INSERTS

TECHNICAL MANUAL

Insert

The EV and EVF inserts provide a prospective threaded fixing and lifting system. These inserts are specifically used for fixing and lifting as well.

The key benefits and features of Insert are as follows:

- EV inserts are anchored in concrete with the cross-pin for load transfer.
- In EVF, Reinforcement bar is inserted through the cross hole to transfer the load into the concrete.
- Available in plain steel and stainless steel.
- Cost effective solutions.

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1. Introduction

EV and EVF threaded inserts are used as fixing insert (for wall support) and lifting insert (for slab lifting purposes).

EV Insert consists of an inner threaded insert tube with a cross-pin for anchoring into the concrete element. It is designed for the installation of precast elements on-site. They are also available in stainless steel.

EVF insert with flat end must always be used with rebar. Under lateral tension, lifting sockets with flat ends have only half the load-bearing capacity compared to axial tension. These inserts are also available in stainless steel as well as acid resistant steel.

EV and EVF inserts can also serve as lifting inserts but are available for specific sizes only.

Figure 1 EV Insert

Figure 2 EVF Insert

2. Product Dimensions

2.1. EV Insert Dimensions

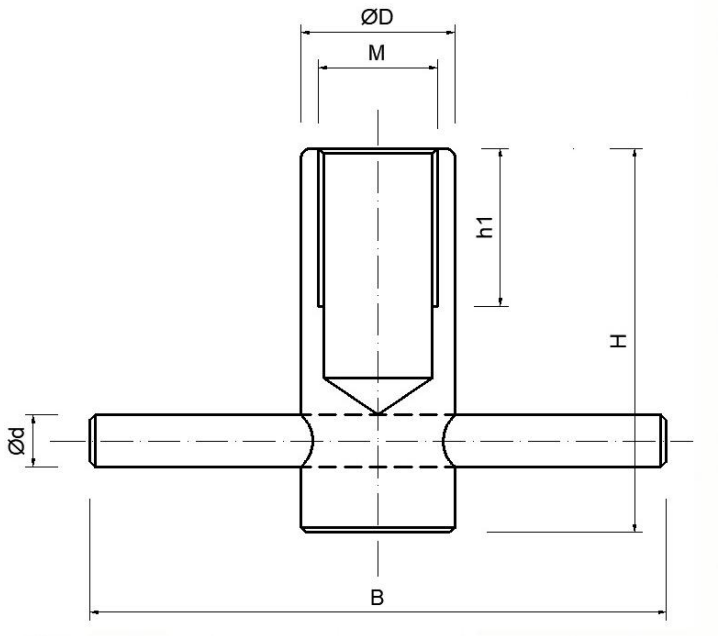


Figure 3 EV Insert

Table 1 EV Insert Dimensions

Insert Size	M	H	h1	ØD	Ød	B
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M 10x45	10	45	20	15	6	50
M 10x50	10	50	20	15	8	60
M 10x60	10	60	20	15	8	60
M 12x50	12	50	24	18	8	60
M 12x70	12	70	24	18	10	75
M 16x50	16	50	28	24	8	60
M 16x70	16	70	32	24	10	75
M 16x90	16	90	32	24	10	75
M 20x100	20	100	35	28	12	85
M 24x120	24	120	45	34	15	110
M 24x150	24	150	45	34	15	110

2.2. EVF Insert Dimensions

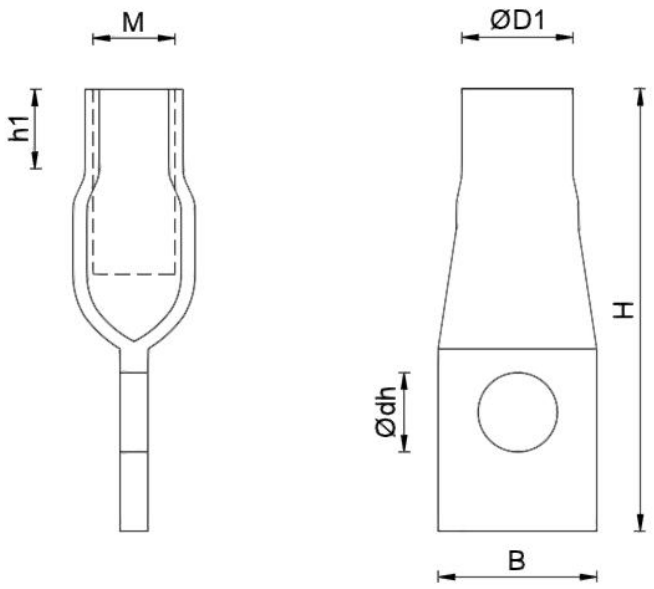


Figure 4 EVF Insert

Table 2 EVF Insert Dimensions

Insert Size	H	ØD	M	B	h1	dh
(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
M6x35	35	8.5	6	13	5	6.3
M6x40	40	8.5	6	13	5	6.3
M6x50	50	8.5	6	13	5	6.3
M8x40	40	12	8	17	8	8.3
M10x45	45	14	10	20	9	10.3
M10x57	57	15	10	21	9	10.3
M12x55	55	17	12	24	11	12.1
M12x65	65	17	12	24	11	12.1
M16x80	80	22	16	32	15	12.1
M16x100	100	22	16	32	15	12.1
M20x95	95	28	20	40	17	14.2
M20x100	100	28	20	40	17	14.2
M20x120	120	28	20	40	17	14.2
M24x120	120	32	24	46	20	14.2
M30x150	150	40	30	57	28	16.0

2.3. Materials

EV Inserts are available in following materials.

Table 3 Materials for Insert

Insert	Material	Material Type	Standard
Socket (EV), EVF	S355J0	Electro Zinced	EN 10025
Socket (EVs), EVFs	1.4301	Stainless Steel	EN 10088
EVFa	1.4401	Acid Resistant Steel	EN 10088
Cross Pin	S355J0	Electro Zinced	EN 10025

2.4 Quality Control

Manufacturing quality control for insert is carried out in accordance with the EN 1090-2.

2.5 Marking

The product marking provides information about the thread size, length of anchor, product name and manufacturing date as shown in figure 4.1.

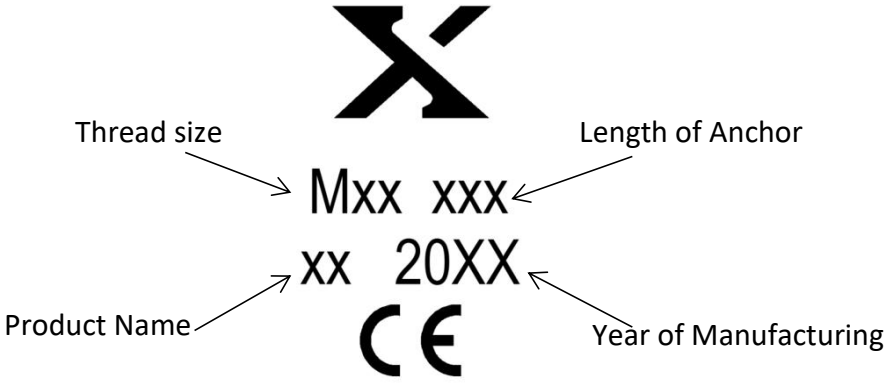


Figure: 4.1

3. Design Load Capacity (Safe Working Loads)

EV and EVF Inserts are designed for uncracked concrete and for ultimate limit state design. EV insert has been designed in such a way that the anchor pin orientation does not affect the capacity of the insert when used as as a fixing insert.

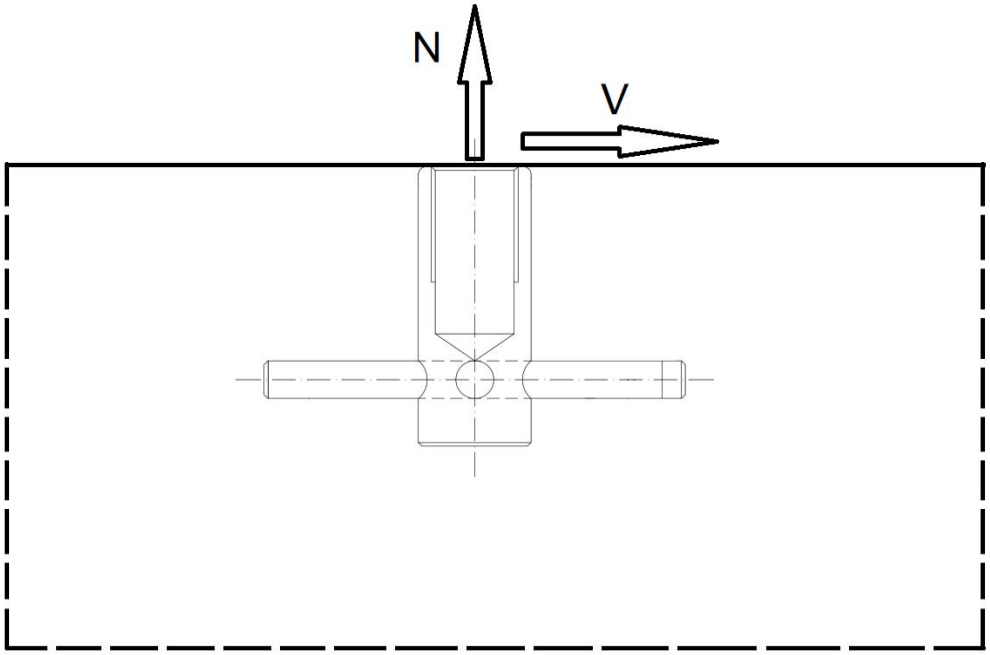


Figure 5

Table 4. Resistance for Tension, N (EV Fixing Insert)

Insert Size	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50
	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
M 10x45	3.35	3.74	4.19	4.59	4.95	5.30
M 10x50	3.48	3.89	4.34	4.76	5.14	5.49
M 10x60	4.13	5.17	5.97	6.54	7.07	7.56
M 12x50	3.48	3.89	4.34	4.76	5.14	5.49
M 12x70	6.18	6.94	7.76	8.50	9.18	9.81
M 16x50	3.48	3.89	4.34	4.76	5.14	5.49
M 16x70	6.84	7.64	8.55	9.36	10.11	10.81
M 16x90	11.32	12.66	14.16	15.51	16.75	17.91
M 20x100	11.19	12.51	13.99	15.32	16.55	17.69
M 24x120	15.86	17.73	19.82	21.72	23.46	25.08
M 24x150	27.02	30.21	33.77	36.99	39.96	42.72

Table 5. Resistance for Shear, V (EV Fixing Insert)

Insert Size	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50
	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
M 10x45	5.02	5.62	6.28	6.88	7.43	7.94
M 10x50	5.21	5.83	6.52	7.14	7.71	8.24
M 10x60	7.17	8.02	8.96	9.82	10.60	11.34
M 12x50	5.21	5.83	6.52	7.14	7.71	8.24
M 12x70	9.31	10.41	11.64	12.75	13.77	14.72
M 16x50	5.21	5.83	6.52	7.14	7.71	8.24
M 16x70	10.26	11.47	12.82	14.04	15.17	16.22
M 16x90	16.99	18.99	21.23	23.26	25.12	26.86
M 20x100	16.78	18.76	20.98	22.98	24.82	26.54
M 24x120	23.79	26.60	29.74	32.57	35.18	37.61
M 24x150	40.52	45.31	50.66	55.49	59.94	64.07

Table 6. Design Resistances for EVF Fixing Insert

Insert Size	Design Resistances [kN]	
	Axial Pull Force, F_{Rd}	Shear Force, V_{Rd}
M6x35	2.6	1.47
M6x40	2.6	1.47
M6x50	2.6	1.47
M8x40	4.3	2.39
M10x45	4.8	2.67
M10x57	6.3	3.53
M12x55	7.8	4.36
M12x65	7.8	4.36
M16x80	18.2	10.22
M16x100	18.2	10.22
M20x95	25.3	14.19
M20x100	25.3	14.19
M20x120	25.3	14.19
M24x120	36.4	20.41
M30x150	67.0	32.21

EV and EVF Inserts, when used as a lifting insert, has resistances based on the table given below.

Table 7. Resistance for EV Lifting Insert

Insert Size	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50
	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
M 12x70	5.39	6.02	6.74	7.38	7.97	8.52
M 16x90	6.66	8.32	10.40	12.48	14.57	15.99
M 20x100	8.88	11.00	12.30	13.48	14.56	15.56
M 24x120	13.89	15.53	17.37	19.03	20.55	21.97
M 24x150	17.51	21.89	27.36	32.83	35.86	38.34

Table 8. Design Resistances for EVF Lifting Insert

Insert Size	Design Resistances [kN]
M12x65	5.0
M16x100	12.0
M20x100	20.0
M24x120	25.0
M30x150	40.0

4. Minimum Element Thickness and Spacing of Inserts

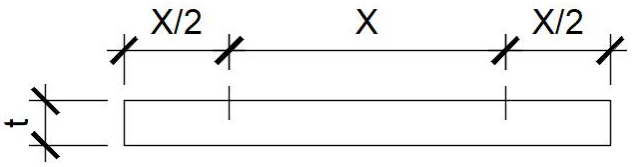


Figure 6

Table 9. Minimum distances for Tension Resistance (EV Fixing Insert)

Insert Size	Edge Distance	Center Distance	Thickness
	X/2, [mm]	X, [mm]	t, [mm]
M 10x45	90	180	80
M 10x50	100	200	80
M 10x60	120	240	95
M 12x50	100	200	80
M 12x70	140	280	110
M 16x50	100	200	80
M 16x70	140	280	120
M 16x90	180	360	150
M 20x100	200	400	150
M 24x120	240	480	180
M 24x150	300	600	240

Table 10. Minimum distances for Shear Resistance (EV Fixing Insert)

Insert Size	Edge Distance	Center Distance	Thickness
	X/2, [mm]	X, [mm]	t, [mm]
M 10x45	135	270	80
M 10x50	150	300	80
M 10x60	180	360	95
M 12x50	150	300	80
M 12x70	210	420	110
M 16x50	150	300	80
M 16x70	210	420	120
M 16x90	270	540	150
M 20x100	300	600	150
M 24x120	360	720	180
M 24x150	450	900	240

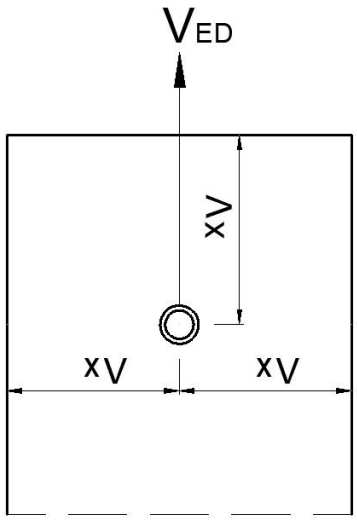


Figure 7

Table 11. Minimum element thickness and minimum distance for Shear Resistance EVF Fixing Insert

Lifting Anchor	Thickness	Edge Distance	Center Distance
	t, [mm]	X/2, [mm]	X, [mm]
M6x35	50	55	110
M6x40	50	60	120
M6x50	50	75	150
M8x40	60	60	120
M10x45	60	70	140
M10x57	60	90	180
M12x55	60	85	170
M12x65	60	100	200
M16x80	80	120	240
M16x100	80	150	300
M20x95	100	145	290
M20x100	100	150	300
M20x120	100	180	360
M24x120	120	180	360
M30x150	140	225	450

Figure 21: Minimum element thickness and minimum lifting insert spacing in slab elements :

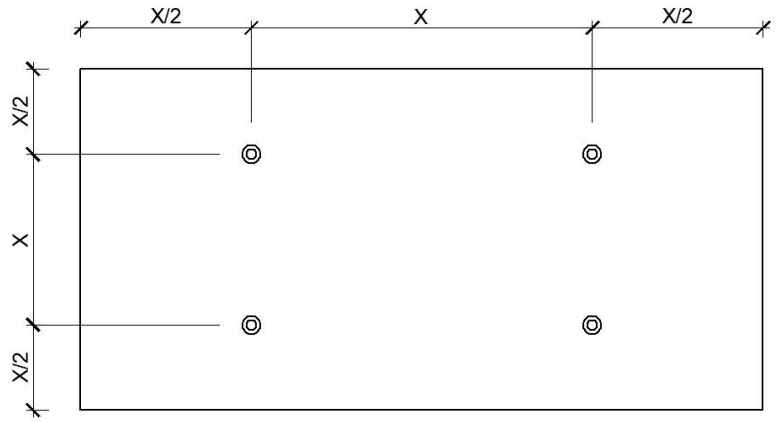


Figure 8

Table 12. Minimum element thickness and minimum distance for EV Lifting Insert

Insert Size	Slab Thickness	Edge Distance	Minimum Centre to centre
	t, [mm]	X/2, [mm]	X, [mm]
M 12x70	110	75	150
M 16x90	150	105	210
M 20x100	150	105	210
M 24x120	180	125	250
M 24x150	240	170	340

Table 13. Minimum element thickness and minimum distance for EVF Lfting Insert

Lifting Anchor	Slab Thickness	Edge Distance	Minimum Centre to centre
	t, [mm]	X/2, [mm]	X, [mm]
M12x65	60	150	300
M16x100	80	200	400
M20x100	100	275	550
M24x120	120	300	600
M30x150	140	325	650

5. Reinforcement

The inserts are designed to be used without additional reinforcement if the conditions for minimum edge distances are followed. If the edge distances are less than those mentioned in the table given in Clause 4, then additional reinforcement needs to provide as shown in the image below.

The reinforcement provided for shear resistance should be equal to the full capacity of the insert and should be designed as such. For tension resistance, the value of resistance becomes 0 kN at 50 mm from the edge. The remaining resistance values can be calculated through interpolation and reinforcement should be provided accordingly.

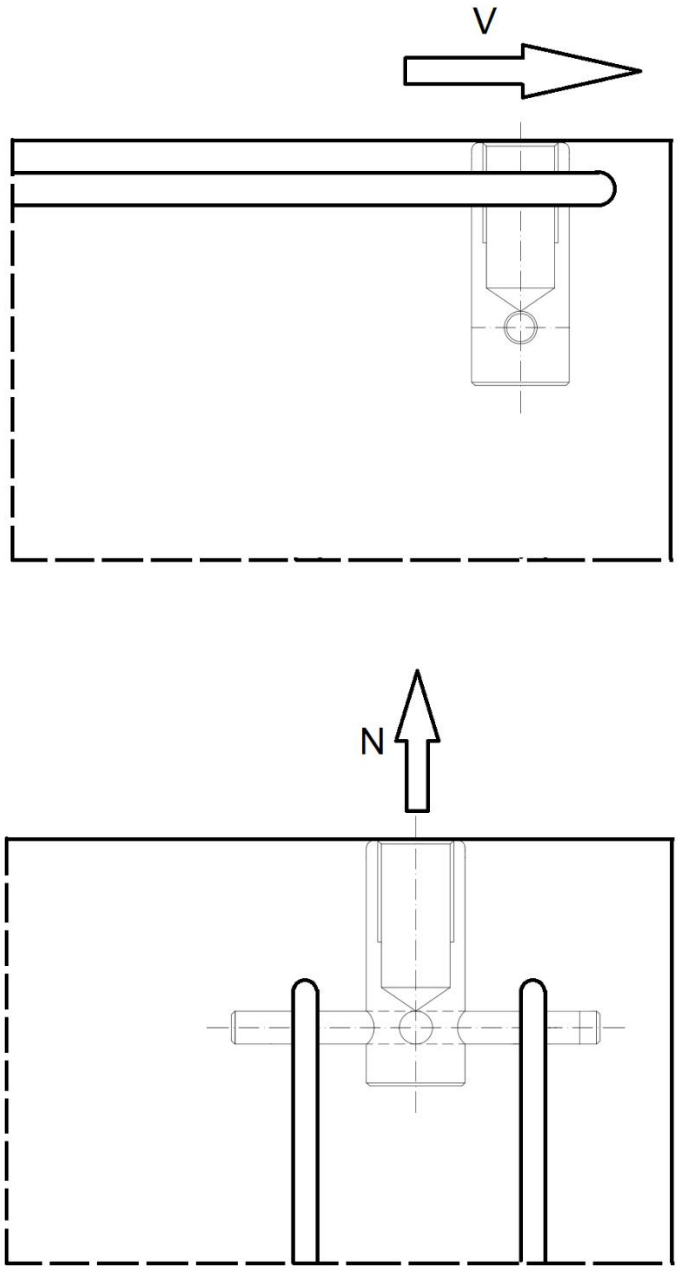


Figure 9

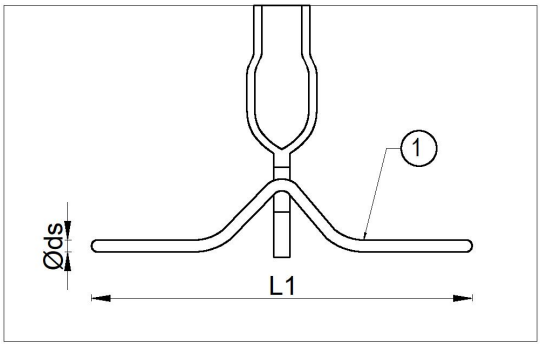
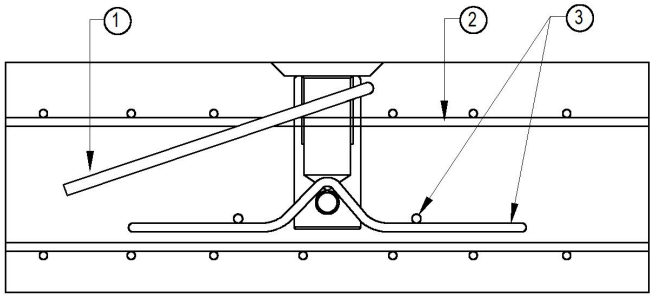


Figure 10 Reinforcement for EVF

Table: 14.Reinforcement for EVF Fixing Insert:

Lifting Anchor	Anchor Reinforcement, 1 (Ø – L1)
M6x35	6 - 200
M6x40	6 - 200
M6x50	6 - 200
M8x40	6 - 280
M10x45	6 - 280
M10x57	6 - 280
M12x55	8 - 340
M12x65	8 - 340
M16x80	10 - 660
M16x100	10 - 660
M20x95	12 - 900
M20x100	12 - 900
M20x120	12 - 900
M24x120	14 - 980
M30x150	20 - 1080

Figure: 11 Reinforcement for EV lifting Anchor :



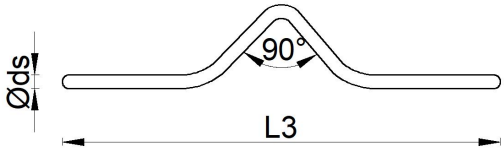
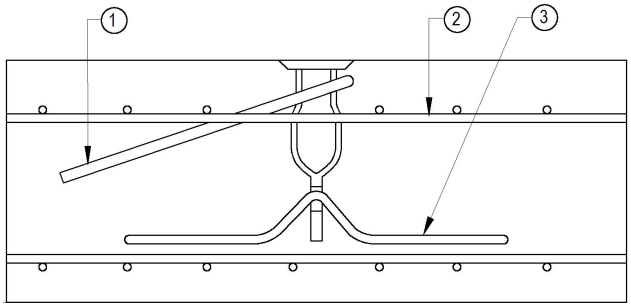


Table: 15 Diagonal Reinforcement for EV lifting Insert :

Lifting Insert	Diagonal pull Reinforcement, 1 (Ø – L2)	2 Layers Mesh Reinforcement 2 [mm²/m]	Anchor Reinforcement, 3 (Øds– L3)
	[mm]	[mm]	[mm]
EV - 12	Ø6 - 150	2 x 131	Ø6 - 530
EV - 16	Ø8 - 200	2 x 188	Ø10 - 740
EV - 20	Ø8 - 300	2 x 188	Ø12 - 980
EV - 24	Ø10 - 300	2 x 188	Ø14 - 1050
EV - 24	Ø10 - 300	2 x 188	Ø16 - 1450

Figure: 12 Reinforcement for EVF lifting Insert :



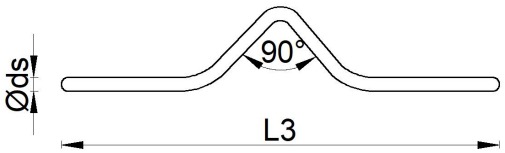


Table: 16 Diagonal Reinforcement for EVF lifting Anchor :

Lifting Insert	Diagonal pull Reinforcement, 1 (Ø – L2)	2 Layers Mesh Reinforcement, 2 [mm²/m]	Anchor Reinforcement, 3 (Øds – L3)
	[mm]	[mm]	[mm]
M12x65	Ø6 - 150	2 x 131	Ø6 - 530
M16x100	Ø8 - 200	2 x 188	Ø10 - 740
M20x100	Ø8 - 300	2 x 188	Ø12 - 980
M24x120	Ø10 - 300	2 x 188	Ø14 - 1050
M30x150	Ø12 - 400	2 x 188	Ø16 - 1450