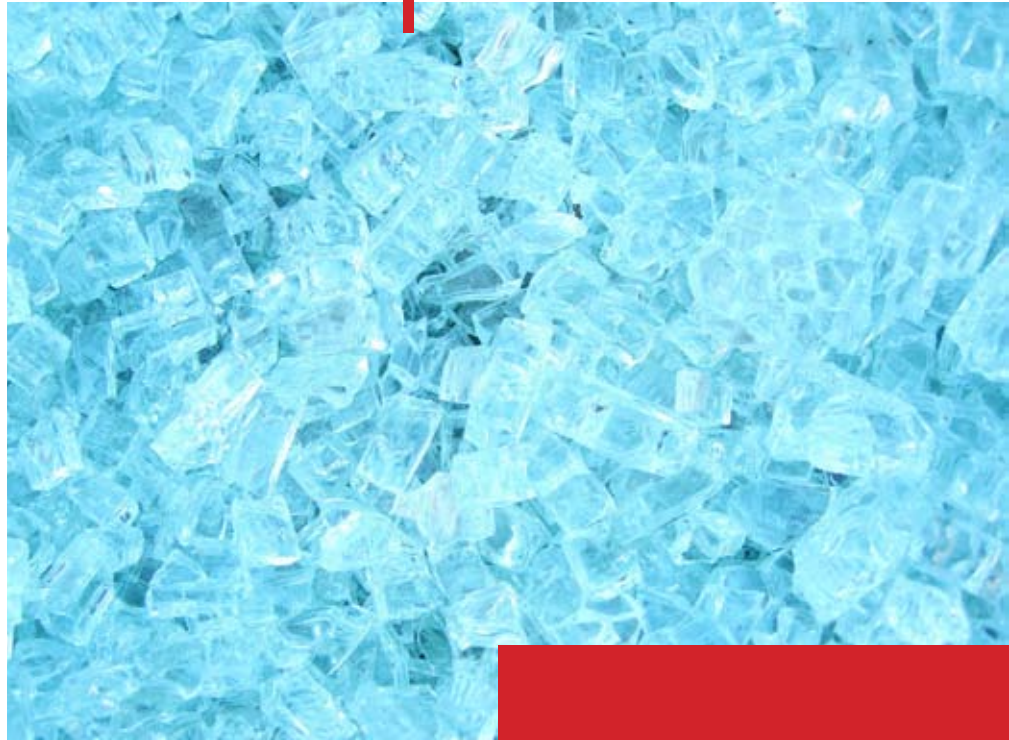


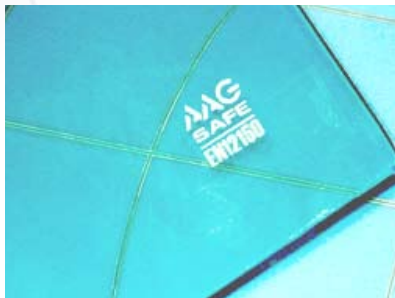
## AAG-dur | AAG-safe



heat strengthened and  
fully tempered glass

The thermal treatment of architectural glass has been developed to increase its capacity to withstand stresses, including impact, deflection and temperature differentials that would cause failure in basic annealed glass. The latest generations of tinted and solar-control glass-types have inherent high absorption factors that make the glass more vulnerable to thermal breakage, consequently requiring compulsory heat-treatment.

AAG-dur and AAG-safe heat-treated glass are both obtained by heating up the glass to a temperature over 600° to attain a stress relieved state , followed by a controlled cooling in order to set-up opposing regions of tension and compression within the glass pane . The forced cooling determines the degree of thermal treatment and defines the differences in strength and characteristics. AAG-dur and AAG-safe have their individual characteristics and it is important to understand the difference in order to value their applications.



## Characteristics

AAG-dur heat-strengthened glass is approximately 2 to 3 times as strong as annealed glass of the same thickness and has a similar breakage pattern.

AAG-safe fully tempered glass is approximately 4 to 5 times stronger than annealed glass in the same thickness and breaks in a typical granular breakage pattern, with numerous pieces, the edges of which are generally blunt.

## Safety

Heat-strengthened glass is not recognized as a safety glazing; however, it satisfies the strength requirements for resistance to most thermal stresses and wind-load conditions. It does not constitute an alternative to toughened glass in situations where safety problems may arise.

The product is tested according to EN1863 and complies with major international standards.

Fully Tempered glass is recognized as a safety glazing material and is tested to EN12150, complying with other major international standards.

## Fallout

AAG-dur is the recommended choice for high-rise curtain-wall constructions or any application where the risk of glass fall-out must be considered. AAG-dur has the tendency, because of the larger breakage pattern, to remain in the frame until it can be replaced, unlike AAG-safe which shatters into small pieces creating a hazardous environment because of the high potential of fall-out from the framing.

## Aesthetics - Optical Quality

The following effects are inherent to the product and cannot be considered as product faults:

### DISTORTION

Because of the glass contact with the rollers during the horizontal heat treatment process, surface deformations in the glass take place which leads to a reduction of surface smoothness, creating 'bows' and 'roller waves'. Heat-treated glass therefore, is not as flat as annealed glass and the degree of distortion is inherent to the process and the limitations are shown in the referenced standards.

Distortion is mainly visible in reflection. The viewer-distance to the reflective glass, the distance of the reflected image from the reflective glass and the viewing angle directly affect the degree of deformation seen of the reflected image.

Distortion in transmission is mainly visible when viewed at a non-perpendicular angle and is more apparent with thicker (over 8mm) glass

Due to its selective cooling process, AAG-dur has a less distorted surface flatness and a better optical quality than AAG-safe, making it the preferred choice for the heat-treatment of highly reflective glass-types and further processing such as lamination.





## ANISOTROPY

A physical effect with all heat treated glass, resulting from the distribution of internal stress leading to double refraction. Perception of dark-colored rings, spots or stripes with polarized light and/or when observed through polarizing lenses is visible depending on the viewing angle. Since natural daylight, depending on the weather and the time of the day shows different proportions of concentration of polarized light, this phenomenon will be observed with different intensity. This effect is further amplified in heat treated IGU or laminated assemblies or any situation entailing superimposed heat treated glass.

## IMPRINT

Small spots (roller pick-ups), may be visible on thicker glass from 10mm and over.

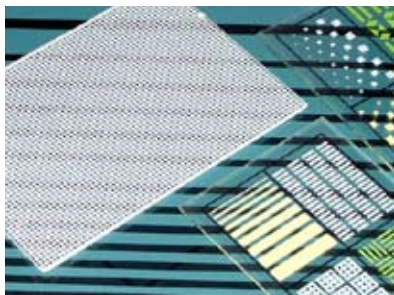


## Spontaneous Breakage

AAG-dur is less susceptible to spontaneous breakage caused by nickel-sulfide inclusions (NiS), thus making the heat soak test redundant. More information on the NiS phenomenon and heat soak testing is available in our document AAG-soak.

## Types of Glass

AAG-dur and AAG-safe are available for all post temperable glass-types in clear, tinted and pyrolitically or magnetron sputtered coated glass, generally complying with EN572 or other acceptable major standards. The resulting heat-treated glass may be incorporated into insulated glass units and laminated glass. Fully tempering accommodates thickness varying from 4mm to 19mm and heat-strengthened glass is available in thickness 6mm, 8mm and 10mm.



## Tolerances

Each component must be cut, drilled, notched, edge-worked and shaped prior to heat treatment.

Tolerances on thickness, dimensions, squareness, drilling and edging as well as location of notches and holes are controlled through EN1863 or EN12150 standard.

## Ceramic fritting

Silk-screen printing or full enameling must be applied prior to the heat treatment. For further information on this matter, refer to the relevant leaflet AAG-screen.

## Compliance with Applicable Standards

Heat strengthened glass: EN1863 – ASTM C1048

Fully tempered glass: EN12150 – ASTM C1048 – ANSI Z97.1

Heat soak tested glass: EN14179

Impact resistance : EN12600 , CPSC 16CFR 1201.4

# PRODUCT PROFILE



## Equipment Review

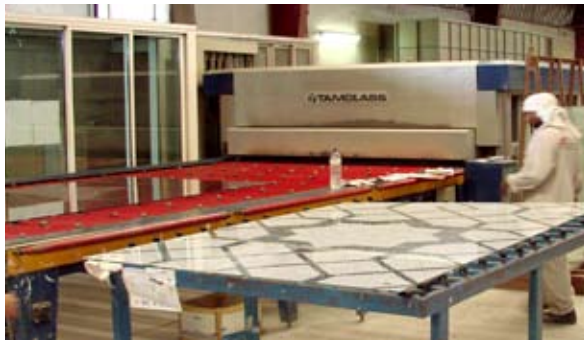
### TAMGLASS MAGNUM PRO-E

Max Glass Size: 3300 x 7500mm

Thickness (FT): 4-19mm

Thickness (HS): 6 – 8-10mm

Capacity: 6mm + 350m<sup>2</sup>/hr



### TAMGLASS HTF III

Max Glass Size: 2400 x 4800mm

Thickness (FT): 4-19mm

Thickness (HS): 6 – 8mm

Capacity: 6mm + 150m<sup>2</sup>/hr

## To Order

When heat treated glass (AAG-safe or AAG-dur) are indicated for rectangular panes, the first dimension shall always be the WIDTH (W), followed by the LENGTH (L).

For patterned glass, or glass with decorative design (silk-screened, sand-blasted or acid etched), the direction of the pattern should be specified relative to one of the dimensions.

The customers are recommended to consult AAG for the intended application.

## Reference Leaflets

- Lamination (AAG-lam)
- Insulated Glass Units (AAG-therm)
- Heat Soak Test (AAG-soak)
- Silk-Screening (AAG-screen)



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