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European Technical Assessment

ETA 16/0064 of 15.04.2024

General part

Trade name of the construction product	**Geoconnect® LL**
Product family to which the construction product belongs	05 – Pins for structural joints.
Manufacturer	**STEEL FOR BRICKS GZ SL** Polígono industrial Alfajarín-El Saco, parcela 10 ES50172 Alfajarín (Zaragoza) Spain
Manufacturing plant(s)	Polígono industrial Malpica, Calle F, 23 ES50016 Zaragoza Spain
This European Technical Assessment contains	14 pages including 2 annexes which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of	European Assessment Document (EAD) 050019-00-0301 *Dowels for structural joints under static and quasi-static loading*. Edition March 2019.
This version replaces	ETA 16/0064 issued on 20.07.2022

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document.

Specific parts of the European Technical Assessment

1 Technical description of the product

Geoconnect® LL is a dowel connector used to transfer shear loads across an expansion joint between building parts made of reinforced normal weight concrete, composed of the following main components:

- male part: a dowel bar of circular cross section made of stainless or galvanized steel and an uncoated or epoxy coated fixed reinforcement.
- female part: a sleeve made of stainless steel or polypropylene, into which the dowel bar is inserted, an uncoated or epoxy coated fixed reinforcement and a nailing plate.

The combinations of dowel bar, sleeve and nailing plate are shown in Table 1.1:

Dowel bar	Sleeve and nailing plate
Stainless steel X2CrNiMoN22-5-3 (1.4462)	Stainless steel X5CrNi18-10 (1.4301)
	Stainless steel X2CrNi18–9 (1.4307)
	Polypropylene
Galvanized steel 42CrMo4 (1.7225)	Polypropylene

Table 1.1: Combinations of dowel bar, sleeve and nailing plate.

Geoconnect® LL belongs to the family of dowels with a single bar and a sleeve with anchor plate and ancillary reinforcement. Within this family, bars made of stainless steel or galvanized steel, and sleeves made of stainless steel or polypropylene apply. Dowels allow axial and lateral transverse movement.

The two components of the dowel connector are manufactured separately in the factory and assembled on the construction site into an expansion joint between concrete elements.

The fixed reinforcement in form of uncoated or epoxy coated rebars are welded to the male and female components during the manufacturing process.

The design reinforcement –reinforcement bars placed in the elements to be connected at the time of dowel installation- is defined case by case.

Where resistance to fire is required, Geoconnect® Fire is supplied as a component of the dowel connector.

The description of the Geoconnect® LL dowel connectors, which includes the description of the components, figures with schematic views of the dowel connectors as well as the dimensional limits of the elements to be connected are shown in annex A.

Calculation methods for the verification of load-bearing capacity of Geoconnect® LL structural joints are provided in EOTA TR065 [1].

[1] EOTA TR065 *Design of structural joints with shear dowels*, October 2019.

2 Specification of the intended use(s) in accordance with the applicable EAD

Geoconnect® LL is used to transfer shear loads across an expansion joint between:

- Floor, roof or foundation slabs in place of half-lap joints.
- Beams or supports and slabs in place of double-support joints.
- Walls in place of tongue and groove joints.

Geoconnect® LL is used and has been assessed for the following use conditions:

- Concrete strength classes according to EN 206-1: C20/25 to C50/60.
- Concrete elements with a minimum slab thickness of h = max {6·d_{bar}; 150 mm}, where d_{bar} is the bar diameter.
- Concrete elements that are designed according to EN 1992-1-1 or EN 1992-1-2 and EOTA TR 065.
- Joints with nominal width from 0 mm to 60 mm.
- When galvanized steel dowel bar is used: dry internal environmental (corrosivity category C1 according to EN ISO 12944-2).
- When stainless steel dowel bar and stainless steel sleeve are used: all corrosivity categories of rural environment, low and mid corrosivity categories of urban environment and low corrosivity category of marine environment, according to table A.1 of EN 1993-1-4.
- When stainless steel dowel bar and plastic sleeve are used: all corrosivity categories of rural, urban, industrial and marine environments according to table A.1 of EN 1993-1-4.

Geoconnect® LL dowels transmit static and quasi-static actions.

Geoconnect® LL dowels are intended to be used in concrete elements subjected to fire exposure when installed with Geoconnect® Fire according to Annex A.4 and Annex B.

The provisions made in this ETA are based on a working life of the Geoconnect® LL dowel connector for the intended use of 50 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

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

Performance of Geoconnect® LL related to the basic requirements for construction works (hereinafter BWR) were determined according to EAD 050019-00-0301. Essential characteristics of Geoconnect® LL are indicated in table 3.1.

Basic requirement	Essential characteristic	Performance
BWR 1	Resistance to steel failure at ULS	$e = 0{,}5 \cdot d_{bar}$
	Resistance to concrete edge failure at ULS not influenced by lateral movements of the dowel	$X_{1,1} = 0{,}21$ $B_{spec,1} = H_{slab} / \tan 33^o$ $H_{spec,1} = H_{slab} / 2$ $k_{1,1} = 0$
	Resistance to concrete edge failure at ULS influenced by lateral movements of the dowel	$X_{1,2} = 0{,}21$ $B_{spec,2} = H_{slab} / \tan 33^o$ $H_{spec,2} = H_{slab} / 2$ $k_{1,2} = 0$
	Resistance to concrete edge failure at SLS	$X_2 = 0{,}58$
	Resistance to steel failure at SLS	Not assessed
BWR 2	Reaction to fire	Class A1
	Resistance to fire	See annex B

Table 3.1: Performance of Geoconnect® LL.

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

According to the Commission Decision 2003/639/EC(EU)[2] the system of assessment and verification of constancy of performance (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies:

Product	Intended use(s)	Level(s) or classes(s)	AVCP System
Dowels for structural joints	For uses subject to structural performance regulations	---	2+
	For uses subject to regulations on reaction to fire	(A1 to E)*, F	4

* Products/materials that do not require to be tested for reaction to fire.

Table 4.1: System of assessment and verification of constancy of performance.

[2] Official Journal of the European Communities L 226/18 of 10/09/2003.

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

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC[3] and the factory production control shall be in accordance with it (the Control Plan specifies the type and frequency of checks/tests conducted during production and on the final product).

Products not manufactured by the kit manufacturer shall also be controlled according to the Control Plan.

Where materials/components are not manufactured and tested by the supplier in accordance with agreed methods, then they shall be subject to suitable checks/tests by the kit manufacturer before acceptance.

Any change in the manufacturing procedure which may affect the properties of the product shall be notified and the necessary type-testing revised according to the *Control Plan.*

Issued in Barcelona on 15 April 2024

by the Catalonia Institute of Construction Technology.

Institut de Tecnologia de la Construcció de Catalunya

Ferran Bermejo Nualart

Technical Director, ITeC

[3] The *Control Plan* is a confidential part of the ETA and only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

ANNEX A: Description of the Geoconnect® LL dowel connectors

A.1. Description of the components (male and female)

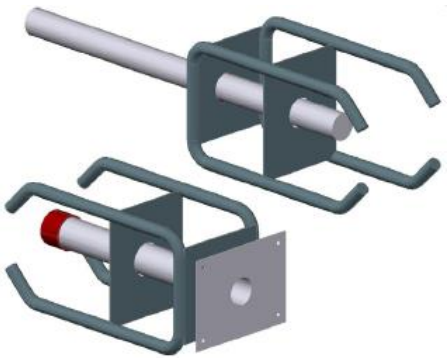


Figure A1.1: Connector Geoconnect® LL which allow axial movement (male and female components).

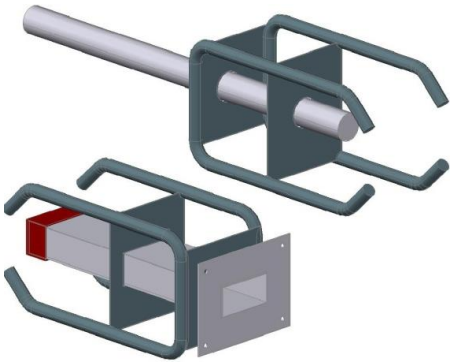
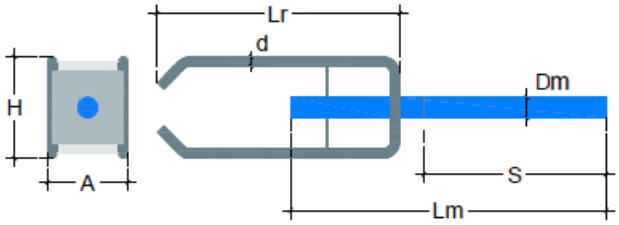


Figure A1.2: Connector Geoconnect® LL which allow axial and lateral transverse movement (male and female components).

Note:

Only the variant with stainless steel sleeve is shown in both figures for clarification purposes.



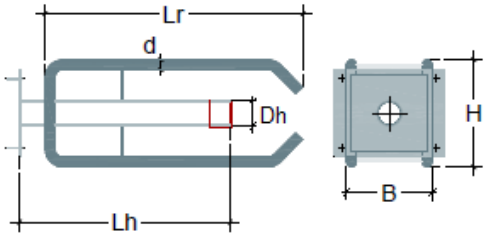
D_m Dowel bar diameter
L_m Dowel bar length
S Overhung
d Reinforcement bar diameter
L_r Reinforcement bar length
H Height
A Width

Figure A1.3: Dimensions of the male component.

Reference	Dimensions of the male component (mm)						
	Dowel bar			Fixed reinforcement			
	D_m	L_m	$S_{(1)}$	d	L_r	H	A
GC-LL-20	20	320	190	10	260	110	85
GC-LL-22	22	350	205	10	260	110	85
GC-LL-25	25	390	225	12	300	125	100
GC-LL-30	30	450	255	12	300	125	100
GC-LL-35	35	520	290	16	350	140	120
GC-LL-40	40	580	320	16	350	140	120

(1) Overhung (for a concrete cover of 30 mm).

Table A1.1: Dimensions of the male component.



D_h Interior sleeve diameter
L_h Sleeve length
d Reinforcement bar diameter
L_r Reinforcement bar length
H Height
B Width

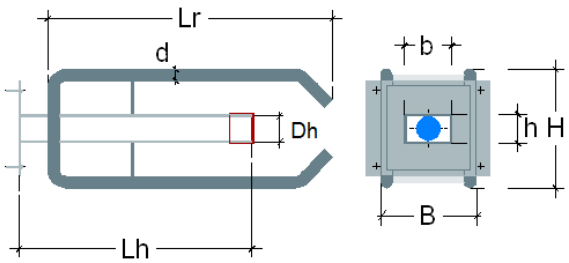
Figure A1.4: Female component for axial movement only.

Reference	Dimensions of the female component for axial movement only (mm)					
	Sleeve		Fixed reinforcement			
	D_h	L_h	d	L_r	H	B
GC-LL-20	21	210	10	260	110	85
GC-LL-22	23	225	10	260	110	85
GC-LL-25	26	245	12	300	125	100
GC-LL-30	31	275	12	300	125	100
GC-LL-35	36	310	16	350	140	120
GC-LL-40	41	340	16	350	140	120

Table A1.2: Dimensions of the female component for axial movement only.

Reference	Dimensions of the nailing plate in the female component for axial movement only (mm)			
	Stainless steel sleeve		Polypropylene sleeve	
	Width	Height	Width	Height
GC-LL-20	90	90	90	90
GC-LL-22				
GC-LL-25				
GC-LL-30				
GC-LL-35				
GC-LL-40	120			

Table A1.3: Dimensions of the nailing plate in the female component for axial movement only.



D_h Sleeve height
b Sleeve width
L_h Sleeve length
d Reinforcement bar diameter
L_r Reinforcement bar length
H Height
B Width

Figure A1.5: Female component for axial and lateral transverse movement.

Reference	Dimensions of the female component for axial and lateral transverse movement (mm)						
	Sleeve			Fixed reinforcement			
	h	b	L_h	d	L_r	H	B
GC-LL-20-DM	21	46	210	10	260	110	85
GC-LL-22-DM	23	56	225	10	260	110	85
GC-LL-25-DM	26	56	245	12	300	125	100
GC-LL-30-DM	31	76	275	12	300	125	100
GC-LL-35-DM	36	76	310	16	350	140	120
GC-LL-40-DM	41	96	340	16	350	140	120

Table A1.4: Dimensions of the female component for axial and lateral transverse movement.

Reference	Dimensions of the nailing plate in the female component for axial and lateral transverse movement (mm)			
	Stainless steel sleeve		Polypropylene sleeve	
	Width	Height	Width	height
GC-LL-20-DM	90	90	90	90
GC-LL-22-DM				
GC-LL-25-DM				
GC-LL-30-DM				
GC-LL-35-DM				
GC-LL-40-DM	120			

Table A1.5: Dimensions of the nailing plate in the female component for axial and lateral transverse movement.

Characteristic	Performance	Standard
Density (g/cm^3)	1,04	EN ISO 1183
Melt flow ratio (g / 10 min)		
(230 ºC / 2,16 kg)	16	EN ISO 1133
(230 ºC / 5,0 kg)	67	EN ISO 1133
Tensile modulus (MPa)	2.600	EN ISO 527-1, -2
Tensile strength (50 mm/min) (MPa)	33	EN ISO 527-1, -2
Flexural modulus (MPa)	2.700	EN ISO 178
Strength to Charpy impact (kJ/m^2)		
- Without notch (23 ºC, type 1, edgewise)	32	EN ISO 179
- Without notch (0 ºC, type 1, edgewise)	18	EN ISO 179
- With notch type A (23 ºC, type 1, edgewise)	2,5	EN ISO 179
- With notch type A (0 ºC, type 1, edgewise)	1,5	EN ISO 179
Hardness (indentation ball H 358/30) (MPa)	90,0	ISO 2039-1
Flexural temperature under load B (0,45 MPa; not annealed) (ºC)	115	EN ISO 75B-1, -2
Flexural temperature under load A (1,80 MPa; not annealed) (ºC)	65	EN ISO 75A-1, -2

Table A1.6: Nominal characteristics of the polypropylene of the sleeve and the nailing plate.

The fixed reinforcement is made of steel rebars according to EN 10080 of the following characteristics:

Characteristic	Performance
Yield strength (R_e) [N/mm^2]	≥ 500
Tensile strength (R_m) [N/mm^2]	≥ 550
Ultimate elongation (ε_u) [%]	≥ 12
R_m / R_e	≥ 1,05

Table A1.7: Nominal characteristics of the steel rebars.

The fixed reinforcement and the steel plates are uncoated or epoxy coated during the manufacturing process with thickness of 100 µm as mean value and 80 µm as minimum value. The mechanical properties of the reinforcement and of the dowel are not affected by this epoxy coating. The epoxy coating colour is maroon.

The plates used to fix the fixed reinforcement in the male and female components are made of uncoated or epoxy coated steel sheets 1,5 mm thick of steel S235 according to EN 10025-2. These plates are also used to support the dowel bars and the sleeve.

A.2. Schematic views of the dowel connectors

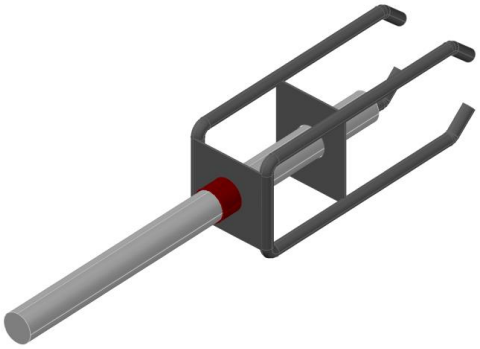


Figure A2.1: Male component.

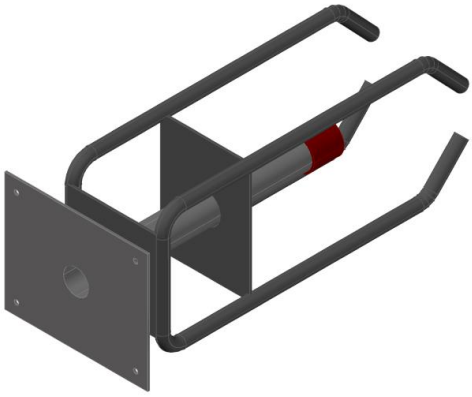


Figure A2.2: Female component with stainless steel sleeve for axial movement only.

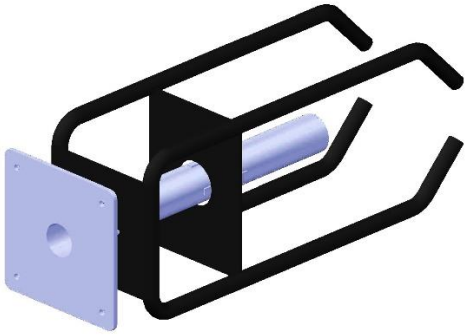


Figure A2.3: Female component with polypropylene sleeve for axial movement only.

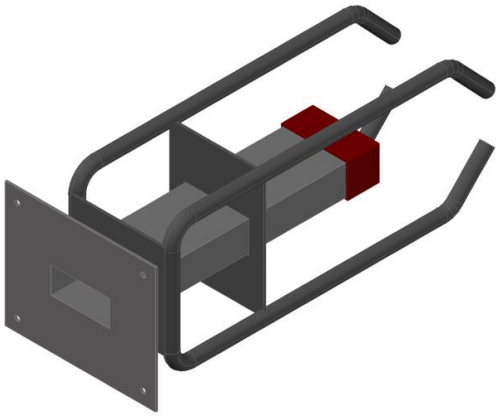


Figure A2.4: Female component with stainless steel sleeve for axial and lateral transverse movement.

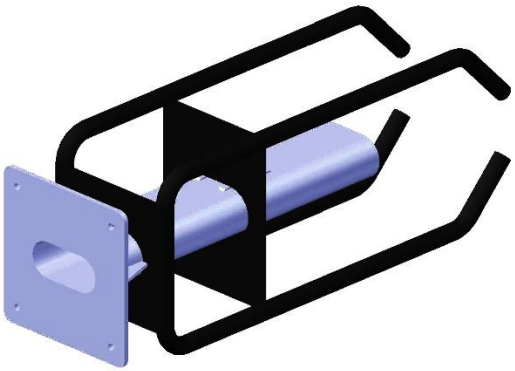


Figure A2.5: Female component with polypropylene sleeve for axial and lateral transverse movement.

A.3. Dimensional limits of the elements to be connected

Reference	Minimum thickness of the concrete elements to be connected (mm)
GC-LL-20	180
GC-LL-22	180
GC-LL-25	200
GC-LL-30	200
GC-LL-35	250
GC-LL-40	250

Table A3.1: Minimum thickness of the concrete elements to be connected.

Reference	Minimum dowel bar introduction in the sleeve (mm)						
	Joint width (w) (mm)						
	0	10	20	30	40	50	60
GC-LL-20	190	180	170	160	150	140	130
GC-LL-22	205	195	185	175	165	155	145
GC-LL-25	225	215	225	235	245	255	165
GC-LL-30	255	245	235	225	215	205	195
GC-LL-35	290	280	270	260	250	240	230
GC-LL-40	320	310	300	290	280	270	260

Table A3.2: Minimum dowel bar introduction in the sleeve (mm).

A.4. Geoconnect® Fire

Geoconnect® Fire consists of a mineral wool panel (20 mm or 30 mm thickness) coated with an intumescent layer of 2,5 mm thickness, with the dimensions shown in table A4.1. Technical specification of Geoconnect® Fire is identified and kept at ITeC. Geoconnect® Fire is supplied by Steel for Bricks under their responsibility.

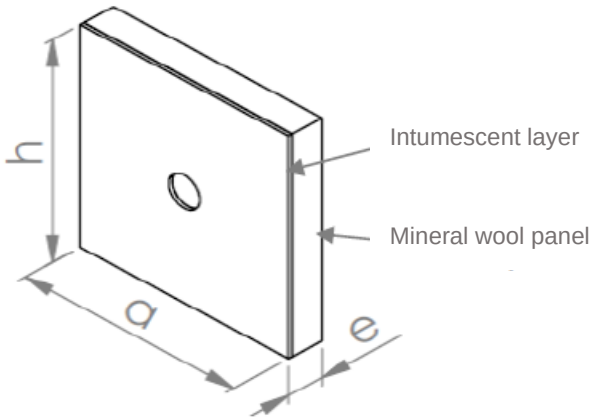


Figure A4.1: Geoconnect® Fire.

Dowel bar diameter (mm)	Geoconnect® Fire		
	Hole diameter (mm)	Minimum height h (mm)	Minimum width a (mm)
20 (GC-LL-20)	21	160	160
22 (GC-LL-22)	23		
25 (GC-LL-25)	26		
30 (GC-LL-30)	31		
35 (GC-LL-35)	36	170	170
40 (GC-LL-40)	41		

Table A4.1: Geoconnect® Fire dimensions.

The selection of Geoconnect® Fire thickness will be done depending on the initial joint width in such a way that the dowel bar unprotected length is the lowest possible. When two Geoconnect® Fire are installed due to the initial joint width, they are positioned adjacent to each other with the intumescent coated layers facing the concrete slabs.

The working life of Geoconnect® Fire has not been assessed in the framework of this ETA and is lower than the working life of the Geoconnect® LL dowel connectors. Therefore, an adequate maintenance and repair, when necessary, of the fire protective product is required.

ANNEX B: Resistance to fire performance

B.1. Classification

The loadbearing reinforced concrete floor consisting of slabs connected with Geoconnect® LL dowel connectors in accordance with section 1 of this ETA, protected with Geoconnect® Fire in accordance with section A.4, is classified R120 according to EN 13501-2.

The resistance to fire test was performed according to EN 1365-2.

B.2. Limits of the performance applicability

The given resistance to fire performance is assessed to be valid considering:

- Connector family: dowels which allow axial movement only.
- Connectors loaded up to the design shear strength values in accordance with ETA 16/0064, in function of the connector used, the slabs characteristics and reinforcement design, and the joint width.
- The concrete slabs and reinforcements, as well as local reinforcements of the connectors, must be designed to have a resistance to fire R120. The minimum slab thickness must be 200 mm with a minimum concrete cover of the slabs lower reinforcements of 40 mm. The concrete surface at the edge of the slabs must be flat and smooth to reach an adequate seal of the joint in case of fire.
- The maximum initial length of the dowel bar unprotected within the initial joint width (not covered by Geoconnect® Fire) must be 10 mm. See also section A.4 for Geoconnect® Fire installation criteria.