

**Requirement  
specifications  
TP650 illmod Trio  
TP651 illmod Trio PA**

**Class 1 sealing system  
for door/window  
frame joints**



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## 1. DEFINITION

**illbruck TP650 illmod Trio** and **illbruck TP651 illmod Trio PA** are open-cell polyurethane foams, impregnated throughout with a stable mix of synthetic resins (free of wax and bitumen) that provides them with the following characteristics, without the addition of a sealing compound or other adhesive:

- Watertightness against driving rain
- Greater airtightness
- Permeable to water vapour\*
- Excellent thermal insulation
- Resistant to UV rays and adverse weather
- Acoustic performance.

These products ensure that joints form part of the continuous shell of a building, creating in a single step the three barriers (airtightness, watertightness against driving rain, and insulation) required for low energy consumption buildings as set out in French thermal regulation 2012 (RT2012).

**illmod Trio** and **Trio PA** are intended for single-stage leaktight joints.

**illmod Trio** and **Trio PA** are packaged in pre-compressed rolls on a cardboard reel.

## 2. TERMINOLOGY

### 2.1 2.1. Terminology relating to construction joints

The definitions below are compliant and consistent with the EN 26927 standard (P 85-102 classification index).

#### Joint:

A joint is a volume existing between two construction components. This volume may be either:

- Left empty
- Caulked using impregnated foam capable of preventing ingress of water or air, within the limits of foreseeable relative movements (see Figure 1).

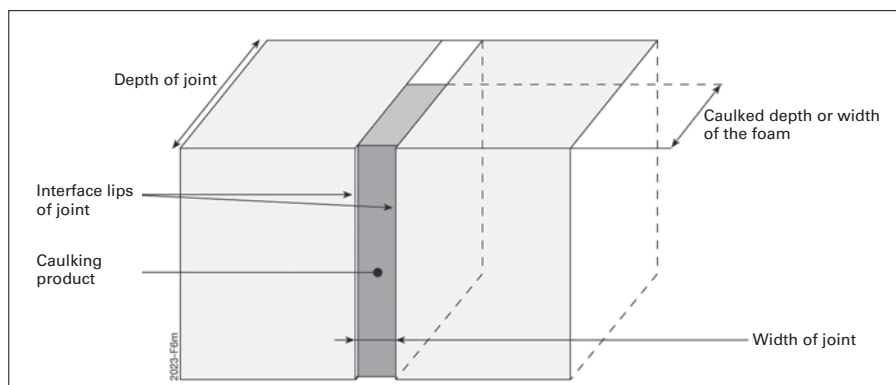


Figure 1: Terminology relating to joints

#### Caulk:

To insert into a joint products capable of preventing ingress of water and air between construction components of the same or different materials.

\* **illmod Trio** and **Trio PA** offer a special characteristic in that their interior and exterior surfaces offer different levels of permeability to water vapour, thanks to a coating (pale grey) on the side to be positioned towards the interior of the building. This characteristic enables water vapour generated in the building to be released to the exterior.

**All joints comprise:**

- An empty volume in which a caulking product can be inserted,
- Two flat contact surfaces (interfaces or lips) between which the caulking product serves its purpose.

**Single-stage joint:**

A joint where air- and watertightness is provided by a caulking product that acts alone.

**Two- or multiple-stage joint:**

A joint where air- and watertightness is provided by several components, one of which is a caulking product.

Caulking products used in single-stage joints can also be used as an initial or second barrier in a two-stage joint.

**2.2 Terminology relating to impregnated foams Impregnated foam**

A pliable alveolar product (such as polyurethane foam), impregnated with a bonding agent (such as resin), available in strips with a rectangular cross-section, of which one surface may be adhesive. The strip is supplied pre-compressed in rolls.

Impregnated foams must be tested according to French standard NF P 85-571 of April 2001 (Impregnated foams, Testing) and compliant with the specifications of French standard NF P 85-570 of April 2001 (Impregnated foams, Definitions, Specifications). These standards distinguish between two classes (see table).

As of April 2010, French DTU 36.5 on the installation of external windows and doors states that only Class 1 impregnated foams are acceptable for peripheral leaktight seals.

	<b>Class 1</b>	<b>Class 2</b>
	Single-stage joint or initial barrier in a two-stage joint	Second barrier in a two-stage joint
Permeability to air*	< 600 l/h/m of joint at 100 Pa	< 600 l/h/m of joint at 100 Pa
Watertightness against driving rain	600 Pa	300 Pa
Recovery of thickness after exposure to UV and heat	$E_v \geq E_n \times 0,33$	-
Recovery of thickness after exposure to humid heat	$E_m \geq E_n \times 0,33$	$E_m \geq E_n \times 0,33$
Remaining compression	$\sigma (12 h) > 5.000 Pa$	$\sigma (12 h) > 5.000 Pa$
Recovery of thickness of compressed products	$E_d \geq E_n \times 0,9$	$E_d \geq E_n \times 0,9$

\*These tests must be performed at the fullest extent of the usable range of the impregnated foam.

**Compatibility**

This is the property by which a caulking product can remain in contact with another material without any physical or chemical interaction affecting their integrity.

**Caulked depth**

The depth (D) is equal to the width of the caulking product (see diagram opposite).

**Usable range**

The maximum range of movement that a caulking product can withstand while remaining effective.

For impregnated foam: the maximum width of a joint within which the impregnated foam serves its purpose (see section 4.4).

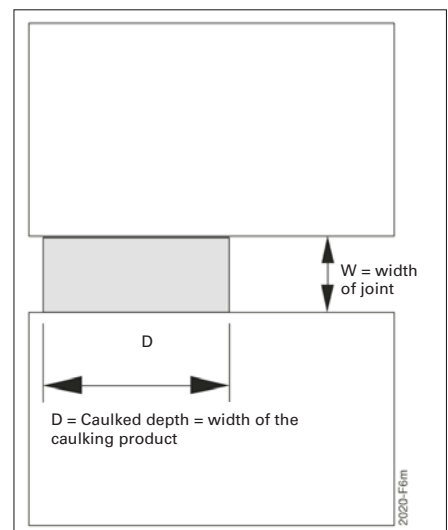


Figure 2: Cross-section of the joint

## 3. IDENTIFICATION

### 3.1. illmod Trio and Trio PA specifications

	Relevant standards	Specifications or classifications obtained
Material		Polyurethane foam + impregnation with a stable mix of synthetic resins
Remaining compression	NF P 85-570	Compliant with the requirements of the standard, Class 1
Penetration of fixings	Test interne	Fastening screws can penetrate without detrimental effect (to see conditions in the paragraph 5.2.4 page 10)
Recovery of thickness of compressed products	NF P 85-570	> 0,9 En
Watertightness against driving rain when used in direct exposure	NF P 85-570	Compliant with the requirements of the standard, Class 1 (minimum 600 Pa) within its usable range
Permeability to air	NF P 85-570	Compliant with the requirements of the standard, Class 1, within its usable
	DIN 18542	$\sigma \leq 0,1 \text{ m}^3 / (\text{h} \cdot \text{m}^2 \cdot (\text{daPa}) \cdot \text{n})$
Resistance to adverse weather, heat and UV rays	NF P 85-570	Compliant with the requirements of the standard, Class 1, within its usable range
Fire classification	DIN 4102	B1 (difficult to ignite)
Temperature for use		from $-30^{\circ}\text{C}$ to $+80^{\circ}\text{C}$
Water vapour resistance coefficient	EN ISO 12572	$\mu \leq 100$ This value is variable and increases with proximity to the interior of the building. Exterior $S_D = 0.09$ Interior $S_D = 0.23$
Thermal conductivity Thermal insulation: U Width of section: 60 mm Width of section: 70 mm Width of section: 80 mm	EN ISO 12667	$\lambda_{10} < 0,048 \text{ W/m} \cdot \text{K}$  0,8 W/(m <sup>2</sup> · K) 0,7 W/(m <sup>2</sup> · K) 0,6 W/(m <sup>2</sup> · K)
Acoustic performance	EN ISO 717-1	$R_{\text{stbw}} 52 \text{ dB}$ in an 8-mm joint according to IFT Rosenheim report 167 33278/1
Shelf-life and storage temperature*		9 months, at a temperature between $+1^{\circ}\text{C}$ and $+20^{\circ}\text{C}$ , in the original packaging

\*For installation temperatures greater than  $+20^{\circ}\text{C}$ , arrangements should be made for the refrigerated storage of illmod Trio.

#### 3.1.1 Compatibility

illmod Trio and Trio PA do not give rise to corrosion when in contact with iron, steel, galvanised sheet metal, aluminium and copper. There is no negative reaction when in contact with cellular concrete, concrete, brick, tile, calcareous stone, rigid PVC, organic glass or wood.

illmod Trio and Trio PA are compatible with all sealants in the Perennator and Tremco ranges. Compatibility with any other sealant or with certain natural stones (e.g. marble) must be tested on a case-by-case basis, as there is a risk that the colour of these materials may be altered.

illmod Trio and Trio PA are compatible with water-based paints and coatings (dispersion) as well as exterior rendering.

illmod Trio and Trio PA must not come into contact with solvent-based products. They may be applied to surfaces that have previously been treated with solvent-based products, but only after the solvents have completely evaporated.



## 3.2 Presentation

### illmod Trio and Trio PA :

- Packaged in pre-compressed rolls
- Self-adhesive on one side
- Strip length varies between 3 and 10 metres
- Available in anthracite grey (pale grey side facing the interior)
- The date of manufacture (week and year) is indicated on the inside of each reel, as well as on the cardboard packaging.

## 3.3 Manufacture, internal inspection and external quality control

The Bodenwöhr factory has ISO 9001 – 14001 – 18001 certification.

- illmodTrio and Trio PA are produced using fully automated and computerised manufacturing processes.
- A production code printed on the outside of each reel ensures that each roll can be traced.
- Factory: Tremco illbruck Production in Bodenwöhr, Germany.
- Manufacturing subject to an 18-point system of continuous internal inspection.
- In parallel, the Hanover MPA BAU carries out regular external quality audits.

## 4. SCOPE

### 4.1. General

Thanks to their innovative design, illmodTrio and Trio PA are designed to be used, as part of the continuous shell of buildings in new construction and renovation works, to create three barriers around windows and doors:

- Exterior: watertightness against driving rain
- Middle: thermal and acoustic insulation
- Interior: airtightness

These three barriers are required in particular in low energy consumption buildings, as set out in French thermal regulation 2012 (RT2012).

With its excellent permeability to water vapour, illmodTrio facilitates the release of water vapour and prevents condensation in and around the treated joint.

**Note:** These requirement specifications apply to joints in vertical walls or slightly inclined structures (walls less than 15° from the vertical, except for surfaces with a limited width, such as plinths, crowns, bay supports, acroterions, etc.) i.e.:

- Joints in the main structure or framework of the construction that are purely structural
- Joints resulting from the juxtaposition of construction components of different materials, such as joints between door/window frames and the main structure, or the same material, such as joints between prefabricated panels fixed together in situ.

Prior to installation, a study must be carried out to ensure the feasibility and continuity of the leaktight seal between components and in relation to coordination of the work carried out by the various trades. Our distribution network provides technical assistance and is at your service for the preparation of this study.

### Exclusions:

- Horizontal wall joints (floor joints)
- Seismic joints
- Joints for swimming pools and tanks
- Leaktight joints for fluids in technical components (pipework, hoses, etc.).
- Joints on surfaces or sections that are not sufficiently rigid (French DTU 36.5, Part 1.1, section 5.9.3.2).

## 4.2 Examples of use

**Examples of use of illmod Trio** (see Figures 6 to 15)

- «Tunnel» or «between reveals» installation of windows: aluminium, steel, wood, combination, PVC and rolling shutter storage compartments, on all surfaces (concrete, masonry, Monomur bricks, wood, etc.).

**Examples of use of illmod Trio PA**

- «Tunnel» installation on frames of limited width
- Installation on drip cap
- Surface-mounted on outer wall

## 4.3 Selection criteria

The prevailing criteria relevant to caulking must be clearly identified:

- Geometry of the joint
- Type and condition of surfaces
- Construction tolerance of the surface
- Stresses relating to external components: in particular the thermal expansion coefficient of components in question and foreseeable movements of the joint.

The pre-compressed thickness of the roll must be less than the initial width of the joint. The choice of cross-section to be used is dependent on the minimum and maximum opening of the joint, as well as its movements and changes in dimensions owing to expansion.

## 4.4 Usable range

The usable range is the range of widths of a joint within which illmod Trio and Trio PA serve their purpose in ensuring a leaktight seal. This range is indicated on the roll packaging and box labels. illmod Trio and Trio PA, which are factory pre-compressed to a compression ratio greater than that required to ensure the leaktightness of the joint (Figure 3.1), decompress slowly after installation to fulfil their function (Figure 3.2). Once decompressed, illmod Trio and Trio PA follow the movements of the joint (expansion / contraction) (Figures 3.3 and 3.4).

**Note:** A distinction is made between:

- The usable range during installation, which corresponds to the width of the joint in question, into which illmod Trio and Trio PA can be inserted (owing to their thickness on the roll)
- The usable range after installation, which indicates the maximum amplitude of movement that illmod Trio and Trio PA can withstand while remaining effective in ensuring a leaktight seal.

Figure 3

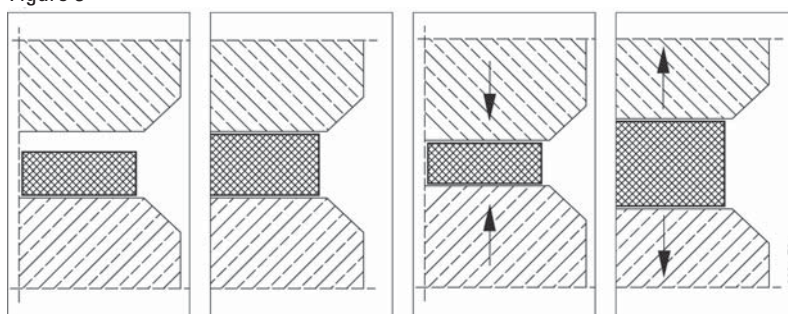


Figure 3.1

Figure 3.2

Figure 3.3

Figure 3.4

## 4.5 Packaging and product selection

### illmod Trio

Width of door/window cross-section (in mm)	Width of strip (in mm)	Usable range during installation (in mm)	Contents of roll (in m)	Pre-compressed on roll (in mm)	Maximum compression (in mm)	Usable range after installation (in mm)
60	58	5 – 10	9,0	4	4	4 – 10
60	58	7 – 15	6,0	6	5	5 – 15
60	58	10 – 20	4,5	8	7	7 – 20
60	58	15 – 30	3,0	13	11	11 – 30
70	66	5 – 10	9,0	4	4	4 – 10
70	66	7 – 15	6,0	6	5	5 – 15
70	66	10 – 20	4,5	8	7	7 – 20
70	66	15 – 30	3,0	13	11	11 – 30
80	77	5 – 10	9,0	4	4	4 – 10
80	77	7 – 15	6,0	6	5	5 – 15
80	77	10 – 20	4,5	8	7	7 – 20
80	77	15 – 30	3,0	13	11	11 – 30

### illmod Trio PA

Width of strip (in mm)	Usable range during installation (in mm)	Contents of roll (in m)	Pre-compressed on roll (in mm)	Maximum compression (in mm)	Usable range after installation (in mm)
30	5 – 10	10,0	4	3.5	3.5 – 10
30	7 – 15	6,0	6	5.5	5.5 – 15
30	10 – 20	6,5	8	7.5	7.5 – 20

## 5. INDICATIONS FOR USE

### 5.1. Checking of surfaces

The geometry of the empty volume to be caulked must be verified prior to installation.

The lips of the joint must be parallel (maximum tolerance of  $\pm 3^\circ$ ).

When used with masonry, the surfaces must be free of any mortar or concrete residues.

If the cross-section of a joint is trapezoidal ( $\sim > 3^\circ$ ), the surface must be reworked so as to obtain parallel contact surfaces.

illmodTrio and Trio PA must be positioned at a slight offset within the joint (1 to 2 mm).

When used with masonry, if it is necessary to rework the surfaces of the joint to be caulked prior to installation, this can be achieved using Tremco Repair Mortar SX450 or SX470.

Comment: If the reinforcement bars are visible in places, it is usually necessary to treat the steel before applying mortar. An anti-corrosion protective coating should be used. Please refer to the manufacturer's technical data sheets for instructions for the use of these products.

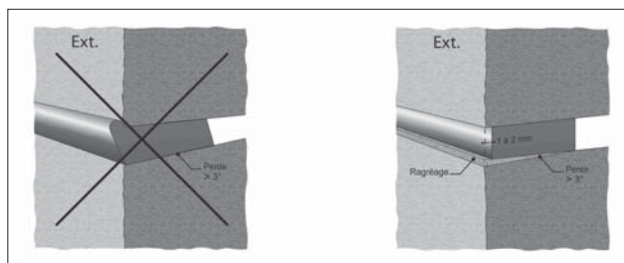


Figure 5.1

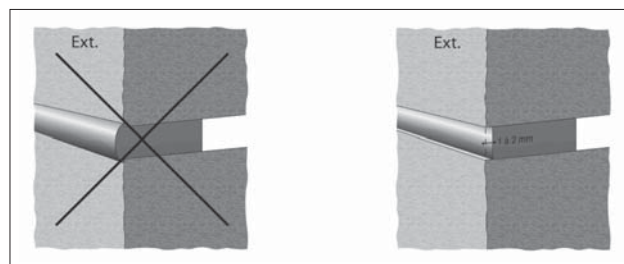


Figure 5.2



## 5.2 Indications for use of illmod Trio and Trio PA

### 5.2.1 General

No special tools are required for the installation of illmod Trio and Trio PA, aside from a tape measure, spatula and scissors. illmod Trio and Trio PA are adhesive on one side in order to facilitate installation.

**Note:** Humidity on the surfaces does not preclude their use, as these products do not act through adhesion but instead through decompression within the joint.

In all cases, to ensure that illmod Trio and Trio PA are correctly installed, care should be taken to:

- Position the foam at a slight offset,
- Prevent any water being retained in the joint,
- Avoid stretching or twisting the foam during installation,
- Create joins as indicated in section 6,
- Position the white side of the strip towards the interior.

#### Product selection:

**illmod Trio:** for joints with a depth greater than or equal to 60 or 70 mm (depending on the seating method)

**illmod Trio PA:** for joints with a depth less than 60 mm

### 5.2.2 Examples of «tunnel» installation

#### Installation of illmod Trio

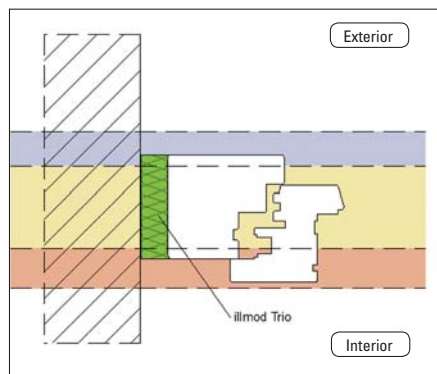


Figure 6

#### illmod Trio with a wood frame

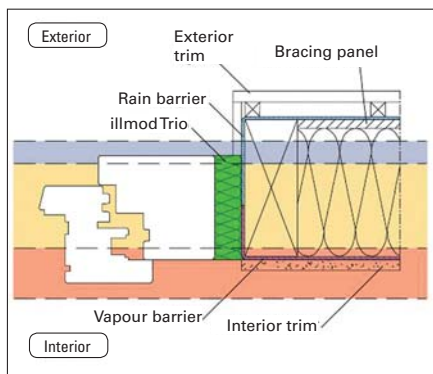


Figure 7

#### illmod Trio used with external insulation

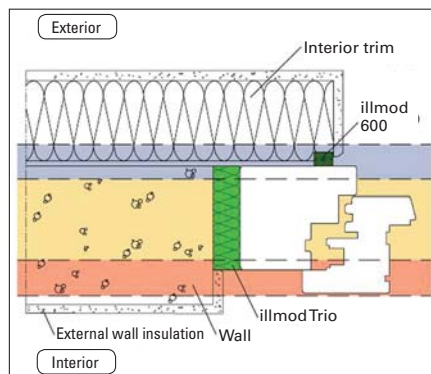


Figure 8

In the event of «tunnel» installation of a window in a bare external wall, with or without an overlap relative to the bare wall, the top joint must be covered with a water repellent mechanism (membrane, overhang, etc.) as specified in section 5.1.2 of French DTU 36-5.

### 5.2.3 Installation in bottom sections

#### illmod Trio with seating screw

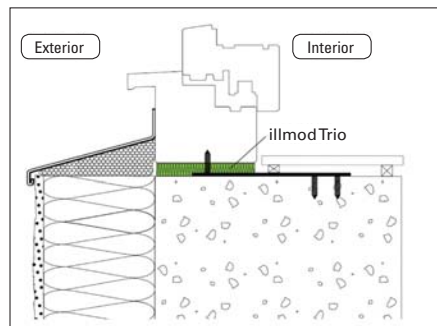


Figure 9

#### illmod Trio PA with seating block

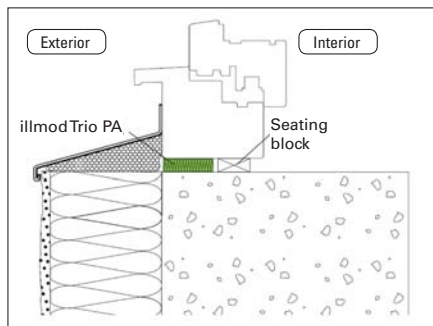


Figure 10

#### illmod Trio PA and seating block on drip cap

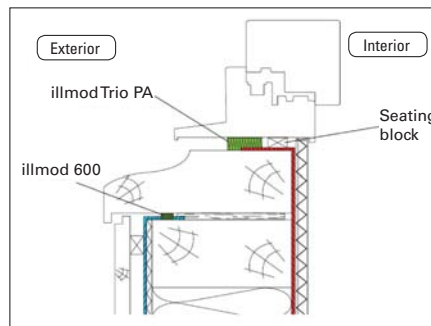


Figure 11

In the event of installation of a door/window frame without a drip cap, a flashing with side panels must be used, in compliance with French DTU 36-5.

## 5.2.4 «Tunnel» installation

illmodTrio and Trio PA are to be installed as follows:

- Having selected illmodTrio or Trio PA on the basis of the depth of the joint, check the width of the joint on site, taking into account the tolerances of the surfaces, so as to ensure that the usable range selected is appropriate (see table in section 4.5 on page 7).
- Cut off the strapping band and the over-compressed first and last centimetres of the roll.
- Horizontal sections: cut with an overlength of 5 mm relative to the dimension between the reveals (see diagram opposite), then affix the strip to the frame, leaving 5 mm to protrude on either side.
- Important: position the pale grey side of the strip towards the interior.
- Vertical sections: cut with an overlength of 5 mm relative to the height of the frame, then affix the strip.
- When not using the roll, replace the strapping band to prevent decompression.

Installation of strips

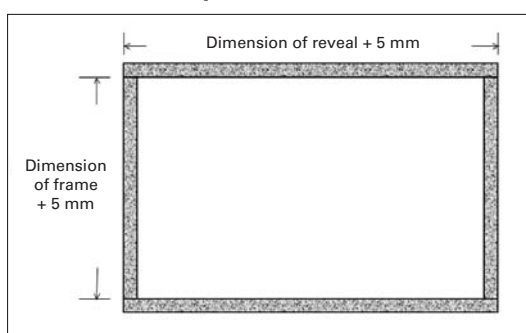


Figure 12

Join at corner – «Tunnel» installation

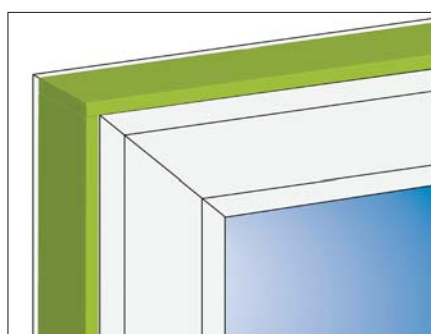


Figure 13

### Joins at corners

At the top and bottom, the horizontal strips must extend over the end of the vertical strips (see diagram below). Do not turn the strip around the corners. **Thanks to their cellular structure**, illmodTrio and Trio PA do not require any additional sealing compound or adhesive in the corners.

### Anchoring of door/window frames

The distribution of anchorings must be compliant with the prevailing codes of practice for the installation of door/window frames. illmodTrio and Trio PA may be penetrated by fastening screws without detrimental effect. However, no fastening screws should be positioned within 20 mm of the external edge of the foam.

## 5.2.5 Surface-mounted on outer wall

### Surface-mounted on outer wall with illmodTrio PA

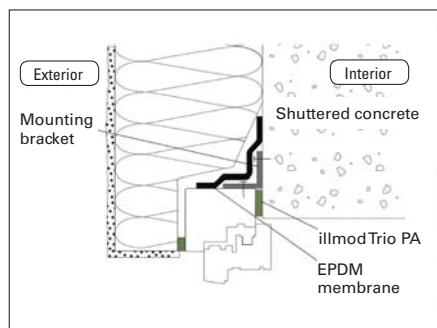


Figure 14

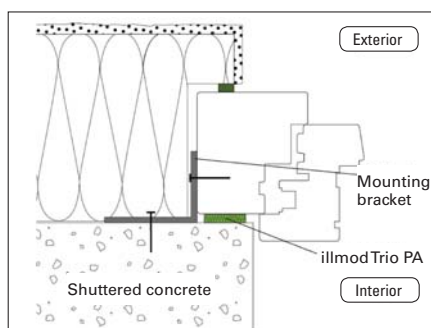


Figure 15

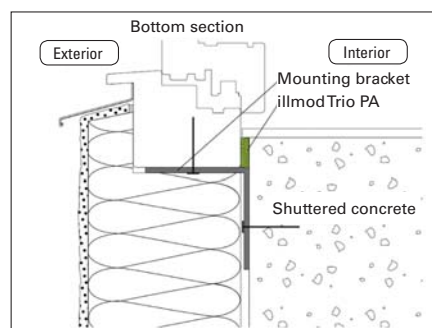


Figure 16

Dans le cas d'une pose en applique extérieure, le joint en partie haute doit être recouvert par une membrane d'étanchéité, par exemple de type illbruck ME220, conformément au DTU 36-5.

### Traitement des angles en applique

Corners in surface-mounted installation Do not turn the strip around the corners; position the horizontal strips first and then finish with the vertical strips, making sure to allow 5 mm of overlength per join

## 6. LINEAR JOINS

Linear joins must be created as follows:

- Carefully cut the ends to be joined at a 90° angle,
- Allow 5 mm of overlength on the new strip,
- Place the two strips end-to-end, pressing together the two cross-sections

Linear joins must not be created by superimposing one end on top of the other.

## 7. DECOMPRESSION OF ROLLS

illmod Trio and Trio PA are factory pre-compressed and decompress slowly after installation to fulfil their function within the joint. The decompression time depends on the temperature. Therefore, so as to facilitate installation, it is recommended that the rolls be stored at a temperature between +1°C and +20°C. For installation temperatures greater than +20°C, arrangements should be made for the refrigerated storage of illmod Trio.

In compliance with French standard NF P85-571, illmod Trio and Trio PA must be left for seven days following installation prior to carrying out any leaktightness tests.

## 8. COATINGS

Following complete decompression, illmod Trio and Trio PA can be painted using water-based paints. However, defects in the appearance of the paint may appear as a result of movement of the joint.

## 9. REPAIRABILITY

In the event that a section of illmod Trio or Trio PA is torn or rendered unusable through poor handling, the damaged section of the strip can be replaced with a corresponding strip of illmod Trio or Trio PA with an overlength of 5 mm, or by filling the cavity with illbruck OT300 or SB860.

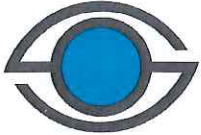
## 10. MANUFACTURER'S COMMITMENT

The distribution network provides technical assistance for user training and installation.

illmod Trio and Trio PA are subject to manufacturers' and traders' professional liability insurance applicable to construction materials (guaranteed for 10 years).

## 11. VALIDITY AND BACKGROUND

These requirement specifications, which are valid until 1 December 20158, are subject to a Socotec technical investigation report reproduced hereinafter in its entirety.



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► **REAL ESTATE CONSTRUCTION TECHNIQUES AND METHODS DEPARTMENT**

## **illmod Trio and illmod Trio PA**

### **Requirement specifications**

- Date of publication of report: May 2012
- Socotec file No.: EAD9212/1
- Report reference: DTM-B/12/785 FV/FD

This report, established as part of our role defined in our Technical Verification Agreement of 4 April 2012, relates to the illmodTrio and illmodTrio PA systems.

*We thank you for having enlisted our services.*

*If you require any further information, please contact your Socotec representative.*

► Your representative:

Frédéric Valem

- ▶ This report comprises 5 pages.
- ▶ Copy number                   1
- ▶ Cc:                               - Information Department

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## 1. PURPOSE

Tremco-illbruck, 12, rue du Parc - Valparc - 67205 - Oberhausbergen, France, has requested the preparation of a Socotec opinion on the requirement specifications of the illmod Trio and illmod Trio PA seals with regard to the use of these products for the external walls of construction works.

This «provisional opinion» technical investigation report sets out to explain the results of our investigation and to specify the position that Socotec is likely to adopt regarding the construction works submitted to it for inspection, in the context of type «L» technical inspections of building works, at the request of prime contractors or others involved in the construction process, in compliance with French standard NF P 03-100.

This report has been drawn up within the context of general conditions No. CG-VT-100-1-09 and special conditions No. CS-EPPN-100-7-02.

## 2. DESCRIPTION OF PROCESS

This process entails the creation of single- or two-stage external wall joints using pre-compressed open-cell polyurethane foam strips, impregnated with a synthetic resin and coated on the interior-facing side with a coating resulting in differing permeability to water vapour on either side of the product.

## 3. SCOPE OF USE

The scope of use considered in the context of the technical investigation report is set out in article 4, «Scope», of the requirement specifications of May 2012. However, single-stage joints between door/window frames and masonry structures comprising small components (concrete blocks, stone blocks, bricks) are limited to a height of 28 metres.

## 4. REFERENCE DOCUMENT

The illmod Trio and illmod Trio PA requirement specifications of May 2012 comprise 13 pages.

## 5. APPLICABLE REGULATIONS AND STANDARDS

The requirement specifications refer to the following French standards:

- NF P 85-570 of April 2001: Products for joints. Impregnated foams - Definitions and specifications.
- NF P 85-571 of April 2001: Products for joints. Impregnated foams - Tests.

## 6. PRODUCT QUALITY CONTROL

illmod Trio and illmod Trio PA seals are manufactured at a factory in Bodenwöhr (Germany), which applies an internal inspection system and has ISO 9001-14001-18001 certification.

In parallel, the Hanover MPA BAU carries out regular external quality audits. Products are identified via a production code specified on the reel of each roll.

## 7. REFERENCES

We examined the following test reports:

- CEBTP test report No. B.222.6 075, entitled «Permeability to air and watertightness», in accordance with French standards NF P 85-570 and NF P 85-571.
- CEBTP test report No. B.252 0 062/3, entitled «Tests for identification and suitability for use according to sections 5.1.2, 5.1.3, 5.2.1, 5.2.3, 5.2.2 and 5.2.4 of French standard NF P 85-571», accompanied by the CEBTP letter.
- Hanover MPA BAU test report No. 103722 (watertightness test).
- Hanover MPA product certification form No. NDS04-2011-0027: Testing requirements according to DIN 18542:2009-07.

## 8. ADDITIONAL REQUIREMENTS AND REMINDERS

- At the time of preparation of the performance documents, the appropriate contractor must carry out a technical study of the construction works to ensure the continuity of an air- and watertight seal between the work performed by the various building contractors. This study may result in two-stage joints being created where continuity cannot be guaranteed.
- The choice of thickness of the impregnated foam must take into account the installation tolerances and future relative movements of the components to be sealed.
- In the event of implementation under the lower crosspiece of frames, the user company must ensure the continuity of compression of the foam at all points, in particular in the bottom corners of door/window frames (continuity of compression between horizontal and vertical seals) by raising the surfaces in advance.
- Door/window frame fastenings and seating blocks must be positioned so as to leave a margin of at least 20 mm of compressed foam from the external edge.
- For horizontal joints between two components of limited width (such as acrotions), the seal created using illmod Trio and illmod Trio PA must be reinforced with an initial watertight barrier (such as a cover).
- In the event of use with surfaces made of materials other than those indicated in the requirement specifications (Art. 3.1.1 Compatibility), the user company must seek validation from Tremco-illbruck.
- For operations relating to the installation of door/window frames, please refer to French document NF DTU 36-5, Part 1-1, section 5.9.3 - Caulking using impregnated foam.
- The finish of internal walls must ensure that the inner surface of the product is protected from all aggressive substances.

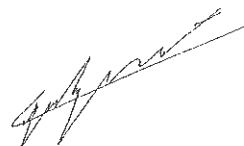
## 9. PROVISIONAL SOCOTEC OPINION

Socotec hereby issues a favourable opinion on the use of the illmod Trio and illmod Trio PA seals within the scope and additional requirements for use set out in paragraphs 3 and 8 of this document. This opinion is issued within the context of Socotec carrying out type «L» technical inspection assignments on specific construction works.

This Socotec opinion is issued for a duration of three years with effect from today, i.e. until 1 June 2015, provided that:

- the products and conditions for use are not subject to modifications and that the company's internal inspection of manufacturing processes is maintained,
- modifications to the requirements imposed by current regulations, standards and professional practices do not have an impact on the content of the requirement specifications,
- the manufacture and implementation of the product are subject to internal inspections appropriate to guarantee their quality,
- no issues severe enough to call this opinion into question are brought to the attention of Socotec.

ENGINEER RESPONSIBLE  
FOR PROJECT



Yann LE GOARANT



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