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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

MEMBER OF EOTA

European Technical Assessment ETA-25/0604 of 2025/08/08

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:	Schöck Isolink Type F
Product family to which the above construction product belongs:	Distance fixing system
Manufacturer:	Schöck Bauteile GmbH Schöckstraße 1 76534 Baden-Baden Internet www.schoeck.com
Manufacturing plant:	Schöck Bauteile GmbH Schöckstraße 1 76534 Baden-Baden
This European Technical Assessment contains:	26 pages including 15 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	EAD 331985-00-0604 – Distance fixing system
This version replaces:	

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

The anchor element Schöck Isolink Type F consists of a profiled, fiberglass-reinforced plastic reinforcement bar with nominal diameters of 12, 16 and 20 mm, into which a connector (Connector EJOT Delta-PT DS) of size M6, M8 or M12 is screwed in at the factory, a hexagon nut and a washer

The anchor element Schöck Isolink Type F are post-installed anchor systems placed into predrilled holes in in concrete and masonry and anchored by bonding.

The anchor element Schöck Isolink Type F distance fixing systems consist of a profiled, fiberglass-reinforced plastic rod (Combar), the Connector (EJOT Delta PT DS) and hexagon screw and washer are made of stainless steel. Additionally, the injection mortar Chemofast STVK is part of the anchoring system (distributed as follower approval with the brand names EJOT Multifix USF, Würth WIT VM 250 and MKT VMUplus)..

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

The intended use is fixings through an ETICS into the loadbearing wall of heavy-duty fixtures such as awnings, French balconies, canopies, satellite dishes, etc.
The system is used for distance installations in the following insulated base materials:

- Normal weight cracked or non-cracked concrete (base material group a)
- Solid masonry bricks (base material group b)
- Perforated or hollow bricks (base material group c)
- autoclaved aerated concrete (base material group d)

Reference to base material group in EAD 330499-02-0601 and EAD 330076-00-0604.

Anchorages subject to: Static or quasi-static loads.
Temperature range:

- T1: -40°C to +40°C (max. short term temperature +40°C and max. long-term temperature +24°C)
- T2: -40 °C to +80 °C (max long term temperature +50 °C and max short term temperature +80 °C)

The minimum and the maximum installation temperature are specified by the manufacturer within the above range.

Use categories in respect of use:

- Category d/d: Use in dry masonry and concrete Category
- Category w/w: Use in wet masonry and concrete Category.

This ETA applies only where concrete or masonry members in which the distance fixing systems are embedded are subject to static or quasi static actions in tension, pressure, shear or combined tension and shear or pressure and shear or bending.

In case of a product use in ETICS or insulations, it must be ensured that no debris and remaining of ETICS or insulations influence the load bearing capacity in the base material.

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B1 to B5.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the anchor of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Characteristics of product

Safety in case of fire (BWR 2):

Essential characteristic	Performance
Reaction to fire	A1 for metal parts and bonding material
Façade fire performance	No performance assessed

Safety in use (BWR4):
Resistance of anchor rods fixed with anchor adhesive in the base material masonry:
The rods with material specification as stated in annex A3 are covered by the following ETAs which provide the relevant performances:

- ETA-16/0089 EJOT Multifix USF Vinylester / Sormat ITH Vinylester
- ETA-16/0757 Würth WIT VM 250
- ETA-13/0909 MKT VMUplus

Resistance of the anchor rods fixed with anchor adhesive in the base material concrete:
The rods with material specification as stated in annex A3 are covered by the following ETAs which provide the relevant performances:

For cracked and uncracked concrete

- ETA-16/0107 EJOT Multifix USF Vinylester / Sormat ITH Vinylester
- ETA-12/0164 Würth WIT VM 250
- ETA-11/0415 MKT VMUplus

Resistance of the plastic part

- Characteristic resistance of the plastic part transferring load to failure under tension loading is not relevant due to the steel element
- Characteristic resistance of the plastic part transferring load to failure under pressure loading
- Characteristic resistance of the plastic part transferring load to failure under shear loading
- Characteristic resistance to failure under pressure load and displacement (buckling of cantilever arm)
- Characteristic resistance to failure under combined shear and pressure load and displacements (buckling of cantilever arm)
- Characteristic resistance under shear loads and displacements (failure of plastic part transferring load, cantilever arm)
- Maximum installation torque moment

The above essential characteristics are detailed in Annex C4 - .

Energy economy and heat retention (BWR6)
Point thermal transmittance:
See annex C1 – C3.

Equivalent thermal conductivity:
No performance assessed

Durability
The verification of durability is part of testing of the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

3.2 Methods of assessment

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements 4 has been made in accordance with the EAD 331985-00-0604 – Distance fixing system.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

4.1 AVCP system

According to the decision 97/463/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

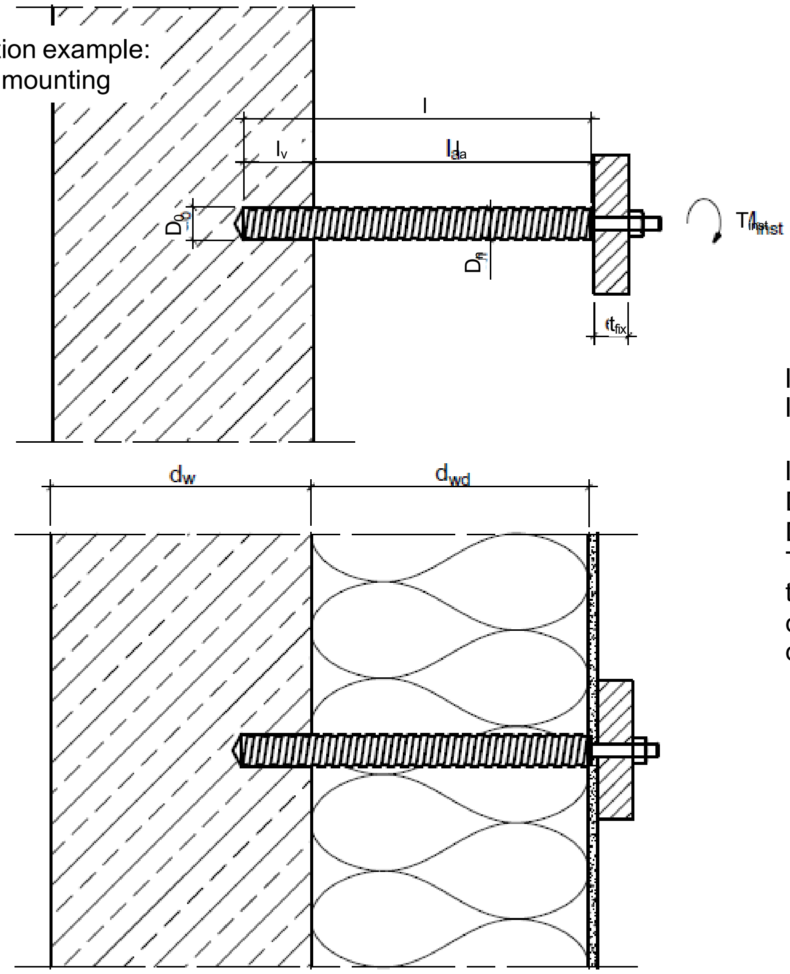
Issued in Copenhagen on 2025-08-08 by

Christian LP

Christian Lundgaard Pedersen
f/Thomas Bruun
Managing Director, ETA-Danmark

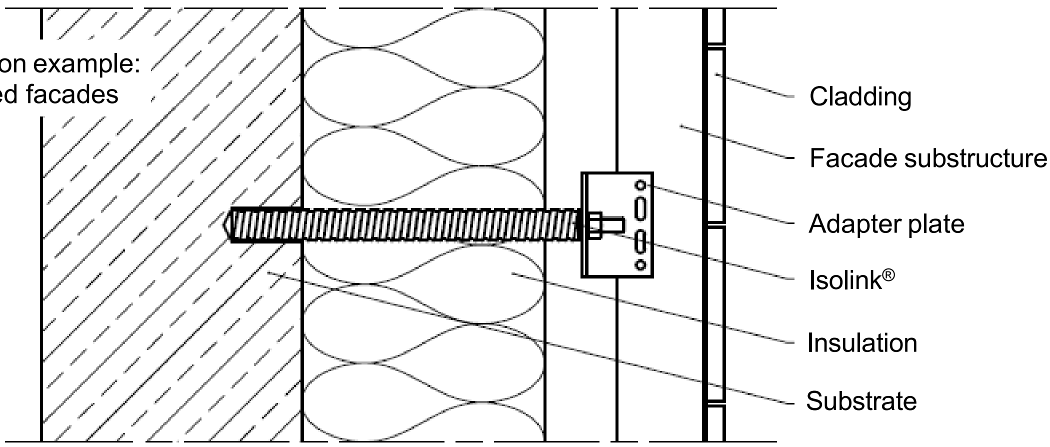
Schöck Isolink® Type F as a spacer assembly for a permanently thermally and electrically decoupled transfer of loads from an add-on part to the concrete or masonry basement.
Anchoring in the underground is carried out via injection systems with ETAs. Attachments are fixed using a screw or a double bolt.

Installation example:
Spacer mounting



l	Length Isolink® Type F
$l_v = h_{ef}$	Length in the subsurface, Effective anchoring length
l_a	Lever arm (non-load-bearing)
D_0	Drill hole diameter
D_n	Nominal diameter Combar®
T_{inst}	Tightening torque
t_{fix}	Thickness of the attachment
d_w	Thickness of substrate
d_{wd}	Thickness of thermal insulation

Installation example:
Ventilated facades



Schöck Isolink® Type F	Annex A1
Installation condition	

Dimensions

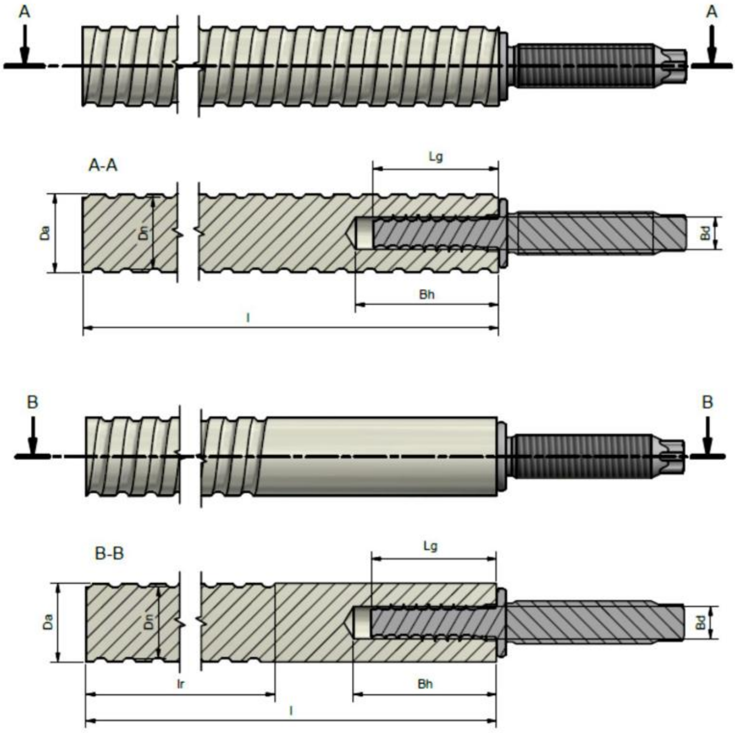
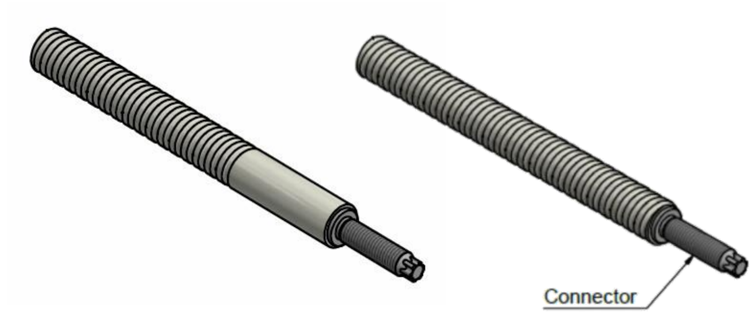


Table 1: Isolink® Type F Dimensions

Designation		Unit	F-D12	F-D16	F-D20
Nominal diameter	D_n	[mm]	12	16	20
External diameter	D_a	[mm]	13.5	18	22
Bored diameter in Combar®	B_d	[mm]	5.4	7.2	9.2
Borehole depth in Combar®	B_h	[mm]	35	40	40
Ribbed length	lr	[mm]	$h_v \le l_R \le l$		
Designation Connector and Connector Thread*			PT60/M6	PT60/M6 PT80/M8	PT60/M6 PT80/M8 PT100/M12



* other head shapes are permitted

Table 2: Materials and components

Designation	Material
Combar®	Glass fiber composite with approval Z-1.6-238
Connection Screw (Connector)	Stainless steel A4; 316 L according to ASTM A 493 $R_m \geq 640$ N/mm² Corrosion resistance class CRC III DIN EN 1993-1-4:2015-10
Washer (optional)	DIN EN ISO 7089:2000-11 Corrosion resistance class CRC III DIN EN 1993-1-4:2015-10
Hex Nut (optional)	DIN EN ISO 4032:2013-04 Strength class 50 according to DIN EN 3506-2:2010-04 Corrosion resistance class CRC III DIN EN 1993-1-4:2015-10
Composite mortar (Injection Mortar)	bonding mortar according to the following ETAs: EJOT Multifix USF Vinylester / Sormat ITH Vinylester ETA-16/0107 Use in concrete, 19.04.2024 ETA-16/0089 Use in masonry, 24.11.2016 Würth WIT VM 250 - ETA-12/0164 Use in concrete 12.11.2015 - ETA-13/1040 Use in masonry 13.01.2015 - ETA-16/0757 Use in masonry 15.12.2016 MKT VMUplus - ETA-11/0415 Use in concrete, 01.06.2021 - ETA-13/0909 Use in masonry, 08.12.2016

Table 3: Combar basic values

Material properties Combar		
Characteristic tensile strength	f_{tk}	1000 N/mm²
Design value of tensile strength	f_{td}	445 N/mm²
Modulus of elasticity (tensile and compression)	E	60000 N/mm²
Design value compressive strength	f_{cd}	265 N/mm²
Electrical resistance	R	10^{10} Ωm
Density	ρ	2.2 g/cm³
Fire Class	[-]	B-s1,d0

Specification of intended use

Anchorages subject to:

Static and quasi-static actions in tension, pressure, shear or combined tension and shear or combined pressure and shear load.

Specification of intended use:
The base material consist of reinforced or unreinforced normal weight concrete of minimum strength glass C20/25 and maximum strength class C50/60 in accordance with EN 206-1.

The Isolink may also be used for anchoring in masonry in accordance with EN 1996-1-1.

Temperature Range for use:
Minimum temperature = -40°C
T(24°C/40°C): (max. short term temperature +40°C and max. long-term temperature +24°C)
T(50°C/80°C) (max. short term temperature +80°C and max. long-term temperature +50°C)

Design:
The anchorages are to be designed under the responsibility of an engineer experienced in anchorages and masonry work with the applicable safety factors.
The design is carried out according to EOTA TR077 (12/2022)

Verifiable calculation notes and drawings shall be prepared taking account of the loads to be anchored, the nature and strength of the base materials and the dimensions of the anchorage members as well as of the relevant tolerances.
The position of the anchor is indicated on the design drawings.

The Isolink® Type F is anchored in the substrate of concrete, masonry or autoclaved aerated concrete.

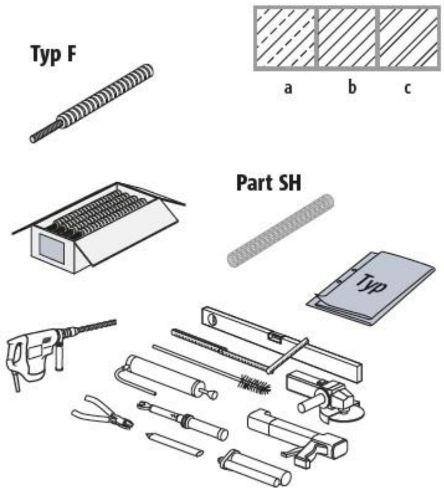
Any other layer, e.g. tolerance levelling layers, adhesives, plaster covering the substrate or outside plasters are considered as to be non load bearing.

Anchorages in concrete under static or quasi-static actions are designed in accordance with EN 1992-4

Installation:
The Schöck Isolink® Type F to be anchored must be installed in accordance with the design drawings prepared in accordance with the installation instructions (see Annex 18 to Annex 20).

Before setting, the type of anchoring base and the thickness of the non-load-bearing layer must be determined.

For anchoring in the respective anchoring base (substrate side), the respective ETAs for the injection system (see Annex 3, Table 2) must be observed.

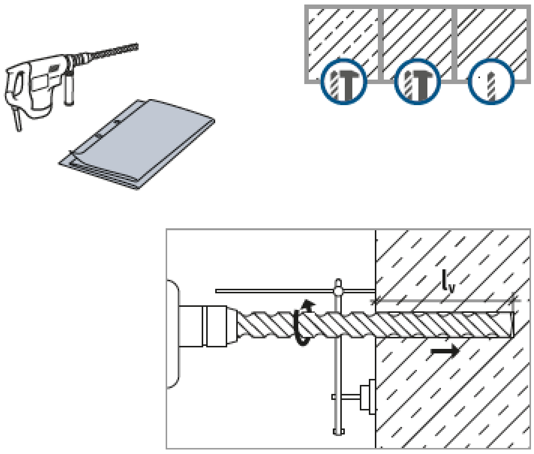


1) Check documents and get materials ready.

For installing in concrete (a), solid masonry units (b) or perforated masonry units (c).

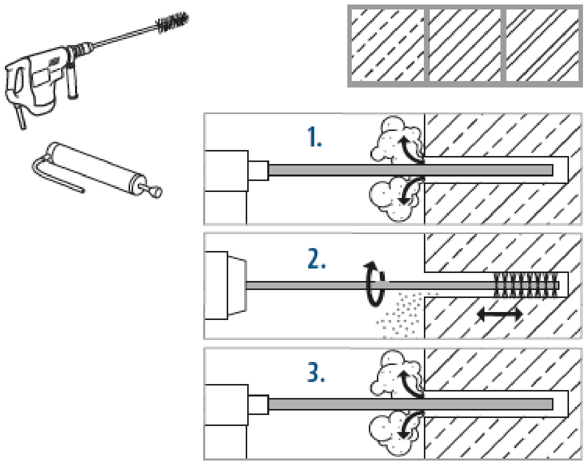
The following tools are required:

- Planning documents
- Schöck Isolink Type F
  - Installation instructions
  - ETA for the used bonding mortar
- Tools for installing
  - Drill and bits
  - Steel cleaning brush
  - Blower air-pump
  - Mesh sleeve (only for perforated units)
  - Cartridge gun



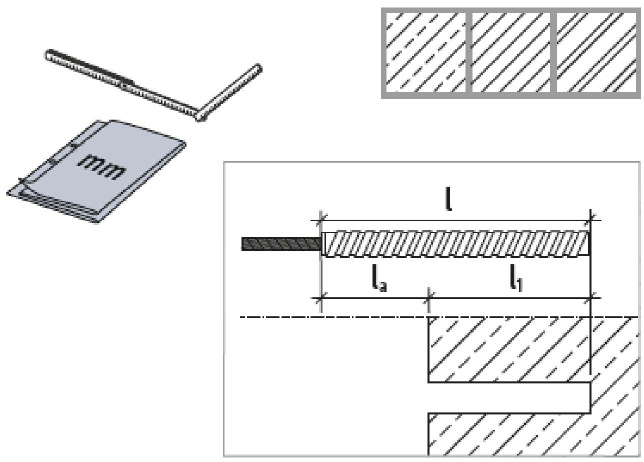
2) Drill.

- Mark the hole position and respect the installation values
- Observe the drilling method according to the ETA of the injection mortar
  - Concrete / Solid stone: hammer drilling
  - ACC and perforated units: rotary drilling



3) Clean the drilling hole.

1) Blow out 4x
2) Brush 4x
3) Blow out 4x

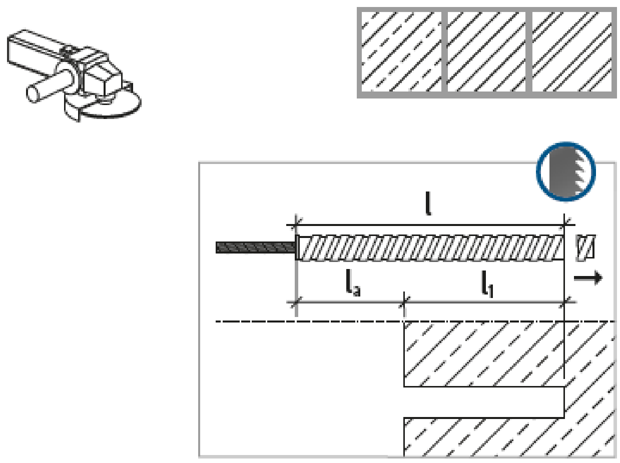


4) Check the product length.

- Measure the depth of the drilled hole.
- Determine the length of Isolink

$l = l_a + l_1$

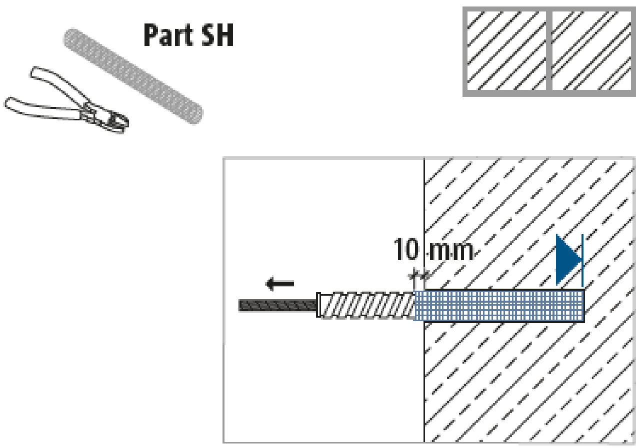
l_a = lever arm
l_1 = embedment length



5) Only if the product is too long.

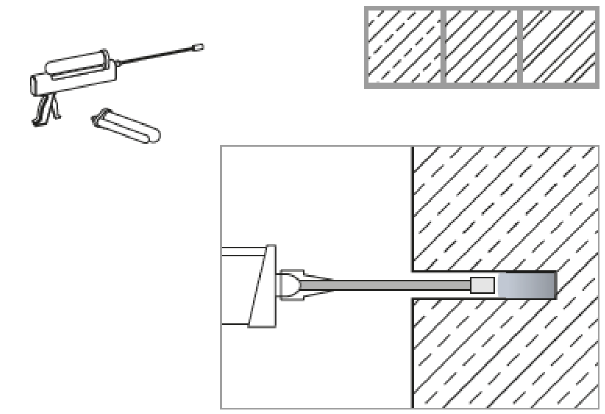
- Shorten the Isolink using an angle grinder or circular saw.

Caution: Do not use a bolt cutter for shortening.
This would damage the Isolink®



6) Set the mesh sleeve for perforated units (c).

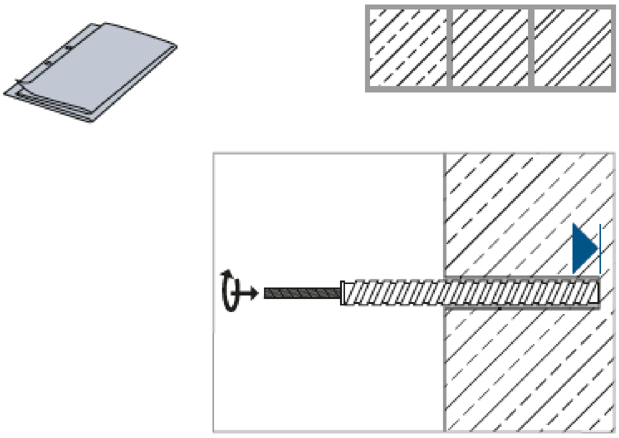
- In case of mash sleeve by the meter
  - Shorten the mash sleeve and close one end by flattening an folding
- Set the mesh sleeve dry into the drilled hole
- Check the position of the mesh sleeve



7) Inject the bond mortar.

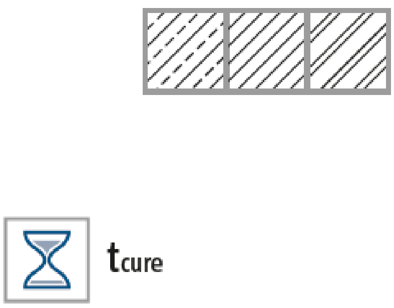
- Follow the instruction guideline of the used mortar.
- Fill the drilled hole or mash sleeve from the bottom of the drilled hole, ensuring that no air bubbles are trapped.

Substrate	Filling amount
Concrete and solid masonry units	approx.. 40% of the drilled hole
Perforated unit with mesh sleeve	100% of the mesh sleeve



8) Set and align the Isolink®.

- Insert the Isolink® into the bonding mortar with a slight rotation by hand.
- Align the Isolink® in line with the planned connection geometry, observing the setting depth.
- The drilled hole is sufficiently filled if after setting of the Isolink® a spall amount of mortar exist from the mouth of drilled hole.



9) Observe the curing time.

- Observe the curing time given in the bonding mortar specifications.
- The Isolink® may not be moved during the curing time.
- After the curing time:
  - The adapters or profiles can be install
  - Observe the torque moment T_{inst}

Calculation of the thermal bridge

The effect of mechanical fasteners in the thermal insulation plane must be taken into account when determining the heat transfer coefficient U in accordance with EN ISO 6946:2008-04.

The corrected thermal transmittance U_c is determined by adding the thermal transmittance of the undisturbed component U and a correction term ΔU_f for mechanical fastening.

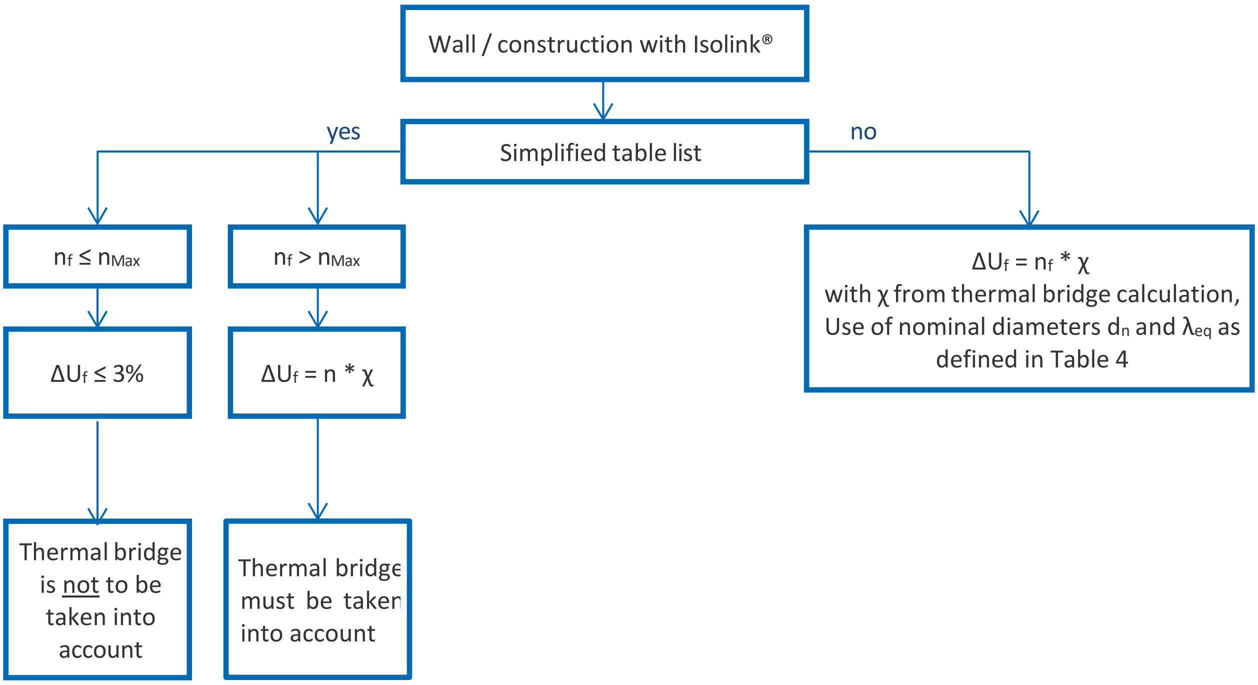
$$UU_{cc} = UU + \Delta UU_{ff} + \Delta UU_{gg}$$

The effect of the anchor can be determined by calculations of the point-related point transfer coefficients χ according to EN ISO 10211:2018-03. The correction of the heat transfer coefficient for mechanical fasteners is as follows: See Tables 5 and 6

$$\Delta UU_{ff} = nn_{ff} \cdot \chi\chi$$

Where n_f is the number of fasteners per square meter. However, if the total correction is less than 3% of U, no correction must be made in accordance with EN ISO 6946:2008-04.

See Tables 7 to 10



For the calculation of the point thermal transmittances for Isolink® Type F, the equivalent thermal conductivity in conjunction with the nominal diameter may be used for simplification.

Table 4: Equivalent Thermal Conductivity Isolink® Type F (Combar® + Connector)

	λ_{eq} [W/(m·K)]										
Insulation thickness [mm]	100	120	140	160	180	200	220	240	260	280	300
Type F D12	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0
Type F D16	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Type F D20	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9

Table 5: Point-related heat transfer coefficient χ per anchor
Insulation thermal conductivity 0.020 W/(m·K) to 0.025 W/(m·K)

WLG 020 to WLG 025	χ [W/K]										
Insulation thickness [mm]	100	120	140	160	180	200	220	240	260	280	300
Type F D12	0.0008	0.0007	0.0006	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003
Type F D16	0.0013	0.0011	0.0010	0.0009	0.0008	0.0007	0.0007	0.0006	0.0006	0.0006	0.0005
Type F D20	0.0018	0.0016	0.0014	0.0013	0.0012	0.0011	0.0010	0.0009	0.0009	0.0008	0.0008

Table 6: Point-related heat transfer coefficient χ per anchor
Insulation thermal conductivity 0.030 W/(m·K) to 0.040 W/(m·K)

WLG 030 to WLG 040	χ [W/K]										
Insulation thickness [mm]	100	120	140	160	180	200	220	240	260	280	300
Type F D12	0.0007	0.0007	0.0006	0.0005	0.0005	0.0004	0.0004	0.0004	0.0003	0.0003	0.0003
Type F D16	0.0013	0.0011	0.0010	0.0009	0.0008	0.0007	0.0007	0.0006	0.0006	0.0005	0.0005
Type F D20	0.0017	0.0015	0.0014	0.0013	0.0011	0.0011	0.0010	0.0009	0.0008	0.0008	0.0007

Intermediate values may be interpolated.

Mathematically maximum number of anchors per m² depending on the thermal insulation with which the correction limit of ≤ 3% according to EN ISO 6946:2008-04 is complied with.

Table 7: Maximum number of Isolink®/m² up to the 3% limit

Insulation thermal conductivity 0.020 W/(m·K)

WLG 020	Isolink® / m² [pieces]										
Insulation thickness [mm]	100	120	140	160	180	200	220	240	260	280	300
Type F D12	7	6	6	6	6	6	6	6	6	6	6
Type F D16	4	4	4	3	3	3	3	3	3	3	3
Type F D20	3	2	2	2	2	2	2	2	2	2	2

Table 8: Maximum number of Isolink®/m² up to the 3% limit

Insulation thermal conductivity 0.030 W/(m·K)

WLG 030	Isolink® / m² [pieces]										
Insulation thickness [mm]	100	120	140	160	180	200	220	240	260	280	300
Type F D12	10	10	10	10	9	9	9	9	9	9	9
Type F D16	6	6	6	5	5	5	5	5	5	5	5
Type F D20	4	4	4	4	4	4	4	3	3	3	3

Table 9: Maximum number of Isolink®/m² up to the 3% limit

Insulation thermal conductivity 0.035 W/(m·K)

WLG 035	Isolink® / m² [pieces]										
Insulation thickness [mm]	100	120	140	160	180	200	220	240	260	280	300
Type F D12	12	12	12	11	11	11	11	11	11	11	11
Type F D16	7	7	7	7	6	6	6	6	6	6	6
Type F D20	5	5	5	4	4	4	4	4	4	4	4

Table 10: Maximum number of Isolink®/m² up to the 3% limit

Insulation thermal conductivity 0.040 W/(m·K)

WLG 040	Isolink® / m² [pieces]										
Insulation thickness [mm]	100	120	140	160	180	200	220	240	260	280	300
Type F D12	14	14	13	13	13	13	13	12	12	12	12
Type F D16	8	8	8	8	7	7	7	7	7	7	7
Type F D20	6	6	5	5	5	5	5	5	5	5	5

Table 11: Mounting values Schöck Isolink® Type F

Installation of attachments		Unit	PT60/M6	PT80/M8	PT100/M12
Connection thread	Ø x l	[mm]	M6 x 30	M8 x 30	M12 x 39
Usable thread length	t_{fix}	[mm]	≤ 23	≤ 21	≤ 25
Tightening torque Concrete	T_{inst}	[Nm]	≤ 6	≤ 12	≤ 25
Tightening torque solid brick	T_{inst}	[Nm]	≤ 5	≤ 5	≤ 5
Tightening torque perforated brick	T_{inst}	[Nm]	≤ 2	≤ 2	≤ 2
Through hole	D	[mm]	≥ 7	≥ 10	≥ 14

Table 12: Installation values for anchoring in concrete

Combar®		Unit	Ø12	Ø16	Ø20
Drill hole diameter	D_0	[mm]	16	20	24
Drill hole depth	l_1	[mm]	h_{ef} + 5 mm		
Diameter of steel brush	D_{Br}	[mm]	18	22	26
Minimum embedment depth	$h_{ef,min}$	[mm]	40	40	40
Calculation maximum embedment depth	$h_{ef,max}$	[mm]	96	128	160
Minimum edge distance	c_{min}	[mm]	60	80	100
Minimum spacing	s_{min}	[mm]	60	80	100
Minimum concrete thickness	h_{min}	[mm]	h_{ef} + 2 d_0 ≥ 100		
Characteristic edge distance	c_{cr}	[mm]	1.5 h_{ef}		
Characteristic spacing	s_{cr}	[mm]	3 h_{ef}		

Table 13: Installation values for anchoring in perforated or solid brick masonry with mash sleeve

Combar®		Unit	Ø12	Ø16	Ø20
Drill hole diameter	D_0	[mm]	18	22	26
Drill hole depth	l_1	[mm]	h_{ef} + 10 mm		
Diameter brush	D_{Br}	[mm]	22	24	28
Metal mash sleeve	SH	[mm]	SH16-100	SH20-100	SH25-100
Minimum anchoring depth	$h_{ef,min}$	[mm]	80	80	80

Table 14: Installation values for anchoring in solid brick masonry without mash sleeve

Combar®		Unit	Ø12	Ø16	Ø20
Drill hole diameter	D_0	[mm]	16	20	24
Drill hole depth	l_1	[mm]	h_{ef} + 5 mm		
Diameter brush	D_{Br}	[mm]	18	22	26
Minimum anchoring depth	$h_{ef,min}$	[mm]	80 (100 mm for PP)		

Table 15: Load-bearing capacity of connecting screw (Steel failure)

Isolink®	Connection thread	$N_{Rk,s}$	$N_{Rd,s}$	$V_{Rk,s}$	$V_{Rd,s}$
[mm]	[mm]	[kN]	[kN]	[kN]	[kN]
Ø 12, 16, 20	M6	12.9	7.5	6.4	4.5
Ø 16, 20	M8	23.4	13.7	11.7	8.2
Ø 20	M12	54.0	31.6	27.0	19.0

Table 15.1: Partial safety factor steel failure

$\gamma_{Ms(tensile)}$	1.71	Steel, tensile
$\gamma_{Ms(shaer)}$	1.42	Steel, shear

Table 16: Load-bearing capacity threaded connector on Combar® (Connector-Combar failure)

Isolink®	Connection thread	$N_{Rk,con}$	$V_{Rk,con}$	$V_{Rk,con(leverarm)}$
[mm]	[mm]	[kN]	[kN]	[kN]
Ø 12	M6	6.7	2.9	1.3
Ø 16	M6	6.7	2.9	1.8
	M8	10.0	4.9	2.3
Ø 20	M8	10.0	4.9	2.8
	M12	11.3	9.0	3.2

Table 16.1: Partial safety factors Connector-Combar failure

γ_{Mcon}	1,7	Connector

Table 17: Displacement under tensile stress

Isolink®	δ / kN
[mm]	[mm/kN]
Ø 12	0.16
Ø 16	0.16
Ø 20	0.16

Table 18: Displacement under transverse stress

Isolink®	δ / kN
[mm]	[mm/kN]
Ø 12	0.16
Ø 16	0.10
Ø 20	0.05

Table 19: Tensile strength in cracked concrete (Combined extraction and concrete excavation)
Range of application with minimum anchoring depth **at h_{ef} ≥ 40mm < 7 · Ø**

Combar®		Temperature (24°C/40°C)		Temperature (50°C/80°C)	
	h_{ef}	$\tau_{Rk,ucr}$	$\tau_{Rk,cr}$	$\tau_{Rk,ucr}$	$\tau_{Rk,cr}$
[mm]	[mm]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
Ø 12	< 84	4.2	3.4	3.1	2.5
Ø 16	< 112	4.2	3.4	3.1	2.5
Ø 20	< 140	4.2	3.4	3.1	2.5

Table 20: Tensile capacity in cracked concrete (Combined extraction and concrete excavation)
Scope of application for large anchoring depth **hef ≥ 7 · Ø**

Combar®		Temperature (24°C/40°C)		Temperature (50°C/80°C)	
	h_{ef}	$\tau_{Rk,ucr}$	$\tau_{Rk,cr}$	$\tau_{Rk,ucr}$	$\tau_{Rk,cr}$
[mm]	[mm]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
Ø 12	≥ 84	4.2	4.2	3.1	3.1
Ø 16	≥ 112	4.2	4.2	3.1	3.1
Ø 20	≥ 140	4.2	4.2	3.1	3.1

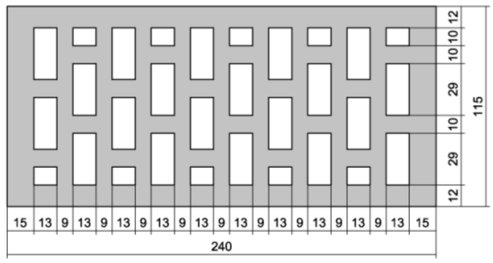
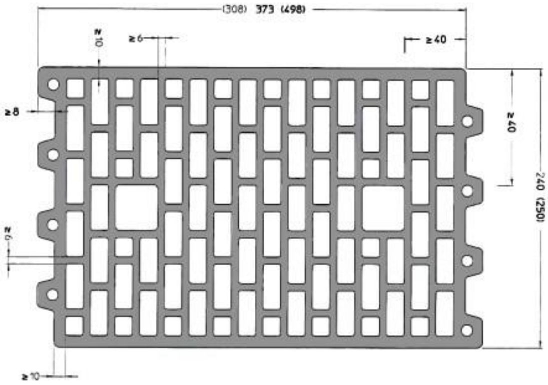
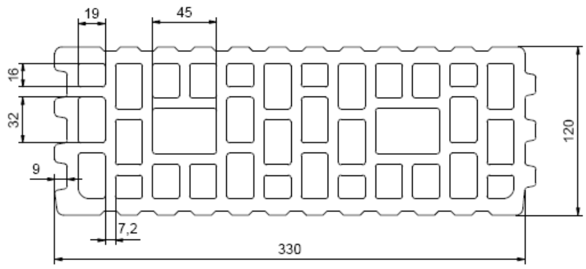
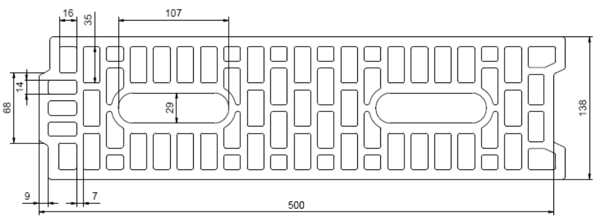
Table 21: Increase factor concrete compressive strength

ψ_c	1.0	Concrete C20/25
ψ_c	1.0	Concrete C30/37
ψ_c	1.0	Concrete C40/50
ψ_c	1.0	Concrete C50/60

Table 22: Installation safety factor

Combar®	$\gamma_{inst,(Zug)}$	$\gamma_{inst,(shrar)}$
[mm]	[-]	[-]
Ø 12	1.2	1.0
Ø 16		
Ø 20		

Table 23: Overview of the masonry blocks

No	Masonry type	Dimensions L/W/H	Stone compressive strength Fb	Geometry
	[-]	[mm]	[N/mm²]	
1	Perforated brick HLZ 2df	240/115/113	12 ρ ≥ 1	
2-3	Perforated brick HLZ 12df	370/240/249	24 ρ ≥ 1	
4	Perforated brick HLZ 12df (Spain)	370/240/249	43 ρ ≥ 1	
5	Perforated brick HLZ 12df (Benelux)	370/240/249	24 ρ ≥ 1	

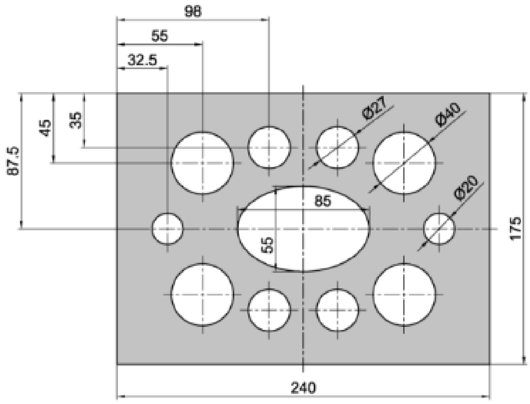
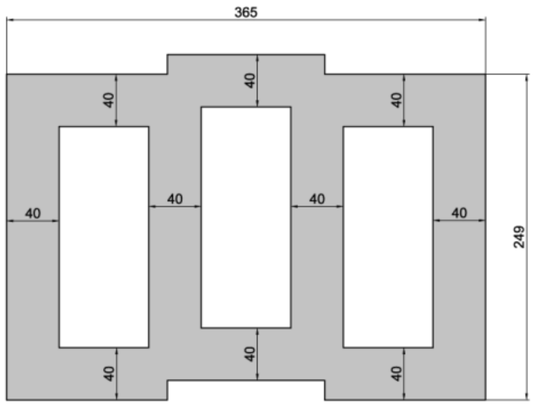
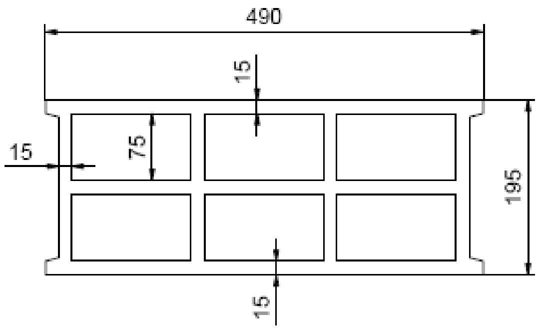
6	Lime-sand perforated brick KSL	240/175/113	12 ρ ≥ 1.5	
7	Hollow Block Lightweight Concrete HBL	247/365/249	2 ρ ≥ 0.5	
8	Hollow Block Lightweight Concrete HBL (France)	247/365/249	2 ρ ≥ 0.5	
9	Lightweight concrete solid brick V	247/365/249	2 ρ ≥ 0.65	
10	Sand-lime brick KS	250/250/240	12 ρ ≥ 1.8	
11	Sand-lime block KSP	500/250/500	21 ρ ≥ 1.8	
12	Solid clay bricks MZ	235/115/110	17 ρ ≥ 1.9	
13-15	Aerated concrete flat block PP4/05	599/240/249	4 ρ ≥ 0.5	

Table 24: Metal mash sleeve

Metal Sleeve	Combar D_n	Outer diameter d_1	Inner diameter d_2	Length open SH l_1	Length closed SH l_2	Mesh size
[-]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
SH 16	Ø 12	16	14.5	150	100	1.0
SH 20	Ø 16	20	19.0	150	100	1.0
SH 25	Ø 20	25	23.5	150	100	1.0

*) The version, which is open on both sides, must be closed on one side with the help of pliers before installation. After closing, at least the total length of the variant closed on one side must be reached

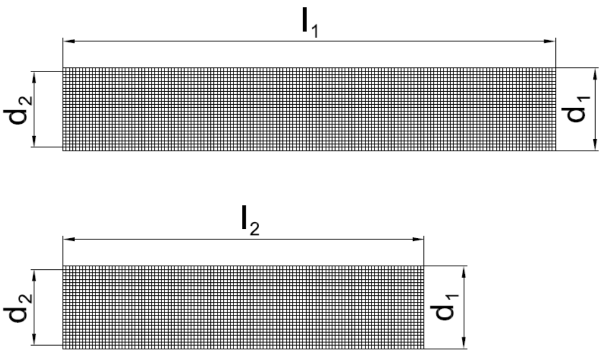


Table 25: Tensile load-bearing capacities in masonry

No	Masonry type	f_b [N/mm²]	c_{min} [mm]	Combar [mm]	$N_{Rk,b}$ (24°C/40°C) [kN] dry	$N_{Rk,b}$ (24°C/40°C) [kN] wet	$N_{Rk,b}$ (50°C/80°C) [kN] dry	$N_{Rk,b}$ (50°C/80°C) [kN] wet
1	Perforated bricks HLZ 2df	18.5	80	12/16/20	4.4	1.7	4.4	1.7
2	Perforated bricks HLZ 12df	27.1	185	12/16/20	5.8	2.2	5.8	2.5
3	Perforated bricks HLZ 12df	29.7	100	12/16/20	4.5	1.7	4.5	1.7
4	Perforated bricks HLZ (Spain)	43.3	100	12/16/20	4.4	1.7	4.4	1.7
5	Perforated bricks HLZ (Benelux)	24.5	100	12/16/20	3.0	1.2	3.0	1.2
6	Performed calcium silicate brick KSL	21.0	90	12/16/20	6.7	4.0	6.7	4.0
7	Hollowblock lightweight concrete HBL	2.0	120	12/16/20	1.1	1.1	1.1	1.1
8	Hollowblock lightweight concrete HBLF(France)	4.8	100	20				
9	Solid lightweight concrete brick V	2.0	120	12/16/20	1.6	1.6	1.6	1.6
10	Calcium silicate brick KS	12.0	125	12/16/20	11.4	6.8	10.7	6.4
11	Calcium silicate block KSP	21.2	100	12/16/20	16.1	9.6	16.1	9.6
12	Solid clay brick MZ	17.5	90	12/16/20	4.9	1.9	4.3	1.7
13	Aerated concrete	4.0	50	12	2.0	1.0	2.0	1.0
14	Aerated concrete	4.0	50	16	3.9	3.5	3.9	3.5
15	Aerated concrete	4.0	50	20	3.9	3.9	3.9	3.9

dry for D/D ; Wet for W/W and D/W

Table 25.1: Partial safety factor

$\gamma_{M,m}$	2.5	Masonry and/or brickwork
$\gamma_{M,ACC}$	2.0	Aerated concrete

Table 25.2: Shear load-bearing capacities in masonry, without lever arm parallel to the edge

No	Masonry type	f_b	c_{min}	Combar	$V_{Rk,b}$
		[N/mm²]	[mm]	[mm]	[kN]
1	Perforated bricks HLZ 2df	18.5	100	12/16/20	2.5[1)]
2	Perforated bricks HLZ 12df	27.1	100	12/16/20	6.0
3	Perforated bricks HLZ 12df	29.7	100	12/16/20	6.0
4	Perforated bricks HLZ (Spain)	43.3	100	12/16/20	2.5[1)]
5	Perforated bricks HLZ (Benelux)	24.5	100	12/16/20	7.8
6	Performed calcium silicate brick KSL	21.0	90	12/16/20	4.8
7	Hollowblock lightweight concrete HBL	2.0	100	12/16/20	2.5[1)]
8	Hollowblock lightweight concrete HBLF(France)	4.8	100	20	2.5[1)]
9	Solid lightweight concrete brick V	2.0	120	12/16/20	4.4
10	Calcium silicate brick KS	12.0	100	12/16/20	8.2[1)]
11	Calcium silicate block KSP	21.2	100	12/16/20	10.9[1)]
12	Solid clay brick MZ	17.5	90	12/16/20	9.9[1)]
13	Aerated concrete	4.0	100	12	4.9[1)]
14	Aerated concrete	4.0	100	16	4.9[1)]
15	Aerated concrete	4.0	100	20	4.9[1)]

1) according TR054 4.2.2.5. Combar Ø20: c_{min} ≥ 120mm

Table 26: β factor for construction site tests

No	Masonry type	β_N (24°C/40°C)		β_N (50°C/80°C)		β_V
		dry	wet	dry	wet	
1-5	Perforated bricks HLZ	0.95	0.37	0.95	0.37	1.0
6	Performed calcium silicate brick KSL	0.95	0.57	0.95	0.57	1.0
7	Hollowblock lightweight concrete HBL	0.95	0.95	0.95	0.95	1.0
8	Hollowblock lightweight concrete HBLF(France)					0.91
9	Solid lightweight concrete brick V	0.95	0.95	0.95	0.95	1.0
10	Calcium silicate brick KS	0.95	0.57	0.89	0.53	1.0
11	Calcium silicate block KSP	0.93	0.56	0.93	0.56	1.0
12	Solid clay brick MZ	0.95	0.37	0.85	0.33	0.81
13	Aerated concrete	0.90	0.43	0.90	0.43	0.87
14	Aerated concrete	0.95	0.85	0.95	0.85	0.87
15	Aerated concrete	0.95	0.95	0.95	0.95	0.87

Table 27: Edge and spacing distances for fastening in masonry blocks

No	Masonry type	Dimension L/W/H	$s_{min,II}$	$s_{cr,II}$	$s_{cr,\perp} = s_{min,\perp}$	Factor group α_g
		[mm]	[mm]	[mm]	[mm]	[-]
1	Perforated bricks HLZ 2df	240/115/113	max(80; 5d0)	240	113	1.1
2	Perforated bricks HLZ 12df	370/240/249	370	370	250	2.0
3	Perforated bricks HLZ 12df	370/240/249	370	370	250	2.0
4	Perforated bricks HLZ (Spain)					
5	Perforated bricks HLZ (Benelux)					
6	Performed calcium silicate brick KSL	240/175/113	max(80; 5d0)	240	113	1.5
7	Hollowblock lightweight concrete HBL	247/365/249	max(80; 5d0)	250	250	2.0
8	Hollowblock lightweight concrete HBLF(France)		max(80; 5d0)			
9	Solid lightweight concrete brick V	247/365/249	max(80; 3d0)	250	250	1.8
10	Calcium silicate brick KS	250/250/240	max(50; 3d0)	250	240	2.0
11	Calcium silicate block KSP		max(50; 3d0)			
12	Solid clay brick MZ	235/115/110	max(50; 3d0)	235	110	2.0
13-15	Aerated concrete	599/240/249	80	300	300	1.0

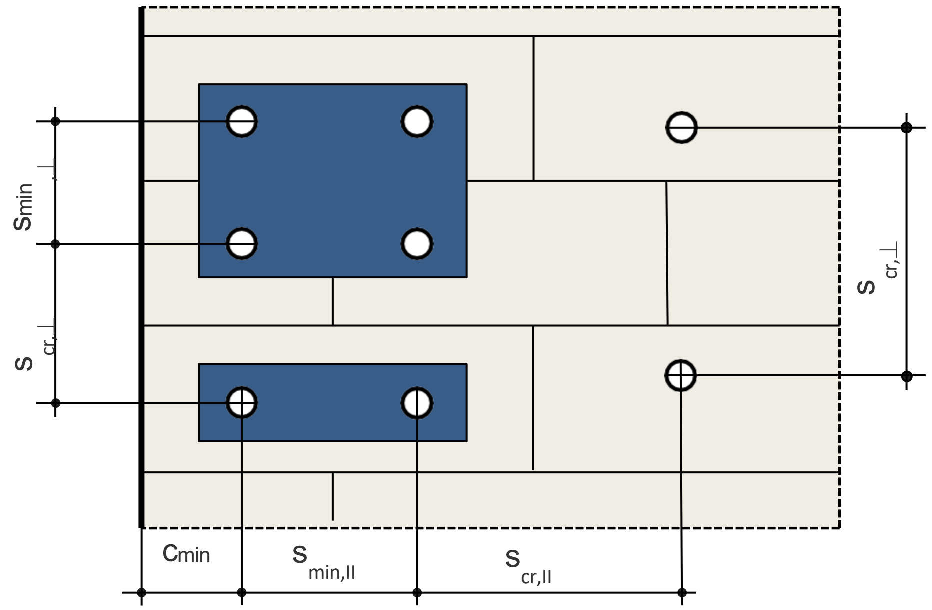


Table 28: Characteristic values for the stability analysis Combar (buckling analysis)

Combar®		Unit	Ø12	Ø16	Ø20
Nominal diameter	D_n	[mm]	12	16	20
Area	A	[mm²]	113	201	314
Moment of inertia	I	[mm⁴]	1018	3217	7854
Modulus of elasticity	E	[N/mm²]	60000	60000	60000
Compressive strength	$f_c°$	[N/mm²]	265	265	265
Max. Compressive Force	P_{Rk}	[kN]	29.9	53.2	83.2

Table 28.1: Characteristic buckling load for a shear displacement δv = 5,0 and 3,0 mm

Size	Thickness of insulation	Lever arm	Free rotatable (Euler 1)		Not free rotatable (Euler 3)	
			δv = 5,0mm $P_{Rk,ca}$	δv = 3,0mm $P_{Rk,ca}$	δv = 5,0mm $P_{Rk,ca}$	δv = 3,0mm $P_{Rk,ca}$
[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]
12	80	91	15.9	21.8	15.9	21.8
	160	171	15.9	20.6	15.9	21.8
	300	311	6.2[1)]	6.2[1)]	11.8[1)]	11.8[1)]
16	80	93	37.4	55.2	37.4	55.2
	160	173	37.4	55.2	37.4	55.2
	300	313	19.4[1)]	19.4[1)]	36.2[1)]	36.2[1)]
20	80	95	48.8	74.2	48.8	74.2
	160	175	48.8	74.2	48.8	74.2
	300	315	46.9[1)]	46.9[1)]	48.8	74.2

[1)] Calculated values for Euler case are decisive

Table 28.2: Partial safety coefficients Stability verification

$\gamma_{M,f}$	1,3	Pressure
$\gamma_{M,E}$	1,3	Modulus of elasticity

To calculate the transverse load capacity $V_{(w)}$ for a displacement w for a cantilever arm, the equation applies:

$$V_{(w)} = \frac{3EI \cdot w}{l_h^3}$$

Verification in the limit state of serviceability $V_{(f)} \leq V_{Ek}$
Lever arm [mm] l_h = la + 0.5·dn + 0.5 t_{fixed}

Table 29: Transverse load capacity $V_{(w)}$ at a maximum deformation w = 3mm

Lever arm l_h	Combar® 12	Combar® 16	Combar® 20
[mm]	[kN]	[kN]	[kN]
80	1.07	3.39	*
120	0.32	1.01	2,45
160	0.13	0.42	1,04
200	0.07	0.22	0,53
240	-	0.13	0,31
280	-	0.08	0,19
320	-	0.05	0,13

Table 29.1: Transverse load capacity $V_{(w)}$ at maximum deformation w = 5mm

Lever arm l_h	Combar® 12	Combar® 16	Combar® 20
[mm]	[kN]	[kN]	[kN]
80	1,79	*	*
120	0,53	1,68	4.09
160	0,22	0,71	1.73
200	0,11	0,36	0.88
240	0,07	0,21	0.51
280	-	0,13	0.32
320	-	0,09	0.22

*$V_{Rk,con}$ in the CCT according to Table 16

Table 30: Quantity of mortar required at a borehole depth l_1

Borehole l_1	Combar® 12		Combar® 16		Combar® 20	
[mm]	Concrete and solid brick	Perforated stone with sieve sleeve	Concrete and solid brick	Perforated stone with sieve sleeve	Concrete and solid brick	Perforated stone with sieve sleeve
50	5 ml	-	7 ml	-	9 ml	-
70	7 ml	-	9 ml	-	11 ml	-
90	8 ml	-	11 ml	-	14 ml	-
100	9 ml	32 ml	12 ml	39 ml	16 ml	54 ml
110	10 ml	35 ml	13 ml	42 ml	17 ml	59 ml

In concrete and solid stone $h_=$ l_1 - 10mm
n perforated stone with sieve sleeve h_{ef} = l_1 - 20mm