PohlCon

KE transport anchors

Technical information

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KE transport anchors

Transporting double walls safely

The product
The design of the KE transport anchor allows for easy integration into the production process. Installation is independent of the position of the lattice girder. This allows the anchor to be used flexibly and in a cost-effective way.

Area of application
KE transport anchors are used for erecting, transporting and moving element walls throughout the entire production process, both in the prefabrication plant and on the construction site. The variety and design of the KE transport anchor make it a unique product in terms of technology, cost effectiveness, and safety.
The KE transport anchor is suitable for element walls that are installed in buildings, especially in basements.

Benefits
- CE mark
- PÜZ-monitored
- 2 load-bearing stages for cost-effective planning

Preliminary remarks

To ensure the highest possible level of safety, KE anchors are tested extensively and PÜZ-monitored. The variety of types with different load capacities allows for cost-effective planning.

The KE transport anchor is subdivided into load classes III and IV.
The use of ductile plain steel and the absence of stiffness-increasing welds not only preclude embrittlement of the anchor areas subject to deformation stresses, but also ensure reliable load transfer acting over the entire anchor leg length.

KE transport anchors
- CE mark
- PÜZ-monitored and certified according to VDI/BV-BS 6205:2021-09 and the Regulation EU 2023/1230
- Compression strut made of laminated veneer lumber with national technical approval
- Two load classes
- Anchor widths from 130-350 mm

According to guideline VDI/BV-BS 6205, the transport anchors are subdivided into load classes III and IV. The KE III anchor is designed for loads from usual component sizes and transport conditions. The KE IV anchor is used for particularly heavy components.

KE III

KE IV

Application

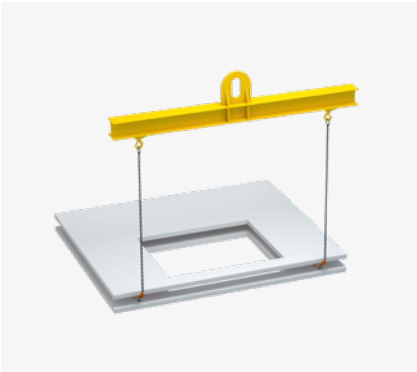
Load

With regard to the load, a distinction must be made between erecting and transporting the precast components.
Types of stress:

Transportation

Axial tension, $\beta = 0°$

Erecting

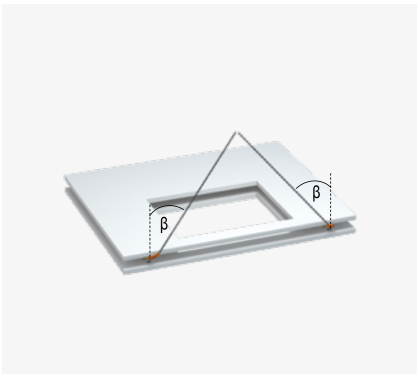


Transverse tension, $\beta \leq 0°$

Rotating

Transverse tension 90° (NUSPL)

Oblique tension, $0° \leq \beta \leq 45°$



Oblique transverse tension, $0° \leq \beta \leq 45°$

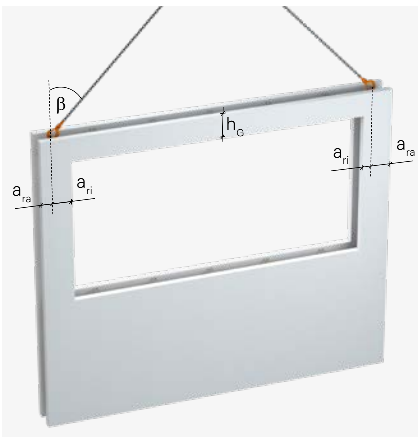
Axial and edge clearances

Installation away from the edge

- KE III
  $a_{ra} \geq 200$ mm
  $a_{ri} \geq 200$ mm
- KE IV
  $a_{ra} \geq 400$ mm
  $a_{ri} \geq 400$ mm

Installation near the edge

- KE III
  $a_{ra} \geq 125$ mm
  $a_{ri} \geq 125$ mm
  $h_G \geq 200$ mm



Notes

The belt is subjected to compressive stress under oblique tension and oblique transverse tension. It must be verified in this respect.

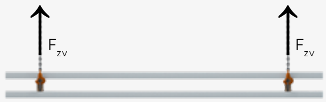
In case of divergent boundary conditions, please contact our technical department at:
technik-hbau@pohlcon.com

Transportation

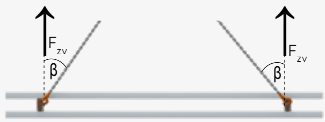
Axial tension

Oblique tension

Erecting

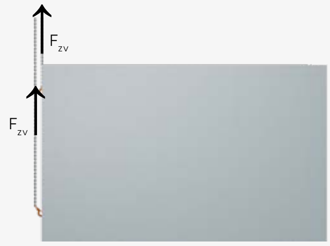


Transverse tension



Oblique transverse tension

Rotating



Transverse tension 90° (NUSPL)

Installation away from the edge

Vertical load component per anchor F_{zv} in kN for installation away from edge

		KE III			KE IV		
	Chain incli-nation β	Concrete strength $f_{c,cube150}$ N/mm²			Concrete strength $f_{c,cube150}$ N/mm²		
		15	20	25	15	20	25
Transport [1]	0°	22.5	25.9	29.0	44.1	50.9	56.9
	30°	19.5	22.4	25.1	38.2	44.1	49.3
	45°	15.9	18.3	20.5	31.2	36.0	40.2
Erecting	0°	8.7	10.0	11.2	10.6	12.2	13.7
	30°	7.5	8.7	9.7	9.2	10.6	11.9
	45°	6.2	7.1	7.9	7.5	8.6	9.7
Rotating	–	16.1	16.1	16.1	25.0	25.0	25.0

1) If transport anchors are installed in precast plants with factory production control in accordance with DIN EN 13369, the table values may be increased by a factor of 1.2.
In this case, dynamic factors smaller than 1.3 must not be used (see pages 18 - 19).

Installation near the edge

Vertical load component per anchor F_{zv} in kN for installation near the edge

		KE III		
	Chain incli-nation β	Concrete strength $f_{c,cube150}$ N/mm²		
		15	20	25
Transpor-tation	0° ≤ β ≤ 45°	12.5	14.0	15.5

Notes

The specified load capacities refer to the vertical load component FZV of a single anchor.
For installation close to the edge, the erection process using transport anchors is to be avoided. The precast components are to be erected by means of a tilting table and only transported vertically.
The specified anchor loads apply to undamaged components. Therefore, the components must be inspected for damage before each lifting operation.

Product details

Dimensions

	KE III			KE IV		
Type	**Dimensions** mm			**Dimensions** mm		
	b	**l**	**l_u**	**b**	**l**	**l_u**
120	120	515	365	120	750	600
130	130	515	365	130	750	600
140	140	515	365	140	750	600
150	150	515	365	150	750	600
160	160	515	365	160	750	600
170	170	515	365	170	750	600
180	180	565	365	180	800	600
190	190	565	365	190	800	600
200	200	565	365	200	800	600
210	210	565	365	210	800	600
220	220	565	365	220	800	600
230	230	565	365	230	800	600
240	240	565	365	240	800	600
250	250	615	365	250	850	600
260	260	615	365	260	850	600
270	270	615	365	270	850	600
280	280	615	365	280	850	600
290	290	615	365	290	850	600
300	300	615	365	300	850	600
310	310	645	365	310	880	600
320	320	645	365	320	880	600
330	330	645	365	330	880	600
340	340	645	365	340	880	600
350	350	645	365	350	880	600


b
l

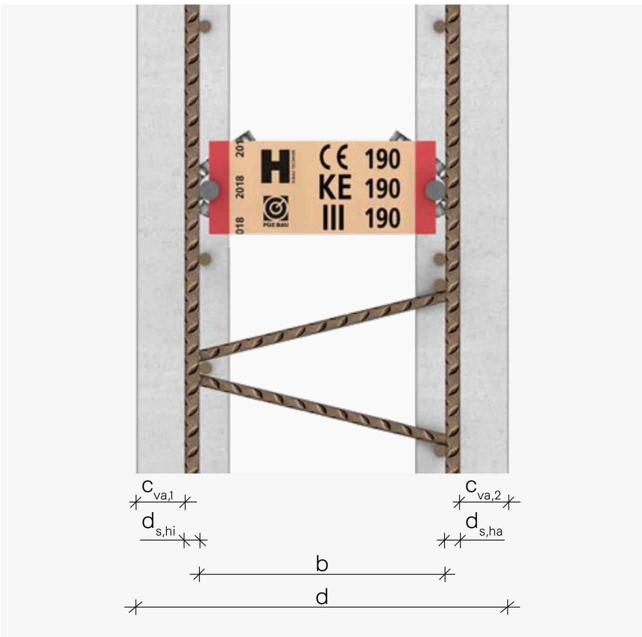

KE 190
III 190

Usage

Determining the required anchor width:

The required anchor width b depends on the structure of the element wall.

Installation of transport anchor parallel to lattice girder



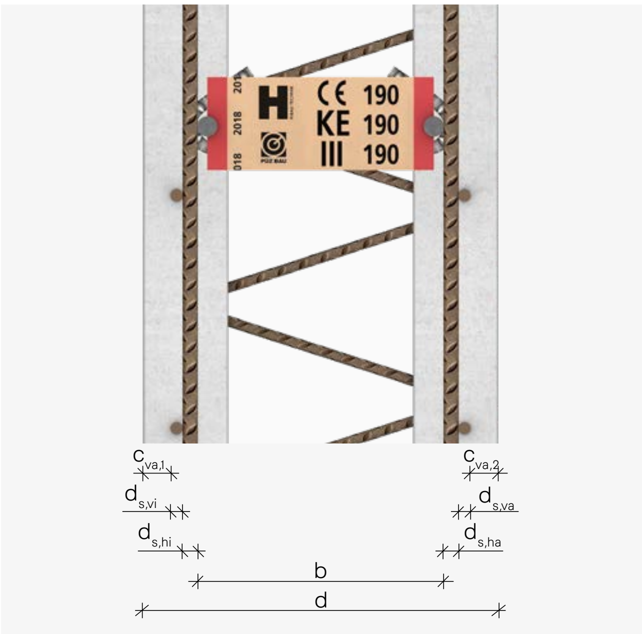
Determining the required anchor width:

$$b = d - c_{va,1} - c_{va,2} - d_{s,hi} - d_{s,ha}$$

b	=	transport anchor width
d	=	wall width
$c_{va,1}$	=	concrete layer, inner shell
$c_{va,2}$	=	concrete layer, outer shell
$d_{s,hi}$	=	diameter of horizontal reinforcement, inner shell
$d_{s,ha}$	=	diameter of horizontal reinforcement, outer shell

As a rule, the transport anchor width corresponds to the height of the lattice girder.

Installation of transport anchor transverse to lattice girder



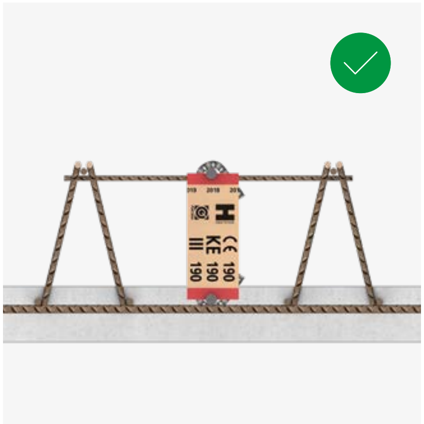
Determining the required anchor width:

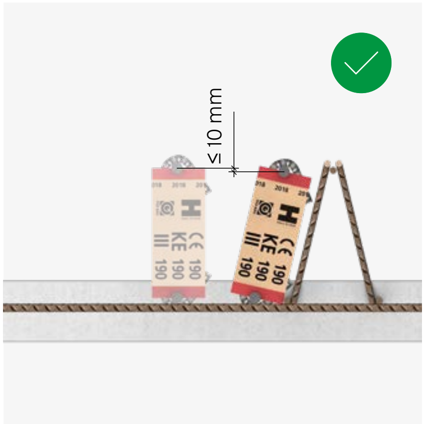
$$b = d - c_{va,1} - c_{va,2} - d_{s,hi} - d_{s,ha} - d_{s,vi} - d_{s,va}$$

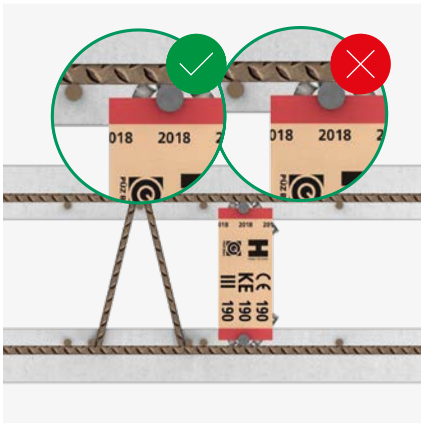
b	=	transport anchor width
d	=	wall width
$c_{va,1}$	=	concrete layer, inner shell
$c_{va,2}$	=	concrete layer, outer shell
$d_{s,hi}$	=	diameter of horizontal reinforcement, inner shell
$d_{s,ha}$	=	diameter of horizontal reinforcement, outer shell
$d_{s,vi}$	=	diameter of vertical reinforcement, inner shell
$d_{s,va}$	=	diameter of vertical reinforcement, outer shell

Boundary conditions

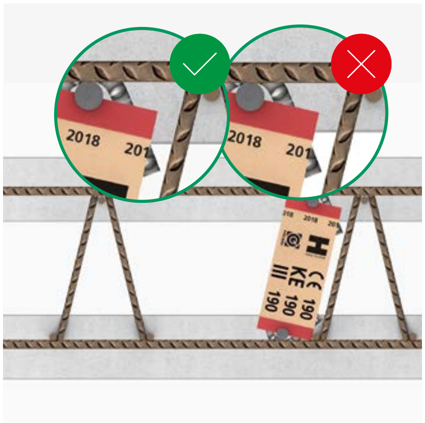
Installation position of the KE transport anchors





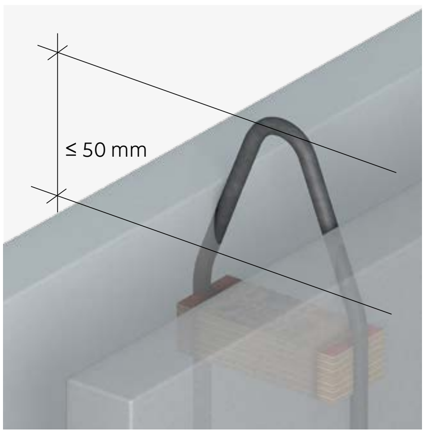


Concrete embed-ment: The red marking must be completely embedded in concrete.



Concrete embedment: The red marking must be completely embedded in concrete.

Minimum concrete cover:
KE III: $c_{vi} \geq 10$ mm
$c_{va} \geq c_{nom} \geq 20$ mm
KE IV: $c_{vi} \geq 18$ mm
$c_{va} \geq c_{nom} \geq 20$ mm



Minimum site requirements

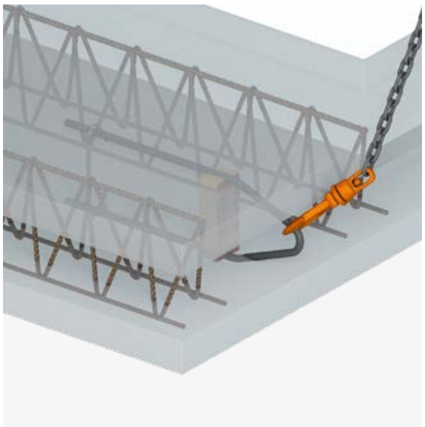
Shell thickness:
KE III: s ≥ 50 mm
KE IV: s ≥ 60 mm

Minimum reinforcement:
Ø 6/20

Installation away from the edge:
horizontal edging
d_s ≥ 10 mm,
lattice girder towards outside

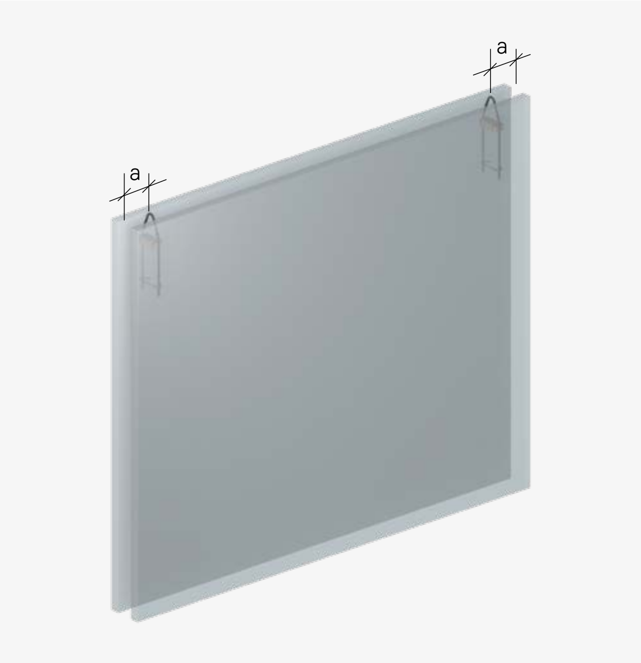
Installation near the edge:
horizontal and vertical edging
d_s ≥ 10 mm, lattice girder towards opening

Installation away from the edge:
with transverse tension lattice girder as edging



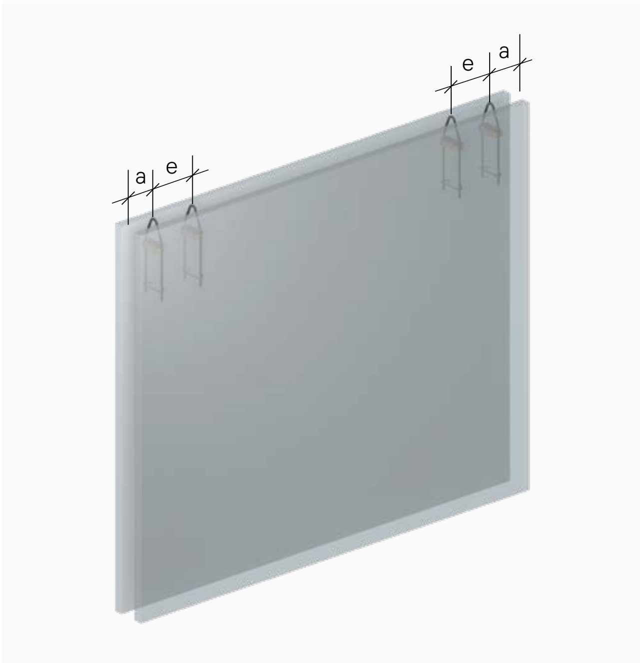
Installation near the edge:
with transverse tension lattice girder as edging on outside and towards inner opening

Number and position of KE transport anchors



- Installation away from the edge
  - edge clearance KE III: a ≥ 200 mm
  - edge clearance KE IV: a ≥ 400 mm
- Installation near the edge
  - edge clearance KE III: a ≥ 125 mm

  Also see information on page 7
- The anchors are to be loaded evenly.



- Edge clearance
  - edge clearance KE III: a ≥ 200 mm
  - edge clearance KE IV: a ≥ 400 mm
- Centre spacing
  - centre spacing KE III: e ≥ 300 mm
  - centre spacing KE IV: e ≥ 600 mm
- The anchors are to be loaded evenly.
- The anchor loads from page 7 are to be multiplied by the safety factor Ψ_4 = 0.75.

Notes

Minimum concrete strength at the time of first lifting $f_{c,cube150}$ ≥ 15 N/mm².
Use two or four transport anchors per precast components.
The transport anchors must be installed symmetrically to the axis of gravity to ensure uniform load distribution.
In case of uneven loading of the transport anchors, the different load effects shall be taken into account.

Dimensioning

Determining the loads acting on the elements

When determining the decisive loads on the transport anchors, the entire manufacturing, storage, transport and installation process must be considered and all relevant stresses must be taken into account. The decisive stress can vary depending on the component geometry, transport and boundary conditions, which is why an individual dimensioning of the transport anchors must be carried out for each project and each component.

The influencing variables to be determined are the static system, weight load, formwork adhesion, dynamic influences and the position and number of transport anchors. Additional stresses can occur on a project-specific basis and must then be taken into account accordingly.

1. Weight load

For the determination of the dead weight, the decisive concrete volume
with a density of 25 kN/m³ is to be used. Any additional loads must be taken into account accordingly.

Weight load of the precast components F_G in kN
$F_G = 25\ \text{kN/m}^3 \cdot V + Z$
V = concrete volume of the precast components in m³
Z = additional loads in kN

2. Formwork adhesion

When precast components are lifted out of the formwork, adhesive forces are experienced that vary in magnitude depending on the form lining used. The following reference values are given as examples in the guideline VDI/BV-BS 6205:

Load from formwork adhesion F_{adh} in kN
$F_{adh} = q_{adh} \cdot A_f$
q_{adh} = basic value of formwork adhesion in kN/m²
A_f = contact area between concrete and formwork in m²

Formwork type	q_{adh} kN/m²
Oiled steel or plastic formwork	≥ 1.0
Painted wooden formwork	≥ 2.0
Untreated wooden formwork	≥ 3.0

3. Dynamic loads

When lifting, transporting and setting down precast components, impact-type stresses occur. The magnitude of the respective stress is determined by the type of lifting equipment used and is taken into account via what is called the dynamic factor Ψ_{dyn}. Along an entire transport chain, different lifting devices may also be used. The decisive dynamic factor must be determined.

The loads obtained are to be multiplied by this factor. The following reference values are given as examples in the guideline VDI/BV-BS 6205:

Lifting device	Ψ_{dyn}
Tower crane	1.3
Truck crane	1.3
Gantry crane	1.3
Transport on level ground	2.5
Transport on uneven terrain	≥ 4

Verification

The following must be verified

$F_{Rd} \geq F_{Ed}$

F_{Rd}	Dimensioning load that can be absorbed by anchors
F_{Ed}	Impacted dimensioning load

Notes
A distinction must be made between erection, rotation and transport operations as specified on page 6. Each individual operation must be verified.

The rated load that can be borne is calculated:

$F_{Rd} = n \cdot F_{ZV} \cdot \Psi_n$

F_{ZV}	Load according to information on page 7
n	Number of anchors used (either 2 or 4 anchors).
$\Psi_n = \Psi_2 = 1.0$	When using two anchors
$\Psi_n = \Psi_4 = 0.75$	When using four anchors

The acting load is calculated:

Erecting

$$F_{Ed} = \left(\frac{F_G}{2} + F_{adh}\right) \cdot \Psi_{dyn}$$

F_G	Weight load of precast component according to information on page 14
F_{adh}	Load according to formwork adhesion according to information on page 14
Ψ_{dyn}	dynamic factor according to information on page 14

Transportation

$F_{Ed} = F_G \cdot \Psi_{dyn}$

F_G	Load according to information on page 14
Ψ_{dyn}	dynamic factor according to information on page 14

Rotating

$$F_{Ed} = \frac{F_G}{2} \cdot \Psi_{dyn}$$

F_G	Weight load of precast component according to information on page 14
Ψ_{dyn}	dynamic factor according to information on page 14

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