



# European Technical Assessment **ETA 18/0265** of 21/02/2022

## General Part

**Technical Assessment Body issuing the ETA**

**Eurofins Expert Services Oy**

**Trade name of the construction product**

**PAROC Fire Steel Protect  
PAROC Fire Steel Protect N1  
PAROC Fire Steel Protect AluCoat  
PAROC Fire Steel Protect N1AluCoat**

**Product family to which the construction product belongs**

Fire protection of loadbearing steel structures

**Manufacturer**

**Paroc Group Oy  
Energiakuja 3, P.O. Box 240  
FI-00181 Helsinki  
Finland**

**Manufacturing plants**

Paroc Polska Sp. z o.o.  
Ul. Gnieznienska 4  
PL-62-240 Trzemeszno, Poland

**This European Technical Assessment contains**

14 pages including 3 Annexes which form an integral part of this assessment

**This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of**

European Assessment Document (EAD)  
350142-00-1106 - Fire protective board, slab and mat products and kits

**This version replaces**

ETA 18/0265, issued on 23/04/2018

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

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es), where relevant).

## Specific Part

### 1 Technical description of the product

The products PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat are stone wool insulation boards. The boards are faced or unfaced as given in Table 1.

Table 1. Facing of PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat

Product name	Facing
PAROC Fire Steel Protect	Unfaced
PAROC Fire Steel Protect N1	Glass fibre tissue
PAROC Fire Steel Protect AluCoat	Aluminium foil
PAROC Fire Steel ProtectN1AluCoat	Glass fibre tissue and aluminium foil

Dimensions and density of the boards are given in Table 2.

Table 2. Dimensions and density of PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat

	Nominal value	Tolerance
Density	160 - 170 kg/m <sup>3</sup>	
Length	600 mm	< ±12 mm
	900 mm	< ±18 mm
Width	1200 mm	< ± 18 mm
Thickness	20 - 60 mm	≤ -1 mm, ≤ +3 mm

The boards are CE marked according to harmonized product standard EN 13162 with designation code MW-EN13162-T5-DS(70,-)-WS-WL(P)-MU1/Z(6,0). The fire protective system is fastened either using welding pins or fire screws. The mechanical fasteners are described in Annex 1. The fasteners are not covered by this ETA and cannot be CE marked on the basis of it.

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

PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat boards are intended to be used for fire protection of structural steel columns and beams as specified in Table 3.

Table 3. Intended use of PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat

Product	Use category	Protection of	Climatic conditions use category
PAROC Fire Steel Protect PAROC Fire Steel Protect N1 PAROC Fire Steel Protect AluCoat PAROC Fire Steel Protect N1AluCoat	Type 4	Load-bearing steel elements as specified in Annex 1	Type Z <sub>2</sub>

The provisions made in this European Technical Assessment are based on an assumed intended working life of 25 years provided that the products are subject to appropriate installation and maintenance.

The indication given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by the Technical Assessment Body issuing this ETA, but is regarded only as a means for expressing the expected economically reasonable working life of the product.

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

Table 4. Basic requirements for construction works and essential characteristics

Basic requirement and essential characteristics	Performance
BWR 2. Safety in case of fire	
Reaction to fire	Clause 3.1
Resistance to fire	Clause 3.2
Durability and serviceability	Clause 3.3
BWR 3. Hygiene, health and the environment	
Water permeability	No performance assessed
BWR 4. Safety and accessibility in use	
Flexural strength	No performance assessed
Dimensional stability	Clause 3.4
BWR 6. Energy economy and heat retention	
Thermal resistance	Clause 3.5
Water vapour transmission coefficient	Clause 3.6

#### 3.1 Reaction to fire

PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat insulation boards have been tested and classified according to Commission Delegated Regulation (EU) No 2016/364. Reaction to fire class of the products is A1.

#### 3.2 Resistance to fire

Resistance to fire of assemblies incorporating PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat or PAROC Fire Steel Protect N1AluCoat boards has been tested according to EN 13381-4:2013 and classified according to EN 13501-2:2016. Description of the tested fire protection assemblies is presented in Annex 1.

Resistance to fire performance classes of the tested assemblies are R 30 - R 240. Tables of insulation thickness required to achieve the resistance to fire class, in relation to section factor and design temperature, are presented in Annex 2 for boards installed with PAROC Welding Pins and in Annex 3 for boards installed with PAROC Fire Springs.

#### 3.3 Durability and serviceability

Working life of the boards is 25 years for the intended use  $Z_2$  (internal use), if not more than accidental wetting and no frosting inside the building is to be expected.

#### 3.4 Dimensional stability

Dimensional stability of the boards has been determined according to EN 1604 in condition 48 h, 70 °C. The change in product length, width and thickness is less than 1 % fulfilling the requirements of product standard EN 13162 designation DS(70,-).

#### 3.5 Thermal resistance

Thermal conductivity  $\lambda_D$  of the boards is 0,038 W/mK.

#### 3.6 Water vapour transmission coefficient

Water vapour transmission coefficient ( $\mu$ ) is 1 for PAROC Fire Steel Protect and PAROC Fire Steel Protect N1.

Water vapour transmission coefficient ( $\mu$ ) for PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat is 54 000 corresponding to declared water vapour resistance  $Z(6,00)$ .

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

According to the European Commission Decision 99/454/EC as amended, the system of assessment and verification of constancy of performance is System 1.

**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 at Eurofins Expert Services Oy.

Issued in Espoo on 21/02/2022  
by Eurofins Expert Services Oy



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## PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat board protection for steel structures

### Installation of fire protection

#### Fire protective boards and fastenings:

Components:

Fire protection material	Stone wool boards PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat manufactured by Paroc Group
Board sizes	1200 mm x 600 mm and 1200 x 900 mm
Nominal density	160 - 170 kg/m <sup>3</sup>
Nominal thickness	20 mm - 60 mm
Fastenings:	
PAROC Welding Pins	Steel pins coated with copper, Ø 2,7 mm, length corresponding to the thickness of the fire protective board
Washers	Galvanized steel washers for welding pins, Ø 30 mm
PAROC Fire Spring	PAROC XFS 001 spiral spring screws made of steel rod. Rod diameter 1,6 mm, spring external diameter 8 mm and top diameter 15 mm

#### Tested applications:

PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat and PAROC Fire Steel Protect N1AluCoat were tested to cover the following applications:

Structural members	Beams and columns, maximum depth (h) of the cross-section 600 mm
Protection	Three and four sided fire exposure
Steel sections	Installed with PAROC Welding Pins: I/H sections and rectangular and square closed sections Installed with PAROC Fire Screws: I/H sections and rectangular columns
Section factor, $A_m/V$	From 47 m <sup>-1</sup> to 281 m <sup>-1</sup>
Design temperature	300 °C to 700 °C

#### Installation

Fire protective system is installed according to the manufacturer's detailed installation instructions and provisions given in this ETA.

#### Installation using PAROC Welding Pins

The insulation boards are fixed to the steel structure using PAROC Welding Pins. The pins used shall be 2 - 3 mm longer than the insulation thickness.

For the insulation boards between two flanges, the pins are placed max. c-c 367 mm in the longitudinal direction, 50 mm in from each joint, with one pin in each side of the board connected to each flange (8 pins / board).

For the insulation boards mounted on flanges (width over 180 mm), the pins are placed max. c-c 367 mm in the longitudinal direction, 50 mm in from each joint (8 pins / board). If the width of the flange is 180 mm or less, minimum one pin should be placed in the center of the board (4 pins/board). For flanges with a width above 180 mm two pins should be used.

Butt-joints are supported from the behind with 100 mm wide PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat or PAROC Fire Steel Protect N1AluCoat stone wool strip of the same thickness as the fire protection board.

All edges of the profile are fully covered by the boards. At installation on beams, the boards on the sides shall cover the bottom layer boards and not vice versa. All joints in insulation shall be tightly sealed, leaving no gaps.

### **Installation using PAROC Fire Springs**

Insulation installed as a box around the profile:

The insulation boards are mounted using PAROC Fire Springs. The length of PAROC Fire Spring shall be selected according to the thickness of the insulation board and shall be minimum 2 x insulation thickness. In case flange width is 300 - 600 mm PAROC Welding Pins are needed to fix the board to the flange according to manufacturer's instructions.

Butt-joints are supported from the behind with 100 mm wide PAROC Fire Steel Protect, PAROC Fire Steel Protect N1, PAROC Fire Steel Protect AluCoat or PAROC Fire Steel Protect N1AluCoat stone wool strip of the same thickness as the fire protection board. Supports shall be positioned at board joints and at the mid of each board, at max 600 mm distance.

Boards on the sides are installed by fastening them to the supports with PAROC Fire Springs with distance from board edges 50 mm and distance between springs  $\leq 150$  mm. The height of the boards shall be the profile height + 2 x insulation thickness.

On the flanges, the protective board is installed using PAROC Fire Springs through the side boards into the edge of the board on the flange. Distance between fire springs shall be  $\leq 200$  mm and fire spring distance from board edges 50 mm. To the lower side of a horizontal beam with flange width more than 300 mm, the protective board shall additionally be fixed with PAROC Welding Pins (max distance between pins 360 mm, 4 pins/board). In case of 4-sided horizontal exposure, no welding pins is needed on the top flange.

All joints in insulation shall be tightly sealed, leaving no gaps.

## Insulation thickness in resistance to fire classes R 30 - R 240 in relation to design temperature and section factor

### Installation with PAROC Welding Pins

#### Insulation thickness for R30 steel structure

Fire resistance period 30 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	20	20	20	20	20	20	20	20	20
50	20	20	20	20	20	20	20	20	20
55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
65	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
75	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
85	20	20	20	20	20	20	20	20	20
90	20	20	20	20	20	20	20	20	20
95	20	20	20	20	20	20	20	20	20
100	20	20	20	20	20	20	20	20	20
105	20	20	20	20	20	20	20	20	20
110	20	20	20	20	20	20	20	20	20
115	20	20	20	20	20	20	20	20	20
120	20	20	20	20	20	20	20	20	20
125	20	20	20	20	20	20	20	20	20
130	20	20	20	20	20	20	20	20	20
135	20	20	20	20	20	20	20	20	20
140	20	20	20	20	20	20	20	20	20
145	20	20	20	20	20	20	20	20	20
150	20	20	20	20	20	20	20	20	20
155	20	20	20	20	20	20	20	20	20
160	20	20	20	20	20	20	20	20	20
165	20	20	20	20	20	20	20	20	20
170	20	20	20	20	20	20	20	20	20
175	20	20	20	20	20	20	20	20	20
180	20	20	20	20	20	20	20	20	20
185	20	20	20	20	20	20	20	20	20
190	20	20	20	20	20	20	20	20	20
195	20	20	20	20	20	20	20	20	20
200	25	20	20	20	20	20	20	20	20
205	25	20	20	20	20	20	20	20	20
210	25	20	20	20	20	20	20	20	20
215	25	20	20	20	20	20	20	20	20
220	25	20	20	20	20	20	20	20	20
225	25	20	20	20	20	20	20	20	20
230	25	20	20	20	20	20	20	20	20
235	25	20	20	20	20	20	20	20	20
240	25	20	20	20	20	20	20	20	20
245	30	20	20	20	20	20	20	20	20
250	30	20	20	20	20	20	20	20	20
255	30	20	20	20	20	20	20	20	20
260	30	20	20	20	20	20	20	20	20
265	30	20	20	20	20	20	20	20	20
270	30	20	20	20	20	20	20	20	20
275	30	20	20	20	20	20	20	20	20
280	30	20	20	20	20	20	20	20	20
281	30	25	20	20	20	20	20	20	20

#### Insulation thickness for R60 steel structure

Fire resistance period 60 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	20	20	20	20	20	20	20	20	20
50	20	20	20	20	20	20	20	20	20
55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
65	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
75	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
85	20	20	20	20	20	20	20	20	20
90	25	20	20	20	20	20	20	20	20
95	25	20	20	20	20	20	20	20	20
100	25	20	20	20	20	20	20	20	20
105	30	20	20	20	20	20	20	20	20
110	30	25	20	20	20	20	20	20	20
115	30	25	20	20	20	20	20	20	20
120	30	25	20	20	20	20	20	20	20
125	40	25	20	20	20	20	20	20	20
130	40	30	20	20	20	20	20	20	20
135	40	30	20	20	20	20	20	20	20
140	40	30	25	20	20	20	20	20	20
145	40	30	25	20	20	20	20	20	20
150	40	30	25	20	20	20	20	20	20
155	40	40	25	20	20	20	20	20	20
160	40	40	30	20	20	20	20	20	20
165	40	40	30	20	20	20	20	20	20
170	50	40	30	25	20	20	20	20	20
175	50	40	30	25	20	20	20	20	20
180	50	40	30	25	20	20	20	20	20
185	50	40	30	25	20	20	20	20	20
190	50	40	30	25	20	20	20	20	20
195	50	40	40	25	20	20	20	20	20
200	50	40	40	25	20	20	20	20	20
205	50	40	40	30	20	20	20	20	20
210	50	40	40	30	25	20	20	20	20
215	50	50	40	30	25	20	20	20	20
220	60	50	40	30	25	20	20	20	20
225	60	50	40	30	25	20	20	20	20
230	60	50	40	30	25	20	20	20	20
235	60	50	40	30	25	20	20	20	20
240	60	50	40	30	25	20	20	20	20
245	60	50	40	30	25	20	20	20	20
250	60	50	40	30	25	20	20	20	20
255	60	50	40	40	25	20	20	20	20
260	60	50	40	40	30	25	20	20	20
265	60	50	40	40	30	25	20	20	20
270	60	50	40	40	30	25	20	20	20
275	-	50	40	40	30	25	20	20	20
280	-	50	40	40	30	25	20	20	20
281	-	50	40	40	30	25	20	20	20

**Insulation thickness for R90 steel structure**

Fire resistance period 90 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	20	20	20	20	20	20	20	20	20
50	20	20	20	20	20	20	20	20	20
55	20	20	20	20	20	20	20	20	20
60	25	20	20	20	20	20	20	20	20
65	25	20	20	20	20	20	20	20	20
70	30	25	20	20	20	20	20	20	20
75	30	25	20	20	20	20	20	20	20
80	40	30	20	20	20	20	20	20	20
85	40	30	25	20	20	20	20	20	20
90	40	30	25	20	20	20	20	20	20
95	40	40	30	20	20	20	20	20	20
100	40	40	30	25	20	20	20	20	20
105	50	40	30	25	20	20	20	20	20
110	50	40	40	30	20	20	20	20	20
115	50	40	40	30	25	20	20	20	20
120	50	50	40	30	25	20	20	20	20
125	50	50	40	30	25	20	20	20	20
130	50	50	40	40	30	20	20	20	20
135	60	50	40	40	30	25	20	20	20
140	60	50	40	40	30	25	20	20	20
145	60	50	50	40	30	25	20	20	20
150	60	50	50	40	40	25	20	20	20
155	60	60	50	40	40	30	25	20	20
160	60	60	50	40	40	30	25	20	20
165	-	60	50	40	40	30	25	20	20
170	-	60	50	40	40	30	25	20	20
175	-	60	50	50	40	30	25	20	20
180	-	60	50	50	40	30	25	25	20
185	-	60	50	50	40	40	30	25	20
190	-	60	50	50	40	40	30	25	20
195	-	60	60	50	40	40	30	25	20
200	-	-	60	50	40	40	30	25	20
205	-	-	60	50	40	40	30	25	20
210	-	-	60	50	40	40	30	25	20
215	-	-	60	50	40	40	30	25	25
220	-	-	60	50	40	40	30	30	25
225	-	-	60	50	50	40	30	30	25
230	-	-	60	50	50	40	40	30	25
235	-	-	60	50	50	40	40	30	25
240	-	-	60	50	50	40	40	30	25
245	-	-	60	50	50	40	40	30	25
250	-	-	60	50	50	40	40	30	25
255	-	-	60	50	50	40	40	30	25
260	-	-	60	50	50	40	40	30	25
265	-	-	60	60	50	40	40	30	25
270	-	-	-	60	50	40	40	30	30
275	-	-	-	60	50	40	40	30	30
280	-	-	-	60	50	40	40	30	30
281	-	-	-	60	50	40	40	30	30

**Insulation thickness for R120 steel structure**

Fire resistance period 120 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	25	20	20	20	20	20	20	20	20
50	30	25	20	20	20	20	20	20	20
55	30	25	20	20	20	20	20	20	20
60	40	30	25	20	20	20	20	20	20
65	40	40	30	20	20	20	20	20	20
70	40	40	30	25	20	20	20	20	20
75	50	40	40	30	20	20	20	20	20
80	50	40	40	30	25	20	20	20	20
85	50	50	40	40	30	20	20	20	20
90	50	50	40	40	30	25	20	20	20
95	60	50	50	40	40	25	20	20	20
100	60	50	50	40	40	30	20	20	20
105	60	60	50	40	40	30	25	20	20
110	60	60	50	50	40	40	25	20	20
115	-	60	50	50	40	40	30	25	20
120	-	60	60	50	40	40	30	25	20
125	-	60	60	50	50	40	30	25	20
130	-	-	60	50	50	40	40	30	25
135	-	-	60	50	50	40	40	30	25
140	-	-	60	60	50	40	40	30	25
145	-	-	60	60	50	40	40	30	25
150	-	-	60	60	50	50	40	40	30
155	-	-	-	60	50	50	40	40	30
160	-	-	-	60	50	50	40	40	30
165	-	-	-	60	50	50	40	40	30
170	-	-	-	60	50	50	40	40	30
175	-	-	-	60	60	50	40	40	30
180	-	-	-	60	60	50	40	40	40
185	-	-	-	60	60	50	50	40	40
190	-	-	-	-	60	50	50	40	40
195	-	-	-	-	60	50	50	40	40
200	-	-	-	-	60	50	50	40	40
205	-	-	-	-	60	50	50	40	40
210	-	-	-	-	60	50	50	40	40
215	-	-	-	-	60	50	50	40	40
220	-	-	-	-	60	50	50	40	40
225	-	-	-	-	60	50	50	40	40
230	-	-	-	-	60	60	50	40	40
235	-	-	-	-	60	60	50	40	40
240	-	-	-	-	60	60	50	50	40
245	-	-	-	-	60	60	50	50	40
250	-	-	-	-	60	60	50	50	40
255	-	-	-	-	60	60	50	50	40
260	-	-	-	-	60	60	50	50	40
265	-	-	-	-	-	60	50	50	40
270	-	-	-	-	-	60	50	50	40
275	-	-	-	-	-	60	50	50	40
280	-	-	-	-	-	60	50	50	40
281	-	-	-	-	-	60	50	50	40



**Insulation thickness for R150 steel structure**

Fire resistance period 150 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	40	30	25	20	20	20	20	20	20
50	40	30	30	20	20	20	20	20	20
55	40	40	30	25	20	20	20	20	20
60	50	40	40	30	25	20	20	20	20
65	50	50	40	40	30	20	20	20	20
70	50	50	50	40	40	25	20	20	20
75	60	50	50	40	40	30	25	20	20
80	60	60	50	50	40	40	30	20	20
85	60	60	50	50	50	40	30	25	20
90	-	60	60	50	50	40	40	30	20
95	-	60	60	50	50	40	40	30	25
100	-	-	60	60	50	50	40	40	25
105	-	-	60	60	50	50	40	40	30
110	-	-	-	60	60	50	50	40	30
115	-	-	-	60	60	50	50	40	40
120	-	-	-	-	60	50	50	40	40
125	-	-	-	-	60	60	50	40	40
130	-	-	-	-	60	60	50	50	40
135	-	-	-	-	60	60	50	50	40
140	-	-	-	-	60	60	50	50	40
145	-	-	-	-	-	60	50	50	40
150	-	-	-	-	-	60	50	50	40
155	-	-	-	-	-	60	60	50	50
160	-	-	-	-	-	60	60	50	50
165	-	-	-	-	-	60	60	50	50
170	-	-	-	-	-	60	60	50	50
175	-	-	-	-	-	60	60	50	50
180	-	-	-	-	-	-	60	50	50
185	-	-	-	-	-	-	60	50	50
190	-	-	-	-	-	-	60	50	50
195	-	-	-	-	-	-	60	50	50
200	-	-	-	-	-	-	60	60	50
205	-	-	-	-	-	-	60	60	50
210	-	-	-	-	-	-	60	60	50
215	-	-	-	-	-	-	60	60	50
220	-	-	-	-	-	-	60	60	50
225	-	-	-	-	-	-	60	60	50
230	-	-	-	-	-	-	60	60	50
235	-	-	-	-	-	-	60	60	50
240	-	-	-	-	-	-	60	60	50
245	-	-	-	-	-	-	60	60	50
250	-	-	-	-	-	-	60	60	50
255	-	-	-	-	-	-	60	60	50
260	-	-	-	-	-	-	-	60	50
265	-	-	-	-	-	-	-	60	50
270	-	-	-	-	-	-	-	60	50
275	-	-	-	-	-	-	-	60	50
280	-	-	-	-	-	-	-	60	50
281	-	-	-	-	-	-	-	60	50

**Insulation thickness for R180 steel structure**

Fire resistance period 180 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	40	40	40	30	20	20	20	20	20
50	50	40	40	40	25	20	20	20	20
55	50	50	40	40	40	25	20	20	20
60	60	50	50	50	40	30	25	20	20
65	60	60	50	50	50	40	30	20	20
70	60	60	60	50	50	40	40	30	20
75	-	60	60	60	50	50	40	40	25
80	-	-	60	60	60	50	50	40	30
85	-	-	-	60	60	50	50	40	40
90	-	-	-	-	60	60	50	50	40
95	-	-	-	-	60	60	50	50	40
100	-	-	-	-	-	60	60	50	50
105	-	-	-	-	-	60	60	50	50
110	-	-	-	-	-	-	60	50	50
115	-	-	-	-	-	-	60	60	50
120	-	-	-	-	-	-	60	60	50
125	-	-	-	-	-	-	60	60	50
130	-	-	-	-	-	-	-	60	50
135	-	-	-	-	-	-	-	60	60
140	-	-	-	-	-	-	-	60	60
145	-	-	-	-	-	-	-	60	60
150	-	-	-	-	-	-	-	60	60
155	-	-	-	-	-	-	-	60	60
160	-	-	-	-	-	-	-	60	60
165	-	-	-	-	-	-	-	60	60
170	-	-	-	-	-	-	-	-	60
175	-	-	-	-	-	-	-	-	60
180	-	-	-	-	-	-	-	-	60
185	-	-	-	-	-	-	-	-	60
190	-	-	-	-	-	-	-	-	60
195	-	-	-	-	-	-	-	-	60
200	-	-	-	-	-	-	-	-	60
205	-	-	-	-	-	-	-	-	60
210	-	-	-	-	-	-	-	-	60
215	-	-	-	-	-	-	-	-	60
220	-	-	-	-	-	-	-	-	60
225	-	-	-	-	-	-	-	-	60
230	-	-	-	-	-	-	-	-	60
235	-	-	-	-	-	-	-	-	60
240	-	-	-	-	-	-	-	-	60
245	-	-	-	-	-	-	-	-	60
250	-	-	-	-	-	-	-	-	60
255	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-
265	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-
281	-	-	-	-	-	-	-	-	-

**Insulation thickness for R210 steel structure**

Fire resistance period 210 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	50	50	50	40	40	30	20	20	20
50	50	50	50	50	40	40	25	20	20
55	60	60	50	50	50	40	40	25	20
60	60	60	60	60	50	50	40	40	25
65	-	-	60	60	60	50	50	40	40
70	-	-	-	-	60	60	50	50	40
75	-	-	-	-	-	60	60	50	50
80	-	-	-	-	-	-	60	60	50
85	-	-	-	-	-	-	60	60	50
90	-	-	-	-	-	-	-	60	60
95	-	-	-	-	-	-	-	60	60
100	-	-	-	-	-	-	-	-	60
105	-	-	-	-	-	-	-	-	60
110	-	-	-	-	-	-	-	-	60
115	-	-	-	-	-	-	-	-	60

**Insulation thickness for R240 steel structure**

Fire resistance period 240 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	60	60	50	50	50	50	40	25	20
50	60	60	60	60	50	50	50	40	20
55	-	-	60	60	60	60	50	50	40
60	-	-	-	-	-	60	60	60	50
65	-	-	-	-	-	-	-	60	60
70	-	-	-	-	-	-	-	-	60
75	-	-	-	-	-	-	-	-	60

## Insulation thickness in resistance to fire classes R 30 - R 240 in relation to design temperature and section factor

### Installation with PAROC Fire Springs

#### Insulation thickness for R30 steel structure

Fire resistance period 30 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	20	20	20	20	20	20	20	20	20
50	20	20	20	20	20	20	20	20	20
55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
65	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
75	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
85	20	20	20	20	20	20	20	20	20
90	20	20	20	20	20	20	20	20	20
95	20	20	20	20	20	20	20	20	20
100	20	20	20	20	20	20	20	20	20
105	20	20	20	20	20	20	20	20	20
110	20	20	20	20	20	20	20	20	20
115	20	20	20	20	20	20	20	20	20
120	20	20	20	20	20	20	20	20	20
125	20	20	20	20	20	20	20	20	20
130	20	20	20	20	20	20	20	20	20
135	20	20	20	20	20	20	20	20	20
140	20	20	20	20	20	20	20	20	20
145	20	20	20	20	20	20	20	20	20
150	20	20	20	20	20	20	20	20	20
155	20	20	20	20	20	20	20	20	20
160	20	20	20	20	20	20	20	20	20
165	20	20	20	20	20	20	20	20	20
170	20	20	20	20	20	20	20	20	20
175	20	20	20	20	20	20	20	20	20
180	25	20	20	20	20	20	20	20	20
185	25	20	20	20	20	20	20	20	20
190	25	20	20	20	20	20	20	20	20
195	25	20	20	20	20	20	20	20	20
200	25	20	20	20	20	20	20	20	20
205	25	20	20	20	20	20	20	20	20
210	25	20	20	20	20	20	20	20	20
215	25	20	20	20	20	20	20	20	20
220	25	20	20	20	20	20	20	20	20
225	30	20	20	20	20	20	20	20	20
230	30	20	20	20	20	20	20	20	20
235	30	20	20	20	20	20	20	20	20
240	30	25	20	20	20	20	20	20	20
245	30	25	20	20	20	20	20	20	20
250	30	25	20	20	20	20	20	20	20
255	30	25	20	20	20	20	20	20	20
260	30	25	20	20	20	20	20	20	20
265	30	25	20	20	20	20	20	20	20
270	30	25	20	20	20	20	20	20	20
275	30	25	20	20	20	20	20	20	20
280	40	25	20	20	20	20	20	20	20
281	40	25	20	20	20	20	20	20	20

#### Insulation thickness for R60 steel structure

Fire resistance period 60 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	20	20	20	20	20	20	20	20	20
50	20	20	20	20	20	20	20	20	20
55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
65	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
75	20	20	20	20	20	20	20	20	20
80	25	20	20	20	20	20	20	20	20
85	25	20	20	20	20	20	20	20	20
90	25	20	20	20	20	20	20	20	20
95	30	25	20	20	20	20	20	20	20
100	30	25	20	20	20	20	20	20	20
105	30	25	20	20	20	20	20	20	20
110	40	25	20	20	20	20	20	20	20
115	40	30	25	20	20	20	20	20	20
120	40	30	25	20	20	20	20	20	20
125	40	30	25	20	20	20	20	20	20
130	40	30	25	20	20	20	20	20	20
135	40	40	25	20	20	20	20	20	20
140	40	40	30	25	20	20	20	20	20
145	40	40	30	25	20	20	20	20	20
150	50	40	30	25	20	20	20	20	20
155	50	40	30	25	20	20	20	20	20
160	50	40	30	25	20	20	20	20	20
165	50	40	40	30	25	20	20	20	20
170	50	40	40	30	25	20	20	20	20
175	50	40	40	30	25	20	20	20	20
180	50	40	40	30	25	20	20	20	20
185	50	50	40	30	25	20	20	20	20
190	60	50	40	30	25	20	20	20	20
195	60	50	40	30	25	25	20	20	20
200	60	50	40	40	30	25	20	20	20
205	60	50	40	40	30	25	20	20	20
210	60	50	40	40	30	25	20	20	20
215	60	50	40	40	30	25	20	20	20
220	60	50	40	40	30	25	20	20	20
225	60	50	40	40	30	25	20	20	20
230	60	50	50	40	30	25	20	20	20
235	60	50	50	40	30	25	25	20	20
240	60	50	50	40	30	25	25	20	20
245	-	60	50	40	30	30	25	20	20
250	-	60	50	40	40	30	25	20	20
255	-	60	50	40	40	30	25	20	20
260	-	60	50	40	40	30	25	20	20
265	-	60	50	40	40	30	25	20	20
270	-	60	50	40	40	30	25	20	20
275	-	60	50	40	40	30	25	20	20
280	-	60	50	40	40	30	25	25	20
281	-	60	50	40	40	30	25	25	20

**Insulation thickness for R90 steel structure**

Fire resistance period 90 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	20	20	20	20	20	20	20	20	20
50	25	20	20	20	20	20	20	20	20
55	25	20	20	20	20	20	20	20	20
60	30	25	20	20	20	20	20	20	20
65	30	25	20	20	20	20	20	20	20
70	40	30	25	20	20	20	20	20	20
75	40	30	25	20	20	20	20	20	20
80	40	40	25	20	20	20	20	20	20
85	40	40	30	25	20	20	20	20	20
90	50	40	30	25	20	20	20	20	20
95	50	40	40	30	25	20	20	20	20
100	50	40	40	30	25	20	20	20	20
105	50	50	40	30	25	20	20	20	20
110	60	50	40	40	30	25	20	20	20
115	60	50	40	40	30	25	20	20	20
120	60	50	40	40	30	25	20	20	20
125	60	50	50	40	30	25	25	20	20
130	60	50	50	40	40	30	25	20	20
135	-	60	50	40	40	30	25	20	20
140	-	60	50	40	40	30	25	25	20
145	-	60	50	50	40	30	30	25	20
150	-	60	50	50	40	40	30	25	20
155	-	60	50	50	40	40	30	25	20
160	-	60	60	50	40	40	30	25	25
165	-	-	60	50	40	40	30	25	25
170	-	-	60	50	50	40	30	30	25
175	-	-	60	50	50	40	40	30	25
180	-	-	60	50	50	40	40	30	25
185	-	-	60	50	50	40	40	30	25
190	-	-	60	60	50	40	40	30	30
195	-	-	60	60	50	40	40	30	30
200	-	-	-	60	50	40	40	40	30
205	-	-	-	60	50	50	40	40	30
210	-	-	-	60	50	50	40	40	30
215	-	-	-	60	50	50	40	40	30
220	-	-	-	60	50	50	40	40	30
225	-	-	-	60	50	50	40	40	30
230	-	-	-	60	60	50	40	40	30
235	-	-	-	60	60	50	40	40	40
240	-	-	-	60	60	50	40	40	40
245	-	-	-	60	60	50	50	40	40
250	-	-	-	-	60	50	50	40	40
255	-	-	-	-	60	50	50	40	40
260	-	-	-	-	60	50	50	40	40
265	-	-	-	-	60	50	50	40	40
270	-	-	-	-	60	50	50	40	40
275	-	-	-	-	60	50	50	40	40
280	-	-	-	-	60	50	50	40	40
281	-	-	-	-	60	50	50	40	40

**Insulation thickness for R120 steel structure**

Fire resistance period 120 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	30	25	20	20	20	20	20	20	20
50	40	30	25	20	20	20	20	20	20
55	40	30	25	20	20	20	20	20	20
60	40	40	30	25	20	20	20	20	20
65	50	40	30	25	20	20	20	20	20
70	50	40	40	30	25	20	20	20	20
75	50	50	40	40	30	25	20	20	20
80	60	50	40	40	30	25	20	20	20
85	60	50	50	40	40	30	25	20	20
90	60	60	50	40	40	30	25	20	20
95	-	60	50	50	40	30	30	25	20
100	-	60	50	50	40	40	30	25	20
105	-	60	60	50	40	40	30	25	25
110	-	-	60	50	50	40	40	30	25
115	-	-	60	50	50	40	40	30	25
120	-	-	60	60	50	40	40	30	30
125	-	-	60	60	50	50	40	40	30
130	-	-	-	60	50	50	40	40	30
135	-	-	-	60	50	50	40	40	30
140	-	-	-	60	60	50	40	40	40
145	-	-	-	60	60	50	50	40	40
150	-	-	-	-	60	50	50	40	40
155	-	-	-	-	60	50	50	40	40
160	-	-	-	-	60	50	50	40	40
165	-	-	-	-	60	60	50	50	40
170	-	-	-	-	60	60	50	50	40
175	-	-	-	-	-	60	50	50	40
180	-	-	-	-	-	60	50	50	40
185	-	-	-	-	-	60	50	50	40
190	-	-	-	-	-	60	60	50	50
195	-	-	-	-	-	60	60	50	50
200	-	-	-	-	-	60	60	50	50
205	-	-	-	-	-	60	60	50	50
210	-	-	-	-	-	-	60	50	50
215	-	-	-	-	-	-	60	50	50
220	-	-	-	-	-	-	60	50	50
225	-	-	-	-	-	-	60	60	50
230	-	-	-	-	-	-	60	60	50
235	-	-	-	-	-	-	60	60	50
240	-	-	-	-	-	-	60	60	50
245	-	-	-	-	-	-	60	60	50
250	-	-	-	-	-	-	60	60	50
255	-	-	-	-	-	-	-	60	50
260	-	-	-	-	-	-	-	60	50
265	-	-	-	-	-	-	-	60	60
270	-	-	-	-	-	-	-	60	60
275	-	-	-	-	-	-	-	60	60
280	-	-	-	-	-	-	-	60	60
281	-	-	-	-	-	-	-	60	60

**Insulation thickness for R150 steel structure**

Fire resistance period 150 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	40	40	30	25	20	20	20	20	20
50	50	40	30	25	20	20	20	20	20
55	50	40	40	30	25	20	20	20	20
60	60	50	40	40	30	25	20	20	20
65	60	50	50	40	40	30	25	20	20
70	60	60	50	40	40	30	25	25	20
75	-	60	50	50	40	40	30	25	20
80	-	60	60	50	50	40	40	30	25
85	-	-	60	50	50	40	40	30	25
90	-	-	60	60	50	50	40	40	30
95	-	-	-	60	50	50	40	40	30
100	-	-	-	60	60	50	40	40	40
105	-	-	-	-	60	50	50	40	40
110	-	-	-	-	60	50	50	40	40
115	-	-	-	-	60	60	50	50	40
120	-	-	-	-	-	60	50	50	40
125	-	-	-	-	-	60	50	50	40
130	-	-	-	-	-	60	60	50	50
135	-	-	-	-	-	60	60	50	50
140	-	-	-	-	-	-	60	50	50
145	-	-	-	-	-	-	60	60	50
150	-	-	-	-	-	-	60	60	50
155	-	-	-	-	-	-	60	60	50
160	-	-	-	-	-	-	-	60	50
165	-	-	-	-	-	-	-	60	60
170	-	-	-	-	-	-	-	60	60
175	-	-	-	-	-	-	-	60	60
180	-	-	-	-	-	-	-	60	60
185	-	-	-	-	-	-	-	-	60
190	-	-	-	-	-	-	-	-	60
195	-	-	-	-	-	-	-	-	60
200	-	-	-	-	-	-	-	-	60
205	-	-	-	-	-	-	-	-	60
210	-	-	-	-	-	-	-	-	60

**Insulation thickness for R180 steel structure**

Fire resistance period 180 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	50	50	40	40	30	25	20	20	20
50	60	50	40	40	30	25	20	20	20
55	60	60	50	40	40	30	25	20	20
60	-	60	50	50	40	40	30	25	20
65	-	-	60	50	50	40	40	30	25
70	-	-	60	60	50	40	40	40	30
75	-	-	-	60	50	50	40	40	30
80	-	-	-	60	60	50	50	40	40
85	-	-	-	-	60	50	50	40	40
90	-	-	-	-	60	60	50	50	40
95	-	-	-	-	-	60	60	50	50
100	-	-	-	-	-	60	60	50	50
105	-	-	-	-	-	-	60	50	50
110	-	-	-	-	-	-	60	60	50
115	-	-	-	-	-	-	60	60	50
120	-	-	-	-	-	-	-	60	60
125	-	-	-	-	-	-	-	60	60
130	-	-	-	-	-	-	-	60	60
135	-	-	-	-	-	-	-	-	60
140	-	-	-	-	-	-	-	-	60
145	-	-	-	-	-	-	-	-	60

**Insulation thickness for R210 steel structure**

Fire resistance period 210 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	60	60	50	40	40	30	25	25	20
50	-	60	50	50	40	40	30	25	20
55	-	-	60	50	50	40	40	30	25
60	-	-	-	60	50	50	40	40	30
65	-	-	-	60	60	50	50	40	40
70	-	-	-	-	60	60	50	50	40
75	-	-	-	-	-	60	50	50	40
80	-	-	-	-	-	60	60	50	50
85	-	-	-	-	-	-	60	60	50
90	-	-	-	-	-	-	60	60	50
95	-	-	-	-	-	-	-	60	60
100	-	-	-	-	-	-	-	60	60
105	-	-	-	-	-	-	-	-	60
110	-	-	-	-	-	-	-	-	60

**Insulation thickness for R240 steel structure**

Fire resistance period 240 minutes									
Design temperature [°C]	300	350	400	450	500	550	600	650	700
Section factor [m <sup>-1</sup> ]	Thickness in mm of fire protection material to maintain steel temperature below design temperature								
47	-	-	60	50	50	40	40	30	25
50	-	-	60	60	50	50	40	40	30
55	-	-	-	60	60	50	50	40	40
60	-	-	-	-	60	60	50	50	40
65	-	-	-	-	-	60	60	50	50
70	-	-	-	-	-	-	60	60	50
75	-	-	-	-	-	-	-	60	50
80	-	-	-	-	-	-	-	60	60
85	-	-	-	-	-	-	-	-	60
90	-	-	-	-	-	-	-	-	60