Telehandlers for Agricultural and Construction Applications

Dana’s Spicer® and Brevini® technologies for telehandlers are engineered to improve performance and efficiency across 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 disciplines of our enterprise strategy – leveraging the core, strengthening customer centricity, expanding global markets, commercializing new technology, and accelerating hybridization and electrification.

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

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.

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.

Corporate Business Units
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Dana’s Business Units

- Light Vehicle Drive Systems
- Commercial Vehicle Drive and Motion Systems
- Off-Highway Drive and Motion Systems
- Power Technologies

Off-Highway Brands

- Drivetrain Systems
- Motion Systems
- Thermal Management
- Sealing

Off-Highway Sectors

- Agricultural
- Construction
- Mining and Forestry
- Material Handling

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.
Drive and Motion Systems for Construction and Agricultural Telehandlers

Telehandlers are used globally across many markets for a wide variety of purposes with both individual purchaser and rental fleets. Such diversity in end-use requires the providers of the major vehicle systems to develop a deep understanding of end-user needs and expectations to determine success.

Based on more than 50 years of experience, Dana has emerged as the market and technology leader for telehandler applications. Spicer® Drivetrain systems make telehandlers operate more efficiently on the worksite, while maximizing speed and fuel economy on the road between work assignments. Now with Brevini® motion systems – specifically developed to perform high-efficiency working functions – Dana supplies a comprehensive range of products. Through integrated electronic, mechanical, and hydraulic systems, our technologies improve the maneuverability, efficiency, speed, and safety of work functions performed by both the machine and its attachments.

The Right Partner for Your Telehandler

Spicer® Drivetrain Systems

Enhance performance and productivity by offering a range of products that constantly meet evolving global customer needs

- Spicer axles deliver the high turning angle required for telehandlers.
- Spicer hydrostatic and hydrodynamic transmissions provide the power to enhance productivity while maximizing fuel efficiency.
- Spicer driveshafts are designed to exacting durability standards and ease of maintenance.

<table>
<thead>
<tr>
<th>Lift Capacity</th>
<th>Spicer® Drivetrain System Solutions</th>
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</thead>
<tbody>
<tr>
<td>Lbs (Tonnes)</td>
<td>Transmission</td>
</tr>
<tr>
<td>4,000-5,000</td>
<td>(1.8-2.3)</td>
</tr>
<tr>
<td>6,000-8,000</td>
<td>(2.7-3.6)</td>
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<tr>
<td>9,000-12,000</td>
<td>(4.0-5.4)</td>
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<tr>
<td>12,000-15,000</td>
<td>(5.4-6.8)</td>
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<tr>
<td>15,000-20,000</td>
<td>(6.8-12.7)</td>
</tr>
<tr>
<td>28,000-35,000</td>
<td>(12.7-16.0)</td>
</tr>
<tr>
<td>35,000-50,000</td>
<td>(16.0-23.0)</td>
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*Other driveshaft series and end-fitting designs available.

Brevini® Motion Systems

Proven Power Conveyance for Work Functions on Machines and Attachments

- Brevini hydraulics deliver reliable power through a combination of robust and efficient motors and pumps. Designed for both open and closed circuits, operate with smoothness and precision even at high pressure and low flow.
- Brevini valves offer a wide range: from a manually actuated design to a sophisticated, remote-operated, proportional configuration that optimizes the hydraulic fluid flow.
- Brevini advanced valves are supported by a top-of-the-line electronic control system incorporating inclinometers, leveling systems, sensors, and human machine interfaces powered by proprietary software.

Lift Capacity Spicer® Drivetrain System Solutions

<table>
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<tr>
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<th>Axle</th>
<th>Driveshaft*</th>
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<tr>
<td>4,000-5,000</td>
<td>(1.8-2.3)</td>
<td>603, 311</td>
<td>211</td>
</tr>
<tr>
<td>6,000-8,000</td>
<td>(2.7-3.6)</td>
<td>T12000, VDT12000</td>
<td>357, 367, 318</td>
</tr>
<tr>
<td>9,000-12,000</td>
<td>(4.0-5.4)</td>
<td>T12000, VDT12000</td>
<td>357, 367, 318</td>
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<td>T20000</td>
<td>360, 319, 2+3</td>
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Market-Driven Innovations

We deliver innovative technologies to meet worldwide customer demands. By anticipating market trends, Dana uses industry expertise to deliver product solutions to help customers achieve their goals.
Full-System Solutions for Agriculture

Our deep understanding of agriculture end-user needs and expectations, together with decades of relevant experience lead to a product portfolio that enhances agricultural telehandlers maneuverability, efficiency and overall performance.

**Brevini® Proportional Directional Valve HPV Series**
- Wide range, regulated flow up to 600 l/m
- 370 bar working pressure
- Remote, electronic operation
- Smooth control to improve work function performance

**Brevini® Boom Angle/Length Extension Sensor AS Series**
- Reliably constructed draw wire length sensor
- Available with dual/redundant output for IEC EN60057 compliance
- Voltage: 4-20 mA or CANbus output from 5 to 12.5 m length range

**Brevini® Electronic Control Management**
- Complete solution for electric hydraulic control and human machine interface through innovative ECUs, display and joystick
- Enhanced programming flexibility to meet any customer requirement

**Spicer® Planetary Steering Axles**
- Modular design to fulfill market demands
- Greater customization of features
- Proven Technology Expertise
- Reliable experience across many applications
- Deliver maximum performance and offer easy, low-cost service

**Spicer® Hydrostatic Continuously Variable Transmission (CVT)**
- Unique two-motor design offers CVT functionality without torque interruption
- Increased efficiency at high travel speeds
- Increased tractive effort at low travel speeds
- Accommodates various combinations of hydraulic motors from 80 cc to 115 cc

**Spicer® Driveshafts**
- A century of quality and innovation
- Ideal for the rigorous demands of most off-highway applications
- Multiple driveshaft and end-fitting combinations
- Designed for minimal maintenance, longer life and reduced operating cost

**Brevini® Piston Pump and Gear Pumps HD1/OT300+OT200**
- Wide range of swashplate controls available
- Two built-in pressure relief valves protect the system from pressure overloads
- Swashplate design
- Integrated electro proportional and on-off valves
- Embedded additional bearings for internal loads

**Brevini® Fan Drive Gear Motor**
- Cast iron body for improved efficiency especially at high oil temperatures
- High volumetric and mechanical efficiencies
- Low noise level
- Built-in proportional relief valve for tank speed control
- Built-in anti cavitation valves

**Brevini® Proportional High Efficiency CFS3 Bankable Valve**
- Compact design electro proportional directional flow sharing valve
- Energy saving, very low pressure drop
- No need for relief valves to avoid zero flow with actuators at end of stroke
- Regulated flow up to 90 l/m @ 310 bar
Full-System Solutions for Construction

Reliability, durability and optimal cost of ownership are the common expectations from both rental fleets and individual machine purchasers in the construction market. Dana has the expertise, global reach and systems know-how to support construction telehandlers manufacturer’s needs worldwide.

Spicer® Planetary Steering Axles
Movable design to full market demands
Greater customization of features
Proven Technology Expertise
Reliable experience across many applications
Deliver maximum performance and offer easy, low-cost service

Spicer® Hydrostatic Continuously Variable Transmission (CVT)
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Compact design electro-proportional directional flow sharing valve
Energy saving: very low pressure drop
No need for relief valves to avoid zero flow with actuators at end of stroke
Regulated flow up to 60 lpm @ 310 bar

Brevini® Slew Drive
Compact solution with hydraulic motors for a perfect fit in machine frames
Range of motor values matches various functional demands
Output pinion variations allow customized configurations

Brevini® Hoisting Winch WPL10C
Designed to be embedded in the structure of the attachment
Complete package with hydraulic motor and brake valve
Better control of the winch due to electronic devices
Perfect spooling is ensured by special grooved drum and tension roller design

Brevini® Proportional Directional Valve HPV Series
Wide range: regulated flow up to 600 l/m – 370 bar working pressure
Remote, electronic operation
Smooth control to improve work function performance

Brevini® Boom Angle/Length Extension Sensor AS Series
Robustly constructed draw wire length sensor
Available with dual redundant output for SIL3/LV1 compliance
Voltage: 4-20 mA or CANbus output from 5 to 12.5 m length range

Brevini® Electronic Control Management
Complete solution for electric hydraulic control and human machine interface through innovative ECUs, display and joystick
Enhanced programming flexibility to meet any customer requirement
Spicer® Smart Suite™ Intelligent Load Monitoring System (ILMS)

Spicer® Smart Suite™ ILMS is designed to alert the operator of potential tipping situations, reduce the risk of vehicle breakdowns, improve productivity and precision, and enhance the long-term durability of powertrain systems.

Monitors Load Weight
Utilizes proprietary data collecting technologies across the vehicle to proactively estimate static loads.

Prevents Boom Overextension
Detects improper operating maneuvers that may lead to tip-over incidents.

Assists with Sloped Surfaces
Autonomously monitors and adapts to various operating conditions and shifts in weight.

Fully integrated e-Drive and e-Motion Systems

A new era of mobility is upon us. Emissions regulations and government policies are manifesting at an ever-increasing pace, and visions of vehicles that reduce operating costs while enhancing productivity and safety are accelerating the need for alternative propulsion solutions. For over 20 years, our group of highly focused engineers has been dedicated to research and development of new technology solutions aimed at electrification. We have built a broad portfolio of award-winning, patented technologies, making us a leader in electrification.

Today we can proudly say that we are the ONLY supplier with the capability to help manufacturers bring electric-driven vehicles to market through our collaborative, systems-oriented approach; decades of expertise; and broad selection of proven drive and motion capabilities for electrified vehicles. Dana offers a full product portfolio and multiple technologies for electrification needs. Through our market-proven brands, we can provide motors, inverters and controllers for low-and high-voltage applications ranging from 24 to 800 V.

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Technologies Customized to Every Part of the Globe

With a presence in 33 countries, Dana Incorporated boasts more than 145 engineering, manufacturing, and distribution facilities. Our worldwide network of local service centers provides assurance that each customer will benefit from our proximity and responsiveness.

About Dana Incorporated
Dana is an integral partner for virtually every major vehicle and engine manufacturer worldwide. We are a leading supplier of drivetrain, sealing, and thermal technologies to the global automotive, commercial-vehicle, and off-highway markets. Founded in 1904, we employ thousands of people across six continents.

About Dana Off-Highway Drive and Motion Systems
Dana delivers fully optimized Spicer® drivetrain and Brevini® motion systems to customers in construction, agriculture, material handling, mining, and industrial markets. We bring our global expertise to the local level with technologies customized to individual requirements through a network of strategically located technology centers, manufacturing locations, and distribution facilities.

Learn more about Dana’s drivetrain and motion systems at dana.com/offhighway.