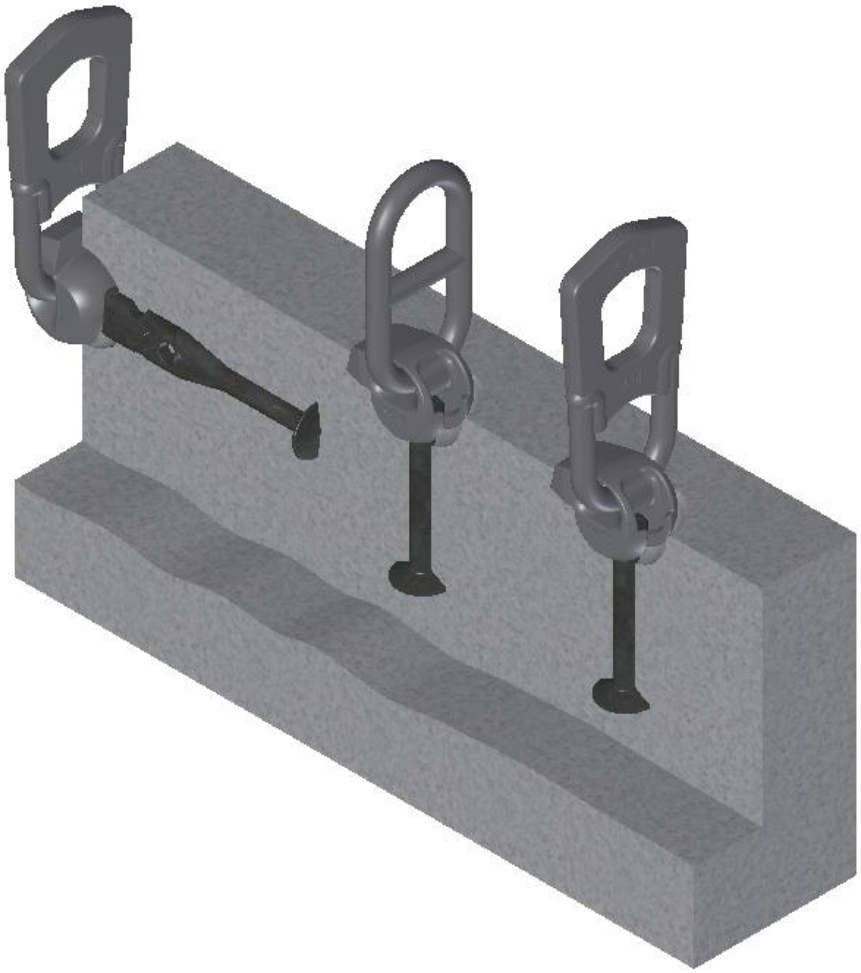
TECHNICAL DOCUMENTATION

LIFTING SYSTEMS | 3D T- SLOT ANCHOR LIFTING SYSTEM



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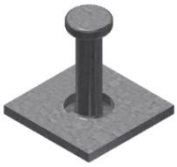
EN – Original Instructions

OVERVIEW

<table>
<tr><th colspan="5">LIFTING CLUTCHES AND TRANSPORT ANCHOR</th></tr>
<tr><td>TH2
 
Page 54</td><td>THR2
 
Page 54</td><td>TH1
 
Page 55</td><td colspan="2">TH1-15/20T
 
Page 55</td></tr>
<tr><td>T-SLOT
 
Page 22</td><td>TKS
 
Page 33</td><td>T-DOUBLE HEAD
 
Page 36</td><td>P-ANCHOR
 
Page 39</td><td>O-ANCHOR
 
Page 42</td></tr>
<tr><td>TKA
 
Page 44</td><td>TSG
 
Page 47</td><td>TKSG
 
Page 50</td><td colspan="2">TPA
 
Page 53</td></tr>
<tr><th colspan="5">RECESS FORMERS AND ACCESSORIES</th></tr>
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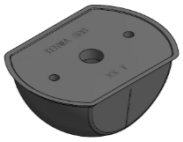
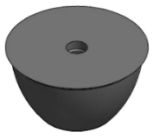
Page 61</td><td>SRB
 
Page 61</td><td>RBK
 
Page 62</td><td>RBP
 
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 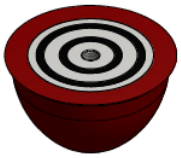
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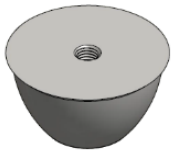
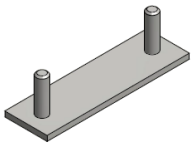
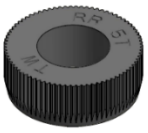
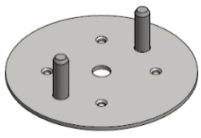
 
Page 63</td><td>SBKM
 
Page 63</td><td>IPK
 
Page 44</td><td>RR
 
Page 63</td><td>IP
 
Page 64</td></tr>
<tr><td>IPD/IPDV
 
Page 64</td><td>TDV
 
Page 64</td><td>OPR
 
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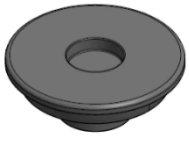
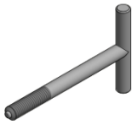
 
Page 65</td><td>SBKM EXTRACTOR
 
Page 65</td></tr>
<tr><td>TH CHECKING CALIBER
 
Page 57</td><td></td><td></td><td></td><td></td></tr>
</table>

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TABLE OF CONTENTS:

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INTRODUCTION

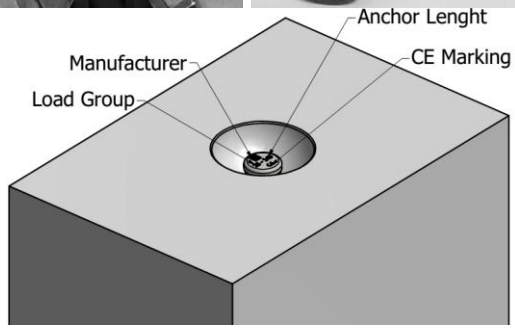
Using the 3D T-slot Anchor System is fast, and the utilisation of a cost-effective T-Slot anchor makes application of this lifting system the most economical solution.
The T-Slot anchor is built into the concrete element with the aid of a rubber recess former. After pouring the concrete into the formwork and after the concrete has hardened, the rubber ball can be removed. The TH2 lifting clutch fits perfectly in the created cavity, facilitating the lifting of the prefabricated element from the formwork.
Some of the important advantages of these systems include:

- Safe, simple and fast connection and disconnection between lifting anchors and lifting clutches.
- Anchors and links are designed for load capacities between **1.3 – 45 t**.
- High quality alloy material for lifting anchors can be used in any environment.
- Available in hot dip galvanised and stainless steel for protection against corrosion.
- Perfect lifting and transport solution for most applications and precast elements.
- CE-certified system. All Terwa lifting systems have the CE marking which guarantees conformance with the European regulations.
- The design for Terwa 3D lifting anchors and technical instructions comply with the national German guideline VDI/BV-BS 6205:2012 “Lifting inserts and lifting insert for precast concrete elements”. Based on this guideline, the manufacturer must also ensure that the lifting systems have sufficient strength to prevent concrete failure.
- The anchors are designed to resist at a minimum safety factor = 3.

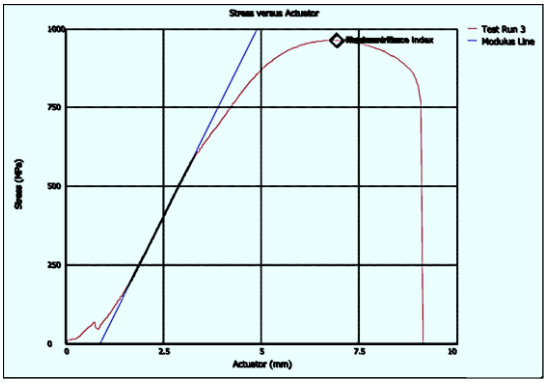
A failure of lifting anchors and lifting anchor devices can endanger human lives as well as can lead to significant damage. Therefore, lifting anchors and lifting devices are high quality products, carefully selected and designed for the intended applications and used by qualified personnel in accordance with the lifting and handling instructions.
Important! Damaged anchors by corrosion or with visible deformations must not be used for lifting.
Welding on the anchor is not permitted.

Quality
Terwa continuously controls the anchor production process in terms of strength, dimensional and material quality, and performs all of the required inspections for a superior quality system. All of the products are tracked from material acquisition to the final, ready to use product.

Marking and traceability
All anchors and lifting clutches are CE marked and have all the necessary data for traceability and the load group.



Anchor testing
Terwa lifting anchors are designed to resist at a minimum safety factor of **3x load group**



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Application of lifting anchor system

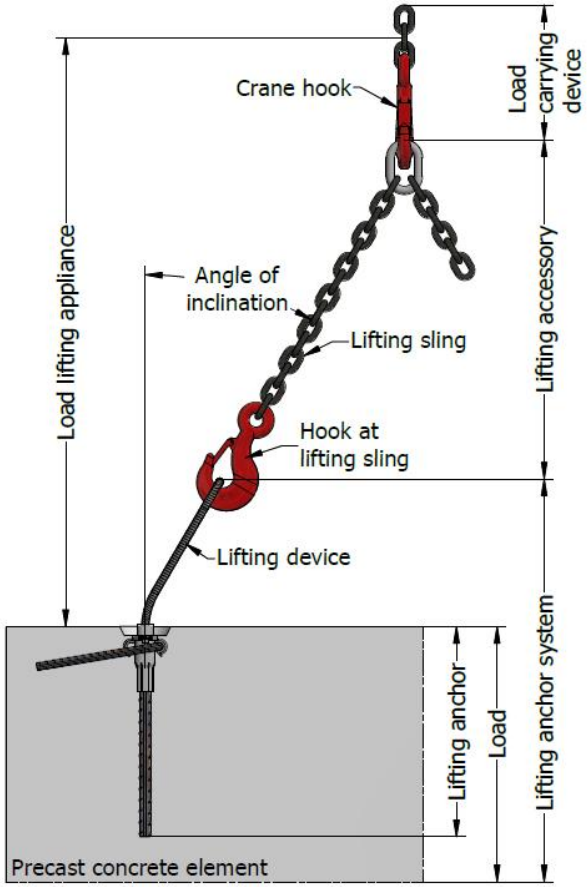
Load carrying devices - are equipment that is permanently connected to the hoist for attaching lifting devices, lifting accessory or loads.

Lifting accessory – equipment that creates a link between the load carrying device and the lifting device.

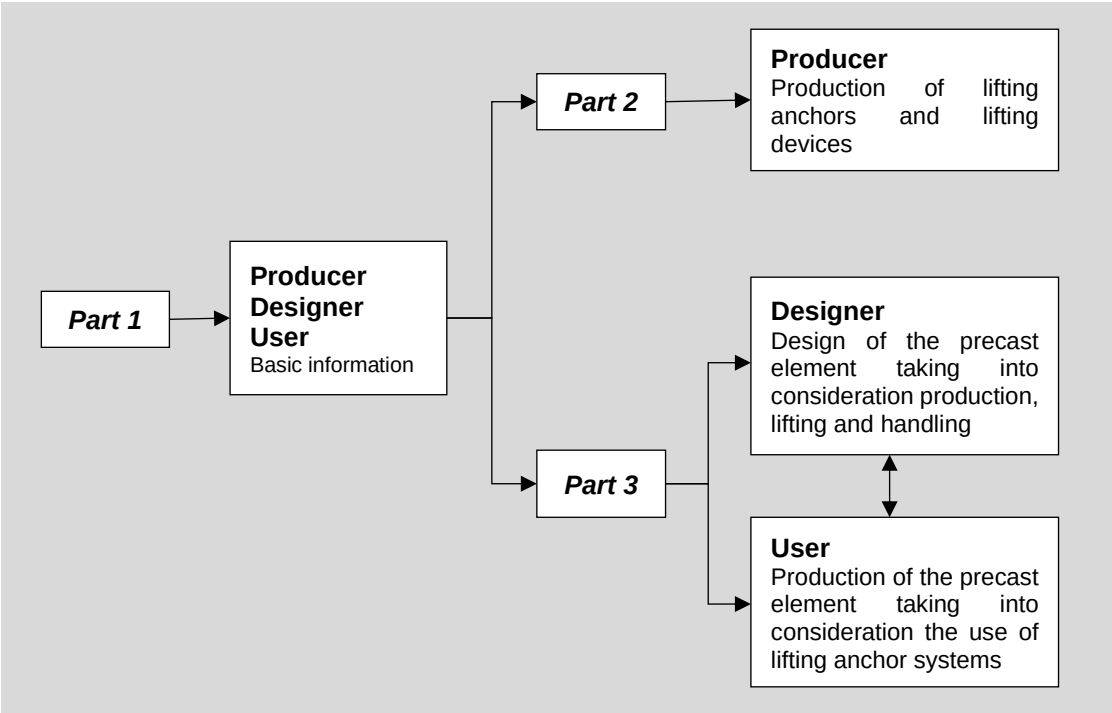
Lifting device (lifting key) – equipment that connects the loads to the load carrying device by means of lifting accessories.

Lifting anchor – steel part embedded in the concrete element, which is intended as an attachment point for the lifting device.

Lifting anchor system - consists of a lifting anchor (insert), which is permanently anchored in the precast concrete element and the corresponding lifting device, which is temporarily fixed to the embedded lifting anchor.



Interaction between the parts of the series of guidelines VDI/BV-BS 6205



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CE MARKING

CE marking means that a product is manufactured and inspected in accordance with a harmonised European standard (hEN) or a European Technical Approval (ETA). ETA can be used as the basis for CE marking for cases in which there is no harmonised EN standard. However, ETA is voluntary and not required by EU directives or legislation. Manufacturers may use the CE marking to declare that their construction products meet harmonised European standards or have been granted ETA Approvals. These documents define properties the products must have to be granted the right to use the CE marking and describe how the manufacture of these products is supervised and tested.
EU Construction Products Regulation takes full effect on 1 July 2013. There are no harmonised EN standards for detailed building parts, such as connections used in concrete constructions, excluding lifting items and devices, which are covered by the EU Machinery Directive. For steel constructions, CE marking will become mandatory as of 1 July 2014, as covered by the EU Construction Products Directive.

PRODUCT RANGE

LIFTING SYSTEM

- **LIFTING CLUTCHES**

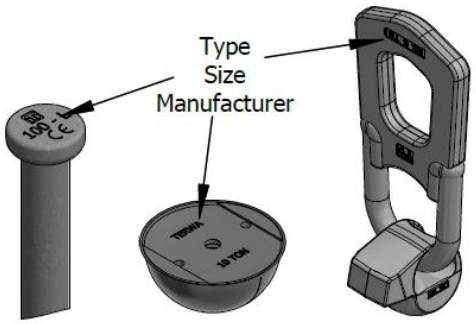
"Terwa" offers various lifting clutches and a wide range of different recess formers. The difference between all of the systems is actually defined by the type of anchors.

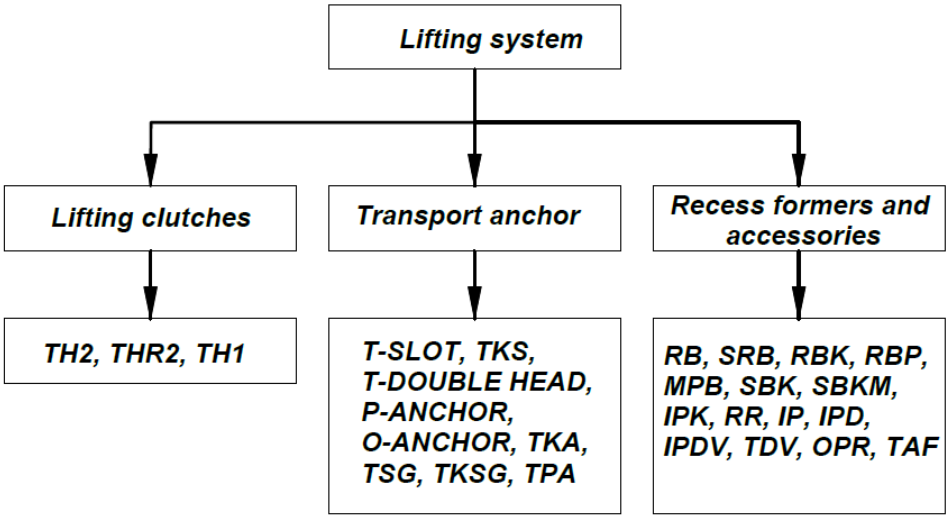
- **TRANSPORT ANCHORS**

The anchors are forged from round carbon steel. Available in black (with no surface treatment other than being slightly oiled) or hot dip galvanised, Terwa abbreviation **''TV''**. A small range of stainless-steel anchors (A**2**-1.4301; AISI 304, Terwa abbreviation SS**2**) is available as well. All anchors are designed to meet a minimum safety factor of c=3.

- **RECESS FORMERS AND ACCESSORIES**

The anchors are fitted in the mould with a recess former. The recess formers are available in the same range as the lifting clutches and the anchors. This is indicated by a load group, marked on the top.
The formers are mounted on the mould using fixing plates.





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TECHNICAL INFORMATION – CHOOSING THE TYPE OF ANCHOR

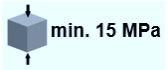
Terwa offers a total of 3 types of lifting systems:

- 1D threaded lifting system
- 2D strip anchor lifting system
- 3D T-slot anchor lifting system

The method for choosing the anchor is identical for all these types and depends on the lifting method and/or experience.
The 1D threaded lifting system is mainly used when the hoisting angles are limited, while the 2D strip anchor lifting system and the 3D T-slot anchor lifting system can be used for all hoisting angles, with minor limitations for the 2D strip anchor lifting system.
The difference between the 2D strip anchor lifting system and the 3D T-slot anchor lifting system lies principally in the experience one has in using one or the other system.
Terwa also has software for making the anchor calculations.

SAFETY RULES

The anchors are embedded in the concrete elements. The lifting system is connected to the anchor only when required for lifting.
Ensure that the concrete has reached MPA strength of at least 15 MP before beginning lifting.



These lifting systems are not suitable for intensive re-use.
In designing the lifting system, the safety factors for the failure mode steel rupture derived from the Machinery Directive 2006/42/EC are:

- **for steel component (solid sections)** $\gamma = 3$
- **for steel wires** $\gamma = 4$

For this, the load-side dynamic working coefficient ψ_{dyn} **= 1.3**
For the determination of the characteristic resistances based on method A in accordance with DIN EN 1990 - Annex D for the concrete break-out, splitting, blow-out and pull-out failure modes, the safety factor is γ **= 2.5**
The safety concept requires that the action E does not exceed the admissible value for the resistance R_{adm}:

$E \leq R_{adm}$ Where: E - action, R_{adm} - admissible load (resistance)

The admissible load (resistance) of lifting anchor and lifting device is obtained as follows:

$R_{adm} = \frac{Rk}{\gamma}$ Where: R_k - characteristic resistance of the anchoring of a lifting anchor or lifting device, γ - global safety factor

Notice: The lifting anchors must always be installed above the centre of gravity. Otherwise, the element can tip over during transport.
The maximum permitted load on the components quoted in the tables has been obtained by applying a safety factor on test data.

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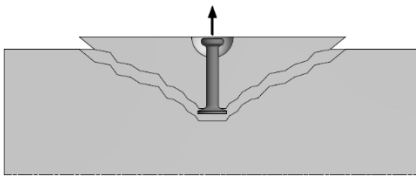
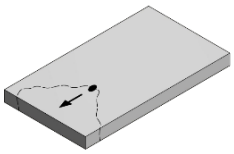
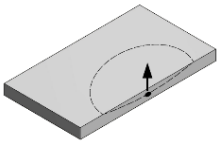
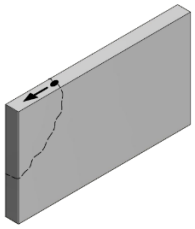
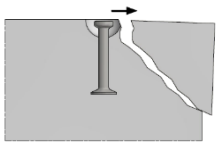
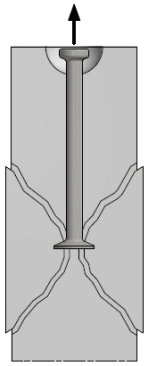
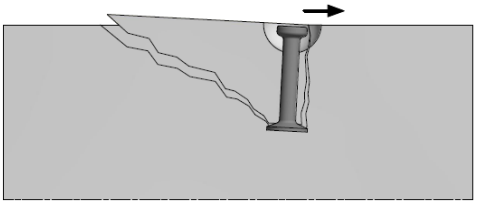
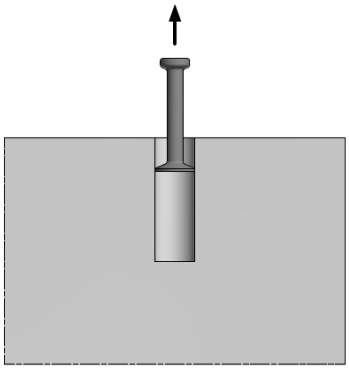
POSSIBLE TYPES OF FAILURE OF A LIFTING ANCHOR

Failure type	Fracture pattern: tensile force	Fracture pattern: transverse shear force
Concrete break-out Failure mode, characterised by a wedge or cone shaped concrete break-out body, which was separated from the anchor ground and is initiated by the lifting anchor		   
Local concrete break-out (blow-out) Concrete spalling at the side of the component that contains the anchor, at the level of the form-fitting load application by the lifting anchor into the concrete break-out at the concrete surface.		
Pry-out (rear breakout of concrete) Failure mode characterised by the concrete breaking out opposite the direction of load, on lifting anchors with shear load.		
Pull-out Failure mode, where the lifting anchor under tension load is pulled out of the concrete with large displacements and a small concrete break-out.		

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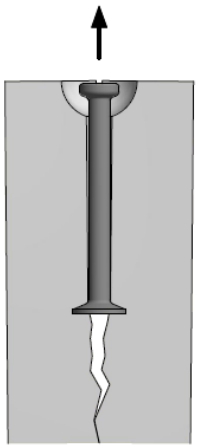
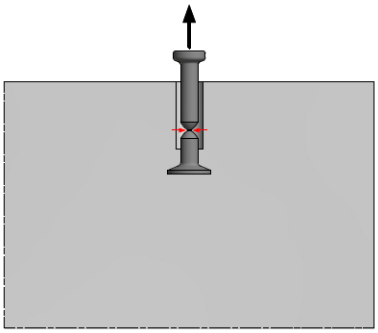
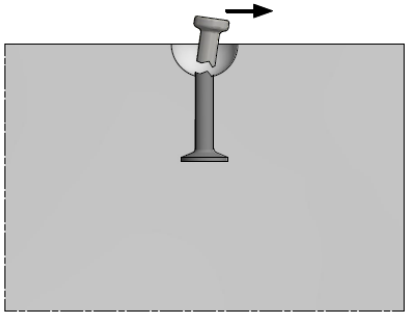
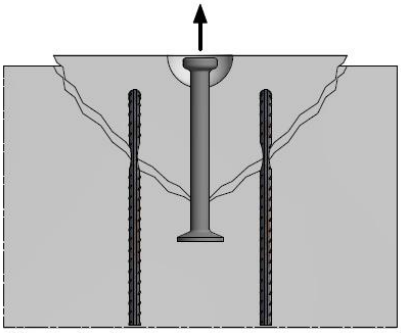
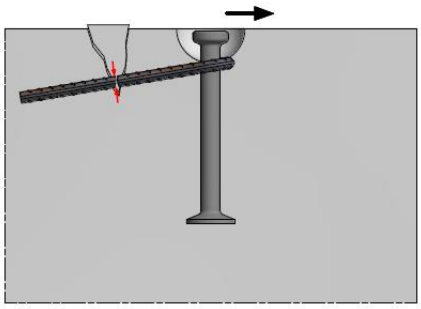
Failure type	Fracture pattern: tensile force	Fracture pattern: transverse shear force
Splitting of the component A concrete failure in which the concrete fractures along a plane passing through the axis of the lifting anchor.		
Steel failure Failure mode characterised by fracture of the steel lifting anchor parts.		
Steel failure of additional reinforcement Steel failure of the supplementary reinforcement loaded directly or indirectly by the lifting anchor		

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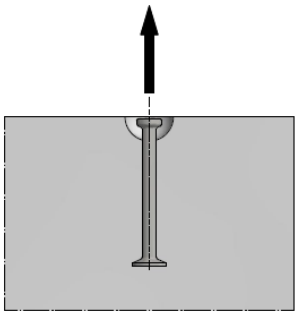
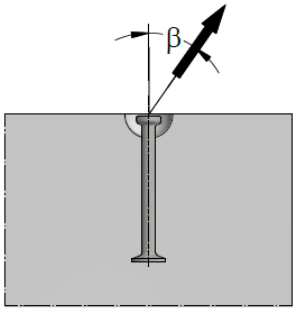
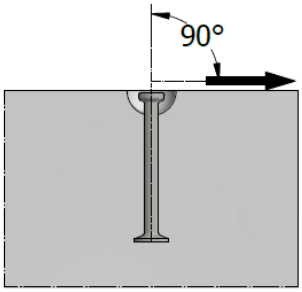
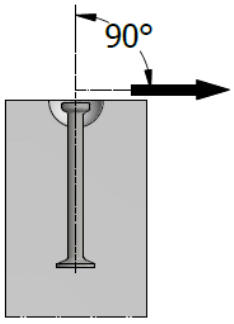
DIMENSIONING OF LIFTING ANCHOR SYSTEM

For the safe dimensioning of lifting anchor systems for precast concrete elements, the following points must be made clear at the start:

- The type of the structural element and the geometry
- Weight and location of centre of gravity of the structural element
- Directions of the loads on the anchor during the entire transport process, with all loading cases that occur.
- The static system of taking on the loads.

To determine the correct size of lifting anchor, the stresses in the direction of the wire rope sling must be determined for all load classes. These stresses must then be compared with the applicable resistance values for the type of loading case.

Stress ≤ Resistance always applies

<table>
<tr><th colspan="4">Direction of stress</th></tr>
<tr><th colspan="2">Axial tension</th><th colspan="2">Parallel shear pull</th></tr>
<tr><td>Load or load component action in the direction of the longitudinal axis of the lifting anchor.</td><td>  </td><td>Load or load component action at an angle β to the longitudinal axis of the lifting anchor in the plane of the precast component.</td><td> 
</td></tr>
<tr><td colspan="4"></td></tr>
<tr><th colspan="2">Transverse shear pull parallel to the structural element plane</th><th colspan="2">Transverse shear pull perpendicular to the structural element plane</th></tr>
<tr><td>Load or load component parallel to the surface of structural element and to the plane of the element, acting at an angle β perpendicular to the longitudinal axis of the lifting anchor.</td><td> 
</td><td>Load or load component parallel to the building component surface and perpendicular to the surface of the component.</td><td> 
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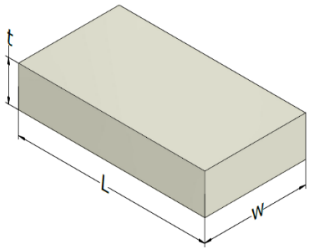
LOAD CAPACITY

The load capacity of the anchor depends on multiple factors, such as:

- The deadweight of the precast concrete element "F_G"
- Adhesion to the formwork
- The load direction, angle of pull
- Number of load-bearing anchors
- The edge distance and spacing of the anchors
- The strength of the concrete when operating, lifting, or transporting
- The embedded depth of the anchor
- Dynamic forces
- The reinforcement arrangement

WEIGHT OF PRECAST UNIT

The total self-weight "$\boldsymbol{F_G}$" of the precast reinforced concrete element is determined using a specific weight of: **ρ = 25kN/m³.** For prefabricated elements composed of reinforcing elements with a higher concentration, this will be taken into consideration when calculating the weight.



$$\boldsymbol{F_G = \rho \times V}$$

$$\mathbf{V = L \times w \times t}$$

Where:
V - volume of precast unit in [m³]
L – length in [m]
w – width in [m]
t – thickness in [m]

ADHESION TO FORMWORK COEFFICIENT

When a precast element is lifted from the formwork, adhesion force between element and formwork develops. This force must be taken into consideration for the calculation of the anchor load and depends on the total area in contact with the formwork, the shape of the precast element and the material of the formwork. The value "$\boldsymbol{F_{adh}}$" of adhesion to the formwork is calculated using the following equation:

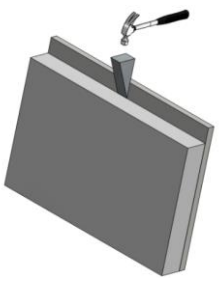
$$\boldsymbol{F_{adh} = q_{adh} \times A_f\ [kN]}$$

Where: F_{adh} – action due to adhesion and form friction, in kN
q_{adh} - the adhesion to formwork and form friction factor corresponding to the material of the formwork
A_f - the area of contact between the formwork and the concrete element when starting the lift

Adhesion to the formwork	q_{adh} in kN/m²
Oiled steel formwork, oiled plastic-coated plywood	≥ 1
Varnished timber formwork with panel boards	≥ 2
Rough timber formwork	≥ 3

In some cases, such as $\boldsymbol{\pi}$ - panel or other specially shaped elements, an increased adhesion coefficient must be taken into consideration.

Increased adhesion to the formwork	
$\boldsymbol{\pi}$ - panels	$F_{adh} = 2 \times F_G\ [kN]$
Ribbed elements	$F_{adh} = 3 \times F_G\ [kN]$
Waffled panel	$F_{adh} = 4 \times F_G\ [kN]$



Adhesion to the formwork should be minimised before lifting the concrete element out of the formwork by removing as many parts of the formwork as possible.

Before lifting from the table, the adhesion to the formwork must be reduced as much as possible by removing the formwork from the concrete element (tilting the formwork table, brief vibration for detachment, using wedges).

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DYNAMIC LOADS COEFFICIENT

During lifting and handling of the precast elements, the lifting devices are subject to dynamic actions. The value of the dynamic actions depends on the type of lifting machinery. Dynamic effect shall be considered by the dynamic factor ψ_{dyn}.

Lifting equipment	Dynamic factor ψ_{dyn}
Tower crane, portal crane and mobile crane	1.3 *)
Lifting and moving on flat terrain	2.5
Lifting and moving on rough terrain	≥ 4.0
*) lower values may be appropriate in precast plants if special arrangements are made.	

For special transport and lifting cases, the dynamic factor is established based on the tests or on proven experience.

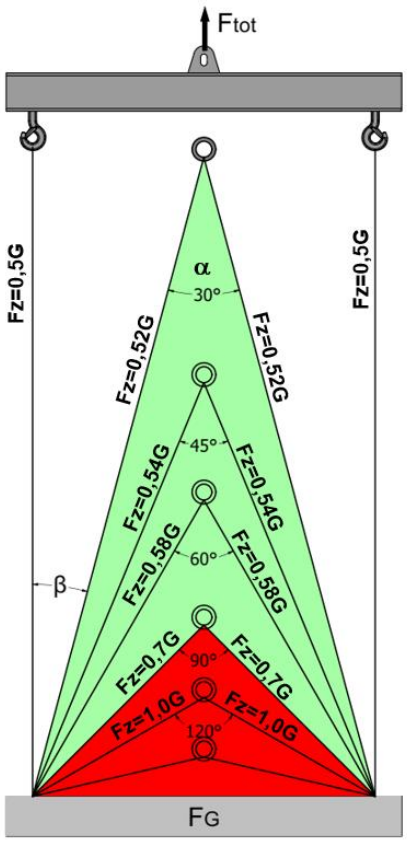
LIFTING OF PRECAST CONCRETE ELEMENT UNDER COMBINED TENSION AND SHEAR LOADING

The load value applied on each anchor depends on the chain inclination, which is defined by the angle β between the normal direction and the lifting chain.
The cable angle β is determined by the length of the suspension chain. We recommend that, if possible, β should be kept to $\beta \leq 30^o$. The tensile force on the anchor will be increased by a cable angle coefficient "**z**".

$$\mathbf{z = 1/cos\beta}$$

$$\boldsymbol{F = \frac{F_{tot} \times z}{n}}$$

Where:
z - cable angle coefficient
n - number of load-bearing anchors



Cable angle β	Spread angle a	Cable angle factor z
0°	-	1.00
7.5°	15°	1.01
15.0°	30°	1.04
22.5°	45°	1.08
30.0°	60°	1.16
*37.5°	75°	1.26
*45.0°	90°	1.41

*** Preferred option ß ≤ 30°**

Note: If no lifting beam is used during transport, the anchor must be installed symmetrical to the load's centre of gravity.
To prevent the prefabricated elements from hanging at an angle when they are moved, the hook in lifting beam must be directly above the centre of gravity.

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ASYMMETRIC DISTRIBUTION OF THE LOAD

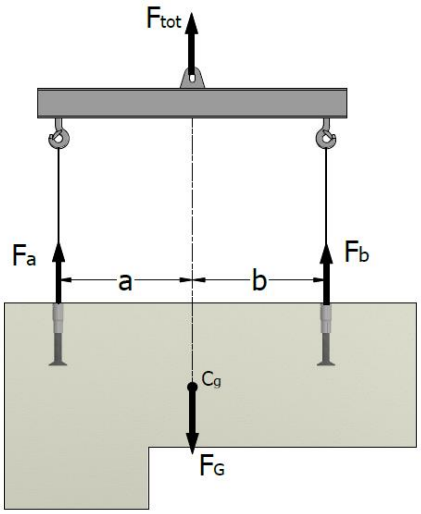
For asymmetrical elements, calculate the loads based on the centre of gravity before installing the anchors.
The load of each anchor depends on the embedded position of the anchor in the precast unit and on the transport mode:

a) If the arrangement of the anchors is asymmetrical in relation to the centre of gravity, the individual anchors support different loads. For the load distribution in asymmetrically installed anchors when a spreader beam is used, the forces on each anchor are calculated using the following equation:

$$F_a = F_{tot} \times \mathbf{b}/(\mathbf{a}+\mathbf{b})$$

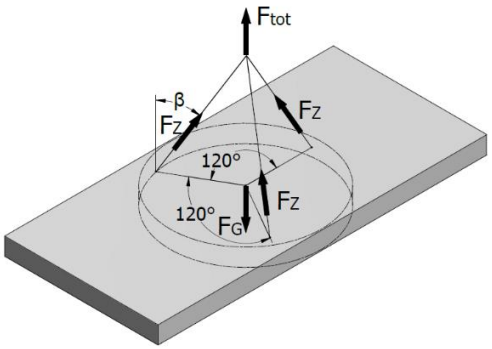
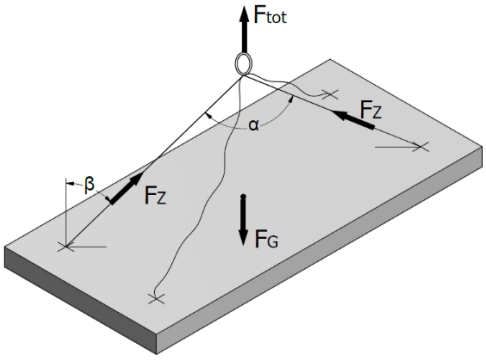
$$F_b = F_{tot} \times \mathbf{a}/(\mathbf{a}+\mathbf{b})$$

Note: To avoid tilting the element during transport, the load should be suspended from the lifting beam in such a way that its centre of gravity (Cg) is directly under the crane hook.



b) For transporting without a lifting beam, the load on the anchor depends on the cable angle (ß).

ANCHORS LIFTING CONDITIONS

Using three anchors spaced the same distance apart from each other as in the figure, three load bearing anchors can be assumed. Load bearing anchors: **n=3** **Load type – lifting of formwork** -shear pull factor $z \geq 1$ -formwork adhesion -no dynamic factor **Load type – transport** -shear pull factor $z \geq 1$ -no formwork adhesion -dynamic factor	
Using four anchors lifted without a spreader beam, only two load bearing anchors can be assumed. The load distribution is randomly based Load bearing anchors: **n=2** **Load type – lifting of formwork** -shear pull factor $z \geq 1$ -formwork adhesion -no dynamic factor **Load type – transport** -shear pull factor $z \geq 1$ -no formwork adhesion -dynamic factor	

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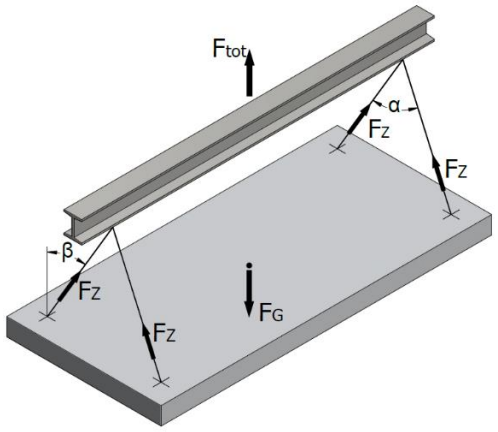
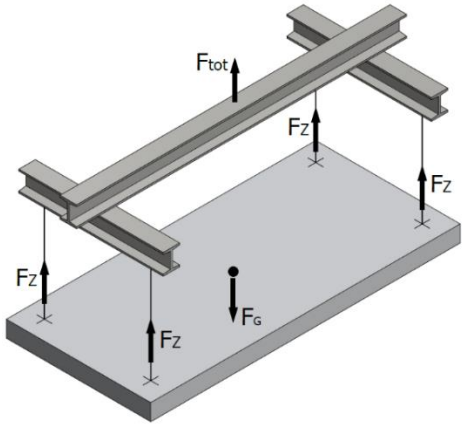
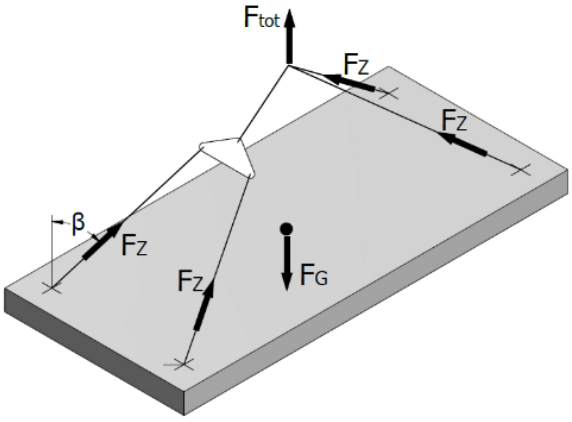
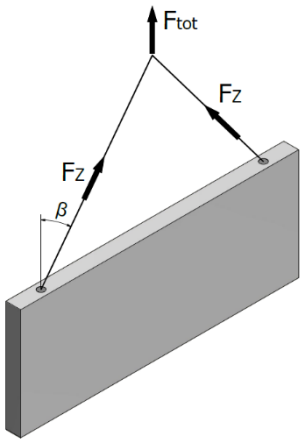
Perfect force distribution is assumed using a spreader beam Load bearing anchors: **n=4** **Load type – lifting of formwork** -shear pull factor $z \geq 1$ -formwork adhesion -no dynamic factor **Load type – transport** -shear pull factor $z \geq 1$ -no formwork adhesion -dynamic factor	
Perfect static weight distribution can be obtained using a lifting beam and two pairs of anchors symmetrically placed. Load bearing anchors: **n=4** **Load type – lifting of formwork** -shear pull factor $z \geq 1$ -formwork adhesion -no dynamic factor **Load type – transport** -shear pull factor $z \geq 1$ -no formwork adhesion -dynamic factor	
The compensating lifting slings ensure equal force distribution. Load bearing anchors: **n=4** **Load type – lifting of formwork** -shear pull factor $z \geq 1$ -formwork adhesion -no dynamic factor **Load type – transport** -shear pull factor $z \geq 1$ -no formwork adhesion -dynamic factor	
Lifting of wall elements parallel to the axis of concrete element Load bearing anchors: **n=2** **Load type – transport** -shear pull factor $z \geq 1$ -no formwork adhesion -dynamic factor	

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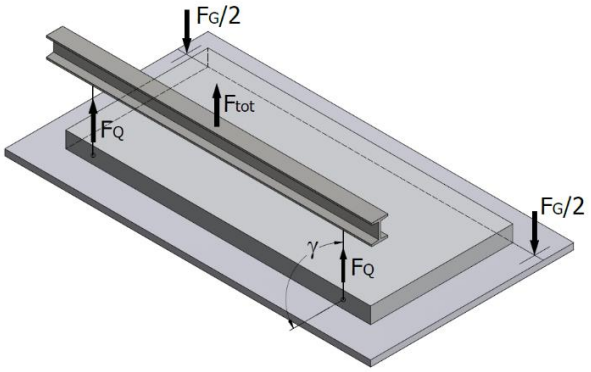
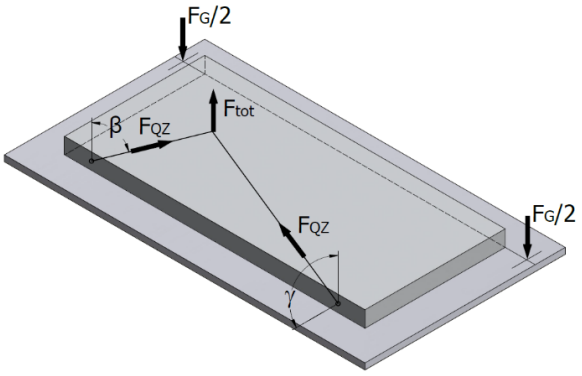
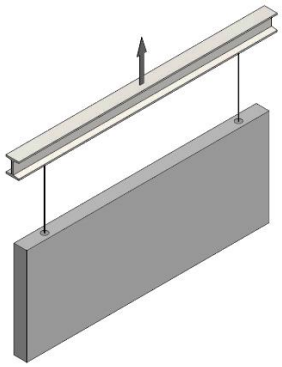
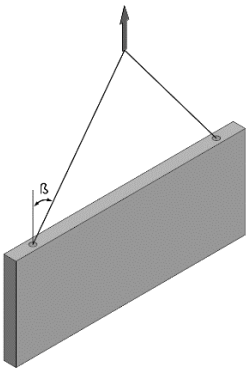
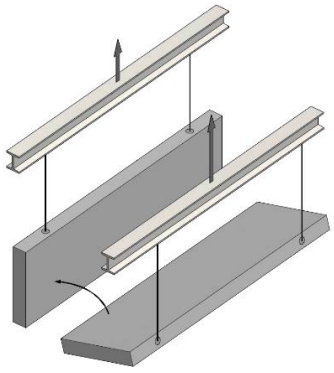
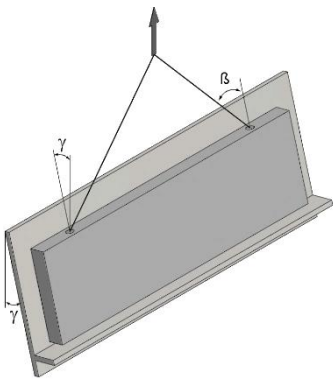
When the element is lifted without a lifting table at a straight angle and contact with the ground is maintained. Additional shear reinforcement is required. Load bearing anchors: **n=2** **Load type – lifting of formwork** -shear pull factor $z = 1$ -formwork adhesion -no dynamic factor **Load type – transport** -shear pull factor $z = 1$ -no formwork adhesion -dynamic factor	
When the element is lifted without a lifting table at a straight angle and contact with the ground is maintained. Additional shear reinforcement is required. ***ß ≤ 30 º*** Load bearing anchors: **n=2** **Load type – lifting of formwork** -shear pull factor $z \geq 1$ -formwork adhesion -no dynamic factor **Load type – transport** -shear pull factor $z \geq 1$ -no formwork adhesion -dynamic factor	

LOAD DIRECTIONS

Various scenarios may occur during transport and lifting, such as tilt-up, rotation, hoisting and, of course, installation. The lifting anchors and clutches must have the capacity for all these cases and combinations of them. Therefore, the load direction is a very important factor for proper anchor selection.

Axial load **ß = 0º to 10º** 	Diagonal load **ß = 10º to 45º** *Note: **ß ≤ 30 º** is recommended* 
Tilting **g = 90 º** ***Additional shear reinforcement steel must be used.*** 	When a tilting table is used, the anchors can be used without additional shear reinforcement steel, not to angle **g < 15 º** 

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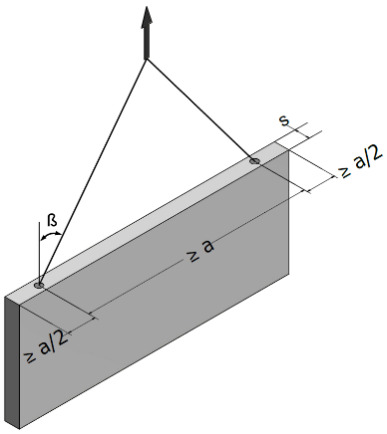
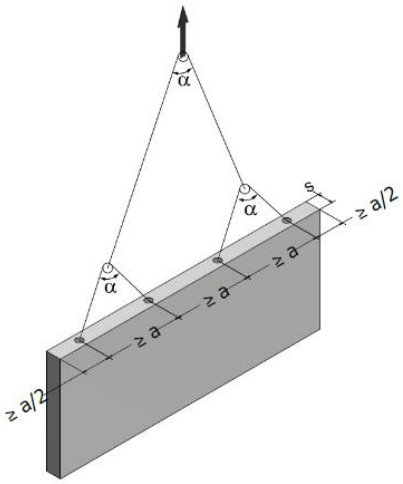
POSITIONING THE ANCHORS IN WALLS

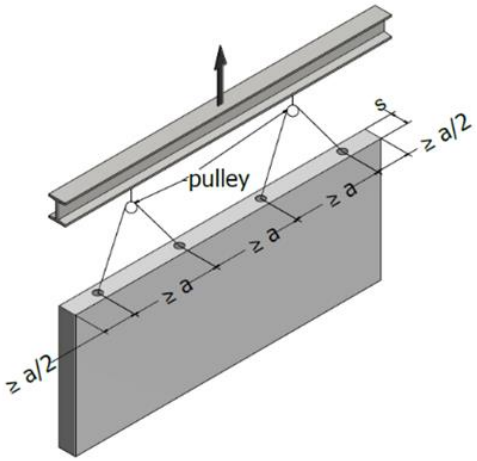
Load bearing anchors:
n=2

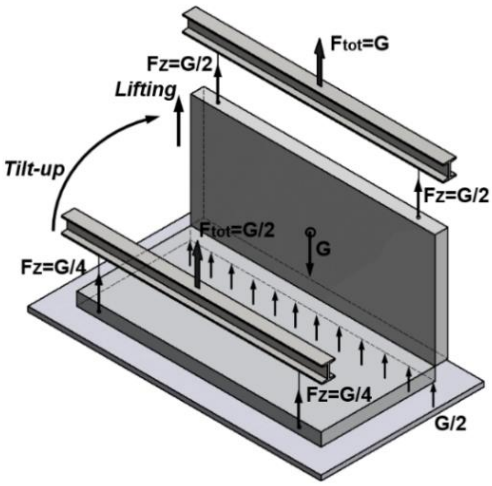


Load bearing anchors:
n=4



Load bearing anchors:
n=4





Lifting the walls from horizontal to vertical position without tilt-up table.

In this case, the anchors are loaded with half of the element weight since half of the element remains in contact with the casting table.

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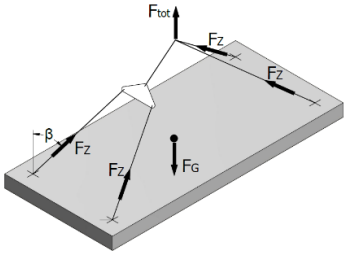
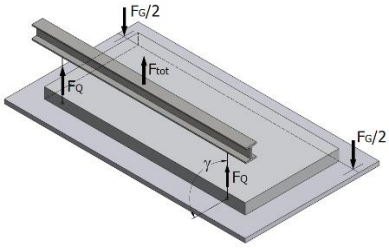
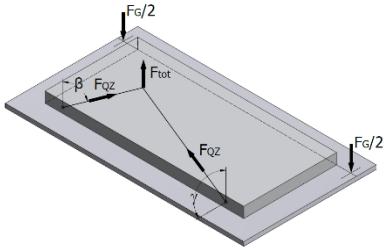
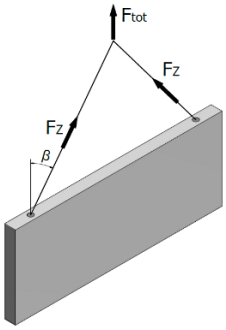
DETERMINATION OF ANCHOR LOAD

Load type		Calculation	Verification
Lifting with formwork adhesion		$F_Z = \frac{(F_G + F_{adh}) \times z}{n}$ F_Z – Load acting on the lifting anchor in kN	$F_Z \leq N_{R,adm}$ $N_{R,adm}$ – admissible normal load
Erecting		$F_Q = \frac{(F_G/2) \times \psi_{dyn}}{n}$ F_Q – Shear load acting on the lifting anchor directed perpendicular to the longitudinal axis of the concrete element when lifting from horizontal position with a beam in kN	$F_Q \leq V_{R,adm}$ $V_{R,adm}$– admissible shear load
		$F_{QZ} = \frac{(F_G/2) \times \psi_{dyn} \times z}{n}$ F_{QZ} – Shear load acting on the lifting anchor inclined and perpendicular to the longitudinal axis of the concrete element when lifting from horizontal position with a beam in kN	$F_{QZ} \leq V_{R,adm}$ $V_{R,adm}$– admissible shear load
Transport		$F_Z = \frac{F_G \times \psi_{dyn} \times z}{n}$ F_Z – Load acting on the lifting anchor in kN	$F_Z \leq N_{R,adm}$ $N_{R,adm}$ – admissible normal load

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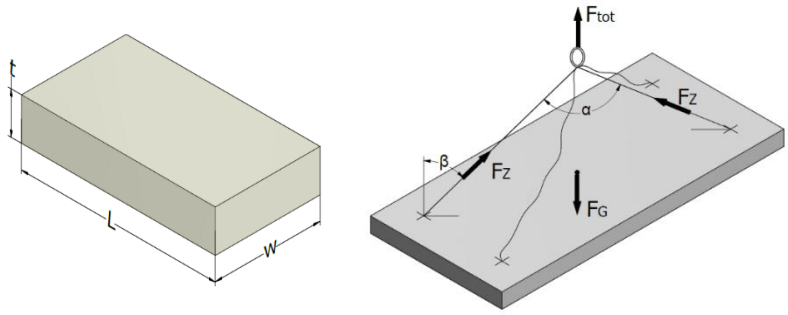
CALCULATION EXAMPLES

Example 1: SLAB UNIT



The slab unit has the following dimensions:
$\boldsymbol{L = 5\ m}$
$\boldsymbol{w = 2\ m}$
$\boldsymbol{t = 0.2\ m}$

Weight $\boldsymbol{F_G = \rho \times V = 25 \times (5 \times 2 \times 0.2) = 50kN}$
Formwork area $\boldsymbol{A_f = L \times w = 5 \times 2 = 10\ m^2}$
Anchor number $\boldsymbol{n = 2}$

General data:	Symbol	De-mould	Transport	Mount
Concrete strength at de-mould [MPa]		15	15	
Concrete strength on site [MPa]				35
Element weight [kN]	$\boldsymbol{F_G}$	50		
Element area in contact with formwork [m²]	$\boldsymbol{A_f}$	10		
Cable angle factor at de-mould (β = 15.0°)	$\boldsymbol{z}$	1.04	1.04	
Cable angle factor on site (β = 30.0°)	$\boldsymbol{z}$			1.16
Dynamic coefficient at transport	ψ_{dyn}		1.3	
Dynamic coefficient on site	ψ_{dyn}			1.3
Adhesion to formwork factor for varnished timber formwork [kN/m²]	$\boldsymbol{q_{adh}}$	2		
Anchor number for de-mould	$\boldsymbol{n}$	2		
Anchor number for transport at the plant	$\boldsymbol{n}$		2	
Anchor number for transport on site	$\boldsymbol{n}$			2

DE-MOULD AT THE PLANT:

Adhesion to formwork factor: q_{adh} = 2 kN/m²
Cable angle factor: z = 1.04 (β = 15.0°)
Concrete strength: 15 MPa

$$\boldsymbol{F_Z = \frac{[(F_G + q_{adh} \times A_f) \times z]}{n} = \frac{[(50 + 2 \times 10) \times 1.04]}{2} = 36.4\ kN}$$

TRANSPORT AT THE PLANT:

Dynamic coefficient: ψ_{dyn} = 1.3
Cable angle factor: z = 1.04 (β = 15.0°)
Concrete strength: 15 MPa

$$\boldsymbol{F_Z = \frac{F_G \times \psi_{dyn} \times z}{n} = \frac{50 \times 1.3 \times 1.04}{2} = 33.80\ kN}$$

TRANSPORT ON SITE:

Dynamic coefficient: ψ_{dyn} = 1.3
Cable angle factor: z = 1.16 (β = 30.0°)
Concrete strength: 35 MPa

$$\boldsymbol{F_Z = \frac{F_G \times \psi_{dyn} \times z}{n} = \frac{50 \times 1.3 \times 1.16}{2} = 37.70\ kN}$$

An anchor in the 4**0 kN** range is required.

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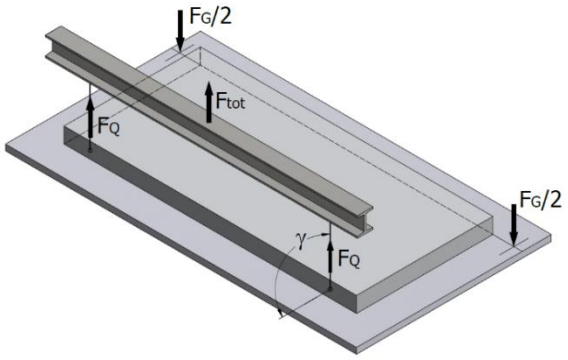
Example 2: WALL PANEL



The slab unit has the following dimensions:
$\boldsymbol{L = 6\ m}$
$\boldsymbol{w = 2\ m}$
$\boldsymbol{t = 0.2\ m}$

Weight $\boldsymbol{F_G = \rho \times V = 25 \times (6 \times 2 \times 0.2) = 60\ kN}$
Formwork area $\boldsymbol{A_f = L \times w = 6 \times 2 = 12\ m^2}$
Anchor number $\boldsymbol{n = 2}$

General data:	Symbol	De-mould	Tilting	Mount
Concrete strength at de-mould [MPa]		15	15	
Concrete strength on site [MPa]				35
Element weight [kN]	F_G	60		
Element area in contact with formwork [m²]	A_f	12		
Cable angle factor at de-mould (β = 0.0°)	z	1.0		
Cable angle factor at tilting (β = 0.0°)	z		1.0	
Cable angle factor on site (β = 30°)	z			1.16
Dynamic coefficient at tilting	ψ_{dyn}		1.3	
Dynamic coefficient on site	ψ_{dyn}			1.3
Adhesion factor for oiled steel formwork [kN/m²]	q_{adh}	1.0		
Anchor number for de-mould	n	2		
Anchor number at tilting	n		2	
Anchor number for transport on site	n			2

DE-MOULD / TILT-UP AT THE PLANT:

Adhesion to formwork factor: q_{adh} = 1 kN/m²
Cable angle factor: z = 1 (β = 0°)
Concrete strength: 15 MPa

$$F_Q = \frac{[(F_G/2 + q_{adh} \times A_f) \times z]}{n} = \frac{[(60/2 + 1 \times 12) \times 1]}{2} = 21.00\ kN$$

TRANSPORT AT THE PLANT:

Dynamic coefficient: ψ_{dyn} = 1.3
Cable angle factor: z = 1 (β = 0°)
Concrete strength: 15 MPa

$$F_Q = \frac{F_G \times \psi_{dyn} \times z}{n} = \frac{60 \times 1.3 \times 1}{2} = 39.00\ kN$$

TRANSPORT ON SITE:

Dynamic coefficient: ψ_{dyn} = 1.3
Cable angle factor: z = 1.16 (β = 30.0°)
Concrete strength: 35 MPa

$$F_Q = \frac{F_G \times \psi_{dyn} \times z}{n} = \frac{60 \times 1.3 \times 1.16}{2} = 45.24\ kN$$

Two anchors embedded on the lateral side, **TKA type in the 50 kN range** are required. For tilting, additional reinforcement will be added (see page 45).

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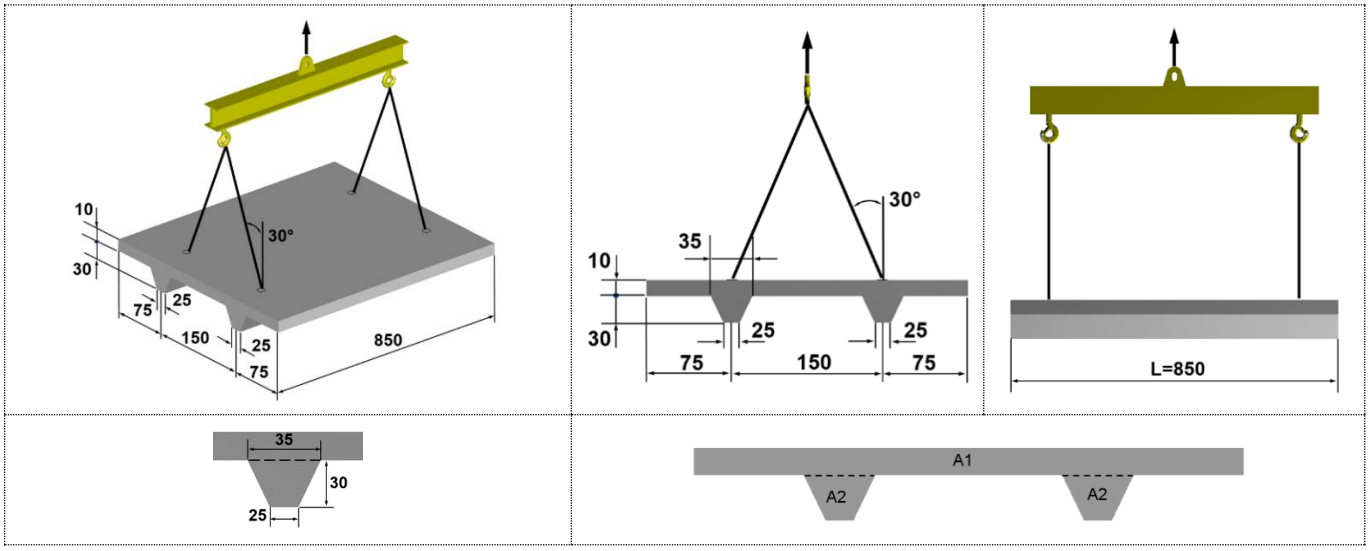
Example 3: DOUBLE-T BEAM



NOTE: Dimensions are in cm

General data:	Symbol	De-mould	Transport
Concrete strength at de-mould and transport [MPa]		25	25
Element weight [kN]	F_G	102	
Formwork area [m²]	A_f	35.8	
Cable angle factor at de-mould (ß = 30.0°)	z	1.16	
Cable angle factor on site (ß = 30.0°)	z		1.16
Dynamic coefficient at transport	ψ_{dyn}		1.3
Anchor number for de-mould and transport	n	4	4

Load capacity when lifting and transporting at the manufacturing plant.

Concrete strength when de-mould	≥ 25 MPa
Cable angle factor	z = 1.16 (ß = 30.0°)
Dynamic coefficient	ψ_{dyn} = 1.3
Anchor number	n = 4

$F_G = V \times \rho = (A \times L) \times \rho = (A1 + A2 \times 2) \times L \times \rho = (0.1 \times 3 + 0.09 \times 2) \times 8.5 \times 25 = 102\ kN$
$L = 8.5\ m$
$A1 = 0.1 \times 3\ (m^2)$
$A2 = \frac{[(0.35 + 0.25) \times 0.3]}{2} = \frac{(0.6 \times 0.3)}{2} = 0.09\ (m^2)$

Weight:	$F_G = 102\ kN$
Adhesion to mould	$F_{adh} = 2 \times F_G = 204\ kN$
Total load	$F_{tot} = F_G + F_{adh} = 102 + 204 = 306\ kN$

LOAD PER ANCHOR WHEN DE-MOULD:

$$\boldsymbol{F = \frac{F_{tot} \times z}{n} = \frac{[(F_G + F_{adh}) \times z]}{n} = \frac{306 \times 1.16}{4} = 88.74\ kN}$$

LOAD PER ANCHOR WHEN TRANSPORTING:

$$\boldsymbol{F = \frac{F_G \times \psi_{dyn} \times z}{n} = \frac{102 \times 1.3 \times 1.16}{4} = 38.46\ kN}$$

Four anchors in the 100 kN range are required (> 88.74 kN)

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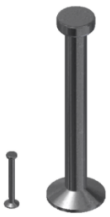
LIFTING ANCHORS

T–SLOT ANCHOR

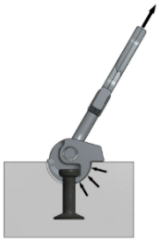
BASIC PRINCIPLES FOR ANCHOR SELECTION

The T-slot anchors are forged from round steel and have a design load capacity in the range of 13kN to 320kN. Suitable for large precast elements, such as slabs, beams, panels and pipes. Anchors from 13 kN to 320 kN are made of S355J2 steel and the 450 kN anchors are made of alloyed steel 42CrMo4 (w1.7225-EN-10083-1). Anchors in the same load group are available in various lengths. Longer anchors are installed for reduced edge spacing or for low concrete strengths. The load on the anchor is transferred to the concrete through the anchor foot.



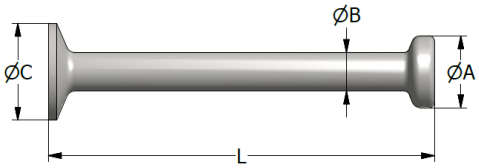
13 kN to 450 kN

Load transfer to the anchor foot



Angled lifting

The anchors must be fixed in the mould using recess formers. The recess former holds the anchor securely in position when pouring the concrete. The recess former creates a void around the anchor head which corresponds to the lifting system head (shackle). Incorrect coupling of parts of different load groups is not possible. Another advantage is that the shackle rests against the concrete during angled pull. The horizontal load is therefore transferred directly to the concrete. For this reason, additional reinforcement is not required in large units. In thin walls, additional reinforcement is necessary for angled lift, to absorb the transverse pulling forces.



T-slot black		T-slot - hot dip galvanised		T slot stainless steel 1.4301 (AISI 304)		Load group	L	ØA	ØB	ØC
Description	Prod. No.	Description	Prod. No.	Description	Prod. No.	kN	mm	mm	mm	mm
Lifting clutch load group 13 kN										
T-013-0040	43177	T-013-0040-TV	43178	T-013-0040-SS2	44405	13	40	19	10	25
T-013-0050	43180	T-013-0050-TV	43181	T-013-0050-SS2	43179	13	50	19	10	25
T-013-0055	43182	T-013-0055-TV	43183	T-013-0055-SS2	44406	13	55	19	10	25
T-013-0065	43184	T-013-0065-TV	43185	T-013-0065-SS2	43186	13	65	19	10	25
T-013-0085	43187	T-013-0085-TV	43188	T-013-0085-SS2	43189	13	85	19	10	25
T-013-0120	43190	T-013-0120-TV	43191	T-013-0120-SS2	43192	13	120	19	10	25
T-013-0240	43193	T-013-0240-TV	43194	T-013-0240-SS2	44407	13	240	19	10	25
Lifting clutch load group 25 kN										
T-025-0045	43808	T-025-0045-TV	43809	T-025-0045-SS2	44408	25	45	26	14	35
T-025-0055	43195	T-025-0055-TV	43196	T-025-0055-SS2	44409	25	55	26	14	35
T-025-0065	43197	T-025-0065-TV	43198	T-025-0065-SS2	61850	25	65	26	14	35
T-025-0070	43199	T-025-0070-TV	43200	T-025-0070-SS2	61851	25	70	26	14	35
T-025-0085	43201	T-025-0085-TV	43202	T-025-0085-SS2	43203	25	85	26	14	35
T-025-0100	43204	T-025-0100-TV	43205	T-025-0100-SS2	61852	25	100	26	14	35
T-025-0120	43206	T-025-0120-TV	43207	T-025-0120-SS2	43208	25	120	26	14	35
T-025-0140	43209	T-025-0140-TV	43817	T-025-0140-SS2	61853	25	140	26	14	35
T-025-0170	43210	T-025-0170-TV	43211	T-025-0170-SS2	43212	25	170	26	14	35
T-025-0210	43820	T-025-0210-TV	44960	T-025-0210-SS2	61854	25	210	26	14	35
T-025-0240	44961	T-025-0240-TV	44962	T-025-0240-SS2	61855	25	240	26	14	35
T-025-0280	43213	T-025-0280-TV	43214	T-025-0280-SS2	61856	25	280	26	14	35

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T-slot black		T-slot - hot dip galvanised		T slot stainless steel 1.4301 (AISI 304)		Load group	L	ØA	ØB	ØC
Description	Prod. No.	Description	Prod. No.	Description	Prod. No.	kN	mm	mm	mm	mm
Lifting clutch load group 50 kN										
T-040-0055	43821	T-040-0055-TV	43822	T-040-0055-SS2	63308	40	55	36	18	45
T-040-0065	43823	T-040-0065-TV	43824	T-040-0065-SS2	63309	40	65	36	18	45
T-040-0070	43825	T-040-0070-TV	43826	T-040-0070-SS2	63310	40	70	36	18	45
T-040-0075	43771	T-040-0075-TV	43772	T-040-0075-SS2	43773	40	75	36	18	45
T-040-0080	43774	T-040-0080-TV	43775	T-040-0080-SS2	43776	40	80	36	18	45
T-040-0095	43777	T-040-0095-TV	43778	T-040-0095-SS2	43779	40	95	36	18	45
T-040-0100	63317	T-040-0100-TV	63318	T-040-0100-SS2	67193	40	100	36	18	45
T-040-0110	43827	T-040-0110-TV	43828	T-040-0110-SS2	63311	40	110	36	18	45
T-040-0120	43780	T-040-0120-TV	43781	T-040-0120-SS2	43782	40	120	36	18	45
T-040-0140	43829	T-040-0140-TV	43830	T-040-0140-SS2	63312	40	140	36	18	45
T-040-0160	43831	T-040-0160-TV	43832	T-040-0160-SS2	63313	40	160	36	18	45
T-040-0170	43833	T-040-0170-TV	43972	T-040-0170-SS2	63314	40	170	36	18	45
T-040-0180	43783	T-040-0180-TV	43784	T-040-0180-SS2	43785	40	180	36	18	45
T-040-0210	43786	T-040-0210-TV	43787	T-040-0210-SS2	43788	40	210	36	18	45
T-040-0240	43789	T-040-0240-TV	43790	T-040-0240-SS2	43791	40	240	36	18	45
T-040-0340	43792	T-040-0340-TV	43793	T-040-0340-SS2	43794	40	340	36	18	45
Lifting clutch load group 50 kN										
T-050-0055	43536	T-050-0055-TV	63299	T-050-0055-SS2	61857	50	55	36	20	50
T-050-0065	43215	T-050-0065-TV	43216	T-050-0065-SS2	61858	50	65	36	20	50
T-050-0075	43217	T-050-0075-TV	43218	T-050-0075-SS2	61859	50	75	36	20	50
T-050-0080	43219	T-050-0080-TV	43220	T-050-0080-SS2	61860	50	80	36	20	50
T-050-0085	43834	T-050-0085-TV	43221	T-050-0085-SS2	60235	50	85	36	20	50
T-050-0095	43222	T-050-0095-TV	43223	T-050-0095-SS2	61861	50	95	36	20	50
T-050-0110	43224	T-050-0110-TV	43835	T-050-0110-SS2	61862	50	110	36	20	50
T-050-0120	43225	T-050-0120-TV	43226	T-050-0120-SS2	43227	50	120	36	20	50
T-050-0140	43228	T-050-0140-TV	43836	T-050-0140-SS2	61863	50	140	36	20	50
T-050-0150	43837	T-050-0150-TV	43838	T-050-0150-SS2	61864	50	150	36	20	50
T-050-0160	43229	T-050-0160-TV	43230	T-050-0160-SS2	61865	50	160	36	20	50
T-050-0170	46267	T-050-0170-TV	48684	T-050-0170-SS2	61866	50	170	36	20	50
T-050-0180	43231	T-050-0180-TV	43232	T-050-0180-SS2	43233	50	180	36	20	50
T-050-0210	43234	T-050-0210-TV	43235	T-050-0210-SS2	61867	50	210	36	20	50
T-050-0240	43236	T-050-0240-TV	43237	T-050-0240-SS2	43238	50	240	36	20	50
T-050-0340	43239	T-050-0340-TV	43240	T-050-0340-SS2	61868	50	340	36	20	50
T-050-0480	43839	T-050-0480-TV	43840	T-050-0480-SS2	61869	50	480	36	20	50
T-050-0680	43604	T-050-0680-TV	46342	T-050-0680-SS2	61870	50	680	36	20	50
Lifting clutch load group 100 kN										
T-075-0100	47482	T-075-0100-TV	43626	T-075-0100-SS2	61873	75	100	46	24	60
T-075-0120	43244	T-075-0120-TV	43245	T-075-0120-SS2	43246	75	120	46	24	60
T-075-0140	43842	T-075-0140-TV	43973	T-075-0140-SS2	61874	75	140	46	24	60
T-075-0150	43247	T-075-0150-TV	43248	T-075-0150-SS2	61875	75	150	46	24	60
T-075-0160	43249	T-075-0160-TV	43250	T-075-0160-SS2	61876	75	160	46	24	60
T-075-0165	43251	T-075-0165-TV	43252	T-075-0165-SS2	60537	75	165	46	24	60
T-075-0170	43253	T-075-0170-TV	43974	T-075-0170-SS2	61877	75	170	46	24	60
T-075-0200	43254	T-075-0200-TV	43255	T-075-0200-SS2	61878	75	200	46	24	60
T-075-0240	44963	T-075-0240-TV	44964	T-075-0240-SS2	61879	75	240	46	24	60
T-075-0280	48043	T-075-0280-TV	48044	T-075-0280-SS2	61880	75	280	46	24	60
T-075-0300	43256	T-075-0300-TV	43257	T-075-0300-SS2	43258	75	300	46	24	60
T-075-0540	43259	T-075-0540-TV	43260	T-075-0540-SS2	61881	75	540	46	24	60
T-075-0680	43843	T-075-0680-TV	43844	T-075-0680-SS2	61882	75	680	46	24	60
Lifting clutch load group 100 kN										
T-100-0115	43266	T-100-0115-TV	43267	T-100-0115-SS2	43268	100	115	46	28	70
T-100-0120	43269	T-100-0120-TV	43270	T-100-0120-SS2	61888	100	120	46	28	70
T-100-0135	43271	T-100-0135-TV	43272	T-100-0135-SS2	60134	100	135	46	28	70
T-100-0140	43847	T-100-0140-TV	61890	T-100-0140-SS2	61889	100	140	46	28	70
T-100-0150	43273	T-100-0150-TV	43274	T-100-0150-SS2	61891	100	150	46	28	70
T-100-0170	43275	T-100-0170-TV	43276	T-100-0170-SS2	43277	100	170	46	28	70

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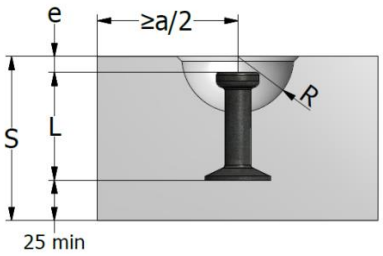
T-slot black		T-slot - hot dip galvanised		T slot stainless steel 1.4301 (AISI 304)		Load group	L	ØA	ØB	ØC
Description	Prod. No.	Description	Prod. No.	Description	Prod. No.	kN	mm	mm	mm	mm
T-100-0200	43848	T-100-0200-TV	44965	T-100-0200-SS2	61892	100	200	46	28	70
T-100-0220	43278	T-100-0220-TV	43849	T-100-0220-SS2	61893	100	220	46	28	70
T-100-0250	43279	T-100-0250-TV	43280	T-100-0250-SS2	60087	100	250	46	28	70
T-100-0340	43281	T-100-0340-TV	43282	T-100-0340-SS2	43283	100	340	46	28	70
T-100-0500	43514	T-100-0500-TV	61895	T-100-0500-SS2	61894	100	500	46	28	70
T-100-0540	47481	T-100-0540-TV	61897	T-100-0540-SS2	61896	100	540	46	28	70
T-100-0650	43284	T-100-0650-TV	43850	T-100-0650-SS2	61898	100	650	46	28	70
T-100-0680	43285	T-100-0680-TV	43286	T-100-0680-SS2	61899	100	680	46	28	70
T-100-1300	45168	T-100-1300-TV	61901	T-100-1300-SS2	61900	100	1300	46	28	70
Lifting clutch load group 200 kN										
T-150-0140	43851	T-150-0140-TV	43852	T-150-0140-SS2	61902	150	140	70	38	80
T-150-0150	43853	T-150-0150-TV	43854	T-150-0150-SS2	61903	150	150	70	38	80
T-150-0165	43287	T-150-0165-TV	43288	T-150-0165-SS2	61904	150	165	70	38	80
T-150-0170	43855	T-150-0170-TV	61906	T-150-0170-SS2	61905	150	170	70	38	80
T-150-0200	43856	T-150-0200-TV	43857	T-150-0200-SS2	60133	150	200	70	38	80
T-150-0210	43289	T-150-0210-TV	43290	T-150-0210-SS2	61907	150	210	70	38	80
T-150-0300	43291	T-150-0300-TV	43292	T-150-0300-SS2	61908	150	300	70	38	80
T-150-0400	43293	T-150-0400-TV	43294	T-150-0400-SS2	62536	150	400	70	38	80
T-150-0840	43295	T-150-0840-TV	43296	T-150-0840-SS2	61909	150	840	70	38	80
Lifting clutch load group 200 kN										
T-200-0200	43298	T-200-0200-TV	44966	T-200-0200-SS2	61916	200	200	70	40	98
T-200-0240	43859	T-200-0240-TV	61918	T-200-0240-SS2	61917	200	240	70	40	98
T-200-0250	43299	T-200-0250-TV	43300	T-200-0250-SS2	61919	200	250	70	40	98
T-200-0340	43301	T-200-0340-TV	43302	T-200-0340-SS2	61920	200	340	70	40	98
T-200-0500	43303	T-200-0500-TV	43304	T-200-0500-SS2	61921	200	500	70	40	98
T-200-1000	43305	T-200-1000-TV	43515	T-200-1000-SS2	61922	200	1000	70	40	98
Lifting clutch load group 320 kN										
T-320-0280	43516	T-320-0280-TV	43306	T-320-0280-SS2	61925	320	280	88	50	135
T-320-0320	46086	T-320-0320-TV	46087	T-320-0320-SS2	61926	320	320	88	50	135
T-320-0500	43517	T-320-0500-TV	43307	T-320-0500-SS2	61927	320	500	88	50	135
T-320-0700	43518	T-320-0700-TV	43308	T-320-0700-SS2	61928	320	700	88	50	135
T-320-1200	43519	T-320-1200-TV	43309	T-320-1200-SS2	61929	320	1200	88	50	135
Lifting clutch load group 450 kN										
T-450-0280	44567	T-450-0280-TV	44571	T-450-0280-SS2	/	450	280	88	50	135
T-450-0500	44568	T-450-0500-TV	44572	T-450-0500-SS2	/	450	500	88	50	135
T-450-0700	44569	T-450-0700-TV	44573	T-450-0700-SS2	/	450	700	88	50	135
T-450-1200	44570	T-450-1200-TV	44574	T-450-1200-SS2	/	450	1200	88	50	135

T-anchors are available in three versions: shot blasting, hot dip galvanised (TV) or stainless steel (SS2) on request.

Type T Anchor Description	Load group [kN]	"R" [mm]	"e" [mm]
T-013-XXXX	13	30	10
T-025-XXXX	25	37	11
T-040-XXXX	40	47	15
T-050-XXXX	50	47	15
T-075-XXXX	75	59	15
T-100-XXXX	100	59	15
T-150-XXXX	150	80	15
T-200-XXXX	200	80	15
T-320-XXXX	320	102	23
T-450-XXXX	450	102	23



- *L = anchor length*
- *a/2 = edge distance*
- *e = cover to anchor head*
- *R = recess radius*

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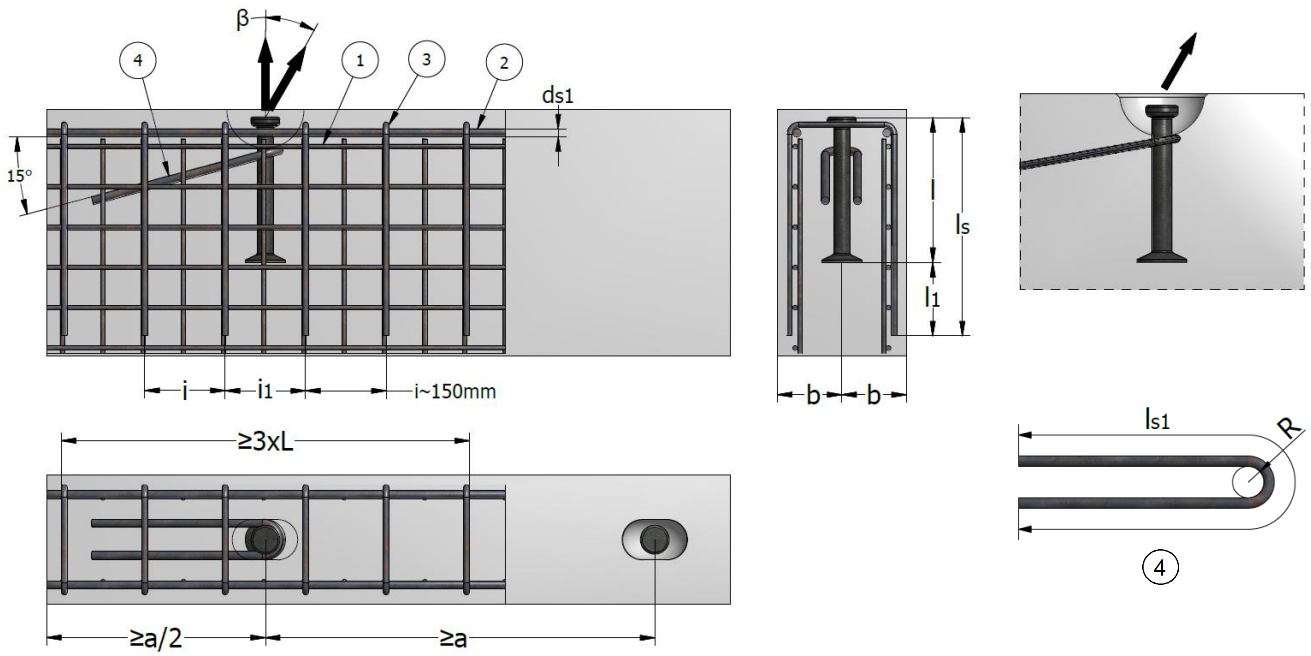
T-ANCHOR – INSTALLATION AND REINFORCEMENT

REINFORCEMENT USED IN ANCHOR ZONE FOR ANGLED LIFT IN PANELS OR BEAMS

For angled pull, additional reinforcement installed in the direction opposite of the load is required. We recommend installing this angled pull reinforcement as close as possible under the recess former and in full contact with the anchor.
The additional reinforcements necessary in the anchor zone for lifting the panels and beams at angles ß ≤ 45° are shown in the figures below and in next table. The concrete strength must be at least 15 MPa. We recommend that angle ß should not exceed 30°.



Note:

The bend radius R according to EN 1992 is not mandatory.

The diagonal reinforcement must be placed as close as possible under the recess former and installed so it is in contact with the lifting anchor.

The reinforced zone must be ≥ 3 × anchor lenght "L". The two stirrups near the anchor should be installed as close as possible to the recess former.

Length $l_s = l_1$ +Anchor length

The dimensions in the illustrations are in [mm]

Type of anchor	Load Group	Mesh reinforcement (1)	Edge reinforcement B500B (2)	Stirrups - B500B (3)						Angled pull reinforcement B500B (4)
				Axial pull β < 30°			Angled pull β > 30° max. 45°			
			ds1	Number of stirrups	"d"	"l_1"	Number of stirrups	"d"	"l_1"	Ø x l_{s1}
Symbol	[kN]	[mm2/m]	[mm]	[pcs]	[mm]	[mm]	[pcs]	[mm]	[mm]	[mm]
T-013-0xxx	13	2 x 60	2 x Ø 10	≥ 2	Ø6	300	≥ 2	Ø6	450	Ø8 x 800
T-025-0xxx	25	2 x 100	2 x Ø 10	≥ 2	Ø8	600	≥ 4	Ø8	600	Ø10 x 1500
T-040-0xxx	40	2 x 125	2 x Ø 10	≥ 2	Ø8	600	≥ 4	Ø8	600	Ø12 x 1600
T-050-0xxx	50	2 x 140	2 x Ø 12	≥ 2	Ø10	750	≥ 4	Ø10	750	Ø16 x 2000
T-075-0xxx	75	2 x 160	2 x Ø 12	≥ 4	Ø10	750	≥ 6	Ø10	750	Ø16 x 2300
T-100-0xxx	100	2 x 180	2 x Ø 12	≥ 4	Ø10	750	≥ 8	Ø10	750	Ø20 x 2600
T-150-0xxx	150	2 x 240	2 x Ø 16	≥ 4	Ø12	800	≥ 6	Ø12	1000	Ø25 x 3000
T-200-0xxx	200	2 x 350	2 x Ø 16	≥ 6	Ø12	1000	≥ 10	Ø12	1000	2 x Ø25 x 3400
T-320-0xxx	320	2 x 400	2 x Ø 16	≥ 8	Ø12	1000	≥ 10	Ø14	1100	2 x Ø25 x 3400
T-450-0xxx	450	2 x 500	2 x Ø 20	≥ 10	Ø14	1400	≥ 12	Ø14	1450	2 x Ø25 x 3400

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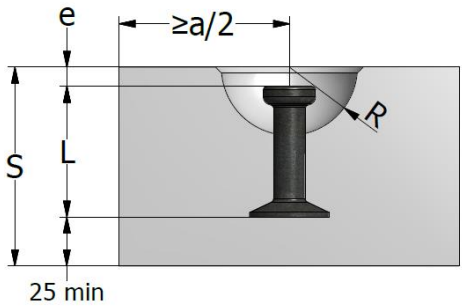
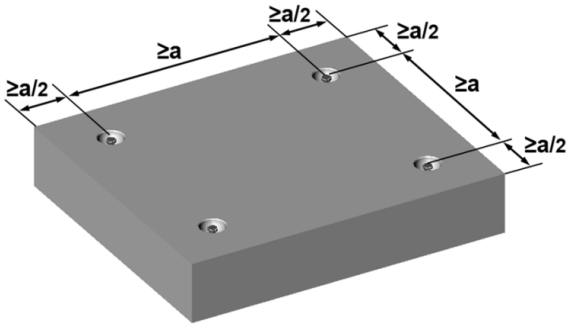
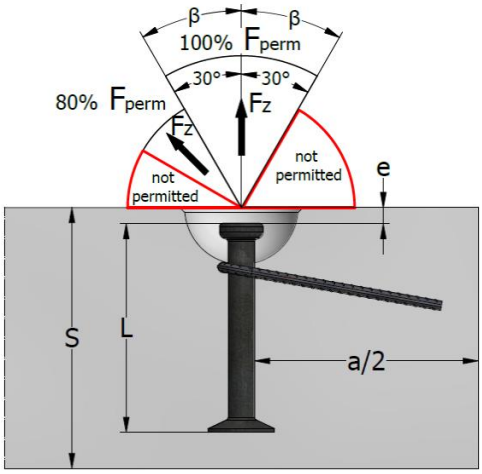
INSTALLATION OF T-ANCHOR IN SLABS





L = anchor length
a/2 = edge distance
e = cover to anchor head
R = recess radius

For slab units or demoulding panels, the edge distance of the "T" anchor (a) is ***a/2 = 3 x (L + e)***



- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***

- *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
- *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
- *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*

- ***Angled pull with cable/chain spread of β > 45° is not permitted***

Required reinforcement

- **Mesh reinforcement -** (1)
- **Angled pull reinforcement -** (4)

T-ANCHOR – LOAD CAPACITY IN SLABS FOR ANY DIRECTION OF PULL							
Type of anchor	Load group	Slab thickness	Load capacity for minimum and normal slab thickness [kN]				Spacing between anchors
			Axial pull F_Z β < 30°	Angled pull F_Z β < 45°	Axial pull and angled pull F_Z β < 45°		
		s	f_{cu} ≥ 15 MPa	f_{cu} ≥ 15 MPa	f_{cu} ≥ 25 MPa	f_{cu} ≥ 35 MPa	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
T-013-0040	13	75	3.0	2.4	3.9	4.6	180
		90	3.8	3.0	4.9	5.7	
T-013-0050		85	10.1	10.1	13.0	13.0	220
		110	12.0	10.4			
T-013-0065		100	13.0	11.1			260
		140					
T-013-0085		120		13.0			315
		180					
T-013-0120		155					375
		250					

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T-ANCHOR – LOAD CAPACITY IN SLABS FOR ANY DIRECTION OF PULL							
Type of anchor	Load group	Slab thickness	Load capacity for minimum and normal slab thickness [kN]				Spacing between anchors
			Axial pull F_Z $\beta < 30°$	Angled pull F_Z $\beta < 45°$	Axial pull and angled pull F_Z $\beta < 45°$		
		s	$f_{cu} \geq 15$ MPa 	$f_{cu} \geq 15$ MPa 	$f_{cu} \geq 25$ MPa 	$f_{cu} \geq 35$ MPa 	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
T-025-0055	25	90	4.7	3.8	6.1	7.2	240
		120	5.6	4.5	7.2	8.6	
T-025-0065		100	13.8	13.8	17.8	21.1	285
		140	17.0	17.0	22.0	25.0	
T-025-0085		120	19.5	19.5	25.0		325
		180	25.0	20.1			
T-025-0120		155		22.8			410
		250		25.0			
T-025-0170		205					520
		350					
T-040-0075	40	115	17.5	17.5	22.6	26.8	325
		165	22.2	22.2	28.7	33.9	
T-040-0100		140	25.3	25.3	32.7	38.6	350
		215	33.6	32.0	40.0	40.0	
T-040-0170		210	40.0	40.0			565
		355					
T-040-0210		250					650
		435					
T-050-0085	50	125	20.1	20.1	26.0	30.8	360
		180	25.7	25.7	33.1	39.2	
T-050-0095		135	23.3	23.3	30.0	35.5	400
		200	30.2	30.2	39.0	46.2	
T-050-0120		160	31.7	31.7	41.0	48.5	475
		250	42.7	40.0	50.0	50.0	
T-050-0180		220	50.0	44.4			630
		370		50.0			
T-050-0240		280					735
		490					
T-075-0100	75	140	24.5	24.5	31.6	37.4	415
		205	31.6	31.6	40.9	48.3	
T-075-0120		160	31.3	31.3	40.4	47.8	490
		245	41.7	41.7	53.8	63.6	
T-075-0140		180	38.6	38.6	49.9	59.0	550
		285	52.6	52.6	67.9	75.0	
T-075-0165		205	48.6	48.6	62.7	74.2	620
		335	67.6	60.0	75.0	75.0	
T-075-0200		240	63.8	60.0			710
		405	75.0	72.4			
T-075-0300		340		75.0			910
		605					
T-100-0115	100	155	29.1	29.2	37.5	44.4	470
		230	38.0	38.0	49.1	58.1	
T-100-0135		175	36.3	36.3	46.8	55.4	550
		270	48.7	48.7	62.9	74.4	
T-100-0150		190	42.0	42.0	54.3	64.2	590
		300	57.3	57.3	73.9	87.5	
T-100-0170		210	50.2	50.2	64.8	76.6	655
		340	69.4	69.4	89.6	100.0	
T-100-0200		240	63.2	63.2	81.7	96.6	730
		400	89.2	80.0	100.0	100.0	

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T-ANCHOR – LOAD CAPACITY IN SLABS FOR ANY DIRECTION OF PULL							
Type of anchor	Load group	Slab thickness	Load capacity for minimum and normal slab thickness [kN]				Spacing between anchors
			Axial pull F_Z $\beta < 30°$	Angled pull F_Z $\beta < 45°$	Axial pull and angled pull F_Z $\beta < 45°$		
		s	$f_{cu} \geq 15$ MPa	$f_{cu} \geq 15$ MPa	$f_{cu} \geq 25$ MPa	$f_{cu} \geq 35$ MPa	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
T-100-0250		290	87.3	80.0	100.0	100.0	890
		500	100.0	100.0			
T-100-0340		380					1025
		680					
T-150-0140	150	180	37.5	37.5	48.6	57.2	560
		275	49.8	49.8	64.3	76.1	
T-150-0165		205	47.3	47.3	61.1	72.3	640
		325	64.5	64.5	83.2	98.5	
T-150-0200		240	62.4	62.4	80.6	95.3	730
		395	87.2	87.2	112.5	133.1	
T-150-0300		340	113.0	113.0	145.8	150.0	1020
		595	150.0	131.3	150.0		
T-150-0400		440		138.6			1195
		795		150.0			
T-200-0200	200	240	61.6	61.6	79.5	94.1	780
		390	85.1	85.1	109.9	130.0	
T-200-0240		280	80.5	80.5	103.9	122.9	900
		470	113.7	113.7	146.7	173.6	
T-200-0340		380	134.9	134.9	174.2	200.0	1175
		670	196.9	160.0	200.0	200.0	
T-200-0500		540	200.0	192.6			1485
		990		200.0			
T-320-0200	320	248	62.4	62.4	80.5	95.3	800
		385	83.8	83.8	108.1	127.9	
T-320-0250		298	86.4	86.4	111.5	132.0	1000
		485	119.7	119.7	154.5	182.9	
T-320-0280		328	102.1	102.1	131.8	155.9	1065
		545	143.4	143.4	185.1	219.0	
T-320-0320		368	124.4	124.4	160.6	190.0	1120
		625	177.2	177.2	228.8	270.7	

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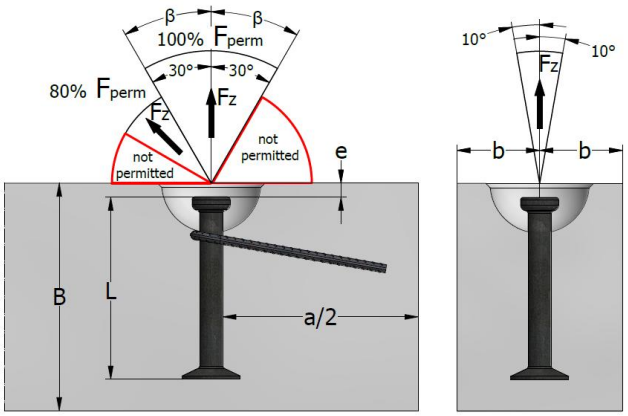
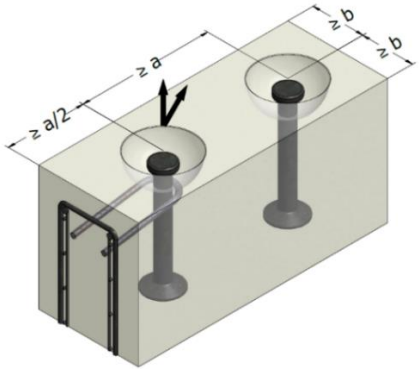
INSTALLATION OF T-ANCHOR IN BEAMS AND WALLS

LOAD CAPACITY IN BEAMS AND WALLS WITHOUT ADDITIONAL REINFORCEMENTS





The angled pull reinforcement must be mounted opposite the direction of the load

The diagonal reinforcement must be placed as close as possible under the recess former and installed so it is in contact with the lifting anchor.

NOTES:

Required reinforcement (*see page 25*)

- **Mesh reinforcement -** (1)
- **Angled pull reinforcement -** (4)

- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***
  - *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
  - *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
  - *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*
- ***Angled pull with cable/chain spread of β > 45° is not permitted***

T-ANCHOR – LOAD CAPACITY IN BEAMS AND WALLS WITH NO SPECIAL REINFORCEMENTS

Type of anchor	Load group	Minimum height of beams	Wall thickness	Load capacity				Spacing between anchors
				Axial pull F_Z $\beta < 30°$	Angled pull F_Z $\beta < 45°$	Axial pull and angled pull F_Z $\beta < 45°$		
				f_{cu} ≥ 15 MPa	f_{cu} ≥ 15 MPa	f_{cu} ≥ 25 MPa	f_{cu} ≥ 35 MPa	
		B	2 x b					a
	[kN]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
T-013-0085	13	180	100	12.2	9.8	13.0	13.0	270
			120	13.0	11.2			
			140	13.0	12.5			
T-013-0120		250	80	13.0	10.7	13.0	13.0	375
			100	13.0	12.7			
			120	13.0	13.0			
T-013-0240		490	60	9.9	9.9	12.7	13.0	735
			80	13.0	13.0	13.0		
			100	13.0	13.0	13.0		
T-025-0120	25	250	120	18.1	14.5	23.3	25.0	375
			140	20.3	16.2	25.0		
			160	22.4	17.9	25.0		
T-025-0170		350	100	20.7	16.5	25.0	25.0	525
			120	23.7	19.0	25.0		
			140	25.0	21.3	25.0		
T-025-0280		570	80	18.4	18.4	23.8	25.0	855
			100	23.0	23.0	25.0		
			120	25.0	25.0	25.0		
T-040-0170	40	347	160	29.8	23.8	38.5	40.0	535
			180	32.5	26.0	40.0		
			200	35.2	28.2			
T-040-0240		487	120	31.3	25.1	40.0	40.0	745
			140	35.2	28.1			
			160	38.9	31.1			
T-040-0340		687	100	29.6	28.7	38.2	40.0	1045
			120	35.6	32.9	40.0		
			140	40.0	36.9			

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T-ANCHOR – LOAD CAPACITY IN BEAMS AND WALLS WITH NO SPECIAL REINFORCEMENTS							
Type of anchor	Load group	Minimum height of beams	Wall thickness	Load capacity			Spacing between anchors
				Axial pull F_Z $\beta < 30°$	Angled pull F_Z $\beta < 45°$	Axial pull and angled pull F_Z $\beta < 45°$	
				$f_{cu} \geq 15$ MPa	$f_{cu} \geq 15$ MPa	$f_{cu} \geq 25$ MPa	$f_{cu} \geq 35$ MPa
		B	2 x b				a
	[kN]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
T-050-0240	50	490	200	45.7	36.5	50.0	50.0	735
			220	49.1	39.2			
			240	50.0	41.9			
T-050-0340		690	160	50.0	40.6	50.0	50.0	1035
			180	50.0	44.4			
			200	50.0	48.0			
T-050-0480		970	140	46.1	46.1	50.0	50.0	1455
			160	50.0	50.0			
			180	50.0	50.0			
T-075-0200	75	410	240	45.1	36.0	58.2	68.8	610
			260	47.8	38.3	61.8	73.1	
			280	50.6	40.5	65.3	75.0	
T-075-0300		610	200	54.1	43.3	69.9	75.0	910
			220	58.1	46.5	75.0		
			240	62.2	49.7	75.0		
T-075-0540		1090	160	63.2	58.4	75.0	75.0	1630
			180	71.1	63.8			
			200	75.0	69.1			
T-100-0170	100	340	300	46.4	37.2	60.0	70.9	520
			350	52.1	41.7	67.3	79.6	
			400	57.6	46.1	74.4	88.0	
T-100-0340		680	280	76.6	61.3	98.9	100.0	1030
			300	80.7	64.5	100.0		
			320	84.7	67.7	100.0		
T-100-0680		1360	160	73.7	70.0	95.2	100.0	2050
			180	83.0	76.5	100.0		
			200	92.2	82.8	100.0		
T-150-0300	150	600	350	81.3	65.0	104.9	124.2	900
			400	89.5	71.9	116.0	137.2	
			500	106.2	85.0	137.1	150.0	
T-150-0400		800	350	102.5	82.0	132.3	150.0	1200
			400	113.2	90.6	146.2		
			450	123.7	99.0	150.0		
T-150-0840		1680	300	150.0	132.5	150.0	150.0	2520
			340	150.0	145.5			
			380	150.0	150.0			
T-200-0340	200	670	500	116.6	93.3	150.6	178.2	1010
			750	158.1	126.5	200.0	200.0	
			1000	196.2	156.9	200.0	200.0	
T-200-0500		990	400	134.8	107.9	174.1	200.0	1490
			500	159.4	127.5	200.0		
			600	182.8	146.2	200.0		
T-200-1000		1990	240	154.9	128.6	200.0	200.0	3000
			300	190.0	152.0	200.0		
			330	200.0	163.2	200.0		
T-320-0320	320	630	600	126.7	101.3	163.5	193.5	940
			800	157.2	125.7	202.9	240.1	
			1200	177.2	141.8	228.8	270.1	
T-320-0700		1390	500	208.6	166.9	269.4	318.7	2080
			600	239.2	191.4	308.8	320.0	
			750	282.8	226.2	320.0	320.0	
T-320-1200		2390	400	272.5	218.0	320.0	320.0	3580
			450	297.7	238.2			
			500	320.0	257.8			
T-450-0500	450	990	800	226.0	180.8	291.8	345.3	1480
			1000	267.2	213.8	345.0	408.2	
			1500	358.4	286.7	450.0	450.0	
T-450-1200		2400	500	322.2	257.8	416.0	450	3580
			600	369.4	295.5	450.0		
			750	436.7	349.4	450.0		

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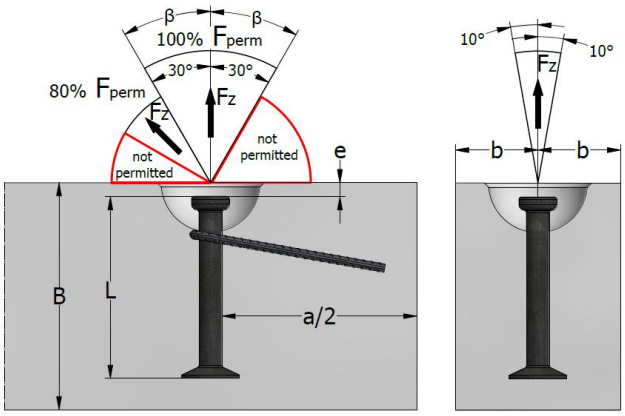
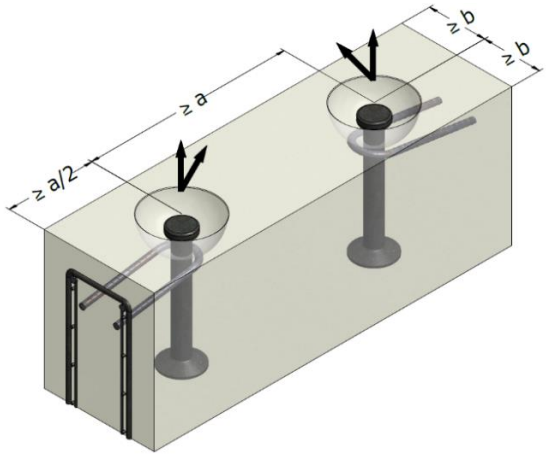
LOAD CAPACITY IN WALLS WITH ADDITIONAL REINFORCEMENTS





The angled pull reinforcement must be mounted opposite the direction of the load
The diagonal reinforcement must be placed as close as possible under the recess former and installed so it is in contact with the lifting anchor.

NOTES:

Required reinforcement (*see page 25*)

- **Mesh reinforcement -** (1)
- **Edge reinforcement -** (2)
- **Stirrups -** (3)
- **Angled pull reinforcement -** (4)

- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***
  - *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
  - *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
  - *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*
- ***Angled pull with cable/chain spread of β > 45° is not permitted***

T-ANCHOR – LOAD CAPACITY IN WALLS WITH ADDITIONAL REINFORCEMENTS

Type of anchor	Load group	Wall thickness 2 x b	Load capacity: Axial pull F_Z β < 30°	Load capacity: Angled pull F_Z β < 45°	Load capacity: Axial pull and angled pull F_Z β < 45°		Spacing between anchors
			f_{cu} ≥ 15 MPa	f_{cu} ≥ 15 MPa	f_{cu} ≥ 25 MPa	f_{cu} ≥ 35 MPa	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
T-013-0120	13	60	9.9	9.9	12.8	13.0	375
		80	13.0	13.0	13.0		
		100	13.0	13.0	13.0		
T-013-0240		60	9.9	9.9	12.8	13.0	735
		80	13.0	13.0	13.0		
		100	13.0	13.0	13.0		
T-025-0170	25	80	18.4	18.4	23.8	25.0	525
		100	23.0	23.0	25.0		
		120	25.0	25.0	25.0		
T-025-0280		80	18.4	18.4	23.8	25.0	855
		100	23.0	23.0	25.0		
		120	25.0	25.0	25.0		
T-040-0240	40	120	35.6	35.6	40.0	40.0	745
		140	40.0	36.0			
		160	40.0	38.5			
T-040-0340		100	29.6	29.6	38.2	40.0	1045
		120	35.6	35.6	40.0		
		140	40.0	40.0	40.0		
T-050-0240	50	160	50.0	45.2	50.0	50.0	735
		180	50.0	48.0			
		200	50.0	50.0			
T-050-0340		120	39.5	39.5	50.0	50.0	1035
		140	46.1	46.1			
		160	50.0	50.0			

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T-ANCHOR – LOAD CAPACITY IN WALLS WITH ADDITIONAL REINFORCEMENTS							
Type of anchor	Load group	Wall thickness	Load capacity				Spacing between anchors
			Axial pull F_Z $\beta < 30°$	Angled pull F_Z $\beta < 45°$	Axial pull and angled pull F_Z $\beta < 45°$		
		2 x b	$f_{cu} \geq 15$ MPa	$f_{cu} \geq 15$ MPa	$f_{cu} \geq 25$ MPa	$f_{cu} \geq 35$ MPa	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
T-050-0480		100	32.9	32.9	42.5		
		120	39.5	39.5	50.0	50.0	1455
		140	46.1	46.1	50.0		
T-075-0300	75	160	63.2	56.6			
		180	71.1	60.0	75.0	75.0	910
		200	75.0	63.2			
T-075-0540		140	55.3	55.3	71.4		
		160	63.2	63.2	75.0	75.0	1630
		180	71.1	71.1	75.0		
T-100-0340	100	200	89.5	71.6			
		240	98.0	78.4	100.0	100.0	1030
		280	100.0	84.7			
T-100-0680		160	73.7	73.7	95.2		
		180	83.0	83.0	100.0	100.0	2050
		200	92.2	92.2	100.0		
T-150-0400	150	300	128.9	103.1			
		400	148.9	119.1	150.0	150.0	1200
		500	150.0	133.1			
T-150-0840		200	111.9	111.9	144.5		
		220	123.1	123.1	150.0	150.0	2520
		240	134.2	134.2	150.0		
T-200-0500	200	400	175.1	140.1			
		500	187.2	149.7	200.0	200.0	1490
		600	200.0	183.4			
T-200-1000		240	154.9	154.9			
		260	167.8	167.8	200.0	200.0	3000
		280	180.7	180.7			
T-320-0700	320	450	282.6	226.1			
		550	312.5	250.0	320.0	320.0	2080
		650	320.0	271.8			
T-320-1200		300	266.7	266.7			
		350	311.1	311.1	320.0	320.0	3580
		400	320.0	320.0			
T-450-1200	450	400	355.5	355.5			
		500	444.4	421.6	450	450	3580
		600	450.0	450.0			

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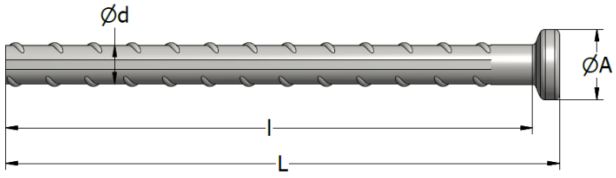
TKS-ANCHOR

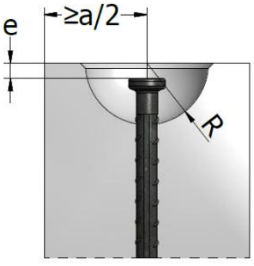
Forged from rebar steel, the TKS-slot anchor has a design load capacity in the range of 25kN to 150kN.

The TKS-rod slot anchor has a ribbed rod through which good anchoring can be obtained. For situations in which an anchoring foot cannot be used, a TKS-rod slot anchor with an adjusted length can provide sufficient anchoring. This anchor is the best solution, especially for very thin elements.



TKS-slot anchor type - black		Load group	Length L	Length l (anchoring)	Ø d	Ø A
Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]
TKS-025-0400	43667	25	400	374	14	26
TKS-025-0520	43668	25	520	494	14	26
TKS-050-0580	43669	50	580	548	20	36
TKS-050-0790	47429	50	790	758	20	36
TKS-050-0900	43670	50	900	868	20	36
TKS-075-0750	43671	75	750	706	25	46
TKS-075-1150	43672	75	1150	1106	25	46
TKS-100-0870	43673	100	870	826	28	46
TKS-100-1300	43674	100	1300	1256	28	46
TKS-150-1080	43675	150	1080	1015	36	70
TKS-150-1550	43676	150	1550	1485	36	70

Type TKS Anchor	Load Group	"R"	"e"
Description	[kN]	[mm]	[mm]
TKS-025-XXXX	25	37	11
TKS-050-XXXX	50	47	15
TKS-075-XXXX	75	59	15
TKS-100-XXXX	100	59	15
TKS-150-XXXX	150	80	15



- *L = anchor length*
- *a/2 = edge distance*
- *e = cover to anchor head*
- *R = recess radius*

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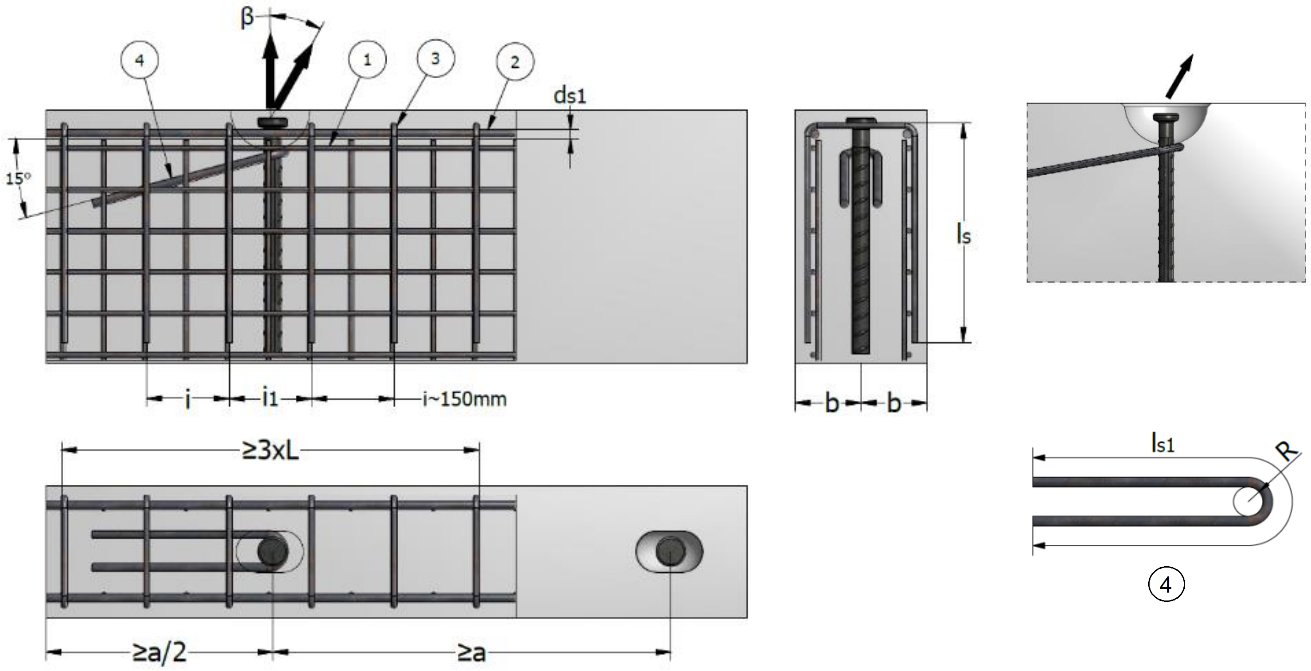
TKS-ANCHOR – INSTALLATION AND REINFORCEMENT

REINFORCEMENT TYPES USED IN THE ANCHOR ZONE FOR PANELS AND BEAMS FOR ANGLE LIFT

Panels and beams containing only basic reinforcements, such as wire mesh, stirrups and edge reinforcement can only be lifted in the axial direction or at an angle not exceeding 30°.
For angled pull, additional reinforcement installed in the direction opposite of the load is required. We recommend installing this angled pull reinforcement as close as possible under the recess former and in full contact with the anchor.
The additional reinforcements necessary in the anchor zone for lifting the panels and beams at angles ß ≤ 45° are shown in the table. The concrete strength must be at least 15 MPa. We recommend that, if possible, angle ß should not exceed 30°.
The stirrups will be installed on both sides of the anchor in an area equal to 3 x length of anchor. The two stirrups near the anchor should be installed as close as possible to the recess former.



Note:

The bend radius R according to EN 1992 is not mandatory.
The diagonal reinforcement must be placed as close as possible under the recess former and installed so it is in contact with the lifting anchor.
The reinforced zone must be ≥ 3 × anchor lenght "L". *The two stirrups near the anchor should be installed as close as possible to the recess former.*
No stirrups required if element thickness is 2 x b > s_{min} – see table below.

Type of anchor	Load Group	Elem. thickness	Spacing between anchors	Mesh reinforcement (1)	Edge reinforcement B500B (2)	Stirrups - B500B (3) Axial pull β < 30° and angled pull 30° < β < 45°			Angled pull reinforcement B500B (4)
		2 x b	"a"		d_{s1}	Elem. Thickness "s_{min}"	"d"	"l_1"	Ø x l_{s1}
Symbol	[kN]	[mm]	[mm]	[mm²/m]	[mm]	[mm]	[mm]	[mm]	[mm]
TKS-025-0400	25	80	360	2 x 100	2 x Ø 10	90	Ø8	600	Ø10 x 600
		100					Ø8	600	
		120					Ø8	600	
TKS-025-0520		100					Ø8	600	
TKS-050-0580	50	100	540	2 x 140	2 x Ø 12	120	Ø10	750	Ø12 x 1000
		120					Ø10	750	
		140					Ø10	750	
		160					Ø10	750	
TKS-050-0900		120					Ø10	850	
TKS-075-0750	75	120	610	2 x 160	2 x Ø 12	140	Ø10	750	Ø20 x 1000
		140					Ø10	750	
		160					Ø10	750	
TKS-075-1150		140					Ø10	900	

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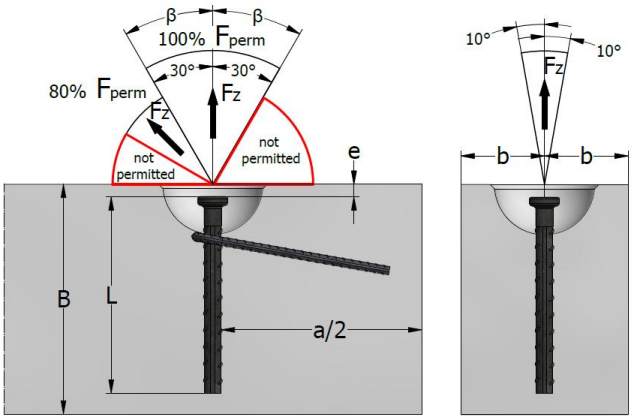
Type of anchor	Load Group	Elem. thickness 2 x b	Spacing between anchors "a"	Mesh reinforcement (1)	Edge reinforcement B500B (2)	Stirrups - B500B (3) Axial pull $\beta < 30°$ and angled pull $30° < \beta < 45°$			Angled pull reinforcement B500B (4)
					d_{s1}	Elem. Thickness "s_{min}"	"d"	"l_1"	Ø x l_{s1}
TKS-100-0870	100	160	720	2 x 180	2 x Ø 14	160	Ø10	800	Ø20 x 1100
TKS-100-1300		140					Ø10	950	
TKS-150-1080	150	200	900	2 x 240	2 x Ø 14	200	Ø12	1020	Ø25 x 1100
TKS-150-1550		160					Ø12	1200	

TKS - LOAD CAPACITY IN BEAMS AND WALLS

Anchor type	Load group	Concrete element thickness	Spacing between anchors	The recommended minimum thickness	Axial pull F_Z $\beta < 30°$		Angled pull F_Z $\beta > 30°$ max. 45°	
		"2 x b"	"a"	"s min"	f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa	f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa
	[kN]	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]
TKS-025-0400	25	80	360	90	25.0	25.0	20.0	25.0
		100			25.0	25.0	20.0	25.0
		120			25.0	25.0	20.0	25.0
TKS-025-0520		100			25.0	25.0	20.0	25.0
TKS-050-0580	50	100	540	120	41.0	50.0	32.6	50.0
		120			44.2	50.0	35.3	50.0
		140			47.0	50.0	37.6	50.0
		160			50.0	50.0	40.0	50.0
TKS-050-0900		120			50.0	50.0	40.0	50.0
TKS-075-0750	75	120	610	140	66.0	75.0	52.8	75.0
		140			70.0	75.0	56.0	75.0
		160			75.0	75.0	60.0	75.0
TKS-075-1150		140			75.0	75.0	60.0	75.0
TKS-100-0870	100	160	720	160	95.0	100.0	76.0	100.0
TKS-100-1300		140			100.0	100.0	80.0	100.0
TKS-150-1080	150	200	900	200	144.0	150.0	115.2	150.0
TKS-150-1550		160			150.0	150.0	130.0	150.0

We recommend that, if possible, angle ß should not exceed 30°.



- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***

- *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
- *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
- *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*

- ***Angled pull with cable/chain spread of β > 45° is not permitted***

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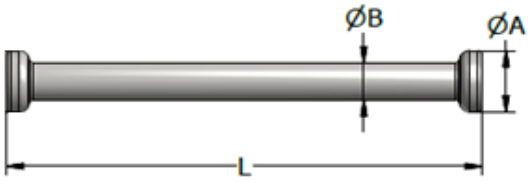
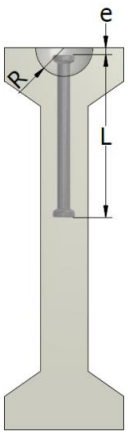
T –DOUBLE HEAD ANCHOR

TERWA T-DOUBLE HEADS are forged from round steel with a design load capacity in the range of 100kN to 320kN. It is specially designed for use in pre-stressed beams with high concrete compressive strength. **The concrete strength must be higher than 45 MPa**.
Can be made in two variants: sandblasted or hot dip galvanised.



T-double head black		T-slot – hot dip galvanised		Load group	L	ØA	ØB
Description	Prod. No.	Description	Prod. No.	kN	mm	mm	mm
T-DH-100-0340	62626	T-DH-100-0340-TV	62633	100	340	46	28
T-DH-150-0400	62627	T-DH-150-0400-TV	62634	150	400	70	38
T-DH-200-0500	62628	T-DH-200-0500-TV	62635	200	500	70	40
T-DH-320-0700	62629	T-DH-320-0700-TV	62636	320	700	88	50

T-double head	Load group	"R"	"e"
Description	kN	mm	mm
T-DH-100-0340	100	59	15
T-DH-150-0400	150	80	15
T-DH-200-0500	200	80	15
T-DH-320-0700	320	102	23



- *L = anchor length*
- *e = cover to anchor head*
- *R = recess radius*

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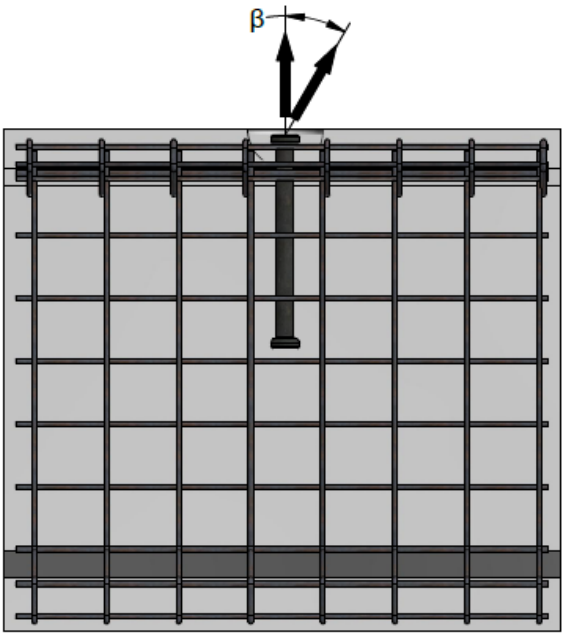
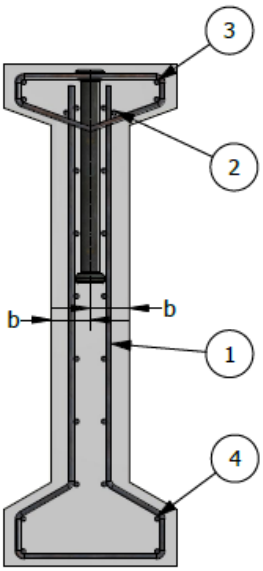
T-DOUBLE HEAD ANCHOR – INSTALLATION AND REINFORCEMENT

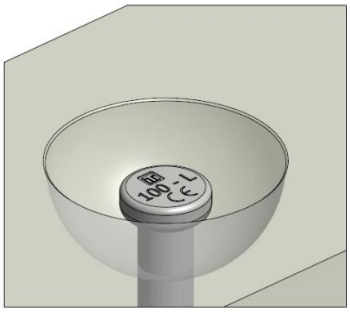
REINFORCEMENT USED IN ANCHOR ZONE FOR ANGLED LIFT IN BEAMS

The concrete strength must be at least 45 MPa during the first lifting action. We recommend that angle ß should not exceed 30°.
The T-double head anchor does not require diagonal reinforcement due to concrete strength > 45MPa.





Mounting position for T-double head anchor



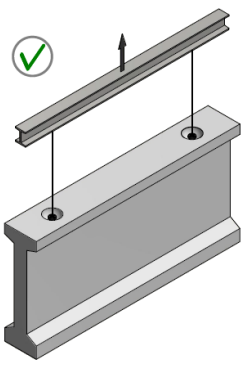
Reinforcement used in anchor zone

Minimum reinforcement required:

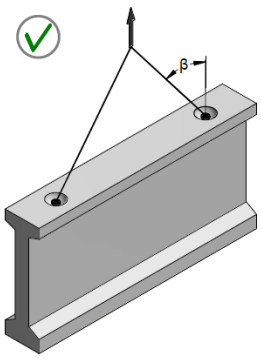
- ***Mesh reinforcement 2 x 188 [mm²/m]*** (1)
- ***Rebar 2 x Ø12*** (2)
- ***Rebar 4 x Ø14*** (3)
- ***Rebar 4 x Ø14*** (4)

T-DOUBLE HEAD LOAD DIRECTIONS

Axial load **ß = 0º to 10º**



Diagonal load **ß = 10º to 45º**
*Note: **ß ≤ 30º** is recommended*



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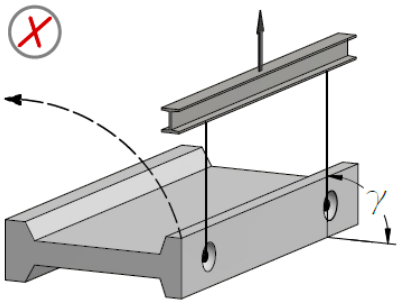
Do not use T-double head for tilting **g = 90 °**

NOT PERMITTED



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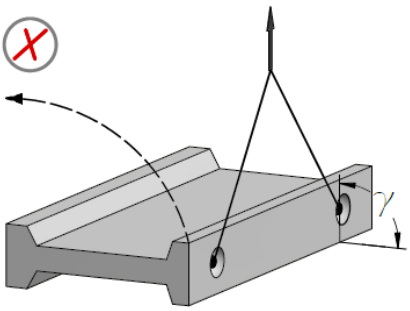

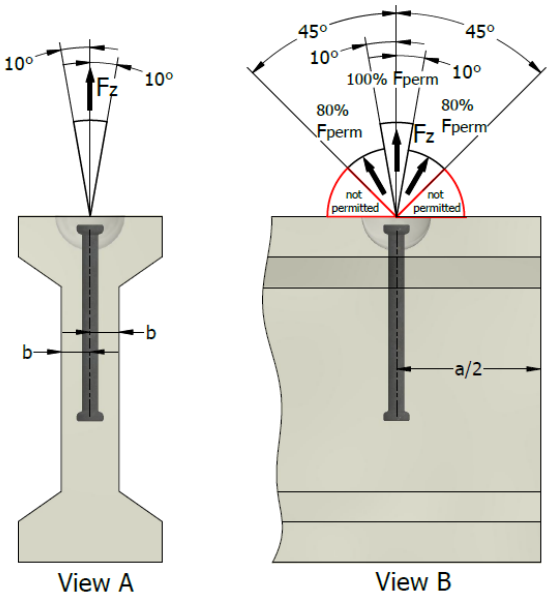

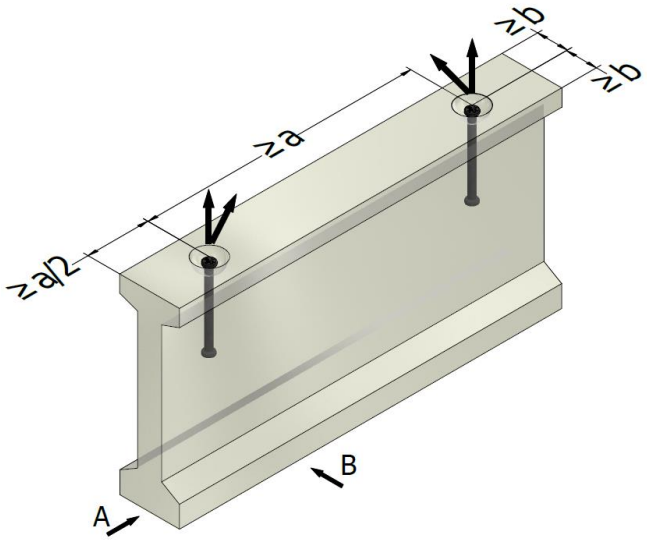

T- DOUBLE HEAD ANCHOR – LOAD CAPACITY IN BEAMS FOR AXIAL AND ANGLE PULL							
Type of anchor	Load group	Minimum web thickness	Minimum axial spacing	Load capacity			
				Axial pull F_Z $\beta < 30°$	Axial pull F_Z $30° < \beta < 45°$	Axial pull F_Z $\beta < 30°$	Axial pull F_Z $30° < \beta < 45°$
		2 x b	a	$f_{cu} \geq 45$ MPa	$f_{cu} \geq 45$ MPa	$f_{cu} \geq 55$ MPa	$f_{cu} \geq 55$ MPa
	[kN]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]
T-DH-100-0340	100	120	1350	85	68	95	76
T-DH-100-0340		140	1350	100	80	100	80
T-DH-150-0400	150	120	1600	130	104	145	116
T-DH-150-0400		140	1600	150	120	150	120
T-DH-200-0500	200	140	2000	170	136	190	152
T-DH-200-0500		160	2000	195	156	200	160
T-DH-320-0700	320	140	2800	220	176	245	196
T-DH-320-0700		160	2800	250	200	280	224
T-DH-320-0700		180	2800	280	224	310	248

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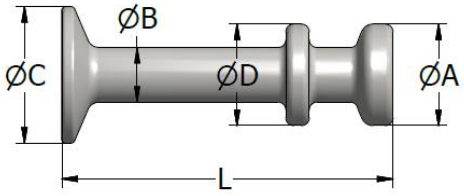
P-ANCHOR

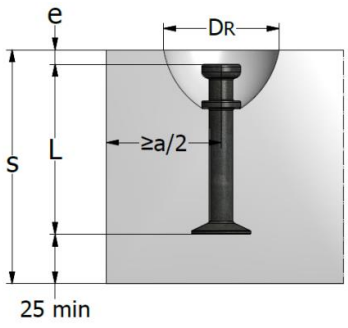
Forged from round carbon steel, the P-slot anchor has a design load capacity in the range of 13 kN to 100 kN. Can be used for face-up elements production, precast tubes, or shafts.
The collar under the anchor head seals the former when the anchor is pushed into the recess former and maintain the anchor in position.



Characteristics of P-anchors

P-anchor black		P-anchor hot dip galvanized		P-anchor – stainless steel 1.4301 (AISI 304)		Load group	L	ØA	ØB	ØC
Descr.	Prod. No.	Descr.	Prod. No.	Descr.	Prod. No.	[kN]	[mm]	[mm]	[mm]	[mm]
P-013-0055	44953	P-013-0055-TV	45848	P-013-0055-SS2	61934	13	55	19	10	25
P-013-0065	46248	P-013-0065-TV	47470	P-013-0065-SS2	61935	13	65	19	10	25
P-013-0085	43337	P-013-0085-TV	43338	P-013-0085-SS2	61936	13	85	19	10	25
P-013-0120	43339	P-013-0120-TV	43340	P-013-0120-SS2	45710	13	120	19	10	25
P-013-0240	46205	P-013-0240-TV	46206	P-013-0240-SS2	61937	13	240	19	10	25
P-025-0055	44281	P-025-0055-TV	44282	P-025-0055-SS2	61938	25	55	26	14	35
P-025-0065	46211	P-025-0065-TV	61939	P-025-0065-SS2	63300	25	65	26	14	35
P-025-0085	43970	P-025-0085-TV	43341	P-025-0085-SS2	44507	25	85	26	14	35
P-025-0110	60680	P-025-0110-TV	60681	P-025-0110-SS2	63301	25	110	26	14	35
P-025-0120	43342	P-025-0120-TV	43343	P-025-0120-SS2	44508	25	120	26	14	35
P-025-0170	43344	P-025-0170-TV	43345	P-025-0170-SS2	61940	25	170	26	14	35
P-050-0075	47860	P-050-0075-TV	44639	P-050-0075-SS2	61941	50	75	36	20	50
P-050-0080	61282	P-050-0080-TV	61283	P-050-0080-SS2	63302	50	80	36	20	50
P-050-0090	46470	P-050-0090-TV	46468	P-050-0090-SS2	61942	50	90	36	20	50
P-050-0110	46469	P-050-0110-TV	46467	P-050-0110-SS2	61943	50	110	36	20	50
P-050-0120	45863	P-050-0120-TV	44640	P-050-0120-SS2	61944	50	120	36	20	50
P-050-0170	61576	P-050-0170-TV	61577	P-050-0170-SS2	63303	50	170	36	20	50
P-050-0240	45864	P-050-0240-TV	44615	P-050-0240-SS2	45189	50	240	36	20	50
P-100-0150	44614	P-100-0150-TV	61946	P-100-0150-SS2	61945	100	150	46	28	70

Type P-Anchor Description	Load Group [kN]	D_R [mm]	e [mm]
P-013-XXXX	13	63	10
P-025-XXXX	25	74	11
P-050-XXXX	50	96	15
P-100-XXXX	100	122	15



- *L = anchor length*
- *a/2 = edge distance*
- *e = cover to anchor head*
- *D_R = recess diameter*

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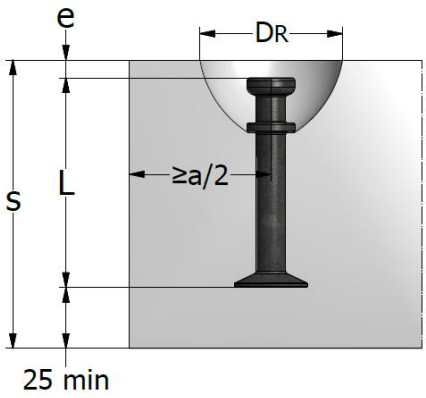
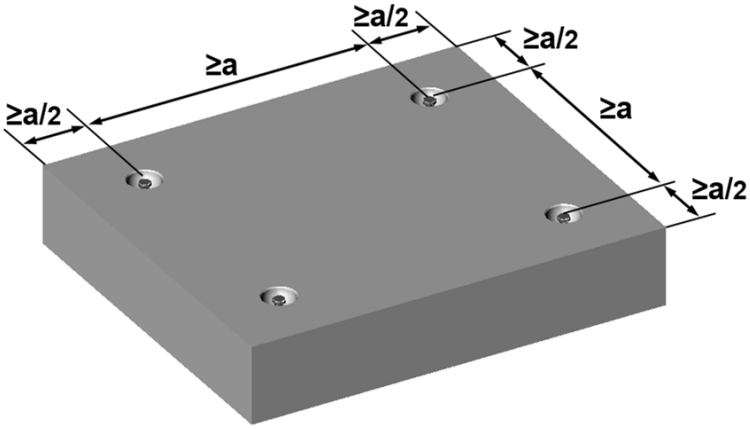
INSTALLATION OF P-ANCHOR IN SLABS

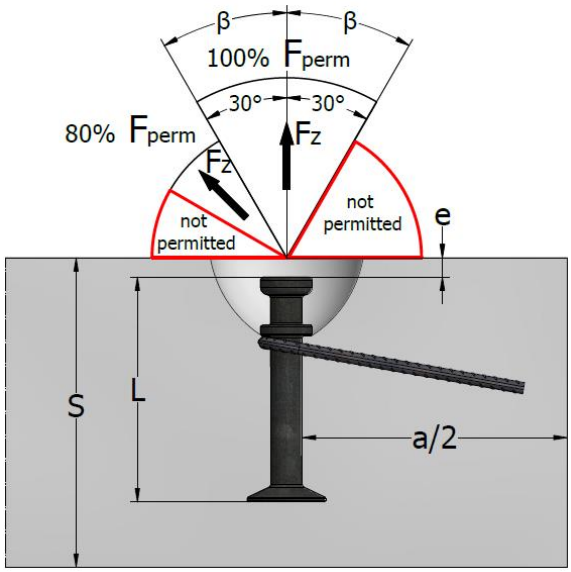




- *L = anchor length*
- *a/2 = edge distance*
- *e = cover to anchor head*
- *D_R = recess diameter*

For slab units or demoulding panels, the edge distance of the "T" anchor (a) is ***a/2 = 3 x (L + e)***

P-ANCHOR – LOAD CAPACITY IN SLABS FOR ANY DIRECTION OF PULL							
Type of anchor	Load group	Minimum thickness	Load capacity for minimum thickness				Minimum spacing between anchors
			Axial pull F_Z $\beta < 30°$	Angled pull F_Z $\beta < 45°$	Axial pull and angled pull F_Z $\beta < 45°$		
		s	f_{cu}≥ 15 MPa	f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa	f_{cu}≥ 35 MPa	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
P-013-0065	13	100	13.0	10.4	13.0	13.0	260
P-025-0085	25	120	19.5	15.6	25.0	25.0	325
P-050-0110	50	150	29.5	23.6	38.1	45.1	450
P-100-0150	100	200	59.5	40.1	60.2	75.5	600



- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***

- *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
- *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
- *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*

- ***Angled pull with cable/chain spread of β > 45° is not permitted***

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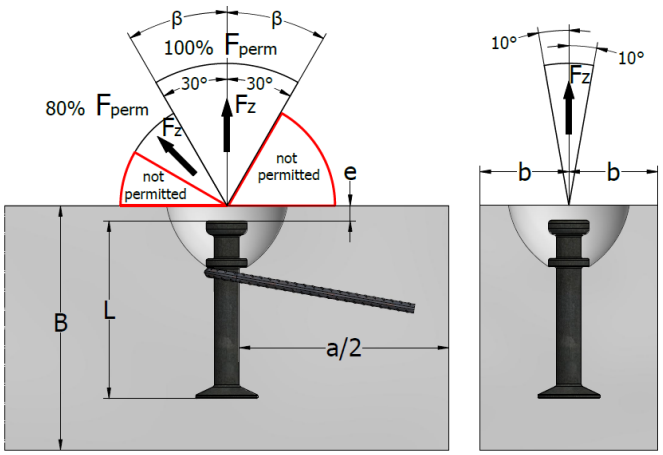
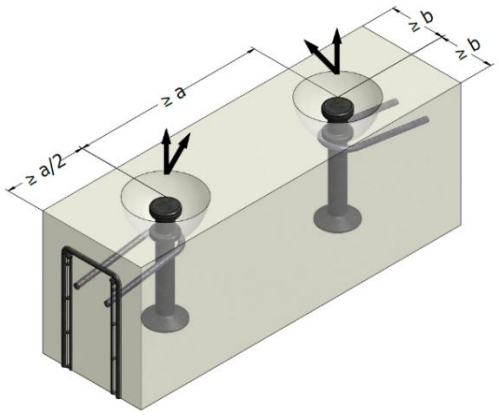
LOAD CAPACITY IN BEAMS AND WALLS WITH ADDITIONAL REINFORCEMENTS





The angled pull reinforcement must be mounted opposite the direction of the load
The diagonal reinforcement must be placed as close as possible under the recess former and installed so it is in contact with the lifting anchor.

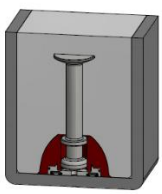
NOTES:
Required reinforcement (*see page 25*)

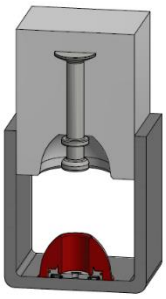
- **Mesh reinforcement -** (1)
- **Edge reinforcement -** (2)
- **Stirrups -** (3)
- **Angled pull reinforcement -** (4)

- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***
  - *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
  - *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
  - *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*
- ***Angled pull with cable/chain spread of β > 45° is not permitted***

P-ANCHOR – LOAD CAPACITY IN BEAMS AND WALLS WITH ADDITIONAL REINFORCEMENTS

Type of anchor	Load group	Minimum height of beams	Wall thickness	Load capacity				Spacing between anchors
				Axial pull F_Z $\beta < 30°$	Angled pull F_Z $\beta < 45°$	Axial pull and angled pull F_Z $\beta < 45°$		
				f_{cu}≥ 15 MPa	f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa	f_{cu}≥ 35 MPa	
		B	2 x b					a
	[kN]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
P-013-0120	13	250	80	13.0	10.7	13.0	13.0	300
			100	13.0	12.7	13.0		
			120	13.0	13.0	13.0		
P-025-0120	25	250	120	18.1	14.5	23.3	25.0	380
			140	20.3	16.2	25.0		
			160	22.4	17.9	25.0		
P-025-0170		350	100	20.7	16.5	25.0	25.0	380
			120	23.7	19.0			
			140	25.0	21.8			
P-050-0240	50	500	200	45.6	36.5	50.0	50.0	500
			220	49.0	39.2			
			240	50.0	41.9			





The recess former MPB made of polyurethane or RBP made of rubber are especially designed to be used in combination with a P-anchor. Use a lubricant with the anchor for an easy mount with the former.

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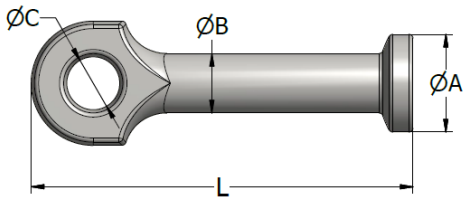
O-ANCHOR

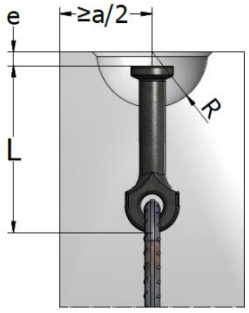
Forged from carbon steel, the O-eye anchor has a design load capacity in the range of 13kN to 200kN.
The O-eye anchor has a hole, in which a reinforcement hairpin has to be placed to obtain good anchoring in small elements and lightweight precast elements, such as pre-stressed beams. Since the entire load is transferred to concrete reinforcement steel, it should be installed so as to maintain direct contact with the base of the hole in the anchor.
Use of this reinforcement is essential. Do not use anchor type O without this reinforcement.
For angled lifting, an additional reinforcement similar to that mounted with the t-slot anchor must be used. Install this angled pull reinforcement as close as possible under the recess former and in full contact with the anchor.
O-anchors are available in two versions: shot blasting and hot dip galvanising (TV).



Characteristics of O-eye anchor

O-anchor black		O-anchor hot dip galvanised		Load group	L	ØA	ØB	ØC
Descr.	Product Nr.	Descr.	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]
O-013-065	43328	O-013-065-TV	43329	13	65	19	10	9
O-025-090	43330	O-025-090-TV	43331	25	90	26	14	13
O-025-120	46261	O-025-120-TV	46262	25	120	26	14	13
O-050-090	43332	O-050-090-TV	43571	50	90	36	20	20
O-050-120	43333	O-050-120-TV	43334	50	120	36	20	20
O-100-115	43556	O-100-115 TV	43557	100	115	47	28	25
O-100-180	43335	O-100-180-TV	43336	100	180	47	28	25
O-200-250	43558	O-200-250 TV	43559	200	250	70	39	37

Type O anchor	Load Group	R	e
Description	[kN]	[mm]	[mm]
O-013-XXXX	13	30	10
O-025-XXXX	25	37	11
O-050-XXXX	50	47	15
O-100-XXXX	100	59	15
O-200-XXXX	200	80	15



- *L = anchor length*
- *a/2 = edge distance*
- *e = cover to anchor head*
- *R = recess radius*

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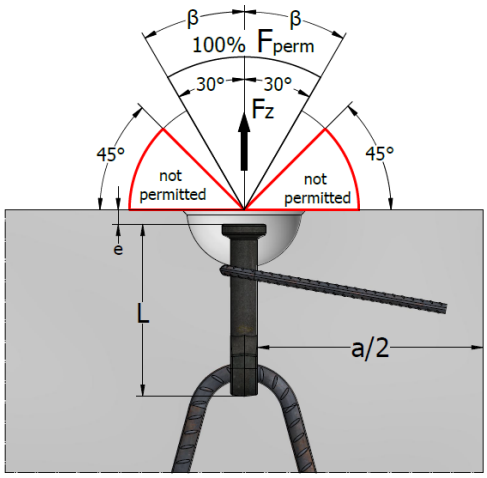
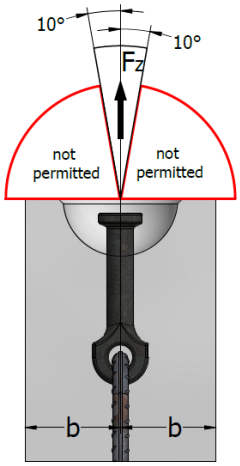
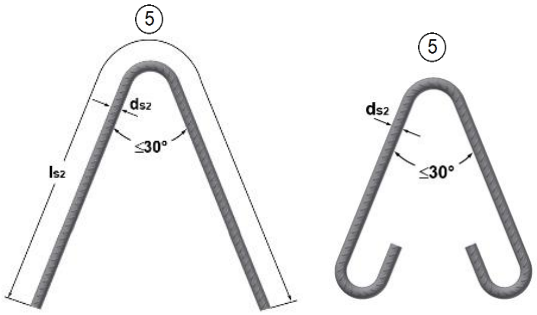
LOAD CAPACITY IN BEAMS AND WALLS WITH ADDITIONAL REINFORCEMENTS O-ANCHOR







- The angled pull reinforcement must be mounted opposite the direction of the load
- The diagonal reinforcement must be placed as close as possible under the recess former and installed so it it is in contact with the lifting anchor.
- The additional reinforcement must be bent at an angle of 30° as shown. The rebar may be shortened if required; the ends can be bent into hooks.

NOTES:

Required reinforcement *(see page 25)*

- **Mesh reinforcement -** (1)
- **Angled pull reinforcement -** (4)
- **Additional reinforcement -** (5)

- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***
  - *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
  - *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
  - *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*
- ***Angled pull with cable/chain spread of β > 45° is not permitted***

O- ANCHOR – LOAD CAPACITY AND REINFORCEMENTS											
O-anchor type	Load group	Minimum thickness	Spacing between anchors	Mesh reinforcement (1)	O-anchor reinforcement Dimensions l_{s2} (5)				Load capacity Axial pull F_Z	Load capacity angled pull F_Z ß ≤ 45°	
		"2 x b"	"a"		f_{cu} ≥ 15 MPa	f_{cu} ≥ 25 MPa	f_{cu} ≥ 35 MPa	d_{s2}	f_{cu} ≥ 15 MPa	f_{cu} ≥ 15 MPa	f_{cu} ≥ 25 MPa
	[kN]	[mm]	[mm]	[mm²/m]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]
O-013-0065	13	80	500	2 x 60	700	550	450	8	13.0	10.4	13.0
O-025-0090	25	80	600	2 x 100	1000	800	650	10	25.0	20.0	25.0
O-050-0120	50	100	750	2 x 140	1700	1400	1100	16	50.0	40.0	50.0
O-100-0180	100	140	1200	2 x 180	2000	1600	1300	20	100.0	80.0	100.0
O-200-0250	200	180	1500	2 x 350	3000	2400	2000	32	200.0	160.0	200.0

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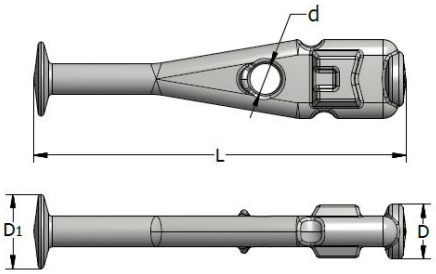
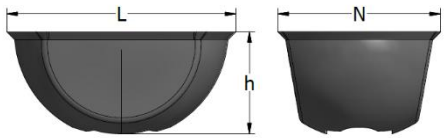
TKA-TILT ANCHOR

Forged from carbon steel, these have a design load capacity in the range of 13 kN to 50 kN.
TKA anchors can carry loads of between 13 kN and 50 kN. These anchors are used for tilting and transporting thin concrete walls. This type of anchor is typically used in combination with additional reinforcing steel. The TKA anchor must be fixed in the mould using a specific recess former RBK. The recess former holds the anchor securely in position when pouring the concrete. The IPK is mounted in the RBK in order to stabilise the RBK during pouring and hardening.
TKA anchors are available in two versions: shot blasting and hot-dip galvanising (TV).
Remark: this anchor does not allow for the lifting shackle to be turned or twisted inside the recess, using a spreader beam is recommended in combination with this anchor.



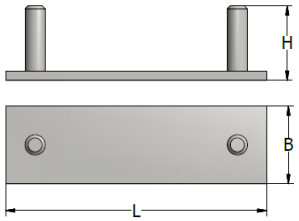
TKA-anchor black		TKA-anchor hot dip galvanised		Load group	L	Ø D	Ø D_1	Ø d
Descr.	Product no.	Descr.	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]
TKA-013-0120	44476	TKA-013-0120-TV	44804	13	120	19	23	11
TKA-025-0170	44477	TKA-025-0170-TV	44805	25	170	25	34	16
TKA-050-0240	44478	TKA-050-240-TV	44806	50	240	36	50	21

Characteristics of RBK balls:



RBK-recess former		Load group	Length L	Height h	Width N
Descr.	Product no.	[kN]	[mm]	[mm]	[mm]
RBK-13	43946	13	70	32	49
RBK-25	43947	25	86	38	60
RBK-50	43948	50	110	53	78

Characteristics of IPK plates:



IPK plates		Load group	Length L	Height H	Width B
Descr.	Product no.	[kN]	[mm]	[mm]	[mm]
IPK -13	47225	13	54	16	15
IPK -25	47224	25	67	16	20
IPK -50	47223	50	84	24	25

For tilting, additional reinforcements have to be installed in the anchor zone. Take care with anchor placement so that the anchors ensure the load transfer. The RBK recess former is removed from the hardened concrete, and then the lifting device can be connected. The shackle nose must be oriented in the direction of lifting.

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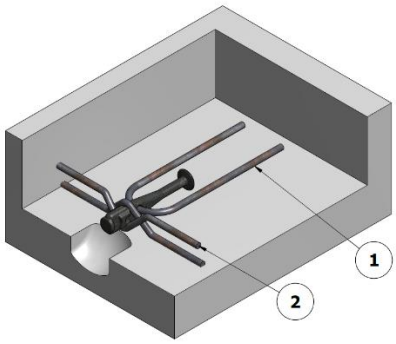
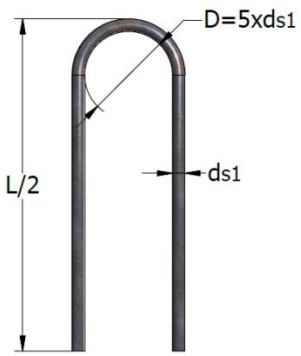
REINFORCEMENT USED IN ANCHOR ZONE FOR ANGLED LIFT IN PANELS OR BEAMS

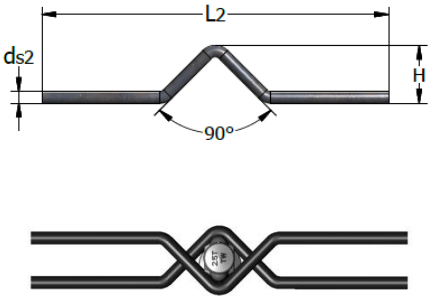
Additional reinforcements:



Reinforcement 1

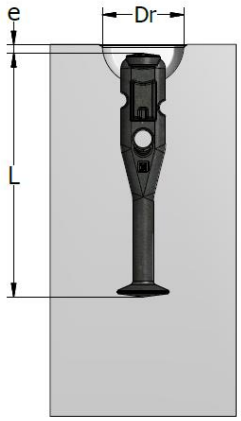


Reinforcement 2



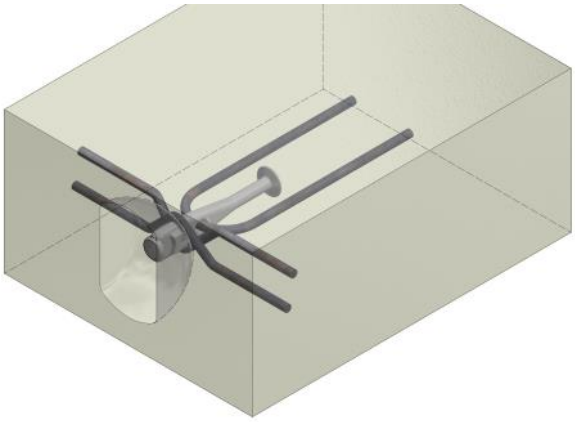
TKA-ANCHOR – LOAD CAPACITY AND REINFORCEMENTS							
TKA-anchor type	Load group	Mesh reinforcement	Reinforcement 1			Reinforcement 2	
			ds_1	L (straight)	L/2 (bent)	ds_2	L_2
	[kN]	[mm²/m]	[mm]	[mm]	[mm]	[mm]	[mm]
TKA-013-0120	13	131	10	1035	500	10	500
TKA-025-0170	25	2 x 131	10	1635	800	12	800
TKA-050-0240	50	2 x 140	12	2240	1100	16	1000

Type TKA Anchor Description	Load Group [kN]	D_R [mm]	e [mm]
TKA-013-0120	13	70	10
TKA-025-XXXX	25	86	11
TKA-050-XXXX	50	110	15



- *L = anchor length*
- *e = cover to anchor head*
- *Dr = recess dimension*

The TKA anchor must be installed correctly oriented, as in the next picture.



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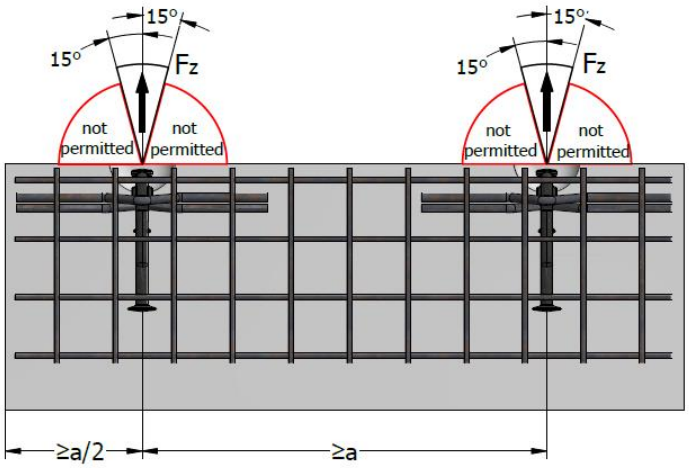
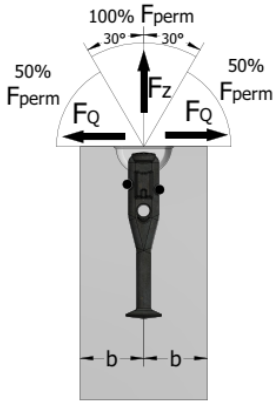
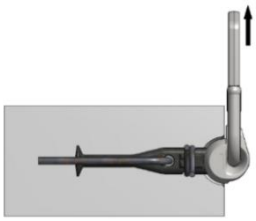
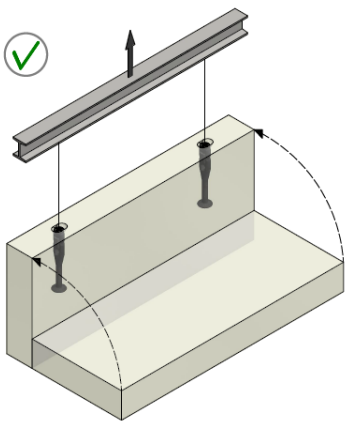
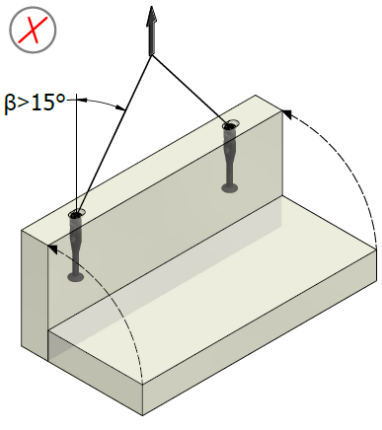
AXIAL LIFT	TRANSVERSE LIFT	
		

Permissible load:

TKA-anchor type	Axial Load	Element thickness 2 x b	Spacing between anchors "a"	Transverse lift F_Q		Axial pull angled pull F_Z ß ≤ 15°	
				Concrete strength		Concrete strength	
				15 MPa	25 MPa	15 MPa	25 MPa
	[kN]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]
TKA-013-0120	13	80	750	3.0	3.6	11.0	13.0
		100		4.0	4.6	12.0	13.0
		120		5.0	5.6	13.0	13.0
TKA-025-0170	25	100	1000	7.8	10.1	22.2	25.0
		110		9.0	11.6	23.8	25.0
		120		10.3	12.5	25.0	25.0
		130		11.6	12.5	25.0	25.0
		140		12.5	12.5	25.0	25.0
TKA-050-0240	50	120	1500	13.8	17.8	31.2	40.0
		130		14.6	18.8	33.1	42.7
		140		15.6	20.1	35.0	45.2
		150		17.3	22.3	36.8	47.5
		160		19.1	24.6	38.7	50.0
		180		20.9	25.0	42.2	50.0
		200		22.6	25.0	45.7	50.0



A spreader beam must be used when tilting precast elements with **β > 15°**



The tilting anchor TKA is permitted only for axial or transverse loading. Diagonal pull with **β > 15°** is not permitted

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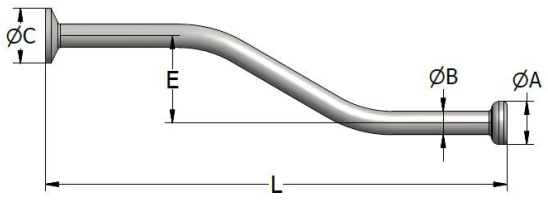
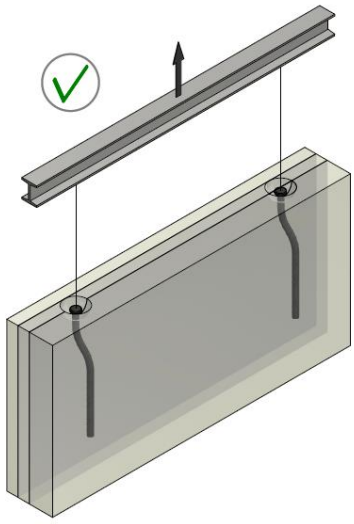
TSG – OFFSET ANCHOR

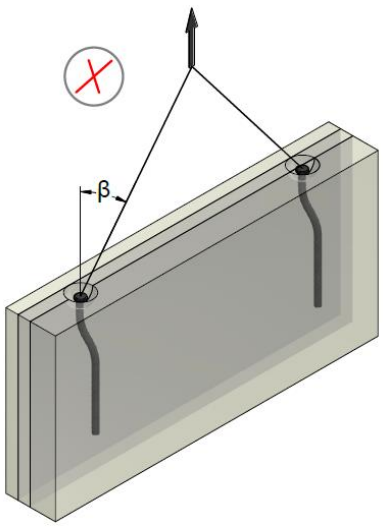
The TSG anchor has a design load capacity in the range of 13kN to 200kN. This type of anchor is mainly used in sandwich panels and allows for an offset centre of gravity to be aligned with the lifting points. The anchor head must be positioned on the axis of symmetry of the sandwich precast panel. To ensure safe load transfer, the anchor leg must be positioned in the middle of the load bearing layer.
TSG anchors are available in two versions: shot blasting and hot galvanising (TV).



TSG- ANCHOR – DIMENSIONS									
TSG black		TSG hot dip galvanised		Load group	L	ØA	ØB	ØC	E
Description	Product no.	Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
TSG-013-0227	43087	TSG-013-0227-TV	43088	13	227	19	10	25	50
TSG-025-0268	43089	TSG-025-0268-TV	43090	25	268	26	14	35	50
TSG-040-0406	43091	TSG-040-0406-TV	43092	40	406	36	18	45	60
TSG-050-0466	43093	TSG-050-0466-TV	43094	50	466	36	20	50	60
TSG-075-0664	43095	TSG-075-0664-TV	43096	75	664	46	24	60	70
TSG-100-0667	43097	TSG-100-0667-TV	43100	100	667	46	28	70	70
TSG-150-0825	43101	TSG-150-0825-TV	43102	150	825	70	38	80	90
TSG-200-0986	43103	TSG-200-0986-TV	43104	200	986	70	40	98	90



To prevent concrete spalling, we recommend using a spreader beam when precast elements must be lifted and transported or during installation.



Diagonal pull with β > 30° is not permitted

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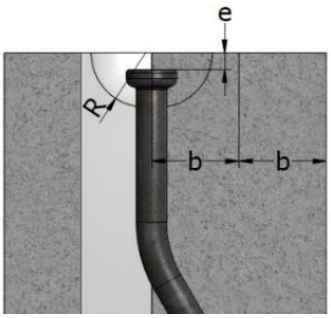
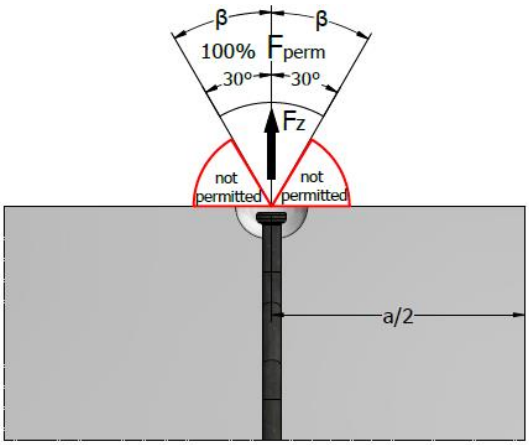
TSG - ANCHOR ARRANGEMENT

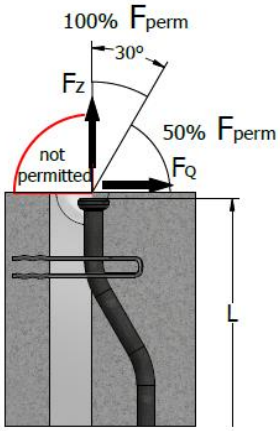
Type TSG Anchor Description	Load group [kN]	"R" [mm]	"e" [mm]
TSG-013-0227	13	30	10
TSG-025-0268	25	37	11
TSG-040-0406	40	47	15
TSG-050-0466	50	47	15
TSG-075-0664	75	59	15
TSG-100-0667	100	59	15
TSG-150-0825	150	80	15
TSG-200-0986	200	80	15



- *2xb = load bearing layer thickness*
- *e = cover to anchor head*
- *R = recess radius*

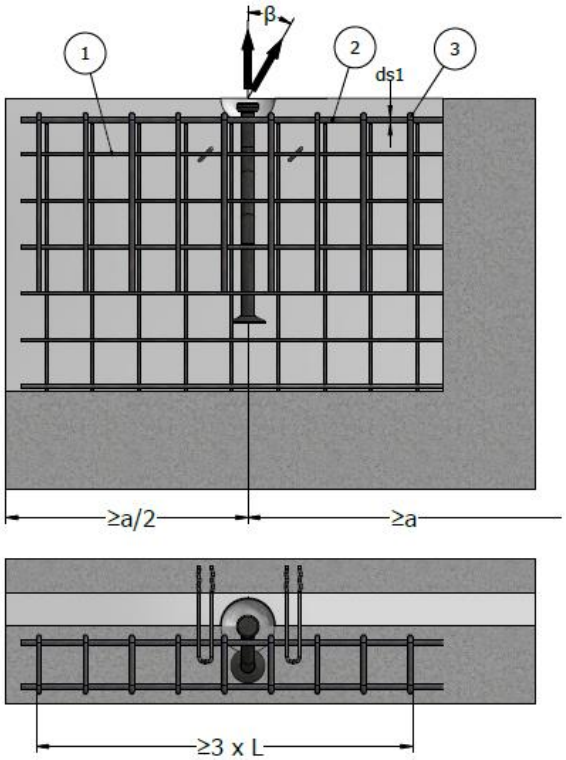
TSG - LOAD CAPACITY IN WALLS - ADDITIONAL REINFORCEMENTS

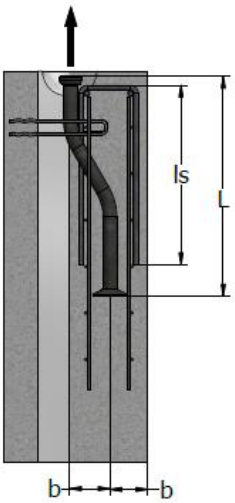


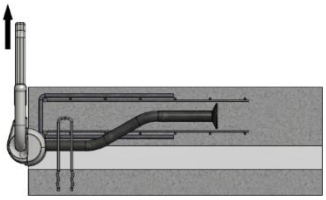


Angled pull with cable/chain spread of β > 30° is not permitted

Using a tilt-up table is recommended for tilt-up operations.







Using an additional sandwich hairpin anchor installed near the anchor is beneficial.

Note:

The bend radius R according to EN 1992 is not mandatory.

The diagonal reinforcement must be placed as close as possible under the recess former and installed so it is in contact with the lifting anchor.

The reinforced zone must be ≥ 3 × anchor lenght "L". *The two stirrups near the anchor should be installed as close as possible to the recess former.*

Length $l_s = l_1$ +Anchor length

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Type of anchor	Load Group	Mesh reinforcement (1)	Edge reinforcement B500B (2)	Stirrups - B500B (3)	
				Axial pull $\beta < 30°$	
			d_{s1}	"d"	"ls"
Symbol	[kN]	[mm2/m]	[mm]	[mm]	[mm]
TSG-013-0227	13	2 x 60	2 x Ø 10	Ø6	400
TSG-025-0268	25	2 x 100	2 x Ø 10	Ø8	600
TSG-040-0406	40	2 x 125	2 x Ø 10	Ø8	750
TSG-050-0466	50	2 x 140	2 x Ø 12	Ø10	750
TSG-075-0664	75	2 x 160	2 x Ø 12	Ø10	1000
TSG-100-0667	100	2 x 180	2 x Ø 12	Ø10	1000
TSG-150-0825	150	2 x 240	2 x Ø 16	Ø10	1000
TSG-200-0986	200	2 x 350	2 x Ø 16	Ø12	1100

TSG-ANCHOR – LOAD CAPACITY IN WALLS WITH ADDITIONAL REINFORCEMENTS

Type of anchor	Load group	Wall thickness	Load capacity				Spacing between anchors
			Axial pull F_Z $\beta < 30°$		Transverse lift F_Q		
		2 x b	f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa	f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
TSG-013-0227	13	80	13.0	13.0	6.5	6.5	260
TSG-025-0268	25	100	15.9	20.3	9.5	12.2	370
		140	20.5	25.0	12.2	12.5	
TSG-040-0406	40	100	27.3	35.2	18.5	20.0	640
		140	35.1	40.0	20.0	20.0	
TSG-050-0466	50	100	35.2	45.4	21.2	25.0	820
		140	45.3	50.0	25.0	25.0	
TSG-075-0664	75	120	50.9	65.8	30.5	37.5	1210
		150	60.2	75.0	36.0	37.5	
TSG-100-0667	100	140	66.5	86.0	39.9	50.0	1220
		180	80.3	100.0	48.2	50.0	
TSG-150-0825	150	180	103.2	133.0	61.9	75.0	1500
		220	120.0	150.0	72.0	75.0	
TSG-200-0986	200	200	135.1	174.4	81.1	100.0	2030
		250	159.7	200.0	95.9	100.0	

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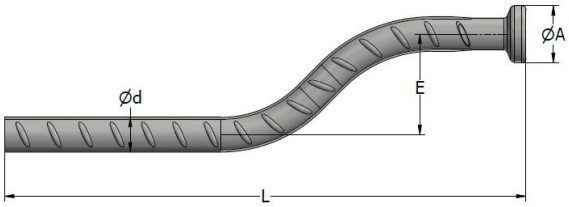
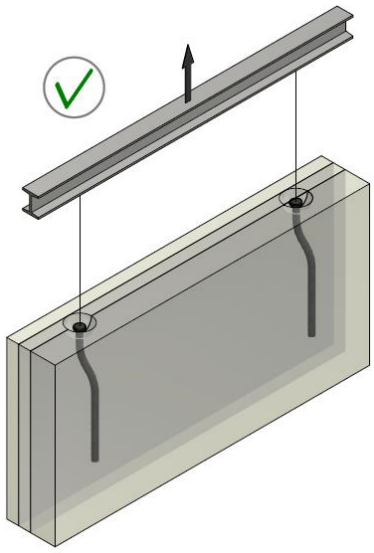
TKSG – OFFSET ANCHOR

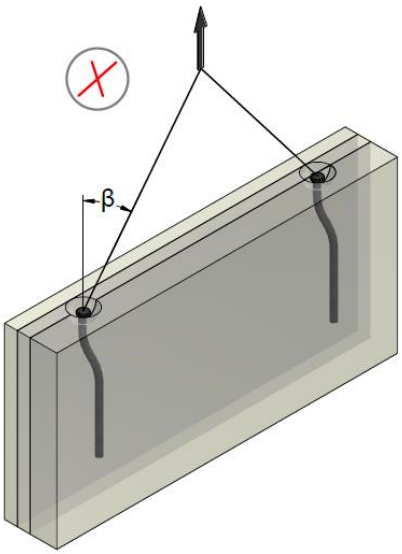
The TKSG anchor has a design load capacity in the range of 25kN to 150kN. This type of anchor is mainly used in sandwich panels. The anchor head must be positioned on the axis of symmetry of the sandwich precast panel. To ensure safe load transfer, the anchor leg must be positioned in the middle of the load bearing layer.
TKSG anchors are available in two versions: shot blasting and hot galvanising (TV).



TKSG-ANCHOR – DIMENSIONS								
TKSG black		TKSG hot dip galvanised		Load group	L	ØA	Ød	E
Description	Product no.	Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]
TKSG-025-0508	64301	TKSG-025-0508-TV	64556	25	508	26	14	50
TKSG-050-0885	64339	TKSG-050-0885-TV	64558	50	885	36	20	60
TKSG-075-1134	64302	TKSG-075-1134-TV	64557	75	1134	46	25	70
TKSG-100-1284	64430	TKSG-100-1284-TV	64559	100	1284	46	28	70
TKSG-150-1535	67191	TKSG-150-1535-TV	67192	150	1535	70	38	90



To prevent concrete spalling, we recommend using a spreader beam when precast elements must be lifted and transported or during installation.



Diagonal pull with β > 30° is not permitted

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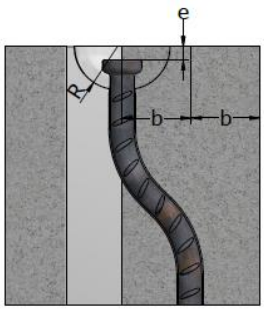
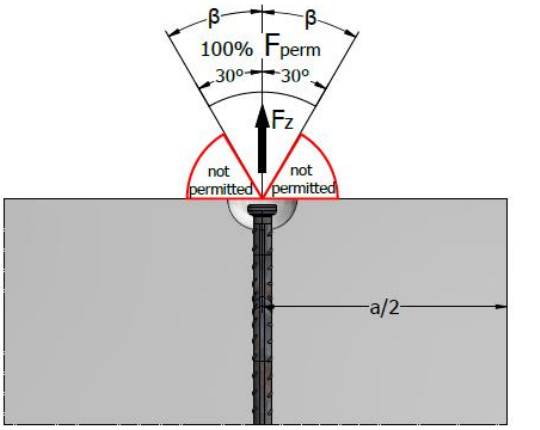
TKSG-ANCHOR ARRANGEMENT

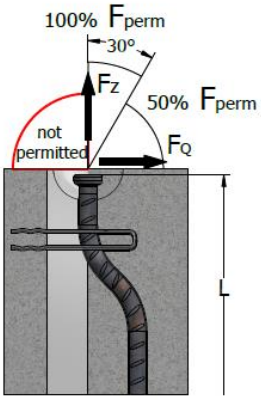
Type TKSG Anchor Description	Load group [kN]	"R" [mm]	"e" [mm]
TKSG-025-0508	25	37	11
TKSG-050-0885	50	47	15
TKSG-075-1134	75	59	15
TKSG-100-1284	100	59	15
TKSG-150-1535	150	80	15



- *2xb = load bearing layer thickness*
- *e = cover to anchor head*
- *R = recess radius*

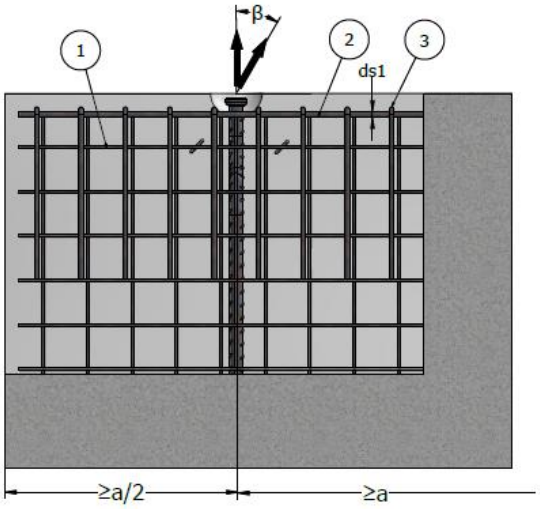
TKSG - LOAD CAPACITY IN WALLS - ADDITIONAL REINFORCEMENTS

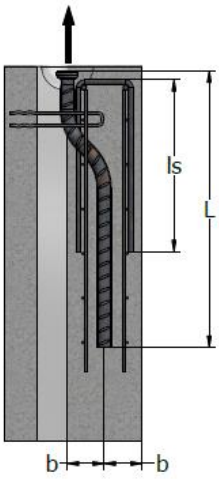


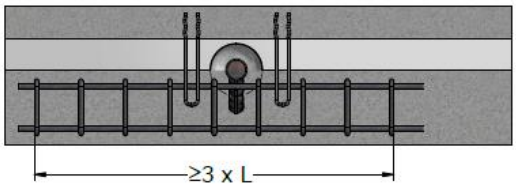


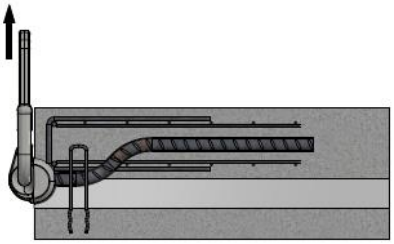
Angled pull with cable/chain spread of β > 30° is not permitted

Using a tilt-up table is recommended for tilt-up operations.









Using an additional sandwich hairpin anchor installed near the anchor is beneficial.

Note:

The bend radius R according to EN 1992 is not mandatory.

The diagonal reinforcement must be placed as close as possible under the recess former and installed so it is in contact with the lifting anchor.

The reinforced zone must be ≥ 3 × anchor lenght "L". *The two stirrups near the anchor should be installed as close as possible to the recess former.*

Length l_s = l_1 +Anchor length

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Type of anchor	Load group	Mesh reinforcement ①	Edge reinforcement B500B ②	Stirrups - B500B ③	
				Axial pull $\beta < 30°$	
			d_{s1}	"d"	"ls"
Symbol	[kN]	[mm²/m]	[mm]	[mm]	[mm]
TKSG-025-0508	25	2 x 100	2 x Ø 10	Ø8	700
TKSG-050-0885	50	2 x 140	2 x Ø 12	Ø8	850
TKSG-075-1134	75	2 x 160	2 x Ø 12	Ø10	950
TKSG-100-1284	100	2 x 180	2 x Ø 12	Ø10	1000
TKSG-150-1535	150	2 x 240	2 x Ø 16	Ø12	1200

TKSG-ANCHOR – LOAD CAPACITY IN WALLS WITH ADDITIONAL REINFORCEMENTS

Type of anchor	Load group	Wall thickness 2 x b	Load capacity				Spacing between anchors
			Axial pull F_Z $\beta < 30°$		Transverse lift F_Q		
			f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa	f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa	a
	[kN]	[mm]	[kN]	[kN]	[kN]	[kN]	[mm]
TKSG-025-0508	25	80	25.0	25.0	12.5	12.5	360
TKSG-050-0885	50	100	40.9	50.0	24.5	25.0	540
		120	44.2	50.0	25.0	25.0	
		140	47.0	50.0	25.0	25.0	
		160	50.0	50.0	25.0	25.0	
TKSG-075-1134	75	120	66.0	75.0	37.5	37.5	610
		140	70.0	75.0	37.5	37.5	
		160	75.0	75.0	37.5	37.5	
TKSG-100-1284	100	140	100.0	100.0	50.0	50.0	720
TKSG-150-1535	150	160	150.0	150.0	75.0	75.0	900

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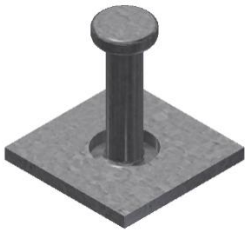
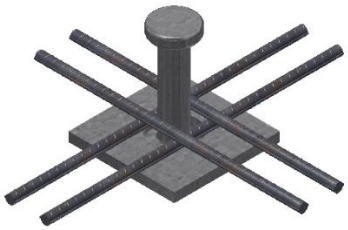
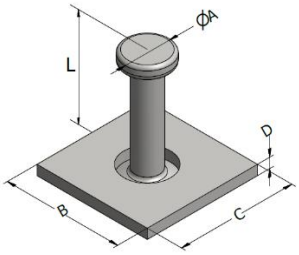
EN – Original Instructions

TPA – PLATE ANCHOR

TPA anchors are fitted with a welded base plate. They have a design load capacity in the range of 25kN, 50kN and 100kN. This type of anchors is mostly used for thin panels. It is essential that this type of anchor be used in combination with additional rebar steel. TPA anchors are available in two versions: shot blasted (black) or hot dip galvanised (TV).

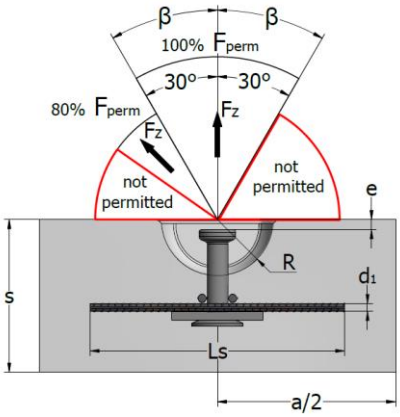






TPA black		TPA hot dip galvanised		Load group	L	ØA	B	C	D
Description	Product no.	Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
TPA-025-055	43507	TPA-025-055-TV	44394	25	55	26	70	70	6
TPA-025-085	43978	TPA-025-085-TV	45341	25	85	26	70	70	6
TPA-025-120	43508	TPA-025-120-TV	44398	25	120	26	70	70	6
TPA-050-055	43509	TPA-050-055-TV	45343	50	55	36	90	90	8
TPA-050-065	43510	TPA-050-065-TV	44400	50	65	36	90	90	8
TPA-050-095	43511	TPA-050-095-TV	45345	50	95	36	90	90	8
TPA-050-110	43512	TPA-050-110-TV	44402	50	110	36	90	90	8
TPA-100-115	43513	TPA-100-115-TV	45347	100	115	46	90	90	10

TPA-ANCHOR ARRANGEMENT



- *L = anchor length*
- *e = cover to anchor head*
- *R = recess radius*

- ***Angled pull of 30° ≤ β ≤ 45° with no angled pull reinforcement is only permitted for:***

- *f_{cu} ≥ 15 MPa and 3 times min. edge distance a/2*
- *f_{cu} ≥ 25 MPa and 2.5 times min. edge distance a/2*
- *f_{cu} ≥ 35 MPa and 2 times min. edge distance a/2*

- ***Angled pull with cable/chain spread of β > 45° is not permitted***

TPA-ANCHOR – LOAD CAPACITY IN SLABS WITH ADDITIONAL REINFORCEMENTS										
TPA-anchor type	Load group	Minimum thickness	Spacing between anchors	L	e	R	d_1	L_S	Axial pull F_Z $\beta < 30°$ and angled pull F_Z $30° < \beta < 45°$	
		"s"	"a"						f_{cu}≥ 15 MPa	f_{cu}≥ 25 MPa
	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]
TPA-025-055	25	85	560	55	11	37	8	200	10.8	14.0
TPA-025-085	25	115	750	85	11	37	10	250	17.0	21.0
TPA-025-120	25	150	1000	120	11	37	10	300	25.0	25.0
TPA-050-055	50	90	750	55	15	47	12	450	14.0	18.6
TPA-050-065	50	100	1000	65	15	47	12	450	16.0	20.8
TPA-050-095	50	125	1000	95	15	47	12	450	28.0	35.0
TPA-050-110	50	145	1000	110	15	47	12	450	34.0	43.8
TPA-100-115	100	150	1280	115	15	59	16	600	34.5	44.5

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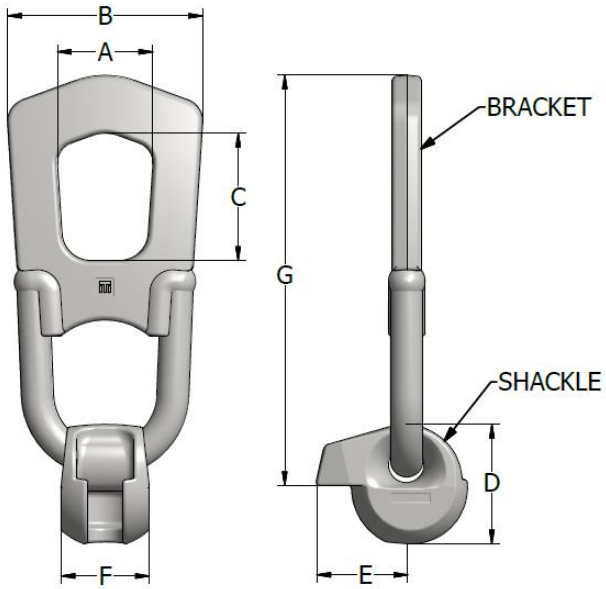
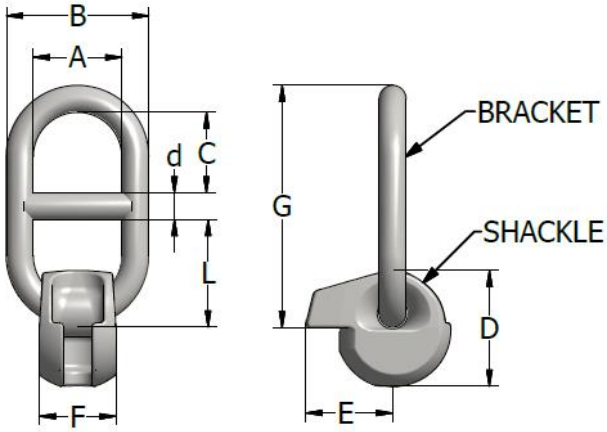
LIFTING CLUTCHES TH2 AND THR2

The 3D lifting systems TH2 and THR2 are made of high-quality steel and are designed with a safety factor of 5. Every system is individually tested for a safety factor 3 times the working load and comes with a unique certificate.
The special design of the clutch ensures a tight, safe connection to the anchor. Of course, the shackle fits the hemispherical cavity created by the recess former perfectly.
The lifting clutch, recess former and anchor are only compatible when they are from the same load group, which is clearly marked on the lifting clutch.



TH2



THR2

TH2 specifications

TH2 lifting system		Load group	A	B	C	D	E	F	G
Type	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
TH2 13	43143	13	48	77	60	55	40	33	165
TH2 25	43144	25	50	92	75	68	55	42	205
TH2 40/50	43145	50	68	121	86	88	64	57	240
TH2 75/100	43146	100	84	170	110	108	90	77	346
TH2 150/200	43147	200	124	230	140	146	118	115	520
TH2 320	43148	320	155	303	175	195	160	155	590
TH2 450	44500	450	155	303	175	195	160	155	590

Specifications of the THR2

TH2 lifting system		Load group	A	B	C	d	L	D	E	F	G
Type	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
THR2 40/50	45281	50	66	106	60	20	80	88	64	57	180
THR2 75/100	45279	100	90	146	58	28	68	108	90	77	210

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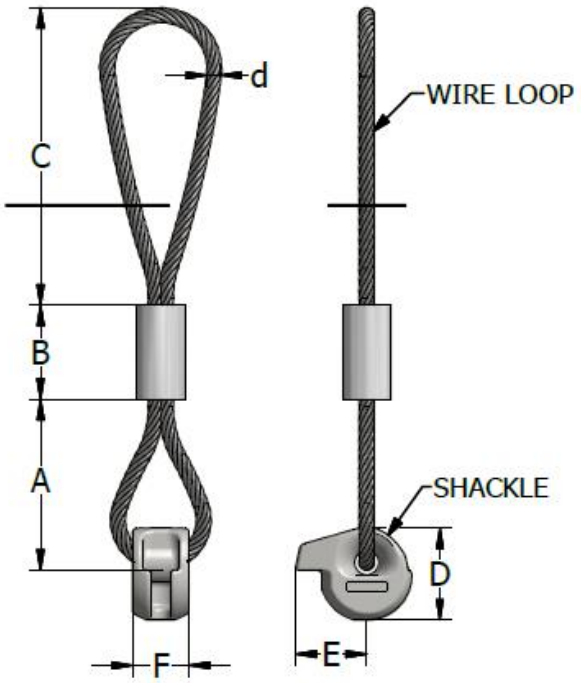
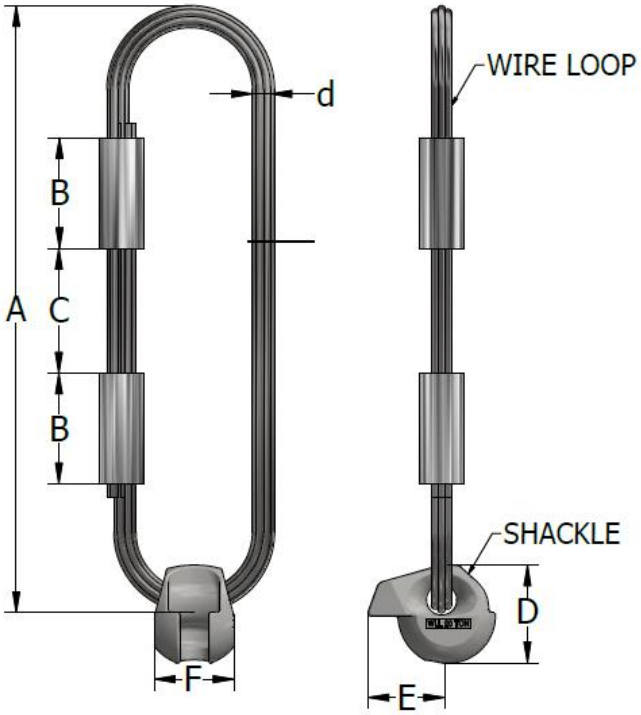
LIFTING CLUTCHES TH1

The 3D lifting systems TH1 are made of high-grade steel wire rope according EN 12385-4, swaged in a ferrule made of AlMg1.8, and a shackle produced from high-strength steel, and they are designed with a safety factor of 5. All the lifting systems are tested individually tested and supplied a unique certificate. The safety factor is 3 times the working load.
The special design of the clutch ensures a tight, safe connection to the anchor. Of course, the shackle fits the hemispherical cavity created by the recess former perfectly.
The lifting clutch, recess former and anchor are only compatible when they are from the same load group, which is clearly marked on the lifting clutch



TH1 1.3 – 10T



TH1-15/20T

TH1 specifications

TH2 lifting system		Load group	A	B	C	D	E	F
Type	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
TH1 13	61536	13	100	54	176	55	40	33
TH1 25	61537	25	120	90	195	68	55	42
TH1 50	61538	50	200	100	295	88	64	57
TH1 75/100	61539	100	240	140	325	108	90	77
TH1 150/200	61540	200	876	160	180	146	118	115

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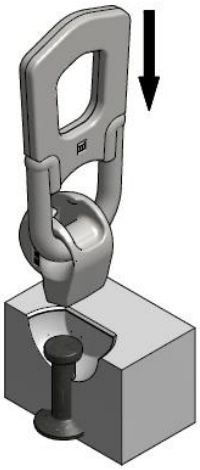
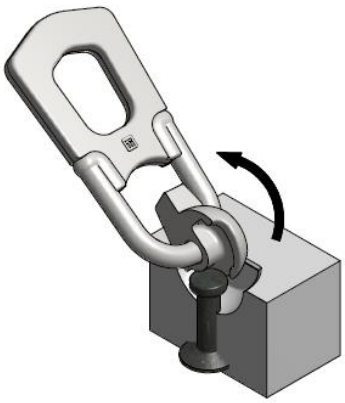
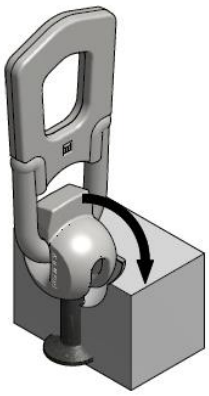
OPERATING INSTRUCTIONS



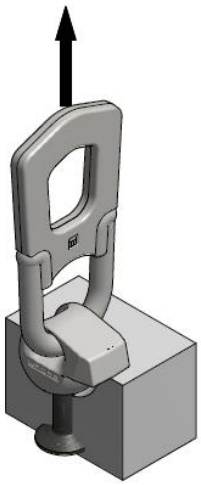
1
The clutch is placed in the right position.



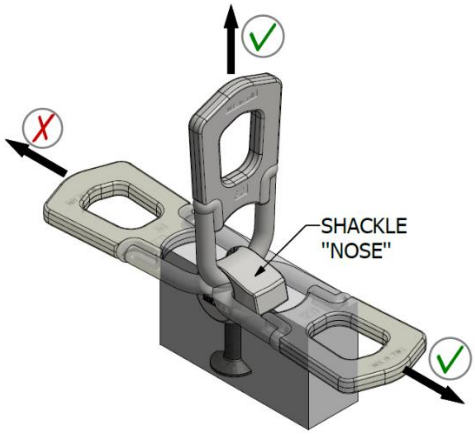
2
Rotate the shackle, until the opening corresponds with the anchor head.



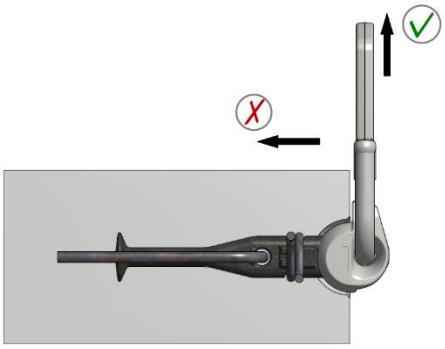
3
The shackle rotates to its locking position.



4
The nose of the shackle is pushed against the concrete element.

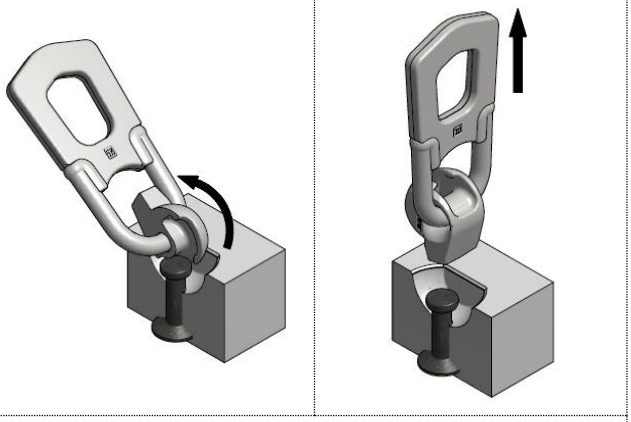


Angled lifting

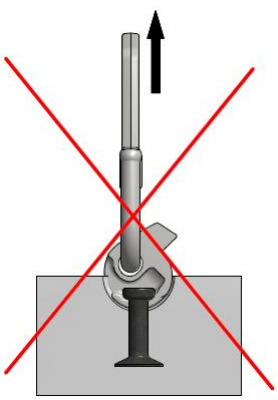


Tilt-up lifting

When tilting the concrete unit with the 3D lifting system, the nose must face the same direction as the load (see illustration above). Due to the counterweight of the nose, the shackle remains connected, even in an unloaded state. To release the 3D lifting system, the load hook is lowered and the shackle is turned up and out. The crane can only be withdrawn after the lifting system is completely detached from the recess and anchor. The 3D lifting system can remain attached to the crane hook until the next use.



Release operation after lifting



If the shackle remains in the position showed above, the lifting of the concrete unit is not allowed

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LIFTING CLUTCHES - SYSTEM MAINTENANCE

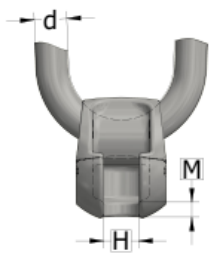
As with all lifting devices, the lifting systems TH1, TH2 and THR2 must be checked at least twice a year by trained personnel. Any defects found should be corrected before use. It is important to determine the amount of wear. The lettering and identification of the lifting system must be visible. If the shackle is deformed or the mouth opening is enlarged, the 3D lifting system must be taken out of use and cannot be repaired. If the limiting dimensions for H given in the tables below are exceeded or fall short for "M", the lifting system is not safe for further use. Repairs, especially welding operations on the lifting system are strictly forbidden. Do not combine our products with accessories from other manufacturers.

- ***Any deformation to the wire rope (see the type of damages mentioned on page 59), shackle, or metal structural elements causes a weakening of the lifting device with the risk of the precast element falling. Do not perform any repair work. The lifting device must be discarded. Lifting loops with broken strands or other signs of damage, kinking, bird caging, corrosion that require discarding according EN 13414-1 must not be used for further lifting.***

- ***Damage, distortions, cracks and extensive corrosion can reduce the load-carrying capacity and lead to failure. This causes a hazard to life and limb. If necessary, any affected parts must be taken out of service immediately.***

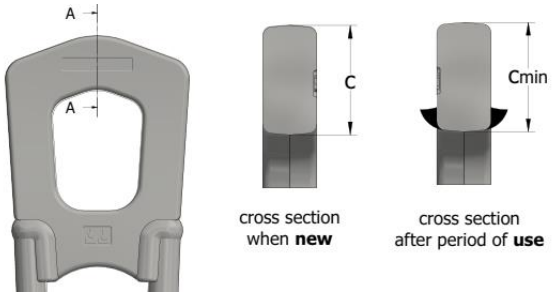
- ***Cables must not come into contact with acids, caustic solutions, or other aggressive substances.***

Shackle dimensions



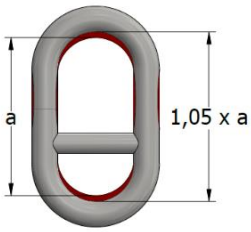
Checking TH caliber available on request

TH2 - Damage by severe wear.
Important! Do not remove or grind the edges formed by wear



Important! It is prohibited to repair any element damaged by misuse. Discard if there is any significant bending.

THR2 - Damage by wear



Wear limits for the lifting clutches:

TYPE	TH2 NUMBER	H MAXIMUM [mm]	M MINIMUM [mm]	CALIBRE "GO/NO-GO" NUMBER	d_{min} [mm]	c_{min} [mm]
TH2 13	43143	13	5.5	46193	10.8	16
TH2 25	43144	18	7	46194	12.6	20
TH2 50	43145	24	9	46195	18.5	28
TH2 100	43146	33	12	46196	26	40
TH2 200	43147	45	18	46197	36	60
TH2 320	43148	56	25	46198	45	80
TH2 450	44500	56	25	46199	47	85

TYPE	THR2 NUMBER	H MAXIMUM [mm]	M MINIMUM [mm]	CALIBRE "GO/NO-GO" NUMBER	d_{min} [mm]	a_{max} [mm]
THR2 40/50	45281	24	9	46195	18.5	147
THR2 75/100	45279	33	12	46196	26	162

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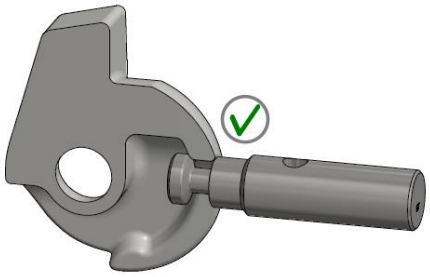
CHECKING THE LIFTING SYSTEM

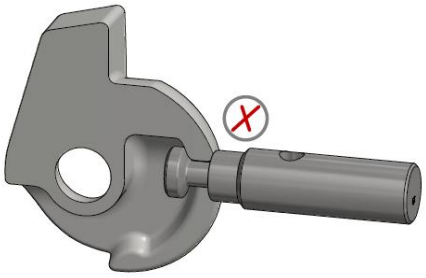
CHECKING DIMENSION “M”

The dimension “M” must be checked in this zone for the risk of fracturing during use.

ACCEPTABLE
Dimension “M” is greater than the minimum permitted.

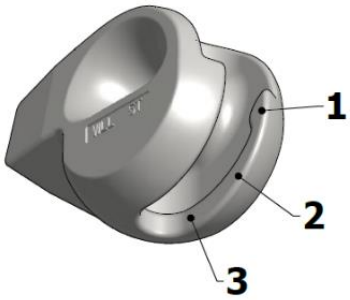


NOT ACCEPTABLE
In this case, dimension “M” is less than permitted.



CHECKING DIMENSION “H”

The “H” dimension must be checked in at least 3 zones for the risk of wearing out during use.



PRIMARY ZONE

ACCEPTABLE Dimension “H” is less than the maximum permitted.	NOT ACCEPTABLE In this case, dimension “H” is greater than permitted.
	

SECONDARY ZONE

ACCEPTABLE Dimension “H” is less than the maximum permitted.	NOT ACCEPTABLE In this case, dimension “H” is greater than permitted.
	

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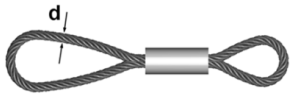
THE THIRD ZONE

ACCEPTABLE Dimension “H” is less than the maximum permitted.	**NOT ACCEPTABLE** In this case, dimension “H” is greater than permitted.
	

CHECKING WIRE CABLE

	**Cable type**	**Number of visible broken wires over a length of**		
		3d	6d	30d
	Stranded rope	4	6	16

d = cable diameter

Wire cables should be inspected and discarded according EN 13414-1 when the following flaws occur:

- Kinking
- One strand is broken
- Separation of the outer layer of braids
- Crushed strands
- Crushing at the shackle contact point with more than 4 ruptured wires on braided cables or more than 10 ruptured wires on cable-laid rope
- Signs of corrosion
- Damage to or severe wear of the closing bush.
- Signs of slipping between the cable and the closing bush
- A cable with several broken wires mentioned in the table above must be taken out of use

Types of wire rope damages		
		
Kinking	**Severe wear**	**Bird caging**
		
Broken wire	**Corrosion**	**Closing bush damage**

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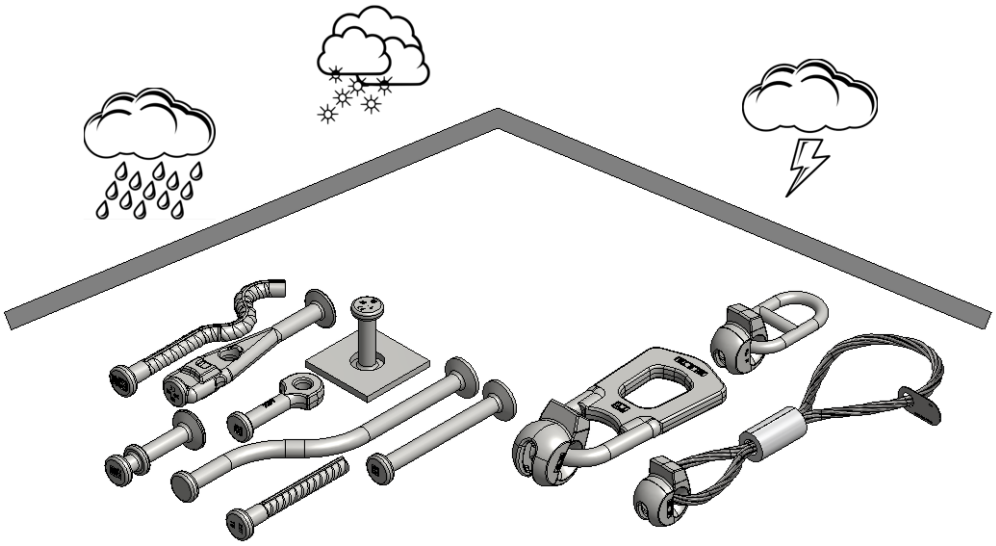
STORAGE REQUIREMENTS

Lifting systems and anchors must be stored and protected in dry conditions, under a roof. Large temperature variations, snow, ice, humidity, or salt and saltwater impact may cause damage to anchor and shorten the service life.



SAFETY INSTRUCTIONS

Warning: Use only trained personnel. Use the anchor and the lifting device by untrained personnel poses the risk of incorrect use or falling, which may cause injury or death. The lifting systems must be used only for lifting and moving precast concrete elements.

Obligatory instructions for safe working:

- All lifting anchors and lifting devices must be operated manually
- Visually inspect lifting anchors before use; check and clean all lifting anchor prior to use
- Hook in all lifting systems separately, without using force. Never use a hammer to close the lifting device.

Respect local regulations for safe lifting and hoisting at all times.

Incorrect use may result in safety hazards and reduced load-carrying capacity. This may cause the lifted object to fall and pose a hazard to life and limb. Lifting anchor systems must be used only by suitable trained personnel.

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ATTACHMENT OF THE SLOT - ANCHORS IN CONCRETE

There must be a cavity in the concrete in order to link the TH2 lifting clutch to the T-slot anchor. This cavity is spherical in shape and can be either a half ball or a small ball slot. Various support kits are available for making this recess. For a half ball cavity, the TH2 lifting clutch can be attached in any direction and can ultimately turn in the cavity during lifting until the lifting hook has reached its proper position. The RB recess former is the most practical.

RECESS FORMERS

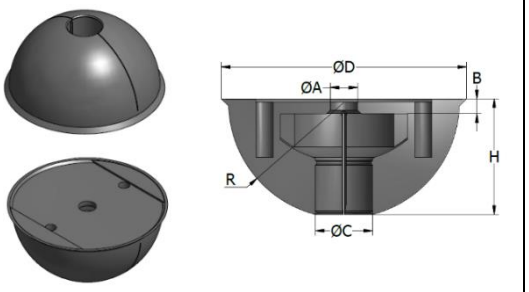
The anchors are fitted in the mould with a recess former. The cavity former, enables the lifting clutch to fit over the anchor. Because of the special design, there are no sharp edges on the precast element. The recess formers are of course available in the same range as the lifting clutches and the anchors. This is indicated by a load group, marked on the top.
The formers are mounted on the mould with fixing plates. After demoulding the element, the recess formers can be removed easily. Another option is represented by the magnetic and steel recess formers.

The standard recess formers are made of rubber shore 65° - 70°. The rubber used has a good resistance to demould oil. The formers will keep their original shape, even when they are heated up to 120°C. They can be used many times. The steel magnetic recess formers are manufactured without rubber.

RB – STANDARD RUBBER RECESS FORMER

The RB rubber recess former is used in combination with the T-slot anchor, O-anchor, TPA anchor, TKS, TSG anchor and TKSG anchor.

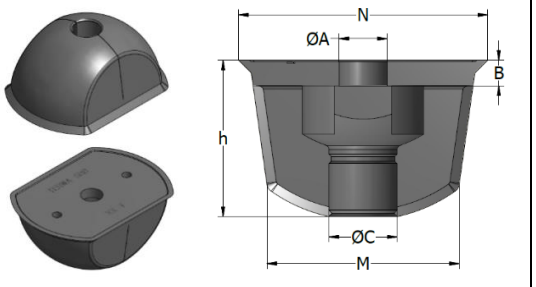
Rubber recess former RB		Load group	R	ØA	B	ØC	ØD	H
Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
RB-013	43905	13	30	9.5	9	10	66	32
RB-025	43906	25	37	14	7.5	14	80	39
RB-040/050	43907	50	47	15	11	20	100	48
RB-075	43908	75	60	15	10.5	24	128	61
RB-100	43909	100	60	15	10.5	28	128	61
RB-150	43910	150	80	19	10.5	38	170	80
RB-200	43911	200	80	19	10.5	40	170	80
RB-320/450	43677	320/450	108	22	15	50	236	107



SRB – NARROW RUBBER RECESS FORMER

The SRB narrow rubber recess former is used in combination with the T-slot anchor, O-anchor, TPA anchor, TKS, TSG anchor and TKSG anchor. Because of its minimal width, it is often used for thin elements, such as panels.

Rubber recess former SRB		Load group	ØA	B	ØC	h	M	N
Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
SRB-013	43949	13	9.5	7	10	29.5	37	47
SRB-025	43950	25	14	6	14	39	44	59
SRB-050	43951	50	15	8	20	49	60	78
SRB-075	43952	75	15	8	24	58	77	97
SRB-100	43953	100	15	8	28	58	77	97
SRB-150	49519	150	15	8	38	86	120	145
SRB-200	43954	200	15	8	40	86	120	145



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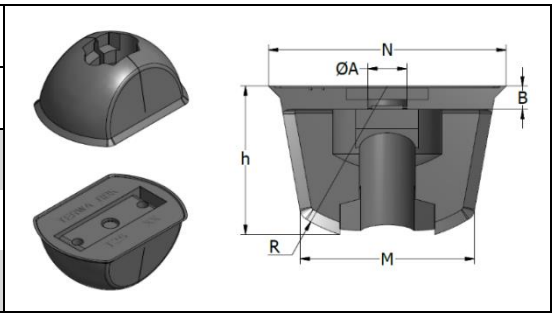
RBK – TKA RUBBER RECESS FORMER

The **RBK** rubber recess former is used in combination with the TKA tilt-up anchor

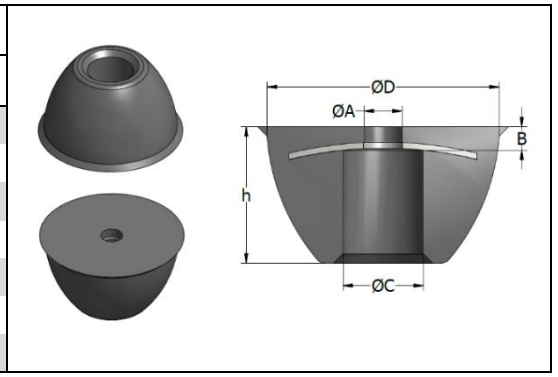
Rubber recess former RBK		Load group	R	ØA	B	h	M	N
Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
RBK-013	43946	13	33	8	6	32	36	49
RBK-025	43947	25	40	10	6	38	44	60
RBK-050	43948	50	55	12	8	53	55	78



RBP – RUBBER RECESS FORMER

The **RBP** rubber recess former is used in combination with the P anchor with collar

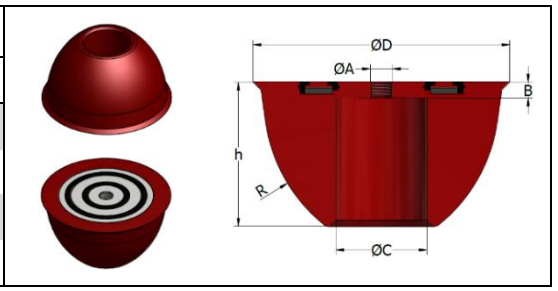
Rubber recess former RBP		Load group	h	ØA	B	ØC	ØD
Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
RBP-13-55 shore	44809	13	36	10	7	18.5	63
RBP-13-70 shore	43759	13	36	10	7	18.5	63
RBP-25-55 shore	44810	25	43.5	12	7	25.5	74
RBP-25-70 shore	43760	25	43.5	12	7	25.5	74
RBP-50-55 shore	44811	50	54	12	8	35.5	96
RBP-50-70 shore	44283	50	54	12	8	35.5	96
RBP-100-70 shore	44284	100	72	14	10	45	122



MPB – MAGNETIC RECESS FORMER

The MPB is made of polyurethane and can be used in combination with a P anchor. Can be used in any situation with steel formwork

Magnetic recess former MPB		Load group	ØA	B	ØC	ØD	h	R
Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
MPB-013	63839	13	M 10	8	18,7	64	33	32
MPB-025	63841	25	M 10	8	25.7	80	43.5	69
MPB-050	63842	50	M 12	8	35.7	101	54	65
MPB-100	63843	75/100	M 12	8	45.7	129	72	80



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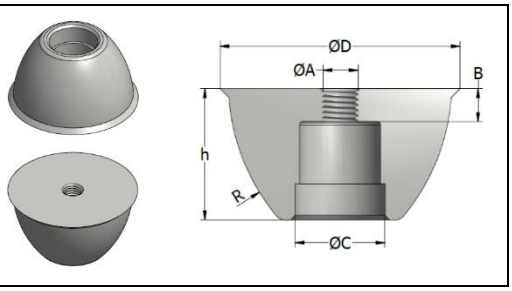
SBK – STEEL RECESS FORMER

The SBK steel recess former is made of steel S355JO and is used in combination with a T-slot anchor, O anchor, TPA anchor, TKS anchor and TKSG anchor. When these anchors are used, a rubber ring RR should be fitted as well.

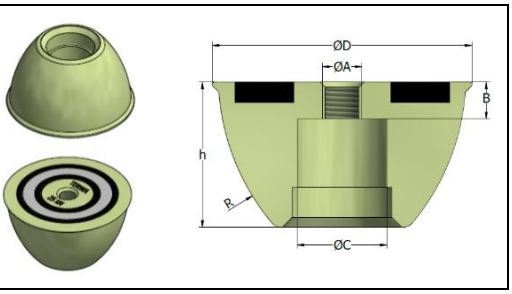
Round steel recess former SBK		Load group	ØA	B	ØC	ØD	h	R
Description	Product no.	[kN]		[mm]	[mm]	[mm]	[mm]	[mm]
SBK-013	44404	13	M12	11	20	63	36	32
SBK-025	45855	25	M12	11	30	80	43.5	69
SBK-050	45856	50	M12	13	37	101	54	65
SBK-100	45857	100	M16	15	48	129	72	80



SBKM – STEEL RECESS FORMER WITH MAGNET

The SBKM steel recess former with magnets is made of S355 galvanised and is used in combination with T-slot anchor, O anchor, TPA anchor, TKS, TSG anchor and TKSG anchor. When these anchors are used, a rubber ring RR should be fitted as well. These recess formers are mostly applied in an upside-down position.

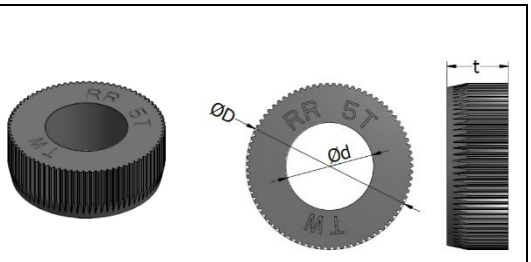
Round steel recess former SBKM		Load group	ØA	B	ØC	ØD	h	R
Description	Product no.	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
SBKM-013	64611	13	M12	11	20	63	36	32
SBKM-025	64612	25	M12	11	30	80	43.5	69
SBKM-050	64613	50	M12	13	37	100	54	65
SBKM-100	64614	100	M16	15	48	129	72	80



RR – RUBBER RING

The rubber ring is used when a T-slot anchor, O anchor, TPA anchor, TKS, TSG anchor and TKSG anchor are fitted in an SBKM steel recess former or SBK to close off the cavity and keep it free of concrete.

Rubber ring RR		Load group	D	d	t
Description	Product no.	[kN]	[mm]	[mm]	[mm]
RR-013	43966	13	21	10	11
RR-025	43967	25	31	14	12
RR-040/050	43968	50	38	20	14
RR-075	43813	75	49	24	20
RR-100	43969	100	49	28	20



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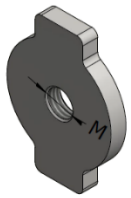
FIXING ACCESSORIES FOR THE RUBBER RECESS FORMERS

IP – FIXING PLATE

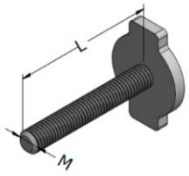
Fixing plate IP		Load group	Thread
Description	Product no.	[kN]	M
IP-013	43913	13	M8
IP-025	43914	25	M10
IP-050	43915	50	M10
IP-075/100	43916	75/100	M12
IP-150/200	43917	150/200	M12
IP-320	43918	320	M16



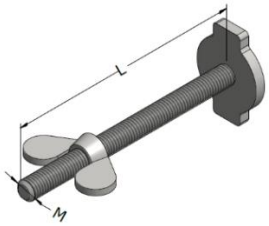
IPD – FIXING PLATE WITH THREADED ROD / IPDV – FIXING PLATE WITH THREADED ROD AND WING NUT

Fixing plate with threaded rod IPD		Fixing plate with threaded rod and wing nut IPDV		Load group	Thread	L
Description	Product no.	Description	Product no.	[kN]	M	[mm]
IPD-013	44051	IPDV-013	43081	13	M 8	100
IPD-025	44052	IPDV-025	43082	25	M 10	100
IPD-050	44053	IPDV-050	43083	50	M 10	100
IPD-075/100	44054	IPDV-075/100	43084	75/100	M 12	100
IPD-150/200	44055	IPDV-150/200	43085	150/200	M 12	100
IPD-320	44056	IPDV-320	43086	320	M 16	100

IPD



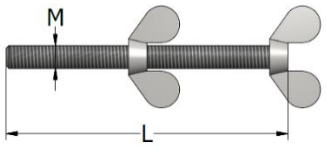
IPDV



TDV – THREAD HOLDING SCREW

The TDV is used for mounting the recess former on the steel formwork. It is fitted with two wing nuts, of which the one at the end is locked.

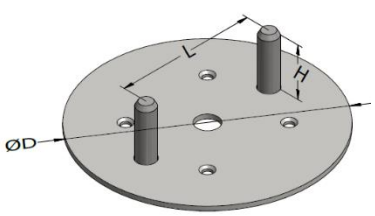
TDV		Load group	Thread	L
Description	Product no.	[kN]	[mm]	[mm]
TDV-3D-013	44589	13	M8	110
TDV-3D-025/050	44590	25–50	M10	110
TDV-3D-075/200	44591	75–200	M12	110
TDV-3D-320	44592	320	M16	110



OPR – MOUNTING PLATE

The OPR is available for mounting the RB recess former on the formwork. The recess former can easily be fitted on the two pins. The OPR also ensures that the recess former remains completely closed while pouring the concrete. The OPR can be nailed or welded to the formwork.

Holding plate OPR		Rubber recess former RB	Load group	D	L	H
Description	Product no.	Description	[kN]	[mm]	[mm]	[mm]
OPR-013	46058	RB-013	13	66	38	17
OPR-025	46059	RB-025	25	80	50	20
OPR-050	46060	RB-050	50	100	60	26
OPR-075/100	46061	RB-075/100	75/100	128	80	31
OPR-150/200	46062	RB-150/200	150/200	170	110	39
OPR-320	46063	RB-320	320	236	128	54



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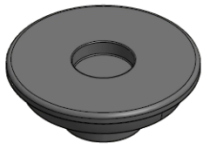
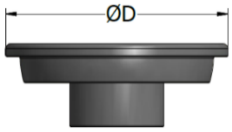
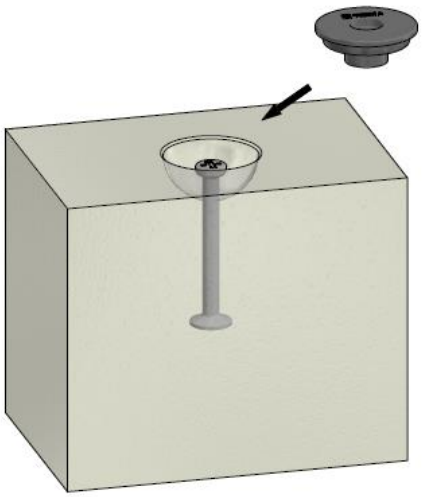
TAF – PROTECTION COVER

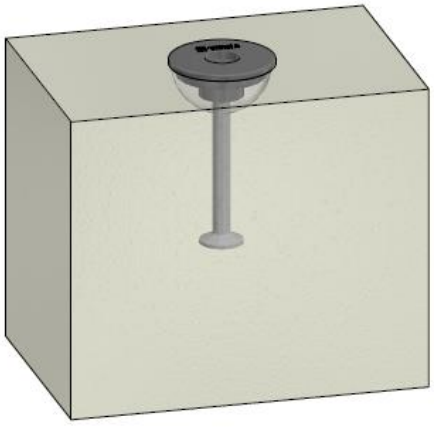
The TAF-protection cover ensures good protection for the anchor and the recess against water, ice or dirt when the concrete precast elements are stored outside.

Protection cover TAF		Load group	D
Description	**Product no.**	**[kN]**	**[mm]**
TAF-013	43170	13	70
TAF-025	43171	25	85
TAF-050	43172	50	104
TAF-075/100	43173	75/100	130
TAF-150/200	46517	150/200	175
TAF-320	46519	320	241





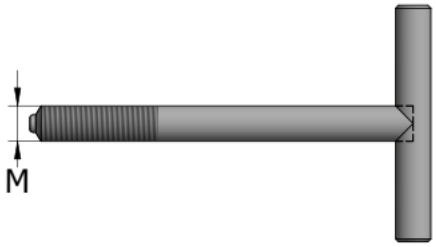




During outside storage, we recommend sealing the recess in concrete to protect against water, ice or dirt.

SBKM – EXTRACTOR

SBKM EXTRACTOR is a special tool used for detaching the SBKM and MPB recess former from the steel formwork. They are made in three variants according to the central threaded hole of SBKM or MPB recess former.



Designation	Article number
SBKM EXTRACTOR M10	66796
SBKM EXTRACTOR M12	65838
SBKM EXTRACTOR M16	65841

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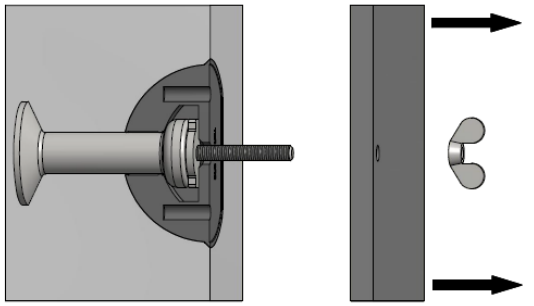
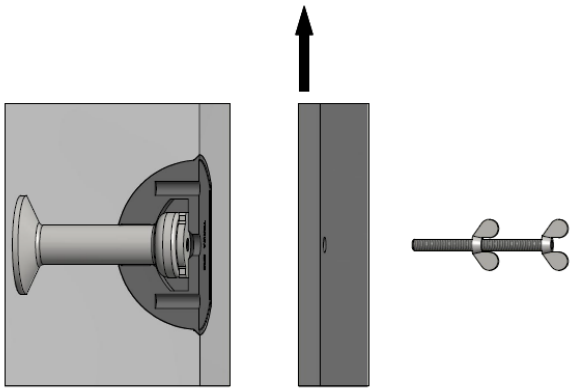
GENERAL INSTRUCTIONS FOR INSTALLATION AND USE

RUBBER RECESS FORMERS

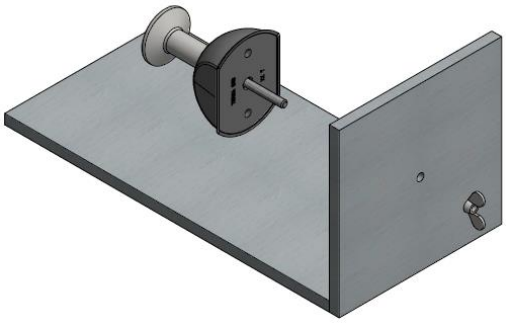
- *If the formwork can only be removed sideways, the fixing plate with a threaded rod IPD or IPDV should be used.*

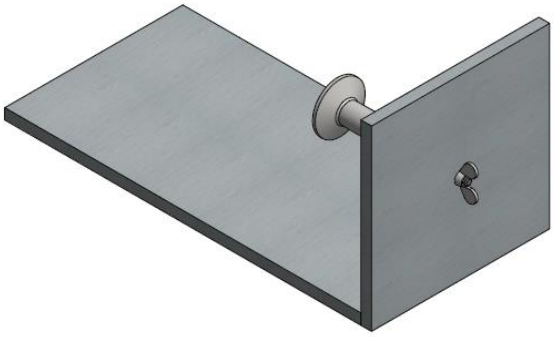


- *If the formwork can only be removed vertically, the fixing plate IP in combination with the threaded screw TDV should be used.*

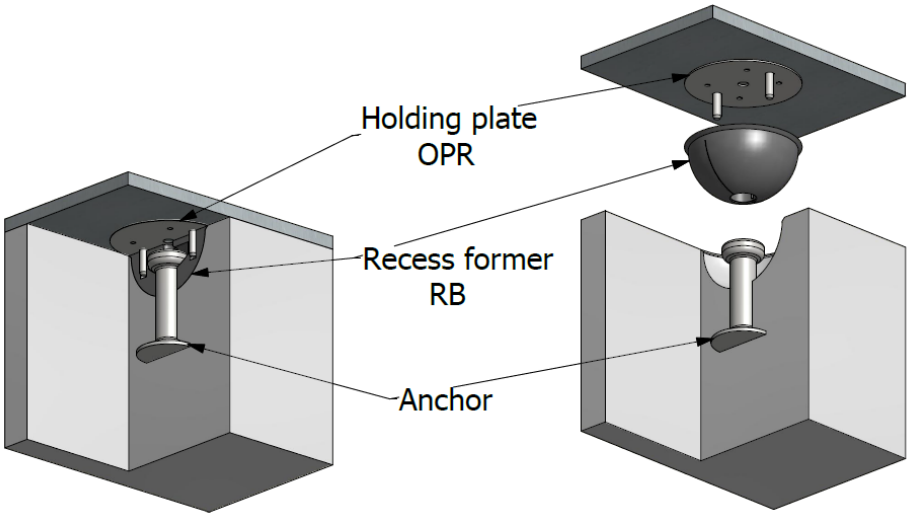


- *The fixing plate with a threaded rod IPD or IPDV and the anchor is fitted in the opened recess former. The recess former is mounted to the formwork with the wing nut. The nut is then tightened securing the recess former and the anchor firmly in position.*





- *For wooden formwork, the recess former can be mounted with the OPR mounting plate. The pins on the OPR ensure that the recess former remains closed when pouring concrete. The OPR is mounted on the formwork with nails.*



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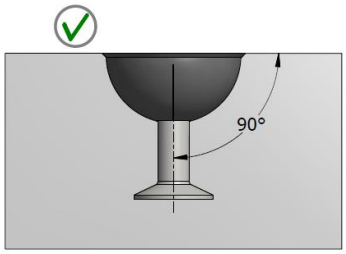
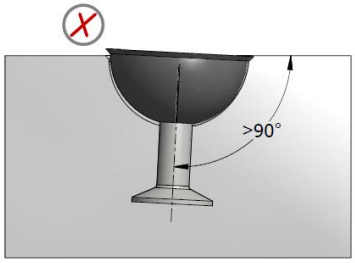
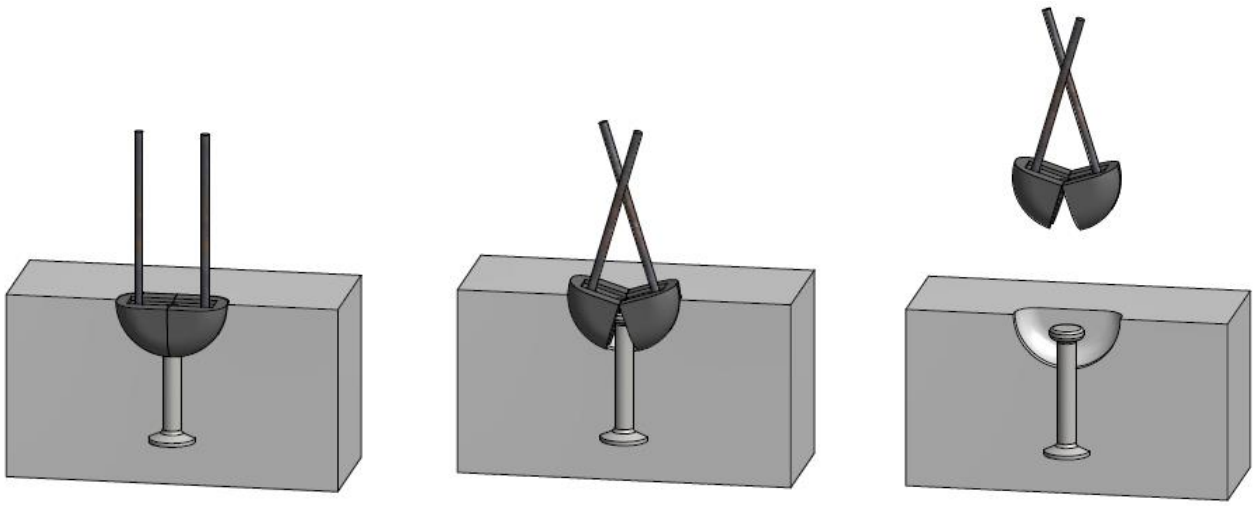
ANCHOR INSTALLATION USING RUBBER RECESS FORMER

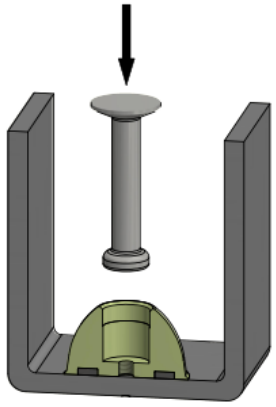
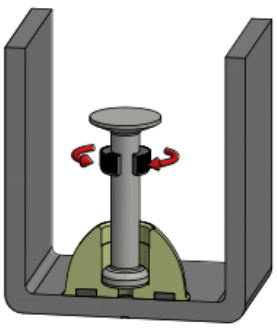
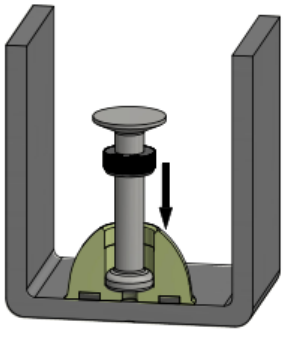
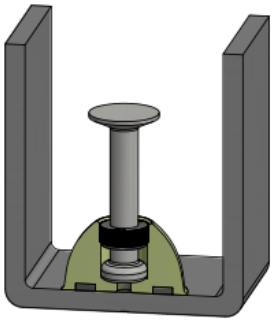
	
CORRECT	**INCORRECT**

REMOVAL OF THE RUBBER RECESS FORMER

Two pieces of rebar steel can be inserted in the recess former holes. Using these rods, the former bends open and can be removed from the anchor. Excessive concrete should be removed beforehand. Do not use a hammer or any other tools, as these can damage the recess former.



STEEL RECESS FORMER

ANCHOR INSTALLATION USING STEEL RECESS FORMER			
Attach the SBKM recess former in the set position. Before installation, be sure that the surface of the formwork is clean. Insert the anchor head in SBKM.	Slide the rubber ring onto the anchor. It is necessary to grease both the rubber ring and anchor head before use.	Push the rubber ring into the hole in the SBKM recess former until it is flush.	Ensure the anchor is securely fitted and tied before pour the concrete.
			

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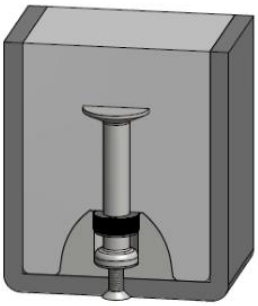
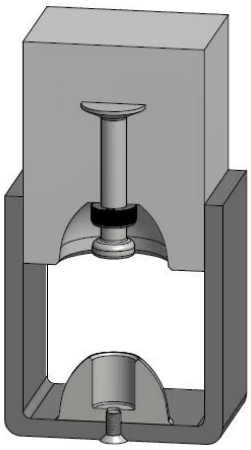
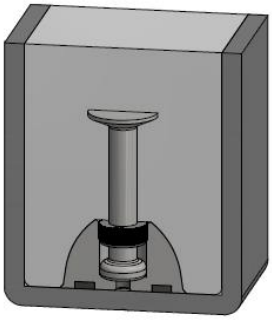
Steel recess former - SBK

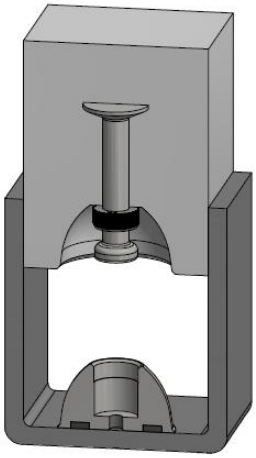




The steel recess formers SBK and SBKM are always used in combination with a rubber ring. The rubber ring ensures that the anchor fits snugly in the former. Moreover, the rubber ring prevents concrete pouring into the recess former.
We recommend lubricating both the anchor head and rubber ring with formwork oil before installation. When the precast element is lifted out of the mould, the anchor and rubber ring detach themselves easily from the recess former.

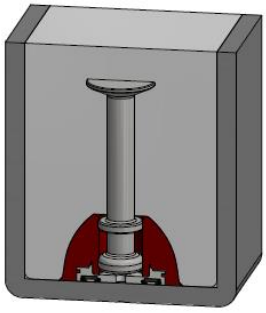
Steel recess former with magnets - SBKM

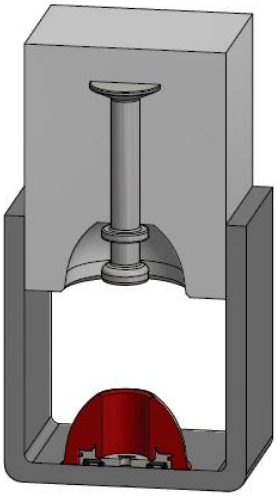




When using this magnetic recess former, it is very important that the surface of the formwork is clean. After demoulding, the magnetic former can be removed from the formwork with a screw.

Magnetic recess former for P-anchor - MPB





The MPB recess former with magnets is made of polyurethane resin and is used in combination with P anchor. These recess formers are mostly applied in an upside-down position.

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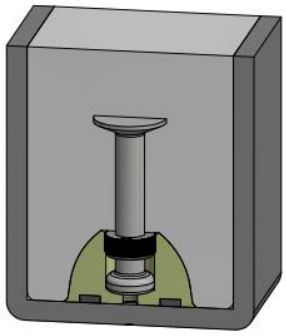
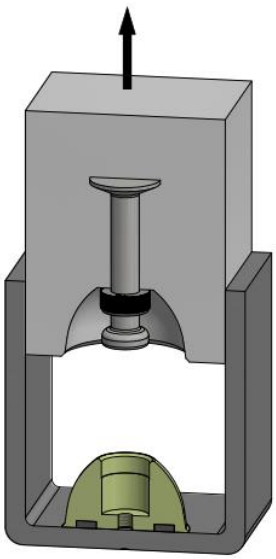
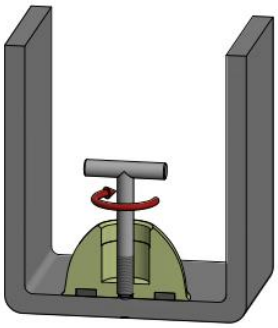
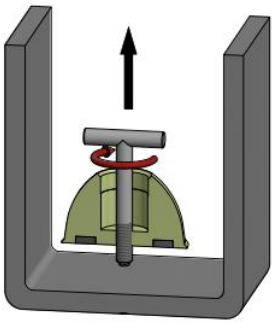
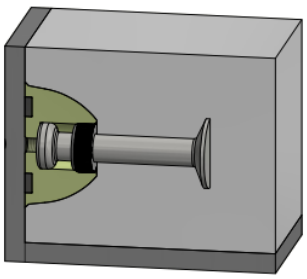
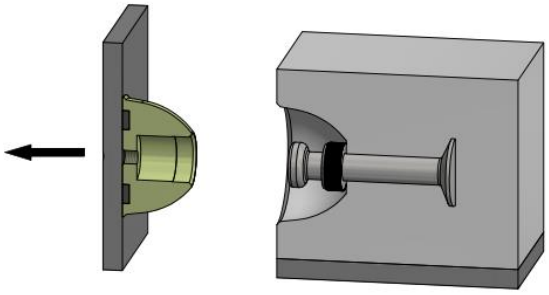
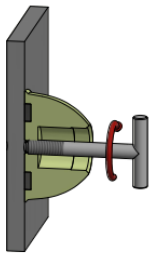
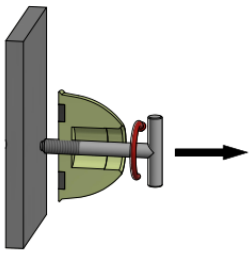
SBKM AND MPB EXTRACTOR APPLICATIONS

SBKM installation at the bottom of the formwork			
Pour and compact the concrete.	When the precast element is lifted from the formwork the rubber ring will slide out easily of the SBKM recess former.	For disassembly, screw the SBKM extractor into the magnetic recess former until this detaches from the formwork.	
			

SBKM installation on the vertical part of the formwork		
Pour and compact the concrete.	When the lateral part of the formwork is removed, the rubber ring will slide out easily of the SBKM recess former.	For disassembly, screw the SBKM extractor into the magnetic recess former until this detaches from the formwork.
		 

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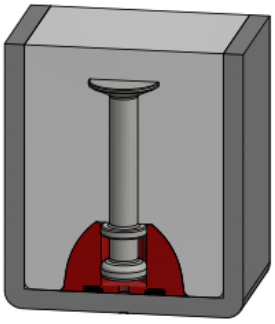
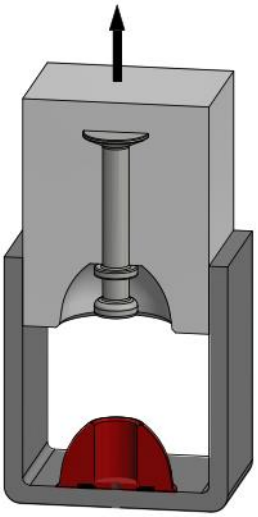
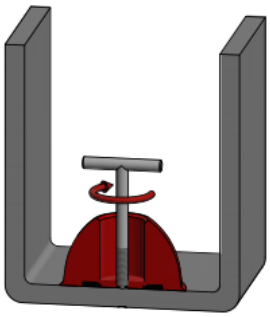
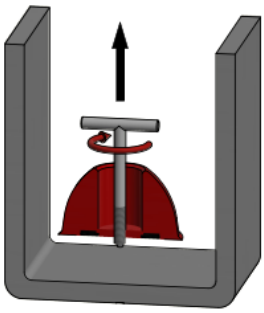
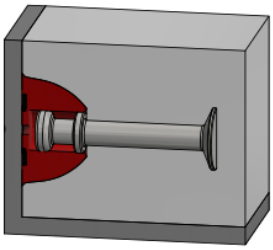
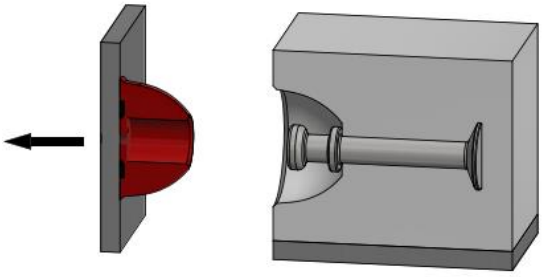
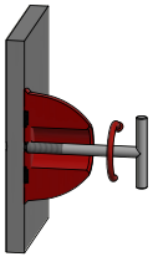
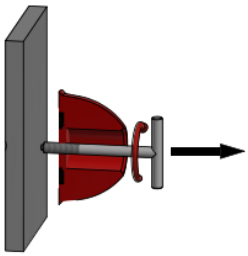
MPB installation at the bottom of the formwork			
Pour and compact the concrete.	When the precast element is lifted from the formwork the P-anchor head will slide out easily of the MPB recess former.	For disassembly, screw the SBKM extractor into the magnetic recess former MPB until this detaches from the formwork.	
			

MPB installation on the vertical part of the formwork		
Pour and compact the concrete.	When the lateral part of the formwork is removed, the P-anchor head will slide out easily of the MPB recess former.	For disassembly, screw the SBKM extractor into the MPB magnetic recess former until this detaches from the formwork.
		 

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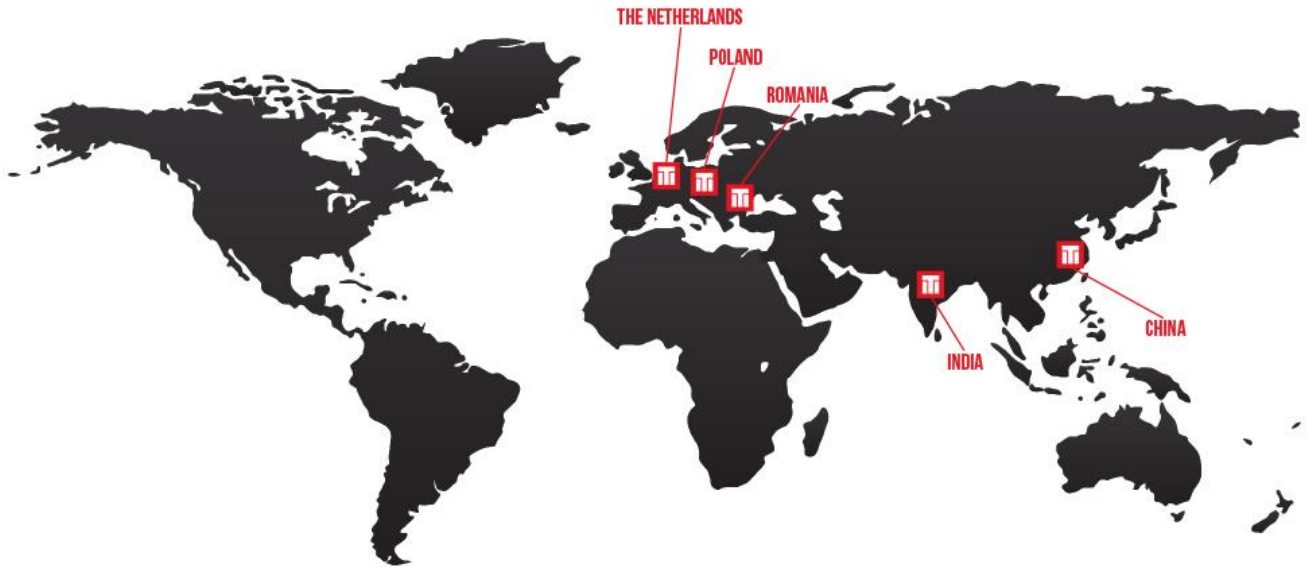

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