

TEST REPORT

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CUSTOMER Ref.: ACC.PREV.91

A.P.S. AROSIO SPA

VIA ROGORINO, 1
 20060 GESSATE MI

Sample: NR. 4 MOCK-UP OF DAMPERS FOR AIR FLOW ADJUSTING 500x500 mm

Identification: A - B - C - D

Date of receipt: 21/01/2015

PERFORMANCE INSULATION TEST

Test modalities:

According to Customer instructions, the samples have been placed in vertical position and one of the two faces has been heated by a lamp positioned orthogonally to the surface. After 24 hours of exposition, have been measured the temperatures of the surface of the two faces of the samples. For more details see the figure 1.

Equipment:

- Digital temperature recorder	YOKOGAWA	Identif. Nr. SPS-0480
- Thermocouples	Type T	Identif. Nr. SPS-0481÷SPS-0484
- Taperline	MP 0÷3 m	Identif. Nr. SPS-0346

Test conditions:

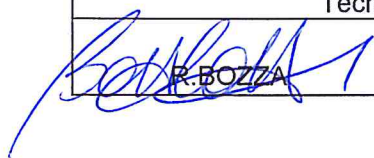
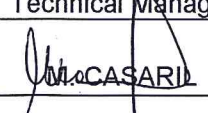
- Lamp	: OSRAM Ultra Vitalux 300 W
- Room temperature	: 16 °C
- Test duration	: 24 h

This test report concerns only the sample submitted to the test. If not otherwise indicated, the sampling operation were performed by the Customer.

Date/s of execution: 22÷24/01/2015

At: OMEKO Lab. - Monza

Notes: - - -

Technician/s	Technical Manager
 R. BOZZA	 M. CASARI

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Results:

Sample	Exposed Surface		Unexposed Surface		ΔT
	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	
A	16	39,3	16	34,5	4,8
B	16	72,4	16	46,1	26,3
C	16	49,0	16	34,8	14,2
D	16	73,2	16	45,3	27,9

- Sample C : PS100PA (Standard aluminium blade with polyurethane filling)
- Sample D : PS100TT PA (Thermal break blade with polyurethane filling)

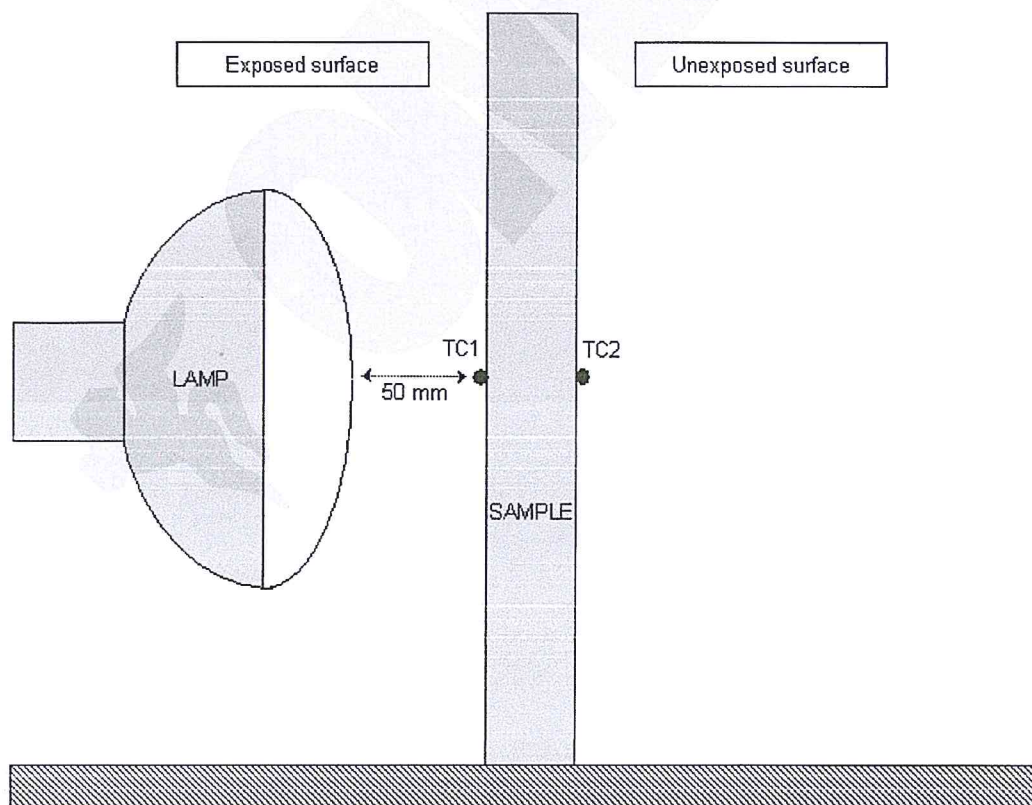


Fig. 1 – Test configuration



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Additional results :

The following mathematical model is not applicable to the samples A and C due to the different mechanism of heat transmission from exposed surface to unexposed surface. This is caused by the aluminium bridge that connect the two surfaces.

Sample	R_{Al} m^2K/W	R_{pol} m^2K/W	R_{air} m^2K/W	R_{tot} m^2K/W	U_{tot} W/m^2K	ΔT K	Q W/m^2
B	$6,8 \times 10^{-6}$	---	0,165	0,165	6,06	26,3	159.4
D	$6,8 \times 10^{-6}$	0,6	---	0,6	1,67	27,9	46,6

- Sample B : PS100TT (Thermal break blade)
- Sample D : PS100TT-PA (Thermal break blade with polyurethane filling)

Notes:

$Q = U_{tot} \times \Delta T$: Heat flux from exposed surface to the unexposed surface (in the measure point) after 24 hours

$U_{tot} = 1 / R_{tot}$: Total thermal transmittance of the sample (in the measure point)

$R_{tot} = 2x R_{Al} + R_{air}$: Thermal resistance of the sample B (in the measure point), where:

- $R_{air} = 0,165 W/m^2K$ (Thermal resistance of the air - Thickness : 0,015 m)
- $R_{Al} = T_{al} / K_{al}$ (Thermal resistance of aluminium)
- $T_{al} : 1,5 \times 10^{-3} m$ (Thickness aluminium)
- $K_{al} : 220 W/mK$ (Thermal conductivity aluminium)

$R_{tot} = 2x R_{Al} + R_{pol}$: Thermal resistance of the sample D (in the measure point), where:

- $R_{Al} = T_{al} / K_{al}$ (Thermal resistance of aluminium)
- $T_{al} : 1,5 \times 10^{-3} m$ (Thickness aluminium)
- $K_{al} : 220 W/mK$ (Thermal conductivity aluminium)
- $R_{pol} = T_{pol} / K_{pol}$ (Thermal resistance of polyurethane)
- $T_{pol} : 0,015 m$ (Thickness polyurethane)
- $K_{pol} : 0,025 W/mK$ (Thermal conductivity polyurethane)



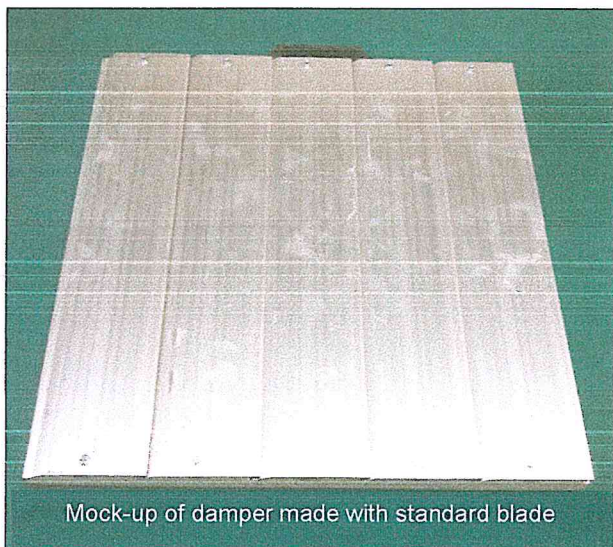
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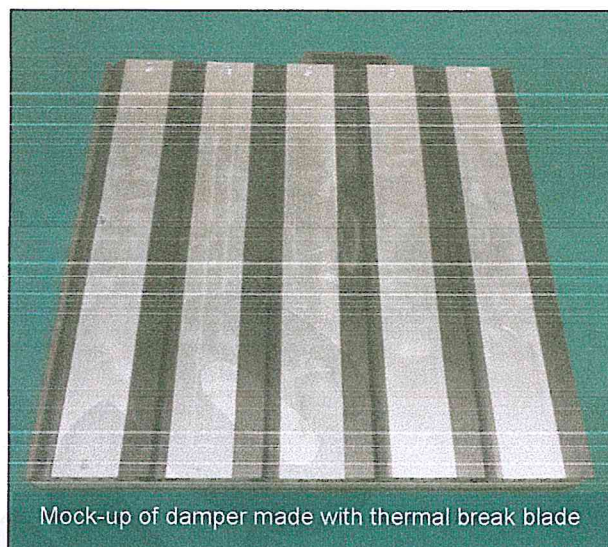
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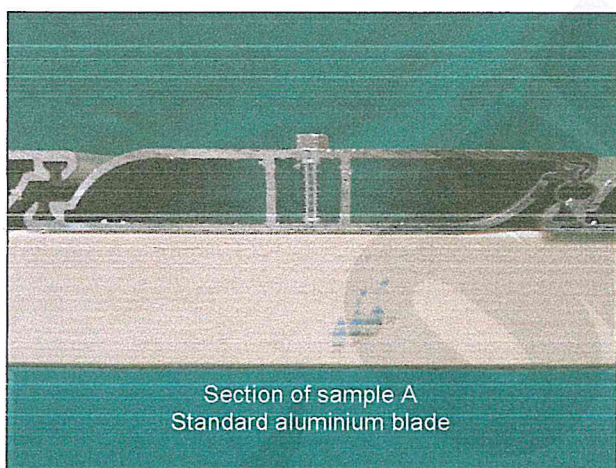
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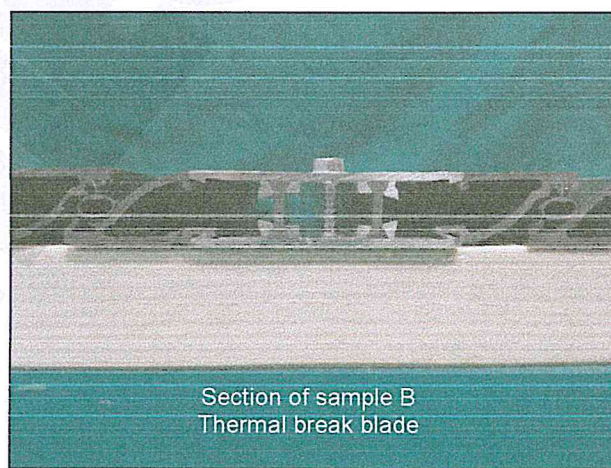
Mock-up of damper made with standard blade



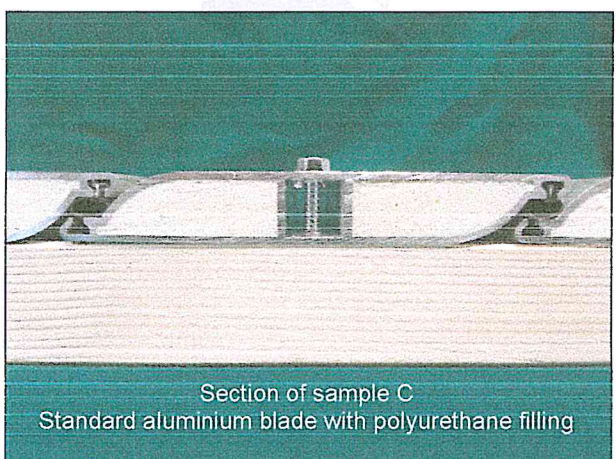
Mock-up of damper made with thermal break blade



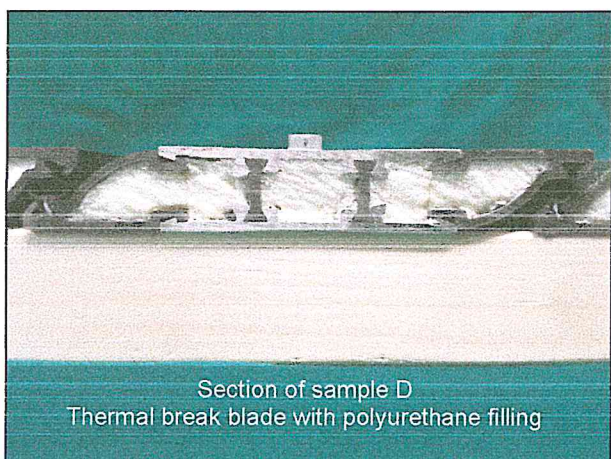
Section of sample A
 Standard aluminium blade



Section of sample B
 Thermal break blade



Section of sample C
 Standard aluminium blade with polyurethane filling



Section of sample D
 Thermal break blade with polyurethane filling