Insulating Glass Unit (IGU) Performance Data

Cardinal LoĒ[™] glass sets the industry standard for energy-efficient coated glass products. Our patented, world-class, sputtered coatings remain unmatched for their quality, aesthetics and performance. These coatings reduce heat transfer while optimizing light transmission. This helps limit heating/cooling loads while protecting interior furnishings from Ultraviolet (UV) damage.

	LoĒ ² -240 [®] LoĒ ³ -340 [®]	Low solar heat gain coefficient (SHCG) with glare control. Both products maintain cool glass temperatures in warm climates.
Solar Control	LoĒ-452+™	Low SHGC with some glare control, low exterior reflection, and 99% UV blocking. Comes standard with Neat+.
	LoĒ ³ -366®	Low SHGC with high visible light transmission while providing year-round comfort.
	LoĒ ² -272 [®] LoĒ ² -270 [®]	Moderate SHGC with high visible light transmission that provides year-round performance
Passive	LoĒ-180 [®] LoĒ-180 ESC™	High SHGC while preventing room heat loss to the outside. LoĒ-180 ESC was engineered to meet ENERGY STAR Canada criteria.
Solar	LoĒ-Di89™	LoĒ-i89 coating on both sides of a single, interior pane, used to meet ENERGY STAR Canada criteria.
Interior (Roomside)	LoĒ-i89®	Enhanced cold climate performance by lowering the U-Factor further. LoĒ-i89 can be combined with any Cardinal LoĒ.
Exterior	Neat+™	Keeps the exterior glass surface cleaner longer than uncoated glass. Neat+ will not change the IGU performance and is available with all Cardinal LoE products.

Cardinal does not recommend solar control LoĒ coatings to be used on the #3 glass surface of a dual pane IGU with a clear outdoor lite. The potential for interior glass breakage resulting from thermal stress is increased. It's recommended that LoĒ-452+, LoĒ²-240 & LoĒ³-340 only be used on the #2 surface.

Cardinal LoĒ coatings may also be combined with tinted glass which can alter color, reduce glare, and add provide additional solar control benefits.



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CARDINAL CASE INDUSTRIES COMPANY

TECHNICAL SERVICE BULLETIN

Bulletin #CG09-12/24

3mm - Double Pane IGU Performance Data

		Vis	ible Lig	Jht		Center	of Glass	
Exterior Glass	Interior Glass	Trans	Reflec	Reflectance		U-Factor BTU/hr/ft²/°F		UV Trans
			Out	In		Air	Argon	
Clear	Clear	82%	15%	15%	.78	.48	.46	58%
Clear	LoĒ-i89 (3)	80%	15%	14%	.75	.33	.29	55%
Clear	LoĒ-180 ESC (3)	79%	15%	15%	.71	.31	.26	25%
Clear	LoĒ-180 (3)	79%	15%	15%	.69	.31	.26	29%
Clear	LoĒ-Di89 (3 & 4)	79%	14%	14%	.71	.26	.23	52%
LoĒ-180 ESC (2)	Clear	79%	15%	15%	.67	.31	.26	25%
LoĒ-180 (2)	Clear	79%	15%	15%	.64	.31	.26	29%
LoĒ ² -272 (2)	Clear	72%	11%	12%	.41	.30	.25	16%
LoĒ ² -270 (2)	Clear	70%	12%	13%	.37	.29	.25	14%
LoĒ ³ -366 (2)	Clear	65%	11%	12%	.27	.29	.24	5%
LoĒ-452+ (2)	Clear	52%	10%	15%	.22	.29	.24	1%
LoĒ ² -240 (2)	Clear	40%	14%	11%	.25	.30	.25	15%
LoĒ ³ -340 (2)	Clear	39%	13%	16%	.18	.29	.24	2%
LoĒ-180 ESC (2)	LoĒ-i89 (4)	78%	15%	14%	.64	.24	.21	24%
LoĒ-180 (2)	LoĒ-i89 (4)	77%	15%	14%	.62	.24	.21	27%
LoĒ ² -272 (2)	LoĒ-i89 (4)	70%	11%	11%	.41	.23	.20	16%
LoĒ ² -270 (2)	LoĒ-i89 (4)	68%	12%	13%	.36	.23	.20	14%
LoĒ ³ -366 (2)	LoĒ-i89 (4)	63%	11%	12%	.27	.23	.20	5%
LoĒ-452+ (2)	LoĒ-i89 (4)	51%	10%	14%	.21	.23	.19	1%
LoĒ ² -240 (2)	LoĒ-i89 (4)	39%	14%	10%	.24	.24	.20	15%
LoĒ ³ -340 (2)	LoĒ-i89 (4)	38%	13%	15%	.17	.23	.20	2%

Notes:

• Values are center of glass calculated using LBNL Window per NFRC 100, actual values may vary due to production tolerances.

• Argon calculations based on 90% gas fill level.

_	Glass	Airspace	Glass
	3mm	13.0mm	3mm
	1⁄8"	1/2"	1/8"

CARDINAL GLASS INDUSTRIES COMPANY

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3mm - Double Pane IGU Tinted Glass Performance Data

		Vis	ible Lig	ht		Center	of Glass	
Exterior Glass	Interior Glass	Trans	Reflec	tance	SHGC	U-Factor BTU/hr/ft²/°F		UV Trans
		Inanis	Out	In		Air	Argon	
	Clear	75%	13%	15%	.59	.48	.46	34%
	LoĒ-i89 (3)	73%	13%	14%	.55	.33	.29	32%
	LoĒ-180 ESC (3)	72%	13%	15%	.52	.31	.26	15%
Green	LoĒ-180 (3)	72%	13%	15%	.51	.31	.26	18%
	LoĒ ² -272 (3)	66%	11%	10%	.41	.30	.25	11%
	LoĒ ² -270 (3)	64%	12%	12%	.39	.29	.25	9%
	LoĒ ³ -366 (3)	59%	11%	11%	.35	.29	.24	3%
	Clear	55%	9%	14%	.58	.48	.46	32%
	LoĒ-i89 (3)	54%	9%	13%	.53	.33	.29	30%
	LoĒ-180 ESC (3)	53%	9%	14%	.50	.31	.26	14%
Gray	LoĒ-180 (3)	53%	9%	14%	.49	.31	.26	17%
	LoĒ ² -272 (3)	48%	8%	10%	.37	.30	.25	10%
	LoĒ ² -270 (3)	47%	9%	11%	.34	.29	.25	9%
	LoĒ ³ -366 (3)	43%	8%	10%	.29	.29	.24	3%
	Clear	61%	10%	14%	.63	.48	.46	33%
	LoĒ-i89 (3)	59%	10%	13%	.58	.33	.29	32%
	LoĒ-180 ESC (3)	59%	10%	14%	.55	.31	.27	15%
Bronze	LoĒ-180 (3)	59%	10%	14%	.53	.31	.26	17%
	LoĒ ² -272 (3)	53%	9%	10%	.39	.30	.25	10%
	LoĒ ² -270 (3)	52%	10%	12%	.36	.30	.25	9%
	LoĒ ³ -366 (3)	48%	9%	11%	.31	.29	.24	3%

Notes:

• Values are center of glass calculated using LBNL Window per NFRC 100, actual values may vary due to production tolerances.

- Argon calculations based on 90% gas fill level.
- (#) after coating is IGU coating surface number.

_	Glass	Airspace	Glass
	3mm	13.0mm	3mm
	1⁄8"	1/2"	1/8''

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6mm - Double Pane IGU Performance Data

		Vis	ible Lig	Jht		Center	of Glass	
Exterior Glass	Interior Glass	Trans	Reflectance		SHGC	U-Factor BTU/hr/ft²/°F		UV Trans
			Out	In		Air	Argon	
Clear	Clear	80%	14%	14%	.73	.47	.45	47%
Clear	LoĒ-i89 (3)	78%	14%	14%	.65	.35	.33	45%
Clear	LoĒ-180 ESC (3)	77%	15%	14%	.63	.33	.32	21%
Clear	LoĒ-180 (3)	77%	15%	14%	.61	.33	.32	24%
Clear	LoĒ-Di89 (3 & 4)	76%	14%	13%	.66	.26	.23	44%
LoĒ-180 ESC (2)	Clear	77%	15%	14%	.62	.31	.26	21%
LoĒ-180 (2)	Clear	77%	15%	14%	.61	.30	.26	24%
LoĒ ² -272 (2)	Clear	70%	10%	11%	.40	.29	.25	14%
LoĒ ² -270 (2)	Clear	67%	12%	13%	.36	.29	.24	12%
LoĒ ³ -366 (2)	Clear	64%	11%	12%	.27	.29	.24	5%
LoĒ-452+ (2)	Clear	51%	9%	15%	.22	.28	.24	1%
LoĒ ² -240 (2)	Clear	38%	14%	10%	.24	.30	.25	13%
LoĒ ³ -340 (2)	Clear	38%	13%	15%	.18	.29	.24	2%
LoĒ-180 ESC (2)	LoĒ-i89 (4)	75%	15%	14%	.60	.24	.21	20%
LoĒ-180 (2)	LoĒ-i89 (4)	75%	15%	13%	.58	.24	.21	23%
LoĒ ² -272 (2)	LoĒ-i89 (4)	68%	10%	11%	.39	.23	.20	14%
LoĒ ² -270 (2)	LoĒ-i89 (4)	66%	12%	12%	.35	.23	.20	12%
LoĒ ³ -366 (2)	LoĒ-i89 (4)	62%	11%	11%	.27	.23	.19	5%
LoĒ-452+ (2)	LoĒ-i89 (4)	49%	9%	14%	.21	.23	.19	1%
LoĒ ² -240 (2)	LoĒ-i89 (4)	37%	14%	10%	.23	.23	.20	12%
LoĒ ³ -340 (2)	LoĒ-i89 (4)	37%	13%	14%	.17	.23	.20	2%

Notes:

• Values are center of glass calculated using LBNL Window per NFRC 100, actual values may vary due to production tolerances.

• Argon calculations based on 90% gas fill level.

_	Glass	Airspace	Glass
	6mm	13.0mm	6mm
-	1⁄4"	1/2"	1⁄4"

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6mm - Double Pane IGU Tinted Glass Performance Data

		Vis	ible Lig	jht		Center	of Glass	
Exterior Glass	Interior Glass	Trans	Reflectance		SHGC	U-Factor BTU/hr/ft ² /°F		UV Trans
		Traile	Out	In		Air	Argon	
	Clear	67%	12%	14%	.47	.47	.45	20%
	LoĒ-i89 (3)	65%	12%	13%	.42	.33	.29	20%
	LoĒ-180 ESC (3)	65%	12%	14%	.40	.31	.26	10%
Green	LoĒ-180 (3)	65%	12%	14%	.40	.30	.26	11%
	LoĒ ² -272 (3)	59%	10%	10%	.35	.29	.25	7%
	LoĒ ² -270 (3)	57%	11%	11%	.34	.29	.24	6%
	LoĒ ³ -366 (3)	53%	10%	10%	.31	.29	.24	2%
	Clear	40%	7%	13%	.46	.47	.45	20%
	LoĒ-i89 (3)	39%	7%	12%	.41	.33	.29	19%
	LoĒ-180 ESC (3)	38%	7%	13%	.38	.31	.26	9%
Gray	LoĒ-180 (3)	38%	7%	13%	.37	.30	.26	10%
	LoĒ ² -272 (3)	35%	6%	9%	.29	.29	.25	7%
	LoĒ ² -270 (3)	34%	7%	11%	.27	.29	.24	6%
	LoĒ ³ -366 (3)	31%	7%	10%	.23	.29	.24	2%
	Clear	48%	8%	13%	.51	.47	.45	21%
	LoĒ-i89 (3)	46%	8%	12%	.47	.33	.29	20%
	LoĒ-180 ESC (3)	46%	8%	14%	.44	.31	.26	9%
Bronze	LoĒ-180 (3)	46%	8%	14%	.43	.30	.26	11%
	LoĒ ² -272 (3)	42%	7%	9%	.32	.29	.25	7%
	LoĒ ² -270 (3)	40%	8%	11%	.30	.29	.24	6%
	LoĒ ³ -366 (3)	37%	7%	10%	.26	.29	.24	2%

Notes:

• Values are center of glass calculated using LBNL Window per NFRC 100, actual values may vary due to production tolerances.

- Argon calculations based on 90% gas fill level.
- (#) after coating is IGU coating surface number.

Glass	Airspace	Glass
6mm	13.0mm	6mm
1⁄4"	1/2"	1/4"

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3mm - Triple Pane IGU Performance Data

			Vis	ible Li	ight		Center	of Glass	
Exterior Glass	Center Glass	Interior Glass	Trans	Refle	ctance	SHGC	U-F BTU/	actor hr/ft²/°F	UV Trans
				Out	In		Air	Argon	
LoĒ-180 ESC (2)	Clear	LoĒ-180 ESC (5)	70%	21%	21%	0.58	.20	.16	10%
LoĒ-180 (2)	Clear	LoĒ-180 (5)	70%	20%	20%	0.56	.19	.15	13%
LoĒ-180 ESC (2)	Clear	LoĒ-Di89 (5 & 6)	69%	20%	19%	0.58	.17	.14	19%
LoĒ ² -272 (2)	Clear	LoĒ-180 (5)	63%	15%	18%	0.37	.19	.15	8%
LoĒ ² -270 (2)	Clear	LoĒ-180 (5)	62%	16%	19%	0.33	.19	.15	7%
LoĒ ³ -366 (2)	Clear	LoĒ-180 (5)	57%	15%	18%	0.25	.19	.15	2%
LoĒ-452+ (2)	Clear	LoĒ-180 (5)	46%	12%	21%	0.20	.19	.15	1%
LoĒ ² -240 (2)	Clear	LoĒ-180 (5)	35%	16%	17%	0.22	.19	.15	7%
LoĒ ³ -340 (2)	Clear	LoĒ-180 (5)	34%	15%	21%	0.16	.19	.15	1%
LoĒ-180 ESC (2)	LoĒ-180 ESC (4)	LoĒ-i89 (6)	69%	21%	19%	0.55	.17	.14	9%
LoĒ-180 (2)	LoĒ-180 (4)	LoĒ-i89 (6)	68%	21%	19%	0.53	.17	.13	13%
LoĒ ² -272 (2)	LoĒ-180 (4)	LoĒ-i89 (6)	62%	15%	16%	0.36	.16	.13	8%
LoĒ ² -270 (2)	LoĒ-180 (4)	LoĒ-i89 (6)	60%	16%	18%	0.32	.16	.13	6%
LoĒ ³ -366 (2)	LoĒ-180 (4)	LoĒ-i89 (6)	56%	15%	17%	0.24	.16	.13	2%
LoĒ-452+ (2)	LoĒ-180 (4)	LoĒ-i89 (6)	45%	12%	19%	0.19	.16	.13	1%
LoĒ ² -240 (2)	LoĒ-180 (4)	LoĒ-i89 (6)	34%	16%	15%	0.21	.16	.13	7%
LoĒ ³ -340 (2)	LoĒ-180 (4)	LoĒ-i89 (6)	33%	15%	19%	0.15	.16	.13	1%

Notes:

• Values are center of glass calculated using LBNL Window per NFRC 100, actual values may vary due to production tolerances.

- Argon calculations based on 90% gas fill level.
- (#) after coating is IGU coating surface number.

Glass	Airspace	Glass	Airspace	Glass
3mm	9.8mm	3mm	9.8mm	3mm
1/8"	3/8"	1/8"	3/8"	1⁄8"

TECHNICAL SERVICE BULLETIN

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3mm - Double Pane IGU Performance Data Comparison of Coating Glass Products

			Vis	ible Li	ght		Center	of Glass	
	Exterior Glass	Interior Glass	Trans	Reflec	ctance	SHGC	U-Fa BTU/h	a ctor nr/ft²/°F	UV Trans
				Out	In		Air	Argon	
	Clear	LoĒ-i89 (3)	80%	15%	14%	.75	.33	.29	55%
	Clear	LoĒ-180 ESC (3)	79%	15%	15%	.71	.31	.27	25%
a	Clear	LoĒ-180 (3)	79%	15%	15%	.69	.31	.26	29%
lin	Clear	LoĒ-Di89 (3 & 4)	79%	14%	14%	.71	.26	.23	52%
arc	LoĒ ² -272 (2)	Clear	72%	11%	12%	.41	.30	.25	16%
Ö	LoĒ ² -270 (2)	Clear	70%	12%	13%	.37	.30	.25	14%
	LoĒ ³ -366 (2)	Clear	65%	11%	12%	.27	.29	.24	5%
	LoĒ-452+ (2)	Clear	52%	10%	15%	.22	.29	.24	1%
L	ClimaGuard [®] 62/27 (2)	Clear	62%	11%	12%	.28	.29	.25	8%
lia	ClimaGuard [®] 55 (2)	Clear	55%	15%	19%	.26	.29	.24	15%
arc	ClimaGuard [®] 53/23 (2)	Clear	53%	13%	12%	.23	.29	.24	10%
jü	ClimaGuard [®] 70 (2)	Clear	69%	15%	16%	.35	.29	.24	20%
G	Clear	ClimaGuard [®] 80/71 (3)	80%	14%	14%	.70	.31	.27	44%
0	SolarBan [®] 70 (2)	Clear	63%	12%	14%	.26	.29	.24	4%
itr	SolarBan [®] 60 (2)	Clear	73%	11%	12%	.40	.30	.25	20%
>	Clear	Sungate [®] 400 (3)	79%	14%	14%	.69	.32	.28	32%

Notes:

• Values are center of glass calculated using LBNL Window per NFRC 100, actual values may vary due to production tolerances.

• Argon calculations based on 90% gas fill level.

Glass	Airspace	Glass			
3mm	13.0mm	3mm			
1⁄8"	1⁄2"	1/8''			

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6mm - Double Pane IGU Performance Data Comparison of Coating Glass Products

			Visible Light				Center of Glass		UV
Exterior Glass		Interior		Reflectance		SHGC	U-Factor		
		Glass	Trans	Out	In		Air	Araon	Trans
	LoĒ-180 (2)	Clear	77%	15%	14%	.61	.30	.26	24%
٦	LoĒ ² -272 (2)	Clear	70%	10%	11%	.40	.29	.25	14%
č	LoĒ ² -270 (2)	Clear	67%	12%	13%	.36	.29	.24	12%
q	LoĒ ³ -366 (2)	Clear	64%	11%	12%	.27	.29	.24	4%
Car	LoĒ-452+ (2)	Clear	51%	9%	15%	.22	.28	.24	1%
	LoĒ ² -240 (2)	Clear	38%	14%	10%	.24	.30	.25	13%
	LoĒ ³ -340 (2)	Clear	38%	13%	15%	.18	.29	.24	2%
	ClimaGuard [®] 53/23 (2)	Clear	52%	13%	12%	.23	.29	.24	9%
	ClimaGuard [®] 55 (2)	Clear	54%	15%	19%	.26	.29	.24	13%
~	Climaguard [®] 62/27 (2)	Clear	60%	12%	14%	.26	.29	.24	6%
a	ClimaGuard [®] 70 (2)	Clear	67%	15%	16%	.34	.29	.24	18%
ġ	SunGuard [®] HP Neutral 78/65 (2)	Clear	78%	13%	13%	.62	.31	.27	38%
a	SunGuard [®] SNX 70+ (2)	Clear	66%	14%	15%	.28	.28	.24	13%
	SunGuard [™] SN 54 (2)	Clear	54%	14%	20%	.28	.29	.24	16%
U	SunGuard [™] SN 68 (2)	Clear	68%	11%	12%	.37	.29	.25	30%
	SunGuard™ SNX 51/23 (2)	Clear	51%	14%	14%	.23	.29	.24	10%
	SunGuard™ SNX 62/27 (2)	Clear	62%	11%	12%	.26	.29	.24	6%
	SolarBan [®] 60 (2)	Clear	70%	11%	12%	.39	.29	.24	18%
0	SolarBan [®] 70 (2)	Clear	64%	13%	14%	.27	.28	.24	6%
Ĕ	SolarBan [®] 90 (2)	Clear	51%	12%	19%	.23	.29	.24	7%
Ż	SolarBan [®] R100 (2)	Clear	42%	32%	14%	.23	.29	.25	12%
	SolarBan [®] R67 (2)	Clear	54%	19%	16%	.29	.29	.24	11%
	SolarBan [®] R77 (2)	Clear	47%	25%	16%	.24	.29	.24	14%
	VE1-2M (2)	Clear	71%	11%	12%	.38	.29	.25	10%
2	VE1-48 (2)	Clear	47%	17%	11%	.37	.31	.26	20%
Ö	VE1-85 (2)	Clear	76%	12%	13%	.55	.31	.27	27%
Virac	VNE1-53 (2)	Clear	49%	19%	21%	.22	.29	.24	3%
	VNE1-63 (2)	Clear	63%	10%	11%	.28	.29	.24	5%
	VNG1-4022 (2)	Clear	40%	19%	16%	.21	.29	.24	6%
	VUE1-50 (2)	Clear	49%	11%	12%	.25	.29	.24	6%

Notes:

• Values are center of glass calculated using LBNL Window per NFRC 100, actual values may vary due to production tolerances.

• Argon calculations based on 90% gas fill level.

Glass	Airspace	Glass			
6mm	13.0mm	6mm			
1⁄4"	1/2"	1⁄4"			