the hole is approximately 3 full and remove the nozzle from the hole.

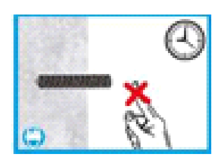
9


10. Select the steel anchor element ensuring it is free from oil or other contaminants, and mark with the required embedment depth. Insert the steel element into the hole using a back and forth twisting motion to ensure complete cover, until it reaches the bottom of the hole. Excess resin will be expelled from the hole evenly around the steel element and there shall be no gaps between the anchor element and the wall of the drilled hole.

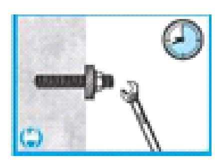
10


11. Clean any excess resin from around the mouth of the hole.

12. Refer to the working and loading times within the tables to determine the appropriate cure time.

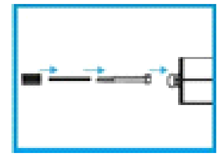
12


13. Position the fixture and tighten the anchor to the appropriate installation torque. Do not over-torque the anchor, as this could adversely affect its performance.

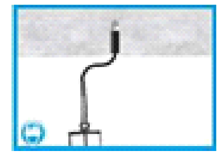
13


DEEP EMBEDMENT & OVERHEAD INSTALLATION METHOD

1a. Perform steps 1-8 under "solid substrate installation method”.



2a. Attach the correct diameter and length extension tube to the nozzle. Select the correct diameter resin stopper for the application, then push and screw the extension tube into the resin stopper. This is held in place with a coarse internal thread. The resin stopper is a reusable accessory.

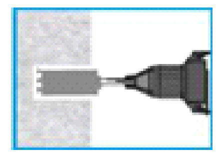


3a. Push the resin stopper and extension tube to the back of the drill hole.

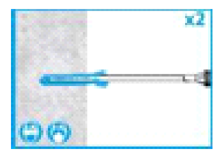
4a. Ensure the extension tube is angled to allow free movement of the resin stopper as the resin is extruded.

5a. Continue from step 10 under "solid substrate installation method”.

DIAMOND CORE DRILLING



1b. Using a diamond core drill (DD) and following the manufacturer's instructions, drill the specified diameter hole to the correct embedment depth then remove the concrete core.

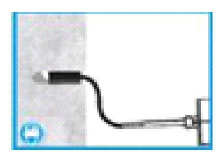


2b. Starting from the back of the hole, flush with pressurised water a minimum of two times and until there is only clean water.

3b. Select the correct size hole cleaning brush. Ensure that the brush is in good condition and of the correct diameter. Insert the brush to the bottom of the hole, using a brush extension if needed to reach the bottom. Withdraw with a twisting motion. There should be a positive interaction between the bristles of the brush and the sides of the drilled hole. Perform the brushing operation twice.

4b. Repeat step 2b (flushing operation x2).

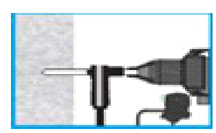
5b. Repeat step 3b (brushing operation x2).



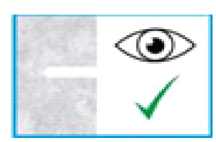
6a. Using the correct air lance and starting from the back of the hole and withdrawing, perform a minimum of two blowing operations and ensure that the hole is clear of debris and excess water.

7a. Continue from step 7 under "solid substrate installation method”

DUSTLESS DRILLING



1c. Using the specified hollow drill bit (HDB) and vacuum system and following the manufacturer's instructions, drill the specified diameter hole to the correct embedment depth. Ensure that the minimum vacuum specifications are met and that the vacuum is turned on.



2c. The hole should be inspected to ensure the system has worked correctly. If the hole is clear of dust and debris, no further cleaning is required.

3c. Continue from step 7 under "solid substrate installation method".

Table B1:

Installation parameters of threaded rod

Sizes			M8	M10	M12	M16	M20	M24
Nominal drill hole diameter	$Ød_0$	[mm]	10	12	14	18	22	26
Diameter of cleaning brush	d_b	[mm]	14	14	20	20	29	29
Torque moment	max T_{fix}	[Nm]	10	20	40	80	150	200
Depth of drill hole for $h_{ef,min}$	$h_0 = h_{ef}$	[mm]	64	80	96	128	160	192
Depth of drill hole for $h_{ef,max}$	$h_0 = h_{ef}$	[mm]	96	120	144	192	240	288
Minimum edge distance	c_{min}	[mm]	35	40	50	65	80	96
Minimum spacing	s_{min}	[mm]	35	40	50	65	80	96
Minimum thickness of member	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm				$h_{ef} + 2d_0$	

Table B2:

Installation parameters of rebar

Sizes			Ø8	Ø10	Ø12	Ø16	Ø20	Ø24
Nominal drill hole diameter	$Ød_0$	[mm]	12	14	16	20 | 22*	25	30* | 32
Diameter of cleaning brush	d_b	[mm]	14	14	19	22	29	40
Manual pump cleaning			h_{ef} < 300 mm					
Depth of drill hole for $h_{ef,min}$	h_{ef}	[mm]	60	60	70	80	90	100
Depth of drill hole for $h_{ef,max}$	h_{ef}	[mm]	160	200	240	320	400	480
Depth of drill hole	h_0	[mm]	h_{ef} +5	h_{ef} +5	h_{ef} +5	h_{ef} +5	h_{ef} +5	h_{ef} +5
Minimum edge distance	c_{min}	[mm]	40	40	50	70	80	100
Minimum spacing	s_{min}	[mm]	40	40	50	70	80	100
Minimum thickness of member	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			$h_{ef} + 2d_0$		

* Only for hammer and dustless drilling

Table B3 .1:

Minimum curing time ICFS CM VESF

Resin cartridge temperature [°C]	T Work [mins]	Base material Temperature [°C]	T Load [mins]
min +5	18	min +5	145
+5 to +10	10	+5 to +10	
+10 to +20	6	+10 to +20	85
+20 to +25	5	+20 to +25	50
+25 to +30	4	+25 to +30	40
+30		+30	35

Table B3. 2:

Minimum curing time ICFS CM VESF

Resin cartridge temperature [°C]	T Work [mins]	Base material Temperature [°C]	T Load [mins]
min +10	30	min +10	5 Hours
+10 to +20	15	+10 to +20	
+20 to +25	10	+20 to +25	145
+25 to +30	7.5	+25 to +30	85
+30 to +35	5	+30 to +35	50
+35 to +40	3.5	+35 to +40	40
+40 to +45	2.5	+40 to +45	35
+45		+45	12

T work is typical gel time at highest temperature

T load is set at the lowest temperature

Table C1:

Design method EN 1992-4
Steel failure - Characteristic values of resistance to tension load of threaded rod

Steel failure – Characteristic resistance								
Sizes			M8	M10	M12	M16	M20	M24
CAS 5.8	$N_{Rk,s}$	[kN]	18	29	42	79	123	177
Partial safety factor	γ_{Ms}	[-]	1.5					
CAS 8.8	$N_{Rk,s}$	[kN]	29	46	67	126	196	282
Partial safety factor	γ_{Ms}	[-]	1.5					
CAS 10.9	$N_{Rk,s}$	[kN]	37	58	84	157	245	353
Partial safety factor	γ_{Ms}	[-]	1.4					
CAS A2-70, CAS A4-70	$N_{Rk,s}$	[kN]	26	41	59	110	172	247
Partial safety factor	γ_{Ms}	[-]	1.9					
CAS A4-80	$N_{Rk,s}$	[kN]	29	46	67	126	196	282
Partial safety factor	γ_{Ms}	[-]	1.6					
CAS HCR	$N_{Rk,s}$	[kN]	26	41	59	110	172	247
Partial safety factor	γ_{Ms}	[-]	1.5					
CAS UHCR	$N_{Rk,s}$	[kN]	26	41	59	110	172	247
Partial safety factor	γ_{Ms}	[-]	1.9					

Table C2:

Design method EN 1992-4
Steel failure - Characteristic values of resistance to tension load of rebar

Steel failure – Characteristic resistance								
Sizes			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
Rebar BSt 500 S	$N_{Rk,s}$	[kN]	28	43	62	111	173	270
Partial safety factor	γ_{Ms}	[-]	1.4					

Table C3:

Design method EN 1992-4
Characteristic values of resistance to tension load of threaded rod

Hammer drilling, Dustless drilling								
Combined pullout and concrete cone failure in uncracked concrete C20/25								
Sizes			M8	M10	M12	M16	M20	M24
Characteristic bond resistance in uncracked concrete for a working life of 50 years and 100 years								
Dry, wet concrete and flooded hole	$\tau R_{k,ucr}$	[N/mm²]	10.0	8.0	9.0	9.5	8.5	8.5
Installation safety factor								
Dry, wet concrete	γinst	[-]	1.2					
Hammer drilling - flooded hole	γinst	[-]	1.2					
Dustless drilling - flooded hole	γinst	[-]	1.4					
Factor for influence of sustained load for a working life 50 years	ψ^0_{sus}	[-]	0.78					
Factor for concrete C25/30 C30/37 C35/45 C40/50 C45/55 C50/60	ψ_c	[-]	1.06 1.12 1.19 1.23 1.27 1.30					

Concrete cone failure			
Factor for concrete cone failure	$k_{ucr,N}$	[-]	11
Edge distance	$s_{cr,N}$	[mm]	$1,5h_{ef}$

Splitting failure								
Sizes			M8	M10	M12	M16	M20	M24
Edge distance	$c_{cr,sp}$	[mm]	2.0h_{ef}			1.5h_{ef}		
Spacing	$s_{cr,sp}$	[mm]	4.0h_{ef}			3.0h_{ef}		

Table C4:

Design method EN 1992-4
Characteristic values of resistance to tension load of rebar

Hammer drilling, Dustless drilling								
Combined pullout and concrete cone failure in uncracked concrete C20/25								
Sizes			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
Characteristic bond resistance in uncracked concrete for a working life of 50 years and 100 years								
Dry, wet concrete and flooded hole	$\tau R_{k,ucr}$	[N/mm^2]	8.5	8	8	7	7	5.5
Installation safety factor								
Dry, wet concrete	γinst	[-]	1.2					
Hammer drilling - flooded hole	γinst	[-]	1.2					
Dustless drilling - flooded hole	γinst	[-]	1.4					
Factor for influence of sustained T1: 24°C / 40°C, load for a working life 50 years T2: 50°C / 80°C	ψ^0_{sus}	[-]	0.75 0.79					
Factor for concrete C25/30 C30/37 C35/45 C40/50 C45/55 C50/60	ψ_c	[-]	1.04 1.08 1.12 1.15 1.17 1.19					

Concrete cone failure			
Factor for concrete cone failure	$k_{ucr,N}$	[-]	11
Edge distance	$s_{cr,N}$	[mm]	1,5h_{ef}

Splitting failure								
Sizes			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
Edge distance	$c_{cr,sp}$	[mm]	2 • h_{ef}					
Spacing	$s_{cr,sp}$	[mm]	2 • $c_{cr,sp}$					

Table C5:

Design method EN 1992-4
Characteristic values of resistance to tension load of threaded rod

Diamond core drilling								
Combined pullout and concrete cone failure in uncracked concrete C20/25								
Sizes			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Characteristic bond resistance in uncracked concrete for a working life of 50 years and 100 years								
Dry, wet concrete and flooded hole	$\tau R_{k,ucr}$	[N/mm^2]	9	8.5	8.5	7.5	6.5	6.5
Installation safety factor								
Dry, wet concrete	γinst	[-]	1					
Flooded hole	γinst	[-]	1.4					
Factor for influence of sustained T1: 24°C / 40°C, load for a working life 50 years T2: 50°C / 80°C	ψ^0_{sus}	[-]	0.83 0.82					
Factor for concrete C25/30 C30/37 C35/45 C40/50 C45/55 C50/60	ψ_c	[-]	1.02 1.04 1.06 1.07 1.08 1.09					

Concrete cone failure			
Factor for concrete cone failure	$k_{ucr,N}$	[-]	11
Edge distance	$c_{cr,N}$	[mm]	1,5h_{ef}

Splitting failure								
Sizes			**M8**	**M10**	**M12**	**M16**	**M20**	**M25**
Edge distance	$c_{cr,sp}$	[mm]	2.0h_{ef}			1.5h_{ef}		
Spacing	$s_{cr,sp}$	[mm]	4.0h_{ef}			3.0h_{ef}		

Table C6:

Design method EN 1992-4
Characteristic values of resistance to tension load of rebar

Diamond core drilling								
Combined pullout and concrete cone failure in uncracked concrete C20/25								
Sizes			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**
Characteristic bond resistance in uncracked concrete for a working life of 50 years and 100 years								
Dry, wet concrete and flooded hole	$\tau R_{k,ucr}$	[N/mm^2]	8	8	7.5	7	6.5	6
Installation safety factor								
Dry, wet concrete	γinst	[-]	1					
Flooded hole	γinst	[-]	1.4					
Factor for influence of sustained T1: 24°C / 40°C, load for a working life 50 years T2: 50°C / 80°C	ψ^0_{sus}	[-]	0.89 0.87					
Factor for concrete C25/30 C30/37 C35/45 C40/50 C45/55 C50/60	ψ_c	[-]	1.02 1.04 1.06 1.07 1.08 1.09					

Concrete cone failure			
Factor for concrete cone failure	$k_{ucr,N}$	[-]	11
Edge distance	$c_{cr,N}$	[mm]	$1,5h_{ef}$

Splitting failure								
Sizes			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**
Edge distance	$c_{cr,sp}$	[mm]	$2 \cdot h_{ef}$					
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$					

Table C7:

Design method EN 1992-4
Characteristic values of resistance to shear load of threaded rod

Steel failure without lever arm								
Sizes			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Characteristic resistance CAS 5.8	$v_{Rk,s}$	[kN]	9	15	21	39	61	88
Partial safety factor	γ_{Ms}	[-]	1.25					
Characteristic resistance CAS 8.8	$v_{Rk,s}$	[kN]	15	23	34	63	98	141
Partial safety factor	γ_{Ms}	[-]	1.25					
Characteristic resistance CAS 10.9	$v_{Rk,s}$	[kN]	18	29	42	79	123	177
Partial safety factor	γ_{Ms}	[-]	1.5					
Characteristic resistance CAS A2-70, CAS A4-70	$v_{Rk,s}$	[kN]	13	20	30	55	86	124
Partial safety factor	γ_{Ms}	[-]	1.56					
Characteristic resistance CAS A4-80	$v_{Rk,s}$	[kN]	15	23	34	63	98	141
Partial safety factor	γ_{Ms}	[-]	1.33					
Characteristic resistance CAS HCR	$v_{Rk,s}$	[kN]	13	20	30	55	86	124
Partial safety factor	γ_{Ms}	[-]	1.25					
Characteristic resistance CAS UHCR	$v_{Rk,s}$	[kN]	13	20	30	55	86	124
Partial safety factor	γ_{Ms}	[-]	1.56					
Characteristic resistance of group of fasteners								
Ductility factor k_7 = 1,0 for steel with rupture elongation A_5 > 8%								

Steel failure with lever arm								
Sizes			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Characteristic resistance CAS 5.8	$M^0_{Rk,s}$	[N.m]	19	37	66	166	325	561
Partial safety factor	γ_{Ms}	[-]	1.25					
Characteristic resistance CAS 8.8	$M^0_{Rk,s}$	[N.m]	30	60	105	266	519	898
Partial safety factor	γ_{Ms}	[-]	1.25					
Characteristic resistance CAS 10.9	$M^0_{Rk,s}$	[N.m]	37	75	131	333	649	1123
Partial safety factor	γ_{Ms}	[-]	1.50					
Characteristic resistance CAS A2-70, CAS A4-70	$M^0_{Rk,s}$	[N.m]	26	52	92	233	454	786
Partial safety factor	γ_{Ms}	[-]	1.56					
Characteristic resistance CAS A4-80	$M^0_{Rk,s}$	[N.m]	30	60	105	266	519	898
Partial safety factor	γ_{Ms}	[-]	1.33					
Characteristic resistance CAS HCR	$M^0_{Rk,s}$	[N.m]	26	52	92	233	454	786
Partial safety factor	γ_{Ms}	[-]	1.25					
Characteristic resistance CAS UHCR	$M^0_{Rk,s}$	[N.m]	26	52	92	233	454	786
Partial safety factor	γ_{Ms}	[-]	1.56					
Concrete pry-out failure								
Factor for resistance to pry-out failure	K_8	[-]	2					

Concrete edge failure								
Sizes			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Outside diameter of fastener	d_{nom}	[mm]	8	10	12	16	20	24
Effective length of fastener	ℓf	[mm]	min $(h_{ef,} 8d_{nom})$					

Table C8:

Design method EN 1992-4
Characteristic values of resistance to shear load of rebar

Steel failure without lever arm								
Sizes			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
Rebar BSt 500 S	$V_{Rk,s}$	[kN]	14	22	31	55	86	135
Partial safety factor	y_{Ms}	[-]	1.5					
Characteristic resistance of group of fasteners								
Ductility factor	k_7 = 1,0 for steel with rupture elongation A_5 > 8%							

Steel failure with lever arm								
Sizes			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
Rebar BSt 500 S	$M^0_{Rk,s}$	[N.m]	33	65	112	265	518	1013
Partial safety factor	y_{Ms}	[-]	1.5					
Concrete pry-out failure								
Factor for resistance to pry-out failure	K_8	[-]	2					

Concrete edge failure								
Sizes			M8	M10	M12	M16	M20	M24
Outside diameter of fastener	d_{nom}	[mm]	8	10	12	16	20	24
Effective length of fastener	ℓf	[mm]	min ($h_{ef,}8d_{nom}$)					

Table C9:

Displacement of threaded rod under tension and
shear load Hammer drilling, Dustless drilling

Anchor Sizes		M8	M10	M12	M16	M20	M24
Tension load							
δN0	[mm/kN]	0.03	0.03	0.03	0.02	0.02	0.02
δN∞	[mm/kN]	0.06	0.05	0.03	0.02	0.02	0.02
Shear load							
δV0	[mm/kN]	0.02	0.01	0.02	0.02	0.02	0.03
δV∞	[mm/kN]	0.04	0.02	0.03	0.03	0.03	0.05

Table C10:

Displacement of threaded rod under tension and shear load Diamond core drilling

Anchor Sizes		M8	M10	M12	M16	M20	M24
Tension load							
δN0	[mm/kN]	0.04	0.03	0.02	0.03	0.02	0.02
δN∞	[mm/kN]	0.11	0.09	0.06	0.05	0.04	0.03
Shear load							
δV0	[mm/kN]	0.02	0.01	0.02	0.02	0.02	0.03
δV∞	[mm/kN]	0.04	0.02	0.03	0.03	0.03	0.05

Table C11:

Displacement of rebar under tension and shear load Hammer drilling, Dustless drilling

Sizes		Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
Tension load							
δN0	[mm/kN]	0.04	0.04	0.04	0.03	0.03	0.03
δN∞	[mm/kN]	0.13	0.12	0.08	0.06	0.05	0.03
Shear load							
δV0	[mm/kN]	0.02	0.02	0.01	0.01	0.01	0.01
δV∞	[mm/kN]	0.03	0.03	0.02	0.02	0.01	0.01

Table C12:

Displacement of rebar under tension and shear load Diamond core drilling

Sizes		Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
Tension load							
δN0	[mm/kN]	0.04	0.04	0.04	0.04	0.04	0.04
δN∞	[mm/kN]	0.12	0.09	0.07	0.05	0.04	0.04
Shear load							
δV0	[mm/kN]	0.02	0.02	0.01	0.01	0.01	0.01
δV∞	[mm/kN]	0.03	0.03	0.02	0.02	0.01	0.01

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