

STARCON



STARCON



Insert for fastening system M8 to M20

Fixing insert systems for concrete elements.

User and design manual

1 Nomenclature

Symbol	Description	Unit
$^{\circ}\text{C}$	Temperature Celsius	$^{\circ}\text{C}$
<i>B</i>	Minimum plate thickness of a tile/slap/deck	<i>mm</i>
<i>COG</i>	Center of gravity	[–]
<i>D</i>	Diameter of the Insert for fastening	<i>mm</i>
<i>D_s</i>	Bending diameter of additional reinforcement	<i>mm</i>
<i>d_s</i>	Diameter additional reinforcement	<i>mm</i>
<i>N</i>	Axial load	<i>N</i>
<i>V</i>	Shear load	<i>N</i>
<i>L</i>	Length of the Insert for fastening	<i>mm</i>
<i>l_s</i>	Length of additional reinforcement	<i>mm</i>
<i>C₁, C₂, C₃, C₄</i>	Edge distances	<i>mm</i>
<i>S</i>	Load group symbol (STARCON)	–
<i>S_Z</i>	Distance between Transport anchors	<i>mm</i>
<i>WLL</i>	Working Load limit	<i>ton</i>

Table 1 Nomenclature

Starcon Precast Concrete Design & Fixing insert Manual

1	Nomenclature	1
2	Identification.....	2
3	Introduction Starcon insert for fastening system M8 to M20.....	3
4	Safety instructions before use	4
5	Advantages of the Starcon system.	4
6	Using the Starcon system.....	4
7	Safety factors for fixing insert systems	5
8	General information	5
9	Design method.....	7
10	Starcon Insert for fastening load data	9
11	General safety information when using the Starcon system.	10
12	Maintenance and inspection	12
13	Disposal / Recycling	13
14	Product data of Insert for fastening	13
15	Product data of connection holding plate for insert for fastening.....	14

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	29-08-2024	New documentation

Table 2 Revision table

3 Introduction Starcon insert for fastening system M8 to M20

Read this instruction manual before using the Starcon Insert for fastening.

Incorrect use can cause injury or danger!

Safety is paramount when using fixing 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 concept of the use Insert for fastening:

The Starcon Fixing insert system consists of two key components: Starcon Insert for fastening and Starcon Connection holding plate shown on Figure 1.

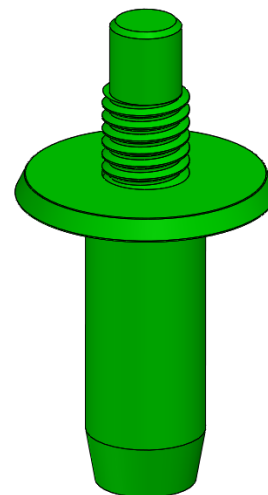
To ensure proper placement of the fixing socket unit in the finished concrete product, the head of the Starcon insert for fastening is assembled into a corresponding Starcon connection holding plate before pouring. Once the concrete reaches a strength of at least 15 MPa, connection holding plate can be removed. At the installation site, connecting and securing precast concrete components may only commence when the concrete has reached a strength of at least 25 MPa. Contact CERTEX DK for lower strength values.

The Starcon fixing socket and systems use the guidelines EN 1090 and CEN/TS 1992-4:2009, combined with EN 13155-2009. This ensures the highest level of safety when using our products.

Material: Steel.
Surface treatment: White zinc plated (WZP).



Insert for fastening



Connection holding plate

Figure 1 Starcon Fixing system.

4 Safety instructions before use



- Starcon Insert for fastening must only be installed on a Starcon Connection holding plate of the same rating.
- Starcon Insert for fastening that are exposed to corrosion, or damaged must not be used.
- Starcon Insert for fastening is not to be used for lifting or transporting precast concrete units.
- The Starcon fixing and handling system must not be used to fix more than the specified load.
- The Starcon fixing system must only be used by skilled, trained employees.
- 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 Starcon insert for fastening. These specialized fasteners are an effective solution for connecting and securing precast concrete components on site. The system comprises fixing sockets pre-set in the concrete, along with other connecting elements and accessories.

The Starcon system is available in groups M8 to M16. It is typically embedded in the concrete element during the prefabrication stage. When connection is needed, we will screw or bolt into the fixing socket. The applied force is transmitted evenly into the concrete through the fixing socket.

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 manufacturer from ensuring that the chosen fixing 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 system

The Starcon system comprises a wide range of anchors in a group from M8 to M20 per fixing socket with various lengths. The principle for using the system is the same for the entire range. The Starcon system consists of the following two main components:

6.1 Starcon Insert for fastening

The Starcon Insert for fastening is a steel embedded member with a specially designed foot for secure anchoring in hardened concrete. The Starcon Insert for fastening is a cylindrical, internally threaded unit, connects to other components using screws or bolts. Starcon inserts for fastening with angle are clearly labelled with dimensions (e.g. 0.5S) and are available in a variety of lengths. They undergo specimen testing for defects, dimensional deviation and tensile strength with a minimum safety factor of 3:1 against metal failure.

6.2 Starcon Connection holding plate

The connection holding plate, typically made of cylindrical plastic components with a threaded end, must be carefully attached to the anchor head and positioned correctly before being securely fastened to the formwork. After the concrete cures and hardens, the connection holding plate is removed, exposing the anchor head seated in a trapezoidal depression. Since the connection holding plate is typically stripped and unscrewed during removal, it's not normally reusable.

7 Safety factors for fixing insert systems

For the calculations of the fixing system, the following safety factors shown Table 3 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	$SF_{concrete} = 2,5$

Table 3 Failure safety factors

8 General information

This section provides essential details on the Starcon Insert for fastening systems, offering clarity and guidance for safe and efficient usage.

8.1 Marking on the Insert for fastening

Each Insert for fastening is clearly labeled with its thread size, and manufacturer's identification, ensuring easy and secure identification of the systems, even post-installation show on Figure 2.



Figure 2 Marking on the cylinder of the Insert for fastening.

8.2 Guidelines for the Insert for fastening selection

When selecting Insert for fastening, it's essential to consider various factors to ensure safety and effectiveness. The tables provided contain crucial information such as maximum load capacities, edge distances, and installation values for different inserts for fastening with angle types. Key points to consider:

- The number of inserts for fastening with angle.
- How the Insert for fastening is arranged.
- The load-bearing capacity of the Insert for fastening.
- Compressive strength of concrete.
- Concrete quality.
- Environmental impact on the use.

8.3 Guidelines for installation

For the Starcon Insert for fastening systems to be appropriately installed, it is imperative to ensure compliance with specific technical criteria and prerequisites:

- Adherence to load capacity specifications of the anchor.
- Maintaining appropriate edge spacing.
- Ensuring the concrete grade is suitable.
- Verifying alignment with the load direction.
- Additional reinforcement requirements.

8.4 Guideline for load capacity

Load capacity of a fixing socket relies on several factors:

- The length of the Insert for fastening.
- The spacing between the Insert for fastening and the edges, both axially and along the edge.
- The direction of the applied load.
- The arrangement of reinforcement within the concrete structure.

9 Design method

This section provides essential information for the correct and safe selection and use of the Insert for fastening. To ensure the construction's durability and safety, it is crucial to carefully follow the manufacturer's technical specifications and guidelines during design and construction. Additionally, the casting process is discussed, including the transfer of load to the concrete using the angle bend, and the importance of correctly placing formwork and anchors during casting to avoid errors and risks. Warnings are given regarding the correct size of formwork and the risk of errors with incorrect sizes, which can lead to potentially dangerous situations.

9.1 Correct placement of connection holding plate and insert for fastening during casting.

Caution: If the connection holding plate is too small, it won't be compatible with the fixing equipment later.

Conversely, if the recess block is too large, attaching the fixing equipment correctly will be impossible, increasing the risk of the fixing equipment slipping out. This could lead to premature fixing insert failure and the subsequent collapse of the construction element. Always ensure the connection holding plate size matches the identified appropriate size. Figure 3 illustrates the correct placement of the connection holding plate in wet concrete to ensure optimal anchorage strength for the Insert for fastening.

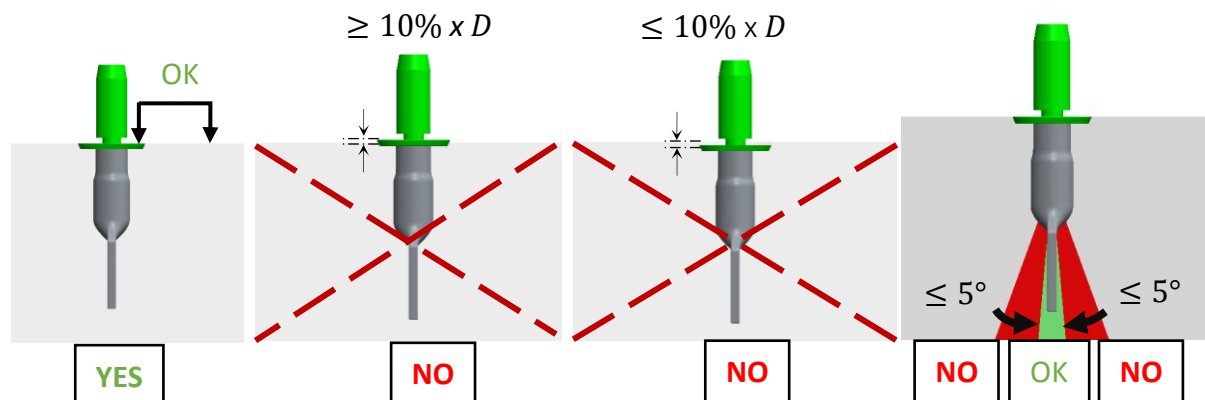


Figure 3 Correct placement of connection holding plate.

9.2 Concrete part dimensions

Figure 4 shows a measurement sketch for the concrete part. The minimum edge distances required for the anchor to ensure adequate load distribution and to prevent edge failures.

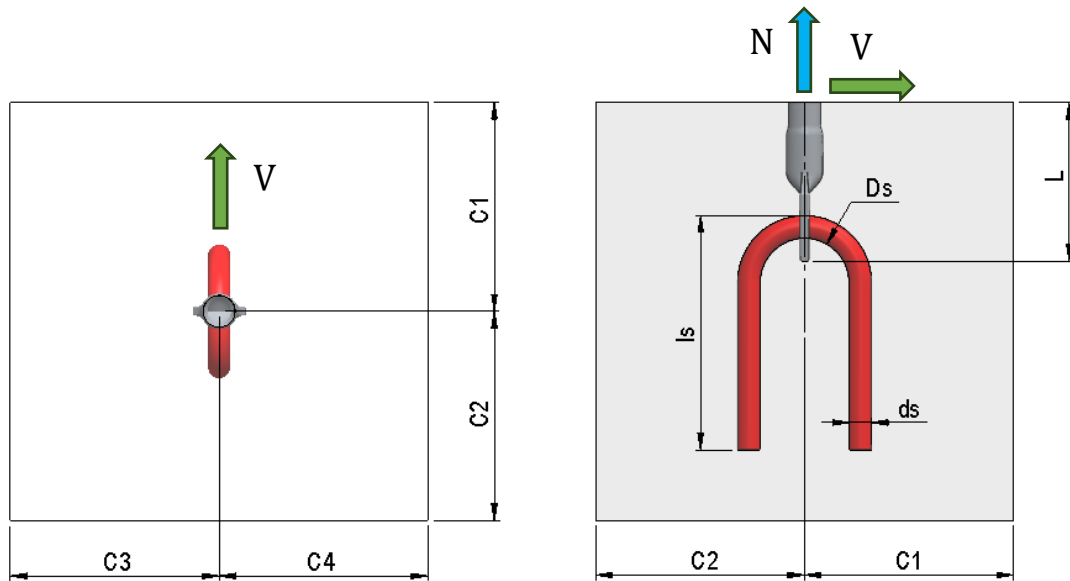


Figure 4 Concrete part.

Table 4 shows the dimensions of the various types of concrete part.

Type	Length <i>L</i> mm	Min. edge distance <i>C</i> ₁ , <i>C</i> ₂ , <i>C</i> ₃ , <i>C</i> ₄ mm	Additional reinforcement		
			<i>D</i> _s mm	<i>d</i> _s mm	<i>l</i> _s mm
M8	53	110	50	6	250
M10	35	70	60	8	250
	57	120			
M12	55	110	60	10	300
M16	80	160	70	12	350
	100	300			
M20	95	190	80	12	400
	115	300			

*C*₁ : Edge distance to the point of shear load application on the free edge.

*C*₂ : Edge distance in the direction opposite to the applied load.

*C*₃, *C*₄: Distances from the edge that are perpendicular to the direction of the shear load.

Edge distance = 2x *L* total length of socket

Min. spacing of 2x *C*₃ must be maintained between two or more sockets

Ensure that the Insert for fastening is oriented with the angle bend parallel to the direction of the shear force as illustrated here.

Table 4 Dimension of the Concrete part

10 Starcon Insert for fastening load data

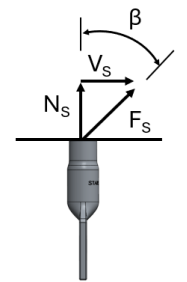
Table 5 provides information to assist in determining appropriate fixing sockets under conditions with varying axial and shear load design on the fixing sockets, conducted in unreinforced C20/25 concrete. The static calculation of the Insert for fastening is performed according to CEN TS 1992-4:2009 - Design of fastenings for use in concrete.

The following boundary conditions are utilized for the calculation:

- **1 anchor** symmetrically positioned to the center of gravity.
- **Dynamic factor** (site handling) $\Gamma_{dyn} = 1.3$

Type	Length <i>L</i> <i>mm</i>	Design load [Ton]			
		Axial N_{RD}	Diagonal Load S_{RD}		Shear V_{RD}
			$\beta \leq 30^\circ$	$\beta \leq 45^\circ$	
M8	53	0,3	0,25	0,19	0,13
M10	35	0,33	0,26	0,20	0,13
	57	0,36	0,29	0,21	0,13
M12	55	0,55	0,46	0,31	0,19
M16	80	1,63	1,38	1,13	1
	100	1,7	1,4	1,2	1
M20	95	2,14	1,88	1,63	1,13
	115	2,2	1,95	1,7	1,2

Interaction – axial load and shear load at the same time: (Utilization axial direction) + (Utilization in shearing) $\leq 120\%$
 $N_{SD} / N_{RD} + V_{SD} / V_{RD} \leq 1,2$



Disclaimer: The table serves solely as a guideline. For accurate guidance and calculations, please contact www.Certex.dk.

Table 5 Insert for fastening load data.

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

Anchors should be transported and stored safely to prevent risks to personnel and nearby objects.

11.2.2 Unpacking

Remove the pallet and packaging protecting the anchors.

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 anchors for any damage.

11.2.5 Installation and Assembly

The anchors are delivered ready for use.

11.2.6 Storage and Protection Between Periods of Normal Use

Inspect the anchors 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 anchors 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 fixing 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 fixing stand, the fixing 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 6 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 Insert for fastening

Figure 5 shows a measurement sketch for the Insert for fastening with labels for the respective dimensions.

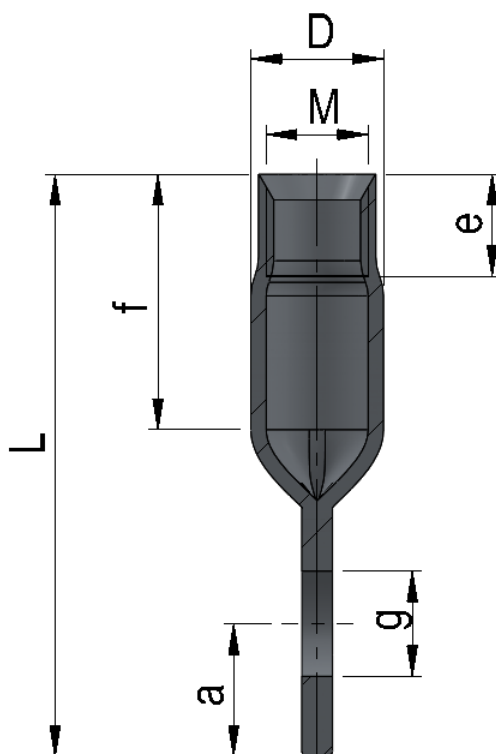


Figure 5 Insert for fastening sketch.

14.1 Technical data

Table 7 shows the dimensions of the various types of Insert for fastening.

Type	Socket dia. D mm	Length L mm	Thread M mm	Thaad length e mm	Distance f mm	Hole distance a mm
M8	11	53	8	8	28	9
M10	13	35	10	10	15	13
	13	57	10	10	25	13
M12	16	55	12	12	20	15
M16	22	80	16	15	30	20
	22	150	16	15	100	20
M20	27	70	20	18	20	22
	27	95	20	18	45	22
	27	150	20	18	100	22

Table 7 Insert for fastening dimension.

15 Product data of connection holding plate for insert for fastening

Figure 6 shows a measurement sketch for the Connection holding plate.

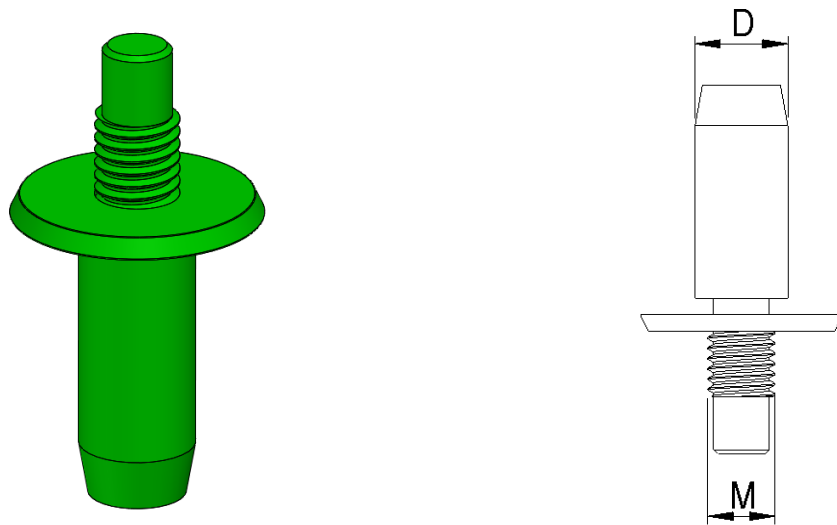


Figure 6 Connection holding plate for insert for fastening.

15.1 Technical data

Table 8 shows the dimensions of the various types of the connection holding plate used for casting of the insert for fastening.

Connection holding plate Starcon Group	D mm	Color
M8	11	Green
M10	11	Yellow
M12	11	Red
M16	17	Black
M20	17	White

Table 8 Dimension of connection holding plate for insert for fastening.

Our industries, products & services

At CERTEX Denmark, we are a secure and reliable total supplier and partner within fixing 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."**