

TEST REPORT

SQM_429_2025

CUSTOMER

Kebe S.A.

PRODUCT NAME

ORTHOBLOCK NK380

TYPE OF PRODUCT

Masonry unit

TYPE OF TEST

**DETERMINATION OF THE DESIGN THERMAL CONDUCTIVITY VALUES OF THE UNIT (EN ISO 10456)
AND OF THE MASONRY MADE WITH IT**

Ordering Kebe S.A.

Product placed on the market from Kebe S.A. - 61100 Nea Santa - Kilkis - GREECE

Data related to the sample examined Masonry unit

Sample origin sampled and provided from the Customer

Manufacturing plant Kebe S.A. - 61100 Nea Santa - Kilkis - GREECE

Estimate prot. 25349/lab of 06/04/2025

Order confirmation email of 06/04/2025

Receipt of the samples June 2025

Test execution June 2025

Laboratory and location of test execution Certimac - via Ravegnana, 186 - Faenza (RA)

Report issued 16/06/2025

Revision n° 01 of 20/06/2025

Test executed by: Eng. S. Marianini

Report drafted by: Eng. S. Marianini

Approval: Technical director Eng. L. Laghi

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*This test report is part of a file in PDF format
digitally signed by Luca Laghi*

Chief Technical Officer
(Eng. Luca Laghi)



1. Object of the test

The following test report describes the determination of thermal design values of a masonry brick. The calculations were performed by means of a Finite Element Model implemented in Ansys 18.2 (Ref. 2-b), applied to a planar cross section (unit length), perpendicular to the holes axis and parallel to the thermal flux. In this calculation, the input data have been modified taking into account the effect of humidity as indicated by the technical standard in Ref. 2-a.

2. Reference standards and documents

The tests have been executed according to the methods defined in the following documentations and reference standards:

- EN ISO 10456:2007. Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)
- CertiMaC calibration report 040219-C-17/Rev01. Calibration of a two-dimensional model for the calculation of the equivalent thermal conductivity of a masonry unit.
- EN 6946:2008. Building components and building elements – Thermal resistance and thermal transmittance – Calculation method.
- Test report SQM_428_2025, Determination of the dry thermal conductivity values of the unit (EN ISO 6946) and of the masonry made with it - Orthoblock NK380.

3. Input data

The technical drawing of the block and the thermal conductivity of fired clay were supplied by the client (Figure 1). All input data used for the calculation are shown in Table 1.

Figure 1. Geometry of the block

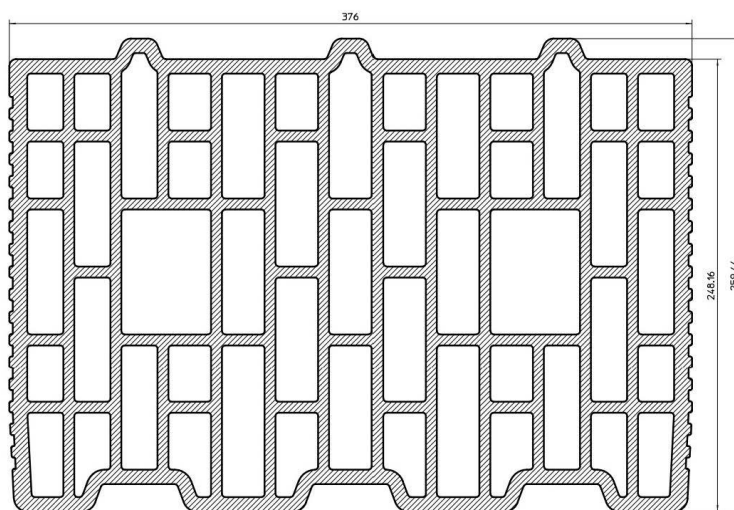


Table 1. Input data

Physical quantity	Nominal value	Ref.
Brick dimensions	250 x 250 x 240 mm	Provided by the Customer
Material thermal conductivity $\lambda_{10,dry,mat}$	0.401 W/mK	Provided by the Customer
Equivalent thermal conductivity of voids	Test Report Orthoblock NK380	Ref. 2-d

4. Determination of the thermal design values

Thermal design values of the masonry are determined as defined by the standards at Ref. 2-a and 2-c, increasing the thermal conductivity of the materials in relation to the moisture content, using the following conversion coefficient (moisture content volume by volume):

$$F_m = e^{f_\psi(\psi_2 - \psi_1)}$$

The standard sets as operating conditions a temperature of 23 ° C and a relative humidity of 80% (precautionary hypothesis), which is related to the test condition at 10 ° C, dry.

5. Results

Table 2 shows the results of the Finite Elements Analysis performed with design thermal values at Ref. 2-a.

Table 2. FEM results

Heat flow [W/m]	Thermal coupling coefficient L^{2D} [W/mK]	Thermal transmittance U [W/m ² K]	Total thermal resistance R_T [m ² K/W]	True thermal resistance of the masonry unit R_t [m ² K/W]	Equivalent thermal conductivity $\lambda_{design,unit}$ [W/mK]
2.20243	0.1101	0.4438	2.2535	2.08035	0.1805

6. Determination of thermal values of the masonry

To conduct a comprehensive assessment of the thermal performance of the masonry, only the horizontal mortar joints were taken into account, without plaster layers. Given the interlocking geometry of the blocks, the vertical joints were not considered in the analysis, as they do not contribute significantly to the overall thermal behavior. In order to ensure a thorough evaluation, the thermal properties of the masonry were analyzed by studying the configuration as detailed in Table 3. The adopted mortar properties refer to the product “**ORTHOBLOCK BOND**”, drawing on thermophysical data made available by the Client.

Table 3. Masonry configurations

Masonry	Description		
1	Horizontal mortar joints	Thickness = 3 mm $\lambda_{\text{mortar}} = 0.61 \text{ W/mK}$	Provided by the Costumer
	Internal plaster	Not present	Provided by the Costumer
	External plaster	Not present	Provided by the Costumer

Table 4 shows the thermal values of the masonry, in the configuration described above.

Table 4. Results of the calculation for the masonry no. 1

Physical quantity	Result
True thermal resistance of the masonry $R_t \text{ [m}^2\text{K/W]}$	2.0016
Equivalent thermal conductivity $\lambda_{\text{design,masonry}} \text{ [W/mK]}$	0.1878
Total thermal resistance $R_T \text{ [m}^2\text{K/W]}$	2.1716
Thermal transmittance $U \text{ [W/m}^2\text{K]}$	0.4605

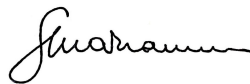
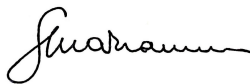
SUMMARY TABLE OF RESULTS

The tests previously described gave the following results:

Product	Equivalent thermal conductivity $\lambda_{\text{design,masonry}}$ [W/mK]	Thermal transmittance U [W/m ² K]
Orthoblock NK380	0.1805	0.4438
Masonry no. 1	0.1878	0.4605

7. List of distribution

ENEA	Archivio	1 copia
Certimac	Archivio	1 copia
Kebe S.A.	Archivio	1 copia

In charged of technical test execution	In charged of technical report drafting	Technical director Approval
Eng. Sebastiano Marianini	Eng. Sebastiano Marianini	Ing. Luca Laghi
		

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