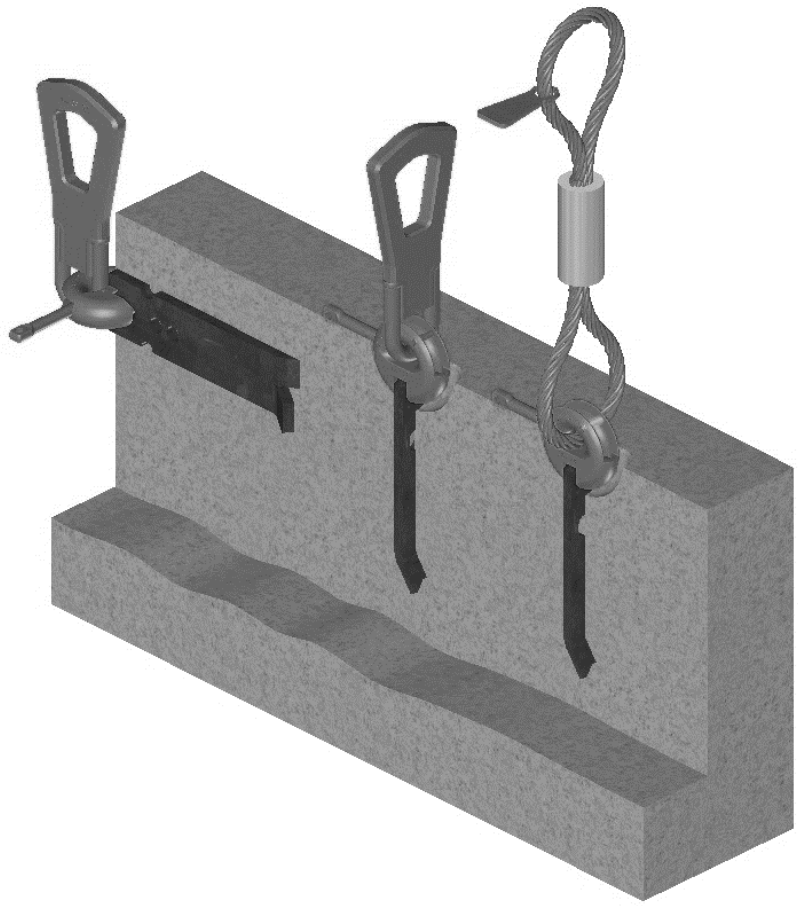
2D - STRIP ANCHOR LIFTING SYSTEM



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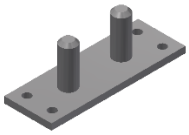
PRODUCT RANGE

LIFTING CLUTCHES AND TRANSPORT ANCHOR			
SA-B  Page 15	**SA-ST**  Page 20	**SA-TTU**  Page 23	**UNIVERSAL ANCHOR 12.5 kN**  Page 27
SA-TU-HP  Page 28	**SA-FA**  Page 31	**SA-FAW**  Page 33	**SA-SP**  Page 35
TF1  Page 38	**TF1-260**  Page 38	**TF2**  Page 38	
RECESS FORMERS AND ACCESORIES			
RBF  Page 44	**RBFM**  Page 45	**TMP**  Page 46	**TDV**  Page 47
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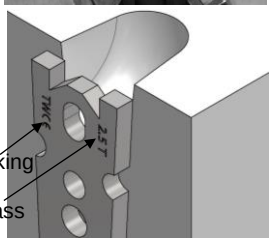
INTRODUCTION

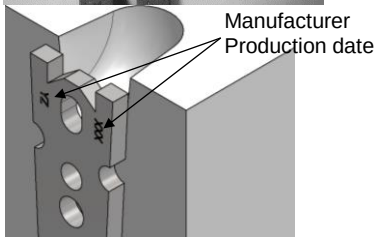
The Strip anchor lifting system manufactured by TERWA is high quality, safe, easy to handle and cost-effective system. It used for transporting all types of concrete elements.
Some of the important advantages of these systems are:

- Safe, simple and fast connection and disconnection between lifting anchors links.
- Anchors and links are designed for load capacities between **0.7 – 26.0 t**.
- High quality alloy material for lifting anchors usable in any environment.
- Available in hot-dip galvanized for corrosion protection.
- Perfect lifting and transport solution for most applications and precast elements.
- CE conform system. All Terwa lifting systems are CE marked which guarantees the alignment to the European regulations.
- The design for Terwa Strip Anchors and technical instructions are according to the national German rule VDI/BV-BS 6205:2012 “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.
- The anchors are designed to resist at a minimum safety factor = 3.
- The welding on the anchor is not allowed.

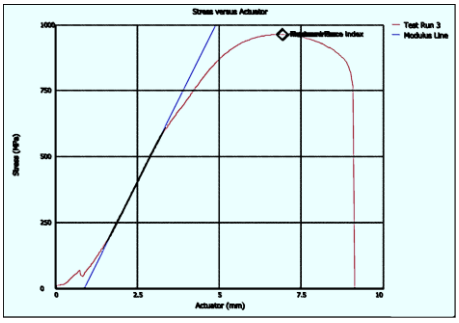
Quality
Terwa control all the time the production process for the anchors from strength, dimensional, material quality point of views and all the required inspections for a superior quality system. All the products are tracked starting from the material acquisition to the final product, ready to be used.

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





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



CE MARKING

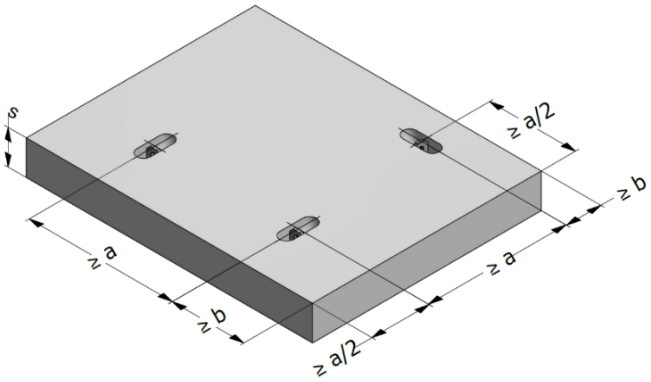
CE marking means that a product is produced and controlled in accordance with a harmonized European standard (hEN) or a European Technical Approval (ETA). ETA can be used as basis for CE marking in cases where no harmonized EN standard is available. However, ETA is voluntary and not required by EU directives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

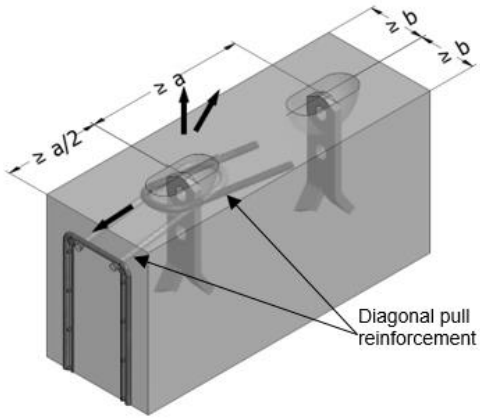
EU’s Construction Products Regulation takes effect in full on 1 July 2013. Detailed building parts, such as connections used in concrete constructions, do not have any harmonized EN standards, excluding lifting items and devices, which are regulated in the EU Machinery Directive. For steel constructions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

BASIC PRINCIPLES FOR THE ANCHOR SELECTION

Anchors for large surface precast unit

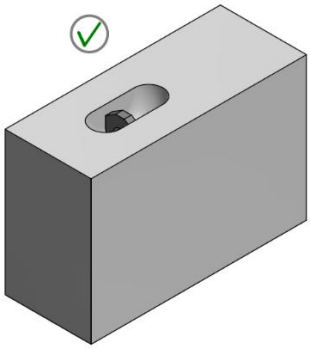


Anchors for thin walled precast units

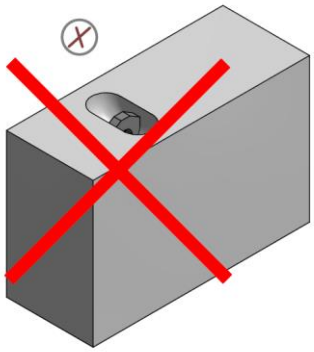


When the load is near to the narrow edge, reinforcement for angled pull is necessary.
The diagonal reinforcement must be designed and used in accordance to EN 1992.

Anchors placement in thin wall elements
In thin walled units, such as panels, the anchors may only be installed with the flat steel at right -angles to the slab.

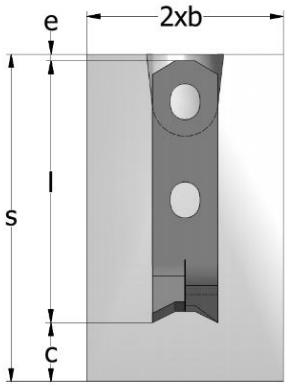


CORRECT INSTALLATION



INCORRECT INSTALLATION

Minimum thickness of the elements

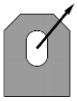


$$S = c + l + e$$

Where:

S = minimum thickness of precast unit
l = anchor length
e = cover to anchor head
c = concrete cover according to EN 1992

The length of the anchor depends on the minimum thickness of precast units and must be chosen in correct way respecting the norms.

Lifting symbols used in the documentation	
Axial pull in direction of anchor axis.	
Transverse pull perpendicular to the anchor surface.	
Transverse pull perpendicular to the anchor surface.	
Angled pull, transverse component perpendicular to the anchor surface.	
Angled pull, transverse component parallel to the anchor surface	

TECHNICAL INFORMATION – CHOOSING THE TYPE OF ANCHOR

INTRODUCTION

Terwa has 3 types of lifting systems:

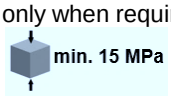
- 1D Threaded lifting system
- 2D Strip anchor lifting system
- 3D T slot anchor lifting system

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:

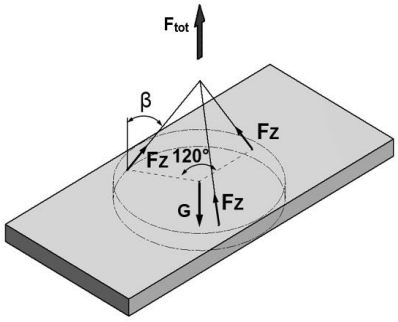
- **for steel component** **c = 3**
- **for concrete element** **c = 2.5**
- **for steel wires** **c = 4**

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

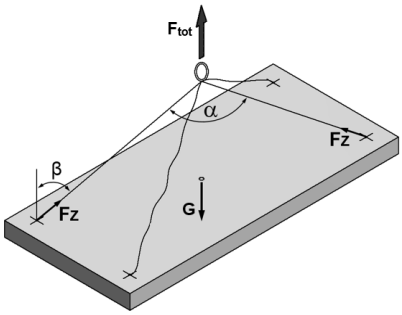
Using three anchors arranged at the same length on from each other like in the figure, can be assumed three load bearing anchors.

Load bearing anchors:
n=3



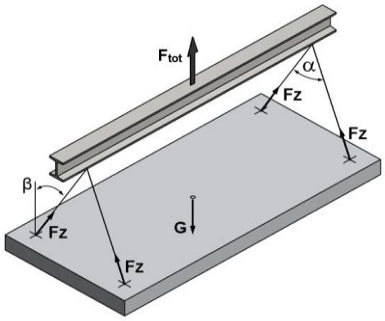
Using four anchors lifted without a spreader beam, only two anchors can be assumed load bearing anchors.

Load bearing anchors:
n=2



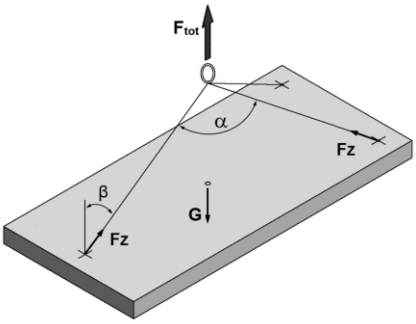
A perfect force distribution is assumed using a spreader beam.

Load bearing anchors:
n=4



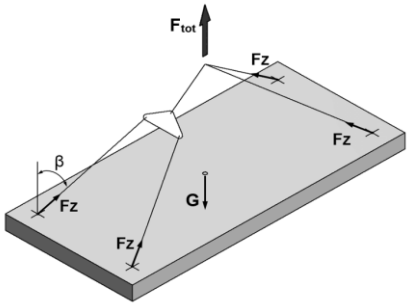
If the anchors are positioning asymmetrically only two bearing anchors can be assumed.

Load bearing anchors:
n=2



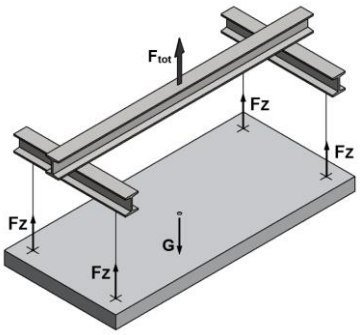
The compensated lifting slings ensure equal force distribution.

Load bearing anchors:
n=4

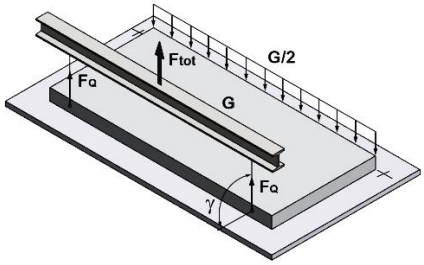


A perfect static weight distribution can be obtained using a lifting beam and two pairs of anchors set out symmetrically.

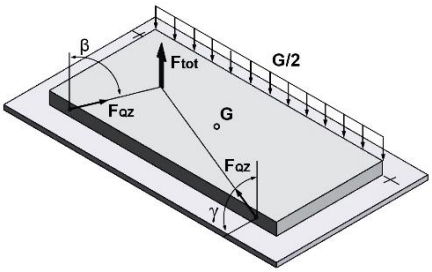
Load bearing anchors:
n=4



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 ≤ 30°***



ASYMETRIC DISTRIBUTION OF THE LOAD

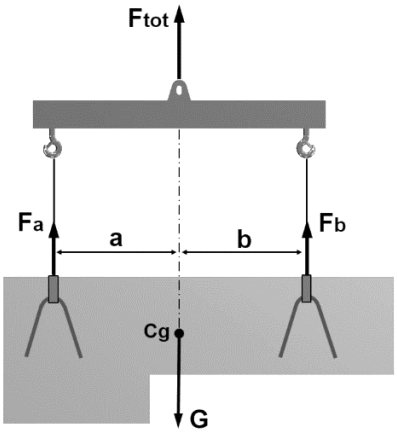
In case of asymmetrical elements before installing the anchors, calculate the loads based on the center of gravity position. The load of each anchor depends on the embedded position of the anchor in the precast unit and on the transporting mode:

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 unit during transport, the load should be suspended from the lifting beam such 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).

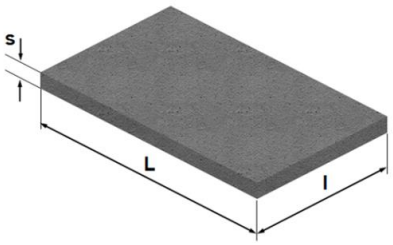
LOAD CAPACITY

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 precast elements which are made with a higher concentration of reinforcing elements in the calculation of weight, this must be considered.



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

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

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 and 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:

$$H_a = q \times A\ [kN]$$

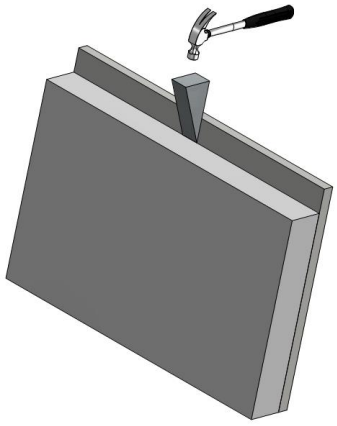
Where:
q- the adhesion to formwork factor according with the material of the formwork
A - the area of contact between the formwork and the concrete unit when starting the lift

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 tilting and transport $f = 1.3$

ON SITE:

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

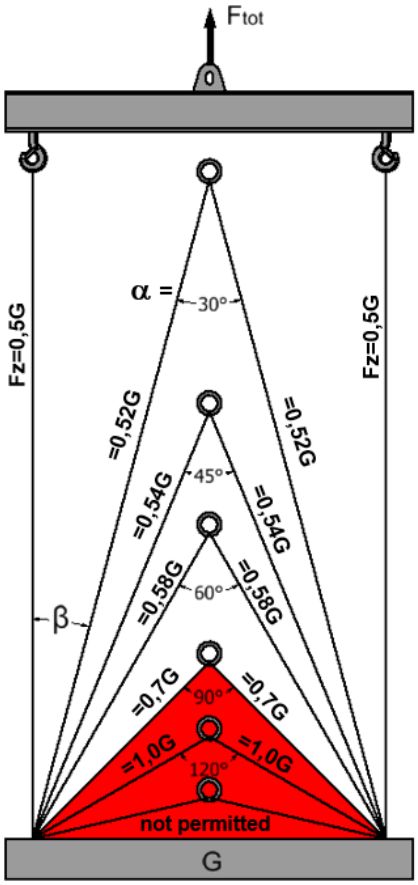
For special transport and lifting cases the dynamic coefficient is established based on the tests or on proven experience.

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

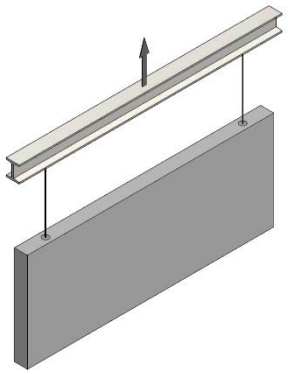
*** preferred ß ≤ 30°**

Note: The anchors have must be installed symmetrically to the center of gravity when is not used for lifting a spreader beam.

LOAD DIRECTIONS

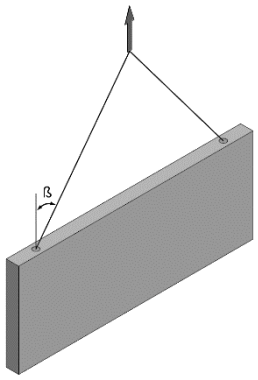
During the transportation and lifting various cases can occur, such tilt-up, rotation, hoisting and of course the installation. The lifting anchor and clutches most carry all this cases and combinations. Therefore, the load direction is a very important factor for a good anchor selection.

Axial load **ß = 0º to 10º**



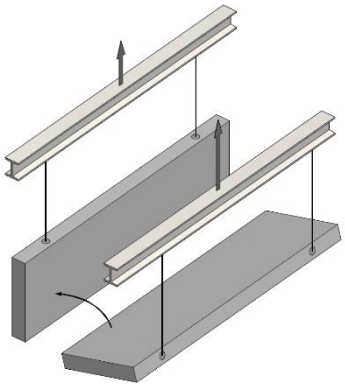
Diagonal load **ß = 10º to 45º**

Note: is recommended ***ß ≤ 30º***

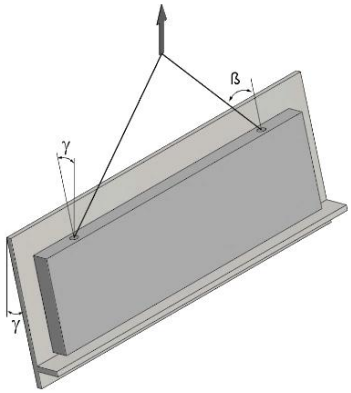


Tilting γ **= 90º**

Additional shear reinforcement steel must be used.

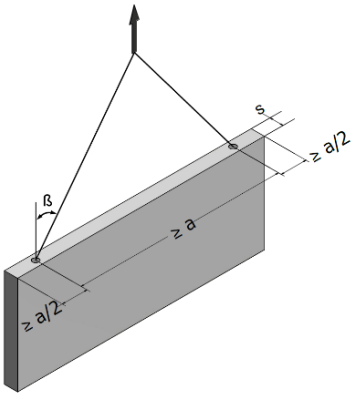


When a tilting table is used, the anchors can be used without the additional shear reinforcement steel, not exceeding the angle γ **< 15º**

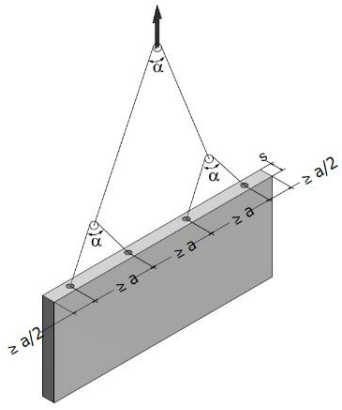


POSITIONATING THE ANCHORS IN WALLS

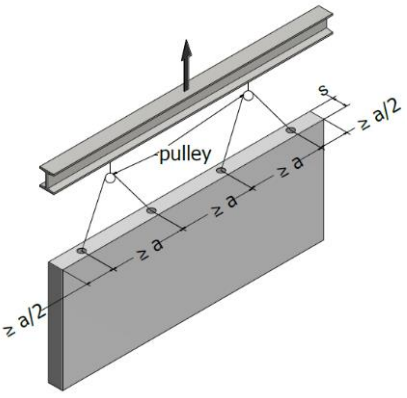
Load bearing anchors: **n=2**

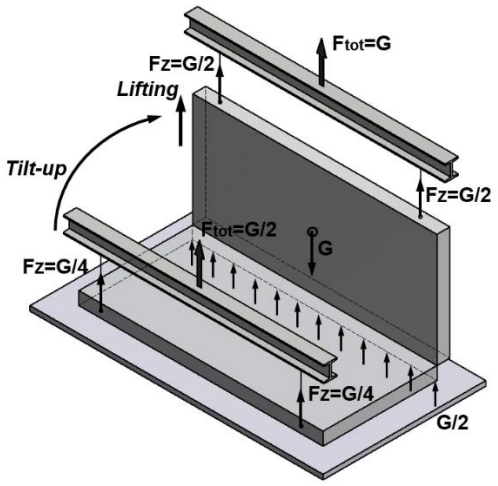


Load bearing anchors: **n=4**



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** $\boldsymbol{F = (F_{tot} \times \mathrm{z})/\mathrm{n} = [(G + H_a) \times f \times z]/n}$

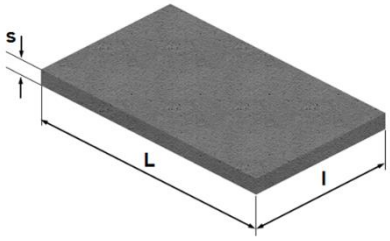
- **When tilting** $\boldsymbol{F = (F_{tot}/2 \times f \times \mathrm{z})/\mathrm{n} = [(G/2 + H_a) \times f \times z]/n}$

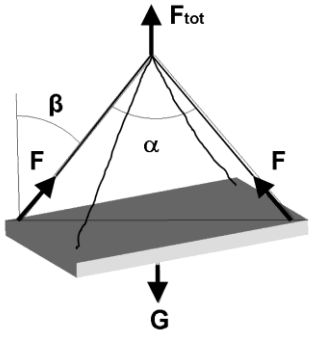
During tilting, the concrete element remains supported on the ground, only the half of the forces have to be taken into account.
In the situation of tilting, load carrying capacity of sockets and anchors is limited to 50% of the axial load.

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

CALCULATION EXAMPLES

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

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

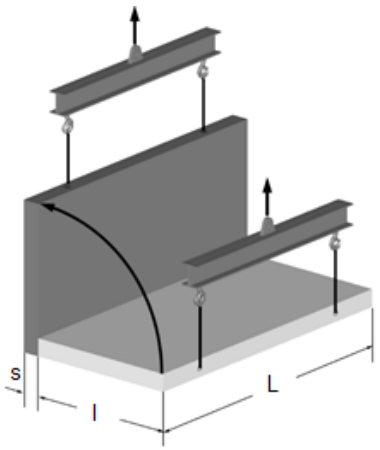
TRANSPORT AT SITE:

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 wall panel 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

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

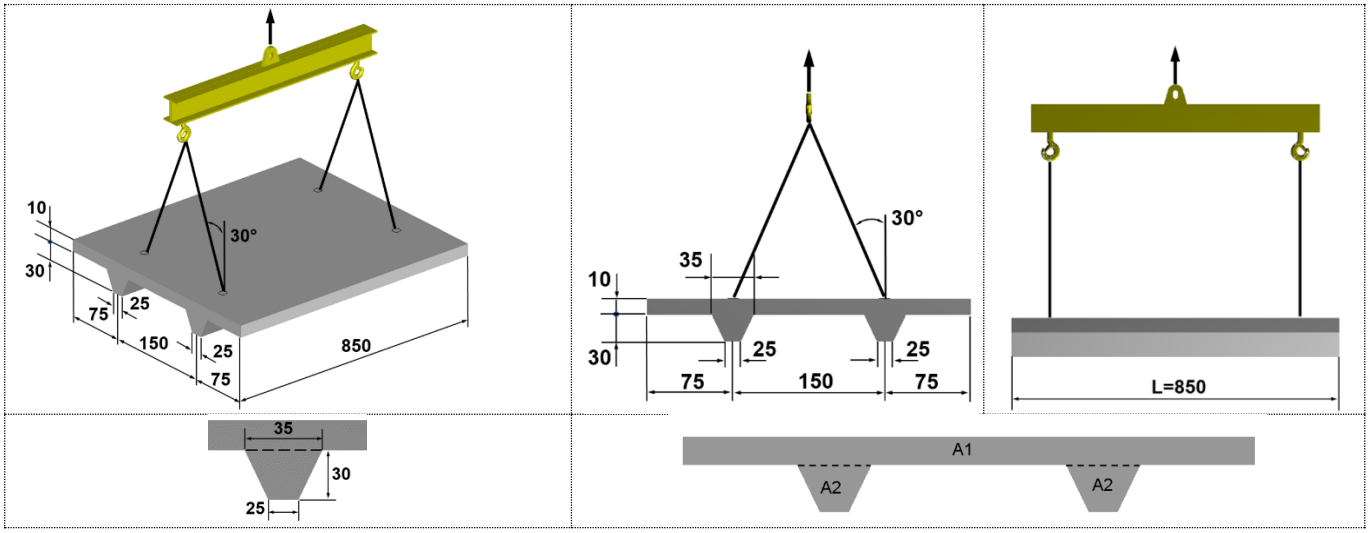
TRANSPORT AT SITE:

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, **SA-TTU type in the 75 kN range** are required. For tilting, additional reinforcement will be added (see page 24).

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
$\boldsymbol{A1 = 0.1\ x\ 3}$ (m²)
$\boldsymbol{A2 = [(35 + 25)\ x\ 30]\ /2}$ (cm²)
$\boldsymbol{A2 = [(0.35 + 0.25) x\ 0.3\ /2 = \ (0.6\ \ x\ 0.3)/2 = 0.09}$ (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:

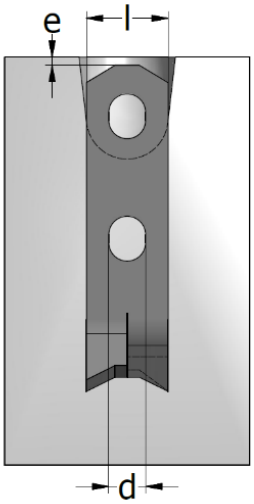
$$\boldsymbol{F = \frac{Ftot\ x\ f\ x\ z}{n} = \frac{G\ x\ f\ x\ z}{n} = \frac{102\ x\ 1.3\ x\ 1.16}{4} = 38.46\ kN}$$

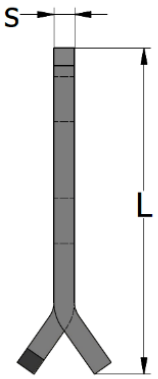
An anchor in the 100 kN range is required (> 88.74 kN)

STRIP ANCHORS

SPREAD ANCHOR SA-B

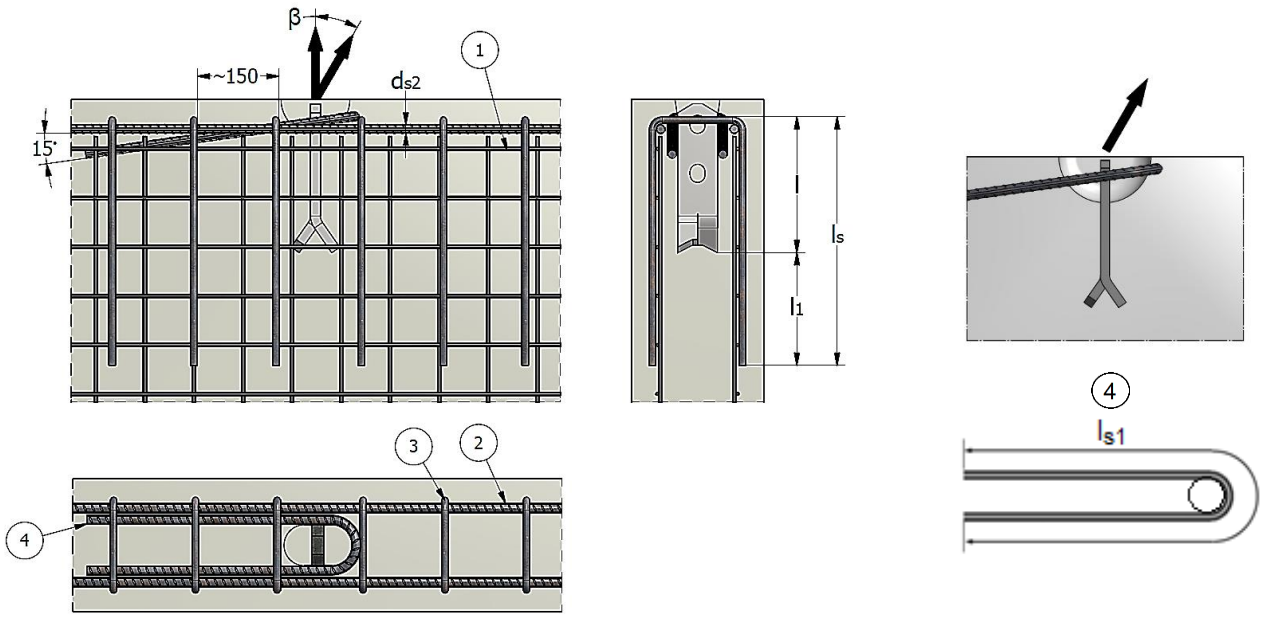
The **SA-B anchors "Spread Anchor"** are designed to load range 14 kN to 220 kN. They are easy adaptable, and they provide an efficient anchorage in thin panels but also for large slabs or other precast elements. The anchor is designed with a hole for extra reinforcement steel.





SPREAD ANCHOR SA -B, DIMENSIONS AND LOAD CAPACITY								
Anchor Type	Product number		L	l	s	d	Load range	e
	Black	Hot-dip galvanized	[mm]	[mm]	[mm]	[mm]	[kN]	[mm]
Load group lifting clutch 25 kN								
SA -B 7 kN – 110	44991	45022	110	30	5	14	7	
SA -B 14 kN – 110	44992	45023	110	30	6	14	14	
SA -B 14 kN – 160	44993	45024	160	30	6	14	14	
SA -B 20 kN – 130	44994	45025	130	30	8	14	20	
SA -B 20 kN – 160	44995	45026	160	30	8	14	20	10
SA -B 20 kN – 210	44996	45027	210	30	8	14	20	
SA -B 25 kN – 150	44997	45028	150	30	10	14	25	
SA -B 25 kN – 200	44998	45029	200	30	10	14	25	
SA -B 25 kN – 250	44999	45030	250	30	10	14	25	
Load group lifting clutch 50 kN								
SA -B 30 kN – 160	45000	45031	160	40	10	18	30	
SA -B 30 kN – 220	45001	45032	220	40	10	18	30	
SA -B 30 kN – 280	45002	45033	280	40	10	18	30	
SA -B 40 kN – 180	45003	45034	180	40	12	18	40	
SA -B 40 kN – 240	45004	45035	240	40	12	18	40	10
SA -B 40 kN – 320	45005	45036	320	40	12	18	40	
SA -B 50 kN – 180	45006	45037	180	40	15	18	50	
SA -B 50 kN – 240	45007	45038	240	40	15	18	50	
SA -B 50 kN – 400	45008	45039	400	40	15	18	50	
Load group lifting clutch 100 kN								
SA -B 53 kN – 220	45009	45040	220	60	12	26	53	
SA -B 53 kN – 260	45010	45041	260	60	12	26	53	
SA -B 53 kN – 340	45011	45042	340	60	12	26	53	
SA -B 75 kN – 260	45012	45043	260	60	15	26	75	
SA -B 75 kN – 300	45013	45044	300	60	15	26	75	15
SA -B 75 kN – 420	45014	45045	420	60	15	26	75	
SA -B 100 kN – 300	45015	45046	300	60	20	27	100	
SA -B 100 kN – 370	45016	45047	370	60	20	27	100	
SA -B 100 kN – 520	45017	45048	520	60	20	27	100	
Load group lifting clutch 260 kN								
SA -B 140 kN – 370	45018	45049	370	80	20	35	140	
SA -B 140 kN – 460	45019	45050	460	80	20	35	140	15
SA -B 220 kN – 500	45020	45051	500	80	25	35	220	
SA -B 220 kN – 620	45021	45052	620	80	25	35	220	

SA-B ANCHOR - INSTALLATION AND REINFORCEMENT



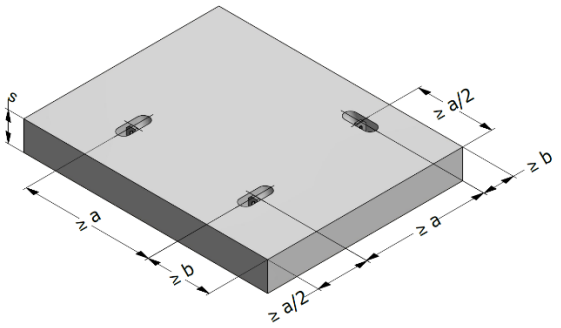
Note: *The bending radius will be established considering the EN 1992.*
The diagonal reinforcement must be placed as much as possible close to the recess former and installed in contact with the lifting anchor.
The reinforced zone must be $\geq 3 \times$ anchor lenght "L".
Length $l_s = l_1$ *+Anchor length*
The dimensions in pictures are in [mm]

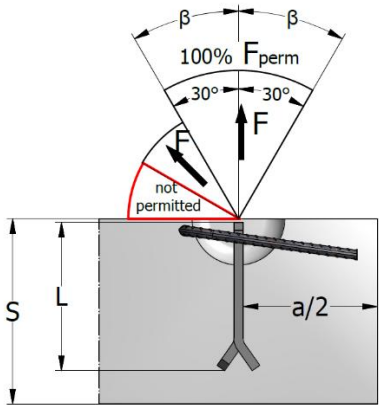
SA-B ANCHOR, INSTALLATION AND REINFORCEMENT						
Anchor Type	**Load group**	**Pull β > 30°**	**Edge reinforcement**	**Angled pull β > 30° max. 45°**		
		Mesh reinforcement (both sides) ①	②	**Stirrups** ③		**Angled pull reinforcement Ø x l_{s1}**
				Ø x l_1	**Number of stirrups**	④
	[kN]	**[mm²/m]**	**d_{s1} [mm]**	**[mm]**	**[pcs.]**	**[mm]**
Load group lifting clutch 25 kN						
SA -B 7 kN	7	2x131	Ø 8	Ø 6 x 400	4	Ø 6 x 900
SA -B 14 kN	14		Ø 8	Ø 6 x 400	4	Ø 6 x 900
SA -B 20 kN	20		Ø 8	Ø 6 x 500	4	Ø 8 x 1000
SA -B 25 kN	25		Ø 10	Ø 8 x 600	4	Ø 8 x 1200
Load group lifting clutch 50 kN						
SA -B 30 kN	30	2x131	Ø 10	Ø 8 x 700	4	Ø10 x 1150
SA -B 40 kN	40		Ø 12	Ø 8 x 800	4	Ø10 x 1500
SA -B 50 kN	50		Ø12	Ø10 x 800	4	Ø12 x 1550
Load group lifting clutch 100 kN						
SA -B 53 kN	53	2x188	Ø12	Ø10 x 800	4	Ø14 x 1800
SA -B 75 kN	75		Ø12	Ø10 x 800	4	Ø14 x 2000
SA -B 100 kN	100		Ø14	Ø10 x1000	6	Ø16 x 2300
Load group lifting clutch 260 kN						
SA -B 140 kN	140	2x257	Ø14	Ø10 x1000	8	Ø20 x 2600
SA -B 220 kN	220		Ø16	Ø10 x1200	8	Ø28 x 3450

INSTALLATION OF SA-B IN SLABS

For the lifting procedure the position of the anchor is very important in the concrete element. In the table below can be observed the axial spacing for SA-B anchors in slabs.

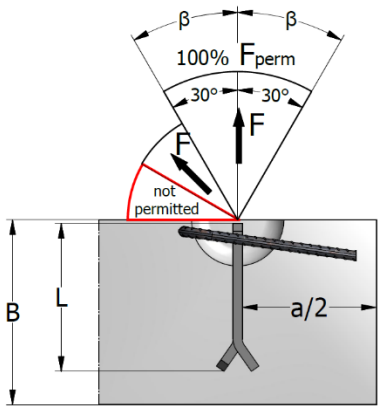
Note: *The minimum accepted concrete cover is 25 mm. For lower thickness for the slab can be accepted only with special corrosion protection. For angled lifting reinforcement steel please consult the page 16.*

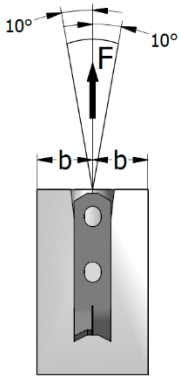


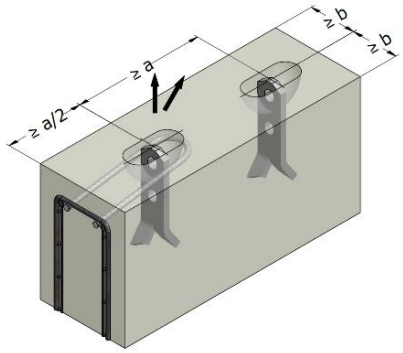


INSTALLATION OF SA-B IN SLABS – LOAD CAPACITY, INSTALLATION DIMENSIONS									
Anchor Type	**Anchor length „L"**	**Load group**	**Minimum thickness of precast unit „S"**	**Minimum edge distance „b"**			**Load capacity f_{cu}≥ 15 MPa**		**Minimum spacing between anchors "a"**
				f_{cu} ≥ 15 MPa	f_{cu} ≥ 25 MPa	f_{cu} ≥ 35 MPa	**Axial pull**	**Angled pull β > 30° max. 45°**	
	[mm]	[kN]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]	[mm]
Load group lifting clutch 25 kN									
SA -B 7 kN – 110	110	7	145	45	40	35	7	5.6	280
SA -B 14 kN – 110	110	14	145	70	50	40	14	11.2	380
SA -B 14 kN – 160	160	20	195	50	35	35	14	11.2	540
SA -B 20 kN – 130	130	20	165	100	70	55	20	16.0	440
SA -B 20 kN – 160	160	20	195	85	65	45	20	16.0	520
SA -B 20 kN – 210	210	20	195	70	50	40	20	16.0	770
SA -B 25 kN – 150	150	25	185	120	85	70	25	20.0	530
SA -B 25 kN – 200	200	25	235	90	64	50	25	20.0	720
SA -B 25 kN – 250	250	25	285	80	55	40	25	20.0	920
Load group lifting clutch 50 kN									
SA -B 30 kN – 160	160	30	195	145	102	80	30	24.0	550
SA -B 30 kN – 220	220	30	255	110	78	61	30	24.0	750
SA -B 30 kN – 280	280	30	315	105	75	58	30	24.0	950
SA -B 40 kN – 180	180	40	215	190	135	105	40	32.0	610
SA -B 40 kN – 240	240	40	275	145	100	80	40	32.0	850
SA -B 40 kN – 320	320	40	355	110	75	60	40	32.0	1170
SA -B 50 kN – 180	180	50	215	260	180	145	50	40.0	600
SA -B 50 kN – 240	240	50	275	195	140	110	50	40.0	840
SA -B 50 kN – 400	400	50	435	115	85	65	50	40.0	1480
Load group lifting clutch 100 kN									
SA -B 53 kN – 220	220	53	260	240	175	155	53	42.4	660
SA -B 53 kN – 260	260	53	300	200	145	135	53	42.4	780
SA -B 53 kN – 340	340	53	380	170	120	110	53	42.4	1020
SA -B 75 kN – 260	260	75	300	300	215	175	75	60.0	900
SA -B 75 kN – 300	300	75	340	265	190	150	75	60.0	1060
SA -B 75 kN – 420	420	75	460	190	135	110	75	60.0	1540
SA -B 100 kN – 300	300	100	340	390	275	220	100	80.0	1030
SA -B 100 kN – 370	370	100	410	315	225	180	100	80.0	1310
SA -B 100 kN – 520	520	100	560	225	160	130	100	80.0	1910
Load group lifting clutch 260 kN									
SA -B 140 kN – 370	370	140	410	500	355	285	140	112.0	1230
SA -B 140 kN – 460	460	140	500	400	285	230	140	112.0	1590
SA -B 220 kN – 500	500	220	540	675	480	385	220	176.0	1700
SA -B 220 kN – 620	620	220	660	540	385	310	220	176.0	2180

INSTALLATION OF SA-B IN BEAMS AND WALLS







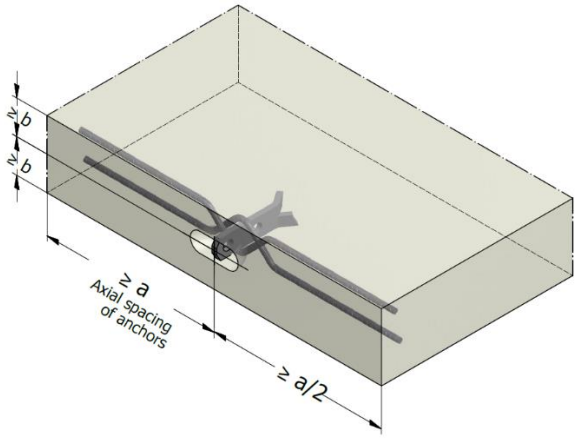
The angled pull reinforcement must be mounted opposite the direction of the load

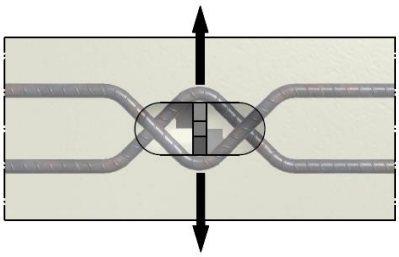
INSTALLATION OF SA-B IN BEAMS AND WALLS – LOAD CAPACITY, INSTALLATION DIMENSIONS

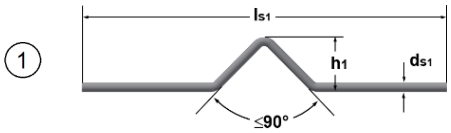
Product Name	Anchor length „L"	Load group	Minimum beam height "B"	Minimum thickness of precast unit "2 × b"			100 % F_{perm} pull $\beta < 30°$	80 % F_{perm} pull $\beta > 30°$ max. 45°	Minimum spacing between anchors "a"
				$f_{cu} \geq 15$ MPa	$f_{cu} \geq 25$ MPa	$f_{cu} \geq 35$ MPa			
	[mm]	[kN]	[mm]	[mm]	[mm]	[kN]			[mm]
Load group lifting clutch 25 kN									
SA -B 7 kN – 110	110	7	240	70	60	60	7	5.6	375
SA -B 14 kN – 110	110	14	240	80	64	65	14	11	375
SA -B 14 kN – 160	160	20	340	80	64	65	14	11	540
SA -B 20 kN – 130	130	20	280	100	80	72	20	16	440
SA -B 20 kN – 160	160	20	350	100	80	72	20	16	520
SA -B 20 kN – 210	210	20	385	100	80	72	20	16	770
SA -B 25 kN – 150	150	25	320	120	95	85	25	20	530
SA -B 25 kN – 200	200	25	420	120	95	85	25	20	720
SA -B 25 kN – 250	250	25	520	120	95	85	25	20	920
Load group lifting clutch 50 kN									
SA -B 30 kN – 160	160	30	340	160	110	100	30	24	550
SA -B 30 kN – 220	220	30	450	130	100	90	30	24	750
SA -B 30 kN – 280	280	30	580	120	95	85	30	24	950
SA -B 40 kN – 180	180	40	380	210	150	130	40	32	610
SA -B 40 kN – 240	240	40	500	200	140	120	40	32	850
SA -B 40 kN – 320	320	40	660	180	130	115	40	32	1170
SA -B 50 kN – 180	180	50	380	350	245	190	50	40	600
SA -B 50 kN – 240	240	50	500	220	155	140	50	40	840
SA -B 50 kN – 400	400	50	820	200	140	130	50	40	1480
Load group lifting clutch 100 kN									
SA -B 53 kN – 220	220	53	460	350	210	150	53	42.4	710
SA -B 53 kN – 260	260	53	545	180	150	120	53	42.4	835
SA -B 53 kN – 340	340	53	700	180	150	120	53	42.4	1080
SA -B 75 kN – 260	260	75	550	340	240	190	75	60	900
SA -B 75 kN – 300	300	75	630	240	170	135	75	60	1060
SA -B 75 kN – 420	420	75	870	200	160	150	75	60	1540
SA -B 100 kN – 300	300	100	630	450	300	200	100	80	1030
SA -B 100 kN – 370	370	100	770	270	216	170	100	80	1310
SA -B 100 kN – 520	520	100	1070	250	200	160	100	80	1910
Load group lifting clutch 260 kN									
SA -B 140 kN – 370	370	140	770	610	420	320	140	112	1230
SA -B 140 kN – 460	460	140	950	350	250	200	140	112	1590
SA -B 220 kN – 500	500	220	1030	760	500	360	220	176	1700
SA -B 220 kN – 620	620	220	1270	450	315	260	220	176	2180

Note: *For required reinforcement and for angled pull please see the table and pictures from page 15.*
Angled pull using cable or chain with $\beta > 45°$ *is* ***not allowed****.*

SA-B ANCHOR - INSTALLATION AND REINFORCEMENT FOR TURNING AND TILTING





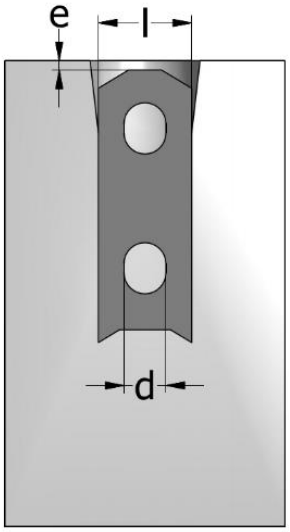


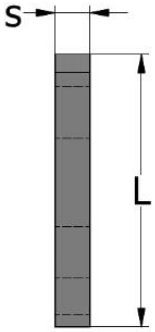
Note: *The bending radius and the length l_s will be established considering the EN 1992.*
The additional reinforcement and the anchor position will be positioned like in picture above.
The dimension h1 will be establish in function of the element thickness.

SA-B ANCHOR – INSTALLATION DIMENSIONS AND REINFORCEMENT FOR TILTING AND TURNING								
Anchor Type	Load group	$f_{cu} \geq 15$ MPa			Tilting and turning reinforcement (1)		$f_{cu} \geq 15$ MPa	
		100 % F_{perm} LIFTING $\beta < 30°$	80 % F_{perm} LIFTING $\beta > 30°$ max. 45°	50 % F_{perm} TILTING	ds_1	ls_1	Minimum spacing between anchors "a"	Minimum edge distance "b"
	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	
Load group lifting clutch 25 kN								
SA -B 7 kN – 110	7	7	5.6	3.5	Ø 8	600	700	100
SA -B 14 kN – 160	14	14	11.2	7	Ø 10	700	700	100
SA -B 20 kN – 210	20	20	16	10	Ø 10	750	800	100
SA -B 25 kN – 250	25	25	20	12.5	Ø 12	800	875	100
Load group lifting clutch 50 KN								
SA -B 30 kN – 280	30	30	24	15	Ø 12	850	950	150
SA -B 40 kN – 320	40	40	32	20	Ø 14	950	1050	150
SA -B 50 kN – 400	50	50	40	25	Ø 16	1000	1435	150
Load group lifting clutch 100 KN								
SA -B 53 kN – 340	53	53	42.4	26.5	Ø16	1000	1200	150
SA -B 75 kN – 420	75	75	60	37.5	Ø 20	1200	1470	250
SA -B 100 kN – 520	100	100	80	50	Ø 20	1500	1820	300
Load group lifting clutch 260 KN								
SA -B 140 kN – 460	140	140	112	70	Ø 25	1800	1800	525
SA -B 220 kN – 620	220	220	176	110	Ø 28	1800	2200	710

STRIP ANCHOR SA - ST

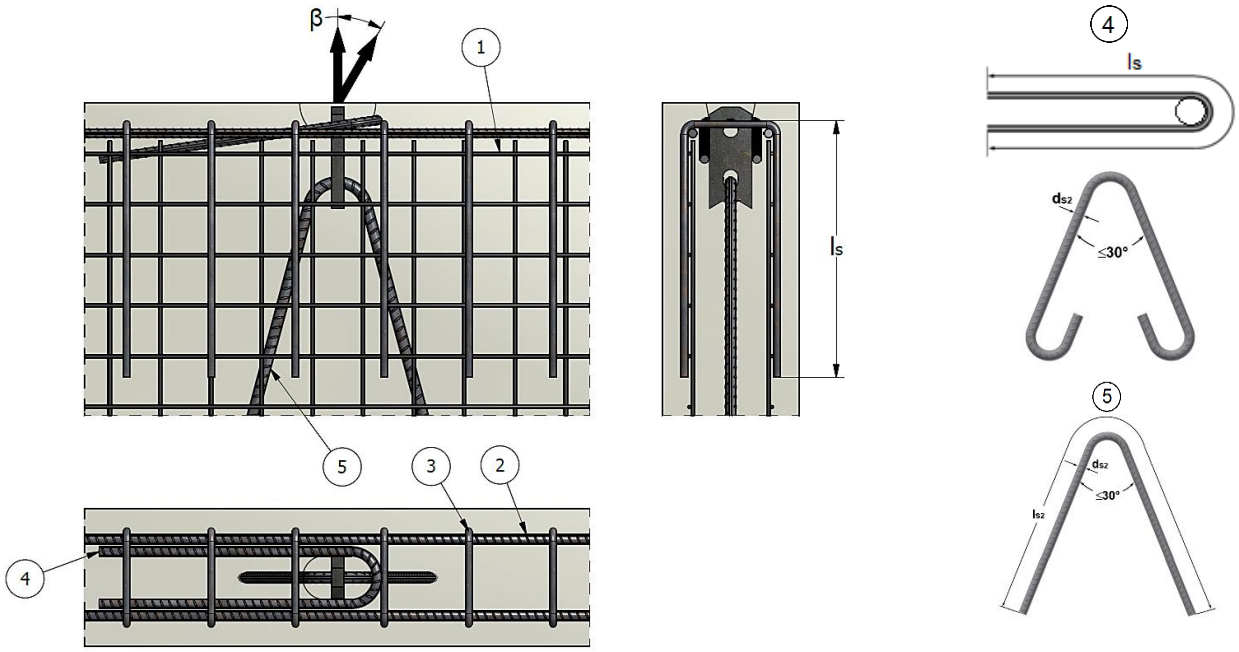
The **SA - ST anchors** are designed to load range 14 kN to 260 kN. This type of anchor is used for prestressed trusses, thin walls and low strength concrete. The anchorage in concrete is achieved by reinforcement steel which must be mounted in the second hole from the lower part of the anchor.





SA-ST ANCHOR – DIMENSIONS AND LOAD CAPACITY								
Anchor Type	**Product number**		**L**	**l**	**s**	**d**	**Load range**	**e**
	Black	**Hot-dip galvanized**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[kN]**	**[mm]**
Load group lifting clutch 25 kN								
SA -ST 7 kN – 90	45053	45066	90	30	6	14	7	10
SA -ST 14 kN – 90	45054	45067	90	30	6	14	14	
SA -ST 20 kN – 90	45055	45068	90	30	8	14	20	
SA -ST 25 kN – 90	45056	45069	90	30	10	14	25	
Load group lifting clutch 50 kN								
SA -ST 30 kN – 120	45057	45070	120	40	10	18	30	10
SA -ST 40 kN – 120	45058	45071	120	40	12	18	40	
SA -ST 50 kN – 120	45059	45072	120	40	15	18	50	
Load group lifting clutch 100 kN								
SA -ST 53 kN – 160	45060	45073	160	60	12	26	53	15
SA -ST 75 kN – 160	45061	45074	160	60	15	26	75	
SA -ST 100 kN – 170	45062	45075	170	60	20	27	100	
Load group lifting clutch 260 kN								
SA -ST 140 kN – 240	45063	45076	240	80	20	35	140	15
SA -ST 220 kN – 300	45064	45077	300	80	25	35	220	
SA -ST 260 kN – 300	45065	45078	300	120	30	35	260	

SA-ST ANCHOR - INSTALLATION AND REINFORCEMENT

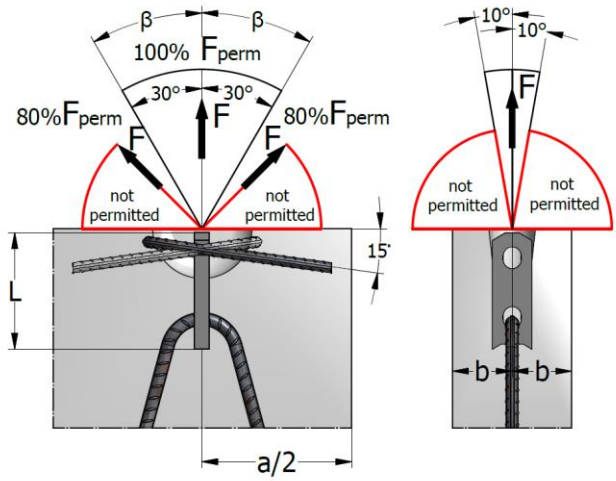


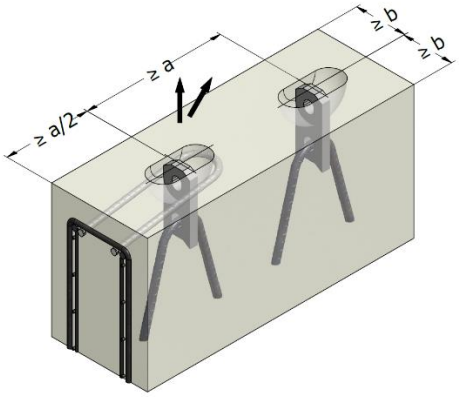
Note: *The bending radius will be established considering the EN 1992.*
The diagonal reinforcement must be placed as much as possible close to the recess former and installed in contact with the lifting anchor.
The reinforced zone must be $\geq 3 \times$ anchor lenght "L".
Length for stirrups $l_s = l_1$ *+Anchor length*
For concrete strength **$f_{cu} \geq 25$ MPa** the length **l_{s2}** of the reinforcement steel can be reduced in relation to the permissible bond stress with 20%.

Angled pull using cable or chain with $\beta > 45°$ *is* ***not allowed***.

SA-B ANCHOR – INSTALLATION AND REINFORCEMENT							
Anchor Type	Load group	Pull $\beta < 30°$		Angled pull $\beta > 30°$ max. 45°			Additional reinforcement for lifting d_{s2} x l_{s2} ⑤
		Mesh reinforcement (both sides) ①	Edge reinforcement ②	Stirrups ③		Angled pull reinforcement Ø x l_s ④	
				Ø x l_1	Number of stirrups		
	[kN]	[mm²/m]	d_{s1} [mm]	[mm]	[pcs.]	[mm]	[mm]
Load group lifting clutch 25 kN							
SA -ST 7 kN	7	2x131	Ø8	Ø 6 x 400	4	Ø 6 x 900	Ø 10 x 650
SA -ST 14 kN	14		Ø8	Ø 6 x 400	4	Ø 6 x 900	Ø 10 x 650
SA -ST 20 kN	20		Ø 8	Ø 6 x 500	4	Ø 8 x 1000	Ø 12 x 800
SA -ST 25 kN	25		Ø 10	Ø 8 x 600	4	Ø 8 x 1200	Ø 12 x 1000
Load group lifting clutch 50 kN							
SA -ST 30 kN	30	2x131	Ø 10	Ø 8 x 700	4	Ø10 x 1150	Ø14 x 1000
SA -ST 40 kN	40		Ø 12	Ø 8 x 800	4	Ø10 x 1500	Ø16 x 1200
SA -ST 50 kN	50		Ø12	Ø10 x 800	4	Ø12 x 1550	Ø16 x 1500
Load group lifting clutch 100 kN							
SA -ST 53 kN	53	2x188	Ø12	Ø10 x 800	4	Ø12 x 1550	Ø16 x 1500
SA -ST 75 kN	75		Ø12	Ø10 x 800	4	Ø14 x 2000	Ø20 x 1750
SA -ST 100 kN	100		Ø14	Ø10 x1000	6	Ø16 x 2300	Ø25 x 1850
Load group lifting clutch 260 kN							
SA -ST 140 kN	140	2x257	Ø14	Ø10 x1000	8	Ø20 x 2600	Ø28 x 2350
SA -ST 220 kN	220		Ø16	Ø10 x1200	8	Ø25 x 3000	Ø28 x 3000
SA -ST 260 kN	260		Ø16	Ø12 x1200	8	Ø25 x 3450	Ø28 x 3050

INSTALLATION OF SA-ST IN BEAMS AND WALLS





The angled pull reinforcement must be mounted opposite the direction of the load and as closed as possible to the recess former.
This type of anchor is not suitable for floor slabs, stairs or other elements which doesn't have enough space for additional pull reinforcement.

INSTALLATION OF SA-ST IN BEAMS AND WALLS – LOAD CAPACITY, INSTALLATION DIMENSIONS						
Anchor Type	Anchor length „L"	Load group	$f_{cu} \geq 15$ MPa			
			Minimum thickness of precast unit "2 × b"	100 % F_{perm} pull $\beta < 30°$	80 % F_{perm} pull $\beta > 30°$ max. 45°	Minimum spacing between anchors "a"
	[mm]	[kN]	[mm]	[kN]	[kN]	[mm]
Load group lifting clutch 25 kN						
SA -ST 7 kN – 90	90	7	80	7	5.6	500
SA -ST 14 kN – 90	90	14	80	14	11	500
SA -ST 20 kN – 90	90	20	90	20	16	600
SA -ST 25 kN – 90	90	25	100	25	20	600
Load group lifting clutch 50 kN						
SA -ST 30 kN – 120	120	30	100	30	24	650
SA -ST 40 kN – 120	120	40	110	40	32	700
SA -ST 50 kN – 120	120	50	120	50	40	750
Load group lifting clutch 100 kN						
SA -ST 53 kN – 160	160	53	120	53	42.4	800
SA -ST 75 kN – 160	160	75	130	75	60	1200
SA -ST 100 kN – 170	170	100	140	100	80	1200
Load group lifting clutch 260 kN						
SA -ST 140 kN – 240	240	140	160	140	112	1500
SA -ST 220 kN – 300	300	220	180	220	176	1500
SA -ST 220 kN – 300	300	260	200	260	208	1500

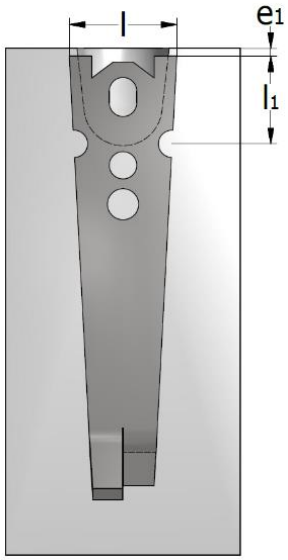
Note: *For required reinforcement and for angled pull please see the table and pictures from page 20.*
Angled pull using cable or chain with $\beta > 45°$ *is* ***not allowed****.*

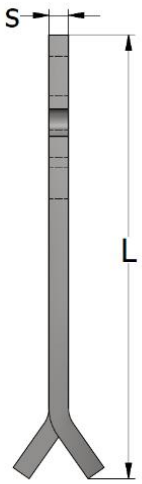
TILT-UP ANCHOR SA-TTU

The **SA - TTU anchors** are designed to load range 14 kN to 220 kN. The main applications for this anchor, are: thin walled concrete elements, being lifted from horizontal to vertical position. The special shape of the anchor head prevents cracking of the concrete. Usually this kind of anchor is used with additional reinforcement, which is required for tilting and turning operations.

125 – 220 kN

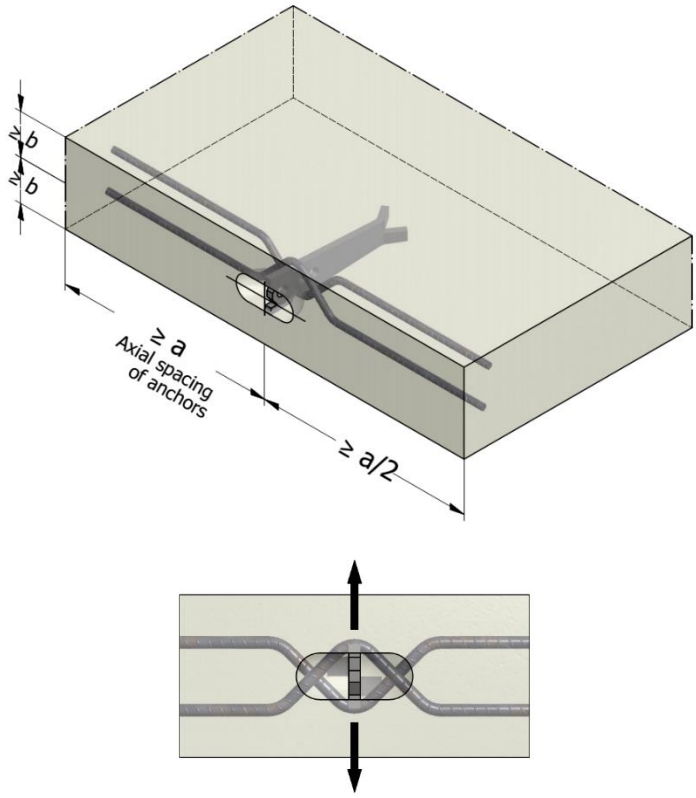
125 – 220 kN

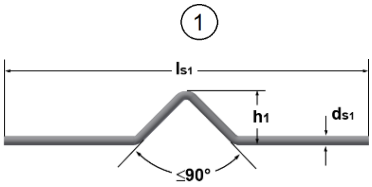


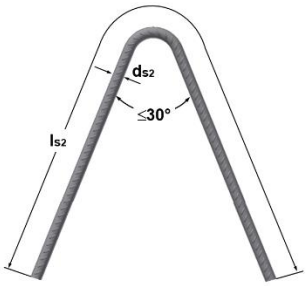


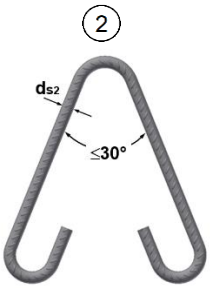
TILT-UP ANCHOR SA - TTU, DIMENSIONS AND LOAD CAPACITY								
Anchor Type	**Product number**		**L**	**l**	**s**	**l1**	**Load range**	**e_1**
	Black	**Hot-dip galvanized**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[kN]**	**[mm]**
Load group lifting clutch 25 kN								
SA - TTU 14 kN – 200	46887	46888	200	55	6	45	14	10
SA - TTU 25 kN – 150	46889	46890	150	55	10	45	25	
SA - TTU 25 kN – 230	46885	46886	230	55	10	45	25	
Load group lifting clutch 50 kN								
SA - TTU 40 kN – 270	46883	46884	270	70	12	70	40	10
SA - TTU 50 kN – 290	46881	46882	290	70	15	70	50	
Load group lifting clutch 100 kN								
SA - TTU 75 kN – 320	46879	46880	320	95	18	90	75	15
SA - TTU 100 kN – 390	46877	46878	390	95	20	90	100	
Load group lifting clutch 260 kN								
SA - TTU 125 kN – 500	62454	62455	500	148	20	90	125	15
SA - TTU 170 kN – 500	62456	62457	500	148	25	90	170	
SA - TTU 220 kN – 500	62458	62459	500	148	30	90	220	

SA-TTU ANCHOR - INSTALLATION AND REINFORCEMENT FOR TURNING AND TILTING





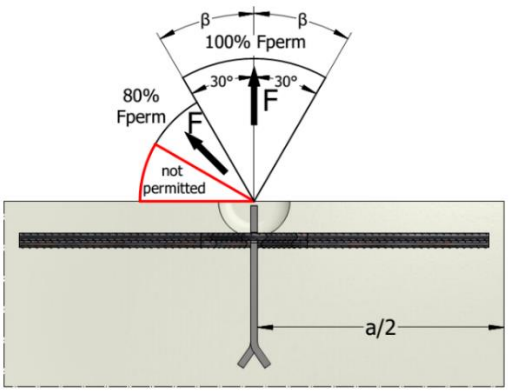


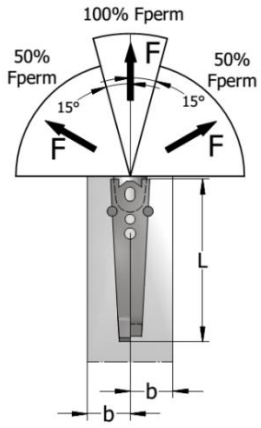


Note: *The bending radius and the length l_s will be established considering the EN 1992.*
The additional reinforcement and the anchor position will be positioned like in picture above.
The dimension h1 will be establish in function of the element thickness.
For other additional reinforcement please see page 16.
For this type of anchor pull reinforcement can be used. When this reinforcement is used please see the SA-ST reinforcement dimensions and position and without pull reinforcement please see the SA-B anchor.

Anchor Type	Load group	Tilting and tilting reinforcement ① $f_{cu} \geq 15$ MPa		Additional reinforcement for lifting (pull) ② $f_{cu} \geq 15$ MPa	
		ds_1	ls_1	ls_2	ds_2
	[kN]	[mm]	[mm]	[mm]	[mm]
SA - TTU 14 kN	14	Ø 10	700	650	Ø 10
SA - TTU 25 kN	25	Ø 12	800	1000	Ø 12
SA - TTU 40 kN	40	Ø 14	950	1200	Ø 16
SA - TTU 50 kN	50	Ø 16	1000	1500	Ø 16
SA - TTU 75 kN	75	Ø 20	1200	1750	Ø 20
SA - TTU 100 kN	100	Ø 20	1500	1900	Ø 20
SA - TTU 125 kN	125	Ø 25	1800	2200	Ø 25
SA - TTU 170 kN	170	Ø 28	1800	2500	Ø 28
SA - TTU 220 kN	220	Ø 28	1800	3000	Ø 28

INSTALLATION OF SA-TTU





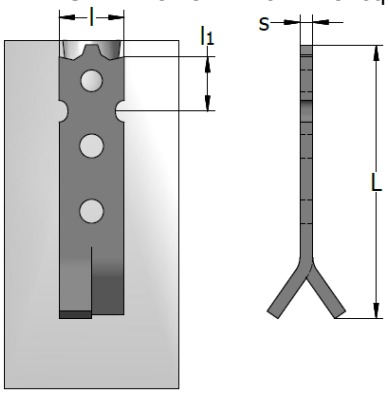
The additional reinforcement must be mounted like in the picture for tilting and tilting operations.

INSTALLATION OF SA-TTU ANCHOR – LOAD CAPACITY, INSTALATION DIMENSIONS							
Anchor Type	Anchor length „L"	Load group	Minimum thickness of precast unit "2 × b"	$f_{cu} \geq 15$ MPa			
				100 % F_{perm} LIFTING $\beta < 30°$	80 % F_{perm} LIFTING $\beta > 30°$ max. 45°	50 % F_{perm} TILTING	Minimum spacing between anchors "a"
	[mm]	[kN]	[mm]	[kN]	[kN]	[kN]	[mm]
Load group lifting clutch 25 kN							
SA - TTU 14 kN	90	14	90	14	11	7	700
SA - TTU 25 kN	90	25	120	25	20	13	800
Load group lifting clutch 50 kN							
SA - TTU 40 kN	120	40	150	40	32	20	950
SA - TTU 50 kN	120	50	180	50	40	25	1000
Load group lifting clutch 100 kN							
SA - TTU 75 kN	160	75	200	75	60	38	1200
SA - TTU 100 kN	170	100	250	100	80	50	1500
Load group lifting clutch 260 kN							
SA - TTU 125 kN	240	125	320	125	100	62.5	1800
SA - TTU 170 kN	300	170	380	170	136	85	1800
SA - TTU 220 kN	300	220	450	220	176	110	1800

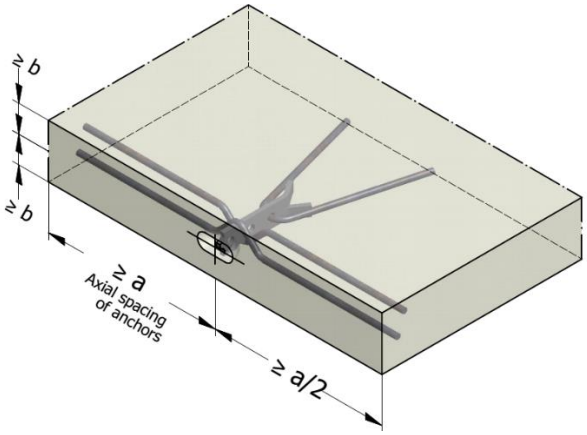
Note: *For required reinforcement and for angled pull please see the table and pictures from page 15.*
Angled pull using cable or chain with $\beta > 45°$ *is* ***not allowed****.*

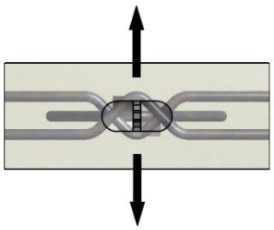
UNIVERSAL ANCHOR 12.5 kN

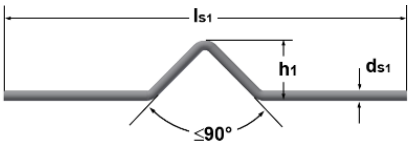
For handling (tilting, turning and lifting) very thin precast concrete units a UNIVERSAL ANCHOR-12.5 kN. is required

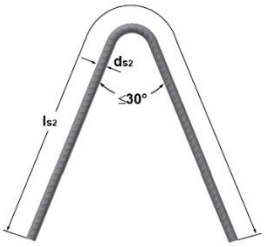


UNIVERSAL ANCHOR 12.5 kN, DIMENSIONS AND LOAD CAPACITY								
Anchor Type	Product number		L	l	s	l1	Load range	e_1
	Black	Hot-dip galvanized	[mm]	[mm]	[mm]	[mm]	[kN]	[mm]
UNIVERSAL ANCHOR 12.5 kN	49094	49095	120	30	6	25	12.5	10









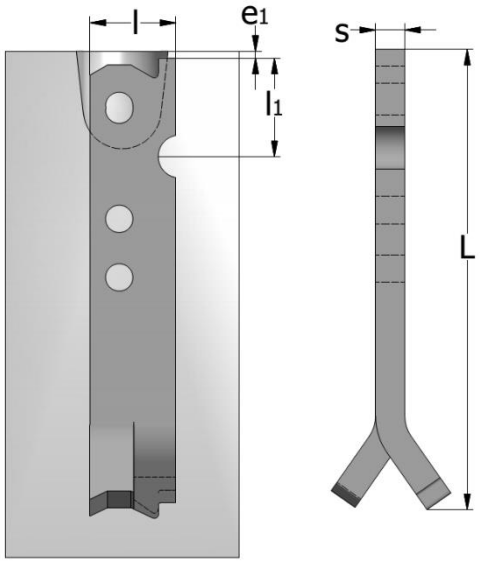
Note: *The bending radius and the length l_s will be established considering the EN 1992.*
dditional reinforcement and the anchor position will be positioned like in picture above.
The dimension h1 will be establish in function of the element thickness.

INSTALLATION OF SA-TTU 12.5 kN ANCHOR – LOAD CAPACITY, INSTALATION DIMENSIONS							
Anchor Type	Anchor length „L"	Load group	Minimum thickness of precast unit "2 × b"	$f_{cu} \geq 15$ MPa			
				100 % F_{perm} LIFTING $\beta < 30°$	80 % F_{perm} LIFTING $30° < \beta < 45°$	50 % F_{perm} TILTING	Minimum spacing between anchors "a"
	[mm]	[kN]	[mm]	[kN]	[kN]	[kN]	[mm]
Load group lifting clutch 12.5 kN							
UNIVERSAL ANCHOR 12.5 kN	120	12.5	60	12.5	10	6.25	240

Anchor Type	Load group	Tilting and tilting reinforcement $f_{cu} \geq 15$ MPa		Additional reinforcement for lifting (pull) $f_{cu} \geq 15$ MPa	
		ds_1	ls_1	ls_2	ds_2
	[kN]	[mm]	[mm]	[mm]	[mm]
UNIVERSAL ANCHOR 12.5 kN	12.5	Ø 10	700	650	Ø 10

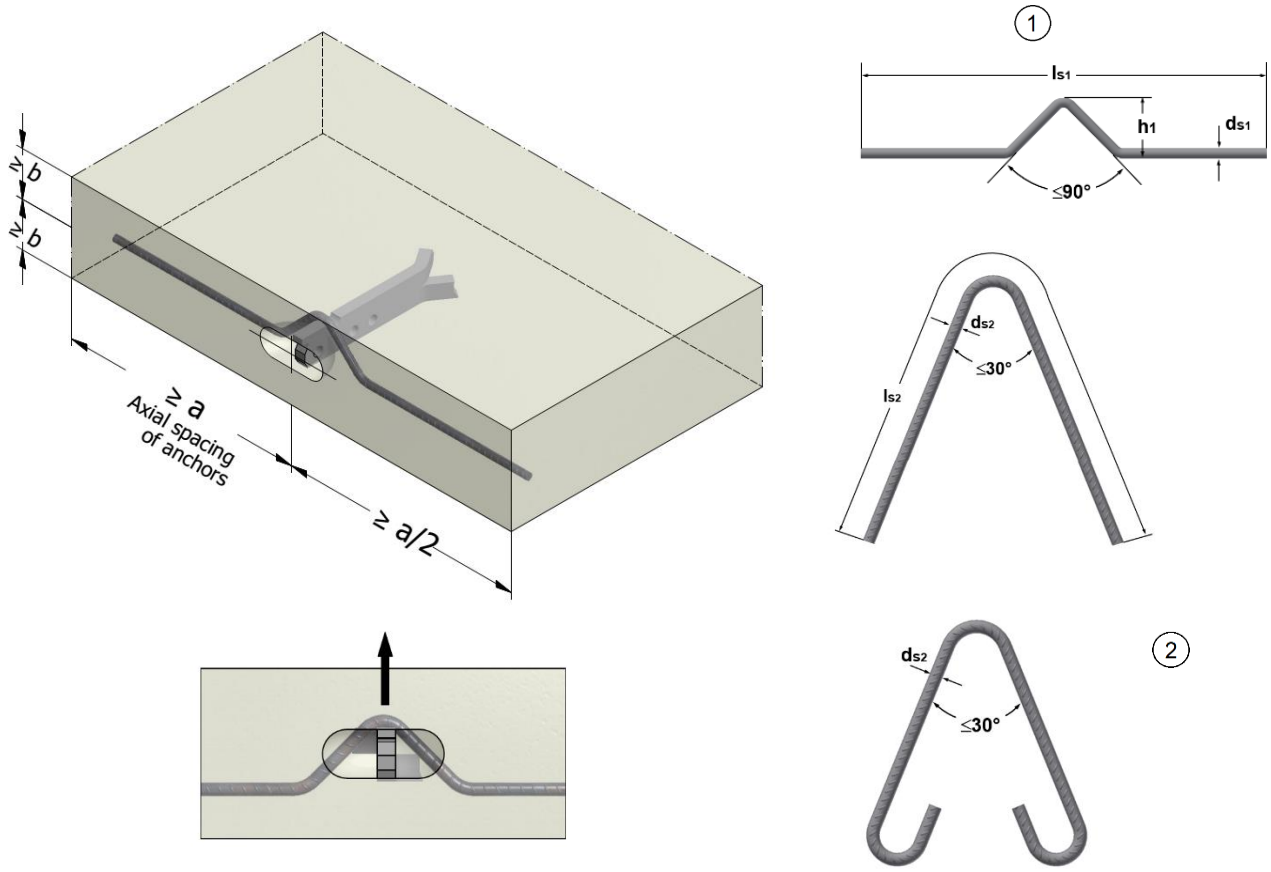
TILT-UP ANCHOR SA-TU-HP

The **SA-TU-HP anchors** are designed to load range 14 kN to 100 kN. The main applications for this anchor, are: thin walled concrete elements, being lifted from horizontal to vertical position. The special shape of the anchor head prevents cracking of the concrete. Usually this kind of anchor is used with additional reinforcement, which is required in the tilting and turning operations.



TILT-UP ANCHOR SA-TU-HP, DIMENSIONS AND LOAD CAPACITY								
Anchor Type	Product number		L	l	s	l_1	Load range	e_1
	Black	Hot-dip galvanized	[mm]	[mm]	[mm]	[mm]	[kN]	[mm]
Load group lifting clutch 25 kN								
SA-TU-HP 14 kN – 200	61625	61626	200	40	6	43	14	10
SA-TU-HP 25 kN – 230	61190	61385	230	40	10	43	25	
Load group lifting clutch 50 kN								
SA-TU-HP 40 kN – 270	61627	61628	270	55	12	51	40	10
SA-TU-HP 50 kN – 290	61301	61386	290	55	15	51	50	
Load group lifting clutch 100 kN								
SA-TU-HP 75 kN – 320	61302	61387	320	80	18	78	75	15
SA-TU-HP 100 kN – 390	61303	61388	390	80	20	78	100	

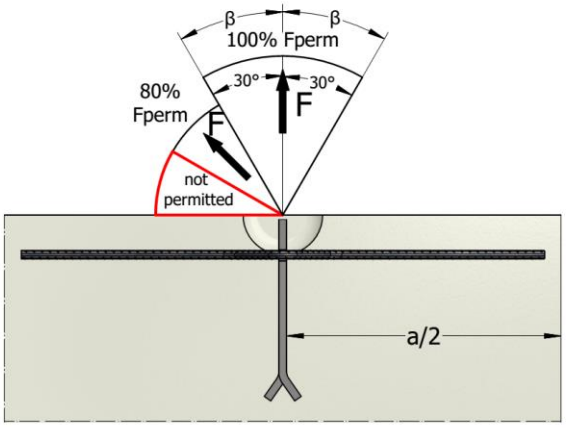
SA-TU-HP ANCHOR - INSTALLATION AND REINFORCEMENT FOR TURNING AND TILTING

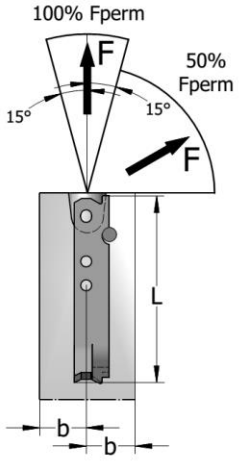


Note: *The bending radius and the length l_s will be established considering the EN 1992.*
The additional reinforcement and the anchor position will be positioned like in picture above.
The dimension h1 will be establish in function of the element thickness.
For other additional reinforcement please see page 16.
For this type of anchor pull reinforcement can be used like in SA-TTU anchor case.

Anchor Type	Load group	Tilting and tilting reinforcement ① $f_{cu} \geq 15$ MPa		Additional reinforcement for lifting (pull) ② $f_{cu} \geq 15$ MPa	
		ds_1	ls_1	ls_2	ds_2
	[kN]	[mm]	[mm]	[mm]	[mm]
SA-TU-HP 14 kN	14	Ø 10	700	650	Ø 10
SA-TU-HP 25 kN	25	Ø 12	800	1000	Ø 12
SA-TU-HP 40 kN	40	Ø 14	950	1200	Ø 16
SA-TU-HP 50 kN	50	Ø 16	1000	1500	Ø 16
SA-TU-HP 75 kN	75	Ø 20	1200	1750	Ø 20
SA-TU-HP 100 kN	100	Ø 20	1500	1900	Ø 20

INSTALLATION OF SA-TU-HP





The additional reinforcement and the anchor must be mounted in a correct position like is shown in the picture.

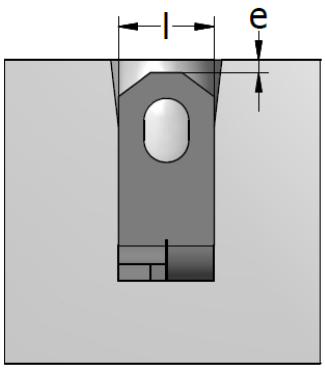
INSTALLATION OF SA-TU-HP ANCHOR – LOAD CAPACITY, INSTALLATION DIMENSIONS

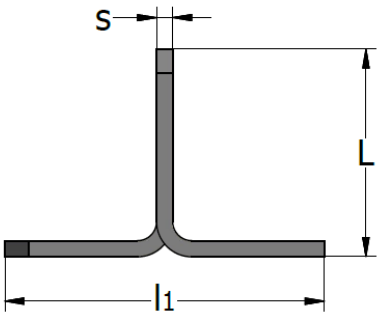
Anchor Type	Anchor length „L"	Load group	Minimum thickness of precast unit "2 × b"	$f_{cu} \geq 15$ MPa			
				100 % F_{perm} LIFTING $\beta < 30°$	80 % F_{perm} LIFTING $\beta > 30°$ max. 45°	50 % F_{perm} TILTING	Minimum spacing between anchors "a"
	[mm]	[kN]	[mm]	[kN]	[kN]	[kN]	[mm]
Load group lifting clutch 25 kN							
SA-TU-HP 14 kN	90	14	90	14	11	7	700
SA-TU-HP 25 kN	90	25	120	25	20	13	800
Load group lifting clutch 50 kN							
SA-TU-HP 40 kN	120	40	150	40	32	20	950
SA-TU-HP 50 kN	120	50	180	50	40	25	1000
Load group lifting clutch 100 kN							
SA-TU-HP 75 kN	160	75	200	75	60	38	1200
SA-TU-HP 100 kN	170	100	250	100	80	50	1500

Note: *For required reinforcement and for angled pull please see the table and pictures from page 15.*
Angled pull using cable or chain with $\beta > 45°$ *is* ***not allowed****.*

FLAT FOOT ANCHOR SA-FA

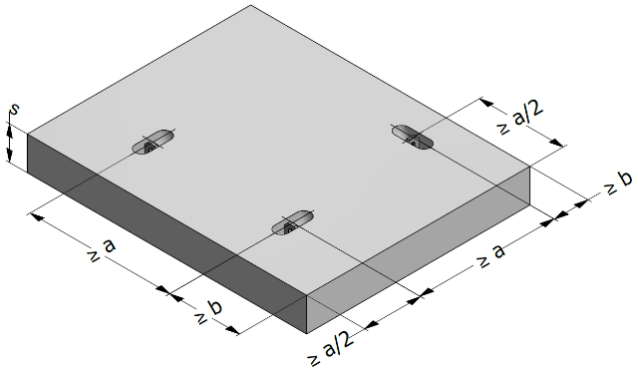
The **SA-FA "Flat foot anchor"** are designed to load range 14 kN to 50 kN. The main applications for this anchor, are: de-mold panel, lifting thin slabs, concrete pipes. These elements must have a concrete strength, at lifting, up to 20 MPa. Reinforcements placed above the anchor legs are strongly recommended.

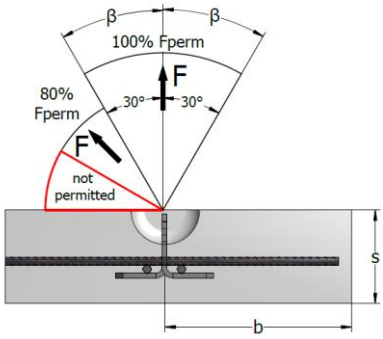


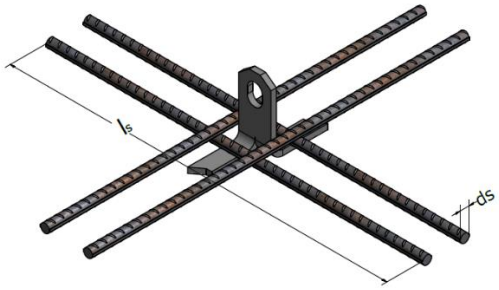


ANCHOR SA-FA, DIMENSIONS AND LOAD CAPACITY								
Anchor Type	**Product number**		**L**	**l**	**s**	**l_1**	**Load range**	**e**
	Black	**Hot-dip galvanized**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[kN]**	**[mm]**
Load group lifting clutch 25 kN								
SA -FA 7 kN – 65	45924	45925	65	30	5	100	7	
SA-FA 14 kN – 68	45922	45923	68	30	6	100	14	
SA-FA 20 kN – 70	45926	45927	70	30	8	100	20	10
SA -FA 20 kN – 100	48362	48363	100	30	8	100	20	
SA-FA 25 kN – 75	45928	45929	75	30	10	100	25	
Load group lifting clutch 50 kN								
SA-FA 30 kN – 90	45930	45931	90	40	10	120	30	
SA-FA 40 kN – 110	45932	45933	110	40	12	120	40	10
SA-FA 50 kN – 125	45934	45935	125	40	15	120	50	

INSTALLATION OF SA-FA







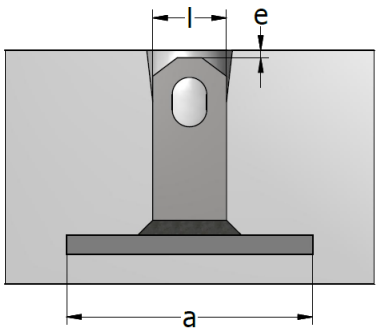
①

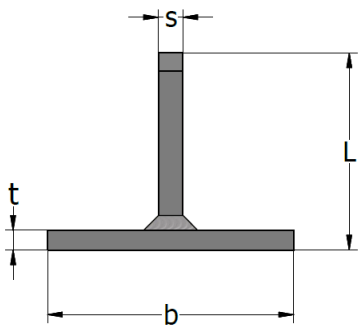
INSTALLATION OF SA-FA ANCHOR – LOAD CAPACITY, INSTALATION DIMENSIONS							
Anchor Type	Anchor length „L"	Load group	$f_{cu} \geq 15$ MPa				
			Minimum thickness of precast unit "s"	100 % F_{perm} pull $\beta < 30°$	80 % F_{perm} pull $\beta > 30°$ max. 45°	Minimum spacing between anchors "a"	Minimum distance from the edge "b"
	[mm]	[kN]	[mm]	[kN]	[kN]	[mm]	[mm]
Load group lifting clutch 25 kN							
SA-FA 7 kN – 65	65	7	92	7	5.6	280	140
SA-FA 14 kN – 68	68	14	95	14	11	280	140
SA-FA 20 kN – 70	70	20	100	20	16	300	150
SA-FA 20 kN – 100	100	20	135	20	16	390	190
SA-FA 25 kN – 75	75	25	105	25	20	320	160
Load group lifting clutch 50 kN							
SA-FA 30 kN – 90	90	30	120	30	24	380	190
SA-FA 40 kN – 110	110	40	140	40	32	460	230
SA-FA 50 kN – 125	125	50	160	50	40	520	260

Anchor Type	Load group	Additional reinforcement for lifting (pull) ① $f_{cu} \geq 15$ MPa	
		ls	ds
	[kN]	[mm]	[mm]
SA-FA 7 kN – 65	7	250	Ø 8
SA-FA 14 kN – 68	14	250	Ø 8
SA-FA 20 kN – 70	20	300	Ø 8
SA-FA 25 kN – 75	25	300	Ø 8
SA-FA 30 kN – 90	30	400	Ø 10
SA-FA 40 kN – 110	40	450	Ø 12
SA-FA 50 kN – 125	50	500	Ø 12

FLAT ANCHOR SA-FAW

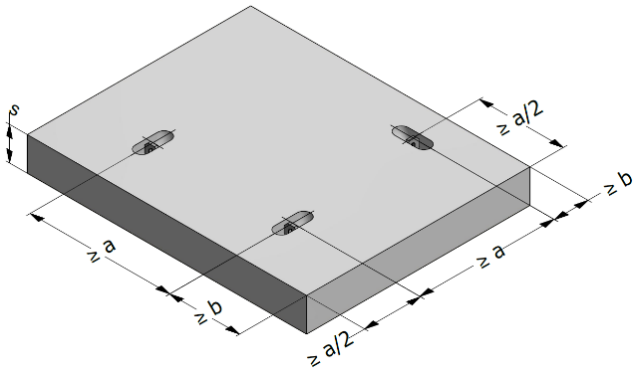
The **SA-FA** are designed to load range 14 kN to 100 kN. The main applications for this anchor, are: de-mold panel, lifting thin slabs, concrete pipes. These elements must have a concrete strength, at lifting, up to 20 MPa. Reinforcements placed above the anchor legs are strongly recommended.

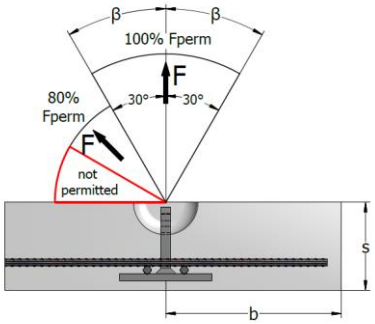


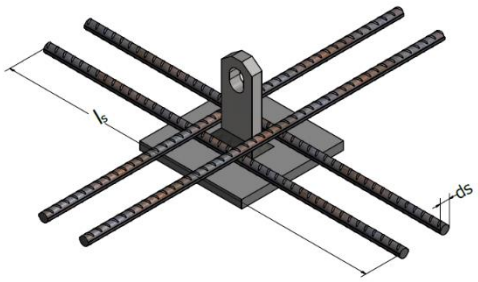


ANCHOR SA-FAW, DIMENSIONS AND LOAD CAPACITY									
Anchor Type	**Product number**		**L**	**l**	**s**	**t**	**axb**	**Load range**	**e**
	Black	**Hot-dip galvanized**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[kN]**	**[mm]**
Load group lifting clutch 25 kN									
SA-FAW 14 kN – 55	62094	61580	55	30	6	8	80x80	14	10
SA-FAW 25 kN – 80	62095	61581	80	30	10	8	80x80	25	
Load group lifting clutch 50 kN									
SA-FAW 50 kN – 120	62096	61582	120	40	15	10	100x100	50	10
Load group lifting clutch 100 kN									
SA-FAW 100 kN – 160	62097	61583	160	60	20	12	140x140	100	15

INSTALLATION OF SA-FAW







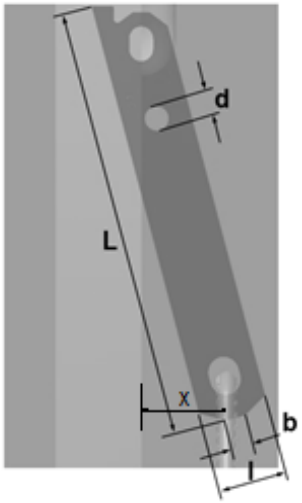
①

INSTALLATION OF SA-FAW ANCHOR – LOAD CAPACITY, INSTALATION DIMENSIONS							
Anchor Type	Anchor length „L"	Load group	$f_{cu} \geq 15$ MPa				
			Minimum thickness of precast unit "s"	100 % F_{perm} pull $\beta < 30°$	80 % F_{perm} pull $\beta > 30°$ max. 45°	Minimum spacing between anchors "a"	Minimum distance from the edge "b"
	[mm]	[kN]	[mm]	[kN]	[kN]	[mm]	[mm]
Load group lifting clutch 25 kN							
SA-FA 14 kN – 55	55	14	85	14	11	230	115
SA-FA 25 kN – 80	80	25	110	25	20	330	165
Load group lifting clutch 50 kN							
SA-FA 50 kN – 120	120	50	150	50	40	480	240
Load group lifting clutch 100 kN							
SA-FA 100 kN – 160	160	100	190	100	80	660	330

Anchor Type	Load group	Additional reinforcement for lifting (pull) ① $f_{cu} \geq 15$ MPa	
		ls	ds
	[kN]	[mm]	[mm]
SA-FA 14 kN – 55	14	210	Ø 8
SA-FA 25 kN – 80	25	300	Ø 8
SA-FA 50 kN – 120	50	450	Ø 12
SA-FA 100 kN – 160	100	600	Ø 16

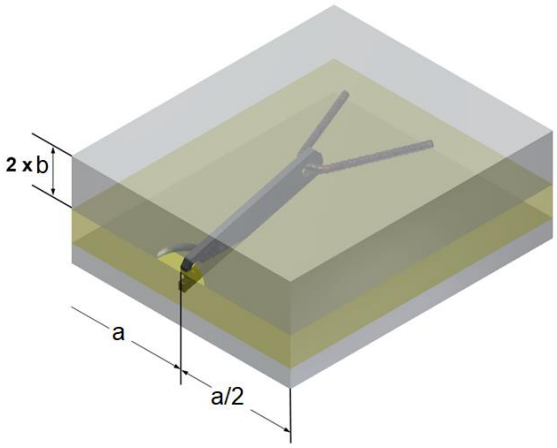
FLAT ANCHOR SA-SP

The **SA-SP Sandwich Panel Anchor** is designed to load range 25 kN to 100 kN. The main applications for this anchor, are: lifting and transport sandwich panels in an upright position. These elements must have a concrete strength, at lifting, up to 20 MPa. This type of anchor must be used together with the additional lifting reinforcement and tilting reinforcement.

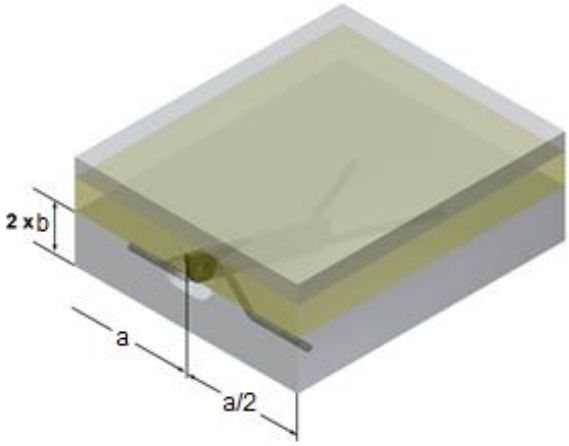


ANCHOR SA-SP, DIMENSIONS AND LOAD CAPACITY										
Product Name	**Product number**		**L**	**l**	**s**	**b**	**d**	**x**	**Load range**	**e**
	Black	**Hot-dip galvanized**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[kN]**	**[mm]**
Load group lifting clutch 25 kN										
SA-SP 25 kN – 250	61461	61462	250	40	10	18	Ø14	48	25	10
Load group lifting clutch 50 kN										
SA-SP 50 kN – 300	61463	61464	300	60	16	26	Ø17.5	53	50	10
Load group lifting clutch 100 kN										
SA-SP 75 kN – 350	61465	61466	350	80	16	35	Ø25	55	75	15
SA-SP 100 kN – 350	61467	61468	350	80	20	35	Ø25	66	100	

INSTALLATION OF SA-SP



Face-down (standard production)

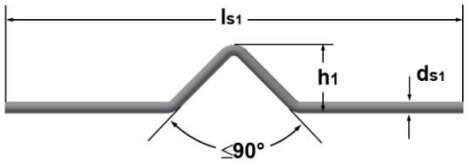


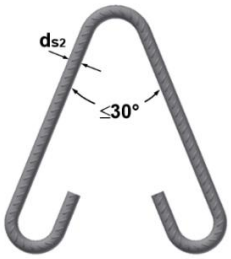
Face-up

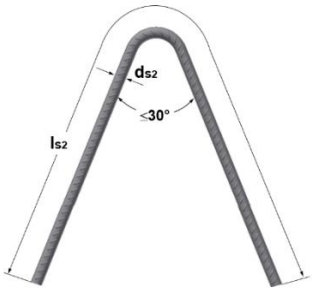
INSTALLATION OF SA-SP ANCHOR – LOAD CAPACITY, INSTALATION DIMENSIONS						
Anchor Type	**L**	**Minimum thickness of precast unit**	**Minimum distances from edge**	**Minimum spacing between center**	**Permitted load Axial and angled pull $f_{cu} \geq 15$ MPa**	**Permitted load Transversal pull $f_{cu} \geq 15$ MPa**
		"2 x b"	**"a/2"**	**"a"**	**β ≤ 30°**	
	[mm]	**[mm]**	**[mm]**	**[mm]**	**[kN]**	**[kN]**
Load group lifting clutch 25 kN						
SA -SP 25 kN – 250	250	100	300	600	25	8
Load group lifting clutch 50 kN						
SA -SP 50 kN – 300	300	120	375	750	50	18
Load group lifting clutch 100 kN						
SA -SP 75 kN – 350	350	130	600	1200	75	26
SA -SP 100 kN – 350	350	140	600	1200	100	35

INSTALLATION OF SA-SP AND ADITIONAL REINFORCEMENT

Erection additional Reinforcement

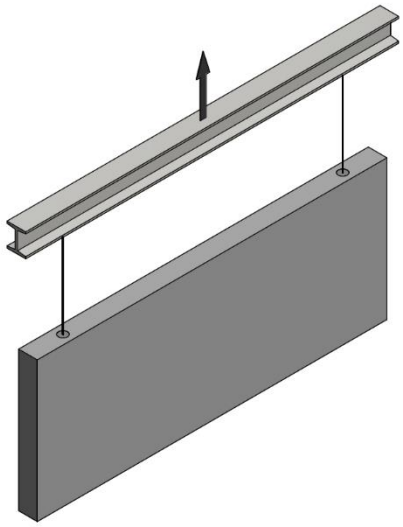


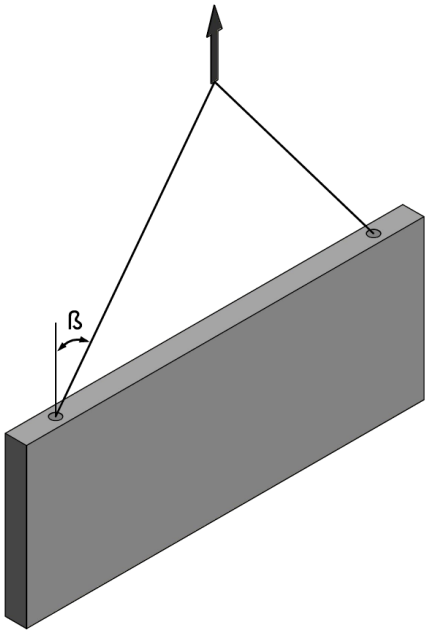




Anchor Type	Load range	Reinforcements - Concrete strength $f_{cu} \geq 15$ MPa		
		Slot -in -link n x Ø x L	Erecting and tilting reinforcement ds_1 x ls_1	Reinforcement tail for lifting ds_2 x ls_2
	[kN]	[mm]	[mm]	[mm]
Load group lifting clutch 25 kN				
SA -SP 25 kN – 250	25	2 x Ø 8 x 600	Ø 10 x 600	Ø 14 x 800
Load group 50 kN (30 kN - 50 kN)				
SA -SP 50 kN – 300	50	2 x Ø8 x 800	Ø14 x 700	Ø16 x 1200
Load group lifting clutch 100 kN				
SA -SP 75 kN – 350	75	2 x Ø10 x 800	Ø16 x 800	Ø25 x 1400
SA -SP 100 kN – 350	100	4 x Ø10 x 800	Ø20 x 900	Ø25 x 1400

Note: *For tilting and transport is highly recommended to use a spreader beam.*
*The maximum angled pull (***$f_{cu} \geq 25$ MPa)** *is* **β ≤ 30°**





2D LIFTING CLUTCHES

Load group [kN]	Lifting system	Anchor group [kN]	Load range anchor [kN]
15 (12.5 kN – 15 kN)	**TF1 - 015**	12.5 – 15	12.5 15
25 (7 kN – 25 kN)	**TF1 - 025** **TF2 - 025**	14 – 25	7 14 20 25
50 (30 kN – 50 kN)	**TF1 - 050** **TF2 - 050**	30 – 50	30 40 50
100 (53 kN – 100 kN)	**TF1 - 100** **TF2 - 100**	53 – 100	53 75 100
260 (125 kN – 260 kN)	**TF1 - 260** **TF2 - 260**	125 – 260	125 140 220 260

Only the same load group components can be assembled together.

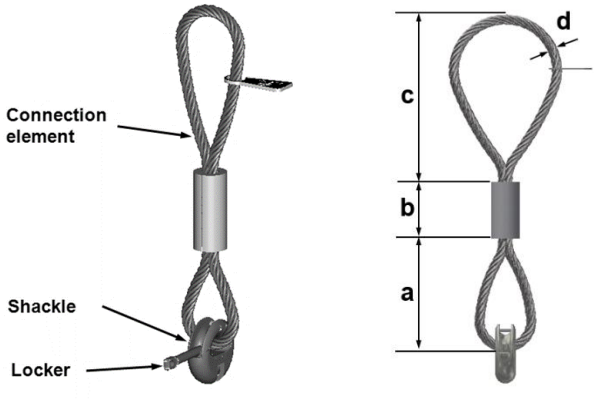
TF1 - 15 kN
TF1 - 25 kN
TF1 - 50 kN
TF1 - 100 kN

TF1 - 260 kN

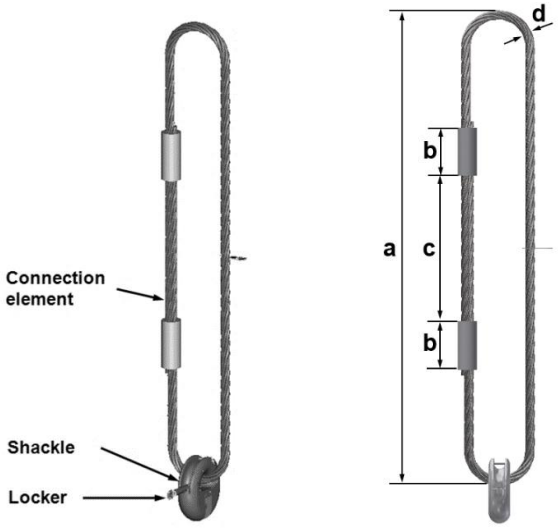
TF2 - 25 kN
TF2 - 50 kN
TF2 - 100 kN
TF2 - 260 kN

The lifting systems TF1 and TF2 are made of high quality steel and they are designed with a safety factor c= 5.
When TF1 and TF2 systems are assembled with the correspondent anchor, they have together the anchor minimum safety factor, c= 3.
Each system is tested before delivery three times the working load and has an individual testing certificate attached.
TF2's is different from TF1's due to the connection element (bracket) with the crane hook.TF1 system has the connection element made by high strength wire cable.
The clutch head (shackle) in each load group matches the shape of the recess former RBF and incorporates a locker which enters the appropriate head anchor hole.

2D LIFTING CLUTCHES – DIMENSIONS AND COMPONENTS



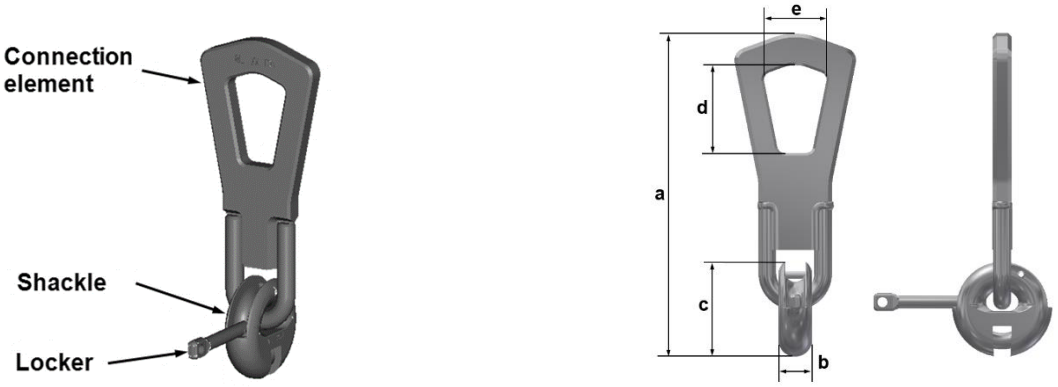
TF1-015 / TF1-025 / TF1-050 / TF1-100



TF1-260

Note: Each lifting clutch TF1 has marked the anchor load group, CE marking, the manufacturer and the identification number.

TF1 (Zinc plated)		Load Class	Load Range	Dimensions			
				a	b	c	d
		[kN]	[kN]	[mm]	[mm]	[mm]	[mm]
TF1 -015	48983	15	15	100	54	176	9
TF1 -025	45948	25	7 – 25	120	90	195	14
TF1 -050	45949	50	30 – 50	200	100	295	18
TF1 -100	45950	100	53 – 100	240	140	325	22
TF1 -260	45951	260	125 – 260	1570	160	480	32



Note: Each lifting clutch TF2 has marked the anchor load group, CE marking, the manufacturer and the identification number.

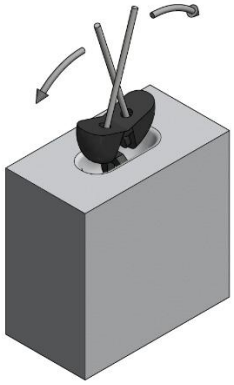
TF2 (Zinc plated)		Load Class	Load Range	Dimensions				
				a	b	c	d	e
		[kN]	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
TF2 -025	44843	25	7– 25	259	27	78,5	70	50
TF2 -050	44844	50	30 – 50	325	36	105	86	58
TF2 -100	44845	100	53 – 100	431	50	146,7	107	75
TF2 -260	44846	260	125 – 260	620	72	216	154	110

2D LIFTING CLUTCHES – APPLICATION INSTRUCTIONS

1) De-mold

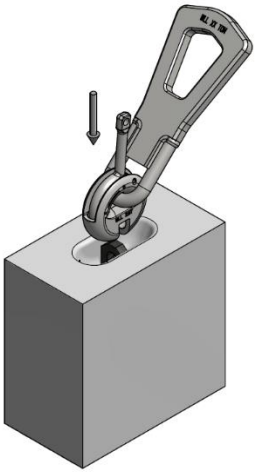
Before lifting the precast concrete element, it is recommended to remove as many parts of the formwork as possible to minimize adhesion to the mold. In the de-mold process, the forces acting on the lift system are considerable greater than the actual weight of the precast element. In the opposite case the precast concrete unit is possible to flake.

2) Removing the recess former



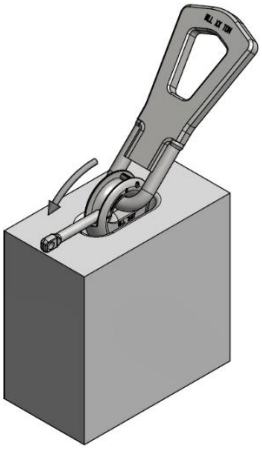
To remove the recess former, two rods are inserted in the holes in the recess former, after that they are levered out by scissors action. Do not use a hammer to remove the recess former; in this case the former can be destroyed.

3) Fitting the lifting system



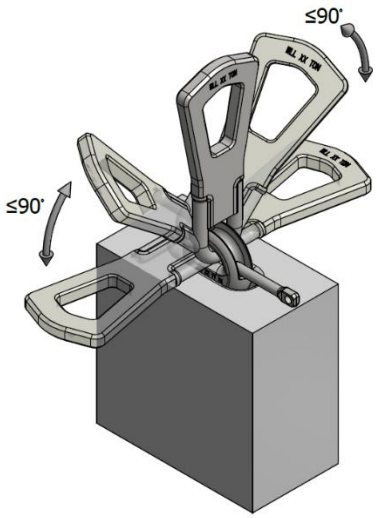
To transport the concrete units, the appropriate lifting system for the load group is inserted over the anchor head. Only matching components will fit together.

4) Locking the lifting system



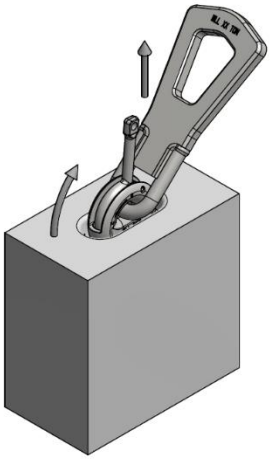
The lifting system is locked by a simple handle on the locker. Now, the lifting system is free to move in any direction. From this moment, the precast concrete unit can be lifted out of the formwork and transported to the point of storage.
The lifting angle, normally must be 30°, but up to 45° is possible.

5) Handling the system



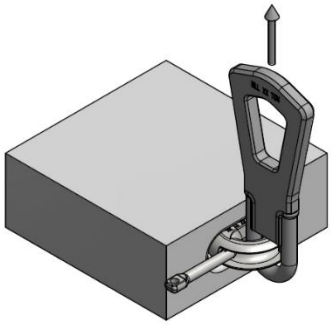
The 2D lifting bracket of the clutch can be moved in any direction. Is not permitted the overload of the lifting anchor (see the 2D lifting anchors conditions).

6) Releasing the lifting system



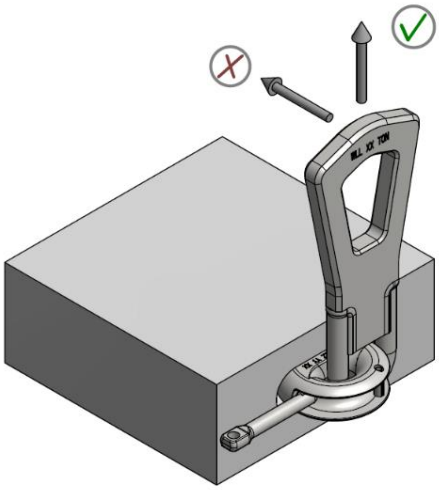
After the lifting/transportation of the precast element the lifting system can be easily released by pushing back the locker after the system is off load. The lifting clutch can remain attached to the crane hook till another use.

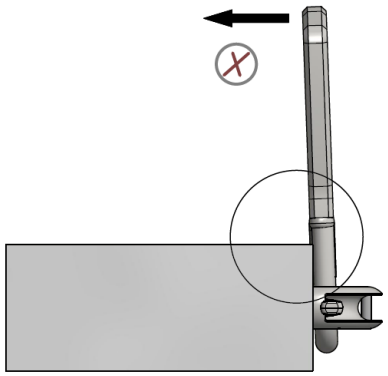
7) Erecting slabs from a horizontal to a vertical position



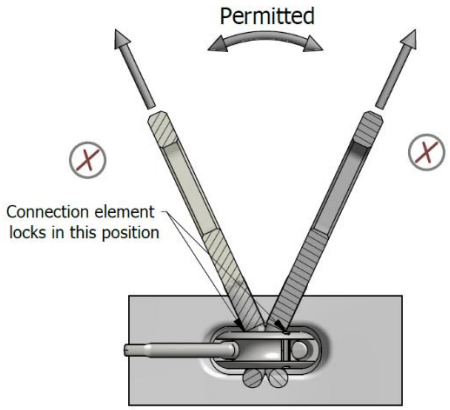
The flat precast concrete units can be moved from a horizontal to a vertical position by using TILT UP anchor SA -TU or SA -TTU with additional reinforcement, embedded in concrete. The direction of pull is at right angles to the cast -in anchor. For lifting it is recommended to use a cross -beam to avoid angular and torsion forces.

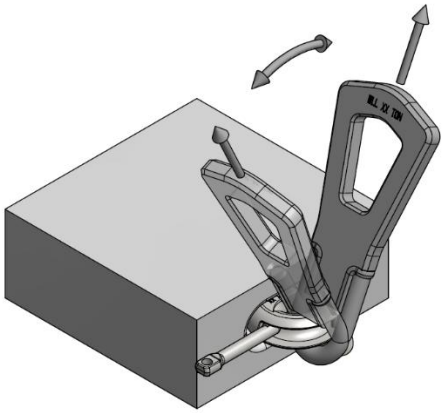
MISUSE OF THE LIFTING SYSTEM



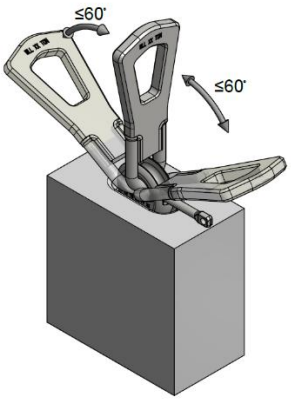


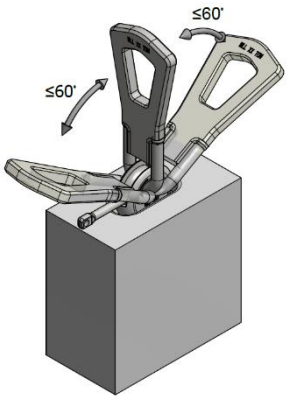
If the lifting direction is not respected big damages can occur on the precast element or on the lifting clutch. A good utilization can prevent damages and can extend the life of the lifting system.





In this position, the connection element may lock within the shackle. A narrow lifting cable angle will determine the connection element to become bent. The problem can be overcome by turning the connection element.
In this position, the connection element cannot lock.





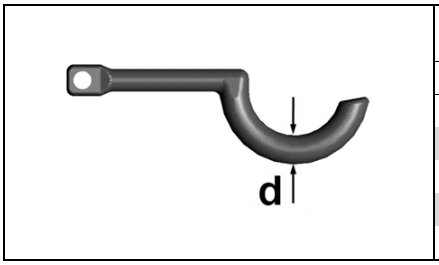
Angled pull using cable or chain with $\beta > 60°$ *is* ***not allowed****.*

THE LIFTING SYSTEM

In common with all lifting devices, the lifting system TF1, TF2 must be checked at least twice a year by trained personnel. Any deformation of a locker means that an overload of the permitted load has occurred at least three times. The damaged locker can be replaced. No other repairs are permitted. We recommend not combining products of different companies.

- **The locker**

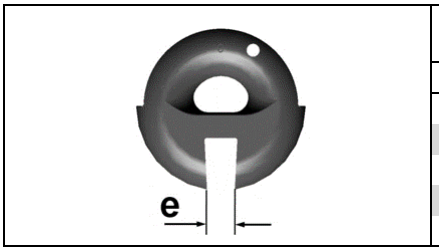
The lifting system with worn or bent locker must be taken out of use. The wear on the locker must be lower than the limits showed in the table below.



Load group	Nominal dimension d	Minimum dimension d
[kN]	[mm]	[mm]
12.5– 15	Ø 8 +0.3/0	7.5
25	Ø 13 +0.5/0	12
50	Ø 17 +0.5/0	16
100	Ø 22 +0.5/0	21
260	Ø 32 +0.5/0	31

- **The shackle**

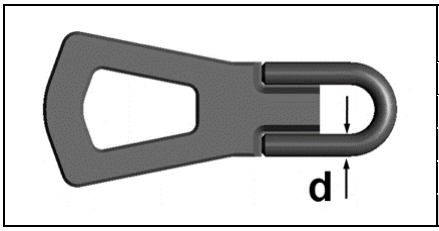
If the shackle is deformed or the opening “e” is enlarged, the lifting system must be taken out of use and cannot be repaired. The wear on the shackle must be lower than the limits showed in the table below.



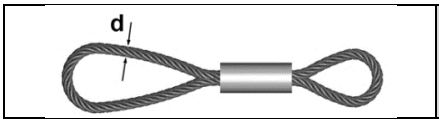
Load group	Nominal dimension e	Maximum dimension e
[kN]	[mm]	[mm]
12.5– 15	7 +0.5/0	8
25	13 +0.5/0	14
50	20 +0.5/0	21
100	22 +0.5/0	23
260	33 +1.0/0	35

- **The connection element**

The connection elements (bracket) to the crane hook, with visible mark of damage or excessive wear must be withdrawn immediately. The wear on the bracket must be lower than the limits showed in the tables below.



Load group	Nominal dimension d	Minimum dimension d
[kN]	[mm]	[mm]
25	14	13
50	20	19
100	26	25
260	40	38,5



Cable type	Number of visible ruptured wires over a length of		
	3d	6d	30d
Braided cable	4	6	16

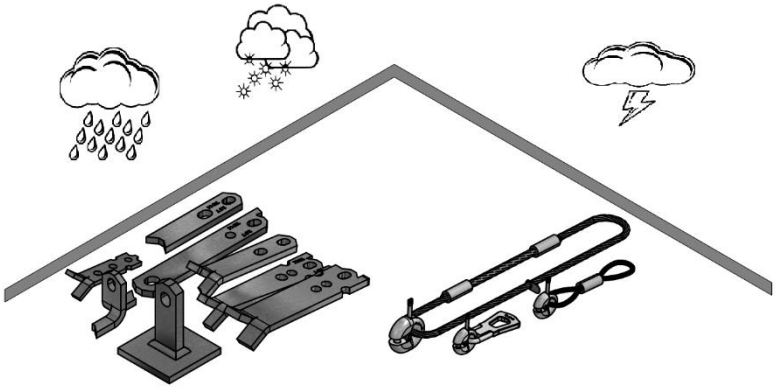
d = cable diameter

WIRE CABLES SHOULD BE CHECKED FOR THE FOLLOWING FLAWS:

- Kinking
- One braid broken
- Separating of the outer layer of braids
- Crushing braids
- Crushing at the shackle contact point with more than 4 ruptured wires on braided cables, or more than 10 ruptured wires on cable laid rope
- Corrosion marks
- Damage or severe wear on the closing bush.
- Signs of slipping between the cable and the closing bush
- High number of ruptured wires. The cable with a number of ruptured wires as in the table above must be taken out of use.

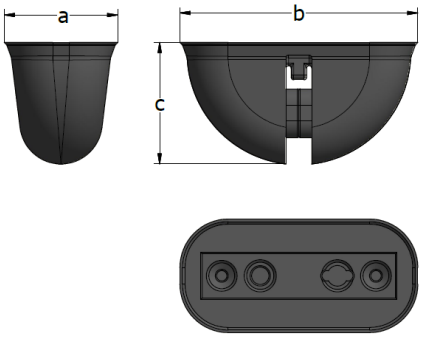
STORAGE REQUIREMENTS

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.



RECESS FORMER "RBF"

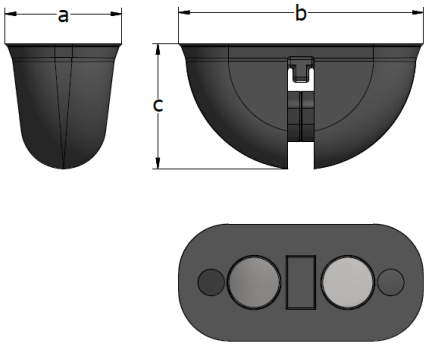
The recess former RBF is made of rubber. It is used to create cavities in concrete round the anchor head. The recess formers are available for load range 12.5 kN - 260 kN



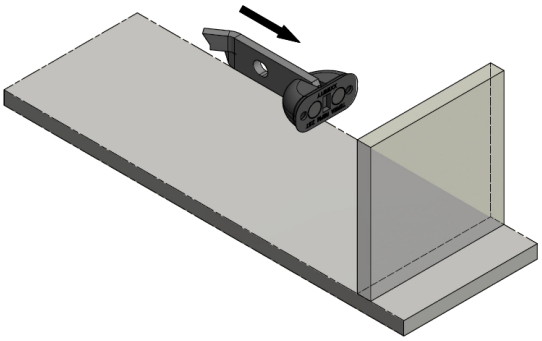
TYPE	Product number	Load group	Dimensions			
			"a"	"b"	"c"	Thread
		[kN]	[mm]	[mm]	[mm]	[Metric]
RBF -015	49098	12.5 - 15	29	62	35	M 8
RBF -025	45131	7– 25	43	104	45	M 8
RBF -050	45132	30 – 50	49	126	59	M 8
RBF -100	45433	75 – 100	67	188	85	M 12
RBF -260	45134	125– 260	112	233	121	M 16

RECESS FORMER "RBFM"

The recess former with magnets RBFM is made of rubber. It is used to create cavities in concrete round the anchor head. The recess formers are available for load range 25 kN - 100 kN



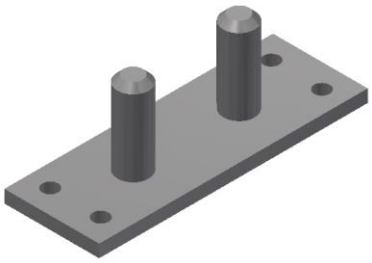
TYPE	Product number	Load group	Dimensions		
			"a"	"b"	"c"
		[kN]	[mm]	[mm]	[mm]
RBFM -025	62154	7– 25	43	104	45
RBFM -050	63083	30 – 50	49	126	59
RBFM -100	63084	75 – 100	67	188	85

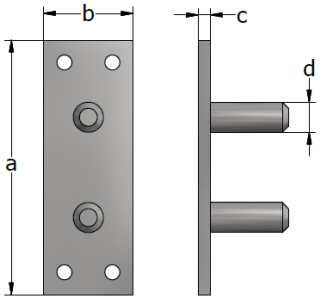


The RBFM Magnetic recess former is used in applications where drilling holes in the steel formwork is not wanted.

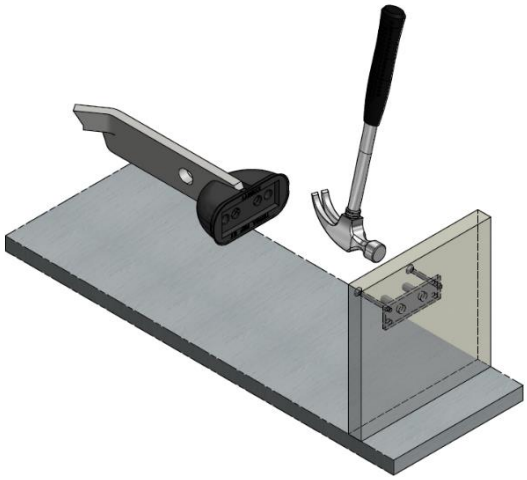
HOLDING PLATE "TMP"

The holding plate TMP consists of a plate with two studs and four holes for nails. The plate can be nailed or welded on the formwork. For assembly, the recess former is fitted on the studs. The formwork can then be easily removed without taking the plate off.





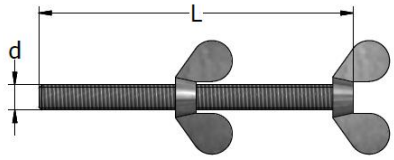
TYPE	Product number	Load group	Dimensions			
			"a"	"b"	"c"	"d"
		[kN]	[mm]	[mm]	[mm]	[mm]
TMP -015	49096	12.5– 15	45	15	3	6
TMP -025	45213	7– 25	73	15	4	10
TMP -050	45169	30 – 50	85	30	4	10
TMP -100	45170	75 – 100	128	40	6	12
TMP -260	45171	125– 260	178	65	8	16



Nail or screw the TMP product on the wooden formwork and press the RBF with the anchor inserted into the holding plate.

THREADED HOLDING BOLT "TDV"

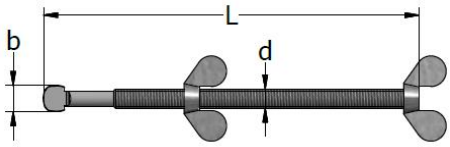
The threaded holding bolt TDV is used for fixing the recess former on the steel formwork. It has a locked wing nut at its upper end. On the thread, there is another one, loose.



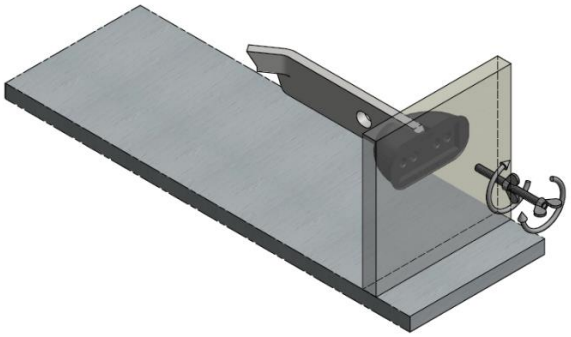
TYPE	Product number	Load group	Dimensions	
			"L"	"diameter"
		[kN]	[mm]	[Metric]
TDV - 025	44575	7- 25	160	M 8
TDV - 050	44576	30 - 50	160	M 8
TDV - 100	44577	75 - 100	160	M 12
TDV - 200	44578	125 - 260	180	M 16

THREADED HOLDING BOLT "TBV" WITH BAYONET END

The threaded holding bolt TBV consists of a threaded bolt with a pressed bayonet end. It is inserted in the bayonet fitting of the recess former and turned to 90° to lock.



TYPE	Product number	Load group	Dimensions		
			"L"	"b"	"diameter"
		[kN]	[mm]	[mm]	[Metric]
TBV - 025	48299	7 - 25	160	11	M 8
TBV - 050	48300	30 - 50	160	11	M 8
TBV - 100	48301	75 - 100	180	16	M 12
TBV - 200	48302	125 - 260	180	16	M 16



Drill the formwork and push the TBV or TDV in the hole, screw the recess former RBF with the anchor mounted. Pull to formwork and tighten with the second nut against the formwork.

ALL SPECIFICATIONS CAN BE CHANGED WITHOUT PREVIOUS NOTICE.

DISCLAIMER