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ATG Technical Approval with Certification

ATG 15/2630

Precast panel hanger device

FIXI3D

Valid from 24/6/2015
until 23/6/2018

Approval and Certification Operator

BCCA

Belgian Construction Certification Association
Rue d'Arlon, 53, B-1040 Brussels
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Approval holder:

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1 Objective and scope of the technical approval

This technical approval is based on the favourable assessment of the product or system by an independent approval operator designated by UBAtc asbl for a specific use. The result of this assessment is described in this approval document. This text identifies the product(s) used in the system and determines the expected performance of the product, assuming that production, use and maintenance of product(s) or system(s), are as specified in this approval document.

The technical approval is accompanied by regular inspections and adjustments in line with technical progress, if such modifications are appropriate. The technical approval shall be reviewed every three years.

For the technical approval to be renewed, the manufacturer shall provide evidence, whenever required, that the necessary steps are continuously being taken to ensure that the assessment described in the approval document still applies. This monitoring is essential and ensures that the product complies with this technical approval. This task is assigned to the certification operator, BCCA, which is designated by the UBAtc.

The continuous character of the checks and statistical interpretation of results enable the associated certification to achieve a high level of reliability.

The approval and certification of conformity with the approval are independent from individual works. The contractor and architect remain fully responsible for the conformity of the execution with the provisions contained in the specifications.

2 Subject

Attachment device, adjustable in three directions, for securing precast reinforced concrete cladding panels with a minimum thickness of 8 cm to a concrete or metal structure.

A ventilated cavity, which may have thermal and/or acoustic insulation, is located behind the precast panels.

Hanger components, two of which are fitted to each panel, include a mounting plate that is designed to be hooked onto the supporting structure, an eye pin that allows the suspension hook device height to be adjusted, a cylindrical spindle for lateral adjustment and an insert that is placed inside in the panel before it is suspended; the entire assembly is made from stainless steel.

The following auxiliary products are required alongside the device, but are not covered by the ATG and certification:

- Spacers;
- Wind anchors;
- Pins;
- Attachment plugs: if attached to a concrete structure, the mounting plates must be secured using stainless steel metal anchors or chemically sealed anchors made from stainless steel that are suitable for use in cracked concrete. The anchors have been awarded the CE mark.
- Bolts: bolts are provided so that the suspension hook device can be attached to a metal support.
- Steel reinforcement bars to be used as reinforcement in the concrete.

3 Materials

– The plates, the square plate on the threaded rod and steel insert straps made from austenitic stainless 1.4401 or 1.4462 (cf. NBN EN 10088-1) made from sheet metal.

  Minimum requirements for 1.4401 materials:
  - Elasticity limit $R_{p0,2}$: 300 N/mm²
  - Tensile strength R_m: 500 N/mm²

– Stainless steel eye pin made from stainless steel 1.4401 (cf. NBN EN 10088-1) manufactured from cold-drawn bars.

  Material requirements:
  - Smooth part
    - Elasticity limit $R_{p0,2}$: 240 N/mm²
    - Resistance Rm: 500 N/mm²
  - Threaded part:
    - Elasticity limit $R_{p0,2}$: 350 N/mm²
    - Resistance Rm: 700 N/mm²

– The axis for 5.0 kN – 34.0 kN classes and connecting bars between the two stainless steel straps made from stainless steel 1.4401 (cf. NBN EN 10088-1) manufactured from drawn bars.

  Material requirements:
  - Elasticity limit $R_{p0,2}$: 320 N/mm²
  - Resistance Rm: 610 N/mm²

– The axis for the 56,0 kN class made from stainless steel 1.4462 (cf. NBN EN 10088-1): from drawn bars.

  Material requirements:
  - Elasticity limit $R_{p0,2}$: 650 N/mm²
  - Resistance Rm: 850 N/mm²

– Bolts: made from steel (A4 Class 70), in compliance with NBN EN 4032

  Connectors between components, such as hammer head bolts, nuts or threaded rods

– Reinforcement bars in the precast panel: high-adherence steel

  These bars are not supplied by Fixinox. They must meet the following requirements:
  - BE 500 S or BE 500 TS, in compliance with NBN A24 301-303, BENOR mark

– The following non-charged components:
  - Round plastic collars for spacers and pins (HDPE)
  - Oval pin collars (PVC)
  - Opening component (EPS)

4 Suspension hook system components

The plate, eye pin, cylindrical spindle and insert are marked with a characteristic colour for the service load limit class. The suspension hook device assemblies have been standardised, according to 8 load categories:

Tableau 1 – Attachment device types

Load categories (kN)	Colour marking
5,0	Black
8,0	Red
11,5	Green
16,0	White
22,0	Yellow
27,0	Blue
34,0	Orange
56,0	Pink

The dimensions of the different components described above can be found attached, together with an overview drawing of the suspension hook system (Annex 1).

4.1 The plate

The plate (Annex 2) is created from a strip made from stainless steel sheet, the lower part of which is punched in the form of a tube so that the eye pin can be inserted. Its upper part is cut out in the shape of a notch. The plate may be doubled, if necessary, in order to distribute the load across two anchors. Three types of plate exist: single plates (PLS), double plates (PLD) and twisted plates (PLV).

The mounting plates are fastened to a concrete structure using stainless steel or chemically sealed stainless steel metal anchors that are suitable for use with cracked concrete.

If the suspension hook is fastened to metal support, the anchor is replaced with a bolt that has been approved by the design office.

The shape of the plate can be adapted to create an acroterion-type attachment device. These adjusted shapes are not covered by the ATG and certification.

4.2 The eye pin

The eye pin (Annex 3) connects the plate to the insert and is used for vertical adjustment. A cylindrical spindle passes through the eye, so that it can be connected to the insert.

The diameter of the eye pin depends on the type. It is threaded at one end, so that its height can be adjusted, and inserted into the upper part of the plate. The other end is smooth and soldered in the shape of an eye, so that the link spindle can be inserted, which is used for lateral adjustment.

The threaded part is fitted with a nut and washer, which must be lubricated, in order to prevent cold welding (sticking) if the suspension hook device is adjusted while connected under tension.

4.3 The insert

The insert (Annex 4) is placed inside the precast component. It consists of straps and an expanded polystyrene cavity (EPS). The straps are connected by a soldered brace.

The two straps are folded in their upper part, so that they stay aligned to the eye pin. One of the two straps has a flat lug that is used to lock the link spindle.

This welded assembly is anchored vertically to the precast component, using two folded bars that pass through the two straps. In addition, one or two reinforcement bars are placed on the fold of the straps. The dimensions of these bars are shown in Annex 5.

4.4 Auxiliary products

The above-mentioned auxiliary products are required for use with the device, but are not covered by the ATG and certification.

4.4.1 Spacers

Spacers (Annex 6) are used to separate the precast component from the support. They are placed immediately adjacent to the insert. They are designed to transfer the compressive forces to the supporting structure. The choice of spacer essentially depends on the normal forces on the spacer and cavity between the precast component and support.

Each spacer includes a screw. The diameter of the screw depends on the load capacity of the suspension hook system, in relation to the wind forces which it has to withstand, and the distance between the structure and precast cladding component. The threaded rod is inserted into a plastic collar with a PVC flange, with a cylindrical section, which forms an integral part of the precast component.

Two spacers can be fitted as wind anchors, if there is no risk that the component will become detached from the support due to wind.

The spacer assembly, except for the collar, is made from stainless steel.

4.4.2 The wind anchor

The wind anchor (Annex 7) replaces the spacer if the precast component is likely to rise due to negative wind pressure. Like the spacer, it serves to separate the precast component from the support but absorbs the forces caused by positive and negative wind pressure.

The choice of wind anchor depends on the cavity, weight of the hanger component and wind pressure, which is calculated according to NBN EN 1991-1-4+ANB with a return period of 50 years.

The choice of wind anchor depends on the support, the position of the architectural component in relation to the support, any other items fitted to the support and the methods used by the fitter.

In principle, three types of wind anchor exist, which are selected according to the situation. The anchorage is calculated on the basis of a specific calculation note provided by the manufacturer. But, depending on the situation at the site, other types of wind anchor may be possible.

The position and length of the connector can be adjusted in different directions, all parts are always made from stainless steel.

4.4.2.1 Side wind anchors attached by plates using a soldered hammer head bolt

The principle of the side wind anchor is to fasten two rails with sealed soldered brackets attached to the appropriate faces of respectively the structure and the precast component at the inside of the ventilated cavity, as these two rails are orthogonal to each other.

4.4.2.2 Side wind anchor attached by plates with a forged head

Connection and adjustment are made possible by two plates with racks that are held in the rails by a notch, the shape of which is adjusted to the necessary rail in the precast component.

4.4.2.3 Wind anchors using a socket and pin

Wind anchors with a socket and pin consist of a plate with an oblong and round hole. This plate is attached through the oblong hole by means of an anchor bolt and separated from the concrete using a bar that is soldered behind the plate. A screw passes through the round hole and is fastened to the cladding panel using a sealed socket in the concrete. The diameter of the bar is equal to the thickness of the screw head.

After all adjustments have been made, the nut at the top of the socket makes it possible to block the system.

4.4.3 The pin

The pin (Annex 8) makes it possible to fasten the precast components to each other and transfer horizontal loads from one component to another, using a pin that is sealed on the edge of the two components. It generally consists of:

- A hollow cylindrical collar made from polyethylene and sealed on the lower edge of the upper plate;
- A polyethylene collar with an oval section sealed on the upper edge of the lower plate, as the large size of the section is parallel to the façade;
- A stainless steel pin, the diameter of which is equal to the inner diameter of the cylindrical collar (single pin).

The oval collar on the lower panel has a larger diameter than the pin; the pin is then sealed in the non-shrink mortar (bonded pin/anchor).

5 Manufacture and marketing

5.1 Manufacture

The different components in the attachment device are manufactured by Fixinox at its factory in 6040 Jumet, Zoning industriel de Jumet, 1ère Rue 8, Belgium or its subcontractors, in compliance with the specifications.

All components that form part of the attachment device (kit), which are described in paragraph 4, are supplied by FIXINOX.

Industrial self-monitoring of manufacturing includes inspecting primary materials, manufacturing and conducting checks on the finished items.

5.2 Marketing

The FIXINOX company is responsible for marketing and can provide users with technical assistance.

6 Installation

The design office must determine and/or prescribe, depending on the relevant forces:

- The type of suspension hook device;
- The position of attachments and accessories;
- The organisation of reinforcement steels in the cladding panels.

It is the responsibility of the panel manufacturer and contractor to use only specialist workers within this field and ensure, by means of regular supervision, that work is completed, at all times and places, according to the specifications of the approval and the attachment device manufacturer. The contractor must also check that the structure is able to distribute the loads created by the panels and the panel manufacturer must ensure that the concrete used in the cladding panel is suitable for the exposure class.

6.1 Manufacture of precast cladding components

Pre-condition: the concrete panels must comply with NBN EN 14992 "Precast concrete products – Wall elements" and its national counterpart NBN B 21-612.

When the panels are manufactured, two suspension hook devices are generally used for each panel. This principle for fitting attachment components is adjusted to the geometry of the precast component and determined by means of a specific calculation. The choice of suspension hook device model is determined by matching the actual load on the suspension hook device and the load capacity of the suspension hook system.

The insert is supplied with the polystyrene cavity and designed to remain in contact with the corresponding formwork face. Concrete bars (Annex 5) are slid into the insert straps, in order to anchor the insert to the concrete. They are kept in place by a set of wedges. Their orientation and level position are maintained by a rigid device that is fastened to the mould. Their dimensions are shown in the relevant table.

Close to each suspension hook device, if necessary, a spacer socket and pin are fitted at the top and base, which are fastened to the formwork. The concrete around the pin sockets must be reinforced by a stainless steel helicoidal reinforcement, if the thickness of the concrete plates is not enough to ensure a nominal coating of 3 cm on each side of the cladding panel. In the corners of the building, if necessary, a wind anchor can be fitted in the axis of each pin.

The entire system must be determined by calculations completed by the design office. This calculation is not covered by the ATG and certification.

6.2 Attaching cladding panels to a concrete or metal structure

6.2.1 Concrete structure

Precast components can only be attached if the resistance of the concrete used in the structure and the concrete used in the cladding plates is at least equal to 25 MPa and if the resistance of the concrete used in the structure is at least equal to that required for the action of the associated stainless steel metal anchors.

The nominal inclination of the tie rods in relation to the vertical elevation is 20 ° (with a tolerance of ± 2 °).

The maximum possible adjustments are as follows:

- In vertical direction: ± 30 mm by turning the nut that rests on the plate;
- In lateral direction: ± 16 mm minimum, by moving the eye pin on the cylindrical spindle
- Distance from the support: ± 30 mm, by means of spacers

The fixing of the panel takes place in the following way:

1. Positioning the attachment system:
   - By sealing the stainless steel threaded rods in the holes drilled in the concrete structure in the defined positions that are already in place, depending on the layout and situation on the construction site,
   - Or expanding the metal anchors.
2. Preparation of cladding plates:
   - Removing the expanded polystyrene,
   - Inserting cylindrical spindles and eye pins,
   - Inserting screws and spacers in their sockets (adjusting the theoretical dimension) and wind anchors in the channels,
   - Bolting plates onto the eye pins,
   - Sealing by folding the safety plate.
3. Lifting and securing the cladding panel:
   - Positioning the plate depending on the layout,
   - Possible insertion of pins and filling oval collars with non-shrink mortar,
   - Positioning plates on the anchors on the structure and tightening fixing bolts.
   - Vertical adjustment using the eye pin.
4. The crane is then released.
5. Depth setting of cladding plates
   - By turning the retention nuts in the intermediate parts and on the spacers, in order to keep it perpendicular to the cladding panel, and on any wind anchors.

6.2.2 Metal structure

If the suspension hook is fastened to a metal support, all the requirements for a concrete structure apply.

Only the attachment plugs are replaced by bolts.

The bolts must be determined by calculations conducted by the design office, according to the requirements of NBN EN 1993-1-8.

6.3 Thermal expansion

As the components are suspended in a fully independent manner, the components are able to expand. Similarly, if a component is fastened to another component by a pin, it can be allowed to expand by sliding the pin in the round PVC tube.

7 Characteristics

7.1 Tensile strength of the attachment device

Initially, orientational traction tests were conducted on one part on the plate/eye pin and on the other part on the inserts in the precast panels.

The test results were evaluated according to paragraph D.7.2 of Annex D of NBN EN 1990 "Design assisted by testing". The coefficient γ_M is set at 1,25 (according to paragraph 5.1 NBN EN 1993-1-4). The factor η_d is set at 1.25.

As part of the industrial self-monitoring conducted by the manufacturer, a statistical analysis is foreseen.

Tableau 2 – Attachment device types

Plate type	Load categories (kN)	Colour marking
PLS	5,0	Black
PLS	8,0	Red
PLS	11,5	Green
PLS	16,0	White
PLS, PLD, PLV	22,0	Yellow
PLS, PLD, PLV	27,0	Blue
PLS, PLD, PLV	34,0	Orange
PLS, PLD	56,0	Pink

7.2 Thermal performance of the FIXI3D system

In the evaluation of the thermal insulation of the building, the thermal transmission coefficient *U (W/(m².K))* is the reference parameter. This value *U* is used for the evaluation of the quality of the thermal insulation of the construction components.

Connections between two construction components create thermal weak points in the envelope. In the case of the suspension hook devices, we speak in terms of isolated thermal bridges χ, in W/K. They indicate a localised heat loss linked to the presence of an effective conductor (in this case stainless steel components) through an insulation system (succession layers concrete-air-insulation).

In the case of FIXI3D, three isolated thermal bridges could be distinguished, linked to three types of connection:

- Suspension hook devices FIXI3D: χ_{susp}
- Spacers: χ_{dist}
- Wind anchors: χ_{vent}

These thermal bridges are mainly caused by the contact surface of components on the supporting structure. The suspension hook system FIXI3D is designed to secure large panels, while minimising contact surfaces with the supporting structure. In this way, by minimising losses caused by isolated attachment devices, satisfactory overall thermal performance can be obtained for the façade.

In order to determine isolated thermal bridge values χ_i, the method described in the European standard for the calculation of thermal bridges (NBN EN ISO 10211) shall be used. For each of the components, a 3D model is created, which includes the component as it is positioned the different layers that form part of the overall assembly. On this basis, the thermal characteristics of the assembly under set temperature and external convection conditions is simulated. The simulation produces a coefficient L_{3D} known as the thermal coupling.

From these 3D calculations, the following values χ_i according to the following formula are derived:

$\chi_i = L_{3D} - U_{ref} * A$With:

- U_{ref}, Thermal transmission coefficient for the component 1D (calculated manually)
- A, the surface of the 3D model studied

The results of this calculation depend on the specific properties and conditions in the walls.

A few examples of thermal bridge values are shown below. The following values are assumed for this purpose:

Tableau 3 – Conditions assumed for the wall

Materials	Thickness (m)	Thermal conductivity
Internal concrete	0,16	1,7
Insulation	0,08	0,035
Ventilated air space	0,04	-
External concrete panel	0,08, 0,09 or 0,10	1,7
Inox 316		16,3

The following temperatures and transition resistances are assumed:

Tableau 4 – Assumed temperatures

h_{int} (W/(m²K))	h_{ext} (W/(m²K))	h_{lame} (W/(m²K))	θ_{int} (°C)	θ_{ext} (°C)
7,7	25	7,7	20	0

The calculation model surfaces depend on the width of the area of influence and insulated thermal bridge.

Tableau 5 – Examples of isolated thermal bridge values

Plate type	External panel thickness (m)	χ_{susp} (W/K)
PLS 5,0	0,08	0,0054
PLS 8,0	0,08	0,0061
PLS 11,5	0,08	0,0074
PLS 16,0	0,09	0,0084
PLS 22,0	0,09	0,0099
PLS 27,0	0,10	0,0112
PLS 34,0	0,10	0,0124
PLS 56,0	0,10	0,0213
Spacer type	**External panel thickness (m)**	**χ_{dist} (W/K)**
04M031-20-y	0,10	0,0291
Wind anchor type	**External panel thickness (m)**	**χ_{vent} (W/K)**
04IM070-17	0,10	0,0218

Use of set χ_i values

Based on these values, it is possible to calculate the overall *U* value, while including all components (the wall and anchors).

For this purpose, the following formula is used:

$$U = U_{ref} + \Delta U \text{with}$$

$$\Delta U = \frac{n_{susp} * \chi_{susp} + n_{spac} * \chi_{spac} + n_{wind} * \chi_{wind}}{A_{panel}}$$

in which $n_{component}$ is the number of each component: suspension hook device, spacer or wind anchor, $\chi_{component}$ is the isolated thermal transmission coefficient of the component, A_{panel} is the surface of the panel secured by means of attachment devices.

The ratio $\frac{\Delta U}{U}$ therefore indicates the proportion of heat losses caused by the anchors.

8 Conditions

A. Only the company referred to on the first page as the holder of an ATG and company/companies responsible for marketing the subject of the approval may claim the application of this technical approval.

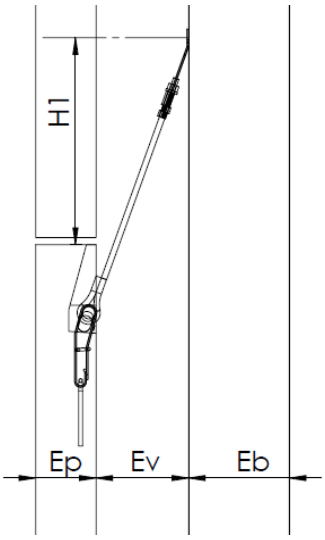
B. This technical approval refers exclusively to the product or system, of which the trade name is mentioned in the header. Holders of a technical approval are not permitted to use the name of the UBAtc, its logo, the ATG brand, the text or approval number to claim product assessments failing to comply with the technical approval, and/or concerning products and/or systems and/or properties or characteristics that do not form the subject of the technical approval.

C. Information provided in any way for (potential) users of the product or system described in the technical approval (e.g. for clients, contractors, consultants, etc.) by the holder of the ATG or his designated and/or approved installers shall not contradict the content of the approval text or information referred to in the approval text.

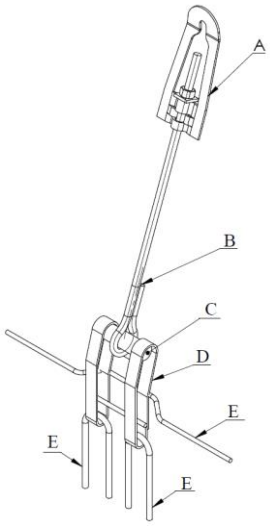
D. Holders of a technical approval are bound at all times to provide UBAtc asbl and the certification operator designated by the UBAtc with prompt or prior notification of any adjustments made to raw materials and products, installation instructions, the manufacturing and construction and/or equipment process, so that they are able to judge whether it is necessary to adjust the technical approval.

E. The copyright belongs to UBAtc asbl.

Annex 1: Overview of FIXI3D

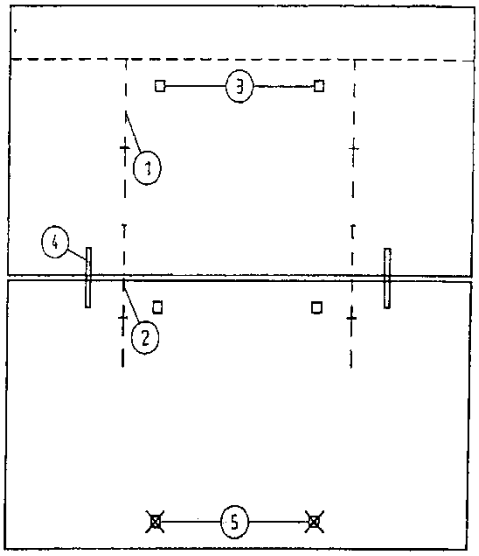


Perspective of the suspension hook device



A: plate
B: eye pin with bolt and washer
C: spindle
D: straps
E: folded bars

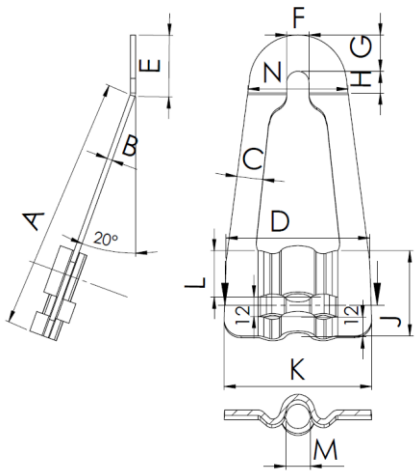
Example of system of 2 architectural panels



1.Suspension hook device
2.Suspension hook device
3.Spacer
4.Pin
5.Wind anchor

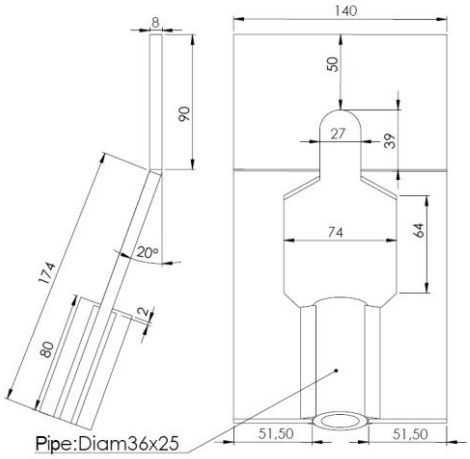
Annex 2: The plate

1. Single plate (PLS) for classes 5.0 - 34.0 kN



Class	Plate dimensions													External dimensions		Colour
(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
	A	B	C	D	E	F	G	H	J	K	L	M	N	Eb_{min}	Ev_{min}	
5,0	125	2	15	71	34	12.5	15	19	44	70	20	10	63	100	60	Black
8,0	125	2	15	71	34	12.5	15	19	44	70	20	12	63	100	60	Red
11,5	145	3	15	78	39	12.5	21	18	44	79	20	14	60	120	60	Green
16,0	158	3	18	93	44	17.0	22	22	49	95	25	15	64	140	60	White
22,0	180	4	18	94	44	17	22	22	49	95	25	17	64	140	80	Yellow
27,0	177	4	21	102	47	20	24	23	54	105	30	20	73	160	80	Blue
34,0	182	4	24	111	57	25	35	22	67	109	43	22	93	200	80	Orange

2. Single plate (PLS) for class 56.0 kN

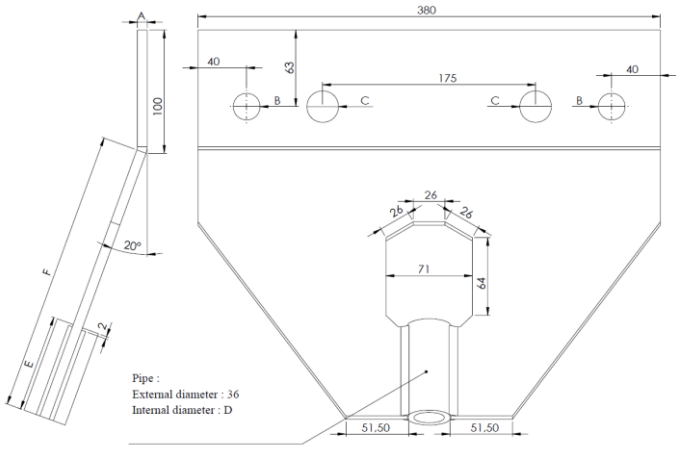


External dimensions		Colour
(mm)	(mm)	
Eb_{min}	Ev_{min}	
330	90	Pink

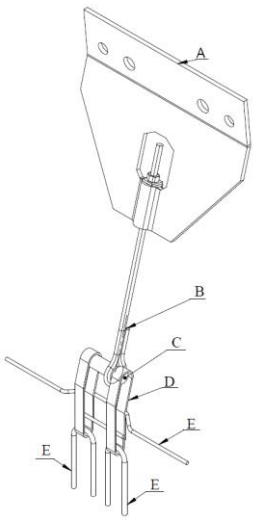
The value Ev_{min} is the minimum value for the cavity. The value Eb_{min} is the minimum value for the thickness of the concrete wall, for which a anchor exists, including anchors marketed by Fixinox S.A.

3. Double straight plate (PLD) for classes 22.0kN, 27.0kN, 34.0kN and 56.0kN

View of the suspension hook device



Perspective of the suspension hook system

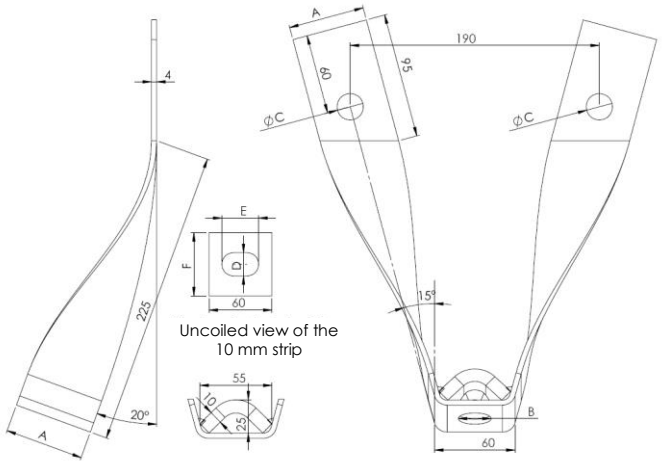


A: plate
B: eye pin with bolt and washer
C: spindle
D: straps
E: folded bars

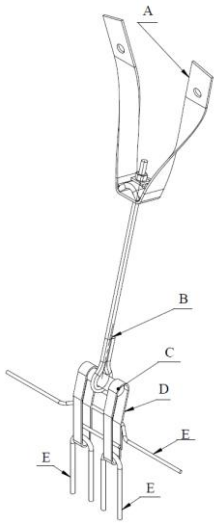
Class	Plate dimensions						External dimensions		Colour
(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
	A	B	C	D	E	F	Eb_{min}	Ev_{min}	
22,0	6	14,0	22	20	70	165	120	80	Yellow
27,0	6	18,0	22	20	70	165	140	80	Blue
34,0	6	18,0	22	25	70	165	140	80	Orange
56,0	8	22,0	26	25	80	175	160	90	Pink

4. Double twisted plate (PLV) for classes 22.0kN, 27.0kN, 34.0kN

Views of the suspension hook device



Perspective of the suspension hook system



A: plate
B: eye pin with bolt and washer
C: spindle
D: straps
E: folded bars

Class	Plate dimensions						External dimensions		Colour
(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
	A	B	C	D	E	F	Eb_{min}	Ev_{min}	
22,0	50	18	14	18	30	50	120	105	Yellow
27,0	50	20	18	20	33	50	140	105	Blue
34,0	60	25	18	22	35	60	140	110	Orange

The value Ev_{min} is the minimum value for the cavity. The value Eb_{min} is the minimum value for the thickness of the concrete wall, for which a anchor exists, including anchors marketed by Fixinox S.A.

Annex 3: The suspension eye rod and axle

View of the suspension hook device

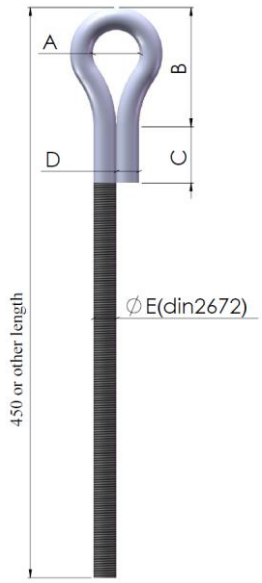
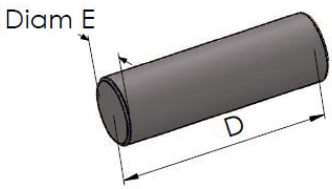


Photo of suspension hook system

Class	Rod dimensions					Colour
(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	
	A	B	C	D	E	
5,0	22	67	>20	7,1	8	Black
8,0	22	52	>20	8,9	10	Red
11,5	28	57	>30	10,6	12	Green
16,0	30	70	>30	12,5	14	White
22,0	34	73	>40	14,6	16	Yellow
27,0	36	82	>40	16,1	18	Blue
34,0	38	87	>40	18,2	20	Orange
56,0	38	87	>40	18,2	20	Pink

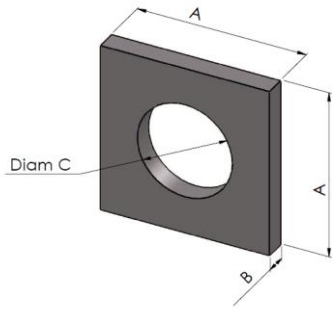
Note: The total length of the eye pin depends on the selected suspension hook device, cavity and plate type.

Perspective of axle



Class	Cylindrical spindle dimensions		Colour
(kN)	(mm)	(mm)	
	D	E	
5,0	87	20	Black
8,0	87	20	Red
11,5	87	24	Green
16,0	95	26	White
22,0	95	30	Yellow
27,0	102	32	Blue
34,0	110	36	Orange
56,0	110	36 (inox 1.4462)	Pink

Perspective of plate



Class	Plate dimensions		
(kN)	(mm)	(mm)	(mm)
	A	B	C
5,0	24	4	8
8,0	24	4	10
11,5	24	4	12
16,0	32	4	14
22,0	32	4	16
27,0	32	4	18
34,0	34	5	20
56,0	34	5	20

Annex 4: The insert

View of straps

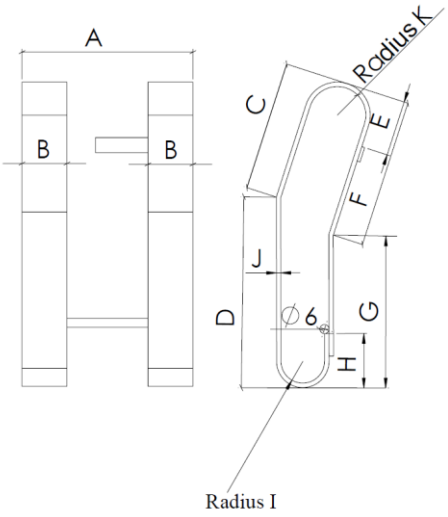
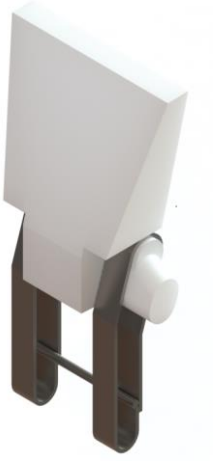
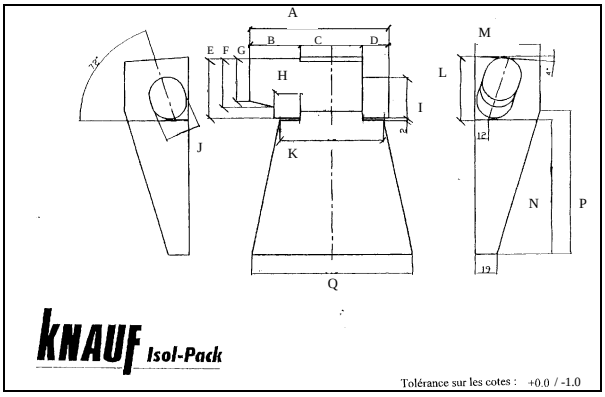


Photo of straps



Class	Strap dimensions											Colour
(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
	A	B	C	D	E	F	G	H	I	J	K	
5,0	85	15	61	81	25	75	61	48	8.5	3	12.5	Black
8,0	85	15	61	81	25	75	61	48	8.5	3	12.5	Red
11,5	95	20	66	109	29	86	83	30	8.5	3	12.5	Green
16,0	97	20	70	92	31	97	58	38	8.5	3	16	White
22,0	97	20	70	98	35	97	58	38	8.5	3	16	Yellow
27,0	102	25	89	98	37	92	85	43	13.5	3	17	Blue
34,0	112	30	98	111	41	105	97	39	13.5	3	18	Orange
56,0	112	30	82	127	43	82	127	46	13.5	5	18	Pink

View of recess component

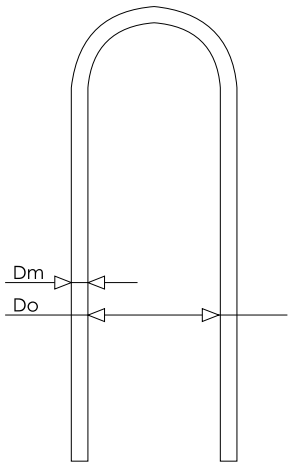


Class	Cavity dimensions															Colour
(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	
5,0	119	44	54	21	50	40	32	24	30	25	95	55	54	120	128	144	Black
8,0	119	44	54	21	50	40	32	24	30	25	95	55	54	120	128	144	Red
11,5	119	44	54	21	50	40	32	24	30	25	95	55	54	120	128	144	Green
16,0	125	44	57	24	55	45	39	24	38	32	95	59	60	120	128	146	White
22,0	125	44	57	24	55	45	39	24	38	32	95	59	60	120	128	146	Yellow
27,0	131	51	52	28	81	68	60	28	40	34	110	86	60	117	130	150	Blue
34,0	150	66	52	32	78	68	60	32	49	37	110	86	60	117	130	150	Orange
56,0	150	66	52	32	78	68	60	32	49	37	110	86	60	117	130	150	Pink

Note: The 2 straps and polystyrene cavity form the insert.

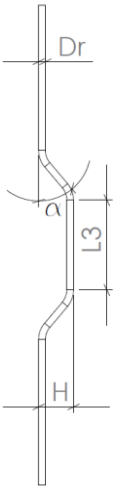
Annex 5: Reinforcement bars

View of anchor bars



Total length L1

View of reinforcement bars

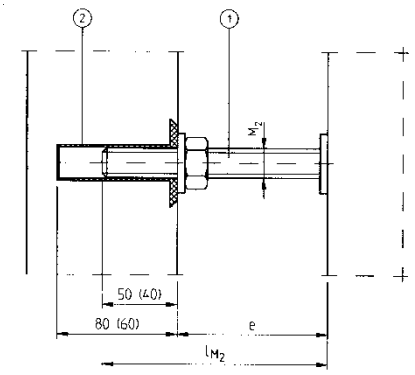


Total length L2

Class	Reinforcement bar dimensions							
(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(°)
	L1	Do	Dm	L2	Dr	L3	H	α
5,0	200	30	6	300	Φ 6	88	30	45
8,0	250	30	6	345	Φ 6	89	30	45
11,5	280	40	8	450	Φ 6	97	30	45
16,0	360	50	10	450	2 Φ 6	95	40	45
22,0	400	50	10	570	2 Φ 6	105	40	45
27,0	460	50	10	520	2 Φ 8	112	50	45
34,0	470	60	12	630	2 Φ 8	124	50	45
56,0	800	60	12	900	2 Φ 8	124	50	60

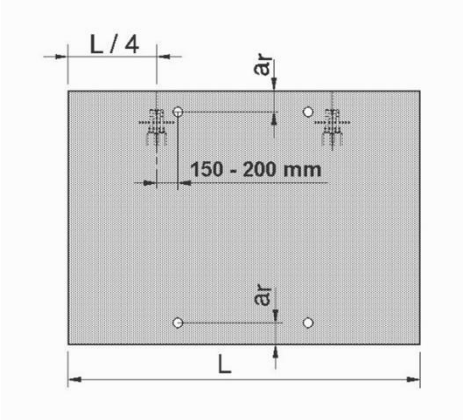
Annex 6: The spacer:

View of spacer



1. Compression spacer
2. HDPE round collar

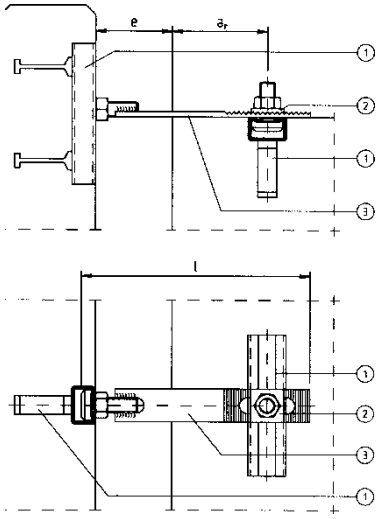
The dimensions and arrangement of the spacers is shown below:



The permissible loads for the spacer and minimum distance a_r must be provided by the manufacturer.

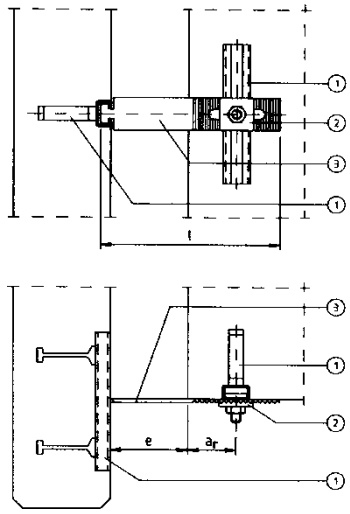
Annex 7: The wind anchor

Type 1: Side wind anchor



1. Anchor rail
2. Hook head bolt with serrated plate
3. Serrated wind anchor with soldered hook head

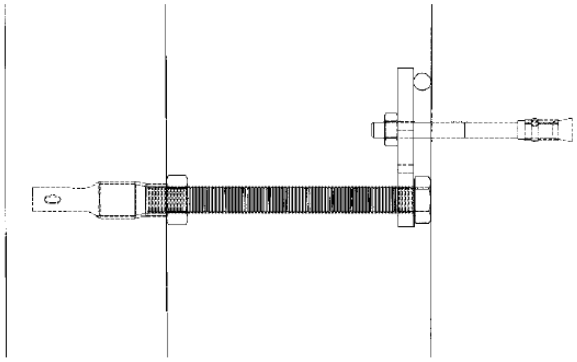
Type 2: Wind anchor secured using forged head plates

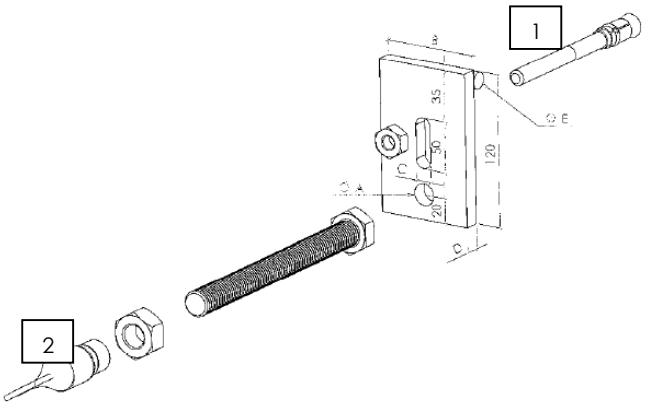


1. Anchor rail
2. Hammer head bolt with serrated plate
3. Serrated wind anchor with hammer head

Note: The permissible loads for the wind anchor, minimum distance a_r and maximum distance e must be provided by the manufacturer.

Type 3: Wind anchor with socket and pin

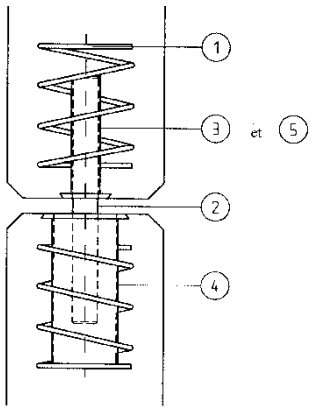




1. Anchor bolt
2. Socket

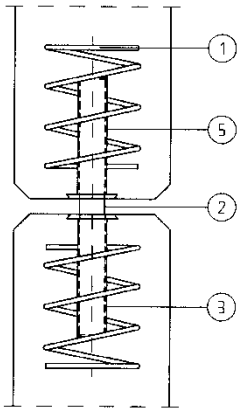
Annex 8: Pin

Sealed pin



1. Spiral: 60 x 80 mm
2. Pin: Ø 16mm or Ø 20 mm
3. HDPE round collar: 16.5 x 80 mm or 20.5 x 80 mm
4. PVC oval collar: 22 x 47 x 100 mm
5. HDPE round collar: Ø 16.5 x 80 mm or 20.5 x 80 mm

Dry pin



1. Spiral: 60 x 80 mm
2. Pin: Ø 16mm or Ø 20 mm
3. HDPE round collar: 16.5 x 80 mm or 20.5 x 80 mm
5. HDPE round collar: Ø 16.5 x 80 mm or 20.5 x 80 mm

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This technical approval has been published by UBAtc, under the responsibility of the approval operator BCCA, and based on favourable opinion of the Specialised Group "Main Works" presented on 18 February 2015.

In addition, the certification operator, BCCA, confirmed that the production process meets the conditions for certification and that a certification agreement was signed by the ATG holder.

Date of publication: 24 June 2015

For UBAtc, declaration of the validity of the approval process

Peter Wouters, Director

For the approval and certification operator

Benny De Blaere, Director

This technical approval shall remain valid, provided the product, its manufacture and all processes that are appropriate for this purpose:

- are maintained, in order to achieve, as a minimum, the performance levels defined in the approval document;
- are continuously monitored by the certification operator, which confirms that the certification continues to be valid;

If these conditions are no longer met, the technical approval shall be suspended or withdrawn and the approval document shall be removed from the UBAtc website.

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