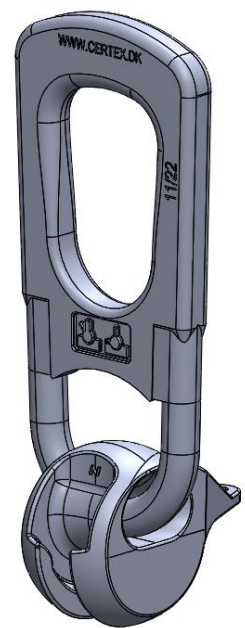


STARCON



STARCON



Spherical lifting eye system 1.3S to 20S

Lifting and handling systems for concrete elements.

User and design manual

1 Nomenclature

Symbol	Description	Unit
σ_{ele}	Concrete strength of the element at the time of lifting	MPa
d_s	Diameter of the wire cable	mm
SF	Safety factor	-
S	Load group symbol (STARCON)	-
WLL	Working Load limit	tons

Table 1 Nomenclature

Starcon spherical lifting eye system

1	Nomenclature	1
2	Identification.....	2
3	Introduction Starcon spherical lifting eye 1.3S to 20S.....	3
4	Safety instructions before use	4
5	Advantages of the Starcon system.	4
6	Using the Starcon lifting eye system.....	5
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2 Identification

Table 2 provides insight into the revision number of this document. It facilitates tracking changes and ensuring version control for accurate referencing and updates.

Version	Responsible	Creator	Date	Comment
A	CERTEX Denmark	JLJ	02-07-2024	New documentation

Table 2 Revision table

3 Introduction Starcon spherical lifting eye 1.3S to 20S.

Read this instruction manual before using the Starcon system. Incorrect use can cause injury or danger!

Safety is paramount when using lifting devices and equipment. Only trained individuals should operate them as per national law. Familiarize yourself with the instruction manual before use to ensure safe operation. Adhering to these guidelines reduces the risk of accidents. Consult relevant national regulations as they may supersede these instructions. All individuals involved with the equipment must read and understand this manual. Contact Certex for assistance or clarification. Always keep the manual with the product. Contact information is provided on the last page.



General description of the Starcon spherical lifting eye system

The Starcon lifting eye system is available in three different variants as shown in Figure 1. It is easy and fast to connect all three types to a hook.

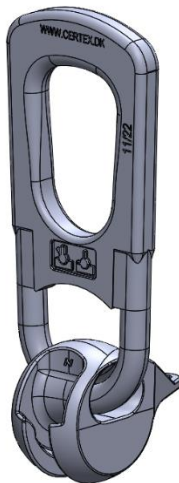
The Starcon lifting anchors and systems use the guidelines described in the German guidelines VDI/BV-BS 6205 and Technical Report CEN/TR 15728, combined with EN 13155-2009. This ensures the highest level of safety when using our products.

Material:

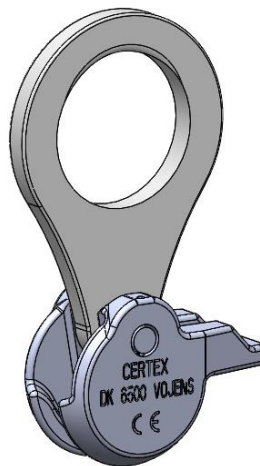
Steel.

Surface treatment:

Hot dip galvanized.

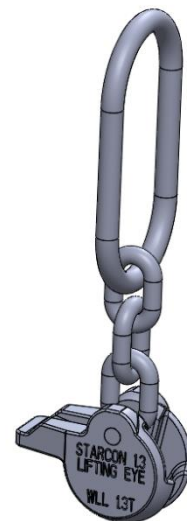


Universal lifting eye



Standard lifting eye with a plate coupling

Figure 1 Starcon lifting eyes.



Lifting eye with flexible coupling

4 Safety instructions before use



- Starcon lifting anchors that are exposed of corrosion, or damaged must not be used.
- The Starcon lifting anchor must only be hoisted by a lifting unit of the same size.
- The Starcon lifting and handling system must not be used to lift more than the specified load.
- The Starcon lifting and handling system must not be used for personnel lifting.
- The Starcon products (anchors) are designed for one-time lifting only.
- The Starcon lifting system must only be used by skilled, trained employees.
- A lifting accessory used with the lifting eye must be correctly marked and approved for lifting.
- Before use, check the weather conditions. Never operate the system if there is a likelihood of lightning in the area and avoid use in extreme weather conditions such as storms, heavy rain, or snowing.
- The concrete safety factor assumes a factory production control complying with EN13369. If these requirements are not fulfilled, a safety factor of $\gamma = 2,5$ shall be used.
- All relevant concrete failure modes shall be verified by the pre casting manufacturer of the concrete elements; the different failure modes and verification methods are specified in EN13155 (Annex H).

5 Advantages of the Starcon system.

The Starcon system offers quick and secure assembly and release options for the lifting eye, facilitating the safe and economical handling of precast concrete units. The self-locking lifting eye prevents accidental release, eliminating the need for time-consuming screw connections and wear-prone wires. The robust lifting eyes ensure long-term reliability.

Available in load groups 1.3S to 20S, the Starcon system features a lifting eye that rotates freely around the anchor's axis. Its unique geometry allows the anchors to bear their full load, even when pulled perpendicularly.

The system's efficiency is proven through years of use and extensive laboratory testing. Components undergo regular production testing and are clearly marked with maximum load information. Each lifting eye is individually tested and marked with a traceability batch code.

5.1 Note

The information in this manual is for guidance only, and the use of the manual does not in any way exempt the user from ensuring that the chosen lifting system is suitable for the intended purpose. The information and data listed in this manual only refer to original Starcon products supplied by CERTEX DANMARK A/S.

6 Using the Starcon lifting eye system

The Starcon system comprises a wide range of Spherical anchors in a load group from 1.3S to 32S per anchor with various lengths. The principle for using the system is the same for the entire range. The Starcon system consists of the following three main components:

6.1 Starcon STA Anchor




The Starcon anchor is a steel component for embedding with a specially designed foot for solid anchoring in hardened concrete. The head of the Starcon anchor, which is cylindrical in shape, connects to a Starcon lifting eye for lifting purposes. Starcon anchors are clearly labeled with sizes (e.g., 2.5S) and are available in different lengths. They undergo sample testing for defects, dimensional deviations, and tensile strength with a safety factor of minimum 3:1 for metallic failure.

6.2 Starcon Former

The former are semi-spherical soft PVC components used for embedding an anchor in wet concrete. The anchor head is placed in the former, which can be attached to the formwork. After the unit is cast and hardened, the former is removed, revealing the anchor head seated in a semi-spherical depression in the concrete. Each former can be used for multiple castings if cleaned and lubricated after each use.

6.3 Starcon lifting eyes and universal lifters

The Starcon lifting eyes is a specially designed component with a spherical-shaped connection that grips in the head of the Spherical anchor. Starcon lifting eyes are tested to twice the allowable load, and all test results are recorded. Each Starcon lifting eye is marked with maximum working load with a safety factor of 4:1. A certificate is issued for each delivery. See Table 3 for load capacity of the lifting eye.

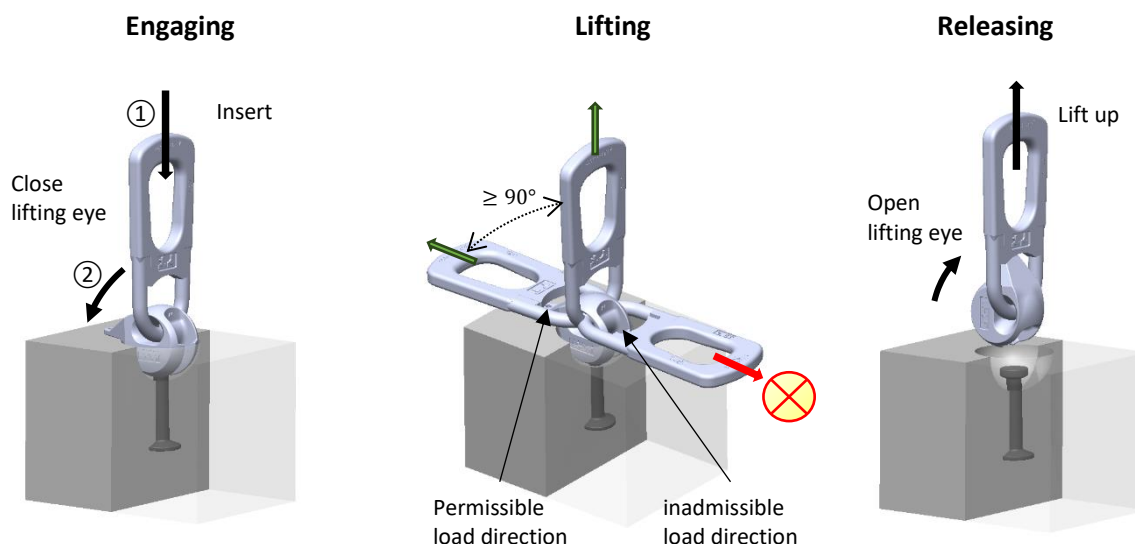
Designation	Load group lifting eye	Load class lifting spherical anchors	Load capacity lifting eye in all directions [kN] ①.		
			 Axial load	 Diagonal load $\geq 45^\circ$	 Shear
Lifting eye 1.3S	1.3	1.3	13		
Lifting eye 2.5S	2.5	2,5	25		
Lifting eye 5S	5	5	50		
Lifting eye 10S	10	7,5	75		
		10	100		
Lifting eye 20S	20	15	140		
		20	200		
Lifting eye 32S	32	32	320		

① The lifting eye system operates based on the load capacity of the lifting anchor, ensuring safe and efficient handling of loads up to the specified limit of the anchor's capability.

Table 3 Load capacity of the lifting eye

6.4 Lifting eye assembly instructions.

In this section the assembly the lifting eye to the spherical anchor is described. Align the spherical Head Lifting eye above the anchor head, opening downwards, and turn the lip to secure it. The eye prevents accidental uncoupling under load. Always ensure the lip points towards the tension direction during lifting. Release the load, then turn the lip back to uncouple. The instruction is shown and explained in Table 4.



Verify the anchor's load capacity matches the lifting link.

- ① To engage, position the ball with the opening facing down over the anchor.
- ② Then rotate the tongue away from the lifting link towards the concrete surface. The lifting link is now secured and ready for use.

The design ensures the eye stays secure under load. Always align the lip with the tension direction when lifting. It supports axial, diagonal. When turning elements, the lip must point towards the tension.

Manually release the load and turn the lip back to disconnect to enable the removal of anchor

Table 4 The connection between the lifting eye and spherical anchor is fast and easy.

7 Safety factors for lifting systems:

For the calculations of the lifting system, the following safety factors shown in Table 5 have been applied to ensure its reliability and safety. These factors, in accordance with the recommendation of EN13155, have been carefully selected as guidelines to ensure optimal safety during the system's operation.

Failure safety factors	
Steel failure of anchors	$SF_{Steel} = 3$
Concrete pull out failure	$SF_{concrete} = 2,5$
Failure in the lifting eye	$SF_{Link} = 4$

Table 5 Failure safety factors

8 Marking on the lifting eye

Each lifting eye is clearly labeled with its workload limit, manufacturer's identification, date of construction, ensuring easy and secure identification of the systems, even post-installation. The marking for the universal lifter is show on Figure 2.

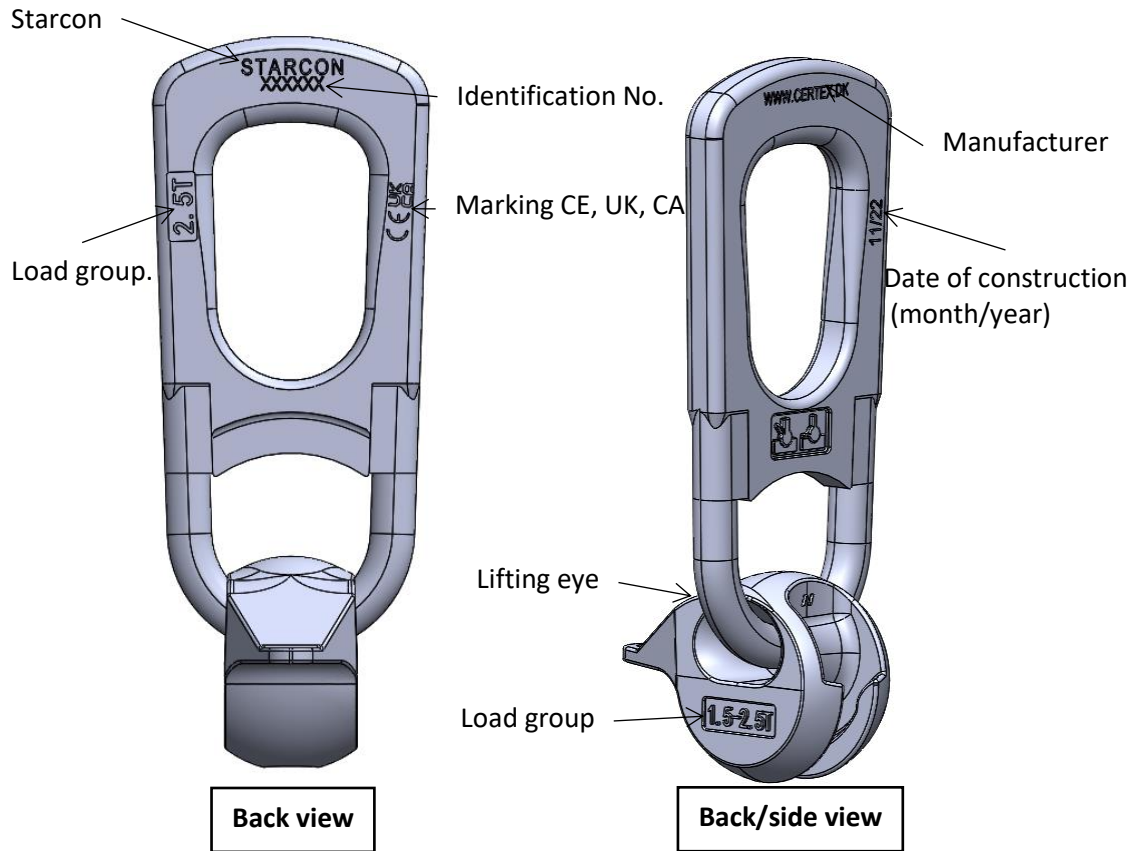


Figure 2 Marking on universal lifting eye.

The marking for the lifting eye used for the coupling and flexible coupling lifting system is show on Figure 3

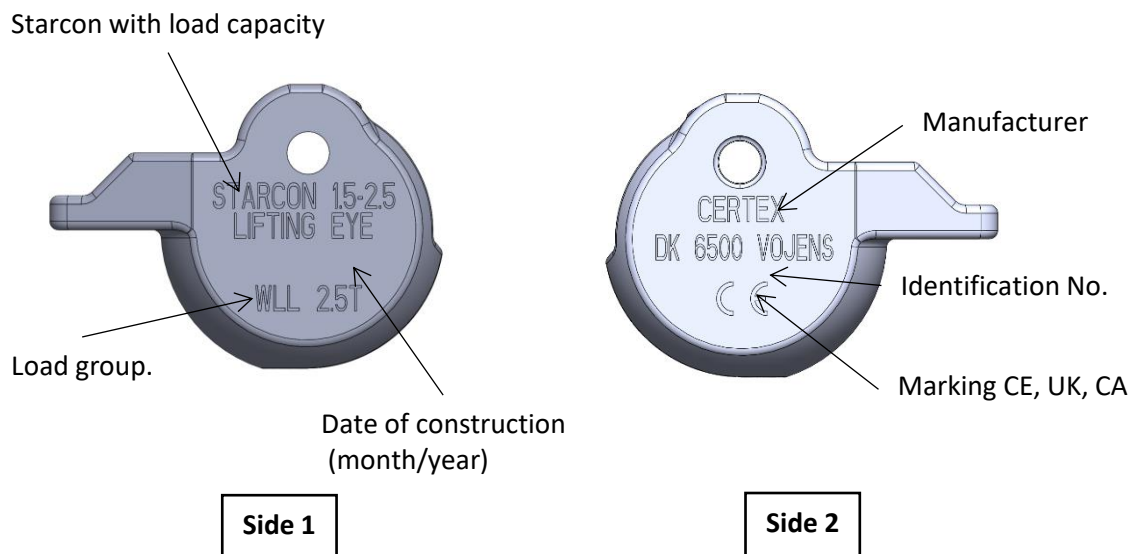


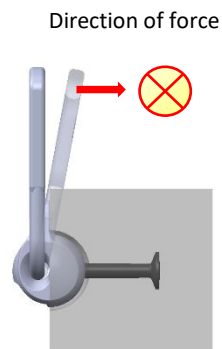
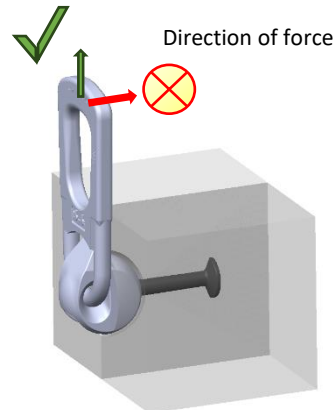
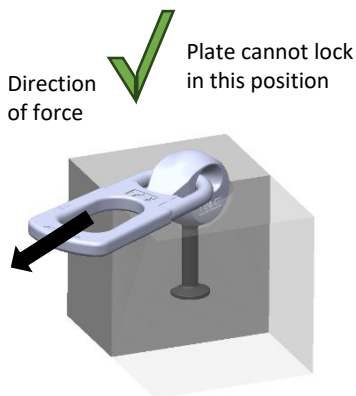
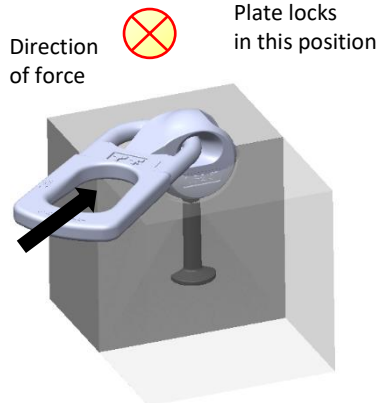
Figure 3 Marking on lifting eye.

9 Misuse of the Starcon lifting eye.

The Starcon lifting eye is used for lifting loads securely. Correct shackle positioning is crucial to avoid bending and damage. Align the shackle at an angle to prevent it from locking or bending under load, ensuring optimal performance and safety. The misuse of the Starcon lifting eye is shown in Table 6.

To prevent locking and deformation, ensure the plate is not positioned beneath lifting eye when the load is applied. An incorrect placement can cause the round shackle to bend under the applied load.

If the shackle is pulled towards the upper surface of the slab under load, it will bend at the edge of the slab.



The plate bends around the element and damaging the anchor and element.

Table 6 Misuse of the Starcon lifting eye system

10 Checking connection fittings

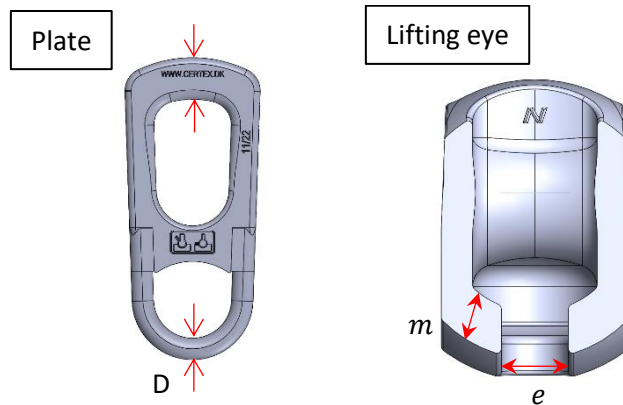
Starcon lifting eye are load-bearing devices designed to work exclusively with STARCON spherical anchors. They require an annual inspection by a qualified expert to ensure safe operation. The product's correct function and safety can only be guaranteed when using original components from STARCON. Users are cautioned against mixing products from other manufacturers.

10.1 Universal lifter wear inspection

Key inspection points must be followed for maintenance shown in Table 7 for universal lifter.

Universal lifter wear inspection

If the plates showing any signs of damage or significant wear should be taken out of service immediately. Please consult the table for the acceptable wear tolerances.



Load group	1.3	2.5	5	10	20
Universal lifter plate					
Nominal dimension D [mm]	$12 \frac{+1,2}{0}$	$14 \frac{+1,2}{0}$	$16 \frac{+1,2}{0}$	$25 \frac{+1,2}{0}$	$30 \frac{+1,2}{0}$
Min. D [mm]	10,5	12,5	18,5	26	36
Nominal dimension g [mm]	$18 \pm 1,0$	$27 \pm 1,0$	$37 \pm 1,0$	$51 \pm 1,0$	$76,5 \pm 1,0$
Min. g [mm]	14	17,5	28	36	56
Universal lifter eye					
Min. m [mm]	5,5	6	8	12	18
Nominal dimension e [mm]	$11,5 \pm 0,5$	$16 \pm 0,5$	$22 \pm 0,5$	$30 \pm 0,5$	$42 \pm 0,5$
Max. e [mm]	13	18	24,5	32,5	47,5

Table 7 Checking for defects of the universal lifter with lifting eye for safe operation.

10.2 Standard coupling wear inspection

Key inspection points must be followed for maintenance shown Table 8 for standard coupling.

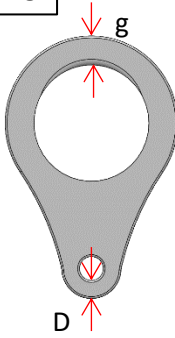
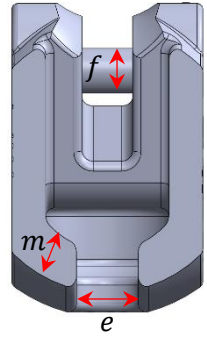
Standard coupling wear inspection		Coupling			Lifting eye	
						
<p>If the plates showing any signs of damage or significant wear should be taken out of service immediately. Please consult the table for the acceptable wear tolerances.</p>						
Load group		1.3	2.5	5	10	20
Standard lifting plate						
Nominal dimension D [mm] 10% from original		6.7 ± 0,3	9,3 ± 0,3	12 ± 0,3	19,2 ± 0,3	23,5 ± 0,3
Min. D [mm] -10% from original		6	8,4	10,9	17,3	21,2
Nominal dimension g [mm]		11 ± 0,3	15 ± 0,3	19 ± 0,3	30 ± 0,3	35 ± 0,3
Min. g [mm] - 10% from original		10	13,6	17,2	27	31,5
Lifting eye						
Min. m [mm]		5,5	6	8	12	18
Nominal dimension e [mm]		11,5 ± 0,5	16 ± 0,5	22 ± 0,5	30 ± 0,5	42 ± 0,5
Max. e [mm]		13	18	24,5	32,5	47,5
Nominal dimension f [mm]		9,5	12,2	15,5	25,5	33
Min. f [mm] 10% from original		8,7	11	14	23	30

Table 8 Checking for defects of the standard coupling with lifting eye for safe operation.

10.3 Flexible coupling wear inspection

Key inspection points must be followed for maintenance shown in Table 9 for flexible coupling.

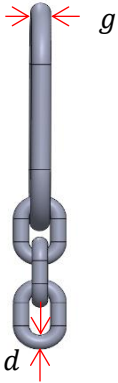
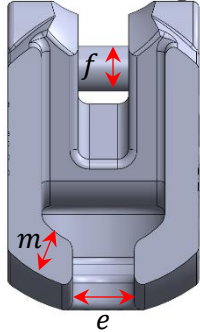
Flexible coupling wear inspection	Link			Lifting eye	
					
Load group	1.3	2.5	5	10	20
Flexible link					
Nominal dimension d [mm]	8 ± 0,3	10 ± 0,4	13 ± 0,5	20 ± 1	26 ± 1,3
Min. d [mm]	7,2	9	11,8	18	23,5
Nominal dimension g [mm]	10 ± 0,4	12 ± 0,5	16 ± 0,6	25 $\frac{+1,3}{-0,3}$	32 ± 1,6
Min. g [mm]	9	10,9	14,5	22,6	29
Lifting eye					
Min. m [mm]	5,5	6	8	12	18
Nominal dimension e [mm]	11,5 ± 0,5	16 ± 0,5	22 ± 0,5	30 ± 0,5	42 ± 0,5
Max. e [mm]	13	18	24,5	32,5	47,5
Nominal dimension f [mm]	9,5	12,2	15,5	25,5	33
Min. f [mm]	8,7	11	14	23	30

Table 9 Checking for defects of the flexible coupling with lifting eye for safe operation.

11 General safety information when using the Starcon system.

General safety information when using the Starcon system.



- Ensure that the marking on the Starcon lifting unit always points in the direction of pull during lifting.
- The lifting machine must be approved to lift at least the maximum applied load + the weight of the Starcon lifting and handling system + any hoisting accessories.
- Lifting movements must be smooth; no sudden or abrupt changes in direction with the lifting machine should be made during a lifting operation, as this can lead to pendulum movements of the load, causing crushing hazards or dropping of the load.
- Where there is a risk of crushing between the load and objects, building parts, machinery, etc., the operator must not be in the danger zone.
- The operator's work area must be flat and free of obstacles that could pose a tripping hazard.
- When depositing the load, the operator must ensure this accepts on a flat and stable surface.
- Only when the load has been deposited and secured the Starcon lifting unit is completely unloaded may it be released and lifted free.
- Before each lift, ensure that both the Starcon lifting unit and the Starcon lifting anchor embedded in the concrete product are free from dirt that could reduce grip.
- Never insert arms or feet under a concrete product.
- Concrete products must never be dragged, only lifted.
- No modifications to the Starcon lifting and handling system may be made without written permission from the manufacturer.
- The operator must always ensure that the connection between the lifting machine and/or any hoisting accessories and the Starcon lifting unit is correct and secured against unintentional detachment.
- The operator must always ensure that the connection between the Starcon lifting unit and the Starcon lifting anchor is correct and secured against unintentional detachment.
- Keep a safe distance and never walk under a suspended load.
- Use gloves, safety shoes and other PPE when handling.
- Never use a Starcon lifting and handling system that has visible defects such as wear, deformations, rust damage, etc.
- Most anchors are designed to be easily handled during installation without the need for lifting equipment. However, some anchors may weigh more and should be handled using lifting equipment. Please refer to the order list for the accurate weight of each product.

11.1 Personal Protection

Always use gloves, a safety helmet, and safety shoes as a minimum requirement when operating the equipment. Keep hands and other body parts away from the lifting stand, lifting accessories, and the load during use.



11.2 Preparation of the product before use

11.2.1 Transport and Storage

The Starcon system should be transported and stored safely to prevent risks to personnel and nearby objects.

11.2.2 Unpacking

Remove the pallet and packaging protecting from the Starcon system.

Cut the safety straps. The person unpacking should wear gloves, safety shoes, and safety glasses when cutting the straps.

11.2.3 Safe Disposal of Packaging Materials

All packaging used by Certex Denmark can be reused. Pallets and all wooden packaging can be reused or recycled.

All plastic, cardboard, and paper materials should be sent to the local recycling center.

If there are no local recycling facilities, the packaging should be returned to Certex Denmark for disposal at the customer's expense.

11.2.4 Preparatory Work Before Installation

After unpacking, visually inspect the Starcon system for any damage.

11.2.5 Installation and Assembly

The Starcon system are delivered ready for use.

11.2.6 Storage and Protection Between Periods of Normal Use

Inspect the Starcon system before each use and lift. Never use anchors or lifting accessories with visible defects such as wear, deformations, corrosion damage, etc.

Always store the lifting bar indoors, in a dry and ventilated area.

11.2.7 Provision of Information (Users, Operators, Service Experts)

All operators or individuals within the danger zone must receive information on operating the Starcon lifting system and must be trained by the supervisor, familiarizing themselves with the product and its use before lifting operations commence.

Operators must be trained in the use of the lifting bar and all its functions and positioned to have a clear view of the entire lifting operation.

11.2.8 Placement of Instruction

All user manuals should always be stored together with the lifting bar.

12 Maintenance and inspection

- All maintenance must be performed when the Starcon lifting unit is unloaded.
- The Starcon lifting unit should be inspected and maintained to ensure it remains in proper condition during use.
- After each use, the Starcon lifting unit should be cleaned and inspected for any faults or deficiencies.
- If any faults are found, they must be rectified, or the Starcon lifting unit should be discarded.
- The Starcon lifting unit should always be stored in a dry and well-ventilated area.
- Any damaged, corroded, or worn-out Starcon lifting unit must be immediately taken out of service and marked not be used again.
- Equipment from Starcon should undergo at least one annual inspection by a qualified skilled person to inspect lifting equipment and cranes.

12.1 Maintenance Schedule



- Only original spare parts may be used, and they must be replaced by a trained individual.
- The annual inspection must be carried out by a qualified individual who has received the necessary training and certification for lifting equipment.
- All services must be documented, and the data must be stored.
- If there are any visual defects or if the labeling is not present on the lifting stand, the lifting stand must be marked as "out of service".

- B** Before use
- A** After use
- M** Monthly, or a maximum of 200 hours of usage.
- Y** Annually, or after a maximum of 2400 hours of use.

Inspection	B	A	M	Y
Perform a visual inspection to check for signs of overload, deformation, damage, wear, and corrosion.	X	X	X	X
The equipment must undergo inspection.			X	
Ensure that the equipment is ready and clearly labeled.			X	X
Inspection should be carried out by a qualified individual with a report prepared.				X

Table 10 Maintenance schedule

13 Disposal / Recycling

This section describes the end of use for the product.

- End of use / Disposal The lifting points shall be sorted / scrapped as general steel scrap.
- The Starcon lifting and handling system should be sorted and disposed of according to appropriate material categories, including metal, plastic, etc.
- Certex can assist you with disposal if required.

14 Product data of universal lifter

Figure 4 shows a measurement sketch for the universal lifter.

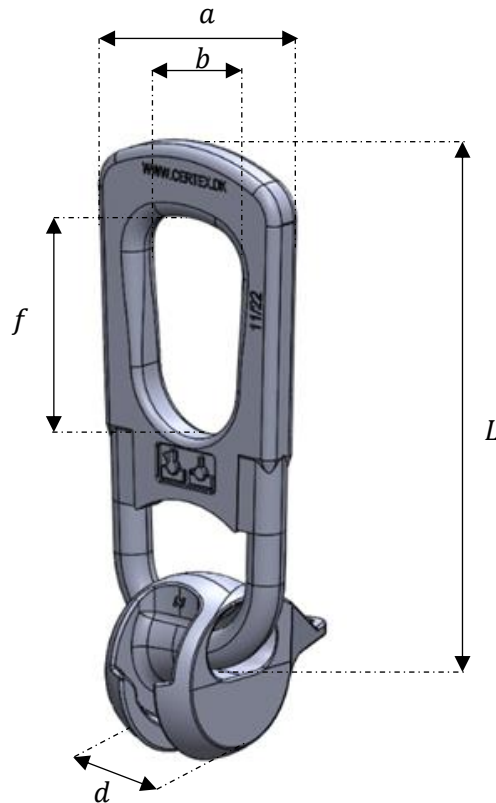


Figure 4 Universal lifter dimension sketch.

14.1 Technical data

Table 11 shows the dimensions of the various types of universal lifter

Load group	Length plate. L mm	Plate width a mm	Hole width b mm	Head width. d mm	Hole height f mm	Thickness of the plate t mm
1.3	160	43,5	73	34	70,5	12,5
2.5S	190	50	88	42	85	14
5.0S	244	67,5	110	55	88	18
10S	342	82	159	74	116	27
20S	430	106	183	110	123,5	31

Table 11 Universal lifter dimension.

15 Product data of flexible coupling

Figure 5 shows a measurement sketch for the flexible coupling.

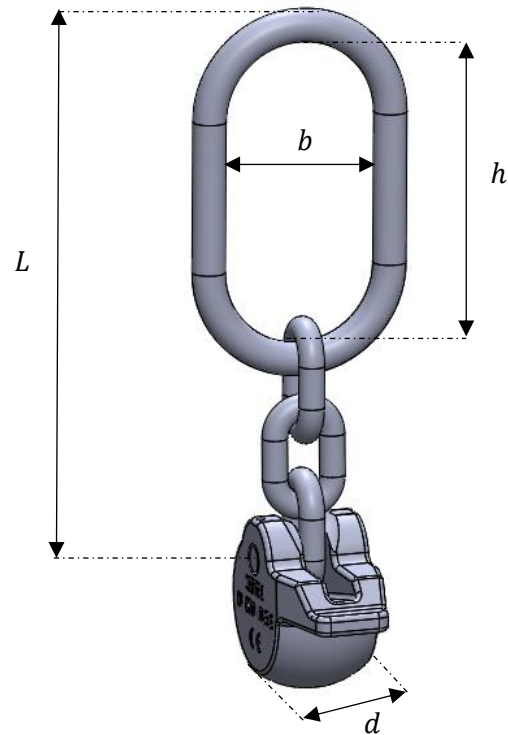


Figure 5 Flexible coupling dimension sketch.

15.1 Technical data

Table 11 shows the dimensions of the various types of flexible coupling

Load group	Length plate. L mm	Ring width b mm	Ring height h mm	Head width. d mm
1.3	182	50	110	34
2.5S	210	60	120	42
5.0S	237	60	120	55
10S	340	100	200	74
20S	484	120	250	110

Table 12 Flexible coupling dimension.

16 Product data of standard coupling

Figure 6 shows a measurement sketch for the standard coupling.

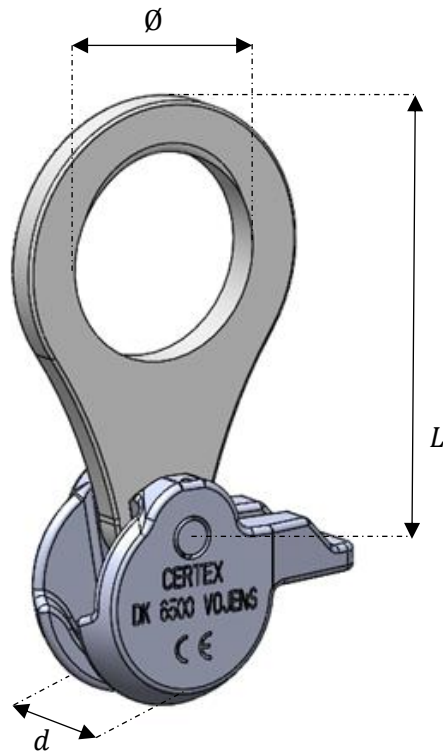


Figure 6 Standard coupling dimension sketch.

16.1 Technical data

Table 11 shows the dimensions of the various types of standard coupling

Load group	Length plate. L mm	Plate hole diameter Ø mm	Head width. d mm	Thickness of the plate t mm
1.3	130	42	34	8
2.5S	165	60	42	10
5.0S	200	62	55	12
10S	285	100	74	20
20S	370	120	110	25

Table 13 standard coupling dimension.

17 EC – Declaration of Conformity of the Machinery

This certificate meets the requirements of the Directive 2006/42/EC Annex II.

Manufacturer and responsible for compiling the technical documentation:

Company:	CERTEX Danmark A/S	Tel. No.:	+45 74 54 14 37
Address:	Trekanten 6-8 6500 Vojens Denmark	E-mail:	info@certex.dk

The undersigned hereby declares that the below specified tool comply with the current safety and health rules and legislation within the European Union. If any changes are made on the tool without approval from the manufacturer, this Declaration no longer applies.

Description:	Starcon spherical lifting eye system
Drawing No.:	XXXXXXXXXX
Serial No.:	XXXXXX
Lifting Capacity:	WLL pr unit
Own Weight:	Kg pr unit

Is made in accordance with the following EC-directive;
2006/42/EC

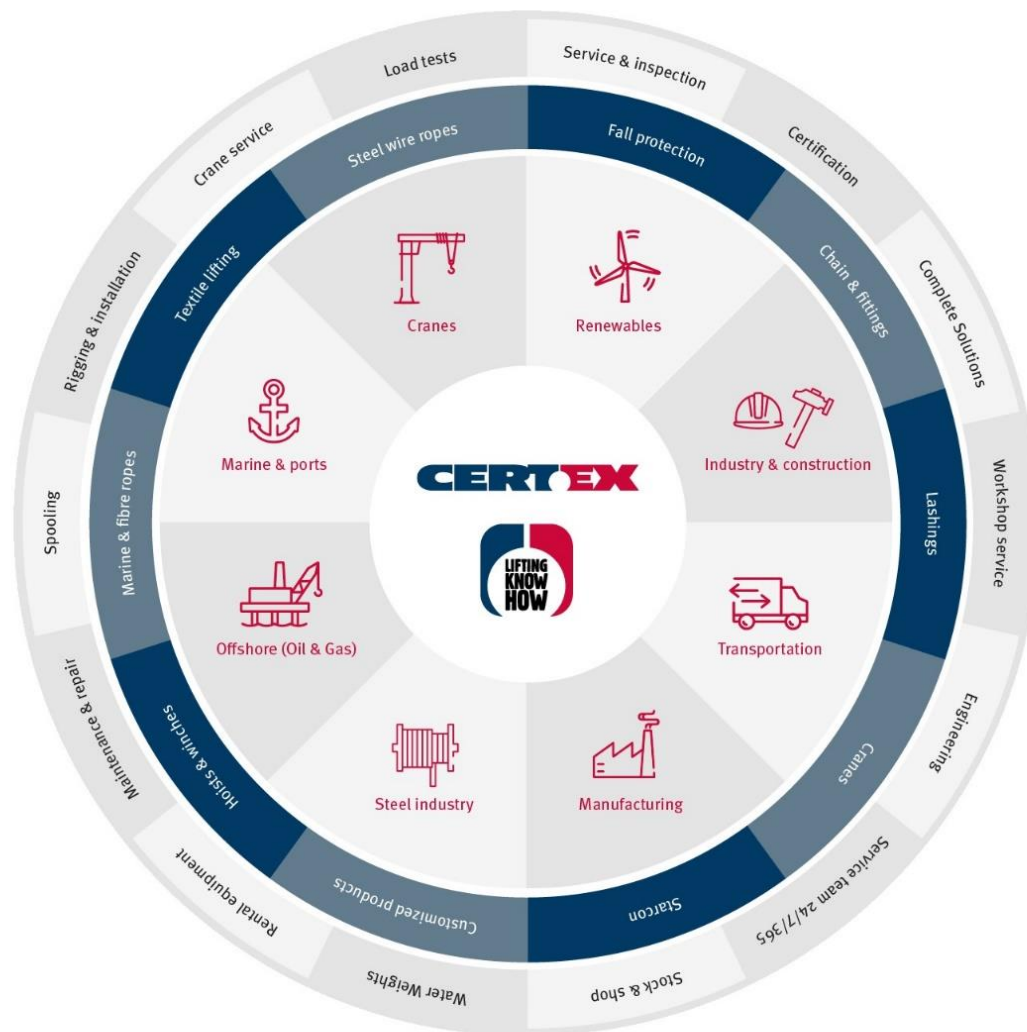
The following standards have been used:
EN 13155+A2 : 2009

Date:

For CERTEX Danmark A/S

Our industries, products & services

At CERTEX Denmark, we are a secure and reliable total supplier and partner within lifting equipment. Below is an overview of the industries we service, our product range, and the services we offer."



"

**Based on many years of experience
& know-how within lifting, load
tests & engineering, CERTEX
Denmark is your reliable partner &
supplier of steel wire, lifting
applications & related services."**