Technical Information LIFTING BOLT ANCHORS with base plate - LHDP

The C.L.P.T. lifting-transport anchors and the corresponding lifting devices are produced with normal **METRIC thread (M) and ROUND METRIC thread (Rd).**

Different factors and influences have to be taken into account to determine the load on the lifting anchors:

1. **Weight** of the element
2. **Adhesion** between the concrete and the mould (steel or timber)
3. **Dynamic factor** (loading increase), dumping during the lifting is determined according to DIN 15018.
4. **Lifting under an angle** when using multiple slings without a beam.
5. Additional reinforcement by **lifting and turning** the precast element.

1 – Calculation of the weight (G) of the element:

G = density concrete (25 kN/m³) x volume (L/m x W/m x T/m) = kN

2 – Calculation of the adhesion (Ha) to the mould:

Ha = surface of the contact area (m²) x adhesion force (kN / m²) = kN

- Adhesion force oiled steel mould = 1 kN/m²
- Adhesion force timber mould (smooth) = 2 kN/m²
- Adhesion force timber mould (rough) = 3 Kn/m²
- Adhesion force TT-Plates = 2 x G
- Adhesion force cassette plates = 3 x G

3 – Dynamic factor / lifting, total load (Vt):

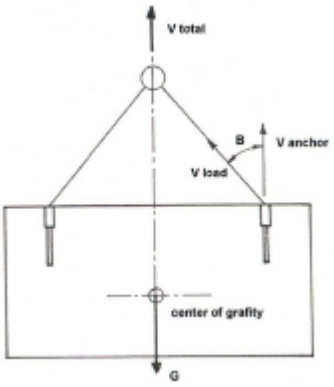
Depending the use of a fork lift truck or a crane with a lifting speed (Vh), the load has to be increased with a **lifting factor (f)**.

Lifting class according DIN 15018	Lifting factor (f) to the lifting speed (Vh)	
	Vh < 90 m/min	Vh > 90 m/min
H1	1,1 + 0,0022 Vh	1,3
H2	1,2 + 0,0044 Vh	1,6
H3	1,3 + 0,0066 Vh	1,9
H4	1,4 + 0,0088 Vh	2,2

Total Load (Vt) = { weight/element (G) + adhesion (Ha) } x lifting factor (f) = kN

4 – Lifting under an angle when using multiple slings without a beam

The load/anchor (Va) = total load (Vt) / number of anchors (a) = kN



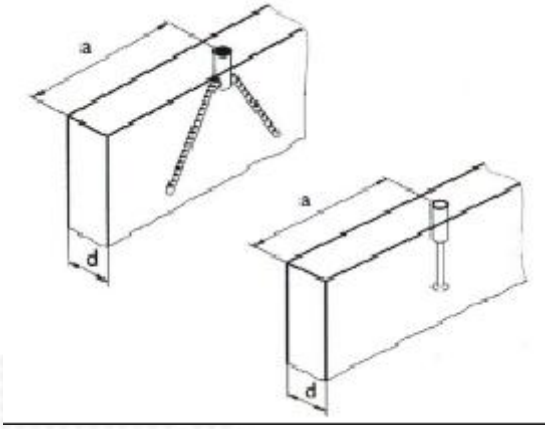
The adapted load (VI) = the load / anchor (Va) / cos B

Increase factor (z) = 1/cos B → or following the table below

Increase factor (z) depend on the lifting angle B					
Lifting angle (B)	0°	15°	30°	45°	60°
Increase factor (Z)	1,00	1,04	1,16	1,41	2,00

The adapted load (VI) = increase factor (z) x the total load/anchor (Va)

5 – For all transport – lifting anchors, the upper- and lower reinforcement steel must be present:

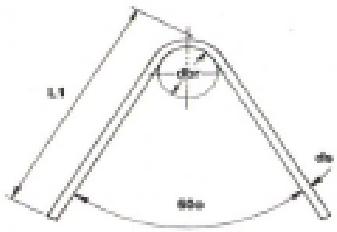


- Permissible load capacity of the socket under axial lift

Thread M or Rd	Load kN	Minimum element thickness d mm	Minimum edge distance a mm
12	5	60	200
16	12	70	250
20	20	90	300
24	25	100	350
30	40	120	400
36	63	200	450
42	80	240	500

Anchorage reinforcement

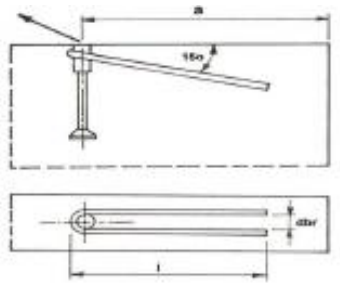
Thread M or Rd	Load kN	Anchor – bar Loading kN	Bar diam. Ds mm	Diam. Of bending dbr mm	Length L1 mm
12	5	2,8	6	24	
16	12	6,8	10	40	
20	20	11,3	12	48	
24	25	14,2	14	56	
30	40	22,7	16	64	



Thread M or Rd	Concrete strength				
	B10	B15	B25	B35	B45
12	270	220	170	140	120
16	350	320	250	200	170
20	490	420	340	280	240
24	520	440	370	300	260
30	730	660	520	430	360

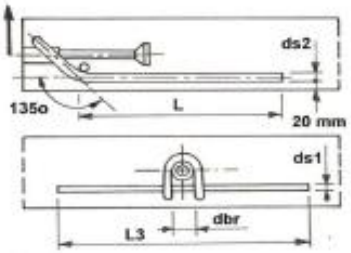
Additional reinforcement for lifting chains that are not axial (vertical)

Thread M or Rd	ds mm	l mm	dbr mm	Total length mm
12	8	100	18	230
16	8	300	23	640
20	10	400	28	840
24	12	500	33	1.050
30	14	600	40	1.260



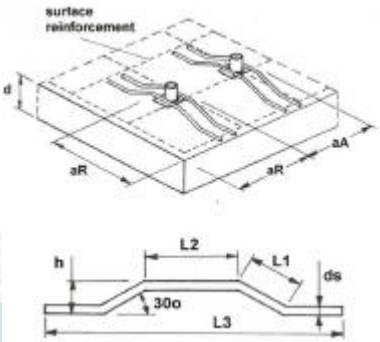
Additional reinforcement for tilting panels from horizontal to vertical

Thread M or Rd	Additional Reinforcement		Radial Reinforcement	
	Ds1 mm	L3 mm	L x dbr x ds2 mm	Total length mm
12	8	500	150 x 32 x 6	460
16	8	500	300 x 32 x 8	770
20	10	500	300 x 40 x 10	840
24	12	500	500 x 48 x 12	1.270
30	12	500	600 x 56 x 12	1.510



Additional reinforcement for flat steel anchor type: LSP

Thread M or Rd	Additional Reinforcement		Minimum	
	ds x h mm	L1 x L2 x L3 mm	element thickness d mm	Distance aR x aA mm
12	6 x 30	60 x 60 x 320	70	180 x 350
16	8 x 35	70 x 70 x 420	85	250 x 500
20	8 x 40	80 x 80 x 640	100	300 x 600
24	10 x 50	100 x 100 x 640	115	400 x 800
30	12 x 55	110 x 110 x 830	140	500 x 1.000



Example to calculate the type of an anchor

Element		Adhesion steel mould	= 1kN/m²
Length (L)	= 4m	Lifting factor (f)	= 1,6
Width (W)	= 1,5m	Lifting angle	= 45°
Thickness (T)	= 0,2m	Quantity of anchors (a)	= 2 pieces

$$VI = \frac{z * [\{(\mathrm{L} * \mathrm{W} * \mathrm{T} * \text{density concrete}) + (L * W * \textit{adhesion steel mould})\} * f]}{\text{quantity of anchors (a)}} = kN/anchor$$

$$VI = \frac{1{,}41 * [\{(4 * 1{,}5 * 0{,}2 * 25) + (4 * 1{,}5 * 1)\} * 1{,}6]}{2} = 41\ kN/anchor$$