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Institute for Building Materials, Concrete Construction and Fire Protection

Braunschweig Civil Engineering Materials Testing Institute

Test report

-Translation-

Document No.:	(1103/530/21 - F) – Hir of August 26, 2022
Customer:	Knauf Ltd. & Partner EW2 Ataqa Industrial Zone Plot No. 258:268 & 290:302 Suez EGYPT
Order Date:	Aug. 01, 2021
Order Ref.:	Purchase Order Number 4502505045-L95
Order received:	Nov. 11, 2021
Subject:	Initial type testing of gypsum plasterboards acc. to EN 520
Test basis:	DIN EN 520:2009
Samples received:	March 22, 2022
Sampling:	By the client
Sample identification:	**Gypsum plasterboard type 12.5 GKF, type F**
Test date:	April 18, 2022 – August 23, 2022

This Test report covers 5 pages, incl. cover sheet, and 2 annexes.

This document is the translated version of Prüfbericht 1103/530/21-F dated 2022/08/26. The legally binding text is the aforementioned German Prüfbericht (Test Report).

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Notified body (0761-CPR) -
Approved as a civil engineering testing, inspection and certifying body as well as notified as a civil engineering testing and certifying body.

1 Background

With the letter of Aug. 01, 2021, Knauf Ltd. & Partner, Suez, Egypt, commissioned MPA Braunschweig to perform tests for determination of the material properties of the gypsum plasterboards according to EN 520.

This test report describes and analyses the performed tests.

Mean values established on the basis of the test results are listed in the summary of the test report.

2 Test material

The client himself had removed the board material to be tested from his production lot. The board material was marked on its rear side. The material arrived at the MPA Braunschweig test laboratory on March 22, 2022 and was then stored in the laboratory so that it was protected against atmospheric influence.

Members of the MPA Braunschweig staff removed specimens of the required dimensions from the board material for the different tests and stored these specimens in conditioned atmospheres until their mass remained constant.

The board material of **type 12.5 GKF, type F** is a gypsum plasterboards, **12.5** mm thick, which is made from gypsum and cartoon. The gypsum contains fibres.

3 Board material testing; preparation; testing proper; evaluation

3.1 Board marking

On their rear sides, the gypsum plasterboards were marked with the following black inscription:

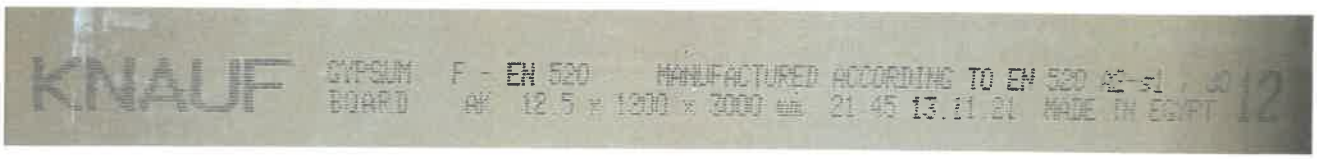


Fig. 1 Rear face marking on the boards, **type 12.5 GKF, type F**.

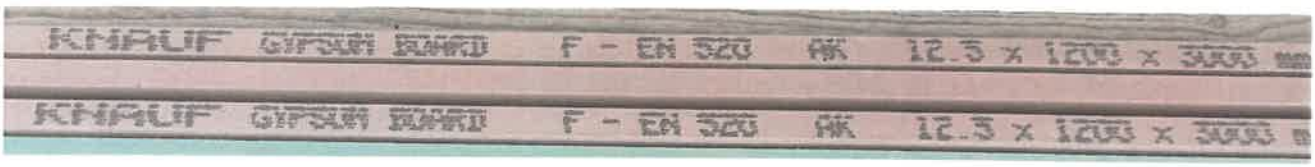


Fig. 2 Lateral marking (Detail) on the boards, **type 12.5 GKF, type F**.

3.2 Testing dimensions and edge profiles according to DIN EN 520

Dimensions

The gypsum plasterboards have the nominal dimensions 1,200 mm wide, 3,000 mm long and **12.5** mm thick. The accepted tolerances are 0 to - 4 mm for the width; 0 to - 5 mm for the length; and ± 0.5 mm for the thickness.

Dimensional testing produced the following mean values, see annex 3:

- Width: 1,198 mm
- Length: 2,997 mm
- Thickness: 12.6 mm

All dimensions are thus within the accepted tolerances.

Squareness

The requirements for squareness are complied with. The accepted tolerance for this board is 3.0 mm. Actual deviations were for the plasterboard 0.3 mm on an average, see annex.

3.3 Testing for bending strength according to DIN EN 520

For determining the bending strength, the MPA Braunschweig staff prepared the specimens so that the specifications in DIN EN 520 were complied with, and the specimens were then stored in a drying cabinet at 40 °C until their mass remained constant. A hydraulic bending test machine with a maximum load of 20 kN was used for testing the bending strength. The specimens were placed on the parallel supports (spaced 350 mm) of the test machine so that the specimens, which had been cut along the longitudinal axis of the board, came to rest on the supports with their faces pointing downwards, while the faces of the specimens cut across the longitudinal axis pointed upwards. The test load was applied at a rate of 250 N/min in the middle between, and in parallel with the supports. The deformation in the middle of the specimens was recorded with a displacement sensor.

The mean values of the collapse loads are:

Longitudinal direction (L) = 656 N (Minimal requirement 550 N, all 3 samples fulfilled)
Transverse direction (T) = 331 N (Minimal requirement 210 N, all 3 samples fulfilled)

The mean values of the deflection are:

Longitudinal direction (L) = 8.8 mm
Transverse direction (T) = 7.9 mm

3.4 Testing for density and weight per unit area according to DIN EN 520

The density and the weight per unit area were determined and then compared with the limiting values for classifying gypsum boards respecting their reaction to fire in accordance with DIN EN 520 Annex B, and with the weight per unit area of gypsum boards in accordance with DIN 18180.

- Density (Gypsum): desired: ≥ 600 kg/m³ mean actual value: 778 kg/m³
- Weight per unit area: desired: ≥ 10 kg/m² mean actual value: 9.8 kg/m².

Requirements for weight per unit area according are complied with. For results, reference is made to annex.

3.5 Testing for cohesion according to DIN EN 520

Each specimen was exposed to the fire at a test temperature of 1000 ± 50 °C. The development of the test temperature was measured at a distance of 15 mm from the specimen surface, using two Ni-CrNi thermocouples. Results were recorded with a strip-chart recorder. While being exposed to the fire, the specimens were tensioned with a 300-gram mass. All six specimens have to meet the requirements. For details see annex.

The specimen fulfilled the requirements of cohesion according to DIN EN 520.

4 Summary

The Materials Testing Institute MPA Braunschweig was commissioned by Knauf Ltd. & Partner from Suez, Egypt, to perform tests for determination of the material properties of their **type 12.5 GKF, type F** plasterboard material.

The mean values of the material properties were determined on the basis of tests performed in compliance with DIN EN 520. Results are listed in Table 1 below.

Table 1 Overview of properties. Bold markered are those values that do not comply with.

Type of board		**type 12.5 GKF, type F**
Board thickness	[mm]	12.5
Dimensions	[mm]	1,198 × 2,997 × 12.6
Edge profile	[mm/m] [mm]	Squareness 0.3 mm/m Taper depth 1.49 mm to 1.79 mm
Collapse load parallel with the fibre	[N]	656
Collapse load perpendicular to the fibre	[N]	331
Apparent density (from bending test)	[kg/m³]	778
Weight per unit area (Gypsum)	[kg/m²]	9.8
Cohesion	Min:sec	No collapse, Contact to ground plate after (average) 03:47

Braunschweig, dated August 26, 2022

Ass. Head of Test Laboratory

Dipl.-Ing. (FH) Hartmann Alberts

Engineer in charge

i.A.

Dipl.-Ing. Sandra Hirschfeld

Client: **Knauf Egypt**

Boardtype: **GKF**
Nominal size: 3000 x 1200 x 12,5 mm³ **GKF**
End-face marking: Knauf Gypsum Board F-EN 520 AK 12.5 x 1200 x 3000 mm manufactured according to EN 520 A2-s1, d0 Made in Egypt, 21:45 13.11.21

Document No: **1103/530/21**
Checker: Schwarz
Date of sampling : not specified
Test material received: 22.03.22

dimensions in as-required:

board number:	length				width				thickness													
	1 [mm]	2 [mm]	3 [mm]	average value [mm]	1 [mm]	2 [mm]	3 [mm]	average value [mm]	1 [mm]	2 [mm]	3 [mm]	4 [mm]	5 [mm]	6 [mm]	7 [mm]	8 [mm]	9 [mm]	10 [mm]	11 [mm]	12 [mm]	average value [mm]
1	2997	2996	2997	**2997**	1198	1199	1198	**1198**	12,6	12,5	12,7	12,7	12,6	12,7	12,6	12,5	12,6	12,7	12,7	12,7	**12,6**
2	2997	2997	2998	**2997**	1198	1198	1199	**1198**	12,5	12,6	12,7	12,7	12,5	12,5	12,2	12,6	12,7	12,7	12,7	12,7	**12,6**
3	2997	2998	2998	**2998**	1198	1198	1198	**1198**	12,5	12,5	12,6	12,5	12,5	12,5	12,3	12,6	12,5	12,7	12,7	12,6	**12,5**
average value:				**2997**				**1198**													**12,6**

squareness and taper profile:

board number:	squareness			taper depth				
	Δ_1 [mm]	Δ_2 [mm]	R_W [mm/m]	1 [mm]	2 [mm]	3 [mm]	4 [mm]	average value [mm]
1	0,44	0	0,18	1,40	1,33	2,10	1,14	1,49
2	0,43	0	0,18	1,89	1,35	1,89	1,26	1,60
3	1,02	0,5	0,63	1,20	2,32	2,32	1,32	1,79
average value:			0,33					1,63

test equipment:

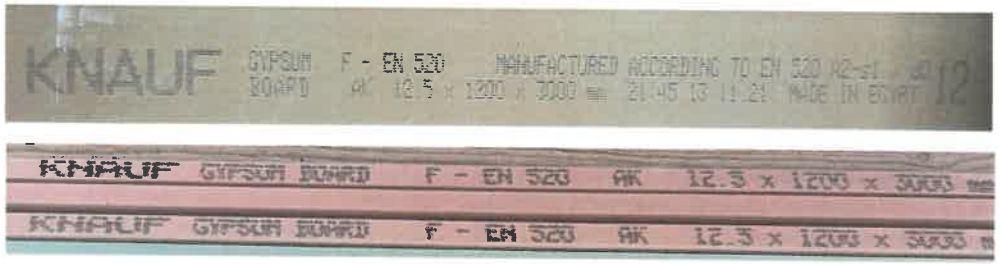
measuring tape: BMI (Inv.-Nr. 5969)
slide gauge: 300 mm (MPA-186)
taper profile counter: Mahr Digital Meßuhr 1075 (MPA-055)
scales: Sartorius (LP 34000 P, Inv.-Nr.: 04011/035)
Sartorius (Inv.-Nr.: 2320210027)
climatic cabinet: Halle I, EG, Heraeus (Can-Bus : DL 021 links)
Cobb-processor : Halle I, Raum 006 (Can-Bus:DL 006)

Cohesion acc. to EN 520:

Sample / Board No.		1 from 1	2 from 1	1 from 2	2 from 2	1 from 3	2 from 3
Exposition to fire:	[min:s]	03:51	03:42	03:43	03:50	03:48	03:50
Contact to plate:	[min:s]	03:51	03:42	03:43	03:50	03:48	03:50
Collapse of sample:	[min:s]	–	–	–	–	–	–
Requirement fulfilled:	–	yes	yes	yes	yes	yes	yes

weight per unit area, density, collapse load, deflection & modulus of elasticity:

test material number:	length [mm]	width [mm]	weight air-dry [g]	weight dry 40° C [g]	weight per unit area [kg/m²]	density [kg/m3]	effective span [mm]	collapse load FU [N]	deflection s_{max} [mm]
1 L	398	300	1190,1	1187,3	9,9	789	350	669	9,07
1 T	400	299	1159,8	1157,2	9,7	768	350	327	7,03
2 L	400	302	1157,6	1155,0	9,6	759	350	656	8,59
2 T	399	299	1192,8	1190,3	10,0	792	350	345	8,98
3 L	400	299	1182,1	1179,4	9,9	789	350	642	8,64
3 T	402	300	1168,5	1165,8	9,7	773	350	323	7,76
average value:									



summary of test results

board number:	dimension length [mm]	dimension width [mm]	dimension thickness [mm]	squareness R_W [mm/m]	taper profile	taper profile depth [mm]	weight per unit area [kg/m²]	density [kg/m³]	collapse load in longitudinal direction (L) [N]	collapse load in transverse direction (T) [N]
1	2996	1198	12,6	0,18		1,49	9,8	779	669	327
2	2997	1198	12,6	0,18		1,60	9,8	776	656	345
3	2998	1198	12,5	0,63		1,79	9,8	781	642	323
average value:	2997	1198	12,6	0,33		1,63	9,8	779	-----	-----
DIN EN 520 requirements	2994 bis 3000	1196 bis 1200	± 0,5 mm	3,0		0,6 bis 2,5	keine	≥ 600	≥ 550	≥ 210
meet:	yes	yes	yes	yes		yes	---	yes	yes	yes