



Laboratory and in "Situ" tests Department
ICECON TEST Laboratory

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TEST REPORT

**DEN BRAVEN POLYURETHANE ADHESIVE
FOR POLYSTYRENE - GUN**

APROVED,
PRESIDENT - GENERAL MANAGER
Prof. Dr. h.c. Polidor BRATU, Ph.D.
Member of the Romanian Academy of Technical Sciences

Test report no.: RI - 16.06.531/1

Date: 9.12.2016

Total no. of pages: 9

Test procedures and standards:

Technical report EOTA TR 46 - 2014

TEST BENEFICIARY: S.C. DEN BRAVEN ROMÂNIA COMEX S.R.L.

Address: Buftea, Str. Răsăritului nr. 51, DN 7, județ Ilfov
Tel: + 40 (21) 316 10 66/67, Fax: +40 (21) 316 10 69

No. and date of the contract: -

Order no: 20993/5.12.2016

The date and number of the delivery and receiving document concerning the Testing Report : **1525/09.12.2016**

APROVED,

DIRECTOR,

Dipl. Eng. Aurelian Ghinea

VERIFIED,

SCIENTIFIC DIRECTOR,

Dipl. Eng. Ovidiu Vasile, Ph.D

Q. A. RESPONSABLE

Dipl. Eng. Mariana Stancu

The results of this test report refer only to the tested object.


Any truncation or extrapolation of the results included in this test report involves the assumption of responsibility by the party performing it.

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Sent to : 1 copy Beneficiary;
1 copy Laboratory

 ICECON TEST	TESTING GROUP LETICS	Test report no.: RI - 16.06.531/1	Page no. 2/9 Copy no.
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1. Identification of the tested object:

- DEN BRAVEN polyurethane adhesive for polystyrene - GUN, manufactured by S.C. DEN BRAVEN ROMÂNIA COMEX SR.L.

2. Description of the tested object:

- mono-component polyurethane adhesive, light yellow in colour, applied by gun, used for bonding EPS boards in thermal insulation system, packaging in 750 ml pressurized cans (metallic tubes).

3. Sampling:

The products were sampled and brought to ICECON TEST, in Romania, by the manufacturer S.C. DEN BRAVEN ROMÂNIA COMEX SR.L.

4. Requested tests: according EOTA - Technical Report TR - 046 "Test methods for foam adhesive for external thermal insulation composite systems (ETICS)"

- density;
- tack free time;
- cutting time;
- bond strength;
- post expansion behaviour;
- shear strength and shear modulus.

5. Receiving date: 16.09.2016 (batch no. 050/09.08.2016)

6. Testing date: 20.09.2016 - 9.12.2016



7. Tests results: The results of the tests are presented in the measurement sheets, part of his report.

8. Results provided by sub-contractors: n/a.

9. Professional remarks: n/a.

10. Conformity to the reference specification: it will be analyzed by the beneficiary or by a third party.



Test responsible: dipl. eng. Daniela Fiat, Ph.D 	Chief Division 1: dipl. eng. Ramona Pințoi, Ph.D 
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MEASUREMENT SHEET

**DEN BRAVEN POLYURETHANE ADHESIVE
FOR POLYSTYRENE - GUN**

Density

STANDARD:

EOTA TR 46 - 2014

PROCEDURE CODE:

-

TESTING DATE: 8.12.2016

TESTED OBJECT: polyurethane adhesives cylindrically shaped beads with diameter approx. 30 mm and 200 mm length, sprayed by gun on a PE-foil at standard conditions; after conditioning the beads are cut on both sides to a length of 100 mm

ENVIRONMENT CONDITIONS: temperature 24⁰C; relative humidity 50%

CONDITIONING: 24 h under standard conditions (23±2)⁰C, (50±5)% RH

SPECIAL ENVIROMENT CONDITIONS FOR PRODUCT TESTING: -

TESTING PLACE: ICECON TEST laboratory

TESTING METHOD: 3.1 from EOTA TR 46 - 2014

TEST RESULTS

Item no.	Characteristics	Symbol	M.U.	Value					
				1	2	3	4	5	Average
1	Density	ρ	kg/m ³	26.52	31.05	32.75	27.67	26.50	28.89

REMARK: -



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MEASUREMENT SHEET

**DEN BRAVEN POLYURETHANE ADHESIVE
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Tack free time

STANDARD:

TR 046 - 2014

PROCEDURE CODE:

-

TESTING DATE: 8.12.2016

TESTED OBJECT: polyurethane adhesives cylindrically shaped beads with diameter approx.
30 mm, sprayed by gun, on a PE-foil at standard conditions

ENVIRONMENT CONDITIONS: temperature 23⁰C; relative humidity 55%

CONDITIONING: -

SPECIAL ENVIROMENT CONDITIONS FOR PRODUCT TESTING: -

TESTING PLACE: ICECON TEST laboratory

TESTING METHOD: 3.2 from EOTA TR 46 - 2014

TEST RESULTS

Item no.	Characteristics	Symbol	M.U.	Value
1	Tack free time	t _{tack free}	min	14

REMARK: -



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MEASUREMENT SHEET

**DEN BRAVEN POLYURETHANE ADHESIVE
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Cutting time

STANDARD:
EOTA TR 46 - 2014

PROCEDURE CODE:
-

TESTING DATE: 8.12.2016

TESTED OBJECT: polyurethane adhesives cylindrically shaped beads of foam with diameter approx. 30 mm, sprayed by gun, on cardboard at standard conditions

ENVIRONMENT CONDITIONS: temperature 24⁰C; relative humidity 50%

CONDITIONING: -

SPECIAL ENVIROMENT CONDITIONS FOR PRODUCT TESTING: -

TESTING PLACE: ICECON TEST laboratory

TESTING METHOD: 3.3 from EOTA TR 46 - 2014

TEST RESULTS

Item no.	Characteristics	Symbol	M.U.	Value
1	Cutting time	t _{cutting}	min.	40

REMARK: -



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MEASUREMENT SHEET

DEN BRAVEN POLYURETHANE ADHESIVE
FOR POLYSTYRENE - GUN

Bond strength

STANDARD:

EOTA TR 46 - 2014

PROCEDURE CODE:

-

TESTING DATE: 20.09.2016

TESTED OBJECT: polyurethane adhesives applied by gun on to the surface of EPS (expanded polystyrene) board, in longitudinal strips, and pressed from the top of concrete slab with dimensions of 400 mm x 400 mm x 40 mm, using at the edges spacers with thickness of 8 mm (samples EPS-foam adhesive-concrete)

ENVIRONMENT CONDITIONS: temperature 23°C; relative humidity 54%

CONDITIONING: 24 h under standard conditions (23±2)°C, (50±5)% RH

SPECIAL ENVIROMENT CONDITIONS FOR PRODUCT TESTING: -

TESTING PLACE: ICECON TEST laboratory

TESTING METHOD: 4.1.1 from EOTA TR 46 - 2014

TEST RESULTS

Item no.	Characteristics	Symbol	M.U.	Value					
				1	2	3	4	5	Average
1	Tensile bond strength to substrate	β_i	N/mm ² (MPa)	0.105	0.094	0.068	0.095	0.129	0.098
2	Failure mode	-	visual	100% adhesive failure at interface EPS/PU	90% cohesive failure in PU; 10% adhesive failure at interface EPS/PU	25% cohesive failure in PU; 75% adhesive failure at interface EPS/PU	50% cohesive failure in PU; 50% adhesive failure at interface EPS/PU	75% cohesive failure in PU; 25% adhesive failure at interface EPS/PU	-

REMARKS:

- Open time = 3 min.
- Foam thickness = 8 mm
- Expanded Polystyrene (EPS) board density = 20 kg/m³



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MEASUREMENT SHEET

DEN BRAVEN POLYURETHANE ADHESIVE
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Post expansion behaviour

STANDARD:

EOTA TR 46 - 2014

PROCEDURE CODE:

-

TESTING DATE: 9.12.2016

TESTED OBJECT: polyurethane adhesives cylindrically shaped beads with diameter approx. 30 mm, sprayed by gun in a square-shaped (400 mm x 400 mm), on EPS (expanded polystyrene) boards, at standard conditions; without delay it is pressed by a wood fibre particle board, until contact with the spacers placed at the corner.

ENVIRONMENT CONDITIONS: temperature 24°C; relative humidity 50%

CONDITIONING: -

SPECIAL ENVIROMENT CONDITIONS FOR PRODUCT TESTING: -

TESTING PLACE: ICECON TEST laboratory

TESTING METHOD: 4.2 from EOTA TR 46 - 2014

TEST RESULTS

Item no.	Characteristics	Symbol	M.U.	Value
1	Post expansion high after 5 min.	M1	mm	11
2	Post expansion high after 10 min.	M2	mm	11
3	Post expansion high after 20 min.	M3	mm	11
4	Post expansion high after 40 min.	M4	mm	10
5	Post expansion high after 60 min.	M5	mm	9
6	Post expansion high after 24 h	M6	mm	9

REMARK:

- EPS (expanded polystyrene) board with density = 20 kg/m³



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MEASUREMENT SHEET

DEN BRAVEN POLYURETHANE ADHESIVE
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Shear strength and shear modulus

STANDARD:

EOTA TR 46 - 2014

PROCEDURE CODE:

-

TESTING DATE: 9.12.2016

TESTED OBJECT: at both ends at a chipboard plate with dimensions of (140 x 100 x 10) mm, were placed the spacer with dimensions (20 x 100 x 8) mm; for the remaining surface (100 x 100) mm, polyurethane adhesives was sprayed by gun, in longitudinal strip and covered after (180±10) seconds with the second chipboard plate, at standard conditions

ENVIRONMENT CONDITIONS: temperature 24°C; relative humidity 50%

CONDITIONING: 48 h under standard conditions (23±2)°C, (50±5)% RH

SPECIAL ENVIRONMENT CONDITIONS FOR PRODUCT TESTING: -

TESTING PLACE: ICECON TEST laboratory

TESTING METHOD: 4.3 from EOTA TR 46 - 2014

TEST RESULTS

Item no.	Characteristics	Symbol	M.U.	Value			
				1	2	3	Average
1	Maximum force	F	N	918	876	926	-
2	Length	l	mm	99	99	99	-
3	Width	b	mm	100	98	100	-
4	Shear strength	σ_s	kPa	92.73	90.29	93.54	92.19
5	Shear modulus	E_s	kPa	204.36	253.71	266.67	241.58


REMARKS:

- chipboards plates type P5 according EN 312, dimension 140 mm x 100 mm x 10 mm
- spacers thickness = 8 mm
- constant speed of test machine = (3 ± 0.5) mm/min.



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SIGNATURES PAGE TESTING TEAM

Function	First and last name	Signature
Product test responsible	dipl. eng. Daniela Fiat, Ph.D	