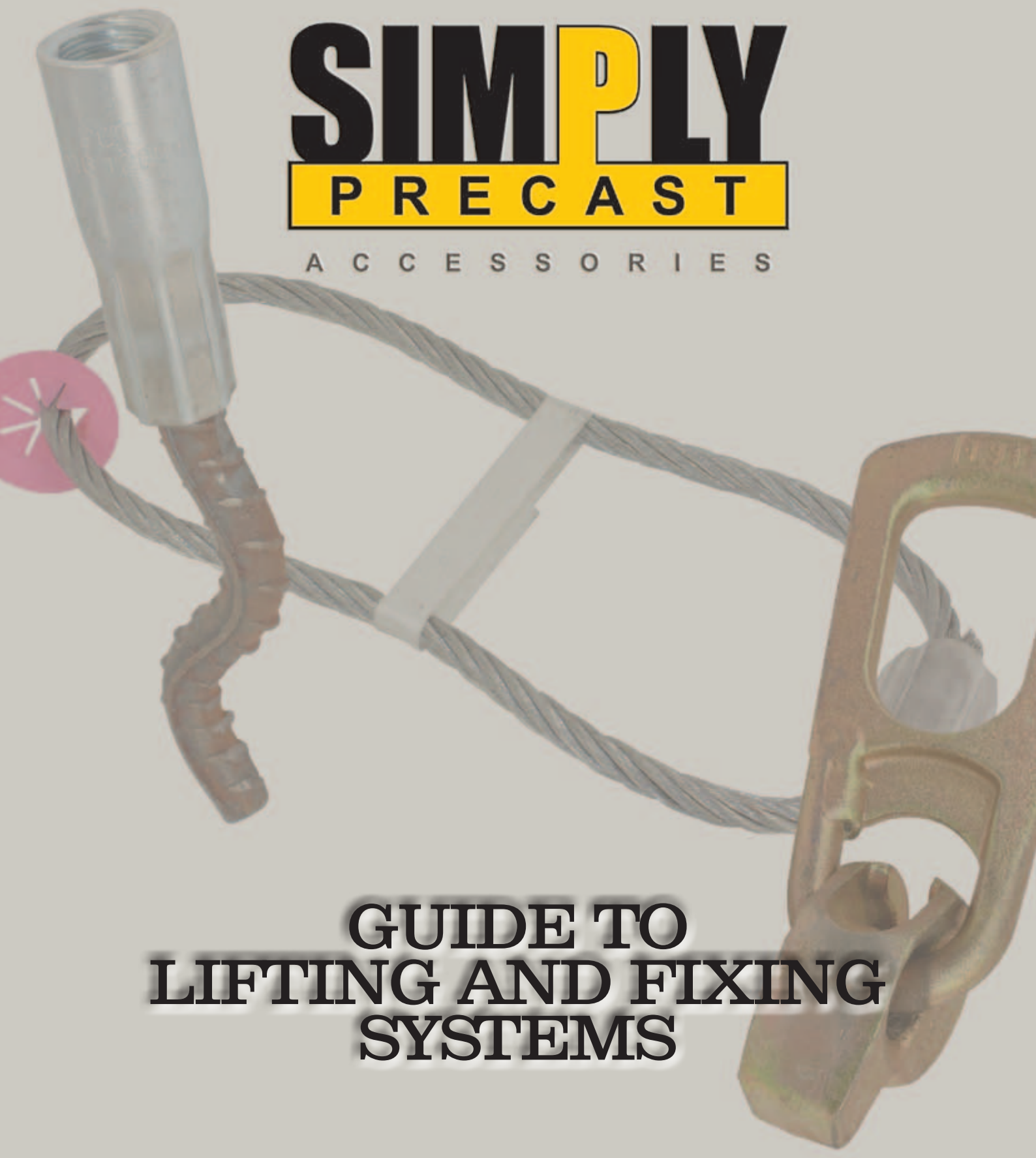
SIMPLY

PRECAST

ACCESSORIES



GUIDE TO LIFTING AND FIXING SYSTEMS

SIMPLY PRECAST ACCESSORIES

BVT RAUSCH

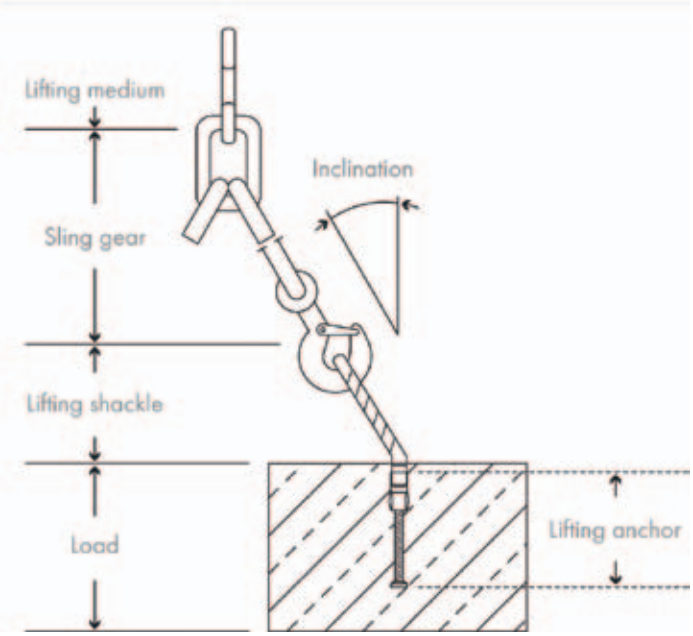
Socket Anchor System

The selection and positioning of lifting anchors is very important and the following points have to be taken into consideration.

- Weight of the unit
- Number of anchors
- Positioning of the anchors
- Adhesion to the mould
- Spread or splay angle factors
- Sling type and arrangement
- Concrete strength at first lift
- Dynamic loads

The lifting system has a minimum safety factor of 3 against steel fracture. A safety factor of 2.5 is used against concrete fracture. The lifting shackle has a safety factor of 5.

All safety factors and lifting criteria are based on the concrete strength of 15 N/mm2 at demoulding and 25 N/mm^2 at transporting and erecting.



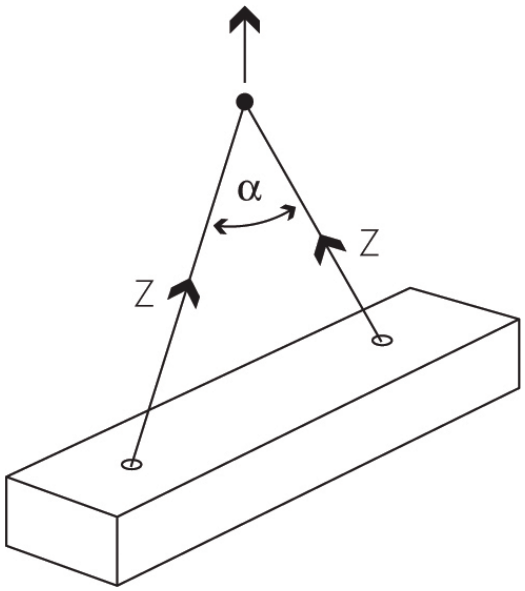
The following criteria should be taken into consideration before selecting the correct lifting system:

Weight of the unit

As a rule, a figure of 25 N/mm^3 is used for calculating the dead weight of a freshly reinforced concrete unit.

Number of anchors

The following criteria should be taken into consideration before selecting the correct lifting system:
The number of anchors depends on the used lifting sling. Please check for the load distribution on the anchors in the static system. If this is not possible then the loads on each individual anchor must be calculated.



Positioning of the anchors

It is advisable that the lifting anchors are placed symmetrically to the centre of gravity. This, combined with the correct sling arrangement, will ensure even load on the anchors.

Adhesion of the mould

The adhesion inside the mould depends on the structure of the mould surface.

- Smooth oiled mould 1 kN/m^2
- Smooth non-oiled mould 2 kN/m^2
- Rough mould 3 kN/m^2

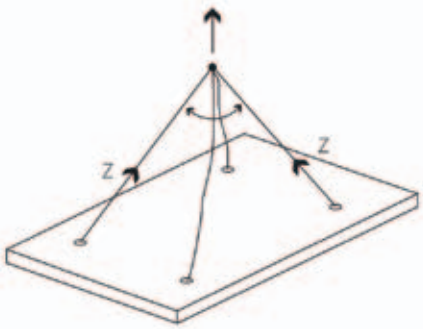
Angle α	Spread angle factor
0°	1.00
30°	1.04
60°	1.16
90°	1.41

Spread or splay angle factors
If the used lifting sling forms a triangle, the forces on the anchors increase in relation to the included angle of the sling.

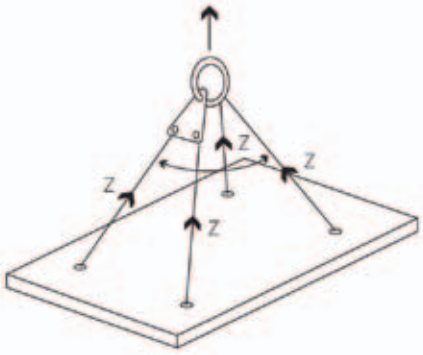
Dynamic loads
The weight of the unit should be multiplied by the impact factor given in the following table.

	Tower, Rail mounted crane		Travelling on smooth ground	Travelling on rough ground
Lifting speed	<90m/min	≥90m/min		
Impact factor	1.00	≥1.30	≥1.65	≥2.00

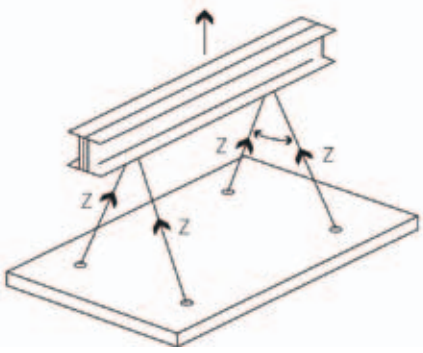
When 4-legged slings are being used only two legs are bearing elements or carrying the load.

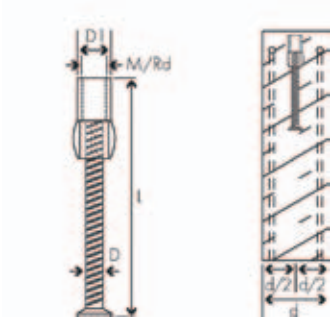


Through a compensating rig system you will assure to distribute the load evenly to all four anchors.



When using a cross beam, the load is distributed to all vier anchors.





Socket foot anchor

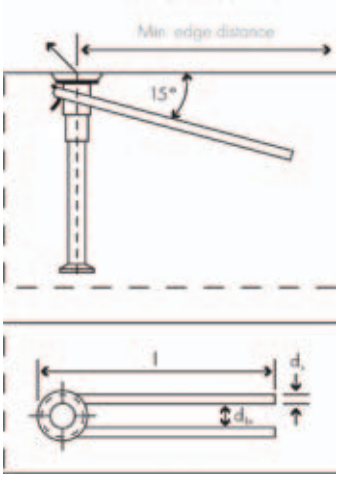
Article No.	Loadstep (t)	Thread M/Rd	L (mm)	D (mm)	D1 (mm)	Min. thickness d (mm)	Edge reinforcement (mm)
7000-12-100	0.5	12	100	10	17	60	Ø 8
7000-12-174	0.5	12	174	10	17	60	Ø 8
7000-14-135	0.8	14	135	10	19	60	Ø 8
7000-14-167	0.8	14	167	10	19	60	Ø 8
7000-16-150	1.2	16	150	10	22	70	Ø 8
7000-16-195	1.2	16	195	10	22	70	Ø 8
7000-18-170	1.6	18	170	14	24	80	2 x Ø 10
7000-18-275	1.6	18	275	14	24	80	2 x Ø 10
7000-20-190	2.0	20	190	14	27	80	2 x Ø 10
7000-20-235	2.0	20	235	14	27	80	2 x Ø 10
7000-24-210	2.5	24	210	14	32	100	2 x Ø 10
7000-24-260	2.5	24	260	14	32	100	2 x Ø 10
7000-30-270	4.0	30	270	18	39	120	2 x Ø 12
7000-30-390	4.0	30	390	18	39	120	2 x Ø 12
7000-36-330	6.3	36	330	24	47	140	2 x Ø 12
7000-36-440	6.3	36	440	24	47	140	2 x Ø 12
7000-42-450	8.0	42	450	28	55	160	2 x Ø 12
7000-42-540	8.0	42	540	28	55	160	2 x Ø 12

Main reinforcement

Element thickness (cm)	Spread angle factor (mm^2/m)
>80	131
>100	2x131
>120	2x188
>140	2x221
>160	2x221
>200	2x221

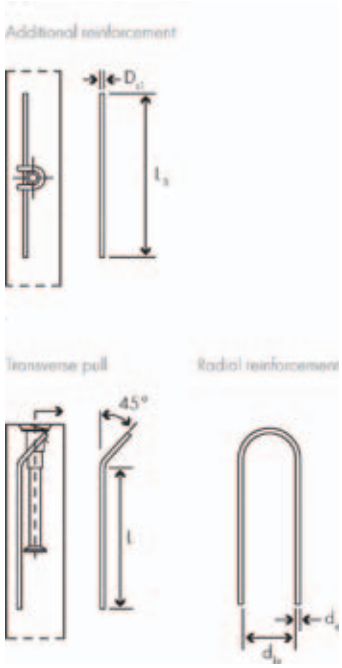
Reinforcement for diagonal pull

Article No.	Loadstep (t)	d_s (mm)	l (mm)	d_{br} (mm)	Total length (mm)
7000-12-100	0.5	8	100	18	230
7000-12-174	0.5	8	100	18	230
7000-14-135	0.8	8	200	20	430
7000-14-167	0.8	8	200	20	430
7000-16-150	1.2	8	300	23	640
7000-16-195	1.2	8	300	23	640
7000-18-170	1.6	10	300	25	640
7000-18-275	1.6	10	300	25	640
7000-20-190	2.0	10	400	28	840
7000-20-235	2.0	10	400	28	840
7000-24-210	2.5	12	500	33	1050
7000-24-260	2.5	12	500	33	1050
7000-30-270	4.0	14	600	40	1260
7000-30-390	4.0	14	600	40	1260
7000-36-330	6.3	16	750	48	1580
7000-36-440	6.3	16	750	48	1580
7000-42-450	8.0	16	900	56	1890
7000-42-540	8.0	16	900	56	1890



Reinforcement for transverse pull

Article No.	Add. reinforcement		Radial reinforcement			
	d_{sl} (mm)	L_3 (mm)	d_s (mm)	L (mm)	d_{br} (mm)	Total length (mm)
7000-12-100	8	500	8	150	32	460
7000-12-174	8	500	8	150	32	460
7000-14-135	8	500	8	200	32	570
7000-14-167	8	500	8	200	32	570
7000-16-150	8	500	8	300	32	770
7000-16-195	8	500	8	300	32	770
7000-18-170	10	500	10	300	40	820
7000-18-275	10	500	10	300	40	820
7000-20-190	10	500	10	300	40	840
7000-20-235	10	500	10	300	40	840
7000-24-210	12	500	12	500	48	1270
7000-24-260	12	500	12	500	48	1270
7000-30-270	12	500	14	600	56	1510
7000-30-390	12	500	14	600	56	1510
7000-36-330	12	500	16	750	64	1860
7000-36-440	12	500	16	750	64	1860
7000-42-450	16	500	16	900	64	2050



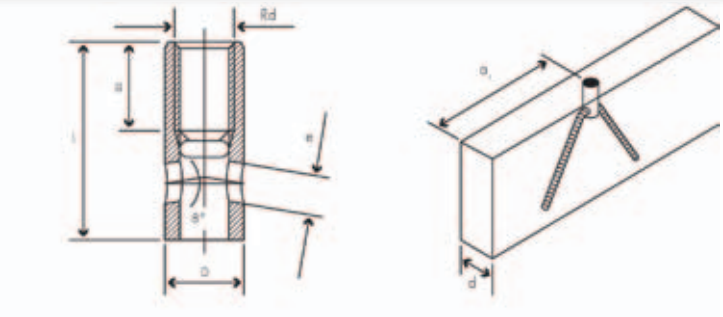
Permissible loads

Article No.	Loadstep (t)	Element thickness	Axial pull		Diagonal pull 45°		Transverse pull		a_r
		d (mm)	B15	B25	B15	B25	B15	B25	(mm)
7000-12	0.5	60	5	5	5	5	2.5	2.5	150
		80					5.0	5.0	
		100							
7000-14	0.8	60	8	8	8	8	4.0	4.0	150
		80					5.8	8.0	
		100					8.0	8/0	
7000-16	1.2	60	12	12	12	12	6.0	6.0	200
		80					6.3	8.9	
		100					8.8	12.0	
		120					11.4	12.0	
7000-18	1.6	60	16	16	16	16	5.3	9.1	250
		100					9.1	12.8	
		120					12.0	16.0	
		140					15.1	16.0	
7000-20	2.0	80	20	20	19.5	20	5.9	9.8	250
		100			20		9.8	13.7	
		120					12.9	18.0	
		140					15.8	20.0	
7000-24	2.5	100	25	25	25	25	8.6	14.0	300
		120					13.1	18.4	
		140					16.5	23.1	
		160					20.2	25.0	
7000-30	4.0	120	40	40	40	40	13.7	19.1	350
		140					17.2	24.0	
		160					21.0	29.3	
7000-36	6.3	140	55.7	63	55.7	63	17.6	24.6	400
		160	63		63		21.5	30.1	
		180					25.6	35.9	
		200					26.7	42.0	
7000-42	8.0	160	72.6	80	72.6	80	22.3	31.2	450
		180	77		77		26.6	37.2	
		200	80		80		31.1	43.6	
		220					33.0	50.3	
7000-52	12.5	200	125	125	125	125	34.1	47.9	550
		220					39.3	55.3	
		240					44.8	63.0	
		260					50.5	71.0	
		280					56.5	79.4	

Reinforcement for diagonal pull

Article No.	Loadstep (t)	Rd	L (mm)	D (mm)	e (mm)	g (mm)	d (mm)	a_r (mm)	Reinforcement (mm^2/m)
7400-12-040	0.5	12	40.0	15.0	8.0	22.0	60	200	131
7400-14-047	0.8	14	47.0	18.0	10.5	25.0	70	250	131
7400-16-054	1.2	16	54.0	21.0	13.0	27.0	70	250	131
7400-18-065	1.6	18	65.0	24.0	13.0	34.0	80	300	188
7400-20-069	2.0	20	69.0	27.2	15.5	35.0	90	300	188
7400-24-078	2.5	24	78.0	31.0	18.0	43.0	100	350	188
7400-30-103	4.0	30	103.0	38.0	22.5	56.0	120	400	211
7400-36-125	6.3	36	110.0	48.0	25.0	68.0	130	450	211
7400-42-145	8.0	42	140.0	54.0	30.0	80.0	140	500	211
7400-52-195	12.5	52	170.0	70.0	38.0	90.0	150	550	211

The reinforcement bar has to be inserted into the lower hole of the Universal socket. The permissible load is determined according to the additional reinforcement bar.



Reinforcement for diagonal pull

Concrete strength	Rd12	Rd14	Rd16	Rd18	Rd20	Rd24	Rd30
B10	270	300	350	470	490	520	730
B15	220	270	320	420	440	470	660
B25	170	210	250	330	340	370	520
B35	140	170	200	280	280	300	430
B45	120	150	170	230	240	260	360
B55	120	130	150	200	210	220	320