

HALFEN HEK PRECAST COUPLER

TECHNICAL PRODUCT INFORMATION



HALFEN HEK PRECAST COUPLER

HEK 18.2-AUS-E

CONCRETE

NEW!

General building authority approval
No. Z-21.8-2086


HALFEN

HALFEN HEK PRECAST COUPLER

Introduction

Immediately loadable and dry connection of precast elements

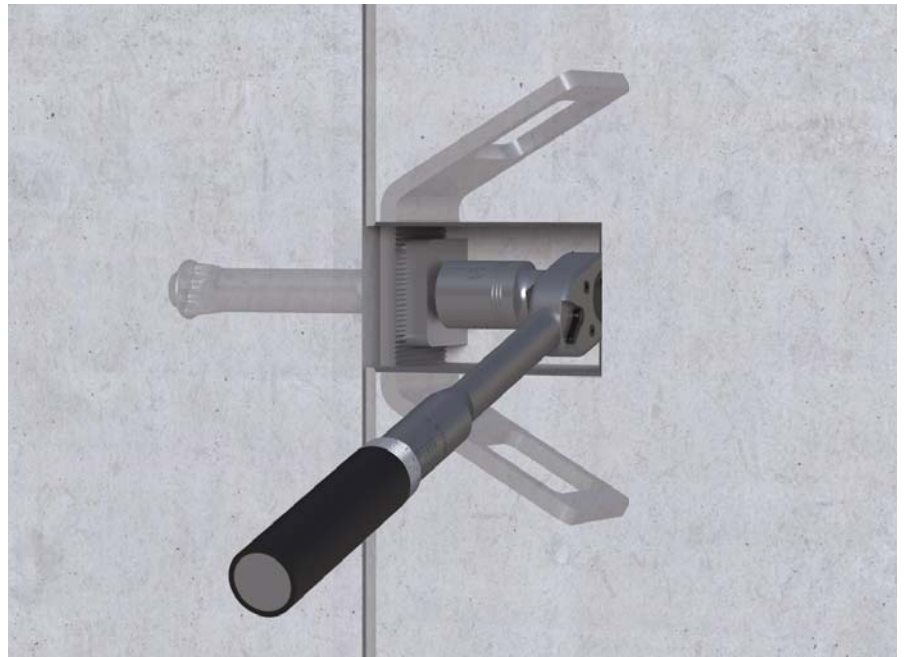
Standard connections of conventional precast elements use steel wire loops or rebend connections, which require subsequent filling of the connection joints with grout mortar; these types of connections are not immediately loadable to their full capacity.

To continue construction, temporary bracing is required to ensure stability of the erected elements until the grout in the joint has cured sufficiently.

In many cases waiting periods have to be taken into account in the construction schedule to allow the grout mortar to cure sufficiently.

This dry connection for precast elements dispenses with grout filling the joint, substantially reducing the time and effort required for installation.

The main benefit of this system is the quick, efficient and weather independent installation of precast concrete elements. The connections can be subjected to their full load capacities immediately after installation. This accelerates the construction process.



Advantages:

- **bolt connection**
- **Building authority approved**
- **durable corrosion protection**
- **short installation time**
- **no temporary bracing required**
- **less crane time**
- **weather independent installation**
- **elements can be easily disassembled**

HEK Precast couplers are suitable for permanent connection of precast concrete elements subjected to static and quasi-static loads in reinforced and non-reinforced concrete of class C20/25 to C50/60.

The precast couplers are suitable for transfer and anchorage of tension and shear loads or a combination of both in cracked and in non-cracked concrete.

The HEK Precast coupler is installed flush in a precast concrete element using a special recess former. A bolt with a counterplate is inserted in the recess and screwed into a DEMU T-FIXX®, DEMU Bolt anchor or DEMU Bar anchor previously cast in a second concrete element to form a positive-locking connection.


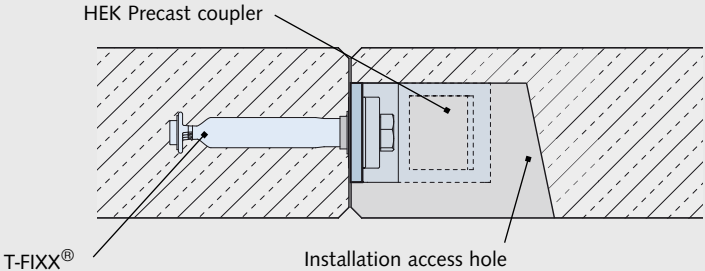

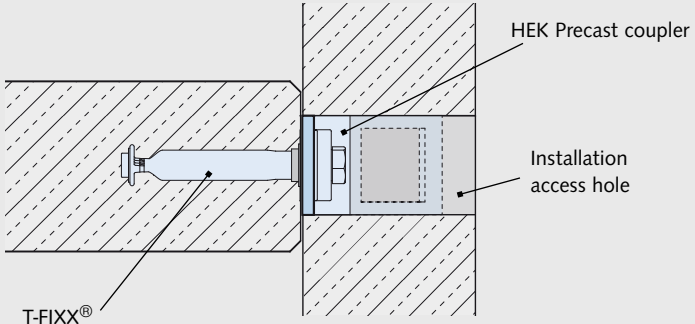

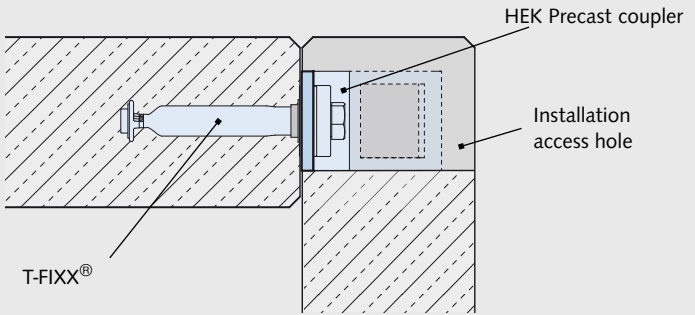


Free download of **General building authority approval Z-21.8-2086**, Design concept acc. to DIN SPEC 1021-4-2 (German version of CEN/TS 1992-4-2) at www.halfen.com



HALFEN HEK PRECAST COUPLER

Application Examples

HEK Precast coupler in butted connection	
Butt connection – wall to wall	Horizontal cross-section
	
HEK Precast coupler in T-connection	
T-connection – wall to wall	Horizontal cross-section
	
Corner connection – wall to wall	Horizontal cross-section
	



We recommend the **Technical Product Information “DEMU Fixing Anchors”** for additional reference when using the HEK system. Free download at www.halfen.com



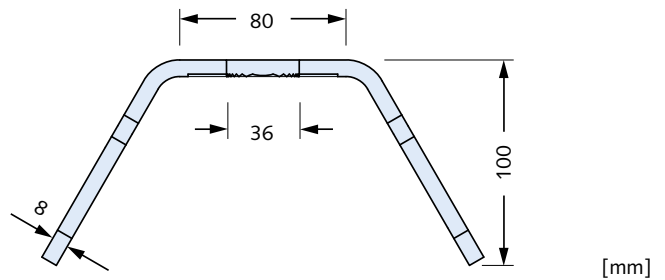
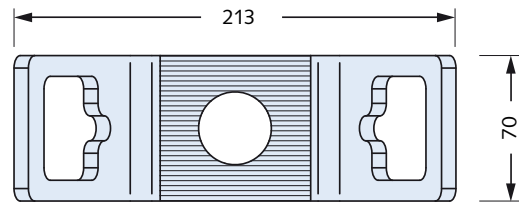
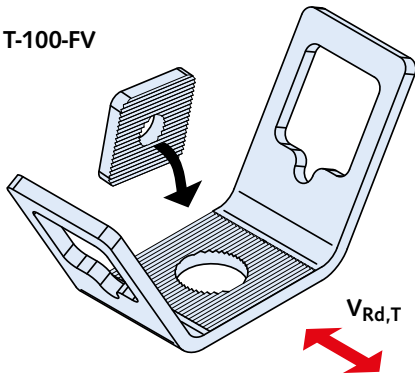
HALFEN HEK PRECAST COUPLER

Product Overview/Design Resistances

Precast coupler HEK2 T-100-FV

The HEK2 T-100-FV Precast coupler is used for load transfer and anchoring of tensile and shear forces perpendicular to the longitudinal axis of the joint.

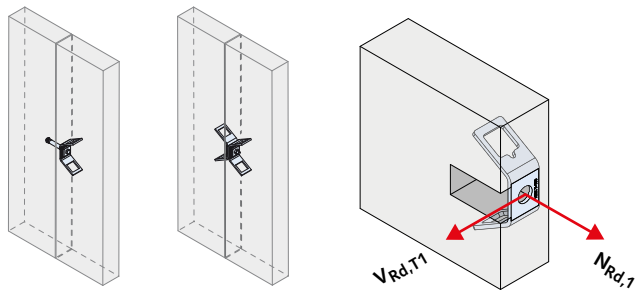
HEK2 T-100-FV



[mm]

Design values of resistance acc. to approval Z-21.8-2086 example ①

HEK2 T-100-FV butted connection



Anchored in non-cracked concrete C30/37 [kN]

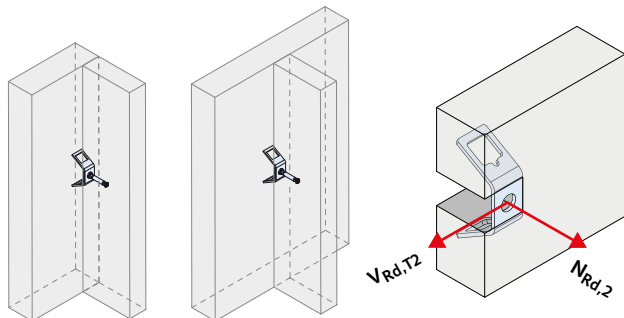
Tensile load	$N_{Rd,1} = 14.0$
Shear load, perpendicular to joint	$ V_{Rd,T1} = 12.0$

Anchored in cracked concrete C30/37 [kN]

Tensile load	$N_{Rd,1} = 10.0$
Shear load, perpendicular to joint	$ V_{Rd,T1} = 8.6$

Combined tensile and shear loads → page 7

HEK2 T-100-FV T-connection



Anchored in non-cracked concrete C30/37 [kN]

Tensile load	$N_{Rd,2} = 18.7$
Shear load, perpendicular to joint	$ V_{Rd,T2} = 26.3 (12.0\text{②})$

Anchored in cracked concrete C30/37 [kN]

Tensile load	$N_{Rd,2} = 13.4$
Shear load, perpendicular to joint	$ V_{Rd,T2} = 18.8 (8.6\text{②})$

② If concrete edge failure cannot be prevented using another method

Combined tensile and shear loads → page 7

① The resistances given for tensile or shear stress are design resistance values according to approval Z-21.8-2086; these are for a single HEK Precast coupler at the component edge with splitting reinforcement and with the following boundary conditions: Concrete C30/37, precast concrete element thickness $h = 100$ mm, edge distances $c_1 = 50$ mm/ $c_2 = 225$ mm, width of connection joint $f \leq 20$ mm, no additional reinforcement. Design resistances for other boundary conditions are available from HALFEN on request.

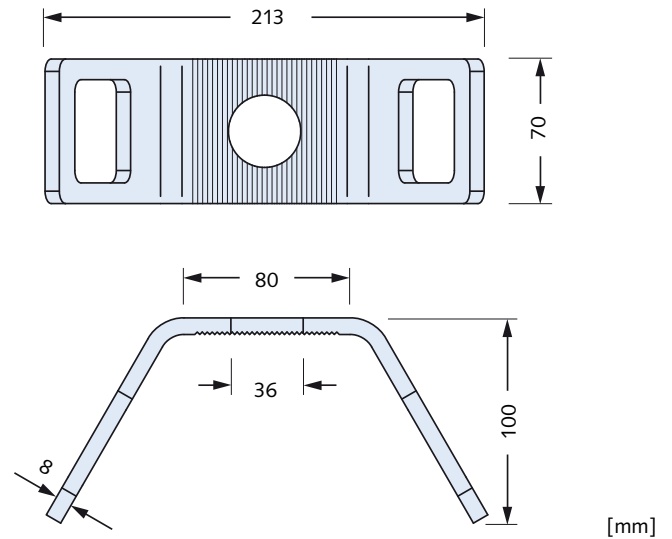
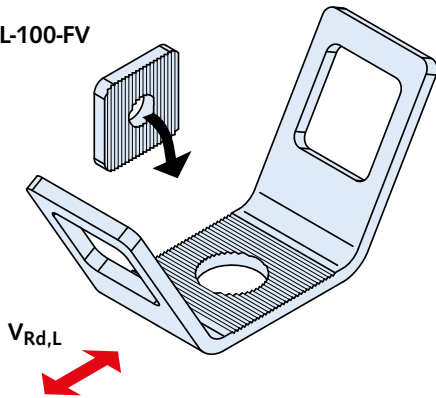
HALFEN HEK PRECAST COUPLER

Product Overview/Design Resistances

Precast coupler HEK2 L-100-FV

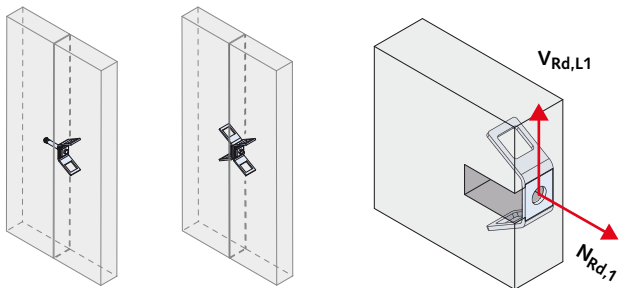
The HEK2 L-100-FV Precast coupler is used for load transfer and anchoring of tensile and shear forces parallel to the longitudinal axis of the joint.

HEK2 L-100-FV



Design values of resistance acc. to approval Z-21.8-2086 example ①

HEK2 L-100-FV butted connection



Anchored in non-cracked concrete C30/37 [kN]

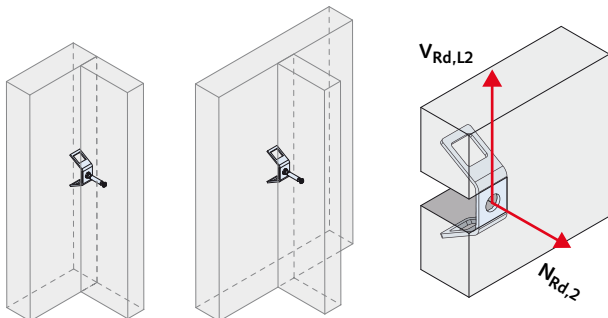
Tensile load	$N_{Rd,1} = 14.0$
Shear load, parallel to joint	$ V_{Rd,L1} = 14.0 (1.7\text{②})$

Anchored in cracked concrete C30/37 [kN]

Tensile load	$N_{Rd,1} = 10.0$
Shear load, parallel to joint	$ V_{Rd,L1} = 10.0 (1.3\text{②})$

② If concrete edge failure cannot be prevented using another method
Combined tensile and shear loads → page 7

HEK2 L-100-FV T-connection



Anchored in non-cracked concrete C30/37 [kN]

Tensile load	$N_{Rd,2} = 18.7$
Shear load, parallel to joint	$ V_{Rd,L2} = 26.3 (4.5\text{②})$

Anchored in cracked concrete C30/37 [kN]

Tensile load	$N_{Rd,2} = 13.4$
Shear load, parallel to joint	$ V_{Rd,L2} = 18.8 (3.2\text{②})$

② If concrete edge failure cannot be prevented using another method
Combined tensile and shear loads → page 7

① The resistances given for tensile or shear stress are design resistance values according to approval Z-21.8-2086; these are for a single HEK Precast coupler at the component edge with splitting reinforcement and with the following boundary conditions: Concrete C30/37, precast concrete element thickness $h = 100$ mm, edge distances $c_1 = 50$ mm/ $c_2 = 225$ mm, width of connection joint $f \leq 20$ mm, no additional reinforcement. Design resistances for other boundary conditions are available from HALFEN on request.

HALFEN HEK PRECAST COUPLER

Dimensioning/Application

Application example HEK Precast coupler with DEMU Fixing anchor

The precast coupler, the fastening bolt and the DEMU Fixing anchor, must each be separately verified. We recommend using the complimentary DEMU Fixing anchors software to

dimension fixing anchors in accordance with CEN 1992-4-1/-2. Download at www.halfen.com/downloads/software.

Type of precast connection	HEK Precast coupler				DEMU Fixing anchor and fastening bolt M16 (grade 8.8)									
	Type	Design resistance N_{Rd} [kN] ①			Type $d_{nom} \times L$ [mm]	Design resistance N_{Rd} [kN] ③								
		C30/37	C40/50	C50/60		C30/37	C40/50	C50/60						
Design resistances tensile stress only		HEK2 L-100-FV HEK2 T-100-FV	14.0	16.3	17.8	T-FIXX GV M16×60	10.3	11.9	13.1					
						T-FIXX GV M16×100	12.4	14.4	15.8					
						T-FIXX GV M16×125	13.6	15.8	17.3					
						1988 FV M16×75	11.1	13.0	14.2					
						1988 FV M16×140	14.3	16.6	18.2					
						1988 FV M16×220	17.5	20.3	22.2					
		HEK2 L-100-FV HEK2 T-100-FV	18.7	21.8	22.0	T-FIXX GV M16×60	10.3	11.9	13.1					
						T-FIXX GV M16×100	12.4	14.4	15.8					
						T-FIXX GV M16×125	13.6	15.8	17.3					
						1988 FV M16×75	11.1	13.0	14.2					
						1988 FV M16×140	14.3	16.6	18.2					
						1988 FV M16×220	17.5	20.3	22.2					
											Typ $d_{nom} \times L$ [mm]	Design resistance $V_{Rd,L}$ [kN] ③		
											C30/37	C40/50	C50/60	
Design resistances shear stress only, parallel to the joint		HEK2 L-100-FV	14.0	16.3	17.8	T-FIXX GV M16×60	10.3	12.0	13.1					
						T-FIXX GV M16×100	15.1	15.1	15.1					
						T-FIXX GV M16×125	15.1	15.1	15.1					
						1988 FV M16×75	17.7	17.7	17.7					
						1988 FV M16×140	17.7	17.7	17.7					
						1988 FV M16×220	17.7	17.7	17.7					
		HEK2 L-100-FV	26.3	28.2	28.2	T-FIXX GV M16×60	10.3	12.0	13.1					
						T-FIXX GV M16×100	15.1	15.1	15.1					
						T-FIXX GV M16×125	15.1	15.1	15.1					
						1988 FV M16×75	17.7	17.7	17.7					
						1988 FV M16×140	17.7	17.7	17.7					
						1988 FV M16×220	17.7	17.7	17.7					
											Typ $d_{nom} \times L$ [mm]	Design resistance $V_{Rd,T}$ [kN] ③		
											C30/37	C40/50	C50/60	
Design resistances shear stress only, perpendicular to the joint		HEK2 T-100-FV	12.0	13.9	15.2	T-FIXX GV M16×60	5.6	6.5	7.2					
						T-FIXX GV M16×100	6.7	7.8	8.6					
						T-FIXX GV M16×125	7.3	8.5	9.3					
						1988 FV M16×75	6.4	7.5	8.2					
						1988 FV M16×140	7.9	9.1	10.0					
						1988 FV M16x220	8.6	10.0	11.0					
		HEK2 T-100-FV	26.3 (12.0②)	28.2 (13.9②)	28.2 (15.2②)	T-FIXX GV M16×60	5.6	6.5	7.2					
						T-FIXX GV M16×100	6.7	7.8	8.6					
						T-FIXX GV M16×125	7.3	8.5	9.3					
						1988 FV M16×75	6.4	7.5	8.2					
						1988 FV M16×140	7.9	9.1	10.0					
						1988 FV M16x220	8.6	10.0	11.0					

① The resistances given for tensile or shear stress are design resistance values according to approval Z-21.8-2086; these are for one HEK Precast coupler in combination with splitting reinforcement, in compliance with the following boundary conditions; component thickness $h = 100$ mm, edge distance $c_1 = 50$ mm and width of connection joint $f \leq 20$ mm, without additional reinforcement. Values only apply for non-cracked concrete.

② If concrete edge failure cannot be prevented using another method.

③ The resistances given for tensile or shear stress are design resistance values according to CEN/TS 1992-4-2; these are for a fixing anchor installed at component edge with tensile splitting reinforcement and the following boundary conditions; component thickness $h = 100$ mm, edge distance $c_1 = 50$ mm and joint width $f = 5$ mm (shear load with lever arm $e = 12$ mm). Values only apply for non-cracked concrete, no dense reinforcement (risk of concrete spalling). Further requirements may result from the fixing anchor verification.

HALFEN HEK PRECAST COUPLER

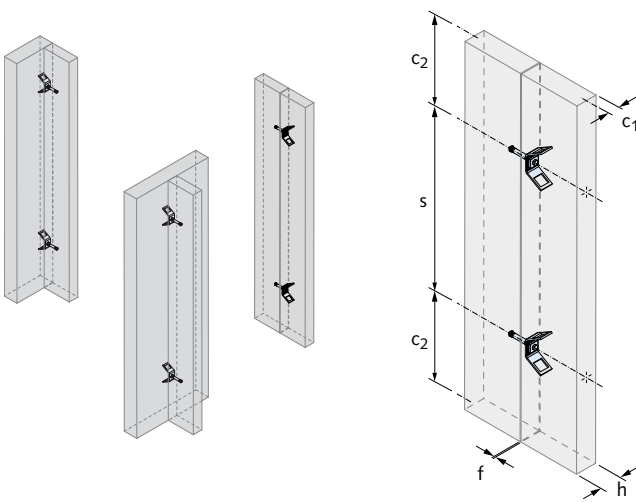
Dimensioning/Boundary Conditions

Combined tensile and shear loads

In practice connection situations are often designed in which the connecting and anchoring elements are simultaneously subjected to tensile and shear stresses. The interaction of the combined loads has to be verified in addition to individual static verification.

The interaction equations specified in DIN SPEC 1021-4:2009-08 must be applied for the HEK Precast coupler.

Boundary conditions



- normal concrete, strength class C20/25 bis C50/60
- component thickness $h \geq 100$ mm
- joint width $f \leq 20$ mm
- edge distance perpendicular to joint $c_1 \geq 50$ mm
- edge distance parallel to joint $c_2 \geq 225$ mm
- axial spacing parallel to joint $s \geq 450$ mm
- at least two HEK Precast couplers per joint
- the HEK Recess former must be used
- minimum bolt size M16
- installation using the provided torque T_{inst} (see tables on page 10 or the installation instructions)

HALFEN HBJ Betojuster

The HALFEN HBJ Betojuster is an auxiliary device for adjusting and aligning precast concrete elements.

Advantages:

- simple screw, damage free, height adjustable installation
- crane time optimisation; once the elements are placed and adequately secured and shored, the crane is available to lift the next element
- adjustment range of up to 35 mm
- requires only standard tools
- minimal effort required
- especially designed for applications where access is restricted



For detailed information please refer to the **Technical Product Information** for the "HALFEN HBJ Betojuster"



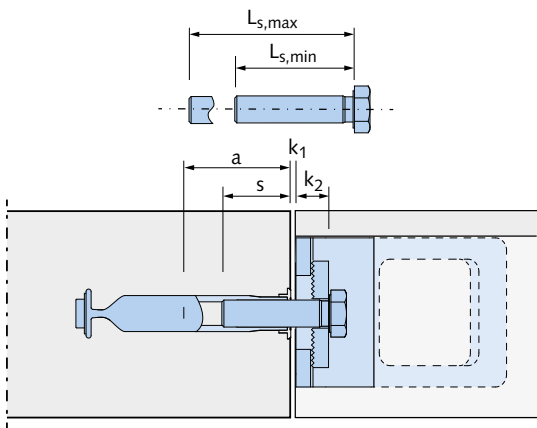
HALFEN HEK PRECAST COUPLER

Boundary conditions/Order information

Required bolt length

General

The HEK Precast coupler is fixed to a cast-in, sleeve anchor with a bolt. Only bolts specified by the responsible engineer are permitted. The required bolt length L_s must be verified.



Required bolt length

$$L_s \geq L_{s,\min}$$

$$L_s \leq L_{s,\max}$$

with

$$L_{s,\min} = s + k_1 + k_2 \text{ (minimum bolt length)}$$

$$L_{s,\max} = a + k_1 + k_2 \text{ (maximum bolt length)}$$

s = minimum screw-in depth of the fixing anchor according to manufacturer's specification

a = maximum screw-in depth of the fixing anchor according to manufacturer's specification

k_1 = clamp thickness of the joint gap

k_2 = 14 mm (clamp thickness of the HEK Precast coupler with counterplate)

Allowable screw-in depth of the DEMU Fixing anchor

Observe the minimum and maximum values for screw-in depth as specified in the Technical Product Information for DEMU fixing anchors. Download at: www.halfen.com

Scope of application/Corrosion protection

The hot-dip galvanized steel precast coupler can only be used in dry interior environments, e.g. in residential projects, offices, schools, hospitals and commercial projects - except for wet rooms.

If all steel parts of the HEK precast coupler in the joint and in the recess opening are completely grouted acc. to DAfStb Guideline "Production and Application of Cementitious Concrete Cast and Grout", the application, regarding exposition class and concrete cover, is considered Eurocode 2 conform.

Hot dipped galvanized (FV)

The HEK Precast coupler and the matching counterplates are hot-dip galvanized according to DIN EN ISO 1461 and DASt Directive 022. The local layer thickness has a minimum cover of $45 \mu\text{m}$ ("local layer thickness" determined according to EN ISO 1461).

DASt: German Committee for Steel Construction.

DAfStB: German Committee for Structural Concrete

Tender specifications (Example)

HALFEN HEK Precast coupler type HEK2 L-100-FV

HALFEN HEK Precast coupler with general building authority approval Z-21.8-2086, for connection of precast elements, for static loads and quasi-static loads, in reinforced and non-reinforced concrete; grade 20/25 to C50/60

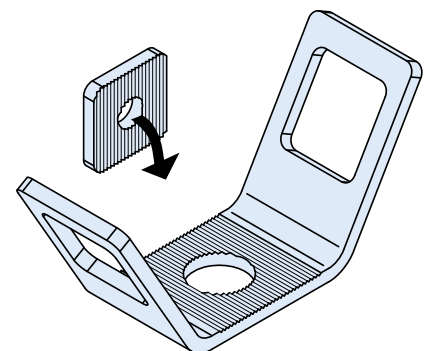
type HEK2 L-100-FV

with

L-100 = serrated for transfer and anchoring of tensile and shear stress parallel to the joint.

FV = hot-dip galvanized for corrosion protection,

or equivalent, delivered and installed according to the manufacturer's installation instructions.

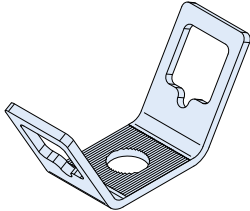


HALFEN HEK PRECAST COUPLER

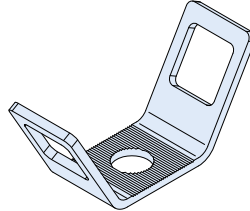
Product overview/accessories

HEK Precast coupler and counterplate

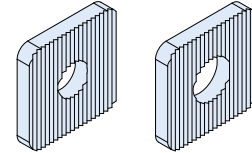
HEK2 T-100-FV Precast coupler



HEK2 L-100-FV Precast coupler



Counterplate for connecting bolts
M 16/M 20



HEK Precast coupler

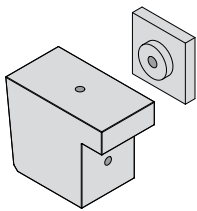
Type	Article name	Order no.
Precast coupler, transfer and anchorage of tensile and shear stress, perpendicular to the joint, hot-dip galvanized	HEK2 T-100-FV	0950.200-00001
Precast coupler, transfer and anchorage of tensile and shear stress, parallel to the joint, hot-dip galvanized	HEK2 L-100-FV	0950.200-00002
Serrated counterplate, hole diameter 17 mm, hot-dip galvanized	HEK2 C-100-17-FV	0950.210-00001
Serrated counterplate, hole diameter 21 mm, hot-dip galvanized	HEK2 C-100-21-FV	0950.210-00002

Bolts are not scope of delivery and have to be ordered separately.

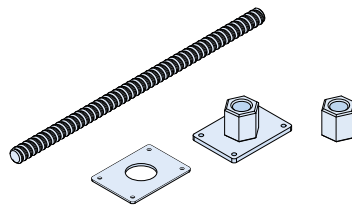
HEK assembly accessories

HALFEN offers a wide range of accessories to allow easy and fast installation. Further information can be found in the "Installation instructions" section.

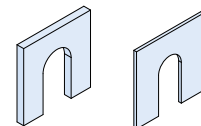
Recess former set, consisting of a two part, reusable, plastic recess former. Inserts with knuckle thread.



HEK Fixing set (with knuckle thread), for connecting the recess former and HEK Precast coupler to the formwork.



Slotted u-shims, hot-dip galvanized, to shim excessive gaps in joints between the HEK Base plate and a fixing anchor.



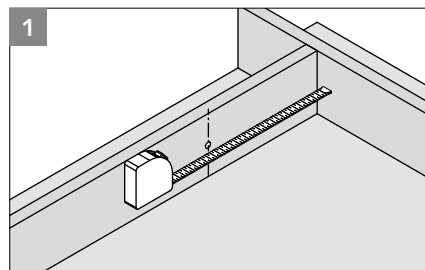
HEK Installation accessories

Part description	Article name	Order no.
Recess former set for element thickness 100 mm	HEK-RF Set-100	0950.240-00001
Recess former set for element thickness 120 mm	HEK-RF Set-120	0950.240-00002
Recess former set for element thickness 140 mm	HEK-RF Set-140	0950.240-00003
Recess former set for element thickness 160 mm	HEK-RF Set-160	0950.240-00004
Recess former set for element thickness 180 mm	HEK-RF Set-180	0950.240-00005
HEK Fixing set, each set contains 2 threaded rods 200 mm, hexagonal nuts, shims and fixing plates	HEK Fixing set	0950.120-00001
U-shim 2 mm, slot width 17 mm, mechanical galvanized	HEK2 SW-100-17×2-MV	0950.220-00001
U-shim 3 mm, slot width 17 mm, mechanical galvanized	HEK2 SW-100-17×3-MV	0950.220-00002
U-shim 5 mm, slot width 17 mm, hot-dip galvanized	HEK2 SW-100-17×5-FV	0950.220-00003
U-shim 2 mm, slot width 21 mm, mechanical galvanized	HEK2 SW-100-21×2-MV	0950.220-00011
U-shim 3 mm, slot width 21 mm, mechanical galvanized	HEK2 SW-100-21×3-MV	0950.220-00012
U-shim 5 mm, slot width 21 mm, hot-dip galvanized	HEK2 SW-100-21×5-FV	0950.220-00013

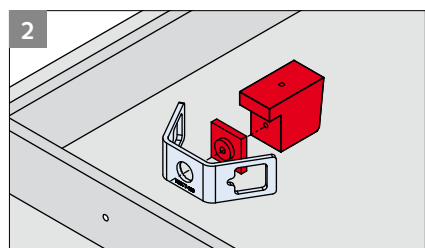
HALFEN HEK PRECAST COUPLER

Installation Instructions

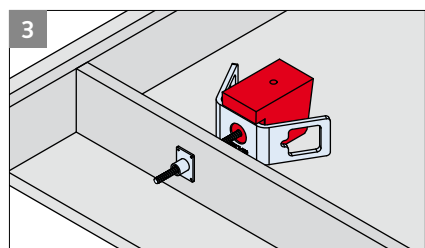
Installation in the precast plant



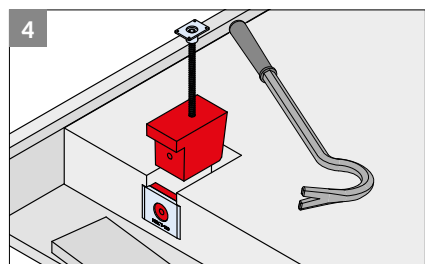
1 Mark the exact position for the precast coupler and drill an 11 mm hole for the bolt in the formwork.



2 Assemble the two part, reusable recess former and the HEK Precast coupler.

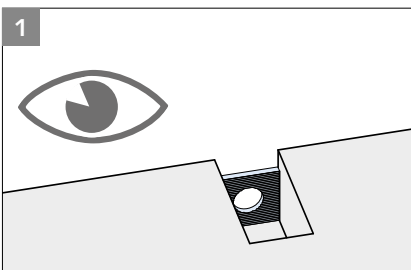


3 Fix the recess formers and precast coupler assembly to the formwork using the HEK Fixing set.

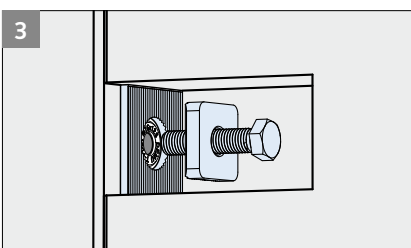


4 After the concrete has sufficiently hardened, unscrew the bolt and remove the formwork. Screw the bolt into the other hole in the top of the recess former and lift it out of the concrete.

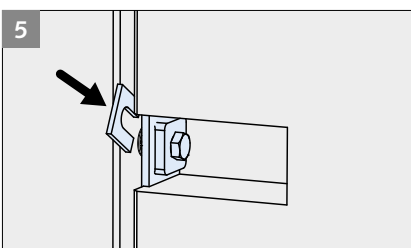
On-site installation



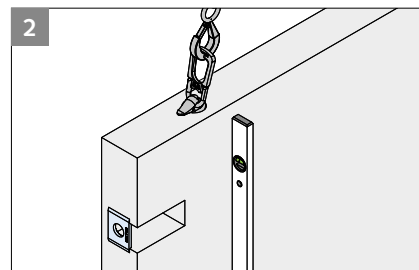
1 Ensure the serration of the HEK Precast coupler is clean; remove any foreign material objects.



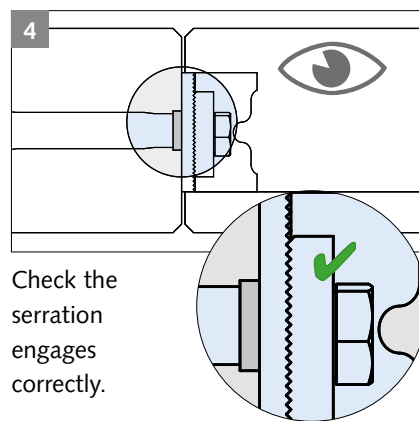
3 Insert the counterplate with the fixing bolt into the installation access hole and screw the bolt into the fixing anchor. Ensure the correct bolt length (the bolt is not part of delivery).



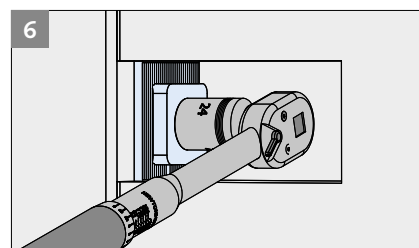
5 If necessary, use slotted shims between the precast coupler and the fixing anchor.



2 Place and adjust the concrete element.



4 Check the serration engages correctly.



6 Observe the installation tightening torque for the HEK Precast coupler as specified in the tables. Please check the manufacturer's specifications for the sleeve anchor separately.

Tightening torque T_{Inst} (recommended values) [Nm]	
Bolt thread	HEK2 T-100-FV/HEK2 L-100-FV
M 16	50 *
M 20	80 *

* Values are valid for unlubricated bolts. It is strongly recommended to use washers for shimming the bolted connection of the HEK precast coupler in case of joints or recessed installed fixing anchors. The specific losses of the clamping force caused by bolt relaxation are already considered with these recommendation values.

Fixing Solutions System

The advantages at a glance

DEMU Fixing anchors with internal thread are suitable for use in permanent anchorages subjected to predominantly static loads or quasi-

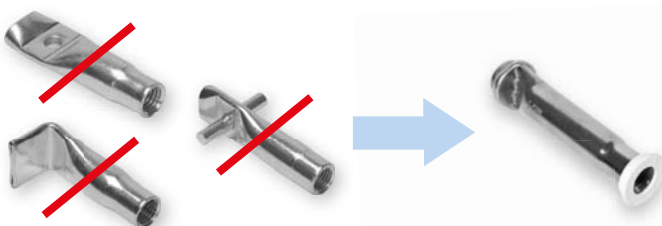
static loads in reinforced and unreinforced normal weight concrete from strength class C20/25 to C90/105.

They may be used in cracked or non-cracked concrete for transfer of tensile loads, shear loads or a combination of both.



	T-FIXX®	Bolt anchor	Bar anchor
Loads	Medium load capacity	High load capacity	High load capacity
Application/ boundary conditions	<ul style="list-style-type: none"> • medium sized loads • near edge applications (also in high strength concrete) • thin concrete • concrete load capacity decisive • normal strength concrete 	<ul style="list-style-type: none"> • high loads • fixing with no influence from edge distance or spacing • high steel strength required • application also in high strength concrete 	<ul style="list-style-type: none"> • high tension loads • use in edge of thin elements (deep embedment required) • high steel strength required • application also in high strength concrete
Application examples	<ul style="list-style-type: none"> • fixing of balcony and bridge railings • fixing of utility equipment, power lines, installation brackets • fixing of stadium seats • fixing of steel access stairs or ladders • fixing of connection elements for precast concrete elements • connection of bracings to precast concrete elements • window fixings 	<ul style="list-style-type: none"> • fixing of balcony and bridge railings • fixing of utility equipment, power lines, installation brackets • fixing of stadium seats • fixing of steel access stairs or ladders 	<ul style="list-style-type: none"> • fixing of balcony and bridge railings • fixing of utility equipment, power lines, installation brackets • fixing of stadium seats • fixing of steel access stairs or ladders
Design concept/ calculation	according to CEN/TS 1992-4-1/2	according to CEN/TS 1992-4-1/2	according to EN 1992-1-1 (Section 8.4)
Calculation software			
European Technical Assessment	ETA-13/0222	ETA-13/0401	

The T-FIXX® Sleeve anchor replaces the standard sleeve anchors



With its wide range of applications and in respect to load capacity the T-FIXX® can replace all anchor sleeves of the same dimensions; because of its higher load characteristics, can even replace anchors with larger dimensions. This allows the use of smaller anchor sizes, which reduces the total cost for each connection.

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