

TEST REPORT N° 2009B COU 8232-1

Including 3 pages + 1 annex
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Mons, October 22th, 2009

REQUESTED BY : AGC Flat Glass Europe - R&D Centre
2 rue de l'Aurore
B-6040 Jumet
Belgium

REFERENCE OF THE REQUEST : Mail du 12/10/2009

CONCERNED MANUFACTURER: AGC Flat Glass Europe - R&D Centre
2 rue de l'Aurore
B-6040 Jumet
Belgium

NUMBER OF SAMPLES AND IDENTIFICATION : Pyropane 211-44
See page 2

PURPOSE OF THE REQUESTED : **Initial Type Test**
Determination of the photo-energetic properties
according to EN 1096-1.*

SAMPLES RECEIVED ON : 13/10/2009

TESTING DATE : 19/10/2009

REMARKS : * Test under accreditation



Notified body (Id.N°1174)
according to ART.18 of the « Construction Products Directive » CPD 89/106/EEC

DESCRIPTION OF THE SAMPLES

Concerned manufacturer	: AGC Flat Glass Europe - R&D Centre 2 rue de l'Aurore B-6040 Jumet Belgium
Production site	: Lodelinsart
Commercial name of the product	: Pyropane 211-44
Customer's references	: code AGC 53516
Internal reference	: CCOU 8232-1
Sampling	: Under responsibility of the applicant
Sampling information	: Traceability of the samples is under responsibility of the manufacturer.
Class of Coating	: C
Coating position	: 2
Low emissivity	: yes
Glass Substrate	: Clear Float Glass
Normal emissivity of clear glass (ϵ_n)	: 0.89
Samples	:
Number of samples	: 1 (100 * 100 mm)
Nominal Thickness	: 6 mm

PHOTO-ENERGETIC PROPERTIES - EN 1096-1*

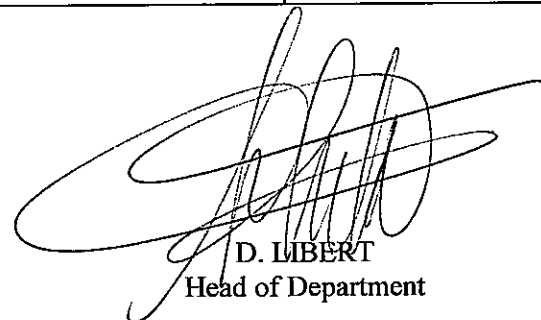
Instruments Description	For emissivity	For optical properties
Spectrophotometer	PerkinElmer SPECTRUM 100	PerkinElmer LAMDA 19
Type	Single Beam (FTIR)	Double Beam
Reflectance accessory	PerkinElmer	
Type of references	SnO ₂ Coated Glass	Primary surface Ag Mirrors
	Gold Mirror	Secondary surface Ag Mirrors
Measurement Responsible	DL	DL

Notes : Uncertainty calculated on emissivity measurement is ± 0.01
Reproducibility on emissivity measurement is estimated to ± 0.005

Considered parameters for the calculation of g and Ug	
Composition of the insulating glass	: 5.85/15/5.85
Position of the coating	: 2
Filling up	: 90% Ar

8232-1 : 5.85 mm

		COATED GLASS (EN 1096-1)		IGU (EN 673)	
U.V. range (280 – 380 nm)					
• Transmission	τ_{uv}	13.5	%	10.3	%
Visible range (380 – 780 nm) – III D65/obs 2°					
• Transmission	τ_v	83.1	%	74.6	%
• Reflection coated side	ρ_v	5.5	%	11.5	%
• Reflection opposite side	ρ'_v	6.3	%	/	
Solar range (300 – 2500 nm)					
• Transmission	τ_e	46.0	%	40.4	%
• Reflection coated side	ρ_e	38.0	%	28.3	%
• Reflection opposite side	ρ'_e	25.9	%	/	
• Solar factor	g	0.50		0.44	
Thermal range (5000 – 50000 nm)					
• Emissivity	ϵ_n	0.020		/	
• Thermal coefficient	Ug	/		1.07	W/m ² °K



D. LIBERT
Head of Department

Glazing and Components - INISMa

Avenue Gouverneur Cornez, 4 B-7000 MONS (Belgique)

Identification du vitrage

Vitrage Simple
8232-1 5.85 mm

micron	cm ⁻¹	Reflexion
5.5	1820	97.80
6.6	1504	97.82
7.4	1348	97.97
8.1	1240	97.96
8.6	1158	97.92
9.2	1088	97.95
9.7	1030	98.03
10.2	978	98.01
10.8	930	97.95
11.3	886	97.93
11.8	846	97.92
12.4	808	97.90
13.0	772	97.91
13.6	738	97.99
14.2	706	97.99
14.8	674	97.83
15.6	642	97.99
16.3	612	98.08
17.2	582	98.02
18.1	552	98.01
19.2	522	97.98
20.3	492	97.96
21.7	460	98.37
23.3	430	98.10
25.3	398	98.17
27.8	360	98.11
30.9	324	98.02
35.7	280	97.94
43.9	228	97.40

reflexion Moy	97.97	<i>Incertitude</i>	<i>reproductibilit</i>
Emissivité	0.020	±0.010	±0.005

Identification du vitrage

Vitrage Simple couche en position 1
8232-1 5.85 mm

Propriétés Lumineuses

```

*****
*   WL * TOTAL * TOTAL * TOTAL *   WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REFLE * ABSORB ** (nm) * TRANS * REFLE * ABSORB *
*****
* 390 * 43.07 * 28.28 * 28.65 ** 580 * 83.07 * 5.60 * 11.33 *
* 400 * 54.09 * 23.68 * 22.23 ** 590 * 82.72 * 5.25 * 11.96 *
* 410 * 62.03 * 18.36 * 19.61 ** 600 * 82.52 * 4.86 * 12.62 *
* 420 * 67.68 * 13.72 * 18.60 ** 610 * 82.10 * 4.44 * 13.46 *
* 430 * 71.70 * 10.05 * 18.24 ** 620 * 81.68 * 4.04 * 14.29 *
* 440 * 74.35 * 7.52 * 18.13 ** 630 * 80.98 * 3.69 * 15.33 *
* 450 * 76.62 * 5.89 * 17.48 ** 640 * 80.19 * 3.47 * 16.34 *
* 460 * 78.43 * 5.07 * 16.50 ** 650 * 79.26 * 3.43 * 17.31 *
* 470 * 79.90 * 4.74 * 15.36 ** 660 * 78.19 * 3.62 * 18.19 *
* 480 * 81.23 * 4.72 * 14.05 ** 670 * 76.86 * 4.08 * 19.06 *
* 490 * 82.27 * 4.88 * 12.85 ** 680 * 75.04 * 4.91 * 20.06 *
* 500 * 83.13 * 5.17 * 11.70 ** 690 * 73.15 * 6.12 * 20.73 *
* 510 * 83.76 * 5.45 * 10.79 ** 700 * 70.85 * 7.76 * 21.40 *
* 520 * 84.03 * 5.71 * 10.25 ** 710 * 68.12 * 9.82 * 22.07 *
* 530 * 84.18 * 5.92 * 9.89 ** 720 * 65.10 * 12.25 * 22.65 *
* 540 * 84.00 * 6.05 * 9.95 ** 730 * 61.98 * 15.12 * 22.90 *
* 550 * 83.96 * 6.09 * 9.95 ** 740 * 58.58 * 18.30 * 23.12 *
* 560 * 83.83 * 6.02 * 10.15 ** 750 * 55.08 * 21.80 * 23.12 *
* 570 * 83.40 * 5.85 * 10.76 ** 760 * 51.38 * 25.37 * 23.25 *
*****

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Proprietes lumineuses Illuminant D65
Light properties
Licht Eigenschaften

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-----
Transmission lumineuse                    (TL)
Light transmittance                        (LT)            83.1 +- .5%
Lichtdurchlässigkeit                        (LR)

Reflexion lumineuse                        (RL)
Light reflectance                            (LR)            5.5 +- .75%
Lichtreflexion                                (LR)

Absorption lumineuse                        (AL)
Light absorption                             (LA)            11.5 +- 1%
Lichtabsorption                              (LA)

```

Identification du vitrage

Vitrage Simple couche en position 1
8232-1 5.85 mm

Propriétés Energétiques

```

*****
*  WL  * TOTAL * TOTAL * TOTAL ** WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REFLE * ABSORB ** (nm) * TRANS * REFLE * ABSORB *
*****
* 300 * 0.01 * 15.69 * 84.31 ** 950 * 10.61 * 77.17 * 12.22 *
* 320 * 0.26 * 21.81 * 77.92 ** 1000 * 7.45 * 81.46 * 11.09 *
* 340 * 7.46 * 29.76 * 62.78 ** 1050 * 5.37 * 85.24 * 9.40 *
* 360 * 18.98 * 32.49 * 48.54 ** 1100 * 4.02 * 87.78 * 8.20 *
* 380 * 31.65 * 30.88 * 37.46 ** 1150 * 3.01 * 89.28 * 7.70 *
* 400 * 54.09 * 23.68 * 22.23 ** 1200 * 2.40 * 90.02 * 7.58 *
* 420 * 67.68 * 13.72 * 18.60 ** 1250 * 1.93 * 91.34 * 6.73 *
* 440 * 74.35 * 7.52 * 18.13 ** 1300 * 1.50 * 92.06 * 6.44 *
* 460 * 78.43 * 5.07 * 16.50 ** 1350 * 1.26 * 92.27 * 6.48 *
* 480 * 81.23 * 4.72 * 14.05 ** 1400 * 0.95 * 92.30 * 6.75 *
* 500 * 83.13 * 5.17 * 11.70 ** 1450 * 0.93 * 91.73 * 7.34 *
* 520 * 84.03 * 5.71 * 10.25 ** 1500 * 0.70 * 91.47 * 7.83 *
* 540 * 84.00 * 6.05 * 9.95 ** 1550 * 0.62 * 91.59 * 7.79 *
* 560 * 83.83 * 6.02 * 10.15 ** 1600 * 0.49 * 92.11 * 7.40 *
* 580 * 83.07 * 5.60 * 11.33 ** 1650 * 0.35 * 93.55 * 6.09 *
* 600 * 82.52 * 4.86 * 12.62 ** 1700 * 0.27 * 93.66 * 6.06 *
* 620 * 81.68 * 4.04 * 14.29 ** 1750 * 0.25 * 93.98 * 5.78 *
* 640 * 80.19 * 3.47 * 16.34 ** 1800 * 0.16 * 93.94 * 5.90 *
* 660 * 78.19 * 3.62 * 18.19 ** 1850 * 0.12 * 94.67 * 5.21 *
* 680 * 75.04 * 4.91 * 20.06 ** 1900 * 0.00 * 93.91 * 6.09 *
* 700 * 70.85 * 7.76 * 21.40 ** 1950 * 0.15 * 94.47 * 5.37 *
* 720 * 65.10 * 12.25 * 22.65 ** 2000 * 0.00 * 95.23 * 4.77 *
* 740 * 58.58 * 18.30 * 23.12 ** 2050 * 0.00 * 96.28 * 3.72 *
* 760 * 51.38 * 25.37 * 23.25 ** 2100 * 0.00 * 96.62 * 3.38 *
* 780 * 44.38 * 32.94 * 22.69 ** 2200 * 0.00 * 95.35 * 4.65 *
* 800 * 37.79 * 40.58 * 21.64 ** 2300 * 0.00 * 94.99 * 5.01 *
* 850 * 24.22 * 56.86 * 18.92 ** 2400 * 0.00 * 96.65 * 3.35 *
* 900 * 16.01 * 69.76 * 14.23 ** 2500 * 0.00 * 96.13 * 3.87 *
*****

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Te	46.0	±0.5%	g	50.2	±1%	Tuv	13.5	±0.50%
Re	38.0	±0.75%	SC	0.58		Ruv	29.1	±0.75%

COLOUR DETERMINATION ACCORDING TO CIE 1976			
VISIBLE RANGE (380 – 780 NM) – ILL D65/OBS 2°			
	L*	a*	b*
Transmission	93.0	-3.82	5.00
Reflection coated side	28.1	-0.71	-5.88

Identification du vitrage

Vitrage Simple couche en position 2
8232-1 5.85 mm

Propriétés Lumineuses

```

*****
* WL * TOTAL * TOTAL * TOTAL ** WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REPLE * ABSORB ** (nm) * TRANS * REPLE * ABSORB *
*****
* 390 * 43.07 * 25.48 * 31.45 ** 580 * 83.07 * 6.38 * 10.55 *
* 400 * 54.09 * 24.73 * 21.17 ** 590 * 82.78 * 6.17 * 11.05 *
* 410 * 62.03 * 21.28 * 16.69 ** 600 * 82.52 * 5.89 * 11.59 *
* 420 * 67.68 * 17.48 * 14.84 ** 610 * 82.10 * 5.58 * 12.32 *
* 430 * 71.70 * 14.27 * 14.03 ** 620 * 81.68 * 5.30 * 13.02 *
* 440 * 74.35 * 11.73 * 13.92 ** 630 * 80.98 * 5.07 * 13.95 *
* 450 * 76.62 * 9.78 * 13.60 ** 640 * 80.19 * 4.90 * 14.91 *
* 460 * 78.43 * 8.36 * 13.21 ** 650 * 79.26 * 4.85 * 15.89 *
* 470 * 79.90 * 7.30 * 12.80 ** 660 * 78.19 * 4.96 * 16.84 *
* 480 * 81.23 * 6.61 * 12.16 ** 670 * 76.86 * 5.28 * 17.86 *
* 490 * 82.27 * 6.22 * 11.51 ** 680 * 75.04 * 5.83 * 19.13 *
* 500 * 83.13 * 6.13 * 10.74 ** 690 * 73.15 * 6.64 * 20.21 *
* 510 * 83.76 * 6.19 * 10.06 ** 700 * 70.85 * 7.72 * 21.44 *
* 520 * 84.03 * 6.31 * 9.65 ** 710 * 68.12 * 9.07 * 22.81 *
* 530 * 84.18 * 6.45 * 9.37 ** 720 * 65.10 * 10.67 * 24.23 *
* 540 * 84.00 * 6.58 * 9.43 ** 730 * 61.98 * 12.43 * 25.58 *
* 550 * 83.96 * 6.63 * 9.41 ** 740 * 58.58 * 14.41 * 27.01 *
* 560 * 83.83 * 6.63 * 9.55 ** 750 * 55.08 * 16.52 * 28.40 *
* 570 * 83.40 * 6.54 * 10.06 ** 760 * 51.38 * 18.64 * 29.98 *
*****

```

Proprietes lumineuses Illuminant D65
Light properties
Licht Eigenschaften

```

-----
Transmission lumineuse                    (TL)
Light transmittance                      (LT)            83.1 +- .5%
Lichtdurchlassigkeit                      (LR)

Reflexion lumineuse                        (RL)
Light reflectance                          (LR)            6.3 +- .75%
Lichtreflexion                             (LR)

Absorption lumineuse                        (AL)
Light absorption                            (LA)            10.6 +- 1%
Lichtabsorption                            (LA)

```

Identification du vitrage

Vitrage Simple couche en position 2
8232-1 5.85 mm

Propriétés Energétiques

```

*****
* WL * TOTAL * TOTAL * TOTAL ** WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REFLE * ABSORB ** (nm) * TRANS * REFLE * ABSORB *
*****
* 300 * 0.01 * 5.61 * 94.39 ** 950 * 10.61 * 44.75 * 44.65 *
* 320 * 0.26 * 5.35 * 94.38 ** 1000 * 7.45 * 46.41 * 46.14 *
* 340 * 7.46 * 7.75 * 84.79 ** 1050 * 5.37 * 48.30 * 46.33 *
* 360 * 18.98 * 19.97 * 61.05 ** 1100 * 4.02 * 49.84 * 46.14 *
* 380 * 31.65 * 23.48 * 44.86 ** 1150 * 3.01 * 51.11 * 45.87 *
* 400 * 54.09 * 24.73 * 21.17 ** 1200 * 2.40 * 52.23 * 45.37 *
* 420 * 67.68 * 17.48 * 14.84 ** 1250 * 1.93 * 54.01 * 44.06 *
* 440 * 74.35 * 11.73 * 13.92 ** 1300 * 1.50 * 55.94 * 42.56 *
* 460 * 78.43 * 8.36 * 13.21 ** 1350 * 1.26 * 57.92 * 40.83 *
* 480 * 81.23 * 6.61 * 12.16 ** 1400 * 0.95 * 59.80 * 39.25 *
* 500 * 83.13 * 6.13 * 10.74 ** 1450 * 0.93 * 61.89 * 37.18 *
* 520 * 84.03 * 6.31 * 9.65 ** 1500 * 0.70 * 64.08 * 35.22 *
* 540 * 84.00 * 6.58 * 9.43 ** 1550 * 0.62 * 66.13 * 33.25 *
* 560 * 83.83 * 6.63 * 9.55 ** 1600 * 0.49 * 68.00 * 31.51 *
* 580 * 83.07 * 6.38 * 10.55 ** 1650 * 0.35 * 69.95 * 29.69 *
* 600 * 82.52 * 5.89 * 11.59 ** 1700 * 0.27 * 70.41 * 29.32 *
* 620 * 81.68 * 5.30 * 13.02 ** 1750 * 0.25 * 70.61 * 29.15 *
* 640 * 80.19 * 4.90 * 14.91 ** 1800 * 0.16 * 70.26 * 29.58 *
* 660 * 78.19 * 4.96 * 16.84 ** 1850 * 0.12 * 70.50 * 29.38 *
* 680 * 75.04 * 5.83 * 19.13 ** 1900 * 0.00 * 69.57 * 30.43 *
* 700 * 70.85 * 7.72 * 21.44 ** 1950 * 0.15 * 70.17 * 29.67 *
* 720 * 65.10 * 10.67 * 24.23 ** 2000 * 0.00 * 70.60 * 29.40 *
* 740 * 58.58 * 14.41 * 27.01 ** 2050 * 0.00 * 71.47 * 28.53 *
* 760 * 51.38 * 18.64 * 29.98 ** 2100 * 0.00 * 71.78 * 28.22 *
* 780 * 44.38 * 22.94 * 32.68 ** 2200 * 0.00 * 67.29 * 32.71 *
* 800 * 37.79 * 27.04 * 35.17 ** 2300 * 0.00 * 68.34 * 31.66 *
* 850 * 24.22 * 35.35 * 40.43 ** 2400 * 0.00 * 69.47 * 30.53 *
* 900 * 16.01 * 41.89 * 42.11 ** 2500 * 0.00 * 65.26 * 34.74 *
*****

```

Te	46.0	±0.5%	g	53.3	±1%	Tuv	13.5	±0.50%
Re	25.9	±0.75%	SC	0.61		Ruv	14.0	±0.75%

Identification du vitrage

Vitrage Double couche en position 2
8232-1 6/15/6
Gaz : 90% Ar

Propriétés Lumineuses

Propriétés Lumineuses

nm	Trans	Refl	nm	Trans	Refl
380	27.0%	24.2%	580	74.5%	11.5%
390	37.8%	26.9%	590	74.0%	11.2%
400	48.8%	27.0%	600	73.5%	10.9%
410	55.6%	24.2%	610	72.8%	10.6%
420	60.2%	21.0%	620	72.1%	10.1%
430	63.6%	18.2%	630	71.1%	9.8%
440	65.8%	15.9%	640	70.1%	9.5%
450	68.1%	14.2%	650	69.1%	9.3%
460	70.1%	13.0%	660	67.9%	9.3%
470	71.6%	12.1%	670	66.5%	9.5%
480	73.1%	11.6%	680	64.7%	9.8%
490	74.2%	11.3%	690	62.8%	10.4%
500	75.1%	11.3%	700	60.6%	11.2%
510	75.8%	11.6%	710	58.0%	12.3%
520	76.1%	11.6%	720	55.3%	13.6%
530	76.2%	11.8%	730	52.4%	15.1%
540	76.1%	11.9%	740	49.4%	16.8%
550	76.0%	11.9%	750	46.2%	18.6%
560	75.7%	11.9%	760	42.9%	20.5%
570	75.0%	11.7%	770	39.8%	22.4%
			780	36.9%	24.3%

	Y	x	y	L*	a*	b*	
TI	74.66%	(+ - 0.75)	0.3152	0.3429	89.2	-4.95	5.22
RI	11.46%	(+ - 1.00)	0.2899	0.2985	40.3	1.78	-7.88

Identification du vitrage

Vitrage Double couche en position 2
8232-1 6/15/6
Gaz : 90% Ar

Propriétés Energétiques

nm	Trans	Refl	nm	Trans	Refl
300	0.0%	5.8%	950	8.4%	44.8%
320	0.0%	5.4%	1000	5.9%	46.5%
340	3.4%	7.8%	1050	4.3%	48.3%
360	15.5%	20.2%	1100	3.2%	49.9%
380	27.0%	24.2%	1150	2.4%	51.1%
400	48.8%	27.0%	1200	1.9%	52.2%
420	60.2%	21.0%	1250	1.6%	54.0%
440	65.8%	15.9%	1300	1.2%	55.9%
460	70.1%	13.0%	1350	1.0%	57.9%
480	73.1%	11.6%	1400	0.8%	59.8%
500	75.1%	11.3%	1450	0.8%	61.9%
520	76.1%	11.6%	1500	0.6%	64.1%
540	76.1%	11.9%	1550	0.5%	66.1%
560	75.7%	11.9%	1600	0.4%	68.0%
580	74.5%	11.5%	1650	0.3%	70.0%
600	73.5%	10.9%	1700	0.2%	70.4%
620	72.1%	10.1%	1750	0.2%	70.8%
640	70.1%	9.5%	1800	0.1%	70.3%
660	67.9%	9.3%	1850	0.1%	70.5%
680	64.7%	9.8%	1900	0.0%	69.6%
700	60.6%	11.2%	1950	0.1%	70.2%
720	55.3%	13.6%	2000	0.0%	70.6%
740	49.4%	16.8%	2050	0.0%	71.5%
760	42.9%	20.5%	2100	0.0%	71.8%
780	36.9%	24.3%	2200	0.0%	67.3%
800	31.2%	28.0%	2300	0.0%	68.3%
850	19.7%	35.7%	2400	0.0%	69.5%
900	12.8%	42.1%	2500	0.0%	65.3%

Te =	40.36%	(+ - 0.75)
Re =	28.34%	(+ - 1.00)

g =	44.08%	(+ - 1.00)
Shading coef =	0.51	(g/0.87)

T uv =	10.26%	(+ - 0.80)
R uv =	14.23%	(+ - 1.10)