Deutsches Institut für Bautechnik

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European Technical Assessment Body for construction products

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European Technical Assessment ETA-11/0402 of 16 March 2026

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	WOLF THERMO MODULE
Product family to which the construction product belongs	Non-load bearing permanent shuttering kit "WOLF THERMO MODULE" based on shuttering elements of EPS
Manufacturer	WOLF THERMO MODULE GmbH Am Ahlbach 3 97297 Waldbüttelbrunn-Roßbrunn DEUTSCHLAND
Manufacturing plant	WOLF THERMO MODULE Fabrikstraße 1 74838 Limbach/Krumbach
This European Technical Assessment contains	28 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Article 95(4) of Regulation (EU) No 2024/3110, on the basis of	EAD 340309-00-0305
This version replaces	ETA-11/0402 issued on 21 December 2016

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Specific part

1 Technical description of the product

1.1 Definition of the construction product

The shuttering system "WOLF THERMO MODULE" is a non load-bearing permanent shuttering kit based on shuttering elements of expanded polystyrene (EPS) (see e. g. Annex A2) and accessory parts applicable as formwork for plain and reinforced concrete walls. The accessory parts are spacers of polypropylene (PP-spacers), end stops and lintel shuttering elements.

The shuttering elements are generally used for external load-bearing walls as well as for internal load-bearing walls. The thickness of the inner shuttering leaves is always 62.5 mm and the thickness of the outer shuttering leaves is in the range of 62.5 mm to 297.5 mm. The elements with inner and outer shuttering leaves of 62.5 mm thickness may be applied for internal walls. The thickness of the concrete core is in the range of 125.0 mm to 250.0 mm.

Finishes are not part of the shuttering system "WOLF THERMO MODULE".

1.2 Shuttering elements

The shuttering elements consist of inner and outer shuttering leaves and polypropylene-spacers (PP-spacers). These components are assembled on site. The shuttering leaves are one-layered and consist of expanded polystyrene (EPS). The thickness of the inner shuttering leave is 62.5 mm. The thickness of the outer shuttering leave depends on the type of element and may be 62.5 mm, 110.0 mm, 172.5 mm, 235.0 mm and 297.5 mm. The thickness of the concrete core is in the range of 125.0 mm to 250.0 mm (see Table 1 in Annex A1).

The length of the elements is in the range of 62.5 mm to 1000.0 mm. The radius of the curved elements is either 1500.0 mm or 3000.0 mm.

The height of all elements is 375.0 mm.

The horizontal top and bottom connecting surface of the shuttering leaves are castellated to allow a tight fit when joined together.

The vertical inner surface of shuttering elements consists of a system of tongues and grooves to allow mechanical interlock of the shuttering leaves with the concrete infill as well as mechanical interlock with end stops and lintel shuttering elements.

The accessory parts of EPS are made of the same polystyrene as the shuttering elements.

1.3 Accessory parts

1.3.1 End stops

End stops are used to ensure a proper sealing of the end of the shuttering elements. End stops are inserted into the gap between the inner and outer shuttering leaves at the end of the shuttering elements.

1.3.2 Lintel shuttering elements

Lintel shuttering elements are put in the gaps between the shuttering leaves and create shuttering elements as lintels. Before concreting the lintel shuttering elements shall be supported. The supports may only be removed after the concrete has hardened sufficiently.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The kit is intended to be used for the construction of internal walls as well as external walls above or below ground which are load-bearing (structural) or non load-bearing (non structural), including those which are subjected to fire regulations.

When using this type of construction below ground a waterproofing according to applicable national rules shall be provided depending on whether non pressing water or pressing water is to be dealt with. The waterproofing shall be protected from mechanical damage by an impact resistant protective layer.

The performance given in Section 3 is only valid if the shuttering elements are used in compliance with the specifications and conditions given in Annex B1.

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 manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Resulting structural pattern	Continuous type according to EAD 340309-00-0305, chapter 1.3.3
Efficiency of filling	see Annex C1
Possibility of steel reinforcement	see Annex C1

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	
EPS	Class E according to EN 13501-1 (with an according density of 23 - 30 kg/m³)
PP-spacer	No performance assessed
Influence of the shuttering kit on the fire resistance	
Continuous wall with Standard Elements	See Annex C2 Determined according to EAD 340309-00-0305, Annex A Table A1[1]
thickness of the concrete core	REI 90 according to EAD 340309-00-0305, Annex A Table A1[1]
thickness of the concrete core	REI 120 according to EAD 340309-00-0305, Annex A Table A1[1]
thickness of the concrete core 125; 140; 187,5 or 250mm	EI 120 according to EAD 340309-00-0305, Annex A Table A1[1]

[1] The assessment of fire resistance in accordance with EAD 340309-00-0305, Annex A, is not recognised in all EOTA member states, including Germany.

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	
Substances classified as Carc. 1A/1B [a)]	None of these raw materials are actively used in the manufacture of the construction product.[b) c)]
Substances classified as Muta. 1A/1B [a)]	
Substances classified as Acute Tox. 1, 2, 3; Repr. 1A/1B; STOT SE 1 and STOT RE 1 [a)]	
Use scenarios regarding BWR 3:	
IA 3	Product with no contact to indoor air
S/W3	Product with no contact to soil, ground- and surface water
Water vapour permeability	See Annex C3
Water absorption	No performance assessed
Water tightness	No performance assessed (finishes are not part of this ETA)

[a)] In accordance with Regulation (EC) No 1272/2008
[b)] Assessment based on the detailed manufacturers' statements on dangerous substances
[c)] Active use is the targeted use of substances to achieve specific product properties. Substances that are present as impurities and/or as a secondary component in the product are therefore not to be regarded as "actively used".

3.4 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Bond strength	
Within the leaf	see Annex C4
EPS leaf to concrete	≥ 0.015 N/mm²
Resistance to impact load	
global resistance	see Annex C4
local resistance	No performance assessed
Resistance to filling pressure	bending tensile strength of the shuttering leaves ≥ 150 kPa (see also designation code of EPS in Annex A1). Tensile Force of PP-Spacer > 2150 N Pull-out Force of PP-Spacer and EPS-leaf > 1080 N
Safety to personal injuries	The shuttering elements do not have sharp or cutting edges. Due to the soft surfaces of the shuttering leaves, there is no risk of abrasion or of cutting to people.

3.5 Protection against noise (BWR 5)

Essential characteristic	Performance
Airborne sound insulation	No performance assessed
Sound absorption	No performance assessed

3.6 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal resistance	See Annex C5
Thermal inertia	See Annex C5

3.7 Aspects of durability

Built-in finishes are not part of the assessed shuttering kit.

Essential characteristic	Performance
Resistance to deterioration	
Physical agent	DS(70,-)3 to EN 13163 See Annex C6
Chemical agent	Built-in finishes are not part of the ETA

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

In accordance with EAD No 340309-00-0305, January 2019, the applicable European legal act is Decision 98/279/EC as amended by Commission Decision 2001/596/EC of 8 January 2001.

The system to be applied is: 2+

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 16 March 2026 by Deutsches Institut für Bautechnik

Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Groth

Deutsches Institut für Bautechnik DIBt

Characteristics of shuttering kit

The shuttering elements correspond to the specifications and drawings given in the Annexes A2 to A7. The characteristic data of standard and special shuttering elements are given in the tables of Annexes A2 to A5. The shuttering system consists of the following shuttering elements:

- Standard shuttering elements (Annex A2)
- Corner shuttering elements and T shuttering elements (Annex A3)
- Curved shuttering elements (Annexes A4 and A5)
- End stops (Annex A6)
- Lintel shuttering elements (Annex A6)
- Polypropylene-spacers (Annex A7)

Shuttering leaves

For the shuttering leaves, expanded polystyrene made of polystyrene particle foam EPS - EN 13163 - T1 - L1 - W2 - S1 - P3 - BS150 - CS(10)150 - DS(N)5 - DLT(1)5 according to EN 13163 is used.

The tensile strength of the EPS-leaves perpendicular to faces shall be more than 100 kPa (TR100 according to EN 13163) and the relative changes in length, width and thickness under specified temperature and humidity conditions shall not exceed 3 % after exposing them for 48 h at 70 °C (DS(70, -)3 according to EN 13163).

The apparent density ρ_a of the EPS-leaves is in the range between 23 and 30 kg/m³ according EN 13163 and the modulus of shear according EN 12090 shall be at least 1,0 MPa and must not exceed 3,8 MPa.

The declared value of thermal conductivity is λ_D = 0.035 W/(m K) according EN 13163.

Spacers

The spacers are moulded of polypropylene (PP-spacers).

The tensile strength of the PP-spacers shall be at least 2150 N and the pull-out strength between PP-spacers and EPS-shuttering leaves shall be at least 1080 N.

Shuttering elements

The material characteristics, dimensions and tolerances of the shuttering elements not indicated in Annexes A2 to A7 are given in the technical documentation[1] of the ETA.

The dimensions of the shuttering elements are given in Table 1. Information on the calculation weights can be found in Annex A8. The values of the heat transfer resistance are given in Table 2 of the "Special Part" of the ETA.

[1] The technical documentation of the ETA is deposited with DIBt and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

Table 1: Dimensions of the shuttering elements

Thickness of the wall [mm]	**Thickness of EPS-Panels** [mm]		**Thickness of concrete core** [mm]
d	inner (d_i)	outer (d_a)	d_k
250.0	62.5	62.5	125.0
312.5	62.5	110.0	140.0
	62.5	62.5	187.5
375.0	62.5	172.5	140.0
	62.5	62.5	250.0
437.5	62.5	235.0	140.0
500.0	62.5	297.5	140.0

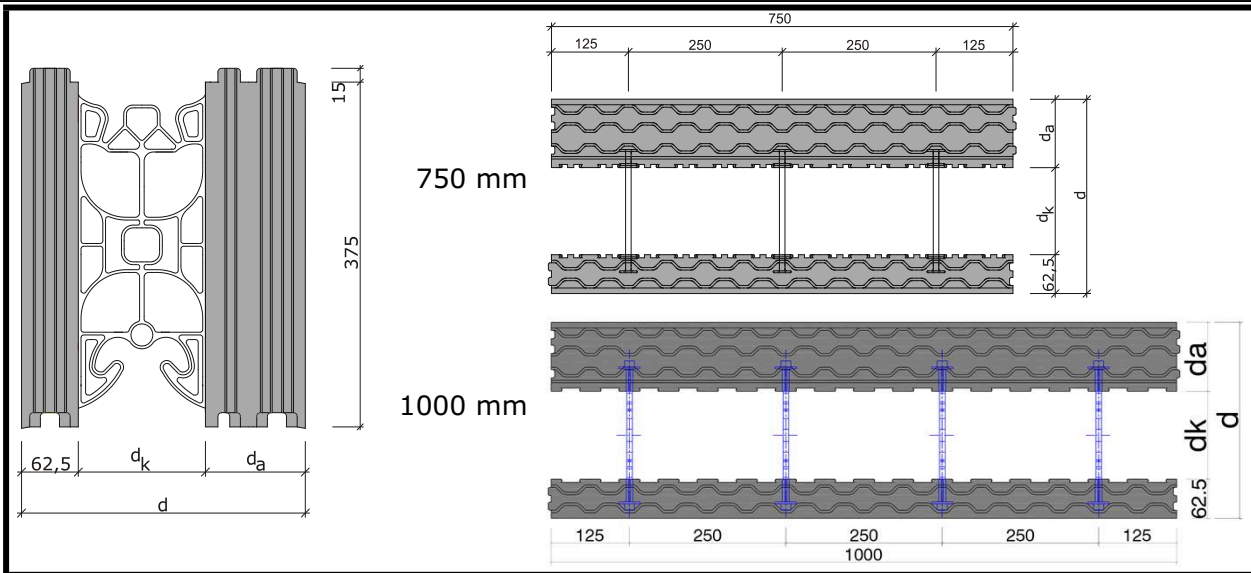
Accessory parts

End stops

End stops are made of the same EPS material as the shuttering leaves with a thickness of 58.0 mm and a height of 375.0 mm. The width is between 125.0 mm and 250.0 mm, depending on the thickness of the concrete core (see Annex A6). The vertical inner surface of the end stops consists of a system of tongues and grooves.

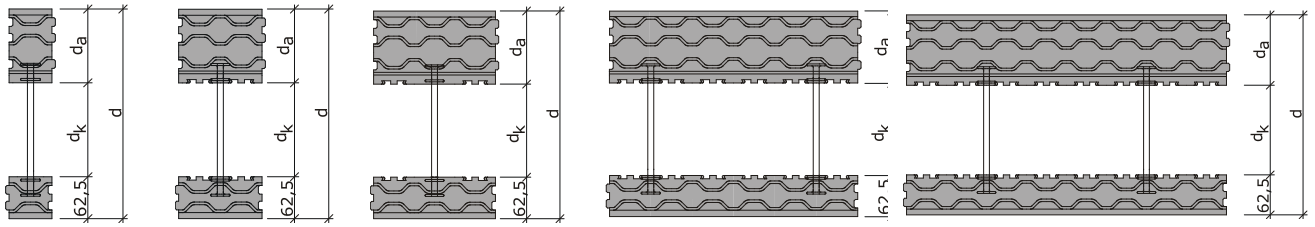
Lintel shuttering elements

Lintel shuttering elements are made of the same EPS material as the shuttering leaves with a height between 125.0 mm and 187.5 mm. The width is between 125.0 mm and 250.0 mm depending on the thickness of the concrete core. The length is 1000.0 mm (see Annex A6). The vertical inner surface of lintel shuttering elements consists of a system of tongues and grooves.



The thickness of the inner shuttering leaves is always 62.5 mm.

62,5 mm 125 mm 187,5 mm 375 mm 500 mm



Type	Concrete core d_k	EPS-leaves (outer) d_a	d
G 62,5-312	140.0	110.0	312.5
G 125-312	140.0	110.0	312.5
G 187,5-312	140.0	110.0	312.5
G 375-312	140.0	110.0	312.5
G 500-312	140.0	110.0	312.5
G 750-312	140.0	110.0	312.5
G 1000-312	140.0	110.0	312.5
G 62,5-437	140.0	235.0	437.5
G 125-437	140.0	235.0	437.5
G 187,5-437	140.0	235.0	437.5
G 375-437	140.0	235.0	437.5
G 500-437	140.0	235.0	437.5
G 750-437	140.0	235.0	437.5
G 1000-437	140.0	235.0	437.5
G 62,5-250	125.0	62.5	250.0
G 125-250	125.0	62.5	250.0
G 187,5-250	125.0	62.5	250.0
G 375-250	125.0	62.5	250.0
G 500-250	125.0	62.5	250.0
G 750-250	125.0	62.5	250.0
G 1000-250	125.0	62.5	250.0

Type	Concrete core d_k	EPS-leaves (outer) d_a	d
G 62,5-312/187	187.5	62.5	312.5
G 125-312/187	187.5	62.5	312.5
G 187,5-312/187	187.5	62.5	312.5
G 375-312/187	187.5	62.5	312.5
G 500-312/187	187.5	62.5	312.5
G 750-312/187	187.5	62.5	312.5
G 1000-312/187	187.5	62.5	312.5
G 62,5-375	250.0	62.5	375.0
G 125-375	250.0	62.5	375.0
G 187,5-375	250.0	62.5	375.0
G 375-375	250.0	62.5	375.0
G 500-375	250.0	62.5	375.0
G 750-375	250.0	62.5	375.0
G 1000-375	250.0	62.5	375.0
G 1000-375	140.0	172.5	375.0
G 1000-500	140.0	297.5	500.0

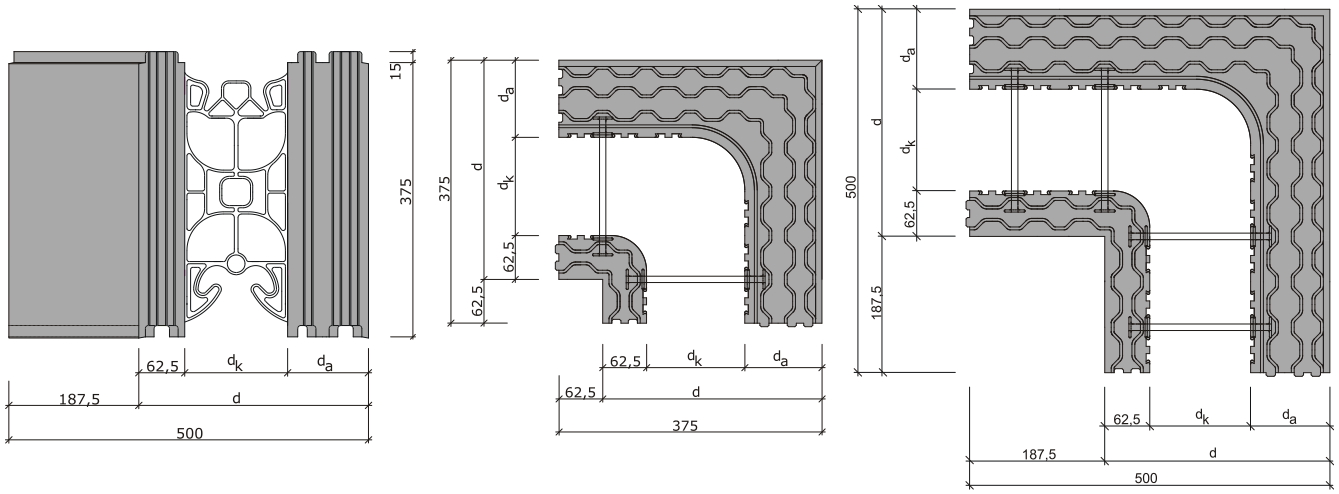
Note: The bond of the shuttering elements has to be executed with a distance of the PP-spacers of at least 12.5 cm.

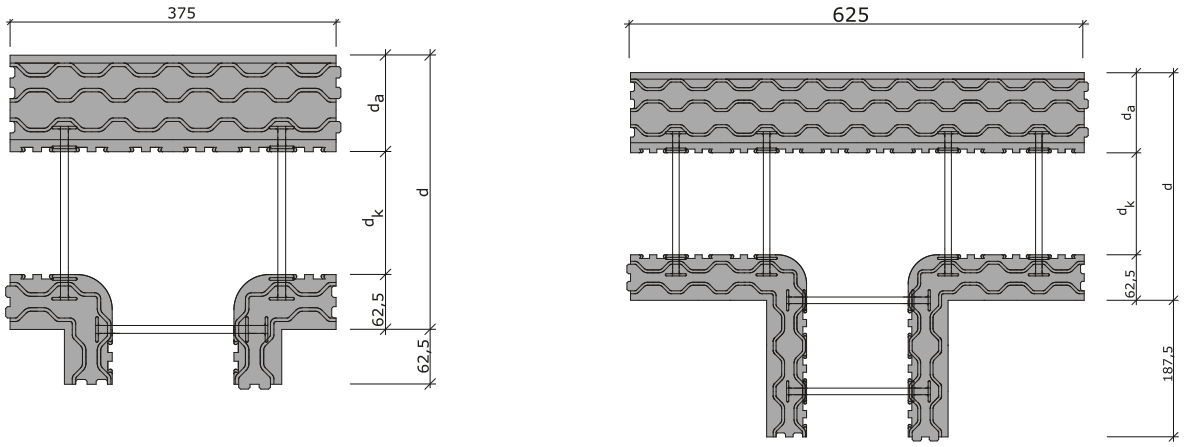
All dimensions in [mm]

WOLF THERMO MODULE

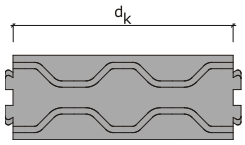
Standard shuttering elements

Annex A2





d, d_a and d_k see Annex A2



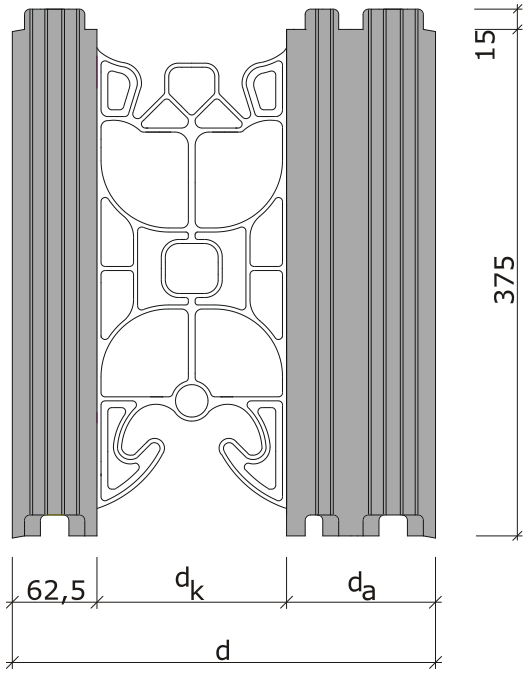
Type	Concrete core d_k
E 125	125.0
E 140	140.0
E 187,5	187.5
E 250	250.0

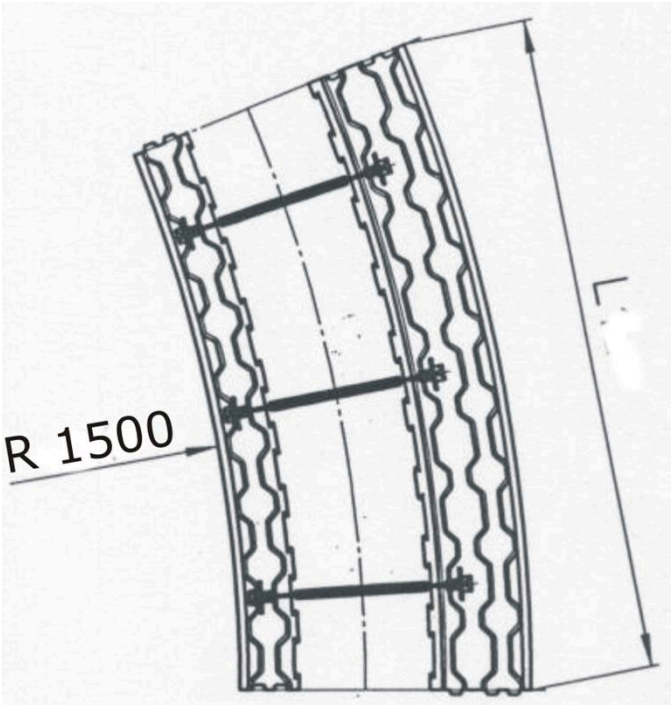
All dimensions in [mm]

WOLF THERMO MODULE

Corner shuttering elements and T shuttering elements

Annex A3





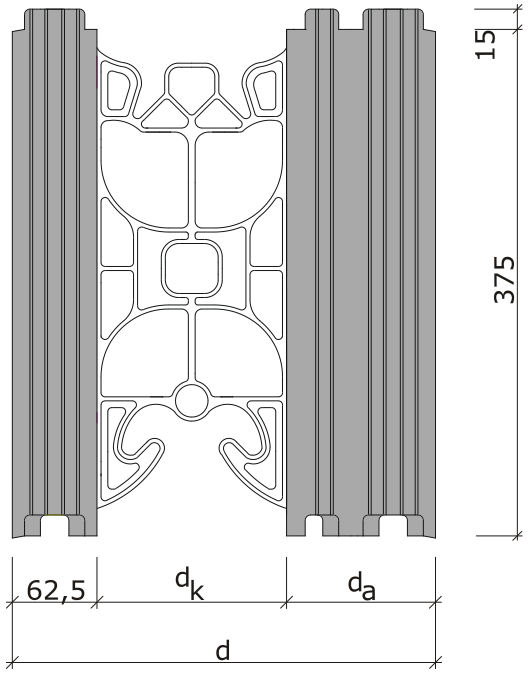
Type	L	d	Concrete core d_k	EPS-leaves (outer) d_a
RA 1500/312 A	707.2	312.5	140.0	110.0
RA 1500/312 B	238.5	312.5	140.0	110.0
RA 1500/437 A	707.2	437.5	140.0	235.0
RA 1500/437 B	238.5	437.5	140.0	235.0

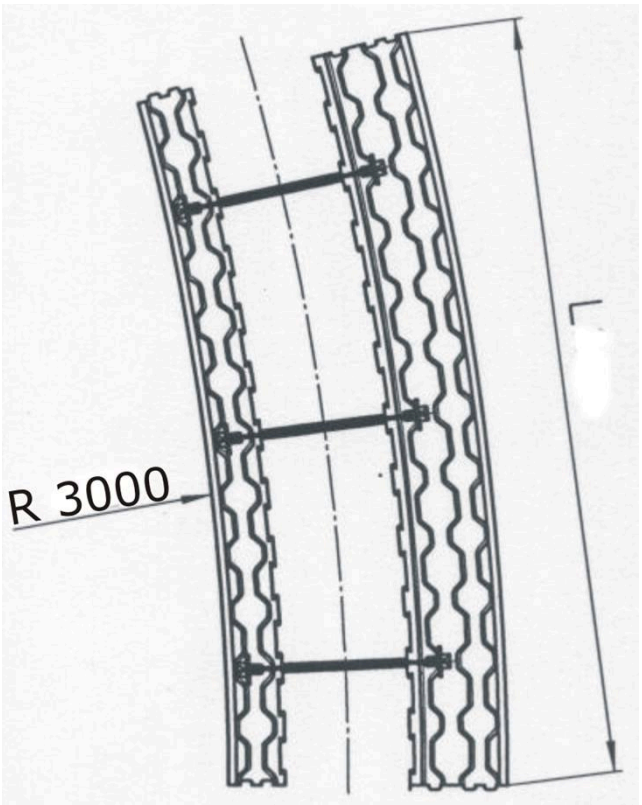
All dimensions in [mm]

WOLF THERMO MODULE

Curved shuttering elements, R = 1500 mm

Annex A4





Type	L	d	Concrete core d_k	EPS-leaves (outer) d_a
RA 3000/312 A	864.7	312.5	140.0	110.0
RA 3000/312 B	288.9	312.5	140.0	110.0
RA 3000/437 A	864.7	437.5	140.0	235.0
RA 3000/437 B	288.9	437.5	140.0	235.0

All dimensions in [mm]

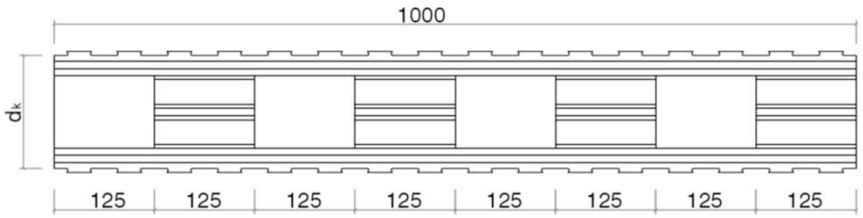
WOLF THERMO MODULE

Curved shuttering elements, R = 3000 mm

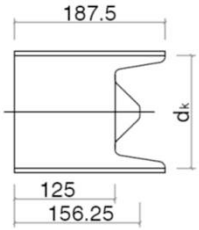
Annex A5

Lintel shuttering element

Top view

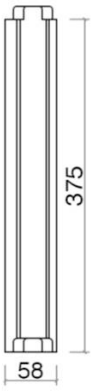


side view

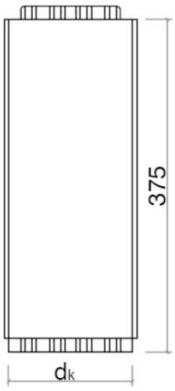


End stop

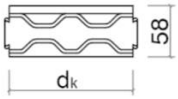
Cross section



Side view

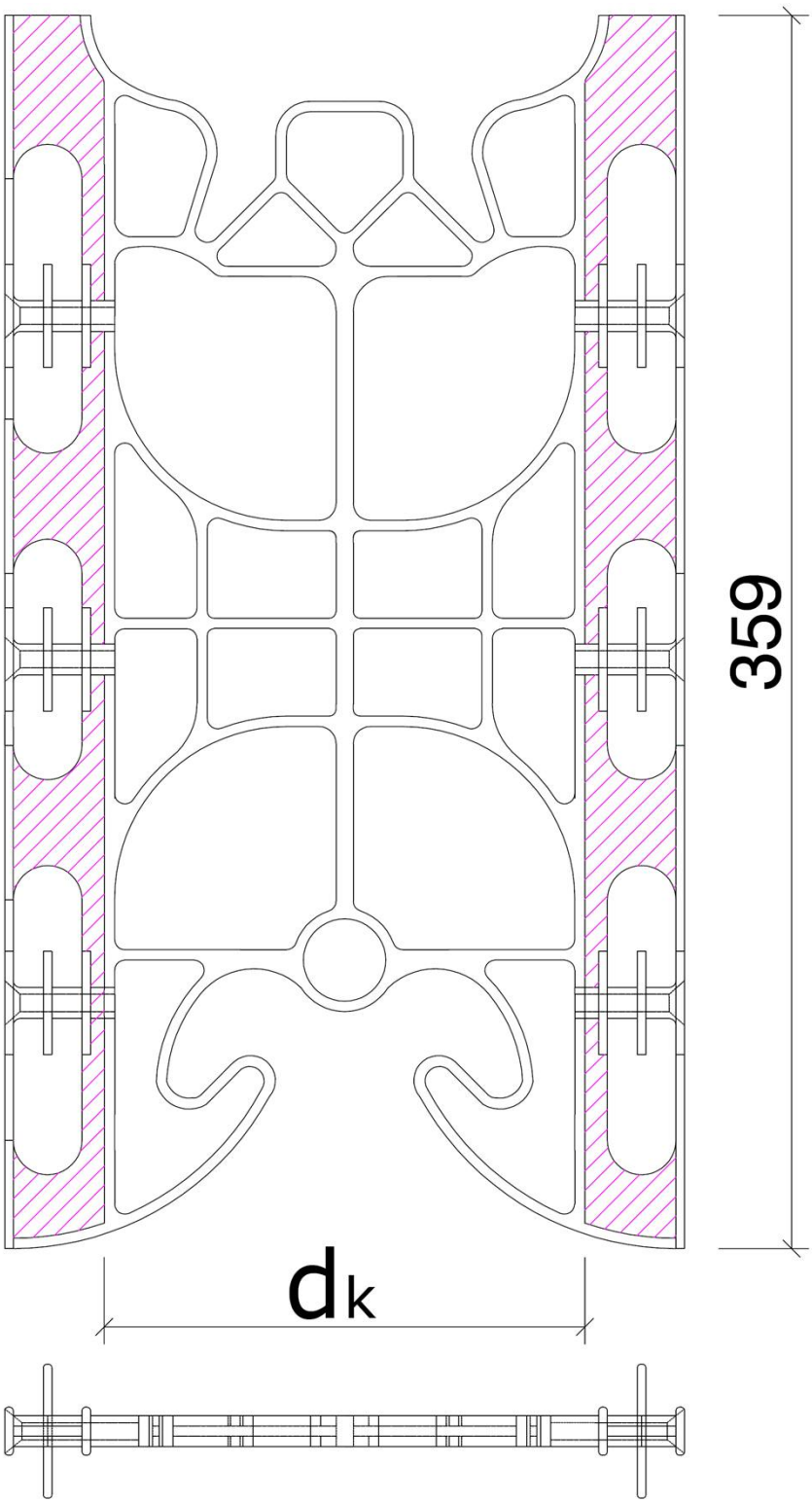


top view



Sketches not to scale
All dimensions in [mm]

WOLF THERMO MODULE	Annex A6
Accessory parts: Lintel shuttering elements and End stops	



Sketches not to scale
All dimensions in [mm]

WOLF THERMO MODULE	Annex A7
Spacers of polypropylene (PP-spacers)	

Type	see Annex	All-over wall thikness	Concrete core	Volume of concrete core per m² wall area	Calculation weight of the		
					Shuttering element	PP-spacer	Wall (without plaster)
		d	d_k	V_k	G_S	G_{PP}	G_W
	Nº	mm	mm	m³/m²	kN/m²	kg/spacer	kN/m²
G 62,5-312	A2	312.5	140.0	0.143	0.04	0.160	3.54
G 125-312	A2	312.5	140.0	0.143	0.04	0.160	3.54
G 187,5-312	A2	312.5	140.0	0.143	0.04	0.160	3.54
G 375-312	A2	312.5	140.0	0.143	0.04	0.160	3.54
G 500-312	A2	312.5	140.0	0.143	0.04	0.160	3.54
G 750-312	A2	312.5	140.0	0.143	0.04	0.160	3.54
G 1000-312	A2	312.5	140.0	0.143	0.04	0.160	3.54
G 62,5-437	A2	437.5	140.0	0.143	0.07	0.160	3.57
G 125-437	A2	437.5	140.0	0.143	0.07	0.160	3.57
G 187,5-437	A2	437.5	140.0	0.143	0.07	0.160	3.57
G 375-437	A2	437.5	140.0	0.143	0.07	0.160	3.57
G 500-437	A2	437.5	140.0	0.143	0.07	0.160	3.57
G 750-437	A2	437.5	140.0	0.143	0.07	0.160	3.57
G 1000-437	A2	437.5	140.0	0.143	0.07	0.160	3.57
G 62,5-250	A2	250.0	125.0	0.128	0.03	0.145	3.16
G 125-250	A2	250.0	125.0	0.128	0.03	0.145	3.16
G 187,5-250	A2	250.0	125.0	0.128	0.03	0.145	3.16
G 375-250	A2	250.0	125.0	0.128	0.03	0.145	3.16
G 500-250	A2	250.0	125.0	0.128	0.03	0.145	3.16
G 750-250	A2	250.0	125.0	0.128	0.03	0.145	3.16
G 1000-250	A2	250.0	125.0	0.128	0.03	0.145	3.16
G 62,5-312/187	A2	312.5	187.5	0.191	0.03	0.185	4.72
G 125-312/187	A2	312.5	187.5	0.191	0.03	0.185	4.72
G 187,5-312/187	A2	312.5	187.5	0.191	0.03	0.185	4.72
G 375-312/187	A2	312.5	187.5	0.191	0.03	0.185	4.72
G 500-312/187	A2	312.5	187.5	0.191	0.03	0.185	4.72
G 750-312/187	A2	312.5	187.5	0.191	0.03	0.185	4.72
G 1000-312/187	A2	312.5	187.5	0.191	0.03	0.185	4.72
G 62,5-375	A2	375.0	250.0	0.253	0.03	0.240	6.28
G 125-375	A2	375.0	250.0	0.253	0.03	0.240	6.28
G 187,5-375	A2	375.0	250.0	0.253	0.03	0.240	6.28
G 375-375	A2	375.0	250.0	0.253	0.03	0.240	6.28
G 500-375	A2	375.0	250.0	0.253	0.03	0.240	6.28
G 750-375	A2	375.0	250.0	0.253	0.03	0.240	6.28
G 1000-375	A2	375.0	250.0	0.253	0.03	0.240	6.28
G 1000-375	A2	375.0	140.0	0.143	0.05	0.160	3.55
G 1000-500	A2	500.0	140.0	0.143	0.08	0.160	3.58

WOLF THERMO MODULE

Dimensions, volumes and calculation weight of the shuttering elements

Annex A8

Deutsches Institut für Bautechnik DIBt

Installation

1 General

The manufacturer shall ensure that the requirements in accordance with sections 1 and 3 of the "Special Part" of this ETA are made known to those involved in planning and execution. The installation guide is deposited with Deutsches Institut für Bautechnik (DIBt) and shall be present at every construction site. If the manufacturer's instructions contain provisions which differ from those stated here, the specifications of the ETA shall apply.

After installation of the shuttering elements (see clause 2 of this Annex) the site-mixed or ready-mixed concrete is brought in and compacted (see clause 3 of this Annex).

In end use conditions concrete walls of a continuous type[1] of plain or reinforced concrete will be formed according to EN 1992-1-1 or according to corresponding national design rules.

For structural design purposes the thickness of the wall and the weight per unit area G_W without rendering is shown in Annex A8.

In end use conditions the EPS-shuttering leaves are the main part of the thermal insulation of the walls.

2 Installation of the shuttering elements

The shuttering elements are put together on site in layers without mortar or adhesive. To receive stable floor high formworks the vertical joints between two elements of one layer have to be shifted of at least 12.5 cm to the vertical joints of the previous and next layer (see Annexes B3 and B4). It is important to ensure that the PP-spacers are aligned one above the other.

The PP-spacers are either assembled on site (concrete core thickness 125.0 mm, 187.5 mm and 250.0 mm) or foamed (factory-made) into the inner and outer EPS-shuttering leaves (concrete core thickness 140.0 mm).

First of all two layers of the entire floor plan shall be interlocked according to the installation guide of the ETA holder.

Afterwards leveling to the subsoil is performed (foundation, bottom plate, and slabs). Voids between the shuttering leaves and the uneven subsoil shall be sealed with PU foam before concreting.

The PP-spacer shall be stacked (one upon the other) for avoiding segregation of concrete, see Annexes B3 and B4.

Subsequently, according to the installation guide of the ETA holder, the walls shall be interlocked to floor height, leveled and fastened to pull-push props (scaffolding supports), see Annex B5.

The pull-push props shall be arranged at a distance of 1.00 m to maximum 1.50 m, to be connected over the entire wall height with the shuttering elements and to be fastened to the floor.

The necessary reinforcement according to the structural analysis shall also be installed in an appropriate way.

Corner shuttering elements and T shuttering elements shall be formed according to Annex A3.

The values of thermal resistance respectively thermal conductivity shall be laid down according to the relevant national technical regulation.

Further information is given in the installation manual.

3 Concreting

For the production of normal-weight concrete with a minimum compressive strength class of C20/25 EN 206 shall apply. The consistency of concrete on compacting by shaking shall be within the lower consistency range F3 and on compacting by poking within the upper

[1] see ETAG 009 chapter 2.2

consistency range F3. The maximum aggregate size shall be at least 4 mm and shall not exceed 16 mm. The concrete shall have rapid or middle strength development according to EN 206.

Placing the concrete shall be performed only by persons who were instructed in the functions and in the proper handling of the shuttering system.

Placing the concrete shall be performed in layers of 0.75 m at a maximum vertical concreting rate of 1.0 m/h.

If equivalent national rules are not available the following instructions shall be considered:

Horizontal day joints shall be arranged preferably at the height of the floor. If day joints can not be avoided within the height between the floors, vertical composite reinforcement bars shall be installed. The composite reinforcement shall comply the following requirements:

- Two adjacent composite reinforcement bars shall not be situated in the same plane parallel to the surface of the wall.
- The distance between two composite reinforcement bars in the direction of the wall shall be at least 10 cm and not larger than 50 cm.
- The total section area of the composite reinforcement bars shall not be less than 1/2000 of the section area of the concrete.
- Anchorage length of the composite reinforcement bars on both sides of the day joint shall at least be 20 cm.

Before the further placing of concrete, cement laitance and detached / loose concrete shall be removed and the day joints shall be sufficiently pre-wetted. At the time of concreting the surface of the older concrete shall be slightly moist, so that the cement paste of the newly brought in concrete can bond well with the older concrete.

If no day joint is planned, placing of the concrete in layers may only be interrupted until the concrete layer brought in last is not solidified yet, so that a good and even bond is still possible between the two concrete layers. When using suitable internal vibrators care shall be taken that the vibrating cylinder can still penetrate the already compacted lower concrete layer.

The concrete may fall freely only up to a maximum height of 2.0 m, beyond that the concrete shall be placed by discharge pipes or concreting tubes with a diameter of 100 mm at the most and shall be led directly to the place of installation.

Cones from pouring shall be avoided by short distances of the places of fill in.

Planning shall allow for sufficient spaces in the reinforcement for discharge pipes or concreting tubes.

After concreting, the walls may not deviate from the plumb line more than 5 mm per running meter wall height, respectively for a wall height greater than 3.0 m not more than 16 mm.

The floor slab may only be placed on walls made of shuttering elements if a sufficient strength of the infill concrete has been reached.

4 Ducts crossing and situated inside the wall

Horizontally passing ducts shall be installed according to the installation guide of the ETA holder and shall be taken into account when designing the wall.

Horizontal ducts situated inside the wall cores shall be avoided. If absolutely necessary, these shall be taken into account when designing the wall.

Also, vertical ducts in the concrete core shall be considered, if their diameter exceeds 1/6 of the thickness of the concrete core and the distance of the pipes is less than 2.0 m.

5 Reworking and finishes

Walls of the type "WOLF THERMO MODULE" shall be protected by finishes (e. g. rendering, plasters, cladding, panelling, coatings). Finishes are not part of the kit and therefore not considered in this ETA. Preferably, for external surfaces the rendering systems used should meet the requirements of ETAG 004. The cladding respectively panelling or their substructures shall be anchored in the concrete core. The execution of the rendering shall be performed according to applicable national rules.

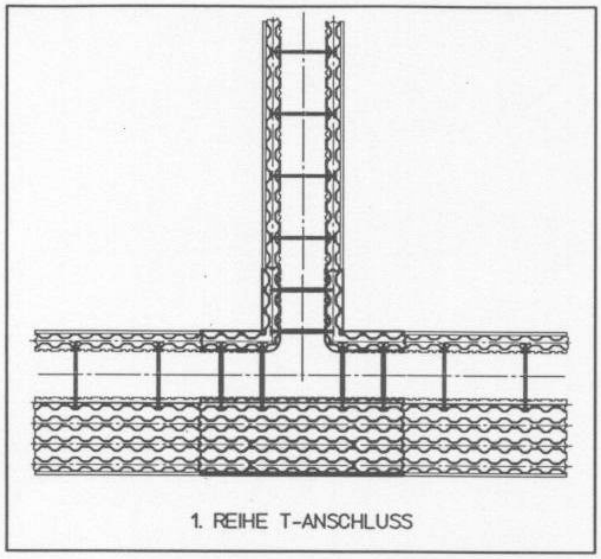
The protection by finishes should be implemented preferably within one month after erecting the structural structure, because of the detrimental influence of weather and UV-radiation on the surface of the EPS-leaves.

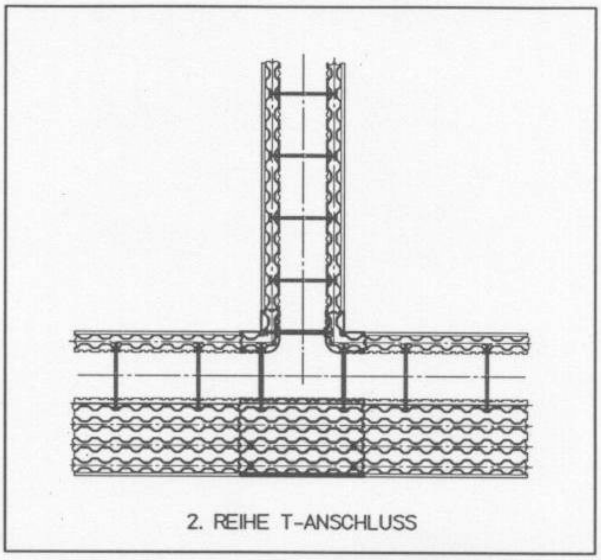
6 Fixing of objects

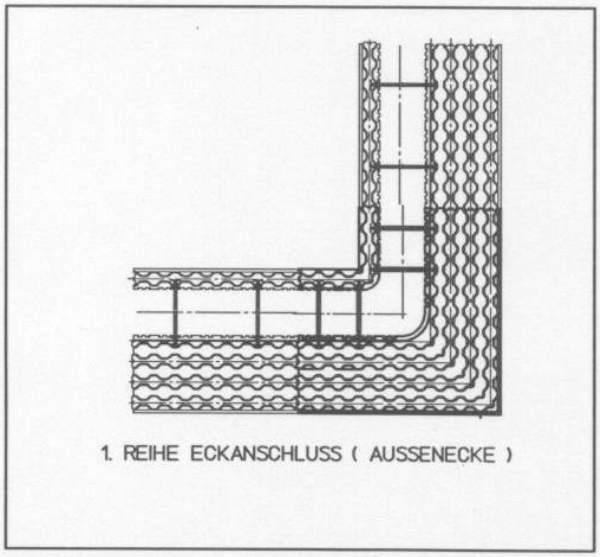
Fixing of objects in the shuttering leaves is not possible. The part of fixings which is relevant for the mechanical resistance shall be in the concrete. The influence of the fixing to the reduction of the thermal resistance has to be considered according to EN ISO 6946.

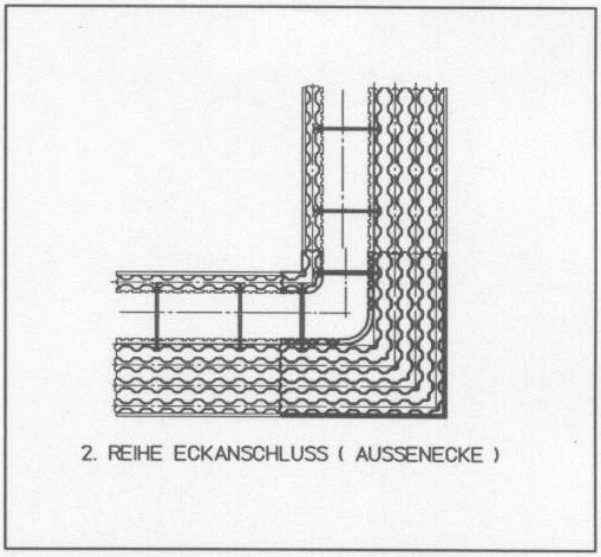
standards and guidelines		issue	title
EN	206	2013 + A2:2021	Concrete: Specification, performance, production and conformity
EN	1992-1-1	2011-01 + A1:2015-03	Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings
EN	12090	2013	Thermal insulating products for building applications – Determination of shear behaviour
EN	13163	2012+A2:2016	Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) – Specification
EN	13501-1	2018	Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests
EN	13501-2	2016	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services;
EN ISO	6946	2018	Building components and building elements - Thermal resistance and thermal transmittance - Calculation method
EN ISO	10456	2010	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007 + Cor. 1:2009)
EN ISO	13788	2013	Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods (ISO 13788:2012)
EAD	040083-00-0404	2019-01	External thermal insulation composite systems (ETICS) with renderings
EAD	340309-00-0305	2019-01	Non load-bearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete

WOLF THERMO MODULE	Annex B2
List of standards and guidelines	

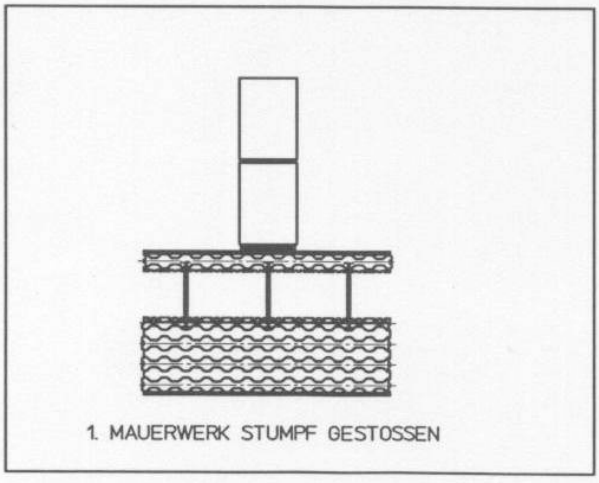


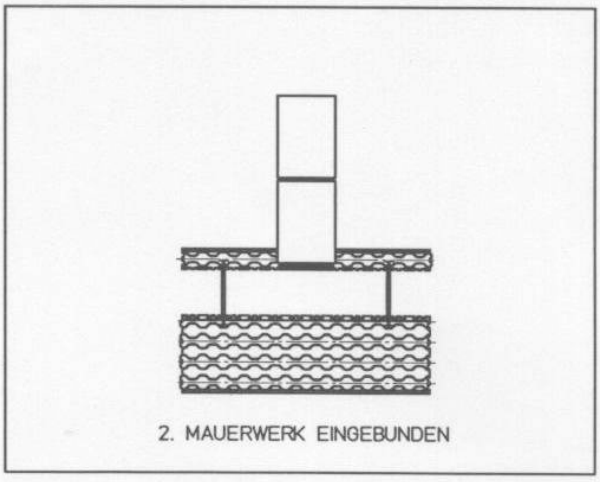




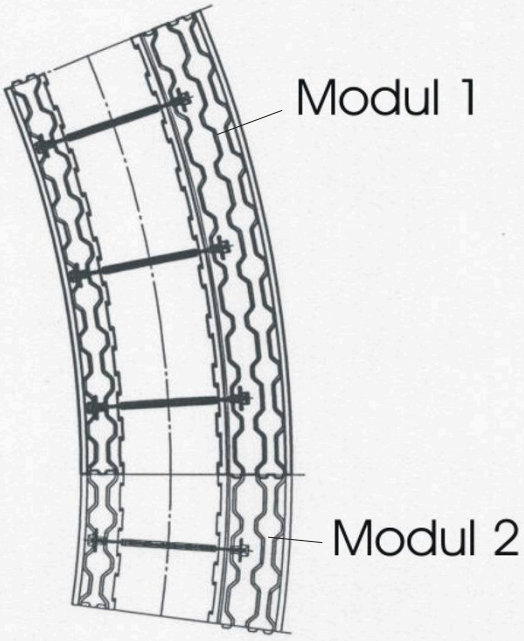


HINWEIS : MODULE IMMER IM VERBAND MIT MIN. 12.5 CM ÜBEREINANDERSETZEN





WOLF THERMO MODULE	Annex B3
Structure of layers: T shuttering elements and Corner shuttering elements Connection: Masonry – Shuttering elements	



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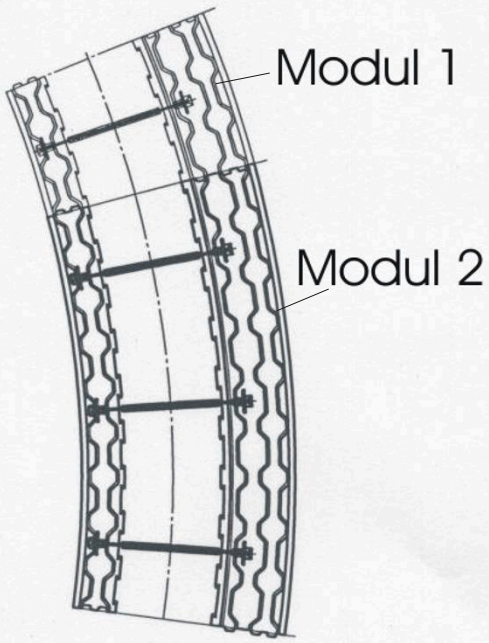
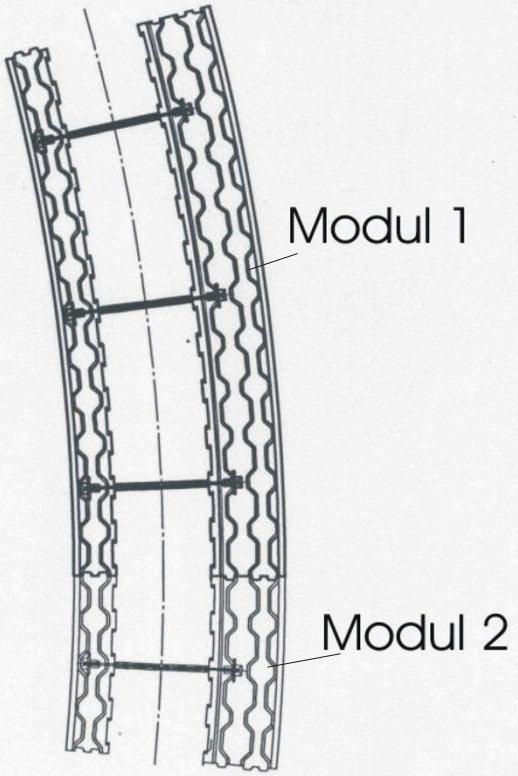


2. REIHE RUNDMODULE R=1500



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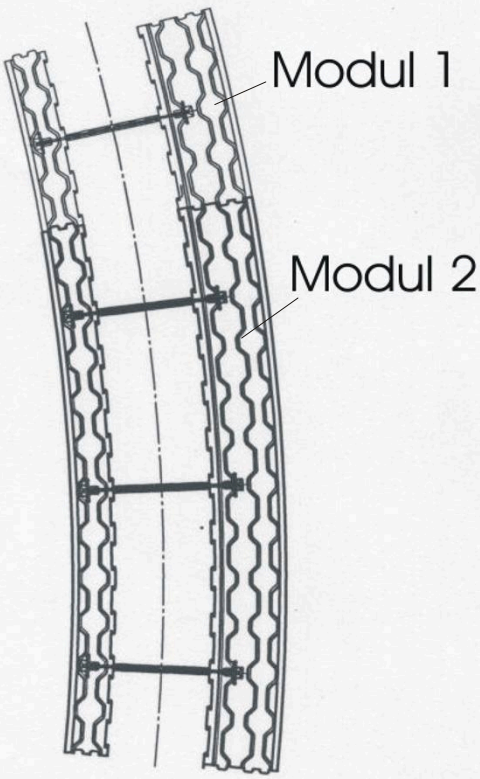
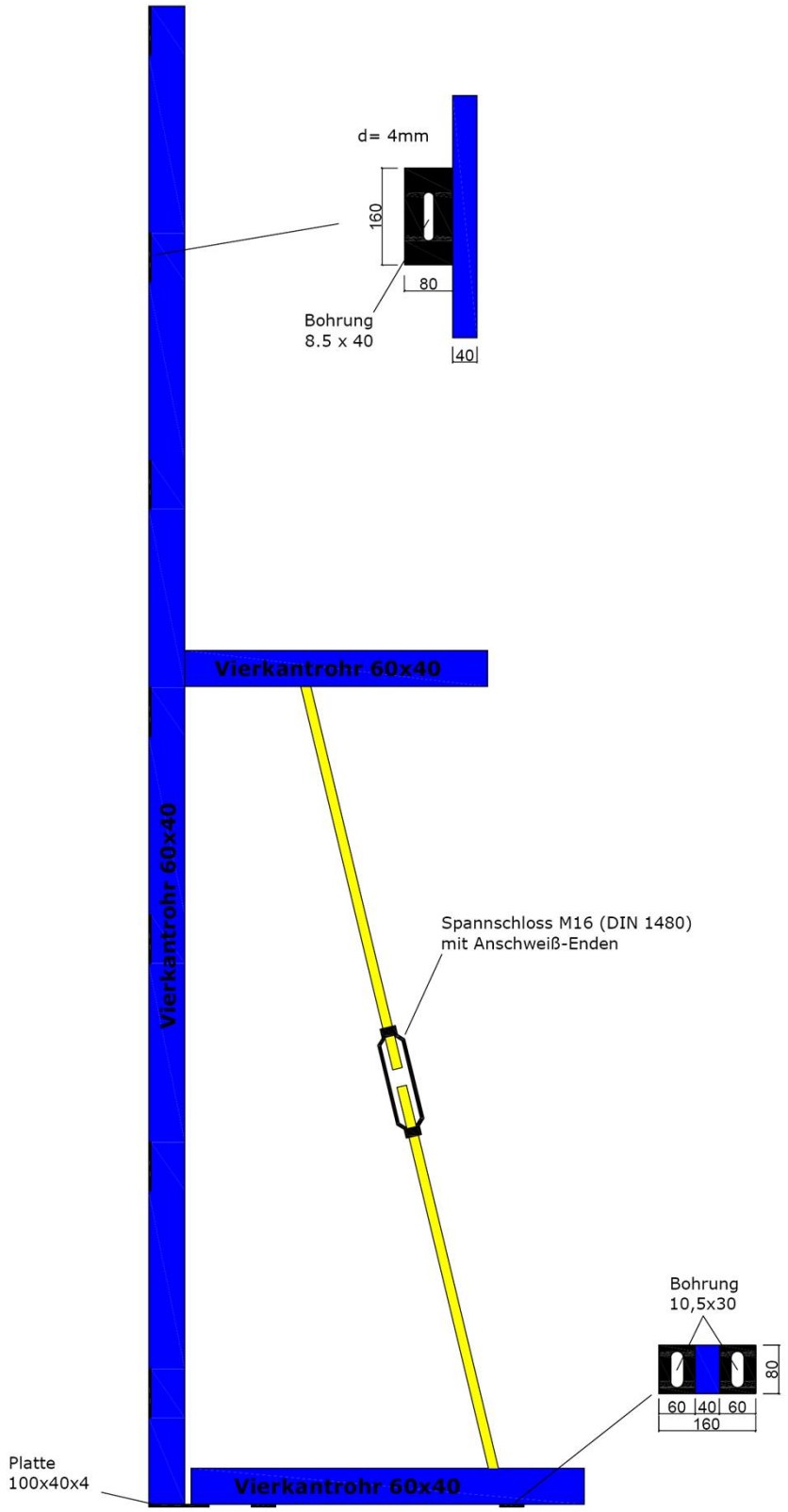


2. REIHE RUNDMODULE R=3000

WOLF THERMO MODULE

Structure of layers: Curved shuttering elements

Annex B4



WOLF THERMO MODULE	Annex B5
Pull-push props	

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Description to BWR 1 – Mechanical resistance and stability

Efficiency of filling

Considering the instructions of Annex B1 and the installation guide of the ETA holder the efficient filling without bursting of the shuttering and without voids or any uncovered reinforcement in the concrete core is possible.

Possibility of steel reinforcement

The instructions in the installation guide of the ETA holder are appropriate to install steel reinforcement for walls according to EN 1992-1-1 or corresponding national rules.

Description to BWR 2 – safety in case of fire

Resistance to fire

The walls will be exposed to the fire on one site only.

According to EAD 340309-00-0305, Annex A, Table A1, for a continuous type of load-bearing walls ("REI") or non load-bearing walls ("EI") and a minimum concrete strength of C16/20 the system meets the criteria "REI" and "EI" as follows (see Table C2.1).

Table C2.1: Determination of “REI” of load bearing wall and "EI" of non load-bearing walls

Thickness of concrete core [mm]	**"REI"** according to EAD 340309-00-0305, Annex A, Table A1	**"EI"** according to EAD 340309-00-0305, Annex A, Table A1
125.0	90	120
140.0		
187.5	120	
250.0		

To classify the shuttering elements of the criteria stated in Table C2.1 the following conditions have to be fulfilled according to Annex A of the EAD 340309-00-0305.

- The design of the building has to take into consideration the secondary effects of fire. Especially constraints, introduced by thermal strain, should be sufficiently low and appropriate building joints should be foreseen. The rules, valid in the place of use, govern. Structural requirements under normal conditions, valid in the place of use, may require larger dimensions. Concrete cover for the reinforcement has to be observed according to the rules valid in the place of use.
- A normal-weight concrete as defined in EN 206 or EN 1992-1-1 shall be used. As far as European standards EN 206 or EN 1992-1-1 are not in force, an equivalent concrete according to national rules, valid in the place of use, is acceptable.
- The strength of concrete shall be between C 16/20 and C 50/60 according to EN 206. In lack of availability of European standard EN 206, alternatively a concrete according to national rules, valid in the place of use, with a compressive strength which fits the range given above, is also considered as appropriate.

Note 1: The classification of the walls constructed with the shuttering system "WOLF THERMO MODULE" regarding to fire resistance are valid only for walls without openings (for windows or doors for examples).

Note 2: The assessment of fire resistance in accordance with EAD 340309-00-0305, Annex A, is not recognised in all EOTA member states, including Germany.

Description of performance to BWR 3 – hygiene, health and environment

Water vapour permeability

The tabulated design value of water vapour diffusion resistance coefficient of expanded polystyrene (EPS), according to EN 12524, is $\mu = 60$.

The values for the water vapour diffusion resistance of concrete in dependence of density and type are tabulated in EN 12524.

Description to BWR 4 – Safety and accessibility in use

Bond Strength

between shuttering leaves

The shuttering leaves are single layered, hence there is no determination of the bond strength between shuttering leaves.

between shuttering leaf and concrete

There is an adhesive bond between the shuttering leaf and the concrete [figure 2.2.10.2.1 (a) in EAD 340309-00-0305, chapter 2.2.10.2].

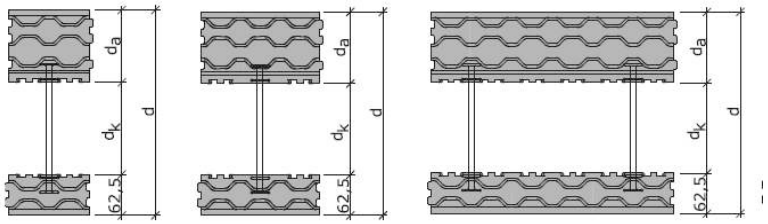

fig 1: Sketch bond between shuttering leaf and concrete core

Under end use conditions the EPS-leaves are durable fixed by the PP-spacers. The bond strength is at least equal to the resisting concrete pressure of the shuttering elements to clause 3.4.2, furthermore the vertical inner surface of shuttering elements consists of a system of tongues and grooves to allow mechanical interlock of the shuttering leaves with the concrete infill.

Resistance to impact load

Global resistance

Concrete walls (without consideration of the finishes), constructed with shuttering system „WOLF THERMO MODULE" and designed according EN 1992-1-1 respectively in lack of availability of EN 1992-1-1 according national design rules, lead to the assumption that concrete core insures an adequate resistance of the complete wall to normal use impact loads.

Description to BWR 6 – Energy economy and heat retention

Thermal Resistance

Assuming a minimal declared value of thermal conductivity of λ_D = 0.035 W/(m K), see clause Annex A1, for the expanded polystyrene and for concrete infill of λ_D = 2.3 W/(m K) (according to EN ISO 10456) the values of declared thermal resistance of the shuttering elements have been determined by numerical calculations. Table C5.1 gives the declared values of thermal resistance R_D.

Table C5.1: Declared values of thermal resistance R_D calculated according to EN ISO 6946, clause 6 as multilayered construct product (with concrete infill without rendering and without consideration of PP-spacer) depending on the thickness of the outer leaf of expanded polystyrene and thickness of concrete core.

Type of shuttering element according to Annex A2	**All-over wall thickness** **d** [mm]	**Thickness of concrete core** **d_k** [mm]	**Thickness of the inner shuttering EPS-leaf** **d_i** [mm]	**Thickness of the outer shuttering EPS-leaf** **d_a** [mm]	**Declared value of thermal resistance** **R_D** [(m² K)/W]
G length-250	250.0	125.0	62.5	62.5	3.626
G length-312	312.5	140.0	62.5	110.0	4.989
G length-312/187	312.5	187.5	62.5	62.5	3.653
G length-375	375.0	250.0	62.5	62.5	3.680
G 1000-375	375.0	140.0	62.5	172.5	6.775
G length-437	437.5	140.0	62.5	235.0	8.561
G 1000-500	500.0	140.0	62.5	297.5	10.347

The planner shall consider accessory parts made of steel as thermal bridges, where relevant, for determination of the thermal resistance.

Heat capacity

The values for the heat capacity of concrete and expanded polystyrene are tabulated in EN ISO 10456.

Description to: Aspects of durability

Resistance to detoriation

Physical agent

The relative changes of the EPS-leaves (see Annex A1) in length, width and thickness under specified temperature and humidity conditions shall not exceed 3 % after exposing them for 48 h at 70 °C (DS(70, -)3, according to EN 13163).