

## **Off-Highway** Drive and Motion Systems

Mobile

Industrial

Electrification. **Delivered.**™



## Established in 1904. Employing 38,000 people across

141 major facilities in 33 countries. Shipping to 14,000 customers in 141 countries. Leveraging a global network of technology centers across 9 countries.

### **Our Vision**

**Powering Innovation** To Move Our World

### **Our Mission**

- This mission is embodied in our company theme: People Finding A Better Way. Driving stakeholder value by:
- powering vehicles and machines around the world
- shaping sustainable progress
- through invention and execution
- making the amazing happen
- wherever people live, work, and play.

### and a million party and the second **Our Values**

- Value Others
- Inspire Innovation
- Grow Responsibly
- Win Together

### 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.

## Why should you rely on Dana? Solutions designed, engineered, and manufactured for maximum efficiency.

We approach electrification with a trained eye and an insightful, innovative perspective, utilizing market synergies to provide an advantage in electrifying offerings across multiple applications.

A component is only as good as the system in which it operates. That's why we take a systems-focused approach, seamlessly integrating our components into complete electrified systems.

## **Corporate Business Units** Light Vehicle Dana serves the global light vehicle, medium- and heavy-duty Drive Systems vehicle, and off-highway markets through four business units: Light Vehicle Driveline Technologies, Commercial Vehicle Driveline Technologies, Off-Highway Drive and Motion Technologies, Power Technologies, which is the center of excellence for sealing and thermal management technologies that span all customers in our on-highway **Commercial Vehicle** Drive and Motion Systems and off-highway markets. **Off-Highway**

WEIGHT REDUCTION For additional payload or battery capacity

# **EFFICIENC**

LIGHT VEHICLE

Reduced energy consumption means increase range and cost savings

## Where there is a need, Dana finds a better way.

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.

We have an in-house, multi-disciplinary team of system solutions engineers who provide turnkey turnkey software and controls for our entire portfolio of technologies. This in-house knowledge and integration produces solutions that provide enhanced performance, packaging optimization, and reduced system weight. All of which results in savings to your bottom line.



**OFF-HIGHWAY VEHICLES** 

**COMMERCIAL VEHICLE** 

PACKAGIN Improved vehicle integration for optimized packaging space

**COOLING SOLUTIONS** Capability to integrate nal-management soluti with power sources

## Off-Highway Drive and Motion Systems

As an innovation leader in off-highway drive and motion systems, Dana continuously improves the performance and efficiency of vehicles and machines worldwide. We aim to be the global technology pacesetter in efficient power conveyance and energy-management solutions.

## Enhanced Brand Portfolio Off-Highway brands



Dana is a leading drivetrain and motion systems provider for electrified off-highway applications.



## **Off-Highway Segments**

Dana leverages our global expertise to engineer the most advanced, customized product solutions for developed and emerging markets. Our drive and motion products serve a wide range of demanding industries, including applications for equipment with wheel and track drives as well as stationary machines.



Industrial



### **Bulk Materials**

Dana has an extensive range of gearboxes with torque ratings of up to 3 million Nm. Our qualified, experienced engineers provide optimum solutions for heavy-duty applications, and our service team delivers support for the entire life cycle after delivery.

### Heavy Industry: Steel, Sugar, and Cement

Brevini<sup>™</sup> gearboxes have been used in heavy-duty operations from mines to steel production for more than 50 years. Our portfolio of advanced technologies has been engineered to support increased productivity and reliability, improved operator safety, and reduced total cost of ownership.

### Mobile



### Agriculture

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.



### Material Handling

Our customized drive and motion systems enhance material-handling 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.



### Mining

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.



### **Construction and Forestry**

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.



### **Onshore and Offshore Marine**

Brevini<sup>™</sup> planetary gearboxes have supported the exacting specifications and certifications of winches and cranes in the marine and offshore market for many years. We also offer a wide range of fluid power solutions that deliver safe and reliable solutions for OEM applications.

### **Environment - Renewable Energy**

Brevini<sup>™</sup> gearboxes for yaw and pitch drives are used by many of the major wind turbine OEMs. We provide engineering input offering sustainable and reliable solutions to meet customer requirements, while our service division has extensive experience in optimizing the performance of gearboxes over the long term.



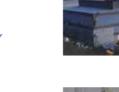


### Industrial and Stationary Equipment

Our range of gearboxes and hydraulic products offers reliable solutions for all equipment within the industrial and stationary sectors. Our products enable high productivity and low maintenance costs backed by our aftermarket support and service.

### **Plastic and Rubber**

Brevini<sup>™</sup> and PIV<sup>™</sup> brand products include single- and twin-screw extruder drives, rack and pinion drives for injection molding machines, planetary gearboxes, and helical and bevel helical gearboxes.

















## **Drive and Motion** Solutions

The drivetrain solutions you need, backed by global expertise and support.

### Spicer<sup>®</sup> Axles and Drives

Spicer<sup>®</sup> axles are engineered to improve performance, tractive effort, and operator comfort in harsh working environments while also supporting on-road mobility through high torque density, high reliability, and robustness.

Our power-dense designs deliver maximum performance in a compact package that improves reliability, durability, stability, and safety.

Dana has a broad range of dedicated solutions matching the different application needs like torque density, specific duty cycle, braking performances, safety standard and robustness.



### Spicer<sup>®</sup> Driveshafts

Built to withstand the roughest terrains and heaviest loads, Spicer driveshafts efficiently and reliably manage input torque to improve productivity, reduce operating costs, and simplify maintenance. They can be customized with a complete set of end fittings, flanges, and service options for any requirement.



### Spicer<sup>®</sup> Transmissions with Electronic Controls

From basic gearboxes to leading-edge powersplit configurations, Dana supplies a wide range of powerful, efficient transmissions and electronic controls that improve fuel efficiency, handling, tractive effort, and operator comfort while reducing noise and ensuring easy maintenance.

Our advanced electronic controls provide multiple smart operating modes that optimize productivity, monitoring and efficiency at every stage of the work cycle.



### Graziano<sup>™</sup> Custom Gears and Shifting Solutions

Our custom-designed high-precision gears and shafts improve the performance, reliability, and durability of final reduction components. We also support technically challenging and complex vehicle applications by leveraging our engineering expertise to supply customized crown wheel and pinion sets.

We offer a range of heavy-duty synchronizers and other shifting solutions that help vehicle and transmission manufacturers overcome the limited availability of engineering resources while giving vehicle operators better control, shifting performance and improved productivity.

Additionally, we leverage our in-house design, prototype, and validation capabilities to produce custom drive assemblies for highly specialized applications with accelerated development timelines.



### Brevini<sup>™</sup> Motion Systems

We serve OEMs as a single supplier for the wide variety of components that maximize the productivity and efficiency of vehicle work functions.

Our comprehensive selection of Brevini<sup>™</sup> motion products includes slewing drives, winches, and a complete range of field-proven gear solutions such as gear units, gear motors, and gearboxes. Additionally, we provide full array of reliable hydraulic pumps, motors, valves, powerpacks and controls.



### **System Solutions**

Vehicle intelligence, autonomous driving systems, Al, electrodynamics, telematics, cybersecurity, and other digital innovations are enabling quantum leaps in vehicle performance and efficiency.

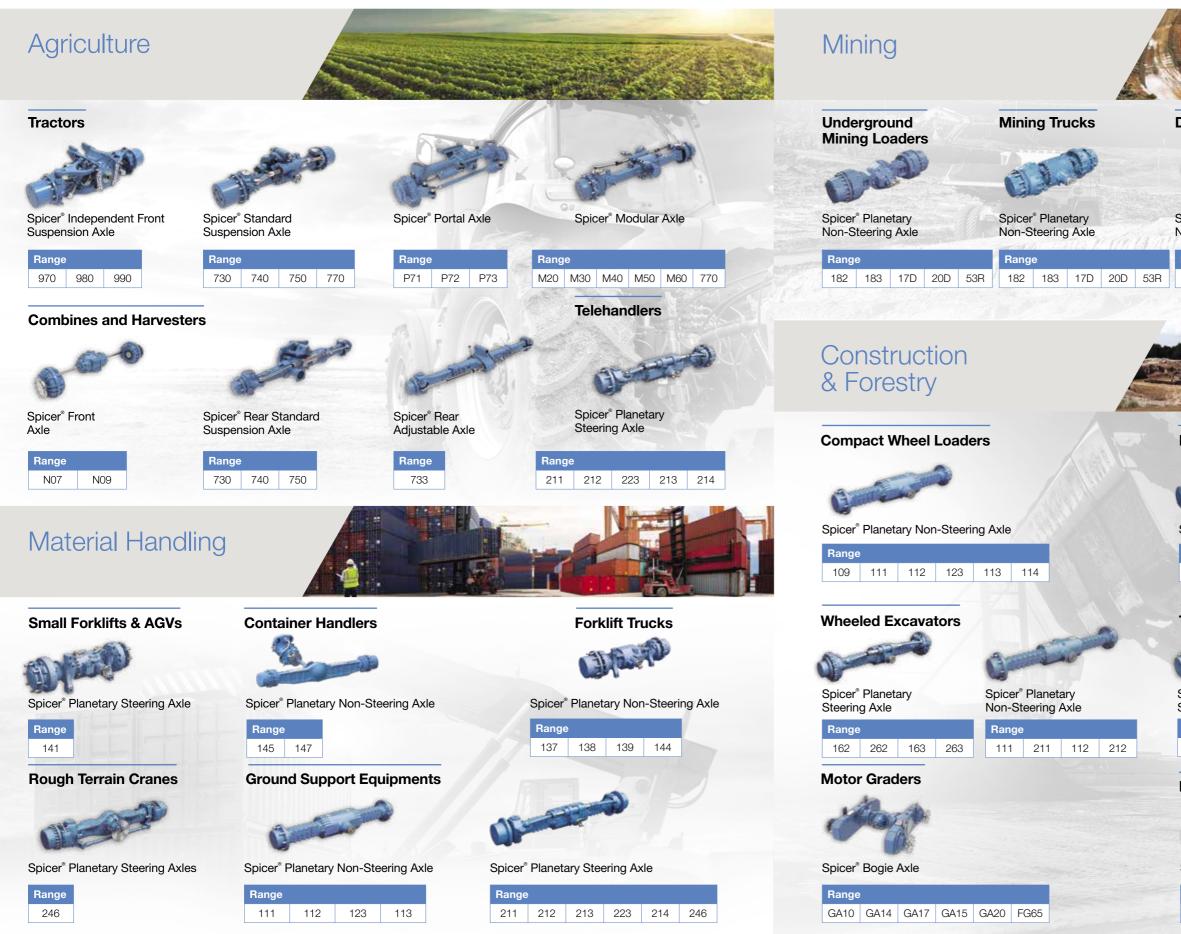
Dana's multi-disciplinary team of system solutions engineers provides turnkey solutions for electric vehicle integration by collaborating with customers. Our holistic approach helps OEMs seamlessly integrate transformative digital technologies with Dana's proven drive and motion systems for the next generation of vehicles.

### e-Drive and e-Motion Solutions

We leverage our complete portfolio of e-Propulsion Systems — e-Axles, e-Drive Units, and e-Hub Drives — as well as e-Powertrains, e-Motion Systems, and electrodynamic modules to enable vehicles to meet the highest standards for efficiency, reliability, and performance.

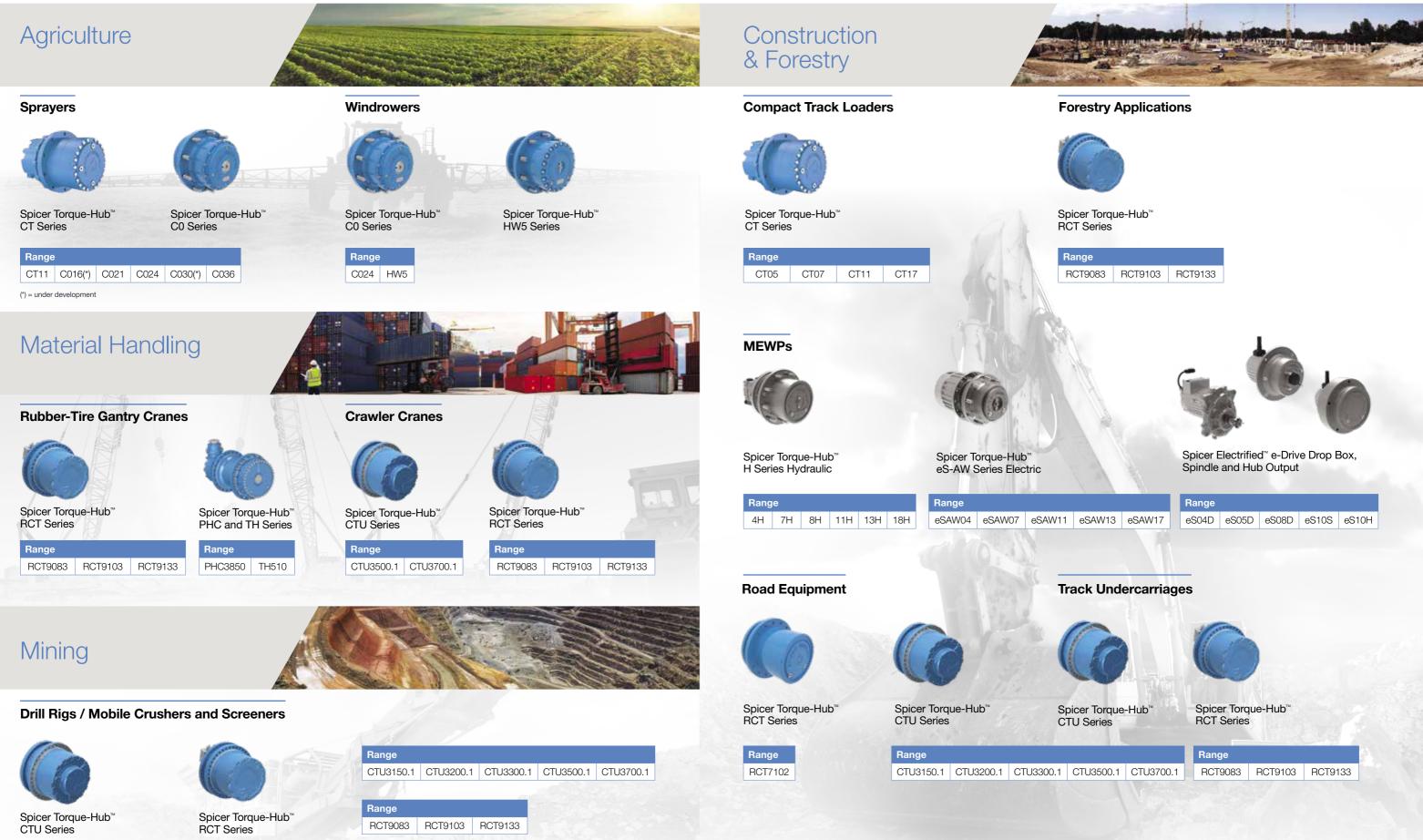
We can help OEMs adapt current ICE-driven applications with effective, low-risk, quick-to-market drive solutions today as we plan for future vehicle configurations with fully integrated systems that deliver superior productivity while reducing manufacturing complexity and total cost of ownership.

## Drive Systems Spicer<sup>®</sup> Axles



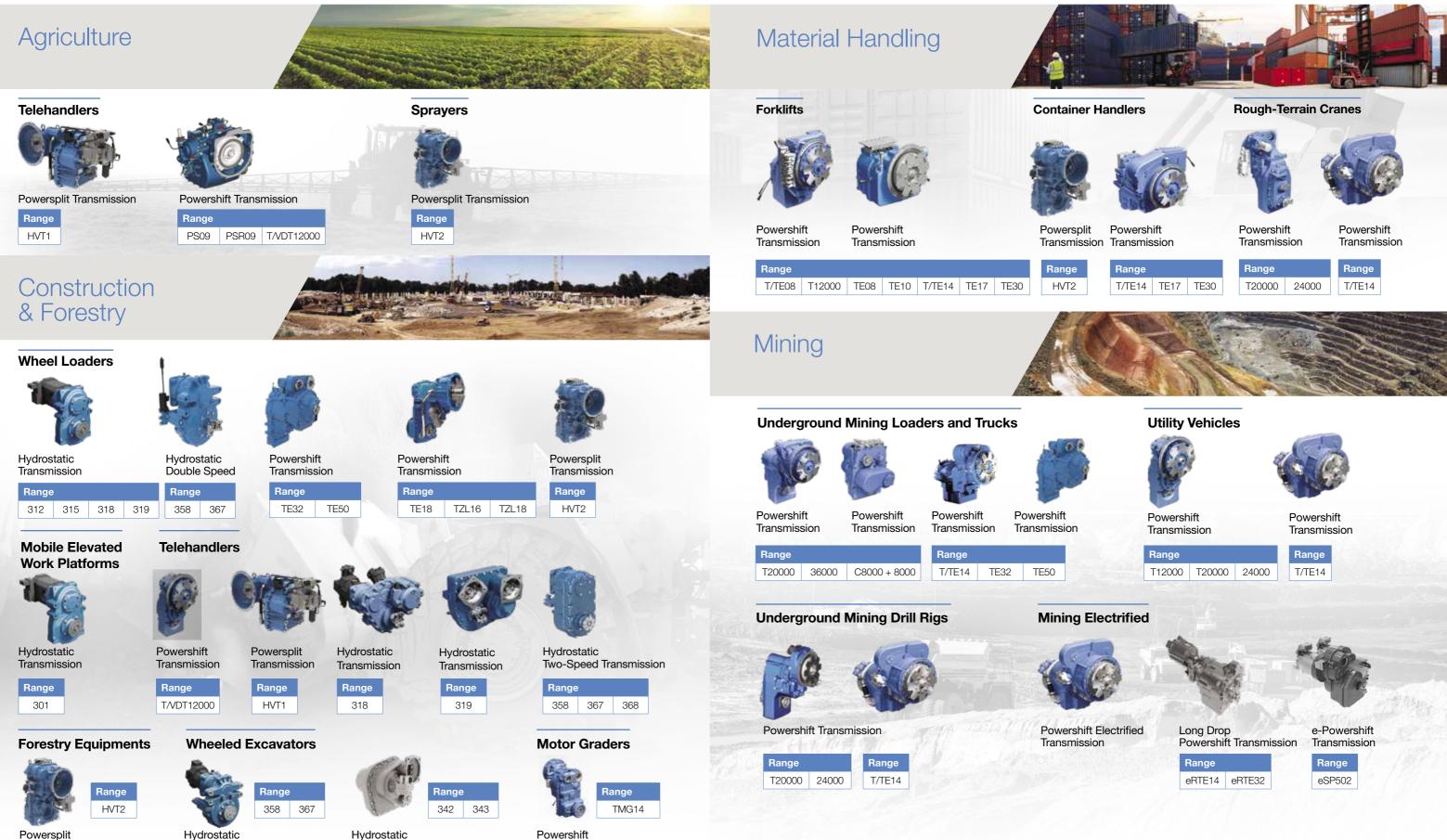
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Spicer <sup>®</sup> Planetary	Spicer <sup>®</sup> Planetary
Non-Steering Axle	Steering Axle
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Large Wheel Loaders	
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Spicer® Planetary Non-Steeri	ing Axle
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Spicer <sup>®</sup> Planetary Steering Axle	Spicer <sup>®</sup> Planetary Non-Steering Axle
Range	Range
211 212 223 213 214	192 193 194
Forestry Applications	
C	
Spicer <sup>®</sup> Rear Axle	
Range   113 114 115 116	6 125 126

## Drive Systems Spicer® Wheel and Track Drives



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ange		
RCT9083	RCT9103	RCT9133

## Drive Systems Spicer<sup>®</sup> Transmissions



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Transmission

Two-Speed Transmission

Transmission

Transmission

## Drive Systems Graziano<sup>™</sup> Custom Gears and Shifting Solutions

### **Synchronizers**





Graziano<sup>™</sup> Synchronizer DC 95/100







Graziano<sup>™</sup> Gears

Graziano<sup>™</sup> Shaft

**Powershift Clutches** 





Graziano<sup>™</sup> Powershift Units

-05

Graziano<sup>™</sup> Powershift Clutches





Fairfield<sup>®</sup> Custom Gears



Graziano<sup>™</sup> Synchronizer TC 102/110/118







Graziano<sup>™</sup> Ring Gears

**Bevel Sets** 



Graziano<sup>™</sup> Crown Wheel and Pinion



Graziano<sup>™</sup> Bevel Gear

Graziano<sup>™</sup> Synchronizer

CSS





### **Combine Harvesters**



Spicer<sup>®</sup> Double Universal Joint 93B35 Wing<sup>™</sup> Series 7C



Spicer

### **Forklifts**



Spicer<sup>®</sup> Wing<sup>™</sup> Series 5C

**Compact Wheel Loaders** 

Spicer<sup>®</sup> Centered Double Cardan 2015-CDC

**Forestry Applications** 

Spicer SPL55

7C with Bearing Support

### **Mining Trucks**



Spicer<sup>®</sup> Wing<sup>™</sup> Series 14C



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## Motion Systems

With global expertise in the design and manufacturing of high-efficiency technologies for industrial and stationary equipment applications, Motion Systems fully integrates into Dana offer Brevini<sup>™</sup> gearboxes, winches and hydraulic solutions, PIV<sup>™</sup> extruders drives, GWB<sup>™</sup> industrial driveshafts, Fairfield® custom gears. Supported applications include on- and offshore, equipment, green technologies, mining, heavy industries, and earthmoving.

### Brevini<sup>™</sup> Planetary Gearboxes



S-Range



Industrial Slewing Drives



Industrial	and E-Range	Planetary (	Jearboxes

Range	Nominal Torque [Nm]	Range	Nominal Torque [Nm]	Range	Nominal Torque [Nm]
S300-S20000	34,000-2,170,000	RPR030-RPR2050	5,000-24,000	E10-E260	1,300-25,000
		SLS300-SLS850	34,000-200,000	EM1010-EM1320	1,000-24,000

### Brevini<sup>™</sup> Helical and Bevel Helical Gearboxes





Helical Bevel Helical Gearbox

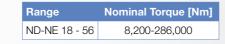
Posired<sup>™</sup> 2

Range	Nominal Torque [Nm]	Range	Nominal Torque [Nm]
E2H-E3H- E4H-E3B- 10,000-290,000	PC-PD-PE-PLC-PLD 60 - 91	340,000-1,100,000	
E4B-E3C- E4C 18 - 56		PB / PLB 16 - 45	5,700-113,000



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### Brevini<sup>™</sup> Gearboxes



Range	Power [Kw]
ML32 - 52	10-100
B580 - 602	30-55
RD33 -52	6-12

Brevini<sup>™</sup> Plano Helical Gearboxes



Range	Max Line Pull at First Layer [kg]	Range	Max Line Pull at First Layer [kg
DW 050-090	500-900	BWT 10.000-30.000	10,000-30,000
BWE 015-160	1,500-16,000		

### GWB<sup>™</sup> Industrial Driveshaft

B7



### **Driveshafts for Industrial Applications**

Range	Torque Range Tcs [Nm]	Flange Diameter [mm]
687/688-598	35 up to 21,500	00-225 / 600-1,300
687-688	2,400-35,000	100-225
587	43,000-57,000	225-285
390/392/ 393/492	60,000-1,170,000	225-550
498/598	210,000-15,000,000	600-1,200

Keep Driveshaft - Special Design super short coupling, tunnel shaft, high speed design, carbon fiber tube electrical insulation, remote lubrication, automatic lubrication, condition monitoring





**Brevini<sup>™</sup> Gearmotors** 



### Gearmotors

Range	Nominal Torque [Nm]
M, N, K, D 00-97	50-18,000





### Winch Drives

Range	Max Output Torque [Nm]
PWD 2100-31100	10,000-110,000
SLW 300-850	85,000-190,000
SMW 1200-3500	300,000-850,000
RCW 908-913	80,000-130,000

### Brevini<sup>™</sup> Pump Drives

	Range	Nominal Power [Kw]
4	BZ265	110-130
Pr-	BZ290	170-190
	BZ340	220-240
	BZ470	380-480



## Motion Systems

### Brevini<sup>™</sup> Pumps



Axial Piston Pumps, Variable Displacement, Closed Loop

Range	Displacement [cc/rev]	Max Pressure [bar]	Range	Displacement [cc/rev]	Max Press [bar]
MD10V	14-64	250	S5AV	32-93.8	350
HD1	55	450	H1V	54.8-225.1	350
S6CV	75-128	400			





Axial Piston Pumps, Fixed Displacement, Open Loop

H1C 6.1-225.1 350	Range	Displacement [cc/rev]	Max Pressure [bar]
	H1C	6.1-225.1	350
SHIIC 10.3-178.1 430	SH11C	10.3-178.1	430

Range	Displacement [cc/rev]	Max Pressur [bar]
OT series 1 - 2 -3	0.73 – 90	270
Hercules gr 2	4.1 – 30	270

Brevini<sup>™</sup> Valves





Bankable Valves

CDC3 -CD3M - CD3

CX3 - CXQ3 - CXDH - CFS3

Max Flow [l/min]

80

55

Туре

ON/OFF

Proportional

Range

Pre-Compensated Directional Control Valves

Range	Inlet Flow [l/min]:	Max Pressure [bar]
HPV 41- 77-310	160-250-600 (*)	370-370-370

(\*) = per Inlet Section



### **CETOP** Valves

Range	Inlet Flow	Max Pressure [bar]
Size 2 (NG4) – Size 8 (NG25)	up to 600 [l/min]	up to 400 bar

Axial Piston Pumps, Variable Displacement, Open Loop

Э	Range	Displacement [cc/rev]	Max Pressure [bar]	
	S5AV	32-93.8	350	
	H1V	54.8-225.1	350	



### Gear Pumps, Fixed displacement, Open Loop

/lax Pressure [bar]	Range	Displacement [cc/rev]	Max Pressure [bar]	
350	OT series 1 - 2 - 3	0.73 – 90	270	
430	Hercules gr 2	4.1 – 30	270	
	Silent plus gr 2	4.1 - 30	250	







Axial Piston Motors, Variable Displacement, Bent Axis

Orbital Motors, Gerotor and Roller

Axial Piston Motors, Variable Displacement, Swashplate

Range Displaceme [cc/rev]

Displacement Max Pressure [cc/rev] [bar] Range SH7V/VR 61-216 430 SH9V 62-216 430



Range

OT series 1 - 2 - 3

Hercules gr 2

Range	Displacement [cc/rev]	Max Pressure [bar]
BGM, BG, BR	13-400	225, 165, 175
HR, HT	80-500	210
AR, BRZV	50-400	210-175

### Brevini<sup>™</sup> Power Units





Mini Powerpacks

Motorpumps

Range	Туре
MC	With 4 cavities for single and double acting circuits
FP	With flexible design thanks to multiple valve seats. Several circuits layout available
DT	Custom Mini Powerpack for presses / telescopic dock levellers
MK	Custom Mini Powerpack for hanged/swing lip dock levellers



Fairfield	Custom	Drives
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Jacking System Drives

Tram System Drives

Range	Max Jacking Torque [Nm]
S60A-S2000	82,000-2,260,00





t	Max Pressure [bar]
	400

### Axial Piston Motors, Fixed Displacement, Bent Axis

Range	Displacement [cc/rev]	Max Pressure [bar]
H1C	6.1-225.1	350
SH11C/CR	10.3-178.1	430

### Gear Motors, Fixed Displacement

Displacement [cc/rev]	Max Pressure [bar]
0.73 – 90	270
4.1 – 30	270



### Micro Powerpacks

Range	Туре	
MR	Micro Powerpack for space demanding applications, 3 cavities for single and double acting circuits	
MW	Micro Powerpacks for double acting circuits with reversible pump	



Transfer Case



**Custom Drive Components** 

## **Electrification Capabilities**

Dana's comprehensive portfolio of drive and motion technologies helps OEMs efficiently transition toward electrification. Our multi-disciplinary team of engineers develops turnkey solutions ranging from plug-and-play components to fully integrated systems.



**EV** Components







Low-Voltage Motors

Low-Voltage Inverters

e-Drive





High Efficiency Transmission High Efficiency Transmission



e-Powershift Transmission e-Powershift Transmission



High-Voltage Motors



High-Voltage Inverters





e-Axle Heavy

EHPS System





e-Hub Drive Compact



e-Hub Drive Heavy

## **Electronics and Mechatronics**

e-Motion

e-Axle Compact



e-Slew Drive



e-Hydraulic Powerpack

**Electronic Control Units** 

**Force Sensors** 



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**On-engine Generators** 

High-Voltage Traction Systems



e-Software



Inclinometer

Angle Transducer

## System Solutions

Dana is a world-class collaborator with OEMs in delivering innovative, best-in-class engineering solutions. With resources located near our customers, we can leverage our core competencies in systems development to produce ground-breaking technologies that boost business performance.

Our systems approach is combined with our industry-leading portfolio of advanced technologies to help OEMs maximize the value of their offerings and find a better way forward.

### **System Thinking**

## We adopt a holistic perspective

to systems that fortifies our offerings

### **System Contents**

## We develop systems

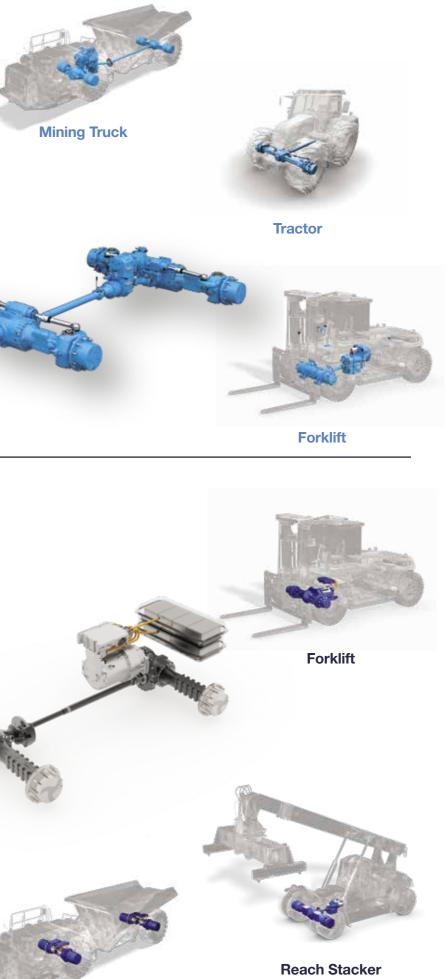
by using our deep portfolio of innovations to address our customers' needs

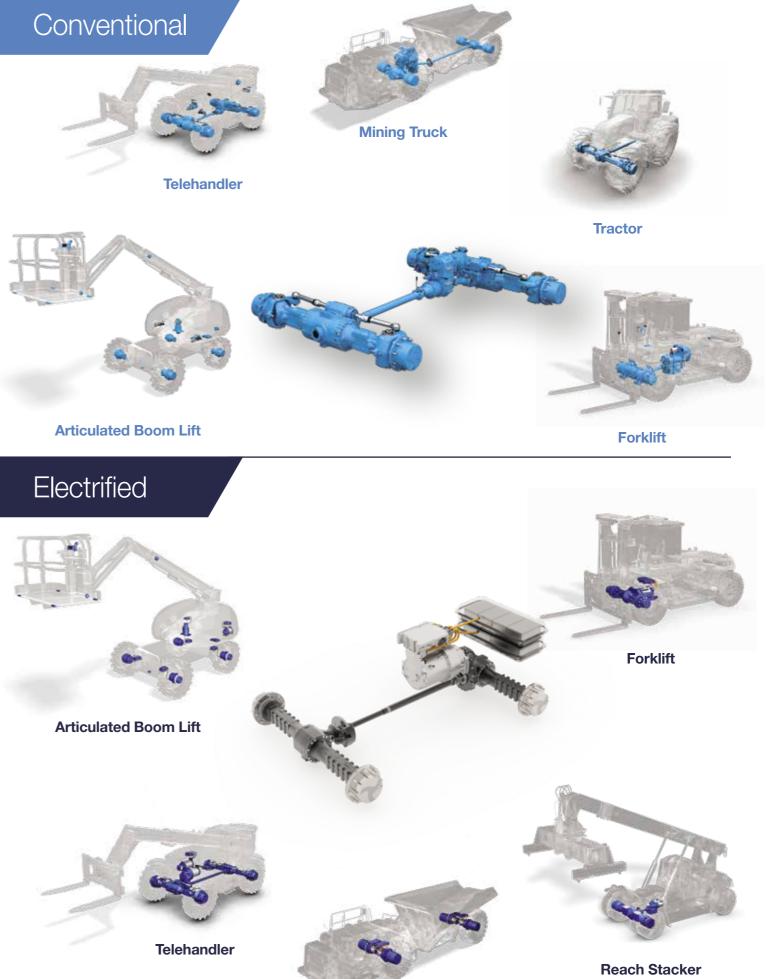
### **Knowledge sharing**

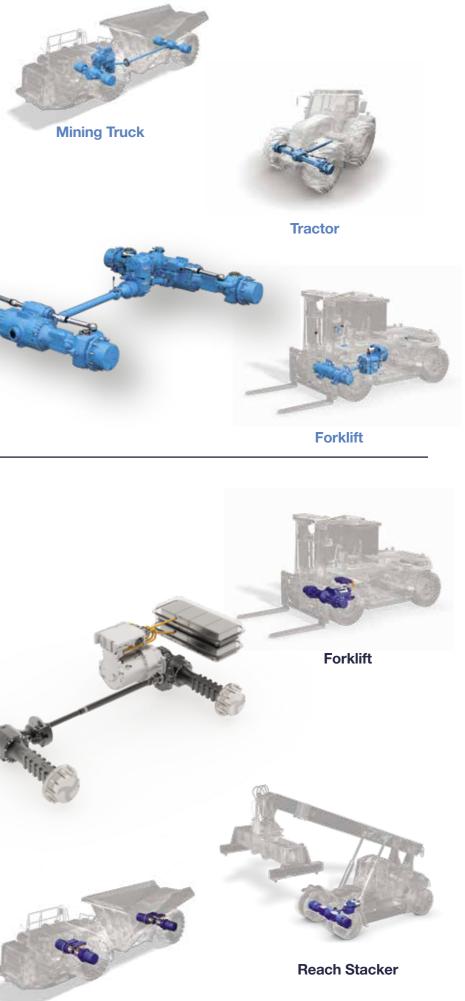
Our culture of continuous improvement

enables our systems engineering teams to share best practices across markets and geographies









Think Why, Think Wider, Think Systems

## **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 is the key to serving 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, service and assembly centers and distribution facilities.



Our strength is being over six continents thanks to our global logistic network.

## **Aftermarket Services**

Our global expertise is delivered to customers at a local level through a constantly growing and improving aftermarket network. Strategically placed service centers provide solutions tailored to individual specifications by an experienced on-the-ground support team. We meet customer needs in every region, on every platform.

## Genuine parts

Dana service parts are manufactured by Dana to the same high standards as original equipment (OE), because they are OE genuine parts. When a part is replaced a complete interchangeability with existing parts provides total product compatibility, with no change in part numbers.

A non-original component can lead to significant vehicle costs down the road. We protect your vehicle durability and performance.

## Dana Distribution Centers

Dana's global network of distribution centers, located in Europe, Americas, Asia and Australia, offer efficient service points supporting regional customer service, inventory, logistics and packaging operations.







## Danaaftermarket.com

### **E-Commerce Platform**

A technology enabled e-commerce platform that brings Dana's global off highway network of distribution centers, products, services and premium brands to your device 24/7 to make better decisions, speed up your operations and ease doing business with Dana.

Using Danaaftermarket.com you can quickly:

- Search for part level detail
- View global availability in real time
- · Place orders from your phone, desktop or tablet
- · Access educational brochures, videos and training
- Order management documentation communicated in real time
- API developer portal enables cross platform integration and real time data exchange

### Spicer<sup>®</sup> Drivetrain catalog

- The new online Spicer® product catalog features the extensive off-highway axles and driveshaft portfolio.
- Quickly and conveniently locate products by model type
- or part number through the search functionality
- and access to usage descriptions and technical details
- to select optimal products for every aftermarket need.
- The product database is always updated as new technologies become available.

## Market-Driven Innovation

**Off-Highway Performance Expectations** 

Safety

Productivity

Maneuverability

Durability

Serviceability

## Total Cost of Ownership

### About Dana Incorporated

Dana is a leader in the design and manufacture of highly efficient propulsion and energy-management solutions for all mobility markets across the globe.

The company's conventional and clean-energy solutions support nearly every vehicle manufacturer with drive and motion systems, electrodynamic technologies, thermal, sealing, and digital solutions.

### About Dana Off-Highway Drive and Motion Systems

Dana delivers fully optimized solutions to customers in the construction, agriculture, material handling, mining, and industrial markets.



Dana.com/oh Dana-industrial.com/contact-us

### Application Policy

Capacity ratings, features, and specifications vary depending upon the model and type of service. Application approvals must be obtained from Dana; contact your representative for application approval. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.