

Lifting and Fixing Tools





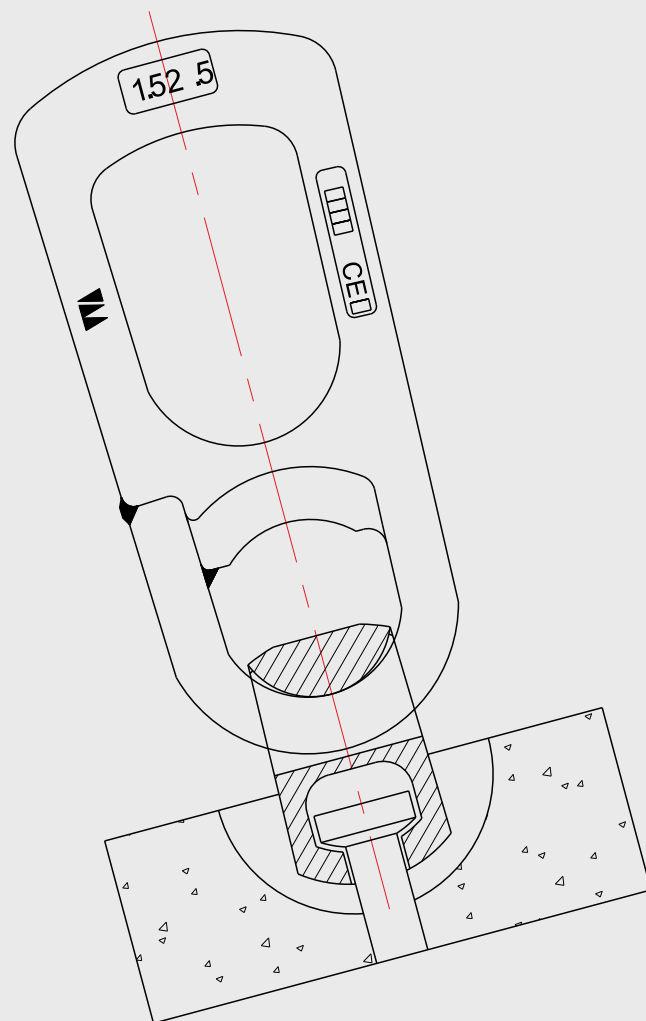


Table of Contents

01. <u>Lifting System with Spherical Head Anchors</u>	04
02. <u>Lifting System with Sockets</u>	12
03. <u>Calculation of Actions on Lifting Inserts</u>	20
04. <u>Fixing System with Sockets</u>	24

Lifting System with Spherical Head Anchors

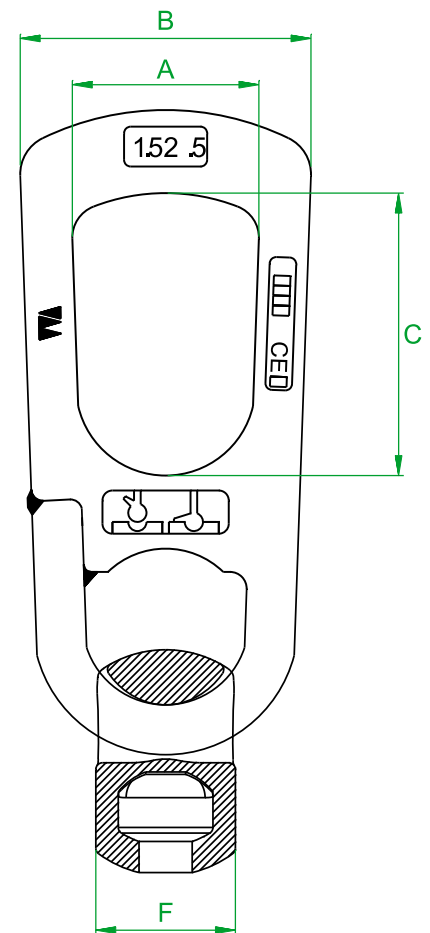
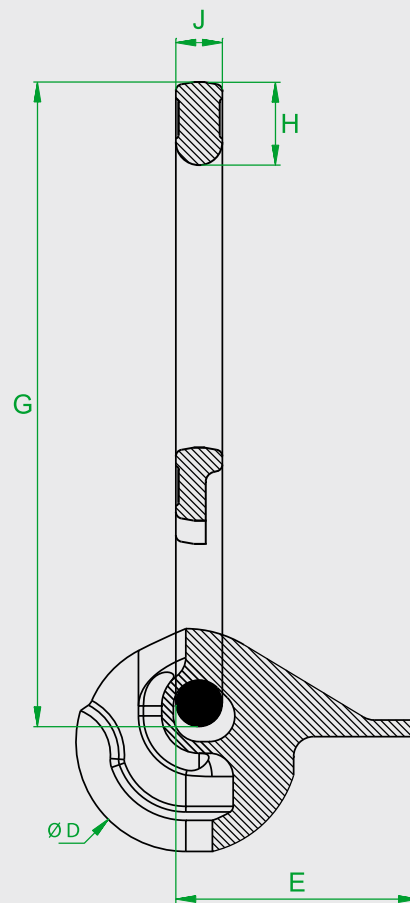
- Lifting System for precast elements
- Working Load from 1.3 to 32 Tons
- Full range of Anchors, Formers, and Lifting Hooks
- Lifting hooks and Formers reusable
- Lifting hooks with CE certification



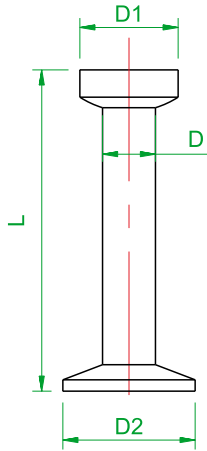
Ref 6102: Lifting eye

Range		1.3 T	2.5 T	5 T	7.5 T - 10 T	15 T - 20 T	32 T
Ref.		6102013	6102025	6102050	6102100	6102200	6102320
A	mm	44	56	68	82	113	175
B	mm	74	88	118	160	191	269
C	mm	70	85	88	112	135	189
ØD	mm	56	68	88	112	152	195
E	mm	54	66	83	113	151	214
F	mm	32	42	57	73	110	153
G	mm	162	196	237	339	447	584
H	mm	20	25	37	50	75	100
J	mm	12	14	16	26	30	45

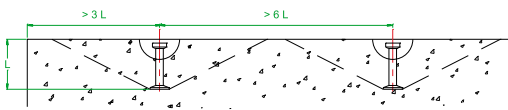
Lifting eyes are provided with CE certificates and usage and safety instructions.



Ref 6000: Foot anchor



Range	1.3 T	2.5 T	5 T	7.5 T	10 T	15 T	20 T	32 T
Ref.	6000013...	6000025...	6000050...	6000075...	6000100...	6000150...	6000200...	6000320...
D mm	10	14	20	24	28	34	38	50
D1 mm	18	25	36	46	47	69	69	88
D2 mm	25	35	50	60	70	85	98	135
L mm	35	45	75	100	115	140	200	200
	40	55	85	120	135	165	240	250
	50	65	95	165	150	200	340	280
	55	75	120	200	170	300	500	320
	65	85	180	240	200	400	1000	500
	85	120	240	300	250			700
	120	140	340		340			1200
	240	170	480		680			
		210						
		240						
		280						



Other lengths can be provided on request.

Foot anchors are in black carbon steel. They are also available with electro-galvanised and hot dip galvanised steel. They can be provided also in stainless steel (on request).

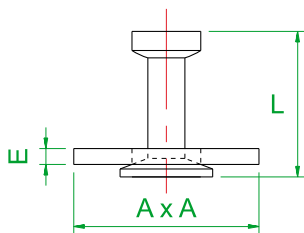
To get the full compression cone, the distance from the concrete edge must be higher than 3L and the distance between anchors must be higher than 6L.

However, even in that case, the load capacity of the anchorage (concrete failure) has to be checked by a qualified people.

DSI-ARTÉON can provide on request anchors welded on a steel plate 20 x 3 mm. This system provides to the precaster an easy, quick and safe solution to place anchors in the element, by spot welding the steel plate to the reinforcing steels of the precast element (pipe, ...).

Dimensions are defined case by case with the customer.

Ref 6010: Plate anchor



Range	2.5 T	5 T	10 T
Ref.	6010025055	6010050065	6010100115
A mm	70	90	90
E mm	6	8	10
L mm	55	65	115

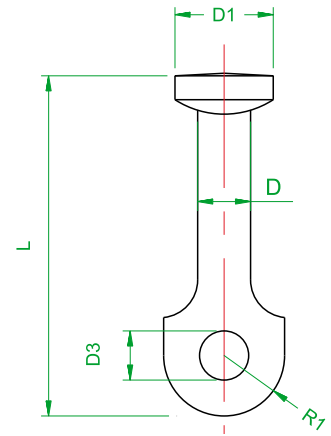
On request.

To know the reinforcing steel to use, and the working load, please request.

Ref 6001: Eye anchor

Range	1.3 T	2.5 T	5 T	10 T	20 T	32 T
Ref.	6001013065	6001025090	6001050120 6001050090	6001100180 6001100115	6001200250	6001320300
D mm	10	14	20	28	38	50
D1 mm	18	25	36	46	69	88
D3 mm	10	13	20	25	38	47
R1 mm	11	16	21.5	27.5	41.5	50
L _{normal} mm	65	90	120	180	250	300
L _{short} mm			90	115		

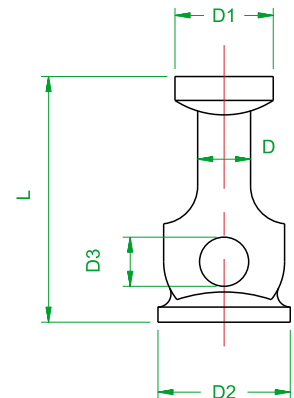
Eye anchors must always be used with a ribbed reinforcing steel, grade FeE500. Eye anchors are available in black carbon steel or hot dip galvanised steel.



Ref 6002: Foot & eye anchor

Range	1.3 T	2.5 T	5 T
Ref.	6002013050	6002025065	6002050080
D mm	10	14	20
D1 mm	18	25	36
D2 mm	22	35	47
D3 mm	10	13	20
L mm	53	65	80

Foot & eye anchors must always be used with a ribbed reinforcing steel, grade FeE500. Foot & eye anchors are available in black carbon steel or hot dip galvanised steel.

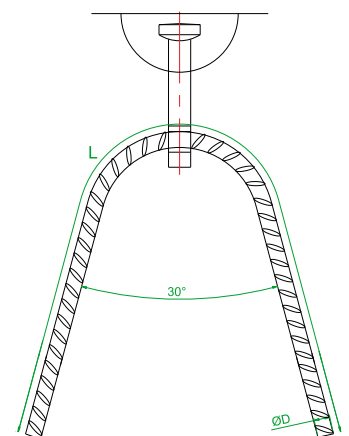


Ribbed reinforcing steel FeE500

To use with the eye anchors and with the foot & eye anchors.

Total length L (mm) of ribbed reinforcing steel to place in the eye of the anchor, depending on the concrete strength.

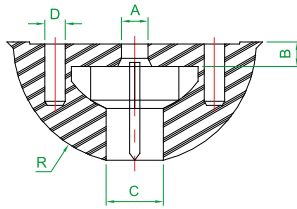
Range	1.3 T	2.5 T	5 T	10 T	20 T	32 T
Rebar diameter						
D mm	8	10	16	20	32	40
Length for Concrete						
10 MPa mm	700	1100	1600	2000	3000	3800
20 MPa mm	600	700	1100	1400	2000	2700
10 MPa mm	450	600	900	1100	1700	2100



Rubber Recess Former and accessories

Ref 6139: Round rubber recess former

Ref 6140: Round rubber recess former + fixing set (= 6139 + 6141)

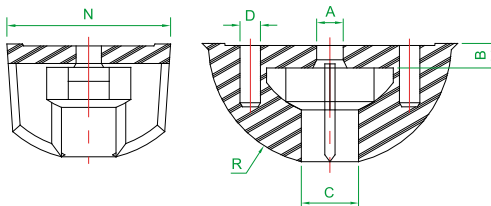


Range		1.3 T	2.5 T	5 T	7.5 T	10 T	15 T	20 T	32 T
Ref.		6139013	6139025	6139050	6139075	6139100	6139150	6139200	6139320
R	mm	30	37	47	59	59	80	80	102
A	mm	9	11	11	13	13	13	13	15
B	mm	6	10	11.5	14	14	16	16	16
C	mm	10	14	20	24	28	34	38	50
D	mm	6.5	6.5	8.5	10.5	10.5	10.5	10.5	10.5

Rubber recess formers can be used 30 to 40 times.

Ref 6137: Narrow rubber recess former

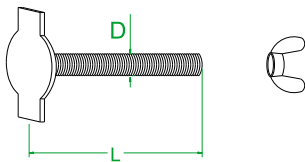
Ref 6138: Narrow rubber recess former + fixing set (= 6137 + 6141)



Range		1.3 T	2.5 T	5 T	7.5 T	10 T	15 T	20 T
Ref.		6137013	6137025	6137050	6137075	6137100	6137150	6137200
R	mm	30	37	47	59	59	80	80
A	mm	9	11	11	13	13	13	13
B	mm	6	10	11.5	14	14	16	16
C	mm	10	14	20	24	28	34	38
D	mm	6.5	6.5	8.5	10.5	10.5	10.5	10.5
N	mm	43	53	69	85	85	124	124

Rubber recess formers can be used 30 to 40 times.

Ref 6141: Fixing set for rubber recess former



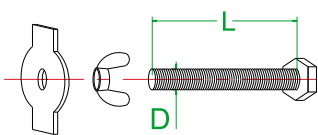
Range		1.3 T	2.5 T	5 T	7.5 T	10 T	15 T	20 T	32 T
Ref.		6141013	6141025	6141050	6141100	6141100	6141200	6141200	6141320
D	mm	M8	M10	M10	M12	M12	M12	M12	M12
L	mm	80	80	100	100	100	100	100	100

Fixing sets are composed of a plate with welded thread bar and the wing nut.

Ref 6142: Threaded plate

Ref 6143: Wing nut

Ref 6144: Screw



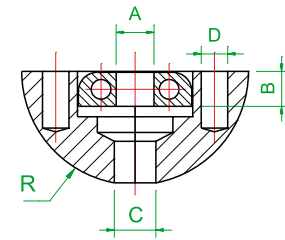
Range		1.3 T	2.5 T	5 T	7.5 T	10 T	15 T	20 T
Plate		6142013	6142025	6142050	6142100	6142100	6142200	6142200
Wing nut		6143008	6143010	6143010	6143012	6143012	6143012	6143012
Screw		6144008	6144010	6144010	6144012	6143012	6143012	6143012
D	mm	M8	M10	M10	M12	M12	M12	M12
L	mm	60	80	80	80	80	80	80

Articulated Steel Recess Former

Ref 6129: Articulated steel former (round)

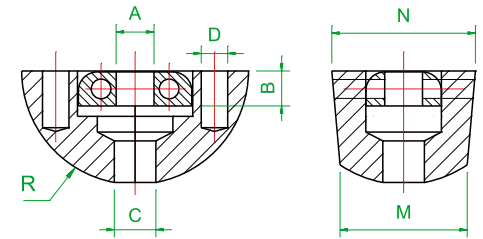
Range		1.3 T	2.5 T	5 T	10 T
Ref.		6129013	6129025	6129050	6129100
R	mm	30	37	14	59
A	mm	M10	M10	M10	M12
B	mm	10	10	10	10
C	mm	11	15	21	29
D	mm	7	7	10	9

Formers can also be supplied on request in 7.5 T



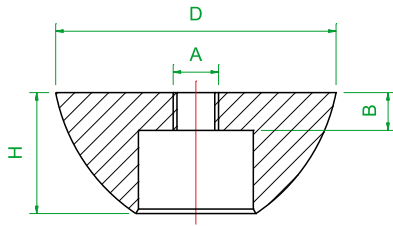
Ref 6127: Narrow articulated steel former

Range		1.3 T	2.5 T
Ref.		6127013M12 (on request)	6127025 (on request)
R	mm	30	37
N	mm	42	48
M	mm	37	43
A	mm	M12	M10
B	mm	12	10
C	mm	11	15
D	mm	No hole	7



Recess Former with Rubber Ring

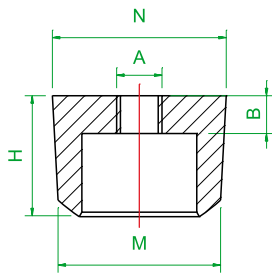
Ref 6150: Steel recess former (hemispherical)



Range	1.3 T	2.5 T	5 T
Ref.	6150013	6150025	6150050
D mm	58	74	94
A mm	M8	M12	M12
B mm	10	10	10
H mm	25	32	39

Steel recess formers must be used with rubber ring ref 6151.

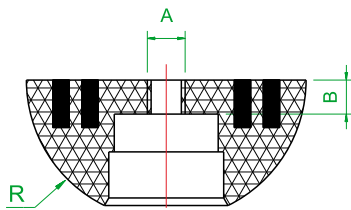
Ref 6152: Narrow steel recess former



Range	1.3 T	2.5 T	5 T
Ref.	6152013 (on request)	6152025 (on request)	6152050 (on request)
D mm	58	74	94
A mm	M8	M12	M12
B mm	10	10	10
H mm	25	32	39
N mm	42	46	69
M mm	34	43	58

Steel recess formers must be used with rubber ring ref 6151.

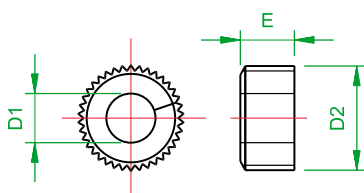
Ref 6154M: Magnetic recess former



Range	1.3 T	2.5 T	5 T	10 T
Ref.	6154013M60	6154025M75	6154050M100	6154100M150
R mm	30	37	47	59
A mm	M10	M10	M10	M10
B mm	6	9	12	12
Magnetic load installed	60 kg	75 kg	100 kg	150 kg

Magnetic recess formers must be used with rubber ring ref 6151.

Ref 6151: Rubber ring



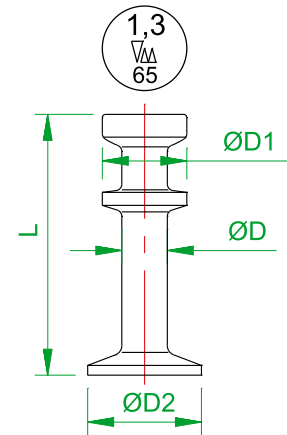
Range	1.3 T	2.5 T	5 T	10 T
Ref.	6151013B	6151025B	6151050C	6151100C
D2 mm	22	32	38.7	49.4
D1 mm	10	14	21	28.5
E mm	11	12	14	20

Double Head Anchor and Recess Formers

Ref 6070: Double head anchor

Range		1.3 T	2.5 T	5 T
Ref.		6070013...	6070025...	6070050...
D	mm	10	14	20
D1	mm	18	25	36
D2	mm	25	35	50
L	mm	55	55	120
		65	65	180
		85	85	
			120	

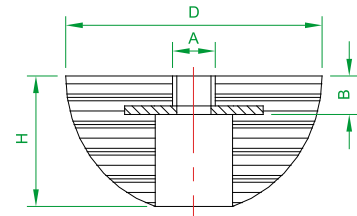
Other length can be provided on request.
Double head anchors are electro-galvanised.



Ref 6170: Tightening former

Range		1.3 T	2.5 T
Ref.		6170013	6170025
D	mm	60	74
A	mm	M8	M10
B	mm	9	11
H	mm	32.7	42.6

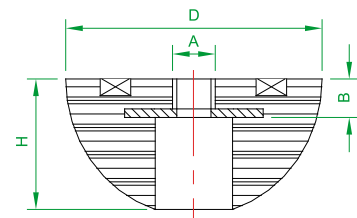
Double head anchors are maintained to the former by tightening.



Ref 6164M: Magnetic tightening former

Range		1.3 T	2.5 T
Ref.		6164013M	6164025M
D	mm	60	74
A	mm	M8	M10
B	mm	9	11
H	mm	32.7	42.6
Magnetic load installed		60 kg	60 kg

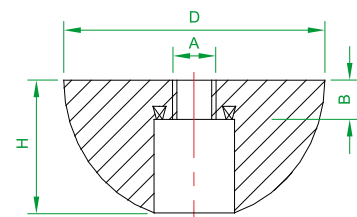
Double head anchors are maintained to the former by tightening.



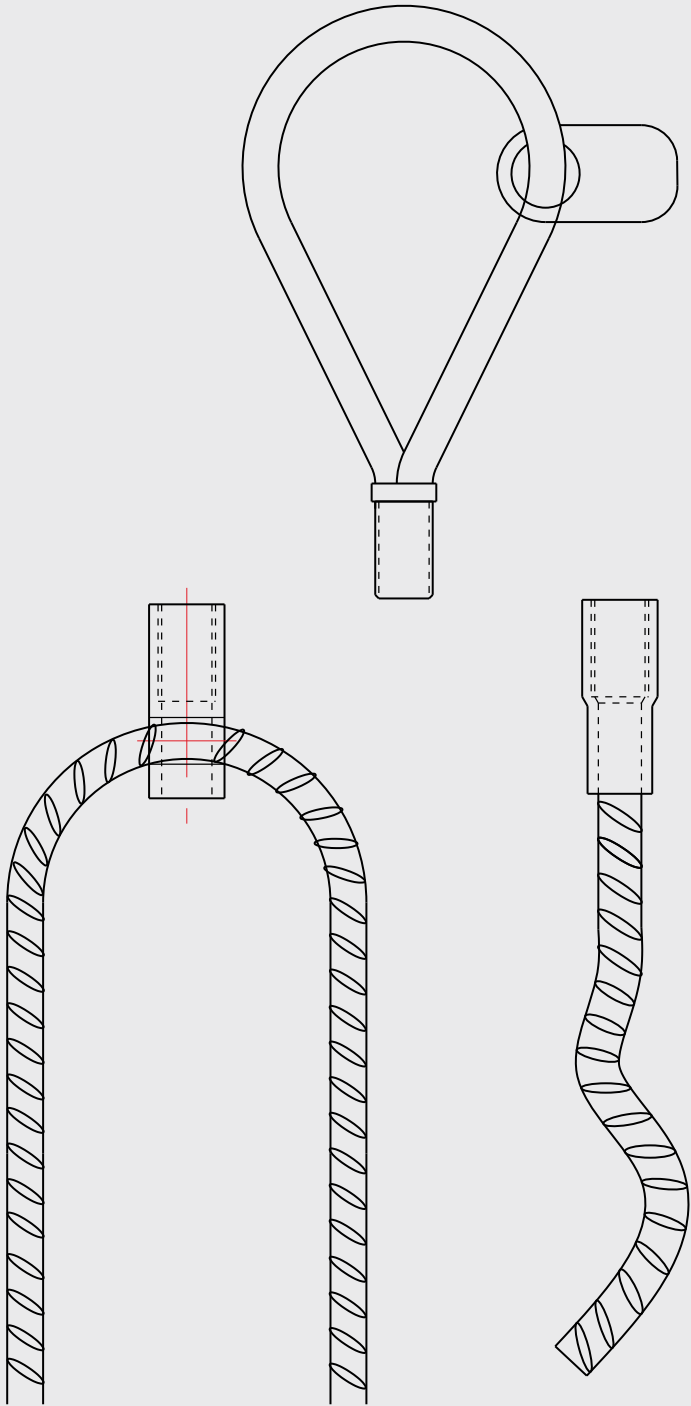
Ref 6160: Magnetgrip former

Range		1.3 T	2.5 T
Ref.		6160013	6160025
D	mm	60	74
A	mm	M8	M10
B	mm	9	11
H	mm	32.7	42.6

Double head anchors are maintained to the former by internal magnets.



Lifting System with Sockets



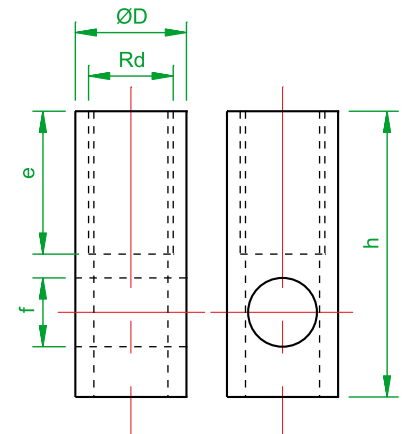
Lifting Socket with Cross Hole

Lifting sockets with cross hole comply with the safety rules for transport anchors for precast concrete units. Lifting sockets may only be used in combination with a lifting loop or Special Lifting Device.

The insert shows an internal thread and cross hole. The reinforcement steel stirrup inserted through this cross hole takes over transmission of power into the unit.

Load bearing capacities and dimensions

Reference	Thread Rd	Load bearing capacities [kg]		Dimensions [mm]				Weight [kg/100 p]
		0° - 45°	Lateral tension	D	h	e	f	
6372005	12	500	250	15.0	40	22	8.0	3.3
6372008	14	800	400	18.0	47	25	10.5	5.0
6372012	16	1200	600	21.0	54	27	13.0	8.0
6372016	18	1600	800	24.0	65	34	13.0	15.5
6372020	20	2000	1000	27.0	69	35	15.5	18.0
6372025	24	2500	1250	31.0	78	43	18.0	22.0
6372040	30	4000	2000	39.5	103	56	22.5	70.0
6372063	36	6300	3150	47.0	125	68	27.5	80.0
6372080	42	8000	4000	54.0	145	80	32.0	105.0
6372125	52	12500	6250	70.0	195	100	40.0	300.0



On lateral tension, lifting sockets with cross hole have just the half load bearing capacity compared to axial tension.

Lifting sockets are manufactured of precision steel in special quality.

They are also available in stainless steel.

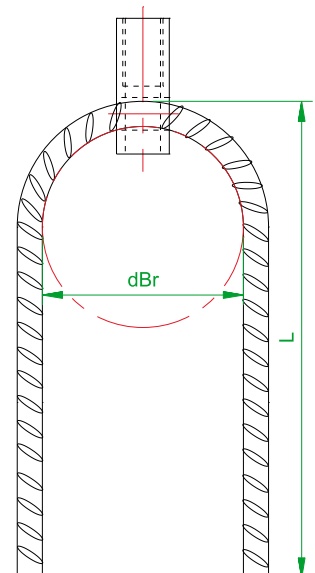
Sockets are electro-galvanized and manufactured with a Rd thread.

Lifting sockets with cross hole must always be used with a steel re-bar as follows:

Diameter and dimensions of reinforcement stirrups

Reference	rebar Ø FeE500 [mm]	Bending diameter d_{Br} [mm]	parallel	
			Length of stirrup L [mm]	Cutting length [mm]
6372005	6	24	240	490
6372008	8	32	280	570
6372012	10	40	330	670
6372016	10	40	420	850
6372020	12	48	440	890
6372025	14	56	480	970
6372040	16	64	650	1320
6372063	20	140	820	1670
6372080	25	175	860	1750
6372125	28	196	1200	2440

Lengths of the stirrups are defined for a concrete strength of minimum 15 MPa.

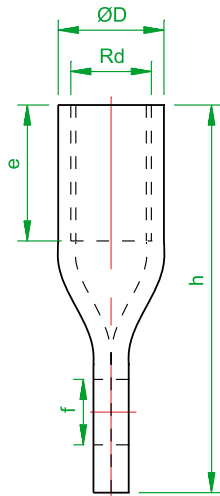


Lifting Socket with Flat End

Lifting sockets with flat end complies with the safety rules for transport anchors for precast concrete units. The lifting socket may only be used in combination with a lifting loop or Special Lifting Device.

The insert shows an internal thread, a flat end and cross hole. The reinforcement steel stirrup inserted through this cross hole takes over transmission of power into the unit.

Load bearing capacities and dimensions



Reference	Thread Rd	Load bearing capacities [kg]		Dimensions [mm]				Weight [kg/100 p]
		0° - 45°	Lateral tension	D	h	e	f	
6374005	12	500	250	15.0	60	22	8.0	5.0
6374008	14	800	400	18.0	70	25	10.5	6.0
6374012	16	1200	600	21.0	77	27	13.0	10.0
6374016	18	1600	800	24.0	85	34	13.0	18.0
6374020	20	2000	1000	27.0	92	35	15.5	21.0
6374025	24	2500	1250	31.0	100	43	18.0	29.0

On lateral tension, lifting sockets with flat end have just the half load bearing capacity compared to axial tension.

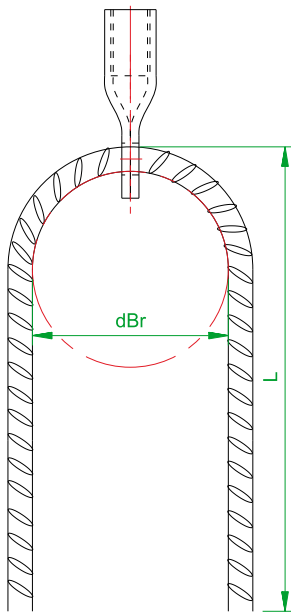
Lifting sockets are manufactured of precision steel in special quality.

They are also available in stainless steel.

Sockets are electro-galvanized and manufactured with a Rd thread.

Lifting sockets with flat end must always be used with a steel re-bar as follows:

Diameter and dimensions of reinforcement stirrups



Reference	rebar Ø FeE500 [mm]	Bending diameter d _{Br} [mm]	parallel	
			Length of stirrup L [mm]	Cutting length [mm]
6374005	6	24	240	490
6374008	8	32	280	570
6374012	10	40	330	670
6374016	10	40	420	850
6374020	12	48	440	890
6374025	14	56	480	970

Lengths of the stirrups are defined for a concrete strength of minimum 15 MPa.

Lifting Socket with Long Wavy Rebar

Lifting sockets with long wavy rebar comply with the safety rules for transport anchors for precast concrete units. Lifting sockets may only be used in combination with a lifting loop or Special Lifting Device.

Load bearing capacities and dimensions

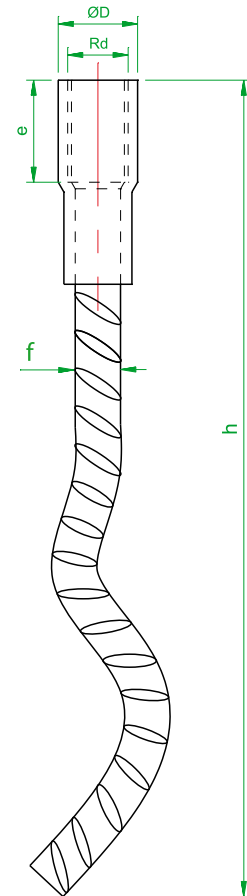
Reference	Thread Rd	Load bearing capacities [kg]		Dimensions [mm]				Weight [kg/100 p]
		0° - 45°	Lateral tension	ØD	h	e	f	
6378005	12	500	250	15.0	137	22	8	7.4
6378008	14	800	400	18.0	170	25	10	14.2
6378012	16	1200	600	21.0	216	27	12	24.6
6378016	18	1600	800	24.0	235	34	14	39.0
6378020	20	2000	1000	27.0	257	35	16	53.1
6378025	24	2500	1250	31.0	350	43	16	73.0
6378040	30	4000	2000	39.5	450	56	20	145.0
6378063	36	6300	3150	47.0	570	68	25	281.0
6378080	42	8000	4000	54.0	620	80	28	389.0
6378125	52	12500	6250	70.0	880	100	32	765.0

On lateral tension, lifting sockets with long wavy rebar have just the half load bearing capacity compared to axial tension.

Lifting sockets with short wavy rebar or straight rebar can also be provided.

Lifting sockets are manufactured of precision steel in special quality.

Sockets are electro-galvanized and manufactured with a Rd thread.

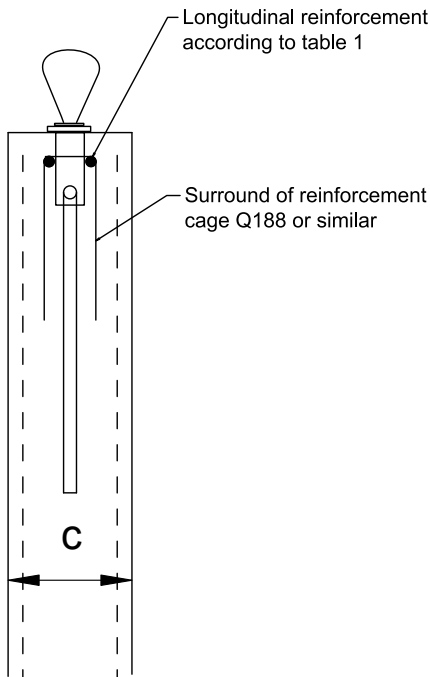


Reinforcement and Minimum Thickness for Sockets...

On use of lifting inserts, precast units must be reinforced with a minimum surface reinforcement (according to table 1) and concrete must have a strength of minimum 15 MPa at first time of lifting. An already existing static-structural reinforcement may be taken into account. The user is personally responsible for further transmission of load into the unit.

Table 1: Minimum reinforcement

Reference	Longitudinal reinforcement FeE500		Surface reinforcement FeE500
	[mm]	[mm]	[cm ² /m]
6372005	Ø 10	850	1.31
6372008	Ø 10	850	1.31
6372012	Ø 10	850	1.31
6372016	Ø 12	850	1.88
6372020	Ø 12	850	1.88
6372025	Ø 12	850	1.88
6372040	Ø 16	1000	1.88
6372063	Ø 16	1000	1.88
6372080	Ø 16	1000	1.88
6372125	Ø 20	1200	1.88

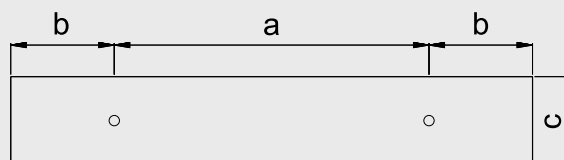


This minimum reinforcement can be replaced by comparable stirrups with longitudinal reinforcement. Diagonal tension requests additional reinforcement (table 3). For transmission of load into the concrete, a reinforcement stirrup of FeE500 is inserted through the cross hole of the lifting socket. Contact of reinforcement and insert has to be ensured in suitable manner (binding wire, but no welding).

Lifting sockets must be used in units with minimum dimensions according to table 2.

Table 2: Minimum axis distance, edge distance, minimum thickness of unit

Reference	Minimum axis distance (a) [mm]	Minimum edge distance (b) [mm]	Minimum thickness of unit (c) [mm]
6372005	300	150	60
6372008	400	200	60
6372012	400	300	80
6372016	500	350	100
6372020	550	400	100
6372025	600	450	120
6372040	650	550	140
6372063	800	700	200
6372080	1000	800	240
6372125	1200	900	275



...with Cross Hole, Flat End and Long Wavy Rebar

On lateral and diagonal tension additional reinforcement (table 3 and 4) to minimum reinforcement (table 1) is to install. It is to observe that additional reinforcement has pressure contact to the insert. Diagonal tension reinforcement is arranged opposite to direction of tensile force.

Table 3: Additional reinforcement on diagonal tension (necessary if $\beta \geq 12.5^\circ$)

Reference	rebar \varnothing FeE500 [mm]	L [mm]	Bending diameter d_{Br} [mm]
6372005	6	150	24
6372008	6	200	24
6372012	8	200	32
6372016	8	250	32
6372020	8	300	32
6372025	10	300	40
6372040	12	400	48
6372063	14	550	56
6372080	16	600	64
6372125	20	750	140

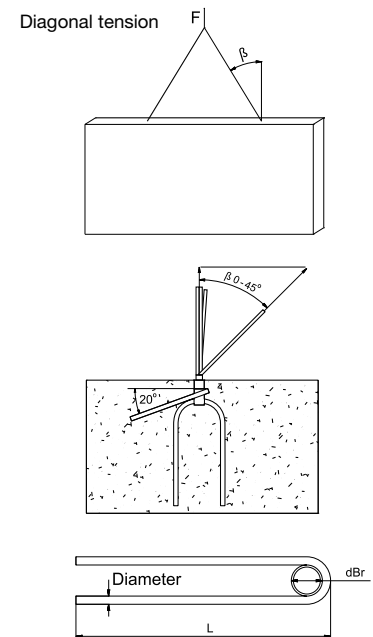
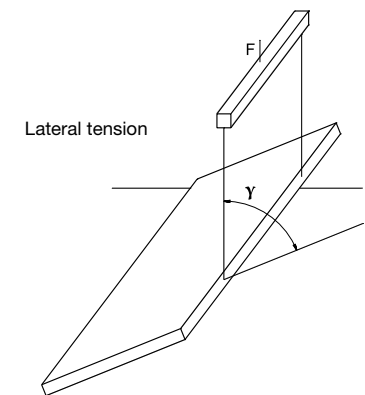
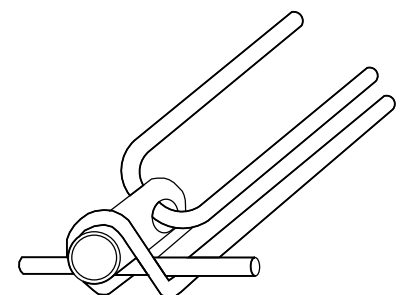
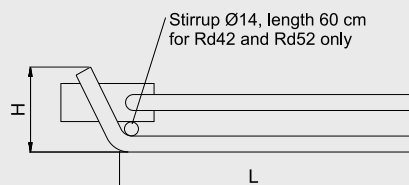


Table 4: Additional reinforcement on lateral tension (necessary if $\gamma \geq 7^\circ$)

Reference	rebar \varnothing FeE500 [mm]	L [mm]	H [mm]	Bending diameter d_{Br} [mm]
6372005	6	270	35	24
6372008	8	350	42	32
6372012	8	420	49	32
6372016	12	460	55	48
6372020	12	490	64	48
6372025	12	520	75	48
6372040	16	570	92	64
6372063	16	690	118	64
6372080	16	830	143	64
6372125	20	930	174	140



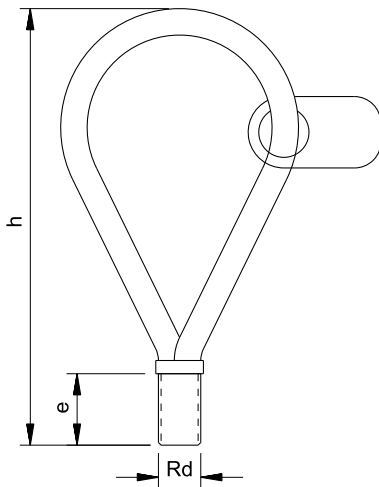
Tilt-up of slabs can lead simultaneous diagonal and lateral tension. Those cases request only lateral reinforcement and covers case of diagonal tension as well. Repeated tilt-down or tilt-up of the unit during installation requests consideration of lateral reinforcement.



Lifting loops can be used with lifting sockets. On use of these lifting loops attention must be paid on this instruction for use, instruction for installation and use of lifting sockets.

Lifting loops are available with Rd thread.

Load bearing capacity and dimensions



Reference	Rd Thread	Load bearing capacity [kg] 0 - 45°	h [mm]	e [mm]
6311005	Rd 12	500	155	22
6311008	Rd 14	800	155	25
6311012	Rd 16	1200	165	27
6311016	Rd 18	1600	190	34
6311020	Rd 20	2000	215	35
6311025	Rd 24	2500	255	44
6311040	Rd 30	4000	300	55
6311063	Rd 36	6300	360	68
6311080	Rd 42	8000	425	75
6311125	Rd 52	12500	530	95

Lifting loops comprise of a special steel wire rope in galvanized quality. Threaded components are made of bright precision steel.

On use attention must be paid on the following:

- Lateral tension of lifting loop is inadmissible. Only axial tension or diagonal tension up to 45° is permissible.
- Threads must be totally driven in.
- Clean dirty threads of transport anchors and lifting loops.

In case of lateral tension, which is inadmissible for lifting loops, we recommend to use the Special Lifting Devices.

As any other lifting equipment, lifting loops must be inspected once a year by an expert.

To prevent a premature state of wear, the vertical curve radius of the load hooks must be at least the same as the wire diameter of the lifting loop.

Special Lifting Devices can be used with lifting sockets. On use of this Special Lifting Device attention must be paid on this instruction for use, instruction for installation and use of lifting sockets.

Special Lifting Devices are available with Rd thread.

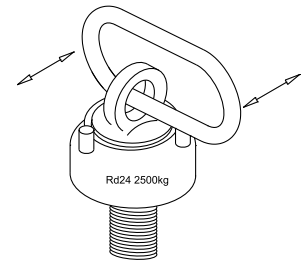
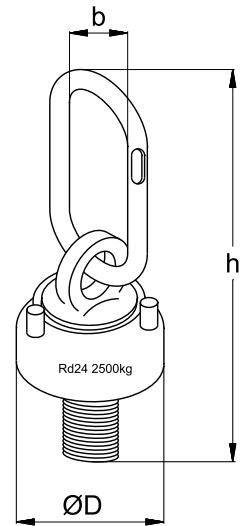
Load bearing capacity and dimensions

Reference	Rd Thread	Load bearing capacity [kg] 0 - 90°	ØD [mm]	h [mm]	b [mm]
6375005	12	500	47	125	35
6375008	14	800	52	126	35
6375012	16	1200	56	151	35
6375016	18	1600	59	152	60
6375020	20	2000	70	158	60
6375025	24	2500	74	187	75
6375040	30	4000	90	219	90
6375063	36	6300	101	255	100
6375080	42	8000	110	256	100
6375125	52	12500	130	344	140

Special Lifting Devices are especially suitable for lateral and diagonal tension and is therefore excellently convenient for tilt-up of flat manufactured panels.

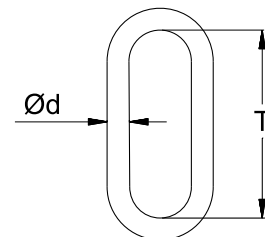
Special Lifting Devices must be driven in a way that the bottom plate has throughout contact with the concrete surface. This is particularly important because, on lifting the Special Lifting Device, a deviation is initiated and spalling is largely prevented. Due to that, bending and damage to the thread can be avoided.

The Special Lifting Device can be used as a usual screw and can be driven in or out of the threaded insert. Only to tighten or loosen the Special Lifting Device, the chainlink can be used. It must be pulled through the chainlink and its recesses fit to the three pins located at the circumference of the Special Lifting Device. This efficient lever-arm enables convenient tightening and removing without any tool.



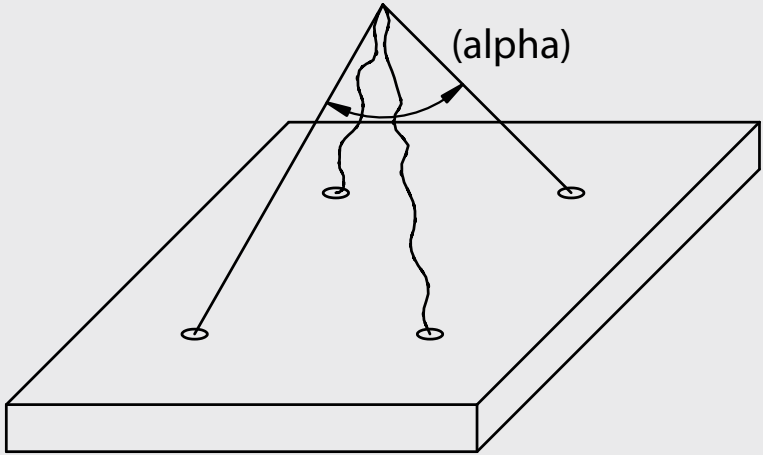
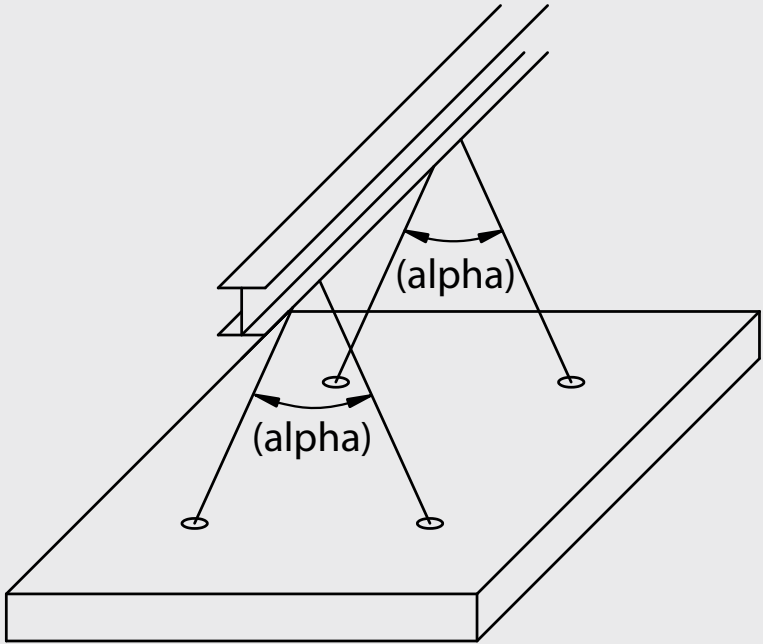
Ring dimensions

Reference	Load bearing capacity [kg] 0 - 90°	Ød [mm]	T [mm]	$T_{max} = 1.05 \times T$ [mm]
6375005	500	10	85	89
6375008	800	10	85	89
6375012	1200	10	110	116
6375016	1600	16	95	100
6375020	2000	16	102	107
6375025	2500	18	125	131
6375040	4000	22	148	155
6375063	6300	26	160	168
6375080	8000	26	160	168
6375125	12500	36	220	231



As any other lifting equipment, lifting loops must be inspected once a year by an expert.

Calculation of Actions on Lifting Inserts



The forces acting on a lifting insert should be calculated taking into account:

- The precast unit weight.
- The adhesion to the mould.
- The lifting machinery (dynamic coefficient).
- The sling angle.
- The number and position of inserts (number of efficient points).

Precast unit weight

The weight to lift has to be calculated taking into consideration the weight of the precast element, but also all the other parts lifted with the precast unit (formworks, preassembled parts).

Actions from adhesion to the mould

Adhesion and form friction will occur when the precast element is removed from the formwork. For practical reasons, the two effects are combined in one value designated q_{adh} . The values for q_{adh} given in table here after may be considered.

Formwork and condition	q_{adh}
Oiled steel mould, oiled plastic coated plywood	1 kN/m ²
Varnished wooden mould	2 kN/m ²
Rough wooden mould	3 kN/m ²

The area to be used in calculations is the total contact area between the concrete and the form.

For some types of uneven form surfaces (structured matrixes, reliefs, structured timber etc.), forces may be much larger than given in the table, and should be considered separately. Force may be zero if the concrete does not come in contact with the form at all, for example if the concrete is poured on a layer of bricks that has been laid out on the form bottom. Large vertical form surfaces may create extensive friction forces due to undulations in the form. Prestressed components will usually have a camber caused by the prestressing force, and will therefore have lower friction against the vertical sides of the form.

Dynamic actions

During lifting and handling, lifting devices are subjected to dynamic actions. The magnitude of the dynamic actions depends on the type of lifting machinery. Dynamic effects should be taken into account by the dynamic coefficient ψ_{dyn} given in the table here after.

lifting machinery	dynamic coefficient (ψ_{dyn})
Stationary crane, rail-mounted crane, speed < 1m/s	1.15
Stationary crane, rail-mounted crane, speed > 1m/s	1.30
Bridge crane, speed < 1m/s	1.15
Bridge crane, speed > 1m/s	1.60
Lifting and moving on flat terrain	2
Lifting and moving on rough terrain	4

Other dynamic influences than covered by this table should be based on special provisions or engineering judgement.

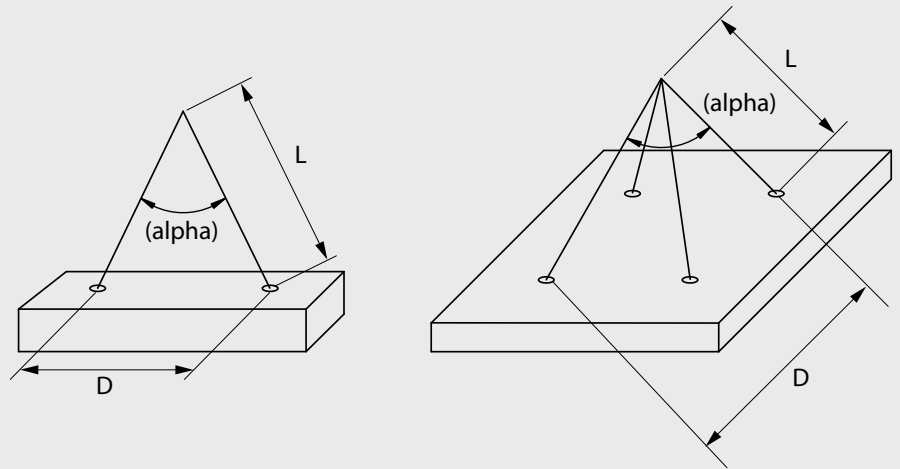
Calculation of Actions on Lifting Inserts

Sling angle

If the ropes, chains or slings are not perfectly vertical when lifting, this will create a sling coefficient given in the table here after, depending on the angle α which is the angle on the top of the slings.

Angle α	Sling length L	Sling coefficient (ψ_{sling})
0°	-	1
30°	2 D	1.04
45°	1.3 D	1.08
60°	D	1.16
90°	0.7 D	1.42
120°	0.6 D	2

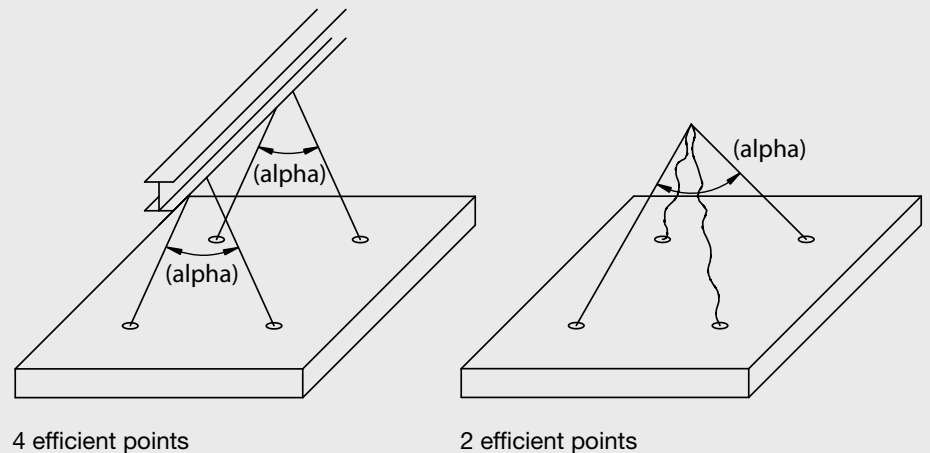
With D = distance between 2 opposite lifting inserts



Number of efficient lifting points

In a statically indeterminate system, the load distribution on inserts depends in most cases on the unknown stiffness of the ropes and the inserts itself. Therefore in most cases, only maximum 2 efficient lifting points should be used in the calculation of the actions on inserts.

Only unless it is ensure by suitable means (spreader, beam) that the load is distribute equally on all the lifting inserts, then the number of efficient point could be equal to the total number of lifting points.



Calculation of actions on lifting inserts

The actions, E_d , should be determined from Equation

$$E_d = \frac{(G + q_{adh} \cdot A_f) \times \psi_{dyn} \times \psi_{sling}}{N_{eff}}$$

with:

- G = weight of the precast concrete element (kN)
- q_{adh} = mould adhesion (kN/m²)
- A_f = form area in contact with concrete (m²)
- ψ_{dyn} = dynamic coefficient
- ψ_{sling} = sling coefficient
- N_{eff} = number of efficient lifting points

Conclusion and other considerations

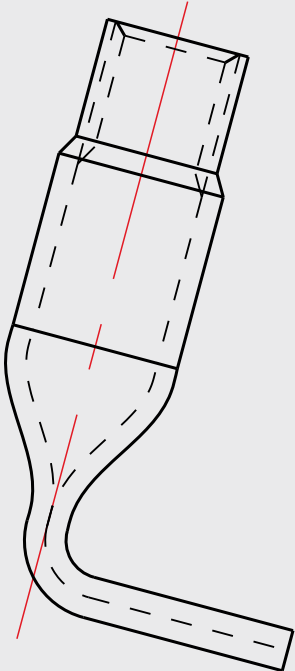
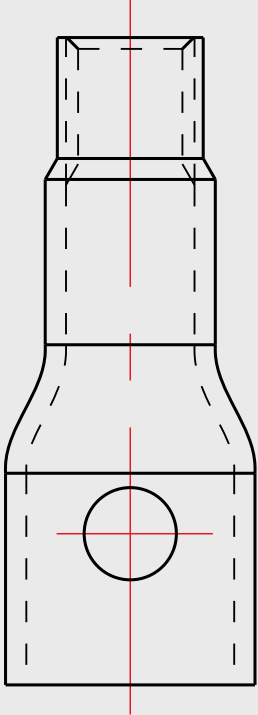
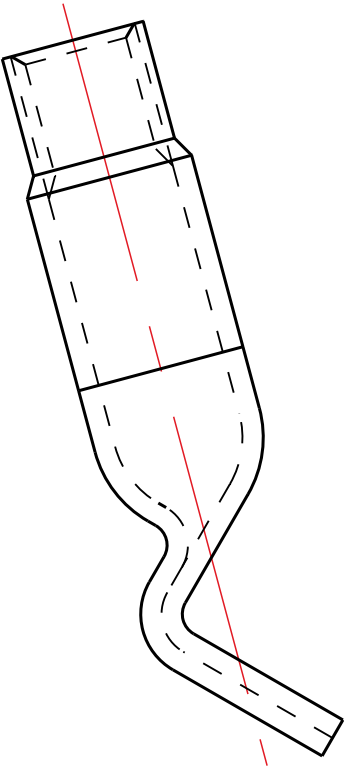
The Safe Working Load of the lifting insert must be higher than E_d .

In some cases, it can be necessary to calculate the action on inserts at different stages of the life of a precast unit (at the precast factory and on site for example).

The concrete strength needs to be clearly defined when lifting at the precast factory and on site, to select and design the type and the size of the inserts.

The load capacity of the anchorage (concrete failure and steel failure) has to be checked by qualified people.

Fixing System with Sockets



Fixing socket with cross hole

Reference	Thread x L	A [mm]	ØD [mm]	E [mm]	F [daN]
63700635EZ	M6 x 35	8.5	6.2	15	120
63700840EZ	M8 x 40	8.5	8.2	15	200
63701050EZ	M10 x 50	11	8.2	20	350
63701260EZ	M12 x 60	15	10.2	25	500
63701670EZ	M16 x 70	20	12.2	25	700
637016100EZ	M16 x 100	20	12.2	45	1000
637020100EZ	M20 x 100	27	14.2	40	1250
637024120EZ	M24 x 120	30	14.2	50	1800
637030150EZ	M30 x 150	38	17.2	65	2750

Reference	Thread x L	C _N [mm]	C _V [mm]	S [mm]	H [mm]
63700635EZ	M6 x 35	55	70	105	80
63700840EZ	M8 x 40	60	80	120	95
63701050EZ	M10 x 50	75	100	150	85
63701260EZ	M12 x 60	90	120	180	125
63701670EZ	M16 x 70	105	140	210	95
637016100EZ	M16 x 100	150	200	300	130
637020100EZ	M20 x 100	150	200	300	125
637024120EZ	M24 x 120	180	240	360	155
637030150EZ	M30 x 150	225	300	450	175

Fixing sockets with cross hole are not self-anchoring sockets.

The largest bar diameter must be chosen that passes through the cross hole ØD. The bar must be a ribbed reinforcement bar grade FeE500 with a length of 9 times the diameter.

Fixing sockets must not be used for lifting but exclusively for fixing. Fixing sockets are electro-galvanised bichromated.

Permissible loads F are defined for concrete compressive strength of 25 MPa.

To avoid premature failure of the socket by blow-out of the concrete, the socket has to be placed with minimum distances, from the edge and between sockets.

For straight pulling N, the minimum edge distance is C_N and the minimum distance between 2 sockets is S.

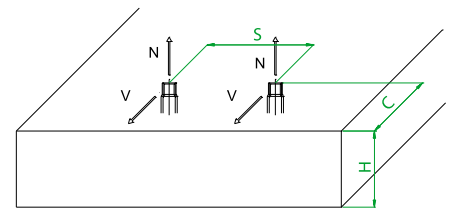
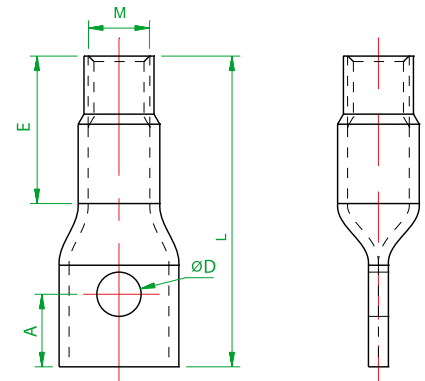
For shear force V, the minimum edge distance is C_V and the minimum distance between 2 sockets is S.

The minimum thickness of the panel should be H (minimum concrete cover of 25 mm).

When the force is a combination of shear force V and straight pull N, the permissible load F should respect the following formula:

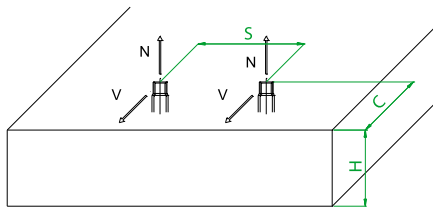
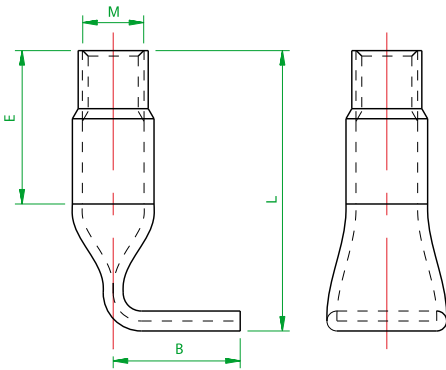
$$\sqrt{V^2 + N^2} \leq \text{perm.F}$$

Fixing sockets must be used with metric thread screw. They must be screwed on at least one time the diameter and no more than E.



Fixing Socket with Bended End

Fixing socket with bended end



Reference	Thread x L	E [mm]	B [mm]	F [daN]
636008035P90EZ	M8 x 35	15	25	180
636008045P90EZ	M8 x 45	15	25	230
636010040P90EZ	M10 x 40	15	25	240
636010060P90EZ	M10 x 60	30	25	400
636012045P90EZ	M12 x 45	25	25	350
636012070P90EZ	M12 x 70	40	25	600
636016060P90EZ	M16 x 60	25	35	600
636016100P90EZ	M16 x 100	45	35	1000
636020070P90EZ	M20 x 70	30	35	1000
636020100P90EZ	M20 x 100	45	35	1250

Reference	Thread x L	C _N [mm]	C _V [mm]	S [mm]	H [mm]
636008035P90EZ	M8 x 35	55	70	105	60
636008045P90EZ	M8 x 45	70	90	135	70
636010040P90EZ	M10 x 40	60	80	120	65
636010060P90EZ	M10 x 60	90	120	180	85
636012045P90EZ	M12 x 45	70	90	135	70
636012070P90EZ	M12 x 70	105	140	210	95
636016060P90EZ	M16 x 60	90	120	180	85
636016100P90EZ	M16 x 100	150	200	300	125
636020070P90EZ	M20 x 70	105	140	210	95
636020100P90EZ	M20 x 100	150	200	300	125

Fixing sockets with bended end are self-anchoring sockets.

Fixing sockets must not be used for lifting but exclusively for fixing.
Fixing sockets are electro-galvanised bichromated.

Permissible loads F are defined for concrete compressive strength of 25 MPa.

To avoid premature failure of the socket by blow-out of the concrete, the socket has to be placed with minimum distances, from the edge and between sockets.

For straight pulling N, the minimum edge distance is C_N and the minimum distance between 2 sockets is S.

For shear force V, the minimum edge distance is C_V and the minimum distance between 2 sockets is S.

The minimum thickness of the panel should be H (minimum concrete cover of 25 mm).

When the force is a combination of shear force V and straight pull N, the permissible load F should respect the following formula:

$$\sqrt{V^2 + N^2} \leq \text{perm.F}$$

Fixing sockets must be used with metric thread screw. They must be screwed on at least one time the diameter and no more than E.

Fixing socket with waved end

Reference	Thread x L	E [mm]	F [daN]
637106030EZO	M6 x 30	10	80
637106050EZO	M6 x 50	30	150
637108040EZO	M8 x 40	15	200
637108050EZO	M8 x 50	20	250
637110040EZO	M10 x 40	15	300
637110050EZO	M10 x 50	20	350
637112060EZO	M12 x 60	25	500
637116100EZO	M16 x 100	45	1000
637120100EZO	M20 x 100	65	1250

Reference	Thread x L	C _N [mm]	C _V [mm]	S [mm]	H [mm]
637106030EZO	M6 x 30	45	60	90	55
637106050EZO	M6 x 50	75	100	150	75
637108040EZO	M8 x 40	60	80	120	65
637108050EZO	M8 x 50	75	100	150	75
637110040EZO	M10 x 40	60	80	120	65
637110050EZO	M10 x 50	75	100	150	75
637112060EZO	M12 x 60	90	120	180	85
637116100EZO	M16 x 100	150	200	300	125
637120100EZO	M20 x 100	150	200	300	125

Fixing sockets with waved end are self-anchoring sockets.

Fixing sockets must not be used for lifting but exclusively for fixing.
Fixing sockets are electro-galvanised bichromated.

Permissible loads F are defined for concrete compressive strength of 25 MPa.

To avoid premature failure of the socket by blow-out of the concrete, the socket has to be placed with minimum distances, from the edge and between sockets.

For straight pulling N, the minimum edge distance is C_N and the minimum distance between 2 sockets is S.

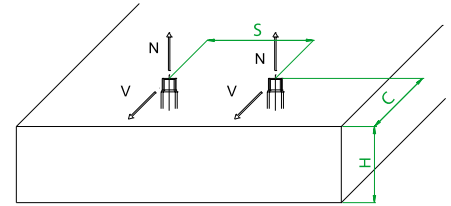
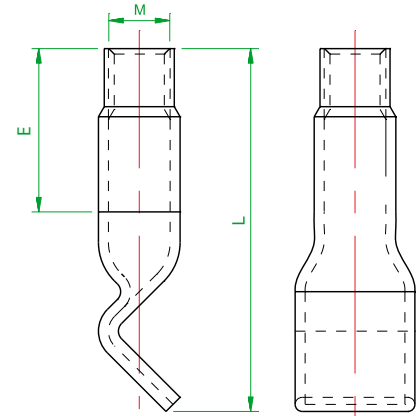
For shear force V, the minimum edge distance is C_V and the minimum distance between 2 sockets is S.

The minimum thickness of the panel should be H (minimum concrete cover of 25 mm).

When the force is a combination of shear force V and straight pull N, the permissible load F should respect the following formula:

$$\sqrt{V^2 + N^2} \leq \text{perm.F}$$

Fixing sockets must be used with metric thread screw. They must be screwed on at least one time the diameter and no more than E.





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