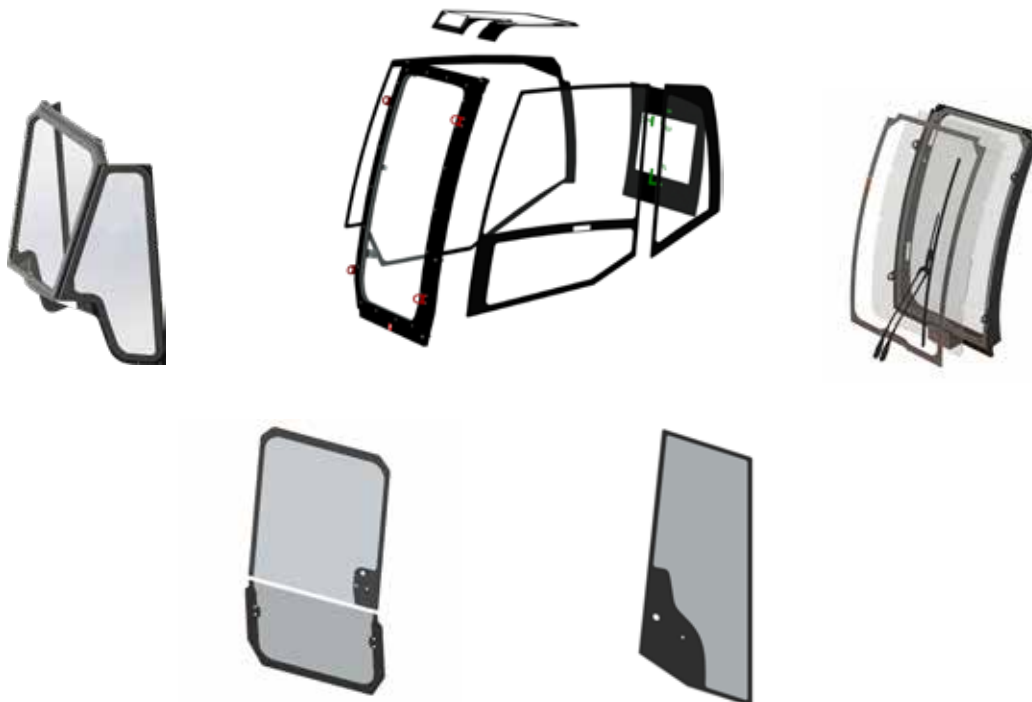




UNBREAKABLE.

HIGH PERFORMANCE SAFETY SCREENS
WITH FOCUS ON A SAFER DRIVER ENVIRONMENT



HIGH PERFORMANCE SAFETY SCREENS



LIFESAVER AS WELL AS MONEY SAVER.

Hammerglass AUTOMOTIVE offers a range of unbreakable protection solutions for driver security. Regardless if you work in environments where the screens are exposed to wear and tear – or if you need protection against explosions and falling stones – Hammerglass has the protection solution for you. With over 10 years of experience and thousands of installations, we secure cabins in everything from mining and construction machinery to trains and emergency vehicles.

Except being one of the market's most secure alternative for a safer driver environment, Hammerglass also delivers unbreakable glass solutions with additional benefits. The material with its abilities gives an outstanding cost efficiency since the owner avoids production stops due to unforeseen changes of broken and worn screens. The Hammerglass scratch protection system with exchangeable ScreenSaver screens and ScreenSaver film contribute to optimal cabin view and minimal production stops.

THIS IS WHY HAMMERGLASS IS THE BEST CHOICE FOR YOU.

- **WORLD CLASS DRIVER PROTECTION - 300 TIMES STRONGER THAN GLASS.**
- **SUPERIOR OPERATING ECONOMY WITHOUT GLASS BREAKAGE.**
- **EXPLOSION TESTED ALTERNATIVE FOR TOUGH ENVIRONMENTS.**
- **LIGHTWEIGHT CONSTRUCTION - LESS LOAD.**
- **EFFECTIVE ANTI-SCRATCH SOLUTIONS.**
- **IMPROVED CABIN COMFORT WITH HEAT REDUCING IR GLASS (INFRARED).**
- **GRID FREE CABINS WITH FREE SIGHT.**
- **AVAILABLE FOR MOST MODELS ON THE MARKET.**

THIS IS HAMMERGLASS®

Hammerglass® is a durable and wear-resistant polycarbonate sheet, 300 times stronger than glass – and virtually unbreakable. Hammerglass screens are coated with a thin layer of silicon oxide which protects against scratches and wear and tear. The surface coating also provides 99.96% UV protection, which prevents Hammerglass screens from clouding or becoming discolored over time. With its array of positive features Hammerglass® is the obvious choice for replacement screens in all types of construction machinery.

Hammerglass AB is certified in accordance with ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and can apply PPAP in all processes. Our structural engineering department will be at OEM's disposal providing its expertise.

FOR ALL TYPES OF VEHICLES

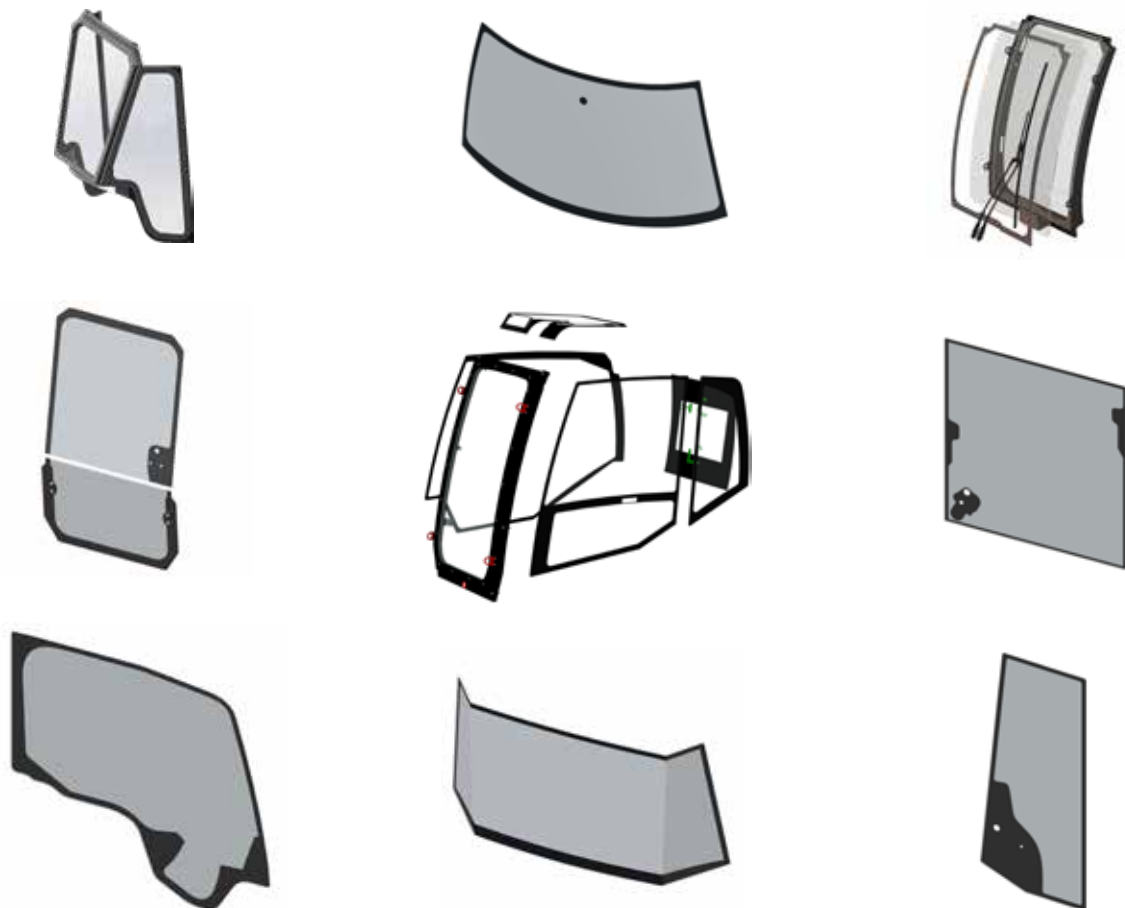


THE INVISIBLE GRID.

Hammerglass offers unbreakable security glass solutions for a variety of different machines and vehicle types. Regardless of the end user, the solution is based on the same principles – safe, unbreakable, lightweight solutions for safe driver environments.

Hammerglass is the world leading supplier of custom made protection solutions in both Protection Class 1, 2 and 3 within most different vehicles and machine categories. Hammerglass delivers unbreakable lightweight solutions as alternative to standard screens, armored glass and bars. The Hammerglass screens can be ordered for most commonly used machinery, with a thickness adjusted after screen size and protection need. The screens are fitted in the same way as the original screens, and can withstand both chemicals and windshield wipers. In addition, the installation does not require any interference with the vehicle's frame – interference that can affect the vehicle's CE rating.

FLAT OR CURVED SCREENS. WHICH MODEL DO YOU NEED?



MAKE DEMANDS ON VEHICLE SCREENS



MAKE TOUGH DEMANDS. THAT'S WHAT WE DO!

Ricochets, falling rocks, branches and unstable loads – an unprotected machine operator leads a dangerous life. With Hammerglass unbreakable screens in the cab, you ensure that the machine operator has a safe working environment.

At Hammerglass, we make tough demands on our vehicle screens and as a customer, you should set equally high demands – after all, this is a vitally important issue. Below we have compiled various requirements that must be set for a vehicle screen depending on the environment in which it is used, and what protection it should provide:

Scratch resistance - The screen should not be scratched by the windscreen wiper, in normal operating environments. Hammerglass screens are coated with a thin layer of silicon oxide which protects against scratches and wear and tear. In sand-filled environments, however, we recommend that a ScreenSaver protective film is applied to the screen.

Sharp object - During quarrying and metal recycling sharp-edged projectiles are propelled at the screen. The screen must withstand such attacks.

Large rocks - The screen must remain in place and protect the driver if large rocks strike the cab at high speed.

Pressure wave - The screen must remain in place in its mounting in an encounter with undetonated explosives. It must not be forced into the cab by the pressure wave or sucked out by the vacuum generated following the explosion. Hammerglass RABS approved screens are explosion tested and comply with these driver safety requirements.

Note that Hammerglass develops screens for different protection requirements and in protection classes based on the environment in which the screen is to be used. This means that all our screens have different properties and can be adapted to different requirements. Which screen is appropriate for which machine is decided on the basis of current protection requirements.

A photograph of a dark, industrial tunnel, likely a mine. The scene is dimly lit, with several bright, circular lights mounted on the left side of the tunnel. These lights illuminate a complex network of cables and machinery. The right side of the tunnel shows a rough, rocky wall. The floor is covered with debris and what appears to be a conveyor system or tracks. The overall atmosphere is gritty and industrial.

***"With Hammerglass, we
have protection that both
saves lives and money
for the company"***

CHOOSE THE CORRECT PROTECTION CLASS.

Roadwork, mining, quarrying, emergency response? Do you need help choosing the level of safety you need for your vehicle?

Hammerglass AUTOMOTIVE offers a comprehensive range of unbreakable screens with focus on a more secure driver environment. Our solutions help to provide enhanced personal protection and a reduced risk of unscheduled stoppages which would entail unnecessary downtime costs. Below you will see a short list of the protection classes and safety levels that are required for work in tough environments.

1

PROTECTION CLASS 1

Range of application: For simpler machinery work where there is a risk for stone chippings

Protective measure: The original screen is exchanged for a Hammerglass screen

Fitting: The same way as the original screen

Protection specification Front window: 8 mm (0.31") Hammerglass, split/non-split

Protection specification Boom side window: 8 mm (0.31") Hammerglass

Accessory: ScreenSaver protective film for the front window

2

PROTECTION CLASS 2

Range of application: For tough driver environments where there is a risk of stone chippings, falling stones and acts of vandalism

Protective measure: The original screen is exchanged for a Hammerglass screen

Fitting: The same way as the original screen

Protection specification Front window: 8/12 mm (0.31/0.47") Hammerglass, split/non-split

Protection specification Other screens: 8/12 mm (0.31/0.47") Hammerglass

Accessory: ScreenSaver protective film for the front window

3

PROTECTION CLASS 3

Range of application: Where there is a risk of undetonated explosives, risk of explosions, where quarrying is being carried out or there is a risk of rock fall

Protective measure: All screens are replaced with Hammerglass screens, the front window is fitted in an explosion tested steel frame (RABS approved)

Fitting: The steel frame is fitted on the cabin without interference with the vehicle's ROPS frame

Protection specification Front window: 12 mm (0.47") Hammerglass in RABS frame

Protection specification Other screens: 12 mm (0.47") Hammerglass

Accessory: ScreenSaver protective film for the front window, or ScreenSaver protective screen

RABS - EXPLOSION TESTED STANDARD

ScreenSaver protective screen
4 mm (0.16") Hammerglass

Evacuation screen
12 mm (0.47") Hammerglass

Other screens
12 mm (0.47") Hammerglass

Clamp frame
For ScreenSaver protective screen

Hammerglass RABS-frame
12 mm (0.47") Hammerglass screen
in explosion tested steel frame



HEALTH AND SAFETY.

Protection Class 3 is the most complete protection class and is for work where there is considerable risk for the driver and vehicle. To achieve Protection Class 3, several protection criteria have to be fulfilled. Below we explain how to equip your vehicle for maximum protection in Protection Class 3.

Requirements for Protection Class 3

- The front window has to be RABS approved, which means that the original front screen is replaced with a 12 mm (0.47") Hammerglass screen fitted in an explosion tested steel frame.
- All other screens in the cabin have to be at least 12 mm (0.47") Hammerglass.
- The cabin has to offer an escape exit via an escape screen. This has to be reachable by the driver in case of rock slides which close off all other exits. The escape exit also has to be openable from the outside.

THIS IS RABS.

RABS is the designation for vehicle screens which indicates that the screens satisfy a combination of international safety standards. Using a RABS-classified solution satisfies personal protection requirements for work involving the risk of undetonated explosives, falling rocks and while quarrying.

In order to be marked RABS Approved, the screens must pass all of the following four tests. Hammerglass 12 mm (0.47") in a steel frame satisfies the RABS requirements.

R

R43

ECE Regulation No.43 (R43). A comprehensive series of tests for vehicle glass, including scratch protection, UV protection and elongation. Compulsory for all vehicles.

A

AXE

Sharp object (EN 356, P8B), a test in which the screen withstands 72 blows from a machine-mounted axe, without the axe penetrating the glass.

B

BLAST

Pressure wave upon detonation (EN 13124-2, EXR 2), a test in which 6.6 lbs. (3 kg) TNT are detonated at a distance of 9.8 feet (3 meters) from a screen mounted in an approved steel frame. The screen is mounted in a steel frame so that it cannot be forced into the cab.

S

STONE

Heavy objects at high speed (EN 15152-2), a test in which a 2.2 lbs. (1 kg) aluminum projectile is propelled against the screen at a speed of 279.6 mph (450 km/h) and at an angle of 90 degrees thereto. Equivalent to a large rock propelled at high speed.
FOPS Falling Object Protective Structure/FOG Falling Object Guard (EN ISO 3449, ISO 10262, ISO 8083). A test where the system is frozen to -18°C, after which a 227 kg heavy steel cylinder is released from a height of 5.2 meters onto the window (corresponds to a force of 11,600 Joules).



EFFECTIVE SCRATCH PROTECTION.

When developing Hammerglass unbreakable screens, our aim was to obtain a safe and secure working environment and fewer operational disruptions. Our screens provide protection against rock fall and explosions, but - like glass - they can be scratched when working in harsh environments. Therefore, we have developed two unique, interchangeable scratch protection solutions that are guaranteed to have a positive impact on the operating economy.

The Hammerglass surface coating is strong but it does not last forever. Even though the screen will provide the driver with a high level of protection for many years to come, the surface will wear out as the machine is used in rough environments such as quarries etc. filled with gravel, grit and sand. Eventually abrasion will reduce the visibility properties of the screen, necessitating replacement of the screen for visibility reasons. As we know that production stoppages are costly, we have developed two scratch protection solutions that minimize the problem of scratched wind-shields.

ScreenSaver protective film - for all Hammerglass front screens

Hammerglass ScreenSaver protective film is an additional protection that extends the life of the Hammerglass pane, while the optical quality is ensured. ScreenSaver protective film is reducing wear, scratches and marks from stone chips. However, it should not be confused with the protective coating of the Hammerglass screens. The unique composition of the ScreenSaver film, consisting of a flexible multi-layer construction in polyurethane, effectively creates the best possible protection for the underlying pane. In addition to being resistant to external damage, the protective film also has selfhealing properties. Hammerglass ScreenSaver protective film is a consumable item. When the film has become sufficiently worn, it is replaced with a new one. Depending on the degree of wear, the sacrificial film will need to be replaced at various intervals. Hammerglass ScreenSaver protective film is only approved in combination with Hammerglass, and not with other materials.

ScreenSaver protective screen - for RABS frames

Dusty environments, quarrying and a constant onslaught of stone chippings cause heavy wear and tear on the machine screens. The Hammerglass ScreenSaver protective screen in 4 mm (0.16") Hammerglass is designed to protect the sturdier 12 mm (0.47") screen in the RABS-frame, and is a pure wear product. The patented ScreenSaver screen is supplied with a moisture absorber around the outer edge and is fitted to the RABS-frame. A rubber seal fits tightly against the frame and prevents the ingress of water between the ScreenSaver screen and the RABS-screen. The ScreenSaver protective screen is easy to remove when not in use, and easy to replace when it has become damaged by stone chippings.

"I saved \$ 1 000 in one year, just by switching to IR screens..."

A real-life example

Pentti Lappalainen runs a large peat farm outside Vasa in Finland. In the summer of 2012 he conducted an experiment: on one of two identical Åkerman E series diggers he fitted Hammerglass IR glass in all of the cab screens. The two machines were used to perform identical tasks on the farm, and were operating for around the same number of hours. The digger fitted with the IR glass had a fuel consumption that was € 1.000 (\$ 1.000) lower than the digger with ordinary glass! A highly unscientific study perhaps, but it nevertheless points to massive opportunities for savings that can be made in relation to the cab cooling system.

OPERATING ECONOMY & COMFORT.

Production downtime, high fuel costs and an uncomfortable working environment. These are just three of the problems that Hammerglass products can remedy – besides saving lives.

Avoid unscheduled stoppages caused by broken screens

Hammerglass products not only aim to save lives but also contribute to improving the company's operating economy. Many machines operate in harsh environments where glass replacement is a part of everyday life. Unfortunately, frequent glass replacement entails production stoppages that quickly result in high costs for the company. Hammerglass in the cab avoids the need for frequent screen replacements and if you opt to supplement your standard screen with sacrificial film or a sacrificial screen (for RABS), downtime is minimal.

Solar heat reduced by half with IR screens

Hammerglass IR (Infrared) removes 45-55% of the incoming solar radiation. The screens are supplied in tinted Hammerglass IR. The weak tinting should however not lead to their being confused with ordinary tinted vehicle windows. When the IR screens are manufactured, a substance is added which absorbs the sun's infrared rays (heat radiation) without any appreciable reduction in the light transmission (approximately 10%). The effect is clearly perceived if one tests the transmitted radiant heat with an IR lamp. Whereas a normal screen provides full radiant heat transmission, the attenuation offered by IR screens is extraordinarily effective.

IR-glass has the same performance as regular Hammerglass when it comes to strength, chemical resistance and scratch resistance. IR-screens can be fitted on all screens except front screens.

Reduced diesel costs

The majority of new machines have air conditioning, but air conditioning uses up a lot of diesel, and even on maximum cool setting that part of the driver's body exposed to the sun's rays can become really hot. With Hammerglass IR the climate within the cab is distinctly more agreeable, and the related diesel costs can be reduced substantially.



UNBREAKABLE.



INFRASTRUCTURE

TRAVEL CENTRES · NOISE REDUCTION · BUS SHELTERS · PEDESTRIAN TUNNELS · BRIDGES · ROOFING
PROTECTIVE SHIELDS · WALL COPING · BALUSTRADES · MEDIA PROTECTION

PROPERTY

WINDOWS & DOORS · BALLISTIC PROTECTION · EXPLOSION PROTECTION · ROOFING · BALUSTRADES
SECURITY FURNISHINGS · UNBREAKABLE MIRRORS

AUTOMOTIVE

SAFETY SCREENS · EXPLOSION TESTED SCREENS · HEAT REDUCING SCREENS
SCREENSAVER PROTECTIVE SCREENS · SCREENSAVER PROTECTIVE FILM



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