

X-TEND[®]

GENERAL CONSTRUCTION APPROVAL

abZ Z-14.7.506 Valid in Germany

Public-law institution jointly founded by the
federal states and the Federation

Technical authority granting approvals
and permits for construction products
and construction techniques

Date: 23 May 2022 Reference number:
I 87-1.14.7-26/22

Decision

renewing the national technical approval /
general construction technique permit of
20 June 2018

Number:
Z-14.7-506

Applicant:
Carl Stahl ARC GmbH
Siemensstraße 2
73079 Süssen
GERMANY

Validity
from: **13 June 2022**
to: **13 June 2023**

Subject of decision:
Carl Stahl cable mesh systems X-TEND

This decision renews national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*) no. Z-14.7-506 of 26 July 2018, as renewed by the decision of 13 May 2020.

This decision contains one page. It applies only in conjunction with the above-mentioned national technical approval / general construction technique permit and shall not be used without it.

Ronald Schwuchow
Head of Section

Drawn up by
Bertram

Translation authorised by DIBt

DIBt

Decision

renewing the national technical approval /
general construction technique permit of
26 July 2018

Zulassungsstelle für Bauprodukte und Bauarten
Bautechnisches Prüfamt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

Date:

13 May 2020

Reference number:

I 87-1.14.7-31/20

Approval number:

Z-14.7-506

Applicant:

Carl Stahl ARC GmbH
Siemensstraße 2
73079 Süssen

Validity

from: **13 June 2020**

to: **13 June 2022**

Subject of approval:

Carl Stahl cable net systems X-TEND

This decision renews national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction permit (*allgemeine Bauartgenehmigung*) no. Z-14.7-506 of 26 July 2018.

This decision contains one page. This decision applies only in conjunction with the above-mentioned decision and shall not be used without it.

Dr.-Ing. Ronald Schwuchow
Head of Section

Drawn up by
Bertram

Translation authorised by DIBt

DIBt

National technical approval / General construction technique permit

Zulassungsstelle für Bauprodukte und Bauarten

Bautechnisches Prüfamnt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

Date:

26 Jul 2018

Reference:

I 34.1-1.14.7-51/18

Number:

Z-14.7-506

Validity

from: 13 June 2018

to: 13 June 2020

Applicant:

Carl Stahl ARC GmbH

Siemensstraße 2

73079 Süssen

Subject of decision:

Carl Stahl cable mesh systems X-TEND

The subject named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*). This decision contains eight pages and 13 annexes. The subject was granted the first national technical approval on 21 December 2006.

Translation authorised by DIBt

DIBt

I GENERAL PROVISIONS

- 1 This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.
- 3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Notwithstanding further provisions in the "Special Provisions", copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.
- 5 This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.
- 6 This decision may be revoked. The provisions contained herein may subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.
- 8 The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

II SPECIAL PROVISIONS

1 Subject concerned and field of use and application

The subject of approval is prefabricated cable mesh systems consisting of cables (mesh cables, lacing cables) made of stainless steel and the appropriate ferrules (clamps) for connecting and redirecting the cables as well as border cables or frames made of tubular sections for framing the cable meshes (see Annex 1).

The border cables are redirected and anchored using appropriate components (eye bolts, eye nuts, shackles, end connectors). The opening angle of the cable mesh is 60°. The mesh width is variable ranging from 35 mm to 100 mm depending on the cable diameter.

The meshes are available in a vertical cable mesh variant (e.g. for balustrades and railings) or a horizontal cable mesh variant.

The cable meshes are suitable for use as fall protection components (e.g. for helicopter landing pads, observation towers or bridges). Further fields of use include zoo enclosures or facades.

2 Provisions for the construction product(s)

2.1 Properties and composition

2.1.1 Cables (mesh cables, lacing cables)

For the cables, the specifications set out in EN 10264-4¹ as well as in the standards of the DIN EN 12385² series shall apply. In addition, the specification set out in Annex 3 shall be observed. For the strength classes the following shall apply:

Cable diameters 1.5 mm and 2.0 mm: Wire tensile strength 1770 N/mm²

Cable diameter 3.0 mm: Wire tensile strength 1570 N/mm²

2.1.2 Border cables

For the border cables, the specifications set out in EN 10264-4¹ as well as in the standards of the DIN EN 12385² series shall apply. In addition, the specification set out in Annex 6 shall be observed. For the strength classes the following shall apply:

Wire rope: Wire tensile strength 1570 N/mm²

Open spiral strands: Wire tensile strength in accordance with European Technical Assessment ETA-10/0358

2.1.3 Mesh ferrules, vertical ferrules, horizontal ferrules and diagonal ferrules

The specifications given in Annexes 3 and 4 shall apply. Detailed specifications pertaining to the dimensions and material properties are deposited with DIBt.

2.1.4 End connectors of the border cables

End connectors covered by European Technical Assessment ETA-10/0358 shall be used for anchoring the border cables. In addition, the specifications given in Annexes 2, 6, 7 as well as 9 to 11 shall apply.

2.1.5 Frames

The frames shall be made from tubular sections of stainless steel. The diameter of the tubular sections shall be 21.3 mm and the wall thickness at least 2 mm (cf. Annex 8).

¹ DIN EN 10264-4:2002-11 Steel wire and wire products - Steel wire for ropes - Part 4: Stainless steel wire
² DIN EN 12385 Steel wire ropes - Safety

2.1.6 Eye bolts, eye nuts, shackles

The eye bolts, eye nuts and shackles shall be made of stainless steel. The materials and minimum breaking strengths shall meet the requirements set out in the standards listed in Annexes 5 and 6.

2.1.7 Corrosion resistance

The meshes and ferrules made of stainless steel shall be classified in corrosion resistance class (CRC) II in accordance with DIN EN 1993-1-4³. Ferrules made of galvanised copper may only be used for accessible constructions in surroundings without important chloride and/or sulphur dioxide exposure. An atmosphere as found on industrial sites shall be excluded.

2.2 Manufacture and marking

2.2.1 Manufacture of cable meshes

Detailed information on the manufacture of the cable meshes is deposited with DIBt.

2.2.2 Marking

The packaging of the cable meshes shall be marked by the manufacturer with the national conformity mark (*Ü-Zeichen*) in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The mark shall only be applied if the requirements given in Section 2.3 are met.

The marking shall also provide information on the manufacturing plant, the year of manufacture, the designation of the construction product and the materials from which the individual components are made.

Cables of different strengths shall be marked in such a way that they cannot be mixed up.

2.3 Confirmation of conformity

2.3.1 General

The confirmation of conformity of the cable meshes with the provisions of the national technical approval included in this decision shall be issued for every manufacturing plant in the form of a certificate of conformity based on factory production control and regular external surveillance including initial type-testing of the cable meshes in accordance with the following provisions.

To issue the certificate of conformity and for external surveillance, including the associated product testing, the manufacturer of the cable meshes shall use a certification body and an inspection body recognised for these purposes.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction product with the national conformity mark (*Ü-Zeichen*) including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control shall be understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products meet the provisions of the national technical approval included in this decision.

³

DIN EN 1993-1-4:2015-10

Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels

The factory production control shall at least include the measures listed below.

– **Cables, border cables**

The required dimensions and tolerances as specified in Section 2.1 shall be checked upon each delivery. Verification of the required material properties as specified in Section 2.1 shall be provided through an inspection certificate "type 3.1" in accordance with DIN EN 10204⁴. The technical delivery conditions in accordance with DIN EN 10264-4¹ and the standards of the DIN EN 12385² series shall be observed.

– **Ferrules, end connectors, frames, shackles, eye nuts, eye bolts**

The required dimensions and tolerances, as specified in Section 2.1, shall be checked for each batch. Verification of the required material properties (and the minimum breaking strengths for shackles, eye nuts and eye bolts), as specified in Section 2.1, shall be provided through an inspection certificate "type 3.1" in accordance with DIN EN 10204⁴.

– **Verification of k_e values (cf. Annex 6)**

The k_e values, as specified in Annex 6, and thus the breaking strengths of the cables and border cables shall be verified regularly through tensile testing of the cables and border cables including the associated ferrules, end connectors, shackles, eye nuts and/or eye bolts. The nature, scope and frequency of these tests shall be agreed upon during initial type-testing (see Section 2.3.3) with the inspection body charged with the task of external surveillance and DIBt.

– **Verification of the modulus of elasticity E_Q**

The E_Q values given in Section 3.2.2 shall be verified regularly through tensile testing of the cables and border cables in accordance with DIN EN 1993-1-11⁵.

The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting material or the components,
- type of check or test,
- date of manufacture and testing of the construction product or the starting material or the components,
- result of the checks and tests and comparison with the requirements,
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and submitted to the inspection body used for external surveillance. They shall be submitted to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately – where technically feasible and necessary to show that the defect has been eliminated.

⁴ DIN EN 10204:2005-01 Metallic products - Types of inspection documents

⁵ DIN EN 1993-1-11:2010-12 Design of steel structures - Part 1-11: Design of structures with tension components

2.3.3 External surveillance

In each manufacturing plant, factory production control shall be checked regularly at least twice a year by means of external surveillance.

Initial type-testing of the construction product shall be carried out within the framework of external surveillance and testing for the required properties of the tension members as described in Section 2.1 shall be carried out on random samples. Sampling and testing shall be the responsibility of the recognised body. The statistical analysis of the values measured within the scope of external surveillance shall prove that the requirements are fulfilled in each case.

The results of certification and external surveillance shall be kept for at least five years. They shall be presented by the certification or inspection body to DIBt and the competent supreme building authority upon request.

3 Provisions for planning, design and execution

3.1 Planning

Planning provisions shall be taken from Annexes 1 to 13. Planning shall also take into account the provisions pertaining to design, as set out in Section 3.2, and execution, as set out in Section 3.3.

3.2 Design

3.2.1 General

The verification concept set out in DIN EN 1993-1-11⁵ shall be used for the ultimate limit state (ULS) verification of the cable meshes.

ULS verification of the cable meshes shall be deemed fulfilled if the loading of the cables, border cables, mesh ferrules, shackles, eye bolts and eye nuts does not exceed the resistance values given in Sections 3.2.3 to 3.2.5.

For the ULS verification of the eye bolts and eye nuts, a linear interaction verification shall be provided in the event of combined tension and shear loading. If the eye bolts and eye nuts are additionally subject to bending, this shall also be taken into account in the ULS verification.

3.2.2 Modulus of elasticity E_Q of the cables and border cables

The following values shall apply:

Wire rope:	$E_Q = 90 \text{ kN/mm}^2$
Open spiral strands:	$E_Q = 130 \text{ kN/mm}^2$

3.2.3 Ultimate tensile strength of the cables and border cables

The ultimate tensile strength $Z_{R,d}$ of the cables and border cables shall be calculated as follows:

$$F_{Rd} = F_{uk} / (1.5 \cdot \gamma_R)$$

where:

$$F_{uk} = F_{min} \cdot k_e$$

characteristic value of the calculated breaking strength of the cables

F_{min} minimum breaking load in accordance with Annex 6, Tables 3 and 5

k_e : loss factor in accordance with Annex 6

$$\gamma_R = 1.0$$

The ultimate tensile strength value shall apply for the cable in connection with the appropriate ferrule or the border cable in connection with the appropriate end connector.

3.2.4 Ultimate sliding force of the mesh ferrules

The differential force of two adjacent mesh ferrules shall be smaller than the ultimate sliding force of the mesh ferrules. The ultimate sliding force $G_{R,d}$ of the mesh ferrules shall be calculated as follows:

Mesh type	Cable diameter [mm]	Ultimate sliding force $G_{R,d}$ [kN]
CX	1.5	0.14
	2.0	0.15
	3.0	0.22
CXS	1.5	0.66

Ferrules made of stainless steel of type CXS shall only be used under static or quasi-static loading.

3.2.5 Design resistance of shackles, eye nuts and eye bolts

The following shall apply to the ultimate tensile strength $N_{R,d}$:

Eye bolt in accordance with DIN 580 ⁶ Eye nut in accordance with DIN 582 ⁷		Shackles in accordance with DIN 82102 ⁸	
Size	Ultimate tensile strength $N_{R,d}$ [kN]	Size	Ultimate tensile strength $N_{R,d}$ [kN]
M 12	12.0	0.6	19.4
M 16	25.1	1	30.0
M 20	42.9	1.6	48.5
M 24	64.2		

In the event of combined loading as described in Section 3.2.1, the ultimate shear strengths of the eye bolts and eye nuts shall be determined in accordance with DIN EN 1993-1-8⁹.

3.2.6 Verification of fall protection

The cable meshes may be used for fall protection purposes provided that the conditions set out in Annexes 7 to 11 are met. Under these conditions, fall protection shall be deemed verified.

3.3 Execution

The manufacturer shall draw up execution instructions for installation of the prefabricated mesh cables and issue these to the executing company. The execution instructions shall in particular contain information on pre-tensioning of the cable meshes. The installation shall be executed in such a way that the cable meshes are accessible for maintenance and repair.

The cable meshes shall only be installed by companies with the necessary experience.

Before installation, an inspection of all individual components of the cable meshes shall be carried out to ensure that they are in good condition. Damaged components shall not be used.

⁶

DIN 580:2010-09

Lifting eye bolts

⁷

DIN 582:2010-09

Lifting eye nuts

⁸

DIN 82102:2005-09

Components for lifting, towing, lashing - Shackle, dee - Stainless steels

⁹

DIN EN:1993-1-8:2010-12

Design of steel structures – Part 1-8: Design of joints, in conjunction with DIN EN 1993-1-8/NA:2010-12

For border cables with end connectors, consisting of a threaded end connector, turnbuckle and threaded fork end connector (cf. Annexes 2, 6, 7 and 9 to 11), the threaded end connector as well as the threaded fork end connector shall be screwed into the turnbuckles to a screw-in depth (thread engagement) corresponding at least to the value of "c" in accordance with Annex B6 of European Technical Assessment ETA-10/0358.

The person responsible for the assembly shall check and document that the minimum screw-in depth (thread engagement) for all threaded connections has been respected.

The executing company shall confirm the conformity of the connections and the installation of the prefabricated cable meshes with the provisions of this national technical approval / general construction technique permit.

To do this, the executing company shall provide a declaration of conformity with the national technical approval / general construction technique permit in accordance with Sections 16a(5) of the Model Building Code (MBO).

4 Provisions for use, maintenance and repair

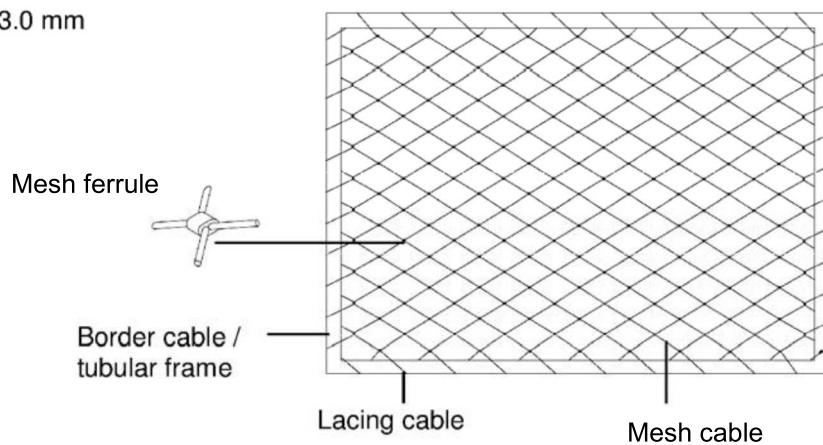
Cable meshes damaged during use shall be repaired and, if necessary, replaced by a specialised company.

Cable meshes designed for and executed to absorb loads from falling or impacting people shall be inspected for damage by the owner/operator at least once a year. Following loading by falling or impacting people, the cable meshes shall be inspected and, if necessary, repaired or replaced by a specialised company.

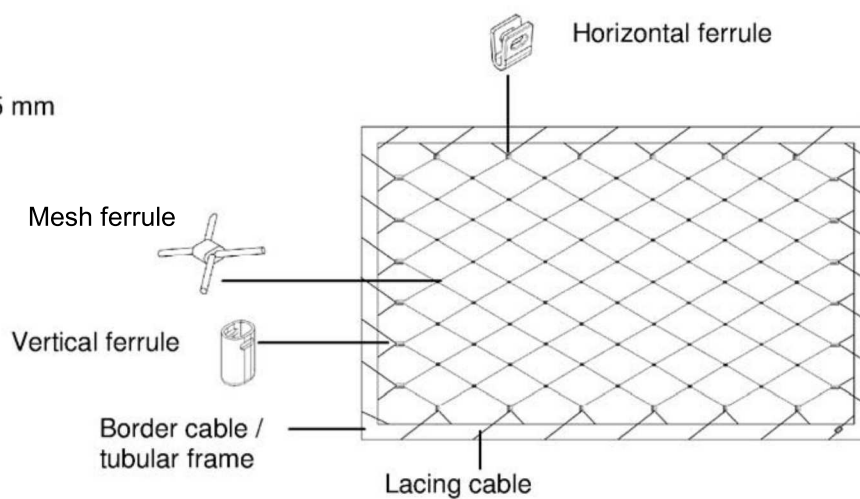
Andreas Schult
Head of Section

Drawn up by

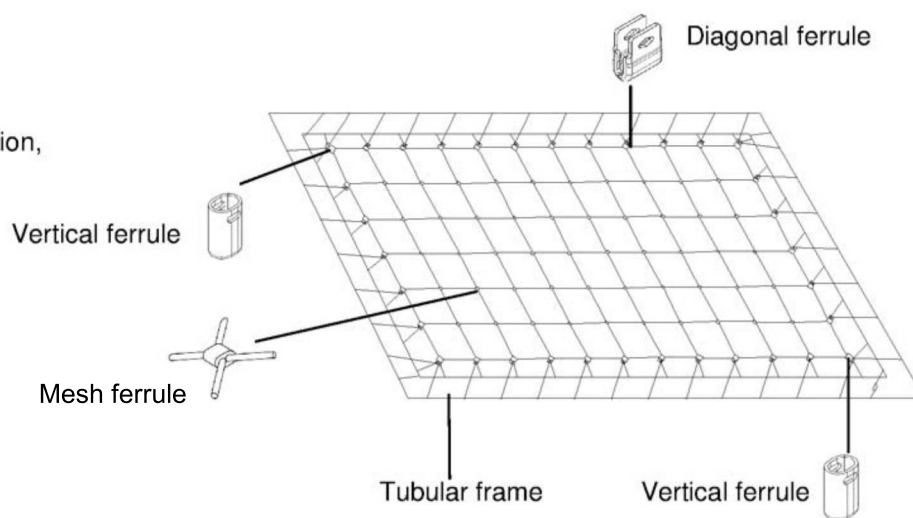
X-TEND CX, cable Ø 1.5 to 3.0 mm



X-TEND CXS, cable Ø 1.5 mm



X-TEND CXS
with diagonal mesh direction,
cable Ø 1.5 mm

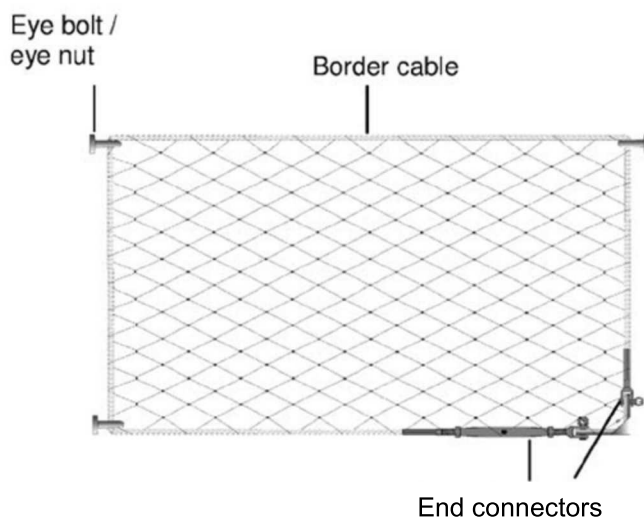


Carl Stahl cable mesh systems X-TEND

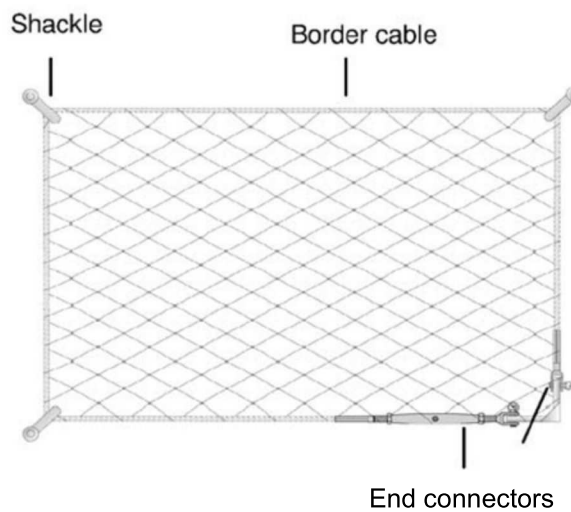
Examples of cable meshes

Annex 1

Border cable guided by eye bolts
respectively eye nuts for
redirecting



Border cable guided by shackles
for redirecting



For border cables, see Annex 6.

Carl Stahl cable mesh systems X-TEND

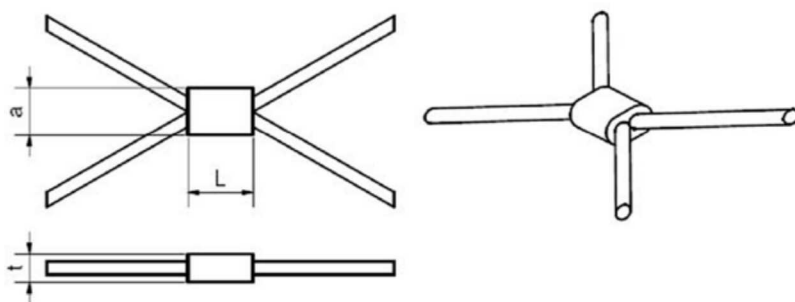
Border cable variants

Annex 2

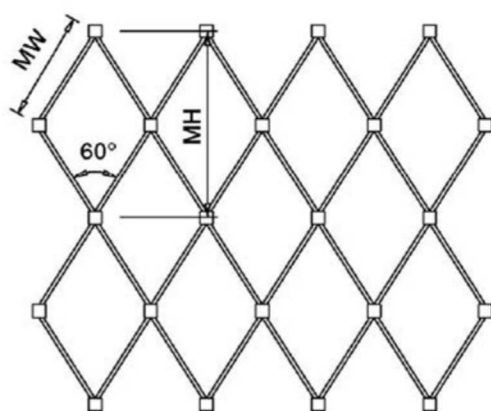
Table 1: Types of cable meshes, cables and mesh ferrules

Type	Wire rope variants	Cable Ø [mm]	Material (cable)	Mesh width MW [mm]	Material (mesh ferrule)	a [mm]	L [mm]	t [mm]
CX	Wire rope 7 x 7	1.5	1.4401	35 to 100	Tin-plated copper	7.30	7.90	2.80
		2.0		50 to 100		10.10	8.90	3.50
	Wire rope 7 x 19	3.0		60 to 100		10.50	11.10	4.55
CXS	Wire rope 7 x 7	1.5		35 to 100	1.4401	7.40	5.50	3.15

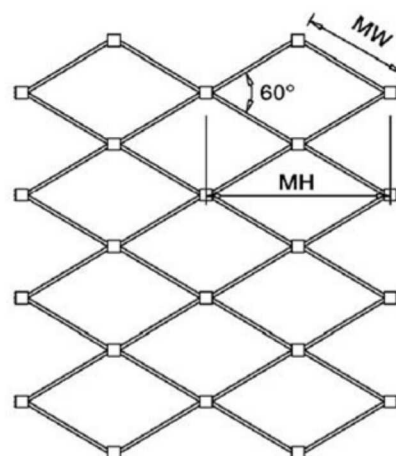
Mesh ferrule



Vertical mesh diamond direction



Horizontal mesh diamond direction

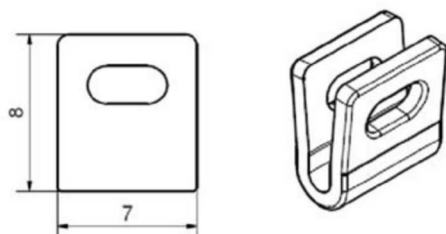


Carl Stahl cable mesh systems X-TEND

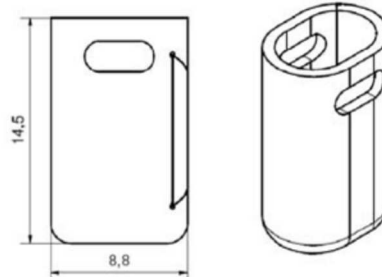
Types of cable meshes, cables and mesh ferrules

Annex 3

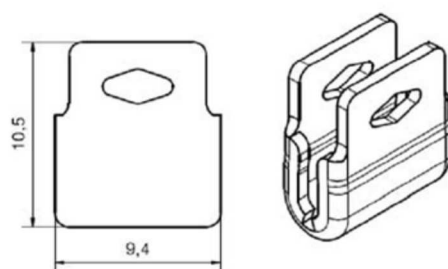
Horizontal ferrule



Vertical ferrule



Diagonal ferrule



Sleeve for vertical ferrule

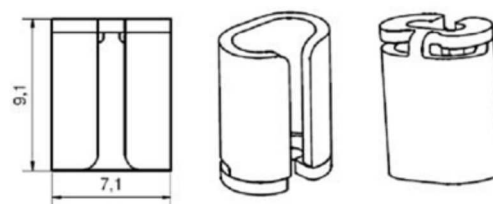


Table 2: Ferrules for border connection of X-TEND CXS mesh with lacing cable

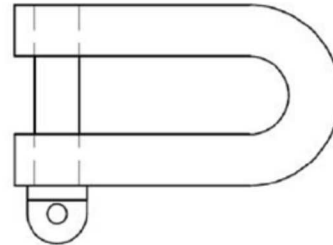
Type	Border ferrule type	Cable Ø [mm]	Material (Cable)	Material (Ferrule)
CXS	Horizontal ferrule	1.5	1.4401	1.4401
	Vertical ferrule			
	Diagonal ferrule			

Carl Stahl cable mesh systems X-TEND

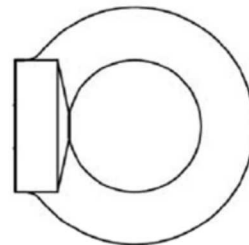
Ferrules for border connection of X-TEND CXS

Annex 4

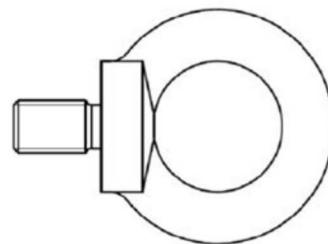
High tensile shackle in acc. with DIN 82102



Eye nut in accordance with DIN 582



Eye bolt in accordance with DIN 580



Carl Stahl cable mesh systems X-TEND

Shackle, eye nut and eye bolt for redirecting border cables

Annex 5

**Table 3 k_e values for connection and redirecting of mesh cables,
minimum breaking strength F_{min} , stranding factor k_s and metallic cross-section A_m of cables**

Type	Ferrule	Cable Ø [mm]	k_e	k_s	A_m [mm ²]	F_{min} [kN]
CX	Mesh ferrule	1.5	0.75	0.79	0.97	1.86
		2.0	0.80	0.83	1.73	2.88
		3.0	0.80	0.81	3.75	5.12
CXS	Mesh ferrule	1.5	0.70	0.79	0.97	1.86
	Horizontal ferrule		0.40			
	Vertical ferrule		0.25			
	Diagonal ferrule		0.55			

Table 4 k_e values for connection and redirecting of border cables

Design variant	Border cable Ø [mm]	Border cable variant	Redirected border cable							Non redirected border cable
			DIN 82102 shackle nominal size			DIN 582 eye nut DIN 580 eye bolt				
			0.6	1	1.6	M12	M16	M20	M24	
Wire rope	8	7x19	0.65	0.65	0.65	0.57	0.65	0.65	0.65	0.65
	10			0.65	0.65		0.57	0.65	0.65	0.65
	12			0.57	0.57			0.57	0.57	0.57
	14				0.57				0.57	0.57
Open spiral strand	8	1x19	Redirecting border cable not permissible							See ETA-10/0358
	10									
	12									
	16	1x37								

End connectors for border cables are covered by European Technical Assessment ETA-10/0358.

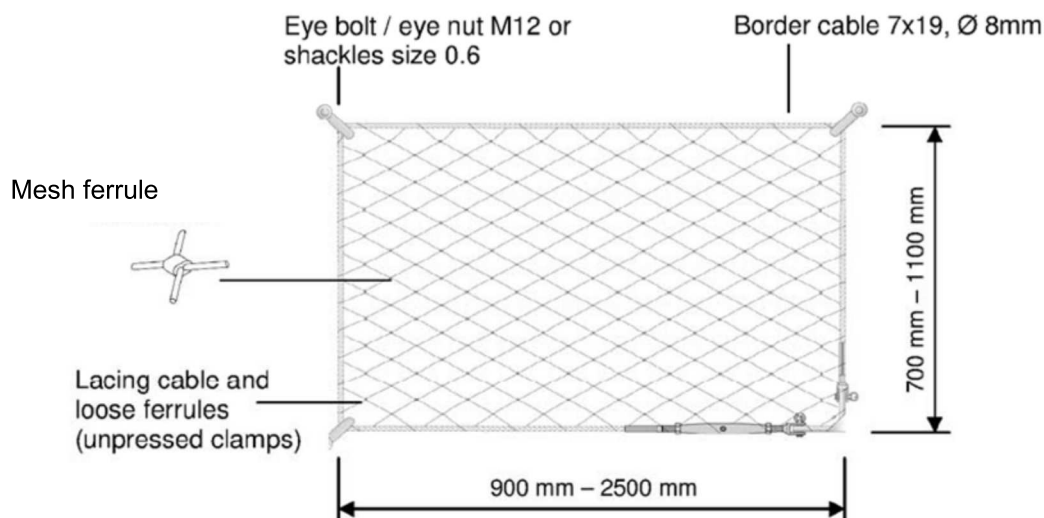
**Table 5 Stranding factor k_s , minimum breaking strength F_{min} and metallic cross-section A_m of
border cables**

Border cable variant	Border cable Ø [mm]	k_s	A_m [mm ²]	F_{min} [kN]
Wire rope 7x19	8	0.77	26.53	36.4
	10		41.45	56.8
	12		59.69	81.8
	14		106.12	111.4
Open spiral strand 1x19	8	See ETA-10/0358		52.8
	10			82.5
	12			118.7
Open spiral strand 1x37	16			192.9

Carl Stahl cable mesh systems X-TEND

k_e values for connection and redirecting, minimum breaking strength F_{min} ,
stranding factor k_s and metallic cross-section A_m for mesh and border cables

Annex 6



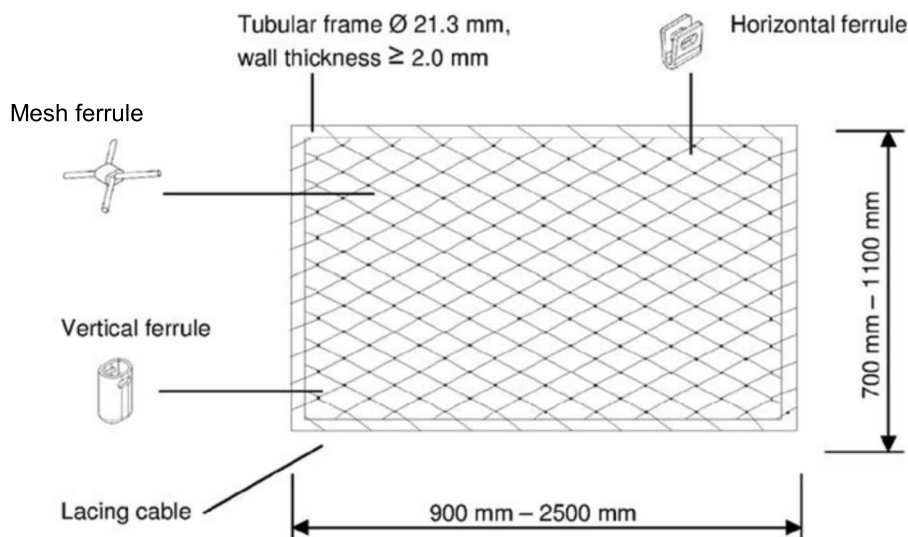
Conditions under which fall protection shall be deemed verified:

1. Mesh type CX:
 - (a) cable dia. 1.5 mm; mesh width from 35 mm to 60 mm,
 - (b) cable dia. 2.0 mm; mesh width from 50 mm to 60 mm.
2. Rectangular mesh panels with the above-mentioned dimensions, with cables running through in longitudinal direction (width direction) and linked with mesh ferrules in transverse direction (height direction).
3. Border fixation by border cable 7x19, Ø 8 mm, tensile breaking strength 1570 N/mm², guided around corners by eye bolts / eye nuts M12, or shackles of size 0.6.
4. Lacing cable matching the mesh cables; mesh cable and lacing cable shall be connected along the edges of the mesh panel using loose ferrules (unpressed clamps) made of tin-plated copper.
5. Handrail shall be executed in accordance with ETB guideline on fall prevention components (*ETB-Richtlinie Bauteile, die gegen Absturz sichern*), Section 3.1.

Carl Stahl cable mesh systems X-TEND

Vertical cable meshes (railing) verified for fall protection
Mesh type CX with border cable

Annex 7



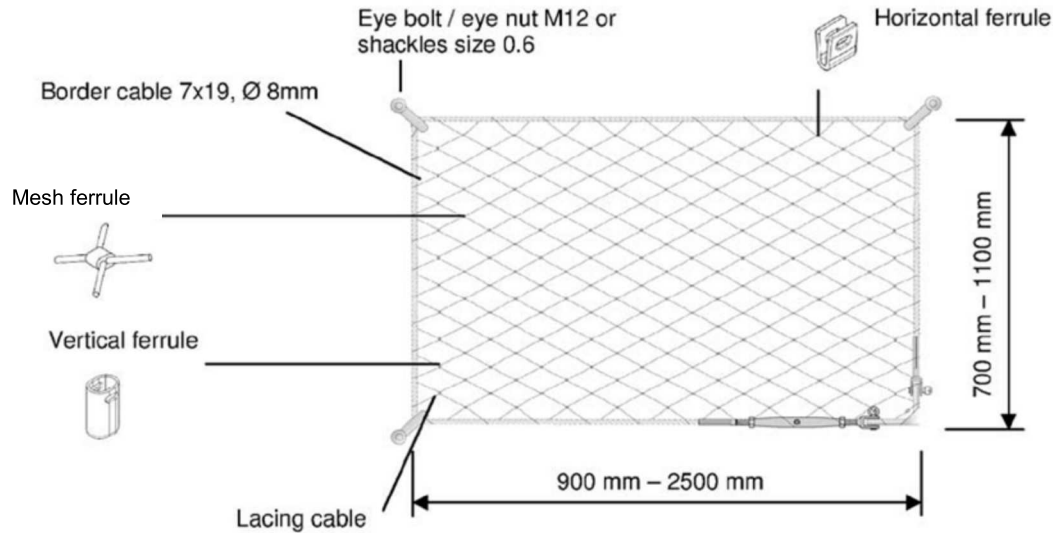
Conditions under which fall protection shall be deemed verified:

1. Mesh type CXS, cable dia. 1.5 mm, mesh width from 35 mm to 60 mm.
2. Rectangular mesh panels with the above-mentioned dimensions, with cables running through in longitudinal direction (width direction) and linked with mesh ferrules in transverse direction (height direction).
3. Mounted on tubular frame made of stainless steel, material no 1.4301 in accordance with DIN EN 10088, tube Ø 21.3 mm, wall thickness ≥ 2 mm.
4. Lacing cable matching the mesh cables; mesh cable and lacing cable shall be connected along the edges of the mesh panel using vertical and horizontal ferrules made of stainless steel.
5. Handrail shall be executed in accordance with ETB guideline on fall prevention components (*ETB-Richtlinie Bauteile, die gegen Absturz sichern*), Section 3.1.

Carl Stahl cable mesh systems X-TEND

Vertical cable meshes (railing) verified for fall protection
Mesh type CXS with tubular frame

Annex 8



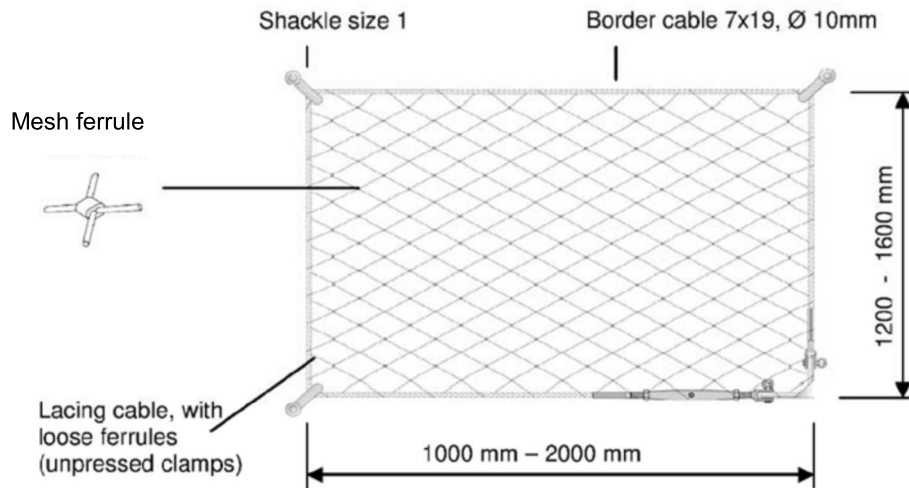
Conditions under which fall protection shall be deemed verified:

1. Mesh type CXS, cable dia. 1.5 mm, mesh width from 35 mm to 60 mm.
2. Rectangular mesh panels with the above-mentioned dimensions, with cables running through in longitudinal direction (width direction) and linked with mesh ferrules in transverse direction (height direction).
3. Border fixation by border cable 7x 19, Ø 8 mm, tensile breaking strength 1570 N/mm², guided around corners by eye bolts / eye nuts M12 or shackles of size 0.6.
4. Lacing cable matching the mesh cables; mesh cable and lacing cable shall be connected along the edges of the mesh panel using vertical and horizontal ferrules made of stainless steel
5. Handrail shall be executed in accordance with ETB guideline on fall prevention components (*ETB-Richtlinie Bauteile, die gegen Absturz sichern*), Section 3.1.

Carl Stahl cable mesh systems X-TEND

Vertical cable meshes (railing) verified for fall protection
Mesh type CXS with border cable

Annex 9



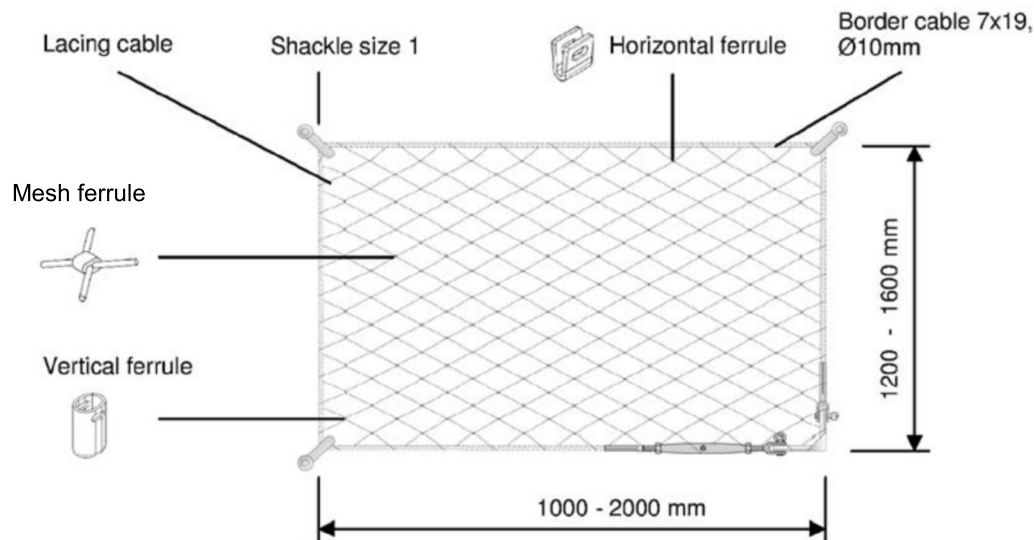
Conditions under which fall protection shall be deemed verified:

1. Mesh type CX, cable dia. 3 mm, mesh width from 60 mm to 100 mm.
2. Rectangular mesh panel with the above-mentioned dimensions, with cables running through in longitudinal direction and linked with mesh ferrules in transverse direction or with cables running through in transverse direction and linked with mesh ferrules in longitudinal direction.
3. Border fixation by border cable 7x19, Ø 10 mm, tensile breaking strength 1570 N/mm², guided around corners by shackles of size 1.
4. Lacing cable matching the mesh cables; mesh cable and lacing cable shall be connected along the edges of the mesh panel using loose ferrules (unpressed clamps) made of tin plated copper.
5. Maximum fall height depending on panel dimensions:
 - (a) 2000 mm x 1600 mm: maximum fall height 2.0 m,
 - (b) 1000 mm x 1600 mm: maximum fall height 1.0 m,
 - (c) Other dimensions in acc. with point 2: maximum fall height can be interpolated between a) and b)

Carl Stahl cable mesh systems X-TEND

Horizontal cable meshes verified for fall protection
Mesh type CX with border cable

Annex 10



Conditions under which fall protection shall be deemed verified:

1. Mesh type CXS, cable dia. 1,5 mm; mesh width from 35 mm.
2. Rectangular mesh panel with the above-mentioned dimensions, with cables running through in longitudinal direction and linked with mesh ferrules in transverse direction or with cables running through in transverse direction and linked with mesh ferrules in longitudinal direction.
3. Border fixation by border cable 7x19, Ø 10 mm, tensile breaking strength 1570 N/mm², guided around corners by shackles of size 1.
4. Lacing cable matching the mesh cable; mesh cable and lacing cable shall be connected along the edges of the mesh panel using loose ferrules (unpressed clamps) made of stainless steel.
5. Maximum fall height 1 m.

Carl Stahl cable mesh systems X-TEND

Horizontal cable meshes verified for fall protection
Mesh type CXS with border cable

Annex 11

Vertical cable mesh, cable Ø 1.5 mm
Type CXS



Vertical cable mesh, cable Ø 2 mm
Type CX



Vertical cable mesh, cable Ø 2 mm
Type CX

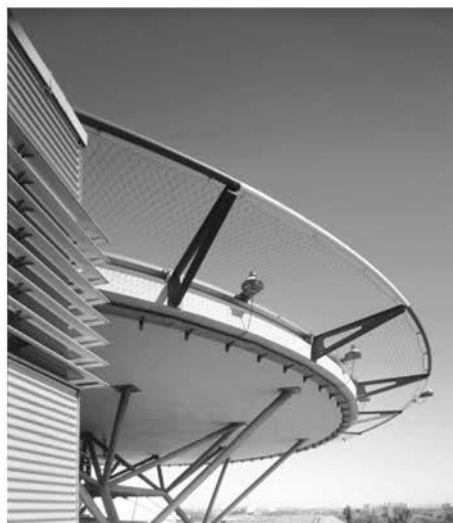


Carl Stahl cable mesh systems X-TEND

Examples of vertical cable meshes

Annex 12

Horizontal cable mesh, cable Ø 3.0 mm
Type CX



Horizontal cable mesh, cable Ø 3.0 mm
Type CX



Horizontal cable mesh, cable Ø 3.0 mm
Type CX



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Examples of horizontal cable meshes

Anlage 13

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