



# Test Report



Hankuk Glass Industries Inc., R&D Center  
296, Oehang 1-gil, Gunsan-si, Jeollabuk-do, (54008), Korea TEL (063) 460-1333 FAX (063) 467-2985

Report No.	20210392	Date of Receipt	2021-06-14	Date of test	2021-06-16 ~ 2021-06-25
Client	SANGBO			Name	Minkyu Hwang
Address	(10016) Tongjin-Eup Daeseomyeong-Ro 50, Gimpo, GyeongGi-DO, South Korea 10016			Uses	Quality Control
Test Sample	SCHUTZEN MX70 (VLT 27%)		Test Item	Optical Properties	

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

## Test Results

1. Test method used : ISO 9050:2003, 3.2 Performance of optical measurements  
KS L 2016:2014, 6.3 Performance of optical measurements; JIS A 5759:2016, 6. Measurement method  
KS L 2514:2011, 4. Measurement of spectral transmission and reflection factor
2. Instrument : 1) FT-IR, Spectrophotometer, Nicolet, 6700, U.S.A.  
2) UV-VIS-NIR Spectrophotometer, Perkin-Elmer, Lambda 950 & 1050, U.S.A.
3. Testing environment : Temperature :min 21 °C, max 25 °C, Humidity :min 60 % R.H., max 65 % R.H.
4. Test Results :

Test Item	Symbol	Unit	ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
Solar Energy Transmittance	TE	%	24.1	25.2	24.1	24.2
Visible Light Transmittance	TL	%	27.1	26.2	27.1	27.1
Ultra Violet Transmittance	TUV	%	0.2		0.2	0.2
Solar Energy Reflectance(Ext.)	RE(e)	%	13.3	13.3	13.3	13.5
Solar Energy Reflectance(Int.)	RE(i)	%	8.1	8.3	8.1	8.1
Visible Light Reflectance(Ext.)	RL(e)	%	13.7	13.5	13.7	13.7
Visible Light Reflectance(Int.)	RL(i)	%	8.0	7.9	8.0	8.0
Solar Energy Absorbance(Ext.)	AE(e)	%	62.6	61.6	62.6	62.3
Correct Emissivity(Ext.)	E(e)	-				0.84
Correct Emissivity(Int.)	E(i)	-				0.83
Shading Coefficient	SC	-		0.52	0.52	
U-Value (Winter)	U-Value	W/m <sup>2</sup> K		5.9	5.9	
Solar Heat Gain Coefficient	SHGC	-			0.45	0.45
Solar Factor	S Factor	%	40.2			

\* Measuring condition(TL% & RL%) : ISO 9050, JIS A 5759 & KS L 2514 : D65/2, KS L 2016 : A/2

\*\* Measuring condition(TE%, RE% & TUV%) : AM=1.5(300nm~2500nm), Film side (attached 3mm Clear Glass) : Inside  
' Continued '

Affirmation	Measurements performed by Name : Kim, Shin Ae 	Approved by Title : Technical Manager Name : Park, Dong Young 
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28 - 06 - 2021

Hankuk Glass Industries Inc.  
Director of R&D Center  
Accredited by KOLAS, Republic of KOREA



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2. The above test report can not be used for any advertisement & lawsuit and for other purpose than submitted.
3. The above test certificate is the accredited test result by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.



## 4. Test Results (Continued) :

Test Item	Unit	ISO 9050 :2003	KS L 2514 :2011
* Total Solar Energy Rejected (TSER)	%	59.8	54.6

\* Film side(attached 3mm Clear Glass): Inside

\* This laboratory is not accredited for the test results marked \*.

Test Item	Unit	Spectrum average	Factor Application			
			ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
** Transmittance (780 nm ~ 2 500 nm)	%	16.9	23.4	24.8	23.4	23.3

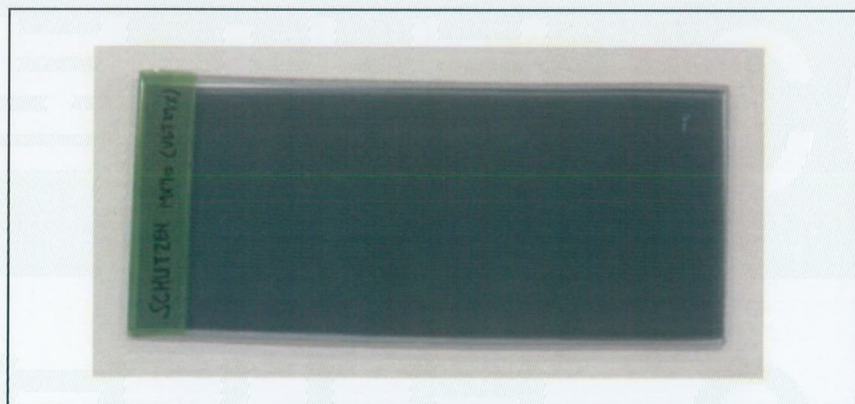
\*\* Film side(attached 3mm Clear Glass): Inside

\*\* This laboratory is not accredited for the test results marked \*\*.

## 5. Specification of Sample :

Sample Type	Film attached Glass	Adhesive Strength	Exist
Film Side (Outside -> Inside)	Side 2	Substrate	3 mm Clear Glass

## 6. Picture of Sample :



\* The result is regarding the sample which is the 3mm clear glass attaching the film

' End '





# Test Report



Hankuk Glass Industries Inc., R&D Center  
296, Oehang 1-gil, Gunsan-si, Jeollabuk-do, (54008), Korea TEL (063) 460-1333 FAX (063) 467-2985

Report No.	20210393	Date of Receipt	2021-06-14	Date of test	2021-06-16 ~ 2021-06-25
Client	SANGBO			Name	MinKyu Hwang
Address	(10016) Tongjin-Eup Daeseomyeong-Ro 50, Gimpo, GyeongGi-DO, South Korea 10016			Uses	Quality Control
Test Sample	SCHUTZEN CX60 (VLT 30%)		Test Item	Optical Properties	

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## Test Results

### 1. Test method used : ISO 9050:2003, 3.2 Performance of optical measurements

KS L 2016:2014, 6.3 Performance of optical measurements; JIS A 5759:2016, 6. Measurement method  
KS L 2514:2011, 4. Measurement of spectral transmission and reflection factor

### 2. Instrument : 1) FT-IR, Spectrophotometer, Nicolet, 6700, U.S.A.

2) UV-VIS-NIR Spectrophotometer, Perkin-Elmer, Lambda 950 & 1050, U.S.A.



### 3. Testing environment : Temperature : min 21 °C, max 25 °C, Humidity : min 60 % R.H., max 65 % R.H.

### 4. Test Results :

Test Item	Symbol	Unit	ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
Solar Energy Transmittance	TE	%	25.2	26.3	25.2	25.2
Visible Light Transmittance	TL	%	29.9	29.7	29.9	29.9
Ultra Violet Transmittance	TUV	%	0.2		0.2	0.2
Solar Energy Reflectance(Ext.)	RE(e)	%	5.1	5.1	5.1	5.1
Solar Energy Reflectance(Int.)	RE(i)	%	5.5	5.6	5.5	5.4
Visible Light Reflectance(Ext.)	RL(e)	%	5.4	5.4	5.4	5.4
Visible Light Reflectance(Int.)	RL(i)	%	5.9	5.8	5.9	5.9
Solar Energy Absorbance(Ext.)	AE(e)	%	69.7	68.6	69.7	69.8
Correct Emissivity(Ext.)	E(e)	-				0.84
Correct Emissivity(Int.)	E(i)	-				0.87
Shading Coefficient	SC	-		0.57	0.56	
U-Value (Winter)	U-Value	W/m <sup>2</sup> K		6.0	6.0	
Solar Heat Gain Coefficient	SHGC	-			0.49	0.49
Solar Factor	S Factor	%	43.5			

\* Measuring condition(TL% & RL%) : ISO 9050, JIS A 5759 & KS L 2514 : D65/2, KS L 2016 : A/2

\*\* Measuring condition(TE%, RE% & TUV%) : AM=1.5(300nm~2500nm), Film side (attached 3mm Clear Glass) : Inside  
' Continued '

Affirmation	Measurements performed by Name : Kim, Shin Ae 	Approved by Title : Technical Manager Name : Park, Dong Young 
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Hankuk Glass Industries Inc.  
Director of R&D Center  
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## 4. Test Results (Continued) :

Test Item	Unit	ISO 9050 :2003	KS L 2514 :2011
* Total Solar Energy Rejected (TSER)	%	56.5	50.6

\* Film side(attached 3mm Clear Glass): Inside

\* This laboratory is not accredited for the test results marked \*.

Test Item	Unit	Spectrum average	Factor Application			
			ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
** Transmittance (780 nm ~ 2 500 nm)	%	17.0	22.1	22.9	22.1	21.9

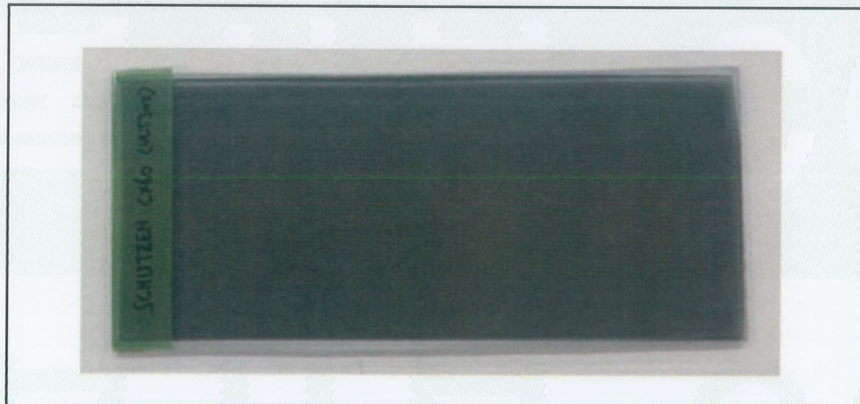
\*\* Film side(attached 3mm Clear Glass): Inside

\*\* This laboratory is not accredited for the test results marked \*\*.

## 5. Specification of Sample :

Sample Type	Film attached Glass	Adhesive Strength	Exist
Film Side (Outside -> Inside)	Side 2	Substrate	3 mm Clear Glass

## 6. Picture of Sample :



\* The result is regarding the sample which is the 3mm clear glass attaching the film

' End '





# Test Report



Hankuk Glass Industries Inc., R&D Center  
296, Oehang 1-gil, Gunsan-si, Jeollabuk-do, (54008), Korea TEL (063) 460-1333 FAX (063) 467-2985

Report No.	20210394	Date of Receipt	2021-06-14	Date of test	2021-06-16 ~ 2021-06-25
Client	SANGBO			Name	MinKyu Hwang
Address	(10016) Tongjin-Eup Daeseomyeong-Ro 50, Gimpo, GyeongGi-DO, South Korea 10016			Uses	Quality Control
Test Sample	SCHUTZEN CX90 (VLT 30%)		Test Item	Optical Properties	

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## Test Results

### 1. Test method used : ISO 9050:2003, 3.2 Performance of optical measurements

KS L 2016:2014, 6.3 Performance of optical measurements; JIS A 5759:2016, 6. Measurement method  
KS L 2514:2011, 4. Measurement of spectral transmission and reflection factor

### 2. Instrument : 1) FT-IR, Spectrophotometer, Nicolet, 6700, U.S.A.

2) UV-VIS-NIR Spectrophotometer, Perkin-Elmer, Lambda 950 & 1050, U.S.A.



### 3. Testing environment : Temperature : min 21 °C, max 25 °C, Humidity : min 60 % R.H., max 65 % R.H.

### 4. Test Results :

Test Item	Symbol	Unit	ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
Solar Energy Transmittance	TE	%	16.8	17.5	16.8	15.5
Visible Light Transmittance	TL	%	31.5	31.2	31.5	31.5
Ultra Violet Transmittance	TUV	%	0.3		0.3	0.3
Solar Energy Reflectance(Ext.)	RE(e)	%	5.0	5.0	5.0	4.9
Solar Energy Reflectance(Int.)	RE(i)	%	5.4	5.0	5.4	5.3
Visible Light Reflectance(Ext.)	RL(e)	%	5.5	5.5	5.5	5.5
Visible Light Reflectance(Int.)	RL(i)	%	5.9	5.9	5.9	5.9
Solar Energy Absorbance(Ext.)	AE(e)	%	78.3	77.6	78.3	79.6
Correct Emissivity(Ext.)	E(e)	-				0.84
Correct Emissivity(Int.)	E(i)	-				0.87
Shading Coefficient	SC	-		0.50	0.50	
U-Value (Winter)	U-Value	W/m <sup>2</sup> K		6.0	6.1	
Solar Heat Gain Coefficient	SHGC	-			0.44	0.43
Solar Factor	S Factor	%	37.3			

\* Measuring condition(TL% & RL%) : ISO 9050, JIS A 5759 & KS L 2514 : D65/2, KS L 2016 : A/2

\*\* Measuring condition(TE%, RE% & TUV%) : AM=1.5(300nm~2500nm), Film side (attached 3mm Clear Glass) : Inside  
' Continued '

Affirmation	Measurements performed by Name : Kim, Shin Ae 	Approved by Title : Technical Manager Name : Park, Dong Young 
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Hankuk Glass Industries Inc.  
Director of R&D Center  
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## 4. Test Results (Continued) :

Test Item	Unit	ISO 9050 :2003	KS L 2514 :2011
* Total Solar Energy Rejected (TSER)	%	62.7	56.8

\* Film side(attached 3mm Clear Glass): Inside

\* This laboratory is not accredited for the test results marked \*.

Test Item	Unit	Spectrum average	Factor Application			
			ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
** Transmittance (780 nm ~ 2 500 nm)	%	1.8	3.5	3.6	3.5	3.4

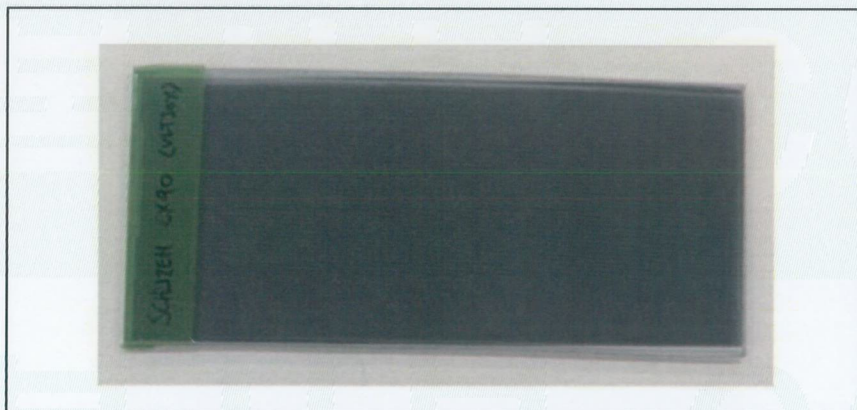
\*\* Film side(attached 3mm Clear Glass): Inside

\*\* This laboratory is not accredited for the test results marked \*\*.

## 5. Specification of Sample :

Sample Type	Film attached Glass	Adhesive Strength	Exist
Film Side (Outside -> Inside)	Side 2	Substrate	3 mm Clear Glass

## 6. Picture of Sample :



\* The result is regarding the sample which is the 3mm clear glass attaching the film

' End '





# Test Report



Hankuk Glass Industries Inc., R&D Center  
296, Oehang 1-gil, Gunsan-si, Jeollabuk-do, (54008), Korea TEL (063) 460-1333 FAX (063) 467-2985

Report No.	20210395	Date of Receipt	2021-06-14	Date of test	2021-06-16 ~ 2021-06-25
Client	SANGBO			Name	MinKyu Hwang
Address	(10016) Tongjin-Eup Daeseomyeong-Ro 50, Gimpo, GyeongGi-DO, South Korea 10016			Uses	Quality Control
Test Sample	SCHUTZEN GX80 (VLT 27%)		Test Item	Optical Properties	

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
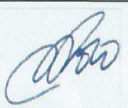
## Test Results

1. Test method used : ISO 9050:2003, 3.2 Performance of optical measurements  
KS L 2016:2014, 6.3 Performance of optical measurements; JIS A 5759:2016, 6. Measurement method  
KS L 2514:2011, 4. Measurement of spectral transmission and reflection factor
2. Instrument : 1) FT-IR, Spectrophotometer, Nicolet, 6700, U.S.A.  
2) UV-VIS-NIR Spectrophotometer, Perkin-Elmer, Lambda 950 & 1050, U.S.A.
3. Testing environment : Temperature :min 21 °C, max 25 °C, Humidity :min 60 % R.H., max 65 % R.H.
4. Test Results :

Test Item	Symbol	Unit	ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
Solar Energy Transmittance	TE	%	21.8	22.7	21.8	21.6
Visible Light Transmittance	TL	%	27.6	27.3	27.6	27.6
Ultra Violet Transmittance	TUV	%	0.2		0.2	0.2
Solar Energy Reflectance(Ext.)	RE(e)	%	11.1	11.2	11.1	11.2
Solar Energy Reflectance(Int.)	RE(i)	%	8.3	8.3	8.3	8.2
Visible Light Reflectance(Ext.)	RL(e)	%	12.0	11.9	12.0	12.0
Visible Light Reflectance(Int.)	RL(i)	%	9.3	9.2	9.3	9.3
Solar Energy Absorbance(Ext.)	AE(e)	%	67.0	66.0	67.0	67.2
Correct Emissivity(Ext.)	E(e)	-				0.84
Correct Emissivity(Int.)	E(i)	-				0.86
Shading Coefficient	SC	-		0.52	0.51	
U-Value (Winter)	U-Value	W/m <sup>2</sup> K		5.9	6.0	
Solar Heat Gain Coefficient	SHGC	-			0.45	0.45
Solar Factor	S Factor	%	39.3			

\* Measuring condition(TL% & RL%) : ISO 9050, JIS A 5759 & KS L 2514 : D65/2, KS L 2016 : A/2

\*\* Measuring condition(TE%, RE% & TUV%) : AM=1.5(300nm~2500nm), Film side (attached 3mm Clear Glass) : Inside  
' Continued '

Affirmation	Measurements performed by Name : Kim, Shin Ae 	Approved by Title : Technical Manager Name : Park, Dong Young 
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## 4. Test Results (Continued) :

Test Item	Unit	ISO 9050 :2003	KS L 2514 :2011
* Total Solar Energy Rejected (TSER)	%	60.7	55.2

\* Film side(attached 3mm Clear Glass): Inside

\* This laboratory is not accredited for the test results marked \*.

Test Item	Unit	Spectrum average	Factor Application			
			ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
** Transmittance (780 nm ~ 2 500 nm)	%	13.1	17.9	18.6	17.9	17.7

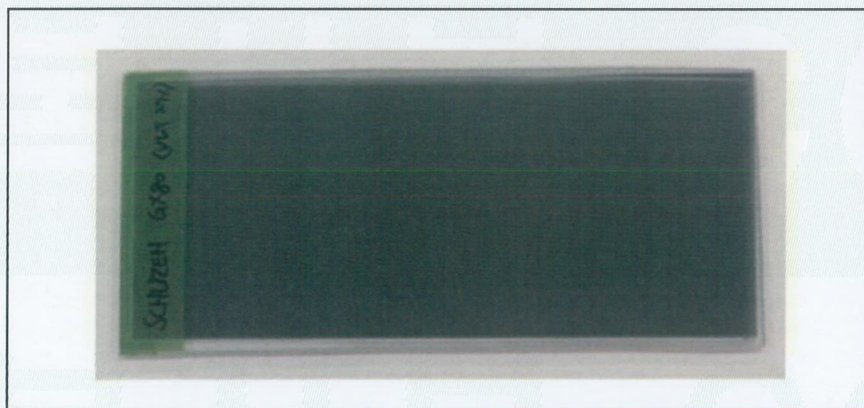
\*\* Film side(attached 3mm Clear Glass): Inside

\*\* This laboratory is not accredited for the test results marked \*\*.

## 5. Specification of Sample :

Sample Type	Film attached Glass	Adhesive Strength	Exist
Film Side (Outside -> Inside)	Side 2	Substrate	3 mm Clear Glass

## 6. Picture of Sample :



\* The result is regarding the sample which is the 3mm clear glass attaching the film

' End '





# Test Report



Hankuk Glass Industries Inc., R&D Center  
296, Oehang 1-gil, Gunsan-si, Jeollabuk-do, (54008), Korea TEL (063) 460-1333 FAX (063) 467-2985

Report No.	20210396	Date of Receipt	2021-06-14	Date of test	2021-06-16 ~ 2021-06-25
Client	SANGBO			Name	MinKyu Hwang
Address	(10016) Tongjin-Eup Daeseomyeong-Ro 50, Gimpo, GyeongGi-DO, South Korea 10016			Uses	Quality Control
Test Sample	SCHUTZEN GX90 (VLT 27%)		Test Item	Optical Properties	

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

## Test Results

1. Test method used : ISO 9050:2003, 3.2 Performance of optical measurements  
KS L 2016:2014, 6.3 Performance of optical measurements; JIS A 5759:2016, 6. Measurement method  
KS L 2514:2011, 4. Measurement of spectral transmission and reflection factor
2. Instrument : 1) FT-IR, Spectrophotometer, Nicolet, 6700, U.S.A.  
2) UV-VIS-NIR Spectrophotometer, Perkin-Elmer, Lambda 950 & 1050, U.S.A.
3. Testing environment : Temperature : min 21 °C, max 25 °C, Humidity : min 60 % R.H., max 65 % R.H.
4. Test Results :

Test Item	Symbol	Unit	ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
Solar Energy Transmittance	TE	%	15.6	16.2	15.6	14.5
Visible Light Transmittance	TL	%	28.5	28.0	28.5	28.5
Ultra Violet Transmittance	TUV	%	0.3		0.3	0.3
Solar Energy Reflectance(Ext.)	RE(e)	%	11.0	11.1	11.0	11.0
Solar Energy Reflectance(Int.)	RE(i)	%	7.1	6.8	7.1	6.8
Visible Light Reflectance(Ext.)	RL(e)	%	11.9	11.9	11.9	11.9
Visible Light Reflectance(Int.)	RL(i)	%	9.4	9.3	9.4	9.4
Solar Energy Absorbance(Ext.)	AE(e)	%	73.4	72.8	73.4	74.5
Correct Emissivity(Ext.)	E(e)	-				0.84
Correct Emissivity(Int.)	E(i)	-				0.86
Shading Coefficient	SC	-		0.47	0.47	
U-Value (Winter)	U-Value	W/m <sup>2</sup> K		5.9	6.0	
Solar Heat Gain Coefficient	SHGC	-			0.41	0.40
Solar Factor	S Factor	%	34.8			

\* Measuring condition(TL% & RL%) : ISO 9050, JIS A 5759 & KS L 2514 : D65/2, KS L 2016 : A/2

\*\* Measuring condition(TE%, RE% & TUV%) : AM=1.5(300nm~2500nm), Film side (attached 3mm Clear Glass) : Inside  
' Continued '

Affirmation	Measurements performed by Name : Kim, Shin Ae 	Approved by Title : Technical Manager Name : Park, Dong Young 
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## 4. Test Results (Continued) :

Test Item	Unit	ISO 9050 :2003	KS L 2514 :2011
* Total Solar Energy Rejected (TSER)	%	65.2	59.8

\* Film side(attached 3mm Clear Glass): Inside

\* This laboratory is not accredited for the test results marked \*.

Test Item	Unit	Spectrum average	Factor Application			
			ISO 9050 :2003	KS L 2016 :2014	JIS A 5759 :2016	KS L 2514 :2011
** Transmittance (780 nm ~ 2 500 nm)	%	2.4	4.2	4.4	4.2	4.1

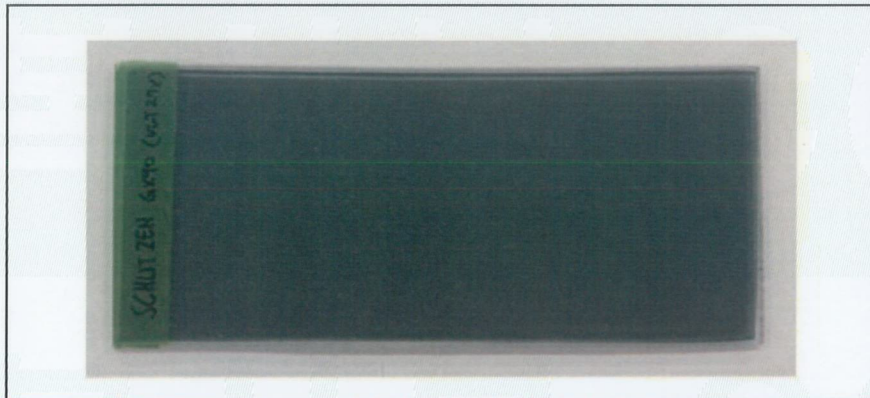
\*\* Film side(attached 3mm Clear Glass): Inside

\*\* This laboratory is not accredited for the test results marked \*\*.

## 5. Specification of Sample :

Sample Type	Film attached Glass	Adhesive Strength	Exist
Film Side (Outside -> Inside)	Side 2	Substrate	3 mm Clear Glass

## 6. Picture of Sample :



\* The result is regarding the sample which is the 3mm clear glass attaching the film

' End '