


HSL-GR Heavy duty anchor

		Benefits
		<ul style="list-style-type: none"> - high loading capacity - force-controlled expansion - reliable pull-down of part fastened - no rotation in hole when tightening bolt

HSL-G-R



Concrete

Fire
resistanceCorrosion
resistanceSmall edge
distance
and spacing

Basic loading data (for a single anchor)

All data in this section applies to

- Non-cracked concrete $f_{cc} = 30 \text{ N/mm}^2$
- No edge distance and spacing influence
- correct setting (see setting operations page xx)

For details see Simplified design method

Characteristic resistance, R_k [kN]:

Anchor size	Concrete Fcc [N/mm ²]	M8	M10	M12	M16	M20
Tensile N_{Rk}	20	21.3	29.5	32.4	48.7	67.1
	30 to 60	22.5	32.7	39.7	59.7	82.2
Shear V_{Rk}	≥ 20	23.1	36.5	53.1	99.0	154.4

Characteristic resistance, R_k [kN]: $S \cdot \gamma_F = S_d \leq R_d = R_k / \gamma_M$

$$S \cdot \gamma_F = S_d \leq R_d = \frac{R_k}{\gamma_M}$$

S actual load

S_d design action (load)

R_d design resistance (anchor)

R_k characteristic anchor resistance

n_{rk} tensile load

v_{rk} shear load

γ_F partial safety factor (action)

γ_M partial safety factor (resistance) = 1.8 (concrete)
 ≥ 1.6 (steel)

$\gamma_F \times \gamma_M \geq 3$ (For Hong Kong Buildings Department submission)

Design resistance, R_d [kN]: $f_{cc} = 30 \text{ N/mm}^2$

Anchor size	M8	M10	M12	M16	M20
Tensile N_{Rk}	10.4	15.1	19.1	30.9	45.7
Shear V_{Rk}	13.9	23.5	34.1	63.6	91.3

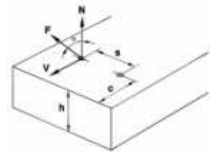
Recommended load, F_{30} in [kN]: $f_{cc} = 30 \text{ N/mm}^2$

Anchor size	M8	M10	M12	M16	M20
Tensile N_{Rk}	7.5	10.9	13.2	19.9	27.4
Shear V_{Rk}	7.7	12.2	17.7	33.0	51.5

Recommended load, F_{30} in [kN]: $f_{cc} = 30 \text{ N/mm}^2$

$$F_{rec} = F_{30} \cdot f_A \cdot f_R$$

Anchor size	M8	M10	M12	M16	M20
h_{nom} [mm]	65	75	80	105	130



f_A : Influence of anchor spacing

Anchor spacing, s [mm]	Tensile / Shear				
	HSL-GR				
	M8	M10	M12	M16	M20
65	0.70				
75	0.72	0.70			
80	0.73	0.71	0.70		
105	0.79	0.76	0.74	0.70	
130	0.85	0.81	0.79	0.73	0.70
155	0.90	0.86	0.84	0.77	0.72
175	0.95	0.90	0.87	0.80	0.75
195	1.0	0.94	0.91	0.82	0.77
225		1.0	1.0	0.87	0.80
240			1.0	0.89	0.82
275				0.94	0.86
315				1.0	0.91
350				1.0	0.95
395					1.0
430					1.0

$$f_A = 0.15 \frac{s}{h_{act.}} + 0.55$$

$$S_{min} = h_{nom}$$

$$S_{cr} = 3 \cdot h_{act.}$$

Separate multiple-anchor fastenings must be least a $\geq 2 s_{cr}$ apart to ensure they do not influence each other.

f_R : Influence of edge distance

Edge distance	Tensile, f_{RN}					Shear, f_{RV}				
	Anchor Size					Anchor Size				
s [mm]	M8	M10	M12	M16	M20	M8	M10	M12	M16	M20
65	0.70					0.30				
75	0.73	0.70				0.37	0.30			
80	0.75	0.71	0.70			0.40	0.44	0.30		
105	0.82	0.78	0.76	0.70		0.59	0.59	0.44	0.30	
130	0.90	0.85	0.83	0.74	0.70	0.77	0.74	0.59	0.41	0.30
155	0.97	0.91	0.88	0.79	0.73	0.95	0.78	0.74	0.52	0.39
162	1.0	0.93	0.90	0.80	0.75	1.0	0.85	0.78	0.55	0.41
187		1.0	0.96	0.85	0.78		1.0	0.92	0.66	0.50
200			1.0	0.88	0.80			1.0	0.72	0.55
225			1.0	0.92	0.84			1.0	0.83	0.64
265				1.0	0.91				1.0	0.79
275				1.0	0.92				1.0	0.82
300				1.0	0.96				1.0	0.91
325					1.0					1.0
350					1.0					1.0

$$f_{RN} = 0.2 \frac{c}{h_{act}} + 0.5$$

$$C_{min} = h_{nom}, C_{cr} = 2.5 \cdot h_{act}$$

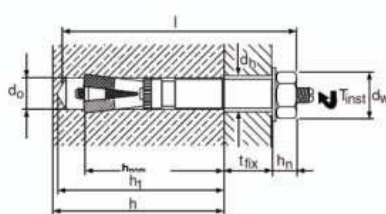
$$f_{RV} = 0.47 \frac{c}{h_{nom}} - 0.17$$

$$C_{min} = h_{nom}, C_{cr} = 2.5 \cdot h_{nom}$$

For combined loads with influence of edge distance :

$$f_{R\alpha} = f_{RN} - (f_{RN} - f_{RV}) \cdot \frac{\alpha}{90}$$

There must be reinforcement in the edge of a concrete component which can take up 0.25 times the anchor load if the edge distance is equal to or less than c_{cr} .

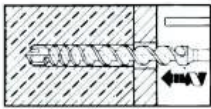
Setting details

HSL-GR

Setting Details			Anchor size HSL-GR				
			M8/ 20	M10/20	M12/25	M16/25	M20/30
d _o	[mm]	Drill bit diameter	12	15	18	24	28
h ₁	[mm]	Hole depth	80	90	100	125	155
h _{nom}	[mm]	Min. Anchorage depth	65	75	80	105	130
t _{fix}	[mm]	Max. Fixture thickness	20	20	25	25	30
l	[mm]	Anchor length	102	115	125	157	190
h _n	[mm]	Head height + washer	9.5	12.0	15.0	18.0	22.0
t _{inst}	[Nm]	Tightening torque	25	40	80	120	200
s _w	[mm]	Width across flats	13	17	19	24	30
d _h	[mm]	Clearance hole	14	17	20	26	31
d _w	[mm]	Washer diameter	20	25	30	40	45
h	[mm]	Min. Base materials thickness	120	140	160	180	220
Drill bit		TE-C3X	12/22	15/27	18/32	-	-
Drill bit		TE-YX	-	-	18/32	24/32	28/32

Installation equipment

Rotary hammer (TE2, TE6, TE6A, TE7, TE7A, TE16, TE30, TE40, TE50, TE60, TE70, TE80) a hammer and a torque wrench.

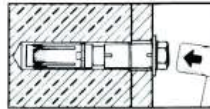
Setting operations



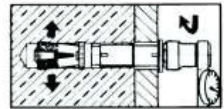
Drill hole with drill bit.



Blow out dust and fragments.



Install anchor.



Apply tightening torque

Anchor mechanical properties

Anchor size			HSL-GR	M8	M10	M12	M16	M20
f _{uk}	[N/mm ²]	Nominal tensile strength		700	700	700	700	700
f _{yk}	[N/mm ²]	Yield strength		450	450	450	450	450
A _s	[mm ²]	Stressed cross-section		36.6	58.0	84.3	157	245
W	[mm ³]	Effective moment of resistance		31.2	62.3	109	277	541
M _d	[Nm]	Design bending moment		18.8	33.5	58.8	149	291