



# Marine Offshore **Off-Highway Drive and Motion Technologies**

Market-leading motion systems by Brevini® and Fairfield® optimize machine performance while maximizing yields. Our products meet requirements for the most diverse marine applications.







Founded in 1904, Dana Incorporated is a world leader in highly engineered solutions for improving the efficiency, performance, and sustainability of powered vehicles and machinery. Dana supports the passenger vehicle, commercial truck, and off-highway markets, as well as industrial and stationary equipment applications.

We maintain a competitive advantage in the marketplace with a commitment to delivering on the five dimensions of our enterprise strategy – leveraging the core, strengthening customer centricity, expanding global markets, commercializing new technology, and accelerating hybridization and electrification.

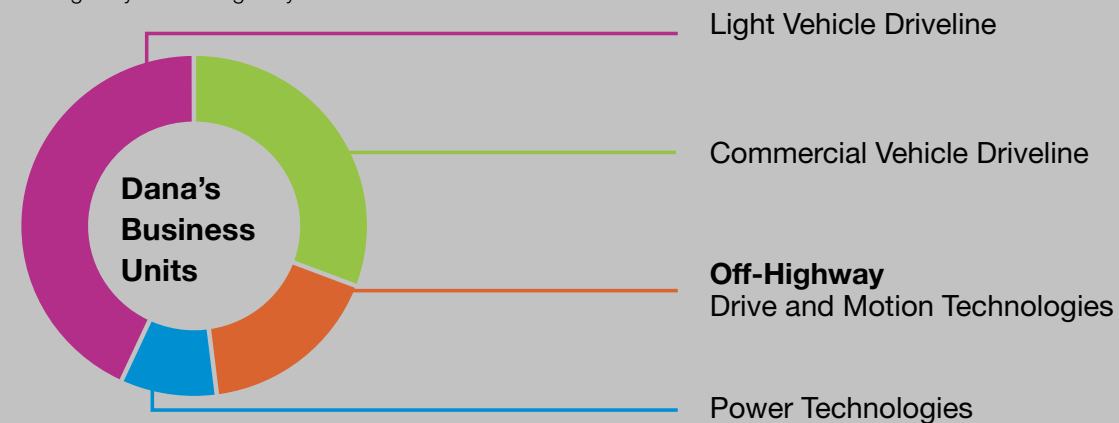
Employing thousands of people in 33 countries, on six continents, our people work tirelessly to deliver long-term value to customers around the world. We have earned our position as a trusted, top-tier supplier by collaborating with customers to develop, integrate, and support the innovations required to improve vehicle performance and efficiency.

Each day, in both large and small ways,  
**Dana is defined as People Finding A Better Way®.**



## Corporate Business Units

Dana serves global light vehicle, medium/heavy vehicle, and off-highway markets through four business units – Light Vehicle Driveline Technologies (Light Vehicle), Commercial Vehicle Driveline Technologies (Commercial Vehicle), Off-Highway Drive and Motion Technologies (Off-Highway), and Power Technologies, which is the center of excellence for sealing and thermal management technologies that span all customers in our on-highway and off-highway markets.



## Off-Highway Brands

### Drivetrain Systems



### Motion Systems



### Thermal Management



### Sealing



## Off-Highway Sectors

### MOBILE

#### Agricultural

Our products are engineered to support increased crop yields, optimized harvesting operations, lower emissions, improved operator safety and comfort, and reduced total cost of ownership, while complying with evolving emissions standards

#### Construction

Integrated drive and motion systems from Dana enhance construction equipment performance, efficiency, and productivity with a range of solutions for vehicles ranging from 3 to 50 tonnes (4 to 55 tons). Spicer® axles, wheel drives, transmissions, driveshafts, and Brevini® motion products are integrated with the most advanced technologies for improved machine operation on any job site, in any condition.

#### Mining and Forestry

Dana designs complete drive and motion systems to meet increasing industry demands for automation and productivity, coupled with high safety standards. Our solutions are specially engineered to maximize vehicle performance in extremely harsh environments.

#### Material Handling

Our custom drive and motion systems enhance material-handling and surface-mining vehicle performance, productivity, and power. Spicer® transmissions, axles, and driveshafts are designed to work seamlessly in any vehicle to allow operators to engage, lift, and transport heavy loads with more precision.

### INDUSTRIAL

Dana's portfolio of advanced motion technologies has been engineered to support increased productivity and reliability, lower emissions, improved operator safety and comfort, and reduced total cost of ownership.





# Marine Applications

Dana works with customers in the marine industry around the world, offering solutions for both industrial applications and self-propelled machines.

Dana's offering includes consulting, systems design, engineering, procurement, manufacturing, and aftermarket support for turnkey projects, new equipment, upgrades, and modernizations.

Marine equipment varies from onshore port applications to offshore marine environments. Onshore includes industrial and mobile applications such as ship-to-shore (STS) cranes, rubber tyre gantry (RTG) cranes, rail-mounted gantry (RMG) cranes, harbor cranes (MHC and GHC), ship lift systems, reach stackers, and straddle carriers.

Offshore applications include Jack-Up systems, cable- and pipe-laying vessels, cargo ships, subsea systems, oil platform equipment, remotely operated vehicle (ROV) launch and recovery systems, and more.

Covering the needs of ports, shipyards and all offshore requirements, Dana is a one-stop opportunity for the marine industry worldwide.

Industrial and mobile solutions, including those for Reach Stackers and Forklift Trucks, are available thanks to the vast array of Brevini® motion systems and Spicer® drivetrain systems.

Moreover, with the recent acquisition of Fairfield®, providing custom gears and drives, Dana has increased its product portfolio and is even better to serve the marine industry today.



# Cable- and Pipe-Laying Tensioners and Azimuth Thrusters

## Cable and Pipe Layer and Tensioner

Cable- and pipe-laying ships are designed for offshore applications. Cable-laying ships lay cable for electric power transmission and telecommunications. Pipe-laying ships are used in the construction of subsea infrastructure for the oil and gas industry. A grapple system (tensioner) assures that the cable or pipe is laid properly. It can also retrieve damaged or misplaced cable/pipe from the ocean floor.

## Azimuth Thrusters

A propulsion system with a rudder steering function, an azimuth thruster delivers precise accuracy and maneuverability combined with efficient speed control. These advantages make the thruster a perfect propulsion solution for cruise ships, mega yachts, ferries, and other offshore vessels. The thruster is one of the most important systems for safe and reliable navigation. Consequently, all components must comply with stringent IACS requirements.

## Pipe Tensioner



## Horizontal Carousel



### Brevini® Helical and Bevel Helical Gearboxes

- Carousel drives
- Supports torque range up to 2200 kNm
- Extensive ratio range
- Special output shaft and bearing
- Forced lubrication system with double motor pump and bypass
- Integrated electromagnetic brake



### Brevini® Industrial Planetary Gearboxes – S Series

- Tensioner drive with integrated output support
- Nominal torques up to 2,170 kNm
- Multiple output shaft options
- Inline and right angle configurations available
- Suitable for both hydraulic and electric motors
- Negative multidisc brake



### Brevini® Winch Drives

- Winch drive for auxiliary hoist system
- Ratio range up to 6.000:1
- Maximum torque up to 850 kNm
- Inline and right angle configuration versions available
- Electric motor connection available
- ATEX certification
- Integrated hydraulic failsafe negative brake and electromagnetic brake available
- Safety devices available as back stop, torque limiter, and sensors



### Brevini® Industrial Planetary Gearboxes

- Pipe handling drives
- Nominal torques up to 26,000 Nm
- Inline and right angle configurations available
- Suitable for both hydraulic and electric motors
- Integrated motor adaptor
- Negative multidisc brake



### Brevini® Industrial Planetary Gearboxes – S Series

- Ratio range up to 5.000:1
- Modular design
- Input flange for hydraulic or electric prime motor
- Compact, light solutions for a perfect fit on machine frames



### Brevini® Axial Piston Motor

- Main hoist drive motor
- Fixed and variable displacement up to 216 cc/rev
- Seven or nine piston options
- Wide control valve range
- ATEX certification
- Environmentally Acceptable Lubricants (EAL fluids)
- Suitable for working in harsh and aggressive environments



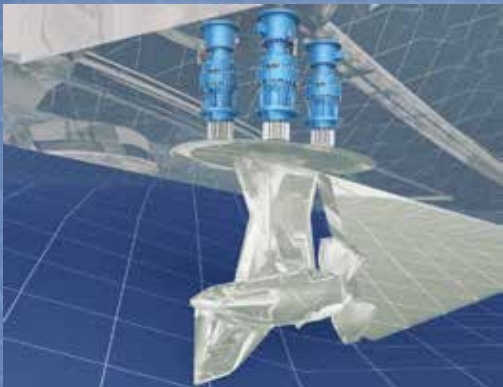
### Brevini® Evolution™ Series Winches

- Winches for auxiliary hoist system
- Line pull up to 30 tons
- Wide range of safety controls
- Equipped with Brevini® high speed axial piston motor
- Man-lifting capabilities



### Brevini® Planetary Gearboxes – Slewing Drives

- Steering drive with integrated output pinion; high quality and special toothing profile
- Output support with eccentricity for a very accurate teeth backlash adjustment
- Integrated safety device options (torque limiter, switches, sensors)
- Environmentally Acceptable Lubricants (EAL fluids)
- Pollution free regulations



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories, **marine painting** cycle and **full third party marine certification**.



# Full-System Solutions for Deck Cranes

Deck cranes – cranes installed on the deck of a ship – come in a wide variety of types and sizes, and are often classified by the specific application for which they are designed. All deck cranes share similar basic functions – lifting, lowering, and positioning a load from one site to another. However, functionality varies greatly depending on where the crane is being used.

Deck cranes designed to move loads when a ship is docked in the quay handle much smaller loads than deck cranes for offshore

applications, which need to manage several hundred tons, often while ships are floating in a stormy sea.

Customizable design options include hydraulic and electric drivelines; telescopic, knuckle, or lattice booms; a range of control system features to improve accuracy; and environmental features to optimize performance based on worksite conditions. Dana works with customers to ensure that all local standards are met, as well as regulations set by the International Association of Classification Societies (IACS).

## Main Hoist System



## Active Heat Compensation Main Hoist Drive



### Brevini® Axial Piston Pumps

Displacement up to 226 cc  
Medium- and high-pressure options  
Fixed and variable displacement available  
Open or closed loop circuit  
ATEX certification  
Environmentally Acceptable Lubricants (EAL fluids)  
Suitable for working in harsh and aggressive environments



### Brevini® Proportional Directional Valves

Oil flow up to 1,000 lt/min  
High modularity  
ATEX certification  
Remote control, electronic operation  
Smooth control to improve operation  
functionality and accuracy



### Brevini® Axial Piston Motors

Main hoist drive motors  
Marine painting cycle  
Fixed and variable displacement  
displacement up to 216 cc/rev  
Seven or nine piston options technologies  
Wide range of control valves  
Third-parties marine and ATEX certification  
Environmentally acceptable lubricants (EAL fluids)  
Suitable for working in harsh and aggressive environments



### Brevini® Industrial Planetary Gearboxes – S Series

Main winch drives  
Ratio range up to 5,000:1  
Modular design  
Input flange for hydraulic or electric prime motor  
Compact, light solutions for a perfect fit on machine frames  
Marine painting cycle  
Third-parties marine certification available



### Brevini® Winch Drives

Winch drive for auxiliary hoist system  
Ratio range up to 6,000:1  
Maximum torque up to 850 kNm  
Third-parties marine certification available  
Inline and right angle configuration versions available  
Electric motor connection available  
ATEX certification  
Integrated hydraulic failsafe negative brake and electromagnetic brake available  
Safety devices available as back stop, torque limiter, and sensors



### Brevini® Evolution™ Series Winches

Winches for auxiliary hoist system  
Line pull up to 30 tons  
Third-parties marine certification available  
Wide range of safety controls  
Equipped with Brevini® high speed axial piston motor  
Man-lifting capabilities



### Brevini® Planetary Gearboxes - Slewing Drives

Torque range up to 370 kNm  
Modular design, inline or right angle configuration  
Range of output support configurations (low angle, long and short support with eccentricity)  
Failsafe negative brakes  
Input flange for hydraulic and electric prime motor  
Compact, light solutions for a perfect fit on machine frames  
Flexible output pinion to meet customer needs  
Product marine/offshore class certification available  
Special solutions to meet requirements for low climate and ATEX certifications



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.



# Full-System Solutions for Jacking Drives

For more than 40 years, Dana's Fairfield® brand has been engineering and building gearboxes for jacking machinery used on offshore platforms.

A complete line of solutions covers a broad range of applications, from lift boats to the largest jack-up platforms. Each drive is designed to meet application-specific requirements and can be driven by electric or hydraulic motors. Features such as customized input configurations, output configurations and specific ratios suited to the application make Dana an ideal partner for your project.

Extensive engineering experience ensures the best solution for each vessel, implementing precision gearing for smooth jacking and unbeatable reliability, even in the most demanding applications.

Certified by the American Bureau of Shipping (ABS) and Det Norske Veritas (DNV), our products benefit from marine-specific coatings and treatments and possess 124K to 3000KNm storm holding capabilities.



## Fairfield® Jacking System Drive

Products certified by the American Bureau of Shipping (ABS) and Det Norske Veritas (DNV)

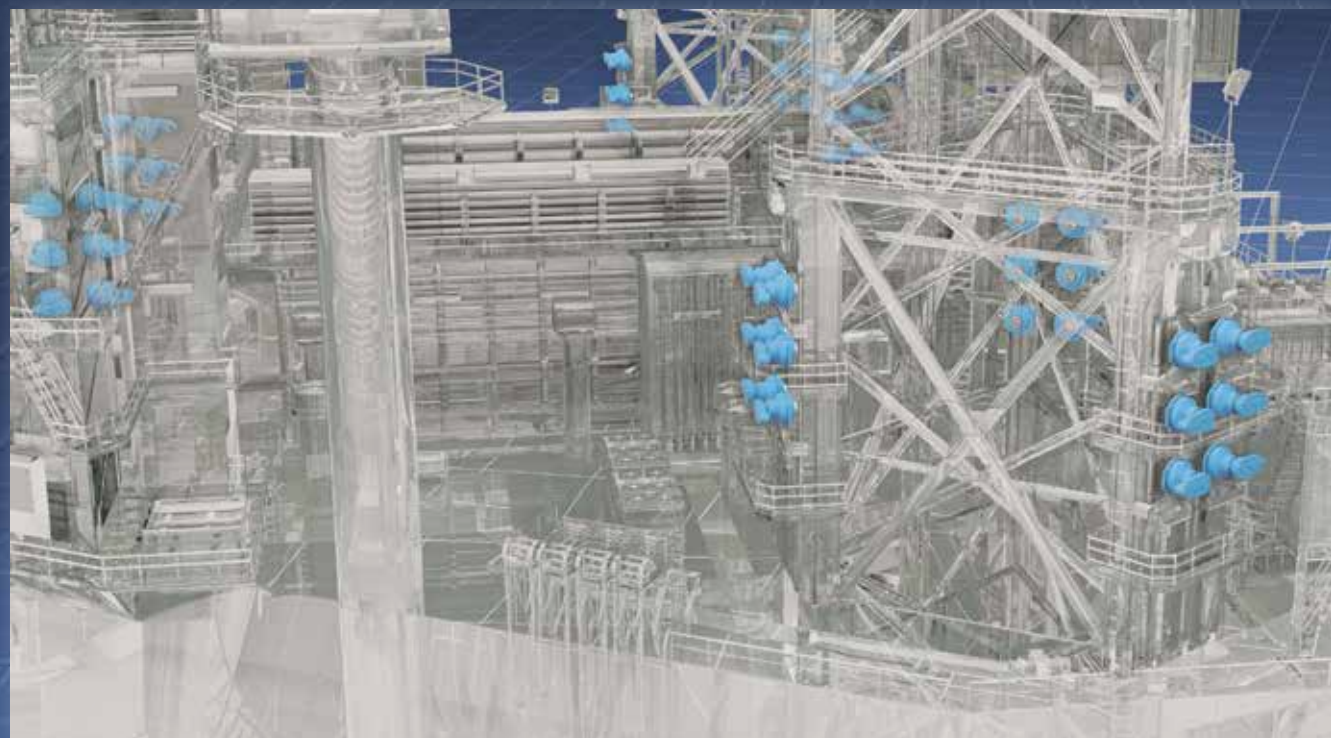
The industry's most complete size range for jack-ups and lift boats

124K Nm to 3000KNm storm holding capabilities

Over 40 years application and design experience

Marine-specific coatings and treatments

Custom interfaces and gear ratios





# Offshore Marine

Dana supplies a wide portfolio of products for lifting, pulling, and slewing machinery. These solutions are designed for cranes, dredgers, gangways, anchor and mooring winches, and hatch covers. Dana also offers Brevini® gearboxes designed for the lifesaving equipment used on life boats, and recent acquisition of Fairfield® enables Dana to cater for a broader range of offshore needs. These include large gearboxes for jack-ups and life boats in offshore oil production, as well as vessels used to erect offshore wind turbines.

The proven reliability and strength of Brevini® planetary gearboxes is matched by Brevini® slewing gear drives that deliver optimal performance in all temperatures and climatic conditions. Dana offers additional Brevini® motion products such as axial piston motors and pumps, and proportional valves developed to perform with high-efficiency working functions. Custom gearboxes by Fairfield® are built specially for offshore winches and cranes.

- Dredgers
- Embarking gangways
- Embarking stairs
- Anchor and mooring winches/windlasses
- Capstans for cable-laying equipment
- Deck cranes and machinery
- Jack-up systems
- Hatch covers
- Winches for life boats/pipe handling davits
- Pods/azimuths/thrusters
- Trawling winches
- Umbilical reel winches
- Pilot house/steering equipment
- Offshore machinery
- Offshore platform cranes



**Jack-up System for Offshore Drilling Platform**



**Crane Vessel**



**Oil and Gas Industry**



# Global Strength

One of the ways we create value is by positioning our technical and manufacturing resources where customers need us globally. Today, that's 33 countries on six continents.

To help customers achieve success, top-tier suppliers must have a global perspective that can be adapted to meet local requirements and end-user expectations. Dana's worldwide leadership, strengthened by the international presence of Brevini®, is the key to serving over 5,000 clients around the world. We bring our

global expertise to the local level with technologies customized to individual requirements through a network of strategically placed technology centers, manufacturing locations, and distribution facilities.

Our global logistics network covers six continents, delivering strength and reliability to customers around the world.

## Brevini® and Fairfield® for Marine Applications

Dana benefits from the extensive experience of two leading brands that have been serving the marine industry since the middle of the last century. Both Brevini® and Fairfield® boast countless applications in which their products ensure efficient operation and safety.

With a deep understanding of market requirements, Dana adds value by ensuring that the right equipment is specified before any project begins. This means delivering quality, modularity, reliability, and providing dedicated features for marine applications. We value collaborative partnerships that allow us to develop strong, long-lasting relationships with original-equipment manufacturers (OEM) and end-users.

## Global Presence

We have the ability to deliver products that meet specific regional requirements through our vast network of nearly 100 engineering, manufacturing, and distribution facilities covering six continents. This global logistic network ensures maximum flexibility and punctuality in the delivery of the products.

## Dana Service and Assembly Centers

Customers can capitalize on the specific market knowledge and engineering expertise of 30 regional former Brevini subsidiaries—now known as Dana Service and Assembly Centers—to provide product customization and service.

## Engineering and Research and Development

We engage in ongoing engineering activities as well as research and development to improve the reliability, performance, and cost-effectiveness of our existing products. We are also focused on the design and development of innovative products that meet customer requirements for new applications. Our objective is to be an essential partner to our customers and we remain highly committed to offering superior product quality, technologically advanced solutions, world-class service, and competitive prices.

# Culture of innovation

Since our introduction of the automotive universal joint in 1904, we have been focused on technological innovation. Every day, Dana employees around the world work together to leverage our shared insight, developing the most innovative technologies that provide more value for our customers and solve their biggest challenges.

Innovation drives growth, and our ever-evolving products and technologies provide customers with cutting-edge solutions, address end-user needs, and capitalize on key market trends. In 2017, Dana engineers achieved a new milestone: the company's 10,000th patent, granted for a Long®-brand heat exchanger with an integrated thermal bypass valve.

## Electrification

Dana's comprehensive strategy for electrification in off-highway markets begins with a foundation of enabling OEM to accelerate their hybrid- and electric-vehicle development programs. We offer a series of market-ready modular hybrid- and electric-drive systems that can fit into existing vehicle design envelopes and provide OEMs with effective, low-risk, quick-to-market solutions. These products can be connected to traditional Spicer® wheel drives, track drives, axles, and transmissions to deliver hybrid or electric functionality. A wide selection of Brevini® motion products to support the unique power distribution requirements of hybrid and electric off-highway vehicles is also currently available.







## About Dana Incorporated

Learn more about Dana's drivetrain and motion systems at [dana.com/offhighway](http://dana.com/offhighway).



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