

Insulated glass-All you should know about insulated glass

Insulated glass,also named as double glazed units,double glass,double glass units,if insulated glass contains 3 glass panels,it's [triple glazed units](#).It's formed with two or three pieces glass,the middle parts are effectively separated with spacer and the edges are sealed to form glass with dry confined space.Insulated glass is widely used in modern glass buildings and glass facades for its high [cost performance and advantages](#).



Features of insulating glass:

Thermal properties:Excellent [thermal insulation performance](#) and the ideal energy efficient building material.The glass thermal conductivity is 0.688 while the air thermal conductivity is 0.027,glass has 27 times higher thermal conductivity than air.The air gap between double glazed units can take advantage of the low thermal conductivity inside to decrease thermal conductivity.

Insulated glass made with clear glass ,U value is only half of monolithic glass,in addition to high performance low-E coating,U value can decrease only 0.6W/M2.K.The glass has high thermal insulation performance and used in passive house.

Glass Configuration	LT %	LR %	U-Summer	U-Winter	SC
6C+ 12A +6C	78	14	2.84	2.70	0.81
6 MD80+12A+6C	68	10	1.6	1.65	0.44
6 MD80+12AR+6C	68	10	1.28	1.37	0.44
6 MD80+12AR+6C+12AR+6DT80	52	12	0.73	0.71	0.37
6 MD80+16AR+6C+16AR+6MD80	52	12	0.59	0.69	0.37

Noise insulation: Insulated glass can reduce noise by 27-50 decibels, and 80 dB of [traffic noise](#) outside can be decreased to only 50 dBs to indoor. Combining with laminated glass, insulated glass sound insulation performance can be Maximized. Insulated glass is also one kind of [acoustic glass](#) products.

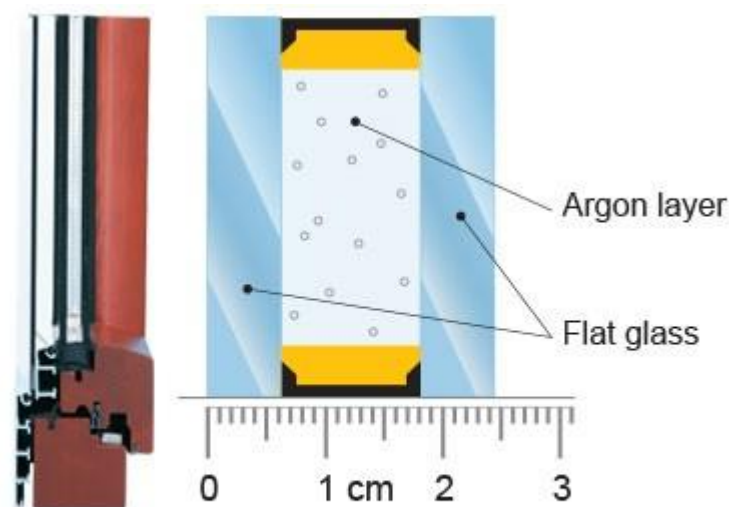
Glass Configuration	6-12-6	6-12-6-12-6	6-16-6-16-6	66.4+12A+66.4
STC	34	37	39	45
OITC	29	29	29	37

Dew free: Excellent anti-dew performance under low temperature. Dew occurs where condensation appears due to the difference between interior and exterior temperature.

Because the inner glass that is in contact with the indoor air is affected by the air barrier, even if the outer layer contact is low, there is no condensation on the glass surface due to the temperature difference. Insulated glass dew point up to -40°C , if filled with argon, dew point decrease to -80°C

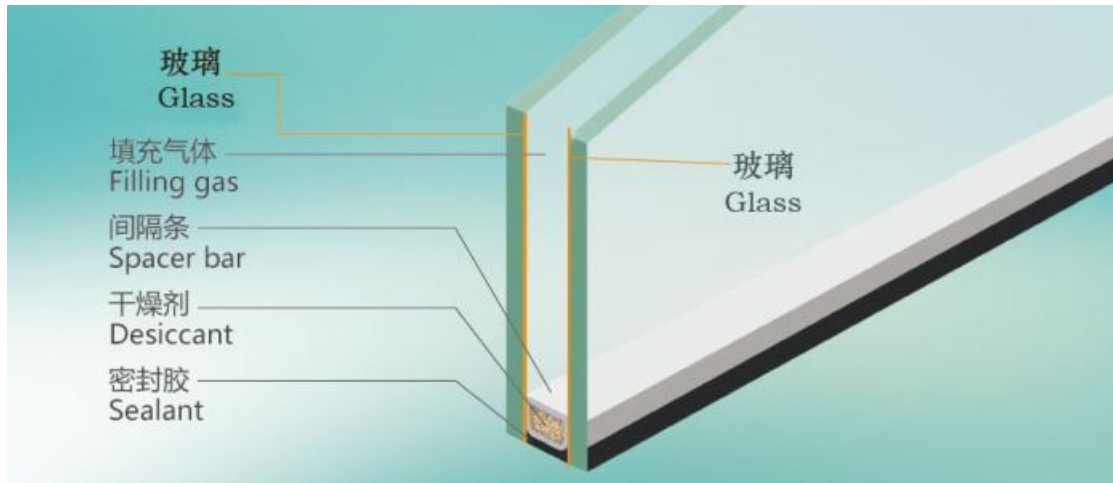
Light weight: Under the same effect of [thermal insulation](#), insulating glass can substitute for part of brick wall or concrete wall to reduce the self-weight of buildings, simplify the building structure and increase daylighting area and enhance indoor comfort level. Even though the air space in insulated glass added the glass thickness, but the insulated overall weight is almost same as the glass weight.

6-12-6 insulated glass weight 30kgs/m², this significantly decrease the overall building weight based on offering excellent thermal insulation and sound proof function. For skyscrapers with hundreds meters high, the building safety can be ensured.



Insulating Glass

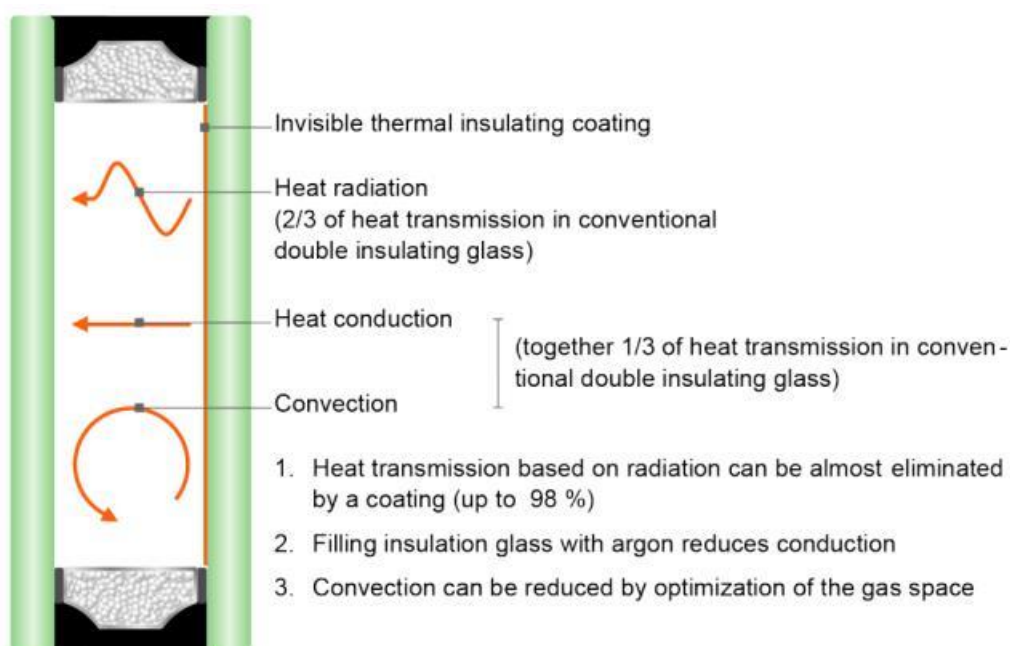
Long lifetime: Insulating glass warranty time is 10 years, in most cases, the insulating lifetime can reach 20 years or even same lifetime as the building itself.



The biggest advantage of insulated glass is energy saving. In most cases, the insulated glass edges are hidden in the aluminium frame, people will only see the glass panels, while even though insulated glass is simple products and widely used in global projects, people still don't know how it works, what affect the insulating glass performance, and more details, here comes the guideline of insulating glass. Firstly let's know the heat transfer methods and types:

Heat Transfer Types

Transfer heat from a high-temperature object to a low-temperature object: heat conduction, heat convection, and thermal radiation.





- **Heat conduction:**Heat Conduct is a phenomenon in which thermal energy is transferred due to the contact of various mass points in the same substance.Glass is good heat conductivity through which far infrared is quite easy to penetrate from the higher temperature side to the low temperature side.
- **Heat Convection:**Heat transfer is the flow of liquid or gas caused by thermal expansion, the hot part rises, and the cold part falls, thereby transferring heat energy. That is, the energy transfer caused by the movement of an object from a certain area of space to another area of different temperature.
- **Thermal Radiation:**Heat radiation means that the heat energy becomes radiant wave energy and is directly emitted. When it reaches an impermeable substance, it is absorbed by it and then becomes heat energy;In glass industry,the heat radiation means glass itself have high temperature after absorbing solar energy and becomes heat energy itself.

After knowing the detailed factors that affect glass thermal insulation performance,here is Morn 's thermal insulation Solutions.SHGC and [U value](#) are the key points deciding glass thermal insulation performance.There's some misunderstanding about glass U value,[learn more here](#).

Methods to increase insulated glass thermal insulation performance:

Body tinted glass:Different from normal clear glass and low iron glass,body tinted glass ,body tinted glass -Grey,Bronze,Green,Pink etc can absorb solar energy and makes glass surface temperature much higher,then conduct the heat to interior surface.

Body tinted glass have same U value with normal glass but much lower SC value.

Body tinted glass can also been coated with low-E coating,compared with clear substrate ones,[Low-E coating on tinted glass IGU](#) has much lower SC,light transmittance and ,also higher price.There's advantages and disadvantages using tinted [substrate low-E coatings](#),Morn is your reliable manufacturer for this glass.

Glass Combination	6 Clear	6 Low Iron	6 Grey	6 Green
SC	0.97	1.03	0.69	0.69
U-Winter	5.81	5.81	5.81	5.81
U-Summer	5.25	5.24	5.25	5.25

Hard coated Low-E coating



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Hard coated Low-E ,also named online low-E coating,it's a functional coating with low radiation performance on the glass surface on the float line by chemical vapor deposition and special materials on the float glass production line.

The main function of the coating is to decrease glass heat radiation.Hard coated low-E emmisivity is about 0.15,the biggest advantage of hard coated low-E is,its chemical performance and firmness is quite good,can be used as single piece glass, and laminated glass,insulated glass.

In China,only AGC and SYP ,Jinjing glass produce limited hard coated low-E glass:Planible G,Sunergy,SY-48,Energy Advantage,SGE60,SGC60,performance data in below table:

Glass Type	Glass Substrate	LT	U Summer	U-Winter	SC
AGC Planbel G	Clear	80	3.06	3.87	0.78
AGC Sunergy	Clear	69	3.42	4.17	0.68
AGC SY-48	Clear	51	3.71	4.38	0.55
Energy Advantage	Clear	83	2.74	3.61	0.82
SGE 60	Crystal Grey	56	2.86	3.71	0.61
SGC 60	Euro Grey	42	2.87	3.72	0.55

Soft Coated Low-E coating

Soft coated low-E,also named as off-line low-E,it is generally vacuum-magnetized sputter coating process, and a multi-layer composite film is coated on the surface of the glass to realize Low-E function. The main functional film layer in the film layer is generally silver (Ag) film, which can be subdivided into single silver low e, double silver low e and [triple silver low e](#).Their price,U value,and glass LSG are quite [different between low-E products](#)..

Soft Coated low-E glass emmisivity is much lower than hard cated low-E,emmisivity is usually below 0.1,and most advanced triple silver low-E,for example,solarban 70XL,emmisivity is only 0.03.

The only shortage of soft coated low-E is can only been insulated inside the IGU,it's easy to be oxidized and damaged once been exposed in the air.

In China,there's hundreds of soft coating lines producing all kinds of soft coated low-E products,available glass substrate can be clear,low iron,body tinted glass etc,light transmittance varies from 10%-85%,and SC value varies from 0.2-0.65,below are some sample low-E performance we produce:

Glass Configuration	Substrate	LT %	U-Summer	U-Winter	SC
Clear 6-12-6	Clear	79	2.70	2.84	0.81
Single PLE88A 6-12-6	Clear	75	1.81	1.81	0.66



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Glass Configuration	Substrate	LT %	U-Summer	U-Winter	SC
Double PDE80A 6-12-6	Clear	71	1.58	1.64	0.48
Triple MTE70 6-12-6	Clear	66	1.58	1.64	0.35

Single Silver Low-E coating

The first generation coating with one silver layer inside the coating. U value is about 1.8W/m².K, SC varies from 0.3-0.7. It has been widely used in various buildings-Glass curtain wall, glass spandrel, etc.

Features

- Visible light transmittance— adequate indoor natural day lighting.
- Solar energy transmittance — a wide range of shading coefficient available.
- High far infrared reflectance — low U-value, reduced thermal transfer due to temperature difference.

Double Silver Low-E coating

Two silver layers inside the coating. While maintaining the same visible light transmittance, it has lower shading coefficient than single silver Low-E. It filters the sunshine as a cool lighting source and provides a solution to energy efficiency in design of high transparency. [Double silver low-E manufacturers](#) has similar performance and many coatings to suite global different altitude and weather conditions.

Features

- Higher visible light transmittance — ensuring better natural lighting
- Extremely low solar heat transmittance — effectively impeding SHGC.

Check the performance data: [Morn Coated Glass Performance Data](#)

Now Morn has developed new products that has same performance as [Solarban 60](#), as well as high light transmittance double silver low-E that used in conservation same as [Iplus 1.1](#) and [Iplus 1.16](#).

Triple Silver Low-E coating

It's developed especially for high latitude areas where require high light transmittance while with the lowest SC to Maximize the sunlight but decrease the thermal pass through the glass.

The LSG usually over 2.0.

Perfectly match the climate in North America, North Europe areas.

Morn offers MWTE70, MWTE72 similar to [PPG solarban 70](#), MWTE58, MWTE60 similar to [PPG solarban 90](#).

Check the performance data: [Triple Silver Low-e Performance Data](#)

Glass Configuration	LT%	LR %	U-Summer	U-Winter	SC
6C+12A+6C	78	14	2.84	2.7	0.81
6MS70+12A+6C	67	11	1.83	1.83	0.59
6MD80+12A+6C	71	10	1.58	1.64	0.48
6MT70+12A+6C	66	13	1.53	1.61	0.37

Even though insulated glass with low-E coating can decrease glass U value, but it's also affected by the [installation angle](#), vertical installed insulating glass will have better U value while horizontal installed IGU U value is much worse.



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Meanwhile, the low-E coating position on exterior panel and interior panels also will have slight difference, the difference mainly happened to the glass SC value, [learn more](#).

Argon Filled Insulating glass

Argon is a kind of inert gas, compared with traditional air, [Argon filled insulated glass](#) have many advantages:

- Keep the IGU pressure balance, glass burst due to the pressure difference can be reduced.
- Increase insulated glass thermal property. Argon filled insulated glass U value is 0.2-0.3W/M².K lower than normal IGU with air.
- Prolong insulated glass lifetime. prolong the desiccant service life in the aluminum spacer frame.
- Protect the low-E coating. Decreasing the low-E coating oxidation rate and prolonging the lifetime of the coated glass.
- the heat convection in the insulated glass can be slowed down, and the sound insulation and noise reduction effect can be further improved.

Poor quality insulated glass might have [argon leakage](#), please be ensure that purchasing insulated glass from reputable and reliable [insulated glass suppliers](#).

Warm edge spacer insulating glass

To ensure the long lifetime and good [thermal insulation performance](#), the edges must be sealed strictly to keep the space between glass panels. The spacer's function are: keep insulated glass structural safety, insulate the IGU internal space. The spacer materials are:

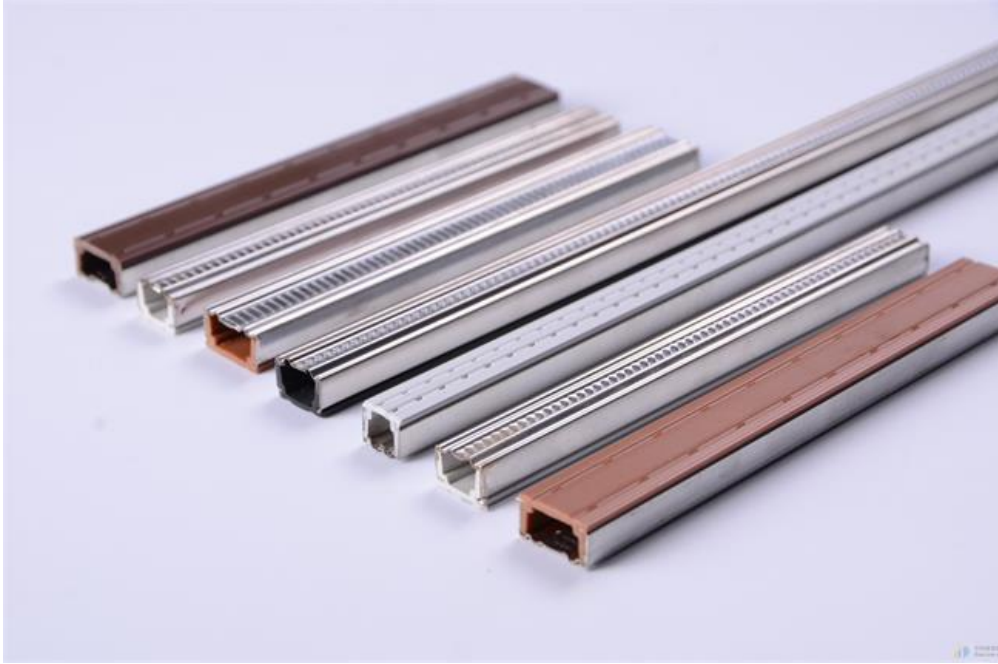
- Aluminium Spacer: Traditional spacers used in the IGU are usually aluminium spacer, the disadvantage is high thermal conductivity.
- Stainless steel spacer: thermal conductivity lower than Aluminium, Stainless steel spacer has difficult in bending, so factories have to use steel connector to join the spacers, which make production efficiency quite low. So this is not widely used in IGU fabricators.
- Thermal break spacers, spacer compose metal and plastic materials. The main brands are [Alupro](#), Technoform, Fenzi, Lisec. The is the most widely used [warm edge spacers](#). Compared with non-metal materials, this kind spacer price is better and more convenient in production.
- Non-metal materials, such as superspacer, TPS, glass fiber stripes. The main brands are [QUANEX](#), they have series products that compose the butyl, desiccant, and structural sealant, so secondary structural sealant is not necessary. But because there's no high efficiency production lines that can produce this kind of insulated glass, the promotion and market for non-metal materials spacers are very limited.

Warm edge spacers can decrease the [insulating glass edge heat transmission loss](#) and increase the windows and doors thermal insulation performance.



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Extra processing of insulated glass:

Capillary tube:

[Capillary tube](#) is small stainless steel tube with only 1mm diameter, it's installed on insulated glass edge (from aluminium spacer bar) and certain parts (around 50mm) is exposed outside to keep air flow inside and outside glass.

Capillary tube is used in insulated glass to balance the air pressure inside and outside of insulated glass to avoid glass contract or expand after installation. But please make sure that your [capillary tube](#) are installed correctly.





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Decorative Cross Bar:

Decorative cross bar is also made with aluminium profiles, Different from aluminium spacer bar, it's used in glass middle, or glass center, it doesn't support the insulated but only have decorative function. The decorative cross bar color can be customized to be same as the windows frame, but do pay attention to the bar position to keep all cross bars in windows&doors paralld.



U channels on insulated glass;

Architects and designers in MEGA areas like to insert U channels at glass edge, the U channel will be embedded with the aluminium frame and work as supporting point for the glass, this will cause bigger and thicker spacer (over 20mm) and increased glass costs.



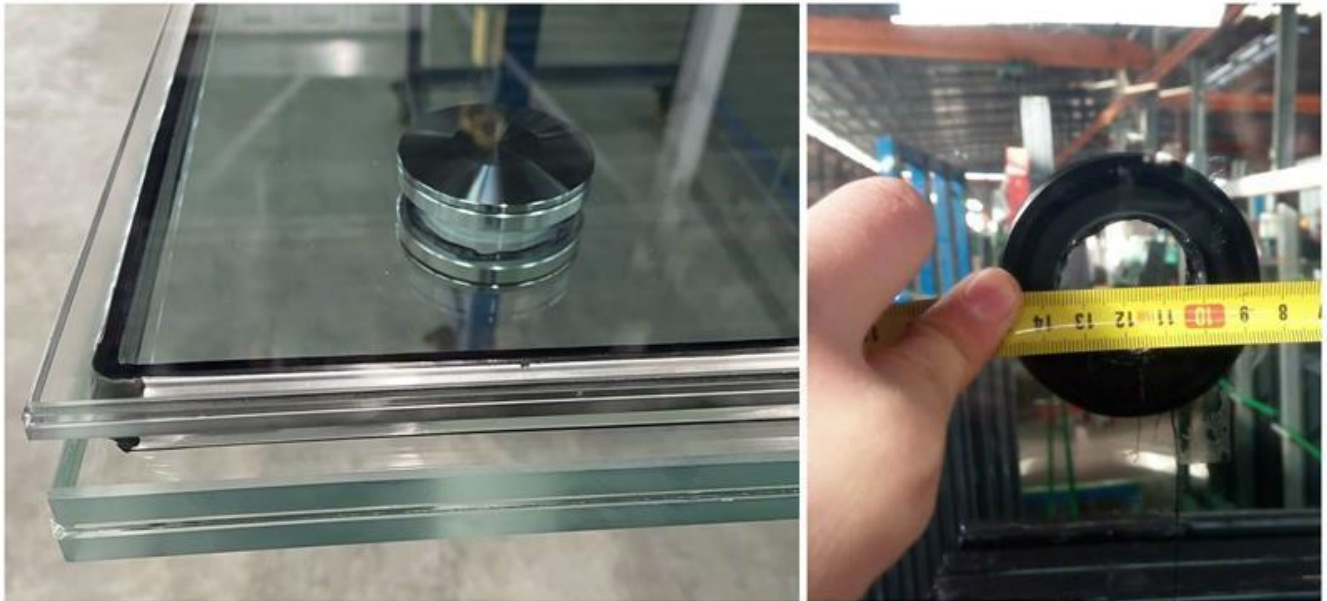


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Perforated IGU;

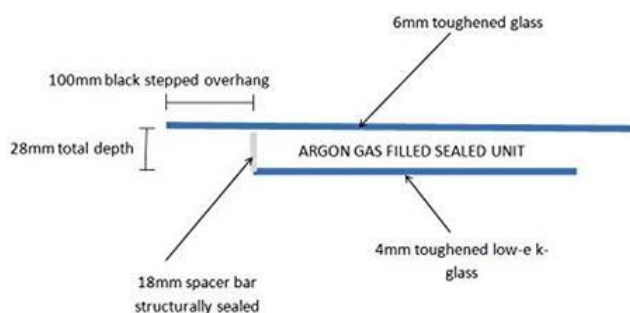
Insulated glass can also be used in point supported glass facade instead of tempered glass and laminated glass. To fix the spider and claw safety, Morn can supply insulated glass with perforations, sealed with aluminium Drings for better and safe installation.



Stepped Insulated Glass:

When it comes to semi-stick glass curtain wall, or glass skylight, stepped insulated glass, or offset insulated glass is used. Silicon sealant can be applied on the glass edge to make it keep uniform color as glass sealant.

Double Glazed Clear Skylight



Insulated glass related tools and software:

WINDOW version 7.7.10. WINDOW is glass performance calculating tools developed by Berkeley Lab, with greater than 80% market share of windows incorporating Low-emissivity (Low-E) coatings in the



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Your turnkey China tempered glass/laminated glass/insulated glass supplier residential sector, and more than 50% in the commercial sector. With NFRC100-2010 and EN673 standards, WINDOW is perfect software.

Download the newest WINDOW version 7.7.10 here: <https://windows.lbl.gov/tools/window/software-download>

OPTICS Version 6.0 Same as WINDOW, OPTICS is developed by Berkeley Lab. The main function of OPTICS is to allow customers design their own glass combination, from laminated glass, insulated glass to laminated insulated glass. In concert with WINDOW software, users can calculate most glass combination performance.

Download OPTICS here: <https://windows.lbl.gov/tools/optics/software-download>

IGDB Version 77.0 The international glazing database (IGDB) is a collection of optical data for glazing products. The IGDB is part of the download package with WINDOW. Most of the experimental input data required by the program to calculate the energy performance indices (e.g., U-factor and g-factor) of a window comes from the IGDB.

Download IGDB here: <https://windows.lbl.gov/tools/IGDB/software-download>

Guardian Acoustic assistant: Guardian Acoustic Assistant is a tool to estimate acoustic performance of different types of glazing.

Due to the large number of potential glazing combinations, certification testing of all glass make-ups is not practical. The information included in the Acoustic Assistant has been compiled according to test protocols and an estimation method developed by Guardian.

Click here and turn to Guardian acoustic assistant: <https://glassanalytics.guardian.com/acoustics-calculator/>

Trosifol Glasglobal: Trosifol Glasglobal calculate the glass Max tensile strength and bending to judge if the glass configuration works or not, or the Max glass size designers can use in the project.

Click here and turn to Trosifol Glasglobal: https://sommer-informatik.com/glasglobal_trosifol/

Guardian BIM Generator: Guardian BIM Generator: Designers, glazing contractors and industry professionals can maximize the power of appearance and performance, streamlining workflow. Construction engineers can request project-specific custom content for curtain wall panels or window-based generic modeling.

Click here and turn to Guardian BIM

Generator: <https://www.guardianglass.com/us/en/tools-and-resources/tools/bim-data>

Vitro Thermal stress analysis: Vitro's Thermal Stress Analysis for Insulated Glass Units (IGUs) provides glass recommendations, without warranty or obligation, based on the design input of your project.

Click here and turn to Vitro's Thermal Stress

Analysis: <http://technicalresources.vitroglazings.com/ThermalStress/>



In the past decades,[vacuum glass](#) was invented and have been applied on buildings ,even though it's U value is much lower,but cannot be used in large scale for technology and costs reason.Click here to learn [vacuum glass history](#).

There're many reasons that affect insulated glass price,customers and designers should confirm the [reasonable glass sizes](#) to decrease the overall purchasing costs after confirming the glass configuration and glass types.Beside glass,insulating glass processing are also important and deciding points that affect [glass quality and glass lifetime](#),make sure your glass supplier has good production rules ,and glass meet international standards,for example [EN1279](#) ,IGCC certificate.

About Morn Building Materials:

A fast growing firm of glass experts specializing in architectural glass products,we offer glass solutions,manufacture,supply,and deliver tempered glass,laminated glass,insulated glass worldwide.

Over 50 China glass factories support Morn BM to be the most professional glass company.High quality engineering glass with CE/IGCC/SGCC/CSI/CEKAL certificates will be the ideal part of your great building .

Morn is committed to be your single-source for any architectural glass products in China.We offer glass solutions for your every special requirement:

Exterior Glass Solutions

- [Acoustic Glass](#)
- [Structural Glass](#)
- [Thermal Insulation Glass](#)
- [Security Glass](#)

Interior Glass Solutions

- [Shower door](#)
- [Mirrors Products](#)
- [Decorative Glass](#)
- [Privacy Glass](#)

Special Glass Solutions

- [Greenhouse Glass](#)
- [AR coated glass](#)
- [Fireproof Glass](#)
- [Auminiums](#)

PRODUCTION CAPABILITY

Spacer Options

Aluminium Spacer,Warm edge Spacer,SuperSpacer,



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Gas Options	Air,Argon
Spacer Thickness	9A,12A,15A, 18A,20A,24A
Sealant Options	PIB,silicon Sealant,Structural slication Sealant,Polysulfide Sealant
Glass Standard	EN1279, ANSI4666,IGCC,GBT11944, 10 years warranty
Glass Size	MIN 300*300MM, MAX 10000*3000MM
Monthly Output	20,000SQM

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