



## **LIEBIG ULTRAPLUS®**

The undercut anchor for exceptionally high loads in cracked and non-cracked concrete



European technical approval option1



## Exceptional loading.

## Exceptional performance.

The unique modular design and absolute strength of the LIEBIG ULTRAPLUS undercut anchor needs no introduction.

Structural engineering professionals around the world will know the brand, the product and its outstanding performance.

They can be forgiven for being less familiar with the EJOT brand, unless career paths have included sorties into the numerous sectors that comprise industrial roofing, cladding and insulation. Designing and manufacturing fastening solutions for this domain is EJOT's world.

Together we are making LIEBIG products and the technical guidance to support them readily accessible; putting the world's finest anchoring technology back in your hands.

The German owned EJOT Group acquired LIEBIG and its products with a vow to provide full accessibility, backed with the technical support that is the cornerstone of its own global organisation.

This brochure brings together the power of LIEBIG's original anchoring technology with EJOT's manufacturing and technical excellence.





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**LIEBIG®**

## The ORIGINAL Anchoring Technology

Heinrich Liebig was an inventor. Since 1946 the originality and innovation that the LIEBIG brand stands for, has gone largely unmatched and unrivalled.

In 1978 he designed and patented the expandable locking toggle.

In 1980 he patented the positive locking toggle bolt which activated expansion segments by way of an ingenious spring-loaded mechanism.

In 1981 he patented the tool he designed to create the perfect shape of undercut required to house the expansion shells of the positive locking toggle.

The LIEBIG ULTRAPLUS undercutting anchorage system was born and in turn, a further range of anchoring products all designed to deliver the same level of performance.





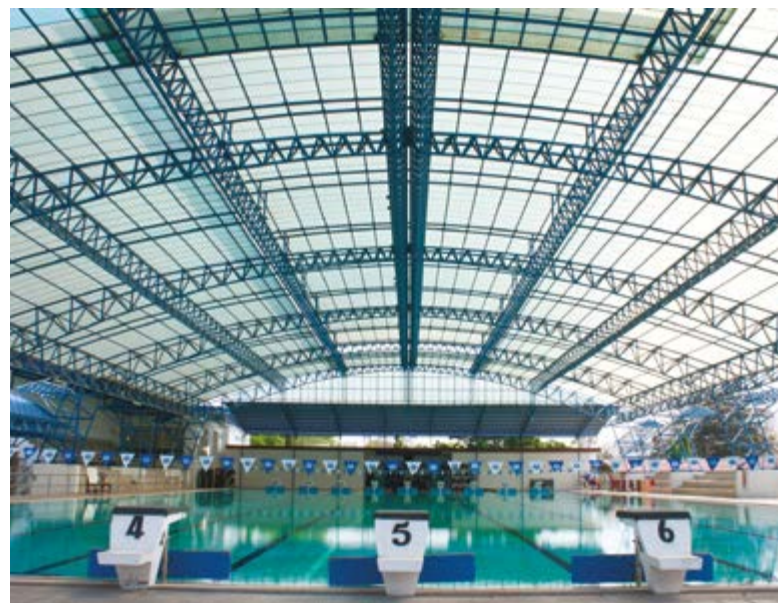


**EJOT®**  
**High performance**  
**fastening with**  
**unrivalled global**  
**support**

Worldwide, the EJOT name is synonymous with the excellence of its products and technical support. This approach has positioned EJOT as market leaders in so many diverse and international sectors, predominantly automotive engineering and industrial roofing / cladding construction.

Our design and testing wing, EJOT Applitec is at the hub of everything we do worldwide, often in partnership with many leading OEM's.

When customers need support with technical issues on-site, particularly where there are structural implications, our teams of Applitec technicians are able to replicate conditions off-site – providing a resource of immeasurable value. Testing data can often enable structural engineers to determine if an incorrect installation is still fit for purpose.





# ULTRAPLUS M12-M36

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

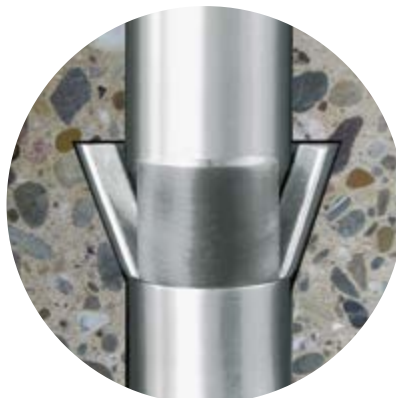
## FUNCTION

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

- Reliable fixing for high loads in cracked and non-cracked concrete
- High margin of safety due to positive undercutting
- Produced from high strength materials
- The spring automatically compensates for tolerances in the fixture thickness
- Modular design allowing for custom lengths and assemblies
- Reduced edge distances and spacings
- Proven performance history in resisting dynamic loads, shock loads and seismic loads. Expert reports available for these and other applications.



## CONSTRUCTION

With hex nut, washer, threaded stud and plastic retaining ring



## MATERIAL

High strength carbon steel, stainless steel

## BASE MATERIAL

Cracked and non-cracked concrete

## APPROVAL

ETA-04/0098 – Option 1 – Approved for cracked and non-cracked concrete

## LOAD RANGE

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

## PRODUCT RANGE

M12 – M36, carbon steel, zinc plated, HDG, sherardised, stainless steel

## CHARACTERISTICS

- Positive undercut anchor with strong mechanical interlock
- Instant loading
- Completely removable
- Through-fix installation
- No expansion forces
- Small edge distances and anchor spacings

## APPLICATIONS

- Nuclear power plants
- Industrial plants
- Water treatment plants
- Petrochemical installations
- Steel construction
- Cranes

## BENEFITS

- Extremely high tensile and shear capacity
- Custom lengths and assemblies readily 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 created using the LIEBIG undercutting tool. When the anchor is inserted through the fixture, spring pressure opens the expanding segments.

These 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.



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# ULTRAPLUS M12-M36

Custom lengths available on request.

## ULTRAPLUS Carbon Steel Zinc Plated

Threaded stud with hex nut and washer

\*Available in high strength zinc plated, sherardised, HDG and stainless steel

Approval: ETA-04/0098 – Option 1 for cracked and non-cracked concrete



Type	Order Code	Thread Size	Diameter x Depth of drilled hole	Max Fixture Thickness	Fixture Hole Diameter	Eff. Embedment Depth	Total Length	Weight (kg/100pcs)	Box Quantity
UP M12-23/140/20	UP1223140020	M12	23x190	20	24	140	220	48	10
UP M16-30/220/30	UP1630220030	M16	30x300	30	32	220	325	123	5
UP M20-36/250/50	UP2036250050	M20	36x330	50	38	250	380	173	5
UP M24-45/280/60*	UP2445280060	M24	45x410	60	46	280	460	408	2
UP M36-67/420/100*	UP3667420100	M36	67x570	100	68	420	700	1305	1

\*Not included in approval. Also available in HDG, sherardised and stainless steel

## INSTALLATION ACCESSORIES

**Undercutting tool for core drilling rigs with 1/2" drive**



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



**Diamond cutting blade**



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

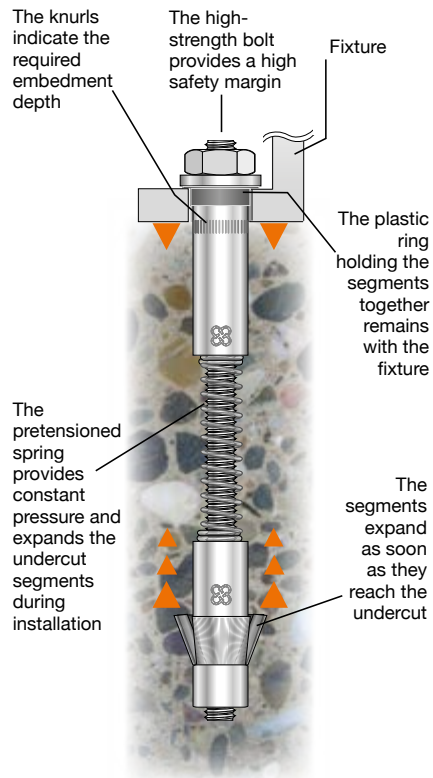
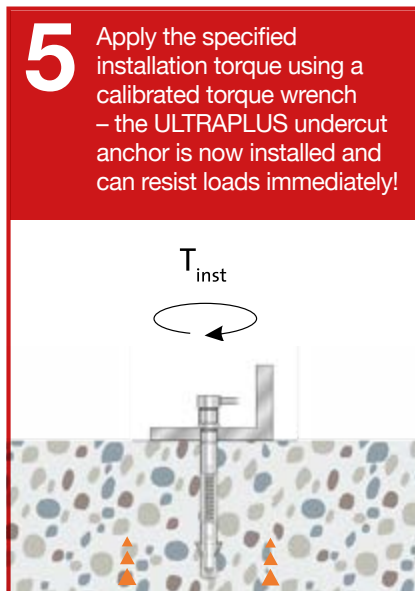
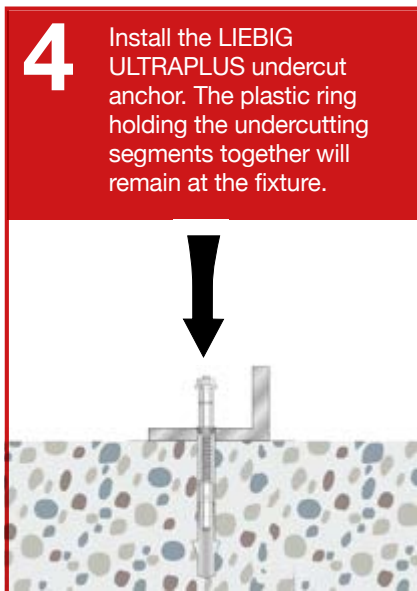
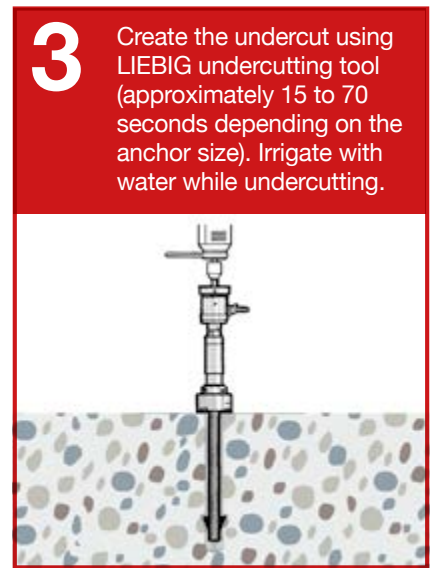
Undercutting tool is available for either purchase or hire.

### Installation data

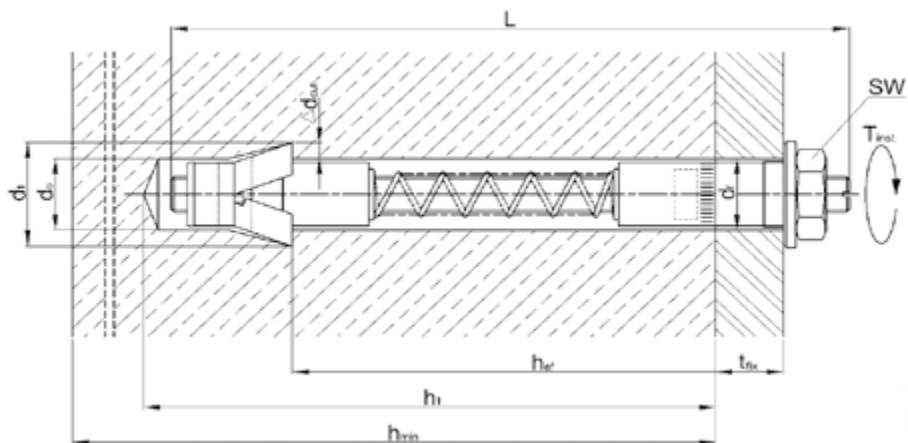
Thread Size			M12	M16	M20	M24	M36	
Drill hole diameter	$d_0$	[mm]	23	30	36	45	67	
Drill hole depth	$h_1$	[mm]	190	300	330	410	570	
Diameter of undercutting	$d_1$	[mm]	35	47	53.5	74	105	
Undercutting	$\Delta d_{cut}$	[mm]	6	8.5	8.75	14.5	19	
Clearance hole in the fixture	Through-fix anchorage	$d_f$	[mm]	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	



# ULTRAPLUS INSTALLATION INSTRUCTIONS



Installed anchor



**Installation video** now available on the EJOT UK YouTube channel

Custom lengths available on request.

### ULTRAPLUS 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-04/0098. Material: Carbon steel zinc plated. Please contact EJOT UK for load and performance data for the stainless steel version, or consult the technical manual.

Thread Size	M12	M16	M20	M24	M36
Effective embedment depth (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>

$N_{perm}$	Concrete	Concrete	[kN]	M12	M16	M20	M24	M36
	Cracked	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
		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
	Non-Cracked Concrete <sup>3)</sup>	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>

$V_{perm}$	Concrete	Concrete	[kN]	M12	M16	M20	M24	M36
	Cracked	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
		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
	Non-Cracked Concrete <sup>3)</sup>	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 bending moments<sup>1) 5)</sup>

$M_{perm}$	[Nm]	M12	M16	M20	M24	M36
		62.4	158.1	309.0	534.5	1881.7

#### Spacings, edge distances and member thicknesses

Parameter	Symbol	[mm]	M12	M16	M20	M24	M36
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>	—	—

1) 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  $\gamma_f = 1.4$ . 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.

2) 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.

3) Concrete is considered non-cracked when the tensile stress within the concrete is  $\sigma_L + \sigma_n \leq 0$ . In the absence of detailed verification  $\sigma_n = 3$  N/mm<sup>2</sup> can be assumed ( $\sigma_L$  equals the tensile stress within the concrete as a result of external loads, forces on anchors included).

4) 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-04/0098.

5) The permissible bending moments are only valid for the threaded stud (e.g. in case of a distance mounting).

6) 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).



# More from EJOT®



Watch the LIEBIG ULTRAPLUS installation animation at the EJOT UK YouTube Channel



Full EJOT UK concrete, brick and block fasteners catalogue.



Full EJOT global Anchoring Systems catalogue.



Full LIEBIG® range of data sheets now available to view and download at [ejot.co.uk](http://ejot.co.uk)



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