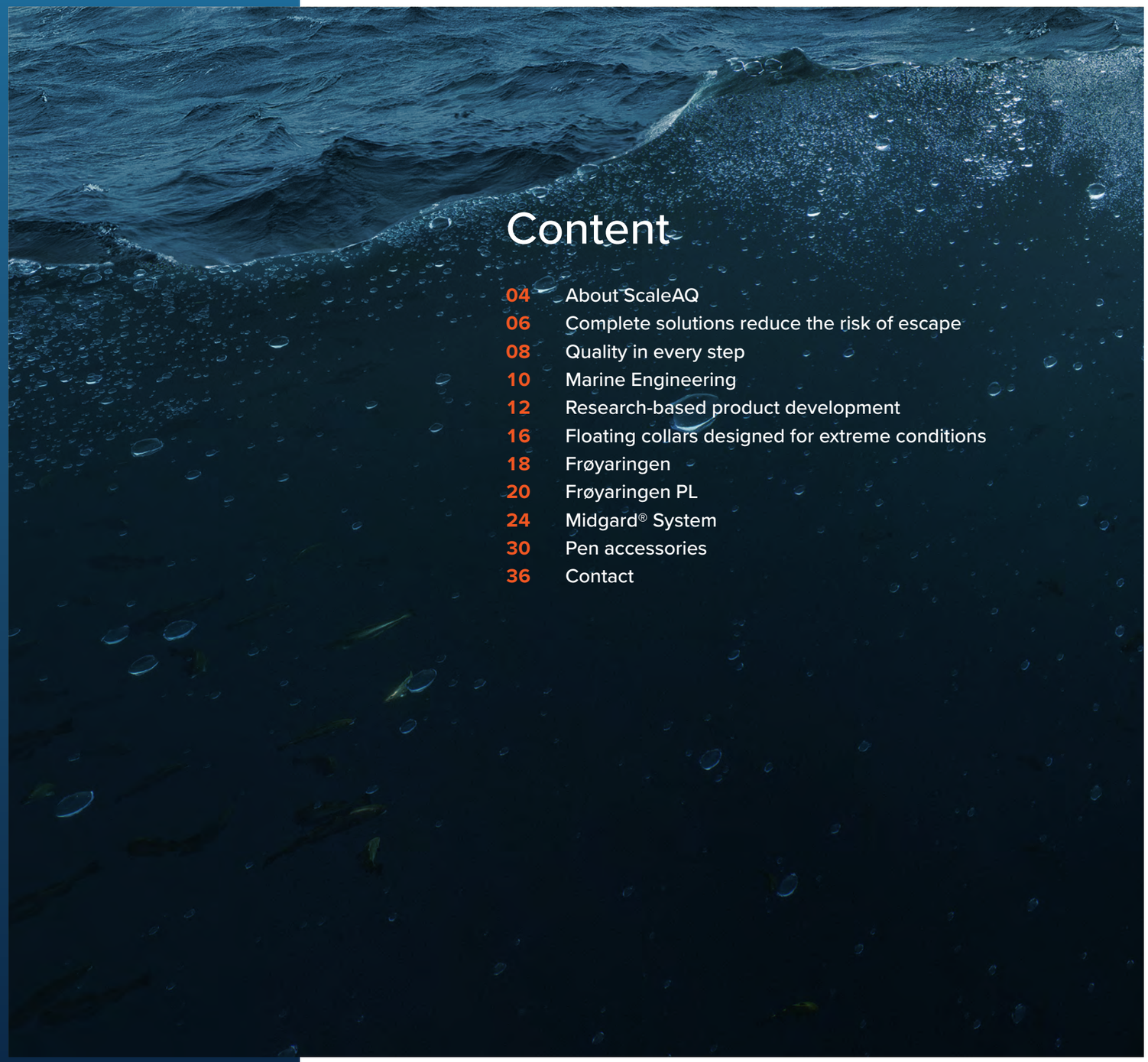
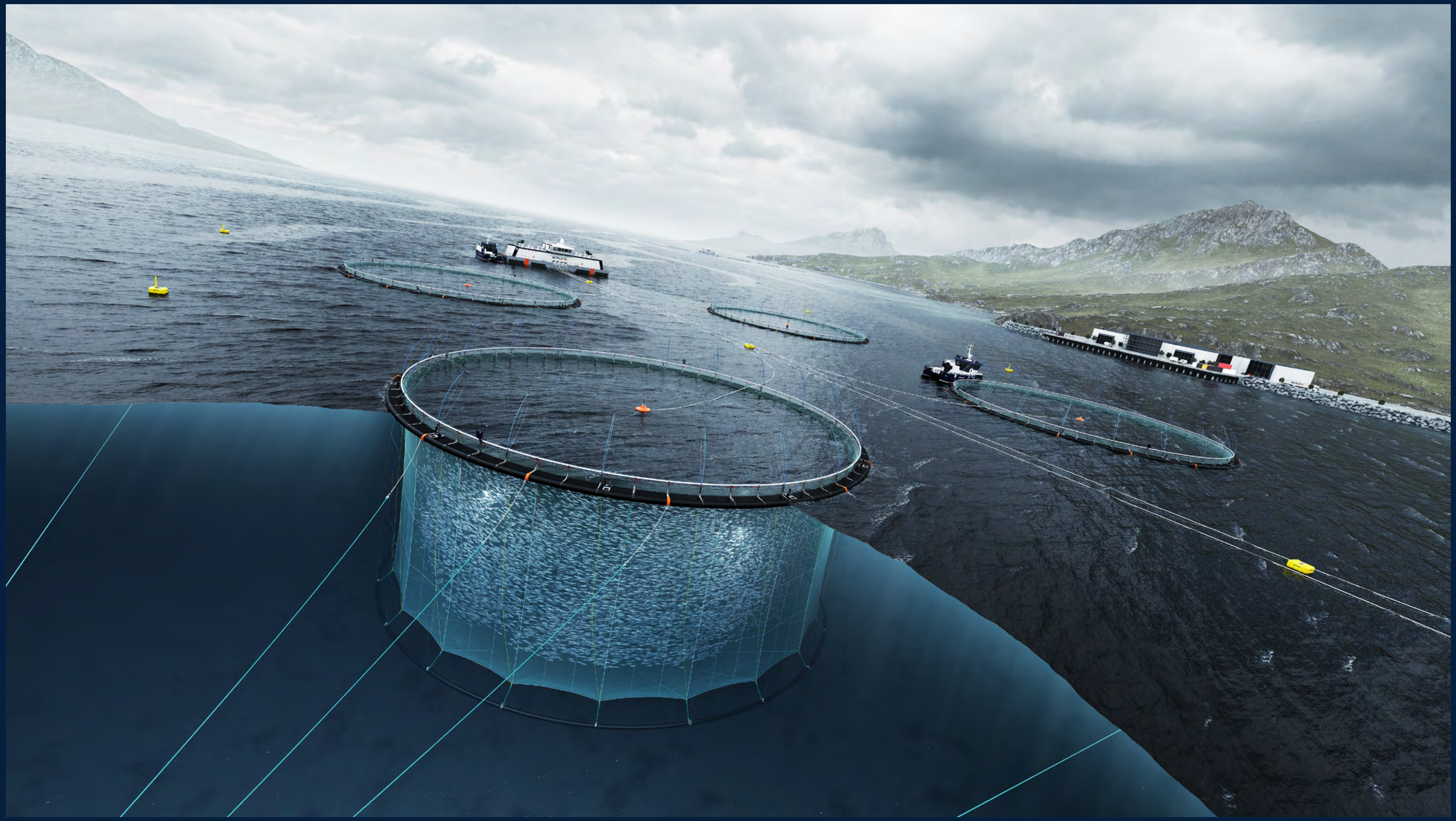
SCALE AQ

Pens



Content



ScaleAQ is a leading global technology provider that supplies and manufactures complete sites for aquaculture industry in more than 40 countries. The company has approximately 900 employees and offices in Norway, Scotland, Poland, Iceland, Chile, Canada, Tasmania and Vietnam. Through focus on sustainability and biology, ScaleAQ has taken a clear role in ensuring the development of technology on the terms of biology and the environment. We do this by producing and delivering technology, infrastructure and services in a solid, sustainable and innovative way.

Complete solutions reduce the risk of escape

ScaleAQ started supplying technical components to the aquaculture industry in the world's toughest and most demanding ocean areas more than 40 years ago. We currently supply complete locations; pens, nets, mooring systems, cameras, barges and software; as a package or individual elements.

The starting point of our recommendations is that everything is connected. The climate both and above and below the water at the given location sets the premises for the choice of solution and composition of elements in a secure facility.

Research and development takes place in close collaboration with customers and leading research institutions, and we have our own Marine Engineering department. This is how we ensure better products – while helping to solve the industry's challenges.

A thorough analysis of the conditions at the location is crucial for us to find the safest solution for your facility

Quality in every aspect

The forces of nature leave no room for error. At sea, you cannot allow yourself to compromise on basic safety requirements. That is why our work is always based on a pre-defined plan – a chronological process. These efforts are conducted by people with experience in and knowledge about aquaculture, climate and offshore structures and using modern analysis tools.

The process ensures a good result

Regardless of whether you are ordering a complete system with a pen, mooring, net, camera and barge, or whether you are just looking for one of the components, our recommendation will be well justified and made on an individual basis, and all factors will be assessed and taken into account.

Concept / Idea / Design
Based on site conditions and analysis.

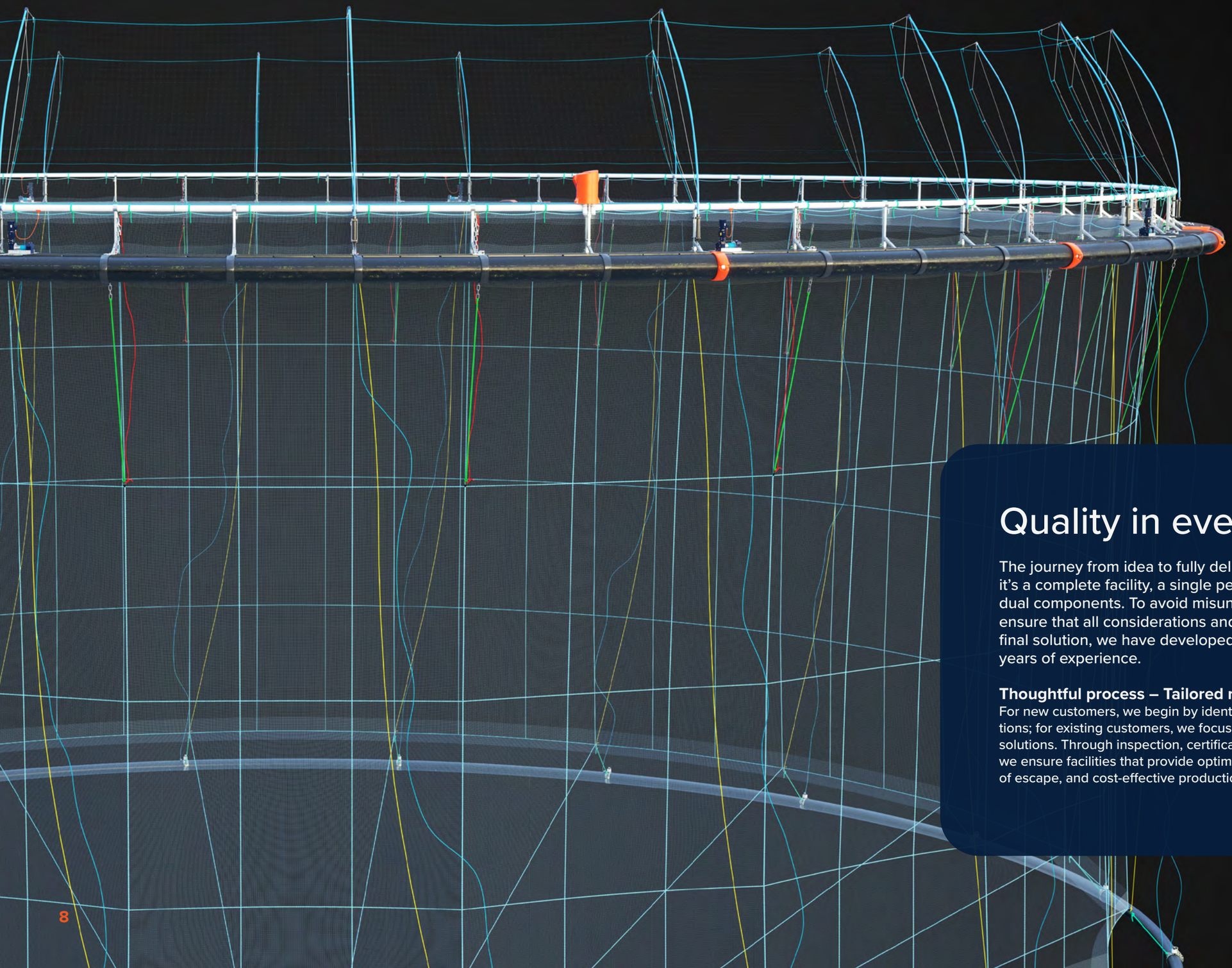
Extended inspection
Verification by external experts.

Certification
Accredited certification.

Function testing
Rigorous testing in collaboration with the customer.

Production / Quality assurance
Final material selection and assembly.

Final product
Quality assurance and delivery.



Quality in every step

The journey from idea to fully delivered product is long—whether it's a complete facility, a single pen, or the replacement of individual components. To avoid misunderstandings along the way and ensure that all considerations and requirements are included in the final solution, we have developed our own work process based on years of experience.

Thoughtful process – Tailored recommendations
For new customers, we begin by identifying the specific needs of their operations; for existing customers, we focus on further developing their current solutions. Through inspection, certification, testing, and quality assurance, we ensure facilities that provide optimal conditions for the fish, minimal risk of escape, and cost-effective production.

Marine Engineering

Over the years, ScaleAQ has built a strong Marine Engineering department, composed of people with extensive maritime experience and solid technical expertise.

Profitable and secure solutions for your site
Every site is unique, which means the optimal solution must also be tailored to that specific location. Providing a well-founded recommendation requires experienced professionals with deep knowledge of aquaculture and offshore structures—along with access to advanced analysis tools for mooring systems, feed barges, floating collars, nets, and specialized components.

The complete package – project management and influence

ScaleAQ takes responsibility for the entire process—from concept to completed facility. This means you can manage everything from a single source, from the moment you identify a potential site to the point when the facility is ready for smolt deployment.

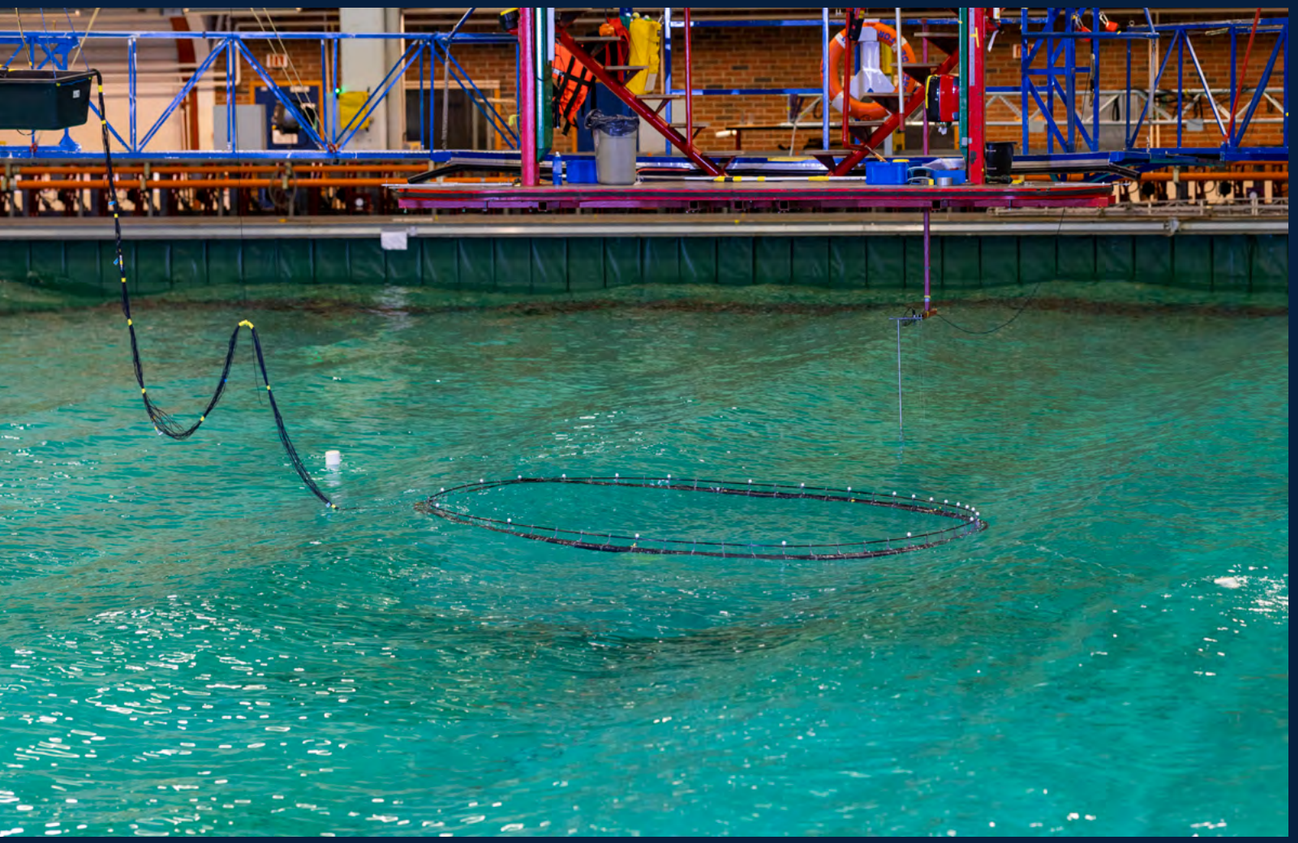
Analyses
The best solutions for moorings, nets, and floating collars are identified through advanced, site-specific analyses and assessments. We combine our expertise with your on-site experience, apply advanced site classification methods, and simulate extreme weather conditions at the location. Floating collars, barges, nets, and mooring systems are modeled using specialized software. By inputting environmental data, we calculate the forces that moorings and pens will be exposed to. This allows us to optimize the mooring components, ensuring compliance with the NS9415 standard. As an additional safety measure, we also conduct a final assessment of the installed mooring system. We analyze your input data and conduct a full analysis before delivering a final report.

Testing
At ScaleAQ, we invest significant time and resources in testing the equipment we deliver—not just in theory, but in real-world conditions. For example, we use powerful winches to apply maximum force to floating collars, ensuring the load on both the structure and its individual components is as realistic as possible. This testing is often carried out in close collaboration with the customer.

ScaleAQ delivers

- Required applications to authorities
- Project planning (analyses)
- Construction
- Delivery
- Installation of complete facilities
- Required certifications and approvals

In addition, you can enter into agreements for ongoing support throughout the operational phase and the entire lifetime of the facility.

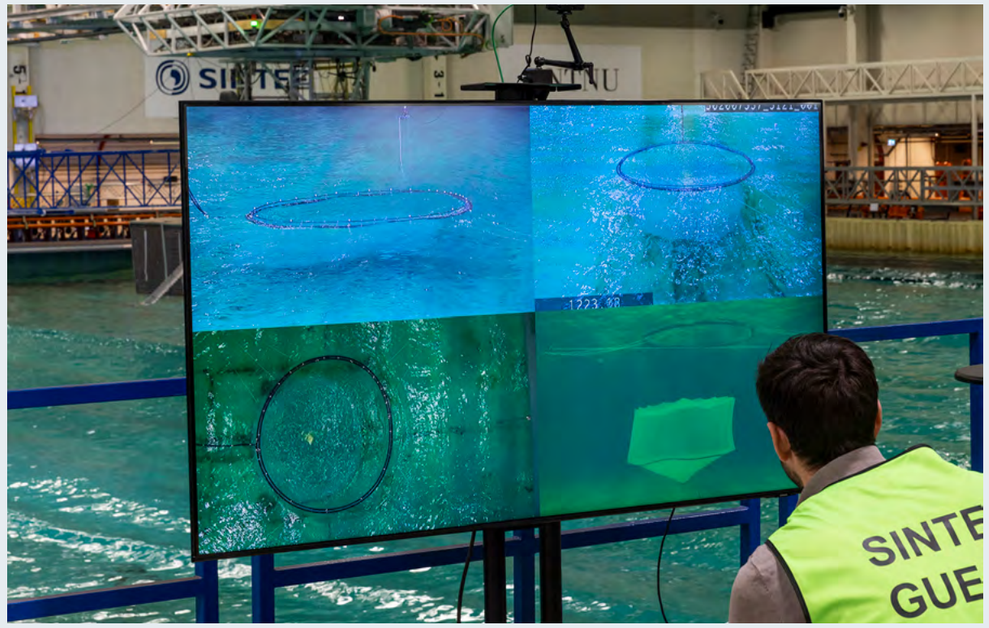


Research-based product development

ScaleAQ's goal aligns with that of the Norwegian aquaculture industry: escape-proof facilities that support sustainable development. That's why product development and innovation are an integral part of the company's overall strategy. In addition to an increasing focus on advanced analysis and its in-house engineering department, ScaleAQ invests heavily in targeted collaboration with SINTEF Marintek in Trondheim and several of our customers. One result of this is the ScaleAQ Midgard® System—the world's first escape-proof pen system.

Marintek/Sintef Ocean Laboratory
Marintek has been, and continues to be, a key partner for ScaleAQ. In particular, we have benefited greatly from scale model testing of current and wave combinations in Marintek's Ocean Laboratory in Trondheim. Here, we have conducted model testing of the Midgard® System, simulating extreme waves, wind, and currents.

Rigorous function testing
Model experiments and theoretical calculations help guide our product development and provide a solid foundation for evaluating the loads equipment will be exposed to. We then test whether theory matches reality—applying extreme stress to floating collars and subjecting both complete structures and individual components to tough functional testing.



We secure the future of aquaculture through testing at Marintek

At ScaleAQ, our goal is to drive sustainable growth in aquaculture. We achieve this through innovative solutions that enhance fish welfare, improve biological performance, and ensure sustainable and profitable operations for our customers.

The key to our success lies in model testing at Marintek (SINTEF Ocean) in Trondheim—a critical process for meeting the industry's high standards. With over 40 years of experience, we have built extensive expertise in everything from analysis to production and research. Since 2012, we have placed particular focus on improving our pen structures through rigorous testing in collaboration with SINTEF Ocean. This partnership reflects our commitment to developing a more sustainable and profitable future for the aquaculture industry.

The model tests have provided essential insight into several factors required to develop an escape-proof pen system. First, we now have precise data on the load patterns affecting the pen. This is crucial for predicting behavior and load responses in these flexible, deformation-sensitive structures. Furthermore, the model tests confirmed that our configuration is optimal in terms of structural interaction, with only minor adjustments needed based on the results. Given the risk factors associated with submerged operations, the information we now hold is invaluable—for both ScaleAQ and our customers—as the industry prepares to take significant steps forward.

Risk management and structural integrity control have become more important than ever with the introduction of NYTEK23 and NS9415:2021. ScaleAQ has led the development of the technical chapters in the Standard Group. As fish are increasingly raised deeper below the surface, the interplay between technology and biology becomes more critical than ever.

Model testing

Date	Scale	Information	Background
2012 – January	1:16	**FR500-157** Standard net, 280 mm sinker tube	FHF, escapes
2012 – November	1:16	**FR500-157** Standard net, 280 / 355 / 400 mm sinker tube Midgard® net, 400 mm sinker tube Spaghetti net	Further development, Midgard®
2015 – April	1:20	**FR630-200** Midgard® net, 400 mm sinker tube 40 m tapered net Predator system	Midgard® development Predator development
2015 – November	1:20	**FR630-200** Subsea net	Concept for development licenses
2017 – August	1:16	**FR500-157** Tapered net 55m	Tapered net, with Lerøy
2019 – August	1:20	**FR500-157** Midgard® with skirt	Midgard® with skirt, with Salmar
2021 – August	1:20	**FR630-200** Midgard®, 500 mm sinker tube ScaleAQ exposed barge Dead fish system	Qualification exposed sites
2023 – February	1:16	**FR500-157** Subsea	Qualification subsea
2023 – February	1:20	**FR630-200** Midgard® with wellboat	Pen + wellboat
2024 – June	1:20	**FR500-157** SirkAQ	Pen, focus on bending stresses
2025 – February	1:20	**CAS** Closed pen 160 m	Concept evaluation
2025 – May	1:20	**FR630-200** Subsea	Exposed
2025 – June	1:20	**FR500-157** SirkAQ	Pen, focus on bending stresses

Floating collars designed for extreme conditions

For more than 40 years, ScaleAQ has been a leading developer and manufacturer of floating collars for the aquaculture industry. Our success is built on the combination of flexible plastic and durable steel – with a strong focus on the transition between the mooring system and the floating collar to ensure optimal load distribution. At the core of our solutions is a unique, integrated, and load-bearing bracing system.

Through continuous development, we have established precise quality control routines for our floating collars. As a result of our focus on research and innovation, we provide safe, efficient, and escape-proof solutions to the aquaculture industry. Our floating collars are available with steel clamps, plastic clamps, or a hybrid configuration to offer maximum flexibility. They remain the preferred choice for farmers seeking reliable, long-lasting pen systems.

Floating collars

Floating collar models	Frøyaringen	Frøyaringen PL
Certified NYTEK23 and NS 9415:2021	Yes	Yes
Brace / Spacer System	Forked brace system w/tension chain	Forked brace system w/tension chain
Clamp Type	Frøyaringen steel clamps	Frøyaringen steel clamps + Injection-moulded HDPE plastic clamps
Mooring Attachment	Mooring via steel clamp (shackle)	Mooring via steel clamp (shackle)
Pen Sizes, Circumference [m]	60-314	90-200
Pen Sizes, Pipe Diameter [mm]	315/400/450/500/560/630	450/500/560
Environmental Class (Hs and Vc)	Exposed / Very High	High
Available with Sinker Tube	Yes	Yes
Shared Clamp for Mooring and Sinker Tube	Yes	Yes, for steel clamps
Buoyancy Backup	Polystyrene	Polystyrene
Subsea	Yes	Yes
Vortex	Yes	No
Midgard	Yes	Yes
10-Year Warranty on Brace System	Yes*	Yes*

*Valid if forked brace is used

Adapted to local conditions

Our floating collars can be tailored to suit any location – from sheltered sites to highly exposed areas. Based on your specifications, we work with you to identify the floating collar best suited to your operations and site conditions. We offer over 100 certified floating collar models in a wide range of relevant dimensions.

Quality

Through years of product development, we have established methods for detailed inspection of our floating collars. By tracing the force transmission throughout the collar, we ensure that all critical load-bearing components are thoroughly inspected and that all safety requirements are met.

Certified at every stage

As one of very few equipment suppliers, ScaleAQ is certified to deliver floating collars, nets, and mooring equipment. Our certifications meet the requirements of NS9415. We exclusively use certified plastic welders with extensive experience in assembly – no matter where in the world we operate. Our experienced team is ready to help you find the right solution for your specific needs.

Steel clamps

Frøyaringen

Frøyaringen is our proven floating collar, engineered to withstand extreme weather and the heavy loads associated with modern aquaculture. Its construction is based on a robust and flexible support system in which the bracing system plays a key role. It ensures optimal load distribution, secondary protection against high stresses, and secures the buoyancy of the entire pen.

Key Benefits of Frøyaringen:

- **Exceptional durability:** The fully welded bracing system and rugged steel clamps provide excellent resistance to operational and environmental loads – including the added weight of today's equipment-heavy farming practices.
- **Enhanced safety:** The continuous steel construction with secondary safeguards minimizes the risk of structural failure or fish escape, while protecting the flotation pipes – the core components of the pen.
- **Flexibility and movement:** The float pipes move freely within the clamps, both in torsion and longitudinally, reducing wear and extending lifespan.
- **Certified quality:** Developed in accordance with NS9415 and thoroughly tested in harsh conditions to ensure safe, year-round operations.
- **Adaptable to various sites:** Frøyaringen is available in multiple sizes and configurations, and is compatible with a wide range of pen systems and farming practices – from sheltered fjords to fully exposed locations.

A Strong and Flexible Support System

At the heart of Frøyaringen is its load-bearing bracing system. The bracing sections distribute forces evenly along the circumference of the pen, while the fully welded steel clamps transfer sea loads and protect the float pipes from localized wear – without restricting movement. All anchoring loads are absorbed by the bracing system. When properly tensioned, this prevents both overloading and slack, ensuring maximum buoyancy and a stable, circular pen ready for any conditions. We also offer a warranty on our forked bracing system.

Strength and Stability – Steel Clamps and Bracing System

The fully welded steel clamps provide extra structural strength and protection against point loads. Designed to handle modern accessories and evolving farming practices, they ensure even load distribution on the float pipes – even in high-current areas with large waves and strong winds.

Certified at Every Stage

For nearly 50 years, ScaleAQ has delivered reliable solutions to the aquaculture industry in some of the world's toughest marine environments. We have extensive experience in the production of floating collars.

Specifications

STEEL CLAMPS

Dimensions	630	560	500	450	400	315
Circumference [m]	140 - 314m	120 - 200m	120 - 200m	90 - 180m	75 - 160m	60 - 120m
Number of float pipes	2	2	2	2	2	2
SDR float pipes	13.6 / 17.0 / 17.6	13.6 / 17.0	13.6 / 17.6	13.6 / 17.6	13.6 / 17.6	13.6 / 17.6
Handrail	Ø160mm	Ø140	Ø140mm	Ø140mm	Ø140mm	Ø125mm
Distance c/c float pipes	1200mm	1100mm	850mm	800mm	740mm	655mm
Walkway width	1200mm	1140mm	850mm	800mm	740mm	655mm
Mooring attachment capacity (ULS/ALS)	30t / 35t	35t / 40t	25t / 30t	18t / 20t	18t / 20t	12t / 15t
Clamp post dimensions	100x80mm	80x60mm	80x60mm	80x60mm	80x60mm	80x40mm
Max Hs/Vc*	Hs=6.0m, Vc=2.0m/s	Hs=6.0, Vc=1.5m/s	Hs=5.0m, Vc=1.5m/s	Hs=3m, Vc=1.0m/s	Hs=3m, Vc=1.0m/s	Hs=3m, Vc=1.0m/s
Net buoyancy w/o sinker tube (160 m circ.)	60 tonnes	46 tonnes	39 tonnes	35 tonnes	21 tonnes	8 tonn (70m circ.)

*Indicative environmental class. Can be adapted to specific site and will depend on site configuration.

Steel and plastic clamps

Frøyaringen PL

Frøyaringen PL is a versatile floating collar developed for fish farmers seeking the combined benefits of both plastic and steel clamps in their pen systems. This unique hybrid construction offers enhanced flexibility while maintaining robust structural integrity.

Key Benefits of Frøyaringen PL:

- **Balanced strength and flexibility:** The combination of steel and plastic clamps ensures an ideal balance between durability and flexibility, even in demanding marine environments.
- **Reinforced safety:** Steel clamps help prevent ovalization of the float pipes, while the plastic clamps reduce friction.
- **Tailored for various sites:** Suitable for both sheltered waters and exposed aquaculture locations.
- **Certified quality:** Designed and tested according to NS9415 standards, ensuring reliable performance in all conditions.
- **Buoyancy guarantee:** The float pipes are filled with polystyrene, ensuring that the collar maintains buoyancy even in the event of damage or puncture.

A Flexible and Gentle Hybrid – Plastic and Steel Combined

Frøyaringen PL is designed to perform across a wide range of site conditions, from protected fjords to more exposed aquaculture areas. Plastic clamps provide gentle handling of the float pipes and minimize friction, while the steel clamps offer added stability and evenly distribute loads throughout the structure. This smart combination of flexible plastic and strong steel ensures maximum safety and operational efficiency.

Certified at Every Stage

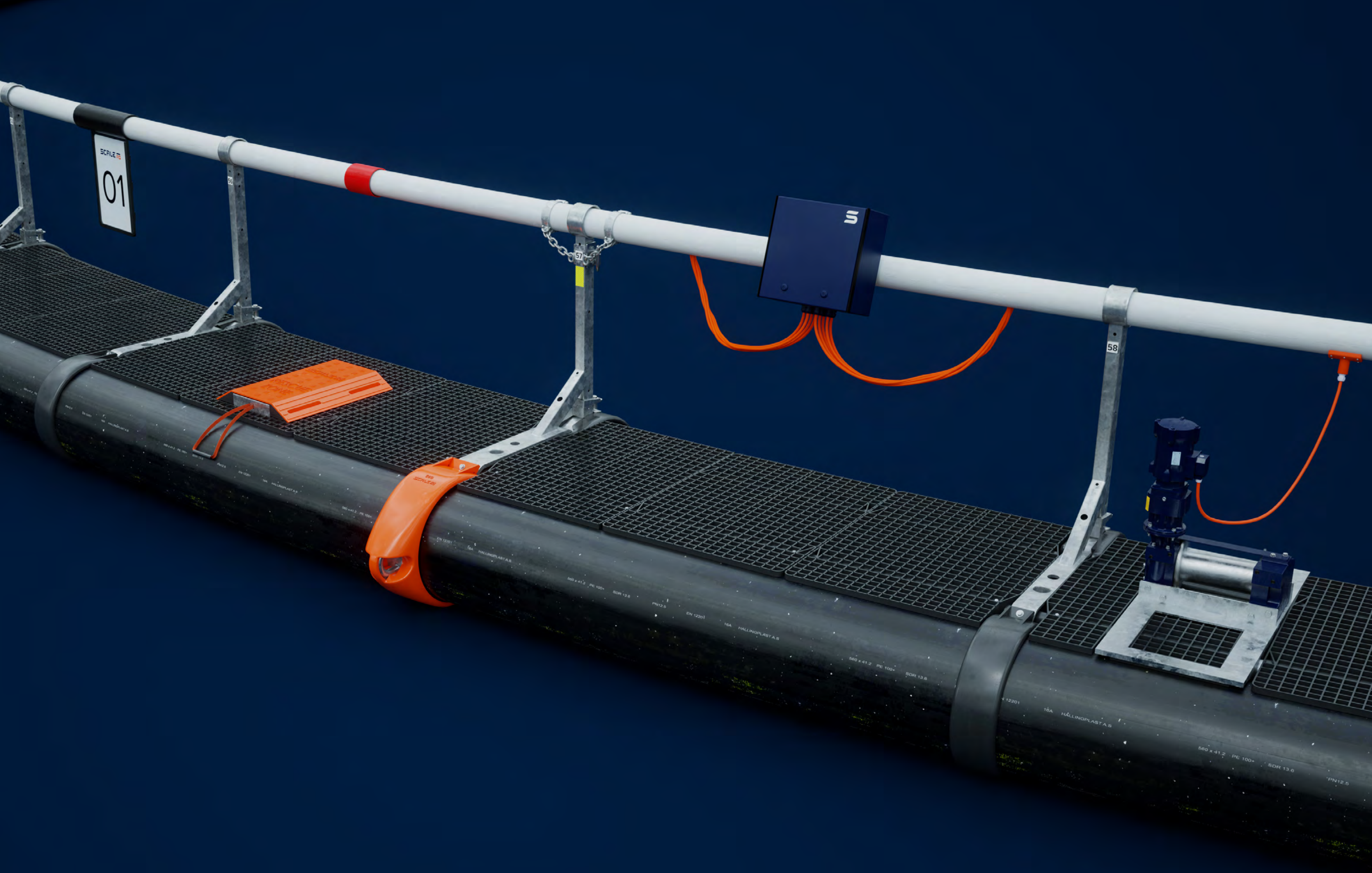
Our certifications meet all the requirements set by NS9415. We exclusively use certified plastic welders with extensive experience in pen assembly – no matter where in the world the work takes place. Our experienced team is ready to help you find the solution that best fits your operational needs.

Specifications

STEEL AND PLASTIC CLAMPS

Dimensions	560	500	450
Circumference [m]	120 - 200m	120 - 200m	90 - 180m
Number of float pipes	2	2	2
SDR float pipes	13.6 / 17.0	13.6 / 17.6	13.6 / 17.6
Handrail	Ø160	Ø140mm	Ø140mm
Distance c/c float pipes	1100mm	850mm	800mm
Walkway width	1140mm	850mm	800mm
Mooring attachment capacity (ULS/ALS)	35t / 40t	25t / 30t	18t / 20t
Clamp post dimensions	Ø180	Ø180	Ø160
Max Hs/Vc*	Hs=6.0, Vc=1.5m/s	Hs=5.0m, Vc=1.5m/s	Hs=3m, Vc=1.0m/s
Net buoyancy w/o sinker tube (160 m circ.)	46 tonnes	39 tonnes	35 tonnes

*Indicative environmental class. Can be adapted to specific site and will depend on site configuration.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560 x 41.2 PE 100+ SDR 13.6 PN12.5 EN 12201 16A HALLINGPLAST A.S

Midgard® System

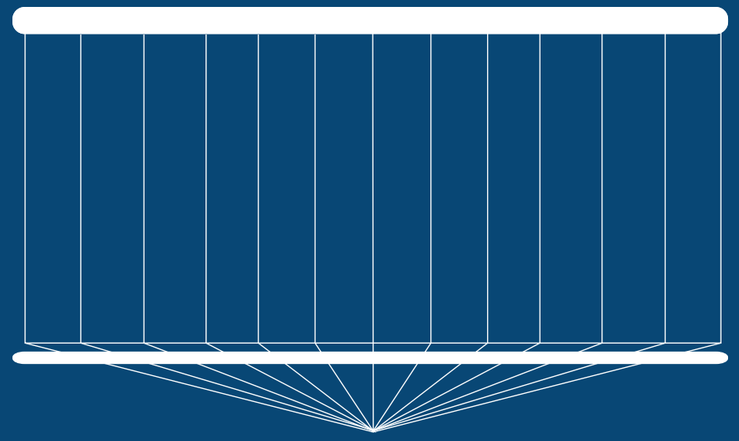
The Midgard net-pen system is built with a focus on optimal interplay between the main components of the pen, net and sinker tube. The system is the result of many years of experience and product development in collaboration with leading salmon farmers around the world. The main focus of development has been net-pen environment and safety.

Developed, tested and operated in collaboration with the largest salmon farmers in the world over many years, the Midgard system is continuously evolving as net-pens are moved into rougher and more challenging waters.

Many of the most demanding locations currently in use would not have been feasible without the assurance of reliability and habitable volumes for fish provided by the Midgard system. The combination of a pen, net and sinker tube adapted to each other and designed as one unit provides flexibility in the toughest conditions. This system is and will continue to be a success for ScaleAQ and our customers.

The Midgard system provides a stable and predictable net volume even under strong current conditions. The cylindrical shape allows the fish to swim deeper in the net-pen without increasing the number of kilograms of fish per cubic meter of water, which is a major advantage for rearing fish below the louse belt.

Several competitors have tried to copy our solution, without understanding that the extensive and cost-intensive work of analyses, tests, customer collaboration and associated documentation is crucial for the system to be delivered, installed and operated as the safest fish farming solution in open net-pens at sea.



Net and sinker tube

The ScaleAQ Midgard® System is an integrated net deployment system where the sinker tube is suspended directly from net baseline rope. It provides a taut net that makes cleaning much easier. This results in better conditions and improved fish welfare.

Winch

The winch evenly raises and lowers the sinker tube in one operation without requiring multiple workboats with cranes.

Attachment

The lift rope hangs loosely and independently from the rest of the system during normal operation. It eliminates the risk of chafing and damage to the net.

The net wall holds loads from the sinker tube (light blue rope), and the sinker tube suspension (dark blue rope) is kept slack during operation and cannot damage the net.

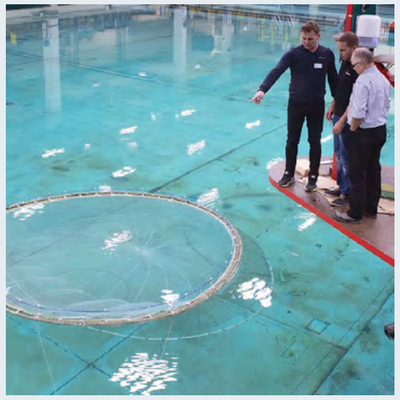
How does the Midgard® System work?

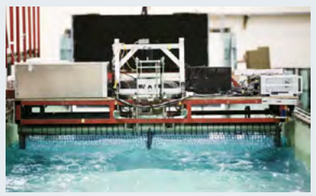
The Midgard system features a tailor-made net system that is dimensioned for our pen and sinker tube solution. With regard to ropes and nets, we focus on minimizing oversized dimensions in order to ensure that contact between the pen and the deployment system is kept to a minimum.

The net is dimensioned and designed to carry the total weight of the sinker tube through the support ropes. This is a significant load, which is often between 11-17 tons, depending on the circumference of the net-pen. The Midgard sinker tube has a much more rigid design than traditional sinker tubes, with a diameter between 400mm or 500mm, depending on the circumference of the net-pen.

This contributes to optimal deployment of the net and a predictable and high volume for the fish to swim in, even when there are high waves and strong sea currents.

In addition to ensuring a good net-pen environment, which is a fundamental aspect that must always be prioritized, this design results in a greatly reduced risk of wear between the net and the deployment system. This is highlighted in the illustration on the left.





Through several years of extensive analysis work, system testing in the Marintek Laboratory in Trondheim and full-scale solutions, in addition to the full operation of the system since 2013, our claim is that the Midgard system has been and continues to be the most well-documented net-pen system for open fish production, which safeguards the net-pen environment in the best possible way and has the lowest risk of escape on the market.

Why use the Midgard® System?

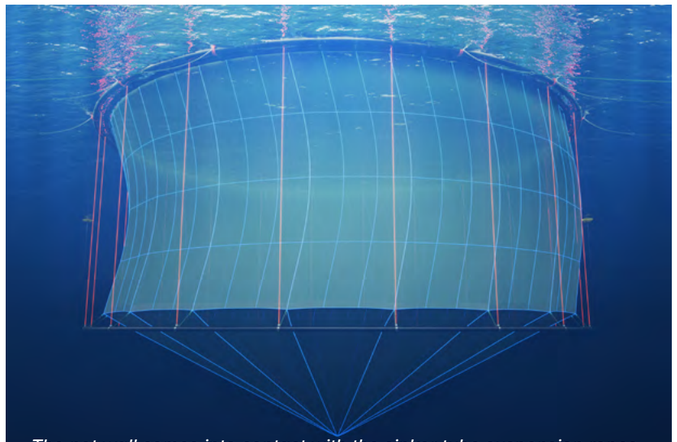
There have been and continue to be many different net solutions for farming salmon on the market. These have been successfully used for many years, but recently, the challenges facing traditional solutions regarding greater exposure have become increasingly evident.

Our experience is that traditional net solutions have usually been the result of a focus on low investment costs and easy/efficient handling for personnel and boats on and around the net-pen during operations such as delousing and slaughter.

With the climate change we are experiencing in the form of more storms and rough weather throughout the year, as well as new locations being further out in more exposed waters where waves are high and ocean currents strong, the inadequacy of traditional net solutions becomes very clear regarding the interplay between the pens and the sinker tube, as well as unpredictable and reduced net volume (net-pen environment/fish welfare) during strong currents and high waves.

The Midgard system continues to use a sinker tube in order to achieve maximum deployment of the net that ensures predictable and high volumes for the fish swimming in the net-pen. This also enables fish farming at sites located in shallow waters.

Other net solutions where sinker tubes are used have problems with contact between the net and the deployment system, either in the form of direct contact with the sinker tube suspension or the sinker tube itself. This becomes especially apparent when large volumes of water flow through the net-pen, as shown in the illustration below. Here, the net makes contact with the sinker tube suspension ropes that run between the pen and the sinker tube, where the load from the sinker tube is connected to the pen.



The net wall comes into contact with the sinker tube suspension ropes and the risk of wear/damage to the net wall increases significantly.

We have chosen to standardize things with ScaleAQ's Midgard system, and it is something we haven't regretted. The net-pen system is very stable, the fish receive the necessary volume, and we can sleep safely at night. Through our many years of collaboration, we have seen that ScaleAQ is passionate about their area of expertise, and that they go the extra mile to keep production at the highest level.

Ken Sverre Høstland
Operations Manager, Bjørøya

Pen accessories

Our range of accessories and extra equipment for pens ensure that our already hardy solutions are even more secure and efficient.

Over the years, we have developed a selection of products that streamline operations by the edge of the pen and improve the safety of all personnel, fish and equipment. Extra equipment completes your aquaculture facility and ensures it is safe.

Please get in touch if you have an idea or a need that is not covered.

Full overview:


Sinker tube system


Bird net with fiberglass rod


Midgard® winch system


Large boat mooring


Electrical cabinet module


Feed pipes


Feed pipe holders


Rescue ladder


Net quick coupling


Fixed tamp holder


Mooring lug insert

Pen sign holder


Universal bracket and accessories


Net hook

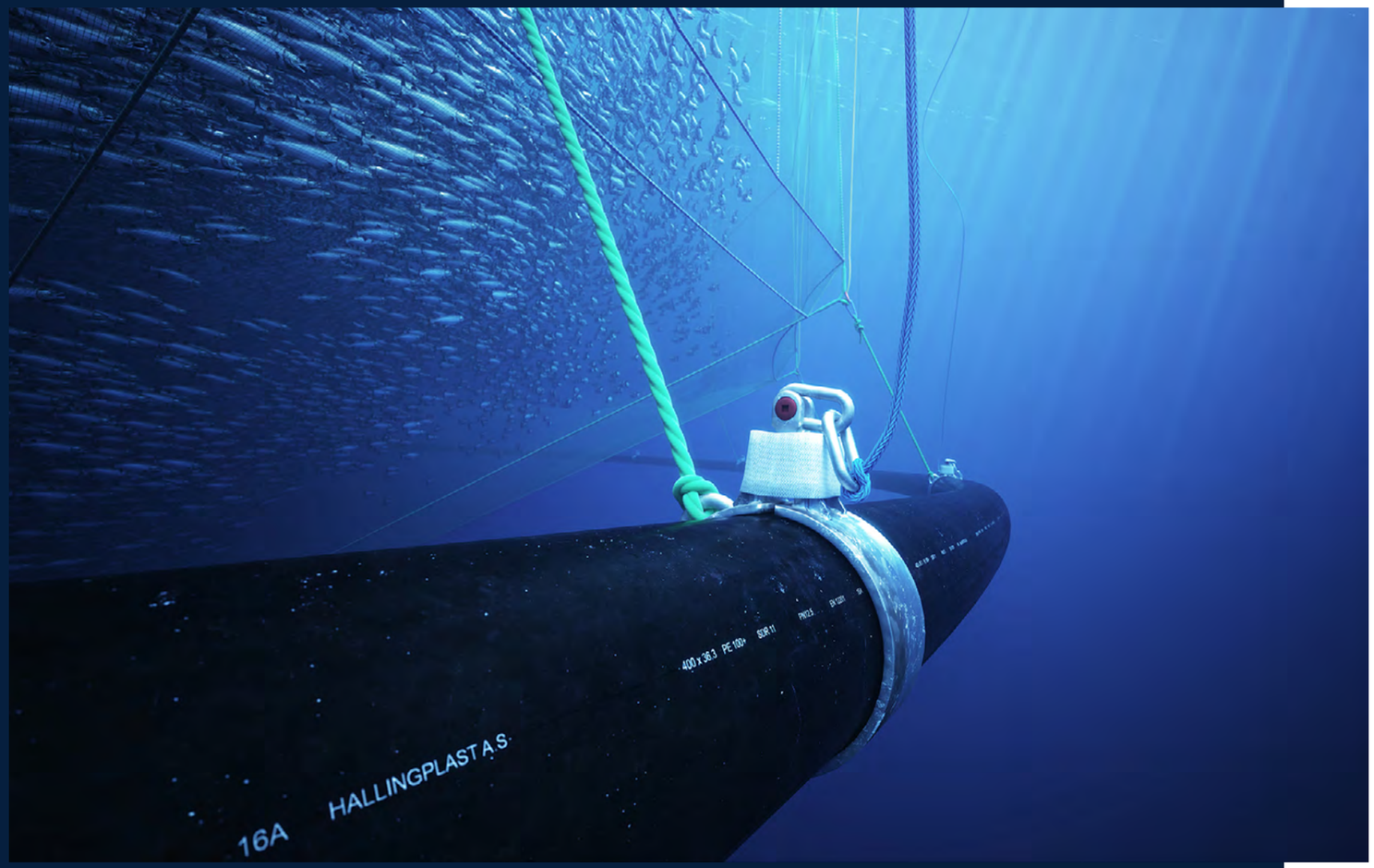

HDPE net hook protector

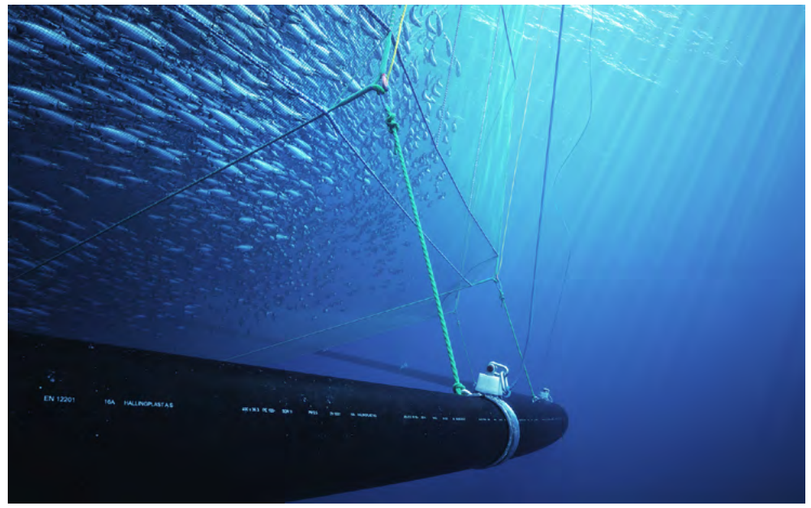

Mooring bracket fender

Read more about all our accessories on scaleaq.com

Sinker Tube System

- Increased safety: Reduces point load, provides full control during net lining, and minimizes the risk of propeller damage.
- Environmental benefits and animal welfare: Open meshes ensure good water flow, reduce fouling, and minimize stress and injuries.
- Easier cleaning: Simple washing, rinsing, and drying without significant shape changes.





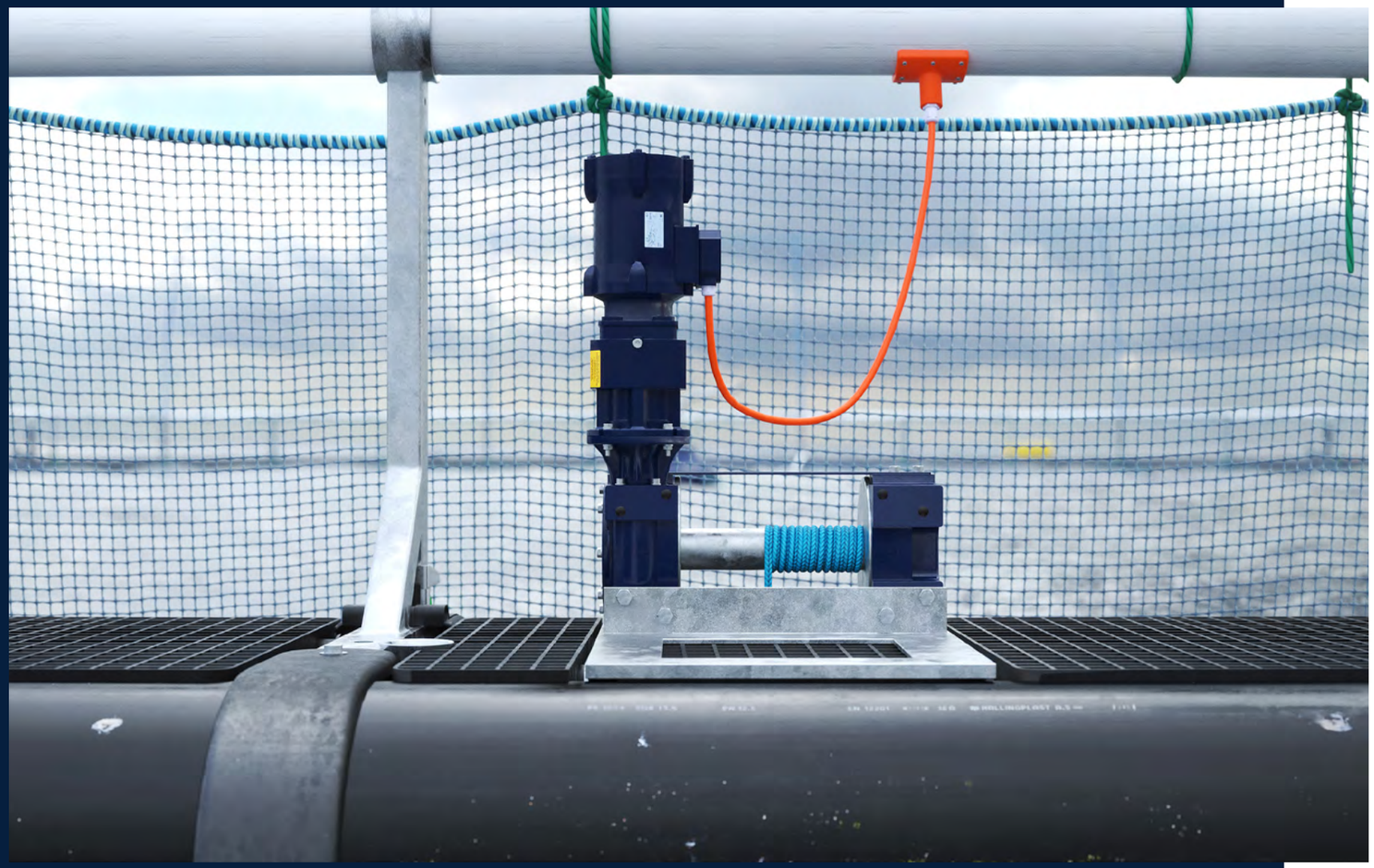
A sinker tube helps prevent the shape and thus the net volume from changing in locations subject to many storms. The sinker tube is designed to make the handling of the net easier.

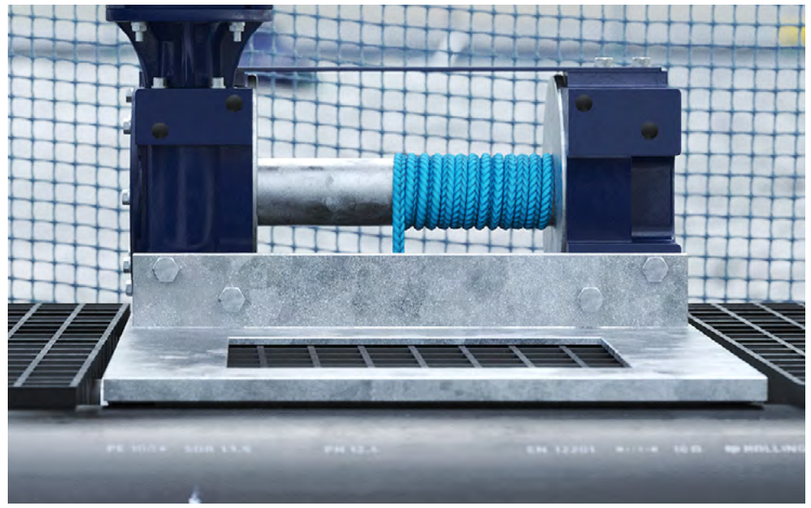
The sinker tube is lifted in “phases” using a crane on a boat, or winches mounted on the floating collar. This allows you to remove fouling while the fish is almost undisturbed in the lower part. Delicing can also be performed safely and controlled because you have good control over the volume of the net.

The weight of the sinker tube varies from 15-140 kg / m. The local conditions determine what weight the sinker tube should have.

Midgard®
Winch System

- Our winch system streamlines operations relating to the raising and lowering of the bottom ring.
- Focus more on HSE and fish welfare.
- Our winch system reduces the use of cranes on board boats and thereby the risk of injury to personnel.





ScaleAQ's winch system is equipped with aquaneema ropes that raise and lower the bottom ring while ensuring even lift under fully controlled conditions. The use of integrated winches instead of cranes is labor-saving and reduces the risk of accidents. The net is subjected to a minimal load, personnel are exposed to less risk, and the likelihood of making mistakes is reduced. This ensures safer, easier and quicker handling of the net, and work can also be carried out in poor weather conditions. When using a crane boat, the net may be subjected to skewed loads and the risk of accidents is increased. The winch makes the entire operation easier, quicker and safer.

Item Number	Item Name
504000	ScaleAQ Midgard® Winch 1.1
505737	Winch rope 12mm, for 15m net, for smetting. With storage loop
505738	Winch rope 12mm, for 20m net, for smetting. With storage loop
505482	Loop for winch rope, for intermediate storage of bottom ring and winch
504140	Handrail lock 160mm, with mounting hardware
505528	Handrail 140mm, with mounting hardware
502187	Control cabinet Winch V2 (230V eller 400V)
502852	Adapter Type 2
502605	Adapter Type 1
505666	Rope guides for winch bracket

Contact your advisor or our customer service center for information about additional options or any other questions regarding the products.

Questions?

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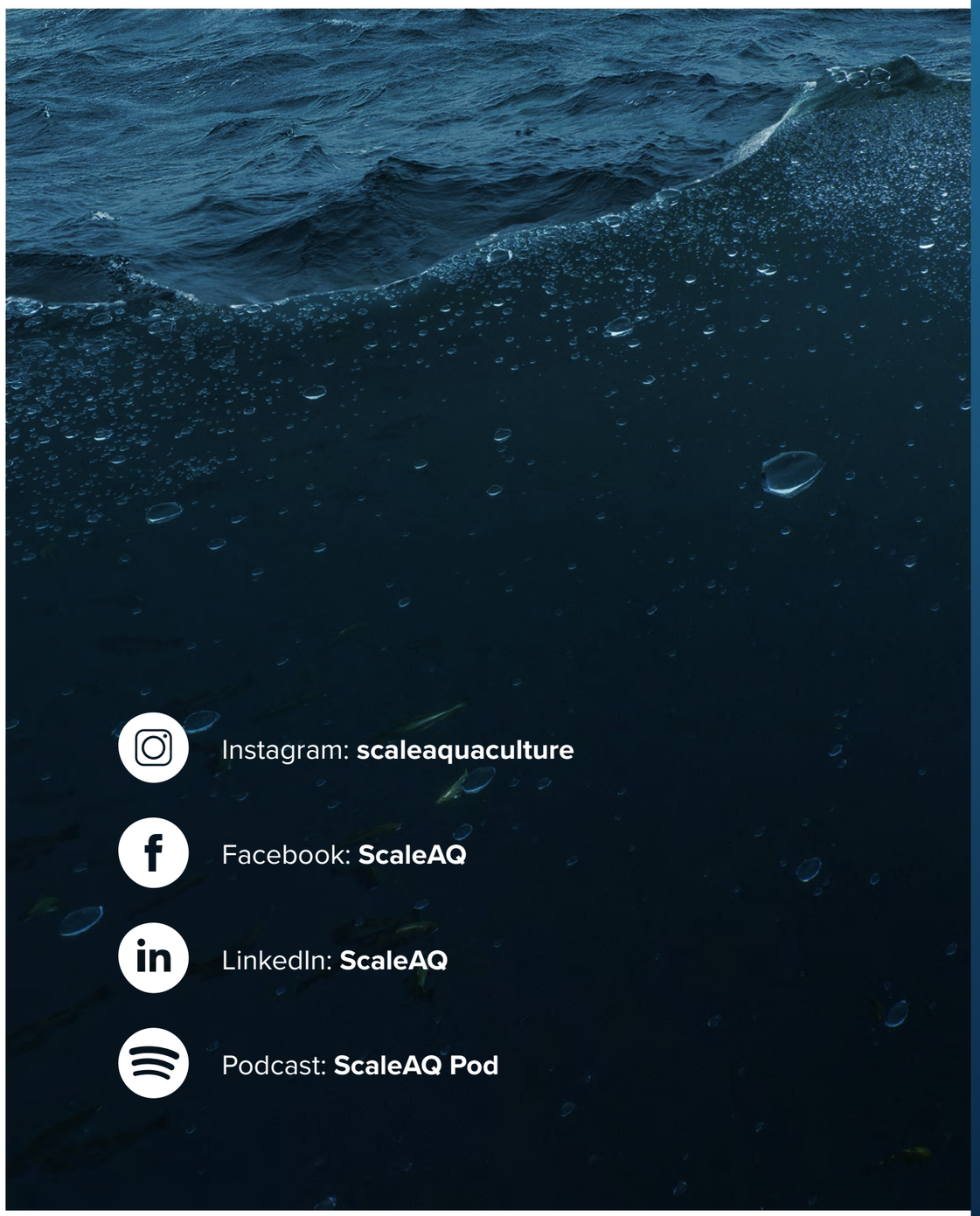

Instagram: **scaleaquaculture**

Facebook: **ScaleAQ**

LinkedIn: **ScaleAQ**

Podcast: **ScaleAQ Pod**

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