

# ULTRAPLUS M12 – M36

The undercut anchor for exceptionally high loads in cracked and non-cracked concrete – also for shock and earthquake loads.

**Function:** When the anchor is installed the expansion segments are driven down to the undercut in the drilled hole. The spring pressure automatically expands the segments into the undercut with an audible “click.” This results in a mechanical undercut connection without any expansion pressure. The “positive undercut” allows perfect bearing of the segments and ensures reliable transmission of the load into the concrete.

## Benefits:

- Dependable fixing for high loads in cracked and non-cracked concrete
- High safety margins due to positive undercutting
- High strength threaded rod – Grade 10.9
- The spring automatically compensates for tolerances in the fixture thickness
- Reduced edge distances and spacings
- Custom lengths available
- Proven performance history in resisting dynamic loads, shock loads, and earthquakes. Expert reports available for these and other applications.



SIMPSON  
Strong-Tie®

IEBIG



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**ULTRAPLUS****CONSTRUCTION:**

**UP** with hex nut, washer, threaded stud and plastic retaining ring

**MATERIAL:**

- Grade 10.9 carbon steel, zinc plated and blue passivated

**BASE MATERIAL:**

Cracked and non-cracked concrete: C20/25 to C50/60

**APPROVAL:**

ETA-04/0099 – Option 1 – Carbon steel, zinc plated

**LOAD RANGE:**

Tension:  $N_{perm} = 19.0 - 320.2$  [kN]  
 Shear:  $V_{perm} = 45.2 - 371.4$  [kN]

**PRODUCT RANGE:**

UP: M12 – M36, carbon steel, zinc plated and blue passivated

**CHARACTERISTICS:**

- Positive undercut anchor with strong mechanical interlock
- Immediately loadable
- Through-fix installation
- Expansion pressure free
- Small edge distances and spacings
- Completely removable

**APPLICATIONS:**

- Steel construction
- Industrial plants
- Nuclear power plants
- Conveyor systems
- Cranes

**BENEFITS:**

- High tension and shear capacities
- Custom lengths available
- Positive undercutting (comparable performance to a cast-in headed stud)

**PRODUCT DESCRIPTION:**

The **ULTRAPLUS** undercut anchor is designed for use in applications where reliability and safety are essential, e.g. for anchoring safety relevant components in nuclear power plants, for industrial plants, conveyor systems, cranes, and also for special civil engineering solutions.

The **LIEBIG ULTRAPLUS** was developed to resist very high loads with its unique undercutting technology. After the hole is drilled, a separate undercut is drilled using a special **LIEBIG** undercutting tool. When the anchor is inserted through the fixture, spring pressure opens the expanding segments. They lock into the undercut with a clearly audible click. The result is a mechanical interlock without expansion stresses. By applying the specified torque, the fixture is fastened in position. The “positive undercut” allows perfect bearing of the segments and ensures reliable transmission of the load into the concrete.



**Carbon steel, zinc plated****ULTRAPLUS UP**

Threaded stud with hex nut and washer

Material: Grade 10.9 carbon steel, zinc plated and blue passivated

Approval: ETA-04/0099 – Option 1

Type	Order Code	Thread Size	Ø x Depth of Drilled Hole	Max. Fixture Thickness	Ø Fixture Hole	Eff. Embedment Depth	Total Length	Weight [kg/100 pcs]	Box Quantity [pcs]
			$d_o \times h_1$	$t_{fx}$	$d_f$	$h_{ef}$	L		
			[mm]	[mm]	[mm]	[mm]	[mm]		
UP M12-23/140/20	UP1223140020	M12	23 x 190	20	24	140	220	48.0	10
UP M16-30/220/30	UP1630220030	M16	30 x 300	30	32	220	325	123.0	5
UP M20-36/250/50	UP2036250050	M20	36 x 330	50	38	250	380	173.0	5
UP M24-45/280/60*	UP2445280060	M24	45 x 410	60	46	280	460	408.0	2
UP M36-67/420/100*	UP3667420100	M36	67 x 570	100	68	420	700	1305.0	1

\*Not included in approval. Available as special order.

Custom lengths available on request.

**Installation Accessories****Hand undercutting tool with lever****Undercutting tool for core drilling rigs with 1/2" drive****Diamond cutting blade**

Compatible ULTRAPLUS	Order Code	kg/pc
M12	DH23	3.5
M16	DH30	4.0
M20	DH36	5.0
M24	DH45	6.0
M36	DH67	9.0

Compatible ULTRAPLUS	Order Code	kg/pc
M12	D23	2.6
M16	D30	3.1
M20	D36	4.1
M24	D45	5.1
M36	D67	8.1

Compatible ULTRAPLUS	Order Code	kg/10 pcs
M12	DE23	0.5
M16	DE30	1.0
M20	DE36	1.2
M24	DE45	2.1
M36	DE67	3.3

Special lengths upon request.

Both types of undercutting tools are available for either purchase or hire.

## Carbon steel, zinc plated

Permissible loads for single anchors with no influencing edge distances or spacings. Loads are calculated using partial safety factors from ETAG 001 and the characteristic anchor and installation data from this catalogue.

Design calculations shall follow the requirements of ETA-04/0099.

**Material:** Carbon steel, Grade 10.9, zinc plated and blue passivated

Thread size		M12	M16	M20	M24	M36
Effective embedment depth ( $h_{ef}$ )	[mm]	140	220	250	280	420
Type UP...		M12-23/140/...	M16-30/220/...	M20-36/250/...	M24-45/280/...	M36-67/420/...

### Permissible tension loads<sup>1)</sup>

$N_{perm}$	Cracked concrete	C20/25	[kN]	19.0	35.7	45.2	80.3	147.6
		C30/37	[kN]	23.2	43.6	55.2	98.0	180.0
Non-cracked concrete <sup>3)</sup>	C40/50	[kN]	26.9	50.4	63.8	113.3	208.1	
	C50/60	[kN]	29.5	55.4	70.1	124.5	228.7	
	C20/25	[kN]	28.6	45.2	66.7	111.9	206.6	
	C30/37	[kN]	34.9	55.2	81.3	136.5	252.0	
	C40/50	[kN]	40.3	63.8	94.0	157.8	291.3	
	C50/60	[kN]	43.4	70.1	103.3	173.5	320.2	

### Permissible shear loads<sup>1) 2)</sup>

$V_{perm}$	Cracked concrete	C20/25	[kN]	45.2	81.0	109.5	160.6	295.1
		C30/37	[kN]	45.2	81.0	109.5	161.9	360.0
Non-cracked concrete <sup>3)</sup>	C40/50	[kN]	45.2	81.0	109.5	161.9	371.4	
	C50/60	[kN]	45.2	81.0	109.5	161.9	371.4	
	C20/25	[kN]	45.2	81.0	109.5	161.9	371.4	
	C30/37	[kN]	45.2	81.0	109.5	161.9	371.4	
	C40/50	[kN]	45.2	81.0	109.5	161.9	371.4	
	C50/60	[kN]	45.2	81.0	109.5	161.9	371.4	

### Permissible bending moments<sup>1) 5)</sup>

$M_{perm}$	[Nm]	62.4	158.1	309.0	534.5	1881.7
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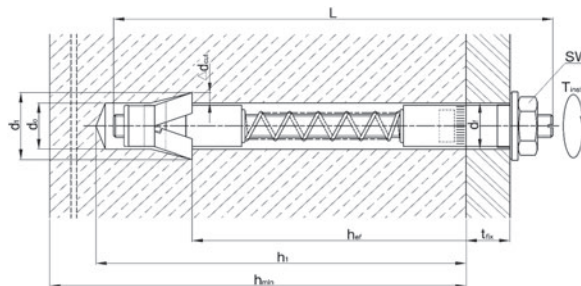
### Spacings, edge distances and member thicknesses

Effective embedment depth	$h_{ef}$	[mm]	140	220	250	280	420
Characteristic spacing <sup>4)</sup>	$s_{cr,N}$	[mm]	420	660	750	840	1260
Minimum spacing	$s_{min}$	[mm]	140	220	250	280	420
Characteristic edge distance <sup>4)</sup>	$c_{cr,N}$	[mm]	210	330	375	420	630
Minimum edge distance	$c_{min}$	[mm]	140	220	250	280	420
Minimum member thickness	$h_{min}$	[mm]	240	360	400	500	700
			-	330 <sup>6)</sup>	360 <sup>6)</sup>	-	-

### Installation data

Drill hole diameter	$d_0$	[mm]	23	30	36	45	67	
Drill hole depth	$h_1$	[mm]	190	300	330	410	570	
Diameter of undercutting	$d_1$	[mm]	35	47	53.5	74	105	
Undercutting	$\Delta d_{cut}$	[mm]	6	8.5	8.75	14.5	19	
Clearance hole in the fixture	Through-fix anchorage	$d_f$	[mm]	24	32	38	46	68
	Installation on threaded stud	$d_f$	[mm]	14	18	22	26	39
Width across flats	$sw$	[mm]	24	36	41	50	75	
Installation torque	$T_{inst}$	[Nm]	120	250	300	790	2000	

### Installed anchor



- The permissible loads have been calculated using the partial safety factors for resistances stated in the ETA-approval and a partial safety factor for actions of  $\gamma_c = 1.4$ . The permissible loads are valid for unreinforced concrete and reinforced concrete with a rebar spacing  $s \geq 15$  cm and reinforced concrete with a rebar spacing  $s \geq 10$  cm if the rebar is 10 mm or smaller.
- The permissible shear loads are based on a single anchor without influencing concrete edges. For shear loads applied close to an edge ( $c \leq 10 h_{ef}$  or  $60 d$ ) concrete edge failure must be checked per ETAG 001, Annex C, design method A.
- Concrete is considered non-cracked when the tensile stress within the concrete is  $\sigma_L + \sigma_R \leq 0$ . In the absence of detailed verification  $\sigma_R = 3 \text{ N/mm}^2$  can be assumed ( $\sigma_L$  equals the tensile stress within the concrete as a result of external loads, forces on anchors included).
- If spacings or edge distances become smaller than the characteristic values (i.e.  $s \leq s_{cr,N}$  and/or  $c \leq c_{cr,N}$ ) a calculation per ETAG 001, Annex C, design method A must be performed. For details, see ETA-04/0099.
- The permissible bending moments are only valid for the threaded stud (e.g. in case of a distance mounting).
- This  $h_{min}$  only applies when the remote face of the concrete is inspected to ensure there has been no break-through as a result of drilling. Otherwise  $h_{min} = 360$  mm (M16) and  $h_{min} = 400$  mm (M20).

**Installation**



**1** Drill hole.



**2** Clean hole with a blow pump.



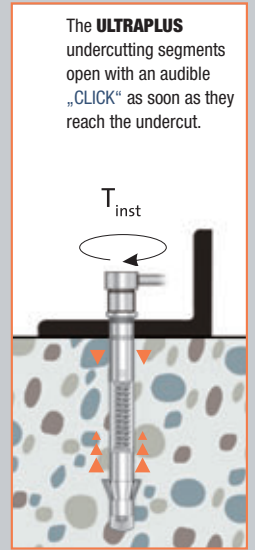
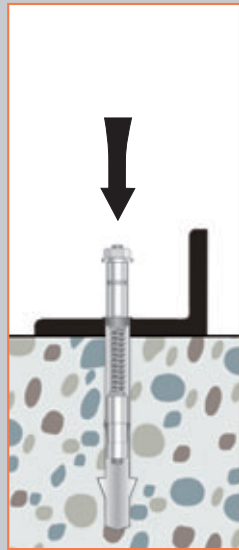
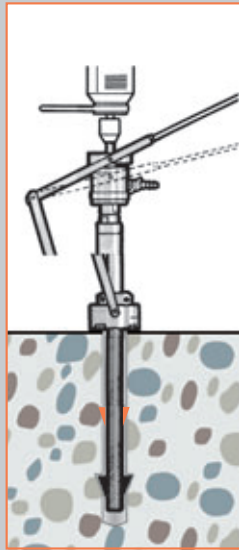
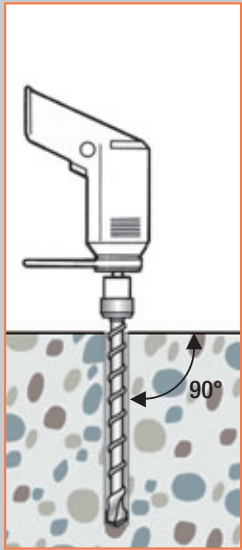
**3** Create the undercut using LIEBIG undercutting tool (approximately 15 to 70 seconds depending on the anchor size). Irrigate with water while undercutting.



**4** Install the LIEBIG **ULTRAPLUS** undercut anchor. The plastic ring holding the undercutting segments together will remain at the fixture.

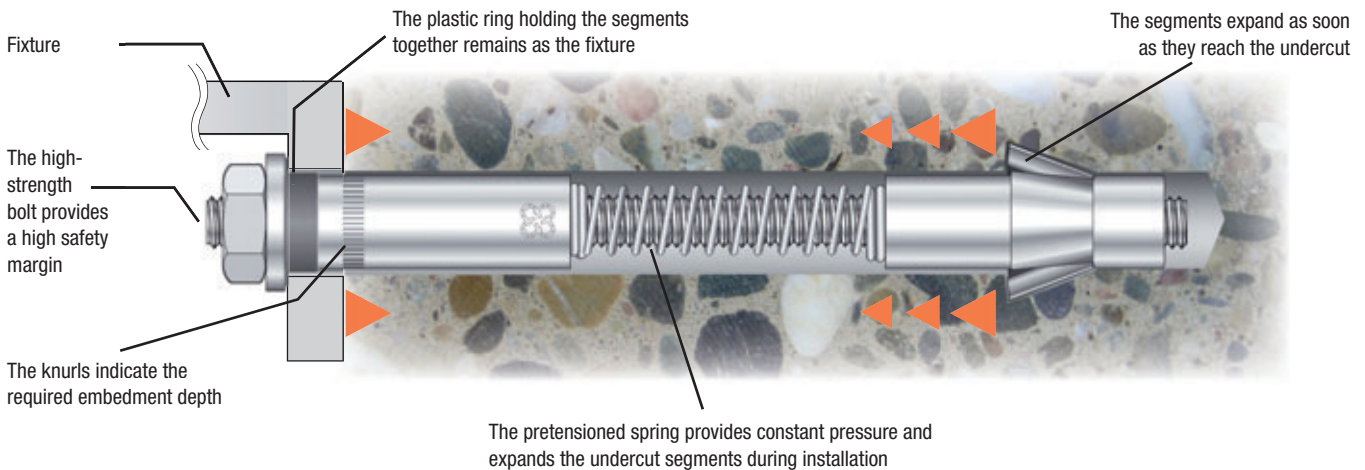


**5** Apply the specified installation torque using a calibrated torque wrench – the **ULTRAPLUS** undercut anchor is now installed and can resist loads immediately!



The **ULTRAPLUS** undercutting segments open with an audible „CLICK“ as soon as they reach the undercut.

\* The LIEBIG undercutting tool is available in models for use in core drilling rigs or as a hand undercutting tool with lever. Both models are available for hire or purchase.



**FIXING IN POWER PLANTS** ▶

LIEBIG **ULTRAPLUS** undercut anchors offer high safety, especially where extraordinary loads are present. With its unique undercutting technology, the **ULTRAPLUS** is the best solution.



◀ **INDUSTRIAL PLANTS/RETROFITS**



The LIEBIG **ULTRAPLUS** undercut anchor can resist high loads problem-free, even at close anchor spacings. The application shown required a load capacity of 294 kN per anchor.  
Solution: LIEBIG **ULTRAPLUS** M36 with 630 mm embedment depth in C50/60 concrete.

**CHALLENGING APPLICATIONS** ▶

The LIEBIG **ULTRAPLUS** is the first choice for unique applications with high loads.

