# Watertight solutions for dry dock operations

## CONVENTIONAL SOLUTIONS VS. GINA GASKET: KEY DIFFERENCES EXPLAINED

# Why effective dry dock sealing matters

**Dry docks are critical infrastructures vital for vessel maintenance, repair, and construction. They provide a controlled, water-free environment, which is essential for efficient and precise operations. In order to keep these environments dry, prevent water ingress, and withstand hydrostatic pressure, it is important to select and apply the right high-performance watertight seal, suitable for the specific gate and project.**

There are different types of dry dock gates, each with its configuration, geometry, closure mechanism, movement, closure path, and load distribution. To achieve watertight performance, some dry dock gates traditionally rely on segmented rubber seals, designed with an angle at both ends and a gap between segments, forming overlapping bevel lap joints. These segment connections can often become weak points, resulting in potential leakages that require additional field rework.

As an advanced alternative, continuous sealing solutions with no connection points—such as the Gina gasket—can eliminate weak regions that compromise sealing performance.

The Gina gasket (Figure 1), made from Natural Rubber (NR), benefits from a simpler handling process due to its flexible nature and absence of internal steel plates, streamlining installation. In the event of localized damage, repairs are straightforward. The damaged section can be removed and replaced with a new piece, which is seamlessly joined to the original gasket through hot vulcanization, restoring the integrity of the seal to its full performance capabilities.

Although both traditional and continuous seals allow for local repairs, the Gina gasket's integral design significantly minimizes the likelihood of initial leakage, reducing the need for rework and overall maintenance efforts.
Avoiding leakages is particularly important as it allows the complete shutdown of water pumps that, if not, would be kept on to extract the excess water. This contributes to a safer environment and reduces electricity consumption.

Dry dock gates are often installed on aging graving dock structures, where surface imperfections are common. With its flexible design and ability to handle high compression without compromising durability, the Gina gasket is ideally suited for these demanding conditions. Its adaptability ensures a secure, watertight seal even on less-than-perfect surfaces.

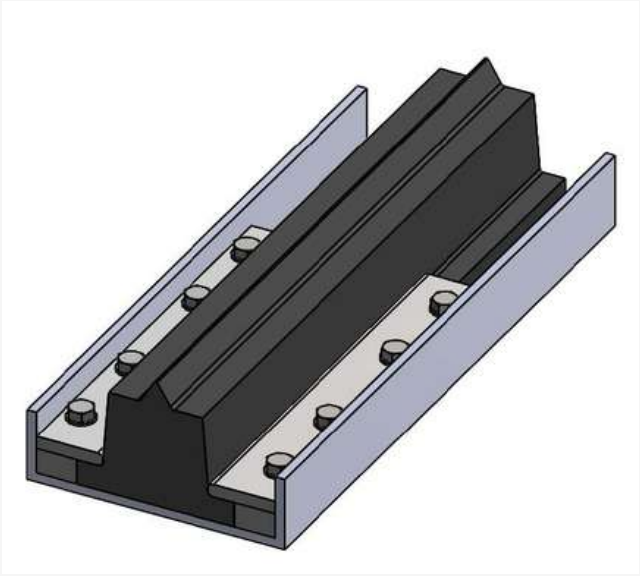

**Figure 1: Gina gasket with installation clamps**

# Traditional vs modern seals
# Geometry and performance

Below is a cross-sectional geometry comparison between a type of traditional seal (Figure 2) and the Gina gasket (Figure 3), highlighting key design differences that impact their performance and application. The traditional seal incorporates embedded plates, which can increase the potential for corrosion over time. It also includes studs that complicate the installation process and contribute to higher shear loads, impacting its overall reliability and ease of use.

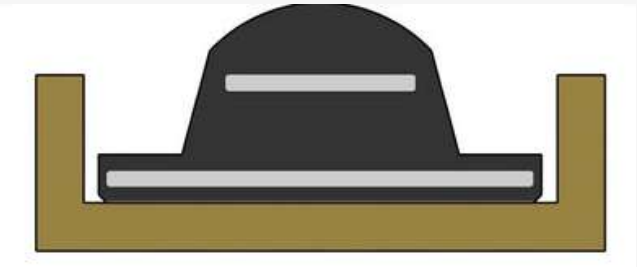

**Figure 2: cross-section of traditional seal**

On the other hand, the Gina gasket's increased height, as shown below in Figure 3, indicates it is designed to accommodate higher compression or sealing forces, making it suitable for uneven surfaces.

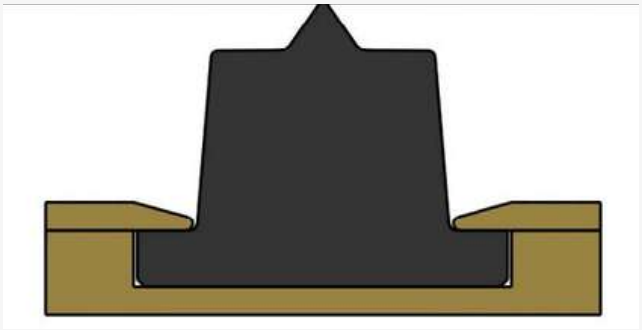

**Figure 3: cross-section of the Gina gasket**

**KEY BENEFITS OF THE GINA GASKET**

**Safer Operating Environment**

- Enhances safety by eliminating water exposure risks.
- Prevents equipment failures and slip hazards.
- Enables safe use of power tools and heavy equipment at ground level.
- Minimizes risks, improves efficiency in maintenance tasks.

**Advancing Sustainability**

- Reduces CO2 emissions by eliminating the need for continuous pumping operations.
- Prevents water ingress, avoiding contamination in docks and surrounding ecosystems.
- Aligns with stringent environmental regulations.

**Energy Savings**

- Reduces energy consumption by eliminating the need for high-capacity pumps.
- Lowers operational energy costs, improving overall efficiency.

**Tolerance and Adaptability:**

- Accommodates surface irregularities on concrete and steel.
- Ensures a secure fit in challenging environments.
- Provides a reliable seal for long-lasting performance.

**Durability and Longevity:**

- Designed for extended service life, reducing maintenance needs.
- Offers excellent load absorption and high compression.
- Highly adaptable to various applications.
- Often lasts for decades without requiring replacement.

# Traditional vs modern seals
# Geometry and performance

**Wastewater Reduction**
- Reduces the need for wastewater management and treatment.
- Brings substantial cost savings.
- Streamlines operations to lower overall operational expenses.

**Risk Mitigation**
- Prevents infrastructure damage and costly repairs.
- Reduces the risk of increased corrosion.
- Ensures structural integrity and operational continuity.
- Supports long-term asset protection.

**Cost-Effective and Easy Installation**
- "Soft nose" design ensures quick watertightness upon contact, also on uneven surfaces.
- Available in multiple sizes for flexibility.
- Single U-Frame design allows for easy, gap-free installation.

**Customizable Hardness Levels:**
- Tailored to meet specific project requirements.
- Varying hardness levels in the nose, body, and flange.
- Ensures optimal performance under applied load and compression conditions.

# Analyzing load-deflection behavior using FEA
# Gina gasket vs traditional seals

When it comes to ensuring watertight performance in dry dock gates, seal design is critical. Using Finite Element Analysis (FEA), we've compared the load-deflection behavior of various seal designs, including the Gina gasket and traditional alternatives.

The results indicated that the Gina gasket (model G150/125-60) delivers significantly higher compression under operating loads compared to traditional designs. Its soft rubber nose is uniquely engineered to conform to surface irregularities, ensuring exceptional sealing performance on uneven or aging dock structures. Unlike traditional seals, which may struggle with misaligned or wavy surfaces, the Gina gasket adapts seamlessly to imperfections, providing reliable watertight performance.

**KEY INSIGHTS FROM THE ANALYSIS**

- Superior Load Handling capability: The Gina gasket not only matches but often surpasses traditional designs in load management, effectively accommodating a wide range of operating conditions.

- Surface Adaptability: Traditional seals are more sensitive to uneven surfaces, while the Gina gasket excels on wavy or imperfect countersurfaces, ensuring consistent sealing and reliability.

- Durable, Leak-Free Design: Where segmented traditional seals risk leakage, the Gina gasket's integral rubber construction provides a continuous, highly durable solution that minimizes the chance of leaks.

**ADVANCED DESIGN, SIMPLIFIED INSTALLATION**

Traditional seal systems with embedded steel plates and bolted-through holes can present significant challenges in dry dock applications. During installation, the vulcanization process often leads to misaligned holes in the steel plate, making alignment difficult and increasing the time required for proper fitting. Furthermore, this design creates concentrated stress points where the bolts meet the rubber and steel, often resulting in tearing of the rubber. Over time, this damage can expose the embedded steel to moisture, leading to internal corrosion and compromising the seal's integrity as well as long-term performance.

The Gina Gasket resolves these issues with a more advanced and reliable design. By eliminating embedded steel plates and holes in the rubber, it avoids the common pitfalls of traditional systems. Instead, external steel clamping strips are used, secured with bolts outside the seal area. This ensures an even distribution of compression across the gasket, enhanced load distribution, thereby maintaining consistent watertight performance and reducing the risk of leaks. Since no steel is embedded in the rubber, there's no chance of internal corrosion, significantly improving the seal's durability.

With its design, the shear load is spread across a larger number of bolts and incorporates retaining plates, reducing stress on individual bolts and lowering the likelihood of bolt failure over time. This is a critical advantage in demanding environments like dry docks, where seals typically must endure significant mechanical loads and water pressure. It also enables easier installation, reduced maintenance, and long-term reliability.

## SETTING THE INDUSTRY STANDARD

With an industry-leading track record in delivering solutions for critical infrastructure, Trelleborg combines innovative design, advanced materials, and decades of experience to solve complex challenges.

From planning and design to implementation, Trelleborg's sealing and damping solutions ensure uncompromising performance, protecting critical infrastructure globally. As the preferred partner, Trelleborg's products, including Gina gaskets, are trusted worldwide to deliver reliability, efficiency, and sustainability.

With over 100 years of expertise in sealing systems, Trelleborg has been a trusted global supplier of Gina gaskets for immersed traffic tunnels, cooling water pipelines, dry docks, and more. Our solutions have been implemented in critical projects across the globe since the early 1960s.

Manufactured from high-quality Natural Rubber (NR), our Gina Gaskets deliver superior flexibility, durability, and watertight performance that stands the test of time. To ensure our solutions perform to the highest standards, we engage with you throughout the entire project lifecycle—from product scoping and design to evaluation, testing, installation, and maintenance. Every seal design is tailored to meet the specific and critical requirements of your project, delivering exceptional performance and reliability.

For more information, contact our Trelleborg Marine and Infrastructure Representative in your region or check out our website.

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Trelleborg Marine and Infrastructure is a leading provider of premium solutions for critical marine, port, and built infrastructure applications. Its innovative polymer and smart technology solutions enhance operational efficiency, safety, and sustainability.

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