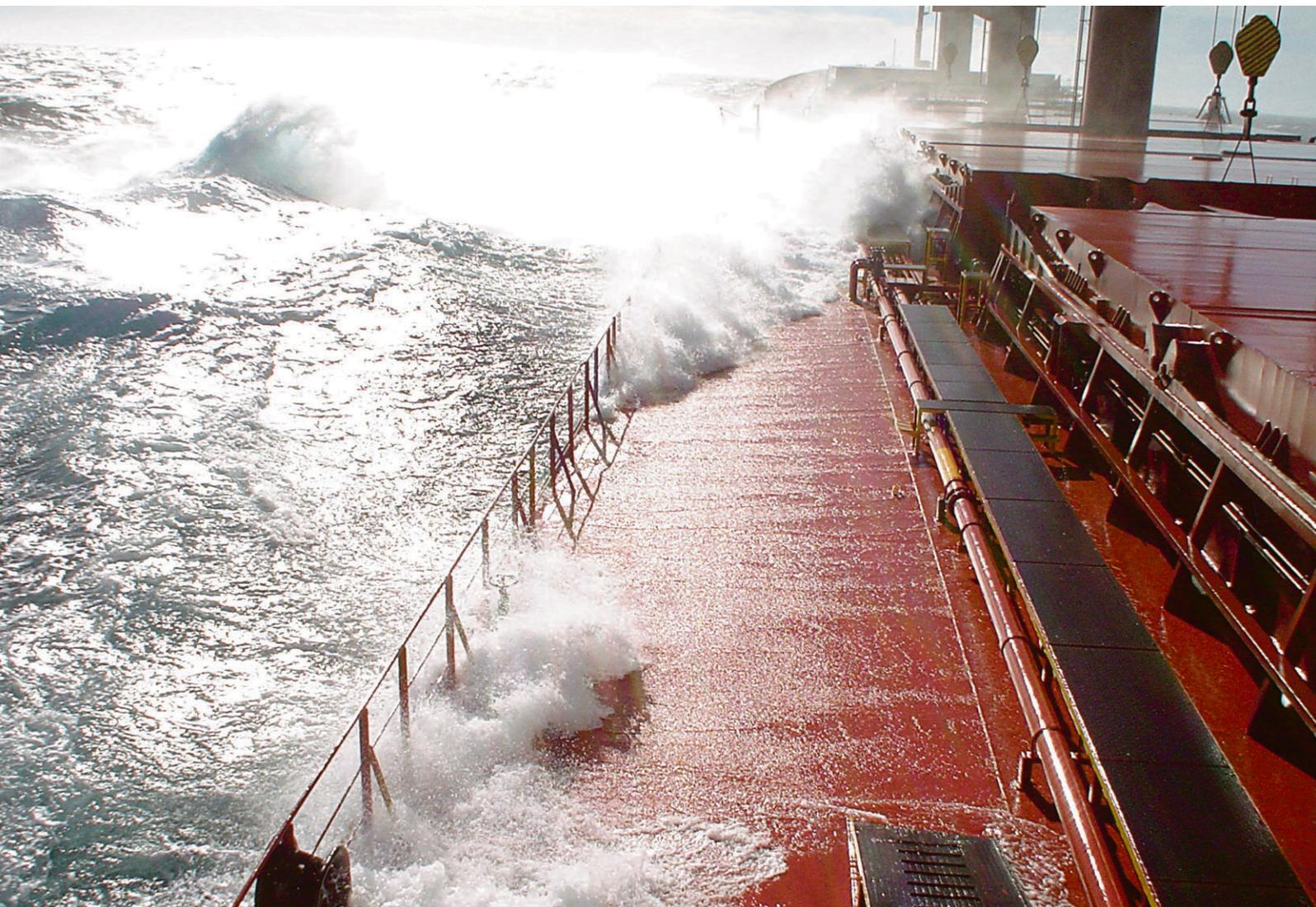


MacGregor sealing solutions

# High quality, longer lifetime and increased safety



At your service



**MACGREGOR**

Designed to perform with the sea

# Why to choose MacGregor sealing solutions?

## **Weathertightness increases safety**

MacGregor sealing systems ensure complete weathertightness and effective functioning of the seal over an extended service life. Climate, cargo types and diverse customer requirements specify the criteria for selecting the right sealing solution. MacGregor seals are manufactured according to exacting specifications to secure the optimum rubber quality for a particular application. Our sealing solutions are designed to provide the best possible protection for your cargo and to reduce the need for maintenance to a minimum – resulting in reduced costs and increased safety.

## **Original MacGregor seals ensure longer service life**

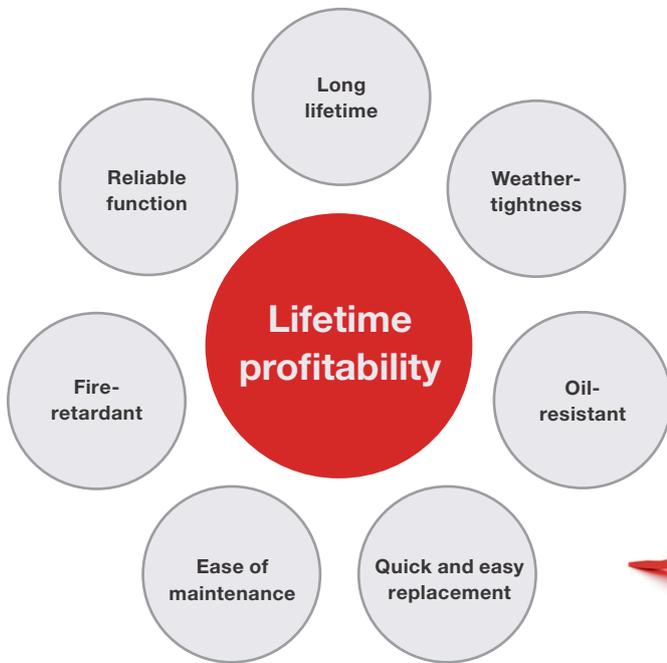
Our choice of original seals and sealing systems is comprehensive. It ranges from traditional sponge and solid rubber seals to advanced panel-joint sealing solutions offering various operating capabilities and flexible cargo handling.

The performance of a seal is determined not only by the mechanical and chemical properties of the rubber material, but also by the geometry of the seal profile. The kinematics and movements of the hatch cover panels in a seaway, and when operating, have to be taken into account as well.

MacGregor offers tested and proven seals and sealing solutions that mean trouble-free operations and safe cargo handling for all types of vessels.



**Secure solutions for even the most delicate types of cargo**



### Customer expectations

The performance expectations and requirements of sealing solutions have grown rapidly because of the increased need for safer and more effective equipment that offers lifetime profitability.



### The importance of getting a good seal

A good hatch cover seal protects cargo and guarantees the safety of the vessel by:

- Allowing for hull and coaming deflections at sea and still maintaining effective sealing
- Keeping water out by weathertight sealing between the hatch covers and the coaming, and in the hatch cover panel joints
- Keeping the cargo dry and any protective and/or inert gases inside the hold



A suitable sealing force is a prerequisite for the sealing arrangement to function correctly. This is not achieved by sealing alone as the whole coaming arrangement has to work in unison. It is of paramount importance for the tightness of the covers that the counterpart position, in relation

to the seal, is correct, and that the support pads, restraints and locators are arranged in an optimal way. Changes in one part of the arrangement can lead to changes in its other components. We see the system as a whole and know how to balance all its parts.

Sealing force  
(kN/m)



### Compression curve

- Optimised sealing forces over a wide compression range

# Selection and operation of our seals



## Sponge

- Traditional hatch cover seal
- Minimal permanent set
- High ozone resistance and tensile strength
- Mainly for older ships where investments in maintenance and/or repair are not economical



## FlexSeal

- Minimal permanent set
- Improved solution to replace sponge seals
- Excellent service life expectancy
- Solid rubber does not absorb water, maintains its original shape and prevents corrosion
- Shape of 'wings' and 'jags' gives it an optimum weathertight fit
- Oil-resistant and arctic types available



### Cat Profile

- No compression bar required
- Reduced installation/maintenance costs
- Works against any surface
- No restriction of lateral movement
- Minimal permanent rubber set
- Abrasion resistant
- Optimised rubber material for minimal wear
- Fire-retardant and arctic types available



### C Gasket

- Sliding C-profile
- Non-sequential sealing for joints between lift-away pontoon hatches as well as between folding and lift-away or rolling hatch cover panels
- Robust profile, bolted to rubber channel
- Easy and reliable operation
- Recommended for two-panel hatches



### Omega

- Non-sequential operation
- Function is based on pressurised air. Unpressurised, a weathertight seal is formed against its rubber counterpart in the joint. For lifting, the two air hoses inside the seal are pressurised and the seal's profile retracts from its counterpart. In emergencies, Omega panels can also be operated without air pressure.
- Uses the ship's standard compressed air system => no special vacuum pumps needed

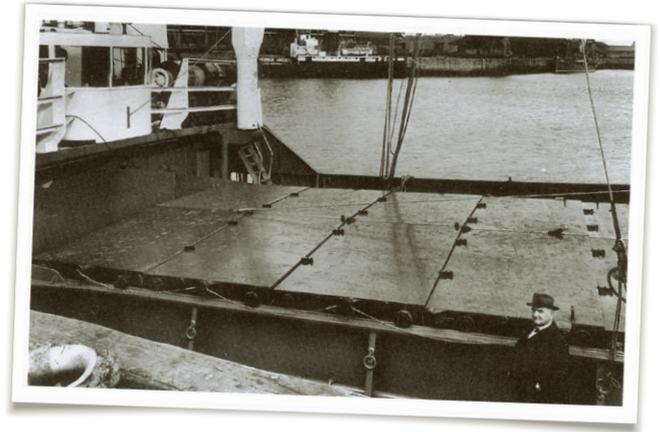


### Omega Lite

- 'Simplified' Omega – without retractable features
- Non-sequential passive sealing for joints between lift-away pontoon hatches
- Replaces active Omega with minimum steel work
- Cost-effective

# Constant development and lengthy experience guarantee high quality solutions

During the 1920s, concerned over unnecessary losses of North Sea colliers, engineers Robert and Joseph MacGregor developed the first steel hatch cover. Deceptively simple, the design consisted of five articulated leaves that stowed neatly at the end of each hatch. Patented in 1929, this ground-breaking concept improved ship and cargo safety and changed the face of cargo care for ever.



Since then, MacGregor hatch covers have been unrivalled in their development and new hatch cover types, designed to protect both the ship and its cargo have been introduced. To mention but a few: the single-pull hatch cover in the 1940s; the flush tweendeck hatch cover and the flush weatherdeck hatch cover in the 1950s; and mechanised lift and roll hatch covers in the 1960s. These new products were followed by innovative sealing solutions for hatch covers that became commercially available in the 1980s.

For more than three decades, new solid rubber seals have been introduced to meet ever stricter operational requirements. Original MacGregor sealing solutions have gained a reputation for safe and reliable seals that perform in almost all climates and environments. To ensure sustainable and cost-effective service our R&D aims at developing sturdy long-lasting seals, which are easily adjustable and replaceable.

## Testing

### Hose test

A hose test is carried out by spraying a jet of water along the cross joints and perimeter seals of the hatch cover. This must be performed with a class-specified minimum water pressure and distance from the structure. During testing, the cargo holds must be empty of cargo.



### Ultrasonic test

An ultrasonic test is carried out using type-approved, efficient and reliable testing equipment. This equipment consists of two parts: an ultrasound multi-transmitter and a hand-held detector. The multi-transmitter is placed in the hold in a central position. It produces a uniformly distributed omnidirectional sound throughout the hold space. The sound energy is measured by the hand-held detector. The transmitter sound is produced in a narrow frequency (kHz) band, and the detector is only tuned to filter out this band. As inspectors wear headphones and read data off a digital display, they are not hampered by surrounding noise and can detect any leaks. The detector's built-in memory function also records the dB values, making the data downloadable to a PC, so that it can be safely logged for reports. For swift, clean and easy testing, ultrasonic technology can be used to check any opening on board a ship that needs to be sealed.



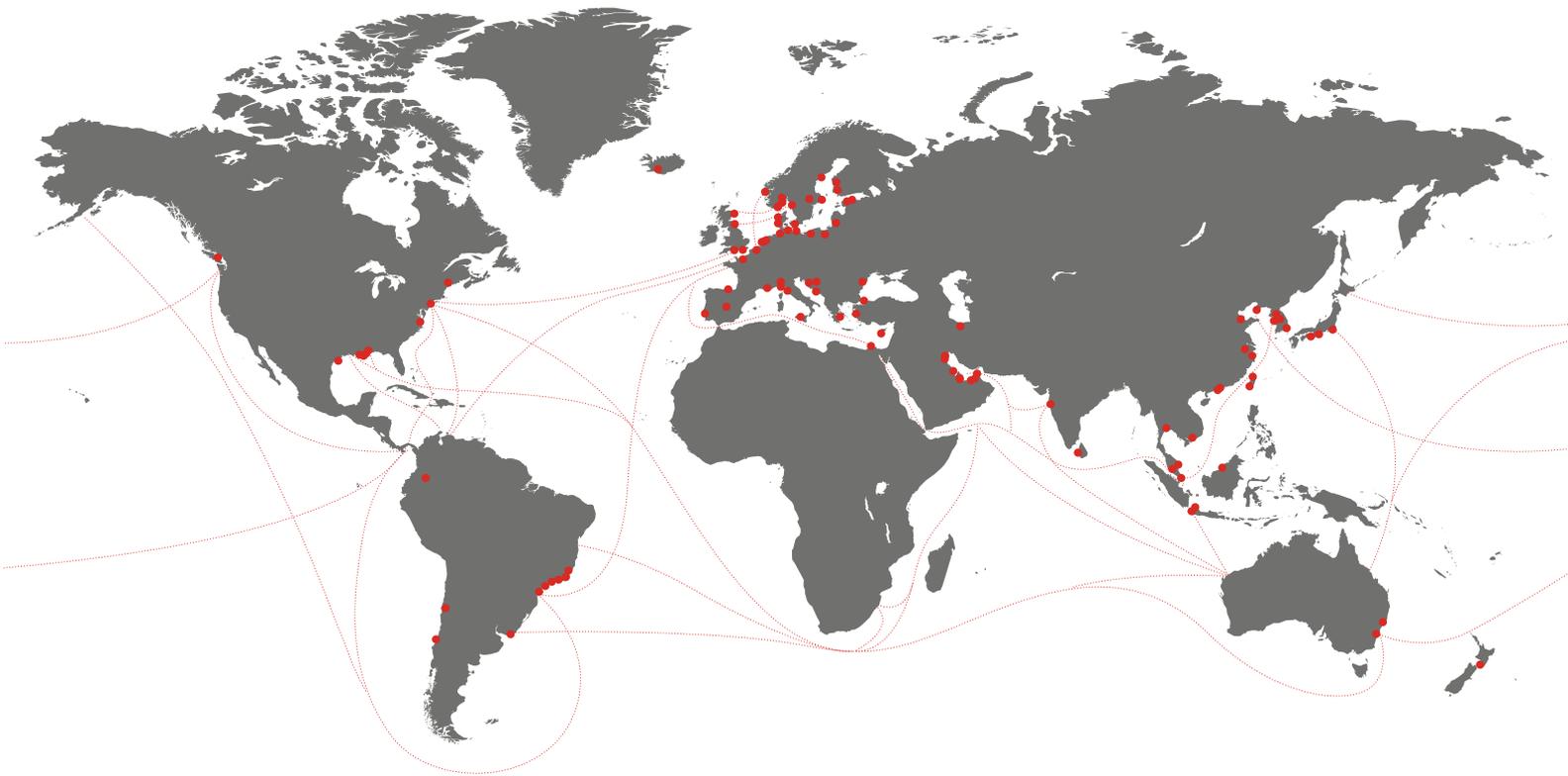
Functional and trustworthy in the most extreme conditions.

**Which seal type to which ship type?**

Ship type	Cat Profile	Flex-Seal	Laby-rinth	Double Rubber Lib	Swing Seal	C Gasket	Omega	Omega Lite	Sponge
<b>Container ships</b>									
Feeder container ships < 1,200 TEU	•	•				•	•	•	•
Feeder container ships > 1,200 TEU	•			•		•	•	•	
Panamax container ships	•		•	•		•	•	•	
Post-panamax container ships	•		•	•		•	•	•	
<b>General cargo ships</b>									
General cargo ships	•				•	•	•	•	
<b>Bulk ships</b>									
Mini-bulkers	•	•							•
Handysize/Handymax	•*	•							•
Panamax/Capesize		•							•
VLOC		•							•

\* Occasionally for open hatch bulk carriers ■ Further specific information is provided in hatch cover brochures and data sheets

Wherever needed, you can rely on our support.



MacGregor shapes the offshore and marine industries by offering world-leading engineering solutions and services with a strong portfolio of MacGregor, Hatlapa, Porsgrunn, Pusnes and Triplex brands. Shipbuilders, owners and operators are able to optimise the lifetime profitability, safety, reliability and environmental sustainability of their operations by working in close cooperation with MacGregor.

MacGregor solutions and services for handling marine cargoes, vessel operations, offshore loads, crude/LNG transfer and offshore mooring are all *designed to perform with the sea*.

*MacGregor is part of Cargotec. Cargotec's class B shares are quoted on NASDAQ OMX Helsinki Ltd.*

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