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Member of



## European Technical Assessment

## ETA 17/0739 of 31/01/2018

English version prepared by ITECONS

### General Part

**Technical Assessment Body issuing the ETA:** ITECONS - Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade

**Trade name of the construction product** Smartbloc System 1  
Smartbloc System 2

**Product family to which the construction product belongs** Building Kits, Units and Prefabricated elements  
Product area code: 34

**Manufacturer** BS1 Byggsystemer AS  
NO 812395742  
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5600 Norheimsund  
Norway

**Manufacturing plant(s)** BS1 – Indústria e Inovação, Lda.  
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5000-023 Adoufe  
Portugal

**This European Technical Assessment contains** 16 pages

**This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of** ETAG 009 used as European Assessment Document (EAD), edition June 2002, *Non load-bearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete*

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## Specific parts

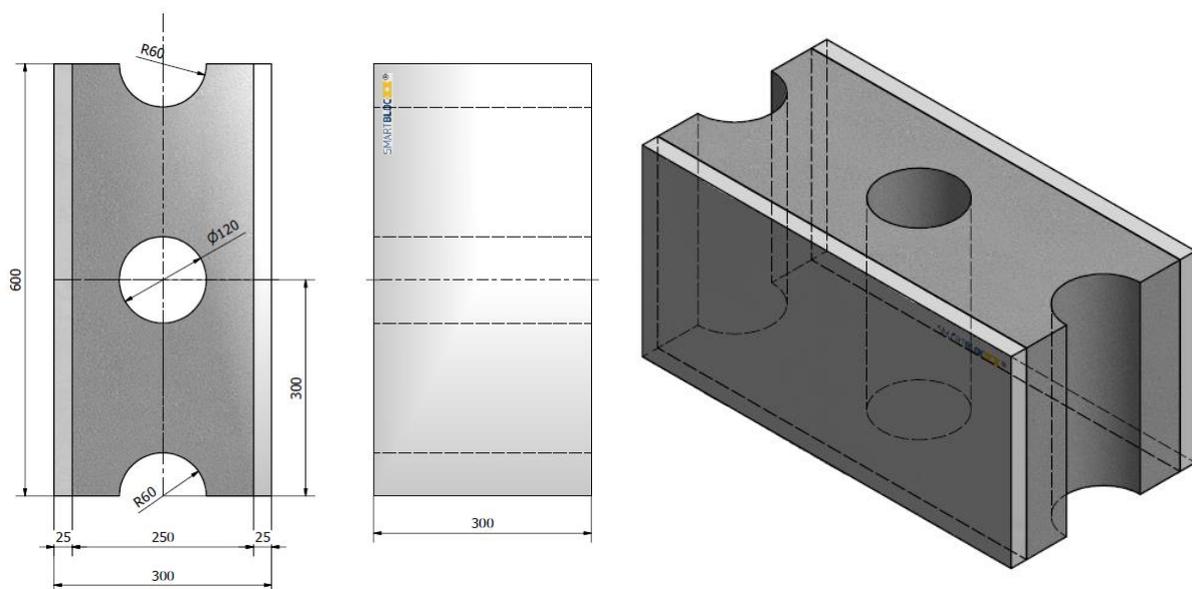
### 1. Technical description of the product

The Smartbloc System is a non load-bearing permanent shuttering system that consists of different types of hollow blocks connected to each other, for construction of external walls, internal walls and partitions, for buildings. These blocks are made of expanded polystyrene (EPS) aggregates concrete and are stacked without the use of mortar. After assembling, the blocks are filled in situ with concrete and reinforcement. The structural pattern in Smartbloc system is the grid type and the basic elements of the shuttering is hollow blocks.

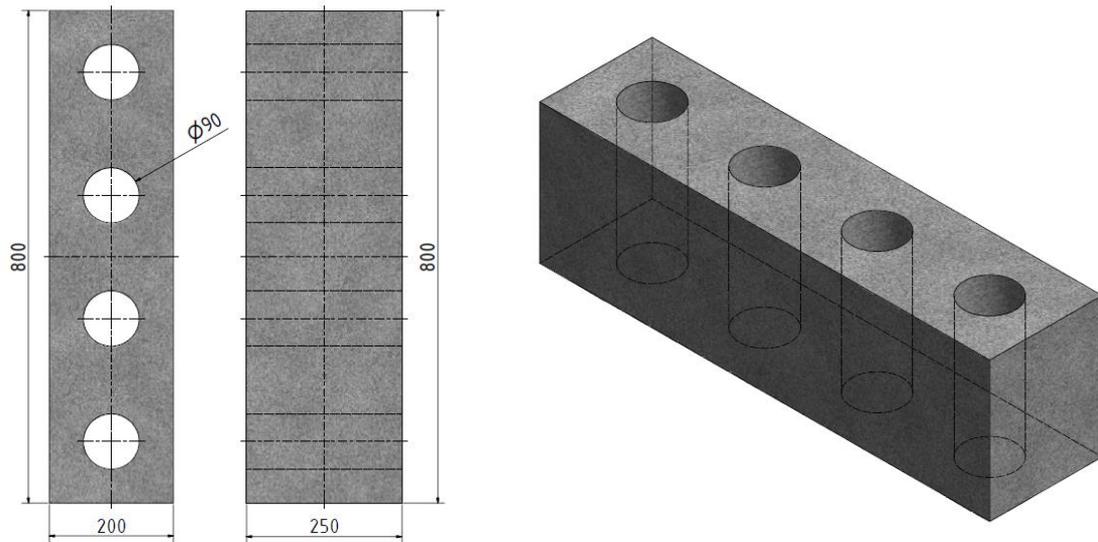
Finishes are not part of the shuttering systems Smartbloc system 1 and Smartbloc system 2.

There are two types of systems:

- Smartbloc system 1
  - Expanded polystyrene (EPS) aggregates concrete block with two layers for strength and insulation (see Figure 1);
  - When assembling, and depending on the structure design, some holes are filled with locking plugs made of the same material as the central layer of the blocks;
  - After assembling, the remaining holes are filled with fresh concrete and the reinforcement (vertical and horizontal) is added.
- Smartbloc system 2
  - Expanded polystyrene (EPS) aggregates concrete block (see Figure 2);
  - When assembling, and depending on the structure design, some holes are filled with locking plugs made of EPS;
  - After assembling, the remaining holes are filled with fresh concrete and the reinforcement (vertical and horizontal) is added.



**Figure 1.** Standard block – Smartbloc system 1 (dimensions in mm)



**Figure 2.** Standard block – Smartbloc system 2 (dimensions in mm)

The Table 1 present the different blocks type for each Smartbloc system. Annex A includes detailed information on each type of block.

**Table 1.** Different blocks type

Description	System	Reference	Dimensions (mm)
N-BLOC	Smartbloc system 1	BLS1600N	600x300x300
L-BLOC	Smartbloc system 1	BLS1600L	750x300/450x300
U-BLOC	Smartbloc system 1	BLS1600NU	600x300x300
		BLS1600LUR	750x300/450x300
		BLS1600LUL	750x300/450x300
		BLS1600XU	900x150/300/450x300
X-BLOC	Smartbloc system 1	BLS1600X	900x150/300/450x300
Locking plug	Smartbloc system 1	–	Diameter 120
N-BLOC 2	Smartbloc system 2	BLS2800N	800x200x250
NU-BLOC 2	Smartbloc system 2	BLS2800NU	800x200x250
Locking plug	Smartbloc system 2	–	Diameter 90

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

The Smartbloc systems are intended to be used as load-bearing (structural) walls. Load-bearing walls ensure the stability of a structure by transferring vertical loads (generally applied from a floor or a roof) and/or horizontal loads applied in the wall plane by a floor or a roof, and possibly lateral loads.

This system is well suited for most types of buildings, houses, offices and stores, warehouse, government buildings and garages and house extensions.

The verification and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the shuttering kit of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be used as a mean for selecting the appropriate product 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**

The verification of the performance characteristics and the assessment of the fitness for the intended use of these systems according to the Basic Requirements were carried out in compliance with ETAG 009, “Non Load-Bearing Permanent Shuttering Kits/Systems Based on the Hollow Blocks or Panels of Insulating Materials and Sometimes Concrete” – edition June 2002 (hereinafter referred to as “ETAG 009, used as EAD”).

### **3.1 Mechanical resistance and stability (BW1)**

#### **3.1.1 Resulting structural pattern**

In end use conditions structures made with shuttering elements Smartbloc systems are structural patterns of a grid type according to ETAG 009, chapter 2.2.

All blocks were designed to ensure the compatibility of the different types of blocks and to ensure they keep the structural pattern.

#### **3.1.2 Efficiency of filling**

Conformity with the requirements of ETAG 009, section 5.1.2 was assessed through on-site observation of the filling with fresh concrete of a trial structure constructed using the system and considering the typical details. Concrete of grade C8/10.S5 (Smartbloc system 1) and of grade C12/15.S3 (Smartbloc system 2) was used and poured into the holes. Apart from some minor difficulties on positioning the blocks, generally no problems were encountered.

The trial structure was inspected for tightness and completeness of fill. On the trial structure, the compatibility of different types of blocks was verified, as well as the verticality of the walls, sufficiently low loss of water between joints and completeness of fill. The wall was efficiently filled without bursting, voids or any uncovered reinforcement observed on the concrete elements.

Considering the instructions and the installation guide of the manufacturer, the efficiency of filling is satisfactory according to ETAG 009 chapter 6.1.2.

#### **3.1.3 Possibility of steel reinforcement**

The installation guide of the manufacturer provides instructions on how to apply the steel reinforcement. The application of the reinforcement does not present significant difficulties.

The result is satisfactory, according to ETAG 009 chapter 6.1.3.

## 3.2 Safety in case of fire (BW2)

### 3.2.1 Reaction to fire

Both systems were tested according to ISO 11925-2:2010, ISO 11925-2:2010/Cor1:2011 and EN 13823:2010+A1:2014 and classified according to EN 13501-1:2007+A1:2009. Table 2 present the reaction to fire classification of the Smartbloc systems.

**Table 2:** Reaction to fire classification of the Smartbloc systems

Product	Class
Smartbloc system 1 Smartbloc system 2	B-s1, d0

### 3.2.2 Resistance to fire

No performance determined.

## 3.3 Hygiene, health and environment (BW3)

### 3.3.1 Dangerous substances

A written declaration was submitted by the ETA holder stating that all components of the system are free from dangerous substances.

In addition to the specific clauses relating to dangerous substances contained in this European Technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

### 3.3.2 Water vapour permeability

The water vapour resistance (Z) of the materials used in the production of the blocks of the Smartbloc systems was determined by the method described in EN 12086 (see Table 3).

**Table 3:** Water vapour resistance of the materials used in the production of the blocks of the Smartbloc systems

Material	Water vapour resistance [m <sup>2</sup> .h.Pa/mg]
Smartbloc system 1 (central layer)	1.00
Smartbloc system 1 (surface layer)	1.36
Smartbloc system 2	2.04

### 3.3.3 Water absorption

The result is satisfactory according to ETAG 009 chapter 5.3.3.

### 3.3.4 Watertightness

No performance determined. The shuttering kits do not have incorporated finishes, therefore this parameter is not part of the ETA.

## 3.4 Safety in use (BW4)

### 3.4.1 Bond strength and resistance to impact load

No performance determined. The shuttering kits do not have incorporated finishes, therefore this parameter is not part of the ETA.

### 3.4.2 Resistance to filling pressure

After pouring the fresh concrete, the shuttering did not show cracks nor failure in current position and at junctions and did not show significant irreversible bowing, so the systems are satisfactory according ETAG 009 chapter 6.4.2.

### 3.4.3 Safety against personal injuries by contact

No performance determined. The shuttering kits do not have incorporated finishes, therefore this parameter is not part of the ETA.

## 3.5 Protection against noise (BWR 5)

### 3.5.1 Airborne sound insulation

The airborne sound insulation of the wall of the Smartbloc systems was measured in accordance with the method described in ISO 10140-1:2010; ISO 10140-2:2010; ISO 10140-4:2010 and ISO 717-1:2013, with rendering mortar on both faces. Table 4 presents the test results for both Smartbloc systems.

**Table 4:** Airborne sound insulation

Product	Assessed build-up	R <sub>w</sub> [dB]
Smartbloc system 1	Smartbloc system 1 with 14mm thick fiber-reinforced dry mortar (REDUR FibrATEK and Viplás®100) on the exterior face and 16mm thick fiber-reinforced dry mortar (REDUR FibrATEK) on the interior face.	37
	Smartbloc system 1 with 14mm thick fiber-reinforced dry mortar (REDUR FibrATEK and Viplás®100) on the exterior face and 16mm thick fiber-reinforced dry mortar (REDUR FibrATEK) on the interior face. Furthermore, on the inner face, gypsum boards with a nominal thickness of 12.5 mm, with a 70 mm thick metallic profile support structure and the air box filled with two layers of 40mm rock wool with a density of 28kg/m <sup>3</sup> , was also applied. Gypsum boards with barred joints and screws.	54
Smartbloc system 2	Smartbloc system 2 with both faces with 15mm thick fibre-reinforced mortar (FiberPuss and Viplás®100).	41
	Smartbloc system 2 with both faces with 15mm thick fibre-reinforced mortar (FiberPuss and Viplás®100). Furthermore, on the inner face, gypsum boards with a nominal thickness of 12.5 mm, with a 70 mm thick metallic profile support structure and the air box filled with a layer of 60mm rock wool with a density of 40kg/m <sup>3</sup> . Gypsum boards with barred joints and screws.	57

### 3.5.2 Sound absorption

No performance determined. The shuttering kits do not have incorporated finishes, therefore this parameter is not part of the ETA.

## 3.6 Energy economy and heat retention (BWR 6)

### 3.6.1 Thermal resistance

The determination of the thermal resistance of the wall of the Smartbloc systems was conducted in accordance with EN ISO 6946 and ISO 10211. The results for the thermal resistance of the wall of the Smartbloc systems (including surface resistances) are presented in Table 5.

**Table 5:** Thermal resistance values (including surface resistances)

Product	R <sub>tot</sub> [m <sup>2</sup> .°C/W]
Smartbloc system 1	3.68
Smartbloc system 2	1.72

### 3.6.2 Influence of moisture transfer on insulating capacity of the wall

The possible influence of moisture transfer on the insulating capability of the wall due to surface condensation and interstitial condensation was evaluated by calculation according to the simplified calculation method presented in the EN ISO 13788. As the influence of moisture transfer depends on the climate and expected use of the building, the calculations were performed considering the generic data from the Table B.1 (critical surface humidity) and Table C.1 (interstitial condensation) of the ISO 13788:2012.

The temperature factors at the internal surface and minimum acceptable surface temperature obtained are presented in Table 6.

**Table 6:** Temperature factors at the internal surface and minimum acceptable surface temperature

Product	$f_{Rsi}$	$\theta_{si,min}$ (°C)	Surface condensation if RH > (at 20°C)
Smartbloc system 1 (external wall)	0.923	18.46	91%
Smartbloc system 1 (junction between external walls)	0.845	16.90	82%
Smartbloc system 1 (external walls join with the floor – 150 mm thick reinforced concrete slab)	0.670	14.76	66%
Smartbloc system 2 (external wall)	0.837	16.74	81%
Smartbloc system 2 (junction between external walls)	0.735	14.70	71%
Smartbloc system 2 (external walls join with the floor – 150 mm thick reinforced concrete slab)	0.590	14.76	59%

According to the data considered, no surface condensation is predicted to occur on the external wall, junction between external walls (Smartbloc system 1 and 2) and external walls join with the floor –

150 mm thick reinforced concrete slab (Smartbloc system 1) and no interstitial condensation is predicted to occur on Smartbloc system 1 and 2.

### 3.6.3 Thermal inertia

The following tables present the information required to calculate the thermal inertial of the wall, according with ETAG 009 chapter 6.3.3: total mass per unit area of the part of the wall which is internal face versus insulation sheet (see Table 7), density of material used (see Table 8), heat capacity of materials (Table 9) and thermal transmittance of the product (Table 10).

**Table 7:** Mass per unit area values

Product	Mass per unit area [kg/m <sup>2</sup> ]
Smartbloc system 1	9.10
Smartbloc system 2	0

**Table 8:** Density of materials values

Material	Density [kg/m <sup>3</sup> ]
Smartbloc system 1 and 2 (concrete)	1850
Smartbloc system 1 and 2 (steel)	7800
Smartbloc system 1 (central layer)	210
Smartbloc system 1 (surface layers)	364
Smartbloc system 2 (central layer)	486

**Table 9:** Heat capacity of materials values

Material	Heat capacity [J/kg K]
Smartbloc system 1 and 2 (concrete)	1000
Smartbloc system 1 and 2 (central layer)	1000
Smartbloc system 1 (surface layers)	1000
Smartbloc system 1 and 2 (steel)	450

**Table 10:** Thermal transmittance values

Product	Thermal transmittance [W/m <sup>2</sup> .°C]
Smartbloc system 1	0.26
Smartbloc system 2	0.58

### 3.7 Aspects of durability, serviceability and identification

#### 3.7.1 Resistance to deterioration

No performance determined. The shuttering kits do not have incorporated finishes, therefore this parameter is not part of the ETA.

#### 3.7.2 Resistance to normal use damage

No performance determined. The shuttering kits do not have incorporated finishes, therefore this parameter is not part of the ETA.

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

According to the Decision 98/279/EC of 5/12/1997, as amended and specified in the mandate CONSTRUCT 97/209, the AVCP systems (further described in Annex V Regulation (EU) No 305/2011) is as shown in Table 11.

**Table 11:** System of assessment and verification of constancy of performance.

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Shuttering systems	Construction of external and internal walls in buildings subject to fire regulations	B	2+

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

The ETA is issued on the basis of agreed data/information, deposited at ITeCons, which identifies the product that has been assessed and judged. It is the manufacturer's responsibility to make sure that all those who use the kit are appropriately informed of specific conditions laid down in this ETA.

Changes to the systems or the components or their production process should be notified to the ITeCons before the changes are introduced. ITeCons will decide whether or not such changes affect the ETA and if so whether further assessment or alterations to the ETA shall be necessary.

#### 5.1 Tasks of the manufacturer

##### 5.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production of concerned product. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this ETA.

The manufacturer may only use components stated in the technical documentation of this ETA including Control Plan. The incoming raw materials are subjected to verifications by the manufacturer before acceptance.

For the components of the system which the manufacturer does not manufacture by himself, he shall make sure that factory production control carried out by the other manufacturers gives the guarantee of the components compliance with the ETA.

The factory production control shall be in accordance with the Control Plan which is a part of technical documentation of this European Technical Assessment. The control plan has been agreed between the manufacturer and ITeCons and is laid down in context of the factory production control system operated by the manufacturer and deposited within ITeCons. The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

### **5.1.2 Other tasks for the manufacturer**

The manufacturer shall, on the basis of a contract, involve a body which is notified for the tasks referred to in section 4 in the field of shutting systems in order to undertake the actions laid down in this clause. For this purpose, the control plan shall be handed over by the manufacturer to the notified bodies involved.

For initial type-testing of the systems the results of the tests performed as part of the assessment for the ETA shall be used unless there are changes in the production line or plant. In such cases the necessary testing has to be agreed with ITeCons.

The manufacturer shall make a declaration of performance, stating that the shutting systems are in conformity with the provisions of this ETA.

Changes to the systems or the components or their production process should be notified to ITeCons before the changes are introduced. ITeCons will decide whether or not such changes affect the ETA and if so whether further assessment or alterations to the ETA shall be necessary.

## **5.2 Tasks for the Notified Body (bodies)**

### **5.2.1 Initial inspection of factory and of factory production control**

The Notified Body shall ascertain that, in accordance with the Control Plan, the factory (in particular the employees and the equipment) and the factory production control are suitable to ensure continuous and orderly manufacturing of the components according to the specifications mentioned in this ETA.

### **5.2.2 Continuous surveillance, assessment and evaluation of factory production control**

Within the scope of continuous surveillance, assessment and evaluation of factory production control, the Notified Body (bodies) shall visit the factory at least once a year for surveillance. It has to be verified that the factory production control is maintained in suitable conditions.

These tasks shall be performed in accordance with the provisions laid down in the control plan.

The Notified Body (bodies) shall retain the essential points of its (their) actions referred to above and state the results obtained and conclusions drawn in a written report. The Notified Body involved by the manufacturer shall issue a certificate of conformity of the factory production control stating the conformity with the provisions of this ETA.

In cases where the provisions of the ETA and its control plan are no longer fulfilled, the Notified Body shall withdraw the certificate of conformity and inform ITeCons without delay.

Issued in Coimbra, Portugal on 31.01.2018

By

Technical Assessment Unit of

ITeCons – Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia,  
Ambiente e Sustentabilidade

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(Andreia Gil, Technical Assessment Unit Coordinator)

Annex A

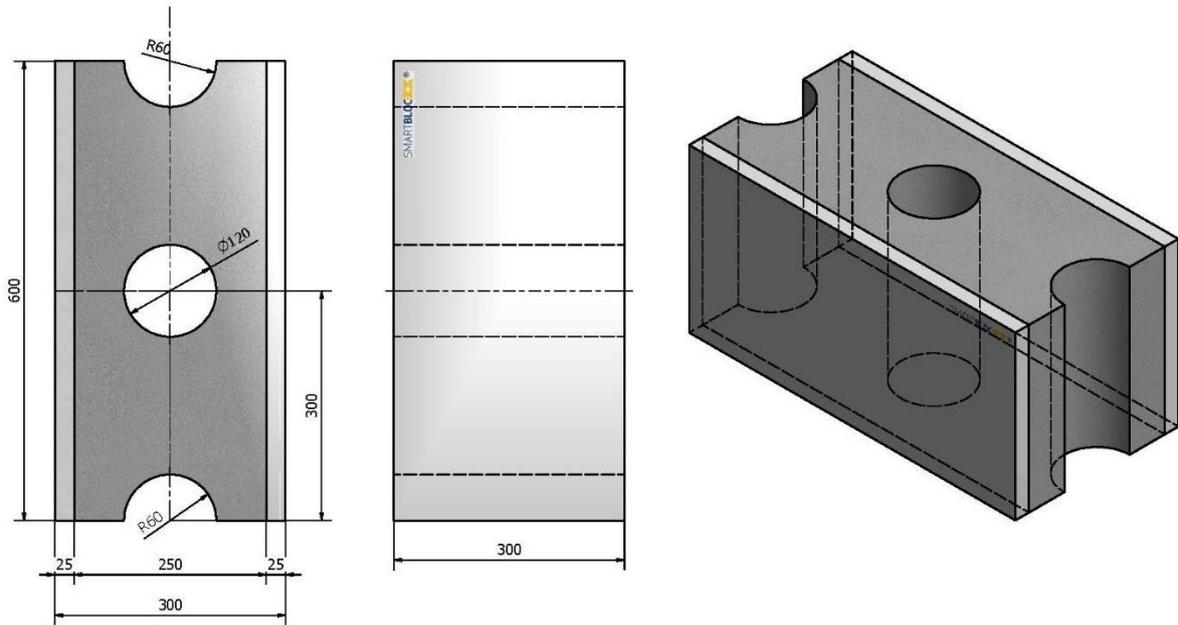


Figure A1: Smartbloc system 1 – N-BLOC (REF. BLS1600N)

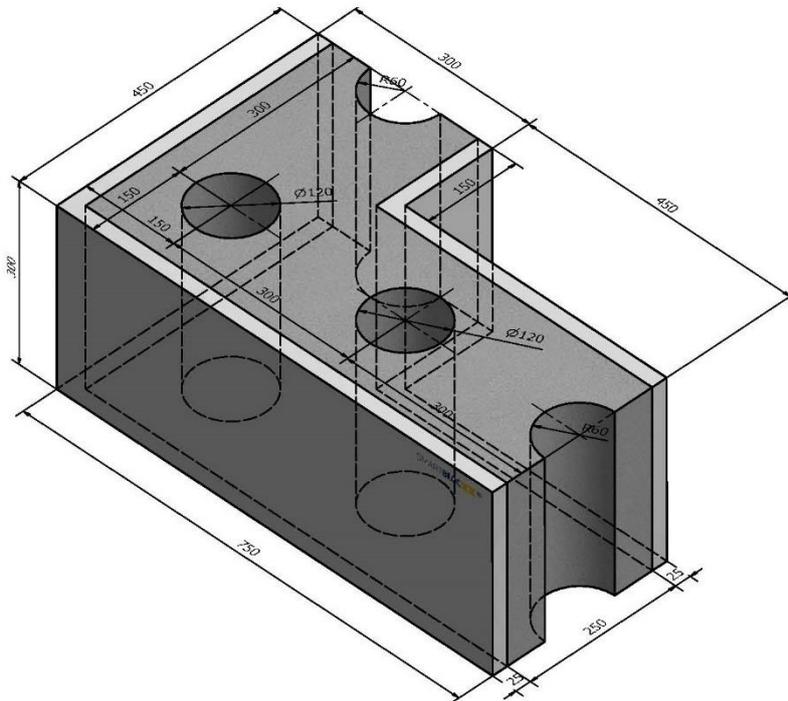
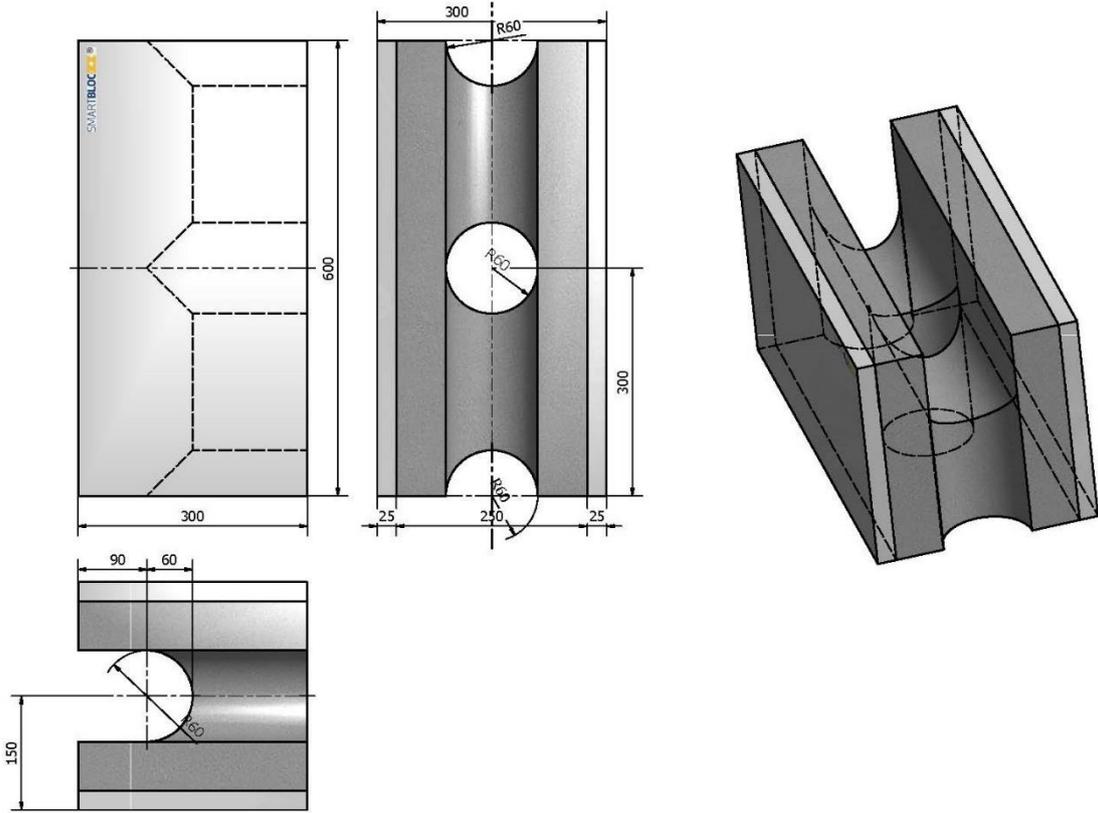
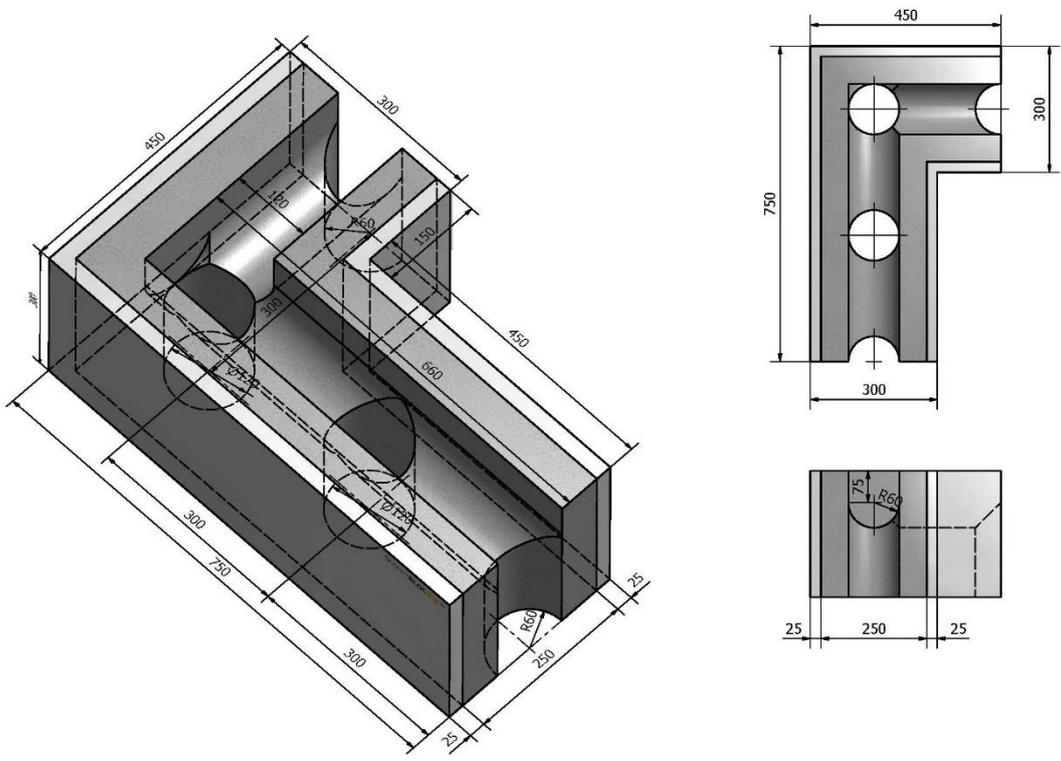


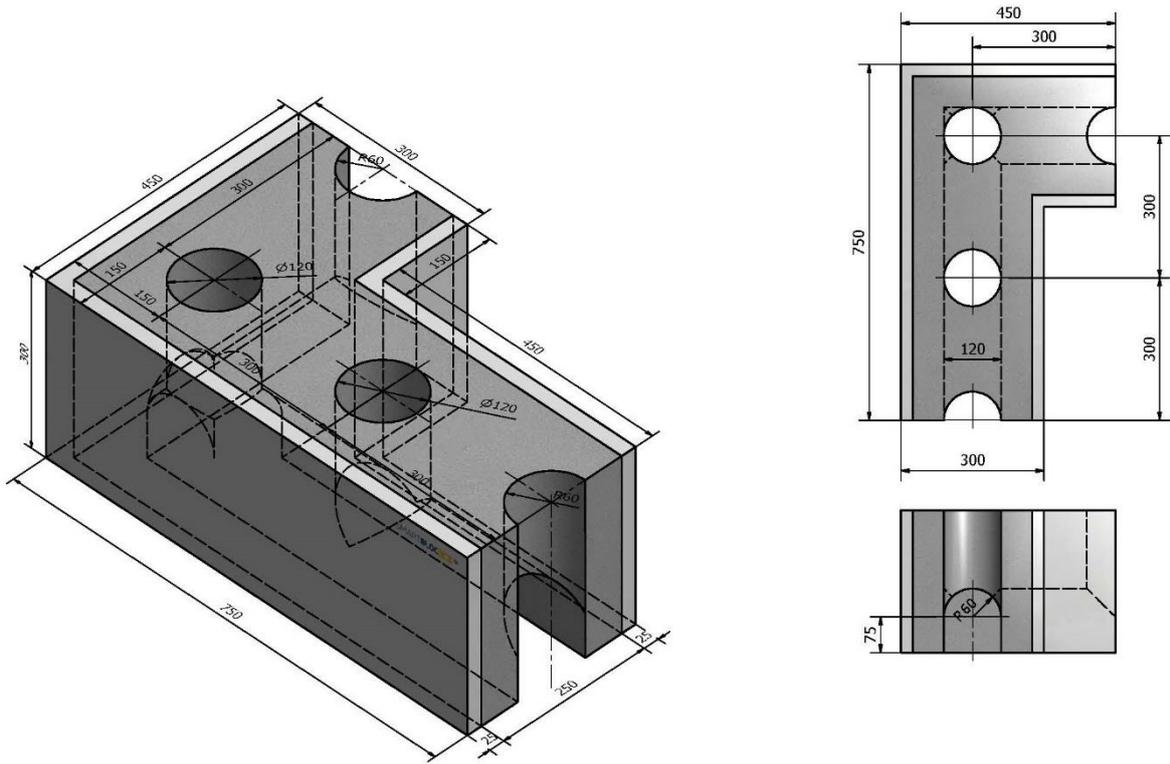
Figure A2: Smartbloc system 1 – L-BLOC (REF. BLS1600L)



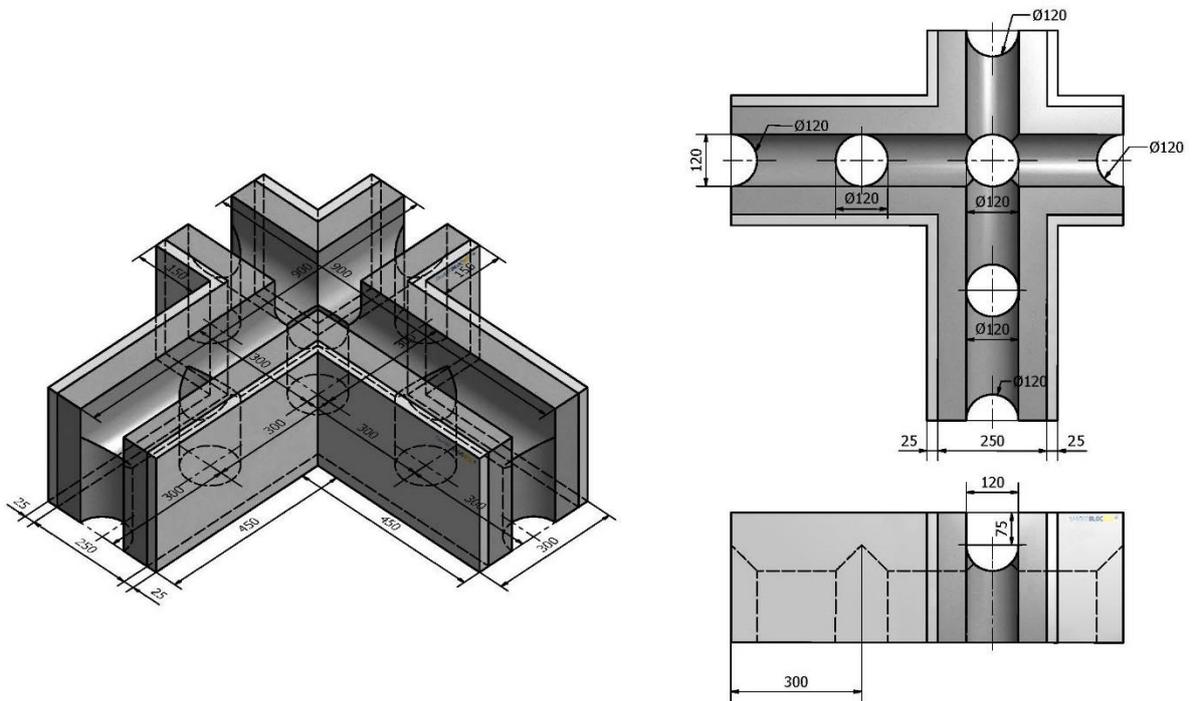
**Figure A3:** Smartbloc system 1 – U-BLOC (REF. BLS1600NU)



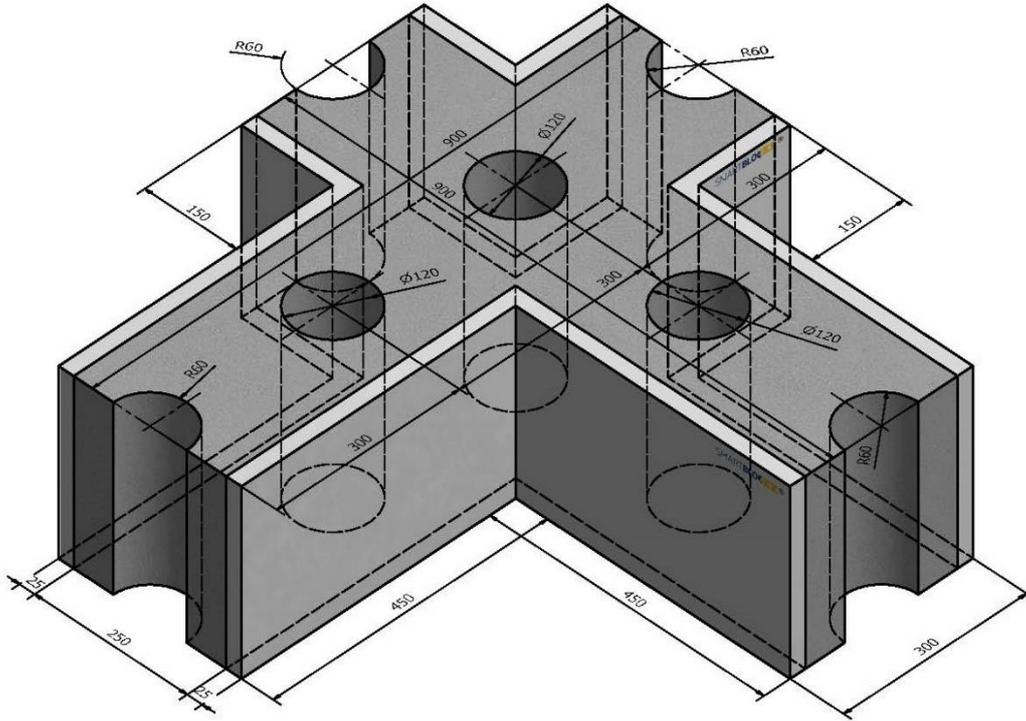
**Figure A4:** Smartbloc system 1 – U-BLOC (REF. BLS1600LUR)



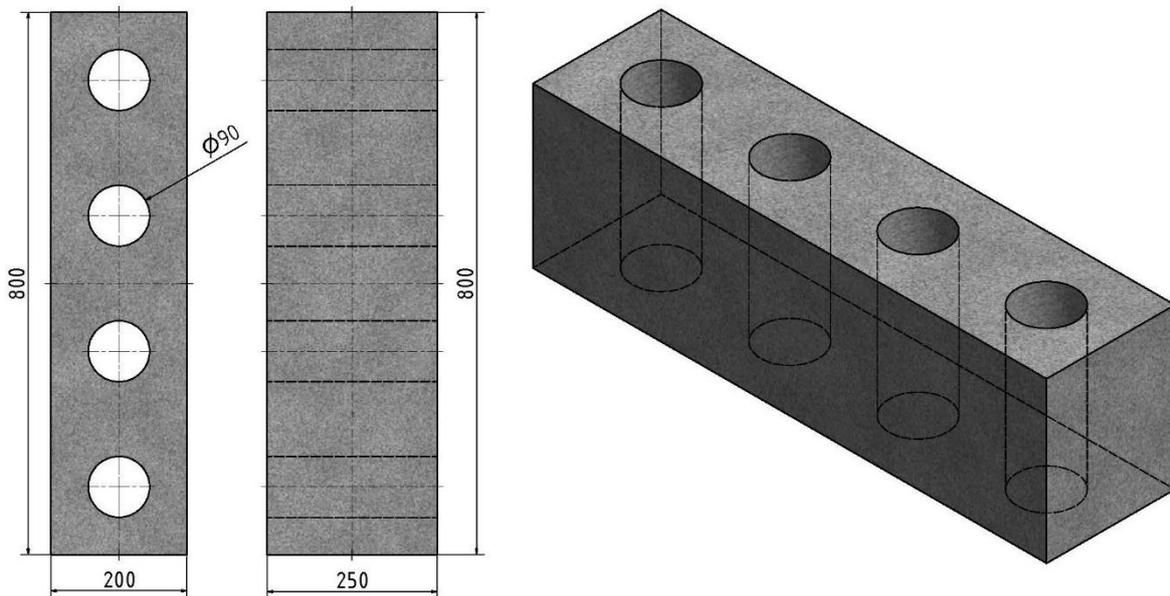
**Figure A5:** Smartbloc system 1 – U-BLOC (REF. BLS1600LUL)



**Figure A6:** Smartbloc system 1 – U-BLOC (REF. BLS1600XU)



**Figure A7:** Smartbloc system 1 – X-BLOC (ref. BLS1600X)



**Figure A8:** Smartbloc system 2 – N-BLOC 2 (ref. BLS2800N)

