



Avenue Gouverneur Cornez, 4  
B-7000 MONS (Belgique)  
Tél. (065)40.34.34  
Fax (065)34.80.05

T.V.A. : BE 0413.106.271  
RC MONS : 130.828 - Enregistrement : 08/02/01

www.bcrc.be

Accreditation N° : 32-Test  
according to ISO 17025

**TEST REPORT N° 2009B COU 8232-2M**

Including 3 pages + 1 annex  
Page 1/3

Mons, October 22<sup>th</sup>, 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 221-37  
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

This report cancel and replaces the report 2009B COU 8232-2



**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 221-37**

Customer's references : **code AGC 53515**

Internal reference : CCOU 8232-2

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 ( $\epsilon_n$ ) : 0.89

Samples :

    Number of samples : 1 (100 \* 100 mm)

    Nominal Thickness : 6 mm

PHOTO-ENERGETIC PROPERTIES - EN 1096-1\*

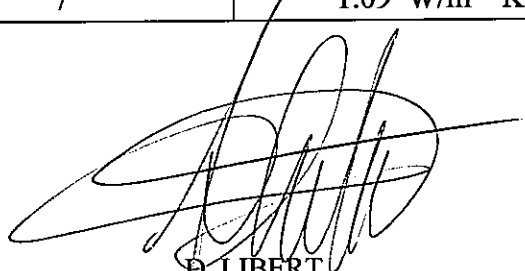
<b>Instruments Description</b>	For emissivity	For optical properties
Spectrophotometer	PerkinElmer SPECTRUM 100	PerkinElmer LAMDA 19
Type	Single Beam (FTIR)	Double Beam
Reflectance accessory	PerkinElmer	
Type of references	SnO <sub>2</sub> Coated Glass	Primary surface Ag Mirrors
	Gold Mirror	Secondary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

Notes : Uncertainty calculated on emissivity measurement is  $\pm 0.01$   
Reproducibility on emissivity measurement is estimated to  $\pm 0.005$

<b>Considered parameters for the calculation of g and U<sub>g</sub></b>	
Composition of the insulating glass	: 5.85/15/5.85
Position of the coating	: 2
Filling up	: 90% Ar

8232-2 : 5.91 mm

		COATED GLASS (EN 1096-1)		IGU (EN 673)	
<b>U.V. range (280 – 380 nm)</b>					
• Transmission	$\tau_{uv}$	12.7	%	9.7	%
<b>Visible range (380 – 780 nm) – III D65/obs 2°</b>					
• Transmission	$\tau_v$	66.9	%	60.5	%
• Reflection coated side	$\rho_v$	12.9	%	13.9	%
• Reflection opposite side	$\rho'_v$	10.6	%	/	
<b>Solar range (300 – 2500 nm)</b>					
• Transmission	$\tau_e$	39.0	%	34.3	%
• Reflection coated side	$\rho_e$	39.6	%	28.5	%
• Reflection opposite side	$\rho'_e$	26.8	%	/	
• Solar factor	g	0.44		0.38	
<b>Thermal range (5000 – 50000 nm)</b>					
• Emissivity	$\epsilon_n$	0.024		/	
• Thermal coefficient	U <sub>g</sub>	/		1.09	W/m <sup>2</sup> °K



D. LIBERT  
Head of Department

Glazing and Components - INISMA

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

☎: 32/(0)65/40.34.34

Fax : 32/(0)65/34.80.05

J:\RAPPORTS ATTESTATION\Cou\2009\AGC CRD Pyropane 8232-2M.doc

e-mail : [info@bcrc.be](mailto:info@bcrc.be)

url : [www.bcrc.be](http://www.bcrc.be)

## Identification du vitrage

Vitrage Simple  
8232-2      5.91 mm

micron	cm <sup>-1</sup>	Reflexion
5.5	1820	97.32
6.6	1504	97.34
7.4	1348	97.49
8.1	1240	97.48
8.6	1158	97.42
9.2	1088	97.48
9.7	1030	97.59
10.2	978	97.55
10.8	930	97.48
11.3	886	97.45
11.8	846	97.44
12.4	808	97.45
13.0	772	97.48
13.6	738	97.57
14.2	706	97.57
14.8	674	97.51
15.6	642	97.58
16.3	612	97.66
17.2	582	97.60
18.1	552	97.69
19.2	522	97.60
20.3	492	97.54
21.7	460	97.97
23.3	430	97.74
25.3	396	98.03
27.8	360	97.70
30.9	324	97.55
35.7	280	97.60
43.9	228	97.18

reflexion Moy  
Emissivité

97.55  
0.024

incertitude  
±0.010

reproductibilité  
±0.005

### Identification du vitrage

Vitrage Simple                    couche en position 1  
8232-2                                5.91 mm

### Propriétés Lumineuses

```

*****
* WL * TOTAL * TOTAL * TOTAL ** WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REFLE * ABSORB ** (nm) * TRANS * REFLE * ABSORB *
*****
* 390 * 41.31 * 21.32 * 37.37 ** 580 * 66.11 * 14.54 * 19.35 *
* 400 * 51.22 * 17.55 * 31.23 ** 590 * 65.82 * 14.65 * 19.53 *
* 410 * 57.39 * 14.11 * 28.51 ** 600 * 65.57 * 14.59 * 19.84 *
* 420 * 60.97 * 11.49 * 27.54 ** 610 * 65.25 * 14.41 * 20.34 *
* 430 * 63.58 * 9.62 * 26.80 ** 620 * 64.90 * 14.14 * 20.96 *
* 440 * 65.11 * 8.43 * 26.47 ** 630 * 64.47 * 13.82 * 21.72 *
* 450 * 66.52 * 7.75 * 25.73 ** 640 * 64.10 * 13.44 * 22.46 *
* 460 * 67.65 * 7.58 * 24.77 ** 650 * 63.70 * 13.08 * 23.21 *
* 470 * 68.31 * 7.72 * 23.96 ** 660 * 63.22 * 12.78 * 23.99 *
* 480 * 68.56 * 8.15 * 23.30 ** 670 * 62.46 * 12.66 * 24.89 *
* 490 * 68.72 * 8.74 * 22.54 ** 680 * 61.73 * 12.66 * 25.60 *
* 500 * 68.68 * 9.52 * 21.80 ** 690 * 60.63 * 12.98 * 26.38 *
* 510 * 68.47 * 10.35 * 21.18 ** 700 * 59.55 * 13.62 * 26.83 *
* 520 * 68.25 * 11.19 * 20.55 ** 710 * 57.87 * 14.56 * 27.57 *
* 530 * 67.89 * 12.02 * 20.09 ** 720 * 56.00 * 15.89 * 28.11 *
* 540 * 67.64 * 12.75 * 19.60 ** 730 * 53.91 * 17.64 * 28.45 *
* 550 * 67.20 * 13.40 * 19.39 ** 740 * 51.76 * 19.77 * 28.48 *
* 560 * 66.96 * 13.93 * 19.11 ** 750 * 49.17 * 22.24 * 28.59 *
* 570 * 66.60 * 14.33 * 19.07 ** 760 * 46.36 * 25.01 * 28.63 *
*****

```

Propriétés lumineuses                    Illuminant D65  
Light properties  
Licht Eigenschaften

```

-----
Transmission lumineuse                    (TL)
Light transmittance                      (LT)            56.9    +- .5%
Lichtdurchlässigkeit                    (LR)

Reflexion lumineuse                      (RL)
Light reflectance                        (LR)            12.9    +- .75%
Lichtreflexion                            (LR)

Absorption lumineuse                      (AL)
Light absorption                         (LA)            20.2    +- 1%
Lichtabsorption                         (LA)

```

### Identification du vitrage

Vitrage Simple      couche en position 1  
8232-2                    5.91 mm

### Propriétés Energétiques

```

*****
* WL * TOTAL * TOTAL * TOTAL ** WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REFLE * ABSORB ** (nm) * TRANS * REFLE * ABSORB *
*****
* 300 * 0.01 * 18.85 * 81.14 ** 950 * 10.15 * 74.93 * 14.92 *
* 320 * 0.28 * 25.41 * 74.31 ** 1000 * 7.03 * 79.57 * 13.39 *
* 340 * 6.83 * 26.96 * 66.22 ** 1050 * 5.10 * 83.62 * 11.28 *
* 360 * 17.87 * 27.71 * 54.42 ** 1100 * 3.75 * 86.38 * 9.88 *
* 380 * 30.24 * 24.56 * 45.21 ** 1150 * 2.96 * 88.02 * 9.02 *
* 400 * 51.22 * 17.55 * 31.23 ** 1200 * 2.31 * 88.87 * 8.82 *
* 420 * 60.97 * 11.49 * 27.54 ** 1250 * 1.75 * 90.18 * 8.07 *
* 440 * 65.11 * 8.43 * 26.47 ** 1300 * 1.38 * 91.00 * 7.61 *
* 460 * 67.65 * 7.58 * 24.77 ** 1350 * 1.11 * 91.22 * 7.67 *
* 480 * 68.56 * 8.15 * 23.30 ** 1400 * 0.93 * 91.28 * 7.79 *
* 500 * 68.68 * 9.52 * 21.80 ** 1450 * 0.79 * 90.77 * 8.44 *
* 520 * 68.25 * 11.19 * 20.55 ** 1500 * 0.69 * 90.54 * 8.77 *
* 540 * 67.64 * 12.75 * 19.60 ** 1550 * 0.50 * 90.70 * 8.80 *
* 560 * 66.96 * 13.93 * 19.11 ** 1600 * 0.38 * 91.29 * 8.33 *
* 580 * 66.11 * 14.54 * 19.35 ** 1650 * 0.29 * 92.74 * 6.96 *
* 600 * 65.57 * 14.59 * 19.84 ** 1700 * 0.29 * 92.91 * 6.80 *
* 620 * 64.90 * 14.14 * 20.96 ** 1750 * 0.16 * 93.26 * 6.58 *
* 640 * 64.10 * 13.44 * 22.46 ** 1800 * 0.08 * 93.24 * 6.68 *
* 660 * 63.22 * 12.78 * 23.99 ** 1850 * 0.05 * 93.98 * 5.97 *
* 680 * 61.73 * 12.66 * 25.60 ** 1900 * 0.00 * 93.24 * 6.76 *
* 700 * 59.55 * 13.62 * 26.83 ** 1950 * 0.11 * 93.76 * 6.13 *
* 720 * 56.00 * 15.89 * 28.11 ** 2000 * 0.00 * 94.57 * 5.43 *
* 740 * 51.76 * 19.77 * 28.48 ** 2050 * 0.00 * 95.62 * 4.38 *
* 760 * 46.36 * 25.01 * 28.63 ** 2100 * 0.00 * 95.99 * 4.01 *
* 780 * 40.92 * 31.22 * 27.85 ** 2200 * 0.00 * 94.74 * 5.26 *
* 800 * 35.25 * 38.03 * 26.72 ** 2300 * 0.00 * 94.39 * 5.61 *
* 850 * 23.41 * 53.63 * 22.97 ** 2400 * 0.00 * 95.95 * 4.05 *
* 900 * 15.53 * 67.10 * 17.36 ** 2500 * 0.00 * 95.53 * 4.47 *
*****

```

Te	39.0	±0.5%	g	44.5	±1%	Tuv	12.7	±0.50%
Re	39.6	±0.75%	SC	0.51		Ruv	26.4	±0.75%

COLOUR DETERMINATION ACCORDING TO CIE 1976			
VISIBLE RANGE (380 – 780 NM) – ILL D65/OBS 2°			
	L*	a*	b*
Transmission	85.4	-2.57	0.58
Reflection coated side	42.6	0.68	12.8

### Identification du vitrage

Vitrage Simple      couche en position 2  
8232-2                    5.91 mm

### Propriétés Lumineuses

```

*****
* WL * TOTAL * TOTAL * TOTAL ** WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REFLE * ABSORB ** (nm) * TRANS * REFLE * ABSORB *
*****
* 390 * 41.31 * 18.90 * 39.79 ** 580 * 66.11 * 10.31 * 23.58 *
* 400 * 51.22 * 20.61 * 28.18 ** 590 * 65.82 * 10.03 * 24.14 *
* 410 * 57.39 * 19.78 * 22.84 ** 600 * 65.57 * 9.68 * 24.75 *
* 420 * 60.97 * 18.17 * 20.85 ** 610 * 65.25 * 9.29 * 25.46 *
* 430 * 63.58 * 16.59 * 19.83 ** 620 * 64.90 * 8.88 * 26.22 *
* 440 * 65.11 * 15.18 * 19.71 ** 630 * 64.47 * 8.48 * 27.06 *
* 450 * 66.52 * 14.04 * 19.44 ** 640 * 64.10 * 8.10 * 27.80 *
* 460 * 67.65 * 13.22 * 19.13 ** 650 * 63.70 * 7.76 * 28.54 *
* 470 * 68.31 * 12.55 * 19.14 ** 660 * 63.22 * 7.54 * 29.23 *
* 480 * 68.56 * 12.04 * 19.41 ** 670 * 62.46 * 7.43 * 30.11 *
* 490 * 68.72 * 11.62 * 19.66 ** 680 * 61.73 * 7.48 * 30.79 *
* 500 * 68.68 * 11.38 * 19.95 ** 690 * 60.63 * 7.75 * 31.62 *
* 510 * 68.47 * 11.22 * 20.31 ** 700 * 59.55 * 8.23 * 32.21 *
* 520 * 68.25 * 11.09 * 20.66 ** 710 * 57.87 * 8.96 * 33.17 *
* 530 * 67.89 * 11.02 * 21.09 ** 720 * 56.00 * 9.95 * 34.05 *
* 540 * 67.64 * 10.93 * 21.43 ** 730 * 53.91 * 11.17 * 34.93 *
* 550 * 67.20 * 10.84 * 21.96 ** 740 * 51.76 * 12.65 * 35.59 *
* 560 * 66.96 * 10.72 * 22.32 ** 750 * 49.17 * 14.32 * 36.51 *
* 570 * 66.60 * 10.56 * 22.84 ** 760 * 46.36 * 16.13 * 37.51 *
*****

```

Propriétés lumineuses      Illuminant D65  
Light properties  
Licht Eigenschaften

```

-----
Transmission lumineuse      (TL)
Light transmittance      (LT)      66.9 +- .5%
Lichtdurchlässigkeit      (LR)

Reflexion lumineuse      (RL)
Light reflectance      (LR)      10.6 +- .75%
Lichtreflexion      (LR)

Absorption lumineuse      (AL)
Light absorption      (LA)      22.6 +- 1%
Lichtabsorption      (LA)

```

### Identification du vitrage

Vitrage Simple      couche en position 2  
8232-2              5.91 mm

### Propriétés Energétiques

```

*****
* WL * TOTAL * TOTAL * TOTAL ** WL * TOTAL * TOTAL * TOTAL *
* (nm) * TRANS * REFLE * ABSORB ** (nm) * TRANS * REFLE * ABSORB *
*****
* 300 * 0.01 * 5.46 * 94.54 ** 950 * 10.15 * 43.56 * 46.29 *
* 320 * 0.28 * 5.26 * 94.46 ** 1000 * 7.03 * 45.74 * 47.23 *
* 340 * 6.83 * 6.47 * 86.70 ** 1050 * 5.10 * 47.89 * 47.01 *
* 360 * 17.87 * 12.77 * 69.36 ** 1100 * 3.75 * 49.64 * 46.61 *
* 380 * 30.24 * 15.60 * 54.17 ** 1150 * 2.96 * 51.07 * 45.97 *
* 400 * 51.22 * 20.61 * 28.18 ** 1200 * 2.31 * 52.35 * 45.34 *
* 420 * 60.97 * 18.17 * 20.85 ** 1250 * 1.75 * 54.19 * 44.06 *
* 440 * 65.11 * 15.18 * 19.71 ** 1300 * 1.38 * 56.27 * 42.35 *
* 460 * 67.65 * 13.22 * 19.13 ** 1350 * 1.11 * 58.32 * 40.57 *
* 480 * 68.56 * 12.04 * 19.41 ** 1400 * 0.93 * 60.26 * 38.81 *
* 500 * 68.68 * 11.38 * 19.95 ** 1450 * 0.79 * 62.54 * 36.68 *
* 520 * 68.25 * 11.09 * 20.66 ** 1500 * 0.69 * 64.77 * 34.55 *
* 540 * 67.64 * 10.93 * 21.43 ** 1550 * 0.50 * 66.80 * 32.70 *
* 560 * 66.96 * 10.72 * 22.32 ** 1600 * 0.38 * 68.66 * 30.96 *
* 580 * 66.11 * 10.31 * 23.58 ** 1650 * 0.29 * 70.57 * 29.13 *
* 600 * 65.57 * 9.68 * 24.75 ** 1700 * 0.29 * 70.99 * 28.72 *
* 620 * 64.90 * 8.88 * 26.22 ** 1750 * 0.16 * 71.18 * 28.66 *
* 640 * 64.10 * 8.10 * 27.80 ** 1800 * 0.08 * 70.84 * 29.07 *
* 660 * 63.22 * 7.54 * 29.23 ** 1850 * 0.05 * 70.96 * 28.99 *
* 680 * 61.73 * 7.48 * 30.79 ** 1900 * 0.00 * 70.17 * 29.83 *
* 700 * 59.55 * 8.23 * 32.21 ** 1950 * 0.11 * 70.86 * 29.03 *
* 720 * 56.00 * 9.95 * 34.05 ** 2000 * 0.00 * 71.19 * 28.81 *
* 740 * 51.76 * 12.65 * 35.59 ** 2050 * 0.00 * 71.96 * 28.04 *
* 760 * 46.36 * 16.13 * 37.51 ** 2100 * 0.00 * 72.25 * 27.75 *
* 780 * 40.92 * 20.03 * 39.04 ** 2200 * 0.00 * 67.63 * 32.37 *
* 800 * 35.25 * 24.13 * 40.62 ** 2300 * 0.00 * 68.84 * 31.16 *
* 850 * 23.41 * 33.09 * 43.51 ** 2400 * 0.00 * 69.79 * 30.21 *
* 900 * 15.53 * 40.11 * 44.35 ** 2500 * 0.00 * 65.72 * 34.28 *
*****

```

Te	39.0	±0.5%	g	47.8	±1%	Tuv	12.7	±0.50%
Re	26.8	±0.75%	SC	0.55		Ruv	9.8	±0.75%



### Identification du vitrage

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

### Propriétés Lumineuses

nm	Trans	Refl	nm	Trans	Refl
380	25.7%	16.3%	580	59.7%	13.6%
390	36.1%	20.2%	590	59.2%	13.2%
400	46.0%	22.7%	600	58.8%	12.9%
410	51.3%	22.3%	610	58.3%	12.4%
420	54.2%	21.0%	620	57.7%	12.0%
430	56.4%	19.7%	630	57.1%	11.5%
440	57.7%	18.4%	640	56.5%	11.1%
450	59.3%	17.4%	650	55.9%	10.7%
460	60.6%	16.7%	660	55.3%	10.4%
470	61.4%	16.1%	670	54.4%	10.2%
480	61.8%	15.6%	680	53.5%	10.2%
490	62.1%	15.2%	690	52.4%	10.4%
500	62.3%	14.9%	700	51.2%	10.7%
510	62.2%	14.8%	710	49.5%	11.3%
520	62.1%	14.6%	720	47.7%	12.2%
530	61.8%	14.5%	730	45.7%	13.2%
540	61.6%	14.4%	740	43.7%	14.5%
550	61.1%	14.2%	750	41.3%	16.0%
560	60.9%	14.1%	760	38.8%	17.6%
570	60.3%	13.9%	770	36.5%	19.4%
			780	34.0%	21.2%

	Y	x	y	L*	a*	b*
TI	60.46% (+ - 0.75)	0.3094	0.3342	82.1	-3.85	1.16
RI	13.90% (+ -1.00)	0.2857	0.3023	44.1	-0.46	-8.06

### Identification du vitrage

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

### Propriétés Energétiques

nm	Trans	Refl	nm	Trans	Refl
300	0.0%	5.8%	950	8.1%	43.8%
320	0.0%	5.3%	1000	5.6%	45.9%
340	3.2%	6.5%	1050	4.1%	48.1%
360	14.6%	13.0%	1100	3.0%	49.8%
380	25.7%	16.3%	1150	2.4%	51.3%
400	46.0%	22.7%	1200	1.9%	52.6%
420	54.2%	21.0%	1250	1.4%	54.4%
440	57.7%	18.4%	1300	1.1%	56.5%
460	60.6%	16.7%	1350	0.9%	58.5%
480	61.8%	15.6%	1400	0.8%	60.4%
500	62.3%	14.9%	1450	0.7%	62.7%
520	62.1%	14.6%	1500	0.6%	64.9%
540	61.6%	14.4%	1550	0.4%	67.0%
560	60.9%	14.1%	1600	0.3%	68.8%
580	59.7%	13.6%	1650	0.3%	70.7%
600	58.8%	12.9%	1700	0.3%	71.1%
620	57.7%	12.0%	1750	0.1%	71.3%
640	56.5%	11.1%	1800	0.1%	71.0%
660	55.3%	10.4%	1850	0.0%	71.1%
680	53.5%	10.2%	1900	0.0%	70.3%
700	51.2%	10.7%	1950	0.1%	71.0%
720	47.7%	12.2%	2000	0.0%	71.3%
740	43.7%	14.5%	2050	0.0%	72.1%
760	38.8%	17.6%	2100	0.0%	72.4%
780	34.0%	21.2%	2200	0.0%	67.8%
800	29.1%	25.0%	2300	0.0%	69.0%
850	19.0%	33.5%	2400	0.0%	70.0%
900	12.5%	40.4%	2500	0.0%	68.0%

<b>Te =</b>	<b>34.26%</b>	<b>(+ - 0.75)</b>
<b>Re =</b>	<b>28.50%</b>	<b>(+ -1.00)</b>

<b>g =</b>	<b>37.98%</b>	<b>(+ -1.00)</b>
<b>Shading coef =</b>	<b>0.44</b>	<b>( g/0.87 )</b>

<b>T uv =</b>	<b>9.66%</b>	<b>(+ - 0.80)</b>
<b>R uv =</b>	<b>10.03%</b>	<b>(+ -1.10)</b>