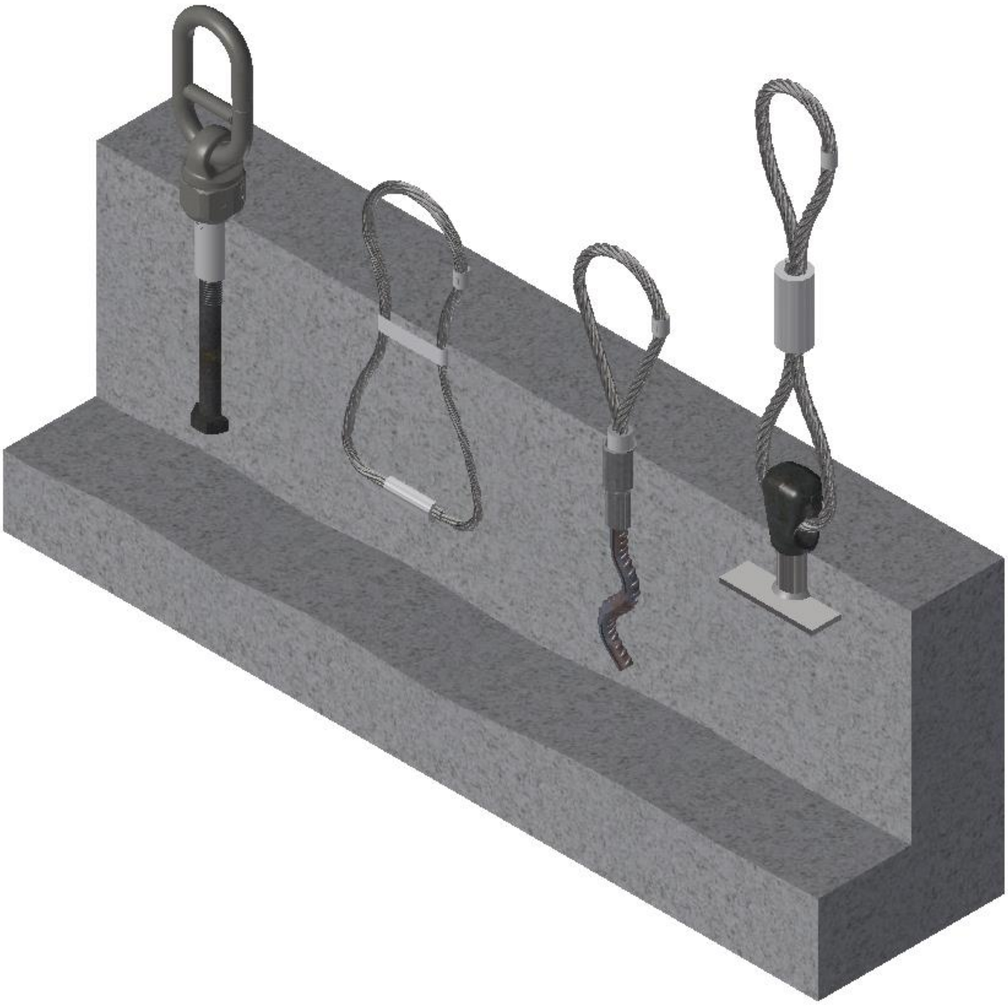
1D-THREAD LIFTING SYSTEMS



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OVERVIEW

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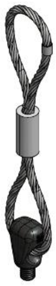
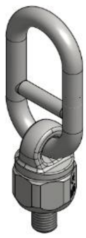
THL  Page 36	**THS1**  Page 38	**THS3-HD**  Page 40	**TIL**  Page 44	
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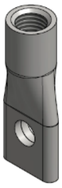
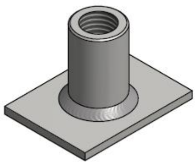
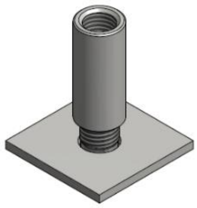
HSB – with stopper  Page 30	**HSR**  Page 31	**HSP**  Page 33	**HBP**  Page 35	
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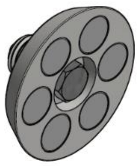
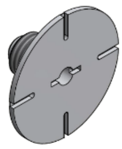
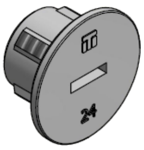
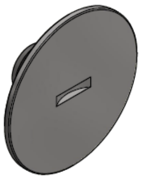
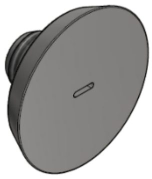
SN  Page 47	**KU-10**  Page 48	**TPM**  Page 49	**KU-02**  Page 49	**TBP**  Page 50
DATA CLIP  Page 50	**PLASTIC PLUG**  Page 51	**TP-02**  Page 52	**COVER SEALING CAP**  Page 53	

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INTRODUCTION

Thread-lifting systems are used in the precast industry and are suitable for lifting, transportation and installation of precast concrete elements on site.
Some of the advantages of this system are:
- a wide range of lifting sockets,
- threaded lifting loops and cast-in lifting loops,
- possibility to establish a connection in a simple and safe manner,
- most of the lifting systems can be re-used
- CE conform system. All Terwa lifting systems are CE marked which guarantees the alignment to the European regulations.

The Thread-lifting system combines a lifting anchor embedded in concrete unit and a lifting device.
The design for Terwa threaded lifting anchors and technical instructions are according to the national German rule VDI/BV-BS6205 “Lifting inserts and lifting insert for precast concrete elements”. Also, based on this rule the lifting systems must ensure that they have enough strength to avoid the concrete failure.

LIFTING SYSTEMS

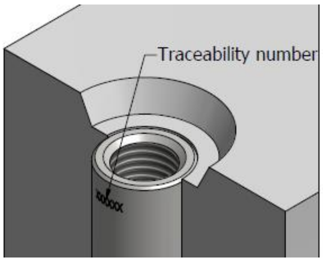
- **RE-USABLE LIFTING SYSTEM AND TRANSPORT ANCHORS**
  - Anchor made from a socket swaged to wavy reinforcement steel.
  - Plain socket lifting inserts.
  - Socket welded to a plate.
  - Anchor made from a socket swaged to a standard screw for thin units.
  - A lifting loop manufactured from high grade steel wire swaged in a steel ferrule.
  - Different accessories for recess forming or fixing of inserts on formwork.

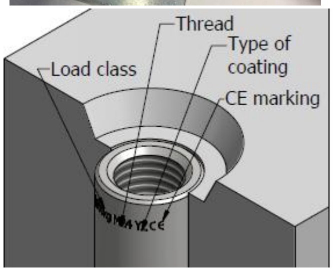
- **CAST-IN LIFTING SYSTEM**
  - Steel wire swaged forming a loop without additional tail.
  - Can be used with standard crane hook.
  - Cut off after use.

- **CONNECTING ELEMENTS AND FIXING ACCESSORIES**
  - Thread connections
  - Fixing Accessories

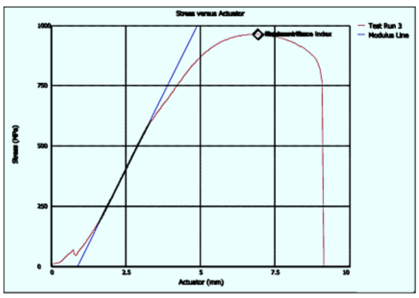
Quality
Terwa control all the time the production process for the anchors from strength, dimensional, material quality point of views and all the required inspections for a superior quality system. All the products are tracked starting from the material acquisition to the final product, ready to be used.

Marking and traceability
All anchors and lifting clutches are CE marked and haves all necessary dates for traceability, thread type and load class.





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



CE MARKING

CE marking means that a product is produced and controlled in accordance with a harmonized European standard (hEN) or a European Technical Approval (ETA). ETA can be used as basis for CE marking in cases where no harmonized EN standard is available. However, ETA is voluntary and not required by EU directives or legislation.

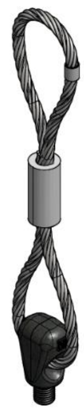
Manufacturers may use CE marking to declare that their construction products meet harmonized European standards or have been granted ETA Approvals. These documents define properties the products must have to be granted the right to use CE marking and describe how the manufacture of these products is supervised and tested.

EU's Construction Products Regulation takes effect in full on 1 July 2013. Detailed building parts, such as connections used in concrete constructions, do not have any harmonized EN standards, excluding lifting items and devices, which are regulated in the EU Machinery Directive. For steel constructions CE marking, will become mandatory as of 1 July 2014, as regulated in the EU Construction Products Directive.

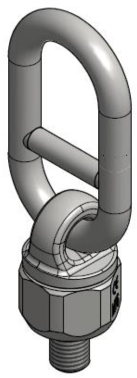
GENERAL GUIDANCE FOR LIFTING WITH TERWA THL, THS1 and THS3

Ensure that the concrete has at least 15 MPa strength before start lifting.
The first choice for most lifting applications is the Lifting Socket with Waved rebar tail (TGK, TGL). For positioning the inserts always check the permitted edge distances and spacing between inserts.
We recommend restricting the lift angle to a maximum of 30° when an angled lift is necessary.
For a proper choosing of lifting system consider how frequently the precast unit is going to be lifted.
The cast in threaded elements (anchors or fixing inserts) can be flush or recessed for corrosion protection.
This recess is filled with fine concrete after use.
All the Lifting Systems are tested before delivery under a test load three times the working load (individual test for THS1 and THS3, test for every batch of THL and TIL).

THL



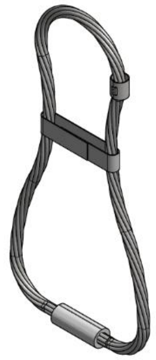
THS1

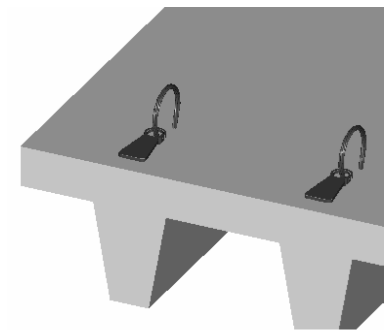


THS3

GENERAL GUIDANCE FOR CAST-IN WIRE LOOP SYSTEMS

Cast-in lifting loops TIL are used for lifting the precast concrete elements, especially beams. The lifting loop can be easily placed in the reinforcement cage of a precast unit. A part of the lifting system remains out of the precast element to mount the crane hook and lift.





TIL

TECHNICAL INFORMATION – CHOOSING THE TYPE OF ANCHOR

INTRODUCTION

Terwa has 3 types of lifting systems:

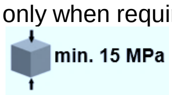
- 1D Threaded lifting system
- 2D Strip anchor lifting system
- 3D T slot anchor lifting system

For all these types the way of choosing the anchor is identical and it depends on the way of lifting and/or experience is the reason of chosing one of the mentioned types.

The1D 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 a small limitation for the 2D Strip anchor lifting system. The difference between the 2D Strip anchor lifting system and the 3D T slot anchor lifting system is mainly caused by the experience in using the one or the other system.
For the calculation of the anchors Terwa also has software for this, with which calculations can be made.

SAFETY RULES

The lifting system consists of a threaded anchor embedded in concrete and a threaded lifting device. The threaded lifting loop is connected to the anchor only when required for lifting. **Ensure that the concrete has reached at least 15 MPa strength before starting the lifting.**



These lifting systems are not suitable for severe re-use.
In designing the lifting system, it is essential to use the following safety factors against breaking:

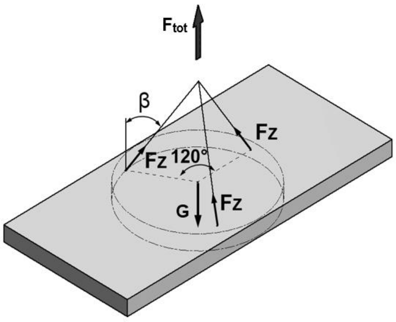
- **for steel component** **c = 3**
- **for concrete element** **c = 2.5**
- **for steel wires** **c = 4**

The maximum load permitted on the components quoted in the tables has been obtained by applying a safety factor on test data.

ANCHORS LIFTING CONDITIONS

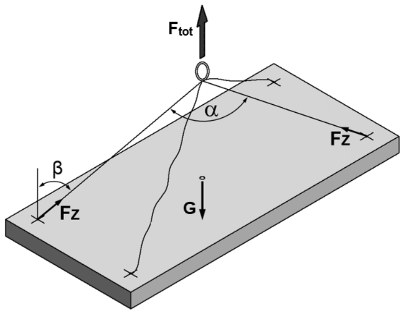
Using three anchors arranged at the same length on from each other like in the figure, can be assumed three load bearing anchors.

Load bearing anchors: **n=3**



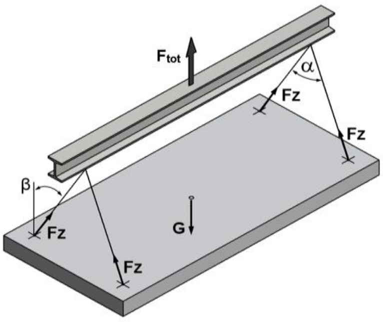
Using four anchors lifted without a spreader beam, only two anchors can be assumed load bearing anchors.

Load bearing anchors: **n=2**



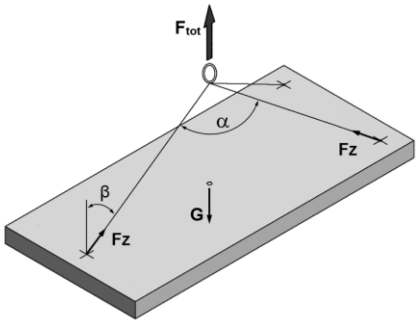
A perfect force distribution is assumed using a spreader beam.

Load bearing anchors: **n=4**



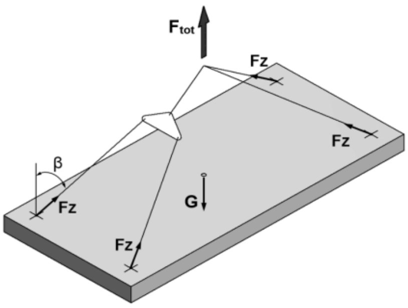
If the anchors are positioning asymmetrically only two bearing anchors can be assumed.

Load bearing anchors: **n=2**



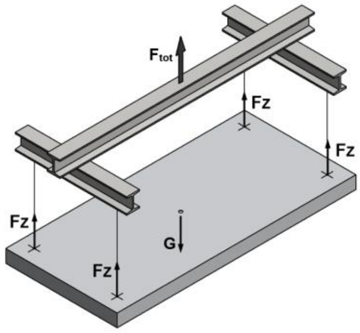
The compensated lifting slings ensure equal force distribution.

Load bearing anchors: **n=4**

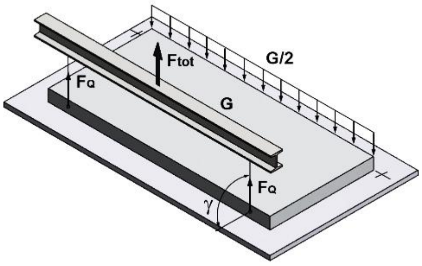


A perfect static weight distribution can be obtained using a lifting beam and two pairs of anchors set out symmetrically.

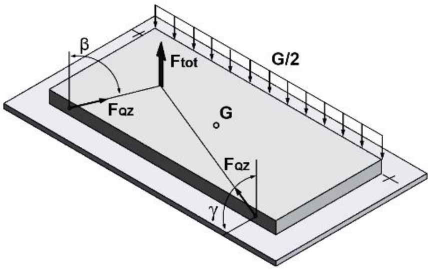
Load bearing anchors: **n=4**



When the element is lifted without lifting table at a straight angle and the contact is kept with the ground. Additional shear reinforcement is required.



When the element is lifted without lifting table, angled and the contact is kept with the ground. Additional shear reinforcement is required. ***ß ≤ 30º***



ASYMETRIC DISTRIBUTION OF THE LOAD

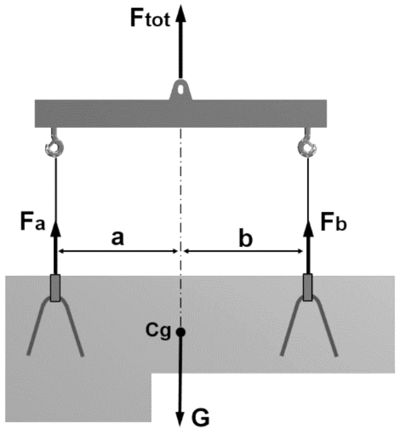
In case of asymmetrical elements before installing the anchors, calculate the loads based on the center of gravity position. The load of each anchor depends on the embedded position of the anchor in the precast unit and on the transporting mode:

a) If the arrangement of the anchors is asymmetrical in relation to the center of gravity, the individual anchor supports different loads. The load distribution in asymmetrical installed anchors when a spreader beam is used the forces on each anchor is calculated with the equation bellow:

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

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

Note: To avoid tilting of the element during transport, the load should be suspended from the lifting beam so that its center of gravity (Cg) is directly below the crane hook.



b) In the case of transporting without lifting beam, the load on the anchor depends on the cable angle (ß).

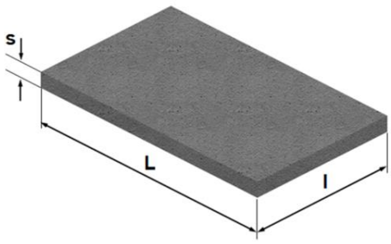
LOAD CAPACITY

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

- The deadweight of the precast concrete element “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 at the time of operating: lifting or transporting
- The embedded depth of the anchor
- Dynamic forces
- The reinforcement arrangement

WEIGHT OF PRECAST UNIT

The total weight “G” of the precast reinforced concrete element is determined using a specific weight of: **ρ = 25kN/m³.** For prefabricated elements that are composed of a higher concentration of reinforcing elements in the calculation of weight will take this into account.



$\mathbf{G} = \boldsymbol{\rho} \times \mathbf{V}$

$\mathbf{V} = \boldsymbol{L} \times \boldsymbol{l} \times \boldsymbol{s}$

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

ADHESION TO FORMWORK COEFFICIENT

When a precast element is lifted from the formwork, adhesion force between element and formwork appear. This force must be considered for the anchor load calculation and depends of the total area in contact with the formwork and the shape of the precast element and the material of the formwork. The value “H_a” of adhesion to the formwork is calculated through the following equation:

$\boldsymbol{H_a} = \boldsymbol{q} \times \boldsymbol{A}\ [\boldsymbol{kN}]$

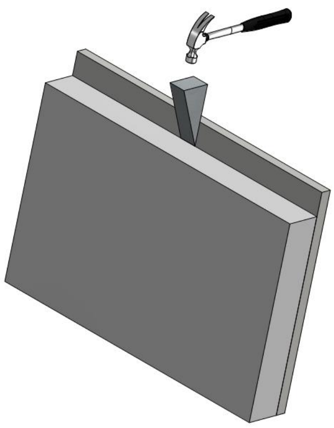
Where:
q- the adhesion to formwork factor according with the material of the formwork
A - the area of contact between the formwork and the concrete element when starting the lift

Adhesion to the formwork	
oiled steel formwork	$q \geq 1\ kN/m^2$
varnished timber formwork	$q \geq 2\ kN/m^2$
rough timber formwork oiled	$q \geq 3\ kN/m^2$

In some cases, like π - panel or other special shaped elements an increased adhesion coefficient must be considered.

Adhesion to the formwork	
Double T beam	$H_a = 2 \times G\ [kN]$
Ribbed elements	$H_a = 3 \times G\ [kN]$
Waffled panel	$H_a = 4 \times G\ [kN]$

Where:
G - dead weight of the element.



Adhesion to the formwork should be minimized 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, short vibration for detachment, using wedges).

DYNAMIC LOADS COEFFICIENT

When the movement of the precast units is performed by lifting gear, dynamic forces which depend on the lifting gear used appear. The lifting classes are described in DIN 15018.

Lifting class	Lifting load coefficient "f" at lifting speed vh	
	Up to 90 m/min	Over 90 m/min
H 1	1.1 + 0.002 vh	1.3
H 2	1.2 + 0.004 vh	1.6
H 3	1.3 + 0.007 vh	1.9
H 4	1.4 + 0.009 vh	2.2

Lifting equipment	Dynamic coefficient "f"
Rail crane, swing-boom crane and fixed crane	1.3 *)
Lifting and transporting on level terrain	2.5
Lifting and transporting on uneven terrain	≥ 4.0
*) lower values may be appropriate in precast plants if special arrangements are made.	

For cranes with precision lifting, such as those in manufacturing plants the lifting load coefficient is $f = 1.1 \div 1.3$.

IN THE PRECAST YARD:
- for lifting out of the formwork $f = 1.1$
- for tilt-up and transport $f = 1.3$

ON SITE:

- for tilt-up/transport/install $f = 1.5$
- when transporting suspended precast elements over uneven terrain, the lifting load coefficient used is $f > 2$.

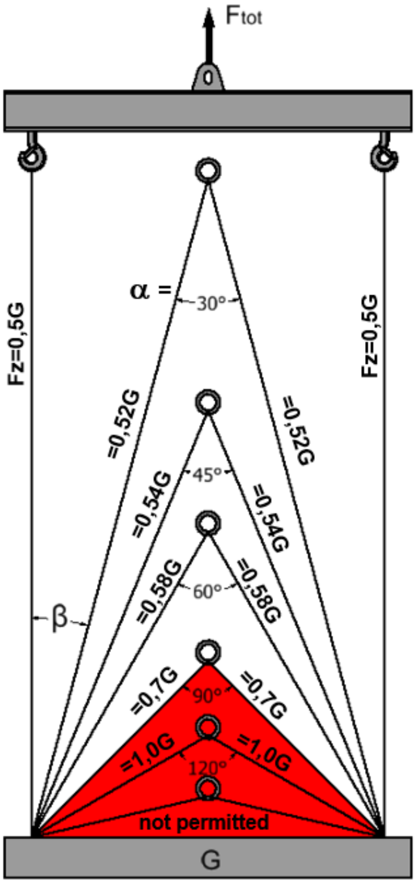
For special transport and lifting cases the dynamic coefficient is established based on the tests or on proven experience.

LIFTING AT AN ANGLE – CABLE ANGLE COEFFICIENT

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 suspending chain. We recommend that, if possible, β should be kept to $\beta \leq 30^o$. The tensile force on the anchor will be increased with a cable angle coefficient "**z**".

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

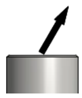
where:
z - cable angle coefficient
n - number of load bearing anchors



Cable angle β	Spread angle α	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 ß ≤ 30°**

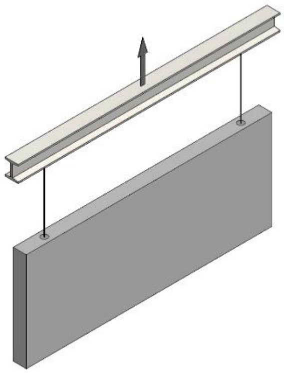
Note: If no lifting beam is used during transport, the anchor must be embedded symmetrically to the load.

Lifting symbols used in the documentation	
Axial pull in direction of anchor axis.	
Transverse pull perpendicular to the anchor axis.	
Angled pull, lifting at an angle to the anchor axis	

LOAD DIRECTIONS

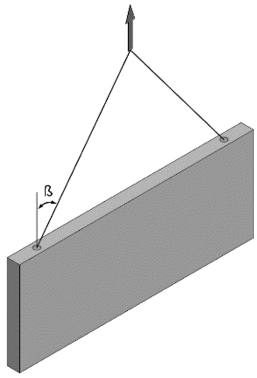
During the transportation and lifting various cases can occur, such tilt-up, rotation, hoisting and of course the installation. The lifting anchor and clutches most carry all this cases and combinations. Therefore, the load direction is a very important factor for a good anchor selection.

Axial load **ß = 0º to 10º**



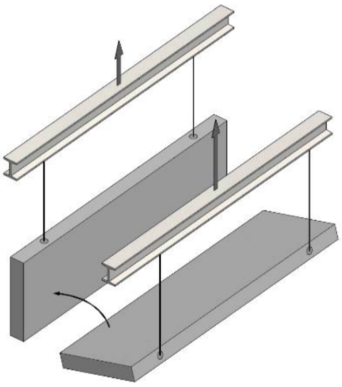
Diagonal load **ß = 10º to 45º**

Note: is recommended ***ß ≤ 30º***

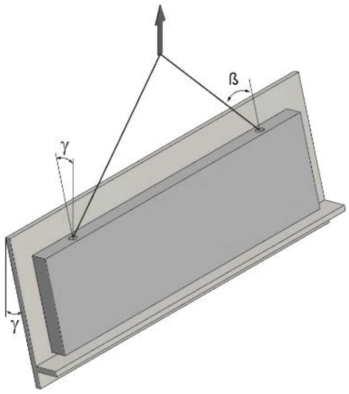


Tilting γ **= 90º**

Additional shear reinforcement steel must be used.

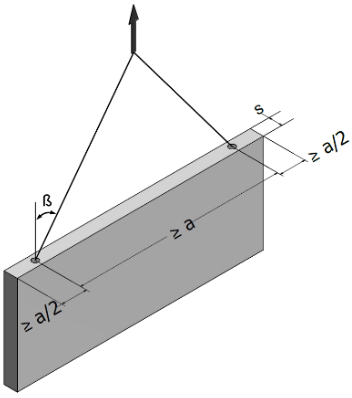


When a tilting table is used, the anchors can be used without the additional shear reinforcement steel, not exceeding the angle γ **< 15º**

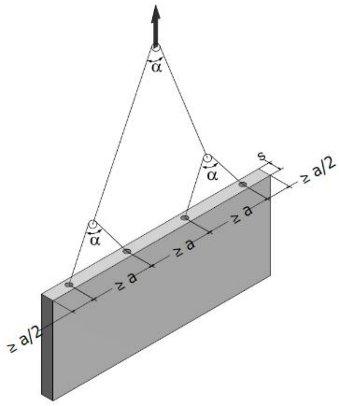


POSITIONING THE ANCHORS IN WALLS

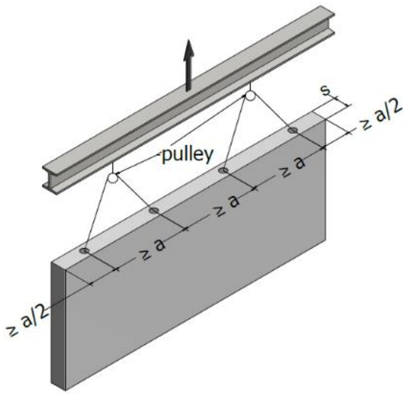
Load bearing anchors:
n=2

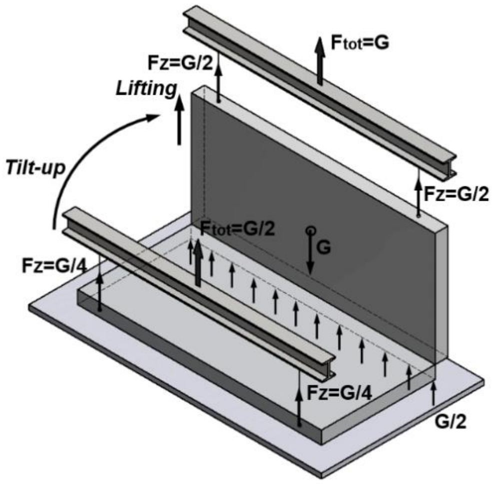


Load bearing anchors:
n=4



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 a half of the element weight because a half of the element remains in contact with the casting table.

DETERMINATION OF ANCHOR LOAD

The load on each load bearing anchor is calculated with the following formula:

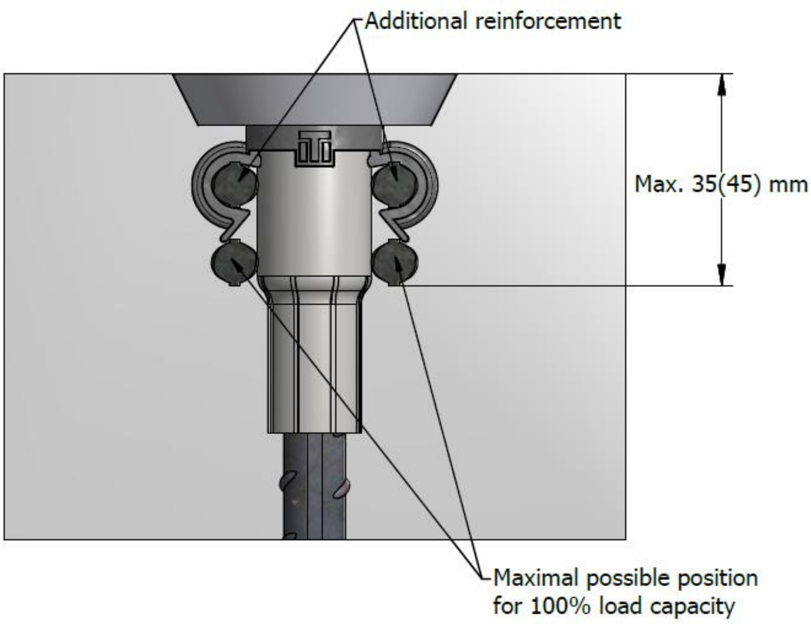
- **When de-mold** $F = (F_{tot} \times f \times z)/n = [(G + H_a) \times f \times z]/n$

- When tilting $F = (F_{tot}/2 \times f \times z)/n = [(G/2 + H_a) \times f \times z]/n$

During tilting, the concrete element remains supported on the ground, only the half of the forces have to be taken into account. **In the situation of tilting, load carrying capacity of sockets and anchors is limited to 50% of the axial load.**

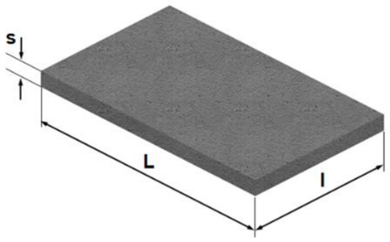
- When lifting $F = (F_{tot} \times f \times z)/n = (G \times f \times z)/n$

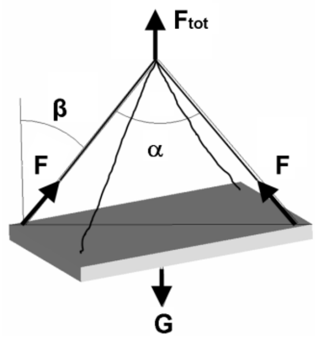
INSTALLATION TOLERANCES FOR ALL TERWA LIFTING SOCKET ANCHORS



CALCULATION EXAMPLE

Example 1: SLAB UNIT





The slab unit has the following dimensions:
$\boldsymbol{L = 5\ m}$,
$\boldsymbol{l = 2\ m}$,
$\boldsymbol{s = 0.2\ m}$

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

General dates:	Symbol	De-mould	Transport	Mount
Concrete strength at de-mold [MPa]		15	15	
Concrete strength on site [MPa]				35
Weight for element [kN]	**G**	50		
Element area in contact with formwork [m²]	**A**	10		
Cable angle factor at de-mold (β = 15.0°)	**z**	1.04	1.04	
Cable angle factor on site (β = 30.0°)	**z**			1.16
Dynamic coefficient at de-mold	**f**	1.1		
Dynamic coefficient at transport	**f**		1.3	
Dynamic coefficient on site	**f**			1.5
Adhesion to formwork factor for varnished timber formwork [kN/m²]	**q**	2		
Anchor number for de-mold	**n**	2		
Anchor number for transport at the plant	**n**		2	
Anchor number for transport on site	**n**			2

DE-MOULD AT THE PLANT:

Adhesion to formwork factor:	q = 2 kN/m^2
Lifting load coefficient:	f = 1.1
Cable angle factor:	z = 1.04 (β = 15.0°)
Concrete strength:	15 MPa

$$\boldsymbol{F = \frac{[(G + q \times A) \times f \times z]}{n} = \frac{[(50 + 2 \times 10) \times 1.1 \times 1.04]}{2} = 40.04\ kN}$$

TRANSPORT AT THE PLANT:

Dynamic coefficient:	f = 1.3
Cable angle factor:	z = 1.04 (β = 15.0°)
Concrete strength:	15 MPa

$$\boldsymbol{F = \frac{G \times f \times z}{n} = \frac{50 \times 1.3 \times 1.04}{2} = 33.80\ kN}$$

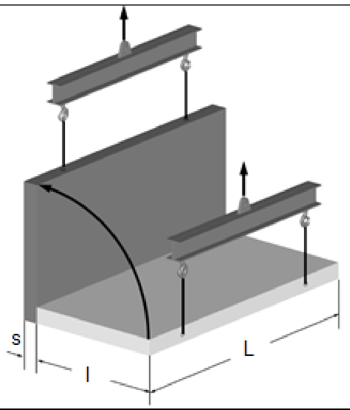
TRANSPORT AT SITE:

Dynamic coefficient:	f = 1.5
Cable angle factor:	z = 1.16 (β = 30.0°)
Concrete strength:	35 MPa

$$\boldsymbol{F = \frac{G \times f \times z}{n} = \frac{50 \times 1.5 \times 1.16}{2} = 43.50\ kN}$$

An anchor in the **50 kN** range is required.

Example 2: WALL PANEL



The slab unit has the following dimensions:
$\boldsymbol{L = 7.5\ m,}$
$\boldsymbol{l = 2\ m}$,
$\boldsymbol{s = 0.18\ m}$

Weight $\boldsymbol{G = \rho \times V = 25 \times (7.5 \times 2 \times 0.18) = 67.5\ kN}$
Formwork area $\boldsymbol{A = L \times l = 7.5 \times 2 = 15\ m^2}$
Anchor number $\boldsymbol{n = 2}$

General dates:	Symbol	De-mould	Tilting	Mount
Concrete strength at de-mold [MPa]		15	15	
Concrete strength on site [MPa]				45
Weight for element [kN]	**G**	67.5		
Element area in contact with formwork [m²]	**A**	15		
Cable angle factor at de-mold (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 de-mold	**f**	1.1		
Dynamic coefficient at tilting	**f**		1.3	
Dynamic coefficient on site	**f**			1.3
Adhesion factor for oiled steel formwork [kN/m²]	**q**	1.0		
Anchor number for de-mold	**n**	4		
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 = 1 kN/m^2
Lifting load coefficient:	f = 1.1
Cable angle factor:	z = 1.04 (β = 15.0°)
Concrete strength:	15 MPa

$$\boldsymbol{F = \frac{[(G/2 + q \times A) \times f \times z]}{n} = \frac{[(67.5/2 + 1 \times 15) \times 1.1 \times 1]}{2} = 26.81\ kN}$$

TRANSPORT AT THE PLANT:

Dynamic coefficient:	f = 1.3
Cable angle factor:	z = 1 (β = 0°)
Concrete strength:	15 MPa

$$\boldsymbol{F = \frac{G \times f \times z}{n} = \frac{67.5 \times 1.3 \times 1}{2} = 43.87\ kN}$$

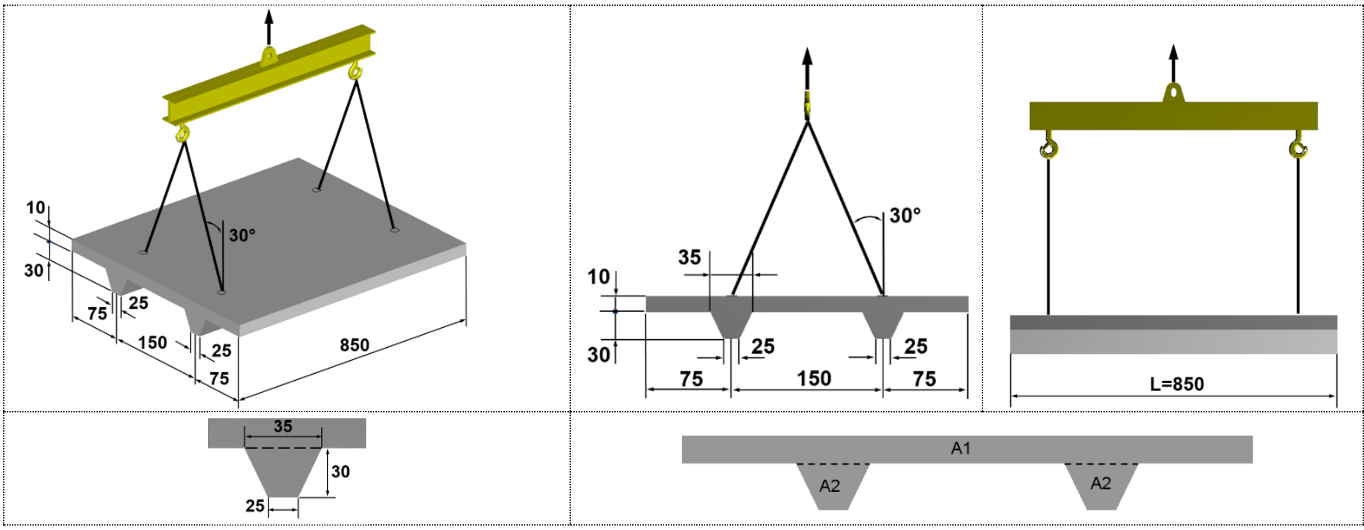
TRANSPORT ON SITE:

Dynamic coefficient:	f = 1.3
Cable angle factor:	z = 1.16 (β = 30.0°)
Concrete strength:	35 MPa

$$\boldsymbol{F = \frac{G \times f \times z}{n} = \frac{67.5 \times 1.3 \times 1.16}{2} = 50.89\ kN}$$

Two anchors embedded on lateral side, in the 63kN range are required.
Usually for this type of anchor reinforcement tail and tilting reinforcement are added.
It is advisable to de-formwork before tilting.

Example 3: DOUBLE-T BEAM



NOTE: Dimensions are in cm

General dates:	Symbol	De-mould	Transport
Concrete strength at de-mould and transport [MPa]		25	25
Weight for element [kN]	**G**	102	
Formwork area [m²]	**A**	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
Lifting load coefficient at de-mould	**f**	1.0	
Lifting load coefficient at transport	**f**		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°)
Lifting load coefficient when transporting	f = 1.3
Lifting load coefficient when de-mould	f = 1.0
Anchor number	n = 4

$G = V\ x\ \rho = (A\ x\ L) x\ \rho = (A1 + A2\ x\ 2)\ x\ L\ \ x\ \rho = (0.1\ x\ 3 + 0.09\ x\ 2)\ x\ 8.5\ x\ 25 = 102\ kN$
L = 8.5 m
$A1 = 0.1\ x\ 3$ (m²)
$A2 = [(35 + 25)\ x\ 30]\ /2$ (cm²)
$A2 = [(0.35 + 0.25) x\ 0.3\ /2 = \ (0.6\ \ x\ 0.3)/2 = 0.09$ (m²)

Weight:	G = 102 kN
Adhesion to mould	Ha = $2\ x\ G\ = 204\ kN$
Total load	$F_{tot} = G\ + Ha = 102 + 204 = 306\ kN$

LOAD PER ANCHOR WHEN DE-MOULD:

$$\boldsymbol{F = \frac{Ftot\ x\ f\ x\ z}{n} = \frac{[(G + Ha) x\ f\ x\ z]}{n} = \frac{306\ x\ 1.0\ x\ 1.16}{4} = 88.74\ kN}$$

LOAD PER ANCHOR WHEN TRANSPORTING:

$$\boldsymbol{F = \frac{Ftot\ x\ f\ x\ z}{n} = \frac{G\ x\ f\ x\ z}{n} = \frac{102\ x\ 1.3\ x\ 1.16}{4} = 38.46\ kN}$$

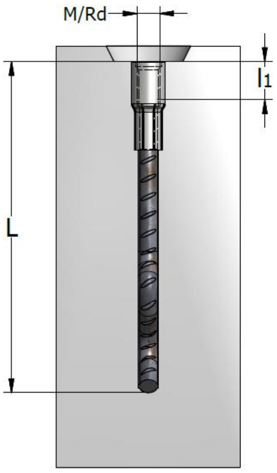
An anchor in the 100 kN range is required (> 88.74 kN)

LIFTING SOCKETS ANCHORS

LIFTING SOCKET - WAVED END REINFORCING STEEL

Waved lifting sockets are used for liftin precast elements with moderate thickness. The waved shape provides a good force transfer into the concrete. These lifting sockets are composed from a steel bush made of S355, stainless steel SS2 or SS4, swaged to a wavy reinforcement bar. The threaded bushes are made with metric thread (M) or round thread (Rd) zinc plated. These lifting sockets are always the preferred option. They ensure the necessary length and edge distance. The preferred lift angle is ß ≤30°.

LIFTING SOCKET – SHORT WAVED END REINFORCING STEEL – TGK

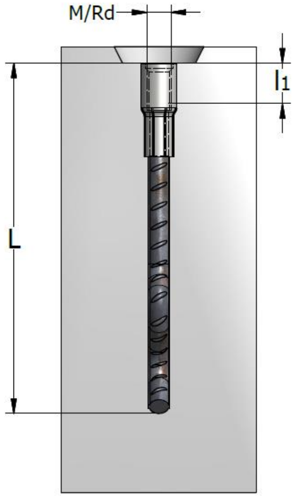


TGK-M	Product number			Load group f_{cu} > 15 MPa	Thread	Bar diam.	Overall length L	l_1
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	[t]	M	[mm]	[mm]	[mm]
TGK-M12-108	45248	48463	48464	0.5	12	8	108	22
TGK-M16-167	45249	48465	48466	1.2	16	12	167	30
TGK-M20-187	45250	48467	48468	2.0	20	14	187	35
TGK-M24-240	45251	48469	48470	2.5	24	16	240	41
TGK-M30-300	45252	48471	48472	4.0	30	20	300	55
TGK-M36-380	45850	48473	48474	6.3	36	25	380	65
TGK-M42-450	45254	48475	48476	8.0	42	28	450	70

TGK-Rd	Product number			Load group f_{cu} > 15 MPa	Thread	Bar diam.	Overall length L	l_1
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	[t]	Rd	[mm]	[mm]	[mm]
TGK-Rd12-108	45771	48441	48442	0.5	12	8	108	22
TGK-Rd16-167	45772	48443	48444	1.2	16	12	167	30
TGK-Rd20-187	45785	48445	48446	2.0	20	14	187	35
TGK-Rd24-240	45774	48447	48448	2.5	24	16	240	41
TGK-Rd24-360	46537	48453	48454	2.5	24	16	360	41
TGK-Rd30-300	45775	48452	48451	4.0	30	20	300	55
TGK-Rd30-420	45259	48449	48450	4.0	30	20	420	55
TGK-Rd36-380	45776	48455	48456	6.3	36	25	380	65
TGK-Rd42-450	45750	48457	48458	8.0	42	28	450	70
TGK-Rd42-500	45979	48459	48460	8.0	42	28	500	70

LIFTING SOCKET – LONG WAVED END REINFORCING STEEL – TGL

Long waved lifting sockets are used for lifting all types of precast concrete elements, especially for erecting thin panels. Also, haves a good application for lifting thin panels with a low reinforcement grade.

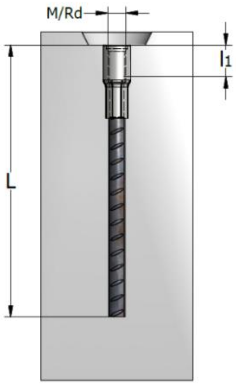


TGL-M	Product number			Load group f_{cu} > 15 MPa	Thread	Bar diam.	Overall length L	l_1
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	[t]	M	[mm]	[mm]	[mm]
TGL-M12-137	45696	48477	48478	0.5	12	8	137	22
TGL-M16-216	45697	48480	48481	1.2	16	12	216	30
TGL-M20-257	45787	48482	48483	2.0	20	14	257	35
TGL-M24-360	45699	48486	48487	2.5	24	16	360	41
TGL-M24-1000	45701	48488	48489	2.5	24	16	1000	41
TGL-M30-450	45700	48484	48485	4.0	30	20	450	55
TGL-M36-570	45788	48490	48491	6.3	36	25	570	65
TGL-M42-620	45789	48492	48493	8.0	42	28	620	70

TGL-Rd	Product number			Load group f_{cu} > 15 MPa	Thread	Bar diam.	Overall length L	l_1
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	[t]	Rd	[mm]	[mm]	[mm]
TGL-Rd12-137	45778	48496	48497	0.5	12	8	137	22
TGL-Rd16-216	45779	48494	48495	1.2	16	12	216	30
TGL-Rd20-257	45780	48498	48499	2.0	20	14	257	35
TGL-Rd24-360	45781	48500	48501	2.5	24	16	360	41
TGL-Rd24-1000	45980	48502	48503	2.5	24	16	1000	41
TGL-Rd30-450	45782	48504	48505	4.0	30	20	450	55
TGL-Rd36-570	45783	48506	48507	6.3	36	25	570	65
TGL-Rd36-900	46071	48508	48509	6.3	36	25	900	65
TGL-Rd42-620	45784	48510	48511	8.0	42	28	620	70

LIFTING SOCKET – STRAIGHT END REINFORCING STEEL – TRL

The TRL anchors are suitable especially for lifting thin concrete panels. The Lifting Sockets with straight end are made in two variants – with metric thread (M) or with round thread (Rd). Threaded socket is manufactured of steel S355JO, zinc plated, or stainless steel and a reinforcing bar made from B500B without coating.

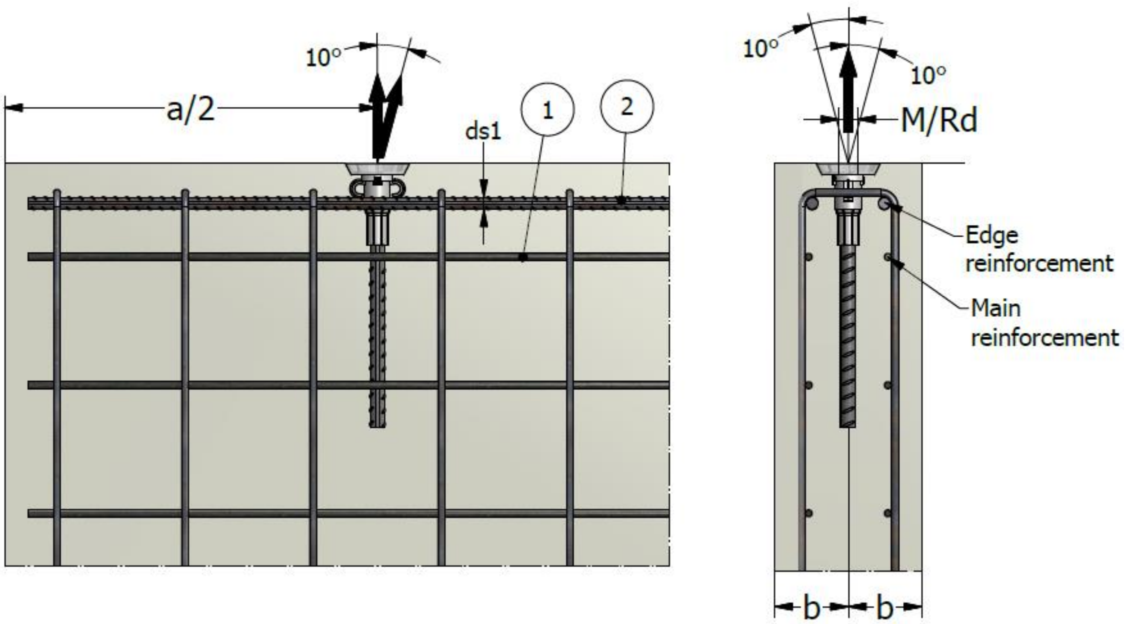


TRL-M	Product number			Load group f_{cu} > 15N/mm²	Thread	Bar diam.	Overall length L	l_1
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	[t]	M	[mm]	[mm]	[mm]
TRL-M12-116	45998	63002	63003	0.5	12	8	116	22
TRL-M12-144	45999	63004	63005	0.5	12	8	144	22
TRL-M16-179	46000	63006	63007	1.2	16	12	179	30
TRL-M16-230	46001	63008	63009	1.2	16	12	230	30
TRL-M20-202	46002	63010	63011	2.0	20	14	202	35
TRL-M20-272	46003	63012	63013	2.0	20	14	272	35
TRL-M24-257	46004	63014	63015	2.5	24	16	257	41
TRL-M24-376	46005	63016	63017	2.5	24	16	376	41
TRL-M24-1016	46006	63018	63019	2.5	24	16	1016	41
TRL-M30-319	46007	63020	63021	4.0	30	20	319	55
TRL-M30-469	46008	63022	63023	4.0	30	20	469	55
TRL-M36-404	46009	63024	63025	6.3	36	25	404	65
TRL-M36-594	46010	63026	63027	6.3	36	25	594	65
TRL-M42-475	46011	63028	63029	8.0	42	28	475	70
TRL-M42-645	46012	63030	63031	8.0	42	28	645	70

TRL-Rd	Product number			Load group f_{cu} > 15N/mm²	Thread	Bar diam.	Overall length L	l_1
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	[t]	Rd	[mm]	[mm]	[mm]
TRL-Rd12-116	46019	63032	63033	0.5	12	8	116	22
TRL-Rd12-144	46020	63034	63035	0.5	12	8	144	22
TRL-Rd16-179	46021	63036	63037	1.2	16	12	179	30
TRL-Rd16-230	46022	63038	63039	1.2	16	12	230	30
TRL-Rd20-202	46023	63040	63041	2.0	20	14	202	35
TRL-Rd20-272	46024	63042	63043	2.0	20	14	272	35
TRL-Rd24-257	46016	63044	63045	2.5	24	16	257	41
TRL-Rd24-376	46017	63046	63047	2.5	24	16	376	41
TRL-Rd24-1016	46018	63048	63049	2.5	24	16	1016	41
TRL-Rd30-319	46025	62843	62842	4.0	30	20	319	55
TRL-Rd30-436	46026	62845	62844	4.0	30	20	436	55
TRL-Rd30-469	46027	62847	62846	4.0	30	20	469	55
TRL-Rd36-404	46028	63050	63051	6.3	36	25	404	65
TRL-Rd36-594	46029	63052	63053	6.3	36	25	594	65
TRL-Rd42-475	46013	63054	63055	8.0	42	28	475	70
TRL-Rd42-645	46015	63056	63057	8.0	42	28	645	70

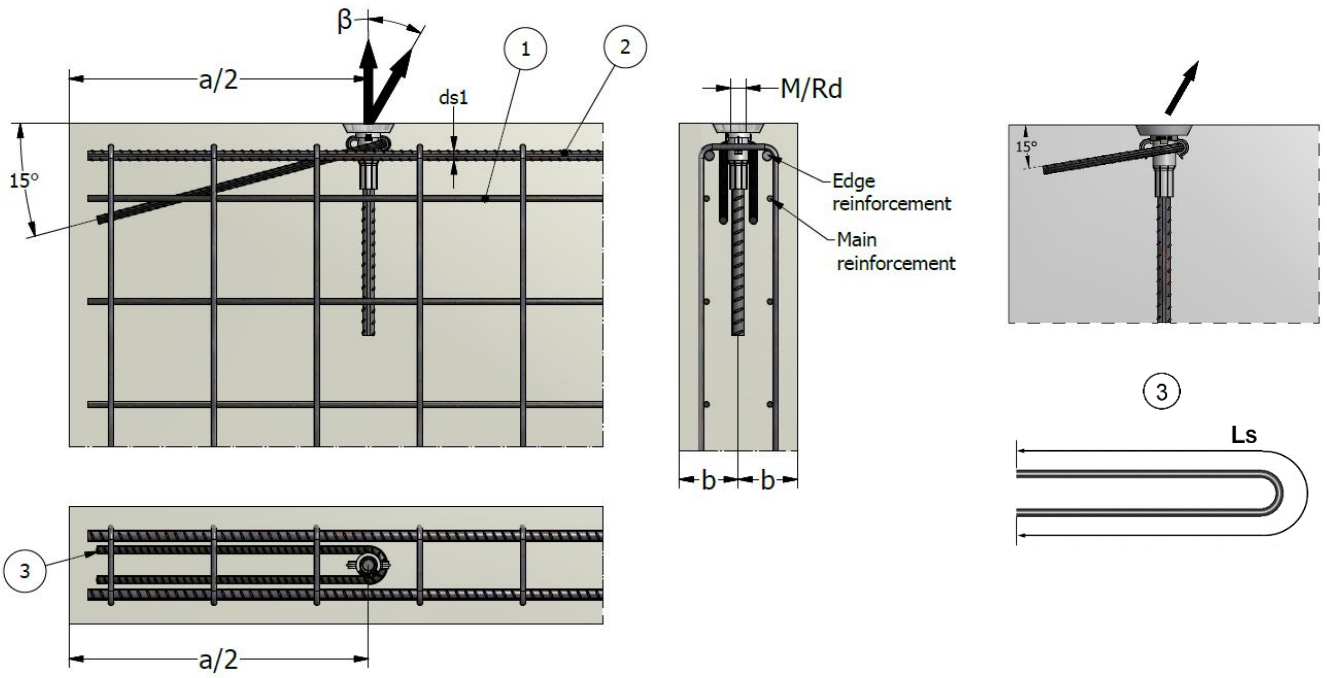
LIFTING SOCKETS ANCHOR – INSTALLATION AND REINFORCEMENTS

REINFORCEMENT AND LOAD CAPACITY – AXIAL LOAD UP TO 10°

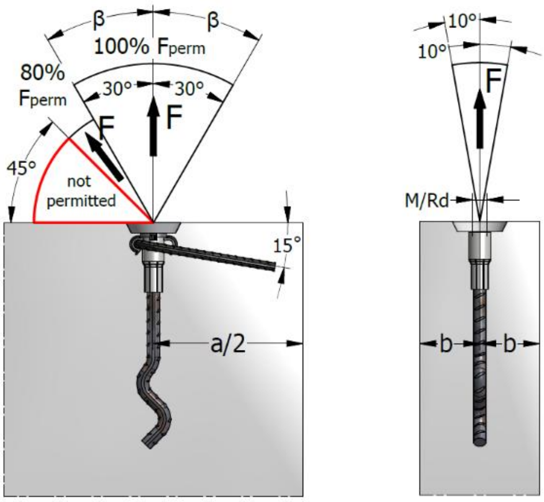


TGK/ TGL/ TRL-M(Rd)	Load group	Minim unit thickness	Axial spacing	Mesh reinforcement 1	Edge reinforcement 2	Load capacity	
		2 x b	a		d_{s1}	f_{cu} > 15N/mm²	f_{cu} > 25N/mm²
	[t]	[mm]	[mm]	[mm²/m]	[mm]	[kN]	[kN]
M(Rd)12	0.5	60	300	1 x 188	Ø8	5.0	5.0
M(Rd)16	1.2	70	400	2 x 131	2 x Ø8	12.0	12.0
M(Rd)20	2.0	90	550	2 x 188	2 x Ø10	16.9	20.0
M(Rd)24	2.5	100	600	2 x 188	2 x Ø12	25.0	25.0
M(Rd)30	4.0	120	650	2 x 188	2 x Ø12	40.0	40.0
M(Rd)36	6.3	150	800	2 x 188	2 x Ø12	51.3	63.0
M(Rd)42	8.0	160	1000	2 x 188	2 x Ø14	80.0	80.0

REINFORCEMENT AND LOAD CAPACITY – DIAGONAL LOAD UP TO 45°



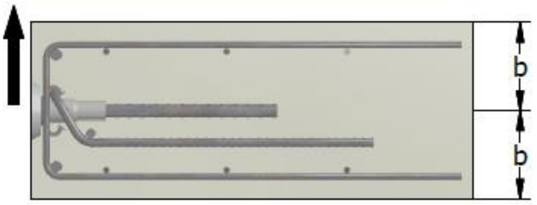
TGK/ TGL/ TRL-M(Rd)	Load group	Minim unit thickness	Axial spacing	Mesh reinforcement (1)	Edge reinforcement (2)	Diagonal reinforcement $\beta > 30°$ max. 45° (3)		Load capacity for lifting loop application		Load capacity for lifting THS application
		2 x b	a		d_{s1}	d_s	L_s	f_{cu} > 15N/mm²	f_{cu} > 25N/mm²	f_{cu} > 25N/mm²
	[t]	[mm]	[mm]	[mm²/m]	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]
M(Rd)12	0.5	60	300	1 x 188	Ø8	Ø6	320	4.0	5.0	5.0
M(Rd)16	1.2	80	400	2 x 131	2 x Ø8	Ø8	640	8.0	10.3	12.0
M(Rd)20	2.0	100	550	2 x 188	2 x Ø10	Ø10	840	13.0	16.8	20.0
M(Rd)24	2.5	120	600	2 x 188	2 x Ø10	Ø10	1050	16.0	20.7	25.0
M(Rd)30	4.0	150	650	2 x 188	2 x Ø12	Ø12	1260	26.0	33.5	40.0
M(Rd)36	6.3	200	800	2 x 188	2 x Ø12	Ø16	1600	37.0	47.8	63.0
M(Rd)42	8.0	240	1000	2 x 188	2 x Ø14	Ø20	2000	49.0	63.2	80.0



Note: *For item 3 the bending radius will be established considering the EN 1992.*

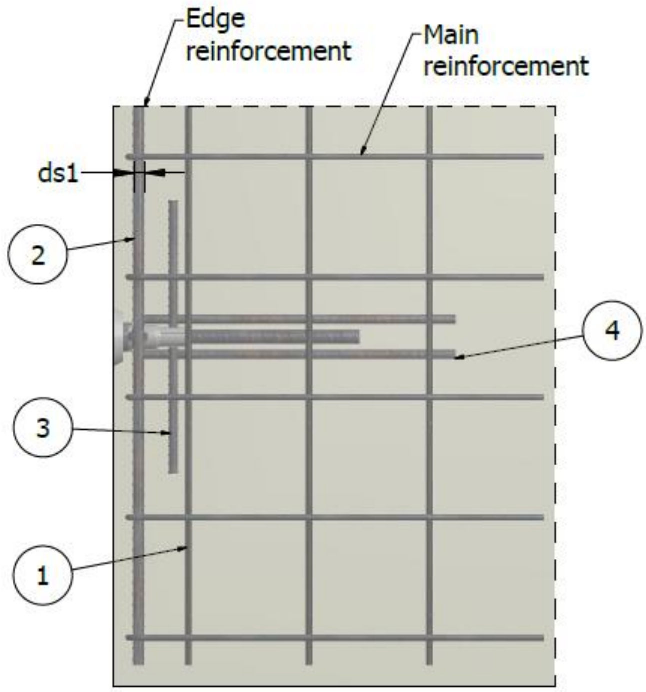
The diagonal reinforcement must be placed with direct contact to the socket anchor.
Always install diagonal reinforcement opposite the load direction.
The dimensions in pictures are in [mm].

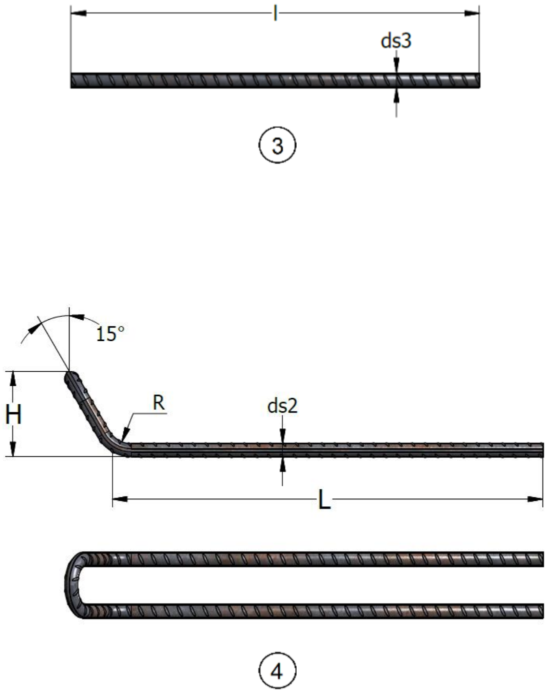
REINFORCEMENT AND LOAD CAPACITY – DIAGONAL LOAD AND TILTING UP TO 90°



Note: *The bending radius will be established considering the EN 1992.*

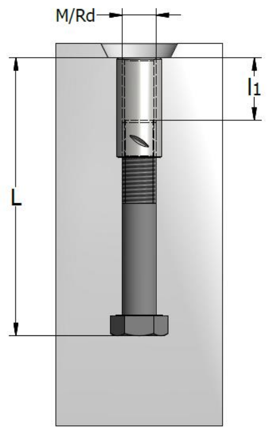
For tilting operation must be used only long socket anchor.
The turning reinforcement must be placed with direct contact to the socket anchor.
The dimensions in pictures are in [mm].
Do not use lifting loop for tilting.





TGK/ TGL/ TRL-M(Rd)	Load group	Minim unit thickness 2 x b	Mesh reinforcement 1	Edge reinforcement 2	Turning reinforcement 4				Lateral reinforcement 3		Load capacity	
				d_{s1}	d_{s2}	L	H	R	d_{s3}	l	f_{cu} > 15N/mm²	f_{cu} > 25N/mm²
	[t]	[mm]	[mm²/m]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]
M(Rd)12	0.5	80	1 x 188	Ø8	6	270	35	12	8	280	2.0	2.5
M(Rd)16	1.2	80	2 x 131	2 x Ø8	8	420	50	16	12	400	4.0	5.2
M(Rd)20	2.0	100	2 x 188	2 x Ø10	10	490	65	20	14	500	9.0	10.0
M(Rd)24	2.5	120	2 x 188	2 x Ø10	12	520	75	24	14	550	11.0	12.5
M(Rd)30	4.0	140	2 x 188	2 x Ø12	12	570	95	24	16	600	16.0	20.0
M(Rd)36	6.3	200	2 x 188	2 x Ø12	14	690	120	30	16	700	27.0	31.5
M(Rd)42	8.0	240	2 x 188	2 x Ø14	16	830	145	32	20	850	37.0	40.0

LIFTING BOLT ANCHOR – HBB



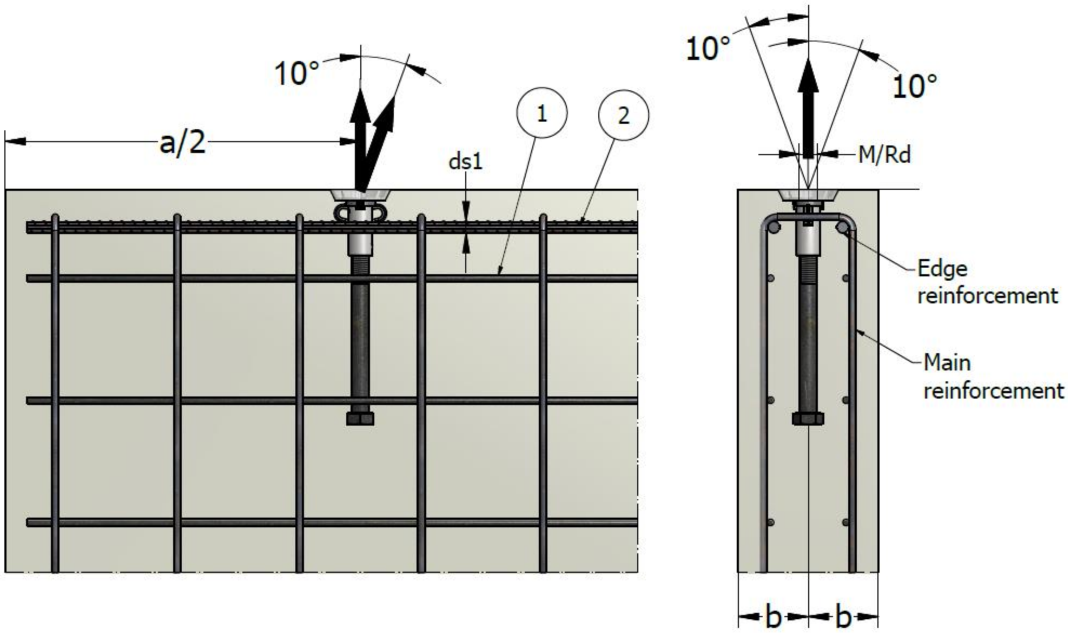
The Lifting Bolt anchors are suitable for shallow embedded elements without the need for a reinforcement tail. The force transfer into the concrete is provided by the bolt heat of the screw. For angled lifts, additional reinforcements are necessary. The lift angle must not exceed 30°. For turning/tilting a special tilting reinforcement must be used. In all cases the standard mesh reinforcement must be present into the concrete element.
These fixing and lifting systems are made from a threaded bush locked on a standard bolt. The threaded bush is manufactured of steel S355JO (yield strength min 355 MPa) galvanic protected (EV) or hot dipped galvanized (TV), the bolt is from steel group 8.8. The threaded bush can also be made of stainless steel W 1.4571 –AISI 316Ti (SS4).

HBB	Product number			Load group f_{cu} > 15N/mm²	Thread	Overall length L	l_1	Bolt
	Zinc galvanizing	Stainless steel SS4	Hot dipped galvanized	[t]	M	[mm]	[mm]	
HBB M12x90	45627	45629	45286	0.5	12	90	22	M12x60
HBB M12x100	43699	43700	45287	0.5	12	100	22	M12x70
HBB M12x150	43703	43704	45753	0.5	12	150	22	M12x120
HBB M16x140	43707	43708	45288	1.2	16	140	30	M16x100
HBB M16x220	43711	43712	45754	1.2	16	220	30	M16x180
HBB M20x140	45628	45631	45289	2.0	20	140	35	M20x90
HBB M20x150	43715	43716	45290	2.0	20	150	35	M20x100
HBB M20x180	43921	43922	45291	2.0	20	180	35	M20x130
HBB M20x270	44534	44535	45756	2.0	20	270	35	M20x220
HBB M24x200	44619	45757	45292	2.5	24	200	45	M24x140
HBB M24x320	44623	44624	45758	2.5	24	320	45	M24x260
HBB M30x240	44627	44628	45639	4.0	30	240	60	M30x160
HBB M30x380	44631	44632	45640	4.0	30	380	60	M30x300
HBB M36x300	44753	44754	45641	6.3	36	300	74	M36x200
HBB M36x420	44757	44758	45642	6.3	36	420	74	M36x320
HBB M42x300	44761	44762	45643	8.0	42	300	70	M42x200
HBB M42x460	44765	44780	45644	8.0	42	460	70	M42x360

HBB	Product number			Load group f_{cu} > 15N/mm²	Thread	Overall length L	l_1	Bolt
	Zinc galvanizing	Stainless steel SS4	Hot dipped galvanized	[t]	Rd	[mm]	[mm]	
HBB Rd12x90	62925	62929	62933	0.5	12	90	22	M12x60
HBB Rd12x100	62926	62930	62934	0.5	12	100	22	M12x70
HBB Rd12x150	62927	62931	62935	0.5	12	150	22	M12x120
HBB Rd16x140	49479	62939	62942	1.2	16	140	30	M16x100
HBB Rd16x220	62937	62940	62943	1.2	16	220	30	M16x180
HBB Rd20x140	62945	62948	62952	2.0	20	140	35	M20x90
HBB Rd20x180	62946	62949	62953	2.0	20	180	35	M20x130
HBB Rd20x270	49480	62950	62954	2.0	20	270	35	M20x220
HBB Rd24x200	49481	62956	62958	2.5	24	200	45	M24x140
HBB Rd24x320	62955	62957	62959	2.5	24	320	45	M24x260
HBB Rd30x240	62961	62964	62967	4.0	30	240	60	M30x160
HBB Rd30x380	62962	62965	62968	4.0	30	380	60	M30x300
HBB Rd36x300	62969	62971	62973	6.3	36	300	74	M36x200
HBB Rd36x420	62970	62972	62974	6.3	36	420	74	M36x320
HBB Rd42x300	62975	62977	62979	8.0	42	300	70	M42x200
HBB Rd42x460	62976	62978	62980	8.0	42	460	70	M42x360

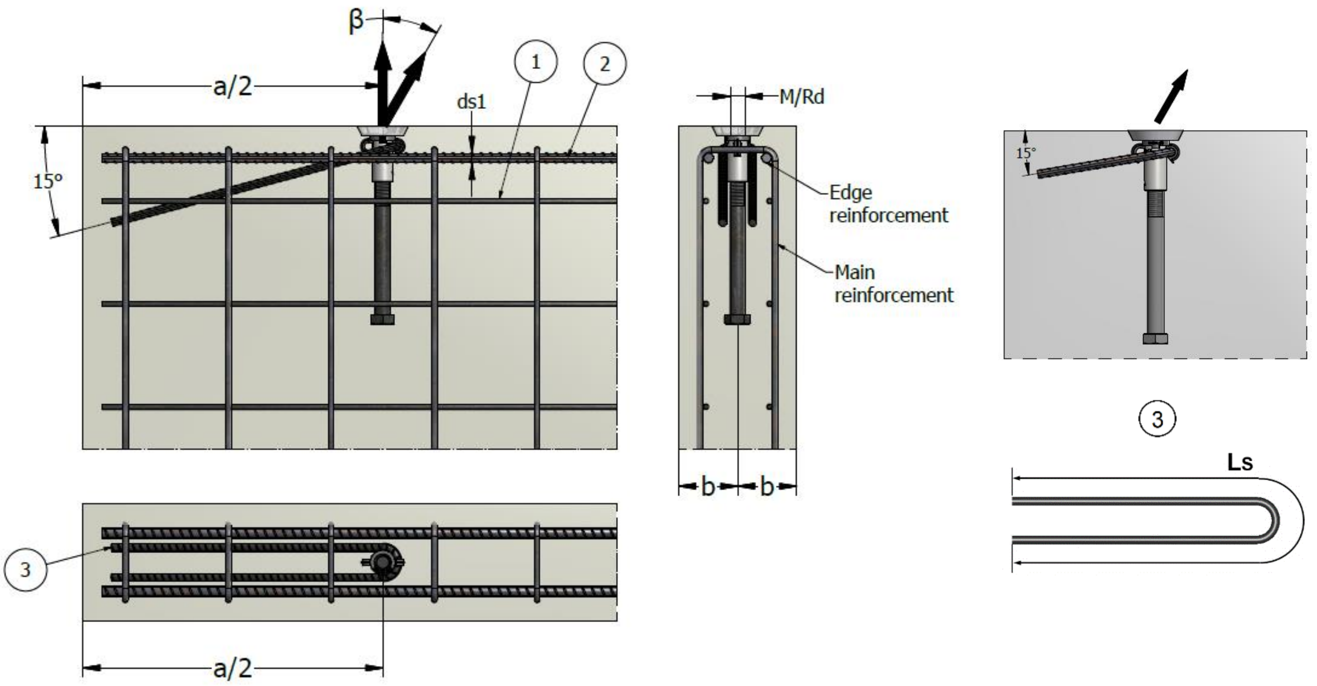
LIFTING BOLT ANCHOR – INSTALLATION AND REINFORCEMENTS

REINFORCEMENT AND LOAD CAPACITY – AXIAL LOAD UP TO 10°

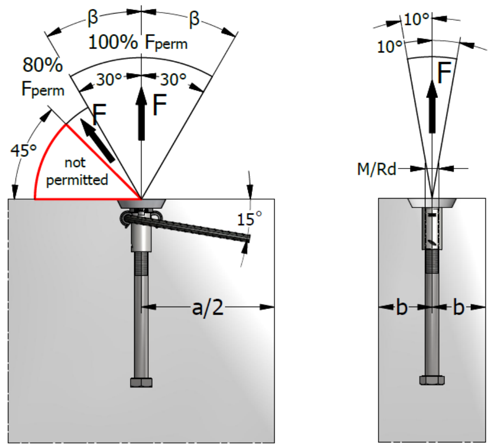


HBB-M(Rd)	Load group	Minim unit thickness	Axial spacing	Mesh reinforcement ①	Edge reinforcement ②	Load capacity	
		2 x b	a		d_{s1}	f_{cu} > 15N/mm²	f_{cu} > 25N/mm²
	[t]	[mm]	[mm]	[mm²/m]	[mm]	[kN]	[kN]
M(Rd)12	0.5	60	300	1 x 188	Ø8	5.0	5.0
M(Rd)16	1.2	70	400	2 x 131	2 x Ø8	12.0	12.0
M(Rd)20	2.0	90	550	2 x 188	2 x Ø10	16.9	20.0
M(Rd)24	2.5	100	600	2 x 188	2 x Ø12	25.0	25.0
M(Rd)30	4.0	120	650	2 x 188	2 x Ø12	40.0	40.0
M(Rd)36	6.3	150	800	2 x 188	2 x Ø12	51.3	63.0
M(Rd)42	8.0	160	1000	2 x 188	2 x Ø14	80.0	80.0

REINFORCEMENT AND LOAD CAPACITY – DIAGONAL LOAD UP TO 45°



HBB-M(Rd)	Load group	Minim unit thickness	Axial spacing	Mesh reinforcement 1	Edge reinforcement 2	Diagonal reinforcement β > 30° max. 45° 3		Load capacity for lifting loop application		Load capacity for lifting THS application
		2 x b	a		d_{s1}	d_s	L_s	f_{cu} > 15N/mm²	f_{cu} > 25N/mm²	f_{cu} > 25N/mm²
	[t]	[mm]	[mm]	[mm²/m]	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]
M(Rd)12	0.5	60	300	1 x 188	Ø8	Ø6	320	4.0	5.0	5.0
M(Rd)16	1.2	80	400	2 x 131	2 x Ø8	Ø8	640	8.0	10.3	12.0
M(Rd)20	2.0	100	550	2 x 188	2 x Ø10	Ø10	840	13.0	16.8	20.0
M(Rd)24	2.5	120	600	2 x 188	2 x Ø10	Ø10	1050	16.0	20.7	25.0
M(Rd)30	4.0	150	650	2 x 188	2 x Ø12	Ø12	1260	26.0	33.5	40.0
M(Rd)36	6.3	200	800	2 x 188	2 x Ø12	Ø16	1600	37.0	47.8	63.0
M(Rd)42	8.0	240	1000	2 x 188	2 x Ø14	Ø20	2000	49.0	63.2	80.0



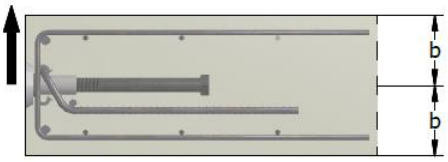
Note: *The bending radius will be established considering the EN 1992.*

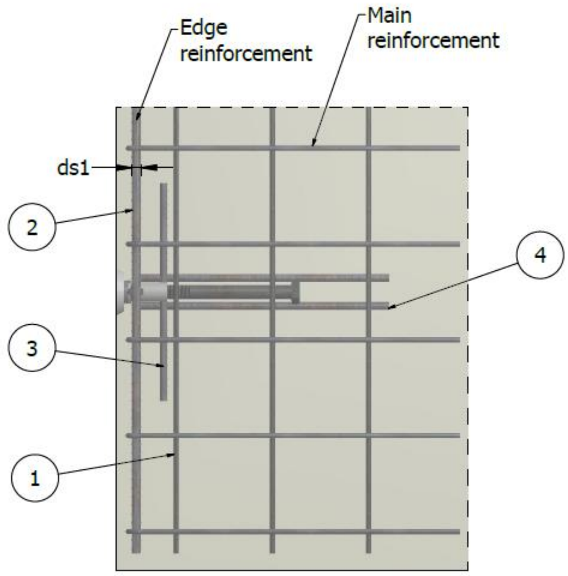
The diagonal reinforcement must be placed with direct contact to the socket anchor.
Always install diagonal reinforcement opposite the load direction.
The dimensions in pictures are in [mm].

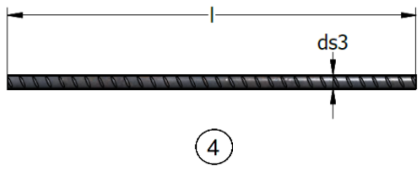
REINFORCEMENT AND LOAD CAPACITY – TILTING UP TO 90°

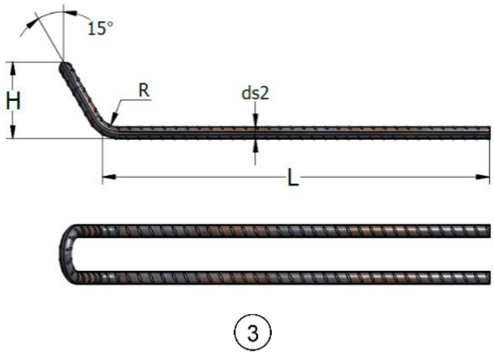
Note: *The bending radius will be established considering the EN 1992.*

For tilting operation must be used only long socket anchor.
The turning reinforcement must be placed with direct contact to the socket anchor.
The dimensions in pictures are in [mm].
Do not use lifting loop for tilting.





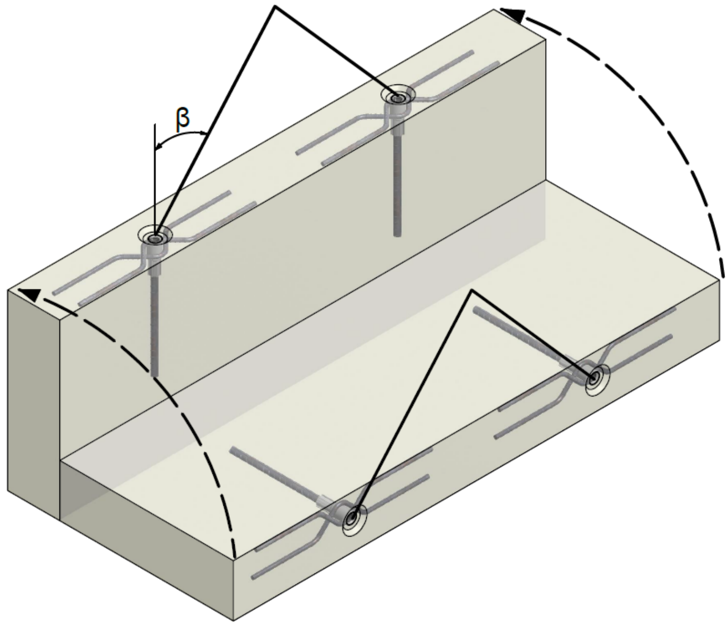


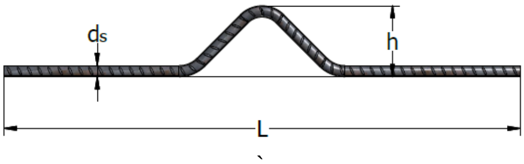


HBB-M(Rd)	Load group	Minim unit thickness 2 x b	Mesh reinforcement 1	Edge reinforcement 2	Turning reinforcement 3				Lateral reinforcement 4		Load capacity	
				d_{s1}	d_{s2}	L	H	R	d_{s3}	l	f_{cu} > 15N/mm²	f_{cu} > 25N/mm²
	[t]	[mm]	[mm²/m]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]
M(Rd)12	0.5	80	1 x 188	Ø8	6	270	35	12	8	280	2.0	2.5
M(Rd)16	1.2	80	2 x 131	2 x Ø8	8	420	50	16	12	400	4.0	5.2
M(Rd)20	2.0	100	2 x 188	2 x Ø10	10	490	65	20	14	500	9.0	10.0
M(Rd)24	2.5	120	2 x 188	2 x Ø10	12	520	75	24	14	550	11.0	12.5
M(Rd)30	4.0	140	2 x 188	2 x Ø12	12	570	95	24	16	600	16.0	20.0
M(Rd)36	6.3	200	2 x 188	2 x Ø12	14	690	120	30	16	700	27.0	31.5
M(Rd)42	8.0	240	2 x 188	2 x Ø14	16	830	145	32	20	850	37.0	40.0

REINFORCEMENT AND LOAD CAPACITY – DIAGONAL LOAD AND TILTING UP TO 90°

For tilting and diagonal pull, additional reinforcements must be installed in the anchor zone. Take care for the anchors placement so that they ensure the load transfer. When turning and lifting at an angle, tilt reinforcement is sufficient and no need of reinforcement for angle lift.
It is recommended that the angle ß, where possible, should not exceed 30°.





Tilt reinforcement

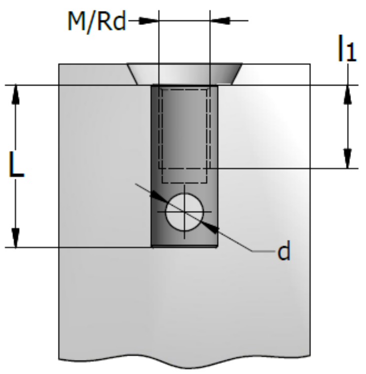
TGK/ TGL/ TRL/HBB - M(Rd)	Tilt reinforcement		
	Ød3	L	h
	[mm]	[mm]	[mm]
M(Rd)12	6	270	35
M(Rd)16	8	420	50
M(Rd)20	10	500	65
M(Rd)24	12	520	75
M(Rd)30	12	570	92
M(Rd)36	14	700	120
M(Rd)42	16	830	145

PLAIN LIFTING SOCKET AND LIFTING SOCKET WITH FLAT END

The Plain Lifting Sockets and the Lifting Sockets with Flat End are economical solutions and are suitable in thin concrete elements, where the long tail provides excellent anchorage. The reinforcement tail is important and must be installed as shown in the next images. The Plain Lifting Sockets are manufactured of steel S355JO zinc plated or of stainless steel AISI 316Ti (SS4), the Lifting Sockets with Flat End are made of steel tube S355JO galvanized**. These sockets are designated for lifting and are not to be confused with fixing sockets.** The safe working loads shown are after the application of a safety factor on test loads: c=2 for 15 MPa concrete and c=3 for steel. These anchors are not designed for tilting.

PLAIN LIFTING SOCKET HSB

These are plain lifting socket made from round bar of steel S355JO galvanized or stainless steel (W 1.4571), without the plastic stopper.

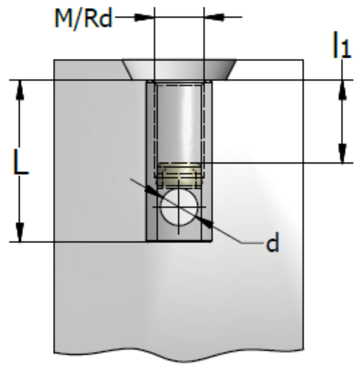


HSB-M	Product number		Thread	Load group f_{cu} > 15 MPa	Overall length L	D	l_1	d
	Zinc galvanizing	Stainless steel SS4	M	[t]	[mm]	[mm]	[mm]	[mm]
HSB-M12x40	45867	45237	12	0.5	40	17	22	8
HSB-M16x54	45868	45238	16	1.2	54	22	27	13
HSB-M20x69	45869	45239	20	2.0	69	27	35	15
HSB-M24x78	45870	45240	24	2.5	78	32	40	18
HSB-M30x105	45871	45241	30	4.0	105	39	55	22
HSB-M36x125	45884	45883	36	6.3	125	47	65	27
HSB-M42x145	45886	45885	42	8.0	145	55	78	32
HSB-M52x195	45888	45887	52	12.5	195	68	100	40

HSB-Rd	Product number		Thread	Load group f_{cu} > 15 MPa	Overall Length L	D	l_1	d
	Zinc galvanizing	Stainless steel SS4	Rd	[t]	[mm]	[mm]	[mm]	[mm]
HSB-Rd12x40	45872	45221	12	0.5	40	17	22	8
HSB-Rd16x54	45873	45222	16	1.2	54	22	27	13
HSB-Rd20x69	45874	45223	20	2.0	69	27	35	15
HSB-Rd24x78	45875	45224	24	2.5	78	32	40	18
HSB-Rd30x105	45876	45225	30	4.0	105	39	55	22
HSB-Rd36x125	45878	45877	36	6.3	125	47	65	27
HSB-Rd42x145	45880	45879	42	8.0	145	55	78	32
HSB-Rd52x195	45882	45881	52	12.5	195	68	100	40

PLAIN LIFTING SOCKET HSB-EV WITH STOPPER

This are plain lifting socket made from round tube of steel S355JO galvanized with a plastic stopper inside made from polyethylene LDPE 035 to stop the wet concrete admission in the thread zone.

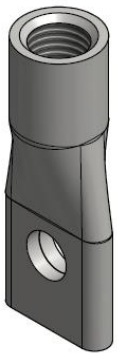


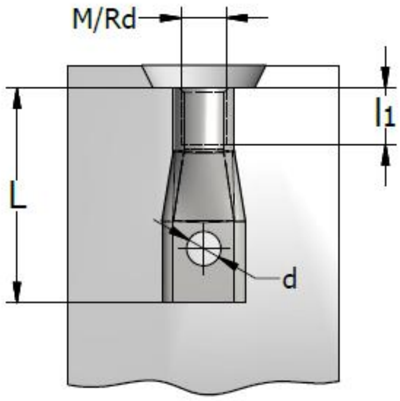
HSB-M	Product no.	Thread	Load group f_{cu} > 15 MPa	Overall Length L	D	l_1	d
	Zinc galvanizing	M	[t]	[mm]	[mm]	[mm]	[mm]
HSB-M12x40	45982	12	0.5	40	17	22	8
HSB-M16x54	45984	16	1.2	54	22	27	13
HSB-M20x69	45986	20	2.0	69	27	35	15
HSB-M24x78	45988	24	2.5	78	32	40	18
HSB-M30x105	45990	30	4.0	105	39	55	22
HSB-M36x125	45992	36	6.3	125	47	65	27
HSB-M42x145	45994	42	8.0	145	55	78	32
HSB-M52x195	45996	52	12.5	195	68	100	40

HSB-Rd	Product no.	Thread	Load group f_{cu} > 15 MPa	Overall Length L	D	l_1	d
	Zinc galvanizing	Rd	[t]	[mm]	[mm]	[mm]	[mm]
HSB-Rd12x40	45983	12	0.5	40	17	22	8
HSB-Rd16x54	45985	16	1.2	54	22	27	13
HSB-Rd20x69	45987	20	2.0	69	27	35	15
HSB-Rd24x78	45989	24	2.5	78	32	40	18
HSB-Rd30x105	45991	30	4.0	105	39	55	22
HSB-Rd36x125	45993	36	6.3	125	47	65	27
HSB-Rd42x145	45995	42	8.0	145	55	78	32
HSB-Rd52x195	45997	52	12.5	195	68	100	40

LIFTING SOCKET WITH FLAT END HSR

The Lifting Sockets with Flat End are made of steel tube S355JO galvanized or stainless steel (W 1.4301).





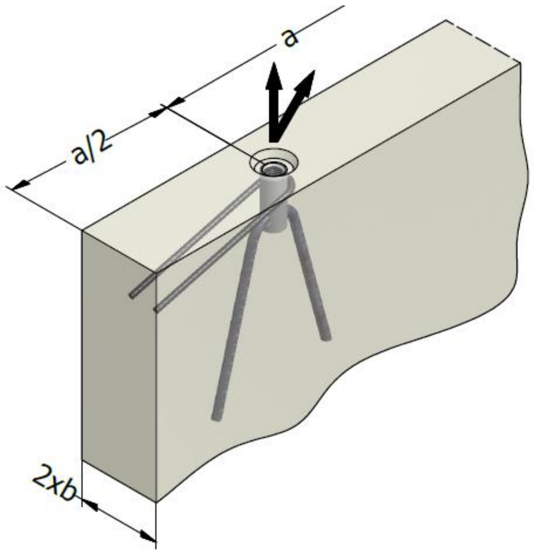
HSR-M	Product no.	Thread	Load group f_{cu} > 15 MPa	Overall Length L	D	l_1	d
	Zinc galvanizing	M	[t]	[mm]	[mm]	[mm]	[mm]
HSR-M12x60	45104	12	0.5	60	17	20	8.2
HSR-M16x80	45105	16	1.2	80	22	21	13.2
HSR-M20x95	45106	20	2.0	95	27	25	15.2
HSR-M24x100	45107	24	2.5	100	32	30	18.2
HSR-M30x135	45108	30	4.0	135	39	35	22.2
HSR-M30x150	45153	30	4.0	150	39	35	22.2

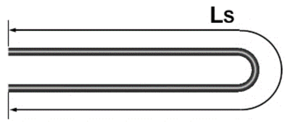
HSR-Rd	Product no.	Thread	Load group f_{cu} > 15 MPa	Overall Length L	D	l_1	d
	Zinc galvanizing	Rd	[t]	[mm]	[mm]	[mm]	[mm]
HSR-Rd12x60	45154	12	0.5	60	17	20	8.2
HSR-Rd16x80	45155	16	1.2	80	22	21	13.2
HSR-Rd20x95	45156	20	2.0	95	27	25	15.2
HSR-Rd24x100	45157	24	2.5	100	32	30	18.2
HSR-Rd30x135	45158	30	4.0	135	39	35	22.2
HSR-Rd30x150	45159	30	4.0	150	39	35	22.2

PLAIN LIFTING SOCKETS – INSTALLATION AND REINFORCEMENTS
LIFTING AND TRANSPORT

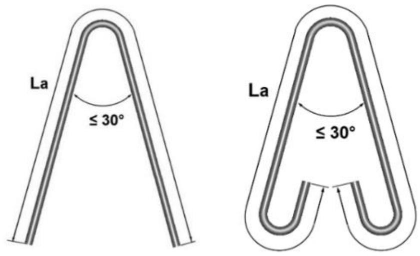
The details on this page are available for panels, but they could equally apply to other components.

Edge distance and spacing of plain lifting sockets and lifting socket with flat end.





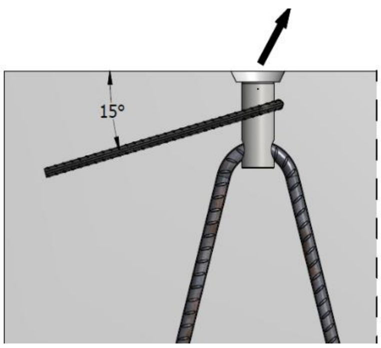
Angled pull reinforcement



Anchorage reinforcement

Note: *The bending radius will be established considering the EN 1992.*
The anchorage reinforcement must be placed with full contact to the bottom edge of the hole.
Reducing the rebar length is permitted; the ends of rebar bended into hooks.
The dimensions in pictures are in [mm].

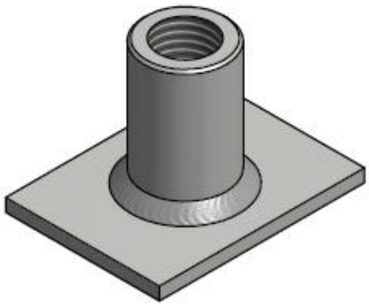
M / Rd	Minim unit thickness 2 x b	Axial spacing a	Mesh reinforcement	Axial load ß ≤10° Load capacity f_{cu} > 15MPa	Diagonal load 10°≤ ß≤30° Load capacity f_{cu} > 15MPa	Diagonal load 10°≤ ß≤30° Angled pull reinforcement Ø x l_s	Diagonal load 10°≤ ß≤45° Load capacity f_{cu} > 15MPa	Diagonal load 10°≤ ß≤45° Angled pull reinforcement Ø x l_s	Anchorage reinforcement d	Anchorage reinforcement Length before bending La
	[mm]	[mm]	[mm²/m]	[kN]	[kN]	[mm]	[kN]	[mm]	[mm]	[mm]
12	60	300	131	5.0	4.0	Ø 6 x 320	4.0	Ø 6 x 320	6	500
16	80	400	131	12.0	9.6	Ø 6 x 520	9.6	Ø 8 x 420	10	700
20	100	550	188	20.0	16.0	Ø 8 x 520	16.0	Ø 8 x 640	12	925
24	120	600	188	25.0	20.0	Ø 8 x 640	20.0	Ø 10 x 640	14	1000
30	140	650	188	40.0	32.0	Ø 10 x 750	32.0	Ø 12 x 850	16	1350
36	200	800	188	63.0	50.4	Ø 12 x 950	50.4	Ø 14 x 1150	20	1700
42	240	1000	188	80.0	64.0	Ø 14 x 1250	64.0	Ø 16 x 1250	25	1825
52	275	1200	188	125.0	100.0	Ø 16 x 1500	100.0	Ø 20 x 1600	28	2500

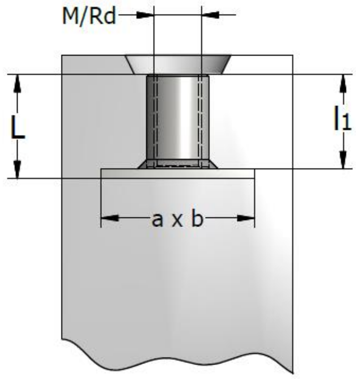


The information presented in these pages are also available for Lifting Sockets with Flat End – **HSR**.

LIFTING SOCKET WITH FOOT PLATE - HSP

The Lifting Socket with Foot Plate is low profile suitable for the face of thin panels or top slabs which are lifted perpendicular to their largest surfaces. The foot plate and the socket are fully welded, so the insert is effectively sealed. The threaded bush is made of steel S355JO, and the plate is manufactured from steel sheet S235JR. They are zinc plated. These products can be made of stainless steel SS2 (W 1.4301) or SS4 (W 1.4571).
The preferred lift angle is an angle **ß ≤ 30°.**
Safe working loads shown are after the application of a safety factor on test loads of 2 for 15MPa concrete and 3 for steel.

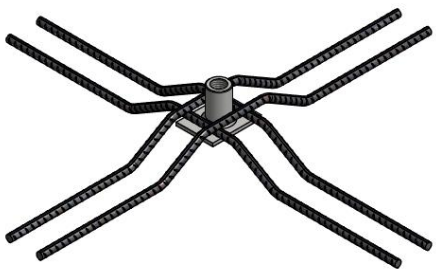


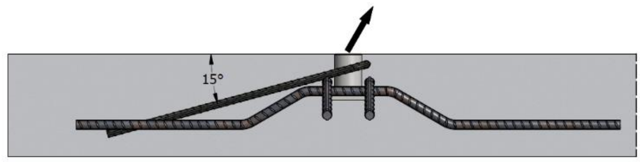


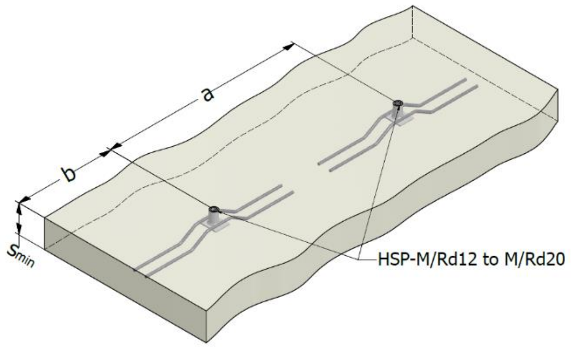
HSP-M	Product no.			Thread	Load group f_{cu} > 15 MPa	Overal length L	a	b
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	M	[t]	[mm]	[mm]	[mm]
HSP-M12	45685	62702	48657	12	0.5	30	35	25
HSP-M16	45686	62701	62700	16	1.2	35	50	35
HSP-M20	43761	62703	48026	20	2.0	47	60	60
HSP-M24	45687	62705	62704	24	2.5	54	80	60
HSP-M30	45688	62707	62706	30	4.0	72	100	80
HSP-M36	45689	62708	48728	36	6.3	84	130	100
HSP-M42	60321	62710	62709	42	8.0	98	130	130
HSP-M52	60323	62712	62711	52	12.5	117	150	130

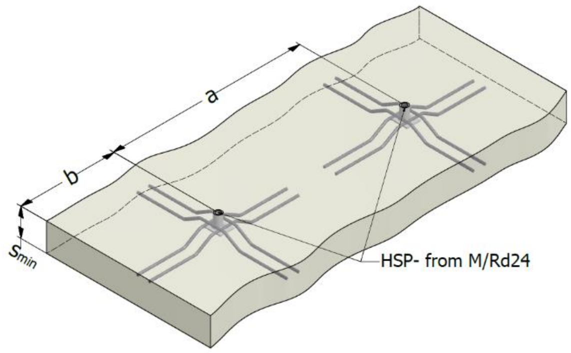
HSP-Rd	Product no.			Thread	Load group f_{cu} > 15 MPa	Overal length L	a	b
	Zinc galvanizing	Stainless steel SS4	Stainless steel SS2	Rd	[t]	[mm]	[mm]	[mm]
HSP-Rd12	45690	62785	62784	12	0.5	30	35	25
HSP-Rd16	45691	47483	45853	16	1.2	35	50	35
HSP-Rd20	45692	62786	60129	20	2.0	47	60	60
HSP-Rd24	45693	62787	47842	24	2.5	54	80	60
HSP-Rd30	45694	47434	62300	30	4.0	72	100	80
HSP-Rd36	45695	61244	61241	36	6.3	84	130	100
HSP-Rd42	60320	61245	61242	42	8.0	98	130	130
HSP-Rd52	60322	61246	61243	52	12.5	117	150	130

LIFTING SOCKETS HSP – INSTALLATION AND REINFORCEMENTS

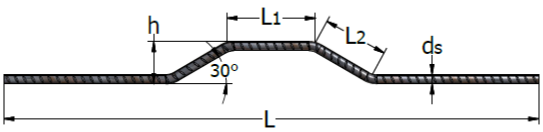


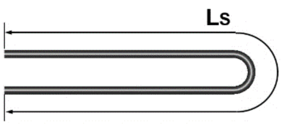






HSP M(Rd)	Load group	Minim unit thickness	Anchor spacing	Edge distance	Mesh reinforcement
		Smin	a	b	
	[t]	[mm]	[mm]	[mm]	[mm²/m]
12	0.5	70	350	200	131
16	1.2	85	500	250	131
20	2.0	100	600	360	188
24	2.5	115	800	400	188
30	4.0	140	1000	500	221
36	6.3	160	1300	650	221
42	8.0	175	1300	650	513
52	12.5	215	1500	750	513





Note: *The bending radius will be established considering the EN 1992.*

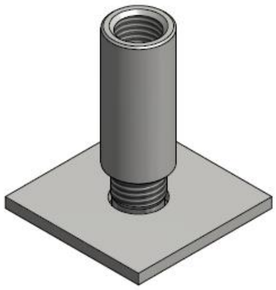
The additional reinforcement must be placed and secured on top of the plate anchor and in direct contact with the plate.

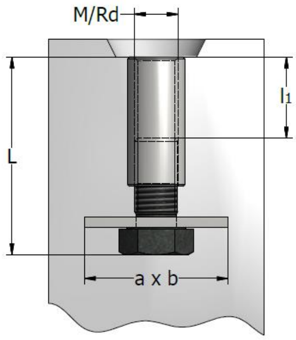
For anchor with thread larger than M24 must be placed additional reinforcement cross-wise in pairs.

The dimensions in pictures are in [mm].

HSP M(Rd)	Additional reinforcement						Axial load ß ≤10°	Diagonal load 10°≤ ß≤30°		Diagonal load 30°≤ ß≤45°	
	number	d_s	L_1	L_2	h	L	Load capacity f_{cu} > 15MPa	Load capacity f_{cu} > 15MPa	Angled pull reinforcement Ø x l_s	Load capacity f_{cu} > 15MPa	Angled pull reinforcement Ø x l_s
	[pcs]	[mm]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]	[mm]	[kN]	[mm]
12	2	6	60	60	30	250	5.0	5.0	Ø 6 x 320	4.0	Ø 6 x 320
16	2	8	90	70	35	420	12.0	12.0	Ø 6 x 520	9.6	Ø 8 x 420
20	2	10	90	80	40	640	20.0	20.0	Ø 8 x 520	16.0	Ø 8 x 640
24	4	10	100	100	50	640	25.0	25.0	Ø 8 x 640	20.0	Ø 10 x 640
30	4	12	110	110	55	850	40.0	40.0	Ø 10 x 750	32.0	Ø 12 x 850
36	4	14	140	120	60	1150	63.0	63.0	Ø 12 x 950	50.4	Ø 14 x 1150
42	4	16	140	120	60	1250	80.0	80.0	Ø 14 x 1250	64.0	Ø 16 x 1250
52	4	20	140	150	75	1550	125.0	125.0	Ø 16 x 1500	100.0	Ø 20 x 1600

LIFTING BOLT ANCHOR – HBP





The Lifting Bolt anchor HBP is made from a threaded bush locked on a standard bolt and an anchorage plate. The threaded bush is manufactured of steel S355JO, electrolytic galvanized (EV) or hot dipped galvanized (TV), the bolt is from steel 8.8 without coating and the plate is from steel S235 also without coating.
The threaded bush can also be made from stainless steel W 1.4571 –AISI 316Ti (SS4).

HBP-M	Product no.			Thread	Load group f_{cu} > 15 MPa	Overall length L	l_1	a	b	Screw
	Zinc galvanizing	Stainless steel SS4	Hot dipped galvanized	M	[t]	[mm]	[mm]	[mm]	[mm]	
HBP M12x55	43687	43688	45295	12	0.5	55	22.5	40	40	M12x25
HBP M16x75	43689	43690	45296	16	1.2	75	30	50	50	M16x35
HBP M20x90	43691	43692	45397	20	2.0	90	37.5	60	60	M20x40
HBP M24x110	43693	43694	45298	24	2.5	110	45	80	80	M24x50
HBP M30x140	43695	43696	46282	30	4.0	140	61	100	100	M30x60

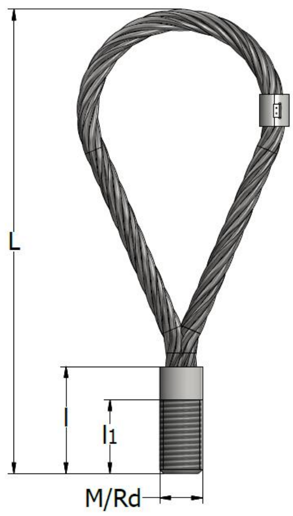
HBP-Rd	Product no.			Thread	Load group f_{cu} > 15 MPa	Overall length L	l_1	a	b	Screw
	Zinc galvanizing	Stainless steel SS4	Hot dipped galvanized	Rd	[t]	[mm]	[mm]	[mm]	[mm]	
HBP Rd12x55	62987	62988	62989	12	0.5	55	22.5	40	40	M12x25
HBP Rd16x75	62990	62991	62992	16	1.2	75	30	50	50	M16x35
HBP Rd20x90	62993	62994	62995	20	2.0	90	37.5	60	60	M20x40
HBP Rd24x110	62996	62997	62998	24	2.5	110	45	80	80	M24x50
HBP Rd30x140	62999	63000	63001	30	4.0	140	61	100	100	M30x60

LIFTING SYSTEMS

THREADED LIFTING LOOP - THL

Threaded lifting loops are suitable to be used with all sizes of threaded lifting sockets. It is economic lifting systems and can be used for most applications, especially for site operations. **Threaded lifting loops are not suitable for turning or tilting. If are kept in stores for reuse they must be inspected every six months and retested every year. These lifting systems are not recommended for severe reuse conditions.**
Threaded lifting loops should only be attached to the concrete unit and used after the concrete strength has reached 15 MPa. In some cases, it may be economical and practical to leave this lifting loop with the concrete unit until final installation.

The threaded lifting loop is made of high grade steel wire AISI 1010 (W 1.1121), swaged in a steel ferrule made of steel S355JO. It is zinc plated for protection against corrosion. To each threaded lifting loop, a label is attached marked with the admissible load, the thread type and the code number of the testing. **Before use, check that the wires are in good condition. Do not use if the wire cable is bent, crushed or kinked and if there is any loosening of the outer layer. Reject if the wire is corroded or the thread is damaged.**

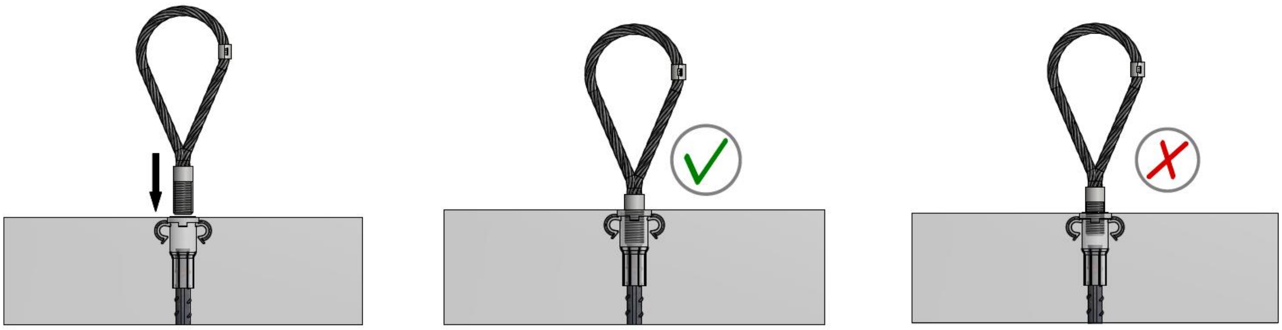


THL-M	Thread	Product no.	THL-Rd	Thread	Product no.	Load group	l_1	l	Wire diam.	L (approx.)
	M			Rd		[t]	[mm]	[mm]	[mm]	[mm]
THL-M12	12	45079	THL-Rd12	12	45737	0.5	18	30	6	155
THL-M16	16	45081	THL-Rd16	16	45738	1.2	24	37	8	155
THL-M20	20	45083	THL-Rd20	20	45739	2.0	30	45	10	215
THL-M24	24	45084	THL-Rd24	24	45740	2.5	36	54	12	255
THL-M30	30	45085	THL-Rd30	30	45741	4.0	45	68	16	300
THL-M36	36	45086	THL-Rd36	36	45742	6.3	54	82	18	340
THL-M42	42	45087	THL-Rd42	42	45743	8.0	63	96	20	425
THL-M52	52	45088	THL-Rd52	52	45744	12.5	85	110	26	510

THL – APPLICATIONS

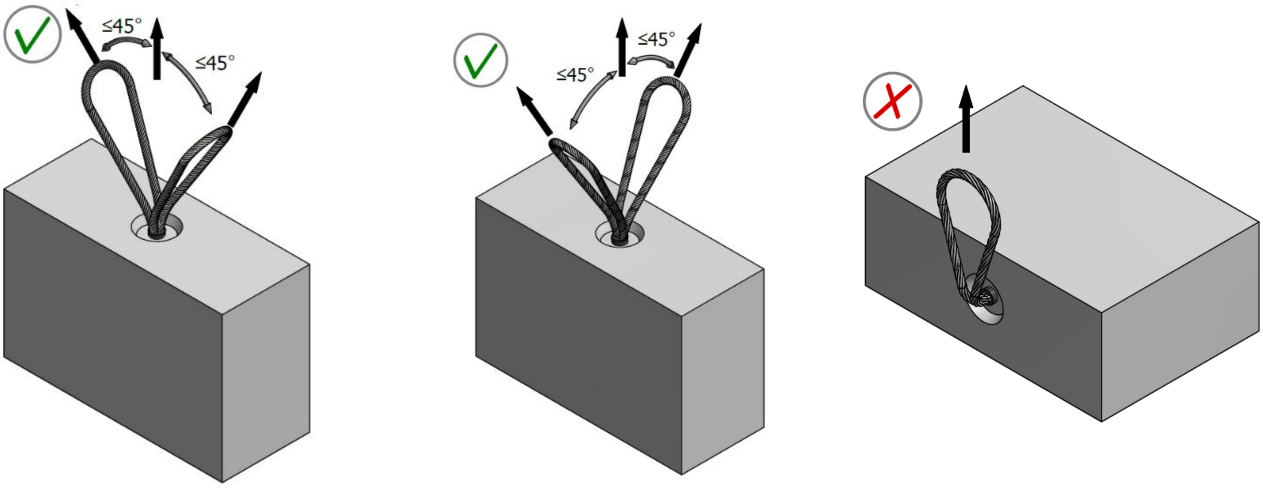
SCREWING DETAILS

Ensure that the thread is fully bottomed out in the socket before lifting. It is permissible to back off one turn to ensure that the wire is correctly aligned for lifting. **It is not accepted gap between concrete element and the body of the lifting system, the thread must be fully threaded inside the socket.**



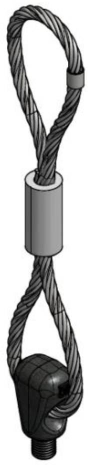
ADDMISSIBLE LOAD DIRECTION

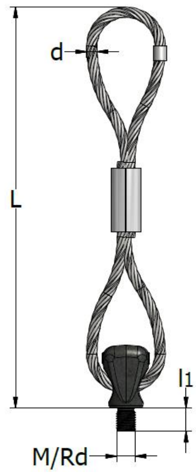
Threaded lifting loops are not suitable for turning or tilting.



LIFTING SLING - THS1

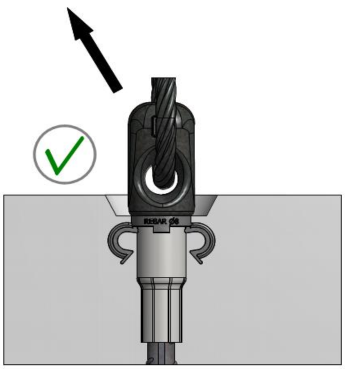
The Lifting Slings can be used with all types of anchors and threaded sockets. Suitable for most lifting situations, particularly site operations. They can be reused, but only after inspection. If they are kept in stores for reuse they must be inspected every six months and retested every year. These lifting systems are not recommended for severe reuse conditions.
Threaded Lifting Sling should only be attached to the concrete unit and used after the concrete strength has reached 15MPa.



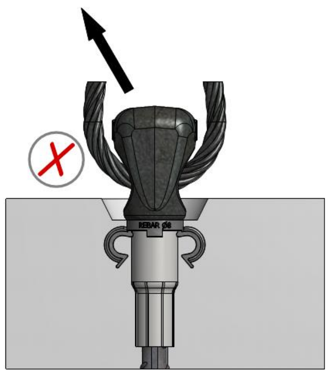


THS1-M	Product no.	Thread	THS1-Rd	Product no.	Thread	Load group	Axial load	L	d	l_1	Wire length
		M			Rd	[t]	[kN]	[mm]	[mm]	[mm]	[mm]
THS1-M12	45890	12	THS1-Rd12	46378	12	1.3	13	310	8	20	700
THS1-M16	45891	16	THS1-Rd16	46379	16	2.5	25	345	9	20	790
THS1-M20	45892	20	THS1-Rd20	46380	20	4.0	40	410	12	25	950
THS1-M24	45893	24	THS1-Rd24	46381	24	5.0	50	435	14	30	1035
THS1-M30	45894	30	THS1-Rd30	46382	30	7.5	75	490	16	37	1130
THS1-M36	46339	36	THS1-Rd36	46383	36	10.0	100	570	18	44	1310
THS1-M42	46340	42	THS1-Rd42	46384	42	12.5	125	650	20	51	1480
THS1-M52	46341	52	THS1-Rd52	46385	52	15.0	150	760	26	62	1765

Threaded Lifting Sling is made from high grade steel wire AISI 1010 (W 1.1121), swaged in a ferrule made of AlMg1.8 and a steel bolt made from high strength steel. It is zinc plated for protection against corrosion. Every Lifting System is individually tested at 3 times the working load and is supplied with a unique certificate. Each threaded lifting loop has a label marked with the admissible load, the thread type and the code number of the testing. Before use, you must check that the wires are in good condition. Do not use if the wire cable is bent, crushed or kinked and if there is any loosening of the outer layer. Reject if the wire is corroded. Ensure that the thread is fully bottomed out in the socket before lifting. It is permissible to back off one turn to ensure that the wire is correctly aligned for lifting.



Optimum load transfer is ensured if the eye bolt is orientated in load direction.

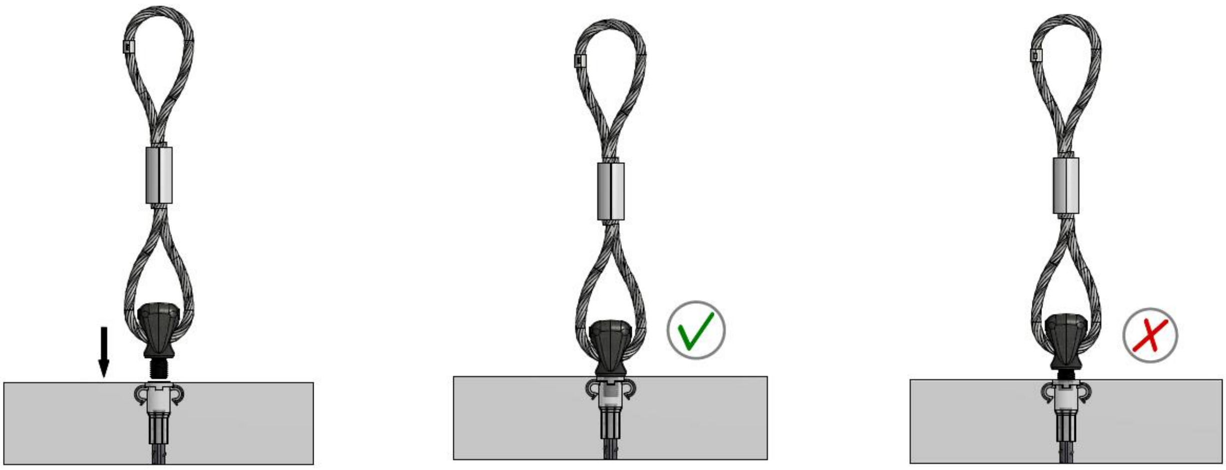


Diagonal or shear load is not permitted in this case.

THS1 – APPLICATIONS

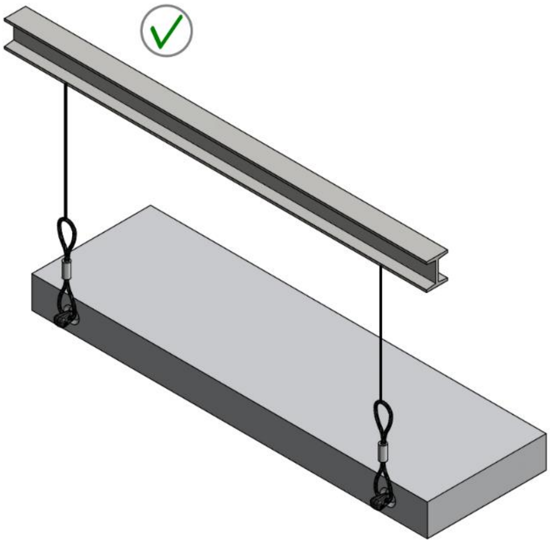
SCREWING DETAILS

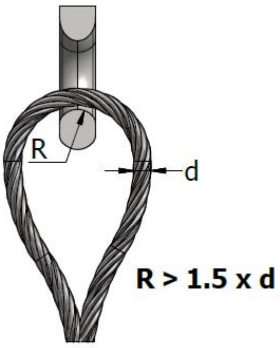
Ensure that the thread is fully bottomed out in the socket before lifting. It is permissible to back off one turn to ensure that the wire is correctly aligned for lifting. **It is not accepted gap between concrete element and the body of the lifting system, the thread must be fully threaded inside the socket.**



The preferred option is the vertical lift. The angle of lift (ß) should normally not be more than 30°. **Pulling back towards the unit is not acceptable.**

ADDMISSIBLE LOAD DIRECTION

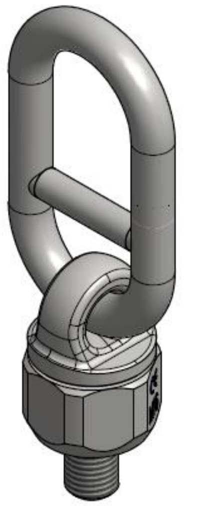


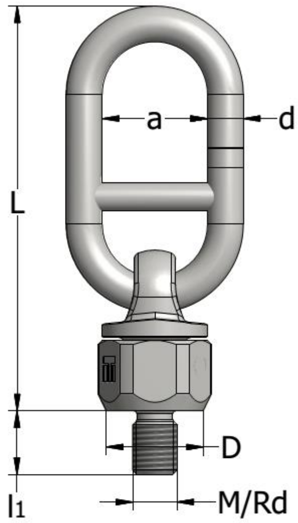


Note: *Minimum radius of the crane hook for the wire loop must be* ***R > 1.5 x d***

THREADED SWIVEL EYE – THS3

The Threaded Swivel Eye can be used for anchors with threaded sockets. They are suitable for most lifting situations, particularly for turning and tilting. They are more suitable for turning and tilting than the lifting systems manufactured from steel wire and can of course be reused, considered the regularly inspection. If they are kept in stores for reuse they must be inspected in accordance with local requirements. The Threaded Swivel Eye THS3. are made of high quality steel and they are designed with a safety factor of 5. Every Lifting System is individually tested at 3 times the working load and is supplied with a unique certificate.
The Threaded Swivel Eye should only be attached to the concrete unit and used after the concrete strength has reached 15 MPa. Usually they will be removed after the concrete elements are installed. This lifting system is suitable for use with threaded socket cast in flush with the surface of the unit or recessed using recess formers.
Ensure that the thread is fully mounted in the socket before lifting.



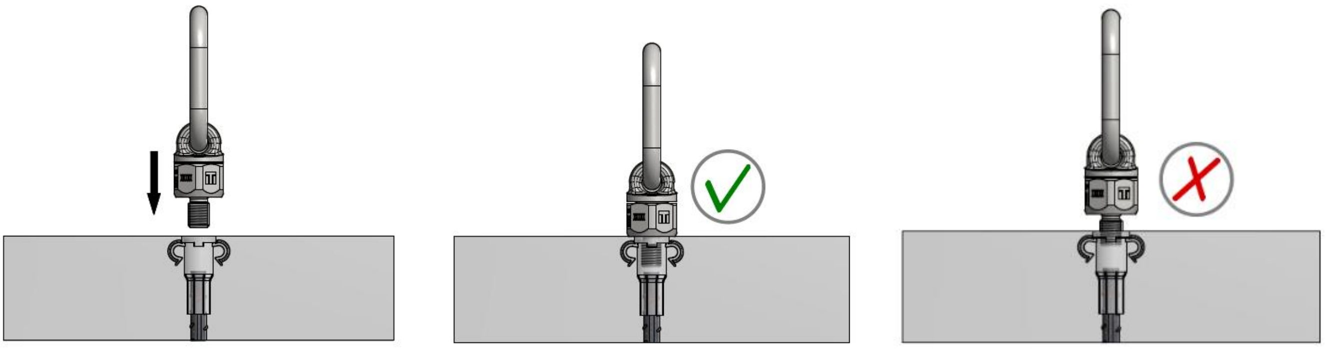


THS3-M	Product no.	Thread	Load group	Axial load	L	a	d	D	l_1
		M	[t]	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
THS3-HD-M12	61703	12	1.3	13	124	34	11	30	17
THS3-HD-M16	61704	16	2.5	25	145	38	13	35	23
THS3-HD-M20	61705	20	4.0	40	169	45	15	44	28.5
THS3-HD-M24	62748	24	5.0	50	198	49	17	44	33.5
THS3-HD-M30	62749	30	7.5	75	230	60	20	59	44.5
THS3-HD-M36	62750	36	10.0	100	264	64	24	59	53.5
THS3-HD-M42	62751	42	12.5	125	285	68	26	75	57.5
THS3-HD-M52	60828	52	15.0	150	307	72	31	84	67.5

THS3-Rd	Product no.	Thread	Load group	Axial load	L	a	d	D	l_1
		Rd	[t]	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
THS3-HD-Rd12	61706	12	1.3	13	124	34	11	30	17
THS3-HD-Rd16	61707	16	2.5	25	145	38	13	35	23
THS3-HD-Rd20	61708	20	4.0	40	169	45	15	44	28.5
THS3-HD-Rd24	62752	24	5.0	50	198	49	17	44	33.5
THS3-HD-Rd30	62753	30	7.5	75	230	60	20	59	44.5
THS3-HD-Rd36	62754	36	10.0	100	264	64	24	59	53.5
THS3-HD-Rd42	62755	42	12.5	125	285	68	26	75	57.5
THS3-HD-Rd52	60829	52	15.0	150	307	72	31	84	67.5

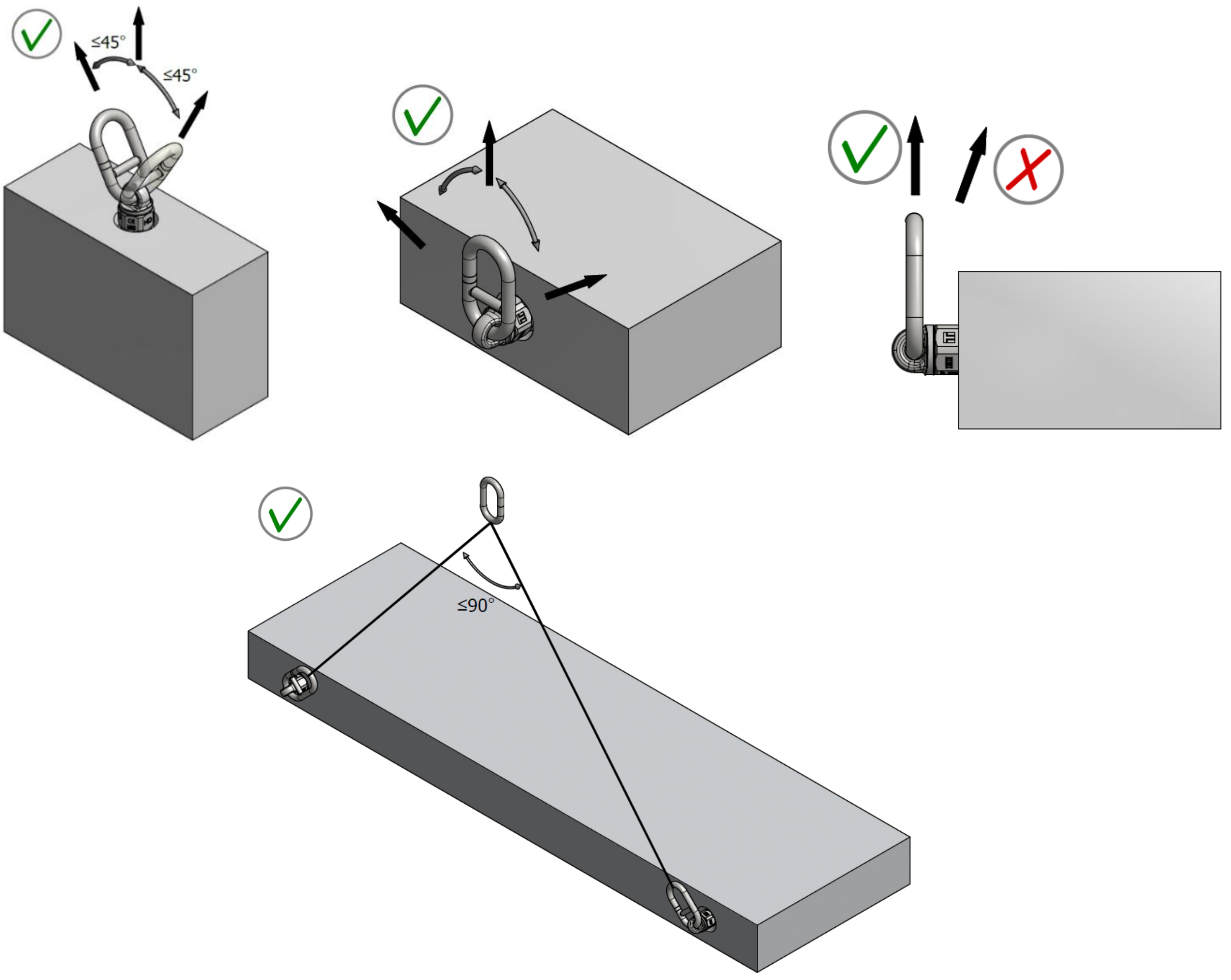
THS3 – APPLICATIONS
SCREWING DETAILS

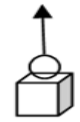
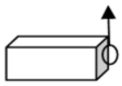
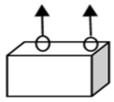
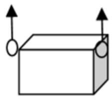
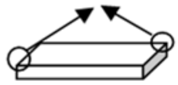
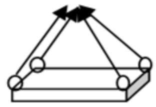
Ensure that the thread is fully bottomed out in the socket before lifting. It is permissible to back off one turn to ensure that the wire is correctly aligned for lifting. **It is not accepted gap between concrete element and the body of the lifting system, the thread must be fully threaded inside the socket.**



The preferred option is the vertical lift. The angle of lift (ß) should normally not be more than 30°. Pulling back towards the unit is not acceptable.

ADDMISSIBLE LOAD DIRECTION



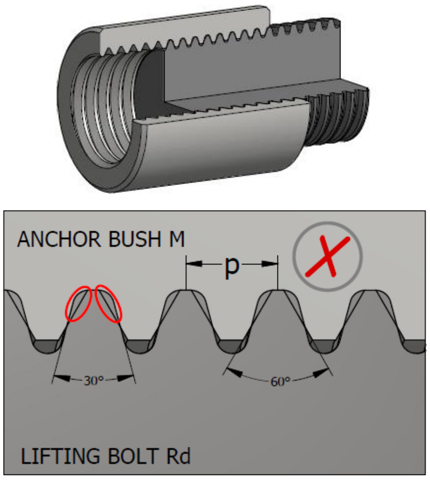
Number of pieces	1	1	2	2	2	2	3 or 4	3 or 4
Kind of attachment								
Inclination angle	0°	90°	0°	90°	0° - 45°	45° - 60°	0° - 45°	45° - 60°
THS3-M/Rd	WLL group	Axial load	Load group	Axial load	Load group	Axial load	Load group	Axial load
	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
THS3-M/Rd12	5	2.5	10	5	3.5	2.5	5	3.5
THS3-M/Rd16	12	6.0	24	12	8.4	6.0	12	8.4
THS3-M/Rd20	20	10.0	40	20	14.0	10.0	20	14.0
THS3-M/Rd24	25	12.5	50	25	17.5	12.5	25	17.5
THS3-M/Rd30	40	20.0	80	40	28.0	20.0	40	28.0
THS3-M/Rd36	63	31.5	126	63	44.1	31.5	63	44.1
THS3-M/Rd42	80	40.0	160	80	56.0	40.0	80	56.0
THS3-M/Rd52	125	62.5	250	125	87.5	62.5	125	87.5

In case of an unsymmetrical load distribution; the lifting capacities applicable to the 2 and 3 or 4 leg slings are the same as for 1 leg types at 90°.
The preferred option is the vertical lift. The angle of lift (**ß**) should not normally be more than 30°. It is not acceptable pulling back towards the unit.

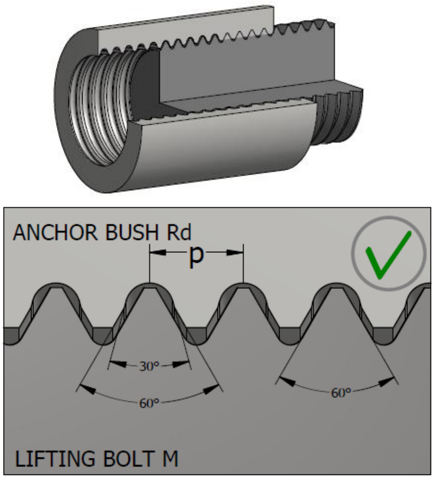
SPECIAL THREAD DESCRIPTION

Terwa special thread Rd is a mix of standard Rd thread and a metric thread according to DIN 13. It has metric screw pitches but a round thread geometry of thread flanks that contain a double angle of 60° and 30°. For that reason, an anchor with special Rd thread can be used in combination with both metric or Rd thread lifting system.

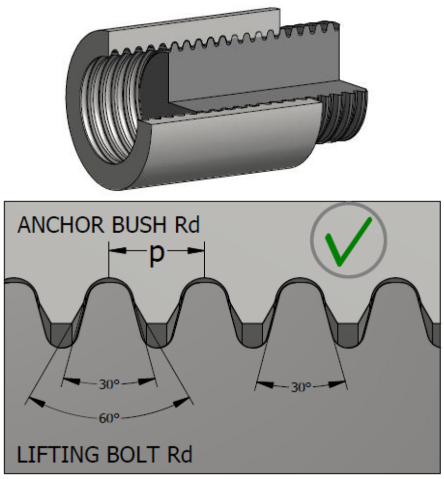
M thread bush and Rd thread bolt



Rd thread bush and metric thread bolt

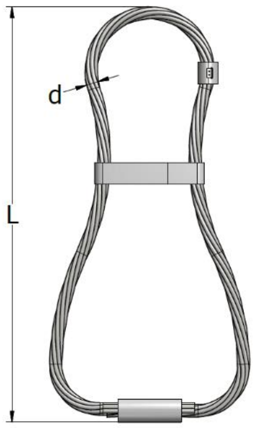


Rd thread bush and Rd thread bolt

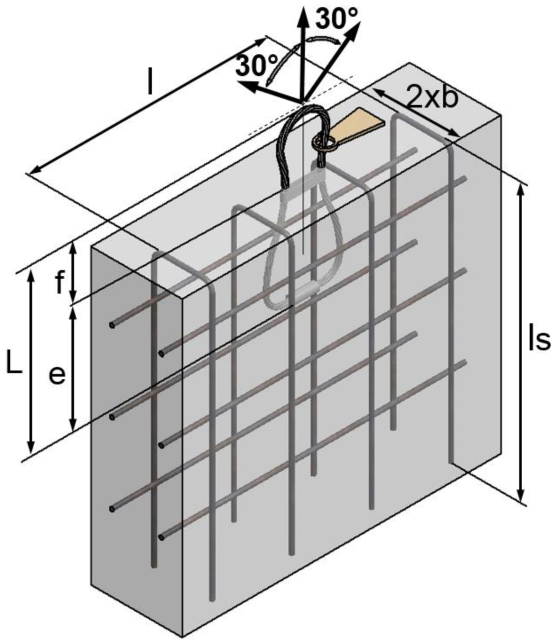


CAST-IN LIFTING LOOPS – TIL

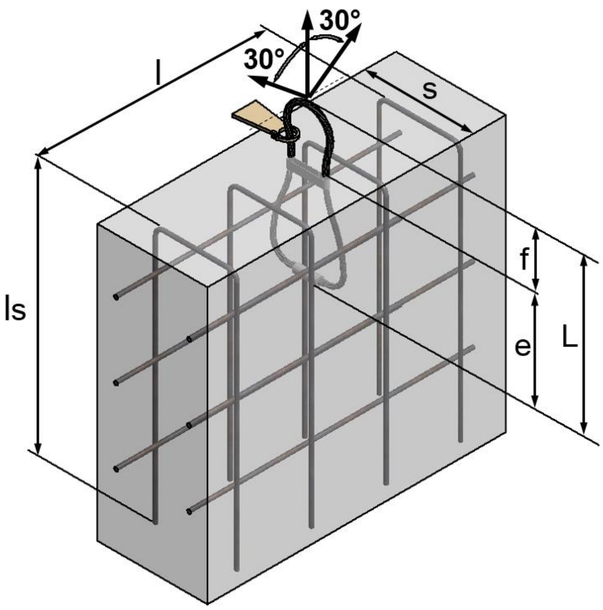
Cast-in Lifting Loops are the most economic lifting system. They require relatively large edge distances. Consider the exposure of steel wire loops after the installation of the concrete unit. Once the unit is set in the finally position protruding loops can be cut off, if required, but the cut ends must be protected against corrosion to avoid rust staining. The wire steel rope is more suitable for forming a cast-in loop because it is flexible, and the lifting loop made from reinforcement bar is liable to fatigue, especially if bent during angled lift. In the table below are indicated the minimum dimensions for installation in reinforced concrete. For acute angled lifts may be required additional lateral reinforcement. Cast-in Lifting Loops are composed from a high-grade steel wire AISI 1010 (W 1.1121), swaged in a ferrule made of AlMg1.8, a fixing strip at the middle an identification label, which must not to slide down the hoop during casting and should remain visible. Each lifting loop has attached a label marked with the admissible load and the code number of the testing. Cast-in Lifting Loops is zinc plated for protection against corrosion. These lifting systems are suitable for use through a single cycle from production to final installation. They are not suitable for multiple use applications. To choose the correct size for any lift it is important to consider the angle of lift, the crane factor and the adhesion to the formwork.
Cast-in lifting loops must be installed in the direction of the expected load. They should be suspended from supports attached to the formwork so that 2/3 of the loop will be cast in and 1/3 remains exposed. The loops must be fastened to the reinforcement cage to avoid movement during concreting. During the storage of the precast unit avoid the bending of steel wire rope. Exposed loops can be attached to standard crane hooks, but the curvature radius of the crane hook should be at least equal to the diameter of the wire rope. It is essential to check that the wire rope is in good condition, without any broken, crushed or with raveled wire. Also, do not use if there are kinks in the loop or the wire rope is excessive corroded! Any Cast-in Lifting Loop with sign of damage should not be used.



TIL	Product no.	Overall length	Wire rope dimensions		Weight	Load group
		L	d	L		f_{cu} > 30 MPa
		[mm]	[mm]	[mm]	[kg/pc]	[t]
TIL-008-210	44812	210	6	540	0.12	0.8
TIL-012-225	44813	225	7	570	0.16	1.2
TIL-016-235	44814	235	8	615	0.22	1.6
TIL-020-275	44815	275	9	690	0.32	2.0
TIL-025-315	44816	315	10	780	0.44	2.5
TIL-040-340	44817	340	12	860	0.69	4.0
TIL-052-360	43599	360	14	1010	0.99	5.2
TIL-063-390	43600	390	16	1100	1.41	6.3
TIL-080-440	43601	440	18	1250	2.08	8.0
TIL-100-525	44818	525	20	1350	3.01	10.0
TIL-125-570	43602	570	22	1500	3.90	12.5
TIL-160-615	44819	615	26	1650	6.05	16.0
TIL-200-730	44820	730	28	1900	8.00	20.0
TIL-250-800	44821	800	32	2000	11.28	25.0
TIL-320-770	46961	770	36	2225	13.40	32.0
TIL-370-950	46962	950	36	2500	15.90	37.0
TIL-470-1100	46963	1100	44	3000	28.20	47.0
TIL-520-1200	47324	1200	44	3350	31.05	52.0



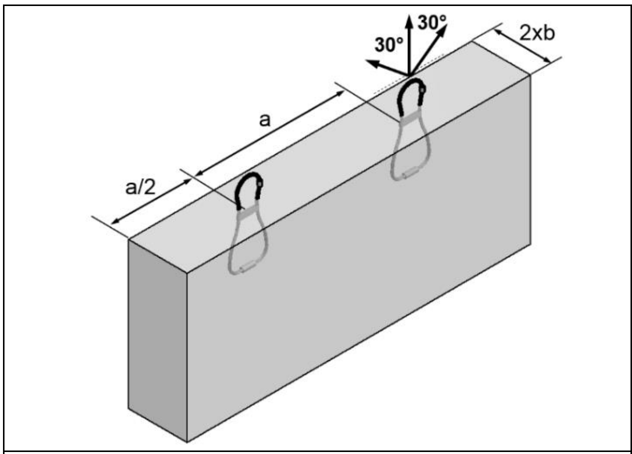
Longitudinal installation

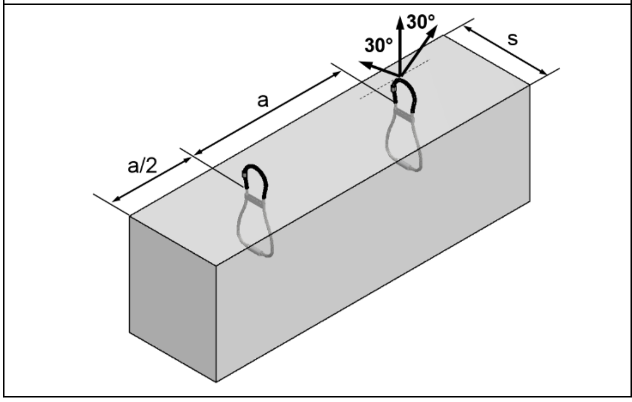


Transversal installation

Installation detail and reinforcement required for TIL – Cast-in lifting system

TIL	Dimensions cast-in		Reinforcement dimension		Minimum precast element width		Load group f_{cu} > 30 MPa
	f	e	Min ls	Min l	s	2xb	
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[t]
TIL-008-210	60	150	250	400	140	80	0.8
TIL-012-225	65	160	300	450	150	100	1.2
TIL-016-235	70	165	350	500	170	120	1.6
TIL-020-275	75	200	350	550	180	140	2.0
TIL-025-315	85	230	450	650	190	160	2.5
TIL-040-340	100	240	500	700	220	200	4.0
TIL-052-360	100	260	550	800	300	240	5.2
TIL-063-390	110	280	600	950	320	280	6.3
TIL-080-440	120	320	700	1050	410	300	8.0
TIL-100-525	135	390	800	1200	440	320	10.0
TIL-125-570	150	420	900	1300	570	360	12.5
TIL-160-615	165	450	1000	1500	630	420	16.0
TIL-200-730	180	550	1150	1700	680	450	20.0
TIL-250-800	200	600	1300	1950	760	500	25.0
TIL-320-770	220	550	Reinforcement must be designed by the lifting design engineer and placed in accordance with the approved lifting design.		800	540	32.0
TIL-370-950	275	675			830	580	37.0
TIL-470-1100	320	780			940	630	47.0
TIL-520-1200	350	850			1050	690	52.0





TIL	Installation dimensions		Minimum precast element width	
	a/2	a	s	2xb
	[mm]	[mm]	[mm]	[mm]
TIL-008-210	270	540	140	80
TIL-012-225	310	620	150	100
TIL-016-235	345	690	170	120
TIL-020-275	415	830	180	140
TIL-025-315	445	890	190	160
TIL-040-340	500	1000	220	200
TIL-052-360	515	1030	300	240
TIL-063-390	575	1150	320	280
TIL-080-440	645	1290	410	300
TIL-100-525	730	1460	440	320
TIL-125-570	810	1620	570	360
TIL-160-615	930	1860	630	420
TIL-200-730	1060	2120	680	450
TIL-250-800	1205	2410	760	500
TIL-320-770	1350	2700	800	540
TIL-370-950	1480	2960	830	580
TIL-470-1100	1645	3290	940	630
TIL-520-1200	1870	3740	1050	690

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 sea water impact may cause damage to anchors and shorten the standing time.

SAFETY INSTRUCTIONS

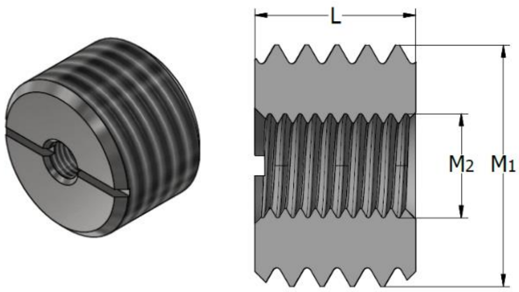
Lifting components must be used by experienced and trained personnel. This reduces the risk of severe damages and injury. Every lifting process must be made according to the instructions.

Obligatory instructions for safe working:

- All lifting anchors must be operated manually.
- Inspect lifting anchors visually before use, check and clean all lifting inserts prior to use.
- Hook in all lifting systems freely without requiring force.
- Respect local regulations for safe lifting and hoisting all times.

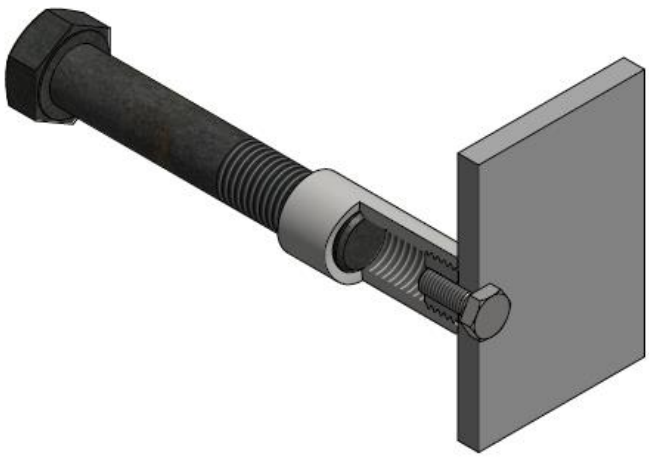
ACCESORIES

DOUBLE METRIC MOUNTING PLUG – SN



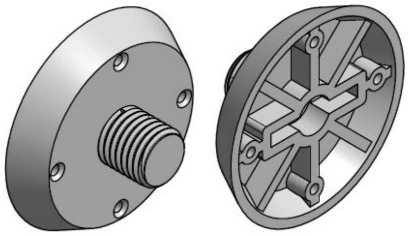
SN	Product no.	Thread M1	Thread M2	L [mm]
SN M12-M6	45214	12	6	16
SN M16-M8	45215	16	8	16
SN M20-M8	45216	20	8	16
SN M24-M8	46303	24	8	16
SN M24-M10	45217	24	10	16
SN M30-M10	45218	30	10	16
SN M30-M8	46079	30	8	16
SN M36-M10	45219	36	10	25
SN M42-M10	45220	42	10	30
SN M48-M10	45464	48	10	36
SN M48-M12	46525	48	12	36
SN M48-M16	46524	48	16	36

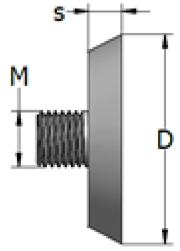
Double metric mounting plug SN is used for fixing the anchors or the lifting sockets on the formwork with a screw.



PLASTIC NAILING PLATE KU-10

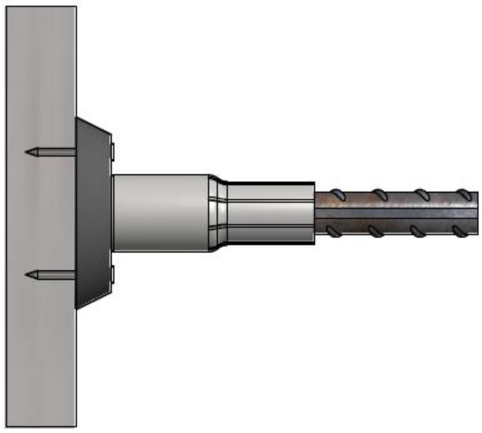
The nailing plates KU-10 are used for fixing the anchors and the lifting sockets to the formwork with nails. The fixing flange ensures a minimal recess around the head of the anchor. The recess is filled with fine concrete for protection against corrosion.

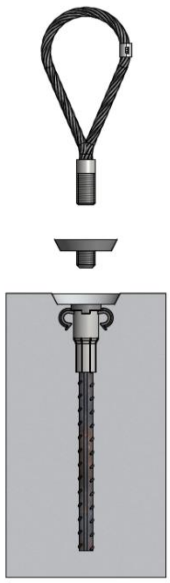




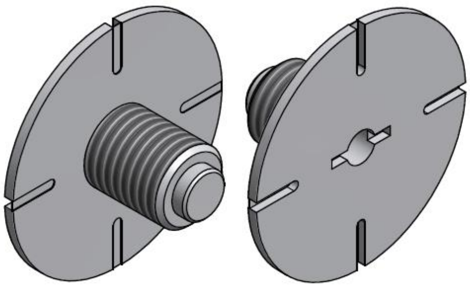
KU-10	Product no.	Thread	Diam. D	Diam. d	s	Color
		M	[mm]	[mm]	[mm]	
KU-10-M12	63246	12	47	37	10	Red RAL 3020
KU-10-M16	63256	16	47	37	10	Grey RAL 7043
KU-10-M20	63257	20	60	50	10	Green RAL 6024
KU-10-M24	63258	24	60	50	10	Blue RAL 5017
KU-10-M30	63259	30	73	63	10	Night blue RAL 5022
KU-10-M36	63260	36	73	63	10	Orange RAL 2009
KU-10-M42	63261	42	96	86	12	Brown RAL 8001
KU-10-M52	63262	52	96	86	12	Black RAL 9017

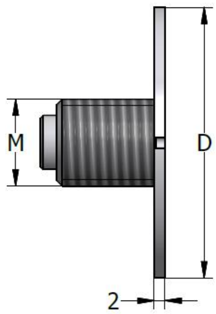
The plastic nailing plates KU-10 are nailed to formwork. Using forming wax on the nailing plate makes it easier to remove and screw on anchor or fixing insert. The anchor must be fastened to the reinforcement by suitable means so that it does not move during concreting. After stripping, unscrew.





PLASTIC NAILING PLATE KU-2



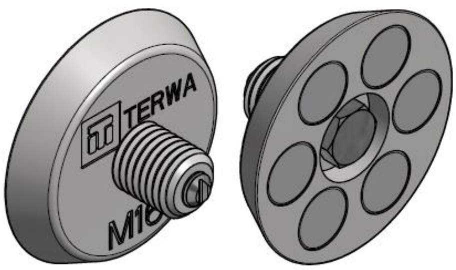


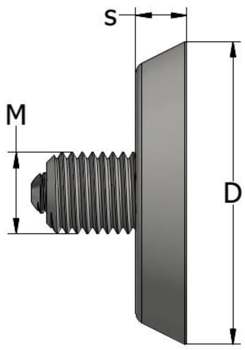
KU-02	Product no.	Thread M	Diam. D [mm]	Thickness [mm]
KU-02-M12	46050	M12	50	2
KU-02-M16	47113	M16	50	2
KU-02-M20	47114	M20	50	2
KU-02-M24	47115	M24	50	2

The nailing plates KU-02 are used for fixing the PSA or PSAD reinforcement coupler to the formwork with nails. These are suitable for fixing the PSA reinforcement coupler at the surface of the concrete units.

STEEL MAGNETIC PLATE - TPM

The plates with magnets TPM are used for fixing the anchors and the lifting sockets to the steel formwork. The fixing flange ensures a minimal recess around the head of the anchor. When using this magnetic recess former, it is very important that the surface of the formwork is clean. The recess is filled with fine concrete for protection against corrosion.





TPM-10	Product no.	Thread M	Diam. D [mm]	s [mm]
TPM-10-M12	47246	12	47	10
TPM-10-M16	48160	16	47	10
TPM-10-M20	48161	20	60	10
TPM-10-M24	48162	24	60	10
TPM-10-M30	47380	30	73	10
TPM-10-M36	48163	36	73	10
TPM-10-M42	48164	42	96	12
TPM-10-M52	48165	52	96	12

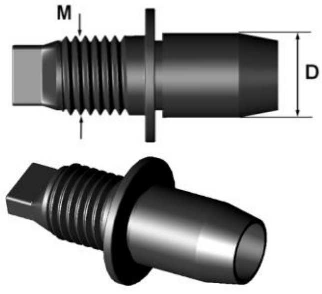
Note: the magnets have high strength so, please be careful with your hands when you mount it on the steel formwork.

BREAKABLE FIXING PIN – TBP

Breakable fixing pin TBP is used for fixing the anchors or the lifting sockets on the formwork. The Breakable fixing pin TBP is made of plastic nylon or polyamide 6.

Working method:

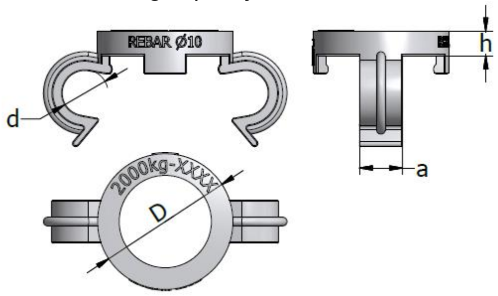
- Insert the Breakable fixing pin TBP in to the formwork.
- Screw the anchor or the fixing insert onto the fixing pin TBP
- Pour concrete.
- Remove the formwork, the fixing pin will break in the formwork.
- Remove the remained part of the fixing pin just before using the thread of the anchor.



TBP	Product no.	Thread M	D [mm]
TBP-M12	45652	12	11
TBP-M16	45653	16	17
TBP-M20	45654	20	17
TBP-M24	45655	24	17

DATA CLIP

With the Terwa DATA CLIP it is easy to identify the lifting anchor embedded in concrete. On this ring is clearly marked the size, the maximum working load, the additional reinforcement steel diameter and manufacturer. In the same time, each DATA CLIP has a unique color code related to the load group of the anchor. The product haves two lateral wings which permit the easy mounting of the additional reinforcement steel on the anchor in a safe zone with a lifting capacity of 100% of the anchor.

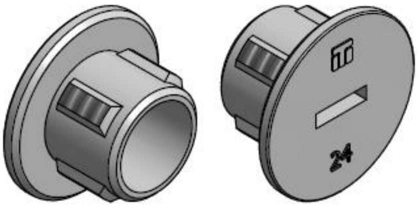


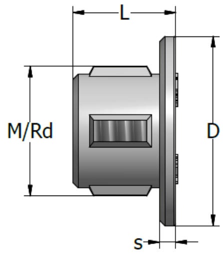
DATA CLIP	Product no.	Thread M	D [mm]	h [mm]	a [mm]	d [mm]	Color
DATA CLIP -M12	62602	12	20.5	4	6.5	6.5	Pink RAL 3015
DATA CLIP -M16	62538	16	26.5	5	7.5	8.5	Oyster white RAL 1013
DATA CLIP -M20	62539	20	31.5	6	10	10.5	Light green RAL 6019
DATA CLIP -M24	62540	24	36.5	6	10	10.5	Light blue RAL 5012
DATA CLIP -M30	62541	30	43.5	6	15	12.5	Lilac RAL 4005
DATA CLIP -M36	62542	36	52.5	8	18	17	Sulfur yellow RAL 1016
DATA CLIP -M42	62543	42	60.5	8	19.5	20	Light brown RAL 8001
DATA CLIP -M52	62544	52	73.5	9	22	20	Dark grey RAL 7037

DATA CLIP	Product no.	Thread Rd	D [mm]	h [mm]	a [mm]	d [mm]	Color
DATA CLIP -Rd12	62643	12	20.5	4	6.5	6.5	Pink RAL 3015
DATA CLIP -Rd16	62644	16	26.5	5	7.5	8.5	Oyster white RAL 1013
DATA CLIP -Rd20	62645	20	31.5	6	10	10.5	Light green RAL 6019
DATA CLIP -Rd24	62646	24	36.5	6	10	10.5	Light blue RAL 5012
DATA CLIP -Rd30	62647	30	43.5	6	15	12.5	Lilac RAL 4005
DATA CLIP -Rd36	62648	36	52.5	8	18	17	Sulfur yellow RAL 1016
DATA CLIP -Rd42	62649	42	60.5	8	19.5	20	Light brown RAL 8001
DATA CLIP -Rd52	62650	52	73.5	9	22	20	Dark grey RAL 7037

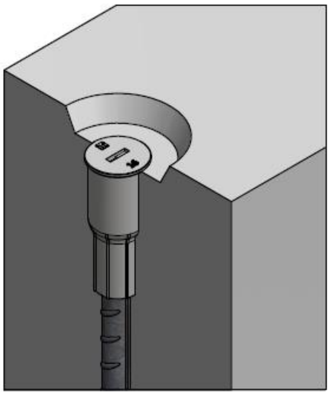
PLASTIC PLUG

Plastic plugs are used to cover the bush and protect the sockets against the rust or dirt. Are available in concrete grey color so, can remain in the concrete element after installation with a good aspect of the element.





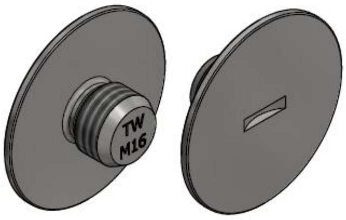
PLASTIC PLUG	Product no.	Thread	Diam. D	L	s
		M/Rd	[mm]	[mm]	[mm]
PLASTIC PLUG -M/Rd12	62768	12	18	12	1.5
PLASTIC PLUG -M/Rd16	62769	16	25	15	2
PLASTIC PLUG -M/Rd20	62770	20	32	18	3
PLASTIC PLUG -M/Rd24	62771	24	35	19	3
PLASTIC PLUG -M/Rd30	62772	30	44	23.5	3
PLASTIC PLUG -M/Rd36	62773	36	53	26	3
PLASTIC PLUG -M/Rd42	62774	42	60	27	3
PLASTIC PLUG -M/Rd52	62775	52	73	32	3

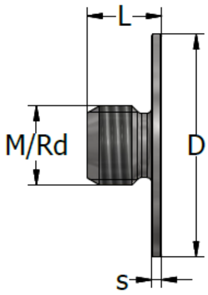


After remove the KU Nailing plate mount the plastic plug inside the socket.
Also, can be used for protection the thread of the socket anchors before installation to prevent the dirt to get into the thread zone of the anchor.

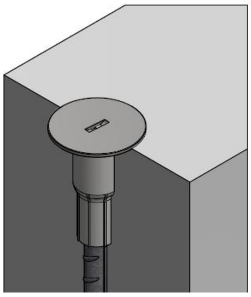
COVER SEALING CAP TP-02

The Cover Sealing Cap is made of Stainless Steel and have the purpose to protect the socket and a nice look on the concrete element.





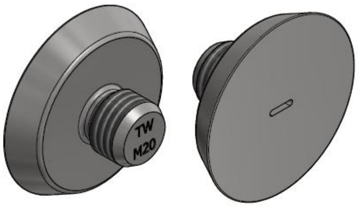
COVER SEALING CAP	Product no.	Thread	Diam. D	L	s
		M/Rd	[mm]	[mm]	[mm]
M/Rd12	61526	12	35	15	2
M/Rd16	61527	16	35	15	2
M/Rd20	61528	20	44	18	2
M/Rd24	61529	24	44	25	2
M/Rd30	61530	30	59	25	2
M/Rd36	61531	36	59	30	2

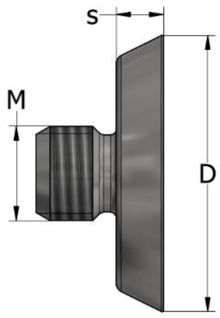


Mount the Cap in the socket after remove the Nailing plate.

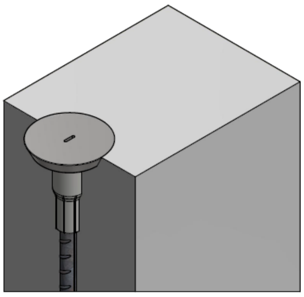
COVER SEALING CAP

The Cover Sealing Cap is made of Stainless Steel and have the purpose to protect the socket and a nice look on the concrete element.





COVER SEALING CAP	Product no.	Thread	Diam. D	s
		M/Rd	[mm]	[mm]
M/Rd12	63115	12	45	10
M/Rd16	63116	16	45	10
M/Rd20	63117	20	54	10
M/Rd24	63118	24	54	10
M/Rd30	63119	30	69	10
M/Rd36	63120	36	69	10
M/Rd42	63121	42	94	12



Mount the Cap in the socket after remove the Nailing plate.

ALL SPECIFICATIONS CAN BE CHANGED WITHOUT PREVIOUS NOTICE.

DISCLAIMER