TECHNICAL MANUAL

KK Lifting System

For safe and efficient lifting of precast concrete elements

Version PEIKKO GROUP 09/2022

peikko®

KK Lifting System

For safe and efficient lifting of precast concrete elements

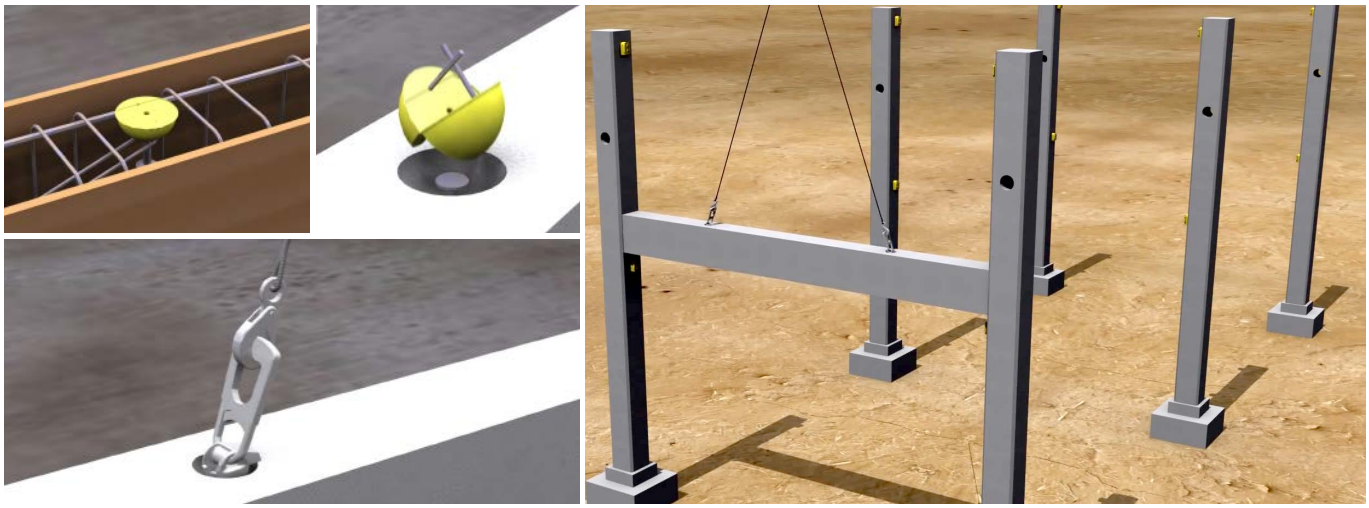
The KK Lifting System with spherical-head KK Lifting Inserts is designed for rapid coupling and release with specially designed KKL Lifting Keys. It is safe on-site with recessed insert installation and gives design freedom in all available load directions.

The KK Lifting System is easy to use thanks to a wide selection of inserts with load capacities up to 32 tons. The KK Lifting System enables lifting angles up to 90 degrees.

- Rapid coupling and release
- All lifting directions possible
- Available in sizes from 1.3 to 32 tons
- Easy installation with recess formers
- Individual serial numbering on KKL Lifting Keys

All Peikko Lifting Systems are designed and manufactured in accordance with EU Machinery Directive 2006/42/EC and VDI/BV-BS 6205.

Product safety in use has been verified by a series of tests conducted in cooperation with the Technical University TU Darmstadt.



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CONTENTS

CONTENTS

Chapter headers explanation:

Chapters are marked by a unique header to explain suitability of information for target group.

DESIGNERS	PRECAST PLANTS	USERS
Designers: Information is intended for designers, civil and structural engineers.	Precast plants: Information is itended for fabricators and companies manufacturing, precast elements.	Users: Information is intended for persons responsible for selection, lifting, transporting and mounting of precast elements.

DESIGNERS	PRECAST PLANTS	USERS
	Gray color in header means that particular information is not targeted directly to group indicated in gray color.	

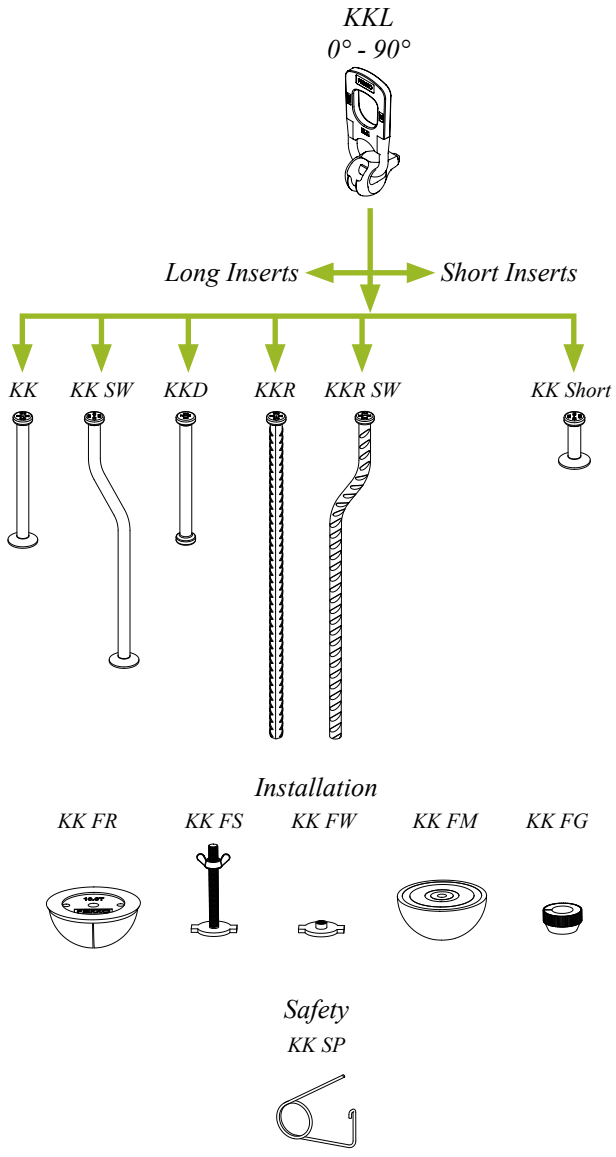
About KK Lifting System

1. Product properties

DESIGNERS	PRECAST PLANTS	USERS

The KK Lifting System is a lifting insert system designed for lifting and handling precast concrete elements. The KK Lifting Insert System is intended for temporarily fastening KKL Lifting Keys to enable concrete elements to be transported and installed. Applications that require permanent load or that affect the stability of a building are not included in this range of applications.

The KK Lifting Insert System consists of a KK Lifting Insert that is permanently anchored in the precast element and a corresponding KKL Lifting Key, which hooks temporarily onto the embedded KK Lifting Insert. *Figure 1* is an overview of the parts of the KK Lifting System.



The KKL key is hooked and secured by single turn onto head of KK anchor in the recess.

The KK long inserts are for application with sufficient anchoring depth such as heigh beams or walls.

The KK short inserts are for application with limited anchoring depth such as slabs. They are not intended for tilting up processes and the load angle is limited to 45°.

All KK Lifting Inserts are cast into concrete elements to enable the elements to be lifted after the concrete hardens. For this reason, KK Lifting Inserts can only be used once.

KK Installation Accessories are used temporarily allowing user to fix KK Lifting Inserts into the formwork.

KK Safety Accessories are used to secure position of the KKL Lifting Key during lifting and turning.

Figure 1. KK Lifting System overview.

For derogating applications such as turning of elements, please refer to our specific Technical Manual for Element Turning. Product CAD files are available in ProdLib design library. https://www.prodlib.com/library/peikko

1.1 Limitations for application

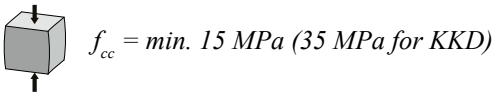
DESIGNERS	PRECAST PLANTS	USERS

Peikko Lifting Systems consists of the Technical Manual and the product. Both yield into a complete unit that follows the safety and health requirements of the machinery directive (2006/42/EC).

The Technical Manual consists of Peikko General Information for Lifting Systems and the specific KK Technical Manual. Peikko KK products are useable only in combination with the Technical Manuals and knowledge of the content within (see *Figure 2*).

Figure 2. KK Lifting System – Complete product definition.

When using Peikko Lifting Systems in concrete elements, the **minimum concrete cube compressive strength must be 15N/mm² at first lifting, except for KKD, which is 35MPa.**



An increase in concrete compressive strength does not automatically lead to an increase in the resistance of the lifting system. Further limitations, restrictions and application conditions are given in manual General Information for Lifting Systems.

1.2 KK Lifting System color coding and marking information

DESIGNERS	PRECAST PLANTS	USERS

Peikko KK Lifting System has a color code for KK FR recess items that enables easy recognition of every load class. KK FR recess items are colored in accordance with *Table 1* and *Figure 3*. This helps the user to allocate the right combination of KK Lifting Insert, KK Accessories, and KKL Lifting Key.

Table 1. KK Lifting System color codes.

Type/Size	KK FR Color
1.3	Light Blue
2.5	Sulphur Yellow
5	Light Blue
7.5	Flame Red
10	Sulphur Yellow
15	Silver Grey
20	Black
32	Silver Grey

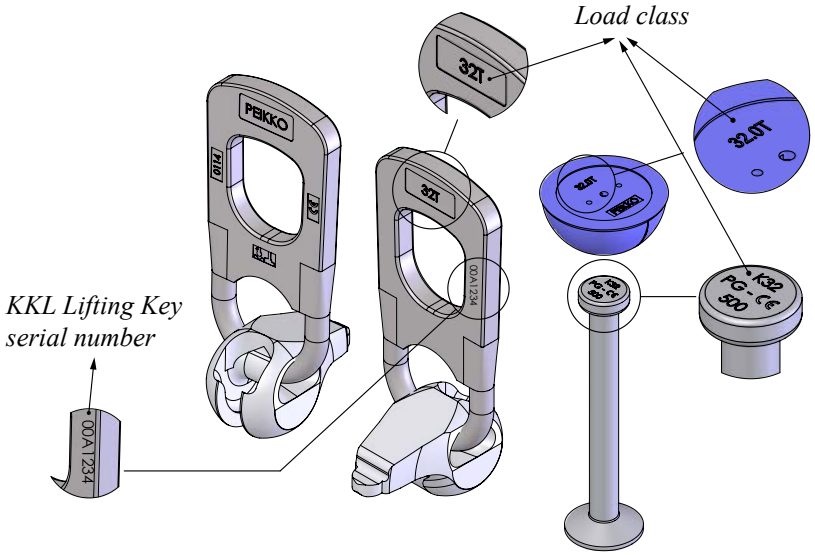


Figure 3. KK color codes and marking information.

The inserts in the KK Lifting System can be identified by the marking on the forged head even after casting. The markings provide the user with information about the manufacturer, the load class/type and the CE marking.

The Lifting Key KKL is marked with a unique serial number, which is engraved on the handle ring (see *Figure 3*).

This serial number enables full traceability from the finished product back to the raw material. This unique feature is provided for safety purposes. A further safety feature of all Peikko Lifting Keys is preloading with at least 2.5 times the safe working load prior to sales. This ensures a quality level that is among the highest on the market, with certifications available upon request (serial number needed).

1.3 KK System product weights

DESIGNERS	PRECAST PLANTS	USERS

Table 2. Weights of KK lifting components.

Load class	1.3	2.5	5.0	7.5	10.0	15.0	20.0	32.0
KK Long Lifting Insert [kg/pcs]								
KK	0.1	0.3	0.8	1.4	2.0	3.8	6.2	13.6
KK SW	-	-	1.4	2.8	3.7	7.0	11.2	-
KKD	-	-	-	-	-	3.8	5.3	-
KKR	-	-	1.5	2.9	4.4	8.3	-	-
KKR SW	-	-	-	-	6.7	13.0	16.7	-
KK Short Lifting Insert								
Length [mm]	*50*	65	*75*	*85*	120	*165*	*165*	*250*
KK Short [kg/pcs]	*0.1*	0.3	*0.3*	*0.5*	0.9	*2.0*	*2.6*	*6.6*
Length [mm]	*55*	*75*	*90*	*100*	*150*	*200*	*200*	*280*
KK Short [kg/pcs]	*0.1*	*0.2*	*0.4*	*0.6*	*1.1*	*2.3*	*2.9*	*6.8*
Length [mm]	65	*85*	*95*	120	*170*	250	340	*320*
KK Short [kg/pcs]	0.1	*0.2*	*0.4*	0.7	*1.2*	2.7	4.3	*7.2*
Length [mm]	85	*90*	*110*	*140*	200	300	-	*500*
KK Short [kg/pcs]	0.1	*0.2*	*0.4*	*0.8*	1.3	3.0	-	*10.6*
Length [mm]	-	*100*	120	*160*	250	-	-	-
KK Short [kg/pcs]	-	*0.2*	0.4	*0.9*	1.6	-	-	-
Length [mm]	-	120	*135*	*170*	-	-	-	-
KK Short [kg/pcs]	-	0.2	*0.5*	*0.9*	-	-	-	-
Length [mm]	-	*140*	180	200	-	-	-	-
KK Short [kg/pcs]	-	*0.2*	0.6	1.1	-	-	-	-
KK Lifting Key								
KKL [kg/pcs]	0.9	1.5	3.1	-	9.0	-	20.3	45.6

Note: *Gray italics* marks lengths of KK Inserts whose delivery may be longer than delivery of the standard items.

2. KK Lifting System – product properties

This section describes the product properties, dimensions, geometrical and reinforcement requirements, as well as the safe working loads of the KK Lifting System parts. All dimensions are valid for black, galvanized and stainless lifting Inserts.

2.1 KK Lifting Inserts

DESIGNERS	PRECAST PLANTS	USERS

The **KK Inserts** are ideal for all types of lifting operations, such as lifting of beams, columns and its turning.

The **KK SW Inserts** and **KKR SW Inserts** are special lifting inserts designed to lift and transport sandwich elements. The bending of the KK insert transfers the lifting head closer to the element's center of gravity and lifts the element in a vertical position.

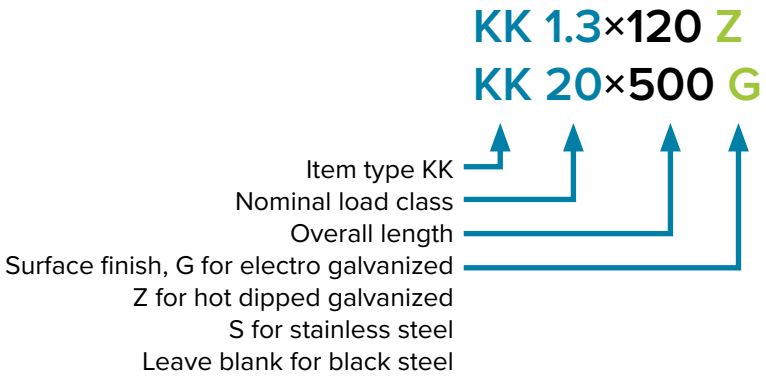
The **KKR Inserts** are particularly good for long and thin elements. Anchors can be used for all load directions.

The **KKD Insert** is the double head version of the standard KK. It has advantages in thin elements with high concrete strength (e.g. webs of prestressed beams).

The **KK Short Inserts** are ideal for slabs with various thicknesses. These inserts can be used for lifting angle up to 45 degrees.

2.1.1 Material options

KK Lifting Inserts are available in black steel as standard items, as well as electro galvanized, hot dipped galvanized, and stainless steel upon request. Material selection is presented in product code during ordering as it is presented in the figure below.



All KK Lifting inserts are designed to withstand temperatures between -20°C and +80°C. Material impact resistance is essential due to rough handling and lifting procedures.

Table 3. Lifting inserts materials.

Rebar material	B500B	EN10080
Round material	S355	EN10025
	1.4401/1.4404/1.4571	EN10088

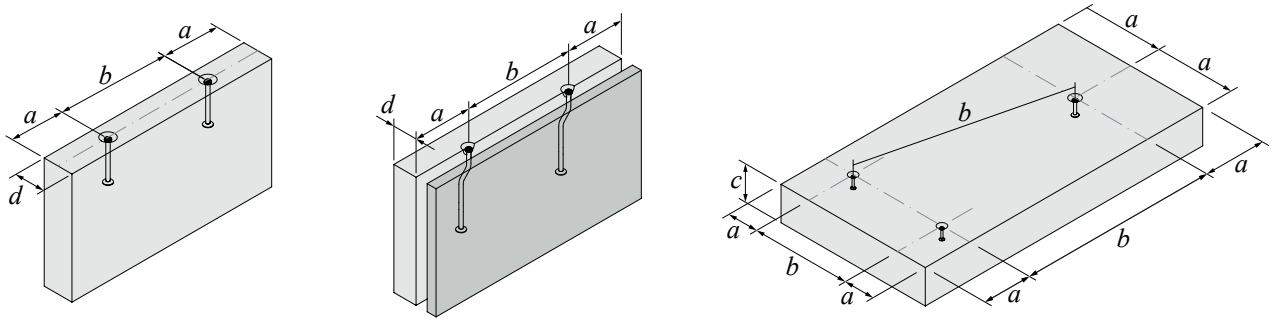
2.1.2 Dimensions and geometry

The minimum element thickness (d or d_{red} and c), minimum edge (a) and axial distances (b) are shown in consolidated tables for the individual KK Lifting Insert.

The load capacities given in this section of the manual are based on specific dimensions, edge and axial distances. The safety factors can only be ensured as described in General Lifting Systems Technical manual, if the geometric specifications are complied with.

KK Long Inserts are commonly used in thin or very thin elements with sufficient anchorage depth. For this reason, most insert types go into the depth of the element. In many cases, capacities are limited by the element thickness (d).

The correct position for KK Long Inserts is shown in *Figure 4*. The forged head of KK SW or KKR SW Inserts should be as close as possible to the center axis of gravity but must align with the inner surface of the support layer. The forged foot is placed in the support layer to ensure sufficient anchorage.



a) KK, KKD, KKR *b) KK SW, KKR SW* *c) KK Short*

Figure 4. KK Inserts geometry requirements.

The Inserts geometry requirements for KK Long Inserts (*Figure 4a, b*) differs from that for KK Short Inserts (*Figure 4c*). The two types cannot replace each other or be applied in the same way unless all the geometric requirements are complied with. The minimum element thickness as well as minimum edge (including edges of openings) and axial distances for the respective KK Lifting Insert types are shown in *Figure 4*. and in *Table 4* to *Table 9*.

2.1.3 Reinforcement

The KK Lifting System requires at least minimum level of reinforcement in the concrete elements. The reinforcement that is defined by the structural design can be considered by taking into account the existing cross section. The required reinforcement level can be attained by using single reinforcing bars or a wire mesh with an equivalent or greater cross section (mm^2/m or cm^2/m). If the designed reinforcement must be removed or cut to install the KK Lifting Insert, this area must be repaired by adding a similar cross section of reinforcement (single bars or wire mesh) with a sufficient overlapping length.

The reinforcement described in *Table 4* to *Table 9* supports only the load impact of the KK Lifting System on the concrete elements. The structural designer must bear in mind that the element may bend as a result of the transportation process. Additional reinforcement may be needed to prevent the element from breaking or cracking. This must be defined separately. Surface reinforcement (mm^2/m) must be considered and installed cross-wise for each element direction.

WARNING:
Never assume sufficient reinforcement – make precise calculations. Too little reinforcement can result in severe accidents and collapsing of the elements.

2.1.4 Reinforcement for diagonal pull (from 12.5° to 45°)

Diagonal pull causes horizontal loads in KKL lifting key and lifting inserts. The impact of horizontal loads from the KKL Lifting Key onto concrete is shown in principle in *Figure 5*. Diagonal pull on the inserts, presented in *Figure 6*, requires special reinforcement around the KK Lifting Recess to support the KK Lifting Insert. This reinforcement must always have direct pressure contact with the recess made with the KK FR (or KK FM) Recess Item. This can be achieved by fixing with wire. The KKL Lifting Key works together with the opening created in the concrete by the recess items KK FR or KK FM for the spherical KKL Lifting Key part. This supports the load impact on KKL Lifting Key, provides better performance and reduces the risk of damaging the lifting system's parts during use.

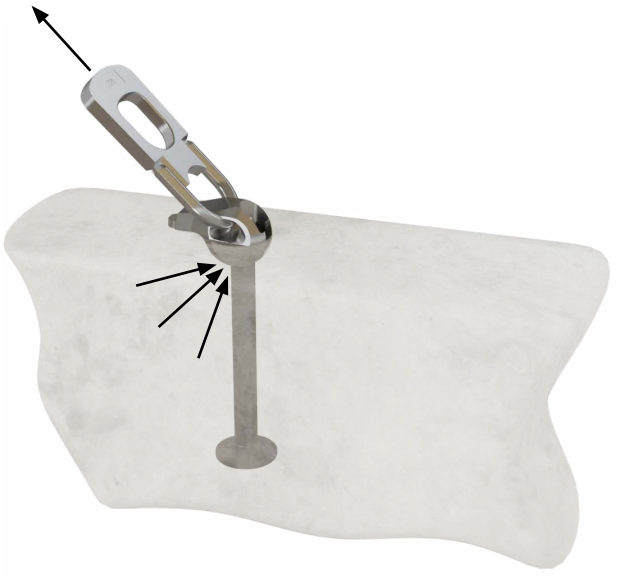


Figure 5. Impact of horizontal loads.

For load angles up to 45°, the reinforcement is shown in *Table 4* to *Table 9*. If the load is limited to a maximum of 30°, rebar with a smaller diameter can be used. The KK Lifting Insert type KKD does not require additional reinforcement due to concrete strength > 35 MPa. All additional reinforcement referred in this section must be installed in such way, that the KK Lifting Inserts are supported.

Figure 6 shows the optimum position for the additional reinforcement.

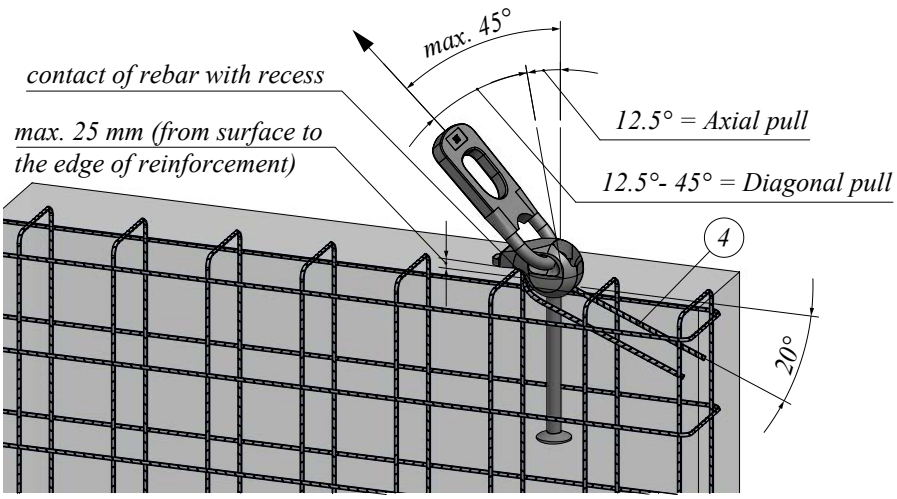


Figure 6. Optimum installation for KK Inserts.

The recommended mandrel diameter of the additional rebar "d_{br}" is the outer diameter of the KK FR recess. This ensures a precise fitting and limits the possibility of installation errors. As an alternative, a sufficiently large mandrel diameter, according to EN1992-1-1:2011 – 8.3, can be used for the additional rebar to encloses the KK FR recess. The diagonal pull rebar must be installed at an angle of 15° up to 20° and sufficiently anchored. *Figure 6* demonstrates proper installation of the diagonal pull rebar.

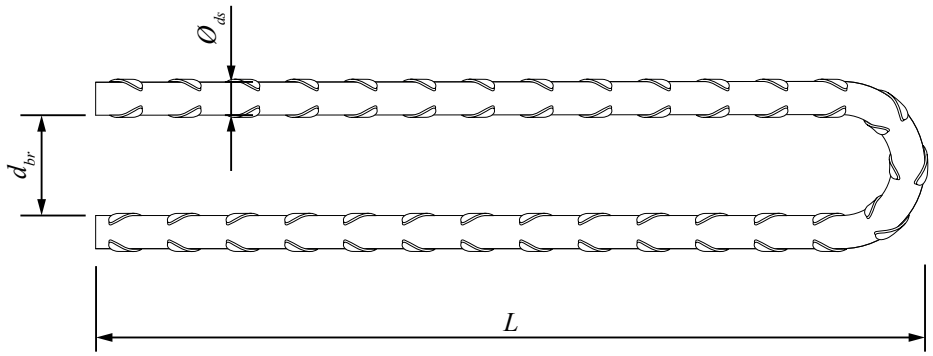


Figure 7. Diagonal rebar dimensions.

If very slim wall elements do not offer sufficient space and concrete cover for placement of supplementary reinforcement, a diagonal pull must be limited to 30°. Optionally smaller rebar diameter of supplementary reinforcement with adequate cross-section area in accordance with *Table 4* to *Table 9* can be used.

2.1.5 Reinforcement for lateral pull (90° for KK Long Inserts only)

Lateral pull presented in *Figure 8*, which results in upward tilting actions, applies only to KK Long Inserts, such as KK, KKR, KKR SW or KK SW. No other types of KK Long Inserts may be used in the lateral direction.

Lateral pull on the inserts requires additional reinforcement around the recess during the early hardening stage of the concrete to support the KK Lifting Insert. This reinforcement must always have direct pressure contact with the recess in the region of contact with the KKL Lifting Key. This can be achieved by using a wire fixing and a precise installation routine. When lowering and raising the component, the user must take into account the direction of the reinforcement in accordance with *Table 4* to *Table 9*. In case of sandwich panels and use of reinforcement ⑤ it is necessary that the inner surface of the bended part of additional reinforcement is in direct contact with the bended part of KK SW anchor.

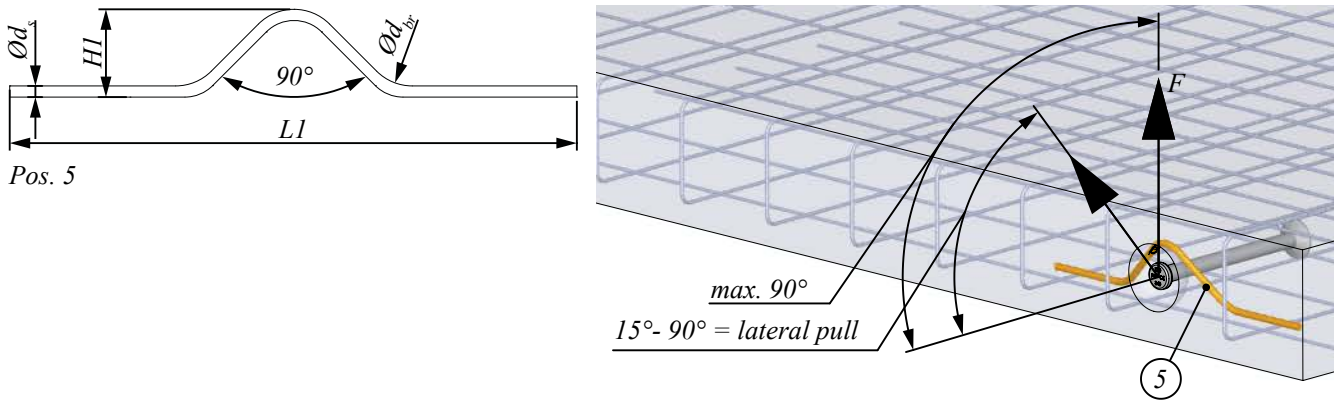


Figure 8. Lateral reinforcement for KK Inserts.

It is beneficial to install sandwich anchor pins for the erection process. Those pins connect the facing layer with the supporting layer. It is recommended that at least two pins be used per anchor as shown in *Figure 9*. For elements with structural surfaces that create higher mold adhesion, several pins should be used across the whole anchor length to avoid damage caused by the erection process.

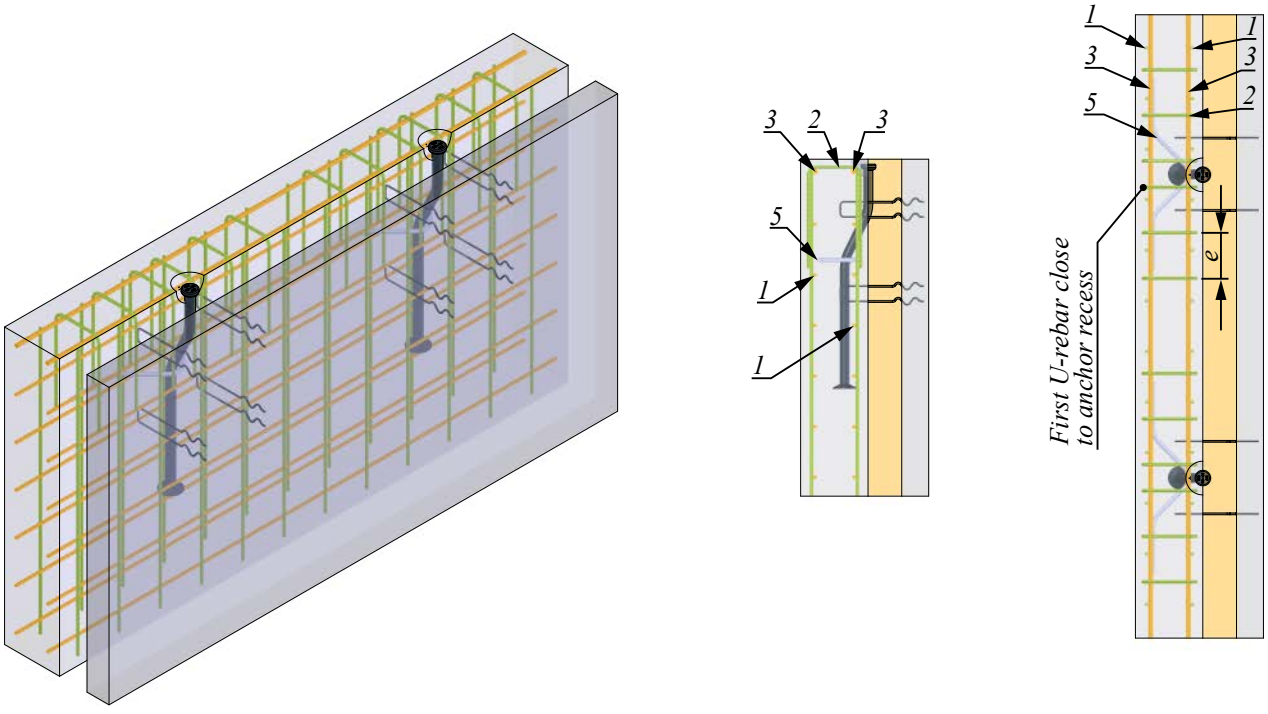


Figure 9. Reinforcement installation to supporting layer.

2.1.6 Reinforcement for combination of diagonal and lateral pull

In the case of combination of loads resulting from diagonal (12.5° > $\beta \leq$ 30°) and lateral pull ($\gamma \geq$ 15°) during tilt-up process, both-sided lateral reinforcement must be used (*Figure 10*). This combination is allowed only for Lifting Inserts KK and KKR. Dimensions of the lateral rebar are defined in relevant tables of this Technical Manual (*Table 4* and *Table 7*).

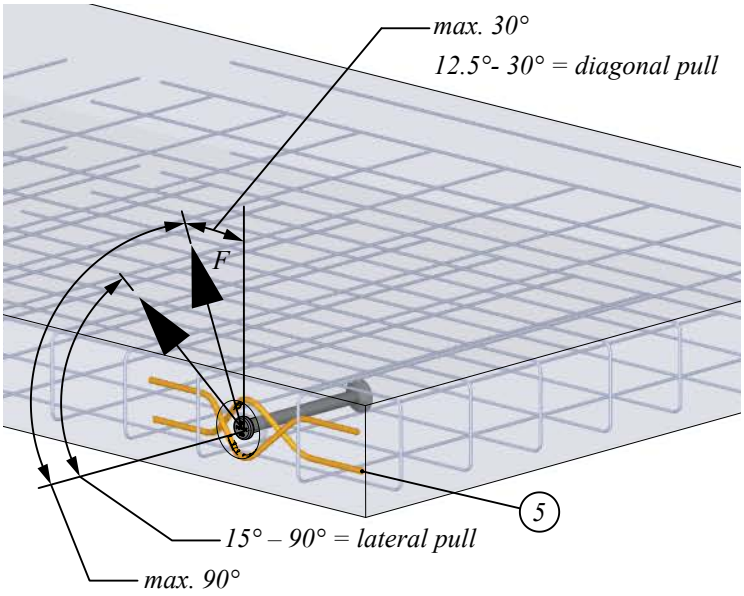


Figure 10. Reinforcement for combination of diagonal and lateral pull.

2.1.7 KK Lifting Inserts Resistances R_{zul}

The admissible load directions and safe working loads (R_{zul}) for the KK Lifting Inserts are presented in the following tables for the individual KK Lifting Insert. Make sure to select inserts that are suitable for the planned load directions.

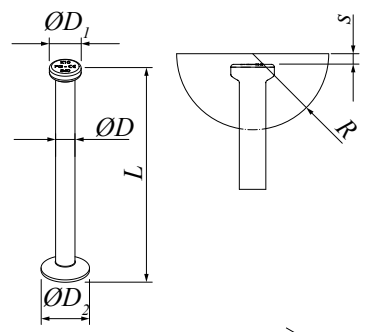
More information on the design concept can be found in the General information Manual.

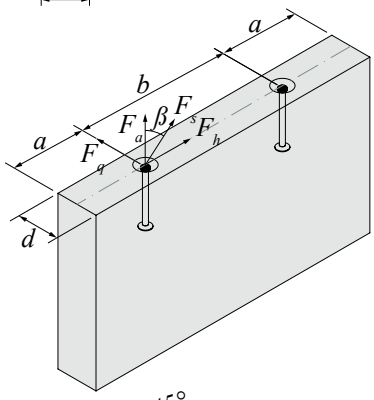
PLEASE NOTE:
Diagonal pull between 12.5° and 45° and lateral pull resulting from tilting up is only permitted with additional reinforcement according to the following section. The geometry specification requires that the installation be within the tolerances as defined in the General Information manual for all Peikko Lifting Systems.

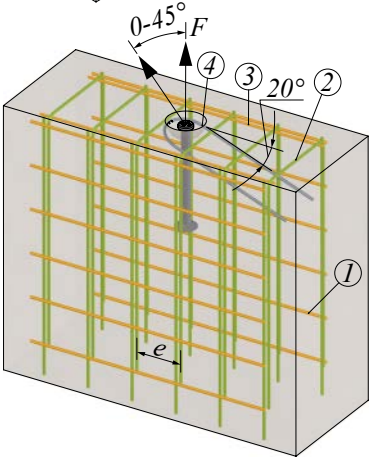
KK Lifting Insert

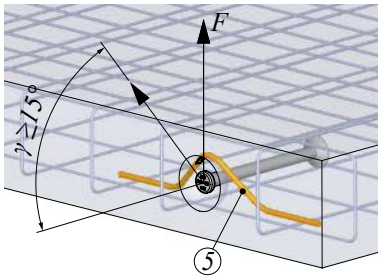
Table 4. KK Lifting insert.

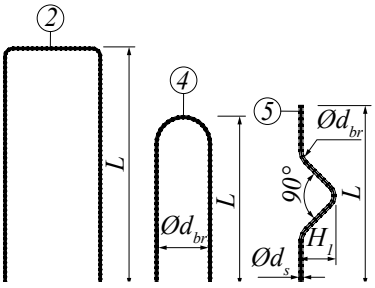
	Color code								
	Load class	1.3	2.5	5.0	7.5	10.0	15.0	20.0	32.0
GEOMETRY	**Dimensions**								
	$ØD$ [mm]	10	14	20	24	28	34	38	50
	$ØD_1$ [mm]	19	26	36	47	47	70	70	88
	$ØD_2$ [mm]	25	35	50	60	70	80	98	135
	R [mm]	30	37	47	59	59	80	80	107
	s [mm]	10	11	15	15	15	15	15	23
	L [mm]	120	170	240	300	340	400	500	700
	Black/Galvanized	●	●	●	●	●	●	●	●
	Stainless	●	●	●	●	●	●	●	●
	Element geometry								
	a [mm]	195	265	380	465	525	620	775	1070
	b [mm]	390	530	760	930	1050	1240	1550	2140
	d [mm]	100	120	180	240	260	280	300	400
RESISTANCES	**Resistances R_{zul} [kN] at wall thickness "d" for axial pull (F_a) up to 12.5° at f_{cc} of**								
	15 MPa	13.0	25.0	50.0	75.0	100.0	140,9	190.6	313.7
	20 MPa						150.0	200.0	320.0
	Resistances R_{zul} [kN] at wall thickness "d" for diagonal pull (F_s) from 12.5° up to 45° at f_{cc} of								
	15 MPa	13.0	20.7	42.7	75.0	96.2	119.8	161.8	266.6
	20 MPa		25.0	50.0		100.0	138.2	186.8	307.7
	25 MPa						150.0	200.0	320.0
	Resistances R_{zul} [kN] at wall thickness "d" for lateral pull (F_q) for 90° at f_{cc} of								
	15 MPa	6.7	10.3	22.9	39.7	48.9	60.9	72.3	135.9
	20 MPa	7.8	11.9	26.4	45.8	56.4	70.4	83.5	156.8
	25 MPa	8.7	13.4	29.5	51.3	63.2	78.8	93.4	175.4
REINFORCEMENT	**Surface reinforcement**								
	① [mm²/m]	188	188	188	188	257	257	424	524
	② ($Ød_s \times L/e$) [mm/cm]	-	-	6Ø10× 650/10	6Ø10× 800/10	6Ø12× 800/10	6Ø12× 800/10	6Ø12× 1000/10	8Ø12× 1200/10
	③ ($Ød_s$) [mm]	-	-	2Ø14	2Ø14	2Ø14	2Ø14	2Ø16	2Ø16
	Diagonal reinforcement for diagonal pull from 12.5° up to 30°								
	④ ($Ød_s \times L$) [mm]	Ø6× 200	Ø8× 300	Ø10× 420	Ø14× 470	Ø14× 620	Ø20× 650	Ø20× 870	Ø25× 1100
	Diagonal reinforcement for diagonal pull from 12.5° up to 45°								
	④ ($Ød_s \times L$) [mm]	Ø8× 200	Ø10× 300	Ø12× 420	Ø16× 580	Ø16× 770	Ø25× 740	Ø25× 980	Ø28× 1400
	Lateral reinforcement for lateral pull for 90° ($\gamma \geq 15°$)								
	⑤ ($Ød_s \times L$) [mm]	Ø10× 600	Ø14× 600	Ø20× 1000	Ø20× 1200	Ø25× 1200	Ø25× 1400	Ø28× 1400	Ø28× 1400
	$Ød_{br}$ [mm]	40	64	140	140	175	175	196	196
	H_1 [mm]	55	70	120	160	180	200	220	320











The safe working load for γ = 90° is valid only with an additional rebar and limited unit thickness may cause impact in the edge region of the element as shown in *Figure 11*.

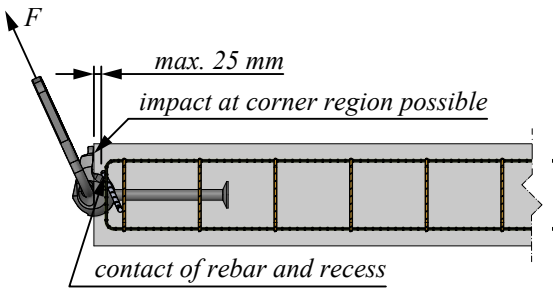


Figure 11. Tilting up with KK Insert.

Make sure to select inserts that are suitable for the planned load directions. *Figure 12* illustrates the load directions related to these tables.

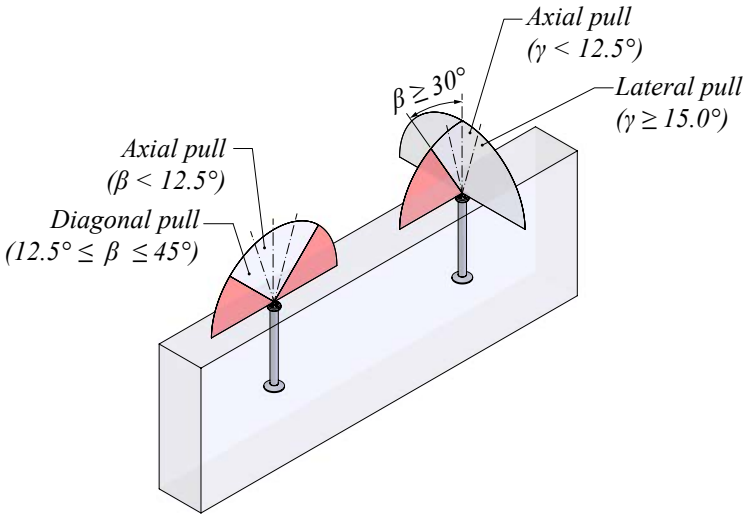
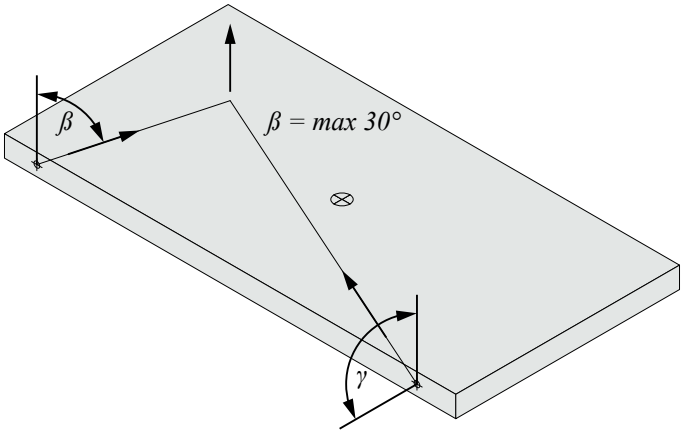


Figure 12. Load directions for KK Inserts.

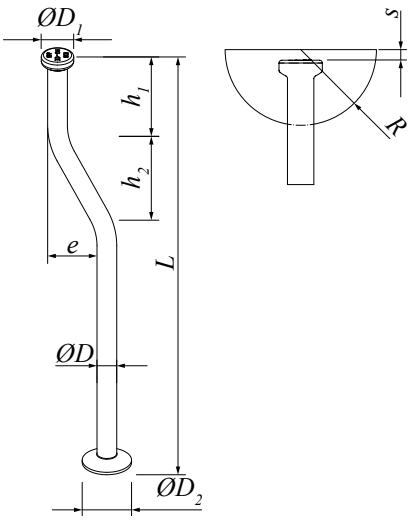
PLEASE NOTE:
During lateral pull, resulting from tilting up, β angle is allowed up to only 30°.

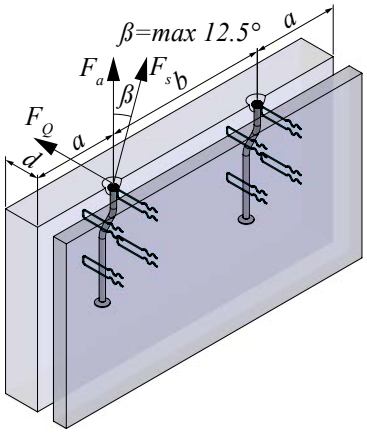


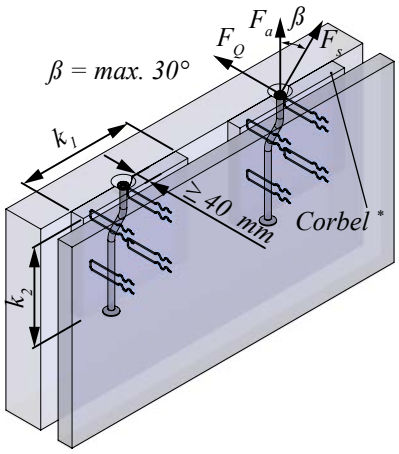
KK SW Lifting Insert

Table 5. KK SW Lifting Insert.

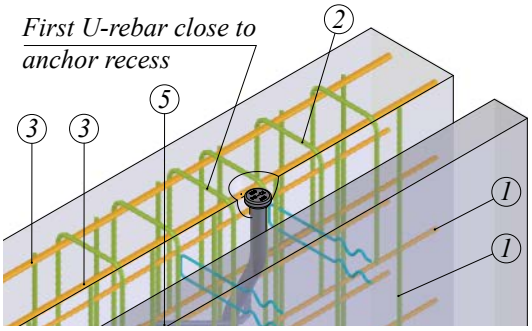
	Color code					
	Load class	5.0	7.5	10.0	15.0	20.0
GEOMETRY	Dimensions					
	ØD [mm]	20	24	28	34	38
	$ØD_1$ [mm]	36	47	47	70	70
	$ØD_2$ [mm]	50	60	70	80	98
	e [mm]	60	70	70	80	90
	R [mm]	47	59	59	80	80
	s [mm]	15	15	15	15	15
	L [mm]	465	665	665	825	985
	h_1 [mm]	46	73	115	125	76
	h_2 [mm]	147	187	197	200	234
	Black/Galvanized	●	●	●	●	●
	Stainless	●	●	●	●	●
	Element geometry					
	a [mm]	380	465	525	620	775
	b [mm]	760	930	1050	1240	1550
	d [mm]	180	240	260	280	300
RESISTANCES	Resistances R_{zul} [kN] at wall thickness "*d*" for axial pull (F_a) up to 12.5° at f_{cc} of					
	15 MPa	50.0	75.0	100.0	140.9	190.6
	20 MPa				150.0	200.0
	Resistances Rzul [kN] at wall thickness "*d*" for diagonal pull (F_s) up to 30° at f_{cc} of					
	15 MPa	42.7	75.0	96.2	119.8	161.8
	20 MPa	50.0		100.0	138.2	186.8
	25 MPa				150.0	200.0
	Resistances R_{zul} [kN] at wall thickness "*d*" tilt up process (y = 90°) at f_{cc} of					
	15 MPa	22.9	39.7	48.9	60.9	72.3
	20 MPa	26.4	45.8	56.4	70.4	83.5
	25 MPa	29.5	51.3	63.2	78.8	93.4
REINFORCEMENT	Surface reinforcement					
	① [mm²/m]	188	188	257	257	424
	② (*Øds*×*L/e*) [mm/cm]	6Ø10×650/10	6Ø10×800/10	6Ø12×800/10	6Ø12×1000/10	6Ø12×1000/10
	③ (*Øds*) [mm]	2Ø14	2Ø14	2Ø14	2Ø14	2Ø16
	Diagonal reinforcement for diagonal pull up to 30°					
	⑥ [d_{br}-*Øds*×*L*] [mm]	125Ø10×550	150Ø14×620	150Ø14×620	190Ø16×870	190Ø16×870
	H_1 [mm]	105	105	105	105	105
	Lateral reinforcement for lateral pull for 90° ($\gamma \geq 15°$)					
	⑤ (*Øds*×*L*) [mm]	Ø20×1000	Ø20×1200	Ø25×1200	Ø25×1400	Ø28×1400
	$Ød_{br}$ [mm]	140	140	175	175	196
	H_1 [mm]	120	160	180	200	220

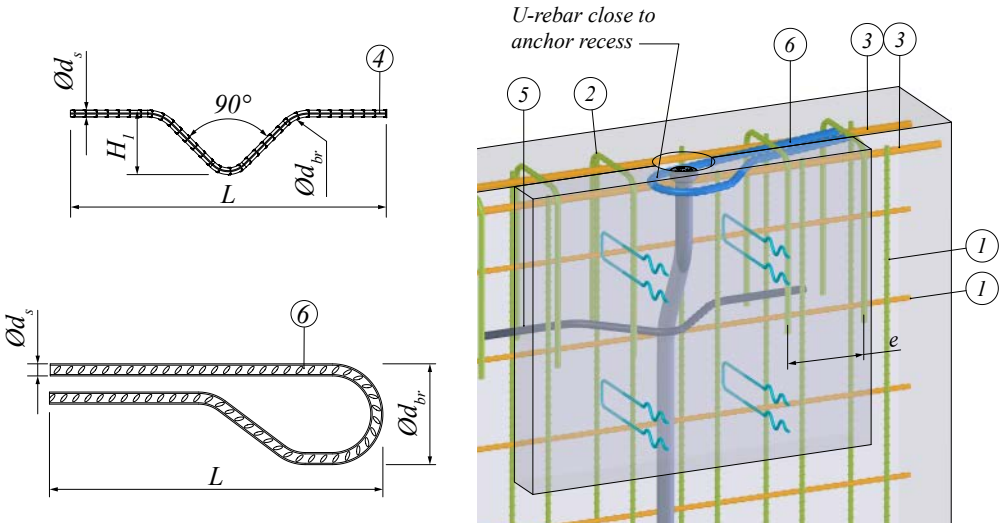






* *Concrete console part for transfering forces during diagonal pull*





KK SW Lifting Inserts require an almost straight pull and the preferred means of lifting and transporting is to use a spreader beam (see *Figure 13*). Diagonal pull is allowed only with additional concrete corbels.

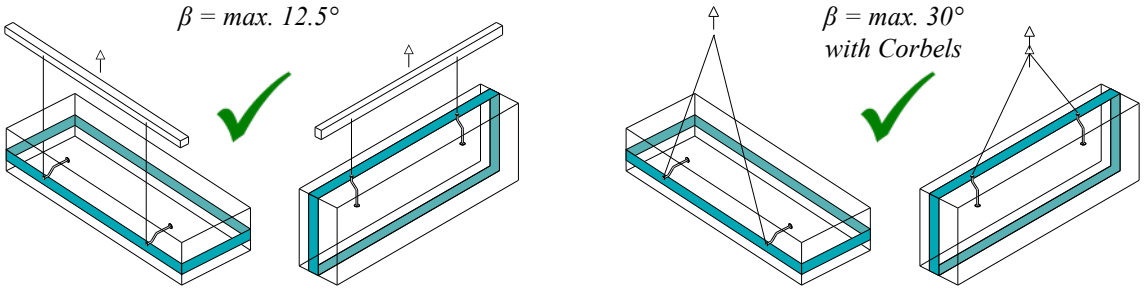


Figure 13. Transport and tilt-up options for elements with KK SW Lifting Inserts.

Make sure to select inserts that are suitable for the planned load directions. *Figure 14* illustrates the load directions related to these tables.

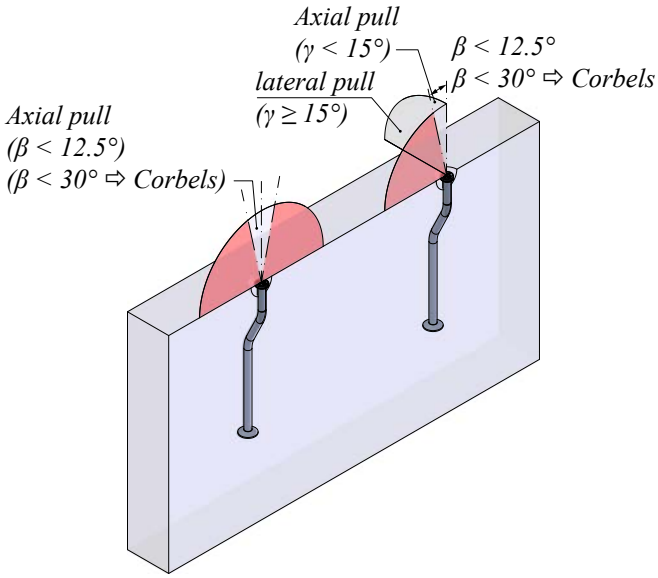


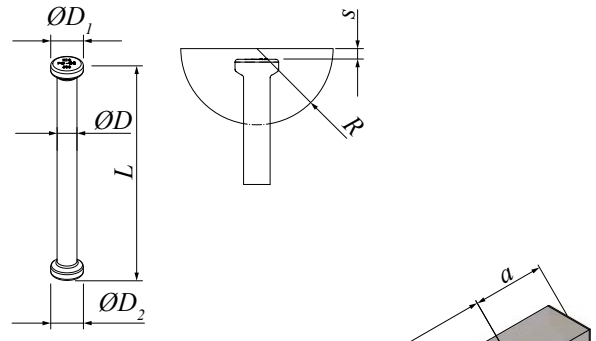
Figure 14. Load directions for KK SW Inserts.

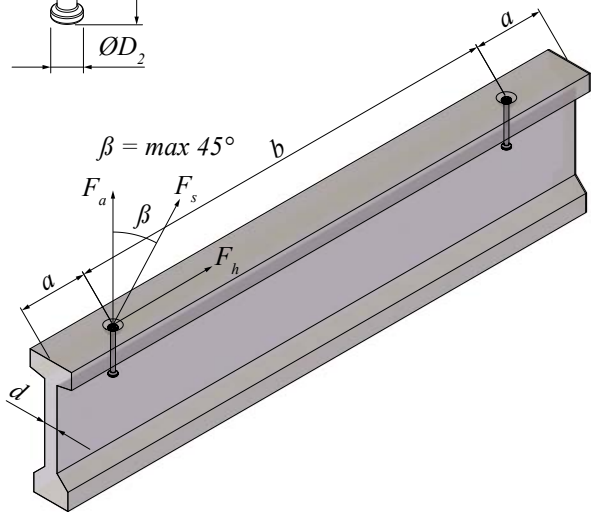
PLEASE NOTE:
During lateral pull, resulting from tilting up, β angle is allowed up to only 12.5°. Concrete corbels shall be used in case of 30° diagonal pull.

KKD Lifting Insert

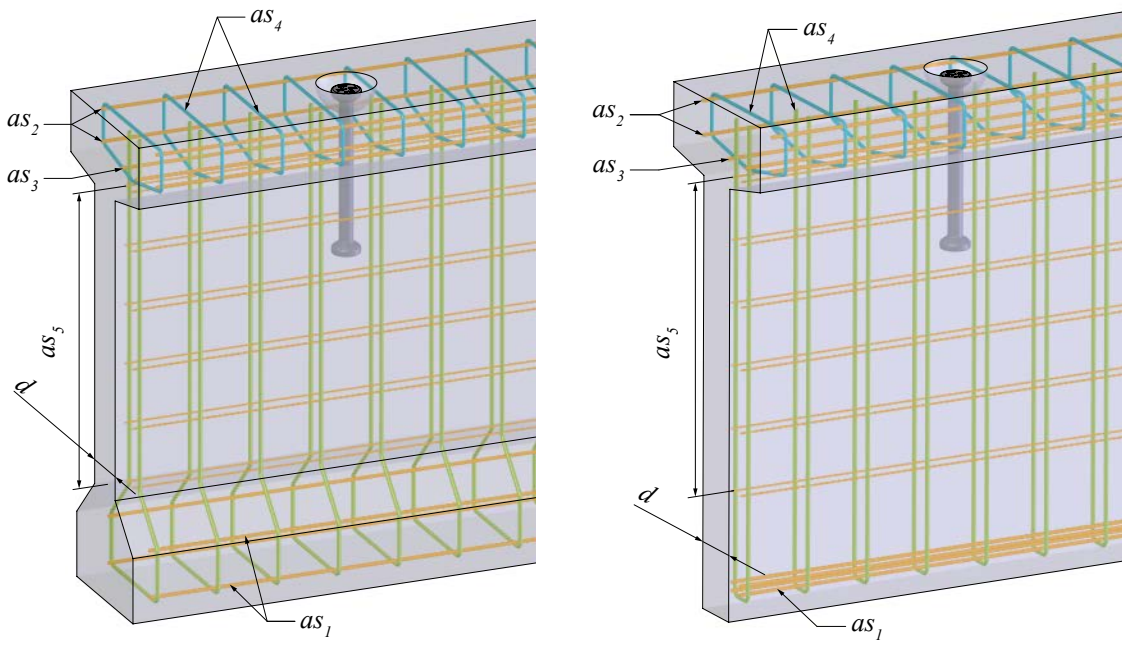
Table 6. KKD Lifting Insert.

			Load class	15.0	20.0
			Color code		
GEOMETRY	DIMENSIONS		ØD [mm]	34	38
			$ØD_1$ [mm]	70	70
			$ØD_2$ [mm]	80	98
			R [mm]	80	80
			s [mm]	15	15
			L [mm]	400	500
			Black/ Galvanized	●	●
			Stainless	●	●
	ELEMENT GEOMETRY		a [mm]	620	775
			b [mm]	1240	1550
			d [mm]	120	120
REINFORCEMENT			Surface reinforcement	15.0	20.0
			as_1 [mm²]	402 alt 2Ø16 or 4Ø12	402 alt 2Ø16 or 4Ø12
			as_2 [mm²]	452 alt 4Ø12	616 alt 4Ø14
			as_3 [mm²]	157 alt 2Ø10	157 alt 2Ø10
			as_4 [mm²/m]	188 alt Ø6/15cm	251 alt Ø8/20cm
			as_5 [mm²/m]	188 alt Ø6/15cm	251 alt Ø8/20cm





RESISTANCES	f_{ck} [MPa]	15.0	20.0
	Resistances [kN] for axial pull (F_a) up to 12.5° with **d ≥ 120 mm**		
	35 MPa	125.6	146.8
	40 MPa	134.3	157.0
	45 MPa	142.5	166.5
	50 MPa	150.0	175.5
	55 MPa	150.0	184.1
	60 MPa	150.0	192.3
	65 MPa	150.0	200.0
	Resistances [kN] for axial pull (F_a) up to 12.5° with **d ≥ 160 mm**		
	35 MPa	135.0	β = max. 12.5°
	40 MPa	144.4	
	45 MPa	150.0	
	50 MPa	150.0	
	55 MPa	150.0	
	60 MPa	150.0	
	65 MPa	150.0	
	Resistances [kN] for diagonal pull (F_s) from 12.5° up to 30° with **d ≥ 120 mm**		
	35 Mpa	105.2	123.0
	40 MPa	112.5	131.5
	45 MPa	119.3	139.4
	50 MPa	125.8	147.0
	55 MPa	131.9	154.1
	60 MPa	137.8	161.0
	65 MPa	143.4	167.6
	Resistances [kN] for diagonal pull (F_s) from 12.5° up to 30° with **d ≥ 160 mm**		
	35 MPa	113.1	β = max. 30°
	40 MPa	120.9	
	45 MPa	128.2	
	50 MPa	135.2	
	55 MPa	141.8	
	60 MPa	148.1	
	65 MPa	150.0	
	Resistances [kN] for diagonal pull (F_s) from 30° up to 45° with **d ≥ 120 mm**		
	35 MPa	107.3	125.4
	40 MPa	114.7	134.1
	45 MPa	121.7	142.2
	50 MPa	128.2	149.9
	55 MPa	134.5	157.2
	60 MPa	140.5	164.2
	65 MPa	146.2	170.9
	Resistances [kN] for diagonal pull (F_s) from 30° up to 45° with **d ≥ 160 mm**		
	35 MPa	115.3	β = max. 45°
	40 MPa	123.3	
	45 MPa	130.7	
	50 MPa	137.8	
	55 MPa	144.5	
	60 MPa	150.0	
	65 MPa	150.0	



Make sure to select inserts that are suitable for the planned load directions. *Figure 15* illustrates the load directions related to these tables.

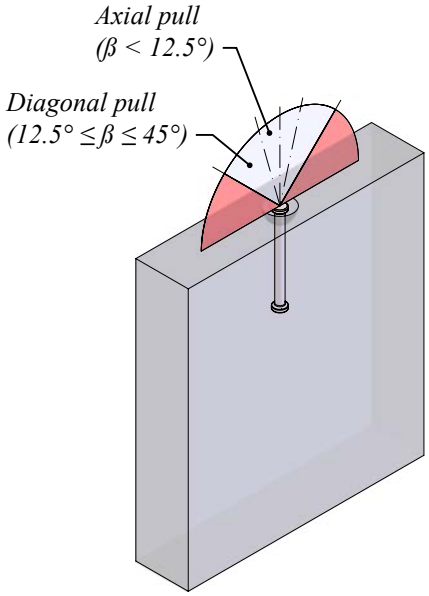


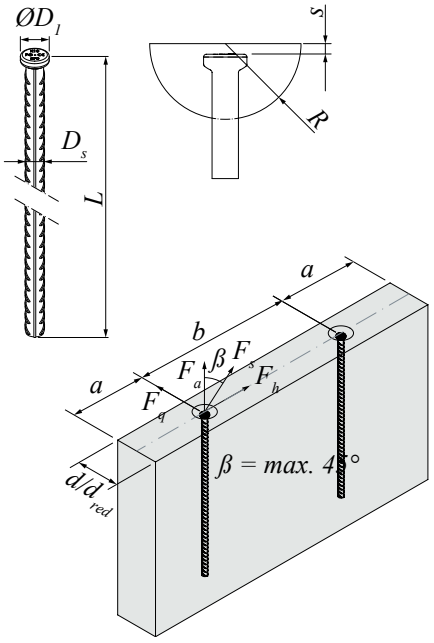
Figure 15. Load directions for KKD Inserts.

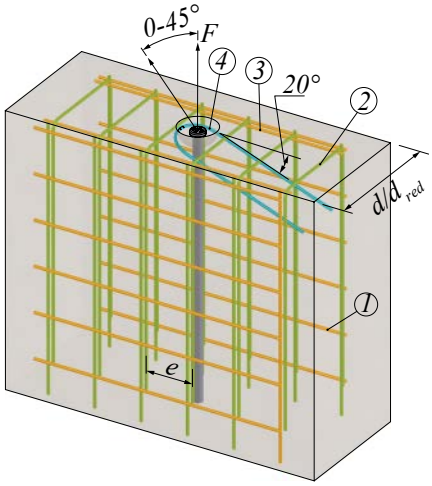
PLEASE NOTE:
KKD must not be used in the case of lateral pull.

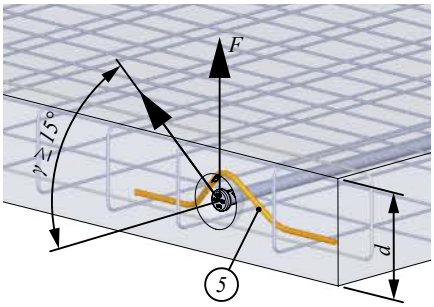
KKR Lifting Insert

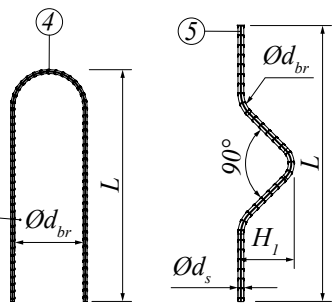
Table 7. KKR Lifting Insert.

	Color code					
	Load class	5.0	7.5	10.0	15.0	20.0
GEOMETRY	Dimensions					
	$ØD_s$ [mm]	20	25	28	36	40
	$ØD_1$ [mm]	36	47	47	70	70
	R [mm]	47	59	59	80	80
	s [mm]	15	15	15	15	15
	L [mm]	580	750	870	1080	1640
	Black/Galvanized	●	●	●	●	●
	Stainless	●	●	●	●	●
	Element geometry (d_{red} is for β from 0° up to 30°)					
	a [mm]	**380**	**465**	**525**	**620**	**775**
	b [mm]	**760**	**930**	**1050**	**1240**	**1550**
	d [mm]	**180**	**240**	**260**	**280**	**300**
	d_{red} [mm]	**120**	**150**	**150**	**180**	**180**
RESISTANCES	Resistances R_{zul} [kN] at wall thickness "d_{red}" for axial (F_a) and diagonal (F_s) pull up to 30° at f_{cc} of					
	15 MPa	50.0	75.0	100.0	150.0	164.7
	Resistances R_{zul} [kN] at wall thickness "d" for axial pull (F_a) up to 12.5° at f_{cc} of					
	15 MPa	50.0	75.0	100.0	150.0	164.7
	20 MPa					190.1
	Resistances R_{zul} [kN] at wall thickness "d" for diagonal pull (F_s) from 12.5° up to 45° at f_{cc} of					
	15 MPa	42.7	75.0	96,2	119.8	164.7
	20 MPa	50.0		100.0	138.2	190.1
	25 MPa				150.0	
	Resistances R_{zul} [kN] at wall thickness "d" for lateral pull (F_q) for 90° at f_{cc} of					
	15 MPa	22.9	39.7	48.9	60.9	72.3
	20 MPa	26.4	45.8	56.4	70.4	83.5
	25 MPa	29.5	51.3	63.2	78.8	93.4
REINFORCEMENT	Surface reinforcement					
	① [mm²/m]	188	188	188	188	257
	② ($Ød s \times L/e$) [mm/cm]	6Ø10 ×650/10	6Ø10 ×800/10	6Ø12 ×800/10	6Ø12 ×800/10	6Ø12 ×1000/10
	③ ($Ød s$) [mm]	2Ø14	2Ø14	2Ø14	2Ø14	2Ø16
	Diagonal reinforcement for diagonal pull from 12.5° up to 30°					
	④ ($Ød s \times L$) [mm]	Ø10×420	Ø14×470	Ø14×620	Ø20×650	Ø20×870
	Diagonal reinforcement for diagonal pull from 12.5° up to 45°					
	④ ($Ød s \times L$) [mm]	Ø12×420	Ø16×580	Ø16×770	Ø25×740	Ø25×980
	Lateral reinforcement for lateral pull for 90° ($\gamma \geq 15°$)					
	⑤ ($Ød s \times L$) [mm]	Ø20×1000	Ø20×1200	Ø25×1200	Ø25×1400	Ø28×1400
	$Ød_{br}$ [mm]	140	140	175	175	196
	H_1 [mm]	120	160	180	200	220









Note: Adjust to the thickness of the element while considering minimum mandrel diameter of the rebar according to relevant standards.

Make sure to select inserts that are suitable for the planned load directions. *Figure 16* illustrates the load directions related to these tables.

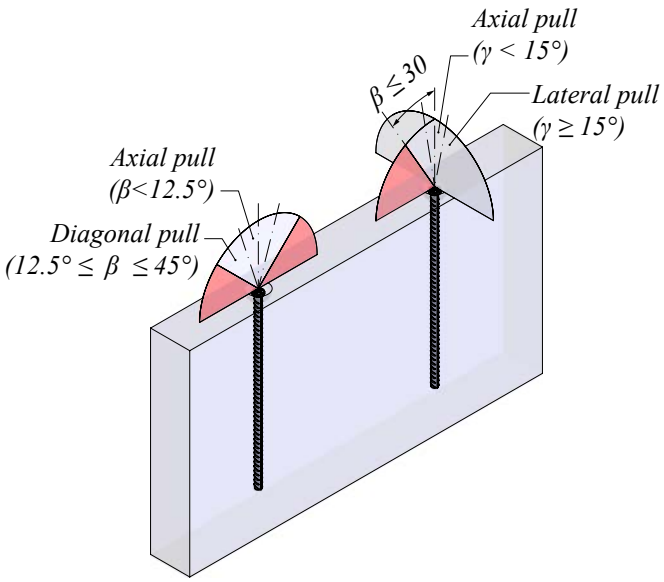
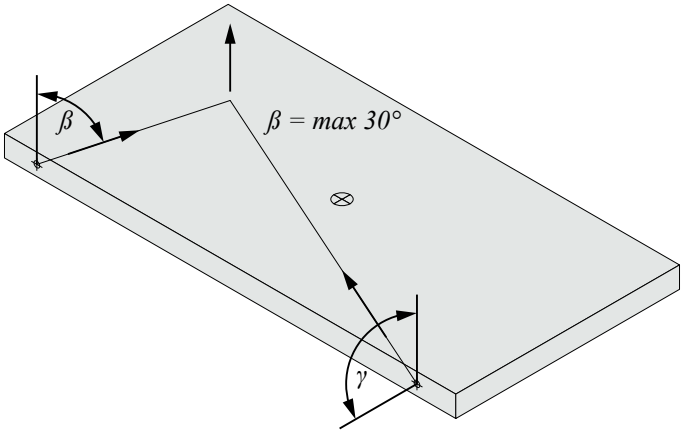


Figure 16. Load directions for KKR Inserts.

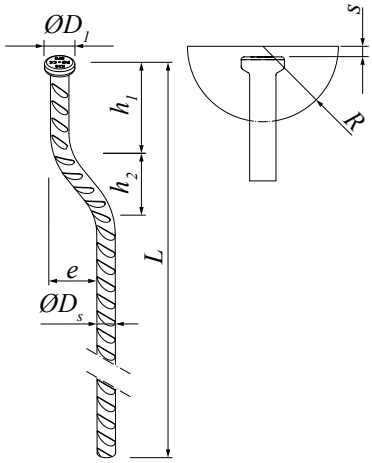
PLEASE NOTE:
During lateral pull, resulting from tilting up, β angle is allowed up to only 30°.

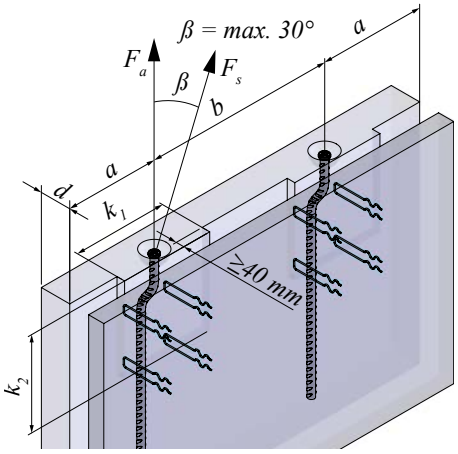


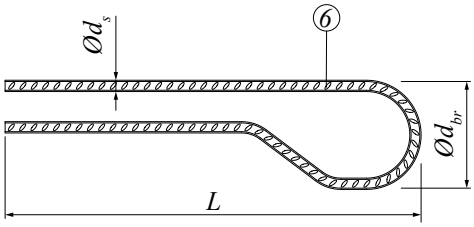
KKR SW Lifting Insert

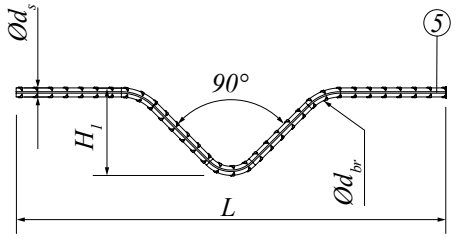
Table 8. KKR SW Lifting Insert.

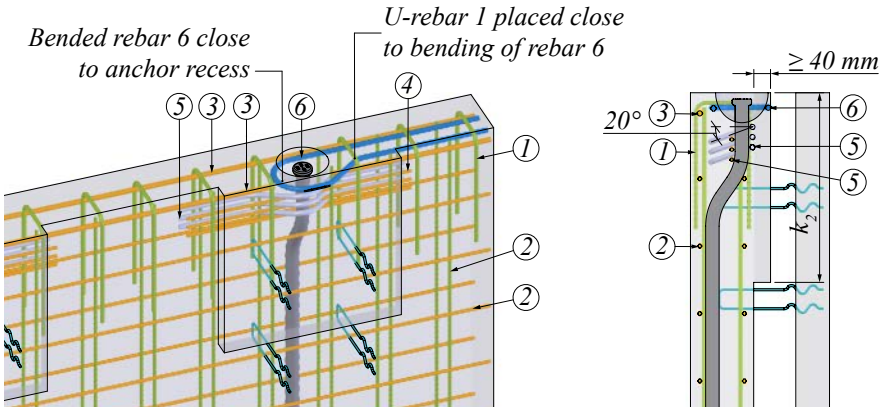
	Color code				
	Load class	7.5	10.0	15.0	20.0
GEOMETRY	**Dimensions**				
	ØD [mm]	25	28	36	40
	$ØD_1$ [mm]	47	47	70	70
	e [mm]	70	70	70	90
	R [mm]	59	59	80	80
	s [mm]	15	15	15	15
	L [mm]	1130	1285	1535	1620
	h_1 [mm]	73	110	123	150
	h_2 [mm]	187	182	195	242
	Black/Galvanized	●	●	●	●
	Stainless	●	●	●	●
	Element geometry				
	a [mm]	900			
	b [mm]	1800			
	d [mm]	100	140	160	180
	k_1 [mm]	600			
	k_2 [mm]	500			
RESISTANCES	Resistances R_{zul} [kN] for **axial** and **diagonal pull** up to 30° at f_{cc} of				
	15 MPa	75	91.7	139.7	164.7
	20 MPa	75	100.0	150.0	190.1
	25 MPa	75	100.0	150.0	200.0
REINFORCEMENT	**Surface reinforcement**				
	1 [mm^2/m]	188	188	188	188
	2 [mm/cm]	355	188	355	355
	3 [n**Ød**]	2Ø12	2Ø12	2Ø12	2Ø12
	Lateral reinforcement for axial and diagonal pull up to 30°				
	4 (n***Ød*** × ***L***) [mm]	2Ø12 ×900	3Ø12 ×900	4Ø12 ×900	5Ø12 ×900
	5 (n***Ød*** × ***L***) [mm]	2Ø12 ×900	3Ø12 ×900	4Ø12 ×900	5Ø12 ×900
	h_1 [mm]	105	105	105	105
	Diagonal reinforcement for **diagonal pull** up to 30°				
	6 ($Ød_{br}$-***Ød*** × ***L***) [mm]	150-Ø14 ×620	150-Ø14 ×620	190-Ø16 ×870	190-Ø16 ×870











Make sure to select inserts that are suitable for the planned load directions. *Figure 17* illustrates the load directions related to these tables.

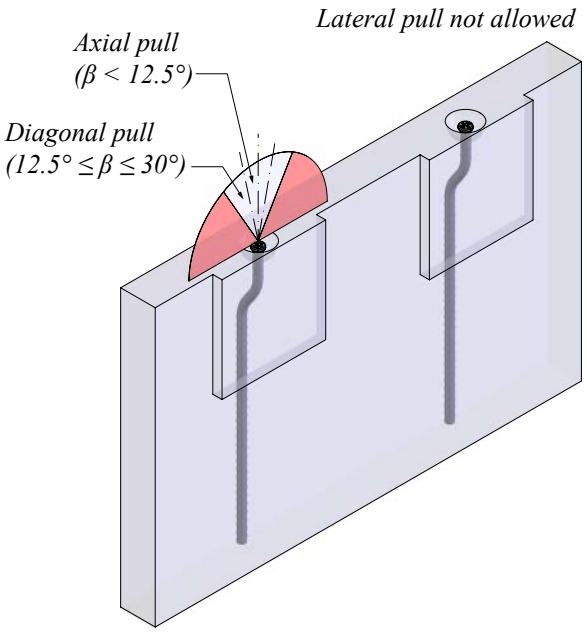


Figure 17. Load directions for KKR SW Inserts.

PLEASE NOTE:
During lateral pull, β angle is allowed up to only 30°.

KK Short Lifting Insert

Table 9. KK Short Lifting Insert.

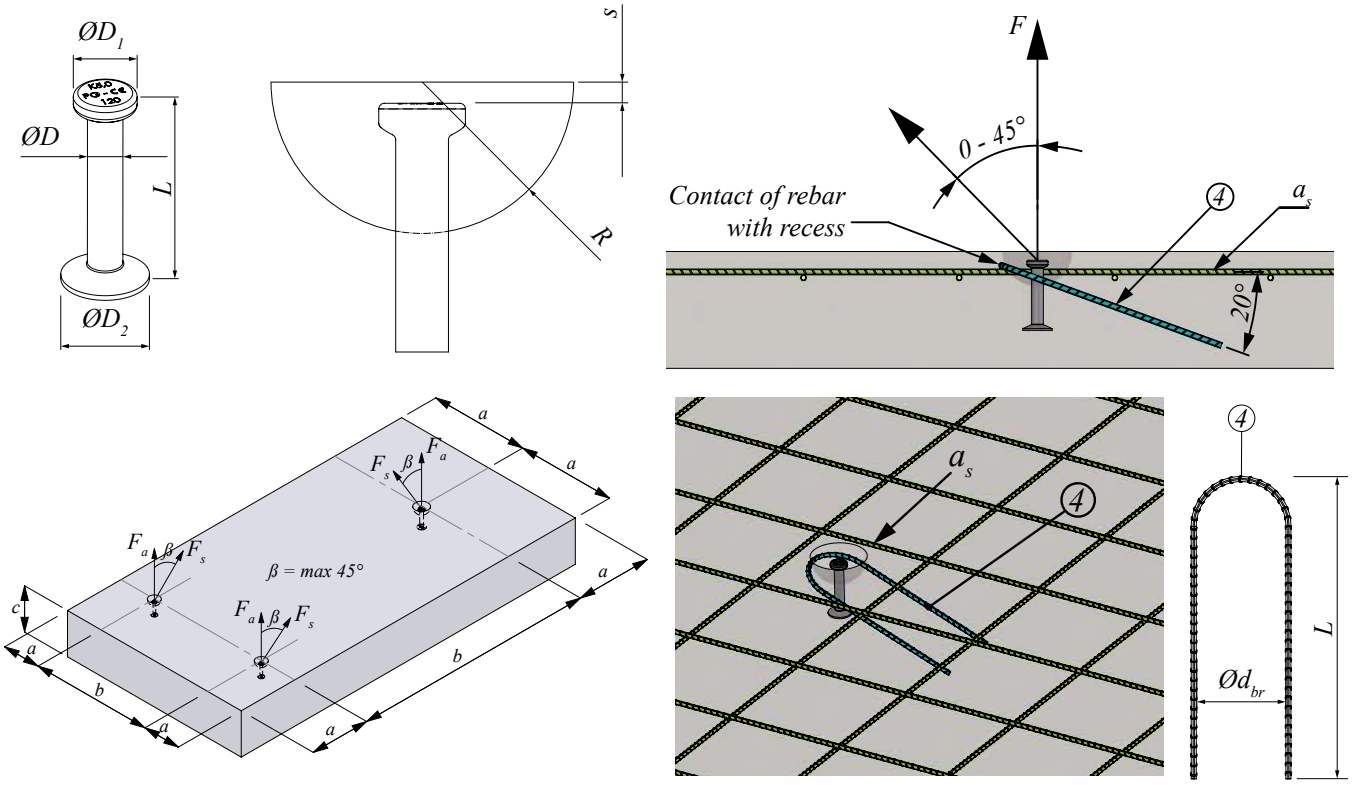
	Color code								
	Load class	1.3	2.5	5.0	7.5	10.0	15.0	20.0	32.0
GEOMETRY	Dimensions								
	ØD [mm]	10	14	20	24	28	34	38	50
	$ØD_1$ [mm]	19	26	36	47	47	70	70	88
	$ØD_2$ [mm]	25	35	50	60	70	80	98	135
	R [mm]	30	37	47	59	59	80	80	107
	s [mm]	10	11	15	15	15	15	15	23
	L [mm]	*50*	65	*75*	*85*	120*	*165*	*165*	*250*
		55	*75*	*90*	*100*	*150**	*200*	*200*	*280*
		65	*85*	95	120*	170*	250	340	*320*
		85	*90*	*110*	*140**	200*	300	-	*500*
		-	*100*	120*	160*	250*	-	-	-
		-	120	*135**	*170**	-	-	-	-
		-	*140*	180*	200*	-	-	-	-
	Black/Galvanized	●	●	●	●	●	●	●	●
	Stainless	●	●	●	●	●	●	●	●
	Element geometry								
	Length [mm]	*50*	65	*75*	*85*	120	*165*	*165*	*250*
	a [mm]	*90*	110	*135*	*150*	200	*265*	*265*	*350*
	b [mm]	*180*	220	*270*	*300*	400	*530*	*530*	*700*
	c [mm]	*85*	105	*120*	*130*	165	*205*	*205*	*295*
	Length [mm]	*55*	*75*	*90*	*100*	*150*	*200*	*200*	*280*
	a [mm]	*95*	*125*	*150*	*170*	*245*	*320*	*320*	*445*
	b [mm]	*190*	*250*	*300*	*340*	*490*	*640*	*640*	*890*
	c [mm]	*90*	*115*	*135*	*145*	*195*	*245*	*245*	*325*
	Length [mm]	65	*85*	*95*	120	*170*	250	340	*320*
	a [mm]	110	*140*	*165*	200	*275*	350	535	*505*
	b [mm]	220	*280*	*330*	400	*550*	700	1070	*1010*
	c [mm]	100	*125*	*140*	165	*215*	295	385	*365*
	Length [mm]	85	*90*	*110*	*140*	200	300	-	*500*
	a [mm]	140	*150*	*185*	*225*	320	465	-	*775*
	b [mm]	280	*300*	*370*	*450*	640	930	-	*1550*
	c [mm]	120	*135*	*155*	*185*	245	345	-	*545*
	Length [mm]	-	*100*	120	*160*	250	-	-	-
	a [mm]	-	*165*	200	*260*	350	-	-	-
	b [mm]	-	*330*	400	*520*	700	-	-	-
	c [mm]	-	*140*	165	*205*	295	-	-	-
	Length [mm]	-	120	*135*	*170*	-	-	-	-
	a [mm]	-	195	*225*	*275*	-	-	-	-
	b [mm]	-	390	*450*	*550*	-	-	-	-
	c [mm]	-	160	*180*	*215*	-	-	-	-
	Length [mm]	-	*140*	*180*	200	-	-	-	-
	a [mm]	-	*225*	*290*	320	-	-	-	-
	b [mm]	-	*450*	*580*	640	-	-	-	-
	c [mm]	-	*180*	*225*	245	-	-	-	-

RESISTANCES

Resistances R_{zul} [kN] for axial and diagonal pull							
Load class	Length [mm]	Resistances R_{zul} [kN] for axial and diagonal pull up to 30° at f_{cc} of			Resistances R_{zul} [kN] for diagonal pull from 30° up to 45° at f_{cc} of		
		15 MPa	20 MPa	25 MPa	15 MPa	20 MPa	25 MPa
1.3	*50*	*10.6*	*12.2*	*13.0*	*9.5*	*11.0*	*12.3*
	55	*12.0*	*13.0*	*13.0*	*10.8*	*12.5*	*13.0*
	65	13.0	13.0	13.0	13.0	13.0	13.0
	85	13.0	13.0	13.0	13.0	13.0	13.0
2.5	65	15.0	17.3	19.3	13.5	15.6	17.4
	75	*18.2*	*21.0*	*23.4*	*16.3*	*18.9*	*21.1*
	85	*21.5*	*24.9*	*25.0*	*19.4*	*22.4*	*25.0*
	90	*23.3*	*25.0*	*25.0*	*21.0*	*24.2*	*25.0*
	100	*25.0*	*25.0*	*25.0*	*24.3*	*25.0*	*25.0*
	120	25.0	25.0	25.0	25.0	25.0	25.0
	140	*25.0*	*25.0*	*25.0*	*25.0*	*25.0*	*25.0*
5.0	*75*	*19.5*	*22.5*	*25.2*	*17.5*	*20.3*	*22.6*
	90	*24.7*	*28.6*	*31.9*	*22.3*	*25.7*	*28.7*
	95	*26.6*	*30.7*	*34.3*	*23.9*	*27.6*	*30.9*
	110	*32.4*	*37.4*	*41.8*	*29.1*	*33.6*	*37.6*
	120	36.4	42.1	47.0	32.8	37.8	42.3
	135	*42.8*	*49.4*	*50.0*	*38.5*	*44.5*	*49.7*
	180	50.0	50.0	50.0	50.0	50.0	50.0
7.5	*85*	*22.8*	*26.3*	*29.4*	*20.5*	*23.7*	*26.4*
	100	*28.3*	*32.6*	*36.5*	*25.4*	*29.4*	*32.8*
	120	36.2	41.8	46.7	32.6	37.6	42.1
	140	*44.8*	*51.7*	*57.8*	*40.3*	*46.5*	*52.0*
	160	*53.9*	*62.3*	*69.6*	*48.5*	*56.0*	*62.7*
	170	*58.7*	*67.8*	*75.0*	*52.8*	*61.0*	*68.2*
	200	73.9	75.0	75.0	66.5	75.0	75.0
10.0	120	36.0	41.6	46.5	32.4	37.4	41.8
	150	*49.1*	*56.6*	*63.3*	*44.1*	*51.0*	*57.0*
	170	*58.5*	*67.5*	*75.5*	*52.6*	*60.8*	*67.9*
	200	73.6	85.0	95.0	66.2	76.5	85.5
	250	100.0	100.0	100.0	91.1	100.0	100.0
15.0	*165*	*55.8*	*64.5*	*72.1*	*50.2*	*58.0*	*64.9*
	200	*73.3*	*84.7*	*94.7*	*66.0*	*76.2*	*85.2*
	250	101.0	116.6	130.3	90.9	104.9	117.3
	300	131.4	150.0	150.0	118.2	136.5	150.0
20.0	*165*	*55.6*	*64.2*	*71.8*	*50.0*	*57.8*	*64.6*
	200	*73.1*	*84.4*	*94.3*	*65.8*	*75.9*	*84.9*
	340	157.2	181.6	200.0	141.5	163.4	182.7
32.0	*250*	*103.6*	*119.6*	*133.7*	*93.2*	*107.7*	*120.4*
	280	*121.7*	*140.5*	*157.1*	*109.5*	*126.4*	*141.4*
	320	*147.2*	*170.0*	*190.1*	*132.5*	*153.0*	*171.1*
	500	*280.6*	*320.0*	*320.0*	*252.6*	*291.6*	*320.0*

Note: *Gray italics* marks lengths of KK Inserts whose delivery may be longer than delivery of the standard items.

REINFORCEMENT	Load class	1.3	2.5	5.0	7.5	10.0	15.0	20.0	32.0
	Surface reinforcement								
	a_s [mm²/m]	188	188	188	188	188	524	524	524
	Diagonal reinforcement for **diagonal pull** from 12.5° up to 30°								
	④ (**Ø*ds*×*L***) [mm]	Ø6×200	Ø8×300	Ø10×420	Ø14×470	Ø14×620	Ø20×650	Ø20×870	Ø25×1100
	Diagonal reinforcement for diagonal pull from 12.5° up to 45°								
	④ (**Ø*ds*×*L***) [mm]	Ø8×200	Ø10×300	Ø12×420	Ø16×580	Ø16×770	Ø25×740	Ø25×980	Ø28×1400



Ød$_{br}$ dimension to be taken from Table 4.

Make sure to select inserts that are suitable for the planned load directions. *Figure 18* illustrates the load directions related to these tables.

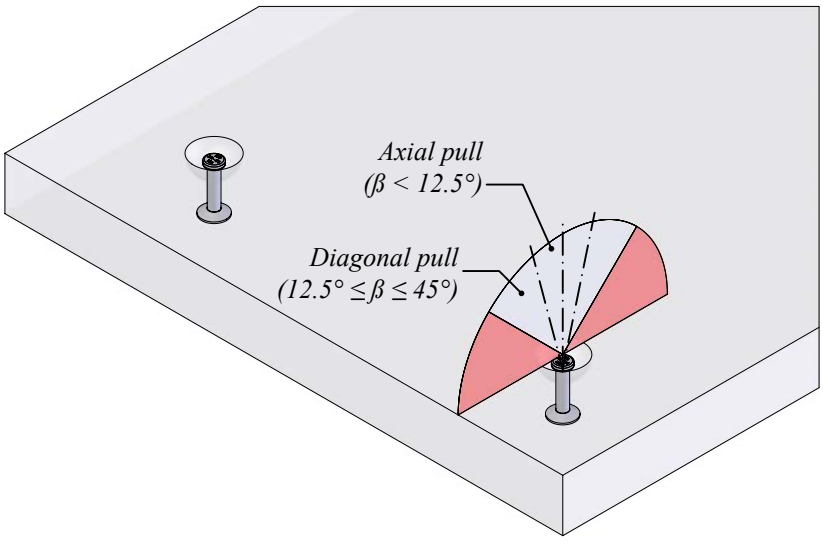


Figure 18. Load directions for KK Short Inserts.

2.2 KKL Lifting Keys

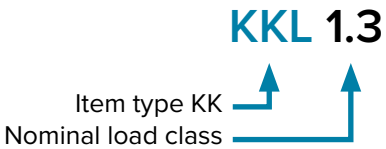
DESIGNERS	PRECAST PLANTS	USERS

KKL Lifting Keys are used to attach hoisting hardware to the KK Lifting Insert, which is cast into the concrete element. KKL Lifting Keys can be used with all KK Lifting System´s insert types. Every KKL Lifting Key has a hole for KK SP Safety Pin, whose dimensions are defined in Chapter 2.3 – *Table 18*.

Before use, select the appropriate KKL Lifting Key that fits your application.

2.2.1 Material options

Peikko KKL Lifting Keys are made of alloy steel and then electro-galvanized. Ordering example for Peikko KKL Lifting Keys is presented in figure below.



2.2.2 Dimension and Resistance R_{zul}

Table 10. KKL Lifting key.

	Load class	1.3	2.5	5.0	7.5 – 10.0	15.0 – 20.0	32.0
	Item No	KKL 1.3	KKL 2.5	KKL 5	KKL 10	KKL 20	KKL 32
GEOMETRY	Dimensions						
	a [mm]	47	58	68	85	110	165
	b [mm]	75	91	118	160	190	272
	c [mm]	71	86	88	115	134	189
	d [mm]	12	14	16	25	40	40
	e [mm]	20	25	37	50	74	100
	f [mm]	33	41	57	73	109	153
	g [mm]	160	198	240	338	435	573
	$Ød_{sp}$ [mm]	3	4	5	7	7	8
RESISTANCE	Resistance R_{zul} [kN] for axial, diagonal and lateral pull up to 90°						
	-	13.0	25.0	50.0	100.0	200.0	320.0

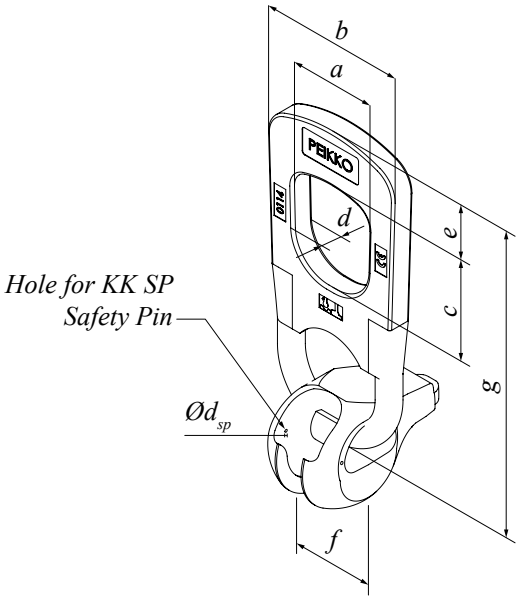


Figure 19. KKL Lifting Key.

2.2.3 Using KKL Lifting Keys

When KK Lifting Systems are used, this manual, including the instructions for safe use, must be available at all times. Before using any of these Peikko products on building sites, the contractor must ensure that the instructions are available and have been read, understood, and followed. Misuse, misapplication, or lack of proper supervision and/or inspection can result in serious accidents.

The safe use of any lifting systems requires the KKL Lifting Key and the insert to fit properly together. The Peikko KK Lifting System has a color code on the KK FR recess items and a load class marking on the anchor head that defines which KKL Lifting Key fits which insert. The permitted load directions must be followed. To secure position of the KKL Lifting Key, the safety pin KK SP has to be used as shown in *Figures in* Installing part of this Technical Manual.

Prior to use, check whether the KKL Lifting Key fits the installed insert. Always ensure that the correct KKL Lifting Key is used with the correct KK Lifting Insert and load class as shown in *Table 1* and *Figure 3*.

For KKL Lifting Keys, load directions between 0° and 90° are permitted. *Figure 20* illustrates the permitted load directions of the KKL Lifting Keys.

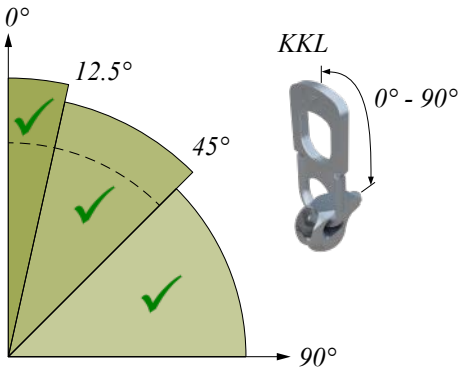
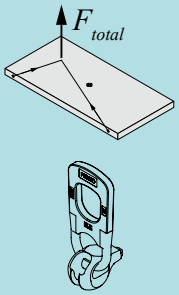
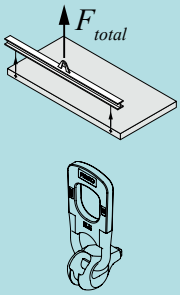
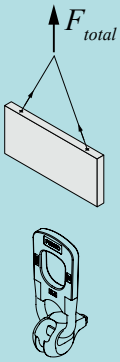
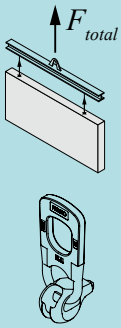
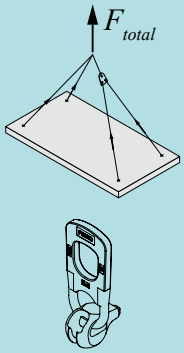


Figure 20. Permitted load directions.

The safe use of any lifting system requires the KKL Lifting Key and the insert to fit properly together. All inserts must fulfill the above mentioned requirement and admissible load directions must be considered prior to use as shown in *Table 11*.

Table 11. Combination of KK Lifting inserts with KKL Lifting Keys.

						
KK		✓	✓	✓	✓	✓
KKR		✓	✓	✓	✓	✗
KKD		✗	✗	✓	✓	✗
KK SW		✗	✓	✗	✓	✗
KKR SW		✗	✗	✓	✓	✗
KK Short		✗	✗	✗	✗	✓

The recess items, such as KK FR or KK FM, create a recess that corresponds very precisely to the geometry of the KKL Lifting Key. Do not break the concrete around the KK Lifting Insert and never mechanically rework the items (see *Figure 21*).

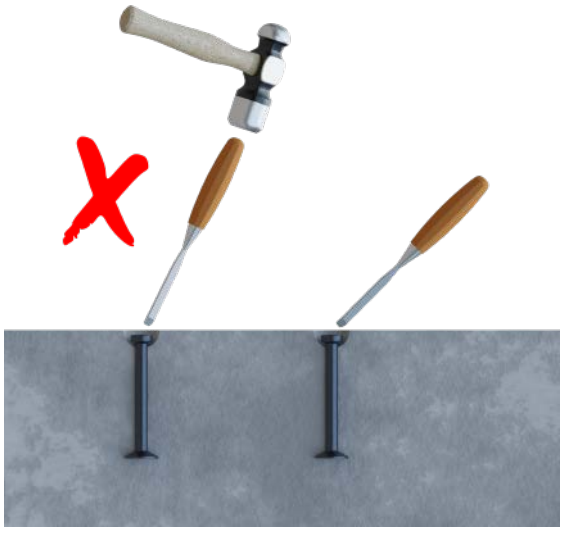


Figure 21. Rework at recess and KK Lifting Insert.

When connecting a KKL Lifting Key to a KK Lifting Insert, ensure that the forged head of the KK Lifting Insert is placed correctly. *Figure 22* shows this connection detail for safety purposes.

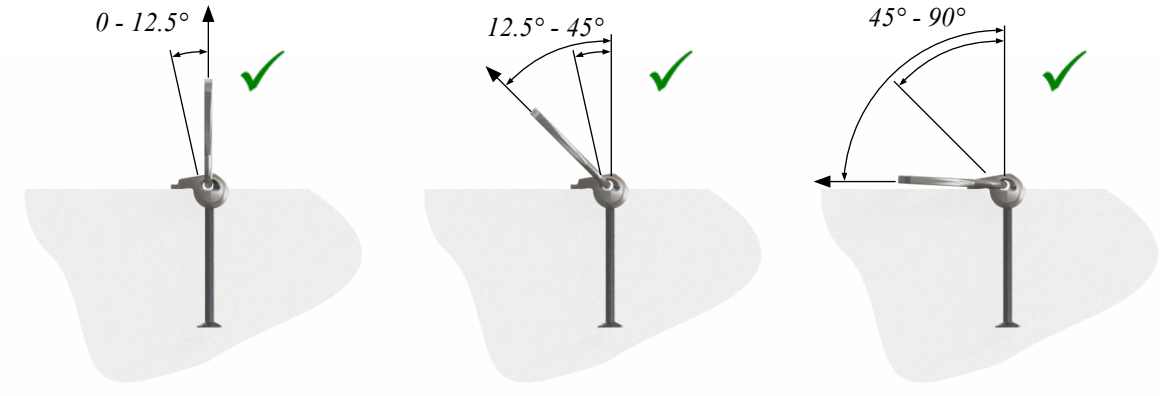


Figure 22. Correct hoisting direction of KKL Lifting Key.

Connect the KKL Lifting Key to the KK Lifting Insert by hanging it above the recess with the leg aligned to the lifting handle. Press the lifting key down to the recess and push and rotate the leg towards the element surface until the leg touches the surface (see *Figure 23*).

The leg of the KKL Lifting Key must always be in contact with the concrete surface. During lifting, the recess supports the lifting key by taking diagonal or shear loads via contact pressure. This can only happen when the recess is used according to the following instructions. The KKL Lifting Key can be used for load directions according to *Figure 23*.

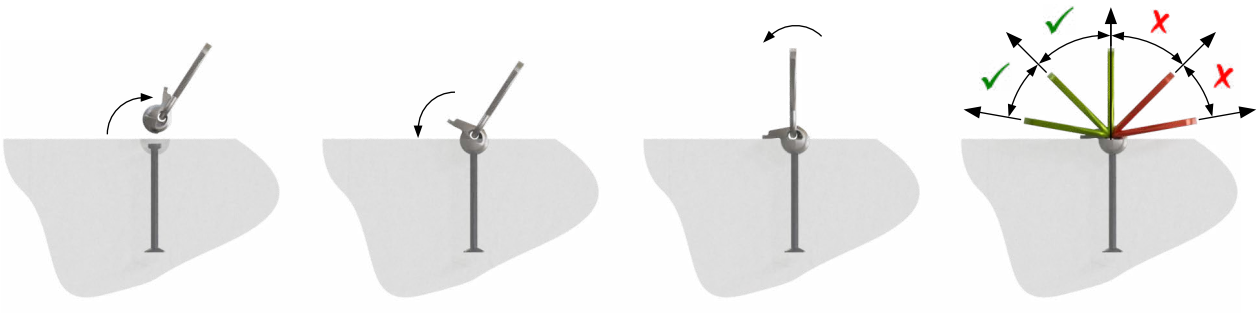


Figure 23. Connection detail of KKL Lifting Key and KK Lifting Insert without safety pin.

The KKL Lifting Clutch does not need any type of spacer under the leg. Never put anything below the leg of the KKL Lifting Key. For fixation of the position of the clutch, Safety pin KK SP can be used as shown in *Figure 24*. Safety pin is used against self-release of the KKL Lifting Clutch from the concrete element during manipulation at building site.

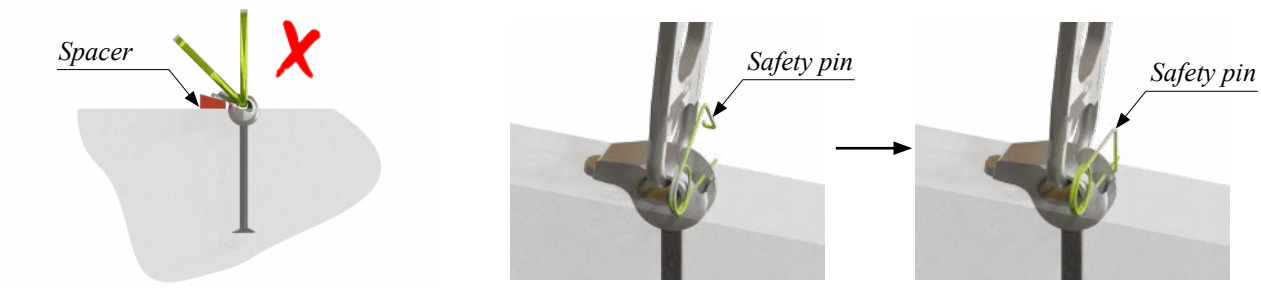


Figure 24. Support detail of KKL Lifting Key leg and safety pin KK SP.

2.3 KK Lifting Accessories

DESIGNERS	PRECAST PLANTS	USERS

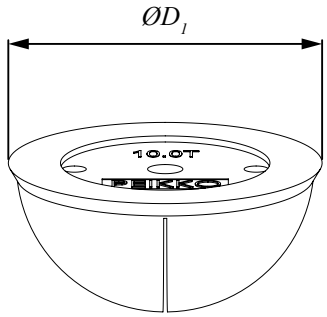
The KK Lifting System has a range of KK Lifting Accessories for installation. KK Lifting Accessories are rotation symmetric and easy to install.

Installation Accessories are efficient aids for users who are placing lifting systems in formwork. Installation Accessories can be screwed, nailed, or fixed with melt adhesives depending on the individual application. Peikko recommends greasing the accessories to prevent concrete pollution from limiting their usability.

KK FR recess items are made of rubber and fixed into the mold using either KK FS Fixing Items or KK FW Fixing Items. They are compatible with all KK Lifting Inserts and KKL Lifting Keys. For KK FR, a color code system shows the load class. There are eight sizes available with different load classes.

Table 12. KK FR dimensions.

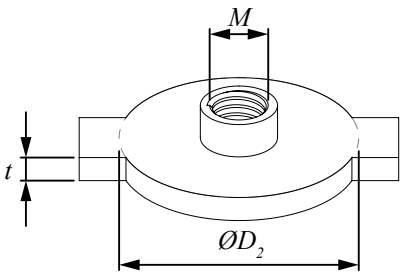
Item	$ØD_1$ [mm]	Color
KK FR1.3	60	Blue
KK FR2.5	74	Yellow
KK FR5.0	94	Blue
KK FR7.5	118	Red
KK FR10	118	Yellow
KK FR15	160	Gray
KK FR20	160	Black
KK FR32	214	Gray



KK FW Fixing Items are inserted into KK FR recess items and then fixed with a metric threaded bar or a screw on the formwork. The formwork must have a drilled hole for the bar to fit through. KK FW Fixing Items are compatible with all of the KK Lifting Inserts and KKL Lifting Keys. The bars and screws can be removed manually.

Table 13. KK FW dimensions.

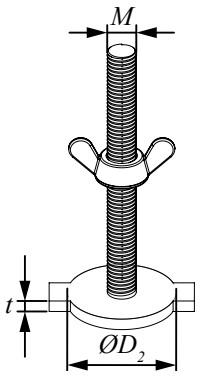
Item	M	t	$ØD_2$	Suitable for use with load class
	[mm]			
KK FW1.3	8	3	19	1.3
KK FW2.5	10	4	26	2.5
KK FW5	10	4	36	5.0
KK FW10	12	4	46	7.5, 10.0
KK FW20	12	4	70	15.0, 20.0
KK FW32	16	6	88	32.0



KK FS Fixing Screws are inserted into KK FR Recess Items and then fixed to the formwork. The formwork must have a drilled hole that the bar fits through. KK FS Fixing Screws are compatible with all of the KK Lifting Inserts and KKL Lifting Keys. The screws can be removed manually.

Table 14. KK FS dimensions.

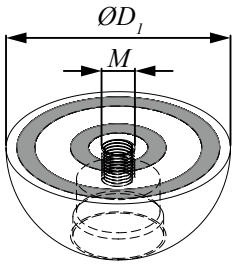
Item	M	t	$ØD_2$	Suitable for use with load class
	[mm]			
KK FS1.3	8	3	19	1.3
KK FS2.5	10	4	26	2.5
KK FS5	10	4	36	5.0
KK FS10	12	4	46	7.5, 10.0
KK FS20	12	4	70	15.0, 20.0
KK FS32	16	6	88	32.0



KK FM magnetic recess items are placed on the steel formwork. No drilling or other formwork treatment is required. A KK FG grommet should be used to fix the KK Lifting Insert in the recess. KK FM magnetic recess items are compatible with all KK Lifting Inserts and KKL Lifting Keys. The recess items can be removed manually.

Table 15. KK FM dimensions.

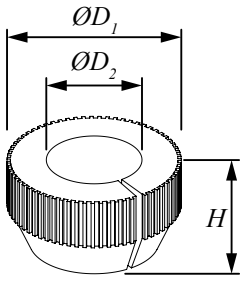
Item	$ØD_1$	M	Suitable for use with load class
	[mm]		
KK FM1.3	60	8	1.3
KK FM2.5	74	12	2.5
KK FM5	94	12	5.0
KK FM10	118	12	7.5, 10.0



KK FG Grommets are inserted into KK FM recess items and then fixed onto the formwork. KK FG Grommets are fixed with a pressure contact of lamellas against the KK FM opening. KK FG Grommets are compatible with all of the KK Lifting Inserts and KKL Lifting Keys and can be removed manually.

Table 16. KK FG dimensions.

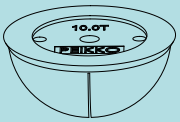
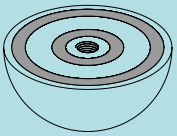
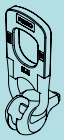
Item	$ØD_1$	$ØD_2$	H	Suitable for use with load class
	[mm]			
KK FG1.3	21	11	11	1.3
KK FG2.5	30.5	14.5	12	2.5
KK FG5	38.5	21	14	5.0
KK FG7.5	49	24.5	27.5	7.5
KK FG10	49	28	27.5	10.0



Before selecting a Lifting System, the user must know which system parts fit together.

Table 17 show the combinations of KK Lifting Inserts, KKL Lifting Keys, and KK Lifting Accessories.

Table 17. Combination of KKL Lifting Keys and KK Lifting accessories.

		KK FR	KK FM
			
KKL		✓	✓
KK FG		✗	✓
KK FW		✓	✗
KK FS		✓	✗

2.4 KK Safety Accessories

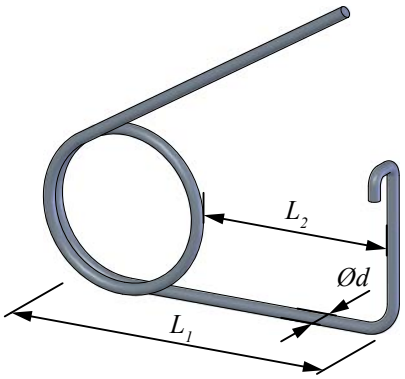
DESIGNERS	PRECAST PLANTS	USERS

KK SP Safety Pins are used to secure position of the KKL Lifting Key in the recess. Safety Pin must be inserted into the hole in the KKL Lifting Clutch head, that both ends of the pin will be above concrete surface around KK FR or KK FM recess.

Safety Pins items are compatible with all KKL Lifting Keys. Peikko recommends using KK SP Safety Pins at applications where a self-release of the KKL Lifting Key is possible such as element turning. Pins must be ordered separately, and they are not a part of standard delivery.

Table 18. KK SP dimensions.

Item	ØD	L_1	L_2	Suitable for use with
	[mm]			
KK SP2.5	2.03	76	42	KKL 1.3
				KKL 2.5
KK SP10	4.47	165	95	KKL 5
				KKL 10
KK SP32	4.88	206	127	KKL 20
				KKL 32



Selecting KK Lifting System

DESIGNERS	PRECAST PLANTS	USERS

Prior to use of KK Lifting Systems components the individual selection of the correct product for the related lifting case must be done. The selection criteria are prescribed in this Technical Manual and the design criteria and examples are prescribed in our Manual for General Lifting Information.

Calculation examples which show the correct design for the different systems are given in the Manual for General Lifting Information.

The overview below (*Figure 25*) gives a quick orientation which Lifting Insert type should be used in which element type.

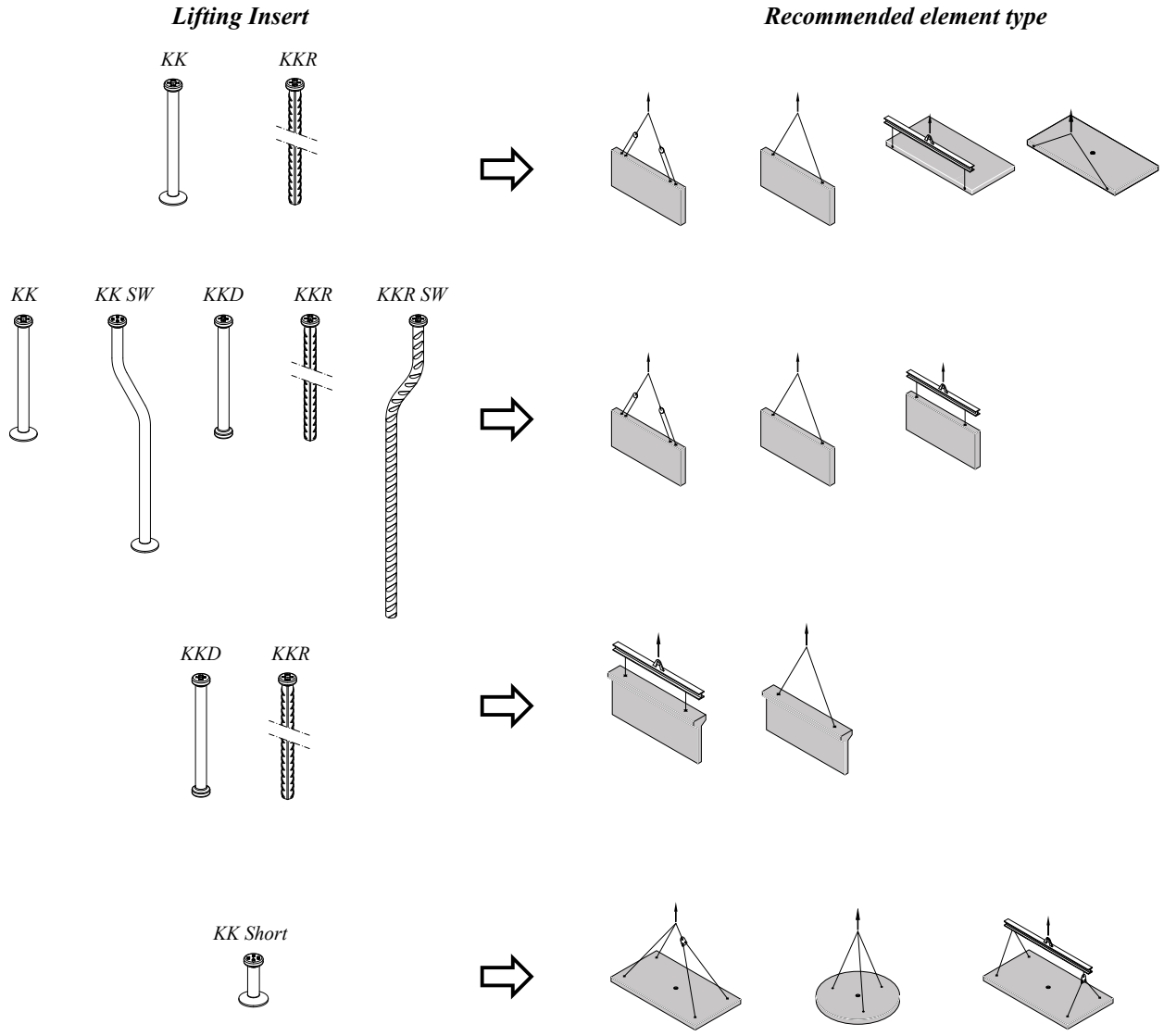
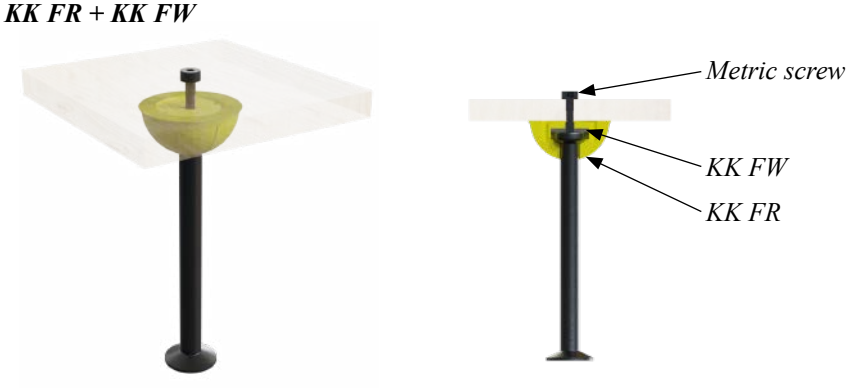


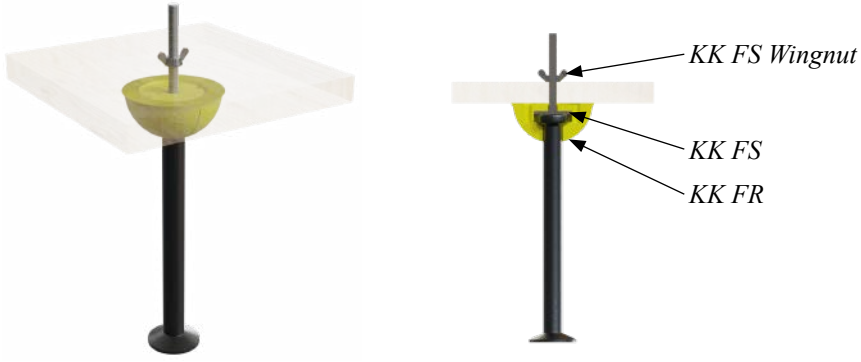
Figure 25. Recommended element types.

The combinations of the KK systems' accessories ease the use and the application. The individual configurations and the installation's design are shown in the following pictures.

KK Insert + KK FR + KK FW



KK Insert + KK FR + KK FS (KK FS Wingnut)



KK Insert + KK FM + KK FG

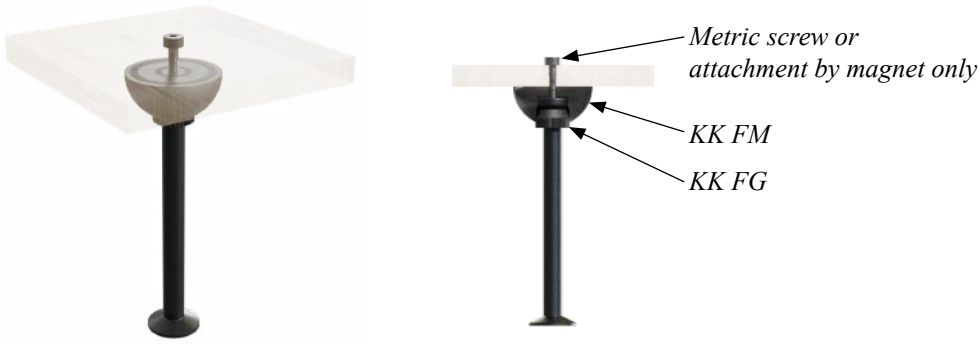


Figure 26. Combinations of the KK Lifting System items.

Annex A – ProdLib and Element Turning

DESIGNERS	PRECAST PLANTS	USERS

For the design work, Peikko offers ProdLib add-ons for KK Lifting Systems with products to be placed into your design. Peikko´s library of design components can be installed as add-on to Revit and AutoCAD. As an alternative, the library can be used as an online version.

The product information has been compiled into one organized product library that is kept automatically up to date. Peikko product library is available in English.

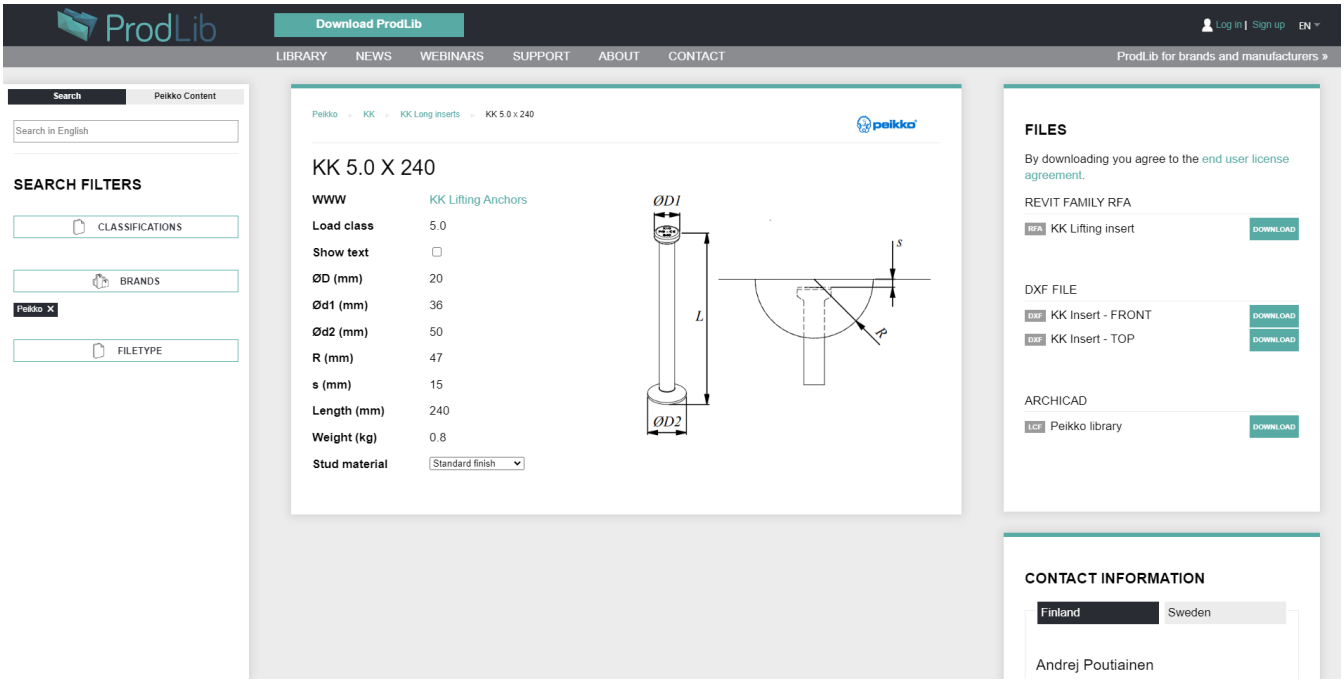


Figure 27. Prodlib with Peikko products.

Applications for Element turning are specified in Peikko Technical Manual for Element Turning.

Figure 28. Element Turning manual.

Installing KK Lifting System

DESIGNERS | PRECAST PLANTS | USERS

The KK Lifting System components are installed either on the construction site or in a precast plant. KK Accessories should be used to facilitate the installation process. Lubricating the KK FR outside and inside prevents concrete or dust pollution from affecting the recess item.

Ensure that the surroundings and environmental conditions are dry and clean for installation. Environmental pollution of all kinds should be avoided or minimized at all times. For easier removal, all installation items, such as KK FR or KK FM, should be lubricated.

The following must be taken into account prior to installing any type of lifting system:

- All workers fulfill the requirements of the documentation and are familiar with it
- The limitations of applications and restrictions are known
- The design assumptions are defined and known

During installation of any type of lifting system, the installation tolerances specified by the manufacturer must be complied with. The installation tolerances for vertical and horizontal positions are given in *Figure 29*, which shows that the insert can incline a maximum of 2.5° in either direction and angle tolerance must remain within 5° of tolerance towards the insert axis.

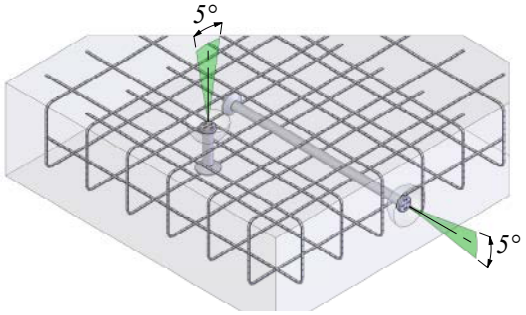
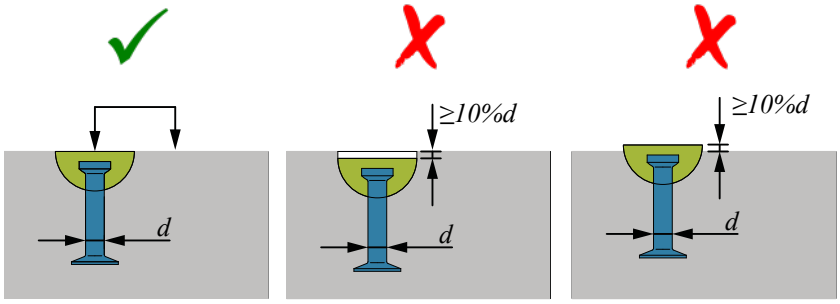


Figure 29. Angle tolerances for installation.

Installation into concrete elements requires the insert to stay in its initial position. If the insert moves out of place, *Table 19* defines the permitted installation tolerances for all inserts.

Table 19. Installation tolerances for KK Lifting Inserts.

Load Class	10% of d [mm]
1.3	±1.0
2.5	±1.4
4.0	±1.8
5.0	±2.0
7.5	±2.4
10.0	±2.8
15.0	±3.4
20.0	±3.8
32.0	±5.0

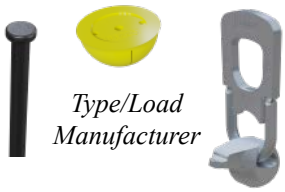


PLEASE NOTE:
The tolerances given in *Table 19* are to be considered for recessed installation with KK FR and KK FM.

For installation purposes, no special marking accessories must be used. The insert is to be fixed into the formwork using Installation Accessories (KK FR or KK FM). The rotation symmetric shape of the fixing items and inserts facilitates installation. No special assembly direction need be considered.

KK 1.3 – 32.0, KKR 1.3 – 15.0

1. Selection

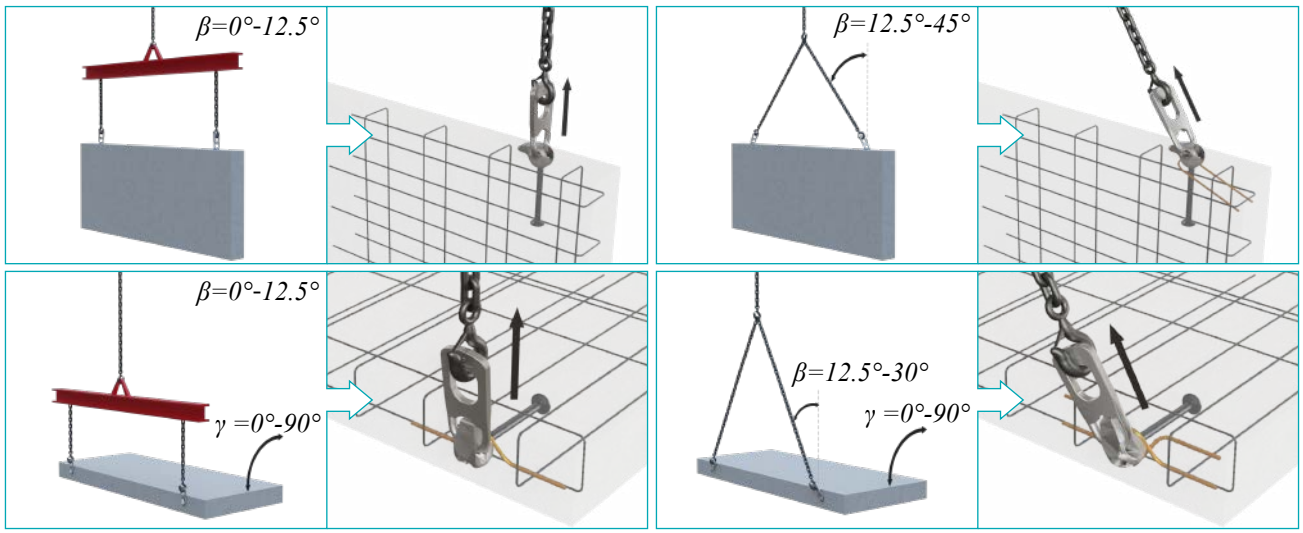


Load Class [t]	KK FR Color
1.3	Blue
2.5	Yellow
5.0	Blue
7.5	Red

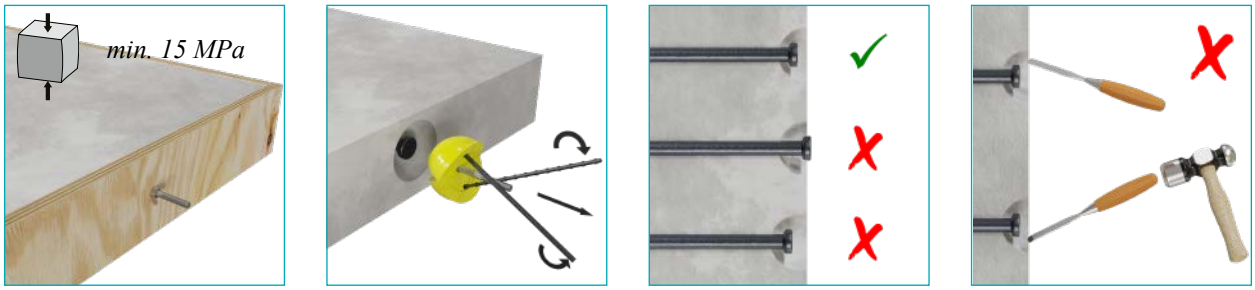
Load Class [t]	KK FR Color
10.0	Yellow
15.0	Gray
20.0	Black
> 32.0	Gray

2. Installation

3. Reinforcement

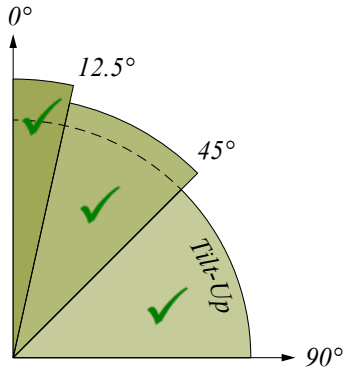


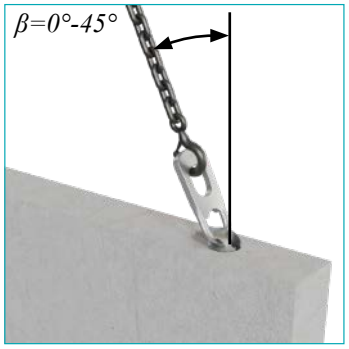
4. Casting



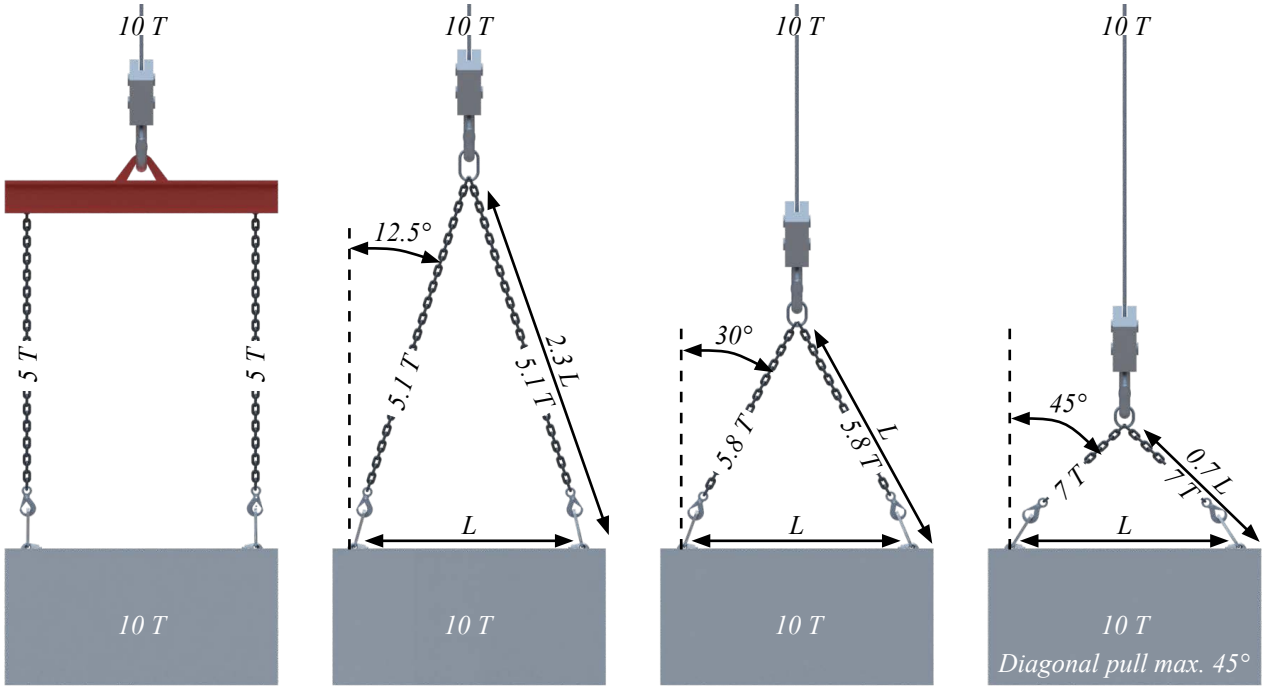
KK 1.3 – 32.0, KKR 1.3 – 15.0

5. Lifting



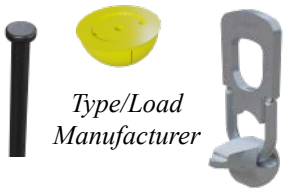


6. Lifting angle influence



KK SW 1.3 – 20.0 and KKR SW 7.5 – 20.0

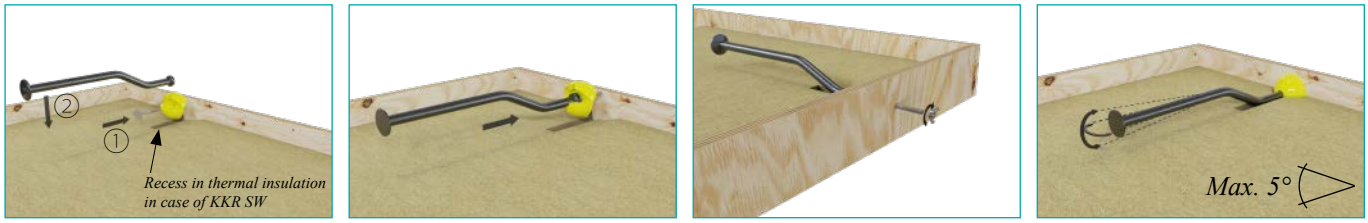
1. Selection



Load Class [t]	KK FR Color
1.3	Blue
2.5	Yellow
5.0	Blue
7.5	Red

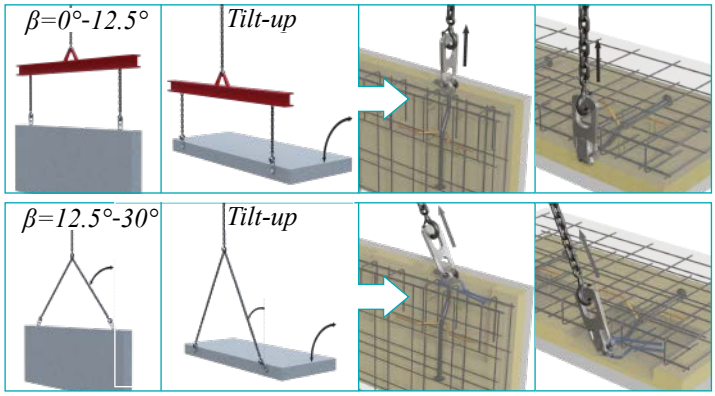
Load Class [t]	KK FR Color
7.5	Red
10.0	Yellow
15.0	Gray
20.0	Black

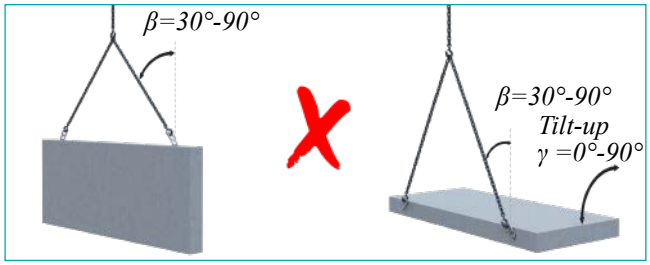
2. Installation



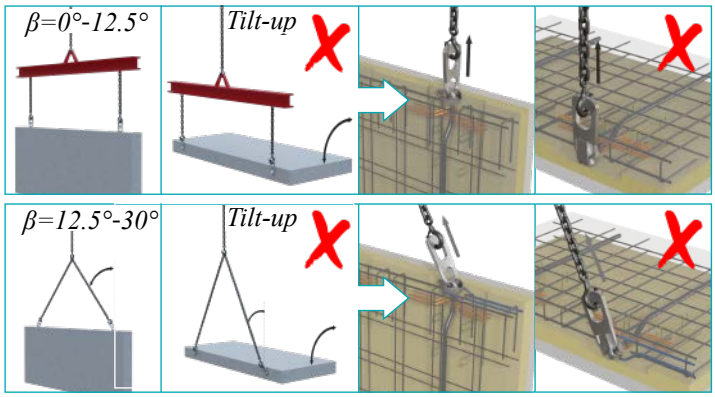
3. Reinforcement

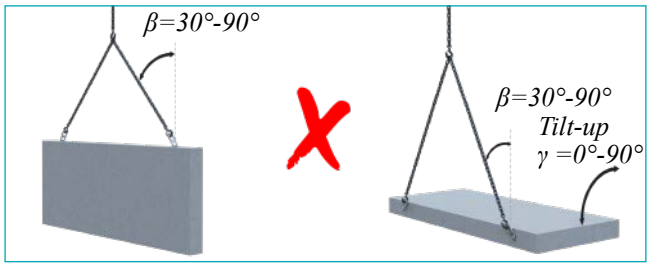
KK SW





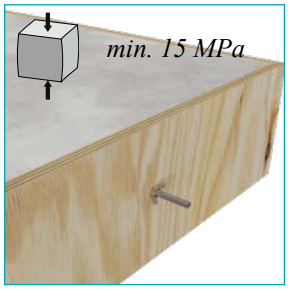
KKR SW

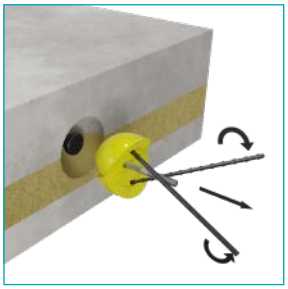
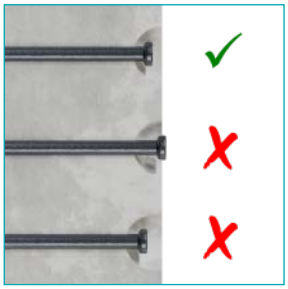
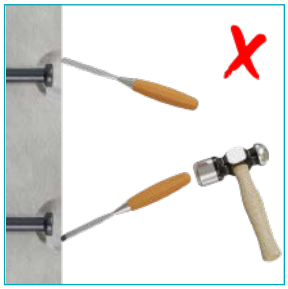




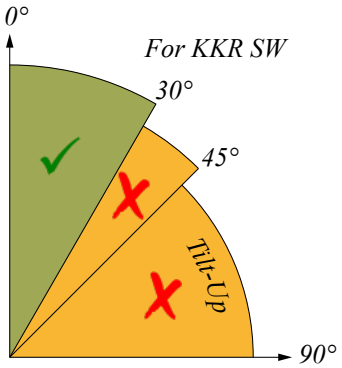
KK SW 1.3 – 20.0 and KKR SW 10.0 – 20.0

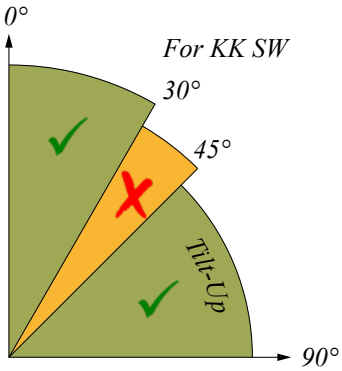
4. Casting

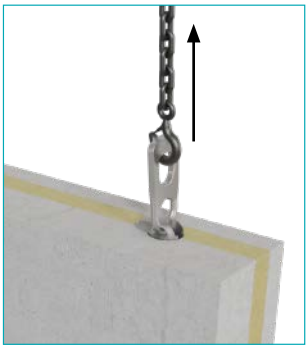


5. Lifting

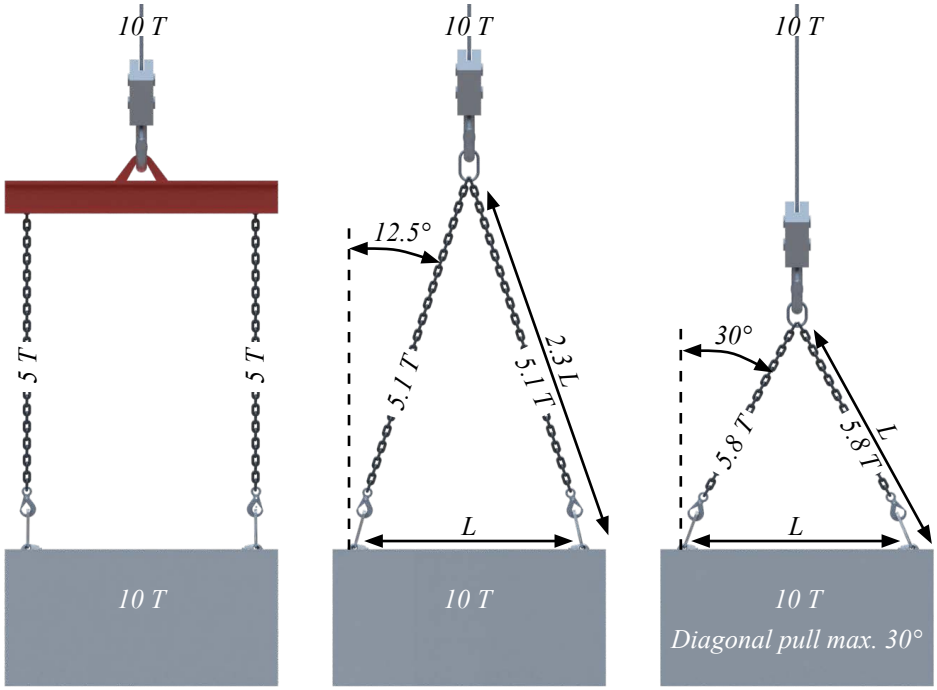




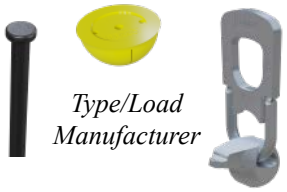
β= 0° - 12.5° for KK SW
β= 12.5° - 30° with Corbel for KK SW
β= 0° - 30° for KKR SW

6. Lifting angle influence



KKD 15.0 – 20.0

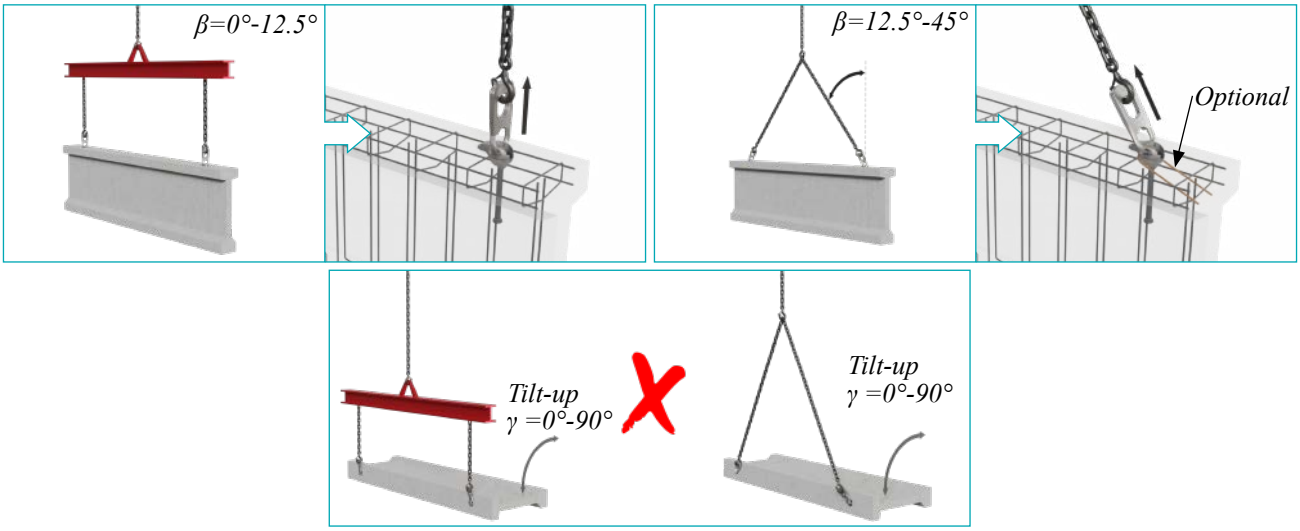
1. Selection



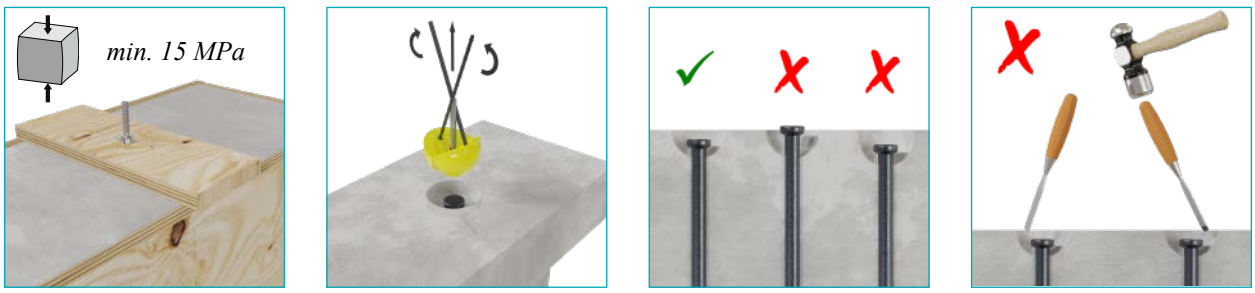
Load Class [t]	KK FR Color
15.0	Gray
20.0	Black

2. Installation

3. Reinforcement

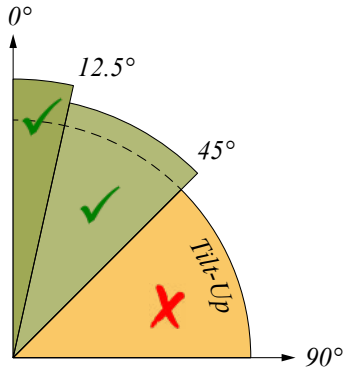


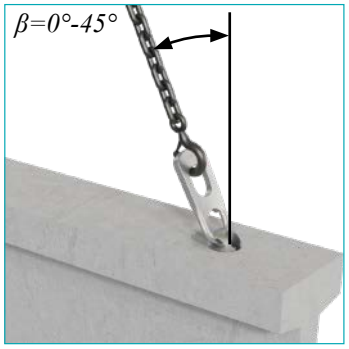
4. Casting



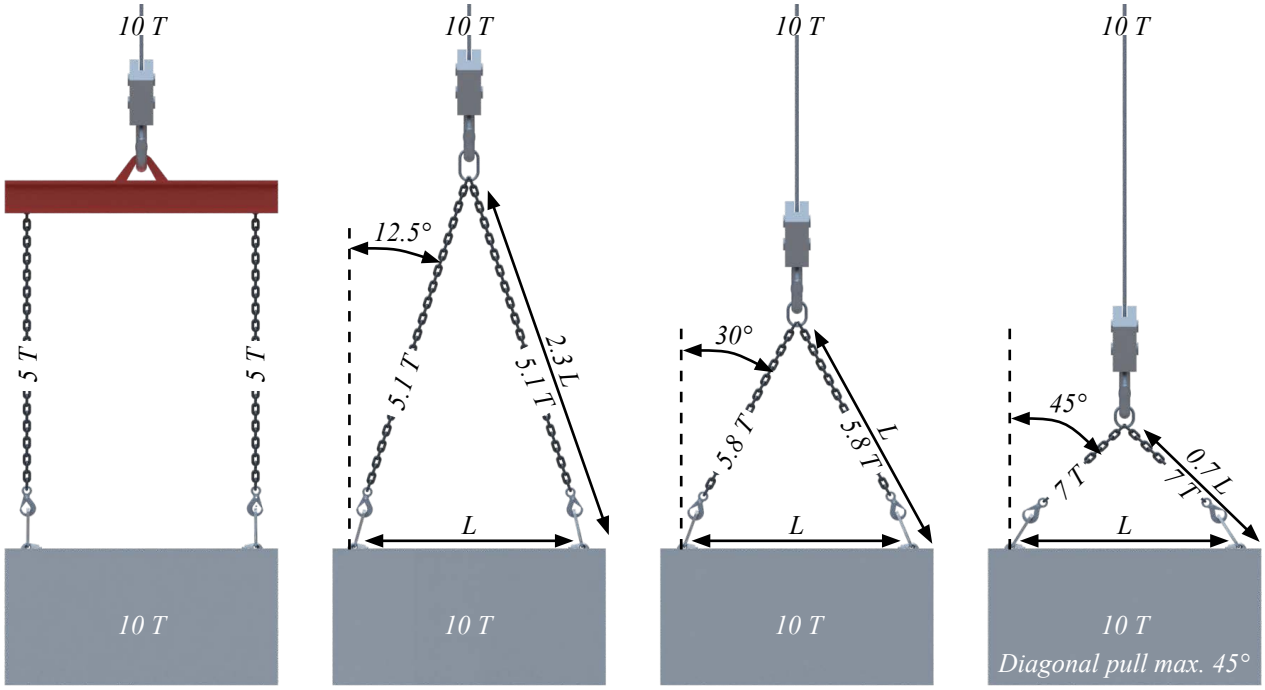
KKD 15.0 – 20.0

5. Lifting



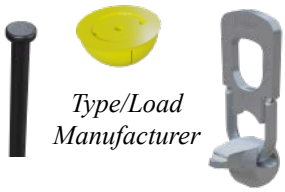


6. Lifting angle influence



KK Short 1.3 – 32.0

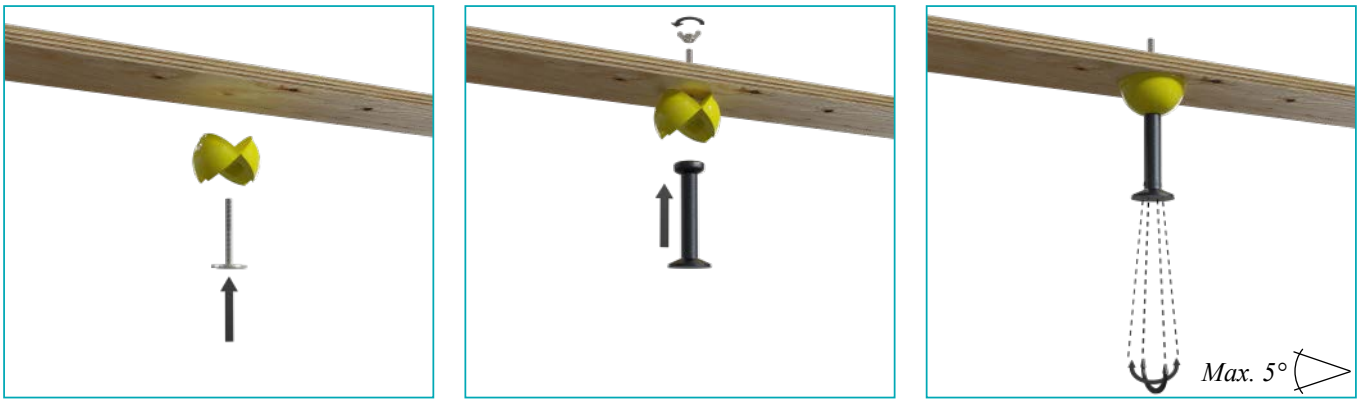
1. Selection



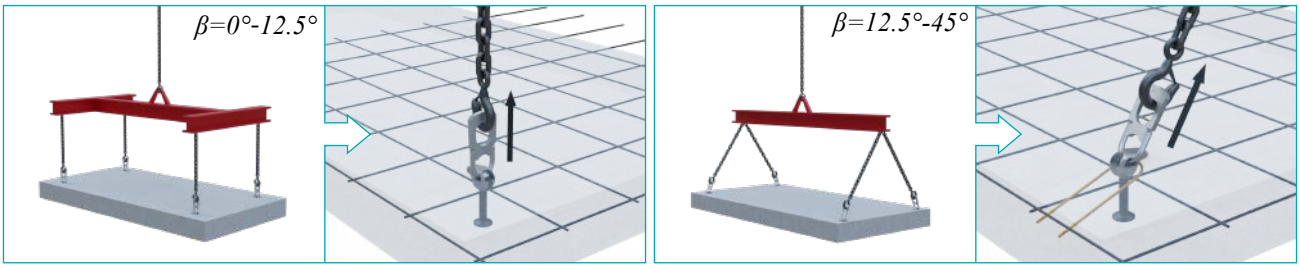
Load Class [t]	KK FR Color
1.3	Blue
2.5	Yellow
5.0	Blue
7.5	Red

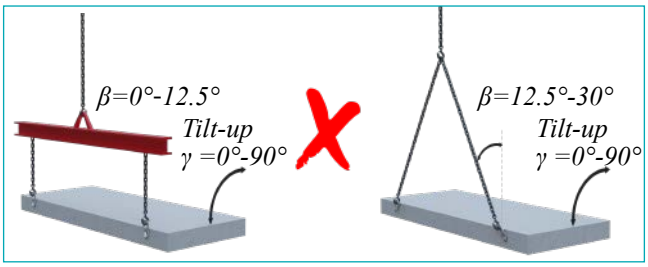
Load Class [t]	KK FR Color
10.0	Yellow
15.0	Gray
20.0	Black
> 32.0	Gray

2. Installation

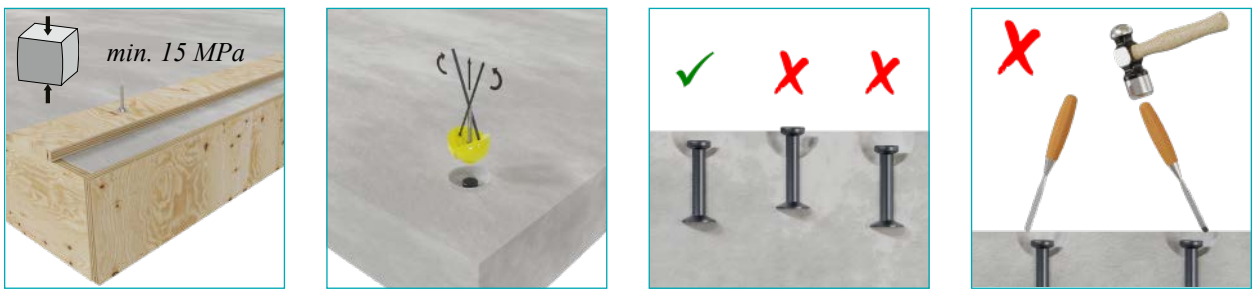


3. Reinforcement



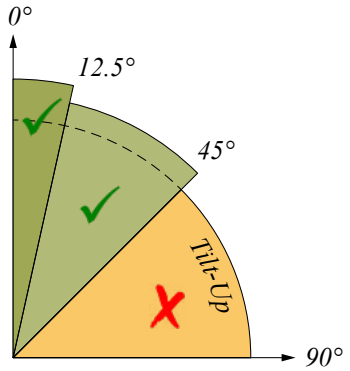


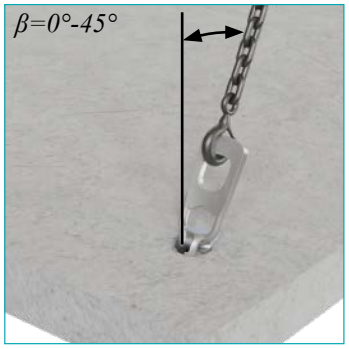
4. Casting



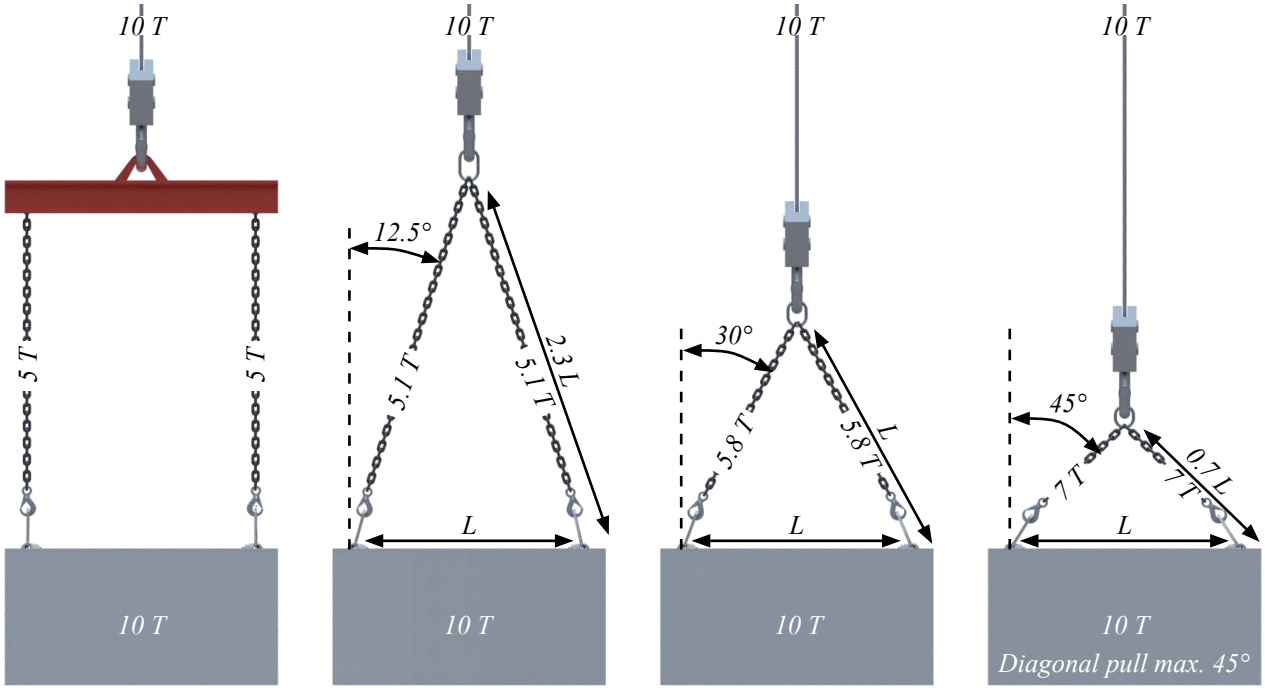
KK Short 1.3 – 32.0

5. Lifting



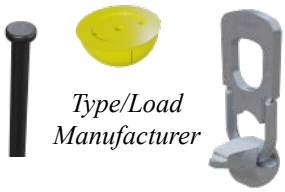


6. Lifting angle influence



KKL 1.3 – 32

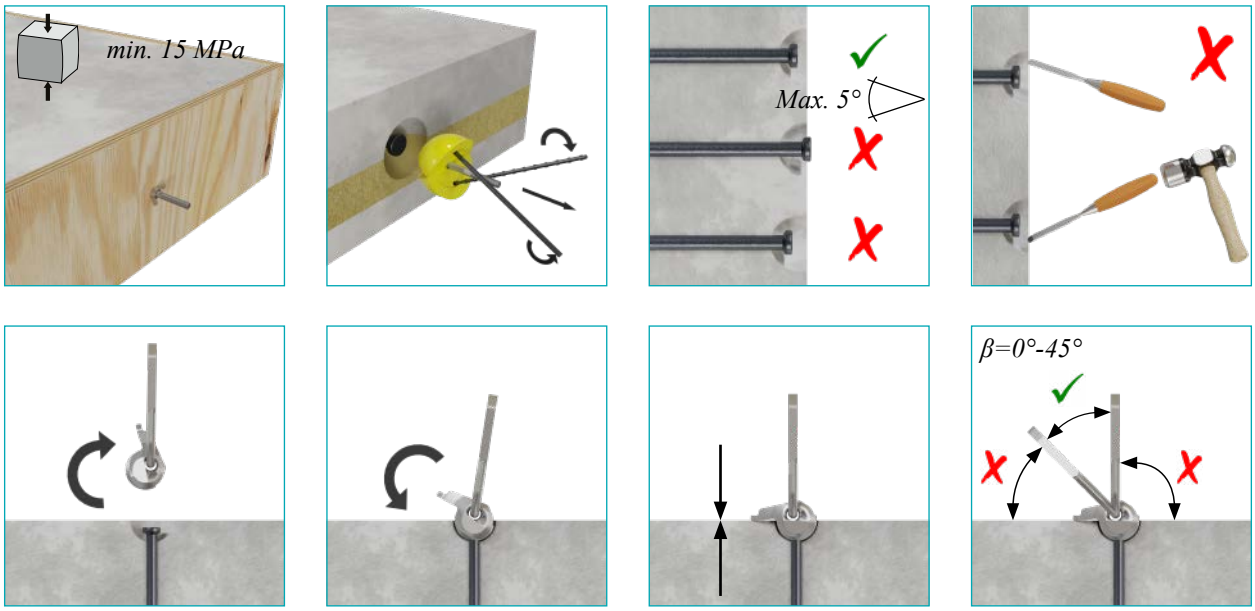
1. Selection

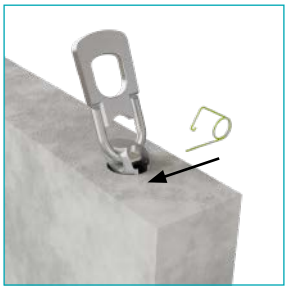


Load Class [t]	KK FR Color
1.3	Blue
2.5	Yellow
5.0	Blue
7.5	Red

Load Class [t]	KK FR Color
10.0	Yellow
15.0	Gray
20.0	Black
> 32.0	Gray

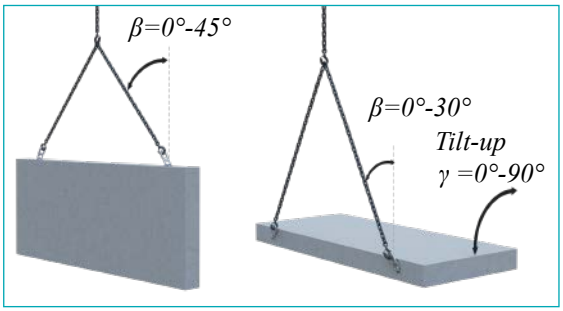
2. Installation



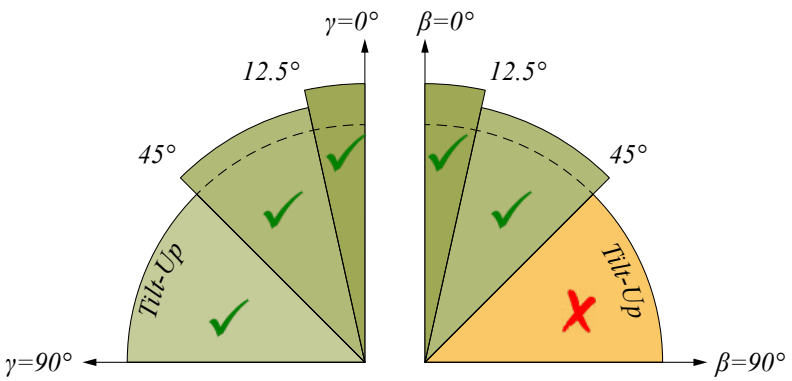


optional safety pin for applications to avoid self release

3. Lifting



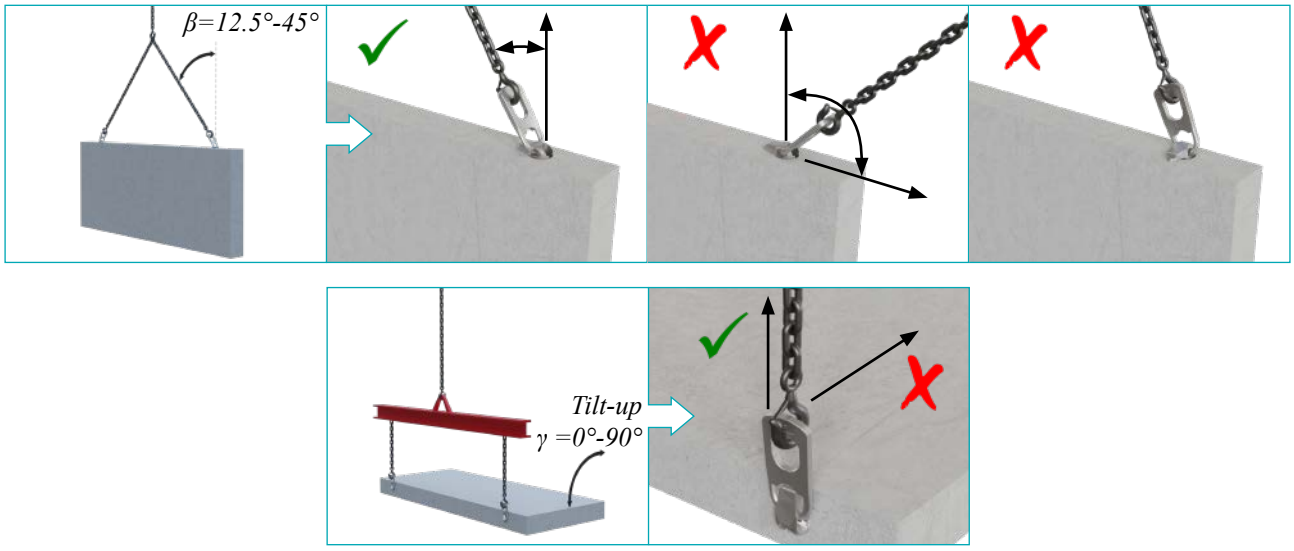
Tilt-up process (β=max. 30°)



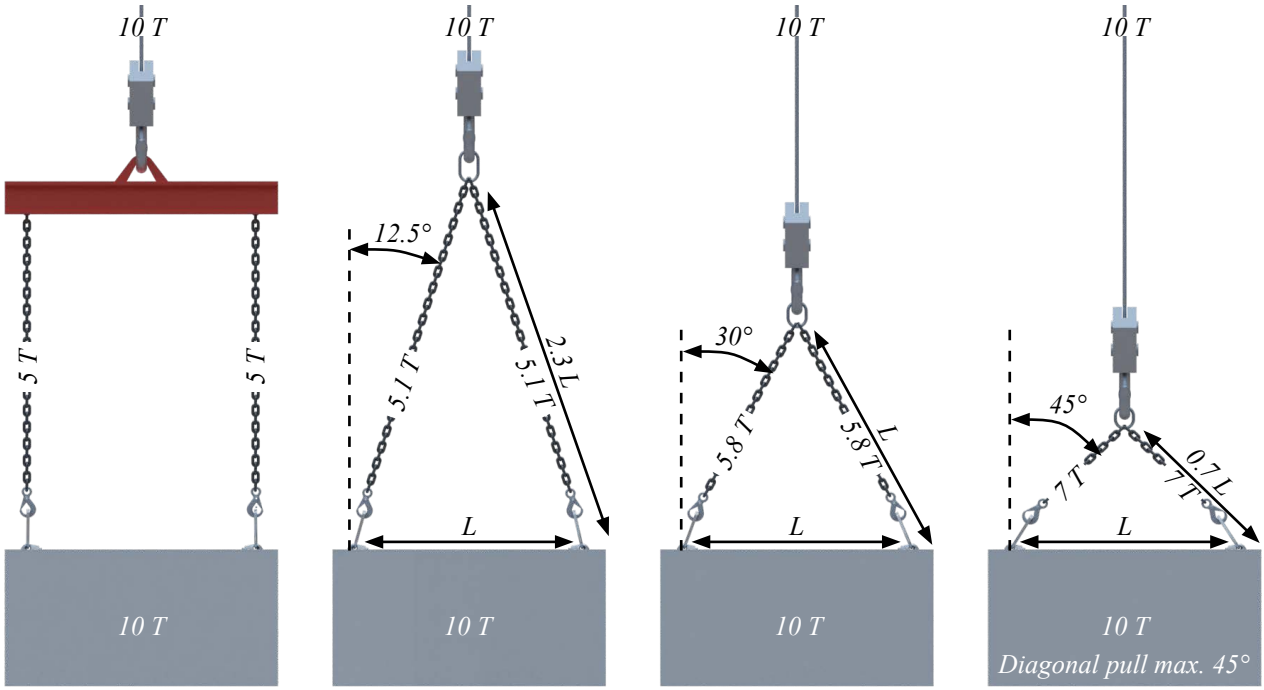
No Tilt-up process

KKL 1.3 – 32

4. Lifting examples



5. Lifting angle influence



NOTES

Revision History

Version: PEIKKO GROUP 09/2022. Revision: 003

- New names of some products
- New compact and more user-friendly layout.
- Added KK SP Safety Pin for KKL Lifting Key and ProdLib information
- Removal of KKE insert, KSR item and Load class 4.0
- Removal of information contained in General Lifting Technical Manual.

Version: PEIKKO GROUP 04/2016. Revision: 002*

- New cover design for 2018 added.

Resources

DESIGN TOOLS

Use our powerful software every day to make your work faster, easier, and more reliable. Peikko design tools include design software, 3D components for modeling programs, installation instructions, technical manuals, and product approvals of Peikko's products.

peikko.com/design-tools

TECHNICAL SUPPORT

Our technical support teams around the world are available to assist you with all of your questions regarding design, installation etc.

peikko.com/technical-support

APPROVALS

Approvals, certificates, and documents related to CE-marking (DoP, DoC) can be found on our websites under each products' product page.

peikko.com/products

EPDS AND MANAGEMENT SYSTEM CERTIFICATES

Environmental Product Declarations and management system certificates can be found at the quality section of our websites.

peikko.com/qehs

CE

COMPANY WITH
MANAGEMENT SYSTEM
CERTIFIED BY DNV
ISO 9001 • ISO 14001
ISO 45001