

HALFEN HD SOCKET LIFTING SYSTEM

Technical Product Information





We are one team. **We are Leviat.**

Leviat is the new name of CRH's construction accessories companies worldwide.

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HALFEN HD SOCKET LIFTING SYSTEM

Certified quality – Connected to safety.



The HALFEN HD Socket Lifting System meets the requirements of European Machinery Directive (MD) 2006/42/EC. The directive defines the required steel-load-bearing properties for anchor systems used for lifting.

In addition, the HALFEN transport anchors already meet the current EN 13155 standard; "Cranes – Safety – Non-fixed load lifting attachments".

Important changes for use in the UK:

The UK is transitioning to its own UK based approval system and, as a result, from January 2023 will no longer accept CE marking. Leviat already has new UKCA marking in place and from 2023 at the latest, the UKCA mark will also be applied directly to the lifting devices, as required by the UKCA regulations. The conformity assessment processes and standards that can be used to demonstrate conformity under UKCA marking are aligned with those required for CE marking, so there is no difference in performance or testing requirements.



EN 13155 is the first harmonized European standard and is therefore a product standard setting out detailed requirements for specified "partly completed machinery", in this case Non-fixed load lifting attachments. The standard serves to coordinate with the Machinery Directive, and on a European technical level, now also considers the decisive composite material concrete, in precast concrete components.

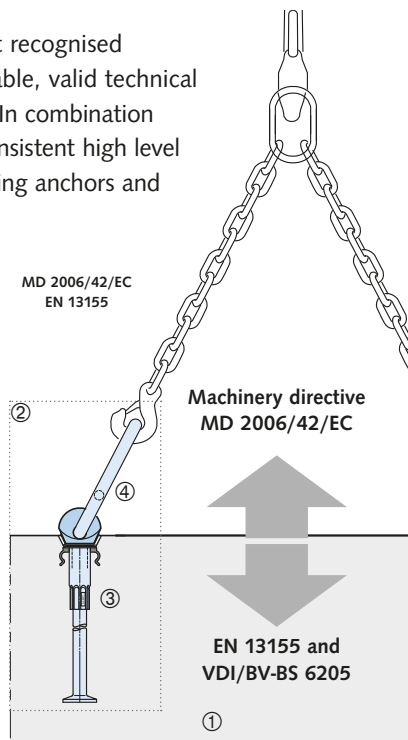
Previous, as a supplement to the Machinery Directive, the German guideline VDI/BV-BS 6205 regulated the resistances of embedded anchors required for the safe use of lifting anchor systems. In the process of publishing EN 13155, the guideline was also fundamentally revised. As before, it continues to provide basics and important additional information for manufacturing, design and use of lifting anchor systems.

The VDI/BV-BS 6205 continues to represent recognised standards of technology in this field; applicable, valid technical specifications will continue to be observed. In combination with EN 13155, we therefore guarantee a consistent high level of safety when using HALFEN HD Socket lifting anchors and lifting anchor systems.

All our lifting anchor systems are CE marked. This confirms conformity with MD 2006/42/EC and EN 13155. This catalogue includes the installation and application instruction as defined in EN 13155. Our lifting anchors and lifting anchor systems are subject to a system of regular internal and external monitoring. We guarantee consistent high quality and maximum safety for you, your company and your employees.



MD 2006/42/EC
EN 13155



- ① Precast element
- ② Lifting anchor system ③+④
- ③ Lifting anchor
- ④ Lifting link

Dependability

High ductility – High performance even in extreme situations



Specially tempered steel guarantees extensive elastic and plastic properties. The required unique steel compositions to achieve these product characteristics are specified by us. Numerous tests and many years of experience guarantee the best possible results and maximum reliability in all applications.

Toughness at subzero temperatures – Same material characteristics irrespective of weather conditions

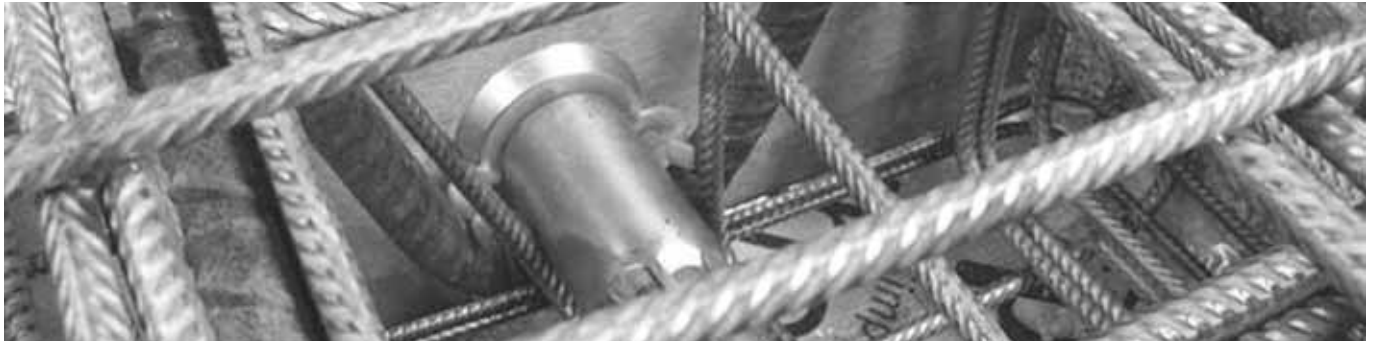


The special composition of the steel ensures constant identical characteristics (temperature independent). The steel used for our products exceeds the requirement of DIN EN 10025.

Quality control – for reliable application



By specifying products, materials and continual raw material and product monitoring, and testing by renown independent bodies and universities, our customers can be sure that the quality and properties of all our Anchors remain consistent.



CONTENT

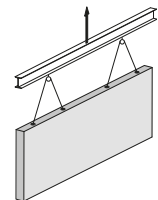
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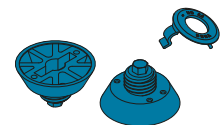
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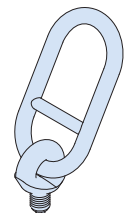
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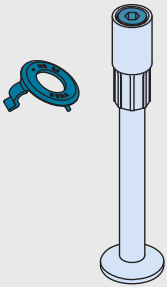
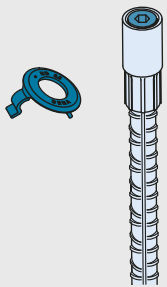
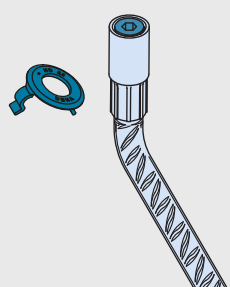
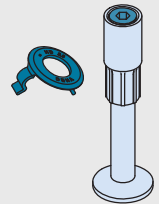
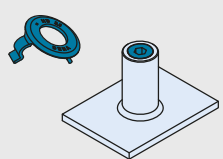
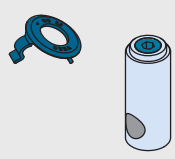


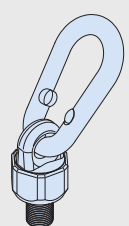
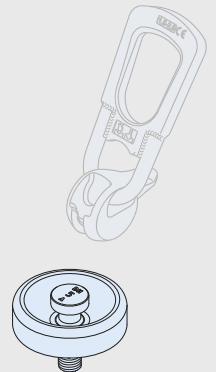


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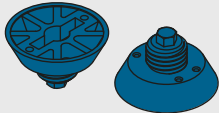
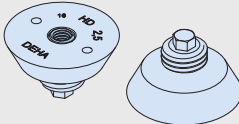
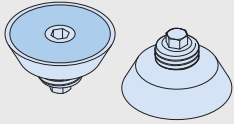
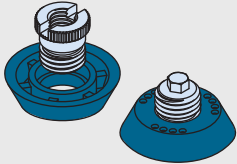
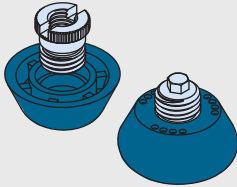


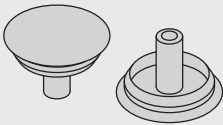
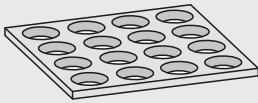
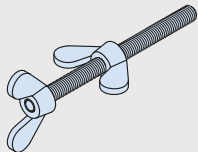
HALFEN HD SOCKET LIFTING SYSTEM

System Overview

HD Transport anchor				
	HD Anchor 6360	HD Rod anchor 6361	HD Rod anchor offset	
				
Application	For lifting a wide range of different format precast concrete elements	For application in especially thin structural elements: garage walls, utility and modular structures	For application in sandwich elements; is used with a compensating beam for transporting and installation	
Load class	1,3 - 25,0	1,3 - 15,0	5,0 - 15,0	
	HD Short anchor 6360	HD Plate anchor 6370	HD Plain anchor with hole 6376	
				
Application	For transporting slab elements; for example floor and roof slabs	For transporting large, thin precast slabs elements that are lifted perpendicular to their main surface	For lifting thin precast walls or for use with low-strength concrete. Load transmission in the concrete is with hanger reinforcement inserted through the anchor hole.	
Load class	1,3 - 7,5	1,3 - 7,5	1,3 - 10,0	
HD Lifting devices				
	HD Lifting link 6362	HD Perfect head lifting link 6377	Rotary head lifting link 6367	HD Adapter 6366
				
Application	For lifting precast elements with cast-in HD Transport anchors	For lifting precast elements with cast-in HD Transport anchors	For lifting precast elements with cast-in HD Anchors. Especially suitable for diagonal and shear loads and for tilting and pitching.	The HD Adapter allows the HD Anchor range to be used with the HALFEN DEHA Universal head lifting link (spherical head anchor system).
Load class	1,3 - 15,0	1,3 - 15,0	1,3 - 25,0	1,3 - 15,0

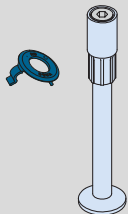
HALFEN HD SOCKET LIFTING SYSTEM

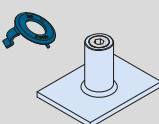
System Overview

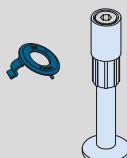
HD Anchor accessories							
	HD Nailing plate, plastic		HD Nailing plate, steel		HD Nailing plate, steel core + magnet		
	6358		6369		6365		
							
Material	Plastic		Steel		Steel		
Application	To secure the HD Anchor to formwork: when using the HD link (6362), the rotary head link (6367), the HD Perfect head (6377) and the adapter (6366) for the Universal head clutch (6102)						
Thread sizes M/Rd	12 - 52						
	Combi nailing plate, steel core+replacement ring		Combi nailing plate, steel core+replacement ring		HD Identification cap		
	6510		6520		6363		
							
Material	Ring: plastic, Thread: steel		Ring: plastic, Thread: steel		Plastic		
Application	To secure the HD Anchor to formwork when using the HD link (6362), the rotary head link (6367), the HD Perfect head (6377) and the adapter (6366) for the Universal head clutch (6102)		To secure the HD Anchor to formwork when using the HD lifting link (6362), the rotary head link (6367) and the HD Perfect head (6377)		The identification cap provides information on the installed HD Anchor. The clip can also be used to secure potentially required reinforcement.		
Thread sizes M/Rd	12 - 64		12 - 52		load class 1,3 - 15,0		
	Sealing caps		Sealing cap		Rubber mould	Retaining bolt S1	
	6359		6315		6513	6329	TPA-S1
							
Material	Plastic		Plastic		Rubber	Steel	
Application	Used to seal and protect threads against dirt and other impurities		Used to seal and protect the anchor against dirt and other impurities. Especially for decorative concrete. Suitable for: (6358), (6369), (6365), (6510)		Mould for making 10 mm thick concrete recess caps	Used to secure the steel nailing plate to the formwork	
Thread sizes M/Rd	12 - 52		12 - 24		all load classes	8, 12, 16	

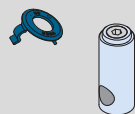
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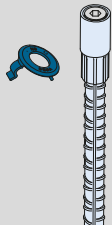
Product Range HD Anchors

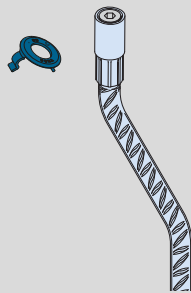
HD Anchor			
Load class			
	Article name	Order no.	0740.130-
Socket zinc-plated	1,3	6360-1,3-130	00001
	2,5	6360-2,5-140	00040
	2,5	6360-2,5-200	00002
	4,0	6360-4,0-258	00003
	5,0	6360-5,0-325	00004
	7,5	6360-7,5-400	00005
	10,0	6360-10,0-475	00006
	12,5	6360-12,5-550	00007
	15,0	6360-15,0-575	00008
	25,0	6360-25,0-630	00041
Socket stainless steel A4	1,3	6360-1,3-130 A4	00009
	2,5	6360-2,5-200 A4	00010
	4,0	6360-4,0-258 A4	00011
	5,0	6360-5,0-325 A4	00012
	7,5	6360-7,5-400 A4	00013
	10,0	6360-10,0-475 A4	00014
	12,5	6360-12,5-550 A4	00015
15,0	6360-15,0-575 A4	00016	

HD Plate anchor			
Load class			
	Article name	Order no.	0740.180-
Zinc-plated	1,3	6370-1,3	00001
	2,5	6370-2,5	00002
	4,0	6370-4,0	00003
	5,0	6370-5,0	00004
	7,5	6370-7,5	00005
Stainless steel A4	1,3	6370-1,3 A4	00006
	2,5	6370-2,5 A4	00007
	4,0	6370-4,0 A4	00008
	5,0	6370-5,0 A4	00009
	7,5	6370-7,5 A4	00010

HD Short anchor			
Load class			
	Article name	Order no.	0740.130-
Socket zinc-plated	1,3	6360-1,3-070	00017
	2,5	6360-2,5-090	00018
	4,0	6360-4,0-125	00019
	5,0	6360-5,0-140	00020
	7,5	6360-7,5-185	00038
	Socket stainless steel A4	1,3	6360-1,3-070 A4
2,5		6360-2,5-090 A4	00022
4,0		6360-4,0-125 A4	00023
5,0		6360-5,0-140 A4	00024
7,5		6360-7,5-185 A4	00039

HD Plain anchor			
Load class			
	Article name	Order no.	0740.190-
Zinc-plated	1,3	6376-1,3	00001
	2,5	6376-2,5	00002
	4,0	6376-4,0	00003
	5,0	6376-5,0	00004
	7,5	6376-7,5	00005
	10,0	6376-10,0	00006
Socket stainless steel A4	1,3	6376-1,3 A4	00007
	2,5	6376-2,5 A4	00008
	4,0	6376-4,0 A4	00009
	5,0	6376-5,0 A4	00010
	7,5	6376-7,5 A4	00011
	10,0	6376-10,0 A4	00012

HD Rod anchor				
Load class				
	Article name	Order no.	0740.140-	
Socket zinc-plated	1,3	6361-1,3-300	00001	
	2,5	6361-2,5-400	00002	
	4,0	6361-4,0-520	00003	
	5,0	6361-5,0-540	00004	
	7,5	6361-7,5-700	00005	
	10,0	6361-10,0-800	00006	
	12,5	6361-12,5-920	00007	
	15,0	6361-15,0-1100	00008	
	Socket stainless steel A4	1,3	6361-1,3-300 A4	00009
		2,5	6361-2,5-400 A4	00010
4,0		6361-4,0-520 A4	00011	
5,0		6361-5,0-540 A4	00012	
7,5		6361-7,5-700 A4	00013	
10,0		6361-10,0-800 A4	00014	
12,5		6361-12,5-920 A4	00015	
15,0	6361-15,0-1100 A4	00016		

HD Rod anchor, offset			
Load class			
	Article name	Order no.	0740,220-
Socket zinc-plated	5,0	6361G-5,0-540	00001
	7,5	6361G-7,5-700	00002
	10,0	6361G-10,0-800	00003
	12,5	6361G-12,5-920	00004
	15,0	6361G-15,0-1100	00005

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Product Range Accessories

HD Anchor accessories										
Load class	Plastic nailing plate		Identification cap, plastic		HD Nailing plate, steel		HD Nailing plate, magnetic		HD Nailing plate, steel with thread-reduction, pre-assembled	
	Article name	Order no. 0741.040-	Article name	Order no. 0741.170-	Article name	Order no. 0741.190-	Article name	Order no. 0741.180-	Article name	Order no. 0741.190-
1,3	6358-12	00001	6363-12	00001	6369-12	00001	6365-12	00001	-	-
2,5	6358-16	00003	6363-16	00002	6369-16	00002	6365-16	00002	6369-16	00102
4,0	6358-20	00005	6363-20	00003	6369-20	00003	6365-20	00003	6369-20	00103
5,0	6358-24	00006	6363-24	00004	6369-24	00004	6365-24	00004	6369-24	00104
7,5	6358-30	00007	6363-30	00005	6369-30	00005	6365-30	00005	6369-30	00105
10,0	6358-36	00008	6363-36	00006	6369-36	00006	6365-36	00006	-	-
12,5	6358-42	00009	6363-42	00007	6369-42	00007	6365-42	00007	-	-
15,0	6358-52	00010	6363-52	00008	6369-52	00008	6365-52	00008	-	-

HD Anchor accessories												
Load class	Nailing plate, steel core h = 10 mm		Replacement ring for 6510 h = 10 mm		Nailing plate, steel core h = 20 mm		Replacement ring for 6520 h = 20 mm		Retaining bolt		Mould for recess fillers	
	Article name	Order no. 0741.080-	Article name	Order no. 0741.090-	Article name	Order no. 0741.210-	Article name	Order no. 0741.230-	Article name	Order no. 0073.060-	Article name	Order no. 0741.290-
1,3	6510-12	00101	6512-12	00001	6520-12	00101	6522-12	00001	S1-08	00001	6329-12-16	00001
2,5	6510-16	00103	6512-16	00003	6520-16	00103	6522-16	00003	S1-12	00002	6329-18-24	00002
4,0	6510-20	00105	6512-20	00005	6520-20	00105	6522-22	00005			6329-30-36	00003
5,0	6510-24	00106	6512-24	00006	6520-24	00106	6522-24	00006			S1-16	00003
7,5	6510-30	00107	6512-30	00007	6520-30	00107	6522-30	00007	-	-		
10,0	6510-36	00108	6512-36	00008	6520-36	00108	6522-36	00008	-	-	-	-
12,5	6510-42	00109	6512-42	00009	6520-42	00109	6522-42	00009	-	-	-	-
15,0	6510-52	00110	6512-52	00010	6520-52	00110	6522-52	00010	-	-	-	-
25,0	6510-64	00111	6512-64	00011	-	-	-	-	-	-	-	-

HD Anchor accessories												
Load class	Sealing cap		Sealing cap*		Sealing cap		HD Assembly pin		Flat seal, rubber (yellow)		Tool for steel nailing plate	
	Article name	Order no. 0741.280-	Article name	Order no. 0741.120-	Article name	Order no. 0741.130	Article name	Order no. 0741.300-	Article name	Order no. 0741.330-	Article name	Order no. 0741.350-
1,3	6313-12	00001	6359-12	00001	6315-12	00001	6330-Rd 12-30	00001	6334-Rd 12-16	00001	6337-Rd 12-16	00001
2,5	6313-16	00002	6359-16	00003	6315-16	00003			6334-Rd 20-24	00002	6337-Rd 20-52	00002
4,0	6313-20	00003	6359-20	00005	6315-20	00005			6334-Rd 30-36	00003		
5,0	6313-24	00004	6359-24	00006	6315-24	00006	-	-	-	-	-	-
7,5	-	-	6359-30	00007	6315-30	00007	-	-	-	-	-	-
10,0	-	-	6359-36	00008	6315-36	00008	-	-	-	-	-	-
12,5	-	-	6359-42	00009	6315-42	00009	-	-	-	-	-	-
15,0	-	-	6359-52	00010	6315-52	00010	-	-	-	-	-	-

*see also page 7; for more detailed information refer to the Technical Product Information "HALFEN HA Socket Lifting System"

HALFEN HD SOCKET LIFTING SYSTEM

Product Range HD Lifting Links and Clutches/ Application Notes

Lifting links										
Load class	HD Link		HD Perfect head		HD Rotary head link		HD Adapter		Universal head clutch	
	Article name	Order no. 0742.130-	Article name	Order no. 0742.170-	Article name	Order no. 0742.230-	Article name	Order no. 0742.140-	Article name	Order no. 0738.010-
1,3	6362-12	00001	6377-12	00001	6367-12	00001	6366-12	00001	6102-1,0/1,3	00001
2,5	6362-16	00002	6377-16	00002	6367-16	00002	6366-16	00002	6102-1,5/2,5	00002
4,0	6362-20	00003	6377-20	00003	6367-20	00003	6366-20	00003	6102-3,0/5,0	00003
5,0	6362-24	00004	6377-24	00004	6367-24	00004	6366-24	00004		
7,5	6362-30	00005	6377-30	00005	6367-30	00005	6366-30	00005	6102-6/10	00004
10,0	6362-36	00006	6377-36	00006	6367-36	00006	6366-36	00006		
12,5	6362-42	00007	6377-42	00007	6367-42	00007	6366-42	00007	6102-12/20	00005
15,0	6362-52	00008	6377-52	00008	6367-52	00008	6366-52	00008		
25,0	-	-	-	-	6367-64	00009	-	-	-	-

Preparation and installing to the formwork

- ① Fix the nailing plate to the formwork (the steel nailing plate is held in place with a retaining bolt).



- ③ Turn the identification cap to the required position (depends on the position of subsequent reinforcement).



- ④ The HD Anchor can now be screwed to the nailing plate (see cut-away detail below).



- ② Press the identification cap on to the sleeve. The sleeve protection is in place on delivery.






Steel nailing plates: The sleeve protection cap is turned inwards while screwing the assembly onto the steel nailing plate (see cut-away below).



Steel nailing plate: Use a retaining screw to fix the HD Anchor and the nailing plate to the formwork.



Colour codes; load classes

Colour	Load class	Thread M/Rd
	red	1,3 12
	light grey	2,5 16
	green	4,0 20
	blue	5,0 24
	violet	7,5 30
	orange	10,0 36
	brown	12,5 42
	black	15,0 52
	green	25,0 64

 The listed load classes only apply for the HD Transport anchor system. The colour codes for the HALFEN DEHA HA Socket anchor system can be found in the technical product information "HALFEN DEHA HA Socket anchors".

HALFEN HD SOCKET LIFTING SYSTEM

Installation and Application

Safety regulations

The transport anchor system consists of the permanently cast-in transport anchor and the temporarily connected lifting equipment.

The basic principles for dimensioning and application of transport anchors can be found in the EN 13155.

The regulations require the following safety factors:

Safety against failure	
Steel failure of anchors:	$\gamma = 3.0$
Concrete failure*:	$\gamma = 2.5$
Breakage of lifting link:	$\gamma = 4.0$

* A safety factor of $\gamma = 2.3$ can be assumed for transport anchors installed in a continuous supervised factory environment.



For safety reasons, the installation and application instructions for the HALFEN Lifting systems must always be available at the place of use.

The installation and application instructions must be kept readily available in the precast plant and on the construction site. The plant or site manager must ensure that the operator has read and understood the installation and application instructions for this system.

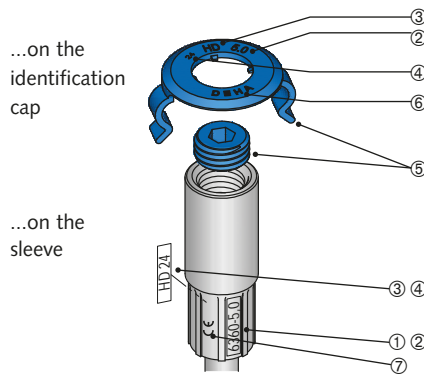
Quality control

All transport anchors and systems are quality controlled in accordance with DIN EN ISO 9001.

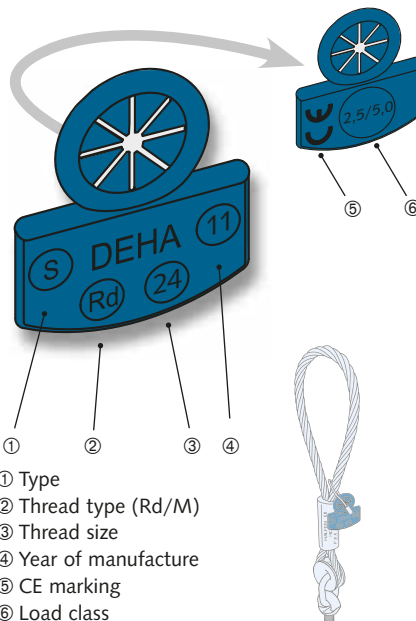
Identification

All HALFEN Lifting and hoisting equipment are clearly and visibly marked. According to EN 13155, identification marking of all lifting elements must remain clearly visible, even after installation.

Identification



- ① Article name, example: 6360
 - ② Load class, example: 5,0
 - ③ HD = anchor type
 - ④ Thread Rd, example: 24
 - ⑤ Colour code for load class, example: blue for 5,0
 - ⑥ Manufacturer mark
 - ⑦ CE marking
- ...on the load label on the clutch



- ① Type
- ② Thread type (Rd/M)
- ③ Thread size
- ④ Year of manufacture
- ⑤ CE marking
- ⑥ Load class

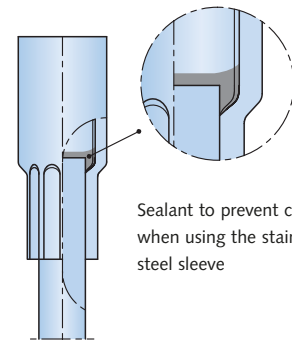
Stainless steel transport anchor

Repeated use of a transport anchor is not permitted. Multiple lifting within one transport-chain from production to final installation of an element is not regarded as repeated use and is therefore allowed.

Transport anchors for permanent use in crane ballast etc. must be made of stainless steel in accordance with the approval regulation for stainless steel; approval no. Z-30.3-6.

If the anchors are regularly exposed to frost and de-icing salt then the shaft must also be ordered in stainless steel.

Corrosion protection



Sealant to prevent corrosion when using the stainless steel sleeve

Damaged anchors

Incorrectly cast or damaged transport anchors, for example damage caused by corrosion, visible deformation etc. must not be used for lifting.

HALFEN HD SOCKET LIFTING SYSTEM

Installation and Application

Criteria for anchor selection

Maximum load capacities, edge distances and installation values can be found in the respective tables. Irrespective of the selected anchor type (selected according to the load acting on the anchor) the following factors must be taken into account for calculation:

- › weight of the precast element
- › number of anchors
- › anchor layout
- › number of load-bearing anchors
- › spread angle in the hoist
- › anchor diagonal load properties
- › dynamic loads
- › adhesion to the formwork

Ensure sufficient pitching reinforcement if slabs are cast in the horizontal and subsequently lifted upright without a tilting-table.

Number of anchors

The number of anchors determines the type of hoist that needs to be used. A hoist with more than two cables is statically indeterminate if the anchors are aligned along a single axis. Hoists with more than three cables are deemed statically indeterminate if measures are not taken to ensure the load is distributed amongst all anchors (for example: with a spreader beam).

Installation and application

The HD Transport anchor system should only be installed when the following technical specifications and requirements have been met:

- › load capacity
- › edge distance
- › concrete grade strength
- › load direction
- › additional reinforcement


Load capacity


The load capacity of the anchor depends on:


- › concrete compression strength f_{ci} at time of lift (cube-test $15 \times 15 \times 15$ cm)
- › anchorage length of the anchor
- › edge and axial anchor-spacing
- › load direction
- › reinforcement layout

Load directions

Definition of load directions:

 **Axial load**
The lifting link acts in the longitudinal direction of the cast-in lifting anchor

 **Diagonal load**
The lifting link acts at an angle to the longitudinal direction directly in the element

 **Shear load**
The lifting link acts perpendicular to the cast-in lifting anchor

Calculating the tension load

As a rule the tension-force Z in the anchor is calculated using the following formulae:

Load case; removing the formwork

$$F_Z = F_G \times z \times \xi / n$$

or

$$F_Z = (F_G + q_{adh} \times A_f) \times z / n$$

Load case; transport

$$F_Z = F_G \times z \times \psi_{dyn} / n$$

Abbreviations:

F_Z = tension force on the anchor [kN]

F_G = element weight [kN]
(according to DIN 1055-1 (06/2002) specific weight of $\gamma = 25$ kN/m³)

A_f = contact surface between the concrete and formwork [m²]

n = number of load-bearing anchors

z = spread angle factor

ξ = formwork adhesion factor

ψ_{dyn} = dynamic factor

q_{adh} = base value for formwork adhesion

F_{adh} = effective load caused by formwork adhesion [kN]

HALFEN HD SOCKET LIFTING SYSTEM

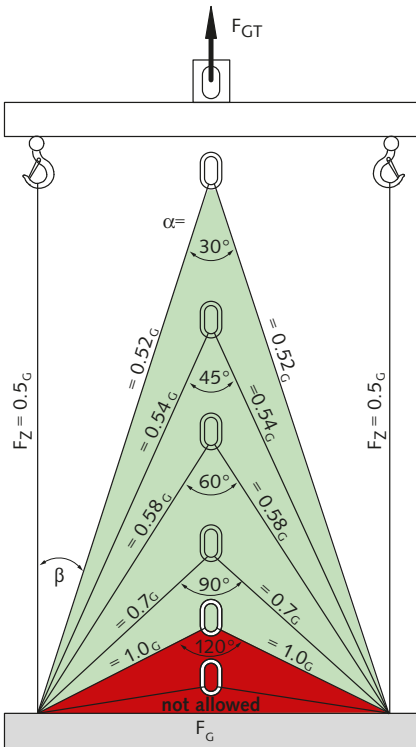
Installation and Application

Load on the anchor – dead-weight

Dead-weight of the element: Volume × specific weight of the concrete

Increase factors:

Spread angle



■ This spread angle is not permitted for cable spread!

Spread angle factor		
Cable angle	Spread angle	Factor
β	α	z
0°	-	1.00
7.5°	15.0°	1.01
15.0°	30.0°	1.04
22.5°	45.0°	1.08
30.0°	60.0°	1.16
37.5°	75.0°	1.26
45.0°	90.0°	1.41
52.5°	105.0°	1.64
60.0°	120.0°	2.00

Dynamic loads

The effect of dynamic loading depends mainly on the lifting equipment between the crane and the load lifting head.

Cables made of steel or synthetic fibre have a damping effect. With increasing cable length the damping effect is increased.

Short chains have an unfavourable effect. The forces acting on the lifting anchor are calculated taking the dynamic factor ψ_{dyn} into account.

Dynamic-factors ψ_{dyn}^*	
Lifting situation	Factors ψ_{dyn}^*
Stationary crane Swing-boom crane Rail crane	1.3
Lifting and moving on level terrain	2.5
Lifting and moving on uneven terrain	≥ 4.0

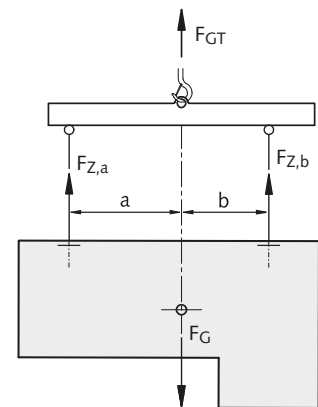
* If other values from reliable tests or through proven experience are available for ψ_{dyn} , then these may be used for calculation.

For other transport and lifting situations the coefficient ψ_{dyn} is defined through reliable tests or proven experience.

Non-symmetrical anchor layout

The load in each anchor is calculated using bar statics if the anchors are not installed symmetrically to the centre of gravity.

Uneven loading of the anchor caused by non-symmetrical installed anchors in respect to the load's centre of gravity:



The centre of gravity of the load will always stabilise verticality under the crane hook. Load distribution in non-symmetrical installed anchors when using a spreader beam is calculated as follows:

$$F_{Z,a} = F_G \times b / (a + b)$$

$$F_{Z,b} = F_G \times a / (a + b)$$

HALFEN HD SOCKET LIFTING SYSTEM

Design Considerations

Loads on the anchor – formwork adhesion

Adhesion:

> Adhesion forces

Depending on the material used for the formwork the adhesion between the formwork and concrete can vary.

The following table can be used as a reference:

Adhesion to the formwork	
Lubricated steel formwork	$q_{adh} \geq 1 \text{ kN/m}^2$
Varnished timber formwork	$q_{adh} \geq 2 \text{ kN/m}^2$
Untreated formwork	$q_{adh} \geq 3 \text{ kN/m}^2$

The adhesion value (F_{adh}) for the formwork is calculated with the following equation:

$$F_{adh} = q_{adh} \times A_f \text{ ①}$$

① Surface of the cast slab attached to the formwork before lifting.

> Increased adhesion

Increased adhesion must be assumed for π -panel and coffered ceilings slabs.

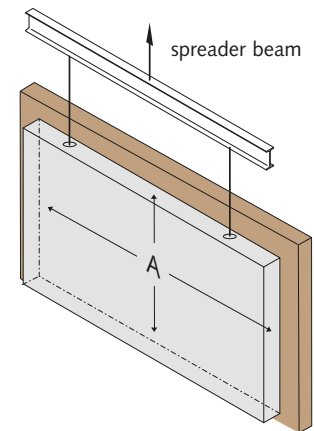
A multiple of the dead weight is used to simplify calculation.

Increased adhesion to the formwork	
π - panel	$\xi = 2$
Ribbed panel	$\xi = 3$
Waffled panel	$\xi = 4$

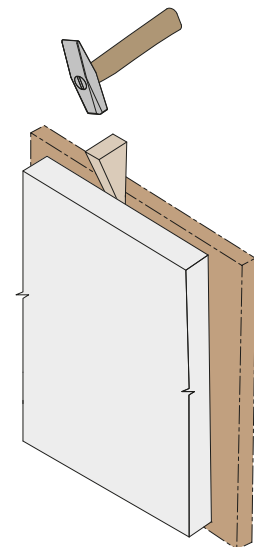
Substantial load increase can also be encountered when components are lifted parallel or near parallel to parts of the formwork. This applies to ribbed slabs and coffered ceiling slabs and can also apply to vertically cast columns and slabs.

> Striking the formwork

Adhesion to the formwork should be minimised before lifting by removing as many parts of the formwork as possible.



Use a wedge to carefully prise difficult to remove formwork from hardened concrete.



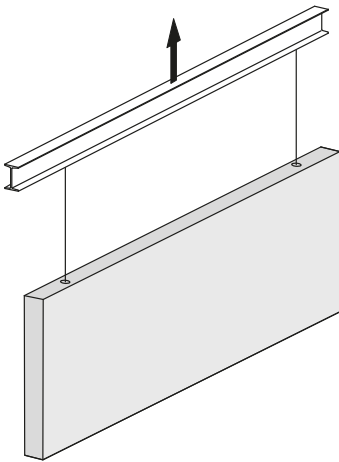
Note: To avoid precast elements hanging at a slant when being moved the hook in the spreader beam should be directly above the centre of gravity. If lifting elements without a spreader beam then the transport anchors should be installed symmetrically to the centre of gravity.

HALFEN HD SOCKET LIFTING SYSTEM

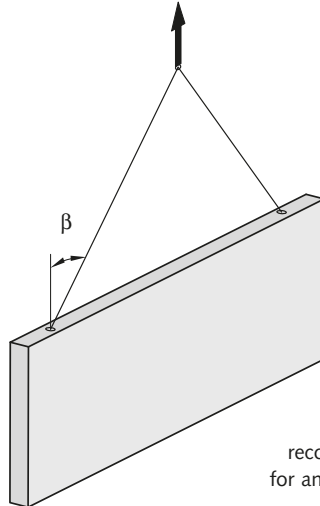
Design Considerations

Tensile loads at the anchors

Axial load β : 0° to 10°

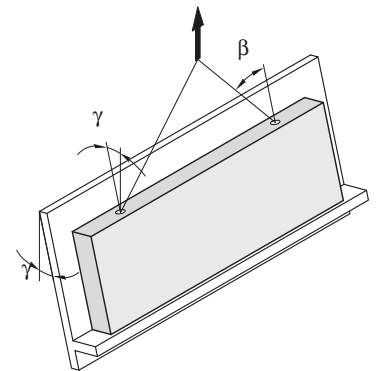
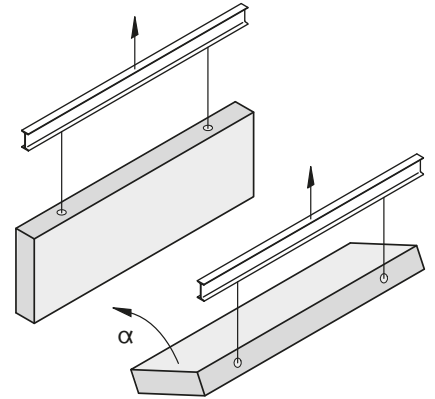


Diagonal load β : 10° to 60° ①



① Not recommended for angles $> 45^\circ$

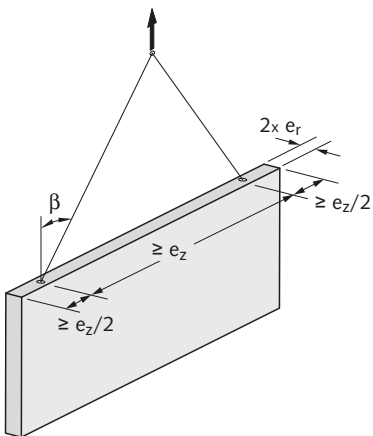
Tilting α : 90°



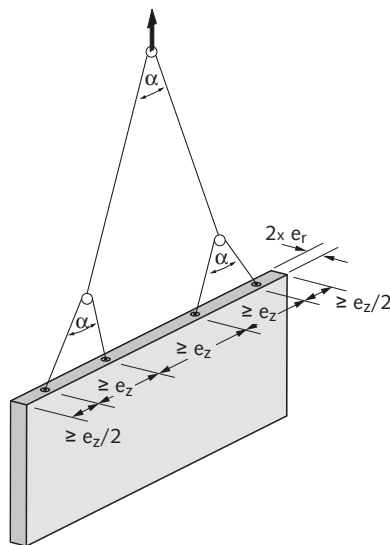
The shear reinforcement can be omitted when using a tilting table and a load angle of $\gamma < 15^\circ$.

Static systems

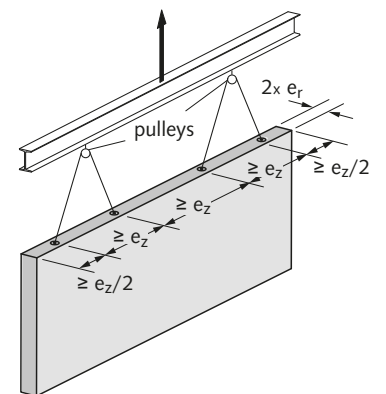
Positioning of anchors in walls



Assumed number of load-bearing anchors: $n = 2$



Assumed number of load-bearing anchors: $n = 4$



Assumed number of load-bearing anchors: $n = 4$

HALFEN HD SOCKET LIFTING SYSTEM

Installation and Application

Calculation – Static systems

Anchor layout in slabs

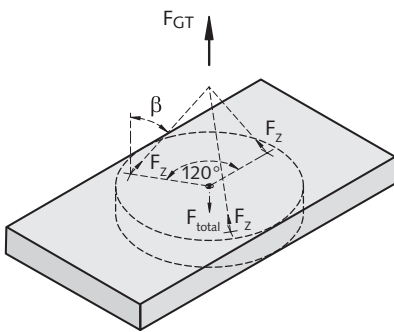
In general, a beam with more than two suspension points or a panel with more than three suspension points is classed as a statically indeterminate system; even if the anchors are arranged symmetrically to the load centre. Because of unavoidable tolerances in suspension systems and in the position of anchors, it should never be assumed that a load is distributed equally among all anchors.

Using tolerance-compensating suspension systems allow exact load distribution (e.g. articulated lifting beam combinations, multiple slings with compensating rig, etc.). This type of system should only be used by experienced personnel; also bear in mind that this system must be used both in the precast factory and on site. If in doubt assume only two anchors

are load-bearing (BGR 500 Ch. 2.8 Point 3.5.3). The use of two anchors is recommended for beams and upright panels installed symmetrically to the load centre. In both instances, it can be assumed that the two anchors will be subjected to equal loads.

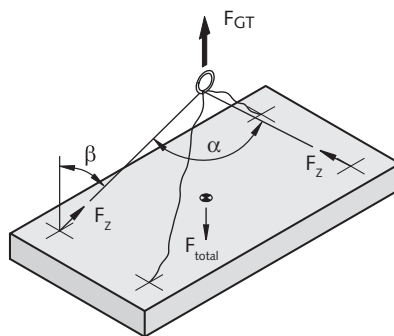
Examples

Using three anchors ensure a static determinate system.



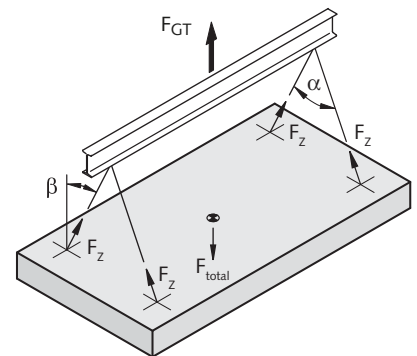
Assumed number of load-bearing anchors: $n = 3$

With four independent cable runs or two single diagonal cables, only two anchors can be assumed to be load-bearing.



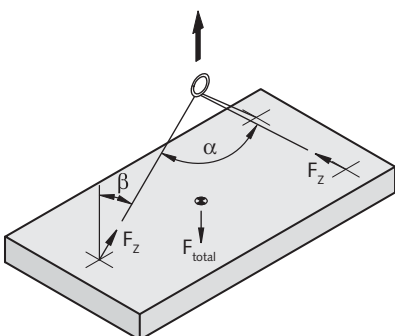
Assumed number of load-bearing anchors: $n = 2$

A perfect static weight distribution is achieved by using a spreader-beam and two symmetrical pairs of anchors.



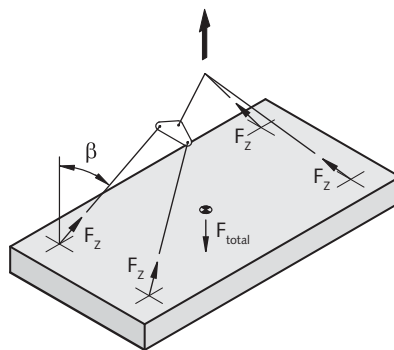
Assumed number of load-bearing anchors: $n = 4$

As the anchors are arranged asymmetrically, only two anchors can be assumed to be load-bearing.



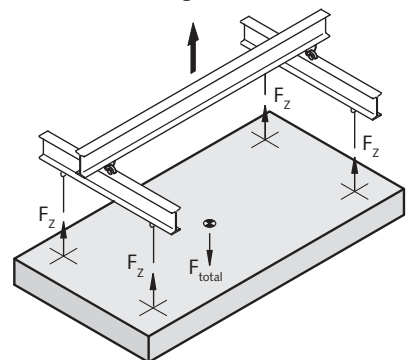
Assumed number of load-bearing anchors: $n = 2$

The system with compensating rig makes it possible to distribute the load evenly over 4 anchors.



Assumed number of load-bearing anchors: $n = 4$

A perfect static weight distribution can be achieved using a spreader-beam which avoids diagonal load.



Assumed number of load-bearing anchors: $n = 4$

HALFEN HD SOCKET LIFTING SYSTEM

Installation and Application

Installation and application – Static systems

Reinforcement recommendations

To ensure correct load distribution and to prevent concrete failure different types of additional reinforcement must be installed. This reinforcement is not scope of delivery and must be supplied in the precast plant.

Standard reinforcement

Generally the main reinforcement consists of mesh reinforcement installed close to the surface on both sides of the slab. Optionally, a single layer of reinforcement can be installed centrally in slabs ≤ 80 mm thick.

Edge reinforcement

Edge reinforcement is normally present in the slabs. Edge reinforcement is only required for the HD Anchor load capacities in higher load classes (\rightarrow see also details on reinforcement in the tables on pages 24–34).

Diagonal load reinforcement

No reinforcement for diagonal load is required for up to 10° axial load in all directions.

The diagonal reinforcement can be omitted with diagonal loads between 10° and 30° and increased element thickness (edge spacing $\geq e1$).

Diagonal load reinforcement is always required for diagonal loads between 30° and 45° .

The diagonal reinforcement can be replaced with transverse reinforcement positioned on both sides of the anchor.

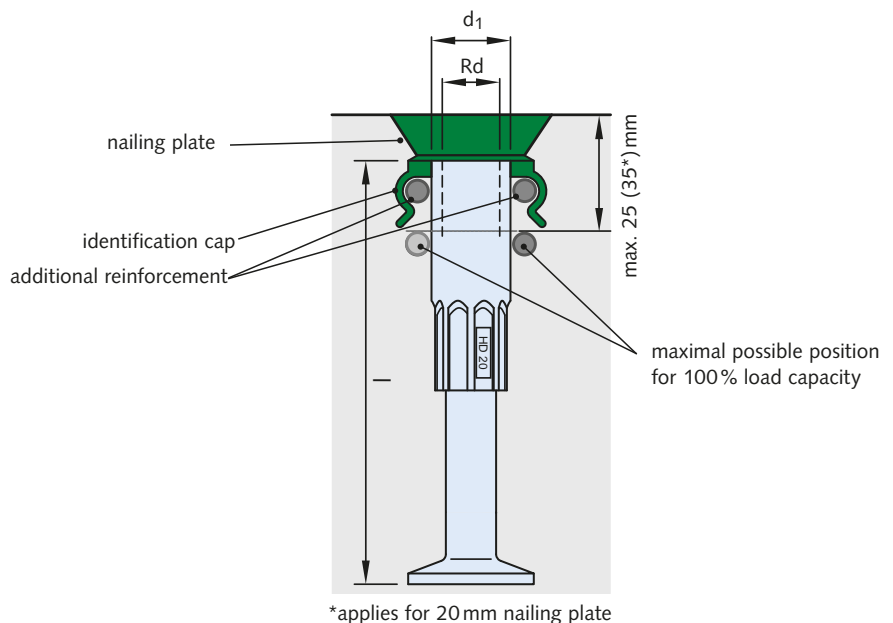
The reinforcement needs to be placed as close as possible to the top of the socket to achieve the load capacities listed in the tables.

Load capacity for diagonal loads is substantially reduced for anchors if the additional reinforcement is installed too deep in the concrete.

Transverse stress reinforcement

Transverse reinforcement is required on both sides of the anchor when lifting slabs upright, removing slabs from tilting tables at angles $< 80^\circ$ or if transported slanted at angles less than 70° .

Single side transverse reinforcement can be installed to ensure transverse loads only act to the one side.

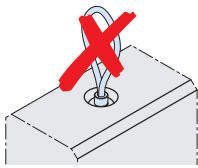


HALFEN HD SOCKET LIFTING SYSTEM

Installation and Application

Using Lifting links

Only use the HD Lifting link and the HD Perfect head lifting link for lifting. For safety reasons using other lifting equipment, for example cable-loops is not permitted.



Labelling

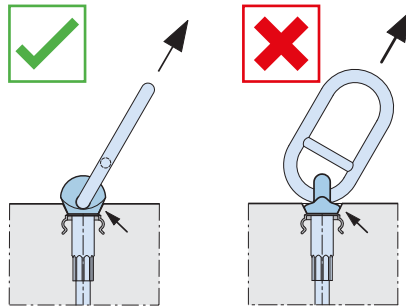
The HD Lifting links are marked with the product name identification, the type of link, the year of manufacture, the thread size and the load range.

Application

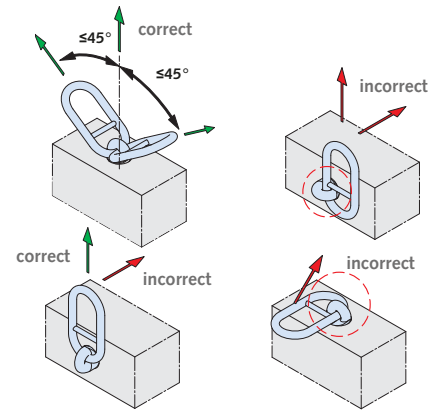
The HD Lifting link is a manually-operated connection.

All applicable accident prevention and health and safety regulations must be observed.

Optimum load distribution is only possible if the direction of load is as shown below. If required, the HD Lifting link can be loosened by a maximum of 90° after being fully tightened.



The following illustrations show correct and incorrect usage.



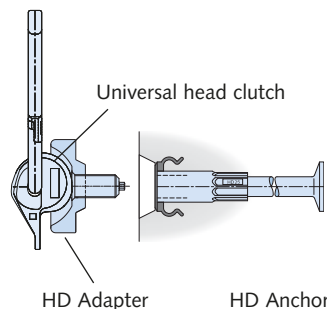
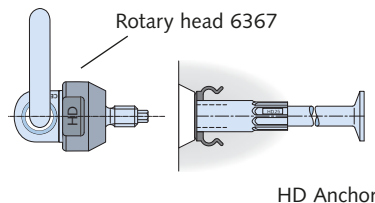
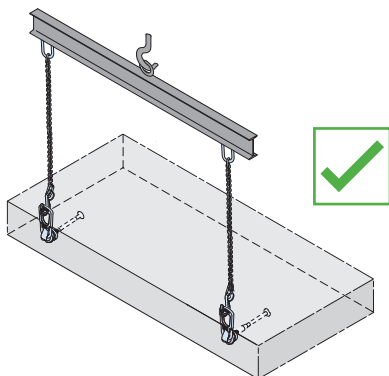
Maintenance

The contractor is responsible for ensuring that suitably trained personnel check the HD Lifting links before each application and that any damage found is repaired.

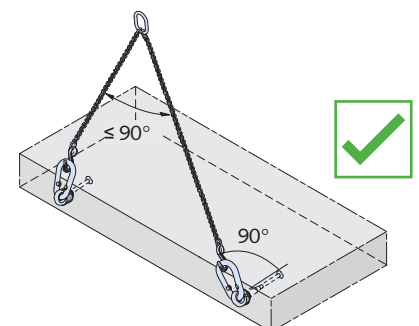
The contractor is also responsible for ensuring that the HD Lifting links are checked by an expert at least once a year. Using damaged HD Lifting links is very dangerous and is not permitted.

General information – pitching with HD Anchors

Always use a spreader beam when using the HD Lifting link 6362 or HD Perfect head 6377 to pitch a concrete panel. Pitching under diagonal load with HD Anchors and HD Lifting links 6362 or 6377 is not permitted.



Alternatively, if a spreader beam is not available it is possible to use the rotary head lifting link 6367 or the HD Adapter no. 6366 in combination with the universal head link no. 6102.



HALFEN HD SOCKET LIFTING SYSTEM

Installation and Application

Installation of the HD Lifting System

HD Anchors are delivered ready for use with a colour coded thread protector ready inserted. The HD Lifting link and the HD Anchors make up the HD Lifting system.

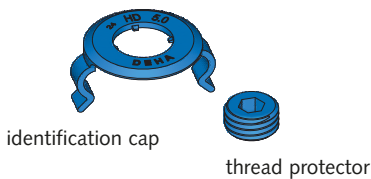


Fig. 1: Nailing plates are either nailed to the formwork or screwed in place using HALFEN Assembly pins through a hole in the formwork (see page 21). The HD Magnetic plate is recommended for use in steel formwork.

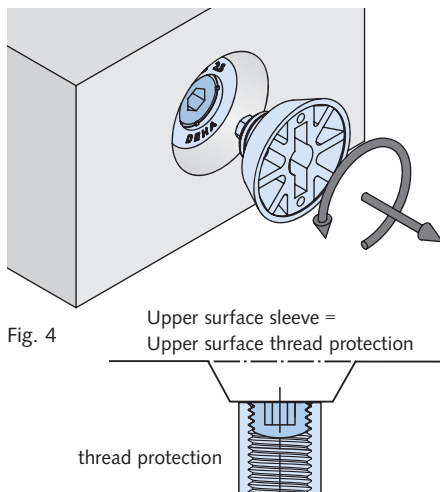
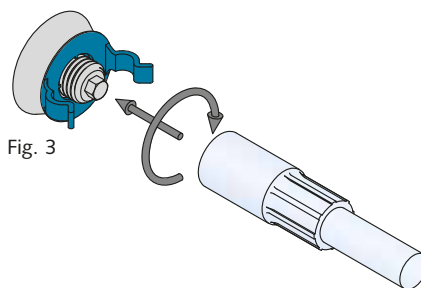
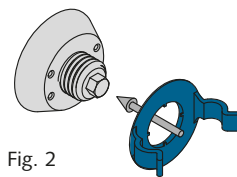
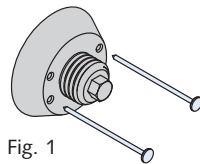
We recommend coating the nailing plate with formwork lubricant.

Fig. 2: Before installing the HD Anchor, the identification cap must be placed on the thread on the nailing plate. The HD Anchor with the inserted thread protection plug is then placed over the hexagonal stud of the nailing plate.

Fig. 3: By turning the HD Anchor the thread protection plug is simultaneously screwed down into the threaded socket. There should be no air gap between the nailing plate and the anchor socket. The identification cap which is now clamped between the anchor and the nailing plate must be rotated to the correct position (the position depends on the diagonal load reinforcement).

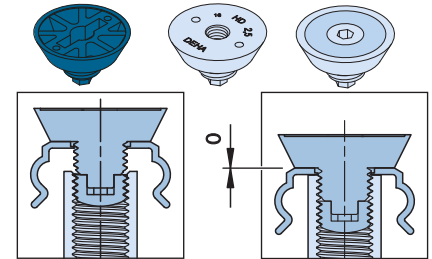
Fig. 4: After the concrete has hardened the nailing plate needs to be removed. To protect the thread ensure the thread protection plug has rotated back to the top of the socket.

Colour code / identification cap		
Load class		Colour
1,3		red
2,5		light grey
4,0		green
5,0		blue
7,5		violet
10,0		orange
12,5		brown
15,0		black
25,0		green



Nailing plates are used to fix the HD Anchors to the formwork. The nailing plates are colour coded according to the load class and are available in plastic or steel for load class 1,3 to 15,0.

! Identification caps and thread protectors are not available for load class 25,0. Identification here is visible when cast in the concrete. The nailing plate article no. 6510 can be used for this load class.



! Identification caps are packed separately. These must be fitted to the appropriate HD Anchor which has the same identification colour. The integrated thread protection remains in the HD Anchor permanently (Fig. 4). The anchors must be adequately fastened to the reinforcement to prevent them moving during concreting. Using formwork wax on the nailing plate makes them easier to remove.

We recommend filling up the hexagonal recess of the thread protection plug with formwork wax or lubricant after each use, particularly during winter. This prevents water getting into the hexagonal recess, which may freeze and block the connection between the thread of the lifting link and the socket protection system.

It is recommended to fill the entire nailing plate recess with formwork wax. This will make it easier to remove any ice which may form.

HALFEN HD SOCKET LIFTING SYSTEM Installation and Application

Installing the HD Anchor using the assembly pin and steel nailing plate

Assembly pins are used in staircase formwork where protruding screws or bolts may present a hazard and are therefore not suitable. The assembly pin provides a safe and easy connection of HD Anchors to the formwork. Assembly pins can be used with nailing plates for load classes from 1,3 to 7,5.

Fig. 5: The assembly pin is screwed in the steel nailing plate; then the sealing plate is placed over the assembly pin.

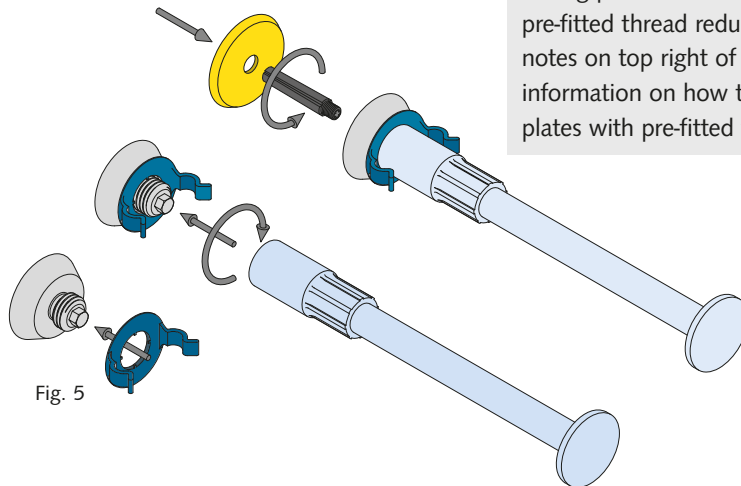


Fig. 5

! The same assembly pin is used for all applications.

The inner thread of M10 and M12 nailing plates are reduced with a pre-fitted thread reducer. See notes on top right of page 9 for information on how to order nailing plates with pre-fitted thread reducers.

Fig. 6: The assembly pin is first screwed into the HD Anchor with the sealing plate held in place by the pin and then pressed through a pre-drilled 8 mm diameter hole in the formwork. The assembly pin can be used in both timber and steel formwork.

We recommend using the assembly pin only with self compacting concrete.

! The seal between the steel nailing plate and the formwork prevents concrete from seeping into and blocking the holes in the nailing plate.

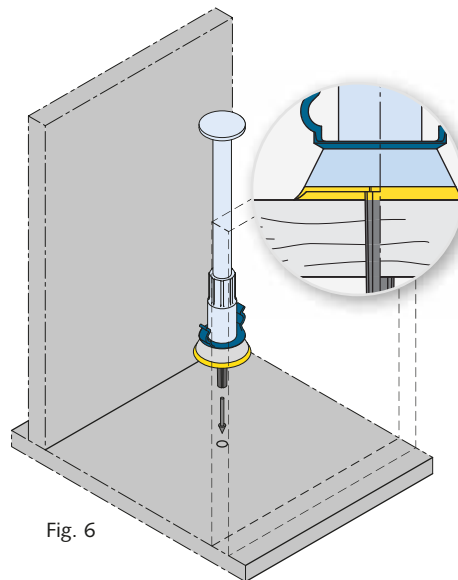


Fig. 6

! The thread of the assembly pin breaks off in the nailing plate and can be removed later.

Fig. 7: For simple removal of the formwork the assembly pin has a design break-off point. This leaves the end of the pin in the steel nailing plate when striking the formwork. The pin end can be removed with a Phillips screwdriver; the steel nailing plate is reusable.

! The sealing plate lip is installed towards the formwork to seal the underneath of the nailing plate.

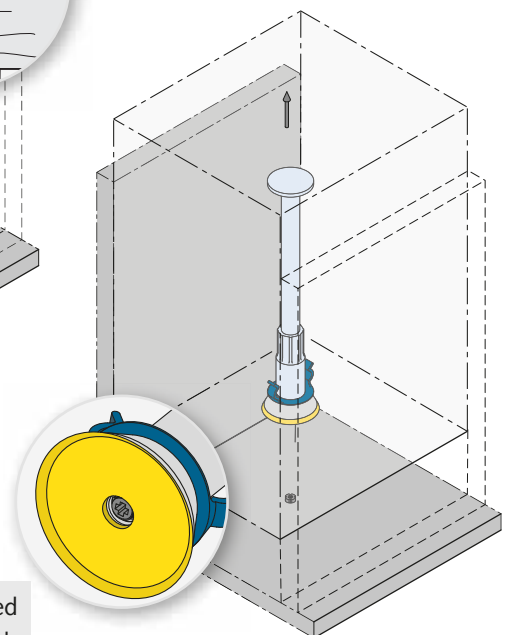
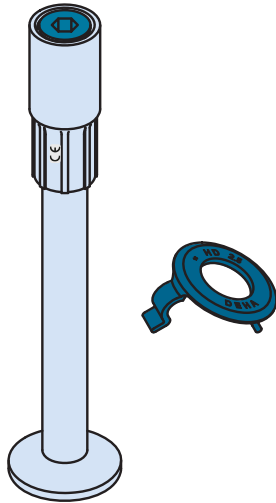


Fig. 7

HALFEN HD SOCKET LIFTING SYSTEM HD Anchor – Dimensions

HD Anchors – Dimensions



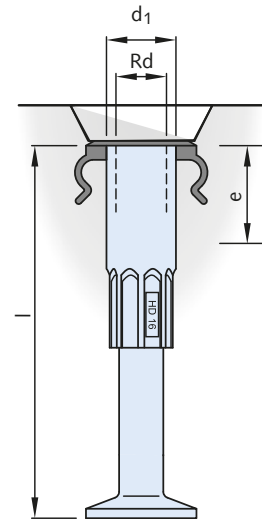
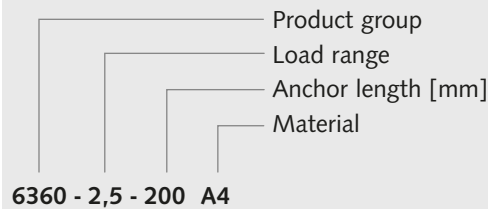
Application:

For transporting reinforced concrete elements of various sizes.

Load classes: 1,3 – 25,0

Scope of delivery: The identification cap is included in delivery up to load class 15,0 (not available for load class 25,0).

Ordering example



HD Anchor – Dimensions									
Load class	Article name		Order no. 0740.130-	Article name		Thread diameter	Sleeve-diameter ①	Length	Screw depth
	Socket zinc-plated			Socket stainless steel A4					
1,3	6360- 1,3-130	00001	6360- 1,3-130 A4	00009	12	17 (15.5)	130	31	
2,5	6360- 2,5-140	00040	-	-	16	22 (21)	140	36	
2,5	6360- 2,5-200	00002	6360- 2,5-200 A4	00010	16	22 (21)	200	36	
4,0	6360- 4,0-258	00003	6360- 4,0-258 A4	00011	20	27 (26)	258	42	
5,0	6360- 5,0-325	00004	6360- 5,0-325 A4	00012	24	32	325	48	
7,5	6360- 7,5-400	00005	6360- 7,5-400 A4	00013	30	39	400	58	
10,0	6360-10,0-475	00006	6360-10,0-475 A4	00014	36	47	475	66	
12,5	6360-12,5-550	00007	6360-12,5-550 A4	00015	42	55	550	75	
15,0	6360-15,0-575	00008	6360-15,0-575 A4	00016	52	68	575	89	
25,0	6360-25,0-630 ^②	00041	-	-	64	83	630	98	

① Smaller sockets in S460 grade steel are available for sleeve diameters in S355 grade specified above (see value in brackets). Delivery subject to confirmation.

② Lifted with the rotary head link 6367-64.

The value given for the concrete compressive strength in the table is for normal concrete as defined in EC2.

Please see the reinforcement drawing and the corresponding load class tables for additional required reinforcement; all additional reinforcement must be supplied by others and is not included in delivery.

We recommend using anchors with stainless steel sockets in external stair elements, especially when installed in the upperside of the element; if necessary with stainless steel heads (non-standard type).

HALFEN HD SOCKET LIFTING SYSTEM

HD Anchor – Load Capacities

Allowable load capacity for HD Anchors														
Load class	Article name	Rd	Minimum element thickness $2 \times e_r$ [mm]	Anchor layout ①		Allowable load capacity [kN] with concrete strength f_{ci}								
				e_1 [mm]	e_z min [mm]	15 N/mm ² for			25 N/mm ² for		35 N/mm ² for			
						axial load and diagonal load up to 30°	diagonal load up to 45°	shear load 90°	axial load and diagonal load up to 45°	shear load 90°	axial load and diagonal load up to 45°	shear load 90°		
1,3	6360-1,3-130	12	80	100	420	13.0	10.4	5.9	13.0	7.5	13.0	7.5		
			100			13.0	10.5	7.5						
			120			13.0	10.5	7.5						
2,5	6360-2,5-140	16	100	115	450	13.5	10.8	6.8	17.4	8.8	20.6	10.4		
			120			15.5	12.4	9.9	20.0	12.7	23.7	14.0		
			140			17.4	13.9	11.6	22.4	14.0	25.0	14.0		
	6360-2,5-200	16	80	115	640	18.7	15.0	4.2	24.1	5.4	25.0	8.8	25.0	6.4
			100			22.7	18.2	6.8	25.0	12.7				10.4
			120			25.0	18.9	9.9						
4,0	6360-4,0-258	20	80	140	800	24.0	21.6	4.1	31.0	5.3	40.0	11.5	40.0	6.3
			100			29.8	26.9	6.9	38.5	8.9				10.5
			120			33.1	29.8	8.9	40.0	16.6				19.6
			140			36.0	31.8	12.9						
			160			39.0	31.8	17.5						
5,0	6360-5,0-325	24	100	150	1000	33.4	33.4	9.3	43.1	12.0	50.0	16.9	50.0	14.2
			120			40.0	40.0	13.1	50.0	19.0				22.5
			140			45.6	42.1	14.7						
			160			49.0	42.1	20.0						
7,5	6360-7,5-400	30	140	190	1230	56.0	56.0	18.1	72.3	23.4	75.0	40.1	75.0	27.7
			160			66.8	66.8	24.2	75.0	42.5				42.5
			180			71.8	67.7	31.1						
			200			75.0	67.7	39.1						
10,0	6360-10,0-475	36	160	200	1460	78.7	78.7	24.0	100.0	39.4	100.0	57.0	57.0	36.5
			180			90.7	90.7	30.5						
			200			98.3	92.6	38.1						
			220			100.0	92.6	46.2						
12,5	6360-12,5-550	42	180	215	1690	111.6	111.6	33.2	125.0	62.4	125.0	71.0	71.0	50.6
			200			125.0	120.2	40.1						
			220			125.0	120.2	48.4						
			240			125.0	120.2	57.9						
15,0	6360-15,0-575	52	180	240	1760	114.1	114.1	29.2	147.4	37.7	150.0	68.5	150.0	44.6
			200			126.8	126.8	36.2	150.0	85.5				85.5
			220			139.5	139.5	44.3						
			240			150.0	144.8	53.0						
			280			150.0	144.8	72.5						
25,0	6360-25,0-630	64	240	300	1890	167.0	133.6	51.0	215.5	65.5	250.0	162.5	250.0	77.6
			300			186.7	149.3	85.0	250.0	162.5				175.0
			350			201.6	161.3	114.5						
			400			215.5	172.4	136.8						
			500			241.0	192.8	156.5						

① e_z = min. anchor spacing; $e_z/2$ = min. edge distance; f_{ci} = cube concrete strength at time of lifting

HALFEN HD SOCKET LIFTING SYSTEM

HD Anchor – Load Capacities

Load capacity

Axial load up to 10°

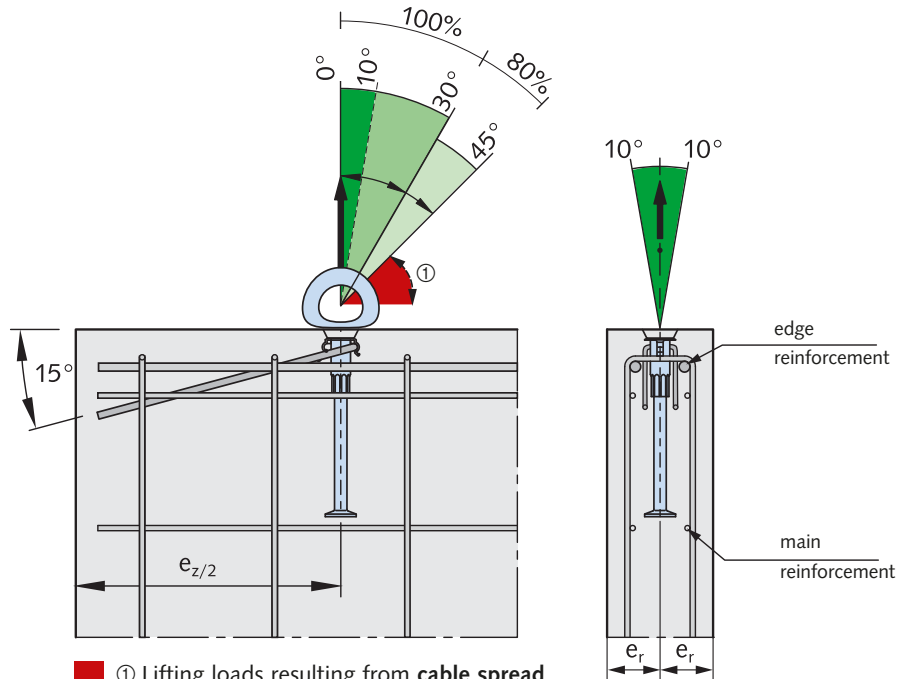
- no diagonal reinforcement is required
- 100% load capacity according to table on → page 22

diagonal load; 10° to 30°

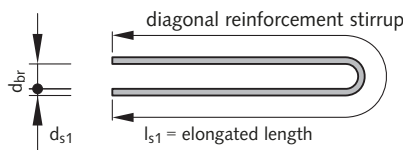
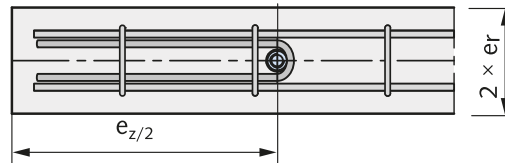
- 100% load capacity according to table on → page 22, diagonal reinforcement is not required if $e_r \geq e_1$ (table page 22)
- shear reinforcement installed on both sides of the anchor can be used instead of diagonal reinforcement

diagonal load; 30° to 45°

- diagonal reinforcement is always required
- approximately 80% loadable in 15 N/mm²; 100% loadable from 25 N/mm² according to the table → page 22
- shear reinforcement installed on both sides of the anchor can be used instead of diagonal reinforcement

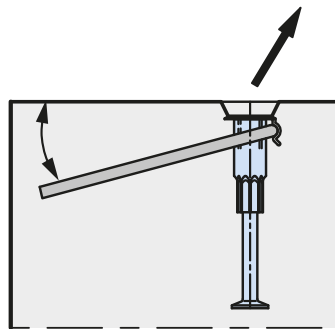


① Lifting loads resulting from cable spread within this (angle) range is not permitted.



The bending roll diameter according to EC2 may be disregarded.

! Diagonal reinforcement must be installed with direct contact to the socket.



Always install diagonal rebar opposite the direction of the load.

i Information on reinforcement: see following page

HALFEN HD SOCKET LIFTING SYSTEM

HD Anchor – Reinforcement

Reinforcement – HD Anchors																
Load class	Article name	Rd	Minimum element thickness $2 \times e_r$ [mm]	④ Main reinforcement mesh both sides [mm ² /m]	axial load 10° [β] edge reinforcement	⑤ Required additional reinforcement* [mm]										
						diagonal load up to 30° [β]			diagonal load up to 45° [β]			shear load 90° [β]				
						d_{s1}	l_{s1} ①②	d_{br}	d_{s1}	l_{s1} ①②	d_{br}	d_{s2}	l_{s2} ②	h_2 ③	r_1	
1,3	6360-1,3-130	12	80	188	-	ø 8	850	30	ø 8	1000	30	ø 8	550	33	15	
			100											43		
			120											53		
2,5	6360-2,5-140	16	100	188	-	ø 10	1200	30	ø 10	1400	30	ø 12	750	47	20	
			120											57		
			140											67		
2,5	6360-2,5-200	16	80	188	-	ø 8	1000	30	ø 10	1200	30	ø 12	750	37	20	
			100											47		
			120											57		
4,0	6360-4,0-258	20	80	188	-	ø 10	1200	40	ø 12	1750	40	ø 16	910	42	25	
			100											52		
			120											62		
			140											72		
			160											82		
5,0	6360-5,0-325	24	100	188	-	ø 12	1750	40	ø 14	2000	40	ø 16	1080	56	25	
			120											66		
			140											76		
			160											86		
7,5	6360-7,5-400	30	140	188	2 ø 12	ø 14	1750	50	ø 16	2000	50	ø 20	1300	84	30	
			160											94		
			180											104		
			200											114		
10,0	6360-10,0-475	36	160	188	2 ø 14	ø 16	2000	50	ø 20	2050	60	ø 20	1690	98	30	
			180											108		
			200											118		
			220											128		
12,5	6360-12,5-550	42	180	188	2 ø 14	ø 20	2050	60	ø 20	2200	60	ø 25	1650	117	40	
			200											127		
			220											137		
			240											147		
15,0	6360-15,0-575	52	180	188	2 ø 14	ø 20	2200	80	ø 25	2200	80	ø 25	1940	123	40	
			200											133		
			220											143		
			240											153		
25,0	6360-25,0-630	64	240	188	2 ø 16	ø 25	2200	100	2 ø 25	2200	100	2 ø 25	2200	174	40	
			300											204		
			350											229		
			400											254		
			500											304		

① This reinforcement applies for 15 N/mm² concrete compression grade, shorter stirrups may be feasible for higher compression grades.

② elongated length ③ with $c_{min} = 20$ mm

④ bent mesh reinforcement or equivalent rebar reinforcement

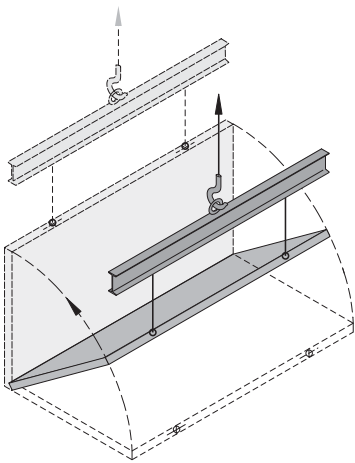
⑤ Diagonal load reinforcement and transverse stress reinforcement must be installed with direct contact to the socket. For this application it is irrelevant if the minimal bending roll diameter is below requirement.

* additional reinforcement must be provided on-site

HALFEN HD SOCKET LIFTING SYSTEM HD Anchor – Reinforcement

Shear load at 90°

- tilting 90° (horizontal to vertical)
- load capacity → see table on page 20

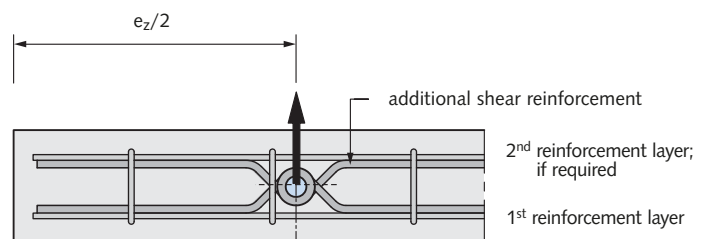
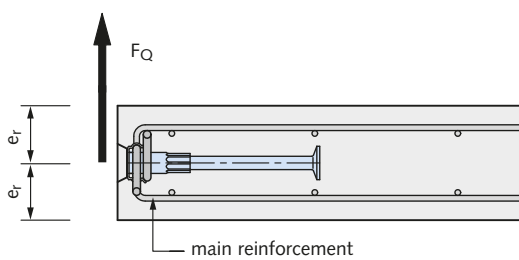
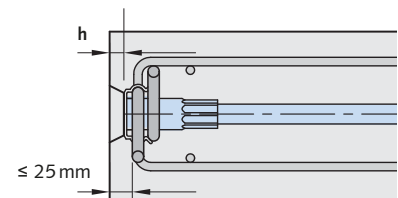
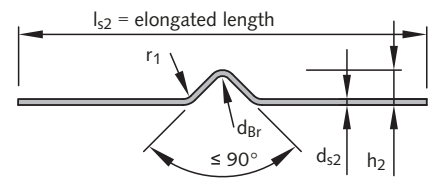


The shear reinforcement on both sides also serves as diagonal load reinforcement. Additional diagonal load reinforcement is not required.

The additional shear reinforcement must be installed with full contact to the anchor.

! The height for the reinforcement depends on the installation depth for the socket and not on the required concrete cover.

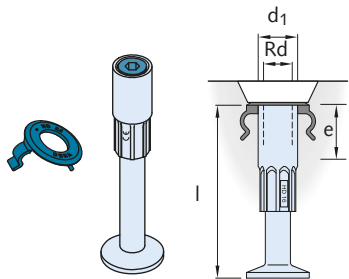
Additional shear reinforcement



HALFEN HD SOCKET LIFTING SYSTEM

HD Short Anchors

Allowable load capacities, dimensions and reinforcement for HD Short anchors



Application: For lifting slab-type elements, floor slabs and similar.
Load classes: 1,3 – 7,5

! Not suitable for lifting wall elements! Not suitable for shear loads in walls!

Table key:

- ① Smaller diameter sockets are available in S460 for selected sleeve diameter in S355 (see values in brackets). Delivery is subject to confirmation.
- ② Elongated length
- ③ Diagonal load reinforcement must be installed with direct contact to the socket. For this application it is irrelevant if the

minimal bending roll diameter is below requirement.

- ④ e_r = edge distance (e_r applies to axial load; for diagonal load, see reinforcement); e_z = axial spacing
- ⑤ The values for intermediate slab thicknesses may be interpolated. f_{ci} = cube concrete strength at time of lifting

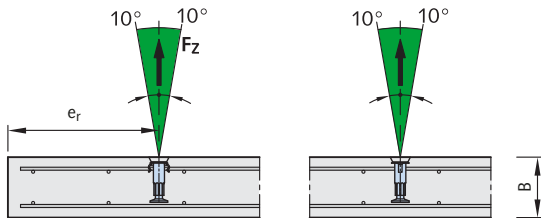
Dimensions and reinforcement – HD Short anchor

Load class	Article name	Order no. 0740.130-	Article name	Order no. 0740.130-	Dimensions HD Short anchors				Main reinforcement mesh both sides mm ² /m	Required additional reinforcement ③ for shear load up to 45°				
					Rd	d ₁ ①	l [mm]	e [mm]		l _{s1} ② [mm]				d _{br}
	zinc-plated		stainless steel A4							15 N/mm ²	25 N/mm ²	35 N/mm ²		
1,3	6360-1,3-070	00017	6360-1,3-070 A4	00021	12	17 (15.5)	70	31	188	10	800	700	600	30
2,5	6360-2,5-090	00018	6360-2,5-090 A4	00022	16	22 (21)	90	36	188	12	900	860	750	30
4,0	6360-4,0-125	00019	6360-4,0-125 A4	00023	20	27 (26)	125	42	188	14	1020	860	750	40
5,0	6360-5,0-140	00020	6360-5,0-140 A4	00024	24	32	140	48	188	14	1650	1400	1200	40
7,5	6360-7,5-185	00038	6360-7,5-185 A4	00039	30	39	185	58	188	16	2000	1600	1400	50

Load capacity – HD Short anchor

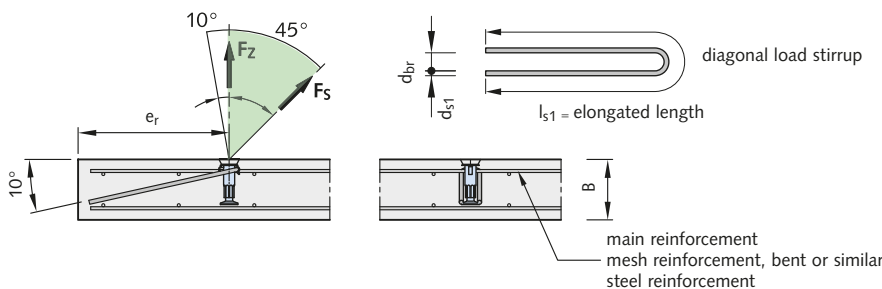
Load class	Article name	Anchor layout ④		Increased slab thickness B ⑤ [mm]	Load capacity [kN] at concrete compression strength f_{ci} for axial and shear load up to 45°			Minimal slab thickness B ⑤ [mm]	Load capacity [kN] at concrete compression strength f_{ci} for axial load and diagonal load up to 45°		
		e_r [mm]	e_z min [mm]		15 N/mm ²	25 N/mm ²	35 N/mm ²		15 N/mm ²	25 N/mm ²	35 N/mm ²
1,3	6360-1,3-070	140	210	115	13.0	13.0	13.0	115	13.0	13.0	13.0
2,5	6360-2,5-090	180	270	160	19.5	25.0	25.0	125	16.5	21.3	25.0
4,0	6360-4,0-125	250	375	220	31.2	40.0	40.0	160	25.3	32.6	38.6
5,0	6360-5,0-140	280	420	275	39.3	50.0	50.0	175	29.1	37.5	44.4
7,5	6360-7,5-185	370	560	360	59.4	75.0	75.0	240	44.9	57.9	68.5

No diagonal load stirrup; axial load up to 10°



See reinforcement drawings and the load class tables for required additional reinforcement; must be provided on site.

With diagonal load stirrup diagonal load up to 45°

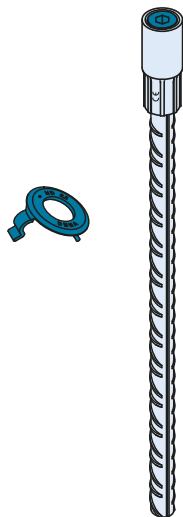


The value for the concrete compressive strength is for normal concrete according to DIN EN 206; resp. DIN 1045-1.

Diagonal load reinforcement is not required if the axial load does not deviate more than 10° from the vertical.

HALFEN HD SOCKET LIFTING SYSTEM HD Rod Anchor – Dimensions

Dimensions – HD Rod anchor

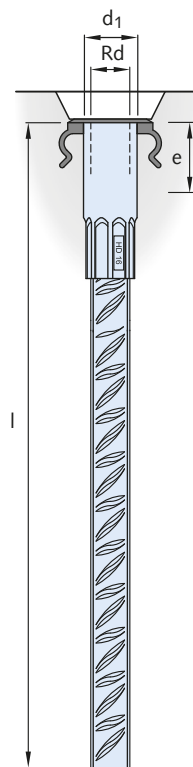


Application:

Used in minimal thickness precast concrete elements; e.g. prefabricated garages, transformer substations, utility and modular structures.

Load classes: 1,3 – 15,0

Scope of delivery: The identification cap is included in delivery.



Ordering example

Product group
Load class
Anchor length [mm]
Material

6361 - 2,5 - 0400 A4

Dimensions – HD Rod anchor

Load class	Article name socket zinc-plated	Order no. 0740.140-	Article name socket stainless steel A4	Order no. 0740.140-	Thread diameter	Socket diameter	Length	Screw depth
					Rd	d ₁ [mm]	l [mm]	e [mm]
1,3	6361-1,3-0300	00001	6361-1,3-0300 A4	00009	12	17 (15.5)	300	31
2,5	6361-2,5-0400	00002	6361-2,5-0400 A4	00010	16	22 (21)	400	36
4,0	6361-4,0-0520	00003	6361-4,0-0520 A4	00011	20	27 (26)	520	42
5,0	6361-5,0-0540	00004	6361-5,0-0540 A4	00012	24	32	540	48
7,5	6361-7,5-0700	00005	6361-7,5-0700 A4	00013	30	39	700	58
10,0	6361-10,0-0800	00006	6361-10,0-0800 A4	00014	36	47	800	66
12,5	6361-12,5-0920	00007	6361-12,5-0920 A4	00015	42	55	920	75
15,0	6361-15,0-1100	00008	6361-15,0-1100 A4	00016	52	68	1100	89

① Smaller diameter sockets are available in S460 for selected sleeve diameter in S355 (see values in brackets). Delivery is subject to confirmation.

See reinforcement drawings and the load class tables on the following pages for required additional reinforcement.*

The value for the concrete strength f_{ci} is for normal concrete according to DIN EN 206; resp. DIN 1045-1.

*additional reinforcement must be provided on-site

HALFEN HD SOCKET LIFTING SYSTEM

HD Rod Anchor – Load Capacities

Load capacities – HD Rod anchor													
Load class	Article name	Rd	Minimum element thickness $2 \times e_r$ [mm]	Anchor layout ①			Load capacity [kN] with concrete strength f_{ci}						
				e_1 with $f_{ci} = 15$ [N/mm ²]	e_1 with $f_{ci} = 25$ [N/mm ²] or higher	e_z min	15 N/mm ² for			25 N/mm ² for		35 N/mm ² for	
							axial and diagonal load up to 30°	diagonal load up to 45°	shear load 90°	axial and diagonal load up to 45°	shear load 90°	axial and diagonal load up to 45°	shear load 90°
1,3	6361-1,3-0300	12	60	100	85	620	13.0	10.5	3.5	13.0	4.5	13.0	5.3
			80						5.9		7.5		7.5
			100						7.5		7.5		7.5
2,5	6361-2,5-0400	16	80	115	100	820	25.0	18.9	4.2	25.0	5.4	25.0	6.3
			100						6.8		8.8		10.4
			120						9.9		12.7		14.0
4,0	6361-4,0-0520	20	80	140	120	980	32.8	29.5	4.1	40.0	5.3	40.0	6.3
			100						6.9		8.9		10.5
			120						8.9		11.5		13.6
			140						12.9		16.6		19.6
			160						17.5		22.5		23.0
5,0	6361-5,0-0540	24	100	150	125	1100	40.9	40.9	9.3	50.0	12.0	50.0	14.2
			120						13.1		16.9		20.0
			140						14.7		19.0		22.5
			160						20.0		25.8		28.0
7,5	6361-7,5-0700	30	120	190	160	1420	66.1	66.1	12.9	75.0	16.7	75.0	19.7
			140						18.1		23.4		27.7
			160						24.4		31.2		36.9
			180						31.1		40.1		42.5
10,0	6361-10,0-0800	36	140	200	170	1620	100.0	92.6	18.2	100.0	23.4	100.0	27.7
			160						24.0		30.9		36.5
			180						30.5		39.4		46.6
			200						38.1		49.1		57.0
12,5	6361-12,5-0920	42	140	215	185	1870	125.0	120.2	20.2	125.0	26.1	125.0	30.9
			160						26.3		33.9		40.1
			180						33.2		42.8		50.6
			200						40.1		51.7		61.2
15,0	6361-15,0-1100	52	160	240	205	2230	150.0	144.8	22.6	150.0	29.2	150.0	34.5
			180						29.2		37.7		44.6
			200						36.2		46.7		55.2
			220						44.3		57.2		67.7
			240						53.0		68.5		81.0

① $e_z/2 = \text{min. edge distance}$; $e_z = \text{min. anchor spacing}$; $f_{ci} = \text{cube concrete strength at time of lifting}$

Axial load up to 10°

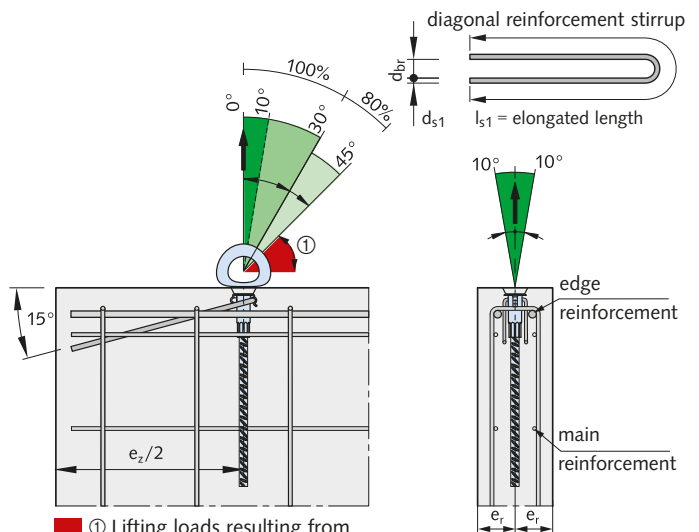
- no diagonal reinforcement is required
- 100% load capacity (see table above)

Diagonal load; 10° to 30°

- 100% load capacity (see table above)
- diagonal reinforcement is not required if $e_r \geq e_1$ (see table above)
- shear reinforcement installed on both sides of the anchor can be used instead of diagonal reinforcement

Diagonal load; 30° to 45°

- diagonal reinforcement is always required
- approximately 80% loadable in 15 N/mm²; 100% loadable from 25 N/mm² (see table above)
- shear reinforcement installed on both sides of the anchor can be used instead of diagonal reinforcement



① Lifting loads resulting from cable spread within this (angle) range is not permitted.

HALFEN HD SOCKET LIFTING SYSTEM

HD Rod Anchor – Reinforcement

Reinforcement – HD Rod anchor																
Load class	Article name	Rd	Minimum element thickness	Main reinforcement mesh both sides ^④	axial load up to 10° [β] edge-reinforcement	Required additional reinforcement* [mm]										
						diagonal load up to 30°			diagonal load up to 45°			shear load 90°				
			$2 \times e_r$ [mm]	[mm ² /m]		d_{s1}	l_{s1} ①②	d_{br}	d_{s1}	l_{s1} ①②	d_{br}	d_{s2}	l_{s2} ③	h_2 ③	r_1	
1,3	6361-1,3-0300	12	60	188	-	ø 8	860	30	ø 8	1000	30	8	550	23	15	
			80											33		
			100											43		
2,5	6361-2,5-0400	16	80	188	-	ø 8	1000	30	ø 10	1200	30	12	750	37	20	
			100											47		
			120											57		
4,0	6361-4,0-0520	20	80	188	2 ø 12	ø 10	1200	40	ø 12	1750	40	16	910	42	25	
			100											52		
			120											62		
			140											72		
			160											82		
5,0	6361-5,0-0540	24	100	188	2 ø 12	ø 12	1750	40	ø 14	2000	40	16	1080	56	25	
			120											66		
			140											76		
			160											86		
7,5	6361-7,5-0700	30	120	188	2 ø 14	ø 14	1750	50	ø 16	2000	50	20	1300	74	30	
			140											84		
			160											94		
			180											104		
10,0	6361-10,0-0800	36	140	188	2 ø 14	ø 16	2000	50	ø 20	2050	60	20	1690	88	30	
			160											98		
			180											108		
			200											118		
12,5	6361-12,5-0920	42	140	188	2 ø 14	ø 20	2050	60	ø 20	2200	60	25	1650	97	40	
			160											107		
			180											117		
			200											127		
15,0	6361-15,0-1100	52	160	188	2 ø 14	ø 20	2200	80	ø 25	2200	80	25	1940	113	40	
			180											123		
			200											133		
			220											143		
			240											153		

① This reinforcement applies for 15 N/mm² concrete compression grade, shorter stirrups may be feasible for higher compression grades.

② elongated length ③ with $c_{min} = 20$ mm

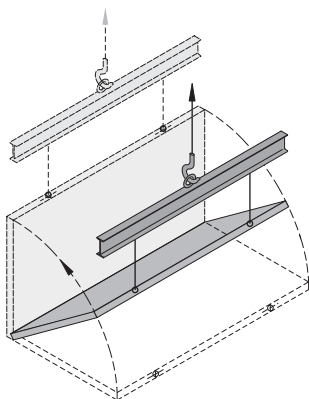
④ bent mesh reinforcement or equivalent rebar reinforcement

⑤ Diagonal load reinforcement and transverse stress reinforcement must be installed with direct contact to the socket. For this application it is irrelevant if the minimal bending roll diameter is below requirement.

* additional reinforcement must be provided on-site

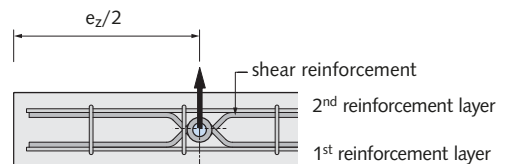
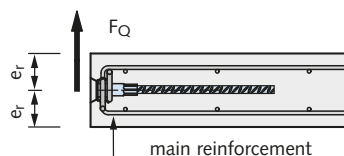
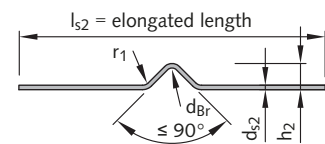
Shear load with 90°

- ▶ tilting 90° (horizontal to vertical)
- ▶ load capacity → see table on page 28



The shear reinforcement on both sides also serves as diagonal load reinforcement. Additional diagonal load reinforcement is not required. The additional shear reinforcement must be installed with full contact to the threaded socket.

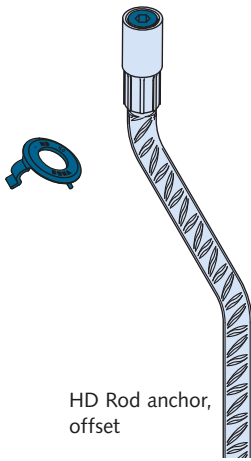
Shear reinforcement



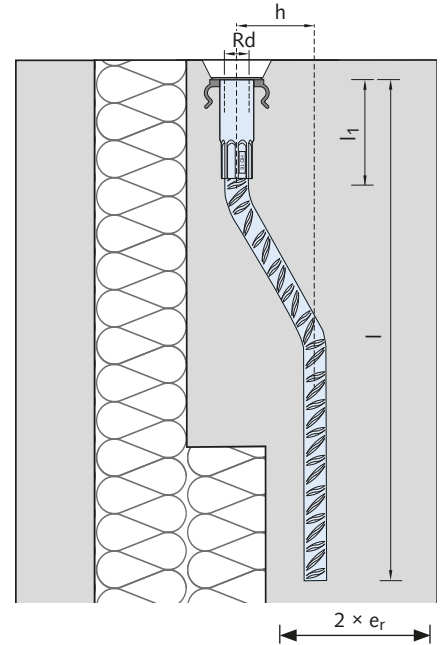
HALFEN HD SOCKET LIFTING SYSTEM

Offset HD Rod Anchor and Additional Reinforcement

Dimensions – offset HD Rod anchor



Application:
The offset spherical head lifting anchor differs from the normal spherical head lifting anchor only by its cranked shape. This unique shape permits the use of this anchor for sandwich panels. The thickness of the load panel is increased around the anchor.



Dimensions – offset HD Rod anchor

Load class	Article name	Order no. 0740.220-	Rd	l [mm]	l ₁ [mm]	h [mm]	Load capacity ^① [kN] ^②
5,0	6361G - 5,0-0800	00001	24	800	135	150	50.0
7,5	6361G - 7,5-0960	00002	30	960	165	150	75.0
10,0	6361G - 10,0-1060	00003	36	1060	180	150	100.0
12,5	6361G-12,5-1180	00004	42	1180	210	150	125.0
15,0	6361G-15,0-1360	00005	52	1360	230	150	150.0

① for $\geq 30\text{N/mm}^2$ ② for axial and diagonal load $\leq 10^\circ$

! Please enquire for minimum order quantity and delivery times for other offset requirements (h).

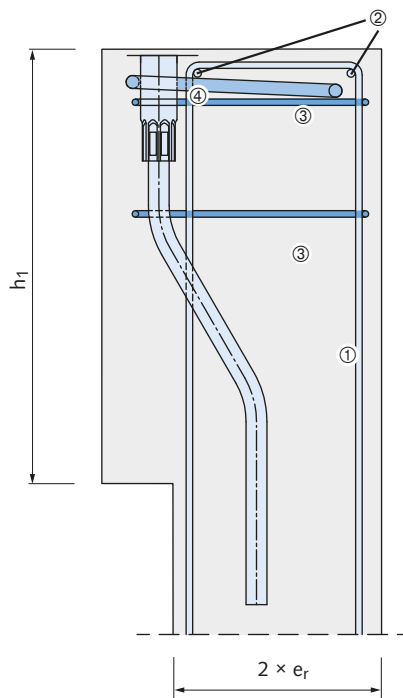
Reinforcement – offset HD Rod anchors

Reinforcement*

- ① u-bar
- ② edge reinforcement
- ③ stirrup
- ④ additional reinforcement (only required for face-up production)

Diagonal load reinforcement and transverse stress reinforcement must be installed with direct contact to the socket. For this application it is irrelevant if the minimal bending roll diameter is below requirement.

* reinforcement must be provided on-site



! The offset HD Anchor must be completely enveloped in concrete. The thickness in the load-bearing layer needs to be increased around the HD Anchor. The concrete cover on all sides of the anchor must be at least 2.5 cm.

HALFEN HD SOCKET LIFTING SYSTEM

Offset HD Rod Anchor and Additional Reinforcement

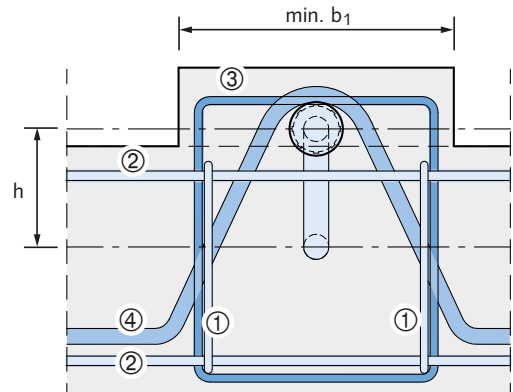
Offset HD Rod anchor – reinforcement												
Load class	Article name	Main reinforcement mesh [mm ² /m]	Edge reinforcement ②		Stirrup reinforcement ③		Anchor reinforcement ④		U-bar ①			
			number	∅ [mm]	number	∅ [mm]	∅ [mm]	length [mm]	number	∅ [mm]	leg length [mm]	
5,0	6361G - 5,0 - 0800	2 × 188	2	10	2	8	16	1300	4	8	1300	
7,5	6361G - 7,5 - 0960	2 × 188	2	12	2	8	20	1300	4	10	1450	
10,0	6361G - 10,0 - 1060	2 × 188	2	12	2	10	20	1700	4	10	1600	
12,5	6361G - 12,5 - 1180	2 × 188	2	12	2	10	25	1800	4	10	1800	
15,0	6361G - 15,0 - 1360	2 × 188	2	12	2	10	25	1940	4	10	2050	

Reinforcement*

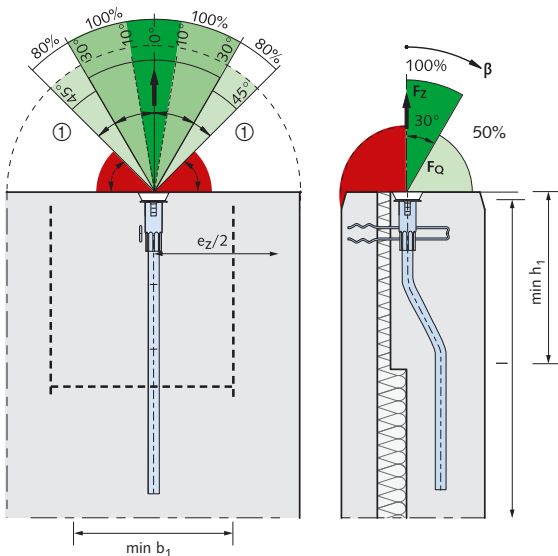
- ① u-bar
- ② edge reinforcement
- ③ stirrup
- ④ additional reinforcement (only required for face-up production)

Diagonal load reinforcement and transverse stress reinforcement must be installed with direct contact to the socket. For this application it is irrelevant if the minimal bending roll diameter is below requirement.

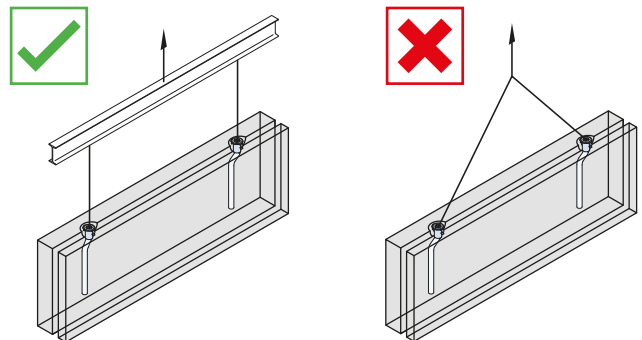
* reinforcement must be provided on-site



Offset HD Rod anchor – element						
Load class	Article name	Minimum element thickness not allowing for anchor $2 \times e_r$ [mm]	min h1 [mm]	min b1 [mm]	min $e_z/2$ [mm]	
5,0	6361G - 5,0 - 0800	100	615	350	550	
7,5	6361G - 7,5 - 0960	120	675	350	720	
10,0	6361G - 10,0 - 1060	140	705	350	810	
12,5	6361G - 12,5 - 1180	140	750	450	940	
15,0	6361G - 15,0 - 1360	160	780	450	1120	



Always use a spreader beam for pitching, lifting and transporting. Using a chain hoist for lifting elements with HD Anchors is not recommended.



- Green: Angle range from 10°: Only permitted with 6367 Rotary head lifting link!
- Red: ① Lifting loads resulting from cable spread within this (angle) range is not permitted.

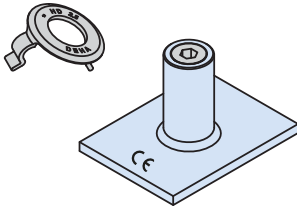


Always use a tilting table for lifting elements upright

HALFEN HD SOCKET LIFTING SYSTEM

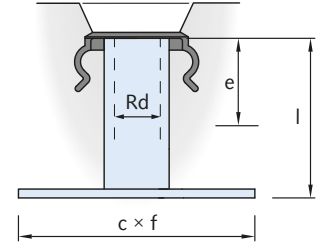
HD Plate Anchor

Load capacities, dimensions and reinforcement for HD Plate anchors



Application:

HD Plate anchors are designed for lifting large, thin-walled, precast concrete elements which are lifted perpendicular to their main surface (slabs and shells). Also available in stainless steel.



Dimensions and reinforcement – HD Plate anchor

Load class	Article name	Order no.	Dimensions HD Plate anchor						Main reinforcement mesh, both sides ②	Required additional reinforcement*						
			Rd	l [mm]	c [mm]	f [mm]	e [mm]	axial and diagonal load additional reinforcement				diagonal load ④ diagonal load stirrup				
	zinc coated	0740.180-							d _{s2} [mm]	l _{s2} [mm]	l _{s3} ① [mm]	h [mm]	d _{s1} [mm]	l _{s1} ①③ [mm]	d _{br} [mm]	
1,3	6370-1,3	00001	12	46	50	50	31	188	4 ø 8	60	425	40	10	750	30	
2,5	6370-2,5	00002	16	54	60	80	36	188	4 ø10	90	640	50	12	1250	30	
4,0	6370-4,0	00003	20	72	80	100	42	188	4 ø12	110	830	55	12	1400	40	
5,0	6370-5,0	00004	24	84	100	130	48	188	4 ø16	140	1140	60	16	1500	40	
7,5	6370-7,5	00005	30	98	130	130	58	257	4 ø16	140	1250	60	16	1750	50	

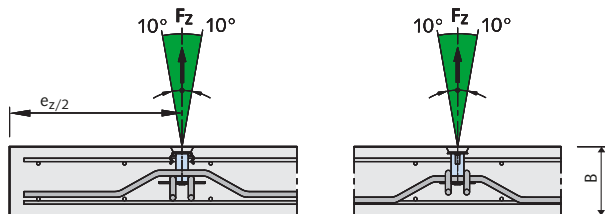
- ① elongated length
 - ② mesh reinforcement, bent or similar steel-rod reinforcement
 - ③ For concrete compressive strength 15 N/mm²; shorter stirrups may be possible for higher concrete compressive strengths.
 - ④ Diagonal load reinforcement must be installed with direct contact to the socket.
For this application it is irrelevant if the minimal bending roll diameter is below requirement.
- *additional reinforcement must be provided on-site!**

Load capacity – HD Plate anchor

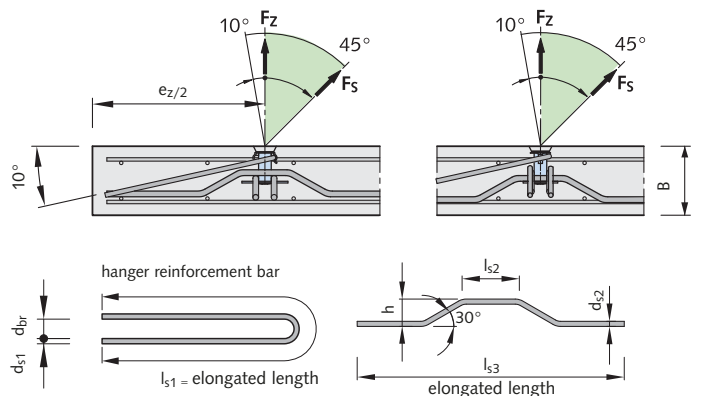
Load class	Article name	Minimum element thickness B [mm]	Anchor position ④		Load capacity [kN] with concrete compressive strength f _{ci} 15 N/mm ²	
			e _z /2 [mm]	e _z min [mm]	axial load up to 10°	diagonal load up to 45°
1,3	6370-1,3	100	250	500	13.0	13.0
2,5	6370-2,5	115	400	800	25.0	25.0
4,0	6370-4,0	150	500	1000	40.0	40.0
5,0	6370-5,0	160	650	1300	50.0	50.0
7,5	6370-7,5	200	650	1300	75.0	75.0

④ e_z/2 = edge spacing; e_z = axial spacing; f_{ci} = cube concrete strength at time of lifting

No diagonal reinforcement; axial load up to 10°

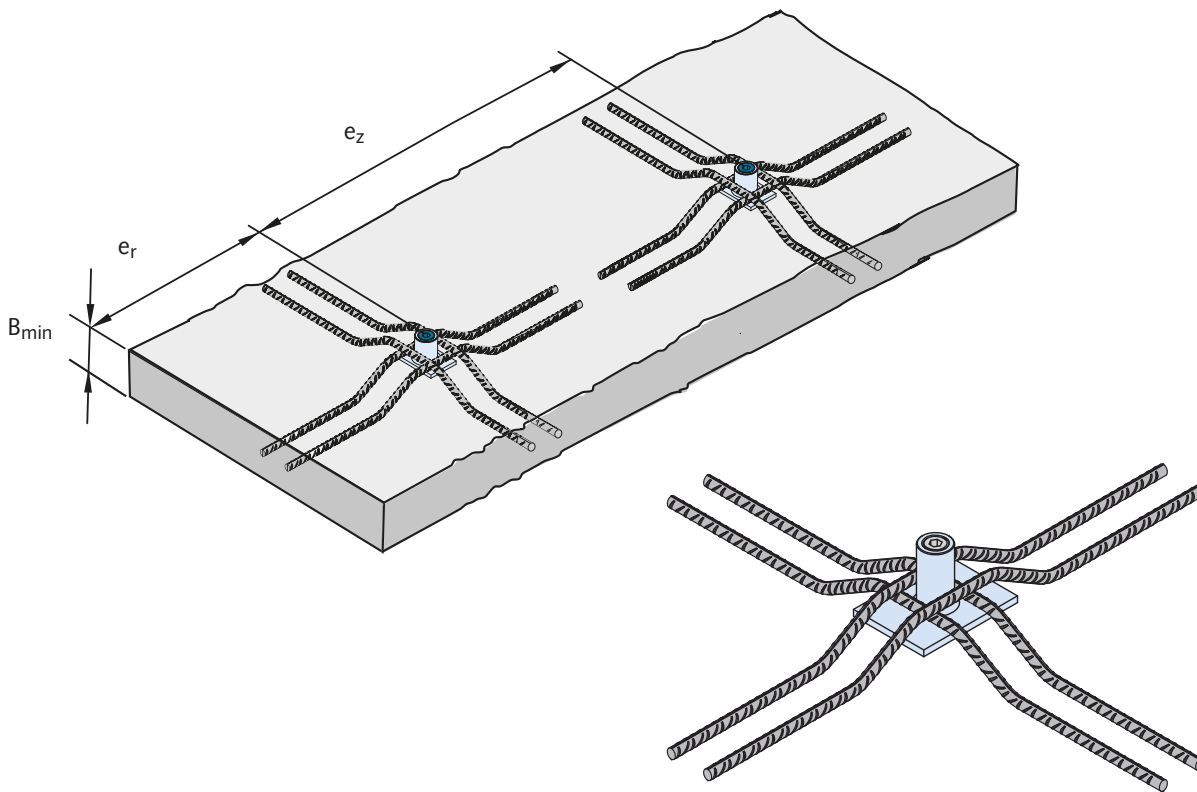


With diagonal reinforcement; diagonal load up to 45°



HALFEN HD SOCKET LIFTING SYSTEM HD Plate Anchor

HD Plate anchor – Calculation and installation



Verification

Subject to slab calculation for the load case “lifting” and required bending reinforcement at the anchors.



Slab thickness

With diagonal load, because of the assumed bond stress, the slab thickness must not exceed 25 cm.

Observe the minimum slab thickness and reinforcement.

Installation; no restraint reinforcement

Additional reinforcement is placed and fixed on top of the bottom plate of the HD Plate anchor.

The rebars used as restraint reinforcement must be installed in two layers, at right angle with full contact to the foot-plate and as close as possible to the socket; the bottom layer must be installed parallel to the short sides of the plate.

Standard reinforcement is installed.

With restraint reinforcement

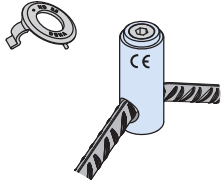
Restraint reinforcement is required in addition to the main reinforcement and the installed crossed additional reinforcement if the HD Plate anchor is subjected to more than 10° of diagonal load.

The restraint reinforcement is installed opposite to the direction of the load.

HALFEN HD SOCKET LIFTING SYSTEM

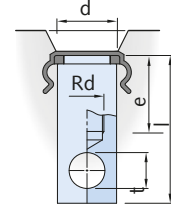
HD Plain Anchor

Approved load capacity, dimensions and reinforcement; HD Plain anchors with hole



Application: HD Plain anchors with hole are used for lifting thin precast walls. Also available in stainless steel.

! HD Plain anchors with hole are not suitable for slabs!



Dimensions and reinforcement – HD Plain anchor [mm]

Load class	Article name	Order no.	Dimensions of the HD Plain anchor						Mandatory reinforcement* for concrete strength $f_{ci} = 15 \text{ N/mm}^2$					
			Rd	l [mm]	d [mm]	t [mm]	e [mm]	axial load			diagonal load ③			
	zinc coated	0740.190						d_{s1} [mm]	l_{s1} ① [mm]	d_{br1} [mm]	d_{s2} [mm]	l_{s2} ② [mm]	d_{br2} [mm]	
1,3	6376 - 1,3	00001	12	65	21	13.5	31	10	650	40	8	850	25	
2,5	6376 - 2,5	00002	16	70	28	17.0	36	12	1000	50	10	1200	30	
4,0	6376 - 4,0	00003	20	85	38	24.5	42	16	1200	65	12	1400	40	
5,0	6376 - 5,0	00004	24	93	40	25.5	48	16	1500	65	14	1750	50	
7,5	6376 - 7,5	00005	30	116	46	28.0	58	20	1750	80	16	2000	50	
10,0	6376 -10,0	00006	36	136	51	30.0	66	25	1850	100	20	2000	55	

① elongated length ② for concrete compressive strength 15 N/mm^2 ; shorter stirrups may be possible for higher concrete compressive strengths.

③ Diagonal load reinforcement must be installed with direct contact to the socket.

For this application it is irrelevant if the minimal bending roll diameter is below requirement.

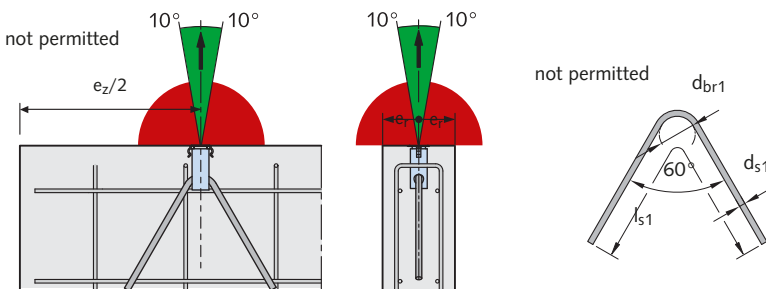
***additional reinforcement must be provided on-site!**

Allowable load capacity – HD Plain anchor

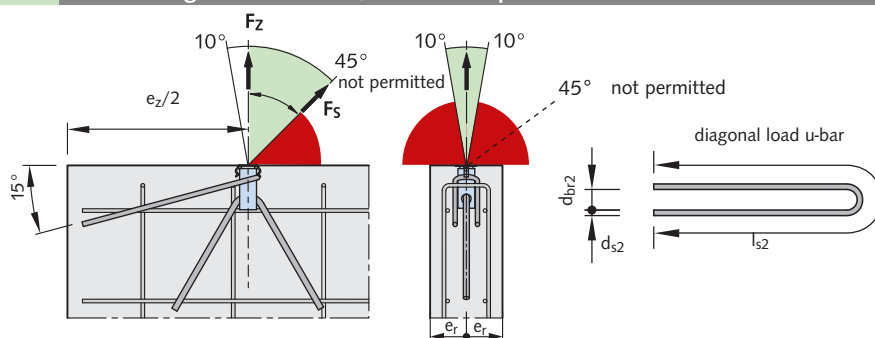
Load class	Article name	Minimum element thickness $2 \times e_r$ [mm]	Anchor layout ④		Load capacity [kN] for concrete strength f_{ci}			
			e_r min [mm]	e_z min [mm]	15 N/mm ² für		25 N/mm ² für	35 N/mm ² für
					axial load up to 10°	diagonal load up to 45°	axial load and diagonal load up to 45°	axial load and diagonal load up to 45°
1,3	6376 - 1,3	80	40	500	13.0	10.5	13.0	13.0
2,5	6376 - 2,5	100	50	600	25.0	20.0	25.0	25.0
4,0	6376 - 4,0	110	55	700	40.0	32.0	40.0	40.0
5,0	6376 - 5,0	120	60	750	50.0	40.0	50.0	50.0
7,5	6376 - 7,5	130	65	1000	75.0	60.0	75.0	75.0
10,0	6376 -10,0	140	70	1200	100.0	80.0	100.0	100.0

④ $e_z/2 = \text{min. edge distance}$; $e_z = \text{min. anchor spacing}$; $f_{ci} = \text{concrete cube strength at time of lifting}$

Without diagonal load u-bar; axial load up to 10°



With diagonal load u-bar; axial load up to 45°



The minimum permitted axial spacing between lifting anchors is e_z .

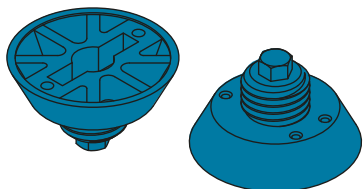
The required hanger reinforcement is inserted through the lower hole in the HD Plain anchor. The hanger reinforcement must be secured in place with full contact to the anchor. Refer to the reinforcement drawings and tables for each load class for any required additional reinforcement. The value given for concrete strength f_{ci} is for normal concrete according to DIN EN 206 or DIN 1045-1.

! The reinforcement must be secured in place with full contact to the anchor.

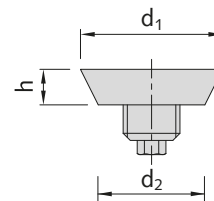
HALFEN HD SOCKET LIFTING SYSTEM

Accessories

HD Nailing plate – plastic



The plastic nailing plates are colour coded according to the thread size.



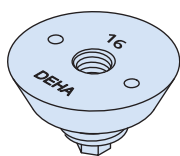
Plastic nailing plates are used to attach HD Anchors to formwork; they are available for thread sizes from Rd 12 to Rd 52.

The resulting recess fits the shape of the HD Lifting link exactly.

The shape of the recess allows the lifting link to distribute shear or diagonal load more effectively into the concrete.

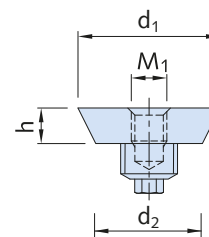
HD Nailing plate; plastic						
Load class	Article name	Order no. 0741.040-	Thread M/Rd	h [mm]	d ₁ [mm]	d ₂ [mm]
1,3	6358-12	00001	12	10	40	30
2,5	6358-16	00003	16	10	40	30
4,0	6358-20	00005	20	10	55	45
5,0	6358-24	00006	24	10	55	45
7,5	6358-30	00007	30	10	70	60
10,0	6358-36	00008	36	10	70	60
12,5	6358-42	00009	42	12	95	85
15,0	6358-52	00010	52	12	95	85

HD Nailing plate – steel



Finish: zinc plated

HD Steel nailing plates are available for thread sizes from Rd 12 to Rd 52



The resulting recess fits the shape of the HD Lifting link exactly. The shape of the recess allows the lifting link to distribute shear or diagonal load more effectively into the concrete.

The pre-assembled HD Nailing plate with adapter 6369-A is intended to be used with assembly pin 6330.

Thread can be reduced from M10/12 to M6 through applying the pre-assembled adapter.

Steel nailing plates 6369-A are delivered in a zinc plated finish for thread sizes 1,3 to 7,5.

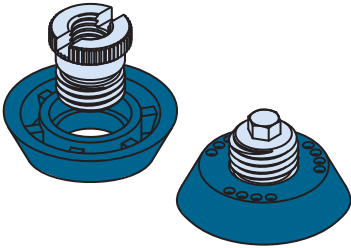
Nailing plate – steel							
Load class	Article name	Order no 0741.190-	for Rd	h [mm]	d ₁ [mm]	d ₂ [mm]	M ₁
1,3	6369- 12	00001	12	10	40	30	6
2,5	6369- 16	00002	16	10	40	30	10
4,0	6369- 20	00003	20	10	55	45	12
5,0	6369- 24	00004	24	10	55	45	12
7,5	6369- 30	00005	30	10	70	60	12
10,0	6369- 36	00006	36	10	70	60	16
12,5	6369- 42	00007	42	12	95	85	16
15,0	6369- 52	00008	52	12	95	85	16


Nailing plate with adapter, pre-assembled							
Load class	Article name	Order no 0741.190-	for Rd	h [mm]	d ₁ [mm]	d ₂ [mm]	M ₁
2,5	6369- 16 -A	00102	16	10	40	30	6
4,0	6369- 20 -A	00103	20	10	55	45	6
5,0	6369- 24 -A	00104	24	10	55	45	6
7,5	6369- 30 -A	00105	30	10	70	60	6

HALFEN HD SOCKET LIFTING SYSTEM

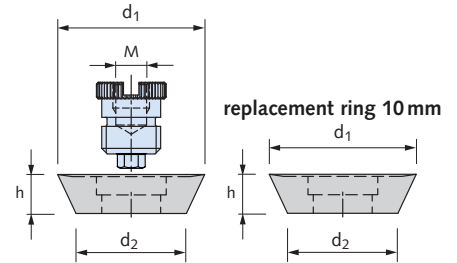
Accessories

HD Nailing plate with steel core and replacement ring – Height 10 mm



 Replacement ring available separately (see Price list)

A retaining bolt is available to attach the nailing plate quickly and securely to the formwork. All bolts used to fix the HD Nailing plate to the formwork must be unscrewed and removed before striking the formwork.

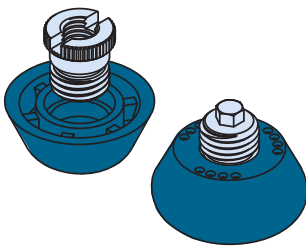



The HD Nailing plate which consists of a steel core and a replacement ring is used for fixing a HD Anchor to the formwork. Available in thread sizes Rd 12 to Rd 64.

The recess in the concrete made by the combi nailing plate matches the shape of the HD Lifting links exactly. This allows the lifting link to rest against the concrete when the anchor is subjected to diagonal or shear loads. The nailing plate core is made of chrome plated metal. The plastic ring is replaceable.

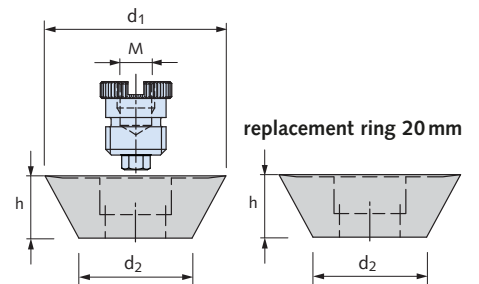
Combi nailing plate with steel-core									Replacement ring	
Load class	Article name	Order no. 0741.080-	Thread M/Rd	h [mm]	d ₁ [mm]	d ₂ [mm]	M [mm]	Article name	Order no. 0741.090-	
1,3	6510-12	00101	12	10	40	30	8	6512- 12	00001	
2,5	6510-16	00103	16	10	40	30	10	6512- 16	00003	
4,0	6510-20	00105	20	10	55	45	12	6512- 20	00005	
5,0	6510-24	00106	24	10	55	45	12	6512- 24	00006	
7,5	6510-30	00107	30	10	70	60	12	6512- 30	00007	
10,0	6510-36	00108	36	10	70	60	12	6512- 36	00008	
12,5	6510-42	00109	42	12	95	85	12	6512- 42	00009	
15,0	6510-52	00110	52	12	95	85	12	6512- 52	00010	
25,0	6510-64	00111	64	12	110	100	16	6512- 64	00011	

HD Nailing plate with steel core and replacement ring – Height 20 mm



 Replacement ring available separately (see Price list)

Bolts used to secure the HD Nailing plate to the formwork must be unscrewed and removed before striking the formwork.



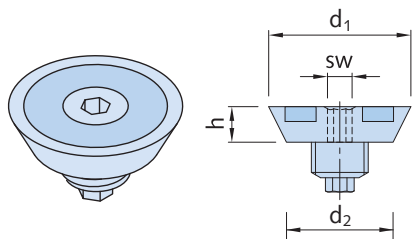
The HD Nailing plate which consists of a steel core and a replacement ring is used for fixing a HD Anchor to the formwork. Available for thread sizes from Rd 12 to Rd 52.

The nailing plate core is made of chrome plated metal; the replacement ring is made of flexible plastic.

Nailing plate with steel-core and replacement ring									Replacement ring	
Load class	Article name	Order no. 0741.210-	thread M/Rd	h [mm]	d ₁ [mm]	d ₂ [mm]	M [mm]	Article name	Order no. 0741.230-	
1,3	6520-12	00101	12	20	50	30	8	6522- 22	00001	
2,5	6520-16	00103	16	20	50	30	8	6522- 16	00003	
4,0	6520-20	00105	20	20	65	45	12	6522- 20	00005	
5,0	6520-24	00106	24	20	65	45	12	6522- 24	00006	
7,5	6520-30	00107	30	20	80	60	12	6522- 30	00007	
10,0	6520-36	00108	36	20	80	60	12	6522- 36	00008	
12,5	6520-42	00109	42	20	105	85	12	6522- 42	00009	
15,0	6520-52	00110	52	20	105	85	12	6512- 52	00010	

HALFEN HD SOCKET LIFTING SYSTEM Accessories

HD Magnetic plate



Finish: zinc galvanized

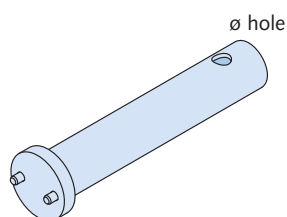
The zinc galvanized steel HD Magnetic plate can be used to secure HD Anchors to steel formwork. Available for thread sizes from Rd 12 to Rd 52. The nailing plate creates a recess in which the perfect head or the adapter is fixed.

Magnetic plate

Load class	Article name	Order no. 0741.180-	Rd	h [mm]	d ₁ [mm]	d ₂ [mm]	SW*
1,3	6365-12	00001	12	12	40	30	6
2,5	6365-16	00002	16	12	40	30	6
4,0	6365-20	00003	20	12	55	45	10
5,0	6365-24	00004	24	12	55	45	10
7,5	6365-30	00005	30	12	70	60	16
10,0	6365-36	00006	36	12	70	60	16
12,5	6365-42	00007	42	12	95	85	16
15,0	6365-52	00008	52	12	95	85	16

*metric wrench size

Tool for steel nailing plate

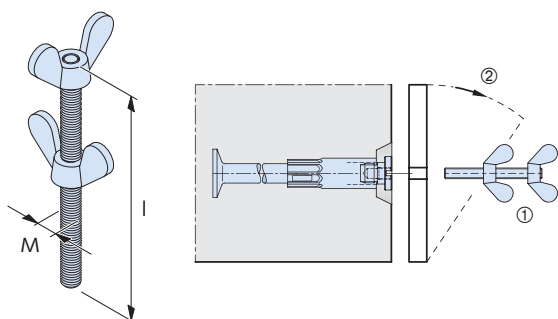


Tool – steel nailing plate

Load class	Article name	Order no. 0741.350-	Rd	ø hole [mm]
1,3-2,5	6337-12 / 16	00001	12-16	10.5
4,0-15,0	6337-20 / 52	00002	20-52	10.5

Facilitates loosening and removal of steel nailing plates.

Retaining bolt S1



The retaining bolt is used to attach the steel nailing plate. A butterfly bolt is crimped to one end to tighten the bolt; an additional butterfly bolt is used to secure the bolt to the formwork.

Retaining bolt

Load class	Article name	Order no. 0073.060-	Thread	l [mm]
4,0-7,5	S1-12	00002	M 12	160
10,0-15,0	S1-16	00003	M 16	160

Removing the formwork:

- ① First remove all retaining bolts
- ② Then remove the side of the formwork

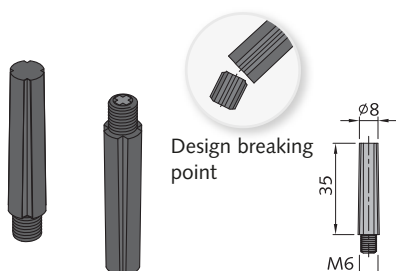
Suitable retaining bolt: see the nailing plate selection tables

HALFEN HD SOCKET LIFTING SYSTEM

Accessories

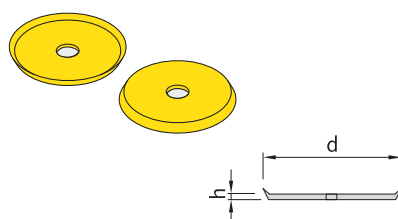
Assembly pin, plastic

The assembly pin is used for quick removal of the formwork. The pin is screwed into the steel nailing plate with adapter. The assembly pin breaks off at the design breaking point when removing the formwork.



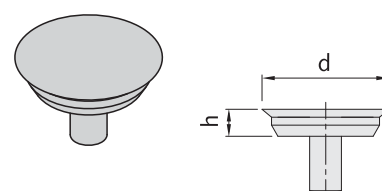
Sealing plate, rubber

The rubber sealing plate is placed between the steel nailing plate and the formwork to prevent cement getting into the nailing plate holes when pouring the concrete. All sealing plates are coloured yellow.



HD Sealing plate, plastic

The grey HD Sealing plate is used to seal recesses and conceal (and protect) the HD Anchors. Available for thread sizes Rd 12 to Rd 24.



Assembly pin, plastic

Article name	Order no. 0741.300-	for load class
6330-1,3-7,5	00001	1,3
		2,5
		4,0
		5,0
		7,5

Sealing plate, rubber

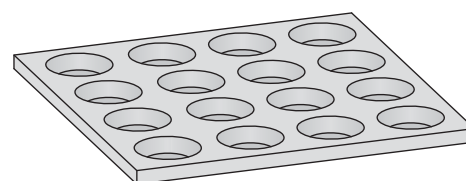
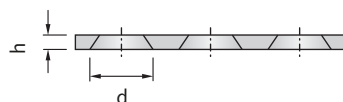
Article name	Order no. 0741.330-	for load class	d [mm]	h [mm]
6334-1,3-2,5	00001	1,3-2,5	40	1.5
6334-4,0-5,0	00002	4,0-5,0	55	1.5
6334-7,5-10,0	00003	7,5-10,0	70	1.5

HD Sealing plate, plastic

Article name	Order no. 0741.280-	for Rd	d [mm]	h [mm]
6513-12	00001	12	40	10
6513-16	00002	16	40	10
6513-20	00003	20	55	10
6513-24	00004	24	55	10

Mould

Mould for making the concrete recess plugs to fill the recesses made by the nailing plates. Rubber, re-usable.



Rubber mould

Article name	Order no. 0741.290-	for load class	h [mm]	d [mm]	Number of plugs
6329- 12-16	00001	1,3 + 2,5	8	37	16
6329- 20-24	00002	4,0 + 5,0	8	52	16
6329- 30-36	00003	7,5 + 10,0	8	67	16
6329- 42-52	00004	12,5 + 15,0	10	92	9

HALFEN HD SOCKET LIFTING SYSTEM

HD Lifting Devices

General information

Health and safety regulations must always be observed.

Regulations covering the use of cranes and other lifting equipment apply.

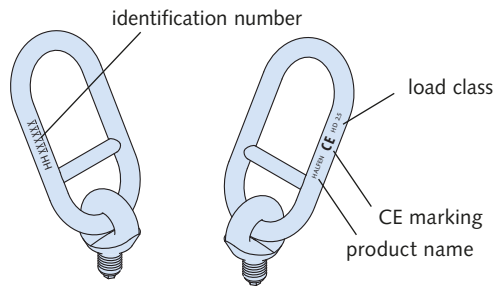
All HD Lifting links are identification marked.

HD Lifting link

While the HD Anchor link is installed, the hexagon shaped tip of the ring bolt simultaneously turns the integrated thread protector.

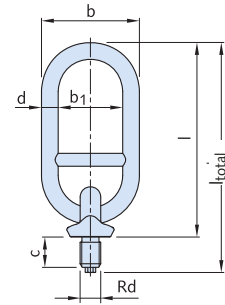
When the HD Lifting link is removed the plastic thread cap returns to the top of the socket to protect the thread.

If the anchor was cast in using the nailing plate or the magnetic recess former then the shape of the final recess allows the HD lifting link to



Finish: zinc plated

distribute shear or diagonal load more effectively into the concrete.



! The threads must be checked regularly for damage. Recutting threads is not permitted.

Dimensions – HD Lifting links

Load class	Article name	Order no. 0742.130-	Rd	weight [kg]	l _{total} [mm]	l [mm]	c [mm]	b [mm]	b ₁ [mm]	d [mm]
1,3	6362-12	00001	12	0.57	177.5	153	18.5	76	50	13
2,5	6362-16	00002	16	0.65	182.5	153	23.5	76	50	13
4,0	6362-20	00003	20	1.21	197.0	162	29.0	82	50	16
5,0	6362-24	00004	24	1.29	203.0	162	35.0	82	50	16
7,5	6362-30	00005	30	2.40	228.0	177	43.0	94	50	22
10,0	6362-36	00006	36	2.54	236.5	177	51.5	94	50	22
12,5	6362-42	00007	42	4.84	286.5	219	59.5	117	65	26
15,0	6362-52	00008	52	5.31	299.5	219	72.5	117	65	26



Before each use check all lifting equipment for correct application and visually inspect to ensure damage-free condition!

It is prohibited to use damaged lifting equipment!



Optional available certificates

(please request when ordering)

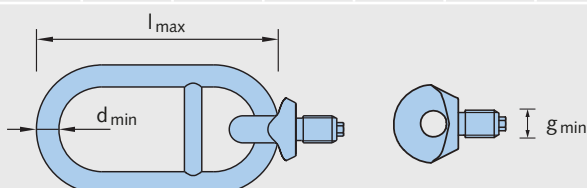
➤ A certificate confirming that all guidelines and quality controlled manufacture were observed; also includes a certificate confirming the type of lifting link with an identification number and inspection table.

➤ In addition to the certificate a written report confirming the lifting link was tested to twice its nominal load capacity.

Please refer to the current price list for order numbers.

HD Lifting links – wear limits

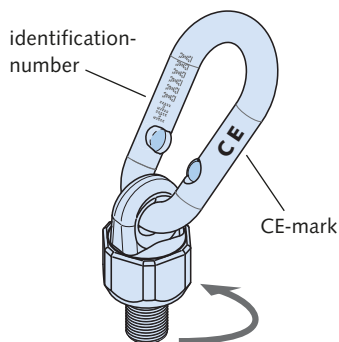
Load class	1,3	2,5	4,0	5,0	7,5	10,0	12,5	15,0
thread Rd	12	16	20	24	30	36	42	52
Link length: wear limits "l" [mm]								
l _{max}	160	160	170	170	185	185	229	229
Handle thickness: wear limits "d" [mm]								
d _{min}	11.7	11.7	14.4	14.4	19.8	19.8	23.4	23.4
Thread thickness: wear limits "g" [mm]								
g _{min}	11.3	15.2	19.1	22.9	28.6	34.3	40.1	49.8



HALFEN HD SOCKET LIFTING SYSTEM

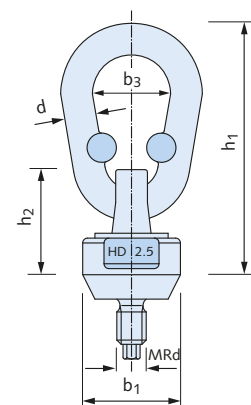
HD Lifting Devices

HD Rotary head lifting link



Application: The HD Rotary head lifting link can be used for diagonal as well as for shear loads.

The rotatable head facilitates insertion into the anchor; the HD Rotary head link can be screwed into the HD Anchor while still attached to the crane hook.



The 6367 Rotary head lifting link

- › forged spanner notches on the rotary link facilitate fitting /removal
- › chrom (VI)-free galvanized coating provides up-to-date environmentally friendly corrosion protection
- › large load surface ensures smooth rotation and turning; even under load
- › link capable of pitching under diagonal load
- › minimal height link size



Improved load transfer with a specially shaped load surface.



Before each use check all lifting equipment for correct application and visually inspect to ensure damage-free condition!
It is prohibited to use damaged lifting equipment!

i Optional available certificates

(please request when ordering)

- › A certificate confirming that all guidelines and quality controlled manufacture were observed; also includes a certificate confirming the type of lifting link with an identification number and inspection table.
- › In addition to the certificate a written report confirming the lifting link was tested to twice its nominal load capacity.

Please refer to the current price list for order numbers.

Dimensions - HD Rotary head lifting link

Load class	Article name	Order no. 0742.230-	thread Rd	b_1 [mm]	b_3 [mm]	h_1 [mm]	h_2 [mm]	wrench [mm]	d [mm]
1,3	6367-12	00001	12	40	32	100	25	34	13
2,5	6367-16	00002	16	40	32	100	25	34	13
4,0	6367-20	00003	20	55	34	126	28	46	16
5,0	6367-24	00004	24	57	45	148	35	50	18
7,5	6367-30	00005	30	70	46	163	41	65	20
10,0	6367-36	00006	36	70	46	163	41	65	20
12,5	6367-42	00007	42	95	60	201	48	75	23
15,0	6367-52	00008	52	95	60	201	48	75	23
25,0	6367-64	00009	64	110	70	246	59	95	30.5

HALFEN HD SOCKET LIFTING SYSTEM

HD Lifting Devices

Application – rotary head lifting link

Pitch limits

Maximal angle of 45° for diagonal load with cable spread or 90° in pitching.

! Note! Reduced load capacity in shear load.

Installation

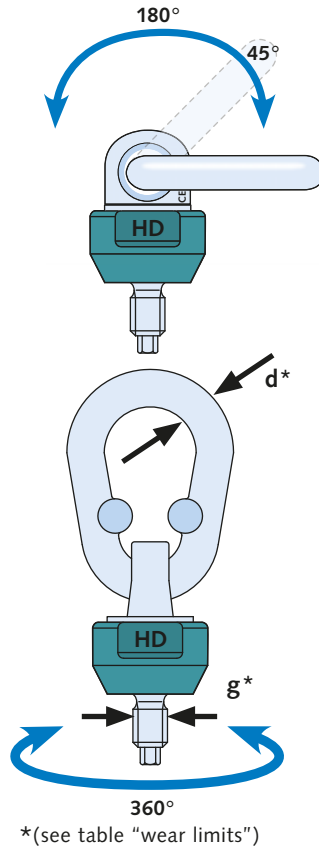
- > forged spanner notches on the head allow easy fitting / removal
- > crimp marks in the link prevent kinking
- > galvanic coating protects against corrosion, this includes the inner parts of the link

Range of movement

- > 180° pivot
- > 360° rotatable

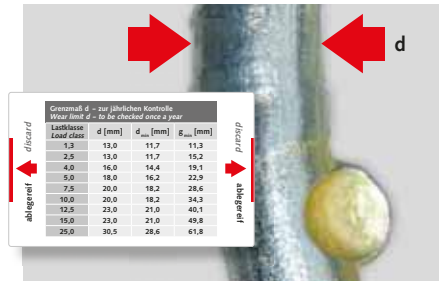
Additional safety

- > a failure safety factor of 4 applies for all load directions
- > rotatable under load



Checking the life-span

Using the HALFEN Check-card the condition of the rotary head link is easily checked on-site (see table below) by checking the joint-gap and the handle. If a HALFEN Check-card is not available a 0.5 mm thick piece of metal can be used instead.

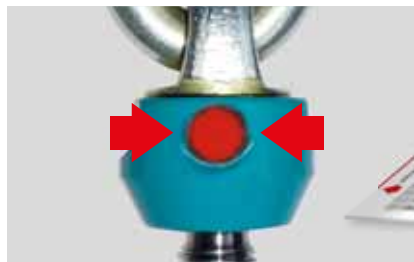


Discard the lifting clutch

To determine if the lifting clutch must be discarded check the following: The joint in the rotary head lifting clutch, minimum thickness (d_{min}) of the lifting-bracket and the condition of the plug. (visual check of the colour security-mark).



Checking the condition of the clutch using the HALFEN Check-card.



Check the colour security-mark on the plug. The security-mark must not have any cracks.



Check wear using the check-card/0.5 mm Discard anchor if the card can be inserted deeper than the red line (as illustrated).

Load capacity – HD Rotary head lifting link						
Load class	Article name	Order no. 0742.230-	Centric load ①	Diagonal load ①	Shear load ①	
			[kN]	≤45° [kN]	[kN]	
1,3	6367-12	00001	13.0	13.0	7.5	
2,5	6367-16	00002	25.0	25.0	14.0	
4,0	6367-20	00003	40.0	40.0	22.5	
5,0	6367-24	00004	50.0	50.0	28.0	
7,5	6367-30	00005	75.0	75.0	42.5	
10,0	6367-36	00006	100.0	100.0	57.0	
12,5	6367-42	00007	125.0	125.0	71.0	
15,0	6367-52	00008	150.0	150.0	85.5	
25,0	6367-64	00009	250.0	250.0	130.0	

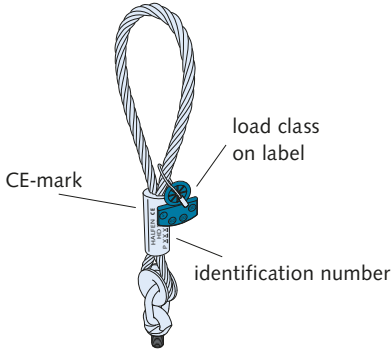
① see pages 12-16 "Load directions"

Wear limits – annual inspection			
Load class	d [mm]	d_{min}^* [mm]	g_{min}^* [mm]
1,3	13.0	11.7	11.3
2,5	13.0	11.7	15.2
4,0	16.0	14.4	19.1
5,0	18.0	16.2	22.9
7,5	20.0	18.2	28.6
10,0	20.0	18.2	34.3
12,5	23.0	21.0	40.1
15,0	23.0	21.0	49.8
25,0	30.5	28.6	61.8

HALFEN HD SOCKET LIFTING SYSTEM

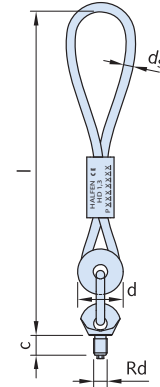
HD Lifting Devices

HD Perfect head lifting link



Application: The HD Perfect head lifting link is especially suited for diagonal loads and is used for lifting wall elements upright with load angles under 90°. Observe the application instructions for HD Anchors!

Optional available certificates: Please request when ordering and refer to the current price list for order numbers. → see pages 39 or 40 for further information.



Dimensions – HD Perfect head lifting link

Load class	Article name	Order no. 0742.170-	Rd	weight [kg]	l [mm]	d [mm]	c [mm]	d _s [mm]
1,3	6377-12	00001	12	0.5	300	41	18.5	8
2,5	6377-16	00002	16	0.9	390	54	23.5	11
4,0	6377-20	00003	20	2.0	510	70	29.0	14
5,0	6377-24	00004	24	2.4	550	70	35.0	16
7,5	6377-30	00005	30	5.8	700	98	43.0	20
10,0	6377-36	00006	36	6.9	760	98	51.5	22
12,5	6377-42	00007	42	11.0	860	124	59.5	24
15,0	6377-52	00008	52	14.0	940	124	72.5	28

Checking the cable loops

All lifting equipment, including cable loops must be checked by a qualified expert at least once a year to ensure safety. There is no predetermined limit on the life span of a cable. We can only guarantee the safety and function of the perfect head if original cable-loops are used. Bolt threads must be checked regularly for any signs of damage. Recutting threads is not permitted.

Cables must be discarded if the following number of broken wires are visible:

cable type	Visible wire breaks over a cable length of:		
	3d	6d	10d
strand cable	4	6	16

Checking the cable loop must also include checking cable loop slip in the ferrule. Cables must not come into contact with acids, caustic solutions or other aggressive substances.

Cable loops are preferable hung in crane hooks with large cross sections. Crane hooks with sharp edges or with minimal cross sections and therefore small diameters may damage and cause cables to deteriorate faster, resulting in a shorter lifespan. Lifting clutches generally have a longer service life than cables, therefore, lifting clutches with cable loops that have been discarded can be returned to us to be repressed.

Cable loops must be checked for following defects:

- > kinking
- > breakage in a cable strand
- > loosening of the exterior wires in the cable length
- > compressive deformation
- > crushing in the load area of the load loop with more than four wire breaks in strand-cables and more than ten breaks in wire-laid cables
- > signs of corrosion
- > excessive wear in the cable or cable-end connections
- > a large number of broken wires



Before each use check all lifting equipment for correct application and visually inspect to ensure damage-free condition!
It is prohibited to use damaged lifting equipment!



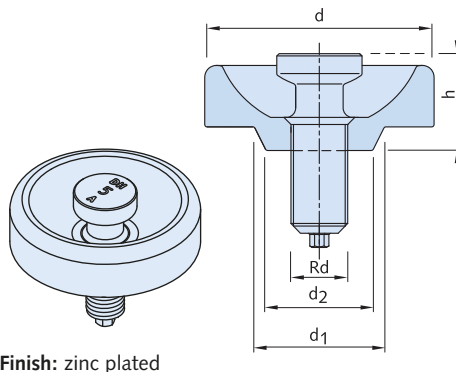
Checking the thread
See HD Link chapter, table on page 39 ("HD Lifting links – wear limits") see "g_{min}".

HALFEN HD SOCKET LIFTING SYSTEM

HD Lifting Devices

Adapter for HALFEN DEHA Universal head clutch

Application: The HD Adapter enables the HALFEN DEHA Spherical head lifting anchor system to be used with the HD Socket lifting system. The universal head lifting link of the appropriate load class can then be attached.



Finish: zinc plated

! The 6366 adapter can only be used when the lifting anchor was installed in a precast concrete element using a nailing plate of 10 - 12 mm height. Using the adapter when a nailing plate with a height of 20 mm was used is not permitted.

Dimensions – HD Adapter

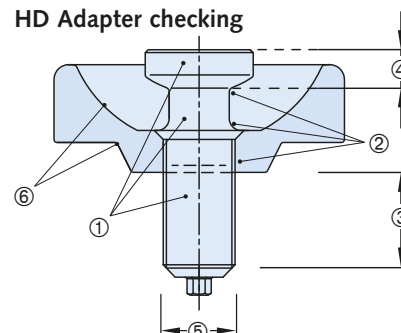
Load class	Article name	Order no. 0742.140-	Rd	d [mm]	d ₁ [mm]	d ₂ [mm]	h [mm]	Suitable for the universal head clutch Article name	
1,3	6366-12	00001	12	70	40	30	30		
2,5	6366-16	00002	16	78	40	30	38		6102- 1,3
4,0	6366-20	00003	20	97	55	45	45		6102- 2,5
5,0	6366-24	00004	24	97	55	45	45		6102- 5,0
7,5	6366-30	00005	30	117	70	60	60		6102-10,0
10,0	6366-36	00006	36	117	70	60	60		6102-20,0
12,5	6366-42	00007	42	117	95	85	95		
15,0	6366-52	00008	52	117	95	85	95		

Inspection procedure – HD Adapter

Discard the HD Adapter if:

- the bolt is bent or deformed in any way
- the thread is damaged or if there is any signs of cracks
- minimal head thickness and thread diameter have been exceeded due to excessive wear
- pressure plate wear has progressed so far that the universal head lifting link only has contact towards the top of the adapter-plate

HD Adapter checking



- ① Visual inspection for bending in the screw/thread and for other deformation (re-bending the screw/thread is not permitted).
- ② Visual inspection of bolt for any signs of cracks.
- ③ Includes a visual inspection of the thread for any damage and atypical wear.
- ④ Check head thickness (see below).
- ⑤ Check thread diameter.
- ⑥ Visual inspection of pressure plate for obvious wear.

Wear limits – HD Adapters

Load class	1,3	2,5	4,0	5,0	7,5	10,0	12,5	15,0
thread Rd	12	16	20	24	30	36	42	52
wear limit								
minimum-thread-ø	11.6	15.5	16.6	23.4	29.3	35.2	41.1	51.0
minimum head thickness ④ [mm]								
min. head thickness	7.0	10.0	11.5	11.5	16.0	16.0	24.5	24.5



Before each use check all lifting equipment for correct application and visually inspect to ensure damage-free condition!

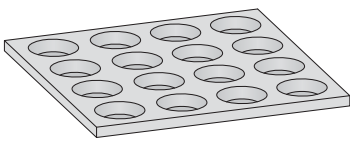
It is prohibited to use damaged lifting equipment!

HALFEN HD SOCKET LIFTING SYSTEM

Installation of concrete recess plugs

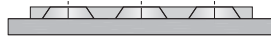
Sealing the nailing plate recess

Recesses in precast balconies, stairs or other elements can be sealed with plastic or steel recess fillers. These however remain visible in the element. If an aesthetic finish is required recesses can be cast in concrete using the same material as in the main element.



This provides a near uniform surface:

- in the same colouring
- in the same material
- with the same texture



A PU (Polyurethane) mould is available to make custom recess fillers in the precast plant; this ensures a visually optimal solution.

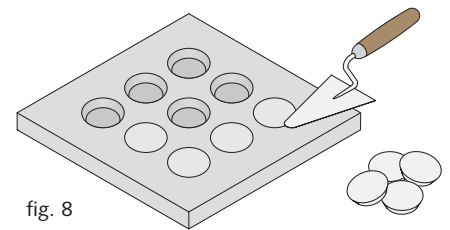


fig. 8



The concrete recess fillers blend in to the surface of the precast concrete parts.

Making the recess fillers (fig. 8)

To achieve the required structure, place the recess filler mould with the larger ring diameter facing down on the formwork and fill with concrete from the same batch as the concrete component.

The concrete is then levelled off.

Remove the mould once the concrete has hardened; the recess fillers can now be removed from the formwork and used.

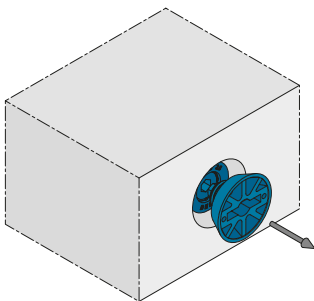


fig. 9

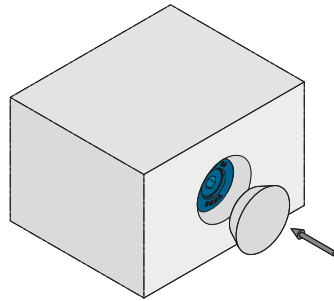


fig. 10

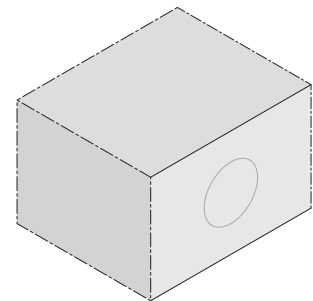


fig. 11

Fixing the recess fillers (fig. 9 - 11)

After final installation of the precast element the recess fillers can be cemented in place.

We recommend using commercially available quick-set mortar.

The moulds are reusable.





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