

Field of Application report of the fire resistance of a non-loadbearing wall with TRIMO sandwich panels product family QBISS ONE type Perform C, Power S and Power T

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1. INTRODUCTION

On the request of Trimo d.o.o. Efectis Nederland BV has summarized the field of application of Trimo non-loadbearing sandwich panels product family QBISS ONE type Perform C, Power S and Power T.

Purpose of this field of application report is to summarize an overview of the combined field of application according to the European standards EN 1364-1 and EN 15254-5.

A brief context about CE marking and European standards is given in chapter paragraph 1.2. However, this document does not represent any classification of the field of application and cannot be used as an official document for CE marking.

This field of application report is based on the test results obtained by Trimo (reference list in chapter 2).

Chapter 3 summarizes the field of application for non-loadbearing sandwich panels product family QBISS ONE type Perform C, Power S and Power T. The field of application is given for the following classifications:

QBISS ONE Perform C; Power S (120 kg/m³) joint type B or BX

Horizontally \geq 100 mm

- For external walls: EI15 (i→o), EI15_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o)
- For partitions: EI15 (i→o), EI15_{ef} (i→o), EI20 (i→o), EI20_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o), EI45 (i→o), EI45_{ef} (i→o)

Horizontally \geq 120 mm

- For external walls: EI15 (i→o), EI15_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o), EI60 (i→o), EI60_{ef} (i→o)
- For partitions: EI15 (i→o), EI15_{ef} (i→o), EI20 (i→o), EI20_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o), EI45 (i→o), EI45_{ef} (i→o), EI60 (i→o), EI60_{ef} (i→o)

Horizontally \geq 150 mm

- For external walls: EI15 (i→o), EI15_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o), EI60 (i→o), EI60_{ef} (i→o), EI90 (i→o), EI90_{ef} (i→o), EI120 (i→o), EI120_{ef} (i→o)
- For partitions: EI15 (i→o), EI15_{ef} (i→o), EI20 (i→o), EI20_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o), EI45 (i→o), EI45_{ef} (i→o), EI60 (i→o), EI60_{ef} (i→o), EI90 (i→o), EI90_{ef} (i→o), EI120 (i→o), EI120_{ef} (i→o)

QBISS ONE Power T (90 kg/m³) joint type B or BX

Horizontally \geq 120 mm

- For external walls: EI15 (i→o), EI15_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o), EI60 (i→o), EI60_{ef} (i→o), EI90 (i→o), EI90_{ef} (i→o), EI120 (i→o), EI120_{ef} (i→o)
- For partitions: EI15 (i→o), EI15_{ef} (i→o), EI20 (i→o), EI20_{ef} (i→o), EI30 (i→o), EI30_{ef} (i→o), EI45 (i→o), EI45_{ef} (i→o), EI60 (i→o), EI60_{ef} (i→o), EI90 (i→o), EI90_{ef} (i→o), EI120 (i→o), EI120_{ef} (i→o)

1.1 DESCRIPTION OF THE QBISS ONE

The QBISS ONE Power T, Perform C and Power S panels (or Trimoterm FTV R) with joints type B and BX are sandwich panels from Trimo d.o.o. with a rock wool core. The sandwich panels are non-loadbearing sandwich panels tested in horizontal direction. A non-loadbearing wall is fixed to vertical constructions such as columns or solid walls and thus will behave differently to a non-load bearing wall fixed to floor slabs.

These panels in end use application are often used as a façade or partition. In the figures below the difference between the different types of joints (B and BX) are shown.

QBISS ONE Power T 90 kg/m³

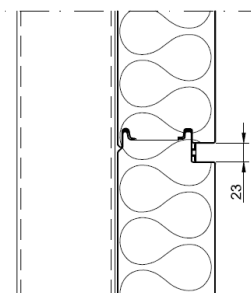
QBISS ONE Perform C 120 kg/m³

QBISS ONE Power S 120 kg/m³ (better mechanical properties)

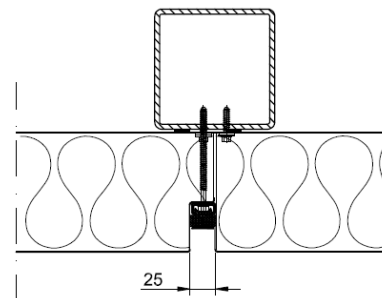
Type B



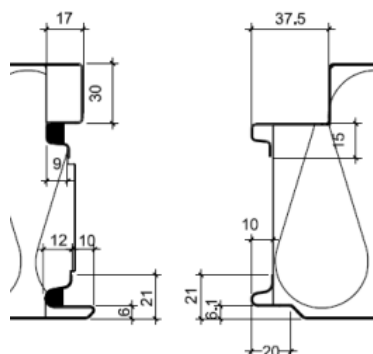
Vertical section



Horizontal section



Type BX



1.2 CE-MARKING AND EUROPEAN STANDARDS

As from July 1, 2013, CE marking is compulsory for all construction products on the market within the European Union. CE marking is possible if the product standard for a particular product has been published in the OJEU and becomes compulsory once the coexistence period has ended. Since the 8th of August 2015 the CE marking of fire resistant is possible self-supporting double skin metal faced insulating panels (EN 14509).

The resistance to fire of a wall or partition made of non-loadbearing sandwich panels is, within the framework of CE marking, to be classified according to the EN 13501-2. The classification of non-loadbearing sandwich panels according to EN 13501-2 is based on fire tests according to the EN 1364-1 (including the direct field of application) and the extended application field of the test results according to the EN 15254-5.

1.3 REVISION INFORMATION

Version	Date	Remarks
2019-Efectis-R000846	June 2019	First issue

2. OVERVIEW OF SUPPORTING REPORTS

This report is based on the reports mentioned below. The test reports describe fire test performed according to EN 1364-1. The EXAP reports describe the extended field of application according to the EN 15254-5 and were based on the test reports.

Test reports		
Notified body	Document reference	Date of issue
ZAG Ljubljana	P 0241/11-530-6	28 th of February 2011
ZAG Ljubljana	P 0139/09-530-5	2 nd of February 2009
ZAG Ljubljana	P 0108/13-530-1	28 th of January 2013
MPA IBMB TU Braunschweig	3490/243/09	15 th of March 2010
ZAG Ljubljana	P 0268/15-530-5	4 th of March 2015
EXAP reports		
Notified body	Document reference	Date of issue
Efectis Netherlands	2019-Efectis-R000045[Rev.2]	June 2019

Table 1 Overview of supporting reports

3. FIELD OF APPLICATION QBISS ONE PERFORM C, POWER S AND POWER T

3.1 VARIATIONS IN THE COATING

A change from a coated to a non-coated sheet is not allowed. A change in emissivity of - 10 % is allowed if the emissivity's for the different sheets are known and it can be proven that the change in emissivity is within the 10% range compared to the tested emissivity and only for the classifications below.

If change in emissivity is allowed					
	QBISS ONE Perform C, Power S				QBISS ONE Power T
Test report	P0241/11-530-6	P0139/09-530-5	P0108/13-530-1	3490/243/09	P0268/15-530-5
EI15	allowed	allowed	allowed	allowed	allowed
EI20 partition only	allowed	allowed	allowed	allowed	allowed
EI30	allowed	allowed	allowed	allowed	allowed
EI45 Partition only	allowed	allowed	allowed	allowed	allowed
EI60	-	not allowed	allowed	allowed	allowed
EI90	-	-	allowed	allowed	allowed
EI120	-	-	allowed	not allowed	not allowed

Table 2 Change in emissivity

3.2 VARIATIONS IN THE METAL MATERIAL

Test results are valid for all grades of steel. Test results are not valid for all grades of stainless steel or for other types of metals.

3.3 CHANGES IN PROFILE GEOMETRY OF FACING

The QBISS ONE panels have flat or small profiling between 0 and 5 mm on both sides. Therefore the test results are valid for any change in the range 0 mm to 5 mm profiling and panels are regarded as symmetrical (for facing, the joint is not symmetrical). This is allowable only if the declared tensile strength value is equal or higher than for the tested panel. This has to be checked!

3.4 VARIATIONS IN THE ADHESIVE

It is not possible to exchange types of glue for the tested constructions.

3.5 VARIATIONS IN THE CORE MATERIAL

The tests are performed with an insulation of rock wool with a density of 120 kg/m³ for QBISS ONE type Perform C, Power S and with a density of 90 kg/m³ for QBISS ONE type Power T.

The test results are valid for any increase in density up to 150 kg/m³. A decrease in density is allowed down to -10 % of tested density.

Density range for QBISS ONE type Perform C, Power S: 108 kg/m^3 - 150 kg/m^3 .
Density range for QBISS ONE type Power T: 80 kg/m^3 - 150 kg/m^3 .

It is not allowed to change the orientation of the fibre of the mineral wool.

Test results are valid for panels with a decrease in the number of lamella or slab joints.

A smaller amount of organic content is allowed compared to the tested one. An increase in organic content of 0,5 percentage points or up to 20 % of tested amount is allowed if the total amount of organic content is below 10 %. An increase is not allowed where the organic content is greater than 10 %.

The nature and proportions of materials used to manufacture the mineral wool fibers shall not be different from those used in the reference test.

3.6 VARIATIONS IN THE ORIENTATION

The tests of QBISS ONE panels are performed in horizontal direction (span from left to right). It is not allowed to span the panels in vertical direction (from bottom to top).

3.7 VARIATIONS IN THE PANEL THICKNESS

Increase in panel thickness is always allowed. In table 3 (paragraph 3.8) the classification for different span lengths and panel thicknesses are shown.

3.8 VARIATIONS IN SPAN LENGTH

In the following table the maximum extended span length is given for the mentioned classifications. The mentioned maximum extension of the span lengths are only valid under the following conditions:

- the maximum span length applies until the next support construction;
- the amount of fasteners is calculated with the use of the method mentioned in annex A.

Maximum extension of the span length for classifications mentioned below			
Thickness horizontally orientated panel [mm]	Classification for maximum span length QBISS ONE Perform C, Power S (120 kg/m^3)		
	$\leq 7,5 \text{ m}$	$\leq 6,0 \text{ m}$	$\leq 4,0 \text{ m}^{**}$
100	EI30	EI30 EI45 partition only*	EI30 EI45 partition only*
120	EI30 EI45 partition only*	EI30 EI45 partition only*	EI60
133	EI60	EI90	EI90
≥ 150	EI120	EI120	EI120
Thickness horizontally orientated panel [mm]	Classification for maximum span length QBISS ONE Power T (90 kg/m^3)		
	$\leq 7,5 \text{ m}$	$\leq 6,0 \text{ m}$	$\leq 4,0 \text{ m}^{**}$
≥ 120	EI90	EI90	EI120

**Note: the classification for EI 20 and EI 45 can only be used for partition walls only, the other classifications can be used for as well the partition walls as well as the external walls.*

*** Extrapolation of the tested span length by 1 meter is possible according to the direct field of application in EN 1364-1. However then the criteria mentioned in the EN 1364-1 have to be met.
Table 3 Maximum extension of the span length for different thicknesses*

3.9 VARIATIONS IN THE LONGITUDINAL JOINT CONSTRUCTION

The panels are tested with joint type B (see page 4). An increase in the overlap in the metal facing at the joint is always allowed if other dimensions remain unchanged. An increase in the amount of fixings is always allowed, a decrease is not allowed.

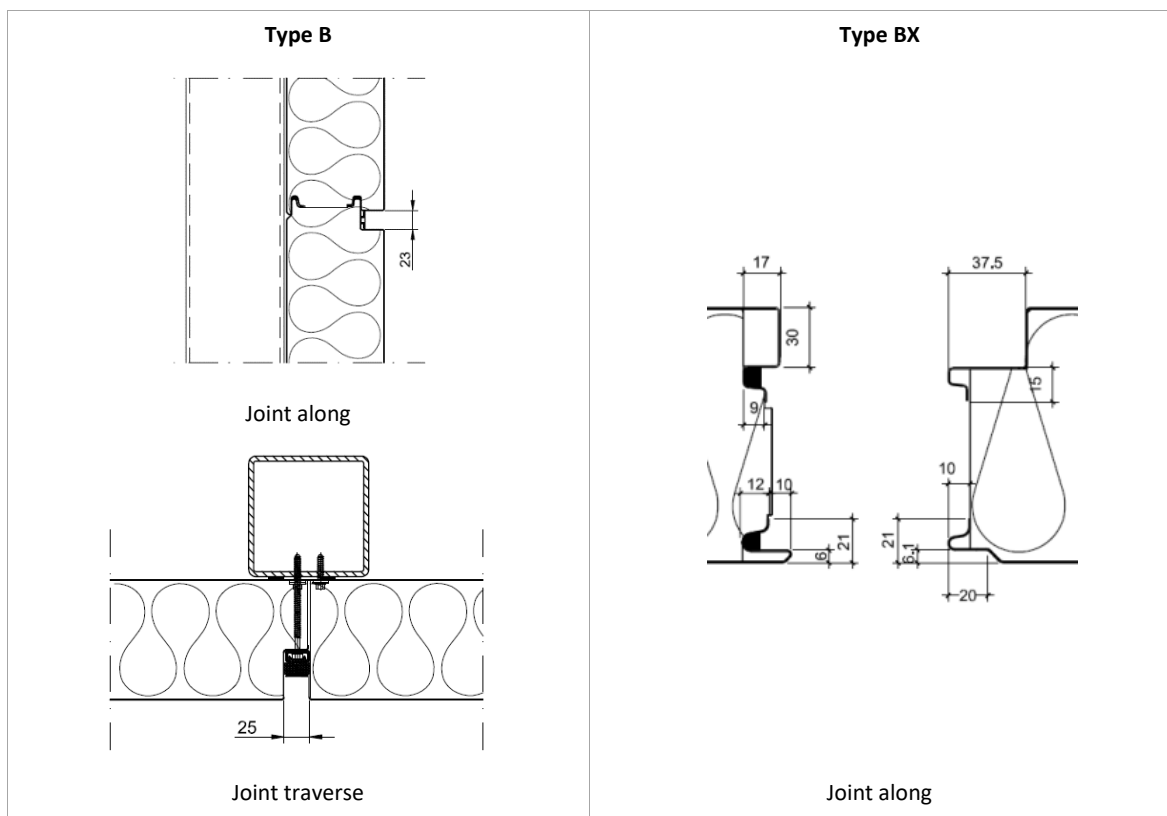
Increase in the depth of the groove and in the tongue respectively is always allowed, but no decrease is allowed compared to the tested one. Dimensional changes in thicknesses in the tongue and groove are allowed up to $\pm 50\%$ of the tested value but minimum thickness is 20 mm.

The difference between joint B and joint BX (see pictures below) is the thickness of the tongue which is 29 mm at type B and 30 mm at type BX. Dimensional change in thickness in the tongue is allowed up to $\pm 50\%$ of the tested value but minimum thickness is 20 mm. If the rest of the joints stay the same it is possible to use joint type BX where type B is tested.

Joints tested without sealants can always be sealed in the metal joint on the exposed side.

If a construction is tested with sealing materials in the joints test results shall only be valid for joints with the same type of sealing materials and shall not be valid for joints without sealants.

An increase in the number of horizontal joints, of the type tested is allowed.



3.10 VARIATIONS IN THE BOUNDARY CONDITIONS AND FIXING SYSTEM

An increase in the amount of fasteners and an increase in the diameter of fasteners are allowed provided that it can be shown that the bearing capacity is not reduced and the risk of collapse is not increased according to calculations given in the calculation method of strength properties in Annex B.

A decrease in the distance of fixing centers is allowed. An increase in the distance of fixing centers is not allowed.

An increase in the protection ability of fixing systems is always allowed. A decrease in the protection ability of fixing systems has to be shown by a fire resistant test.

3.11 DIMENSIONS OF WALL CONSTRUCTION

For horizontal installation the height of the wall in end-use application can be freely increased, provided that each panel is fixed to the bearing structure in such a way that the load is not accumulated from above (to the lower parts of the wall) can be freely increased providing that the panels in the reference test are fixed as described in EN 1364-1. The maximum span length of the QBISS ONE non-loadbearing sandwich panel is given in paragraph 3.8 of this report.

A decrease in height and/or width of the wall is allowed.

For constructions with single wall elements between two vertical structural elements, where the self-load is carried by the floor and the wall elements are supported by the vertical edges, the height of the construction may be increased under the following condition:

- the height may be increased by 1 meter in addition to the tested height, provided that the lower elements can carry the load of the elements above.

The tests are performed with a height of 3000 mm, except for the panel of test report 3490/243/09 where a height of 5500 mm is tested with a panel thickness of 172 mm.

3.12 SUPPORT STRUCTURE

In the end use situation the support structure has at least the same fire resistance classification time for loadbearing capacity (R) as the panel assembly has for insulation and/or integrity, the fixing system has the same loadbearing capacity (R) in the support structure as in the frame used in the reference test and the fixation area can also be protected with thermal insulation. If such thermal insulation is used in the test, thermal insulation with at least same fire performance shall also be used in end use conditions.

3.13 HEATING CONDITIONS

The tests were carried out according to the standard heating curve given in EN 1363-1. Therefore the results are also valid for the external fire exposure curve given in EN 1363-2. This is shown with (-ef) in the classification on page 3 of this report.

4. CONCLUDING REMARKS

Efectis Nederland has performed this assessment based on the test results obtained according to EN 1364-1, EN 15254-5 and its experience with the fire testing of such constructions. This report does not represent any classification of the field of application.



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Project leader fire engineering



P.W.M. Kortekaas
Senior Project Leader Resistance to Fire

ANNEX

Annex A: calculation method of fasteners
Annex B: calculation method of strength properties

5. ANNEX A: CALCULATION METHOD OF FASTENERS

For extension of the span length the following calculation shall be made:

The forces act on one side of the structure, but both sides of the wall must be of the same design with the same amount and place of the fasteners because the fire can come from both sides.

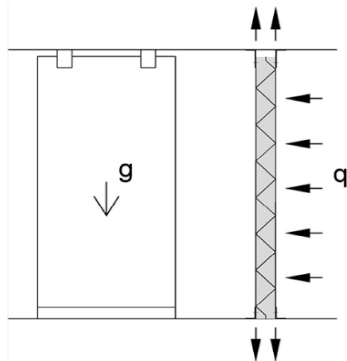


Figure 1 Forces by vertical mounting orientation

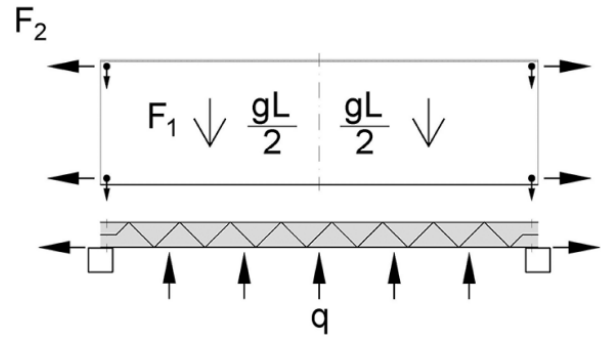


Figure 2 Forces by horizontal mounting orientation

Vertical mounting orientation :

De forces acting at the top of the panels:

$$\begin{aligned} \text{Tensile forces} & : F_{t,Ed} = L b (q + g) \\ \text{Shear forces} & : F_{v,Ed} = (L b q) / 2 \end{aligned}$$

Horizontal mounting orientation:

Forces are acting on the extreme fastener at the end of the panels:

$$\begin{aligned} \text{Tensile forces} & : F_{t,Ed} = (L b q) / 2 \\ \text{Shear forces} & : F_1 = (L b q) / 2 \\ & F_2 = L b (q + gL/8b) \\ & F_{v,Ed} = \text{sqrt}(F_1^2 + F_2^2) \end{aligned}$$

where:

- q is air pressure in fire (0.3 kPa if nothing else specified)
- g is own weight in kPa
- L is the span length in meters
- b is the panel width in meters
- n is the amount of fasteners

The number of fasteners needed is calculated as following for temperature on the fasteners as measured from the fire test:

$$F_{v,Ed}/F_{v,Rd} + F_{t,Ed}/F_{t,Rd} \leq n k$$

where:

- $F_{v,Rd}$ and $F_{t,Rd}$ = the design value for shear and tensile strength of the fastener in normal temperature;
- $F_{v,Ed}$ and $F_{t,Ed}$ = the forces acting at the fasteners calculated from the formulae above
- n = the number of fasteners
- k = the decrease on the yield strength of the used steel according to EN 1993-1-2 ($k=1$ for steel temperature up to 400°C and below 1 for steel temperature above 400°C)

The material and load factors are set to 1,0 in the above equations.

6. ANNEX B: CALCULATION METHOD OF STRENGTH PROPERTIES

An easy way to validate the load bearing capacity of fasteners and fixing system is to calculate the imposed load per fastener in the reference test and fix the amount of fasteners so that the load per fastener imposed by the changes made is less than in the reference test. A more accurate calculation method is given in Annex A of this report. Calculations of panel-fastening suspension capacity shall be made:

- a) for the exposed metal face after it has delaminated from the core; and
- b) for the unexposed metal face assuming it carries the whole weight of the core material.

Temperature data are needed at the panel head detail. Strength loss of the metal facings and other fabrication details which transmit the load at the panel head shall be calculated and fastening shear and pull-out strength data used to check that the dead loads can be carried throughout the classification period.