



Dredging



DAMEN



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Dredging shapes the world



The Dutch have lived below sea level for centuries. We respect the sea, whether we fight against her waves or sail across her oceans. For both we need ships: purpose-built, thoroughly researched, proven over time and outfitted with the latest innovations. Damen builds those ships.

When it comes to dredging, Damen delivers the complete range of vessels and services needed for the job. Our dismountable Cutter Suction Dredgers have extremely short delivery times and, like our Trailing Suction Hopper Dredgers, are based on the latest technology, research and design.

As Damen is a total solution provider, we deliver also all the auxiliary equipment, such as booster stations, pipelines and instrumentation to optimise the dredging process.

In addition, we build dedicated dredging support vessels, such as Multi Cats and Shoalbusters, Stan Tugs and Survey Vessels.

To ensure the continuous and smooth operation of our clients' dredging systems, Damen Services offers repair, maintenance and training facilities from Service Hubs around the world.

DAMEN'S BACKBONE

In-depth knowledge

All Damen dredgers benefit from thorough R&D and, with research taking place on successive generations of standard dredgers, continual product innovation is guaranteed.

A dedicated research team investigates dredge processes in Damen dredgers. This results in a knowledge centre which ensures that

the latest developments in dredging technology are applied in standard dredging products. Continuous improvements in the equipment makes the standard dredgers efficient, environmentally friendly and safe.

Based on the research of the dredging process and understanding the requirements results in innovative solutions for challenging demands.



SUSTAINABILITY

Through the entire lifecycle

The maritime industry recognises the increasing focus on environmental sustainability. With operations close to shore and in major urbanised areas, the environmental impact that the dredger has needs to be minimised.

Damen has developed, tested and delivered a range of electrically driven dredge pumps, as well as electrically powered dredgers. These electric

drives effectively reduce emissions and noise levels and minimise environmental risks.

Moreover, Damen fits out all its dredge pumps with a mechanical shaft seal, which does not require additional greasing. Damen continues to work towards reducing the environmental impact of dredging.

STANDARDISATION

Key to success

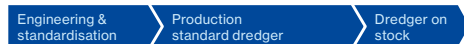
Building standard dredgers in series gives our clients fast access to proven, reliable technology. Our standard designs can be tailored to individual client needs via modular construction, ensuring you of the dredger you need, whatever challenge you are facing. Standard designs can always be equipped with various options to suit specific tasks.



Benefits of standardisation

- Fast response to customer requests
- Competitive pricing
- Short delivery times due to stock hulls
- Reliable, tested and proven technology
- Continuous product development
- Interchangeability of ships, crew, spares
- Lower maintenance costs
- Guaranteed performance
- Benchmark for the industry

Damen standard



Standard dredgers built on stock

Client request



BUILDING ON STOCK

Proven design, short-term delivery

Keeping our standardised dredgers on stock enables us to deliver them to you in record time. From initial order,

customisation and trials, the dredger can be delivered to you in a matter of a few short months or even weeks.

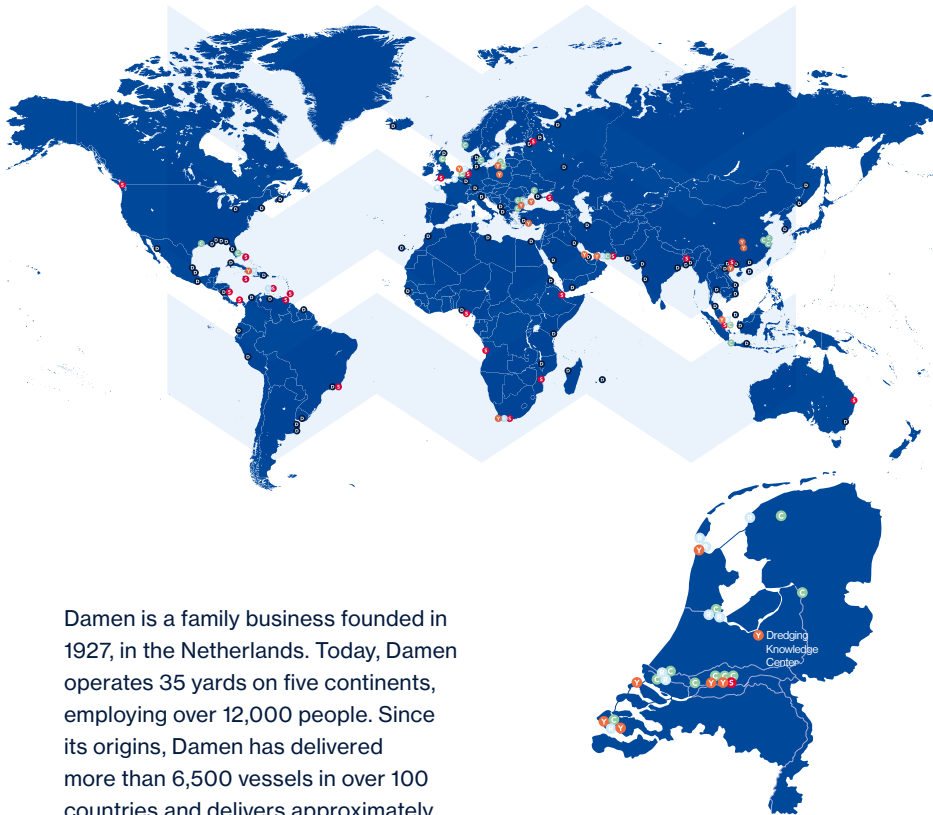


Conventional shipbuilding



GLOBAL PRESENCE

Founded in the Netherlands



Damen is a family business founded in 1927, in the Netherlands. Today, Damen operates 35 yards on five continents, employing over 12,000 people. Since its origins, Damen has delivered more than 6,500 vessels in over 100 countries and delivers approximately 175 newbuild vessels annually.

Based on its unique, standardised ship-design concept Damen is able to guarantee consistent quality.

- Y Damen newbuild yard
- R Damen Shiprepair & Conversion yard
- D Damen Technical Cooperation yard
- S Damen service hub
- C Damen Company



TRADING

Buying and selling

Damen Trading is specialised in the sale, purchase and chartering of all types of used vessels. Over the years, Damen Trading has acquired a lot of

knowledge in brokerage, ensuring you of a complete service before, during and after vessel acquisition.

CUSTOMER FINANCE

Financing and leasing

Damen Customer Finance offers a selection of arrangements, applicable to any Damen product for clients in both the private and public sectors.

As a major client of the Dutch Export Credit Agency Atradius, Damen has gained a wealth of experience in the arrangement of export loans.



DAMEN TECHNICAL COOPERATION

Think global, act local



Damen can assist customers in building Damen vessels locally via Damen Technical Cooperation (DTC). This highly flexible option results in a valuable transfer of technology and enables owners to enjoy Damen quality, combined with the convenience of local production. Since DTC was established, Damen has built over

1,500 vessels locally in over 60 countries.

Damen can deliver from the licence and vessel design to a full material package and if necessary turnkey solutions based on client requirements. DTC's scope covers the entire Damen portfolio.



Design & Licences

Basic and/or detailed designs provided
License/royalty for multiple series
Proven design



Material packages

Renowned suppliers
Materials on stock
Advanced logistics



Building assistance

Assistance on-site
Enhance shipyard skills
Transfer of knowledge/technology

YOUR PARTNER FOR SHAPING YOUR DREDGING JOB





MISSION EQUIPMENT

For all dredging operations



Maintenance dredging

- › Maintaining harbours and ports at depth
- › Keeping navigation channels open
- › Beach nourishment for coastal protection
- › Keeping inlets at hydropower dams clean



Capital Dredging

- › Creating a new harbour
- › Reclaiming land from the sea
- › Expansion of existing harbours



Aggregate Dredging

- › Offshore mining of sand and gravel
- › Onshore mining of sand and gravel
- › Deep sea mining



Environmental Dredging

- › Removing polluted sediment in harbours
- › Cleaning lakes and shores at industrial sites





WHATEVER THE JOB

Fit for purpose

Whatever dredging job you are doing, there is a Damen dredger and the necessary equipment to tackle it - all designed with harsh operating environments in mind. The long-term presence of Damen in the various segments of the dredging industry has resulted in a wide range of standard dredgers and auxiliary vessels which can be customised effortlessly.

Your operations can be enhanced using customised dredgers

- › Trailing Suction Hopper Dredgers can be equipped with customised hopper discharge equipment;
- › Cutter Suction Dredgers can be delivered or retrofitted with options such as anchor booms or spud carriage pontoons, boosting their operational efficiency;
- › DOP Dredgers are designed as modular constructions of limited unit size and weight and can be transported to remote areas smoothly;
- › Marine Aggregate Dredgers are designed to fit your operational profile keeping loading time and sailing speed first, ensuring timely tidal harbour access.



IN ALL DETAILS

Top quality

Top quality means a robust, fit for purpose design. Top quality is mastering every detail, without losing track of the overall concept. Damen makes all its dredgers and

dredging components ready for heavy-duty operations.

Our design fundamentals are reliability and durability – keys to making every dredging job a success.

ALWAYS TOP OF MIND

Crew safety and comfort

Safety is an important driver in all that we do. The dredging business is no exception. Besides safety, crew comfort is a key focus. This is why our dredgers are spacious, with comfortable control cabins and bridges as well as ergonomic layout of workspaces with clear lines of sight.



The dredging portfolio

1 Cutter Suction Dredgers

- › Sand mining
- › Capital dredging
- › River maintenance

2 Trailing Suction Hopper Dredgers

- › Harbour maintenance
- › Capital dredging
- › Deep sea mining
- › Beach nourishment

3 DOP dredgers

- › Hydro power dam maintenance
- › Environmental clean ups
- › Sand mining

4 DOP dredge pumps

- › Barge unloading
- › Sand mining
- › Environmental clean-up
- › Creating building pits

5 WID dredging systems

- › Mass flow sediment removal

6 Multi Cats

- › Anchor-handling
- › Floating pipe line-handling
- › Cutter teeth replacement

7 Booster Stations

- › Increase discharge distances





Maintenance dredging

Maintenance dredging ensures optimal access to existing navigation channels and continued operations of hydropower dams. The aim is to combat the effects of rivers, currents and tides which would otherwise silt up with the constant ebb and flow of tides and currents.

The solution lies in using lightly manoeuvrable Trailing Suction Hopper Dredgers or stationary Cutter Suction Dredgers to keep things flowing. For the deep inlets of hydropower dams DOP dredgers are the perfect tool.









Capital dredging

Capital dredging involves reclaiming new stretches of land from the water. This includes creation and expansion of harbours.

Capital dredging is necessary as seaborne trade continues to grow and in order to accommodate patterns of urban development.



Aggregate dredging

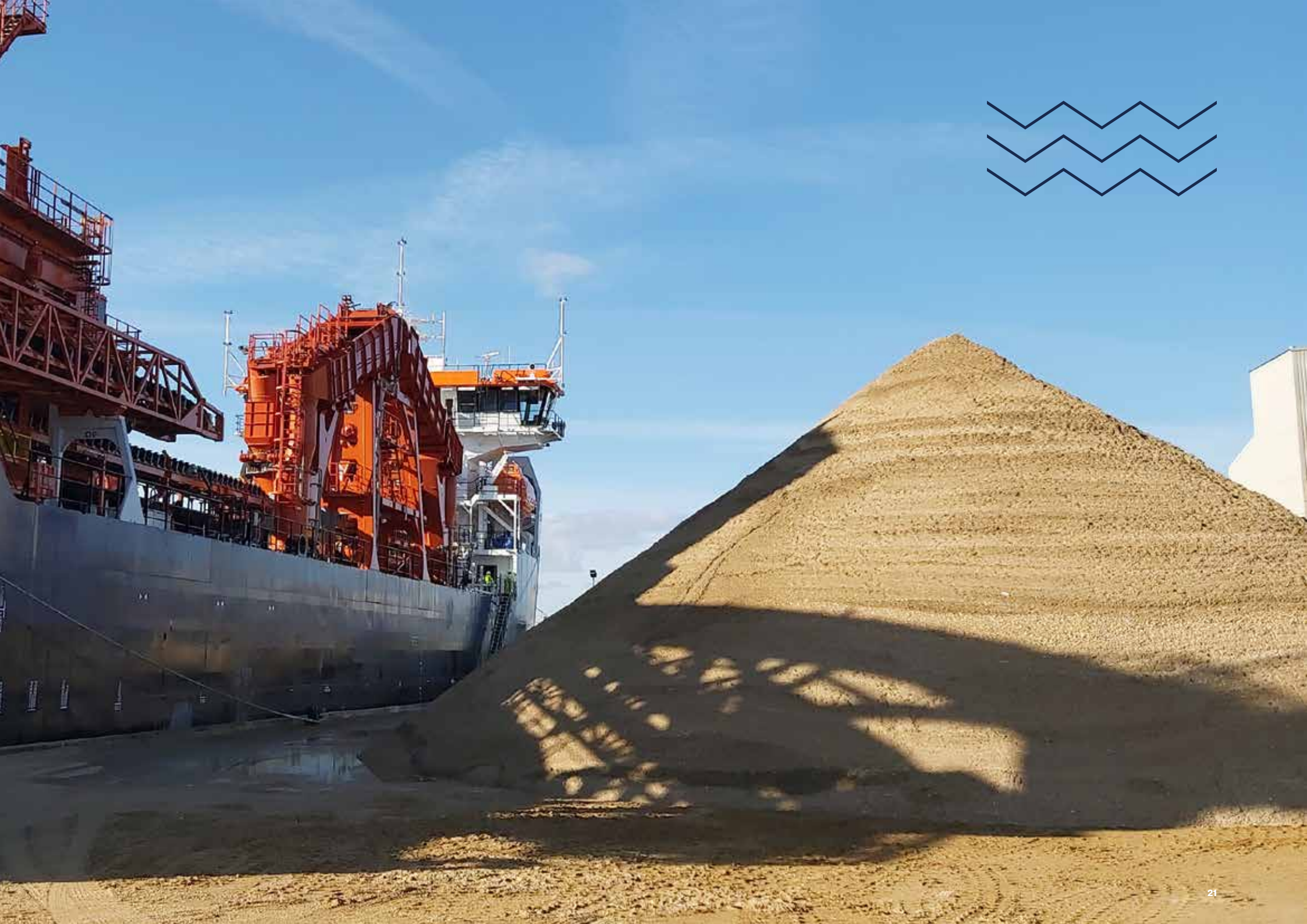
A growing world economy and population requires a constant supply of sand and gravel. This continuous demand for construction materials requires a constant feed of aggregates.

The aggregate dredging industry operates inland mining pits as well as offshore activity.

Efficient offshore operations take into account the full operational profile, including sailing distances, loading times and restrictions, in order to ensure efficiency in transshipment.

For onshore mining, Damen supplies various dredgers, catering for diverse dredging depths and material hardness.







Environmental dredging

Dredging has a role in helping to safeguard the environment. For example, cleaning up contaminated sediment from waterways. These contaminated sediments can be removed to be cleaned or stored. Key features during environmental

clean-up include achieving the highest possible mixture concentration and minimal turbidity. Precision dredging can be achieved using the right tools and instrumentation for the job, resulting in a safe environment for the crew as well as for local residents.





ARMED TO THE TEETH CSD series

The Damen standard CSD range consists of five types of dredger. These stationary vessels include an ergonomically designed operating cabin, a main pontoon housing the diesel engines and dredge pump, plus side pontoons, the cutter ladder and the spud poles. This modular design

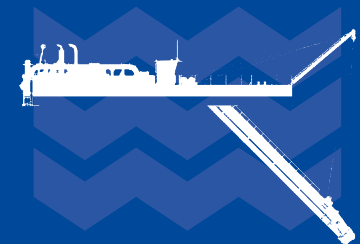
ensures practical transport. Moreover, the compact size and weight result in practical dismantling and reassembly on the jobsite.

The CSDs are well powered – the power balance is such that all functions of the dredgers can be

operated simultaneously. The modern computer controlled Caterpillar diesels engines have been selected on low fuel consumption and low emission values. They are connected to a closed fresh water cooling system using box or plate coolers.

Available options

- › Anchor booms
- › Spud carriage pontoon
- › Day accommodation
- › Deck crane
- › Navigation package
- › Communication package
- › Wedge piece
- › Swivel hose
- › Heavy duty cutter
- › Increased dredging depth
- › Dredge pump production measurement
- › Position visualisation
- › Class certificate



CSD range

Depth	up to 25 m
Dredge pipe diameter	from 250 - 650 mm
Mixture capacity	up to 7,000 m ³ /h
Installed power	up to 3,938 kW
Total weight	up to 660 t





MAINTAINING THE RIGHT DEPTH TSHD series

Using extensive in-house and in-depth dredging expertise, our engineers have designed the Trailing Suction Hopper Dredgers (TSHD) from the user's perspective; from 1,000 m³ to 5,000 m³. Efficient in operation and practical in maintenance, they are the most advanced and sustainable TSHDs

we have ever built. Standard, but customizable for your specific operation. It is everything you need to carry out your own dredging activities. This includes all the benefits of operating your own vessel: flexibility and efficiency, twinned with the right

balance between OPEX and CAPEX. We offer a Port & Maintenance THSD range, to keep your port and maintenance dredging tasks up to date. And a Multi Purpose THSD range, to provide you with the power and hopper capacity to take on a wide range of dredging operations.

Available options

- › Self-discharging installation
- › Degassing system
- › Instrumentation packages
- › Non-radioactive production measurement
- › Additional accommodation space (Multi Purpose)
- › Additional booster station (Multi Purpose)



TSHD Port & Maintenance range

Depth	up to 25 m
Dredge pipe diameter	up to 700 mm
Hopper volume	900 - 3,000 m ³



TSHD Multi Purpose range

Depth	up to 30 m
Dredge pipe diameter	up to 900 mm
Hopper volume	2,000 - 5,600 m ³



VERSATILITY IS KEY

DOP submersible dredge pumps

Damen offers a complete range of heavy-duty submersible dredge pumps. These compact DOP pumps are directly powered by either a hydraulic or an electric motor, mounted in a protective casing. A highly efficient,

wear-resistant dredge pump with a large spherical passage is at the heart of the DOP pump. It has excellent suction properties and reaches extremely high mixture densities. The DOP pump has been designed for

highly abrasive dredging environments. It is user friendly and easy to maintain. With over 450 units sold the DOP submersible dredge pump has become the standard in the dredging industry.

Available options

- › Various suction heads
- › Electrically and hydraulically powered DOPs
- › Diesel hydraulic power packs
- › Diesel & electrically driven jet water packs
- › Mixture hoses with and without floats
- › Discharge piping on land and afloat
- › Hydraulic hoses including quick couplings
- › Dredge pump production measurement



DOP pump range

Depth	unlimited
Dredge pipe diameter	from 180 - 450 mm
Mixture capacity	up to 4,000 m³/h
Installed power	up to 400 kW
Total weight	up to 7.35 t





DEEP DREDGING

DOP dredgers

The DOP Dredgers come in different sizes, and can each be delivered in four different configurations, depending on the dredging depth as well as on the sand mining method required. Key to the DOP Dredger is its modular

design, enabling easy transport, local construction of the pontoons and practical later additions following an increased dredging depth.

The DOP dredger is of a simple design which is the result of using standard

dredging components, smartly made for quick reassembly even in remote locations. The submersed dredge pump maximises the dredge production.

Available options

- › Additional pontoons and ladder extension for increasing dredging depth
- › Wire suspended DOP with sand mining head
- › Rigid hinged cutter ladder for cutter unit
- › Dredge pump production measurement
- › Position visualisation
- › Navigation package
- › Mixture hoses with and without floats
- › Discharge piping on land and afloat
- › Hydraulic hoses including quick couplings



DOP dredger range

Depth	up to 50 m
Discharge pipe diameter	from 150 - 350 mm
Mixture capacity	up to 2,400 m³/h
Cutter power	up to 47 kW
Length	15 - 45 m





Available options

- › Bottom doors
- › Spud poles for quick mooring
- › Instrumentation packages
- › Self-emptying system with inboard discharge pump and bow coupling
- › Different type of dry unloader machine



MAD range

Depth	up to 60 m
Trailing pipe	up to 750 mm
Hopper volume	3,500 - 8,000 m ³

EFFICIENT MARINE AGGREGATE DREDGING

MAD series

Damen has developed a dedicated range of Marine Aggregate Dredgers (MAD) for the offshore mining of sand and gravel. Using our knowledge and experience designing vessels for the offshore industry, we have paid

particular attention to the optimization of the hull design, which has resulted in the aggregate dredgers having excellent seakeeping performance. Our in-house designed trailing pipe, underwater dredge pump and

screening towers ensure efficient dredging operations. The vessel is also able to autonomously unload the dry cargo to shore.





Available options

- › Remote control
- › Separate double walled fuel tank
- › Priming unit
- › Hydraulically operated rubber ring gate valves
- › Pontoon-based floating booster



Booster Station range

Pipe Diameter	250 - 750 mm
Production	1,000 - 10,000 m³/h
Installed power	up to 2,240 kW
Unit weight	up to 70 t

BRIDGING THE GAP

Booster Stations

All booster stations are fitted out with an electric drive or a radiator-cooled diesel engine, which have a constant power over a large speed range. The direct driven dredge pump is identical to those in CSDs. Booster stations are

the ideal tool to bridge large discharge distances to a spoil field, either as single station or with multiple boosters working in series.

The design of the booster station frame is based on container sizes,

enabling practical hoisting and transport. The dredge pump drive is mounted in a casing; the dredge pump is directly accessed for easy maintenance.





Available options

- › Trailing suction pipes
- › Submersed and in board dredge pumps
- › DynaCover outer pump casing
- › Degassing systems
- › Dredge valves
- › Drag heads
- › Turning glands
- › Cardan and single hinges
- › Jet water monitors
- › Overflows
- › Dredge monitoring systems

Trailing pipe range

Pipe diameter	350 - 900 mm
Pumps / valves	low/medium/high pressure

BUILD YOUR OWN DREDGER

Trailing suction pipe packages

Complete trailing pipe packages are shipped around the globe for newbuilds or retrofits of trailing suction hopper dredgers. The dredging mission equipment is designed for a specific vessel, making use of a range

of standard components. At the heart of each dredger is a Damen in-house designed dredge pump, cast in wear resistant materials, fitted out with a maintenance friendly mechanical seal. The dredging

package may include any hopper loading or discharging component including dredge valves and overflows, all according to the hopper dredgers specific operational profile.





Available options

- › Dredge pump performance
- › Dredge pump production measurement
- › TSHD monitoring DDM
- › Position visualisation
- › Remote control
- › Online connectivity
- › Survey systems
- › CCTV systems
- › Control & automation

EFFICIENCY IS KEY

Dredging instrumentation

In building a more sustainability world, efficient dredging is the key in any dredging job. Yet due to the nature of the job, the operator is basically blinded during the operation, making the best efficiency point hard to obtain. Dredging instrumentation makes the invisible visible for the operator, lending a pair of eyes on

the functionality of the dredging equipment, the efficiency of the dredge pump, or preventing under- and over-dredging. Valuable process parameters are shown on screen enabling the operator to optimise the production. With online connectivity, real life data can be analysed from any other place in the world. Damen

can deliver dredging instrumentation, spanning everything from a simple dredge pump monitoring vacuum transmitter, to a comprehensive, state-of-the-art package combining data from all aspects of the operation. All dredging instrumentation is available for newbuilds as well as retrofits.





WID range

Depth	up to 20.0 m*
Width	up to 14.5 m*
Total flow	up to 10,500 m ³ /h*
Footprint	up to 28 m ² *

*Depend on vessel and dredging conditions

COMPACT PACKAGE TURNS YOUR VESSEL INTO A DREDGER

Water Injection Dredgers

A Water Injection Dredger (WID) aims to remove sediment by injecting it with a large quantity of pressurised water. The bottom sediment, being silt or fine sand, will lift and be removed by

current, gradient or tidal movement. The WID gear can be integrated on a new vessel, or it can be retrofitted to an existing one. The design of the various components is such that it is

delivered as a modular dismountable feature. As a result, flexibility is added to the primary tasks of the vessel. The plug and play system can be installed easily without docking.





Available options

- › Deck crane
- › Nautical and communication equipment
- › Survey equipment
- › Fresh water tanks
- › Dredge plough
- › WID system

Multi Cat range

Length	10 - 37 m
Beam	4,5 - 13 m
Bollard pull	2 - 43 t
Speed	7 - 10 knots
Draught max	1.3 – 2.6 m

EFFICIENT DREDGE ASSISTANT

Multi Cats

The Multi Cat is a reliable workboat fit for a variety of tasks in the dredging environment. Its large, flush deck space is optimised to accommodate gear such as dredge anchors and

discharge piping. It is fitted out with a crane for tasks such as delivering supplies and spares to dredgers. From the wheelhouse the crew has 360° visibility. All jobs can be handled with

minimal crew. This shallow draught workhorse can do its job effortlessly in harbours and shallow waters. The Multi Cat is strongly constructed and is fitted out with heavy fendering.





RORO deep sea mining tool

Deep sea mining up to -200 m has been made possible using the RoRo modular system. This innovative concept includes a continuous loading process which boosts the efficiency. The new development is an answer to a growing demand for raw materials while sand winning locations are located farther from shore at increased dredging depths.

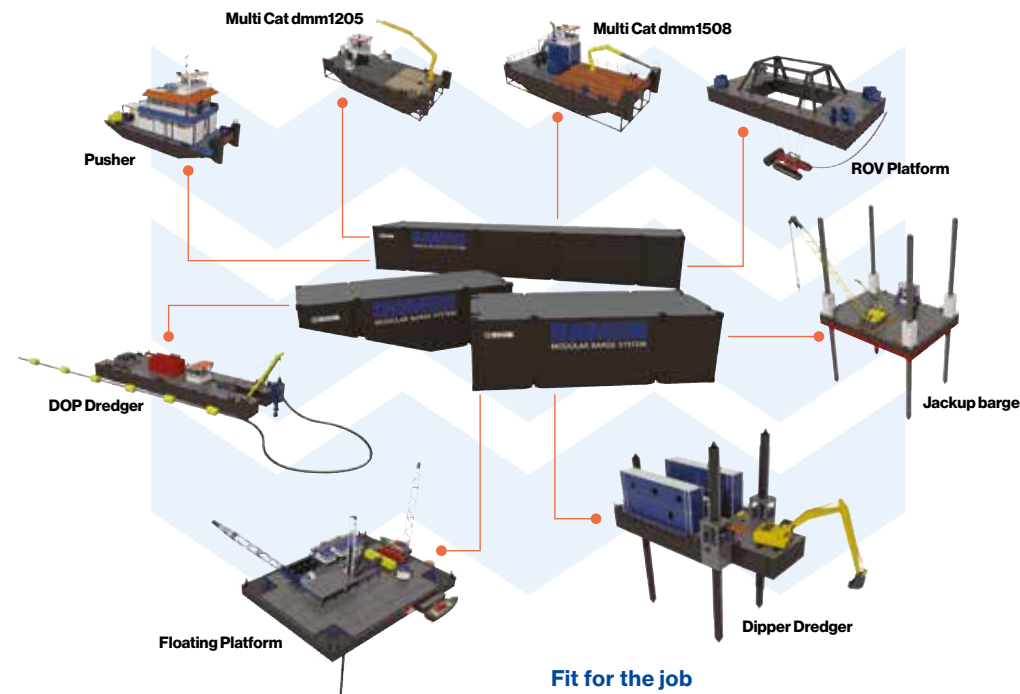
Two vital aspects of the RoRo Deep Dredge installation are the key to

its flexibility. First of all the dredging equipment is placed on a Platform Supply Vessel - thus the storage and transport facility of the mined sand has been separated and performed by a number of barges. Secondly, the steel suction pipes of TSHDs have been replaced by a flexible hose. Hence the dredging depth can vary and has become independent from the vessels' length.

Suitable for

- Deep sea mining of aggregates and minerals
- Plug and play system for outfitting platform supply vessel

Complete range of dredging gear



Fit for the job

- Pontoons
- Modular barges
- Barges
- Split barges
- Shoalbusters
- Modular Multi Cats

Any dredging job requires support vessels, whether it is a pontoon for easily moving around an excavator with a DOP pump, a number of hopper barges for transporting the dredged sediment, or a customised locally

assembled modular vessel or platform using container-sized barge modules. All standard pontoons and barges have a wide scope of usage. The standardised vessels are available in a range of sizes for use in all waters.

Dredging Mission Equipment



DAMEN SHIPREPAIR & CONVERSION

Your partner in maintenance and conversion



In addition to shipbuilding and ship design, Damen offers a network of 13 repair and conversion yards worldwide. With drydocks up to 420 x 80 metres, Damen handles 1,500 repair and maintenance jobs annually. The facilities are spread throughout Europe and in Singapore, South Africa, Americas and the UAE, for your convenience and flexibility.

› REPAIR › CONVERSION › REFIT › MAINTENANCE › HARBOUR & VOYAGE

CASE 1:

Conversion to dual fuel hopper dredger

Damen Shiprepair Dunkerque converts the 8,500 m³ trailing suction hopper dredger Samuel de Champlain. The hopper was built in 2002 with a diesel-electric burning MGO propulsion system. Now, it will run on dual-fuel combining LNG and MGO. The turnkey package includes engineering, procurement and

changing the generators to dual-fuel models as well as the installation of onboard LNG storage facilities. The conversion, the first of its kind in Europe, is part of an EU-supported initiative to promote LNG propulsion in short-sea vessels operating along the European Atlantic coast.



CASE 2:

Building your dredger on your local yard



A local yard for the construction of your dredger may be at the top of your priority list. Damen can either deliver the complete design plus a components package to this yard of your choice. Or Damen can supply the dredging mission equipment, drives, project management, field service assistance or any other support you need for the design of your local naval architect.

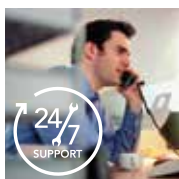
Whatever the dredging equipment package exactly comprises, together we will ensure that the end result meets the highest standards. Dedicated project management works closely together with the local industry and supplier network. This stimulates local employment opportunities and boosts the regional economy, with a well performing dredger as result.

NEVER SET SAIL ALONE

Damen Services

From the moment your vessel is ordered, Damen Services is on board. We offer a wide-ranging portfolio of customer support and after-sales services covering the vessel's complete lifecycle.

Damen Services intends to provide added value to a Damen vessel, whether this involves a single intervention or a complete package such as integrated logistics support or a long-term service agreement.



» Integrated logistics support

Integrated Logistics Support (ILS) is increasingly applied in the commercial and coastguard sectors today. If requested, Damen can supply a customised ILS program with our newly built products.

» Getting started

Damen Services is able to tailor its service packages to specific requirements. In this way we ensure our clients can begin their operations as soon as we deliver their vessel on location.

» Innovation

We respond to the rapidly changing world with the continuous development of our services. This includes an expanding focus on digitalisation and sustainability. Examples include remote monitoring, a personal webportal for maintenance management, 3D parts printing and intelligent asset management.

» Warranty Support

Customer satisfaction is of utmost importance to us. Customers can reach out to a dedicated service team 24 hours a day, seven days a week. As well as having access to Damen via our mobile app, customers are visited by a Damen technician, regardless of whether there is an issue or not.

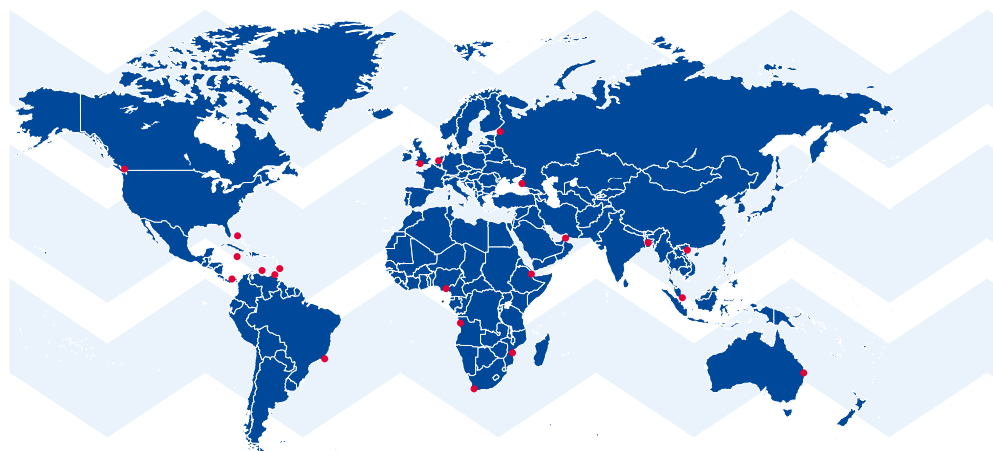


» Keeping you going

Downtime is becoming more and more expensive. Damen Services' portfolio enables reduction of downtime, either upfront via taking over the entire maintenance strategy or via quick intervention if a malfunction occurs.

» Worldwide service hubs

To fulfill our customers' need for short reaction times and understanding of local languages and cultures, Damen Services started multiple Service Hubs. These Service Hubs are tailored to regional demands and are able to supply all necessary services from our portfolio.



GETTING STARTED

KEEPING YOU GOING

INTEGRATED LOGISTICS SUPPORT

- Reliability, Availability and Maintainability Analysis
- Reliability Centered Maintenance Analysis
- Logistic Support Analysis

DELIVERY

- Warranty support
- My Damen Commissioning



COMBINED SERVICES PACKAGE


- Ship delivery
- Initial spare parts package
- Vessel operating manual
- Training
- Maintenance management solutions

LONG-TERM SERVICE AGREEMENT

- Allround services
- Fleet support:
 - Parts, maintenance and repair
 - Consultancy
 - Conversion
 - Refit

A BROAD SCOPE OF VESSELS





Colophon

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