



# Off-Highway **Fluid Power** Technologies

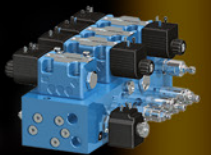
Hydraulic and Electronic solutions for Mobile and Stationary working functions



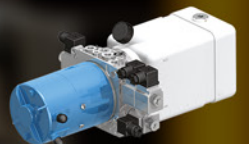
**Pumps**



**Motors**



**Valves**



**Power Units**



**Electronics**



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 more than 30,000 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.

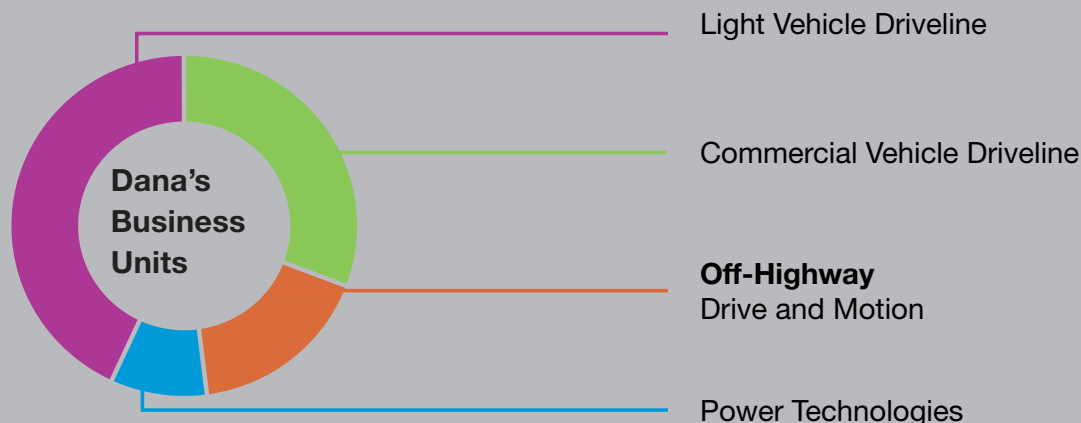
Each day, in both large and small ways,

**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

# Off-Highway Sectors

## Drivetrain Systems



**SPICER®**

*Drivetrain Systems*

## Motion Systems



**BREVINI®**

*Motion Systems*



## Thermal Management



**LONG®**

*Thermal Products*

## Sealing



**VICTOR REINZ®**

*Sealing Products*

## 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 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.





# Moving forwards is part of our history

From the early years, when the Brevini brothers founded the company in Reggio Emilia, manufacturing gearboxes, mostly for farming equipment, to today's global concern in the form of Dana Motion Systems Italia, the company has built its success on a future-oriented business strategy and investments in technology. Expansion into global markets and diversification based on increasingly broad expertise have led to milestones spanning decades from the 1960's up to today.

SAM Hydraulic, Hydr-App and Aron were established respectively in 1973, 1974 and 1978. Expansion and booming exports marked the 80's and culminated in the founding of Brevini Group Holding company in 1987 with turnover reaching significant figures by the end of the decade. 1995 saw the beginning of Brevini Hydraulics and in 2003 Brevini Fluid Power

was established. Later in that decade, acquisition of BPE Electronics (2009) and OT Oiltechnology (2010) increased the group's scope through a wider product portfolio, with an aim to providing customers with a complete range of solutions as opposed to just selling isolated componentry. A year after setting up One Brevini in 2016, the next major step in Brevini's forward-moving history was to have the greatest impact.

With the recent acquisition by Dana Incorporated, today's Fluid Power offering gains in strength and benefits from a significantly broader product portfolio. Together with new synergies across the entire company, in particular for mobile applications and in the Off-Highway segment, growth will be as much a part of the past as of the present and future.



## Highlights

## Employees

>460



## Distribution Centre

1



## Export

65%



## Production Facilities

4



## Production Capacity

2 Mill / Year  
Pieces





# New synergies to enhance our offering

Greater opportunities have come from the recent combination of Brevini into Dana's business activities worldwide. The Fluid Power offering has been strengthened with a larger product portfolio and evident synergies within the group are building blocks for the future.

While an increased Fluid Power portfolio will benefit the Off-Highway business across numerous industries such as construction, mining, material handling and agriculture, Brevini solutions will spread to all mobile applications without being limited to one market segment.

Distributors and customers alike now have the chance to source all key products from one supplier. The variety is wide

in terms of standard solutions, while the company's know-how is now strong enough to develop customized products for specific applications. Simplifying the customer supply chain brings advantages that include optimization of timing, resources and costs. This leads to savings for customers benefitting from a single point of contact, bulk shipping opportunities and single order management for a full range of products.

Fluid Power's global sales network is now able to ensure direct service at a local level thanks to its numerous SACs (Service and Assembly Centers) and local distributors.

2003  
Brevini Fluid Power  
was established



2010  
Acquisition of  
OT

2009  
Acquisition of  
BPE

2016  
One Brevini



2017  
DANA



## Dana - your single supplier

Dana's engineering capabilities, broad product range, and focus on collaboration with customers allow us to deliver optimal solutions with the performance required to support high levels of efficiency. As a single supplier with a unique portfolio of Brevini® motion systems and Spicer® drivetrains, we can also help to optimize supply chains.



**BREVINI®**  
Motion Systems



**SPICER®**  
Drivetrain Systems

DANA  
SYNERGIES

BROADER  
PRODUCT  
PORTFOLIO

ONE-STOP  
SUPPLIER

GLOBAL  
SCOPE  
LOCAL  
FOCUS

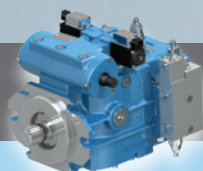


# Advanced Fluid Power Technologies

The Dana Motion Systems range of fluid power solutions gives a comprehensive offering for mobile and industrial applications.

## Pumps

### Axial piston pump variable displacement



#### Closed loop

Pcont = 250 bar – 420 bar

Series	cc/rev	rpm
MD10V 014	14	3.600
MD10V 018	18	3.600
MD10V 021	21	3.600
MD10V 028	28	3.600
MD10V 046	46	3.600
MD10V 050	50	3.600
MD10V 064	64	3.600
HD1 055	55	3.800
S6CV 075	75	3.400
S6CV 128	128	2.850

### Axial piston pump variable displacement



#### Open loop

Pcont = 250 bar – 350 bar

Series	cc/rev	rpm
S5AV 032	32	3.150
S5AV 045	43,3	2.700
S5AV 050	49,7	3.000
S5AV 063	64	2.500
S5AV 075	75	2.600
S5AV 093	93,8	2.350
H1V 055	54,8	2.600
H1V 075	75,3	2.300
H1V 108	107,5	2.000
H1V 160	160,8	1.800
H1V 226	225,1	1.500

### Axial piston pump fixed displacement

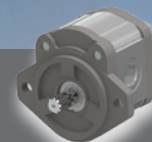


#### Open loop

Pcont = 350 bar

Series	cc/rev	rpm
H1C 006	6,1	5.000
H1C 226	225,1	1.600
Pcont = 430 bar		
SH11C 010	10,3	3.150
SH11C 016	16	3.150
SH11C 020	19,9	2.500
SH11C 030	31,9	2.500
SH11C 045	46	2.245
SH11C 055	56,3	2.000
SH11C 063	63,3	2.000
SH11C 075	77,8	1.800
SH11C 090	86,2	1.800
SH11C 108	108,4	1.600
SH11C 125	124,8	1.550
SH11C 160	163,9	1.450
SH11C 180	178,1	1.450

### Gear pumps



Series	cc/rev	pmax [bar]
OT 050 - GR 0.5	0,18 – 1,52	250
OT 100 - GR 1	0,73 – 9,9	300
OT 150 - GR 1.5	3,7 – 7	300
OT 200 - GR 2	4,2 – 30	300
OT 200 silent - GR 2	4,2 – 30	300
Hercules - GR 2	4,2 – 28	330
OT 300 - GR 3	22 – 90	300



# Full Range at a Glance

The complete product line includes: axial piston and gear pumps and orbital motors; cetop, proportional, cartridge, and modular valves; hydraulic valves, joysticks and electronic modules; standard and customized mini hydraulic powerpacks; electronics including sensors and load cells; and hydraulic circuits for industrial and mobile applications. These products represent four decades of global technological expertise in fluid power.

## Valves

### Directional valves



#### Open center

**Pcont = 350 bar – 400 bar**

Series	Inlet flow [l/min]	
<b>DCV 20</b>	40	Monoblock
<b>DCV 40</b>	70	Monoblock
<b>DCV 30</b>	40	Section
<b>DCV 50</b>	70	Section
<b>DCV 80</b>	120	Section
<b>DCV MG</b>	230	Section

### Stackable valves



#### Size 6 On Off and proportional

**Pmax = up to 310 bar**

Series	Flow max [l/min]	
<b>CDC3</b>	30	On/Off compact
<b>CD3</b>	40	On/Off
<b>CD3L</b>	40	On/Off LS signal
<b>CX3</b>	up to 20	Proportional control
<b>CXQ3</b>	up to 25	Proportional flow control

#### Size 6 Pre - Post compensated

**Pmax = up to 310 bar**

Series	Regulated flow [l/min]	
<b>CXDH3</b>	up to 35	Proportional pre compensated
<b>CDH3</b>	1,3 – 26	Proportional pre compensated
<b>CFS3</b>	60	Proportional Flow Sharing

Modular options available

#### Size 10 On Off

Series	Flow max [l/min]	
<b>CD5</b>	80	On/Off compact

### Proportional directional valves



#### Open and closed centre version

**Max working pressure = 370 bar**

Series	Inlet flow [l/min]	Section flow [l/min]
<b>HPV 41</b>	160	130
<b>HPV 77</b>	240	190
<b>HPV310</b>	600	550

Wide range of electric controls PWM

Available also in ATEX version

Wide range of joysticks single and multi-axes (up to four) with additional control functions

### Cetop valves



Series	Flow max [l/min]	Pressure [bar]
<b>Cetop 2/NG04</b>	20	250
<b>Cetop 3/NG06</b>	60	350
<b>Cetop 5/NG10</b>	120	350
<b>Cetop 7/NG16</b>	300	350
<b>Cetop 8/NG25</b>	600	320

#### Atex valves

<b>AD3 XG - XD</b>	60	250
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#### Proportional - Cetop valves

<b>Cetop 2/NG04</b>	10	250
<b>Cetop 3/NG06</b>	40	350
<b>Cetop 5/NG10</b>	100	320

#### Subplates

<b>BS/BM</b>	20 – 600	250
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#### Circuit selector

<b>ADL/CDL</b>	80	320
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# Advanced Fluid Power Technologies

## Motors

### Axial piston motor variable displacement



#### Open and closed loop

Pcont = 430 bar

Series	cc/rev	rpm
SH7V-R 055	61	4.450
SH7V-R 075	80,6	4.000
SH7V-R 108	112,5	3.550
SH7V-R 160	160,8	3.100
SH7V-R 200	216	2.900
SH9V 061	62	4.450
SH9V 085	85,3	4.000
SH9V 115	115,7	3.550
SH9V 165	166,2	3.100
SH9V 215	216	2.900

Motors can swivel to zero displacement

### Axial piston motor fixed displacement



#### Open and closed loop

Pcont = 350 bar

Series	cc/rev	rpm
H1C 006	6, 1	5.000
H1C 226	225,1	1.600

Pcont = 430 bar

Series	cc/rev	rpm
SH11C 010	10,3	8.000
SH11C 016	16	8.000
SH11C-R 020	19,9	6.300
SH11C-R 030	31,9	6.300
SH11C-R 045	46	5.600
SH11C-R 055	56,3	5.000
SH11C-R 063	63,3	5.000
SH11C-R 075	77,8	4.500
SH11C-R 090	86,2	4.500
SH11C-R 108	108,4	4.000
SH11C-R 125	124,8	4.000
SH11C-R 160	163,9	3.600
SH11C-R 180	178,1	3.600

### Orbital motor

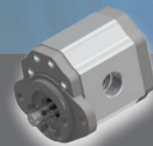


#### Open and closed loop

Pcont = 280 bar – 350 bar

Series	cc/rev	rpm Max	Torque max. [Nm]
BGM	13 - 50	1.935	83
BG	50 - 400	1.530	400
BR	50 - 400	970	750
HR	80 - 400	995	980
HT	160 - 500	780	1.370
ARS/ARF	50 - 400	970	510
BRZV (CTM)	50 - 400	775	292

### Gear motors and Flow Dividers



Series	cc	pmax [bar]
OT 100 – GR1	1,55 – 9,9	300
OT 200 – GR2	4,2 – 30	300
OT 200 silent – GR2	4,2 – 30	300
Hercules – GR2	4,2 – 28	330
OT 300 – GR3	22 – 90	300

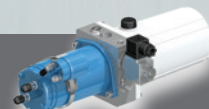
## Power Units

### Mini powerpacks



Series	Pump/cc	Motor
MC2 – MC4	0,25 – 9,8	DC/AC-B14
FP	0,25 – 9,8	DC/AC-B14
DT	0,25 – 9,8	DC/AC-B14
MK1 – MK2	Dockleveler units	
EP - MP	Pump-DC motor combinations	

### Micro powerpacks



Series	Pump/cc	Motor
MR2 – MR4	0,25 – 1,26	DC/AC-B14
MW – MW1	0,25 – 1,26	DC/AC-B14



## Ancillaries

### Gearboxes



Series	Ratio	Power (kW)
<b>ML 32</b>	1:1 up to 1:3,8	10
<b>ML 52</b>	1:1 up to 1:3,8	30
<b>B580</b>	1:1 up to 1:4,8	30
<b>B585</b>	1:1 up to 1:5	40
<b>B600</b>	1:1 up to 1:3,8	50
<b>B502</b>	1:1 up to 1:3,8	55
<b>B582</b>	1:1 up to 1:3,8	55
<b>B602</b>	1:1 up to 1:3,8	100
<b>RD33</b>	0,66 up to 0,26	6
<b>RD42</b>	0,66 up to 0,29	6
<b>RD52</b>	0,66 up to 0,26	12

### Clutches



Series	Mechanical	Electro mech.	Speed max. [rpm]	Torque max. [Nm]
<b>IM05</b>	X		2.000	9
<b>IM1</b>	X		2.700	19
<b>IM2</b>	X		2.700	60
<b>IE10</b>		X	5.000	10
<b>IE13</b>		X	5.000	13

## Electronics

### Electronic control systems



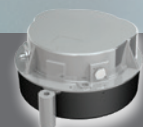
Type	Description	Technical features
<b>BM/BMS</b>	Programmable ECU	from 15 to 177 I/Os in one ECU
<b>M82/M92</b>	Limiting device	load, working area or moment limitation up to PLd EN13849
<b>VPL</b>	Bar led display	load, moment limitation up to PLb EN13849
<b>IDXY</b>	Tilt switch	tilt limitation up to PLd EN13849

### Force sensor



Type	Description	Technical features
<b>TPE/TT/TC</b>	load cells	custom design available, available redundant
<b>TD</b>	Strain gauge transducer	moment detection
<b>TPV</b>	Pressure sensor	up to 600bar, PLdEN13849 available

### Position sensor



Type	Description	Technical features
<b>TL/AS series</b>	draw wire position sensor	length and angle detection up to 18m and 360°, available redundant
<b>TAC/SP</b>	Angle sensor	angle detection 1 or 2 axis, available redundant

### Human machine interface



Type	Description	Technical features
<b>OPUS</b>	Graphic display	from 4,3" to 12" size
<b>BJ</b>	Joystick	custom design available



# 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 in today's ever-changing market conditions, top-tier suppliers must have a global perspective on megatrends and technology advancements that can be adapted and deployed to meet local requirements and end-user expectations. At Dana, we continue to deepen our commitment to global markets by making investments that optimize our already substantial footprint, extensive market knowledge, and established supply chain.

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.

## Safety First: All Day Every Day

### Workplace Safety

Dana is committed to the safety of its employees. Our vision for workplace safety is "Safety First: All Day Every Day." This vision is guided by our safety policy, which applies to all employees, visitors, and contractors working at our sites. We believe in providing a safe working environment for all stakeholders and are committed to continuous improvement in our occupational health and safety performance. Dana's safety policy provides organizational commitments that are core to our business focus on safety as committed by the highest levels of our organization.



# 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.

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## Electrification

Dana's comprehensive strategy for electrification in off-highway markets begins with a foundation of enabling original-equipment manufacturers 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 are also currently available.





